

ASSE Tech Brief



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ANSI/ASSE Z88.2-2015 – BACKGROUND MATERIALS Practices for Respiratory Protection

Title: ANSI/ASSE Z88.2-2015 Practices for Respiratory Protection

Previous Versions: (Various different versions from 1969 until 1992. The Z88.2 Standard was then administratively withdrawn by ANSI in 2002. The recently approved Z88.2 is viewed as a new standard as opposed to a revision due to the initial withdrawal).

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Scope and Background Materials

1.1 Scope. This standard sets forth minimally accepted practices for occupational respirator use; provides information and guidance on the proper selection, use and maintenance of respirators and contains requirements for establishing, implementing and evaluating respirator programs. The standard covers the use of respirators to protect persons against the inhalation of harmful air contaminants and against oxygen-deficient atmospheres in the workplace. The following are not covered by this standard:

- a) underwater breathing devices;
- b) aircraft oxygen systems;
- c) supplied-air suits;
- d) use of respirators under military combat conditions, and
- e) medical inhalators and resuscitators.

1.2 Purpose. The purpose of this standard is to provide information and guidance on the proper selection, use and maintenance of respirators, which will help safeguard the life and health of respirator wearers. This standard is written for all persons concerned with respiratory protection, but especially for those primarily responsible for establishing and administering an acceptable respirator program. The standard contains requirements recommended for enforcement authorities in establishing regulations or codes for respiratory protection use.

1.3 Exceptions. Users of this standard shall be aware that regulatory agencies may have

requirements that are different from this standard.

2. NORMATIVE REFERENCES

The following standards contain provisions that, through reference in this text, constitute provisions of this American National Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI Z88.6-2006, *Respiratory Protection - Respirator Use - Physical Qualifications for Personnel*

ANSI Z88.10-2010, *Respirator Fit Test Methods*

CGA C-7-2011, *Guide to the Preparation of Precautionary Labeling and Marking of Compressed Gas Containers*

CGA G-7.1-2011, *Commodity Specification for Air*

Code of Federal Regulations, Title 49, Part 180, *Continuing Qualification and Maintenance of Packaging*

United States Pharmacopoeia, 2009

National Fire Protection Association (NFPA) 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, 2014 Edition

National Fire Protection Association (NFPA) 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services*, 2013 Edition

3. DEFINITIONS

3.1 Abrasive Blasting Respirator. An airline respirator designed to protect the wearer from inhalation of, impact of and abrasion by materials used or generated in abrasive blasting.

3.2 Aerodynamic Diameter. The diameter of a unit density sphere having the same terminal settling velocity as the particle in question.

3.3 Aerosol. Particles, solid or liquid, suspended in air (e.g., dust, fumes, mists or fibers).

3.4 Airline Respirator (Supplied-Air Respirator – SAR). An atmosphere-supplying respirator in which the respirable air is supplied from a hose or breathing tube, rather than being carried by the wearer.

3.5 Air-Purifying Respirator. A respirator where ambient air is passed through an air-purifying element by either inhalation or by means of a blower.

3.6 Ambient Air Pump. A motorized blower used to supply air to a continuous flow airline respirator.

3.7 Approved. A respirator for which a formal certificate was issued by the National Institute for Occupational Safety and Health (NIOSH) or by NIOSH and the Mine Safety and Health Administration (MSHA) in accordance with 42 CFR Part 84 *Respiratory Protective Devices* and is maintained in full compliance with the certificate.

3.8 Assigned Protection Factor (APF). The minimum expected workplace level of respiratory protection that would be provided by a properly functioning and used respirator or a class of respirators to properly fitted and trained wearers when all elements of an effective respirator program are established and are being implemented.

3.9 Atmosphere-Supplying Respirator. A class of respirators that supply a respirable atmosphere, independent of the workplace atmosphere. This class includes airline respirators and self-contained breathing apparatus (SCBA).

3.10 Bioaerosol. A liquid droplet (generated for example by coughing, sneezing) or a solid particle (generated for example by sweeping, shoveling) suspended in the air that is living or originate from living organisms. Bioaerosols include living or dead microorganisms, fragments, toxins and particulate waste products from all varieties of living things. They are capable of causing infection, adverse or allergic response potentially leading to disease.

Note: Individual bioaerosols most often range in size from 0.01 μ m to 100 μ m in diameter.

3.11 Bio-Monitoring. A determination of the concentration of a substance in biological fluids or tissue and used for occupational exposure surveillance.

3.12 Canister (Air-Purifying). A container with (1) gas and vapor removing sorbent or catalyst or (2) gas and vapor removing sorbent or catalyst that remove gases and vapors, and filter that removes particles from inspired air (or air drawn through the unit). Typically attached to a full facepiece either mounted directly to the chin or connected to a breathing tube so the canister may be worn in the front or back of the person.

Note: Respirators with air-purifying canisters are approved by NIOSH as gas masks, and contain an approval number TC-14G-xxxx.

3.13 Canister (Carbon Dioxide Scrub-bing). A container filled with a chemical used to remove carbon dioxide from exhaled air before that air is rebreathed in a closed-circuit SCBA.

3.14 Canister (Oxygen-Generating). A container filled with a chemical that generates oxygen

by chemical reaction used in closed-circuit SCBA.

3.15 Cartridge. A small container filled with sorbents or catalysts that remove gases and vapors from the inspired air. The cartridge may also have particulate filters that are an integral part or ones that are replaceable.

3.16 Ceiling Limit. The maximum allow-able concentration of an airborne contam-inant that shall not be exceeded at any time.

3.17 Certified. See “Approved”.

3.18 Change Schedule. A time interval after which a used filter, cartridge or canister is replaced with a new one.

3.19 Confined Space. An enclosed space not designed for human occupancy that has the following characteristics:

- a) restricted entry and exit;
- b) primary function is something other than human occupancy, and
- c) contains potential or known respiratory hazards.

Examples of confined spaces include, but are not limited to; tanks, silos, vessels, pits, sewers, pipelines, tank cars, boilers, septic tanks and utility vaults. See 29 CFR 1910.146 and ANSI/ASSE Z117.1 for more details on permit-required confined spaces.

3.20 Contaminant. A potentially harmful, irritating or nuisance airborne material.

3.21 Continuous Flow Respirator. An atmosphere-supplying respirator that pro-vides a continuous flow of respirable air to the respiratory inlet covering.

3.22 Demand Respirator. An atmosphere-supplying respirator that admits respirable air to the respiratory inlet covering only when a negative pressure is created inside the respiratory inlet covering by inhalation.

3.23 Dust. An aerosol consisting of mechanically produced solid particles de-rived from breaking up of larger particles.

3.24 End-of-Service-Life Indicator (ESLI). A system or device that warns the wearer of the approach of the end of adequate respiratory protection.

3.25 Escape-Only Respirator. A respirator intended only for use during emergency egress from a hazardous atmosphere.

3.26 Occupational Exposure Limit (OEL). The maximum allowable concentration of a contaminant in the air to which an individual may be exposed over a period of time. Commonly

used OELs include OSHA permissible exposure limits (PELs) and ACGIH® threshold limit values (TLVs®). (ACGIH® and TLVs® are registered trademarks of the American Conference of Governmental Industrial Hygienists.) These may be time-weighted averages, short-term limits or ceiling limits.

3.27 Filter. Material used in air-purifying respirators to remove solid or liquid aerosols from inspired air. Some filters are encapsulated in a container and some are not.

N-Series Particulate Filter – The NIOSH classification for particulate filters effective against particulate aerosols free of oil; time-use restrictions may apply.

R-Series Particulate Filter – The NIOSH classification for particulate filters effective against all particulate aerosols; time-use restrictions may apply.

P-Series Particulate Filter – The NIOSH classification for particulate filters effective against all particulate aerosols.

HE Filter – The NIOSH classification for a 99.97% efficiency filters used in powered air-purifying respirator (PAPR) which is effective against all particulate aerosols.

N-, R- and P-series particulate filters are tested at 99.97%, 99% and 95% efficiency levels, referred to as classes 100, 99 and 95 respectively.

3.28 Filtering Facepiece. A negative-pressure respirator where the filter is an integral part of the facepiece or comprises the entire facepiece.

3.29 Fit Factor. A numeric expression of how well a tight-fitting respirator fits a wearer during a quantitative fit test. It is the ratio of the measured challenge agent concentration outside the respirator (C_{out}) to its concentration inside the respirator (C_{in}).

$$(\text{Fit factor} = C_{out} / C_{in})$$

A fit factor resulting from a qualitative fit test has been validated to 100 (Annex A.6).

3.30 Fit Test. The use of a qualitative or quantitative protocol to evaluate sealing surface leakage of a specific tight-fitting respirator while worn by an individual.

3.31 Fume. Aerosols formed by condensation of a vaporized solid.

3.32 Gas. A fluid that has neither independent shape nor volume and tends to expand indefinitely. In contrast, liquids have independent volume, but not independent shape.

3.33 Hazardous Atmosphere. An atmosphere that contains a contaminant(s) in excess of the occupational exposure limit or that is oxygen-deficient.

3.34 Hazard Ratio. A number obtained by dividing the concentration of a contaminant by its occupational exposure limit.

3.35 Helmet. A hood that offers head protection against impact and penetration to the wearer.

3.36 High-Efficiency Particulate Air (HEPA) Filter. HEPA filters are considered N100, R100, P100 and HE. P100 and HE filters are identified with a magenta color.

3.37 Hood. Tight-fitting or loose-fitting-respiratory inlet covering that completely covers the head and neck and may cover portions of the shoulders.

3.38 Immediately Dangerous to Life or Health (IDLH). Any atmosphere that poses an immediate hazard to life or poses immediate irreversible debilitating effects on health.

3.39 Loose-Fitting Facepiece. A respiratory inlet covering that is designed to form a partial seal with the face, does not cover the neck and shoulders and may or may not offer head protection against impact and penetration.

3.40 Mass Median Aerodynamic Diameter (MMAD). The calculated aerodynamic diameter that divides the aerosol particles based on the weight of the particles. By weight, 50% of the particles will be larger than the MMAD and 50% of the particles will be smaller than the MMAD.

3.41 Mist. An aerosol composed of liquid droplets produced either mechanically or by condensation of vaporized liquid.

3.42 Mouthpiece and Nose Clamp Assembly. A respiratory inlet covering that is held in the wearer's mouth and must always be used in conjunction with a nose clamp.

3.43 Maximum Use Concentration (MUC). The maximum atmospheric concentration of a hazardous substance from which a wearer can be expected to be protected, when wearing a respirator, and is frequently determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be frequently determined mathematically by multiplying the assigned protection factor specified for a respirator by the required time weighted average occupational exposure limit (OEL), short-term exposure limit or ceiling limit. When no OEL is available for a hazardous substance, an employer must determine a MUC on the basis of relevant available information and informed professional judgment.

3.44 Negative-Pressure Respirator. A respirator in which the air pressure inside the respiratory inlet covering is negative during inhalation with respect to the ambient air pressure.

3.45 Physician or Other Licensed Health Care Professional (PLHCP). An individual whose legally permitted scope of practice (i.e., license, registration or certification) allows them to independently provide, or be delegated the responsibility to provide, some or all of the health

care services required by 29 CFR 1910.134(e).

3.46 Positive-Pressure Respirator. A respirator in which the pressure inside the respiratory inlet covering is normally positive with respect to ambient air pressure (Annex A.7).

3.47 Powered Air-Purifying Respirator. An air-purifying respirator that uses a blower to move the ambient atmosphere through air-purifying elements into the respiratory inlet covering.

3.48 Pressure-Demand Respirator. An atmosphere-supplying respirator in which the pressure inside the respiratory inlet covering, in relation to the pressure surrounding the outside of the respiratory inlet covering, is positive during both inhalation and exhalation.

3.49 Qualitative Fit Test (QLFT). A pass/ fail fit test that relies on the subject's sensory response to detect a challenge agent.

3.50 Quantitative Fit Test (QNFT). A fit test that uses an instrument to measure facesal leakage.

3.51 Respirator. Personal protective equip-ment designed to protect the wearer from inhalation of hazardous atmospheres.

3.52 Respiratory Inlet Covering. That portion of a respirator that connects the wearer's respiratory tract to an air-purifying or atmosphere-supplying respirator. They may be either tight fitting or loose fitting in design. It may be a facepiece, helmet, hood or mouthpiece/nose clamp.

3.53 Required Fit Factor (RFF). The numeric value established as pass/fail point or acceptance criterion for a quantitative fit test.

3.54 Respirator Manufacturer. An entity that designs and/or manufactures a respi-rator, or has a respirator designed and/or manufactured for them under their name or trademark.

3.55 Respirator User Instructions. Instructions and information provided by the respirator manufacturer.

3.56 Self-Contained Breathing Apparatus (SCBA). An atmosphere-supplying respirator in which the respirable gas source is designed to be carried by the wearer.

3.57 Service Life. The period of time that a respirator provides adequate protection to the wearer.

3.58 Shall. The word "shall" is to be under-stood as denoting a mandatory requirement.

3.59 Should. The word "should" denotes a recommendation.

3.60 Sorbent. A material that removes specific gases and vapors from the inhaled air.

3.61 Supplied-Air Respirator. See “Airline Respirator”.

3.62 Tight-Fitting Respiratory Inlet Covering. A respirator component designed to form a complete seal with the face or neck. A half-facepiece (includes quarter masks, filtering facepiece and half-masks with elastomeric facepieces) covers the nose and mouth; a full facepiece covers the nose, mouth and eyes. Tight-fitting hoods seal at the neck.

3.63 User. Person or organization who makes use of the respirator; for example, one involved in selecting, maintaining or wearing the respirator.

3.64 Vapor. The gaseous phase of matter that normally exists in a liquid or solid state at room temperature and pressure.

3.65 Wearer. The person who wears the respirator.

3.66 Wearer Seal Check (a.k.a. User Seal Check). A procedure conducted by the wearer to determine if a tight-fitting respirator is properly donned. See Section 10.

3.67 Written Record. Documentation, either paper or electronic, of any record-keeping requirements and details of the respirator program.

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Links and information related to ANSI/ASSE American National Standards

- [Official Memorandum of Understanding Between OSHA & ANSI](#)
- [Office of Management & Budget Circular OMB-A119](#)
- [Safeguarding: Are ANSI Standards Really Voluntary?](#)
- [Standards History Article](#)
- [The Impact of Standards on Corporate Profitability A Summary of Research Conducted by ASTM International \(Reprinted with permission from ASTM Standardization News, Vol. 35, No. 7, copyright ASTM International, 100 Barr Harbor Dr., West Conshohocken, PA 19428, www.astm.org\)](#)
- [Position Statement on Consensus Standards](#)
- [What’s the Difference Between an OSHA Rule and an ANSI Standard?](#)

Examples of Recognition

U.S. DOL/OSHA:

https://www.osha.gov/Publications/SECG_RPS/CPL_2-0_120.pdf

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=12716&p_table=STANDARDS

https://www.osha.gov/dep/ohe/tuberculosis/1910_134-1910_139sidebyside.pdf

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10125

CDC/NIOSH

http://www.cdc.gov/niosh/nas/ppt/QUADCharts08/Z6JH_FY08_QC.htm

U.S Department of Energy

<http://www.fnal.gov/directorate/Legal/files/Mod%20100.pdf>