Safety and Health
for
Marine Oil Spill Response Workers

Training and Reference Manual

Recognizing Hazards, Managing the Risks

Developed by

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Alaska Steamship Response

Alaska Steamship Response (ASR) is a non-profit (IRS 501(c)(3)) corporation chartered and registered in the State of Alaska. ASR provides emergency incident management services, contingency planning, and has been certified by the Alaska Department of Environmental Conservation (ADEC) as both an incident management team and response plan facilitator under the requirements of AS 46.04.055 and 18 AAC 75.400 - 18 AAC 75.496.

ASR has approximately forty strategically located responders throughout Alaska, from Dutch Harbor to Ketchikan. These responders, all experienced in Alaska maritime operations, meet ADEC standards for incident commanders.

About the author and editor

David Eley is a retired US Coast Guard commander and former Coast Guard Captain of the Port for Southeast Alaska with over 30 years of experience in marine transportation, emergency management, environmental protection, maritime safety and health, and international affairs. While in the Coast Guard he served as Incident Commander (IC) and Federal On-Scene Coordinator (FOSC) for a number of vessel casualties and oil spills. Since retirement from the Coast Guard, Mr. Eley has undertaken a number of consultative projects in marine transportation emergency planning. His clients include the U.S. National Park Service, the cruise ship industry, Alaska Department of Environmental Conservation, the US Coast Guard, citizens' environmental protection advisory groups, and the Alaska Marine Highway System. He currently serves as executive director of Alaska Steamship Response.

He has a Master of Science in Public Health (Industrial Hygiene and Environmental Health) from the University of North Carolina. He is a former certified industrial hygienist.

Contents

I. Introduction

A. Using this Manual and Training Aid

Oil spill responders must have annual refresher training in Hazardous Waste Operations and Emergency Response (HAZWOPER). This is a requirement both under US OSHA (29 CFR 1910.120) and the Alaska Department of Environmental Conservation (ADEC) (18 AAC 75.400 - 18 AAC 75.496.

ASR members must recognize and manage the hazards of uncontrolled oil spills or take defensive, protective action accordingly.

This manual is designed to help meet this annual recertification requirement AND serve as a key reference source for an actual response.

Competencies developed within this training manual include the seven competencies recommended by OSHA for oil spill responders.

In addition, the training materials in this manual will show you the steps needed to:

- Complete a risk assessment (ICS form 215A)
- Complete a site health and safety plan. (ICS form 208)

ASR Team Member Competencies

1. Recognize basic hazards and risks.
2. Define and use essential hazardous material terms.
3. Use hazard and risk assessment techniques including confined space entry protocols.
4. Select personal protective equipment with due regard for the hazards created by the equipment.
5. Outline basic oil spill control and containment.
6. Implement basic decontamination procedures.
7. Practice safety and health within the overall incident action plan or emergency response plan.

B. References used in this manual

This manual and reference, which was developed specifically for ASR incident management team (IMT) members, draws from three key references which are included in this document as references or annexes. Not included in this manual, but referenced extensively, is the USCG *Incident Management Handbook* (2014) available on ASR flash drives or at USCG Homeport.

Material Safety Data Sheets (MSDS) for various marine fuel oils. MSDS are the starting point in developing any spill response safety plan. Several pages in length and in a standard format, they provide all the essential physical, chemical and hazard properties for particular oils as well as safe handling instructions. This annex includes MSDS the oils carried as fuel on non-tank vessels heavy and intermediate fuel oils (HFO or IFO), marine gas oil (MGO), and gasoline, which could come from the car deck of a ferry. MSDS's are in the reference section of this guide.

Annex 1:
U.S. Department of Labor Occupational Safety and Health Administration OSHA 3172 2001, Training Marine Oil Spill Response Workers under OSHA's Hazardous Waste Operations and Emergency Response Standard. (Unnecessary pages of this booklet have been removed including Appendices A-C.)

As the title implies this booklet interprets training requirements for oil spill responders under OSHA's Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) or 29 CFR 1910.120.

Annex 2: Spill Tactics for Alaska Responders (STAR Manual). Section B. Tactics, Part 1: Safety

The Spill Tactics for Alaska Responders (STAR) manual provides standardized oil spill response tactics specific to the State of Alaska. The information in this manual bridges the gap between oil spill contingency planning and response by providing standard tactics and terminology that can be easily transferred from contingency plan to Incident Action Plan.

The STAR Manual was commissioned by ADEC and developed through a cooperative consensus-based work group process involving federal and Alaska spill response agencies working with representatives of oil spill response organizations and contingency plan holders.

The STAR manual is organized according to five general categories of oil spill response tactics: Safety, Oil Spill Surveillance and Tracking, Mechanical Response, Non-Mechanical Response, and Logistics. Mechanical Response tactics are subdivided into Containment and Recovery, Sensitive Area Protection, and Primary Storage and Transfer of Recovered Products and Waste. ASR IMT members have the entire STAR manual on their response flash-drive and are encouraged to consult this useful reference tool.

Annex 3: USCG Safety Officer's Job Aid, Appendix H & I – Site Safety and Health Plan Requirements, the ICS-208-CG and the ICS-215a

The USCG has developed a number of comprehensive job aids for Incident Command System (ICS) positions which can be downloaded at (http://homeport.uscg.mil/ics/). Appendix H of the Safety Officer's job aid provides complete instructions, with examples, for completing the site safety and health plan (ICS-208-CG) and the hazard/risk analysis worksheet (ICS-215a).

USCG Incident Management Handbook

The USCG Incident Management Handbook (IMH) 2014 is the primary guide for ASR is developing and running an incident management structure. Safety, health and risk management is conducted within the system shown in this reference. The USCG IMH can be downloaded at USCG Homeport (http://homeport.uscg.mil/ics/) and should also be in ASR flash drives provided to individual members of the IMT.

C. Roles and Competencies for ASR team members

ASR team members are not expected to do actual 'hands-on' oil spill cleanup. That is the role of oil spill cleanup contractors - referred to as Oil Spill Resource Organizations (OSRO's) by the US Coast Guard and Primary Response Action Contractors (PRAC's) by the State of Alaska. However, ASR members may conduct initial incident size up and therefore must have the ability to recognize the hazards of uncontrolled oil spills or take defensive, protective action accordingly. ASR team members will be required to serve in key roles within incident management and therefore must understand hazards and how to set a management structure in place to control those hazards.

Table 4 of Annex 1 (OSHA) list competencies for various positions within a marine oil spill response. An ASR IMT member may serve in one of three roles, each with its prerequisite knowledge, as listed below:

INITIATE RESPONSE ONLY

- Understand the hazards of oil and the risks in a spill.
- Understand what happens during an emergency involving spilled oil.
- Recognize the presence of oil or related hazardous materials in an emergency.
- Identify hazardous substances, if possible (e.g., appearance, smell, monitoring equipment).
- Understand individual role in employer's emergency response plan.
- Recognize when help is needed and when to request assistance from the response team.

DEFENSIVE RESPONSE

- Know basic hazard and risk assessment techniques.
- Know how to select and use proper personal protective equipment necessary for the first responder operation level.
- Understand basic hazardous materials terms.
- Know how to perform basic control, containment, and/ or confinement operations within the capabilities of the resources and available personal protective equipment.
- Know how to implement basic decontamination procedures.
- Understand the relevant standard operating and termination procedures.

ON-SCENE COORDINATOR (i.e. Incident Commander or Section Chief within the ICS structure)

- Know and be able to implement the employer's incident command system.
- Know how to implement the employer's emergency response plan.
- Know and understand the hazards and risks associated with employees working in personal protective clothing.
- Know how to implement the local emergency response plan.
- Know the state emergency response plan and the Federal Regional Response Team.
- Know and understand the importance of decontamination procedures.

Removing redundancies amongst positions provides the following list of required competencies for an ASR responder.

1. Recognize basic hazards and risks in marine oil spill response including precautions for confined space entry.
2. Define and use essential hazardous material terms.
3. Use hazard and risk assessment techniques.
4. Select personal protective equipment with due regard for the hazards created by the equipment.
5. Outline basic oil spill control and containment.
6. Implement basic decontamination procedures.
7. Practice safety and health within the overall incident action plan or emergency response plan.

Each of these competencies will be addressed in this reference and training manual.

II. Hazards and risks from marine oil spills

Incident management teams and field workers must anticipate and control exposure to oil spills. Risks can be divided into two main categories: physical and chemical.

Simply put, a physical hazard is an item or situation that may cause harm from other than a chemical reaction with your body. Injuries from machinery, confined space entry (oxygen deprivation), flying particle matter, and fire are all physical hazards.

> Situational Awareness: A level of consciousness, developed through training and education, which allows you to recognize potential hazards and threats within your environment.

The OSHA standard (Annex 1) lists 27 different potential physical hazards in oil spill up operations.

TEST YOURSELF. List as many physical hazards as you can below. Then check your answers against the hazards listed on page 5 of Annex 1.

Note: Make the effort to list at least 20 hazards before you review the lists in Annex 1. This exercise will build situational awareness.

---

1 _____ 13 _____

2 _____ 14 _____

3 _____ 15 _____

4 _____ 16 _____

5 _____ 17 _____

6 _____ 18 _____

7 _____ 19 _____

8 _____ 20 _____

9 _____ 21 _____

10 _____ 22 _____

11 _____ 23 _____

12 _____ 24 _____

In general, chemical hazards are created by materials capable of injuring the body by chemical reaction. Examples of chemical hazards include carbon monoxide exposure (CO interferes with O_2 uptake by blood hemoglobin), or benzene exposure (a gasoline additive that can cause leukemia).

The physical property of the hazardous material determines the exposure pathway.

List the main exposure pathway(s) for:

Carbon monoxide:

_____

_____

Coal tar:

_____

_____

Lead:

_____

_____

Benzene:

_____

_____

Exercise: Chemicals in Oil

Table 1 of OSHA 3172 (Training for Oil Spill Response Workers under HAZWOPER) lists common chemicals associated with oils and their hazardous effects. Examine this table and answer the following questions:

1. Which of the listed chemical components can potentially cause cancer?
   a. _____
   b. _____
   c. _____
2. Which of the listed chemicals are generated by combustion of oil?
   a. _____
   b. _____
   c. _____
   d. _____

III. Basic Hazardous Material Terms and How to Use Them

A. Definition of hazardous substances and wastes

A glossary of important terms is included in Section IX. A. An overview of key terms is discussed in this section.

The term *hazardous substance* as defined by OSHA is:

> *"…any substance…which [through exposure] results or may result in adverse effects on the health or safety of employees." (29 CFR 1910.120(a)(3)).”*

EPA has identified four characteristics for *hazardous waste*.

- Ignitability: Generally, a liquid with a flash point less than 60 °C (140 °F), or not a liquid but capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard, or an ignitable compressed gas.
- Corrosivity: Aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, or a liquid capable of corroding steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at 55 °C (130 °F).
- Reactivity: Generally, a solid waste normally unstable and readily undergoes violent change without detonating, or reacts violently with water or forms toxic or potentially explosive mixtures with water, or is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes, or is capable of detonation or explosive reaction is a forbidden explosive as defined in 49 CFR 173.54, or is a Division 1.1, 1.2 or 1.3 explosive as defined in 49 CFR 173.50 and 173.53.
- Toxicity: A waste that contains any number of chemicals in sufficient concentrations to present a danger to human health or the environment.

Key Terms

Asphyxiant

Vapor Pressure

Flash Point

Lower Explosive Limit

Vapor Density

Specific Gravity

PPM

Exposure limits: STEL, TLV, and PEL

Carcinogens, mutagens, teratogens

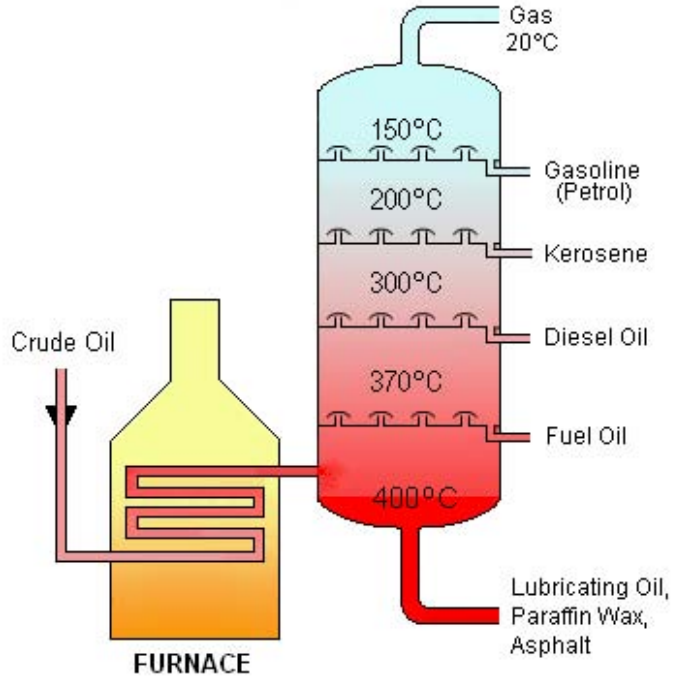
See 40 CFR 261.20 through 261.24 for exact definitions and test methods.

B. Key conversion measurements

The international maritime community uses metric units. United States generally uses units of the English measurement system. The table below shows key conversions for various units of measure used in health and safety guidelines. The back cover of the USCG IMH provides a useful conversion table. There are several good smart phone apps, too.

Measurement	**Metric**	**Conversion factor to English System**
Temperature	Centigrade	$9/5^0$ C + 32^0 to Fahrenheit
Pressure	Pascal (Pa)	Pa/0.0004 = Pounds per square inch (psi)
Volume	Liters (l)	Liter/3.785 = Gallons
Length	One meter (m) = 100 centimeters (cm) = 1000 millimeters (mm)	Meter X 39 = inches Cm/2.54 = inches
Toxic concentrations and density	Milligrams/liter (mg/l) Grams/cubic centimeter (g/cm^3)	
Parts per million (ppm) Parts per billion (ppm)	One molecule of hazard per million (billion) molecules of water or air	N/A

C. What is oil?



Crude oil is a complex mixture of a number of hundreds of different chemicals, many of which are toxic and/or highly flammable. Raw or unprocessed crude oil is not generally useful in industrial applications and for internal combustion engines. Instead, the hundreds of different hydrocarbon compounds in crude oil are separated in a refinery by their boiling points into components which can be used as fuels, lubricants, asphalts, and as feedstocks in petrochemical processes that manufacture (to name a few) plastics, detergents, solvents, elastomers, and fibers (nylon and polyesters).

D. Persistent and Non-persistent Oil

Generally, persistent oils do not dissipate quickly and will therefore pose potential threats to natural resources when released to the environment. In contrast, when released to the environment, non-persistent oils will dissipate rapidly through evaporation or dissipation through the water column. Spills of these oils rarely allow comprehensive response and cleanup.

Federal regulations (33 CFR 155.1020) define these oils as follows:

Non-persistent or Group I oil means a petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions—

(1) At least 50% of which by volume, distill at a temperature of 340 degrees C (645 degrees F); and

(2) At least 95% of which by volume, distill at a temperature of 370 degrees C (700 degrees F).

Persistent oil means a petroleum based oil that does not meet the distillation criteria for a non-persistent oil. For the purposes of this subpart, persistent oils are further classified based on specific gravity as follows:

(1) Group II—specific gravity of less than .85.
(2) Group III—specific gravity equal to or greater than .85 and less than .95.
(3) Group IV—specific gravity equal to or greater than .95 and less than or equal to 1.0.
(4) Group V—specific gravity greater than 1.0.

Non-persistent oils include:

_____

_____

_____

_____

Persistent oils include:

_____

_____

_____

_____

E. Using Material Safety Data Sheets (MSDS)

A Material Safety Data Sheet (MSDS) provides basic information on a material or chemical product. A MSDS describes:

- The properties and potential hazards of the material,
- How to use it safely, and
- What to do in an emergency.

The MSDS is essential information for workers using a hazardous product under routine conditions and the key reference document for safety and health plans for spill response and cleanup.

The information for most MSDS' developed today are summarized under an ANSI standard for MSDS preparation. MSDSs are organized into 16 sections:

1. Product and company information
2. Hazards identification with pictograms
3. Product composition
4. First aid measures
5. Fire-fighting measures
6. Accidental release measures
7. Handling and storage
8. Exposure controls and personal protection
9. Physical and chemical properties
10. Stability and reactivity
11. Toxicological information
12. Ecological information
13. Disposal considerations
14. Transport information
15. Regulatory information
16. Other information

F. How to read the GHS Pictogram

The **Globally Harmonized System of Classification and Labeling of Chemicals** (**GHS**) is an internationally agreed-upon system, created by the United Nations.

The GHS was designed to replace all the diverse classification systems and present one universal standard which all countries should follow (however, the GHS is not compulsory under UN law). In the longer term, the GHS is expected to improve knowledge of the chronic health hazards of chemicals and encourage a move towards the elimination of hazardous chemicals, especially carcinogens, mutagens and reproductive toxins, or their replacement with less hazardous ones. The US Department of Labor (OSHA) provides extensive guidance for the use and implementation of GHS.

GHS uses internationally recognized pictograms for the various hazard classes. See the glossary in the reference sections for both the pictograms and defined terms.

Most Material Safety Data Sheets (MSDS) now use the GHS including the MSDS' provided for gasoline, marine gas oil and intermediate fuel oil provided with this manual.

G. Exercise: Comparing properties of hazardous substances

Exercise: Comparing the physical and chemical properties of oils

Using the three MSDS's provided in this manual, enter the property units for each oil and rank or compare the relative hazard.

For each property or characteristic draw a frowny-face next to the oil that is a clearly the most hazardous for that property.

Characteristic	**Marine Gas Oil (diesel)**		**Marine Fuel Oil (HFO or IFO)**		**Gasoline**	
Flammability (NFPA)	3		2		3	
Carcinogenicity	2				2	
STEL (lowest value given)			5 ppm (H_2S)			
Odor Threshold (lower is better)	0.1 – 1 ppm		NO			
Flash Point			60^0C			
Lower Explosive Limit					1.3%	
Vapor Pressure			210 Pa (1.6 mm)			
Heavier than air? (Vapor density)			>5		3 to 4	
Specific gravity of liquid					0.8	

From the table above what type of physical and liquid properties are most helpful for initial incident size up?

Use the glossary in the reference section to complete the following:

Match the description with the type of health hazard.

_____ Burns skin	A. Irritant
_____ Causes cancer	B. Corrosive
_____ Skin itch	C. Target organ
_____ Gene damage (sperm or egg)	D. Sensitizer
_____ Allergic response	E. Carcinogen
_____ Liver damage	F. Teratogen
_____ Fetus damage	G. Mutagen
_____ Freezes skin	H. Cryogenic

IV. Risk Assessment Techniques

A. Defining Risk

Risk is a factor severity (how bad could the injury be?) and probability of occurrence. Combining the probability of occurrence with severity, a risk assessment matrix (RAM) like the one below developed by the International Crisis Management Association can define the level of risk.

Remember: Always approach UPWIND and UPGRADE whenever possible and particularly if doing incident size up.

RAM		Probability				
Severity		Frequent	Likely	Occasional	Seldom	Unlikely
		A	B	C	D	E
Catastrophic	I	Extremely				
Critical	II	High	High			
Moderate	III		Medium			
Negligible	IV				Low	

The risks inherent in oil spill response and cleanup are reasonably well understood. There are more physical hazards than chemical hazards.

Hazards for first responders are:

- Fire and explosion.
- Over exposure to vapors, fumes and particulates
- Confined space entry/rescue
- Falls
- Drowning

In general, site safety for prolonged oil spill cleanup should address the risk of:

- Slips, trips and falls.
- Heavy equipment operations
- Work around deep water
- Skin contact
- Inhaling particulate matter under certain situations
- Spread of oil and contaminated material

Consider the impact of current and projected weather in assessing risk.

In my experience, slips, trips and falls are the most common cause of injury during oil spill response. Lack of precaution in confined space entry, however, presents the highest risk of fatality.

Recognizing and evaluating confined space entry hazards is an essential part of the site health and safety plan (HASP). Low oxygen and toxic gases can in confined space, under certain conditions, can kill within 3-4 minutes upon entry.

Always start with a developed site safety plan template, then adjust.

B. Risk Analysis Worksheet

For a response that will last more than a few hours, the US Coast Guard has developed an Incident Action Plan Safety Analysis Worksheet (ICS-215a). This worksheet is to aid the Safety Officer in completing an operational risk assessment to prioritize hazards and develop appropriate controls. Work assignments are listed along with associated hazards. A calculation is made that determines what level of risk each work assignment poses. For those assignments having significant risk, controls are developed for safeguarding responders. The net risk is evaluated against the gain. The Incident Commander should be alerted to all safety hazards that receive an amber or red GAR rating after controls have been established.

The steps for developing an ICS-215a are shown in Tab G, the Safety Officer's Job Aid for evaluating risk.

Exercise: Using the example ICS-215a in Tab G, complete a risk evaluation for two of the beach clean-up functions for the *M/V New Carissa*.

C. Equipment Used to Evaluate Risk

Review the STAR Manual (Tab E) and list basic equipment used for defining risk.

1. _____
2. _____
3. _____
4. _____
5. _____

Quiz:

The first piece of analytical equipment that should be used on a spill site to identify potential hazards is the:

A. Oxygen meter
B. Combustible gas indicator
C. Colorimetric sampling tubes
D. Radiation meter

If you were entering a spill site and your combustible gas indicator read 25% of the L.E.L. you should:

A. Proceed with caution
B. Leave the site immediately
C. Continue with the survey
D. None of the above

V. Personal Protective Equipment

A. Selection and Use

The level of protection is determined by site conditions.

Review the protective equipment as described in the STAR Manual (Tab E) and answer the following:

1. LEL 12% Type: _____
2. Beach cleanup, open air environment; weathered oil. Type: _____
3. Everything looks good except H_2S is 25 ppm. Type: _____
4. Beach cleanup, open air environment; fresh crude oil spill. Type: _____

Note: INSIST WORKERS WEAR SAFETY GLASSES. Eye injury to oil spill workers is a common, serious and easily preventable. Safety glasses are inexpensive and comfortable. Ensure they are available and used.

B. Fire Extinguishers

The fire extinguisher is a basic, essential, but often neglected piece of protective equipment. Always have a fire extinguisher at hand.

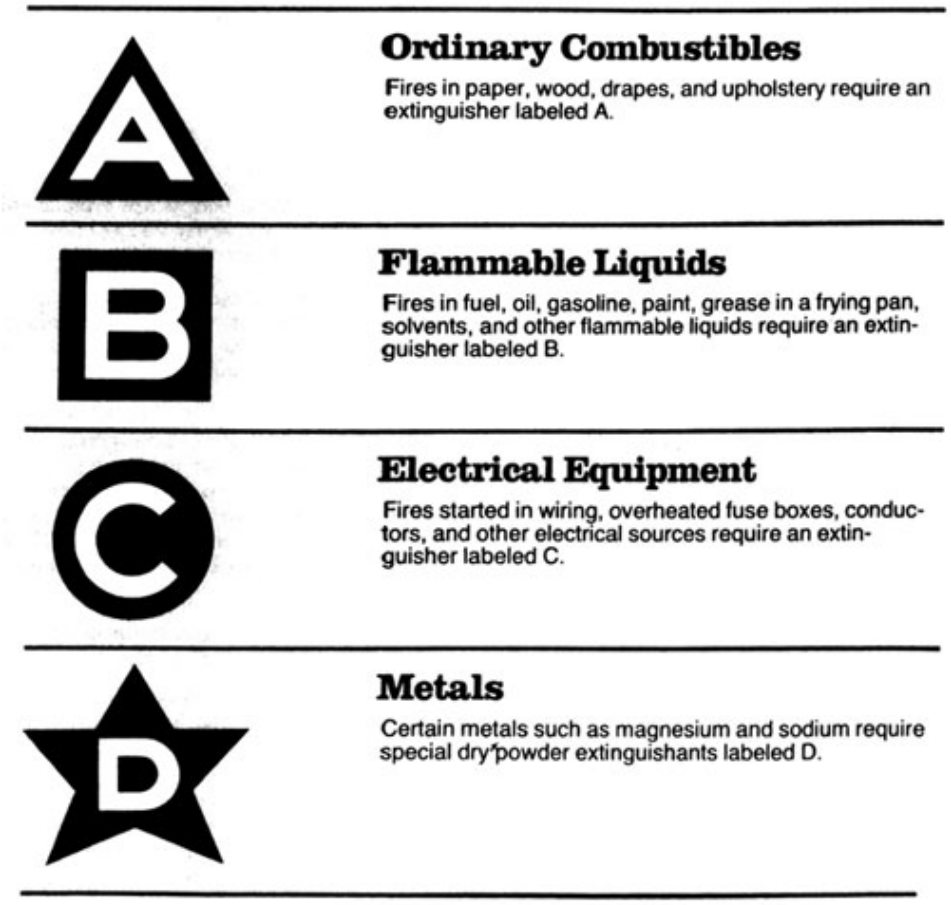
FIRE EXTINGUISHER SELECTION MEMORY AID

A: For fuel that creates an **Ash**

B: For fuel that **Boils**

C: For things that have a **Current**

D: For fuel that **Dents** (metals)



C. Hazards and Risks for PPE

Personal protective equipment (PPE), as the names implies, protects but the gear can also create hazards.

List the hazards for the responder at left fitted with Level-A protection. Hint: Think through the different activities the hazmat worker undertakes; donning the gear, work in the hot zone, and leaving the hot zone through the decon corridor. (Refer to the STAR Manual.)

VI. Safe Control and Containment/Confinement Operations

A. Confined Space Entry

Recognizing and evaluating confined space entry hazards is an essential part of the site health and safety plan (HASP). Low oxygen and toxic gases can in confined space, under certain conditions, can kill within 3-4 minutes upon entry.

What is a confined space?

OSHA regulations for shipyard safety and health define enclosed and confined spaces as follows:

> An area on a vessel or vessel section or within a shipyard such as, but not limited to: cargo tanks or holds; pump or engine rooms; storage lockers; tanks containing flammable or combustible liquids, gases, or solids; rooms within buildings; crawl spaces; tunnels; or accessways. The atmosphere within a space is the entire area within its bounds. [29 CFR 1915.11(b)]
>
> Any space or void with limited access for entry and exit access, such as a double bottom tank, cofferdam, or other space, which, by its design and confined nature can readily create or aggravate a hazardous exposure. [29 CFR 1915.4(p)]
>
> Spaces with limited openings for entry and exit with unfavorable natural ventilation — not intended for human occupancy — can readily aggravate a hazardous exposure because of its design (e.g., double bottom tank, wing tank, cofferdam).
>
> **Enclosed Space**
> "Any space, other than a confined space, which is enclosed by bulkheads and overhead. These may include cargo holds, tanks, quarters, and machinery and boiler spaces." [29 CFR 1915.4(q)]
>
> The following table comes from the USCG policy on confined space entry.

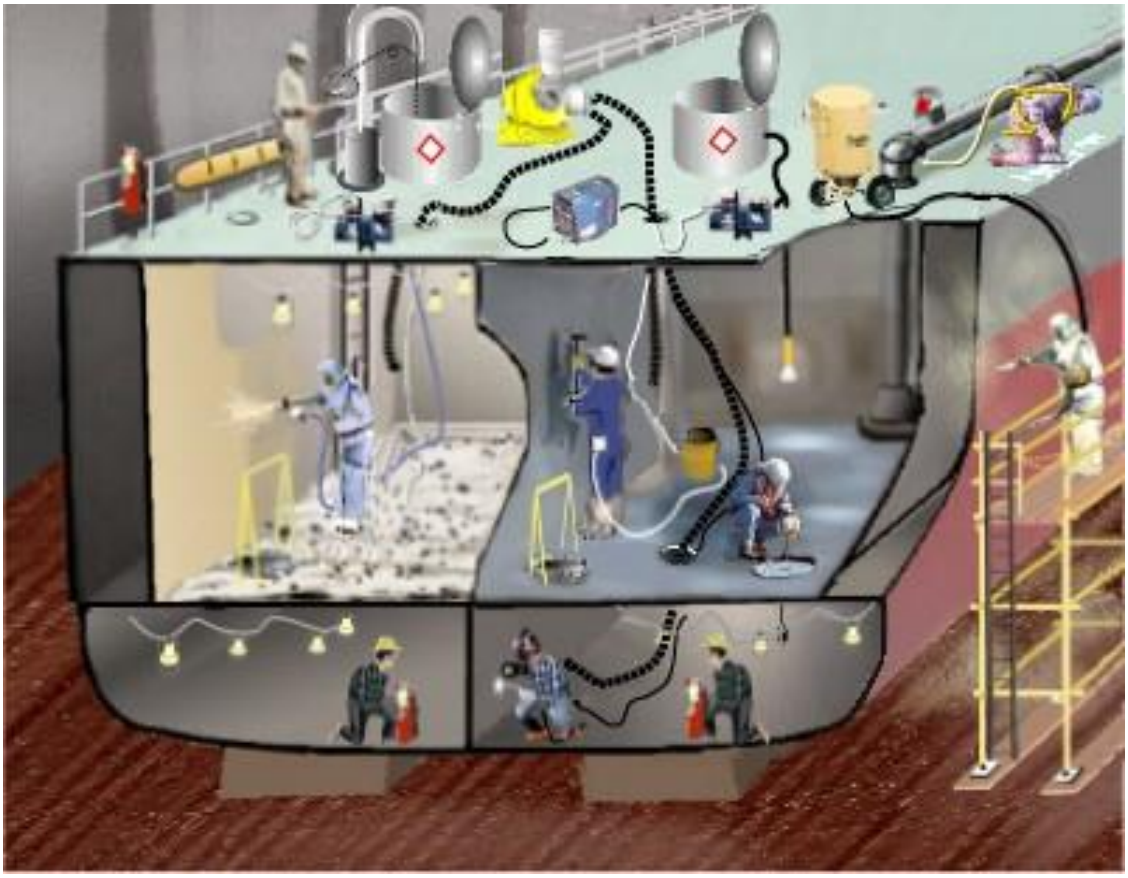
Examples (not limited to) of confined spaces:

Confined Spaces	**Hazard** [2)]
Voids/Cofferdams [1)]	P– O; S- F,T
Sealed Compartments [1)]	P– O; S- F,T
Double Bottoms/Sides/Duct Keels[1)]	P– O; S- F,T
Spaces Coated with a Preservative [1)]	P– O; S- F,T
Engine Crankcases/Scavenging Spaces[1)]	P– O; S- F,T
Large Heat Exchangers [1)]	P– O; S- F,T
Fuel/Lube Oil/Sludge Tanks [1)]	P- F,T; S- O
Water tanks [1)]	P– O; S- F,T
Cargo Holds [1 & 3)]	Cargo Dependent – see note 3
Cargo Containers [1)]	P- F,T; S- O

2) Hazards – P (Primary); S (Secondary); O (Oxygen Deprivation); F – (Flammability); T – (Toxicity)

3) Cargos holds that include scrap iron, fresh fruit, molasses, vegetable oils, grain, coal, any organic matter which might decay may lead to an oxygen deprived atmosphere. Grain, sand, coal, etc. are engulfment hazards.

List the hazards in this confined space



Hazards:

1. _____
2. _____
3. _____
4. _____
5. _____

Non-confined spaces that may pose a risk	**Possible Hazard(s)**	**Safe Work Practice**
CO_2 Storage Room	O_2 deprivation due to leaking CO_2	Ensure proper ventilation, wear O_2 meter, Carry EEBA
Machinery Spaces	Noise, flammability, toxicity; MSDs – H_2S	Hearing protection
Flammable Storage Lockers/Paint Rooms	Flammability, Toxicity	Ensure proper ventilation
Battery Room	Flammability, Toxicity	Ensure proper ventilation
Bosn Shop	O_2 deprivation, toxicity	Ensure proper ventilation
Workshops	Toxicity from welding fumes, flammability, noise	Ensure proper ventilation
Provisions/Non-Flammable Storage	O_2 deprivation	Ensure proper ventilation

Summary of hazards associated with confined space entry

- Oxygen deficient or enriched atmosphere
- Flammable atmosphere
- Toxic atmosphere
- Extreme temperature (hot or cold)
- Engulfment hazard (such as grain, coal, sand, gypsum, or similar material)
- Extreme noise
- Slick / wet surfaces & tripping hazards
- Falling objects
- Potential for rapidly changing atmosphere

Policy for confined space entry

The US Coast Guard has a very conservative definition and approach for confined spaces.[1] ASR members shall follow this policy unless Incident Command develops and promulgates alternative procedures.

A confined space is an area on a vessel or vessel section that has the following characteristics:

1. Limited access or egress; ***or***
2. Contains or may contain an atmosphere whose oxygen content is or may become less than 19.5% or greater than 22.0% by volume; ***or***
3. Contains or may contain an atmosphere in which flammable vapors or gases exceed or may exceed 10% of the lower explosive limit (LEL); ***or***
4. Contains or may contain vapors or gases whose concentration exceeds or may exceed the OSHA Permissible Exposure Limit (PEL) or ACGIH Threshold Limit Value (TLV); ***or***
5. Contains other hazards which are created or aggravated by the size and confined nature of a space or by the type of activity occurring in the space

.

DO NOT ENTER A CONFINED SPACE UNLESS:

_____

_____

_____

_____

[1] US Coast Guard policy for confined space entry:
COMDTINST M5100.47,Chapter 6, change 11, (2) COMDTNOTE 1600, (3) MSM Vol. 1, Chapter 10 & Appendix A, C, G to chapter 10, (4) 29 CFR 1915, Part B

B. Decontamination

Decontamination procedures will follow the protocols established in the STAR manual (Annex 2). Review this annex and answer the following questions and complete the exercise.

A. List the 3 objectives of any decontamination plan.

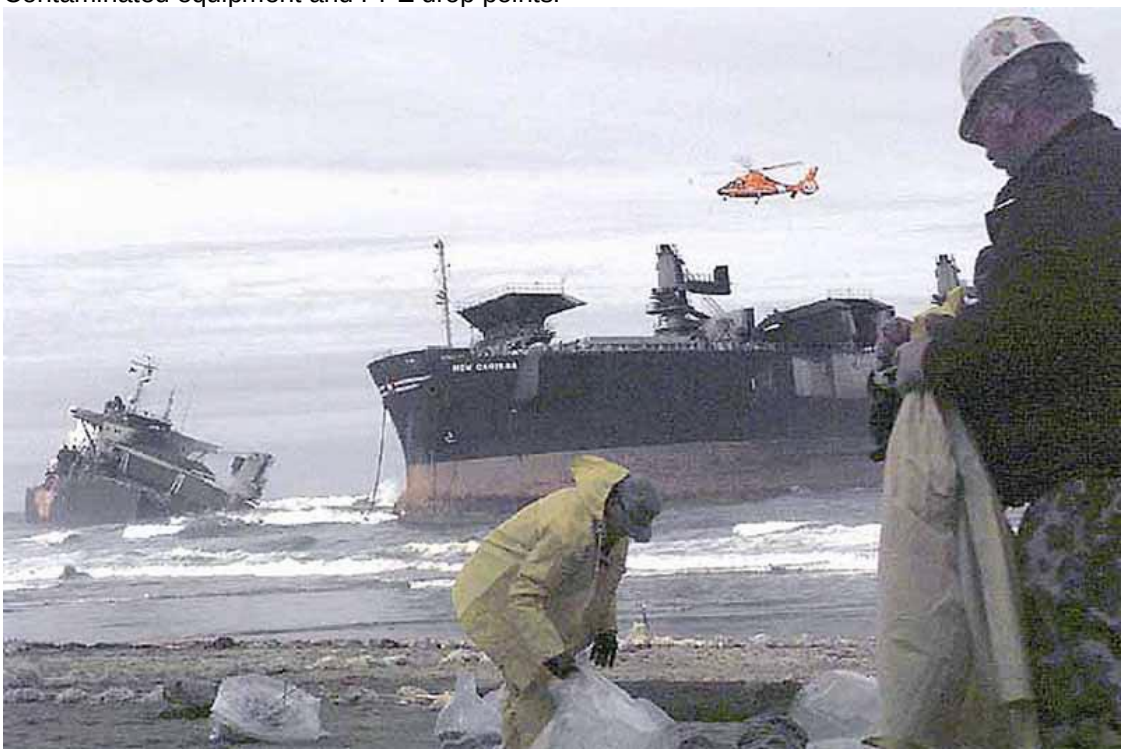
1. _____
2. _____
3. _____

B. List the three decontamination zones and the function of each in checking the spread of contaminants.

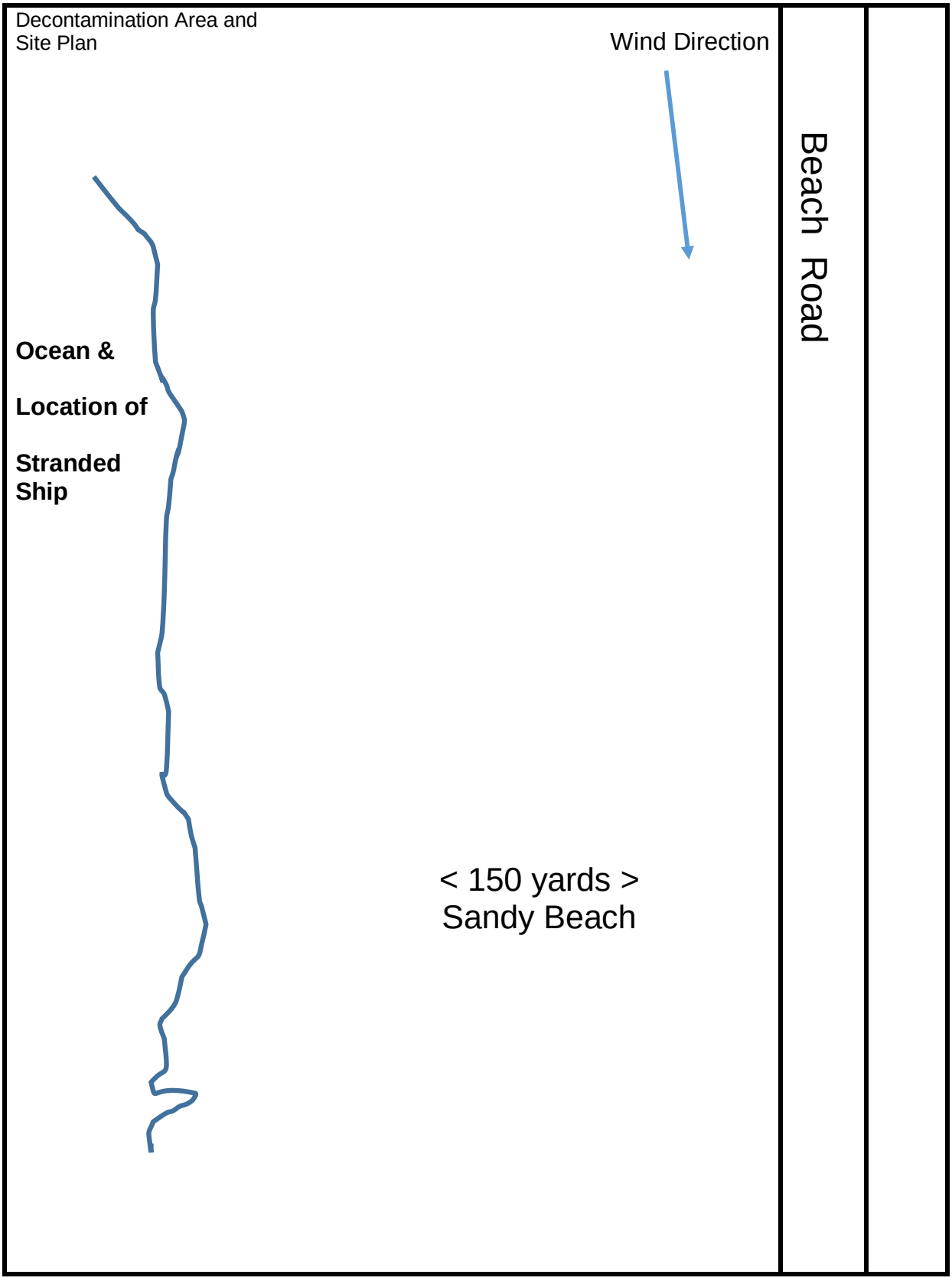
1. _____
2. _____
3. _____

On the following page draw a decontamination plan for the oil spill cleanup pictured below. Designate areas for the following activities using the STAR Manual symbols:

1. Oil collection
2. Potable water, electric power, and waste disposal
3. Heavy equipment and machinery access points
4. Distinct entry and exit points, and physically separate entry paths from contaminated area to clean area and vice versa.
5. Medical/first aid stations
6. Contaminated equipment and PPE drop points.



Beach cleanup for the M/V New Carissa


Decontamination Area and
Site Plan
Wind Direction
Beach Road
Ocean &
Location of
Stranded
Ship
< 150 yards >
Sandy Beach

C. Emergency Response Plans and ICS

For any prolonged incident or spill cleanup a specific incident action plan (IAP) will be developed and promulgated. The IAP must address site safety and health.

Contingency planning for oil spills and other vessel emergencies are addressed in other plans. These plans are useful for initial response. They include:

- Ship Oil Pollution Emergency Plan (SOPEP) required by IMO.
- Vessel Response Plans required by the USCG and ADEC.

Incident Command System (ICS)

Reference: 2014 USCG Incident Management Handbook, page 6-8 and the Safety Officer Job Aid available at USCG Homeport.

For General Staff remember the acronym F.L.O.P.

Command Staff is the abbreviation for please (PLS) as in 'Please may I serve you?'

TEST YOURSELF

Draw the organizational chart for the Incident Command from memory in the space below. Include command staff and general staff.

The ICS Safety Officer

The Safety Officer is responsible for monitoring and assessing hazardous and unsafe situations and developing measures to assure personnel safety.

The Safety Officer will correct unsafe acts or conditions through the regular line of authority, although the **Safety Officer may exercise emergency authority to prevent or stop unsafe acts** when immediate action is required.

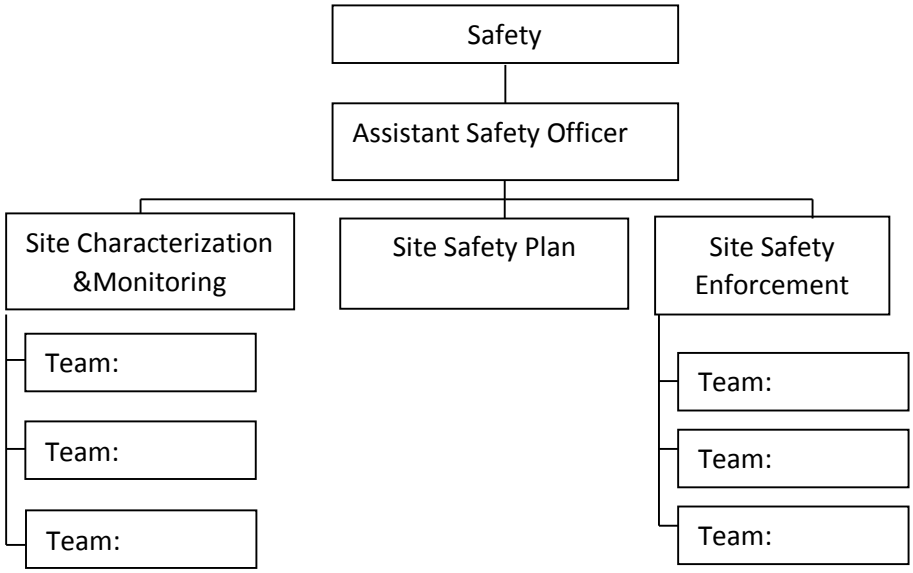
The Safety Officer maintains awareness of active and developing situations.

The Safety Officer ensures the Site Safety and Health Plan is prepared and implemented.

The Safety Officer ensures there are safety messages in each Incident Action Plan.

For large, complex responses, ICS can 'grow' the safety component. Put another way, a number of people can serve under the Safety Officer command staff position. **Only one Safety Officer** will be assigned for each incident, including incidents operating under Unified Command and multi-jurisdiction incidents. The Safety Officer may have assistants, as necessary, and the assistants may also represent assisting agencies or jurisdictions.

A detailed list of the Safety Officer's responsibilities is provided in the Safety Officer's Job Aid available on the ASR flash drive and at USCG Homeport.



Appendix H, Developing a Health and Safety Plan, and Appendix I, Risk assessment are reproduced in this manual as Tab F & G, respectively.

Site Characterization and Monitoring:

a. Initial on scene hazard assessment of the incident.

b. Conduct air monitoring and sampling of spilled oil on scene.

c. Provide continuous air monitoring if necessary.

d. Ensure workers are safely monitored by use of passive dosimeters.

e. Provide heat or cold stress monitoring, using WBGT or other measuring device.

f. Provide on scene fatigue monitoring for work-rest regimen recommendations.

Developing an ICS Site Safety Plan (HASP)

a. Draft initial basic emergency response site safety plan. Ensure copies get distributed as soon as possible to staging areas and field personnel.

b. Receive reports from Site Safety Enforcement Assistant and incorporate changes into the site safety plan.

c. Ensure a comprehensive Health and Safety Plan (HASP) is completed (ICS-208, see Tab F) in time to be incorporated into Incident Action Plan.

d. Provide safety messages for ICS form 204 prior to the planning meeting. If site safety plan is completed, consider inserting: “All personnel shall review site safety plan prior to commencement of operations.”

e. Review Medical Plan 206 and forward to the Safety Officer for signature.

f. Review Incident Action Plan. Ensure plan provisions are in compliance with 29 CFR 1910.120. Review HAZWOPER Compliance Checklist to ensure requirements met.

Site Safety Enforcement

a. Enforce site safety plan on scene.

b. Use site safety enforcement log and ensure completion in time for updating new site safety plan for next operational period.

c. Terminate all imminently dangerous operations immediately. For other non-time critical safety hazards contact the Safety Officer for termination guidance.

d. Attend morning field safety briefings at Staging Areas and assembly points to ensure site safety plan was covered.

e. Keep workers, supervisors and the Safety Officer informed often.

VII. References

A. Glossary of Key Terms

Boiling Point: The temperature at which a liquid changes to a vapor, that is, it is the temperature where the pressure of the liquid equals the atmospheric pressure. Boiling point is important because it can dictate the route of entry. For liquids with a high boiling point the most common route of entry is by body contact, while for liquids with a low-boiling point the most common route of entry is inhalation.

Carcinogenicity: In simple terms, the ability of a chemical to mutate a cell's DNA to reproduce rapidly reproducing cancerous (malignant cells.

Density/Specific Gravity: The density of a substance is its mass per unit volume, commonly expressed in grams per cubic centimeter (g/cc). If the specific gravity of a substance is greater than 1 it will sink in water. The substance will float if the specific gravity is less than 1. A spilt substance with a SG greater than 1 will sink in water and thus present less an exposure hazard to humans. However, it may be more of an environmental hazard for it can more easily disperse through the water column.

Flashpoint: The minimum temperature at which a liquid or volatile solid produces sufficient flammable vapors to ignite. If the vapor does ignite, combustion can continue as long as the temperature remains at or above the flashpoint. Thus, a low flashpoint indicates two important characteristics of a hazardous substance. A low flash point indicates that the substance is (1) flammable and (2) emits volatile vapors which may be toxic.

Flammables and Combustibles:
Flammables are any solid, liquid, vapor, or gas that will ignite easily and burn rapidly. Solid flammables include dusts, and powders such as charcoal and aluminum, and also include low ignition point materials such as films and fibers. The US Department of Transportation (DOT) defines flammable liquid as a liquid having a flash point of not more than 60.5°C (141°F). See 49 CFR 173.120.

Combustibles ignite only after being heated to their flashpoint temperature. Any solid that is capable of burning is considered a combustible. DOT defines a combustible liquid as any liquid that does not meet the definition of any other hazard class and has a flash point *above* 60.5°C (141°F).

Oxidizers
Oxidizers are substances that are able to supply oxygen chemically or supplement oxygen with other oxidizing gases enabling the support of fire. Oxidizers can exist in the form of a solid, liquid, or gas. Some common oxidizers include chlorine, peroxides and nitrates.

Occupational exposure limits (OELs, TLVs, PELs, etc.) are the maximum concentrations of substances in air in which a person can safety work. The limits can be expressed in parts per million (ppm) only if the substance exists as a gas or vapor at normal room temperature and pressure.

Odor threshold: The concentration of a substance in air (normally expressed as ppm) at which it can be smelled.

Solubility: The ability or tendency of a substance (solid, liquid, gas, or vapor) to blend with another to produce a uniformly dispersed mixture. The solubility of a substance is independent of its density or specific gravity. Oils are, of course, insoluble in water.

Vapor Pressure is the pressure exerted by a vapor against the sides of a closed container. Vapor pressure (VP) is temperature dependent; as the temperature increases, so does the vapor pressure.

Therefore, VP of a chemical must always be given with the temperature at which the VP was measured. Room temperature VP is the most helpful. If a chemical has a high vapor pressure, more of it will be in the air than a chemical with low vapor pressure. If the material is toxic or flammable, a high VP liquid will be extremely dangerous.

Vapor Density: The density of a gas or vapor can be compared to the density of the ambient atmosphere. If the density of a vapor or gas is greater than that of the ambient air, then it will settle to the lowest point; and if the vapor density is close to air density or lower, the vapor will tend to disperse in the atmosphere. It is, therefore, important to know the vapor density of gases or vapors, since it can determine the proper response action at an emergency release.

B. GHS Pictogram Terms Defined

See US OSHA Guide to GHS for an extensive discussion.

GHS Pictograms and Hazard Classes		
 • Oxidizers	 • Flammables • Self reactives • Pyrophorics • Self-Heating • Emits flammable gas • Organic peroxides	 • Explosives (Divisions 1.1 to 1.4 only) • Self reactives • Organic peroxides
 • Acute toxicity (severe)	 • Corrosive to metals • Skin corrosion • Serious eye damage/eye irritation	 • Gases under pressure
 • Carcinogen • Respiratory sensitizer • Reproductive toxicity • Target Organ toxicity • Mutagenicity • Aspiration toxicity	 • Aquatic Toxicity (acute) • Aquatic Toxicity (chronic)	 • Irritant • Dermal sensitizer • Acute toxicity (harmful)

The main elements of the hazard classification criteria are summarized below:

Physical hazards

Physical hazards are largely based on those of the United Nations Dangerous Goods System. These regulations and UN test methods can be found at the United Nations website at [1]. Some additions and changes were necessary since the scope of the GHS includes all target audiences.

- **Explosives**, which are assigned to one of six subcategories depending on the type of hazard they present, as used in the UN Dangerous Goods System.
- A **Flammable Gas** is one that has a flammable range in air at 20 °C and a standard pressure of 101.3 kPa. Substances and mixtures of this hazard class are assigned to one of two hazard categories on the basis of the outcome of the test or calculation method.
- **Flammable Aerosols** should be considered for classification as Category 1 or Category 2 if they contain any component, which is classified as flammable according to the GHS criteria, that is, flammable liquids, flammable gases or flammable solids.
- **Oxidizing Gases** are any gas that may, generally by providing oxygen, cause or contribute to the combustion of other material more than air does. Substances and mixtures of this hazard class are assigned to a single hazard category on the basis that, generally by providing oxygen, they cause or contribute to the combustion of other material more than air does.
- **Gases Under Pressure** are gases contained in a receptacle at a pressure not less than 280 Pa at 20 °C or as a refrigerated liquid. This endpoint covers four types of gases or gaseous mixtures to address the effects of sudden release of pressure or freezing which may lead to serious damage to people, property, or the environment independent of other hazards the gases may pose.
- A **Flammable Liquid** is a liquid with a flash point of not more than 93 °C. Substances and mixtures of this hazard class are assigned to one of four hazard categories on the basis of the flash point and boiling point.
- A **Flammable Solid** is one that is readily combustible or may cause or contribute to fire through friction. Readily combustible solids are powdered, granular, or pasty substances which are dangerous if they can be easily ignited by brief contact with an ignition source, such as a burning match, and if the flame spreads rapidly.
- **Self-Reactive Substances** are thermally unstable liquids or solids liable to undergo a strongly exothermic thermal decomposition even without participation of oxygen (air). This definition excludes materials classified under the GHS as explosive, organic peroxides or as oxidizing.
- A **Pyrophoric Liquid** is a liquid that, even in small quantities, is liable to ignite within five minutes after coming into contact with air. Substances and mixtures of this hazard class are assigned to a single hazard category on the basis of the outcome of the UN Test N.3.
- A **Pyrophoric Solid** is a solid that, even in small quantities, is liable to ignite within five minutes after coming into contact with air. Substances and mixtures of this hazard class are assigned to a single hazard category on the basis of the outcome of the UN Test N.2.
- **Self-Heating Substances** are solids or liquids, other than a pyrophoric substance, which, by reaction with air and without energy supply, is liable to self-heat. Substances and mixtures of this hazard class are assigned to one of two hazard categories on the basis of the outcome of the UN Test N.4.
- **Substances which on Contact with Water Emit Flammable Gases** are substances that, in contact with water, emit flammable gases; or, are solids or liquids which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities. Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of the outcome of UN Test N.5, which measures gas evolution and speed of evolution.
- **Oxidizing Liquids** are liquids that, while in itself is not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material. Substances and mixtures of this hazard class are assigned to one of three hazard categories on the basis of the outcome of UN Test O.2.
- **Oxidizing Solids** are solids that, while itself is not necessarily combustible, may, generally by yielding oxygen, cause or contribute to the combustion of other material. Substances and

mixtures of this hazard class are assigned to one of three hazard categories on the basis of the outcome of UN Test O.1.

- **Organic Peroxides** are organic liquids or solids that contain the bivalent -0-0- structure and may be considered a derivative of hydrogen peroxide, where one or both of the hydrogen atoms have been replaced by organic radicals. The term also includes organic peroxide formulations (mixtures). Substances and mixtures of this hazard class are assigned to one of seven 'Types', A to G, on the basis of the outcome of the UN Test Series A to H.
- **Substances Corrosive to Metal** are substances or a mixtures that by chemical action will materially damage, or even destroy metals. These substances or mixtures are classified in a single hazard category on the basis of tests (Steel: ISO 9328 (II): 1991 - Steel type P235; Aluminum: ASTM G31-72 (1990) - non-clad types 7075-T6 or AZ5GU-T66). The GHS criteria are a corrosion rate on steel or aluminum surfaces exceeding 6.25 mm per year at a test temperature of 55 °C.

Health hazards

- **Acute Toxicity** includes five GHS categories from which the appropriate elements relevant to transport, consumer, worker and environment protection can be selected. Substances are assigned to one of the five toxicity categories on the basis of LD_{50} (oral, dermal) or LC_{50} (inhalation).
- **Skin Corrosion** means the production of irreversible damage to the skin following the application of a test substance for up to 4 hours. Substances and mixtures in this hazard class are assigned to a single harmonized corrosion category.
- **Skin Irritation** means the production of reversible damage to the skin following the application of a test substance for up to 4 hours. Substances and mixtures in this hazard class are assigned to a single irritant category. For those authorities, such as pesticide regulators, wanting more than one designation for skin irritation, an additional mild irritant category is provided.
- **Serious Eye Damage** means the production of tissue damage in the eye, or serious physical decay of vision, following application of a test substance to the front surface of the eye, which is not fully reversible within 21 days of application. Substances and mixtures in this hazard class are assigned to a single harmonized category.
- **Eye Irritation** means changes in the eye following the application of a test substance to the front surface of the eye, which are fully reversible within 21 days of application. Substances and mixtures in this hazard class are assigned to a single harmonized hazard category. For authorities, such as pesticide regulators, wanting more than one designation for eye irritation, one of two subcategories can be selected, depending on whether the effects are reversible in 21 or 7 days.
- **Respiratory Sensitizer** means a substance that induces hypersensitivity of the airways following inhalation of the substance. Substances and mixtures in this hazard class are assigned to one hazard category.
- **Skin Sensitizer** means a substance that will induce an allergic response following skin contact. The definition for "skin sensitizer" is equivalent to "contact sensitizer". Substances and mixtures in this hazard class are assigned to one hazard category.
- **Germ Cell Mutagenicity** means an agent giving rise to an increased occurrence of mutations in populations of cells and/or organisms. Substances and mixtures in this hazard class are assigned to one of two hazard categories. Category 1 has two subcategories.
- **Carcinogenicity** means a chemical substance or a mixture of chemical substances that induce cancer or increase its incidence. Substances and mixtures in this hazard class are assigned to one of two hazard categories. Category 1 has two subcategories.
- **Reproductive Toxicity** includes adverse effects on sexual function and fertility in adult males and females, as well as developmental toxicity in offspring. Substances and mixtures with reproductive and/or developmental effects are assigned to one of two hazard categories, 'known or presumed' and 'suspected'. Category 1 has two subcategories for reproductive and developmental effects. Materials, which cause concern for the health of breastfed children, have a separate category, Effects on or Via Lactation.

- **Specific Target Organ Toxicity (STOT)** [2] category distinguishes between single and repeated exposure for Target Organ Effects. All significant health effects, not otherwise specifically included in the GHS, that can impair function, both reversible and irreversible, immediate and/or delayed are included in the non-lethal target organ/systemic toxicity class (TOST). Narcotic effects and respiratory tract irritation are considered to be target organ systemic effects following a single exposure. Substances and mixtures of the single exposure target organ toxicity hazard class are assigned to one of three hazard categories. Substances and mixtures of the repeated exposure target organ toxicity hazard class are assigned to one of two hazard categories.
- **Aspiration Hazard** includes severe acute effects such as chemical pneumonia, varying degrees of pulmonary injury or death following aspiration. Aspiration is the entry of a liquid or solid directly through the oral or nasal cavity, or indirectly from vomiting, into the trachea and lower respiratory system. Substances and mixtures of this hazard class are assigned to one of two hazard categories this hazard class on the basis of viscosity.

Environmental hazards

- **Acute Aquatic Toxicity** means the intrinsic property of a material to cause injury to an aquatic organism in a short-term exposure. Substances and mixtures of this hazard class are assigned to one of three toxicity categories on the basis of acute toxicity data: LC_{50} (fish) or EC_{50} (crustacean) or ErC_{50} (for algae or other aquatic plants). In some regulatory systems these acute toxicity categories may be subdivided or extended for certain sectors.
- **Chronic Aquatic Toxicity** means the potential or actual properties of a material to cause adverse effects to aquatic organisms during exposures that are determined in relation to the lifecycle of the organism. Substances and mixtures in this hazard class are assigned to one of four toxicity categories on the basis of acute data and environmental fate data: LC_{50} (fish) or EC_{50} (crustacea) or ErC_{50} (for algae or other aquatic plants) and degradation or bioaccumulation.

C. Key Reference Sources

OSHA Guide to GHS at https://www.osha.gov/dsg/hazcom/ghs.html

US Coast Guard policy for confined space entry:
COMDTINST M5100.47,Chapter 6, change 11, (2) COMDTNOTE 1600, (3) MSM Vol. 1, Chapter 10 & Appendix A, C, G to chapter 10, (4) 29 CFR 1915, Part B

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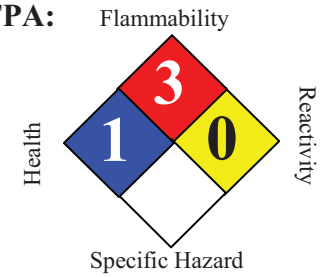
Safety Data Sheet
Gasoline, Unleaded

NFPA:



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Gasoline, Unleaded			
Synonyms	:	Blend of Highly Flammable Petroleum Distillates, Regular, Mid-Grade, Premium, 888100008809			
SDS Number	:	888100008809	**Version**	:	1.1
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications :

Flammable Liquid – Category 1 or 2 depending on formulation.
Aspiration Hazard – Category 1
Carcinogenicity – Category 2
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Skin Irritation – Category 2
Eye Irritation – Category 2B
Chronic Aquatic Toxicity – Category 2

Pictograms :

Signal Word : **Danger**

Hazard Statements

Extremely flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon gasoline by mouth.
Suspected of causing blood cancer if repeated over-exposure by inhalation and/or skin contact occurs.
May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation or skin contact. Causes eye irritation. Can be absorbed through skin.
May cause drowsiness or dizziness. Extreme exposure such as intentional inhalation may cause unconsciousness, asphyxiation and death.
Repeated or prolonged skin contact can cause irritation and dermatitis.

Harmful to aquatic life.

Precautionary statements

Prevention : Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, welding and hot surfaces.
No smoking.
Keep container tightly closed.
Ground and/or bond container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools (if tools are used in flammable atmosphere).
Take precautionary measures against static discharge.
Wear gloves, eye protection and face protection (as needed to prevent skin and eye contact with liquid).
Wash hands or liquid-contacted skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Do not breathe vapors.
Use only outdoors or in a well-ventilated area.

Response : In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.
If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If skin or eye irritation persists, get medical attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Get medical attention if you feel unwell.

Storage : Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers. Some containers not approved for gasoline may dissolve and release flammable gasoline liquid and vapors.

Disposal : Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Gasoline, natural; Low boiling point naphtha	8006-61-9	10 - 30%
Toluene	108-88-3	10 - 30%
Xylene	1330-20-7	10 - 30%
Ethanol; ethyl alcohol	64-17-5	0-8.2%
Trimethylbenzene	25551-13-7	1 - 5%
Isopentane; 2-methylbutane	78-78-4	1 - 5%

Naphthalene	91-20-3	1 - 5%
Benzene	71-43-2	Less than 1.3%
Pentane	109-66-0	1 - 5%
Cyclohexane	110-82-7	1 - 5%
Ethylbenzene	100-41-4	1 - 5%
Butane	106-97-8	1 - 20%
Heptane [and isomers]	142-82-5	0.5 - 0.75%
N-hexane	110-54-3	0.5 - 0.75%

SECTION 4. FIRST AID MEASURES

Inhalation : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Seek medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use. Contaminated leather, particularly footwear, must be discarded. Note that contaminated clothing may be a fire hazard. Seek medical advice if symptoms persist or develop.

Eye contact : Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice if symptoms persist or develop.

Ingestion : Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Obtain medical attention.

Notes to physician : Symptoms: Dizziness, Discomfort, Headache, Nausea, Kidney disorders, Liver disorders. Aspiration may cause pulmonary edema and pneumonitis. Swallowing gasoline is more likely to be fatal for small children than adults, even if aspiration does not occur.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.

Specific hazards during fire fighting : Extremely flammable liquid and vapor. This material is combustible/flammable and is sensitive to fire, heat, and static discharge.

Special protective equipment for fire-fighters : Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Further information	:	Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam. Exposure to decomposition products may be a hazard to health. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water spray to cool unopened containers. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate personnel to safe areas. Ventilate the area. Remove all sources of ignition. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).
Environmental precautions	:	Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling :

Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.

(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Reports suggest that government-mandated ethanol, if present, may not be compatible with fiberglass gasoline tanks. Ethanol may dissolve fiberglass resin, causing engine damage and possibly allow leakage of explosive gasoline.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Store only in containers approved and labeled for gasoline.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Benzene	71-43-2	TWA	1 ppm
		71-43-2	STEL	5 ppm
		71-43-2	OSHA_ACT	0.5 ppm
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Ethanol; Ethyl alcohol	64-17-5	PEL	1,000 ppm 1,900 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Cyclohexane	110-82-7	PEL	300 ppm 1,050 mg/m3
	Ethylbenzene	100-41-4	PEL	100 ppm 435 mg/m3
	Heptane [and isomers]	142-82-5	PEL	500 ppm 2,000 mg/m3
	N-hexane	110-54-3	PEL	500 ppm 1,800 mg/m3
ACGIH	Toluene	108-88-3	TWA	50 ppm
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Ethanol; Ethyl alcohol	64-17-5	TWA	1,000 ppm
	Trimethylbenzene	25551-13-7	TWA	25 ppm
	Isopentane; 2-Methylbutane	78-78-4	TWA	600 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Benzene	71-43-2	TWA	0.5 ppm
		71-43-2	STEL	2.5 ppm
	Pentane	109-66-0	TWA	600 ppm
	Cyclohexane	110-82-7	TWA	100 ppm
	Ethylbenzene	100-41-4	TWA	100 ppm
		100-41-4	STEL	125 ppm
	Heptane [and isomers]	142-82-5	TWA	400 ppm
		142-82-5	STEL	500 ppm

	N-hexane	110-54-3	TWA	50 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying. Ensure that eyewash stations and safety showers are close to the workstation location.

Hand protection : Gloves constructed of nitrile or neoprene are recommended. Consult manufacturer specifications for further information.

Skin and body protection : If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.

Respiratory protection : A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Clear to straw colored liquid

Odor : Characteristic hydrocarbon-like

Odor threshold 0.5 - 1.1 ppm

pH : Not applicable

Melting point/freezing point About -101°C (-150°F)

Initial boiling point & range Boiling point varies: 30 – 200°C (85 – 392°F)

Flash point < -21°C (-5.8°F)

Evaporation rate : Higher initially and declining as lighter components evaporate

Flammability (solid, gas) : Flammable vapor released by liquid

Upper explosive limit	7.6 %(V)
Lower explosive limit	1.3 %(V)
Vapor pressure	345 - 1,034 hPa at 37.8 °C (100.0 °F)
Vapor density (air = 1)	Approximately 3 to 4
Relative density (water = 1)	0.8 g/mL
Solubility (in water)	Negligible
Partition coefficient (n-octanol/water)	2 – 7 as log Pow
Auto-ignition temperature	Approximately 250°C (480°F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	0.64 to 0.88 mm²/s range reported for gasoline
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature)	: Hydrocarbon liquids without static dissipater additive may have conductivity below 1 picoSiemens per meter (pS/m). The highest electro-static ignition risks are associated with "ultra-low conductivities" below 5 pS/m. See Section 7 for sources of information on defining safe loading and handling procedures for low conductivity products.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, alkaline products and strong acids. Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.
Conditions to avoid	: Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	: Ignition and burning can release carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

SECTION 11. TOXICOLOGICAL INFORMATION

Skin contact	: Irritating to skin. Can be partially absorbed through skin.
Eye contact	: Irritating to eyes.
Ingestion	: Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest and death may occur.

Inhalation and further information

Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, over excitation. Exposure to very high levels can result in unconsciousness and death.

Repeated over-exposure may cause liver and kidney injuries.
Components of the product may affect the nervous system.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.
This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

Component:

Gasoline, natural; Low boiling point naphtha	8006-61-9	Acute oral toxicity: LD50 rat Dose: 18.8 mg/kg Acute inhalation toxicity: LC50 rat Dose: 20.7 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Moderate eye irritation
Toluene	108-88-3	Acute oral toxicity: LD50 rat Dose: 636 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 12,124 mg/kg Acute inhalation toxicity: LC50 rat Dose: 49 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may defat the skin and produce dermatitis. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Xylene	1330-20-7	Acute oral toxicity: LD50 rat Dose: 2,840 mg/kg Acute dermal toxicity: LD50 rabbit Dose: ca. 4,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 6,350 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation

		Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Ethanol; Ethyl alcohol	64-17-5	Acute oral toxicity: LD50 rat Dose: 6,200 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 19,999 mg/kg Acute inhalation toxicity: LC50 rat Dose: 8,001 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Prolonged skin contact may cause skin irritation and/or dermatitis. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Mild eye irritation
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130
Benzene	71-43-2	Acute oral toxicity: LD50 rat Dose: 930 mg/kg Acute inhalation toxicity: LC50 rat Dose: 44 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Risk of serious damage to eyes.
Pentane	109-66-0	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 364 mg/l Exposure time: 4 h Skin irritation: Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Cyclohexane	110-82-7	Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 14 mg/l Exposure time: 4 h

		Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Ethylbenzene	100-41-4	Acute oral toxicity: LD50 rat Dose: 3,500 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 15,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 18 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Risk of serious damage to eyes.
Heptane [and isomers]	142-82-5	Acute oral toxicity: LD50 rat Dose: 15,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 103 g/m3 Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
N-hexane	110-54-3	Acute oral toxicity: LD50 rat Dose: 25,000 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 171.6 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Teratogenicity: N11.00418960

Carcinogenicity

NTP	:	Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2)
IARC	:	Gasoline, natural; Low boiling point naphtha (CAS-No.: 8006-61-9) Naphthalene (CAS-No.: 91-20-3) Benzene (CAS-No.: 71-43-2) Ethylbenzene (CAS-No.: 100-41-4)
OSHA	:	Benzene (CAS-No.: 71-43-2)
CA Prop 65	:	WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene (CAS-No.: 108-88-3)

Benzene (CAS-No.: 71-43-2)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Toluene	108-88-3	Toxicity to fish: LC50 Species: Carassius auratus (goldfish) Dose: 13 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 11.5 mg/l Exposure time: 48 h Toxicity to algae: IC50 Species: Selenastrum capricornutum (green algae) Dose: 12 mg/l Exposure time: 72 h
Ethanol; Ethyl alcohol	64-17-5	Toxicity to fish: LC50 Species: Leuciscus idus (Golden orfe) Dose: 8,140 mg/l Exposure time: 48 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 9,268 - 14,221 mg/l Exposure time: 48 h
Isopentane; 2-Methylbutane	78-78-4	Toxicity to fish: LC50 Species: Oncorhynchus mykiss (rainbow trout) Dose: 3.1 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 2.3 mg/l Exposure time: 96 h
Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h
Pentane	109-66-0	Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 9.74 mg/l Exposure time: 48 h
Cyclohexane	110-82-7	Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 3.78 mg/l Exposure time: 48 h

Heptane [and isomers]	142-82-5	Toxicity to fish: LC50 Species: Carassius auratus (goldfish) Dose: 4 mg/l Exposure time: 24 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 1.5 mg/l Exposure time: 48 h
N-hexane	110-54-3	Toxicity to fish: LC50 Species: Pimephales promelas (fathead minnow) Dose: 2.5 mg/l Exposure time: 96 h Acute and prolonged toxicity for aquatic invertebrates: EC50 Species: Daphnia magna (Water flea) Dose: 2.1 mg/l Exposure time: 48 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: Petrol
UN-No.	: 1203
Class	: 3
Packing group	: II

TDG

Proper shipping name	: Gasoline
UN-No.	: UN1203
Class	: 3
Packing group	: II

IATA Cargo Transport

UN UN-No.	: UN1203
Description of the goods	: Gasoline
Class	: 3
Packaging group	: II
ICAO-Labels	: 3
Packing instruction (cargo aircraft)	: 364
Packing instruction (cargo aircraft)	: Y341

IATA Passenger Transport

UN UN-No.	: UN1203
Description of the goods	: Gasoline
Class	: 3

Packaging group	:	II
ICAO-Labels	:	3
Packing instruction (passenger aircraft)	:	353
Packing instruction (passenger aircraft)	:	Y341

IMDG-Code

UN-No.	:	UN 1203
Description of the goods	:	Gasoline
Class	:	3
Packaging group	:	II
IMDG-Labels	:	3
EmS Number	:	F-E S-E
Marine pollutant	:	No

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid
Highly toxic by ingestion
Moderate skin irritant
Severe eye irritant
Carcinogen

TSCA Status : On TSCA Inventory

DSL Status : . All components are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Toluene	108-88-3
Benzene	71-43-2

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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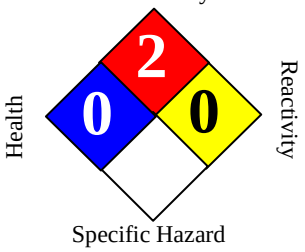
Safety Data Sheet
Diesel Low Sulfur (LSD) and Ultra Low Sulfur Diesel (ULSD)

NFPA:



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Diesel Low Sulfur (LSD) and Ultra Low Sulfur Diesel (ULSD)		
Synonyms	:	CARB Diesel, 888100004478		
MSDS Number		888100004478	**Version**	2.31
Product Use Description				
Company		For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259		
Tesoro Call Center		(877) 783-7676	**Chemtrec (Emergency Contact)**	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications

Flammable Liquid – Category 3
Skin Irritation – Category 2
Eye Irritation – Category 2B
Aspiration Hazard – Category 1
Carcinogenicity – Category 2
Acute Toxicity - Inhalation – Category 4
Chronic Aquatic Toxicity – Category 2

Pictograms

Signal Word **Danger**

Hazard Statements

Flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon diesel by mouth.
Causes skin irritation.
Causes eye irritation.
Suspected of causing skin cancer if repeated and prolonged skin contact occurs.
Suspected of causing cancer in the respiratory system if repeated and prolonged over-exposure by inhalation occurs.
May cause damage to liver, kidneys and nervous system by repeated and prolonged inhalation.

Toxic if inhaled.
May cause drowsiness or dizziness by inhalation.
Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, welding and hot surfaces.
No smoking.
Keep container tightly closed.
Ground and/or bond container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools if tools are used in flammable atmosphere.
Take precautionary measures against static discharge.
Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid.
Wash hands or liquid-contacted skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Avoid breathing vapors or mists.
Use only outdoors or in a well-ventilated area.

Response

In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.
If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If skin or eye irritation persists, get medical attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Immediately call or doctor or emergency medical provider. See Section 4 and Section 11 for medical treatment information.

Storage

Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers.

Disposal

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	100%
Nonane	111-84-2	0 - 5%
Naphthalene	91-20-3	0 - 1%

1,2,4-Trimethylbenzene	95-63-6	0 - 2%
Xylene	1330-20-7	0 - 2%
Sulfur	7704-34-9	15 ppm maximum

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. Give oxygen. If breathing is irregular or stopped, administer artificial respiration. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention immediately.

Eye contact : Remove contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes. If symptoms persist, seek medical attention.

Ingestion : Do not induce vomiting without medical advice. If a person vomits when lying on his back, place him in the recovery position. Seek medical attention immediately.

Notes to physician : Symptoms: Dizziness, Discomfort, Headache, Nausea, Disorder, Vomiting, Lung edema, Liver disorders, Kidney disorders. Aspiration may cause pulmonary edema and pneumonitis.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray or fire fighting foam. LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers. Keep containers and surroundings cool with water spray.

Specific hazards during fire fighting : Fire Hazard Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray.

Special protective equipment for fire-fighters : Wear self-contained breathing apparatus and protective suit. Use personal protective equipment.

Further information : Exposure to decomposition products may be a hazard to health. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact. Ensure adequate ventilation. Use personal protective equipment.

Environmental precautions	:	Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection. Discharge into the environment must be avoided. If the product contaminates rivers and lakes or drains inform respective authorities.
Methods for cleaning up	:	Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling

: Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

: Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.

(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).

(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities

: Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA Z1	Xylene	1330-20-7	PEL	100 ppm 435 mg/m3
	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
ACGIH	Diesel Fuel	68476-30-2	TWA	100 mg/m3
	Xylene	1330-20-7	TWA	100 ppm
		1330-20-7	STEL	150 ppm
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Nonane	111-84-2	TWA	200 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended. Consult manufacturer specifications for further information.

Skin and body protection : If needed to prevent skin contact, chemical protective clothing such as of DuPont TyChem®, Saranex or equivalent recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.

Respiratory protection : A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Clear to straw colored liquid
Odor	Characteristic petroleum or kerosene-like odor
Odor threshold	0.1 - 1 ppm typically reported
pH	Not applicable
Melting point/freezing point	Gel point can be about -15°F; freezing requires laboratory conditions
Initial boiling point & range	154 - 372 °C (310° - 702 °F)
Flash point	38°C Minimum for #1 Diesel, 52°C Minimum for #2 Diesel
Evaporation rate	Higher initially and declining as lighter components evaporate
Flammability (solid, gas)	Flammable vapor released by liquid
Upper explosive limit	6.5 %(V)
Lower explosive limit	0.6 %(V)
Vapor pressure	< 2 mm Hg at 20 °C
Vapor density (air = 1)	> 4.5
Relative density (water = 1)	0.86 g/mL
Solubility (in water)	0.0005 g/100 mL
Partition coefficient (n-octanol/water)	> 3.3 as log Pow
Auto-ignition temperature	257 °C (495 °F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	1 to 6 mm²/s range reported for No.1 or No.2 diesel at ambient temperatures
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature	Diesel Fuel Oils at terminal load rack: At least 25 pS/m Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m ULSD at terminal load rack with conductivity additive: At least 50 pS/m JP-8 at terminal load rack: 150 pS/m to 600 pS/m

SECTION 10. STABILITY AND REACTIVITY

Reactivity	: Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	Stable under normal conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents, peroxides, acids and alkalies. Do not use with Viton or Fluorel gaskets or seals.
Conditions to avoid	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and, depending on formulation, trace amounts

of sulfur dioxide. Diesel exhaust particals may be a lung hazard (see Section 11).

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation : Vapors or mists from this material can irritate the nose, throat, and lungs, and can cause signs and symptoms of central nervous system depression, depending on the concentration and duration of exposure.

Skin contact Skin irritation leading to dermatitis may occur upon prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed. Long-term, repeated skin contact may cause skin cancer.

Eye contact Eye irritation may result from contact with liquid, mists, and/or vapors.

Ingestion Harmful or fatal if swallowed. Do NOT induce vomiting. This material can irritate the mouth, throat, stomach, and cause nausea, vomiting, diarrhea and restlessness Aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death.

Target organs Central nervous system, Eyes, Skin, Kidney, Liver

Further information Studies have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.
Repeated over-exposure may cause liver and kidney injury
IARC classifies whole diesel fuel exhaust particulates as carcinogenic to humans (Group 1). NIOSH regards whole diesel fuel exhaust particulates as a potential cause of occupational lung cancer based on animal studies and limited evidence in humans.

Component:

Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6	Acute oral toxicity: LD50 rat Dose: 5,001 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: 7.64 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Severe skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation
Nonane	111-84-2	Acute oral toxicity: LD50 mouse Dose: 218 mg/kg Acute inhalation toxicity: LC50 rat Exposure time: 4 h
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg

		Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130
1,2,4-Trimethylbenzene	95-63-6	Acute inhalation toxicity: LC50 rat Dose: 18 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation Eye irritation: Classification: Irritating to eyes. Result: Eye irritation
Xylene	1330-20-7	Acute oral toxicity: LD50 rat Dose: 2,840 mg/kg Acute dermal toxicity: LD50 rabbit Dose: ca. 4,500 mg/kg Acute inhalation toxicity: LC50 rat Dose: 6,350 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Repeated or prolonged exposure may cause skin irritation and dermatitis, due to degreasing properties of the product. Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

Carcinogenicity

NTP Naphthalene (CAS-No.: 91-20-3)

IARC Naphthalene (CAS-No.: 91-20-3)

OSHA No component of this product which is present at levels greater than or equal to 0.1 % is identified as a carcinogen or potential carcinogen by OSHA.

CA Prop 65 WARNING! This product contains a chemical known to the State of California to cause cancer.
naphthalene (CAS-No.: 91-20-3)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

Component:

Diesel	68476-34-6	Toxicity to fish: LC50 Species: Jordanella floridae Dose: 54 mg/l

Exposure time: 96 h

Toxicity to crustacia:
Species: Palaemonetes pugio
TLm (48 hour) = 3.4 mg/l

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: DIESEL FUEL
UN-No.	: UN1202 (NA 1993)
Class	: 3
Packing group	: III

TDG

Proper shipping name	: DIESEL FUEL
UN-No.	: UN1202 (NA 1993)
Class	: 3
Packing group	: III

IATA Cargo Transport

UN UN-No.	: UN1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III
ICAO-Labels	: 3
Packing instruction (cargo aircraft)	: 366
Packing instruction (cargo aircraft)	: Y344

IATA Passenger Transport

UN UN-No.	: UN1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III
ICAO-Labels	: 3
Packing instruction (passenger aircraft)	: 355
Packing instruction (passenger aircraft)	: Y344

IMDG-Code

UN-No.	: UN 1202 (NA 1993)
Description of the goods	: DIESEL FUEL
Class	: 3
Packaging group	: III
IMDG-Labels	: 3

EmS Number	:	F-E S-E
Marine pollutant	:	No

SECTION 15. REGULATORY INFORMATION

: **CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)**
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply**.**

TSCA Status : On TSCA Inventory

DSL Status : All components of this product are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

Components	CAS-No.
Xylene	1330-20-7
1,2,4-Trimethylbenzene	95-63-6
Naphthalene	91-20-3

PENN RTK — US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Components	CAS-No.
Nonane	111-84-2
Naphthalene	91-20-3
1,2,4-Trimethylbenzene	95-63-6
xylene	1330-20-7
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

MASS RTK — US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Components	CAS-No.
Xylene	1330-20-7
1,2,4-Trimethylbenzene	95-63-6
Naphthalene	91-20-3
Nonane	111-84-2

NJ RTK — US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components	CAS-No.
Nonane	111-84-2

Naphthalene	91-20-3
1,2,4-Trimethylbenzene	95-63-6
Xylene	1330-20-7
Fuels, diesel, No 2; Gasoil - unspecified	68476-34-6

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Naphthalene 91-20-3

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

10/29/2012

1153, 1250, 1443, 1454, 1814, 1815, 1866, 1925

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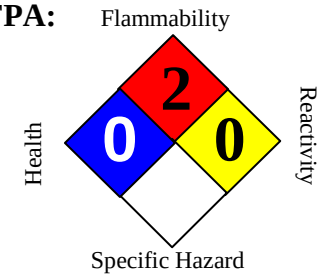
Material Safety Data Sheet
Fuel Oil

NFPA:



TESORO

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Fuel Oil			
Synonyms	:	Bunkers, Black Fuel Oil, MFO, Industrial Fuel Oil, 6 Oil, Slurry Fuel Oil, RFO, Refinery Fuel Oil, High Sulfur Fuel Oil, HSFO, IFO-30, IFO-180, IFO-380, IFO-510, IFO-700, Bunker C, Bunker Fuel Oil, Marine Fuel Oil, Decant Oil, Utility Fuel Oil, LSFO, Six Oil, 888100008793			
SDS Number	:	888100008793	**Version**	:	1.20
Product Use Description	:	Fuel, Intermediate Stream			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications

Flammable Liquid – Category 4
Carcinogenicity – Category 1B
Toxic to Reproduction – Category 1B
Specific Target Organ Toxicity (Repeated Exposure) – Category 2
Acute Toxicity – Inhalation – Category 4
Acute Aquatic Toxicity– Category 3

Pictograms

Signal Word

DANGER

Hazard Statements

Combustible liquid.
May cause cancer from prolonged and repeated skin contact.
May damage fertility or the unborn child.
May cause damage to liver, kidney and nervous system through prolonged or repeated exposure.
Harmful if inhaled.
Harmful to aquatic life
Skin and eye irritant.
May contain and release toxic hydrogen sulfide (H2S) gas.

Precautionary Statements

Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from flames and hot surfaces. No smoking. Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid. Wash hands or liquid-contacted skin thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe vapors or mists. Use only outdoors or in a well-ventilated area
Response	In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish. Get medical advice or attention if you feel unwell, are exposed, or become concerned. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If skin or eye irritation persists, get medical attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call or doctor or emergency medical provider
Storage	Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers.
Disposal	Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	100%
Polycyclic aromatic compounds (PACs or PNAs)		Typically 1.5%
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8	Trace to 0.2%
Hydrogen Sulfide	7783-06-4	Trace to 0.2%
Sulfur (for waters within 25 miles of California shores)	17704-34-9	Trace to 0.1%
Sulfur (for waters within 200 miles of American shores)	17704-34-9	Trace to 1.0%
Sulfur (for International waters)	17704-34-9	Trace to 3.5%

SECTION 4. FIRST AID MEASURES

Inhalation : Move to fresh air. Give oxygen. If breathing is irregular or stopped, administer artificial respiration. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap

		and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, call a physician.
Eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. If eye irritation persists, consult a specialist.
Ingestion	:	Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.
Notes to physician	:	Symptoms: Dizziness, Discomfort, Headache, Nausea, Disorder, Vomiting, Liver disorders, Kidney disorders, Aspiration may cause pulmonary edema and pneumonitis.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray.
Specific hazards during fire fighting	:	Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.
Special protective equipment for fire-fighters	:	Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.
Further information	:	Flammable vapor production at ambient temperature in the open is expected to be minimal, as the material is generally wet. However, depending on oil content and conditions, it is possible flammable vapors could accumulate in the headspace of storage containers, presenting a flammability and explosion hazard. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas.
Environmental precautions	:	Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material.
Methods for cleaning up	:	Take up with sand or oil absorbing materials. Carefully vacuum, shovel, scoop or sweep up into a waste container for reclamation or disposal.

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling	:	Keep away from fire, sparks and heated surfaces. No smoking near areas where

material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for storage, including any incompatabilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Hydrogen sulfide may accumulate in tanks and bulk transport compartments. Consider appropriate respiratory protection (see Section 8). Stand upwind. Avoid vapors when opening hatches and dome covers. Confined spaces should be ventilated and gas tested prior to entry.

Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

No decomposition if stored and applied as directed.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA	Polycyclic aromatic compounds (or coal tar pitch volatiles – benzene soluble)		PEL	0.2 mg/m3
	Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	PEL	5 mg/m3 (as mineral oil mist)
	Hydrogen Sulfide	7783-06-4	STEL	20 ppm
ACGIH	Hydrogen Sulfide	7783-06-4	TWA	1 ppm
		7783-06-4	STEL	5 ppm

	Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	TWA	0.2 mg/m3 (as mineral oil) Sum of 15 NTP-listed polynuclear aromatic hydrocarbons 0.005 mg/m3
	Polycyclic aromatic compounds (or coal tar pitch volatiles – benzene soluble)		TWA	0.2 mg/m3

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Eye protection : Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Hand protection : Gloves constructed of nitrile, neoprene, or PVC are recommended.

Skin and body protection : Chemical protective clothing such as DuPont Tyvek QC, TyChem® or equivalent, recommended based on degree of exposure. The resistance of specific material may vary from product to product as well as with degree of exposure.

Respiratory protection : If hydrogen sulfide concentration may exceed permissible exposure limit, a positive-pressure SCBA or Type C supplied air respirator with escape bottle is required as respiratory protection. If hydrogen sulfide concentration is below H2S permissible exposure limit a NIOSH/ MSHA-approved air-purifying respirator with acid gas cartridges may be acceptable for odor control, but continuous air monitoring for H2S is recommended. Protection provided by air-purifying respirators is limited. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection.

Work / Hygiene practices : Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance Dark green to brown or black liquid

Odor Petroleum asphalt odor

Odor threshold	No data available
pH	Not applicable
Melting point/freezing point	32° - 80°C (89.6° - 176°F)
Initial boiling point & range	154 - 372 °C (310° - 702 °F)
Flash point	60°C (140°F) minimum
Evaporation rate	Higher initially and declining as lighter components evaporate
Flammability (solid, gas)	Flammable vapor released by heated liquid
Upper explosive limit	No data available
Lower explosive limit	No data available
Vapor pressure	210 Pa at 25°C
Vapor density (air = 1)	>5
Relative density (water = 1)	>0.9 to 1.2 g/mL
Solubility (in water)	6 to 1400 mg/L at 25°C
Partition coefficient (n-octanol/water)	3.4 to 5 as log Pow at 25°C
Auto-ignition temperature	>176°C (>350 °F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	>300 cST typical at 40°C

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Vapors may form explosive mixtures with air. Hazardous polymerization does not occur.
Chemical Stability		Stable under normal conditions.
Possibility of hazardous reactions		Can react with strong oxidizing agents and peroxides. Keep away from strong acids and bases.
Conditions to avoid		Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Keep away from strong oxidizers.
Hazardous decomposition products		Carbon monoxide, carbon dioxide and noncombusted hydrocarbons (smoke).

SECTION 11. TOXICOLOGICAL INFORMATION

Inhalation	:	Because of its low vapor pressure, this product presents a minimal inhalation hazard at ambient temperature. Upon heating, fumes may be evolved. Inhalation of fumes or mist may result in respiratory tract irritation and central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death. The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death. Irritating and toxic hydrogen sulfide gas may be present. Greater than 15 - 20 ppm continuous exposure can cause mucous membrane and respiratory tract

irritation. 50 - 500 ppm can cause headache, nausea, and dizziness. Continued exposure at these levels can lead to loss of reasoning and balance, difficulty in breathing, fluid in the lungs, and possible loss of consciousness. Greater than 500 ppm can cause rapid unconsciousness due to respiratory paralysis and death by suffocation unless the victim is removed from exposure and successfully resuscitated. Greater than 1000 ppm can cause immediate unconsciousness and death if not promptly revived. After-effects from overexposure are not anticipated except what would be expected if the victim was without oxygen for more than 3 to 5 minutes (asphyxiation). The "rotten egg" odor of hydrogen sulfide is not a reliable indicator for warning of exposure, since olfactory fatigue (loss of smell) readily occurs, especially at concentrations above 50 ppm. At high concentrations, the victim may not even recognize the odor before becoming unconscious.

Skin irritation

May cause skin irritation with prolonged or repeated contact. Practically non-toxic if absorbed following acute (single) exposure. Exposure may cause a phototoxicity reaction: liquid or mist on the skin may produce a painful sunburn reaction when exposed to sunlight. Product may be hot which could cause 1st, 2nd, or 3rd degree thermal burns.

Eye irritation

May cause irritation, experienced as mild discomfort and seen as slight excess redness of the eye.

Ingestion

This material has a low order of acute toxicity. If large quantities are ingested, nausea, vomiting and diarrhea may result. Ingestion may also cause effects similar to inhalation of the product. Could present an aspiration hazard if liquid is inhaled into lungs, particularly from vomiting after ingestion. Aspiration may result in chemical pneumonia, severe lung damage, respiratory failure and even death.

Further information

This material contains polynuclear aromatic hydrocarbons (PNAs), some of which are animal carcinogens. Studies have shown that similar products produce skin cancer or skin tumors in laboratory animals following repeated applications without washing or removal. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation. The presence of carcinogenic PNAs indicates that precautions should be taken to minimize repeated and prolonged inhalation of fumes or mists. Dermal application of gas oil to rats resulted in limited evidence of liver damage (i.e., increased liver weight and changes in hepatic serum enzyme activity) and bone marrow toxicity (hypoplasia and decreased hemoglobin.) Petroleum industry experience indicates that a program providing for good personal hygiene, proper use of personal protective equipment, and minimizing the repeated and prolonged exposure to liquids and fumes, is effective in reducing or eliminating the carcinogenic risk of high boiling aromatic oils (polynuclear aromatic hydrocarbons) to humans.
Liver and kidney injuries may occur.
Components of the product may affect the nervous system.

Component:

Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4	Acute oral toxicity: LD50 rat Dose: 4,320 mg/kg Acute dermal toxicity: LD50 rabbit Dose: 2,001 mg/kg Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation

Carcinogenicity: Animal experiments showed a statistically significant number of tumors.

Carcinogenicity

NTP	Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)
IARC	Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause cancer. Benzo[a]pyrene; Benzo[def]chrysene (CAS-No.: 50-32-8)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Consult federal, state and local waste regulations to determine appropriate waste characterization of material and allowable disposal methods.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	:	Not regulated if shipped below 140°F (60°C) Elevated temperature liquid, flammable (if shipped above 140°F (60°C)).
UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	9
Packing group	:	III
Hazard inducer	:	(Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)

TDG

Proper shipping name	:	Not regulated if shipped below 140°F (60°C) Elevated temperature liquid, flammable (if shipped above 140°F (60°C)).
UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	9
Packing group	:	III
Hazard inducer	:	(Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)

IATA Cargo Transport

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9

IATA Passenger Transport

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9

IMDG-Code

UN-No.	:	Not regulated if shipped below 140°F (60°C) 3256 if shipped above 140°F (60°C)
Description of the goods	:	Elevated temperature liquid, n.o.s. (Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil)
Class	:	Not regulated if shipped below 140°F (60°c) Not permitted for transport (at 140°F (60°C) or higher temperature) 9
Packaging group	:	III
IMDG-Labels	:	9
EmS Number	:	F-A S-P
Marine pollutant	:	No

SECTION 15. REGULATORY INFORMATION

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

TSCA Status : On TSCA Inventory

DSL Status : All components of this product are on the Canadian DSL list.

SARA 311/312 Hazards : Fire Hazard
Acute Health Hazard
Chronic Health Hazard

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required

Components	CAS-No.
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

SARA III — US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR355, Appendix A)

Components	CAS-No.

PENN RTK — US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Components	CAS-No.
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

MASS RTK — US. Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Components	CAS-No.
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

NJ RTK US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Components	CAS-No.
Clarified oils (petroleum), catalytic cracked; Heavy Fuel oil	64741-62-4
Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

California Prop. 65 : WARNING! This product contains a chemical known in the State of California to cause cancer.

Benzo[a]pyrene; Benzo[def]chrysene	50-32-8

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 07/26/2012

65, 66, 121, 295, 296, 347, 1003, 1006, 1007, 1009, 1010, 1022, 1054, 1083, 1084, 1085, 1089, 1586, 1886

Training Marine Oil Spill Response Workers Under OSHA's Hazardous Waste Operations and Emergency Response Standard

U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3172
2001

About this Booklet

This informational booklet is intended to provide a generic, non-exhaustive overview of a particular standards-related topic. This publication does not itself alter or determine compliance responsibilities, which are set forth in OSHA standards themselves and the *Occupational Safety and Health Act*. Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements, the reader should consult current and administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the Courts.

This information will be made available to sensory impaired individuals upon request.

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See also OSHA's Website at www.osha.gov

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Introduction

This booklet, written for marine oil spill response employers,* describes the training your employees need under HAZWOPER, the Hazardous Waste Operations and Emergency Response standard, *Title 29 of Code of Federal Regulations* (*CFR*) *1910.120*. The Occupational Safety and Health Administration (OSHA) published HAZWOPER to protect workers involved in hazardous substance emergency response and cleanup operations.

Train workers to the HIGHEST LEVEL of responsibility you may assign them.

Not every spill response worker needs the same amount of training. The type of training you give your workers depends on how close they will be to a spill and what role they will have in stopping, containing, or recovering the spilled material from the release. For example, if you have workers who control an oil spill early in an incident, they need more training than workers who simply warn others about a spill. This booklet explains how HAZWOPER training requirements apply to the range of workers who participate in marine oil spill response. To use this guidance effectively, you need to know the duties you expect your workers to perform and the exposure conditions under which you would allow them to work. You must train your workers to the highest level of skill, responsibility, and exposure that you will assign them.

This booklet was prepared by OSHA's Office of Health Compliance Assistance in conjunction with the U.S. Coast Guard Office of Response.

*Oil spill response accounts for the majority of marine spill response operations and is the focus of this pamphlet. HAZWOPER training, however, is required for all marine spill response operations conducted under the National Contingency Plan. The training you provide must cover the range of hazardous substance spills you expect your marine response employees to handle.

How Marine Oil Spill Responses Are Organized and Managed

Marine oil spill response is organized and managed according to the regulations found in 40 *CFR* 300, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). These regulations describe procedures for responding to hazardous substance releases and oil discharges. Appendix E of the regulation specifically addresses oil spill response. The U.S. Coast Guard (USCG) and the Environmental Protection Agency (EPA) jointly led the development of the NCP.

Marine oil spill response involves a network of government agencies, community organizations, industry groups, and contractors. Federal and/or state agencies usually monitor the responsible party (generally the owner or operator of the vessel, facility, port, or pipeline involved in the spill). The Federal Government can direct clean-up operations if the responsible party does not respond adequately, is not capable of taking action, or is unknown.

An On-Scene Coordinator (OSC) acts as the leader for response activities. In the coastal areas of the United States, USCG serves as the OSC for oil spill responses. In inland areas, including rivers and other inland waters, EPA generally takes the lead.

HAZWOPER requires that a senior official who is present at the response site, an Incident Commander, lead an emergency response operation. For marine oil spills, the ranking Coast Guard officer or EPA official at the spill scene usually functions as the On-Scene Incident Commander. The emergency response remains in effect until the Incident Commander declares it completed.

OSHA is responsible for assuring safe and healthful working conditions for working men and women. During marine oil spill response, OSHA provides advice and consultation at the request of other government agencies. If necessary, OSHA uses enforcement action to assure that workers are properly protected.

A spill and safety briefing at a major oil spill.

Emergency Response vs. Post-Emergency Response

The HAZWOPER standard identifies two basic phases of a response action: emergency response and post-emergency response. Depending on the size of the spill, these phases may be managed differently. In addition, workers who participate ONLY in post-emergency response require different training than emergency response workers receive.

Emergency response is "a response effort…to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance" (29 *CFR* 1910.120(a)(3)). For marine oil spills, an uncontrolled release is a situation in which the oil and its associated airborne and surface contamination hazards are releasing into the environment or are in danger of releasing into the environment and posing a worker exposure hazard. Oil in grounded ships, which is in danger of being released into the environment, represents an emergency response situation. On-water containment, skimming operations, and underwater oil recovery operations also are considered to be emergency response activities because the oil is still in danger of being released into the environment. Shoreline cleanup is normally considered to be a post-emergency response unless the oil is below the high-tide mark or storm surge boundary (active or forecasted) and can reasonably be expected to be re-released into the marine environment.

Post-emergency response is performed "after the immediate threat of a release has been stabilized or eliminated and cleanup of the site has begun" (*29 CFR* 1910.120(a)(3)). Oil spilled into a marine environment is considered to be stabilized when it is in a stable container with no compromised structural integrity, to limit the potential for worker exposure to associated hazards. This includes floating bladders, barges, drums, and roll-off containers on shore. Oil also is considered to be stabilized when it is stranded on shore and not reasonably expected to re-release into the environment through wave or storm effects. Floating oil is not considered to be stabilized, even if contained within a boom.

During response to a large release such as a marine oil spill, emergency response and post-emergency response cleanup activities may occur at the same time. In these cases, the boundaries between the emergency response area and the post-emergency response area must be well defined and explained to responders and cleanup workers.

Applying the HAZWOPER Standard to Marine Oil Spills

HAZWOPER Requirements that Apply to Marine Oil Spills

The NCP defines oil as any kind of oil in any form, including petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes but not dredged spoil (dirt or rock).

Response actions conducted under the NCP must comply with the provisions of HAZWOPER. You'll find this requirement in 40 *CFR* 300.150. Therefore, if your workers are participating in a response action under the NCP, you must have an occupational safety and health program consistent with HAZWOPER and you must train your workers according to HAZWOPER's training requirements. This applies whether the responsible party or a government agency is directing the cleanup.

For marine oil spill emergency response, the HAZWOPER provisions that most directly apply include:

- Emergency response operations in HAZWOPER paragraph (q), and
- Post-emergency response cleanup operations in paragraph (q)(11).

See also emergency response training provisions in paragraph (q)(6), and post-emergency response training requirements in paragraph (q)(11).

When HAZWOPER Does Not Apply

HAZWOPER does not apply to incidental releases that are limited in quantity and pose no safety and health threat to employees working in the immediate vicinity of the spill. These oil spills can be absorbed or controlled at the time of the release by employees in the immediate vicinity. The difference between emergency spills and incidental releases is described in the definition of emergency response in HAZWOPER paragraph (a)(3). An incidental release does not have the potential to become an emergency within a short time. If an incidental release occurs, employers do not need to implement HAZWOPER.

> ***The NCP defines oil as any kind of oil in any form, including petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes but not dredged spoil (dirt or rock.)***

HAZWOPER Coverage for Volunteers

Volunteers frequently participate in marine oil spill response, but Federal OSHA standards do not cover uncompensated workers. In states approved to manage their own occupational health and safety program (called OSHA state plan states), volunteers are often covered under state plan HAZWOPER requirements. In states administered by Federal OSHA, volunteers are covered by the EPA HAZWOPER standard (40 *CFR* 311). EPA's HAZWOPER standard has **identical requirements,** but the coverage is different from Federal OSHA standard coverage. The EPA standard covers local and state government employees, both compensated and volunteers.

A ship exploded and caught fire off the coast of New Jersey. About 127,000 gallons of oil were unaccounted for after the incident.

Hazards to Marine Oil Spill Responders

Marine oil spill responders face a variety of health and safety hazards, including fire and explosion, oxygen deficiency, exposure to carcinogens and other chemical hazards, heat and cold stress, and safety hazards associated with working around heavy equipment in a marine environment. A full discussion of these hazards is beyond the scope of this training booklet, but a brief list of hazards and their known health consequences is shown in Table 1. Your workers should be trained to anticipate and control exposure to the hazards associated with their assigned duties.

To determine acceptable levels of exposure and train your workers about them, consult OSHA's exposure limits in Subparts G and Z. If OSHA does not regulate an exposure of concern, consult the National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limits (RELs) and Immediately Dangerous to Life and Health (IDLH) levels. If neither OSHA nor NIOSH has established a limit, consult the American Conference of Government Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) for chemical, physical, and biological agents. You may use a more protective limit than OSHA's if one has been established and plan your controls accordingly. Material Safety Data Sheets from the product manufacturer may provide useful information for worker training.

Additional Hazards

Marine oil spill responders need training to work safely around these and other potential hazards. You should decide which hazards apply to your operations.

- Biological (e.g., plants, animals, insects, remediation materials)
- Drowning
- Noise
- Electricity
- Slips and Trips
- Biohazardous debris (e.g., syringes on shoreline)
- Ergonomic Stresses (e.g., repetitive strain, low back pain)
- Sunburn
- Confined Spaces
- Underwater Diving
- Falls
- Unguarded Equipment
- Cranes
- Fatigue
- Vehicles (e.g., aircraft, boats, cars, trucks)
- Cutting and Welding
- Fire and Explosion
- Degreasers
- Heat or Cold Stress
- Dispersants
- In-Situ Burning Particles

Other OSHA standards apply to marine oil spill response and cleanup operations. See Appendix A, Related OSHA Standards.

Fire ensues after oil is released during a lightering accident.

Table 1. Hazardous Chemicals and Their Effects

Hazardous Chemicals	Adverse Health Effects
Benzene (crude oils high in BTEX, benzene, toluene, ethylbenzene, and xylene)	Irritation to eyes, skin, and respiratory system; dizziness; rapid heart rate; headaches; tremors; confusion; unconsciousness; anemia; cancer
Benzo(a)pyrene (a polycyclic aromatic hydrocarbon reproductive [see below], formed when oil or gasoline burns)	Irritation to eyes and skin, cancer, possible effects
Carbon dioxide (inerting atmosphere, byproduct of combustion)	Dizziness, headaches, elevated blood pressure, rapid heart rate, loss of consciousness asphyxiation, coma
Carbon monoxide (byproduct of combustion) Irritation to eyes, skin, and respiratory	Dizziness, confusion, headaches, nausea, weakness, loss of consciousness, asphyxiation, coma
Ethyl benzene (high in gasoline)	Irritation to eyes, skin, and respiratory system; loss of consciousness; asphyxiation; nervous system effects
Hydrogen sulfide (oils high in sulfur, decaying plants and animals)	Irritation to eyes, skin, and respiratory system; dizziness; drowsiness; cough; headaches; nervous system effects
Methyl tert-butyl ether (MTBE) (octane booster and clean air additive for gasoline, or pure MTBE)	Irritation to eyes, skin, and respiratory system; headaches; nausea; dizziness; confusion; fatigue; weakness; nervous system, liver, and kidney
Polycyclic aromatic hydrocarbons (PAHs) (occur in crude oil, and formed during burning of oil)	Irritation to eyes and skin, cancer, possible reproductive effects, immune system effects
Sulfuric acid (byproduct of combustion of sour petroleum product)	Irritation to eyes, skin, teeth, and upper respiratory system; severe tissue burns; cancer
Toluene (high BTEX crude oils)	Irritation to eyes, skin, respiratory system; fatigue; confusion; dizziness; headaches; memory loss; nausea; nervous system, liver, and kidney effects
Xylenes (high BTEX crude oils)	Irritation to eyes, skin, respiratory system; dizziness; confusion; change in sense of balance; nervous system gastrointestinal system, liver, kidney, and blood effects

Training Requirements

HAZWOPER training requirements that apply to marine oil spill emergency response are located in 29 *CFR* 1910.120(q)(6). Requirements and training guidance for post-emergency response are in HAZWOPER paragraph (q)(11) and in OSHA Instruction CPL 2-2.51, Inspection Guidelines for Post-Emergency Response Operations Under 29 *CFR* 1910.120. The HAZWOPER training requirements are based on your workers' assigned duties during an oil spill. For example, if you have deck hands who are assigned to equipment decontamination during and after an oil spill, you need to provide the level of HAZWOPER training required for the duties and hazards of the decontamination tasks.

Figures 1 and 2 comprise a training decision flowchart. Begin at the top of the chart (Figure 1) if your workers participate in emergency response. Begin at Figure 2 (indicated by the arrow) if your workers perform cleanup only after the release is stabilized (post-emergency). Emergency response workers may perform cleanup activities without further HAZWOPER training if you can certify that they have the skills and knowledge to do so safely.

After you determine the type(s) of training your workers need, turn to Table 2 or 3, as indicated on Figure 1. These tables show each type or category of training described in the flowchart. Table 2 contains the emergency response training requirements. For each type of emergency response training shown in the flowchart, Table 2 lists the specific HAZWOPER training requirements and examples of corresponding oil spill job functions.

Table 3 shows post-emergency response training. In the left-hand column, you'll find the hazard characteristics that distinguish each type of training because this is how the HAZWOPER standard itself separates cleanup training categories. Verify that the hazards your workers might face fit within the training category you've chosen. Table 3 also lists the HAZWOPER training requirements and examples of job functions that might require that training.

Training Content

Because workers need to be trained **before** they respond, you should train your emergency response workers to the highest level of responsibility they might need to assume. You should train your cleanup workers to the highest exposure conditions they may encounter. You must never expect or allow your workers to perform an emergency response or cleanup operation without proper training and certification.

Table 4 lists training topics and competencies for categories of training described in Tables 2 and 3. The listed topics paraphrase the HAZWOPER required competencies listed in paragraphs (q) and (e) of the standard. As an example, if your workers perform defensive actions for all emergency response operations, they need 8 hours of training in areas 31-36 and competency in areas 25-30 on Table 4. This is equivalent to HAZWOPER requirements for the first-responder operations level in (q)(6)(ii) of the standard.

A vessel carrying more than 7 million gallons of oil breaks apart, spilling its entire cargo.

Certifying and Updating Training

Workers who receive HAZWOPER training must receive a written certificate when they successfully complete the training. This is a requirement of paragraphs (e)(6) and (q)(6). Figure 2, Sample Certifications, illustrates examples of training certification cards given to workers completing various levels of HAZWOPER training. You do not need to repeat the initial training if the worker goes to work at a new site. The worker must have additional training or site briefings, however, that are needed to work safely at the new spill incident or cleanup site. Every year, your emergency responders and cleanup workers must receive refresher training to maintain and demonstrate competency.

For information about the acceptability of various technology-based training formats, see OSHA letters of interpretation on OSHA's website at: http://www.osha.gov.

Note that Tables 2, 3, and 4 clarify HAZWOPER training requirements. You cannot use these tables as a substitute for the language of the regulation. Also, training required by other OSHA standards that may also apply to your employees is not discussed in this booket.

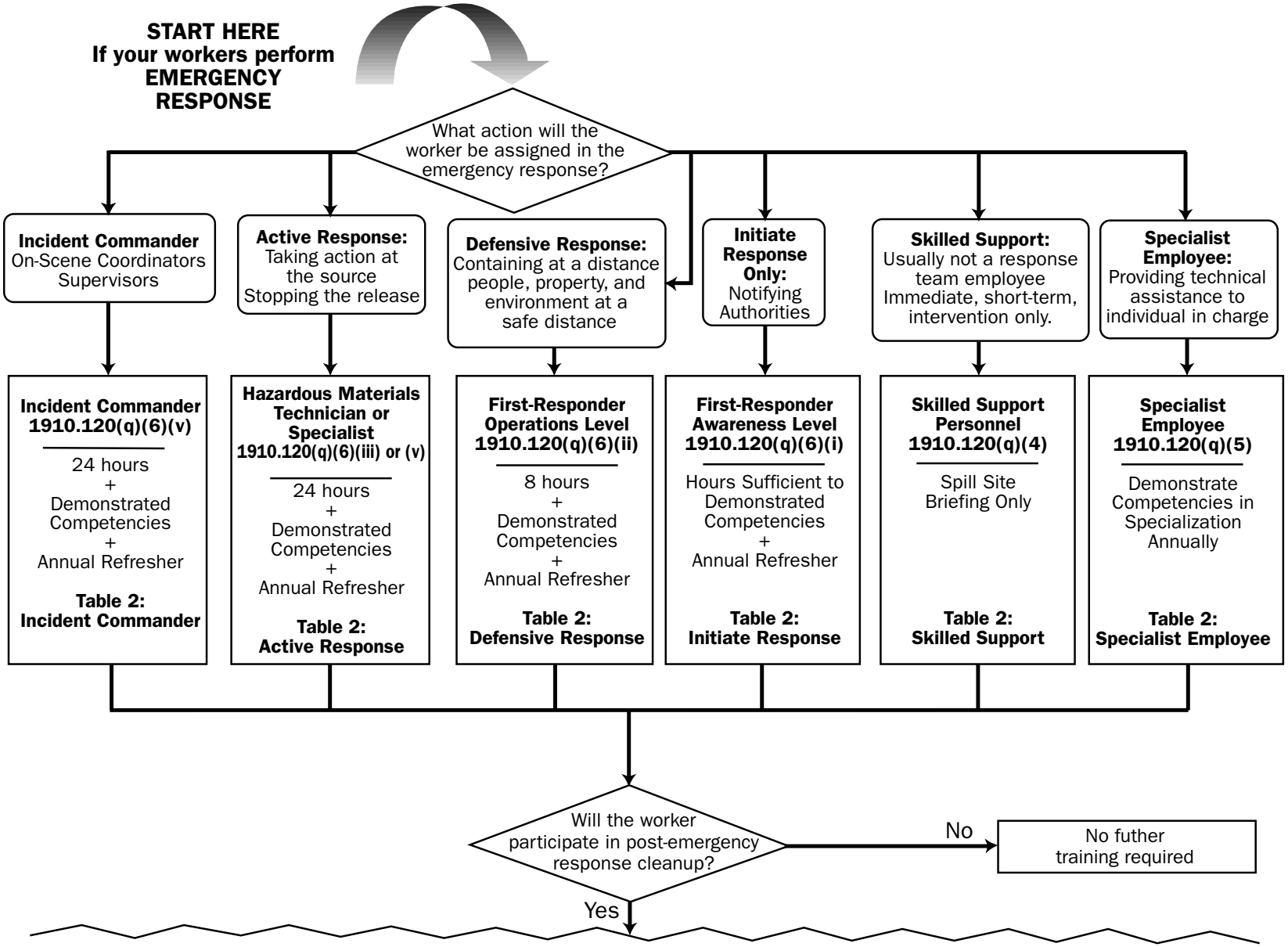
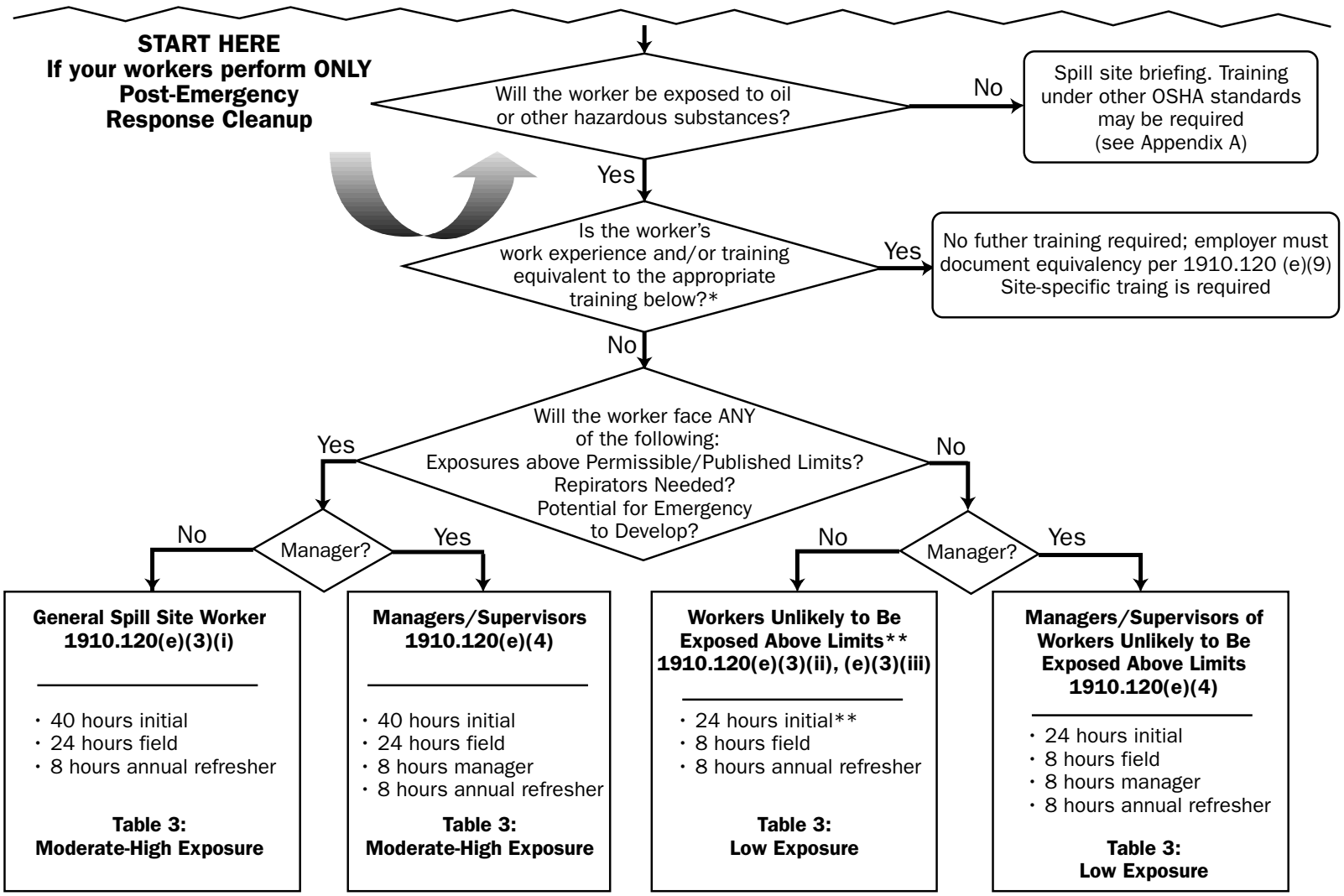


Figure 1. Training Decisions Flowchart for Emergency Response Workers



*Typically, First Responder Awareness Level training (1910.120 (q)(6)(i) will NOT prepare a worker for cleanup operations because it addresses emergency notification procedures only. Workers who could have direct contact with or potential exposure to hazardous substances often need additional training.

**If you need to train workers for a specific spill and for tasks that involve minimal exposure (e.g., beach cleanup workers) you may be able to use the reduced traing provision OSHA describe in its compliance directive, CPL2-2.51. This directive applies in limited circumstances. See the directive and Table 1B.

Figure 2. Training Decisions Flowchart for Post-Emergency Response Cleanup Workers

Table 2. Training for Workers Who Perform Emergency Response

Job functions are examples **only**. Workers should be trained to the highest level of responsibility you would assign them. See Table 4 for descriptions of training topics and competency areas.

	Job Function Examples	Minimum Training & Experience
Incident Commander	- On-Scene Coordinators - On-Scene Coordinator Representatives - On-Scene Industry Representatives - ICS Operations Section Chief - ICS Site Safety Enforcement Personnel - Supervisors/Managers - ICS Safety Officer - ICS Group Supervisors	**As shown on Figure 1** 24 hours initial emergency response training covering areas 25-36 **AND** competency in areas 1-6 Annual refresher training or annual demonstration of competency, ensuring competencies in areas 25-36 and 1-6
Active Response	- Work close to flammable/combustible liquids such as in a pumping operation - Work in confined or enclosed spaces containing volatile oil - Underwater free-floating oil removal - Soil/sand subsurface oil assessment - Plugging holes/emergency repairs to source - Diving operations close to source - Work adjacent to volatile fuel during initial spill hours (boat operations, etc.) - Site characterization of chemical exposures, air monitoring/sampling - Soil investigation/sampling - Dispersant application and monitoring operations - In-situ burn and monitoring operations - Application of herding agents/emulsion breakers - Marine chemist activities - Salvage response - Booming operations at source - Vessel damage assessment - Accident investigation - Firefighting response	**As shown on Figure 1** **Technician Level [(q)(6)(iii)]:** • 24 hours initial emergency response training covering areas 25-36 **AND** competency in areas 7-15 • Annual refresher training or annual demonstration of competency, ensuring competencies in areas 25-36 and 7-15 **OR** **Specialist Level [(q)(6)(iv)]:** • 24 hours initial emergency response training covering areas 7-15 and 25-36 **AND** competency in areas 16-24 • Annual refresher training or annual demonstration of competency, ensuring competencies in areas 7-36
Defensive Response	- Booming operations at a safe distance* - Surface level shoreline impact assessment - Manual pickup and removal of irritant oil and oily debris for oils that could be re-released into environment - Damming/diking at a safe distance - Loading of oil into receptacles at a safe distance - Emergency medical personnel (if working in contaminated areas) - Staging area managers - Vacuum truck operations at a safe distance - Security operations - Safety zone enforcement - Skimmer/boat operations at a safe distance	**As shown on Figure 1** • 8 hours initial emergency response training covering areas 31-36 **AND** competency in areas 25-30 • Annual refresher training or annual demonstration of competency, ensuring competencies in areas 25-36

Table 2. Training for Workers Who Perform Emergency Response (Cont).

	Job Function Examples	Minimum Training & Experience
Initiate Response	- Crew members who discover a release and alert the proper emergency response personnel - Industry and government watchstanders	**As shown on Figure 1** • Sufficient hours to demonstrate competency in areas 31-36 • Annual refresher training including demonstation of competency in areas 31-36 • Additional training required for post-emergency cleanup activities unless there is no exposure to hazardous substances. See Figure 1 for guidance.
Skilled Support	- Immediate, short-term intervention of a specialized nature that cannot be performed by other workers - On-scene resource documentation - Operation of certain equipment such as mechanized digging equipment, cranes, and other hoisting equipment - Aerial assessment - Remote sensing aerial platforms - Photo-documentation - Administrative/finance support	**As shown on Figure 1** • Spill site briefing in areas 55-59
Specialist Employer	- Dispersion modeling personnel - Meteorologist - Analytical chemical/oil specialist - Professional engineer/spill recovery system or shipbuilding specialist	**As shown on Figure 1** • Briefing covering areas 55-59 • Training or demonstrated competency in area of specialization annually

NOTES:

1. Tables 2, 3, and 4 are intended to clarify HAZWOPER (29 *CFR* 1910.120 or 1926.65) training requirements for marine oil spill response. The tables do not relieve employers from the requirements of HAZWOPER, nor do they specifically address training that may be required by other OSHA standards.
2. All employees should receive pre-entry site briefings covering, at a minimum, training areas 55-59 in Table 4.
3. Table 4 lists the training areas referenced throughout Tables 2 and 3. For example, an Incident Commander must receive 24 hours of initial training covering training areas 25-36 in Table 4.

*Defensive personnel must be at a safe distance from the point of release, outside the hot zone or danger zone.

Table 3. Training for Workers Who Perform Only Post-Emergency Response

Job functions are examples **only.** Workers should be trained to the highest level of responsibility you would assign them.

	Job/Site Characterization	Job Function Examples	Minimum Training & Experience
Moderate-High (At/Above Exposure Limits)	• Unknown oil or unknown hazardous substance mixed with oil • Exposures equal or exceed exposure limits or other published limits • Respiratory protection required • Concentrations at or above 10 percent of the Lower Explosive Limit (LEL) • Oxygen levels ≥ 19.5 <22 percent) • Carcinogen: known or suspected • Situations in which oil is known but parameters above cannot be reasonabily assessed	- Manual cleanup of stranded oil with potential skin carcinogens (e.g., benzo (a) pyrene) - Cleanup of stranded oil when toxic chemicals are persistent and above exposure limits - Wildlife capture and treatment depending on explosives - Load and transfer piled oil-saturated decaying plants and animals that provide a hydrogen sulfide risk - Cleanup of stranded oil in confined spaces - On land marsh burning operations	• 40 hours of initial training in areas 37-43 and 3 days supervised field experience, or equivalent training certification • At least 8 hours of annual refresher training • Supervisory/management personnel must also receive 8 hours of additional initial training covering at a minimum areas 51-54
Low (Below Exposure Limits)	**Routine spill cleanup workers [(e)(3)(iii)]:** • Oil and other hazards of spill constituents known • Exposures may cause irritation (skin, eye, respiratory) but are below permissible published limits • Oxygen levels ≥ 19.5 <22 percent) • Concentrations less than 10 percent, but more than the LEL • Other significant hazards may be present: Physical, safety, ergonomic, thermal. **[(e)(3)(ii)]:** • Oil and other hazards of spill constituents known • Exposures below permissible/published limits	- Pressure washing operations of stranded weathered oil - Cutting of contaminated live vegetation - Natural resource damage assissment - Bioremediation operations - Shoreline cleanup assessment - Vessel/equipment decontamination - Underwater stranded oil removal operations - Soil/sand substance oil removal - Containerized/packaged waste handling and disposal for transport operations	**As shown in Figure 1** • 24 hours of initial training in areas 44-50 and 1 day supervised field experience, or equivalent training • At least 8 hours of annual refresher training • Supervisory management personnel must also receive 8 hours of additional initial training covering at a minimum areas 51-54

Table 3. Training for Workers Who Perform Only Post-Emergency Response (Cont.)

Job/Site Characterization		Job Function Examples	Minimum Training & Experience
Non-Recurring/Minimal Exposure	• Oil and other spill constituents known • Exposures below permission/ published limits • Respirators not required • Oxygen levels ≥ 19.5 <22 percent) • No potential for chemical emergency, explosion, or fire • Minimal irritants to respiratory system, eyes, or skin • No significant physical, safety, ergonomic, and thermal hazards	- Workers who do not participate in marine oil spill responses on a frequent recurring basis and who will have minimal exposure - Tarball shoreline cleanup - On scene cost documentation - Operators of large construction vehicles during stranded oil removal	**As footnoted in Figure 1** • If conditions described in CPL 2-2.51 are met, reduced initial training or equivalent training certification covering items 44-50 • Up-to-date training consistent with 1910.38(a) and 1910.1200, and health and safety training associated with assigned tasks **Supervisory/management personnel** must receive: • At least 24 hours of initial training in areas 44-50 and 1 day of supervised field experience; • 8 hours of additional initial training covering at a minimum areas 51-54; and • 8 hours annual refresher training
No Exposure	• Area characterized and stable with: • **No** potential for exposure to hazardous waste or substances by any route (i.e., inhalation, skin absorption, ingestion No safety hazards associated with hazardous waste or hazardous substances	- Aerial photo documentation - Historians - Command Post support - Press - Food service personel - Legal representation - Over-flight assessment (if no potential for exposure) - Resource tracking (if no potential for exposure) - Financial services personnel	**As shown in Figure 1** • Briefing covering areas 55-59

NOTES:

1. Tables 2, 3, and 4 are intended to clarify HAZWOPER (29 *CFR* 1910.120 or 1926.65) training requirements for marine oil spill response. The tables do not relieve employers from the requirements of HAZWOPER, nor do they specifically address training that may be required by other OSHA standards.
2. All employees should receive pre-entry site briefings covering, at a minimum, training areas 55-59 in Table 4.
3. Equivalent training must be documented or certified by the employer. The documentation or certification must show that an employee's work experience and/or training has resulted in training equivalent to the training required in paragraphs (e)(1) through (e)(4) of 1910.120. Equivalently trained employees must receive appropriate, site-specific training prior to site entry and have appropriate supervised experience at the new site. Equivalent training includes any academic training or the training that existing employees might have received from prior spill site experience. Certification or documentation as equivalently trained does not apply to refresher training requirements.
4. Table 4 lists the training areas referenced throughout Tables 2 and 3. For example, SupervisorylManagement personnel in low exposure level conditions must receive 8 hours of additional initial training covering those training areas 51-54 in Table 4.
5. The oxygen concentration range used in these tables, ≥ 19.5 < 22 percent, is consistent with 29 *CFR* 1915 Subpart B, Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment.

Table 4. Training Topics and Competency Areas (from Tables 2 and 3)

ON-SCENE COORDINATOR

1) Know and be able to implement the employer's incident command system.
2) Know how to implement the employer's emergency response plan.
3) Know and understand the hazards and risks associated with employees working in personal protective clothing.
4) Know how to implement the local emergency response plan.
5) Know the state emergency response plan and the Federal Regional Response Team.
6) Know and understand the importance of decontamination procedures.

ACTIVE RESPONSE

7) Know how to implement the employer's emergency response plan.
8) Know how to use field survey instruments and equipment to classify, identify, and verify known and unknown materials.
9) Be able to function within an assigned role in the Incident Command System.
10) Know how to select and use proper specialized personal protective equipment provided to the hazardous materials echnician.
11) Understand and be able to apply hazard and risk assessment techniques.
12) Be able to perform advanced control, containment, and/or confinement operations within the capabilities of the resources and available personal protective equipment.
13) Understand and implement decontamination procedures.
14) Understand termination procedures.
15) Understand terminology and behavior of chemicals and their toxic effects.
16) Know how to use advanced survey instruments and equipment to classify, identify, and verify known and unknown materials.
17) Understand in-depth hazard and risk techniques.
18) Be able to determine and implement decontamination procedures.
19) Know how to implement the local emergency response plan.
20) Know the state emergency response plan.
21) Be able to develop a site safety and control plan.
22) Understand chemical, radiological, and toxicological terminology and behavior.
23) Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist.
24) Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available.

DEFENSIVE RESPONSE

25) Know basic hazard and risk assessment techniques.
26) Know how to select and use proper personal protective equipment necessary for the first responder operation level.
27) Understand basic hazardous materials terms.
28) Know how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and available personal protective equipment.
29) Know how to implement basic decontamination procedures.
30) Understand the relevant standard operating and termination procedures.

INITIATE RESPONSE ONLY

31) Understand the hazards of oil and the risks in a spill.
32) Understand what happens during an emergency involving spilled oil.
33) Recognize the presence of oil or related hazardous materials in an emergency.
34) Identify hazardous substances, if possible (e.g., appearance, smell, monitoring equipment).
35) Understand individual role in employer's emergency response plan.
36) Recognize when help is needed and when to request assistance from the response team.

POST-EMERGENCY CLEANUP—EXPOSURES ABOVE EXPOSURE LIMITS

37) Know the name(s) of and how to contact the site safety and health personnel for spill cleanup.
38) Know the safety, health, and other hazards present during oi spill cleanup.
39) Know safe cleanup work practices including decontamination procedures to minimize risks.
40) Know how to use available controls and equipment, including contamination control procedures and personal protective equipment, to minimize risks.
41) Know the contents of the safety and health plan for the specific cleanup.
42) Know and be able to recognize signs and symptoms of overexposure to hazards present.
43) Know the medical surveillance requirements.

POST-EMERGENCY CLEANUP—EXPOSURES BELOW EXPOSURE LIMITS OR NON-RECURRING MINIMAL EXPOSURE

44) Know the name(s) of and how to contact site safety and health personnel for spill cleanup.
45) Know the safety, health, and other hazards present during oil spill cleanup.
46) Know safe cleanup work practices including decontamination procedures to minimize risks.
47) Know how to use available controls and equipment, including contamination control and personal protective equipment, to minimize risks from hazards present.
48) Know the contents of the safety and health plan prepared for the specific cleanup.
49) Know and be able to recognize signs and symptoms of overexposure to hazards present.
50) Know the medical surveillance requirements.

SUPERVISOR/MANAGER FOR CLEANUP OPERATIONS

51) Know and be able to implement effectively the employer's safety and health program.
52) Know and be able to implement effectively the employer's personal protective equipment plan.
53) Know and be able to implement effectively the employer's spill containment program.
54) Know and be able to implement effectively health hazard monitoring procedure and techniques.

BRIEFING TOPICS

55) Purpose of visit or duties to be performed.
56) Site personnel, chain-of-command, and communications procedures.
57) Chemical/physical hazards involved, signs and symptoms o exposure.
58) Emergency alarm system, escape routes, and places of refuge.
59) Appropriate contamination control procedures, personal protective equipment, decontamination, and other control measures provided.

Figure 3. Sample Certifications

No. 00232

This is to certify that

John Smith

has satisfactorily completed

40-Hour HAZWOPER Marine Oil Spill Training

as described in 29 *CFR* 1910.120(e)

H.L. Teacher, Instructor Date

SEA Training Institute

Street, City, ST 00001

No. 00233

This is to certify that

Jane Smith

has satisfactorily completed

8-Hour HAZWOPER Marine Oil Spill Supervisor Training

as described in 29 *CFR* 1910.120(e)(4)

H.L. Teacher, Instructor Date

SEA Training Institute

Street, City, ST 00001

No. 00234

This is to certify that

Joy Smith

satisfactorily completed

HAZWOPER Post-Emergency Response Cleanup Training for Minimal Exposure Conditions Only for (insert name of spill) Spill

consistent with OSHA CPL 2-2.51

H.L. Teacher, Instructor Date

SEA Training Institute

Street, City, ST 00001

No. 00235

This is to certify that

James Smith

has satisfactorily completed

24-Hour Marine Oil Spill Training for Hazardous Materials Technicians and demonstrated the necessary competencies

as described in 29 *CFR* 1910.120(q)(6)(iv)

H.L. Teacher, Instructor Date

SEA Training Institute

Street, City, ST 00001

No. 00236

This is to certify that

Julie Smith

has satisfactorily completed

8-Hour HAZWOPER Marine Refresher Training for Hazardous Waste Site Workers

as described in 29 *CFR* 1910.120(e)(8)

H.L. Teacher, Instructor Date

SEA Training Institute

Street, City, ST 00001

No. 00237

This is to certify that

Joe Smith

has satisfactorily demonstrated competency in lieu of annual refresher training for

Marine Oil Spill First Responder Operations Level

as described in 29 *CFR* 1910.120(q)(8)

H.L. Teacher, Instructor Date

SEA Training Institute

Street, City, ST 00001

Oil Spill Scenario

This scenario is not intended to represent a typical marine oil spill. It illustrates levels of training needed for several job functions and hazardous exposure levels. Information in parentheses refers to the training levels in the Figure 1 flowchart.

Incident

A tugboat is pushing a barge loaded with a sour crude that contains sulfur, benzene, toluene, and xylene to an anchorage for lightering (See Figure 4). The anchorage is within sight of the local Coast Guard Marine Safety Office. Contractor resources also are located in the port within view of the anchorage. The tug pushing the barge miscalculates the turning radius, causing the barge to collide with the stern of a tank vessel. The vessels lock together. As a result, two of the barge's port cargo tanks are breached, releasing several thousand gallons of crude oil into the water. Prevailing winds and currents carry the oil away from the vessels. Some oil is trapped between the barge and the tank vessel.

It is midday on a sunny summer day. The wind is 5 knots. The water temperature is around 70 degrees Fahrenheit. Air temperature is around 84 degrees Fahrenheit.

Discovery

Members of the tug crew immediately notify the Coast Guard of the incident (Figure 1: First Responder Awareness Level).

The tug and tank vessel crews remain with their vessels to ensure control of their ships. Vapors from the fresh oil begin to irritate the eyes of the captains and the crews. Both captains order crew members to remain upwind of the oil and avoid the area between the vessels where the oil is trapped.

Initial Emergency Response

The owner of the barge is located across the country. According to the company's emergency response plan, the owner calls an Oil Spill Removal Organization (OSRO) to clean up the spill. The tug captain is designated by the owner to be the company's representative. Because the owner is not on-scene and does not participate in spill response activities, he is not required to have HAZWOPER training. The tug captain is on-scene making decisions in the response. Therefore, the tug captain must have Incident Commander training for emergency response (Figure 1: Incident Commander).

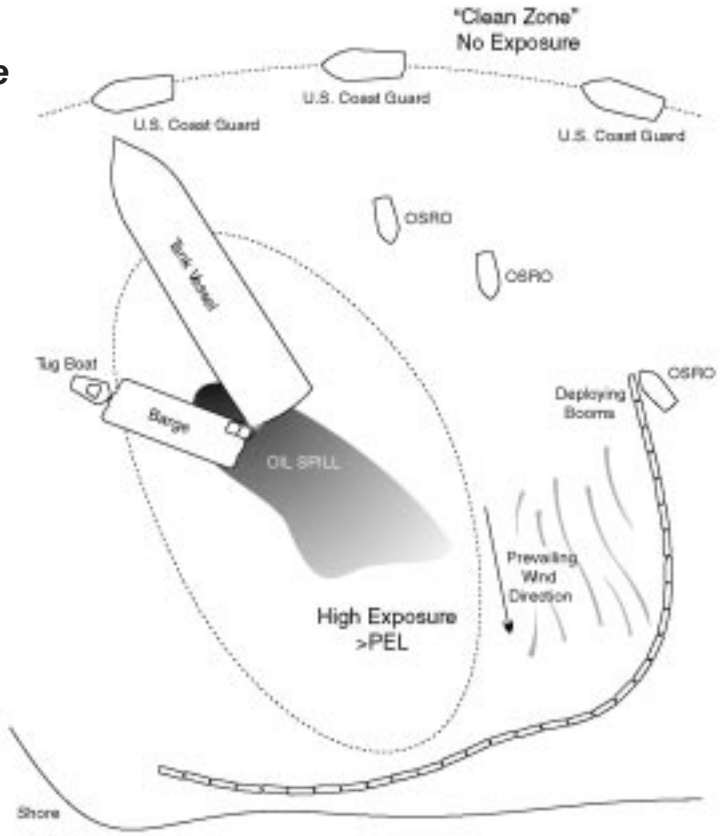


Figure 4. Illustration of Incident

The Coast Guard radios the tug captain to confirm the oil type, the same type listed on the cargo manifest faxed by the owner. The owner also faxes the cargo manifest to the OSRO. The Coast Guard uses references and advice from federal health professionals to estimate a safe distance from the spill.

After consultation with references, mathematical computer models, and federal health and safety professionals, the Coast Guard creates a safety zone around the spill and uses its boats to enforce it (Figure 1: First-Responder Operations Level).

The safety zone is conservatively large to maximize public safety. Support staff, news media, and other workers who will have no exposure to hazardous substances (Figure 1: Workers unlikely to be exposed over limits) will use the safety zone.

Initial Assessment

An hour after the initial oil release, two OSRO boats approach the spill from downwind to characterize the plume and determine the release zone boundaries. Their crews will monitor exposure levels using air-monitoring equipment (Figure 1: Hazardous Materials Technician or Specialist). Because exposure to hydrogen sulfide and benzene is expected, these responders must wear self-contained breathing apparatus (SCBA) while confirming estimated exposures. They may be able to switch to air-purifying respirators after the assessment.

They continue monitoring as the OSRO boats approach the spill until reaching permissible exposure limits. The boats work around the spill area to identify the limits of the High Exposure zone caused by vapors escaping the oil. Colorimetric tubes confirm air concentrations of 0.5 ppm of benzene and 4 ppm hydrogen sulfide at 200 feet (61 meters) downwind of the slick and 100 feet (30 meters) across the widest part of the plume.

The responders complete site characterization in areas where oil could be trapped between vessels, beneath piers, and in dock corners and other bounded spaces.

Outside the high exposure zone (the hot zone), workers prepare deflection and exclusion booms to divert the oil to a recovery site (Figure 1: First-Responder Operations Level).

The response team sets up a command center to coordinate response and cleanup activities. This area supports the Incident Commander, (Figure 1: Incident Commander), supervisors of the clean-up crews (Figure 1: Managers/Supervisors) with hourly requirements dependent on exposure, and other personnel (training depends on duties and exposures).

Mechanical Recovery

Four hours have passed. Air measurements of hydrogen sulfide, benzene, toluene, and xylene, taken with colorimetric tubes, register well below permissible exposure limits near the leading edge of the slick. An industrial hygienist and a marine chemist conduct a more detailed site characterization using advanced air-monitoring equipment such as a portable infrared analyzer and portable gas chromatograph (Figure 1a: Hazardous Materials Technician/Specialist, or Specialist Employee, depending on job duties). They confirm that the air exposures from the oil slick are below permissible limits. Air concentrations are above permissible limits, however, near oil trapped between the vessels and oil remaining in the damaged tanks.

Oil recovery skimmers arrive to skim free-floating oil. Containment boom and skimmer operators work from a boat. These operators wear goggles and protective clothing because the oil could irritate their skin and eyes. Because air concentrations are below permissible limits, operators are not required to wear respirators (Figure 1: First-Responder Operations Level).

The ships' support crews remain upwind of the spill (Figure 1: Skilled Support Personnel or Figure 1: Workers unlikely to be exposed over limits).

Tending an oil skimmer.

Shoreline Cleanup

Six hours have passed. Oil reaches the shoreline. Skimmers near the shore remove oil that was deflected into recovery areas (Figure 1: First-Responder Operations Level, if these workers also participate in emergency response; or Figure 1: Workers unlikely to be exposed over limits, if these workers perform cleanup only).

The oil continues to irritate skin and eyes, so workers cleaning the shoreline wear chemical protective clothing, gloves, booties, and goggles. Because of the increased clothing requirements, site safety officer assistants begin monitoring for heat stress (Figure 1: Skilled Support Personnel or Figure 2: Workers unlikely to be exposed over limits, depending on the assistants' job duties).

Responders form decontamination lines at each shoreline cleanup area. Each worker decontaminates before a break period and at the end of the shift. Workers dispose of outer booties, wash or remove oiled clothing, dispose of outer gloves, wash goggles and remove inner gloves. To minimize the spread of contamination, workers conduct their own decontamination while a worker stands by to assist. The decontamination assistants take responsibility for maintaining and dismantling the decontamination line (Figure 2: Workers unlikely to be exposed over limits, if these workers perform cleanup operations only).

Vessel

A skimming team recovers oil trapped between the vessels. Vessel personnel in SCBAs measure chemical and oxygen concentrations and the percentage of the lower explosive limit (LEL) for the space between the vessels (Figure 1: Hazardous Materials Technician/Specialist, or Specialist Employee, depending on job duties). Results of the monitoring indicate that workers conducting skimming operations must also be in SCBA. The workers decide to wait until exposure levels register below permissible limits before removing the oil.

Cleanup worker in Level C personal protective equipment.

Aboard the barge, a pumping team prepares to pump oil from the damaged cargo tanks into the tank vessel (Figure 1: Hazardous Materials Technician or Specialist). Explosion is a risk during pumping operations, so responders measure the LEL percentage and oxygen concentration throughout the operation. Before starting the pumping operations, workers in SCBAs put vapor recovery systems in place. Once the vapor recovery systems are in place, measured chemical concentration levels drop below permissible exposure limits and workers begin pumping.

Final Stages

Two days later, no free-floating oil remains. Pumping operations are completed. No hazardous chemicals are detected by air-monitoring equipment. The oil is weathered and is no longer an irritant; however, slip and trip hazards persist. Shoreline cleanup operations continue.

No repair facility is located within a reasonably safe distance for transport, so workers conduct initial, temporary repairs for safe sailing. They clean the damaged tanks inside and out before patching and welding them. There is a risk of explosion, oxygen deficiency, and overexposures to chemicals (Figure 1: General Spill Site Worker, if the workers perform cleanup only). Forced ventilation makes the holds safe, and a competent person tests them before the cleaning begins. A marine chemist tests and certifies the areas Safe for Hot Work before cutting and/or welding operations begin.

The company's site safety and health plan does not cover the disposal of waste containers. Because of this oversight, oiled debris and waste decay in the containers, releasing hydrogen sulfide. A hazardous materials response team removes the contaminated waste from the containers (Figure 1: General Spill Site Worker).

A week has passed. To speed removal of remaining debris on shore, training is offered to a team of local volunteers (Figure 2: Workers unlikely to be exposed above limits, and associated footnote). Trained supervisors (Figure 2: Managers/Supervisors of workers unlikely to be exposed above limits, with training level dependent on anticipated exposures) oversee the volunteers. As shoreline cleanup progresses, shoreline clean-up assessment teams begin to verify that shorelines are clean (Figure 2: Workers unlikely to be exposed above limits).

Shoreline cleanup operations during New Carissa oil spill, March 2000.

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Spill Tactics for Alaska Responders (STAR)

SAFETY

TRACKING

MECHANICAL

NON-MECHANICAL

LOGISTICS

April 2006

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SAFETY CHECKLIST

Everyone working on a spill response must understand that safety is the number one objective. The Safety Officer is responsible for the health and safety of all response personnel in the field, which includes establishing safety zones, personal protective equipment (PPE) requirements, hazard identification, and preparation of Site Safety Plan(s). The Safety Officer also supports establishment of site entry criteria and decontamination facilities. The following checklist is a general safety checklist that should be used by all incident personnel.

General Safety Checklist:

- ☐ Obtain a safety briefing from your supervisor or the Safety Officer before beginning work.
- ☐ Read, understand, and follow the Site Safety Plan developed for the incident.
- ☐ Read the Material Safety Data Sheet (MSDS) for all products that you will be working to contain or remove.
- ☐ In all cases of an unknown chemical, the Safety Officer will assist/verify identification prior to any containment or removal actions.
- ☐ Wear the appropriate personal protective equipment (PPE) as directed by the Site Safety Plan.
- ☐ Assess the safety of the situation on a regular basis. Consider the following types of hazards:
  - ☐ Fire and explosion risk
  - ☐ Chemical exposure
  - ☐ Safety of on-water or on-ice operations
  - ☐ Temperature extremes (i.e., heat stress and hypothermia)
  - ☐ Report any sightings of bears to your supervisor and request a bear guard if appropriate
  - ☐ Other physical hazards, including noise
- ☐ Report any unsafe conditions to your supervisor or the Safety Officer.
- ☐ Report any accidents and/or injuries to your supervisor.
- ☐ Do not attempt any tasks that you are not trained to perform.
- ☐ Use the "Buddy System" in all controlled access areas.
- ☐ Follow decontamination procedures established for the incident.
- ☐ Segregate wastes according to procedure established for the incident, as directed by the Waste Management Plan.
- ☐ Participate in an incident safety critique prior to departing the incident.
- ☐ Maintain integrity of safety zone (hot, warm, cold) to prevent the spread of contamination.

SAFETY TACTICS

INTRODUCTION

Safety is the number one objective for spill response operations. Protection of worker health and safety should be a constant consideration throughout the spill response. Section A, Part III of this manual contains a Safety Checklist which should be consulted frequently throughout the response.

The safety tactics in this section are applicable to all spill types and sizes, in all environments. For the purpose of this manual, safety tactics are divided into four main categories, and their sequence in this manual roughly corresponds to the order in which they will be addressed during a spill response.

- ***Site Entry Criteria*** provides guidance on establishing minimum standards for site entry by properly trained spill responders.
- ***Personal Protective Equipment*** provides guidance on protective equipment to be worn during site entry by properly trained spill responders.
- ***Site Layout and Control*** provides guidance on establishing the work site layout and control boundaries for site entry by properly trained spill responders.
- ***Personnel Decontamination*** provides guidance on establishing minimum standards for decontamination by properly trained spill responders.

SITE ENTRY CRITERIA

OBJECTIVE & STRATEGY

SEC

The objective of this section is to protect worker safety and health by giving guidance on establishing minimum standards for site entry by properly trained oil spill response workers. Safety is always the primary objective of any response.

Either of the following two documents supersedes this guidance:

- **Incident-specific Site Safety Plan**
- **Corporate or Agency safety procedures and training for employees/responders**

This section contains recommended site safety entry guidelines for crude oil/petroleum spill cleanup operations. In all cases, physical hazards of entry must be considered along with health hazards. The exposure limits in this section are based on standards established by the Occupational Safety and Health Administration (OSHA). More restrictive limits may be set by your employer. Verify your exposure limits before site entry.

See references for additional information.

TACTIC DESCRIPTION

General Limits to Entry

The decision as to whether or not any given entry shall be attempted is ultimately the responsibility of the On-Scene Commander with advice and guidance from:

- The Site Safety Officer
- The Field Team Leader
- Unified Command

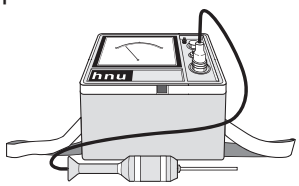
Site Safety Assessment

Before commencing oil spill response operations, a site safety assessment should be completed by a Site Safety Officer, or a properly trained field team member. Once the site safety assessment is completed, the proper level of Personal Protective Equipment (PPE) will be determined.

The following are four levels of respiratory protection for entry into varying conditions listed in descending order of protection. Other PPE, such as splash suits, hard hats, safety glasses, steel-toed boots,

Site Entry Criteria

etc., will also be needed, depending on the situation, to ensure the health and safety of the responders. It is required to consult with a "competent person" for job specific PPE requirements. All employees must have had the necessary training pertaining to their tasks prior to entering any site.



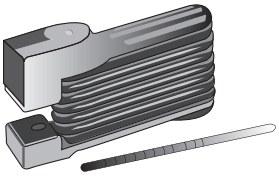
Please note that the recommended levels reflect a 12-hour shift.

*Level A – Highest Level of Protection**

Entry by two or more workers dressed in fully-encapsulated suits and SCBAs is allowed under the following conditions:

- Back-up observers with SCBAs standing by
- Oxygen atmospheric concentration should be below 23.5%
- Percentage of LEL is less than 10% as measured by a calibrated direct reading handheld instrument

*Level B**

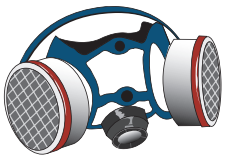


Entry by two workers with SCBAs is allowed under the following conditions:

- Back-up observers with SCBAs standing by
- Oxygen atmospheric concentration should be below 23.5%
- Percentage of LEL is less than 10% as measured by a calibrated direct reading handheld instrument
- Normal natural or mechanical ventilation is available
- No visible mist or fog of oil present

Level C

Entry with full-face or half-face air purifying respirator and organic vapor cartridges is allowed by any number of workers without back up observers under the following conditions:



- Oxygen atmospheric concentration is between 19.5% and 23.5%
- Percentage of LEL is less than 10% as measured by a calibrated direct reading handheld instrument
- Total hydrocarbon concentration is less than 500 ppm
- H2S air concentration is less than 10 ppm
- Benzene air concentration:
  - Full-face respirator - less than 10 ppm
  - Half-face respirator - less than 5 ppm

*NOTE: When available, positive-pressure supplied air respirators with an escape SCBA can be used instead of SCBAs.

- Normal natural or mechanical ventilation is available
- No visible mist or fog of oil present

Level D – Lowest Level of Protection

Entry without respiratory protection is allowed for any work required under the following conditions:

- Oxygen atmospheric concentration is between 19.5% and 23.5%
- Percentage of LEL is less than 10% as measured by a calibrated direct reading handheld instrument
- Total hydrocarbon concentration is less than 50 ppm
- H2S air concentration is less than 10 ppm
- Benzene air concentration is less than 0.6 ppm
- Normal natural or mechanical ventilation is available
- No visible mist or fog of oil is present

Note that in environments in which excess dust and debris are present, an organic vapor/high efficiency particulate air filter is recommended (OV/HEPA).

DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

- A trained person using properly calibrated equipment must conduct air monitoring prior to and periodically during response operations, and as necessary when conditions change.
- If permissible entry conditions change outside of allowable criteria during entry, the entry must be terminated.
- The team conducting the site assessment should enter the site from an upwind or cross-wind aspect and progress slowly. After the airborne flammability, oxygen, and toxicity have been determined, the team should assess the site's chemical and physical hazards so that proper decisions can be made regarding PPE and other safety and health issues.
- Respiratory protection should only be worn by responders operating under respirator operating procedures (i.e., regular training, fit-testing, medical monitoring, inspection, cleaning, storage and periodic program evaluations) as required by OSHA 29 CFR 1910.134.

REFERENCES TO OTHER TACTICS

- PPE PERSONAL PROTECTIVE EQUIPMENT
- SCL SITE LAYOUT & CONTROL
- Dp PERSONNEL DECONTAMINATION

PERSONAL PROTECTIVE EQUIPMENT

OBJECTIVE & STRATEGY

The objective of this section is to protect worker safety and health by giving guidance on selecting Personal Protective Equipment (PPE) to be worn during site entry by properly trained oil spill response workers. Safety is always the first objective of any response. Either of the following two documents supersedes this guidance:

- Incident-specific Site Safety Plan
- Oil Spill Response Organization safety procedures and training for employees/responders

The following are recommended PPE guidance for crude oil/ petroleum spill cleanup operations.

Personal Protective Equipment is designed to protect workers from safety and health hazards, and to prevent injury resulting from incorrect use and/or malfunction of equipment. In general, the greater the level of risk, the greater the level of PPE required.

TACTIC DESCRIPTION

Personal Protective Equipment includes:

- Respiratory protection with respirators: Self Contained Breathing Apparatus (SCBA), air-purifying respirator
- Skin protection: full body covering including protective clothing with appropriate gloves and boots
- Eye protection with safety glasses, goggles, and/or face shields

- Head injury protection with a hard hat
- Thermal protection, as required, with cold weather clothing, including steel-toed footwear or arctic boots

- Hearing protection with earplugs or earmuffs

PPE is divided into four categories based on the level of personal protection afforded:

- **Level A** provides the greatest level of skin, respiratory and eye protection.
- **Level B** offers the highest level of respiratory protection but lesser level of skin protection (e.g., skin protection is required for exposure to liquids but not vapor).

Personal Protective Equipment

- **Level C** is used when concentrations and types of airborne substances are known and the criteria for using air-purifying respirators are met.
- **Level D** consists of work clothing affording minimal protection, used for nuisance contamination only.

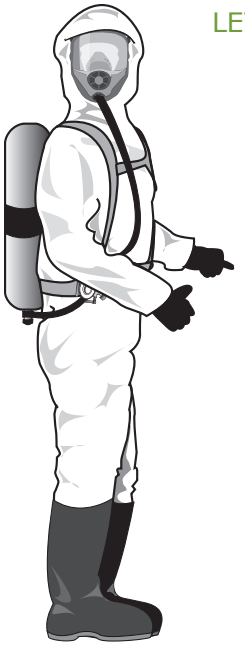
Most spill site workers will use Levels C and D.

Personal Protective Equipment Categories

Note: * indicates optional equipment.

LEVEL A – HIGHEST LEVEL OF PROTECTION

- SCBA or positive-pressure, supplied-air respirator with escape SCBA
- Totally encapsulating chemical-protective suit with vapor barrier
- Coveralls*
- Long underwear*
- Gloves - outer, chemical resistant*
- Gloves - inner, chemical resistant
- Boots - chemical resistant, steel toe and shank
- Boot covers*
- Hard hat (under suit)*
- Disposable protective suit, gloves, and boots (may be worn over or under encapsulating suit depending on suit design)
- Hearing protection*



LEVEL B

- SCBA or positive-pressure, supplied-air respirator with escape SCBA
- Hooded chemical-resistant clothing (overalls and long-sleeved jacket coveralls; one- or two-piece chemical splash suit; disposable chemical-resistant overalls). May also be encapsulating.
- Coveralls*
- Gloves - outer, chemical resistant
- Gloves - inner, chemical resistant
- Boots- chemical resistant, steel toe and shank
- Boot covers*
- Hard hat*
- Face shield*
- Hearing protection*
- Personal Flotation Device (PFD)*

LEVEL C

- Full-face or half-face mask air-purifying respirators with appropriate cartridges
- Chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls.)
- Coveralls*
- Gloves - outer, chemical resistant
- Gloves - inner, chemical resistant
- Boots - steel toe and shank as appropriate to spilled product
- Boot covers*
- Hard hat*
- Face shield*
- Hearing protection*
- Personal Flotation Device (PFD)*

LEVEL D – LOWEST LEVEL OF PROTECTION

- Coveralls
- Gloves*
- Boots/shoes - steel toe and shank as appropriate to spilled product
- Boot covers*
- Safety glasses or chemical splash goggles
- Hard hat
- Hearing protection*
- Face shield*
- Personal Flotation Device (PFD)*

DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

- Maintaining adequate supplies of PPE is often a logistical challenge; Team Leaders should provide the Supply Unit with anticipated PPE needs in advance and on a regular basis.
- Respiratory protection should only be worn by responders operating under respirator operating procedures (i.e., regular training, fit-testing, medical monitoring, inspection, cleaning, storage and periodic program evaluations) as required by OSHA 29 CFR 1910.134.

Personal Protective Equipment

REFERENCES TO OTHER TACTICS

- SEC • SITE ENTRY CRITERIA
- SCL • SITE LAYOUT & CONTROL
- Dp • PERSONNEL DECONTAMINATION

SITE LAYOUT & CONTROL

OBJECTIVE & STRATEGY

SCL

The objective of this section is to protect worker safety and health by giving guidance on establishing the work site layout and control boundaries for site entry by properly trained oil spill response workers. Safety is always the first objective of any response. Either of the following two documents supersedes this guidance:

- Incident-specific Site Safety Plan
- Oil Spill Response Organization safety procedures and training for employees/responders

This section contains recommended site layout and control guidelines for crude oil/petroleum spill cleanup operations. In all cases, physical hazards of entry must be considered along with health hazards.

TACTIC DESCRIPTION

Control boundaries must be established for any spill site to ensure that workers and the public are not exposed to the spilled substance. Three distinct zones should be established by the Site Safety Officer around the spill site:

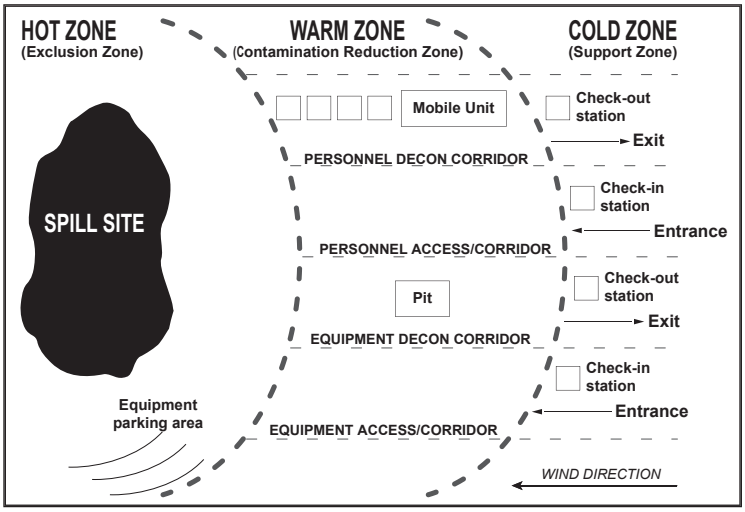


Figure SLC-1. Spill site zones layout.

- **Hot Zone or Exclusion Zone** — control zone perimeter established by the Safety Officer where site safety assessment and site entry criteria have been applied.
- **Warm Zone or Contamination Reduction Zone** — allows for a orderly transition from the Hot Zone to the cold zone: workers shed contaminated clothing, equipment and personnel are decontaminated.
- **Cold Zone or Support Zone** — free of contamination: support facilities, staging area, warm-up trailer, bathroom facilities, and mobile command post.

Site Layout & Control

DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

The following guidance should be considered when establishing site layout and control:

- The Hot Zone should be as small as possible to prevent the spread of contamination, but large enough to accommodate emerging conditions, such as migration of the spilled product or changes in the direction of the wind.
- The Hot Zone should provide for parking/storage of contaminated equipment in order to minimize decontamination until the work is completed.
- Walking boards or other type of traffic control will assist in minimizing the spread of contamination with the Hot Zone.
- To the extent possible, warm zone facilities should be located up-wind and up-hill from the Hot Zone.
- Security should be established around the Hot and Warm Zones to protect the public health and safety.
- Check-in/check-out procedures should be established for all personnel and equipment entering the Hot Zone.
- If the PPE for the site is designated as Level A or B, the "buddy system" should be used to account for all personnel in the Hot Zone.
- For on-water operations, the Warm Zone may be on the deck of a support vessel, with the Hot Zone on one side of the vessel and the Cold Zone on the opposite side.
- All eating and living areas must be kept in the Cold Zone.
- Keep in mind that the Site Layout and Control Plan may be implemented into the Safety Plan, Waste Management Plan, and the Decontamination Plan. Coordination with staff developing these plans could save duplication of work.

REFERENCES TO OTHER TACTICS

- SEC SITE ENTRY CRITERIA
- PPE PERSONAL PROTECTIVE EQUIPMENT
- Dp PERSONNEL DECONTAMINATION
- Dv VESSEL DECONTAMINATION

PERSONNEL DECONTAMINATION

OBJECTIVE & STRATEGY

Dp

The objective of this section is to protect worker safety and health and prevent the spread of contamination. This section provides guidance to be used in establishing minimum standards for decontamination by properly trained oil spill response workers. Safety is always the first objective of any response. Either of the following two documents supersedes this guidance:

- Incident-specific Decontamination Plan (usually part of the Site Safety Plan)
- Oil Spill Response Organization decontamination procedures and training for employees/responders

The following are recommended decontamination guidelines for crude oil/petroleum spill cleanup operations.

TACTIC DESCRIPTION

Decontamination involves the removal of oil or other contaminants from personnel or equipment after they leave the Hot Zone. The purposes of decontamination are to:

- Minimize worker contact with contaminants.
- Prevent spread of contaminants to clean areas and exposure to personnel there.
- Remove contaminants from equipment to allow its reuse.

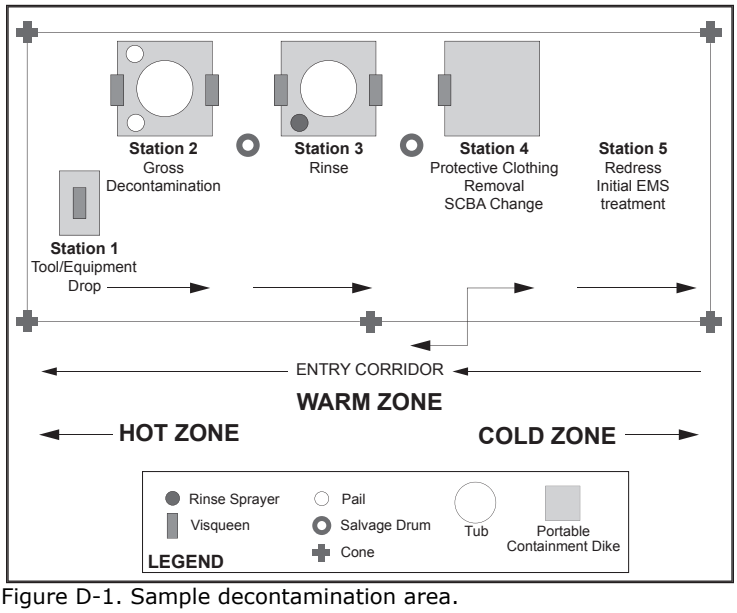


Figure D-1. Sample decontamination area.

Decontamination is conducted in the Warm Zone, which is the control point for personnel and equipment entering and leaving the Hot Zone. Decontamination is divided into four categories based on the level of personal protective equipment (PPE) being used for the spill zone. In general, personnel and equipment move through

Personnel Decontamination

various steps of decontamination to ensure that gross contamination is removed first, and that uncontaminated clothing/equipment do not become contaminated by the decontamination process. Flow charts are presented below for each of the four levels of protection, with the highest level being Level A.

Level A

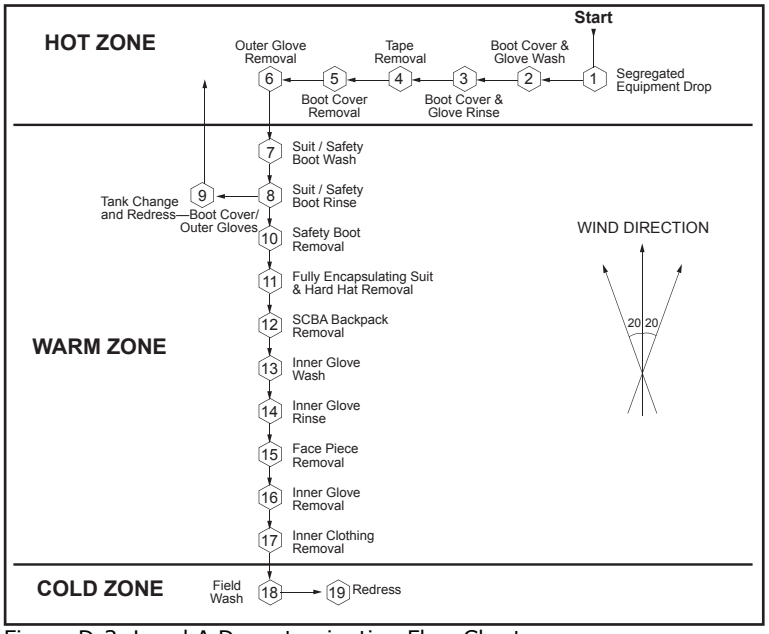


Figure D-2. Level A Decontamination Flow Chart.

Level B

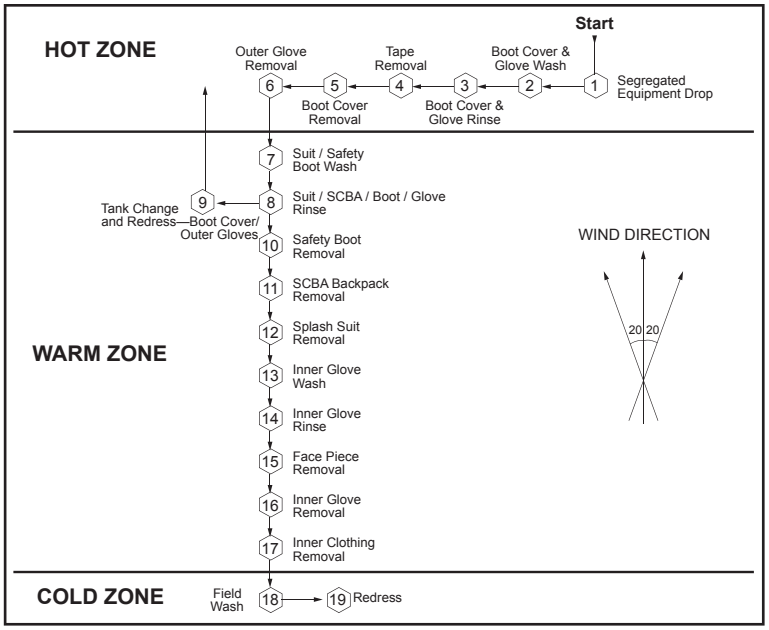


Figure D-3. Level B Decontamination Flow Chart.

Level C

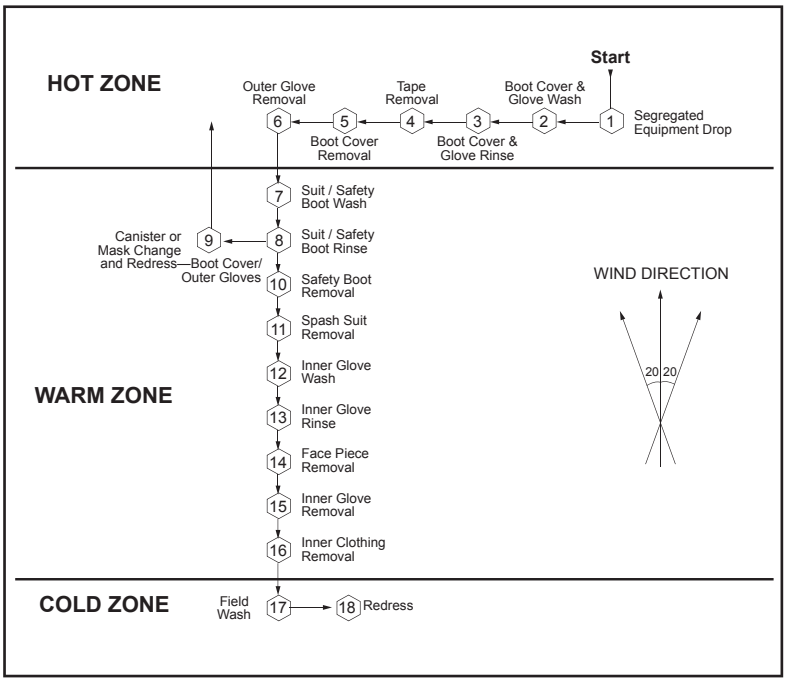


Figure D-4. Level C Decontamination Flow Chart.

Level D

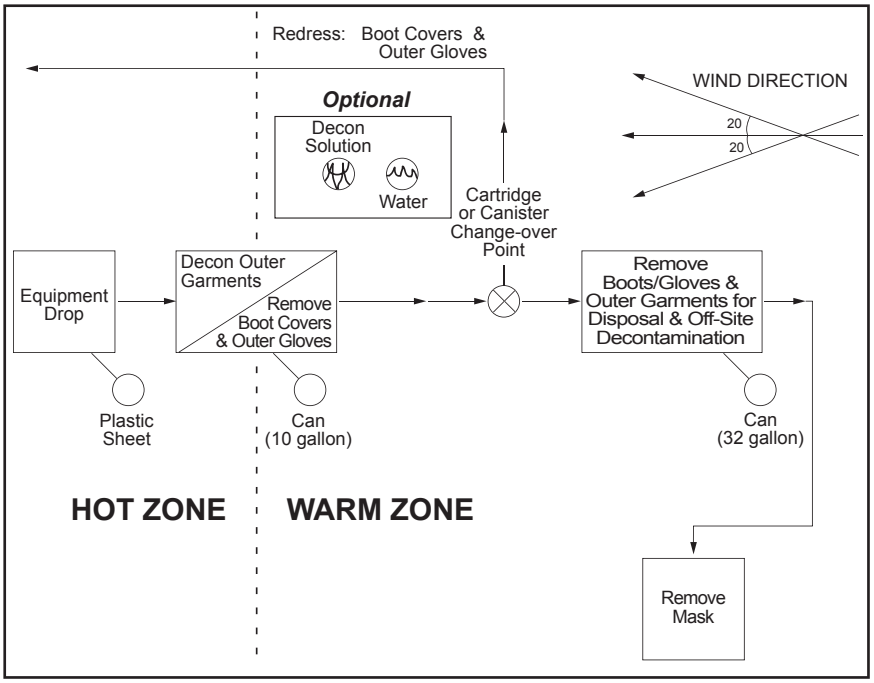


Figure D-5. Level D Decontamination Flow Chart.

Personnel Decontamination

DEPLOYMENT CONSIDERATIONS AND LIMITATIONS

- Plan for containment, collection, and disposal of contaminated solutions and wastes generated from decontamination.
- Develop separate decontamination processes for heavy equipment and machinery to prevent cross-contamination of personnel.
- Separate decontamination stations to prevent personnel cross-contamination.
- Develop distinct entry and exit points, and physically separate entry paths from contaminated area to clean area and vice versa.
- Establish procedures for minimum decontamination for restroom use and medical emergencies.
- Locate medical/first aid stations to avoid exposure to contaminants.
- Stress the use of extra steps to avoid contact with or handling of contaminants.
- Wrap sampling/monitoring equipment in disposable see-through plastic bags.
- Where possible, use disposable protective clothing and equipment, such as PPE and chemical-protective clothing (CPC).
- Use strippable coatings for equipment where possible.
- Use double containerization of contaminated wastes and recovered materials (e.g., plastic liners in overpack drums).
- Inspect all PPE/CPC for cuts, tears, punctures, abrasions, and other signs of deterioration prior to use or reuse.
- Assure proper fastening and sealing of CPC and PPE.
- First-stage decontamination personnel must wear the same, or one level lower, PPE as clean-up workers.
- Consider placing containment boom around vessels where on-water decontamination is performed.
- Consider placing containment boom along shoreline where decontamination is performed adjacent to a water body.
- Use plywood walking board, or other similar material to establish pathways for heavy foot traffic areas.

Personnel Decontamination

REFERENCES TO OTHER TACTICS

- SEC • SITE ENTRY CRITERIA
- PPE • PERSONAL PROTECTIVE EQUIPMENT
- SCL • SITE LAYOUT & CONTROL
- Dv • VESSEL DECONTAMINATION

EQUIPMENT AND PERSONNEL RESOURCES

Resources required for decontamination and decontamination setup will depend on the following:

- Availability of potable water, electric power, and waste disposal.
- Mobilization time and duration of site activities.
- Level and type of cleanup and response activity expected at site, and site conditions.
- Available space for decontamination setup and location requirements for decontamination line.
- Health hazards presented by contaminants at cleanup/response site.
- Need for additional controls (e.g., vapor diffusion/dispersion, movement/transfer of gross waste).

Typical Decontamination Equipment and Personnel Needs for Level C and D

Dp

Typical Equipment	Function	Quantity	Notes
Wash tubs, scrub brushes, disposable rags	Decontamination	>3	
Portable decon berm	Decontamination	>4	
Galvanized bucket	Decontamination	>2	
Sprayer	Decontamination	>2	
Salvage drum	Decontamination	>2	
Traffic cone	Designate decon area	>4	
Caution tape	Designate decon area	>2 rolls	
Visqueen	Decon area	> 1 roll	
Trash cans (with liners)	Waste receptacle	>1	
Oily waste dumpster	Waste receptacle	1	
Light plant/generators	Illumination/power	>1	
Portable building/tent/heater	Keep personnel warm and dry	Optional	
Typical Personnel	**Function**	**Quantity**	**Notes**
Field Team Leader	Supervises operations	1	
Skilled Technicians	Crew vessels and operate response equipment	1 to 2	
General Technicians	Work under the direction of skilled technicians	2 to 10	

Appendix H – Site Safety and Health Plan Requirements and the ICS-208-CG

Required by Law and Regulation: Hazardous Waste Operations and Emergency Response (29 CFR, Part 1910.120)

- Site Safety and Health Plan (SSHP) Requirement: 29 CFR 1910.120(b)(1)(i) "Employers shall develop and implement a written safety and health program for their employees involved in hazardous waste operations. The program shall be designed to identify, evaluate, and control safety and health hazards, and provide for emergency response for hazardous waste operations."

Site Safety & Health Plan Definition of a Hazardous Material: 1910.120(a)(3)

- "A chemical, mixture of chemicals or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees."

Required Components: 1910.120(b)(1)(ii):

- The written safety and health program shall incorporate the following:
- Organizational structure
- Comprehensive workplan
- Site-specific safety and health plan
- Safety and health training program

- Medical surveillance program
- Standard operating procedures for safety and health
- Interface between general program and site specific activities

ICS-208-CG Site Safety & Health Plan

- Meets U.S. regulatory requirements for a Site Safety & Health Plan
- Enforcement & feedback loop
- ICS Compatible - Complements the Incident Action Plan (IAP)
- Checklist vs. wordy - moderately easy to complete; easy to use.
- Provides direction and documentation of incident safety activities and requirements
- Communicates Direction - Gives written direction to field responders and supervisors of what is required to keep personnel safe and document safe work practices

Other ICS Forms cover other regulatory Aspects:

- ICS-201, ICS-203 - Organizational Structure
- ICS-201, 203, 205 - Lines of Communication
- IAP - Comprehensive Workplan
- ICS-206 - Medical Plan
- IAP - Alarms, Illumination
- IAP - Food Handling, Toilets

Information Sources to Develop the ICS-208:

- Material Safety Data Sheet (MSDS)
- Contingency Plans
- Emergency Response Plans
- ICS-215a, Hazard/Risk Analysis
- Technical Specialist
- Chemical Manufacturer
- Chemtrec 1-800-434-9300
- Work Analysis Matrix, ICS-234
- ICS-215, Operational Planning Worksheet
- Operations Section Chief

Example ICS-208 Site Safety & Health Plans can be found on Homeport in the ICS Library Forms (http://homeport.uscg.mil/ics/).

NOTE: The FEMA ICS-208 is a Safety Message form and not a Site Safety and Health Plan.

ICS-208-CG Site Safety & Health Plan Table of Forms

Because the Complete ICS-208 is 32 pages long, it was not included in this Job Aid. Blank and Example ICS-208 Site Safety & Health Plans can be found on Homeport in the ICS Library in the Forms section (http://homeport.uscg.mil/ics/). The first page is shown below:

Site Safety and Health Plan ICS-208-CG (rev 9/06)

Incident Name: _____ Date/Time Prepared: _____ Operational Period: _____

Purpose. The ICS Compatible Site Safety and Health Plan is designed for safety and health personnel that use the Incident Command System (ICS). It is compatible with ICS and is intended to meet the requirements of the Hazardous Waste Operations and Emergency Response regulation (Title 29, Code of Federal Regulations, Part 1910.120). The plan avoids the duplication found between many other site safety plans and certain ICS forms. It is also in a format familiar to users of ICS. Although primarily designed for oil and chemical spills, the plan can be used for all hazard situations.

Questions on the document should be addressed to the Coast Guard Office of Incident Management and Preparedness (G-RPP).

Table of Forms

FORM NAME	FORM #	USE	REQUIRED	OPTIONAL	ATTACHED
Emergency Safety and Response Plan	A	Emergency response phase (uncontrolled)	X		
Site Safety Plan	B	Post-emergency phase (stabilized, cleanup)	X		
Site Map	C	Post-emergency phase map of site and hazards	X		
Emergency Response Plan	D	Part of Form B, to address emergencies	X		
Exposure Monitoring Plan	E	Exposure monitoring Plan to monitor exposure	X		
Air Monitoring Log	E-1	To log air monitoring data	X*		
Personal Protective Equipment	F	To document PPE equipment and procedures	X*		
Decontamination	G	To document decon equipment and procedures	X*		
Site Safety Enforcement Log	H	To use in enforcing safety on site		X	
Worker Acknowledgement Form	I	To document workers receiving briefings		X	
Form A Compliance Checklist	J	To assist in ensuring HAZWOPER compliance		X	
Form B Compliance Checklist	K	To assist in ensuring HAZWOPER compliance		X	
Drum Compliance Checklist	L	To assist in ensuring HAZWOPER compliance		X	
Other:					

**Required only if function or equipment is used during a response*

SITE SAFETY AND CONTROL PLAN (ICS FORM 208)	**1. Incident Name:**	**2. Date Prepared:**	**3. Operational Period Time:**

Section I. Site Information

4. Incident Location:

Section II. Organization

5. Incident Commander:	**6. HM Group Supervisor:**	**7. Tech. Specialist - HM Reference:**
8. Safety Officer:	**9. Entry Leader:**	**10. Site Access Control Leader:**
11. Asst. Safety Officer - HM:	**12. Decontamination Leader:**	**13. Safe Refuge Area Mgr:**
14. Environmental Health:		

15. Entry Team (Buddy System) Name: **Level**		**16. Decontamination Element Name:** **Level**	
Entry 1		**Decon 1**	
Entry 2		**Decon 2**	
Entry 3		**Decon 3**	
Entry 4		**Decon 4**	

Section III. Hazard/Risk Analysis

17. Material	**Container type**	**Qty.**	**Phys. State**	**pH**	**IDLH**	**F.P.**	**I.T.**	**V.P.**	**V.D.**	**S.G.**	**LEL**	**UEL**

Comment:

Section IV. Hazard Monitoring

18. LEL Instrument(s):	**19. O_2 Instrument(s):**
20. Toxicity/PPM Instrument(s):	**21. Radiological Instrument(s):**

Comment:

Section V. Decontamination Procedures

22. Standard Decontamination Procedures:	**YES:**	**NO:**	**Comment:**

Section VI. Site Communications					
23. Command Frequency			**24 Tactical Frequency:**	**25. Entry Frequency:**	
Section VII. Medical Assistance					
26. Medical Monitoring	**YES:**	**NO:**	**27. Medical Treatment and Transport In-place**	**YES:**	**NO:**
Comment:					

Section VIII. Site Map											
28. Site Map:											
	Weather		**Command Post**		**Zones**		**Assembly Areas**		**Escape Areas**		**Other**

Section IX. Entry Objectives
29. Entry Objectives:

Section X. SOP'S and Safe Work Practices			
30. Modifications to Documented SOP's or Work Practices	**YES:**	**NO:**	
Comment:			

Section XI. Emergency Procedures
31. Emergency Procedures:

Section XII. Safety Briefing	
32. Asst. Safety Officer HM Signature:	**Safety Briefing Completed (Time):**
33. HM Group Supervisor Signature:	**34. Incident Commander Signature:**

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Appendix I – Evaluating Hazard/Risk and Example ICS-215a-CG Hazard/Risk Analysis Worksheet

Risk is the probability that an activity or work assignment will result in a mishap or accident. All activities have some associated level of risk. Our job as Safety Officers is to identify and quantify risk, inform others and implement measures to mitigate or reduce risk. In other words, manage risk.

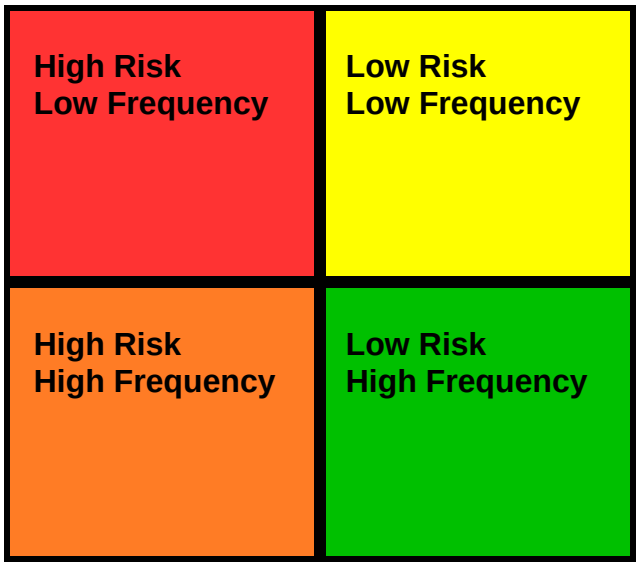
Steps in Analyzing Risk

1. With the OSC, Identify hazards within the incident environment.
2. With the OSC, categorize high and low risk activities or work assignments.
3. Determine the benefit or gain from conducting these activities.
4. Consider canceling or delaying any high risk activity that has little or no benefit or gain.
5. For high risk activities with a high benefit mitigate the hazard with managerial resources such as protective equipment, training and experience.

In Operational Risk Management, a prioritization process is followed whereby the risks with the greatest loss and the greatest probability of occurring are handled first. Risks with lower probability of occurrence and lower loss are handled in descending order.

Prioritizing Risk Potential

- High Risk – Activity likely to cause serious injury or death
- Low Risk – Activity unlikely to cause serious injury or death
- High Frequency – Resources are experienced in responding to and conducting these activities or tactics
- Low Frequency – Resources are inexperienced in responding to and conducting these tactics



GREEN - Low Risk Activity conducted by Resources who do the job frequently
RED - High Risk Activity conducted by Resources who rarely do the job

High Risk activities can then be broken into two categories:

- Activities which move slowly and have ample time for decision making.
- Activities which move quickly and have very little time for decision making.

The OSC and SOFR as a team:

1. Identify Mission Tasks
2. Categorize Hazards & Risks
3. Determine benefit or gain
4. Cancel or delay high risk activities with no gain
5. Mitigate Hazard or Risk
6. Execute Decision
7. Monitor Situation

Steps 1-5 are developed on the ICS-215a. Steps 6 and 7 are done in the field.

Example ICS-215a Hazard/Risk Analysis

INCIDENT ACTION PLAN SAFETY ANALYSIS

1. Incident Name: MIRLO
2. Operating Period: DDMMYY 0600-0600

3. DIVISION/ GROUP/OTHER LOCATION	4. Work Assignments	5. Gain	6. HAZARDS	Chem Exposure	Irritant	Drowning	Tripping	Heat Stress	Poor Lifting	Sun Burn	Fatigue	Noise	Fire/Explosion		7. CONTROLS	Training	Air Monitoring	Chem PPE	UW PPE	Drink Fluids	Sunblock/Sunglasses	Work/Rest Period	Distance	Hearing Protection	8. ORM SEVERITY	ORM PROBABILITY	ORM EXPOSURE	ORM GAR
Oil Rec Group	Boom vessel, recover spilled product, conduct pre-impact and shoreline clean up	Human Health X Security Environment X Economy X	Check	X	X	X	X	X	X	X	X	X	X		Check	X	X	X	X	X	X	X		X	3	4	2	24
Safety Zone Group	Enforce Safety Zone around vessel	Human Health X Security X Environment X Economy X	Check			X	X	X	X	X	X	X			Check	X	X		X	X	X	X	X	X	2	2	3	12
Thumb Pt Staging	Maintain Resources for immediate use	Human Health Security Environment X Economy X	Check				X	X	X	X	X				Check	X				X	X	X	X		2	2	2	8
		Human Health Security Environment Economy	Check												Check													
		Human Health Security Environment Economy	Check												Check													
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		Human Health Security Environment Economy	Check												Check													
		Human Health Security Environment Economy	Check												Check													

ICS-215A-CG (rev 6/06)

Operational Risk Management Key

Scale	1	2	3	4	5	Gar Scale	#	1-19	20-39	40-59	60-79	80-100
Severity	Slight	Minimal	Signi-icant	Major	Catas-trophic		Risk	Slight	Possible	Substantial	High	Very High
Probability	Remote	Un-likely	50/50	>50	Very Likely		Color	Green	Amber	Red	Red	Red
Exposure	Below Avg	Avg	Above Avg	Great	N/A		Action	Possibly Acceptable	Attention Needed	Correction Required	Immediate Correction	Discontinue/ Stop

9. Prepared by (Name and Position)

M. Smith, SOFR

ICS 215a Instructions

INCIDENT ACTION PLAN SAFETY ANALYSIS (ICS-215A-CG (rev 6/06))
Instructions for filling out the form

Purpose: The purpose of this worksheet is to aid the Safety Officer in completing an operational risk assessment to prioritize hazards and develop appropriate controls.

Preparation: During the Incident Action Planning cycle where the Operations Section Chief (OSC) is preparing for the tactics meeting, the Safety Officer works alongside the OSC and completes the Incident Action Plan Safety Analysis. This sheet mirrors the ICS 215 form. Work assignments are listed along with associated hazards. A calculation is made that determines what level of risk each work assignment poses. For those assignments having significant risk, controls are developed for safeguarding responders. The net risk is evaluated against the gain. The Incident Commander should be alerted to all safety hazards that receive an amber or red GAR rating after controls have been established.

Distribution: The Operational Hazard Worksheet is attached to the Incident Site Safety Plan and is distributed according to the instruction for Site Safety Plans.

Instructions:

Item #	Item Title	Instructions
1	Incident Name	Print the name assigned to the incident.
2	Date/Time Prepared	Enter date (month, day, year) and time prepared.
3	Division/Group	Enter the Branch, Division or Group title in abbreviated form.
4	Work Assignment	List the work assignment for each Branch, Division or Group.
5	Gain	Check the gain that is achieved when the work assignment is accomplished.
6	Hazards	Using the IAP Safety Analysis Aid (page 2), list the type of hazards likely to be encountered for the work assignment. Place a check mark in the box below the hazard.
7	Controls	Using the IAP Safety Analysis Aid (page 2), list the type of controls likely to be used for addressing the hazards listed. Place a check mark in the box below the control.
8	GAR	Using the "Key", assign a number from 1 to 5 based on the level of severity, probability and exposure. Multiply all numbers together to get a total. Enter this number into the total column. Gar means **G**reen, **A**mber, **R**ed. Using the GAR scale on the bottom of the sheet, assign a color, risk level or action phrase in this block.
9	Prepared by	Enter the name of the person who completed this worksheet.

ICS-215A-CG INCIDENT ACTION PLAN SAFETY ANALYSIS AID

HAZARDS:

Physical	Chemical/Biological	Human
• Slipping	• Explosion	• Violence
• Tripping	• Flammable	• Poor Lifting
• Fall	• Air Reactive	• Repetition
• Overhead	• Water Reactive	• Excessive Force
• Heat Stress	• Chem Reactive	• Poor posture
• Cold Stress	• Alpha Rad	• Awkward motion
• Electrical	• Beta Rad	• Fatigue
• Blunt Objects	• Gamma Rad	• Poor hygiene
• Sharp Objects	• X Rad	• Illness
• Noise	• Bio-weapon	• Alcohol/Drugs
• Vehicle	• Chem-weapon	• Over crowding
• Fire	• Irritant	• Poor comms
• Sun/UV Glare	• Asphyxiant	• Noise interference
• Sun Burn	• Oxidizer	• Smoking
• Moving Pinch Points	• Carcinogen	• Driving
• Unguarded Machinery	• Corrosive	**Animal/Plant**
• Lightning	• Cryogenic	• Bites/Stings
• Drowning	• Toxic	• Poison
• Engulfment	• Biomed/pathogen	• Thorns/burrs
• Limited Egress/Access	• Particulates	• Swarms
	• Fumes (weld etc.)	• Disease
	• O2 Deficiency	• Feces/Coliforms

CONTROLS:

Types of Engineering Controls:

• Barriers	• Shields	• Dams
• Capping	• Covering	• Fencing
• Terminating	• Shutting	• Blocking
• Chocks	• Enclosures	• Diverters
• Flanging	• Guarding	• Substitution
• Anchoring	• Ventilation	• Blowing
• Scaffolding	• Grounding	• Substitution
• Bonding	• Insulation	• Lighting
• Locks, Tags	• Kill-switches	• Shut-off valves
• Taglines	• Circuit Breakers	• Process change
• Plugging, patching	• Sealing	• Absorbers

Types of Administrative Controls:

• Reduced work duration	• Worker rotation	• Safety plans
• Training	• Safety briefs	• Relief personnel
• Maintenance	• Drinking fluids	• Work/rest periods
• Good housekeeping	• Roving security	• Signs
• Warning lights	• Alarms	• Break areas
• Pre-inspections	• Field checks	• Buddy system
• Line of sight comms	• Comms schedule	• Equipt staging
• Load shifting	• Hazard marking	• Placarding
• Labeling	• Hand signals	• Safety observers
• Fendering	• Work plans	• Replenish fluids
• Handcarts/trolleys	• Fire extinguishers	• Drum bulking
• Eye Wash Station	• Hand washers	• Showers

Types of Personal Protective Equipment Controls:

• Hard hats	• Steel-toed shoes	• Safety glasses
• Safety goggles	• Face shields	• Hearing Protection
• Life jacket	• Fall arrests	• SCBA
• APRs	• Chemical suits	• Flash suits
• Fire resistant suits	• Work gloves	• Chemical gloves
• Sun glasses	• Sun-block	• Life rings
• Eye wash stations	• Night vision	• Thermal protection
• Dry/wet suits	• Hand warmers	• Wind breaker coat
• Knee pads	• Over garments	• Coveralls
• Booties	• Cooling vests	• Chap lip protection
• Hats for warming	• Gloves (warmth)	• Clothing (warmth)