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API Selection and Training Guidelines for In Situ Burning Personnel

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API Selection and Training Guidelines for *In Situ* Burning Personnel

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HOW TO USE THIS DOCUMENT

THE FIRST TEN SECTIONS OF THIS DOCUMENT DESCRIBE THE CAPABILITIES THAT MAY BE NEEDED BY EACH OF THE TEN POSITION DESCRIPTIONS THAT ARE EXPECTED TO DESCRIBE ALL *IN SITU* BURN RESPONDERS. DETAILS OF MANY OF THESE CAPABILITIES ARE COMMON TO SOME OR ALL POSITIONS. TO AVOID REPETITION, SUCH DETAILS ARE LISTED IN THE ELEVENTH SECTION.

FOR A LISTING OF CAPABILITIES THAT MAY BE NEEDED FOR A PARTICULAR POSITION, SEE THE SPECIFIC SECTION FOR THAT POSITION. THESE CAPABILITIES ARE INDEXED TO THE DETAILS IN THE ELEVENTH SECTION.

TO VIEW ALL *IN SITU* BURN RELATED CAPABILITIES AND THE DETAILED JOB PERFORMANCE REQUIREMENTS, REQUISITE KNOWLEDGE, AND REQUISITE SKILLS FOR EACH CAPABILITY—GO DIRECTLY TO THE ELEVENTH SECTION.

THE OVERALL SUPERVISOR OF AN *IN SITU* BURN OPERATION MAY HAVE A DIFFERENT INCIDENT COMMAND SYSTEM TITLE DEPENDING UPON WHETHER THE OPERATION IS THE ONLY RESPONSE OPERATION BEING CONDUCTED OR IS ONLY PART OF A LARGER RESPONSE EFFORT. TO AVOID CONFUSION, THE TERM BURN BOSS IS USED IN THIS DOCUMENT TO REFER TO THE OPERATIONAL SUPERVISOR OF THE *IN SITU* BURNING ACTIVITY; HOWEVER, THAT ACTIVITY MAY BE ASSIGNED IN A PARTICULAR INCIDENT COMMAND ORGANIZATIONAL STRUCTURE. THE TERM BURN BOSS ORIGINATED FROM THE WILDLAND PRESCRIBED BURN CONTEXT.

Introduction

This document was developed under the auspices of the Joint Industry Oil Spill Preparedness and Response (OSPR) Task Force (JITF) and the American Petroleum Institute, Oil Spill, Emergency Preparedness & Response Subcommittee (OSEPR). These groups convened to evaluate the procedures and lessons learned during the *Deepwater Horizon* oil spill response. The initial focus was to identify potential opportunities for improvement to the oil spill response system. One of the categories addressed by the JITF and OSPR was *in situ* burning of spilled oil. Within this category, a number of projects were identified to be worked on by individual project teams. One of those projects was to develop selection and training guidance for oil spill responders to *in situ* burns. Consequently, a project team was formed of volunteers representing the oil and gas industry, federal and state government, subject matter experts, oil spill response organizations, and manufacturers of relevant equipment.

This document was developed to assist in selection and training of *in situ* burn responders. Guidance for making an appropriate decision to use *in situ* burning is covered in *A Decision-maker's Guide to In-situ Burning,* API Publication 4740.

Project Mission: To develop guidelines to ensure *in situ* burn responders have the necessary competencies to safely execute their jobs during a burn. The purpose of this guidance is to provide a systematic approach to assist users in the selection of responder qualifications and the training requirements for responders to spilled oil in the open water environment, ice conditions on water bodies, and the inland environment, including spills affecting waterways and those lakes not considered open water.

Target Audience: These guidelines are intended to be primarily used by training officers, to develop a curriculum to train *in situ* burn responders, and a burn boss, to determine the level of competency of a burn team.

Charter: This document was produced by a cross-functional team of responders and interested parties who drew on their experience, their colleagues' experience, and available literature to develop guidelines of competencies for *in situ* burn responders.

Organization of the Guidelines: Ten specific job positions descriptions are identified, which are designed such that all participants in an *in situ* burn operation can be assigned to one or several of the positions described, for training and experience purposes. The ISB positions are:

1. Burn Boss (ISB Operations Supervisor)
2. Safety Officers
3. Vessel Captains
4. Fire Suppression Specialists
5. Ignition and Spill Control Agent Specialists
6. Small Boat Operators and Deck Hands
7. Air Monitoring Specialists
8. Skilled Support Personnel
9. Aerials Surveillance Specialists
10. Observers

The basic requisite skills, which apply across all positions, are presented last, in Section 11 of this document. Each of the ten identified positions have five competency categories. These follow the usual time sequence of a response: analysis, planning, implementation, evaluation, and termination. Training and fitness are a sixth category. Each competency category has a number of competencies that are usually relevant for that position.

For each position:

- Competencies are listed in the section with the position description.
- Competencies are further defined by Job Performance Requirements.
- Training and/or experience for each Job Performance Requirement are described by the listed *Requisite Knowledge* and *Requisite Skills*.
- Competencies are identified for three types of spill locations:
    - open water,
    - on land, rivers, streams, and small lakes,
    - various ice on water conditions.

The detail of Job Performance Requirements is only contained in Section 11 of this document to avoid repetition. Section 11 is cross-referenced with Sections 1 through 10 by using a parallel numbering system in the following manner.

X Position

X.X Competency Category

X.X.X Competency

X.X.X.X Job Performance Requirement
Requisite Knowledge...
Requisite Skills...

0 Administration

0.1 General

0.1.1 Scope: This guidance is intended to be international in its scope with United States regulatory requirements used as exemplars that may be replaced by applicable jurisdictional requirements. References to the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation (29 *CFR* 1910.120) and the Incident Command System (ICS) may be replaced by local jurisdictional requirements outside of the United States. In the absence of applicable local requirements, HAZWOPER and ICS should be considered as a recognized standard of practice. This guidance is not intended to instruct the reader on how to conduct an *in situ* burn, or overlap with either of the *in situ* burn manuals (API Technical Reports 1251 & 1252).

0.1.2 Purpose: The purpose of this guidance is to provide a systematic approach to assist users in the selection of responder qualifications and the training requirements for responders to *in situ* burning of spilled oil in the open water environment, ice conditions on water bodies, and the inland environment, including spills affecting waterways and those lakes not considered open water. It is not intended to describe when to use *in situ* burning.

0.1.3 Applicability: The intent of this guidance is not to specify minimum training and/or competency requirements applicable to all situations. Instead, it is intended to inform those managing an oil spill response of likely skill levels needed to perform in a variety of circumstances. Situation specific requirements should be selected from among the following guidance by spill managers to reflect the needs of that incident, with personnel safety being a primary consideration. In some situations one person may have dual roles for which a blend of competencies and/or training may be appropriate.

0.1.4 Equivalency of Experience and Training: Competencies listed in this guidance are designed to be met by either experience or training, except where applicable law specifies training. Each competency has a description of the requisite knowledge and skills that usually apply to that competency. Those managing responder selection for a specific incident can modify the knowledge and skills necessary for the situation and conditions.

0.1.5 Medical Qualification and Skills

0.1.5.1 Medical Qualification: Some jurisdictions require by law or regulation that workers assigned certain tasks be medically qualified as capable of performing the tasks without risk of medical complications due to a lack of medical fitness of the worker. In the United States, the HAZWOPER regulation has such requirements that apply to oil spill response using *in situ* burning. The fitness of each worker for assigned tasks is determined by a licensed health care professional, usually an occupational health physician. If a worker exhibits symptoms of exposure, the worker must be re-qualified to be allowed to return to performing those tasks.

0.1.5.2 First Aid: Some jurisdictions require by law or regulation that employers ensure the ready availability of medical treatment in near proximity to the workplace. In the United States, the OSHA regulation on Medical Services and First Aid (29 *CFR* 1910.151) applies. Near proximity means 3–4 minutes in workplaces where serious accidents such as those involving falls, suffocation, electrocution, or amputation are possible. The employer must ensure that an available employee trained in basic first aid; EMS response personnel; or a clinic, infirmary, or hospital must be in near proximity. The HAZWOPER regulation at 29 *CFR* 1910.120(q)(3)(vi) also has requirements about advanced first aid availability; see the standard and the OSHA interpretation letter of July 17, 1991.

0.1.6 Position Competency Matrix: This matrix provides an overview of the competencies recommended for each of the defined positions. Designated personnel are to have training or experience meeting or exceeding OSHA's Best Practices for Workplace First Aid Training Programs, taking into account the rapid availability of professional medical care and the potential of specific kinds of injuries.

Position Competency Matrix

Position → ---------- Competency ↓	Burn Boss	Safety Officer	Vessel Captain	Fire-fighter	Ignition Specialist	Small Boat Operators & Deck Hands	Air Monitoring	Skilled Support Personnel	Aerial Survey Specialist	Observer
Oil Hazards	X	X	X	X	X	X	X	X	X	X
Sensitive Resources	X		X	X	X			X*	X	X*
Risk to Environment	X							X*		X*
Task Force Tactics	X	X	X	X	X	X	X	X*	X	X
Vessel Navigation			X							
Vessel Handing			X							
Small Boat Safety	X	X	X		X*	X	X*	X*		
Spill Control Agent Usage	X	X			X*					
PPE	X	X	X	X	X	X	X	X		X
On-Water Ignition	X	X	X		X					
Ignition on Land/Ice	X	X			X					
Aerial Ignition	X	X			X					
Ops Briefing	X	X	X	X	X	X	X	X	X	X
Boom Deployment	X		X		X	X				
Boom Towing			X			X				
Deck Hand & Small Boats	X		X		X*	X	X*	X*		
Firefighting	X	X	X	X	X	X	X	X*		
First Aid	X*	X*	X*	X*	X*	X*	X*	X*		X*
Air Monitoring	X	X					X			
Aerial Survey	X		X						X	
Worker Exposure	X	X	X	X	X	X	X	X	X	X
Response Critique	X	X	X	X	X	X	X	X	X	X*
Impact to Environment	X						X	X*		
OSHA HAZWOPER	24	24	8 to 24	24	24	8 to 24	24	24	Briefing	Briefing
ICS	ICS-300+	ICS-200+	ICS-200	ICS-200	ICS-100	ICS-100	ICS-100	ICS-100	ICS-100	
Fitness	Light	Moderate	Moderate	Arduous	Arduous	Arduous	Moderate	As Needed	Light	Light

* When this is an assigned task.

API Selection and Training Guidelines for *In Situ* Burning Personnel

U.S. Navy photo by Mass Communication Specialist 2nd Class Justin Stumberg

1 Burn Boss (Operations Supervisor)—Selection and Training Recommendations

1.1 General

1.1.1 Introduction: The burn boss is the person in command of *in situ* burn operations. The burn boss shall have training and/or experience to:

- Analyze the oil spillage proposed for *in situ* burning.
- Plan specific tactical operations for the location where the spilled oil is situated and with the equipment available.
- In open water, situations this person shall:
    - direct efficient vessel, small boat, and boom usage,
    - enforce vessel and small boat safety.
- In environments that are mainly terrestrial, this person shall:
    - direct efficient use of work crews, earthmoving equipment, boom deployment from shore or small boats;
    - enforce fire ground discipline and small boat safety.
- In ice conditions on water, this person shall:
    - direct efficient vessel, small boat, and boom usage,
    - direct burning operations on ice and in ice trenches or around ice on a water body,
    - enforce vessel and small boat safety.
- In all situations, this person shall:
    - ensure appropriate personal protective equipment usage,
    - evaluate burning effectiveness and air quality impacts, and
    - effectively manage personnel directly involved with the burn.

The burn boss is responsible to approve all aspects of *in situ* burn operations but may be assisted by the recommendations of the safety officers, air monitoring specialists, the environmental unit (if one is stood up), vessel captains, and other subject matter experts.

1.1.2 Position Definition: The person in overall command of *in situ* burn operations will be referred to as the burn boss in this guidance. The burn boss is that person responsible for all decisions relating to the management of *in situ* burning conducted in a location isolated from any other spill response operations. For a small spill where *in situ* burning is the only response technique and the source has been secured, this person may be the incident commander in the context of a NIMS incident command system. In a larger spill with multiple response operations, this person may have an incident command system title of a branch director, division supervisor, or a task force leader.

1.1.3 Goal: The goal of this section is to ensure the *in situ* burn boss has the knowledge and skills to perform the following tasks safely.

(a) Analyze a spilled oil incident in the open water environment to determine the magnitude of the situation in terms of outcomes by completing the following tasks:

1. Collect and interpret hazard and response information from printed resources, technical resources, computer databases, and monitoring equipment.
2. Estimate the potential outcomes of various alternative *in situ* burning techniques within the impacted area at the oil spill incident.

(b) Plan *in situ* burn operations within the capabilities of available resources by completing the following tasks:

1. Identify the response objectives for the *in situ* burning of spilled oil.
2. Identify the potential tactical options available by response objective.
3. Approve a Site Safety Plan including the level of personal protective equipment required for personnel assignments when implementing a given tactical option.
4. Develop a tactical Incident Action Plan for the operational period.

(c) Implement *in situ* burn operations by completing the following tasks:

1. Establish an Incident Command System (ICS) organization for the *in situ* burn.
2. Direct assigned resources by allocating tasks and managing on-scene activities.
3. Ensure management overview, technical expertise, and logistical support are sufficient to maintain tactical operations.
4. Provide a focal point for information transfer through the ICS structure.

(d) Evaluate the progress of the planned response to ensure the response objectives are being met safely, effectively, and efficiently and adjust the burn plan accordingly by evaluating the effectiveness of the control functions.

(e) Terminate the response by completing the following tasks:

1. Conduct a response debriefing.
2. Conduct an after action critique.
3. Report and document the *in situ* burn operation, including residuals, to the proper authority.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

1.2 Competencies—Analyzing the Situation

1.2.1 Oil Hazards Control

1.2.1.1 Identify hazards to *in situ* burn oil spill responders.
1.2.1.2 Approve acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
1.2.1.3 Predict the behavior of spilled oil in varying conditions for all operational environments.
1.2.1.4 Identify conditions conducive to successful *in situ* burning of spilled oil.
1.2.1.5 Analyze ice conditions and forecasts that may affect oil spill response (when the situation involves ice conditions on water).

1.2.2 Identification and Protection of Sensitive Resources

1.2.2.1 Identify sensitive resources in the area of *in situ* burn operations.
1.2.2.2 Predict the impact of *in situ* burning on the sensitive resources identified.
1.2.2.3 Develop protection strategies for sensitive resources.

1.2.3 Anticipate Potential Environmental Impacts of *In Situ* Burning of Oil

1.2.3.1 Identify airborne impacts.
1.2.3.2 Identify surface water impacts.
1.2.3.3 Identify subsurface water impacts.
1.2.3.4 Identify soil impacts.

1.3 Competencies—Planning the *In Situ* Burn Response

1.3.1 Task Force Tactics

1.3.1.1 Identify and decide on tactical options for *in situ* burning.
1.3.1.2 Specify minimum equipment capabilities and quantities for the applicable operating environments.
1.3.1.3 Develop a timeline for daily *in situ* burn operations.
1.3.1.4 Approve protective actions to ensure the health and safety of response personnel.

1.3.2–1.3.3 NA

1.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil (when used)

1.3.4.1 Awareness of small boat safety issues.
1.3.4.2 Small boat seaworthiness, stability, and safety.
1.3.4.3 Small boat transfer practices.

1.3.5 Spill Control Agent Usage During *In Situ* Burning of Oil (when used)

1.3.5.1 Be able to identify conditions where the use of spill control agents would significantly enhance the effectiveness of *in situ* burning.
1.3.5.2 Understand the legal requirements for using spill control agents.
1.3.5.3 Understand the environmental conditions when spill control agents can be effectively used.
1.3.5.4 Evaluate the hazards and application techniques relating to safe use of spill control agents.

1.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

1.3.6.1 Understand and approve the use of general personal safety equipment and procedures considering the recommendations of the safety officer.
1.3.6.2 Approve and direct the use of commercial personal floatation devices during *in situ* burn operations on or near water.
1.3.6.3 Approve and direct the use of personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.
1.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

1.3.7 On-Water Ignition of *In Situ* Burning of Spilled Oil (when used)

1.3.7.1 Be able to select and direct deployment of appropriate ignition systems.
1.3.7.2 Evaluate spilled oil weathering and emulsification as that affects ignitability.
1.3.7.3 Inspection and evaluation of the condition of fire boom for further use.

1.3.8 Ignition of *In Situ* Spilled Oil on Land or Solid Ice (when used)

1.3.8.1 Be able to select and direct deployment of appropriate ignition systems.
1.3.8.2 Evaluate spilled oil distribution to optimize ignition sequencing.
1.3.8.3 Inspection and evaluation of the condition of burn areas for further action.

1.3.9 Aerial Ignition of *In Situ* Burning of Spilled Oil (when used)

1.3.9.1 Be able to describe and specify the necessary airframe, ignition system equipment, personnel qualifications, safety features, aviation management, and ground support needed for helitorch operations or other appropriate aerial ignition system.
1.3.9.2 Develop and brief to pilots and air crew a detailed firing plan and communications protocol.
1.3.9.3 Be able to direct pilots as to ignition locations, timing, and firing sequences in accordance with *ad hoc* instructions or a detailed ignition plan.

1.4 Competencies—Implementing a Planned *In Situ* Burn Response

1.4.1 Operational Period Briefing

1.4.1.1 Ensure that a pre-operations work plan and safety briefing is delivered to all personnel involved in the *in situ* burn response.

1.4.2 Fire Boom and Containment Boom Deployment and Recovery (when used)

1.4.2.1 Evaluate and select fire boom and containment boom for *in situ* burning.
1.4.2.2 Specify vessel speed and power characteristics for positioning fire boom.
1.4.2.3 Approve the installation of towing bridle components for towed boom.
1.4.2.4 Direct deployment of fire and containment boom on open waters.
1.4.2.5 Direct the installation of mooring lines and anchors for boom deployed from shore.
1.4.2.6 Direct recovery and cleaning or disposal of oiled boom and towing bridle components.

1.4.3 NA

1.4.4 Deck Hand and Small Boat Operations

1.4.4.1 Small boat operations.
1.4.4.2 Small boat handling.
1.4.4.3 Small boat emergencies.

1.4.5 Fire Suppression During *In Situ* Burning of Oil

1.4.5.1 Direct tactical operations that result in self-extinguishment of burning oil on the water.
1.4.5.2 Direct firefighting on boom towing vessels, small boats, and support vessels.
1.4.5.3 Ensure that conditions during burns on land support effective fire control and smoke management.
1.4.5.4 Design firebreaks to limit the spread of burning oil to controllable areas.
1.4.5.5 Position equipment and crews to ensure that burning does not extend beyond the planned burn area.
1.4.5.6 Ensure that escape pathways on land are identified and maintained for all personnel.

1.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (see 0.1.5.2)

1.4.6.1 In consultation with the safety officers, ensure that workers are designated and capable of performing first aid for co-workers.
1.4.6.2 Designate medical support facilities to send casualties to when injuries need treatment or evaluation beyond the first aid level of care.

1.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

1.5.1 Airborne Hazards Monitoring

1.5.1.1 Approve the hazards to monitor, action levels, and corrective action options.
1.5.1.2 Approve the selection of monitoring equipment.
1.5.1.3 Approve a Quality Assurance Project Plan (QAPP) for airborne hazard monitoring.
1.5.1.4 NA

1.5.2 Aerial Surveillance of *In Situ* Burning Progress (when used)

1.5.2.1 Direct aerial surveillance to observe, interpret, and communicate the location and circumstances of oil that may be amenable to *in situ* burning.

1.5.2.2 Coordinate oil collection tactics with boats using aerial surveillance (when boats are used).

1.5.2.3 Direct the documentation of spilled oil collection and burn efficiency.

1.5.2.4 Direct the deployment and collection of data from unmanned observation platforms such as unmanned aerial vehicles, drones, and tethered balloons (when used).

1.6 Competencies—Terminating the *In Situ* Burning Response

1.6.1 Worker Exposure Briefing and Recordkeeping

1.6.1.1 Conduct worker exposure briefings.

1.6.1.2 Ensure that Site Safety Plan documentation is complete.

1.6.1.3 Ensure that any injuries or workers developing signs and symptoms indicating possible overexposures or health hazards receive appropriate medical evaluation and treatment.

1.6.2 Response Effectiveness Analysis and Critique

1.6.2.1 Perform analysis of response actions.

1.6.2.2 Provide a common operating picture to the following operational period.

1.6.2.3 Evaluate the effectiveness of spilled oil removal by *in situ* burning operations.

1.6.2.4 Conduct a critique of the response involving all members of the operation.

1.6.3 Documenting Environmental Impacts of *In Situ* Burning of Oil

1.6.3.1 Record environmental impacts evidenced by air monitoring data, oil removal effectiveness data, and observations/data on impacts to sensitive resources.

1.6.3.2 Understanding the nature, mass, and extent of unrecovered burn residue.

1.7 Training and Physical Fitness

1.7.1 OSHA HAZWOPER Training

1.7.1.1 24 hours of *in situ* burn focused HAZWOPER initial emergency response training.

1.7.2 Incident Command System (ICS) Training

1.7.2.1 ICS-100 Introduction to the Incident Command System.

1.7.2.2 ICS-200 ICS for Single Resources and Initial Action Incidents.

1.7.2.3 ICS-300 Intermediate ICS for Expanding Incidents.

1.7.2.4 Advanced position specific training (ICS-410) is suggested for complex burns.

1.7.3 Physical and Mental Fitness

1.7.3.1 Personnel should have the capability for LIGHT physical activity. See Subsection 11.7.3.1.

1.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods.

1.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

1.7.4 NA

Elastec photo by Donnie Wilson

2 Safety Officers—Selection and Training Recommendations

2.1 General

2.1.1 Introduction: The safety officer for an *in situ* burn operation of spilled oil shall have training and/or experience to:

- Analyze the personnel safety hazards related to *in situ* burning.
- In the open water environment, this person shall:
  - understand the safety consequences of specific tactical operations proposed for the location where the spilled oil is situated; and
  - with the equipment to be used, ensure safe vessel, boat, and boom usage, as well as enforcing small boat safety.
- In environments that are mainly terrestrial, this person shall:
  - analyze safe use of work crews and earthmoving equipment,
  - assess fireground personnel placement,
  - assess safe boom deployment from shore or small boats,
  - enforce fire ground discipline, and
  - small boat safety.
- In ice conditions on water, this person shall:
  - analyze safe vessel, small boat, and boom usage,
  - burning operations on ice and in ice trenches or around ice on a water body,
  - enforce vessel and small boat safety.
- In all situations, this person shall:
  - ensure appropriate and personnel protective equipment usage,
  - evaluate air quality impacts for workers, and
  - effectively assist the *in situ* burn boss.

2.1.2 Position Definition: The safety officer of the *in situ* burn operation is that person who works within an incident command system to ensure that recognized safe practices are followed by all involved personnel throughout the conduct of the *in situ* burn. This safety officer will be called upon to provide technical advice or assistance regarding safety issues to the *in situ* burn boss and to the overall incident safety officer at an oil spill involving response activities in addition to *in situ* burning.

2.1.3 Goal: The goal of this section is to ensure the *in situ* burn safety officer has the knowledge and skills to perform the following tasks safely and to document the procedures in a written Site Safety Plan, or in a larger incident to the *in situ* burn annex to the overall Site Safety Plan.

(a) Analyze a spilled oil incident in the open water environment to determine the magnitude of the problem in terms of safety by completing the following tasks:

1. Collect and interpret hazard and response information from other responders, printed resources, technical resources, computer databases, and monitoring equipment.
2. Estimate the safety hazards for workers within the impacted area at the oil spill incident.

(b) Assist in planning *in situ* burn operations within the capabilities of available vessels and/or vehicles, personnel, containment & fire boom, personal protective equipment, and support equipment by completing the following tasks:

1. Identify the safety precautions for potential action options involving the *in situ* burning of spilled oil. If assigned, prepare an *in situ* burn annex to Site Safety Plan and otherwise review it and recommend any changes to the burn boss.
2. Provide recommendations regarding safety considerations attendant to tactical options.
3. Recommend the level of personal protective equipment required for personnel assignments when implementing a given tactical option.
4. Assist in the development of the tactical action burn plan by providing recommendations regarding worker safety.
5. Recommend appropriate decontamination procedures.
6. Ensure appropriate emergency medical services are provided.

(c) Ensure the safe implementation of *in situ* burn operations by completing the following tasks:

1. Perform the duties of a safety officer in an incident command system (ICS) organization for the *in situ* burn.
2. Identify safety considerations for personnel performing the response functions identified in the burn plan.
3. Conduct safety briefings for personnel performing the response functions identified in the burn plan.
4. Assist in the implementation and enforcement of safety considerations.
5. Maintain communications within the incident command structure during the incident.
6. Monitor status reports of activities in the area of operation.
7. Evaluate the monitoring of airborne emissions and exposure of workers, the public, and environmental receptors.

(d) Evaluate the progress of the planned response to ensure the response objectives are being met safely by completing the following tasks:

1. Identify deviations from safety considerations and any dangerous situations.
2. Alter, suspend, or terminate any activities that are judged to be unsafe.

(e) Assist in terminating the response by completing the following tasks:

1. Perform the reporting, documentation, and follow-up required by or assigned to the *in situ* burn safety officer.
2. Assist in the debriefing of *in situ* burn personnel. Assist in the after action critique.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

2.2 Competencies—Analyzing the Situation

2.2.1 Oil Hazards Control

2.2.1.1 Identify hazards to *in situ* burn oil spill responders.
2.2.1.2 Determine and recommend acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
2.2.1.3 Predict the behavior of spilled oil in varying conditions.
2.2.1.4 Identify conditions conducive to successful *in situ* burning of spilled oil.
2.2.1.5 Analyze ice conditions and forecasts that may affect oil spill response (when the situation involves ice conditions on water).

2.2.2–2.2.3 NA

2.3 Competencies—Planning the *In Situ* Burn Response

2.3.1 Task Force Tactics

2.3.1.1 Identify and evaluate tactical options for *in situ* burning.
2.3.1.2 Evaluate the safety considerations of equipment capabilities and quantities for the applicable operating environments.
2.3.1.3 Review the timeline for daily *in situ* burn operations.
2.3.1.4 Determine and recommend protective actions to ensure the health and safety of response personnel including the environment, oil, fire, and combustion products.

2.3.2–2.3.3 NA

2.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil (when used)

2.3.4.1 Awareness of small boat safety issues.
2.3.4.2 Small boat seaworthiness, stability, and safety.
2.3.4.3 Safe small boat transfer practices.

2.3.5 Spill Control Agent Usage During *In Situ* Burning of Oil (when used)

2.3.5.1 Be able to identify safety concerns when spill control agents are proposed to assist with *in situ* burning.
2.3.5.2 NA
2.3.5.3 Understand the environmental conditions when spill control agents can be safely used.
2.3.5.4 Evaluate the hazards and application techniques relating to safe use of spill control agents.

2.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

2.3.6.1 Ensure the use of general personal safety equipment and procedures.
2.3.6.2 Ensure the use of commercial personal floatation devices during *in situ* burn operations.
2.3.6.3 Ensure the use of personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.
2.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

2.3.7 On-Water Ignition of *In Situ* Burning of Spilled Oil (when used)

2.3.7.1 Assess the safety of selection and deployment of appropriate ignition systems.
2.3.7.2 NA
2.3.7.3 NA

2.3.8 Ignition of *In Situ* Spilled Oil on Land or Solid Ice (when used)

2.3.8.1 Assess the safety of selection and deployment of appropriate ignition systems.

2.3.8.2 Evaluate spilled oil distribution as that affects the safety of ignition sequence options.

2.3.8.3 NA

2.3.9 Aerial Ignition of *In Situ* Burning of Spilled Oil (when used)

2.3.9.1 NA

2.3.9.2 Evaluate for safety concerns the site-specific firing plan and communications protocol with pilots and air crew.

2.3.9.3 NA

2.4 Competencies—Implementing a Planned *In Situ* Burn Response

2.4.1 Operational Period Briefing

2.4.1.1 Assist the burn boss in ensuring the delivery of a pre-operations work plan and safety briefing to all personnel involved in the *in situ* burn response, including preparation and distribution of the Site Safety Plan.

2.4.2–2.4.4 NA

2.4.5 Fire Suppression During *In Situ* Burning of Oil

2.4.5.1 Evaluate safety implications of tactical operations that result in self-extinguishment.

2.4.5.2 Ensure appropriate equipment for firefighting on boom towing vessels, small boats, and support vessels.

2.4.5.3 Ensure that conditions during burns on land support safe fire control and smoke management.

2.4.5.4 Evaluate the design of firebreaks to limit the spread of burning oil to controllable areas.

2.4.5.5 Ensure safe positioning of equipment and crews to ensure that burning does not extend beyond the planned burn area.

2.4.5.6 Ensure that escape pathways on land are identified and maintained for all personnel.

2.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (see 0.1.5.2)

2.4.6.1 Advise the burn boss on designating workers who are to be capable of performing first aid.

2.4.6.2 Identify and recommend medical support facilities to send casualties to when injuries need treatment or evaluation beyond the first aid level of care.

2.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

2.5.1 Airborne Hazards Monitoring

2.5.1.1 Determine and recommend appropriate hazards to monitor, action levels, and corrective action options.

2.5.1.2–2.5.1.4 NA

2.5.2 NA

2.6 Competencies—Terminating the *In Situ* Burning Response

2.6.1 Worker Exposure Briefing and Recordkeeping

2.6.1.1 Conduct worker exposure briefings for the burn boss.

2.6.1.2 Assist the burn boss in ensuring that *in situ* burn portion of the Site Safety Plan documentation is complete.

2.6.1.3 Ensure that any injuries or workers developing signs and symptoms indicating possible overexposures or health hazards receive appropriate medical evaluation and treatment.

2.6.2 Response Effectiveness Analysis and Critique

2.6.2.1 Perform analysis of the safety of response actions taken during the operational period and provide that to the burn boss and analysts.

2.6.2.2–2.6.2.3 NA

2.6.2.4 Assist in conducting a critique of the response involving all members of the operation.

2.6.3 NA

2.7 Training and Physical Fitness

2.7.1 OSHA HAZWOPER Training

2.7.1.1 24 hours of *in situ* burn focused HAZWOPER initial emergency response training.

2.7.2 Incident Command System (ICS) Training

2.7.2.1 ICS-100 Introduction to the Incident Command System.

2.7.2.2 ICS-200 ICS for Single Resources and Initial Action Incidents.

2.7.2.3 NA

2.7.2.4 Advanced position specific training (ICS-410) is suggested for complex burns.

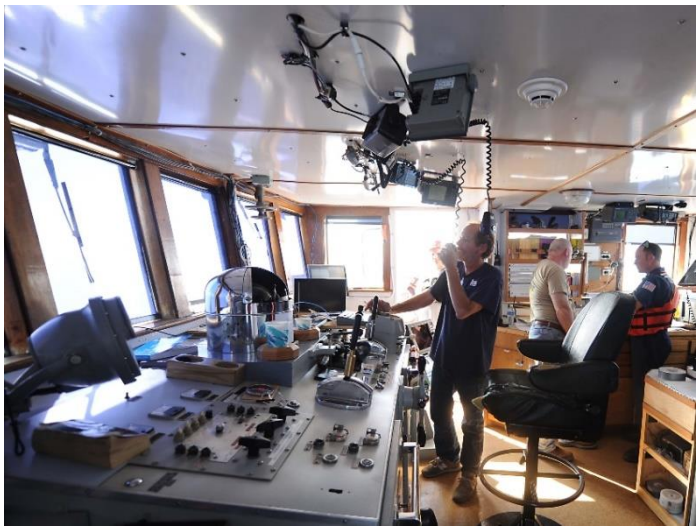
2.7.3 Physical and Mental Fitness

2.7.3.1 Personnel should have the capability for MODERATE physical activity. See Subsection 11.7.3.1.

2.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods.

2.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

2.7.4 NA



U.S. Navy photo by Mass Communication Specialist 2nd Class Justin Stumberg

3 Vessel Captains—Selection and Training Recommendations

3.1 General

3.1.1 Introduction: A vessel captain should have the training and experience to navigate and maneuver a vessel to deploy, position, and tow boom in coordination with other tow vessels or provide support vessel capabilities for command, air monitoring, operational surveillance, on-ice operations, and/or small boat operations relating the *in situ* burn operations. This person shall meet all the relevant competencies of this subsection. This person shall receive any additional training to meet certification requirements of the International Maritime Organization, and the maritime and coastguard agencies of relevant jurisdictions. See Definitions (pp. 76–81) for definitions of vessels and small boats as used in this guidance.

3.1.2 Position Definition: A vessel captain is in overall charge of an individual vessel and has the final authority for the safety and navigation of the vessel. This person navigates and steers, or directs the steering of vessels during *in situ* burning operations for spilled oil. This person supervises the loading, unloading, operating signal devices, and the repair of defective equipment. This person directs the crew to deploy and recover oil spill containment and fire boom. This person coordinates boom positioning with other cooperating vessel captains in accordance with the directives of the *in situ* burn boss.

3.1.3 Goal: The goal of this section is to ensure a vessel captain engaged in an *in situ* burn operation has the knowledge and skills to perform the following tasks safely:

(a) Analyze a spilled oil incident in the open water environment (including ice conditions) to determine the capabilities of the vessel being used to complete the following tasks:

1. Collect and interpret forecasted weather and forecasted sea state. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.
2. Review the tasks which the vessel is expected to be assigned to determine whether the vessel has the necessary seaworthiness, stability, maneuverability, engine power, speed characteristics, crew makeup, crew capacity, deck space, cargo capacity, crane/hoist capability, and towing capacity for *in situ* burn operations in accordance with the written tactical plan for use within the impacted area at the oil spill incident.

(b) Plan operations of the vessel to perform its role in the *in situ* burn plan within the competencies of available personnel, and the capacity of available containment and fire boom, personal protective equipment, and support equipment by completing the following tasks:

1. Understand the response objectives for the *in situ* burning of spilled oil.
2. Identify how the vessel can participate in the potential tactical options to achieve the response objectives.

3. Review the level of flotation equipment required for personnel assignments on the vessel or associated small boats when implementing a given tactical option.
4. Understand the tactical action plan for the operational period and prepare for vessel participation, including safety considerations, consistent with the capability of the vessel, assigned personnel, associated small boats, containment and fire boom, personal protective equipment, and support equipment.

(c) Implement *in situ* burn operations by completing the following tasks:

1. Perform the duties of a vessel captain acting within an incident command system (ICS) organization for the *in situ* burn.
2. Direct assigned resources by allocating tasks and managing on-vessel activities.
3. Ensure that supervision, technical expertise, and logistical support are sufficient to maintain tactical operations on the vessel.
4. Provide a focal point for information transfer between the vessel and the overall ICS structure of the *in situ* burn.

(d) Evaluate the progress of the planned response to ensure the response objectives are being met safely, effectively, and efficiently and notify the burn boss of information that is suggestive of a need to adjust the burn plan.

(e) Terminate the response by completing the following tasks:

1. Participate in a response debriefing.
2. Participate in an after action critique.
3. Provide reports and documentation of vessel operations as directed.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

3.2 Competencies—Analyzing the Situation

3.2.1 Oil Hazards Control

3.2.1.1 Understand hazards to *in situ* burn oil spill responders.
3.2.1.2 Prevent unacceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
3.2.1.3 Understand the behavior of spilled oil in varying conditions.
3.2.1.4 Understand conditions conducive to successful *in situ* burning of spilled oil.
3.2.1.5 Understand ice conditions that may affect oil spill response.

3.2.2 Identification and Protection of Sensitive Resources

3.2.2.1 Be aware of sensitive resources in the area of *in situ* burn operations.
3.2.2.2 Understand the impact of *in situ* burning on the sensitive resources identified.
3.2.2.3 Implement protection strategies for sensitive resources.

3.2.3 NA

3.3 Competencies—Planning the *In Situ* Burn Response

3.3.1 Task Force Tactics

3.3.1.1 Perform tactical options as directed for *in situ* burning.
3.3.1.2 Understand minimum vessel and equipment capabilities.
3.3.1.3 Understand the timeline for daily *in situ* burn operations.
3.3.1.4 Follow protective actions to ensure the health and safety of response personnel.

3.3.2 Vessel Navigation

3.3.2.1 Be able to navigate a vessel to reach the intended destination safely and efficiently.
3.3.2.2 Understanding and obeying navigational Rules of the Road.

3.3.3 Vessel Handling During *In Situ* Burning of Oil

3.3.3.1 Proficiency in maneuvering a vessel alongside and underway.

3.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil

3.3.4.1 Awareness of small boat safety issues.
3.3.4.2 Small boat seaworthiness, stability, and safety.
3.3.4.3 Small boat transfer practices.

3.3.5 NA

3.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

3.3.6.1 Understand and use general personal safety equipment and procedures.
3.3.6.2 Understand and use commercial personal floatation devices during *in situ* burn operations.
3.3.6.3 Use personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations. (This only applies if the vessel captain directly supervises deck hands and small boat operators working with oiled boom. Otherwise this requirement is not considered necessary for this position.)
3.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations. (This only applies if the vessel captain directly supervises deck hands and small boat operators working with oiled boom. Otherwise this requirement is not considered necessary for this position.)

3.3.7 On-Water Ignition of *In Situ* Burning of Spilled Oil (when used)

3.3.7.1 Understand the selection and deployment of appropriate ignition systems.
3.3.7.2 Understand spilled oil weathering and emulsification as that affects ignitability.
3.3.7.3 Inspect and evaluate the condition of fire boom for further use.

3.3.8–3.3.9 NA

3.4 Competencies—Implementing a Planned *In Situ* Burn Response

3.4.1 Operational Period Briefing

3.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

3.4.2 Fire Boom and Containment Boom Deployment and Recovery

3.4.2.1 Advise on vessel capability for use to deploy or recover boom.
3.4.2.2 Maintain vessel speed and power characteristics for positioning fire boom.
3.4.2.3 Direct the installation of towing bridle components for towed boom.
3.4.2.4 Deploy fire and containment boom on open waters.
3.4.2.5 NA
3.4.2.6 Recover and clean or dispose of oiled boom and towing bridle components. (Applies when the vessel captain directly supervises deck hands and small boat operators.)

3.4.3 Fire Boom and Containment Boom Positioning

3.4.3.1 Maintain relative towing speeds for effective concentration of oil using booms.
3.4.3.2 Maneuver vessels to position boom to concentrate oil for *in situ* burning.
3.4.3.3 Adjust boom configuration to changing conditions.

3.4.4 Deck Hand and Small Boat Operations

3.4.4.1 Small boat operations.
3.4.4.2 Small boat handling.
3.4.4.3 Small boat emergencies.

3.4.5 Fire Suppression During *In Situ* Burning of Oil

3.4.5.1 Perform tactical operations that result in self-extinguishment of burning oil on the water.
3.4.5.2 Perform firefighting on boom positioning vessels, small boats, and support vessels.
3.4.5.3–3.4.5.6 NA

3.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (when the job assignment includes medical first aid responsibility—see 0.1.5.2)

3.4.6.1 Capable of performing first aid for co-workers.

3.4.6.2 NA

3.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

3.5.1 NA

3.5.2 Aerial Surveillance of *In Situ* Burning Progress (when used)

3.5.2.1 NA

3.5.2.2 Coordinate oil collection tactics with aerial surveillance specialists.

3.5.2.3–3.5.2.4 NA

3.6 Competencies—Terminating the *In Situ* Burning Response

3.6.1 Worker Exposure Briefing and Recordkeeping

3.6.1.1 Worker exposure briefings.

3.6.1.2 Assist with Site Safety Plan documentation as requested.

3.6.1.3 Worker injuries and symptoms of exposure.

3.6.2 Response Effectiveness Analysis and Critique

3.6.2.1–3.6.2.3 NA

3.6.2.4 Critique of the response involving all members of the operation.

3.6.3 NA

3.7 Training and Physical Fitness

3.7.1 OSHA HAZWOPER Training

3.7.1.1 *In situ* burn focused HAZWOPER training:

- at least 8 hours of initial emergency response training when duties ONLY involve defensive response such as booming or boat operations at a safe distance, or
- at least 24 hours of response operations training when duties involve active response such as booming or boat operations at the source of the spill or ANY work close to volatile fuel or flammable/combustible liquids.

3.7.2 Incident Command System (ICS) Training

3.7.2.1 ICS-100 Introduction to the Incident Command System.

3.7.2.2 ICS-200 ICS for Single Resources and Initial Action Incidents. (This may be omitted if not a supervisor.)

3.7.2.3 NA

3.7.3 Physical and Mental Fitness

3.7.3.1 Personnel should have the capability for MODERATE physical activity. See Subsection 11.7.3.1.

3.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods, while complying with any watch-standing limits required by law.

3.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

3.7.4 NA

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4 Fire Suppression Specialists—Selection and Training Recommendations

4.1 General

4.1.1 Introduction: A fire suppression specialist should have the training and experience to prevent an *in situ* burn operation from exceeding burn parameters, i.e., excessive smoke plume or causing wildland fires in non-target burn areas, and be able to protect or fight fire that threatens non-target areas including vulnerable crops, structures, or infrastructure. This person shall meet all the relevant competencies of this subsection. This person shall receive any additional training to meet certification requirements for wildland firefighting and/or industrial firefighting.

4.1.2 Position Definition: A fire suppression specialist is a firefighter with specific training or experience to safely and effectively function within an incident command system at an *in situ* burn operation. This person constructs firebreaks and, if necessary, extinguishes fire in non-target areas during an *in situ* burning operation for spilled oil. This person uses manual tools, operates fire apparatus, and drives firefighting support vehicles. This person may operate earthmoving equipment if they have sufficient training and experience.

4.1.3 Goal: The goal of this section is to ensure a fire suppression specialist who is engaged in an *in situ* burn operation has the knowledge and skills to perform the following tasks safely:

(a) Analyze a spilled oil incident in the inland environment to determine the capabilities needed to contain fire to the target areas by completing the following tasks:

1. Collect and interpret forecasted weather, forecasted wildfire potential, and forecasted stream flood levels. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.
2. Review the tasks to which the fire suppression specialist is expected to be assigned, to determine whether the vehicles and equipment available are sufficient.

(b) Understand planned operations to ensure they reflect the competencies of available personnel and the capacity of available containment and fire boom, personal protective equipment, and support equipment by completing the following tasks:

1. Be aware of the response objectives for the *in situ* burning of spilled oil.
2. Identify how the fire suppression personnel are expected to participate in achieving the response objectives.
3. Understand the level of personal protective equipment required for personnel assignments when implementing a given tactical option.

4. Review the tactical action plan for the operational period, including safety considerations, consistent with the local emergency response plan and the organization's standard operating procedures and within the capability of available equipment, personnel, small boats, containment and fire boom, personal protective equipment, and support equipment.

(c) Implement *in situ* burn operations by completing the following tasks:

1. Perform the duties of a fire suppression specialist acting within an incident command system (ICS) organization for the *in situ* burn.
2. Direct assigned resources by allocating tasks, managing, and performing fire suppression activities as assigned.
3. Assist supervisors, technical experts, and logistical support in maintaining tactical operations.
4. Participate in information transfer through the ICS structure.

(d) Asses the progress of the planned response to ensure the response objectives are being met safely, effectively, and efficiently and notify the chain of command of information that is suggestive of a need to adjust the burn plan.

(e) Terminate the response by completing the following tasks:

1. Participate in a response debriefing.
2. Participate in an after action critique.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

4.2 Competencies—Analyzing the Situation

4.2.1 Oil Hazards Control

4.2.1.1 Understand hazards to *in situ* burn oil spill responders.
4.2.1.2 Understand acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
4.2.1.3 Understand the behavior of spilled oil on land, rivers, streams, and small lakes.
4.2.1.4 Understand conditions conducive to successful *in situ* burning of spilled oil on land, rivers, streams, and small lakes.
4.2.1.5 NA

4.2.2 Identification and Protection of Sensitive Resources

4.2.2.1 Be aware of sensitive resources in the area of *in situ* burn operations.
4.2.2.2 Understand the impact of *in situ* burning on the sensitive resources identified.
4.2.2.3 Implement protection strategies for sensitive resources.

4.2.3 NA

4.3 Competencies—Planning the *In Situ* Burn Response

4.3.1 *In Situ* Burn Tactics on Land, Rivers, Streams, and Small Lakes

4.3.1.1 Implement tactical options for fire suppression associated with *in situ* burning in inland areas, including fields, desert, prairie, wetlands, savannahs, forest, streams, ponds, and lakes.
4.3.1.2 Understand minimum equipment capabilities and quantities for fire suppression associated with operations on land.
4.3.1.3 Understand the timeline for daily *in situ* burn operations.
4.3.1.4 Follow protective actions to ensure the health and safety of response personnel.

4.3.2–4.3.5 NA

4.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

4.3.6.1 Understand and use general personal safety equipment and procedures.
4.3.6.2 Understand and use personal floatation devices during *in situ* burn operations on or near water (when appropriate).

4.3.6.3 Use personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.
4.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

4.3.7–4.3.9 NA

4.4 Competencies—Implementing a Planned *In Situ* Burn Response

4.4.1 Operational Period Briefing

4.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

4.4.2–4.4.4 NA

4.4.5 Fire Suppression During *In Situ* Burning of Oil

4.4.5.1–4.4.5.2 NA
4.4.5.3 Be aware of conditions needed for effective fire control and smoke management.
4.4.5.4 Construct firebreaks to limit the spread of burning oil to controllable areas.
4.4.5.5 Prevent fire from extending beyond the planned burn area.
4.4.5.6 Assist in maintaining escape pathways for all personnel.

4.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (when the job assignment includes medical first aid responsibility—see 0.1.5.2)

4.4.6.1 Capable of performing first aid for co-workers.
4.4.6.2 NA

4.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

4.5.1–4.5.2 NA

4.6 Competencies—Terminating the *In Situ* Burning Response

4.6.1 Worker Exposure Briefing and Record

4.6.1.1 Worker exposure briefings.
4.6.1.2 Contribute to Site Safety Plan documentation as requested.
4.6.1.3 Worker injuries and symptoms of exposure.

4.6.2 Response Effectiveness Analysis and Critique

4.6.2.1–4.6.2.3 NA
4.6.2.4 Critique of the response involving all members of the operation.

4.6.3 NA

4.7 Training and Physical Fitness

4.7.1 OSHA HAZWOPER Training

4.7.1.1 24 hours of *in situ* burn focused HAZWOPER initial emergency response training.

4.7.2 Incident Command System (ICS) Training

4.7.2.1 ICS-100 Introduction to the Incident Command System.
4.7.2.2 ICS-200 ICS for Single Resources and Initial Action Incidents. This may be omitted if the worker is not a supervisor.
4.7.2.3 NA

4.7.3 Physical and Mental Fitness

4.7.3.1 Personnel should have the capability for ARDUOUS physical activity. See Subsection 11.7.3.1.
4.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia.
4.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

4.7.4 NA

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5 Ignition and Spill Control Agent Specialists—Selection and Training Recommendations

5.1 General

5.1.1 Introduction: An ignition and spill control agent specialist should have training or experience to safely ignite *in situ* burns as directed by the burn boss. Also this person may apply chemical agents to concentrate oil for *in situ* burning (chemical herding) or to treat emulsified oil chemically to reduce the emulsion and thereby enhance the potential for ignition success. This person should meet all appropriate competencies of this section.

5.1.2 Position Definition: An ignition and spill control agent specialist for *in situ* burning of spilled oil response has the knowledge and experience to deploy hand-held ignition systems to initiate an *in situ* burn and, with appropriate approvals, to deploy spill control agents such as herding agents to contain and concentrate spilled oil or emulsion breakers to assist in ignition and enhance the efficiency of an *in situ* burn. This person may operate from small boats for spills on water, but would usually not be the steersman or small boat operator. This person may operate from aircraft, but usually would direct pilots from the ground.

5.1.3 Goal: The goal of this section is to ensure the *in situ* burn ignition control specialist has the knowledge and skills to perform the following tasks safely.

(a) Analyze a spilled oil incident to determine the safety implications for tasks assigned to an ignition control specialist by completing the following tasks:

1. Collect and interpret forecasted weather, forecasted wildfire potential, and forecasted stream flood levels. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.
2. Estimate the potential safety implications and level of effort involved with tasks that an ignition control specialist can be expected to be assigned within the impacted area at the oil spill incident.

(b) Plan *in situ* burn ignition control specialist tasks within the capabilities of available vehicles, vessels, small boats, personnel, containment & fire boom, personal protective equipment, and support equipment by completing the following tasks:

1. Understand the response objectives for the *in situ* burning of spilled oil.
2. Understand how an ignition control specialist will participate in the tactical plan to achieve the response objectives.
3. Understand the level of personal protective equipment required for ignition of oil or spill control

agent application, when implementing a given tactical option.

4. Understand the tactical action plan for the operational period, including safety considerations, consistent with the capability of available vehicles, vessels, small boats, personnel, boom, personal protective equipment, and support equipment.

(c) Implement *in situ* burn ignition operations by completing the following tasks:

1. Perform assigned duties within the supervisory organization as part of an incident command system (ICS) for the *in situ* burn.
2. Use assigned resources by preparing and ensuring the safety of ignition system components, including practicing the deployment of ignition systems in a non-oiled location with the same wind and wave characteristics if on water or the same weather and topographic conditions as the target ignition location if on land.
3. Monitor safety conditions and that technical expertise and logistical support are sufficient to maintain tactical operations for ignition activities.
4. Provide frequent status reports as directed through the ICS communications structure.

(d) Implement spill control agent application in support of *in situ* burn ignition operations on water when assigned to do so by completing the following tasks:

1. Perform assigned duties within the supervisory organization as part of an incident command system (ICS) for the *in situ* burn.
2. Use assigned resources to prepare and ensure the safety of spill control agent application equipment in a non-oiled location with the same wind and wave characteristics as the target ignition location.
3. Monitor that safety conditions, technical expertise, and logistical support are sufficient to maintain tactical operations for spill control agent application.
4. Provide frequent status reports as directed through the ICS communications structure.

(e) Evaluate the progress of the burn ignition to ensure it is being safely, effectively, and efficiently done and to communicate through the chain of command information that is suggestive of a need to adjust the burn plan.

(f) Terminate the response by completing the following tasks:

1. Participate in a response debriefing.
2. Participate in an after action critique.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

5.2 Competencies—Analyzing the Situation

5.2.1 Oil Hazards Control

5.2.1.1 Understand hazards to *in situ* burn oil spill responders.
5.2.1.2 Understand acceptable levels of exposure to spilled oil constituents, any spill control agents used, and land combustion emissions.
5.2.1.3 Understand the behavior of spilled oil in varying conditions.
5.2.1.4 Understand conditions conducive to successful *in situ* burning of spilled oil.
5.2.1.5 Understand ice conditions that may affect oil spill response (when the situation involves ice conditions on water).

5.2.2 Identification and Protection of Sensitive Resources

5.2.2.1 Be aware of sensitive resources in the area of *in situ* burn operations.
5.2.2.2 Understand the impact of *in situ* burning on the sensitive resources identified.
5.2.2.3 Implement protection strategies for sensitive resources.

5.2.3 NA

5.3 Competencies—Planning the *In Situ* Burn Response

5.3.1 Task Force Tactics

5.3.1.1 Be aware of tactical options for ignition of *in situ* burning on open waters.
5.3.1.2 Understand minimum equipment capabilities and quantities for the applicable operating environments.
5.3.1.3 Understand the timeline for daily *in situ* burn operations.
5.3.1.4 Follow protective actions to ensure the health and safety of response personnel.

5.3.2–5.3.3 NA

5.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil (when used)

5.3.4.1 Awareness of small boat safety issues.
5.3.4.2 Small boat seaworthiness, stability, and safety.
5.3.4.3 Safe small boat transfer practices.

5.3.5 Spill Control Agent Usage During *In Situ* Burning of Oil

5.3.5.1 Be able to identify conditions where the use of spill control agents would significantly enhance the effectiveness of *in situ* burning.
5.3.5.2 Understand the legal requirements for using spill control agents.
5.3.5.3 Understand the environmental conditions when spill control agents can be effectively used.
5.3.5.4 Evaluate the hazards and application techniques relating to safe use of spill control agents.

5.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

5.3.6.1 Understand and use general personal safety equipment and procedures.
5.3.6.2 Understand and use commercial personal floatation devices during *in situ* burn operations on or near water.
5.3.6.3 Use personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.
5.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

5.3.7 On-Water Ignition of *In Situ* Burning of Spilled Oil

5.3.7.1 Be able to understand, select, and deploy appropriate ignition systems.
5.3.7.2 Evaluate spilled oil weathering and emulsification as that affects ignitability.
5.3.7.3 Inspect and evaluate the condition of fire boom for further use.

5.3.8 Ignition of *In Situ* Spilled Oil on Land or Solid Ice (when used)

5.3.8.1 Be able to understand, select, and deploy appropriate ignition systems.
5.3.8.2 Evaluate spilled oil distribution as that affects ignition sequence options.
5.3.8.3 Inspect and evaluate the condition of burn areas for further action.

5.3.9 Aerial Ignition of *In Situ* Burning of Spilled Oil (when used)

5.3.9.1 Be able to describe and specify the necessary airframe, ignition system equipment, personnel qualifications, safety features, aviation management, and ground support needed for helitorch operations or other appropriate aerial ignition system.
5.3.9.2 Understand the components of a detailed firing plan and communications protocol.
5.3.9.3 Be able to direct pilots as to ignition locations, timing, and firing sequences in accordance with *ad hoc* instructions or a detailed ignition plan.

5.4 Competencies—Implementing a Planned *In Situ* Burn Response

5.4.1 Operational Period Briefing

5.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

5.4.2 Fire Boom and Containment Boom Deployment and Recovery

5.4.2.1–5.4.2.5 NA
5.4.2.6 Recover and clean or dispose of oiled boom and towing bridle components.

5.4.3 NA

5.4.4 Deck Hand/Small Boat Operations.

5.4.4.1 Small boat operations.
5.4.4.2 NA
5.4.4.3 Small boat emergencies.

5.4.5 Fire Suppression During *In Situ* Burning of Oil

5.4.5.1 Assist tactical operations that result in self-extinguishment of burning oil on the water.
5.4.5.2 Perform firefighting on boom positioning vessels, small boats, and support vessels.
5.4.5.3 Be aware of conditions needed for effective fire control and smoke management.
5.4.5.4 Evaluate the design of firebreaks to limit the spread of burning oil to controllable areas.
5.4.5.5 Prevent fire from extending beyond the planned burn area.
5.4.5.6 Assist in maintaining escape pathways for all personnel.

5.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (when the job assignment includes medical first aid responsibility—see 0.1.5.2)

5.4.6.1 Capable of performing first aid for co-workers.
5.4.6.2 NA

5.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

5.5.1–5.5.2 NA

5.6 Competencies—Terminating the *In Situ* Burning Response

5.6.1 Worker Exposure Briefing and Recordkeeping

5.6.1.1 Worker exposure briefings.
5.6.1.2 Contribute to Site Safety Plan documentation as assigned.
5.6.1.3 Worker injuries and symptoms of exposure.

5.6.2 Response Effectiveness Analysis and Critique

5.6.2.1–5.6.2.3 NA
5.6.2.4 Critique of the response involving all members of the operation.

5.6.3 NA

5.7 Training and Physical Fitness

5.7.1 OSHA HAZWOPER Training

5.7.1.1 24 hours of *in situ* burn focused HAZWOPER initial emergency response training.

5.7.2 Incident Command System (ICS) Training

5.7.2.1 ICS-100 Introduction to the Incident Command System.
5.7.2.2–5.7.2.3 NA

5.7.3 Physical and Mental Fitness

5.7.3.1 Personnel should have the capability for ARDUOUS physical activity. See Subsection 11.7.3.1.
5.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia.
5.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

5.7.4 NA

U.S. Navy photo by Mass Communication Specialist 2nd Class Justin Stumberg

6 Small Boat Operators and Deck Hands—Selection and Training Recommendations

6.1 General

6.1.1 Introduction: A deck hand and/or small boat operator handles ropes and lines; deploys, recovers, and connects boom and towing bridle; releases tow lines on command of the vessel captain or burn boss; operates supporting engines and pumps; assists in personnel transfers from the vessel to small boats; steers, operates, and controls small boats; and generally provides manual labor support on a small boat or vessel. This person should have training or experience to meet all competencies of this section.

6.1.2 Position Definition: A deck hand and/or small boat operator performs a wide variety of manual physical-mental tasks necessary to the operation of vessels, small boats, and equipment used for *in situ* burning of spilled oil. They load and unload equipment and supplies, operate and repair mechanical equipment, deploy and retrieve boom, connect and anchor boom, deploy towing lines, monitor towed boom, recover boom, relay information, operate winches and other deck equipment, operate and steer small open boats used for air monitoring and manual ignition system placement.

6.1.3 Goal: The goal of this section is to ensure that a deck hand and small boat operator involved in an *in situ* burn of spilled oil has the knowledge and skills to perform the following tasks safely.

(a) Be knowledgeable about spilled oil in the environment and understand the safety implications for tasks assigned to a deck hand and small boat operator by completing the following tasks:

1. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.
2. Understand the potential safety implications and level of effort involved with tasks that a deck hand or small boat operator can be expected to be assigned within the impacted area at the oil spill incident.

(b) Plan *in situ* burn deck hand and small boat operator tasks within the capabilities of available small boats and vessels, personnel, containment & fire boom, personal protective equipment, and support equipment by completing the following tasks:

1. Be aware of the response objectives for the *in situ* burning of spilled oil.
2. Know how a deck hand/small boat operator will participate in the tactical plan to achieve the response objectives.
3. Understand the level of personal protective equipment required for personnel assignments when implementing a given tactical option.
4. Understand the tactical action plan for the operational period, including safety considerations,

consistent with the capability of available vessels, small boats, personnel, boom, personal protective equipment, and support equipment.

(c) Implement *in situ* burn operations by completing the following tasks:

1. Perform duties within the supervisory organization of the incident command system (ICS) for the *in situ* burn.
2. Direct assigned resources by allocating tasks, supervising on-scene activities, performing assigned tasks, deploying or recovering equipment, and operating small boats.
3. Monitor safety conditions and that the level of technical expertise and logistical support are sufficient to maintain tactical operations on the small boat or vessel.
4. Provide frequent status reports as directed through the ICS communications structure.

(d) Evaluate the progress of assigned tasks to ensure the response objectives are being met safely, effectively, and efficiently and communicate through the chain of command information that is suggestive of a need to adjust the burn plan.

(e) Terminate the response by completing the following tasks:

1. Participate in a response debriefing.
2. Participate in an after action critique.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

6.2 Competencies—Analyzing the Situation

6.2.1 Oil Hazards Control

6.2.1.1 Understand hazards to *in situ* burn oil spill responders.
6.2.1.2 Understand acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
6.2.1.3 Understand the behavior of spilled oil in various situations.
6.2.1.4 Understand conditions conducive to successful *in situ* burning of spilled oil.
6.2.1.5 Understand ice conditions that may affect oil spill response.

6.2.2–6.2.3 NA

6.3 Competencies—Planning the *In Situ* Burn Response

6.3.1 Task Force Tactics

6.3.1.1 Implement as directed, tactical options for *in situ* burning.
6.3.1.2 Understand minimum vessel, small boat, and equipment capabilities.
6.3.1.3 NA
6.3.1.4 Follow protective actions to ensure the health and safety of response personnel.

6.3.2–6.3.3 NA

6.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil

6.3.4.1 Awareness of small boat safety issues.
6.3.4.2 Small boat seaworthiness, stability, and safety.
6.3.4.3 Safe small boat transfer practices.

6.3.5 NA

6.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

6.3.6.1 Understand and use general personal safety equipment and procedures.
6.3.6.2 Understand and use commercial personal floatation devices during *in situ* burn operations.
6.3.6.3 Use personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.
6.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

6.3.7–6.3.9 NA

6.4 Competencies—Implementing a Planned *In Situ* Burn Response

6.4.1 Operational Period Briefing

6.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

6.4.2 Fire Boom and Containment Boom Deployment and Recovery

6.4.2.1 Understand the selection factors for fire boom and containment boom use for *in situ* burning.
6.4.2.2 Small boat speed and power characteristics for positioning fire boom.
6.4.2.3 Install towing bridle components for towed boom.
6.4.2.4 Deploy fire and containment boom on open waters.
6.4.2.5 Install mooring lines and anchors for boom deployed from shore.
6.4.2.6 Recover and clean or dispose of oiled boom and towing bridle components.

6.4.3 Fire Boom and Containment Boom Positioning

6.4.3.1 NA
6.4.3.2 Assist in positioning boom to concentrate oil for *in situ* burning.
6.4.3.3 Adjust boom configuration to changing conditions as directed.

6.4.4 Deck Hand/Small Boat Operations

6.4.4.1 Small boat operations.
6.4.4.2 Small boat handling.
6.4.4.3 Small boat emergencies.

6.4.5 Fire Suppression During *In Situ* Burning of Oil

6.4.5.1 Perform tactical operations that result in self-extinguishment of burning oil on the water.
6.4.5.2 Perform firefighting on boom positioning vessels, small boats, and support vessels.
6.4.5.3–6.4.5.6 NA

6.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (when the job assignment includes medical first aid responsibility—see 0.1.5.2)

6.4.6.1 Capable of performing first aid for co-workers.
6.4.6.2 NA

6.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

6.5.1–6.5.2 NA

6.6 Competencies—Terminating the *In Situ* Burning Response

6.6.1 Worker Exposure Briefing and Recordkeeping

6.6.1.1 Worker exposure briefings.
6.6.1.2 Contribute to Site Safety Plan documentation as requested.
6.6.1.3 Worker injuries and symptoms of exposure.

6.6.2 Response Effectiveness Analysis and Critique

6.6.2.1–6.6.2.3 NA
6.6.2.4 Critique of the response involving all members of the operation.

6.6.3 NA

6.7 Training and Physical Fitness

6.7.1 OSHA HAZWOPER Training

6.7.1.1 *In situ* burn focused HAZWOPER training

- at least 8 hours of initial emergency response training when duties ONLY involve defensive response such as booming or boat operations at a safe distance, or
- at least 24 hours of response operations training when duties involve active response such as booming or boat operations at the source of the spill or ANY work close to volatile fuel or flammable/combustible liquids.

6.7.2 Incident Command System (ICS) Training

6.7.2.1 ICS-100 Introduction to the Incident Command System.

6.7.2.2–6.7.2.3 NA

6.7.3 Physical and Mental Fitness

6.7.3.1 Personnel should have the capability for ARDUOUS physical activity. See Subsection 11.7.3.1.

6.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia.

6.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

6.7.4 NA

Elastec photo by Donnie Wilson

7 Air Monitoring Specialists—Selection and Training Recommendations

7.1 General

7.1.1 Introduction: An air monitoring specialist operates and maintains air monitoring equipment, collects and communicates air monitoring data, performs quality assurance procedures, and advises the burn boss on appropriate monitoring locations. This person should have training or experience to meet all competencies of this section.

7.1.2 Position Definition: An air monitoring specialist collects airborne emissions data from the spilled oil and *in situ* burning. This person collects data in a scientifically defensible manner for use by decision makers to protect workers, the public, and other environmental receptors. For *in situ* burning operations on water, this person is generally anticipated to be operating from vessels or small boats that can readily change locations to collect data. In inland *in situ* burning operations, this person is generally anticipated to be operating from field locations on land and occasionally from small boats that can readily change locations to collect data.

7.1.3 Goal: The goal of this section is to ensure the *in situ* burn air monitoring specialist has the knowledge and skills to perform the following tasks safely.

(a) Analyze a spilled oil incident to determine the magnitude of the problem in terms of outcomes by completing the following tasks:

1. Collect and interpret forecasted weather, forecasted sea state, and air monitoring equipment. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.
2. Recommend the options for obtaining information on airborne contaminants in the areas of impact likely to be effected by an *in situ* burn.

(b) Plan *in situ* burn monitoring within the capabilities of available vessels, vehicles, personnel, and support equipment by completing the following tasks:

1. Recommend monitoring objectives for the *in situ* burning of spilled oil.
2. Recommend potential tactical options available for collecting monitoring data.
3. Recommend the level of personal protective equipment required for monitoring personnel assignments when implementing a given tactical option for collecting monitoring data.
4. Recommend a monitoring plan for the operational period, including safety considerations, that

incorporates quality control criteria and is consistent with the response objectives and within the capability of available vessels, personnel, monitoring equipment, personal protective equipment, and support equipment.

(c) Implement *in situ* burn monitoring operations by completing the following tasks:

1. Perform the duties of an air monitoring specialist acting within the incident command system (ICS) organization for the *in situ* burn.
2. Direct assigned resources by allocating tasks, supervising on-scene activities, and performing assigned tasks. Deploy, read, calibrate, and recover air monitoring equipment.
3. Monitor safety conditions and that the level of technical expertise and logistical support are sufficient to maintain monitoring operations.
4. Provide frequent status reports and safety concerns as directed through the ICS communications structure.
5. Pursuant to the monitoring plan communicate and document monitoring data as directed in a timely manner.

(d) Evaluate the progress of monitoring operations to ensure the monitoring objectives are being met safely, effectively, and efficiently and communicate through the chain of command information that is suggestive of a need to adjust the burn plan.

(e) Terminate the response by completing the following tasks:

1. Participate in a response debriefing.
2. Participate in an after action critique.
3. Report and document the *in situ* burn monitoring data and/or samples and submit the report/samples to the proper entity.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

7.2 Competencies—Analyzing the Situation

7.2.1 Oil Hazards Control

7.2.1.1 Understand hazards to *in situ* burn oil spill responders.
7.2.1.2 Determine and recommend acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
7.2.1.3 Understand the behavior of spilled oil in varying conditions.
7.2.1.4 Understand conditions conducive to successful *in situ* burning of spilled oil.
7.2.1.5 Understand ice conditions that may affect oil spill response (when there are ice conditions on water).

7.2.2–7.2.3 NA

7.3 Competencies—Planning the *In Situ* Burn Response

7.3.1 Task Force Tactics

7.3.1.1–7.3.1.3 NA
7.3.1.4 Follow protective actions to ensure the health and safety of response personnel.

7.3.2–7.3.3 NA

7.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil

7.3.4.1 Awareness of small boat safety issues.
7.3.4.2 Small boat stability and safety.
7.3.4.3 Safe small boat transfer practices.

7.3.5 NA

7.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

7.3.6.1 Understand and use general personal safety equipment and procedures.

7.3.6.2 Understand and use commercial personal floatation devices during *in situ* burn operations on or near water.

7.3.6.3 Use personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.

7.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

7.3.7–7.3.9 NA

7.4 Competencies—Implementing a Planned *In Situ* Burn Response

7.4.1 Operational Period Briefing

7.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

7.4.2–7.4.3 NA

7.4.4 Deck Hand/Small Boat Operations (when used)

7.4.4.1 Small boat operations.

7.4.4.2 NA

7.4.4.3 Small boat emergencies.

7.4.5 Fire Suppression During *In Situ* Burning of Oil

7.4.5.1 NA

7.4.5.2 Perform firefighting on boom towing vessels, small boats, and support vessels (when job assignment involves working on or near vessels, small boats, and support vessels).

7.4.5.3–7.4.5.6 NA

7.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (when the job assignment includes medical first aid responsibility—see 0.1.5.2)

7.4.6.1 Capable of performing first aid for co-workers.

7.4.6.2 NA

7.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

7.5.1 Airborne Hazards Monitoring

7.5.1.1 Determine appropriate hazards to monitor, action levels, and corrective action options.

7.5.1.2 Identify and recommend appropriate monitoring equipment.

7.5.1.3 Develop/implement a Quality Assurance Project Plan (QAPP) for airborne hazard monitoring.

7.5.1.4 Perform field monitoring and communicate results.

7.5.2 NA

7.6 Competencies—Terminating the *In Situ* Burning Response

7.6.1 Worker Exposure Briefing and Record

7.6.1.1 Worker exposure briefings.

7.6.1.2 Contribute to Site Safety Plan documentation as requested.

7.6.1.3 Worker injuries and symptoms of exposure.

7.6.2 Response Effectiveness Analysis and Critique

7.6.2.1–7.6.2.3 NA

7.6.2.4 Critique of the response involving all members of the operation.

7.6.3 Documenting Environmental Impacts of *In Situ* Burning of Oil

7.6.3.1 Assist in recording and understanding environmental impacts as evidenced by air monitoring data, relative to oil removal effectiveness data, and observations/data on impacts to sensitive resources.

7.6.3.2 NA

7.7 Training and Physical Fitness

7.7.1 OSHA HAZWOPER Training

7.7.1.1 24 hours of *in situ* burn focused HAZWOPER initial emergency response training.

7.7.2 Incident Command System (ICS) Training

7.7.2.1 ICS-100 Introduction to the Incident Command System.

7.7.2.2–7.7.2.3 NA

7.7.3 Physical and Mental Fitness

7.7.3.1 Personnel should have the capability for MODERATE physical activity. See Subsection 11.7.3.1.

7.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia.

7.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

7.7.4 NA

U.S. Navy photo by Mass Communication Specialist 2nd Class Justin Stumberg

8 Skilled Support Personnel—Selection and Training Recommendations

8.1 General

8.1.1 Introduction: Skilled support personnel provide special skills and supporting services during a spill response. They may assist the burn boss (chain of command) with technical advice, specific technical skills services, operational surveillance with respect to ice safety hazards of the overall *in situ* burn task force, providing skilled manual labor, providing unique local knowledge, or capability. This person should have either previous or on-site training/experience to meet the competencies of this section.

8.1.2 Position Definition: Skilled support personnel provide skills and services on-site that are ancillary to the oil spill response. Examples are airframe pilots, technical experts, ice conditions analysts, mechanics, sampling technicians, on-ice crew workers, wildlife recovery specialists, and local conditions experts. It is assumed that skilled support personnel have an intermittent or episodic potential for dermal or inhalation exposure to spilled oil, chemical hazards, or are involved in small boat operations. If that is not so, the person should be classified in a position that accurately reflects their exposure potential.

8.1.3 Goal: The goal of this section is to ensure that skilled support personnel have the knowledge and skills to perform the following tasks safely.

(a) Analyze a spilled oil incident in the open water environment in ice conditions on water or on land to determine the risks involved with performing the tasks they will be assigned to perform. Collect and interpret forecasted weather information. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.

(b) Plan to perform assigned tasks during *in situ* burn operations within the capabilities of available vessels, personal protective equipment, and support equipment by completing the following tasks:

1. Understand the response objectives for the *in situ* burning of spilled oil.
2. Understand the potential tactical options available to perform their assigned tasks.
3. Use the level of personal protective equipment required for personnel assignments when implementing a given tactical option.
4. Be aware of the tactical Incident Action Plan for the operational period and their role in it, including safety considerations described in the Site Safety Plan. Organize tasks and sequencing to be consistent with the local emergency response plan and the organization's standard operating procedures, to be within the capability of available fire control apparatus, vehicles, vessels, small boats, personnel, boom, personal protective equipment, and support equipment.

(c) Implement *in situ* burn operations by completing assigned tasks:

1. Operate and communicate within the incident command system (ICS) organization for the *in situ* burn.
2. Use or direct assigned resources by allocating tasks and managing on-scene activities.
3. Monitor safety conditions and that technical expertise and logistical support are sufficient to maintain tactical operations.

(d) Monitor the progress of the assigned tasks to ensure the response objectives are being met safely, effectively, and efficiently. Advise incident management of any need to adjust the burn plan.

(e) Terminate the response by participating in a response debriefing.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

8.2 Competencies—Analyzing the Situation

8.2.1 Oil Hazards Control

8.2.1.1 Understand hazards to *in situ* burn oil spill responders.
8.2.1.2 Understand acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
8.2.1.3 Understand the behavior of spilled oil in varying conditions.
8.2.1.4 Understand conditions conducive to successful *in situ* burning of spilled oil.
8.2.1.5 Analyze ice conditions and forecasts that may affect oil spill response (only applicable when special skills employ this competency).

8.2.2 Identification and Protection of Sensitive Resources (only applicable when special skills employ this competency)

8.2.2.1 Identify sensitive resources in the area of *in situ* burn operations.
8.2.2.2 Predict the impact of *in situ* burning on the sensitive resources identified.
8.2.2.3 Identify and implement protection strategies for sensitive resources.

8.2.3 Anticipate Potential Environmental Impacts of *In Situ* Burning of Oil (when this is an assigned task)

8.2.3.1 Identify and report airborne impacts.
8.2.3.2 Identify and report surface water impacts.
8.2.3.3 Identify and report subsurface water impacts.
8.2.3.4 Identify and report soil impacts.

8.3 Competencies—Planning the *In Situ* Burn Response

8.3.1 On Ice Tactics (only applicable when special skills employ this competency)

8.3.1.1 Implement tactical options for *in situ* burning on solid central pack and fast ice.
8.3.1.2 NA
8.3.1.3 Understand the timeline for daily *in situ* burn operations.
8.3.1.4 Follow protective actions to ensure the health and safety of response personnel.

8.3.2–8.3.3 NA

8.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil (when used)

8.3.4.1 Awareness of small boat safety issues.
8.3.4.2 Small boat seaworthiness, stability, and safety.
8.3.4.3 Safe small boat transfer practices.

8.3.5 NA

8.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

8.3.6.1 Understand and use general personal safety equipment and procedures.
8.3.6.2 Understand and use commercial personal floatation devices during *in situ* burn operations on or near water.

8.3.6.3 Use personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.
8.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

8.3.7–8.3.9 NA

8.4 Competencies—Implementing a Planned *In Situ* Burn Response

8.4.1 Operational Period Briefing

8.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

8.4.2–8.4.3 NA

8.4.4 Small Boat Operations (when used)

8.4.4.1 Small boat operations.
8.4.4.2 NA
8.4.4.3 Small boat emergencies.

8.4.5 Fire Suppression During *In Situ* Burning of Oil (only applicable when special skills employ this competency)

8.4.5.1 Assist tactical operations that result in self-extinguishment of burning oil on the water.
8.4.5.2 Perform firefighting on boom positioning vessels, small boats, and support vessels.
8.4.5.3 For fires on land, be aware of conditions needed for effective fire control and smoke management.
8.4.5.4 Construct firebreaks to limit the spread of burning oil to controllable areas.
8.4.5.5 Prevent fire from extending beyond the planned burn area.
8.4.5.6 Assist in assuring that escape pathways are identified and maintained for all personnel.

8.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (when the job assignment includes medical first aid responsibility—see 0.1.5.2)

8.4.6.1 Capable of performing first aid for co-workers.
8.4.6.2 NA

8.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

8.5.1–8.5.2 NA

8.6 Competencies—Terminating the *In Situ* Burning Response

8.6.1 Worker Exposure Briefing and Recordkeeping

8.6.1.1 Worker exposure briefings.
8.6.1.2 Contribute to Site Safety Plan documentation as requested.
8.6.1.3 Worker injuries and symptoms of exposure.

8.6.2 Response Effectiveness Analysis and Critique

8.6.2.1–8.6.2.3 NA
8.6.2.4 Critique of the response involving all members of the operation.

8.6.3 Documenting Environmental Impacts of *In Situ* Burning of Oil (only applicable when special skills employ this competency)

8.6.3.1 Record air monitoring data, oil removal effectiveness data, and observations/data on impacts to sensitive resources. Collect samples of environmental media to support observational data.
8.6.3.2 Understand and record the nature, mass, and extent of unrecovered burn residue.

8.7 Training and Physical Fitness

8.7.1 OSHA HAZWOPER Training

8.7.1.1 24 hours of *in situ* burn focused HAZWOPER initial emergency response training.

8.7.2 Incident Command System (ICS) Training

8.7.2.1 ICS-100 Introduction to the Incident Command System training.
8.7.2.2–8.7.2.3 NA

8.7.3 Physical and Mental Fitness (assigned duties determine which of the following options will apply)

8.7.3.1 Assigned duties determine whether personnel should have the capability for LIGHT, MODERATE, or ARDUOUS physical activity. See Subsection 11.7.3.1.

8.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia.

8.7.3.3 Medical surveillance requirements of the jurisdiction should be met. See Subsection 11.7.3.3.

8.7.4 NA

Elastec photo by Donnie Wilson

9 Aerial Surveillance Specialists—Selection and Training Recommendations

9.1 General

9.1.1 Introduction: An aerial surveillance specialist assists the burn boss (incident command) with operational surveillance of the overall *in situ* burn task force deployment to locate, direct vessels to encounter, and collect spilled oil from an overhead observation point of view in order to facilitate *in situ* burning efficiency. This person needs to be trained to recognize and collect data on oil slick size and location, as well as amounts of oil consumed by *in situ* burning operations. This person should have training or experience to meet the competencies of this section.

9.1.2 Position Definition: An aerial surveillance specialist collects real-time data on the location and condition of spilled oil, as well as the progress of oil collection and *in situ* burning operations. The observation platform is usually a fixed-wing aircraft or helicopter; however, surface vessels, tethered balloons, and unmanned aerial vehicles (drones) are also used to collect data in real time. This person relays information through the incident command chain so that tactical operations can be adjusted to enhance efficiency and safety.

9.1.3 Goal: The goal of this section is to ensure the *in situ* burn aerial surveillance specialist has the knowledge and skills to perform the following tasks safely.

(a) Analyze a spilled oil incident to determine the magnitude of the problem in terms of outcomes by completing the following tasks:

1. Collect and interpret forecasted weather. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.
2. Estimate the potential outcomes within the impacted area at the oil spill incident.

(b) Assist in planning *in situ* burn aerial surveillance operations within the capabilities of available aerial observation platforms by completing the following tasks:

1. Understand the response objectives for the *in situ* burning of spilled oil.
2. Understand the potential aerial observation options available.
3. Assist the burn boss in developing an aerial observation plan for the operational period, including safety considerations, consistent with the local emergency response plan and the organization's

standard operating procedures and within the capability of available aerial platforms, personnel, and support equipment.

(c) Implement *in situ* burn aerial surveillance by completing the following tasks:

1. Perform duties within the incident command system (ICS) organization established for the *in situ* burn.
2. Direct assigned resources by allocating tasks and managing on-scene activities.
3. Monitor safety conditions and that technical expertise and logistical support are sufficient to maintain aerial surveillance operations.
4. Provide frequent status reports as directed through the ICS communications structure.

(d) Evaluate the progress of the planned response to ensure the response objectives are being met safely, effectively, and efficiently and communicate through the chain of command information that is suggestive of a need to adjust the burn plan.

(e) Terminate the response by completing the following tasks:

1. Participate in a response debriefing.
2. Participate in an after action critique.
3. Report and document the *in situ* burn operation aerial observations and submit the report through the chain of command.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

9.2 Competencies—Analyzing the Situation

9.2.1 Oil Hazards Control

9.2.1.1 Understand hazards to *in situ* burn oil spill responders.
9.2.1.2 Understand acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
9.2.1.3 Understand the behavior of spilled oil in varying conditions.
9.2.1.4 Understand conditions conducive to successful *in situ* burning of spilled oil.
9.2.1.5 Understand ice conditions that may affect oil spill response (when the situation involves ice conditions on water).

9.2.2 Identification and Protection of Sensitive Resources

9.2.2.1 Be aware of sensitive resources in the area of *in situ* burn operations.
9.2.2.2 Understand the impact of *in situ* burning on the sensitive resources identified.
9.2.2.3 Suggest protection strategies for sensitive resources.

9.2.3 NA

9.3 Competencies—Planning the *In Situ* Burn Response

9.3.1 Task Force Tactics

9.3.1.1 Identify tactical options for aerial surveillance of *in situ* burning.
9.3.1.2 NA
9.3.1.3 Understand the timeline for daily *in situ* burn operations.
9.3.1.4 Follow protective actions to ensure the health and safety of response personnel. (This requirement usually not needed unless the person is stationed on a support vessel or on land.)

9.3.2–9.3.9 NA

9.4 Competencies—Implementing a Planned *In Situ* Burn Response

9.4.1 Operational Period Briefing

9.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

9.4.2–9.4.6 NA

9.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

9.5.1 NA

9.5.2 Aerial Surveillance of *In Situ* Burning Progress

9.5.2.1 Observe, interpret, and communicate the location and apparent thickness of sea ice and apparent thickness of floating oil that may be amenable to *in situ* burning.

9.5.2.2 Coordinate oil collection tactics with vessels.

9.5.2.3 Document spilled oil collection and burn efficiency.

9.5.2.4 Deploy and collect data from unmanned observation platforms such as unmanned aerial vehicles, drones, and tethered balloons (when used).

9.6 Competencies—Terminating the *In Situ* Burning Response

9.6.1 Worker Exposure Briefing and Recordkeeping

9.6.1.1 Worker exposure briefings.

9.6.1.2 Contribute to Site Safety Plan documentation as requested.

9.6.1.3 Worker injuries and symptoms of exposure.

9.6.2 Response Effectiveness Analysis and Critique

9.6.2.1–9.6.2.3 NA

9.6.2.4 Critique of the response involving all members of the operation.

9.6.3 NA

9.7 Training and Physical Fitness

9.7.1 OSHA HAZWOPER Training.

9.7.1.1 A comprehensive site-specific *in situ* burn focused HAZWOPER safety briefing.

9.7.2 Incident Command System (ICS) Training

9.7.2.1 ICS-100 Introduction to the Incident Command System.

9.7.2.2–9.7.2.3 NA

9.7.3 Physical and Mental Fitness.

9.7.3.1 Personnel should have the capability for LIGHT physical activity. See Subsection 11.7.3.1.

9.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods.

9.7.3.3 Medical surveillance requirements of the jurisdiction should be met. In the United States, it is usually not required for the duties of this position. Medical treatment must be made available if this person exhibits signs or symptoms of exposure. See Subsection 11.7.3.3.

9.7.4 Aircraft Safety

9.7.4.1 Light Aircraft Passenger Safety briefing (when a passenger or crew in an aircraft).

Elastec photo by Donnie Wilson

10 Observers—Knowledge and Training Recommendations

10.1 General

10.1.1 Introduction: An observer is a person who is not critical to the function of *in situ* burning, but may be included on site for a variety of public information, observation, logistic support, dedicated medical support services, regulatory, or oversight purposes. This person should have either previous or on-site training to meet the competencies of this section.

10.1.2 Position Definition: An observer is a worker designated to record data, formulate opinions, or provide custodial services. This person may be advising on the conduct of the response, informing the public (media), public interest surveillance, performing independent scientific (observational) research, conducting governmental or contract oversight, or providing clerical, communications, dedicated medical support, food service, or recordkeeping services. It is assumed that an observer has a negligible potential for dermal or inhalation exposure to spilled oil. It is also assumed that observers are not present in small boats at any time. If those assumptions are not met, the person should be classified in a position that accurately reflects their exposure potential and risk. This position classification includes any person present on-site who does not have an operational function in the *in situ* burn and for whom exposure and risk are negligible.

10.1.3 Goal: The goal of this section is to ensure that an observer involved with *in situ* burn operations keeps out of harm's way, does not impair the safety of operations, and has the knowledge and skills to perform the following tasks safely.

(a) Analyze a spilled oil incident in the open water environment to determine the safety implications for themselves by completing the following tasks:

1. Read and understand hazard and response information from the Incident Action Plan and Site Safety Plan.
2. Estimate the potential safety implications and level of effort involved with the specific tasks in which the observer will be engaged while within the impacted area at the oil spill incident.

(b) Plan *in situ* burn observer actions such that they will not interfere with operational tasks of the burn and not pose a safety hazard for other workers while considering personal protective equipment and any equipment needed to perform the specific observer tasks by completing the following:

1. Identify the observer's objectives during the *in situ* burning of spilled oil.
2. Identify the potential tactical options available to the observer to attain those objectives.
3. Understand the personal protective equipment required for observers when implementing a given tactical option available to the observer.

(c) Implement *in situ* burn observation activities by completing the following tasks:

1. Communicate observer actions for safety purposes within the supervisory organization as part of an incident command system (ICS) for the *in situ* burn.
2. Use only assigned resources.

(d) Evaluate whether observer objectives are being met safely, effectively, and efficiently and recommend adjustments to the burn plan through the supervisory organization of the assigned unit of the ICS.

FOR SPECIFIC REQUIREMENTS FOR EACH COMPETENCY LISTED BELOW, SEE THE CORRESPONDING NUMBERED SUBSECTION OF THE COMPETENCIES DETAIL SECTION (I.E., 11.X.X.X)

10.2 Competencies—Analyzing the Situation

10.2.1 Oil Hazards Control

10.2.1.1 Understand hazards to *in situ* burn oil spill responders.
10.2.1.2 Understand acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.
10.2.1.3–10.2.1.5 NA

10.2.2 Identification and Protection of Sensitive Resources (when this is an assigned task)

10.2.2.1 Identify sensitive resources in the area of *in situ* burn operations.
10.2.2.2 Predict the impact of *in situ* burning on the sensitive resources identified.
10.2.2.3 Suggest protection strategies for sensitive resources.

10.2.3 Anticipate Potential Environmental Impacts of *In Situ* Burning of Oil (when this is an assigned task)

10.2.3.1 Identify airborne impacts.
10.2.3.2 Identify surface water impacts.
10.2.3.3 Identify subsurface water impacts.
10.2.3.4 Identify soil impacts.

10.3 Competencies—Planning the *In Situ* Burn Response

10.3.1 Task Force Tactics

10.3.1.1–10.3.1.3 NA
10.3.1.4 Follow protective actions to ensure the health and safety of response personnel.

10.3.2–10.3.5 NA

10.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

10.3.6.1 Understand and use general personal safety equipment and procedures.
10.3.6.2 Understand and use commercial personal floatation devices during *in situ* burn operations (for operations near water).
10.3.6.3–10.3.6.4 NA

10.3.7–10.3.9 NA

10.4 Competencies—Implementing a Planned *In Situ* Burn Response

10.4.1 Operational Period Briefing

10.4.1.1 Understand the importance of the pre-operations work plan and safety briefing at the start of each operational period.

10.4.2–10.4.6 NA

10.5 NA

10.6 Competencies—Terminating the *In Situ* Burning Response

10.6.1 Worker Exposure Briefing and Recordkeeping

10.6.1.1 Worker exposure briefings.

10.6.1.2–10.6.1.3 NA

10.6.2 Response Effectiveness Analysis and Critique

10.6.2.1–10.6.2.3 NA

10.6.2.4 Critique of the response involving all members of the operation.

10.6.3 NA

10.7 Training and Physical Fitness

10.7.1 OSHA HAZWOPER Training

10.7.1.1 A comprehensive site-specific *in situ* burn focused HAZWOPER safety briefing.

10.7.2 NA (it is suggested but not required that observers take ICS-100 Introduction to the Incident Command System training)

10.7.3 Physical and Mental Fitness

10.7.3.1 Personnel should have the capability for LIGHT physical activity. See Subsection 11.7.3.1.

10.7.3.2 Personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods.

10.7.3.3 Medical surveillance requirements of the jurisdiction should be met. In the United States, it is usually not required for the duties of this position. Medical treatment must be made available if this person exhibits signs or symptoms of exposure. See Subsection 11.7.3.3.

10.7.4 NA

U.S. Navy photo by Mass Communication Specialist 2nd Class Justin Stumberg

11 Competency Details, Job Performance Requirements, and Requisite Knowledge and Skills

11.1 General

Oil spill responders working on an *in situ* burn can all be categorized into ten defined job positions using this guidance for purposes of determining the experience or training appropriate for each person. The positions are described in detail in Sections 1 through 10 of this guidance. For each position, the competencies necessary have been identified. Many of the competencies necessary are common to some or all of the positions. Consequently, in these guidelines the competency details are only being listed once to save space. The job performance requirements for each competency contain detailed descriptions of the *Requisite Knowledge* and *Requisite Skills* that can apply for each job position.

Each responder must receive any additional training to meet applicable national standards, such as those of the United States Department of Transportation (DOT), United States Coast Guard (USCG), United States Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), United States Department of the Interior [Bureau of Safety and Environmental Enforcement (BSEE)], and other appropriate national, state, local, or provincial requirements relating to fire hazards and occupational health and safety.

11.2 Competencies—Analyzing the Situation

11.2.1 Oil Hazards Control

11.2.1.1 Identify hazards to *in situ* burn oil spill responders.

Requisite Knowledge for All: Understand the following concepts: oil types and composition, fresh oil composition, weathering of oil, oil viscosity, vapor pressure of oil constituents, flammability concepts, emulsification process and mousse formation, volatile organic compounds (VOCs), oil combustion products, carbon dioxide, carbon monoxide, sulfur compounds including hydrogen sulfide and sulfur dioxide, nitrogen oxides, poly aromatic hydrocarbons (PAHs), airborne particulate hazards including particulate matter less than 10 microns (PM-10), particulate matter less than 2.5 microns (PM-2.5), oxidizers, ignition promoters, ignition system components, spill control agents including oil herding agents, and oil dispersants, as well as *in situ* burn residue composition.

Requisite Skill for All: Use printed and electronic reference materials to identify the hazards associated with each assigned task/job associated with various *in situ* burn response tactics during a response to a specific spill situation.

[referenced in 1.2.1.1, 2.2.1.1, 3.2.1.1, 4.2.1.1, 5.2.1.1, 6.2.1.1, 7.2.1.1, 8.2.1.1, 9.2.1.1, 10.2.1.1]

11.2.1.2 Understand acceptable levels of exposure to spilled oil constituents, any spill control agents used, and combustion emissions.

Requisite Knowledge for Burn Boss, Safety Officers, and Air Monitoring Specialists: Understand toxicological principles, including exposure routes, acute and delayed toxicity (chronic), local and systemic exposure effects, dose response, and synergistic effects. Understand the toxicity of dermal exposure to oil, volatile organic chemicals, carbon dioxide, airborne particulate matter, nitrous oxides, sulfur compounds, gasoline and diesel fuel, and engine exhaust. Be able to explain terms used to define relevant regulatory and professional standard based exposure limits and how they apply to workers and the public. In the United States, these terms include parts per million (ppm), parts per billion (ppb), LD50, LC50, Permissible Exposure Limit (PEL), TLV-TWA, TLV-STEL, TLV-C, IDLH, AEGLs, and NAAQS (see Definitions, pp. 76–81). Know that when a limit is exceeded, additional safety precautions or PPE are required.

Requisite Knowledge for Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Skilled Support Personnel, Aerial Surveillance Specialists, and Observers: Understand toxicological principles, including exposure routes, acute and delayed toxicity (chronic), local and systemic exposure effects, dose response, and synergistic effects. Understand the toxicity of dermal exposure to oil, volatile organic chemicals, carbon dioxide, airborne particulate matter, nitrous oxides, sulfur compounds, gasoline and diesel fuel, and engine exhaust. Be able to understand common hazard communications terms found on material safety data sheets.

Requisite Skill for All: Anticipate and ensure control of exposures to the oil hazards associated with duties to which workers are assigned while performing *in situ* burning of spilled oil. Evaluate exposure potential to oil vapors, smoke from burned oil and vegetation, burned oil residue, emulsified oil, weathered oil residue, *in situ* burn ignition system components, and any spill control agents used.

[referenced in 1.2.1.2, 2.2.1.2, 3.2.1.2, 4.2.1.2, 5.2.1.2, 6.2.1.2, 7.2.1.2, 8.2.1.2, 9.2.1.2, 10.2.1.2]

11.2.1.3 Analyze the behavior of spilled oil in open water, on land, rivers, streams, small lakes, and in ice conditions.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Understand how oil behaves in each relevant operational environment under the following conditions: emulsified oil compared to fresh oil, subsurface spillage/leak, water temperature changes, air temperature changes, wind action, wave action, current impacts on surface oil, weathering of oil at various temperatures, ice coverage, oil in frazil and brash ice, oil in brine channels, current impacts on oil under ice, ice trapped by ice ridges on the bottom of fast ice, encapsulated oil in ice, and behavior of *in situ* burn residue.

Requisite Skill for Burn Boss, Safety Officers, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Be able to predict the influence of changing conditions on spilled oil. Be able to obtain local weather, ice and sea state and/or current conditions for short-term forecasted weather conditions and seasonal ice conditions for the expected area of oil impact.

[referenced in 1.2.1.3, 2.2.1.3, 3.2.1.3, 4.2.1.3, 5.2.1.3, 6.2.1.3, 7.2.1.3, 8.2.1.3, 9.2.1.3]

11.2.1.4 Identify conditions conducive to successful *in situ* burning of spilled oil.

<u>In Open Water Situations:</u>

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Understand the limiting criteria

for the following conditions that affect *in situ* burn success: wind, wave height, oil type, oil viscosity, oil thickness, oil weathering, oil emulsification, current, and ignition system heat output.

Requisite Skill for Burn Boss, Safety Officers, and Vessel Captains: Be capable of assessing the following conditions: appropriate distance from public receptors, worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, suitable vessels and equipment, sufficient trained personnel, appropriate permissions and permits from regulatory authorities, and consent of the responsible party.

Requisite Skill for Ignition and Spill Control Agent Specialists, Air Monitoring Specialists, Skilled Support Personnel *, *Small Boat Operators and Deck Hands, and Aerial Surveillance Specialists:* Be capable of assessing the following conditions: appropriate distance from public receptors, worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, suitable vessels, small boats, and equipment.

<u>On Land, Rivers, Streams, and Small Lakes:</u>

Requisite Knowledge for Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand the limiting criteria for the following conditions that affect *in situ* burn success: oil type, oil viscosity, oil thickness, wind speed, wind direction, solar thermal updrafts, vegetative fuel loads, topography, emulsification, current, and ignition system heat output.

Requisite Skill for Burn Boss, Safety Officers, Fire Suppression Specialists, Air Monitoring Specialists, and Skilled Support Personnel: Be capable of assessing the following conditions: appropriate distance from public receptors, worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, ability to contain and suppress burning to the target locations, suitable equipment, sufficient trained personnel, appropriate permissions and permits from regulatory authorities, consent of the responsible party, and consent of land owners.

Requisite Skill for Ignition and Spill Control Agent Specialists: Be capable of assessing the following conditions: appropriate distance from public receptors, worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, ability to contain and suppress burning to the target locations, suitable equipment, and sufficient trained personnel.

Requisite Skill for Small Boat Operators and Deck Hands: Understand the importance of the following conditions: appropriate distance from public receptors, worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, ability to contain and suppress burning to the target locations, suitable equipment, and sufficient trained personnel.

<u>In Ice Conditions on Water:</u>

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Understand the limiting criteria for the following conditions that affect *in situ* burn success: ice coverage, ice thickness, ice movement, ice formation and breakup seasons, wind, wave height, oil type, oil viscosity, oil thickness, oil weathering, oil emulsification, encapsulation of oil in ice, current under ice, and ignition system heat output.

Requisite Skill for Burn Boss, Safety Officers, Air Monitoring Specialists, and Skilled Support Personnel *: Be capable of assessing the following conditions: appropriate distance from public receptors, worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, suitable vessels and equipment, sustainability of *in situ* burn task

* When this is an assigned task.

force at the spill site, sufficient trained personnel, appropriate permissions and permits from regulatory authorities, and consent of the responsible party.

Requisite Skill for Vessel Captains, Ignition and Spill Control Agent Specialists, and Aerial Surveillance Specialists: Be capable of assessing the following conditions: worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, suitable vessels/small boats and equipment.

Requisite Skill for Small Boat Operators and Deck Hands: Understand the importance of the following conditions: appropriate distance from public receptors, worker safety, weather forecast, ability to contain the oil to maintain a minimum thickness to burn, suitable vessels and equipment, sustainability of *in situ* burn task force at the spill site, sufficient trained personnel.

[referenced in 1.2.1.4, 2.2.1.4, 3.2.1.4, 4.2.1.4, 5.2.1.4, 6.2.1.4, 7.2.1.4, 8.2.1.4, 9.2.1.4]

11.2.1.5 Analyze ice conditions and forecasts that may affect oil spill response (when the situation involves ice conditions on water).

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Understand the process of ice formation, ice aging changes, ice breakup applicable in the area of spill response operations. Understand ice types, their characteristics and hazards relative to *in situ* burning of spilled oil.

Requisite Skill for Burn Boss, Safety Officers: Be capable of assessing the likely condition of ice from direct visual observation, reports from aerial observers, other observation-based reports, ice trajectory models and historical data. Be capable of directing ice access/ice profiling activities to determine the thickness of the ice at a location and its ability to safety support personnel and equipment.

Requisite Skill for Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Aerial Surveillance Specialists: Be capable of assessing the likely condition of ice from direct visual observation.

Requisite Skill for Air Monitoring Specialists and Skilled Support Personnel [*]*:* Be capable of assessing the likely condition of ice from direct visual observation, reports from aerial observers, other observation-based reports, ice trajectory models and historical data. Estimate the potential safety implications of existing, changing, and forecasted ice conditions to vessels, small boats, and personnel performing *in situ* burning. Be capable of conducting ice access/ice profiling activities to determine the thickness of the ice at a location and its ability to safety support personnel and equipment.

[referenced in 1.2.1.5, 2.2.1.5, 3.2.1.5, 5.2.1.5, 6.2.1.5, 7.2.1.5, 8.2.1.5, 9.2.1.5]

11.2.2 Identification and Protection of Sensitive Resources

11.2.2.1 Identify sensitive resources in the area of *in situ* burn operations.

In Open Water Situations:

Requisite Knowledge for Burn Boss and Skilled Support Personnel *: Be able to access sources and expertise for information on the local populations and locations of endangered and threatened species, local seabed, water column, and avian natural resources, transient (migrating) species, fisheries, subsistence hunting and fishing, marinas and port facilities, off-shore infrastructure, beaches, and human populations.

Requisite Knowledge for Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Skilled Support Personnel, Aerial Surveillance Specialists, and Observers *: Be aware of the local populations and locations of endangered and threatened species, local seabed, water column, and avian natural resources, transient (migrating)

[*] When this is an assigned task.

species, fisheries, subsistence hunting and fishing, marinas and port facilities, off-shore infrastructure, beaches, and human populations.

On Land, Rivers, Streams, and Small Lakes:

Requisite Knowledge for Burn Boss and Skilled Support Personnel *: Be able to access sources and expertise for information on the local populations and locations of endangered and threatened species, indigenous wildlife, livestock operations, types of vegetation in the burn area and its susceptibility to *in situ* burn induced damage, local stream and lake water quality ratings, transient (migrating) species, fisheries, subsistence hunting and fishing, marinas and port facilities, locks and dams, drinking water and industrial intakes, beaches, power transmission facilities, underground utilities, archeological sites, and human populations.

*Requisite Knowledge for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Skilled Support Personnel, and Observers *:* Be aware of local populations and locations of endangered and threatened species, indigenous wildlife, livestock operations, types of vegetation in the burn area and its susceptibility to *in situ* burn induced damage, local stream and lake water quality ratings, transient (migrating) species, fisheries, subsistence hunting and fishing, marinas and port facilities, locks and dams, drinking water and industrial intakes, beaches, power transmission facilities, underground utilities, archeological sites, and human populations.

In Ice Conditions on Water:

Requisite Knowledge for Burn Boss and Skilled Support Personnel *: Be able to access sources and expertise for information on the local populations and locations of endangered and threatened species, local seabed, shoreline, tundra, permafrost, water column, and avian natural resources, transient (migrating) species, fisheries, subsistence hunting and fishing, marinas and port facilities, off-shore infrastructure, beaches, and human populations.

Requisite Knowledge for Vessel Captains, Ignition and Spill Control Agent Specialists, Skilled Support Personnel, Aerial Surveillance Specialists, and Observers *: Be aware of local populations and locations of endangered and threatened species, local seabed, shoreline, tundra, permafrost, water column, and avian natural resources, transient (migrating) species, fisheries, subsistence hunting and fishing, marinas and port facilities, off-shore infrastructure, beaches, and human populations.

All Conditions:

Requisite Skill for Burn Boss: Be able to direct the development of a situation-specific list of sensitive resources to be considered for potential *in situ* burn impacts. Be able to find and access suitable expertise to assist in developing and validating such listing.

*Requisite Skill for Skilled Support Personnel *, and Observers* *: Be able to recommend sensitive resources to be considered for potential *in situ* burn impacts. Be able to find and access suitable expertise to assist in developing and validating such listing.

Requisite Skill for Vessel Captains, Fire Suppression Specialists, and Ignition and Spill Control Agent Specialists: Be familiar with the situation-specific list of sensitive resources to be considered for potential *in situ* burn impacts.

Requisite Skill for Aerial Surveillance Specialists: Be able to report resources recognized by aerial observation through the ICS chain of command.

[referenced in 1.2.2.1, 3.2.2.1, 4.2.2.1, 5.2.2.1, 8.2.2.1, 9.2.2.1, 10.2.2.1]

11.2.2.2 Predict the impact of *in situ* burning on the sensitive resources identified.

*Requisite Knowledge for Burn Boss, Skilled Support Personnel *, and Observers* *: Know of the effect of *in situ* burning on the availability of toxic oil constituents, smoke, and combustion

* When this is an assigned task.

products to sensitive receptors. As appropriate, understand the impact of heat from *in situ* burning on the water column in open water situations. As appropriate, understand the impact of heat from *in situ* burning on plant roots and different plant communities in terrestrial environments. As appropriate, understand the impact of heat from *in situ* burning on ice features. Understand the temporal susceptibility of the various sensitive resources. Understand how *in situ* burning can reduce the impact of spilled oil to sensitive resources.

Requisite Knowledge for Vessel Captain and Aerial Surveillance Specialists: Know of the effect of *in situ* burning on the availability of toxic oil constituents, smoke, and combustion products to sensitive receptors. Understand the impact of heat from *in situ* burn on ice features and on the water column. Understand the temporal susceptibility of the various sensitive resources. Understand how *in situ* burn can reduce the impact of spilled oil to sensitive resources.

Requisite Knowledge for Fire Suppression Specialists and Ignition and Spill Control Agent Specialists: Know of the effect of *in situ* burning on the availability of toxic oil constituents, smoke and combustion products to sensitive receptors. Understand the impact of heat from *in situ* burning on plant roots and different plant communities. Understand the temporal susceptibility of the various sensitive resources. Understand how *in situ* burning can reduce the impact of spilled oil to sensitive resources.

Requisite Skill for Burn Boss, Vessel Captains, and Skilled Support Personnel * Analyze situation-specific conditions that determine what impact use of or not using *in situ* burning will have on sensitive resources.

*Requisite Skill for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Observers *:* Understand the situation-specific conditions that determine what impact use of *in situ* burn fire control and surveillance activities will have on sensitive resources. Advise the chain of command if loss of control of an *in situ* burn is threatening sensitive resources.

Requisite Skill for Aerial Surveillance Specialists: Analyze the aerial observations of situation-specific conditions that determine what impact use of *in situ* burn or not using *in situ* burn will have on sensitive resources. Report findings through the ICS chain of command.

[referenced in 1.2.2.2, 3.2.2.2, 4.2.2.2, 5.2.2.2, 8.2.2.2, 9.2.2.2, 10.2.2.2]

11.2.2.3 Develop protection strategies for sensitive resources.

*Requisite Knowledge for Burn Boss, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Skilled Support Personnel *, Aerial Surveillance Specialists, and Observers* *: Understand options to protect sensitive resources, including location, timing, weather, and ways of repelling or isolating sensitive resources. In terrestrial environments also understand the use of firebreaks, fire suppression, techniques to minimize soil compaction, and flooding of wetlands as protection strategies.

Requisite Skill for Burn Boss: Be able to direct the development of protection strategies to ward off sensitive resources from areas of *in situ* burn impact. Use tactical decisions in open water and ice environments to locate or re-locate *in situ* burning to areas that minimize impacts of sensitive resources. In terrestrial environments use tactical decisions to restrict the size, sequence, soil compaction, or flooding of *in situ* burn areas.

Requisite Skill for Vessel Captains: Perform protection strategies as directed by the burn boss to ward off sensitive resources from areas of *in situ* burn impact. Advise the burn boss on tactical options to locate or re-locate *in situ* burning to areas that minimize impacts of sensitive resources.

Requisite Skill for Fire Suppression Specialists and Ignition and Spill Control Agent Specialists: Perform protection strategies as directed by the burn boss to ward off sensitive resources from areas of *in situ* burn impact. Advise the burn boss on tactical options to restrict

* When this is an assigned task.

the size, sequence, soil compaction or flooding of *in situ* burning areas that minimize impacts to sensitive resources.

Requisite Skill for Skilled Support Personnel * *and Observers* *: Recommend protection strategies to ward off sensitive resources from areas of *in situ* burn impact. Advise the burn boss on tactical options to restrict the size, sequence, soil compaction, or flooding of *in situ* burning areas that minimize impacts to sensitive resources.

Requisite Skill for Aerial Surveillance Specialists: Recommend oil collection and burning tactics based on aerial observation to avoid sensitive resources.

[referenced in 1.2.2.3, 3.2.2.3, 4.2.2.3, 5.2.2.3, 8.2.2.3, 9.2.2.3, 10.2.2.3]

11.2.3 Anticipate Potential Environmental Impacts of *In Situ* Burning of Oil

11.2.3.1 Identify airborne impacts.

Requisite Knowledge for Burn Boss, Skilled Support Personnel *, *and Observers* *: Understand the following concepts: dispersion of particulates and vapors, effect of wind speed, effect of solar irradiation, effect of the height of the mixing layer, and the effect of surface roughness. In terrestrial environments understand the influence of the composition, combustibility and fuel load of vegetative matter in the burn area.

Requisite Skill for Burn Boss: Predict the likely downwind safe distance for responders and the general public from a specific *in situ* burn operation.

Requisite Skill for Skilled Support Personnel * *and Observers* *: Understand that the likely downwind safe distance for responders and the general public from a specific *in situ* burn operation can be appropriately modeled. Report findings through the ICS chain of command.

[referenced in 1.2.3.1, 8.2.3.1, 10.2.3.1]

11.2.3.2 Identify surface water impacts.

Requisite Knowledge for Burn Boss, Skilled Support Personnel *, *and Observers* *: Understand the factors affecting oil spreading, factors affecting self-concentration of burning oil, when and where oil herding agents may facilitate more efficient *in situ* burn operations. Understand how the composition of *in situ* burn residues may affect aquatic wildlife and the biodegradability of unrecovered residue.

Requisite Skill for Burn Boss, Skilled Support Personnel *, *and Observers* *: Predict potential positive and negative environmental impacts applicable to a specific spill situation on water bodies both with and without current.

[referenced in 1.2.3.2, 8.2.3.2, 10.2.3.2]

11.2.3.3 Identify subsurface water impacts.

Requisite Knowledge for Burn Boss, Skilled Support Personnel *, *and Observers* *: Understand the effect of heat from *in situ* burning on the subsurface. Understand the behavior of *in situ* burn residual matter under various conditions, including initial oil composition, effect of weathering before *in situ* burning occurs, and effect of emulsification.

Requisite Skill for Burn Boss, Skilled Support Personnel *, *and Observers* *: Predict potential subsurface impacts of heat and *in situ* burn residual matter for a specific *in situ* burn situation.

[referenced in 1.2.3.3, 8.2.3.3, 10.2.3.3]

11.2.3.4 Identify soil impacts.

Requisite Knowledge for Burn Boss, Skilled Support Personnel *, *and Observers* *: Understand the effect of heat from *in situ* burning on soils found in different habitats, including upland, wetland, desert, and tundra. Understand the behavior of *in situ* burn residual matter

* When this is an assigned task.

under various conditions, including initial oil composition, effect of weathering before *in situ* burning occurs, effects of activities involved in the collection of residual material, factors affecting biodegradation of oil and burn residuals in soils.

Requisite Skill for Burn Boss, Skilled Support Personnel *, *and Observers* *: Predict potential soil impacts resulting form *in situ* burn tactics chosen for a specific *in situ* burn situation.

[referenced in 1.2.3.4, 8.2.3.4, 10.2.3.4]

11.3 Competencies—Planning the *In Situ* Burn Response

11.3.1 Task Force Tactics

11.3.1.1 Identify and implement tactical options for *in situ* burning.

In Open Water Situations:

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, and Small Boat Operators and Deck Hands: Understand fire boom positioning techniques, including catenary or U-shaped configuration, concentration of oil using a funnel technique, unconfined *in situ* burning conditions, *in situ* burning on oil confined by shoreline and wind.

Requisite Skill for Burn Boss: Be able to direct the positioning of vessels, personnel, and equipment to perform safe and effective *in situ* burning in a variety of situations operations at sea and in large lakes.

Requisite Skill for Vessel Captains: Be able to position a vessel, its personnel, and equipment to perform safe and effective *in situ* burn in accordance with instructions provided by the burn boss (incident command) at sea and in large lakes. Be able to coordinate vessel positioning with other vessels in an *in situ* burn task force, particularly when towing boom.

Requisite Skill for Safety Officers: For a given set of conditions, be able to identify vessels and equipment that will be suitable for safe and effective *in situ* burn operations at sea and in large lakes.

Requisite Skill for Ignition and Spill Control Agent Specialists: Perform safe and effective ignition of an *in situ* burn in accordance with instructions provided by the burn boss (incident command) from small boats or vessels. Be able to coordinate vessel/small boat positioning with other vessels in an *in situ* burn task force for safe and effective ignition of an *in situ* burn.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to assist in deployment of fire boom and towing gear in a safe and effective manner in accordance with instructions provided by the burn boss (incident command). Be able to coordinate vessel/small boat positioning with other vessels/small boats in an *in situ* burn task force.

On Land, Rivers, Streams, and Small Lakes:

Requisite Knowledge for Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Small Boat Operators and Deck Hands: Understand firebreak construction techniques, including using existing roads or topographical features, using earthmoving equipment and/or hand tools. Understand positioning of personnel so they can safely retreat if necessary, use of containment and fire boom on water, and use of boats to access oil on water.

Requisite Skill for Burn Boss: Be able to direct the positioning of vehicles, personnel, and equipment to perform safe and effective *in situ* burning in fields, desert, prairie, wetlands, savannah, forest, rivers, streams, ponds, and small lakes.

* When this is an assigned task.

Requisite Skill for Safety Officers: For a given set of conditions, be able to identify vehicles and equipment that will be suitable for safe and effective *in situ* burn operations in fields, desert, prairie, wetlands, savannah, forest, rivers, streams, ponds, and small lakes.

Requisite Skill for Fire Suppression Specialists: Be able implement the positioning of vehicles, personnel and equipment to perform safe and effective fire suppression associated with *in situ* burning in a variety of situations.

Requisite Skill for Ignition and Spill Control Agent Specialists: Perform safe and effective ignition of *in situ* burns in fields, desert, prairie, wetlands, savannah, forest, rivers, streams, ponds, and small lakes.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to deploy containment and fire boom from vessels and small boats, using shore moorings and anchors in a safe and effective manner in accordance with instructions provided by the burn boss.

<u>In Ice Conditions on Water with Less Than 3/10 Ice Coverage:</u>

Requisite Knowledge for Burn Boss, Safety Officers, Ignition and Spill Control Agent Specialists, and Small Boat Operators and Deck Hands: Understand fire boom positioning techniques, including catenary or U-shaped configuration, concentration of oil using a funnel technique, unconfined *in situ* burning conditions, *in situ* burning on oil confined by wind among ice floes or against a solid ice margin or shoreline.

Requisite Skill for Burn Boss: Be able to direct the positioning of vessels, personnel, and equipment to perform safe and effective *in situ* burning in a variety of situations on open waters with less than 3/10 ice coverage.

Requisite Skill for Safety Officers: For a given set of conditions, be able to identify vessels and equipment that will be suitable for safe and effective *in situ* burn operations in a variety of situations when ice coverage is less than 3/10.

Requisite Skill for Ignition and Spill Control Agent Specialists: Perform safe and effective ignition of an *in situ* burn in accordance with instructions provided by the burn boss (incident command). Be able to coordinate vessel/small boat positioning with other vessels in an *in situ* burn task force for safe and effective ignition of an *in situ* burn.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to position small boats and deploy containment and fire boom using shore and anchors in a safe and effective manner in accordance with instructions provided by the burn boss.

<u>In Ice Conditions on Water with More Than 3/10 Ice Coverage:</u>

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, and Small Boat Operators and Deck Hands: Understand the limitations of fire boom in drift and pack ice conditions, natural concentration of oil between ice floes, unconfined *in situ* burning conditions, *in situ* burning on oil confined by wind against a shoreline or fast ice margin.

Requisite Skill for Burn Boss: Be able to direct the positioning of vessels, personnel, and equipment to perform safe and effective *in situ* burning over a range of ice coverage and ice composition situations.

Requisite Skill for Vessel Captains: Be able to position a vessel, its personnel, and equipment to perform safe and effective *in situ* burn in accordance with instructions provided by the burn boss (incident command) at sea and in large lakes. Be able to coordinate vessel positioning with other vessels in an *in situ* burn task force, particularly when towing boom.

Requisite Skill for Safety Officers: Be able to evaluate safety and health hazards associated with the positioning of vessels, personnel and equipment to perform safe and effective *in situ* burning over a range of ice coverage and ice composition situations.

Requisite Skill for Ignition and Spill Control Agent Specialists: Perform safe and effective ignition of an *in situ* burn in accordance with instructions provided by the burn boss (incident command). Be able to coordinate vessel/small boat positioning with other vessels in an *in situ* burn task force for safe and effective ignition of an *in situ* burn.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to position small boats and deploy containment and fire boom using shore and anchors in a safe and effective manner in accordance with instructions provided by the burn boss.

In Ice Conditions on Solid Central Pack and Fast Ice:

Requisite Knowledge for Burn Boss, Safety Officers, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *: Understand snow and ice berm construction for *in situ* burning on spill to the surface of solid ice. Understand how brine channels in solid ice can be used for burning trapped and encapsulated oil. Understand how, when current is present under ice, to cut trenches and install diversion barriers in slots in ice to contain oil for *in situ* burning in sumps cut in the ice. Understand the techniques for cutting and removing cut blocks from solid ice.

Requisite Skill for Burn Boss: Be able to direct the positioning of personnel and equipment to perform safe and effective containment of oil and *in situ* burning in a variety of solid pack and fast ice situations.

Requisite Skill for Safety Officers: For a given set of conditions, be able to identify transportation and equipment that will be suitable for safe and effective containment of oil and *in situ* burning in a variety of solid pack and fast ice situations.

Requisite Skill for Ignition and Spill Control Agent Specialists: Perform safe and effective ignition of an *in situ* burn in a variety of solid pack and fast ice situations.

*Requisite Skill for Skilled Support Personnel *:* Be able to perform safe and effective containment of oil and *in situ* burning in a variety of solid pack and fast ice situations.

When Aerial Observation Is Used:

Requisite Knowledge for Aerial Surveillance Specialists: Understand fire boom positioning techniques, including catenary or U-shaped configuration, concentration of oil using a funnel boom configuration, unconfined *in situ* burn conditions, *in situ* burn of oil among ice floes or against a solid ice margin or shoreline. Understand aerial flight pattern options over an *in situ* burn operation.

Requisite Skill for Aerial Surveillance Specialists: Be able to observe and communicate the positioning of vessels and small boats relative to oil slicks on the water to implement safe and effective *in situ* burning operations in accordance with instructions provided by the burn boss (incident command). Be able to coordinate vessel positioning in an *in situ* burn task force, particularly when towing boom and performing ignition operations.

[referenced in 1.3.1.1, 2.3.1.1, 3.3.1.1, 4.3.1.1, 5.3.1.1, 6.3.1.1, 8.3.1.1, 9.3.1.1]

11.3.1.2 Minimum equipment capabilities and quantities for the applicable operating environments.

In Open Water Situations:

Requisite Knowledge for Burn Boss, Safety Officers, and Vessel Captains: Understand vessel and small boat size, maneuverability, and power needs for positioning fire boom in transit and in burning configurations. Understand vessel requirements for *in situ* burn ignition, air quality monitoring, fire boom deployment and recovery, on-scene command, fire suppression, and operational surveillance. Understand fire boom selection criteria, advantages and disadvantages of available fire boom, towing bridle requirements, containment boom selection criteria for collection (not burning) tactics, and support equipment needs (power, lifting, pumps, etc.).

* When this is an assigned task.

Requisite Knowledge for Ignition and Spill Control Agent Specialists: Understand ignition systems operating and safety criteria for open water use, including use in ice conditions. Understand how to determine ignition system heat output, duration, and quantity necessary to support planned operations. Understand small boat size, maneuverability, and power needs for attaining a position where ignition systems can be safely and effectively delivered into an oil slick for ignition to be effective. Understand small boat requirements for *in situ* burn ignition.

Requisite Skill for Burn Boss: For a given set of conditions, be able to select vessels and equipment that will be suitable for safe and effective *in situ* burn operations at sea and in large lakes.

Requisite Skill for Safety Officers: Be able to evaluate safety and health hazards associated with the positioning of vessels, personnel, and equipment to perform safe and effective *in situ* burning in a variety of situations at sea and in large lakes.

Requisite Skill for Vessel Captains: For a given set of conditions, be able to implement vessel and small boat positioning and equipment operation for *in situ* burn operations in accordance with the burn boss (incident command) instructions and in a safe and effective manner.

Requisite Skill for Ignition and Spill Control Agent Specialists: For a given set of conditions, be able to implement ignition system deployment from vessels and small boats for *in situ* burn operations in accordance with the burn boss (incident command) instructions and in a safe and effective manner.

<u>On Land:</u>

Requisite Knowledge for Burn Boss, Safety Officers, and Fire Suppression Specialists: Understand vehicle size, maneuverability, and power needs for fire suppression at the *in situ* burn site and adjacent locations where fire could spread. Understand personnel mobility requirements for *in situ* burn ignition, air quality monitoring, fire suppression, on-scene command, and operational surveillance. Understand equipment selection criteria, advantages and disadvantages of available equipment, and what would be needed to recover equipment that becomes disabled or stuck.

Requisite Knowledge for Ignition and Spill Control Agent Specialists: Understand ignition systems operating and safety criteria for use on land. Understand how to determine ignition system heat output, duration, and quantity necessary to support planned operations. Understand vehicle size, maneuverability and power needs for access, egress and fire suppression at the *in situ* burn site and adjacent locations where fire could spread. Understand personnel mobility requirements for *in situ* burn ignition, air quality monitoring, fire suppression, on-scene command, and operational surveillance. Understand equipment selection criteria, advantages, and disadvantages of available equipment.

Requisite Skill for Burn Boss: For a given set of conditions, be able to select vehicles, personnel and equipment to perform safe and effective *in situ* burning in a variety of situations, including fields, desert, prairie, wetlands, savannahs, tundra, and forest.

Requisite Skill for Safety Officers: Be able to evaluate safety and health hazards associated with the positioning of vehicles, personnel, and equipment to perform safe and effective *in situ* burning in a variety of situations, including fields, desert, prairie, wetlands, savannahs, tundra, and forest.

Requisite Skill for Fire Suppression Specialists: For a given set of conditions, be able to use vehicles and equipment to perform safe and effective *in situ* burning in a variety of situations, including fields, desert, prairie, wetlands, savannahs, tundra, and forest.

Requisite Skill for Ignition and Spill Control Agent Specialists: For a given set of conditions, be able to safely use suitable ignition systems to perform safe and effective ignition of an *in situ* burns in a variety of situations, including fields, desert, prairie, wetlands, savannahs, tundra, and forest.

On Rivers, Streams, and Small Lakes:

Requisite Knowledge for Burn Boss and Safety Officers: Understand boat size, maneuverability, and power needs for positioning and deploying fire boom using two boats or setting boom attached to shore moorings or anchors. Understand vessel and small boat requirements for *in situ* burn ignition, air quality monitoring, fire boom deployment and recovery, on-scene command, fire suppression, and operational surveillance. Understand fire boom selection criteria, advantages, and disadvantages of available fire boom, towing bridle requirements, containment boom selection criteria for collection (not burning) tactics, and support equipment needs (power, lifting, pumps, etc.).

Requisite Skill for Burn Boss: For a given set of conditions, be able to select boats, personnel, and equipment to perform safe and effective *in situ* burning in a variety of situations, including rivers, streams, ponds, and small lakes, and equipment that will be suitable for safe and effective *in situ* burn operations.

Requisite Skill for Safety Officers: Be able to evaluate safety and health hazards associated with the positioning of vehicles, personnel, and equipment to perform safe and effective *in situ* burning in a variety of situations, including rivers, streams, ponds, and small lakes.

In Ice Conditions on Water:

Requisite Knowledge for Burn Boss and Safety Officers: Understand vessel size, sustainability, and power needs for offshore support, including providing accommodations for the burning crew, crane services, and working deck space for boom deployment, retrieval, and maintenance/repair. Understand vessel size, maneuverability and power needs for positioning fire boom in transit and in burning configurations. Understand vessel/small boat requirements for *in situ* burn ignition, air quality monitoring, fire boom deployment and recovery, and operational surveillance. Understand fire boom selection criteria, advantages and disadvantages of available fire boom in ice conditions, towing bridle requirements, containment boom selection criteria for collection (not burning) tactics, and support equipment needs (power, lifting, pumps, etc.).

Requisite Skill for Burn Boss: For a given set of conditions be able to select vessels and equipment that will be suitable for safe and effective *in situ* burning in a variety of situations on open waters with ice coverage.

Requisite Skill for Safety Officers: Be able to evaluate safety and health hazards associated with the positioning of vessels, personnel and equipment to perform safe and effective *in situ* burning in a variety of situations on open waters with ice coverage.

In Ice Conditions on Solid Central Pack and Fast Ice:

Requisite Knowledge for Burn Boss and Safety Officers: Understand equipment and personnel requirements for *in situ* burn ignition, air quality monitoring, berm or ice trench construction, on-scene command, and operational surveillance. Understand the transportation and access capability needed to deploy the needed equipment and personnel.

Requisite Knowledge for Ignition and Spill Control Agent Specialists: Understand ignition systems operating and safety criteria for use on solid ice. Understand how to determine ignition system heat output, duration and quantity necessary to support planned operations. Understand equipment selection criteria, advantages and disadvantages of available equipment. Understand how to contain and ignite oil using berm or ice trench construction. Understand the transportation and access capability needed to deploy the needed equipment and personnel on solid ice.

Requisite Skill for Burn Boss: For a given set of conditions, be able to select equipment and position personnel to perform safe and effective collection of oil and *in situ* burning in a variety of solid pack and fast ice situations.

Requisite Skill for Safety Officers: Be able to evaluate safety and health hazards associated with the positioning of personnel and equipment to perform safe and effective collection of oil and *in situ* burning in a variety of solid pack and fast ice situations.

Requisite Skill for Ignition and Spill Control Agent Specialists: Perform safe and effective ignition of *in situ* burns in a variety of solid pack and fast ice situations.

When Using Small Boats:

Requisite Knowledge for Small Boat Operators and Deck Hands: Understand vessel/small boat requirements for *in situ* burn ignition, and operational surveillance. Understand containment boom and fire boom characteristics, fire boom selection criteria, advantages and disadvantages of available fire boom, towing bridle requirements, containment boom selection criteria for collection (not burning) tactics, and support equipment needs (power, lifting, pumps, etc.).

Requisite Skill for Small Boat Operators and Deck Hands: For a given set of conditions be able to implement equipment operation for *in situ* burn operations in accordance with the burn boss (incident commander), vessel captain or deck hand supervisor's instructions and in a safe and effective manner.

[referenced in 1.3.1.2, 2.3.1.2, 3.3.1.2, 4.3.1.2, 5.3.1.2, 6.3.1.2]

11.3.1.3 Timeline for daily *in situ* burn operations.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Skilled Support Personnel [*], and Aerial Surveillance Specialists: An understanding of the expected deployment times for personnel and the equipment needed for *in situ* burn operations.

Requisite Skill for Burn Boss: Be able to calculate transit times between point of origin, staging and burn areas (including time involved in towing boomed oil to a safe location to conduct the burn), deployment and recovery times, expected burn rates, and effective workday length for a given *in situ* burn situation.

Requisite Skill for Safety Officers: Be able to confirm estimates of effective workday length for a given *in situ* burn situation with respect to personnel fatigue considerations. Provide the burn boss (incident command) with recommendations on workday length for a given *in situ* burn situation.

Requisite Skill for Vessel Captains: Be able to confirm estimates of transit times between point of origin staging docks and burn areas (including time involved in towing boomed oil to a safe location to conduct the burn), deployment and recovery times, expected burn rates, and effective workday length for a given *in situ* burn situation. Provide the burn boss (incident command) with timely updates of progress and anticipated deviations from the approved timeline.

*Requisite Skill for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Skilled Support Personnel *, and Aerial Surveillance Specialists:* Be aware of estimated transit times between point of origin and burn areas (including time involved in towing boomed oil to a safe location to conduct the burn), deployment and recovery times, expected burn rates, and effective workday length for a given *in situ* burn situation. Provide the burn boss (incident command) with timely updates of progress and anticipated deviations from the approved timeline.

[referenced in 1.3.1.3, 2.3.1.3, 3.3.1.3, 4.3.1.3, 5.3.1.3, 8.3.1.3, 9.3.1.3]

11.3.1.4 Protective actions to ensure the health and safety of response personnel.

Requisite Knowledge for Burn Boss, Safety Officers, Ignition and Spill Control Agent Specialists, Air Monitoring Specialists, and Skilled Support Personnel: Understand safe

[*] When this is an assigned task.

practices for transferring personnel between vessels and small boats or positioning of personnel for a burn on land or ice, preventing heat stress and hypothermia, work/rest cycles, personal protective equipment capabilities, deploying and recovering boom and towing bridle from vessels and shore, ignition of oil, applying spill control agents, and protection from aggressive wildlife, as well as vehicle, vessel, and boat positioning relative to ice conditions, surface oil, and burn emissions.

Requisite Knowledge for Vessel Captains and Small Boat Operators and Deck Hands: Understand safe practices for: transferring personnel between vessels and small boats, preventing heat stress and hypothermia, work/rest cycles, personal protective equipment capabilities, deploying and recovering boom and towing bridle from vessels and shore, ignition of oil, and protection from aggressive wildlife, as well as vessel and boat positioning relative to ice conditions, surface oil and burn emissions.

Requisite Knowledge for Fire Suppression Specialists: Understand safe practices for: positioning of personnel for a burn on land, preventing heat stress and hypothermia, work/rest cycles, personal protective equipment capabilities, ignition of oil, protection from aggressive wildlife, deploying and recovering boom, and transferring personnel in and out of small boats, as well as boat positioning relative to surface oil and burn emissions. Understand thermal radiation hazards and thermal exposure limits.

Requisite Knowledge Aerial Surveillance Specialists (when operating from a support vessel): Understand safe practices for: transferring personnel between vessels and small boats, preventing heat stress and hypothermia, work/rest cycles, personal protective equipment capabilities, and protection from aggressive wildlife.

Requisite Knowledge for Observers: Understand safe practices for positioning of personnel for a burn on land, preventing heat stress and hypothermia, work/rest cycles, personal protective equipment capabilities, and protection from aggressive wildlife.

Requisite Skill for Burn Boss: Be capable of critically reviewing and approving a Site Safety Plan for *in situ* burning operations.

Requisite Skill for Safety Officers: Be capable of assessing hazards and developing a situation-specific Site Safety Plan for *in situ* burn operations.

Requisite Skill for Vessel Captains: Be capable of piloting the vessel and directing work operations on it in a safe and effective manner in accordance with the situation-specific Site Safety Plan.

Requisite Skill for Fire Suppression Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Be capable of performing work operations in a safe and effective manner in accordance with the situation-specific Site Safety Plan.

Requisite Skill for Air Surveillance Specialists and Observers: Be capable of assessing hazards and following a situation-specific Site Safety Plan for *in situ* burn operations.

[referenced in 1.3.1.4, 2.3.1.4, 3.3.1.4, 4.3.1.4, 5.3.1.4, 6.3.1.4, 7.3.1.4, 8.3.1.4, 9.3.1.4, 10.3.1.4]

11.3.2 Vessel Navigation (applies to Vessel Captains only)

11.3.2.1 Be able to navigate a vessel to reach the intended destination safely and efficiently.

Requisite Knowledge: Understand all aspects of determining vessel positioning and safe navigation including dead reckoning, use of paper and electronic charts, operation and use of electronic navigation, tides and currents, aids to navigation, and safety.

Requisite Skill: Be able to determine location of vessel in relation to other vessels and dangers to navigation by all available means and to plot and follow a course from points A to B. Utilize these skills to plot courses and develop routes for operational planning purposes as well as when underway.

[referenced in 3.3.2.1]

11.3.2.2 Understanding and obeying navigational rules of the road.

Requisite Knowledge: Know the International Regulations for Preventing Collisions at Sea, 1972 as amended (72 COLREGS) for marine and inland waters.

Requisite Skill: Be able to navigate a vessel safely by properly maneuvering a vessel in sight of other vessels and in restricted visibility, use appropriate sounds signals, and display correct lights and signal shapes.

[referenced in 3.3.2.2]

11.3.3 Vessel Handling During *In Situ* Burning of Oil (when vessels are used)

11.3.3.1 Proficiency in maneuvering a vessel alongside and underway.

Requisite Knowledge for Vessel Captains: Understand the forces that affect vessel handling and the operational limitations and characteristics of vessels while underway, docking, towing, and coming alongside other vessels, buoys, boom, etc.

Requisite Skill for Vessel Captains: Demonstrate the ability to get vessels away from dock or ship; handle a vessel in following, head, and beam seas; maneuver and hold station within one vessel length of a fixed object (buoy, mooring, piling); maneuver and hold station with a floating object (boom, towline float); maneuver and take an adrift object alongside and aboard the vessel [towline, personal floatation devices (PFD), float, life raft]; maneuver a vessel when constrained by depth, channel size, etc.; maneuver alongside another vessel with no way on; coming alongside an underway vessel; anchoring and weighing anchor.

[referenced in 3.3.3.1]

11.3.4 Small Boat Handling and Safety During *In Situ* Burning of Oil (when small boats are used)

11.3.4.1 Awareness of small boat safety issues.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand the hazards involved in small boat operations and the types of small boats that are safe for operations in various combinations of sea state and/or current, weather and task assignments. Know the safety equipment necessary for safe small boat operations.

Requisite Skill for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Demonstrate an understanding of how to safely operate in a small boat in various conditions and deploy and use safety equipment for fire suppression, taking on water, man overboard, distress calling, and other onboard emergencies.

[referenced in 1.3.4.1, 2.3.4.1, 3.3.4.1, 5.3.4.1, 6.3.4.1, 7.3.4.1, 8.3.4.1]

11.3.4.2 Small boat seaworthiness, stability, and safety.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand methods for securing a small boat in preparation for heavy weather, signs of an unstable small boat, use of fire extinguishers and other onboard emergency equipment, signs of propeller cavitations, and actions to take if the small boat goes aground or is damaged by ice.

Requisite Skill for Burn Boss: Be able to direct the use of personal floatation devices (PFD), life rafts, and lifesaving equipment. In cold weather direct the use of buoyant worksuits (Class V Thermal PFD worksuit) and hypothermia bags. Demonstrate an understanding of bringing a small boat up to full speed, tight radius turns without causing propeller cavitations, and high-speed avoidance techniques including turns and emergency astern.

Requisite Skill for Safety Officers: Be able to ensure small boat occupants are trained to use personal floatation devices (PFD), life rafts, and lifesaving equipment. In cold weather demonstrate using buoyant worksuits (Class V Thermal PFD worksuits) and hypothermia bags.

Requisite Skill for Vessel Captains: Show ability to load small boats so that stability is not adversely affected. Demonstrate using PFDs, life rafts, and lifesaving equipment. In cold weather be capable of using buoyant worksuits (Class V Thermal PFD worksuit), hypothermia bags. Be capable of bringing a small boat up to full speed, tight radius turns without causing propeller cavitations, high-speed avoidance techniques including turns and emergency astern. Demonstrate ability to safely operate a boat under various speeds, avoid collisions, anchor, and maneuver a small boat under extreme or adverse conditions.

Requisite Skill for Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Demonstrate using personal floatation devices (PFD), buoyant worksuits (Class V Thermal PFD worksuit), hypothermia bags, life rafts, and lifesaving equipment.

[referenced in 1.3.4.2, 2.3.4.2, 3.3.4.2, 5.3.4.2, 6.3.4.2, 7.3.4.2, 8.3.4.2]

11.3.4.3 Small boat transfer practices.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand necessary safety requirements and safety equipment, coordination, minimum personnel, identification of hazards, and control techniques to use during transfers between small boats and vessels, shore or solid ice.

Requisite Skill for Burn Boss: Specify written personnel transfer procedures to apply to all vessels and small boats in a specific *in situ* burn operation (using as a reference, for example, IMCA M 202, Guidance on the Transfer of Personnel to and from Offshore Vessels, March 2010, International Marine Contractors Association). Ensure that all personnel are trained on the procedure. Be capable of carrying out small boat embark/debark vessel transfers while correctly using personal safety equipment during transfers. Be capable of recovering personnel from the water.

Requisite Skill for Safety Officers: Review and advise the burn boss on the written personnel transfer procedure to apply to all vessels and small boats in a specific *in situ* burn operation (using as a reference, for example, IMCA M 202, Guidance on the Transfer of Personnel to and from Offshore Vessels, March 2010, International Marine Contractors Association). Ensure that all personnel are trained on the procedure. Be capable of carrying out small boat embark/debark transfers while correctly using personal safety equipment during transfers. Be capable of recovering personnel from the water.

Requisite Skill for Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Be able to conduct small boat and vessel embark/debark transfers in accordance with the written personnel transfer procedure approved by the burn boss that applies to all vessels and small boats in a specific *in situ* burn operation. Demonstrate carrying out small boat and vessel embark/debark transfers while correctly using safety equipment during transfers. Demonstrate ability to recover personnel from the water.

[referenced in 1.3.4.3, 2.3.4.3, 3.3.4.3, 5.3.4.3, 6.3.4.3, 7.3.4.3, 8.3.4.3]

11.3.5 Spill Control Agent Usage During *In Situ* Burning of Oil (when used)

11.3.5.1 Be able to identify conditions where the use of spill control agents would significantly enhance the effectiveness of *in situ* burning.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Understand the effects of oil type, weathering of oil, fraction of oil emulsified, water and air temperature, wave action, and wind speed on the ease of ignition and

sustainability of burning. Understand how and under what conditions spill control agents such as demulsifiers or surface collecting (herding) agents will aid ignition and sustainability of *in situ* burning.

Requisite Skill for Burn Boss: Be able to determine if the effectiveness of *in situ* burning would be significantly aided by the use of a specific spill control agent.

Requisite Skill for Safety Officers: Be able to assess the worker safety issues of using spill control agents.

Requisite Skill for Ignition and Spill Control Agent Specialists: Be able to visually distinguish oil thickness and emulsification.

[referenced in 1.3.5.1, 2.3.5.1, 5.3.5.1]

11.3.5.2 Legal requirements for using spill control agents.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Understand the requirements of the jurisdiction such as the National Contingency Plan (NCP—40 *CFR* 300) in the United States. Be familiar with the NCP Product Schedule and how to obtain the most current version of the schedule. Understand what criteria a spill control agent must meet to be listed on the NCP Product Schedule. Understand how to determine local permitting or permission requirements for *in situ* burning and spill control agent use.

Requisite Skill for Burn Boss: In a specific situation, be able to provide the information and planning details necessary to satisfy authorities who will decide whether to allow the use of spill control agents with *in situ* burning or not.

Requisite Skill for Safety Officers and Ignition and Spill Control Agent Specialists: In a specific situation, be able to provide the information and planning details necessary to the burn boss who will decide whether to contact the authorities to request permission to use spill control agents with *in situ* burning or not.

[referenced in 1.3.5.2, 5.3.5.2]

11.3.5.3 Understand the environmental conditions when spill control agents can be effectively used.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Understand the effective range of conditions where various spill control agents would be useful. Understand the logistics of effectively applying each spill control agent.

Requisite Skill for Burn Boss, and Ignition and Spill Control Agent Specialists: Be able to evaluate the efficacy and expected benefit, if any, of using a specific spill control agent in a given situation.

Requisite Skill for Safety Officers: Be able to evaluate the worker safety issues of using a specific spill control agent in a given situation. Be able to recommend safety precautions to be taken when using specific spill control agents under various environmental conditions.

[referenced in 1.3.5.3, 2.3.5.3, 5.3.5.3]

11.3.5.4 Evaluate the hazards and application techniques relating to safe use of spill control agents.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Understand how to determine the hazards to workers, the public, and other environmental receptors, of using spill control agents. Be aware of which application techniques are most effective for different spill control agents.

Requisite Skill for Burn Boss: Demonstrate the ability to safely and effectively direct the application of spill control agents in appropriate circumstances.

Requisite Skill for Safety Officers and Ignition and Spill Control Agent Specialists: Demonstrate the ability to ensure worker safety during application of spill control agents.

[referenced in 1.3.5.4, 2.3.5.4, 5.3.5.4]

11.3.6 Responder Personal Protective Equipment During *In Situ* Burning of Oil

11.3.6.1 Use of general personal safety equipment and procedures considering the recommendations of the Safety Officer.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Observers: Understand the use of appropriate safety harness, head protection (hard hat), eye, hearing, foot, and hand protective equipment for likely workplace physical hazards and weather conditions.

Requisite Skill for Burn Boss: Direct workers to correctly don and doff appropriate personal safety equipment for the physical hazards of the situation and also follow established procedures to prevent hypothermia and heat stress.

Requisite Skill for Safety Officers: Ensure that workers to correctly don and doff appropriate personal safety equipment for the physical hazards of the situation and also follow established procedures to prevent hypothermia and heat stress.

Requisite Skill for Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Observers: Be able to correctly don and doff appropriate personal safety equipment for the physical hazards of the situation and also follow established procedures to prevent hypothermia and heat stress.

[referenced in 1.3.6.1, 2.3.6.1, 3.3.6.1, 4.3.6.1, 5.3.6.1, 6.3.6.1, 7.3.6.1, 8.3.6.1, 10.3.6.1]

11.3.6.2 Use of commercial personal floatation devices during *in situ* burn operations on or near water.

Requisite Knowledge for Burn Boss, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand how to select appropriate commercial vessel personal floatation devices for tasks associated with *in situ* burning operations. Buoyant worksuits (Class V Thermal PFD worksuit) should be considered for small boat and deck operations in cold water and ice conditions.

Requisite Knowledge for Safety Officers: Recommend appropriate commercial vessel personal floatation devices for tasks associated with *in situ* burning operations on or near water bodies. Buoyant worksuits (Class V Thermal PFD worksuit) should be considered for small boat and deck operations in cold water and ice conditions.

Requisite Knowledge for Fire Suppression Specialists, and Observers: Understand how to select appropriate commercial personal floatation devices for tasks associated with *in situ* burning operations.

Requisite Skill for Burn Boss: Direct workers to correctly don and doff appropriate personal floatation devices and to perform necessary tasks while wearing it.

Requisite Skill for Safety Officers: Ensure that workers correctly choose and wear appropriate personal floatation devices and to perform necessary tasks while wearing it.

Requisite Skill for Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Observers: Be able to correctly don and doff appropriate personal floatation devices and to perform necessary tasks while wearing it.

[referenced in 1.3.6.2, 2.3.6.2, 3.3.6.2, 4.3.6.2, 5.3.6.2, 6.3.6.2, 7.3.6.2, 8.3.6.2, 10.3.6.2]

11.3.6.3 Use personal protective equipment for fire, oil, and chemical hazards during *in situ* burn operations.

Requisite Knowledge Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring

Specialists, Skilled Support Personnel *, *and those Vessel Captains who directly supervise Small Boat Operators and Deck Hands working with oiled boom:* Understand effective personal protective equipment for tasks associated with *in situ* burning operations. Identify respiratory hazards and respiratory protection options. Identify skin contact exposure hazards and skin contact protection options. Identify flash (fire) hazards and appropriate protective clothing to mitigate flash hazards (e.g., flame-resistant clothing, firefighter turnout gear or wildland fire gear). Understand when flash hazard protection should be used instead of oil and chemical contact protection.

Requisite Skill for Burn Boss: Direct workers to correctly don and doff appropriate personal protective equipment and to perform necessary tasks while wearing it.

Requisite Skill for Safety Officers: Verify and ensure the selection and use of appropriate personal protective equipment to perform necessary tasks while wearing it.

Requisite Skill for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and those Vessel Captains who directly supervise Small Boat Operators and Deck Hands working with oiled boom: Be able to correctly don and doff appropriate personal protective equipment and to perform necessary tasks while wearing it.

[referenced in 1.3.6.3, 2.3.6.3, 3.3.6.3, 4.3.6.3, 5.3.6.3, 6.3.6.3, 7.3.6.3, 8.3.6.3]

11.3.6.4 Prevent cross-contamination from personal protective equipment during *in situ* burn operations.

Requisite Knowledge for Burn Boss, Safety Officers, and those Vessel Captains who directly supervise Small Boat Operators and Deck Hands working with oiled boom: Understand how to decontaminate workers. Be able to plan work activities to minimize contamination by oil. Understand how oiled personal protective equipment is to be cleaned or disposed.

Requisite Knowledge for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand how to decontaminate self and co-workers. Be able to plan work activities to minimize contamination by oil. Understand how oiled personal protective equipment is to be cleaned or disposed.

Requisite Skill for Burn Boss, and those Vessel Captains who directly supervise Small Boat Operators and Deck Hands working with oiled boom: Direct workers to use and remove personal protective equipment to minimize secondary contamination. Direct workers to perform field self-decontamination and decontaminate co-workers. Direct workers to package contaminated personal protective equipment for disposition.

Requisite Skill for Safety Officers: Ensure that the use and removal of personal protective equipment by workers is done to minimize secondary contamination. Ensure workers can perform field self-decontamination and decontaminate co-workers. Ensure that contaminated personal protective equipment is appropriately packaged for disposition.

Requisite Skill for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Be able to use and remove personal protective equipment to minimize secondary contamination. Be able to perform field self-decontamination and decontaminate co-workers. Be able to package contaminated personal protective equipment for disposition.

[referenced in 1.3.6.4, 2.3.6.4, 3.3.6.4, 4.3.6.4, 5.3.6.4, 6.3.6.4, 7.3.6.4, 8.3.6.4]

11.3.7 On-Water Ignition of *In Situ* Burning of Spilled Oil (when used)

11.3.7.1 Be able to select and deploy appropriate ignition systems.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, and Ignition and Spill Control Agent Specialists: Understand the construction, characteristics, and hazards of

* When this is an assigned task.

available hand-held *in situ* burn ignition systems, including commercially available devices and *ad hoc* options. Be able to evaluate the safety and expected effectiveness of available ignition system options for specific applications. Be aware of chemical compatibility issues while igniter components are stored prior to use. Be able to identify the safest placement of ignition personnel prior to, upon deployment and after deployment of ignition systems on an oil slick.

Requisite Skill for Burn Boss: Know how to deploy *in situ* burn ignition systems in a safe manner from small boats or shore access points. Ensure that ignition specialists have practiced deploying the ignition systems to be used in a specific situation in a safe area before an attempt to ignite contained oil.

Requisite Skill for Safety Officers: Ensure that *in situ* burn ignition systems are deployed in a safe manner from small boats or shore access points. Ensure that ignition specialists have practiced deploying the ignition systems to be used in a specific situation in a safe area before an attempt to ignite contained oil.

Requisite Skill for Vessel Captains: Be able to identify the safest placement of ignition personnel, towing vessels, and support vessels prior to, upon deployment, and after deployment of ignition systems on an oil slick.

Requisite Skill for Ignition and Spill Control Agent Specialists: Be able to deploy *in situ* burn ignition systems in a safe manner from small boats or shore access points. Demonstrate ability in a safe area at a spill with the ignition system to be used before attempting ignition of contained oil.

[referenced in 1.3.7.1, 2.3.7.1, 3.3.7.1, 5.3.7.1]

11.3.7.2 Evaluate spilled oil weathering and emulsification as that affects ignitability.

Requisite Knowledge for Burn Boss, Vessel Captains, and Ignition and Spill Control Agent Specialists: Understand the effects of oil type, weathering of oil, fraction of oil emulsified, water and air temperature, wave action, and wind speed on the ease of ignition and sustainability of burning.

Requisite Skill for Burn Boss, Vessel Captains, and Ignition and Spill Control Agent Specialists: Be able to visually evaluate oil thickness and emulsification as it affects ignitability of an oil slick.

[referenced in 1.3.7.2, 3.3.7.2, 5.3.7.2]

11.3.7.3 Inspect and evaluate the condition of fire boom for further use.

Requisite Knowledge for Burn Boss, Vessel Captains, and Ignition and Spill Control Agent Specialists: Understand the construction and characteristics of available fire boom, replaceable fire boom components, and indicators of fire boom condition.

Requisite Skill for Burn Boss, Vessel Captains, and Ignition and Spill Control Agent Specialists: Be able to recognize the difference between boom damage that indicates imminent failure and boom that can withstand additional burn evolutions.

[referenced in 1.3.7.3, 3.3.7.3, 5.3.7.3]

11.3.8 Ignition of *In Situ* Spilled Oil on Land or Solid Ice (when used)

11.3.8.1 Be able to select and deploy appropriate ignition systems.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Understand the construction, characteristics, and hazards of available hand-held *in situ* burn ignition systems, including commercially available devices and ad hoc options. Be able to evaluate the safety and expected effectiveness of available ignition system options for specific applications. Be able to identify the safest placement of ignition personnel during and after ignition of an oil spill.

Requisite Skill for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Know how to deploy *in situ* burn ignition devices in a safe manner. Ensure that ignition specialists have practiced operating the ignition systems to be used in a specific situation in a safe area before an attempt to ignite contained oil.

[referenced in 1.3.8.1, 2.3.8.1, 5.3.8.1]

11.3.8.2 Evaluate spilled oil distribution to optimize ignition sequencing.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Understand the effects of oil type, weathering of oil, topography, vegetative fuel load, soil and air temperature, humidity, and wind speed on the ease of ignition, fire control, and sustainability of burning.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: Be able to develop a plan specifying ignition locations and sequencing that allows for the safe retreat of ignition personnel from the fire and minimizes the potential for the burn to move over fire control lines and ignite unintended areas.

[referenced in 1.3.8.2, 2.3.8.2, 5.3.8.2]

11.3.8.3 Inspect and evaluate the condition of burn areas for further action.

Requisite Knowledge for Burn Boss and Ignition and Spill Control Agent Specialists: Understand the conditions necessary to be able to successfully reignite a previously burned spill. Understand options for burn residue removal that minimize soil compaction and mixing oil into the soil.

Requisite Knowledge for Burn Boss, and Ignition and Spill Control Agent Specialists: Be able to recognize when a burned area can be reignited for additional burning and when burn residue can be collected without causing more damage than leaving it.

[referenced in 1.3.8.3, 5.3.8.3]

11.3.9 Aerial Ignition of *In Situ* Burning of Spilled Oil (when used)

11.3.9.1 Be able to describe and specify the necessary airframe, ignition system equipment, personnel qualifications, safety features, aviation management, and ground support needed for helitorch operations or other appropriate aerial ignition system.

Requisite Knowledge for Burn Boss and Ignition and Spill Control Agent Specialists: Familiarity with the subject matter described in the Interagency Aerial Ignition Guide (PMS 501, March 2012 as amended) regarding helitorch operations. The guide is a publication of the National Wildfire Coordinating Group. Updated or equivalent procedures of the local jurisdiction may be substituted.

Requisite Skill for Burn Boss and Ignition and Spill Control Agent Specialists: Be able to specify resources needed to mount an aerial ignition operation to support *in situ* burning of oil.

[referenced in 1.3.9.1, 5.3.9.1]

11.3.9.2 Develop and brief to pilots and air crew a detailed firing plan and communications protocol.

Requisite Knowledge for Burn Boss, Safety Officers, and Ignition and Spill Control Agent Specialists: An understanding of safety issues that affect air crews and ground crews.

Requisite Skill for Burn Boss: Be able to direct the development of written instructions (Aerial Ignition Project Aviation Safety Plan [PSAP]) for safe deployment, support, and use of aerial ignition assets that address safety, effective communications, and the efficient use of aerial assets to conduct *in situ* burn ignition.

Requisite Skill for Safety Officers: Be able to evaluate written instructions (Aerial Ignition Project Aviation Safety Plan [PASP]) for safe deployment, support and use of aerial ignition assets that address safety, effective communications, and the efficient use of aerial assets to conduct *in situ* burn ignition.

Requisite Skill for Ignition and Spill Control Agent Specialists: Be able to follow written instructions prepared at the direction of the burn boss (i.e., PASP) for safe deployment, support, and use of aerial ignition assets that address safety, effective communications, and the efficient use of aerial assets to conduct *in situ* burn ignition.

(PASP templates and examples are available on U.S. Forest Service, National Park Service and National Wildfire Coordinating Group websites.)

[referenced in 1.3.9.2, 2.3.9.2, 5.3.9.2]

11.3.9.3 Be able to direct pilots as to ignition locations, timing, and firing sequences in accordance with *ad hoc* instructions or a detailed ignition plan.

Requisite Knowledge for Burn Boss and Ignition and Spill Control Agent Specialists: Understand how to use a PSAP to formulate communications to pilots. Understand how to formulate clear radio or phone communications for timing and geographical location of firing targets.

Requisite Skill for Burn Boss and Ignition and Spill Control Agent Specialists: Be able to effectively communicate with pilots to direct aerial ignition operations.

[referenced in 1.3.9.3, 5.3.9.3]

11.4 Competencies—Implementing a Planned *In Situ* Burn Response

11.4.1 Operational Period Briefing

11.4.1.1 Pre-operations work plan and safety briefing for all personnel involved in the *in situ* burn response.

Requisite Knowledge for All: Understand the components of an operational period briefing covering an ICS incident action plan, including a situation assessment; mission/goals of *in situ* burn operations; risk management concerns; safety and emergency procedures; communications protocols; support services processes, schedule, and timeline; and expectations.

Requisite Skill for Burn Boss: Be able to direct and deliver a concise and to the point pre-operational briefing that imparts information needed for safe and effective performance during the operational period.

Requisite Skill for Safety Officers: Be able to assist in preparation and delivery of a concise and to the point pre-operational briefing that imparts information needed for safe and effective performance during the operational period**.**

Requisite Skill for Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, Aerial Surveillance Specialists, and Observers: Attend and understand the pre-operations work plan and safety briefing for all personnel involved in the *in situ* burn response.

[referenced in 1.4.1.1, 2.4.1.1, 3.4.1.1, 4.4.1.1, 5.4.1.1, 6.4.1.1, 7.4.1.1, 8.4.1.1, 9.4.1.1,10.4.1.1]

11.4.2 Fire Boom and Containment Boom Deployment and Recovery (when used)

11.4.2.1 Evaluate and select fire boom and containment boom for *in situ* burning.

Requisite Knowledge for Burn Boss, Vessel Captains, and Small Boat Operators and Deck Hands: Understand the characteristics, design factors, components, strength, and forces exerted on fire boom and containment boom, both while deployed slack and under tension from towing or current. Know the different types of fire boom and containment boom that may be available. Understand anchoring forces, anchor options, and fixed boom tactics to contain oil on water.

Requisite Skill for Burn Boss: Be able to compare available boom options for *in situ* burn operations, determine the resources needed to implement each option, and select the most

effective option. Understand how containment boom can be used on top of ice in overflood conditions to contain oil on water that is on top of the ice.

Requisite Skill for Vessel Captains: Be able to advise the burn boss if the expected tasks are within the operational capabilities of the captain's vessel. Be able to maintain and coordinate with other towing vessels the relative towing speed of fire boom to obtain optimal burn efficiency when using various *in situ* burning tactics.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to determine the resources needed to implement boom deployment and advise the burn boss equipment needed to position boom.

[referenced in 1.4.2.1, 3.4.2.1, 6.4.2.1]

11.4.2.2 Vessel/small boat speed and power characteristics for positioning fire boom.

Requisite Knowledge for Burn Boss, Vessel Captains, and Small Boat Operators and Deck Hands: Understand the needed capabilities of vessels/small boats and the range of recommended towing speeds to maintain effective *in situ* burning in open waters. Understand the capabilities of small boats for positioning fire boom in current and against shore or ice.

Requisite Skill for Burn Boss: Be able to assign vessels to tasks within their operational capabilities and direct vessel captains to maintain the relative towing speed of fire boom to obtain optimal burn efficiency when using various *in situ* burning tactics.

Requisite Skill for Vessel Captains and Small Boat Operators and Deck Hands: Be able to maintain the relative towing speed of fire boom to obtain optimal burn efficiency when using various *in situ* burning tactics.

[referenced in 1.4.2.2, 3.4.2.2, 6.4.2.2]

11.4.2.3 Towing bridle components for towed boom.

Requisite Knowledge for Burn Boss, Vessel Captains, and Small Boat Operators and Deck Hands: Understand the strength needs of towing bridle components for different boom configurations and positioning tactics.

Requisite Skill for Burn Boss and Vessel Captains: Be able to direct workers on the composition of towing bridle, and the manner of securing it to towing vessels that will allow for fast and safe release of the towed boom in an emergency.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to connect towing bridle, and secure it to positioning vessels so that fast and safe release of the towed boom can occur in an emergency.

[referenced in 1.4.2.3, 3.4.2.3, 6.4.2.3]

11.4.2.4 Fire and containment boom on open waters.

Requisite Knowledge for Burn Boss, Vessel Captains, and Small Boat Operators and Deck Hands: Understand the equipment and manpower necessary to deploy different types of fire and containment boom. Know the types of boom connections and how to safely make them.

Requisite Skill for Burn Boss and Vessel Captains: Be able to direct workers in safe deployment and connection of boom components and towing bridle on open waters. Be able to direct workers in techniques for the safe release of towing lines under tension.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to safely deploy and connect boom components and towing bridle. Be able to use techniques for the safe release of towing lines under tension.

[referenced in 1.4.2.4, 3.4.2.4, 6.4.2.4]

11.4.2.5 Determine and install mooring lines and anchors for boom deployed from shore.

Requisite Knowledge for Burn Boss and Small Boat Operators and Deck Hands: Understand the strength needs of mooring components for different boom configurations when anchored to shore and in water.

Requisite Skill for Burn Boss: Be able to direct workers on the composition of anchoring lines and tackle, and the manner of securing them to shore moorings and anchors that will allow for fast and safe adjustment if water levels or current speeds change.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to position anchoring lines and tackle and secure them to shore moorings and anchors that will allow for fast and safe adjustment if water levels or current speeds change.

[referenced in 1.4.2.5, 6.4.2.5]

11.4.2.6 Recover and clean or dispose of oiled boom and towing bridle components.

Requisite Knowledge for Burn Boss, Vessel Captains, Ignition and Spill Control Agent Specialists, and Small Boat Operators and Deck Hands: Understand safe recovery and cleaning techniques for oiled fire boom and containment boom on a vessel, from a shore, and at a port facility. Understand factors affecting the reuse of fire and containment boom.

Requisite Skill for Burn Boss: Be able to direct workers in safe and efficient recovery of boom and towing bridle components. Be able to recognize when boom is no longer reusable or repairable in the field and needs to be replaced. Be able to arrange for disposal or storage of used boom and tackle.

Requisite Skill for Vessel Captains: Be able to direct workers in safe and efficient recovery of boom and towing bridle components. Be able to recognize when boom is no longer reusable or repairable in the field and needs to be replaced.

Requisite Skill for Ignition and Spill Control Agent Specialists: Be able to recognize when boom is no longer reusable or repairable in the field and needs to be replaced.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to recover boom and towing bridle components in a safe and efficient manner. Be able to recognize when boom is no longer reusable or repairable in the field and needs to be replaced. Be capable of cleaning and positioning used boom and tackle for disposal or storage.

[referenced in 1.4.2.6, 3.4.2.6, 5.4.2.6, 6.4.2.6]

11.4.3 Fire Boom and Containment Boom Positioning Operations (when used)

11.4.3.1 Towing speeds for effective concentration of spilled oil using booms.

Requisite Knowledge for Vessel Captains: Understand the vessel speed requirements for effective boom positioning operations. Understand the forces on boom and boom system components in various towing system configurations, relative towing speeds, and sea states.

Requisite Skill for Vessel Captains: Demonstrate ability to ensure that towing speeds are effective in concentrating oil without entrainment and loss of oil under the boom, or causing boom system failure due to excessive forces on any component of the boom system.

[referenced in 3.4.3.1]

11.4.3.2 Position boom with vessels to concentrate oil for *in situ* burning.

Requisite Knowledge for Vessel Captains and Small Boat Operators and Deck Hands: Understand the vessel characteristics, crew staffing, and positioning techniques needed to maneuver boom and perform boom sweeps to concentrate oil for *in situ* burning.

Requisite Skill for Vessel Captains: Be able to position boom by towing it to an oil collection location with a vessel. Be able to maneuver and recover the free end of boom towed by another vessel. Be able to coordinate boom positioning with another vessel.

Requisite Skill for Small Boat Operators and Deck Hands: When directed by the vessel captain, be able to recover and secure the free end of boom towed by another vessel.

[referenced in 3.4.3.2, 6.4.3.2]

11.4.3.3 Adjustment of boom configuration to changing conditions.

Requisite Knowledge for Burn Boss, Vessel Captains, and Small Boat Operators and Deck Hands: Understand the forces to which boom components are subjected in various combinations of towing configuration, vessel speed, wind conditions, and sea state. Know how to determine when boom system components have deteriorated.

Requisite Skill for Burn Boss: Determine and ensure that vessel captains and deck hands are capable of monitoring conditions and safely adjusting boom towing bridle connections to ensure the integrity and safety of the boom system. Take action if boom integrity or towing bridle components deteriorate due to wear or weather conditions. Ensure that deck hands and vessel captains understand how to safety quick disconnect boom when given a command or adverse conditions require it.

Requisite Skill for Vessel Captains: Direct and supervise crew to monitor conditions and adjust boom towing bridle connections to ensure the integrity and safety of the boom system. Be able to alert the chain of command if boom integrity or towing bridle components deteriorate due to wear or weather conditions. Be able to safely quick disconnect boom or supervise deck crew in doing so when given a command or adverse conditions require it.

Requisite Skill for Small Boat Operators and Deck Hands: Demonstrate being able to monitor conditions and adjust boom towing bridle connections to ensure the integrity and safety of the boom system. Be able to alert the chain of command if boom integrity or towing bridle components deteriorate due to wear or weather conditions. Be able to safely quick disconnect boom when given a command or adverse conditions require it.

[referenced in 3.4.3.3, 6.4.3.3]

11.4.4 Deck Hand and Small Boat Operations (when used)

11.4.4.1 Small boat operations.

Requisite Knowledge for Burn Boss, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand the operation of small boats, including engine, steering, handling lines, limitations of equipment, taking orders, maintaining proper lookout, and basic navigation.

Requisite Skill for Burn Boss and Vessel Captains: Demonstrate an understanding of how small boats are maneuvered using steering and engine(s), tying and untying lines, loading and unloading gear and equipment, and use of associated equipment such pumps and winches.

Requisite Skill for Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Demonstrate how small boats are maneuvered using steering and engine(s), tying and untying lines, loading and unloading gear and equipment, and use of associated equipment such pumps and winches. Be able to assist in the event of equipment failure and repair.

[referenced in 1.4.4.1, 3.4.4.1, 5.4.4.1, 6.4.4.1, 7.4.4.1, 8.4.4.1]

11.4.4.2 Small boat handling.

Requisite Knowledge for Burn Boss, Vessel Captains, and Small Boat Operators and Deck Hands: Understand the forces that affect boat handling and the operational limitations and characteristics of small boats. Know procedures if engine fails, loss of electrical power, high engine temperature, low/no engine oil pressure, shaft vibration, and steering casualty.

Requisite Skill for Burn Boss, Vessel Captains, and Small Boat Operators and Deck Hands: Demonstrate an understanding of the factors to be considered when directing activities to get small boats away from docks or larger vessels; handling of small boats in following, head, and beam seas; maneuvering and holding station within one boat length of a fixed object (buoy, mooring, piling); maneuvering and holding station with a floating object (boom, towline float); maneuvering and taking an adrift object alongside and aboard the small boat [towline, personal floatation devices (PFD), float, life raft]; maneuver a small boat in a narrow channel or in a river (waiverable if none involved); maneuvering alongside another boat or vessel with no way on, coming alongside an underway vessel, anchoring and weighing anchor.

[referenced in 1.4.4.2, 3.4.4.2, 6.4.4.2]

11.4.4.3 Small boat emergencies.

Requisite Knowledge for Burn Boss, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Understand the hazards involved in small boat operations under various conditions and combinations of sea state, ice conditions, weather, and task assignments. Know the purpose and use of emergency and lifesaving equipment and techniques to minimize hazards on small boats.

Requisite Skill for Burn Boss, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Demonstrate the ability to recognize and respond to emergencies involving small boats including use of personal flotation devices including buoyant worksuits (Class V Thermal PFD worksuit), fire suppression techniques, distress calling, man overboard equipment, pumps, and other incident specific equipment.

[referenced in 1.4.4.3, 3.4.4.3, 5.4.4.3, 6.4.4.3, 7.4.4.3, 8.4.4.3]

11.4.5 Fire Suppression During *In Situ* Burning of Oil

11.4.5.1 Perform tactical operations that result in self-extinguishment of burning oil on the water.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, and Skilled Support Personnel: Understand tactical options that will result in the oil becoming too thin to sustain combustion or otherwise suppress vaporization and combustion.

Requisite Skill for Burn Boss: Be able to direct vessel captains to implement tactical options to inhibit continued burning of oil.

Requisite Skill for Safety Officers: Be able to communicate the safety implications of tactical options to inhibit continued burning of oil.

Requisite Skill for Vessel Captains and Skilled Support Personnel[*]*:* Be able to implement tactical options in coordination with other vessels under the direction of the burn boss to inhibit continued burning of oil.

Requisite Skill for Ignition and Spill Control Agent Specialists: Be able to communicate with the burn boss and vessel captains to implement tactical options to inhibit continued burning of oil.

Requisite Skill for Small Boat Operators and Deck Hands: Be able to implement tactical options as directed to inhibit continued burning of oil.

[referenced in 1.4.5.1, 2.4.5.1, 3.4.5.1, 5.4.5.1, 6.4.5.1, 8.4.5.1]

11.4.5.2 Perform firefighting on boom towing vessels, small boats, and support vessels.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists,

[*] When this is an assigned task.

Skilled Support Personnel: Understand fire response operations on vessels/small boats, using fire extinguishers, and the equipment needs to ensure safe and effective firefighting.

Requisite Skill for Burn Boss and Vessel Captains: Be able to direct workers in fighting fires on vessels/boats.

Requisite Skill for Safety Officers: Be able to ensure that workers are trained and have appropriate equipment for fighting fires on vessels/boats.

Requisite Skill Knowledge for Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, and Skilled Support Personnel: Be able to implement emergency procedures for fires on vessels/small boats.

[referenced in 1.4.5.2, 2.4.5.2, 3.4.5.2, 5.4.5.2, 6.4.5.2, 7.4.5.2, 8.4.5.2]

11.4.5.3 Maintaining conditions during burns on land to support effective fire control and smoke management.

*Requisite Knowledge for Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *:* Understand the effects of ambient temperature, wind speed, wind direction, thermal updrafts, solar radiation, height of the mixing layer, vegetative fuel load, humidity, and topography.

Requisite Skill for Burn Boss: Be able to direct burn operations to safely maintain the burn within the planned burn area such that there is low risk of the fire extending to other areas and that smoke impacts are minimized.

Requisite Skill for Safety Officers: Be able to review and recommend options for burn operations to safely maintain the burn within the planned burn area such that there is low risk of the fire extending to other areas and that smoke impacts to workers are minimized.

*Requisite Skill for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *:* Be able to assist in safely maintaining the burn within the planned burn area such that there is low risk of the fire extending to other areas and that smoke impacts are minimized.

[referenced in 1.4.5.3, 2.4.5.3, 4.4.5.3, 5.4.5.3, 8.4.5.3]

11.4.5.4 Use firebreaks to limit the spread of burning oil to controllable areas.

*Requisite Knowledge for Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *:* Understand the design criteria for firebreaks taking into account weather, vegetative fuel characteristics, equipment capacity, and crew competencies available for their construction.

Requisite Skill for Burn Boss: Be able to direct construction of effective firebreaks in a safe and timely manner.

Requisite Skill for Safety Officers and Ignition and Spill Control Agent Specialists: Be able to review and recommend options for construction of effective firebreaks in a safe and timely manner.

*Requisite Skill for Fire Suppression Specialists and Skilled Support Personnel *:* Be able to construct effective firebreaks in a safe and timely manner.

[referenced in 1.4.5.4, 2.4.5.4, 4.4.5.4, 5.4.5.4, 8.4.5.4]

11.4.5.5 Position equipment and crews to ensure that burning does not extend beyond the planned burn area.

*Requisite Knowledge for Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *:* Understand the capability and capacity of firefighting equipment and personnel to ensure effective firefighting. Identify

* When this is an assigned task.

vulnerable infrastructure such as power lines, underground utilities, structures, bridges, docks, and marinas.

Requisite Skill for Burn Boss: Be able to direct workers in fighting fires that escape the planned burn areas. Ensure that water or other extinguishing media are of sufficient quantity and availability for both planned operations and contingency measures.

Requisite Skill for Safety Officers: Be able to review options to ensure the safety of workers when fighting fires that escape the planned burn areas. Be able to ensure that water or other extinguishing media are of sufficient quantity and availability for both planned operations and contingency measures.

*Requisite Skill for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *:* Be able to participate as directed in fighting fires that escape the planned burn areas. Be able to advise the chain of command on the needed quantity and availability of water or other extinguishing media for the operations directed.

[referenced in 1.4.5.5, 2.4.5.5, 4.4.5.5, 5.4.5.5, 8.4.5.5]

11.4.5.6 Implement escape pathways on land.

*Requisite Knowledge for Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *:* Understand the factors that threaten the safety of responders, including thermal radiation, heat or cold stress, fatigue, hydration management, visibility, communications continuity, and the ability of ingress and egress pathways to support the weight and size of vehicles and equipment.

Requisite Skill for Burn Boss: Be able to ensure that access routes for the personnel, equipment and vehicles used are safe, passable, will support any vehicles being used, and are compatible with each vehicle's turn radius for cornering or reversing direction of movement. Be able to develop an escape timeline for every assigned resource so that retreat decisions can be timely made.

Requisite Skill for Safety Officers: Be able to advise the burn boss on options for access routes for the personnel, equipment and vehicles used that are safe, passable, will support any vehicles being used, and are compatible with each vehicle's turn radius for cornering or reversing direction of movement. Be able to review the escape timeline for every assigned resource to ensure that retreat decisions can be timely made.

*Requisite Skill for Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, and Skilled Support Personnel *:* Demonstrate awareness of access/egress routes for the personnel, equipment and vehicles used that are safe, passable, will support any vehicles being used, and are compatible with each vehicle's turn radius for cornering or reversing direction of movement. Be able to alert the chain of command if access/egress routes are found to be or become impassable for any personnel, vehicle, or equipment participating in the *in situ* burn operation. Demonstrate awareness of the escape timelines for assigned resources so that retreat decisions can be timely made.

[referenced in 1.4.5.6, 2.4.5.6, 4.4.5.6, 5.4.5.6, 8.4.5.6]

11.4.6 Medical Emergency/First Aid During *In Situ* Burn Operations (for workers assigned medical first aid responsibility—see 0.1.5.2)

11.4.6.1 Designated workers * are to be capable of performing first aid for co-workers.

Requisite Knowledge for All Designated Workers: Training or experience meeting or exceeding OSHA's Best Practices for Workplace First Aid Training Programs taking into account the rapid availability of professional medical care and the potential of specific kinds of injuries. This should include cardiopulmonary resuscitation (CPR) and how to operate an

* When this is an assigned task.

automated external defibrillator (AED). For cold weather conditions, know how to properly use hypothermia bags.

Requisite Skill for Burn Boss and Safety Officers: Be able to ensure that designated workers are available to provide first aid within 3 or 4 minutes of the location of each responder.

Requisite Skill for All Designated Workers: Be able to apply first aid and CPR as demonstrated by having an appropriate certification from a recognized provider such as the American Red Cross, American Heart Association, or the National Safety Council.

[referenced in 1.4.6.1, 2.4.6.1, 3.4.6.1, 4.4.6.1, 5.4.6.1, 6.4.6.1, 7.4.6.1, 8.4.6.1, 10.4.1.1]

11.4.6.2 Designation of the most accessible medical support facility to send casualties to when injuries need treatment or evaluation beyond the first aid level of care.

Requisite Knowledge for Burn Boss and Safety Officers: Understand the location and capabilities of the nearest medical care facilities to the job site, this may include medical professionals stationed on site or on support vessels but should also include permanent trauma centers. Understand the planning considerations for transport and the time needed to transfer casualties who need medical care or evaluation beyond that which can be provided at the job site or on support vessels.

Requisite Skill for Burn Boss: Be able to select primary and secondary medical facilities, and means of transport for any casualties that may occur at a specific job site. Ensure that this information is briefed and included in the medical treatment section of the Site Safety Plan.

Requisite Skill for Safety Officers: Be able to recommend primary and secondary medical facilities, and means of transport for any casualties that may occur at a specific job site. Include this information in site safety briefings and in the medical treatment section of the Site Safety Plan.

[referenced in 1.4.6.2, 2.4.6.2]

11.5 Competencies—Evaluating Progress of an *In Situ* Burn Response

11.5.1 Airborne Hazards Monitoring

11.5.1.1 Determine the hazards to monitor, action levels, and corrective action options.

Requisite Knowledge for Burn Boss, Safety Officers, and Air Monitoring Specialists: Understand the components of unburned vapor and burned oil vapor and smoke, including carbon dioxide, water vapor, carbon monoxide, hydrogen sulfide, sulfur dioxide, nitrogen oxides, volatile organic compounds (VOCs), polyaromatic hydrocarbons (PAHs), particulate matter less than 10 microns (PM-10), and particulate matter less than 2.5 microns (PM-2.5). Understand how to select appropriate action levels to protect workers. In the United States, these include IDLH, PELs, TLV-TWA, TLV-STEL, and TLV-C. Know about human health standards for the general public, which in the United States include Acute Effects Guideline Levels (AEGLs) and National Ambient Air Quality Standards (NAAQS) as well as the exposure times over which they apply.

Requisite Skill for Burn Boss: Be able to approve what hazards to monitor, where to monitor for each, the frequency of monitoring and select action levels. In the United States, demonstrate familiarity with the Special Monitoring of Applied Response Technologies (SMART) protocols developed by the USCG, USEPA, NOAA, CDC, and BSEE for monitoring *in situ* burn emissions.

Requisite Skill for Safety Officers and Air Monitoring Specialists: Be able to recommend to the burn boss what hazards to monitor, where to monitor for each, the frequency of monitoring, and select action levels. Be able to convert between health action levels unit and the output units on the monitoring equipment used. In the United States, demonstrate familiarity with the Special Monitoring of Applied Response Technologies (SMART) protocols developed by the USCG, USEPA, NOAA, CDC, and BSEE for monitoring *in situ* burn emissions. Be able to

ensure monitoring plans address monitoring of hazards to workers and make appropriate recommendations to the burn boss regarding monitoring of worker exposures.

[referenced in 1.5.1.1, 2.5.1.1, 7.5.1.1]

11.5.1.2 Selection of monitoring equipment.

Requisite Knowledge for Burn Boss and Air Monitoring Specialists: Understand the distinction between real time air monitors and air sampling devices. Understand what types of monitoring technology is available to measure carbon monoxide, sulfur dioxide, hydrogen sulfide, VOCs, PAHs, PM-10, or PM-2.5. Understand the importance and needed values of the following criteria for monitoring equipment: ruggedness and portability, operating temperature, operational duration, limit of detection, reliability, sensitivity, concentration range, readout options, data logging, and data download capability.

Requisite Skill for Burn Boss and Air Monitoring Specialists: Be able to select or recommend monitoring equipment for a given situation. Be able to convert between health action levels and the output units of the selected monitoring equipment.

[referenced in 1.5.1.2, 7.5.1.2]

11.5.1.3 Develop a Quality Assurance Project Plan (QAPP) for airborne hazard monitoring.

Requisite Knowledge for Burn Boss, Safety Officers, and Air Monitoring Specialists: Understand the procedures that those who conduct a monitoring project will take to ensure that the data collected meets project requirements.

Requisite Skill for Burn Boss: Be competent to review, critique, and approve a QAPP for airborne hazards monitoring during *in situ* burn operations.

Requisite Skill for Air Monitoring Specialists: Be competent to develop a QAPP for airborne hazards monitoring during *in situ* burn operations.

[referenced in 1.5.1.3, 7.5.1.3]

11.5.1.4 Perform field monitoring and communicate results.

Requisite Knowledge for Air Monitoring Specialists: Understand how to operate the specific equipment being used for monitoring.

Requisite Skill for Air Monitoring Specialists: Be able to conduct monitoring at the locations and times directed by the burn boss (chain-of-command). Be able to report results in a timely manner as directed. Be able to calibrate equipment and conduct quality assurance procedures as specified in the approved QAPP.

[referenced in 7.5.1.4]

11.5.2 Aerial Surveillance of *In Situ* Burning Progress (when used)

11.5.2.1 Conduct aerial surveillance to observe, interpret, and communicate the location and circumstances of oil that may be amenable to *in situ* burning.

Requisite Knowledge for Burn Boss and Aerial Surveillance Specialists: Understand the use of standardized spill tracking forms or software to document time, location, estimate of areal extent, and appearance of the oil spill. For spills on water, understand the effects of wind and current on oil spill movement over time, how to estimate oil thickness, and the collectability of oil in towed boom and the conditions of sea ice (if any). Describe how to systematically search for spilled oil on water that has drifted away from the source of spillage.

Requisite Skill for Burn Boss and Aerial Surveillance Specialists: Be able to utilize ASTM F1779 Standard Practice for Reporting Visual Observations of Oil on Water and ASTM F2534 Guide for Visually Estimating Oil Spill Thickness on Water, or other equivalent standards such as the NOAA Open Water Oil Identification Job Aid for Aerial Observation. Be able to classify spilled oil by color, appearance, slick shape and distribution. Show ability to distinguish oil slicks from other visual effects seen on the water surface.

[referenced in 1.5.2.1, 9.5.2.1]

11.5.2.2 Coordinate oil collection tactics with vessels and small boats using aerial surveillance (when used).

Requisite Skill for Burn Boss: Develop, distribute, and follow incident-specific communications protocols.

Requisite Skill for Vessel Captains and Aerial Surveillance Specialists: Demonstrate understanding and ability to comply with incident-specific communications protocols.

[referenced in 1.5.2.2, 3.5.2.2, 9.5.2.2]

11.5.2.3 Document spilled oil collection and burn efficiency.

Requisite Knowledge for Burn Boss and Aerial Surveillance Specialists: Understand the type, frequency, and level of detail necessary to be documented so that meaningful analysis can result in burn efficiency estimates of high confidence.

Requisite Skill for Burn Boss: Be able to direct the collection of quality data and ensure that analysis is appropriately conducted.

Requisite Skill for Aerial Surveillance Specialists: Be able to perform the collection of quality data and ensure that analysis is appropriately conducted. Show ability to calculate removal efficiencies.

[referenced in 1.5.2.3, 9.5.2.3]

11.5.2.4 Deploy and collect data from unmanned observation platforms such as unmanned aerial vehicles, drones, and tethered balloons (when used).

Requisite Knowledge for Burn Boss and Aerial Surveillance Specialists: Understand the operational characteristics of unmanned data collection platforms and how to use them to collect oil location and burn efficiency data.

Requisite Skill for Burn Boss: Be able to direct the operation of unmanned data collection platforms, coordinate information collected with burn operations on the surface, and ensure the documentation and analysis of the collected data.

Requisite Skill for Aerial Surveillance Specialists [*]*:* Be able to operate unmanned data collection platforms, coordinate information collected with burn operations on the surface, and obtain the documentation and collected data for analysis.

[referenced in 1.5.2.4, 9.5.2.4]

11.6 Competencies—Terminating the *In Situ* Burning Response

11.6.1 Worker Exposure Briefing and Recordkeeping

11.6.1.1 Conduct worker exposure briefings.

Requisite Knowledge for All: Understand the purpose and content of a worker exposure briefing such as that required by the HAZWOPER regulation.

Requisite Skill for Burn Boss: Be able to provide short and focused briefings covering description of the oil and smoke components and any other hazardous materials involved, potential exposure routes and health risks to workers, signs and symptoms of exposure and where to go for treatment, and call for reporting and documentation of any known injuries or significant exposures.

Requisite Skill for Safety Officers: Be able to assist in providing short and focused briefings covering description of the oil and smoke components and any other hazardous materials involved, potential exposure routes and health risks to workers, signs and symptoms of exposure and where to go for treatment, and call for documentation of any known injuries.

[*] When this is an assigned task.

Requisite Skill for Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, Aerial Surveillance Specialists, and Observers: Understand the process of reporting and documenting any known injuries or significant exposures.

[referenced in 1.6.1.1, 2.6.1.1, 3.6.1.1, 4.6.1.1, 5.6.1.1, 6.6.1.1, 7.6.1.1, 8.6.1.1, 9.6.1.1, 10.6.1.1]

11.6.1.2 Ensure that Site Safety Plan documentation is complete.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Understand the purpose and component parts of a Site Safety Plan.

Requisite Skill for Burn Boss: Be able to review for completeness and approve a Site Safety Plan, to ensure that it meets the HAZWOPER regulation requirements.

Requisite Skill for Safety Officers: Be able to assist the Burn Boss in compiling an *In Situ* Burn Site Safety Plan, which meets the HAZWOPER regulation requirements.

Requisite Skill for Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, Aerial Surveillance Specialists, and Observers: Be able to contribute information to the Site Safety Plan as requested.

[referenced in 1.6.1.2, 2.6.1.2, 3.6.1.2, 4.6.1.2, 5.6.1.2, 6.6.1.2, 7.6.1.2, 8.6.1.2, 9.6.1.2]

11.6.1.3 Ensure that any injuries or workers developing signs and symptoms indicating possible overexposures or health hazards receive appropriate medical evaluation and treatment.

Requisite Knowledge for Burn Boss, Safety Officers, and Vessel Captains: Understand the purpose and requirements for medical surveillance. In the United States, these are in the HAZWOPER regulations 1910.120 (f) and (3).

[referenced in 1.6.1.3, 2.6.1.3, 3.6.1.3, 4.6.1.3, 5.6.1.3, 6.6.1.3, 7.6.1.3, 8.6.1.3, 9.6.1.3]

11.6.2 Response Effectiveness Analysis and Critique

11.6.2.1 Analysis of response actions.

Requisite Knowledge for Burn Boss and Safety Officers: Understand the purposes and components of a post-incident analysis and the activity sectors that should be analyzed.

Requisite Skill for Burn Boss: Be able to identify and assign personnel with the skills to objectively evaluate *in situ* burn response activity and prepare a report for use in the incident critique.

Requisite Skill for Safety Officers: Be able to assist in the evaluation of *in situ* burn response activities from a safety standpoint and assist in preparation of a report for use in the incident critique.

[referenced in 1.6.2.1, 2.6.2.1]

11.6.2.2 Provision of a common operating picture to the following operational period.

Requisite Knowledge for Burn Boss: Understand how to assess the effects of tactics on the accomplishment of operational period goals and objectives.

Requisite Skill for Burn Boss: Be able to briefly summarize *in situ* burning activity, tactics used, and suggested changes for the following operational period.

[referenced in 1.6.2.2]

11.6.2.3 Effectiveness of spilled oil removal by *in situ* burning operations.

Requisite Knowledge for Burn Boss: Understand the type, frequency, and level of detail necessary to be documented so that meaningful analysis can result in burn efficiency

estimates of high confidence. Understand what data needs to be collected to compare *in situ* burn removal with other actual oil removal efforts or with estimates of what level of effort would have been required using other oil removal methods to achieve the same result as actual *in situ* burning operations.

Requisite Skill for Burn Boss: Be able to direct the analysis of *in situ* burning effectiveness and ensure that it is documented in a conclusive manner. Demonstrate the capability to provide a common operational picture and response tactics effectiveness information to inform those making decisions regarding tactics during the following operational period.

[referenced in 1.6.2.3]

11.6.2.4 Critique of the response involving all members of the operation.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Understand the purpose of a critique is to communicate the lessons learned from the perspective of personnel assigned to each type of task.

Requisite Skill for Burn Boss: Be able to ensure that the critique is led by a knowledgeable but independent facilitator who will keep the discussion focused on improving the health and safety of responders during future operations incidents and who will compile a list of action items and those responsible for them.

Requisite Skill for Safety Officers, Vessel Captains, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, Air Monitoring Specialists, Skilled Support Personnel, and Aerial Surveillance Specialists: Be capable of keeping the discussion focused on improving the health and safety of responders during future operations.

[referenced in 1.6.2.4, 2.6.2.4, 3.6.2.4, 4.6.2.4, 5.6.2.4, 6.6.2.4, 7.6.2.4, 8.6.2.4, 9.6.2.4,10.6.2.4]

11.6.3 Documenting Environmental Impacts of *In Situ* Burning of Oil

11.6.3.1 Facilitate recording and understanding environmental impacts evidenced by air monitoring data, oil removal effectiveness data, and observations/data on impacts to sensitive resources.

Requisite Knowledge for Burn Boss, Air Monitoring Specialists, and Skilled Support Personnel *:* Understand the components of such a report and the ongoing data collection necessary to support an analysis.

*Requisite Skill Knowledge for Burn Boss, Air Monitoring Specialists, and Skilled Support Personnel *:* Be able to ensure the collection of necessary data. Be able to support preparation of a report after the response addressing this topic.

[referenced in 1.6.3.1, 7.6.3.1, 8.6.3.1]

11.6.3.2 Understanding the nature, mass, and extent of unrecovered burn residue.

Requisite Knowledge for Burn Boss and Skilled Support Personnel: Understand the data that needs to be collected during an *in situ* burn operation to support this analysis. Understand the potential impacts of unrecovered unburned oil residues.

Requisite Skill for Burn Boss: Be able to ensure the collection of necessary data. Be able to support preparation of a report after the response to address this topic.

*Requisite Skill Skilled Support Personnel *:* Be able collect the necessary data. Be able to prepare or support preparation of a report after the response to address this topic.

[referenced in 1.6.3.2, 8.6.3.2]

* When this is an assigned task.

11.7 Training and Physical Fitness

11.7.1 OSHA HAZWOPER Training

11.7.1.1 *In situ* burn focused HAZWOPER initial emergency response training.

Requisite Knowledge for Burn Boss, Safety Officers, Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Air Monitoring Specialists, and Skilled Support Personnel: A site-specific briefing and a minimum of 24 hours of training covering the applicable competencies listed in Subsections 1.1 through 1.6 of this guide and that otherwise complies with the HAZWOPER regulation at 29 *CFR* 1910.120(q) or a local jurisdictional equivalent requirement outside the United States. This includes currency of required refresher training or documented equivalent experience.

Requisite Knowledge for Vessel Captains and Small Boat Operators and Deck Hands: A site-specific briefing and

- at least 8 hours of initial emergency response training (when duties ONLY involve defensive response such as booming or boat operations at a safe distance), or
- at least 24 hours of response operations training (when duties involve active response such as booming or boat operations at the source of the spill or ANY work close to volatile fuel or flammable/combustible liquids).

The training is to cover the applicable competencies listed in Subsections 1.1 through 1.6 of this guide and otherwise complies with the HAZWOPER regulation at 29 *CFR* 1910.120(q) or a local jurisdictional equivalent requirement outside the United States. This includes currency of required refresher training or documented equivalent experience. If the captain performs deck hand tasks she/he must also meet the higher-level training for the deck hand.

Requisite Knowledge for Aerial Surveillance Specialists and Observers: A comprehensive site-specific briefing is required covering the HAZWOPER first responder awareness level [29 *CFR* 1910.120(q)(6)(i)] or a local jurisdictional equivalent requirement outside the United States. A 4-hour minimum duration is suggested, covering at least the following:

a. Purpose and limitations of activities to be performed.

b. Site personnel organization, chain-of-command, and communications procedures.

c. Chemical/physical hazards involved, ways exposure might occur, signs and symptoms of exposure.

d. Emergency alarm system, escape routes, and places of refuge, vessel and small boat emergencies.

e. Appropriate contamination control procedures, personal protective equipment, decontamination, and other control measures provided.

Requisite Skill: Demonstrate skills consistent with the applicable competencies listed in this guide.

[referenced in 1.7.1.1, 2.7.1.1, 3.7.1.1, 4.7.1.1, 5.7.1.1, 6.7.1.1, 7.7.1.1, 8.7.1.1, 9.7.1.1,10.7.1.1]

11.7.2 Incident Command System (ICS) Training

11.7.2.1 ICS-100 Introduction to the Incident Command System.

Requisite Knowledge for All Positions, except Observers (although recommended for Observers): It covers the main features and principles, and organizational structure of the system.

[referenced in 1.7.2.1, 2.7.2.1, 3.7.2.1, 4.7.2.1, 5.7.2.1, 6.7.2.1, 7.7.2.1, 8.7.2.1, 9.7.2.1,10.7.2]

11.7.2.2 ICS-200 ICS for Single Resources and Initial Action Incidents.

Requisite Knowledge for Burn Boss, Safety Officers, Vessel Captains, and Fire Suppression Specialists: It covers topics relevant to personnel who are likely to assume a supervisory position within the ICS.

[referenced in 1.7.2.2, 2.7.2.2, 3.7.2.2, 4.7.2.2]

11.7.2.3 ICS-300 Intermediate ICS for Expanding Incidents.

Requisite Knowledge for Burn Boss: It prepares personnel who require advanced knowledge and application of the ICS for more complex situations. An acceptable alternative is ICS-Command and General Staff training, which is a combination of ICS-300 and ICS-400 Advanced ICS.

[referenced in 1.7.2.3]

11.7.3 Physical, Mental and Medical Fitness

11.7.3.1 Physical fitness expectations for typical position assignments.

Burn Boss, *Skilled Support Personnel* [*], *Aerial Surveillance Specialists, and Observers:* These personnel should as a minimum have the capability for LIGHT physical activity. Duties mainly involve office-type work with occasional field activity characterized by light physical exertion requiring basic good health. Activities may include climbing ship ladders, standing, maintaining balance at sea, operating a vehicle, and long hours of work, as well as some bending, stooping, or light lifting. Individuals can usually govern the extent and pace of their physical activity.

*Safety Officers, Vessel Captains, Air Monitoring Specialists, and Skilled Support Personnel *:* These personnel should as a minimum have the capability for MODERATE physical activity, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia. Duties involve fieldwork requiring complete control of all physical faculties and may include considerable walking over irregular surfaces, climbing ship ladders and inclines, maintaining balance at sea, entering and exiting small boats, operating a vehicle, standing for long periods of time, lifting 25 to 50 pounds, climbing, bending, stooping, squatting, twisting, and reaching. Occasional demands may be required for moderately strenuous activities in emergencies over long periods of time. Individuals usually set their own work pace.

*Fire Suppression Specialists, Ignition and Spill Control Agent Specialists, Small Boat Operators and Deck Hands, and Skilled Support Personnel *:* These personnel should have the capability for ARDUOUS physical activity, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia. Duties involve fieldwork requiring complete control of all physical faculties and requiring physical performance calling for above-average endurance and superior conditioning. These duties may include an occasional demand for extraordinarily strenuous activities in emergencies under adverse environmental conditions and over extended periods of time. Requirements include walking for considerable distances while wearing protective gear and carrying loads on uneven surfaces, climbing, jumping, bending, stooping, squatting, twisting, bending, and reaching. The pace of work typically is set by the situation.

[referenced in 1.7.3.1, 2.7.3.1, 3.7.3.1, 4.7.3.1, 5.7.3.1, 6.7.3.1, 7.7.3.1, 8.7.3.1, 9.7.3.1,10.7.3.1]

11.7.3.2 All personnel should be able to work consecutive 12–14 hour days under physical and emotional stress for sustained periods, while complying with work/rest periods and wearing duration limits for personal protective equipment set to protect against heat stress or hypothermia.

[referenced in 1.7.3.2, 2.7.3.2, 3.7.3.2, 4.7.3.2, 5.7.3.2, 6.7.3.2, 7.7.3.2, 8.7.3.2, 9.7.3.2,10.7.3.2]

[*] When this is an assigned task.

11.7.3.3 Medical surveillance requirements of the jurisdiction should be met. In the United States, if the employer determines that personnel qualify for HAZWOPER medical surveillance pursuant to 29 *CFR* 1910.120(f) and/or respirator medical evaluation pursuant to 29 *CFR* 1910.134(e), then the pre-assignment and refresher physician's written opinions shall be current and any recommended limitation upon the employee's assigned work shall be consistent with the duties assigned. Medical treatment must be made available if this person exhibits signs or symptoms of exposure.

In the United States, medical surveillance is typically not required for *Aerial Surveillance Specialists or Observers*.

[referenced in 1.7.3.3, 2.7.3.3, 3.7.3.3, 4.7.3.3, 5.7.3.3, 6.7.3.3, 7.7.3.3, 8.7.3.3, 9.7.3.3,10.7.3.3]

11.7.4 Aircraft Safety

11.7.4.1 Light Aircraft Passenger Safety briefing (if applicable *).

*Requisite Knowledge for Aerial Surveillance Specialists *:* Safe entry and exit from the aircraft used, inter-aircraft communications, routine and emergency communications with *in situ* burn command officer/burn boss and other specified responders, procedures for water evacuation of the aircraft.

Requisite Skill: Demonstrate skills consistent with the above procedures.

[referenced in 9.7.4.1]

* When this is an assigned task.

Definitions

Action Level. Observed condition or measured level of exposure to a harmful substance, condition, or hazard that would identify the need for the implementation of a management action, at times determined by regulatory mandate appropriate to address such condition.

Acute Effects Guideline Levels (AEGL). Exposure guidelines designed to help responders determine airborne levels of specific contaminants that are safe for the general public, including sensitive individuals. They apply for single non-repetitive exposures that do not exceed 8 hours.

Beam Seas. Waves coming from an approximately right angle to the course of the vessel.

Boom. A temporary floating barrier used to contain, divert, deflect, and collect an oil spill on water. They come in many shapes and sizes, with various levels of effectiveness in different types of water conditions.

Buoy. A float placed in water bodies to mark a location or enable the retrieval of an object.

Brash Ice. Accumulations of floating ice fragments not more than 2 m across. Typical of ice breakup. Created when larger ice features collide and degrade.

Bureau of Safety and Environmental Enforcement (BSEE). A United States government agency whose stated mission is "to promote safety, protect the environment and conserve resources offshore through vigorous regulatory oversight and enforcement."

Burn Boss. The person in command of *in situ* burn operations. Responsible for all decisions relating to the management of *in situ* burning. This person may be the incident commander (IC) when *in situ* burning is the only response activity. In other situations, this person may have another ICS position title.

Burn Efficiency. Percent reduction in original oil mass following combustion.

Burn Residues. Unburned oil and incomplete combustion products remaining on land, water, snow, or ice when an *in situ* burn extinguishes. Residues can range from brittle stiff, taffy-like material, to a liquid similar to the original oil.

Carbon Monoxide. Common by-product of incomplete combustion.

Cavitation. The formation of partial vacuums in a liquid by a swiftly moving solid body such as a propeller. Undesirable because it causes noise, vibration, erosion of surfaces, and reductions of propulsion efficiency.

Centers for Disease Control (CDC). A United States government agency of the Department of Health and Human Services. Its mission is to protect the public from disease by conducting critical science and providing health information.

Containment. The use of boom, herding agents, or natural barriers on land or ice, to constrain and concentrate an oil slick.

Containment Boom. A boom designed to contain oil. Usually not fire resistant or designed to recover oil itself.

Contamination. An undesirable substance deposited on a substrate, either by direct contact or by transfer of the substance from another substrate. Not to be confused with exposure.

Dead Reckoning. Calculating a current position by using a previously determined position and advancing that position based on known or estimated speeds over elapsed time and course.

Deck Hand. A spill responder who: handles ropes and lines; deploys, recovers, and connects boom and towing bridle; releases tow lines on command of the boat captain; operates supporting engines and pumps; assists in personnel transfers from the vessel to small boats; and generally provides manual labor support on a vessel.

Dispersants. Chemicals such as surfactants that are used to aid the breakdown of spilled oil into small droplets.

Dispersion. The breaking up of an oil slick into small droplets that are mixed into the water column by wave action and water surface turbulence. Can be aided by natural or applied surfactant chemicals.

Emulsification. The process where two liquids are mixed that are normally not soluble in each other. The dispersed liquid is contained as very small bubbles in the continuous phase liquid. Emulsions are typically of limited stability, which is dependent on a number of physical and chemical conditions. For oil spills, the term emulsions usually refers to oil dispersed in water, while the term mousse often refers to water dispersed in oil.

Encapsulation. The process of oil on the underside of a growing ice sheet being enclosed into the ice by the downward growth of ice crystals.

Exposure. Being in direct contact with and being acted upon or influenced by a foreign substance.

Fire Boom. A boom designed to resist degradation by fire and heat in order to facilitate *in situ* burning of oil.

Flame-Resistant Clothing. Clothing that is treated with chemicals and/or made of material that resists igniting if the responder is exposed to fire or heat.

Frazil Ice. A collection of loose, randomly oriented needle-shaped ice crystals in water. It resembles slush and has the appearance of being slightly oily when seen on the water. It is the first stage of formation of sea ice, but can form on rivers and lakes.

Fresh Water. Waters that have salinity less than 0.5 parts per thousand.

Hazard. Potential for adverse or harmful consequences. In practical terms, a hazard is often associated with an activity or condition that, if left uncontrolled, can result in injury, illness, death, property damage, business interruption, harm to the environment, or an impact on the reputation of an entity.

HAZWOPER. Acronym for Hazardous Waste Operations and Emergency Response. A United States government regulation covering worker safety when oil and hazardous materials are involved in a release or potential release. Developed by the Occupational Safety and Health Administration pursuant to authority of the Superfund Amendments and Reauthorization Act of 1986. Found in the Code of Federal Regulations (29 *CFR* 1910.120).

Head Seas. Waves coming from directly ahead.

Helitorch. A gelled-fuel aerial ignition device that is attached to a helicopter's external cargo hook. The pilot controls ignition and fuel feed. The unit can be jettisoned in case of emergency.

Herding Agent (Herder). Specific chemical materials that are surface-active, spread rapidly and have surface spreading pressures of two to four times petroleum oils. Oil surrounded by herding agent reduces its surface area and becomes thicker, an advantage for *in situ* burning.

Ice-Affected Waters. Waters that have some ice form on their surface.

Ignition System. Any system used to set an oil spill on fire deliberately. Designed to provide enough heat to an oil spill to generate sufficient vapors for sustained ignition. It also provides an ignition source.

Immediately Dangerous to Life and Health level (IDLH). A value defined by OSHA as an atmospheric concentration of any toxic, corrosive or asphyxiating substance that poses an immediate threat to life and health or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere.

Incident Command System (ICS). A systematic management process used for the command, control and coordination of emergency response. Also refers to a specific emergency management system required by United States law.

***In Situ* Burning.** Burning of oil in place (Latin, "*in situ*") is a response technique used to lessen the amount of oil reaching sensitive areas, which can be employed when the thickness of the oil is sufficient to sustain combustion and be used on both water, snow, ice, and land. It involves combustion of hydrocarbon vapors that yield predominantly carbon dioxide and water to the atmosphere.

Incident Commander (IC). Individual responsible for the overall management of the response—responsible for all aspects of the response, including developing incident objectives and managing all incident operations, setting priorities, and defining the Incident Command System (ICS) organization for the particular response.

Marine (also, Saltwater or Sea Water). Classification of a water body based on salinity from 17 parts per thousand and higher.

Mousse. An emulsion where water is dispersed in oil. Appearance is thick, foamy, red to dark brown, and may increase the apparent volume of the oil up to four times. Occurs when spilled oil and water are mixed by wave action and wind.

National Ambient Air Quality Standards (NAAQS). United States standards to protect the public and the environment. USEPA is required to develop them by the Clean Air Act. The standards are expressed as an averaged concentration in air.

National Contingency Plan (NCP). Regulations developed by the United States Environmental Protection Agency to implement a response to oil spills and releases of hazardous materials. It is authorized by the Clean Water Act of 1972 and the "Superfund" law of 1980, and codified at 40 *CFR* 300.

National Incident Management System (NIMS). United States government approach to proactively and systematically manage incidents involving all threats and hazards. Incorporates all levels of government, non-governmental organizations, and the private sector.

National Oceanic and Atmospheric Administration (NOAA). A United States government agency of the Department of Commerce. Mission is to understand and predict changes in climate, weather, oceans and coasts. Also assigned to conserve and manage coastal and marine ecosystems. Provides scientific support for oil and hazardous materials spill response and planning.

Natural Resources. Resources that are held in trust for the public that include land, fish, wildlife, biota, air water, groundwater, drinking water supplies, and other such resources.

Observer. A person on-site at a spill response who is not functionally involved in response operations. Performs public information, observation, logistical support, or oversight, which does <u>not</u> involve an expectation of potential exposure to oil or chemicals.

Oil. Any kind of petroleum hydrocarbon, in particular those in liquid form that could be spilled.

Oil Spill Control Agents. Chemicals used in treating oil spills, including dispersants, bioremediation agents (nutrient additions), herding agents, emulsion treating agents, solidifiers, elasticity modifiers, surface washing agents, and other miscellaneous oil spill treatments. In many situations, there may be restrictions on their use.

Open Water. Large bodies of water, including the ocean and large lakes where the use of *in situ* burning is primarily managed and deployed using vessels.

Oxidizers. A chemical that contributes oxygen (or otherwise accepts electrons) to a reaction, which can cause or contribute to combustion of other material.

Particulate Matter Less Than 2.5 Microns (PM-2.5). Suspension of fine solid or liquid particles in air, such as dust, fog, fume, mist, smoke, or sprays that are less than 2.5 microns (0.0001 inch) in diameter. Can be inhaled deeply into the alveoli of the lungs.

Particulate Matter Less Than 10 Microns (PM-10). Suspension of fine solid or liquid particles in air, such as dust, fog, fume, mist, smoke or sprays that are less than 10 microns (0.0004 inch) in diameter. Can be inhaled and settle in the bronchi and lungs.

Parts per Billion (ppb). A unit of concentration. One ppb is roughly equivalent to one teaspoon in 1,300,000 gallons.

Parts per Million (ppm). A unit of concentration. One ppm is roughly equivalent to one teaspoon in 1,300 gallons.

Parts per Thousand (ppt). A unit of concentration. One ppt is roughly equivalent to one teaspoon in 1.3 gallons.

Permissible Exposure Limit (PEL). An exposure limit that is published and enforced by OSHA as a legal standard (29 *CFR* 1910.1000, subpart Z), expressed as 8-hour TWAs, ceiling values, and STELs. Expressed as a concentration in air for a specific chemical.

Personal Floatation Device (PFD). A floatation device designed to keep a person afloat in the water such as life preservers and life jackets.

Personal Protective Equipment. Clothing and equipment designed to protect responders from serious workplace injuries or illnesses resulting from contact with chemical, radiological, electrical, mechanical, or other workplace hazards.

Pipeline and Hazardous Materials Safety Administration (PHMSA). A United States government agency of the Department of Transportation that provides response expertise pertaining to transportation of oil by all modes of transportation. It establishes oil discharge contingency planning requirements for pipelines, transport by rail and containers or bulk transport of oil.

Polycyclic Aromatic Hydrocarbons (PAHs). Chemicals composed of multiple rings of hydrogen and carbon. They are found in crude oil and smoke plumes, refined petroleum and incomplete combustion of organic matter, including cooked foods. They have very low vapor pressures and relatively low flammability (compared to other compounds in crude oils). There are over 100 PAH compounds and their toxicity ranges from slight to carcinogenic in even small doses. USEPA has designated 16 PAHs at priority pollutants.

Polynuclear Aromatic Hydrocarbons (PNAs). A subset of PAHs with fused rings that share one or more sides.

Product Schedule. The NCP product schedule is a list of products for which data has been submitted regarding use as a spill control agent. Listing does not mean approval; it only means that certain data are available.

Quality Assurance Project Plan (QAPP). Documentation of the planning, implementation, and assessment procedures for a particular environmental sampling project.

Responsible Party. Person, business or entity that has been identified as owning and/or operating the vessel or facility from which the spill occurred. The term does not imply criminal negligence.

Safety. Freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment.

Safety Officer. A person that works within an ICS to ensure that recognized safe practices are followed. Has the authority to stop unsafe actions.

Sensitive Resources. Land, fish, wildlife, biota, endangered species, air, water, ground water, drinking water supplies, infrastructure, economic, and cultural assets, potentially at risk from an oil spill. Most often these resources belong to, are managed by, held in trust by, appertaining to, or otherwise controlled by governments or other organizations for the common good. Oil spill sensitivity varies with such factors as species, season, and weather conditions.

Sheen. A very thin layer of floating oil, less than 0.005 mm thickness.

Short-Term Exposure Limit (STEL). Usually a 15-minute TWA exposure that shall not be exceeded at any time during the workday unless another time limit is established.

Site Safety Plan (SSP). A written plan that addresses the specific safety and health hazards of the response site and the requirements and procedures for responder protection.

Slick. A thin layer of spilled oil on water.

Small Boat. A watercraft designed to float or plane on the surface that is small enough to be carried aboard another vessel. Typically, it is not decked over and is used for utility actions during an *in situ* burn such as recovery of lines, repair of boom, ignition of oil, air monitoring and transfer of personnel to shore or to other vessels.

Small Boat Operator. A crew member in charge of a small boat, including steering and navigation. Sometimes referred to as a coxswain.

Sorbent. Any material which easily takes up oil through absorption or adsorption. Used to remove oil and hazardous substances from water.

Spreading. The dominant transport process for most oil spills, whether on water, on land, or in ice/snow. Spreading occurs due to surface tension and gravity.

Sulfur Dioxide. A gas formed when sulfur in an oil or hydrogen sulfide oxidizes during combustion.

Surface Tension. The tendency of a liquid surface, in contact with air, to contract due to an imbalance of forces on the molecules in the bulk liquid versus those at the surface of the liquid in contact with air.

Surfactant. A surface-active agent chemical, which contains both oil-soluble and water-soluble components.

Threshold Limit Value (TLV). An airborne concentration of a substance to which it is believed that nearly all workers can be exposed day after day for a working lifetime without adverse health effects. It is a recommendation of the American Conference of Governmental and Industrial Hygienists (ACGIH) and is not legally enforceable. There are different TLV types depending upon the time duration of allowed exposure.

Time-weighted Average (TWA). Usually an average airborne exposure in any 8-hour work shift of a 40-hour workweek that shall not be exceeded. Expressed as an averaged concentration in air.

Toxicity. The inherent potential or capacity of a material (e.g., oil, chemicals) to cause adverse effects in a living organism.

United States Coast Guard (USCG). A federal government agency under the Department of Homeland Security (DHS) that provides oversight, direction and coordination of oil spill and hazardous materials release response within coastal, offshore and commercially navigable waterways of the United States pursuant to the National Contingency Plan (40 *CFR* 300).

United States Environmental Protection Agency (USEPA). A federal government agency that directs and provides oversight and coordination for oil and hazardous materials spill response and is responsible for planning and preparedness for response in the inland zone pursuant to the National Contingency Plan (40 *CFR* 300).

Vapor Pressure. The pressure of the vapor resulting from the evaporation of a liquid. Different chemicals have different vapor pressures. Vapor pressure increases with temperature to reach one atmosphere at the boiling point of the material. Higher vapor pressure means faster evaporation.

Vessel. A watercraft designed for extended operation in large lakes and oceans.

Vessel Captain. The person in ultimate command of an individual vessel who is responsible for safe and efficient operations, cargo, navigation, crew management, and compliance with law.

Viscosity. The resistance to flow of a liquid. This bulk property is temperature dependent, with higher temperatures resulting in lower viscosity and quicker flow.

Volatile Organic Chemicals (VOC). Organic compounds that participate in atmospheric photochemical reactions. They evaporate quickly and some are toxic. Includes low molecular weight hydrocarbons found in crude oil and some refined products.

Water Column. An imaginary cylinder or box extending from the surface of the water to the bottom.

Weathering. The effects on the composition of oil from physical and biological processes that occur when oil is spilled in the natural environment. Includes spreading, evaporation, dissolution, photo-oxidation, emulsification, sedimentation, mineralization, and biodegradation.

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