

Final paragraph (h)(3)(i)(A) requires respirators for use in non-emergency situations to be inspected before each use and during cleaning. For respirators designated for use in an emergency situation, final paragraph (h)(3)(i)(B) requires that they be inspected at least monthly and in accordance with the manufacturer's instruction. In addition, emergency respirators must be examined to ensure that they are working properly before and after each use. Examining respirator performance before and after each use is not intended to be as extensive and thorough a process as respirator inspection. A basic examination conducted prior to each use will provide assurance to the wearer that the respirator which he/she is about to don in an emergency situation will work properly, e.g., that the cylinders on the SCBA are charged, that air is available and flowing. This examination can be done fairly quickly, and OSHA believes that this added measure of employee protection is both necessary and appropriate.

Respirators used for escape only are to be inspected prior to being carried into the workplace (paragraph (h)(3)(i)(C)). The Dow Chemical Company (Ex. 54-278) addressed the inspection of emergency escape respirators, stating, "Emergency escape respirators such as mouthbit respirators, usually stored in the box or bag they come in, do not need to be inspected monthly." OSHA agrees with this statement. Mouthbit or other emergency escape respirators are carried by an individual worker into the workplace for personal use in an emergency, and must be inspected for proper condition prior to being carried into the workplace. Additional monthly inspections of emergency escape respirators that are stored for future use are unnecessary, since they will be inspected prior to being carried into the workplace. Final paragraph (h)(3)(i)(C) therefore specifies that "escape-only" respirators need only be inspected before being carried into the workplace.

Although no commenters were opposed to the inspection requirements, some participants raised the issues that are discussed below with respect to inspection frequency and procedures. When respirators are inspected, the final rule (paragraph (h)(3)(ii)(A)) requires that the inspection include an examination to ensure that respirators are working properly, including an examination of the tightness of connections and the condition of the various components. Two comments were made with respect to respirator inspection procedures. John Clarke of Electronic and Information Technologies (Ex. 54-162) stated that

checking for proper function (examination to ensure that respirators work properly) presents a dilemma if use is to include sanitizing the facepiece. He pointed out that SCBAs reserved for use by multiple persons presents a special problem. Likewise, John O'Green of American Electric Power (Ex. 54-181) asked that "functional check" be better defined and clarified. He stated that requiring the actual activation of the respirator, including the flow of air to the facepiece, could be time consuming for all the emergency respirators in their facilities. OSHA does not intend that the respirator be physically placed on the employee to examine the respirator to ensure that it is working properly. Visual inspection can detect factors that would interfere with proper performance, e.g., distortion in shape (often the result of improper storage), missing or loose components, blockage, and improper connections. Alarms can also be examined without actually putting the respirator on the employee. In addition, examining elastomer parts for pliability and signs of deterioration, as required by final paragraph (h)(3)(ii)(B), can be performed without wearing the respirator.

Under paragraph (h)(3)(iii) of the final rule, SCBAs must be inspected monthly. The employer must ensure that the cylinders are fully charged. Recharging is required when the pressure falls below 90 percent of the manufacturer's recommended pressure level. The Westminster, Maryland Fire Department (Ex. 54-68) strongly recommended that the apparatus be inspected at the beginning of each shift or workday rather than monthly. OSHA notes that the final rule specifies only the minimum requirements for an effective respiratory protection program. Employers, however, are encouraged to exceed these minimum criteria if, by doing so, employee protection and operating efficiency are enhanced.

The final provision for recharging air and oxygen cylinders for SCBAs in paragraph (h)(3)(iii) is unchanged from proposed paragraph (h)(3)(i)(C). Although no commenters disagreed with this provision as proposed, a few commenters (Exs. 54-6, 54-220) asked OSHA to clarify the requirement that SCBA equipment be maintained in a fully charged state and recharged when the pressure falls to 90% or less of the manufacturer's recommended pressure level. By way of example, OSHA notes that if the manufacturer states that the cylinder is fully charged at 100 psi, the cylinder must be recharged when the pressure falls to 90 psi (i.e., 90% of the fully charged level). The 90 percent

level was selected to ensure that sufficient air remains in the cylinder to allow emergency responders to perform their required duties in a contaminated or oxygen-deficient atmosphere and still have sufficient air available to escape from these conditions. The 90 percent level, and the requirement that cylinders be recharged once the pressure falls below 90 percent, was also recommended by the American Industrial Hygiene Association (Ex. 54-208).

In two separate submissions to the record (Exs. 54-121 and 54-135), Consolidated Engineering Services asked what type of training is required for employees who inspect respirators used for emergency response. OSHA notes that, under final paragraph (k), the specifics of an appropriate training program are left to the discretion of the employer. Regarding respirators for emergency use, final paragraph (k)(1)(iii) requires that employees be trained in how to use the respirator effectively in emergency situations, while final paragraph (k)(1)(iv) requires training on how to inspect the respirator. As these paragraphs make clear, OSHA requires the employer to develop appropriate training programs for employees who inspect emergency respirators.

As part of the inspection process for respirators that are maintained for use in emergencies, paragraph (h)(3)(iv) of the final standard requires certification of the inspection. Documentation of certification includes the date of inspection, 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 tagged to the respirator or its storage compartment, or otherwise stored in the form of inspection reports (i.e., paper or electronic), and be maintained until replaced following a subsequent certification.

This requirement was included in the proposal, and several comments addressed it. Dow Chemical (Ex. 54-278) stated that it supports the proposed requirement. The American Petroleum Institute (Ex. 54-330) recommended that OSHA require "identification of the person that made the inspection" in lieu of a signature. However, OSHA believes that the inspector's name or signature is a clear and precise identification, and therefore has retained this requirement in the final rule as proposed.

The final provision of paragraph (h) deals with respirator repairs and adjustments. Final paragraph (h)(4) provides that respirators that fail

inspections, or are otherwise defective, are to be removed from service and discarded, repaired, or adjusted according to the specified procedures. In addition, the employer shall ensure that repairs or adjustments to respirators are made only by persons appropriately trained to do so, and that they use only the respirator manufacturer's NIOSH-approved parts that are designed for the particular respirator. The repairs also must be made in accordance with the manufacturer's recommendations and specifications. 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.

Several comments were submitted to the record regarding this particular provision. Consolidated Engineering Services (Exs. 54-121 and 54-135) and the Florida Department of Labor and Employment Security (Ex. 54-79) asked what type of training is required for employees who repair and adjust respirators. Motorola (Ex. 54-187) also addressed this point, but added that specialized training for most respirator repair work was not necessary, and that the training program required by the standard should provide employees with sufficient expertise to perform the necessary repair work, or at least to recognize when repair is beyond their ability. Another commenter (Ex. 54-293) asserted that, depending on the manufacturer's recommendation, a trained person may or may not be necessary to make repairs; for example, no training is required to replace a broken respirator strap.

In response to these concerns, OSHA does not believe that it is necessary or appropriate to specify in detail in the final rule the type of training that is required to qualify a person to repair and adjust respirators. However, because of the important health-related functions of respirators, the person making the repair needs to be properly trained. OSHA expects that such repair will often be performed by the manufacturer, particularly if special expertise is required. Where this is not the case, the employer must ensure that the employee or person repairing the respirator has the skills necessary to conduct the appropriate repair and adjustment functions. The use of the term "appropriately trained" refers to an individual who has received training from the respirator manufacturer or otherwise has demonstrated that he/she has the skills to return the respirator to its original state of effectiveness.

The AFL-CIO (Ex. 54-428) and Service Employees International Union (SEIU) (Ex. 54-455) recommended that OSHA require employers to tag as "out of service" those respirators that fail inspections. OSHA agrees that some means must be available for ensuring that only properly functioning respirators are introduced into the workplace. However, OSHA believes that the decision on how to handle respirators that fail inspection is most appropriately addressed in the employer's respirator protection program, as required under final paragraph (c). Specifically, final paragraph (c)(1)(v) would allow such procedures to be tailored to satisfy the needs of a particular workplace.

The SEIU (Ex. 54-455) recommended that OSHA require employers to keep an adequate supply of cartridges and other routine replacement parts in stock and readily accessible to employees so that they can replace needed parts. OSHA does not believe it is necessary to specify that employers must maintain an adequate number of spare parts. Final paragraph (h)(4) requires that defective respirators be removed from service unless they are repaired or adjusted, and an employer who does not keep on hand sufficient parts to allow respirators to be repaired will need to remove those respirators from service until suitable repairs can be made. Thus, an employer who does not maintain an adequate inventory of parts will either need to keep extra respirators on hand or cease operations that require respirator use until parts can be obtained or installed.

Paragraph (i)—Breathing Air Quality and Use

This paragraph of the respiratory protection standard requires that breathing air for atmosphere-supplying respirators be of high purity, meet quality levels for content, and not exceed certain contaminant levels and moisture requirements. The paragraph sets performance standards for the operation and maintenance of breathing air compressors and cylinders, establishes methods for ensuring breathing air quality, and sets requirements for the quality of purchased breathing air.

Paragraph (i)(1) of the final standard applies to atmosphere-supplying respirators that are being used to protect employees, and requires that breathing air supplied to these respirators be of high purity. This same requirement for breathing air quality was included in proposed paragraph (i)(1). Both the prior and final rules refer to a number of standard references that establish

parameters for breathing air quality. For example, under (i)(1)(i), the final rule requires the employer to ensure that oxygen used for breathing purposes meets the requirements of the United States Pharmacopoeia (USP) for medical or breathing oxygen. This provision is the same as the requirement in OSHA's prior respiratory protection standard at paragraph (d)(1). The ANSI Z88.2-1992 respirator standard, in Clause 10.5.1, also requires that air be of high purity and that oxygen meet the USP requirements. Inclusion of this requirement in the final rule was strongly supported by the AFL-CIO (Ex. 54-428), which stated that the employer must ensure that "compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration is of high purity and in accordance with the specifications listed in [proposed paragraph] (i)(1)."

Under paragraph (i)(1)(ii) of the final standard, breathing air must meet at least the requirements for Type I—Grade D breathing air, as described in the ANSI/CGA G-7.1-1989 standard, which is the latest revision of that reference standard and the one currently used by OSHA when determining breathing air quality. Final paragraph (i)(1)(ii) identifies the specifications for the contents of Grade D breathing air: oxygen content (volume/volume) of 19.5 to 23.5 percent; hydrocarbon (condensed) concentration of five milligrams or less per cubic meter of air; carbon monoxide level of 10 ppm or less; carbon dioxide level of 1,000 ppm or less; and a lack of noticeable odor.

The OSHA respiratory protection standard adopted in 1971 referenced the then-current CGA G-7.1-1966 breathing air quality standard. In 1973, and again in 1989, the CGA, in conjunction with ANSI, revised the G-7.1 standard. The Grade D specification was changed as part of the 1989 ANSI revision, at which time the carbon monoxide level was reduced from 20 ppm to 10 ppm. The OSHA Directorate of Compliance Programs subsequently issued letters of interpretation in 1991 and 1992 that required employers to use the updated Grade D specifications for breathing air quality.

The proposal requested comments on whether acceptable respirator breathing air quality should continue to meet the specifications for Grade D breathing air described in the ANSI/CGA G 7.1-1989 standard. Commenters supported inclusion of a requirement for use of the 1989 Grade D breathing air values in the final rule (Exs. 54-141, 54-189, 54-267, 54-286, 54-408, 54-443). For example, the Tennessee Valley Authority (Ex. 54-189) and Norfolk Southern (Ex. 54-267)

supported the Grade D breathing air requirement, stating that, in their experience, the Grade D air they have been using is fully adequate and safe, and that OSHA should not adopt more stringent requirements across the board.

Modern Safety Techniques, Inc. (Ex. 54-141) supported maintaining the Grade D breathing air quality requirement but recommended that the OSHA rule not specify the year of the ANSI/CGA standard, because, for example, employers were confused when the CGA revised the ANSI/CGA G-7.1 standard in 1989 and the OSHA standard referred to an earlier version of that standard. However, the regulations governing the incorporation of documents by reference (1 CFR 51) require that the revision date of incorporated references be specified when they are included in any new or revised standard. Where incorporated references are used in final paragraph (i), therefore, the latest revision dates for these references have been used.

The Los Alamos National Laboratory (LANL) (Ex. 36-52) recommended that Grade E air rather than Grade D air be used since most air that passes the Grade D requirements will also pass Grade E requirements. The Grade E specifications narrow the range of permitted oxygen content from 19.5-23.5 percent to 20 to 22 percent oxygen and lower the allowable carbon dioxide level from 1000 ppm to 500 ppm. LANL gave no specific safety or health reason for OSHA to adopt this more stringent recommendation. The Service Employees International Union (Ex. 54-455), however, points out that Grade E air of reliable quality may be difficult for employers to obtain. In addition, OSHA is not aware of any problems that have occurred as a result of breathing Grade D air, and believes that the Grade D specifications will fully protect employees who use atmosphere-supplying respirators. Therefore, OSHA is not convinced a higher grade of air is required, and the final rule specifies Grade D air.

OSHA has been informed that NIOSH has been working with the National Aeronautics and Space Administration (NASA) on a new "liquid air SCBA" that may be submitted for NIOSH certification in the future. In its revision of the 42 CFR 84 respirator certification standard, NIOSH incorporated the CGA Commodity Specification for Air in the CGA's G-7.1-1966 standard to maintain the quality verification category for Type II liquid compressed air, which had been removed from the updated ANSI/CGA G-7.1-1989 standard. NIOSH included this specification because a liquid compressed air quality

category is needed for future evaluations of atmosphere-supplying respirators that use liquefied compressed air. NIOSH continues to recommend the use of the ANSI/CGA G-7.1-1989 standard for breathing air quality for currently issued respirator certifications.

Under paragraph (i)(2) of the final standard, employers are prohibited from using compressed oxygen in atmosphere-supplying respirators, including open-circuit SCBAs, that have previously used compressed air. This prohibition was proposed in the NPRM, and is intended to prevent the 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. Comments to the record (Exs. 10, 54-165, 54-208, 54-218) support this provision. Additionally, the prohibition is consistent with Clause 10.5.2 of the ANSI Z88.2-1992 standard.

Proposed paragraph (i)(3) would have prohibited the use of oxygen with supplied air respirators. This provision was intended to avoid the possibility of fires and explosions that can result when oxygen is used in high concentrations. However, some respiratory equipment is specifically designed to avoid fire and explosion hazards when used with oxygen in concentrations greater than 23.5%. Therefore, paragraph (i)(3) of the final standard specifies that oxygen in concentrations greater than 23.5% is to be used only with equipment designed specifically for oxygen service or distribution. Several commenters pointed out the need to specify a maximum oxygen concentration (Exs. 54-165, 54-208, 54-218, 54-219). Clause 10.5.2 of the ANSI Z88.2-1992 standard (Ex. 81) also states, "Oxygen concentrations greater than 23.5% shall be used only in equipment designed for oxygen service or distribution." OSHA agrees with the recommendations made by the AIHA (Ex. 54-208), 3M (Ex. 54-218), and Monsanto (Ex. 54-219) that the final rule adopt the maximum oxygen concentration language from the ANSI standard, and the final rule reflects this recommendation.

Final paragraph (i)(4) requires that breathing air for respirators provided from cylinders or air compressors meet certain minimum standards. Under final paragraph (i)(4)(i), cylinders must be tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (DOT) (49 CFR parts 173 and 178); these DOT regulations are also required for NIOSH respirator certification. The DOT regulations in

parts 173 and 178 cover the construction, maintenance, and testing of these compressed air cylinders, and are necessary to prevent the explosions that can result if high pressure breathing air cylinders rupture. The proposal referenced only 49 CFR part 178, but the AIHA (Ex. 54-208) recommended that the DOT requirements found in 49 CFR part 173 also be specified in the final rule because they apply to breathing air cylinders. Final paragraph (i)(4)(i) therefore includes a reference to part 173 in addition to part 178.

Paragraph (i)(4)(ii) of the final standard includes a provision requiring employers to ensure that cylinders of purchased breathing air are accompanied by a certificate from the supplier stating that the air meets the requirements for Type 1-Grade D breathing air contained in paragraph (i)(1)(ii) of the final standard. Employers must obtain a certificate of analysis of purchased breathing air from the supplier to ensure that its content and quality meet the requirements for Grade D breathing air. This will allow the employer to have assurance that the purchased breathing air being used by employees is safe. The proposal did not include a requirement for the certification of the quality of purchased breathing air. There was, however, support in the record (Exs. 54-234, 54-266, 54-273, 54-330, 54-408) for adding this requirement. For example, the American Petroleum Institute (Ex. 54-330) and Duquesne Light Company (Ex. 54-408) recommended that additional guidance, similar to that in ANSI Z88.2-1992, be provided to ensure the quality of purchased breathing air. Exxon (Ex. 54-266) stated that OSHA should not allow the direct blending of compressed nitrogen and oxygen gases by the employer to produce Grade D air, citing the "extreme consequences of having too little oxygen in a cylinder." Exxon further recommended that 100% of the cylinders be tested for oxygen content for all nitrogen/oxygen mixed cylinders (Ex. 54-266). The requirement that the employer obtain a certificate of analysis of purchased breathing air means that every cylinder will have been analyzed for oxygen content by the supplier and, therefore, the situation feared by Exxon will not arise.

Final paragraph (i)(4)(iii) requires that the moisture content of compressed air in air cylinders not exceed a dew point of -50°F (-45.6°C) at one atmosphere of pressure. This requirement will prevent respirator valves from freezing, which can occur when excess moisture accumulates on the valves. This provision has been revised from the proposed requirement to be consistent

with the latest versions of the standard references for moisture content of compressed breathing air, the ANSI Z88.2-1992 and ANSI/CGA G-7.1-1989 standards. Consistency between the required value and the standard references will avoid confusion in measuring moisture content and, consequently, will enhance employee protection. This dew point value, as the AIHA (Ex. 54-208) recommended, has been taken from the ANSI/CGA G-7.1-1989 specifications for Grade D air and replaces the 27 ml/m³ value for moisture content specified in the proposal.

Final paragraph (i)(5)(i) requires that compressors that supply breathing air are to be constructed and situated so that contaminated air cannot enter the air supply system. This provision from the prior standard is retained and also reflects the intent of the proposed requirement. The purity of the air entering the compressor intake is a major factor in the purity of air delivered to the respirator user. The location of the intake is most important, and must be in an uncontaminated area where exhaust gases from nearby vehicles, the internal combustion motor 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. Contaminated air or exhaust gases from internal combustion engines that are taken into the compressor are major hazards to the purity of breathing air from compressors, and these hazards occur with all compressors, not just oil-lubricated ones. Respirator users have died or been injured when the air intake was not properly located to avoid contaminants. Final paragraph (i)(5)(i), therefore, requires that air intakes for all compressors be located in a way that avoids entry of any contaminated air into the compressor.

Support for this requirement can be found in the Distler air compressor study (Ex. 32-1). This study recommended that engine exhaust gases should be piped upward or downwind from the compressor air intake, particularly where exhaust gases are not reliably dispersed, such as in partially enclosed spaces or in turbulent wind areas. The compressor exhaust piping used in the Distler study had to be repositioned several times to find a location where the exhaust gases would not be picked up by the compressor air intake. All of these findings reinforce the importance of locating the compressor's air intake in an area that ensures that only high-quality air can be taken in. No comments were received

on the proposed requirement for the location of compressor air intakes.

Final paragraph (i)(5)(ii) has been slightly modified from proposed requirement (i)(4)(ii) to require that the moisture content of compressed air be minimized so that the dew point at one atmosphere of pressure is 10 degrees Fahrenheit (5.56 degrees Celsius) below the ambient temperature to prevent water freezing in valves and connections of the air supply system. Such freezing can block air lines, fittings, and pressure regulators. This final requirement is similar to the parallel provision of the previous standard, which required that breathing air meet the requirements of CGA G-7.1-1966. Two commenters (Exs. 54-208, 54-218) pointed out that the proposal specified a dew point of 10 degrees Celsius instead of the 10 degrees Fahrenheit specified in the ANSI/CGA G-7.1-1989 standard. The value in final paragraph (i)(5)(ii) has been revised to match the 10° F provision in the G-7.1-1989 standard for Grade D air, with an equivalent value of 5.56° C added to comply with a Federal government requirement (P.L. 100-418 and E.O. 12770) that scientific and technical measures are expressed as metric units.

Paragraph (d)(2)(ii) of the prior standard required air compressors to have a receiver of sufficient capacity to permit the respirator user to escape from a hazardous atmosphere in the event of compressor failure. However, under paragraph (d)(2) of the final standard, the only respirators that can now be used in IDLH atmospheres are either SCBAs or supplied-air respirators with an auxiliary self-contained air supply for escape. Consequently, a requirement for an air receiver to permit escape from IDLH atmospheres is no longer needed in the final rule. Also, the prior respiratory protection standard, in paragraph (d)(2)(ii), required compressors to have alarms to indicate compressor failure and overheating; this requirement was part of the same provision that specified that a receiver for escape from a contaminated atmosphere in the event of compressor failure be available. This alarm requirement was deleted from the proposal and is not part of the final standard. An alarm to indicate compressor failure or overheating is unnecessary in non-IDLH atmospheres since, as OSHA stated in the proposal, the respirator user can readily exit the hazardous area if the respirator fails.

The deletion from the final standard of the prior standard's requirement for compressors to be equipped with receivers if they were to be used in hazardous atmospheres will clarify an

enforcement issue that has arisen in connection with ambient air movers. Ambient air movers have been developed to provide air to supplied-air respirators. These units are small electric compressors that are not oil-lubricated and have no air receiver. Such compressors are used in non-IDLH atmospheres. The use of ambient air movers has been allowed under an existing OSHA compliance directive even though such devices do not have the air receiver required for air compressors by the prior respiratory protection standard. However, the final standard removes the air receiver requirement for compressors, and ambient air movers will therefore be treated like any other air compressor used in non-IDLH atmospheres.

Under final paragraph (i)(5)(iii), compressors must be equipped with suitable in-line air-purifying sorbent beds and filters to further assure breathing air purity. The Associated Builders and Contractors, Inc. (Ex. 54-309) recommended that the corresponding provision in the proposal be revised to add the requirement that employers change air-purifying sorbent bed and filters in accordance with the manufacturer's instructions. Also, clause 10.5.4.2 of the ANSI Z88.2-1992 standard recommends that maintenance and replacement or refurbishment of the air-purifying and filter media be performed periodically by trained personnel and in accordance with the manufacturer's recommendations and instructions. OSHA agrees with the Associated Builders and Contractors that sorbent beds and filters must be maintained properly, and has added language to paragraph (i)(5)(iii) that is similar to that in ANSI Z88.2-1992, and requires sorbent beds and filters to be maintained and replaced or refurbished periodically in accordance with the manufacturer's recommendations. The Associated Builders and Contractors also recommended that sorbent bed and filter changes be documented, that such documentation be retained for one year, and that it be made available to OSHA on request. However, OSHA is not generally requiring that records of respirator maintenance performed under this standard be kept and does not believe such a requirement is necessary here. Instead, OSHA is requiring in paragraph (i)(5)(iv) that a tag containing the most recent date of sorbent bed replacement or refurbishing, along with the signature of the person performing the change, be kept at the compressor. This tagging requirement is also consistent with OSHA's efforts, as required by the Paperwork Reduction

Act of 1995, to reduce paperwork to the extent consistent with employee safety and health.

Paragraphs (l)(6) and (i)(7) address the control of carbon monoxide levels in breathing air. Paragraph (i)(6) requires that, for compressors that are not oil lubricated, the CO levels in the breathing air may not exceed 10ppm. Paragraph (i)(7) requires monitoring of CO levels for oil lubricated compressors. OSHA stated in the NPRM that one method to prevent contaminated air from reaching the breathing air supply was to require carbon monoxide filters with continuous alarms for all breathing air compressors. The agency requested comments on the use of carbon monoxide alarms, high-temperature alarms, and shutoff devices in the workplace (59 FR 58926). A number of comments were received that addressed the issue of carbon monoxide monitors and alarms.

Modern Safety Techniques, Inc. (MST) (Ex. 54-141) noted that in many workplaces it may be impossible or cost prohibitive to relocate the air intake to an area that would reduce the likelihood of carbon monoxide entering the system. In these cases, MST recommended continuous monitoring as the only method that would ensure breathing air quality. MST stated that the use of a carbon monoxide alarm or measuring device is necessary to tell whether carbon monoxide purifiers (e.g., Hopcalite filters) are functioning properly. MST stated, "Unless continuous monitoring is being conducted on the breathing air supply, 'frequent' monitoring, or proper placement of the breathing air supply, only assures that the requirements are met at *that* particular instance in time." [Emphasis in original.] Eugene Satrun, an industrial hygienist who runs a respirator program in Illinois (Ex. 54-261), supported the need for continuous carbon monoxide monitors, noting that automatic compressors can be operated with a vehicle running nearby and may consequently pull significant levels of carbon monoxide into the intake.

Several commenters were opposed to OSHA adopting a requirement for continuous carbon monoxide monitoring and alarms (Exs. 54-234, 54-250, 54-408). They stated that the requirements for sorbent bed filtration, proper air inlet location, and Grade D air quality, confirmed by periodic sampling, would be sufficient to control the carbon monoxide hazard. Kodak (Ex. 54-265) stated that it has assessed the purity of compressed air for breathing use over a period of 18 years at its plants, collecting and analyzing more than 1200 samples, and that no

incidents of carbon monoxide production involving oil-lubricated compressors have been reported. Carbon monoxide production, Kodak stated, is best prevented by adequate procedures, awareness, and certification. Kodak did not provide specific procedures for determining air system compliance, nor further clarification of what is meant by awareness or certification. The Duquesne Light Company (Ex. 54-408) stated that continuous monitoring was unnecessary, and that requiring filtration or purification of the air supply, proper location of the air intake, and Grade D air purity should be sufficient to ensure a safe breathing air supply. Meridian Oil (Ex. 54-206) opposed continuous monitors because these devices can generate false alarms.

Other commenters proposed alternatives to continuous monitoring. Niagara Mohawk Power (Ex. 54-177), in comments opposing carbon monoxide alarms, stated that carbon monoxide filters with color-change indicators are an appropriate method to monitor carbon monoxide. Monsanto (Ex. 54-219) stated that OSHA should not require all compressors to have carbon monoxide filters and alarms. Monsanto stated that high-temperature alarms or automatic compressor shut downs would only be needed when there was a reasonable possibility of carbon monoxide production in the compressor due to equipment problems. TU Electric (Ex. 54-250) stated that carbon monoxide filters or continuous monitoring alarms should not be required for all breathing air compressors, but that regular testing of breathing air prior to use, and testing in specific locations on a regular basis during compressor use, should be required. This commenter also recommended against a requirement for carbon monoxide filters or monitors for oil-free compressors.

Other commenters (Exs. 54-206, 54-234, 54-250) supported testing ambient air near the intake on a regular basis, but did not recommend a testing frequency. General guidance for periodic sampling of air quality for compressors is specified in Clause 10.5.4.3 and Table 4 of the ANSI Z88.2-1992 standard. The ANSI procedure was recommended by several commenters (Exs. 54-234, 54-250, 54-263, 54-273, 54-363). ANSI Z88.2-1992 recommends acceptance testing prior to initial use and representative sampling at distribution supply points on a periodic basis to ensure "a continued high-quality air supply." Norfolk Southern (Ex. 54-267) stated that OSHA should not require the use of carbon monoxide filters with compressor-supplied air, and that the

employer should have the option of using a carbon monoxide detector. This commenter stated also that installing a carbon monoxide filter is not reasonable for those systems that already have a carbon monoxide detector and high-temperature alarm. St. Lawrence Gas (Ex. 54-402) commented that carbon monoxide alarms should not be required and noted that it has found the use of carbon monoxide-to-carbon dioxide converters (with color-change indicators) sufficient for detecting the presence of carbon monoxide. ORC (Ex. 54-424) stated that carbon monoxide alarms or high-temperature alarms are not needed for all compressors. ORC recommended that adequate procedures, awareness, and certification for installation are the best means to ensure that contaminated air does not enter the compressor. This language is similar to that used by Kodak (Ex. 54-265), and, like Kodak, ORC (Ex. 54-424) did not provide any elaboration of the phrase "adequate procedures, awareness, and certification for installation."

A carbon monoxide monitor with an alarm can be used to continuously measure the breathing air and warn respirator users when carbon monoxide levels exceed the 10 ppm limit set for Grade D breathing air. However, these alarms need to be properly maintained to function effectively. MST (Ex. 54-141) stated that the electrochemical type of sensors used today are specific for carbon monoxide, are relatively stable during temperature and humidity changes, and are accurate enough to meet the CGA G-7.1-1989 requirements. These sensors have replaced the older metal oxide sensors that had problems with false alarms. However, the electrochemical sensors must be calibrated periodically (usually on a monthly basis) to perform accurately. The Service Employees International Union (Ex. 54-455) also recommended that the final standard address regular replacement of alarm sensors and filter media.

Carbon monoxide filters with color-change indicators are used to convert carbon monoxide in breathing air to carbon dioxide, which is less likely to pose a hazard to the respirator user. The source of the carbon monoxide can be from contamination of the intake air or from carbon monoxide generated by the compressor. However, the color change in the indicator results from moisture in the breathing air that is trapped in the filter element. The color-change indicator, therefore, does not indicate the presence of carbon monoxide, but instead signals only the presence of moisture, which can render the sorbent filters ineffective. Consequently, the

color-change indicator cannot be used directly to detect carbon monoxide. In addition, these carbon monoxide filters, like carbon monoxide alarms, need periodic maintenance to ensure their continued effectiveness.

In summary, strong arguments favor a requirement for continuous carbon monoxide monitoring of compressor-generated breathing air. This is the case because preventing carbon monoxide contamination by locating the air intake for compressors in an area that is free of carbon monoxide contamination is difficult in many cases and impossible in others. Automatic compressors with poorly located air intakes may operate when a running vehicle is in the immediate area, thereby contaminating the air supply with carbon monoxide from the vehicle's exhaust. In addition, older compressors, which may still be operational after hundreds, if not thousands of operating hours, may allow increased oil blow-by due to piston ring and cylinder wear, which increases the possibility of carbon monoxide contamination.

The most convincing evidence against a requirement for continuous carbon monoxide monitoring comes from the 18-year collection of sampling results taken by Kodak (Ex. 54-265). OSHA notes, however, that Kodak's results are likely to be due to the company's careful observance of operating procedures, such as procedures ensuring the proper location of air intakes and regular and thorough maintenance and repair of all compressors. OSHA notes that Clause 10.5.4.3 of the ANSI Z88.2-1992 standard calls for periodic, rather than continuous, sampling of breathing air from the air supply.

The arguments for and against carbon monoxide alarms are less well defined than the case for carbon monoxide monitoring devices. Several commenters specifically recommended the use of carbon monoxide alarms whenever compressed air is being used as breathing air (Exs. 54-337, 54-428, 54-455). The AFL-CIO (Ex. 54-428) recommended the use of carbon monoxide alarms or monitors on all air supply systems that service respirators with Grade D breathing air. Both of these recommendations would assure an air supply uncontaminated by carbon monoxide. The proponents of carbon monoxide alarms (Exs. 54-141, 54-261, 54-337, 54-428, 54-455) state that they are needed to alert personnel that equipment is malfunctioning; the Exxon Company (Ex. 54-266) stated that gasoline- and diesel-powered compressors should be required to have carbon monoxide alarms to detect exhaust gases that enter the air supply,

as well as compressor failure and high-temperature alarms; other commenters (Exs. 54-337, 54-428) would require the use of carbon monoxide alarms to prevent accidental carbon monoxide contamination whenever compressed air is being used as breathing air.

The opponents (Exs. 54-177, 54-206, 54-219, 54-234, 54-250, 54-265, 54-402) of carbon monoxide alarms cite the availability of alternate equipment and procedures that they claim are as effective as alarms in protecting the purity of breathing air. Examples of these alternatives are filters with color-change indicators, carbon monoxide-to-carbon dioxide converters, oil-free compressors, proper air intake placement, certification of air compressor systems, and periodic monitoring (Exs. 54-177, 54-206, 54-219, 54-250, 54-265, 54-330, 54-402, 54-408, 54-424).

OSHA believes that it is essential for the employer to ensure that excessive carbon monoxide is not in the compressed breathing air supplied to respirators. Final paragraphs (i)(6) and (i)(7), therefore, require that the employer prevent carbon monoxide levels in the breathing air from exceeding 10 ppm. For compressors that are not oil-lubricated, this requirement can be met by several different methods, including the use of continuous carbon monoxide alarms, carbon monoxide filters, 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. No single method will be appropriate in all situations, and several methods may need to be combined, e.g., the use of carbon monoxide alarms with carbon monoxide filters where conditions are such that a reliable carbon monoxide-free area for compressor air intakes cannot be found. As the comments to the record show, there was no agreement on the most appropriate method for ensuring that carbon monoxide would not contaminate the breathing air coming from compressors. OSHA has decided that a performance-based requirement ensuring that carbon monoxide does not contaminate breathing air will give employers flexibility in selecting the method(s) most appropriate for conditions in their workplace.

Oil-lubricated compressors can produce carbon monoxide if the oil enters the combustion chamber and is ignited. This can be a particularly severe problem in older compressors whose piston rings and cylinders are worn. Final paragraph (i)(7) requires that such compressors have a high-temperature or

carbon monoxide alarm, or both. If only a high-temperature alarm is used, the air from the oil-lubricated compressor must be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm. The latter requirement ensures that carbon monoxide that enters a poorly located compressor air intake, as well as carbon monoxide generated by the compressor itself, is detected.

Final paragraph (i)(7) is similar to a provision in the previous standard. In the NPRM, OSHA proposed to delete the requirement from the previous respirator standard that oil-lubricated compressors be equipped with carbon monoxide alarms and high-temperature shutoff devices. However, a number of commenters (Exs. 54-144, 54-219, 54-266) stated that precautions against excessive carbon monoxide were needed when oil-lubricated compressors were used. Modern Safety Techniques (Ex. 54-144) stated that oil-lubricated compressors used by industry to supply breathing air often have hundreds of hours of use, allowing greater oil blow-by and therefore greater potential for carbon monoxide production, was reported in the Distler study. That study found that properly functioning air compressors are unlikely to reach temperatures at which carbon monoxide production occurs. Exxon (Ex. 54-266) encouraged OSHA to include a requirement for in-line carbon monoxide alarms for diesel- or gasoline-powered compressors, since its experience indicates that the use of these compressors increases the risk of carbon monoxide contamination from the compressor's exhaust. Monsanto (Ex. 54-219) stated that high-temperature alarms or automatic compressor shutoffs would be needed when there was a reasonable possibility of carbon monoxide production in the compressor due to equipment problems. The Service Employees International Union (Ex. 54-455) argued that the requirements specifying Grade D breathing air purity and location of the compressor air intake in an uncontaminated atmosphere were not sufficient to ensure that carbon monoxide is not entrained in the system.

An incident of carbon monoxide production by an oil-lubricated compressor was described in a MSHA Accident Investigation Report issued in January 1985 (Ex. 38-12). An oil-cooled, diesel-powered, two-stage, rotary air compressor overheated during a sandblasting operation at a limestone quarry. The air compressor thermobypass valve, which should have directed the oil through a cooling

radiator once the oil had reached a temperature of 185°F, failed, which allowed the temperature of the cooling oil to rise above its flashpoint of 420°F. The oil ignited, producing carbon monoxide. The compressor was equipped with a high-temperature shutoff switch set for 235°F, but it had been disconnected for at least 30 days prior to the incident. The compressor was not equipped with a carbon monoxide filter or alarm. The sandblaster collapsed from carbon monoxide poisoning. Monsanto (Ex. 54-219) stated that this incident resulted from a failure to follow the provision in the previous standard requiring that oil-lubricated compressors have a functional high-temperature or carbon monoxide alarm, or both. OSHA believes that this incident, as well as the comments described above, supports carrying the previous standard's requirement forward in the final rule.

Final paragraph (i)(8) requires that air line couplings be incompatible with outlets for non-respirable worksite air or other gas systems to prevent the inadvertent provision of nonrespirable gases to airline respirators. Breathing air couplings, therefore, are to be made incompatible with outlets from nonrespirable plant air and other gas systems. This requirement is similar to the provision in paragraph (d)(3) of the previous respiratory protection standard and proposed paragraph (i)(5) of the NPRM. Martin Marietta (Ex. 54-410) stated that there have been documented cases in which cross-connections have introduced hazardous contaminants into breathing air lines. To avoid this problem, Martin Marietta recommended that OSHA add a provision to the final standard that prohibits connecting breathing air lines to any nonrespirable gas source or process. Consistent with this recommendation, OSHA has added a sentence to paragraph (i)(8) requiring that no asphyxiating substance be introduced into breathing air lines. This requirement will cover not only the contamination of the breathing air system from cross-connections, but will also cover other potential contaminating conditions, *e.g.*, using nitrogen to blow out worksite air lines where the worksite air source is also used for breathing air.

The final standard also requires that the employer prevent utility oxygen, *i.e.*, oxygen supplied to meet other manufacturing needs, from entering the respirator air supply system. As discussed above, the standard permits oxygen to be used in respirators designed for oxygen service. The final standard prohibits the introduction of utility oxygen into breathing air systems

that supply respirators that are not designed for oxygen service; this provision is needed to prevent the 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.

Final rule paragraph (i)(9) requires employers to use breathing gas containers marked in accordance with the NIOSH respirator certification standard at 42 CFR part 84. This requirement differs from proposed paragraph (i)(6), which listed several additional standards for breathing gas containers. These additional standards have been incorporated into 42 CFR part 84, making reference to them in the final rule unnecessary.

Paragraph (j)—Identification of Filters, Cartridges, and Canisters

The final rule provides that the employer only use filter cartridges and canisters that are labeled and color coded with the NIOSH approval label and that the label not be removed or made illegible. This is similar to the parallel requirement in the proposal, which was supported by commenters (Exs. 54-361, 54-428, 54-455). OSHA has modified the proposed language in certain respects to add compliance flexibility while retaining the original objective, *i.e.*, assurance that these elements meet NIOSH's stringent requirements. These comments and modifications are discussed below.

OSHA proposed to eliminate from the previous respiratory protection standard the language in paragraphs (g)(1) to (g)(6), which described labeling requirements, and Table I-1, which listed color codes assigned to canisters and cartridges. These requirements were adopted from the original national consensus standard (*i.e.*, ANSI K13.1, "Standard for Identification of Air-Purifying Respirator Canisters and Cartridges") adopted by OSHA in 1971. In place of these requirements, proposed paragraph (j)(1) would have required employers to ensure that all filters, cartridges, and canisters bear a NIOSH approval label before being placed into service.

Proposed paragraph (j)(2) specified that the label not be removed, obscured, or defaced while the filter, cartridge, or canister was in service to ensure that the label provided information to the employee about the protection being afforded by the respirator. In the final standard, OSHA has combined proposed paragraphs (j)(1) and (j)(2) into a single paragraph (j). The changes from the previous standard recognize that employers who use respirators should

be able to rely on labeling and color coding by respirator manufacturers for assurance that the respirators meet NIOSH requirements.

This position is consistent with that taken by many commenters, who noted that the labeling and color coding of filters are the responsibility of the respirator manufacturer (Exs. 54-208, 54-218, 54-219, 54-278, 54-289) and are required by NIOSH for certification. OSHA agrees that color coding and the attachment of NIOSH approval labels to respirators are the responsibility of the manufacturer. However, it is still the employer's responsibility to use only components bearing a NIOSH approval label, and to ensure that the NIOSH approval labels are not removed from the filters, cartridges, and canisters that are used in the workplace and remain legible.

The NIOSH label serves several purposes. It ensures selection of appropriate filters for the contaminants encountered in the workplace and permits the employee using the respirator to check and confirm that the respirator has the appropriate filters before the respirator is used. David Lee, a CIH, CSP, and respirator consultant (Ex. 54-304), commented that, once a filter selection is made and the respirator is donned, the label becomes meaningless. However, the employee is not the only one who uses the color coding and label. Color coding and labeling also allow fellow employees, supervisors, and the respirator program administrator to readily determine that the appropriate filters are being used by the employee. Cartridges that are appropriate for one operation may be inappropriate for another, and color coding and labeling allow respirator users with inappropriate filters to be identified in the workplace and potential respiratory hazards to be avoided.

Proposed paragraph (j)(2) required that the NIOSH approval label not be "removed, obscured or defaced" while respirators are being used. 3M (Ex. 54-218) and Monsanto (Ex. 54-219) urged OSHA to add the word "intentionally" before "removed, obscured or defaced," since they believe that an employer would be in violation of this provision if, for example, a label is covered with paint overspray during use. Monsanto also stated that some OSHA substance-specific standards require that cartridges be dated by the employee to indicate when they were first put into service and that some employers could use this dating method to control cartridge use even when not required by OSHA. Accordingly, Monsanto urged OSHA to add the phrase "except if it is to record

initial use information" to paragraph (j)(2) to clarify that adding a date to the NIOSH label is allowed and will not be regarded as defacing the label. David Lee (Ex. 54-304) was concerned that dirt, dust, and debris can easily obscure the label once the respirator is in use and that employees would be required by the proposed provision to leave the area to clean the label to make it legible. Dow (Ex. 54-278) stated that, because of the small size of the label on some cartridges, the employer cannot date the cartridges without obscuring some of the information on the label. To resolve this problem, Dow suggested that the words "pertinent information" be added before "obscured."

OSHA has not added the term "intentional" to final paragraph (j) because it would be difficult, if not impossible, to determine if the removal or obscuring of a NIOSH label was accidental or intentional. Also, the final provision does not include an exemption for documenting the initial use date on cartridge and canister labels, since OSHA already permits this practice. OSHA's experience indicates that the initial use date can easily be added to a filter, cartridge, or canister without obscuring the label, and this procedure has not proven to be a problem in the substance-specific standards that require such dating. The term "pertinent information" has not been included in final paragraph (j) because OSHA believes that all of the information on the NIOSH approval label is pertinent. The degree of cleanliness required of the label while the respirator is in service should not be an issue because the label only needs to be legible and reasonably clean to provide the required information. Any dust, dirt, paint overspray, or other substance that completely obscures the label would also affect respirator cleanliness and the service life of the filter, resulting in replacement of the filter with new filters that have unobscured labels, as required by paragraph (g).

In summary, final paragraph (j) combines into a single provision the proposed requirements that employers ensure that the manufacturer's NIOSH approval label is on the cartridge, filter, or canister, and that employers maintain the labels in legible condition while the cartridge, filter, or canister is in service. As with the proposed paragraphs, this provision is a performance-based requirement that permits employers to adopt whatever procedures are appropriate to ensure that the label remains on the filter and is not removed, defaced, or obscured during respirator use.

Paragraph (k)—Training and Information

Paragraphs (k)(1)–(3) of the final standard require employers to provide effective training for employees required by the employer to wear respirators. Employees must be trained sufficiently to be able to demonstrate a knowledge of why the respirator is necessary; how improper fit, usage, or maintenance can compromise the protective effect of the respirator; the limitations and capabilities of the selected respirator; how to deal with emergency situations involving the use of respirators or with respirator malfunction; how to inspect, don and remove, and check the seal of the respirator; procedures for maintenance and storage of the respirator; the medical symptoms and signs that may limit or prevent the effective use of respirators; and the general requirements of this standard.

Paragraph (k)(4) allows for the "portability" of previous respirator training, and paragraph (k)(5) specifies the requirement for at least annual retraining. Also, as discussed earlier under the Summary and Explanation for paragraph (c), Respiratory Protection Program, final paragraph (k)(6) requires employers to provide the basic advisory information presented in Appendix D of this section to employees who voluntarily use respirators in their workplace.

The final standard requires that training be understandable and be given to the employee prior to using a respirator in the workplace, and annually thereafter. Additionally, if the employer has reason to believe that any employee who has already been trained does not have sufficient understanding and skill to use the respirator, the employer must retrain the employee in those areas in which his or her knowledge or skill is deficient. Retraining is also required when changes in the workplace or in the type of respirator used render previous training obsolete.

Section 1910.134(e)(5) of the previous standard required training in the selection, use, and maintenance of respirators and required respirator wearers to be provided an opportunity to handle the respirator, have it fitted properly, test its facepiece seal, and wear it in normal air for a familiarity period. The final training paragraph retains many of these provisions. However, the format of the final training provisions is different, and specific provisions for annual training and retraining are included in the final standard. Although the previous standard's requirement for a familiarity

period has not specifically been retained, the final standard requires the respirator wearer to be trained sufficiently to demonstrate the ability to use the respirator properly, which may or may not necessitate wearing the respirator in normal air "for a long familiarity period."

The record shows widespread agreement that employee training is a critical part of a successful respiratory protection program and is essential for correct respirator use (Exs. 15-13, 15-18, 15-19, 15-22, 15-30, 15-33, 15-41, 15-45, 15-50, 15-53, 15-54, 15-67, 15-79, 54-5, 54-68, 54-91, 54-92, 54-165, 54-172, 54-208, 54-219, 54-278, 54-361, 54-387, 54-428, 54-455, Tr. 186, 387, 595, 1011, 1063, 1083, 1103, 1226).

For example, James Johnson of the Lawrence Livermore National Laboratory testified:

The training element of the respiratory protection program is one of the most important elements to assure the respirator is properly used and is performing as intended * * *. This is the only time that the worker has a chance to interact with a trained professional who can properly instruct that person on the correct use of the respirator, the employee can see what is right, what doesn't work, and can understand this item that is given to him to wear throughout a year to help protect his health * * * (Tr. 186)

Dan Faulkner of the United Steelworkers of America concurred, commenting that: Training must be seen as a critical component of respiratory protection. This is an area that is grossly ignored under the current regulation * * *. The very first step in the education process must be to empower workers to identify the hazardous substances involved and at what levels they are exposed. In order for the workers to have confidence that his/her respirator is providing the necessary protection from the hostile work environment they must have a thorough knowledge of this entire process. Once this is understood, the worker can make an informed decision on what type of respirator to wear. (Tr. 1062)

ASARCO, Inc. (ASARCO) agrees about the importance of training and reports that its company Respiratory Protection Program Manual states: "For the safe use of any respirator, it is essential that the user be properly instructed in the respirator's purpose, selection, fitting, use, and limitations" (Ex. 163).

OSHA agrees with the many commenters who urged OSHA to mandate a program that is performance oriented and can be presented informally (Exs. 15-13, 15-18, 15-22, 15-30, 15-41, 15-47, 15-62, 15-73, 15-75, 54-213, 54-265, 54-275, 54-455). The final standard does not specify how the training is to be performed nor the format to be used by the employer. As suggested by commenters (Ex. 15-53, Tr. 837, Tr. 1087), the employer can use

whatever training method is effective for the particular worksite, provided that the method addresses the required topics. Employers can use prepared materials such as audio-visual and slide presentations, formal classroom instruction, informal discussions during safety meetings, training programs developed or conducted by unions or outside sources such as respirator manufacturers, or a combination of these methods.

As in the proposal, several categories of training information must be addressed in the final rule. The final provisions have been simplified since the proposal, but the information to be covered is essentially the same as that proposed.

Paragraph (k)(1) requires the employer to ensure that before the employee uses the respirator in the workplace, the employee demonstrates that he/she has learned the information communicated under the training program. The employer can comply with this provision by reviewing with the employee, either in writing or orally, the informational part of the training program and by reviewing the employee's hands-on use of respirators.

OSHA's personal protective equipment standard (§ 1910.132(f)(2)) also requires that employees demonstrate effectiveness in using PPE before workplace use. When that standard was adopted in 1994, OSHA stated that "in order for training to be successful, clear and measurable objectives must be set, and employees must demonstrate that the training objectives have been reached by showing that they understand the information provided and that they can use the PPE properly" (59 FR 16339). This reasoning applies equally to respiratory protection. In the NPRM for the respiratory protection standard (proposed paragraph (k)(1)(iii)), OSHA proposed a similar requirement, which stated that the training itself was to include "sufficient practice to enable the employee to become * * * effective in performing tasks [relating to inspection, donning and removal, checking the fit and seals, and in wearing the respirator.]"

The final standard's requirement that employees "demonstrate" competence in using respiratory equipment is supported by the recommendation of commenters that the PPE standard's similar requirement replace the less direct provision in the respiratory protection proposal (Exs. 54-213, 54-319). OSHA's enforcement of the PPE standard has reinforced the Agency's belief that training effectiveness must be evaluated by demonstrating how well

employees use equipment on-the-job. OSHA believes that adopting a provision in the respirator standard that is worded similarly to the corresponding requirement in the PPE standard will promote compliance with both standards and uniformity of interpretations and enforcement actions. Moreover, measuring the adequacy of training by evaluating the employee's knowledge gained from the training is consistent with the performance orientation of the final standard and with the absence of specific hourly training requirements in the final standard.

The first category of information to be included in the training program, specified in final paragraph (k)(1)(i), is a discussion of why the use of the respirator is necessary. Proposed paragraph (k)(1)(i) specifically set forth that this discussion was to include information on the nature, extent, and effects of the respiratory hazards to which the employee may be exposed while using the respirator. The language of final paragraph (k)(1)(i) has been simplified; OSHA believes that training in why the respirator is necessary will include information on the nature, extent, and effects of the respiratory hazards. For example, such training would address the identification of the hazardous chemicals involved, the extent of employee exposures to those chemicals, and the potential health effects of such exposure. Much of this information will be available on the Material Safety Data Sheets that chemical manufacturers provide to employers under the Hazard Communication standard (29 CFR 1910.1200). Employee training on the health effects of hazardous chemicals is also required under the Hazard Communication standard, and the same training could help satisfy this respirator training requirement. Many commenters agreed that hazard information is an essential element of training (Exs. 15-10, 15-14, 15-18, 15-19, 15-27A, 15-41, 15-46, 15-53, 15-62, 15-73, 54-5, 54-68, 54-91, 54-165, 54-172, 54-208, 54-278, 54-361, 54-428, 54-455).

Information regarding the consequences of improper fit, usage or maintenance on respirator effectiveness must also be provided to employees under final paragraph (k)(1)(i). Improper attention to any of these program elements would obviously defeat the effectiveness of the respirator. Employees must understand that proper fit, usage and maintenance of respirators is critical to ensure that they can perform their protective function.

Under final paragraph (k)(1)(ii), employers are to explain 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 also 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 such situations.

Paragraph (k)(1)(iii) requires that employees be provided with information on respirator use in emergency situations, including those in which the respirator malfunctions. This training requirement was included in proposed paragraph (k)(1)(v). Respirators malfunction on occasion, work routines change, and emergency situations occur that require a different respirator. The training program must discuss these possibilities and the procedures the employer has established to deal with them. Commenters concurred that comprehensive training is necessary where respirators are to be used in IDLH situations, including oxygen-deficient atmospheres, such as those that occur in firefighting, rescue operations and confined area entry (Exs. 15-18, 15-19, 15-26, 15-31, 15-33, 15-37, 15-41, 15-48, 15-50, 15-54, 15-55, 15-56, 15-59, 15-70).

The employee should be able to thoroughly understand the operation of the respirator as a result of this training and demonstrate the ability to properly use the respirator selected. Numerous commenters supported the elements in the training program provided for under final paragraphs (k)(1)(ii) and (iii) (Exs. 61-3, 15-14, 15-18, 15-27A, 15-41, 15-46, 15-53, 15-62, 15-73, 54-5, 54-68, 54-91, 54-172, 54-208, 54-361, 54-428, 54-455). For example, Michael P. Rehfeld, Safety Officer, Westminster Fire Department, stated that:

In section (k) of the NPRM dealing with training, I strongly believe OSHA should put the strongest emphasis. It has been my experience that the stronger the employer training program the less likely that an employee would become injured or dies from a respiratory protection failure. OSHA has historically put a strong emphasis on training (1910.120, 1910.1200, 1910.138, 1910.146). The same emphasis should appear in this rule (Ex. 54-68).

Final paragraph (k)(1)(iv) requires the employer to provide specific instruction on how respirators are inspected, donned, removed, positive/negative pressure checked, and worn. Although the employer is required to ensure that respirator inspections are performed, employees using the equipment may frequently be responsible for inspecting the respirators assigned to them. In this case it is necessary that respirator users have this process explained and demonstrated to them so that they are capable of recognizing any problems that may diminish the protective capability of the respirator. The training must include the steps employees are to follow if they discover any problems during inspection, such as to whom problems should be reported and where replacement equipment can be obtained if needed. If, however, the employer routinely has extensive inspections done by separate personnel, individual respirator wearers are not required to be trained in how to perform full inspections. Training only in those parts of the inspection process that may be their responsibility would be sufficient.

The training under this paragraph must also include the procedures for donning and removing the respirator, checking the fit and seals, and using the respirator. Respirator fit in the workplace must be as close as possible to the fit obtained during fit testing; therefore, employees must know how to follow procedures that will improve fit in the workplace. The fit testing procedures can also help in training employees. For example, employers can use quantitative fit testing procedures to demonstrate to employees the dramatic improvement in measured fit when the respirator is adjusted properly (See the discussion above of paragraph (f) and Ex. 15-44, Tr. 1083).

Final paragraph (k)(1)(iv) requires training in how to check the respirator seal. Appendix B-1 describes methods for checking the seal of positive and negative pressure facepieces. Employees must be trained in the methods set forth in Appendix B-1 or in alternative methods that are equally effective. The training requirements set forth in paragraph (k)(1)(iv) were widely supported in the record (Exs. 15-10, 15-14, 15-22, 15-27A, 15-41, 15-46, 15-50, 15-62, 15-73, 54-5, 54-68, 54-91, 54-165, 54-172, 54-208, 54-219, 54-278, 54-361, 54-428, 54-455).

Final paragraph (k)(1)(v), like proposed paragraph (k)(1)(iv), requires the employer to explain the procedures for maintenance and storage of respirators. The extent of training required under this provision 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 activities, employees may need only to be informed of the maintenance and storage procedures without having to learn significant technical maintenance information. The importance of providing some knowledge to all employees regarding maintenance and storage of respirators was recognized by a number of commenters. Those commenters stated that employees must 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 (Exs. 61-3, 61-8, 15-10, 15-14, 15-27A, 15-41, 15-46, 15-50, 15-62, Tr. 1063).

Final paragraph (k)(1)(vi) requires that employees be instructed in ways to recognize the medical signs and symptoms that may limit or prevent the effective use of respirators. This provision was not included in the proposed standard. However, the Agency agrees with the AFL-CIO (Ex. 54-428) that employee knowledge of this information is important to ensure implementation of a successful respirator program. An employee's knowledge of the medical problems that may preclude the employee from using some types of respirators or from wearing a respirator under certain workplace conditions helps assure that the employee receives the protection intended by the standard. Examples of medical conditions and signs and symptoms that may affect an employee's ability to use a respirator are provided in mandatory Appendix C of the final standard. Training in these signs and symptoms need not be medically sophisticated or burdensome.

Employees must be provided only with medical information sufficient for them to recognize the signs or symptoms of medical conditions (e.g., shortness of breath, dizziness) that may affect their use of respirators. This information will also enable employees to understand the purpose of the medical assessment procedures required under paragraph (e) of the final standard, will improve the ability of employees to recognize and report medical signs and symptoms, and will give them the knowledge they need to initiate the follow-up medical evaluations required under paragraph (e) of this section, if necessary.

Final paragraph (k)(1)(vii) requires the employer to inform employees of the

general requirements of this section. OSHA agrees with Organization Resources Counselors (Ex. 54-424) that "general requirements" better describes the substantive purpose of this provision than did the word "contents," which was used in proposed paragraph (k)(1)(vi). OSHA believes it is necessary to ensure that employees know, in general, the employer's obligations under the standard with respect to employee protection. This discussion need not focus on the details of the standard's provisions but could, for example, simply inform employees that employers are obligated to develop a written program, properly select respirators, evaluate respirator use, correct deficiencies in respirator use, conduct medical evaluations, provide for the maintenance, storage, and cleaning of respirators, and retain and provide access to specific records.

Proposed paragraph (k)(1)(vi) would have required that employees be provided with information on the written respiratory protection program, as well as the location and availability of the written program and the standard. These elements are omitted from final paragraph (k)(1)(vii) because they are addressed in other provisions of the final standard. For example, employee access to the standard and written program is required under final paragraph (m)(4), and employee knowledge about the written respirator program will be imparted to employees under the training required by final paragraph (k)(1), which specifies the elements to be included in the written respirator program.

All of the training elements are important. They are presented in performance language to give the employer flexibility to adapt the training to specific workplace conditions and to the respirators used. Unless the training information is presented in a way that employees can understand, the training will not be effective. Therefore, final paragraph (k)(2) requires that training be conducted in a way that is understandable to employees. Employers should develop training programs based upon their employees' educational level and language background. This will ensure that all employees will receive training that will enable them to maximize the effectiveness of the respirators they use. Inclusion of a provision addressing training comprehension was supported in the record (Tr. 166) and is consistent with similar requirements in other recent OSHA rulemakings (Cadmium, 29 CFR 1910.1027; Bloodborne

pathogens, 29 CFR 1910.1030; Formaldehyde, 29 CFR 1910.1048).

Final paragraph (k)(3) requires the employer to provide training before the employee uses a respirator in the workplace. This provision was included under proposed paragraph (k)(2) and was widely supported by rulemaking participants (Tr. 1011, Tr. 1986; Exs. 54-91, 54-165, 54-196, 54-234, 54-267, 54-278, 54-298, 54-319, 54-334, 54-361, 54-387, 54-428, 54-455). No comments opposing this requirement were received.

Final paragraph (k)(4) provides that an employer who can demonstrate that a new employee has received training within the last 12 months that addressed the elements specified in paragraph (k)(1)(i) through (vii) is not required to repeat such training provided that, as required by paragraph (k)(1), the employee can demonstrate knowledge of the element(s). Employers availing themselves of this provision must, however, provide subsequent training no later than 12 months from the date of the previous training, as required by final paragraph (k)(4).

An employee who has been trained in the use of respirators who moves to another job that involves the use of respirators may not need to take all of the initial training prescribed in paragraph (k)(4). Prior training in the topics required by the standard may remain relevant in the new work setting. Thus, OSHA is permitting limited "portability" of training, as noted in the standard. Training in the elements listed in paragraph (k)(1) that has been provided in the past 12 months by a previous employer may be taken into account by the new employer when evaluating the training needs of that new employee.

The employer must demonstrate that the employee has received the prior training and retained the necessary knowledge before the prior training can be accepted as meeting the requirements of paragraph (k). Discussions with the employee and with the previous employer may be used to determine whether the previous training has been sufficient to enable the employee to wear, use, and care for the respirator successfully. If the employer cannot demonstrate that the new employee has been trained in the required elements of the program, and understands these elements, the new employer is obligated to train the employee. In cases where training in some elements is lacking or inadequate, the employer is required by paragraph (k)(4) to provide training in those elements.

Final paragraph (k)(5) requires retraining annually and when certain

situations occur. The requirement for annual training was strongly supported by management, labor, and other rulemaking participants as being necessary to ensure the continuing effectiveness of the respirator program (Exs. 15-10, 15-18, 15-19, 15-20, 15-37, 15-44, 15-47, 15-48, 15-50, 15-54, 15-55, 15-71, 54-91, 54-157, 54-165, 54-173, 54-208, 54-222, 54-245, 54-265, 54-292, 54-319, 54-332, 54-361, 54-363, 54-387, 54-424, 54-427, 54-428, 54-442, 54-455, 122, 166; Tr. 187, 443, 547, 614, 1011, 1022, 1226, 1768). For example, the Railway Labor Executive Association testified:

The training requirements as proposed should be mandated on an annual basis . . . Such a training schedule will assure continuous familiarization with the equipment and will serve to negate the inevitable effects of complacency on the part of both the employer and the employee. (Tr. 443)

Exxon stated that "Annual training is good so the employee will feel comfortable with the respirator they will be using in the future" (Tr. 547). James Johnson of Lawrence Livermore National Laboratory testified that annual training is ". . . necessary to ensure a reasonable amount of recall and performance . . ." (Tr. 187). Eastman Chemical Company (Ex. 54-245) commented that "Eastman supports [the] annual training requirement . . . our Company believes this is necessary to adequately train employees." ASARCO and U.S. Steel require that their employees who wear respirators undergo annual training, and ASARCO states in its Respiratory Protection Manual that:

All respirator wearing employees shall be given annual training on routine respirator use. . . . Applicable individuals will also be thoroughly instructed and trained annually in the use of respiratory protection and necessary procedures for non-routine or emergency situations. (Ex. 163)

The Respirator Protection Program training manual for U.S. Steel, submitted by AISI, requires that: "Each respirator wearer should be retrained at least annually. Where necessary, more frequent training should be performed. The required use of respirators should be specified in routine training aids such as Safe Job Procedures." (Ex. 142)

A number of commenters recommended that training should be required less frequently than annually (Exs. 15-41, 54-316, 54-324) or should be required only in response to a change in the respirator program (Exs. 54-168, 54-172, 54-178, 54-187, 54-213, 54-234, 54-267, 54-273, 54-275, 54-278, 54-297, 54-307, 54-316, 54-324, 54-334, 54-352, 54-389, 54-408, 54-434).

Other commenters recommended more frequent (than annual) training for employees required to use SCBAs, or for employees who may be required to use respirators in emergency situations (Exs. 54-210, 54-290, 54-363, 54-410, 54-424).

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. Further, as specifically noted by several witnesses at the hearing, annual training is necessary so that employees will be confident when using respirators (Tr. 547, Tr. 595). Annual training will also eliminate complacency on the part of both the employer and employees with respect to respirator use (Tr. 443), and annual training will ensure a reasonable amount of recall and performance on the part of the respirator user (Tr. 187). In addition, periodic training provides an opportunity for the employee to interact with trained professionals who can provide instruction and understanding in the correct use of the respirator (Tr. 186), which will serve to overcome employee resistance to proper respirator use (Tr. 1021). OSHA also believes that employee interaction with respirator instructors on at least an annual basis will reinforce employee knowledge about the correct use of respirators and other pertinent elements of the respiratory protection program.

Commenters requesting that training be required less frequently than annually provided no substantive data demonstrating that training every two years, for example, would be sufficient for respirator users to retain information critical to the successful use of respirators on a continuing basis (Exs. 54-316, 54-324). Less frequent periodic training would tend to diminish employee attention to proper respirator use and may result in a long period of poor respirator practice before problems are identified and corrected. OSHA notes that both the ANSI Z88.2-1980 and Z88.2-1992 respiratory protection standards provide for annual retraining. Further, annual periodic training of workers with respect to the use of respirators is required in other OSHA standards (i.e., 29 CFR 1910.1001, Asbestos; 29 CFR 1910.1017, Vinyl chloride; 29 CFR 1910.1018, Arsenic; 29 CFR 1910.1025, Lead; 29 CFR 1910.1029, Coke oven emissions; 29 CFR 1910.1043, Cotton dust; 29 CFR 1910.1044, Dibromochloropropane (DBCP); 29 CFR 1910.1045, Acrylonitrile; 29 CFR 1910.1047, Ethylene oxide; and 29 CFR 1910.1048, Formaldehyde). In addition, OSHA's

compliance experience has demonstrated that inadequate respirator training is a common problem (Ex. 33-5), and is often associated with respirator program deficiencies that could lead to employee exposures to workplace contaminants. Adherence to annual training will minimize respirator misuse. Thus, the Agency's experience under other rulemakings, as well as its compliance experience with the previous respiratory protection standard, serve, in part, as the basis for concluding that annual training for respirator users under this final standard is reasonable and appropriate.

As noted above, a number of commenters argued that training should be required only to inform employees about changes in the respirator program. This view suggests that regular, periodic training in the use of respirators is not necessary to ensure the success of a respirator program. However, as discussed above, evidence provided by management, labor, and other participants in this and other rulemaking records demonstrates the importance of reinforcing an employee's knowledge with respect to the use of respirators on a regular basis to ensure the successful use of respirators. Accordingly, the final standard in paragraph (k)(5) includes the requirement for annual training for respirator users. This provision ensures the successful implementation of the respiratory protection program by keeping employees thoroughly and accurately informed on a regular basis regarding the current status of the program.

Several commenters recommended that training be provided more frequently than annually to users of SCBAs and to employees who are required to use respirators during emergency situations (Exs. 54-210, 54-290, 54-363, 54-410, 54-424). OSHA agrees that retraining more frequently than annually may be appropriate for some users of SCBAs and emergency responders. This concern is addressed in final paragraph (k)(5), which contemplates such additional training in circumstances in which the employer has reason to believe that a previously trained employee does not have the understanding and skill required to use the respirator properly on a continuing basis. Although this provision is performance oriented, it requires that more frequent (than annual) periodic training be provided if necessary (e.g., because of the complexity of the respirator or exposure conditions). If respirator users must be trained more frequently than annually to retain the knowledge necessary to ensure proper

use of the respirator, then the employer must provide the additional training.

Final paragraphs (k)(5)(i)-(iii) require additional training when changes in the workplace (process change, increase in exposure, new hazards) or in the type of respirator used by the employee render previous training obsolete, 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. These provisions recognize circumstances that require supplemental training in addition to full annual training. For example, retraining with respect to the nature of the hazard may be necessary because of an increase in the workplace level of a hazardous substance. Retraining would also be required when an employee does not sufficiently understand any program element (Ex. 54-387). OSHA believes that the regulatory burden imposed on employers by final paragraph (k)(5) will be minimal because this paragraph only requires element-specific retraining on an as-needed basis to supplement annual training.

Final paragraph (k)(6) provides very basic protection for employees who use respirators voluntarily. As discussed, in connection with paragraph (c)(2), such employees are only covered by those provisions of this standard that are necessary to ensure that respirator use does not present a health hazard to these employees. Respirator use can create health and safety problems. For example, an employee who has chronic obstructive lung disease and who is given a negative pressure air-purifying respirator to wear may be at risk of hypertension, overexertion, and dizziness. Employees who voluntarily use some types of respirators (e.g., air-purifying respirators) are potentially exposed to the hazards associated with respirator use. Consequently, in paragraph (k)(6), OSHA requires employers to provide employees who voluntarily use some types of respirators (e.g., air purifying respirators) with the informational material in Appendix D so that the employee will be familiar with basic respirator use procedures.

Paragraph (l)—Program Evaluation

Paragraph (l) requires employers to perform evaluations to determine whether the respiratory protection program is functioning effectively. Problems with protection, irritation, breathing resistance, comfort, and other respirator-related factors occasionally arise in most respiratory protection programs. Although it is not possible to eliminate all problems associated with respirator use, the employer must

eliminate as many problems as possible to improve respiratory protection and encourage employee acceptance and safe use of respirators. Eliminating problems is accomplished most effectively when the respiratory protection program is evaluated thoroughly and revised as necessary. Although the previous respiratory protection standard requires that the employer perform regular checks of the effectiveness of the respiratory protection program, it provided little guidance regarding how these evaluations are to be done. The final rule, like the proposal, describes the required program evaluation with greater specificity than OSHA's previous respiratory protection standard did.

Final paragraph (c) of the respirator standard requires the employer to establish a written respiratory protection program. The program must include procedures for evaluating the effectiveness of the respirator program and must designate a program administrator who is to monitor conditions in the workplace on a regular basis to ensure that the provisions of the written respiratory protection program are being properly implemented. Final paragraph (l) specifies certain steps the employer must take as part of his/her regular evaluation of the respiratory protection program.

Paragraph (l) requires the employer to consult employees who use respirators to ascertain whether they perceive any problems with the equipment and to obtain their views on program effectiveness. This assessment must evaluate such factors as difficulty breathing or fatigue during respirator use, whether the respirator interferes with hearing and vision, communication, or job performance or restricts movement, whether the respirator causes discomfort, and whether the employee has confidence in the respirator's effectiveness. The employer must correct any problems that are revealed by the evaluation.

The record supports the need to review and evaluate workplace respirator use to ensure the continuous effectiveness of the respirator program (Exs. 54-91, 54-153, 54-181, 54-213, 54-219, 54-234, 54-244, 54-252, 54-263, 54-265, 54-54-286, 54-297, 54-330, 54-352, 54-387, 54-424, 54-428, 54-455, Tr. 387, 1012, 1714, 1733, 1998). Based on the record, however, the final program evaluation provisions were modified, as discussed below, from those proposed.

Final paragraph (l)(1) requires the employer to conduct regular evaluations of the workplace to ensure that the

provisions of the written program are being properly implemented for all employees required to use respirators, and to ensure the continued effectiveness of the program. Proposed paragraph (l)(1) required the employer to review the written respiratory protection program at least annually and to conduct frequent random inspections of the workplace to ensure that the provisions of the program are being properly implemented for all employees. The review of the written program was to include an assessment of each written program element specified under proposed paragraph (c)(1) of the standard.

The final standard under paragraph (l) has deleted the proposed provisions for annual written program review of each element and "frequent random" workplace evaluations in favor of more performance-oriented requirements. Although a number of commenters supported annual written program review (Exs. 54-91, 54-153, 54-181, 54-213, 54-244, 54-265, 54-361, 54-387, 54-424, 54-428), others asserted that program review was necessary but should only be required on an as-needed, rather than annual, basis as necessitated by workplace or user conditions or characteristics (Exs. 54-177, 54-234, 54-263, 54-286, 54-297, 54-330, 54-352, 54-402, Tr. 1733). The Chemical Manufacturers Association (CMA) (Ex. 54-263), for example, stated:

For simple programs such as a single air purifying respirator in use with a single contaminant, assessments might be necessary once every 3-5 years. For programs with numerous hazards that change repeatedly such as batch processes, reviews may be needed more frequently.

The CMA (Ex. 54-263) and Mobil Corporation (Ex. 54-234) support adoption of the ANSI Z88.2 (1992) recommendation that reads "The program shall be periodically audited to ensure that it is implemented and reflects the written procedures." Consumer Power (Ex. 54-297) argued that program review and revision should be required "as necessary to reflect changes in respirator used, training, fit test methods, and storage or maintenance of the respirator in use at the facility."

OSHA agrees with commenters that a more performance-oriented approach with respect to written program review is appropriate in lieu of an annual requirement. The Agency believes that the final standard will ensure the maintenance of an up-to-date written respirator program without imposing an arbitrary review schedule. Final paragraph (c)(1) states, in part, that the program shall be updated as necessary

to reflect changes in workplace conditions and respirator use. This provision requires employers to review the written program and to revise, as necessary, the written program elements specified in paragraph (c)(1) when workplace conditions affecting the use of respirators change.

Accordingly, the final standard does not contain the proposed requirement for an annual written program review but instead requires program review and revision as necessary based on workplace changes. Evaluation frequency to ensure the continued effectiveness of the program is to be based on program complexity and on factors such as the nature and extent of workplace hazards, types of respirators in use, variability of workplace processes and operations, number of respirator users, and worker experience in the use of respirators. In other words, the employer must audit respirator use in the workplace with sufficient frequency to ensure that continuous, successful implementation of all written respirator program elements prescribed under paragraph (c) is being achieved.

As noted previously, the proposed requirement for "frequent random" workplace evaluations has been deleted in favor of a requirement for evaluations conducted on an as-necessary basis. OSHA agrees with commenters' assertions that the meaning of the term "frequent random" was unclear (Exs. 54-181, 54-334), especially with respect to conditions of infrequent or brief respirator use (Exs. 54-166, 54-177). In such instances, the commenters indicated that evaluations would have to be scheduled based on when respirators are used. The Agency believes that the final standard's evaluation procedures incorporate a flexible and reasonable approach that will meet the needs of different workplaces while ensuring continued, effective implementation of the respirator program. OSHA emphasizes that the change in language in the final standard is not intended to deemphasize the importance of conducting evaluations.

Final paragraph (l)(2) requires the employer to consult regularly with employees who wear respirators to obtain their views on the effectiveness of the program and to correct any problems that are identified. 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, whether respirators are correctly selected for the hazards encountered, whether respirators are

being worn when necessary, and whether respirators are being maintained properly. Many commenters (Exs. 54-91, 54-153, 54-181, 54-213, 54-265, 54-361, 54-387, 54-424, 54-488) supported the proposed requirement for the employer periodically to consult with employees.

This requirement is essentially unchanged from the proposed provision. Some commenters (Exs. 54-187, 54-278) argued that the employer's obligations to consult with employees should be limited to those employees required by OSHA to wear respirators. However, as explained in detail in the Summary and Explanation for paragraphs (a) and (c), OSHA believes that all employees who are required to wear respirators should be covered by the program, regardless of whether their respirator use is required by OSHA or their employer.

Thus, final paragraph (l)(2) requires the employer to consult with employees who wear respirators when auditing the effectiveness of the respirator program. As discussed above in connection with paragraph (c), OSHA has consistently required employers who provide their employees with respirators to ensure that those respirators do not pose a health hazard (e.g., do not increase the work-of-breathing in a way that threatens health, do not impair vision or hearing). In general, assessments conducted to comply with paragraph (l) will involve a technical evaluation of whether respirators are being used properly. If respirators are not being used properly, the employer is required to correct any problems found during the assessment. The areas to be reevaluated include whether the respirator program is providing employees with properly fitting respirators and whether the appropriate respirators are being selected, used, and maintained properly.

Proposed paragraph (l)(2)(i), which would have required the employer to assess whether the program was "preventing the occurrence of illness," has been deleted from the final rule. Commenters noted that the individual performing the program evaluation under this paragraph is not likely to be a health care professional with sufficient expertise to identify illnesses caused by improper respirator use, other than skin/eye irritation, which can readily be observed by the program administrator, supervisor, employer, or employee. Commenters argued that medical determinations and evaluations are part of the review of an employee's medical status required by paragraph (e) of this section (Exs. 54-187, 54-237). OSHA agrees and, accordingly, has

omitted this proposed requirement from final paragraph (l)(2). However, identification of respirator-related medical conditions, such as skin irritation, would properly be part of the program evaluation. Employees identified during the evaluation as having skin irritation can either be referred to the PLHCP or be advised by the program administrator about the need to leave the respirator use area as necessary to wash the face and facepiece, as permitted by paragraph (g). It should be noted that final paragraph (e)(7)(iii) requires medical evaluation if observations made during the program evaluation indicate that such evaluation is necessary.

Paragraph (m)—Recordkeeping

The final standard requires the employer to establish and retain written information regarding medical evaluations, fit testing, and the respirator program. The final provisions addressing these records differ in some respects from the proposed requirements. In the proposed rule, paragraph (c) contained recordkeeping provisions for the written respiratory program, paragraph (m) required retention of medical evaluation records, and fit testing records were required to be maintained under Appendix A. In the final rule, however, all recordkeeping requirements have been consolidated in paragraph (m), in response to those commenters who suggested that placing all recordkeeping provisions in one paragraph will improve understanding of the rule's recordkeeping obligations (Exs. 54-267, 54-286).

Paragraph (m)(1) of the final standard requires the employer to retain a medical evaluation record for each employee subject to medical evaluation under final paragraph (e). Such records are to be kept and made available as required by 29 CFR 1910.1020, OSHA's Access to Employee Exposure and Medical Records rule. The 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. It is standard medical practice to make and retain written records of medical examinations and evaluations. Retention of such records will enable PLHCPs in subsequent evaluations to determine whether the employee's health has deteriorated, and will enable employees to obtain copies for their personal physician or other licensed health care professional to review as necessary.

Although the format of final paragraph (m)(1) has been simplified from that of the proposed rule, the substance of the medical evaluation records to be retained is similar. Several proposed paragraphs referred specifically to provisions in 29 CFR 1910.1020 that address the maintenance, availability, and transfer of the medical evaluation records. As recommended by several commenters, however, only one reference to 29 CFR 1910.1020 is needed for this purpose, and the final respiratory protection rule has been revised accordingly (Exs. 54-220, 54-350, 54-362, 54-455, Tr. 1054).

Final paragraph (m)(2) addresses the retention of respirator fit-testing records. The provisions of this paragraph remain basically unchanged from the requirements of Appendix A, section II. 12 of the proposal. The records specified in final paragraphs (m)(2)(i)(A)—(E) consist of the name or identification of the person tested; the type of fit test performed (QLFT, QNFT—irritant smoke, saccharin, etc.); the make, model, and size of the respirator fitted; the date of the fit test; pass/fail results if a QLFT is used; or the fit factor and strip chart recording or other record of the test results if quantitative fit testing was performed.

Under final paragraph (m)(2)(ii), the fit test record must be maintained until the next fit test is administered. 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. OSHA agrees with commenters (Exs. 36-6, 36-17, 36-34, 36-46, 54-165, 54-210) who stated that fit testing records must be maintained to ensure that all respirator users have received a fit test, the respirator selected by fit testing is being used, and retesting is being performed annually.

Some commenters argued that the employer should only be required to certify that fit testing has been completed, and that retaining the other proposed information would provide little additional benefit (Exs. 54-222, 54-310). OSHA disagrees with this position. The Agency believes it is essential that fit test records identify the respirator and employee being fit tested. As noted in the preceding paragraph, other commenters stated that the information in this record would be the only means of determining whether the

appropriate respirator was being used by the employee. OSHA believes that the effectiveness of the respiratory protection program will be substantially improved if these records are kept. Similar recordkeeping requirements are found in many OSHA standards: 29 CFR 1910.1027, Cadmium; 29 CFR 1910.1028, Benzene; 29 CFR 1910.1048, Formaldehyde; 29 CFR 1910.1050, Methylenedianiline.

Final paragraph (m)(3) specifically requires employers to maintain a written copy of the current respiratory protection program prescribed by final paragraph (c). As discussed under paragraph (c), a written program is necessary to assure the appropriate use of respirators and the on-going effectiveness of the program.

Final paragraph (m)(4) provides that written materials required to be maintained under final paragraph (m) must be made available, upon request, to employees and to the Assistant Secretary for examination and copying. This final paragraph replaces, but is consistent with, the record availability requirement of proposed paragraph (m)(2). Employee access to these records is necessary to ensure that employees can assess and verify information describing their exposure to respiratory hazards in the workplace and the effectiveness of the respirator program in protecting them from those hazards. Access to these records by the Assistant Secretary or his or her designees is necessary to allow OSHA to monitor compliance with the standard and its effectiveness.

The access provisions in final paragraph (m)(4) are consistent with provisions found in other OSHA standards: 29 CFR 1910.1001, Asbestos; 29 CFR 1910.1027, Cadmium; 29 CFR 1910.1028, Benzene; 29 CFR 1910.1047, Ethylene Oxide; 29 CFR 1910.1048, Formaldehyde; and 29 CFR 1910.1050, Methylenedianiline.

Paragraph (n)—Dates

The final Respiratory Protection standard will become effective on April 8, 1998. For most requirements of the standard, however, compliance need not be achieved until the start-up dates specified in paragraph (n) of the final rule. Unless a different start-up date is specified for a particular requirement, compliance must be achieved by the effective date.

The proposal would have required compliance with all provisions of the standard 90 days after publication of the final standard in the **Federal Register**. The Air Conditioning Contractors of America (Ex. 54-248) stated that a 90-day compliance period should be

sufficient if OSHA plans to disseminate information to employers in a "user-friendly" format, but that additional time would be required if industry organizations had to analyze and distribute information on the final standard by themselves. Several commenters recommended a 6-12 month effective date for implementing the final standard (Exs. 54-248, 54-271, 54-283, 54-293, 54-309). The U.S. Enrichment Corporation (Ex. 54-283) wanted the standard phased in over a 12-month period to allow additional time for the employer to obtain respiratory protection equipment from manufacturers and to perform fit testing. The American Subcontractors Association (Ex. 54-293) stated that small contractors rely on their organization and others for education and training regarding new standards, and that a 90-day period is too short a period for transition to a new program. They specifically mentioned training, updating written programs, changing written standard operating procedures (SOPs), and medical examinations as provisions in the standard that may be difficult to comply with in a short time period. The Associated Building Contractors (Ex. 54-309) also wanted the final standard to be phased in over 12 months to allow for revising written SOPs and programs, training, and medical evaluation of respirator users. Exxon (Ex. 54-266) and the American Petroleum Institute (Ex. 54-330) stated that employers could not fit test every employee within the specified 90-day effective date and recommended that employees be fit tested within one year of the effective date of the standard.

Based on many of these comments, OSHA concludes that additional time is required for employers to comply with certain provisions of the final standard. The Agency has therefore included extended start-up dates for some of the program elements. OSHA does intend, however, to disseminate information on this standard in a "user friendly" format.

Within 150 days of the effective date of the standard, employers must determine whether respirator use is required under paragraph (a). This period will afford employers sufficient time to become familiar with the final standard and to evaluate whether respirator use is required in their workplaces.

Employers must comply with all the remaining requirements of the respirator standard no later than 180 days after the effective date of the standard. OSHA concludes that with the start-up dates provided, all employers will have adequate time to comply. Paragraph

(n)(3) states that if there is an administrative or judicial delay of the standard, the respiratory protection provisions of the previous standards (i.e., 29 CFR 1910.134 and 29 CFR 1926.103) will remain in effect and will be enforced until the issues have been resolved. Many employers already have an established respiratory protection program that includes specific program elements (e.g., fit testing, annual training, medical evaluations of respirator users, and program evaluation) that comply with the requirements of the Agency's prior respirator standards. Program elements that were implemented to meet the prior respirator standards' requirements may also meet the requirements of this final respiratory protection standard. Paragraph (n)(4) states that if, in the 12 month period preceding the effective date of the revised standard, the employer has conducted annual respirator training, fit testing, respirator program evaluation, or medical evaluations, the employer may use the results of these activities to comply with the corresponding provisions of this section, provided that these activities were conducted in a manner that meets the requirements of the revised standard. For example, if the employer has an existing fit testing program in place on the effective date of the final standard, the employer may continue that fit testing program if it meets the fit testing requirements of the final standard. In such cases, employees would be retested within one year of their last fit test date. Employers, therefore, can incorporate annual fit testing, training, and program evaluation into their existing respiratory protection programs if the appropriate program elements comply with the provisions of the final standard. This approach should help reduce the impact of the final rule on employers with effective existing respirator programs.

Paragraph (o)—Appendices

The final paragraph of the standard identifies four appendices that supplement the requirements specified in the regulatory text. Appendices A (Fit Testing Procedures), B-1 (User Seal Check Procedures), B-2 (Cleaning Procedures), and C (Medical Questionnaire) are mandatory, and contain requirements for performing fit testing, user seal checks, cleaning, and medical evaluations that supplement the regulatory requirements in paragraphs (e), (f), (g), and (h) of the final standard.

Appendix D (Information for Employees Using Respirators When Not

Required Under The Standard) is nonmandatory.

The four appendices are discussed in detail under the Summary and Explanation sections of the corresponding paragraphs of the final standard: Appendix A in paragraph (f), "Fit Testing"; Appendix B-1 in paragraph (g), "Use of respirators"; Appendix B-2 in paragraph (h), "Maintenance and care of respirators"; Appendix C in paragraph (e), "Medical evaluation"; Appendix D in paragraph (c), "Written program" and paragraph (a), "Permissible practice."

Paragraph (p)—Revisions to Specific OSHA Standards

A number of OSHA standards regulating exposure to toxic substance and harmful physical agents incorporate certain provisions of 29 CFR 1910.134. OSHA proposed to revise these provisions to simplify compliance for employers by consolidating many of the Agency's respirator requirements, removing inconsistencies, and deleting duplicative requirements. The purpose of revising the respirator-related provisions of OSHA's existing standards was to conform these standards, to the extent possible, to each other and to revised 29 CFR 1910.134 in general. These standards will be improved by this process, because they will now refer to the revised respiratory protection standard, which is based on current respirator use and technology. For example, revising the respirator-approval references in these standards from MSHA/NIOSH, Bureau of Mines, and ANSI Z88.2-1969 to the recently published NIOSH regulation at 42 CFR Part 84 updates these respiratory protection provisions. The Agency concludes, therefore, that updating these standards is consistent with the proposed goal of bringing uniformity to OSHA's respiratory protection requirements. OSHA believes that regulatory consistency will improve compliance with the respiratory protection provisions, reduce the compliance burden on the regulated community, and, consequently, enhance the protection provided to employees who use respirators. OSHA's review of the rulemaking record shows that no commenters objected to updating the provisions of these standards to conform with the requirements of revised 29 CFR 1910.134.

The Agency also notes that revised 29 CFR 1910.134 is intended to serve as a "building block" standard with respect to future standards that may contain respiratory protection requirements. To the extent possible, therefore, future standards that regulate respirator use in

controlling employee exposure to toxic substances and harmful physical agents will refer to provisions of the final respiratory protection standard at 29 CFR 1910.134 instead of containing their own respirator requirements. (However, these standards will continue to have any respirator requirements, e.g., canister/cartridge change schedules, that are specific to the substance or agent being regulated.)

In developing the final revision, OSHA also revised the wording and/or location of some paragraphs to improve the comprehensibility and uniformity of the requirements; however, the substantive requirements of the standards addressing respirators have not been revised. Additionally, the tables in the substance-specific standards specifying parameters for respirator selection have not been republished because these tables will remain unchanged and, thus, will continue to be part of the substance-specific standards until resolution of the reserved portions of this final standard.

OSHA found that the existing substance-specific standards were especially in need of revision. Except for a limited number of respirator provisions unique to each substance-specific standard, the remaining regulatory text on respirators now reads virtually the same for each of these standards. For example, all provisions addressing respirator use, selection, and fit testing were deleted from the substance-specific standards, making these standards consistent with the final respiratory protection standard with respect to these requirements. The Agency believes that revisions to 29 CFR 1910.134 are sufficiently comprehensive to allow deletion of those provisions in the substance-specific standards that duplicated provisions of revised 29 CFR 1910.134. A provision was retained only when it addressed conditions (for example, medical evaluation) that were unique and/or integral to the substance-specific standard. The Agency concludes, therefore, that deletion of duplicative provisions from the substance-specific standards will reduce confusion among members of the regulated community and decrease the burden of compliance. It will thereby enhance compliance with the respiratory protection requirements and, consequently, improve the protection afforded to employees who use respirators to control exposure to the toxic substances and harmful physical agents regulated by these standards. The proposed revisions to the substance-specific standards were widely supported by rulemaking participants (Exs. 54-187, 54-208, 54-

219, 54-220, 54-233, 54-234, 54-261, 54-263, 54-266, 54-267, 54-273, 54-283, 54-289, 54-327, 54-333, 54-363, 54-424.)

In general, for the substance-specific standards, the incorporated provisions of revised 29 CFR 1910.134 cover the following requirements: definitions (paragraph (b)); respiratory protection program (paragraph (c)); selection of respirators (paragraph (d)); fit testing (paragraph (f)); use of respirators (paragraph (g)); maintenance and care of respirators (paragraph (h)); breathing air quality and use (paragraph (i)); identification of filters, cartridges, and canisters (paragraph (j)); training and information (paragraph (k)); program evaluation (paragraph (l)); and recordkeeping (paragraph (m)). Each of these requirements was addressed by paragraphs (b), (c), (d), (e), and (f) of the prior respiratory protection standard.

OSHA did not propose to conform the respirator provisions of its Cadmium, Benzene, Formaldehyde, 1,3-Butadiene, and Methylene chloride standards with the corresponding requirements of revised 29 CFR 1910.134. Rulemaking participants recommended that the respirator provisions of the existing Cadmium, Benzene, and Formaldehyde standards be revised to conform with those provisions of 29 CFR 1910.134 to improve regulatory consistency and uniformity (Exs. 54-194, 54-195, 54-208, 54-218, 54-275, 54-294, 54-337, 54-350, 54-387, 54-434). In view of these comments, the Agency assumes that a consensus exists among the regulated community to bring these standards (as well as the 1,3-Butadiene and Methylene chloride standards, which were issued after the close of the comment period for the respirator rulemaking) into conformity with the revised respiratory protection standard. Accordingly, these standards have been revised in the same manner as the other substance-specific standards for which OSHA proposed revisions.

In revising the fit-testing provisions (paragraph (f)) of the substance-specific standards, the frequency of respirator fit testing was revised from semiannually to annually for the Asbestos (29 CFR 1910.1001 and 1926.1101), Arsenic (29 CFR 1910.1018), Lead (29 CFR 1910.1025 and 1926.62) and Acrylonitrile (29 CFR 1910.1045) standards. The Agency believes that this revision will not diminish the effectiveness of respiratory protection provided by these standards. OSHA's experience in recent rulemakings (Cadmium, 1992; Methyleneedianiline, 1992; Formaldehyde, 1992; Methylene chloride, 1997) has led the Agency to conclude that annual respirator fit

testing, which is provided for in the recent standards, protects employees appropriately, and that semi-annual fit testing is not necessary for employee protection. The basis for adopting a semiannual fit-testing requirement is not discussed in the preambles to any of the standards that contain that requirement. For example, there is no discussion in the preambles of those standards that semiannual fit testing was adopted because of the toxic properties of the regulated substances or the particular characteristics of the respirators to be used.

Recent rulemakings, including proposed revisions to the respiratory protection standard, have provided the Agency with much more scientific and experiential information on fit testing than was available when the affected standards were adopted. A number of commenters in the current rulemaking asserted that provisions for semiannual fit testing in the existing Asbestos, Arsenic, Lead, and Acrylonitrile standards should be revised to conform to the annual fit testing requirements of the recently-adopted standards (Exs. 54-5, 54-179, 54-186, 54-208, 54-218, 54-219, 54-222, 54-242, 54-289, 54-326, 54-330, 54-348, 54-410, 54-424, 54-439, 54-443.) The Agency, therefore, concludes that it is reasonable and appropriate, for the purpose of regulatory consistency and uniformity, to require only annual respirator fit testing in its substance-specific standards.

While the proposal did not incorporate revised paragraph (m) (recordkeeping) into the existing substance-specific standards, OSHA incorporated this paragraph in the final rulemaking in the belief that such action: (1) Will make recordkeeping requirements consistent and uniform for employers who use respirators to control employee exposures to the airborne contaminants regulated by the substance-specific standards; (2) will reduce the regulatory burden on employers because they are currently required under 29 CFR 1910.1020 to maintain exposure and medical records; and, (3) it is a prevailing business and industrial-hygiene practice to retain fit-testing records to demonstrate that protection was provided to exposed employees.

For the 13 carcinogens addressed by existing 29 CFR 1910.1003 (the "13 Carcinogens standard"), the provision requiring employers to ensure that employees use respirators "in accordance with 29 CFR 1910.134" was amended to require compliance with paragraphs (b), (c), (d) (except (d)(1)(iii), (iv), and (d)(3)), and (e)-(m) of the

final standard. While the proposal did not incorporate revised paragraph (e) (medical evaluation) into the 13 Carcinogens standard, OSHA did so in the final rulemaking because such incorporation is consistent with the requirements of existing 29 CFR 1910.134, conforms to accepted industry practice, and improves comprehension of, and compliance with, the respiratory protection requirements of the 13 Carcinogens standard.

Unlike 29 CFR 1910.1003, each of the existing substance-specific OSHA standards includes unique medical-evaluation requirements for employees who use respirators. OSHA believes that the medical-evaluation requirements for respirator use established under its existing substance-specific standards provide a high degree of medical protection to employees who are required to use respirators to control their exposures to the airborne substances regulated by the substance-specific standards. In addition, the medical-evaluation requirements for respirator use in the substance-specific standards are part of a comprehensive, integrated medical-surveillance program designed to evaluate employees for conditions and risks associated with exposure to the regulated substances; consequently, OSHA believes that any revision to the frequency or content of medical evaluations for respirator use would unnecessarily disrupt ongoing medical-surveillance programs and, therefore, jeopardize the health of employees who must use respirators to prevent exposure to hazardous workplace substances.

Paragraph (d)(1)(iii) of the revised respiratory protection standard, which requires employers to estimate exposure levels in selecting appropriate respirators, has not been incorporated into OSHA's substance-specific standards in the final rulemaking. The existing substance-specific standards, except the 13 Carcinogens standard, already include exposure assessment provisions that are more specific than the general exposure-assessment requirement in the final respiratory protection standard. With respect to the 13 Carcinogens standard, no PELs or other exposure criteria are specified in that standard that would be relevant to respirator selection. In the 13 Carcinogens standard, exposure estimates for the substances regulated by the standard are not necessary for respirator selection because appropriate respirators have been identified for specific work activities that occur during employee exposure to each of the 13 carcinogenic substances.

OSHA excepted substance-specific standards that already contain requirements for cartridge- and canister-change schedules (Vinyl chloride, Benzene, Acrylonitrile, Formaldehyde, and 1,3-Butadiene) from paragraphs (d)(3)(iii)(B) (1) and (2) of the revised respiratory protection standard, which also addresses change schedules, to preclude regulatory conflict. The Agency finds that information obtained during the rulemakings for these substance-specific standards resulted in the development of change schedules that were especially tailored to the chemistry of the specific substance, documented the exposure conditions requiring these schedules, and determined the types of respirators required for employee protection. Consequently, the Agency concludes that the change schedules adopted during these rulemakings must not be replaced by the generic change-schedule requirements of revised 29 CFR 1910.134.

As proposed, the Agency also removed a number of appendices from the substance-specific standards that addressed fit-testing requirements, replacing them with references to Appendix A of revised 29 CFR 1910.134. In this regard, the Agency proposed to update Section IV of Appendix B of 29 CFR 1910.1025 (the Lead standard) by citing Appendix A of 29 CFR 1910.134 as the reference for fit-testing procedures; the proposed revision has been made in the final rulemaking. While not proposed, the Agency revised the same information in Appendix B of 29 CFR 1926.62 (the Lead standard for Construction), removed the sixth paragraph from Section IV of Appendix B of 29 CFR 1910.1025 and 1926.62 as being outdated, and revised references for respirator approval in Section IV of Appendix B of 29 CFR 1910.1025, Section IV of Appendix A to 29 CFR 1910.1045 (the Acrylonitrile standard), Section IV of Appendix A to 29 CFR 1910.1047 (the Ethylene Oxide standard), Section III of Appendix A to 29 CFR 1910.1050 (the 4, 4'-Methylenedianiline standard), and Section IV of Appendix B to 29 CFR 1926.62, Lead in Construction. The Agency believes that these revisions will conform the affected standards with the provisions of the revised respiratory protection standard; the resulting consistency will, therefore, reduce confusion and ease compliance.

The following provisions, addressing fit-testing, respirator selection, and respirator use, have been deleted from OSHA's substance-specific standards

because they duplicate requirements specified in revised 29 CFR 1910.134:

(1) *Fit Testing*

This requirement is specified in paragraph (f) of the revised respiratory protection standard, allowing for the removal of the following paragraphs:

- (a) 29 CFR 1910.1001 Asbestos.
 - (g)(4) and Appendix C
 - (b) 29 CFR 1910.1018 Inorganic arsenic.
 - (h)(3) (i), (ii), and (iii)
 - (c) 29 CFR 1910.1025 Lead.
 - (f)(3) (i) and (ii), and Appendix D; Section IV of Appendix B revised in part
 - (d) 29 CFR 1910.1027 Cadmium.
 - (g)(4) and Appendix C
 - (e) 29 CFR 1910.1028 Benzene.
 - (g)(5) and Appendix E
 - (f) 29 CFR 1910.1045 Acrylonitrile.
 - (h)(3)(iii)
 - (g) 1910.1048 Formaldehyde.
 - (g)(3)(ii) and Appendix E
 - (h) 29 CFR 1910.1050 Methylenedianiline.
 - (h)(5) and Appendix E
 - (i) 29 CFR 1910.1051 1,3-Butadiene.
 - (h)(5) and Appendix E
 - (j) 29 CFR 1910.1052 Methylene chloride.
 - (g)(7)
 - (k) 29 CFR 1926.60 Methylenedianiline.
 - (i)(5) and Appendix E
 - (l) 29 CFR 1926.62 Lead.
 - (f)(3) (i) and (ii), and Appendix D; Section IV of Appendix B revised in part
 - (m) 29 CFR 1926.1101 Asbestos.
 - (h)(4) and Appendix C
 - (n) 29 CFR 1926.1127 Cadmium.
 - (g)(4) and Appendix C
- (2) *Respirator-Approval Requirements that Reference MSHA or NIOSH 30 CFR Part 11*

The requirement to select respirators approved by NIOSH in 42 CFR part 84 is specified in paragraph (d)(1)(ii) of the revised respiratory protection standard. This requirement updates the existing respirator-approval requirement in the substance-specific standards to select respirators approved by MSHA or NIOSH under 30 CFR part 11, allowing for removal of the following paragraphs:

- (a) 29 CFR 1910.1001 Asbestos.
 - (g)(2)(i) [part]
- (b) 29 CFR 1910.1017 Vinyl chloride.
 - (g)(2)
- (c) 29 CFR 1910.1018 Inorganic arsenic.
 - (h)(2)(iii)
- (d) 29 CFR 1910.1025 Lead.
 - (f)(2)(iii); Section IV of Appendix B revised in part
- (e) 29 CFR 1910.1027 Cadmium.
 - (g)(2)(i) [part]
- (f) 29 CFR 1910.1028 Benzene

- (g)(2)(ii)
 (g) 29 CFR 1910.1029 Coke oven emissions.
 (g)(2)(iii)
 (h) 29 CFR 1910.1044 1,2-Dibromo-3-chloropropane.
 (h)(2)(ii)
 (i) 29 CFR 1910.1045 Acrylonitrile.
 (h)(2)(ii); Section IV of Appendix A revised in part
 (j) 29 CFR 1910.1047 Ethylene oxide.
 (g)(2)(ii); Section IV of Appendix A revised in part
 (k) 29 CFR 1910.1048 Formaldehyde.
 (g)(2)(i) [part]
 (l) 29 CFR 1910.1050 Methylene dianiline.
 (h)(2)(ii); Section III of Appendix A revised in part
 (m) 29 CFR 1910.1051 1,3-Butadiene.
 (h)(2)(ii) [part]
 (n) 29 CFR 1910.1052 Methylene chloride.
 (g)(3) [part]
 (o) 29 CFR 1926.60 Methylene dianiline.
 (i)(2)(ii)
 (p) 29 CFR 1926.62 Lead.
 (f)(2)(iii); Section IV of Appendix B revised in part
 (q) 29 CFR 1926.1101 Asbestos.
 (h)(2)(ii)
 (r) 29 CFR 1926.1127 Cadmium.
 (g)(2)(i) [part]
- (3) *Respirator Use*
- Paragraph (g) of the revised respiratory protection standard addresses, in part, facepiece seal protection (paragraph (g)(1)), and employees leaving the work area to wash their faces and respirator facepieces (paragraph (g)(2)(ii)(A)) and to change filter elements (paragraph (g)(2)(ii) (B) and (C)), allowing removal of the following paragraphs:
- (a) 29 CFR 1910.1001 Asbestos.
 (g)(3) (ii) and (iii)
 (b) 29 CFR 1910.1018 Inorganic arsenic.
 (h)(4) (ii) and (iii)
 (c) 29 CFR 1910.1025 Lead.
 (f)(4) (ii) and (iii)
 (d) 29 CFR 1910.1027 Cadmium.
 (g)(3) (ii) and (iii)
 (e) 29 CFR 1910.1028 Benzene.
 (g)(4)(iii)
 (f) 29 CFR 1910.1029 Coke oven emissions.
 (g)(4)
 (g) 29 CFR 1910.1043 Cotton dust.
 (f)(4)
 (h) 29 CFR 1910.1044 1,2-Dibromo-3-chloropropane.
 (h)(3)(ii)
 (i) 29 CFR 1910.1045 Acrylonitrile.
 (h)(3)(iv)
 (j) 29 CFR 1910.1048 Formaldehyde.
 (g)(3)(v)

- (k) 29 CFR 1910.1050 Methylene dianiline.
 (h)(4)(ii)
 (l) 29 CFR 1910.1051 1,3-Butadiene.
 (h)(4)(v)
 (m) 29 CFR 1910.1052 Methylene chloride.
 (g)(5)
 (n) 29 CFR 1926.60 Methylene dianiline. (i)(4)(ii)
 (o) 29 CFR 1926.62 Lead.
 (f)(4) (ii) and (iii)
 (p) 1926.1101 Asbestos.
 (h)(3) (ii) and (iii)
 (q) 29 CFR 19126.1127 Cadmium.
 (g)(3) (ii) and (iii)

The full text, after deletions and revisions, of the paragraphs dealing with respirators that remain in each of OSHA's existing substance specific standards has been published in Section XI of this preamble.

The provisions of the respiratory protection standard found in 29 CFR part 1926 (Construction), specifically 29 CFR 1926.103, are now identical to the new 29 CFR 1910.134. Following its policy of not repeating identical health provisions in order to reduce paperwork burden and to avoid regulatory confusion, OSHA is deleting the duplicate text in 29 CFR 1926.103 and cross-referencing the text in 29 CFR 1910.134. To implement this action, the title of this section remains, but a Note is added to read: "Note: The requirements applicable to construction work under this section are identical to those set forth at 29 CFR 1910.134 of this chapter." For the convenience of the Construction industry, OSHA makes available an indexed manual that includes the full text of all regulations applicable to construction, including OSHA's respirator requirements.

OSHA is also revising or removing a number of provisions in addition to safety and health standards, other than the substance-specific standards, that duplicate provisions now found in the revised respiratory protection standard. These standards and their revisions include:

- (1) 29 CFR 1910.94 Ventilation.
 (a)(1)(i)—Removed the phrase "continuous flow" from the definition of abrasive-blasting respirator consistent with the proposed requirement to select respirators in accordance with 29 CFR 1910.134.
 (a)(5)(i)—Revised the reference from "30 CFR part 11" to "42 CFR Part 84."
 (a)(5)(iii)—Provided the reference "42 CFR Part 84."
 (a)(5)(iv)—Revised the reference from "§ 1910.134 (a) and (b)" to "§ 1910.134."
 (a)(6)—Revised the air-requirement reference for abrasive-blasting

respirators from "ANSI Z9.2-1960" to "29 CFR 1910.134(i)."

(c)(6)(iii)(a)—Revised the reference from "MSHA/NIOSH/ANSI Z-88.2-1969" to "NIOSH under 42 CFR Part 84."

(d)(9)(vi)—Revised the reference from "MSHA/NIOSH" to "NIOSH under 42 CFR Part 84."

(2) 29 CFR 1910.111 Storage and handling of anhydrous ammonia.

(a)(2)(x)—Revised the reference from "MSHA" to "the National Institute for Occupational Safety and Health (NIOSH) under 42 CFR Part 84."

(b)(10)(ii)—Revised the reference from "Bureau of Mines" to "NIOSH under 42 CFR Part 84."

(3) 29 CFR 1910.156 Fire brigades.

(f)(1)(i) and (v)—Revised the reference from "MSHA/NIOSH" to "NIOSH under 42 CFR Part 84."

(4) 29 CFR 1910.252 General requirements.

(c)(4)(ii) and (iii), (c)(7)(iii), (c)(9)(i), and (c)(10)—Revised the references from "MSHA/NIOSH" to "National Institute for Occupational Safety and Health (NIOSH) under 42 CFR Part 84" and "NIOSH under 42 CFR Part 84."

(5) 29 CFR 1910.261 Pulp, paper, and paperboard mills.

(b)(2) and (g)(10)—Revised the reference from "ANSI Z88.2-1969" to "29 CFR 1910.134."

(h)(2)(iii) and (iv)—Revised the reference from "ANSI Z-88.2-1969 and K-13.1-1967" to "29 CFR 1910.134."

(6) 29 CFR 1926.57 Ventilation.

(f)(1)(ii)—Removed the phrase "continuous flow" from the definition of abrasive-blasting respirator consistent with the proposed requirement to select respirators in accordance with 29 CFR 1910.134.

(f)(5)(i)—Revised the reference from "30 CFR Part 11" to "42 CFR Part 84."

(f)(5)(iii)—Provided the reference "42 CFR Part 84."

(f)(6)—Revised the air-requirement reference for abrasive-blasting respirators from "ANSI Z9.2-1960" to "29 CFR 1910.134(i)."

(h)(6)(iii)(A)—Revised the reference from "MSHA/NIOSH/ANSI Z-88.2-1969" to "NIOSH under 42 CFR Part 84."

(i)(9)(vi)—Revised the reference from "MSHA/NIOSH" to "NIOSH under 42 CFR Part 84."

(7) 29 CFR 1926.103 Respiratory protection.

Removed paragraphs (a) through (i) and replaced them with a note to read as follows:

Note: The requirements applicable to construction work under this section are identical to those set forth at § 1910.134 of this chapter.

(8) 29 CFR 1926.800 Underground construction.

(g)(2)—Revised the reference from “MSHA/NIOSH” to “the National Institute for Occupational Safety and Health under 42 CFR Part 84,” and from “§ 1926.103 (b) and (c)” to “29 CFR 1926.103.”

Appendices

The four appendices are discussed in detail under the Summary and Explanation sections for the following paragraphs of the final standard: Appendix A in paragraph (f), “Fit Testing”; Appendix B-1 in paragraph (g), “Use of respirators”; Appendix B-2 in paragraph (h), “Maintenance and care of respirators”; Appendix C in paragraph (e), “Medical evaluation”; Appendix D in paragraphs (c), “Written program” and paragraph (a), “Permissible practice.”

VIII. Authority and Signature

This document was prepared under the direction of Charles N. Jeffress, Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210.

Pursuant to sections 4, 6(b), 8(c), and 8(g) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Sec. 107 of the Contract Work Hours and Safety Standards Act (the Construction Safety Act) (40 U.S.C. 333); Sec. 41, the Longshore and Harbor Worker’s Compensation Act (33 U.S.C. 941); Secretary of Labor’s Order Nos. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR part 1911; 29 CFR parts 1910 and 1926 are amended as set forth below.

List of Subjects in 29 CFR Parts 1910 and 1926

Health, Occupational safety and health, Reporting and recordkeeping requirements.

Signed at Washington, DC, this 15th day of December, 1997.

Charles N. Jeffress,

Assistant Secretary of Labor for Occupational Safety and Health.

IX. Amended Standards

Part 1910 of Title 29 of the Code of Federal Regulations is hereby amended as follows:

PART 1910—[AMENDED]

Subpart G—[Amended]

1. The authority citation for Subpart G of Part 1910 is revised to read as follows:

Authority: Secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor’s Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR part 1911.

2. Section 1910.94 is amended by revising paragraphs (a)(1)(ii), (a)(5)(i), (a)(5)(iii) introductory text, (a)(5)(iv), (a)(6), (c)(6)(iii)(a), and (d)(9)(vi) as follows:

§ 1910.94 Ventilation.

- (a) * * *
- (1) * * *

(ii) *Abrasive-blasting respirator.* A respirator constructed so that it covers the wearer’s head, neck, and shoulders to protect the wearer from rebounding abrasive.

* * * * *

(5) *Personal protective equipment.* (i) Employers must use only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) under 42 CFR part 84 to protect employees from dusts produced during abrasive-blasting operations.

* * * * *

(iii) Properly fitted particulate-filter respirators, commonly referred to as dust-filter respirators, may be used for short, intermittent, or occasional dust exposures such as cleanup, dumping of dust collectors, or unloading shipments of sand at a receiving point when it is not feasible to control the dust by enclosure, exhaust ventilation, or other means. The respirators used must be approved by NIOSH under 42 CFR part 84 for protection against the specific type of dust encountered.

* * * * *

(iv) For employees who use respirators required by this section, the employer must implement a respiratory protection program in accordance with 29 CFR 1910.134.

* * * * *

(6) *Air supply and air compressors.* Air for abrasive-blasting respirators must be free of harmful quantities of dusts, mists, or noxious gases, and must meet the requirements for supplied-air quality and use specified in 29 CFR 1910.134(i).

* * * * *

- (c) * * *
- (6) * * *

(iii) (a) When an operator is in a booth downstream from the object being sprayed, an air-supplied respirator or other type of respirator must be used by employees that has been approved by NIOSH under 42 CFR part 84 for the material being sprayed.

* * * * *

(d) * * *

(9) * * *

(vi) During the emergencies specified in paragraph (d)(11)(v) of this section, if employees must be in areas where the concentrations of air contaminants are greater than the limits set by paragraph (d)(2)(iii) of this section or the oxygen concentration is less than 19.5 percent, they must use respirators that reduce their exposure to a level below these limits or that provide adequate oxygen. Such respirators must also be provided in marked, quickly-accessible storage compartments built for this purpose when the possibility exists that hazardous concentrations of air contaminants could be released accidentally. The respirators must be approved by the NIOSH under 42 CFR part 84, selected by a competent industrial hygienist or other technically-qualified source, and used in accordance with 29 CFR 1910.134.

* * * * *

Subpart H—[Amended]

3. The authority citation for subpart H of part 1910 is revised to read as follows:

Authority: Secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor’s Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR part 1911.

4. Section 1910.111 is amended by revising paragraphs (a)(2)(x) and (b)(10)(ii) as follows:

§ 1910.111 Storage and handling of anhydrous ammonia.

- (a) * * *
- (2) * * *

(x) *Gas masks.* Gas masks must be approved by the National Institute for Occupational Safety and Health (NIOSH) under 42 CFR part 84 for use with anhydrous ammonia.

* * * * *

- (b) * * *
- (10) * * *

(ii) Stationary storage installations must have at least two suitable gas masks in readily-accessible locations. Full-face masks with ammonia canisters that have been approved by NIOSH under 42 CFR part 84 are suitable for emergency action involving most anhydrous ammonia leaks, particularly leaks that occur outdoors. For respiratory protection in concentrated ammonia atmospheres, a self-contained breathing apparatus is required.

* * * * *

Subpart I—[Amended]

5. The authority citation for Subpart I of Part 1910 is revised to read as follows:

Authority: Sections 4, 6, and 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable.

Sections 1910.132, 1910.134, and 1910.138 also issued under 29 CFR part 1911.

Sections 1910.133, 1910.135, and 1910.136 also issued under 29 CFR part 1911 and 5 U.S.C. 553.

6. Section 1910.134 is redesignated as § 1910.139 in subpart I and amended by revising its title and adding introductory text to read as follows:

§ 1910.139 Respiratory protection for M. tuberculosis.

This section applies only to respiratory protection against M. tuberculosis and applies in lieu of § 1910.134.

* * * * *

7. A new section 1910.134 is added to read as follows:

§ 1910.134 Respiratory protection.

This section applies to General Industry (part 1910), Shipyards (part 1915), Marine Terminals (part 1917), Longshoring (part 1918), and Construction (part 1926).

(a) *Permissible practice.* (1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to this section.

(2) Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protection program which shall include the requirements outlined in paragraph (c) of this section.

(b) *Definitions.* The following definitions are important terms used in the respiratory protection standard in this section.

Air-purifying respirator means 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 means a respirator that supplies the respirator user with breathing air from a source independent of the ambient atmosphere, and includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units.

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

Demand respirator means 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 means 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 significant release of an airborne contaminant.

Employee exposure means 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) means 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 means a respirator intended to be used only for emergency exit.

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

Filtering facepiece (dust mask) means 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.

Fit factor means 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 means 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 means a rigid respiratory inlet covering that also provides head protection against impact and penetration.

High efficiency particulate air (HEPA) filter means a filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Hood means 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) means 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 means the physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures which are involved in a fire situation beyond the incipient stage. (See 29 CFR 1910.155)

Loose-fitting facepiece means 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) means 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 means an atmosphere with an oxygen content below 19.5% by volume.

Physician or other licensed health care professional (PLHCP) means 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 paragraph (e) of this section.

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

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

Pressure demand respirator means 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) means a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

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

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

Self-contained breathing apparatus (SCBA) means an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Service life means 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 means an atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

This section means this respiratory protection standard.

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

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

(c) *Respiratory protection program.* This paragraph requires the employer to develop and implement a written respiratory protection program with required worksite-specific procedures and elements for required respirator use. The program must be administered by a suitably trained program administrator. In addition, certain program elements may be required for voluntary use to prevent potential hazards associated with the use of the respirator. The Small Entity Compliance Guide contains criteria for the selection of a program administrator and a sample program that meets the requirements of this paragraph. Copies of the Small Entity Compliance Guide will be available on or about April 8, 1998 from the Occupational Safety and Health Administration's Office of Publications, Room N 3101, 200 Constitution Avenue, NW, Washington, DC, 20210 (202-219-4667).

(1) In any workplace where respirators are necessary to protect the health of the employee or whenever respirators are required by the

employer, the employer shall establish and implement a written respiratory protection program with worksite-specific procedures. The program shall be updated as necessary to reflect those changes in workplace conditions that affect respirator use. The employer shall include in the program the following provisions of this section, as applicable:

(i) Procedures for selecting respirators for use in the workplace;

(ii) Medical evaluations of employees required to use respirators;

(iii) Fit testing procedures for tight-fitting respirators;

(iv) Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;

(v) Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators;

(vi) Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;

(vii) Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations;

(viii) Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance; and

(ix) Procedures for regularly evaluating the effectiveness of the program.

(2) Where respirator use is not required:

(i) An employer may provide respirators at the request of employees or permit employees to use their own respirators, if the employer determines that such respirator use will not in itself create a hazard. If the employer determines that any voluntary respirator use is permissible, the employer shall provide the respirator users with the information contained in Appendix D to this section ("Information for Employees Using Respirators When Not Required Under the Standard"); and

(ii) In addition, the employer must establish and implement those elements of a written respiratory protection program necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks).

(3) The employer shall designate a program administrator who is qualified by appropriate training or experience that is commensurate with the complexity of the program to administer or oversee the respiratory protection program and conduct the required evaluations of program effectiveness.

(4) The employer shall provide respirators, training, and medical evaluations at no cost to the employee.

(d) *Selection of respirators.* This paragraph requires the employer to evaluate respiratory hazard(s) in the workplace, identify relevant workplace and user factors, and base respirator selection on these factors. The paragraph also specifies appropriately protective respirators for use in IDLH atmospheres, and limits the selection and use of air-purifying respirators.

(1) *General requirements.* (i) The employer shall select and provide an appropriate respirator based on the respiratory hazard(s) to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.

(ii) The employer shall select a NIOSH-certified respirator. The respirator shall be used in compliance with the conditions of its certification.

(iii) The employer shall identify and evaluate the respiratory hazard(s) in the workplace; this evaluation shall include a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form. Where the employer cannot identify or reasonably estimate the employee exposure, the employer shall consider the atmosphere to be IDLH.

(iv) The employer shall select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

(2) *Respirators for IDLH atmospheres.*

(i) The employer shall provide the following respirators for employee use in IDLH atmospheres:

(A) A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or

(B) A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.

(ii) Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

(iii) All oxygen-deficient atmospheres shall be considered IDLH. Exception: If the employer demonstrates that, under all foreseeable conditions, the oxygen concentration can be maintained within

the ranges specified in Table II of this section (i.e., for the altitudes set out in the table), then any atmosphere-supplying respirator may be used.

(3) *Respirators for atmospheres that are not IDLH.* (i) The employer shall provide a respirator that is adequate to protect the health of the employee and ensure compliance with all other OSHA statutory and regulatory requirements, under routine and reasonably foreseeable emergency situations.

(A) *Assigned Protection Factors (APFs)* [Reserved]

(B) *Maximum Use Concentration (MUC)* [Reserved]

(ii) The respirator selected shall be appropriate for the chemical state and physical form of the contaminant.

(iii) For protection against gases and vapors, the employer shall provide:

(A) An atmosphere-supplying respirator, or

(B) An air-purifying respirator, provided that:

(1) The respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant; or

(2) If there is no ESLI appropriate for conditions in the employer's workplace, the employer implements a change schedule for canisters and cartridges that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The employer shall describe in the respirator program the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data.

(iv) For protection against particulates, the employer shall provide:

(A) An atmosphere-supplying respirator; or

(B) An air-purifying respirator equipped with a filter certified by NIOSH under 30 CFR part 11 as a high efficiency particulate air (HEPA) filter, or an air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR part 84; or

(C) For contaminants consisting primarily of particles with mass median aerodynamic diameters (MMAD) of at least 2 micrometers, an air-purifying respirator equipped with any filter certified for particulates by NIOSH.

TABLE I.—Assigned Protection Factors [Reserved]

TABLE II

| Altitude (ft.) | Oxygen deficient Atmospheres (% O ₂) for which the employer may rely on atmosphere-supplying respirators |
|--------------------------------|--|
| Less than 3,001 | 16.0–19.5 |
| 3,001–4,000 | 16.4–19.5 |
| 4,001–5,000 | 17.1–19.5 |
| 5,001–6,000 | 17.8–19.5 |
| 6,001–7,000 | 18.5–19.5 |
| 7,001–8,000 ¹ | 19.3–19.5. |

¹ Above 8,000 feet the exception does not apply. Oxygen-enriched breathing air must be supplied above 14,000 feet.

(e) *Medical evaluation.* Using a respirator may place a physiological burden on employees that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of the employee. Accordingly, this paragraph specifies the minimum requirements for medical evaluation that employers must implement to determine the employee's ability to use a respirator.

(1) *General.* The employer shall provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator in the workplace. The employer may discontinue an employee's medical evaluations when the employee is no longer required to use a respirator.

(2) *Medical evaluation procedures.* (i) The employer shall identify a physician or other licensed health care professional (PLHCP) to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information as the medical questionnaire.

(ii) The medical evaluation shall obtain the information requested by the questionnaire in Sections 1 and 2, Part A of Appendix C of this section.

(3) *Follow-up medical examination.*

(i) The employer shall ensure that a follow-up medical examination is provided for an employee who gives a positive response to any question among questions 1 through 8 in Section 2, Part A of Appendix C or whose initial medical examination demonstrates the need for a follow-up medical examination.

(ii) The follow-up medical examination shall include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.

(4) *Administration of the medical questionnaire and examinations.* (i) The medical questionnaire and examinations shall be administered confidentially during the employee's normal working hours or at a time and place convenient to the employee. The medical questionnaire shall be administered in a manner that ensures that the employee understands its content.

(ii) The employer shall provide the employee with an opportunity to discuss the questionnaire and examination results with the PLHCP.

(5) *Supplemental information for the PLHCP.* (i) The following information must be provided to the PLHCP before the PLHCP makes a recommendation concerning an employee's ability to use a respirator:

(A) The type and weight of the respirator to be used by the employee;

(B) The duration and frequency of respirator use (including use for rescue and escape);

(C) The expected physical work effort;

(D) Additional protective clothing and equipment to be worn; and

(E) Temperature and humidity extremes that may be encountered.

(ii) Any supplemental information provided previously to the PLHCP regarding an employee need not be provided for a subsequent medical evaluation if the information and the PLHCP remain the same.

(iii) The employer shall provide the PLHCP with a copy of the written respiratory protection program and a copy of this section.

Note to Paragraph (e)(5)(iii): When the employer replaces a PLHCP, the employer must ensure that the new PLHCP obtains this information, either by providing the documents directly to the PLHCP or having the documents transferred from the former PLHCP to the new PLHCP. However, OSHA does not expect employers to have employees medically reevaluated solely because a new PLHCP has been selected.

(6) *Medical determination.* In determining the employee's ability to use a respirator, the employer shall:

(i) Obtain a written recommendation regarding the employee's ability to use the respirator from the PLHCP. The recommendation shall provide only the following information:

(A) Any limitations on respirator use related to the medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator;

(B) The need, if any, for follow-up medical evaluations; and

(C) A statement that the PLHCP has provided the employee with a copy of the PLHCP's written recommendation.

(ii) If the respirator is a negative pressure respirator and the PLHCP finds a medical condition that may place the employee's health at increased risk if the respirator is used, the employer shall provide a PAPR if the PLHCP's medical evaluation finds that the employee can use such a respirator; if a subsequent medical evaluation finds that the employee is medically able to use a negative pressure respirator, then the employer is no longer required to provide a PAPR.

(7) *Additional medical evaluations.* At a minimum, the employer shall provide additional medical evaluations that comply with the requirements of this section if:

(i) An employee reports medical signs or symptoms that are related to ability to use a respirator;

(ii) A PLHCP, supervisor, or the respirator program administrator informs the employer that an employee needs to be reevaluated;

(iii) Information from the respiratory protection program, including observations made during fit testing and program evaluation, indicates a need for employee reevaluation; or

(iv) A change occurs in workplace conditions (e.g., physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.

(f) *Fit testing.* This paragraph requires that, before an employee may be required to use any respirator with a negative or positive pressure tight-fitting facepiece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used. This paragraph specifies the kinds of fit tests allowed, the procedures for conducting them, and how the results of the fit tests must be used.

(1) The employer shall ensure that employees using a tight-fitting facepiece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT) as stated in this paragraph.

(2) The employer shall ensure that an employee using a tight-fitting facepiece respirator is fit tested prior to initial use of the respirator, whenever a different respirator facepiece (size, style, model or make) is used, and at least annually thereafter.

(3) The employer shall conduct an additional fit test whenever the employee reports, or the employer, PLHCP, supervisor, or program administrator makes visual observations of, changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental

changes, cosmetic surgery, or an obvious change in body weight.

(4) If after passing a QLFT or QNFT, the employee subsequently notifies the employer, program administrator, supervisor, or PLHCP that the fit of the respirator is unacceptable, the employee shall be given a reasonable opportunity to select a different respirator facepiece and to be retested.

(5) The fit test shall be administered using an OSHA-accepted QLFT or QNFT protocol. The OSHA-accepted QLFT and QNFT protocols and procedures are contained in Appendix A of this section.

(6) QLFT may only be used to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less.

(7) If the fit factor, as determined through an OSHA-accepted QNFT protocol, is equal to or greater than 100 for tight-fitting half facepieces, or equal to or greater than 500 for tight-fitting full facepieces, the QNFT has been passed with that respirator.

(8) Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators shall be accomplished by performing quantitative or qualitative fit testing in the negative pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.

(i) Qualitative fit testing of these respirators shall be accomplished by temporarily converting the respirator user's actual facepiece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure air-purifying respirator facepiece with the same sealing surfaces as a surrogate for the atmosphere-supplying or powered air-purifying respirator facepiece.

(ii) Quantitative fit testing of these respirators shall be accomplished by modifying the facepiece to allow sampling inside the facepiece in the breathing zone of the user, midway between the nose and mouth. This requirement shall be accomplished by installing a permanent sampling probe onto a surrogate facepiece, or by using a sampling adapter designed to temporarily provide a means of sampling air from inside the facepiece.

(iii) Any modifications to the respirator facepiece for fit testing shall be completely removed, and the facepiece restored to NIOSH-approved configuration, before that facepiece can be used in the workplace.

(g) *Use of respirators.* This paragraph requires employers to establish and implement procedures for the proper use of respirators. These requirements

include prohibiting conditions that may result in facepiece seal leakage, preventing employees from removing respirators in hazardous environments, taking actions to ensure continued effective respirator operation throughout the work shift, and establishing procedures for the use of respirators in IDLH atmospheres or in interior structural firefighting situations.

(1) *Facepiece seal protection.* (i) The employer shall not permit respirators with tight-fitting facepieces to be worn by employees who have:

(A) Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or

(B) Any condition that interferes with the face-to-facepiece seal or valve function.

(ii) If an employee wears corrective glasses or goggles or other personal protective equipment, the employer shall ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

(iii) For all tight-fitting respirators, the employer shall ensure that employees perform a user seal check each time they put on the respirator using the procedures in Appendix B-1 or procedures recommended by the respirator manufacturer that the employer demonstrates are as effective as those in Appendix B-1 of this section.

(2) *Continuing respirator effectiveness.* (i) Appropriate surveillance shall be maintained of work area conditions and degree of employee exposure or stress. When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, the employer shall reevaluate the continued effectiveness of the respirator.

(ii) The employer shall ensure that employees leave the respirator use area:

(A) To wash their faces and respirator facepieces as necessary to prevent eye or skin irritation associated with respirator use; or

(B) If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece; or

(C) To replace the respirator or the filter, cartridge, or canister elements.

(iii) If the employee detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece, the employer must replace or repair the respirator before allowing the employee to return to the work area.

(3) *Procedures for IDLH atmospheres.* For all IDLH atmospheres, the employer shall ensure that:

(i) One employee or, when needed, more than one employee is located outside the IDLH atmosphere;

(ii) Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere;

(iii) The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue;

(iv) The employer or designee is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue;

(v) The employer or designee authorized to do so by the employer, once notified, provides necessary assistance appropriate to the situation;

(vi) Employee(s) located outside the IDLH atmospheres are equipped with:

(A) Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either

(B) Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or

(C) Equivalent means for rescue where retrieval equipment is not required under paragraph (g)(3)(vi)(B).

(4) *Procedures for interior structural firefighting.* In addition to the requirements set forth under paragraph (g)(3), in interior structural fires, the employer shall ensure that:

(i) At least two employees enter the IDLH atmosphere and remain in visual or voice contact with one another at all times;

(ii) At least two employees are located outside the IDLH atmosphere; and

(iii) All employees engaged in interior structural firefighting use SCBAs.

Note 1 to paragraph (g): One of the two individuals located outside the IDLH atmosphere may be assigned to an additional role, such as incident commander in charge of the emergency or safety officer, so long as this individual is able to perform assistance or rescue activities without jeopardizing the safety or health of any firefighter working at the incident.

Note 2 to paragraph (g): Nothing in this section is meant to preclude firefighters from performing emergency rescue activities before an entire team has assembled.

(h) *Maintenance and care of respirators.* This paragraph requires the employer to provide for the cleaning and disinfecting, storage, inspection, and repair of respirators used by employees.

(1) *Cleaning and disinfecting.* The employer shall provide each respirator user with a respirator that is clean, sanitary, and in good working order. The employer shall ensure that respirators are cleaned and disinfected using the procedures in Appendix B-2 of this section, or procedures recommended by the respirator manufacturer, provided that such procedures are of equivalent effectiveness. The respirators shall be cleaned and disinfected at the following intervals:

(i) Respirators issued for the exclusive use of an employee shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition;

(ii) Respirators issued to more than one employee shall be cleaned and disinfected before being worn by different individuals;

(iii) Respirators maintained for emergency use shall be cleaned and disinfected after each use; and

(iv) Respirators used in fit testing and training shall be cleaned and disinfected after each use.

(2) *Storage.* The employer shall ensure that respirators are stored as follows:

(i) All respirators shall be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they shall be packed or stored to prevent deformation of the facepiece and exhalation valve.

(ii) In addition to the requirements of paragraph (h)(2)(i) of this section, emergency respirators shall be:

(A) Kept accessible to the work area;

(B) Stored in compartments or in covers that are clearly marked as containing emergency respirators; and

(C) Stored in accordance with any applicable manufacturer instructions.

(3) *Inspection.* (i) The employer shall ensure that respirators are inspected as follows:

(A) All respirators used in routine situations shall be inspected before each use and during cleaning;

(B) All respirators maintained for use in emergency situations shall be inspected at least monthly and in accordance with the manufacturer's recommendations, and shall be checked for proper function before and after each use; and

(C) Emergency escape-only respirators shall be inspected before being carried into the workplace for use.

(ii) The employer shall ensure that respirator inspections include the following:

(A) 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; and

(B) A check of elastomeric parts for pliability and signs of deterioration.

(iii) In addition to the requirements of paragraphs (h)(3)(i) and (ii) of this section, self-contained breathing apparatus shall be inspected monthly.

Air and oxygen cylinders shall be maintained in a fully charged state and shall be recharged when the pressure falls to 90% of the manufacturer's recommended pressure level. The employer shall determine that the regulator and warning devices function properly.

(iv) For respirators maintained for emergency use, the employer shall:

(A) Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator; and

(B) Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information shall be maintained until replaced following a subsequent certification.

(4) *Repairs.* The employer shall ensure that respirators that fail an inspection or are otherwise found to be defective are removed from service, and are discarded or repaired or adjusted in accordance with the following procedures:

(i) Repairs or adjustments to respirators are to be made only by persons appropriately trained to perform such operations and shall use only the respirator manufacturer's NIOSH-approved parts designed for the respirator;

(ii) Repairs shall be made according to the manufacturer's recommendations and specifications for the type and extent of repairs to be performed; and

(iii) Reducing and admission valves, regulators, and alarms shall be adjusted or repaired only by the manufacturer or a technician trained by the manufacturer.

(i) *Breathing air quality and use.* This paragraph requires the employer to provide employees using atmosphere-supplying respirators (supplied-air and SCBA) with breathing gases of high purity.

(1) The employer shall ensure that compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration accords with the following specifications:

(i) Compressed and liquid oxygen shall meet the United States Pharmacopoeia requirements for medical or breathing oxygen; and

(ii) Compressed breathing air shall meet at least the requirements for Type 1-Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:

(A) Oxygen content (v/v) of 19.5–23.5%;

(B) Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;

(C) Carbon monoxide (CO) content of 10 ppm or less;

(D) Carbon dioxide content of 1,000 ppm or less; and

(E) Lack of noticeable odor.

(2) The employer shall ensure that compressed oxygen is not used in atmosphere-supplying respirators that have previously used compressed air.

(3) The employer shall ensure that oxygen concentrations greater than 23.5% are used only in equipment designed for oxygen service or distribution.

(4) The employer shall ensure that cylinders used to supply breathing air to respirators meet the following requirements:

(i) Cylinders are tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR part 173 and part 178);

(ii) Cylinders of purchased breathing air have a certificate of analysis from the supplier that the breathing air meets the requirements for Type 1—Grade D breathing air; and

(iii) The moisture content in the cylinder does not exceed a dew point of -50°F (-45.6°C) at 1 atmosphere pressure.

(5) The employer shall ensure that compressors used to supply breathing air to respirators are constructed and situated so as to:

(i) Prevent entry of contaminated air into the air-supply system;

(ii) Minimize moisture content so that the dew point at 1 atmosphere pressure is 10 degrees F (5.56°C) below the ambient temperature;

(iii) Have suitable in-line air-purifying sorbent beds and filters to further ensure breathing air quality. Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions.

(iv) Have a tag containing the most recent change date and the signature of the person authorized by the employer to perform the change. The tag shall be maintained at the compressor.

(6) For compressors that are not oil-lubricated, the employer shall ensure that carbon monoxide levels in the breathing air do not exceed 10 ppm.

(7) For oil-lubricated compressors, the employer shall use a high-temperature or carbon monoxide alarm, or both, to monitor carbon monoxide levels. If only high-temperature alarms are used, the air supply shall be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

(8) The employer shall ensure that breathing air couplings are incompatible with outlets for nonrespirable worksite air or other gas systems. No asphyxiating substance shall be introduced into breathing air lines.

(9) The employer shall use breathing gas containers marked in accordance with the NIOSH respirator certification standard, 42 CFR part 84.

(j) *Identification of filters, cartridges, and canisters.* The employer shall ensure that all filters, cartridges and canisters used in the workplace are labeled and color coded with the NIOSH approval label and that the label is not removed and remains legible.

(k) *Training and information.* This paragraph requires the employer to provide effective training to employees who are required to use respirators. The training must be comprehensive, understandable, and recur annually, and more often if necessary. This paragraph also requires the employer to provide the basic information on respirators in Appendix D of this section to employees who wear respirators when not required by this section or by the employer to do so.

(1) The employer shall ensure that each employee can demonstrate knowledge of at least the following:

(i) Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;

(ii) What the limitations and capabilities of the respirator are;

(iii) How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;

(iv) How to inspect, put on and remove, use, and check the seals of the respirator;

(v) What the procedures are for maintenance and storage of the respirator;

(vi) How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and

(vii) The general requirements of this section.

(2) The training shall be conducted in a manner that is understandable to the employee.

(3) The employer shall provide the training prior to requiring the employee to use a respirator in the workplace.

(4) An employer who is able to demonstrate that a new employee has received training within the last 12 months that addresses the elements specified in paragraph (k)(1)(i) through (vii) is not required to repeat such training provided that, as required by paragraph (k)(1), the employee can demonstrate knowledge of those element(s). Previous training not repeated initially by the employer must be provided no later than 12 months from the date of the previous training.

(5) Retraining shall be administered annually, and when the following situations occur:

(i) Changes in the workplace or the type of respirator render previous training obsolete;

(ii) Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill; or

(iii) Any other situation arises in which retraining appears necessary to ensure safe respirator use.

(6) The basic advisory information on respirators, as presented in Appendix D of this section, shall be provided by the employer in any written or oral format, to employees who wear respirators when such use is not required by this section or by the employer.

(l) *Program evaluation.* This section requires the employer to conduct evaluations of the workplace to ensure that the written respiratory protection program is being properly implemented, and to consult employees to ensure that they are using the respirators properly.

(1) The employer shall conduct evaluations of the workplace as necessary to ensure that the provisions of the current written program are being effectively implemented and that it continues to be effective.

(2) The employer shall regularly consult employees required to use respirators to assess the employees' views on program effectiveness and to identify any problems. Any problems that are identified during this assessment shall be corrected. Factors to be assessed include, but are not limited to:

(i) Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);

(ii) Appropriate respirator selection for the hazards to which the employee is exposed;

(iii) Proper respirator use under the workplace conditions the employee encounters; and

(iv) Proper respirator maintenance.

(m) *Recordkeeping.* This section requires the employer to establish and retain written information regarding medical evaluations, fit testing, and the respirator program. This information will facilitate 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.

(1) *Medical evaluation.* Records of medical evaluations required by this section must be retained and made available in accordance with 29 CFR 1910.1020.

(2) *Fit testing.* (i) The employer shall establish a record of the qualitative and quantitative fit tests administered to an employee including:

(A) The name or identification of the employee tested;

(B) Type of fit test performed;

(C) Specific make, model, style, and size of respirator tested;

(D) Date of test; and

(E) The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs.

(ii) Fit test records shall be retained for respirator users until the next fit test is administered.

(3) A written copy of the current respirator program shall be retained by the employer.

(4) Written materials required to be retained under this paragraph shall be made available upon request to affected employees and to the Assistant Secretary or designee for examination and copying.

(n) *Dates.* (1) *Effective date.* This section is effective April 8, 1998. The obligations imposed by this section commence on the effective date unless otherwise noted in this paragraph. Compliance with obligations that do not commence on the effective date shall occur no later than the applicable start-up date.

(2) *Compliance dates.* All obligations of this section commence on the effective date except as follows:

(i) The determination that respirator use is required (paragraph (a)) shall be completed no later than September 8, 1998.

(ii) Compliance with provisions of this section for all other provisions shall be completed no later than October 5, 1998.

(3) The provisions of 29 CFR 1910.134 and 29 CFR 1926.103, contained in the 29 CFR parts 1900 to 1910.99 and the 29 CFR part 1926 editions, revised as of

July 1, 1997, are in effect and enforceable until April 8, 1998, or during any administrative or judicial stay of the provisions of this section.

(4) *Existing Respiratory Protection Programs.* If, in the 12 month period preceding April 8, 1998, the employer has conducted annual respirator training, fit testing, respirator program evaluation, or medical evaluations, the employer may use the results of those activities to comply with the corresponding provisions of this section, providing that these activities were conducted in a manner that meets the requirements of this section.

(o) *Appendices.* (1) Compliance with Appendix A, Appendix B-1, Appendix B-2, and Appendix C of this section is mandatory.

(2) Appendix D of this section is non-mandatory and is not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

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) The following test exercises are to be performed for all fit testing methods prescribed in this appendix, except for the CNP method. A separate fit testing exercise regimen is contained in the CNP protocol. The test subject shall perform exercises, in the test environment, in the following manner:

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

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

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

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

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

Rainbow Passage

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

(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° C (77° F) shall be used for the solutions.

(3) The isoamyl acetate (IAA) (also known as 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 #14 and #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 or P100 series 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:

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

Where $ff_1, ff_2, ff_3, \text{ etc.}$ 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 respirator is fitted with a high-efficiency filter and that the sampling probe and line are properly attached to the facepiece.

(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 Dynatech Nevada 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—1.5 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 test subject shall be trained to hold his or her breath for at least 20 seconds.

(6) The test subject shall don the test respirator without any assistance from the individual who conducts the CNP 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 shall have an effective audio warning device when the test subject fails to hold his or her breath during the test. The test shall be terminated whenever the test subject failed to hold his or her breath. The test subject 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.

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.

Appendix B-1 to § 1910.134: User Seal Check Procedures (Mandatory)

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

I. Facepiece Positive and/or Negative Pressure Checks

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

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

II. Manufacturer's Recommended User Seal Check Procedures

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the

positive and/or negative pressure check procedures provided that the employer demonstrates that the manufacturer's procedures are equally effective.

Appendix B-2 to § 1910.134: Respirator Cleaning Procedures (Mandatory)

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 in Appendix B-2. Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth in Appendix B-2, 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.

I. Procedures for Cleaning Respirators

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

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

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

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

1. 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,

2. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43° C (110° F); or,

3. 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 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 C to § 1910.134: OSHA Respirator Medical Evaluation Questionnaire (Mandatory)

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

To the employee:

Can you read (circle one): Yes/No

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

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

1. Today's date: _____
2. Your name: _____
3. Your age (to nearest year): _____
4. Sex (circle one): Male/Female
5. Your height: _____ ft. _____ in.
6. Your weight: _____ lbs.
7. Your job title: _____
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): _____
9. The best time to phone you at this number: _____
10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): Yes/No
11. Check the type of respirator you will use (you can check more than one category):
 - a. _____ 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 (circle 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 of respirator (please circle "yes" or "no").

1. Do you *currently* smoke tobacco, or have you smoked tobacco in the last month: Yes/No
2. Have you *ever had* any of the following conditions?
 - a. Seizures (fits): Yes/No
 - b. Diabetes (sugar disease): Yes/No
 - c. Allergic reactions that interfere with your breathing: Yes/No
 - d. Claustrophobia (fear of closed-in places): Yes/No
 - e. Trouble smelling odors: Yes/No
3. Have you *ever had* any of the following pulmonary or lung problems?
 - a. Asbestosis: Yes/No
 - b. Asthma: Yes/No

- c. Chronic bronchitis: Yes/No
 d. Emphysema: Yes/No
 e. Pneumonia: Yes/No
 f. Tuberculosis: Yes/No
 g. Silicosis: Yes/No
 h. Pneumothorax (collapsed lung): Yes/No
 i. Lung cancer: Yes/No
 j. Broken ribs: Yes/No
 k. Any chest injuries or surgeries: Yes/No
 l. Any other lung problem that you've been told about: Yes/No
4. Do you *currently* have any of the following symptoms of pulmonary or lung illness?
 a. Shortness of breath: Yes/No
 b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: Yes/No
 c. Shortness of breath when walking with other people at an ordinary pace on level ground: Yes/No
 d. Have to stop for breath when walking at your own pace on level ground: Yes/No
 e. Shortness of breath when washing or dressing yourself: Yes/No
 f. Shortness of breath that interferes with your job: Yes/No
 g. Coughing that produces phlegm (thick sputum): Yes/No
 h. Coughing that wakes you early in the morning: Yes/No
 i. Coughing that occurs mostly when you are lying down: Yes/No
 j. Coughing up blood in the last month: Yes/No
 k. Wheezing: Yes/No
 l. Wheezing that interferes with your job: Yes/No
 m. Chest pain when you breathe deeply: Yes/No
 n. Any other symptoms that you think may be related to lung problems: Yes/No
5. Have you *ever had* any of the following cardiovascular or heart problems?
 a. Heart attack: Yes/No
 b. Stroke: Yes/No
 c. Angina: Yes/No
 d. Heart failure: Yes/No
 e. Swelling in your legs or feet (not caused by walking): Yes/No
 f. Heart arrhythmia (heart beating irregularly): Yes/No
 g. High blood pressure: Yes/No
 h. Any other heart problem that you've been told about: Yes/No
6. Have you *ever had* any of the following cardiovascular or heart symptoms?
 a. Frequent pain or tightness in your chest: Yes/No
 b. Pain or tightness in your chest during physical activity: Yes/No
 c. Pain or tightness in your chest that interferes with your job: Yes/No
 d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
 e. Heartburn or indigestion that is not related to eating: Yes/No
 f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No
7. Do you *currently* take medication for any of the following problems?
 a. Breathing or lung problems: Yes/No
 b. Heart trouble: Yes/No
 c. Blood pressure: Yes/No
 d. Seizures (fits): Yes/No
8. If you've used a respirator, have you *ever had* any of the following problems? (If you've never used a respirator, check the following space and go to question 9):
 a. Eye irritation: Yes/No
 b. Skin allergies or rashes: Yes/No
 c. Anxiety: Yes/No
 d. General weakness or fatigue: Yes/No
 e. Any other problem that interferes with your use of a respirator: Yes/No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No
- 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) (circle "yes" or "no" for all answers that apply to you)?
 a. Escape only (no rescue): Yes/No
 b. Emergency rescue only: Yes/No
 c. Less than 5 hours *per week*: Yes/No
 d. Less than 2 hours *per day*: Yes/No
 e. 2 to 4 hours *per day*: Yes/No

- f. Over 4 hours *per day*: Yes/No
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):
- Name of the first toxic substance: _____
- Estimated maximum exposure level per shift: _____
- Duration of exposure per shift: _____
- Name of the second toxic substance: _____
- Estimated maximum exposure level per shift: _____

- Duration of exposure per shift: _____
- Name of the third toxic substance: _____
- Estimated maximum exposure level per shift: _____
- Duration of exposure per shift: _____
- 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): _____

Appendix D to § 1910.134 (Non-Mandatory) Information for Employees Using Respirators When Not Required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

- You should do the following:
1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
 2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
 3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
 4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

Subpart L—[Amended]

8. The authority citation for Subpart L of Part 1910 is revised to read as follows:

Authority: Secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR

25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable.

9. Section 1910.156 is amended by revising paragraphs (f)(1)(i) and (f)(1)(v) as follows:

§ 1910.156 Fire brigades.

* * * * *

(f) *Respiratory protection.* (1) *General.* (i) The employer must ensure that respirators are provided to, and used by, fire brigade members, and that the respirators meet the requirements of 29 CFR 1910.134 and this paragraph.

* * * * *

(v) Self-contained breathing apparatuses must have a minimum service-life rating of 30 minutes in accordance with the methods and requirements specified by NIOSH under 42 CFR part 84, except for escape self-contained breathing apparatus (ESCBA) used only for emergency escape purposes.

* * * * *

Subpart Q—[Amended]

10. The authority citation for Subpart Q of Part 1910 is revised to read as follows:

Authority: Secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR part 1911.

11. Section 1910.252 is amended by revising paragraphs (c)(4)(ii), (c)(4)(iii), (c)(7)(iii), (c)(9)(i), and (c)(10) as follows:

§ 1910.252 General requirements.

* * * * *

- (c) * * *
- (4) * * *

(ii) *Airline respirators.* In circumstances for which it is impossible to provide such ventilation, airline respirators or hose masks approved for this purpose by the National Institute for Occupational Safety and Health (NIOSH) under 42 CFR part 84 must be used.

(iii) *Self-contained units.* In areas immediately hazardous to life, a full-facepiece, pressure-demand, self-contained breathing apparatus or a combination full-facepiece, pressure-demand supplied-air respirator with an auxiliary, self-contained air supply approved by NIOSH under 42 CFR part 84 must be used.

* * * * *

(7) * * *

(iii) *Local ventilation.* In confined spaces or indoors, welding or cutting operations involving metals containing lead, other than as an impurity, or

metals coated with lead-bearing materials, including paint, must be done using local exhaust ventilation or airline respirators. Such operations, when done outdoors, must be done using respirators approved for this purpose by NIOSH under 42 CFR part 84. In all cases, workers in the immediate vicinity of the cutting operation must be protected by local exhaust ventilation or airline respirators.

* * * * *

(9) * * *

(i) *General.* In confined spaces or indoors, welding or cutting operations involving cadmium-bearing or cadmium-coated base metals must be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by 29 CFR 1910.1000. Such operations, when done outdoors, must be done using respirators, such as fume respirators, approved for this purpose by NIOSH under 42 CFR part 84.

* * * * *

(10) *Mercury.* In confined spaces or indoors, welding or cutting operations involving metals coated with mercury-bearing materials, including paint, must be done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions show that employee exposure is within the acceptable concentrations specified by 29 CFR 1910.1000. Such operations, when done outdoors, must be done using respirators approved for this purpose by NIOSH under 42 CFR part 84.

* * * * *

Subpart R—[Amended]

12. The authority citation for Subpart R of Part 1910 is revised as follows:

Authority: Sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR part 11.

Sections 1910.261, 1910.262, 1910.265 through 1910.269, 1910.274, and 1910.275 also issued under 29 CFR part 1911.

13. Section 1910.261 is amended by revising paragraphs (b)(2), (g)(10), (h)(2)(iii), and (h)(2)(iv) as follows:

§ 1910.261 Pulp, paper, and paperboard mills.

* * * * *

(b) * * *

(2) *Personal protective clothing and equipment.* Foot protection, shin guards, hard hats, noise-attenuation devices, and other personal protective clothing and equipment must be worn when the extent of the hazard warrants their use. Such equipment must be worn when specifically required by other paragraphs of this section, and must be maintained in accordance with applicable American National Standards Institute standards. Respirators, goggles, protective masks, rubber gloves, rubber boots, and other such equipment must be cleaned and disinfected before being used by another employee. Required eye, head, and ear protection must conform to American National Standards Institute standards Z24.22-1957, Z87.1-1968, and Z89.1-1969.

Respiratory protection must conform to the requirements of 29 CFR 1910.134.

* * * * *

(g) * * *

(10) *Gas masks (digester building).* Gas masks must be available, and they must furnish adequate protection against sulfuric acid and chlorine gases and be inspected and repaired in accordance with 29 CFR 1910.134.

* * * * *

(h) * * *

(2) * * *

(iii) Gas masks must be provided for emergency use in accordance with 29 CFR 1910.134.

(iv) For emergency and rescue operations, the employer must provide employees with self-contained breathing apparatuses or supplied-air respirators, and ensure that employees use these respirators, in accordance with the requirements of 29 CFR 1910.134.

* * * * *

Subpart Z—[Amended]

14. The general authority citation for Subpart Z of 29 CFR Part 1910 is revised to read as follows:

Authority: Secs. 4, 6, and 8 of the Occupational Safety and Health Act (29 U.S.C. 653, 655, and 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR Part 1911.

* * * * *

15. Section 1910.1001 is amended by removing Appendix C and revising paragraph (g), to read as follows:

§ 1910.1001 Asbestos.

* * * * *

(g) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls.

(ii) Work operations, such as maintenance and repair activities, for which engineering and work-practice controls are not feasible.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the TWA and/or excursion limit.

(iv) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) The employer must provide a tight-fitting, powered, air-purifying respirator instead of any negative-pressure respirator specified in Table 1 of this section when an employee chooses to use this type of respirator and the respirator provides adequate protection to the employee.

(iii) No employee must be assigned to tasks requiring the use of respirators if, based on their most recent medical examination, the examining physician determines that the employee will be unable to function normally using a respirator, or that the safety or health of the employee or other employees will be impaired by the use of a respirator. Such employees must be assigned to another job or given the opportunity to transfer to a different position, the duties of which they can perform. If such a transfer position is available, the position must be with the same employer, in the same geographical area, and with the same seniority, status, and rate of pay the employee had just prior to such transfer.

(3) *Respirator selection.* The employer must select and provide the appropriate respirator from Table 1 of this section.

TABLE 1.—RESPIRATORY PROTECTION FOR ASBESTOS FIBERS

| Airborne concentration of asbestos or conditions of use | Required respirator |
|---|---|
| Not in excess of 1 f/cc (10 X PEL) | Half-mask air purifying respirator other than a disposable respirator, equipped with high efficiency filters. |

TABLE 1.—RESPIRATORY PROTECTION FOR ASBESTOS FIBERS—Continued

| Airborne concentration of asbestos or conditions of use | Required respirator |
|---|---|
| Not in excess of 5 f/cc (50 X PEL) | Full facepiece air-purifying respirator equipped with high efficiency filters. |
| Not in excess of 10 f/cc (100 X PEL) | Any powered air-purifying respirator equipped with high efficiency filters or any supplied air respirator operated in continuous flow mode. |
| Not in excess of 100 f/cc (1,000 X PEL) | Full facepiece supplied air respirator operated in pressure demand mode. |
| Greater than 100 f/cc (1,000 X PEL) or unknown concentration. | Full facepiece supplied air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus. |

NOTE: a. Respirators assigned for high environmental concentrations may be used at lower concentrations, or when required respirator use is independent of concentration.
 b. A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameter or larger.

* * * * *
 16. Section 1910.1003 is amended by revising paragraphs (c)(4)(iv) and (d)(1) as follows:

§ 1910.1003 13 Carcinogens (4-Nitrobiphenyl, etc.).

* * * * *
 (c) * * *
 (4) * * *
 (iv) Employees engaged in handling operations involving the carcinogens addressed by this section must be provided with, and required to wear and use, a half-face filter-type respirator for dusts, mists, and fumes. A respirator

affording higher levels of protection than this respirator may be substituted.

* * * * *
 (d) * * *
 (1) *Respirator program.* The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b), (c), (d) (except (d)(1)(iii) and (iv), and (d)(3)), and (e) through (m).

* * * * *
 17. Section 1910.1017 is amended by revising paragraph (g) to read as follows:

§ 1910.1017 Vinyl chloride.

* * * * *

(g) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph.

(2) *Respirator program.* The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii), and (d)(3)(iii)(B)(1) and (2)), and (f) through (m).

(3) *Respirator selection.* (i) Respirators must be selected from the following table:

| Atmospheric concentration of vinyl chloride | Required apparatus |
|---|---|
| (i) Unknown, or above 3,600 p/m | Open-circuit, self-contained breathing apparatus, pressure demand type, with full facepiece. |
| (ii) Not over 3,600 p/m | (A) Combination type C supplied air respirator, pressure demand type, with full or half facepiece, and auxiliary self-contained air supply; or |
| (iii) Not over 1,000 p/m | (B) Combination type, supplied air respirator continuous flow type, with full or half facepiece, and auxiliary self-contained air supply. Type C, supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood. |
| (iv) Not over 100 p/m | (A) Combination type C supplied air respirator demand type, with full facepiece, and auxiliary self-contained air supply; or |
| (v) Not over 25 p/m | (B) Open-circuit self-contained breathing apparatus with full facepiece, in demand mode; or Type (C) supplied air respirator, demand type, with full facepiece. |
| (vi) Not over 10 p/m | (A) A powered air-purifying respirator with hood, helmet, full or half facepiece, and a canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 p/m, or |
| | (B) Gas mask, front- or back-mounted canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 p/m. |
| | (A) Combination type C supplied-air respirator, demand type, with half facepiece, and auxiliary self-contained air supply; or |
| | (B) Type C supplied-air respirator, demand type, with half facepiece; or |
| | (C) Any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 p/m. |

(ii) When air-purifying respirators are used:

(A) Air-purifying canisters or cartridges must be replaced prior to the expiration of their service life or the end of the shift in which they are first used, whichever occurs first.

(B) A continuous-monitoring and alarm system must be provided when concentrations of vinyl chloride could reasonably exceed the allowable concentrations for the devices in use. Such a system must be used to alert employees when vinyl chloride

concentrations exceed the allowable concentrations for the devices in use.

(iii) Respirators specified for higher concentrations may be used for lower concentrations.

* * * * *

18. Section 1910.1018 is amended by revising paragraph (h) to read as follows:

§ 1910.1018 Inorganic arsenic.

* * * * *

(h) *Respiratory protection.* (1) *General.* For employees who use

respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering or work-practice controls.

(ii) Work operations, such as maintenance and repair activities, for which the employer establishes that

engineering and work-practice controls are not feasible.

(iii) Work operations for which engineering and work-practice controls are not yet sufficient to reduce employee exposures to or below the permissible exposure limit.

(iv) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) If an employee exhibits breathing difficulty during fit testing or respirator use, they must be examined by a physician trained in pulmonary

medicine to determine whether they can use a respirator while performing the required duty.

(3) *Respirator selection.* (i) The employer must use Table I of this section to select the appropriate respirator or combination of respirators for inorganic arsenic compounds without significant vapor pressure, and Table II of this section to select the appropriate respirator or combination of respirators for inorganic arsenic compounds that have significant vapor pressure.

(ii) When employee exposures exceed the permissible exposure limit for inorganic arsenic and also exceed the

relevant limit for other gases (for example, sulfur dioxide), an air-purifying respirator provided to the employee as specified by this section must have a combination high-efficiency filter with an appropriate gas sorbent. (See footnote in Table 1 of this section.)

(iii) Employees required to use respirators may choose, and the employer must provide, a powered air-purifying respirator if it will provide proper protection. In addition, the employer must provide a combination dust and acid-gas respirator to employees who are exposed to gases over the relevant exposure limits.

TABLE I.—RESPIRATORY PROTECTION FOR INORGANIC ARSENIC PARTICULATE EXCEPT FOR THOSE WITH SIGNIFICANT VAPOR PRESSURE

| Concentration of inorganic arsenic (as As) or condition of use | Required respirator |
|--|--|
| (i) Unknown or greater or lesser than 20,000 µg/m(3) (20 mg/m(3)) or firefighting. | (A) Any full facepiece self-contained breathing apparatus operated in positive pressure mode. |
| (ii) Not greater than 20,000 µg/m(3) (20 mg/m(3)). | (A) Supplied air respirator with full facepiece, hood, or helmet or suit and operated in positive pressure mode. |
| (iii) Not greater than 10,000 µg/m(3) (10 mg/m(3)). | (A) Powered air-purifying respirators in all inlet face coverings with high efficiency filters ¹ . |
| (iv) Not greater than 500 µg/m(3) | (B) Half-mask supplied air respirators operated in positive pressure mode. (A) Full facepiece air-purifying respirator equipped with high-efficiency filter ¹ . (B) Any full facepiece supplied air respirator. |
| (v) Not greater than 100 µg/m(3) | (C) Any full facepiece self-contained breathing apparatus. (A) Half-mask air-purifying respirator equipped with high-efficiency filter ¹ . (B) Any half-mask supplied air respirator. |

¹ High-efficiency filter-99.97 pct efficiency against 0.3 micrometer monodisperse diethyl-hexyl phthalate (DOP) particles.

TABLE II.—RESPIRATORY PROTECTION FOR INORGANIC ARSENICALS (SUCH AS ARSENIC TRICHLORIDE² AND ARSENIC PHOSPHIDE) WITH SIGNIFICANT VAPOR PRESSURE

| Concentration of inorganic arsenic (as As) or condition of use | Required respirator |
|--|--|
| (i) Unknown or greater or lesser than 20,000 µg/m(3) (20 mg/m(3)) or firefighting. | (A) Any full facepiece self-contained breathing apparatus operated in positive pressure mode. |
| (ii) Not greater than 20,000 µg/m(3) (20 mg/m(3)). | (A) Supplied air respirator with full facepiece, hood, or helmet or suit and operated in positive pressure mode. |
| (iii) Not greater than 10,000 µg/m(3) (10 mg/m(3)). | (A) Half-mask ² supplied air respirator operated in positive pressure mode. |
| (iv) Not greater than 500 µg/m(3) | (A) Front or back mounted gas mask equipped with high-efficiency filter ¹ and acid gas canister. (B) Any full facepiece supplied air respirator. (C) Any full facepiece self-contained breathing apparatus. |
| (v) Not greater than 100 µg/m(3) | (A) Half-mask air-purifying respirator equipped with high efficiency filter ¹ and acid gas cartridge. (B) Any half-mask supplied air respirator. |

¹ High-efficiency filter-99.97 pct efficiency against 0.3 micrometer monodisperse diethyl-hexyl phthalate (DOP) particles.

² Half-mask respirators shall not be used for protection against arsenic trichloride, as it is rapidly absorbed through the skin.

* * * * *

19. Section 1910.1025 is amended by revising paragraph (f); revising the second and fourth paragraphs of Section IV to Appendix B; removing the sixth paragraph of Section IV to Appendix B; and removing Appendix D, as follows:

§ 1910.1025 Lead.

* * * * *

(f) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement engineering or work-practice controls, except that no employer can

require an employee to use a respirator longer than 4.4 hours per day.

(ii) Work operations for which engineering and work-practice controls are not sufficient to reduce employee exposures to or below the permissible exposure limit.

(iii) Periods when an employee requests a respirator.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) If an employee has breathing difficulty during fit testing or respirator use, the employer must provide the employee with a medical examination in accordance with paragraph (j)(3)(i)(C)

of this section to determine whether or not the employee can use a respirator while performing the required duty.

TABLE II.—RESPIRATORY PROTECTION FOR LEAD AEROSOLS

| Airborne concentration of lead or condition of use | Required respirator |
|--|---|
| Not in excess of 0.5 mg/m ³ (10X PEL) | Half-mask, air-purifying respirator equipped with high efficiency filters. ^{2,3} |
| Not in excess of 2.5 mg/m ³ (50X PEL) | Full facepiece, air-purifying respirator with high efficiency filters. ³ |
| Not in excess of 50 mg/m ³ (1000X PEL) | (1) Any powered, air-purifying respirator with high efficiency filters ³ ; or (2) Half-mask supplied-air respirator operated in positive-pressure mode. ² |
| Not in excess of 100 mg/m ³ (2000XPEL) | Supplied-air respirators with full facepiece, hood, helmet, or suit, operated in positive pressure mode. |
| Greater than 100 mg/m ³ , unknown concentration or fire fighting. | Full facepiece, self-contained breathing apparatus operated in positive-pressure mode. |

¹ Respirators specified for high concentrations can be used at lower concentrations of lead.
² Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.
³ A high efficiency particulate filter means 99.97 percent efficient against 0.3 micron size particles.

(3) *Respirator selection.* (i) The employer must select the appropriate respirator or combination of respirators from Table II of this section.

(ii) The employer must provide a powered air-purifying respirator instead of the respirator specified in Table II of this section when an employee chooses to use this type of respirator and such a respirator provides adequate protection to the employee.

* * * * *

Appendix B to § 1910.1025—Employee Standard Summary

* * * * *

IV. Respiratory Protection—Paragraph (f)

* * * * *

Your employer is required to select respirators from the seven types listed in Table II of the Respiratory Protection section of the standard (§ 1910.1025(f)). Any respirator chosen must be approved by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 42 CFR part 84. This respirator selection table will enable your employer to choose a type of respirator that will give you a proper amount of protection based on your airborne lead exposure. Your employer may select a type of respirator that provides greater protection than that required by the standard; that is, one recommended for a higher concentration of lead than is present in your workplace. For example, a powered air-purifying respirator (PAPR) is much more protective than a typical negative pressure respirator, and may also be more comfortable to wear. A PAPR has a filter, cartridge, or canister to clean the air, and a power source that continuously blows filtered air into your breathing zone. Your employer might make a PAPR available to you to ease the burden of having to wear a respirator for long periods

of time. The standard provides that you can obtain a PAPR upon request.

* * * * *

Your employer must ensure that your respirator facepiece fits properly. Proper fit of a respirator facepiece is critical to your protection from airborne lead. Obtaining a proper fit on each employee may require your employer to make available several different types of respirator masks. To ensure that your respirator fits properly and that facepiece leakage is minimal, your employer must give you either a qualitative or quantitative fit test as specified in Appendix A of the Respiratory Protection standard located at 29 CFR 1910.134.

* * * * *

20. Section 1910.1027 is amended by removing and reserving Appendix C and revising paragraph (g) to read as follows:

§ 1910.1027 Cadmium.

* * * * *

(g) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls when employee exposure levels exceed the PEL.

(ii) Maintenance and repair activities, and brief or intermittent operations, for which employee exposures exceed the PEL and engineering and work-practice controls are not feasible or are not required.

(iii) Activities in regulated areas specified in paragraph (e) of this section.

(iv) Work operations for which the employer has implemented all feasible engineering and work-practice controls

and such controls are not sufficient to reduce employee exposures to or below the PEL.

(v) Work operations for which an employee is exposed to cadmium at or above the action level, and the employee requests a respirator.

(vi) Work operations for which an employee is exposed to cadmium above the PEL and engineering controls are not required by paragraph (f)(1)(ii) of this section.

(vii) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) No employees must use a respirator if, based on their most recent medical examination, the examining physician determines that they will be unable to continue to function normally while using a respirator. If the physician determines that the employee must be limited in, or removed from, their current job because of their inability to use a respirator, the limitation or removal must be in accordance with paragraphs (l) (11) and (12) of this section.

(iii) If an employee has breathing difficulty during fit testing or respirator use, the employer must provide the employee with a medical examination in accordance with paragraph (l)(6)(ii) of this section to determine if the employee can use a respirator while performing the required duties.

(3) *Respirator selection.* (i) The employer must select the appropriate respirator from Table 2 of this section.

TABLE 2.—RESPIRATORY PROTECTION FOR CADMIUM

| Airborne concentration or condition of use ^a | Required respirator type ^b |
|---|--|
| 10 X or less | A half mask, air-purifying equipped with a HEPA ^c filter. ^d |
| 25 X or less | A powered air-purifying respirator ("PAPR") with a loose-fitting hood or helmet equipped with a HEPA filter, or a supplied-air respirator with a loose-fitting hood or helmet facepiece operated in the continuous flow mode. |
| 50 X or less | A full facepiece air-purifying respirator equipped with a HEPA filter, or a powered air-purifying respirator with a tight-fitting half mask equipped with a HEPA filter, or a supplied-air respirator with a tight-fitting half mask operated in the continuous flow mode. |
| 250 X or less | A powered air-purifying respirator with a tight fitting full facepiece equipped with a HEPA filter, or a supplied-air respirator with a tight-fitting full facepiece operated in the continuous flow mode. |
| 1000 X or less | A supplied air respirator with half mask or full facepiece operated in the pressure demand or other positive pressure mode. |
| >1000 X or unknown concentrations | A self-contained breathing apparatus with a full facepiece operated in the pressure demand or other positive pressure mode, or a supplied-air respirator with a full facepiece operated in the pressure demand or other positive pressure mode and equipped with an auxiliary escape type self-contained breathing apparatus operated in the pressure demand mode. |
| Fire fighting | A self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. |

^a Concentrations expressed as multiple of the PEL.

^b Respirators assigned for higher environmental concentrations may be used at lower exposure levels. Quantitative fit testing is required for all tight-fitting air purifying respirators where airborne concentration of cadmium exceeds 10 times the TWA PEL (10 X 5 ug/m(3) = 50 ug/m(3)). A full facepiece respirator is required when eye irritation is experienced.

^c HEPA means High-efficiency Particulate Air.

^d Fit testing, qualitative or quantitative, is required.

SOURCE: Respiratory Decision Logic, NIOSH, 1987.

(ii) The employer must provide an employee with a powered air-purifying respirator instead of a negative-pressure respirator when an employee who is entitled to a respirator chooses to use this type of respirator and such a respirator provides adequate protection to the employee.

* * * * *

21. Section 1910.1028 is amended by removing Appendix E and revising paragraph (g) to read as follows:

§ 1910.1028 Benzene.

* * * * *

(g) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls.

(ii) Work operations for which the employer establishes that compliance with either the TWA or STEL through the use of engineering and work-practice controls is not feasible; for example, some maintenance and repair activities, vessel cleaning, or other operations for which engineering and work-practice controls are infeasible because exposures are intermittent and limited in duration.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient, or are not required under paragraph (f)(1)(iii) of this section, to reduce employee exposure to or below the PELs.

(iv) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with

29 CFR 1910.134 (b) through (d) (except (d)(1)(iii), (d)(3)(iii)(b)(1), and (2)), and (f) through (m).

(ii) For air-purifying respirators, the employer must replace the air-purifying element at the expiration of its service life or at the beginning of each shift in which such elements are used, whichever comes first.

(iii) If NIOSH approves an air-purifying element with an end-of-service-life indicator for benzene, such an element may be used until the indicator shows no further useful life.

(3) *Respirator selection.* (i) The employer must select the appropriate respirator from Table 1 of this section.

(ii) Any employee who cannot use a negative-pressure respirator must be allowed to use a respirator with less breathing resistance, such as a powered air-purifying respirator or supplied-air respirator.

TABLE 1.—RESPIRATORY PROTECTION FOR BENZENE

| Airborne concentration of benzene or condition of use | Respirator type |
|---|--|
| (a) Less than or equal to 10 ppm | (1) Half-mask air-purifying respirator with organic vapor cartridge. |
| (b) Less than or equal to 50 ppm | (1) Full facepiece respirator with organic vapor cartridges. (1) Full facepiece gas mask with chin style canister. ¹ |
| (c) Less than or equal to 100 ppm | (1) Full facepiece powered air-purifying respirator with organic vapor canister. ¹ |
| (d) Less than or equal to 1,000 ppm | (1) Supplied air respirator with full facepiece in positive-pressure mode. |
| (e) Greater than 1,000 ppm or unknown concentration. | (1) Self-contained breathing apparatus with full facepiece in positive pressure mode. |
| (f) Escape | (2) Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply. |
| | (1) Any organic vapor gas mask; or |
| | (2) Any self-contained breathing apparatus with full facepiece. |

TABLE 1.—RESPIRATORY PROTECTION FOR BENZENE—Continued

| Airborne concentration of benzene or condition of use | Respirator type |
|---|--|
| (g) Firefighting | (1) Full facepiece self-contained breathing apparatus in positive pressure mode. |

¹ Canisters must have a minimum service life of four (4) hours when tested at 150 ppm benzene, at a flow rate of 64 LPM, 25 deg. C, and 85% relative humidity for non-powered air purifying respirators. The flow rate shall be 115 LPM and 170 LPM respectively for tight fitting and loose fitting powered air-purifying respirators.

* * * * *
 22. Section 1910.1029 is amended by revising paragraph (g) to read as follows:

§ 1910.1029 Coke oven emissions.

* * * * *
 (g) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Compliance with the permissible

exposure limit may not be achieved by the use of respirators except during:
 (i) Periods necessary to install or implement feasible engineering and work-practice controls.
 (ii) Work operations, such as maintenance and repair activity, for which engineering and work-practice controls are technologically not feasible.
 (iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce

employee exposure to or below the permissible exposure limit.
 (iv) Emergencies.
 (2) *Respirator program.* The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).
 (3) *Respirator selection.* The employer must select appropriate respirators or combination of respirators from Table I of this section.

TABLE I.—RESPIRATORY PROTECTION FOR COKE OVEN EMISSIONS

| Airborne concentration of coke oven emissions | Required respirator |
|--|---|
| (a) Any concentration | (1) A Type C supplied air respirator operated in pressure demand or other positive pressure or continuous flow mode; or (2) A powered air-purifying particulate filter respirator for dust and mist or (3) A powered air-purifying particulate filter respirator or combination chemical cartridge and particulate filter respirator for coke oven emissions. |
| (b) Concentrations not greater than 1500 ug/m ³ | (1) Any particulate filter respirator for dust and mist except single-use respirator; or (2) Any particulate filter respirator or combination chemical cartridge and particulate filter respirator for coke oven emissions; or (3) Any respirator listed in paragraph (g)(3)(a) of this section. |

* * * * *
 23. Section 1910.1043 is amended by revising paragraph (f) to read as follows:

§ 1910.1043 Cotton dust.

* * * * *
 (f) *Respiratory protection.* (1) *General.* For employees who are required to use respirators by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls.

(ii) Maintenance and repair activities for which engineering and work-practice controls are not feasible.
 (iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limits.
 (iv) Work operations specified under paragraph (g)(1) of this section.
 (v) Periods for which an employee requests a respirator.
 (2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) Whenever a physician determines that an employee who works in an area in which the cotton-dust concentration exceeds the PEL is unable to use a respirator, including a powered air-purifying respirator, the employee must be given the opportunity to transfer to an available position, or to a position that becomes available later, that has a cotton-dust concentration at or below the PEL. The employer must ensure that such employees retain their current wage rate or other benefits as a result of the transfer.
 (3) *Respirator selection.* (i) The employer must select the appropriate respirator from Table I of this section.

TABLE I

| Cotton dust concentration | Required respirator |
|--|---|
| Not greater than: | |
| (a) 5 × the applicable permissible exposure limit (PEL). | A disposable respirator with a particulate filter. |
| (b) 10 × the applicable PEL | A quarter or half-mask respirator, other than a disposable respirator, equipped with particulate filters. |
| (c) 100 × the applicable PEL | A full facepiece respirator equipped with high-efficiency particulate filters. |
| (d) Greater than 100 × the applicable PEL | A powered air-purifying respirator equipped with high-efficiency particulate filters. |

Notes:

1. A disposable respirator means the filter element is an inseparable part of the respirator.
2. Any respirators permitted at higher environmental concentrations can be used at lower concentrations.

- 3. Self-contained breathing apparatus are not required respirators but are permitted respirators.
- 4. Supplied air respirators are not required but are permitted under the following conditions: Cotton dust concentration not greater than 10X the PEL—Any supplied air respirator; not greater than 100X the PEL—Any supplied air respirator with full facepiece, helmet or hood; greater than 100X the PEL—A supplied air respirator operated in positive pressure mode.

(ii) Whenever respirators are required by this section for cotton-dust concentrations that do not exceed the applicable permissible exposure limit by a multiple of 100 (100 X), the employer must, when requested by an employee, provide a powered air-purifying respirator with a high-efficiency particulate filter instead of the respirator specified in paragraphs (a), (b), or (c) of Table I of this section.

24. Section 1910.1044 is amended by revising paragraph (h) to read as follows:

§ 1910.1044 1,2-Dibromo-3-chloropropane.

* * * * *

(h) *Respiratory protection.* (1) *General.* For employees who are required to use respirators by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Periods necessary to install or implement feasible engineering and work-practice controls.
- (ii) Maintenance and repair activities for which engineering and work-practice controls are not feasible.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limit.

(iv) Emergencies.

(2) *Respirator program.* The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(3) *Respirator selection.* The employer must select the appropriate respirator from Table 1 of this section.

TABLE 1.—RESPIRATORY PROTECTION FOR DBCP

| Airborne concentration of DBCP or condition of use | Respirator type |
|---|---|
| (a) Less than or equal to 10 ppb | (1) Any supplied-air respirator; or (2) any self-contained breathing apparatus. |
| (b) Less than or equal to 50 ppb | (1) Any supplied-air respirator with full facepiece, helmet, or hood; or (2) any self-contained breathing apparatus with full facepiece. |
| (c) Less than or equal to 1,000 ppb | (1) A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous flow mode. |
| (d) Less than or equal to 2,000 ppb | (1) A Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive pressure mode, or with full facepiece, helmet, or hood operated in continuous flow mode. |
| (e) Greater than 2,000 ppb or entry and escape from unknown concentrations. | (1) A combination respirator which includes a Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive pressure or continuous flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or positive pressure mode; or (2) a self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive pressure mode. |
| (f) Firefighting | (1) A self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive pressure mode. |

25. Section 1910.1045 is amended by revising paragraph (h) and the first paragraph of Section IV to Appendix A to read as follows:

§ 1910.1045 Acrylonitrile.

* * * * *

(h) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Periods necessary to install or implement feasible engineering and work-practice controls.

(ii) Work operations, such as maintenance and repair activities or reactor cleaning, for which the employer establishes that engineering and work-practice controls are not feasible.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the permissible exposure limits.

(iv) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii), (d)(3)(iii)(b)(1), and (2)), and (f) through (m).

(ii) If air-purifying respirators (chemical-cartridge or chemical-canister types) are used:

(A) The air-purifying canister or cartridge must be replaced prior to the expiration of its service life or at the completion of each shift, whichever occurs first.

(B) A label must be attached to the cartridge or canister to indicate the date and time at which it is first installed on the respirator.

(3) *Respirator selection.* The employer must select the appropriate respirator from Table I of this section.

TABLE I.—RESPIRATORY PROTECTION FOR ACRYLONITRILE (AN)

| Concentration of AN or condition of use | Respirator type |
|--|--|
| (a) Less than or equal to 20 ppm | (1) Chemical cartridge respirator with organic vapor cartridge(s) and half-mask facepiece; or (2) Supplied air respirator with half-mask facepiece. |
| (b) Less than or equal to 100 ppm or maximum use concentration (MUC) of cartridges or canisters, whichever is lower. | (1) Full facepiece respirator with (A) organic vapor cartridges, (B) organic vapor gas mask chin-style, or (C) organic vapor gas mask canister, front-or back-mounted; |

TABLE I.—RESPIRATORY PROTECTION FOR ACRYLONITRILE (AN)—Continued

| Concentration of AN or condition of use | Respirator type |
|--|--|
| (c) Less than or equal to 4,000 ppm | (2) Supplied air respirator with full facepiece; or (3) Self-contained breathing apparatus with full facepiece. (1) Supplied air respirator operated in the positive pressure mode with full facepiece, helmet, suit, or hood. |
| (d) Greater than 4,000 ppm or unknown concentration. | (1) Supplied air and auxiliary self-contained breathing apparatus with full facepiece in positive pressure mode; or (2) Self-contained breathing apparatus with full facepiece in positive pressure mode. |
| (e) Firefighting | Self-contained breathing apparatus with full facepiece in positive pressure mode. |
| (f) Escape | (1) Any organic vapor respirator, or (2) Any self-contained breathing apparatus. |

* * * * *
Appendix A to § 1910.1045—Substance Safety Data Sheet for Acrylonitrile
 * * * * *

IV. Respirators and Protective Clothing
 A. Respirators. You may be required to wear a respirator for nonroutine activities, in emergencies, while your employer is in the process of reducing acrylonitrile exposures through engineering controls, and in areas where engineering controls are not feasible. If respirators are worn, they must have a label issued by the National Institute for Occupational Safety and Health under the provisions of 42 CFR part 84 stating that the respirators have been approved for use with organic vapors. For effective protection, respirators must fit your face and head snugly. Respirators must not be loosened or removed in work situations where their use is required.

* * * * *

26. Section 1910.1047 is amended by removing table 1 following paragraph (h)(2) and revising paragraph (g) and the first paragraph of Section IV to Appendix A to read as follows:

§ 1910.1047 Ethylene oxide.

* * * * *

(g) *Respiratory protection and personal protective equipment.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Periods necessary to install or implement feasible engineering and work-practice controls.
- (ii) Work operations, such as maintenance and repair activities and

vessel cleaning, for which engineering and work-practice controls are not feasible.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the TWA.

(iv) Emergencies.

(2) *Respirator program.* The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(3) *Respirator selection.* The employer must select the appropriate respirator from Table 1 of this section.

TABLE 1.—MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION FOR AIRBORNE ETO

| Condition of use or concentration of airborne EtO (ppm) | Minimum required respirator |
|--|--|
| Equal to or less than 50 | (a) Full facepiece respirator with EtO approved canister, front-or back-mounted. |
| Equal to or less than 2,000 | (a) Positive-pressure supplied air respirator, equipped with full facepiece, hood, or helmet, or (b) Continuous-flow supplied air respirator (positive pressure) equipped with hood, helmet or suit. |
| Concentration above 2,000 or unknown concentration (such as in emergencies). | (a) Positive-pressure self-contained breathing apparatus (SCBA), equipped with full facepiece, or (b) Positive-pressure full facepiece supplied air respirator equipped with an auxiliary positive-pressure self-contained breathing apparatus. |
| Firefighting | (a) Positive pressure self-contained breathing apparatus equipped with full facepiece. |
| Escape | (a) Any respirator described above. |

Note. Respirators approved for use in higher concentrations are permitted to be used in lower concentrations.

(4) *Protective clothing and equipment.* When employees could have eye or skin contact with EtO or EtO solutions, the employer must select and provide, at no cost to the employee, appropriate protective clothing or other equipment in accordance with 29 CFR 1910.132 and 1910.133 to protect any area of the employee's body that may come in contact with the EtO or EtO solution, and must ensure that the employee wears the protective clothing and equipment provided.

* * * * *

Appendix A to § 1910.1047—Substance Safety Data Sheet for Ethylene Oxide (Non-mandatory)

* * * * *

IV. Respirators and Protective Clothing

A. Respirators. You may be required to wear a respirator for nonroutine activities, in emergencies, while your employer is in the process of reducing EtO exposures through engineering controls, and in areas where engineering controls are not feasible. As of the effective date of this standard, only air-supplied, positive-pressure, full-facepiece respirators are approved for protection against EtO. If air-purifying respirators are

worn in the future, they must have a label issued by the National Institute for Occupational Safety and Health under the provisions of 42 CFR part 84 stating that the respirators have been approved for use with ethylene oxide. For effective protection, respirators must fit your face and head snugly. Respirators must not be loosened or removed in work situations where their use is required.

* * * * *

27. Section 1910.1048 is amended by removing Appendix E and revising paragraph (g) to read as follows:

§ 1910.1048 Formaldehyde.

* * * * *

(g) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Periods necessary to install or implement feasible engineering and work-practice controls.
- (ii) Work operations, such as maintenance and repair activities or vessel cleaning, for which the employer establishes that engineering and work-practice controls are not feasible.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the PELs.

- (iv) Emergencies.
- (2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii), (d)(3)(iii)(b)(1), and (2)), and (f) through (m).
- (ii) If air-purifying chemical-cartridge respirators are used, the employer must:
 - (A) Replace the cartridge after three (3) hours of use or at the end of the workshift, whichever occurs first, unless

the cartridge contains a NIOSH-approved end-of-service-life indicator (ESLI) to show when breakthrough occurs.

(B) Unless the canister contains a NIOSH-approved ESLI to show when breakthrough occurs, replace canisters used in atmospheres up to 7.5 ppm (10xPEL) every four (4) hours and industrial-sized canisters used in atmospheres up to 75 ppm (100xPEL) every two (2) hours, or at the end of the workshift, whichever occurs first.

(3) *Respirator selection.* (i) The employer must select appropriate respirators from Table 1 in this section.

TABLE 1.—MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION AGAINST FORMALDEHYDE

| Condition of use or formaldehyde concentration (ppm) | Minimum respirator required ¹ |
|--|--|
| Up to 7.5 ppm. (10 x PEL) | Full facepiece with cartridges or canisters specifically approved for protection against formaldehyde. ² |
| Up to 75 ppm. (100 x PEL) | Full-face mask with chin style or chest or back mounted type, with industrial size canister specifically approved for protection against formaldehyde. Type C supplied air respirator, demand type, or continuous flow type, with full facepiece, hood, or helmet. |
| Above 75 ppm or unknown. (emergencies). (100 x PEL). | Self-contained breathing apparatus (SCBA) with positive pressure full facepiece. Combination supplied-air, full facepiece positive pressure respirator with auxiliary self-contained air supply. |
| Firefighting | SCBA with positive pressure in full face-piece. |
| Escape | SCBA in demand or pressure demand mode. Full-face mask with chin style or front or back mounted type industrial size canister specifically approved for protection against formaldehyde. |

¹ Respirators specified for use at higher concentrations may be used at lower concentrations.

² A half-mask respirator with cartridges specifically approved for protection against formaldehyde can be substituted for the full facepiece respirator providing that effective gas-proof goggles are provided and used in combination with the half-mask respirator.

(ii) The employer must provide a powered air-purifying respirator adequate to protect against formaldehyde exposure to any employee who has difficulty using a negative-pressure respirator.

* * * * *

28. Section 1910.1050 is amended by revising paragraph (h) and the first paragraph of Section III to Appendix A to read as follows:

§ 1910.1050 Methylenedianiline.

* * * * *

(h) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Periods necessary to install or implement feasible engineering and work-practice controls.
- (ii) Work operations for which the employer establishes that engineering and work-practice controls are not feasible.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the PEL.

(iv) Emergencies.
 (2) *Respirator program.* The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(3) *Respirator selection.* (i) The employer must select, and ensure that employees use, the appropriate respirator from Table 1 in this section.

TABLE 1.—RESPIRATORY PROTECTION FOR MDA

| Airborne concentration of MDA or condition of use | Respirator type |
|---|---|
| a. Less than or equal to 10 x PEL | (1) Half-Mask Respirator with HEPA ¹ Cartridge. ² |
| b. Less than or equal to 50 x PEL | (1) Full facepiece Respirator with HEPA ¹ Cartridge or Canister. ² |
| c. Less than or equal to 1000 x PEL | (1) Full facepiece powered air-purifying respirator with HEPA ¹ cartridges. ² |
| d. Greater than 1000 x PEL or unknown concentrations. | (1) Self-contained breathing apparatus with full facepiece in positive pressure mode. (2) Full facepiece positive pressure demand supplied-air respirator with auxiliary self-contained air supply. |
| e. Escape | (1) Any full facepiece air-purifying respirator with HEPA ¹ cartridges; ² (2) Any positive pressure or continuous flow self-contained breathing apparatus with full facepiece or hood. |
| f. Firefighting | (1) Full facepiece self-contained breathing apparatus in positive pressure demand mode. |

Note: Respirators assigned for higher environmental concentrations may be used at lower concentrations.

¹ High Efficiency Particulate in Air filter (HEPA) means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers or larger.

² Combination HEPA/Organic Vapor Cartridges shall be used whenever MDA in liquid form or a process requiring heat is used.

(ii) Any employee who cannot use a negative-pressure respirator must be given the option of using a positive-pressure respirator, or a supplied-air respirator operated in the continuous-flow or pressure-demand mode.

* * * * *

Appendix A to § 1910.1050—Substance Safety Data Sheet for 4,4'-Methylenedianiline

* * * * *

III. Protective Clothing and Equipment

A. Respirators. Respirators are required for those operations in which engineering controls or work-practice controls are not adequate or feasible to reduce exposure to the permissible limit. If respirators are worn, they must have a label issued by the National Institute for Occupational Safety and Health under the provisions of 42 CFR part 84 stating that the respirators have been approved for this purpose, and cartridges and canisters must be replaced in accordance with the requirements of 29 CFR 1910.134. If you experience difficulty breathing while wearing a respirator, you can request a positive-pressure respirator from your employer. You must be thoroughly trained to use the assigned respirator, and the training must be provided by your employer.

* * * * *

29. Section 1910.1051 is amended by removing and reserving Appendix E and revising paragraph (h) to read as follows:

§ 1910.1051 1,3-Butadiene.

* * * * *

(h) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls.

(ii) Non-routine work operations that are performed infrequently and for which employee exposures are limited in duration.

(iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposures to or below the PELs.

(iv) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii), (d)(3)(iii)(B)(1), and (2)), and (f) through (m).

(ii) If air-purifying respirators are used, the employer must replace the air-purifying filter elements according to the replacement schedule set for the class of respirators listed in Table 1 of this section, and at the beginning of each work shift.

(iii) Instead of using the replacement schedule listed in Table 1 of this

section, the employer may replace cartridges or canisters at 90% of their expiration service life, provided the employer:

(A) Demonstrates that employees will be adequately protected by this procedure.

(B) Uses BD breakthrough data for this purpose that have been derived from tests conducted under worst-case conditions of humidity, temperature, and air-flow rate through the filter element, and the employer also describes the data supporting the cartridge-or canister-change schedule, as well as the basis for using the data in the employer's respirator program.

(iv) A label must be attached to each filter element to indicate the date and time it is first installed on the respirator.

(v) If NIOSH approves an end-of-service-life indicator (ESLI) for an air-purifying filter element, the element may be used until the ESLI shows no further useful service life or until the element is replaced at the beginning of the next work shift, whichever occurs first.

(vi) Regardless of the air-purifying element used, if an employee detects the odor of BD, the employer must replace the air-purifying element immediately.

(3) *Respirator selection.* (i) The employer must select appropriate respirators from Table 1 of this section.

TABLE 1.—MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION FOR AIRBORNE BD

| Concentration of airborne BD (ppm) or condition of use | Minimum required respirator |
|---|---|
| Less than or equal to 5 ppm (5 times PEL) | (a) Air-purifying half mask or full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 4 hours. |
| Less than or equal to 10 ppm (10 times PEL) ... | (a) Air-purifying half mask or full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 3 hours. |
| Less than or equal to 25 ppm (25 times PEL) ... | (a) Air-purifying full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every 2 hours. (b) Any powered air-purifying respirator equipped with approved BD or organic vapor cartridges. PAPR cartridges shall be replaced every 2 hours. (c) Continuous flow supplied air respirator equipped with a hood or helmet. |
| Less than or equal to 50 ppm (50 times PEL) ... | (a) Air-purifying full facepiece respirator equipped with approved BD or organic vapor cartridges or canisters. Cartridges or canisters shall be replaced every (1) hour. (b) Powered air-purifying respirator equipped with a tight-fitting facepiece and an approved BD or organic vapor cartridges. PAPR cartridges shall be replaced every (1) hour. |
| Less than or equal to 1,000 ppm (1,000 times PEL). | (a) Supplied air respirator equipped with a half mask of full facepiece and operated in a pressure demand or other positive pressure mode. |
| Greater than 1000 ppm unknown concentration, or firefighting. | (a) Self-contained breathing apparatus equipped with a full facepiece and operated in a pressure demand or other positive pressure mode. (b) Any supplied air respirator equipped with a full facepiece and operated in a pressure demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in a pressure demand or other positive pressure mode. |
| Escape from IDLH conditions | (a) Any positive pressure self-contained breathing apparatus with an appropriate service life. |

TABLE 1.—MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION FOR AIRBORNE BD—Continued

| Concentration of airborne BD (ppm) or condition of use | Minimum required respirator |
|--|---|
| | (b) A air-purifying full facepiece respirator equipped with a front or back mounted BD or organic vapor canister. |

NOTES: Respirators approved for use in higher concentrations are permitted to be used in lower concentrations. Full facepiece is required when eye irritation is anticipated.

(ii) Air-purifying respirators must have filter elements approved by NIOSH for organic vapors or BD.

(iii) When an employee whose job requires the use of a respirator cannot use a negative-pressure respirator, the employer must provide the employee with a respirator that has less breathing resistance than the negative-pressure respirator, such as a powered air-purifying respirator or supplied-air respirator, when the employee is able to use it and if it provides the employee adequate protection.

* * * * *

30. Section 1910.1052 is amended by revising paragraph (g) to read as follows:

§ 1910.1052 Methylene chloride.

* * * * *

(g) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

(i) Periods when an employee's exposure to MC exceeds the 8-hour TWA, PEL, or STEL (for example, when an employee is using MC in a regulated area).

(ii) Periods necessary to install or implement feasible engineering and work-practice controls.

(iii) A few work operations, such as some maintenance operations and repair activities, for which the employer demonstrates that engineering and work-practice controls are infeasible.

(iv) Work operations for which feasible engineering and work-practice

controls are not sufficient to reduce employee exposures to or below the PELs.

(v) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (m) (except (d)(1)(iii)).

(ii) Employers who provide employees with gas masks with organic-vapor canisters for the purpose of emergency escape must replace the canisters after any emergency use and before the gas masks are returned to service.

(3) *Respirator selection.* The employer must select appropriate atmosphere-supplying respirators from Table 2 of this section.

TABLE 2.—MINIMUM REQUIREMENTS FOR RESPIRATORY PROTECTION FOR AIRBORNE METHYLENE CHLORIDE

| Methylene chloride airborne concentration (ppm) or condition of use | Minimum respirator required ¹ |
|--|--|
| Up to 625 ppm (25 X PEL) | (1) Continuous flow supplied-air respirator, hood or helmet. |
| Up to 1250 ppm (50 X 8-TWA PEL) | (1) Full facepiece supplied-air respirator operated in negative pressure (demand) mode. (2) Full facepiece self-contained breathing apparatus (SCBA) operated in negative pressure (demand) mode. |
| Up to 5000 ppm (200 X 8-TWA PEL) | (1) Continuous flow supplied-air respirator, full facepiece. (2) Pressure demand supplied-air respirator, full facepiece. (3) Positive pressure full facepiece SCBA. |
| Unknown concentration, or above 5000 ppm (Greater than 200 X 8-TWA PEL). | (1) Positive pressure full facepiece SCBA. (2) Full facepiece pressure demand supplied-air respirator with an auxiliary self-contained air supply. |
| Fire fighting | Positive pressure full facepiece SCBA. |
| Emergency escape | (1) Any continuous flow or pressure demand SCBA. (2) Gas mask with organic vapor canister. |

¹ Respirators assigned for higher airborne concentrations may be used at lower concentrations.

(4) *Medical evaluation.* Before having an employee use a supplied-air respirator in the negative-pressure mode, or a gas mask with an organic-vapor canister for emergency escape, the employer must:

(i) Have a physician or other licensed health-care professional (PLHCP) evaluate the employee's ability to use such respiratory protection.

(ii) Ensure that the PLHCP provides their findings in a written opinion to the employee and the employer.

* * * * *

PART 1926—[AMENDED]

Subpart D—[Amended]

31. The authority citation for Subpart D of Part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR Part 11.

Secs. 1926.58, 1926.59, 1926.60, and 1926.65 of 29 CFR, also issued under 5 U.S.C. 553, and 29 CFR Part 1911.

Sec. 1926.62 of 29 CFR, also issued under sec. 1031 of the Housing and Community Development Act of 1992 (42 U.S.C. 4853).

Sec. 1926.65 of 29 CFR, also issued under sec. 126 of the Superfund Amendments and Reauthorization Act of 1986, as amended (29 U.S.C. 655 note), and 5 U.S.C. 553.

32. Section 1926.57 is amended by revising paragraphs (f)(1)(ii), (f)(5)(i) and (iii), (f)(6), (h)(6)(iii)(A), and (i)(9)(vi) to read as follows:

§ 1926.57 Ventilation.

* * * * *

(f) * * *
 (1) * * *
 (ii) *Abrasive-blasting respirator.* A respirator constructed so that it covers the wearer's head, neck, and shoulders to protect the wearer from rebounding abrasive.
 * * * * *

(5) *Personal protective equipment.* (i) Employers must use only respirators approved by NIOSH under 42 CFR part 84 for protecting employees from dusts produced during abrasive-blasting operations.
 * * * * *

(iii) Properly fitted particulate-filter respirators, commonly referred to as dust-filter respirators, may be used for short, intermittent, or occasional dust exposures such as cleanup, dumping of dust collectors, or unloading shipments of sand at a receiving point when it is not feasible to control the dust by enclosure, exhaust ventilation, or other means. The respirators used must be approved by NIOSH under 42 CFR part 84 for protection against the specific type of dust encountered.
 * * * * *

(6) *Air supply and air compressors.* Air for abrasive-blasting respirators must be free of harmful quantities of dusts, mists, or noxious gases, and must meet the requirements for supplied-air

quality and use specified in 29 CFR 1910.134(i).

* * * * *
 (h) * * *
 (6) * * *
 (iii)(A) When an operator is in a booth downstream of the object being sprayed, an air-supplied respirator or other type of respirator approved by NIOSH under 42 CFR Part 84 for the material being sprayed should be used by the operator.
 * * * * *

(i) * * *
 (9) * * *

(vi) When, during the emergencies specified in paragraph (i)(11)(v) of this section, employees must be in areas where concentrations of air contaminants are greater than the limits set by paragraph (i)(2)(iii) of this section or oxygen concentrations are less than 19.5 percent, they must use respirators that reduce their exposure to a level below these limits or that provide adequate oxygen. Such respirators must also be provided in marked, quickly-accessible storage compartments built for this purpose when the possibility exists of accidental release of hazardous concentrations of air contaminants. Respirators must be approved by NIOSH under 42 CFR part 84, selected by a competent industrial hygienist or other technically-qualified source, and used in accordance with 29 CFR 1926.103.
 * * * * *

33. Section 1926.60 is amended by removing Appendix E and revising paragraph (i) to read as follows:

§ 1926.60 Methylene dianiline.
 * * * * *

(i) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Periods necessary to install or implement feasible engineering and work-practice controls.
- (ii) Work operations, such as maintenance and repair activities and spray-application processes, for which engineering and work-practice controls are not feasible.
- (iii) Work operations for which feasible engineering and work-practice controls are not yet sufficient to reduce employee exposure to or below the PELs.

- (iv) Emergencies.
- (2) *Respirator program.* The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii), and (f) through (m)).
- (3) *Respirator selection.* (i) The employer must select the appropriate respirator from Table 1 of this section.

TABLE 1.—RESPIRATORY PROTECTION FOR MDA

| Airborne concentration of MDA or condition of use | Respirator type |
|--|---|
| a. Less than or equal to 10 × PEL | (1) Half-Mask Respirator with HEPA ¹ Cartridge. ² |
| b. Less than or equal to 50 × PEL | (1) Full facepiece Respirator with HEPA ¹ Cartridge or Canister. ² |
| c. Less than or equal to 1000 × PEL | (1) Full facepiece powered air-purifying respirator with HEPA ¹ cartridge. ² |
| d. Greater than 1000 × PEL or unknown concentration. | (1) Self-contained breathing apparatus with full facepiece in positive pressure mode. (2) Full facepiece positive pressure demand supplied-air respirator with auxiliary self-contained air supply. |
| e. Escape | (1) Any full facepiece air-purifying respirator with HEPA ¹ cartridges. ² (2) Any positive pressure or continuous flow self-contained breathing apparatus with full facepiece or hood. |
| f. Firefighting | (1) Full facepiece self-contained breathing apparatus in positive pressure demand mode. |

NOTE: Respirators assigned for higher environmental concentrations may be used at lower concentrations.
¹High Efficiency Particulate in Air filter (HEPA) means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers or larger.
²Combination HEPA/Organic Vapor Cartridges shall be used whenever MDA in liquid form or a process requiring heat is used.

(ii) An employee who cannot use a negative-pressure respirator must be given the option of using a positive-pressure respirator, or a supplied-air respirator operated in the continuous-flow or pressure-demand mode.
 * * * * *

34. Section 1926.62 is amended by revising paragraph (f); revising the second and fourth paragraphs of Section IV to Appendix B; removing the sixth

paragraph of Section IV to Appendix B; and removing Appendix D, as follows:

§ 1926.62 Lead.
 * * * * *

(f) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Periods when an employee's exposure to lead exceeds the PEL.
- (ii) Work operations for which engineering and work-practice controls are not sufficient to reduce employee exposures to or below the PEL.
- (iii) Periods when an employee requests a respirator.
- (iv) Periods when respirators are required to provide interim protection of employees while they perform the

operations specified in paragraph (d)(2) of this section.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with 29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) If an employee has breathing difficulty during fit testing or respirator

use, the employer must provide the employee with a medical examination in accordance with paragraph (j)(3)(i)(B) of this section to determine whether or not the employee can use a respirator while performing the required duty.

(3) *Respirator selection.* (i) The employer must select the appropriate

respirator or combination of respirators from Table I of this section.

(ii) The employer must provide a powered air-purifying respirator when an employee chooses to use such a respirator and it will provide adequate protection to the employee.

TABLE 1.—RESPIRATORY PROTECTION FOR LEAD AEROSOLS

| Airborne concentration of lead or condition of use | Required respirator ¹ |
|---|--|
| Not in excess of 500 ug/m ³ | 1/2 mask air purifying respirator with high efficiency filters. ^{2,3} 1/2 mask supplied air respirator operated in demand (negative pressure) mode. |
| Not in excess of 1,250 ug/m ³ | Loose fitting hood or helmet powered air purifying respirator with high efficiency filters. ³ Hood or helmet supplied air respirator operated in a continuous-flow mode—e.g., type CE abrasive blasting respirators operated in a continuous-flow mode. |
| Not in excess of 2,500 ug/m ³ | Full facepiece air purifying respirator with high efficiency filters. ³ Tight fitting powered air purifying respirator with high efficiency filters. ³ Full facepiece supplied air respirator operated in demand mode. 1/2 mask or full facepiece supplied air respirator operated in a continuous-flow mode. |
| Not in excess of 50,000 ug/m ³ | Full facepiece self-contained breathing apparatus (SCBA) operated in demand mode. |
| Not in excess of 100,000 ug/m ³ | 1/2 mask supplied air respirator operated in pressure demand or other positive-pressure mode. Full facepiece supplied air respirator operated in pressure demand or other positive-pressure mode—e.g., type CE abrasive blasting respirators operated in a positive-pressure mode. |
| Greater than 100,000 ug/m ³ unknown concentration, or fire fighting. | Full facepiece SCBA operated in pressure demand or other positive-pressure mode. |

¹ Respirators specified for higher concentrations can be used at lower concentrations of lead.

² Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

³ A high efficiency particulate filter (HEPA) means a filter that is a 99.97 percent efficient against particles of 0.3 micron size or larger.

* * * * *

Appendix B to § 1926.62—Employee Standard Summary

* * * * *

IV. Respiratory Protection—Paragraph (f)

* * * * *

Your employer is required to select respirators from the types listed in Table I of the Respiratory Protection section of the standard (§ 1926.62 (f)). Any respirator chosen must be approved by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 42 CFR part 84. This respirator selection table will enable your employer to choose a type of respirator that will give you a proper amount of protection based on your airborne lead exposure. Your employer may select a type of respirator that provides greater protection than that required by the standard; that is, one recommended for a higher concentration of lead than is present in your workplace. For example, a powered air-purifying respirator (PAPR) is much more protective than a typical negative pressure respirator, and may also be more comfortable to wear. A PAPR has a filter, cartridge, or canister to clean the air, and a power source that continuously blows filtered air into your breathing zone. Your employer might make a PAPR available to you to ease

the burden of having to wear a respirator for long periods of time. The standard provides that you can obtain a PAPR upon request.

* * * * *

Your employer must ensure that your respirator facepiece fits properly. Proper fit of a respirator facepiece is critical to your protection from airborne lead. Obtaining a proper fit on each employee may require your employer to make available several different types of respirator masks. To ensure that your respirator fits properly and that facepiece leakage is minimal, your employer must give you either a qualitative or quantitative fit test as specified in Appendix A of the Respiratory Protection standard located at 29 CFR 1910.134.

* * * * *

Subpart E—[Amended]

35. The authority citation for Subpart E of Part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR part 11.

36. Section 1926.103 is revised to read as follows:

§ 1926.103 Respiratory protection.

Note: The requirements applicable to construction work under this section are identical to those set forth at 29 CFR 1910.134 of this chapter.

Subpart S—[Amended]

37. The authority citation for Subpart S of Part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (40 U.S.C. 333); secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable.

38. Section 1926.800 is amended by revising paragraph (g)(2) as follows:

§ 1926.800 Underground construction.

* * * * *

(g) * * *
(2) *Self-rescuers.* The employer must provide self-rescuers approved by the National Institute for Occupational Safety and Health under 42 CFR part 84. The respirators must be immediately available to all employees at work stations in underground areas where employees might be trapped by smoke or gas. The selection, issuance, use, and care of respirators must be in accordance with 29 CFR 1926.103.

* * * * *

Subpart Z—[Amended]

39. The authority citation for Subpart Z of Part 1926 is revised to read as follows:

Authority: Secs. 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Orders 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable; and 29 CFR part 11.

Section 1926.1102 of 29 CFR not issued under 29 U.S.C. 655 or 29 CFR part 1911; also issued under 5 U.S.C. 553.

40. Section 1926.1101 is amended by removing and reserving Appendix C and revising paragraph (h) to read as follows:

§ 1926.1101 Asbestos.

* * * * *

(h) *Respiratory protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply with the requirements of this paragraph. Respirators must be used during:

- (i) Class I asbestos work.
- (ii) Class II asbestos work when ACM is not removed in a substantially intact state.
- (iii) Class II and III asbestos work that is not performed using wet methods, except for removal of ACM from sloped roofs when a negative-exposure assessment has been conducted and ACM is removed in an intact state.
- (iv) Class II and III asbestos work for which a negative-exposure assessment has not been conducted.
- (v) Class III asbestos work when TSI or surfacing ACM or PACM is being disturbed.
- (vi) Class IV asbestos work performed within regulated areas where employees who are performing other work are required to use respirators.
- (vii) Work operations covered by this section for which employees are exposed above the TWA or excursion limit.
- (viii) Emergencies.
- (2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with

29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) No employee shall be assigned to asbestos work that requires respirator use if, based on their most recent medical examination, the examining physician determines that the employee will be unable to function normally while using a respirator, or that the safety or health of the employee or other employees will be impaired by the employee's respirator use. Such employees must be assigned to another job or given the opportunity to transfer to a different position that they can perform. If such a transfer position is available, it must be with the same employer, in the same geographical area, and with the same seniority, status, rate of pay, and other job benefits the employee had just prior to such transfer.

(3) *Respirator selection.* (i) The employer must select the appropriate respirator from Table 1 of this section.

TABLE 1.—RESPIRATORY PROTECTION FOR ASBESTOS FIBERS

| Airborne concentrations of asbestos or conditions of use | Required respirator |
|--|---|
| Not in excess of 1 f/cc (10 X PEL), or otherwise as required independent of exposure pursuant to paragraph (h)(2)(iv) of this section. | Half-mask air purifying respirator other than a disposable respirator, equipped with high efficiency filters. |
| Not in excess of 5 f/cc (50 X PEL) | Full facepiece air-purifying respirator equipped with high efficiency filters. |
| Not in excess of 10 f/cc (100 X PEL) | Any powered air-purifying respirator equipped with high efficiency filter or any supplied air respirator operated in continuous flow mode. |
| Not in excess of 100 f/cc (1,000 X PEL) or unknown concentration. | Full facepiece supplied air respirator operated in pressure demand mode. |
| Greater than 100 f/cc (1,000 X PEL) or unknown concentration. | Full facepiece supplied air respirator operated in pressure demand mode, equipped with an auxiliary positive pressure self-contained breathing apparatus. |

NOTE: a. Respirators assigned for high environmental concentrations may be used at lower concentrations, or when required respirator use is independent of concentration.

b. A high efficiency filter means a filter that is at least 99.97 percent efficient against mono-dispersed particles of 0.3 micrometers in diameters in diameter or larger.

(ii) The employer must provide an employee with a tight-fitting, powered air-purifying respirator instead of a negative-pressure respirator from Table 1 when the employee chooses to use this type of respirator and such a respirator will provide adequate protection to the employee.

(iii) The employer must provide a half-mask air-purifying respirator, other than a disposable respirator, that is equipped with high-efficiency filters when the employee performs:

(A) Class II and III asbestos work and a negative-exposure assessment has not been conducted by the employer.

(B) Class III asbestos work when TSI or surfacing ACM or PACM is being disturbed.

(iv) The employer must provide employees with a full-facepiece

supplied-air respirator operated in the pressure-demand mode and equipped with an auxiliary, positive-pressure self-contained breathing apparatus when the employees are in a regulated area where Class I work is being performed and the employer has not conducted a negative-exposure assessment.

* * * * *

41. Section 1926.1127 is amended by removing and reserving Appendix C and revising paragraph (g) to read as follows:

§ 1926.1127 Cadmium.

* * * * *

(g) *Respirator protection.* (1) *General.* For employees who use respirators required by this section, the employer must provide respirators that comply

with the requirements of this paragraph. Respirators must be used during:

(i) Periods necessary to install or implement feasible engineering and work-practice controls when employee exposures exceed the PEL.

(ii) Maintenance and repair activities, and brief or intermittent work operations, for which employee exposures exceed the PEL and engineering and work-practice controls are not feasible or are not required.

(iii) Work operations in the regulated areas specified in paragraph (e) of this section.

(iv) Work operations for which the employer has implemented all feasible engineering and work-practice controls, and such controls are not sufficient to reduce employee exposures to or below the PEL.

(v) Work operations for which an employee, who is exposed to cadmium at or above the action level, requests a respirator.

(vi) Work operations for which engineering controls are not required by paragraph (f)(1)(ii) of this section to reduce employee exposures that exceed the PEL.

(vii) Emergencies.

(2) *Respirator program.* (i) The employer must implement a respiratory protection program in accordance with

29 CFR 1910.134 (b) through (d) (except (d)(1)(iii)), and (f) through (m).

(ii) If an employee exhibits breathing difficulty during fit testing or respirator use, the employer must provide the employee with a medical examination in accordance with paragraph (l)(6)(ii) of this section to determine if the employee can use a respirator while performing the required duties.

(iii) No employee must use a respirator when, based on their most recent medical examination, the examining physician determines that

the employee will be unable to continue to function normally while using a respirator. If the physician determines the employee must be limited in, or removed from, their current job because of the employee's inability to use a respirator, the job limitation or removal must be conducted in accordance with paragraphs (l) (11) and (12) of this section.

(3) *Respirator selection.* (i) The employer must select the appropriate respirator from Table 1 of this section.

TABLE 1.—RESPIRATORY PROTECTION FOR CADMIUM

| Airborne concentration or condition of use ^a | Required respirator type ^b |
|---|--|
| 10 X or less | A half mask, air-purifying equipped with a HEPA ^c filter. ^d |
| 25 X or less | A powered air-purifying respirator ("PAPR") with a loose-fitting hood or helmet equipped with a HEPA filter, or a supplied-air respirator with a loose-fitting hood or helmet facepiece operated in the continuous flow mode. |
| 50 X or less | A full facepiece air-purifying respirator equipped with a HEPA filter, or a powered air-purifying respirator with a tight-fitting half mask equipped with a HEPA filter, or a supplied-air respirator with a tight-fitting half mask operated in the continuous flow mode. |
| 250 X or less | A powered air-purifying respirator with a tight fitting full facepiece equipped with a HEPA filter, or a supplied-air respirator with a tight-fitting full facepiece operated in the continuous flow mode. |
| 1000 X or less | A supplied air respirator with half mask or full facepiece operated in the pressure demand or other positive pressure mode. |
| >1000 X or unknown concentrations | A self-contained breathing apparatus with a full facepiece operated in the pressure demand or other positive pressure mode, or a supplied-air respirator with a full facepiece operated in the pressure demand or other positive pressure mode and equipped with an auxiliary escape type self-contained breathing apparatus operated in the pressure demand mode. |
| Firefighting | A self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. |

^a Concentrations expressed as multiple of the PEL.

^b Respirators assigned for higher environmental concentrations may be used at lower exposure levels. Quantitative fit testing is required for all tight-fitting air purifying respirators where airborne concentration of cadmium exceeds 10 times the TWA PEL (10 X 5 ug/m(3) = 50 ug/m(3)). A full facepiece respirator is required when eye irritation is experienced.

^c HEPA means High-efficiency Particulate Air.

^d Fit testing, qualitative or quantitative, is required.

SOURCE: Respiratory Decision Logic, NIOSH, 1987.

(ii) The employer must provide a powered air-purifying respirator instead of a negative-pressure respirator when an employee entitled to a respirator chooses to use this type of respirator and such a respirator will provide adequate protection to the employee.

* * * * *

Note: The following table will not appear in the Code of Federal Regulations.

REDESIGNATION TABLE FOR ACTIONS ON SPECIFIC STANDARDS

| Old section | New section |
|----------------------|-------------|
| 1910.94: | |
| (a)(1)(ii) | Revised. |
| (a)(5)(i) | Revised. |
| (a)(5)(iii) | Revised. |
| (a)(5)(iv) | Revised. |
| (a)(6) | Revised. |
| (c)(6)(iii)(a) | Revised. |
| (d)(9)(vi) | Revised. |
| 1910.111: | |
| (a)(2)(x) | Revised. |
| (b)(10)(ii) | Revised. |

REDESIGNATION TABLE FOR ACTIONS ON SPECIFIC STANDARDS—Continued

| Old section | New section |
|-------------------|-----------------------|
| 1910.156: | |
| (f)(1)(i) | Revised. |
| (f)(1)(v) | Revised. |
| 1910.252: | |
| (c)(4)(ii) | Revised. |
| (c)(4)(iii) | Revised. |
| (c)(7)(iii) | Revised. |
| (c)(9)(i) | Revised. |
| (c)(10) | Revised. |
| 1910.261: | |
| (b)(2) | Revised. |
| (g)(10) | Revised. |
| (h)(2)(iii) | Revised. |
| (h)(2)(iv) | Revised. |
| 1910.1001: | |
| (g)(1) | Revised. |
| (g)(2)(i) | Revised; (g)(3). |
| (g)(2)(ii) | Revised; (g)(2)(ii). |
| (g)(3)(i) | Revised; (g)(2)(i). |
| (g)(3)(ii) | Removed. |
| (g)(3)(iii) | Removed. |
| (g)(3)(iv) | Revised; (g)(2)(iii). |
| (g)(4) | Removed. |

REDESIGNATION TABLE FOR ACTIONS ON SPECIFIC STANDARDS—Continued

| Old section | New section |
|-----------------------------|-----------------------|
| Appendix C | Removed. |
| 1910.1003: | |
| (c)(4)(iv) | Revised. |
| (d)(1) [Reserved] ... | Revised. |
| 1910.1017: | |
| (g)(1) | Revised. |
| (g)(2) | Removed. |
| (g)(3) | Revised; (g)(2). |
| (g)(4) | Revised; (g)(3)(i). |
| (g)(5) | Removed. |
| (g)(6) (i) and (ii) | Revised; (g)(3)(ii). |
| (g)(7) | Revised; (g)(3)(iii). |
| 1910.1018: | |
| (h)(1) | Revised. |
| (h)(2)(i) | Revised; (h)(3)(i). |
| (h)(2)(ii) | Revised; (h)(3)(ii). |
| (h)(2)(iii) | Removed. |
| (h)(3)(i), (ii), and (iii). | Removed. |
| (h)(3)(iv) | Revised; (h)(2)(ii). |
| (h)(4)(i) | Revised; (h)(2)(i). |
| (h)(4) (ii) and (iii) ... | Removed. |
| (h)(5) (i) and (ii) | Removed. |

REDESIGNATION TABLE FOR ACTIONS ON SPECIFIC STANDARDS—Continued

REDESIGNATION TABLE FOR ACTIONS ON SPECIFIC STANDARDS—Continued

REDESIGNATION TABLE FOR ACTIONS ON SPECIFIC STANDARDS—Continued

| Old section | New section | Old section | New section | Old section | New section |
|----------------------------|-----------------------|-------------------|--------------------------|----------------------------|-----------------------|
| (h)(5)(iii) | Revised; (h)(4)(iii). | (h)(3)(i) | Revised; (h)(2)(i). | (f)(5)(iii) | Revised. |
| 1910.1025: | | (h)(3)(ii) | Revised; (h)(2)(ii). | (f)(6) | Revised. |
| (f)(1) and (f)(1)(i) ... | Revised. | (h)(3)(iii) | Removed. | (f)(6)(i), (ii), and (iii) | Removed. |
| (f)(2)(i) | Revised; (f)(3)(i). | (h)(3)(iv) | Removed. | (h)(6)(iii)(A) | Revised. |
| (f)(2)(ii) | Revised; (f)(3)(ii). | Appendix A, Sec- | Revised first para- | (i)(9)(vi) | Revised. |
| (f)(2)(iii) | Removed. | tion IV. | graph. | 1926.60: | |
| (f)(3)(i) and (ii) | Removed. | 1910.1047: | | (i)(1) | Revised. |
| (f)(3)(iii) | Revised; (f)(2)(ii). | (g)(1) | Revised. | (i)(2)(i) | Revised; (i)(3)(i). |
| (f)(4)(i) | Revised; (f)(2)(i). | (g)(2)(i) | Revised; (g)(3). | (i)(2)(ii) | Removed. |
| (f)(4) (ii) and (iii) | Removed. | (g)(2)(ii) | Removed. | (i)(2)(iii) | Revised; (i)(3)(ii). |
| Appendix B, Sec- | Revised second and | (g)(3) | Revised; (g)(2). | (i)(3) | Revised; (i)(2). |
| tion IV. | fourth paragraphs; | (g)(4) | Revised; (g)(4). | (i)(4) | Removed. |
| | removed sixth para- | Appendix A, Sec- | Revised first para- | (i)(5) | Removed. |
| | graph. | tion IV. | graph. | Appendix E | Removed. |
| Appendix D | Removed. | 1910.1048: | | 1926.62: | |
| 1910.1027: | | (g)(1) | Revised. | (f)(1) | Revised. |
| (g)(1) | Revised. | (g)(2)(i) | Revised; (g)(3)(i). | (f)(2)(i) | Revised; (f)(3)(i). |
| (g)(2)(i) | Revised; (f)(3)(i). | (g)(2)(ii) | Revised; (g)(3)(ii). | (f)(2)(ii) | Revised; (f)(3)(ii). |
| (g)(2)(ii) | Revised; (f)(3)(ii). | (g)(3)(i) | Revised; (g)(2)(i). | (f)(2)(iii) | Removed. |
| (g)(3)(i) | Revised; (f)(2)(i). | (g)(3)(ii) | Removed. | (f)(3)(i) | Removed. |
| (g)(3) (ii) and (iii) ... | Removed. | (g)(3)(iii) | Revised; (g)(2)(iii)(A). | (f)(3)(ii) | Removed. |
| (g)(3)(iv) | Revised; (g)(2)(iii). | (g)(3)(iv) | Revised; (g)(2)(iii)(B). | (f)(3)(iii) | Revised; (f)(2)(ii). |
| (g)(3)(v) | Revised; (g)(2)(ii). | (g)(3)(v) | Removed. | (f)(4)(i) | Revised; (f)(2)(i). |
| (g)(4) | Removed. | Appendix E | Removed. | (f)(4) (ii) and (iii) | Removed. |
| Appendix C | Removed. | 1910.1050: | | Appendix B, Sec- | Revised second and |
| 1910.1028: | | (h)(1) | Revised. | tion IV. | fourth paragraphs; |
| (g)(1) | Revised. | (h)(2)(i) | Revised; (h)(3)(i). | | removed sixth para- |
| (g)(2)(i) | Revised; (g)(3)(i). | (h)(2)(ii) | Removed. | Appendix D | graph. |
| (g)(2)(ii) | Removed. | (h)(2)(iii) | Revised; (h)(3)(ii). | | Removed. |
| (g)(2)(iii) | Revised; (g)(3)(ii). | (h)(3) | Revised; (h)(2). | 1926.103: | |
| (g)(3) | Revised; (g)(2). | (h)(4) | Removed. | All | Revised to a single |
| (g)(4)(i) | Revised; (g)(2)(ii). | (h)(5) | Removed. | | provision. |
| (g)(4)(ii) | Revised; (g)(2)(iii). | Appendix A, Sec- | Revised first para- | 1926.800: | |
| (g)(4)(iii) | Removed. | tion III. | graph. | (g)(2) | Revised. |
| (g)(5) | Removed. | Appendix E | Removed. | 1926.1101: | |
| Appendix E | Removed. | 1910.1051: | | (h)(1) | Revised. |
| 1910.1029: | | (h)(1) | Revised. | (h)(2)(i) | Revised; (h)(3)(i). |
| (g)(1)(i) | Revised. | (h)(2)(i) | Revised; (h)(3)(i). | (h)(2)(ii) | Removed. |
| (g)(1)(ii) | Removed. | (h)(2)(ii) | Revised; (h)(3)(ii). | (h)(2)(iii) | Revised; (h)(3)(ii). |
| (g)(2)(i) | Revised; (g)(3). | (h)(2)(iii) | Revised; (h)(3)(iii). | (h)(2)(iv) | Revised; (h)(3)(iii). |
| (g)(2)(ii) and (iii) | Removed. | (h)(3) | Revised; (h)(2)(i). | (h)(2)(v) | Revised; (h)(3)(iv). |
| (g)(3) | Revised; (g)(2). | (h)(4)(i) | Revised; (h)(2)(ii). | (h)(3)(i) | Revised; (h)(2)(i). |
| (g)(4) | Removed. | (h)(4)(ii) | Revised; (h)(2)(iii). | (h)(3)(ii) | Removed. |
| 1910.1043: | | (h)(4)(iii) | Revised; (h)(2) (iv) | (h)(3)(iii) | Removed. |
| (f)(1) | Revised. | (h)(4)(iv) | and (vi). | (h)(3)(iv) | Revised; (h)(2)(ii). |
| (f)(2)(i) | Revised; (f)(3)(i). | (h)(4)(v) | Revised; (h)(2) (vi) | (h)(4) | Removed. |
| (f)(2)(ii) | Removed. | (h)(5) | and (vi). | Appendix C | Removed. |
| (f)(2)(iii) | Revised; (f)(3)(ii). | Appendix E | Removed. | 1926.1127: | |
| (f)(2)(iv) | Revised; (f)(2)(ii). | 1910.1052: | Removed. | (g)(1) | Revised. |
| (f)(3) | Revised; (f)(2)(i). | (g)(1) | Revised. | (g)(2)(i) | Revised; (g)(3)(i). |
| (f)(4) | Removed. | (g)(2) | Revised; (g)(4). | (g)(2)(ii) | Revised; (g)(3)(ii). |
| 1910.1044: | | (g)(3) | Revised; (g)(3). | (g)(3)(i) | Revised; (g)(2)(i). |
| (h)(1) | Revised. | (g)(4) | Revised; (g)(2)(i). | (g)(3)(ii) and (iii) | Removed. |
| (h)(2)(i) | Revised; (h)(3). | (g)(5) | Removed. | (g)(3)(iv) | Revised; (g)(2)(ii). |
| (h)(2)(ii) | Removed. | (g)(6) | Revised; (g)(2)(ii). | (g)(3)(v) | Revised; (g)(2)(iii). |
| (h)(3)(i) | Revised; (h)(3). | (g)(7) | Removed. | (g)(4) | Removed. |
| (h)(3)(ii) | Removed. | 1926.57: | | Appendix C | Removed. |
| 1910.1045: | | (f)(1)(ii) | Revised. | | |
| (h)(1) | Revised. | (f)(5)(i) | Revised. | | |
| (h)(2)(i) | Revised; (h)(3). | | | | |
| (h)(2)(ii) | Removed. | | | | |