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PROPOSED CHANGES IN 30CFR11
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THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH,
TESTING AND CERTIFICATION BRANCH
RESPIRATOR APPROVAL REGULATIONS
(30CFR11)
COMMENTARY ON PROPOSED CHANGES BY
DARREL D. DOUGLAS

I would like to thank the National Institute for Occupational Safety and Health, (NIOSH) for initiating this hearing. The respirator approval regulations are not perfect, but no set of regulations is perfect. It is pleasing, however to find a government agency which invites public comment prior to issuing proposed changes in regulations. The proposals we offer here are not meant to criticize the existing regulations but to improve and modernize them in light of the knowledge gained from our respirator research program.

Proposed revisions in 30 CFR 11:

1. Respirator approval through quantitative fit testing.

The principle concern of the respirator approval regulations at present is to insure that the respirator hardware, the facepiece, the straps, breathing tubes, hoses and ancillary equipment are of durable material and meet certain standards of construction. For example:

1. Respirator exhalation valves are machine tested before being approved.
2. Filters and sorbents used in air-purifying respirators are machine tested to insure that they meet minimum standards.
3. Self-contained breathing apparatus are machine tested to insure that they contain enough air to meet minimum standards for time of use.

Presently the problem of how well the respirator fits the user is resolved by test subjects who perform a series of exercises while wearing the respirator in the isoamyl acetate chamber. In order for the respirator to be approved, isoamyl acetate must not be detected by the wearer. Isoamyl acetate can easily fatigue the olfactory bulbs and if this occurs, a leak within the facepiece may not be detected. The odor threshold for isoamyl acetate varies between people, and no test is specified for the determination of the test subjects isoamyl acetate odor threshold. The number of persons tested and the test procedures are not uniform in the regulations.

This method of testing should be changed, so that the human nose is not the leak detecting machine. NIOSH is aware of this problem and has funded work at the Los Alamos Scientific Laboratory (LASL) to devise a respirator test method which provides an estimate of how the respirator fits potential users. The system developed at LASL involves the use of a test atmosphere which can be detected by a machine. The subject wearing the respirator is placed in the test atmosphere

and a sample of the air within the respirator is removed and compared with the concentration of the test atmosphere outside the respirator. In this way we can quantitate the amount of leakage that occurs when wearing a respirator. This test equipment will be described later.

In addition to the use of a quantitative testing device, Los Alamos has under the sponsorship of NIOSH conducted research into the selection of human respirator test panels, which are representative of U. S. adult facial sizes.¹ This project used anthropometric measurements from a survey of Air Force men and women, and developed facial size boundaries which respirators should be able to fit. In addition, they developed a test panel of 25 persons, which are considered to be representative of US adult facial sizes. Work has been done with this panel since 1975 at Los Alamos.

Those involved in respirator testing would like to use more than 25 persons for testing. It would be better to increase the panel from 25 to 250 persons; however, economics must also be considered. Under rapid testing conditions it is possible to test one respirator in one week with a 25 person panel. The 250 person panel would raise the cost of testing to a prohibitive point.

Since 1970 LASL has been testing respirators using quantitative fit testing procedures. A summary of these tests up to 1975 as they relate to approved respirators has been published by E. C. Hyatt.²

While the masks in Hyatt's report were NIOSH/MESA or Bureau of Mines approved, and thus appear to the user to be equal, the report showed that they were not equal in terms of protection provided the user.

Los Alamos has tested over 50 different respirators using the concept of the 25 person panel since 1975. Table II provides some data on how air purifying respirators fared:

Table II
Air-Purifying Quantitative Fit Test Results

Mask Type	Number Tested	PF	Number of Masks Meeting the PF		
			Entire Panel	Males Only	Females Only
Quarter Mask	5	10	1	2	1
Half Mask	12	10	1	7	1
Full Face	5	100	2	4	2

An important difference between the later studies done at LASL and those reported on by E. C. Hyatt is that the 25 person panel included womens facial sizes while subjects in Hyatt's report were all male. Only a few masks could satisfactorily fit all facial sizes in our test panel. The majority of the masks provided a better fit for the male facial sizes. If only males are considered, the protection provided by respirators is much better than with females added to the panel.

Women are forming a greater percentage of work force and are working in all types of occupations. We must consider the anthropometric differences between men and women and insure that there are respirators available that fit them.

This proposal would use a 25 person to panel test respirators in a quantitative fit testing atmosphere, while carrying out a set of exercises. We believe that 24 of the 25 subjects should successfully meet the PF under consideration for the respirator being tested. This system should provide a reasonable estimate of the PF which people can expect when using this respirator, and would identify a minimum protection factor (PF) for each respirator tested. We recommend the respirators be assigned to a respirator class in Table I (see attached recommendations) after testing. Under such a system it is possible to have full face masks with a PF ranging from 10 to 1000 and at the same time have half masks with PFs ranging from 10 to 1000. If the PF for the mask is clearly designated than the public would be able to choose a mask providing adequate protection for the problem at hand.

Our recommendations include a provision for facepieces to be approved for only a portion of the population. We believe that the manufacturer should designate the facial sizes his mask can reasonably fit, and have the mask tested with subjects of those facial sizes. If only part of the panel is being tested, than all of the partial panel members should pass the test successfully. The user will have to be cognizant of the important facial dimensions as they concern respirators.

While the insertion of quantitative fit testing into the approval system appears to be a major undertaking, it is certainly within the capabilities of NIOSH TCB to do this. At this time they have sufficient equipment to perform the quantitative fit tests recommended. The anthropometric panel of tests subjects is not now available; however such a panel can be selected from the residents of Morgantown. LASL has been asked to assist TCB in setting up such a panel and the initial steps have been taken. We believe that this panel can be ready for testing before these regulations have gone into effect.

2. Definitions

(r) Hazardous Atmosphere -- As written this definition means the air around us is a hazard. It is rewritten to consider the PEL.

Definition (z) Omit -- the definition itself is not necessary .

Section 11.4 ---ANSI Z88.2 is mentioned here and the name should be expanded to read Z88.2, 1969.

. Approvals

Section 11.30 --- Certificate Scope of Approval. The present policy NIOSH under these two paragraphs is to issue approvals only upon complete assemblies. However there are occasions when a manufacturer has had a respirator approved and desires to make what are considered to be small changes in the components of the assembly. The manufacturer sends the part to NIOSH and if they believe the part is satisfactory and does not adversely affect the operation of the apparatus as approved, the change is allowed. A letter of notification is sent to the manufacturer, but no notification is made to the public. Since no changes are made in the over all assembly the part numbers may remain unchanged.

These changes may affect the user. For example, the Mine Safety Appliance Company offers a Comfo Respirator which has had three respirator facepiece bodies under the same approval label. Two of these bodies have the same dimension but the third is different. Such a change may affect those who have gotten a satisfactory fit with the older facepiece and may not realize the new respirator they buy will be different. A similar case occurred recently in the case of the Cover respirator which has an approval for a half-mask facepiece. The redesigned facepiece is being sold under an extension of the old approval. Again it is possible that a user of the Cover respirator may have received a satisfactory fit with the old facepiece, but they may not recognize the fact that they are getting a different respirator.

To alert the user of a change occurring, I suggest that changes be incorporated in the approval label. For example, a change in the straps, in the respirator body or in the respirator exhalation valve should be accompanied by a change in the approval label. If the original approval is TC-19-103 than a modification would make this TC-19-103a and the second modification would be TC-19-103b and so on. Paragraph 11.30(b) is rewritten to reflect this change.

4. Quantitative Fit Testing

Paragraphs 11.63 (b) and (c) have be inserted to require quantitative fit testing for respirator approval which I recommended in my opening comments.

5. SCBAs

Section 11.70 (a)(i) -- The paragraph on demand type apparatus should be deleted. This classification provides poorer protection than that provided by air-purifying respirators. (Table III) This category of respirators is usually reserved for serious exposures, and the demand classification with its inadequate PFs should be eliminated.

Table III
Supplied Air Quantitative Fit Test Results

Respirator Type	PF	Number of Masks Tested	Number of Masks Meeting the PF
Continuous Flow			
Half Mask	2000	6	5
Full Face	2000	6	5
Pressure Demand	2000	7	7
Demand	50	8	0
	20	8	4
	10	8	4
	5	8	4

6. Fire Fighting Requirements

Section 11.70(e) While this equipment was originally developed and approved for mine rescue and recovery operation, times have changed. One of the larger users of these equipment now are fire departments, and there is nothing in this section which speaks to the needs of providing equipment that is resistant to the heat of the fire or the cold of the winter time.

7. Enriched Oxygen Atmospheres

Section 11.79 Breathing Gas (c) This paragraph requires the use of grade D air or higher quality. Under conditions of low pressure the oxygen range allowed under grade D air will not supply sufficient oxygen to the user. When the atmospheric pressure is at 9 psi it is necessary to raise the oxygen content to 30% to allow the wearer to function satisfactory. I recommend that the oxygen content be changed to all for this condition.

Consideration should also be given to deleting this entire section. This has nothing to do with the durability of the equipment or its ability to fit the wearer. This requirement should really be the responsibility of OSHA.

8. SCBA Flow Rates and Service Times

Section 11.85-7 The flow from the apparatus should be greater than 200 liters per minute, which is a low flow rate. It is possible for an athletic individual to demand an instantaneous flow of several hundred liters per minute. The instantaneous flow rate should be raised to at least to 600 liter per minute.

Section 11.85-10 -- Service time tests -- This test does not take into account the fact that many of these devices are used in high stress, high work rate situations. The breathing machine can should provide a much higher work rate than it has provided at this time. Users are finding that they seldom can obtain the use time indicated on the bottle. The use of a work rate equivalent to that of a 150# man working at 70% of his maximum work rate is recommended.

Section 11.85-11 The determination of service time for Closed Circuit (CC) apparatus should be done in the same manner as OC apparatus

Section 11.85-12 The present SCBA man test are deleted in favor of new tests specified in 11.85-14

Section 11.85-14 I suggest that the present set of tests be deleted and tests using a vertical and walking treadmill be substituted using a work rate equivalent to that of a 150# man working at 60% of his maximum stress. In addition breathing resistance and respiration rate should be recorded contineously.

Section 11.85-15 These tests are replaced by those in 11.85-14.

Section 11.85-16 This test determines the maximum life of the air supply which is not necessary for approval. This section is deleted.

Section 11.85-19 Gas Tightness Test -- This section is replaced with the standard quantitative fit testing program listed in 9. Subpart I, Gas masks

Paragraph 11.90 The description of gas masks, states that only full face masks can be used, with the exception of escape masks. I believe there should be a change to allow half and quarter mask to be used. For long time use while exposed to a relatively small concentrations of a toxic materials the user may desire to use a canister with a half-facepiece. The user should have this choice.

The number of gases tested for cartridges and canisters is inadequate. There should be in the approval document a list of all the materials that the canister can be used for, the maximum time of use, and the maximum use concentration. At this time I have no solution to the problem of what gases and vapor should be tested to provide the maximum information for the minimum amount of testing, but the solution should be sought now. The work of Gary Nelson at the Lawrence Livermore Laboratory has shown that the sorbtion times of organic vapors commonly encountered in industry vary widely from that of carbon tetrachloride. Some offical notice of these variations should be made in the regulations.

11.85-19 and 11.103-3 These sections on gas tight fitness testing are deleted since quantitataive fit testing is recommended.

10. Subpart J -- Supplied-Air Respirators

Type A and Type B respirators should be eliminated. These are negative pressure devices and should no longer be allowed. Demand flow air line respirators should also be eliminated. As mentioned previously, these provide poorer protection than air purifying respirators. In the attached recommendations I have referenced all sections which are affected.

Section 11.120 Air Velocity and Noise Level -- This section requires that the noise level not exceed 80 dBA within the hood. I question the need for this requirement. The present noise level requirement for occupational exposure 90 dBA. I suggest the hood sound level requirement be raised to 85 dBA.

Section 11.124-21 Test for Protection During Abrasive Blasting -- This test should be eliminated and the standard quantitative fit testing using a DOP or sodium chloride aerosol should be substituted.

11. Subpart K -- Dust, Fumes and Mist Respirators -

Section 11.130--This entire section describing Dust, Fume and Mist (DFM) is to be deleted. DFM respirators are used with a variety of filters which are of varying efficiency. The regulatory agencies could determine which materials require high efficiency and publish these in their regulations. I have substituted the phrase highly toxic for those materials which require the use of high efficiency filters.

Addition comments concern the raising of the allowable sound level in hoods and helmets to 85 dBA and deleting the gas tightness test sections. The testing of valveless and single use respirators has been combined with those of reusable respirators. The so called single use respirator should meet the same requirements as any other respirator.

12. Subpart L -- Chemical Cartridge Respirators

The same remarks concerning gas masks sorbents materials and canisters can be made for chemical cartridges respirators.

13. Subpart M

Pesticide Respirators-- Calling this a pesticide respirator is misleading. It consists of a chemical cartridge respirator or a gas mask coupled with a filter. The filter must be at least a fume filter for a half mask and for full face respirators must be equivalent to a high efficiency filter. The regulations should state these facts clearly and rely on Subparts K and L for the approval details. My recommendations do this.

1. "Selection of Respirator Test Panels Representative of U.S. Adult Facial Sizes," by A. Hack, E. Hyatt, B. Held, T. Moore, C. Richards, and J. McConville, LA-5488, March, 1974, Los Alamos Scientific Laboratory.
2. "Respirator Protection Factors," by E. Hyatt, LA-6084-MS, January, 1975, Los Alamos Scientific Laboratory.

PROPOSED CHANGES IN 30 CFR 11, TEXT

by

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Text presently in 30 CFR 11 to be deleted is underlined. New text to be added is bracketed by \$. . . . \$.

1) Delete 11.3(a):

(a) "Air Contamination Level" means the standards of contaminant levels prescribed by the Secretary of Labor in accordance with the provisions of the Occupational Safety and Health Act of 1970 (Public Law 91-596; 84 Stat. 1590).

2) 11.3 New definition:

(a) \$ "Aerodynamic diameter" is defined as the aerodynamic diameter of a unit density sphere having a settling velocity in air equal to that of the particle under consideration.\$

3) 11.3(r) Revise definition:

(r) "Hazardous atmosphere" means: (1) Any atmosphere containing a toxic or disease producing gas, vapor, dust, fume, \$ or \$ mist, \$ in a concentration above the permissible exposure concentration of the toxic materials present; \$ or pesticide, either immediately or not immediately dangerous to life or health; or (2) any oxygen-deficient atmosphere.

4) 11.3(y) New definition:

\$ (y) "Mass Median Aerodynamic Diameter" is defined as the aerodynamic diameter for which 50 percent of the mass is associated with particles less than the stated diameter. \$

5) 11.3(y) Revise paragraph designation:

(y) \$ (z) \$ "Mist" means a liquid condensation particle with size ranging from submicroscopic to macroscopic.

6) 11.3(z) delete definition:

(z) "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.

- 7) 11.3(bb) New definition
 § (bb) "Permissible exposure limit" is the air contaminant exposure limit prescribed in the Occupational Safety and Health Standards 29 CFR 1000 for each substance listed in Tables Z-1, Z-2 and Z-3. §
- 8) 11.3(bb) through (hh), revise paragraph headings:
 (bb) to § (cc) §, (cc) to § (dd) § ... (hh) to §(ii) §
- 9) 11.4 add date to text:
 ...In addition, copies of the American National Standards Practices for Respiratory Protection Z88.2, § 1969 §
- 10) 11.30(b) Revise to allow subassembly approval:
 (b) The Bureau and the Institute will not issue certificates of approval for any respirator component or for any respirator subassembly § by itself; however approved changes in respirator subassemblies shall be acknowledged on the approval label through the use of a letter designation following the approval number. §
- 11) 11.63(b) New requirement for quantitative fit testing as part of respirator approval procedures:
 § (b) Respirators in subparts H through N shall in addition to the specific requirements mentioned in the subpart be quantitatively fit tested prior to approval and assigned a respirator classification as shown in Table I §

§ TABLE I
 QUANTITATIVE FIT TEST
 RESPIRATOR CLASSIFICATION

Minimum Protection Factor Achieved	Respirator Classification	Maximum Use Concentration
10	10	(10) (PFL)
20	20	(20) (PFL)
50	50	(50) (PFL)
100	100	(100) (PFL)
1000	1000	(1000) (PFL)
10000	10000	(10000) (PFL)

Note: Air purifying respirators are not be used in any Immediately Dangerous to Life or Health atmosphere. Air purifying respirators, nonpowered, are not to be used in aerosol concentrations above 300 mg/m³ or in atmospheres which exceed the MUC of the sorbent cartridge or canister. §

§ (1) All tight fitting facepieces (quarter masks, half masks and full facepieces) must be quantitatively fit tested on an anthropometric test panel. The test panel shall consist of 25 persons determined as described in LASL Report 5488². The 25 person panel may be chosen without regard to sex. Full facepiece respirators will be tested by a test panel designed to evaluate the performance of full facepieces. (See Figure 1) Half mask and quarter mask respirators shall be tested on a test panel designed to evaluate the performance of half masks. (See Figure 2) §

§ (i) Five samples of each design or size of facepiece shall be available for testing as received from the applicant after being modified to permit the removal of a sample of the atmosphere within the facepiece. §

§ (ii) The air-purifying respirator shall be equipped with a HE filter. §

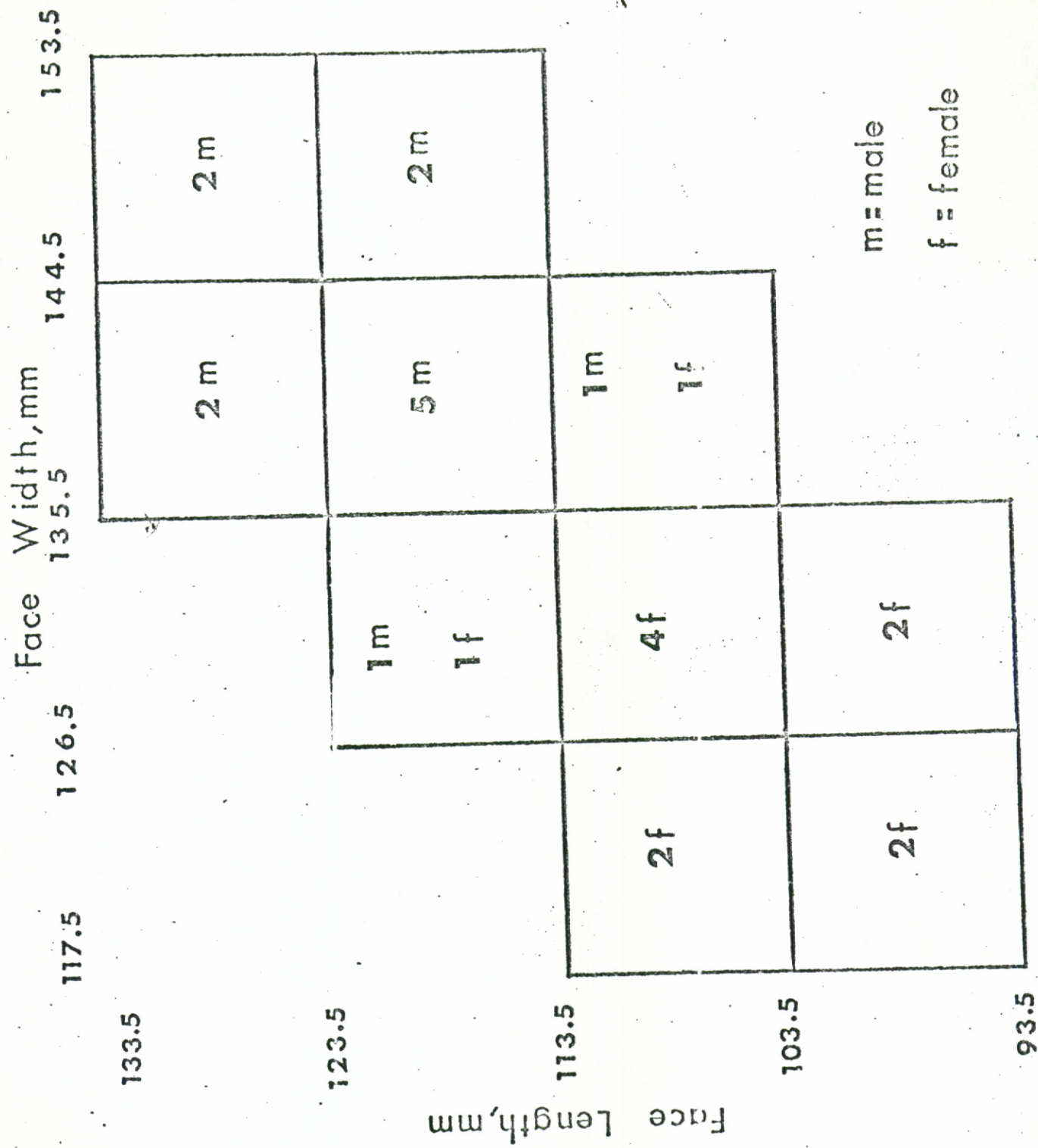
§ (iii) The air supplied respirator shall be operated as directed in the manufacturer's instructions.

§ (iv) The applicant may request testing on a reduced panel of not less than six test subjects. All test panels matrix boxes used must be contiguous. §

§ (v) The lowest PF achieved by 95% of the test subjects shall be used to determine the respirator class. If the lowest PF falls between 2 classes, the lower class shall be used. §

§ (vi) Subjects testing half or quarter masks shall wear safety glasses as described in ANSI-Z87 during the tests specified in paragraph (1)(viii). Safety glasses shall be sized for the subject. If the wearing of safety glasses is incompatible with the wearing of the respirator the quantitative fit test shall not be run. The facepiece shall be donned and adjusted as specified in the manufacturer's written instructions prior to carrying out the safety glasses quantitative fit test. §

§ (vii) Prior to the quantitative fit testing positive or negative pressure tests or other qualitative tests described by the manufacturer shall be performed and the facepiece shall be adjusted to obtain the best possible fit. §



PANEL FOR FULL-FACE MASKS
FIGURE 1

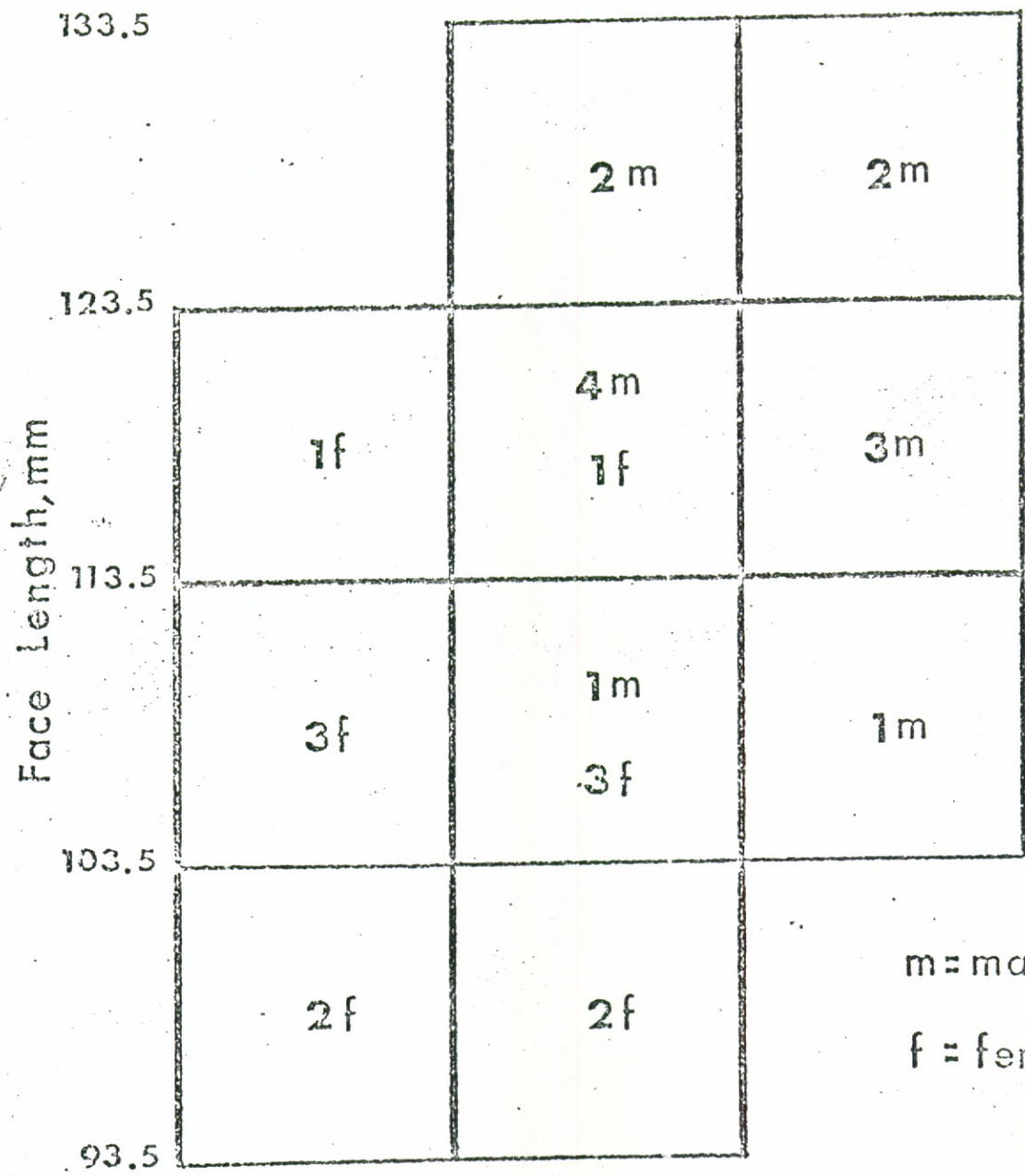
Lip Length, mm

34.5

43.5

52.5

61.5



m = male

f = female

PANEL FOR HALF-MASKS

FIGURE 2

§ (viii) Each test subject who has achieved the best possible fit as described in paragraph (vi) above shall be quantitatively fit tested. Subject who are testing half or quarter masks respirators shall continue to wear safety glasses during the test. The following test exercises shall be performed by each test subject while in the test atmosphere until a steady penetration reading is obtained or until the exercise has been performed for a maximum of two minutes. §

§ (a) § Normal breathing with head held still. §

§ (b) § Deep breathing with head held still. §

§ (c) § Turning head slowly from side to side pausing for two breaths before turning directions. §

§ (d) § Nodding head slowly up and down pausing for two breaths before changing directions. §

§ (e) Reading prepared text slowly loud enough to be heard by test operator. §

§ (f) Smiling for half and quarter masks or frowning for full facepieces. §

§ (g) Normal breathing with head motionless. §

§ (ix) Aerosol penetrations shall be recorded on a strip chart recorder. The peak penetration achieved during each exercise shall be averaged and the average of each exercise except for (f) shall be averaged to determine the test results. §

§ (2) All loose fitting hoods and helmets must be quantitatively fit tested on a test panel. The test shall consist of 10 persons chosen without regard to sex from each box in the full face matrix. §

§ (i) Five samples of each design or size of the hood or helmet shall be available for testing as received from the applicant after being modified to permit the removal of a sample of the atmosphere within the facepiece. §

§ (ii) The following test exercises shall be performed by each test subject while in the test atmosphere until a steady penetration reading is obtained or a maximum 2 minutes. §

§ (a) Standing still, arms hanging downward along the side of body, normal breathing. §

§ (b) Bending forward and touching toes repeatedly. §

§ (c) Running in place. §

§ (d) Raising arms above head and looking upward repeatedly. §

§ (f) Bending knees and squatting repeatedly. §

§ (g) Standing still with 36 inch dowel held in hands, as a spray nozzle. Twist from waist while simulating body motions of a sandblaster. §

§ (h) Standing still, arms hanging downward along sides of body, normal breathing. §

§ (iii) Aerosol penetrations shall be recorded on a strip chart recorder. The average penetration achieved during each exercise shall be averaged, except for (c), to determine the test results. §

§ 11.63(c) Quantitative Fit Testing Equipment shall meet the following specifications:

1) Test Agent	Minimum Sensitivity	Concentration mg/m ³	Size MMAD	Geometric Standard Deviation
i) NaCl	0.02%	10-20 mg/cm	0.5-0.7 u	2+ 0.2
ii) Poly-DOP	0.02%	20-40 mg/cm	0.5-0.7 u	2+ 0.2
2) Test Chambers				
i) Constant concentration-+ 5% of selected concentration				
ii) Uniform distribution in chamber. §				

12) 11.63 Change paragraph designations:

- (b) to § (d) §
- (c) to § (e) §
- (d) to § (f) §

13) 11.70 (a) (2) (i) delete

(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.

14) 11.70(e) New requirement for firefighting use:

§ (f) All components shall function in the hot and cold environmental conditions encountered by emergency fire crews §

15) 11.79 (c) Requirement is revised:

(c) Compressed, gaseous breathing air shall meet the applicable minimum grade requirement for Type I gaseous air set forth in the Compressed Gas Association Commodity Specification for Air, G-7 (Grade D or higher quality). § When users are at atmospheric pressure less than sea level precautions shall be taken to increase the oxygen content accordingly. §

16) 11.85-8 Increase flow rate:

(b) the flow from the apparatus shall be greater than 200 § 600 § liters per minute when the pressure in the facepiece of pressure-demand-apparatus is lowered by 51 mm. (2 inches) water-column height when full container pressure is applied.

17) 11.85-10 (a) change work rate:

(a) Service time will be measured with a breathing machine as described in 11.85-3. § set at a work rate equivalent to a 150 lb man in average physical condition working at 70% of maximal stress. §

18) 11.85-11 change work rate:

(a) The closed-circuit apparatus will be classified according to the length of the time it supplies adequate breathing gas to the wearer during man test No. 4 described in Table 4. § while being tested as described in 11.85-10 (a) §

19) 11.85-12 (d) Change man test procedures:

(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, and 4. § 11.85-14 §. 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.

- 20) 11.85-14 (a) Change mantest procedures:
 (a) The man tests described in Tables 1, 2, 3, and 4 represent the workload performed in the mining, mineral, or allied industries by a person wearing the apparatus tested. § All apparatus will be man tested for the desired service life. Tests will be conducted at a workrate equivalent to 60% of the maximum stress of a 150# man in average physical condition. Test apparatus will be a ladder treadmill 25% of the time and a walking treadmill 75% of the time. §
- 21) 11.85-14 (e) Change sampling frequency:
 (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. § continuously during the test period. §
- 22) 11.85-14 (f) delete old man-test tables:
 (f) Man tests 1, 2, 3, 4, 5, and 6 shall be conducted in duplicate.
- 23) 11.85-15 delete entire section on existing man-test procedures 1, 2, 3, and 4.
- 24) 11-85-16 delete entire section on man test procedures describing method of determining maximum life of SCBA.
- 25) 11.85-19 delete entire section on gas tight fit tests:
11.85-19 Gas tightness test; minimum requirements.
- 26) Revise to allow half and quarter masks to be used as gas masks:
 11.90 Gas masks; description.
- (a) Gas masks including all completely assembled air purifying masks which are designed for use as respiratory protection during entry into and escape 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 § half mask, quarter mask or § 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 § half mask, quarter mask or § full facepiece, a canister which is usually attached to the facepiece, an associated connections.

- 27) 11.102.3 Delete entire section on gas tight fit test requirements.
- 28) Subpart J--Delete all mention of Type A & B Respirators and delete all reference to demand flow mode.

delete the following sections

<u>11.110(a)(1), (2), (3), (4),</u>	
<u>11.117 (c)</u>	11.124-13
<u>11.122</u>	11.124-16
<u>11.123</u>	11.124-17
<u>11.124-1</u>	11.124-18
<u>11.124-2</u>	11.124-19
<u>11.124-3</u>	11.124-20
<u>11.124-4</u>	11.124-22
<u>11.124-8(a)</u>	11.124-23
<u>11.124-8(b)</u>	
<u>11.124-10</u>	
<u>11.124-11</u>	

delete reference to Type A & Type B respirators in the following sections:

11.116 (b)
 11.116 (c)
 11.119
 11.124-7
 Table 8
 124-9(a)
 124-9(b)

- 29) Delete reference to demand flow mode in the following sections:
 Table 8 (5 times)
 11.111(a)(2)
- 30) Table 8--hose collapse resistance requirement for Type A hose should be moved under Type C requirements.
- 31) 11.120 Raise allowable sound pressure levels:
 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. § 85 §
- 32) Delete 11.120 (a) and 11.120 (b). These sections refer to Type A and Type B harnesses.

- 33) 124-8 (c) Delete reference to Type B harness:
 (b) (1) 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.
- 34) 11.124-9(c) delete demand mode:
 (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.
- 35) Delete the following sections:
 11.124-21(b) delete reference to 11.124-22, 23 & 24
 11.124-21(f) delete reference to 11.124-22, 23 & 24
- 36) 11.130 Delete entire section describing dust, fume and mist respirators.
- 37) 11.131 Remove mention of 11.130:
 11.131 Dust, fume and mist respirators; required components.
 (a) Each dust, fume, and mist respirator described in 11.130 shall, where its design requires, contain the following component parts:
- 38) 11.135 (a) delete
 (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.
- 39) 11.139 change 80 to 85
 11.139 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. \$85\$
- 40) 11.140-1 delete entire section on gas tight fitness
 11.140-2 delete entire section on gas tight fitness

41) 11.140-4 add following text

§ (h) For valveless respirators three respirators will be tested. As described in 11.140-4, airflow will be cycled through the respirator by a breathing machine at the rate of 24 respirations per minute with a minute volume of 40 liters; a breathing machine cam with a work rate of $622 \text{ kg.-m}^2/\text{minute}$ shall be used.

(i) Air exhaled through the respirator will be $35^\circ + 3^\circ\text{F.}$ with 94 ± 3 percent relative humidity.

(ii) Air inhaled through the respirator will be sampled and analyzed for respirator leakage.

(iii) The total amount of unretained test suspension, after drying, in samples taken during testing, shall not exceed 1.8 milligrams for any single test. §

42) 11.140-5 delete entire section which refers to single use respirators.

43) 11.140-11 Delete reference to air contamination level: 11.140-11 Silica dust loading test; DOP filter test; respirators designed as respiratory protection against \$ highly toxic \$ dust, fumes, and mists having an air contamination level less than 0.05 milligram per cubic meter and against radio-nuclides; minimum requirements.

44) 11.140-12 Delete reference to air contamination level: 11.140-12 Silica dust loading test; respirators designed as protection against \$ highly toxic \$ dust, fumes, and mists having an air contamination level less than 0.05 milligram per cubic meter and against radio-nuclides; minimum requirements.

Three respirators will be tested in accordance with the provisions of 11.140-4 and shall meet the minimum requirements of 11.140-4 and 11.140.9.

45) Delete Table 9 which is used in the gas tight fitness test.

46) Table 10

Delete phrase Air Contamination Level not less than $0.5\text{mg}/\text{m}^3$ or 2mppcf (three deletions)

Delete phrase Air Contamination Level less than $0.5\text{mg}/\text{m}^3$ or 2mppcf (one deletion)

Add to fifth entry in table:

Dust, mists, and fumes: \$ highly toxic \$

46) Subpart M

11.170 through 11.183.7; Delete all and replace as follows:

§ Pesticide respirators are chemical cartridge respirators composed of organic vapor cartridges and a fume filter or an organic vapor canister and a high efficiency filter. §

SUMMARY OF SUGGESTED CHANGES

30 CFR 11

Subpart	Section Number	Section Contents	Comment
A	11.1	Purpose	Unchanged
General	11.2	Approved Respirator	Unchanged
Provisions	11.3	Definitions	delete (a) "Air Contamination Level Revise definition of (r) hazardous atmosphere add new definitions: (a) aerodynamic diameter (y) mass median aerodynamic diameter bb) permissible exposure limit
	11.4	incorporation by reference of other respirator documents	add date of issue after reference to ANSI Z88.2 (1969)
B			
Application for approval	11.10 through 11.12	How to apply for approval	Unchanged
Subpart C	1.20 through 11.21	Fee Schedule	Unchanged
Fees			
Subpart D			
Approval and Disapproval	11.30 (b)	Certificates of approval & scope of approval	Changed to require certification acknowledgement of respirator sub assemblies
	11.30 (c) through 11.36	Content of Approval Label	Unchanged

Subpart	Section Number	Section Contents	Comment
E Quality Control	11.40 through 11.43	Revocation and changes	Unchanged
F Classification of approved respirators; scope of approval; atmospheric hazards; service time.	11.50 through 11.53		Unchanged
Subpart G General Construction and Performance requirements	11.60 through 11.61	General Construction Requirements	Unchanged
	11.62	Component parts	Unchanged
	11.63(a)	Test Requirements	Unchanged
	11.63(b) through 11.63(c)	Requires Quantitative Fit testing	This addition requires quantitative fit testing prior to approval and assignment of a respirator classification to the approved respirator. Details of testing are described.
	11.63(b) through (d)		with new additions changes paragraph headings from (b) to (d), from (d) to (f).
H 11.70 Self Contained Breathing Apparatus	11.70(a) (2) (i)	SCBA description	Delete demand mode equipment
	11.70(e)	New testing requirements	Require SCBA's to function under environmental conditions encountered in fire fighting.

Subpart	Section Number	Section Contents	Comment
	11.71 through 11.78	Hardware Requirements	Unchanged
	11.79 (c)	Breathing Air Specifications	change to permit the O ₂ content of breathing air to exceed 23.5% under low pressure conditions of use.
	11.79-1 through 11.85-7	Hardware Requirements, resistance specifications	Unchanged
	11.85-8	Gas Flow Test Open Circuit (OC) Apparatus	Changed minimum required flow from 200 to 600 l/m.
	11.85-9	Closed Circuit (CC) Gas flow test	Unchanged
	11.85-10	Service Time Test OC	Changed breathing machine setting to a higher work rate.
	11.85-11	Service Time Test OC	Change to same test as given in 11.85-10
	11.85-12	CO ₂ Test, OC & CC ² devices	Delete man test Tables 1, 2 and 4. Replace with tests in 11.85-14.
	11.85-13	Low Temperature Test	Unchanged
	11.85-14(a)	Man Test Regimen	Specify Ladder Treadmill and Walking Treadmill
	11.85-14(e)	Sampling during man tests	Change to continuous
	11.85-14(f)	Sets number of tests	Delete old man test tables
	11.85-15	Man Test Regimen	Delete
	11.85-16	Man Test Regimen	Delete

Subpart	Section Number	Section Contents	Comment
	11.85-17	Man Tests for Liquid Oxygen System	Unchanged
	11.85-18	Man Tests; Performance Requirements	Unchanged
	11.85-19	Gas Tightness Test Minimum Requirement	Delete
	Tables I, II, III, IV	Man test Tables	Delete
Subpart I Gas Masks	11.90(a)	Gas Mask; Descriptions	Half & Quarter Masks included.
	11.91 through 11.102-2		Unchanged
	11-102-3	Facepiece Tests; Minimum Requirements	Delete
J Supplied Air Respirator	11.110 (a) (1) through (4)	Supplied Air Respirator Descripr.	Delete to remove Type A and B masks
	11.110 (a) (5) & (6)	Description of Type C and CE Respirators	Unchanged
	11.111 (a) (2)	Supplied Air Respirator Components	Delete Phrase " <u>Demand</u> or
	11.112 through 11.115	Hardware Specification	Unchanged
	11.116(b)	Facepieces, hoods and helmets	Delete B, BE
	11.116(c)	minimum requirements	Delete B, BE

Subpart	Section Number	Section Contents	Comment
	11.117 (c)	Air Flow Check Valves	Delete
	11.118	Head Harness	Unchanged
	11.119	Head & neck protection	Delete AE, BE
	11.120	Sound level maximum	Delete 80 dBA Insert 85 dBA
	11.122 through 11.124-4	Type A & Type B Air Supply Specifications	Delete
	11-124 through 11.124-6	Type C Air Supply Specifications	Unchanged
	11.124-7	Air Hose Requirements	Delete Type A, Type B,
	11.124-8(a)	Type A Harness Specifications	Delete
	11.124-8(b)	Type B Harness Specifications	Delete
	11.124-8(c)	Type C Harness Specifications	Delete Type B
	11.124-9(a)	Breathing Tube Tests	Delete
	11.124-9(b)		Delete reference to 11.124-9(a)
	11.124-9(c) (1)		Delete "Demand and"
	11.124-10 through 11.124.11	Type A & Type B Air Flow Resistance Tests	Delete
	11.124-12	Type C Air Flow Resis-	Unchanged
	11.124-13	Demand Mode	Delete
	11.124-14 through 11.124-15	Air Flow Resistance exhalation valve test	Unchanged
	11.124-16 through 11.124-20	Vapor Tight Fitness Test	Delete

Subpart	Section Number	Section Contents	Comment
	11.124-21 (b) & (f)	Abrasive Blasting Protection Tests	Delete 11.124-22, 11.124-23, & 11.124-24
	11.124-22 through 11.124-23	Abrasive Blasting Protection Tests for Type A & B	Delete
	11.124-24	Abrasive Blasting Protection Tests for Type C	Unchanged
	Table 8	Air Supply line tests requirements	Delete Columns for Type A & Type B Move hose collapse resistance requirement to Columns for Type C.

Delete all reference to demand flow mode.

K
Dust, Fume &
Mist Respirators

11.130	Description of Dust, Fume, & Mist Respirators	Delete
11.131	DF&M respirator Components	Delete "11.130"
11.132 11.133 11.134	Hardware Requirements	Unchanged
11.135 (a) and (c)	Size Requirements	Delete
11.136 11.137 11.138	Hardware Requirements	Delete
11.139	Sound Level Requirements	Delete 80 dBA Insert 85 dBA

Subpart	Section Number	Section Contents	Comment
	11.140-1	Vapor Tightness	Delete
	11.140-2	Fitness Test	Delete
	11.140-3	DF&M Performance Requirements	Unchanged
	11.140-4	Filter Test Requirements	Combines single use respirators with other dust respirators
	11.140-5	Single Use Filter Test Requirements	Delete
	11.140-6 through 11.140-11	Filter Test Requirements	Unchanged
	11.140-12	HE Filter Test Requirements	Replaces air concentration level less than 0.05mg/m ³ with "highly toxic."
	Table 9	Vapor Tight Fitness Test	Delete
L Chemical Cartridge Respirators	11.150 through 11.160		Unchanged
	11.161	Sound Level Requirements	Delete 80 dBA Replace 85 dBA
	11.162-3	Vapor Tight Fitness test	Delete
	11.162-4 through 11.162-8		Unchanged
Subpart M Pesticide Respirators	11.170 through 11.183-7		Delete
	11.170		New section defining pesticide respirators as chemical cartridge respirators or gas masks with combination cartridges and filters.

Curriculum Vitae

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Education:

1. BS in Civil Engineering, University of Washington, 1954
2. Continuing education courses in noise, ventilation, heat stress, health physics, epidemiology, human anatomy and physiology, and management.

Employment, Industrial Hygiene:

1. Industrial Hygiene Engineer, Los Angeles City Health Department, 1954-1955, 1955-1957
2. Industrial Hygiene Engineer, Boeing Company, 1957-1960
3. Industrial Hygiene Engineer, University of Washington, 1960-1961
4. Chief Industrial Hygiene Engineer, Oregon State Board of Health, 1961-1971
5. Director, Occupational Health, Oregon State Board of Health, 1971-1974
6. Assistant Professor of Environmental Medicine, University of Oregon Medical School, 1965-1974
7. Industrial Hygiene Engineer, Los Alamos Scientific Laboratory, 1974-1975
8. Leader, Respirator Research and Development Section, Los Alamos Scientific Laboratory, 1975-Present

Licenses:

1. Registered Professional Engineer, State of Oregon, July, 1962
2. Certified in the Comprehensive Practice of Industrial Hygiene, July, 1965.

Professional Societies:

1. American Industrial Hygiene Association, member since 1957.
2. American Conference of Governmental Industrial Hygienists, member since 1964. Member, Board of Directors, since 1971, Chairman of Conference, 1976-1977.

Publications:

1. Douglas, D.D., "Mercury Poisoning," Oregon State Health Bulletin, 1966.
2. Douglas, D. D., "Industrial Audiometric Testing in Oregon," National Safety News, 1973.
3. Morton, W. E., Crawford, E. D., Maricle, R. A., Douglas, D. D., Freed, V. H., "Hypertension in Oregon Pesticide-Formulation Workers," Journal of Occupational Medicine, March 1975, Volume 17, No. 3
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