94-014

federal register

Tuesday
May 24, 1994

Part II

Department of Health and Human Services

Public Health Service

42 CFR Part 84

Respiratory Protective Devices; Proposed Rule

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

42 CFR Part 84

RIN 0905–AB58

Respiratory Protective Devices

AGENCY: National Institute for Occupational Safety and Health (NIOSH), Centers for Disease Control and Prevention, Public Health Service, HHS.

ACTION: Notice of proposed rulemaking.

SUMMARY: This proposed rule addresses NIOSH's and the Department of Labor/Mine Safety and Health Administration's (MSHA) certification requirements for respiratory protective devices. Specifically, the proposal would replace existing MSHA regulations with new public health regulations, while also upgrading current testing requirements for particulate filters.

This action is the first of a series of modules which will, over the next several years, upgrade current respirator requirements. This modular approach will allow improvements to be implemented on a priority basis as well as facilitate adaptation to new requirements by the manufacturers and users of respirators. Except for the particulate-filter requirements, most requirements of existing regulations would be incorporated into the new regulations without change. The proposed testing requirements for particulate filters would significantly improve the current approach to evaluating the effectiveness of an air-purifying respirator's filter to remove toxic particulates from the ambient air, updating existing provisions to be consistent with two decades of advances in respiratory protection technology.

The certification of air-purifying respirators under these proposed requirements would also enable respirator users to select from a broader range of certified respirators that meet the current performance criteria recommended by CDC for respiratory devices used in health-care settings for protection against *Mycobacterium tuberculosis*, the infectious agent that causes tuberculosis (TB).

This Notice also announces an informal public meeting on the proposed rule, as indicated below.

Elsewhere in this issue of the **Federal Register**, MSHA is publishing a proposal to remove existing regulations at 30 CFR part 11, which would be made obsolete by a final rule resulting from this proposed rule.

DATES: Written comments must be received at the NIOSH Docket Office before the close of business on July 8, 1994. Interested persons wishing to provide oral comments at an informal public meeting should file a request for appearance with the NIOSH Docket Office no later than the close of business May 31, 1994. The informal public meeting will be held on June 7th and 8th, 1994, beginning both days at 9 a.m.

ADDRESSES: Comments on the proposed rule should be mailed in triplicate to the NIOSH Docket Office, Robert A. Taft Laboratories, Mail Stop C34, 4676 Columbia Parkway, Cincinnati, Ohio 45226. Requests to participate in the public meeting should be mailed in duplicate to the NIOSH Docket Officer, at the same address. The informal public meeting will be held at the Holiday Inn/Capitol, 550 C St., SW., Washington, DC.

FOR FURTHER INFORMATION CONTACT: Richard W. Metzler, Chief, Certification and Quality Assurance Branch, Division of Safety Research, NIOSH, 944 Chestnut Ridge Road, Morgantown, West Virginia 26505–2888; the telephone number is (304) 284–5713. Additional copies of this proposed rule can be obtained by calling the NIOSH toll-free information number (1–800–35–NIOSH). Arrangements have also been made for this proposed rule to be listed on the electronic bulletin boards of the Government Printing Office and of the Department of Labor; the telephone numbers are (202) 512–1387 and (202) 219–4784, respectively.

SUPPLEMENTARY INFORMATION:

I. Paperwork Reduction Act

Manufacturers seeking approval of respiratory protective devices would continue to be required to submit applications for approval, including related drawings, drawing lists, specifications, and descriptions. The paperwork burden for this application process is identical to that included in existing 30 CFR 11.10, previously approved by the Office of Management and Budget (OMB).

However, those sections containing information collections are being submitted to OMB for review under section 3504(h) of the Paperwork Reduction Act of 1980. Other organizations and individuals desiring to submit comments on the information collections should direct them to the NIOSH Docket Office and to the Office of Information and Regulatory Affairs, OMB, New Exectutive Office Building (Room 3208), Washington, DC 20503, ATTN: Desk Officer for HHS/PHS/CDC/NIOSH.

II. Background

The existing rules and procedures in 30 CFR Part 11 for approval of respiratory-protective devices, or respirators, evolved from rules and procedures developed by the U.S. Department of the Interior, Bureau of Mines (BOM). Until 1972, the BOM was solely responsible for testing and approving respirators. In 1972, Part 11 was published jointly by the BOM and NIOSH. This regulation replaced the BOM's rules and procedures, and delineated the responsibilities of the two agencies. Under this regulation, the BOM evaluated respirator performance, and NIOSH was responsible for administration of the quality control provisions. The BOM also tested the safety of electrical components of respirators for use in potentially explosive atmospheres in underground-gassy mines (intrinsic safety) under the requirements of 30 CFR part 18.

A Memorandum of Understanding, dated May 30, 1972, between the two agencies refined their respective roles, and part 11 was amended in 1973. Under this arrangement, NIOSH undertook primary responsibility for performance testing of respirators. Although all approvals continued to be issued jointly, the BOM primarily retained only the responsibility to test for intrinsic safety on the small number of respirators that had electrical components.

The Mining Enforcement and Safety Administration, MSHA's predecessor agency, was created in 1974, and the responsibilities of the BOM under part 11 were transferred to that agency. Since MSHA was created in 1978, it has continued to test electrical components of respirators for intrinsic safety. MSHA has issued separate approvals for respirators meeting the requirements of 30 CFR part 18. While MSHA currently reviews applications for respirator certifications and has conducted some product evaluations, laboratory testing, quality assurance, and product audit for certain respirators, the principal testing and approval activities specified by part 11 are primarily conducted by NIOSH. NIOSH is proposing to redesignate the requirements for the certification of respiratory-protective devices of part 11 to part 84 of Title 42 (42 CFR part 84) under this action.

Following promulgation of 30 CFR part 11 in 1972, NIOSH began conducting research in several areas of respiratory protection. Concurrently, NIOSH began to receive public input

concerning the respirator-certification program.

In December 1977, NIOSH conducted a public meeting to obtain comments on changes needed in 30 CFR part 11. In 1979, a group of outside consultants conducted a thorough review of the program. The report received from those consultants was published by NIOSH for further consideration by other interested persons, and a public meeting was held in July 1980 to obtain their comments on the program. In December 1981, the American National Standards Institute Z88 Committee on Respiratory Protection commented on 30 CFR part 11. In January 1982, the Mine Health Research Advisory Committee transmitted its recommendations to NIOSH for further changes to the program. Since 1982, NIOSH has solicited and investigated reports of problems with NIOSH/MSHA-certified respirators with the purpose of obtaining direct public input into the approval program.

Investigations, research, comments, and analyses were considered by NIOSH and MSHA in preparation of a proposed comprehensive revision to the approval requirements. These changes to existing requirements and tests were proposed as a new 42 CFR part 84, which was published on August 27, 1987 (52 FR 32402). Two public meetings were held to obtain comments on the proposal (in San Francisco, CA on January 20, 1988, and in Washington, D.C. on January 27–28, 1988). Two extensions of the public comment period were issued (52 FR 37639 and 53 FR 5595), with it ending on March 28, 1988. Concurrent with the publication of the proposed part 84, MSHA published a notice in the **Federal Register** (52 FR 32313) proposing the withdrawal of 30 CFR part 11 upon final publication of 42 CFR part 84. Under that proposal, MSHA would have retained a consultative role in the approval of respirators used in mining in order to protect the health and safety of miners, particularly concerning mine rescue and mine emergency respirators.

During the 7-month comment period following the publication of the proposed part 84, NIOSH received 271 comments on this comprehensive proposal. Since receiving these comments, NIOSH has been conducting investigations and research to consider the technical issues addressed in these comments. Delays have been experienced in finalizing a revised part 84 draft as a result of the number and diversity of the comments received. NIOSH determined that at least four major, and more than one hundred minor technical and administrative changes to the first comprehensive proposal would be required to adequately address all the areas of concern. Consequently, NIOSH has reevaluated its intent to develop and implement a single, comprehensive revision to the existing regulation of part 11.

Instead, NIOSH intends to promulgate modifications to the existing requirements of 30 CFR part 11 in a series of modules. There are numerous benefits to utilizing a modular approach to promulgate the anticipated changes to the existing requirements. Among these are the following considerations:

1. Improvements can be implemented on a priority basis, assuring that those expected to contribute most to improving worker protection are implemented first,

2. Incremental promulgation of improvements should facilitate adaptation to new requirements by the respirator manufacturer and user communities, minimizing the potential for any disruption in the supply of certified respirators, and

3. Public participation in the rulemaking process will be facilitated by proposing important regulatory changes in individual segments of separate rulemaking.

The anticipated subjects and sequence of the NIOSH rulemaking, according to this modular approach are:

Subject area	Anticipated timetable for proposed rule
Particulate Filter Tests	May 1994.
Assigned Protection Factors	Late 1994.
Administrative Program (application submittal and processing, fee structure, etc.).	Early 1995.
Quality Assurance Requirements.	Early 1995.
Gas and Vapor Requirements	Mid 1995.
Positive Pressure SCBA Requirements.	Early 1996.
Simulated Workplace Protection Factor Test.	Early 1997.

NIOSH is proposing a limited revision to the existing requirements of 30 CFR part 11 in this first "module", requiring updated particulate filter tests. These proposed changes would produce significant improvements in the level of protection provided to the wearers of the respiratory protective devices and would enable users to easily discern the level of protection that can be expected when using a particular respirator, with little impact on the certification process. NIOSH estimates that these changes to the particulate filter requirements will affect approximately 80% of all respirators currently marketed.

These new filter requirements would update the existing 30 CFR part 11 provisions to provide a particulate efficiency determination and classification system consistent with advances in respiratory protection technology. The tests to determine the respirator filter's particulate efficiency enable classification of the filters on their ability to inhibit the penetration of particulates of the most penetrating size. The effectiveness of a device to remove particulates from the ambient air would be reflected in a three-tiered classification system based on the filter's demonstrated efficiency. Classification of the filters in this manner eliminates the need to test and classify the filter respirator according to composition of contaminant (e.g., "dust, fume, and mist", "asbestos"), since the penetration rate for particulates in the atmosphere, regardless of composition, will not exceed that of the test particulate. To revise respirator nomenclature to be consistent with this fundamental change in certification philosophy, the words "dust, fume and mist" have been changed to "particulate" in the proposed rule.

NIOSH has long been concerned with the health risks to workers due to the inappropriate selection and use of dust/mist and dust/fume/mist respirators. Assigned Protection Factor (APF) values are used in the respirator selection process to indicate the expected protection level. NIOSH has considered the possibility of reducing the Assigned Protection Factor (APF) values given in the NIOSH Guide to Industrial Respiratory Protection and in the Respirator Decision Logic for dust and fume respirators to account for filter penetration that can occur, theoretically, when these respirators are inappropriately used against aerosols less than 2 micrometers in diameter. On September 15, 1992, NIOSH prepared a draft report, "A Performance Evaluation of DM and DFM Filter Respirators Certified for Protection Against Toxic Dusts, Fumes, and Mist," explaining its concerns and suggested course of action NIOSH solicited an external scientific peer review of this draft report on September 15, 1992. This review did not support an immediate revision of the APF values. The reviewers recommended that NIOSH address the concern about excessive filter penetration by incorporating improved filter-penetration tests into the respirator certification regulation.

After careful consideration of this issue, NIOSH agrees with the scientific reviewers that, during the transition period for the implementation of the provisions contained in this rule, an

adjustment of APF values is unnecessary and may confuse respirator users. NIOSH will continue to recommend the APF values contained in the NIOSH Guide to Industrial Respiratory Protection (September 1987) and in the Respirator Decision Logic (May 1987) for respirators previously certified under the provisions of 30 CFR part 11. For respirators certified for protection against particulate exposures under the new part 84 which would replace the existing Dust/Mist and Dust/Fume/Mist filter respirators under 30 CFR part 11, NIOSH will be recommending new APF values that account for the new nomenclature and test criteria. These new values, updating the recommendations cited above, will be published in a Respirator User's Notice accompanying publication of this rule as final. It is anticipated that the module on Assigned Protection Factors will be proposed in late 1994, at which time public comment will be solicited.

The current regulation in 30 CFR part 11 was developed to certify respirators used in mining and general industry. They do not contain performance requirements for certifying air-purifying respirators against biological agents. Likewise, the modifications to the current requirements in this proposed rule were not developed specifically to certify respirators against biological agents. However, the provisions of this rule will address an important public health need regarding the control of *Mycobacterium tuberculosis*, the causative agent of TB, transmission in health care and other facilities.

In response to the recognized risk of TB transmission in health-care facilities, increases in TB in many areas, and recent outbreaks of multidrug-resistant TB, CDC has published draft recommendations revising existing CDC guidelines for preventing the transmission of tuberculosis in health care facilities, entitled "Guidelines for Preventing the Transmission of Tuberculosis in Health-Care Facilities, Second Edition", published in the **Federal Register** on October 12, 1993 (58 FR 52810). This draft enumerates four performance criteria that CDC has determined are necessary for respiratory protective devices used in health-care settings for protection against TB. The only currently certified air-purifying respirator class that meets all the respiratory protection performance criteria in the CDC draft is a respirator with a high efficiency (HEPA) filter. However, all six classes of air-purifying, particulate respirators to be certified under the provisions of the new particulate filter tests (filter penetration) would meet or exceed the performance recommendations contained in the CDC document. These other classes of air-purifying, particulate respirators are expected to be markedly less expensive than respirators with HEPA filters.

Consequently, immediate implementation of the modifications included in this rule should promote a substantial increase in respiratory protection provided to health care and other workers potentially exposed to the *M. tuberculosis* droplet nuclei in health-care and other occupational settings. For this reason, NIOSH is moving forward with a schedule to publish a final rule pertaining to particulate filters in late-1994.

III. Public Meeting

The record of the informal public meeting will remain open until July 8, 1994 to allow interested persons to submit written statements or comments regarding oral presentations made at the public meeting.

The rule is proposed to be effective as follows:

1. 42 CFR part 84 will be effective 30 days from publication of this rule as final, and;

2. Sale and distribution of respirators listed as certified under the provisions of 30 CFR Part 11, subparts K or M will no longer be authorized effective 2 years from the date of publication of this rule as final.

NIOSH is specifying an effective date for implementation for the final rule to allow the introduction of filters demonstrating enhanced performance as soon as possible. The existing 30 CFR part 11 is expected to remain in effect for 6 months after this rule becomes final to provide a transition period for manufacturers to prepare for new 42 CFR part 84 applications. NIOSH believes that this period provides ample transition time for manufacturers to assemble the information necessary for application for certification of particulate respirators under the new part 84. Additionally, 2 years from the date this rule becomes final, respirators can no longer be distributed or sold as NIOSH-approved under part 11, subpart K or M, unless they demonstrate compliance with and are certified under the provisions of the new part 84. This 2-year period was selected to ensure that an ample supply of respirators remain available for use. NIOSH believes that this timeframe will provide ample time for manufacturers to have respirators approved and manufactured in sufficient quantities to meet the demand. NIOSH specifically requests comments on the appropriateness of a 2-year phase-in period, as proposed.

The administrative record of this rulemaking will consist of this May 24, 1994 Notice of Proposed Rulemaking; all other relevant **Federal Register** notices; agency records on this subject; all written submissions made in response to the Notices; and the record of the informal public meeting. The record of the informal public meeting will consist of the meeting schedule, transcripts made by NIOSH of the oral comments at the meeting, any written comments submitted by presenters at the meeting, and statements or comments regarding oral presentations made at the public meeting submitted by interested persons within the allotted comment period. No written submission, or any portion thereof, made in response to this Notice will be received or held in confidence. The administrative record of the rulemaking will be made available for viewing and copying in the NIOSH Docket Office. All requests for any portion of the administrative record must be submitted in writing.

All interested persons are encouraged to submit written comments to assure receipt on or before the close of business July 8, 1994, and to advise the NIOSH Docket Office by the necessary date of their intent to participate in the informal public meeting. All requests for appearance at the informal public meeting should contain the name, address, and telephone number, any business affiliation of the person desiring to make a presentation, a brief summary of the presentation, and the approximate time requested for the presentation. NIOSH requests that oral presentations be limited to 10 minutes. Groups having similar interests are requested to combine their comments and present them through a single representative. NIOSH will assign the time available for the meeting among the persons who properly file a request for appearance.

After reviewing the submitted summaries and the requests for appearance, NIOSH will schedule each appearance and notify each participant by mail or telephone of the time assigned to the person and the approximate time the person's oral presentation is scheduled to begin. The meeting schedule will be placed on file in the NIOSH Docket Office.

The proceedings of the meeting will be transcribed. Any interested person may, consistent with the orderly conduct of the meeting, record or otherwise make a transcript of the meeting. Each participant may present relevant written information, data, or views for inclusion in the record of the meeting.

Any person who desires to submit an advance written statement may file three copies with the NIOSH Docket Office. A participant may be accompanied by a reasonable number of additional persons, space permitting.

If a participant is not present when his or her presentation is scheduled to begin, the remaining participants will be heard in order. At the conclusion of the meeting, an attempt will be made to hear any scheduled participants who missed his or her assigned time. Interested persons attending the meeting who did not request an opportunity to make an oral presentation may be given an opportunity to do so at the conclusion of the meeting, at the discretion of the presiding officer.

IV. Discussion of Proposed Rule—Testing of Particulate Filters

The BOM was solely responsible for testing and approving respirators until 1972. In 1972, the existing rules and procedures in 30 CFR part 11 for approval of respiratory protective devices, or respirators, were published jointly by the BOM and NIOSH. Since 1974, the Mining Enforcement and Safety Administration (MSHA's predecessor agency), MSHA, and the Occupational Safety and Health Administration (OSHA) have regulated the selection, use, and maintenance of respirators in the workplace under their enforcement authorities. With this redesignation of the requirements for the certification of respirators, NIOSH is deleting §§ 11.2 and 11.21 because these sections of part 11 have been superseded by OSHA's and MSHA's respirator workplace regulations. Also, the codification of the redesignated sections into a non-hyphenated numbering system results in the deletion of several "general heading" sections that contain no substantive requirements. These include §§ 11.85, 11.102, 11.124, 11.140, and 11.162.

Existing subpart M of part 11 (§§ 11.170 through 11.183–7) addresses the requirements for pesticide respirators. The proposal eliminates this category and the tests specific to it, leaving subpart M reserved. The proposal also eliminates all references to subpart M and pesticides as a classification for approval. Manufacturers can continue to manufacture and market respirators labelled for use as pesticide respirators, as well as other contaminant classifications, based on the testing performed under the proposed filter penetration test. NIOSH, however, would discontinue issuance of certifications that classify these respirators as suitable for use against a specific particulate. The proposed test would provide a suitable determination as to the effectiveness of the filter element in removing particulates from the ambient air, regardless of the contaminant.

The existing test requirements in §§ 11.124–21 through 11.124–24 specify a person wearing the respirator to be exposed to an abrasive blasting environment in which the blasting agent is composed of 99+ percent free silica (SiO_2). The purpose of this requirement was to determine the adequacy of protection provided in such environments. Over the past two decades, NIOSH has not conducted these tests which would pose known or potential health risks of exposure to fractured crystalline silica to prospective test subjects. These tests have been replaced administratively. This policy will remain in effect until these regulatory requirements are addressed in a later module.

The proposed 42 CFR part 84 regulation is generally consistent with the current MSHA and NIOSH respirator approval program, placing responsibility for certifying most respirators with NIOSH. MSHA and NIOSH would continue to jointly review and approve respirators used for mine emergencies, mine rescue, and the associated service-life plans, users' manuals, and other documentation. Among the types of devices for which this role is particularly important are self-contained self-rescue devices. This preserves MSHA's current role in the certification of certain respirators whose unique use in mining is an important part of safeguarding the health and safety of miners. In addition, MSHA would continue to test electrical and electronic components of respirators for use in potentially explosive atmospheres in underground gassy mines and issue a separate MSHA approval under 30 CFR part 18 for such respirators. In implementing the proposed regulation, NIOSH and MSHA will develop a new Memorandum of Understanding which will reflect administrative matters related to respirator approval, including immediate notification to MSHA of field complaints and identified deficiencies concerning approved respirators.

With the transfer of part 11 from title 30 to part 84 of title 42, MSHA and NIOSH would no longer process applications for new approvals or extensions of approval of respirators under part 11 provisions. All applications received after the effective date of part 84 will be considered as applications for a new or extension of approval under part 84. NIOSH realizes that with this step in the development of part 84, some of the respirators that are currently approved would need to be modified to meet the new requirements, while some would not. Additionally, with each step in the modular rulemaking approach being pursued, an increasing number of respirator designs will be affected by the new regulation. NIOSH realizes that the incremental implementation of improved test and performance requirements could cause some confusion as to which respirators have demonstrated performance to the improved requirements. To address this possibility, the Institute intends to continue issuing new and extension of approval numbers in the same format designation (TC number) as issued under existing part 11 for those respirator types whose technical requirements for approval under part 84 have not been modified from existing part 11. A new approval number series will be initiated for the products whose technical requirements have been upgraded under part 84. By checking the approval number, respirator users will be able to quickly and easily distinguish those products that have demonstrated the improved performance requirements of the new part 84 from those that have demonstrated compliance with only the existing part 11 standard. The Institute further intends to issue public notices of the new approval designations to be used for the products demonstrating improved performance to alert users that such improved standards are available.

Section-by-Section Discussion

All sections redesignated to 42 CFR part 84 without modification from 30 CFR part 11 are not included in this discussion of the proposed rule. The sections redesignated without modification will be revised, where appropriate, to:

(1) remove references to MSHA, except for those related to certain mining applications,

(2) update the NIOSH certifying organization to the Certification and Quality Assurance Branch, Division of Safety Research, NIOSH, 944 Chestnut Ridge Road, Morgantown, West Virginia 26505–2888,

(3) remove references to subpart M, pesticide respirators, and tests for protection during abrasive blasting, and

(4) correct nonsubstantive typographical errors and reference the new part 84 section designations.

The sections redesignated without modification are as follows:

84.1, 84.3, 84.11, 84.12, 84.21, 84.22, 84.30, 84.31, 84.32, 84.34, 84.35, 84.36, 84.40, 84.41, 84.42, 84.43, 84.50, 84.51, 84.53, 84.60, 84.62, 84.63, 84.64, 84.65, 84.66, 84.70, 84.71, 84.72, 84.73, 84.74, 84.75, 84.76, 84.77, 84.78, 84.79, 84.80, 84.81, 84.82, 84.83, 84.84, 84.85, 84.86, 84.87, 84.88, 84.89, 84.90, 84.91, 84.92, 84.93, 84.94, 84.95, 84.96, 84.97, 84.98, 84.99, 84.100, 84.101, 84.102, 84.103, 84.104, 84.110, 84.111, 84.112, 84.113, 84.114, 84.115, 84.116, 84.117, 84.118, 84.119, 84.120, 84.121, 84.122, 84.123, 84.124, 84.126, 84.130, 84.131, 84.132, 84.133, 84.134, 84.135, 84.136, 84.137, 84.138, 84.139, 84.140, 84.141, 84.142, 84.143, 84.144, 84.145, 84.146, 84.147, 84.148, 84.149, 84.150, 84.151, 84.152, 84.153, 84.154, 84.155, 84.156, 84.157, 84.158, 84.159, 84.160, 84.161, 84.162, 84.163, 84.172, 84.173, 84.174, 84.175, 84.176, 84.178, 84.179, 84.186, 84.190, 84.191, 84.192, 84.193, 84.194, 84.195, 84.196, 84.197, 84.198, 84.199, 84.200, 84.201, 84.202, 84.204, 84.205, 84.207, 84.250, 84.251, 84.252, 84.253, 84.254, 84.255, 84.256, 84.257, and 84.258.

These sections, and revisions of these sections, will be subject to public comment in future rulemaking.

The following section-by-section analysis discusses each new or revised section to 42 CFR part 84. All part and section references for part 11 are to Title 30 of the Code of Federal Regulations (30 CFR). All part and section references for part 84 are to Title 42 of the Code of Federal Regulations (42 CFR).

Subpart A—General Provisions

Section 84.2 Definitions

This section would be redesignated and revised from the existing § 11.3.

The existing definitions for "air contamination level", "Bureau", "concentration limits for radionuclides", "DOP", "MESA", "pesticide", "radionuclides", and "smoke" would be deleted. These terms are used in provisions that are modified or deleted as a result of the filter penetration test changes being proposed. These definitions would, therefore, become unnecessary.

The existing definition for "Testing and Certification Laboratory" would be modified to reflect the present name of the organization as the "Certification and Quality Assurance Branch."

Section 84.4 Respirators For Mine Rescue or Other Emergency Use In Mines

This section would be new, and would maintain MSHA's role in the approval of respirators designed for mine rescue or other mine emergency use. Under the proposal MSHA and NIOSH would conduct joint review and certification of respirators used for mine emergencies and mine rescue. This provision recognizes MSHA's expertise in identifying the special needs and considerations for respirators used in the mining environment. This role would replace MSHA's existing role as a joint approver of all respirators.

Paragraph (a) specifies that NIOSH and MSHA would jointly certify any respirator designed for mine emergencies, mine rescue or other emergency use in mines. This joint review and certification would include any associated service-life plans, user's manuals, and other supporting documentation. This paragraph further specifies that certifications for these respirators include any identified use limitations related to mine safety and health as a condition of certification.

Paragraph (b) specifies NIOSH and MSHA would jointly address recall and retrofit matters arising from field complaints or identified deficiencies concerning any respirators used in the mining environment. The new Memorandum of Understanding would further delineate MSHA's role in such matters, including participation in any related field or manufacturing site audits.

Subpart B—Application for Approval

Section 84.10 Application Procedures

This section would be redesignated from existing § 11.10 with only paragraph (e) modified. Paragraph (e) would retain the existing requirement for inspection, examination, and testing by MSHA of electrical and electronic components to be permissible in accordance with 30 CFR part 18 for respirators intended for use in mining environments and having permissible electrical or electronic components. MSHA would continue to conduct this testing and issue a separate MSHA approval number for those respirators found acceptable. The process for conducting the permissibility evaluation of these components and their identification would remain unchanged from the existing policies and practices.

Subpart C—Fees

Section 84.20 Examination, Inspection, and Testing of Complete Respirator Assemblies; Fees

This section would be redesignated from existing § 11.20, and modified only to reflect the new particulate filter classification scheme.

Subpart D—Approval and Disapproval

Section 84.33 Approval Labels and Markings; Approval of Contents; Use

This section would be redesignated from existing § 11.33.

Paragraph (b) would specify the use of the NIOSH emblem on the approval label, replacing the MSHA emblem.

Paragraph (e) of this section would be modified to identify the existing "dust, fume, and mist" class of respirator as a "particulate" respirator. The new designation is consistent with the proposed testing criteria under which these respirators are certified. The table in paragraph (e) identifying the approval label requirements would be modified by the removal of references specific to paint spray and pesticide respirators, also consistent with the changes associated with the instantaneous penetration tests.

Subpart F—Classification of Approved Respirators; Scope of Approval; Atmospheric Hazards; Service Time

Section 84.52 Respiratory Hazards; Classification

This section would be redesignated from existing § 11.52.

It would be modified only to delete paragraph (d). Reference to the pesticide "classification" would no longer be appropriate with the introduction of the "particulates" classification with the new instantaneous-penetration test.

Subpart G—General Construction and Performance Requirements

Section 84.61 General Construction Requirements

This section would be redesignated from existing § 11.61.

The provision for respirator components to meet the permissibility requirements of 30 CFR part 18 [paragraph (e)] would be deleted because MSHA's workplace regulations separately and independently establish this requirement for certain mining applications. This change would be consistent with existing practice, whereby, MSHA conducts the evaluation and testing of these components and issues a separate approval to cover this aspect of respirator design.

Subpart I—Gas Masks

Section 84.125 Particulate Tests; Canisters Containing Particulate Filters; Minimum Requirements

This section would be redesignated from existing § 11.102–4, without modification except to specify the new requirements that respirators for protection against particulates (dusts

fumes, mists, and smokes) in combination with gases, vapors, or gases and vapors, must meet. With the exception of the airflow resistance test of § 84.183, these respirators are required to meet the proposed requirements specified in §§ 84.170 through 84.186.

Subpart K—Particulate Respirators

Section 84.170 Particulate Respirators; Description

This section would be derived from existing § 11.130. It would be revised to define particulate respirators in a more concise way than previously provided for those designed for protection against dusts, fumes, and mists.

Paragraph (a) would describe particulate air-purifying respirators as those designed with filters to provide respiratory protection against atmospheres that: (1) Contain adequate oxygen to support life and (2) are contaminated with particulates not immediately dangerous to life or health. The particulates for which protection would be provided include contaminants such as dusts, fumes, mists and smoke. The respirator could be designed to remove contaminants, either solid or both liquid and solid, from the wearer's breathing air.

Paragraph (b) would establish the classification of particulate air-purifying respirators as either powered or non-powered. Powered respirators would include those designs where a motor or other device enhances the air flow of inhalation air through the filter to provide breathing air to the wearer. Non-powered respirators would include respirators that depend solely on the inhalation and exhalation of the wearer to provide an adequate supply of purified-breathing air to the wearer. Either class of respirator, powered or non-powered, could be designed and intended for removal of solid particulates only or for both liquid and solid particulates. A "liquid only" category is not included because a filter that can effectively remove liquid particulates from the ambient air will also effectively remove solid particulates.

Paragraphs (c) and (d) would establish the classification of filter elements used with non-powered and powered air-purifying respirators, respectively. These classifications are based on the filter's efficiency in removing particulates from the ambient air as demonstrated by the test requirements specified in this subpart.

Paragraphs (c)(1) and (d)(1), (c)(2) and (d)(2), and (c)(3) would define the efficiency level for particulate removal needed to be achieved in the performance testing for a filter element to be classified as a Type A, B, or C filter, respectively. A Type A filter would be required to perform at a minimum efficiency of 99.97%, a Type B filter at a minimum efficiency of 99%, and a Type C at a minimum efficiency of 95%.

Section 84.171 Particulate Respirators; Required Components

This section would be redesignated from existing § 11.131, modified only to incorporate the new terminology of "particulates" to describe dusts, fumes and mists.

Section 84.177 Inhalation and Exhalation Valves; Minimum Requirements

This section would be redesignated from existing § 11.137, modified only to delete reference to the existing silica dust tests for single-use respirators of § 11.140–5. The respirator performance requirements of these existing tests are replaced by the particulate instantaneous filter penetration test contained in this proposal.

Section 84.180 Particulate Respirators; Filter Type Identification

This section proposes a new classification system for identification of the efficiency of the filters for particulate respirators. The new proposed terminology of "particulate respirator" would replace the existing "dust, fume, and mist respirator", as discussed previously.

The requirement for the manufacturer to specify the filter-efficiency/particulate-type classification in the certification application would be contained in paragraph (a). This classification would include the type of particulates that the filter is designed to remove, either solid or both liquid and solid, and the expected efficiency of the filter based on the test requirements specified in § 84.184.

The information to be included on the label of a filter for a certified particulate respirator is specified in paragraphs (b)(1) through (b)(6). This labeling would define the efficiency level achieved in the performance testing (i.e., Type A, B, or C filter) and whether the filter would perform properly in the removal of solid only (S) or both liquid and solid (L&S) particulates. This information would be necessary to allow the user to make an informed decision on selecting the appropriate respiratory protection. To facilitate this selection process, the Type A, L&S filters are color coded magenta to allow them to be easily distinguished from the other filter types. The filters other than Type A, L&S could be of any color, except magenta. This color coding would be consistent with the present universally-accepted color-code convention which identifies the best performing filters (HEPA's) by their magenta color.

Section 84.181 Isoamyl Acetate Tightness Test; Particulate Respirators With Filters Not Intended To Be Replaced

This section would be redesignated from existing § 11.140–1 with the test unchanged. Because the proposal would not classify respirators as designed for protection against fumes from various metals having an air contamination level not less than 0.05 milligram per cubic meter, the test would be redirected to evaluate the performance of particulate respirators with filters not intended to be replaced.

Section 84.182 Isoamyl Acetate Tightness Test; Respirators With Replaceable Filters; Minimum Requirements

This section would be redesignated from existing § 11.140–2 with the test unchanged. Because the proposal would not classify respirators designed for protection against dusts, fumes and mists having an air contamination level less than 0.05 milligram per cubic meter, or radionuclides, the test would be redirected to evaluate the performance of particulate respirators with replaceable filters.

Section 84.183 Airflow-Resistance Tests

Section 84.183 would be redesignated from § 11.140–9, modified to delete the final inhalation resistance requirements. The proposed instantaneous-penetration tests are not designed to simulate loading of the filter at the worksite, and represent a significant change in the testing philosophy from the existing requirements. Therefore, these requirements would not be necessary or appropriate with the introduction of these new tests.

Section 84.184 Particulate Instantaneous-Penetration-Filter Test

This section would be new. Section 84.184 would specify the test criteria and acceptable performance criteria for the new particulate instantaneous-penetration-filter test.

Paragraph (a) would require the instantaneous-penetration efficiency testing of 30 filters of each particulate respirator model. Testing would be conducted using a solid particulate aerosol or an oil liquid particulate

aerosol for solid particulate certification and both liquid and solid particulate certification, respectively.

Paragraph (b) would apply to filters having separable air-purifying elements. All the respirator's air-purifying elements, including the element's holders and gaskets, are specified to be installed on the respirator as used when mounted for testing.

Paragraph (c) would require the preconditioning of all air-purifying elements of the respirators prior to testing. The elements, removed from their packaging, are placed in an environment of 85±5 percent relative humidity at 38±2.5 degrees celsius (100±4.5 degrees fahrenheit) for 25±1 hours. Following the humidity conditioning, filters are required to be sealed in a gas-tight container until tested.

Paragraph (d) would apply to filters having non-separable air-purifying elements. It would require the exhalation valves to be sealed during the testing. Sealing of the valves would ensure that the test results were not affected by any valve leakage, if present.

Paragraph (e) would specify the continuous test-aerosol airflow rates to be used in testing single and paired filters. Respirators with a single filter are penetration-tested at a continuous airflow rate of 85 liters (3.0 cubic feet) per minute ±5 percent. For pairs, the test-aerosol airflow rate would be 42.5 liters (1.5 cubic feet) per minute ±5 percent through each filter. This airflow rate is representative of a high work rate. These test conditions would ensure that a sufficient number of particulates are applied to the filter during the test period to provide an adequate indication of the efficiency of the filters.

Paragraph (f) would specify the test criteria for powered air-purifying particulate respirators (PAPRs). The PAPRs are penetration tested while operating in their routine operational mode. This would require fully-charged batteries, if so equipped, or at normal line voltage, if line-powered. PAPRs with loose fitting facepieces are tested in a free-flow mode, while those with tight-fitting facepieces are tested on a headform connected to a breathing machine or equivalent breathing device. The breathing machine would have a workrate cam of 622 kp-m/min. operated at a rate of 24 respirations per minute with a minute volume of 40 liters.

Paragraph (g) would describe the penetration test aerosols and the test criteria to be used. A sodium chloride solid aerosol would be used when testing for filter leakage of solid particulate aerosols. A neutralized-dioctyl phthalate (DOP), or equivalent oil, liquid aerosol would be specified as the testing agent when testing for filter leakage of liquid particulate aerosols. The penetration test would be continued until maximum penetration is achieved or until an aerosol mass of at least 200±5 mg for non-powered respirators, or at least 2,000±50 mg for powered air-purifying respirators, has contacted the filter unit.

Paragraph (g)(1) would identify the test conditions for the sodium chloride solid aerosol to be at 25±5 degrees celsius (77±9 degrees fahrenheit) and relative humidity of less than 30 percent. The aerosol specified to be used in these tests would be neutralized to the Boltzmann equilibrium state, and the maximum concentration would not exceed 200 mg/m^3.

Paragraph (g)(2) would specify the DOP or equivalent oil, liquid particulate aerosol. The test conditions for the liquid aerosol are specified to be at 25±5 degrees celsius. The aerosol specified to be used in these tests would be neutralized to the Boltzmann equilibrium state, and the maximum concentration would not exceed 200 mg/m^3.

Paragraph (h) would specify the particle size limitations at the test conditions for the filter-penetration-test aerosols. The sodium chloride aerosol would have a particle size distribution with count median diameter between 0.06 and 0.11 micrometer and a standard geometric deviation not exceeding 1.84. The liquid particulate aerosol would have a particle size distribution with count median diameter between 0.17 and 0.22 micrometer and a standard geometric deviation not exceeding 1.60. These particle size distribution values would be determined at the specified test conditions with a differential mobility particle sizer.

Paragraph (i) would require the instantaneous penetration of the filter (i.e., the amount of aerosol particles that pass through the filter) to be monitored and recorded throughout the test period by a suitable forward-light-scattering photometer or equivalent instrumentation.

Paragraph (j) would require the maximum filter penetration for each of the 30 filters to be determined and recorded. The mean maximum penetration, m, and the standard deviation, s, would be required to be calculated from these data. The test static U for the particulate respirator filter would be calculated as the sum of the mean maximum penetration and 2.22 multiplied by the standard deviation. The test static would be used to determine if the performance of the filter would meet the requirement for the requested classification (type). For a type A filter, the test static would be less than or equal to 0.0003; for a type B, the test static would be less than or equal to 0.01; for a type C, the test static would be less than or equal to 0.05.

Section 84.185 Powered, Particulate Respirator Flow Requirements

This section would be new. It would specify the minimum requirements and criteria for verification of the airflow rates of powered, particulate respirators. This section would also define the classes as loose-fitting and tight-fitting, depending on their reliance on the tightness of the face seal.

The airflow of a powered air-purifying respirator would be measured after each of the penetration tests. The airflow requirements that a powered air-purifying respirator would be required to meet are specified based on its design classification as tight-fitting or loose-fitting. The minimum airflow requirements for each class are specified in paragraphs (a) and (b) of this section. A tight-fitting, powered, air-purifying respirator would be defined as designed to seal to the wearer's face and provide protection as a non-powered respirator in the event of a blower failure. A loose-fitting, powered, air-purifying respirator would be defined as designed to function without reliance on a tight-fitting face seal.

Paragraph (a) would require tight-fitting, powered air-purifying respirators to maintain an air-flow rate of at least 115 liters (4.06 cubic feet) per minute for a period of at least 4 hours unless otherwise specified.

Paragraph (b) would require loose-fitting, powered air-purifying respirators to maintain an air-flow rate of at least 170 liters (6.0 cubic feet) per minute for a period of at least 4 hours, unless otherwise specified.

Paragraph (c) would require powered air-purifying respirators to be provided with an acceptable mechanism and appropriate instructions, whereby, the user can routinely and simply determine that the minimum airflow is maintained.

Subpart L—Chemical Cartridge Respirators

Section 84.203 Breathing Resistance Tests; Minimum Requirements

This section would be redesignated from existing § 11.162–1.

It would be modified only to delete reference to various "classifications", such as paints and pneumoconiosis and fibrous producing dusts, that would no

longer be appropriate with the introduction of the "particulates" classification with the new instantaneous-penetration test.

Section 84.206 Particulate Tests; Respirators With Filters; Minimum Requirements; General

This section would be redesignated from existing § 11.162–7. It would be modified only to delete reference to various "classifications", such as paints and pneumoconiosis and fibrous producing dusts, that would no longer be appropriate with the introduction of the "particulates" classification with the new instantaneous-penetration test.

Derivation Table

The following derivation table lists: (1) Each section number of the proposed rule (New Section); and (2) The section number of the existing standard from which the proposed standard is derived (Old Section).

DERIVATION TABLE

New section	Old section
84.1	11.1
84.2	11.3
84.3	11.4
84.4	New.
84.10	11.10
84.11	11.11
84.12	11.12
84.20	11.20
84.21	11.21
84.22	11.22
84.30	11.30
84.31	11.31
84.32	11.32
84.33	11.33
84.34	11.34
84.35	11.35
84.36	11.36
84.40	11.40
84.41	11.41
84.42	11.42
84.43	11.43
84.50	11.50
84.51	11.51
84.52	11.52
84.53	11.53
84.60	11.60
84.61	11.61
84.62	11.62
84.63	11.63
84.64	11.64
84.65	11.65
84.66	11.66
84.70	11.70
84.71	11.71
84.72	11.72
84.73	11.73
84.74	11.74
84.75	11.75
84.76	11.76
84.77	11.77
84.78	11.78
84.79	11.79
84.80	11.79–1

DERIVATION TABLE—Continued

New section	Old section
84.81	11.80
84.82	11.81
84.83	11.82
84.84	11.83
84.85	11.84
84.86	11.85–1
84.87	11.85–2
84.88	11.85–3
84.89	11.85–4
84.90	11.85–5
84.91	11.85–6
84.92	11.85–7
84.93	11.85–8
84.94	11.85–9
84.95	11.85–10
84.96	11.85–11
84.97	11.85–12
84.98	11.85–13
84.99	11.85–14
84.100	11.85–15
84.101	11.85–16
84.102	11.85–17
84.103	11.85–18
84.104	11.85–19
84.110	11.90
84.111	11.91
84.112	11.92
84.113	11.93
84.114	11.94
84.115	11.95
84.116	11.96
84.117	11.97
84.118	11.98
84.119	11.99
84.120	11.100
84.121	11.101
84.122	11.102–1
84.123	11.102–2
84.124	11.102–3
84.125	11.102–4
84.126	11.102–5
84.130	11.110
84.131	11.111
84.132	11.112
84.133	11.113
84.134	11.114
84.135	11.115
84.136	11.116
84.137	11.117
84.138	11.118
84.139	11.119
84.140	11.120
84.141	11.121
84.142	11.122
84.143	11.123
84.144	11.124–1
84.145	11.124–2
84.146	11.124–3
84.147	11.124–4
84.148	11.124–5
84.149	11.124–6
84.150	11.124–7
84.151	11.124–8
84.152	11.124–9
84.153	11.124–10
84.154	11.124–11
84.155	11.124–12
84.156	11.124–13
84.157	11.124–14
84.158	11.124–15
84.159	11.124–16
84.160	11.124–17

DERIVATION TABLE—Continued

New section	Old section
84.161	11.124–18
84.162	11.124–19
84.163	11.124–20
84.170	11.130
84.171	11.131
84.172	11.132
84.173	11.133
84.174	11.134
84.175	11.135
84.176	11.136
84.177	11.137
84.178	11.138
84.179	11.139
84.180	New.
84.181	11.140–1
84.182	11.140–2
84.183	11.140.9
84.184	New.
84.185	New.
84.186	11.140–10
84.190	11.150
84.191	11.151
84.192	11.152
84.193	11.153
84.194	11.154
84.195	11.155
84.196	11.156
84.197	11.157
84.198	11.158
84.199	11.158–1
84.200	11.159
84.201	11.160
84.202	11.161
84.203	11.162–1
84.204	11.162–2
84.205	11.162–3
84.206	11.162–7
84.207	11.162–8
84.250	11.200
84.251	11.201
84.252	11.202
84.253	11.203
84.254	11.204
84.255	11.205
84.256	11.206
84.257	11.207
84.258	11.208

Distribution Table

The following distribution table lists: (1) The section number of the existing part 11 standard (Old Section); and (2) each section number of the proposed rule (New Section).

DISTRIBUTION TABLE

Old section	New section
11.1	84.1
11.2	Removed.
11.2–1	Removed.
11.3	84.2
11.4	84.3
11.10	84.10
11.11	84.11
11.12	84.12
11.20	84.20
11.21	84.21
11.22	84.22
11.30	84.30

DISTRIBUTION TABLE—Continued

Old section	New section
11.31	84.31
11.32	84.32
11.33	84.33
11.34	84.34
11.35	84.35
11.36	84.36
11.40	84.40
11.41	84.41
11.42	84.42
11.43	84.43
11.50	84.50
11.51	84.51
11.52	84.52
11.53	84.53
11.60	84.60
11.61	84.61
11.62	84.62
11.63	84.63
11.64	84.64
11.65	84.65
11.66	84.66
11.70	84.70
11.71	84.71
11.72	84.72
11.73	84.73
11.74	84.74
11.75	84.75
11.76	84.76
11.77	84.77
11.78	84.78
11.79	84.79
11.79–1	84.80
11.80	84.81
11.81	84.82
11.82	84.83
11.83	84.84
11.84	84.85
11.85	Removed.
11.85–1	84.86
11.85–2	84.87
11.85–3	84.88
11.85–4	84.89
11.85–5	84.90
11.85–6	84.91
11.85–7	84.92
11.85–8	84.93
11.85–9	84.94
11.85–10	84.95
11.85–11	84.96
11.85–12	84.97
11.85–13	84.98
11.85–14	84.99
11.85–15	84.100
11.85–16	84.101
11.85–17	84.102
11.85–18	84.103
11.85–19	84.104
11.90	84.110
11.91	84.111
11.92	84.112
11.93	84.113
11.94	84.114
11.95	84.115
11.96	84.116
11.97	84.117
11.98	84.118
11.99	84.119
11.100	84.120
11.101	84.121
11.102	Removed.
11.102–1	84.122
11.102–2	84.123

DISTRIBUTION TABLE—Continued

Old section	New section
11.102–3	84.124
11.102–4	84.125
11.102–5	84.126
11.110	84.130
11.111	84.131
11.112	84.132
11.113	84.133
11.114	84.134
11.115	84.135
11.116	84.136
11.117	84.137
11.118	84.138
11.119	84.139
11.120	84.140
11.121	84.141
11.122	84.142
11.123	84.143
11.124	Removed.
11.124–1	84.144
11.124–2	84.145
11.124–3	84.146
11.124–4	84.147
11.124–5	84.148
11.124–6	84.149
11.124–7	84.150
11.124–8	84.151
11.124–9	84.152
11.124–10	84.153
11.124–11	84.154
11.124–12	84.155
11.124–13	84.156
11.124–14	84.157
11.124–15	84.158
11.124–16	84.159
11.124–17	84.160
11.124–18	84.161
11.124–19	84.162
11.124–20	84.163
11.124–21	Removed.
11.124–22	Removed.
11.124–23	Removed.
11.124–24	Removed.
11.130	84.170
11.131	84.171
11.132	84.172
11.133	84.173
11.134	84.174
11.135	84.175
11.136	84.176
11.137	84.177
11.138	84.178
11.139	84.179
11.140	Removed.
11.140–1	84.181
11.140–2	84.182
11.140–3	84.183
11.140–4	Removed.
11.140–5	Removed.
11.140–6	Removed.
11.140–7	Removed.
11.140–8	Removed.
11.140–9	84.183
11.140–10	84.146
11.140–11	Removed.
11.140–12	Removed.
11.150	84.190
11.151	84.191
11.152	84.192
11.153	84.193
11.154	84.194
11.155	84.195
11.156	84.196

DISTRIBUTION TABLE—Continued

Old section	New section
11.157	84.197
11.158	84.198
11.158–1	84.199
11.159	84.200
11.160	84.201
11.161	84.202
11.162	Removed.
11.162–1	84.203
11.162–2	84.204
11.162–3	84.205
11.162–4	Removed.
11.162–5	Removed.
11.162–6	Removed.
11.162–7	84.206
11.162–8	84.207
11.170	Removed.
11.171	Removed.
11.172	Removed.
11.173	Removed.
11.174	Removed.
11.175	Removed.
11.176	Removed.
11.177	Removed.
11.178	Removed.
11.179	Removed.
11.180	Removed.
11.181	Removed.
11.182	Removed.
11.183	Removed.
11.183–1	Removed.
11.183–2	Removed.
11.183–3	Removed.
11.183–4	Removed.
11.183–5	Removed.
11.183–6	Removed.
11.183–7	Removed.
11.200	84.250
11.201	84.251
11.202	84.252
11.203	84.253
11.204	84.254
11.205	84.255
11.206	84.256
11.207	84.257
11.208	84.258

V. Executive Order 12866 and Regulatory Flexibility Act

Section 1 of Executive Order 12866 requires that before the Department promulgates a new regulation, the need for the regulation must be assessed, alternatives identified and assessed, the regulations designed to achieve their objectives in the most cost-effective manner, and, to the extent feasible, use performance standards. In addition, Section 5 of the Order requires an assessment of the burden imposed by existing regulations, to identify those that have become unjustified or unnecessary as a result of changed circumstances. The Department is proposing these changes in compliance with both sections of the Executive Order.

The Department generally prepares a regulatory flexibility analysis, in accordance with the Regulatory

Flexibility Act, if the rule is expected to have a significant impact on a substantial number of small entities. That Act also requires that the Department periodically review existing regulations and consider reforming those that burden small entities, taking into account the degree to which technology or other factors have changed in the area affected by the rule.

The Department does not believe that this proposal is "economically significant" within the definition of E.O. 12866 (e.g., it would not have an effect on the economy of $100 million). Nor does the Department believe that the proposal will have a significant impact on a substantial number of small firms. However, it will create costs for some firms in the respirator industry, and benefits for hospitals and other entities using respirators. The magnitude of these effects is uncertain. Accordingly, the Department has prepared the following voluntary Initial Regulatory Flexibility Analysis.

Most employers rely on government standards to determine acceptable levels of respirator performance. It would be inefficient and unreasonably costly for each of millions of occasional purchasers of these inexpensive devices to independently attempt to determine which devices operate effectively to filter out minuscule particles.

This proposal will remove a regulatory impediment to the improved design of respirators by substituting a performance standard for an obsolete specifications standard. The practical effect of this will be to enable firms to substitute a more effective and efficient filter material in low-cost Class B and Class C respirators (respirators already using high efficiency filters meeting Class A requirements will not be affected by this proposal).

It is our understanding that substituting better filter material will have negligible effects on the costs of filters, over the long run. The material may cost very slightly more, but its cost will remain measured in pennies per filter. NIOSH specifically solicits comments and data for projected estimates of cost for materials and labor for these improved respirators.

The demonstrated level of performance for filters will, however, be substantially more effective. Instead of an efficiency rate of 95 percent for removing particles sized at 1 to 2 micrometers in diameter, they will demonstrate the ability to remove particles of less than 1 micrometer in diameter at a typical efficiency rate of 95 to 99.97 percent. The importance of this change will vary considerably from workplace setting to setting. However, in at least some settings the benefits will be considerable.

For example, the classes of particulate filter respirators certified under this rule will meet or exceed the CDC recommendations for respiratory protective devices used for *M. tuberculosis*. Of the currently NIOSH-certified respirators, only high-efficiency particulate air (HEPA) filters meet or exceed these recommendations. The certification to an enhanced performance level will create options for the choice of respirators that adhere to CDC recommendations at reduced expense. A disposable (one-time use) HEPA filter respirator generally sells for around $7 to $10 and replaceable respirators equipped with HEPA filters can cost $20 or more, with replacement filters costing about $5 each. Replacement non-HEPA filters cost about $1 to $2 each. Disposable non-HEPA filters cost about $1 to $8 each when purchased in bulk.

The Department would expect similar effects—both improved health and cost avoidance—in many other settings. The Department does not have any basis at this time for quantifying either benefits or costs. The Department does know that as many as seven million workers use respirators at some time each year. NIOSH estimates that employers annually purchase over 110 million disposable respirators. The Department requests comments on potential savings in other settings.

There are approximately 35 manufacturers of these devices. NIOSH believes that most of these already possess or have access to test equipment needed to perform the new filter tests the Department proposes to require. As is currently required under 30 CFR part 11, NIOSH would continue to require that applicants conduct or have conducted examinations, inspections, and tests of respirator performance at least equivalent to those set by the respirator certification tests. This is to assure that all necessary research and development is conducted by the applicant prior to submitting an application to the Federal Government for testing of the respirator by NIOSH. For those manufacturers that do not currently possess this capability, NIOSH estimates that the purchase of this equipment represents an investment of approximately $60,000. Amortized over time, this would not represent a significant cost for most manufacturers.

Filter materials are currently available that can be substituted into present filter designs with minimal redesign (if any) to meet the performance requirements of the new tests. Some currently NIOSH-certified respirators have, when tested using the new standards, demonstrated acceptable performance. Therefore, little or no cost will be needed to develop suitable filtration materials or redesign existing devices. However, the Department does realize that additional development and redesign costs may be incurred to augment the presently available products. NIOSH specifically requests relevant data and comments on projected costs of redesign of respirators.

Notwithstanding these general conclusions, there may be some manufacturers that will find it financially difficult, or a poor investment, to meet the new standards. The Department would expect such problems to result from free market competition rather than the specific standards of these proposed regulations. That is, most knowledgeable employers would purchase more cost-effective respirators voluntarily and force major changes in the market if the present regulatory barriers were removed. Nonetheless, there may be regulatory alternatives that would minimize burdens on the smallest firms and the Department welcomes suggestions for these.

List of Subjects in 42 CFR Part 84

Labeling, Mine safety and health, Occupational safety and health, Personal protective equipment, Reporting and recordkeeping requirements, Respirators.

Dated: February 14, 1994.

Philip R. Lee,

Assistant Secretary for Health.

Approved: March 8, 1994.

Donna E. Shalala,

Secretary.

For the reasons set out in the preamble, 42 CFR part 84 is proposed to be added to read as follows:

PART 84—APPROVAL OF RESPIRATORY PROTECTIVE DEVICES

Subpart A—General Provisions

Subpart B—Application for Approval

Authority: 29 U.S.C. 577a, 651 *et seq.*, and 657(g); 30 U.S.C. 3, 5, 7, 811, 842(h), 844.

Subpart A—General Provisions

§ 84.1 Purpose.

The purpose of the regulations contained in this part 84 is:

(a) To establish procedures and prescribe requirements which must be met in filing applications for approval by the National Institute for Occupational Safety and Health of respirators or changes or modifications of approved respirators;

(b) To establish a schedule of fees to be charged each applicant for the inspections, examinations, and testing conducted by the Institute under the provisions of this part;

(c) To provide for the issuance of certificates of approval or modifications of certificates of approval for respirators which have met the applicable construction, performance, and respiratory protection requirements set forth in this part; and

(d) To specify minimum requirements and to prescribe methods to be employed by the Institute and by the applicant in conducting inspections, examinations, and tests to determine the effectiveness of respirators used during entry into or escape from hazardous atmospheres.

§ 84.2 Definitions.

As used in this part—

(a) *Applicant* means an individual, partnership, company, corporation, association, or other organization that designs, manufactures, assembles, or controls the assembly of a respirator and who seeks to obtain a certificate of approval for such respirator.

(b) *Approval* means a certificate or formal document issued by the Institute stating that an individual respirator or combination of respirators has met the minimum requirements of this part 84, and that the applicant is authorized to use and attach an approval label to any respirator, respirator container, or instruction card for any respirator manufactured or assembled in conformance with the plans and specifications upon which the approval was based, as evidence of such approval.

(c) *Approved* means conforming to the minimum requirements of this part 84.

(d) *Auxiliary equipment* means a self-contained breathing apparatus, the use of which is limited in underground mine rescue and recovery operations to situations where the wearer has ready access to fresh air and at least one crew equipped with approved self-contained breathing apparatus of 2 hours or longer rating, is in reserve at a fresh-air base.

(e) *Certification and Quality Assurance Branch* means the Certification and Quality Assurance Branch, Division of Safety Research, Appalachian Laboratory for Occupational Safety and Health, National Institute for Occupational Safety and Health, 944 Chestnut Ridge Road, Morgantown, West Virginia 26505–2888.

(f) *Compressed-breathing gas* means oxygen or air stored in a compressed state and supplied to the wearer in gaseous form.

(g) *dBA* means sound pressure levels in decibels, as measured with the A-weighted network of a standard sound level meter using slow response.

(h) *Dust* means a solid mechanically produced particle with a size ranging from submicroscopic to macroscopic.

(i) Respirators *for entry into and escape from* means respiratory devices providing protection during entry into

and escape from hazardous atmospheres.

(j) Respirators *for escape only* means respiratory devices providing protection only during escape from hazardous atmospheres.

(k) A *facepiece* or *mouthpiece* is a respirator component designed to provide a gas-tight or dust-tight fit with the face and may include headbands, valves, and connections for canisters, cartridges, filters, or respirable gas source.

(l) *Final inspection* means that activity carried out on a product after all manufacturing and assembly operations are completed to insure completeness and adherence to performance or other specifications, including satisfactory appearance.

(m) *Fume* means a solid condensation particle, generally less than 1 micrometer in diameter.

(n) *Gas* means an aeriform fluid which is in a gaseous state at ordinary temperature and pressure.

(o) *Hazardous atmosphere* means;

(1) Any atmosphere containing a toxic or disease producing gas, vapor, dust, fume, mist, or pesticide, either immediately or not immediately dangerous to life or health; or

(2) Any oxygen-deficient atmosphere.

(p) A *hood* or *helmet* is a respirator component which covers the wearer's head and neck, or head, neck, and shoulders, and is supplied with incoming respirable air for the wearer to breathe. It may include a headharness and connection for a breathing tube.

(q) *Immediately dangerous to life or health* means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health.

(r) *Incoming inspection* means the activity of receiving, examining, and accepting only those materials and parts whose quality conforms to specification requirements.

(s) *In-process inspection* means the control of products at the source of production and at each step of the manufacturing process, so that departures from specifications can be corrected before defective components or materials are assembled into the finished product.

(t) *Institute* means the National Institute for Occupational Safety and Health, Department of Health and Human Services.

(u) *Liquefied-breathing gas* means oxygen or air stored in liquid form and supplied to the wearer in a gaseous form.

(v) *Mist* means a liquid condensation particle with a size ranging from submicroscopic to macroscopic.

(w) *MSHA* means the Mine Safety and Health Administration, U.S. Department of Labor.

(x) *Not immediately dangerous to life or health* means any hazardous atmosphere which may produce physical discomfort immediately, chronic poisoning after repeated exposure, or acute adverse physiological symptoms after prolonged exposure.

(y) *Oxygen-deficient atmosphere* means an atmosphere which contains an oxygen partial pressure of less than 148 millimeters of mercury (19.5 percent by volume at sea level).

(z) *Powered air-purifying respirator* means a device equipped with a facepiece, hood, or helmet, breathing tube, canister, cartridge, filter, canister with filter, or cartridge with filter, and a blower.

(aa) *Respirator* means any device designed to provide the wearer with respiratory protection against inhalation of a hazardous atmosphere.

(bb) *Single-use respirator* means a respirator that is entirely discarded after excessive resistance, sorbent exhaustion, or physical damage renders it unsuitable for further use.

(cc) *Vapor* means the gaseous state of a substance that is solid or liquid at ordinary temperature and pressure.

§ 84.3 Incorporation by reference.

Note: The technical publications referenced in this part 84, which have been prepared by organizations other than the Institute, were approved for incorporation by reference in 30 CFR part 11. The Institute will be submitting these publications for approval of the incorporation by reference by the Director of the Office of the Federal Register under this part 84 prior to the publication of a final rule.

§ 84.4 Respirators for mine rescue or other emergency use in mines.

(a) (1) NIOSH and the Mine Safety and Health Administration (MSHA), U.S. Department of Labor, shall jointly review and issue certifications for respirators used for mine emergencies and mine rescue, including any associated service-life plans, users' manuals and other supporting documentation.

(2) Each certification for a respirator designed for mine rescue or other emergency use in mines shall include, as a condition of approval, any use limitations related to mine safety and health.

(b) NIOSH and MSHA shall jointly determine appropriate recall and retrofit remedies for field complaints or identified deficiencies involving any respirators used in the mining environment.

Subpart B—Application for Approval

§ 84.10 Application procedures.

(a) Inspection, examination, and testing leading to the approval of the types of respirators classified in subpart F of this part shall be undertaken by the Institute only pursuant to written applications which meet the minimum requirements set forth in this subpart B.

(b) Applications shall be submitted to the Certification and Quality Assurance Branch, and shall be accompanied by a check, bank draft, or money order in the amount specified in subpart C of this part, payable to the order of the National Institute for Occupational Safety and Health.

(c) Except as provided in § 84.64, the examination, inspection, and testing of all respirators shall be conducted by the Certification and Quality Assurance Branch.

(d) Applicants, manufacturers, or their representatives may visit or communicate with the Certification and Quality Assurance Branch in order to discuss the requirements for approval of any respirator or the proposed designs thereof. No charge shall be made for such consultation and no written report shall be issued to applicants, manufacturers, or their representatives by the Institute as a result of such consultation.

(e) Respirators having electrical or electronic components that are required to be permissible under chapter I of title 30 shall be tested in accordance with 30 CFR part 18. Applications for approval of such respirators by MSHA shall be submitted in writing to: MSHA, Approval and Certification Center, Box 251, Industrial Park Road, Triadelphia, West Virginia 26059.

§ 84.11 Contents of application.

(a) Each application for approval shall contain a complete written description of the respirator for which approval is requested together with drawings and specifications (and lists thereof) showing full details of construction of the respirator and of the materials used.

(b) Drawings shall be titled, numbered, and dated; any revision dates shall be shown on the drawings, and the purpose of each revision being sought shall be shown on the drawing or described on an attachment to the drawing to which it applies.

(c) Each application for approval shall contain a proposed plan for quality control which meets the minimum

requirements set forth in subpart E of this part.

(d) Each application shall contain a statement that the respirator has been pretested by the applicant as prescribed in § 84.64, and shall include the results of such tests.

(e) Each application for approval shall contain a statement that the respirator and component parts submitted for approval are either prototypes, or made on regular production tooling, with no operation included which will not be incorporated in regular production processing.

§ 84.12 Delivery of respirators and components by applicant; requirements.

(a) Each applicant shall, when an application is filed pursuant to § 84.10, be advised by the Institute of the total number of respirators and component parts required for testing.

(b) The applicant shall deliver, at his own expense, the number of completely assembled respirators and component parts required for testing, to the Certification and Quality Assurance Branch.

(c) Respirators and component parts submitted for approval must be made from materials specified in the application.

(d) One completely assembled respirator approved under the provisions of this part may be retained by the Institute as a laboratory exhibit, the remaining respirators may be returned to the applicant at his own expense, upon written request within 30 days after notice of approval. If no such request is made, the respirators will be disposed of by the Institute in such manner as it deems appropriate.

(e) Where a respirator fails to meet the requirements for approval set forth in this part, all respirators and components delivered in accordance with this section may be returned to the applicant at his own expense, upon written request within 30 days after notice of disapproval. If no such request is made, the respirators will be disposed of by the Institute in such manner as it deems appropriate.

Subpart C—Fees

§ 84.20 Examination, inspection, and testing of complete respirator assemblies; fees.

Except as provided in § 84.22, the following fees shall be charged by the Institute for the examination, inspection and testing of complete respirator assemblies:

Self-contained breathing apparatus:	
Entry and escape, 1 hour or more	$3,500
Entry and escape, less than 1 hour	2,750
Escape only	2,000
Gas masks:	
Single hazard	1,100
Type N	4,100
Supplied-air respirators	750
Particulate respirators:	
All Types	1,250
Chemical cartridge respirators	1,150

§ 84.21 Examination, inspection, and testing of respirator components or subassemblies; fees.

Except as provided in § 84.22, the following fees shall be charged by the Institute for the examination, inspection and testing of the individual respirator components or subassemblies:

Facepieces	$450
Canisters	900
Cartridges	600
Filters	650
Hoses	250
Blowers	250
Harnesses	100

§ 84.22 Unlisted fees; additional fees; payment by applicant prior to approval.

(a) Applications for the examination, inspection and testing of complete respirator assemblies which are not listed in § 84.20, or for the examination, inspection, and testing of respirator components or subassemblies which are not listed in § 84.21, shall be accompanied by the following deposits:

Complete respirator assembly	$1,500
Each individual component or subassembly	500

(b) The Institute reserves the right to conduct any examination, inspection, or test it deems necessary to determine the quality and effectiveness of any listed or unlisted respirator assembly or respirator component or subassembly, and to assess the cost of such examinations, inspections, or tests against the applicant prior to the issuance of any approval for such assembly, component, or subassembly.

(c) The fees charged for the examination, inspection, and testing of unlisted respirator assemblies, unlisted individual respirator components or subassemblies, and for the additional examination, inspection, and testing of listed respirator assemblies and components or subassemblies shall be at the rate of $100 per day for each man-day required to be expended by the Institute.

(d) Upon completion of all examinations, inspections, and tests of unlisted respirator assemblies or components, or following the completion of any additional examination, inspections, or tests of listed assemblies, or components or subassemblies, including retesting subsequent to disapproval, the Institute shall advise the applicant in writing of the total cost assessed and the additional amount, if any, which must be paid to the Institute as a condition of approval.

(e) In the event the amount assessed by the Institute for unlisted assemblies, or components or subassemblies is less than the amount of the deposit submitted in accordance with paragraph (a) of this section, the Institute shall refund the overpayment upon the issuance of any approval or notice of disapproval.

Subpart D—Approval and Disapproval

§ 84.30 Certificates of approval; scope of approval.

(a) The Institute shall issue certificates of approval pursuant to the provisions of this subpart only for individual, completely assembled respirators which have been examined, inspected, and tested, and which meet the minimum requirements set forth in subparts H through L of this part, as applicable.

(b) The Institute will not issue certificates of approval for any respirator component or for any respirator subassembly.

(c) The Institute shall not issue an informal notification of approval. However, if the application for approval, submitted in accordance with § 84.11, states that the submitted respirator and component parts are only prototypes, the Institute will examine, inspect, and test such respirator and component parts in accordance with the provisions of this part 84. If, upon completion of such examinations, inspections and tests, it is found that the prototype meets the minimum requirements set forth in this part, the Institute may inform the applicant, in writing, of the results of the examinations, inspections, and tests, and may require him to resubmit respirators and component parts made on regular production tooling, with no operations included which will not be incorporated in regular production processing, for further examination, inspection, and testing, prior to issuance of the certificate of approval.

(d) Applicants required to resubmit respirators and component parts made on regular production tooling, with no operation included which will not be incorporated in regular production processing, shall be charged fees in accordance with subpart C of this part.

§ 84.31 Certificates of approval; contents.

(a) The certificate of approval shall contain a classification and a description of the respirator or combination of respirators for which it is issued, as provided in this part.

(b) The certificate of approval shall specifically set forth any restrictions or limitations on the respirator's use in hazardous atmospheres.

(c) Each certificate of approval shall be accompanied by the drawings and specifications (and lists thereof) submitted by the applicant in accordance with § 84.11. These drawings and specifications shall be referenced in the certificate of approval, and shall be maintained by the applicant. The drawings and specifications listed in each certificate of approval shall set forth in detail the design and construction requirements which shall be met by the applicant during commercial production of the respirator.

(d) Each certificate of approval shall be accompanied by a reproduction of the approval label design to be employed by the applicant with each approved respirator, as provided in § 84.33.

(e) No test data or specific laboratory findings will accompany any certificate of approval, however, the Institute will release pertinent test data and specific findings upon written request by the applicant, or as required by statute or regulation.

(f) Each certificate of approval shall also contain the approved quality control plan as specified in § 84.42.

§ 84.32 Notice of disapproval.

(a) If, upon the completion of the examinations, inspections, and tests required to be conducted in accordance with the provisions of this part, it is found that the respirator does not meet the minimum requirements set forth in this part, the Institute shall issue a written notice of disapproval to the applicant.

(b) Each notice of disapproval shall be accompanied by all pertinent data or findings with respect to the defects of the respirator for which approval was sought with a view to the possible correction of any such defects.

(c) The Institute shall not disclose, except to the applicant or as required by statute or regulation, any data, findings, or other information with respect to any respirator for which a notice of disapproval is issued.

§ 84.33 Approval labels and markings; approval of contents; use.

(a) Full-scale reproductions of approval labels and markings, and a sketch or description of the method of application and position on the harness, container, canister, cartridge, filter, or other component, together with instructions for the use and maintenance of the respirator shall be submitted to the Institute for approval.

(b) Approval labels shall bear the emblem of the National Institute for Occupational Safety and Health and the seal of the Department of Health and Human Services, the applicant's name and address, an approval number assigned by the Institute and, where appropriate, restrictions or limitations placed upon the use of the respirator by the Institute. The approval number assigned by the Institute shall be designated by the prefix TC and a serial number.

(c) The Institute shall, where necessary, notify the applicant when additional labels, markings, or instructions will be required.

(d) Approval labels and markings shall only be used by the applicant to whom they were issued.

(e) Legible reproductions or abbreviated forms of the label approved by the Institute for use on each respirator shall be attached to or printed at the following locations:

Respirator type	Label type	Location
Self-contained breathing apparatus	Entire	Harness assembly and canister (where applicable).
Gas mask	Entire	Mask container and canister.
Supplied air respirator	....do	Respirator container or instruction card.
Particulate respirator	....do	Respirator container and filter container.
	Abbreviated	Filters.
Chemical-cartridge respirator	Entire	Respirator container, cartridge container, and filter containers (where applicable).
	Abbreviated	Cartridges and filters and filter containers.

(f) The use of any Institute approval label obligates the applicant to whom it is issued to maintain or cause to be maintained the approved quality control sampling schedule and the acceptable quality level for each characteristic tested, and to assure that it is manufactured according to the drawings and specifications upon which the certificate of approval is based.

(g) Each respirator, respirator component, and respirator container shall, as required by the Institute to assure quality control and proper use of the respirator, be labeled distinctly to show the name of the applicant, and the name and letters or numbers by which the respirator or respirator component is designated for trade purposes, and the lot number, serial number, or approximate date of manufacture.

§ 84.34 Revocation of certificates of approval.

The Institute reserves the right to revoke, for cause, any certificate of approval issued pursuant to the provisions of this part. Such causes include, but are not limited to, misuse of approval labels and markings, misleading advertising, and failure to maintain or cause to be maintained the quality control requirements of the certificate of approval.

§ 84.35 Changes or modification of approved respirators; issuance of modification of certificate of approval.

(a) Each applicant may, if he desires to change any feature of an approved respirator, request a modification of the original certificate of approval issued by the Institute for such respirator by filing an application for such modification in accordance with the provisions of this section.

(b) Applications shall be submitted as for an original certificate of approval, with a request for a modification of the existing certificate to cover any proposed change.

(c) The application shall be accompanied by appropriate drawings and specifications, and by a proposed quality control plan which meets the requirements of subpart E of this part.

(d) The application for modification together with the accompanying material, shall be examined by the

Institute to determine whether testing will be required.

(e) The Institute shall inform the applicant of the fee required for any additional testing and the applicant will be charged for the actual cost of any examination, inspection, or test required, and such fees shall be submitted in accordance with the provisions of subpart C of this part.

(f) If the proposed change or modification meets the requirements of this part, a formal certificate of modification will be issued, accompanied, where necessary, by a list of new and revised drawings and specifications covering the change(s) and reproductions of revised approval labels.

§ 84.36 Delivery of changed or modified approved respirator.

An approved respirator for which a formal certificate of modification has been issued shall be delivered, with proper markings and containers, by the applicant to the Certification and Quality Assurance Branch, as soon as it is commercially produced.

Subpart E—Quality Control

§ 84.40 Quality control plans; filing requirements.

As a part of each application for approval or modification of approval submitted pursuant to this part, each applicant shall file with the Institute a proposed quality control plan which shall be designed to assure the quality of respiratory protection provided by the respirator for which approval is sought.

§ 84.41 Quality control plans; contents.

(a) Each quality control plan shall contain provisions for the management of quality, including:

(1) Requirements for the production of quality data and the use of quality control records;

(2) Control of engineering drawings, documentations, and changes;

(3) Control and calibration of measuring and test equipment;

(4) Control of purchased material to include incoming inspection;

(5) Lot identification, control of processes, manufacturing, fabrication, and assembly work conducted in the applicant's plant;

(6) Audit of final inspection of the completed product; and,

(7) The organizational structure necessary to carry out these provisions.

(b) Each provision for incoming and final inspection in the quality control plan shall include a procedure for the selection of a sample of respirators and the components thereof for testing, in accordance with procedures set forth in Military Standard MIL–STD–105D, "Sampling Procedures and Tables for Inspection by Attributes," or Military Standard MIL–STD–414, "Sampling Procedures and Tables for Inspection by Variables for Percent Defective," or an approved equivalent sampling procedure, or an approved combination of sampling procedures. Incoming bulk raw material inspection or verification of specification, and in-process inspection shall be sufficient to ensure control of product quality through the manufacturing cycle.

(c) The sampling procedure shall include a list of the characteristics to be tested by the applicant or his agent.

(d) The characteristics listed in accordance with paragraph (c) of this section shall be classified according to the potential effect of such defect and grouped into the following classes:

(1) *Critical.* A defect that judgment and experience indicate is likely to result in a condition immediately hazardous to life or health for individuals using or depending upon the respirator;

(2) *Major A.* A defect, other than critical, that is likely to result in failure to the degree that the respirator does not provide any respiratory protection, or a defect that reduces protection and is not detectable by the user;

(3) *Major B.* A defect, other than Major A or critical, that is likely to result in reduced respiratory protection, and is detectable by the user; and

(4) *Minor.* A defect that is not likely to materially reduce the usability of the respirator for its intended purpose, or a defect that is a departure from established standards and has little bearing on the effective use or operation of the respirator.

(e) The quality control inspection test method to be used by the applicant or his agent for each characteristic required to be tested shall be described in detail.

(f) Each item manufactured shall be 100 percent inspected for defects in all critical characteristics and all defective items shall be rejected.

(g) The Acceptable Quality Level (AQL) for each major or minor defect so classified by the applicant shall be:

(1) *Major A.* 1.0 percent;

(2) *Major B.* 2.5 percent; and

(3) *Minor.* 4.0 percent.

(h) Except as provided in paragraph (i) of this section, inspection level II as described in MIL–STD–105D, or inspection level IV as described in MIL–STD–414, shall be used for major and minor characteristics and 100 percent inspection for critical characteristics.

(i) Subject to the approval of the Institute, where the quality control plan provisions for raw material, processes, manufacturing, and fabrication, inspections are adequate to insure control of finished article quality, destructive testing of finished articles may be conducted at a lower level of inspection than that specified in paragraph (h) of this section.

§ 84.42 Proposed quality control plans; approval by the Institute.

(a) Each proposed quality control plan submitted in accordance with this subpart shall be reviewed by the Institute to determine its effectiveness in insuring the quality of respiratory protection provided by the respirator for which an approval is sought.

(b) If the Institute determines that the proposed quality control plan submitted by the applicant will not insure adequate quality control, the Institute shall require the applicant to modify the procedures and testing requirements of the plan prior to approval of the plan and issuance of any certificate of approval.

(c) Approved quality control plans shall constitute a part of and be incorporated into any certificate of approval issued by the Institute, and compliance with such plans by the applicant shall be a condition of approval.

§ 84.43 Quality control records; review by the Institute; revocation of approval.

(a) The applicant shall keep quality control inspection records sufficient to carry out the procedures required in MIL–STD–105D or MIL–STD–414, or an approved equivalent sampling procedure.

(b) The Institute reserves the right to have its representatives inspect the applicant's quality control test methods, equipment, and records, and to interview any employee or agent of the applicant in regard to quality control test methods, equipment, and records.

(c) The Institute reserves the right to revoke, for cause any certificate of approval where it is found that the applicant's quality control test methods, equipment, or records do not insure effective quality control over the respirator for which the approval was issued.

Subpart F—Classification of Approved Respirators; Scope of Approval; Atmospheric Hazards; Service Time

§ 84.50 Types of respirators to be approved; scope of approval.

Approvals shall be issued for the types of respirators which have been classified pursuant to this subpart F, have been inspected, examined and tested by the Institute, in accordance

with the provisions of subparts G through L of this part, and have been found to provide respiratory protection for fixed periods of time against the hazards specified in such approval.

§ 84.51 Entry and escape, or escape only; classification.

Respirators described in subparts H through L of this part shall be classified for use as follows:

(a) *Entry and escape.* Respirators designed and approved for use during entry into a hazardous atmosphere, and for escape from a hazardous atmosphere; or

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

§ 84.52 Respiratory hazards; classification.

Respirators described in subparts H through L of this part shall be classified as approved for use against any or all of the following respiratory hazards:

(a) Oxygen deficiency;

(b) Gases and vapors; and

(c) Particles, including dusts, fumes and mists.

§ 84.53 Service time; classification.

(a) Respirators described in subparts H through L of this part shall be classified, where applicable, as approved for use during the following prescribed service times:

(1) Four hours;

(2) Three hours;

(3) Two hours;

(4) One hour;

(5) Forty-five minutes;

(6) Thirty minutes;

(7) Fifteen minutes;

(8) Ten minutes;

(9) Five minutes; or

(10) Three minutes.

(b) Other service times may be prescribed by the Institute.

Subpart G—General Construction and Performance Requirements

§ 84.60 Construction and performance requirements; general.

(a) The Institute shall issue approvals for the types of respirators described in subparts H through L of this part which have met the minimum requirements set forth for such respirators in this part 84.

(b) In addition to the types of respirators specified in subparts H through L of this part, the Institute shall issue approvals for other respiratory protective devices not specifically described in this part 84 subject to such additional requirements as may be imposed in accordance with § 84.63(c).

§ 84.61 General construction requirements.

(a) 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 and evidence good workmanship.

(b) Respirator components which come into contact with the wearer's skin shall be made of nonirritating materials.

(c) Components replaced during or after use shall be constructed of materials which will not be damaged by normal handling.

(d) Mouthpieces, hoods, helmets, and facepieces, except those employed in single-use respirators, shall be constructed of materials which will withstand repeated disinfection as recommended by the applicant in his instructions for use of the device.

§ 84.62 Component parts; minimum requirements.

(a) The component parts of each respirator shall be:

(1) Designed, constructed, and fitted to insure against creation of any hazard to the wearer;

(2) Assembled to permit easy access for inspection and repair of functional parts; and

(3) Assembled to permit easy access to parts which require periodic cleaning and disinfecting.

(b) Replacement parts shall be designed and constructed to permit easy installation and to maintain the effectiveness of the respirator.

§ 84.63 Test requirements; general.

(a) Each respirator and respirator component shall when tested by the applicant and by the Institute, meet the applicable requirements set forth in subparts H through L of this part.

(b) Where a combination respirator is assembled from two or more types of respirators, as described in this part, each of the individual respirator types which have been combined shall, as applicable, meet the minimum requirements for such respirators set forth in subparts H through L of this part, and such combination respirators, except as specified in § 84.70(b)(2), will be classified by the type of respirator in the combination which provides the least protection to the user.

(c) In addition to the minimum requirements set forth in subparts H through L of this part, the Institute reserves the right to require, as a further condition of approval, any additional requirements deemed necessary to establish the quality, effectiveness, and safety of any respirator used as protection against hazardous atmospheres.

(d) Where it is determined after receipt of an application that additional requirements will be required for approval, the Institute will notify the applicant in writing of these additional requirements, and necessary examinations, inspections, or tests, stating generally the reasons for such requirements, examinations, inspections, or tests.

§ 84.64 Pretesting by applicant; approval of test methods.

(a) Prior to making or filing any application for approval or modification of approval, the applicant shall conduct, or cause to be conducted, examinations, inspections, and tests of respirator performance which are equal to or exceed the severity of those prescribed in this part.

(b) With the application, the applicant shall provide a statement to the Institute showing the types and results of the examinations, inspections, and tests required under paragraph (a) of this section and state that the respirator meets the minimum requirements of subparts H through L of this part, as applicable. Complete examination, inspection, and test data shall be retained on file by the applicant and be submitted, upon request, to the Institute.

(c) The Institute may, upon written request by the applicant, provide drawings and descriptions of its test equipment and otherwise assist the applicant in establishing a test laboratory or securing the services of a testing agency.

(d) No approval will be issued until the Institute has validated the applicant's test results.

§ 84.65 Conduct of examinations, inspections, and tests by the Institute; assistance by applicant; observers; recorded data; public demonstrations.

(a) All examinations, inspections, and tests conducted pursuant to subparts H through L of this part will be under the sole direction and control of the Institute.

(b) The Institute may, as a condition of approval, require the assistance of the applicant or agents of the applicant during the assembly, disassembly, or preparation of any respirator or respirator component prior to testing or in the operation of such equipment during testing.

(c) Only Institute personnel, persons assisting the Institute pursuant to paragraph (b) of this section, and such other persons as are requested by the Institute or the applicant to be

observers, shall be present during any examination, inspection, or test conducted prior to the issuance of an approval by the Institute for the equipment under consideration.

(d) The Institute shall hold as confidential any analyses, drawings, specifications, or materials submitted by the applicant and shall not disclose any principles or patentable features of such equipment, except as required by statute or regulation.

(e) As a condition of each approval issued for any respirator, the Institute reserves the right, following the issuance of such approval, to conduct such public tests and demonstrations of the approved respiratory equipment as is deemed appropriate.

§ 84.66 Withdrawal of applications; refund of fees.

(a) Any applicant may, upon a written request submitted to the Institute, withdraw any application for approval of any respirator.

(b) Upon receipt of a written request for the withdrawal of an application, the Institute shall determine the total man-days expended and the amount due for services already performed during the course of any examinations, inspections, or tests conducted pursuant to such application. The total amount due shall be determined in accordance with the provisions of § 84.22 and assessed against the fees submitted by the applicant. If the total amount assessed is less than the fees submitted, the Institute shall refund the balance together with a statement of the charges made for services rendered.

Subpart H—Self-Contained Breathing Apparatus

§ 84.70 Self-contained breathing apparatus; description.

(a) Self-contained breathing apparatus, including all completely assembled, portable, self-contained devices designed for use as respiratory protection during entry into and escape from or escape only from hazardous atmospheres, are described as follows:

(1) *Closed-circuit apparatus.* An apparatus of the type in which the exhalation is rebreathed by the wearer after the carbon dioxide has been effectively removed and a suitable oxygen concentration restored from sources composed of:

(i) Compressed oxygen; or

(ii) Chemical oxygen; or

(iii) Liquid-oxygen.

(2) *Open-circuit apparatus.* An apparatus of the following types from which exhalation is vented to the atmosphere and not rebreathed:

(i) *Demand-type apparatus.* An apparatus in which the pressure inside the facepiece in relation to the immediate environment is positive during exhalation and negative during inhalation; or

(ii) *Pressure-demand-type apparatus.* An apparatus in which the pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.

(b) The following respirators may be classified as designed and approved for use during emergency entry into a hazardous atmosphere:

(1) A combination respirator which includes a self-contained breathing apparatus; and

(2) A Type "C" or Type "CE" supplied air respirator, where—

(i) The self-contained breathing apparatus is classified for 3-, 5-, or 10-minute service time and the air line supply is used during entry; or

(ii) The self-contained breathing apparatus is classified for 15 minutes or longer service time and not more than 20 percent of the rated capacity of the air supply is used during entry.

(c) Self-contained breathing apparatus classified for less than 1 hour service time will not be approved for use during underground mine rescue and recovery operations except as auxiliary equipment.

(d) Self-contained breathing apparatus classified for less than 30 minutes' service time will not be approved for use as auxiliary equipment during underground mine rescue and recovery operations.

§ 84.71 Self-contained breathing apparatus; required components.

(a) Each self-contained breathing apparatus described in § 84.70 shall, where its design requires, contain the following component parts:

(1) Facepiece or mouthpiece, and noseclip;

(2) Respirable breathing gas container;

(3) Supply of respirable breathing gas;

(4) Gas pressure or liquid level gages;

(5) Timer;

(6) Remaining service life indicator or warning device;

(7) Hand-operated valves;

(8) Breathing bag;

(9) Safety relief valve or safety relief system; and

(10) Harness.

(b) The components of each self-contained breathing apparatus shall meet the minimum construction requirements set forth in subpart G of this part.

§ 84.72 Breathing tubes; minimum requirements.

Flexible breathing tubes used in conjunction with breathing apparatus shall be designed and constructed to prevent:

(a) Restriction of free head movement;

(b) Disturbance of the fit of facepieces and mouthpieces;

(c) Interference with the wearer's activities; and

(d) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 84.73 Harnesses; installation and construction; minimum requirements.

(a) Each apparatus shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the apparatus in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of apparatus parts and, where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 84.74 Apparatus containers; minimum requirements.

(a) Apparatus may be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of the respirator it contains, and all appropriate approval labels.

(b) Containers supplied by the applicant for carrying or storing self-contained breathing apparatus will be inspected, examined, and tested as components of the respirator for which approval is sought.

(c) Containers for self-contained breathing apparatus shall be designed and constructed to permit easy removal of the apparatus.

§ 84.75 Half-mask facepieces, full facepieces, mouthpieces; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes, either:

(1) By providing more than one facepiece size; or

(2) By providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for the optional use of corrective spectacles or lenses which shall not reduce the respiratory protective qualities of the apparatus.

(c) Apparatus with mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or apparatus and provide an airtight seal.

(d) Facepieces shall be designed to prevent eyepiece, spectacle, and lens fogging.

§ 84.76 Facepieces; eyepieces; minimum requirements.

(a) Facepieces shall be designed and constructed to provide adequate vision which is not distorted by the eyepiece.

(b) All eyepieces shall be designed and constructed to meet the impact and penetration requirements specified in Federal Specification, Mask, Air Line, and Respirator, Air Filtering, Industrial, GGG–M–125d, October 11, 1965. This Federal Specification is available from the Government Printing Office or the General Services Administration.

§ 84.77 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against damage and distortion.

(b) Exhalation valves shall be:

(1) Protected against external influence; and

(2) Designed and constructed to prevent inward leakage of contaminated air.

§ 84.78 Head harnesses; minimum requirements.

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

(b) Mouthpieces shall be equipped, where applicable, with adjustable and replaceable harnesses designed and constructed to hold the mouthpiece in place.

§ 84.79 Breathing gas; minimum requirements.

(a) Breathing gas used to supply apparatus shall be respirable and contain no less than 19.5 (dry atmosphere) volume percent of oxygen.

(b) Oxygen, including liquid oxygen, shall meet the minimum requirements for medical or breathing oxygen set forth in the U.S. Pharmacopeia.

(c) Compressed, gaseous breathing air shall meet the applicable minimum grade requirements for Type I gaseous air set forth in the Compressed Gas Association Commodity Specification for Air, G–7.1 (Grade D or higher quality).

(d) Compressed, liquefied breathing air shall meet the applicable minimum grade requirements for Type II liquid air set forth in the Compressed Gas Association Commodity Specification for Air, G–7.1 (Grade B or higher quality).

§ 84.80 Interchangeability of oxygen and air prohibited.

Approvals shall not be issued by the Institute for any apparatus, combination of respirator assemblies, or any apparatus or respirator component which is designed or constructed to permit the interchangeable use of oxygen and air.

§ 84.81 Compressed breathing gas and liquefied breathing gas containers; minimum requirements.

(a) Compressed breathing gas and liquefied breathing gas containers shall meet the minimum requirements of the Department of Transportation for interstate shipment of such containers when fully charged.

(b) Such containers shall be permanently and legibly marked to identify their contents, e.g., compressed breathing air, compressed breathing oxygen, liquefied breathing air, or liquefied breathing oxygen.

(c) Containers normally removed from apparatus for refilling shall be equipped with a dial indicating gage which shows the pressure in the container.

(d) Compressed breathing gas contained valves or a separate charging system or adapter provided with each apparatus shall be equipped with outlet threads specified for the service by the American National Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections, B57.1 (1965), obtainable from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

§ 84.82 Gas pressure gages; minimum requirements.

(a) Gas pressure gages employed on compressed breathing gas containers shall be calibrated in pounds per square inch.

(b) Liquid-level gages shall be calibrated in fractions of total container capacity, or in units of liquid volume.

(c) Gas pressure gages other than those specified in paragraphs (a) and (b) of this section shall be calibrated in:

(1) Pounds per square inch; or

(2) In fractions of total container capacity; or

(3) Both in pounds per square inch and fractions of total container capacity.

(d)(1) Dial-indicating gages shall be reliable to within ±5 percent of full scale when tested both up and down the scale at each of 5 equal intervals.

(2) The full-scale graduation of dial-indicating gages shall not exceed 150 percent of the maximum rated cylinder pressures specified for the container in applicable Department of Transportation specifications or permits.

(e)(1) Stem-type gages shall be readable by sight and by touch and shall have a stem travel distance of not less than one-fourth inch between each graduation.

(2) A minimum of five graduations shall be engraved on the stem of each gage and these graduations shall include readings for empty, one-quarter, one-half, three-quarters, and full.

(3) Stem gage readings shall not vary from true readings by more than one-sixteenth inch per inch of stem travel.

(f) The loss of gas through a broken gage or severed gage connection shall not exceed 70 liters per minute when the cylinder pressure is 6,900 kN/m.^{2} (1,000 pounds per square inch gage) or when the liquid level is at one-half.

(g) Where gages are connected to the apparatus through a gage line, the gage and line shall be capable of being isolated from the apparatus except where the failure of the gage or line would not impair the performance or service life of the apparatus.

(h) Oxygen pressure gages shall have the words "Oxygen" and "Use No Oil" marked prominently on the gage.

(i)(1) Apparatus using compressed breathing gas, except apparatus classified for escape only, shall be equipped with gages visible to the wearer which indicate the remaining gas content in the container.

(2) Apparatus using liquefied breathing gas, except apparatus classified for escape only, shall be equipped with gages visible to the wearer which indicate the remaining liquid content in the container; however, where the liquid content cannot be rapidly vented, and the service time of the device begins immediately after filling, a timer shall be provided in place of a visible gage.

§ 84.83 Timers; elapsed time indicators; remaining service life indicators; minimum requirements.

(a) Elapsed time indicators shall be provided for apparatus with a chemical oxygen source, except:

(1) Apparatus used for escape only; or

(2) Liquefied breathing gas apparatus equipped with gages visible to the wearer which indicate the remaining liquid content in the container.

(b) The timer or other indicator shall be accurately calibrated in minutes of remaining service life.

(c) Timers shall be readable by sight and by touch during use by the wearer.

(d) Timers shall be equipped with automatically preset alarms which will warn the wearer for a period of 7 seconds or more after the preset time has elapsed.

(e) Remaining service-life indicators or warning devices shall be provided in addition to a pressure gage on compressed gas self-contained breathing apparatus, except apparatus used for escape only, and shall operate

automatically without preadjustment by the wearer.

(f) Each remaining service-life indicator or warning device shall give an alarm when the remaining service life of the apparatus is reduced within a range of 20 to 25 percent of its rated service time.

§ 84.84 Hand-operated valves; minimum requirements.

(a) Hand-operated valves shall be designed and constructed to prevent removal of the stem from the valve body during normal usage to insure against a sudden release of the full pressure of the container when the valve is opened.

(b) Valves shall be designed or positioned to prevent accidental opening and closing, and damage from external forces.

(c) Valves operated during use of the apparatus shall be installed in locations where they can be readily adjusted by the wearer.

(d) Main-line valves, designed and constructed to conserve gas in the event of a regulator or demand valve failure, shall be provided in addition to gas container valves, except when such failure will not affect performance.

(e) Hand-operated bypass systems designed and constructed to permit the wearer to breathe and to conserve his gas supply in the event of a regulator or demand valve failure, shall be provided where necessary.

(f) Valves installed on apparatus shall be clearly distinguishable from one another by sight and touch.

(g) The bypass system valve control shall be colored red.

(h) A main-line or bypass valve or system will not be required on apparatus for escape only.

(i) Safety relief valves or systems, designed and constructed to release excess pressure in the breathing circuit, shall be provided on closed-circuit apparatus, and shall meet the following requirements:

(1) The relief valve or system shall operate automatically when the pressure in the breathing circuit on the inhalation side of the breathing bag reaches 13 mm. (one-half inch) water-column height of pressure above the minimum pressure required to fill the breathing bag, within the breathing resistance requirements for the apparatus.

(2) The relief valve or system shall be designed to prevent external atmospheres from entering the breathing circuit.

(3) The relief valve or system shall be designed to permit manual overriding for test purposes and in the event of a failure in the valve or system.

§ 84.85 Breathing bags; minimum requirements.

(a) Breathing bags shall have sufficient volume to prevent gas waste during exhalation and to provide an adequate reserve for inhalation.

(b) Breathing bags shall be constructed of materials which are flexible and resistant to gasoline vapors.

(c) Breathing bags shall be installed in a location which will protect them from damage or collapse by external forces, except on apparatus classified for escape only.

§ 84.86 Component parts exposed to oxygen pressures; minimum requirements.

Each applicant shall certify that the materials employed in the construction of component parts exposed to oxygen pressures above atmospheric pressure are safe and compatible for their intended use.

§ 84.87 Compressed gas filters; minimum requirements.

All self-contained breathing apparatus using compressed gas shall have a filter downstream of the gas source to effectively remove particles from the gas stream.

§ 84.88 Breathing bag test.

(a) Breathing bags will be tested in an air atmosphere saturated with gasoline vapor at room temperature (24–30 °C./75–85 °F.) for a continuous period of twice the rated time of the apparatus (except for apparatus for escape only where the test period shall be the rated time of the apparatus).

(b) The bag will be operated during this test by a breathing machine with 24 respirations per minute and a minute-volume of 40 liters.

(c) A breathing machine cam with a work rate of 622 kg.-m./min. will be used.[1]

(d) The air within the bag(s) shall not contain more than 100 parts per million of gasoline vapor at the end of the test.

§ 84.89 Weight requirement.

(a) The completely assembled and fully charged apparatus shall not weigh more than 16 kg. (35 pounds); however, where the weight decreases by more than 25 percent of its initial charge weight during its rated service life, the maximum allowable weight of a completely assembled and fully charged apparatus shall be 18 kg. (40 pounds).

(b) Where an apparatus employs equipment which contributes materially to the wearer's comfort, e.g., a cooling system, the completely assembled and fully charged apparatus shall not weigh more than 18 kg. (40 pounds) regardless of the decrease in weight during use.

§ 84.90 Breathing resistance test; inhalation.

(a) Resistance to inhalation airflow will be measured in the facepiece or mouthpiece while the apparatus is operated by a breathing machine as described in § 84.88.

(b) The inhalation resistance of open-circuit apparatus shall not exceed 32 mm. (1.25 inch) water-column height (at a flow rate of 120 liters per minute).

(c) The inhalation resistance of closed-circuit apparatus shall not exceed the difference between exhalation resistance (§ 84.91(e)) and 10 cm. (4 inches) water-column height.

§ 84.91 Breathing resistance test; exhalation.

(a) Resistance to exhalation airflow will be measured in the facepiece or mouthpiece of open-circuit apparatus with air flowing at a continuous rate of 85 liters per minute.

(b) The exhalation resistance of demand apparatus shall not exceed 25 mm. (1 inch) water-column height.

(c) The exhalation resistance of pressure-demand apparatus shall not exceed the static pressure in the facepiece by more than 51 mm. (2 inches) water-column height.

(d) The static pressure (at zero flow) in the facepiece shall not exceed 38 mm. (1.5 inches) water-column height.

(e) Resistance to exhalation airflow will be measured in the facepiece or mouthpiece of closed-circuit apparatus with a breathing machine as described in § 84.88, and the exhalation resistance shall not exceed 51 mm. (2 inches) water-column height.

§ 84.92 Exhalation valve leakage test.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. (1 inch) water-column height while in a normal operating position.

(b) Leakage between the valve and the valve seat shall not exceed 30 milliliters per minute.

§ 84.93 Gas flow test; open-circuit apparatus.

(a) A static-flow test will be performed on all open-circuit apparatus.

(b) The flow from the apparatus shall be greater than 200 liters per minute when the pressure in the facepiece of demand-apparatus is lowered by 51 mm. (2 inches) water-column height when full container pressure is applied.

[1] Silverman, L., G. Lee, T. Plotkin, L. Amory, and A. R. Yancey, Fundamental Factors in Design of Protective Equipment, O.S.R.D. Report No. 5732, issued Apr. 1, 1945. The dimensions of the breathing machine cam are available from the Institute upon request.

(c) Where pressure demand apparatus are tested, the flow will be measured at zero gage pressure in the facepiece.

(d) Where apparatus with compressed-breathing-gas containers are tested, the flow test shall also be made with 3,450 kN/m.[2] (500 p.s.i.g.) container pressure applied.

§ 84.94 Gas flow test; closed-circuit apparatus.

(a) Where oxygen is supplied by a constant-flow device only, the rate of flow shall be at least 3 liters per minute for the entire rated service time of the apparatus.

(b) Where constant flow is used in conjunction with demand flow, the constant flow shall be greater than 1.5 liters per minute for the entire rated service time.

(c) All demand-flow devices shall provide at least 30 liters of oxygen per minute when in the fully open position.

§ 84.95 Service time test; open-circuit apparatus.

(a) Service time will be measured with a breathing machine as described in § 84.88.

(b) The open-circuit apparatus will be classified according to the length of time it supplies air or oxygen to the breathing machine.

(c) The service time obtained on this test will be used to classify the open-circuit apparatus in accordance with § 84.53.

§ 84.96 Service time test; closed-circuit apparatus.

(a) The closed-circuit apparatus will be classified according to the length of time it supplies adequate breathing gas to the wearer during man test No. 4 described in Table 4 of this subpart.

(b) The service time obtained on man test No. 4 will be used to classify the closed-circuit apparatus in accordance with § 84.53.

§ 84.97 Test for carbon dioxide in inspired gas; open- and closed-circuit apparatus; maximum allowable limits.

(a) Open-circuit apparatus:

(1) The concentration of carbon dioxide in inspired gas in open-circuit apparatus will be measured at the mouth while the apparatus mounted on a dummy head is operated by a breathing machine.[2]

(2) The breathing rate will be 14.5 respirations per minute with a minute-volume of 10.5 liters.

(3) A sedentary breathing machine cam will be used.

(4) The apparatus will be tested at a temperature of 27 ± 2° C. (80 ± 5° F.).

(5) A concentration of 5 percent carbon dioxide in air will be exhaled into the facepiece.

(b) Closed-circuit apparatus. The concentration of carbon dioxide in inspired gas in closed-circuit apparatus will be measured at the mouth while the parts of the apparatus contributing to dead-air space are mounted on a dummy head and operated by the breathing machine as in paragraphs (a)(1) through (5) of this section.

(c) During the testing required by paragraphs (a) and (b) of this section, the concentration of carbon dioxide in inspired gas at the mouth will be continuously recorded, and the maximum average concentration during the inhalation portion of the breathing cycle shall not exceed the following limits:

Where the service time is	Maximum allowable average concentration of carbon dioxide in inspired air percent by volume
Not more than 30 minutes	2.5
1 hour	2.0
2 hours	1.5
3 hours	1.0
4 hours	1.0

(d) In addition to the test requirements for closed-circuit apparatus set forth in paragraph (b) of this section, gas samples will be taken during the course of the man tests described in Tables 1, 2, 3, and 4 of this subpart. These gas samples will be taken from the closed-circuit apparatus at a point downstream of the carbon dioxide sorbent, and they shall not contain more than 0.5 percent carbon dioxide at any time, except on apparatus for escape only, using a mouthpiece only, the sample shall not contain more than 1.5 percent carbon dioxide at any time.

§ 84.98 Tests during low temperature operation.

(a) The applicant shall specify the minimum temperature for safe operation and two persons will perform the tests described in paragraphs (c) and (d) of this section, wearing the apparatus according to applicant's directions. At the specified temperature, the apparatus shall meet all the requirements described in paragraph (e) of this section.

(b) The apparatus will be precooled at the specified minimum temperature for 4 hours.

(c) The apparatus will be worn in the low temperature chamber for 30 minutes, or for the service time of the apparatus, whichever is less.

(d) During the test period, alternate 1-minute periods of exercise and rest will be required with the exercise periods consisting of stepping onto and off a box 21.5 cm. (8½ inches) high at a rate of 30 cycles per minute.

(e)(1) The apparatus shall function satisfactorily at the specified minimum temperature on duplicate tests.

(2) The wearer shall have sufficient unobscured vision to perform the work.

(3) The wearer shall not experience undue discomfort because of airflow restriction or other physical or chemical changes in the operation of the apparatus.

(f) Auxiliary low-temperature parts which are commercially available to the user may be used on the apparatus to meet the requirements described in paragraph (e) of this section.

§ 84.99 Man tests; testing conditions; general requirements.

(a) The man tests described in Tables 1, 2, 3, and 4 of this subpart represent the workload performed in the mining, mineral, or allied industries by a person wearing the apparatus tested.

(b) The apparatus tested will be worn by Institute personnel trained in the use of self-contained breathing apparatus, and the wearer will, before participating in these tests, pass a physical examination conducted by a qualified physician.

(c) All man tests will be conducted by the Institute.

(d) The apparatus will be examined before each man test to ensure that it is in proper working order.

(e) Breathing resistance will be measured within the facepiece or mouthpiece and the wearer's pulse and respiration rate will be recorded during each 2 minute sample period prescribed in tests 1, 2, 3, and 4.

(f) Man tests 1, 2, 3, 4, 5, and 6 will be conducted in duplicate.

(g) If man tests are not completed through no fault of the apparatus, the test will be repeated.

§ 84.100 Man tests 1, 2, 3, and 4; requirements.

Man tests 1, 2, 3, and 4, set forth in Tables 1, 2, 3, and 4 of this subpart, respectively, prescribe the duration and sequence of specific activities. These tests will be conducted to:

(a) Familiarize the wearer with the apparatus during use;

(b) Provide for a gradual increase in activity;

(c) Evaluate the apparatus under different types of work and physical orientation; and

[2] Kloos, E. J., and J. Lamonica, A Machine-Test Method for Measuring Carbon Dioxide in the Inspired Air of Self-Contained Breathing Apparatus. Bureau of Mines Report of Investigations 6865, 1966, 11 pp.

(d) Provide information on the operating and breathing characteristics of the apparatus during actual use.

§ 84.101 Man test 5; requirements.

(a) Test 5 will be conducted to determine the maximum length of time the apparatus will supply the respiratory needs of the wearer while he is sitting at rest.

(b) The wearer will manipulate the devices controlling the supply of breathing gas to the advantage of the apparatus.

(c) Samples of inspiration from within the apparatus facepiece or mouthpiece shall be taken once every 15 minutes, and shall meet the minimum requirement for oxygen specified in § 84.79(a), and the maximum allowable average concentration of carbon dioxide specified in § 84.97(c).

(d) One sample of inspiration will be taken in the case of 3-, 5-, and 10-minute apparatus.

§ 84.102 Man test 6; requirements.

(a) Man test 6 will be conducted with respect to liquefied breathing gas apparatus only.

(b) This test will be conducted to evaluate operation of the apparatus in other than vertical positions.

(c) The wearer will lie face downward for one-fourth the service life of the apparatus with a full charge of liquefied breathing gas, and then a one-quarter full charge of liquefied breathing gas.

(d) The test will be repeated with the wearer lying on each side and on his back.

(e) The oxygen content of the gas supplied to the wearer by the apparatus will be continuously measured.

§ 84.103 Man tests; performance requirements.

(a) The apparatus shall satisfy the respiratory requirements of the wearer for the classified service time.

(b) Fogging of the eyepiece shall not obscure the wearer's vision, and the wearer shall not experience undue discomfort because of fit or other characteristics of the apparatus.

(c) When the ambient temperature during testing is 24±6 °C. (75±10 °F.), the maximum temperature of inspired air recorded during man tests shall not exceed the following, after correction for deviation from 24 °C. (75 °F.):

Where service life of apparatus is—	Where percent relative humidity of inspired air is—	Maximum permissible temperature of inspired air shall not exceed—	
		°F.	°C.
¼ hour or less	0–100	135	57
½ hour to ¾ hour	0–50	125	52
	50–100	[1] 110	[1] 43
1 to 2 hours	0–50	115	46
	50–100	[1] 105	[1] 41
3 hours	0–50	110	43
	50–100	[1] 100	[1] 38
4 hours	0–50	105	41
	50–100	[1] 95	[1] 35

[1] Where percent relative humidity is 50–100 and apparatus is designed for escape only, these maximum permissible temperatures will be increased by 5 °C. (10 °F.).

§ 84.104 Gas tightness test; minimum requirements.

(a) Each apparatus will be tested for tightness by persons wearing it in an atmosphere of 1,000 p.p.m. isoamyl acetate.

(b) Six persons will each wear the apparatus in the test concentrations specified in paragraph (a) of this section for 2 minutes and none shall detect the odor or taste of the test vapor.

Tables to Subpart H of Part 84

TABLE 1.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 1, IN MINUTES

[42 CFR part 84, subpart H]

Activity	Service time—							
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2, 3, and 4 hours
Sampling and readings				2	2	2	2	Perform 1 hour test 2, 3, or 4 times respectively.
Walks at 4.8 km. (3 miles) per hour.	3	5	3	4	8	12	18	
Sampling and readings			2	2	2	2	2	
Walks at 4.8 km. (3 miles) per hour.			3	5	8	12	18	
Sampling and readings			2	2	2	2	2	
Walks at 4.8 km. (3 miles) per hour.					6	13	16	
Sampling and readings					2	2	2	

TABLE 2.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 2, IN MINUTES

[42 CFR part 84, subpart H]

Activity	Service time							
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2, 3 and 4 hours [1]
Sampling and readings				2	2	2	2	2.
Walks at 4.8 km. (3 miles) per hour.			1	1	3	4	6	10.
Carries 23 kg. (50 pound) weight over overcast.			1 time in 2 minutes.	1 time in 2 minutes.	2 times in 4 minutes.	3 times in 6 minutes.	4 times in 8 minutes.	5 times in 10 minutes.
Walks at 4.8 km. (3 miles) per hour.				1	3	3	3	5.
Climbs vertical treadmill [2] (or equivalent).	1	1	1	1	1	1	1	1.
Walks at 4.8 km. (3 miles) per hour.		1	1			2	3	5.
Climbs vertical treadmill (or equivalent).		1				1	1	1.
Sampling and readings					2	2	2	2.
Walks at 4.8 km. (3 miles) per hour.				2	2	3	5	11.
Climbs vertical treadmill (or equivalent).				1	1	1	1	1.
Carries 23 kg. (50 pound) weight over overcast.				1 time in 2 minutes.	3 times in 6 minutes.	4 times in 8 minutes.	5 times in 10 minutes.	5 times in 10 minutes.
Sampling and readings			2			2	2	2.
Walks at 4.8 km. (3 miles) per hour.				1	3	3	3	
Climbs vertical treadmill (or equivalent).			1		1	1	1	Then repeat above activities once.
Walks at 4.8 km. (3 miles) per hour.			2			2	3	
Climbs vertical treadmill (or equivalent).						1	1	
Carries 20 kg. (45 pound) weight and walks at 4.8 km. (3 miles) per hour.	1						2	
Walks at 4.8 km. (3 miles) per hour.	1	2				1	4	
Sampling and readings				2	2	2	2	

[1] Total test time for Test 2 for 2-hour, 3-hour, and 4-hour apparatus is 2 hours.

[2] Treadmill shall be inclined 15° from vertical and operated at a speed of 1 foot per second.

TABLE 3.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 3, IN MINUTES

[42 CFR part 84, subpart H]

Activity	Service time							
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2, 3 and 4 hours [1]
Sampling and readings				2	2	2	2	(2)
Walks at 4.8 km. (3 miles) per hour.			1	1	2	2	3	
Runs at 9.7 km. (6 miles) per hour.	1	1	1	1	1	1	1	
Pulls 20 kg. (45 pound) weight to 5 feet.		15 times in 1 minute.		30 times in 2 minutes.	30 times in 2 minutes.	30 times in 2 minutes.	60 times in 6 minutes.	
Lies on side	½	1	1	2	3	4	5	
Lies on back	½	1	1	2	2	3	3	
Crawls on hands and knees	1	1	1	2	2	2	2	
Sampling and readings			2		2	2	2	
Runs at 9.7 km. (6 miles) per hour.				1	1	1	1	
Walks at 4.8 km. (3 miles) per hour.					2	8	10	

TABLE 3.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 3, IN MINUTES—Continued

[42 CFR part 84, subpart H]

Activity	Service time							
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2, 3 and 4 hours [1]
Pulls 20 kg. (45 pound) weight to 5 feet.	.....	.....	30 times in 2 minutes.	.....	60 times in 6 minutes.	60 times in 6 minutes.	60 times in 6 minutes.	
Sampling and readings	.....	.....	.....	2	.....	2	2	
Walks at 4.8 km. (3 miles) per hour.	.....	.....	1	.....	3	4	10	
Lies on side	.....	.....	.....	.....	.....	2	4	
Lies on back	.....	.....	.....	.....	.....	2	1	
Sampling and readings	.....	.....	.....	.....	2	2	2	

[1] Total test time for Test 3 for 2-hour, 3-hour, and 4-hour apparatus is 2 hours.
[2] Perform test No. 3 for 1-hour apparatus; then perform test No. 1 for 1-hour apparatus.

TABLE 4.—DURATION AND SEQUENCE OF SPECIFIC ACTIVITIES FOR TEST 4, IN MINUTES

[42 CFR part 84, subpart H]

Activity	Service time-									
	3 minutes	5 minutes	10 minutes	15 minutes	30 minutes	45 minutes	1 hour	2 hours	3 hours	4 hours
Sampling and readings	.....	.....	.....	2	2	2	2	[2]	[3]	[4]
Walks at 4.8 km. (3 miles) per hour.	.....	.....	.....	1	2	2	2			
Climbs vertical treadmill [1] (or equivalent).	1	1	1	1	1	1	1			
Walks at 4.8 km. (3 miles) per hour.	.....	1	1	1	2	2	2			
Pulls 20 kg. (45 pound) weight to 5 feet.	.....	30 times in 2 minutes.	30 times in 2 minutes.	30 times in 2 minutes.	60 times in 5 minutes.	60 times in 5 minutes.	60 times in 5 mins..			
Walks at 4.8 km. (3 miles) per hour.	.....	.....	1	1	1	2	3			
Carries 23 kg. (50 pound) weight over overcast.	.....	.....	.....	1 time in 1 minute.	1 time in 1 minute.	2 times in 3 minutes.	4 times in 8 mins..			
Sampling and readings	.....	.....	2	.....	2	2	2			
Walks at 4.8 km. (3 miles) per hour.	.....	.....	.....	1	3	3	4			
Runs at 9.7 km. (6 miles) per hour.	.....	1	1	1	1	1	1			
Carries 23 kg. (50 pound) weight over overcast.	.....	.....	1 time in 1 minute.	1 time in 1 minute.	2 times in 3 minutes.	4 times in 6 minutes.	6 times in 9 mins..			
Pulls 20 kg (45 pound) weight to 5 feet.	15 times in 1 minute.	.....	.....	15 times in 1 minute.	60 times in 5 minutes.	30 times in 2 minutes.	36 times in 3 mins..			
Sampling and readings	.....	.....	.....	2	2	2	2			
Walks at 4.8 km. (3 miles) per hour.	1	.....	1	.....	.....	2	6			
Pulls 20 kg. (45 pound) weight to 5 feet.	.....	.....	.....	.....	.....	60 times in 5 minutes.	60 times in 5 mins..			
Carries 20 kg. (45 pound) weight and walks at 4.8 km. (3 miles) per hour.	.....	.....	.....	.....	.....	3	3			
Sampling and readings	.....	.....	.....	.....	.....	2	2			

[1] Treadmill shall be inclined 15° from vertical and operated at a speed of 30 cm. (1 foot) per second.
[2] Perform test No. 1 for 30-minute apparatus; then perform test No. 4 for 1-hour apparatus; then perform test No. 1 for 30-minute apparatus.
[3] Perform test No. 1 for 1-hour apparatus; then perform test No. 4 for 1-hour apparatus; then perform test No. 1 for 1-hour apparatus.
[4] Perform test No. 1 for 1-hour apparatus; then perform test No. 4 for 1-hour apparatus; then perform test No. 1 for 1-hour apparatus twice (i.e., two one-hour tests).

Subpart I—Gas Masks

§ 84.110 Gas masks; description.

(a) Gas masks including all completely assembled air purifying masks designed for use as respiratory protection during entry into atmospheres not immediately dangerous to life or health or escape only from hazardous atmospheres containing adequate oxygen to support life are described as follows:

(1) *Front-mounted or back-mounted gas mask.* A gas mask which consists of a full facepiece, a breathing tube, a canister at the front or back, a canister harness, and associated connections.

(2) *Chin-style gas mask.* A gas mask which consists of a full facepiece, a canister which is usually attached to the facepiece, and associated connections.

(3) *Escape gas mask.* A gas mask designed for use during escape only from hazardous atmospheres which consists of a facepiece or mouthpiece, a canister, and associated connections.

(b) Gas masks shall be further described according to the types of gases or vapors against which they are designed to provide respiratory protection, as follows:

Type of front-mounted or back-mounted gas mask:
Acid gas[1 2 3]
Ammonia
Carbon monoxide
Organic vapor[1 2 3]
Other gas(es) and vapor(s)[1 2 3]
Combination of two or more of the above gases and vapors.[1 2 3]
Combination of acid gas, ammonia, carbon monoxide, and organic vapors.[1 2 3]
Type of chin-style gas mask:
Acid gas[1 2 3]
Ammonia
Carbon monoxide
Organic vapor[1 2 3]
Other gas(es) and vapor(s)[1 2 3]
Combination of two or more of the above gases and vapors.[1 2 3]
Type of escape gas mask:
Acid gas[1 2 3 4]
Ammonia[4]
Carbon monoxide
Organic vapor[1 2 3 4]
Other gas(es) and vapor(s)[1 2 3 4]
Combination of two or more of the above gases and vapors.[1 2 3 4]

[1] Approval may be for acid gases or organic vapors as a class or for specific acid gases or organic vapors.

[2] Not for use against gases or vapors with poor warning properties (except where MSHA or Occupational Safety and Health Administration standards permit such use for a specific gas or vapor), or those which generate high heats or reaction with sorbent materials in the canister.

[3] Use of the gas mask may be limited by factors such as lower explosive limit, toxicological effects, and facepiece fit. Limitations on gas mask service life and sorbent capacity limitations shall be specified by the applicant in instructions for selection, use and maintenance of the gas mask.

[4] Eye protection may be required in certain concentrations of gases and vapors.

(c) Gas masks for respiratory protection against gases and vapors other than those specified in paragraph (b) of this section, may be approved upon submittal of an application in writing for approval to the Certification and Quality Assurance Branch listing the gas or vapor and suggested maximum use concentration for the specific type of gas mask. The Institute will consider the application and accept or reject it on the basis of effect on the wearer's health and safety and any field experience in use of gas masks for such exposures. If the application is accepted, the Institute will test such masks in accordance with the requirements of this subpart.

§ 84.111 Gas masks; required components.

(a) Each gas mask described in § 84.110 shall, where its design requires, contain the following component parts:

(1) Facepiece or mouthpiece and noseclip;

(2) Canister or cartridge;

(3) Canister harness;

(4) External check valve; and

(5) Breathing tube.

(b) The components of each gas mask shall meet the minimum construction requirements set forth in subpart G of this part.

§ 84.112 Canisters and cartridges in parallel; resistance requirements.

Where two or more canisters or cartridges are used in parallel, their resistance to airflow shall be essentially equal.

§ 84.113 Canisters and cartridges; color and markings; requirements.

The color and markings of all canisters and cartridges or labels shall conform with the requirements of the American National Standard for Identification of Air Purifying Respirator Canisters and Cartridges, K 13.1–1973, obtainable from the American National Standards Institute, Inc.; 1430 Broadway; New York, N.Y. 10018.

§ 84.114 Filters used with canisters and cartridges; location; replacement.

(a) Particulate matter filters used in conjunction with a canister or cartridge shall be located on the inlet side of the canister or cartridge.

(b) Filters shall be incorporated in or firmly attached to the canister or cartridge and each filter assembly shall, where applicable, be designed to permit its easy removal from and replacement in the canister or cartridge.

§ 84.115 Breathing tubes; minimum requirements.

Flexible breathing tubes used in conjunction with gas masks shall be designed and constructed to prevent:

(a) Restriction of free head movement;

(b) Disturbance of the fit of facepieces or mouthpieces;

(c) Interference with the wearer's activities; and

(d) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 84.116 Harnesses; installation and construction; minimum requirements.

(a) Each gas mask shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the gas mask in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of gas mask parts, and where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 84.117 Gas mask containers; minimum requirements.

(a) Gas masks shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of mask it contains and all appropriate approval labels.

(b) Containers for gas masks shall be designed and constructed to permit easy removal of the mask.

§ 84.118 Half-mask facepieces, full facepieces, and mouthpieces; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either:

(1) By providing more than one facepiece size; or

(2) By providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for optional use of corrective spectacles or lenses, which shall not reduce the respiratory protective qualities of the gas mask.

(c) Half-mask facepieces shall not interfere with the fit of common industrial safety spectacles, as determined by the Institute's facepiece tests in § 84.124.

(d) Gas masks with mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or gas mask and provide an airtight seal.

(e) Facepieces shall be designed to prevent eyepiece fogging.

§ 84.119 Facepieces; eyepieces; minimum requirements.

(a) Full facepieces shall be designed and constructed to provide adequate vision which is not distorted by the eye.

(b) All eyepieces shall be designed and constructed to meet the impact and penetration requirements specified in Federal Specification, Mask, Air Line: and Respirator, Air Filtering, Industrial, GGG–M–125d, October 11, 1965.

§ 84.120 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against damage and distortion.

(b) Inhalation valves shall be designed and constructed to prevent excessive exhaled air from adversely affecting cartridges, canisters, and filters.

(c) Exhalation valves shall be protected against external influence, and designed and constructed to prevent inward leakage of contaminated air.

§ 84.121 Head harnesses; minimum requirements.

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

(b) Mouthpieces shall be equipped, where applicable, with adjustable and replaceable harnesses designed and constructed to hold the mouthpiece in place.

§ 84.122 Breathing resistance test; minimum requirements.

(a) Resistance to airflow will be measured in the facepiece or mouthpiece of a gas mask mounted on a breathing machine both before and after each test conducted in accordance with §§ 84.124, 84.125, and 84.126, with air flowing at a continuous rate of 85 liters per minute.

(b) The maximum allowable resistance requirements for gas masks are as follows:

MAXIMUM RESISTANCE
[mm. water-column height]

Type of gas mask	Inhalation		Exhalation
	Initial	Final[1]	
Front-mounted or back-mounted (without particulate filter)	60	75	20
Front-mounted or back-mounted (with approved particulate filter)	70	85	20
Chin-style (without particulate filter)	40	55	20
Chin-style (with approved particulate filter)	65	80	20
Escape (without particulate filter)	60	75	20
Escape (with approved particulate filter)	70	85	20

[1] Measured at end of the service life specified in tables 5, 6, and 7 of this subpart.

§ 84.123 Exhalation valve leakage test.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 84.124 Facepiece tests; minimum requirements.

(a) The complete gas mask will be fitted to the faces of persons having varying facial shapes and sizes.

(b) Where the applicant specifies a facepiece size or sizes for the gas mask, together with the approximate measurements of faces they are designed to fit, the Institute will insure that test subjects suit such facial measurements.

(c) Any gas mask parts which must be removed to perform the facepiece or mouthpiece fit test shall be replaceable without special tools and without disturbing the facepiece or mouthpiece fit.

(d) The facepiece or mouthpiece fit test, using positive or negative pressure recommended by the applicant and described in his instructions will be used before each test specified in paragraph (e) of this section, and in § 84.125.

(e) (1) Each wearer will enter a chamber containing 100 p.p.m. isoamyl acetate vapor for a half-mask facepiece and 1,000 p.p.m. isoamyl acetate vapor for a full facepiece or mouthpiece.

(2) The facepiece or mouthpiece may be adjusted, if necessary, in the test chamber before starting the tests.

(3) Each wearer will remain in the chamber for 8 minutes while performing the following activities:

(i) Two minutes, nodding and turning head;

(ii) Two minutes, calisthenic arm movements;

(iii) Two minutes, running in place; and

(iv) Two minutes, pumping with a tire pump into a 28 liter (1 cubic foot) container.

(4) Each wearer shall not detect the odor of isoamyl acetate during the test.

§ 84.125 Particulate tests; canisters containing particulate filters; minimum requirements.

Gas mask canisters containing filters for protection against particulates (e.g. dusts, fumes, mists, and smokes) in combination with gases, vapors, or gases and vapors, shall also comply with the requirements as prescribed in §§ 84.170 through 84.186, except for the airflow resistance test of § 84.183.

§ 84.126 Canister bench tests; minimum requirements.

(a) (1) Bench tests, except for carbon monoxide tests, will be made on an apparatus that allows the test atmosphere at 50±5 percent relative humidity and room temperature (25±2.5 °C.) to enter the canister continuously at concentrations and rates of flow specified in Tables 5, 6, and 7 of this subpart.

(2) Three canisters will be removed from containers and tested as received from the applicant.

(3) Two canisters, other than those described in paragraph (a)(2) of this section, will be equilibrated at room temperature by passing 25 percent relative humidity air through them at 64 liters per minute for 6 hours.

(4) Two canisters, other than those described in paragraphs (a) (2) and (3) of this section, will be equilibrated at room temperature by passing 85 percent relative humidity air through them at 64 liters per minute for 6 hours.

(5) The equilibrated canisters will be resealed, kept in an upright position at room temperature, and tested within 18 hours.

(b) Front-mounted and back-mounted gas mask canisters will be tested and shall meet the minimum requirements set forth in Table 5 of this subpart.

(c) (1) Front-mounted, and back-mounted, and chin-style canisters designated as providing respiratory protection against gases, ammonia, organic vapors, carbon monoxide and particulate contaminants shall have a window or other indicator to warn the gas mask wearer when the canister will no longer satisfactorily remove carbon monoxide from the inhaled air.

(2) Other types of front- and back-mounted canisters may also be equipped with a window or other indicator to warn of imminent leakage of other gases or vapors.

(3) The window indicator canisters will be tested as regular canisters, but shall show a satisfactory indicator change or other warning before the allowable canister penetration has occurred.

(d) Chin-style gas mask canisters shall meet the minimum requirements set forth in Table 6 of this subpart.

(e) Escape gas mask canisters shall meet the minimum requirements set forth in Table 7 of this subpart.

Tables to Subpart I of Part 84

TABLE 5.—CANISTER BENCH TESTS AND REQUIREMENTS FOR FRONT-MOUNTED AND BACK-MOUNTED GAS MASK CANISTERS

[42 CFR part 84, subpart I]

Canister type	Test condition	Test atmosphere			Number of tests	Maximum allowable penetration (parts per million)	Minimum service life (minutes) [1]
		Gas or vapor	Concentration (parts per million)	Flow rate (liters per minute)			
Acid gas	As received	SO_2	20,000	64	3	5	12
	Equilibrated	Cl_2	20,000	64	3	5	12
		SO_2	20,000	32	4	5	12
		Cl_2	20,000	32	4	5	12
Organic vapor	As received	CCl_4	20,000	64	3	5	12
	Equilibrated	CCl_4	20,000	32	4	5	12
Ammonia	As received	NH_3	30,000	64	3	50	12
	Equilibrated	NH_3	30,000	32	4	50	12
Carbon monoxide	As received	CO	20,000	[2] 64	2	[3]	60
		CO	5,000	[4] 32	3	[3]	60
		CO	3,000	[2] 32	3	.....	60
Combination of 2 or 3 of above types [5]	.....	.....	.....	.....	.....	[3]	.....
Combination of all of above.[6]							

[1] Minimum life will be determined at the indicated penetration.
[2] Relative humidity of test atmosphere will be 95 ± 3pct; temperature of test atmosphere will be 25 ± 2.5 °C.
[3] Maximum allowable CO penetration will be 385 cm^3 during the minimum life. The penetration shall not exceed 500 p/m during this time.
[4] Relative humidity of test atmosphere will be 95 ± 3pct; temperature of test atmosphere entering the test fixture will be 0 + 2.5 °C −0 °C.
[5] Test conditions and requirements will be applicable as shown above.
[6] Test conditions and requirements will be applicable as shown above, except the minimum service lives for acid gas, organic vapor, and ammonia will be 6 min instead of 12 min.

TABLE 6.—CANISTER BENCH TESTS AND REQUIREMENTS FOR CHIN-STYLE GAS MASK CANISTERS

[42 CFR part 84, subpart I]

Canister type	Test condition	Test atmosphere			Number of tests	Maximum allowable penetration (parts per million)	Minimum service life (minutes) [1]
		Gas or vapor	Concentration (parts per million)	Flow rate (liters per minute)			
Acid gas	As received	SO_2	5,000	64	3	5	12
	Equilibrated	Cl_2	5,000	64	3	5	12
		SO_2	5,000	32	4	5	12
		Cl_2	5,000	32	4	5	12
Organic vapor	As received	CCl_4	5,000	64	3	5	12
	Equilibrated	CCl_4	5,000	32	4	5	12
Ammonia	As received	NH_3	5,000	64	3	50	12
	Equilibrated	NH_3	5,000	32	4	50	12
Carbon monoxide	As received	CO	20,000	[2] 64	2	[3]	60
		CO	5,000	[4] 32	3	[3]	60
		CO	3,000	[2] 32	3	[3]	60
Combination of 2 or 3 of above types [5]							
Combination of all of above types [6]							

[1] Minimum life will be determined at the indicated penetration.

[2] Relative humidity of test atmosphere will be 95 ± 3pct; temperature of test atmosphere will be 25 ± 2.5° C.
[3] Maximum allowable CO penetration will be 385 cm^3 during the minimum life. The penetration shall not exceed 500 p/m during this time.
[4] Relative humidity of test atmosphere will be 95 ± 3pct; temperature of test atmosphere entering the test fixture will be 0 + 2.5° C − 0° C.
[5] Test conditions and requirements will be applicable as shown above.
[6] Test conditions and requirements will be applicable as shown above, except the minimum service lives for acid gas, organic vapor, and ammonia will be 6 min instead of 12 min.

TABLE 7.—CANISTER BENCH TESTS AND REQUIREMENTS FOR ESCAPE GAS MASK CANISTERS

[42 CFR part 84, subpart I]

Canister type	Test condition	Test atmosphere			Number of tests	Maximum allowable penetration (parts per million)	Minimum service life (minutes)[1]
		Gas or vapor	Concentration (parts per million)	Flow rate (liters per minute)			
Acid gas	As received	SO_2	5,000	64	3	5	12
	Equilibrated	Cl_2	5,000	64	3	5	12
		SO_2	5,000	32	4	5	12
		Cl_2	5,000	32	4	5	12
Organic vapor	As received	CCl_4	5,000	64	3	5	12
	Equilibrated	CCl_4	5,000	32	4	5	12
Ammonia	As received	NH_3	5,000	64	3	50	12
	Equilibrated	NH_3	5,000	32	4	50	12
Carbon monoxide	As received	CO	10,000	[2] 32	2	[3]	[4] 60
		CO	5,000	.....	3	[3]	60
		CO	3,000	[5] 32	3	[3]	60
				[2] 32			

[1] Minimum life will be determined at the indicated penetration.
[2] Relative humidity of test atmosphere will be 95 ± 3pct; temperature of test atmosphere will be 25 ± 2.5 °C.
[3] Maximum allowable CO penetration will be 385 cm^3 during the minimum life. The penetration shall not exceed 500 p/m during this time.
[4] If effluent temperature exceeds 100 °C during this test, the escape gas mask shall be equipped with an effective heat exchanger.
[5] Relative humidity of test atmosphere will be 95 ± 3 pct; temperature of test atmosphere entering the test fixture will be 0+2.5 °C − 0 °C.

Subpart J—Supplied-Air Respirators

§ 84.130 Supplied-air respirators; description.

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

(1) Type "A" supplied-air respirators. A hose mask respirator, for entry into and escape from atmospheres not immediately dangerous to life or health, which consists of a motor-driven or hand-operated blower that permits the free entrance of air when the blower is not operating, a strong large-diameter hose having a low resistance to airflow, a harness to which the hose and the life-line are attached and a tight-fitting facepiece.

(2) Type "AE" supplied-air respirators. A Type "A" supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning.

(3) Type "B" supplied-air respirators. A hose mask respirator, for entry into and escape from atmospheres not immediately dangerous to life or health, which consists of a strong large-diameter hose with low resistance to airflow through which the user draws inspired air by means of his lungs alone, a harness to which the hose is attached, and a tight-fitting facepiece.

(4) Type "BE" supplied-air respirators. A type "B" supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning.

(5) Type "C" supplied-air respirators. An airline respirator, for entry into and escape from atmospheres not immediately dangerous to life or health, which consists of a source of respirable breathing air, a hose, a detachable coupling, a control valve, orifice, a demand valve or pressure demand valve, an arrangement for attaching the hose to the wearer, and a facepiece, hood, or helmet.

(6) Type "CE" supplied-air respirators. A type "C" supplied-air respirator equipped with additional devices designed to protect the wearer's head and neck against impact and abrasion from rebounding abrasive material, and with shielding material such as plastic, glass, woven wire, sheet metal, or other suitable material to protect the window(s) of facepieces, hoods, and helmets which do not unduly interfere with the wearer's vision and permit easy access to the external surface of such window(s) for cleaning.

§ 84.131 Supplied-air respirators; required components.

(a) Each supplied-air respirator described in § 84.130 shall, where its design requires, contain the following component parts:

(1) Facepiece, hood, or helmet;

(2) Air supply valve, orifice, or demand or pressure-demand regulator;

(3) Hand operated or motor driven air blower;

(4) Air supply hose;

(5) Detachable couplings;
(6) Flexible breathing tube; and
(7) Respirator harness.
(b) The component parts of each supplied-air respirator shall meet the minimum construction requirements set forth in subpart G of this part.

§ 84.132 Breathing tubes; minimum requirements.

Flexible breathing tubes used in conjunction with supplied-air respirators shall be designed and constructed to prevent:
(a) Restriction of free head movement;
(b) Disturbance of the fit of facepieces, mouthpieces, hoods, or helmets;
(c) Interference with the wearer's activities; and
(d) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 84.133 Harnesses; installation and construction; minimum requirements.

(a) Each supplied-air respirator shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the respirator in position against the wearer's body.
(b) Harnesses shall be designed and constructed to permit easy removal and replacement of respirator parts, and where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 84.134 Respirator containers; minimum requirements.

Supplied-air respirators shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of the respirator it contains, and all appropriate approval labels.

§ 84.135 Half-mask facepieces, full facepieces, hoods, and helmets; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either:
(1) By providing more than one facepiece size; or
(2) By providing one facepiece size which will fit varying facial shapes and sizes.
(b) Full facepieces shall provide for optional use of corrective spectacles or lenses, which shall not reduce the respiratory protective qualities of the respirator.
(c) Hoods and helmets shall be designed and constructed to fit persons with various head sizes, provide for the optional use of corrective spectacles or lenses, and insure against any restriction of movement by the wearer.
(d) Facepieces, hoods, and helmets shall be designed to prevent eyepiece fogging.

§ 84.136 Facepieces, hoods, and helmets; eyepieces; minimum requirements.

(a) Facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepiece.
(b) All eyepieces except those on Types B, BE, C, and CE supplied-air respirators shall be designed and constructed to meet the impact and penetration requirements specified in Federal Specification, Mask, Air Line, and Respirator, Air Filtering, Industrial GGG–M–125d, October 11, 1965.
(c) (1) The eyepieces of AE, BE, and CE type supplied-air respirators shall be shielded by plastic, glass, woven wire, sheet metal, or other suitable material which does not interfere with the vision of the wearer.
(2) Shields shall be mounted and attached to the facepiece to provide easy access to the external surface of the eyepiece for cleaning.

§ 84.137 Inhalation and exhalation valves; check valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against distortion.
(b) Exhalation valves shall be:
(1) Protected against damage and external influence; and
(2) Designed and constructed to prevent inward leakage of contaminated air.
(c) Check valves designed and constructed to allow airflow toward the facepiece only shall be provided in the connections to the facepiece or in the hose fitting near the facepiece of all Type A, AE, B, and BE supplied-air respirators.

§ 84.138 Head harnesses; minimum requirements.

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

§ 84.139 Head and neck protection; supplied-air respirators; minimum requirements.

Type AE, BE, and CE supplied-air respirators shall be designed and constructed to provide protection against impact and abrasion from rebounding abrasive materials to the wearer's head and neck.

§ 84.140 Air velocity and noise levels; hoods and helmets; minimum requirements.

Noise levels generated by the respirator will be measured inside the hood or helmet at maximum airflow obtainable within pressure and hose length requirements and shall not exceed 80 dBA.

§ 84.141 Breathing gas; minimum requirements.

(a) Breathing gas used to supply supplied-air respirators shall be respirable breathing air and contain no less than 19.5 volume-percent of oxygen.
(b) Compressed, gaseous breathing air shall meet the applicable minimum grade requirements for Type I gaseous air set forth in the Compressed Gas Association Commodity Specification for Air, G–7.1 (Grade D or higher quality).
(c) Compressed, liquefied breathing air shall meet the applicable minimum grade requirements for Type II liquid air set forth in the Compressed Gas Association Commodity Specification for Air, G–7.1 (Grade B or higher quality).

§ 84.142 Air supply source; hand-operated or motor driven air blowers; Type A supplied-air respirators; minimum requirements.

(a) Blowers shall be designed and constructed to deliver an adequate amount of air to the wearer with either direction of rotation, unless constructed to permit rotation in one direction only, and to permit the free entrance of air to the hose when the blower is not operated.
(b) No multiple systems, whereby more than one user is supplied by one blower, will be approved, unless each hose line is connected directly to a manifold at the blower.

§ 84.143 Terminal fittings or chambers; Type B supplied-air respirators; minimum requirements.

(a) Blowers or connections to air supplies providing positive pressures shall not be approved for use on Type B supplied-air respirators.
(b) Terminal fittings or chambers employed in Type B supplied-air respirators, shall be:
(1) Installed in the inlet of the hose.
(2) Designed and constructed to provide for the drawing of air through corrosion resistant material arranged so as to be capable of removing material larger than 0.149 mm. in diameter (149 micrometers, 100-mesh, U.S. Standard sieve).
(3) Installed to provide a means for fastening or anchoring the fitting or

chamber in a fixed position in a zone of respirable air.

§ 84.144 Hand-operated blower test; minimum requirements.

(a) Hand-operated blowers shall be tested by attaching them to a mechanical drive and operating them 6 to 8 hours daily for a period of 100 hours at a speed necessary to deliver 50 liters of air per minute through each completely assembled respirator. Each respirator shall be equipped with the maximum length of hose with which the device is to be approved and the hose shall be connected to each blower or manifold outlet designed for hose connections.

(b) The crank speed of the hand-operated blower shall not exceed 50 revolutions per minute in order to deliver the required 50 liters of air per minute to each facepiece.

(c) The power required to deliver 50 liters of air per minute to each wearer through the maximum length of hose shall not exceed one-fiftieth horsepower, and the torque shall not exceed a force of 2.3 kg. (5 pounds) on a 20 cm. (8-inch) crank, as defined in § 84.146.

(d) The blower shall operate throughout the period without failure or indication of excessive wear of bearings or other working parts.

§ 84.145 Motor-operated blower test; minimum requirements.

(a) Motor-operated blowers shall be tested by operating them at their specified running speed 6 to 8 hours daily for a period of 100 hours when assembled with the kind and maximum length of hose for which the device is to be approved and when connected to each blower or manifold outlet designed for hose connections.

(b) The connection between the motor and the blower shall be so constructed that the motor may be disengaged from the blower when the blower is operated by hand.

(c) The blower shall operate throughout the period without failure or indication of excessive wear of bearings or other working parts.

(d) Where a blower, which is ordinarily motor driven, is operated by hand, the power required to deliver 50 liters of air per minute to each wearer through the maximum length of hose shall not exceed one-fiftieth horsepower, and the torque shall not exceed a force of 2.3 kg. (5 pounds) on a 20 cm. (8-inch) crank, as defined in § 84.146.

(e) Where the respirator is assembled with the facepiece and 15 m. (50 feet) of the hose for which it is to be approved, and when connected to one outlet with all other outlets closed and operated at a speed not exceeding 50 revolutions of the crank per minute, the amount of air delivered into the respiratory-inlet covering shall not exceed 150 liters per minute.

§ 84.146 Method of measuring the power and torque required to operate blowers.

As shown in Figure 1 of this section, the blower crank is replaced by a wooden drum, a (13 cm. (5 inches) in diameter is convenient). This drum is wound with about 12 m. (40 feet) of No. 2 picture cord, b. A weight, c, of sufficient mass to rotate the blower at the desired speed is suspended from this wire cord. A mark is made on the cord about 3 to 4.5 m. (10 to 15 feet) from the weight, c. Another mark is placed at a measured distance (6–9 m./ 20–30 feet is convenient) from the first. These are used to facilitate timing. To determine the torque or horsepower required to operate the blower, the drum is started in rotation manually at or slightly above the speed at which the power measurement is to be made. The blower is then permitted to assume constant speed, and then as the first mark on the wire leaves the drum, a stopwatch is started. The watch is stopped when the second mark leaves the drum. From these data the foot-pounds per minute and the torque may be calculated.

Figure 1—Apparatus for measuring power required to operate blower. (42 CFR part 84, subpart J, § 84.146)

Note: Figure 1 does not appear here, but is identical to the one that appears in 30 CFR 11.124–3. The full text will be included and printed in the final rule.]

§ 84.147 Type B supplied-air respirator; minimum requirements.

No Type B supplied-air respirator shall be approved for use with a blower or with connection to an air supply device at positive pressures.

§ 84.148 Type C supplied-air respirator, continuous flow class; minimum requirements.

(a) Respirators tested under this section shall be approved only when they supply respirable air at the pressures and quantities required.

(b) The pressure at the inlet of the hose connection shall not exceed 863 kN/m². (125 pounds per square inch gage).

(c) Where the pressure at any point in the supply system exceeds 863 kN/m.² (125 pounds per square inch gage), the respirator shall be equipped with a pressure-release mechanism that will prevent the pressure at the hose connection from exceeding 863 kN/m.² (125 pounds per square inch gage) under any conditions.

§ 84.149 Type C supplied-air respirator, demand and pressure demand class; minimum requirements.

(a) Respirators tested under this section shall be approved only when used to supply respirable air at the pressures and quantities required.

(b) The manufacturer shall specify the range of air pressure at the point of attachment of the air-supply hose to the air-supply system, and the range of hose length for the respirator. For example, he might specify that the respirator be used with compressed air at pressures ranging from 280–550 kN/m.² (40 to 80 pounds per square inch) with from 6 to 76 m. (15 to 250 feet) of air-supply hose.

(c) The specified air pressure at the point of attachment of the hose to the air-supply system shall not exceed 863 kN/m.² (125 pounds per square inch gage).

(d) (1) Where the pressure in the air-supply system exceeds 863 kN/m.² (125 pounds per square inch gage), the respirator shall be equipped with a pressure-release mechanism that will prevent the pressure at the point of attachment of the hose to the air-supply system from exceeding 863 kN/m.² (125 pounds per square inch gage).

(2) The pressure-release mechanism shall be set to operate at a pressure not more than 20 percent above the manufacturer's highest specified pressure. For example, if the highest specified pressure is 863 kN/m.² (125 pounds per square inch), the pressure-release mechanism would be set to operate at a maximum of 1,035 kN/m.² (150 pounds per square inch).

§ 84.150 Air-supply line tests; minimum requirements.

Air supply lines employed on Type A, Type B, and Type C supplied-air respirators shall meet the minimum test requirements set forth in Table 8 of this subpart.

§ 84.151 Harness test; minimum requirements.

(a) (1) Shoulder straps employed on Type A supplied-air respirators shall be tested for strength of material, joints, and seams and must separately withstand a pull of 113 kg. (250 pounds) for 30 minutes without failure.

(2) Belts, rings, and attachments for life lines must withstand a pull of 136 kg. (300 pounds) for 30 minutes without failure.

(3) The hose shall be firmly attached to the harness so as to withstand a pull of 113 kg. (250 pounds) for 30 minutes without separating, and the hose

attachments shall be arranged so that the pull or drag of the hose behind an advancing wearer does not disarrange the harness or exert pull upon the facepiece.

(4) The arrangement and suitability of all harness accessories and fittings will be considered.

(b)(1) The harness employed on Type B supplied-air respirators shall not be uncomfortable, disturbing, or interfere with the movements of the wearer.

(2) The harness shall be easily adjustable to various sizes.

(3) The hose shall be attached to the harness in a manner that will withstand a pull of 45 kg. (100 pounds) for 30 minutes without separating or showing signs of failure.

(4) The design of the harness and attachment of the line shall permit dragging the maximum length of hose considered for approval over a concrete floor without disarranging the harness or exerting a pull on the facepiece.

(5) The arrangement and suitability of all harness accessories and fittings will be considered.

(c) The harness employed on Type C respirators shall be similar to that required on the Type B respirator, or, it may consist of a simple arrangement for attaching the hose to a part of the wearer's clothing in a practical manner that prevents a pull equivalent to dragging the maximum length of the hose over a concrete floor from exerting pull upon the respiratory-inlet covering.

(d) Where supplied-air respirators have a rigid or partly rigid head covering, a suitable harness shall be required to assist in holding this covering in place.

§ 84.152 Breathing tube test; minimum requirements.

(a)(1) Type A and Type B supplied-air respirators shall employ one or two flexible breathing tubes of the nonkinking type which extend from the facepiece to a connecting hose coupling attached to the belt or harness.

(2) The breathing tubes employed shall permit free head movement, insure against closing off by kinking or by chin or arm pressure, and they shall not create a pull that will loosen the facepiece or disturb the wearer.

(b) Breathing tubes employed on Type C supplied-air respirators of the continuous flow class shall meet the minimum requirements set forth in paragraph (a) of this section, however, an extension of the connecting hose may be employed in lieu of the breathing tubes required.

(c)(1) A flexible, nonkinking type breathing tube shall:

(i) Be employed on Type C supplied-air respirators of the demand and pressure-demand class; and

(ii) Extend from the facepiece to the demand or pressure-demand valve, except where the valve is attached directly to the facepiece.

(2) The breathing tube shall permit free head movement, insure against closing off by kinking or by chin or arm pressure, and shall not create a pull that will loosen the facepiece or disturb the wearer.

§ 84.153 Airflow resistance test, Type A and Type AE supplied-air respirators; minimum requirements.

(a) Airflow resistance will be determined when the respirator is completely assembled with the respiratory-inlet covering, the air-supply device, and the maximum length of air-supply hose coiled for one-half its length in loops 1.5 to 2.1 m. (5 to 7 feet) in diameter.

(b) The inhalation resistance, drawn at the rate of 85 liters (3 cubic feet) per minute when the blower is not operating or under any practical condition of blower operation shall not exceed the following amounts:

Maximum length of hose for which respirator is approved		Maximum resistance, water column height	
Feet	Meters	Inches	Millimeters
75	23	1.5	38
150	46	2.5	64
250	76	3.5	89
300	91	4.0	102

(c) The exhalation resistance shall not exceed 25 mm. (1 inch) of water-column height at a flow rate of 85 liters (3 cubic feet) per minute when the blower is not operating or under any practical condition of blower operation.

§ 84.154 Airflow resistance test; Type B and Type BE supplied-air respirators; minimum requirements.

(a) Airflow resistance shall be determined when the respirator is completely assembled with the respiratory-inlet covering and the hose in the maximum length to be considered for approval, coiled in loops 1.5 to 2.1 m. (5 to 7 feet) in diameter.

(b) Airflow resistance shall not exceed 38 mm. (1.5 inches) of water-column height to air drawn at the flow rate of 85 liters (3 cubic feet) per minute.

(c) The exhalation resistance shall not exceed 25 mm. (1 inch) of water-column height at this flow rate.

§ 84.155 Airflow resistance test; Type C supplied-air respirator, continuous flow class and Type CE supplied-air respirator; minimum requirements.

The resistance to air flowing from the respirator shall not exceed 25 mm. (1 inch) of water-column height when the air flow into the respiratory-inlet covering is 115 liters (4 cubic feet) per minute.

§ 84.156 Airflow resistance test; Type C supplied-air respirator, demand class; minimum requirements.

(a) Inhalation resistance shall not exceed 50 millimeters (2 inches) of water at an air flow of 115 liters (4 cubic feet) per minute.

(b) The exhalation resistance to a flow of air at a rate of 85 liters (3 cubic feet) per minute shall not exceed 25 millimeters (1 inch) of water.

§ 84.157 Airflow resistance test; Type C supplied-air respirator, pressure-demand class; minimum requirements.

(a) The static pressure in the facepiece shall not exceed 38 mm. (1.5 inches) of water-column height.

(b) The pressure in the facepiece shall not fall below atmospheric at inhalation airflows less than 115 liters (4 cubic feet) per minute.

(c) The exhalation resistance to a flow of air at a rate of 85 liters (3 cubic feet) per minute shall not exceed the static pressure in the facepiece by more than 51 mm. (2 inches) of water-column height.

§ 84.158 Exhalation valve leakage test.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 84.159 Man tests for gases and vapors; supplied-air respirators; general performance requirements.

(a) Wearers will enter a chamber containing a gas or vapor as prescribed in §§ 84.160, 84.161, 84.162, and 84.163.

(b) Each wearer will spend 10 minutes in work to provide observations on freedom of the device from leakage. The freedom and comfort allowed the wearer will also be considered.

(c) Time during the test period will be divided as follows:

(1) Five minutes. Walking, turning head, dipping chin; and

(2) Five minutes. Pumping air with a tire pump into a 28-liter (1 cubic foot) container, or equivalent work.

(d) No odor of the test gas or vapor shall be detected by the wearer in the air breathed during any such test, and the wearer shall not be subjected to any undue discomfort or encumbrance because of the fit, air delivery, or other features of the respirator during the testing period.

§ 84.160 Man test for gases and vapors; Type A and Type AE respirators; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1±0.025 percent isoamyl acetate vapor, and the blower, the intake of the hose, and not more than 25 percent of the hose length will be located in isoamyl acetate-free air.

(b) The man in the isoamyl acetate atmosphere will draw his inspired air through the hose, connections, and all parts of the air device by means of his lungs alone (blower not operating).

(c) The 10-minute work test will be repeated with the blower in operation at any practical speed up to 50 revolutions of the crank per minute.

§ 84.161 Man test for gases and vapors; Type B and Type BE respirators; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1±0.025 percent isoamyl acetate vapor, and the intake of the hose, and not more than 25 percent of the hose length will be located in isoamyl acetate-free air.

(b) The man in the isoamyl acetate atmosphere will draw his inspired air through the hose and connections by means of his lungs alone.

§ 84.162 Man test for gases and vapors; Type C respirators, continuous-flow class and Type CE supplied-air respirators; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1±0.025 percent isoamyl acetate vapor, the intake of the hose will be connected to a suitable source of respirable air, and not more than 25 percent of the hose length will be located in isoamyl acetate-free air.

(b) The minimum flow of air required to maintain a positive pressure in the respiratory-inlet covering throughout the entire breathing cycle will be supplied to the wearer, provided however, that airflow shall not be less than 115 liters per minute for tight-fitting and not less than 170 liters per minute for loose-fitting respiratory inlet-coverings.

(c) The test will be repeated with the maximum rate of flow attainable within specified operating pressures.

§ 84.163 Man test for gases and vapors; Type C supplied-air respirators, demand and pressure-demand classes; test requirements.

(a) The completely assembled respirator will be worn in a chamber containing 0.1±0.025 percent isoamyl acetate vapor, the intake of the hose will be connected to a suitable source of respirable air, and not more than 25 percent of the hose length will be located in isoamyl acetate-free air.

(b) The test will be conducted at the minimum pressure with the maximum hose length and will be repeated at the maximum pressure with the minimum hose length.

Tables to Subpart J of Part 84

TABLE 8.—AIR-SUPPLY-LINE REQUIREMENTS AND TESTS

[42 CFR part 84, subpart J]

Specific requirements	Requirements for the air-supply lines of the indicated type of supplied-air respirators		
	Type A	Type B	Type C
Length of hose	Maximum of 91 m. (300 feet) in multiples of 7.6 m. (25 feet).	Maximum of 23 m. (75 feet) in multiples of 7.6 m. (25 feet).	Maximum of 91 m. (300 feet) in multiples of 7.6 m. (25 feet). It will be permissible for the applicant to supply hose of the approved type of shorter length than 7.6 m. (25 feet) provided it meets the requirements of the part.
Airflow	None	None	The air-supply hose with air regulating valve or orifice shall permit a flow of not less than 115 liters (4 cubic feet) per minute to tight-fitting and 170 liters (6 cubic feet) per minute to loose-fitting respiratory-inlet coverings through the maximum length of hose for which approval is granted and at the minimum specified air-supply pressure. The maximum flow shall not exceed 425 liters (15 cubic feet) per minute at the maximum specified air-supply pressure with the minimum length of hose for which approval is granted.

TABLE 8.—AIR-SUPPLY-LINE REQUIREMENTS AND TESTS—Continued

[42 CFR part 84, subpart J]

Specific requirements	Requirements for the air-supply lines of the indicated type of supplied-air respirators		
	Type A	Type B	Type C
Airflow	....do	....do	The air-supply hose, detachable coupling, and demand valve of the demand class or pressure-demand valve of the pressure-demand class for Type C supplied-air respirators, demand and pressure-demand classes, shall be capable of delivering respirable air at a rate of not less than 115 liters (4 cubic feet) per minute to the respiratory-inlet covering at an inhalation resistance not exceeding 50 millimeters (2 inches) of water-column height measured in the respiratory-inlet covering with any combination of air-supply pressure and length of hose within the applicant's specified range of pressure and hose length. The airflow rate and resistance to inhalation shall be measured while the demand or pressure-demand valve is actuated 20 times per minute by a source of intermittent suction. The maximum rate of flow to the respiratory-inlet covering shall not exceed 425 liters (15 cubic feet) per minute under the specified operating conditions.
Air-regulating valve	....do	....do	If an air-regulating valve is provided, it shall be so designed that it will remain at a specific adjustment, which will not be affected by the ordinary movement of the wearer. The valve must be so constructed that the air supply with the maximum length of hose and at the minimum specified air-supply pressure will not be less than 115 liters (4 cubic feet) of air per minute to tight-fitting and 170 liters (6 cubic feet) of air per minute of loose-fitting respiratory inlet coverings for any adjustment of the valve. If a demand or pressure-demand valve replaces the air-regulating valve, it shall be connected to the air-supply at the maximum air pressure for which approval is sought by means of the minimum length of air-supply hose for which approval is sought. The outlet of the demand or pressure-demand valve shall be connected to a source of intermittent suction so that the demand or pressure-demand valve is actuated approximately 20 times per minute for a total of 100,000 inhalations. To expedite this test, the rate of actuation may be increased if mutually agreeable to the applicant and NIOSH. During this test the valve shall function.
Noncollapsibility	The hose shall not collapse or exhibit permanent deformation when a force of 90 kg. (200 pounds) is applied for 5 minutes between 2 planes 7.6 cm. (3 inches) wide on opposite sides of the hose.	Same as Type A	None.
Nonkinkability	None	None	A 7.6 m. (25 foot) section of the hose will be placed on a horizontal-plane surface and shaped into a one-loop coil with one end of the hose connected to an airflow meter and the other end of the hose supplied with air at the minimum specified supply pressure. The connection shall be in the plane of the loop. The other end of the hose will be pulled tangentially to the loop and in the plane of the loop until the hose straightens. To meet the requirements of this test the loop shall maintain a uniform near-circular shape and ultimately unfold as a spiral, without any localized deformation that decreases the flow of air to less than 90 percent of the flow when the hose is tested while remaining in a straight line.

TABLE 8.—AIR-SUPPLY-LINE REQUIREMENTS AND TESTS—Continued

[42 CFR part 84, subpart J]

Specific requirements	Requirements for the air-supply lines of the indicated type of supplied-air respirators		
	Type A	Type B	Type C
Strength of hose and couplings.	Hose and couplings shall not separate or fail when tested with a pull of 113 kg. (250 pounds) for 5 minutes.	Same as Type A	Hose and couplings shall not exhibit any separation or failure when tested with a pull of 45 kg. (100 pounds) for 5 minutes and when tested by subjecting them to an internal air pressure of 2 times the maximum respirator-supply pressure that is specified by the applicant or at 173 kN/m. ^{2} (25 pounds per square inch) gage, whichever is higher.
Tightness	No air leakage shall occur when the hose and couplings are joined and the joint(s) are immersed in water and subjected to an internal air pressure of 35 kN/m. ^{2} (5 pounds per square inch) gage.	None	Leakage of air exceeding 50 cc. per minute at each coupling shall not be permitted when the hose and couplings are joined and are immersed in water, with air flowing through the respirator under a pressure of 173 kN/m. ^{2} (25 pounds per square inch) gage applied to the inlet end of the air-supply hose, or at twice the maximum respirator-supply pressure that is specified by the applicant, whichever is higher.
Permeation of hose by gasoline.	The permeation of the hose by gasoline will be tested by immersing 7.6 m. (25 feet) of hose and one coupling in gasoline, with air flowing through the hose at the rate of 8 liters per minute for 6 hours. The air from the hose shall not contain more than 0.01 percent by volume of gasoline vapor at the end of the test.	Same as for Type A	Same as for Type A, except the test period shall be 1 hour.
Detachable coupling	None	None	A hand-operated detachable coupling by which the wearer can readily attach or detach the connecting hose shall be provided at a convenient location. This coupling shall be durable, remain connected under all conditions of normal respirator use, and meet the prescribed tests for strength and tightness of hose and couplings.

Subpart K—Particulate Respirators

§ 84.170 Particulate respirators; description.

(a) Particulate air-purifying respirators have filters to remove solid or both liquid and solid particulates from the ambient air. They are designed for use as respiratory protection against atmospheres with particulate contaminants (e.g., dust, fume, mists) that are not immediately dangerous to life or health and that contain adequate oxygen to support life.

(b) Particulate air-purifying respirators are classified as either non-powered or powered, according to their design and are further classified into one of two types: those intended for removal of solid particulates only and those intended for both liquid and solid particulates.

(c) Non-powered particulate air-purifying respirators are classified according to the efficiency of the filter element(s) as tested according to the requirements of this part.

(1) Type A filters shall demonstrate a minimum efficiency of 99.97 percent.

(2) Type B filters shall demonstrate a minimum efficiency of 99 percent.

(3) Type C filters shall demonstrate a minimum efficiency of 95 percent.

(d) Powered particulate air-purifying respirators are classified according to the efficiency of the filter element(s) as tested according to the requirements of this part.

(1) Type A filters shall demonstrate a minimum efficiency of 99.97 percent.

(2) Type B filters shall demonstrate a minimum efficiency of 99 percent.

§ 84.171 Particulate respirators; required components.

(a) Each particulate respirator described in § 84.170 shall, where its design requires, contain the following component parts:

(1) Facepiece, mouthpiece with noseclip, hood, or helmet;

(2) Filter unit;

(3) Harness;

(4) Attached blower; and

(5) Breathing tube.

(b) The components of each particulate respirator shall meet the minimum construction requirements set forth in subpart G of this part.

§ 84.172 Breathing tubes; minimum requirements.

Flexible breathing tubes used in conjunction with respirators shall be designed and constructed to prevent:

(a) Restriction of free head movement;

(b) Disturbance of the fit of facepieces, mouthpieces, hoods, or helmets;

(c) Interference with the wearer's activities; and

(d) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 84.173 Harnesses; installation and construction; minimum requirements.

(a) Each respirator shall, where necessary, be equipped with a suitable harness designed and constructed to

hold the components of the respirator in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of respirator parts, and, where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 84.174 Respirator containers; minimum requirements.

(a) Except as provided in paragraph (b) of this section each respirator shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type of respirator it contains, and all appropriate approval labels.

(b) Containers for single-use respirators may provide for storage of more than one respirator, however, such containers shall be designed and constructed to prevent contamination of respirators which are not removed, and to prevent damage to respirators during transit.

§ 84.175 Half-mask facepieces, full facepieces, hoods, helmets, and mouthpieces; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either:

(1) By providing more than one facepiece size; or

(2) By providing one facepiece size which will fit varying facial shapes and sizes.

(b) Full facepieces shall provide for optional use of corrective spectacles or lenses, which shall not reduce the respiratory protective qualities of the respirator.

(c) Hoods and helmets shall be designed and constructed to fit persons with various head sizes, provide for the optional use of corrective spectacles or lenses, and insure against any restriction of movement by the wearer.

(d) Mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or respirator and provide an airtight seal.

(e) Facepieces, hoods, and helmets shall be designed to prevent eyepiece fogging.

(f) Half-mask facepieces shall not interfere with the fit of common industrial safety corrective spectacles, as determined by the Institute's facepiece tests in §§ 84.181 and 84.182.

§ 84.176 Facepieces, hoods, and helmets; eyepieces; minimum requirements.

Facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepieces.

§ 84.177 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be protected against distortion.

(b) Inhalation valves shall be designed and constructed and provided where necessary to prevent excessive exhaled air from adversely affecting filters, except where filters are specifically designed to resist moisture.

(c) Exhalation valves shall be:

(1) Provided where necessary;

(2) Protected against damage and external influence; and

(3) Designed and constructed to prevent inward leakage of contaminated air.

§ 84.178 Head harnesses; minimum requirements.

(a) All facepieces shall be equipped with head harnesses designed and constructed to provide adequate tension during use and an even distribution of pressure over the entire area in contact with the face.

(b) Facepiece head harnesses, except those employed on single-use respirators, shall be adjustable and replaceable.

(c) Mouthpieces shall be equipped, where applicable, with adjustable and replaceable harnesses, designed and constructed to hold the mouthpiece in place.

§ 84.179 Air velocity and noise levels; hoods and helmets; minimum requirements.

Noise levels generated by the respirator will be measured inside the hood or helmet at maximum airflow obtainable and shall not exceed 80 dBA.

§ 84.180 Particulate respirators; filter type identification.

(a) The respirator manufacturer, as part of the application for certification, shall specify the filter-efficiency/particulate-type classification (i.e., ≥95, ≥99, or ≥99.97 percent efficiency against solid or both liquid and solid particulates) for which certification is being sought.

(b) Filters shall be prominently labeled as follows:

(1) Type A (99.97% efficiency) filters intended for use against only solid particulates shall be labeled "Type A/S Particulate Filter" and shall be a color other than magenta.

(2) Type A (99.97% efficiency) filters intended for use against both liquid and solid particulates shall be labeled "Type A/L&S Particulate Filter" and shall be color coded magenta.

(3) Type B (99% efficiency) filters intended for use against only solid particulates shall be labeled "Type B/S Particulate Filter" and shall be a color other than magenta.

(4) Type B (99% efficiency) filters intended for use against both liquid and solid particulates shall be labeled "Type B/L&S Particulate Filter" and shall be a color other that magenta.

(5) Type C (95% efficiency) filters intended for use against only solid particulates shall be labeled as "Type C/S Particulate Filter" and shall be a color other that magenta.

(6) Type C (95% efficiency) filters intended for use against both liquid and solid particulates shall be labeled as "Type C/L&S Particulate Filter" and shall be a color other than magenta.

§ 84.181 Isoamyl acetate tightness test; particulate respirators with filters not intended to be replaced.

(a) The respirator will be modified in such a manner that all of the air that normally would be inhaled through the inhalation port(s) is drawn through an efficient activated charcoal-filled canister, or cartridge(s), without interference with the face-contacting portion of the facepiece.

(b) The modified respirator will be worn by persons for at least 2 minutes each in a test chamber containing 100 parts (by volume) of isoamyl-acetate vapor per million parts of air.

(c) The odor of isoamyl-acetate shall not be detected by the wearers of the modified respirator while in the test atmosphere.

§ 84.182 Isoamyl acetate tightness test; respirators with replaceable filters; minimum requirements.

(a) The applicant shall provide a charcoal-filled canister or cartridge of a size and resistance similar to the filter unit with connectors which can be attached to the facepiece in the same manner as the filter unit.

(b) (1) The canister or cartridge will be used in place of the filter unit, and persons will each wear a modified half-mask facepiece for 5 minutes in a test chamber containing 100 parts (by volume) of isoamyl-acetate vapor per million parts of air.

(2) The following work schedule will be performed by each wearer in the test chamber:

(i) Two minutes walking, nodding, and shaking head in normal movements; and

(ii) Three minutes exercising and running in place.

(3) The facepiece shall be capable of adjustment, according to the applicant's instructions, to each wearer's face, and the odor of isoamyl-acetate shall not be detectable by any wearer during the test.

(c) Where the respirator is equipped with a full facepiece, hood, helmet, or

mouthpiece, the canister or cartridge will be used in place of the filter unit, and persons will each wear the modified respiratory-inlet covering for 5 minutes in a test chamber containing 1,000 parts (by volume) of isoamyl-acetate vapor per million parts of air, performing the work schedule specified in paragraph (b)(2) of this section.

§ 84.183 Airflow-resistance tests.

(a) Resistance to airflow shall be measured in the facepiece, mouthpiece, hood, or helmet of a particulate respirator (complete respirator) mounted on a test fixture with air flowing at a continuous rate of 85 liters (3.0 cubic feet) per minute, before each test conducted in accordance with § 84.184.

(b) The resistances for particulate respirators upon initial inhalation shall not exceed 30 mm water column height (1.18 inch) pressure and upon initial exhalation shall not exceed 20 mm water column height (0.79 inch) pressure.

§ 84.184 Particulate instantaneous-penetration-filter test.

(a) Thirty filters of each particulate respirator model shall be tested for instantaneous penetration efficiency against:

(1) A solid sodium chloride particulate aerosol as per this section if solid particulate certification only is requested by the applicant.

(2) A dioctyl phthalate or equivalent oil liquid particulate aerosol as per this section if both liquid and solid particulate certification is requested by the applicant.

(b) Air-purifying elements of the respirators including the element's holders and gaskets; when separable, shall be tested for instantaneous filter leakage as mounted on a test fixture that incorporates the connector in the manner as used on the respirator.

(c) Prior to penetration testing, all air-purifying elements of particulate filter respirators shall be taken out of their packaging and placed in an environment of 85±5 percent relative humidity at 38±2.5 °C (100±4.5 °F) for 25±1 hours. Following the humidity conditioning, filters shall be sealed in a gas-tight container until tested.

(d) When the air-purifying elements are not separable, the exhalation valves shall be blocked so as to ensure that leakage, if present, is not included in the filter penetration evaluation.

(e) For air-purifying respirators with a single filter, filters shall be penetration tested at a continuous airflow rate of 85 liters (3.0 cubic feet) per minute ±5 percent. Where filters are to be used in pairs, the test-aerosol airflow rate shall be 42.5 liters (1.5 cubic feet) per minute ±5 percent through each filter.

(f) Powered air-purifying particulate respirators (PAPRs) shall be penetration tested while operating in their routine operational mode (with fully-charged batteries if they possess battery packs or at normal line voltage, if line-powered). Powered air-purifying respirators with loose fitting facepieces shall be tested in a free-flow mode. Powered air-purifying respirators with tight fitting facepieces shall be tested on a headform connected to a breathing machine operated at a rate of 24 respirations per minute with a minute volume of 40 liters and equipped with a workrate cam of 622 kp-m/min or equivalent breathing device. The airflow of a powered air-purifying respirator will be measured after each of the penetration tests and it shall meet the airflow requirements of § 84.185 of this Subpart.

(g) Penetration test aerosols.

(1) When testing for filter leakage of solid particulate aerosols, a sodium chloride solid aerosol at 25±5 °C (77±9 °F) and relative humidity of less than 30 percent that has been neutralized to the Boltzmann equilibrium state shall be used. Each respirator filter unit shall be challenged with a concentration not exceeding 200 mg/m³. For nonpowered respirators, the penetration test shall continue until maximum penetration is achieved or until an aerosol mass of at least 200±5 mg has contacted the filter unit. For powered air-purifying respirators, the penetration test shall continue until maximum penetration is achieved or until a mass of at least 2,000±50 mg has contacted the filter unit.

(2) When testing for filter leakage of oil liquid particulate aerosols, a dioctyl phthalate (DOP) or equivalent oil at 25±5 °C that has been neutralized to the Boltzmann equilibrium state shall be used. Each respirator filter unit shall be challenged with a concentration not exceeding 200 mg/m³. For non-powered respirators, the penetration test shall continue until maximum penetration is achieved or until an aerosol mass of at least 200±5 mg has contacted the filter unit. For powered air-purifying respirators, the penetration test shall continue until a maximum penetration is achieved or until a mass of at least 2,000±50 mg has contacted the filter unit.

(h) The sodium chloride test aerosol shall have a particle size distribution with count median diameter between 0.06 and 0.11 micrometer and a standard geometric deviation not exceeding 1.86 at the specified test conditions as determined with a differential mobility particle sizer. The liquid particulate test aerosol shall have a particle size distribution with count median diameter between 0.17 and 0.22 micrometer and a standard geometric deviation not exceeding 1.60 at the specified test conditions as determined with a differential mobility particle sizer.

(i) The instantaneous penetration of the filter shall be monitored and recorded throughout the test period by a suitable forward-light-scattering photometer or equivalent instrumentation.

(j) The maximum filter penetration for each of the 30 filters shall be determined and recorded. The mean maximum penetration, m, and the standard deviation, s, shall be calculated. The particulate respirator filter shall be considered as meeting the requirement of this Subpart if the test static U meets the following condition:

$U=m+2.22s\leq 0.0003$ type A.
$U=m+2.22s\leq 0.01$ type B.
$U=m+2.22s\leq 0.05$ type C.

§ 84.185 Powered, particulate respirator flow requirements.

Powered, air-purifying respirators shall be classified as tight-fitting or loose-fitting depending on their design. Tight-fitting, powered, air-purifying respirators shall be designed to seal to the wearer's face and shall provide protection as a non-powered respirator in the event of a blower failure. Loose-fitting, powered, air-purifying respirators shall be designed to function without reliance on a tight-fitting faceseal. The minimum airflow requirements for each class is as follows:

(a) Tight-fitting, powered, air-purifying respirators shall maintain an airflow rate of at least 115 liters (4.06 cubic feet) per minute for a period of at least 4 hours unless otherwise specified.

(b) Loose-fitting, powered, air-purifying respirators shall maintain an airflow rate of at least 170 liters (6.0 cubic feet) per minute for a period of at least 4 hours unless otherwise specified.

(c) Powered, air-purifying respirators shall be provided with an acceptable mechanism and appropriate instructions whereby the user can routinely and simply determine that the minimum airflow is maintained.

§ 84.186 Exhalation valve leakage test; minimum requirements.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

Subpart L—Chemical Cartridge Respirators

§ 84.190 Chemical cartridge respirators: description.

(a) Chemical cartridge respirators including all completely assembled respirators which are designed for use as respiratory protection during entry into or escape from atmospheres not immediately dangerous to life and health, are described according to the specific gases or vapors against which they are designed to provide respiratory protection, as follows:

Type of chemical cartridge respirator [1]	Maximum use concentration, parts per million
Ammonia	300
Chlorine	10
Hydrogen chloride	50
Methyl amine	100
Organic vapor	[2] 1,000
Sulfur dioxide	50
Vinyl chloride	10

[1] Not for use against gases or vapors with poor warning properties (except where MSHA or Occupational Safety and Health Administration standards may permit such use for a specific gas or vapor) or those which generate high heats of reaction with sorbent material in the cartridge.

[2] Maximum use concentrations are lower for organic vapors which produce atmospheres immediately hazardous to life or health at concentrations equal to or lower than this concentration.

(b) Chemical cartridge respirators for respiratory protection against gases or vapors, which are not specifically listed with their maximum use concentration, may be approved if the applicant submits a request for such approval, in writing, to the Institute. The Institute shall consider each such application and accept or reject the application after a review of the effects on the wearer's health and safety and in the light of any field experience in use of chemical cartridge respirators as protection against such hazards.

§ 84.191 Chemical cartridge respirators; required components.

(a) Each chemical cartridge respirator described in § 84.190 shall, where its design requires, contain the following component parts:

(1) Facepiece, mouthpiece, and noseclip, hood, or helmet;

(2) Cartridge;

(3) Cartridge with filter;

(4) Harness;

(5) Breathing tube; and

(6) Attached blower.

(b) The components of each chemical cartridge respirator shall meet the minimum construction requirements set forth in subpart G of this part.

§ 84.192 Cartridges in parallel; resistance requirements.

Where two or more cartridges are used in parallel, their resistance to airflow shall be essentially equal.

§ 84.193 Cartridges; color and markings; requirements.

The color and markings of all cartridges or labels shall conform with the requirements of the American National Standard for Identification of Gas Mask Canisters, K13.1, obtainable from American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.

§ 84.194 Filters used with chemical cartridges; location; replacement.

(a) Particulate matter filters used in conjunction with a chemical cartridge shall be located on the inlet side of the cartridge.

(b) Filters shall be incorporated in or firmly attached to the cartridge and each filter assembly shall, where applicable, be designed to permit its easy removal from and replacement on the cartridge.

§ 84.195 Breathing tubes; minimum requirements.

Flexible breathing tubes used in conjunction with respirators shall be designed and constructed to prevent:

(a) Restriction of free head movement;

(b) Disturbance of the fit of facepieces, mouthpieces, hoods, or helmets;

(c) Interference with the wearer's activities; and

(d) Shutoff of airflow due to kinking, or from chin or arm pressure.

§ 84.196 Harnesses; installation and construction; minimum requirements.

(a) Each respirator shall, where necessary, be equipped with a suitable harness designed and constructed to hold the components of the respirator in position against the wearer's body.

(b) Harnesses shall be designed and constructed to permit easy removal and replacement of respirator parts and, where applicable, provide for holding a full facepiece in the ready position when not in use.

§ 84.197 Respirator containers; minimum requirements.

Respirators shall be equipped with a substantial, durable container bearing markings which show the applicant's name, the type and commercial designation of the respirator it contains and all appropriate approval labels.

§ 84.198 Half-mask facepieces, full facepieces, mouthpieces, hoods, and helmets; fit; minimum requirements.

(a) Half-mask facepieces and full facepieces shall be designed and constructed to fit persons with various facial shapes and sizes either:

(1) By providing more than one facepiece size; or

(2) By providing one facepiece size which will fit varying facial shapes and sizes.

(b) Hoods and helmets shall be designed and constructed to fit persons with various head sizes, provide for the optional use of corrective spectacles or lenses, and insure against any restriction of movement by the wearer.

(c) Mouthpieces shall be equipped with noseclips which are securely attached to the mouthpiece or respirator and provide an airtight fit.

(d) Full facepieces shall provide for optional use of corrective spectacles or lenses which shall not reduce the respiratory protective qualities of the respirator.

(e) Facepieces, hoods, and helmets shall be designed to prevent eyepiece fogging.

§ 84.199 Facepieces, hoods, and helmets; eyepieces; minimum requirements.

Facepieces, hoods, and helmets shall be designed and constructed to provide adequate vision which is not distorted by the eyepieces.

§ 84.200 Inhalation and exhalation valves; minimum requirements.

(a) Inhalation and exhalation valves shall be provided where necessary and protected against distortion.

(b) Inhalation valves shall be designed and constructed to prevent excessive exhaled air from entering cartridges or adversely affecting canisters.

(c) Exhalation valves shall be:

(1) Protected against damage and external influence; and

(2) Designed and constructed to prevent inward leakage of contaminated air.

§ 84.201 Head harnesses; minimum requirements.

(a) (1) Facepieces for chemical cartridge respirators other than single-use vinyl chloride shall be equipped with adjustable and replaceable head harnesses designed and constructed to provide adequate tension during use and an even distribution of pressure over the entire area in contact with the face.

(2) Facepieces for single-use vinyl chloride respirators shall be equipped with adjustable head harnesses designed and constructed to provide adequate tension during use and an even

distribution of pressure over the entire area in contact with the face.

(b) Mouthpieces shall be equipped where applicable, with an adjustable and replaceable harness designed and constructed to hold the mouthpiece in place.

§ 84.202 Air velocity and noise levels; hoods and helmets; minimum requirements.

Noise levels generated by the respirator will be measured inside the hood or helmet at maximum airflow obtainable and shall not exceed 80 dBA.

§ 84.203 Breathing resistance test; minimum requirements.

(a) Resistance to airflow will be measured in the facepiece, mouthpiece, hood, or helmet of a chemical cartridge respirator mounted on a test fixture with air flowing at a continuous rate of 85 liters per minute, both before and after each test conducted in accordance with §§ 84.206 through 84.207.

(b) The maximum allowable resistance requirements for chemical cartridge respirators are as follows:

MAXIMUM RESISTANCE

[Millimeter water column height]

Type of chemical-cartridge respirator	Inhalation		Exhalation
	Initial	Final [1]	
Other than single-use vinyl chloride respirators:			
For gases, vapors, or gases and vapors	40	45	20
For gases, vapors, or gases and vapors, and particulates	50	70	20
Single-use respirator with valves:			
For vinyl chloride	20	25	20
For vinyl chloride and particulates	30	45	20

MAXIMUM RESISTANCE—Continued

[Millimeter water column height]

Type of chemical-cartridge respirator	Inhalation		Exhalation
	Initial	Final [1]	
Single-use respirator without valves:			
For vinyl chloride	15	20	[2]
For vinyl chloride and particulates	25	40	[2]

[1] Measured at end of service life specified in Table 11 of this subpart.

[2] Same as inhalation.

§ 84.204 Exhalation valve leakage test; minimum requirements.

(a) Dry exhalation valves and valve seats will be subjected to a suction of 25 mm. water-column height while in a normal operating position.

(b) Leakage between the valve and valve seat shall not exceed 30 milliliters per minute.

§ 84.205 Facepiece test; minimum requirements.

(a) The complete chemical cartridge respirator will be fitted to the faces of persons having varying facial shapes and sizes.

(b) Where the applicant specifies a facepiece size or sizes for the respirator together with the approximate measurement of faces they are designed to fit, the Institute will provide test subjects to suit such facial measurements.

(c) Any chemical cartridge respirator part which must be removed to perform the facepiece or mouthpiece fit test shall be replaceable without special tools and without disturbing facepiece or mouthpiece fit.

(d) The facepiece or mouthpiece fit test using the positive or negative pressure recommended by the applicant and described in his instructions will be used before each test.

(e) [1] Each wearer will enter a chamber containing 100 p.p.m. isoamyl acetate vapor for half-mask facepieces, and 1,000 p.p.m. for full facepieces, mouthpieces, hoods, and helmets.

(2) The facepiece or mouthpiece may be adjusted, if necessary, in the test chamber before starting the test.

(3) Each wearer will remain in the chamber for 8 minutes while performing the following activities:

(i) Two minutes, nodding and turning head;

(ii) Two minutes, calisthenic arm movements;

(iii) Two minutes, running in place; and

(iv) Two minutes, pumping with a tire pump into a 28-liter (1 cubic-foot) container.

(4) Each wearer shall not detect the odor of isoamyl-acetate vapor during the test.

§ 84.206 Particulate tests; respirators with filters; minimum requirements; general.

(a) Three respirators with cartridges containing, or having attached to them, filters for protection against particulates will be tested in accordance with the provisions of § 84.207.

(b) In addition to the test requirements set forth in paragraph (a) of this section, three such respirators will be tested, as appropriate, in accordance with the provisions of §§ 84.180 through 84.186; however, the maximum allowable resistance of complete particulate, and gas, vapor, or gas and vapor chemical cartridge respirators shall not exceed the maximum allowable limits set forth in § 84.203.

§ 84.207 Bench tests; gas and vapor tests; minimum requirements; general.

(a) Bench tests will be made on an apparatus that allows the test atmosphere at 50±5 percent relative humidity and room temperature, approximately 25 °C, to enter the cartridges continuously at predetermined concentrations and rates of flow, and that has means for determining the test life of the cartridges.

(b) Where two cartridges are used in parallel on a chemical cartridge respirator, the bench test will be performed with the cartridges arranged in parallel, and the test requirements will apply to the combination rather than to the individual cartridges.

(c) Three cartridges or pairs of cartridges will be removed from containers and tested as received from the applicant.

(d) Two cartridges or pairs of cartridges will be equilibrated at room temperature by passing 25 percent relative humidity air through them at the following flow rates (expressed in liters per minute (l.p.m.)] for 6 hours:

Type of cartridge	Airflow rate, L p.m.
Air purifying	25
Powered air purifying with tight-fitting facepiece	115
Powered air purifying with loose-fitting hood or helmet	170

(e) Two cartridges or pairs of cartridges will be equilibrated by passing 85 percent relative humidity air through them at the flow rates stated in paragraph (d) of this section.

(f) All cartridges will be resealed, kept in an upright position, at room temperatures, and tested within 18 hours.

(g) Cartridges will be tested and shall meet the minimum requirements set forth in Table 11 of this subpart.

Tables to Subpart L of part 84.

Tables 9 and 10 [Reserved].

TABLE 11.—CARTRIDGE BENCH TESTS AND REQUIREMENTS

[42 CFR part 84, subpart L]

Cartridge	Test condition	Test atmosphere		Flowrate (l.p.m.)	Number of tests	Penetration (p.p.m.) [1]	Minimum life [2] (minutes)
		Gas or vapor	Concentration (p.p.m.)				
Ammonia	As received	NH_3	1000	64	3	50	50
Ammonia	Equilibrated	NH_3	1000	32	4	50	50
Chlorine	As received	Cl_2	500	64	3	5	35
Chlorine	Equilibrated	Cl_2	500	32	4	5	35
Hydrogen chloride	As received	HCl	500	64	3	5	50
Hydrogen chloride	Equilibrated	HCl	500	32	4	5	50
Methylamine	As received	CH_3NH_2	1000	64	3	10	25
Methylamine	Equilibrated	CH_3NH_2	1000	32	4	10	25
Organic vapors	As received	CCl_4	1000	64	3	5	50
Organic vapors	Equilibrated	CCl_4	1000	32	4	5	50
Sulfur dioxide	As received	SO_2	500	64	3	5	30
Sulfur dioxide	Equilibrated	SO_2	500	32	4	5	30

[1] Minimum life will be determined at the indicated penetration.

[2] Where a respirator is designed for respiratory protection against more than one type of gas or vapor, as for use in ammonia and in chlorine, the minimum life shall be one-half that shown for each type of gas or vapor. Where a respirator is designed for respiratory protection against more than one gas of a type, as for use in chlorine and sulfur dioxide, the stated minimal life shall apply.

Subpart M—[Reserved]

Subpart N—Special Use Respirators

§ 84.250 Vinyl chloride respirators; description.

Vinyl chloride respirators, including all completely assembled respirators which are designed for use as respiratory protection during entry into and escape from vinyl chloride atmospheres containing adequate oxygen to support life, are described according to their construction as follows:

(a) Front-mounted or back-mounted gas masks;

(b) Chin-style gas masks;

(c) Chemical-cartridge respirators;

(d) Powered air-purifying respirators; and

(e) Other devices, including combination respirators.

§ 84.251 Required components.

(a) Each vinyl chloride respirator described in § 84.250 shall, where its design requires, contain the following component parts:

(1) Facepiece;

(2) Canister with end-of-service-life indicator;

(3) Cartridge with end-of-service-life indicator;

(4) Harness;

(5) Attached blower; and

(6) Breathing tube.

(b) The components of each vinyl chloride respirator shall meet the minimum construction requirements set forth in Subpart G of this part.

§ 84.252 Gas masks; requirements and tests.

(a) Except for the tests prescribed in § 84.126, the minimum requirements and performance tests for gas masks, prescribed in Subpart I of this part, are applicable to vinyl chloride gas masks.

(b) The following bench tests are applicable to canisters designed for use with gas masks for entry into and escape from vinyl chloride atmospheres containing adequate oxygen to support life:

(1) Four canisters will be equilibrated at 25±5 °C by passing 85±5 percent relative humidity air through them at 64 liters per minute for six hours.

(2) The equilibrated canisters will be resealed, kept in an upright position at room temperature, and tested according to paragraph (b)(3) of this section within 18 hours.

(3) The canisters equilibrated and stored as described in paragraphs (b) (1) and (2) of this section will be tested on an apparatus that allows the test atmosphere at 85±5 percent relative humidity and 25±5 °C to enter the canister continuously at a concentration of 25 ppm vinyl chloride monomer at a total flow rate of 64 liters per minute.

(4) The maximum allowable penetration after six hours of testing according to paragraph (b)(3) of this section shall not exceed 1 ppm vinyl chloride.

(c) Where canisters are submitted for testing and approval with a service life of more than four hours, the period of time for testing for vinyl chloride penetration will be performed at 150% of the service life specified in the manufacturer's application. Example: If a manufacturer requests approval of a respirator for six hours use against exposure to vinyl chloride, the maximum allowable penetration after nine hours of testing shall not exceed 1 ppm vinyl chloride.

§ 84.253 Chemical-cartridge respirators; requirements and tests.

(a) Except for the tests prescribed in §§ 84.206 and 84.207, the minimum requirements and performance tests for chemical-cartridge respirators prescribed in Subpart L of this part are applicable to replaceable-cartridge and single-use vinyl chloride chemical-cartridge respirators.

(b) The following bench tests are applicable to cartridges designed for use with chemical-cartridge respirators for entry into and escape from vinyl chloride atmospheres containing adequate oxygen to support life:

(1) Where two cartridges are used in parallel on a chemical-cartridge respirator, the bench test requirements will apply to the combination rather than the individual cartridges.

(2) Four cartridges or pairs of cartridges will be equilibrated at 25±5 °C by passing 85±5 percent relative

humidity air through them at 25 liters per minute for six hours.

(3) The equilibrated cartridges will be resealed, kept in an upright position, at room temperature, and tested according to paragraphs (b) (4) and (b)(5) of this section for other than single-use respirators or according to paragraphs (b)(6) and (b)(7) of this section for single-use respirators within 18 hours.

(4) The cartridges or pairs of cartridges for other than single-use respirators, equilibrated and stored as described in paragraphs (b)(1), (b)(2), and (b)(3) of this section, will be tested on an apparatus that allows the test atmosphere at 85± 5 percent relative humidity and 25±5 °C, to enter the cartridges or pairs of cartridges continuously at a concentration of 10 ppm vinyl chloride monomer at a total flowrate of 64 liters per minute.

(5) The maximum allowable penetration after 90 minutes testing of cartridges or pairs of cartridges for other than single-use respirators, according to paragraph (b)(4) of this section shall not exceed 1 ppm vinyl chloride.

(6) The single-use respirators, equilibrated and stored as described in paragraphs (b)(2) and (b)(3) of this section, will be tested on an apparatus that allows a test atmosphere at 85±5 percent relative humidity and 25±5 °C to be cycled through the respirator by a breathing machine at a concentration of 10 ppm vinyl chloride monomer at the rate of 24 respirations per minute at a minute volume of 40±0.6 liters. Air exhaled through the respirator will be 35±2 °C with 94±3 percent relative humidity.

(7) The maximum allowable penetration after 144 minutes testing of respirators, according to paragraph (b)(6) of this section, shall not exceed 1 ppm vinyl chloride.

§ 84.254 Powered air-purifying respirators; requirements and tests.

(a) Except for the tests prescribed in § 84.207, the minimum requirements and performance tests for powered air-purifying respirators prescribed in subpart L of this part are applicable to vinyl chloride powered air-purifying respirators.

(b) The following bench tests are applicable to cartridges designed for use with powered air-purifying respirators for entry into and escape from vinyl chloride atmospheres containing adequate oxygen to support life.

(1) Four cartridges will be equilibrated at 25± °C by passing 85±5 percent relative humidity air through them at 115 liters per minute for tight-fitting facepieces and 170 liters per minute for loose-fitting hoods and helmets, for six hours.

(2) The equilibrated cartridges will be resealed, kept in an upright position at room temperature and tested according to paragraph (b)(3) of this section within 18 hours.

(3) The cartridges equilibrated and stored as described in paragraphs (b)(1) and (2) of this section will be tested on an apparatus that allows the test atmosphere at 85±5 percent relative humidity and 25±5 °C to enter the cartridge continuously at a concentration of 25 ppm vinyl chloride monomer at a total flow rate of 115 liters per minute for tight-fitting facepieces and 170 liters per minute for loose-fitting hoods and helmets.

(4) The maximum allowable penetration after six hours of testing according to paragraph (b)(3) of this section shall not exceed 1 ppm vinyl chloride.

§ 84.255 Requirements for end-of-service-life indicator.

(a) Each canister or cartridge submitted for testing and approval in accordance with §§ 84.252, 84.253, and 84.254 shall be equipped with a canister or cartridge end-of-service-life indicator which shows a satisfactory indicator change or other obvious warning before 1 ppm vinyl chloride penetration occurs. The indicator shall show such change or afford such warning at 80±10 percent of the total service life to 1 ppm leakage, as determined by continuing each test described in §§ 84.252(b), 84.253(b), and 84.254(b) until a 1 ppm leakage of vinyl chloride occurs.

(b) The applicant shall provide sufficient pretest data to verify the performance of the end-of-service-life indicator required in paragraph (a) of this section.

§ 84.256 Quality control requirements.

(a) In addition to the construction and performance requirements specified in §§ 84.251, 84.252, 84.253, 84.254, and 84.255, the quality control requirements in paragraphs (b), (c), and (d) of this section apply to approval of gas masks, chemical cartridge respirators, and powered air-purifying respirators for entry into and escape from vinyl chloride atmospheres containing adequate oxygen to support life.

(b) The respirators submitted for approval as described in paragraph (a) of this section shall be accompanied by a complete quality control plan meeting the requirements of subpart E of this part.

(c)(1) The applicant shall specify in the plan that a sufficient number of samples will be drawn from each bulk container of sorbent material and that where activated carbon is used, the following specific tests will be performed:

(i) Apparent density;

(ii) Iodine number;

(iii) Moisture content;

(iv) Carbon tetrachloride number; and

(v) Mesh size.

(2) The tests in paragraph (c)(1) of this section shall be performed in a quantity necessary to assure continued satisfactory conformance of the canisters and cartridges to the requirements of this subpart.

(d) Final performance quality control tests on the complete canisters and cartridges shall be accomplished using the bench tests and procedures prescribed in §§ 84.252, 84.253, 84.254, and 84.255.

§ 84.257 Labeling requirements.

(a) A warning shall be placed on the label of each gas mask, chemical-cartridge respirator, and powered air-purifying respirator, and on the label of each canister and cartridge, alerting the wearer to the need for a fitting test in accordance with the manufacturer's facepiece fitting instructions, providing service life information, providing specific instructions for disposal, and advising that the wearer may communicate to NIOSH any difficulties that may be experienced in the design and performance of any gas mask, chemical-cartridge respirator, or powered air-purifying respirator approved under the requirements of this subpart. The service lives of respirators meeting the test requirements of this subpart shall be specified as follows:

Chemical-cartridge respirator	1 hour.
Gas mask	4 hours.
Powered air-purifying respirator	4 hours.

(b) Where the service life of a respirator is approved for more than four hours, the service life for which the respirator has been approved will be specified.

§ 84.258 Fees.

The following fees shall be charged for the examination, inspection, and testing of complete assemblies and components of respirators described in §§ 84.250 and 84.251.

Complete gas mask	$1,100
Complete chemical-cartridge respirator	1,150
Complete powered air-purifying respirator	1,500
Canister or cartridge only	750

[FR Doc. 94–11879 Filed 5–19–94; 9:44 am]

BILLING CODE 4160–19–P