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RECOMMENDATIONS FOR THE AMENDMENT OF THE
RESPIRATOR TEST AND APPROVAL DOCUMENT,
30 CFR 11

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RECOMMENDATIONS FOR AMENDMENT OF 30 CFR 11 WHICH ARE OF MAJOR IMPORTANCE

A. Administrative Amendments

1. Permit Public to Review and Comment on Proposals to Approve New Types of Respirators, Proposals for New Test Procedures, and Proposals for New Test Criteria

Section 11.60(b) of 30 CFR 11 permits the approval of respirators of types not listed in 30 CFR 11. Section 11.90 (c) of 30 CFR 11 permits the approvals of gas masks for vapors and gases other than those listed in Subpart 1. Section 11.150 (note) of 30 CFR 11 permits the approval of chemical cartridge respirators for vapors and gases other than those listed in Subpart L.

It is recommended that 30 CFR 11 be amended to require that proposals for the approval of new types of respirators not listed in 30 CFR 11, that proposals for new test procedures and test criteria for testing new types of respirators, and that proposals for new test procedures and new test criteria for use in approving respirators for protection of persons against inhalation of air contaminants not listed in 30 CFR 11 be published in the Federal Register and that the public be allowed adequate time to review and comment on these proposals before they are used in approving respirators. It is recommended that 30 CFR 11 be amended to require that the acceptance of new types of respirators for approval, and

that the acceptance of new test procedures and new test criteria for use in approving new types of respirators, and that the acceptance of new test procedures and new test criteria for use in approving respirators against air contaminants other than those listed in 30 CFR 11 be published in the Federal Register as official rulemaking after the public has been able to review and comment on the proposals.

2. Procedure to Permit Applicants for Approval of Respirators to Appeal Decision of NIOSH and MESA Personnel

It is recommended that 30 CFR be amended to permit applicants for approval of respirators to appeal decisions of NIOSH and MESA personnel pertaining to acceptance of respirators for approval, demands to make changes in the construction of respirators, methods employed to carry out performance tests on respirators, and requirements for quality assurance of respirators. The appeals procedure should permit applicants to appeal said decisions to some organization not directly involved in approving respirators.

3. SI Units

30 CFR 11 should be amended such that all values of measurement be listed in SI units.

B. Technical Amendments

1. Establishment of Minimum Protection Factors for All Types of Respirators by Means of Quantitative Fit Tests

It is recommended that 30 CFR 11 be amended to establish minimum protection factors for all types of respirators and that appropriate quantitative fit

tests be carried out to determine whether or not respirators submitted for approval meet the minimum protection factor criteria.

This amendment of 30 CFR 11 should include the following requirements: Panels of human subjects having appropriate anthropometric characteristics representing at least 95 percent of the adult working population, both males and females, should be used to carry out the quantitative respirator fit tests. Consideration should be given to the selection of human subjects to insure that their anthropometric characteristics are compatible with dimensional characteristics of respiratory-inlet coverings. An applicant should be permitted to submit for approval a respirator which fits a specific portion of the adult working population. Human subjects wearing respirators in test atmospheres should carry out exercises which simulate movements of workers in work operations. The penetration of test agents into respiratory inlet-coverings of respirators worn by human subjects carrying out exercises during quantitative fit testing should be measured by appropriate instruments. To determine whether or not a given make and model respirator achieves the minimum protection factor established for the type of respirator it is, at least three series of quantitative respirator fit tests should be carried out by the panel of human subjects. In order to be approved, the given make and model respirator must achieve protection factors equal to or greater than the established minimum protection factor for the type of respirator.

2. Permit Approval of Respirators Regardless of Design Which Meet Performance Criteria

It is recommended that 30 CFR 11 be amended to insure that respirators are not restricted by design requirements from receiving approvals provided that the respirators are capable of meeting established performance criteria.

It is especially important that 30 CFR 11 be amended to permit the approval of any type of air-purifying respirator for any type of air-contaminant if the respirator is capable of meeting the established performance criteria.

3. Clarify Classifications and Descriptions of Particulate-Filter Respirators and Chemical Cartridge Respirators

The classifications and descriptions of particulate-filter respirators given in Subpart K of 30 CFR 11 and chemical cartridge respirators given in Subpart L of 30 CFR 11 are confusing to respirator users, government officials having jurisdiction over respirator programs, respirator manufacturers, and the general public. Therefore, it is recommended that Subparts K and L of 30 CFR 11 be amended to clarify the classifications and descriptions of particulate-filter respirators and chemical cartridge respirators.

4. Leak Testing of Exhalation Valves

30 CFR 11 now requires that exhalation valves be tested for air leakage under static conditions whereas exhalation valves operate dynamically. Test results have shown that there is little correlation between the results of air leakage tests of exhalation valves under static conditions and the results of tests involving the measurement of the leakage of a test agent

through exhalation valves operated under dynamic conditions. Therefore, it is recommended that 30 CFR 11 be amended to require that when leakage tests of exhalation valves are required, these tests shall be carried out to determine the leakage of an appropriate test agent through the valves under dynamic conditions and that the permitted leakage be appropriate to established minimum respirator protection factors.

5. Testing Performance of Air-Purifying Respirators Which Allow Exhaled Air to Contact Air-Purifying Elements

Contact of exhaled air with an air-purifying element of an air-purifying respirator may either decrease the useful service life or increase the useful service life of the element. Therefore, 30 CFR 11 should be amended to require that any air-purifying respirator which allows exhaled air to contact the air-purifying element be tested for performance concerning protection against any air contaminant (particulate matter, vapor, gas) with the use of a breathing machine operated to simulate the breathing of a human working at a moderate pace and with the exhaled air having temperature and humidity equivalent to human body conditions.

6. Breathing Resistance Criteria

Many of the breathing resistance requirements listed in 30 CFR 11 for various types of respirators are arbitrary and are not based upon physiological factors. Thus, it is recommended that all respirator breathing resistance criteria listed in 30 CFR 11 be reviewed and that 30 CFR 11 be amended to list respirator breathing resistance criteria which are based upon physiological

limitations.

7. Clarify Approval of Air-Purifying Respirators for Protection Against Vapors and gases Which Lack Adequate Warning Properties

Section 11.90(b) (footnote 4) of Subpart I of 30 CFR 11 prohibits the use of approved gas masks for protecting persons against vapors and gases which have poor warning properties. Section 11.150 (footnote 7) of Subpart L of 30 CFR 11 prohibits the use of approved chemical cartridge respirators for protecting persons against vapors and gases which have poor warning properties. Some promulgated and proposed Federal exposure standards permit the use of air-purifying respirators against specific vapors and gases which do not have adequate warning properties provided that particular work practices described in the standards are carried out. Therefore, it is recommended that

Sections 11.90(b) (footnote 4) of Subpart I of 30 CFR 11 and 11.150 (footnote 7) of Subpart L of 30 CFR 11 be amended to prohibit the use of air-purifying respirators for protection of persons against vapors and gases which lack adequate warning properties or which allow the use of air-purify respirators for routine protection of persons against specific vapors and gases which lack adequate warning properties - provided that particular work practices described in the standards are carried out.

8. Performance Requirements for Respirator Eyepieces

30 CFR 11 does not list performance requirements for eyepieces in respiratory-inlet coverings of some types of respirators permitted for entry into hazardous atmospheres. Therefore, it is recommended that 30 CFR 11 be amended to mandate that eyepieces in the respiratory-inlet coverings of all types of respirators approved for use in entry

of persons into hazardous atmospheres (both immediately and not immediately dangerous to life or health) meet the eyepiece impact and penetration criteria specified in the latest edition of Federal Specification GGG-M-125, Mask Air Line, and Respirators, Air Filtering, Industrial.

9. Approval of Respirators Equipped with Suits

30 CFR 11 does not list a suit as an acceptable respiratory-inlet covering. Respirators equipped with suits have not been accepted for approval. Therefore, it is recommended that 30 CFR 11 be amended to permit the approval of respirators equipped with suits.

10. Noise Levels Generated by Respirator Operation

Some Subparts of 30 CFR 11 concerning supplied-air respirators and powered air-purifying respirators list a test procedure and criterion pertaining to the noise generated by these respirators when they are equipped with helmets or hoods as the respiratory-inlet coverings. However, the test procedure for measuring the noise level is vague. No mention is made in 30 CFR 11 of a noise level criterion for the mentioned types of respirators equipped with suits as respiratory-inlet coverings. A noise level criterion is not listed in 30 CFR 11 for supplied-air respirators and powered air-purifying respirators which may be equipped with a quarter-mask facepiece, half-mask facepiece, full facepiece, or mouthpiece/nose clamp as the respiratory inlet covering even though it is possible that these respirators may generate noise at harmful levels. Thus,

it is recommended that 30 CFR 11 be amended to require that the noise levels generated by supplied-air respirators and powered air-purifying respirators equipped with any type of respiratory-inlet covering be measured at the ear position for the maximum approved air flow, that the noise levels be measured inside respiratory-inlet coverings at the ear position when coverings are in the form of a helmet, hood or suit, that noise measurements be taken in an environment where the ambient noise level does not exceed 40 dBA, and that the maximum permitted noise level at the ear position be 80dBA.

11. Establishment of Test Procedures and Criteria for Loose-Fitting Respiratory-Inlet Coverings For Various Types of Air Contaminants

30 CFR 11 is vague in regard to the performance of loose-fitting type respiratory-inlet coverings in regard to protection offered by these coverings against particulate matter, vapors and gases, and combinations of particulate matter, vapors and gases. Therefore, it is recommended that 30 CFR 11 be amended to contain test procedures and test criteria to permit the approval of respirators equipped with loose-fitting respiratory-inlet coverings such as helmets, hoods, and suits which would insure that loose-fitting respiratory-inlet coverings provide adequate protection against any of the following air contaminants:

(a) particulate matter, (b) vapors and gases, or (c) combinations of particulate matter, vapors, and gases.

12. Restriction of Approvals of Supplied-Air Respirators

Subpart J of 30 CFR 11 permits the approval of a hose mask with blower for protection of persons against atmospheres immediately dangerous to life or health. Loss of the source of respirable air for a hose mask with blower is possible. Thus, it is recommended that Subpart J of 30 CFR 11 be amended so that all types of supplied-air respirators (airline respirator, hose mask with blower, hose mask without blower) are not approved for protection of persons against atmospheres immediately dangerous to life or health.

13. Improvement of Test Procedures and Criteria for Performance Testing of Powered Air-purifying Respirators Against Air Contaminants

Some sections of Subparts of 30 CFR 11 concerning the performance testing of powered air-purifying respirators require the testing of such a respirator with the air-flow rate through the respirator being 115 liters per minute if the respirator is equipped with a tight-fitting respiratory-inlet covering and 170 liters per minute if the respirator is equipped with a loose-fitting respiratory-inlet covering whereas 30 CFR 11 sometimes requires that the respirator be operated at its actual air flow which is not allowed to be less than 115 liters per minute if the respirator is equipped with a tight-fitting respiratory-inlet covering and not less than 170 liters per minute if the respirator is equipped with a loose-fitting respiratory-inlet covering. Most sections of Subparts of 30 CFR 11 pertaining to the performance

testing of powered air-purifying respirators require a test period of 240 minutes while other sections list either a lower or longer test period. It is reasonable to expect that a powered air-purifying respirator should provide adequate respiratory protection for at least half a normal work shift which would be 240 minutes (4 hours). Therefore, it is recommended that 30 CFR 11 be amended to require that when testing the performance of a powered air-purifying respirator, the respirator be operated in the test atmosphere at its actual air flow which shall never be less than 115 liters per minute during the test period when the respirator is equipped with a tight-fitting respiratory-inlet covering and never less than 170 liters per minute during the test period when the respirator is equipped with a loose-fitting respiratory-inlet covering, and that the test period shall be 240 minutes.

14. Reduction of Minimum Service Life of Canister of Gas Mask Designed for Protection Against More Than One Type of Vapor or Gas

Section 11.162-8 (Table 11, Footnote 2) of Subpart L of 30 CFR 11 concerning bench testing of cartridges of Chemical cartridge respirators against vapors and gases permits where a chemical cartridge respirator is designed for protection of persons against more than one type of vapor or gas, then the minimum vapor or gas service life of the cartridge shall not be required to exceed one-half the listed minimum service life for each type of vapor or gas. This is a reasonable requirement which eliminates the need for bulky and

heavy cartridges. However, section 11.102-5 (Tables 5,6, and 7) of Subpart I of 30 CFR 11 concerning bench testing of canisters of gas masks against vapors and gases requires that the canister of a gas mask designed for protection of persons against more than one type of vapor or gas must meet the minimum vapor or gas service life listed for each type of vapor or gas. This performance requirement for gas mask canisters means that a canister designed for more than one type of vapor or gas will be bulky and heavy. Therefore, it is recommended that section 11.102-5 (Tables 5, 6, and 7) be amended to state that where a gas mask is designed to protect persons against more than one type of vapor or gas, then the minimum vapor or gas service life of the canister shall not be required to exceed one-half the listed minimum service life for each type of vapor or gas.

15. Approval of Self-Contained Breathing Apparatus, Supplied-Air Respirators, Powered Particulate-Filter Respirators, and Non-Powered Particulate-Filter Respirators for Use By Persons Engaged in Abrasive Blasting

Currently, only Subpart J of 30 CFR 11 pertaining to supplied-air respirators contains provisions for approval of respirators for use by persons engaged in abrasive blasting operations. In many modern industrial plants where abrasive blasting is carried out effective ventilation systems are used to reduce the concentrations of abrasive particulate matter to very low levels. The use of minimum protection factors assigned to various types of respirators and measurements of the concentrations of abrasive particulate matter in work places

where abrasive blasing is carried out would permit the use of other types of respirators in addition to supplied-air respirators for respiratory protection of persons engaged in abrasive blasting. It is recommended that 30 CFR 11 be amended to permit the approval of self-contained breathing apparatus, supplied-air respirators, powered particulate-filter respirators, and non-powered particulate-filters resporators for use in protecting persons engaged in abrasive blasing. The test procedures and test criteria would depend upon the minimum protection factor established for each type of respirator. The test procedures should include a test which simulates abrasive blasting. In order to prevent exposure of persons to abrasive particulate matter during testing, a mechanically-operated manikin to which the respirator is attached would be used instead of a human subject wearing the respirator. Excessive scratching of a respirator eyepiece by "abrasive" particulate can be hazardous to the respirator wearer since such scratching may impair the wearer's vision. It is recommended that the eye-peices of respirators used in abrasive blasting tests be required to meet the criteria listed for definition and haze listed in the ANSI Z87.1-1968 American National Standard for Occupation^{al} and Education^{al} Eye and Face Protection.

DETAILED RECOMMENDATIONS FOR AMENDMENT OF VARIOUS SUBPARTS
OF 30 CFR 11

Subpart A - General Provisions

11.3 Definitions

It is recommended that the following definitions be included in section 11.3 of Subpart A of 30 CFR 11. Some of these definitions are additional definitions to be added to 11.3 and some are revisions of definitions already in 11.3.

Abrasive-Blasting Respirator

A respirator designed to protect the wearer against inhalation of and impact and abrasion of the head and neck from particulate matter during abrasive ^{blasting.} ~~blasting.~~

Adequate Warning Properties

Substances which can be readily detected by odor, taste or irritation at concentrations within three times the permissible exposure limit but which never exceed the ceiling limit. Substances which cause rapid olfactory fatigue and have no other warning properties are excluded.

Aerosol

A system consisting of particles, solid or liquid, suspended in air.

Airline Respirator

A supplied-air respirator whose respiratory-inlet converging is supplied with respirable air through a hose from a remotely located source of compressed air which may be a compressor or compressed air cylinder.

Air Purifying Respirator

A respirator equipped with an element(s) designed to remove a contaminant(s) from inspired air.

Breathing Tube

A tube through which air or oxygen flows to the respiratory-inlet covering of a respirator.

Canister (Air-Purifying)

A container comprising a filter and/or sorbent and/or catalyst which removes a specific contaminant(s) from the air drawn through it.

Canister (Oxygen-Generating)

A container filled with a chemical which generates oxygen by chemical reaction.

Cartridge (Air-Purifying)

A small canister (air-Purifying).

Cartridge (Air-Purifying), Integral

A cartridge (air-purifying) which is a permanent component of a respirator.

Cartridge (Air-Purifying), Non-Replacable

See Cartridges (Air-Purifying), Integral

Cartridge (Air-Purifying), Replacable

A cartridge (air-purifying) which may be removed from a respirator and replaced.

Cartridge (Air-Purifying), Reuseable

A cartridge (air-purifying) which may be used repeatedly until the end of its useful life is reached and which may be used beyond a single work shift.

Cartridge (Air-Purifying), Single-Use

A cartridge (air-purifying) designed to be discarded when the end of its useful life is reached and which must not be used beyond a single work shift.

Chemical Cartridge Respirator

An air-purifying respirator equipped with a cartridge(s)

(air-purifying) to remove a single vapor or gas, a single class of vapors or gases, a combination of two or more vapors or gases, or a combination of two or more classes of vapors or gases from air where adequate oxygen to support life is present and where particulate matter is absent. This type respirator may be equipped with an additional filter(s) to remove particulate matter from air.

Escape Gas Mask

A gas mask designed for escape only from a hazardous atmosphere.

Facepiece

That portion of a respirator that covers the wearer's nose and mouth in a quarter-mask or half-mask facepiece or that covers the wearer's nose, mouth, and eyes in a full facepiece. It is designed to make a gas-tight or particle-tight fit with the face and may include headband(s), valve(s) and connections for an air-purifying element or respirable gas source or both.

Fibrosis-Producing Dust

Dust, which when inhaled, deposited, and retained in the lungs, may produce fibrous growth within the lungs which impairs lung function.

Filter

A media component used in a respirator to remove particulate matter from inspired air.

Filter, Integral

A filter which is a permanent component of a respirator.

Filter, Non-Replaceable

See filter, Integral

Filter, Non-restorable, Reusable

A filter which may be used repeatedly without cleaning or reconstituting until the end of its useful life is reached and which may be used beyond a single work shift.

Filter, Non-Reusable

See Filter, Single-Use.

Filter, Replaceable

A filter which may be removed from a respirator and replaced.

Filter, Restorable, Reusable

A filter which, after one or more uses, may be cleaned or otherwise reconstituted. This process may be repeated until such cleaning or reconstitution becomes ineffective.

Filter, Reusable

A filter which may be used repeatedly until the end of its useful life is reached and which may be used beyond a single work shift.

Filter, Single-Use

A filter designed to be discarded when the end of its useful life is reached and which must not be used beyond a single work shift.

Fog

A mist sufficient concentration to perceptively obscure vision.

Gas Mask

An air-purifying respirator with canister(s) (Air Purifying)

to remove a single vapor or gas, a single class of vapors or gases, a combination of two or more vapors or gases, or a combination of two or more classes of vapors or gases from air where adequate oxygen to support life is present and where particulate matter is absent. This type respirator may be equipped with an additional filter(s) to remove particulate matter from air.

Gas Mask, Chin Style

A gas mask having a canister(s) (air-purifying) which is directly attached to the respiratory-inlet covering.

Gas Mask, Front-Mounted or Back-Mounted

A gas mask with the canister(s) (air-purifying) supported on the front or back of the wearer's body.

Hazardous Atmosphere

Any atmosphere, either immediately or not immediately dangerous to life or health, which is oxygen deficient or which contains a toxic or disease-producing air contaminant.

Headband

See Head Harness

Head Harness

A device for holding a facepiece or mouthpiece securely in place on a respirator wearer's head.

Helmet

That portion of a respirator which shields the eyes, face, neck and other parts of the head.

High Heat of Reaction

Sorbents used in canisters (air-Purifying) may react with certain vapors and gases to generate a large amount of heat, which may result in high temperatures on the surface of the

canisters. The temperature of the hot surface of a canister may be sufficiently high to cause burns on any part of the body in contact with the canister. The high heat of reaction may be readily noticed by the increase in temperature of the inspired air which would be a warning to the respirator wearer that he or she is in a dangerously high concentration of a vapor or gas.

High Efficiency Filter

A filter which has an efficiency equal to or exceeding 99.97 percent for removal of particulate matter from air.

Hood

That portion of a respirator which completely covers the head and neck and which may cover portions of the shoulders.

Hose Mask with Blower

A supplied-air respirator whose respiratory-inlet covering is supplied with respirable air through a hose by a remote hand-operated or a motor-operated blower located in an atmosphere having respirable air. The wearer can continue to inhale through the hose and blower if the blower fails.

Hose Mask without Blower

A supplied-air respirator whose respiratory-inlet covering is supplied with respirable air through a hose by inspiration of the wearer with the inlet of the hose remotely located in an atmosphere having respirable air.

Immediately Dangerous to Life of Health Atmosphere

Any hazardous atmosphere that poses an immediate hazard to life or produces irreversible debilitating effects on health.

Mouthpiece/Nose Clamp

A type of respiratory-inlet covering that provides a gas-

tight or particle-tight seal with the respirator wearer's mouth when the mouthpiece is inserted into the mouth and the respirator wearer's nostrils are closed by the nose clamp.

Not Immediately Dangerous to Life or Health Atmosphere

Any hazardous atmosphere which may produce physical discomfort immediately, chronic irreversible poisoning after repeated exposure, or acute irreversible physiological symptoms after prolonged exposure.

Oxygen Deficient Atmosphere

An atmosphere which contains less than 19.5 percent oxygen by volume at sea level.

Particulate Matter

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

Permissible Time Weighted Average Concentration

The average concentration of a substance in air during an 8-hour work shift prescribed by the Secretary of Labor in accordance with the provisions of the Occupational Safety and Health Act of 1970 (Public Law 91-596, 84 Stat. 1590)

Poor Warning Properties

Substances which cannot be readily detected by odor, taste, or irritation at concentrations within three times the permissible exposure limit but never to exceed the ceiling concentration. Substances which cause rapid olfactory fatigue and have no other warning properties are classed as having poor warning properties.

Powered Air-Purifying Respirators

An air-purifying respirator having a powered blower, stationery or carried by the respirator wearer, which pulls or pushes

ambient air through an air-purifying element(s) and then supplies purified air to the respiratory-inlet covering.

Pneumoconiosis-Producing Dust

Dust, which when inhaled, deposited, and retained in the lungs, may produce signs, symptoms, and findings of pulmonary disease.

Protection Factor

The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside a respirator at the breathing zone of the respirator wearer. The protection factor is a measure of the degree of protection provided by a respirator to a wearer.

Remaining Service Life Indicator or Warning Device

An indicator or warning device on a respirator which warns the respirator wearer that the end of the service life of the respirator is approaching.

Respirable Air

Air that is fit to be breathed.

Respirable Breathing Gas

A gas which meets the minimum requirements of the latest ANSI Z86.1 Standard for Type I, Grade D, Gaseous Air or Type II, Grade B, Liquid Air, or U. S. Pharmacopia for Medical or breathing oxygen, or chemically generated oxygen meeting the requirements of the latest edition of Military Specification MIL-E-83252 or the latest edition of Military Specification MIL-O-15633, whichever is applicable.

Respiratory-Inlet Covering

That portion of a respirator which connects the wearer's respiratory tract to an air-purifying device or respirable gas source or both. Examples include facepiece, mouthpiece/nose

clamp, helmet, hood, or suit.

Reusable Respirator

A respirator which may be used repeatedly until the end of its useful life is reached and which may be used beyond a single work shift.

Self-Contained Breathing Apparatus

A respirator with a source of respirable breathing gas independent of the ambient atmosphere carried by the wearer.

Self-Contained Breathing Apparatus, Closed-Circuit

A self-contained breathing apparatus of the type in which the wearer's exhalation is rebreathed after carbon dioxide has been effectively removed and a suitable oxygen concentration has been restored.

Self-Contained Breathing Apparatus, Demand Type

A self-contained breathing apparatus in which the pressure inside the respirator in relation to pressure of the ambient atmosphere is positive during exhalation and negative during inhalation.

Self-Contained Breathing Apparatus, Open Circuit

A self-contained breathing apparatus of the type where the wearer's exhalation is expelled to the ambient atmosphere.

Self-Contained Breathing Apparatus, Positive Pressure

A self-contained breathing apparatus in which the pressure inside the respirator in relation to the pressure of the ambient atmosphere is positive during both exhalation and inhalation.

Service Life

The period of time that a respirator or respirator component provides adequate protection to the respirator wearer, such

as the period of time that an air-purifying device is effective for removing a harmful substance from air.

Single-Use Respirator

A respirator designed to be discarded when the end of its useful service life is reached and which must not be used beyond a single work shift.

Smoke

A system, which includes products of combustion, pyrolysis or chemical reaction, of substances in the form of visible and invisible solid and liquid particles and gaseous products in air. Smoke particles usually have sufficient concentration to perceptively obscure vision.

Sorbent

A material contained in a cartridge (air-purifying) or canister (air-purifying) which removes toxic vapors and gases from air.

Spray

A liquid particle which is mechanically produced with sizes generally in the visible or macroscopic range.

Suit

That portion of a respirator which completely covers the body of the respirator wearer.

Supplied-Air Respirator

A respirator which supplies respirable air from a remote source such as a compressor, blower, or compressed air cylinder(s) through a hose to the respiratory-inlet covering.

Window Indicator

A device on a cartridge (air-purifying) or canister (air-

purifying) which visually denotes that the end of the service life of the cartridge or canister is approaching.

Subpart B-Application for Approval

11.11(a)

Add the following sentence at the end of 11.11(a): "Instructions for the use and maintenance of the respirator shall be included."

Subpart D- Approval and Disapproval

11.30(e)

Add 11.30(e) to include an appeals procedure as described in Recommendation A.2 under Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

11.35(c)

Revise 11.35(c) to read as follows: "The application shall be accompanied by appropriate parts and materials lists, drawings, specifications, and instructions, if applicable, and by a proposed quality control plan which meets the requirements of Subpart E of this part."

Subpart F - Classification of Approved Respirators: Scope of Approval; Atmosphere Hazards; Service Time

The letter "M" in sections 11.50 through 11.53 should be changed to the letter "N" wherever the letter "M" occurs.

11.51

Revise 11.51 to read as follows: "Respirators described in Subparts H through N of this part shall be approved for use as follows: (a) Entry and escape. Respirators designed and approved for use during (i) entry into a hazardous atmosphere not immediately dangerous to life

or health and for escape from any hazardous atmosphere, or
(ii) entry into a hazardous atmosphere immediately dangerous to life or health and for escape from this atmosphere.

(b) Escape only. Respirators designed and approved for use only during escape from any hazardous atmosphere."

11.52

Revise 11.52 to read as follows: "respirators described in Subparts H through N of this part shall be approved for use against any or all of the following respiratory hazards:

- (a) Oxygen deficiency;
- (b) Vapors and gases;
- (c) Particulate matter."

11.53

The service times listed in 11.53 belong in Subpart H which describes self-contained breathing devices and test procedures and test criteria for these devices. Thus, the service times listed in 11.53 should be removed from Subpart F and should be placed in Subpart H and the words "Service Time" should be removed from the title of Subpart F. A one and one-half hour service time should be added to the service time list when this list has been moved to Subpart H.

Subpart G- General Construction and Performance Requirements

The letter "M" in sections 11.60, 11.63, 11.64, and 11.65 should be changed to the letter "N" wherever the letter "M" occurs.

11.60 (b)

Reference is made to Recommendation A.1 under Recommendations For Amendment of 30 CFR 11 Which are of Major Importance

Add the following to 11.60 (b): "Proposals for approval of respiratory protective devices not specifically described in this Part 11 and proposed test procedures and test criteria for use in approving these devices shall be published in the Federal Register and the public shall be allowed adequate time to review and comment on these proposals before they are used in approving these devices. Acceptance for approval of new types of respiratory protective devices not specifically described in this Part 11 and acceptance of new test procedures and test criteria for these devices shall be published in the Federal Register as official rulemaking after the public has been able to review and comment on the proposals."

11.61(a)

Revise 11.61(a) to read as follows: "Respirators will not be accepted by the Institute for examination, inspection, and testing, unless they are designed on sound engineering and scientific principles, constructed of suitable materials, provide good durability, and evidence good workmanship."

11.62(a)(1)

Revise 11.62(a)(1) to read as follows: "Designed, constructed, and fitted so that the complete respirator assembly shall not incorporate any feature which may injure the wearer during normal use;"

11.63(c)

Reference is made to Recommendation A.1 under Recommendations for Amendment of 30 CFR 11 Which Are of Major Importance.

Add the following to 11.63(c): "Proposals for additional requirements shall be published in the Federal Register and

the public shall be allowed adequate time to review and comment on these proposals before they are used in approving these respirators. Acceptance of these additional requirements shall be published in the Federal Register as official rulemaking after the public has been able to review and comment on the proposals."

11.64(c)

Revise 11.64(c) to read as follows: "(1) the Institute shall, at the written request of the applicant, supply a current description of the equipment and procedures used in testing respirators for approval. This description shall include:

- (i) drawings of the equipment layout including drawings of any fabricated or modified parts;
 - (ii) a list of all components of apparatus including names of manufacturers and model numbers;
 - (iii) specifications which determine the selection of all components of the equipment and substances used in components;
 - (iv) Descriptions of all procedures necessary to achieve consistent and reproducible results, including any special skills, techniques, or training of operators.
- (2) Any changes in test equipment and test procedures used to approve respirators which are not described in 30 CFR 11 which affect the method of testing or analyzing test data shall be furnished to holders of approved respirators when such changes are made by the Institute."

11.65(c)

Revise 11.65(c) to read as follows: "Only Institute and Mining and Enforcement Safety Administration personnel,

persons assisting the Institute pursuant to paragraph (b) of this section, and such other persons mutually agreeable to the Institute, the Mining Enforcement and Safety Administration, and the applicant, shall be present during any examination, inspection, or test conducted prior to the issuance of an approval by the Institute and the Mining Enforcement and Safety Administration for the equipment under consideration."

11.65(d)

Add "test data " after "analyses," in 11.65(d).

11.65(e)

Revise 11.65(e) to read as follows:"As a condition of each approval issued for any respirator the Institute and the Mining Enforcement and Safety Administration reserve the right, following the issuance of such approval to conduct such public tests and demonstrations in accordance with the provisions of 30 CFR 11 of the approved respiratory equipment. "

Subpart H-Self-Contained Breathing Apparatus

11.70(a)(1)

Add the following sentence to follow(iii): "The apparatus may be of the demand type or positive pressure type."

11.70(a)(2)

Change "Pressure-demand type apparatus" to "Positive pressure type apparatus".

11.70(b)

Change "(b)" to "(c)", change "(c)" to "(d)", change "(d)" to "(e)", and substitute the following as "(b)": "Self-contained breathing apparatus shall be classified as approved

for the following prescribed service times:

- (1) Four hours;
- (2) Three hours;
- (3) Two hours;
- (4) One and one-half hours;
- (5) One hour;
- (6) Forty-five minutes;
- (7) Thirty minutes;
- (8) Fifteen minutes;
- (9) Ten minutes;
- (10) Five minutes;
- (11) Three minutes."

11.71(a)(1)

Change 11.71(a)(1) to read as follows: "Respiratory-inlet coverings;"

11.72(a)(2)

Revise 11.72(a)(2) to read as follows" "Disturbance of the fit of the respiratory-inlet coverings;"

11.73(b)

Change "full facepiece" to "respiratory-inlet covering".

11.75

Change the title to read as follows" "Respiratory-Inlet Coverings; Fit; minimum requirements."

11.75(a)

Reference is made to Recommendation B.1 under Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

11.75(a) should be revised as follows: "respiratory-inlet coverings shall be designed and constructed to fit a panel of human subjects having appropriate anthropometric char-

acterists representing at least 95 percent of the adult working population, both males and females. An applicant shall be permitted to submit for approval an apparatus having a respiratory-inlet covering which fits a specific portion of the panel."

11.75(d)

Revise 11.75(d) to read as follows: "Respiratory-inlet coverings shall be designed to minimize eyepiece, spectacle, and lens fogging."

11.76

Change the title to read as follows: "Respiratory-inlet coverings; minimum requirements."

11.76(a)

Change "Facepieces" to "Respiratory-inlet coverings".

11.76(b)

Reference is made to Recommendation B.8 under Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

Revise 11.76(b) to read as follows: "All eyepieces of apparatus designed for entry into hazardous atmospheres shall meet the impact and penetration requirements specified in the latest edition of Federal Specification GGG-M-125, Mask, Airline, and Respirators, Air Filtering, Industrial."

11.78(a)

Change the words "during suspension" to "during use".

11.79

Delete 11.79(a) in its entirety.

Change 11.79(b) to the following: "Compressed gaseous oxygen or liquid oxygen shall meet the requirements of the U.S. Pharmacopeia for medical or breathing oxygen, and chemically generated oxygen shall meet the requirements of the

latest edition of Military Specification MIL-E-83252 or the latest edition of Military Specification MIL-O-15633, whichever is applicable."

Change 11.79(c) to the following: "Compressed gaseous breathing air shall meet the requirements of the latest edition of ANSI Z86.1 Standard for Type I, Grade D, Gaseous Air."

Change 11.79(d) to the following: "Compressed liquified breathing air shall meet the requirements of the latest edition of ANSI z86.1 Standard for Type II, Grade B, Liquid Air."

11.80(b)

Revise 11.80(b) to read as follows: "Breathing gas containers shall be premanently and legibly marked to identify their contents in accordance with the requirements of the ANSI Z48.1-1954 (R-1971) American National Standard Method of ^{Marking} Portable Compressed Gas Containers; Federal Specification BB-A-1034a, June 21, 1968, Air, Compressed for Breathing Purposes; or Interim Federal Specification GG-B-00675c, October 7, 1974, Breathing Apparatus, Self-Contained; whichever is applicable."

11.80(c)

Revise 11.80(c) to read as follows: "Containers normally removed from apparatus for refilling shall be equipped with an indicator showing the pressure in the container."

11.80(d)

Change "(1965)" to "(latest edition)".

11.81

Change the title to read as follows: "Pressure indicators; minimum requirements."

Change 11.81(a) to read as follows: "Pressure indicators employed on compressed breathing gas containers shall be calibrated in units^S of force per unit area."

Change the words "pounds per square inch" to the words "force per unit area" in 11.81(c)(1) and in 11.81(c)(3).

11.82(b)

Revise 11.82(b) to read as follows: "The timer or other indicator shall be accurately calibrated to indicate remaining service life."

11.83(e)

Delete the words "Hand-operated".

11.83(g)

Revise 11.83(g) to read as follows: "The manually operated bypass system valve control shall be colored red."

11.83(i)

Delete the word "manual".

11.85-4(a)

Change "The completely assembled and fully charged apparatus shall not weigh more than 16 kg. (35 pounds);" to "The completely assembled apparatus, charged to half its service lift shall not weigh more than 16 kg. (35 pounds);".

11.85-6(b)

Revise 11.85-6(b) to read as follows: "The exhalation resistance of open-circuit apparatus shall not exceed 20 mm (0.8 inch) water-column height."

11.85-6(c)

Revise 11.85-6(c) to read as follows: "The exhalation resistance of positive pressure apparatus shall not exceed the static pressure in the respiratory-inlet covering by more than 50 mm. (2 inches) water-column height."

11.85-6(e)

Revise 11.85-6(e) to read as follows: "Resistance to ex-

halation airflow will be measured in the respiratory-inlet covering of closed-circuit apparatus with a breathing machine as described in section 11.85-3, and the exhalation resistance shall not exceed 50 mm. (2 inches) water-column height for demand devices and 90 mm. (3.5 inches) water-column height for positive pressure devices."

11.85-7

Revise 11.85-7 in accordance with Recommendations B.4 given in Recommendations for Amendment of 30 CFR 11 Which Are of Major Importance.

11.85-8(b)

Change "51 mm." to "50 mm."

11.85-8(c)

Change "pressure-demand" to "positive pressure."

11.85-9(c)

Revise 11.85-9(c) to read as follows: "All demand flow devices shall provide at least 115 liters per minute oxygen when the pressure in the respiratory-inlet covering is at its permissible minimum."

11.85-12

Consideration should be given to increasing the maximum allowable average concentration of carbon dioxide within the respiratory-inlet covering for apparatus for escape only which utilize any type of respiratory inlet covering (the U.S. Navy currently is charged in research on this matter).

11.85-14

Establish procedures for man testing of an apparatus having

a service life time of one and one-half hours.

11.85-19 Revise 11.85-19 in accordance with Recommendation B.1 given in Recommendations For Amendment of 30 CFR 11 Which are of Major Importance.

11.85-20

Add a section 11.85-20 which would describe test procedures and test criteria to be used for approval of self-contained breathing apparatus for use by persons engaged in abrasive blasting. See Recommendation B.15 given in Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

Subpart I - Gas Masks

11.90(a) (1)

Revise 11.90(a) (1) to read as follows: "Front-mounted or back-mounted gas mask. A gas mask which consists of a facepiece or mouthpiece/nose clamp, a breathing tube(s), a canister(s) which is located at the front or back of the wearer, a canister harness(es), and associated connections."

11.90(a) (2)

Revise 11.90(a) (2) to read as follows: "Chin style Gas Mask. A gas mask which consists of a facepiece or mouthpiece/nose clamp, a canister(s) which usually is attached to the facepiece or mouthpiece/nose clamp, and associated connections."

11.90(a) (3)

Revise 19.90(a) (3) to read as follows: "Escape Gas Mask. A gas mask designed for escape only from hazardous atmospheres which consists of a facepiece or mouthpiece/nose clamp, a canister(s), and associated connections."

11.90 (Footnote 4 under tables listing vapors and gases for which gas masks are designed to provide respiratory protection). Revise Footnote 4 in accordance with Recommendation B.7 given in Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

11.90(c)

Revise 11.90(c) in accordance with Recommendation A.1 in Recommendations for Amendment of 30 CFR 11 Which Are of Major Importance.

Revise 11.90(c) as follows: "Gas masks for respiratory protection against vapors and gases other than those specified in paragraph (b) of this section may be approved. The applicant shall submit a request for approval, in writing, to the Institute, listing the vapor or gas and suggested test procedures and test criteria. The Institute and the Mining Enforcement and Safety Administration shall consider the application and shall propose accepting the application or shall reject the application on the basis of effect on the gas mask wearer's health and safety and any field experience in use of gas masks for such exposures. If the Institute proposes acceptance of the gas mask for approval, the Institute and the Mining Enforcement and Safety Administration shall publish in the Federal Register the proposed test procedures and test criteria and permit the public adequate time to review and comment on the proposals. After reviewing comments and recommendations made by the public on the proposals, if the Institute and the Mining Enforcement and Safety Administration accept the proposals or accept modified proposals, they shall publish the new test procedures and the new test criteria in the Federal Register as official rulemaking."

11.91(a)(1)

Revise 11.91(a)(1) to read as follows: "Facepiece or mouthpiece/nose clamp;"

11.91(a)(4)

Change "external check valve" to "inhalation valve".

11.96(b)

Change "Full Facepiece" to "Facepiece and mouthpiece/nose clamp".

11.98(a)

Reference is made to Recommendation B.1 under Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

11.98(a) should be revised as follows: "Respiratory-inlet coverings shall be designed and constructed to fit a panel of human subjects having appropriate anthropometric characteristics representing at least 95 percent of the adult working population, both males and females. An applicant shall be permitted to submit for approval a gas mask having a respiratory-inlet covering which fits a given portion of the panel."

11.98(d)

Change "nose clips" to "nose clamps".

11.98(e)

Revise 11.98(e) to read as follows: "Facepieces shall be designed to minimize eyepiece fogging."

11.99(b)

Revise 11.99(b) to read as follows: All eyepieces shall be designed to meet the impact and penetration requirements of the latest edition of Federal Specification GGG-M-125, Mask, Airline, and Respirator, Air Filtering, Industrial."

11.101(a)

Delete the word "replaceable".

11.101(b)

Revise 11.101(b) to read as follows; "Mouthpiece/nose clamps shall be equipped, where applicable, with adjustable harnesses designed and constructed to hold the mouthpiece in place."

11.102-1(b)

Reference is made to Recommendation B.6 under Recommendations

for Amendment of 30 CFR 11 Which Are of Major Importance.

11.102-2

Revise 11.102-2 in accordance with Recommendations B.4 given in Recommendations for Amendment of 30 CFR 11 Which Are of Major Importance.

11.102-3

Revise title of 11.102-3 to read: "Respirator-inlet covering tests; minimum requirements." ^{REVISE (a), (b), and (c)} In accordance with ^{Recommendation B.4 presented in} Recommendations for Amendment of 30 CFR 11 Which are of Major Importance.

11.102-4(b)

Revise 11.102-4(b) to read as follows: "A gas mask canister designed for protection against smokes shall be tested in an atmosphere concentration of 100 ± 25 micrograms of monodisperse dioctyle phthalate (DOP) aerosol particles (0.3 micrometer particle size) per liter of air at a continuous flow of 85 liters per minute for a period of 5 to 10 seconds and the aerosol particle penetration through the canister shall not exceed -0.03 percent of the test concentration."

11.102-5(a) (1)

Revise the test atmosphere humidity requirement to " 50 ± 3 percent relative humidity" and revise the test atmosphere temperature requirement to " $25^{\circ} \pm 2.5^{\circ}\text{C}$ ".

11.102-5(a) (3)

Revise the equilibration test conditions to " 25 ± 3 percent relative humidity" and $25^{\circ} \pm 2.5^{\circ}\text{C}$.

11.102-5(a) (4)

Revise the equilibration test conditions to " 85 ± 3 percent relative humidity" and " $25^{\circ} \pm 2.5^{\circ}\text{C}$ ".

11.102-5 (tables 5,6,7)

Reference is made to Recommendation B14 under Recommendations for Amendment of 30 CFR 11 Which Are of Major Importance. Add a footnote in Tables 5, 6, and 7 which states "Where a gas mask is designed to protect persons against more than one type of vapor or gas, such as acidic gases and organic vapors, then the minimum vapor or gas service life of the canister shall not be required to exceed one-half the listed minimum service life for each type of vapor or gas."

Subpart J-Supplied-Air Respirators11.110(a)

Revise 11.110(a) to conform with Recommendation B.12 given in the Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

Revision of 11.110(a) would mean that it should read as follows:

"Supplied-air respirators, including all completely assembled respirators designed for use as respiratory protection during entry into and escape from hazardous atmospheres not immediately dangerous to life and health are described as follows:"

Subpart 11.110(a) (1)

Revise 11.110(a) (1) to read as follows: Type "A" supplied-air respirators. A hose mask with blower is a supplied-air respirator whose respiratory-inlet covering is supplied with respirable air through a hose by a remotely hand-operated or a motor-operated blower located in an atmosphere having respirable air. The wearer can continue to inhale through the hose and blower if the blower fails."

Subpart 11.110(a) (2)

Revise 11.110(a) (2) to read as follows: "Type AE" supplied-air respirator. A Type "A" Supplied-air respirator equipped with additional devices to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and if necessary with shielding to protect the eyepiece of the respiratory-inlet covering against impact and abrasion from rebounding abrasive material."

Subpart 11.110(a) (3)

Revise 11.110(a) (3) to read as follows: "Type "B" supplied-air respirator. A hose mask without blower is a supplied-air respirator whose respiratory-inlet covering is supplied with respirable air through a hose by inspiration of the wearer with the inlet of the hose remotely located in an atmosphere having respirable air."

11.110(a) (4)

Revise 11.110(a) (4) to read as follows: "Type "BE" supplied-air respirator. A type "B" supplied-air respirator equipped with additional devices to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and, if necessary, with shielding to protect the eye-
peice of the respiratory-inlet covering against impact and abrasion from rebounding abrasive material."

11.110(a) (5)

Revise 11.110(a) (5) to read as follows: "Type "C" supplied-air respirator. An airline respirator is a supplied-air respirator which supplies respirable air from a remote source such as a compressor, blower, or compressed air cylinder(s) through a hose to the respiratory-inlet covering."

11.110(a) (6)

Revise 11.110(a) (6) to read as follows" "Type "CE" supplied-air respirator. A type "C" supplied-air respirator equipped with additional devices to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and, if necessary, with shielding to protect the eyepiece of the respiratory-inlet covering against impact and abrasion from rebounding abrasive material."

11.111(a) (1)

Substitute "Respiratory-inlet covering" for "Facepeice, hood, or helmet".

11.111(a) (2)

Substitute "positive pressure" for "pressure-demand".

11.112(a) (2)

Revise 11.112(a) (2) to read as follows: "Disturbance of the fit of respiratory-inlet coverings;"

11.113(b)

Substitute "respiratory-inlet covering" for "full facepiece".

11.115

Change the title of 11.115 to "Respiratory-inlet coverings; fit; minimum requirements."

11.115(a)

Reference is made to Recommendation B.1 given in the Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance. Revise 11.115(a) to read as follows: "A respiratory-inlet covering shall be designed and constructed to fit a panel of human subjects having appropriate anthropometric characteristics representing at least 95 percent of the adult working population, both males and females. An applicant shall be permitted to submit for approval a respirator having a respiratory-inlet covering which fits a specific portion of the panel."

11.115(b) (c) (d)

Delete 11.115(b) through 11.115(c) and substitute for these as 11.115(b) the following: "A respiratory-inlet covering shall provide for optional use of corrective spectacles or lenses, where applicable, which shall not reduce the respiratory protective qualities of the respirator, and shall be designed to minimize eyepiece fogging."

11.116

Change the title of 11.116 to read "Respiratory-inlet coverings; eyepieces; minimum requirements."

11.116(a)

Substitute "Respiratory-inlet coverings" for "facepieces, hoods, and helmets".

11.116(b)

Revise 11.116 (b) to read as follows: "Where applicable, eyepieces shall be designed and constructed to meet the impact and penetration requirements of the latest edition of Federal Specification GGG-M-125, Mask, Airline, and Respirator, Air Filtering, Industrial."/>

11.116(c) (1)

Revise 11.116(c) (1) to read as follows: "Where applicable, the eyepieces of AE, BE, and CE type supplied-air respirators shall be shielded to prevent damage caused by rebounding abrasive particulate matter, and the shielding shall be designed so as not to interfere with the vision of the respirator wearer."

11.116(c) (a)

Substitute "respiratory-inlet covering" for "facepiece".

11.117

Change the title of 11.117 to read as follows: "Inhalation and exhalation valves; minimum requirements."

11.117(c)

Revise 11.117(c) to read as follows: "Inhalation valves shall be provided in all type A, AE, B, and BE supplied-air respirators equipped with facepieces, or mouthpieces/nose clamps."

11.118

Revise 11.118 into a paragraph (a) and a paragraph (b) as follows:

"(a) Facepieces shall be equipped with adjustable head harnesses which are designed and constructed to provide adequate tension during use, and an even distribution of pressure over the entire area of the face in contact with the facepiece.

(b) Mouthpieces/nose clamps shall be equipped, where applicable, with adjustable head harnesses designed and constructed to hold the mouthpiece in place in the respirator wearer's mouth."

11.120

Revise the title of 11.120 to read as follows: "Air velocity and noise levels, minimum requirements."

Reference is made to Recommendation B.10 given in Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance. Revise 11.120 to read as follows: "The noise level generated by the respirator equipped

with any type of respiratory inlet-covering shall be measured at the ear level at the maximum airflow obtainable within specified pressure and hose length requirements and shall not exceed 80 dBA. When the respirator is equipped with a respiratory-inlet covering that covers the respirator wearer's head, the noise level shall be measured inside the covering at the ear level. The noise level measurement shall be taken in an environment where the ambient ^{noise} does not exceed 40 dBA."

11.121

Change the title of 11.121 to read as follows: "Breathing gas; minimum user requirements."

11.121(b)

Revise 11.121(b) to read as follows: "Compressed gaseous breathing air shall meet the requirements for Type I, Grade D, gaseous air set forth in the latest edition of the ANSI Z86.1 Standard."

11.121(c)

Revise 11.121 to read as follows: "Compressed, liquified breathing air shall meet the requirements for Type II, Grade B, liquid air set forth in the latest edition of the ANSI Z86.1 Standard."

11.124-5 and 11.124-6

Combine 11.124-5 and 11.124-6 by carrying out the following:

Change the title of 11.124-5 to "Type C supplied-air respirators; pressures and hose lengths; minimum requirements."

Eliminate the title of 11.124-6.

Eliminate (c) in 11.124-5 and (d) in 11.124-6 since these are requirements for respirator users.

Eliminate (a) and (c) in 11.125-6.

Convert (b) in 11.125-6 to (c) in 11.125-5.

11.124-10(c)

Change the "25 mm. (1 inch)" to "20 mm. (0.8 inch)."

11.124-11(b)

Revise 11.124-11(b) to read as follows: "Inhalation airflow resistance shall not exceed 38 mm. (1.5 inches) of water-column height at the air flow rate of 85 liters (3 cubic feet) per minute."

11.124-11(c)

Change the "25 mm (1 inch)" to "20 mm. (0.8 inch)."

11.124-13(b)

Change the "25 mm. (1 inch)" to "20 mm. (0.8 inch)."

11.124-14(c)

Change the 51 mm. (2 inches)" to "50 mm. (2 inches)."

11.124-15

Revise 11.124-15 in accordance with Recommendation B.4 given in Recommendations For Amendment Of 30 CFR 11 Which Are of Major Importance.

11.124-16 through 11.124-20

Revise 11.124-16 through 11.124-20 in accordance with Recommendation B.1 given in Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance.

11.124-21 through 11.124-24

Revise 11.124-21 through 11.124-24 in accordance with Recommendation B.15 given in Recommendations For Amendment of 30 CFR 11 Which Are of Major Importance. A test time period of 4 hours is recommended.

Table 8

Replace the words "pressure-demand" with the words "positive pressure" in Table 8.

In the "tightness" test for the type C supplied-air respirator described in Table 8, eliminate the requirement that the air must be flowing through the hose and couplings since this results in much waste of compressed air and the test is valid under static conditions as long as the pressure of the

air inside the hose and couplings is as specified.

Miscellaneous Concerning supplied-Air Respirators Equipped with Helmets,
Hoods, or Suits

Users of supplied-air respirators equipped with helmets, hoods, or suits have a great need for said devices which would contain helmets, hoods, or suits that would provide adequate protection against (a) particulate matter only, (b) gaseous matter only, and (c) combination of particulate matter and gaseous matter. Consideration should be given to establishing test procedures and test criteria which would permit the approval of supplied-air respirators equipped with helmets, hoods, or suits for protection against particulate matter only, gaseous matter only, or combination particulate matter and gaseous matter.

Subpart K - Dust, Fume, and Mist RespiratorsSubpart K Title

Change the title of Subpart K to "Particulate-Filter Respirators."

11.130

Change the title of 11.130 to "Particulate-Filter respirators; description."

Eliminate all of 11.130 and substitute the following:

"A particulate-filter respirator is an air-purifying respirator equipped with a filter(s) designed to remove a single type of particulate matter or a combination of two or more types of particulate matter from ambient air before the air is inhaled by the respirator wearer. A particulate-filter respirator is designed for use as respiratory protection during entry into and escape from a hazardous atmosphere containing airborne particulate matter which contains adequate oxygen to support life. Particulate-filter respirators shall be classified as follows:

- (a) Non-powered. The respirator wearer inhales through a filter(s) which removes particulate matter from the ambient air.
- (b) Powered. A blower, carried by the respirator wearer or remotely located, passes ambient air through a filter(s) which removes particulate matter from the air and provides the purified air to the respiratory-inlet covering.

Particulate-filter respirators may be designed to provide protection of persons against inhalation of any single or combination of particulate hazards such as dust, fume, spray, and mist.

A particulate-filter respirator shall not be restricted by design requirements from being approved for protection against any particulate hazard provided that the respirator is capable of meeting the established performance criteria.

An applicant shall check the appropriate columns in the following table entitled Description Of Non-Powered Particulate-Filter Respirators to present an overall description of a non-powered particulate-filter respirator. An applicant shall check the appropriate columns in the following table entitled Description Of Powered Particulate-Filter Respirators to present an overall description of a powered particulate-filter respirator."

11.131

Change the title of 11.131 to read as follows: "Particulate-filter respirators; required components."

11.131(a) (1)

Revise 11.131 to read as follows: "Respiratory-inlet covering;"

11.131(a) (4)

Eliminate the word "Attached."

11.132(a) (2)

Revise 11.132(a) (2) to read as follows: "Disturbance of fit of respiratory-inlet covering;"

11.133(b)

Change "full facepiece" to "respiratory-inlet covering."

11.134(b)

Delete the words "for single-use."

11.135

Change the title of 11.135 to read as follows: "Respiratory-inlet coverings; Fit; minimum requirements."

11.135(a) and (c)

Reference is made to Recommendation B.1 given in The Recommendations For Amendment Of 30 CFR 11 Which Are Of Major Importance.

Combine 11.135(a) and 11.135(c) and revise to read as follows:

"A respiratory-inlet covering shall be designed and constructed to fit a panel of human subjects having appropriate anthropometric characteristics representing at least 95 percent of the adult working population, both males and females. An applicant shall be permitted to submit for approval a respirator having a respiratory-inlet covering which fits a specific portion of the panel."

11.135(b) and (e)

Combine 11.135(b) and 11.135(e) and then revise them to read as follows: "A respiratory-inlet covering shall provide for optional use of corrective spectacles or lenses, where applicable, which shall not reduce the respiratory protective qualities of the respirator, and shall be designed to minimize eyepiece fogging."

11.135(d)

Change "noseclips" to "nose clamps."

11.135(f)

Change "half-mask" to "quarter-mask and half-mask."

11.136

Change "Facepieces, hoods, and helmets" to "respiratory-inlet coverings" and make this paragraph (a) of 11.136. Add the following as paragraph (b) of 11.136: "Where applicable, eyepieces shall be designed and constructed to meet the impact and penetration requirements of the latest edition of Federal Specification GGG-M-125, Mask, Airline, and Respirator, Air Filtering, Industrial."

11.138

Combine (a) and (b) of 11.138 and revise to read as follows: "(a) Facepieces shall be equipped with adjustable head harnesses which are designed and constructed to provide adequate tension during use, and an even distribution of pressure over the entire area of the face in contact with the facepiece."

Make (c) of 11.138 and revise to read as follows: "(b) Mouthpiece/nose clamps shall be equipped, where applicable, with adjustable head harnesses designed and constructed to hold the mouthpiece in place in the respirator wearer's mouth."

11.139

Revise the title of 11.139 to read as follows: "Powered particulate-filter respirators; air velocity and noise levels; minimum requirements."

Reference is made to Recommendation B.10 given in Recommendations For Amendment Of 30 CFR 11 Which Are Of Major Importance. Revise 11.139 to read as follows: "The noise level generated by a powered particulate-filter respirator equipped with any type of respiratory-inlet covering shall be measured at the ear level at the maximum airflow obtainable with the respirator's blower operating normally and shall not exceed 80 dBA. When the respirator is equipped with a respiratory-inlet covering that covers the respirator wearer's head, the noise level shall be measured inside the covering at the ear level. The noise level measurement shall be taken in an environment where the ambient noise does not exceed 40 dBA."

11.140

Change the title of 11.140 to read as follows: "Particulate-filter respirators; performance requirements; general."

Revise 11.140 to read as follows: "Particulate-filter respirators and the individual components of each device shall, as appropriate, meet the requirements specified in the tests described in the table entitled

"Aerosol Tests, Resistance Tests, Conditions, Requirements" and prescribed in the table entitled "Respirator Aerosol And Resistance Tests Required For Approval," and shall meet established quantitative respirator fit ~~test~~ criteria. Exhalation valves shall meet leakage criteria given in 11.140-10." 11.140-1 and 11.140-2

Reference is made to Recommendation B.1 given in Recommendations For Amendment Of 30 CFR 11 Which Are of Major Importance.

Revise 11.140-1 and 11.140-2 to establish minimum protection factor criteria and require the use of quantitative respirator fit tests to determine if respirators meet the protection factor criteria. This should be done in accordance with Recommendation B.1 presented in Recommendations For Amendment Of 30 CFR 11 Which Are of Major Importance.

11.140-3 through 11.140-9, 11.140-11 and 11.140-12

The tables entitled "Aerosol Tests, Resistance Tests, Conditions, Requirements" and "Respirator Aerosol And Resistance Tests Required For Approval" can replace 11.140-3 through 11.140-9, 11.140-11 and 11.140-12.

11.140-10

Revise 11.140-10 in accordance with Recommendation B.4 given in Recommendations For Amendment Of 30 CFR 11 Which Are Of Major Importance.

Miscellaneous Comments Pertaining to Silica Dust, Lead Fume, and Silica Mist Tests

A study of the use of silica dust and silica mist for use in testing the performance of respirators carried out by the Respirator Research and Development Section of the Los Alamos Scientific Laboratory indicates that there is very little correlation between the results of tests using these aerosols carried out by different laboratories and that test results frequently cannot be reproduced with precision. The lead fume test also is known to pose serious problems involving correlation of test results obtained by different laboratories and reproducibility of test results.

Therefore, it is recommended that work be done to either improve tests using the mentioned aerosols or to develop new tests which utilize different aerosols which may be generated, controlled, and measured with greater precision.

TABLE
DESCRIPTION OF POWERED PARTICULATE-FILTER RESPIRATORS

RESPIRATORY-INLET COVERING				FLOWER LOCATION	TYPE OF POWER	FILTER TYPE	AEROSOL TYPE (ONE OR MORE)		FILTER EFFICIENCY		
QUARTER MASK FACE-PIECE	HALF MASK FACE-PIECE	FULL FACE-PIECE	HELMET				HOOD	SUIT	OTHER	DUST FUME SPRAY AND MIST	OTHER
				CARRIED BY WEARER	BATTERY	SINGLE-USE					
				PORTABLE, REMOTE	EXTERNAL ELECTRICAL SOURCE	REUSABLE WITH CLEANING					
				STATIONARY, REMOTE	OTHER	REUSABLE WITHOUT CLEANING					

a STANDARD FILTER EFFICIENCY IS $\geq 99.0\%$ AND $< 99.97\%$

b HIGH FILTER EFFICIENCY IS $\geq 99.97\%$

TABLE
DESCRIPTION OF NON-POWERED PARTICULATE FILTER RESPIRATORS

RESPIRATORY INLET COVERING			EXHALATION VALVE	INHALATION VALVE	HEAD HARNESS ATTACHMENT	FILTER ATTACHMENT	FILTER TYPE	AEROSOL TYPE (ONE OR MORE)	FILTER EFFICIENCY
QUARTER MASK	HALF MASK FACE-PIECE	FULL MOUTH FACE-PIECE/NOSE CLAMP	PRESENT	PRESENT	REPLACEABLE	NON-REPLACEABLE	SINGLE-USE	DUST	(C) OTHER STANDARDS
FACE-PIECE			NOT PRESENT	NOT PRESENT	REPLACEABLE	NON-REPLACEABLE	REUSABLE WITH CLEANING	FUME	(A)
FACE-PIECE	FACE-PIECE	FACE-PIECE	PRESENT	PRESENT	REPLACEABLE	NON-REPLACEABLE	REUSABLE WITHOUT CLEANING	SPRAY AND MIST	(B) HIGH
FACE-PIECE	FACE-PIECE	FACE-PIECE	PRESENT	PRESENT	REPLACEABLE	NON-REPLACEABLE	REUSABLE WITH CLEANING	OTHER	(C) HIGH
FACE-PIECE	FACE-PIECE	FACE-PIECE	PRESENT	PRESENT	REPLACEABLE	NON-REPLACEABLE	REUSABLE WITHOUT CLEANING	OTHER	(C) HIGH

a Standard filter efficiency is $\geq 99.0\%$ and $< 99.97\%$

b High filter efficiency is $\geq 99.97\%$

TABLE

AEROSOL TESTS, RESISTANCE TESTS, CONDITIONS, REQUIREMENTS

TEST NO.	AEROSOL PARTICLE SIZE (µm)	AEROSOL PARTICLE CONC. Mg/M ³	TYPE OF AIR FLOW THROUGH RESPIRATOR		RATE OF VOLUMETRIC AIR FLOW THROUGH RESPIRATOR		AEROSOL TEST PERIOD (MINUTES)	TEST ATMOSPHERE CONDITIONS		MAX. PERMITTED AEROSOL PENET. OF RESP. (Mg)	MAX. PERMITTED RESISTANCE TO CONTINUOUS AIR FLOW OF 85 LPM OFFERED BY RESPIRATOR			
			CON-	PULSAT	NPPFR (lpm)	PPFR (lpm)		TEMP. (°C)	REL. HUM. (%)		INITIAL mm H ₂ O	FINAL mm H ₂ O	INITIAL mm H ₂ O	FINAL mm H ₂ O
1	SILICA	9M = 55 ± 5	X		32		90	22.5 ± 2.5	50 ± 5	1.5	12	15	15	15
2	DUST (b)	0.5:0.1	X		32		90	22.5 ± 2.5	50 ± 5	1.5	30	50	20	20
3		9M =		X	40 (c)		90	22.5 ± 2.5	50 ± 5	1.8	12	15	15	15
4		9M =		X	40 (c)		90	22.5 ± 2.5	50 ± 5	1.8	30	50	20	20
5		< 2 (b)	X		115 (d)		240	22.5 ± 2.5	50 ± 5	14.4	30 (f)	50 (f)	20 (f)	20 (f)
6			X		170 (e)		240	22.5 ± 2.5	50 ± 5	21.3	NA	NA	NA	NA
7	SILICA	22.5 ±	X		32		312	22.5 ± 2.5		2.5 (h)	12	15	15	15
8	MIST (g)	2.5 (h)	X		32		312	22.5 ± 2.5		2.5 (h)	30	50	20	20
9				X	40 (c)		312	22.5 ± 2.5		3.1 (h)	12	15	15	15
10				X	40 (c)		312	22.5 ± 2.5		3.1 (h)	30	50	20	20
11			X		115 (d)		240	22.5 ± 2.5		6.9 (k)	30 (f)	50 (f)	20 (f)	20 (f)
12			X		170 (e)		240	22.5 ± 2.5		10.2 (h)	NA	NA	NA	NA
13	LEAD	17.5 ±	X		32		312	22.5 ± 2.5	50 ± 5	1.5 (j)	12	15	15	15
14	FUME (i)	2.5 (j)	X		32		312	22.5 ± 2.5	50 ± 5	1.5 (j)	30	50	20	20
15				X	40 (c)		312	22.5 ± 2.5	50 ± 5	1.8 (j)	12	15	15	15
16				X	40 (c)		312	22.5 ± 2.5	50 ± 5	1.8 (j)	30	50	20	20
17			X		115 (d)		240	22.5 ± 2.5	50 ± 5	4.2 (j)	30 (f)	50 (f)	20 (f)	20 (f)
18			X		170 (e)		240	22.5 ± 2.5	50 ± 5	6.2 (j)	NA	NA	NA	NA

TABLE

RESPIRATOR AEROSOL AND RESISTANCE TESTS REQUIRED FOR APPROVAL

RESPIRATOR TYPE	FILTER TYPE	ANY HAZARDOUS MATERIAL IN FORM OF AIRBORNE PARTICULATE MATTER HAVING A PERMISSIBLE TWA CONCENTRATION ≤ 0.05 NG/M ³ OR ≤ 2 mppcf			ANY HAZARDOUS MATERIAL IN FORM OF AIRBORNE PARTICULATE HAVING A PERMISSIBLE TWA CONCENTRATION ≤ 0.05 NG/M ³ OR ≤ 2 mppcf
		DUST	FUME	SPRAY OR MIST	
NON-POWERED PARTICULATE-FILTER RESPIRATOR DESIGNED TO PERMIT EXHALED AIR TO CONTACT FILTER(S).	SINGLE-USE	3	15	9	21(a) 3(b)
	REUSABLE WITH CLEANING	4(c)	16(c)	10(c)	22(a)(d) 4(b)(c)
	REUSABLE WITHOUT CLEANING	4	16	10	22(a) 4(b)
NON-POWERED PARTICULATE-FILTER RESPIRATOR DESIGNED TO PROHIBIT EXHALED AIR FROM CONTACTING FILTER(S)	SINGLE-USE	1	13	7	19(a) 1(b)
	REUSABLE WITH CLEANING	2(c)	14(c)	8(c)	20(a)(d) 2(b)(c)
	REUSABLE WITHOUT CLEANING	2	14	8	20(a) 2(b)
POWERED PARTICULATE-FILTER RESPIRATOR WITH TIGHT-FITTING RESPIRATORY-INLET COVERING	REUSABLE WITH CLEANING	5(c)	17(c)	11(c)	23(a)(d) 5(b)(c)
	REUSABLE WITHOUT CLEANING	5	17	11	23(a) 5(b)
	REUSABLE WITH CLEANING	6(c)	18(c)	12(c)	24(a)(d) 6(b)(c)
POWERED PARTICULATE-FILTER RESPIRATOR WITH LOOSE-FITTING RESPIRATORY-INLET COVERING	REUSABLE WITHOUT CLEANING	6	18	12	24(a) 6(b)

TWA MEANS TIME WEIGHTED AVERAGE mppcf MEANS MILLION PARTICLES PER CUBIC FOOT AIR

- a. Test is carried out for aerosol particle penetration only.
- b. Test is carried out for particulate loading of filter(s). Respirator must meet initial and final resistance criteria.
- c. A respirator containing a reusable filter(s) with cleaning is given 3 successive aerosol tests. The filter(s) is cleaned after the first and the second tests. The respirator is required to meet all criteria for each test.

- d. The respirator must be tested for DOP aerosol particle penetration initially, and after each of the two cleaning operations on the filter(s) has been carried out. The respirator is required to meet all criteria for each test.

Subpart L - Chemical Cartridge Respirators11.150

Revise 11.150 as follows:

"A chemical cartridge respirator is an air-purifying respirator equipped with a cartridge to remove a single vapor or gas, a single class of vapors or gases, two or more vapors or gases or two or more classes of vapors or gases from the ambient air before the air is inspired. The chemical cartridge respirator may be equipped with a filter(s) in addition to the cartridge(s) to remove particulate matter from ambient air before the air is inspired. A chemical cartridge respirator is designed for use as respiratory protection during entry into and escape from a hazardous atmosphere not immediately dangerous to life or health and which contains adequate oxygen to support life. Chemical cartridge respirators may be classified as follows:

- (a) Non-powered. The respirator wearer inhales through a cartridge(s) which removes vapors and gases from the ambient air (if the respirator also contains a filter(s), particulate matter will be removed from the ambient air).
- (b) Powered. A blower, carried by the respirator wearer or remotely located, passes ambient air through a cartridge(s) which removes vapors and gases from the air and provides the purified air to the respiratory-inlet covering (if the respirator also contains a filter(s), particulate matter will be removed from the ambient air).

Chemical cartridge respirators shall be further described according to the vapors and gases against which they are designed to provide respiratory protection, as follows:

Ammonia
Chlorine
Hydrogen chloride

Methyl amine

Organic vapor

Sulfur dioxide

Chemical cartridge respirators may be designed to provide protection of persons against inhalation of any single or combination of vapors and gases and in addition against any single or combination of various types of particulate matter. A chemical cartridge respirator shall not be restricted by design requirements from being approved for protection against any vapor, gas, and particulate hazard provided that the respirator is capable of meeting established performance criteria.

Chemical cartridge respirators are not approved for use in respiratory protection against vapor and gas that lack adequate warning properties except where Federal exposure standards allow the use of air-purifying respirators to allow persons to escape from specific vapors and gases which lack adequate warning properties or which allow the use of air-purifying respirators for routine respiratory protection against specific vapors and gases which lack adequate warning properties provided that particular work practices described in the standards are carried out.

NOTE: Chemical cartridge respirators for respiratory protection against vapors and gases which have not been listed in the table in this section may be approved. The applicant shall submit a request for approval to the Institute, listing the vapor or gas and suggest test procedures and test criteria. The Institute and the Mining Enforcement and Safety Administration will consider the application and propose to accept the application or reject the application on the basis of effect on the respirator wearer's health and safety and any field experience in the use of chemical cartridge respirators for such exposures. If the Institute and the Mining Enforcement and Safety Administration propose to accept the application, these agencies shall publish in the Federal Register the proposed test procedures and test criteria and the public shall be allowed adequate time to review and comment

on the proposals. After the Institute and the Mining Enforcement and Safety Administration have considered any comments and suggestions received from the public, and these agencies have agreed upon the proposed or modified test procedures and test criteria, they shall publish the acceptable test procedures and test criteria in the Federal Register as an official rule-making before they make use of the new test procedures and test criteria in the approval of respirators."

11.151(a) (1)

Revise 11.151 (a) (1) to read as follows: "Respiratory-inlet coverings;"

11.153

Revise 11.153 to read as follows: "The color and markings of all cartridges or labels shall conform with the requirements of the ANSI K13.1-1973 American National Standard Identification of Air-Purifying Respirator Canisters and Cartridges."

11.155(a) (2)

Revise 11.155(a) (2) to read as follows: "Disturbance of fit of respiratory-inlet coverings;"

11.156(b)

Change "full facepiece" to "respiratory-inlet covering."

11.158

Change the title of 11.158 to read as follows: "Respiratory-inlet coverings; Fit; minimum requirements."

11.158(a) and (b)

Reference is made to Recommendation B.1 given in the Recommendations For Amendment of 30 CFR 11 Which Are Of Major Importance. Combine 11.158(a) and (b) and revise to read as follows: "A respiratory-inlet covering shall be designed and constructed to fit a panel of human subjects having appropriate anthropometric characteristics representing at least 95 percent of the adult working population, both males and females. An applicant shall be permitted to submit for approval a respirator having a respiratory-inlet

covering which fits a specific portion of the panel."

11.158(c)

Change "noseclips" to "nose clamps."

11.158(d) and (e)

Combine 11.158(d) and (e) and revise to read as follows: "A respiratory-inlet covering shall provide for optional use of corrective spectacles or lenses, where applicable, which shall not reduce the respiratory protective qualities of the respirator, and shall be designed to minimize eyepiece fogging."

11.158-1

Change "Facepieces, hoods, and helmets" to "respiratory-inlet coverings" and make this paragraph (a) of 11.158-1. Add the following as paragraph (b) of 11.158-1: "Where applicable, eyepieces shall be designed and constructed to meet the impact and penetration requirements of the latest edition of Federal Specification GGG-M-125 Mask, Airline, and Respirator, Air Filtering, Industrial."

11.160(a)

Change "in contact with the face" to "of the face in contact with the facepiece."

11.160(b)

Delete "and replaceable" and add "in the wearer's mouth" at the end of the sentence.

11.161

Revise the title of 11.161 to read as follows: "Powered chemical cartridge respirators; air velocity and noise levels; minimum requirements."

Reference is made to Recommendation B.10 given in Recommendations For Amendment of 30 CFR 11 Which Are Of Major Importance. Revise 11.161 to

read as follows: "The noise level generated by a powered chemical cartridge

respirator equipped with any type of respiratory-inlet covering shall be measured at the ear level at the maximum airflow obtainable with the respirator's blower operating normally and shall not exceed 80 dBA. When the respirator is equipped with a respiratory-inlet covering that covers the respirator wearer's head, the noise level shall be measured inside the covering at the ear level. The noise level measurement shall be taken in an environment where the ambient noise does not exceed 40 dBA."

11.162-1(a)

Change "facepiece, mouthpiece, hood, or helmet" to "respiratory-inlet covering."

11.162-1(b)

Reference is made to Recommendation B.6 given in the Recommendations For Amendment Of 30 CFR 11 Which Are Of Major Importance.

11.162-2

Revise 11.162-2 in accordance with Recommendation B.4 given in Recommendations For Amendment Of 30 CFR 11 Which Are Of Major Importance.

11.162-3

Reference is made to Recommendation B.1 given in Recommendations For Amendment Of 30 CFR 11 Which Are Of Major Importance.

Revise 11.162-3 to establish minimum protection factor criteria and require the use of quantitative respirator fit tests to determine if respirators meet the protection factor criteria. This should be done in accordance with Recommendation B.1 presented in Recommendations for Amendment Of 30 CFR 11 Which Are Of Major Importance.

11.162-4, 11.162-5, 11.162-6

The lacquer and enamel aerosol tests need much improvement. It is almost impossible to obtain the lacquer and enamel materials listed in 11.162-5 and 11.162-6 respectively. As these lacquer and enamel materials age, the characteristics of the aerosols generated change and this greatly affects the test results.

Substitution of other lacquer and enamel materials for those listed in 11.162-5 and 11.162-6 respectively results in the generation of aerosols of widely varying characteristics which affect test results. It is strongly recommended that a study be made of the lacquer and enamel aerosol tests with the aim of improving these tests.

11.162-8

Section 11.162-8 describes continuous-flow type vapor and gas bench tests which are designed to evaluate the performance of non-powered chemical cartridge respirators designed to prohibit contact of the exhaled air with the chemical cartridge and to evaluate the performance of powered chemical cartridge respirators. Section 11.162-8 does not list test procedures and test criteria for non-powered chemical cartridge respirators designed to permit the exhaled air to contact the chemical cartridge. Any chemical cartridge respirator designed to allow the exhaled air to contact the chemical cartridge should be tested for performance using a breathing machine with the exhaled air having a temperature and humidity equivalent to body conditions. It is recommended that 11.162.8 be revised to include vapor and gas type bench tests and test criteria suitable for a chemical cartridge respirator which has a design and construction that permits exhaled air to contact the chemical cartridge. The test procedure should utilize a breathing machine which cycles air flow through the respirator at 24 respirations per minute with a minute volume of 40 liters (the breathing machine shall be equipped with a cam that causes the machine to simulate breathing at a $622 \text{ Kg-M}^2/\text{minute}$ (work rate)). The exhaled air from the breathing machine should be at a temperature of $35^\circ \pm 2^\circ\text{C}$ ($95 \pm 3^\circ\text{F}$) with a relative humidity of 94 ± 3 percent. Minimum service life values for non-powered chemical cartridge respirators designed to permit exhaled air to contact chemical cartridges should be equivalent to the minimum service life values for non-powered chemical cartridge respirators designed to prohibit contact of the exhaled air with chemical cartridges taking into account the differences in the minute volume flow

rates used in carrying out the vapor and gas service life tests.

11.162-8 lists an air flow rate of 115 liters per minute for high humidity and low humidity equilibration of chemical cartridge used in powered chemical cartridge respirators equipped with tight-fitting respiratory-inlet coverings and lists an air flow rate of 170 liters per minute for high humidity and low humidity equilibration of chemical cartridges used in powered chemical cartridge respirators equipped with loose-fitting respiratory-inlet coverings. Instead 11.162-8 should state that the powered chemical cartridge respirator should be operated at its normal air flow rate which shall never be less than 115 liters per minute during the test period if the respirator is equipped with a tight-fitting respiratory-inlet covering and which shall never be less than 170 liters per minute during the test period if the respirator is equipped with a loose-fitting respiratory-inlet covering.

Table 11 in 11.162-8 indicates that chemical cartridges used in powered chemical cartridge respirators are given vapor and gas service life tests at the low air flow rates of 64 liters per minute and 32 liters per minute which are the air flow rates for use in testing chemical cartridges of non-powered chemical cartridge respirators designed to prevent exhaled air from contacting the chemical cartridges. This is wrong. The vapor and gas service life tests of chemical cartridges used in powered chemical cartridge respirators should be carried out with the respirator being operated at its normal air flow rate which shall never be less than 115 liters per minute during the test period if the respirator is equipped with a tight-fitting respiratory-inlet covering and which shall never be less than 170 liters per minute during the test period if the respirator is equipped with a loose-fitting respiratory-inlet covering.

Table 11 in 11.162-8 indicates that the minimum vapor and gas service life values for chemical cartridges used in powered chemical cartridge respirators shall be the same as for chemical cartridges used in non-powered chemical

cartridge respirators designed to prevent exhaled air from contacting the chemical cartridges. This is wrong. It is reasonable to expect that a powered chemical cartridge respirator should provide adequate respiratory protection for half a normal work shift which is 240 minutes. Thus, Table 11 in 11.162-8 should be corrected to list 240 minutes as the minimum service life for cartridges used in powered chemical cartridge respirators. Since vapor and gas service life tests on high and low humidity equilibrated chemical cartridges used in non-powered chemical cartridge from contracting chemical cartridges are carried out at an air flow rate which is one-half that used in testing non-equilibrated chemical cartridges and reducing the air flow through the chemical cartridges of powered chemical cartridge respirators being operated would not be possible, it would be satisfactory to list a vapor and gas service life value for the equilibrated chemical cartridges of the powered chemical cartridge respirators of 120 minutes. The following revised Table 11 entitled "Chemical Cartridge Vapor and Gas Bench Test Conditions and Requirements" lists the conditions and requirements for various vapor and gas bench tests for chemical cartridges employed in both non-powered and powered chemical cartridge respirators.

TABLE II
CHEMICAL CARTRIDGE VAPOR AND GAS BENCH TEST CONDITIONS AND REQUIREMENTS

VAPOR OR GAS IN AIR	TEST CONDITION	VAPOR OR GAS CONC	FLOW RATE THROUGH RESPIRATOR				NO OF TESTS PERMITTED	MAX PERMITTED VAPOR OR GAS PEN. (ppm)	MINIMUM SERVICE LIFE			
			NPCCR ALLOWING EXH. AIR FROM CONTACT. CARTRIDGE (lpm)	NPCCR PROHIB. EXH. AIR FROM CONTACT. FROM RESP.-IN. RESP.-IN. COVERING (lpm)	PCCR WITH TIGHT FITTING (lpm)	PCCR WITH LOOSE FITTING (lpm)			NPCCR ALLOWING EXH. AIR FROM CONTACT. CARTRIDGE (min)	NPCCR PROHIBITING EXH. AIR FROM CONTACTING CARTRIDGE (min)	PCCR WITH TIGHT FITTING RESP. IN. COVERING (min)	PCCR WITH LOOSE FITTING RESP. IN. COVERING (min)
AMMONIA	AR	1,000	64	40 ^(c)	115 ^(b)	170 ^(c)	3	50	50	80	240	240
			32	40 ^(c)	115 ^(b)	170 ^(c)	2	50	50	40	120	120
			32	40 ^(c)	115 ^(b)	170 ^(c)	2	50	50	40	120	120
			32	40 ^(c)	115 ^(b)	170 ^(c)	2	50	50	40	120	120
CHLORINE	AR	500	64	40 ^(c)	115 ^(b)	170 ^(c)	3	5	35	56	240	240
			32	40 ^(c)	115 ^(b)	170 ^(c)	2	5	35	28	120	120
			32	40 ^(c)	115 ^(b)	170 ^(c)	2	5	35	28	120	120
			32	40 ^(c)	115 ^(b)	170 ^(c)	2	5	35	28	120	120

CHLORINE	LHE	500	32	40(a)	115(b)	170(c)	2	5	35	28	120	120
HYDROGEN CHLORIDE	AR	500	64	40(b)	115(b)	170(c)	3	5	50	80	240	240
							3	5				
							3	5				
							3	5				
HYDROGEN CHLORIDE	HHE	500	32	40(a)	115(b)	170(c)	2	5	50	40	120	120
							2	5				
							2	5				
							2	5				
HYDROGEN CHLORIDE	LHE	500	32	40(a)	115(b)	170(c)	2	5	50	40	120	120
							2	5				
							2	5				
							2	5				
METHYL AMINE	AR	1,000	64	40(b)	115(b)	170(c)	3	10	25	40	240	240
							3	10				
							3	10				
							3	10				
METHYL AMINE	HHE	1,000	32	40(a)	115(b)	170(c)	2	10	25	20	120	120
							2	10				
							2	10				
							2	10				
METHYL AMINE	LHE	1,000	32	40(a)	115(b)	170(c)	2	10	25	20	120	120
							2	10				
							2	10				
							2	10				

ORGANIC VAPOR	AR	1000	64	40 ^(a)	115 ^(b)	170 ^(c)	3	5	50	80	240	240
ORGANIC VAPOR	HHE	1000	32	40 ^(a)	115 ^(b)	170 ^(c)	2	5	50	40	120	120
ORGANIC VAPOR	LHE	1000	32	40 ^(a)	115 ^(b)	170 ^(c)	2	5	50	40	120	120
SULFUR DIOXIDE	AR	500	64	40 ^(a)	115 ^(b)	170 ^(c)	3	5	30	48	240	240
SULFUR DIOXIDE	HHE	500	32	40 ^(a)	115 ^(b)	170 ^(c)	2	5	30	24	120	120
SULFUR DIOXIDE	LHE	500	32	40 ^(a)	115 ^(b)	170 ^(c)	2	5	30	24	120	120

AR means "As Received".

HHE means "High Humidity Equilibration".

LHE means "Low Humidity Equilibration".

NPCCR means "Non-Powered Chemical Cartridge Respirator".

PCCR means "Powered Chemical Cartridge Respirator".

lpm means "liter per minute".

ppm means "parts per million".

- a. Air is cycled through the chemical, cartridge by means of a breathing machine operating at 24 respirations per minute with a minute volume of 40 liters. The breathing machine is equipped with a cam that simulates the breathing pattern for a 622 kg-m²/minute work rate.
- b. The powered respirator is operated normally to pull the test atmosphere through the chemical cartridge at a flow rate that shall not be less than 115 liters per minute during the test period.
- c. The powered respirator is operated normally to pull the test atmosphere through the chemical cartridge at a flow rate that shall not be less than 170 liters per minute during the test period.

Subpart M - Pesticide Respirators11.170 (a)

Change "Air-purifying: respirator with attached blower" to "Powered air-purifying respirator."

11.171 (a) (1)

Change " facepiece, mouthpiece and noseclip, helmet, or hood" to "respiratory-inlet covering."

11.171 (a) (5)

Delete the word "attached."

11.173

Revise 11.171 to read as follows: "The color and markings of all canisters and cartridges or labels shall conform with the requirements of the ANSI K13.1-1973 American National Standard Identification of Air-Purifying Respirator Canisters and Cartridges."

11.175 (a) (2)

Revise 11.175 (a) (2) to read as follows: "Disturbance of fit of respiratory-inlet coverings;"

11.176 (b)

Change "full facepiece" to "respiratory-inlet covering."

11.178

Change title of 11.178 to read as follows: "Respiratory-inlet coverings; fit; minimum requirements."

11.178 (a) and (c)

Reference is made to Recommendation B.1 given in the recommendations for amendment of 30 CFR 11 which are of major importance. Combine 11.178 (a) and (b) and revise to read as follows: "A respiratory-inlet covering shall be designed and constructed to fit a panel of human subjects having appropriate anthropometric

characteristics representing at least 95 percent of the adult working population, both males and females. An applicant shall be permitted to submit for approval a respirator having a respiratory-inlet covering which fits a specific portion of the panel."

11.178 (b) and (e)

Revise 11.178 (b) and (e) to read as follows: "A respiratory-inlet covering shall provide for optional use of corrective spectacles or lenses, where applicable, which shall not reduce the respiratory protective qualities of the respirator, and shall be designed to minimize eyepiece fogging."

11.178 (d)

Change "noseclips" to "nose clamps."

11.178 (f)

Change "half-mask" to "quarter-mask and half-mask."

11.179

Change the title of 11.179 to read as follows: "Respiratory-inlet coverings; eyepieces; minimum requirements."

11.179 (a)

Change "facepieces, hoods, and helmets" to "respiratory-inlet coverings."

11.179 (b)

Revise 11.179 (b) to read as follows: "Where applicable, eyepieces shall be designed and constructed to meet the impact and penetration requirements of the latest edition of Federal Specification GGG-M-125, Mask, Airline, and Respirator, Air Filtering, Industrial."

11.181 (a)

Change "in contact with the face" to "of the face in contact with the facepiece."

11.181 (b)

Delete "and replaceable" and add "in the wearer's mouth" at the end of the sentence.

11.182

Revise the title of 11.182 to read as follows: "Powered air-purifying respirators; air velocity and noise levels; minimum requirements."

Reference is made to Recommendation B.10 given in recommendations for amendment of 30 CFR 11 which are of major importance. Revise 11.182 to read as follows: " the noise level generated by a powered air-purifying respirator equipped with any type of respiratory-inlet covering shall be measured at the ear level at the maximum airflow obtainable with the respirator's blower operating normally and shall not exceed 80 dBA. When the respirator is equipped with a respiratory-inlet covering that covers the respirator wearer's head; the noise level shall be measured inside the covering at the ear level. The noise level measurement shall be taken in an environment where the ambient noise does not exceed 40 dBA."

11.183 - 1 (a)

Change "facepiece, mouthpiece, hood, or helmet" to "respiratory-inlet covering."

11.183 -1 (b)

Reference is made to Recommendation B.6 given in the recommendations for amendment to 30 CFR 11 which are of major importance.

11.183 - 2

Revise 11.183-2 in accordance with Recommendation B.4 given in the recommendations for amendment of 30 CFR 11 which are of major importance.

11.183-3

Reference is made to Recommendation B.1 given in the recommendations for amendment of 30 CFR 11 which are of major importance. Revise 11.183-3 to establish minimum protection factor criteria and require the use of quantitative respirator fit tests to determine if respirators meet the protection factor criteria. This should be done in accordance with Recommendation B.1 presented in recommendations for amendment of 30 CFR 11 which are of major importance.

11.183-4 and 11.183-5

The silica dust tests described in 11.183-4 supposedly insure that air-purifying type respirators used for protection of persons against inhalation of pesticides are equipped with filters which have adequate capacity for loading with retained particulate matter so that rapid plugging of these filters by retained particulate matter does not occur since such plugging would cause the filters to offer excessive resistance to air flow. The lead fume tests described in 11.183-5 supposedly insure that air-purifying type respirators used for protection of persons against inhalation of pesticides are equipped with filters which are highly efficient for removing very small size particles from air so that pesticide particles do not penetrate into respirators being worn by persons who are exposed to atmospheres containing pesticides. Unfortunately, it is not known if there is a meaningful correlation between the results of the silica dust tests and the lead fume tests and the actual performance of the respirators being used for protection of persons against inhalation of pesticides. It is suggested that a study be made to determine if the silica dust tests and lead fume

tests are meaningful in insuring that respirators function properly as respiratory protective devices for pesticides. Perhaps such a study may result in improved aerosol particle loading and penetration tests which are more reflective of actual pesticides.

11.183-6

A DOP aerosol filter test is a good test for measuring the effectiveness of a filter for removal of small size particles from air. At the present time, section 11.183-6 requires testing only canisters used in front-mounted and back-mounted canister gas mask pesticide respirators for DOP aerosol particle penetration. It is recommended that consideration be given to revising 11.183-6 to extend the use of the DOP aerosol particle penetration test to include testing the cartridges of non-powered chemical cartridge pesticide respirators, the cartridges of powered air-purifying pesticide respirators, and the canisters of chin style gas mask pesticide respirators.

11.183-7

Section 11.183-7 covers the testing of the air-purifying devices used in pesticide respirators to insure that these devices effectively remove vapors and gases of pesticides from the ambient air before the air is inhaled by the wearers of pesticide respirators. However, section 11.183-7 involves only the use of the vapor of carbon tetrachloride, a chlorinated hydrocarbon, as the test agent. It is not known if an air-purifying device which is effective for removing carbon tetrachloride vapor from air will be effective in removing vapors and gases of the very many different kinds of pesticides from air. It is recommended that a development

project be carried out to develop vapor and gas service life tests for air-purifying devices employed in pesticide respirators which would involve the use of vapors and gases of actual pesticides which would represent the various classes of chemical pesticides.

11.183-7 (a) (4) and (5)

Revise 11.183-7 (a) (4) and 11.183-7 (a) (5) to require that the flow of the humidity equilibration atmosphere into a cartridge employed in a powered air-purifying respirator during a humidity equilibration time period be the effective air flow of the powered air-purifying respirator which shall never be less than 115 liters per minute if the respirator is equipped with a tight-fitting respiratory-inlet covering and never less than 170 liters per minute if the respirator is equipped with a loose-fitting respiratory-inlet covering.

11.183-7 (b), Table 12

It is reasonable to expect that the air-purifying device used in a powered air-purifying respirator should offer a service life of at least half a normal work shift which would be four hours. Thus it is recommended that Table 12 in 11.183-7 be revised to list a minimum service life of 240 minutes for the air-purifying devices of powered air-purifying respirators when they are tested under "as received" conditions and 120 minutes for the air-purifying devices of powered air-purifying respirators when they are tested after "high humidity equilibration" and after "low humidity equilibration." (120 minutes is a satisfactory service life for the tests carried out after "humidity equilibration" of the air-purifying devices since the air flow used in these tests is the actual air flow of the powered respirators and this air flow cannot be reduced to one-half of the air flow used in tests

carried out under "as received" conditions which is the type of air flow used in testing air-purifying devices employed in non-powered respirators after "humidity equilibration.)"

Subpart N--Special-use Respirators

11.201 (a) (1)

change "Facepiece" to "Respiratory-inlet covering."

11.204 (b) (1)

Revise 11.204 (b) (1) to require that the flow of highly humid air into a cartridge employed in a powered air-purifying respirator during the high humidity equilibration time period be the effective air flow of the powered air-purifying respirator which shall never be less than 115 liters per minute if the respirator is equipped with a tight-fitting respiratory-inlet covering and never less than 170 liters per minute if the respirator is equipped with a loose-fitting respiratory-inlet covering.

11.204 (b) (3)

Revise 11.204 (b) (3) to require that the flow of the test atmosphere containing vinyl chloride into a cartridge employed in a powered air-purifying respirator during the service life test be the effective air flow of the powered air-purifying respirator which shall never be less than 115 liters per minute if the respirator is equipped with a tight-fitting respiratory-inlet covering and never less than 170 liters per minute if the respirator is equipped with a loose-fitting respiratory-inlet covering.