

TENNESSEE CHILL BOX

Respiratory Protection fact Sheet

Air-purifying Respirators

Air-Purifying respirators have filters, cartridges, or canisters that remove contaminants from the air by passing the ambient air through the air-purifying element before it reach the user.

Supplied Air Respirators

Supplied Air Respirators provide a supply of clean, safe air to the wearer. These units pump air through a hose to a hood or face mask, or a Self-Contained Breathing Apparatus which uses backpack tanks.

OSHA requirements for Supplied Air Respirators (SAR)

5.3.4.4 Supplied Air Respirators (SAR)

Portable breathing air compressors do not require a CO or high temperature alarm if using carbon vanes as the air mover. OSHA also requires that employees have a reliable source of air with an oxygen content of at least 19.5% according to 29 CFR 1910.134(d).

Do not use powered air-purifying respirators if airflow is less than **4 cfm** (115 lpm) for tight fitting face pieces or **6 cfm** (170 lpm) for hood and/or helmets.

Airline Respirators

These lightweight devices use an external source of air connected by a hose, or "airline," to the face piece, hood, or helmet. They offer many advantages and may be the preferred form of respiratory protection in many applications. Some airline models are equipped with an air cylinder for emergency escape from Immediately Dangerous to Life and Health (IDLH) conditions. Airline respirators (and SCBAs) are approved for use under the following conditions where the use of air purifying respirators is precluded:

- In atmospheres where contaminants have poor warning properties - i.e., they do not emit a detectable odor or taste, or cause irritation at safe concentrations.
- In the presence of substances that would generate a high heat reaction with the adsorbent in an air purifying respirator.
- Where chemicals in the atmosphere are adsorbed very poorly by the adsorbents used in air purifying respirators, causing very short service life, or where the chemicals are not adsorbed at all.
- Where 2 or more contaminants exist in the atmosphere for which different air purifying elements are recommended - such as ammonia and mercury - and a combination element is not available.
- When the concentration of a substance is greater than the approved limit, the assigned protection factor times the permissible exposure limit (PEL) for an air purifying respirator

Note: Only airline respirators equipped with emergency escape air bottles or SCBAs are approved for entry into IDLH atmospheres or atmospheres with oxygen levels below 19.5%.

Airline respirators provide clean, breathable air from a source outside the contaminated area or from bottled air - unlike air purifying respirators, which remove contaminants from the air as the wearer breathes. Because of this difference, airline respirators can protect workers in atmospheres with higher concentrations of contaminants than can air purifying respirators. Airline respirators are used for confined space applications, HazMat response, spray

painting, asbestos removal, and other applications where a supply of clean, breathable air is required to provide protection superior to that provided by air purifying respirators.

Only self-contained breathing apparatus (SCBA) or airline respirators with escape bottles are approved for use in contaminant concentrations up to immediately dangerous to life and health (IDLH) levels.

Other airline respirators should not be used under IDLH conditions. IDLH conditions include the following:

Toxicity. When contaminant concentration meets or exceeds the IDLH level set for that particular substance.

Low Oxygen Level. Less than 19.5% O₂ by volume.

Flammability. When the concentration of a flammable substance exceeds 10% of the lower explosion limit (LEL).

Unknown. Any unknown exposure level or contaminant must be treated as IDLH.

Airline respirators offer a choice of 2 modes of operation:

Continuous-Flow (CF) Types Provide a continuous flow of air at a constant flow rate. Continuous flow has a lower initial cost, less maintenance, more comfort in heat, but it cannot be used in IDLH atmospheres.

Pressure Demand (PD) Types Usually contain a regulator and a special exhalation valve that work together to maintain positive pressure in the respirator at all times. The regulator controls the amount of air released into the face piece as required by the wearer's inhalation and exhalation cycles.

Pressure demand gives higher protection, does not waste air supply, and can be used with an escape cylinder in IDLH atmospheres, but it has a higher initial cost and requires more maintenance.

Airline respirators can be full or half-mask face pieces, hoods or helmets. The airline hose and fittings are part of the approved respirator assembly and must be certified and supplied by the manufacturer of the respirator. If another hose is used, the assembly is no longer approved, because there is no assurance that the proper airflow will be obtained. Any manufacturer's air pump can be used to supply air to the respirator as long as the air capacity and rated pressure are sufficient.

Sources of Air

Breathable air can be supplied from the following sources:

Cylinder of Breathing Air. Usually used with pressure demand respirators, which have a lower rate of air consumption than continuous-flow respirators.

Compressed Air. Obtained from an internally lubricated compressor - may be used only if safeguards are installed to ensure Grade D air. These include a sorbent cartridge; a particulate filter; a compressor failure alarm; a holding tank to store enough air to enable the respirator wearer to escape in the event of compressor failure; and a high temperature alarm; a carbon monoxide (CO) alarm, or both. If only a high temperature alarm is used, the air from the compressor must be monitored frequently to ensure that the CO concentration does not exceed 10ppm.

Portable Air Pump. A low pressure, oil-free rotary vane air pump that moves air from a clean air atmosphere to the respirator wearer. Since there is no internal lubrication, the pump does not require the safeguards necessary for compressors. Such low pressure air pumps must be used with respirators that require less than 15psig. (This includes most continuous-flow respirators.)

Portable air pumps are an economical and reliable air supply for continuous-flow airline respirators. The capacity of an air pump varies, and includes pumps with air capacity for 1 to 4 workers, so you can choose the best size for your needs.

Self-Contained Breathing Apparatus (SCBA)

These respirators offer the greatest protection available, delivering air from a pressurized bottle on the wearer's back. Used under the conditions listed below:

- In oxygen-deficient atmospheres (where the oxygen level is below 19.5%).
- In poorly ventilated areas, or confined spaces - such as tanks, small rooms, tunnels, or vessels - unless the confined space is well ventilated and the concentration of toxic contaminants is known to be below the upper limit recommended for the respirator.

- In atmospheres where the concentration of contaminants is immediately dangerous to life or health (IDLH). An IDLH atmosphere is one that poses immediate hazard to life or produces irreversible debilitating effects on health.
- In atmospheres where the concentration of toxic contaminants is unknown. Any unknown concentration must be treated as IDLH.
- For firefighting.

Fit Testing

The respiratory face piece must provide a good face piece-to-face seal to guarantee wearer safety and comfort. This is ensured by appropriate fit testing.

In qualitative testing, a harmless irritant, taste solution or aromatic is introduced into the breathing zone. The wearer performs exercises to simulate normal use of the respirator. Proper fit is indicated if the user detects no odor, taste, or irritation.

In quantitative testing, the user enters a test chamber wearing a respirator fitted with a gas detecting probe, and performs exercises that could cause face piece leakage, while a harmless gas is introduced. The air inside the face piece is monitored. (Probed models of most reusable respirators are available.)

Fit must be verified at each wearing. In a negative-pressure check (used for air-purifying and airline respirators on which all air inlets can be blocked or covered); the wearer inhales gently (with all inlets closed) and holds his or her breath for at least 10 seconds. The face piece should collapse slightly and no inward leakage of air should be detected. In a positive-pressure check (used for respirators with tight-fitting inlet covering containing both inhalation and exhalation valves), the exhalation valve or breathing tube (or both) are closed off. When the wearer exhales gently, a slight positive pressure should be detected, with no outward leakage between the sealing surface of the face piece and the wearer's face.

Cautions for Respirator Use

- Air-purifying and airline respirators with a half-mask or full-facemask must not be used when conditions prevent a good face piece-to-face seal. Such conditions include beard and sideburn growths and the use of spectacles, goggles, caps, or head coverings that have temples or straps that pass between the face piece sealing flange and the wearer's face. Hood-type respirators must be used under these conditions. For those who need to wear glasses with a full-facemask respirator, a special spectacle frame assembly, into which corrective lenses can be inserted, is available.
- For toxic contaminants that can be absorbed through the skin, appropriate gloves and protective clothing must be used. For toxic substances that are eye irritants, such as formaldehyde, gastight goggles or full-facemask respirators must be used.
- A properly selected and fitted air-purifying respirator will significantly reduce, but will not completely eliminate, the breathing of contaminants by the wearer. In atmospheres containing substances (such as asbestos) that cause cancers or other long-latency diseases, even at exposures below the permissible exposure limit, an airline respirator will provide better protection.
- The respirator wearer should immediately leave the area and replace the respirator and/or cartridges and filters if breathing becomes difficult; if dizziness or other distress occurs; if the wearer smells, tastes, or is irritated by the contaminants; or if the respirator becomes damaged.

Glossary

- **APF** (Assigned Protection Factor). The minimum anticipated level of protection provided by each type of respirator. $APF \times PEL$ (Permissible Exposure Limit) = maximum workplace concentration for a given respirator.
- **Atm.** Atmosphere(s).
- **Canister or cartridge.** Container with a filter, sorbent, catalyst, or combination of these elements that removes specific contaminants from air passing through as the wearer inhales.
- **End-of-service-life indicator.** System that warns the respirator user of the approach of the end of adequate respiratory protection of a respirator, filter, or sorbent.
- **Escape-only respirator.** Respirator intended for use only in emergency exit.

- **IDLH** (Immediately Dangerous to Life and Health). An atmosphere that poses an immediate threat to life; produces immediate, irreversible health effects; or impairs an individual's ability to escape.
- **Negative-pressure (tight fitting) respirator**. Respirator in which air pressure inside the face piece is negative (relative to ambient air pressure) when the wearer inhales.
- **NIOSH**. National Institute for Occupational Safety and Health.
- **mg/ft³**. Milligrams per cubic feet.
- **mg/m³**. Milligrams per cubic meter.
- **MSHA**. Mine Safety Health Administration.
- **NTP**. Normal temperature and pressure.
- **OSHA**. Occupational Safety and Health Administration.
- **Oxygen-deficient atmosphere**. Atmosphere with oxygen content below 19.5% by volume at sea level.
- **PEL** (Permissible Exposure Limit). The highest allowable concentration of a substance to which any employee may be exposed over an eight-hour time-weighted average. Assigned Protection Factor (APF) x PEL = maximum workplace concentration for a given respirator.
- **Positive-pressure respirator**. An atmosphere-supply respirator in which air pressure inside the face piece is reduced when the wearer inhales.
- **ppm**. Parts per million.
- **psig**. Pounds per square inch (gauge).
- **TLV/TWA** (Threshold Limit Value/Time-Weighted Average). The concentration of a substance in the air for a normal 8-hour work shift and a 40-hour workweek to which nearly all workers may be repeatedly exposed without adverse effect.

****Credit from Jim Anderson, BASF, Contributor to EPA, NIOSH, OSHA****

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Sounds like you got a winner, Mike. BASF as you know has a lot of contractor contacts. If you have pricing, sales sheets or other information, we would be glad to get it out to our sales force so they can promote your product to our customers.

I have been active with the EPA, NIOSH, OSHA and other govt. agencies over the last couple of years working on the guidelines now posted on www.spraypolyurethane.org
Your "invention" fits right in for worker safety and protection.

Regards,
Jim

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