OSHA - Respiratory Protection Standard

Work Instruction

29 CFR 1910.134

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Introduction			
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Purpose	
	This program is intended to be a resource for instructors of occupational safety and health and is not a substitute for any of the provisions of the Occupational Safety and Health Act of 1970 or for any standards issued by the U.S. Department of Labor's Occupational Safety and Health Administration (OSHA). OSHA's Office of Training and Education wishes to acknowledge 3M Occupational Health and Safety Division, MSA, North Safety Products and TSI for contributing some of the graphics used in this program. Appearance of their products does not imply endorsement by the U.S. Department of Labor.

Scope

	This standard applies to: • General Industry (Part 1910), • Shipyards (Part 1915), • Marine Terminals (Part 1917), • Longshoring (Part 1918), and • Construction (Part 1926).

General Standard Structure

	(a) Permissible practice (b) Definitions (c) Respirator program (d) Selection of respirators (e) Medical evaluation (f) Fit testing (g) Use of respirators (h) Maintenance and care (i) Breathing air quality and use (j) Identification of filters, cartridges, and canisters (k) Training and information (l) Program evaluation (m) Recordkeeping

Permissible Practice

Permissible Practice

	The primary means to control occupational diseases caused by breathing contaminated air is through the use of feasible engineering controls, such as enclosures, confinement of operations, ventilation, or substitution of less toxic materials
	• When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to this standard
	• Employer shall provide respirators, when necessary, which are applicable and suitable for the purpose intended
	• Employer shall be responsible for establishment and maintenance of a respirator program which includes the requirements of paragraph (c), *Respiratory protection program*

Definitions

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Employee Exposure

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

Respiratory Inlet Covering

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

Tight-Fitting Coverings

Tight-Fitting Coverings

Quarter Mask

Half Mask

Full Facepiece

Mouthpiece/Nose Clamp
(no fit test required)

Loose-Fitting Coverings
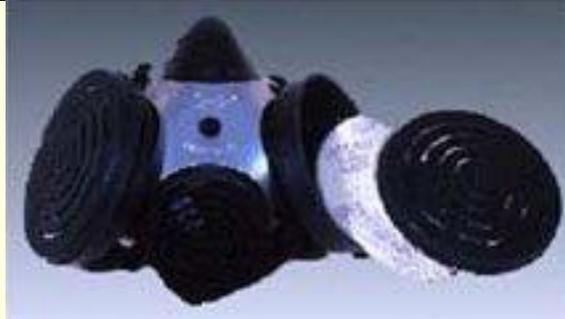
Loose-Fitting Coverings

Hood | Helmet

Loose-Fitting Facepiece | Full Body Suit

Filter

A component used in respirators to remove solid or liquid aerosols from the inspired air. Also called air purifying element

Canister or Cartridge

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

Negative Pressure Respirator

A respirator in which the air pressure inside the facepiece is **negative during inhalation** with respect to the ambient air pressure outside the respirator.

Filtering Facepiece (Dust Mask)

A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Air-Purifying Respirator (APR)

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

Positive Pressure Respirator

A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator

Powered Air-Purifying Respirator (PAPR)

An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

Atmosphere-Supplying Respirator

A respirator that supplies the user with breathing air from a source independent of the ambient atmosphere

Includes supplied-air respirators (SARs) and self-contained breathing apparatus (SCBA) units

Classes of Atmosphere-Supplying Respirators

Continuous Flow. Provides a continuous flow of breathing air to the respiratory inlet covering

Demand. Admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation

Pressure Demand. Admits breathing air to the facepiece when the positive pressure inside the facepiece is reduced by inhalation

Supplied Air Respirator (SAR)

An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user. Also called **airline respirator.**

Self-Contained Breathing Apparatus (SCBA

An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

Escape-Only Respirator

	A respirator intended to be used only for emergency exit.

Procedure

Respirator Program		
Procedure Steps	**Step**	**Action**
	1	Must develop a **written program** with **worksite-specific procedures** when respirators are necessary or required by the employer
	2	Must update program as necessary to reflect changes in workplace conditions that affect respirator use
	3	Must designate a **program administrator** who is qualified by appropriate training or experience to administer or oversee the program and conduct the required program evaluations
	4	Must provide respirators, training, and medical evaluations at no cost to the employee
	5	**Note:** OSHA has prepared a Small Entity Compliance Guide that contains criteria for selection of a program administrator and a sample program.

Respirator Program - Where Respirator Use is Not Required		
Procedure Steps	**Step**	**Action**
	1	Employer may provide respirators at employee's request or permit employees to use their own respirators, if employer determines that such use in itself will not create a hazard
	2	If voluntary use is permissible, employer must provide users with the information contained in Appendix D
	3	Must establish and implement those elements of a written program necessary to ensure that employee is **medically able to use the respirator** and that it is cleaned, stored, and maintained so it **does not present a health hazard** to the user
	4	Exception: Employers are not required to include in a written program employees whose only use of respirators involves voluntary use of filtering facepieces (dust masks).

Selection of Respirators

Selection of Respirators

	Employer must select and provide an appropriate respirator based on the respiratory hazards to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.

Procedure Steps	**Step**	**Action**
	1	Select a **NIOSH-certified respirator** that shall be used in compliance with the conditions of its certification
	2	Identify and evaluate the respiratory hazards in the workplace, including a reasonable estimate of employee exposures and identification of the contaminant's chemical state and physical form
	3	Where exposure cannot be identified or reasonably estimated, the atmosphere shall be considered **Immediately Dangerous to Life or Health (IDLH)**
	4	Select respirators from a sufficient number of models and sizes so that the respirator is acceptable to, and correctly fits, the user

Selection of Respirators

Related Facts	**No.**	**Description**	**Pg.**
	1	Immediately Dangerous to Life or Health (IDLH)	13
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	3	Maximum Use Concentration (MUC)	15
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Immediately Dangerous to Life or Health (IDLH)

	An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.
Oxygen Deficient Atmosphere	An atmosphere with an oxygen content below 19.5% by volume All oxygen deficient atmospheres are considered IDLH
Respirators for IDLH Atmospheres	 Full Facepiece Pressure Demand SCBA certified by NIOSH for a minimum service life of 30 minutes Combination Full Facepiece Pressure Demand SAR with Auxiliary Self-Contained Air Supply
	Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used. Exception: Employers may use any atmosphere-supplying respirator, provided they can demonstrate, under all foreseeable conditions, that oxygen levels in the work area can be maintained within the ranges specified in Table II (i.e., between 19.5% and a lower value that corresponds to an altitude-adjusted oxygen partial pressure equivalent to 16% oxygen at sea level).

Assigned Protection Factor (APF)

	The workplace level of respiratory protection that a respirator or class of respirators is expected to provide to employees when the employer implements a continuing, effective respiratory protection program as specified in this section.

Must use the APF's listed in Table 1 to select a respirator that meets or exceeds the required level of protection

When using a combination respirator (e.g., airline with an air-purifying filter), must ensure that the APF is appropriate to the mode of operation in which the respirator is being used

TABLE 1 – ASSIGNED PROTECTION FACTORS[5]

Respirator Type[1,2]	Quarter Mask	Half Mask	Full Face	Helmet/Hood	Loose-Fitting
Air Purifying	5	[3]10	50	-----------------	-----------------
PAPR	-----------------	50	1,000	[4]25/1,000	25
SAR					
Demand	-----------------	10	50	-----------------	-----------------
Continuous Flow	-----------------	50	1,000	[4]25/1,000	25
Pressure Demand/ other (+) pressure	-----------------	50	1,000	-----------------	-----------------
SCBA					
Demand	-----------------	10	50	50	-----------------
Pressure Demand/ other (+) pressure	-----------------	-----------------	10,000	10,000	-----------------

[1]May use respirators assigned for higher concentrations in lower concentrations or when required use is independent of concentration.

[2]These APF's are only effective when employer has a continuing, effective respirator program per 1910.134.

[3]This APF category includes filtering facepieces and elastomeric facepieces.

[4]Must have manufacturer test evidence to support an APF of 1,000 or else these respirators receive an APF of 25.

[5]These APFs do not apply to escape-only respirators. Escape respirators must conform to 1910.134(d)(2)(ii) or OSHA's substance specific standards, if used with those substances.

Maximum Use Concentration (MUC)

	The maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator, and is determined by the **assigned protection factor** of the respirator or class of respirators and the exposure limit of the hazardous substance

MUC = APF x OSHA Exposure Limit[1]

[1]When no OSHA exposure limit is available for a hazardous substance, the employer must determine an MUC on the basis of relevant available information and informed professional judgment. |
| | • Must select a respirator that maintains exposure to the hazardous substance, when measured outside the respirator, at or below the MUC
• Must not apply MUCs to conditions that are IDLH; instead must use respirators listed for IDLH conditions per paragraph (d)(2)
• When the calculated MUC exceeds the IDLH level for a hazardous substance, or the performance limits of the cartridge or canister, then employers must set the maximum MUC at that lower limit
• Must select a respirator appropriate for the chemical state and physical form of the contaminant |
| | What is the MUC for an employee wearing a half-mask air purifying respirator (APF=10) in an atmosphere of sulfur dioxide gas (PEL=5 ppm)?

MUC = APF x OSHA Exposure Limit

MUC = 10 x 5 ppm = 50 ppm

Note that this calculated value does not exceed the IDLH level for sulfur dioxide (100 ppm), so that the MUC for this example would be 50 ppm. |

End-of-Service-Life Indicator (ESLI)

A system that warns the user of the approach of the end of adequate respiratory protection; e.g., the sorbent is approaching saturation or is no longer effective.

Atmosphere-supplying respirator, or

Air-purifying respirator, provided that:

- respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant; or
- if there is no ESLI appropriate for conditions in the workplace, employer implements a change schedule for canisters and cartridges based on objective information or data that will ensure that they are changed before the end of their service life
  - employer must describe the information and data relied upon and basis for the change schedule and reliance on the data

On July 10, 1995, 30 CFR 11 ("Part 11") was replaced by 42 CFR 84 ("Part 84")

Only certifications of non-powered, air-purifying, particulate-filter respirators are affected by this change

Remaining portions of Part 11 were incorporated into Part 84 without change

Classes of Nonpowered Air-Purifying Particulate Filters

Nine classes: three levels of filter efficiency, each with three categories of resistance to filter efficiency degradation due to the presence of oil aerosols

N	R	P
100	100	100
99	99	99
95	95	95

N for *Not* resistant to oil

R for *Res*istant to oil

P for oil *Proof*

Selection and Use

- If no oil particles are present, use any series (N, R, or P)
- If oil particles are present, use only R or P series
- Follow the respirator filter manufacturer's service-time-limit recommendations

High Efficiency Filters	Filter that is at least 99.97% efficient in removing monodisperse particles of 0.3 micrometers in diameter. (HEPA filter per NIOSH 30 CFR 11) Equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

	Atmosphere-supplying respirator; or
	Air-purifying respirator equipped with HEPA filters certified by NIOSH under 30 CFR Part 11 or with filters certified for particulates under 42 CFR Part 84; or
	• Air-purifying respirator equipped with any filter certified for particulates by NIOSH for contaminants consisting primarily of particles with mass median aerodynamic diameters of at least 2 micrometers
	An individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him/her to independently provide, or be delegated the responsibility to provide, some or all of the health care services required by paragraph (e), Medical evaluation.

Medical Evaluation Procedures

Medical Evaluation Procedures		
Procedure Steps	**Step**	**Action**
	1	Must provide a medical evaluation to determine employee's ability to use a respirator, **before fit testing and use**
	2	Must identify a PLHCP to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information
	3	Medical evaluation must obtain the information requested by the questionnaire in Sections 1 and 2, Part A of App. C
	4	Follow-up medical examination is required for an employee who gives a positive response to any question among questions 1 through 8 in Section 2, Part A of App. C or whose initial medical examination demonstrates the need for a follow-up medical examination

Additional Medical Evaluations

	Annual review of medical status is not required
	At a minimum, employer must provide additional medical evaluations if:
	• Employee reports medical signs or symptoms related to the ability to use a respirator PLHCP, supervisor, or program administrator informs the employer that an employee needs to be reevaluated
	• Information from the respirator program, including observations made during fit testing and program evaluation, indicates a need
	• Change occurs in workplace conditions that may substantially increase the physiological burden on an employee

Fit Testing

Fit Testing

Before an employee uses any respirator with a negative or positive pressure tight-fitting facepiece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used.

Procedure Steps	Step	Action	Pg.
	1	A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.	22
	2	An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.	22
	3	Employees using tight-fitting facepiece respirators must pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT):	23
	4	Must conduct an additional fit test whenever the employee reports, or the employer or PLHCP makes visual observations of, changes in the employee's physical condition (e.g., facial scarring, dental changes, cosmetic surgery, or obvious change in body weight) that could affect respirator fit	23
	5	A quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio:	23
	6	QLFT may only be used to fit test negative pressure APRs that must achieve a fit factor or 100 or less	24
	7	If the fit factor is determined to be equal to or greater than 100 for tight-fitting half facepieces or equal to or greater than 500 for tight-fitting	24

		full facepieces, the QNFT has been passed with that respirator	

Step 1.

A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

Step 2.

An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

Step 3.

Employees using tight-fitting facepiece respirators must pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT):

- prior to initial use,
- whenever a different respirator facepiece (size, style, model or make) is used, and
- at least annually thereafter

Step 4.

Must conduct an additional fit test whenever the employee reports, or the employer or PLHCP makes visual observations of, changes in the employee's physical condition (e.g., facial scarring, dental changes, cosmetic surgery, or obvious change in body weight) that could affect respirator fit

The fit test must be administered using an OSHA-accepted QLFT or QNFT protocol contained in Appendix A

QLFT Protocols:

- Isoamyl acetate
- Saccharin
- Bitrex
- Irritant smoke

QNFT Protocols:

- Generated Aerosol (corn oil, salt, DEHP)
- Condensation Nuclei Counter (PortaCount)
- Controlled Negative Pressure (Dynatech FitTester 3000)
- Controlled Negative Pressure (CNP) REDON

Step 5.

A quantitative estimate of the fit of a particular respirator to a specific individual, and typically estimates the ratio:

$$\frac{\textit{Concentration of a substance in ambient air}}{\textit{Concentration inside the respirator when worn}}$$

Step 6.

QLFT may only be used to fit test negative pressure APRs that must achieve a fit factor or 100 or less

Step 7.

If the fit factor is determined to be equal to or greater than 100 for tight-fitting half facepieces or equal to or greater than 500 for tight-fitting full facepieces, the QNFT has been passed with that respirator

Use of Respirators

Use of Respirators			
Related Facts	**No.**	**Description**	**Pg.**
	1	Facepiece Seal Protection	24
	2	User Seal Check	24
	3	Continuing Respirator Effectiveness	25
	4	Procedures for IDLH Atmospheres	25
	5	Procedures for Interior Structural Firefighting	26

Facepiece Seal Protection	
	Respirators with tight-fitting facepieces must not be worn by employees who have facial hair or any condition that interferes with the face-to-facepiece seal or valve function
	Corrective glasses or goggles or other PPE must be worn in a manner that does not interfere with the face-to-facepiece seal
	Employees wearing tight-fitting respirators must perform a user seal check **each time they put on the respirator** using the procedures in Appendix B-1 or equally effective manufacturer's procedures

User Seal Check

	Positive Pressure Check Negative Pressure Check
	An action conducted by the respirator user to determine if the respirator is properly seated to the face.

Continuing Respirator Effectiveness

Maintain appropriate surveillance of work area conditions and degree of exposure or stress; reevaluate the respirator's effectiveness when it may be affected by changes in these

Employees must leave the respirator use area:

- to wash their faces and respirator facepieces as necessary
- if they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the facepiece
- to replace the respirator or filter, cartridge, or canister

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

Procedures for IDLH Atmospheres

- One employee or, when needed, more than one employee must be located outside the IDLH atmosphere
- Visual, voice, or signal line communication must be maintained between employees inside and outside
- Employees located outside must be trained and equipped to provide effective emergency rescue
- Employer or authorized designee must be notified before any employee outside the IDLH atmosphere enters to provide emergency rescue
- Employer or authorized designee, once notified, must provide necessary assistance appropriate to the situation

	Employees located outside the IDLH atmosphere must be equipped with:
	• a pressure demand or other positive pressure SCBA or SAR with auxiliary SCBA; and either
	• appropriate retrieval equipment for removing employees who enter, where retrieval equipment would contribute to the rescue of employees and would not increase the overall risk resulting from entry; or
	• equivalent means for rescue where retrieval equipment is not required per above

Procedures for Interior Structural Firefighting

	In addition to the procedures for respirator use in IDLH atmospheres, in interior structural fires:
	• At least two employees must enter and remain in visual or voice contact with one another at all times
	• At least two employees must be located outside
	• All employees engaged in interior structural firefighting must use SCBAs
	• One employee located outside may be assigned an additional role (e.g., incident commander), so long as this doesn't interfere with their assistance or rescue activities
	• This standard does not preclude firefighters from performing emergency rescue before an entire team has assembled

Maintenance and Care

Maintenance and Care

	Provide each user with a respirator that is clean, sanitary and in good working order
	Use procedures in Appendix B-2 or equivalent manufacturer's recommendations
	Clean and disinfect at the following intervals: • as often as necessary when issued for exclusive use • before being worn by different individuals when issued to more than one employee • after each use for emergency respirators and those used in fit testing and training

Breathing Air Quality and Use

Breathing Air Quality and Use

	Compressed breathing air must meet at least the requirements for Type 1 - Grade D breathing air described in ANSI/CGA G-7.1-1989: - Oxygen content (v/v) of 19.5 - 23.5% - Hydrocarbon (condensed) content of 5 milligrams per cubic meter (mg/m3) of air or less - CO content of 10 parts per million (ppm) or less CO_2 content of 1,000 ppm or less - Lack of noticeable odor Compressors supplying breathing air to respirators must be equipped with suitable in-line air-purifying sorbent beds and filters that are maintained and replaced or refurbished per manufacturer's instructions
	For compressors not oil lubricated, CO levels in the breathing air must not exceed 10 ppm For oil-lubricated compressors, a high-temperature or CO alarm, or both, must be used to monitor CO levels if only high-temperature alarms are used, the air supply must be monitored at sufficient intervals to prevent CO levels from exceeding 10 ppm

Identification of Filters, Cartridges, and Canisters

Identification of Filters, Cartridges, and Canisters	
	All filters, cartridges and canisters used in the workplace must be labeled and color coded with the NIOSH approval label The label must not be removed and must remain legible "TC number" is no longer on cartridges or filters (Part 84) Marked with "NIOSH", manufacturer's name and part number, and an abbreviation to indicate cartridge or filter type (e.g., N95, P100, etc.) Matrix approval label supplied, usually as insert in box

Training and Information

Training and Information

Employers must provide effective training to employees who are required to use respirators.

Training and Information

Employees who are required to use respirators must be trained such that they can demonstrate knowledge of at least:

- why the respirator is necessary and how improper fit, use, or maintenance can compromise its protective effect
- limitations and capabilities of the respirator
- effective use in emergency situations
- how to inspect, put on and remove, use and check the seals
- maintenance and storage
- recognition of medical signs and symptoms that may limit or prevent effective use
- general requirements of this standard

Training and Information

	Training must be provided prior to use, unless acceptable training has been provided by another employer within the past 12 months
	Retraining is required annually, and when:
	• changes in the workplace or type of respirator render previous training obsolete • there are inadequacies in the employee's knowledge or use • any other situation arises in which retraining appears necessary
	The basic advisory information in Appendix D must be provided to employees who wear respirators when use is not required by this standard or by the employer

Program Evaluation

Program Evaluation

	Must conduct evaluations of the workplace as necessary to ensure effective implementation of the program
	Must regularly consult employees required to use respirators to assess their views on program effectiveness and to identify and correct any problems
	factors to be assessed include, but are not limited to:
	• respirator fit (including effect on workplace performance) • appropriate selection • proper use • proper maintenance

Recordkeeping

Recordkeeping

	Records of medical evaluations must be retained and made available per 29 CFR 1910.1020
	• A record of fit tests must be established and retained until the next fit test is administered
	• A written copy of the current program must be retained
	• Written materials required to be retained must be made available upon request to affected employees and OSHA

Quiz

Directions	
	When you feel you understand the information presented in this module, take the Test that follows.
	For each multiple-choice question:
	• Click on the grey box next to your answer and a yellow ball will appear in the box.
	• Click the Next button [>] on the navigation panel or press the **Enter** key on your keyboard to move on to the next question.
	• Continue through all of the questions until you come to the question Review page.
	The Review page tells you how many you answered correctly and how many you answered correctly on the first try.
	Good Luck!

Retraining is required annually, and when:

Question Responses		Choice Text	"x" = correct	Pg.
	A.	changes in the workplace or type of respirator render previous training obsolete		32
	B.	there are inadequacies in the employee's knowledge or use		32
	C.	any other situation arises in which retraining appears necessary		32
	D.	All of the above	x	32

Response A.

changes in the workplace or type of respirator render previous training obsolete

Response B.

there are inadequacies in the employee's knowledge or use

Response C.

any other situation arises in which retraining appears necessary

Response D.

All of the above

Correct	Retraining is required annually for any and all of these reasons.

How well did you do?

You have reached the end of the test questions for this lesson.

If you missed any questions: Click the **Review** button below to turn on the review mode. Each question will be shown with your answer and the correct answer. The correct answer will be marked by a green ball; if your answer was incorrect it will be marked with a red X.

To leave this lesson click the **Exit** button