



Standard Operating Guidelines

SOG #: P103 – Oil Spill Respiratory Protection Recommendations

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Oil Spill Respiratory Protection Recommendations

Respiratory protection often is not necessary at an oil spill; however, the employer is responsible for determining and documenting whether workers need to wear a respirator. If an employee's exposure exceeds a permissible exposure limit, they must wear NIOSH-approved respirators. The respiratory protection requirements, compliant with 29 CFR 1910.134, must be included in the Site Specific Health and Safety Plan. Employee personal air monitoring and sampling data must be communicated to the worker. 29 CFR 1910.134 also has specific record management requirements.

Respiratory Health Concerns at Oil Spills

- **Oil (Fresh and Weathered)** - Oil is a mixture of hydrocarbons and consists of light, medium and heavy chemicals. Many of the hydrocarbons present in gasoline and diesel fuels are carcinogenic. The hydrocarbons in oil are mostly alkanes, cycloalkanes and various aromatic hydrocarbons. The light parts, such as benzene, xylene, toluene, and ethyl benzene generally evaporate into the air in the first 24 hours of a spill. Inhalation hazards generally associated with oils are inhalation of the toxic volatile hydrocarbon components, such as benzene and oil droplets/oily particles released into the air during cleanup operations.
- **In-situ Burning** – Carbon monoxide, nitrogen dioxide, sulfur dioxide and particulate matter are generated during in-situ burning operations and any activity using gasoline, diesel, or propane-powered machinery. Carbon monoxide is a chemical asphyxiant while nitrogen dioxide may cause pulmonary edema and sulfur dioxide may cause broncho-constriction. In-situ burning is a high risk activity and approval from the Regional Response Team (RRT) is required. In-situ burn plans must also be review and approved by the Incident Safety Officer.
- **Dispersants and Decontamination Agents** – Often contain petroleum distillates and may cause irritation of the nose and eyes, headache, a metallic taste, or vomiting. When swallowed, the lighter, more volatile distillate products can be absorbed into the lungs interfering with the lung's functions and may result in chemical pneumonia. Review the SDS for each dispersant or decontamination agent to determine the exact contaminants and exposure limits.

Exposure Limits for Common Contaminants at Oil Spills

Contaminant	IDLH ¹⁰	OSHA Exposure Limits ¹⁰	ACGIH Exposure Limits ¹²	Explosive Range ¹⁰	Ionization Potential ¹⁰	PID Correction Factors ¹¹
Benzene	500ppm	TWA: 1 ppm, STEL: 5ppm	TWA: 0.5ppm, STEL: 2.5ppm	1.2-7.8%	9.24 eV	0.47
Toluene	500ppm	TWA: 200ppm, Ceiling: 300ppm	TWA: 20 ppm	1.1-7.1%	8.82 eV	0.45
Butane	1600ppm (10%LEL)	--	STEL: 1000ppm	1.6-8.4%	10.63 eV	--
Carbon Monoxide	1200ppm	TWA: 35ppm, Ceiling: 200ppm	TWA: 25ppm	12.5-74%	--	--
Diesel Fuel	600ppm (10%LEL)	--	TWA: 100mg/m ³ /~11ppm (total hydrocarbon vapor)	0.6-7.5%	Mixture	0.7
Ethyl Benzene	800ppm (10%LEL)	TWA: 100ppm	TWA: 20ppm	0.8-6.7%	8.76 eV	0.65
Gasoline	--	--	TWA: 300ppm, STEL: 500ppm	1.4-7.6%	Mixture	0.9-1.0
Hydrogen Sulfide	100ppm	Ceiling: 20ppm	TWA: 1ppm, STEL: 5ppm	4.0-44.0%	10.46 eV	3.3
Kerosene (Jet Fuel)	700ppm (10%LEL)	--	TWA: 200 mg/m ³ /~29ppm (total hydrocarbon vapor)	0.7-5.0%	Mixture	0.6-1.0
Nitrogen Dioxide	20ppm	Ceiling: 5ppm	TWA: 0.2ppm	--	--	--
Oil Mist	2500 mg/m ³ /~149ppm	TWA: 5 mg/m ³ /~0.3ppm	--	--	Mixture	--
Pentane	1500ppm (10%LEL)	TWA: 1000ppm	1000ppm	1.5-7.8%	10.34 eV	8.4
Petroleum Distillates	1100ppm (10%LEL)	TWA: 500ppm	--	1.1-5.9%	Mixture	--
Sulfur Dioxide	100ppm	TWA: 5ppm	STEL: 0.25ppm	--	--	--
Xylenes	900ppm (10%LEL)	TWA: 100ppm	TWA: 100ppm, STEL: 150ppm	0.9-7.0%	8.44 – 8.56 eV	0.39-0.40

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Determining if Respiratory Protection is Necessary

Use data from PID/FID and other direct reading Instruments to determine the concentration of known or anticipated contaminants. This evaluation may need to be performed continuously while the work is occurring. Certain tasks, such as pressure washing containment boom and vessels may generate oil mists and particulates in concentrations that warrant respiratory protection. This exposure evaluation may need to be repeated throughout the duration of the work. A worker must wear a respirator if the exposure limit is exceeded. Certain situations may require a worker to wear respiratory protection until an assessment can be completed and the data proves a respirator is not required. Further, voluntary use of respirators shall always be allowed.

If a worker may be exposed to contaminants at concentrations above a published limit, use this known concentration and the PEL/TLV to determine the **Hazard Ratio**:

$$\text{Hazard Ratio} = \frac{\text{Known Concentration}}{\text{PEL or TLV}}$$

Choose a respirator type where the **Hazard Ratio** is less than the **Assigned Protection Factor (APF)**:

Respirator Type	Assigned Protection Factor (APF)
½ Face Air Purifying	10
Full Face Air Purifying	50
Full Face Powered Air Purifying (PAPR)	1000
Supplied Air (SAR)	1000 (10000 with an escape tank)
Self-Contained Breathing Apparatus (SCBA)	10000

If an Air Purifying Respirator (APR) is necessary, choose the cartridge that protects against all of the known/anticipated contaminants.

EPA Emergency Responders have access to the following SCOTT APR Equipment:

SCOTT Multipurpose Cartridges (Part # 7422-SD1):

- good for organic vapors, chlorine, chlorine dioxide, hydrogen chloride, hydrogen fluoride, hydrogen sulfide (escape only), sulfur dioxide, ammonia, methylamine and formaldehyde; 99.97% efficient against solid or liquid particles including oil-based particles.
- Review the SCOTT End-of-Service-Life Calculator found at [SCOTT Safety SureLife Cartridge Calculator](http://scott.surelife.com/CartridgeCalculator) to determine your respirator change-out schedule.

SCOTT P100 Cartridges (Part# 7422-FP1):

- 99.97% efficient against solid or liquid particles including oil-based particles.

Special Requirements for In-situ Burning - A SCBA must be readily available for each worker performing the in-situ burn. Workers participating in the in-situ burn must be trained and medically qualified to wear an SCBA. The SCBA must be on the vessel during off-shore operations or readily available during on-shore operations.



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Remember:

Do's	Don'ts
<ul style="list-style-type: none">Do implement Engineering Controls to reduce or control airborne hazard before resorting to Respiratory Protection.Do get a Medical Evaluation prior to wearing a respirator.Do get Quantitatively Fit Tested prior to using a respirator and annually thereafter.Do receive annual training on your respirator.Do read and understand the respirator manufacturer's instructions.Do understand what contaminants and hazards you may be exposed to.Do know the capabilities and limitations of your respirator and what to do in an emergency situation.Do perform user seal checks every time you put on your respirator.Do Inspect, Clean, and Sanitize respirator prior to and after each use	<ul style="list-style-type: none">Don't wear a respirator that you have NOT been Fit Tested for and approved to wear.Don't wear a tight-fitting respirator if you have facial hair growth between the face-to-face piece seal.Don't use a respirator, filter, cartridge, or canister that has NOT been certified by NIOSH.Don't wait until you smell a gas or vapor to change your chemical cartridge/canister.Don't remove your respirator in a contaminated environment.Don't use a respirator that is damaged or defective.Don't store a wet respirator in an air tight container. Always thoroughly dry respirator prior to storage.Don't use an APR in an atmosphere that is oxygen deficient or Immediately Dangerous to Life and Health (IDLH).Don't use an APR to protect against carbon monoxide or chemicals with poor/no warning properties (i.e. smell, taste).Don't enter an unknown environment without a Self-Contained Breathing Apparatus (SCBA).

For additional information on the Emergency Responder Respiratory Protection Program, go to <http://epaosc.org/hsmanualregion4> (log in required).

References

- [OSHA Compendium of Oil Spill Safety Data Sheets \(includes SDS's for dispersants and DECON agents\)](#)
- Other SDS: [Benzene](#), [Ethyl Benzene](#), [Toluene](#), [Xylene](#)
- [Emergency Response and Removal Operations Job Hazard Analysis](#)
- [Emergency Response, Removal and Prevention Health and Safety Standard Operating Guidelines](#)
- [Emergency Response, Removal and Prevention PPE Selection Guides](#)
- [OSHA PPE Matrix for Oil Spill Response](#)
- [NIOSH Respiratory Protection Recommendations – Deepwater Horizon Response](#)
- [Emergency Response Air Monitoring Guidance Tables \(EPA ERTG, 2012, Version 3\)](#)
- [Hazard Evaluation Flow Chart for Unknowns \(EPA ERTG, 2005, Version 6\)](#)
- [NIOSH Pocket Guide to Chemical Hazards](#)
- [RAE Systems Technical Note TN-106](#)
- [American Conference of Governmental Industrial Hygienist TLVs and BEIs](#)
- [SCOTT Safety SureLife Cartridge Calculator](#)
- [MSA Emergency Response Application \(Respirator Cartridge Calculator\)](#)

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