

# Respiratory Protection Guide

## Minimum Respiratory Protection Requirements\*(See Notes)

Hazard **	Exposure Limit ***	Chronic Health Hazard	Acute Exposure Symptoms	Outdoors	Shop/Indoors	Confined Spaces	Ska-packs Required at
<b>Aluminum (Al)</b>	Fumes-5 mg/m <sup>3</sup> Dust-10 mg/m <sup>3</sup>	Absorbed in the lungs, may cause lung disease	Irritation of the skin, eyes, nose and throat	Natural ventilation in large open areas	Mechanical ventilation respirator may be needed	Mechanical ventilation respirator may be needed	Not Determined
<b>Asbestos (Dust)</b>	0.1 fiber/cc	Known carcinogen, can cause lung disease	Respiratory tract and eye irritation	Exposure Not Allowed	Exposure Not Allowed	Exposure Not Allowed	Exposure Not Allowed
<b>Benzene</b>	1 ppm	Known carcinogen	Eye/lung irritation, dizziness, drowsiness	Natural ventilation & APR in open areas	APR, local ventilation	APR/supplied air and mechanical ventilation	1000ppm
<b>Cadmium (Cd)</b>	0.005 mg/m <sup>3</sup>	Suspect Carcinogen Affects Heart, lungs, liver, kidneys, others	Irritation, respiratory distress, dizziness, headache, pain, nausea	Natural ventilation & APR in open areas	APR with local exhaust or supplied air without local exhaust	Mechanical ventilation and air line respirators	5 mg/m <sup>3</sup>
<b>Carbon Monoxide (CO)</b>	25ppm	Interferes with the bodies absorption of oxygen	Headache, dizziness, loss of consciousness, nausea	Natural ventilation in large open areas	Mechanical ventilation respirator may be needed	Mechanical ventilation respirator may be needed	1200ppm
<b>Chromium (Cr)</b>	0.05 mg/m <sup>3</sup>	Possible lung cancer blood, liver & kidney disease	Coughing, congestion, skin ulcers & dermatitis	Natural ventilation & APR in open areas	APR with local exhaust or supplied air without local exhaust	Mechanical ventilation and air line respirators	250 mg/m <sup>3</sup>
<b>Cobalt</b>	0.1 mg/m <sup>3</sup>	Possible lung disease including asthma	Cough, shortness of breath, dermatitis	Natural ventilation & APR in open areas	APR with local exhaust or supplied air without local exhaust	Mechanical ventilation and air line respirators	20 mg/m <sup>3</sup>
<b>Copper (Cu)</b>	0.1 mg/m <sup>3</sup>	Irritation, flu-like symptoms	Metallic or sweet taste, nausea	Natural ventilation & APR in open areas	APR with local exhaust or supplied air without local exhaust	Mechanical ventilation & APR, supplied air may be needed	100 mg/m <sup>3</sup>
<b>Crystalline Silica Including Ceramic Fiber</b>	0.05 fiber/cc to 0.1 fiber/cc	Possible carcinogen	Skin, eye & respiratory tract irritation	Natural ventilation & APR in open areas	APR	APR or supplied air	25 mg/m <sup>3</sup>
<b>Hydrogen Fluoride (HF Acid)</b>	3ppm	Produces lung and skin ulcers that are slow healing	Severe irritant and corrosive to all tissue	Full Face APR with acid gas cartridge in low concentrations	Full Face APR with acid gas cartridge in low concentrations	Supplied air, mechanical ventilation	30ppm

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<b>Hydrogen Sulfide (H<sub>2</sub>S)</b>	10ppm	Digestive tract disturbance, fatigue, insomnia, photosensitive	Headache, dizziness, nausea, eye/nose/throat irritation, collapse, death	Supplied air & natural ventilation	N/A due to toxicity & flammability	Not normally allowed, supplied air w/escape pack & mech. ventilation	100ppm
<b>Iron Oxide (Carbon Steel) (Fe<sub>2</sub>O<sub>3</sub>)</b>	5 mg/m <sup>3</sup>	Possible lung disease	Not determined, possibly stomach cramps	Natural ventilation in large open areas	Mechanical ventilation, APR may be needed	Mechanical ventilation, APR may be needed	2500 mg/m <sup>3</sup>
<b>Lead (Pb)</b>	0.05 mg/m <sup>3</sup>	May damage numerous organs & the muscular/skeletal system	Pain, headache, weakness, nausea, vomiting	Natural ventilation & APR in open areas	Exhaust hoods and air line respirators	Local ventilation and air line respirators	100 mg/m <sup>3</sup>
<b>Manganese (Mn)</b>	1 mg/m <sup>3</sup>	May cause nervous system damage	Irritation, flu-like symptoms, shortness of breath	Natural ventilation in large open areas	APR with local exhaust or supplied air without local exhaust	Mechanical ventilation & APR, supplied air may be needed	500 mg/m <sup>3</sup>
<b>Molybdenum (Mo)</b>	10 mg/m <sup>3</sup>	Anorexia, diarrhea, liver & kidney damage	Irritation to eyes, nose, throat	Natural ventilation & APR in open areas	APR with local exhaust or supplied air without local exhaust	APR with local exhaust or supplied air without local exhaust	5000 mg/m <sup>3</sup>
<b>Naphtha (Coal Tar)</b>	100 ppm	Possible Carcinogen	Headache, dizziness, nausea, loss of consciousness	Natural ventilation & APR in open areas	Probably N/A due to fire hazard. Local exhaust & APR	Probably N/A due to fire hazard. Local exhaust & supplied air	1000 mg/m <sup>3</sup>
<b>Nickel (NI)</b>	1 mg/m <sup>3</sup>	Possible carcinogen	Rash, headache, dizziness, nausea, weakness	Natural ventilation & APR in open areas	APR with local exhaust or supplied air without local exhaust	Supplied air, mechanical ventilation	10 mg/m <sup>3</sup>

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<b>Niobium (Nb)</b>	Not established	Possible kidney & liver damage	Irritating to skin & eyes	Natural ventilation & APR in open areas	APR with local exhaust or supplied air without local exhaust	Supplied air, mechanical ventilation	Not Established
<b>Nitric Acid</b>	2ppm	Delayed respiratory distress, destroys all tissue it contacts	Severe irritant, destroys all tissue it contacts	Supplied air and natural or mechanical ventilation	Supplied air & mechanical ventilation	Supplied air & mechanical ventilation	25ppm
<b>Oxides of Nitrogen (NO, NO<sub>2</sub>, N<sub>2</sub>O, etc.)</b>	Various	Possible chemical pneumonia	Poor warning properties, respiratory distress & irritation	Natural ventilation in large open areas, respirators may be required	Exhaust hoods and air line respirators	Local ventilation and air line respirators	Varies
<b>Ozone (O<sub>3</sub>)</b>	0.1ppm (Ceiling)	Irritating, prolonged exposure may cause respiratory disease	Headaches, fatigue, shortness of breath	Natural ventilation in large open areas	Local ventilation or air line respirators	Supplied air, mechanical ventilation	5ppm
<b>Petroleum (Hydrocarbon Vapors)</b>	500ppm (PEL)	Possible chemical pneumonia with prolonged exposure	Headaches, fatigue, nausea, shortness of breath, drowsiness	Natural ventilation & APR in open areas	Probably N/A due to fire hazard. Local exhaust & APR	Probably N/A due to fire hazard. Mechanical ventilation & APR	1100ppm
<b>Phosgene (COCl<sub>2</sub>)</b>	0.1ppm	May cause delayed pneumonia, dermatitis, O <sub>2</sub> deficiency in blood	Burning skin/throat, chest pain, coughing, vomiting, bluish skin	Supplied air and natural or mechanical ventilation	Supplied air & mechanical ventilation	Supplied air & mechanical ventilation	2ppm
<b>Phosphorus (P<sub>4</sub>)</b>	0.1 mg/m <sup>3</sup>	Eye/respiratory tract irritation, jaundice, anemia	Burns to the eyes & skin, abdominal pain, nausea	Supplied air and natural or mechanical ventilation	Supplied air and natural or mechanical ventilation	Supplied air and natural or mechanical ventilation	5 mg/m <sup>3</sup>

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<b>Sulfuric Acid (H<sub>2</sub>SO<sub>4</sub>)</b>	1 mg/m <sup>3</sup>	Emphysema, bronchitis, dermatitis	Destructive to all tissue	Natural ventilation & full face APR in open areas	Full face APR with local exhaust or supplied air without local exhaust	Supplied air & mechanical ventilation	15 mg/m <sup>3</sup>
<b>Tantalum (Ta)</b>	5 mg/m <sup>3</sup>	None known	Irritating to eyes & skin	Natural ventilation in large open areas	Mechanical ventilation, APR may be needed	Mechanical ventilation, APR may be needed	2500 mg/m <sup>3</sup>
<b>Titanium (Ti)</b>	10 mg/m <sup>3</sup>	Suspected carcinogen, possible lung fibrosis	Irritating to eyes, nose & throat	Natural ventilation & APR in open areas	Mechanical ventilation, APR	Supplied air, mechanical ventilation	Not Determined
<b>Tungsten (W)</b>	(OSHA none) NIOSH 5 mg/m <sup>3</sup>	Possible lung fibrosis, blood changes	Irritating to eyes, skin & respiratory tract	Natural ventilation & APR in open areas	Mechanical ventilation, APR	Supplied air, mechanical ventilation	Not Determined
<b>Vanadium (V)</b>	0.05 mg/m <sup>3</sup>	Tongue & skin discoloration, irritation of respiratory tract	Sore throat, coughing, bronchitis, shortness of breath	Natural ventilation in large open areas	Mechanical ventilation, APR may be needed	Mechanical ventilation, APR may be needed	35 mg/m <sup>3</sup>
<b>Hexavalent chromium - Cr(VI)</b>	0.5 µg/m <sup>3</sup>	Asthma, perforated eardrums, kidney damage, liver damage, respiratory cancer	Eye irritation, respiratory irritation, abdominal pain, nose irritation	Natural ventilation in open areas	HEPA APR, or mechanical ventilation	Supplied air, or Full Face APR	5.0 µg/m <sup>3</sup>

\*The above guidelines are the minimum requirements for use against hazards exceeding the PEL/TLV's. Additional requirements may apply. Contact the safety department for additional information

\*\*Fumes unless otherwise noted.

\*\*\*TLV's unless otherwise noted.

APR = Air Purifying Respirator, half face unless otherwise noted, with appropriate cartridges