Oil Spill Cleanup Initiative

Safety and Health Awareness for Oil Spill Cleanup Workers

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

NIEHS
National Institute of Environmental Health Sciences

OSHA Occupational Safety and Health Administration
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WORKER EDUCATION & TRAINING PROGRAM

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Preface

Oil spill cleanup workers can face potential hazards from oil byproducts, dispersants, detergents and degreasers. Drowning, heat illness and falls also pose hazards, as can encounters with insects, snakes and other wild species native to the impacted areas. In these situations, OSHA goals include ensuring that workers receive appropriate training and protective equipment. This training tool was developed by National Institutes of Health, National Institute of Environmental Health Sciences, as a health and safety resource for those who will participate in an oil spill response and cleanup.

PLEASE NOTE: For information from OSHA on worker safety guidelines during oil spill cleanup, visit http://www.osha.gov. These web pages include information from federal and other sources intended to protect the health and safety of workers. Please check back often; we will continue to update the page with the most current information.

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Employer Responsibilities and Worker Rights

Employers have responsibilities and workers have rights under the OSH Act.

- The Occupational Safety and Health Act requires that employers provide a safe and healthful workplace free of recognized hazards and follow OSHA standards. Employers must also provide training and required protective equipment.

- Workers must follow the employer's safety and health rules that comply with OSHA standards and wear or use all required gear and equipment. Workers are encouraged to report hazardous conditions to a supervisor and report hazardous conditions to OSHA if employers do not fix them.

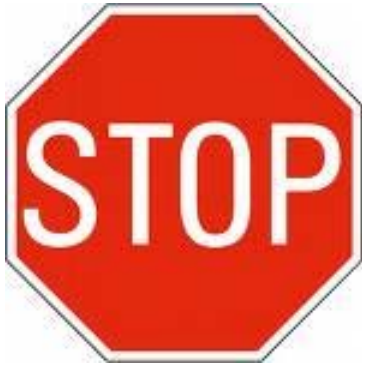
At the end of this awareness-level training you will be able to:

- Explain what an oil spill is
- Understand the characteristics of oil and the risks associated with oil spills
- Describe the characteristics of a spill response
- Describe how to identify and control hazards during the response and clean-up phases of an oil spill
- Describe the role of a first responder awareness level individual in response to an oil spill

Advanced/Additional Training Required for Those Involved in an Oil Spill

- This training tool does NOT replace the additional duty specific training or PPE specific training requirements.
- Regardless of work scope, many topics covered in this awareness training tool have corresponding OSHA standards—such standards must be met in order to safely and legally perform associated job duties.
- Cleanup workers should always keep in mind that when in doubt about the safety of an activity, stop what you are doing and ask questions. Be sure you are safe before continuing.
- Contact the NIEHS National Clearinghouse for Worker Safety and Health Training for more information http://tools.niehs.nih.gov/wetp.

When in doubt about the safety of an activity, stop what you are doing!



Be sure you are safe before continuing.

MODULE 1

Introduction to Oil Spill Cleanup

National Contingency Plan

The federal government's blueprint for responding to both oil spills and hazardous substance releases. The National Contingency Plan is the result of the country's efforts to develop a national response capability and promote overall coordination among the hierarchy of responders and contingency plans.

Unified Command

FOSC: Federal On Scene Coordinator

SOSC: State On Scene Coordinator

RPIC: Incident Commander for the responsible party

Health and Safety Plans

- OSHA has regulations that require employers to have detailed Health and Safety Plans (HASP) to protect workers involved in cleanup operations.* The HASP serves as a guide for employers and workers to follow during their daily operations to prevent the spread of contamination, injury, and death.

Review your employer's HASP before you start work!

*OSHA, 29 CFR 1910.120(b)(4)(ii)

HASP (continued)

This document covers some HASP sections that may be used during an oil spill response. The site safety section includes general information from several of the HASP sections listed below.

All HASPs <u>must</u> cover <u>all</u> of the following:

- Introduction
- Key Personnel
- Hazard Assessment
- Training
- PPE
- Temperature Extremes
- Medical Surveillance
- Exposure Monitoring and Air Sampling
- Site Control
- Decontamination
- Emergency Response/ Contingency Plan
- Emergency Action Plan
- Confined Space Entry
- Spill Containment

OSHA's Hazardous Waste Operations and Emergency Response Standard (HAZWOPER)

- Activities related to stopping the oil spill or containing the spilled oil are considered "emergency response" activities under OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, 29 CFR 1910.120 and 1926.65.

- In addition, cleanup sites may be considered or may become hazardous waste sites and should follow the requirements for hazardous waste sites under HAZWOPER, requiring specific training and control measures, if certain criteria apply. Shoreline cleanup is considered "post-emergency clean-up operations."

- Furthermore, if HAZWOPER conflicts or overlaps with any other OSHA standard, the provision more protective of employee safety and health must be followed.

HAZWOPER Requirements that Apply to Marine Oil Spills

- Marine oil spill cleanup is organized and managed according to the regulations found in the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) at 40 CFR 300.

- Response actions conducted under the NCP must comply with the provisions of HAZWOPER.

- See specifically the HAZWOPER provisions in paragraph (q) (Emergency response operations) and paragraph (q) (11) Post-emergency response cleanup operations.

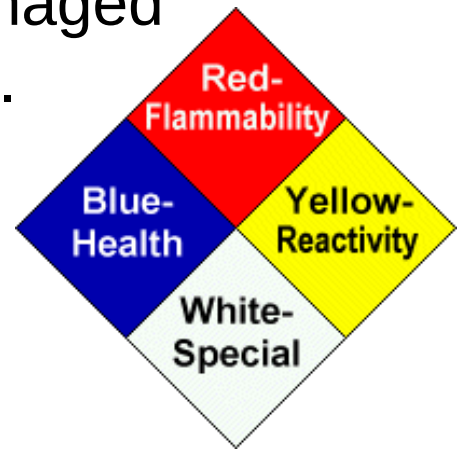
Proper Instruction for Cleanup Workers

Personnel should be given:

- An initial briefing utilizing the Site Safety Plan or NIMS assignment form at the site prior to their participation
- A briefing on emergency procedures under the site-specific HASP
- Instruction in the wearing of appropriate personal protective equipment
- Information on what health hazards from oil and other chemicals might be encountered
- Explanation of what duties are to be performed
- Chain of command
- Instruction on the decontamination procedures to be followed
- All other appropriate safety and health precautions

Hazardous Materials and Hazard Communication

- Do not handle unmarked, unlabeled, or damaged containers—report these to your supervisor.
- Specific Hazard Communication training is required on the hazards from the oil and from any hazardous materials being used or use that you may come in contact with.



- Material Safety Data Sheets (MSDS) must be available for all hazardous materials. Review them and follow as appropriate.
- Warning labels, such as NFPA 704M may be found on chemical containers being used.

Emergency in the Field

- Notify your supervisor, safety officer or incident commander about all injuries and hazardous material exposures sustained at your site. Your Employer's HASP will describe the emergency procedures to be followed.
- Ask what first aid support is available during your briefing; be sure you understand where it is located.
- For minor injuries or health concerns go to:
  - First Aid
  - Local hospitals or clinics
  - EMT or nurse station
- For serious emergencies call your direct supervisor or 911.
- Know your exact location.
- Keep injured worker in safe location until assistance arrives.
- Don't move unless safety of worker is at risk.
- Use the buddy system to aid and help each other.

The FIRST Priority is to Protect Yourself

- Watch for lacerations, slips, falls, and trips, especially while working on oil-slick rocks.
- Be careful walking over and handling debris that is covered with water due to increased risk of slips, trips and falls.
- Remain current with tetanus vaccination.
- Get the Hepatitis B vaccine series if you will be performing direct patient care or otherwise expect to have contact with bodily fluids.
- Avoid contact with stagnant water.

Protect Yourself (continued)

- Be sure to use the decontamination procedures set by your employer before eating or drinking, using the toilet during the workday, and do a full decontamination, including a shower if available, at the end of shift.
- Wash and sanitize immediately if exposed to toxic substances.
- Rubber type steel toe/shank footwear will protect your feet from injury and from oil exposure.
- Wear oil resistant gloves when in contact with oil and oil waste and outer durable gloves when handling debris.
- Use hearing protection in noisy environments.
- Know your medicines, allergies, and blood type.
- If in doubt, contact your supervisor!
- **Do not stand or come in contact with unknown liquids or substances.**

Physical Environment

The land and near shore:

- Mostly flat, some gradual sloping, coastal, some areas at or below sea level.
- Water-saturated coastal and swamp regions with marshes.
- Eastern LA shoreline created by silt deposits from the Mississippi River.

The Climate (May – November):

- High Humidity
- High Temperatures
- UV exposure – sunburns can be serious
- Potential for storms and lightning
- High and Low Tides

Atchafalaya Basin Scene

MODULE 2

Oil Spill Cleanup and Health Concerns

What is an Oil Spill?

- An oil spill is the release of a liquid petroleum hydrocarbon into the environment due to human activity, and is a form of pollution. The April 2010 Gulf of Mexico oil spill involves crude oil released from the explosion of an off-shore drilling rig.

- During an oil spill cleanup, workers may encounter many types of crude oil, including fresh and weathered, which contain carcinogenic volatile aromatic compounds like benzene, toluene and naphthalene.

What is Crude Oil?

- Crude oil is a mixture of hydrocarbons and consists of light, medium and heavy chemicals.

- The hydrocarbons in crude oil are mostly alkanes, cycloalkanes and various aromatic hydrocarbons while the other organic compounds contain nitrogen, oxygen and sulfur, and trace amounts of metals such as iron, nickel, copper and vanadium. The exact molecular composition varies widely.

- The light parts, such as benzene, xylene, toluene and ethyl benzene generally evaporate into the air in the first 24 hours of a spill (usually before reaching the shore).

- The medium and heavy parts (consistency much like motor oil) is what cleanup operations on the land and near shore areas focus on.

Be cautious during cleanup operations. If you are unsure, ask your supervisor before proceeding!

What is in the Crude Oil from this Spill?

- You will be dealing with highly weathered oil and other environmental conditions.
- The crude oil changes over time as the volatile part evaporates and the oil weathers and rots (degrades) and mixes with sea water, seaweed and other vegetation and debris.
- Weathering of oil occurs rapidly at first and slows down over time as light and medium hydrocarbon chains are evaporated or dissolved away by sunlight, waves, and winds.
- Inside of storage containers and bags, oily waste will degrade over time, especially in high temps and give off foul smelling and possibly toxic gases and vapors.

Occupational Exposure Limits (OEL)

- Cleanup workers typically work > 8 hours/day for 7-14 days in a row.
- NOTE: Workers should be informed that OELs based on standard times are not appropriate for monitoring.
- NOTE: OELs don’t include skin contact, absorption and ingestion which are common in cleanups.
- **Check with your site supervisor for additional guidance!**

Crude Oil

- Complex mixture of carcinogenic substances.
- Includes hydrocarbon compounds (alkanes, cycloalkanes, aromatics, polynuclear aromatic compounds) and hydrocarbon compounds (sulphur compounds, nitrogen compounds, oxygen compounds, traces of organo-metallic compounds).

Health hazards generally associated with crude oils:

- Inhalation of the toxic volatile hydrocarbon components, such as benzene, and dermatitis from repeated or prolonged skin contact can cause dermatitis or skin cancer.

Weathered Crude Oil

- Weathered crude or "mousse" is crude petroleum that has lost much of its more volatile components and has mixed with sea water and organic matter.

- Weathering is a series of chemical and physical changes that cause spilled oil to break down and become heavier than water. Winds, waves, and currents may result in natural dispersion, breaking a slick into droplets which are then distributed throughout the water. These droplets may also result in the creation of a secondary slick or thin film on the surface of the water.

Health Risks of Weathered Crude Oil

- Potential dermatitis hazard from skin contact.
- Inhaling oil droplets/ oily particles put into the air during cleanup operations can be irritating to eyes, nose, throat and lungs.
- Evaporation that occurs during the first 24 to 48 hours after the spill may reduce inhalation hazards from the toxic volatile components, such as benzene. (CDC)

NOTE: Even if air sampling shows no detectable levels or very low levels of volatile organic compounds (VOCs), there still may be health effects.

Weathered Crude Oil

Tarballs

- Weathering processes eventually create a tarball that is hard and crusty on the outside and soft and gooey on the inside. Turbulence in the water or beach activity from people or animals may break open tarballs, exposing their softer, more fluid centers.

Health Risks of Tarballs

- The most common reaction to the chemicals in tarballs is an allergic reaction or developing rashes. This can happen even from brief contact with oil.
- In general, contact with oil should be avoided. If contact occurs, wash the area with soap and water, baby oil, or a widely used, safe cleaning compound such as the cleaning paste sold at auto parts stores.
- Little is known about longer term exposure to tarballs. Use PPE when you come into contact with tarballs.

Patchy Coverage of Tarballs on South Padre Island Beach 2009

Nitrogen Dioxide (NO_2)

- Gas with a distinctive reddish-brown color.

Health Risks of Nitrogen Dioxide

- Respiratory irritant and is capable of causing pulmonary edema.
- A concentration of 50 ppm is moderately irritating to the eyes and nose and may cause pulmonary edema and possibly subacute or chronic lesions in the lungs.
- Odor of NO_2 is first perceptible to most people in the range of 0.11 to 0.22 ppm.
- **May be a hazard during burning operations!**

Occupational Exposure Limits for NO_2

- The NIOSH Recommended Exposure Limit for NO_2 is 1 ppm for a 15 minute period, the same as the OSHA ceiling limit for this compound. There is no full shift TWA exposure criteria set by either NIOSH or OSHA for this compound. The ACGIH TLV for NO2 is 3 ppm for an 8-hour TWA, with a STEL of 5 ppm for 15 minutes.

NOTE: Workers should be informed that OELs based on standard times are not appropriate for monitoring.

- NOTE: OELs do not include skin contact, absorption and ingestion which are common in cleanups.

- **Check with your site supervisor for additional guidance!**

Sulfur Dioxide (SO_2)

- **SO_2 is released when burning crude oil and during degradation**

SO_2 Plume

Health Risks

- Short-term exposures to SO_2, ranging from 5 minutes to 24 hours, can cause adverse respiratory effects including bronchoconstriction and increased asthma symptoms.
- When reacting with other compounds in the atmosphere to form small particles, they can penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death.
- **EPA set a 24-hour primary standard at 140 ppb and an annual average standard at 30 ppb, and set a 3-hour average secondary standard at 500 ppb.**
- Sulfur dioxide emissions are also a precursor to acid rain and atmospheric particulates.

Gasoline and Diesel Fuels

- Gasoline or petrol is a petroleum-derived liquid mixture which is primarily used as a fuel in internal combustion engines. Diesel fuel is any liquid fuel used in diesel engines. These and other fuels will be used on the cleanup and can add to worker hazards.

- Many of the non-aliphatic hydrocarbons naturally present in gasoline and diesel fuels are carcinogenic.

- Brief inhalation of these and similar substances can also produce many of the effects of alcohol intoxication and, sometimes, a hallucinogen-like "trip."

- Diesel combustion exhaust contains hazardous gases and particles which can be harmful if inhaled.

Diesel Combustion Exhaust

- The largest components of most combustion gases is nitrogen (N_2), water vapor (H_2O), and carbon dioxide(CO_2).
- Relatively small components of it are noxious or toxic substances, such as carbon monoxide (CO), hydrocarbons, nitrogen oxides (NO_x), Ozone(O_3), partly unburnt fuel, and particulate matter.
- Workers may be exposed to diesel combustion exhaust from working near diesel powered generators.

Carbon Dioxide (CO_2)

- Carbon dioxide is colorless. At low concentrations, the gas is odorless. At higher concentrations it has a sharp, acidic odor.
- CO_2 is an asphyxiant and an irritant. When inhaled it can produce a sour taste in the mouth and a stinging sensation in the nose and throat.
- Amounts above 5,000 ppm are considered very unhealthy, and those above about 50,000 ppm (equal to 5% by volume) are considered dangerous.

Carbon Monoxide (CO) Exposure

Carbon Monoxide has no warning properties; it is a colorless odorless gas

- **CO may be present with:**
  - Any activity using gasoline, diesel or propane-powered machinery
  - Work near operating equipment
  - Debris reduction sites
  - Work near hot work (cutting, welding) especially in confined spaces

- **To control CO exposures:**
  - Wear CO monitoring equipment
  - Do not use gas/diesel powered equipment indoors or in enclosed areas
  - Use forced air ventilation

Symptoms: Headache, dizziness, drowsiness, or nausea progressing to vomiting, loss of consciousness. Prolonged or high exposure can lead to coma or death. If you experience any of these symptoms where CO may be present **- LEAVE AREA IMMEDIATELY.**

What Happens When the Oil Reaches Shore?

- Oil exposure to the shoreline depends on wave energy and tides, substrate type, and slope of the shoreline.
- Shoreline type is classified by rank depending on how easy the oil would be to clean up, how long the oil would persist, and how sensitive the shoreline is.
- Oil may persist longer than expected based on microclimates. Some of the weathered crude may develop a thin “skin” which when disturbed during cleanup, releases fresher oil.
- Oil may not weather into a semisolid tar because of the water emulsification and organic matter, vegetation mixed into the mousse.

Crude Oil Washing Up on Beach

Environmental Damage

- Workers should expect to encounter dead and bloated animal carcasses, struggling and dying wildlife, and crude oil impacts to the shoreline.

- The various element groups affected are: Birds, Reptiles and Amphibians, Fish, Invertebrates, Habitats and Plants, Wetlands, and Marine Mammals and Terrestrial Mammals.

- Thousands of animals die immediately from being inundated with the oil.

- Higher death rates follow in subsequent years, partially because animals ingest prey from contaminated soil and from ingestion of oil residues on hair due to grooming.

Habitat Affected

Birds

- The oil penetrates up the structure of the plumage of birds, reducing insulating ability.
- Birds typically ingest oil that covers their feathers as they attempt to preen, causing kidney damage, and altered liver function.

Rocks

- Oil that washes up on the shoreline typically collects on rocks. Oil slick rocks cause increased slip, trip and fall hazards to emergency responders and cleanup workers.

Equipment Used

Containment Boom

- A flexible, fence-type, water-borne pollutant containment barrier that floats on the water.
- Used to contain oil slicks and lift the oil off the water.
- Boom is reusable and must be decontaminated after use.
- It is very heavy to carry and difficult to work with.

Containment Boom

Oil Skimmer

Machine that separates oil floating on water.

Three common types:

- Weir skimmers function by allowing the oil floating on the surface of the water to flow over a weir. The height of the weir may be adjustable.
- Drum skimmers function by using a rotating element such as a drum, to which the oil adheres. The oil is wiped from the surface of the drum and collected.
- Oleophilic skimmers use ropes, discs, or drums that are treated with a substance or otherwise manufactured to adhere to oil.

Texas General Land Office Deploying DESMI Terminator Skimmer*

* DESMI terminator skimmer is a type of weir skimmer.

Other Equipment

- Vacuums
  - remove oil from beaches and water surface
- Shovels
  - used to clean up oil on beaches

- Oil Absorbent socks, pompoms, and other equipment are also used alongside boom and are not reused.

Methods of Cleanup

- Bioremediation, including use of dispersants
- Controlled burning
- Shoveling
- High-pressure hot water

Bioremediation

- Use of microorganisms or biological agents to break down or remove oil.

Bioremediation Accelerator

- Chemically and physically bonds to both soluble and insoluble hydrocarbons.
- Acts as a herding agent in water and on the surface, floating molecules to the surface of the water, including solubles such as phenols and BTEX (benzene, toluene, ethylbenzene, and xylenes), forming gel-like agglomerations.
- **These are usually chemical products with hazardous properties. Workers need additional training in their safe use and perhaps additional PPE. Check with your site supervisor for MSDSs.**

Chemical Dispersants

- Chemical dispersants such as COREXIT (Nalco) EC9500A and EC9527A may be used for beach cleanup operations.
- Aerial and boat spraying are the most common delivery systems.
- **Aerial Spraying** - Aircraft provide the most rapid method of applying dispersants to an oil spill. For aerial spraying, the dispersant is applied undiluted. Careful selection of spray nozzles is critical to achieve desired dose levels, since droplet size must be controlled.
- **Boat Spraying** – Dispersant may also be applied by workboats equipped with spray booms mounted ahead of the bow wake. The preferred and most effective method of application from a workboat is to use a low-volume, low-pressure pump so the chemical can be applied undiluted.

COREXIT (Nalco) EC9500A, EC9527A

Exposure:

- Avoid eye contact. In case of eye contact, immediately flush eyes with large amounts of water for at least 15 minutes.
- In case of skin contact, immediately flush with large amounts of water, and soap if available. Remove contaminated clothing, including shoes, after flushing has begun. If irritation persists, seek medical attention.
- Avoid prolonged breathing of vapors. Use with ventilation equal to unobstructed outdoors in moderate breeze.

COREXIT (Nalco) 9500

- COREXIT (Nalco) 9500 contains between 10-30% of petroleum distillates (solvent).

Petroleum Distillates Exposure:

- Upon skin contact, petroleum distillates can produce local skin irritation and sensitivity to light in some individuals.

- When swallowed, the lighter, more volatile distillate products can be sucked into the lungs interfering with the lung's functions and may result in chemical pneumonia. Aspiration of fluid into the lungs can occur both during swallowing and vomiting of the product.

COREXIT (Nalco) EC9527A

- COREXIT EC9527A contains between 30-60% of 2-butoxyethanol (solvent).
- 2-butoxyethanol is a clear, colorless liquid that smells somewhat like ether.
- 2-Butoxyethanol can be inhaled in your lungs or ingested through your stomach and intestines when you eat food or drink water that contains the chemical.

Exposure Limits:

- Effects – exposure of 100 ppm or more of 2-butoxyethanol vapors in air for 4 or 8 hours has caused irritation of the nose and eyes, headache, a metallic taste, or vomiting.
- 2-Butoxyethanol (from 2-butoxyethanol or 2-butoxyethanol acetate exposure) can be measured in blood and urine.

Controlled Burning

- Burns the oil off of the water.
- Can effectively reduce the amount of oil in water.
- Can only be done in low wind.
- Can cause air pollution and respiratory ailments.

A controlled burn to clear marsh grasses can also be used BEFORE the oil reaches the shore.

Controlled Burn Operation

Shoveling

Removal of contaminated material

- Use buddy system – one worker holds a disposable bag and the other shovels.

- Sand is removed and taken to a facility for processing to remove the crude oil.

- Can be done on sandy beaches or saltwater marshes.

High-pressure Hot Water

- Process of spraying oil-stricken beaches with hot water.
- Initial step is to spray the rocky shore with high pressure jets of water from hoses.
- After the oil is sprayed off the surface of the rocks on the beach, the oil drains into areas that have booms in place.
- Not used to date in Gulf Coast cleanup

High-pressure Hot Water (continued)

Occupational Hazards

- The spray uses hot water at temperatures near 180 degrees Fahrenheit or 60 degrees Celsius from a type of wand nozzle which can cause first and second degree burns.

- High-pressure water typically is released at 690 kPa and flows at a rate around 1,890 liters per minute. High-pressure water contact can cause skin swelling and small abrasions. Longer term exposure can cause extremely painful, swollen and pale skin because of vascular compromise and tissue necrosi.

May cause inhalation of weathered oil!

High-pressure Hot Water (continued)

Environmental Hazards

- Areas that were cleaned with this technique need to be repeatedly cleaned, because the oil remains after each cleaning.
- May push the oil deeper into the soil and rock along the beach.
- Microbial populations on the shoreline may become displaced and destroyed. Many of these organisms (e.g. plankton) are the basis of the coastal marine food chain, and others (e.g. certain bacteria and fungi) are capable of facilitating the biodegradation of oil.

Additional training and safety precautions must be provided if you are working on this type of operation.

How Do Chemicals Enter Your Body?

- Skin contact/ absorption
- Inhalation
- Ingestion
- Injection

Contact/Absorption

- Some chemicals can cause irritation or rashes (dermatitis) if they touch your skin.
- For certain chemicals, once they touch the skin, they are absorbed and go into the bloodstream, sometimes without causing any visible damage to your skin (e.g., a rash).
- If chemicals get inside of your body they may be able to pass through to your bloodstream and be carried to other organs and parts of your body.
- Some areas are more at risk than others (e.g., eye, groin, wrists, forehead). Proper PPE use prevents this.
- Open wounds can increase absorption.

Inhalation

- When airborne chemicals enter your lungs, they can be absorbed into your bloodstream.
- Airborne chemicals are breathed in through the mouth or nose.
- Gases and vapors can reach the deep lungs.
- Particle and droplet size affects where the chemical settles in the respiratory tract.
- Where the chemical settles in the respiratory tract influences symptoms and diseases.

Ingestion

- Chemical is swallowed through your mouth and is absorbed through the digestive tract.
- To minimize the ingestion route, good hygiene practices need to be observed. Follow your employer's decontamination procedures in the HASP, which should include a way to wash before eating, drinking, using toilet (NOTE: This can be difficult in very remote locations).
- Oil can rub off dirty hands and contaminate food, drinks or tobacco products.
- Chemicals in the air can settle on food or drink and be swallowed.
- Swallowed chemicals are absorbed in the digestive tract.
- Chemicals can be caught in mucus and swallowed.

Injection

- The chemical enters the body through a sharp object like a needle.
- Injection may occur when a worker is cut or their skin is punctured by a sharp, contaminated object such as metal, glass or a needle.
- **Cleanup workers may encounter random debris (including medical waste) and come into contact with products containing asbestos debris, PCB and pesticide containers.**
- Disaster response and cleanup frequently requires handling of debris containing sharp objects.
- When handling sharp objects and debris that may be contaminated, wear a protective, durable work glove over your chemical protective glove.

Personal Protective Equipment (PPE) Protection

- Depending upon your work site's PPE program and assigned job task, any of the following PPE may be required:

- **Level D modified clothing is the most common - Protective pants, boots, disposable gloves, life jackets and duct tape. Protective pants are typically tied off at the waist. Boots are duct taped to pants in order to form a seal.**

- Disposable gloves need to be replaced as they will fill up with water/sweat.

- NOTE: More conventional hazmat gear will likely not be used. Rarely, respirators ranging from an N-95 to a Powered Air Purifying Respirator (PAPR) will be used.

Working Near the Water

- There is a potential for drowning when working in this environment. Make sure life jackets or personal flotation devices (PFDs) are available and used when working in/near the water.

NOTE: Make sure the site safety plan addresses these issues.

PPE Protection for Shoreline Cleanup Operations

Four and ½ levels of PPE

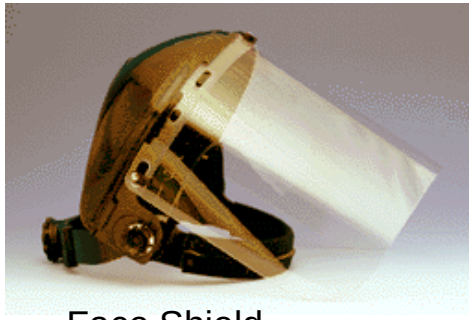
- Level A
- Level B and B+

- **Level C (will focus on these)**
- **Level D and D modified (will focus on these)**

PPE Examples

Safety glasses

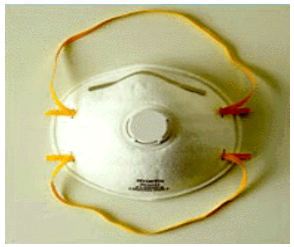
Safety Goggles



Face Shield

Level C PPE with Coated Protective splash suit and APR respirators

Example of Leather gloves
Courtesy Kirkwood



N-95 respirator

½ face APR

Example of Nitrile gloves
Courtesy Kirkwood

Level C

- Air Purified Respirator (APR) (full or ½ face) or PAPR
- Splash suit
  - Choice of fabric, seam and design should be based on expected level of liquid oil exposure
- Inner and outer gloves
- Eye Protection if ½ face APR is worn
- Boots
- May have head protection

Level D

- Could include:
  - Apron
  - Gloves
  - Hard hat
  - Eye protection
  - Boots
  - (Basic work PPE)
  - Liquid-resistant sleeves

Level D Modified PPE Doffed to Waist

How Can You Protect Yourself from Hazardous Chemicals?

When dealing with health and safety hazards try to control them by using the hierarchy of controls

Respirators

- Wear NIOSH-approved respirators with the proper cartridges for the hazards in your work area (which may include organic vapor types). This should be included in your employer's HASP:
  - Dust masks do not provide adequate protection against vapors, gases, and some toxic materials.
  - Cartridges must be changed based on change-out schedule determined by employer.
  - If a full respirator is used, there is a need for training, fit testing, medical approval and change-out schedule, cleaning and maintenance procedures. Disposable half face with OV cartridges may be used.
  - Users must be fit tested for any air purified respirator (APR) regardless of face type.

½ face respirator with P-100/OV/AG cartridges

If in doubt about respirators, see your Supervisor!

See: OSHA Respiratory Protection standard, 29 CFR 1910.134

N-95 Respirator

Tips for Using PPE

- NEVER use damaged PPE.
- Only use PPE that has been properly selected for the given hazard and that fits correctly.
- Make sure you have had training before donning PPE in the hazard zone.
- Always inspect PPE before use.
- PPE should be properly cleaned and inspected before use.

Only use PPE as a last resort to control hazards!

Basics of Decontamination: Types of Contamination

- All workers leaving the Exclusion Zone whether contaminated or not should be considered exposed and be decontaminated.

- This is because:
  -Contamination cannot always be seen
  -Contamination may be located on the surface of PPE or on the inside (permeation)
  -We never assume anything is 100% clean

- Decontamination Protection Levels
  - Specified on the site specific plan (SSP)
  - Decon personnel same level as entry team or one level down
  - Based on:
    - Degree of hazard
    - Amount of contamination
    - Length of exposure

Mass decon: Photo courtesy IUOE

Decontamination (Decon)

- Process of removing, destroying, or reducing the activity of materials such as toxic chemicals that could endanger a person or the environment.
- Prevents spreading contamination to other locations (like your vehicle or home).
- **Site workers who use the site's Standard Operating Procedures/Guidelines (SOP/SOG) are less likely to be contaminated than site workers who do not use these practices.**
- **All HASPs must cover decontamination procedures.**

Depending on your job task, you may come in contact with hazardous materials which will require you to be decontaminated.

Decontamination Sequence

- Remove all tape first
- Remove boots and outer gloves
- Remove suit by only touching inside
- Remove APR (if applicable)
- Remove inner gloves
- Wash hands and face
  - avoid inadvertent ingestion
  - remember nothing is 100% clean
- Avoid handling contaminated equipment, PPE
- Know water source before using
- No water present - bring towelettes or waterless hand cleaner

Types of Decontamination

- Primary
  - Performed on-scene in the Contamination Reduction Zone (CRZ)
- Secondary
  - If necessary (tool, respirator cleaning)
  - Performed post incident not in CRZ
- Emergency
  - Normally performed by first responders
  - May not be formal decon procedures

Decontamination

Primary

- Located immediately outside the hot zone
- May include full wash/rinse routine or may be dry decon
- Full wash/rinse involves large amounts of water
- Concentrate on most heavily contaminated areas first
- PPE removed in proper sequence

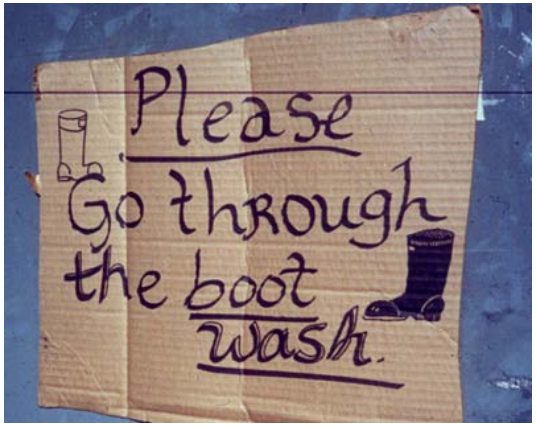
Secondary

- Usually involves tools & equipment
- Important to wear gloves
- Some equipment difficult to decon

Emergency Decontamination

- Rapid removal of contaminated clothing
- Usually involves rinsing and removal
- Done anywhere
- Done if danger to life/health
- Certain substances (corrosives) may require emergency decontamination

Decontamination



Field decon boot wash

MODULE 3

Other Cleanup Health and Safety Issues

Heat Stress

Common signs and symptoms workers experience for each of these conditions.

Heat Stress	Heat Exhaustion	Heat Stroke
Headache	Headache	Headache
Thirst	Dizziness	Dizziness
Profuse sweating	Confusion	Restlessness
Muscle aches	Nausea	Confusion
	Sweating-pale, clammy skin	Hot, flushed dry skin
	Cramps in legs & abdomen	Body temp above 104°F
	Rapid, weakening pulse & breathing	Unresponsive/disoriented

Heat Stress (continued)

- Take frequent drinks during the work shift. Drink sports drinks, instead of water, if you can. Avoid alcohol, caffeinated drinks, or heavy meals.
- Take frequent rest breaks during the shift. Heat stroke is a killer. Know the signs of heat-related illnesses.
- Monitor yourself and coworkers, use the buddy system. Use monitoring such as aural temperature readings.
- Block out direct sun or other heat sources and shelter in shaded areas.
- Wear lightweight, light-colored, loose-fitting clothes and a hat if available. Get medical help for symptoms such as altered vital signs, confusion, profuse sweating, excessive fatigue, or rapid heartbeat.

Heat Stress (continued)

- Seek medical attention for symptoms of:
  - Extremely high body temperature (above 103°F)
  - Red, hot, and dry skin (no sweating)
  - Rapid, strong pulse
  - Throbbing headache
  - Dizziness
  - Nausea

- Take shelter in shaded areas and loosen or remove excess protective clothing if feasible.

- If available, use cooling equipment, such as vortex tubes, chilling vests or chilled supplied air, in order to maintain proper body temperature.

Sunburn

- Prevent overexposing skin and eyes to sunlight and wind.
- Use sunscreen and lip balm.
- Use protective eyewear.
- Limit exposure as much as possible. Take frequent breaks in shaded areas, if possible.
- Sunburn reduces responder readiness and increases the likelihood of skin cancer.

Eye Injuries

- Eye injuries can be caused by dust, flying debris, oil droplets, and other chemicals.
- Use safety glasses with side shields as a minimum. An eyewear retainer strap is suggested.
- Consider safety goggles for protection from chemicals or for use over regular prescription eyeglasses.
- Only use protective eyewear that has an ANSI Z87 mark on the lenses or frames.

Noise Exposure

- Use hearing protection whenever noisy equipment is used.
- If you can't have a normal conversation with someone 3 feet away or closer you probably need hearing protection!

! Hearing protection must be part of a hearing conservation program.

Slips, Trips and Falls

- Watch for slips, falls, and trips, especially while walking and working on oil slick surfaces. In a cleanup, many surfaces, including steps, ladder rungs, and boat decks may be slippery from oil.

- Be careful walking over debris that is covered with water or oil due to increased risk of slips, trips and falls. Be extra careful if you are handling or carrying anything.

Vehicle and Boat Use

- Make sure your vehicle or boat is working properly.
- Obey all traffic laws.
- Drive defensively.
- Be prepared for delays.
- Watch for vehicles, flaggers, and overloaded vehicles.
- BOATING – be careful when working over and near the water. Wear a life jacket or personal floatation device when working near water.

Avoid Using Large Vehicles on Populated Beaches

Heavy Equipment

- OSHA requires machinery to be inspected by a qualified worker before each use.
- Be alert to the activities around you.
- Do not use equipment unless trained to do so.
- Do not walk under or through areas where heavy equipment is lifting objects or behind equipment.
- Do not climb onto or ride loads being lifted or moved. Do not ride on equipment or in bucket.

Trench Foot (Immersion Foot)

- Trench foot, also known as immersion foot, occurs when the feet are wet for long periods of time. It can be quite painful.
- Symptoms include a tingling and/or itching sensation, pain, swelling, cold and blotchy skin, numbness, and a prickly or heavy feeling in the foot. The foot may be red, dry, and painful after it becomes warm. Blisters may form, followed by skin and tissue dying and falling off. Obtain medical assistance as soon as possible.
- To prevent trench foot, when possible, air-dry and elevate your feet, and exchange wet shoes and socks for dry ones.

Poisonous Plants

- Learn to recognize poisonous plants:
  - Poison Ivy
  - Poison Oak
  - Poison Sumac
- Use gloves and wear long pants when contact with poisonous plants is possible.
- Rubbing alcohol, if used immediately upon exposure, may remove the oily resin that causes the allergic reaction.
- Clothes, shoes, and tools may become contaminated from contact with poisonous plants.
- **The allergens from burning poisonous plants can be inhaled, causing lung irritation!**

Insects and Insect-borne Diseases

- Mosquitoes – Mosquitoes can carry diseases such as West Nile virus. Use screens on dwellings, and wear long pants, socks, and long-sleeved shirts. Use insect repellents that contain DEET or Picaridin. (Make sure you follow the directions written on the label.)

- Chiggers or Trombiculidae - is a family of mites (also called berry bugs; harvest mites; red bugs; scrub-itch mites) attach to the host, pierce the skin, inject enzymes into the bite wound that digest cellular contents, and then suck up the digested tissue through a tube formed by hardened skin cells called a stylostome. They do not burrow into the skin or suck blood. Itching from a chigger bite may not develop until 24–48 hours after the bite, where a red welt/bump on the skin may appear. The larva remains attached to a suitable host for 3 to 5 days before dropping off to begin its nymph stage. Use insect repellents that contain DEET or Picaridin. (Make sure you follow the directions written on the label.)

Insects and Insect-borne Diseases (continued)

- Spiders – Depending on the area of the country, black widow and brown recluse spiders may be present. If you suspect being bitten by a venomous spider seek medical attention and bring in the spider, if available, for identification.

- Ticks – Ticks can carry diseases such as Lyme, Ehrlichiosis, and Babesia. Use insect repellent with DEET and wear long sleeves, long pants and socks. Check your body for ticks after being outdoors. If you notice a tick on your skin, remove promptly. To remove, use tweezers, if available, pulling straight up in a steady, slow motion.

Animals and Animal-borne Diseases

- Beware of wild or stray animals. Avoid wild or stray animals. Call local authorities to handle animals.

- Many animals will die due to exposure with the crude oil. Get rid of dead animals according to local guidelines. Wear proper protective clothing when handling carcasses.

- If you do get bitten or scratched by an animal, seek medical attention immediately, even if it is a domestic animal.

Beware of Alligators and Snakes

Alligators

- American alligators live in freshwater environments, such as marshes, wetlands, and swamps, as well as brackish environments (between salt and fresh waters).
- Large male alligators are solitary, territorial animals and will defend prime territory.
- Be aware of your surroundings. Try to stay at least fifteen feet away.
- Avoid surprising the reptiles.
- Fight back if you're attacked.
  - Go for the head.
  - Get medical attention promptly!

Snakes and Other Reptiles

- Be on the alert for snakes swimming in the water to get to higher ground and hiding under debris or other objects. If you see a snake, back away from it slowly and do not touch it.
- If you or someone else is bitten by a snake:
  - Remember the color and shape of the snake, which can help with treatment of the snake bite.
  - Keep the bitten person still and calm; this can slow down the spread of venom if the snake is poisonous.
  - Seek medical attention as soon as possible; dial 911 or call local Emergency Medical Services (EMS).
  - Apply first aid if you can not get the person to the hospital right away Lay or sit the person down with the bite below the level of the heart; tell him/her to stay calm and still.
  - Cover the bite with a clean, dry dressing.
  - Use appropriate tools to move debris and to probe areas that may harbor snakes or other threats.

Other Protective Measures

- Insect repellent with Deet or Picaridin
- PPE – For information on what equipment you need for protection, contact your local OSHA office or NIOSH
- Personal floatation device
- Earplugs
- Bottled water
- Sunscreen
- Rain gear
- Pocket Knife (put in your checked luggage)

Fatigue and Stress

- Pace yourself, especially when working long shifts and many days in a row and take frequent rest breaks.
- Watch out for each other. Use the buddy system on your crews, especially in remote locations. Co-workers may not notice a hazard nearby or behind.
- Be conscious of those around you. Responders who are exhausted, feeling stressed or even temporarily distracted may place themselves and others at risk.
- Maintain as normal a schedule as possible: regular eating and sleeping are crucial.
- Make sure that you drink plenty of fluids such as water or sports drinks.
- **Decon prior to eating, drinking, or smoking**

Fatigue and Stress (continued)

- Whenever possible, take breaks away from the cleanup area. Eat and drink in the cleanest area available.
- Recognize and accept what you cannot change—the chain of command, organizational structure, waiting, equipment failures, etc.
- Many cleanup workers will be from the affected communities. Give yourself permission to feel rotten: You are in a difficult situation.
- Recurring thoughts, dreams, or flashbacks are normal—do not try to fight them. Seek counseling as needed.
- Communicate with your loved ones at home as frequently as possible.

Fatigue and Stress (continued)

What you can do at home:

- Reconnect with family, spiritual, and community supports.
- Consider keeping a journal.
- Do not make any big life decisions.
- Spend time with others or alone doing the things you enjoy to refresh and recharge yourself.
- Be aware that you may feel particularly fearful for your family. This is normal and will pass in time.

Fatigue and Stress (continued)

What you can do at home:

- Remember that “getting back to normal” takes time. Gradually work back into your routine. Let others carry more weight for a while at home and at work.
- Be aware that recovery is not a straight path but a matter of two steps forward and one back. You will make progress.
- Your family will experience the disaster along with you. You need to support each other. This is a time for patience, understanding, and communication.
- Avoid overuse of drugs or alcohol. You do not need to complicate your situation with a substance abuse problem.
- Refer to counseling if needed.

Summary

- Proper training is a key component of a safe response and cleanup.
- The oil and hazardous materials associated with the cleanup can be hazardous to human health.
- The hazards and issues covered in this training tool are dynamic and require vigilance and flexibility.
- The key to a safe response is attention to the safety issues of your work environment.

REMEMBER – if you are unsure about an activity or operation, stop what you are doing and consult with a supervisor!

Information Sources

This training tool is based on recommendations from:

- National Institute of Environmental Health Sciences (NIEHS)
- National Institute for Occupational Safety and Health (NIOSH)
- Occupational Safety and Health Administration (OSHA)
- Centers for Disease Control and Prevention (CDC)
- Environmental Protection Agency (EPA)

Factsheets from these agencies and other oil spill response resources are available on the NIEHS National Clearinghouse for Worker Safety and Health Training website, http://tools.niehs.nih.gov/wetp and http://www.osha.gov.