Supplied Air Respirators

Airline respirators and SCBAs

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This module is introductory training for employees who wear supplied air respirators.

The two main types of supplied air respirators are covered in this module. Abrasive blasting hoods or re-breather type respirators are not covered.

This module only covers basic facts of supplied air respirators and is not complete training by itself.

You will also be given hands-on training with the respiratory equipment you use.
What are supplied air respirators?

**Airline respirator** – air from a compressor

**SCBA (self-contained breathing apparatus)** – air from a tank

Supplied air respirators provide positive pressure inside the facepiece at all times.
Conditions where supplied-air respirators are required

- Oxygen deficiency
- High levels of toxic chemicals in the air – above “IDLH” levels
- Other conditions of high levels of highly toxic chemicals in the air
- Firefighting
What is oxygen deficiency?

An oxygen deficiency can be life-threatening.

Normal air contains 21% oxygen. A space with oxygen content below 19.5% is “oxygen deficient”.

Lack of oxygen can cause immediate collapse and death.

Oxygen deficiency can occur in confined or enclosed spaces or areas of large chemical leaks.
## Effects of oxygen deficiency

<table>
<thead>
<tr>
<th>% Oxygen</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.5% - 16%</td>
<td>Fatigue, mild impaired coordination</td>
</tr>
<tr>
<td>16% - 12%</td>
<td>Increased breathing rate and pulse; impaired coordination, perception</td>
</tr>
<tr>
<td>12% - 10%</td>
<td>Further increased breathing rate, blue lips, mental confusion</td>
</tr>
<tr>
<td>10% - 8%</td>
<td>Fainting, nausea, vomiting, mental confusion within minutes, collapse</td>
</tr>
<tr>
<td>8% - 6%</td>
<td>Collapse, death within 8 minutes</td>
</tr>
<tr>
<td>6% - 0%</td>
<td>Coma within 40 seconds, death</td>
</tr>
</tbody>
</table>
“IDLH” means immediately dangerous to life or health.

Many chemicals have a listed IDLH level.

Oxygen deficiency is also IDLH.

IDLH conditions can occur in confined spaces, large chemical spills or leaks, and fires.

[NIOSH Table of IDLH Values]
Example of IDLH - Hydrogen Sulfide ($H_2S$)

Hydrogen sulfide gas is commonly found in sewers.
It can be instantly fatal at higher levels in a confined space.
IDLH level is 100 ppm.
Disturbing sewage sludge can release more hydrogen sulfide gas.
Supplied air respirators are normally needed to enter sewers.

<table>
<thead>
<tr>
<th>30</th>
<th>100</th>
<th>200</th>
<th>600</th>
<th>1000</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong odor</td>
<td>Loss of smell</td>
<td>Coughing, red eyes</td>
<td>Unconscious in 30 min.</td>
<td>Instant collapse</td>
<td>Death in minutes</td>
</tr>
</tbody>
</table>

$H_2S$ in parts per million (ppm)
To safely enter a space with an IDLH atmosphere:

- must use a supplied air respirator,
- must have at least one or two standby persons at entrance,
- standby employees must be trained to conduct emergency rescue,
- appropriate retrieval equipment may be needed.
Escaping an IDLH Atmosphere

In IDLH conditions, a worker may need to escape or immediately leave the area.

An SCBA allows escape at any time.

Airline respirators need a small escape bottle of air attached at the waist.
Escape-only supplied air respirators

Escape-only respirators can be used in situations where chemical releases might occur, but the air is normally uncontaminated.

They provide 5 to 10 minutes of clean air from a small tank.
Supplied air respirator selection

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Type of Respirator</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDLH conditions or oxygen</td>
<td>SCBA or airline with escape bottle</td>
</tr>
<tr>
<td>deficiency</td>
<td></td>
</tr>
<tr>
<td>Dust/chemical levels up to</td>
<td>Airline with tight-fitting full facepiece or full hood</td>
</tr>
<tr>
<td>1000 times PEL</td>
<td></td>
</tr>
<tr>
<td>Dust/chemical levels up to</td>
<td>Airline with tight-fitting half facepiece</td>
</tr>
<tr>
<td>50 times PEL</td>
<td></td>
</tr>
<tr>
<td>Dust/chemical levels up to</td>
<td>Airline with loose facepiece</td>
</tr>
<tr>
<td>25 times PEL</td>
<td></td>
</tr>
</tbody>
</table>

PEL = permissible exposure limit
Airline respirator advantages and limitations

**Advantages –**

- continuous air supply,
- lightweight,
- less maintenance,
- don’t need to buy tank air

**Limitations-**

- tied to a 300 ft. hose,
- depends on output of compressor,
- needs an attached escape bottle in IDLH conditions
More facts about airline respirators

Airline respirators are either constant flow or pressure demand, providing positive pressure inside the facepiece at all times.

Pressure demand means air is provided as needed by a pressure regulator.

These respirators provide 4 cfm of air pressure for tight fitting facepieces, or 6 cfm for loose-fitting facepieces.

CFM – cubic feet per minute

Loose-fitting airline respirator
SCBA advantages and limitations

Advantages
✓ highest form of protection,
✓ can be used anywhere,
✓ allows unrestricted mobility

Limitations
✓ heavy & bulky,
✓ limited air supply (30 - 60 min.),
✓ extensive training required,
✓ high maintenance
Using SCBAs

SCBAs are sophisticated respirator equipment used for possible or actual life-threatening situations.

SCBAs should not be used without extensive hands-on training and frequent re-training.

Most SCBA manufacturers or distributors provide this training.

In the case of a large chemical spill or leak, it may be safer to call professional emergency responders.
Air quality for supplied air respirators

Air for breathing must be “Grade D” air:
- Oxygen content of 19.5-23.5 percent,
- Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less,
- Carbon monoxide content of 10 parts per million (ppm) or less,
- Carbon dioxide less than 1000 ppm,
- No noticeable odor.
Two options for airline respirators

Oil-lubricated compressor

Ambient air pump

Ambient air pumps and asbestos removal
If breathing air comes from an oil-lubricated compressor, air filters and a carbon monoxide monitor are required.

Grade D breathing air quality

3-stage filters

carbon monoxide monitor
Storage and maintenance

Store facepiece and regulator in clean, dry place.

Coil up airline hose and store in protected area to prevent damage.

Clean as needed before storage – especially the inside of the facepiece.

Inspect facepiece and hose for damage and replace as needed.

Replacement parts must be the same brand.
Where we require the use of supplied air respirators

Describe areas or work situations where supplied air respirators must be used
What supplied respirators we use

Describe or show the supplied air respirators used at worksites
How we provide grade D air to our supplied air respirators

Describe or show the source of Grade D air for supplied air respirator in use
Additional Information

Risk of using plant air

CDC/NIOSH – A guide to atmosphere-supplying respirators

L & I respirator regulations - WAC 296-842