



1.0 SCOPE

This standard sets forth accepted practices for the use of respiratory protection. It provides guidance on the proper selection, use, and care of respirators, and describes the essentials of a respiratory protection program. The standard conforms with regulations promulgated under the Occupational Safety and Health Act (OSHA) CFR 29, Section 1910.134. Specific state and non-U.S. safety and health standards may require special consideration.

2.0 DEFINITIONS

2.1 AIR-PURIFYING RESPIRATOR

A respirator designed to remove contaminants from ambient air prior to its inhalation.

2.2 APPROVED RESPIRATOR

A respirator tested and listed as satisfactory in the United States by the Mine Safety and Health Administration, U.S. Department of Labor, and the National Institute for Occupational Safety and Health, or a government agency or nationally recognized scientific body in non-U.S. locations.

2.3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH

Any hazardous atmosphere that poses an immediate threat to life or health or that poses an immediate threat of severe exposure to contaminants such as radioactive materials which are likely to have adverse delayed effects on health.

2.4 NEGATIVE PRESSURE RESPIRATOR

A respirator in which the air pressure inside the facepiece is positive during exhalation in relation to the air pressure of the outside atmosphere and negative during inhalation in relation to the air pressure of the outside atmosphere.

2.5 POSITIVE PRESSURE RESPIRATOR

A respirator in which the air pressure inside the respiratory- inlet covering is positive in relation to the air pressure of the outside atmosphere during exhalation and inhalation.

2.6 QUALIFIED PERSONNEL

A qualified person is one who has completed a training course approved by the American Industrial Hygiene Association or NIOSH, or sponsored by an educational institution recognized for its training in the occupational health and safety areas. In

lieu of formal training, a qualified person may have worked under the direction of a trained industrial hygienist and demonstrated the knowledge and understanding needed to administer the respiratory protection program.

2.7 RESPIRATOR

A device designed to protect the wearer from inhalation of harmful atmospheres.

2.8 SHALL

Denotes a requirement.

2.9 SHOULD

Denotes a recommendation.

3.0 POLICY

3.1 PRIORITIES OR CONTROL METHODS

Control of potentially harmful occupational exposures shall be accomplished as far as practical or feasible by work practices, or engineering control measures. When these methods of control are not practical or feasible, such as in emergency or demolition activities, or while they are being developed and instituted, or when use of respirators is determined to be appropriate as supplemental protection, employees' health shall be protected by the use of appropriate respirators. Alcoa shall provide respirators as needed for protecting the health of the Alcoa employee.

4.0 ELEMENTS OF A RESPIRATORY PROTECTION PROGRAM

Elements of the program must be documented in a written respiratory protection program.

4.1 WRITTEN RESPIRATORY PROTECTION PROGRAM

The Respiratory Protection Administrator shall prepare a written respiratory protection program which shall include, at a minimum, all of the provisions described in Section 4 of this standard.

4.2 ASSIGNMENT OF RESPONSIBILITY

4.2.1 Respiratory Protection Administrator

Where the use of respirators is required, a respiratory protection program shall be established which shall comply with the provisions of this standard. A

Respiratory Protection Administrator shall be selected from plant safety, industrial hygiene or other qualified personnel to administer and coordinate the overall plant respiratory protection program.

4.2.2 Employee Responsibility

Employees shall use the provided respiratory protection in strict accordance with the training received. They shall immediately report any respirator malfunctions to the responsible persons in their departments.

4.2.3 Program Evaluation

An appraisal, including a formal self-evaluation, of the effectiveness of the respirator program shall be carried out at least annually by the Respiratory Protection Administrator. Action shall be taken to correct defects found in the program.

4.3 RESPIRATOR SELECTION

The selection of a proper respirator for any given situation shall require consideration of the following factors:

4.3.1 Nature of Hazard

The following factors concerning the nature of the hazard requiring the use of respirators shall be considered in respirator selection:

- 1) Type of hazard
 - a) oxygen deficiency
 - b) contaminant
- 2) Physical properties
- 3) Chemical properties
- 4) Physiological effects on the body.
- 5) Actual or potential concentration of a toxic material
 - a) Average
 - b) Peak

- 6) Established permissible exposure limits, i.e. 8 hour time-weighted average, short term, ceiling or peak.
- 7) Whether the hazard is an immediately dangerous to life or health concentration of a toxic material.
- 8) Warning properties.

4.3.2 Location of Hazardous Area

The location of the hazardous area with respect to a safe area having respirable air shall be considered in selecting a respirator, since this will permit planning for the escape of workers if an emergency occurs, for the entry of workers to perform maintenance duties, and for rescue operations.

4.3.3 Duration of Respirator Use

The period of time that a respirator must be worn is an important factor that shall be taken into account in selecting a respirator. Consideration shall be given to the type of respirator application, such as for routine, nonroutine, emergency, or rescue use. It would not be desirable, for example, to select respirators that are heavy or that offer high resistance to breathing for routine wearing for many hours each day.

4.3.4 Respirator Characteristics

The physical characteristics, the functional capabilities, and the performance limitations of the various types of respirators shall be considered in selecting a respirator.

4.3.5 Assigned Protection Factor

The expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users. Multiplying the permissible exposure limit or ceiling concentrations, whichever is applicable, by the assigned protection factor gives the maximum concentration of the contaminant for which the respirator should be used. This calculated concentration may not exceed concentration limits established by the manufacturer or the respirator approval agency.

4.3.5.1 Workplace Protection Factor

An experimentally determined measure of protection afforded by a respirator under conditions of use. It is defined as the ratio of the concentration of airborne contaminant outside the respirator to the

concentration inside the respirator as measured during actual use situations.

4.3.5.2 Fit Factor

The ratio of the concentration of airborne contaminant outside the respirator to the concentration inside the respirator determined under laboratory conditions.

A protection factor is a selection and use guide, and should only be used in conjunction with the selection criteria outlined in this standard and the advice of the Respiratory Protection Administrator. (See Table 1, 18.1.1 for list of respirator protection factors.)

4.3.6 Approved Respirators

Approved respirators shall be used when they are available. Any modification that is not authorized by the approval agencies of an approved respirator voids the approval.

4.3.7 Workplace Environmental Measurements

Selection of a proper respirator should be based on the concentration of the respiratory hazard as measured in the work area, or anticipated potential concentration, as determined by Respiratory Protection Administrator. Air samples should be collected periodically during respirator use to ensure that continued use of the selected respirator remains appropriate. (See Alcoa Industrial Hygiene Manual, Chapter 11, for exposure monitoring guidelines).

4.4 TRAINING

The supervisor, the person issuing respirators, and the respirator wearers shall be given adequate training by a qualified person(s) to ensure the proper use of respirators.

4.4.1 Training Content

To ensure the proper and safe use of a respirator, the minimum training of each respirator wearer shall include the following elements:

- 1) The reasons for the need of respiratory protection.
- 2) The nature, extent, and effects of respiratory hazards to which the person may be exposed.

- 3) An explanation of why engineering controls are not being applied or are not adequate and of what effort is being made to reduce or eliminate the need for respirators.
- 4) An explanation of why a particular type of respirator has been selected for a specific respiratory hazard.
- 5) An explanation of the operation, and the capabilities and limitations of the respirator selected.
- 6) Instruction in inspecting, donning, checking the fit of, and wearing the respirator.
- 7) An opportunity for each respirator wearer to handle the respirator, learn how to don and wear it properly, check its seals, wear it in a safe atmosphere.
- 8) An explanation of how maintenance and storage of the respirator is carried out.
- 9) Instructions on how to recognize and cope with emergency situations.
- 10) Instructions as needed for special respirator use.
- 11) Regulations concerning respirator use.

4.4.2 Refresher Training

Refresher training shall be conducted at least on an annual basis for all respirator wearers. The content of the training may vary depending on the frequency of respirator use and type of respirator worn. As a minimum, training shall include proper donning procedures, maintenance and care of assigned respirators, the hazards for which the respirators are assigned, and the limitations of the respirators used.

4.5 MEDICAL EVALUATION

A physician shall determine what physiological conditions are pertinent for the wearing of different types of respirators, and whether or not a person may be assigned to a task requiring the use of a respirator. This determination shall be made, reviewed or evaluated with a frequency which meets applicable regulations, Alcoa Medical Protocol B-25 and local plant practices and policies.

4.6 FIT-TESTING

Each wearer of a tight-fitting face piece respirator shall pass a qualitative or quantitative fit-test to assure satisfactory fit on an annual basis. Each respirator wearer shall be required to check the seal of the respirator by appropriate means prior to entering a potentially hazardous atmosphere.

Note: Fit testing on a more frequent basis may be required by specific regulations.

4.6.1 Test Method

A qualitative or quantitative respirator fit test shall be used to determine the ability of each individual respirator wearer to obtain a satisfactory fit with all respirators which have tight-fitting face pieces, both positive and negative pressure. The results of qualitative or quantitative fit tests shall be used to select specific types, makes, and models of respirators used by individual respirator wearers.

For tight fitting face-pieces used for positive pressure respirators, a fit factor of 100 by quantitative fit test or passing a qualitative fit test assures that there is a good fit of the face-piece. Increased assigned protection factors are applied based on continuous positive pressure within the face-piece, relative to outside the face-piece.

Quantitative fit test protocols used shall insure a fit factor of at least 10 times the assigned protection factor. Qualitative protocols used shall follow validated procedures. The tests shall be designed to assess fit factors 10 times greater than the assigned protection factor. Quantitative fit testing is recommended whenever a full face-piece respirator, in negative pressure mode (e.g., Air Purifying), is used for protection greater than 10X PEL or if exposures could exceed 10X PEL. (Refer to OSHA Appendix D to Section 1910.1025 - "Qualitative Fit Test Protocols" for currently acceptable qualitative fit test protocols which can be followed. These protocols are subject to revision.)

4.6.2 Facial Hair

A respirator equipped with a facepiece shall not be worn if facial hair comes between the sealing periphery of the facepiece and the face or if facial hair interferes with valve function.

4.7 RESPIRATOR MAINTENANCE

Respirator maintenance and inspection shall be performed regularly. Maintenance shall be carried out on a schedule which ensures that each respirator wearer is provided with a respirator that is clean and in good operating condition.

4.7.1 Cleaning and Sanitizing

Each respirator shall be cleaned and sanitized to ensure that the respirator wearer is provided with a clean and sanitized respirator at all times. A respirator issued for other than continuous personal use by a particular worker, such as with routine, non-routine, emergency, or rescue use, shall be cleaned and sanitized after each use.

4.7.2 Inspection

Each respirator shall be inspected routinely before and after use. A respirator shall be inspected by the user immediately prior to each use to ensure that it is in proper working condition. After cleaning and sanitizing, each respirator shall be inspected to determine if it is in proper working condition, if it needs replacement of parts or repairs, or if it should be discarded.

In addition to inspection before and after each use, each respirator stored for emergency or rescue use shall be inspected at least monthly. Respirator inspection shall include a check for tightness of connections; for the condition of the respiratory-inlet covering, head harness, valves, connecting tubes, harness assemblies, filters, cartridges, canisters, end-of-service life indicator, and shelf life date(s); and for the proper function of regulators, alarms, and other warning systems.

Each rubber or other elastomeric part shall be inspected for pliability and signs of deterioration. Each air and oxygen cylinder shall be inspected to ensure that it is fully charged according to the manufacturer's instructions.

A record of inspection dates, findings, and remedial actions shall be kept for each respirator maintained for emergency or rescue use.

4.7.3 Repair

Replacement of parts or repairs shall be done only by persons trained in proper respirator assembly and correction of possible respirator malfunctions and defects. Replacement parts shall be only those designed for the specific respirator being repaired. Reducing or admission valves, regulators, and alarms shall be returned to the manufacturer or to a trained technician for repair or adjustment. Instrumentation for valve, regulator, and alarm adjustments and tests must be approved by the valve, regulator, or alarm manufacturer.

4.7.4 Storage

Respirators shall be stored in a manner that will protect them from dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent distortion of rubber or other elastomeric

parts. Respirators shall not be stored in such places as lockers and tool boxes unless they are protected from contamination, distortion, and damage. Emergency and rescue-use respirators that are placed in work areas shall be quickly accessible at all times. The storage cabinet or container in which they are stored shall be clearly marked.

4.8 RECORDKEEPING

Records shall be maintained by the Respiratory Protection Administrator or their designee as part of the overall respiratory protection program.

4.8.1 Types of Records

Recordkeeping requirements will vary greatly with the complexity of a location's use of respirators. The following represents a minimum requirement:

- 1) Employee training session outlines and attendance records.
- 2) Results of fit-test.
- 3) Medical acceptance or rejection of an employee's use of respirators on his/her job.
- 4) Reports of monthly inspections of emergency use respirators.

4.8.2 Record Retention

Records required under this section shall be maintained for at least 40 years, or for the duration of employment plus 30 years.

5.0 QUALITY OF RESPIRABLE AIR

5.1 SPECIFICATIONS FOR RESPIRABLE AIR

Compressed air and liquid air, used for respiration shall be of high purity. Breathing air shall meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1989. This currently requires that the carbon monoxide level not exceed 10 ppm, the carbon dioxide content not exceed 1000 ppm, the condensed hydrocarbons (oil mist) not exceed 5 mg/m³, and there be no pronounced odor.

5.2 COMPRESSED AIR

Breathing air may be supplied to respirators from cylinders or air compressors.

A breathing-air type compressor shall be used. A compressor shutoff alarm and suitable in-line air purifying sorbent bed and filters to assure breathing air quality shall also be incorporated into the system. An air-storage receiver shall also be

provided to furnish the wearer with an adequate supply of escape air if the compressor fails to operate. In addition, compressor air intakes shall be situated so as to avoid the entry of contaminated air into the system.

If an oil-lubricated compressor is used, it shall have a high temperature or carbon monoxide alarm, or both. If only a high temperature alarm is used, the air from the compressor shall be frequently tested for carbon monoxide to ensure that it meets the specifications for respirable air.

The contents of compressed air cylinders used to provide the air supply for an airline respirator shall be tested for oxygen concentration and carbon monoxide content. The air supply in the cylinder shall be sufficient to permit completion of the work and escape.

6.0 BIBLIOGRAPHY

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Appendix D.

RESPIRATORY PROTECTION18.1.1
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PAGE 11 OF 11**ASSIGNED PROTECTION FACTORS (a)****NEGATIVE PRESSURE RESPIRATORS**

Type of Respirator	Respiratory Inlet Covering		
	1/4 Mask	Half Mask (b)	Full Facepiece
Air Purifying	5	10	50
Atmosphere Supplying: SCBA (demand) (c)	-	10	50
Air Line (demand)	-	10	50

POSITIVE PRESSURE RESPIRATORS

Type of Respirator	Respirator Inlet Covering			
	Half Mask	Full Face	Helmet/Hood	Loose Fitting Facepiece
Powered Air Purifying	50	250	25	25
Atmosphere Supplying: Air Line Pressure Demand	50	1000	-	-
Air Line Continuous Flow	50	1000	25	25
Self Contained Breathing Apparatus (d): Pressure Demand Open/Closed Circuit	-	>1000	-	-

TABLE 1, 18.1.1

- a) These assigned protection factors are intended to be maximum values used by Alcoa facilities. Whenever local regulations require more stringent APF, lower numbers should be used.
- b) Includes disposable half masks and half masks with elastomeric facepieces.
- c) Demand SCBA shall not be used for emergency situations such as fire fighting.
- d) Although positive pressure respirators are currently regarded as providing the highest level of respiratory protection, a limited number of recent simulated workplace studies concluded that all users may not achieve protection factors of 10,000. Based on this limited data, a definitive assigned protection factor could not be listed for positive pressure SCBA's. For emergency planning purposes where concentrations can be estimated, an assigned protection factor of no higher than 10,000 should be used.

Note: Assigned protection factors are not applicable for escape respirators. For combination respirators e.g. air line respirators equipped with an air purifying filter, the mode of operation in use will dictate the assigned protection factor to be named.