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Prevent Infection from Contaminated Flood Waters

To prevent infection from contaminated flood water:

- Leave the flooded zone.
- Avoid swallowing contaminated water.
- Drink municipal or bottled water treated with chlorine or other effective disinfectants. If bottled water is not available, boil water before drinking, washing, or using to brush teeth. You may wish to view more information on keeping food and water safe after a disaster.
- Wash hands and feet that have been in contact with the contaminated water with soap and clean water. If soap and clean water are not available, use an alcohol-based hand rub to clean hands.

- Disinfect water for washing by mixing 1/8 teaspoon of household bleach per 1 gallon of water. Let it stand for 30 minutes. If the water is cloudy, use a solution of 1/4 teaspoon of household bleach per 1 gallon of water.
- If there has been a backflow of sewage into your house, wear rubber boots and waterproof gloves during cleanup. Remove and discard contaminated household materials that you can't disinfect such as wall coverings, cloth, rugs, and drywall.
- If you have any open cuts or sores that you may expose to floodwater, keep them as clean as possible by washing them with soap and clean water, and apply an antibiotic ointment to discourage infection.
- Wash clothes contaminated with flood or sewage water in hot water and detergent and separately from uncontaminated clothes and linens.
- Do not allow children to play in floodwater areas and do not allow children to play with floodwater-contaminated toys that you have not disinfected. Disinfect toys using a solution of one cup of bleach in five gallons of water.

If you, or someone you are caring for, have been exposed to sewage-contaminated waters, then you may have been exposed to disease causing germs. Take a bath or shower with clean water and soap, and clean your clothes and other belongings as described above. If you exposed wounds to the sewage contaminated floodwaters, clean and treat them as described above. Pay close attention to your health status. If you develop diarrhea, vomiting or fever, drink extra fluids and seek a medical evaluation.

You may also wish to view information on protecting yourself from chemicals released during a natural disaster.

Additional Resources:

- Natural Disasters - Facts about Infectious Diseases
- Healthcare Services for Natural Disaster Survivors
- Cleaning up and Safety Precautions after a Natural Disaster

The short link for this FAQ is http://1.usa.gov/pvovla

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FLD 02 INCLEMENT WEATHER

Hot weather (ambient temperatures over 70°F), cold weather (ambient temperatures below 40°F), rain, snow, ice, and lightning are examples of inclement weather that may be hazardous or add risk to work activities. Extremes of heat, cold, and humidity, as well as rain, snow, and ice, can adversely affect monitoring instrument response and reliability, respiratory protection performance, and chemical protective clothing materials.

RELATED FLDs AND OP

FLD 05 – Heat Stress Prevention and Monitoring
FLD 06 – Cold Stress
OP 05-03-008 – Inclement Weather & Business Disruption Policy

PROCEDURE

The potential for exacerbating the impact of physical hazards must be considered for tasks that expose personnel to inclement weather. Risk assessment and hazards analysis should be accomplished during the planning stages of a project for the most likely inclement weather conditions that may be encountered, i.e., rain and lightning in late spring, summer, and early fall, or lightning prone areas; cold, snow, and ice in winter. The Field Safety Officer (FSO) must determine the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his/her work and be actively alert to these hazards. Managers and workers must be familiar with the requirements of FLD 05 and FLD 06.

A pre-site activity risk assessment must be completed when inclement weather occurs. Weather conditions that affect instruments and personal protective equipment (PPE) function must be conveyed to site workers who should monitor function and integrity of PPE and be alert to changing weather conditions. A decision must be made on the proper safety procedures to use if work must continue, or to stop work if the risk is too great. The appropriate Safety Professional **must be notified of all instances of the need to stop work for safety reasons, including inclement weather**.

Heat

Hot, dry weather increases risk of soil drying, erosion, and dust dispersion, which may present or increase risk of exposure and environmental impact from toxic hazards. Hot weather will increase pressure on closed containers and the rate of volatilization, thereby potentially increasing the risk of exposure to toxic, flammable, or explosive atmospheres.

Prevention and Protective Measures

Employees must be protected from airborne contaminants using engineering controls such as wetting dry soil to prevent particle dispersion, and providing local ventilation to reduce volatile air contaminants to safe levels, or if engineering controls are infeasible, using prescribed PPE. Wind shifts and velocity should be measured where change may result in dispersion of airborne contaminants into the work area.

Rain, Wet Weather, and High Humidity

Wet conditions resulting from rain and wet weather increase slipping and tripping hazards, braking distances of vehicles, the potential for vehicle skidding, or difficulties in handling powered devices such as augers and drills. Rain fills holes, obscures trip and fall hazards, and increases risk of electrical shock

when working with electrical equipment. Changes in soil conditions caused by rain can impact trenching and excavating activities, creating the potential for quicksand formation, wall collapse, and cave-in. Vehicles become stuck in mud, and tools and personnel can slip on wet surfaces. Rain and wet conditions may decrease visibility (especially for personnel wearing respiratory protection) and limit the effectiveness of certain direct-reading instruments (e.g., photoionization detectors [PIDs]).

Feet that become wet and are allowed to remain wet can lead to serious problems under both heat and cold conditions. Activities that may result in wet feet include extended work in chemical protective clothing and wading in water/liquid during biological assessments. Trench foot, paddy foot, and immersion foot are terms associated with foot ailments resulting from feet being wet for long periods of time. All have similar symptoms and effects. Initial symptoms include edema (swelling), tingling, itching, and severe pain. These may be followed by more severe symptoms including blistering, death of skin tissue, and ulceration. (NOTE: The following Preventive and Protective Measures also apply to Cold, Snow, and Ice.)

Preventive and Protective Measures

Walkways, stairs, ladders, elevated workplaces, and scaffold platforms must be kept free of mud, ice, and snow. Employees shall be prohibited from working on scaffolds covered with snow, ice, or other slippery material except as necessary for removal of such materials.

Vehicles used in rain or cold weather must have working windshield wipers and defrosters, and windows must be kept clear of obstruction.

Drivers must observe traffic laws, including maintaining speed within limits safe for weather conditions, and wearing seat belts at all times. Note that this may mean operating below the posted speed limit.

When walking, workers should use a walking stick or probe to test footing ahead where there is standing water, snow, or ice to protect the walker against stepping into potholes or onto puncture hazards, buried containers, or other potential structurally unsound surfaces.

Prior to using vehicles or equipment in off-road work, workers should walk the work area or intended travelway when puddles or snow may obscure potholes, puncture hazards, or buried containers, or other potential structurally unsound surfaces.

Project managers should arrange to have winches, come-alongs, or other mechanical assistance available when vehicles are used in areas where there is increased risk of getting stuck. Cable or rope and mechanical equipment used for pulling stuck vehicles must be designed for the purpose, of sufficient capacity for the load, and be inspected regularly and before use to ensure safety. **Manually pushing stuck vehicles is to be avoided**.

Prevention methods are required when work is performed in wet conditions or when conditions result in sweating, causing the feet to become and remain wet. Proper hygiene is critical. Workers must dry their feet and change socks regularly to avoid conditions associated with wet feet. Use of foot talc or powder can additionally assist in prevention of this type of condition.

Cold, Snow, and Ice

Cold weather affects vehicle operation by increasing difficulty in starting and braking. Ice, frost, and snow can accumulate on windows and reduce vision. Cold, wet weather can cause icing of roadways,

driveways, parking areas, general work places, ladders, stairs, and platforms. Ice is not always as obvious to see as snow or rain, and requires special attention, especially when driving or walking.

Snow and ice increase the risk of accidents such as slipping when walking, climbing steps and ladders, or working at elevation, and the risk of accidents when driving vehicles or operating heavy equipment. Heavy snow and ice storms may cause electric lines to sag or break, and the use of electrical equipment in snow increases the risk of electric shock. Snow can hide potholes and mud, which can result in vehicles getting stuck or persons falling when stepping into hidden holes. Snow also may cover water, drums or other containers, sharp metal objects, debris, or other objects that can cause falls or punctures.

Preventive and Protective Measures

WESTON personnel are cautioned against operating motor vehicles such as cars or trucks on ice under any circumstances. If traveling in icy conditions, WESTON personnel should follow all public service advisories that curtail driving activities.

Personnel performing activities that require working over ice should be aware of minimal ice thickness safety guidelines as follows:

- 4-inch minimum: activities such as walking or skating.
- 6-inch minimum: activities such as snowmobiling or the use of equipment with the same weight and cross-sectional area as a snowmobile.

Personnel should always be aware that these measurement guidelines are under ideal conditions and that snow cover, conditions on rivers, ponds, or lakes with active currents, and other environmental factors impact the safety of working on ice. Clear ice typically is the strongest, while ice that appears cloudy or honeycombed (contains entrained air) is not as structurally strong. Measurements made by drilling or cutting through the ice should be made every few feet to verify safe conditions. Provisions for rescue (e.g., ladders or long poles and effective communications) must be available at the work site.

Lightning

Lightning represents a hazard of electrical shock that is increased when working in flat open spaces, elevated work places, or near tall structures or equipment such as stacks, radio towers, and drill rigs. Lightning has caused chemical storage tank fires and grass or forest fires. Static charges associated with nearby electrical storms can increase risk of fire or explosion when working around flammable materials, and can adversely affect monitoring instruments.

Lightning is the most dangerous and frequently encountered weather hazard people experience each year. Lightning affects all regions. **Florida, Michigan, Pennsylvania, North Carolina, New York, Ohio, Texas, Tennessee, Georgia, and Colorado** have the most lightning deaths and injuries.

Preventive and Protective Measures

Prior to working in areas or beginning projects when or where there is an increased potential for lightning striking personnel, steps must be taken to predict the occurrence of lightning strikes. Recommendations include:

- Check with client management to determine if there are any patterns or noted conditions that can help predict lightning or if there are structures that are prone to lightning strikes. Arrange for

client notification when there is increased potential for lightning activities. Ensure that clients include WESTON workers in lightning contingency plans.

- Monitor weather reports.
- Note weather changes and conditions that produce lightning.
- Stop work in open areas, around drill rigs or other structures that may attract lightning, on or in water and in elevated work places when lightning strikes are sighted or thunder is heard near a work site.
- Ensure all personnel are provided with safe areas of refuge. Prevent personnel from standing in open areas, under lone trees, or under drill rigs.
- Observe the "30-30" Rule. If you see lightning and thunder is heard within 30 seconds (approximately 6 miles), seek shelter. If you hear thunder, but did not see the lightning, you can assume that lightning is within 6 miles and you should seek shelter. Remain in the sheltered location for 30 minutes following the last lightning strike.
- Use a hand held static potential meter (lightning detection device) to monitor the potential difference between a cloud and the ground. When the measured potential is greater than 2 kV/m, there is a potential for a lightning strike – seek shelter.

High Wind and Tornado Safety

High Winds

Many construction workers have died due to wind-related accidents and injuries. A ladder that seems secure under normal circumstances can become unstable during windy conditions and cause you to fall. Scaffolding that is improperly secured can rip free during strong winds and kill bystanders. The risk of injury for construction workers increases during strong winds. Keep in mind that changing weather conditions can affect your daily work tasks, and make sure you have a game plan to prevent proper damage and personal injury.

Stay Informed: With today's modern technology available at the touch of a button, you should keep up to date with the latest local weather reports. Visit weatherbug.com or weather.gov to stay informed in case of wind warnings, watches, and advisories. Larger projects may have their own weather station on site to provide instant weather data. Use daily hazard assessments to determine if working conditions have changed or will change throughout the day.

Be Prepared: When you know the weather will be windy, secure loose building materials, scaffolding and fencing that could be picked up or torn loose by strong winds and thrown onto surrounding streets, structures, vehicles, or bystanders.

Know the Limits of Your Equipment: When operating any equipment, take time to read the operator's manual and become familiar with the wind specifications. Many crane manufacturers have high-wind guidelines to prevent you from operating a crane in unsafe weather. You should also check safety equipment such as fall protection to determine if it is adequate for windy conditions.

Know the Terminology

Severe Thunderstorm Watch

A Severe Thunderstorm Watch means that strong thunderstorms capable of producing winds of 58 mph or higher and/or hail 3/4 inches in diameter or larger are possible. If you are in the area of a Severe Thunderstorm Watch, you should be prepared to take shelter from thunderstorms. Severe Thunderstorm Watches are generally issued for 6-hour periods.

Severe Thunderstorm Warning

A Severe Thunderstorm Warning means that thunderstorms capable of strong winds and/or large hail are occurring or could form at any time. If you are in the area of a severe thunderstorm, you should take shelter indoors immediately, avoid windows, and be prepared for high winds and hail. Severe Thunderstorm Warnings are generally in effect for an hour or less.

High Wind Watch

A High Wind Watch is issued when sustained winds exceeding 40 mph and/or frequent gusts over 60 mph are likely to develop in the next 24 to 48 hours. For summit areas, high wind watches are issued when sustained winds are expected to exceed 45 mph and/or frequently gust over 60 mph. If you are in an area for which a High Wind Watch has been issued you should secure loose objects outdoors that may blow about and avoid outdoor activity that exposes you to high winds.

High Wind Warning

A High Wind Warning is issued when sustained winds exceeding 40 mph and/or frequent gusts over 60 mph are occurring or imminent. For summit areas, warnings are issued for winds exceeding 45 mph and/or frequently gusting over 60 mph. Wind warnings may issued up to 24 hours ahead of the onset of high winds and remain in effect for 6 to 12 hours. If you are in an area where a high wind warning is in effect you should avoid activities that expose you to high winds. Loose objects may be blown around. Tree limbs may break and fall. Power lines may be blown down.

Wind Advisory

A Wind Advisory is issued when sustained winds of 30 to 39 mph and/or frequent gusts to 50 mph or greater are occurring or imminent. Wind advisories may be in effect for 6 to 12 hours. If you are in an area where a wind advisory is in effect you should secure loose objects that may be blown about outdoors and limit activity that may expose you to high winds.

Work Safely: If you will be working on a windy day, you should be alert and protected. Wear eye protection to prevent dust and other particles from entering or striking your eyes. Keep your hard hat on at all times to prevent injuries from falling or flying objects. The likelihood of falls from heights is greatly increased by strong winds. Wear the necessary PPE to ensure your safety.

To avoid flying debris and to minimize damage during high winds:

- Shut down outdoor activities involving work at elevation on ladders, scaffolding, aerial lifts, etc.; handling large tarps and plastic sheeting when wind speeds exceed 25 mph; including work with radioactive materials and highly toxic materials that could be dispersed by the winds.
- At 13 - 18 mph wind will raise dust. Follow the dust action level.

- Move mobile items stored outside to indoor storage.
- Secure any items that cannot be moved inside.
- Be careful opening exterior doors.
- Be cautious about downed power lines, tree limbs, and debris on roads.
- Be alert for animals who have escaped from farms and zoos.

Stay Away from Power Lines: High winds can cause tree limbs to fall on power lines resulting in electrocution hazards or loss of power. Your best bet is to keep your distance.

Tornados

What is a TORNADO?

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud. It is spawned by a thunderstorm or as a result of severe weather associated with hurricanes. A funnel cloud is formed as cool air overrides a layer of warm air, forcing the warm air to rise rapidly. The damage from a tornado results from high wind velocity and wind blown debris.

Tornado Safety

When a tornado approaches, you have only a brief amount of time to make life-or-death decisions. Advance planning and quick response are the keys to surviving a tornado.

Purchase a NOAA Weather Alert radio with an alert feature. When tuned to the proper frequency, these weather radios remain silent until a weather emergency occurs. Once they pick up the alarm tone, they will begin broadcasting emergency weather information so that citizens can protect themselves and their property. Some models of the NOAA weather radio incorporate the Specific Area Message Encoder technology, allowing users to target only those warnings that affect their immediate geographic area.

Conduct tornado drills. Designate an area to serve as your safe area, and practice having team members assemble there in response to a mock tornado warning.

Emergency Communications Plan. Develop an emergency communications plan in case team members are separated from one another when a tornado warning goes into effect. Designate an emergency coordinator. Instruct everyone to contact this coordinator in a weather emergency for instructions on what to do during the storm and where to reassemble after the emergency has passed. Design contingency plans to be consistent with client contingency plans. When possible use client warning and alerting systems and confirm that team members have access to shelters and know how to get to them.

Know the Difference between a Tornado Watch and a Tornado Warning

Tornado Watch: Issued by the National Weather Service when tornadoes are possible in your area. You should remain alert for approaching storms. Remind family members of where the safe areas are within your home, and carefully monitor radio or television reports for further developments.

Tornado Warning: Indicates that a tornado has been sighted in your area, or is indicated on weather radar. You should proceed to safe shelter immediately.

When A Tornado Warning Goes In Effect, Put Your Safety Plans In Action.

In Your Automobile: Motor vehicles are easily overturned by tornado winds. Leave your vehicle and seek shelter in a sturdy building. As a last resort, seek shelter in a ditch or culvert. Do not try to outrun or outmaneuver a tornado! Use the time to seek appropriate shelter outside your vehicle.

Office Buildings, Hotels, and Shopping Centers: Take shelter in an interior hallway on a lower floor. A closet, bathroom or other small room with short, stout walls will give some protection from collapse and flying debris. Otherwise, get under heavy furniture and stay away from windows. Many tornado deaths have occurred in large buildings due to the collapse of a roof or wide span wall. A corner area, away from a window, is safer than the middle of a wide span wall.

Out In Open Country: When severe weather approaches, seek inside shelter immediately. The chances of encountering falling trees, downed power lines and lightning are far greater than encountering a tornado itself. If a tornado approaches, lie flat in the nearest depression, such as a culvert or ditch, and cover your head with your arms.

BE ALERT TO CHANGING WEATHER CONDITIONS

HAVE AN EMERGENCY WEATHER PLAN IN PLACE

REHEARSE YOUR CONTINGENCY PLANS PERIODICALLY

KNOW WHERE TO GO WHEN A TORNADO THREATENS.

FLD 10 MANUAL LIFTING AND HANDLING OF HEAVY OBJECTS

Improper lifting can result in cuts, pinches, crushing, and serious injury to back, abdomen, arm and leg muscles, and joints. Even relatively light objects, lifted improperly, can contribute to injury. Muscle and joint injuries occur when objects to be lifted are too heavy or awkward, are lifted improperly, or in areas where access is restricted. Lifting tasks which are awkward and repetitive, even if involving only light objects, can lead to nerve and joint damage.

At the project level, the need for manual lifting or handling of heavy objects must be identified as a physical hazard in the planning stages of a project Health and Safety Plan (HASP).

MANUAL LIFTING

Plan any manual lifting task noting the following:

Contact hazards. Check each object before lifting for presence of splinters, slivers, sharp edges or parts, cracks and loose joints, which can result in cuts. Signs of biological hazards, and chemical or radioactive material contamination.

- **Weight of object**. Unless involved in weight training, recommended safe lifting weights for an average man or woman are 50 and 35 pounds, respectively.
- **Size and shape of object**. Large and oddly shaped objects are more difficult to lift, even within safe weight limits, due to imbalanced center of gravity.
- **Area in which lifting is to be done.** Heavy objects can pinch or crush fingers, toes, arms, and legs between the object and nearby objects (e.g., walls, tables, counters, or railings). Check for pinch points such as other objects close by and ensure there is room for safe lifting.
- **Conditions under which lifting is to be accomplished.** Check for wet or slippery surfaces. Consider level of protection to be used. Level B or A protection may add up to 40 lbs. To be lifted, as well as restricting range of motion and adding to area restriction by increasing bulk.

Route to be traveled, if lifting includes carrying. Check walking and working surfaces for slip and trip hazards, note ramps, changes in level of elevation, and ladders or stairways that need to be negotiated.

Manual Lifting - Prevention and Protection

- Before lifting, identify the potential for contact hazards on objects to be lifted. Check each object before lifting, remove any noted hazards as feasible, and wear gloves (cotton, at a minimum, or leather, kevlar, or chemical resistant material, depending on the nature of the hazard).
- Avoid contact with, or cover cracks or loose joints to reduce hazards of pinching.
- Workers must know their lifting limitations, plan before lifting, keep themselves in good physical condition, and get help if uncertain that they can lift safely. Managers must plan and allow for safe lifting.
- When lifting an object from the floor:
  - Determine that the object is within the safe weight limit.
  - Check for contact hazards.
  - Walk the intended route of travel to identify and remove slip and fall hazards.
  - Identify changes in elevation, steps, ramps, stairs and ladders that must be negotiated.

- To lift square or rectangular objects:
  - Avoid reaching as you lift.
  - Set feet firmly, placing one foot alongside the load and the other slightly behind the load.
  - Keep objects close to the body.
  - Squat in front of the load.
  - Grasp one of the top corners away from the body and the opposite bottom corner closest to the body.
  - Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight and tuck in the chin.
  - Straighten the legs, keeping the spine straight, pull the object into the body and stand up slowly and evenly without jerking or twisting.

If turning or change of direction is required, turn with feet without twisting the torso and step in the direction of travel

To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object and the surface on which the object is set.

Workers must be trained and have the opportunity to use the above steps with lighter objects before performing heavy lifting. **For odd-shaped objects, the only modification needed should be hand-hold position**. When two or more persons are lifting, have a plan and a set of signals so lifting occurs simultaneously.

Do not carry objects in a manner which obstructs vision in the line of travel.

Carry objects so one hand is free to hold the handrail on stairs and that there is an unobstructed view of footing. Carry objects in a manner to permit use of both hands while climbing a ladder.

MANUAL HANDLING OF HEAVY OBJECTS

Manual handling of heavy objects, even when not lifting, can pose the same hazards as lifting including cuts, pinches, bruises, crushing, muscle and joint strain, and contact with hazardous materials and biological hazards.

Drums and other containers which must be maneuvered for access to information or sampling locations, that are inaccessible to mechanical handling equipment, require manual handling and special precautions. When handling of heavy objects does not involve lifting, workers can handle heavier objects safely, even those weighing several hundred pounds, if proper techniques are used. In many instances, the procedures involve balancing and taking advantage of the shape of the object.

Manual Handling - Prevention and Protection

Prior to performing manual handling, it must be determined that it can be done safely and that mechanical assistance is infeasible. Mechanical equipment or assistance such as dollies, carts, come-alongs or rollers are to be used whenever possible. Mechanical assistance must be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists. Objects to be moved must be secured to prevent falling and properly balanced to prevent tipping.

The minimum protection for manual handling is heavy cotton or leather gloves, safety boots, and coveralls. Metatarsal guards, chemical protective clothing, and metal mesh or kevlar gloves must be used as risk increases of heavy items falling, hazardous materials contact and sharp edges, splinters or slivers.

Workers must be aware of and work within their weight-handling capabilities.

Objects to be manually handled must be checked for contact hazards before handling, and to ensure handling will not trap hands, arms, legs, or feet between the object and other objects, walls, or railings.

Properly trained personnel may roll heavy objects with a round base such as 55-gallon drums or compressed gas cylinders, if rolling will not damage the structural integrity. Rolling must be controlled by chutes, tag-lines, or other means of limiting acceleration. Use of the legs for pushing and tag-line control of rolled objects must be stressed.

Only properly trained personnel may move cylindrical objects which must remain upright by hand. Cylindrical objects, such as drums that must remain upright, are handled manually by slightly tilting the object, using the legs for control, and balancing the object on the bottom edge. The handler then walks beside the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus maintaining balance and a steady controlled forward motion.

Prior to moving cylindrical objects in this way, the route of travel must be walked to identify any changes of elevation, pot holes, or other obstructions that could cause the object to snag, tip, or get out of control.

Flat, square, or rectangular objects are most easily handled using make-shift rollers or skids to break the friction with the resting surface and pushing, using the legs.

FLD 11 ROUGH TERRAIN/ATV USE

RELATED FLDs

FLD 02 – Inclement Weather
FLD 05 – Heat Stress Prevention and Monitoring
FLD 06 – Cold Stress
FLD 22 – Heavy Equipment Operation
FLD 47 – Clearing, Grubbing, and Logging Operations
FLD 57 – Motor Vehicle Safety

HAZARD

Physical hazards associated with rough terrain include vehicle accidents, heavy equipment incidents, falling, slipping, and tripping.

Driving vehicles on uneven surfaces creates a possibility of the vehicle rolling, getting stuck in mud or ditches, or of an accident due to flat tires or striking obstacles and other vehicles.

When working on foot, step inclines and heavy or downed vegetation can hide holes or breaks in the terrain, increasing the risk of slips, trips, and falls.

RECOGNITION AND RISK ASSESSMENT

Rough terrain complicates work activities and adds to or increases risk. In the planning stages of a project, rough terrain must be considered as a physical hazard and identified in the site-specific health and safety plan (HASP). Risk assessment is usually accomplished from site history information (i.e., site topography) and on site by the Field Safety Officer (FSO).

HAZARD PREVENTION AND PROTECTION PROGRAMS

Safety on Foot

Personnel working on rough terrain should maintain a high level of physical conditioning due to increased body stress and exertion.

The site crew should be alert and observe terrain while walking to minimize slips, trips, and falls.

Boots should be ankle high or higher to provide additional support and stability.

Work will be completed in adequate natural light or sufficient illumination will be maintained.

Site personnel will conduct an initial walkover and the “buddy system” will be implemented.

Emergency communications such as a cell phone or two-way radio should be carried at all times.

Personnel should be aware of potential hazards and ensure the availability of first-aid supplies and knowledge of the location of the nearest medical assistance.

VEHICLE SAFETY

Vehicle drivers and passengers will wear seatbelts at all times.

Hazards can be prevented by ensuring regular maintenance is performed on vehicles and all safety features are working. Have brakes and wheel bearings of vehicles used off road or in four wheel drive inspected at increased frequency (suggest inspections at twice the manufacturer's recommended frequency).

In order to minimize accidents, site surveillance on foot may be required to ensure clear driving paths.

Minimize side hill travel. Travel straight up and down hills whenever possible. Passengers will not be allowed when side hill travel is required.

Take into account loads or superstructure of vehicles which raise the center of gravity and increase risk of tipping.

Cross streams, small logs or other passable (there is adequate clearance of the undercarriage) obstructions at right angles.

Four wheel drive vehicles should be used if terrain conditions are wet, frozen, broken, or otherwise deemed unsafe for two wheel drive vehicles by the FSO. Use of vehicles off-road will be specifically addressed in the HASP and personnel operating vehicles will be checked for proficiency.

- Before moving a vehicle in the field, first walk the route of travel, inspecting for depressions, stumps, gullies, ruts, and similar obstacles.
- Always check the brakes of a vehicle before traveling, particularly on rough, uneven, or hilly ground.
- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts, and mountings.
- Engage the all wheel drive when traveling off highway on hilly terrain.
- Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).
- Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
- After the vehicle/equipment has been moved to a new site, set all brakes and/or locks. When grades are steep, block the wheels.

Definitions

Class I, All-terrain vehicle (ATV): A motorized off-highway vehicle, 50 in. (127 cm) or less in width, having dry weight of 800 lbs (362.9 kg) or less, and traveling on three or more low pressure tires (10 lbs [4.5 kg] psi or less), with a seat designed to be straddled by the operator.

Class I, Category G, ATV: An ATV intended for general recreational and utility use.

Class I, Category U, ATV: An ATV intended primarily for utility use.

Class II, ATV: A motorized off-highway vehicle with a width which exceeds 50 in. (127 cm) or having a dry weight that exceeds 800 lbs (362.9 kg), traveling on four or more low-profile, low-pressure tires (10 lbs [4.5 kg] psi or less) and having a bench seat.

NOTE: Utility Vehicles are designed to perform off-road utility tasks such as passenger and cargo transportation and are addressed separately below. Examples are Rangers, Rhino, M-Gators, Gators, and Mules.

Rollover Protective Structure (ROPS). A cab or frame that provides a safe environment for the tractor operator in the event of a rollover.

ALL TERRAIN VEHICLES (ATVS)

Qualifications

ATV operators will have completed a nationally recognized accredited ATV training course (such as provided by the Specialty Vehicles Institute of America or in-house resources that have been certified as trainers by an accredited organization) prior to operation of the vehicle.

The operator must pass an operating skills test prior to being allowed to operate an ATV. Proof of completion of this training will be maintained.

Equipment

All ATVs shall be equipped with:

- An operable audible warning device (horn);
- Headlights (if it will be used during hours of darkness);
- Taillights; and
- Brake lights.
- Mufflers and spark arresters.

All Class II ATVs will be equipped with ROPS and seatbelts

Operation

Only Class I and Class II ATVs with four or more wheels may be used. Class III ATV's may not be used.

The manufacturer's recommended payload will not be exceeded at any time.

Gloves and an approved motorcycle helmet with full-face shield or goggles will be worn at all times while operating a Class I ATV.

An ATV will not be driven on public roadways except to cross the roadway, and it will only be driven on a public roadway at designated crossing points or with a road guard (no paved road use unless allowed by the manufacturer).

A copy of the operator's manual will be kept on the vehicle and protected from the elements (if practicable).

Tires shall be inflated to the pressures recommended by the manufacturer.

Passengers are prohibited on Class I ATVs.

UTILITY VEHICLES

Utility vehicles are defined as specialty Class II ATVs designed to perform off-road utility tasks such as passenger and cargo transportation. Examples are Rangers, Rhino, M-Gators, Gators, and Mules.

Utility vehicle operators shall be trained and familiar with the use of all controls; understand proper moving, stopping, turning and other operating characteristics of the vehicle. Operators must review all training materials provided by the manufacturer for the specific vehicles, and training should be in accordance with appropriate manufacturer recommendations. A copy of the operator's manual shall be kept on the vehicle at all times and protected from the elements. At a minimum, training should address:

- Basic riding tips from the manufacturer's published literature for each vehicle.
- Reading terrain.
- Climbing hilly terrain.
- Descending a hill.
- Traversing a slope.
- Riding through water.
- Cargo carriers and accessories.
- Loading and unloading.
- Troubleshooting.
- Proper preventative maintenance, (i.e., oil levels, tire pressure requirements and scheduled maintenance requirements according to the manufacturer's guidelines.).

Utility vehicles shall be equipped with:

- Operable audible warning device (horn).
- Headlights.
- Taillights.
- Brake lights.
- Seatbelts.
- ROPS.

Occupancy in utility vehicles is limited to manufacturer designated seating that has built-in seatbelts. Passengers may not ride in the vehicle's back cargo area unless the vehicle is otherwise equipped. Note: When used for emergency response, medical litters may be placed in the back cargo area but must be secured as described below.

The manufacturer's recommended load carrying capacity, personnel capacity, or maximum safe vehicle speed shall not be exceeded at any time.

Cargo items will be secured as necessary to prevent movement/tipping. All loads over fifty pounds (to include medical litters) must be securely strapped to cargo tie-downs in the rear and to the cargo shelf in the front.

Seatbelts will be worn by operators and passengers of specialty vehicles where installed by the manufacturer. Operators and passengers shall wear goggles at all times when a utility vehicle, not equipped with a windshield, is in motion.

Utility vehicles will not normally be driven on public roadways except to cross the roadway, and will only be driven on a public roadway at designated crossing points or with a road guard. Utility vehicles that are allowed to operate outside a controlled work area and/or on public roads will meet the minimum vehicle safety standards in accordance with 49 CFR 571.5, to include ROPs, seatbelts and placement of "Slow Moving Vehicle" emblems where required.

Manufacturer-installed safety equipment will be maintained in working order and used in compliance with the requirement of this regulation and in accordance with manufacturer's recommendations.

RULES

Observe the following practices to help prevent accidents:

- Do not misuse utility vehicles.
- Reduce speed and exercise extreme caution on slopes or on rough ground.
- Do not overload vehicle and avoid shifting loads. Reduce load when operating over rough or hilly terrain.
- Do not stop or start suddenly when going uphill or downhill. Be especially cautious when changing direction on slopes.
- Stay alert for holes, rocks, and other hidden hazards in the terrain.
- Keep away from drop-offs, ditches, embankments, as well as ponds and other bodies of water. The machine could suddenly turn over if a wheel is over the edge of a cliff or ditch, or if an edge caves in.
- Keep front wheels straight at crest of hill or going over bumps.
- When descending a hill, remove foot from accelerator and apply brakes to reduce speed and maintain control.

Transport Loads Safely

- Be sure load is evenly distributed.
- Do not load above the load guard.
- Securely anchor all loads in cargo box.
- Reduce cargo box capacity when operating on rough or hilly terrain.
- Use existing trails. Avoid terrain such as dangerous slopes and impassable swamps. Watch carefully for sharp bumps, holes, ruts, or obstacles.
- Look ahead at terrain. Know what is coming and be prepared to react. Be alert for hazards.
- Keep front wheels straight at the crest of a hill or going over bumps.
- Reduce speed according to trail, terrain, and visibility conditions.
- The passenger should always use the hand holds.

Climbing or Descending a Hill

- Always use the brakes when going down slopes, the utility vehicle can speed up (freewheel) going down a slope. Engine or clutch braking effect is minimal.
- Balance loads evenly and secure them. Braking could shift the load and affect vehicle stability.
- Sit on the center of the seat and keep both feet within the foot platform.
- Never drive past the limit of visibility. Slow down near the crest of a hill until getting a clear view of the other side.
- If the vehicle stops or loses power going up a hill, lock the park brake to hold the vehicle on slope. Maintain direction of travel and release the brake slowly. Back straight down hill slowly while maintaining control. Do not turn the vehicle sideways. The vehicle is more stable in a straight forward or rearward position.
- If the utility vehicle begins to tip, turn the front wheel downhill to gain control before proceeding.

Riding Through Water

- Avoid water whenever possible. If the drive belt becomes wet, slippage will occur and the vehicle will lose power.
- Never cross any body of water where the depth may be unknown to the operator. As an operational guideline, deep water is considered anything in excess of 152 mm (6 in.) in depth. Tires may float, making it difficult to maintain control.
- Choose a course within the waterway where both banks have a gradual incline. Cross at a point known to be safe.
- Proceed at a slow steady speed to avoid submerged obstacles and slippery rocks.
- Avoid water crossings where the operation of a utility vehicle may cause damage to waterway beds or erode waterway shoreline.

FLD 12 HOUSEKEEPING

Hazards associated with poor housekeeping include but are not limited to slips, trips, falls, punctures, cuts, and fires. Good housekeeping is a critical element when working under all FLDs. Housekeeping inspection checklists are available on-line on the Weston Environmental, Health, and Safety (EHS) Portal site.

RECOGNITION AND RISK ASSESSMENT

Good housekeeping is an important element of incident prevention. Good housekeeping should be planned at the beginning of the job and carefully supervised and monitored through project completion.

Housekeeping requirements must be addressed in the planning stages of a project Health and Safety Plan (HASP). Risk assessment can be accomplished in the development stages of a project by listing in the site-specific HASP, good housekeeping requirements and the hazards associated with poor housekeeping (e.g., slips, trips and falls). The Field Safety Officer (FSO) must make decisions on the proper safety procedures and recommend them to the site manager. Each worker must evaluate the risk associated with his or her work and be actively alert to these hazards. Any site worker may stop work if safety procedures are not followed or the risk is too great.

PREVENTION AND PROTECTION

Incidents can be prevented or minimized by following the general guidelines described below:

1. Plan ahead. A materials storage area which has been planned is more orderly than one which has developed haphazardly.
2. Assign responsibilities. If the size of the job and work force merit, a person should be assigned specific responsibility for clean up. Ideally, each individual should pick up his or her work area and help keep the site neat.
3. Implement the program. Housekeeping must be part of the daily routine, with clean-up being a continuous procedure.

Incidents caused by poor housekeeping can also be prevented by adherence to the following rules.

Lunch areas should be kept clear of empty bottles, containers, and papers. Trash disposal cans should be provided. An effective means of preventing litter is the provision of suitable receptacles for hazardous waste as well as no hazardous waste.

Accumulation of flammable and combustible liquids on floors, walls, and other areas is prohibited. All spills of flammable and combustible liquids must be cleaned up immediately.

Combustible waste such as soiled rags and paper is to be stored in a safe place (e.g., covered metal container) and disposed of regularly.

Materials must be stacked and stored to prevent sliding or collapsing.

WESTON project managers and WESTON subcontractors should provide sufficient personnel and equipment to ensure compliance with all housekeeping requirements.

Work will not be allowed in areas that do not comply with the requirements of this FLD.

The FSO and WESTON subcontractors will inspect the work area daily for adequate housekeeping and record findings on the daily inspection report.

Adequate lighting should be provided in or around all work areas, passageways, stairs, ladders, and other areas used by personnel.

All stairways, passageways, gangways, decontamination lines, and accessways shall be kept free of materials, supplies, and obstructions at all times.

Loose or light material should not be stored or left on roofs or floors that are not enclosed, unless it is safely secured.

Tools, materials, extension cords, hoses, or debris are to be used, disposed of, and stored so as not to cause a tripping or other hazard.

Tools, materials, and equipment subject to displacement or falling should be adequately secured.

Empty bags that contained lime, cement, and other dust-producing materials should be removed periodically, as specified by the designated authority.

Protruding nails in scrap boards, planks, and timbers should be removed, hammered in, or bent over flush with the wood, unless placed in containers or trucks for removal.

Walkways, runways, and sidewalks should be kept clear of excavated material or other obstructions and no sidewalks should be undermined unless shored to carry a minimum live load of 125 pounds per square foot.

Containers should be provided for storing or carrying rivets, bolts, and drift pins, and secured against accidental displacement when aloft.

When rivet heads are knocked off or backed out, they should be prevented from falling.

Form and scrap lumber and debris should be cleared from work areas, passageways, and stairs in and around building storage yards and other structures.

All storage and construction sites should be kept free of the accumulation of combustible materials.

All materials should be maintained in neat stockpiles for ease of access. Aisles and walkways should be kept clear of loose materials and tools.

Areas prone to weeds and grass should be kept mowed. A standard procedure should be established for cleanup of such areas, as specified by the FSO.

Rubbish, brush, long grass, or other combustible material must be kept from areas where flammable and combustible liquids are stored, handled, or processed.

FLD 18 OPERATION AND USE OF BOATS

GENERAL

WESTON acknowledges the significant hazard that operating watercraft creates for our personnel, vendors and clients. This procedure describes the minimum requirements for WESTON personnel to be involved in activities or tasks that require the use of boats (watercraft). The following is an outline of the combinations of personnel that are possible in a boating related job:

1. Only WESTON Personnel
2. WESTON personnel and client and/or vendor personnel
3. Vendor personnel only

WESTON requires that a Pilot, Helmsman, or Captain of the vessel be identified and approved for all three of these personnel combinations involving watercraft. For tasks that require non-WESTON personnel to be present on a WESTON boat, the boat or other watercraft may need to be operated by an individual with a current U.S. Coast Guard (USCG) Captain's license and rating for the type of vessel being operated.

NOTE: *The local Coast Guard Regional Marine Safety Office (MSO) should be contacted to determine the need for a Captains license. Criteria to be assessed would include; location, type craft, tasks to be conducted, personnel involved and the basis for passengers to be onboard.*

APPROVALS

Use of watercraft requires the written approval of the Division Safety Manager (DSM) **and** a Boating Safety Review Committee Member. The DSM and Boating Safety Review Committee Member shall review and approve Health and Safety Plan tasks associated with the use of all watercraft. Approved Boating Safety Review Committee Members are that can be contacted are as follows:

Name	Location	Work Phone Number	Cell Phone Number
James Davis	Mobile, AL	(251) 602-1898	(334) 319-0380
Brad Benson	Carlsbad, CA	(760) 931-5105	
Mike Stuart	Albuquerque, NM	(505) 837-6566	(505) 259-7613
Theodore Blackburn	Bedford, NH	(603) 656-5442	(603) 860-4457

A Pilot, Helmsman, or Captain shall be identified by name and approved by the DSM and a member of the Boating Safety Review Committee. The Pilot, Helmsman, or Captain shall prepare a float plan and file the float plan with the DSM, Safety Officer, and the Project Manager. The Float Plan may also be filed with the appropriate authority (U.S. Coast Guard). Pilot, Helmsman, or Captain qualifications and experience shall be defined at a minimum as follows:

- License and rating (Coast Guard and State or other) if required,
- Experience with type/size of boat being used
- Experience on body of water where the boat will be operating

REFERENCES

Related FLD OPS:

FLD02 - Inclement Weather
FLD05 - Heat Stress Prevention and Monitoring
FLD06 - Cold Stress
FLD07 - Wet Feet
FLD10 - Manual Lifting of Heavy Objects
FLD15 - Remote Areas
FLD19 - Working Over or Near Water
FLD32 - Fire Extinguisher Required and Requirements

Reference Guide to State Boating Laws (fifth edition)-USCG

PROCEDURE

This field operating procedure is intended as an overview and guide for boating operation and safety. This field operating procedure is much too brief to adequately prepare personnel to operate watercraft or work on the water. At a minimum, WESTON requires that WESTON personnel and Vendors who plan to operate watercraft take a course on Boating Skills and Seamanship offered by the Coast Guard Auxiliary, as well as any State-required training. Topics covered usually include sailing, marine engines, navigation, ropes and knots, locks and dams, and safe boat handling and operation.

Introduction

Watercraft are frequently used in WESTON field activities to gather environmental information and samples. The use of boats without adequate preparation and training can lead to accidents, injuries, and death.

Whether a passenger or Pilot, Helmsman, or Captain of the Boat used for environmental monitoring, all personnel have responsibilities for safety. All personnel working on boats need some basic information about boat safety equipment and preparation, and about routine boating procedures and emergency procedures. Even if an individual does not plan to pilot a boat, an accident may unexpectedly put him or her in command or in the water alone.

Three major areas of boating safety will be discussed in this field operating procedure:

1. Selection and preparation of the vessel and its equipment.

Coast Guard Notes:
A Coast Guard study of boating accidents shows that the main cause of fatalities to be boats capsizing due to someone standing up in the boat, improper loading of the boat, or ignoring weather warnings. Most boating fatalities resulted from boats capsizing. The second and third largest number of fatalities resulted from falls overboard, vessels sinking, and collisions.

Every person operating a boat is legally responsible for inspecting, equipping, and operating the boat in compliance with federal and state regulations and for any damage that may be caused by operation of the boat. The person in command of a boat is required to know the requirements for operation and navigation of the boat, the regulations that apply locally, and the mandatory rules of the road.

The rules of the road are the codes governing the lights to be carried by boats, the signals to be made, and the actions of one boat with respect to another when the risk of collision exists. International Rules of the Road for preventing collision at sea were first formalized in 1889 for navigation in international waters. The United States has adopted similar rules that must be followed in all United States waters. (The separate rules that have existed for the Great Lakes, the Mississippi River and its tributaries, and the intracoastal waterway and other inland waters are in the process of

2. Preparation of information and other items needed for the field trip.
3. Operation of the vessel under routine and emergency conditions.

Much of the information in this field operating procedure has been drawn from publications of the U.S. Coast Guard and the U.S. Coast Guard Auxiliary. Many other references are available, such as "Chapman Piloting – Seamanship & Small Boat Handling" by Elbert S. Maloney. Please refer to these sources for additional information.

Hazard Recognition

The hazards associated with the operation and use of watercraft include but are not limited to:

- drowning,
- heat stress,
- cold stress,
- hypothermia, and
- injuries from slips, trips, and falls.

The potential for back injuries due to improper lifting techniques also exists when working on boats. Carelessness, horseplay, or other unsafe acts that could cause injury to personnel when operating or using boats are prohibited.

There are also serious hazards associated with untrained, inexperienced personnel operating boats and/or boating equipment, lack of USCG-approved Personal Floatation Devices (PFD), and misuse of appropriate PPE , which could result in injury or death.

Some of the most serious and often neglected hazards associated with boating safety include:

- Weather – weather and weather forecasts need to be reviewed prior to departure and while boating. Changes in weather conditions can happen quickly and can create serious problems if caught unaware.
- Operating in unfamiliar waters – currents, subsurface obstructions, and navigation need to be included in float plan development
- Operating an unfamiliar vessel – different types of boats have different characteristics in handling and performance. The type of vessel must be both appropriate for the type of waters where the vessel will operate and for the type of work expected to be performed.

Documentation Requirements

Health and Safety Plan

A WESTON HASP is required for any work involving a boat or other watercraft. This HASP shall include specific descriptions of :

- Work to be performed from the watercraft,
- Body of water that will be involved,
- Type of boat to be used,
- Identity and qualifications & experience of the Pilot, Helmsman, or Captain and the crew.
- Definition of conditions such as weather and hours of operation where the boat will be prohibited from operating or will be required to stop work and return to port.

- Communication methods and frequency.
- Methods of navigation, charts and maps

Pre-Trip Hazard Assessment and Boating Checklist

The Pilot, Helmsman or Captain shall be responsible for completing a Daily Boating Pre-Trip Inspection Checklist (Refer to attachment "A") prior to each days operations. Any deficiencies noted shall be resolved prior to leaving the dock.

Registration

All boats must be registered and their numbers and validation stickers displayed. The certificate of registration must be onboard at all times when the boat is being operated.

NOTE: Livery boats under 26 feet in length, hired for less than seven days, need not carry the certificate, but must have copy of the lease or rental agreement on board, signed by the owner/representative and by the person renting the boat. The agreement must show the registration number and the period of time for which the boat is rented.

Navigation Charts

Up-to-date navigation charts, a GPS, and a compass should be taken and information should be obtained about any unusual navigation hazards that may be likely in the are, such as shoals, sandbars, rocks, or rapids.

Float Plans

The Pilot, Helmsman, or Captain shall prepare a float plan for each trip and file it with the DSM, Safety Officer and the Project PM who will be responsible to request a search if necessary. At a minimum, the Float Plan should include destination, time of return, who is on board, and a description of the boat (refer to Attachment E—Sample Float Plan).

The Coast Guard's recommended format for a Float Plan provides space for recording:

1. Description of boat in detail, so the boat can be identified and its position can be estimated
2. Number of persons aboard and who they are
3. Radio type and frequencies available
4. Trip expectations, destination, and latest expected return time
5. Name and telephone numbers of Coast Guard or other agency to be notified if return is delayed beyond the latest expected return time.

Selection and Preparation of the Vessel

This section describes requirements for the selection and preparation of a vessel, compliance with WESTON operating procedures, boating safety regulations, and recommendations for achieving more than the minimum protection required.

Only watercraft that is considered to be stable in the environment of use should be used for environmental monitoring and sampling projects. Canoes and kayaks, due to their tipable nature, are not considered to be stable and should not be used unless specific approval is obtained from the responsible DSM. and a Boating Safety Review Committee member.

One convenient way to see if a watercraft is in compliance with the minimum safety requirements is to request a complimentary inspection from the local Coast Guard Auxiliary. A member of the Coast Guard Auxiliary will examine the watercraft for compliance with the federal regulations and additional recommendations that the Auxiliary considers desirable for safety. If the watercraft passes the inspection, a current Courtesy Examination decal will be placed on the watercraft. If the watercraft does not pass, a confidential report of deficiencies will be given to the watercraft owner.

All powered watercraft are required to be registered, usually with a number assigned by the state.

Equipment Needed or Required

Equipment needed or required on all motorboats includes a fire extinguisher, a signaling device, means of preventing accumulation of flammable fuel vapors, an approved PFD for each person onboard, visual distress signals, and lights if the vessel will be operated at any time before sunrise or after sunset. Refer to Attachment "B" for additional equipment discussion and Attachment "A" for an Daily Pre-trip Inspection/Equipment Checklist

Recommended Inspections

Before a boat is taken out on a field trip, it should be inspected carefully to see that the engine has an adequate fuel supply and is in good working order, that all navigation and communication equipment is working, and that all safety equipment is on board and accessible. In addition, all watercraft equipment is expected to be in good operating condition.

The Coast Guard Auxiliary publishes information that can be used to develop a pre-trip checklist for each specific type of boat. They also provide information that can be used to prepare guidelines for engine troubleshooting and for routine engine maintenance. The watercraft should not be operated unless a complete pre-trip watercraft inspection is conducted and there are no deficiencies detected.

Refueling Precautions

Gasoline is flammable and watercraft are very susceptible to damage from fire that special safety precautions must be taken. Four basic precautions are:

- keep all sources of ignition away from flammable vapors
- keep the nozzle of the fueling source in contact with the fill opening to prevent static sparks
- avoid overfilling tanks
- never fill portable fuel tanks in the boat. (Portable tanks should be filled on the dock or at another location.)

The precautions for fueling boats with inboard engines are usually more elaborate than for outboard motors because inboard engine fuel tanks cannot be filled remote from the boat and special ventilation equipment is needed.

Equipment

All boats to be used on WESTON projects will be require to have, at a minimum, the equipment indicated below. Additional information on equipment, loading and boat handling is contained in Attachment B.

Minimum Required Safety Equipment for Boats to 26 Feet

Equipment	*Class A* *Less Than 16 Feet (4.9m)*	*Class 1* *16 Feet to Less Than 26 Feet (4.9–7.9m)*
Personal flotation devices	One Type I, II, III, or IV for each person.	One Type I, II, or III for each person on board or being towed on water skiis, etc., plus one Type IV available to be thrown.
Fire extinguishers		
When no fixed fire extinguishing system is installed in machinery space(s)	At least one B-I type approved hand portable fire extinguisher. Not require on outboard motorboats less than 26 feet (7.9 m) in length and not carrying passengers for hire if the construction of such motorboats will not permit the entrapment of flammable gases or vapors.*	
When fixed fire extinguishing system is installed in machinery space(s)	None	
Ventilation	At least two ventilator ducts fitted with cowls or their equivalent for the purpose of properly and efficiently ventilating the bilges of every engine and fuel tank compartment of boats constructed or decked over after 25 April 1940, using gasoline or other fuel having a flashpoint less than 110°F. (43°C). Boats built after 31 July 1981 must have operable power blowers.	
Whistle	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal" audible 1/2 mile.	
Bell	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal."	
Backfire flame arrester	One approved device on each carburetor of all gasoline engines installed after 25 April 1940, expect outboard motors.	
Visual distress signals	Required only when operating at night or carrying six or fewer passengers for hire. Same equipment as for larger boats.	Orange flag with black square-and-disc (D); and an S-O-S electric light (N); or three orange smoke signals, hand held or floating (D); or three red flares of handheld, meteor, or parachute type (D/N).

*Dry chemical and carbon dioxide (CO_2) or the most widely used types, in that order. Other approved types are acceptable. Toxic vaporizing-liquid type fire extinguishers, such as those containing tetrachloride or chlorobromomethane, are not acceptable.

Minimum Required Safety Equipment for Boats 26 to 65 Feet

Equipment	*Class 2* *26 Feet to Less Than 40 Feet (7.9–12.2m)*	*Class 3* *40 Feet to Not More Than 65 Feet (12.2–19.8m)*
Personal flotation devices	One Type I, II, or III for each person on board devices or being towed on water skiis, etc., plus one Type IV available to be thrown.	
Fire extinguishers		
When no fixed fire extinguishing system is installed in machinery space(s)	At least two B-I type approved hand portable fire extinguishers, or at least one B-II type approved hand portable fire extinguisher.	At least three B-I type approved hand protable fire extinguishers, or at least one B-I type plus one B-II type approved hand portable fire extinguisher.
When fixed fire estinguishing system is installed in machinery space(s)	At least one B-I type approved hand portable fire extinguisher.	At least two B-I type approved hand portable fire extinguishers, or at least one B-II approved unit.
Ventilation	At least two ventilator ducts fitted with cowls or their equivalent for the purpose of properly and efficiently ventilating the bilges of every engine and fuel tank compartment of boats constructed or decked over after 25 April 1940, using gasoline or other fuel having a flashpoint less than 110°F. (43°C). Boats built after 31 July 1981 must have operable power blowers.	
Whistle	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal" audible 1/2 mile.	Boats 39.4 to 65.7 feet (12–20 m)—device meeting technical specifications of Inland Rules Annex III, audible 1/2 mile.
Bell	Boats up to 39.4 feet (12 m)—any device capable of making an "efficient sound signal."	Boats 39.4 to 65.7 feet (12–20 m)—bell meeting technical specifications of Inalnd Rules Annex II; mouth diameter of at least 7.9 inches (200 m).
Backfire flame arrester	One approved device on each carburetor of all gasoline engines installed after 25 April 1940, expect outboard motors.	
Visual distress signals	Orange flag with black square-and-disc (D); and an S-O-S electric light (N); or three orange smoke signals, hand held or floating (D); or three red flares of handheld, meteor, or parachute type (D/N).	

Accidents

Various studies have shown the following to be the major causes of boating accidents:

- Overloading, overpowering, and improper trim.
- High speed turns, especially in rough water.
- Failure to keep a sharp lookout for obstructions.
- Going out in bad weather (or not starting for home soon enough when good weather turns bad).
- Standing in a moving boat.
- Having too much weight too high in the boat, as when someone sits on the deck of a small outboard.
- Leaks in the fuel system.
- Going too far offshore.

Each of these factors, and others not listed here, should be avoided. A carefully matched boat, motor, and propeller, operated in accordance with the law and with courtesy, will go a long way

toward eliminating accidents. Always remember that the possibility of trouble always exists; be prepared to act in an emergency.

Man Overboard

If someone falls overboard, maneuver the boat's stern away from him. Shift into neutral immediately (kill the motor if you do not have a gearshift) and throw a buoyant cushion or life jacket near the victim (try to get it close, but do not aim directly at the victim). Make sure you are well clear of the person in the water before shifting into gear again.

Circle around quickly, selecting a course that will allow you to approach the person with the boat headed into the wind or waves. Approach him slowly, taking care to come alongside and not over him. Stop the motor before attempting to get the victim aboard.

When alongside, extend a paddle or boathook to him, or one end of a line. With the motor stopped, lead him around to the stern, where the freeboard is the lowest, if there is enough space at the transom for him to get aboard without contacting the motor. If this is not feasible, help the victim aboard over the side as far aft as possible. In either case, the use of a boarding ladder will be of help. To avoid a capsize while the victim is coming aboard, other passengers should shift their weight to the opposite side to maintain trim as much as possible. When helping a person aboard, hold him under the armpits and lift gently.

In Case of an Accident

Personnel involved in a boating accident are required to stop and give as much help as possible without seriously endangering their boat or passengers. Personnel must identify themselves and their boat to any person injured or to the owner of any property damaged.

Personnel witnessing an accident may now render assistance with reasonable assurance of freedom from liability. The Federal Boat Safety Act of 1971 contains a "good samaritan" section which provides that any person who renders assistance at the scene of a vessel accident will not be liable for civil damages from such action if he acts as a reasonably prudent man would have acted under the same circumstances.

When giving first aid, proceed slowly. More damage may be done by the well-meaning amateur than was caused by the actual injury. Remember, there are only three instances when speed in giving first aid is required:

1. When the victim has stopped breathing and has no pulse.
2. When there is arterial bleeding.
3. When the victim has been subjected to other injuries that may be life threatening.

The measures required in these instances are taught in standard first aid courses. An NOI is to be completed and submitted, as appropriate. If the incident results in the sinking of the vessel, or damage to the vessel, a Coast Guard report and NOI is to be submitted as soon as possible.

ATTACHMENT A
PRE-BOAT TRIP INSPECTION CHECKLIST

Boat Pre-trip Inspection Checklist

Date:
Name of inspector:
Type of vessel:
Type of engine(s):
Rated boat weight capacity:
Captain of the boat:
List of personnel who will be part of the trip:

BASICS			
Is there a fire extinguisher on board (Type ABC)?	☐ YES	☐ NO*	
Is the fire extinguisher inspected?	☐ YES Date of inspection ___/___/_____	☐ NO*	☐ Not Applicable
Are lifejackets available for each person on board?	☐ YES Specify Type: _____	☐ NO*	
Has the first aid kit been inspected?	☐ YES Date of inspection ___/___/_____	☐ NO	
Is the first aid kit in a waterproof container?	☐ YES	☐ NO	
Indicate the emergency signaling devices on board (e.g., flares, mirrors, flags, etc.).	List:		
What electronics/navigational devices are you planning to use (e.g., radar, GPS, depth finder, compass, communications [e.g., 2-way radio, _____, marine radio, etc.], etc.)?	List:		
What body of water will the boat be operating in?	☐ river ☐ stream ☐ lake ☐ ocean ☐ pond	Name: _____ Location: _____	
Are there any special conditions present (barge traffic, dam, adverse weather, operation near shipping lanes, near sand bars, etc…)	☐ YES	☐ NO	List:

BOAT			
Is the boat registration inspection updated for the current year?	☐ YES	☐ NO*	
Are the fuel levels adequate?	☐ YES Fuel levels_____	☐ NO*	
Are bail plugs (upper and lower) present on boat?	☐ YES	☐ NO*	
Is the motor size adequate for the boat (see boat specifications)?	☐ YES	☐ NO*	
Are there holes or cracks in the hull?	☐ YES*	☐ NO	
Is the bilge pump operational?	☐ YES	☐ NO*	
Do all engine(s) operate properly?	☐ YES	☐ NO*	
Are spare fuses available on board? (if req'd)	☐ YES	☐ NO	
Does the boat need to have an anchor?	☐ YES	☐ NO	
Is an anchor present?	☐ YES	☐ NO	
Is there enough rope on the anchor for the location, depth, and scope?	☐ YES Length of rope_____	☐ NO	
If operating at night, are the navigational lights working?	☐ YES	☐ NO*	☐ Not Applicable
If operating at night, does the pilot, helmsman, or captain have prior experience operating in such conditions?	☐ YES	☐ NO*	
Overall, is the vessel sea-worthy? (If possible this determination should be made by Coast Guard personnel, prior to the trip.)	☐ YES	☐ NO*	
Will the dead weight (people + equipment) exceed the maximum weight requirements for the boat?	☐ YES*	☐ NO	
TRAILER			
Is trailer in good condition?	☐ YES	☐ NO	☐ Not Applicable
Are the trailer lights working properly?	☐ YES	☐ NO	
Is the winch operating properly?	☐ YES	☐ NO	
Is the winch strap in good condition?	☐ YES	☐ NO	
Are the trailer rollers cracked?	☐ YES	☐ NO	
Are the trailer boat guides straight and in good condition?	☐ YES	☐ NO	
Do the tires have appropriate air pressure?	☐ YES	☐ NO	
Are the tires in good condition?	☐ YES	☐ NO	
Are the engines secured to or removed from the transom during transportation?	☐ YES	☐ NO	

SUPPLEMENTAL INFORMATION			
WEATHER FORECAST			
How will the pilot, helmsman, or captain and crew keep track of changing weather conditions?			
Will someone onshore track weather conditions also?	☐ YES	☐ NO	
How will that person remain in contact with the boat?			
For a small boat (under 21'), are the waves equal or greater than 2 feet (1' wave)?	☐ YES*	☐ NO	☐ Not Applicable
For a larger boat, are the waves equal or greater to 4 feet (2' wave)?	☐ YES*	☐ NO	☐ Not Applicable
For any boat, is the wind speed equal or greater than 15 knots?	☐ YES*	☐ NO	☐ Not Applicable
OTHER			
Has a float plan been filed with the Project PM?	☐ YES Plan filed with _____	☐ NO	
Is the operator licensed (with the State or with Coast Guard)?	☐ YES	☐ NO*	
Are any members of the crew capable of operating the boat if the pilot, helmsman, or captain is incapacitated?	☐ YES	☐ NO*	
Does the HASP describe the task(s) involved with the operation of boats?	☐ YES	☐ NO*	

*If any answer followed by an asterisk is checked, justify task continuation if a "No" is checked.

I certify that I have inspected all the items on this checklist and that the information is accurate to the best of my knowledge.

Reviewer's Signature: _____ Date: _____

NOTE: Copy of checklist to be placed in Project file.

ATTACHMENT B
HANDLING AND EQUIPMENT DISCUSSION

HANDLING

Before getting underway, have all weight evenly distributed so that the boat will trim properly – level from side to side and slightly down at the stern, never down at the bow. Passengers should be seated toward the centerline of the craft and not hanging over the sides; with not too many forward or aft. If the load is concentrated near the bow or stern, the boat will plow or drag needlessly, reducing the safety margin and increasing fuel consumption. Proper trim is essential to proper performance.

In boarding from a pier, step into the boat as near to the center as possible, keeping body weight low. When boarding from a beach, come in over the bow. Keep lines tight or have someone steady the boat.

Never jump into a boat or step on the gunwale (edge of the hull). Pile gear to be taken aboard on the pier so that it can be easily reached from the center of the boat. Better still, hand it in to someone already aboard. It is the team leader's responsibility to determine that each boat, after loading, is within the maximum allowed load.

Trim the boat as well as possible before getting underway. In smaller craft, it is dangerous for passengers to change places or move while the boat is in motion. If movement becomes essential, slow or stop the boat first, remembering in rough weather to keep enough momentum to retain steerage control and to keep the craft headed into wind and waves. Have the person who must move keep low and near the boat's centerline.

Outboard craft are often operated at relatively high speeds and their stability becomes a matter of safety. Some hulls will run straight ahead quite steadily but have a tendency to heel excessively, or even flip over, when turned sharply. The faster a boat goes, the less keel it requires, and the more important it is to reduce speed before starting a turn. Never turn more sharply than necessary. Normal operation seldom requires a sudden, sharp, high-speed turn. Every outboard operator must carry one or more types of emergency signaling equipment, in good condition and ready for immediate use. If no distress equipment is on board, an outboard boatman in need of help can always signal by slowly and repeatedly raising and lowering his arms outstretched to each side while he stands in the craft (or from a kneeling position if rough water conditions make standing hazardous).

Whenever boating in unfamiliar waters, take advantage of "local knowledge:" watch the operation of boats piloted by skippers who are at home in these waters, and do not hesitate to ask questions about possible hazards.

Many persons who have not handled a small boat have the misconception that one can be maneuvered and stopped as easily as an automobile. This is not the case; however, much can be done with a boat if one takes it slowly and easily. The new boat operator should practice leaving from and returning to the pier, and other maneuvers, until he has developed both skill and confidence. Begin cautiously at first and gradually build up to the procedures of experienced operators.

Always slow down gradually rather than pulling the throttle back quickly. All boats have a stern wave that will catch up with and pass the craft if it comes to an abrupt stop. This can bring water into the boat, especially if it has a low-cut transom with no motor well.

All boating at night will be performed at reduced speeds. Personnel, who become disoriented, or unsure of their position, should stop the boat until they can determine where they are.

Radio contact between crews should be more frequent; crew check-ins at set intervals will be mandatory.

Fire Extinguisher

Every motorboat will have a fire extinguisher suitable for putting out a fire of burning liquids or electrical equipment. Fire extinguishers must show approval by Underwriters' Laboratories, Inc. (UL) or another testing laboratory. For boats less than 26 feet in length, the required extinguisher has to have a rating of B-1.

Small extinguishers usually have very limited fire-fighting capability, and may be inadequate for a fire involving liquid fuel. WESTON recommends that new or replacement fire extinguishers be the dry chemical, of the largest capacity that will fit conveniently in the boat. (A 6-pound dry chemical fire extinguisher with a rating of 2A; 40B is commercially available.)

If WESTON has responsibility for a fueling location, WESTON requires that a special extinguisher be available at that location that is effective on spill fires (a foam-type that forms an aqueous film).

Signaling Devices for Navigation

Boats up to 39.4 feet are required to carry a whistle or horn that can be heard for at least one mile. The device can be operated by mouth, hand, or power. Longer boats have the same requirements except that the whistle or horn must be operated by power.

Preventing Accumulation of Fuel Vapors

Powered ventilation is needed for motorboats with enclosed spaces in which flammable fuel vapors may accumulate, such as engine and fuel tank compartments, in order to prevent explosion and fire. Special ventilation is not required in open boats in which flammable vapors are not likely to accumulate. (If gasoline is spilled in any boat, there will be an accumulation of flammable vapors in the boat until the vapors are removed by exhaust blowers or air circulation.)

Personal Flotation Devices

All boats less than 16 feet in length are required by law to carry at least one approved personal flotation device for each person onboard. Boats of greater length are required to carry at least one approved wearable personal flotation device for each person onboard, plus one throw-able flotation device. Five types of personal flotation devices are approved by the Coast Guard. Four of the types are acceptable for recreational boats and readily available: Types I, II, III, and IV. A Type V work-jacket is not approved for recreational boats. Of the four wearable types of approved flotation devices, only two Types I and II are designed to prevent the drowning of an unconscious person.

A Type I device is the familiar collar-type life jacket. It provides more than 20 pounds of buoyancy and is designed to deep the wearer afloat for extended periods of time in rough water. A Type I device is recommended for maximum protection. Type I devices are required on commercial vessels and on licensed passenger-carrying vessels. (Reflective tape is required on Type I devices on passenger-carrying vessels.)

A Type II device is more comfortable to wear than a Type I device, but has less buoyancy (15.5 pounds) and is less able to turn an unconscious person face upwards.

A Type III personal flotation device is designed to keep a conscious person in a vertical or slightly backward position, but not to turn an unconscious person over from a face downward position (even though it does have some turning ability). Buoyancy provided is 15.5 pounds minimum.

A Type IV personal flotation device is not designed to be worn but to be thrown to a conscious person in the water. Buoyancy provided is 16.5 pounds. One Type IV device is required for each boat 16 feet and over in length. Type IV devices are permitted as the minimum required in canoes, kayaks, and other vessels less than 16 feet in length.

A Type V personal flotation device is a wearable work jacket designed to deep a conscious person in a vertical or slightly backward position, but it is not designed to turn an unconscious person over from a face-downward position. Buoyancy provided is 27 pounds minimum. (Type V devices are not approved for use in recreational boats, and they usually cannot be purchased in stores that sell only recreational boats and equipment.)

WESTON personnel working on a boat are required to use either a Type I or II personal flotation device while underway. For cold weather operations, recommended devices are float coats or exposure suits, both Coast Guard approved. Other types of PFDs may be approved for use based upon location (i.e., ponds, lakes, etc.) and task activities (i.e., sampling, surveying, etc.) under a site-specific HASP and Float Plan.

Visual Distress Signals

Visual distress signals are needed for any boating activity where the need to signal for emergency help may arise. Personnel who are close to another boat can wave their outstretched arms up and down to signal distress. However, at distances farther from shore or other boats, another way may be needed to signal for help. By carrying approved visual distress signals, boaters can assure that they have a noticeable and effective way of attracting attention to secure prompt assistance in case of an emergency.

Since January 1981, visual distress signals have been required for all recreational boats except manually-propelled boats, boats less than 16 feet in length, open sailboats less than 26 feet in length, boats on Western rivers, and boats participating in organized events such as races and regattas.

When a search is underway, the time it takes to locate a boat in difficulty or a person in the water can be reduced by the use of visual distress signals.

There are two types of signaling devices: non-pyrotechnic and pyrotechnic. Each device is approved for day use, for night use, or for both day and night. Visual distress signaling devices must carry the manufacturer's certification that they meet Coast Guard requirements.

Non-pyrotechnic devices include:

- An orange distress flag, 3-feet square with a black square and a black ball. This is accepted as a day signal only.
- An electric distress light, which must automatically flash the international SOS distress signal (three short flashes, three long flashes, and three short flashes) four to six times each minute. This is accepted as a night signal only. (An ordinary flashlight is not acceptable since it must be flashed manually and does not normally produce enough candle power.)

One flag and one electric distress light will meet the requirements for visual distress signals. These are best for small boats because there is less chance for fire and explosion than with pyrotechnic devices.

Pyrotechnic devices that meet the requirements include:

- Hand-held orange smoke distress signals (day use only)
- Floating orange smoke distress signals lasting 5 or 15 minutes (day use)
- Hand-held red flare distress signals (day or night use)

The minimum number of pyrotechnic devices required (because they are single-use devices, with limited burning time) is three for day use and three for night use, or three that can be used effectively either day or night.

Pistol-projected parachute red flare distress signals, which require suitable approved launching devices, can be used in the day or at night. Also approved for day or night use are self-contained rocket-propelled parachute red flares and red aerial pyrotechnic flare signals, which may need approved, suitable launching devices.

Visual distress signals are an important part of a boat's safety and survival gear. They should be in good condition and easily accessible. Pyrotechnic devices must be stored to protect them from water, puncturing and access by children. They must also be handled very carefully to prevent setting fire to the boat.

Pyrotechnic devices that have passed their expiration date (42 months from the date of manufacture) need to be replaced. The expiration date on pyrotechnic devices, if used, should be checked before the boat is launched.

Identification Lights

Every boat is required to be equipped with certain lights if it is on the water at any time after sunset and before sunrise. The purpose of these lights is to identify the boat's location so that collision can be avoided.

Vessels underway after sunset and before sunrise are required to display at least three lights: a green light and a red running light, each visible for one mile, and a white anchor light visible for two miles. (Details of location and visibility distance may vary, depending on the area in which the boat will be operating.)

The green light must be visible only from directly ahead of a boat and on the right or starboard side of the boat through an arc of 112½ degrees, or only as far back as an angle of 22½ degrees to the rear of a right angle from the centerline of the boat. In the corresponding sector on the left side of a vessel, from dead ahead to 2 points aft of the port beam, the vessel must display a red light.

Each vessel must display a white anchor light that can be seen from all directions. Two white lights are required for vessels operating in international waters, and two lights may be used by vessels in other waters. One white light must be visible through the combined arcs of the red and green lights and be mounted 1 meter (3.3 feet) higher than they are. The second white light must be visible from the rear of the boat, through the arc that is not covered by the front white light.

Under the rules governing all United States waters (except the Great Lakes until March 1983), motorboats from 26 feet up to 65 feet in length must have an additional white light in the forepart of

the vessel that is visible for a distance of 2 miles through the same arc of visibility as the red and green lights (20 points).

The nautical jargon for the 112½ degree arc of visibility for the starboard green light is: "Visible from dead ahead to 2 points abaft the starboard beam." In nautical terminology, a circle of 360 degrees has 32 points, corresponding to the points of the compass, and each point equals 11¼ degrees of the circle. Another way of describing the arc of visibility would be to say that on a boat heading north, the green light would have to be seen by boats approaching from any direction between north and east-south-east.

The particular arc of 112½ degrees, or 10 points, represents the "Danger Zone" for the boat, the directions in which the boat must yield the right of way to other vessels. Any vessel that can see the green light on the boat can "Go," because it has the right of way.

In that sector of approach, you are in the Give Way vessel (or Burdened vessel). The other vessel is the Stand On vessel (or Privileged Vessel).

Personnel who expect to be out in a boat after dark in waters where large vessels, tugboats, or working boats may be encountered, need to learn exactly what lighting such vessels will display in order to avoid dangerous situations.

Additional Equipment Recommended

In addition to required equipment, other equipment is recommended for safe boating operations, including an up-to-date chart of the area of operations, a compass for open waters, paddles or oars, a boat hook, and a bailing bucket or bilge pump.

The Coast Guard Auxiliary recommends that each boat carry a first aid kit, emergency water and food, an anchor and rope, a radio for monitoring weather information, and a radiotelephone for emergencies.

The Coast Guard Auxiliary also recommends that spare parts and tools be carried in case of engine trouble or an emergency. For outboard motorboats this includes:

- spare spark plugs
- starter cord
- shear pins
- cotter pins
- a propeller

For inboard motorboats, spare equipment includes:

- bilge pump
- carburetor drip pan
- backfire arrestor
- spark plugs
- coil
- fuel pump
- fuel filter element and gasket
- points and condenser
- propeller

- distributor or parts
- generator and starter brushes
- fuses
- V-belts
- spare oil

The anchor should be selected for the type of bottom where it will be used and be capable of holding the boat against wind and current. Since anchors hold better against a horizontal pull, a 3-foot length of chain is recommended to hold the top of the anchor down. The length of anchor rope should be seven times as the deep as the water.

Personal Gear

Personal gear should include appropriate footwear, clothing to provide protection from extremes of heat and cold, extra dry clothing, medication for motion sickness, if needed, and a water-resistant outer garment. If water temperatures below 60□F or 16□C are expected, wearing a float coat, wet suit, or exposure coveralls is recommended.

Sampling Apparatus and Equipment

Sampling apparatus and equipment should be weighed and the weight marked on an outside surface for convenience in balancing the load in a boat. It will also make it easier to calculate the total load being placed in a boat and to avoid overloading. In figuring the load on the boat, remember to add the estimated weight of samples to be gathered on the trip.

Preparation for Emergencies

Preparation for emergencies should include making sure that everyone in the boat can put on his or her personal flotation device quickly and correctly, and that everyone knows to stay with the boat if it should capsize. Preparation should also be made for any other emergency procedures. (If the passengers on the boat include non-swimmers, they should wear personal flotation devices when there is any likelihood that they may fall into the water.) A site-specific H&S meeting should be given immediately prior to conducting boat operations.

One of the Coast Guard requirements for personal flotation devices that are not worn is that they be readily accessible. They must not be in a locker or be obstructed by other gear.

Field personnel should plan how to conduct scheduled sampling activities with minimum disturbance of the balance of the boat or risk of capsizing or falling out of the boat. Planning should include any special precautions that may be needed (such as using a safety line on a piece of apparatus or on a person using sampling equipment).

In order to prevent capsizing or swamping, a boat must not be overloaded. The total load of passengers, motor, sampling apparatus and other gear should not exceed the weight limit stated on the capacity plate on the boat. It may be prudent to reduce the load in the boat if inclement weather, turbulent water conditions, or vigorous sampling activities are anticipated.

Getting Into and Loading a Boat

Getting into and loading a boat at a dock takes a little care and practice, because it is different from simply stepping down to another level. If you board a boat the wrong way, it may move away from the dock or it may tip precariously. Be sure that the boat is secured to the dock, then grasp one or both

sides of the boat and step into the center of the boat. Stepping into the center of the boat, or as near the centerline as possible, reduces the chance of tipping the boat and losing your balance.

Loading gear into a boat also takes care and practice. Incorrect loading may cause the boat to tip and the gear may fall into the boat or the water.

It is always preferable to load a boat with another person. One person stands with both feet on the dock, passing the gear over and down to another person standing in the center of the boat.

Sampling apparatus, equipment and containers must be loaded into a boat in a safe manner so there is no damage or spill. In the boat, the load should be stashed equally on both sides fore and aft (front and back) with the weight distributed as evenly as possible.

All sampling gear, particularly any that is heavy, should be tied down or secured to keep it from moving around when the boat gets underway, turns, vibrates, or reacts to rough waters.

Although sampling activities may require standing up or leaning over the side of the boat, such actions should be done carefully and under controlled conditions, when the boat is not moving. When the boat is moving, personnel should sit on the seats provided. No one should ride on the bow or gunwales (sides) of the boat.

Personal flotation devices should be worn whenever there is a higher than normal risk of falling out of a boat, such as when the boat is moving at high speed or in rough water. (In some boating activities the safe practice would be to wear a personal flotation device at all times.)

ATTACHMENT C
WEIGHT CAPACITY CALCULATION

WEIGHT CARRYING CAPACITY

One of the most important safety requirements is to limit the weight of the total load on a boat to the rated capacity of the boat. Most boats built since 1972 have been required to display their load capacity on a plate mounted in the boat.

Capacity Considerations

a.	Listed capacity of vessel:	_____	Certified Capacity of the Vessel in Pounds
b.	# of People & Weight:	_____	Approximate Weight of Personnel in Pounds
c.	Weight of Motor:	_____	Listed Weight of Motor in Pounds
d.	Weight of Gear:	_____	List Equipment and Weight
…….	Fuel (Gallons/Pounds)…….	_____	……. _____
…….		_____	……. _____
…….		_____	……. _____
…….		_____	……. _____
…….		_____	……. _____
e.	**Total Weight of Gear/Equip:**	**_____**	Add items (c + d)
e.	Number/Volume of water samples:	_____	List the number and Volume of Water Samples (in Gallons) to be collected
f.	Weight of Water Samples:	_____	Multiply (# of Samples x Volume in Gallons x 8.33 lbs/gallon)
g.	Weight of Other Samples:	_____	Estimate the number and weight of other samples
h.	**Total Weight of Samples:**	**_____**	Add items (f + g)
i.	**Weight of Personnel & Equip:**	**_____**	**Add items (b + e + h)**
j.	**Capacity Factor:**	**_____**	**Insert a Capacity Reduction for Rough Weather**
k.	**Planned Weight:**	**_____**	**Add (i +j)**

If The Planned Weight in (k) is greater than the Certified Weight in (a), then the weight shall be adjusted be limiting equipment, personnel or samples as necessary to reduce the weight in the vessel.

In the combination capacity plate and certificate of compliance for an outboard motorboat, the first entry lists the manufacturer's rating of the maximum horsepower engine that is safe to use on the boat. The second entry lists the maximum number and weight of persons that can be carried and the third entry lists the maximum weight that can safely be carried by the boat (including persons, motor, and gear). Some boats may have two plates: a certificate of compliance and a separate capacity plate.

In order to avoid exceeding the load carrying capacity of a boat, it is necessary to know the number and total weight of all passengers and the weight of all the equipment and gear planned to be taken on board, including fuel, food, and environmental sampling apparatus. To this total weight must be added the estimated weight of the water or other samples to be collected and brought on board.

The recommended maximum weight shown on the capacity plate may be more than can be carried safely under some weather conditions and for some activities. For example, if rough water is expected, less weight should be carried so that the boat rides higher in the water and is less likely to be swamped by waves.

ATTACHMENT D
BOATING OPERATION UNDER ROUTINE AND EMERGENCY CONDITIONS

OPERATION OF THE VESSEL UNDER ROUTINE AND EMERGENCY CONDITIONS

Boating Operations

Operation of a boat used for WESTON field activities may be so routine that everyone knows how to operate the boat and is thoroughly qualified to operate it under all conditions. If that is not the case, the person in charge of the boat should familiarize a second person on board with the operation and navigation of the boat. Doing so ensures a backup person who can run the boat and get it back to port if the pilot becomes disabled.

Weather Conditions

Before leaving the dock, check the local weather forecast for the area and look for weather signals that may be displayed at marinas, municipal piers, lighthouses, or Coast Guard stations.

The U.S. Weather Bureau publishes charts giving the locations and telephone numbers of all Weather Bureau offices and the location and time schedule of all stations that broadcast marine weather information. The charts also show the location of all storm warning display stations. Charts for local areas can be obtained from the Government Printing Office.

A small craft warning indicates winds up to 38 miles per hour, or 33 knots, and /or sea conditions considered dangerous for small craft such as the ones used commonly in WESTON activities. The daytime signal is one triangular red pennant. Although most display sites do not post night signals, the night signal for a small craft warning is one red light displayed above one white light.

A gale warning, with winds within the range of 34 to 47 knots, or 39 to 54 miles per hour, is signaled by two triangular red flags.

A storm, which may have winds of 48 to 63 knots, or 55 miles per hour up to 73 miles per hour, is forecast when a single square red flag with a black center is displayed.

Two square red flags with black centers are displayed only to show the forecast of a hurricane or tropical cyclone, in which winds speeds of more than 74 knots can be expected.

In addition to getting weather information before beginning a boat trip, it is a good idea to keep track of weather conditions as they develop while the boating activity is underway. Pay attention to increases in wind speed or waves, changes in wind direction, or approach of storm clouds, listen for static on an AM radio, or monitor a weather radio.

Rules of the Road

Every person operating a boat is legally responsible for any damage the boat or its waste may cause. For example, creating an unnecessarily large wake can cause problems in a crowded anchorage or other area, and the boat operator may be held responsible for any damage caused by such a wake.

The person in command of a boat is required to have knowledge of the requirements for operation and navigation of the boat, and of the regulations that apply locally, including the mandatory rules of the road.

The rules of the road that must be followed by everyone operating a boat govern three major subjects: identification lights, rules for steering and signaling course, and signals in fog. The major emphasis in this section will be on rules for steering and signaling course.

Rules for steering and for signaling course are designed to prevent collision by defining which of two approaching vessels has the right-of-way, and what signals are used to quickly signal intent and agreement or disagreement.

The vessel that has the right-of-way is the privileged vessel, now referred to as the Stand On vessel. The Stand On vessel has a right to maintain its course and speed. It also has a duty to maintain its course and speed so that the other vessel can base its actions on known conditions. If a collision becomes imminent, the Stand On vessel no longer has the right-of-way or any privilege.

The vessel that does not have the right-of-way is the Give Way vessel, previously referred to as the "burdened" vessel. When this vessel approaches another closely enough so that collision is possible if both vessels continue, the Give Way vessel must slow, turn or take other positive action to avoid collision.

The steering rules for power vessels apply when two are in sight of each other and close enough so that a collision could occur if both vessels continue on the same course at the same speed.

When two vessels are meeting, crossing, or overtaking, which vessel has the right-of-way? What signals are used to communicate? The following discussion presents three different situations, recommended actions, and recommended signals.

Meeting Situation

When two vessels are approaching head, on or nearly so, in a meeting situation, neither has the right-of-way. If their courses are likely to result in a collision, both must alter their course to the starboard (right) so that each can pass safely to the port (left) of the other.

As a confirmation of its intention to take a particular course, a vessel will give a "course indicating signal" of one or two short blasts on a whistle or horn. In United States waters, the other vessel will signal its understanding and agreement by answering with the same signal, and its lack of understanding or agreement by sounding the danger signal, four short blasts. (In international waters no response is required, and the danger signal is five short blasts.)

One blast in a meeting situation signals intention to alter course to the starboard and to pass the other vessel port to port. Two blasts in the same situation signals intention to alter course to the port and to pass starboard to starboard.

Crossing Situation

When two vessels are approaching at an angle in a crossing situation, the vessel on the right has the right-of-way. As described earlier, your vessel must "give way" or yield the right-of-way to any vessel approaching from any direction on your right between dead ahead to two compass points abaft your starboard beam (the arc of 112½ degrees in which your vessel shows the green light at night). The Give Way vessel must slow or alter course to avoid collision, while the Stand On vessel maintains her course and speed. The U.S. signals are one short blast by the Stand On vessel to indicate intention to maintain course and speed, and an answering blast from the Give Way vessel to
indicate that she has heard and understood the signal the signal and will keep clear. If there is any doubt, the danger signal of four blasts should be sounded and both vessels must stop. Then the vessels must exchange signals until there is an agreement on the courses to be taken.

If you see the red light of a vessel which is crossing your course at night, that vessel has the right-of-way and your vessel must keep clear.

Overtaking Situation

If one vessel is overtaking another, the overtaking vessel is burdened and must be ready to give way until the overtaken vessel has been passed safely.

If the overtaking vessel wishes to pass to the starboard side of the other vessel (altering course to the starboard), the overtaking (Give Way) vessel gives one short signal on the whistle or horn. If she wishes to pass to the port side the overtaking vessel gives two short signals. The Stand On, or privileged, vessel (the one being overtaken) must either indicate agreement by repeating the signal given or disagreement by giving the danger signal.

If you see the white light of another vessel at night, but cannot see either the red or green lights, you are approaching the vessel from the rear and must follow the rules for overtaking another vessel.

Special Situation

In a narrow channel, keep to the right side of the channel if possible, and when nearing a bend where another vessel might not be seen, signal with a prolonged whistle blast of 4 to 6 seconds.

Large deep-draft ships, which may not be able to maneuver or stop easily, have the right-of-way in such situations.

Generally, right-of way must be given to fishing vessels, sailing vessels, and very large vessels.

Fog Signals

In orders to avoid collisions in fog or other conditions of poor visibility, the rules of the road require all vessels to sound fog, mist, falling snow or heavy rain, by day or by night.

A power vessel underway must should signal one prolonged blast on the whistle at least every minute. A vessel at anchor (outside of a specified anchorage area) must ring its bell or sound its horn or whistle rapidly for 5 seconds at a time and at least one time each minute.

Towing vessels underway must sound a series of three blasts in succession every minute, in a series consisting of one prolonged and two short blasts.

Navigation Aids

On the navigable waters of the United States a system of aids to navigation exist that boaters should be familiar with: buoys, markers and lights.

These navigation aids are provided to mark channels and obstructions for the convenience and safety of vessels, to provide direction, and to give information on exact position.

The basic system provides black rectangular buoys or markers with odd numbers on one side of the channel, and red triangular buoys or markers with even numbers on the other side. On rivers, the black rectangular shapes and odd numbers will be on the left or port side of the boat if it is traveling up the flow of the river.

When returning from the sea, going upstream, the red triangular shapes and the even numbers will be on the right or starboard side of the boat: "red right returning.". Conversely, if the red buoys are on the opposite side, the boat is traveling downriver and heading toward the sea.

In the Great Lakes, going westerly, or to the source of one of the lakes, corresponds to going upstream from the sea. When traveling in that direction, the black rectangular and odd will be on the port side (left), and the red triangular and even will be on the starboard side.

On the Intracoastal Waterway, "upstream" or "returning from the sea" is marked from New Jersey going south to the southernmost tip of Florida, and west to Texas. On the Pacific Coast, "upstream" is marked in the direction of travel from California to Alaska. Another way of viewing the system is that travel "clockwise" corresponds to "upstream."

Buoys and markers on the Intracoastal Waterway are marked with a yellow band, stripe, square or triangle. For example, a yellow band near the top of a black can buoy identifies it as being on the Intracoastal Waterway, as does a yellow square on a lighted black marker.

Regulatory markers may provide information or give warning, such as a boat speed restrictions.

In waters too deep for other types of navigation aides, Texas Tower structures and lightships provide warning and guidance to ships. Most of the lightships have been replaced by the Texas Towers.

Large navigational buoys have primary and standby generators for operation of a high-intensity light, a radio beacon and a fog signal. These 40-foot diameter buoys are replacing lighthouses at major harbor entrances. (They have meteorological monitoring apparatus for air and water temperature, wind speed and direction, and other data.)

Some buoys have an automated light, a fog horn, and a marine radio beacon.

Boat Handling

Even in calm water a boat does not handle like any land vehicle. It turns differently, starts differently, and stops differently. The Corporate Health and Safety Department recommends personnel take one of the boating skills courses offered by the Coast Guard Auxiliary and practice handling a boat under calm conditions.

Even personnel who have operated a boat may not have had training or experience in the type of boat used to perform work for WESTON, handling a boat under conditions where there is heavy traffic, narrow channels, and swift current or stormy weather. Training is recommended before difficult conditions arise. For example, the Boating Skills and Seamanship textbook and courses cover topics such as towing a disabled boat, operating on a river and going through locks, special hazards of dams, and navigating safely through waves that could capsize a vessel.

Boating Emergencies

Boating personnel need to understand two aspects of distress signals: when to use them and how to respond when others use them. If a boat capsizes, loses power in high winds or heavy seas, or collides with a fixed object or another boat, emergency help will be needed. If such an event occurs, or if a member of the team has a major medical emergency, call for help by any means available: horn, whistle, radio, or visual distress signals.

If a radio is onboard, should send a “Mayday” distress message on either VHF Channel 16 or 2182 kilohertz, following the recommended format. A Mayday message must include the following information:

1. Boat and call letters
2. Location
3. The nature of distress
4. The number of persons aboard and conditions of any injured
5. Estimated seaworthiness of the boat
6. Detailed description of the boat
7. Anything else that may help rescuers locate the boat

If the distressed boat is close enough to shore or other vessels for someone to see it, use the short-range distress signal or arm waving, as well as an orange smoke signal. (Do not stand up unless the water is calm.)

If no other vessel or source of assistance is close by, hoist a distress flag if one is onboard and can be seen, or if it is dark, use an electric distress light.

If only pyrotechnic distress signals are onboard, prepare to use them when someone is in a position to see them. In general, wait until another boat or an aircraft can be seen or heard, or it is reasonably sure that someone on shore is in position to see the signal. Use caution when using pyrotechnic devices not to set fire to the boat or its cargo.

If the boat capsizes, “ STAY WITH THE BOAT" Get into it if possible. Water conducts heat away from the body rapidly, and in 50 degree water, survival time may be as little as three hours.

Conserving body heat is important to extend survival time. To conserve body heat:

1. Wear the warmest personal flotation device available
2. DO NOT SWIM AWAY FROM THE BOAT
3. Get up out of the water as far as possible

If it is not possible to get out of the water, assume the fetal position to reduce the escape of heat from the body. If there are several persons, huddle with the others, side-by-side in a circle. Do not swim for shore unless there is absolutely no chance of rescue. The boat is easier for rescuers to spot than an individual in the water.

A response to a distress signal should be made by anyone near enough to answer or assist.

Personnel in boats equipped with a radio should notify the nearest Coast Guard station on VHF marine Channel 16, or someone else on CB Channel 9, upon seeing or hearing a distress signal. Personnel in a position to assist without being endangered should do so. (The “Good Samaritan” clause in the Federal Boat Safety Act of 1971 protects from liability anyone who provides or arranges towage, medical treatment, or other assistance as an ordinary, reasonably prudent person would under the same or similar circumstances.)

ATTACHMENT E
BOATING SAFETY REGULATIONS
FEDERAL REQUIREMENTS
FLOAT PLAN

FLOAT PLAN

Compplete this form before going boating and leave it with a reliable person who can be depended upon to notify the Coast Fuard or other rescue organization, should you not return as scheduled. Do not file this plan with the Coast Guard.

1. Person Reporting Overdue

Name: _____ Phone: _____

Address: _____

_____

2. Description of Boat

Registration/Documentation No.: _____

Length: _____ Make: _____ Type: _____

Hull Color: _____ Trim Color: _____

Fuel Capacity: _____ Engine Type: _____ No. of Engines: _____

Distinguishing Features: _____

3. Operator of Boat

Name: _____ Age: _____

Health: _____ Phone: _____

Address:

_____

Operator's Experience: _____

_____

4. Survival Equipment (Check as Appropriate)

☐ # PFDs: _____ ☐ Flares ☐ Mirror

☐ Smoke Signals ☐ Water ☐ Anchor

☐ Raft or Dinghy ☐ EPIRB ☐ **Horn** ☐ **Whistle**

☐ Others _____

_____

5. Marine Radio

☐ Yes ☐ No

Type: _____ Freqs.: _____

6. Trip Expectations

Depart From: _____

Departure Date: _____ Time: _____

Going To: _____

Arrival Date: _____ Time: _____

If Operator has not arrived/returned by: Date: _____ Time: _____

Call the Coast Guard or Local Authority at the following number:

_____

_____

7. Vehicle Description

License No.: _____ Make: _____

Model: _____ Color: _____

Where is vehicle parked? _____

8. Persons on Board

Name	Age	Phone	Medical Conditions

9. Remarks

_____

_____

_____

_____

ATTACHMENT F
GLOSSARY OF BOATING TERMS

A

ABAFT - Toward the rear (stern) of the boat. Behind.
ABEAM - At right angles to the keel of the boat, but not on the boat.
ABOARD - On or within the boat.
ABOVE DECK - On the deck (not over it - see ALOFT).
AFT - Toward the stern of the boat.
AGROUND - Touching or fast to the bottom.
AHEAD - In a forward direction.
AIDS TO NAVIGATION (AtoN) - Artificial objects to supplement natural landmarks to indicate safe and unsafe waters.
ALOFT - Above the deck of the boat.
AMIDSHIPS - In or toward the center of the boat.
ANCHOR - A heavy metal device, fastened to a chain or line, to hold a vessel in position, partly because of its weight, but chiefly because the designed shape digs into the bottom.
ANCHORAGE - A place suitable for anchoring in relation to the wind, seas and bottom.
ASTERN - In back of the boat, opposite of ahead.
ATHWARTSHIPS - At right angles to the centerline of the boat; rowboat seats are generally athwartships.

B

BATTEN DOWN - Secure hatches and loose objects both within the hull and on deck.
BEACON - A lighted or unlighted fixed aid to navigation attached directly to the earth's surface. (Lights and daybeacons both constitute "beacons.")
BEAM - The greatest width of the boat.
BEARING - The direction of an object expressed either as a true bearing as shown on the chart, or as a bearing relative to the heading of the boat.
BELOW - Beneath the deck.
BIGHT - The part of the rope or line, between the end and the standing part, on which a knot is formed. A shallow bay.
BILGE - The interior of the hull below the floor boards.
BITTER END - The last part of a rope or chain. The inboard end of the anchor rode.
BLOCK - A wooden or metal case enclosing one or more pulleys and

having a hook, eye, or strap by which it may be attached.
BOAT - A fairly indefinite term. A waterborne vehicle smaller than a ship. One definition is a small craft carried aboard a ship.
BOAT HOOK - A short shaft with a fitting at one end shaped to facilitate use in putting a line over a piling, recovering an object dropped overboard, or in pushing or fending off.
BOW - The forward part of a boat.
BOW LINE - A docking line leading from the bow.
BOW SPRING LINE - A bow pivot line used in docking and undocking, or to prevent the boat from moving forward or astern while made fast to a pier.
BOWLINE KNOT - A knot used to form a temporary loop in the end of a line.
BOWSPRIT - A spar extending forward from the bow.
BRIDGE - The location from which a vessel is steered and its speed controlled. "Control Station" is really a more appropriate term for small craft.
BULKHEAD - A vertical partition separating compartments.
BUOY - An anchored float used for marking a position on the water or a hazard or a shoal and for mooring.

C

CABIN - A compartment for passengers or crew.
CAPSIZE - To turn over.
CAST OFF - To let go.
CATAMARAN - A twin-hulled boat, with hulls side-by-side.
CHAFING GEAR - Tubing or cloth wrapping used to protect a line from chafing on a rough surface.
CHANNEL - 1. That part of a body of water deep enough for navigation through an area otherwise not suitable. It is usually marked by a single or double line of buoys and sometimes by range markers. 2. The deepest part of a stream, bay, or strait, through which the main current flows. 3. A name given to a large strait, for example, the English Channel.
CHART - A map for use by navigators.
CHINE - The intersection of the bottom and sides of a flat or v-bottomed boat.
CHOCK - A fitting through which anchor or mooring lines are led. Usually U-shaped to reduce chafe.
CLEAT - A fitting to which lines are made fast. The classic cleat to which lines are belayed is approximately anvil-shaped.
CLOVE HITCH - A knot for temporarily fastening a line to a spar or piling.
COAMING - A vertical piece around the edge of a cockpit, hatch, etc. to prevent water on deck from running below.
COCKPIT - An opening in the deck from which the boat is handled.
COIL - To lay a line down in circular turns.
COMPASS - Navigation instrument, either magnetic (showing magnetic north) or gyro (showing true north).
COMPASS CARD - Part of a compass, the card is graduated in degrees, to conform with the magnetic meridian-referenced direction system inscribed with direction which remains constant; the vessel turns, not the card.

COMPASS ROSE - The resulting figure when the complete 360° directional system is developed as a circle with each degree graduated upon it, and with the 000° indicated as True North. True North is also known as true rose. This is printed on nautical charts for determining direction.
CURRENT - The horizontal movement of water.

D

DAYBEACON - A fixed navigation aid structure used in shallow waters upon which is placed one or more daymarks.
DAYMARK - A signboard attached to a daybeacon to convey navigational information presenting one of several standard shapes (square, triangle, rectangle) and colors (red, green, orange, yellow, or black). Daymarks usually have reflective material indicating the shape, but may also be lighted.
DEAD AHEAD - Directly ahead.
DEAD ASTERN - Directly aft or behind.
DEAD RECKONING - A plot of courses steered and distances traveled through the water.
DECK - A permanent covering over a compartment, hull or any part of a ship serving as a floor.
DISPLACEMENT - The weight of water displaced by a floating vessel.
DISPLACEMENT HULL - A type of hull that plows through the water, displacing a weight of water equal to its own weight, even when more power is added.
DOCK - A protected water area in which vessels are moored. The term is often used to denote a pier or a wharf.
DRAFT - The depth of water a boat draws.

E

EASE - To slacken or relieve tension on a line.
EBB TIDE - A receding tide.
EVEN KEEL - When a boat is floating on its designed waterline, it is said to be floating on an even keel.
EYE OF THE WIND - The direction from which the wind is blowing.
EYE SPLICE - A permanent loop spliced in the end of a line.

F

FAST - Said of an object that is secured to another.
FATHOM - Six feet.
FENDER - A cushion, placed between boats, or between a boat and a pier, to prevent damage.
FIGURE EIGHT KNOT - A knot in the form of a figure eight, placed in the end of a line to prevent the line from passing through a grommet or a block.

FLAME ARRESTER - A safety device, such as a metal mesh protector, to prevent an exhaust backfire from causing an explosion; operates by absorbing heat.
FLARE - The outward curve of a vessel's sides near the bow. A distress signal.
FLYING BRIDGE - An added set of controls above the level of the normal control station for better visibility. Usually open, but may have a collapsible top for shade.
FOLLOWING SEA - An overtaking sea that comes from astern.
FORE AND AFT - In a line parallel to the keel.
FORWARD - Toward the bow of the boat.
FOULED - Any piece of equipment that is jammed or entangled, or dirtied.
FOUNDER - hen a vessel fills with water and sinks.
FREEBOARD - The minimum vertical distance from the surface of the water to the gunwale.

G

GAFF - A spar to support the head of a gaff sail.
GALLEY - The kitchen area of a boat.
GANGWAY - The area of a ship's side where people board and disembark.
GEAR - A general term for ropes, blocks, tackle and other equipment.
GIVE-WAY VESSEL - A term, from the Navigational Rules, used to describe the vessel which must yield in meeting, crossing, or overtaking situations.
GRAB RAILS - Hand-hold fittings mounted on cabin tops and sides for personal safety when moving around the boat.
GROUND TACKLE - Anchor, anchor rode (line or chain), and all the shackles and other gear used for attachment.
GUNWALE - The upper edge of a boat's sides.

H

HARBOR - A safe anchorage, protected from most storms; may be natural or man-made, with breakwaters and jetties; a place for docking and loading.
HATCH - An opening in a boat's deck fitted with a watertight cover.
HEAD - A marine toilet. Also the upper corner of a triangular sail.
HEADING - The direction in which a vessel's bow points at any given time.
HEADWAY - The forward motion of a boat. Opposite of sternway.
HEAVE TO - To bring a vessel up in a position where it will maintain little or no headway, usually with the bow into the wind or nearly so.
HEEL - To tip to one side.
HELM - The wheel or tiller controlling the rudder.
HITCH - A knot used to secure a rope to another object or to another rope, or to form a loop or a noose in a rope.
HOLD - A compartment below deck in a large vessel, used solely for

carrying cargo.
HULL - The main body of a vessel.
HYPOTHERMIA - A life-threatening condition in which the body's warming mechanisms fail to maintain normal body temperature and the entire body cools.

I

INBOARD - More toward the center of a vessel; inside; a motor fitted inside the boat.

J

There are no boating terms under this heading.

K

KEDGE - To use an anchor to move a boat by hauling on the anchor rode; a basic anchor type.
KEEL - The centerline of a boat running fore and aft; the backbone of a vessel.
KETCH - A two-masted sailboat with the smaller after mast stepped ahead of the rudder post.
KNOT - A measure of speed equal to one nautical mile (6076 feet) per hour. A fastening made by interweaving rope to form a stopper, to enclose or bind an object, to form a loop or a noose, to tie a small rope to an object, or to tie the ends of two small ropes together.

L

LEEWARD - The direction away from the wind. Opposite of windward.
LEEWAY - The sideways movement of the boat caused by either wind or current.
LINE - Rope and cordage used aboard a vessel.
LOG - A record of courses or operation. Also, a device to measure speed.

LUBBER'S LINE - A mark or permanent line on a compass indicating the direction forward; parallel to the keel when properly installed.

M

MAST - A spar set upright to support rigging and sails.
MONOHULL - A boat with one hull.

MOORING - An arrangement for securing a boat to a mooring buoy or a pier.
MOORING BUOY - A buoy secured to a permanent anchor sunk deeply into the bottom.

N

NAUTICAL MILE - One minute of latitude; approximately 6076 feet - about 1/8 longer than the statute mile of 5280 feet.
NAVIGATION - The art and science of conducting a boat safely from one point to another.

O

OUTBOARD - Toward or beyond the boat's sides. A detachable engine mounted on a boat's stern.
OUTDRIVE - A propulsion system for boats with an inboard engine operating an exterior drive, with drive shaft, gears, and propeller; also called stern-drive and inboard/outboard.
OVERBOARD - Over the side or out of the boat.

P

PAINTER - A line attached to the bow of a boat for use in towing or making fast.
PAY OUT - To ease out a line, or let it run in a controlled manner.
PENNANT (sometimes PENDANT) - The line by which a boat is made fast to a mooring buoy.
PERSONAL FLOTATION DEVICE (PFD) - PDF is official terminology for life jacket. When properly used, the PDF will support a person in the water. Available in several sizes and types.
PIER - A loading/landing platform extending at an angle from the shore.
PILOTING - Navigation by use of visible references, the depth of the water, etc.
PITCH - 1. The alternate rise and fall of the bow of a vessel proceeding through waves; 2. The theoretical distance advanced by a propeller in one revolution; 3. Tar and resin used for caulking between the planks of a wooden vessel.
PITCHPOLING - A small boat being thrown end-over-end in very rough seas.
PLANING HULL - A type of hull shaped to glide easily across the water at high speed.
PORT - The left side of a boat looking forward. A harbor.
PROPELLER - A rotating device, with two or more blades, that acts as a screw in propelling a vessel.

Q

QUARTER - The sides of a boat aft of amidships.
QUARTERING SEA - Sea coming on a boat's quarter.

R

REEF - To reduce the sail area.
RIGGING - The general term for all the lines of a vessel.
RODE - The anchor line and/or chain.
ROLL - The alternating motion of a boat, leaning alternately to port and starboard; the motion of a boat about its fore-and-aft axis.
ROPE - In general, cordage as it is purchased at the store. When it comes aboard a vessel and is put to use, it becomes a line.
RUDDER - A vertical plate or board for steering a boat.
RUNNING LIGHTS - Lights required to be shown on boats underway between sundown and sunup.

S

SCOPE - The ratio of the length of an anchor line, from a vessel's bow to the anchor, to the depth of the water.
SCREW - A boat's propeller.
SEA ANCHOR - Any device used to reduce a boat's drift before the wind.

SECURE - To make fast.
SHACKLE - A "U" shaped connector with a pin or bolt across the open end.
SHEAR PIN - A safety device, used to fasten a propeller to its shaft; it breaks when the propeller hits a solid object, thus preventing further damage.
SHEET BEND - A knot used to join two ropes. Functionally different from a square knot in that it can be used between lines of different diameters.
SHIP - A larger vessel usually used for ocean travel. A vessel able to carry a "boat" on board.
SHOAL - An offshore hazard to navigation at a depth of 16 fathoms (30 meters or 96 feet) or less, composed of unconsolidated material.
SLACK - Not fastened; loose. Also, to loosen.
SLOOP - A single masted vessel with working sails (main and jib) set fore and aft.
SPLICE - To permanently join two ropes by tucking their strands alternately over and under each other.
SPRING LINE - A pivot line used in docking, undocking, or to prevent the boat from moving forward or astern while made fast to a dock.
SQUALL - A sudden, violent wind often accompanied by rain.
SQUARE KNOT - A knot used to join two lines of similar size. Also called a reef knot.
STANDING PART - That part of a line which is made fast. The main

part of a line as distinguished from the bight and the end.
STAND-ON VESSEL - That vessel which continues its course in the same direction at the same speed during a crossing or overtaking situation, unless a collision appears imminent. (Was formerly called "the privileged vessel.")
STARBOARD - The right side of a boat when looking forward.
STERN - The after part (back) of the boat.
STERN LINE - A docking line leading away from the stern.
STOW - To pack or store away; especially, to pack in an orderly, compact manner.
SWAMP - To fill with water, but not settle to the bottom.

T

TACKLE - A combination of blocks and line to increase mechanical advantage.
THWART - A seat or brace running laterally across a boat.
TIDE - The periodic rise and fall of water level in the oceans.
TILLER - A bar or handle for turning a boat's rudder or an outboard motor. **TOPSIDES** - The sides of a vessel between the waterline and the deck; sometimes referring to onto or above the deck.
TRANSOM - The stern cross-section of a square-sterned boat.
TRIM - Fore and aft balance of a boat.
TRIMARAN - A boat with three hulls.
TRIPLINE - A line fast to the crown of an anchor by means of which it can be hauled out when dug too deeply or fouled; a similar line used on a sea anchor to bring it aboard.
TRUE NORTH POLE - The north end of the earth's axis. Also called North Geographic Pole. The direction indicated by 000° (or 360°) on the true compass rose.
TRUE WIND - The actual direction from which the wind is blowing.
TURNBUCKLE - A threaded, adjustable rigging fitting, used for stays, lifelines and sometimes other rigging.

U

UNDERWAY - Vessel in motion, i.e., when not moored, at anchor, or aground.

V

V BOTTOM - A hull with the bottom section in the shape of a "V."
VARIATION - The angular difference between the magnetic meridian and the geographic meridian at a particular location.
VHF RADIO - A very high frequency electronic communications and direction finding system.

W

WAKE - Moving waves, track or path that a boat leaves behind when moving across the waters.
WATERLINE - A line painted on a hull which shows the point to which a boat sinks when it is properly trimmed.
WAY - Movement of a vessel through the water, such as headway, sternway, or leeway.
WHARF - A man-made structure bonding the edge of a dock and built along or at an angle to the shoreline, used for loading, unloading, or tying up vessels.
WINCH - A device used to increase hauling power when raising or trimming sails.
WINDWARD - Toward the direction from which the wind is coming. Opposite of leeward.

X

There are no boating terms under this heading.

Y

YAW - To swing off course, as when due to the impact of a following or quartering sea.
YAWL - A two-masted sailboat with the small mizzen mast stepped abaft the rudder post.

Z

There are no boating terms under this heading.

Revised 4/2002

FLD 19 WORKING OVER OR NEAR WATER

RELATED FLDs

FLD02 – Inclement Weather
FLD05 – Heat Stress Prevention and Monitoring
FLD06 – Cold Stress
FLD18 – Operation and Use of Boats
FLD22 – Heavy Equipment Operation
FLD23 – Cranes, Rigging, and Slings
FLD24 – Aerial Lifts/Manlifts
FLD25– Working at Elevation/Fall Protection

RECOGNITION AND HAZARD ASSESSMENT

Hazards associated with working around water include drowning, frostbite, hypothermia, and/or injury from falling into the water. Heat stress hazards may also be present. Carelessness, horseplay, or other unsafe acts could cause injury to personnel working over or near water. There are also hazards associated with untrained personnel operating equipment. Lack of personal protective equipment (PPE) or misuse of PPE could result in injury or death.

Proper precautions should be taken at all times when personnel are working over or near water. Whenever there is a body of water in close proximity to a work location, the proper safety procedures should be implemented. Requirements for equipment or procedures will be based on an evaluation of work tasks, drowning, and injury potential.

New field team members should be thoroughly indoctrinated in safe work practices pertinent to the work to which they are assigned.

PREVENTION AND PROTECTION PROGRAM

When working over or near water where there is potential for drowning, engineering controls such as installation of guardrails, toeboards, and other PPE such as safety line systems, shall be used to prevent personnel from falling into the water. In addition, flotation devices must be worn and other lifesaving devices must be present. Personal flotation devices (PFDs) should be designed to float unconscious or helpless persons face up.

Safety Nets

Safety nets must be provided when workplaces are more than 25 feet above the ground or water surface, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts is impractical.

- Where safety net protection is required, operations shall not be undertaken until the net is in place and has been tested.
- Nets shall extend 8 feet beyond the edge of the work surface where employees are exposed and shall be installed as close under the work surface as practical, but in no case more than 25 feet below such work surface. Nets shall be hung with sufficient clearance to prevent user's contact with the surfaces or structures below. Such clearances shall be determined by impact load testing.
- It is intended that only one level of nets be required for bridge construction.

- The mesh size of nets shall not exceed 6 inches by 6 inches. All new nets shall meet accepted performance standards of 17,500 foot-pounds minimum impact resistance, as determined and certified by the manufacturer, and shall bear a label of proof test. Edge ropes shall provide a minimum breaking strength of 5,000 pounds.

General Safety Precautions

Work shall be halted when significant wave action exists.

All general safety precautions will be adhered to when working over or near water to prevent accidents caused from careless behavior or horseplay.

Only personnel who are trained in the operation of marine equipment (e.g., boats, barges) will be allowed to operate the equipment.

Ramps for vehicle or personnel access to or between barges shall be of adequate strength, provided with guard rails, well-maintained and properly secured. For personnel access, a safe walkway may be substituted for the ramp. All access routes and passageways shall be kept free of ice, snow, grease, mud, and other obstructions. Nonslip surfaces shall be provided on all working decks, stair treads, ship ladders, platforms, catwalks, and walkways, particularly on the weather side of all doorways opening on deck.

Guardrails, bulwarks, or taut cable guardlines shall be provided for deck openings, elevated surfaces, and similar locations where persons may fall or slip. They shall be at least 42 inches high and have an intermediate rail.

If a Jacob's ladder is used, it will be of the double-rung or flat-tread type. It will be well-maintained and properly secured. The ladder will either hang without slack from its lashings or be pulled up entirely. When the upper end of the access-way rests on or is flush with the top of the bulwark (side of the ship above the upper deck), steps, properly secured and equipped with at least one hand rail approximately 33 inches in height, shall be provided between the top of the bulwark and the deck.

Obstructions will not be laid on or across gangways. The access-way will be adequately illuminated for its full length. All attempts will be made to place the access-way in a position that the load will not pass over personnel.

Any obstruction in a passageway that restricts normal passage shall be posted with warning signs or distinctively marked. Employees shall not be permitted to pass fore and aft, over or around the deck loads unless there is a safe passage. Decks and other working surfaces will be maintained in a safe condition and adequate safe walkways will be maintained for passage around the deck. All deck fittings and other obstructions that present stumbling hazards shall be painted yellow or marked with yellow trim.

Personnel will not walk along the sides of covered barges with coamings (raised frame to keep out water) more than 5 feet high unless there is a 3-foot clear walkway, a grab rail, or a taut handline.

Unless railings or other suitable protection exists, all personnel will use suitable protection against falling and/or drowning.

First-aid supplies should be aboard all lifesaving craft (or readily accessible) and arrangements for ambulance service should be made as location changes.

Personnel should be discouraged from jumping to or from any craft which is not secured, and from jumping between craft when a gangplank should be used.

Fall protection should be provided when working over or near water where there is a potential for falling or slipping into the water.

In areas subject to tidal flow or rising water levels, the Field Safety Officer (FSO) will monitor the water level to ensure that employees will not be trapped between a work area and the water level.

Life Saving Equipment

Equipment and procedures will conform to U.S. Coast Guard (USCG) and/or Occupational Safety and Health Administration (OSHA) requirements and applicable local regulations.

Personnel working over or near water shall be provided with USCG-approved PFDs (life jackets or buoyant work vests), which shall be worn whenever there is potential drowning hazard. PFDs should be designed to float unconscious or helpless persons face up.

Prior to and after each use, PFDs and life preservers shall be inspected for defects which would alter their strength or buoyancy (e.g., rips, tears, holes). All defective units shall be removed from the site and replaced. At no times will defective units be used.

USCG-approved life rings (rope attachment not required) and ring buoys (rope attachment required) should have attached at least 90 feet of 3/8-inch solid braid polypropylene rope or equal. The life rings or ring buoys shall be readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet. One ring buoy or life ring shall be provided on each lifesaving skiff.

Lights conforming to 16 CFR 161.012 will be required whenever there is a potential need for life rings to be used after dark. Lights on life rings are required only in locations where adequate general lighting (e.g., floodlights) is not provided.

In locations where waters are rough or swift, or where manually-operated boats are not practical, a power boat suitable for the waters shall be provided and equipped for lifesaving.

The maximum number of passengers and weight that can safely be transported shall be posted on all launches, motorboats, and skiffs. This number shall not be exceeded and in no case shall the number of passengers (including crew) exceed the number of PFDs aboard. Outboard motors and skiffs shall meet the minimum flotation requirements of the USCG. A certification tag affixed to the hull is satisfactory evidence of compliance. An efficient whistle or signal device shall be provided on all powered vessels to give signals required by the navigation rules applicable to the waters on which the vessel is operated.

Any vessel, except those easily boarded from the water, shall provide at least one portable or permanent ladder of sufficient length to rescue a person overboard.

FLD 22 EARTH MOVING EQUIPMENT/MATERIAL HANDLING EQUIPMENT

REFERENCES

29 CFR Part 1926 Subparts 600-602

RELATED FLDs

FLD 23 – Cranes, Rigging, and Slings
FLD 24 – Aerial Lifts/Manlifts
FLD 34 – Utilities
FLD 35 – Electrical Safety

PROCEDURE

These rules apply to the following types of earthmoving equipment: scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment.

Machinery and Mechanized Equipment Safety

Before any machinery or mechanized equipment is placed in use, it will be inspected and tested by a competent mechanic and certified to be in safe operating condition.

WESTON will designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operating condition. Tests will be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition.

Preventative maintenance procedures recommended by the manufacturer will be followed.

Any machinery or equipment found to be unsafe shall be removed from service and its use prohibited until unsafe conditions have been repaired or corrected.

Inspections or determinations of road conditions and structures will be made in advance to ensure that clearances and load capacities are safe for the passing or placement of any machinery or equipment.

Machinery and mechanized equipment will be operated only by designated personnel. Equipment deficiencies observed at any time that affect safe operation will be corrected before continuing operation.

Seat belts shall be provided on all equipment covered by this section and shall meet the requirements of the Society of Automotive Engineers (J386-1969) and Seat Belts for Construction Equipment. Seat belts for agricultural and light industrial tractors shall meet the seat belt requirements of Society of Automotive Engineers (J333a-1970), Operator Protection for Agricultural and Light Industrial Tractors.

Seat belts shall be worn when provided by the manufacturer. Passengers shall not be allowed to ride on equipment unless equipment is designed with additional seats with safety belts.

Audible alarms. All bi-directional machines, such as rollers, compacters, front-end loaders, bulldozers, and similar equipment, shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in an operative condition.

Getting off or on any equipment while it is in motion is prohibited.

Machinery or equipment requiring an operator will not be permitted to run unattended.

Machinery or equipment will not be operated in a manner that will endanger persons or property, nor will the safe operating speeds or loads be exceeded.

All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done. The only exemption is equipment designed to be serviced or maintained while running.

All repairs on machinery or equipment will be made at a location that will provide protection from traffic or other hazards to maintenance personnel.

Machinery and equipment, or parts thereof, that are suspended or held apart by slings, hoists, or jacks also will be substantially blocked or cribbed before personnel are permitted to work underneath or between them.

Bulldozer and scraper blades, front end-loader buckets, dump bodies, and similar equipment will be either fully lowered or blocked when being repaired or when not in use. All controls will be in a neutral position, with the engines stopped and brakes set, unless work being performed on the machine requires otherwise.

Stationary machinery and equipment will be placed on a firm foundation and secured before being operated.

All points requiring lubrication during operation will have fittings so located or guarded to be accessible without hazardous exposure.

When necessary, all mobile equipment and the operating area will be adequately illuminated while work is in progress.

Mechanized equipment will be shut down prior to and during fueling operations. Closed systems, with automatic shutoff that will prevent spillage if connections are broken, may be used to fuel diesel powered equipment left running.

All towing devices used on any combinations of equipment will be securely mounted and structurally adequate for the weight drawn.

Persons will not be permitted to get between a piece of towing equipment and the item being towed until the towing equipment has come to a complete stop.

All equipment with windshields will be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.

All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, will have lights or reflectors, or barricades equipped with lights or reflectors, to identify the location of the equipment.

Whenever the equipment is parked, the parking brake will be set. Equipment parked on inclines will have the wheels chocked or track mechanism blocked and the parking brake set. Equipment such as lift trucks and stackers will have the rated capacity posted on the vehicle so as to be clearly visible to the operator. When auxiliary removable counterweights are provided by the manufacturer, corresponding alternate rated capacities also will be clearly shown on the vehicle. The ratings will not be exceeded.

Steering or spinner knobs will not be attached to the steering wheel unless the steering mechanism prevents road reactions from causing the steering hand wheel to spin. When permitted, the steering knob will be mounted within the periphery of the wheel.

All industrial trucks in use will meet the requirements of design, construction, stability, inspection, testing, maintenance, and operation, defined in American National Standards Institute (ANSI) B56.1, Safety Standards for Powered Industrial Trucks.

The installation of live booms on material and personnel hoists is prohibited.

The controls of loaders, excavators, or similar equipment with folding booms or lift arms will not be operated from a ground position unless so designed.

Personnel will not work or pass under the buckets or booms of loaders in operation.

Cranes and any other equipment used for lifting must be inspected as required and records of inspection must be maintained.

Drill Rigs

See FLD 56, *Drilling Safety*

FLD 34 UNDERGROUND UTILITIES

REFERENCES

29 CFR 1926.651, *Specific Excavation Requirements*
ANSI Standard Z 535.1, *American National Standard for Safety Color Code*

RELATED FLDs

FLD 42 – Lockout/Tagout

This Field Operation Procedure (FLD) provides requirements for identification, location, and avoidance of underground utilities, appurtenances, and structures during intrusive activities. These requirements are applicable to all Weston Solutions, Inc. (WESTON) operations. The procedures address the requirements and recommendations for identifying and locating, working around, and encountering or contacting underground utilities. The FLD also addresses actions to be taken in response to encountering or contacting underground utilities.

DEFINITIONS

Aggressive Methods

The use of mechanized equipment such as (but not limited to) excavators, backhoes, drill rigs, directional drilling, Geoprobe operations (including all direct push techniques), or road saws.

Buffer Zone

As defined in this procedure, the area around a utility where only non-aggressive excavation methods may be utilized, unless specific conditions are met.

The definition cited above, and the excavation requirements and restrictions associated with it, will vary depending on the particular state regulations. WESTON requires the imposition of a **three-foot** Buffer Zone on all sides of the utility as measured from the outside edges of the utility, both horizontally and vertically. State and/or local buffer zone requirements must be verified by consulting the applicable state regulations in the event buffer zones greater than three feet are required.

The term "Buffer Zone" may be referred to as the "Tolerance Zone", "Safety Zone", or "Approximate Location of Underground Utilities" in some jurisdictions.

Competent Person

A Competent Person has the ability to recognize hazards associated with underground utilities and the authority to stop or direct operations to ensure the safety of personnel and conformance with this procedure. The Competent Person has an understanding of this procedure, and the "One-Call" system requirements for the jurisdiction where excavation is occurring. The Competent Person must be capable of notifying One-Call agencies and maintaining and tracking One-Call Locate Numbers. Additionally, they must have knowledge of methods and work practices for excavation work and the identification, avoidance, and protection of underground utilities.

The designation of a Competent Person will be made by the Site Manager (SM) or Project Manager (PM) and documented in the site-specific Health and Safety Plan (HASP) or attachment to the HASP. Each WESTON Competent Person is required to successfully complete WESTON's internal training program on the use and application of this FLD and possess appropriate and relevant field experience.

The names of Subcontractor Competent Persons will be documented in the Site-Specific *Subcontractor Acknowledgment: Supervisor Personnel, Competence of Personnel, and Task Understanding* form. Subcontractor Competent Persons will be expected to follow this FLD or their company's procedures, whichever is more restrictive.

Damage

Damage may be considered as any undesired impact or unanticipated removal of support from an underground utility as a result of excavation or demolition. Damage may be as simple as minor contact (by any means) resulting in displacement of protective coating. The utility owner must be contacted regarding any damage or question of damage.

De-Energize

As applicable to a utility, to physically eliminate and/or prevent the presence, transmission, flow, or release of energy or materials which may cause harm to personnel or property.

Excavation (Intrusive Activity)

An operation using mechanized equipment for the purpose of movement or removal of earth, rock, or the materials in the ground, including but not limited to: digging, blasting, augering, test boring, drilling, pile driving, directional drilling, grading, plowing-in, hammering (including hammer-drill soil gas sampling tube installation), pulling-in, jacking-in, trenching, tunneling, structural demolition, milling, scraping, tree and root removal (grubbing), and fence or sign post installation. Note that in some States or jurisdictions, excavation may include hand augering or use of other hand tools.

Jurisdiction

The Authority having legal jurisdiction for establishing and/or enforcing regulations and requirements for notification of excavation activities and associated identification and marking of underground utilities. In the United States, the States have jurisdiction, and most consider the regulations applicable when excavation is to be performed in any location, including any public or private way, any company right-of-way or easement, or any public or privately owned land or way. Note: One caveat to remember – Jurisdiction may flow to the "owner" on private or government-owned property because the State One-Call Agencies may not clear utilities on such facilities.

Note that easement boundaries may require differing methods for compliance assurance. Railroads and certain above ground utilities have easements that require specific procedures for excavation (including shoring and shielding of both the utility as well as for the track and/or poles). In these cases it may be required that an inspector or representative of the railroad or utility is present at all phases of the activity.

Locate

To indicate the existence of a utility by establishing a mark through the use of flags, pins, stakes, paint, or some other customary manner, that *approximately* determines the location of a line or facility.

Locate Request

A communication between an entity performing intrusive activities and a utility marking agency (One-Call, etc).

Non-Aggressive Methods

Non-Aggressive methods involve the use of manual methods such as hand digging with shovels or by potholing or daylighting methods.

Observer

The person assigned to visually monitor and, as needed, signal the operator during mechanized intrusive activity when the activity is occurring within three feet of the outside edge of the buffer zone. The observer remains in close communication with the equipment operator(s) and will stop the activity if needed.

One-Call Agency

An entity that administers a system through which a person can notify owners/operators of underground lines or utilities of the intent to perform intrusive activities in proposed public areas. **It is important to note that not all underground utility owners may be required to join the One-Call system. Additionally, some underground utility owners may not comply with State registration requirements.** The SM or Competent Person is responsible to determine additional utilities that may need to be contacted individually.

Positive Response

Verification prior to the intrusive activity, to ensure that all contacted (typically via the One-Call Agency) owner/operators have located and marked the underground utilities. The SM or Competent Person is responsible to determine/verify ownership of the property where the intrusive activity will occur, including any easements.

Potholing or Daylighting

The practice of exposing an underground facility by safe, *non-aggressive* excavation methods in order to determine the precise horizontal and vertical position and orientation of underground lines or utilities. potholing or daylighting are terms used to describe the excavating of buried facilities using an air or water "knife" coupled with vacuum excavation that exposes underground utilizes to the "daylight" – a positive and safe means of identification and confirmation of exact utility location.

Target Rich Environment

Areas where multiple utilities are known or suspected of being located, areas where utility locations are in question and/or difficult to obtain information on, or areas with known or suspect high-risk utilities. **Note: Military Bases (active or inactive) are to be considered "Target Rich Environments".**

Underground Utility

An underground or submerged conductor, pipe, or structure used in transporting or providing electric, communications service, gas, oil or oil product, sewage, storm drainage, water, or other service and appurtenances thereto. As used in this procedure, utility includes all underground appurtenances and structures.

The following are examples of the types of underground utilities that may be present in a given location:

- Natural gas pipelines
- Electric cables

- Water pipelines
- Fiber optic telecommunications lines
- Telephone cable lines
- Steam pipelines
- Gasoline, oil, or other fuels
- Sewer pipelines
- Vents for sewer and gasoline/diesel fueling systems
- Underground Storage Tanks (USTs)
- Abandoned underground structures containing hazardous materials, hazardous wastes, and radioactive materials

Underground Utility Owner

Any person, utility, municipality, authority, political subdivision or other person or entity who owns, operates, or controls the operation of an underground line/facility.

White Lining

The practice whereby the person (in this case WESTON or a Subcontractor) who intends to perform intrusive activities, pre-marks the site with an outline of the area where intrusive activities will occur. This involves the use of white paint, flags, stakes, or a combination thereof to mark the extent of where work is to be performed. The marking may vary depending on what intrusive activities are to be conducted. For example, for general excavation, an areal outline of the excavation shall be marked, while for drilling, the individual boreholes shall be marked. Studies have shown that pre-marking is a practice that does prevent utility contact incidents. Check State or local regulatory requirements to ensure compliance.

RESPONSIBILITIES

Competent Person

The Competent Person shall be responsible for:

- Obtaining a copy of, and understanding the applicable regulations for the state of jurisdiction where the excavation activities are to be performed.
- Contacting the appropriate One-Call Agency or private locating service, as applicable.
- Recording One-Call locate numbers.
- If necessary, renewing One-Call locate numbers before expiration.
- Ensuring that white-lining of the area to be excavated is performed; if another equal or better protective measure is necessary because of the nature of the work, state/local regulation, or client requirements, the HASP should be amended to reflect the change.
- Ensuring that a "positive response" has been received from every utility owner/operator identified by the One-Call Agency (and any non-member utility as necessary) and that they have located their underground utilities and have appropriately marked any potential conflicts with the areas of planned intrusive activities prior to the start of intrusive work.

- Ensuring that appropriate means for supporting and protecting any exposed utility have been discussed with the utility owner and such means are available on-site.
- Ensuring that above-ground utilities and other appurtenances will not create a problem, or be impacted by WESTON activities. In all cases provisions for protection of any utility, structure, or appurtenance must be made.
- Ensuring that provisions for emergency actions and emergency shut-off/mitigation of utilities have been discussed with utility owners and field personnel.
- Ensuring that pictures are taken before, during, and after intrusive activities and placing such pictures in the project file. Pictures should provide visual documentation of actual site conditions, including but not limited to exposed utilities, methods used for bracing utilities and markings placed on the surface by utility locating services. Consideration should also include placing of a known object in the picture field to provide a "scale" for size/distance comparison.
- Completion and maintenance of the Underground Utilities Locating and Marking Checklist (Attachment A) and the Underground Utilities Management Checklist (Attachment B).
- Reviewing applicable Activity Hazard Analyses (AHAs) with all project members before work begins.
- Conducting training on communication protocols to be used by the excavation observer and equipment operator.
- Ensuring implementation of appropriate work practices during intrusive activities (including maintaining the prescribed buffer zone for use of aggressive methods).
- Conducting daily or more frequent (due to changes in conditions) inspections of the excavation area to make sure that all markings are intact.
- Providing the Field Safety Officer (FSO) with all required documentation on a daily basis.

Observer

Whenever intrusive operations with mechanized equipment are being conducted *within three feet of the outside edge of the buffer zone*, horizontally and vertically, an observer must be assigned to monitor the activities. The observer is responsible for:

- Maintaining a safe vantage point relative to digging machinery, excavation edge, and proximity to the hazard posed by the utility.
- Observing the operation to ensure that the operator stops operations if utilities are observed.
- Reviewing hand signals and other forms of communication with the operator. Note: hand signals should be as those identified under ANSI, OSHA, or the Corps of Engineers for Crane Hand Signals, or another, equally effective and understood system.
- Properly signaling the operator.
- Stopping the operation immediately if the observer's attention must be diverted even momentarily.
- Stopping the operation immediately if a hand signal or other directive is not followed. Operations will not resume until the observer and operator mutually agree that the reason(s) for not complying with the directive(s) are/is identified and fully corrected.
- Maintaining required records, such as logbook entries, or other, as requested by line management.

Line Management

The PM or SM shall be responsible for:

- Establishing the site culture with the assistance of the FSO that ensures compliance with this FLD, as well as providing the leadership to "do the right thing" whenever unanticipated circumstances arise.
- Providing the necessary resources, including sufficient schedule for compliance with this FLD.
- Designating a Competent Person or ensuring that a subcontractor Competent Person is designated, prior to the start of work.
- Discussing intrusive activity liability with the Client prior to the start of work. Best practices for identification of underground utilities must be included with the proposal and/or HASP, as well as WESTON's requirement for Client sign-off (if the Client is the property owner or if the Client selects the drilling/intrusive action location) when identifying specific work locations for intrusive activities. In cases where the client, such as EPA, will or cannot sign off on liability or provide indemnification, discussions with the appropriate client representatives on intrusive activities will be documented in the project file.

  Note: In any 'target-rich" work environment, best practices must include the requirement for potholing/daylighting or careful hand-digging – whenever possible (at least 5 feet below grade) – since these are recognized processes for visually verifying the exact location of underground utilities while minimizing the potential for utility damage.
- **For excavations using aggressive methods in target-rich environments**, consideration should be given for establishing an agreement with an Emergency Response Contractor and/or the specific utility owner prior to the start of intrusive activities. This agreement should include specific emergency notification procedures for each utility identified to ensure that timely response can be accomplished in the event of a utility strike.
- Determining/verifying ownership of the property where the intrusive activity will occur, including any easements.
- Contacting all utilities not notified directly by the utility notification center, including those known to local personnel and the property owner.
- Obtaining Profit Center Manager approval for any deviations from this FLD, including best practices, or for addressing any set of circumstances not specifically addressed in this FLD that may place WESTON or its employees at risk.

Environmental, Health, and Safety Personnel

The FSO shall be responsible for:

- Providing oversight on the implementation of the requirements contained in this FLD.
- Consulting with the PM, SM, Competent Person, and the appropriate Division Environmental, Health, and Safety Manager (DEHSM) (or Corporate EHS) on underground utility issues.
- Acting as the Competent Person or Observer as necessary and qualified.

Procedure

The following sections provide the requirements and recommendations, which are intended to prevent injury to personnel, damage to infrastructure, and associated indirect effects associated with encountering

or contacting underground utilities during intrusive work. Underground utilities present multiple potential hazards that must be recognized before and during work which occurs near them, therefore, this procedure is divided into sections addressing underground utility identification and location, working around or near underground utilities, and actions to be taken in the event that underground utilities are encountered or contacted. Hazards that may be presented by underground utilities include explosion and fire, electrocution, toxic exposures, pathogens, and drowning.

Identifying and Locating Underground Utilities

The potential for underground utilities or other subsurface feature (e.g., subsurface mines) must be evaluated as early as possible in the planning phase for any project which involves intrusive activities. The following sections describe various methods for identifying and locating utilities on a site. The *Underground Utilities Locating and Marking Checklist* (Attachment A) and the *Underground Utilities Management Checklist* (Attachment B) must be completed before any activities meeting the definition of excavation are conducted. Attachment A is intended to be used as a guide during the process of locating and marking utilities in the area to be excavated. Attachment B is intended to be used as a guide in the overall process of underground utilities management during the course of the project.

Note: Attachments A and B or their equivalents must be used to document compliance with this FLD and will be subject to audit.

Prior to excavation all underground utilities must be located and identified by at least two of the following:

- The Utility Owner
- The Property Owner
- A Private or Public Utility Locating Service
- Review of the most current utility drawing, maps or other available records by an approved WESTON Competent Person
- Use of utility locating technology by a WESTON Competent Person or subcontractor – this includes the use of potholing or daylighting in a "target-rich" work environment or whenever a full clearance (without restrictions) cannot be obtained from a utility locating service.

As an aid in determining the potential for or existence of utilities follow the criteria outlined in Attachment C (Utilities Research Options).

Pre-Planning and the Site HASP

The site-specific HASP developed for the project must:

- Identify the location and types of underground utilities that are believed to be present on the site.
- Reference this procedure (FLD 34), and describe how it will be implemented on the project.
- Contain an AHA in which the hazards associated with underground utilities are identified, as well as the measures used to control them.
- Contain any site or contract-specific requirements (e.g., Corps of Engineers, EM 385-1-1, Section 25) that may be applicable.
- Contain clear and concise procedures to be followed in the event that contact with underground utilities occurs.

- Address underground utilities and potential associated scenarios in the emergency response section of the HASP.

"One-Call" Locating and Marking Services

Every state has utility marking service programs that have various names such as "One-Call", "Dig-Safe", "Call-Before-You-Dig", "Dig-Safely", and many others. These services will identify the types and locations of any utility that may exist in an area to be excavated, as long as the property is in the public domain.

- The appropriate One-Call service for the jurisdiction where the project is located must be contacted prior to beginning excavation work. The One-Call Agency should be given as detailed a description of the property as possible; address, cross street, utility pole numbers, physical description, etc.
- Notification to the One-Call service shall allow sufficient lead-time for the Agency to mark the utilities before excavation begins. The lead times vary, but range from two to ten days, depending on the state of jurisdiction.
- In the event the State or Local One-Call service number is in question call "811" (the Federal Call before You Dig Number) for access to the appropriate locator service.
- A complete listing of One-Call agencies and telephone numbers for all states is available in the *"Call-Before-You-Dig Call Center Directory"*, which can be accessed on the Internet at the WebPage (http://underspace.com/index.htm) sponsored by *"Underground Focus"* magazine.
- Once notified, the One-Call Agency will provide the contractor with a unique "locate number" or "reference number". This reference number must be kept in the project files by the Competent Person or designee. Additionally, the reference numbers have expiration dates, which may vary depending on the particular One-Call Agency. The valid period of the locate number and required renew notification date shall be requested from the One-Call Agency.
- On a project with multiple contractors, each contractor must request a separate locate number. Under no circumstances will any other contractor or entity be allowed to "work under our locate number". Subcontractors to WESTON may excavate under the locate number secured by WESTON, provided that they are excavating within the area which was previously white-lined by WESTON and subsequently marked. **However, the One-Call Agency must be contacted and notified of this arrangement so that the subcontractor can be recorded as working under the existing locate number.** If a WESTON subcontractor will be excavating in an area not white-lined by WESTON, then the WESTON subcontractor must request a new locate. **Note: State and local requirements must be checked for local application of this procedure.**
- The area where work is to be performed shall be white-lined before the locating service goes to the site.
- It is good practice to arrange a pre-excavation meeting at the project site with the personnel performing the utility location and marking. This meeting will facilitate communications, coordinate the marking with actual excavation, and assure identification of high-priority utilities.
- The One-Call Agency should provide the identities of the utility owners that will be notified of the locate request. This information shall be recorded on the Underground Utilities Locating and Marking Checklist (Appendix A) and maintained in the project files. The contact person and phone number for each utility owner shall also be recorded. ***Note that all utility owners are not members of the One-Call system.*** This does not eliminate the need to contact a non-member owner if you have knowledge or suspect that excavation will impact their utility.

- The utility owners should provide a "positive response" relative to the locate request, which can consist of two types of action by the utility owner. The facility owner or operator is required to 1) mark its underground utilities with stakes, paint, or flags, or 2) notify the excavator that the utility owner/operator has no underground utilities in the area of the excavation.
- The positive responses shall be recorded on the Underground Utilities Locating and Marking Checklist (Attachment A) and crosschecked with the list of utility owners that the One-Call Agency stated they would notify. If it is discovered that a utility owner has not provided a positive response, then the One-Call Agency must be notified.
- Excavation shall not be conducted until positive responses have been received from all utility owners identified by the One-Call Agency as having underground utilities on the property.
- Before beginning excavation, the excavator must verify that the location marked was correct, and the distinct, color-coded markings of all utility owners are present.
- Examine the site to check for any visible signs of underground utilities that have not been located and marked such as pedestals, risers, meters, warning signs, manholes, pull boxes, valve boxes, patched asphalt or concrete pavement, areas of subsidence, fresh sod or grass, lack of grass or vegetation, and new trench lines.
- The markings placed by the utility owners should be documented by WESTON using a still, digital, or video camera, whenever practical and reasonable. The photo-documentation shall be maintained with the project files.
- The markings placed by the utility owners or marking services typically follow the American Public Works Association Uniform Color Code as described in ANSI Standard Z 535.1. This code follows:

American Public Works Association Uniform Color Code

Red		Electric Power Lines, Cables, Conduit
Orange		Communications, Telephone, Cable TV
Yellow		Gas, Oil, Steam, Petroleum or Gaseous Materials
Green		Sewers and Drains
Blue		Potable Water Systems
Purple		Reclaimed Water, Irrigation, Slurry Lines
Pink		Temporary Survey Markings
White		Proposed Excavation

Note: Unless otherwise specified in the utility clearance, such clearance will not be considered valid after 30 days from the date it was issued.

Private Utility Locating and Marking Services

- **One-Call agencies arrange for the identification and marking of underground utilities only on public property, up to the point of contact with private property.** In the event that activities are to be conducted on non-public properties, the presence, location, depth, and orientation of all underground utilities shall be ascertained through records review, including any site plot plans, utility layout plans, and as-built drawings available from the property owner, as well as through interviews with knowledgeable personnel associated with the property (See Attachment C). Additionally, for excavations using aggressive methods in target-rich

environments or other situations where utility locations are in question, the information gathered from these sources shall be verified by physical detection methods (non-aggressive), performance of a geophysical survey, or by procuring the services of a private utility locating and marking service. If any detection methods are to be self-performed, the requirements within this FLD must be followed. **A list of vendors providing this service can be found in the *"Network of Underground Damage Prevention Professionals"* which can be accessed on the Internet at the *"Underspace"* WebPage (http://underspace.com/index.htm).**

Self-Performance of Utility Locating and Marking

The techniques and instruments used to locate and characterize underground utilities can be extremely complicated and difficult to use effectively. Additionally, interpretation of the data generated by this instrumentation can be difficult. The utility marking services, as previously described are staffed by well-trained, experienced professionals who perform locating activities on a regular basis. For these reasons, it is most desirable that these professional services are used for utility location and marking on projects.

- In some instances on private property or in other areas not served by One-Call agencies (e.g., long-term projects where excavation is a primary task, and the presence of underground utilities is extensive) it may be prudent to self-perform locating and marking activities.
- If locating and marking is to be self-performed, all personnel using instrumentation will be trained on the use of the equipment that will be used, and the interpretation of the data.
- There are a variety of locating methods which may be utilized for self-performance of utility locating as categorized below:
  - Magnetic field-based locators or path tracers
  - Buried electronic marker systems (EMS)
  - Ground penetration radar-based buried –structure detectors
  - Acoustics-based plastic pipe locators
  - Active probes, beacons, or sondes for non-metallic pipes
  - Magnetic polyethylene pipe
- Before self-performing any underground utility locating on a project, approval must be obtained from the appropriate WESTON DEHSM or the Corporate EHS Director.

Working Near or Around Underground Utilities

After the site has been properly evaluated for the presence of aboveground utilities, underground utilities, and other appurtenances, intrusive activities may begin. Because there is no perfect way of eliminating the hazards presented by underground utilities, an effort must be made to perform the tasks following the direction and guidance as described by the following best practices that should be implemented during the execution of the project.

Work Site Review

Before beginning intrusive activities, a meeting shall be held between all members of the project team. This shall consist of a review of the marked utility locations with the equipment operators, observers, laborers, etc.

Preservation of Marks

During excavation, efforts must be made to preserve the markings placed by the utility owners until they are no longer required. If any markings are obliterated, the One-Call Agency must be contacted for re-marking. No intrusive activities are to take place if markings are not visible.

Excavation Observer

Whenever intrusive operations are being conducted within three feet of the edge of the buffer zone, an observer must be assigned to monitor the activities. The observer will be designated each day, and a review of hand signals and other forms of communication between the observer and operator will be conducted. The directives of the observer will be followed precisely and immediately by those operating equipment.

Excavation Within The Buffer Zone

Mechanical means of excavation may not be used within 36 inches (see Buffer Zone) of any marked or suspect utility until the utility has been exposed. Mechanical methods may be used, as necessary, for initial penetration and removal of pavement, rock or other materials requiring use of mechanical means of excavation provided a spotter is used. Once the underground utility has been exposed, further excavation must be performed, employing reasonable precautions to avoid damage to the utility, including but not limited to any substantial weakening of structural or lateral support, or penetration or destruction of the utility or its protective coatings. For purposes of this section, "mechanical means of excavation" means excavation using any device or tool powered by an engine except air vacuum or like methods of excavation.

A request to utilize aggressive excavation methods in the buffer zone may be made if:

- There is no other appropriate and reasonable alternative to using aggressive methods in the buffer zone; and
- The utility has been de-energized (and purged if necessary), verified as de-energized, and locked-out; or
- The depth and orientation of the utility has been adequately and visually determined through the use of non-aggressive methods such as air/hydro/vacuum excavation, potholing, probing, hand-digging, or a combination thereof; and
- For utilities containing electrical energy, the depth of the existing water table is below the location of the utility; and
- Request for the exemption has been submitted to the appropriate DEHSM and Profit Center Manger for approval.

The following conditions will apply to this request:

- Aggressive methods may be used in the buffer zone only to the extent allowed by the applicable state or other jurisdictional regulations.
- Appropriate physical protection measures for exposed utilities shall be implemented to eliminate the potential for equipment contact with utilities.
- The extent of the project excavation area to be covered by the exemption request must be specified in the request for exemption.
- When evaluating the use of aggressive excavation methods in the buffer zone, the DEHSM will consider the type of utility involved and the associated risk potential. Based on this evaluation, the Profit Center Manager and/or DEHSM may impose further conditions and requirements. Even if the above exemption conditions are met, the DEHSM has authority to deny the request.

Unless exempted according to the above provisions of this procedure, only non-aggressive methods may be used within the buffer zone. These methods are used in order to prevent mechanical contact with underground utilities, which could result in damage to the utility and create the potential for personal injury and property damage. Following are examples of non-aggressive excavation methods:

- Hand-digging
  - Non-conductive hand tools must be used when digging within the buffer zone surrounding underground electrical utilities.
  - If conductive hand tools must be used near electrical lines, then the FSO and/or DEHSM shall be consulted to determine additional requirements relative to safe electrical practices, procedures, and equipment.
- Hydro-excavation (water pressure).
- Air excavation (air pressure).
- Vacuum extraction (soil excavation/removal).
- Air excavation/vacuum extraction combination.
- Aggressive methods may be used for the removal of pavement over a utility, if allowed by the state regulations.

Protection of Underground Utilities

It is very important that consideration be given to the protection of underground utilities when performing adjacent intrusive activities. This is necessary not only to prevent physical damage and associated indirect effects, but also to prevent the potential for injury to employees and the public.

- When using aggressive excavation methods within the buffer zone around exposed underground utilities, physical protection must be used as required by OSHA in 29 CFR 1926.651. Basically, this involves creation of a physical barrier between the mechanized operation and the utility. The following are some possible types of physical protective measures:
  - Heavy timbers, similar to swamp or crane mats.
  - Sheets of plywood.
  - Blasting mats.
- Once exposed, underground utilities no longer have the support provided by surrounding soil and may need to be physically supported to prevent shifting, bending, separation, or collapse, which could result in damage to the utility, and possibly personnel. Following are suggested support methods:
  - Timber shoring underneath the utility.
  - Timbers or girders over the top of the excavation fitted with hangers that support the utility.
  - Design by a Professional Engineer for complicated or large applications.
- Utilities must also be protected from objects that may fall into the excavation such as rocks and equipment. This can be accomplished by following these guidelines:
  - Cast spoils as far away from the excavation as possible. Excavated and loose materials shall be kept a minimum of two feet from the edge of excavations.
  - Relocate large rocks, cobbles, and boulders away from the excavation and sloped spoils piles.

- When vehicles and machinery are operating adjacent to excavations, warning systems such as soil berms, stop logs or barricades shall be utilized to prevent vehicles from entering the excavation or trench.
- Scaling or barricades shall be used to prevent rock and soils from falling into the excavation.
- Barriers shall be provided to prevent personnel from inadvertently falling into an excavation.

De-Energizing Utilities

Utilities can carry many types of potential energy, including electricity, flowing liquids, liquids under pressure, or gasses under pressure. A release may happen if a utility conveyance is compromised and could result in personal injury, property damage, and other indirect effects. If the white lines of the proposed excavation area overlaps or extends into the buffer zone of a known underground utility, then if at all possible, that utility should be de-energized to physically prevent the transmission, flow, or release of energy. Conversely, if the buffer zone of the known utility lies outside of the white-lined, proposed excavation area, then de-energizing is not required.

- The owner of the utility shall be contacted to determine the feasibility and methodology of de-energizing the utility. Plenty of lead-time should be provided for this since it may take utility companies weeks to de-energize some utilities.
- Depending on the utility and the material being conveyed, isolation points which may be suitable for de-energizing include but are not limited to the following:
  - Electrical circuit breakers
  - Slide gate
  - Disconnect switches
  - Piping flanges
  - Other similar devices
- When utilities are de-energized, it must be verified by demonstration. This can be accomplished by methods such as, testing equipment, switching on a machine or lighting, or opening a valve. For any current-carrying electrical equipment, such as cables or electrical panels, successful de-energizing must be certified through the use of appropriate electrical testing equipment and qualified personnel.
- Whenever a utility is de-energized, a means of ensuring that the energy isolation device and equipment cannot be operated until the device is removed must be provided.
- When de-energizing and locking out of utilities is practiced, the provisions of FLD 42 Lockout/ Tagout shall be followed, as applicable.

Damage Discovery

During excavation, utility damage may be discovered which is pre-existing or otherwise not related to a known contact. Disclosure to the utility owner is very important because the possibility of utility failure or endangerment of the surrounding population increases when damage has occurred. The utility may not immediately fail as a result of damage, but the utility owner or operator must be afforded the opportunity to inspect the utility and make a damage assessment and effect repairs if necessary. The following guidance applies:

- Observe and photograph the utility from a safe distance and determine if there is damage. Damage would be all breaks, leaks, nicks, dents, gouges, grooves, or other damages to utility lines, conduits, coatings, or cathodic protection systems.

- The owner of the affected utility must be contacted immediately.
- The One-Call Agency or private location service must be contacted immediately.
- A Notification of Incident (NOI) Report will be used to document such a discovery.

Encountering Unexpected Underground Utilities

It is possible that underground utilities will be encountered in locations that have previously been "cleared" of having underground utilities by the locating service, or are found outside of the area, which has been marked as having underground utilities. In either case, if this occurs, the following applies:

- Site personnel must be warned and moved to a safe location; equipment engines and ignition sources should be turned off, if possible, as the operator is exiting his/her equipment.
- Intrusive activities must be stopped.
- The owner of the affected utility must be immediately contacted.
- The One-Call Agency or private location service must be contacted immediately.
- The PM, SM, and FSO must be notified.
- No further intrusive activities may be conducted until:
  - The One-Call Agency/private location service and/or the subject utility owner visit the site;
  - Identification of the utility owner and the type of material/energy being conveyed by the utility has been made; and
  - The orientation and depth of the subject utility has been determined and suitably marked.
- A NOI Report must be completed. The report should be accompanied by photographs clearly showing the marking(s), and the actual location, with a distance gauge to document how far off the mark the utility was encountered.

Contacting Underground Utilities

If excavation or other equipment being used for intrusive activities makes contact with an underground utility, the following guidelines apply:

- Site personnel must be warned and moved to a safe location; equipment engines and ignition sources should be turned off, if possible, as the operator is exiting his/her equipment.
- Intrusive activities must be stopped immediately.
- Observe the utility from a safe distance and determine if there is damage. Damage would be all breaks, leaks, nicks, dents, gouges, grooves, scratched coatings, cathodic protection compromise, material leakage, obvious electrical energy.
- Move all personnel to the evacuation meeting point as described in the HASP.

  EXCEPTION: *If an electrical line has been contacted and it is your belief that equipment (such as an excavator) is electrically energized, do not approach the equipment. Order the operator to remain in the equipment until emergency personnel can de-energize the source (unless the equipment is on fire, at which time the operator should jump off of the vehicle and shuffle along the ground to a safe area). Shuffling is required because current flows outward through the soil in a ripple pattern called a power gradient, creating a pattern of high and low potential, Shuffling decreases the chance that these gradients could be bridged, causing current to flow through the body, resulting in electrocution.*

- Secure the area to prevent the public from entering.
- Contact emergency responders as specified in the HASP.
- Immediately contact the One-Call Agency or if known, the utility owner.
- Notify the PM, SM, FSO and DEHSM.
- No further intrusive activities may be conducted until:
  - The utility owner inspects the scene and after repairs, verifies that all danger has passed.
  - The orientation and depth of the subject utility has been determined and suitably marked.
  - Permission from the emergency responders to resume work has been given.
- A WESTON NOI Report must be completed. The report should be accompanied by photographs clearly showing the marking(s), and the actual location, with a distance gauge to document how far off the mark the utility was encountered.
- State and Local regulations must be reviewed to determine if reporting to any additional agencies is required.

ATTACHMENTS

Attachment A – Underground Utilities Locating and Marking Checklist

Attachment B – Underground Utilities Management Checklist

Attachment C – Utilities Research Options

Attachment D – Sources of Information

Informational Addendum 16 June 2010

ATTACHMENT A
UNDERGROUND UTILITIES LOCATING AND MARKING CHECKLIST

Weston Solutions, Inc.

To be Completed by PM and/or "Competent Person"
Complete Form as Location/Marking Progresses and Maintain in Site Files

PROJECT INFORMATION:	**Location:**
Project Name:	Task/Activity:
WESTON Competent Person:	Start Date of Work:
WESTON Subcontractor: ☐ No ☐ Yes:	Private Locating Service Required: ☐ Yes ☐ No
Subcontractor Competent Person:	If Not, Explain:
Property Owner:	
NOTIFICATION:	
Locating Service Name:	Locating Service Tel. Number:
Date Locating Service Notified:	Locate Ticket Number:
Address of Property to be Marked:	Locate Ticket Expiration Date:
Nearest Intersecting Street:	
Are There Any Utilities on the Properties That the Locating Service Will Not Contact? ☐ Yes ☐ No Specify:	

Enter Utility Information in Table 1 Below. In Addition to Utility Locating Services, Consult Client, Utility Owners, Drawings, Facility Personnel, Maintenance Personnel, Municipalities (See Appendix C).

Table 1. On-Site Utility Information

Name of Utility Company	Type of Utility	Color Code	Utility Present On-Site?	Emergency Phone Number	Date Marks Completed
	Electric	RED			
	Communications, Phone, CATV	ORANGE			
	Gas, Oil, Steam, Petroleum	YELLOW			
	Sewers, Drains	GREEN			
	Potable Water	BLUE			
	Reclaimed Water, Irrigation	PURPLE			
	Temporary Survey Markings	PINK			
To be performed by excavator prior to utility mark-out.	Proposed Excavation	WHITE			

White-Lining Completed?

☐ No Explain: _____ ☐ Yes: Date: _____ By Whom? _____

LOCATING AND MARKING:

Have All Utilities Identified in Table 1 Been Marked?

☐ Yes ☐ No (If No, Contact Locating Service for Resolution)

Problem(s) With Markings?

☐ Yes ☐ No ☐ No Marks ☐ Incorrect Location ☐ Too Wide

☐ Other: _____ ☐ Not All Utilities Marked Per Table 1 (notify marking service)

Measurements Taken: ☐ Yes ☐ No

Documentation of Marks: ☐ Photos ☐ Video ☐ Other: _____

EXCAVATION:

Utilities Accurately Marked? ☐ Yes ☐ No

If no, describe: _____

Were Unmarked or Mis-Marked Utilities Encountered? ☐ Yes ☐ No

If Yes, Specify: _____

Locating Service Notified? ☐ Yes ☐ No

Will Excavation Continue Past Locate Number Expiration? ☐ Yes ☐ No

If Yes, Locate Number Renewed? ☐ Yes ☐ No New Expiration Date: _____

Any Other Problems/Concerns? Specify: _____

_____

Form Completed By:	Signature:	Date:

ATTACHMENT B
UNDERGROUND UTILITIES MANAGEMENT CHECKLIST

Weston Solutions, Inc.

To be Completed by PM and/or "Competent Person"

Complete Form as Project Progresses and Maintain in Site Files.

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Pre-Planning	1	Excavation/Best Practices in Work Scope?				
	2	Underground Utilities Identified?				
	3	Competent Person Assigned?				
	4	Has a Copy of the Applicable State Regulations Been Obtained, Read, Understood?				
	5	EHS Plan Addresses Underground Utilities? (AHAs, Contingency Plan, State Regulations Appendix)				
Identifying, Locating and Marking	6	Locating and Marking Checklist Initiated? (Attachment A)				
	7	Identification and Address of Property Determined, Including Nearest Intersection?				
	8	One-Call Agency Contacted?				
	9	Additional Locating and Marking Required on Property? (One-Call agency marks to public property line only)				
	10	Additional Marker/Locator Identified?				
	11	Additional Marker/Locator Qualified?				
	12	Weston Self-Performing Location and Marking?				
	13	If Yes to 12 Above, Approval From Division EHS Manager?				
	14	Area of Excavation "White-Lined" by WESTON?				
	15	WESTON Present When Markings Completed?				
	16	All Utilities Marked? (Refer to Attachment A, Table 1)				
	17	All Markings Photo/Video Documented?				

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Identifying, Locating and Marking – Continued	18	Area Checked for Signs of Previous Excavation? (Subsidence, new grass, patching, etc)				
	19	All Applicable Information Recorded on Attachment A?				
	20	Multiple Contractors Excavating On-Site?				
	21	Separate Locate Requests for All Contractors?				
	22	WESTON Subcontractors Excavating in WESTON White-Lined Area(s)?				
	23	If Yes to 22 Above, One-Call Agency Contacted to Determine if WESTON Subcontractor Can be Added to Existing Locate Ticket?				
Excavation Activities	24	Meeting and Site Walkover Conducted with Project Personnel? (Managers, Equipment Operators, Laborers, Competent Person, Excavation Observer, etc)				
	25	AHA and HASP Review Conducted With Personnel?				
	26	Do Site Activities Have Potential to Obliterate Utility Markings?				
	27	If Yes to 26 Above, Have Provisions Been Made to Preserve Markings?				
	28	Has an Excavation Observer Been Designated to Monitor Excavation When Occurring within 3 Feet of the Buffer Zone?				
	29	Have Operator and Observer Reviewed Commands and Signals?				
	30	Has WESTON-Required Buffer Zone Been Marked on Either Side of Markings Placed by Locator?				

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Excavation Within Buffer Zone	31	Is Excavation Within The Buffer Zone Absolutely Necessary?				
	32	If Yes to 31 Above, Can Non-Aggressive Methods Be Used For Excavation In The Buffer Zone? If Yes, Identify Appropriate Non-Aggressive Methods.				
	33	If No to 32 Above, Has a Buffer Zone Exemption Request Been Approved? If No, then Aggressive Methods May Not Be Used in The Buffer Zone.				
	34	If Yes to 33 Above, Has the Utility Been De-Energized, Purged, Verified/Tested, and Locked-Out? Or, Has The Depth and Orientation of the Utility Been Adequately and Visually Determined Through The Use of Non-Aggressive Methods?				
	35	If Yes to 34 Above, Have All of The Following Conditions Been Met? For Utilities Containing Electrical Energy, Is The Depth of The Water Table Below The Depth of The Utility? Have Regulations Been Consulted to Determine Specific State Requirements Relative to Excavating in The Buffer Zone? Have Appropriate Physical Protection Measures Been Implemented to Prevent Equipment Contact With Utilities and to Prevent Damage to Utilities? If No to Any of The Above Conditions, Then Only Non-Aggressive Excavation Methods May Conducted in The Buffer Zone, Since The Conditions of The Exemption Have Not Been Satisfied.				
Working Around Exposed Utilities	36	If Necessary, Have Provisions Been Made to Support the Utility During Work Activities?				
	37	Have Spoils Been Placed as far Away From the Excavation as Feasible?				

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Working Around Exposed Utilities – Continued	38	Has the Utility Been De-Energized? (If Any Portion of the Buffer Zone around a Utility is Inside of the White-Lined Area)				
	39	Has the Isolation Point for the De-Energized Utility Been Physically Locked-Out?				
	40	If No to 39 Above, Has a Spotter Been Assigned to Monitor Isolation Point?				
	41	If Yes to 40 Above, Does the Spotter Have Adequate Communications? (Radio, Telephone, etc)				
	42	Has the Isolation Point Been Tagged?				
Damage Discovery	43	Has Pre-Existing Damage to a Utility Been Discovered During Excavation?				
	44	If Yes to 43 Above, Has the One-Call Agency and/or Utility Owner Been Notified?				
	45	If Yes to 43 Above, Have Photographs Been taken?				
Encountering or Contacting Underground Utilities	46	Have Utilities Been Encountered in Locations That Have Not Been Marked?				
	47	If Yes to 46 Above, Has the One-Call Agency or Other Locating Service Been Contacted?				
	48	If Yes to 46 Above, Has the PM and Appropriate DSM Been Notified?				
	49	If Yes to 46 Above, Has a WESTON Notification of Incident (NOI) Report Been Completed? (Include Photographs)				
	50	Have Excavation Equipment Come In Contact With Underground utilities?				
	51	If Yes to 50 Above, Were Intrusive Activities Immediately Curtailed?				

PHASE		TASK	YES	NO	NA	COMMENTS Required if Response is No or NA. (Reference Item Number)
Encountering or Contacting Underground Utilities – Continued	52	If Yes to 50 Above, Has a Damage Determination Been Made From a Safe Distance?				
	53	If Yes to 50 Above, Has the Area Been Secured?				
	54	If Yes to 50 Above, Have Emergency Responders Been Notified?				
	55	If Yes to 50 Above, Has the Locating Agency and/or Utility Owner Been Notified?				
	56	If Yes to 50 Above, Have State and Local Reporting Requirements Been Met?				
	57	If Yes to 50 Above, Were Intrusive Activities Curtailed Until Inspection From Utility Owner, Orientation and Depth of Utility Was Determined and Marked, Permission From Emergency Responders Given?				
	58	If Yes to 50 Above, Has a WESTON Notification of Incident (NOI) Report Been Completed? (Include Photographs)				

CHECKLIST COMPLETED BY:

NAME	SIGNATURE	DATE
NAME	SIGNATURE	DATE

ATTACHMENT C
UTILITY RESEARCH OPTIONS

In the course of determining and verifying underground utility location it is expected that a minimum of two resources will be used. As a means of assisting the search for sources, the following is offered.

Records Sources:

- ☐ Utility Section of the State DOT or other Public Agency
- ☐ One-Call Center
- ☐ Public Service Commission or similar organization
- ☐ County Clerks Office
- ☐ Landowner
- ☐ Internet or Computer database
- ☐ Visual Site Inspection
- ☐ Utility Owner

From the Above Collect:

- ☐ Previous construction plans in the area
- ☐ Conduit maps
- ☐ Direct-Buried Cable records
- ☐ Distribution maps
- ☐ Service record maps
- ☐ As-built and record drawings
- ☐ Field notes
- ☐ County, city, utility owner or other geographic information system database
- ☐ Circuit diagrams
- ☐ Oral histories (current or previous employees, residents).

Review Records and Obtain Information For:

- ☐ Indications of additional and/or other available records
- ☐ Duplicate information that lends credibility to data
- ☐ Any additional need for clarifications from owners/others

ATTACHMENT D
SOURCES OF INFORMATION

Organizations

- Common Ground Alliance
  http://www.commongroundalliance.com/wc.dll?cga~toppage
- Center for Subsurface Strategic Action (CSSA)
  http://underspace.com/cs/index.htm
- DigSafely
  http://www.digsafely.com/digsafely/default.asp
- National Utility Contractors Association (NUCA)
  http://www.nuca.com/
- National Utility Locating Contractors Association (NULCA)
  http://underspace.com/nu/index.htm
- Underground Focus Magazine
  http://underspace.com/uf/index.htm
- NUCA State Listing of One-Call centers
  http://www.nuca.com/
- Utility Safety Magazine
  http://www.utilitysafety.com/

Vendors and Commercial Sites

- RadioDetection, Inc. (Detection Instruments)
  http://www.radiodee.com/
- Heath Consultants (Detection Instruments)
  http://www.heathus.com/
- Ben Meadows Company (Detection Instruments)
  http://www.benmeadows.com/cgi-bin/SoftCart.exe/index.html?E+scstore
- So-Deep, Inc. (Complete Utilities Services)
  http://www.sodeep.com/
- Concept Engineering Group, Inc. (Air Excavation Equipment)
  http://www.air-spade.com/index.html
- Rycom Instruments, Inc. (Detection Instruments)
  http://www.rycominstruments.com/

- Schonstedt Instrument Company (Detection Instruments)
  http://www.schonstedt.com/

- Forestry Suppliers, Inc. (Fiberglass Probe – "Fiberglass Tile Probe", Part #77543, Approx. $20.00, Telephone 800-647-5368)
  http://www.forestry-suppliers.com/

REFERENCES

Common Ground Study of One-Call Systems and Damage Prevention Best Practices, August 1999, Sponsored by US DOT.

INFORMATIONAL ADDENDUM
16 JUNE 2010

Overview of Underground Utility Detection Methods

Induction Utility Locators

Induction utility locators operate by locating either a background signal or by locating a signal introduced into the utility line using a transmitter. There are three sources of background signals that can be located. A utility line can act like a radio antenna, transmitting electromagnetic signals that can be picked up with a receiver. AC power lines have a 50HZ signal associated with them. This signal occurs in all active AC power lines regardless of voltage. Utilities in close proximity to AC power lines or used as grounds may also have a 50HZ signal that can be located with a receiver. A signal can be indirectly induced onto a utility line by placing the transmitter above the line. Through a process of trial and error, the exact above position can be determined. A direct induced signal can be generated using an induction clamp. The inductor clamp induces a signal on specific utilities. This is the preferred method of tracing, where possible. By virtue of the closed loop, there is little chance of interference with the resulting signals. When access can be gained to a conduit, a flexible insulated trace wire can be used. The resulting signal loop can be traced. This is very useful for non-metallic conduits. Finally, these signals can be located horizontally on the surface using a receiver. The receiver is moved across the estimated location of the utility line until the highest signal strength is achieved. This is the approximate horizontal location of the utility. The receiver is then rotated until minimal signal strength is achieved. This will give the approximate orientation of the utility. Vertical depth, however, derived from this equipment is subject to gross error.

Magnetic Locators

Ferrous Metal or Magnetic locators operate by indicating the relative amounts of buried ferrous metals. They have limited application to locating and identifying utility lines but can be very useful for locating underground storage tanks (UST's) and buried manhole covers or other subsurface objects with a large ferrous metal content.

Electromagnetic Surveys

Electromagnetic survey equipment is used to locate metallic utilities. This method pulses the ground and records the signal retransmitted back to the unit from subsurface metal. Particularly useful for locating metal pipelines and conduit, this device also can help locate other subsurface objects such as UST’s, buried foundations (that contain structural steel), and pilings and pile caps (that also contain steel).

Ground Penetrating Radar

Ground Penetrating Radar (GPR) is an electromagnetic method that detects interfaces between subsurface materials with differing dielectric constants (a term that describes an electrical parameter of a material). The GPR system consists of an antenna, which houses the transmitter and receiver; and a profiling recorder, which processes the received signal and produces a graphic display of the data. The transmitter radiates repetitive short-duration EM signals into the earth from an antenna moving across the ground surface. Electromagnetic waves are reflected back to the receiver by interfaces between materials with differing dielectric constants. The intensity of the reflected signal is a function of the contrast in the dielectric constant at the interface, the conductivity of the material, which the wave is traveling through, and the frequency of the signal. Subsurface features which may cause such reflections are: 1) natural geologic conditions such as changes in sediment composition, bedding and cementation horizons, voids, and water content; or 2) man-introduced materials or changes to the subsurface such as soil backfill, buried debris, tanks, pipelines, and utilities. The profiling recorder receives the signal from the antennae and produces a continuous cross section of the subsurface interface reflections, referred to as reflectors.

Depth of investigation of the GPR signal is highly site specific, and is limited by signal attenuation (absorption) of the subsurface materials. Signal attenuation is dependent upon the electrical conductivity of the subsurface materials. Signal attenuation is greatest in materials with relatively high electrical conductivity such as clays and brackish groundwater, and lowest in relatively low conductivity materials such as unsaturated sand or rock. Maximum depth of investigation is also dependent on antennae frequency and generally increases with decreasing frequency; however, the ability to identify smaller features is diminished as frequency decreases.

The various GPR antennas used are internally shielded from aboveground interference sources. Accordingly, the GPR signal is minimally affected by nearby aboveground conductive objects such as metal fences, overhead power lines, and vehicles.

A GPR survey is performed by towing an antenna across the ground along predetermined transect lines. The antennae is either pulled by a person or towed behind a vehicle. Preliminary GPR transects are performed over random areas of the site to calibrate the GPR equipment and characterize overall site conditions. The optimum time range settings are selected to provide the best combination of depth of investigation and data resolution for the subsurface conditions at the site. Ideally, the survey is performed along a pre-selected system of perpendicular or parallel transect lines. The configuration of the transect lines is designed based on the geometry and size of the target and the dimensions of the site. The beginning and ending points of the transect lines and grid intersection points, or nodes, are marked on the ground with spray paint or survey flags. A grid system is used to increase the probability of crossing the short axis of a target providing a more definitive signature in the data. The location of the antenna along a transect line is electronically marked on the cross section at each grid intersection point to allow correlation of the data to actual ground locations. The location of the targets can be marked on the ground surface using spray paint or survey flags.

Acoustic Location Methods

Acoustic location methods generally apply to waterlines. A highly sensitive Acoustic Receiver listens for background sounds of water flowing; (at joints, leaks, etc.) or to sounds introduced into the water main using a transducer. This method may have good identification results, but can be inaccurate. Acoustics can also being utilized to determine the location of plastic gas lines.

FLD 44 BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN - FIRST AID PROVIDERS

RELATED FLDs

FLD 43 – Biological Hazards
FLD 45 – Bloodborne Pathogens Exposure Control Plan – Work with Infectious Waste

INTRODUCTION

Bloodborne pathogens are pathogenic microorganisms which may be present in human blood and can cause disease in humans. These pathogens include, but are not limited to hepatitis B virus (HBV) and human immunodeficiency virus (HIV). The Occupational Safety and Health Administration (OSHA) requires compliance with 29 CFR 1910.1030, Occupational Exposure to Bloodborne Pathogens Standard where, as a condition of employment, there is known or potential exposure to bloodborne pathogens. A source of occupational exposure may occur when an employee gives First Aid and CPR to an individual who has infectious blood and the potentially infectious materials come in contact with the employee's eyes, mucous membranes, non-intact skin through cuts and abrasions.

Additional sources of exposure are contact with infectious waste found at hazardous waste sites; glassware, needles, and other sharp objects which have been involved in injuries to personnel resulting in contamination with blood or related bodily fluids; and laboratory personnel who may analyze samples containing infectious waste. FLD 45 provides a separate Bloodborne Pathogens Exposure Control Plan for Work with Infectious Waste.

In July 1992, OSHA issued a final Standard for Protection of Workers Potentially Exposed to Bloodborne Pathogens (29 CFR 1910.1030). This standard primarily involves medical and research personnel and their exposure to blood or blood-containing fluids infected with Bloodborne Pathogens. The HIV and HBV pathogens could potentially be present in viable states at emergency response sites and infectious or hazardous waste sites, with hepatitis virus being the more likely to survive in temperatures outside the body temperature ranges. Another potential for exposure would be from workers who could be infected. The OSHA Standard specifically includes first aid providers among workers covered by this standard.

WESTON's Corporate Environmental, Health, and Safety (CE&HS) Director is responsible for managing this Exposure Control Plan (ECP). WESTON's Division Environmental, Health, and Safety Managers (DEHSMs) will provide technical guidance and assistance in review and implementation.

This ECP is available on the WESTON EHS Portal site.

SCOPE

WESTON personnel do not provide medical assistance as a primary job duty, however, this Bloodborne Pathogen ECP is applicable to designated first aid providers. Weston workers expected to administer first aid must have a basic understanding of bloodborne pathogens in order to protect themselves effectively from any hazards. At a minimum, this Bloodborne Pathogen ECP for First Aid Providers will be on site and implemented for each project.

WESTON personnel may deliver First Aid and CPR in a nonclinical setting. First Aid and CPR duties are often performed in uncontrolled environments, which, due to a lack of time and other factors, do not allow for application of a complex decision-making process to the emergency at hand.

This ECP is intended to assist personnel in making decisions concerning the use of personal protective equipment (PPE) and resuscitation equipment, as well as for decontamination, labeling, containerizing and disposal procedures.

Information Program

Completion of health and safety plans (HASP) requires identification and assessment of risk from exposure to biological hazards. This ECP deals with forms of infection that are of concern to workers who can come in contact with bodily fluids associated with blood.

WESTON training programs will provide information on bloodborne pathogens and the Occupational Exposure to Bloodborne Pathogens Standard to all field personnel with special emphasis on those employees who may be certified and called upon to perform First Aid.

Exposure Control

This ECP is designed to eliminate or minimize employee exposure to bloodborne pathogens through information and training, use of PPE, safe handling procedures, decontamination, and proper disposal methods.

Exposure Determination

Employees certified in First Aid and CPR may be at risk from bloodborne pathogens when these services are rendered. Attachment 1 identifies tasks in which occupational exposure may occur, potential contact, and required protective measures for First Aid providers.

METHODS OF COMPLIANCE

Universal Precautions

When treating a victim for an injury, conducting CPR, or handling potentially infectious waste, the use of universal precautions is the recommended approach to infection control. Universal precautions assume all human blood and certain human body fluids are infectious for HIV, HBV and other bloodborne pathogens. Other body substances, including feces, urine, or vomit are not included, unless they contain visible blood. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

Work Practice Controls

Work practice controls reduce the likelihood of exposure by formalizing the manner in which a task is performed.

- All first aid procedures involving blood or other potentially infectious materials shall be performed in a manner that minimizes splashing, spraying, spattering, and generation of droplets of these substances.
- Mouth suctioning of blood or other infectious materials is prohibited.
- When handling sharps such as needles used for bee stings or diabetes, do not recap, purposely bend, break by hand, remove from disposable syringes, or otherwise manipulate by hand.
- As soon as possible after use, contaminated sharps are to be placed in puncture proof/leak proof containers until they can be disposed.

- Broken glassware which may be contaminated shall not be picked up directly with the hands unless gloves are used to protect the hands against cuts. It is best to use mechanical means, such as a brush and dust pan then place contaminated broken glass in a puncture proof/leak proof container.
- When handling red bag waste, hold the top end of the bag rather than the bottom.
- Containers of potentially infectious waste should be labeled with a biohazard label.
- All PPE should be inspected prior to use. PPE should not be worn if the PPE barrier is compromised.
- Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with blood, other body fluids to which universal precautions apply, or their potentially contaminated articles. Hands should always be washed after gloves are removed even if the gloves appear intact.
- Where hand washing facilities are not readily accessible, an antiseptic hand cleaner along with clean cloth/paper towels or antiseptic towelettes should be used. When antiseptic hand cleaners or towelettes are used hands shall be washed with soap and running water as soon as feasible.

Engineering Controls

Engineering controls isolate or remove the bloodborne pathogen hazard from the workplace.

- Proper containerizing, labeling and disposal of contaminated items are required for all potentially infectious waste.
- Minimizing needle sticks by placing them in a puncture proof container.
- Limiting access or close off areas which contain potentially infectious materials.

Administrative Controls

Administrative controls reduce or eliminate bloodborne pathogen hazards from the workplace by program development (i.e., ECP), auditing to ensure these programs are in place and implemented, and providing information and training.

Personal Protective Equipment (PPE)

PPE is specialized clothing or equipment worn by an employee for protection against a hazard. Attachment 1 provides examples of recommendations for PPE in the nonclinical setting; the list is not intended to be all-inclusive.

First-aid kits will be supplemented with bloodborne pathogen kits or supplies and will be readily accessible at all times. The CEH&S Department maintains a list of the minimum content of bloodborne pathogen PPE kits or supplies. The list is accessible on the EHS Portal Site.

If the chance of being exposed to blood is high, the caregiver should put on protective attire before beginning CPR or First Aid. Protective barriers should be used in accordance with the level of exposure encountered.

Under rare or extraordinary circumstances, a responding employee may decide, based on his or her judgment, that use of PPE would prevent delivery of care or pose an increased hazard to safety of the

employee or co-worker. When this judgment has been made, an investigation of the event will be initiated and documented in order to determine what changes in procedures or protective equipment is needed.

Resuscitation Equipment

No transmission of HBV or HIV infection during mouth to mouth resuscitation has been documented. However, because of the risk of salivary transmission of other infectious diseases and the theoretical risk of HIV and HBV transmission during artificial ventilation of trauma victims, disposable mouth to mouth resuscitation masks (one-way valve type only) should be used. These devices are designed to isolate emergency response personnel from contact with victim's blood and blood-contaminated saliva, respiratory secretions, and vomit. Disposable resuscitation equipment and devices should be disposed of once they have been used.

Decontamination and Disposal

All PPE will be removed prior to leaving a contaminated area and secured properly for decontamination or proper disposal.

Decontamination uses physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal. All spills of blood and blood-contaminated fluids should be promptly cleaned up. The area should be decontaminated with a commercial disinfectant solution or a 1:100 solution of household bleach. Soiled cleaning equipment should be cleaned and decontaminated with the disinfectant solution.

If a victim's clothes become soiled with blood during First Aid or CPR, the soiled material (i.e., clothes, resuscitation equipment or disposable towels) should be placed in a red or orange plastic bag. If possible this bag should accompany the victim to the hospital or ambulance. Where on-site emergency care is given and additional medical treatment is not likely, soiled material should be placed in a red or orange plastic bag and then pick-up should be arranged by a local medical waste disposal company. Containers must be identified prior to transport or pick-up.

Any questions regarding the disposal or management of soiled garments or materials should be directed to CE&HS or the applicable DEHSM.

Containerizing

The potentially contaminated materials and sharps container generated from giving First Aid and CPR will be placed in a red or orange container/bag. When PPE is removed it shall be placed in an appropriate designated area for containerization. If the outside contamination of the primary container occurs, the primary container shall be placed within a second container which prevents leakage during handling processing storage, transport or shipping and is labeled or color coded.

Sharps such as needles used for bee stings or diabetes should be placed in a puncture proof/leak proof color coded or labeled container. If other contents could puncture the primary container, the primary container shall be placed within a secondary container which is puncture resistant. The liquid generated from the decontamination process should be contained in a leak proof container until a local medical waste disposal company can provide information on proper disposal based on local, state and federal regulations.

Labeling and Hazard Communication

Biohazard warning labels required by the Standard [29 CFR 1910.1030(g)(1)(i)(B)] must be attached to containers of regulated wastes or other containers of potentially infectious materials during storage, transport or shipment. Red or orange bags may be substituted for labeling requirements, otherwise, a biohazard label with lettering or symbols should be affixed to the outside of each bag or container generated. Consequently, any container so labeled or any red or orange bagged waste or materials shall be considered to contain either blood or other infectious material.

Incident Reporting

When an employee gives First Aid or CPR, or is potentially exposed to a bloodborne pathogen, a Notification of Incident (NOI) Report must be completed. The report must indicate "Potential Exposure to Bloodborne Pathogens". Additionally, the employee will acknowledge potential exposure to bloodborne pathogen on the Monthly Employee Health and Safety Report.

Vaccination and Post-Exposure Evaluation and Follow-up

The pre-work Hepatitis B Vaccination for First Aid providers is not required, it will therefore, be offered post-exposure.

Hepatitis B vaccines are effective in preventing hepatitis B following a documented exposure when given within 1 week after HBV exposure. The vaccine may be more effective when combined with HBIG, a preparation of immune globulin with high levels of antibody to HBV (anti-HBs). The U.S. Public Health Service and Center for Disease Control guidelines should be accessed for current information.

Upon suspicion or verification of exposure to blood or infectious materials, Hepatitis vaccine will be made available to the exposed individual(s) at no cost to the employee. The employee will immediately be referred to WESTON's Occupational Medical Consultant (OMC) for counseling and management.

In the event the employee declines the Hepatitis B vaccine the Hepatitis B Vaccine Declination form (Attachment 2) must be completed and filed with CE&HS and the OMC.

Upon learning of exposure to a source or source individual found to be positive for HBV or HIV, WESTON's OMC will provide direction on case management. The OMC, after discussion of the exposure situation with the medical clinic or hospital where the victim was evaluated and treated for injury, will determine whether the exposed employee should be tested for HBV or HIV prior to the status of the source being known (or in the case where the source is unknown).

HBV and HIV testing of the source individual should be done at the local offices' medical clinic or at the hospital where the victim was treated for injury. Local laws may apply for testing source individuals in situations where consent cannot be obtained because the source refuses testing or cannot be identified (i.e., an unconscious patient). If the job location does not allow access to the local offices' medical clinic then a new WESTON OMC will be consulted for guidance. The alternate clinic/hospital must offer pretest counseling, post test counseling and referral for treatment.

Consult with WESTON's OMC to determine if the exposed employee should be given the HBV post-exposure vaccination.

Collection and testing of blood for HBV and HIV serological status shall be performed as soon as feasible on the exposed employee’s blood (after consent) where the source is found to be positive for HIV or

HBV. Results of the source individual's testing shall be made available to the exposed employee, and the employee shall be informed by CEHS and/or the OMC of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual. When the source individual is already known to be infected with HBV or HIV testing of the source individual known HBV or HIV status need not be repeated (Center for Disease Control, 1985).

If the source of the exposure is a needle stick or bloodstained material (i.e., blood stained material contacted an open wound on a field team member) the source should be placed in an appropriate container (i.e., sharps container for needles and red bag for blood tainted material). The container should be given to the WESTON medical clinic for analysis. If the source is found to be HBV or HIV positive, the incident report must be updated to change the status from suspected to confirmed exposure. At this point the NOI Report will be placed in a limited control access portion of incident filing system to maintain confidentiality.

Human Immunodeficiency Virus Post Exposure Management

For any exposure to a source or source individual who has AIDS, who is found to be positive for HIV infection or who refuses testing, the worker should be counseled regarding the risk of infection and evaluated clinically and serologically for evidence for the HIV infection as soon as possible after the exposure. WESTON's OMC will provide direction on the case management.

If the source individual was tested and found to be seronegative, follow-up will be determined by WESTON's OMC.

If the source or source individual cannot be identified, decisions regarding appropriate follow-up should be individualized. Serological testing will be made available to all workers who may be concerned they have been infected with HIV through an occupational exposure. WESTON's OMC will provide direction on the case management.

Communication of Hazards to Employees

Training Schedule

WESTON ensures that employees, who are certified to provide First Aid and CPR, are trained in all components of the bloodborne pathogen standard upon assignment and at the annual refresher training. All First Aid providers must be aware of task modifications or procedure changes which might affect occupational exposure.

Training Contents

A training sign-up sheet will be completed to include course title, date, attendees' names, signatures, job classifications, instructor's name, and duration of the class. Training content will include the following information:

- Where an accessible copy of the regulatory text and the WESTON's ECP can be found.
- An explanation of WESTON's ECP and the means by which employees can obtain a copy of the written plan.
- A general explanation of the epidemiology and symptoms of bloodborne diseases.
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.

- An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE.
- Information on the types, proper use, location, removal, handling, decontamination and disposal of PPE.
- An explanation of the basis for selection of PPE.
- Information on the Hepatitis B vaccine (or any new vaccines), including information on its efficacy, safety, method of administration, the benefits of being vaccinated.
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available.
- Information on the post-exposure evaluation and follow-up that WESTON is required to provide for the employee following an exposure incident.
- An explanation of the signs and labels and/or color coding for disposal of infectious materials.
- An opportunity for interactive questions and answers with the person conducting the training session.

Recordkeeping

When an employee gives First Aid or CPR and in doing so becomes subject to this ECP, he/she will verbally report the incident according to WESTON's Operating Practices and then as soon as possible complete a WESTON NOI Report. As part of a medical record, the circumstances of exposure will be kept confidential. Relevant information includes the activities in which the worker was engaged at the time of exposure, the extent to which appropriate work practices and PPE were used, and a description of the source of exposure (USHHS and NIOSH, 1989). When the source is tested for HIV or HBV, the incident report is updated and placed in a confidential file.

Dates

This Exposure Control Plan was revised effective March 2008.

ATTACHMENT 1
TASK IDENTIFICATION, POTENTIAL CONTACT, AND PROTECTION

CPR AND FIRST AID			
EMERGENCY SITUATION	**SERVICE**	**POTENTIAL CONTACT**	**PPE SUGGESTED**
Victim is lying on the ground	Primary survey of victim and opening victims airway	Skin to skin contact	Gloves
Victims breathing has ceased	Rescue breathing	Skin to skin contact Mouth to mouth contact	Gloves Resuscitation mouthpiece
No pulse	CPR	Skin to skin contact	Gloves Resuscitation mouthpiece
Victim is lying on the ground	Secondary survey of victim	Skin to skin contact	Gloves
Choking without stoppage of breathing	Heimlich maneuver	Skin to skin contact	None required if skin is intact Non-intact skin requires gloves
Heart Attack	Comfort victim	Skin to skin contact	Gloves
Bleeding with spurting blood	External control	Skin to skin contact	Gloves Gown or coveralls Apron (option) Mask or face protection Eyewear
Minimal bleeding	External control	Skin to skin contact	Gloves
Compound fractures	External control	Skin to skin contact	Gloves
Burns	External control	Skin to skin contact	Gloves
Poisoning	If induced vomiting is needed	Skin to skin contact	Gloves Eyewear
Diabetic shock	Giving an injection	Sharps from needle could cause direct injection	Gloves Sharps container
Bites and stings	Giving an injection	Sharps from needle could cause direct injection	Gloves Sharps container
Seizures	External control	Eyes and skin contact	Gloves Eyewear

CPR AND FIRST AID			
EMERGENCY SITUATION	**SERVICE**	**POTENTIAL CONTACT**	**PPE SUGGESTED**
Stroke	Provide comfort	None	Gloves
Heat Stress/Cold Stress	External control	Skin to skin contact	Gloves
Victim has fainted	Raise legs for shock	Skin to skin contact	Gloves
Victim falls down in hazardous atmosphere	Rescue victim from area	Skin to skin contact	Gloves
Soiled clothes handling	Place soiled clothing and materials in red/orange bag	Skin contact with bloodborne pathogens in clothing fabrics	Gloves Gown or apron (as needed)
Decontamination	Scrub with disinfectant	Skin contact with bloodborne pathogens in clothing fabrics	Gloves Gown or apron (as needed)
Containerization	Place contaminated clothing into bags	Potential skin contact with residual bloodborne pathogen on bags	Gloves Gown or apron (as needed)

ATTACHMENT 2
DECLINATION OF VACCINATION
(29 CFR 1910.1030, APPENDIX A)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

_____ _____

Employee Signature Date

_____

Employee Name (Print)

_____

Employee Number

_____ _____

Safety Officer Signature Date

A copy of this form will be maintained in the employees medical file, a copy given to the employee, and the original forwarded to the OMC.

FLD 45 BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN - WORK WITH INFECTIOUS WASTE

RELATED FLDs

FLD 43 – Biological Hazards
FLD 44 – Bloodborne Pathogens Exposure Control Plan – First Aid Providers

INTRODUCTION

This FLD has been prepared to not only limit risk of bloodborne pathogen exposure, but to provide appropriate guidance for and protection from other disease-causing microorganisms during the work defined herein.

Bloodborne pathogens are pathogenic microorganisms which may be present in human blood and can cause disease in humans. These pathogens include, but are not limited to hepatitis B virus (HBV) and human immunodeficiency virus (HIV). The Occupational Safety and Health Administration (OSHA) requires compliance with 29 CFR 1910.1030, Occupational Exposure to Bloodborne Pathogens Standard where, as a condition of employment, there is known or potential exposure to bloodborne pathogens. Occupational exposure occurs when potentially infectious materials come in contact with an employee's eyes, mucous membranes, non-intact skin through cuts and abrasions. Sources of occupational exposure may occur when an employee comes in contact with raw sewage or waste at a sanitary landfill, infectious waste found at hazardous waste sites, and when laboratory personnel analyze samples that may contain infectious waste. Additional sources of exposure are contact with infected glassware, needles, and other sharp objects which may result in injuries to personnel due to contamination with blood or related bodily fluids.

NOTE: FLD 44 provides a separate Bloodborne Pathogens Exposure Control Plan for First Aid Providers.

In July 1992, OSHA issued a final Standard for Protection of Workers Potentially Exposed to Bloodborne Pathogens (29 CFR 1910.1030). This standard primarily involves medical and research personnel and their exposure to blood or blood-containing fluids infected with Bloodborne Pathogens. The HIV and HBV pathogens could potentially be present in viable states at emergency response sites and infectious or hazardous waste sites, with hepatitis virus being the more likely to survive in temperatures outside the body temperature ranges. Another potential for exposure would be from workers who could be infected.

WESTON's Corporate Environmental, Health, and Safety (CE&HS) Director is responsible for managing this Exposure Control Plan (ECP). WESTON's Division Environmental, Health, and Safety Managers (DEHSMs) will provide technical guidance and assistance in review and implementation.

This ECP is available on the WESTON EHS Portal site.

Scope

WESTON workers who may be exposed to bloodborne pathogens at a waste site must have a basic understanding of bloodborne pathogens in order to protect themselves effectively from any hazards. If medical waste is anticipated on a site, this Bloodborne Pathogen ECP for Hazardous Waste Workers will be on site and implemented.

This ECP applies to WESTON activities, other than first aid related, which could result in exposure to bloodborne pathogens. This ECP is intended to assist personnel in making decisions concerning the use of

personal protective equipment (PPE), as well as for handling, decontamination, labeling, containing, and disposal procedures.

Information Program

WESTON requires that employees who work at hazardous waste sites recognize, evaluate, and control etiological hazards. Because there is a risk, albeit low, of contact with infectious waste in many WESTON activities, WESTON Environmental, Health, and Safety (EHS) training programs include information on biological hazards including infectious agents.

Completion of health and safety plans (HASP) requires identification and assessment of risk from exposure to biological hazards. This ECP deals primarily with two forms of infection, HBV and HIV, which are of concern to workers who can come in contact with contaminated infectious waste.

Exposure Control

This ECP is designed to eliminate or minimize employee exposure to bloodborne pathogens and other disease-causing microorganisms through information and training, use of PPE, safe handling procedures, decontamination, and proper disposal methods.

Exposure Determination

Good practice as well as the OSHA regulation requires that the Bloodborne Pathogen Exposure Control Program identify the WESTON activities which increase risk of exposure to disease-causing microorganisms. These activities include: hazardous waste site workers, employees working on sanitary landfills, as well as employees working with sewage who may potentially encounter infectious waste.

Field team members must be alert for and avoid any contact with red or orange bags of waste, syringes or needles and materials which have been soiled with blood. The Field Safety Officer (FSO) should contact the client regarding these types of wastes.

Laboratory personnel may be exposed to infectious waste during analysis of sample generated from hazardous waste sites. If infectious waste is known to be present on a job site, the site-specific HASP will include a site-specific Exposure Prevention Plan based on this ECP.

Attachment 1 lists the sub-tasks which identify potential contact and PPE requirements.

Methods of Compliance

<u>Universal Precautions</u>

All containers which are red or orange or contain a label indicating etiological agent or biohazard labels shall be treated as infectious. In addition, discovery of needles, vials, test tubes, petri dishes, or other material typical of medical waste or illegal drug usage will be considered infectious. Upon such discovery, the site-specific HASP will be amended to incorporate an Exposure Prevention Plan, if one has not been completed.

<u>Work Practice Controls</u>

Work practice controls reduce the likelihood of exposure by formalizing the manner in which a task is performed:

- Eating, drinking, smoking, applying cosmetic or lip balm and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure.
- While wearing gloves, avoid touching personal items, such as a comb. Also avoid touching your face and eyes, etc.
- Broken glassware which may be contaminated shall not be picked up directly with the hands unless gloves are used to protect the hands against cuts. It is best to use mechanical means, such as a brush and dust pan then place contaminated broken glass in a puncture proof/leak proof container.
- When handling red bag waste, hold the bag top rather than the bottom.
- Samples containing potentially infectious waste must be labeled accordingly.
- Inspect PPE prior to use. Do not use when the PPE barrier is compromised.
- Hands and other skin surfaces should be washed immediately and thoroughly if handling potentially contaminated articles. Hands should always be washed after gloves are removed even if the gloves appear intact. Where hand washing facilities are not readily accessible, antiseptic hand cleaners and clean cloth/paper towels or antiseptic towelettes should be used. When antiseptic hand cleaners or towelettes are used, hands shall be washed with soap and running water as soon as feasible.
- All work involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances.

Laboratory workers or laboratory procedures such as sample injection and calibration of analytical equipment often involve the use of syringes and needles. If use of these devices results in a cut, puncture or injection, the equipment shall be handled as if contaminated with bloodborne pathogens and the preceding and following procedures must be followed.

Engineering Controls

Engineering controls isolate or remove the bloodborne pathogen hazard from the workplace:

- Proper decontamination, containerizing, labeling and disposal of contaminated items are required for all potentially infectious waste.
- Minimizing needle sticks placing them in a puncture proof container.
- Barrier tape should be used to limit access or close off areas which contain potentially infectious materials.
- Samples which contain potentially infectious waste or contain a biohazard warning label should be handled in a laboratory hood.

Administrative Controls

Administrative controls reduce or eliminate bloodborne pathogen hazards from the workplace by program development (i.e., Exposure Control Plan), auditing to ensure these programs are in place and implemented, and by providing information and training.

Personal Protective Equipment (PPE)

PPE is specialized clothing or equipment worn by an employee for protection against a hazard, when engineering and administrative controls are not available or feasible or where they must be supplemented.

Where there is a potential exposure to bloodborne pathogens or other disease-causing microorganisms the laboratory safety programs and site-specific HASP will address appropriate PPE for these hazards. Attachment 1 outlines suggested PPE ensembles based upon task.

First-aid kits will be supplemented with bloodborne pathogen PPE kits or supplies and will be readily accessible at all times. The CEH&S Department maintains a list of the minimum content of bloodborne pathogen PPE kits and/or supplies. This list is accessible on the WESTON EHS Portal Site.

Decontamination

Decontamination uses physical or chemical means to remove, inactivate, or destroy pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Visible contamination should first be removed with disposable towels or other appropriate means that will ensure protection against direct contact. The area should be decontaminated with a commercial disinfectant solution or a 1:10 to 1:100 solution of household bleach. Soiled cleaning equipment should be cleaned and decontaminated with the disinfectant solution.

Soiled clothes or disposable towels should be placed in a red or orange plastic bag. Work coveralls which have been or are believed to be contaminated may be laundered at a laundry facility capable of handling contaminated clothing. The laundry service must be informed of the potential contamination. The work coveralls should be placed in a red or orange bag. Site equipment which has been contaminated with blood or other infectious material shall be decontaminated. Boots and leather goods may be brush-scrubbed with soap and hot water to remove contamination.

Management and disposal of PPE and materials will be identified in the HASP. Any questions regarding the disposal or management of soiled garments or materials should be directed to CE&HS or the applicable DEHSM.

All PPE should be removed and contained prior to leaving the work area. Hands must be washed immediately after each contact with a potentially contaminated person or articles. Use non-abrasive ordinary soaps. Use waterless disinfectant solution when soap and water are not available on-site. Once off-site, use a restroom sink for handwashing.

Laboratory workers should ensure that glassware has been thoroughly decontaminated with high temperature water. The biohazard information regarding the samples should be transferred to the down end users of the sample material or sample containers (i.e., bottle washers and those persons involved in containerization and disposal of samples).

Containerizing

When PPE is removed it shall be placed in an appropriate designated area for containerization. If outside contamination of the primary container occurs, the primary container shall be placed within a second container which prevents leakage during handling processing storage, transport or shipping and is labeled or color coded.

Sharps should be placed in a puncture proof/leak proof color coded or labeled container. If other contents could puncture the primary container, the primary container shall be placed within a secondary container which is puncture resistant. The liquid generated from the decontamination process should be contained in a leakproof container until a local medical waste disposal company can provide information on proper disposal based on local, state and federal regulations.

Labeling and Hazard Communication

As, or if, required, biohazard labels required by the Standard [29 CFR 1910.1030(g)(1)(i)(B)] must be attached to containers of regulated wastes used to store, transport, or ship potentially infectious material. Red or orange bags may be substituted for the labeling requirements, otherwise, a biohazard label with lettering or symbols should be affixed to the outside of each bag or container generated. Consequently, any container so labeled or any red or orange bagged waste or materials shall be considered to contain either blood or other infectious material.

Disposal

A local medical waste disposal facility should be contacted when disposal for infectious waste from a hazardous waste site or laboratory is required. Request the medical disposal company to supply a sturdy shipping container with manifest and appropriate shipping labels.

Incident Reporting

When an employee is potentially exposed to a bloodborne pathogen, a Notification of Incident (NOI) Report must be completed. The report must indicate "Potential Exposure to Bloodborne Pathogens". Additionally, the employee will acknowledge potential exposure to bloodborne pathogens on the Monthly Employee Health and Safety Report.

Vaccination and Post-Exposure Evaluation and Follow-up

Vaccinations will be provided for WESTON waste site workers only if review of the site-specific HASP with WESTON's Occupational Medical Consultant (OMC) results in medical direction to do so. Vaccinations will then be administered as directed by WESTON's OMC. If vaccinations are offered, the Standard provides for the employee opting to decline the vaccination. In such cases, the employee will be provided with a copy of this FLD and must sign the declination form, Attachment 2.

Hepatitis B vaccines are effective in preventing hepatitis B following a documented exposure when given within 1 week after HBV exposure. The vaccine may be more effective when combined with HBIG, a preparation of immune globulin with high levels of antibody to HBV (anti-HBs). The U.S. Public Health Service and Center for Disease Control guidelines should be accessed for current information.

Upon suspicion of or verification of an exposure to Hepatitis B, any other bloodborne pathogen or infectious agent, WESTON's OMC will be requested to provide advice on appropriate testing and follow-up. If the exposure is suspected or known to be to Hepatitis B, vaccination will be offered at no cost to the employee. As with the pre-exposure vaccination, employees may decline the vaccination as provided by the Standard and must do so by completing the declination Form in Attachment 2.

Communication of Hazards to Employees

Training Schedule

Employees who may be exposed to infectious waste at field sites and or during sample analysis are to be trained in regards to all components of the standard and at the annual refresher training. Employees will also be informed whenever changes such as modification of tasks or procedures affect the employees' occupational exposure.

Training Contents

A training sign-up sheet will be completed to include course title, date, attendees' names, signatures, job classifications, instructor's name, and duration of the class.

Training content will include the following information:

- Where an accessible copy of the regulatory text and the WESTON's ECP can be found.
- An explanation of WESTON's ECP and the means by which employees can obtain a copy of the written plan;
- A general explanation of the epidemiology and symptoms of bloodborne diseases.
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials.
- An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and PPE.
- Information on the types, proper use, location, removal, handling, decontamination and disposal of PPE;
- An explanation of the basis for selection of PPE.
- Information on the Hepatitis B vaccine (or any new vaccines), including information on its efficacy, safety, method of administration, the benefits of being vaccinated.
- An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available.
- Information on the post-exposure evaluation and follow-up that WESTON is required to provide for the employee following an exposure incident.
- An explanation of the signs and labels and/or color coding for disposal of infectious materials.
- An opportunity for interactive questions and answers with the person conducting the training session.

Recordkeeping

In the event an employee is exposed to infectious agents as identified in this ECP, he/she will verbally report the incident according to WESTON's Operating Practices and then as soon as possible complete a WESTON NOI Report. As part of a medical record, the circumstances of exposure will be kept confidential. Relevant information includes the activities in which the worker was engaged at the time of exposure, the extent to which appropriate work practices and PPE were used, and a description of the source of exposure. When the source is tested for HIV or HBV, the incident report is updated and placed in a confidential file.

Dates

This Exposure Control Plan was revised effective March 2008.

ATTACHMENT 1
TASK BY TASK IDENTIFICATION OF RISK AND PROTECTION

LOP will be determined and documented in the Health and Safety Plan.

HAZARDOUS AND SANITARY WASTE SITE WORKERS TASKS			
SITUATIONS AT WASTE SITES	**TASK**	**POTENTIAL CONTACT**	**PPE SUGGESTED**
Red or orange bag waste with or without biohazard label	Containerize bags i.e., place in a roll-off containers or drum.	skin contact with contamination	Use disposable gown or disposable Tyvek (or equivalent) Puncture resistant gloves * Surgical gloves Safety glasses Head and boot covers
Needles or sharps	Identify needles/sharps working at waste sites.	Sharps and needles could cause direct injection	If area of contamination can be taped off and access is not allowed then no PPE is required.
	Containerize needles and sharps		Disposable gown or Tyvek (or equivalent) Safety glasses Surgical gloves Safety boots Sharps container
Blood stained materials	Identify blood stained materials working at hazardous waste site	Skin contact with contamination	If area of contamination can be taped off and access is not allowed then no PPE is required.
	Containerize blood stained materials.		Surgical gloves Safety glasses Gown or Tyvek (or equivalent) boot covers (if material is on the ground)
Infectious waste in containers or piles, not marked	Sampling infectious waste	Skin contact with contamination Sharps and needles can cause direct injection	Surgical and Abrasion resistant * gloves Gown or Tyvek (or equivalent) Safety glasses Respirator Boot covers Head covers
Drum with Biohazard label	Moving drums of potentially infectious waste	Slight potential for skin contact with residual contamination on outside of drum	Surgical gloves Abrasion-resistant gloves Safety glasses
Decontamination	Scrub with Disinfectant	Skin contact with bloodborne pathogens in clothing fabrics	Gown or apron Gloves Safety glasses

***NOTE: Puncture and abrasion resistant gloves reduce risk of cuts or puncture, but DO NOT totally eliminate the risk.**

LABORATORY PERSONNEL ANALYZING HAZARDOUS WASTE SITE SAMPLES			
SAMPLES	**TASK**	**POTENTIAL CONTACT**	**PPE REQUIRED**
Samples containing blood stained materials	Obtain aliquot of sample and process material for analysis	Potential skin contact with bloodborne pathogen	Surgical gloves Safety glasses Gown, apron or lab coat Respirator as necessary
Samples containing sharps such as needles		Sharps and needles can cause direct injection	Puncture resistant gloves * Surgical gloves Gown, apron or lab coat
Samples which contain a etiologic or biohazard label		Potential skin contact with bloodborne pathogen and direct injection from sharps and needles	Surgical gloves Gown, apron or lab coat Puncture resistant gloves * (where there are sharps) Respirator as necessary

*(**NOTE: Puncture resistant gloves reduce risk of puncture, but DO NOT totally eliminate the risk.**)

ATTACHMENT 2
HEPATITIS B VACCINE DECLINATION

(29 CFR 1910.1030, Appendix A)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

_____ _____

Employee Signature Date

_____

Employee Name (Print)

_____

Employee Number

_____ _____

Safety Officer Signature Date

A copy of this form will be maintained in the employee's medical file, a copy given to the employee, and the original forwarded to the Occupational Medical Consultant (OMC).

FLD 58 DRUM HANDLING OPERATIONS

REFERENCES

29 CFR 1910.120 and 29 CFR 1926.65 – Occupational Safety and Health Administration (OSHA)
40 CFR Parts 264, 265 and 311 – U.S. Environmental Protection Agency (EPA)
49 CFR Parts 171 through 178 – U.S. Department of Transportation (DOT)
USACE EM 385-1-1 – U.S. Army Corps of Engineers

RELATED FLDs

FLD 08 – Confined Space Entry Program
FLD 40 – Storage Tank Removal and Decommissioning

One of the most hazardous operations to be conducted at any hazardous waste site is the handling of drums and other containers. Container contents cannot be relied upon to be the same as existing markings. Extreme caution is necessary for the safety of site workers, the public and the environment.

Accidents have occurred during the handling of drums and other containers. Hazards associated with drum or other container handling include; fires, explosions, vapor releases, spills and injuries from lifting or other physical hazards associated with moving containers. In order to increase employee safety when container movement or handling is anticipated, strict guidelines that limit the numbers of personnel exposed to drum/container handling hazards are necessary.

This FLD identifies generic safety guidance for those activities involving drum handling at hazardous waste operations. Site-specific criteria must be included in any health and safety plan (HASP) to anticipate potential hazards associated with drum handling task.

Various standards are in effect for the movement and handling of drums and other containers. Site-specific HASPs must anticipate and follow the standards referenced as related to site activities.

GENERAL

Hazardous substances, contaminated liquids, and other residues will be handled, transported, labeled, and disposed of in accordance with this FLD and applicable regulatory standards.

Drums and containers used during remediation activities must meet the appropriate DOT, OSHA, and EPA regulations for the wastes or materials that they contain.

When practical, drums and containers are to be inspected and their integrity ensured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions (e.g., buried beneath the earth, stacked behind other drums, stacked several tiers high in a pile) will be moved to an accessible location and inspected prior to further handling.

Unlabeled drums and containers will be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled.

Site operations must be organized to minimize the amount of drum or container movement.

Fire extinguishing equipment will be on hand and ready for use to control incipient fires.

Level B protective equipment must be used as a minimum unless available evidence/research indicates that a lower level of protection is safe or a higher level of protection is necessary.

Locating and Inspecting Drums/Containers - Minimal Criteria

Review background data and site history to determine types and location of containers either known or suspect.

Conduct geophysical surveys utilizing devices such as, ground-penetrating system or other type of detection system or device to estimate the location and depth of buried drums or containers.

Monitor the site utilizing appropriate direct-reading instrumentation to verify the presence of potential volatile materials.

For visible containers, approach containers cautiously and in appropriate levels of protection based upon available evidence. Continue air monitoring with direct-reading instruments following appropriate action levels.

Visually determine container integrity and observe for signs of current or historic leakage.

Container Movement and Handling - Minimal Criteria

Implement a spill containment plan prior to any container movement. This plan must include, at a minimum, provisions for appropriate types and numbers of over-pack containers, absorbent, tools and other emergency equipment determined to be necessary. Personnel must be instructed in procedures to follow in the event of a spill.

Monitor containers utilizing the appropriate direct-reading instruments for each container to verify potential leakage and employee exposure to contents.

Perform excavation activities carefully to avoid the possibility of rupturing any containers. Excavation activities must be in compliance with 29 CFR 1926 Subpart P (Excavations).

Prior to movement of drums or containers, brief all employees exposed to the transfer operation on the potential hazards associated with the contents of the drums or containers.

Empty all drums and containers that cannot be moved without rupture, leaking, or spills. Drums or containers will be emptied into a sound container using a device classified for the material being transferred.

Move and handle containers preferably using a drum grappler. Other means of handling must be justified in the HASP. Movement by hand is to be offered as a last resort.

Overpack damaged containers or those with suspect integrity or transfer contents to appropriate containers prior to movement (if safe to do so). Proper assessment of contents must be made prior to transfer. Proper grounding and bonding techniques must be followed.

Use blast shields on excavation and container handling equipment unless the hazard and risk assessment indicates it is safe to perform the operation without blast shields.

If drums are to be moved utilizing drum slings, yokes, or other accessories, ensure that workers move away from the area after affixing the accessory and prior to drum movement by the equipment operator.

Do not move critically swollen containers by hand. Pressure is to be safely relieved prior to movement unless movement is by grappler and properly protected equipment operator.

Remotely handle containers suspected of containing explosive or reactive materials.

Drum Staging, Opening, and Sampling - Minimal Criteria

Identify staging areas prior to container movement. Based upon the perceived risk from container contents, the staging area must be remote from other site activities.

Ensure that minimal and appropriate equipment (e.g., fire protection, spill control and containment, PPE) is available at the staging area.

Stage compressed gas cylinders in a shaded area.

Remotely handle potentially reactive, explosive, or shock-sensitive containers and stage them separate from other containers.

Stage containers to allow ease in sampling, appropriate aisle space and the avoidance of cross-contamination or reaction during opening activities.

Ensure that employees do not stand upon or work from drums or containers.

Open all drums and containers in such a manner that excess interior pressure will be safely relieved. If pressure cannot be relieved from a remote location, ensure that appropriate shielding is placed between the employee and the drums or containers to reduce the risk of injury.

Ensure that material handling equipment used to transfer drums and containers is selected, positioned and operated to minimize the potential for sources of ignition related to the equipment from igniting vapors released from ruptured drums or containers.

Do not handle drums and containers containing radioactive wastes until appropriate clearance is obtained in writing from the Corporate Radiation Safety Officer, Corporate Health and Safety Director, or designee.

Use only spark-proof tools in drum opening operations.

Perform sampling of containers and drums in accordance with a sampling plan prepared as a part of the site-specific HASP.

As a minimum, take the following special precautions when handling drums and containers containing or suspected of containing shock-sensitive wastes:

- All non essential employees will be evacuated from the area of transfer.
- Material handling equipment will be provided with explosive containment devices or protective shields to protect equipment operators from the potential of exploding containers.

- An employee alarm system capable of being heard or seen above surrounding light and noise conditions will be used to signal the commencement and completion of explosive waste handling activities.
- Continuous communications (i.e., portable radios, hand signals, telephones, as appropriate) will be maintained between the employee in charge of the immediate handling area and both the field safety officer and the command post until such time as the handling operation is completed.
- Communication equipment or methods that could cause shock sensitive materials to explode will not be used.
- Drums and containers under pressure, as evidenced by bulging or swelling, will not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosive relief of the drum.
- Drums and containers containing packaged laboratory wastes will be considered to contain shock sensitive or explosive materials until they have been characterized.

Laboratory Waste Packs (Lab Packs)

In addition to the requirements outlined for shock sensitive wastes, the following precautions will be taken at a minimum when handling laboratory waste packs (lab packs):

- Lab packs will be opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes.
- If crystalline material is noted on any container, the contents will be handled as a shock sensitive waste until the contents are identified.
- Remote opening of Lab Pack containers is the preferred technique.
- Manual opening lab packs must be approved in the HASP based upon appropriate hazard analysis.

Consolidation and Re-containerization - Minimal Criteria

Segregate containers based upon on-site compatibility testing.

Promptly clean up any spillage to preclude inadvertent reactions or cross-contamination.

Perform bulking of materials only after appropriate compatibility testing.

Ensure that drums and other repackaging containers meet DOT criteria for the hazard class of the material.

Interim Storage and Transportation - Minimal Criteria

Ensure that Interim Storage areas are in compliance with EPA standards for container storage.

Inspect storage areas weekly, at a minimum. The criteria outlined in 40 CFR Part 265 will be utilized as guidance.

Ensure that adequate aisle space is maintained for worker protection in the storage area.

Ensure that containers are protected (as necessary) from adverse weather conditions. Containers of compressed gasses or reactive or explosive materials should be protected from environmental conditions by covers or shades.

Ensure that fire extinguishers and eye wash stations are available near the storage area.

Ensure that adequate spill control equipment is available near the storage area.

Transport containers according to appropriate USDOT and USEPA regulations.

Tank and Vault Procedures

Tanks and vaults containing hazardous substances must be handled in a manner similar to that for drums and containers, taking into consideration the size of the tank or vault as well as FLD 40.

Appropriate tank or vault entry procedures must be in compliance with FLD 08, Confined Space Entry Program.

Summary of Safety Precautions for Drum, Cylinder, and Unknown Container Handling

ACTIVITY: Locating Containers and Conducting Inventory	
POTENTIAL SAFETY HAZARD: Unknown location and contents of drums can lead to unsuspected hazards.	
Safety Tips	• Carefully review background data pertaining to the location and types of wastes on-site. • Conduct visual to minimize the possibility of puncturing drums. A spotter should be utilized to identify drums during excavation activities. • During the random sampling of containers, which may be required for an inventory, spacing between containers should be adequate to allow for emergency evacuation if needed. • Use remotely operated, non-sparking tools for random sampling whenever possible. • Use direct-reading air monitoring equipment to detect hot spots where contamination may pose a risk to worker safety.
ACTIVITY: Determining Container Integrity	
POTENTIAL SAFETY HAZARD: The process of visual inspections requires close contact with containers of unknown content.	
Safety Tips	• Approach container cautiously. Conduct air monitoring to indicate levels of hazards that require withdrawal from the work area or use of additional safety equipment. • Any container that is critically swollen should not be approached without proper PPE. It should be isolated using a barricade until the pressure can be relieved remotely. • Use of the grappler or other remotely operated equipment can eliminate the need for determining container integrity prior to excavation, provided that rupture of the container will not result in fire or unacceptable environmental impact.
ACTIVITY: Container Excavation and Handling	
POTENTIAL SAFETY HAZARD: Exposure to toxic/hazardous vapors; rupture of containers.	
Safety Tips	• Where buried drums are suspected, conduct a visual survey before using any construction equipment in order to minimize the possibility of rupture. (If practical, a geophysical survey could be used prior to excavation.) • Use a container grappler where possible and cost-effective to minimize contact with containers. If a grappler is not available, pump or over pack drums of poor integrity before excavation. • Ground equipment prior to transferring wastes to new containers. • Use non-sparking hand tools and non-sparking bucket teeth on excavation equipment, and use Plexiglas shields on vehicle cabs. • Where slings, yokes, or other accessories must be used, workers should back away from the work area after attaching the accessory and before the container is lifted. • Critically swollen or bulging drums should not be handled until pressure can be relieved. • Use bars that fit over the teeth of excavation buckets to prevent container puncture. • Where ionizing levels of radiation are detected, the Field Safety Officer and Site Radiological Control Technician should be contacted and the work activity should stop. • Where explosive or shock-sensitive material is suspected, every effort should be made to handle the container remotely. Gas cylinders should not be dragged during handling. • Use direct-reading air monitoring equipment when in close proximity to containers to detect any hot spots.

ACTIVITY: Container Staging and Opening	
POTENTIAL SAFETY HAZARD: Release of toxic, hazardous vapors, rupture of containers.	
Safety Tips	• Stage gas cylinders in a cool, shaded area. • Stage potentially explosive or shock-sensitive wastes in a diked, fenced area. • Use remote container opening methods where containers are determined to be unsound. • Conduct remote-operated container opening form behind a barricade or behind a Plexiglas shield if backhoe-mounted puncture is being used. • Isolate container opening form staging and other activities if possible to prevent a chain reaction if an explosion or reaction does occur. • If container opening cannot be isolated from staging, containers should be staged so as to: (1) minimize the possibility of chain reactions in the event of a fire or explosion; and (2) provide adequate space for emergency evacuation. • Use only non-sparking hand tools if containers are to be opened manually. • Remotely relieve the pressure of critically swollen containers before opening. • Clean up spills promptly to minimize mixing of incompatible materials (Use the SPCCP for guidance.)
ACTIVITY: Consolidation and Recontainerization	
POTENTIAL SAFETY HAZARD: Mixing of incompatible wastes.	
Safety Tips	• Perform on-site compatibility or HAZCAT testing on all containers. • Segregate wastes according to compatibility class following compatibility testing. • Clean up spills promptly to avoid mixing or incompatible wastes. • Intentional mixing of incompatible wastes such as acids and bases should be performed under controlled conditions in a reaction tank where temperature and vapor release can be monitored. • Monitor for incompatible reactions during consolidation using direct-reading air monitoring equipment.
ACTIVITY: Interim storage and transportation.	
POTENTIAL SAFETY HAZARD: Mixing of incompatible wastes.	
Safety Tips	• Segregate incompatible wastes using dikes during interim storage. • Maintain a weekly inspection schedule. • Allow adequate aisle space between containers to allow rapid exit of workers in case of emergency. • Keep explosives and gas cylinders in a cool, shaded, or roofed area. • Prevent contact of water reactive wastes with water. • Clean up spills or leaks promptly. • Have fire fighting equipment readily available within the storage area. • Ensure adherence to DOT regulations regarding transport of incompatible wastes and container integrity.

FLD 61 GASOLINE CONTAMINANT EXPOSURES

RELATED FLDs
FLD54 – Benzene Exposure Control Plan

Gasoline produced in the United States can contain up to 5% benzene by volume, therefore, if gasoline contamination is a concern, there may be the potential for benzene to be present in the breathing zone at concentrations reaching or exceeding the OSHA Permissible Exposure Level (PEL) of 1 ppm or American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 0.5 ppm. A determination of the magnitude of worker exposure must be made to allow use of this guideline and of the applicability of the gasoline TLV/Time Weighted Average (TWA) or establish the need to follow the OSHA Benzene exposure requirements (29 CFR 1910.1028 and FLD 54).

Actions for this guide are based upon the ACGIH TLV/TWA for Gasoline of 300 ppm.

The "units" as measured by a photo ionization detector (PID) or flame ionization detector (FID) can be paired with Levels of Protection (LOP) as long as the benzene concentration is less than 0.5 ppm.

0-10 units* = Level D
10-150 units* = Level D
150-300 units* = Level C
300 units or greater* = Level B

Monitoring Requirements

A properly calibrated PID or FID must be used to monitor total organic vapor exposure. However, at 10 units* or higher, site personnel must evaluate the potential for benzene-specific exposure.

To quantify benzene exposure, the RAE Systems UltraRAE with the RAE-SEP benzene tubes (see RAE Systems Guide TN-127) is the PID of choice as cross-sensitivities are eliminated or greatly minimized. The LOP identified above may be used provided benzene exposures remain below 0.5 ppm.

An alternative, but less accurate procedure using colorimetric chemical detector tubes (Draeger benzene0.5/c or equivalent tube) may be used to quantify benzene concentration. If less than 0.5 ppm, continue with the LOP referenced.

RAE-SEP tube or colorimetric tube readings must be made and documented at 60 minute (maximum) intervals during potential exposure situations when the PID/FID readings are 10 units or greater.

All air monitoring needs to be conducted within the employee's breathing zone

If benzene exposures are equal to, or greater than 0.5 ppm, compliance with FLD 54 and OSHA's Benzene standard (29 CFR 1910.1028) is required.

For Level C operations, a full-face air-purifying respirator must be used. Cartridges must be changed at the end of service life (indicator) or used for no longer than 4-hour work periods.

HEPATITIS A

General Information

Who is at risk?

Although anyone can get Hepatitis A, some people are at greater risk, such as those who:

- Travel to or live in countries where Hepatitis A is common
- Have sexual contact with someone who has Hepatitis A
- Are men who have sexual encounters with other men
- Use recreational drugs, whether injected or not
- Have clotting-factor disorders, such as hemophilia
- Are household members or caregivers of a person infected with Hepatitis A

What is hepatitis?

"Hepatitis" means inflammation of the liver. The liver is a vital organ that processes nutrients, filters the blood, and fights infections. When the liver is inflamed or damaged, its function can be affected.

Hepatitis is most often caused by a virus. In the United States, the most common types of viral hepatitis are Hepatitis A, Hepatitis B, and Hepatitis C. Heavy alcohol use, toxins, some medications, and certain medical conditions can also cause hepatitis.

What is Hepatitis A?

Hepatitis A is a contagious liver disease that results from infection with the Hepatitis A virus. It can range in severity from a mild illness lasting a few weeks to a severe illness lasting several months.

How common is Hepatitis A?

Hepatitis A still occurs in the United States, although not as frequently as it once did. Over the last 20 years, there has been more than a 90% decrease in Hepatitis A cases. New cases are now estimated to be around 20,000 each year. Many experts believe this decline is a result of the vaccination of children and people at risk for Hepatitis A.

Hepatitis A can be prevented with a safe and effective vaccine.

How is Hepatitis A spread?

Hepatitis A is usually spread when a person ingests fecal matter—even in microscopic amounts—from contact with objects, food, or drinks contaminated by feces or stool from an infected person.

Hepatitis A can be spread when:

- An infected person does not wash his or her hands properly after going to the bathroom and then touches objects or food
- A caregiver does not properly wash his or her hands after changing diapers or cleaning up the stool of an infected person
- Someone engages in certain sexual activities, such as oral-anal contact with an infected person

Hepatitis A also can be spread through contaminated food or water. This most often occurs in countries where Hepatitis A is common, especially if personal hygiene or sanitary conditions are poor. Contamination of food can happen at any point: growing, harvesting, processing, handling, and even after cooking.

Who should get vaccinated against Hepatitis A?

Vaccination is recommended for certain groups, including:

- Men who have sexual encounters with other men
- Users of recreational drugs, whether injected or not
- People with chronic or long-term liver disease, including Hepatitis B or Hepatitis C
- Travelers to countries where Hepatitis A is common
- People with clotting-factor disorders
- Family and caregivers of adoptees from countries where Hepatitis A is common
- All children at age 1 year

What are the symptoms of Hepatitis A?

Not everyone has symptoms. If symptoms develop, they usually appear 2 to 6 weeks after exposure and can include:

- Fever
- Fatigue
- Loss of appetite
- Nausea
- Vomiting
- Abdominal pain
- Grey-colored stools
- Dark urine
- Joint pain
- Jaundice

Symptoms are more likely to occur in adults than in children. They usually last less than 2 months, although some people can be ill for as long as 6 months.

How is Hepatitis A diagnosed and treated?

A doctor can determine if a person has Hepatitis A by discussing his or her symptoms and taking a blood sample. To treat Hepatitis A, doctors usually recommend rest, adequate nutrition, fluids, and medical monitoring. Some people will need to be hospitalized. It can take a few months before people begin to feel better.

People can spread Hepatitis A even if they don't look or feel sick. Some adults and many children have no symptoms.

How serious is Hepatitis A?

Most people who get Hepatitis A feel sick for several months, but they usually recover completely and do not have lasting liver damage. Sometimes Hepatitis A can cause liver failure and death, although this is rare and occurs more commonly in people older than 50 and people with other liver diseases.

Can Hepatitis A be prevented?

Yes. The best way to prevent Hepatitis A is by getting vaccinated. Experts recommend the vaccine for all children, some international travelers, and people with certain risk factors and medical conditions. The Hepatitis A vaccine is safe and effective and given as 2 shots, 6 months apart. Both shots are needed for long-term protection.

Frequent handwashing with soap and water—particularly after using the bathroom, changing a diaper, or before preparing or eating food—also helps prevent the spread of Hepatitis A.

For more information

Talk to your health professional, call your health department, or visit www.cdc.gov/hepatitis or www.cdc.gov/travel.

DEPARTMENT OF HEALTH & HUMAN SERVICES
Centers for Disease Control and Prevention
Division of Viral Hepatitis

CDC
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www.cdc.gov/hepatitis

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Emergency Responder Health and Safety Manual

Chapter II-1

Physical Stress Management Program

Final

Customized for Organization Name on Date

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LIST OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
°C	degrees Celsius
CFR	Code of Federal Regulations
dBA	decibels measured on the A scale
dBC	decibels measured on the C scale
ECT	equivalent chill temperature
EMT	emergency medical technician
EPA	U.S. Environmental Protection Agency
ERT	Environmental Response Team
°F	degrees Fahrenheit
HASPs	health and safety plans
HAZWOPER	OSHA's Hazardous Waste Operations and Emergency Response standard
HQ	Headquarters
MHR	maximum heart rate
NDT	National Decontamination Team
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NRR	noise reduction rating
NWS	National Weather Service
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PEL	OSHA's permissible exposure limit
PPE	personal protective equipment
SHEMP	Safety, Health, and Environmental Management Program
STS	standard threshold shift
TLV	ACGIH's threshold limit value
TWA	time-weighted average
WBGT	wet bulb globe temperature

1.0 INTRODUCTION

1.1 Background Information and Regulatory Basis

Text Box 1
Physical Stressors Addressed in This Chapter

- Fatigue
- Heat stress
- Cold stress
- Noise stress
- Vibration
- Overexertion (due to heavy manual labor)
- Altitude

EPA emergency responders respond to sudden releases of oil or hazardous substances, and in some cases, must work under difficult physical conditions while wearing protective clothing and equipment. For example, responders might be required to work in environments that pose altitude, heat, cold, noise, or vibrational stress. Also, given the nature of field work, emergency responders may overexert themselves or experience fatigue. Text Box 1 lists the physical stressors addressed in this chapter.

The following Occupational Safety and Health Administration (OSHA) regulations and EPA guidelines were used to develop this chapter:

- Safety Health and Environmental Management (SHEM) Guideline No. 33 (Heat Stress and Cold Stress, December 2004).
- SHEM Guideline No. 37 (Occupational Noise and Hearing Conservation, October 2004).
- 29 CFR 1910.95 (OSHA Occupational Noise Exposure standard).

In addition, documents by the American Conference of Governmental Industrial Hygienists (ACGIH), the National Fire Protection Association (NFPA), and others contributed to the content of this chapter.

This chapter provides specific requirements that all EPA organizations must meet to implement a physical stress management program for emergency responders. These minimum requirements have been established to ensure that:

- Emergency responders receive training on the hazards associated with physical stressors, the symptoms associated with them, procedures to prevent adverse effects from occurring, and procedures for addressing adverse health effects (Section 3);
- Appropriate medical surveillance is conducted (before entering and while in the field) to monitor employee health status (Section 4);
- Nationally consistent procedures are in place for implementing engineering/administrative controls that reduce the risks posed by physical stressors (Sections 5 through 11);
- Nationally consistent recordkeeping practices are implemented (Section 12); and
- Evaluations are performed to assess the effectiveness of EPA's physical stress management program and to foster continual improvement (Section 13).

The procedures presented in this chapter represent the minimum requirements that EPA organizations must meet to avoid exposure to (and potentially experiencing adverse effects from) physical stressors.

1.2 Instructions for Users

In accordance with OSWER Directive 9285.3-12, this chapter must be implemented across all EPA regions, the Environmental Response Team (ERT), the National Decontamination Team (NDT), and Headquarters (HQ). This means each EPA organization must adopt the minimum Agency requirements and management practices listed in the chapter and produce a customized version of the chapter which is reviewed/updated on an annual basis.

To customize the chapter, users must (1) complete Appendix A and (2) insert organization-specific information into the blank spaces (highlighted in yellow) that appear throughout the chapter. If organizations advocate additional policies and procedures exceeding the minimum Agency requirements, they must document them in Appendix B. Tools have been developed to support this chapter, including a glossary (Appendix C) and a Quick Reference Guide for emergency responders (Appendix D). (The Quick Reference Guide for this chapter must be included in the Field Guide described in Section 4.4 of the Introduction to this manual.) Appendix E provides instructions for incorporating physical stress information in site-specific health and safety plans (HASPs).

See the Introduction to this manual for details on customizing and posting an organization's physical stress management program to EPA's Web site (http://www.epaosc.net/_HealthSafetyManual).

2.0 ROLES AND RESPONSIBILITIES

Health and Safety Program Contacts (HSPCs), Removal Managers, Safety, Health, and Environmental Management Program (SHEMP) Managers, and individual emergency responders have roles and responsibilities in implementing the Agency's physical stress management program. Appendix A details the tasks that these key personnel must perform. If an organization wishes to delegate a task to someone other than the default assignment in the appendix, users can do so when they customize Appendix A and when they fill information into the yellow-highlighted areas that appear throughout the chapter's text.

3.0 PHYSICAL STRESS TRAINING

Emergency responders and their supervisors must have a thorough understanding of the hazards and symptoms associated with exposure to physical stressors, measures that can be taken to prevent adverse health effects, and procedures (including first aid) to follow if adverse effects occur. All On-Scene Coordinators (OSCs) and emergency responders must receive physical stress management training.

The training program consists of seven modules. Table 1 summarizes the content covered in each module and the minimum frequency of delivery. Modules can be presented separately or all at once. Most of the modules can be covered during annual health and safety refresher training (as required by 29 CFR 1910.120). Decisions related to training delivery are left to the discretion of the SHEMP Manager (or another designated person), who is responsible for ensuring that training occurs and is tracked and documented (Section 12.1). The Removal Manager must be informed of employees who have/have not completed their training requirements. The HSPC (or another designated person) may assist with these tasks. The Removal Manager (or another designated person) must (1) provide the resources (including time and monetary support) needed to complete the training modules, (2) prevent employees who have NOT completed their training requirements from working in the field, and (3) attend training sessions to demonstrate management's support of the physical stress management program.

Table 1
Components of EPA's Physical Stress Training Program

Training Module	Frequency of Delivery	Training Program Content
Fatigue	Initial training upon employment and as needed thereafter	• How fatigue impairs judgment and performance. • The relationship between fatigue and accidents. • Rules of thumb regarding work/rest schedules.
Heat Stress[a]	SHEM Guideline 33 requires initial training upon employment and retraining if changes in the workplace or personal protective equipment (PPE) render previous training obsolete, and/or it is apparent that an employee has not retained the information presented during the initial training course.	• Hazards and potential health effects associated with heat stress. • Predisposing factors and symptoms of heat-related disorders. • First aid and emergency medical procedures to follow in the event of heat stress. • Work practices, precautions, and procedures to take in areas that pose heat stress hazards. • Reporting procedures for employees that experience signs of heat stress. • Eating and drinking habits. • The purpose, advantages, and descriptions of environmental and medical surveillance programs. • Proper use of protective clothing and equipment.
Cold Stress[a]		• Recognition of symptoms of hypothermia, frostbite, or excessive cooling of the body (even when shivering does not occur). • First aid and emergency medical procedures, including rewarming procedures. • Safety work practices and personal protective clothing. • Eating and drinking habits. • The purpose, advantages, and descriptions of environmental and medical surveillance programs.
Noise and Hearing Conservation[b]	Initial training upon employment and annually thereafter (as mandated in OSHA 29 CFR 1910.95).	• The effect noise has on hearing. • The purpose, advantages, disadvantages, and attenuation of hearing protectors. • Instructions in selecting, fitting, using, and caring for hearing protectors. • The purpose and procedures associated with audiometric testing. *Note: Attendees must receive the following handouts: (1) a copy of OSHA 29 CFR 1910.95, (2) additional materials that OSHA has given EPA on hearing protection, and (3) other educational materials that EPA has prepared about noise stress and hearing conservation programs.*
Vibration Stress	Initial training upon employment and as needed thereafter	• Injuries caused by vibration stress. • Signs and symptoms of injury. • Engineering and work practice controls. • Sources/recognition of vibration hazards in the field.
Overexertion Injuries/Heavy Manual Labor	Initial training upon employment and as needed thereafter	• How overexertion injuries occur. • Symptoms and consequences of overexertion injuries. • Job tasks which cause injuries. • Methods to minimize injury. • Reporting injuries.
Altitude	Initial training upon employment and as needed thereafter	• Hazards and potential health effects associated with work at altitude. • Predisposing factors and symptoms of altitude illnesses. • Emergency procedures to follow in the event of altitude illness. • Work practices, precautions, and procedures for work at altitude. • Eating and drinking habits and the impact on altitude tolerance.

[a] Training requirements listed in SHEM Guideline No. 33.
[b] Training requirements listed in OSHA 29 CFR 1910.95(k) and SHEM Guideline No. 37.

4.0 MEDICAL SURVEILLANCE

The purpose of medical surveillance is to identify employees who are at risk of experiencing adverse health effects associated with physical stressors. Critical information is obtained about the health status of employees before they go into the field (annual physical exams) and while they are actually working in the field (onsite medical monitoring).

4.1 Before Going Into the Field—Obtaining an Annual Medical Examination

Emergency responders must obtain a medical examination each year (see Chapter I-1 of the Emergency Responder Health and Safety Manual on Medical Surveillance). These examinations will determine if employees are capable of performing their duties while wearing PPE under stressful conditions (e.g., temperature extremes). Physicians look for medical conditions (such as heart disease, diabetes, atherosclerotic vascular disease, and central nervous system disease) that might increase an individual's risk for heat stroke or intolerance for cold stress. Employees who have such conditions must be aware of the symptoms of stress when working in the field. In some cases, a physician might determine that an individual is not medically cleared to perform his/her duties and will recommend restrictions on the employee's activities.

4.2 In the Field—Conducting Onsite Medical Monitoring

Monitoring vital signs in the field helps identify those employees who are overly stressed and at risk of developing adverse health effects (Appendix D and Appendix F).

4.2.1 Determining When Onsite Medical Monitoring Is Necessary

The Onsite Safety Officer is responsible for determining whether onsite medical monitoring (e.g., blood pressure and heart rate measurements) is required. The SHEMP Manager (or another designated person) or the HSPC (or another designated person) will assist with this determination (if necessary). Onsite medical monitoring must be performed whenever high air temperatures, high humidity, PPE, strenuous physical activities, or a combination of these factors increase the potential for a heat-related injury. (Section 6.1 provides additional details about determining whether heat stress concerns are warranted.) In addition, regardless of what environmental conditions exist, onsite medical monitoring must always be performed whenever employees are required to don Level A PPE (i.e., blood pressure and heart rate monitoring must be conducted prior to donning and after doffing Level A PPE) (See Text Box 2).

Text Box 2
Demand of Wearing PPE

Wearing PPE is physically demanding, exacerbates other physical stressors present at a site, suppresses the body's ability to dissipate heat, and makes it difficult for coworkers to observe the symptoms of heat stress.

4.2.2 Procedures for Onsite Medical Monitoring

If onsite medical monitoring is necessary, the Onsite Safety Officer is responsible for ensuring that a Medical Monitor is present to track employee vital signs. The Medical Monitor must be someone who knows how to measure and interpret vital signs, recognize the symptoms of physical stress-related disorders, and monitor work/rest cycles. The Onsite Safety Officer must obtain support from a health professional to serve as the Medical Monitor, such as a local emergency medical technician (EMT) (or an EMT crew if necessary), a nurse, or a nurse assistant.

When onsite medical monitoring is necessary, the Onsite Safety Officer must establish medical or vital signs checkpoints for employees to go through before entering the work (hot) zone, after leaving the decontamination (decon) line, and before leaving the work site at the end of the work shift. The Medical Monitor must take vital signs as employees pass through the checkpoints and monitor work/rest cycles. Appendix F provides tools to assist the Medical Monitor. Appendix F-1 lists the vital signs (e.g., heart rate, blood pressure, oral temperature, etc.) that must be monitored, thresholds that raise concern, and corrective actions to protect employees. Appendix F-2 provides a form to assist tracking an employee's vital signs. If the Medical Monitor believes an employee is stressed, this information must be communicated to the employee and the Onsite Safety Officer, or to the employee's direct supervisor, with recommended corrective action.

5.0 FATIGUE

Fatigue is often accompanied by feelings of weariness, sleepiness, or irritability, and leads to inefficiency and a reduced capacity for work. Fatigue presents a risk as it can impair judgment, affect vision, and slow down reflexes. Fatigue also increases the likelihood of automobile accidents and is the number one cause of workplace fatalities. Emergency responders and their supervisors must understand the danger of fatigue and implement administrative and work practice controls to minimize fatigue.

5.1 Establishing Reasonable Work/Rest Schedules

Individuals must receive adequate time to rest and recover after long or physically demanding work shifts. The following guidelines must be followed to establish reasonable work/rest schedules, prevent low morale and employees from becoming overly fatigued:

- **A 16-hour shift must be the MAXIMUM that individuals are allowed to work**. The 2:1 work/rest ratio is a rule of thumb that supervisors must follow when establishing work/rest schedules. This means that individuals who have worked for 16 hours continuously (including transportation time to and from a site) must be provided an 8-hour rest period. On rare occasions it may be necessary for emergency responders to exceed the 16-hour limit due to the nature and extent of the response. If this occurs, the 2:1 work ratio must be restored as quickly as possible and efforts must be made to establish more workable shifts.

- **Shorter work shifts must be established (8 to 12 hours or less) during long-term or high altitude response activities**. Shortening shifts helps employees maintain a high level of alertness and performance and prevents adverse psychological, physiological, and musculoskeletal consequences.

- **Seven-day work weeks should be avoided.** Seven-day work-week schedules should be avoided if at all possible because they hasten fatigue and contribute to low morale.

- **Limits must be placed on the amount of time employees are allowed to drive.** EPA recognizes one provision of the Department of Transportation's Federal Motor Carrier Safety Administration (FMCSA) Hours-of-Service Regulations for driving time (49 CFR Part 395). Individuals may drive up to 11 hours (includes time taken for rest, meal, and fuel stops) during a 14-hour work shift. Exceedances will only be allowed in cases where an employee is driving with a partner and upon approval of the local SHEMP Manager (or another designated person). If another eligible driver is present, that individual may take over for the driver and operate the vehicle until he/she has reached the 14-hour work shift limit. Allowable driving time is shorter if an employee has already been working in the field. For example, an employee who has worked onsite for 8 hours can only drive for 6 hours.

- **Rest periods must really be rest periods**. When emergency responders work long or physically demanding shifts, Lead OSCs/Onsite Safety Officers, Removal Managers, and SHEMP Managers must reduce nonessential tasks. For example, transportation back to lodging or administrative support for routine paperwork and expense reports may be provided so that the rest period is not an extension of the work period. Additionally, providing an environment with adequate heat, ventilation, air conditioning, and light reduces the effects of fatigue.

The Onsite Safety Officer and supervisors directly in charge of emergency responders must inform employees of EPA's work/rest guidelines and ensure that they do not assign work schedules that exceed these guidelines under most circumstances. To meet these guidelines, it may be necessary to mobilize additional personnel to relieve those already working. If additional resources are necessary, the Onsite Safety Officer must notify the Removal Manager, who will ensure that the appropriate numbers of emergency responders are provided for the response activity.

5.2 Other Practices Designed to Address Fatigue

In addition to establishing work/rest schedules, the following practices help address fatigue:

- **Promote good nutrition and exercise**. Proper nutrition and exercise are key components for successfully conducting operations with long or physically demanding shifts. Employees should avoid consuming large amounts of caffeine, alcohol, and sugary foods and get regular exercise.

- **Encourage self-awareness**. Employees must be encouraged to alert their supervisors if they feel fatigued or burdened by their physical duties.

- **Encourage use of the buddy system**. Emergency responders must be encouraged to look out for each other. Whenever possible, emergency responders must work in pairs or teams.

6.0 HEAT STRESS

Emergency responders must perform strenuous physical activities in environments with high air temperatures or high humidity, often while wearing PPE. PPE reduces the body’s ability to dissipate heat and can cause heat stress. Heat stress is the heat load imposed on a worker from metabolic heat (due to physical activity), environmental factors (air movement, air temperature, radiant heat, and humidity), and clothing. Heat stress can lead to heat strain (the body’s physiological response to heat stress) and a variety of heat-related disorders including heat stroke (the most serious heat illness and a medical emergency that can cause brain damage or death). Other heat-related disorders by increasing order of severity include heat rash, heat syncope, heat cramps, and heat exhaustion.

It is very difficult to predict who will experience a heat-related disorder in a specific setting because individual responses to heat stress vary greatly from one individual to another in the same environment, and for the same individual in different settings and from time to time. The effects of heat stress are progressive and dangerous if left ignored. Excessive heat strain can be avoided by recognizing and understanding personal characteristics that predispose its development, watching for the symptoms of excessive heat strain, and addressing them as soon as they appear. Appendix G provides information on the symptoms and first aid/corrective actions for heat-related disorders. EPA’s approach for managing heat stress follows.

6.1 Assessing the Potential for Heat-Related Hazards

When working in the field, the Onsite Safety Officer must assess conditions to determine whether administrative/engineering controls must be implemented to reduce the physiological strain caused by heat stress and/or whether onsite medical monitoring is required. When making assessments, the Onsite Safety Officer must consider the following:

- **Environmental factors**. Air temperature, humidity, and sources of radiant heat (such as the sun or hot machinery) may contribute to heat stress. The greater the magnitude of these factors the greater the heat burden to the employee. Air movement (e.g., from a breeze or a fan) enhances cooling through evaporation of perspiration. Employees will not benefit from a breeze, however, if working in an enclosed area.

- **Clothing and work demand levels**. Wearing heavy or reduced-permeability clothing (e.g., water-vapor-impermeable, air-impermeable, and thermally insulating clothing, as well as encapsulating suits (Level A) and multiple layers of clothing) and high physical exertion increases the chance of adverse health effects from the heat. As noted by ACGIH, "[w]ith heat removal hampered by clothing, metabolic heat may produce excessive heat strain even when ambient conditions are considered cool." Workers wearing chemical protective clothing may start to exhibit signs of heat strain when performing heavy exercise in temperate conditions (69.8°F or 21°C).[1]

- **Personal factors**. Some people are more susceptible to heat-related disorders. Under the same environmental and work conditions, employees who are acclimatized (i.e., accustomed to working in the prevailing environmental conditions), in good health, and well hydrated are less likely to experience heat-related health effects than employees who are not. Other factors that affect individual heat sensitivity include age; weight; state of physical fitness; metabolism; use of alcohol, drugs, and prescription and over-the-counter medications; and a variety of medical conditions (e.g., hypertension).

ACGIH's Threshold Limit Values (TLVs) provide a tool to assess potential heat stress situations and make decisions about appropriate work-rest regimes. Appendix H provides detailed information about the TLV approach. Each organization's HSPC (or another designated person) must maintain the most recent edition of the ACGIH TLV booklet[2] and ensure that the information is made available to the Onsite Safety Officer. The TLV approach involves the following steps:

- **Performing environmental monitoring to determine the wet bulb globe temperature (WBGT).** The WBGT is obtained from a direct-reading instrument[3] that takes air temperature, humidity, radiant heat sources, and air movement into consideration. *(Note: Although WBGT readings are reported in degrees, the measurement incorporates information about more than just air temperature. As a result, standard air temperature readings cannot be substituted for WBGT measurements.)*

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[1] Bélard, J.L., Stonevich, R.L. Overview of Heat Stress among Waste Abatement Workers. Appl. Occup. Environ. Hyg. 10 (11): 903-907 (1995).

[2] *TLVs7 and BEIs7 Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices*. The ACGIH TLV booklet is published on an annual basis and may be obtained from the American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati, Ohio 45240-4148. Telephone: 513-742-2020; Web site: http://www.acgih.org.

[3] Examples of portable heat stress monitors include the QUESTEMP° Series (32/34/36) of portable heat stress monitor kits (Quest Technologies, Inc., Oconomowoc, WI); the RSS-214 WIBGET heat stress monitor (AIM, Centennial, CO), and the Metrosonics hs-32 general purpose area heat stress monitor (Quest Technologies, Inc., Oconomowoc, WI).

- **Comparing WBGT measurements to ACGIH's TLVs**. Appendix H presents ACGIH's screening criteria for heat stress exposure under different work-rest regimes and levels of physical activity for both acclimatized and unacclimatized employees. The screening criteria include adjustments for the impact that different ensembles of clothing (with reported clothing adjustment factors) have on an employee's tolerance for heat. **ACGIH=s TLV screening values must not be used to make decisions about safe conditions for employees wearing completely encapsulating suits (Level A), or multiple layers of clothing or other clothing types where no data are available for clothing adjustments.** For these kinds of ensembles, the ACGIH TLVs are not a useful screening method to determine a threshold for heat stress management. The Onsite Safety Officer must assume that individuals wearing these ensembles risk heat-related disorders even in mild temperature conditions. Onsite medical monitoring must be required for employees wearing Level A PPE or clothing types/ensembles that lack clothing adjustment factors.

6.2 Managing the Risks Associated with Heat Stress

6.2.1 Increasing Preparedness and Raising Awareness

The best defense against heat stress is to acclimatize employees before they go into the field. Increase employees' heat tolerance by implementing a heat acclimatization program and by improving general physical fitness. Acclimatization is a gradual process that requires physical activity under heat stress conditions similar to those anticipated for the work (i.e., acclimatization to one heat stress level does not provide full acclimatization to a higher level of heat stress). Substantial acclimatization requires 1 to 2 hours of continuous heat stress exposure per day for at least 5 days and, for practical purposes, is complete in 10 to 14 days. Acclimatization is lost quickly if heat stress exposure stops. Two days without exposure is made up the first day back at work. However, a week or two without exposure requires 4 to 7 days for re-acclimatization to occur.

Before working in a hot environment, employees must understand the hazards associated with heat stress, including the symptoms of heat-related disorders, preventative measures, and first aid procedures. These topics must be covered in the training program discussed in Section 3. Supervisors must ensure that employees review the key points about heat stress in the Quick Reference Guide (Appendix D) whenever they work at a site where heat stress is a concern.

6.2.2 Engineering/Administrative Controls and PPE to Mitigate Heat Stress

The Onsite Safety Officer is responsible for determining which heat stress controls must be used, incorporating information about these controls into site-specific HASPs, and ensuring that the controls are implemented. Engineering and administrative controls must be used before PPE. Local organizations (e.g., fire departments, police departments, construction firms, etc.) may also be consulted for the precautions they take to minimize heat stress.

Examples of engineering/administrative controls include:

- Scheduling "hot jobs" for the cooler part of the day or for the cooler part of the year if the task does not have to be performed immediately.

- Positioning large pedestal fans for localized, spot cooling (provided they do not interfere with other workplace controls or affect exposure to chemical agents).

- Placing shields or barriers around equipment that produces radiant heat.

- Providing a cool, shaded, or air-conditioned rest area for employees with ample hydration supplies.

- Limiting the amount of time employees spend in hot environments by decreasing their work time in the hot environment and/or increasing their recovery time spent in cooler environments. Work-to-rest ratios are best determined by onsite medical monitoring (Section 4.2).

- Reducing the metabolic demands of a job through mechanization, special tools, or by increasing the number of employees per task.

- Providing adequate amounts of cool potable water near work areas (including onsite medical monitoring exit checkpoints) and encouraging all employees to drink a cup of water every 15 to 20 minutes (at least 1 quart per person, per hour) to maintain fluid replacement. Thirst sensation should not be relied upon as the sole guide for water intake and proper hydration.

- Supplementing fluid replacement (hydration) with commercial electrolyte replacement drinks (sports drinks) to help retain fluids and maintain electrolyte levels. Electrolyte replacement drinks are appropriate during the first 5 to 10 days of activity in heat (when unacclimatized workers lose more salt in sweat), under conditions of profuse sweating, and for first aid. (See Text Box 3 for proper heat stress hydration.)

- Identifying and medically monitoring employees with high risk factors (e.g., hypertension, prescription or non-prescription medication that reduces heat tolerance, etc.).

Text Box 3
Hydration for Heat Stress

Before Work: Drink extra fluids (1 to 2 cups of water, juice, or a sports drink) to prepare for the heat.

During Work: Take several fluid breaks every hour, drinking at least 1 quart of fluid (primarily water). Supplement fluid replacement with a sports drink to maintain electrolyte levels.

After Work: Continue drinking (beyond thirst) to replace fluid losses and ensure rehydration.

Enhance rehydration by adding extra salt to meals; eating bananas and citrus fruits; drinking lemonade, orange juice, or tomato juice; and avoiding excess caffeine (coffee and colas) and alcohol.

Specialized PPE must be considered an option when engineering/administrative controls do not protect employees from heat stress hazards. Examples include ice- or cold-pack vests, inline vortex units that cool the air provided to suits and respirators, and water-cooled suits that circulate fluid to absorb excess heat. Additional information on protective equipment for managing heat stress is available in the OSHA Technical Manual, Section III, Chapter IV. PPE cooling systems: (1) must not be used in lieu of administrative and work practice controls; (2) may be quite heavy and limit mobility; (3) may mask heat stress symptoms and delay proper hydration (e.g., ice-pack vests); (4) provide cooling for a limited period of time; and (5) may require extra resources not present at every site (e.g., air compressors and refrigeration/freezer capacity) to store equipment.

6.2.3 Symptoms of and Responding to Heat Stress

The Onsite Safety Officer must implement a buddy system in which employees are responsible for observing fellow workers for symptoms of heat stress. Common early symptoms include headache, muscle cramps, and unusual fatigue. Treatment for early symptoms of heat stress includes resting in a cool place and drinking plenty of fluids (water and an electrolyte replacement drink).

If left untreated, mild cases of heat illness can progress to more serious conditions characterized by:

- Confusion or irritability;

- Nausea/vomiting;
- Weakness;
- Rapid pulse;
- Excessive sweating or hot dry skin;
- Seizures; and
- Fainting or loss of consciousness.

If any of these symptoms are observed, immediately call for medical assistance and administer emergency first aid (Text Box 4).

Text Box 4
Emergency First Aid for Heat Stress

- Lay employee down in a shady, cool area;
- Elevate the feet;
- Remove all outer clothing;
- Pour cool water on employee and vigorously fan to cool; and
- Get employee to a hospital as quickly as possible.

The Onsite Safety Officer must ensure that employees have access to emergency medical services (in a reasonable time frame) including the provision of first aid treatment.[4] If timely access is an issue or the risk of heat stress is significant, emergency medical services (EMTs and an ambulance) must be available at the site. All employees and supervisors must receive information on first aid procedures during physical stress management training (Section 3). These procedures are listed in Appendix G.

7.0 COLD STRESS

Cold stress is the physiological response resulting from the body's or a portion of the body's (such as the hands, feet, head, or limbs) net heat loss and can lead to various injuries or health effects. In cold environments, body energy is used to maintain the internal core (rectal) temperature (99.6°F / 37.6°C). If the core temperature falls due to cold exposure, the body shifts blood circulation from the extremities (hands, feet, arms, and legs) to the core (chest and abdomen) causing exposed extremities to cool rapidly. This increases the risk of developing frostbite and hypothermia, the former of which causes tissue damage (possibly leading to amputation) and the latter of which can be deadly. Where cold water is present, trench foot is another condition that may arise. The symptoms, adverse effects, and first aid procedures associated with trench foot, frostbite, and hypothermia are in Appendix I and Section 7.2. Other hazards associated with cold weather are noted in Text Box 5.

Text Box 5
Other Hazards Associated with Cold Weather

Eye effects. Employees working in a snow- and/or ice-covered terrain may experience adverse eye effects from ultraviolet light and glare (temporary loss of vision and/or conjunctivitis) and blowing ice crystals. This problem can be avoided by providing employees with glacier glasses or snow goggles.

Increased exposure to volatile organic compounds. Cold air is denser than warm air and can cause a modest increase in volatile contaminant concentrations due to evaporation (mass/volume). Working at high altitudes may lead to an increase in respiration rates (due to reduced oxygen levels or increased activity) and cause employees to inhale larger volumes of air and potentially more air contaminants. This issue might affect respiratory protection requirements.

7.1 Assessing the Potential for Cold-Related Hazards

[4] Consult the local emergency medical service provider to determine the typical response time as well as the emergency response equipment available. OSHA states that acceptable response time for administering emergency medical care is based on the severity of potential accidents. For example, a 3- to 4-minute response time (from time of injury to time of administering first aid) is required if possible accidents could result in severe bleeding, suffocation, or other life threatening or permanently disabling injury or illness. A longer response time, such as 15 minutes, is acceptable if a life-threatening or permanently disabling injury is an unlikely outcome of an accident.

There is little risk of cold stress when air temperatures are equal to or greater than 61°F (16°C).[5] When temperatures are below 61°F (16°C), local weather conditions must be monitored to determine the potential for cold-related hazards (Text Box 6). When determining if cold weather poses a hazard consider: (1) air temperature (dry bulb temperature); (2) air velocity; (3) relative humidity; (4) contact with cold water or surfaces; (5) potential for clothes to become wet (rain or snow melt, or from perspiration); and (6) personal factors (e.g., allergies, cardiovascular disease, diabetes, use of drugs that impair thermoregulatory response, and smoking or drinking).

Two tools to aid in protecting employees are:

- **The National Weather Service (NWS)** provides a color-coded windchill chart that shows how rapidly frostbite can occur at different temperatures and wind speeds (see Appendix J).

- **ACGIH** publishes detailed guidelines (reported as TLVs) for protecting workers from cold. The TLVs, based on dry bulb temperatures or the wind chill index (equivalent chill temperatures), help employers recognize and mitigate cold stress. The HSPC (or another designated person) must ensure that cold stress information is available to EPA employees. The ACGIH TLV booklet lists actions to be taken when air and wind chill temperatures fall to specific levels (Appendix J).

Text Box 6
Obtaining Local Weather Information

Local news and the Internet are good sources of weather information for a specific work location. Information on current conditions and short- and long-term forecasts is also available through the National Oceanic and Atmospheric Administration (see http://iwin.nws.noaa.gov/iwin/iwdspg1.html.) In addition, site conditions are usually monitored with a portable weather (meteorological) station. Weather parameters monitored include wind speed, wind direction, atmospheric pressure, air temperature, relative humidity, and others.

7.2 Managing the Risks Associated with Cold Stress

7.2.1 Increasing Preparedness and Raising Awareness

Employees must understand the hazards associated with cold stress before working in a cold environment. These include the symptoms, preventative measures, and first aid procedures for cold-related stress/injury. These topics must be covered in the training program discussed in Section 3. Supervisors must ensure that employees review the key points about cold stress in the Quick Reference Guide (Appendix D) whenever they work at a site where cold stress is a concern.

7.2.2 Engineering/Administrative Controls and PPE to Mitigate Cold Stress

The Onsite Safety Officer is responsible for determining which cold-related controls to employ. Examples of controls and other protective measures include:

- Instructing employees to wear appropriate protective clothing, such as a hat, insulated boots or footwear, and layers of clothing (Appendix K).

- Scheduling the coldest work for the warmest part of the day or for the warmest part of the year if the task does not have to be performed immediately.

[5] The ACGIH TLV Booklet recommends special provisions (e.g., warm air jets, radiant heaters, contact warm plates) for keeping a worker's hands warm if fine work is performed with bare hands for more than 10 to 20 minutes in an environment below 61°F (16°C). For sedentary work, gloves should be used if fine manual dexterity is not required.

- Arranging work to minimize sedentary positions (e.g., sitting and standing) for long periods.
- Keeping the appropriate work rate to preclude heavy perspiration so that clothing does not become wet.
- Providing a warm shelter (if possible) that employees can go to during rest periods.
- Providing warm, sweet (non-caffeinated/non-alcoholic) drinks and soups to maintain energy and fluid levels.
- Providing general or spot heating (such as warm air jets, radiant heaters, or contact warm plates) to increase the temperature at the workplace, especially if employees are required to perform fine work with their hands. If fine work is required for more than 10 to 20 minutes at a time, ACGIH recommends periodic hand warming whenever air temperatures drop below 61°F (16°C).
- Using insulated material on equipment handles (especially metal handles) when temperatures drop below 30°F (-1°C).
- Avoiding the use of unprotected metal chair seats.
- Shielding work areas from windy conditions.
- Implementing a work-rest schedule that reduces the exposure time in the cold environment and/or increases the recovery time spent in warm environments. *(Note: It is important to avoid fatigue since energy is needed to keep the body's muscles warm.)*
- Identifying and medically monitoring employees with high risk factors (e.g., diseases of the nervous system, vascular disease, cold intolerance, or use of drugs that impair thermoregulation).

7.2.3 Symptoms of and Responding to Cold Stress

The Onsite Safety Officer must implement a buddy system in which employees are responsible for observing fellow workers for symptoms of cold stress, especially when the wind chill is 10.4°F (-12°C) or lower. Early symptoms of cold stress include cold hands and other extremities, shivering, and reduced manual dexterity. Treatment for early symptoms of cold stress includes rewarming in a heated shelter or rest area, consuming warm, sweet drinks and soup for fluid replacement and energy, and putting on extra insulating clothing (if inadequate).

If left untreated, early symptoms of cold stress can progress to more serious conditions characterized by:

- Pain in the extremities;
- Severe shivering;
- Fatigue;
- Drowsiness;
- Loss of coordination;
- Slurred speech;
- Unusual behavior (confusion, disorientation, irritability, euphoria, other); and
- Numbness, tingling, stinging, itching, burning, or aching of the hands, feet or other extremities.

If any of these symptoms are observed, immediately call for medical assistance and administer emergency first aid (Text Box 7).

Text Box 7
Emergency First Aid for Cold Stress

- Move employee to a warm area and prevent further cold exposure;
- Handle minimally and gently;
- Remove wet clothes and replace with warm, dry, loose clothing;
- Place copious amounts of insulation (blankets, towels, newspapers, etc.) around the employee to prevent heat loss; and
- Get to a hospital as quickly as possible.

The Onsite Safety Officer must ensure that employees have access to emergency medical services (in a reasonable time frame) including the provision of first aid treatment (see footnote 4, Section 6). If timely access is an issue or the risk of cold stress is significant, emergency medical services (EMTs and an ambulance) must be available at the site. All employees and supervisors must receive information on first aid procedures during physical stress management training (Section 3). Appendix I lists actions that must be taken for trench foot, frostbite, and hypothermia.

8.0 NOISE AND HEARING CONSERVATION

As discussed in Text Box 8, occupational noise exposure can lead to adverse effects including permanent hearing loss. The extent of damage depends primarily on the intensity and the duration of the noise exposure. OSHA's permissible exposure limit (PEL) for occupational noise exposure is an 8-hour time-weighted average (TWA) sound pressure level of 90 decibels measured on the A scale (dBA) (slow response) of a standard sound level meter. (See Appendix C, the Glossary, for a discussion of the frequency weighting network used to measure noise with a sound level meter.) Exposures at and above this level are considered potentially hazardous and an 8-hour TWA of 85 dBA (or, equivalently, a dose of 50 percent) requires participation in a hearing conservation program.

Text Box 8
Adverse Effects Associated with Noise Exposure

Tinnitus is a condition characterized by permanent ringing in the ears.

Temporary hearing loss can result from short-term exposures to noise, but normal hearing returns after a period of rest.

Permanent hearing loss can occur from prolonged exposure to high noise levels.

Noise can create **communication interference**, which makes it difficult for workers to hear verbal communication, alarms, or warning sounds.

Physiological stress reactions, such as a rise in blood pressure, an increase in sweating, and a faster heart rate, can result from exposures to occupational noise.

Hearing threshold shifts might initially be temporary, but may become permanent with prolonged exposures.

The OSHA Noise Exposure standard (29 CFR 1910.95) and SHEM Guideline No. 37 provide information about procedures that must be taken to protect employees from excessive exposure to occupational noise. Whenever employee noise exposures equal or exceed an 8-hour TWA of 85 dBA, the following hearing conservation program elements are required:

- Training (noise hazards, hearing protection, audiometric testing);
- Audiometric testing; and
- Provision for and use of hearing protection.

Because emergency responders might respond to sites where the noise levels exceed 85 dBA, these employees must receive training, audiometric testing, and hearing protectors as required by the OSHA standard and SHEM guidelines. In the field, EPA must monitor noise exposure, implement engineering and administrative controls to reduce noise exposure if necessary, and promote the use of hearing protection if it is infeasible to reduce exposures to acceptable levels.

8.1 Training

Emergency responders must receive annual occupational noise and hearing conversation training. Section 3 of this chapter (which addresses training) presents information about the topics that must be covered.

8.2 Audiometric Testing

As noted in the Medical Surveillance chapter (Chapter I-1 of EPA's Emergency Responder Health and Safety Manual), all emergency responders must receive a medical examination each year, including audiometric testing. The SHEMP Manager must ensure that the audiometric tests are performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a properly trained and certified technician. Requirements that must be met when performing and interpreting audiograms are outlined in Section 1910.95(g) and Appendices C through F of 29 CFR 1910.95. If the examiner determines that an employee has experienced a standard threshold shift (STS), the employee must be notified of this fact in writing within 21 days of the determination and the SHEMP Manager (or another designated person) must perform the follow-up activities listed in Text Box 9.

Text Box 9
Follow-up Procedures if an Employee Experiences a Work-Related Standard Threshold Shift
(from Section 1910.95[g][8] of OSHA's Noise Exposure standard 29 CFR 1910.95)

Unless a physician determines that the STS is not work related or aggravated by occupational noise exposure, the employer must ensure that the following steps are taken when an STS occurs:

•Employees not using hearing protection must be fitted with hearing protection, trained in its use and care, and required to use hearing protection.

•Employees already using hearing protection must be refitted and retrained in its use and provided with hearing protection offering greater attenuation if necessary.

•The employee must be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear is caused or aggravated by wearing hearing protection.

•The employee must be informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protection is suspected.

8.3 Hearing Protection

EPA must provide hearing protection (e.g., ear plugs and ear muffs) to emergency responders. A variety of suitable hearing protection must be made available from which employees can select. The SHEMP Manager (or another designated person) must ensure that employees receive a proper initial fitting, as well as training on how to use and care for their hearing protection. In the field, the Onsite Safety Officer is responsible for ensuring that hearing protection is available on site and that it is worn by:

- Any employee who is subjected to noise exceeding the sound pressure levels listed in Table 2 (see below); or

- Any employee who is exposed to an 8-hour TWA of 85 dBA (or greater) and either (1) has not yet received a baseline audiogram or (2) has already experienced an STS.

To be conservative, until noise monitoring can be performed at a site, assume that hearing protection is required if employees need to raise their voices to be heard, since this could be an indicator that sound pressure levels exceed 85 dBA.

Different hearing protection has different noise reduction ratings (NRRs). The NRR is often printed on the hearing protection package or the manufacturer's Web site. Higher NRRs generally suggest more effective hearing protection than lower NRRs. However, laboratory-obtained real ear attenuation for hearing

protection can seldom be achieved in the workplace. To estimate the adequacy of hearing protection attenuation in the work environment, use a noise dosimeter or sound level meter set to the A-weighting network and:

1. Obtain the employee's A-weighted TWA.
2. Subtract 7 decibels from the NRR and then subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the hearing protection.

If the noise dosimeter does not display the employee's A-weighted TWA, convert the A-weighted dose to a TWA by consulting SHEM Guideline 37, Appendix A or the OSHA Noise Exposure Standard, Appendix A. Other methods for estimating the adequacy of hearing protection attention are listed in SHEM Guideline 37, Appendix B.

When deciding which type of protection is adequate, supervisors must remember that the goal is to reduce exposure to an 8-hour TWA of 90 dBA or less. In the special case of an employee who has experienced hearing loss (recorded as an STS), the goal is to reduce exposure to 85 dBA or less as an 8-hour TWA. Ear plugs or ear muffs are typically adequate for most noise exposure situations encountered by EPA employees. However, some very noisy environments (e.g., an airport flight line) require extra noise attenuation, such as ear plugs plus ear muffs worn simultaneously as "double hearing protection."

8.4 Measuring Noise Exposure Levels

Employees developing a HASP must obtain information in advance about the noise levels and types of equipment at a site, as well as whether emergency responders will be working near noise sources. In the absence of site-specific information, employees making decisions about the need for hearing protection may rely on historic noise exposure information and experiences with similar equipment and working conditions. Once in the field, noise monitoring must be conducted if the Onsite Safety Officer suspects that exposures might be at or above 85 dBA, the level at which two people standing a few feet apart can talk in normal tones. Factors which suggest that noise exposures might be approaching this level include employee complaints about the loudness of noise or noisy conditions which make normal conversation difficult.

There are two basic types of instruments that are commonly used to measure noise exposure: (1) the sound level meter, and (2) the noise dosimeter (see the Glossary, Appendix C, for details). Regardless of which method is used, the Onsite Safety Officer must ensure that all noise measurements are recorded and must use these measurements to determine whether it is necessary to take action to protect employees from potentially damaging noise levels.

8.5 Exposure Limits That Trigger the Need for Protective Measures

OSHA has established guidelines to help determine which noise exposures are permissible and which present a hazard. OSHA's permissible noise exposures (Table 2) indicate how long it is acceptable to be exposed to different sound pressure levels. As noted in Section 1910.95(b)(1) of OSHA's Occupational Noise Exposure standard, when employees are subjected to noise exceeding the sound pressure levels listed in Table 2, employers are required to take action to protect employees, which they can do by implementing administrative/engineering controls or, if such measures are not effective, by instructing employees to wear hearing protection. As a general rule, for every 5 decibel increase in sound level, the allowable amount of time the unprotected employee can spend in that environment is cut in half. The footnote for Table 2 specifies the technique that employers can use to determine whether permissible levels have been exceeded in instances where the daily noise exposure is composed of two or more periods of exposure at different levels.

Table 2
OSHA Sound Pressure Levels and Durations of Work That Must Not Be Exceeded

Sound Pressure Level (decibels on the A-weighted scale)	Duration
80	32 hours
81	28 hours
82	24 hours
83	21 hours
84	18 hours
85	16 hours
86	14 hours
87	12 hours
88	10.5 hours
89	9 hours
90	8 hours
91	7 hours
92	6 hours
93	5 hours
94	4.5 hours
95	4 hours
96	3.5 hours
97	3 hours
98	2.5 hours

Sound Pressure Level (decibels on the A-weighted scale)	Duration
99	2 hours, 18 minutes
100	2 hours
101	1 hour, 42 minutes
102	1 hour, 30 minutes
103	1 hour, 18 minutes
104	1 hour, 6 minutes
105	1 hour
106	52 minutes
107	46 minutes
108	40 minutes
109	34 minutes
110	30 minutes
111	27 minutes
112	23 minutes
113	20 minutes
114	18 minutes
115	15 minutes
118	10 minutes
122	5 minutes

Source: Adapted from Appendix A of OSHA's Occupational Noise Exposure standard.
Note: When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1 + C_2/T_2 + \ldots + C_n/T_n$ exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C_n indicates the total time of exposure at a specified noise level, and T_n indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 decibels peak sound pressure level.

For example, if an employee has a daily noise exposure composed of four periods of noise exposure as follows:

Noise Period	Noise Level	Total Duration of Exposure at the Noise Level (C_n)	Total Duration of Exposure Permitted at the Noise Level (T_n) (from OSHA Table G-16A)
1	80 dBA	1 hour	32 hours
2	90 dBA	5 hours	8 hours
3	95 dBA	1 hour	4 hours
4	100 dBA	1 hour	2 hours

Then $C_1/T_1 + C_2/T_2 + C_3/T_3 + C_4/T_4 = 1/32 + 5/8 + 1/4 + 1/2 = 0.031 + 0.625 + 0.25 + 0.5 = 1.41$
Thus, the combined effect is greater than unity (1) and exceeds the OSHA PEL for a mixed exposure.

8.6 Engineering and Administrative Controls

If noise levels exceed OSHA's permissible levels (Table 2), administrative and/or engineering controls must be implemented to reduce the noise to levels that fall below the ranges listed in Table 2. The Onsite Safety Officer is responsible for determining the engineering and administrative controls that must be employed, incorporating information about these controls into the site-specific HASP, ensuring that the controls are implemented, and performing follow-up monitoring to determine whether the controls have succeeded in reducing noise exposures to permissible levels. If engineering/administrative controls alone do not effectively reduce noise levels, then the Onsite Safety Officer must ensure that emergency responders are using appropriate PPE (i.e., hearing protection) while performing onsite activities. Engineering and administrative controls that reduce noise exposure include:

- Installing sound-dampening materials;
- Installing a muffler;
- Erecting acoustical enclosures and barriers;
- Increasing the distance between employees and noise sources (e.g., placing electric power generators or compressors at a distance from work areas);
- Selecting less noisy equipment when a choice is available;
- Rotating employees who are operating noisy machines;
- Shifting an employee to a less noisy job once daily maximum noise doses have been approached;
- Temporarily powering-down noisy equipment when employees must be in an area;
- Keeping windows and doors closed when noisy outdoor equipment is nearby; and
- Moving unnecessary workers out of areas with high noise operations (e.g., when pressure relief valves are bled).

9.0 VIBRATION

Emergency responders have the potential to suffer adverse effects when operating machinery on the job. EPA's strategy for protecting emergency responders from the adverse effects of vibration includes:

- **Identifying potential vibration hazards.** The SHEMP Manager (or another designated person) must arrange task-specific evaluations of vibration hazards and implement follow-up procedures if necessary. Emergency responders must help identify potential hazards and bring them to management's attention. Additionally, the Removal Manager, SHEMP Manager, and HSPC must review potential sources of vibration as part of the annual program evaluation (Section 13).
- **Minimizing the effects of vibration through the use of engineering and work practice controls, protective equipment, and proper equipment maintenance**. The best engineering control is to isolate the individual from the source of vibration if possible. Purchasing equipment with vibration controls built into the design is an effective solution. Positioning is also important; efforts must be made

to eliminate awkward, asymmetric postures when working with tools, sitting, or standing. Adequate lumbar support, adjustable seat pans, back and arm rests, and other ergonomic modifications also provide better support and reduce vibration. The Onsite Safety Officer must determine which controls need to be applied at a particular site and seek advice from the Removal Manager, SHEMP Manager, or HSPC if assistance is needed in implementing these controls.

10.0 OVEREXERTION INJURIES FROM HEAVY MANUAL LABOR

Heavy manual labor can cause overexertion and the potential for injury. The SHEMP Manager (or another designated person) must ensure that tasks involving heavy manual labor are managed to minimize the opportunity for overexertion. The following procedures will help reduce the risk of injury:

- **Evaluate jobs, processes, and operations for injury potential**. When doing so, assess the three categories of risk factors (Text Box 10) that impact the likelihood of developing injuries.

- **Consider engineering/administrative controls if a job process or operation has the potential to cause overexertion**. Options that could be explored include the use of ergonomically designed tools or administrative controls such as job rotation, work pacing, or additional work breaks. The Onsite Safety Officer must determine which controls are appropriate and seek advice from the Removal Manager, SHEMP Manager, or HSPC if assistance is needed in implementing these controls.

Text Box 10
Risk Factors That Lead to Overexertion Injuries

Personal risk factors are conditions or characteristics of the employee that affect the probability that an overexertion injury may occur. Personal risk factors include age, level of physical conditioning, strength, and medical history.

Environmental risk factors are conditions or characteristics of the external surroundings that affect the probability that an overexertion injury may occur. Environmental risk factors include temperature, lighting, noise, and vibration.

Job-related risk factors are conditions or characteristics of the manual labor that affect the probability that an overexertion injury may occur. Job-related risk factors include weight of the load being moved, location of the load relative to the worker, size and shape of the object moved, and frequency of handling.

11.0 ALTITUDE

Emergency responders may be required to work at high altitudes. Altitude is defined on the following scale of feet above sea level: (1) High (8,000-12,000 feet); (2) Very High (12,000-18,000 feet); and (3) Extreme (18,000+ feet). As altitude increases, atmospheric (barometric) pressure decreases, the partial pressure of oxygen decreases, ultraviolet radiation increases, and the air gets drier and colder (Section 7). As the partial pressure of oxygen decreases there is less oxygen available for the body to use (hypoxia) and a series of physiological effects occur (see Table 3). Normal responses to working at altitude include increased rate and depth of breathing, increased heart rate, shortness of breath on exertion, sleep disturbances with frequent arousals and periodic breathing, and increased urination.

Several altitude-related illnesses can occur when ascending to high altitudes (above 8,000 feet) that range from uncomfortable symptoms to life-threatening conditions and death. The occurrence of these illnesses varies with the rate of ascent, elevation gained, and individual susceptibility. Text Box 11 lists the symptoms of altitude illnesses. If any of these symptoms are observed, immediately call for medical assistance. Emergency medical treatment and decent from altitude may be necessary.

Table 3

Barometric Pressure, Oxygen Partial Pressure, and Equivalent Percent Oxygen Concentration Variation with Altitude and Physiological Effects[a]

Altitude (feet)	Barometric Pressure (torr or mm Hg)	Partial Pressure of Oxygen (pO_2) (torr or mm Hg)	Equivalent Oxygen Concentration (%)	Physiological Effects of pO_2 Levels[b]
0	760	159	20.9	None in healthy adults
1,000	731	153	20.1	
2,000	704	147	19.3	
3,000	677	142	18.7	
4,000	652	137	18	
5,000	627	131	17.2	
6,000	603	126	16.6	Loss of night vision may occur at elevations above 5,000 feet.
7,000	580	121	16	Increased pulmonary ventilation and cardiac output, loss of coordination, and impaired attention and thinking may occur.
8,000	559	117	15.4	Rapid exposure to altitudes over 8,000 feet may cause high altitude sickness (respiratory alkalosis, headache, nausea and vomiting) in unacclimatized individuals. Rapid ascent increases the risk of high altitude pulmonary edema and cerebral edema.
9,000	537	112	14.7	
10,000	517	108	14.2	
11,000	498	104	13.7	Abnormal fatigue on exertion, faulty coordination, impaired judgment, and emotional upset.
12,000	479	100	13.2	
13,000	461	98	12.8	
14,000	443	93	12.2	Impaired respiration, very poor judgment and coordination, and tunnel vision.

[a] The information in Table 3 was adapted from Table F-1 (Barometric Pressure, Oxygen Partial Pressure, and Percent Oxygen Concentration Variation with Altitude and Physiological Effect) in the 2007 ACGIH TLV Booklet.

[b] The approximate physiological effect in healthy adults is influenced by duration of the oxygen deficiency, work rate, breathing rate, temperature, health status, age, and pulmonary acclimatization.

To minimize the effects of working at higher altitudes, emergency responders must allow adequate time for their bodies to adjust or acclimatize to the decreased levels of oxygen. Acclimatization starts at low altitudes and continues to about 18,000 feet, but the process varies widely from one individual to another, both in time and degree. The average time for acclimatization is 3 to 5 days. Previous tolerance to altitude is a good indication of future tolerance; however, some individuals may not be able to acclimatize to altitude at all (e.g., due to preexisting conditions such as asthma, or other lung or heart disease).

Text Box 11
Symptoms of Altitude Illness

- Headache (moderate to severe)
- Loss of coordination
- Confusion
- Weakness/fatigue
- Lack of appetite
- Nausea/vomiting
- Cough (dry or productive)
- Shortness of breath at rest
- Bluish skin color
- Chest tightness or congestion
- Lightheadedness/dizziness

To facilitate the adjustment of working at altitudes, the following guidelines are suggested:

- Ascend gradually (e.g., spend several days at 5,000 feet before ascending to 10,000 feet).[6] If gradual ascent is not possible, rest for 2 days after arrival at altitude (light exercise/no heavy exertion).

[6] Gradual exposure to altitude will allow time for altitude tolerance to develop and reduce the risk of illness. Other

- Sleep at a lower altitude than the workplace, if possible.
- Hydrate before, during, and after work — drink at least 4 to 5 quarts of water a day. Note that heat stress conditions may increase hydration needs (Section 6.2.2).
- Use work/rest cycles with reduced work rates and increased rest periods.
- Avoid salty foods, caffeine, alcohol, tobacco, and depressant drugs (e.g., sleeping pills, narcotics).
- Eat low fat, high carbohydrate meals.

The Onsite Safety Officer and supervisors directly in charge of emergency responders must ensure that employees adhere to the above guidelines when working at high altitudes.

The Onsite Safety Officer must implement a buddy system where employees are responsible for observing fellow workers for symptoms of altitude illness. The Onsite Safety Officer must also ensure that employees have access to emergency medical services in a reasonable time frame (see footnote 4, Section 6). If timely access is an issue or the risk of altitude illness is significant, emergency medical services (EMTs and an ambulance) must be available at the site.

Before working in a high altitude environment, all employees and supervisors must understand the hazards associated with altitude, including the symptoms of altitude illnesses, preventative measures, and emergency medical procedures. These topics must be covered in the training program discussed in Section 3.

Supervisors must ensure that employees review the key points about altitude in the Quick Reference Guide (Appendix D) whenever they work at high altitudes.

12.0 RECORDKEEPING

EPA's recordkeeping goal is to ensure that nationally consistent, readily accessible records are maintained at each EPA organization. Table 4 and Sections 12.1 through 12.5 provide details about the specific recordkeeping procedures that must be followed, who is expected to complete specific forms, and who must retain copies of the records.

guidelines for gradual ascent include: (1) No faster than 1,000 feet per day at altitudes over 9,000 feet with a rest every 2 to 3 days; or (2) a rest day at 8,000 feet, then a rest day for every 2,000 feet of further ascent. [Source: Burr, R.E. Environmental Medicine: Heat, Cold, and Altitude. In Military Preventive Medicine: Mobilization and Deployment, Volume 1 (Section 2, Chapter 19). Borden Institute, Office of The Surgeon General, U.S. Army Medical Department Center & School, U.S. Army, 2003. Page 399.]

Table 4
Recordkeeping Requirements Associated with the Physical Stress Management Program

Required Record	Details/Specified Forms	Completed/Compiled By[a]	Retained By[a]
Training records	Training rosters (see Appendix L)	Course Instructor	SHEMP Manager
	Training certification letters (see Appendix L)	SHEMP Manager	• SHEMP Manager • Employee
Documentation of onsite monitoring	• Noise exposure records • Environmental measurement records (e.g., WBGT readings)	Onsite employees	• OSC • SHEMP Manager
Documentation of onsite medical monitoring	Responder Field Medical Status Form (see Part II of Appendix F)	Medical Monitor (e.g., an EMT, nurse, or a nurse assistant)	SHEMP Manager
Audiometric test results	Audiometric test records	Examiners	SHEMP Manager
OSHA Log	*OSHA 300 Log of Work-Related Injuries and Illnesses*	SHEMP Manager	SHEMP Manager
Injury, Illness, and Near Miss Reporting	*OSHA & EPA 301 Injury, Illness and Near Miss Report*	Supervisors	SHEMP Manager
Physical Stress Management Program Evaluation Form	Checklist (see Appendix M)	SHEMP Manager (plus other relevant stakeholders)	SHEMP Manager

[a] The assignment of recordkeeping responsibilities has been made with regional audiences in mind, and as a result, the positions listed might not be applicable for ERT, NDT, and HQ. Users can adjust the assignments when they go through the process of customizing Appendix A and filling information into the yellow-highlighted spaces that appear throughout Sections 12.1 through 12.5 of this chapter.

12.1 Training Records

Training records must be maintained to document the successful completion of employee training requirements. EPA accepts variation in training record documentation across EPA organizations. An acceptable format is to issue a training certification letter (see Appendix L for a template). If this approach is used, the SHEMP Manager (or another designated person) is responsible for issuing such letters and retaining copies. Emergency responders must also retain copies and ensure that they are available upon request. As an alternative, training rosters (see Appendix L for a template) can be used to document who was in attendance for a particular training course. The roster must be signed by the instructor and retained by the SHEMP Manager (or another designated person). All completed training must be documented in TrainTrax (see Section 5.3 of the manual's Introduction).

12.2 Documenting Environmental Conditions and Noise Exposure Measurements

A variety of field measurements might be taken to determine whether physical stress conditions (e.g., temperature, wind speed, etc.) pose a concern. The Onsite Safety Officer is responsible for ensuring that this monitoring occurs, retaining the monitoring records, and forwarding copies of the records to the SHEMP Manager (or another designated person). SHEM Guideline 37 (Occupational Noise and Hearing Conservation) requires the SHEMP Manager (or another designated person) to maintain records of all employee noise exposure measurements for at least 2 years.

12.3 Documentation of Onsite Medical Monitoring

The Medical Monitor (e.g., an EMT obtained to perform onsite monitoring) must use a form (see Appendix F-2 for a sample) to track employee vital signs in the field when required. Forms must be forwarded to the Onsite Safety Officer, who in turn must submit them to the SHEMP Manager (or another designated person), who will retain copies.

12.4 OSHA Recordkeeping and Reporting

If altitude illness, heat stroke, heat exhaustion, hypothermia, frostbite, or any other injuries, health effects, or near misses associated with physical stresses occur during site work, the employee's immediate supervisor (or another designated person) must complete an *OSHA & EPA 301-Injury, Illness & Near Miss Report* with the employee and forward this information to the SHEMP Manager. The SHEMP Manager is responsible for determining if the injuries or health effects are recordable under the OSHA recordkeeping requirements, and logging recordable cases under section M-6 ("All Other Illnesses") on the *OSHA 300 Log of Work-Related Injuries and Illnesses*. In addition, the SHEMP Manager (or another designated person) is required to record all work-related STS on the OSHA 300 Log. Page 21 of SHEM Guideline 37 (Occupational Noise and Hearing Conservation) summarizes the requirements for reporting STS on the OSHA 300 Log.

12.5 Evaluation Form

As described in Section 13, the SHEMP Manager (or another designated person) must complete the *Physical Stress Management Program Evaluation Form* (Appendix M) annually and retain copies of the completed forms.

13.0 PROGRAM EVALUATIONS

An evaluation of each organization's program must be performed to ensure that EPA's physical stress management program is being implemented properly and performing satisfactorily across the Agency.

13.1 Internal Evaluations

As noted in Section 5.4.1 of the manual's Introduction, EPA's organizations must assess their health and safety programs at least annually. The purpose of the internal evaluation is to ensure that the organization's program is (1) being implemented in accordance with the minimum requirements identified in this chapter, and (2) meeting its ultimate objective to minimize the risk of injuries that result from physical stressors. Appendix M provides a checklist that can be used to assist in evaluating the physical stress management program.

13.2 External Evaluations

Once a year, representatives from the Core ER Audit Team evaluate each EPA organization to examine the elements of the organization's emergency response program, including health and safety and the physical stress management program, to ensure that the program is being implemented in a consistent fashion across the Agency. EPA organizations must provide the Core ER Audit Team members with the information they need to complete their evaluation.

13.3 Field Audits

Field audits must be performed to ensure that the protective measures required in the Agency's health and safety programs are being implemented in the field, including physical stress management. Care must be taken during these audits to ensure that issues related to physical stressors are addressed if such issues are relevant for a particular response action. Section 5.4.2 of the manual's Introduction provides additional information on the intent of the field audits, including the individuals who will be responsible for performing them and the number that must be completed each year.

APPENDIX A

Physical Stress Management Program: Designation of Roles and Responsibilities

A-1 Task Chart for Implementing the Physical Stress Management Program Chapter

A-2 List of Organization Name Emergency Responders

Instructions for Users

Appendix A provides a place for users to insert organization-specific information into the Physical Stress Management chapter. Appendix A-1 presents a list of tasks that must be performed to ensure the smooth operation of a physical stress management program. The tasks are listed in rows. EPA position titles (e.g., the Removal Manager or the Health and Safety Program Contact) are listed in columns. Each task has been assigned to a default position. For some of the tasks, check marks have been placed in two or more columns to indicate that more than one person assumes responsibility for that task. **Please note that users can re-delegate tasks.**

Users must take the following steps to customize Appendix A-1:

- Fill in the background information requested at the top of page A-3. For example, indicate when the table is being updated and who is doing the updating.
- Fill in actual names under the position titles.
- Add columns to include additional key players (if necessary).
- Add rows to the table (if necessary) to provide information about activities that exceed the minimum requirements already included in Appendix A-1. (See Appendix B for a list of your organization's additional policies and procedures related to physical stress management.)
- Determine whether any of the recommended task assignments must be delegated to another person. (If so, move the check marks to re-assign the task.)
- Ensure that each task has been assigned to a specific person.

ATTENTION ERT, NDT, and HQ Users: The tasks and position titles that appear in Appendix A-1 have been written with regional audiences in mind. ERT, NDT, and HQ users should modify the language that appears in the rows and column headers to reflect the needs of their organization.

APPENDIX A-1
Task Chart for Implementing the Physical Stress Management Program Chapter

This table has been customized for: EPA Organization.
Last Updated on: Month Day, Year .
Updated by Name .

ROLES ► / TASKS ▼ / Name of person in role ►	Who is Responsible for Each Task or Action?							
	Removal Manager	**SHEMP Manager**	**Health and Safety Program Contact**	**Lead OSCs/ Onsite Safety Officers**	**Emergency Responders**	**Supervisors**	**Medical Monitors**	**Others**
	(Name)	**(Name)**	**(Name)**	**(Name)**	**(See Appendix A-2)**	**(Name)**	**(Name)**	**(Name)**
General Tasks								
1. Ensure that procedures outlined in the Physical Stress chapter are followed by all responsible parties. Support initiatives that the SHEMP Manager establishes and authorize the use of funds and human resources to support the organization's physical stress management program.	✓							
2. Serve as the organization's technical expert (or assign another person) on physical stressors.		✓						
3. Serve as the organization's contact on physical stress-related issues for EPA's emergency responders. (Facilitate and coordinate communication between managers who administer the organization's physical stress management program and emergency responders who are subject to the program.)			✓					
4. Implement the Physical Stress chapter by: (1) customizing the chapter with organization-specific information, (2) reviewing/updating the customized version annually, and (3) adopting the requirements and practices in the chapter. Post the customized chapter to the manual's Web site and inform stakeholders of its availability.	✓	✓	✓	✓	✓	✓		
Tasks Associated with Physical Stress Management Training (Section 3)								
5. Attend and complete the training modules in EPA's physical stress management program (Table 1).				✓	✓	✓		
6. Prevent employees from working in the field if they have not completed the physical stress management training requirements. Provide the resources (including time and monetary support) needed to ensure successful completion of training courses. If possible, attend the training to demonstrate management's support.	✓							
7. Develop training materials that cover the components listed in Table 1 of this chapter and ensure that training is delivered to emergency responders.		✓	✓					
8. Ensure that training requirements are tracked (Section 5.3 of the manual's Introduction for procedures), and that the Removal Manager is aware of which employees have/have not completed their training requirements.		✓	✓					

ROLES ► / TASKS ▼	Who is Responsible for Each Task or Action?							
	Removal Manager	SHEMP Manager	Health and Safety Program Contact	Lead OSCs/ Onsite Safety Officers	Emergency Responders	Supervisors	Medical Monitors	Others
Name of person in role ►	(Name)	(Name)	(Name)	(Name)	(See Appendix A-2)	(Name)	(Name)	(Name)
Tasks Associated with Medical Surveillance (see Section 4)								
9. Obtain a medical examination and audiometric test.				✓	✓			
10. Ensure that emergency responders receive medical examinations.	✓	✓	✓					
11. Determine whether onsite medical monitoring is necessary (Section 4.2.1). If monitoring is necessary, arrange for a trained Medical Monitor (e.g., an EMT or other trained health care professional) to take vital signs on site.		✓	✓	✓				
12. If onsite medical monitoring is necessary, establish a checkpoint for employees when entering/exiting the work zone and leaving the work site. Take vital signs. Alert employees, their immediate supervisors, and the Onsite Safety Officer if monitoring results suggest an employee is overly taxed (Section 4.2.2).				✓			✓	
13. Ensure that Appendix F-2 of the Physical Stress chapter is given to the Medical Monitor.				✓				
Tasks Associated with Onsite Safety Controls—Addressing Fatigue (Section 5), Heat Stress (Section 6), Cold Stress (Section 7), Noise Stress (Section 8), Vibration (Section 9), Overexertion Due to Heavy Manual Labor (Section 10), and Altitude (Section 11)								
14. Establish reasonable work/rest schedules. (Section 5.1 recommends the 2:1 work/rest ratio, shorter work shifts for long-term or high altitude response activities, and limits on the amount of time employees are allowed to drive.)				✓		✓		
15. Alert the Removal Manager if additional employees are needed to relieve those working on site in order to establish a more reasonable work/rest schedule.				✓				
16. To avoid excessively long shifts, ensure that the appropriate number of employees are provided for response activities.	✓							
17. Determine whether heat stress or cold stress is a concern. Perform environmental monitoring, assess weather conditions, and account for the level of PPE to be worn. Determine administrative controls and work practices to be employed (Section 6.2.2 and Section 7.2.2), incorporate information on these controls into the site-specific HASP, and ensure that the controls are implemented in the field.				✓				
18. Ensure that emergency responders receive initial fitting for their hearing protectors and training on how to use and care for their protectors.		✓						
19. Ensure that hearing protectors are available and being worn if necessary. (See Section 8.3 for additional guidance.)				✓		✓		

ROLES ► / TASKS ▼ / Name of person in role ►	Who is Responsible for Each Task or Action?							
	Removal Manager	**SHEMP Manager**	**Health and Safety Program Contact**	**Lead OSCs/ Onsite Safety Officers**	**Emergency Responders**	**Supervisors**	**Medical Monitors**	**Others**
	(Name)	**(Name)**	**(Name)**	**(Name)**	**(See Appendix A-2)**	**(Name)**	**(Name)**	**(Name)**
20. Ensure that noise monitoring is performed if exposures might be at or above 85 decibels, and use noise measurements to determine whether it is necessary to take action to protect employees from potentially damaging noise levels (Table 2). If a hazard exists, determine the administrative controls and work practices that must be used (Section 8.6), incorporate information on these controls into the site-specific HASP, and ensure that the controls are implemented in the field. If the controls fail to reduce sound levels to "permissible noise exposure" levels, ensure that employees are using hearing protectors that will reduce noise exposure to acceptable levels.				✓				
21. Identify possible vibration hazards in the field and request task-specific evaluations.					✓			
22. Determine the administrative/engineering controls that must be taken to reduce vibrational stress (Section 9) or the risk of an overexertion injury (Section 10). Incorporate information on these controls into the site-specific HASP and ensure that the controls are implemented in the field.				✓				
23. Determine whether high altitude is a concern and the administrative controls and work practices to be employed (Section 11). Incorporate information on these controls into the site-specific HASP and ensure that the controls are implemented in the field.				✓				
24. Upon request, assist the Onsite Safety Officer in determining/implementing work practice, engineering, or administrative controls.		✓	✓					
25. Upon request, perform task-specific evaluations to assess the physical hazards.		✓						
26. Instruct emergency responders to review the Quick Reference Guide (Appendix D).		✓		✓		✓		
27. Ensure that employees have access to emergency medical services in a reasonable time frame.				✓				
28. If signs of physical stress are apparent, take corrective actions and/or provide first aid treatment until the employee can be provided with professional medical care.				✓	✓	✓	✓	
29. Provide technical support to emergency responders to ensure that the HASP addresses physical stress management issues.	✓	✓	✓					
30. Ensure that all physical stress-related components of the HASP are implemented in the field.	✓	✓	✓	✓				
Tasks Associated with Recordkeeping Activities (Section 12)								
31. Use employee training certificates or other forms (e.g., signed training logs) to document training.		✓						
32. Retain training certification letters or other documentation to prove completion of a training requirement.		✓			✓			

ROLES ► / TASKS ▼ / Name of person in role ►	Who is Responsible for Each Task or Action?							
	Removal Manager	**SHEMP Manager**	**Health and Safety Program Contact**	**Lead OSCs/ Onsite Safety Officers**	**Emergency Responders**	**Supervisors**	**Medical Monitors**	**Others**
	(Name)	**(Name)**	**(Name)**	**(Name)**	**(See Appendix A-2)**	**(Name)**	**(Name)**	**(Name)**
33. Ensure that the following records are submitted to the SHEMP Manager (or another designated person): (1) environmental records that document weather conditions, (2) noise exposure records, and (3) onsite medical monitoring records (must be retained in a confidential manner).				✓				
34. Retain copies of environmental monitoring, noise exposure records, and onsite medical monitoring records (must be retained in a confidential manner). Ensure that noise exposure measurement records are retained for at least 2 years.		✓						
35. Record work-related altitude illness, noise injuries, heat stroke, heat exhaustion, hypothermia, frostbite, or other health effects associated with physical stresses on an *OSHA & EPA 301-Injury, Illness & Near Miss Report.*					✓	✓		
36. Forward completed *OSHA & EPA 301-Injury, Illness & Near Miss Reports* to the SHEMP Manager.						✓		
37. Determine if health effects on *OSHA & EPA 301-Injury, Illness & Near Miss Reports* are recordable under OSHA recordkeeping requirements and log recordable cases on the *OSHA 300 Log of Work-Related Injuries and Illnesses.*		✓						
38. Retain completed *Physical Stress Management Program Evaluation Forms.*		✓						
Tasks Associated with Program Evaluations and Field Audits (Section 13)								
39. Perform physical stress internal program evaluations on an annual basis. Complete the *Physical Stress Management Program Evaluation Form* (see Appendix M).	✓	✓	✓					
40. Correct deficiencies identified during internal evaluations. If necessary, request senior management assistance.	✓	✓						
41. Upon request, provide physical stress management program information to Core ER Audit Team representatives for annual health and safety evaluations.	✓	✓	✓	✓				
42. Ensure that physical stress issues are addressed during field audits if relevant.		✓	✓					
Additional Tasks That Reflect Organization-Specific Practices (Appendix B)								

APPENDIX A-2

List of Organization Name Emergency Responders

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APPENDIX B

Physical Stress Management Program: Documentation of Additional Policies and Procedures

The procedures and tasks outlined in the Physical Stress chapter represent the **minimum requirements** that each EPA organization must meet to minimize the hazards associated with physical stressors. If users advocate the use of additional policies and procedures, they must also:

- Add information about additional tasks in the rows that appear at the end of Appendix A-1 and ensure that each task is assigned to a specific individual; and

- Ensure that the additional procedures are mentioned in the main text of the Physical Stress chapter. This can be accomplished by either (1) inserting the additional policies and procedures directly into the relevant portions of the main body of the chapter or (2) adding a sentence within the main text that directs readers to Appendix B for more information.

Topic	**Please document the additional elected policies and procedures required for Organization Name here.**
Section 3 Training	
Section 4 Medical Surveillance	
Section 5 Fatigue	
Section 6 Heat Stress	
Section 7 Cold Stress	
Section 8 Noise and Hearing Conservation	
Section 9 Vibration	
Section 10 Overexertion Injuries from Heavy Manual Labor	
Section 11 Altitude	
Section 12 Recordkeeping	
Section 13 Program Evaluations	
Other topics _____ _____	

APPENDIX C

Glossary

GLOSSARY

Acclimatization
The physiological adaptations the body undergoes in response to new climatic or other environmental conditions such as altitude, temperature, and humidity.

Audiogram
A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

Audiometer
The instrument used for measuring pure tone, air conduction hearing thresholds.

Audiometric tests
Tests conducted with audiometers that usually consist of air conduction, pure tone, and hearing threshold measurements at 500, 1000, 2000, 3000, 4000, and 6000 hertz (Hz). Right and left ears are individually tested.

Decibel (dB)
A convenient means for describing the logarithmic level of sound intensity, sound power, or sound pressure above arbitrarily chosen reference values. A decibel is the logarithm of a ratio (where the ratio of concern is the measured quantity over a reference quantity) and is defined as: dB = 10 log (A/B).

dBA
Sound pressure level in decibels measured with the A-weighting network on a sound level meter. The A-scale or frequency weighting discriminates (attenuates) against very low frequencies (as does the human ear) and is best for measuring general sound levels.

dBC
Sound pressure level in decibels measured with the C-weighting network on a sound level meter. The C-scale discriminates (attenuates) very little against low frequencies.

Dry bulb temperature
The temperature of air as registered by a thermal sensor (such as an ordinary mercury-in-glass thermometer) shielded from direct radiant energy sources.

Electrolytes and electrolyte balance
Electrolytes are chemicals (salts and minerals) in the blood that regulate bodily functions such as muscle contraction, nerve impulse conduction, acid-base balance of the blood, blood clotting, and normal heart rhythm. The body's major electrolytes are sodium, potassium, calcium, magnesium, chloride, bicarbonate, phosphate, and sulfate. Electrolyte balance refers to the equilibrium between the concentrations (normal range) of electrolytes that is necessary for normal health and functioning of the body. Electrolyte imbalance refers to electrolyte concentrations higher or lower than the normal ranges and is commonly caused by loss of body fluids through prolonged vomiting, diarrhea, sweating, or high fever.

Equivalent chill temperature or ECT (also called the windchill index)
To judge the cold hazard of an environment, the combined effect of both low air temperature and wind speed must be taken into consideration because the human body senses cold as a result of both air temperature and wind velocity. The ECT or the wind chill factor is the cooling effect of any combination of temperature and wind velocity or air movement on exposed human skin. This value can be obtained by

consulting an ECT chart (also called the wind chill index) relating the actual dry-bulb air temperature and the wind speed.

Frequency weighting networks (or scales)
Sound level meters (SLM) are normally equipped with three frequency weighting networks or scales, referred to as A, B, and C, because the human ear is not equally responsive to all sound frequencies. The responses of a SLM are modified with the frequency-weighting networks to respond to sound in a manner similar to the human ear response. The human ear is most sensitive in the range 2000 to 5000 Hertz and least sensitive at extremely high and low frequencies. This phenomenon is more pronounced at low sound pressure levels than at high sound pressure levels. The three weighting networks are electronic filters that attenuate sound level as a function of frequency and are the means by which the SLM responds more to some frequencies than to others. The very low frequencies are attenuated or filtered out severely by the A network, moderately by the B network, and minimally by the C network. The A-weighting approximates the ear's response for low-level sound (below 55 dB), is commonly used to measure noise to evaluate its effect on humans, and has been incorporated into many occupational noise standards. The B-weighting is intended to approximate the ear's response for sound pressure levels between 55 and 85 dB, and the C-weighting corresponds to the ear's response level above 85 dB.

Frostbite
Frostbite occurs when there is freezing of the fluids around the cells of body tissues. It usually occurs when temperatures are 28ºF or lower, but wind chill factors can allow frostbite to occur in above freezing temperatures. The most vulnerable parts of the body are the nose, cheeks, ears, fingers, and toes. Damage from frostbite can affect either the outer layers of skin only, or it can include tissue beneath these outer layers. Damage from frostbite can be serious; scarring, tissue death, and amputation are all possibilities, as is permanent loss of movement in the affected parts.

Hand-arm vibration
Hand-arm vibration occurs when segmental vibration is applied locally to the hands and arms from hand-held vibratory tools such as pneumatic impact and rotary tools, gasoline-powered chainsaws, and electronic tools such as grinders. It can affect one or both arms. The predominant health effect is known as hand-arm vibration syndrome—a condition that causes circulatory, sensory, motor, and musculoskeletal disturbances.

Heat strain
The overall physiological response from heat stress which dissipates excess heat from the body and includes an increase in body temperature, heart rate, and sweating. Heat strain is associated with a continuum of heat illness that includes mild illness (heat rash, heat cramps, and heat syncope), heat exhaustion, and heat stroke, the most severe heat disorder that is life-threatening. Heat strain and heat illness will worsen if not recognized and managed early (i.e., mild illness will progress to more serious heat-related disorders).

- ***Heat cramps:*** A mild form of heat injury that occurs after prolonged exposure to heat with profuse perspiration (e.g., due to strenuous activity) and inadequate electrolyte replacement (primarily sodium). The symptoms of heat cramps include spasm and pain in the muscles of the abdomen, arms, legs, hands, and feet.

- ***Heat syncope (fainting):*** Collapse and/or loss of consciousness without an increase in body temperature or cessation of sweating. It occurs during prolonged standing in a hot environment and results from blood pooling in dilated blood vessels in the skin and in the lower part of the body (i.e., inadequate venous blood return to the heart and brain). Heat syncope is treated by having the worker lie

or sit down and is prevented through acclimatization and intermittent activity (moving around) so blood flow to the brain is maintained.

- ***Heat exhaustion:*** A heat-related illness characterized by muscular weakness, distress, nausea, vomiting, dizziness, pale clammy skin, and fainting. It is usually associated with an inadequate water intake, lack of heat acclimatization and physical fitness, and compromised health status (e.g., predisposing medical conditions such as peripheral nerve injuries and chronic illnesses that weaken cardiac output or reduce circulating blood volume).

- ***Heat stroke:*** An acute medical emergency arising from exposure to heat, an excessive rise in body temperature, and failure of the temperature regulating mechanism. Body temperature may rise to 106ºF or higher within 10 to 15 minutes. Heat stroke can cause death or permanent disability if timely emergency treatment is not provided. The symptoms of heat stroke vary but may include an extremely high body temperature (above 103ºF); red, hot, and dry skin (no sweating); rapid, strong pulse; throbbing headache; dizziness; nausea; confusion; and unconsciousness.

Heat stress
The net heat load to which a worker may be exposed, based on a combination of factors including work load, environmental factors (e.g., air temperature and movement, humidity, radiant heat exchange), and clothing.

Hypothermia
A lowering of the core body temperature to 95ºF or below. Hypothermia occurs when body heat is lost faster than it can be replaced. It is most likely to occur at very cold temperatures; but can occur above 40ºF if a person becomes chilled from rain, high wind, perspiration, or submersion in cold water. The warning signs in adults include impaired coordination, cold and pale skin, shivering, exhaustion, confusion, fumbling hands, memory loss, slurred speech, and drowsiness. Below about 86ºF, most victims are unconscious. At 68 to 77ºF, death can result due to heart failure.

Noise dose
The amount of actual exposure relative to the amount of allowable exposure, and for which 100% and above represents exposures that are hazardous. The noise dose is calculated according to the following formulas:

- When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by: D = 100 C/T where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given by Table G-16a in 29 CFR 1910.95, Appendix A.

- When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by:

$$D = [C_1/T_1 + C_2/T_2 + ... + C_n/T_n] \times 100,$$

where C_n indicates the total time of exposure at a specific noise level, and T_n indicates the reference duration for that level as given by Table G-16a in 29 CFR 1910.95, Appendix A.

Noise dosimeter
An instrument (which functions as a "data-logger") that stores sound level measurements and integrates these measurements over time to provide an average noise exposure reading for a given period of time (e.g., an 8-hour workday). The results are presented as a noise dose and/or time-weighted average. A microphone

is attached to a worker's clothing and the exposure measurements are read at the end of the desired time period. Since the dosimeter is worn by a worker, it measures noise levels in all the locations where that specific worker spent time during the period monitored.

Noise reduction rating (NRR)
The noise reduction rating is a single-number attenuation index that represents the overall average noise reduction, in decibels, that a hearing protection device will provide in an environment with a known C-weighted sound level. It is pre-calculated by manufacturers and required by law to be shown on the label of each hearing protector sold in the United States.

Orthostatic vital signs
Orthostatic (tilt or postural) vital signs are serial measurements of blood pressure and pulse that are taken with the patient in the supine, sitting, and standing positions. The results are used to assess possible blood volume depletion and the need for fluid replacement, more extensive testing, or treatment. A sustained drop of 20 mm Hg in systolic blood pressure or a sustained rise of 20 beats per minute in pulse with sitting or standing is a positive test for orthostasis and indicates dehydration or mild shock.

Permissible exposure limit
Permissible exposure limits or PELs are occupational exposure limits for chemical and physical agents established by the Occupational Safety and Health Administration (OSHA). OSHA PELs have the force of law.

Recommended exposure limit
Recommended exposure limits or RELs are occupational exposure limits for chemical and physical agents established by the National Institute for Occupational Safety and Health (NIOSH). RELs are recommended exposure limits and do not have the force of law (unless enacted into law by OSHA or a state with an OSHA-approved job safety and health program).

Sound level meter
A direct-reading electronic instrument that measures sound pressure level. Sound level meters can typically measure overall sound levels (weighted or flat), sound levels in discreet frequency bands, and maximum, minimum, peak, equivalent, and instantaneous sound levels for specific periods of time. These measurements can be used to screen various noise sources to determine which make the most significant contribution to worker exposure. This method is most accurate when the noise levels are relatively constant and workers stay at a constant distance from the noise source.

Standard threshold shift
A change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more at 2000, 3000, and 4000 Hertz (Hz) in either ear.

Threshold limit value
Threshold limit values or TLVs are occupational exposure limits for chemical substances and physical agents established by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs are guidelines to be used by professionals trained in the practice of industrial hygiene and do not have the force of law (unless enacted into law by OSHA or a state with an OSHA-approved and monitored job safety and health program).

Time-weighted average (TWA)
TWA refers to an exposure which has been weighted for a certain time duration. An 8-hour TWA represents the average exposure measured over an 8-hour workday.

Tinnitus
A condition characterized by a sensation of ringing, buzzing, roaring, or other sound in the ears. Tinnitus often occurs in conjunction with hearing loss.

Trench foot
Trench foot or immersion foot is caused by long, continuous exposure to cold without freezing, combined with persistent dampness or actual immersion in water. Symptoms consist of swelling, tingling, itching, burning, and pain. Blistering and ulceration may also occur.

Wet bulb, globe temperature (WBGT)
A composite temperature used to estimate the effect of heat stress. It is influenced by air temperature, humidity, air movement, and radiant heat. WBGT values are calculated using one of the following equations:

With direct exposure to sunlight: $WBGT_{out} = 0.7T_{nwb} + 0.2T_g + 0.1T_{db}$

Without direct exposure to the sun: $WBGT_{in} = 0.7T_{nwb} + 0.3T_g$
where:

T_{nwb} = natural wet bulb temperature (humidity indicator)
The natural wet-bulb temperature is determined with a wet-bulb thermometer (a mercury-in-glass thermometer with the bulb covered with a cloth saturated with water that is exposed to natural air movement and unshielded from radiation) or a standard sling psychrometer or its equivalent. This temperature is influenced by the evaporation rate of water and depends on the amount of water vapor in the air (humidity).

T_g = globe temperature (radiant heat indicator)
The globe temperature is determined with a globe thermometer (a thin-wall, blackened copper sphere with a temperature-sensing device at its center) and is a measure of radiant heat.

T_{db} = dry bulb temperature (normal air temperature)
Dry bulb temperature is temperature determined with an ordinary mercury-in-glass thermometer shielded from direct radiant energy sources.

The WBGT is an index of the environmental contribution to heat stress and is adjusted for the contributions of work demands (light, moderate, heavy, and very heavy work rates) and clothing. The higher the WBGT value the lower the allocation of work (percent work) in the work/rest regimen.

Whole-body vibration
Vibration transmitted to the entire human body through some supporting structure such as a vehicle seat, platform, or building floor. Whole-body vibration can create lower back pain.

Wind chill
See equivalent chill temperature.

APPENDIX D

Quick Reference Guide for EPA Emergency Responders: Physical Stressors

Background Information/Instructions

This appendix summarizes information that emergency responders need to know in the field about the physical stress management program.

The Quick Reference Guide must be incorporated into the organization's Field Guide and distributed to emergency responders, who will be instructed to bring the guide with them into the field (see Section 4.4 of the manual's Introduction for further instructions and the Manual's Web site).

Physical Stress Management
Quick Reference Guide For Emergency Responders in Organization Name

Fatigue (Section 5)

Why Should You Be Concerned?
Fatigue impairs judgment, effects vision, and slows down reflexes. It also enhances the likelihood of auto accidents, which are the number one cause of workplace fatalities.

What Can You Do to Avoid Fatigue?
- Tell your supervisor if you are starting to feel fatigued.
- Avoid large quantities of caffeine and sugary food.
- Get regular exercise.
- Be aware of the following guidelines that exist for establishing a reasonable work/rest schedule:
  - A 16-hour shift is the MAXIMUM that individuals must be allowed to work. Shorter work shifts (8 to 12 hours) must be established during long-term response activities.
  - Individuals must not drive more than11 hours (including time for rest/meal/fuel stops) during a 14-hour work shift. Upon approval of the local SHEMP Manager (or another designated person), the driving guideline may be exceeded provided the employee is driving with a partner (another eligible driver).

Heat Stress (Section 6)

Why Should You Be Concerned?
- Heat stroke can cause renal failure, brain damage, or death.
- Other heat-related illnesses can cause painful cramping or fainting (which can result in dangerous falls).

First Aid Procedures: See Appendix G.

What Can You Do to Avoid Injury?
- ***Increase preparedness***. Participate in a heat acclimatization program and maintain good physical conditioning.
- ***Wear light clothing (if possible)***. Wear light, loose-fitting, breathable clothing (e.g., cotton). Wearing PPE (semi-permeable or impermeable chemical-resistant suits and respirators) dramatically reduces the ability to dissipate excess body heat and increases the risk of heat strain.
- ***Drink plenty of water***. Drink water BEFORE you get thirsty. Drink frequently (beyond your thirst) when you are working in hot places.
- ***Avoid caffeine and alcohol***.
- ***Acknowledge risk factors***. Inform your supervisor of conditions (e.g., hypertension) or medications that decrease your tolerance to heat exposure.
- ***Eat smaller meals*** before work and avoid lots of sugar.
- ***Take frequent breaks in cool shaded areas with moving air***.
- ***Be observant***. Be aware of how your body is reacting and tell your supervisor you need a break if you are uncomfortable. Work in pairs and stay alert for symptoms of heat stress.
- ***Follow appropriate engineering/administrative controls***

Danger Signs for Heat Stress:
- ***Heat stroke***: Symptoms include: internal body temperatures equal to or exceeding 105.8°F (41°C); altered mental status (irritability, confusion, or inability to think coherently); convulsions, seizures; dry, pale skin with no sweating (although sweating does not rule out heat stroke) or hot, red skin that appears sunburned; rapid, weak pulse; and rapid shallow breathing. *Note: If an employee exhibits any of the danger signs of heat stress it is an immediate, life-threatening emergency requiring immediate emergency medical care and hospitalization.*
- ***Other heat illnesses***. Other illnesses (Appendix G) can be a precursor to heat stroke. Symptoms of heat exhaustion (headache, nausea, dizziness, vertigo, tiredness, weakness, thirst, giddiness, profuse perspiration, or pale or flushed, cool, moist, clammy skin), heat syncope (fainting), or heat cramps (painful muscle spasms) need to be treated quickly.

Cold Stress (Section 7)

Why Should You Be Concerned?
- Hypothermia can be fatal.
- Frostbite can result in amputation.

First Aid Procedures: see Appendix I.

What Can You Do to Avoid Injury?
- ***Wear warm clothes***. Wear several loose, warm layers. Wear a hat and insulated footwear. Keep a change of dry clothes available (Appendix K).
- ***Stay dry***. Moisture reduces clothing's insulating value.
- ***Avoid caffeine, alcohol, and smoking***.
- ***Drink plenty of liquids and eat nutritious food***. Drink water or warm, sweet, non-caffeinated, non-alcoholic drinks or soup. (*Note: Dehydration occurs insidiously in cold weather.) Consume warm, high calorie food, such as pasta, to maintain energy reserves.)*
- ***Get rest***. Avoid fatigue since energy is consumed to keep the body warm. Take frequent breaks in a warm setting.
- ***Be observant***. Be aware of how you are reacting to the cold and tell your supervisor you need a break if you are uncomfortable. Work in pairs and stay alert for signs of cold stress in yourself and coworkers.
- ***Acknowledge risk factors***. Older people are not able to generate heat as rapidly as younger people. Certain nervous system and vascular diseases make some people less tolerant to cold stress. Some medications (e.g., antidepressants, sedatives, or tranquilizers) impair thermoregulation.
- ***Follow appropriate engineering/administrative controls***.

Danger Signs for Cold Stress
- ***Hypothermia***: Symptoms include: uncontrollable shivering (might be diminished in older adults); stomping of feet to generate heat; numbness; glassy stare; a puffy or swollen face; apathy, loss of coordination; slurred speech; confusion; loss of logical thinking; loss of consciousness; and pale cold skin that might be marked with irregular blue or pink spots. As body temperature drops, these symptoms worsen and shivering will stop. Employees might be unable to walk or stand. Significant drops in blood pressure, pulse rate, and respiration are possible.
- ***Frostbite***: Affected body parts will get cold, tingling, stinging or aching, and then will turn numb. The skin will turn red, then purple, then white, and will be cold to the touch. Blisters may form in severe cases.

Noise and Hearing Conservation (Section 8)

Why Should You Be Concerned?
Excessive exposure to noise can cause temporary or permanent hearing loss. It can also cause tinnitus (ringing in ears) and more physiologic reactions, such as a rise in blood pressure or a faster heart rate.

What Can You Do to Avoid Injury?
- Participate in an audiometric testing program.
- Wear hearing protection (e.g., ear plugs or muffs or both). Generally, if you need to raise your voice to be heard, you should wear hearing protection. Sound level measurements or noise dosimetry must be performed to show that noise exposure levels are below the action levels.
- Implement engineering/administrative controls if noise levels exceed OSHA's permissible noise levels. Controls include: installing sound-dampening materials or mufflers, erecting acoustical enclosures and barriers, increasing the distance between employees and noise sources, rotating employees who are operating noisy machines, and keeping windows and doors closed when noisy equipment is nearby.

Vibration (Section 9)

Why Should You Be Concerned?
- Hand-arm vibration can cause circulatory, sensory, motor, and musculoskeletal disturbance.
- Whole-body vibration can create lower back pain.

What Can You Do to Avoid Injury?
- Identify tasks that might pose vibrational stress.
- Use equipment that has built-in vibration controls.
- Eliminate awkward, asymmetric postures when working with tools, sitting, or standing.
- Provide adequate lumbar support, adjustable seat pans, back and arm rests, and other ergonomic modifications to better support and reduce vibration.

Overexertion (Section 10)

Why Should You Be Concerned?
Heavy labor can cause overexertion injuries and result in serious and long-lasting adverse health effects.

What Can You Do to Avoid Injury?
- Identify tasks that might exceed your physical capacities.
- Implement engineering and administrative controls, such as work station redesign, tool redesign, job rotation, and work pacing.

Altitude (Section 11)

Why Should You Be Concerned?
- At high altitudes less oxygen is available for the body to use, the air is colder, and ultraviolet radiation is more intense.
- Working at high altitudes has significant effects on physical and psychological performance and causes altitude illness which may be fatal.

What Can You Do to Avoid Altitude Illness?
- Ascend gradually. Spend several days at 5,000 feet before ascending to 10,000 feet. If not possible, rest for 2 days after arrival at altitude.
- Sleep at a lower altitude than the workplace.
- Drink plenty of water before, during, and after work.
- Use reduced work rates and increased rest periods.
- Avoid salty foods, caffeine, alcohol, tobacco, and depressant drugs.
- Eat low fat, high carbohydrate meals.
- Inform your supervisor of conditions (asthma, heart/lung disorders) or medications that decrease your tolerance to high altitudes.
- Be aware of how your body is reacting and tell your supervisor if you are uncomfortable or do not feel well. Work in pairs and stay alert for symptoms of altitude illness (e.g., headache, loss of coordination, confusion, weakness, lack of appetite, nausea, vomiting, shortness of breath, chest tightness, dizziness, bluish skin color).

APPENDIX E

Instructions for Site-Specific HASP Development: Physical Stress Management

Emergency responders can use information from the customized version of their Physical Stress chapter to develop site-specific health and safety plans (HASPs). For example, emergency responders can do the following when developing their HASP:

- **Insert customized versions of the following sections (depending on which physical stressors are a concern at a particular site) into the HASP:**

Appendix A	Physical Stress Management Program: Designation of Roles and Responsibilities
Appendix B	Physical Stress Management Program: Documentation of Additional Policies and Procedures
Appendix D	Quick Reference Guide for EPA Emergency Responders: Physical Stressors
Section 3	Physical Stress Training
Section 4	Medical Surveillance
Appendix F	Tools for the Onsite Medical Monitor
Section 5	Fatigue
Section 6	Heat Stress
Section 7	Cold Stress
Appendix G	Heat Illnesses—Potential Outcomes, Symptoms, and First Aid/Corrective Actions
Appendix H	ACGIH's Heat Stress TLVs
Section 8	Noise and Hearing Conservation
Appendix I	Cold Injury and Illness—Potential Outcomes, Symptoms, and First Aid/Corrective Actions
Appendix J	Recognizing and Mitigating Cold Stress/Cold Hazards
Appendix K	Protective Clothing for Cold Environments
Section 9	Vibration
Section 10	Overexertion Injuries from Heavy Manual Labor
Section 11	Altitude
Section 12	Recordkeeping

Note: These sections might contain more background information than is necessary for a HASP. Thus, emergency responders are encouraged to streamline and edit these sections to meet their needs.

- **Insert additional site-specific information into the HASP**. For example, if emergency responders develop their own program-implementation forms as opposed to using the sample forms included in this chapter, these documents will need to be incorporated into the HASP. Additionally, the HASP needs to include any site-specific procedures that are required to comply with state or local regulations.

APPENDIX F

Tools for the Onsite Medical Monitor

F-1 **Monitoring Vital Signs or Conditions and Identifying When Corrective Action Is Needed**
F-2 **Onsite Medical Monitoring Tracking Form (Sample)**

APPENDIX F-1

Monitoring Vital Signs or Conditions and Identifying When Corrective Action Is Needed[a]

Vital Sign or Condition	Scenarios Where Monitoring Is Warranted	Evaluation Procedures	Decision Criteria/Course of Action
Heart rate (pulse)	Conditions for potential heat stress (regardless of what type of PPE is worn)	*Entry heart rate:* Measure the entry heart rate (radial pulse) before donning PPE. Calculate the worker's maximum heart rate (MHR), where **MHR = 220 - Age**. Then calculate 70% of the MHR. Example: 70% MHR for a 35 year old would be = (220-35) x 0.70 = 130 *(Note: For convenience, the Medical Monitoring Tracking Form (see Part II of Appendix F) lists the average 70% MHR for several age ranges.)*	*Entry heart rate:* If entry heart rate exceeds 70% MHR, the worker must not be allowed to conduct on-scene activities that contribute to physical stress. Or, if the entry heart rate exceeds 110 beats per minute (bpm), shorten the next work period by one third and maintain the same rest period. Adjust work/rest cycles as needed to achieve appropriate vital signs.
		Exit heart rate: Determine the exit heart rate (and measure other vital signs) at the beginning of each rest period and then every 5 or 10 minutes until the heart rate returns to within 10% of entry level.	*Exit heart rate:* If an exit heart rate does not return to within 10 % of the pre-entry level within 10 minutes of stopping activities (and removing PPE), then the worker must receive additional medical evaluation (e.g., orthostatic vital signs). Contact the medical advisor for further guidance. Notify the Onsite Safety Officer of status.
Oral temperature	Conditions for potential heat stress (regardless of what type of PPE is worn)	*Entry temperature:* Measure oral temperature with a clinical thermometer at the beginning and the end of the work. Be aware of the thermometer response time and encourage the worker to avoid talking or opening his or her mouth during the test period. Avoid taking the reading shortly after the worker has consumed fluids. *(Note that recent fluid intake can cause false readings.)*	*Entry temperature:* If the entry oral temperature exceeds 99.5 °F, the worker must not be allowed to conduct on-scene activities that contribute to physical stress.
		Exit temperature: Determine the exit temperature (and measure other vital signs) at the beginning of each rest period.	*Exit temperature:* If exit oral temperature exceeds 99.7°F, shorten the next work cycle by one third and monitor carefully. If the exit oral temperature exceeds 101°F, the worker must receive additional medical evaluation. Contact the medical advisor for further guidance. Notify the Onsite Safety Officer of status.

Vital Sign or Condition	Scenarios Where Monitoring Is Warranted	Evaluation Procedures	Decision Criteria/Course of Action
Respiration rate (breaths/minute)	Level A entry (before and after donning PPE) or other conditions for potential heat stress (regardless of what type of PPE is worn)	*Entry respirations:* Measure the entry respirations before donning PPE. Count breaths for one minute.	*Entry respirations:* If respirations exceed 24 breaths per minute, exclude worker from entry and check other vital signs (heart rate, blood pressure, temperature).
		Exit respirations: Determine the exit respirations at the beginning of each rest period and then every 5 or 10 minutes until the entry rate is re-established.	*Exit respirations:* If an exit respiration rate does not return to within 10% of the pre-entry level within 10 minutes of stopping activities (and removing PPE), the worker must receive more medical evaluation (e.g., orthostatic vital signs). Contact the medical advisor for further guidance. Notify the Onsite Safety Officer of status.
Estimation of fluid loss (weight)	Level A or B entry or other conditions raise concern about the workers' ability to drink adequate hydrating fluids	Weigh the worker at the beginning and end of each work day and before and after each Level A or B entry. To the extent possible, ensure that conditions are similar during the entry and exit measurements.	Weight loss should not exceed 1.5% of total body weight in a work day. If weight loss exceeds this amount, fluid intake should increase (1 cup every 20 minutes). *Immediate steps:* If loss of 3% or less occurs, drink fluid to replenish/maintain hydration. Adjust standard work/rest guidelines, if necessary. If loss is greater than 3%, contact the medical advisor for further guidance. Notify the Onsite Safety Officer of status.
Blood pressure	Level A entry (before and after donning PPE) or other conditions raise concern about the workers' ability to drink adequate hydrating fluids	*Entry blood pressure:* Blood pressure must be taken prior to entry. Record readings in units of millimeters of mercury (mm Hg), with the higher systolic value over the lower diastolic value (e.g., 120/80 mm Hg).	*Entry blood pressure:* If entry diastolic blood pressure (lower number) is above 105 mm-Hg, he or she must be prohibited from donning Level A or B PPE, informed that they are at increased risk of complications associated with hypertension (i.e., heart attack or stroke), and encouraged to seek followup consultation with a doctor.
		Exit blood pressure: Determine the exit blood pressure at the beginning of each rest period and then every 5 or 10 minutes until 10% of the entry rate is re-established.	*Exit blood pressure:* If exit diastolic pressure (lower number) is not within 10 percent of the entry level within 10 minutes, continue taking vital signs every 5 to 10 minutes and consider obtaining orthostatic vital signs. Contact the medical advisor for further guidance. Notify the Onsite Safety Officer of status.

Vital Sign or Condition	Scenarios Where Monitoring Is Warranted	Evaluation Procedures	Decision Criteria/Course of Action
General health (history)	Conditions for heat stress (regardless of what type of PPE is worn)	Talk to the responder and pay attention to both the worker's responses and physical appearance. Ask "How do you feel?" prior to entry; also ask whether the worker has experienced a condition that could affect heat tolerance. Examples of such conditions include: *In past 2 weeks:* a change in prescription medications; *In past 72 hours:* illness (nausea, vomiting, diarrhea, fever, respiratory infection, use of over-the-counter medications (e.g., cold or allergy medications), or heavy alcohol consumption (all of which can cause dehydration); *or* pregnancy; *or* any alcohol consumption within the past 6 hours. For level A or B entry (or other conditions that raise concern about the worker's ability to drink adequate fluids), maintain visual contact with the responder or use the buddy system, particularly in situations where it is difficult to communicate (e.g., when using full-facepiece respirators).	*General health upon entry:* Workers must be excluded from entry if their responses indicate current dizziness, headache, chest pains, poor health, large open sores, or that the person has experienced a condition that could affect heat tolerance (the specific condition need not be indicated). Further medical examination is appropriate. *General health during level A or B entry:* A worker who complains of dizziness, headache, chest pains, nausea, weakness, or shortness of breath, or shows changes in speech or behavior, must immediately have their PPE removed, be decontaminated (if necessary), and be evaluated. *General health upon exit:* Contact the medical advisor if the individual is not alert and oriented, is dizzy, shows signs of slurred speech or weakness, or is not feeling well. The medical advisor will determine the appropriate treatment or action. The Onsite Safety Officer must be notified of the worker's condition.
Recently experienced heat illness	Conditions for heat stress (regardless of what type of PPE is worn)	Determine whether the responder has experienced heat illness in the past 72 hours.	An individual who has experienced heat illness in the past 72 hours must be excluded from additional conditions of heat stress.
Orthostatic (postural) vital signs	This specialty test is performed when exit heart rate and/or blood pressure do not return to within 10% of entry levels within 10 minutes or if fluid loss is greater than 3%	Contact the medical advisor for further guidance when these conditions occur. Orthostatic testing (postural vital signs) can help medical personnel differentiate between certain causes of elevated heart rate and blood pressure. Specifically, a dehydrated person may not have adequate blood volume in the circulatory system to maintain a steady blood pressure with changes in position (supine, sitting, and standing). Obtain orthostatic vital signs by first having the individual lie down for several minutes. Then test the person's heart rate and blood pressure while he or she is lying down and again within 2 minutes of sitting or standing up. Provide support and encourage the person to lie down again if he or she becomes dizzy during the test.	Followup medical attention should be considered (1) if the blood pressure remains elevated or (2) if the following occurs 2 minutes after the person sits or stands up: • the pulse increases 20 beats/minute or more, or • systolic pressure (upper number) decreases by 20 mmHg (compare to the systolic pressure lying down). Increased heart rate and/or decreased systolic blood pressure suggest circulatory fluid levels are not adequate to maintain blood pressure in the standing position (due to the effect of gravity) and the heart may beat faster to compensate. The medical advisor will determine the appropriate treatment or action. The Onsite Safety Officer must be notified of the worker's condition.

[a] When onsite medical monitoring is necessary, the Onsite Safety Officer must establish vital signs checkpoints for employees to pass through before entering the work (hot) zone, after leaving the decontamination (decon) line, and before leaving the work site at the end of the day. Exit checkpoints must be equipped with sufficient hydration supplies (water and sports drinks).

Sources: NFPA 471 (National Fire Protection Association, 2002, *Recommended Practice for Responding to Hazardous Materials Incidents)*, and OSHA TM (OSHA Technical Manual, Section III, Chapter 4.V.E. (TED 01-00-015).

APPENDIX F-2

Onsite Medical Monitoring Tracking Form (Sample)

RESPONDER FIELD MEDICAL STATUS			Vital signs within 10% of entry level?
Incident Location: **Date:**_____	**Hazard: CHEM, BIO, RAD**	**PPE Used:**	
RESPONDER NAME:		**Age:**	
Monitored Signs and Conditions:	**ENTRY** Perform tests within one hour before donning PPE; exclude individual from entry if indicated levels are exceeded.	**EXIT** After removing PPE; repeat tests every 5 to 10 minutes. Perform other tests or treatment if not within 10% of baseline (entry levels) after 10 minutes, or if criteria are exceeded.*	
Monitored By: (Initials)			✓
BLOOD PRESSURE (systolic/diastolic mm-Hg)	**BP =**_____/_____ (Not to exceed 105 diastolic) **Time** _____	**BP =**___/___ **Time** _____ **BP =**___/____ **Time** _____	
RESPIRATION RATE (breaths/minute)	**Respiration rate =**_____ (Not to exceed 24/minute**)** **Time**_____	**Resp =**_____**Time**_____ **Resp =**_____**Time**_____	
HEART RATE (beats/minute) Calculate 70% max =_____ (see next page) 70% maximum=(220-age) x 0.70	**HR =**_____**Time** _____ (Not to exceed 70% of maximum heart rate. Additionally, if HR exceeds 110 beats/minute, shorten the work period.)	**HR =** _____ **Time**_____ **HR =** _____ **Time**_____	
TEMPERATURE (EF, oral)	**Temp=** _____ **Time**_____ 97.0EF minimum 99.5EF maximum at entry	**Temp=**_____ **Time**_____ **Temp=**_____ **Time**_____ If over 99.7EF, shorten next work cycle by one-third. If over 101EF, further medical evaluation is required.	
GENERAL HEALTH (history, "how do you feel?")			
WEIGHT (calculate fluid loss - see next page)	**Pounds =** _____	**Pounds =** ____ >3% change?__ Loss of 3% or more requires further medical evaluation.	
***OTHER:**_____ (orthostatic (postural) vital signs, etc.)	**Notes:**	**Notes:**	
SCBA USE	**On air time**_____ **psi** _____	**Off air time**_____ **psi**_____	

HEART RATE (beats/minute)

Quick Look-up		
Age	**70% MHR**	**85%**
20-25	140	170
25-30	136	165
30-35	132	160
35-40	128	155
40-45	125	152
45-50	122	148

Calculate Responder MHR

(220 - _____) x 0.70 = _____ beats/minute

[age]

ESTIMATE FLUID LOSS

Quick Look-up	
Worker weight	**Fluid loss 3%**
100 lb	3 lb
130 lb	4 lb
170 lb	5 lb
200 lb	6 lb
230 lb	7 lb
270 lb	8 lb

A. ***Calculate responder fluid loss:***

(entry weight) - (exit weight) = loss

_____ - _____ = _____ lbs

[entry weight] [exit weight] [fluid loss]

A

B. ***Calculate 3% of responder's weight:***

(weight) x (3/100) = 3% of total weight

_____ x 0.03 = _____ lbs

[entry weight] **B**

Is responder fluid loss (A) greater than calculated 3% of entry weight (B)?

ADDITIONAL NOTES AND RECORDS:

APPENDIX G

Heat Illnesses—Potential Outcomes, Symptoms, and First Aid/Corrective Actions

Information About Heat Illnesses[a]

Heat Illness	Symptoms	First Aid/Corrective Actions
HEAT FATIGUE is a feeling of weakness brought on by high outdoor temperature. A factor that predisposes an individual to heat fatigue is lack of acclimatization.	• Impaired performance of skilled sensorimotor, mental, or vigilance jobs. • Cool, moist skin. • Weakened pulse. • May feel faint.	Move to a cool area before a more serious heat-related condition develops. Acclimatization and training for work in hot environments is advisable.
HEAT RASHES are the most common problem in hot work environments and are regarded as the least serious of heat illnesses. Prickly heat is the most common form of heat rash. It manifests itself as red papules and appears in areas where the skin is persistently wetted by unevaporated sweat (and is often complicated by wearing PPE). The papules give rise to a prickling sensation as sweating increases. If left untreated, heat rash papules may become infected.	Rash/irritated skin.	Mild drying lotions are usually prescribed to treat heat rash. In addition, the skin must be kept clean in order to prevent infection. May require some time away from tasks requiring the use of PPE.
HEAT SYNCOPE (also known as heat collapse) is characterized by fainting while standing in the heat. The condition is similar to heat exhaustion, except that heat syncope does not affect the body's heat balance. Fainting occurs because blood pools in the extremities and prevents enough oxygen from reaching the brain. The onset of heat collapse is rapid and unpredictable. Preventative measures include acclimatizing workers to hot environments and avoiding static standing positions in the heat.	Fainting.	Treatment for heat syncope includes: • Moving the employee to a cooler area. • Allowing the employee to rest while lying down. • Having employees avoid tasks where they are immobile. Recovery is usually prompt and complete. Employees who experience heat syncope should be evaluated by an occupational medicine physician and be medically cleared before returning to work in an environment with potential heat stress conditions. Employees who are medically cleared to return to work should be acclimatized.

Heat Illness	Symptoms	First Aid/Corrective Actions
HEAT CRAMPS involve painful muscle spasms, typically in the abdomen, arms, or legs. Although less severe than heat stroke or heat exhaustion, heat cramps are often the first signal that a person is having trouble with the heat. The cramps are most often caused by an electrolyte imbalance that results from perspiration without adequate water and electrolyte replenishment.	Painful muscle spasms in the abdomen, arms, or legs.	Treatment includes replacing the loss of fluids and electrolytes from the body. • Give the employee an electrolyte replacement drink (sports drink). Call for immediate medical assistance. • Refusing water, vomiting, and changes in consciousness mean the victim's condition is getting worse. • If vomiting occurs, stop giving fluids and position the victim on his/her side. • Watch for breathing problems. • Keep the victim lying down and continue to cool the body. Place ice packs or cold packs (if available) on each of the victim's wrists and ankles, on the groin, under each armpit, and at the back of the neck. • DO NOT apply rubbing alcohol (isopropyl alcohol). • Exert firm pressure with hands on the cramped muscles or gently massage to help relieve pain.
HEAT EXHAUSTION occurs with excessive water and electrolyte loss, which happens when there is inadequate intake of water and electrolyte replacement to compensate for loss of fluid through perspiration. While this condition responds favorably to prompt treatment, it can progress to heat stroke if left untreated. Heat exhaustion can be accompanied by fainting, which can result in injury or pose a hazard if the victim is operating machinery or involved in an operation that should not be left unattended.	• Headache. • Nausea. • Dizziness, vertigo, and possible fainting. • Tiredness and weakness. • Thirst. • Giddiness. • Profuse perspiration. • Pale or flushed, cool, moist, clammy skin. *Note: Heat exhaustion is distinguished from heat stroke by the presence of normal mental status and by a lower body temperature (below 104°F [40°C].*	This condition requires medical attention. Rapid and preemptive response is necessary to effectively treat employees exhibiting symptoms of heat exhaustion and prevent progression to heat stroke. Immediate steps include: • Moving the employee to a cooler environment. • Laying the employee down and elevating the feet. • Giving the employee sips of water or an electrolyte replacement drink. • Allowing the employee to rest until urine volume/color indicates that the body's water balance has been restored.

Heat Illness	Symptoms	First Aid/Corrective Actions
HEAT STROKE is the most serious heat illness. It occurs when the body's temperature regulation system fails and internal temperature rises to critical levels. Heat stroke is a life-threatening situation that requires immediate emergency medical care and hospitalization. Heat stroke can lead to renal failure, brain damage, or death. The likelihood of heat stroke increases when air temperatures are higher than skin temperature, and when individuals are low on fluids, sleep deprived, unacclimatized to the hot environment, or using certain medications, such as antihistamines, phenothiazine, and cyclic antidepressants. Other risk factors that can increase the likelihood of heat stroke include use of PPE, obesity, febrile illness, skin disorders that affect sweating, alcohol abuse, and a history of previous heat-related illness.	• Altered mental status (e.g., confusion, irritability, irrational behavior, loss of consciousness, or the inability to think coherently) *Note: Altered mental status (caused by heat injury to the brain) distinguishes heat stroke from all other forms of heat-related illness.* • Convulsions/seizures. • Dry, pale skin with no sweating (although sweating does not rule out heat stroke) or hot, red skin that appears sunburned. • Internal body temperatures equal to or exceeding 105.8°F (41°C). • Rapid, weak pulse. • Rapid, shallow breathing.	**CALL FOR AN AMBULANCE**. Heat stroke is a medical emergency that requires immediate emergency medical services. Immediate first aid measures may include: • Rapid cooling by immersion in chilled water with massage or wrapping in wet sheets and vigorous fanning with cool dry air. (Avoid overcooling.) • Treatment for shock if present. .

[a] Most of the information presented in this table was excerpted directly from SHEM Guideline 33 (December 2004).

APPENDIX H

ACGIH's Heat Stress TLVs

ACGIH's Heat Stress TLVs

Background

The heat stress Threshold Limit Values (TLVs) (Table H-1 below) were developed by the American Conference of Governmental Industrial Hygienists (ACGIH) and are expressed as wet bulb globe temperatures (WBGTs) in degrees Celsius (°C). The WBGT is a useful first-order index of the environmental contribution to heat stress and must be adjusted for the contributions of work demands and clothing. The TLVs represent workplace conditions under which it is believed that nearly all adequately hydrated, unmedicated, healthy workers (excluding those wearing clothing ensembles that limit heat loss) may be repeatedly exposed without developing adverse health effects or exceeding a core temperature of 100.4°F (38°C).

WBGT measurements collected in the field are compared to the WBGT screening values listed in Table H-1 to determine whether heat stress conditions pose concern at a particular site. The table accounts for varying levels of work demands (e.g., light to very heavy work, see Table H-2 for details) and heat stress levels considered safe for acclimatized workers (who are accustomed to working in heat) and unacclimatized workers. Correction factors must be applied to the field WBGT measurement to account for different clothing ensembles (see Table H-3 for details). **However, the TLV screening criteria must never be used to guide decisions regarding whether conditions are safe for workers wearing (1) completely encapsulating suits (Level A PPE) or (2) multiple layers or other clothing types where no data are available for heat loss adjustments.** In these situations, assume that individuals wearing this type of clothing are at risk of developing heat-related illness (even when ambient conditions are considered cool) and implement onsite medical monitoring for these workers.

Using the TLV Screening Table (*Note: See page H-5 for an example*)

Step #1: Select the work-rate category from Table H-2.

Step #2: Determine the clothing adjustment factor for the clothing ensemble employees are wearing from Table H-3. (If no value is available in the table for the type of clothing, or encapsulating suits or multiple layers are worn, the TLV screening criteria cannot be used and onsite medical monitoring is required in conjunction with an effective heat stress management program.)

Step #3: Obtain a field WBGT measurement with a portable heat stress monitor (see footnote 3 in Section 6) and adjust the reading for the clothing employees are wearing by adding the clothing adjustment factor to the WBGT reading.

Step #4: Compare the clothing adjusted WBGT measurement to the WBGT value listed in Table H-1 for the work-rest regime that applies to the workers. If the measured WBGT adjusted for clothing is less than the Action Limit, there is little risk of excessive exposure to heat stress. If the value is above the Action Limit, but below the TLV, a heat stress management program must be in place (i.e., heat stress monitoring, appropriate work practices and hydration, medical surveillance, and training for workers and supervisors).

In contrast, if the adjusted field measurement is higher than the TLV in Table H-1, additional measures are required to ensure the safety of workers such as a more detailed analysis of the work task and exposure (consult the ACGIH Documentation of the Threshold Limit Values for Heat Stress and Strain), onsite medical monitoring to assess the degree of heat strain, and job-specific administrative/engineering controls.

Note: Table H-1 is a screening tool. As noted by the ACGIH, it is possible that a condition may be above the TLV or Action Limit criteria provided in Table H-1 and still not represent an exposure above the TLV or the Action Limit. To make this determination, a detailed analysis is required. Methods are fully described in ACGIH's Documentation of the TLV for Heat Stress and Strain, in industrial hygiene and safety books, and in other sources. Further, any time workers report symptoms of heat-related disorders such as fatigue, nausea, dizziness, and lightheadedness, a re-analysis of exposure conditions and controls should be conducted.

Table H-1
Screening Criteria for Heat Stress (WBGT Values in °C)

Work Allocation in an Hourly Cycle of Work and Recovery	TLVs for Acclimatized Workers				Action Limits for Unacclimatized Workers			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75% to 100%	31.0	28.0	--	--	28.0	25.0	--	--
50% to 75%	31.0	29.0	27.5	--	28.5	26.0	24.0	--
25% to 50%	32.0	30.0	29.0	28.0	29.5	27.0	25.5	24.5
0% to 25%	32.5	31.5	30.5	30.0	30.0	29.0	28.0	27.0

Notes to Table H-1:

- Adapted from the 2007 TLVs® and BEIs® Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. American Conference of Governmental Industrial Hygienists, Cincinnati, OH.
- WBGT values are expressed to the nearest 0.5°C.
- If work and rest environments (locations) are different, hourly time-weighted average (TWA) WBGT values should be calculated and used.
- If work demands vary within the hour, hourly time-weighted averages (TWAs) for work rates (Table H-1) should be calculated and used. Note that the metabolic rate for rest is already factored into the screening limits.
- Screening values assume a work-rest regimen of a 5-day workweek and an 8-hour workday with short morning and afternoon breaks (approximately 15 minutes each) and a longer lunch break (30 to 60 minutes). When workdays are extended, consult the ACGIH Documentation of the Threshold Limit Values for Heat Stress and Strain.
- Because of the physiological strain associated with heavy and very heavy work among less fit workers, screening values are not provided for continuous (heavy and very heavy) work, and for up to 25% rest in an hour for very heavy work. As a result, this table must not be used as a screening guide for workers who perform heavy work for more than 45 minutes per hour or very heavy work for more than 30 minutes per hour. Onsite medical monitoring is a better option under such circumstances.

Table H-2
Work Rate Categories

Category	Representative Metabolic Work Rate (Watts)	Example Activities
Rest	115	Sitting.
Light	180	Sitting with light manual work with hands or hands and arms, and driving.
		Standing with some light arm work and occasional walking.
Moderate	300	Sustained moderate hand and arm work, arm and leg work, or arm and trunk work.
		Light pushing and pulling.
		Normal walking.
Heavy	415	Intense arm and trunk work, carrying, shoveling, manual sawing.
		Pushing and pulling heavy loads.
		Walking at a fast pace.
Very Heavy	520	Very intense activity at fast to maximum pace.

Notes to Table H-2:

- Adapted from the 2007 TLVs® and BEIs® Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.
- The effect of body weight on the estimated metabolic rate is determined by multiplying the estimated rate by the ratio of actual body weight divided by 154 lbs (70 kg).

Table H-3
Clothing Adjustment Factors for Some Clothing Ensembles

Clothing Type	Addition to WBGT (°C)
Work clothes (long sleeve shirt and pants)	0
Cloth coveralls (woven material)	0
Polyolefin coveralls	1
SMS (spun bonded-melt blown-spun bonded) polypropylene coveralls	1.5
Double-layer woven clothing	3
Limited-use vapor-barrier coveralls	11

Notes to Table H-3:

- Adapted from the 2007 TLVs® and BEIs® Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.
- The clothing adjustment factors must NOT be used for completely encapsulating suits (Level A PPE) and cannot be added for multiple layers. The use of coveralls assumes that only modesty clothing (underwear) is worn underneath, not a second layer of clothing.
- When clothing adjustment values are not available from Table H-1 or the published literature for the clothing ensemble workers are wearing, onsite medical monitoring is necessary.

EXAMPLE: Using the TLV Screening Table

The Onsite Safety Officer uses a direct reading WBGT meter and obtains a WBGT reading of 23°C. The work plan calls for a worker to perform moderately demanding physical work (walking about with light pushing or lifting) while wearing long-sleeve double layer (woven) coveralls. The worker arrives earlier in the week from a cooler climate, and is not acclimatized.

- Add 3.0 to the WBGT reading to adjust for the heavier clothing ensemble. The clothing adjusted WBGT reading is 23°C + 3.0°C = 26.0°C.

- Consult Table H-1 for unacclimatized workers with a "moderate" work demand. The table includes a WBGT Action Limit of 26.0°C for a maximum work/rest regime of 75 percent work and 25 percent rest every hour (i.e., 45 minutes work and 15 minutes rest in a cool location). If the employee works no longer than 45 minutes of each hour and no harder than the "moderate" physical work load, adverse health effects due to heat stress are unlikely in a healthy hydrated worker. In this example, onsite medical monitoring is probably not necessary unless other factors, such as worker's health status, indicate otherwise.

Later in the day, the same employee switches to light work (standing, taking notes, with some walking about). The WBGT reading remains at 23°C.

- The adjusted WBGT reading is still 26.0°C because the employee's clothing ensemble has not changed.

- The WBGT Action Limits in Table H-1 for an unacclimatized worker performing light work range from 28.0°C to 30.0°C.

- The measured WBGT reading adjusted for clothing is less than the Action Limits for light work. This finding suggests there is little risk of excessive exposure to heat stress.

- With the lighter physical exertion, the WBGT Action Limits indicate the employee can work for the full hour (and for several hours in a row) with no rest period (100 percent work), as long as the employee does not report heat-related symptoms and stays well hydrated.

APPENDIX I

Cold Injury and Illness—Potential Outcomes, Symptoms, and First Aid/Corrective Actions

Information about Cold Injury and Illness[a]

Cold Stress/Injury	Symptoms	First Aid/Corrective Action
TRENCH FOOT is a nonfreezing cold injury and is observed in people whose feet have been wet, but not freezing, for prolonged periods. It is usually associated with restricted circulation (constriction by shoes and clothing).	Symptoms include difficulty walking, numbness, swelling, itching, and tingling/burning pain. Skin color changes from red to pale and mottled, then gray to blue. Blistering, skin sores, and infection may occur.	• Prevent further exposure. • Remove wet, constrictive clothing. • Air-dry feet, no immersion in water. • Re-warm passively at room temperature. • No massaging or rubbing (may worsen the injury). • Elevate, wrap in dry, loose dressing. • Do not walk on injured feet. • Obtain medical evaluation and treatment.
FROSTBITE occurs when the skin freezes and loses water. Frostbite typically affects the extremities, particularly the feet, hands, nose, cheeks, and ears. Frostbite damage can result in scarring, tissue death, and loss of movement in the affected parts. In severe cases, amputation of the frostbitten area may be required. Frostbite usually occurs when temperatures are 28°F or lower, but wind chill factors can allow frostbite to occur in above freezing temperatures.	• The symptoms of frostbite include coldness, numbness, tingling, stinging, pain, blisters, and skin color changes to white or grayish-yellow, then to reddish-violet, and finally to black as the tissue dies. • When frostbite of the outer layer of skin occurs, the skin has a waxy or whitish look and is firm to the touch (the tissue underneath is still resilient). • In cases of deep frostbite, the tissues are cold, pale, and solid. Injury is severe.	Frostbite victims must receive medical attention as soon as possible. In the interim, victims must be brought into a warm area and given a warm non-alcoholic drink. Do NOT leave the victim alone. Do NOT rub the affected area in an effort to warm the frostbitten areas. As an alternative, wrap the area in a soft cloth. If help is delayed, rewarm the affected area by immersing it in warm (NOT hot) water that is slightly above body temperature (no hotter than 105°F [39°C]). Do NOT pour water on the affected part. Also, do not go through the process of rewarming an area if there is a possibility that it will get cold again. Warming and recooling will cause severe/permanent tissue damage.

Cold Stress/Injury	Symptoms	First Aid/Corrective Action
HYPOTHERMIA is a potentially life-threatening health condition that arises when body heat is lost faster than it can be replaced. Initial symptoms usually appear when the body temperature drops to around 95°F (36°C). Severe hypothermia develops when the body's temperature drops to around 82°F (28.0°C). Death is likely if the body's temperature drops below 78°F (25.5°C). The risk factors for hypothermia are: • Exhaustion; • Immobilization; • Injury or entrapment; • Use of alcohol or other substances that impair judgment; • Inadequate protective clothing; and • Drugs that impair thermoregulatory response.	• Symptoms include uncontrollable shivering (although the shivering response might be diminished in older adults), stomping of feet to generate heat, numbness, glassy stare, a puffy or swollen face, apathy, loss of coordination (e.g., fumbling items in one's hand), slurred speech, lethargy, confusion, a loss of logical thinking, and loss of consciousness. Also, the skin will likely be pale and cold and it might have large irregular blue or pink spots. • As body temperature falls, the above symptoms worsen and shivering may stop and workers may be unable to walk or stand. • If hypothermia progresses, significant drops in blood pressure, pulse rate, and respiration may result.	For **mild hypothermia** (core temperature 90°F - 95°F): • Move to a warm area and stay active. • Remove wet clothes; replace with dry clothes or blankets. • Cover the head. • Provide a warm (not hot) sugary drink to promote metabolism and assist in raising the internal core temperature. Avoid drinks with caffeine. For **moderate** (core temperature 82°F - 90°F) to **severe hypothermia** (core temperature below 82°F): • Immediate hospital treatment is required. Activate emergency medical services. • Handle the worker minimally and gently. • Move to a warm place and remove wet clothes. • Place copious amounts of insulation (blankets, towels, pillows, scarves, newspapers, etc.) around the worker to prevent heat loss. • Do not raise the feet. • Do not apply external heat to re-warm. If the worker is in the water and unable to exit, secure collars, belts, hoods, etc. in an attempt to maintain warmer water against the body. Move all extremities as close to the torso as possible to conserve body heat.

[a] Much of the information presented in this table was obtained from SHEM Guideline 33 (December 2004).

APPENDIX J

Recognizing and Mitigating Cold Stress/Cold Hazards

Recognizing and Mitigating Cold Stress/Cold Hazards

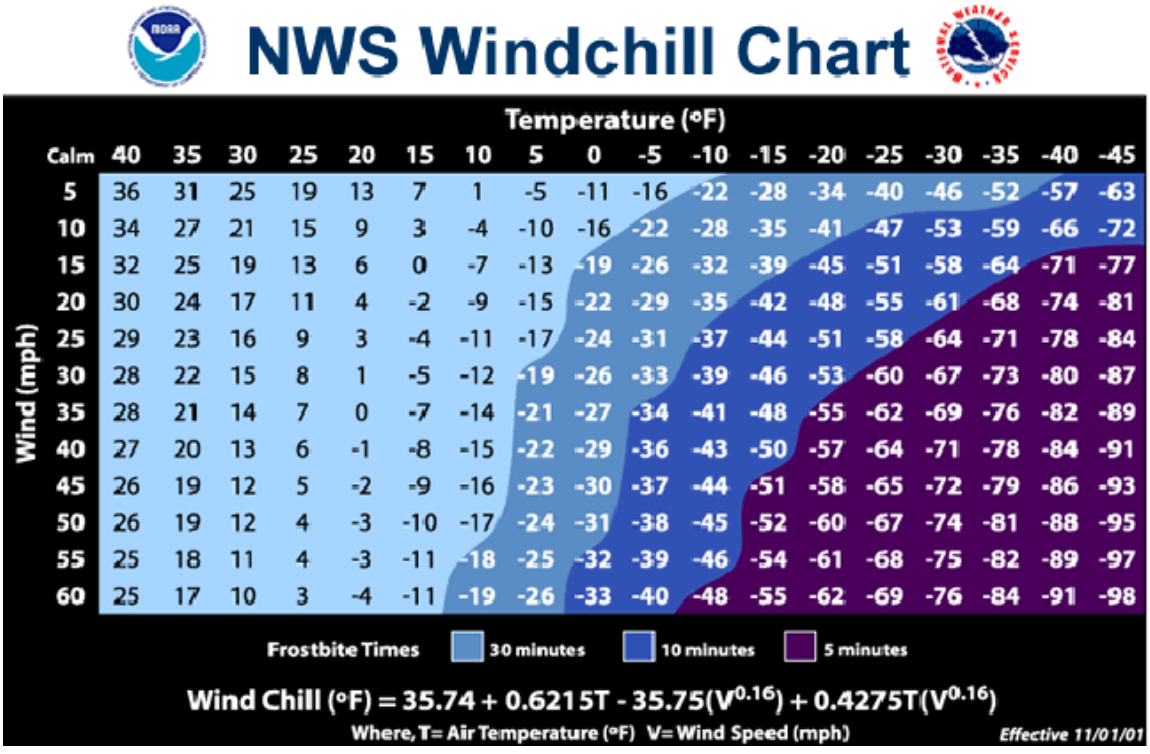
Introduction

Two tools that EPA managers can use to help assess cold weather conditions and make decisions about how to protect employees are available through:

- The National Oceanic and Atmospheric Administration's (NOAA's) National Weather Service (NWS), and
- The American Conference of Governmental Industrial Hygienists (ACGIH).

The NWS Windchill Chart

NOAA's most recent NWS Windchill Chart is presented below. It was created in 2001 and is considered more accurate than earlier windchill charts because it uses the human face as a model, is based on modern heat transfer theory (which describes the physics of heat loss from the body to its surroundings on cold and breezy days), and it uses wind speed calculated at the average height of the human face (5 feet) instead of at 33 feet (the standard anemometer height).The chart describes the relationship between air temperature, wind speed, and the combined effect these factors have on the human body. It indicates exposure times within which frostbite is likely to occur to exposed skin. The likelihood of frostbite increases as temperatures decrease and wind speeds increase. At higher wind speeds the air removes heat faster than a person's metabolism and circulatory system replace it, resulting in conditions that can cause or promote frostbite. More information about wind chill, including an online windchill calculator is available at http://www.crh.noaa.gov/fsd/winter/windchill.php.



ACGIH's TLVs for Cold Stress

ACGIH publishes detailed guidelines (reported as TLVs) to protect workers from adverse health effects due to cold. Some of the guidelines are based on dry bulb temperature and others are based on the wind chill index (equivalent chill temperatures or ECTs), which accounts for the combined effect of temperature and wind speed. The objective of the guidelines is the recognition of situations that could (1) reduce an employee's core temperature below 96.8°F or (2) allow tissue to freeze.

The guidelines are presented in ACGIH's TLV booklet,[7] which the Health and Safety Program Contact (or another designated person) should make available to EPA employees. The booklet presents:

- A chart that indicates how quickly frostbite sets in under different ECTs. Like the NWS Windchill Chart, the ACGIH ECT chart can be used to determine the level of danger associated with different combinations of air temperature and wind speed. It is important to note, however, that the NWS Windchill Chart may be a more accurate representation of the effective relationship between cold and wind on humans. Nevertheless, ACGIH's TLVs offer valuable advice for safety managers because (as described below) the booklet links specific mitigation actions to specific ECTs, a feature that can be particularly useful in providing insight into the actions that are required to protect workers under different scenarios.

- A table that identifies work/warm-up schedules for properly clothed workers for 4-hour periods of work at temperatures below freezing and provides insight on how long people can be exposed to varying levels of cold weather before they should be sent into a sheltered environment to warm up.

- A list of recommended actions to take when air temperatures or ECTs fall to certain levels (see below).

Examples of ACGIH Cold Stress Recommendations in the TLV Booklet[a]

TLV	Action[b]
Air temperature is less than 60.8°F (16°C)	• Measure air temperature regularly to ensure adequate information for decisionmakers. • Warm hands if "fine" work is required for more than 10 to 20 minutes at a time. Warm air jets, radiant heaters, or contact warm plates could be used. If fine manual dexterity is not required but the worker is sedentary, ensure that the worker is using gloves.
Air temperature is less than or equal to 39.2°F (4°C)	Workers must wear protective clothing appropriate for the temperature, wind, and level of physical activity (e.g., provide gloves for workers performing light work at 39.2°F). Provide auxiliary heat when exposed areas of the body cannot be protected from a sensation of excessive cold or frostbite.
Air temperature is less than or equal to 35.6°F (2°C)	Workers who become immersed in water or whose clothing becomes wet must immediately change clothing and potentially be treated for hypothermia.

[1] *TLVs7 and BEIs7 Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices.* The ACGIH TLV booklet is published on an annual basis and may be obtained from the American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Drive, Cincinnati, Ohio 45240-4148. Telephone: 513-742-2020; Web site: http://www.acgih.org.

TLV	Action[b]
Air temperature is less than or equal to 30.2°F (-1°C)	• Measure and record both the dry bulb (air) temperature and the wind speed at least every 4 hours, and determine the ECT (windchill temperature) for each set of readings. • Ensure that metal tool handles and control bars are covered by insulating material. • Prevent workers affected by diseases or medications that interfere with normal body temperature regulation from working in the field.
Air temperature is less than or equal to 0°F (-17.5°C)	• Protect hands with mittens (rather than gloves). Machine controls and tools should be designed so that they can be operated without removing the mittens. • If wind speeds exceed 5 mph obtain a statement of medical qualification for any employee who routinely works under these conditions.
Air temperature is less than or equal to -11.2°F (-24°C) and wind speeds less than 5 mph	Obtain a statement of medical qualification for any employee who routinely works under these conditions.
ECT is less than or equal to 19.4°F (-7°C)	• The risk of injury from cold is moderate. • Record ECT (windchill temperature) along with the air temperature and wind speed. • If work is continuous, provide heated warming shelters (tents, cabins, restrooms) and ensure workers are well hydrated and nourished (avoiding diuretics such as coffee).
ECT is less than or equal to 10.4°F (-12°C)	• The risk of injury from cold is high. • Use the buddy system or visually supervise workers. • Manage work to avoid wet clothing (including wet clothing caused by heavy sweating), allow drying or changing frequently if clothes become wet. • Minimize sitting or standing still for long periods of time. • Avoid requiring newly arrived employees to work full time in the cold during their initial days onsite (e.g., alternate work and warming periods until employees are acclimated to working conditions). • Instruct employees in safety and health procedures for cold stress (e.g., at the safety meeting at the beginning of each work shift).
ECT is less than or equal to 25.6°F (-32°C)	Do not allow continuous exposure.

[a] Not a comprehensive list of ACGIH cold stress recommendations.

[b] Some of the language presented in this column has been streamlined from that which appears in ACGIH's TLV Booklet.

APPENDIX K

Protective Clothing for Cold Environments

Protective Clothing for Cold Environments

General Guidelines[8]

- Wear **layers** of clothing to insulate the body.
- Wear an **outer** layer to break the wind and allow some ventilation. The exterior shell layer should be windproof and preferably waterproof. Outer garments made of high-tech synthetic fabrics are windproof, moisture/water repellant or resistant, abrasion resistant, breathable, strong, soft, quick drying, and/or light-weight.
- Wear a **middle** layer of down or wool to absorb perspiration and provide insulation even when wet (such as wool sweaters, pants, or a down jacket). Avoid jeans and corduroys. Clothing made of synthetic materials is quick-drying, exceptionally warm (wet or dry), and/or warmer per pound than wool.
- Wear an **inner** layer of cotton or synthetic weave to allow ventilation. Undergarments should supply the worker with basic insulation and pull moisture away from the skin. Natural fibers, such as cotton, wool, or silk, can be quite warm and are sufficient for light activities. For heavier work activities, synthetic fabrics (e.g., polypropylene, treated polyester) absorb less moisture and carry water droplets away from the skin.
- Be aware that the type of fabric you choose for clothing is important. For example, cotton loses its insulation value when it becomes wet, but wool does not. Also be aware that the best combination of clothing to wear might differ depending on the specific cold stress situation.
- Wear a hat, insulated head covering under a hard hat, insulated hood, or headband for head protection and a neck gaiter or scarf to protect the neck.
- Wear insulated socks, boots, or other footwear.
- Keep a change of dry clothing available in case work clothes become wet.
- Do not wear tight clothing. Loose clothing allows better ventilation. Caution: loose clothing could get caught in tools or machinery.

[8] Source: SHEM Guideline 33 (December 2004).

APPENDIX L

Examples of Training Documentation

L-1 **Training Certification Letter**
L-2 **Training Roster**

APPENDIX L-1

Training Certification Letter

U.S. Environmental Protection Agency (EPA)
Name of EPA Organization
Street Address
City, State, and Zip Code

Date: _____

SUBJECT: Documentation of Completion of the _____ Course

To:	
(Name of Trainee)	(Job Title)
From:	
(Name of Person Issuing this Letter)	(Job Title)

This letter documents that (Name of Trainee) has participated in the following training:

Course Name:
Course Location:
Course Date:
Name of Instructor:
Instructor's
Qualifications:
Topics Covered:

APPENDIX L-2

TRAINING ROSTER
PHYSICAL STRESS TRAINING

Course name: _____

Course location: _____

Course date: _____

Name of instructor: _____

Instructor's qualifications: _____

Topics addressed: _____

Name of Attendee (print)		Phone Number

Signature of Instructor: _____ Date: _____

APPENDIX M

Physical Stress Management Program Evaluation Form

PHYSICAL STRESS MANAGEMENT PROGRAM EVALUATION FORM

This audit form has been filled out for: Organization Name
Date of review: _____
Name of reviewer: _____ Phone number: _____

REVIEW CRITERIA	COMPLIANT		
	Yes	No	N/A
General			
1. The Removal Manager, Health and Safety Program Contact (HSPC), SHEMP Manager, and other relevant stakeholders have met to customize the Physical Stress Management chapter and have assigned roles and responsibilities to specific individuals. They have also posted the customized chapter to the manual's Web site and informed all relevant stakeholders of its availability.			
2. Annual meetings are held to review and update the customized version of the Physical Stress Management chapter.			
Physical Stress Training (Section 3.0)			
3. All emergency responders receive physical stress training initially upon employment and annually thereafter for heat stress, cold stress, and hearing conservation, and as needed for all other modules of the physical stress training program.			
4. Training is tracked and documented.			
5. The Removal Manager is informed of employees who have/have not completed their training requirements.			
6. Adequate resources are available for the preparation and completion of the physical stress training modules.			
7. Employees who have not completed their training requirements are prevented from working in the field.			
8. The Removal Manager attends training sessions to demonstrate management's support of the physical stress management program.			
9. Supervisors ensure that employees review the physical stress Quick Reference Guide whenever they work at a site where physical stresses are a concern.			
Medical Surveillance (Section 4.0)			
10. All emergency responders receive annual medical examinations.			
11. Onsite medical monitoring (e.g., blood pressure and heart rate measurements) is performed whenever high air temperatures, high humidity, PPE, strenuous physical activities, or a combination of these factors increase the potential for a heat-related injury.			
12. Onsite medical monitoring is always performed (regardless of what environmental conditions exist) when employees wear Level A PPE.			
13. All Medical Monitors are trained to measure and interpret vital signs, recognize symptoms of heat illness, and monitor work/rest cycles.			
14. When onsite medical monitoring is necessary, vital signs checkpoints are established for employees to pass through before entering the work (hot) zone, after leaving the decontamination (decon) line, and before leaving the worksite at the end of the work shift.			
15. Medical Monitors communicate information regarding overly stressed employees to the employees and the Onsite Safety Officer, or to the employees' supervisors with recommended corrective action.			
16. When timely access to emergency medical services is an issue or the risk of physical stress effects (e.g., heat stress, cold stress, altitude illness) is significant, emergency medical services (EMTs and an ambulance) are available at the field site.			
Fatigue (Section 5.0)			

REVIEW CRITERIA	COMPLIANT		
	Yes	No	N/A
17. Supervisors follow the 2:1 work/rest ratio to establish work/rest schedules (i.e., a 16-hour work shift is the maximum that individuals typically are allowed to work).			
18. Shorter work shifts (8 to 12 hours or less) are established during long-term or high altitude response activities.			
19. Seven-day work-week schedules are avoided.			
20. Emergency responders do not exceed 11 hours behind the wheel during a 14-hour work shift.			
21. Allowable driving time is shorter (less than 11 hours) when employees have already been working in the field (i.e., 14 hours minus hours already worked).			
22. Nonessential tasks are reduced for emergency responders who work long or physically demanding shifts.			
23. Good nutrition and exercise are promoted.			
24. Employees are encouraged to alert their supervisors if they feel overly fatigued.			
25. Emergency responders work in pairs or teams and observe each other for symptoms of physical stress (e.g., fatigue, heat stress, cold stress, and altitude illness).			
26. Onsite Safety Officers and supervisors ensure that emergency responders adhere to EPA guidelines to minimize fatigue.			
Heat Stress (Section 6.0)			
27. The HSPC maintains the most recent edition of the ACGIH TLV Booklet and makes the heat stress and strain information available to emergency responders.			
28. Onsite Safety Officers assess heat stress conditions by considering environmental factors, clothing and work demand levels, and personal factors.			
29. Properly calibrated and maintained portable heat stress monitors are available to emergency responders.			
30. Environmental monitoring is performed to determine WBGT readings and the results are compared to ACGIH's screening criteria for heat stress.			
31. Heat acclimatization programs are implemented before emergency responders go into the field whenever possible.			
32. Heat stress controls (engineering, administrative, PPE) are incorporated into site-specific HASPs and implemented in the field.			
33. Adequate amounts of cool potable water and electrolyte replacement drinks are available in the field.			
Cold Stress (Section 7.0)			
34. The HSPC maintains the most recent edition of the ACGIH TLV Booklet and makes the cold stress information available to emergency responders.			
34. Onsite Safety Officers assess cold stress conditions by considering environmental factors, contact with cold water or surfaces, the potential for clothing to become wet, and personal factors.			
35. Local weather conditions are monitored in the field to determine the potential for cold-related hazards.			
36. The NWS windchill chart and/or ACGIH cold stress TLVs are used to protect emergency responders from cold-related hazards.			
37. Cold stress controls (engineering, administrative, PPE) are incorporated into site-specific HASPS and implemented in the field.			
38. Adequate provisions and supplies for working in cold environments are available in the field (e.g., warming shelters, general or spot heating, and hydration supplies).			
Noise and Hearing Conservation (Section 8.0)			
39. All emergency responders receive annual audiograms in accordance with the OSHA Noise standard.			

REVIEW CRITERIA	COMPLIANT		
	Yes	No	N/A
40. Employees that experience a standard threshold shift are notified within 21 days of the determination and the SHEMP Manager performs the follow-up activities required by the OSHA Noise standard.			
41. A variety of suitable hearing protection is available and employees receive proper initial fitting and training on the use and care of their hearing protection.			
42. Onsite Safety Officers ensure that hearing protection is worn by employees according to the requirements of the OSHA Noise standard.			
43. The adequacy of hearing protection attenuation is estimated by obtaining the employee's A-weighted TWA, subtracting 7 decibels from the NRR and then subtracting the remainder (of the NRR) from the TWA to obtain the estimated A-weighted TWA under the hearing protection.			
44. Noise monitoring is conducted in the field whenever exposures might be at or above 85 dBA.			
45. Properly calibrated and maintained noise monitoring equipment is available to emergency responders.			
46. All noise measurements are documented and the information is used to take action to protect employees from elevated noise levels.			
47. When noise levels exceed OSHA's permissible levels, administrative and/or engineering controls are incorporated into site-specific HASPs and implemented to reduce the noise to acceptable levels.			
48. When administrative and/or engineering controls are implemented, follow-up noise monitoring is performed to determine whether the controls have succeeded in reducing noise exposures to permissible levels.			
49. Adequate noise control materials and supplies are available in the field when needed (e.g., sound-dampening materials, acoustical enclosures and barriers).			
Vibration (Section 9.0)			
50. Task-specific evaluations of vibration hazards are conducted and follow-up procedures are implemented if necessary.			
51. Emergency responders assist in identifying potential vibration hazards in the field.			
52. The Removal Manager, SHEMP Manager, and HSPC review potential sources of vibration during the annual program evaluation.			
53. Appropriate controls (e.g., engineering, work practice, PPE, equipment maintenance) are implemented to minimize vibration hazards.			
Overexertion Injuries from Heavy Manual Labor (Section 10.0)			
54. Tasks involving heavy manual labor are managed to minimize overexertion injuries.			
55. Jobs, processes, and operations are evaluated for manual labor injury potential by assessing personal, environmental, and job-related risk factors.			
56. Appropriate controls (engineering, administrative) are implemented to minimize overexertion injuries.			
Altitude (Section 11.0)			
57. Emergency responders allow adequate time for their bodies to adjust to decreased levels of oxygen at high altitudes.			
58. Onsite Safety Officers and supervisors ensure that employees adhere to EPA guidelines for working at altitudes.			
Recordkeeping (Section 12.0)			
59. Training documentation (certification letters, training rosters) is issued to employees and maintained by the SHEMP Manager.			
60. Emergency responders retain copies of their training documentation and make it available upon request.			
61. Physical stress monitoring records (e.g., WBGT, wind speed, temperature, noise) are retained by Onsite Safety Officers and the SHEMP Manager.			

REVIEW CRITERIA	COMPLIANT		
	Yes	No	N/A
62. Medical Monitors use Appendix F-1 to track employee vital signs and forward completed forms to the Onsite Safety Officers, who in turn submit the forms to the SHEMP Manager.			
63. Onsite medical monitoring documentation (Appendix F-2) is maintained by the SHEMP Manager.			
64. *OSHA & EPA 301-Injury, Illness & Near Miss Reports* are completed by employees and their supervisors when a physical stress injury, illness, or near miss occurs and forwarded (by supervisors) to the SHEMP Manager.			
65. The SHEMP Manager reviews all *OSHA & EPA 301-Injury, Illness & Near Miss Reports* and logs recordable physical stress cases on the *OSHA 300 Log of Work-Related Injuries and Illnesses* under section M-6 ("All Other Illnesses").			
66. All work-related standard threshold shifts are recorded on the *OSHA 300 Log of Work-Related Injuries and Illnesses.*			
67. The SHEMP Manager completes the *Physical Stress Management Program Evaluation Form* on an annual basis and retains copies of the completed forms.			

Notice of Findings:

RST 2 FLD 43A ANIMALS

Animals represent hazards because of their poisons or venoms, size and aggressiveness, diseases transmitted, or the insects they may carry.

Feral Animals

Landfills and abandoned buildings often attract stray or abandoned dogs. These animals often become pack-oriented, very aggressive, and represent serious risk of harm to unprotected workers.

Workers entering abandoned buildings should be alert for such animals and avoid approaching them since this may provoke aggressive behavior. Avoidance and protection protocols include watching for animal dens, using good housekeeping, and using repellents.

Dangerous Wild Animals

Work in remote areas inhabited by wild animals that have been known to cause injury and kill human beings, requires that companies working in these areas carefully plan for wildlife encounters. This FLD outlines actions that, when properly implemented, should provide a high degree of protection for WESTON employees and wildlife.

See Wildlife Hazard Recognition and Protection Procedure (Attached).

Venomous Snakes and Lizards

Venomous Snakes

Venomous snakes are common around the world. The major variables are the likelihood of encounter and the snake that is likely to be encountered. Encounters with snakes may be caused by moving containers, reaching into holes, or just walking through high grass, swampy areas, or rocks. **Do not attempt to catch any snakes.**

Symptom of venomous snake bites:

- Bloody wound discharge, blurred vision, burning, convulsions, diarrhea, dizziness, excessive sweating, fainting, fang marks in the skin, fever, increased thirst, local tissue death, loss of muscle coordination, nausea and vomiting, numbness and tingling, rapid pulse, severe pain, skin discoloration, swelling at the site of the bite, weakness.

Venom from venomous snakes and lizards can be divided into three types of toxins, however, there are some indications that snake venom may have more than one toxin and characteristics may change as a snake ages. The three types of toxins and their effects are:

Hemotoxins destroy blood cells and affect the circulatory system. The site of the bite rapidly becomes swollen, discolored, and painful. This is usually accompanied by swelling, discoloration, and pain progressing toward the heart.

Neurotoxins affect the nervous system and symptoms vary from foggy vision, dizziness, and other comparatively mild symptoms to rigid or flaccid paralysis, shortness of breath, weakness or paralysis of the lower limbs, double vision, inability to speak or swallow, drooping eyelids, and involuntary tremors of the facial muscles. Death can occur in as little as ten minutes, usually due to abrupt cessation of respiration.
Myotoxins destroy cells and cause muscle necrosis.

In the US, with the exception of the coral snakes which tend to have neuron-toxic venom, most venomous snakes have been categorized as having hemotoxic venom (in some areas Mojave rattlesnakes are found to have neuron-toxic venom). There is some indication that some species of rattlesnakes have both hemotoxic and neuron-toxic venom. It is also reported that venom of younger snakes may be more neuron-toxic

There are many are highly venomous snakes worldwide, some are deadly and most can be deadly without proper care.

Geographical Listing of Venomous Snakes

Following is a list of poisonous snakes by geographic area. This list is extensive but may not be all inclusive. In planning for work around the world, also contact local agencies to determine whether there may be additional venomous snakes or lizards.

North America

Copperheads (Broad-banded, Northern, Osage, Southern, Trans-Pecos)
Rattlesnakes Diamondback (eastern and western), Massasauga (eastern and western)
Cottonmouth or water moccasin (Eastern)

Prevention of Bites

Key factors to working safely in areas where snakes or lizards may be encountered include:

- Be alert
- Use care when reaching into or moving containers
- Use sticks or long-handled tools when reaching where you cannot see
- Be familiar with the habits and habitats of snakes in the vicinity of an incident or site
- In areas or activities where encounters with snakes are likely, wear sturdy leather or rubber work boots and snake chaps
- Do not attempt to catch snakes unless required and qualified

A snake bite warrants medical attention after administration of proper first-aid procedures. It is important to contact local medical facilities to determine where anti-venoms are located.

First-Aid

1. Keep the person calm. Restrict movement, and keep the affected area below heart level to reduce the flow of venom.

2. Remove any rings or constricting items because the affected area may swell. Create a loose splint to help restrict movement of the area.

3. If the area of the bite begins to swell and change color, the snake was probably venomous.

4. Monitor the person's vital signs -- temperature, pulse, rate of breathing, and blood pressure if possible. If there are signs of shock (such as paleness), lay the person flat, raise the feet about a foot, and cover the person with a blanket.

5. Get medical help immediately.

6. Try to photograph or identify the snake. Do not waste time hunting for the snake, and do not risk another bite. Be careful of the head of a dead snake. A snake can actually bite for up to an hour after it is dead (from a reflex).

- DO NOT allow the person to become over-exerted. If necessary, carry the person to safety.
- DO NOT apply a tourniquet.
- DO NOT apply cold compresses to a snake bite.
- DO NOT cut into a snake bite with a knife or razor.
- DO NOT try to suction the venom by mouth.
- DO NOT give stimulants or pain medications unless instructed to do so by a doctor.
- DO NOT give the person anything by mouth.
- DO NOT raise the site of the bite above the level of the person's heart
- Transport the victim to medical attention immediately

Animal Borne Diseases

Rabies

Animal borne diseases include rabies (generally found in dogs, skunks, raccoons, bats, and foxes). Rabies varies from area to area as do the animals most likely to be rabid.

Questions and Answers about Rabies

Q. What is Rabies and how is it transmitted?

A. Rabies is a viral infection most often transmitted by bites of animals infected with the virus.

Q. What animals are most likely to be infected?

A. Skunks, raccoons, foxes, and bats are wild animals most frequently found to be infected with rabies; however, any warm blooded animal can be infected. Squirrels, groundhogs, horses, cattle, and rabbits have been tested positive for rabies. Dogs and cats are frequently rabies-infected if not immunized.

Q. How can you tell if an animal is rabies-infected?

A. Rabies infection is not always apparent. Signs to look for in wild animals are over-aggressiveness or passivity. Spotting animals which are normally nocturnal (active at night) during the day and being able to approach them would be an example of unusual behavior. Finding a bat alive and on the ground is abnormal. The best precaution, however, is to observe wild animals from a safe distance, even if they are injured. Avoid dogs and cats that you do not know.

Q. What should you do if bitten by an animal you suspect is infected with rabies?

A. As quickly as possible, wash the bite area with soap and water, then disinfect with 70% alcohol and seek medical attention for follow-up. Try to capture the animal. Avoid being bitten again or contacting the mouth or any saliva of the animal. Keep the animal under surveillance and call the police for assistance to capture it. Have the animal tested.

A dead animal believed to be infected should be preserved and tested for rabies. Health departments are often sources where information can be found regarding testing.

Q. Is there a cure for rabies?

A. Rabies is preventable, even after being bitten, if treatment is begun soon enough. Getting prompt medical attention and confirming the rabies infection of an animal are very important. **Rabies is not curable once symptoms or signs of rabies appear.**

There are vaccines available that should be considered if a work assignment involves trapping animals likely to carry rabies. Medical consultants must be involved in decisions to immunize workers against rabies.

Hantavirus

WESTON employees or contractors/subcontractors conducting field work in areas where there is evidence of a rodent population should be aware of an increased level of concern regarding the transmission of "Hantavirus"-associated diseases. Hantavirus is associated with rodents, especially the deer mouse (*Peromyscus maniculanis*) as a primary reservoir host. Hantavirus has resulted in several deaths in the U.S.

The Hantavirus can be transmitted by infected rodents through their saliva, urine, and feces. Human infection may occur when infected wastes are inhaled as a result of aerosols produced directly from the animals. They also may come from dried materials introduced into broken skin or onto mucous membranes. Infections in humans occur most in adults and are associated with

activities that provide contact with infected rodents in rural/semi-rural areas. Hantavirus begins with one or more flu-like symptoms (i.e., fever, muscle aches, headache, and/or cough) and progresses rapidly to severe lung disease. Early diagnosis and treatment are vital.

Prevention

Personnel involved in work areas where rodents and the presence of the Hantavirus are known or suspected will need to take personal protective measures and to develop an expanded site safety plan.

Field personnel involved in trapping or contacting rodents or their waste products will need to wear respirators with high-efficiency particulate air (HEPA) filters, eye protection, Tyvek coveralls, chemical-resistant gloves, and disposable boot covers. Strict decontamination requirements are needed. Double-bag, label, and specific handling, packaging, shipping, storage, and analytical procedures are required to minimize the risks of exposure from collected mice. More detailed procedures can be obtained from WESTON Corporate Health and Safety.

For employees and facilities in rural/semi-rural areas, the following risk-reduction strategies are appropriate:

- Eliminate rodents and reduce availability of food sources and nesting sites used by rodents.
- Store trash/garbage in rodent-proof metal or thick plastic containers with tight lids.
- Cut all grass/underbrush in proximity to buildings.
- Prevent rodents from entering buildings (e.g., use steel wool, screen, etc., to eliminate openings).

Plague

Described under Insects (Fleas)

Anthrax

Anthrax is an acute infectious disease caused by the spore-forming bacterium *Bacillus anthracis*. Anthrax most commonly occurs in wild and domestic lower vertebrates (cattle, sheep, goats, and other herbivores), but it can also occur in humans when they are exposed to infected animals or tissue from infected animals.

Anthrax is most common in agricultural regions where it occurs in animals. When anthrax affects humans, it is usually due to an occupational exposure to infected animals or their products. Workers who are exposed to dead animals and animal products from other countries where anthrax is more common may become infected with *B. anthracis* (industrial anthrax). Anthrax in wild livestock has occurred in the U.S.

Anthrax infection can occur in three forms: cutaneous (skin), inhalation, and gastrointestinal. *B. anthracis* spores can live in the soil for many years, and humans can become infected with anthrax by handling products from infected animals or by inhaling anthrax spores from contaminated animal products. Anthrax can also be spread by eating undercooked meat from infected animals. It is rare to find infected animals in the U.S.

Cutaneous: Most (about 95%) anthrax infections occur when the bacterium enters a cut or abrasion on the skin, such as when handling contaminated wool, hides, leather, or hair products (especially goat hair) of infected animals. Skin infection begins as a raised itchy bump that resembles an insect bite but within 1-2 days develops into a vesicle and then a painless ulcer, usually 1-3 cm in diameter, with a characteristic black necrotic (dying) area in the center. Lymph glands in the adjacent area may swell. About 20% of untreated cases of cutaneous anthrax will result in death. Deaths are rare with appropriate antimicrobial therapy.

Inhalation: Initial symptoms may resemble a common cold. After several days, the symptoms may progress to severe breathing problems and shock. Inhalation anthrax is usually fatal.

Intestinal: The intestinal disease form of anthrax may follow the consumption of contaminated meat and is characterized by an acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, and fever are followed by abdominal pain, vomiting of blood, and severe diarrhea. Intestinal anthrax results in death in 25% to 60% of cases.

Anthrax is not known to spread from one person to another person. Communicability is not a concern in managing or visiting patients with inhalation anthrax.

Prevention

In countries where anthrax is common and vaccination levels of animal herds are low, humans should avoid contact with livestock and animal products and avoid eating meat that has not been properly slaughtered and cooked. Also, an anthrax vaccine has been licensed for use in humans. The vaccine is reported to be 93% effective in protecting against anthrax.

Doctors can prescribe effective antibiotics. To be effective, treatment should be initiated early. If left untreated, the disease can be fatal.

Direct person-to-person spread of anthrax is extremely unlikely; however, a patient's clothing and body may be contaminated with anthrax spores. Effective decontamination of people can be accomplished by a thorough wash down with anti-microbe effective soap and water. Waste water should be treated with bleach or other anti-microbial agent. Effective decontamination of articles can be accomplished by boiling contaminated articles in water for 30 minutes or longer and using common disinfectants. Chlorine is effective in destroying spores and vegetative cells on surfaces. Burning the clothing is also effective. After decontamination, there is no need to immunize, treat, or isolate contacts of people ill with anthrax unless they also were also exposed to the same source of infection. Early antibiotic treatment of anthrax is essential–delay seriously lessens chances for survival. Treatment for anthrax infection and other bacterial infections

includes large doses of intravenous and oral antibiotics, such as fluoroquinolones, like ciprofloxacin (cipro), doxycycline, erythromycin, vancomycin, or penicillin. In possible cases of inhalation anthrax exposure to unvaccinated personnel, early antibiotic prophylaxis treatment is crucial to prevent possible death.

No skin, especially if it has any wounds or scratches, should be exposed. Disposable personal protective equipment is preferable, but if not available, decontamination can be achieved by washing any exposed equipment in hot water, bleach and detergent. Disposable personal protective equipment and filters should be burned and buried. The size of Bacillus anthracis bacillii ranges from 0.5 μm to 5.0 μm. Anyone working with anthrax in a suspected or confirmed victim should wear respiratory equipment capable of filtering this size of particle or smaller. The U.S. National Institute for Occupational Safety and Health (NIOSH) and Mine Safety and Health Administration (MSHA) approved high efficiency-respirator, such as a half-face disposable respirator with a HEPA filter, is recommended. All possibly contaminated bedding or clothing should be isolated in double plastic bags and treated as possible bio-hazard waste. Dead victims that are opened and not burned provide an ideal source of anthrax spores; the victim should be sealed in an airtight body bag. Cremating victims is the preferred way of handling body disposal. No embalming or autopsy should be attempted without a fully equipped biohazard lab and trained and knowledgeable personnel.

Delays of only a few days may make the disease untreatable and treatment should be started even without symptoms if possible contamination or exposure is suspected. Animals with anthrax often just die without any apparent symptoms. Initial symptoms may resemble a common cold – sore throat, mild fever, muscle aches and malaise. After a few days, the symptoms may progress to severe breathing problems and shock and ultimately death. Death can occur from about two days to a month after exposure with deaths apparently peaking at about 8 days after exposure. [8] Antibiotic-resistant strains of anthrax are known.

Aerial spores can be trapped by a simple HEPA or P100 filter. Inhalation of anthrax spores can be prevented with a full-face mask using appropriate filtration. Unbroken skin can be decontaminated by washing with simple soap and water. All of these procedures do not kill the spores which are very hard to kill and require extensive treatment to eradicate them. Filters, clothes, etc. exposed to possible anthrax contaminated environments should be treated with chemicals or destroyed by fire to minimize the possibility of spreading the contamination.

In recent years there have been many attempts to develop new drugs against anthrax; but the existing supply still works fine if treatment is started soon enough.

Prevention can also be accomplished through early detection. In response to the U.S. Postal Service (USPS) anthrax attacks of October 2001, the USPS has installed BioDetection Systems (BDS) in their large-scale mail cancellation facilities. BDS response plans have been formulated by the USPS in conjunction with local responders including fire, police, hospitals, and public health. Employees of these facilities have been educated about anthrax, response actions and prophylactic medication. Because of the time delay inherent in getting final verification that anthrax has been used, prophylactic antibiotics for possibly exposed personnel should commence as soon as possible.

The ultimate in prevention is vaccination against infection but this has to be done well in advance of exposure.

Anthrax spores can survive for long periods of time in the environment after release. Methods for cleaning anthrax contaminated sites commonly use oxidizing agents such as peroxides, ethylene Oxide, Sandia Foam, chlorine dioxide (used in the Hart Senate office building), and liquid bleach products containing sodium hypochlorite. These agents slowly destroy bacterial spores. A bleach solution for treating hard surfaces has been approved by the EPA and can be prepared by mixing one part bleach (5.25%-6.00%) to one part white vinegar to eight parts water. Bleach and vinegar must not be combined together directly, rather some water must first be added to the bleach (e.g., two cups water to one cup of bleach), then vinegar (e.g., one cup), and then the rest of the water (e.g., six cups). The pH of the solution should be tested with a paper test strip; and treated surfaces must remain in contact with the bleach solution for 60 minutes (repeated applications will be necessary to keep the surfaces wet).

Chlorine dioxide has emerged as the preferred biocide against anthrax-contaminated sites, having been employed in the treatment of numerous government buildings over the past decade. Its chief drawback is the need for *in situ* processes to have the reactant on demand.

To speed the process, trace amounts of a non-toxic catalyst composed of iron and tetro-amido macrocyclic ligands are combined with sodium carbonate and bicarbonate and converted into a spray. The spray formula is applied to an infested area and is followed by another spray containing tertiary-butyl hydroperoxide

Using the catalyst method, a complete destruction of all anthrax spores takes 30 minutes. A standard catalyst-free spray destroys fewer than half the spores in the same amount of time. They can be heated, exposed to the harshest chemicals, and they do not easily die.

Brucellosis

Brucellosis, also called undulant fever or Malta fever, is a zoonosis (infectious disease transmitted from animals to humans) caused by bacteria of the genus *Brucella*. It is primarily a disease of domestic animals (goats, pigs, cattle, dogs, etc.) and humans and has a worldwide distribution.

Although brucellosis can be found worldwide, it is more common in countries that do not have good standardized and effective public health and domestic animal health programs. Areas currently listed as high risk include the Caribbean.

The disease is transmitted either through contaminated or untreated milk (and its derivates) or through direct contact with infected animals, which may include dogs, pigs, camels, and ruminants, primarily sheep, goats, cattle, and bison. This also includes contact with their carcasses.

Leftovers from parturition are also extremely rich in highly virulent brucellae. Brucellae, along with leptospira have the unique property of being able to penetrate through intact human skin, so infection by mere hand contact with infectious material is likely to occur.

The disease is now usually associated with the consumption of un-pasteurized milk and soft cheeses made from the milk of infected animals and with occupational exposure of veterinarians and slaughterhouse workers. Some vaccines used in livestock, most notably *B. abortus* strain 19 also cause disease in humans if accidentally injected. Problems with vaccine induced cases in the United States declined after the release of the RB-51 strain developed in the 1990s and the relaxation of laws requiring vaccination of cattle in many states.

The incubation period of brucellosis is, usually, of one to three weeks, but some rare instances may take several months to surface.

Brucellosis induces inconstant fevers, sweating, weakness, anemia, headaches, depression and muscular and bodily pain.

The symptoms are like those associated with many other febrile diseases, but with emphasis on muscular pain and sweating. The duration of the disease can vary from a few weeks to many months or even years. In first stage of the disease, septicaemia occurs and leads to the classic triad of undulant fevers, sweating (often with characteristic smell, likened to wet hay) and migratory arthralgia and myalgia.

Prevention

The main way of preventing brucellosis is by using fastidious hygiene in producing raw milk products, or by pasteurization of all milk that is to be ingested by human beings, either in its pure form or as a derivate, such as cheese.

Provide protection from skin contact when handling potentially infected animals.

Q fever

Q fever is caused by infection with *Coxiella burnetii*. This organism is uncommon but may be found in cattle, sheep, goats and other domestic mammals, including cats and dogs. The infection results from inhalation of contaminated particles in the air, and from contact with the vaginal mucus, milk, feces, urine or semen of infected animals. The incubation period is 9-40 days. It is considered possibly the most infectious disease in the world, as a human being can be infected by a single bacterium.

The most common manifestation is flu-like symptoms with abrupt onset of fever, malaise, profuse perspiration, severe headache, myalgia (muscle pain), joint pain, loss of appetite, upper respiratory problems, dry cough, pleuritic pain, chills, confusion and gastro-intestinal symptoms such as nausea, vomiting and diarrhea. The fever lasts approximately 7-14 days.

During the course, the disease can progress to an atypical pneumonia, which can result in a life threatening acute respiratory distress syndrome (ARDS), whereby such symptoms usually occur during the first 4-5 days of infection.

Less often the Q fever causes (granulomatous) hepatitis which becomes symptomatic with malaise, fever, liver enlargement (hepatomegaly), pain in the right upper quadrant of the abdomen and jaundice (icterus).

The chronic form of the Q fever is virtually identical with the inflammation of the inner lining of the heart (endocarditis), which can occur after months or decades following the infection. It is usually deadly if untreated. However, with appropriate treatment this lethality is around 10%.

The common way of infection is inhalation of contaminated dust, contact with contaminated milk, meat, wool and particularly birthing products. Ticks can transfer the pathogenic agent to other animals. Transfer between humans seems extremely rare and has so far been described in very few cases.

Prevention

Q fever is effectively prevented by intradermal vaccination with a vaccine composed of killed *Coxiella burnetii* organisms. Skin and blood tests should be done before vaccination to identify preexisting immunity; the reason is that vaccinating subjects who already have immunity can result in a severe local reaction. After a single dose of vaccine, protective immunity lasts for many years. Revaccination is not generally required. Annual screening is typically recommended.

Wear appropriate PPE when handling potentially infected animals or materials**.**

Leptospirosis

Leptospirosis is a bacterial disease that affects humans and animals. It is caused by bacteria of the genus *Leptospira*.

The time between a person's exposure to a contaminated source and becoming sick is 2 days to 4 weeks. Illness usually begins abruptly with fever and other symptoms. Leptospirosis may occur in two phases; after the first phase, with fever, chills, headache, muscle aches, vomiting, or diarrhea, the patient may recover for a time but become ill again. If a second phase occurs, it is more severe; the person may have kidney or liver failure or meningitis. This phase is also called Weil's disease.

The illness lasts from a few days to 3 weeks or longer. Without treatment, recovery may take several months. In rare cases death occurs.

Many of these symptoms can be mistaken for other diseases. Leptospirosis is confirmed by laboratory testing of a blood or urine sample.

Leptospira organisms have been found in cattle, pigs, horses, dogs, rodents, and wild animals. Humans become infected through contact with water, food, or soil containing waste from these infected animals. This may happen by consuming contaminated food or water or through skin contact, especially with mucosal surfaces, such as the eyes or nose, or with broken skin. The disease is not known to be spread from person to person.

Leptospirosis occurs worldwide but is most common in temperate or tropical climates. It is an occupational hazard for many people who work outdoors or with animals, for example, farmers, sewer workers, veterinarians, fish workers, dairy farmers, or military personnel. It is a recreational hazard for campers or those who participate in outdoor sports in contaminated areas and has been associated with swimming, wading, and whitewater rafting in contaminated lakes and rivers. The incidence is also increasing among urban children.

The risk of acquiring leptospirosis can be greatly reduced by not swimming or wading in water that might be contaminated with animal urine.

Protective clothing or footwear should be worn by those exposed to contaminated water or soil because of their job or recreational activities.

Prevention

Avoid risky foods and drinks.

Buy it bottled or bring it to a rolling boil for 1 minute before drink it. Bottled carbonated water is safer than non-carbonated water.

Ask for drinks without ice unless the ice is made from bottled or boiled water. Avoid popsicles and flavored ices that may have been made with contaminated water.
Eat foods that have been thoroughly cooked and that are still hot and steaming

Avoid raw vegetables and fruits that cannot be peeled. Vegetables like lettuce are easily contaminated and are very hard to wash well. When eating raw fruit or vegetables that can be peeled, peel them yourself. (Wash your hands with soap first.) Do not eat the peelings.

Avoid foods and beverages from street vendors. It is difficult for food to be kept clean on the street, and many travelers get sick from food bought from street vendors.

Leptospirosis is treated with antibiotics, such as doxycycline or penicillin, which should be given early in the course of the disease. Intravenous antibiotics may be required for persons with more severe symptoms. Persons with symptoms suggestive of leptospirosis should contact a health care provider.

Ebola

Ebola is both the common term used to describe a group of viruses belonging to genus Ebolavirus, family Filoviridae, and the common name for the disease which they cause, Ebola hemorrhagic fever. Ebola viruses are morphologically similar to the Marburg virus, also in the family Filoviridae, and share similar disease symptoms. Ebola has caused a number of serious and highly publicized outbreaks since its discovery.

Despite considerable effort by the World Health Organization, no animal reservoir capable of sustaining the virus between outbreaks has been identified. However, it has been hypothesized that the most likely candidate is the fruit bat.

Ebola hemorrhagic fever is potentially lethal and encompasses a range of symptoms including fever, vomiting, diarrhea, generalized pain or malaise, and sometimes internal and external bleeding. Mortality rates are extremely high, with the human case-fatality rate ranging from 50% - 89%, according to viral subtype. [2] The cause of death is usually due to hypovolemic shock or organ failure.

Because Ebola is potentially lethal and since no approved vaccine or treatment is available, Ebola is classified as a biosafety level 4 agent, as well as a Category A bioterrorism agent by the Centers for Disease Control and Prevention.

Symptoms are varied and often appear suddenly. Initial symptoms include high fever (at least 38.8°C), severe headache, muscle joint, or abdominal pain, severe weakness and exhaustion, sore throat, nausea, and dizziness. Before an outbreak is suspected, these early symptoms are easily mistaken for malaria, typhoid fever, dysentery, influenza, or various bacterial infections, which are all far more common and less reliably fatal.

Ebola may progress to cause more serious symptoms, such as diarrhea, dark or bloody feces, vomiting blood, red eyes due to distention and hemorrhage of sclerotic arterioles, petechia, maculopapular rash, and purpura. Other secondary symptoms include hypotension (less than 90 mm Hg systolic /60 mm Hg diastolic), hypovolemia, tachycardia, organ damage (especially the kidneys, spleen, and liver) as a result of disseminated systemic necrosis, and protinuria. The interior bleeding is caused by a chemical reaction between the virus and the platelets which creates a chemical that will cut cell sized holes into the capillary walls.

Among humans, the virus is transmitted by direct contact with infected body fluids, or to a lesser extent, skin or mucus membrane contact. The incubation period can be anywhere from 2 to 21 days, but is generally between 5 and 10 days.

Although airborne transmission between monkeys has been demonstrated by an accidental outbreak in a laboratory located in Virginia, USA, there is very limited evidence for human-to-human airborne transmission in any reported epidemics.

The infection of human cases with Ebola virus has been documented through the handling of infected chimpanzees, and gorillas--both dead and alive.

So far, all epidemics of Ebola have occurred in sub-optimal hospital conditions, where practices of basic hygiene and sanitation are often either luxuries or unknown to caretakers and where disposable needles and autoclaves are unavailable or too expensive. In modern hospitals with disposable needles and knowledge of basic hygiene and barrier nursing techniques, Ebola rarely spreads on such a large scale.

Prevention

Prevention methods include good hygiene in medical settings and awareness of the virus in travel areas. There is no known effective vaccine for humans.

Prevention efforts should concentrate on avoiding contact with host or vector species. Travelers should not visit locations where an outbreak is occurring. Contact with rodents should be avoided. Minimize exposure to arthropod bites by using permethrin-impregnated bed nets and insect repellents.

Strict compliance with infection control precautions (i.e., use of disposable gloves, face shields, and disposable gowns to prevent direct contact with body fluids and splashes to mucous membranes when caring for patients or handling clinical specimens; appropriate use and disposal of sharp instruments; hand washing and use of disinfectants) is recommended to avoid health care-associated infections.

Contact with dead primates should be avoided.

Bird and Bat Borne or Enhanced Diseases

See also under Molds and Fungus

Histoplasmosis

Histoplasmosis is a fungal infection which enters the body through the lungs. The infection enters the body through the lungs. The fungus grows as a mold in the soil, and infection results from breathing in airborne particles. Soil contaminated with bird or bat droppings are known to have a higher concentration of histoplasmosis.

There may be a short period of active infection, or it can become chronic and spread throughout the body. Most people who do develop symptoms will have a flu-like syndrome (acute-fever, chills cough, and chest pain; chronic-chest pain, cough with blood, fever, shortness of breath, sweating) and lung complaints related to pneumonia or other lung involvement. Approximately 10% of the population will develop inflammation in response to the initial infection. This can effect the skin, bones or joints, or the lining of the heart (pericardium). These symptoms are not due to fungal infection of those body parts, but due to inflammation.

In a small number of patients, histoplasmosis may become widespread (disseminated) in involve the blood, brain, adrenal glands, or other organs. Very young or old are at a higher risk for

disseminated histoplasmosis. Symptoms include fevers, headache, neck stiffness, mouth sores, skin lesions.

Histoplasmosis may be prevented by reducing dust exposure in areas containing bird or bat droppings. Wear PPE and respirator when working within this environment. Institute work practices and dust control measures, i.e. moist/wet area, that eliminate or reduce dust generation which will reduce risks of infection and subsequent development of disease.

Treatment

The main treatment for histoplasmosis is antifungal drugs. Amphotericin B, itraonazole, and ketoconazole are the usual treatments. Long-term treatment with antifungal drugs may be needed.

Psittacosis

Psittacosis is a disease caused by a bacteria that is found in bird droppings and other secretions (often carried by pet birds). The bacteria is found worldwide.

Symptoms of psittacosis infection may include a low-grade fever that often becomes worse as the disease progresses, including anorexia, sore throat, light sensitivity, and a severe headache.

Ammonia and sodium hypochlorite based disinfectants are effective disinfectants for Psittacossis.

Where it is necessary to remove bat droppings from buildings prior to renovation or demolition it is prudent to assume infection and use the following precautions:

- Avoid areas that may harbor the bacteria, e.g., accumulations of bird or bat droppings.

- Areas known or suspected of being contaminated by *the organisms causing* Psittacosis such as bird roosts, attics, or even entire buildings that contain accumulations of bat or bird manure, should be posted with signs warning of the health risk. The building or area should be secured

- Before an activity is started that may disturb any material that might be contaminated by Psittacosis, workers should be informed in writing of the personal risk factors that increase an individual's chances of developing these diseases. Such a written communication should include a warning that individuals with weakened immune systems are at the greatest risk of developing severe forms of these diseases become infected. These people should seek advice from their health care provider about whether they should avoid exposure to materials that might be contaminated with these organisms.

The best way to prevent exposure is to avoid situations where material that might be contaminated can become aerosolized and subsequently inhaled. A brief inhalation exposure to

highly contaminated dust may be all that is needed to cause infection and subsequent development of psittacosis. Therefore, work practices and dust control measures that eliminate or reduce dust generation during the removal of bat manure from a building will also reduce risks of infection and subsequent development of disease. For example, instead of shoveling or sweeping dry, dusty material, carefully wetting it with a water spray can reduce the amount of dust aerosolized during an activity. Adding a surfactant or wetting agent to the water might reduce further the amount of aerosolized dust.

Once the material is wetted, it can be collected in double, heavy-duty plastic bags, a 55-gallon drum, or some other secure container for immediate disposal. An alternative method is use of an industrial vacuum cleaner with a high-efficiency filter to *bag* contaminated material. Truck-mounted or trailer-mounted vacuum systems are recommended for buildings with large accumulations of bat or bird manure. These high-volume systems can remove tons of contaminated material in a short period. Using long, large-diameter hoses, such a system can also remove contaminated material located several stories above its waste hopper. This advantage eliminates the risk of dust exposure that can happen when bags tear accidentally or containers break during their transfer to the ground.

The removal of all material that might be contaminated from a building and immediate waste disposal will eliminate any further risk that someone might be exposed to aerosolized spores. Air sampling, surface sampling, or the use of any other method intended to confirm that no infectious agents remain following removal of bat manure is unnecessary in most cases. However, before a removal activity is considered finished, the cleaned area should be inspected visually to ensure that no residual dust or debris remains.

Spraying 1:10 bleach to water mixture on droppings and allowing it to dry is also a recommended practice for the psittacosis organisms.

Because work practices and dust control measures to reduce worker exposures to these organisms have not been fully evaluated, using personal protective equipment is still necessary during some activities. During removal of an accumulation of bat or bird manure from an enclosed area such as an attic, dust control measures should be used, but wearing a NIOSH-approved respirator and other items of personal protective equipment is also recommended to reduce further the risk of exposure to the organisms that cause Psittacosis.

Treatment

Psittacosis is often hard to diagnoses and while a concern, it does not occur with great frequency. Knowledge of the symptoms and of potential exposure is important when seeking medical follow-up for potential exposure.

There are various medical treatments for psittacosis based on extent of infection. The sooner the disease is diagnosed and treatment is begun the more effective the treatment will be.

APPENDIX A
Dangerous Animals - Wildlife Hazard Recognition and Protection

GENERAL

Work in remote areas inhabited by wild animals that have been known to cause injury and kill human beings, requires that companies working in these areas carefully plan for wildlife encounters. This procedure outlines actions that when properly implemented should provide a high degree of protection for employees and wildlife.
These procedures apply to employees who prepare Health and Safety Plans or perform fieldwork in environments in which wild animals may be encountered. However, due to the unpredictable nature of wild animals this single document cannot possibly cover all potential risks or protective measures. Therefore, prior to entering remote areas inhabited by dangerous wildlife, contact local wildlife agencies to gather additional information concerning local risks and protective measures.

ATTACHMENTS

Attachments 1 and 2 outline behavioral characteristics of and outline controls that will minimize human injury, loss of property, and unnecessary destruction of wildlife, while ensuring a safe work environment.

WILDLIFE AVOIDANCE AND BASIC PROTECTIVE MEASURES

The best protective measure is simply avoidance. Large numbers of humans present deterrence to wild animals; therefore, whenever possible teams in the field should work together in groups of four or more. Whenever practical, fieldwork should be scheduled around the seasonal cycles of wildlife in the area. When wild animal avoidance cannot be achieved through scheduling, personnel involved in field activities in which encounters with wild animals may result, will take the following steps and will be equipped and trained, as set forth below.

CLEAR THE AREA

Evaluate and control the area before entry by

- Determine areas of recent sightings through local Fish and Game, state troopers, etc.;
- Conduct a site observation from an off-site elevated point, if possible;
- Conduct a controlled walk through in the area by a trained observer;
- Arrange a briefing by a local specialist, e. g., Fish and Game, etc.; and
- Utilizing appropriate noisemakers.

BASIC EQUIPMENT

Employees entering an environment where encounters with wild animals are possible should be provided, as a minimum:

- Noisemakers, such as air horns, bells, etc.; and
- Bear spray of not less than 16-ounce capacity (with holster), equivalent to capsicum pepper (red pepper extract), which is capable of spraying at least 15 feet. (Notes: Normally cannot be transported in side aircraft passenger compartments and may be

considered a hazardous material, check with airlines and hazardous material shippers for current information).

TRAINING

Prior to entering and / or working in areas inhabited by dangerous wildlife each employee should receive training as outlined in this procedure. At a minimum, training must include information related to:

- Wildlife present, habitat, behavior patterns, including when wild animals are most active, etc.
- Warning signs, such as tracks, bedding areas, scat, claw marks, offspring, paths, etc.,
- Avoidance measures
- Other hazards, precautions, and protective measures as outlined in the Attachments,
- (At the jobsite) spray demonstration and safety instructions which include location of and persons designated as "bear watch"

An outline of the training content should be reviewed and approved by the Divisional EHS manager and should be documented. A record of the training will be maintained at the job site, filed with the SSHSP and in the employee's training records.

VEHICLE SAFETY

Use extreme caution, particularly in darkness, when operating vehicles in areas where wild animals may be present. Collisions with large animals have been known to cause significant property damage and personal injuries to vehicle passengers, including fatalities.

ATTACHMENT 1

BEAR SAFETY – HAZARD RECOGNITION AND PRECAUTIONS

On occasion fieldwork may be conducted in a location where bears may be encountered. The following technical information, precautions, and guidelines for operations in which bears could be encountered are based on experience and conditions for field work. Bears are intelligent, wild animals and are potentially dangerous, and would rather be left alone. The more bears are understood the less they will be feared. This attachment is intended to provide information that will enable Weston to plan for bear encounters and to properly address face-to-face encounters.

Bear Life History

Although bears are creatures of habit, they are also intelligent, and each has its own personality. The way a bear reacts is often dictated by what it has learned from its mother, the experience it has had on its own, and the instincts nature has provided. Like other intelligent animals, we can make general statements about bears, but few people can accurately predict their behavior.

Bears have an incredible sense of smell, and seem to trust it more than any other sense. Hearing and sight are also important, but to a lesser degree. A bear's hearing is probably better than ours, but not as keen as a dog's hearing. Their sight is probably comparable to that of a human. Black bears tend to favor forested habitats.

Bears are opportunists, relying on their intelligence and their senses to find food. They use different habitats throughout the year, depending on the availability of food and other necessities. The area a bear covers in a given year is partially dependent on how far it has to go to satisfy these basic needs. In some areas, individual bears have home ranges of less than a square mile; in other areas ranges can encompass hundreds of square miles. Males usually range over larger areas than females.

In spring, bears begin coming out of hibernation. Males are usually the first bears to emerge, usually in April, and females with new cubs are usually the last, sometimes as late as late June. When bears emerge from their dens, they are lethargic for the first few days, frequently sleeping near their dens and not eating. When they do start eating, they seek carrion (deer, etc.), roots, and emerging vegetation. In coastal areas, beaches become travel corridors as bears seek these foods.

In early summer, bears eat new grasses and forage as they develop in higher elevations. In coastal areas, salmon are the most important food from June through September. This period is one of the few times that bears are found in large groups, and it is the time that most people see bears. Bears often travel, eat, and sleep along streams for weeks at a time.

Other summer foods for bears include grasses and ground squirrels. When bears kill or scavenge large prey, they commonly cover the portions they cannot eat with sticks and duff. A bear may remain near a food cache for days and it will defend it from intruders.

During the late summer and early fall, bears move inland and consume large amounts of blueberries, and other succulent fruits. As the seasons progress towards winter, a bear's diet becomes more varied. This is the time that bears are adding final deposits of fat before their long winter naps.

In October and November, bears move into their denning areas and begin preparing a suitable den. Black bears usually den in holes under large trees or rock outcrops, or in small natural cavities. Dens are just large enough for the bears to squeeze into. Bears rarely eat, drink, urinate, or defecate while they are denning. They sleep deeply, but do not truly hibernate, and they can be awakened by loud noises or disturbances.

Cubs are born in the den, usually in January. Black bear cubs usually stay with their mothers for a year and a half. Black bears are sexually mature at age 2. Mating season is in the spring (May or June) and both species are polygamous (multiple mates). Black bears can live for 25 – 30 years, although most live less than 20 years.

BEAR AND HUMAN INTERACTIONS

Bears generally prefer to be left alone, but they share their homes with other creatures, including humans, who intrude on virtually every aspect of the bear's life. Bears are normally tolerant of these activities and generally find a secure way to avoid them. Humans can help bears make a graceful retreat and avoid many close encounters by letting them know we are coming. Walking in groups, talking, and wearing noise making devices, such as bear bells, all serve to warn a bear of your approach. When possible, avoid hiking and camping in areas where bears are common, such as bear trails through heavy brush or along salmon streams. Always keep an eye out for bears and bear signs. If you happen upon a dead animal, especially one that is covered with sticks and duff (a bear cache), immediately retreat the way you came, but do not run, and make a detour around the area. If you see a cub up a tree or a small bear walking alone, immediately retreat and detour around the area. Like all young animals, cubs wander away from their mothers, but females are furiously protective when they believe their cubs are threatened. Even if we do everything possible to avoid meeting a bear, sometimes bears come to us.

Bears are both intelligent and opportunistic, and they express these qualities through their curiosity. This curiosity frequently brings them into "human habitat." When this happens, we often feel vulnerable, and the bear is sometimes viewed as a threat or nuisance. In most cases, a curious bear will investigate a "human sign," perhaps test it out (chew on a raft, bite into some cans, etc.), and leave, never to return. If the bear was rewarded during his investigation by finding something to eat, it is hard to stop them from returning once they have had a food-reward. That is why we emphasize the importance of keeping human food and garbage away from bears. When in bear country, always think about the way you store, cook, and dispose of your food. **Never feed bears!** This is both illegal and foolish. Food should be stored in airtight containers, preferably away from living and sleeping areas. Garbage should be thoroughly incinerated as soon as possible. Fish and game should be cleaned well away from camp, and clothing that smells of fish and game should be stored away from sleeping areas. Menstruating women should take extra precautions to keep themselves as clean as possible, and soiled tampons and pads should

be treated as another form of organic garbage. Once a bear has obtained food from people, it may continue to frequent areas occupied by people. If a bear does not find food or garbage after the next few tries, it may give up and move back into a more natural feeding pattern. Occasionally, though, the bear will continue to seek human foods and can become a "problem bear." Some bears become bold enough to raid campsites and break into cabins to search for human food. Shooting bears in the rump with cracker shells, flares, rubber bullets, and birdshot are common methods of "aversive conditioning." These are also very dangerous techniques, because they may seriously injure a bear if not done properly and/or they may cause a bear to attack the shooter.

BLACK BEARS

Black Bear Identification: Black bears are the smallest and most abundant of the bear species. They are five to six feet long and stand about two to three feet high at the shoulders. They weigh from 200 to 500 pounds. While they are most commonly black, other color phases include brown (cinnamon), and, rarely, gray (blue), and white. Muzzles are usually brown. Black bears can be distinguished from brown bears by:

- Their head shape (a black bear's nose is straight in profile, a brown bear's is dished);
- Their claws (black bear's claws are curved and smaller, brown bears are relatively straight and longer);
- Their body shape (when standing, a black bear's rump seems to be higher than its shoulders; a brown bear's shoulders are usually higher than its rump); and

Typical Habitat: Black bears occupy a wide range of habitats, but seem to be most common in forested areas.

AVOIDING BEAR ENCOUNTERS WHEN

- The Bear sees you but you do not know the bear is around: The bear will likely avoid detection people and will simply move away when they sense a human.
- You see a bear and it does not know you are there: Move away slowly. Avoid intercepting the bear if it is walking. If possible, detour around the bear. If the bear is close to you, stand where you are or back away slowly. Do not act threateningly toward the bear, it may know you are there but it has chosen to ignore you as long as you are not a threat.
- You see the bear and the bear sees you: Do not act threateningly, but let the bear know you are human. Wave your arms slowly, talk in a calm voice, and walk away slowly in a lateral direction, keeping an eye on the bear. Unless you are very close to a car or a building, never run from bears. In a bear's world, when something runs it is an open invitation to chase it. Bears will chase a running object even if they have no previous intention of catching it. Bears can run as fast as a racehorse, so humans have little or no chance of outrunning a bear.
- You see a bear; the bear sees you and stands on its hind legs: This means that the bear is seeking more information. Bears stand on their hind legs to get a better look, or smell, at something they are uncertain of. It is your cue to help it figure

out what you are. Help the bear by waving your arms slowly and talking to it. Standing is not a precursor to an attack. Bears do not attack on their hind legs. It is also important to remember that when a bear goes back down on all fours from a standing position, it may come towards you a few steps. This is normal, and probably not an aggressive act.

- The bear sees you, recognizes you as a human, but continues to come towards you slowly: This may mean several things, depending on the bear and the situation. It may mean that the bear does not see you as a threat, and just wants to get by you (especially if the bear is used to humans, as in a National Park); the bear wants to get food from you (if it has gotten food from people before); the bear wants to test your dominance (it views you as another bear); or may be stalking you as food (more common with black bear, but a rare occurrence). In all cases, your reaction should be to back off the trail very slowly, stand abreast if you are in a group, talk loudly, and/or use a noise-making device. If the bear continues to advance, you should stop. At this point, it is important to give the bear the message that if he continues to advance it will cost him. Continue to make loud noises and present a large visual image to the bear (standing abreast, open your coat). In bear language, bears assert themselves by showing their size. If an adult brown bear continues to come at you, climbing 20 feet or higher up a tree may also be an option if one is next to you (remember, never run from bears). Keep in mind, though, black bears can climb trees.
- The bear recognizes you as a human and acts nervous or aggressive: When bears are nervous or stressed they can be extremely dangerous. This is when it is important to try to understand what is going on in the bears mind. Nervous bears growl, woof, make popping sounds with their teeth, rock back and forth on their front legs, and often stand sideways to their opponent. A universal sign of a nervous bear is excessive salivation (sometimes it looks like they have white lips). When a bear shows any of these signs, stand where you are and talk in a calm voice. Do not try to imitate bear sounds, this may only serve to confuse and further agitate the bear. If you are in a group, stand abreast.
- The bear charges: If all other signals fail, a bear will charge. Surprisingly, most bear charges are just another form of their language. The majority of these are "bluff charges," that is; the bear stops before making contact with their opponent. There are many different types of bluff charges ranging from a loping uncertain gait to a full-blown charge. If a bear charges, stand still.
- The bear attacks: When all else fails, a bear may attack. Attacks may be preceded by all of the behaviors previously described or they may be sudden. Seemingly unprovoked attacks are often the result of a bear being surprised (and feeling threatened), a bear defending its food cache, or a female defending her cubs. When a bear attacks, it typically runs with its body low to the ground, legs are stiff, ears are flattened, hair on the nape of the neck is up, and the bear moves in a fast, determined way. Front paws are often used to knock the opponent down and jaws are used to subdue it.

AFTER A BEAR ENCOUNTER

Black bears have been known to view humans as prey, and if you struggle with the attacking black bear, it will probably go elsewhere for its meal.

- Bear Sprays: Are easy to carry and use, little risk of permanent damage to bears and humans, effective in many situations. However, using a spray may change a false charge into a real charge, they are ineffective at ranges greater than 20 feet, ineffective in windy conditions, dangerous if accidentally discharged in a closed area such as an aircraft cockpit.

The most effective tool you have against an attacking bear is your brain. Although bears are intelligent animals, we are smarter and can often think our way out of a bad situation if we try.

ATTACHMENT 2

HAZARDS AND PRECAUTIONS – DEER

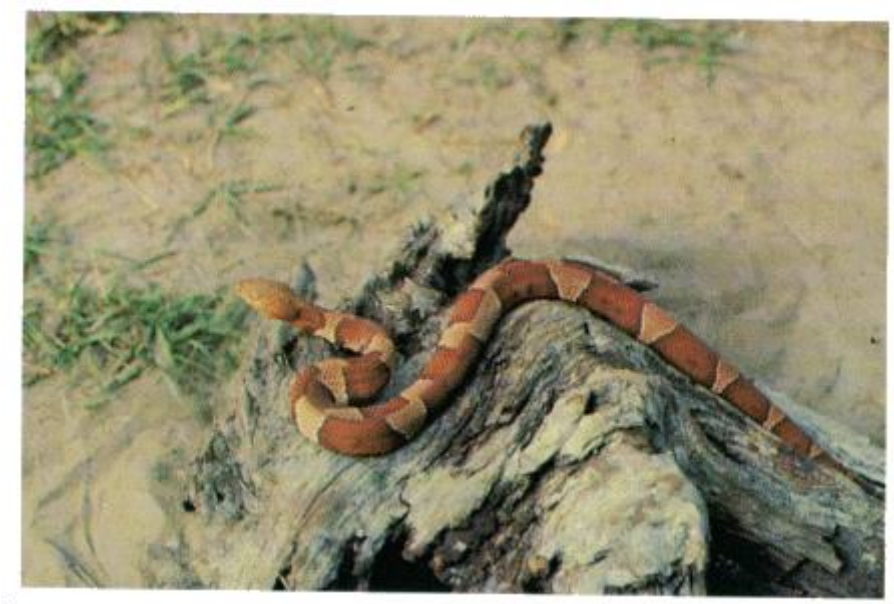
The following technical information, precautions, and guidelines for operations in which Deer may be encountered. The more the species are understood, the easier it will be to avoid contact with them thus preventing injury to ourselves and to the animals. All big game species are unpredictable and can be dangerous under certain conditions. This attachment is intended to provide information that will enable Weston to plan for encounters and to properly address face-to-face encounters.

WHITE-TAILED DEER

The White-tailed deer found thought the eastern and western part of the United States have been known to attack people on many occasions. It is unknown whether Black-tailed deer have made any such attacks, but it is possible for someone to be injured by an irate buck in the breeding season (late fall). Deer are well equipped to injure humans. They are very fast. Bucks have sharp antlers and can clear amazingly high obstacles with graceful, arching leaps. They can run with remarkable speed, even in dense cover, and have excellent camouflage. When working in areas populated with deer, it is just common sense not to approach any large wild animal too closely. It is unlikely that an attack from a deer would be fatal but it is possible and serious injury is likely.

APPENDIX B - PICTURES OF POISONOUS SNAKES AND LIZARDS

Americas



American copperhead

Cotton Mouth – East and Southeast US

Timber Rattlesnake – Eastern US

FLD 43 B INSECTS

Sting and Biting Insects

Contact with stinging insects may result in site personnel experiencing adverse health affects that range from being mildly uncomfortable to being life threatening. Therefore, stinging insects present a serious hazard to site personnel and extreme caution must be exercised whenever site and weather conditions increase the risk of encountering stinging insects. These include the following:

- Bees (Honeybees, bumble bees, wasps, and hornets and wingless wasps)
- Scorpions
- Fire ants
- Spiders
- Ticks
- Deer Flies
- Mosquito
- Fleas
- Bed Bugs

Bees, Wasps, Hornets and Yellow Jackets

The severity of an insect sting reaction varies from person to person. A normal reaction will result in pain, swelling and redness confined to the sting site. Simply disinfect the area (washing with soap and water will do) and apply ice to reduce the swelling.

A large local reaction will result in swelling that extends beyond the sting site. For example, a sting on the forearm could result in the entire arm swelling twice its normal size.

Although alarming in appearance, this condition is often treated the same as a normal reaction. An unusually painful or very large local reaction may need medical attention. Because this condition may persist for two to three days, antihistamines and corticosteroids are sometimes prescribed to lessen the discomfort.

Yellow jackets, hornets and wasps can sting repeatedly. Honeybees have barbed stingers that are left behind in their victim’s skin. These stingers are best removed by a scraping action, rather than a pulling motion, which may actually squeeze more venom into the skin.

Scorpions (Caribbean)

Scorpion stings are a major public health problem in many underdeveloped tropical countries. For every person killed by a poisonous snake, 10 are killed by a poisonous scorpion. In the United States, only 4 deaths in 11 years have occurred as a result of scorpion stings. Furthermore, scorpions can be found outside their normal range of distribution, ie, when they

accidentally crawl into luggage, boxes, containers, or shoes and are unwittingly transported home via human travelers.

Out of 1,500 scorpion species, 50 are dangerous to humans. Scorpion stings cause a wide range of conditions, from severe local skin reactions to neurologic, respiratory, and cardiovascular collapse.

Almost all of these lethal scorpions belong to the scorpion family called the Buthidae. The Buthidae are small to mid-size scorpions (0.8 inch to 5.0 inches) and normally uniformly colored without patterns or shapes. Poisonous scorpions also tend to have weak-looking pincers, thin bodies, and thick tails, as opposed to the strong heavy pincers, thick bodies, and thin tails seen in nonlethal scorpions. The lethal members of the Buthidae family include the genera of *Tityus* which can be found in the Caribbean.

A scorpion has a flattened elongated body and can easily hide in cracks. Scorpions are members of the Arachnid (spider) family. The bodies consist of 3-segments, they also have 4 pairs of legs, a pair of claws, and a segmented tail that has a poisonous spike at the end. Scorpions vary in size from 1-20 cm in length.

However, scorpions may be found outside their habitat range of distribution when inadvertently transported with luggage and cargo.

Prevention

Preventive measures include awareness of scorpions, shaking out clothing and boots before putting them on looking before reaching into likely hiding places and wearing gloves, long sleeved shirts and pants.

Symptoms

In mild cases, the only symptom may be a mild tingling or burning at site of sting.

In severe cases, symptoms may include:

- Eyes and ears - Double vision
- Lungs - Difficulty breathing, No breathing, Rapid breathing,
- Nose, mouth, and throat – Drooling, Spasm of the voice box, Thick-feeling tongue
- Heart and blood - High blood pressure, Increased or decreased heart rate, Irregular heartbeat
- Kidneys and bladder Urinary incontinence, Urine output, decreased
- Muscles and joints - Muscle spasms
- Nervous system – Paralysis, Random movements of head, eye, or neck, Restlessness, Seizures, Stiffness
- Stomach and intestinal tract - Abdominal cramps, Fecal incontinence
- Other -Convulsions

Treatment

1. Recognize scorpion sting symptoms:
2. Wash the area with soap and water.
3. Apply a cool compress on the area of the scorpion sting. Ice (wrapped in a washcloth or other suitable covering) may be applied to the sting location for 10 minutes. Remove compress for 10 minutes and repeat as necessary.
4. Call the Poison Control Center. If you develop symptoms of a poisonous scorpion sting, go to the nearest emergency care facility.
5. Keep your tetanus shots and boosters current.

Fire Ants (Caribbean)

Fire ants are aggressive, reddish-brown to black ants that are 1/8 inch to 1/4 inch long. They construct nests, which are often visible as dome-shaped mounds of soil, sometimes as large as 3 feet across and 1 1/2 feet in height. In sandy soils, mounds are flatter and less visible. Fire ants usually build mounds in sunny, open areas such as lawns, pastures, cultivated fields and meadows, but they are not restricted to these areas. Mounds or nests may be located in rotting logs, around trees and stumps, under pavement and buildings, and occasionally indoors.

Fire ants use their stingers to immobilize or kill prey and to defend ant mounds from disturbance by larger animals, such as humans. Any disturbance sends hundreds of workers out to attack anything that moves. The ant grabs its victim with its mandibles (mouthparts) and then inserts its stinger. The process of stinging releases a chemical, which alerts other ants, inducing them to sting. In addition, one ant can sting several times without letting go with its mandibles.

Once stung, humans experience a sharp pain that lasts a couple of minutes, then after a while the sting starts itching and a welt appears. Fire ant venom contains alkaloids and a relatively small amount of protein. The alkaloids kill skin cells; this attracts white blood cells, which form a pustule within a few hours of being stung. The fluid in the pustule is sterile, but if the pustule is broken, the wound may become infected. The protein in the venom can cause allergic reactions that may require medical attention.

Some of the factors related to stinging insects that increase the risk associated with accidental contact are:

- The nests for these insects are frequently found in remote wooded or grassy areas and hidden in cavities
- The nests can be situated in trees, rocks, bushes or in the ground, and are usually difficult to see
- Accidental contact with these insects is highly probable, especially during warm weather conditions when the insects are most active
- If a site worker accidentally disturbs a nest, the worker may be inflicted with multiple stings, causing extreme pain and swelling which can leave the worker incapacitated and in need of medical attention

- Some people are hypersensitive to the toxins injected by a sting, and when stung, experience a violent and immediate allergic reaction resulting in a life-threatening condition known as anaphylactic shock
- Anaphylactic shock manifests itself very rapidly and is characterized by extreme swelling of the body, eyes, face, mouth and respiratory passages
- The hypersensitivity needed to cause anaphylactic shock, can in some people, accumulate over time and exposure, therefore, even if someone has been stung previously, and not experienced an allergic reaction, there is no guarantee that they will not have an allergic reaction if they are stung again

With these things in mind, and with the high probability of contact with stinging insects, use the following safe work practices:

- If a worker knows that he is hypersensitive to bee, wasp or hornet stings, inform the site Safety officer of this condition prior to participation in site activities
- All site personnel will be watchful for the presence of stinging insects and their nests, and will advise the Site Safety officer if a stinging insect nest is located or suspected in the area
- Any nests located on site will be flagged off and site personnel will be notified of its presence
- If attacked, site personnel will immediately seek shelter and stay there. Do not jump in water (bees will still be in the area when you come up). Once safe, remove stings from your skin, it does not matter how you do it, but do it as quickly as possible to reduce the amount of venom they inject. Obtain first aid treatment and contact the safety officer who will observe for signs of allergic reaction

Treatment for fire ant stings is aimed at preventing secondary bacterial infection, which may occur if the pustule is scratched or broken. Clean the blisters with soap and water to prevent secondary infection. Do not break the blister. Topical corticosteroid ointments and oral antihistamines may relieve the itching associated with these reactions.

Site personnel with a known hypersensitivity to stinging insects will keep required emergency medication on or near their person at all times

Spiders

A large variety of spiders may be encountered during site activities. Extreme caution must be used when lifting logs and debris, since spiders are typically found in these areas.

While most spider bites merely cause localized pain, swelling, reddening, and in some cases, tissue damage, there are a few spiders that, due to the severity of the physiological affects caused by their venom, are dangerous.

Black Widow: The black widow is a coal-black bulbous spider 3/4 to 1 1/2 inches in length, with a bright red hourglass on the under side of the abdomen. The black widow is usually found in dark moist locations, especially under rocks, rotting logs and may even be found in outdoor toilets where they inhabit the underside of the seat. Victims of a black widow bite may exhibit the following signs or symptoms:

- Sensation of pinprick or minor burning at the time of the bite
- Appearance of small punctures (but sometimes none are visible)
- After 15 to 60 minutes, intense pain is felt at the site of the bite which spreads quickly, and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, poor coordination, dilated pupils and generalized swelling of face and extremities

Brown Recluse: The brown or violin spider is brownish to tan in color, rather flat, and 1/2 to 5/8 inches long. However, unlike the typical species, this spider has been encountered without a violin or "fiddle" shaped mark on the top of the head. Of the brown spider, there are three varieties found in the United States that present a problem to site personnel. These are the brown recluse, the desert violin and the Arizona violin. These spiders may be found in a variety of locations including trees, rocks or in dark locations. Victims of a brown or violin spider bite may exhibit the following signs or symptoms:

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite
- Formation of a large, red, swollen, postulating lesion with a bull's-eye appearance
- Systemic affects may include a generalized rash, joint pain, chills, fever, nausea and vomiting
- Pain may become severe after 8 hours, with the onset of tissue necrosis

There is no effective first aid treatment for either of these bites. Except for very young, very old or weak victims, spider bites are not considered to be life threatening. However, medical treatment must be sought to reduce the extent of damage caused by the injected toxins.

Brown Recluse Spider

Black Widow Spider

First aid should include:

- If possible, catch the spider to confirm its identity. Even if the body is crushed, save it for identification
- Clean the bitten area with soap and water or rubbing alcohol
- To relieve pain, place an ice pack over the bite
- Keep the victim quiet and monitor breathing

Seek immediate medical attention

Sensitivity Reaction to Insect Stings or Bites

A sensitivity reaction is one of the more dangerous and acute effects of insect bites or stings. It is the most common cause of fatalities from bites, particularly from bees, wasps, and spiders. Anaphylactic shock due to stings can lead to severe reactions in the circulatory, respiratory, and central nervous system. This can also result in death.

Site personnel must be questioned regarding their allergic reaction to insect bites. Anyone knowingly allergic should be required to carry and know how to use a response kit (e.g., Epi-Kit). First aid providers must be instructed on how to use the kit also. The kit must be inspected to ensure it is updated.

Administer first aid and observe persons reporting stings for signs of allergic reaction, such as unusual swelling, nausea, dizziness, and shock. At the first sign of these symptoms, take the individual to a medical facility for attention.

Insect Borne Diseases

Diseases that are spread by insects include the following: Lyme Disease (tick); Bubonic and other forms of Plaque (fleas); Malaria, West Nile Virus and Equine Encephalitis (mosquito).

Tick Borne Diseases

Lyme disease is the second most rapidly spreading disease in the U.S.

Lyme Disease

1. Facts

Definition:

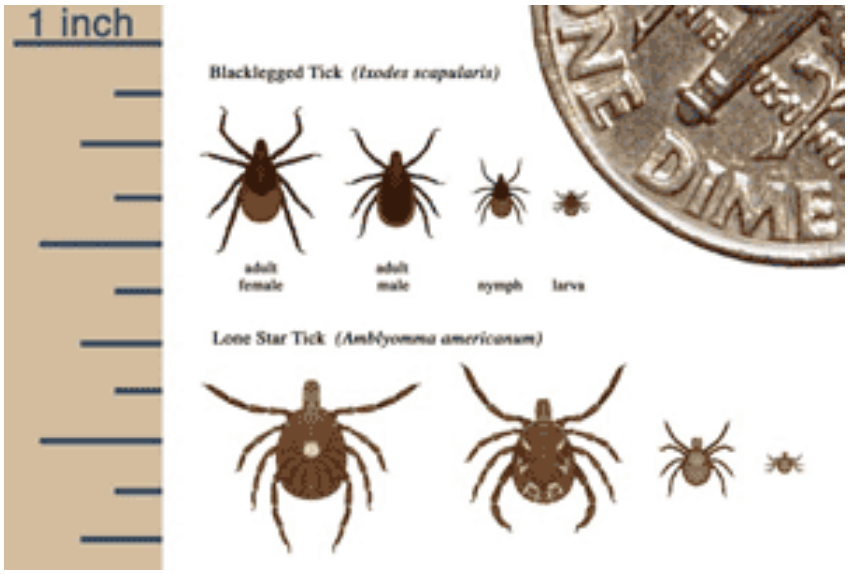
- Bacterial infection transmitted by the bite of an infected black-legged tick more popularly known as the deer tick.

- Prevalence (nationwide and other countries).

- Three stages/sizes of deer ticks:
    - Larvae
    - Nymph
    - Adult

Tick season is May through October.

Not all ticks transmit Lyme disease (Black legged or deer tick [upper] compared to the Lone Star tick [lower])



- Ticks must be attached for several hours before Lyme disease can be transmitted.
- Being bitten by a tick does not mean you will get Lyme disease.

2. Prevention and Protection:

- Wear light-colored, tight-knit clothing.
- Wear long pants and long-sleeved shirts.
- Tuck pant legs into shoes or boots.
- Wear a hat.
- Use insect repellant containing DEET ((follow manufacturer's instructions for use).
- Check yourself daily for ticks after being in grassy, wooded areas.
- Request information from the Health and Safety Medical Section regarding Lyme Disease.

3. If Bitten:

- Remove the tick immediately with fine-tipped tweezers. Grasp the tick as close to the skin as possible. Pull gently but firmly without twisting or crushing the tick.
- Wash your hands and dab the bite with an antiseptic.

- Save the tick in a jar in some alcohol. Label the jar with the date of the bite, the area where you picked up the tick and the spot on your body where you were bitten.
- Monitor the bite for any signs of infection or rash.

4. Symptoms:

Early Signs (may vary from person to person)

- Expanding skin rash.

- Flu-like symptoms during summer or early fall that include the following:
  - Chills, fever, headache, swollen lymph nodes.
  - Stiff neck, aching joints, and muscles.
  - Fatigue.

- Later signs
  - Nervous system problems.
  - Heart problems.
  - Arthritis, especially in knees.

5. Upon Onset of Symptoms:

- Notify your Safety Officer (SO) and your supervisor.

Ehrlichiosis

Ehrlichiosis is the general name used to describe several bacterial diseases that affect animals and humans. These diseases are caused by the organisms in the genus *Ehrlichia*. Worldwide, there are currently four ehrlichial species that are known to cause disease in humans.

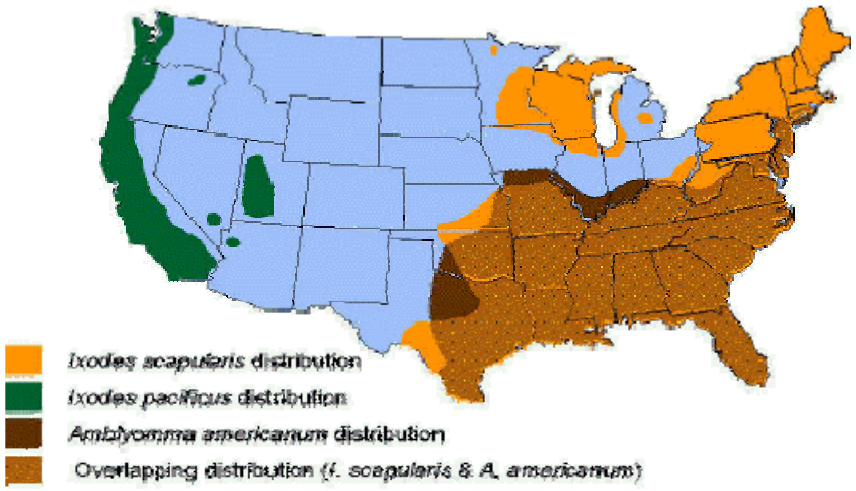
In the United States, ehrlichiae are transmitted by the bite of an infected tick. The lone star tick (*Amblyomma americanum*) and the blacklegged tick (*Ixodes scapularis)* are known vectors of ehrlichiosis.

The symptoms of ehrlichiosis may resemble symptoms of various other infectious and non-infectious diseases. These clinical features generally include fever, headache, fatigue, and muscle aches. Other signs and symptoms may include nausea, vomiting, diarrhea, cough, joint pains, confusion, and occasionally rash. Symptoms typically appear after an incubation period of 5-10 days following the tick bite. It is possible that many individuals who become infected with ehrlichiae do not become ill or they develop only very mild symptoms.

Most cases of ehrlichiosis are reported within the geographic distribution of the vector ticks (see map below). Occasionally, cases are reported from areas outside the distribution of the tick vector. In most instances, these cases have involved persons who traveled to areas where the diseases are endemic, and who had been bitten by an infected tick and developed symptoms after

returning home. Therefore, if you traveled to an ehrlichiosis-endemic area 2 weeks prior to becoming ill, you should tell your doctor where you traveled.

Figure 20. Areas where human ehrlichiosis may occur based on approximate distribution of vector tick species



A diagnosis of ehrlichiosis is based on a combination of clinical signs and symptoms and confirmatory laboratory tests. Blood samples can be sent to a reference laboratory for testing. However, the availability of the different types of laboratory tests varies considerably. Other laboratory findings indicative of ehrlichiosis include low white blood cell count, low platelet count, and elevated liver enzymes.

Ehrlichiosis is treated with a tetracycline antibiotic, usually doxycycline.

Very little is known about immunity to ehrlichial infections. Although it has been proposed that infection with ehrlichiae confers long-term protection against reinfection, there have been occassional reports of laboratory-confirmed reinfection. Short-term protection has been described in animals infected with some *Ehrlichia* species and this protection wanes after about 1 year. Clearly, more studies are needed to determine the extent and duration of protection against reinfection in humans.

Limiting exposure to ticks reduces the likelihood of infection in persons exposed to tick-infested habitats. Prompt careful inspection of your body and removal of crawling or attached ticks is an important method of preventing disease. It may take 24–48 hours of attachment before microorganisms are transmitted from the tick to you.

Preventive measures - Follow protection protocols for Lyme disease

Babesiosis

Babesiosis is an intraerythrocytic parasitic infection caused by protozoa of the genus *Babesia* and transmitted through the bite of the *Ixodes* tick, the same vector responsible for transmission of Lyme disease. While most cases are tick-borne, transfusion and transplacental transmission

have been reported. In the United States, babesiosis is usually an asymptomatic infection in healthy individuals. Several groups of patients become symptomatic, and, within these subpopulations, significant morbidity and mortality occur. The disease most severely affects patients who are elderly, immunocompromised, or asplenic. Among those symptomatically infected, the mortality rate is 10% in the United States.

The primary vectors of the parasite are ticks of the genus *Ixodes*. In the United States, the black-legged tick, *Ixodes scapularis* (also known as *Ixodes dammini*) is the primary vector for the parasite. The *Ixodes* tick vector for *Babesia* is the same vector that locally transmits *Borrelia burgdorferi*, the agent implicated in Lyme disease. The primary US animal reservoir is the white-footed mouse, *Peromyscus leucopus*. Additionally, white-tailed deer serve as transport hosts for the adult tick vector, *I scapularis*.

The Ixodid ticks ingest *Babesia* during feeding from the host, multiply the protozoa in their gut wall, and concentrate it in their salivary glands. The tick inoculates a new host when feeding again. The parasite then infects red blood cells (RBCs) and differentiated and undifferentiated trophozoites are produced. The former produce 2-4 merozoites that disrupt the RBC and go on to invade other RBCs. This leads to hemolytic anemia, thrombocytopenia, and atypical lymphocyte formation. Alterations in RBC membranes cause decreased conformability and increased red cell adherence, which can lead to development of acute respiratory distress syndrome (ARDS) among those severely affected.

The signs and symptoms mimic malaria and range in severity from asymptomatic to septic shock.

Symptoms include: Generalized weakness, fatigue, depression, fever, anorexia and weight loss, CNS - Headache, photophobia, neck stiffness, altered sensorium, pulmonary - Cough, shortness of breath, GI - Nausea, vomiting, abdominal pain, Musculoskeletal - Arthralgia and myalgia and Renal - Dark urine

Prevention

Prevention measures are the same as for Lyme and other insect borne diseases

Tularemia

Tularemia (also known as "rabbit fever") is a serious infectious disease caused by the bacterium *Francisella tularensis*. The disease is endemic in North America. The primary vectors are ticks and deer flies, but the disease can also be spread through other arthropods. Animals such as rabbits, prairie dogs, hares and muskrats serve as reservoir hosts.

Depending on the site of infection, tularemia has six characteristic clinical syndromes: ulceroglandular, glandular, oropharyngeal, pneumonic, oculoglandular, and typhoidal.

The disease has a very rapid onset, with headache, fatigue, dizziness, muscle pains, loss of appetite and nausea. Face and eyes redden and become inflamed. Inflammation spreads to the

lymph nodes, which enlarge and may suppurate (mimicking bubonic plague). Lymph node involvement is accompanied by a high fever. Death may result.

Francisella tularensis is one of the most infective bacteria known; fewer than ten organisms can cause disease leading to severe illness. The bacteria penetrate into the body through damaged skin and mucous membranes, or through inhalation. Humans are most often infected by tick bite or through handling an infected animal. Ingesting infected water, soil, or food can also cause infection. Tularemia can also be acquired by inhalation; hunters are at a higher risk for this disease because of the potential of inhaling the bacteria during the skinning process. Tularemia is not spread directly from person to person.

No vaccine is available to the general public The best way to prevent tularemia infection is to wear rubber gloves when handling or skinning rodents or lagomorphs (as rabbits), avoid ingesting uncooked wild game and untreated water sources, and wearing long-sleeved clothes and using an insect repellant to prevent tick bites.

Prevention

No vaccine is available to the general public The best way to prevent tularemia infection is to wear rubber gloves when handling or skinning rodents or lagomorphs (as rabbits), avoid ingesting uncooked wild game and untreated water sources, and wearing long-sleeved clothes and using an insect repellant to prevent tick bites.

Other diseases primarily transmitted by Arthropods (Ticks, mites, lice etc.)

Thyphus (Not to be confused with Typhoid Fever [discussed in these FLDs])

For the unrelated disease caused by Salmonella typhi, see Typhoid fever. For the unrelated disease caused by Salmonella paratyphi, please refer to Paratyphoid fever. For the monster of Greek mythology, see Typhus (monster).

Typhus is any one of several similar diseases caused by louse-borne bacteria. The name comes from the Greek *typhos,* meaning smoky or lazy, describing the state of mind of those affected with typhus. *Rickettsia* is endemic in rodent hosts, including mice and rats, and spreads to humans through mites, fleas and body lice. The arthropod vector flourishes under conditions of poor hygiene, such as those found in prisons or refugee camps, amongst the homeless, or until the middle of the 20th century, in armies in the field. In tropical countries, typhus is often mistaken for dengue fever.

Endemic typhu

Endemic typhus (also called "flea-borne typhus" and "murine typhus" or "rat flea typhus") is caused by the bacteria *Rickettsia typhi*, and is transmitted by the flea that infest rats. Symptoms of endemic typhus include headache, fever, chills, myalgia, nausea, vomiting, and cough.

Endemic typhus is highly treatable with antibiotics. Most people recover fully, but death may occur in the elderly, severely disabled or patients with a depressed immune system.

Encephalitis Arboviral Encephalitides

Perspectives

Arthropod-borne viruses, i.e., arboviruses, are viruses that are maintained in nature through biological transmission between susceptible vertebrate hosts by blood feeding arthropods (mosquitoes, psychodids, ceratopogonids, and ticks). Vertebrate infection occurs when the infected arthropod takes a blood meal. The term 'arbovirus' has no taxonomic significance. Arboviruses that cause human encephalitis are members of three virus families: the *Togaviridae* (genus Alphavirus, *Flaviviridae*, and *Bunyaviridae*.

All arboviral encephalitides are zoonotic, being maintained in complex life cycles involving a nonhuman primary vertebrate host and a primary arthropod vector. These cycles usually remain undetected until humans encroach on a natural focus, or the virus escapes this focus via a secondary vector or vertebrate host as the result of some ecologic change. Humans and domestic animals can develop clinical illness but usually are "dead-end" hosts because they do not produce significant viremia, and do not contribute to the transmission cycle. Many arboviruses that cause encephalitis have a variety of different vertebrate hosts and some are transmitted by more than one vector. Maintenance of the viruses in nature may be facilitated by vertical transmission (e.g., the virus is transmitted from the female through the eggs to the offspring).

Arboviral encephalitides have a global distribution, but there are four main virus agents of encephalitis in the United States, all of which are transmitted by mosquitoes. A new Powassan-like virus has recently been isolated from deer ticks. Its relatedness to Powassan virus and its ability to cause disease has not been well documented. Most cases of arboviral encephalitis occur from June through September, when arthropods are most active. In milder (i.e., warmer) parts of the country, where arthropods are active late into the year, cases can occur into the winter months.

There is expanded discussion of several of these diseases (West Nile and Eastern Equien Encephalitis elsewhere in this document. A more general discussion is found in Attachment 2.

Mosquito Borne Diseases

Malaria

Malaria is a mosquito-borne disease caused by a parasite. Four kinds of malaria parasites can infect humans: *Plasmodium falciparum, P. vivax, P. ovale,* and *P. malariae*.

People with malaria often experience fever, chills, and flu-like illness. Left untreated, they may develop severe complications and die. Each year 350-500 million cases of malaria occur worldwide. Infection with any of the malaria species can make a person feel very ill; infection with *P. falciparum*, if not promptly treated, may be fatal. Although malaria can be a fatal disease, illness and death from malaria are largely preventable.

This sometimes fatal disease can be prevented and cured. Bed nets, insecticides, and anti-malarial drugs are effective tools to fight malaria in areas where it is transmitted. Travelers to a malaria-risk area should avoid mosquito bites and take a preventive anti-malarial drug. Malaria was eradicated from the United States in the early 1950s. However, malaria is common in many developing countries and travelers who visit these areas risk getting malaria.

Returning travelers and arriving immigrants could also reintroduce the disease in the United States if they are infected with malaria when they return. The mosquito that transmits malaria, *Anopheles*, is found throughout much of the United States. If local mosquitoes bite an infected person, those mosquitoes can, in turn, infect local residents (*introduced malaria*).

Because the malaria parasite is found in red blood cells, malaria can also be transmitted through blood transfusion, organ transplant, or the shared use of needles or syringes contaminated with blood. Malaria may also be transmitted from a mother to her fetus before or during delivery ("congenital" malaria).

Malaria is not transmitted from person to person like a cold or the flu. You cannot get malaria from casual contact with malaria-infected people.

Prevention and control

You can prevent malaria by:

- keeping mosquitoes from biting you, especially at night
- taking anti-malarial drugs to kill the parasites
- eliminating places where mosquitoes breed
- spraying insecticides on walls to kill adult mosquitoes that come inside
- sleeping under bed nets - especially effective if they have been treated with insecticide,
- wearing insect repellent and long-sleeved clothing if out of doors at night

The surest way for you and your health-care provider to know whether you have malaria is to have a diagnostic test where a drop of your blood is examined under the microscope for the presence of malaria parasites. If you are sick and there is any suspicion of malaria (for example, if you have recently traveled in a malaria-risk area) the test should be performed without delay.

The disease should be treated early in its course, before it becomes severe and poses a risk to the patient's life. Several good anti-malarial drugs are available, and should be administered early on. The most important step is to think about malaria, so that the disease is diagnosed and treated in time.

West Nile Virus

West Nile virus (WNV) is a potentially serious illness. Experts believe WNV is established as a seasonal epidemic in North America that flares up in the summer and continues into the fall. This fact sheet contains important information that can help you recognize and prevent WNV.

The easiest and best way to avoid WNV is to prevent mosquito bites.

- When you are outdoors, use insect repellent containing an EPA-registered active ingredient. Follow the directions on the package.

- Many mosquitoes are most active at dusk and dawn. Be sure to use insect repellent and wear long sleeves and pants at these times or consider staying indoors during these hours.

- Make sure you have good screens on your windows and doors to keep mosquitoes out.

- Get rid of mosquito breeding sites by emptying standing water from buckets, barrels and drainage ditches.

About one in 150 people infected with WNV will develop severe illness. The severe symptoms can include high fever, headache, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness and paralysis. These symptoms may last several weeks, and neurological effects may be permanent.

Up to 20 percent of the people who become infected have symptoms such as fever, headache, and body aches, nausea, vomiting, and sometimes swollen lymph glands or a skin rash on the chest, stomach and back. Symptoms can last for as short as a few days, though even healthy people have become sick for several weeks.

Approximately 80 percent of people (about 4 out of 5) who are infected with WNV will not show any symptoms at all. Most often, WNV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds. Infected mosquitoes can then spread WNV to humans and other animals when they bite.

In a very small number of cases, WNV also has been spread through blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.

WNV is not spread through casual contact such as touching or kissing a person with the virus.

Symptoms typically develop between 3 - 14 days after being bitten by an infected mosquito.

There is no specific treatment for WNV infection. In cases with milder symptoms, people experience symptoms such as fever and aches that pass on their own, although even healthy people have become sick for several weeks. In more severe cases, people usually need to go to the hospital where they can receive supportive treatment including intravenous fluids, help with breathing and nursing care.

Milder WNV illness improves on its own, and people do not necessarily need to seek medical attention for this infection though they may choose to do so. If you develop symptoms of severe WNV illness, such as unusually severe headaches or confusion, seek medical attention immediately. Severe WNV illness usually requires hospitalization. Pregnant women and nursing mothers are encouraged to talk to their doctor if they develop symptoms that could be WNV. People over the age of 50 are more likely to develop serious symptoms of WNV if they do get sick and should take special care to avoid mosquito bites.

The more time you're outdoors, the more time you could be bitten by an infected mosquito. Pay attention to avoiding mosquito bites if you spend a lot of time outside, either working or playing.

All donated blood is checked for WNV before being used. The risk of getting WNV through blood transfusions and organ transplants is very small, and should not prevent people who need surgery from having it. If you have concerns, talk to your doctor.

Equine Encephalitis

Eastern equine encephalitis (EEE) is a mosquito-borne viral disease. EEE virus (EEEV) occurs in the eastern half of the United States where it causes disease in humans, horses, and some bird species. Because of the high mortality rate, EEE is regarded as one of the most serious mosquito-borne diseases in the United States.

EEEV is transmitted to humans through the bite of an infected mosquito. It generally takes from 3 to 10 days to develop symptoms of EEE after being bitten by an infected mosquito. The main EEEV transmission cycle is between birds and mosquitoes.

Many species of mosquitoes can become infected with EEEV. The most important mosquito species in maintaining the bird-mosquito transmission cycle is *Culiseta melanura*, which reproduces in freshwater hardwood swamps. *Culiseta melanura*, however, is not considered to be an important vector of EEEV to horses or humans because it feeds almost exclusively on birds.

Transmission to horses or humans requires mosquito species capable of creating a "bridge" between infected birds and uninfected mammals such as some *Aedes*, *Coquillettidia*, and *Culex* species.

Horses are susceptible to EEE and some cases are fatal. EEEV infections in horses, however, are not a significant risk factor for human infection because horses are considered to be "dead-end" hosts for the virus (i.e., the amount of EEEV in their bloodstreams is usually insufficient to infect mosquitoes).

Eastern equine encephalitis virus is a member of the family Togaviridae, genus *Alphaviru c*losely related to Western equine encephalitis virus and Venezuelan equine encephalitis virus

Many persons infected with EEEV have no apparent illness. In those persons who do develop illness, symptoms range from mild flu-like illness to inflammation of the brain, coma and death.

The mortality rate from EEE is approximately one-third, making it one of the most deadly mosquito-borne diseases in the United States.

There is no specific treatment for EEE; optimal medical care includes hospitalization and supportive care (for example, expert nursing care, respiratory support, prevention of secondary bacterial infections, and physical therapy, depending on the situation).

Approximately half of those persons who survive EEE will have mild to severe permanent neurologic damage.

Incidence rate includes:

- Approximately 220 confirmed cases in the US 1964-2004, Average of 5 cases/year, with a range from 0-15 cases

- States with largest number of cases includes New Jersey.

- EEEV transmission is most common in and around freshwater hardwood swamps in the Atlantic Coast states and the Great Lakes region.

- Human cases occur relatively infrequently, largely because the primary transmission cycle takes place in and around swampy areas where human populations tend to be limited.

Risk Groups:

- Residents of and visitors to endemic areas (areas with an established presence of the virus)

- People who engage in outdoor work and recreational activities in endemic areas.

- Persons over age 50 and younger than age 15 seem to be at greatest risk for developing severe EEE when infected with the virus.

Prevention

- A vaccine is available to protect equines.

- People should avoid mosquito bites by employing personal and workplace protection measures, such as using an EPA-registered repellent according to manufacturers' instructions, wearing protective clothing, avoiding outdoor activity when mosquitoes are active (some bridge vectors of EEEV are aggressive day-biters), and removing standing water that can provide mosquito breeding sites.

- There are laboratory tests to diagnosis EEEV infection including serology, especially IgM testing of serum and cerebrospinal fluid (CSF), and neutralizing antibody testing of acute- and convalescent-phase serum.

Meningitis

Meningitis is a viral disease that can affect the central nervous system that is transmitted through the bite from an infected mosquito.

Symptoms can be nonexistent or severe and flu-like, with fever, chills, tiredness, headache, nausea and vomiting. If not treated promptly the disease can be fatal.

Prevention

- A vaccine is available. It's 80% effective after a single dose and 97.5% effective after a second dose.

  Use precautions as for other mosquito borne diseases. Avoid mosquito bites by employing personal and workplace protection measures, such as using an EPA-registered repellent according to manufacturers' instructions, wearing protective clothing, avoiding outdoor activity when mosquitoes are active and removing standing water that can provide mosquito breeding sites.

Deer Flies (See Tularemia above)

Fleas

Flea is a common name for insects of the order Siphonaptera which are wingless insects with mouthparts adapted for piercing skin and sucking blood. Fleas are external parasites, living by hematophagy off the blood of mammals (including humans). Some species include the cat flea (*Ctenocephalides felis*), dog flea (*Ctenocephalides canis*), and human flea (*Pulex irritans*).

Fleas are small (1.5 to 3.3 mm) long, agile, dark-colored, wingless insect with tube-like mouth parts adapted to feeding on the blood of their hoists. Their legs are long, with the hind pair well adapted for jumping. A flea can jump vertically up to seven inches and horizontally up to 13 inches. The flea body is hard, polished, and covered with many hairs and short spines directed backwards which assists its movement on the host. The body is able to withstand great pressure. Hard squeezing between the fingers is not normally sufficient to kill a flea.

Fleas lay tiny white oval-shaped eggs. The larva is small, pale, has bristles covering its worm-like body, lacks eyes, and has mouthparts adapted to chewing.

Fleas can cause medical problems include flea allergy dermatitis, secondary skin irritations and, in extreme cases, anemia, tapeworms, and stomach flu. Fleas can transmit murine typhus (endemic typhus) fever among animals and from animal to humans. Fleas can also transmit bubonic plague. Tapeworms normally infest in human severe cases. Although the bite is rarely felt, it is the resulting irritation caused by the flea salivary secretions that varies among individuals. Some result in a severe reaction including a general rash or inflammation resulting in secondary infections caused by scratching the irritated shin. Most bites are found on the feet and legs with the formation of small, hard, red, slightly raised itching spots with a single puncture point in the center of each spot.

Treatment

Flea bites can be treated with anti-itch creams, usually antihistamines or hydrocortisone.

Bed Bugs

Bed bugs are small parasitic insects that feed on human blood. A number of health effects may occur due to bed bugs including skin rashes, prominent blisters, psychological effects and allergic symptoms. Diagnosis involves finding the bed bugs and the occurrence of compatible symptoms. Treatment is otherwise symptomatic.

Adult bed bugs are reddish-brown, flattened, oval and wingless. Bed bugs have microscopic hairs that give them a banded appearance. Adults grow to 4-5mm in length and 1.5-3 mm wide. A bed bug pierces the skin of its host with two hollow feeding tubes shaped like tongues. The one tube injects its saliva, which contains anticoagulants and anesthetics, while the other draws blood of its host. After feeding for approximately five minutes, the bug returns to its hiding place. Although bed bugs can live for a year without feeding, they normally feed every five to ten days.

Eradication of bed bugs frequently requires a combination of pesticide and non-pesticide approaches. Pyrethroids, dichlorvos, and malathion have historically been effective. Mechanical approaches include vacuuming and heat treating or wrapping mattresses have also been recommended.

ATTACHMENT 1

RICKETTSIAL INFECTIONS

Rickettsial Infections

Description

Many species of Rickettsia can cause illnesses in humans (Table below). The term “rickettsiae” conventionally embraces a polyphyletic group of microorganisms in the class Proteobacteria, comprising species belonging to the genera *Rickettsia*, *Ehrlichia*, *Coxiella*, and *Bartonella*. These agents are usually not transmissible directly from person to person except by blood transfusion or organ transplantation, although sexual and placental transmission has been proposed for *Coxiella*. Transmission generally occurs via an infected arthropod vector or through exposure to an infected animal reservoir host. However, sennetsu fever is acquired following consumption of raw fish products. The clinical severity and duration of illnesses associated with different rickettsial infections vary considerably, even within a given antigenic group. Rickettsioses range in severity from diseases that are usually relatively mild (cat scratch disease) to those that can be life-threatening (murine typhus) and they vary in duration from those that can be self-limiting to chronic (Q fever and bartonelloses) or recrudescent (Brill-Zinsser disease). Most patients with rickettsial infections recover with timely use of appropriate antibiotic therapy.

Travelers may be at risk for exposure to agents of rickettsial diseases if they engage in occupational or recreational activities which bring them into contact with habitats that support the vectors or animal reservoir species associated with these pathogens.

The geographic distribution and the risks for exposure to rickettsial agents are described below and in the Table below.

Trench Fever

Trench fever, which is caused by *Bartonella quintanta*, is transmitted from one person to another by the human body louse. Contemporary outbreaks of both diseases are rare in most developed countries and generally occur only in communities and populations in which body louse infestations are frequent, especially during the colder months when louse-infested clothing is not laundered. Foci of trench fever have also been recognized among homeless populations in urban centers of industrialized countries. Travelers who are not at risk of exposure to body lice or to persons with lice are unlikely to acquire these illnesses. However, health-care workers who care for these patients may be at risk for acquiring louse-borne illnesses through inhalation or inoculation of infectious louse feces into the skin or conjunctiva.

Murine Typhus

Murine typhus, which is caused by infection with *Rickettsia typhi*, is transmitted to humans by rat fleas, particularly during exposure in rat-infested buildings (3). Flea-infested rats can be found throughout the year in humid tropical environments, especially in harbor or riverine environments. In temperate regions, they are most common during the warm summer months.

Travelers who participate in outdoor activities in grassy or wooded areas (e.g., trekking, camping, or going on safari) may be at risk for acquiring tick-borne illnesses, including those caused by *Rickettsia*, and *Ehrlichia* species (see below).

TABLE Epidemiologic features and symptoms of rickettsial diseases

ANTIGENIC GROUP	DISEASE	AGENT	PREDOMINANT SYMPTOMS*	VECTOR OR ACQUISITION MECHANISM	ANIMAL RESERVOIR	GEOGRAPHIC DISTRIBUTION OUTSIDE THE US
Typhus fevers	Murine typhus	*R. typhi*	As above, generally less severe	Rat flea	Rats, mice	Worldwide
Spotted fevers						
Coxiella	Q fever	*Coxiella burnetii*	Fever, headache, chills, sweating, pneumonia, hepatitis, endocarditis	Most human infections are acquired by inhalation of infectious aerosols; tick	Goats, sheep, cattle, domestic cats, other	Worldwide
Bartonella	Cat-scratch disease	*Bartonella henselae*	Fever, adenopathy, neuroretinitis, encephalitis	Cat flea	Domestic cats	Worldwide
	Trench fever	*B. quintana*	Fever, headache, pain in shins, splenomegaly, disseminated rash	Human body louse	Humans	Worldwide
Ehrlichia	Ehrlichosis	*Ehrlichia chaffeensis*[#]	Fever, headache, nausea, occasionally rash	Tick	Various large and small mammals, including deer and rodents	Worldwide

This represents only a partial list of symptoms. Patients may have different symptoms or only a few of those listed.

Anaplasmosis aznd Ehrlichiosis

Human ehrlichiosis and anaplasmosis are acute tick-borne diseases, associated with the lone star tick, *Amblyomma americanum*, and *Ixodes* ticks, respectively. Because one tick may be infected with more than one tick-borne pathogen (e.g. *Borrelia burgdorferi*, the causative agent of Lyme disease, or various *Babesia* species, agent of human babesiosis), patients may be present with

atypical clinical symptoms that complicate treatment. Ehrlichioses and anaplasmosis are characterized by infection of different types of leukocytes, where the causative agent multiplies in cytoplasmic membrane-bound vacuole called morulae. Morulae can sometimes be detected in Giemsa-stained blood smears.

Q FEVER

Q fever occurs worldwide, most often in persons who have contact with infected goat, sheep, cat and cattle, particularly parturient animals (especially farmers, veterinarians, butchers, meat packers, and seasonal workers). Travelers who visit farms or rural communities can be exposed to *Coxiella burnetii*, the agent of Q fever, through airborne transmission (via animal-contaminated soil and dust) or less commonly through consumption of unpasteurized milk products or by exposure to infected ticks. These infections may initially result in only mild and self-limiting influenza-like illnesses, but if untreated, infections may become chronic, particularly in persons with preexisting heart valve abnormalities or with prosthetic valves. Such persons can develop chronic and potentially fatal endocarditis.

Cat-Scratch Disease

Cat-scratch disease is contracted through scratches and bites from domestic cats, particularly kittens, infected with *Bartonella henselae*, and possibly from their fleas (3, 4). Exposure can therefore occur wherever cats are found.

Symptoms

Clinical presentations of rickettsial illnesses vary (Table above), but common early symptoms, including fever, headache, and malaise, are generally nonspecific. Illnesses resulting from infection with rickettsial agents may go unrecognized or are attributed to other causes. Atypical presentations are common and may be expected with poorly characterized non-indigenous agents, so appropriate samples for examination by specialized reference laboratories should be obtained. A diagnosis of rickettsial diseases is based on two or more of the following: 1) clinical symptoms and an epidemiologic history compatible with a rickettsial disease, 2) the development of specific convalescent-phase antibodies reactive with a given pathogen or antigenic group, 3) a positive polymerase chain reaction test result, 4) specific immunohistologic detection of rickettsial agent, or 5) isolation of a rickettsial agent. Ascertaining the likely place and the nature of potential exposures is particularly helpful for accurate diagnostic testing.

Prevention

With the exception of the louse-borne diseases described above, for which contact with infectious arthropod feces is the primary mode of transmission (through autoinoculation into a wound, conjunctiva, or inhalation), travelers and health-care providers are generally not at risk for becoming infected via exposure to an ill person. Limiting exposures to vectors or animal reservoirs remains the best means for reducing the risk for disease. Travelers and persons working in areas where organisms may be present should implement prevention based on avoidance of vector-infested habitats, use of repellents and protective clothing, prompt detection and removal of arthropods from clothing and skin, and attention to hygiene.

Q fever and *Bartonella* group diseases may pose a special risk for persons with abnormal or prosthetic heart valves, and *Rickettsia, Ehrlichia,* and *Bartonella* for persons who are immuno-compromised.

ATTACHMENT 2

ENCEPHALITIS ARBOVIRAL ENCEPHALITIDES

Encephalitis Arboviral Encephalitides

Perspectives

Arthropod-borne viruses, i.e., arboviruses, are viruses that are maintained in nature through biological transmission between susceptible vertebrate hosts by blood feeding arthropods (mosquitoes, psychodids, ceratopogonids, and ticks). Vertebrate infection occurs when the infected arthropod takes a blood meal. The term 'arbovirus' has no taxonomic significance. Arboviruses that cause human encephalitis are members of three virus families: the *Togaviridae* (genus Alphavirus, *Flaviviridae*, and *Bunyaviridae*.

All arboviral encephalitides are zoonotic, being maintained in complex life cycles involving a nonhuman primary vertebrate host and a primary arthropod vector. These cycles usually remain undetected until humans encroach on a natural focus, or the virus escapes this focus via a secondary vector or vertebrate host as the result of some ecologic change. Humans and domestic animals can develop clinical illness but usually are "dead-end" hosts because they do not produce significant viremia, and do not contribute to the transmission cycle. Many arboviruses that cause encephalitis have a variety of different vertebrate hosts and some are transmitted by more than one vector. Maintenance of the viruses in nature may be facilitated by vertical transmission (e.g., the virus is transmitted from the female through the eggs to the offspring).

Arboviral encephalitides have a global distribution which is transmitted by mosquitoes. Powassan, is a minor cause of encephalitis in the northern United States, and is transmitted by ticks. A new Powassan-like virus has recently been isolated from deer ticks. Its relatedness to Powassan virus and its ability to cause disease has not been well documented. Most cases of arboviral encephalitis occur from June through September, when arthropods are most active. In milder (i.e., warmer) parts of the country, where arthropods are active late into the year, cases can occur into the winter months.

The majority of human infections is asymptomatic or may result in a nonspecific flu-like syndrome. Onset may be insidious or sudden with fever, headache, myalgias, malaise and occasionally prostration. Infection may, however, lead to encephalitis, with a fatal outcome or permanent neurologic sequelae. Fortunately, only a small proportion of infected persons progress to frank encephalitis.

Experimental studies have shown that invasion of the central nervous system (CNS), generally follows initial virus replication in various peripheral sites and a period of viremia. Viral transfer from the blood to the CNS through the olfactory tract has been suggested. Because the arboviral encephalitides are viral diseases, antibiotics are not effective for treatment and no effective antiviral drugs have yet been discovered.

Prevention

Arboviral encephalitis can be prevented in two major ways: personal protective measures and public health measures to reduce the population of infected mosquitoes. Personal measures include reducing time outdoors particularly in early evening hours, wearing long pants and long sleeved shirts and applying mosquito repellent to exposed skin areas. Public health measures often require spraying of insecticides to kill juvenile (larvae) and adult mosquitoes.

Selection of mosquito control methods depends on what needs to be achieved; but, in most emergency situations, the preferred method to achieve maximum results over a wide area is aerial spraying. In many states aerial spraying may be available in certain locations as a means to control nuisance mosquitoes. Such resources can be redirected to areas of virus activity. When aerial spraying is not routinely used, such services are usually contracted for a given time period. Financing of aerial spraying costs during large outbreaks is usually provided by state emergency contingency funds. Federal funding of emergency spraying is rare and almost always requires a federal disaster declaration. Such disaster declarations usually occur when the vector-borne disease has the potential to infect large numbers of people, when a large population is at risk and when the area requiring treatment is extensive. Special large planes maintained by the United States Air Force can be called upon to deliver the insecticide(s) chosen for such emergencies. Federal disaster declarations have relied heavily on risk assessment by the CDC.

There are no commercially available human vaccines for these U.S. diseases.

Powassan Encephalitis

Powassan (POW) virus is a flavivirus and currently the only well documented tick-borne transmitted arbovirus occurring in the United States and Canada. Recently a Powassan-like virus was isolated from the deer tick, *Ixodes scapularis*. Its relationship to POW and its ability to cause human disease has not been fully elucidated. POW's range in the United States is primarily in the upper tier States. In addition to isolations from man, the virus has been recovered from ticks *(Ixodes marxi, I. cookei* and *Dermacentor andersoni*) and from the tissues of a skunk (*Spiligale putorius*). It is a rare cause of acute viral encephalitis. POW virus was first isolated from the brain of a 5-year-old child who died in Ontario in 1958. Patients who recover may have residual neurological problems.

Other Arboviral Encephalitides

Many other arboviral encephalitides occur throughout the world. Most of these diseases are problems only for those individuals traveling to countries where the viruses are endemic.

West Nile Encephalitis

Discussed elsewhere in this document

FLD 43 D HAZARDOUS PLANTS

A number of hazardous plants may be encountered during field operations. The ailments associated with these plants range from mild hay fever to contact dermatitis. Plants that present the greatest risk to site workers are those that produce allergic reactions and tissue injury.

Plants That Cause Skin and Tissue Injury

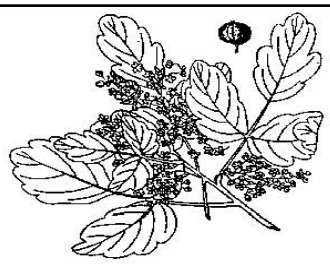
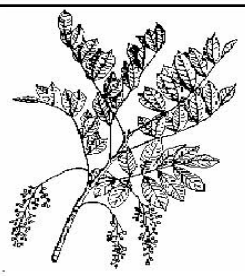
Contact with sharp leaves and thorns are of special concern to site personnel. This concern stems from the fact that punctures, cuts, and even minor scrapes caused by accidental contact may result in skin lesions and the introduction of fungi or bacteria through the skin. This is especially important in light of the fact that the warm moist environment created inside protective clothing is ideal for the propagation of fungal and bacterial infection. Personnel receiving any of the injuries listed above, even minor scrapes shall report immediately for continued observation and care. Keeping the skin covered as much as possible (i.e., long pants and long sleeved shirts) in areas where these plants are known to exist will limit much of the potential exposure.

Plants That Cause an Allergic Reaction

The poisonous plants of greatest concern are poison ivy, poison oak, and poison sumac. Contact with the poisonous sap of these plants produces a severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim also may develop a high fever and may be very ill. Ordinarily, the rash begins within a few hours after exposure, but it may be delayed for 24 to 48 hours.

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. In certain seasons, both plants also have greenish-white flowers and berries that grow in clusters. Poison sumac is a tall shrub or small tree with 6 to 12 leaflets arranged in pairs with a single leaflet at the end. This plant grows in wooded, swampy areas.

Poison Ivy/Poison Oak/Poison Sumac

Poison Ivy	Poison Oak	Poison Sumac
		

The reaction associated with exposure to these plants will generally cause the following signs and symptoms:

- Blistering at the site of contact, usually occurring within 12 to 48 hours after contact
- Reddening, swelling, itching and burning at the site of contact
- Pain, if the reaction is severe
- Conjunctivitis, asthma, and other allergic reactions if the person is extremely sensitive to the poisonous plant toxin

If the rash is scratched, secondary infections can occur. Preventive measures that are effective for most site personnel include:

- Avoid contact with any poisonous plants on site, and keep a steady watch to identify, report and mark poisonous plants found on site
- Wash hands, face or other exposed areas at the beginning of each break period and at the end of each workday
- Avoid contact with, and wash on a daily basis, contaminated tools, equipment and clothing
- Barrier creams, detoxification/wash solutions and orally administered desensitization may prove effective and should be tried to find the best preventive solution

Keeping the skin covered as much as possible (i.e., long pants and long sleeved shirts) in areas where these plants are known to exist will limit much of the potential exposure.

Plants That are Poisonous

There are a number of plants worldwide beside poison ivy, oak and sumac which have poisonous properties. In many cases consumption of these plants or parts of these plants can result in poisoning. In other cases, contact with the plants may be poisonous. The following is a listing with pertinent information on poisonous properties and locations of a number of plants.

In general, when working in the outdoors or where you may come in contact with household plants or where your families may come in contact with these plants, it is important that as soon as possible after contact the area or areas should be thoroughly washed and hands must be thoroughly washed before eating drinking, smoking or any other hand to mouth contact.

In keeping with our 24/7 BBS concept, it is important to remember that children are particularly vulnerable to many of the poisonous parts of these plants. Many of these poisonous parts resemble non-poisonous food items such as berries and are attractive.

As with most lists there is extensive information but the list may not include all poisonous plants.

It is important to remember that this document is a starting point to be supplemented with local information. The majority of this information is from a list found in Wikipedia an on line Dictionary readily accessible via Google. The website has pictures of these plants as well as links to other information sources.

POISONOUS PLANTS

From Wikipedia,

This is a list of plants containing poisonous parts that pose a serious risk of illness, injury, or death to humans.

Poisonous Food Plants

- Apple (*Malus domestica*) **Found worldwide in cooler climates**. Seeds contain cyanogenic glycosides; although the amount found in most apples won't kill a person.

- Cherry (*Prunus cerasus*), as well as other species (*Prunus spp*) such as peach (*Prunus persica*), plum (*Prunus domestica*), almond (*Prunus dulcis*) and apricot (*Prunus armeninaca*). **There are around 430 species of *Prunus*, spread throughout the northern temperate regions of the globe.** Leaves and seeds contain cyanogenic glycosides

- Rhubarb (*Rheum rhaponticum*) **Found worldwide**. Leaves, but not stems, contain oxalic acid salts, causing kidney disorders, convulsions, and coma. Rarely fatal.

- Tomato (*Solanum lycopersicum*) **Found worldwide.** Foliage and vines contain alkaloid poisons which cause digestive upset and nervous excitement.

Other Poisonous Plants

- Autumn crocus. **Found in North America.** The bulbs are poisonous and cause nausea, vomiting, diarrhea. **Can be fatal**.

- Azalea **Found Worldwide.** All parts of the plant are poisonous and cause nausea, vomiting, depression, breathing difficulties, and coma. Rarely fatal.

- Bittersweet nightshade N**aturalized in North America.** All parts are poisonous, containing solanine and causing fatigue, paralysis, convulsions and diarrhea. Rarely fatal.

- Bleeding heart / Dutchman's breeches. **Found in North America.** Leaves and roots are poisonous and cause convulsions and other nervous symptoms.

- Black locust. **Naturalized in North America**. Pods are toxic

- Caladium / Elephant ear. **Ornamental plants in North America.** All parts of the plant are poisonous. Symptoms are generally irritation, pain, and swelling of tissues. If the mouth or tongue swells, breathing may be fatally blocked.

- Castor Oil Plant (*Ricinus communis*) Castor Oil Plant. **Found Worldwide.** The phytotoxin is **ricin**, an extremely toxic water soluble protein, which is concentrated in the seed. Also present are ricinine, an alkaloid, and an irritant oil. Causes burning in mouth and throat, convulsions, and is **often fatal.**

- Daffodil. **Found worldwide.** The bulbs are poisonous and cause nausea, vomiting, and diarrhea. **Can be fatal**.

- Daphne (*Daphne sp.*) **Ornamental plant worldwide**. The berries (either red or yellow) are poisonous, causing burns to mouth and digestive tract, followed by coma. **Often fatal.**

- Darnel/Poison Ryegrass (*Lolium temulentum*) **Usually grows in the same production zones as wheat and is considered a weed.** The seeds and seed heads of this common garden weed may contain the alkaloids temuline and loliine. Some experts also point to the fungus ergot or fungi of the genus endoconidium both of which grow on the seed heads of rye grasses as an additional source of toxicity.

- Deadly nightshade (*Atropa belladonna*) **Naturalized in parts of North America**. All parts of the plant contain the toxic alkaloid atropine. The young plants and seeds are especially poisonous, causing nausea, muscle twitches, paralysis; **often fatal**.

- Dumbcane / dieffenbachia. **Found in tropical areas and popular as house plants.** All parts are poisonous, causing intense burning, irritation, and immobility of the tongue, mouth, and throat. Swelling can be severe enough to block breathing leading to death.

- Ivy**. Native to North America** where winters are not severe. The leaves and berries are poisonous, causing stomach pains, labored breathing, possible coma.
- Jerusalem cherry **United States** All parts, especially the berries, are poisonous, causing nausea and vomiting. **Looks like a cherry tomato**. It is occasionally fatal, especially to children.

- Lilies **Worldwide** There are some 3500 species that comprise the lily (Lilaceae) family. Some are beneficial including (foods such as onion, shallot, garlic, chives [all *Allium* spp] and asparagus) and some with medicinal uses (colchicine and red squill) Many produce alkalids which are poisonous, especially to cats.

- Manchineel (*Hippomane mancinella*) **Native to the Caribbean (including Puerto Rico and the Virgin Islands).** It is one of the most poisonous trees in the world All parts of this tree including the fruit contain toxic phorbol esters typical of the Euphorbiacea. Sap may cause burning of the skin and smoke form burning may cause eye irritation and blindness. Fruits, which are similar in appearance to an apple, are green or greenish-yellow when ripe.

- Oak Worldwide Most species foliage and acorns are mildly poisonous, causing digestive upset, heart trouble, contact dermatitis. Rarely fatal.

- Poison-ivy (*Toxicodendron radicans*), Poison-oak (*T. diversilobum*), and Poison Sumac (*T.vernix*) **North America** All parts of these plants contain a highly irritating oil with urushiol (this is actually not a poison but an allergen). Skin reactions can include blisters and rashes. It spreads readily to clothes and back again, and has a very long life. Infections can follow scratching.

- Pokeweed (*Phytolacca sp.*) **Native to North America.** Leaves, berries and roots contain phytolaccatoxin and phytolaccigenin - toxin in young leaves is reduced with each boiling and draining.