Controlling Hazards During the 2011 Earthquake and Tsunami Response

Dangerous work: Members of Virginia Task Force 1 from the Fairfax County Fire and Rescue Department search for survivors in Ofunato, Japan. U.S. Navy photo by Mass Communication Specialist 1st Class Matthew M. Bradley/Released.

Table of Contents

Table of Contents

Table of Contents

Table of Contents

NIEHS Response Training Tool

This training tool is an awareness-level health and safety resource for U.S. responders (including USAR, medical personnel, rad-techs and military personnel) who may participate in 2011 Japan earthquake and tsunami response.

This tool will help workers understand at an awareness level: what earthquakes/tsunamis are, characteristics of an earthquake response, and how to identify and control hazards pertaining to the response and cleanup activities associated with an earthquake.

This tool also focuses on radiological hazards created by the Fukushima Daiichi nuclear power plant.

Trainers may use this tool to aid in the development of an earthquake awareness level course or other awareness level materials (fact-sheets, table-top activities, etc.).

Advanced/Additional Training Required for Those Involved in the 2011 Japan Earthquake Response

- **This training tool does not replace specific fire fighting training, additional duty-specific training, or personal protective equipment (PPE)-specific training requirements.**
- **Regardless of work scope, there are many topics covered in this awareness training tool that have corresponding Occupational Safety and Health (OSHA) standards—such standards must be met in order to safely and legally perform associated job duties.**
- **Responders should always keep in mind that, when in doubt about the safety of an activity, they should stop what they are doing. Be sure to be safe before continuing. Don't be a dead hero.**

Contact the NIEHS National Clearinghouse for Worker Safety and Health Training (202-331-7733) for information regarding advanced training for earthquake response.

Employer and Worker Responsibilities

Even though the response takes place in Japan, employers and workers have responsibilities under the Occupational Safety and Health (OSH) Act.

- The OSH Act requires employers to provide a safe and healthful workplace, free of recognized hazards, and to follow Occupational Safety and Health (OSHA) standards. Employers' responsibilities also include providing training, medical examinations, and recordkeeping.
- Workers must follow the employer's safety and health rules and wear or use all required gear and equipment; follow safe work practices for their job, as directed by their employer; report hazardous conditions to a supervisor; and report hazardous conditions to OSHA if employers do not fix them.
- If participating as a volunteer sponsored by a foreign nation, OSHA standards provide a good reference even though coverage may be provided under the host country’s occupational safety plans.

Disaster situations covered in this training tool include

Japan earthquake aftermath, tsunami aftermath and the Fukushima Daiichi nuclear power plant incident

U.S. Department of Health and Human Services
National Institutes of Health
National Institute of Enviromental Health Sciences

Module 1-Understanding ICS and the Role of U.S. Responders in Japan

Sailor carrying supplies for relief effort 3-13-11,Image courtesy US Navy

You will be part of the U.S. Incident Command System

U.S. Sea Hawks delivering aid, 3-15-11, image courtesy US Navy

The ICS has three main purposes

- Ensure the safety of responders and others
- Achieve the tactical objectives
- Use resources efficiently

U.S. sailors walking towards ship washed up by Tsunami, 3-13-11

Under unity of command, you will:

- Report to only one supervisor
- Receive work assignments only from him or her

Virginia Task Force 1 performs last minute equipment checks, 3-14-11

Accountability under ICS save lives

- Be sure to check-in and receive an assignment from sponsoring command staff.
- Be aware that operations follow a specific protocol which may be in the form of an Incident Action Plan. Check out the plan.
- Be sure to identify your supervisor.

Unified Command is the ICS applied on a disaster involving multiple agencies

Allows Incident Commanders to make joint decisions by establishing a single command structure

U.S. Navy and Japan SDF coordinating search and rescue

Responders should receive an initial briefing at the site prior to assignment

Los Angeles County Fire Dept Search and Rescue Team Briefing, Misawa, Japan 3-14-11

Be prepared to deal with emergencies in the field

- Notify your supervisor or incident commander about all injuries sustained at your site.
- Ask what first aid support is available and where it is located during your briefing.
- For minor injuries or health concerns go to:
  - First Aid
  - Local hospitals or clinics
  - EMT or nurse station
- For serious emergencies call 119 (Japan)
- Know your exact location; use GPS.

Be prepared for a language barrier. Know where and how to use translators or translation aids.

Naval Air Crewman uses a translation card to ask a Japanese man what additional supplies and assistance are needed in his area. (U.S. Navy)

Make sure you use assigned protective equipment

- Consider steel toe/shank footwear, if available.
- Use durable gloves when handling debris.
- Use hearing protection for noisy environments.
- If in doubt, contact your supervisor!

Hachinohe, Japan March 18, 2011

NIEHS Response Training Tool

Module 2–Controlling Post Earthquake and Tsunami Hazards in Japan

Physical Environment: Japan coast

The Land:

- Dense urban development
- Steep hills
- Flat and coastal areas

The Climate:

- Humid: may experience periods of rain and/or snow
- Temperature 32˚F to 60˚F

Be prepared to control hazards left in the aftermath of the earthquake and tsunami

- Aftershocks
- Structures to collapse (buildings, bridges, dams, etc.)
- Damage to utilities (gas, electric, phone, etc.)
- Release of hazardous materials
- Radiation and radioactive contamination
- Other disasters:
  - Landslides
  - Liquefaction
  - Avalanches
  - Flash floods
  - Fires
  - Tsunamis

Be prepared for aftershocks

- An aftershock is an earthquake that occurs after a previous quake.
- Occurs in the same area as the main quake.
- Is of less magnitude.
- ***An aftershock is an earthquake!***
- Follow procedures outlined your Health and Safety Plan for aftershocks.

Landslides and Avalanches

- A landslide is an abrupt downhill movement of soil and bedrock (in response to gravity).
- Landslides can be triggered by earthquakes or other natural causes .
- Landslides create ground movement from rock falls, deep failure of slopes, and shallow debris flows.
- An avalanche is a flow of snow or rocks down a mountainside.
- Debris may continue to shift as it is removed.
- Debris may contain victims.
- ***Do not traverse unstable ground and debris.***

Landslide in Niigata Chuetsu Oki Japan 2007

Landslide Oumigawa Japan 2007

Liquefaction

- The phenomenon of a reduction in the strength and stiffness of a soil
- Due to shaking and water-saturation, granular material temporarily loses its strength and transforms from soft soils to a liquid.
- May cause structures, such as buildings or bridges, to tilt or sink into the liquefied ground.
- Can create moving areas of “liquid” ground.
- Can undermine structural stability and safety.
- ***Liquefaction may not be apparent.***
- ***Park equipment with caution.***

Liquefaction results after earthquake in Japan

Liquefaction from 2011 Japan earthquake

Flash Floods

Flash floods:

- Rapid flooding of low-lying areas.
- Flood occurs in less than six hours.
- May appear with earthquake/aftershock.

What to do:

- Know the area you are working in.
- Find higher ground.
- Put on a personal floatation device (PFD), if available.
- Do not try to cross rapidly rising water.

Are you at risk? Have an escape route!

Fires caused by earthquake

- Often the leading cause of property damage and casualties.
- Be prepared to encounter fire, and know how to contact fire personnel.
- Debris left from fires may smolder for days to weeks.
- Be prepared to encounter smoldering debris during search and rescue and cleanup activities.

Fires near the Sendai Port resulting from 2011 Japan earthquake and tsunami.

Tsunamis are the leading edge of an incoming tide that forms a wave(s) of water that travels up a river or narrow bay against the direction of the current. Created when a body of water is rapidly displaced.

- Know your location and tsunami risk during response activities.
- ***Know your escape route should tsunami approach; look for tsunami signs like the ones below.***

Aftermath of 2011 Japan earthquake tsunamis

A tsunami caused most of the damage in Japan after the March 2011 earthquake

Risk factors that can increase damage and your risk to injuries

- Areas near fault lines or low elevation coast
- Structures built on unstable soil and rock
- Structures not built or retrofitted to earthquake-grade standards
- Brittle materials (such as glass)
- Structures built on steep slopes and areas prone to landslides and liquefaction

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

There are multiple structural integrity hazards

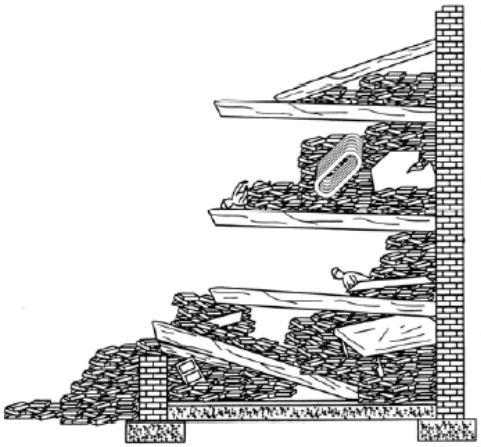
- Earthquakes can severely damage structures, such as buildings, bridges, and dams.
- Never assume that damaged structures or ground are stable; have a registered professional engineer or architect **certify** that it is safe.
- Assume all stairs, floors, and roofs are unsafe until inspected.
- Look up and be aware of hidden and/or overhead hazards.
- ***Watch out for unstable ground (not firm or firmly fixed) or flooring that could give way and cause entrapment or a fall to a lower level.***

Leave immediately if you hear shifting or unusual noises—A COLLAPSE MAY BE OCCURING

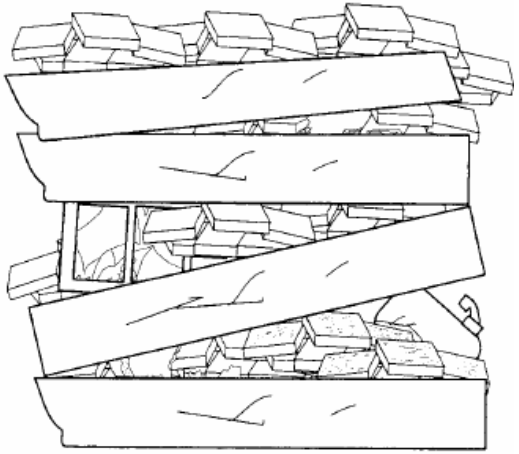
Structural Integrity (continued)

- OSHA requires walls or floor to be shored or braced before demolition, if workers are within structure. (29 CFR Part 1926.850(b))
- Cut off, cap, or control all service utility lines outside the building before demolition work begins. Notify appropriate utility company in advance.
- If it is necessary to maintain any utilities during demolition, such lines shall be temporarily relocated and protected.
- Find and remove any hazardous substance before demolition.
- Do not cut or remove any structural or load-supporting members on any floor until all stories above such a floor have been demolished and removed.

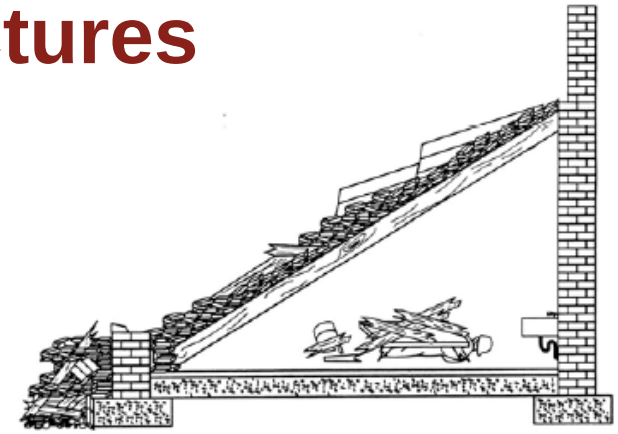
Examples of Unstable Structures



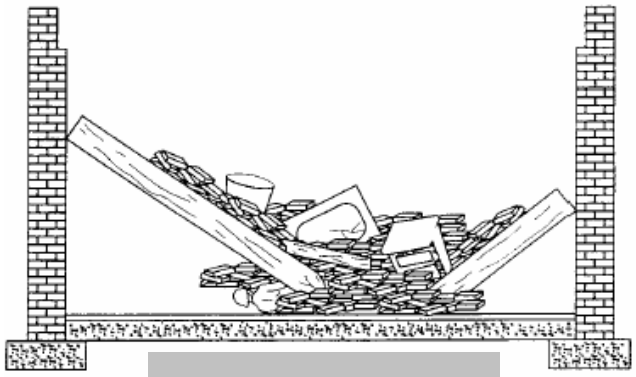
Cantilever



Pancake



Lean to



V-shape

Be aware of fallen debris that has created a natural support for other structures!

Structure stability may be severely compromised because of initial damage and chaotic mixing with mud, water and other materials from the tsunami

Stabilizing structures by shoring and bracing, including the use of heavy equipment, is a highly skilled task

- Only properly trained personnel should participate in structure stabilization operations.
- Some of the most dangerous work you will encounter is work performed concerning a collapsed or unstable structure.

Do the following before you stabilize structures

- Know that you've received the correct training.
- Recognize the multiple hazards associated with stabilizing structures.
- ***Know how TO COMMUNICATE THE HAZARDS-understand notification procedures.***
- Installing and removing structural supports, including shoring and bracing systems, requires engineered plans for each site.
- Establish limited access zones and escape routes before work begins.

Demolishing Structures

- Only participate in demolition if you are trained to do so **AND KNOW THE ASSOCIATED HAZARDS.**
- Engineered demolition plans are required for every project (emergency, fire, escape, etc.).
- A competent person must oversee all work.
- Stop work and report new and/or unexpected hazards (e.g., a hidden gas main is pulled up).
- Post DANGER signs where imminent hazards exist.

See OSHA 1926 Subpart T, Demolition, for further information

Overhead hazards and falling debris

- Injuries to disaster site workers are often the result of falling materials and debris related to unstable structures, and other compromised surfaces.
- Overhead falling hazards may include:
  - Loose debris
  - Building components
  - Unsecured building contents such as bathtubs, refrigerators, furniture, etc.

In these areas, follow safe work practices and wear appropriate PPE, such as hard hat, work clothes, safety shoes, gloves, safety glasses, and respirator.

Debris Piles and Unstable Surfaces

- Walk and work on surfaces you know are stable.
- If post-fire, look for smoldering material on or beneath the surface.
- Watch for hazardous materials.
- Use other ways to get to work surfaces, such as bucket trucks.
- Erect scaffolding and park lift equipment onto stable surfaces, and anchor to stable structures.
- Wear protective equipment provided, including hard hats, safety glasses, leather gloves and safety shoes with slip resistant soles.
- Use fall protection with lifelines tied off to suitable anchorage points, including bucket trucks, whenever possible.
- Watch for fall hazards to other levels.

Fire and Smoldering Debris

- There were many fires caused by the earthquake and tsunami in Japan.
- 25% of fire-related deaths in the United States are caused by smoldering fires.
- Smoldering debris may remain for weeks and could reignite if combined with combustible materials or if oxygen becomes available (i.e., disturbing debris during cleanup operations).
- Fire extinguishers should be available at every cleanup activity.

Confined Spaces

What is a Confined Space (CS)?

- Space with limited access and egress
- Large enough for bodily entry
- Not designed for occupancy
- Examples: boiler, pit, septic tank, utility vault, well, basement, trench, collapsed structure, and elevator shaft

What hazards make it a permit required CS?

- Oxygen deficiency
- Entrapment
- Engulfment
- Hazardous atmosphere
- Any other recognized, serious health or safety hazard

Before you enter a confined space (CS), your supervisor must:

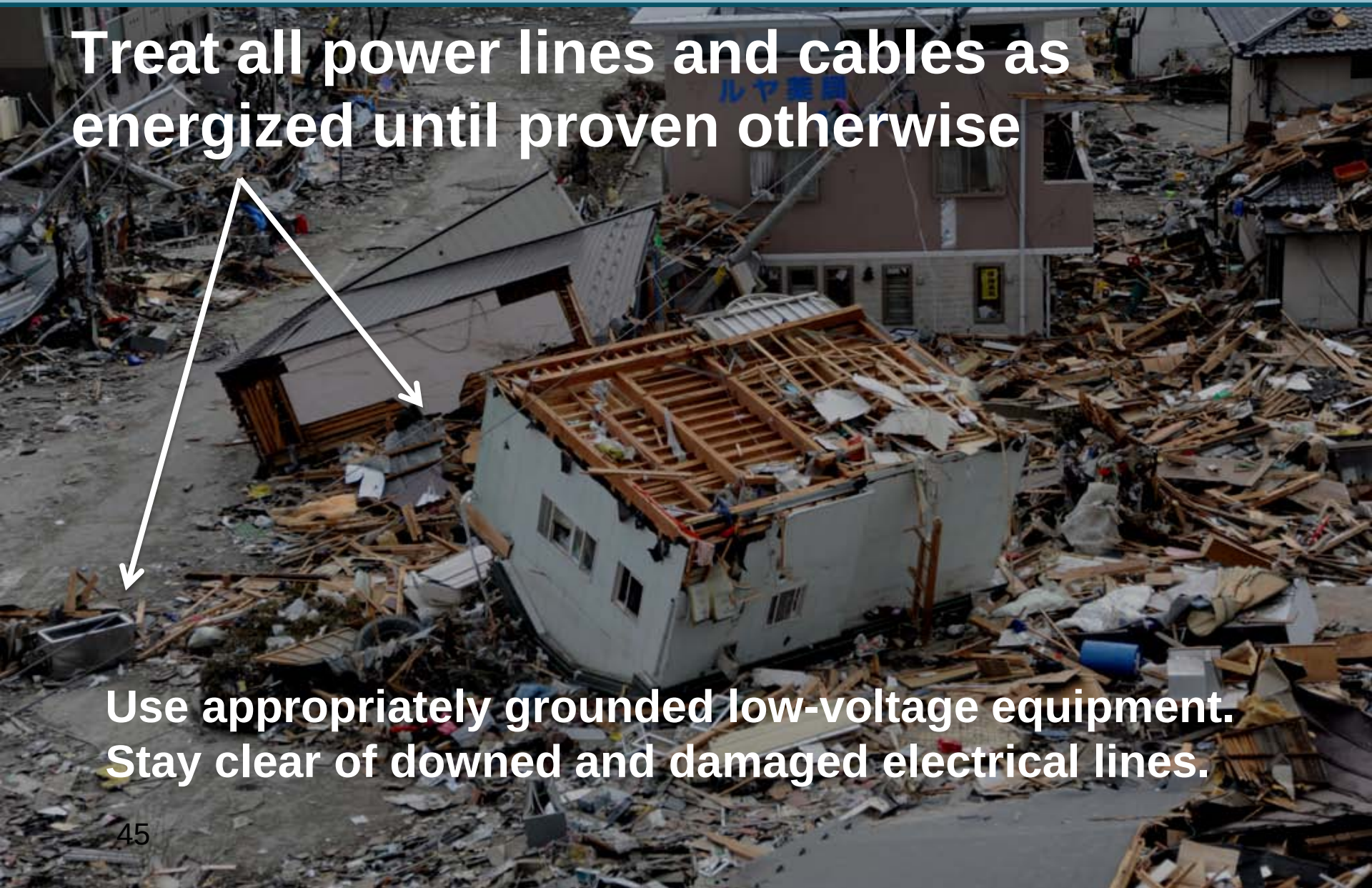
- Make sure you and the attendant are trained.
- Ventilate and monitor surroundings for hazardous atmosphere. For example, use a Combustible Gas Indicator (CGI) to detect and measure airborne concentrations of combustible gases or vapors, and/or a portable Photo Ionization Detector (PID) to detect organic vapors.
- Lock out or tag out all energy sources in the space.
- Issue appropriate PPE, possibly including self-contained breathing apparatus (SCBA).
- Establish barriers to external traffic, such as vehicles and pedestrians.
- Provide ladders or similar equipment for safe entry and exit.
- Provide good communications equipment and alarm systems.
- Have rescue equipment and trained rescue personnel nearby.

If the CS is caused by structural collapse, have space certified safe by a registered professional engineer or architect before you enter!

Electrical Hazards

- Four main types of electrical injuries seen in disaster cleanups:
  - Electric shock
  - Burns
  - Falls caused by contact with electricity
  - Electrocution
- Avoid working with electricity in wet environments. If this must be done, use equipment approved for wet conditions
- Electrical cords and outlets must meet OSHA standards
- Use double insulated tools
- Use Ground Fault Circuit Interrupters (GFCIs) on all power tools and cords as close to the panel as possible
- Do not re-energize electrical systems, or use electrical equipment that has been in fire or water, until it has been evaluated by a qualified electrician

Portable GFCI



Treat all power lines and cables as energized until proven otherwise

Use appropriately grounded low-voltage equipment.
Stay clear of downed and damaged electrical lines.

Damaged utilities can be hazardous for response workers

- Look for overhead power lines and buried power line indicators. Post warning signs.
- Contact utilities for buried power line locations.
- Stay at least 10 feet away from overhead power lines.
- Unless you know otherwise, assume that overhead lines are energized.
- Get the owner/operator of the lines to de-energize and ground lines when working near them - work through Japanese Liaison.
- Use protective measures such as guarding or insulating the lines.
- Use non-conductive wood or fiberglass ladders when working near power lines.

Before working near debris or removing debris, make sure there are no live wires, fuel lines, or chemical lines!

Retained water hazards

Levee or Dike Failures

The most frequent (and dangerous) form of levee failure is a breach. A levee breach occurs when part of the levee actually breaks away, leaving a large opening for water to flood the land protected by the levee.

Picture of levee breach

Greywater

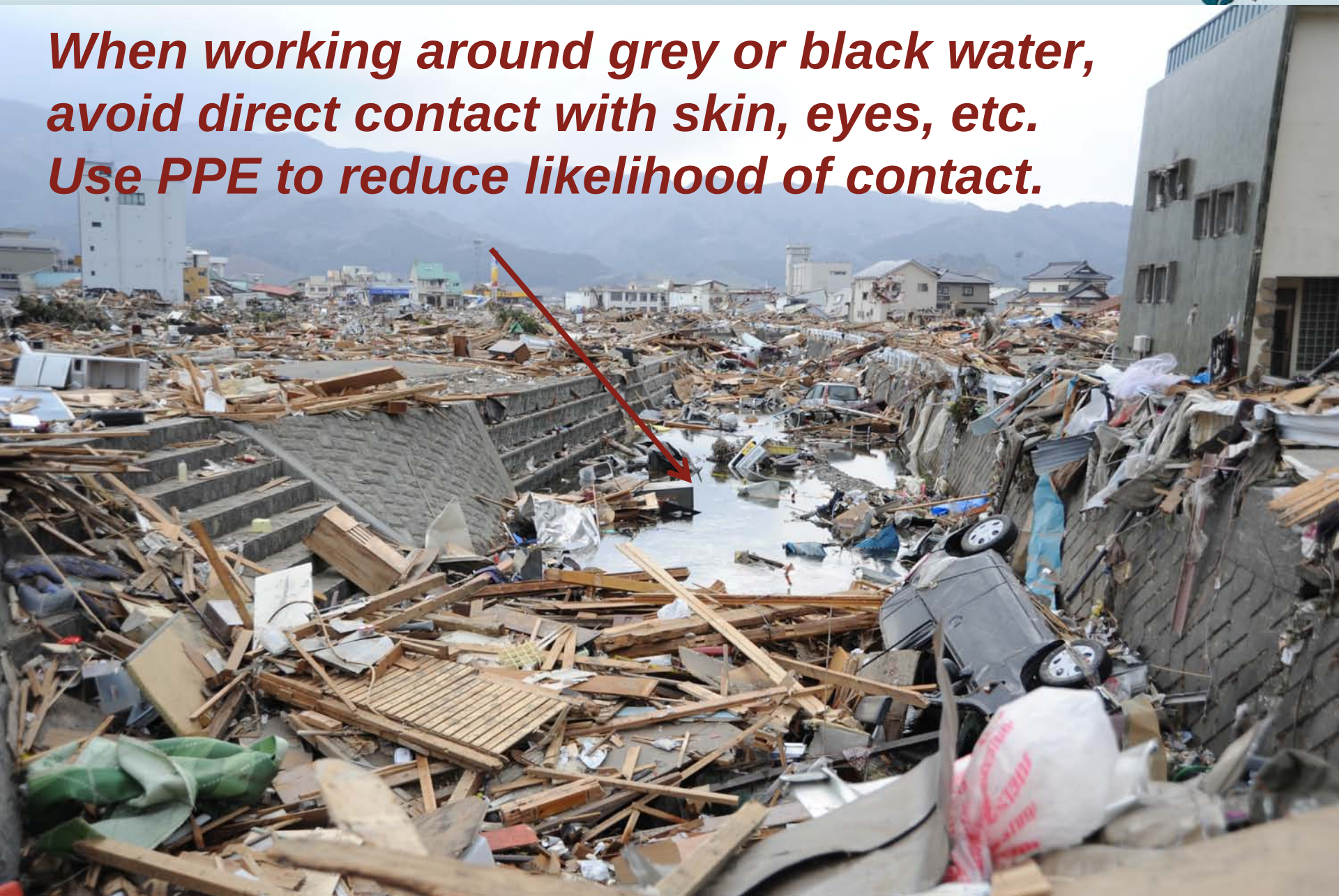
Greywater, also known as sullage, is non-industrial wastewater generated from domestic processes, such as dish washing, laundry, and bathing. Greywater comprises 50-80% of residential wastewater.

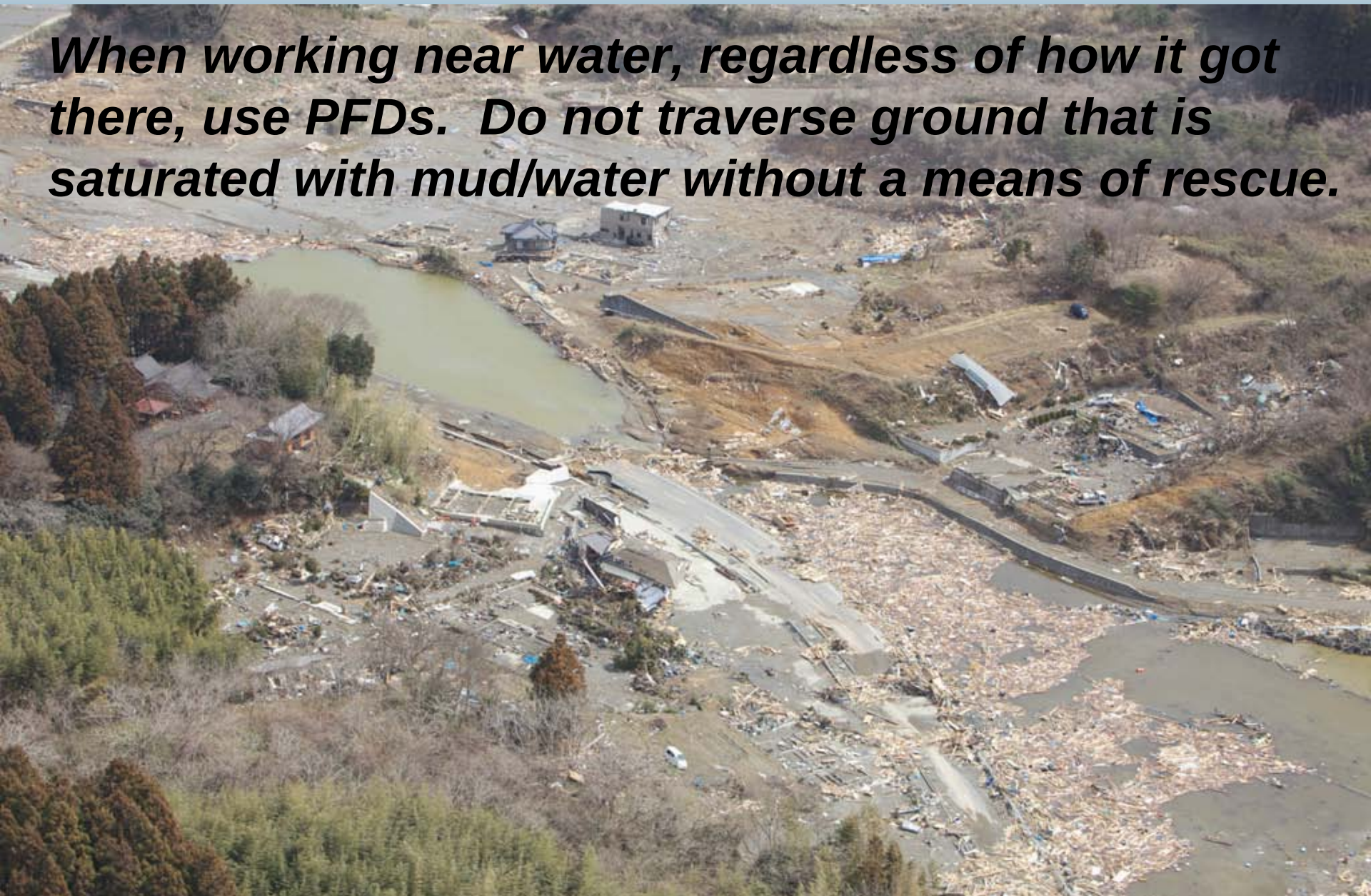
Blackwater

Blackwater is water that contains high concentrations of organic waste and pathogens that need to decompose before it can safely be released into the environment. Blackwater includes water from toilets and garbage disposals.

Aftermath of Japan earthquake 2011: potential grey/black water

When working around grey or black water, avoid direct contact with skin, eyes, etc. Use PPE to reduce likelihood of contact.





When working near water, regardless of how it got there, use PFDs. Do not traverse ground that is saturated with mud/water without a means of rescue.

Health and Safety Plans (HASP)

OSHA has set regulations that require Health and Safety Plans (HASP) to protect workers involved in national response operations.* The HASP serves as a guide for employers and workers to follow during their daily operations to prevent the spread of contamination, injury, and death. ***Review your HASP before you start work!***

2011, post-tsunami Japan coast

While working in Japan, you must work under a HASP developed for the response!

*OSHA, 29 CFR 1910.120, HAZWOPER

HASP (continued)

This document covers some HASP sections that will be used on the worksites during an earthquake response. The site safety section includes general information from several of the HASP sections listed below.

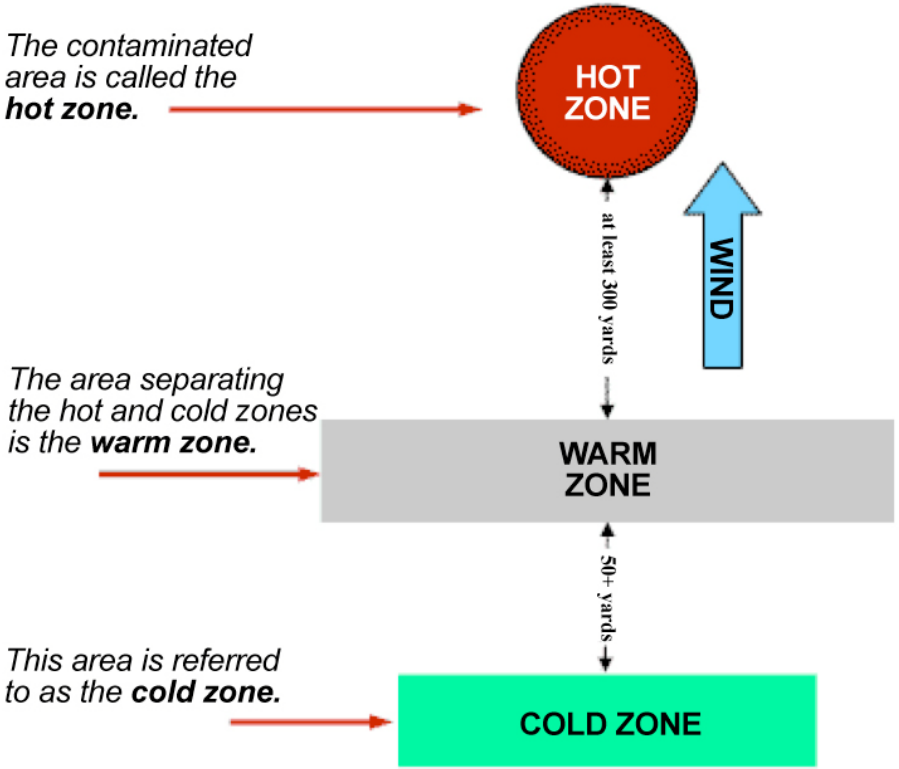
All HASPs must cover <u>all</u> of the following:

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

Elements of a Site Specific HASP

- Responsibility/Key Line Personnel
- Identification of Competent/Qualified Persons
- Scope of Work Evaluation
- Hazard/Risk/Exposure Assessment
- Control Measures
- Periodic Inspections
- Daily Safety Planner
- Compliance
- Written Progressive Disciplinary Program
- Hazard Correction
- Training and Instruction
- Project Site Orientation
- Employee Communication System
- Record Keeping
- Accident/ Exposure Investigation
- Emergency Action Plan
- Site-specific Medical Emergency Plan
- Hazard Communication Plan
- Worker training and instruction check lists

Use Site Control to control chemical and radiological contamination



Site control consists of the following components:

- Control zones (see image to left)
- HASP
- Communication
- Emergency plan
- Site map
- Use of “buddy system”

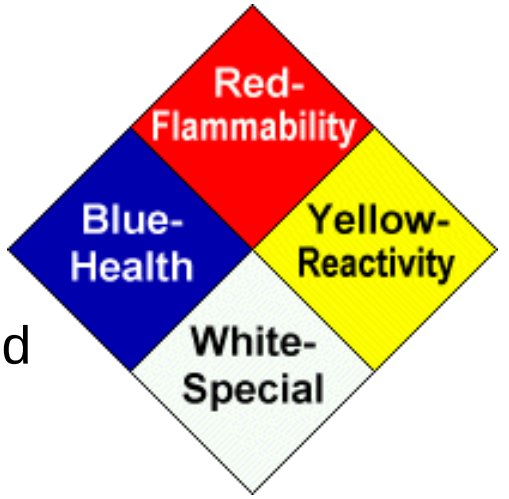
Hazardous Materials that may be associated with commercial and residential debris

- Asbestos
- Ash
- Compressed gas cylinders and propane cylinders
- Gasoline cans (& other fuel containers)
- Bulk chemicals & chemical containers
- Lead acid batteries
- Paints and thinners
- Bulk pesticides
- Bulk fertilizers
- Moldy materials
- Munitions
- Laboratory equipment
- Lead
- Electrical transformers
- Air conditioners
- Large metal appliances & equipment
- Automobiles
- Transformers
- Other particulate matter
- Radiological material

Hazardous Materials and Hazard Communication

- The earthquake and tsunami may have dislodged or damaged tanks, drums, pipes, and equipment that may contain hazardous materials.
- Do not handle unidentified or damaged containers; report these to your supervisor.
- Understand Material Safety Data Sheets (MSDS), and follow as appropriate.
- NFPA 704M warning labels may also be useful in the field.
- Specific Hazard Communication training is required for any potential chemicals with which you may come in contact.

IMDG



NFPA

While in Japan, look for any suspicious labels to identify hazardous materials and stay clear unless authorized to handle.

You may encounter victims

- During response and cleanup, you may encounter trapped victims.
- Some may be alive.
- The longer it takes to reach a trapped person, the lower their chance of survival.
- Be prepared that you may find deceased bodies or body parts.

The Golden Day of Survival

30 Minutes	91.0% Survive
1 Day	81.0% Survive
2 Days	36.7% Survive
3 Days	33.7% Survive
4 Days	19.0% Survive
5 Days	7.4% Survive

From U.K. Fire Service Search and Rescue Team Structural Collapse

Bloodborne Hazards

- Use disposable nitrile or similar gloves when handling human remains or assisting those with injuries.
- Replace gloves if punctured or torn.
- Do not handle human remains or assist those with injuries if you have skin cuts or punctures.
- Use goggles, or face shield and mask, when handling human remains, i.e., recovering the deceased. Make sure to wear a respirator.
- Transport human remains in closed, leak-proof, labeled containers.

OSHA Blood Borne Pathogen Standard: 29 CFR 1910.1030

First receivers may first have to further decon patients

Photo courtesy SEIU

- Have proper training for Hazmat situation.
- Understand the use and limitations of PPE.
- Watch for hazards such as slips, trips and falls, and body strain.
- Use a partner to lift patients.
- Be wary of heatstress.
- ***Make sure you DECON before you remove your PPE!***

All radioactive contamination must removed with mild soap and water before exiting PPE

- Your PPE will protect you from alpha radiation
- PPE may not protect you from beta radiation
- PPE will not protect you from gamma radiation

Photo courtesy SEIU Education and Support Fund

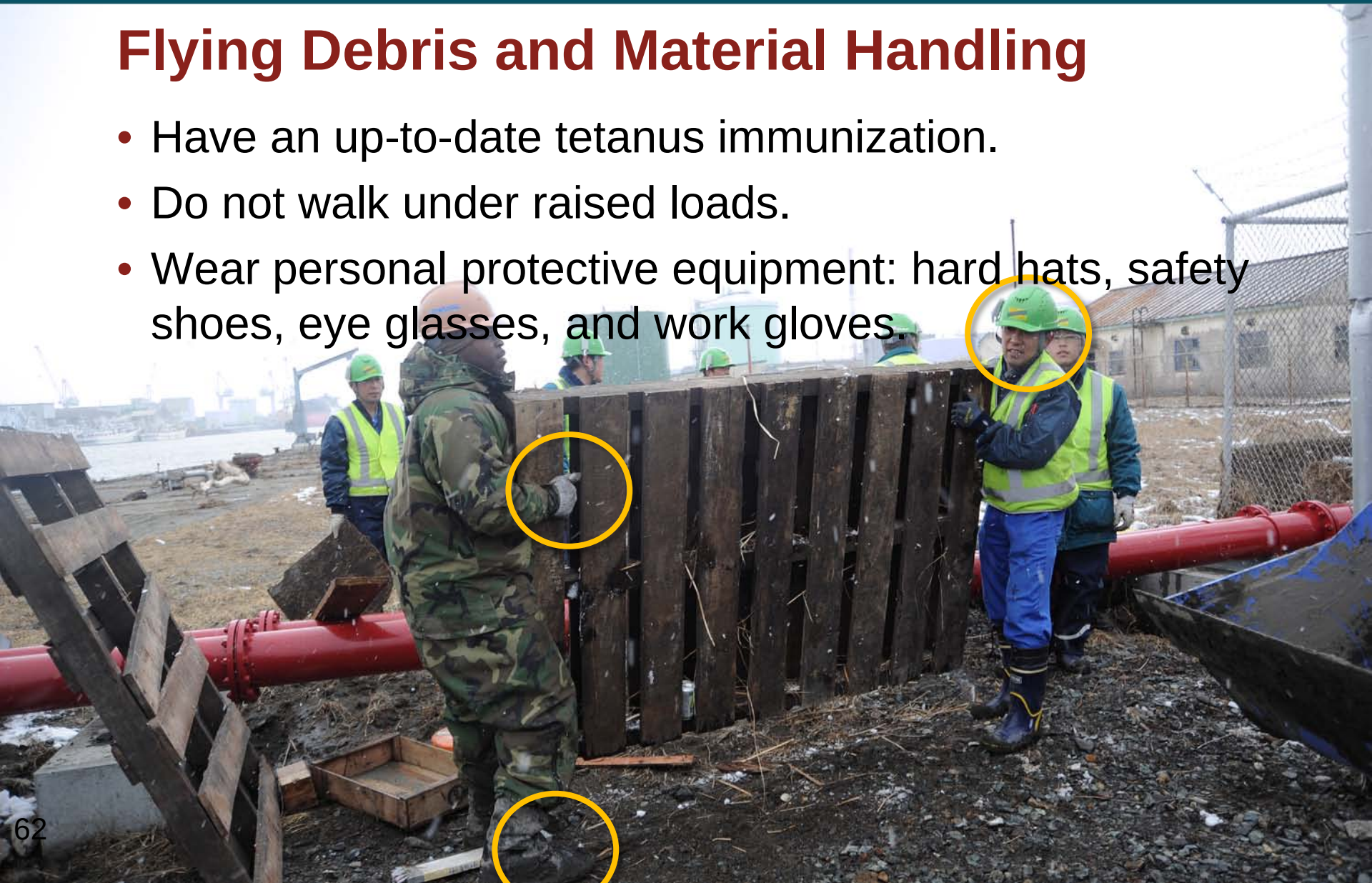
Activities involving deceased victims

2005 hurricane DMORT station, Mississippi.

- Do not handle remains unless they are decontaminated.
- Need protection from blood-borne and airborne-transmissible pathogens (PAPR, protective clothing, etc.).
- Monitor yourself for signs of fatigue and stress.

Flying Debris and Material Handling

- Have an up-to-date tetanus immunization.
- Do not walk under raised loads.
- Wear personal protective equipment: hard hats, safety shoes, eye glasses, and work gloves.



Be careful of how you use your body. Use mechanical lifting when possible and practice good ergonomics when mechanical lifting is not available. Use partners to move heavy loads.

Carbon Monoxide (CO) Exposure

- **CO may be present with:**
  - Any activity using gasoline, diesel, or propane-powered machinery
  - Work near operating equipment
  - Debris reduction sites
  - Work near hot work (cutting, welding), especially in confined spaces
- **To control CO exposures:**
  - Wear CO monitoring equipment
  - Do not use gas/diesel powered equipment indoors or in enclosed areas
  - Use forced air ventilation (e.g., blower)

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

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

Portable Generators

Hazards include:

- Carbon monoxide poisoning
- Electrocution from backfeed

If it is necessary to use a portable generator, follow manufacturer's recommendations and specifications:

- Use a qualified electrician to assist in installation and start-up activities.
- If using gasoline- and diesel-powered portable generators, switch the main breaker or fuse on the service panel to the "off" position before starting the generator.
- Do not use on or in wet surfaces.
- Do not operate in rain unless the generator can be kept dry.
- When refueling, turn off and wait for motor to cool, or use appropriate funnel to prevent spills onto hot engine.
- Do not use indoors or in temporary or permanent shelter.

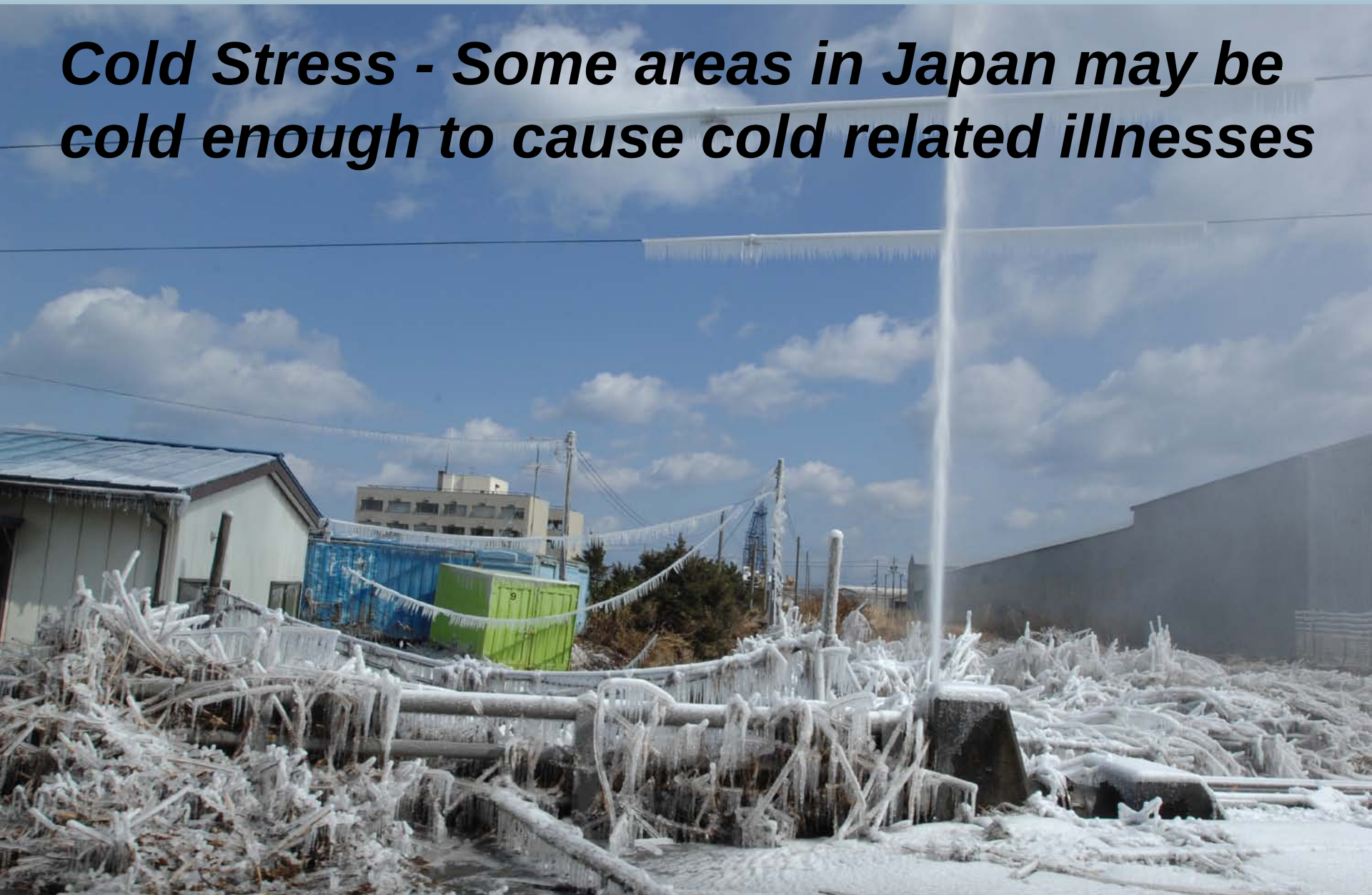
Heat Stress

Common signs and symptoms that workers may experience if they have one of these conditions

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

Heat Stress (continued)

- Drink when thirsty. Avoid alcohol, caffeinated drinks, or heavy meals.
- Know the signs of heat-related illnesses.
- Monitor yourself and coworkers, and use the buddy-system. Use monitoring, such as body temperature readings.
- Block out direct sun or other heat sources, and take shelter in shaded areas.
- Use cooling fans/air-conditioning and rest regularly.
- Wear lightweight, light-colored, loose-fitting clothes and a hat, if available. Get medical help for symptoms, such as altered vital signs, confusion, profuse sweating, excessive fatigue, or rapid heartbeat.
- Fire fighters should unbutton and remove bunker gear when resting.



Cold Stress - Some areas in Japan may be cold enough to cause cold related illnesses

Cold related illnesses and their symptoms

Hypothermia	Frost bite	Trench foot	Chilblains
Lower body temp Shivering Loss of motor skill Confusion Pale skin Blue lips, ears, fingers	Stinging or aching hands or feet, followed by numbness. Skin color becomes red, then purple, then white. Skin may blister.	Tingling, itching, or burning sensations in feet Blisters may be present	Skin redness with itching Inflamed ulcers on the fingers or toes Red nose or earlobes

To reduce risk of cold related illness

- Watch out for you and your coworkers' symptoms of cold stress illnesses.
- Wear insulated, water proof footwear and change when wet.
- Wear breathable, cold weather gear and dress in layers.
- Drink plenty of liquids, but avoid caffeine and alcohol.
- Eat high calorie foods to maintain energy reserves.

You may be working around, with or on heavy equipment during the response including:

- Excavators/backhoe
- Front end loaders
- Forklifts
- Bobcats
- ATVs
- Tractors
- Cranes
- Trailers
- Dump trucks

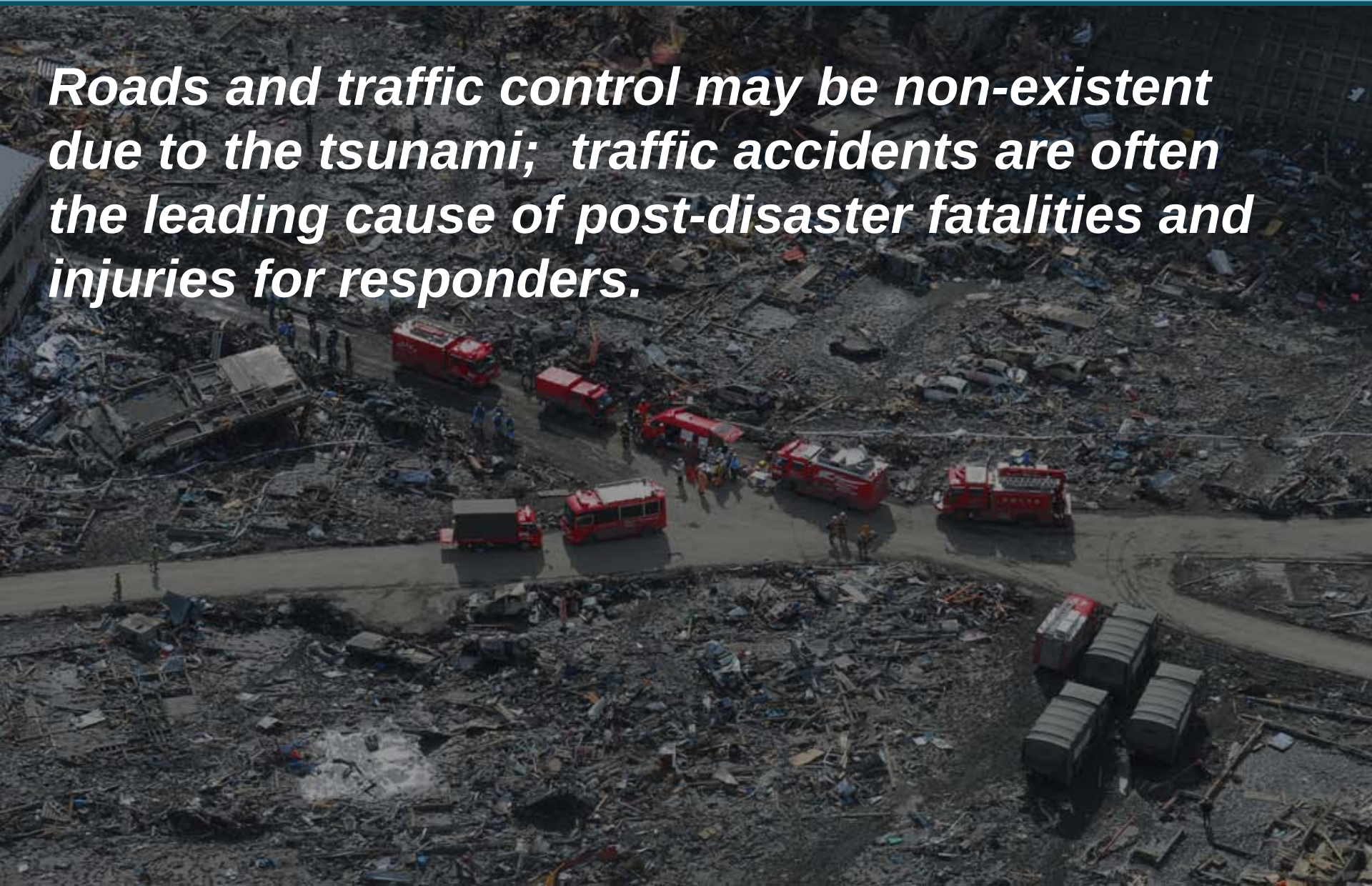
Heavy equipment use (continued)

- OSHA requires machinery to be inspected by a qualified worker before each use.
- Be alert to the activities around you.
- Do not direct equipment unless trained to do so.
- Do not walk under or through areas where heavy equipment is lifting objects or behind equipment.
- Do not climb onto or ride loads being lifted or moved. Do not ride on equipment or in bucket.
- Pay attention to unstable ground caused by the quake and extremely sloped areas.
- Do not exceed the load capacity of lifting equipment.

Operate and work with debris removal equipment to reduce injuries

Hazards:

- Overhead power lines
- Traffic issues
- Congested, bottle-neck areas
- Ground crew working with equipment
- Worker on top of potentially unstable load
- Modified trailer used to haul oversized load debris
- No traffic control (direction)
- Low visibility from fog or airborne particulates



Roads and traffic control may be non-existent due to the tsunami; traffic accidents are often the leading cause of post-disaster fatalities and injuries for responders.

Preventing accidents from driving and traffic issues (controls may be temporary)

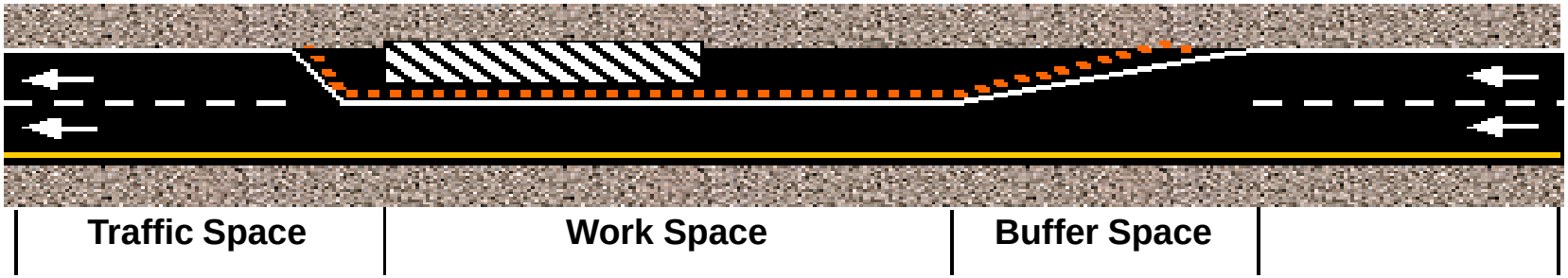
Worksites must be posted with legible traffic signs at points of hazard. Flag persons or Flaggers are used when signs, signals, and barricades do not provide adequate protection for workers. Workers in these areas may experience:

- Damaged infrastructure
- Heavy traffic-delays
- Inexperienced or poor drivers
- Poor visibility due to smoke, ash and fog
- Fatigued drivers

Those working near traffic should wear high visibility clothing or PPE.

Road Work Zone Safety

- There must be a traffic control plan for the movement of vehicles.
- Traffic Control Devices should be used inside the work zone.
- Flaggers and others providing temporary traffic control should wear high visibility, reflective clothing.
- Flagger stations should be illuminated.
- Flaggers should be trained/certified and use the signaling methods required by the authority in charge.



Component Parts of a Temporary Traffic Control Zone

Hot Work

- Follow all established hot work permit requirements; refer to competent hot work supervisor when questions arise.
- Establish a fire watch for duration of work and for at least 30 minutes after work is complete *(See NFPA 241 and 51b).*
- Generation and retention of carbon monoxide and other toxic materials may reach high levels, especially in confined spaces or enclosed areas.
- ***Follow hierarchy of controls!*** Use ventilation, if possible, along with appropriate PPE, as outlined in hot work permit.

Jackhammers and Concrete Saws

- Only use jackhammers and concrete saws if trained to do so
- Inspect and operate jackhammers and concrete saws in accordance with manufacturers recommendations
- Wear appropriate PPE, including safety glasses, face shield, hard hat, safety shoes, durable work clothes, and gloves
- Use hierarchy of controls if excessive dust is produced
- Be aware of kickback, pull-in hazards
- Take breaks when you become fatigued
- Do not use on unstable surfaces
- Do not use foot to guide pick

Operating a Chain Saw

- Operate, adjust, and maintain the saw according to manufacturer's instructions.
- Properly sharpen the saw's chain and properly lubricate the bar and chain with bar and chain oil.
- Operator should periodically check and adjust the tension of the chain saw blade to ensure good cutting action.
- Choose the proper size of chain saw to match the job.
- Include safety features, such as a chain brake, front and rear hand guards, stop switch, chain catcher, and a spark arrester.

Operating a Chain Saw (continued)

- **Wear the appropriate protective equipment:**
  - Hard hat
  - Safety glasses
  - Hearing protection
  - Heavy work gloves
  - Cut-resistant legwear (chain saw chaps)
- **Always cut at waist level or below**
- **Avoid contact with power lines**
- **Bystanders or coworkers should remain at least:**
  - Two tree lengths (at least 150 feet) away from anyone felling a tree
  - 30 feet from anyone operating a chain saw to remove limbs or cut a fallen tree

High Pressure Washers

Associated hazards include:

- Chemical burns
- Lacerations
- Thermal burns
- Contusions
- Back and shoulder strains
- Carbon Monoxide production
- Chemical penetration
- Projectile production
- Electric shock

Safe use guidelines include:

- Inspection of washer
- Training and proper use
- PPE (including insulating rubber boots)
- Hazcom for cleaning agents
- Use with GFCI and proper electrical safety

Hand and Portable Power Tools—always use PPE!

Hand Tools

- Inspect tools in accordance with manufacturer's specifications
- Take damaged tools out of service
- Use only sharp tools

Portable Power Tools

- Inspect tools in accordance with manufacturer's specifications
- Use with sharp blades
- Use with GFCI
- Use with proper gauge electric cord
- Use double insulated tools

Personal Protective Equipment (PPE)

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

- Protective clothing ranging from standard coveralls to a chemical resistant suit with hood and booties.
- Respirator ranging from an N-95 to a PAPR for high exposure and strenuous work. In rare cases a supplied air respirator may be required.
- Protective footwear with steel toe and insole. A chemical resistant boot or outer boot may be required for some work.

PPE (continued)

- Disposable cut/abrasive resistant work glove. A chemical resistant glove may be required for some work .
- Fully enclosed goggles (better for ash) or safety glasses.
- Ear protection in noisy areas.
- Head protection if in construction or demolition zones.
- Be sure to follow your work site's PPE program.
- If you are working near downed power lines:
  - Nomex clothing compliant with NFPA 1500, rubber gloves, dielectric overshoes, and insulated tools.

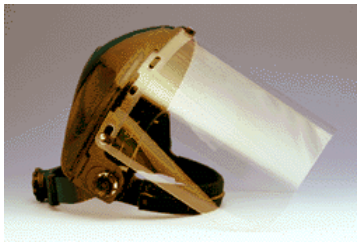
The OSHA PPE standard (29 CFR 1910 Subpart I) must be followed when selecting and using PPE.

Examples of PPE

Level C PPE with Tyvek Splash Suit and APR Respirators

Example of Nitrile gloves Courtesy Kirkwood

Example of Leather gloves Courtesy Kirkwood



Face Shield

Safety Glasses

Safety Goggles

N-95 Respirator

½ Face APR

Full Face APR

PAPR

Air–Purifying Respirator

Try to apply the following engineering controls, in addition to wearing a respirator:

- Wet methods
- Appropriate HEPA vacuum

Minimize particulate matter (dust) production:

- Do not use a vacuum that is not approved for ash and does not contain a HEPA filter.
- Do not aggressively dry sweep.
- Avoid walking in single file lines as those walking behind the leader may become covered in particulate matter.

Wetted debris during clean up of 2003 Angora wildfire

Air–Purifying Respirator (continued)

Wearing NIOSH-approved respirators:

- **If in doubt about respirators, see your supervisor.**
- An N-95 (filters out 95% of particles) or greater may be acceptable for some activities.
- Use an elastomeric, half-mask respirator with N,R, or P-100 series filters if asbestos or carcinogen may be present.
- If airborne contaminants are causing eye irritation, full-face respirators with P-100 organic vapor/acid gas (OV/AG) combination cartridges should be used.
- Surgical masks should not be used because they do not provide adequate protection.
- Replace filters when breathing becomes difficult or when you detect an odor through organic vapor cartridges (29 CFR 1910.134).

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

Special rules for respirators

- Make sure you are medically cleared to wear your chosen respirator
- Make sure you received the required training
- Make sure you are fit tested for your respirator
- Inspect your respirator each time you put it on and remove it
- Perform a user seal check each time you put it on
- Clean your elastomeric respirator at least once a day in accordance with the manufacturer's recommendations
- Store elastomeric respirators in a clean bag
- If your respirator becomes damaged or fails to function, stop work and retrieve a new one

OSHA respiratory protection standard, 29 CFR 1910.134

Decontamination (Decon)

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

- Decon is the process of removing, destroying, or reducing the activity of materials, such as ash, asbestos, or toxic chemicals that could endanger an individual or the environment.
- Prevents spreading contamination to other locations (like your vehicle or home).
- Site workers who use the site's Standard Operating Procedure are less likely to be contaminated than site workers who do not use these practices.

A decontamination plan should include:

Training

- Location and layout of decontamination stations and areas
- Decontamination methods
- Required decontamination equipment
- SOPs to minimize worker contact with contamination during decontamination
- SOPs for decontamination line personnel
- Procedures for collection, storage and disposal of clothing, equipment, and any other materials that have not been completely decontaminated
- Disposal of PPE and decon solutions as contaminated waste
- Adequate personal washing stations

Prevent the spread of contamination to your family and home

- Bringing home contaminated work clothes or equipment may contaminate your home and place your family at risk.
- Bring a clean change of clothes to the worksite.
- Wash work clothes separately - preferably in an employer provided location.

Animals, Insects and Plants

The Japanese Brown Widow spider

- **To protect yourself from mosquitoes:**
  - Use screens on dwellings.
  - Wear long pants, socks, and long-sleeved shirts.
  - Use insect repellents that contain DEET or Picaridin.
- **Beware of wild or stray animals:**
  - Avoid wild or stray animals; call local authorities to handle animals.
  - Get rid of dead animals according to local guidelines.
  - Wear and clean proper protective clothing when handling carcasses.
  - Look out for rodents in structures (especially confined spaces).
- **Be aware of poisonous or harmful plants in your work area.**

Animal, Insects and Plants (continued)

- **There are three species of poisonous snake in Japan: the Japanese keelpack, the *habu* and *mamushi*.**
- **Be on the alert for snakes that may be hiding in unusual places.**
- **If you are bitten:**
  - Seek immediate medical attention.
  - Identify the snake so if poisonous, you can be given you're given the correct antivenom.
  - Do not cut the wound or attempt to get suck the venom out; contact your local emergency department for further care.

Mamushi pit viper venom will cause tissue to "melt"; seek treatment immediately if bitten

Protect your skin with impenetrable clothing layer!

General Safety Tips

- Be careful and use safety measures outlined in your worksite's HASP at all times.
- Walking/working surfaces may be wet, slippery, and unstable. Spread sand and wear slip resistant footwear if possible (to reduce slips and falls).

General Safety Tips (continued)

- Walking over and handling debris that is unstable can cause cuts, scrapes, bruises, sprains, etc.
- Make sure you have had a current tetanus vaccination.
  - Revaccinate for a dirty wound if current vaccination is over five years old.
  - If you will be performing direct patient care or otherwise expect to have contact with bodily fluids, get the Hepatitis B vaccine series.
- Avoid contact with stagnant water.
  - If exposed to stagnant water, wash and decontaminate yourself and any contaminated equipment immediately.
- Use steel toe insole, non-slip footwear.
- Use durable outer gloves when handling debris.
- Wear ear protection for noisy environments.

Excavation Hazards

Search and rescue, structural repair, demolition and cleanup operations may require excavation

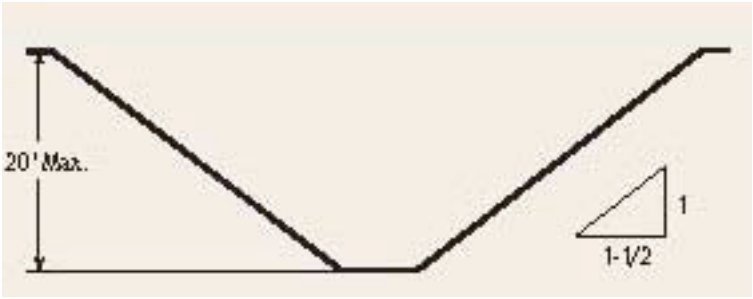
- Excavations can create many hazards that must be controlled to safely work around and in them.
- An excavation is any man-made cut, hole, trench, or depression in the earth formed by earth removal.
- A trench is defined as a narrow, below-ground excavation that is deeper than it is wide, and is no wider than 15 feet.
- The following are potential excavation hazards:
  - Cave in
  - Falls, falling loads
  - Hazardous atmosphere
  - Incidents involving mobile equipment

Excavation (continued)

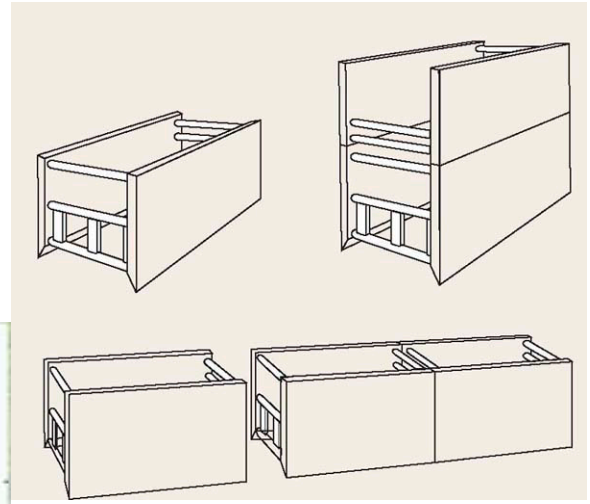
- A competent person must evaluate soil for excavation safety. All excavations/trenches should have safe means for entering and exiting (ladders, safe design, etc.). DO NOT enter an unsafe excavation!
- In trench excavations that are over 4 feet deep, a stairway, ladder, ramp or other safe means of egress must be provided so as to require no more than 25 feet of lateral travel for employees (i.e. Distance to egress must be 25 feet or less).
- If an excavation is five feet deep or more, one of the following engineering controls must be used:
  - Shoring
  - Shielding
  - Sloping

See OSHA's Trenching and Excavation Factsheet

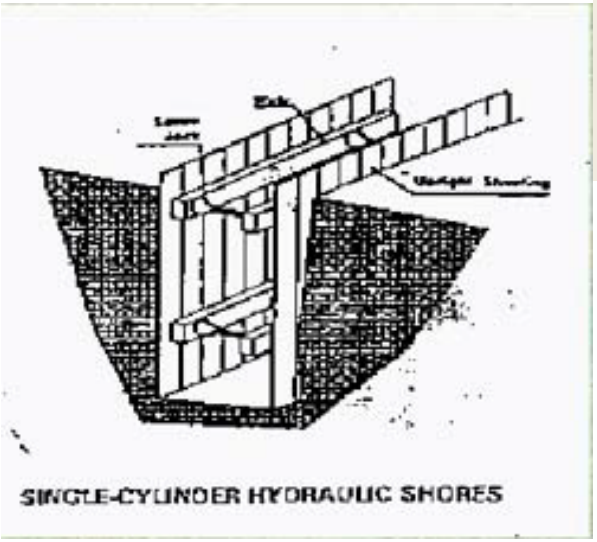
Controlling Excavation Hazards



Sloping in type C soil



Shielding



Shoring

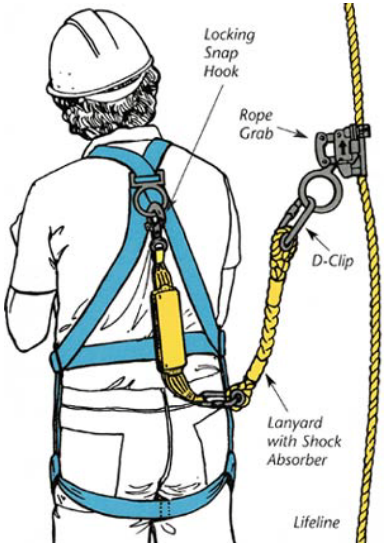
Aerial Lifts

An aerial lift is a vehicle-mounted device used to get a worker to an elevated position (also called “cherry picker” or “boom truck”).

- Only trained and authorized people may operate the lift.
- Read and understand the safety and operating instructions, including all warning decals or labels.
- Check for overhead objects before use.
- Stay far from debris piles, drop-offs, and floor openings.
- Never use near electric lines unless they are deenergized or adequate clearance is maintained.
- Refuel tanks only when the unit is off and charge batteries in a well ventilated area away from open flames.
- Elevate the lift only when it is on a firm and level surface.
- Whenever working out of an aerial lift, a full body harness must be worn and properly attached to the basket.
- Never drive the aerial lift when it is elevated above the limit the manufacturer considers safe.

Falls from Heights Six Feet and Higher

- **Employees shall be protected from falls greater than six feet to a lower level. (29 CFR Part 1926.500)**
  - Guardrail systems
  - Safety net systems
  - Fall arrest systems (less effective than guardrail and safety net systems)
  - Cover or guard any openings or floor holes as soon as they are created
  - Make sure floor hole covers support two times the weight of employees, equipment, and materials
  - Be careful when stepping into areas that are unstable/uneven or where the surface cannot be visualized (i.e., if covered by water)
- **Workers should prevent items from falling onto people below.**



Ladder: Safety-ladders can create a fall hazard

- Base must be set from the wall at a 1:4 ratio.
- Position portable ladders to extend at least three feet above landing; use a grab device when three foot extension is not possible.
- Secure at the top to a rigid support.
- Do not apply more weight on the ladder than it is designed to support, and make sure that the weight on the ladder will not cause it to slip off its support.
- Before each use, inspect ladders for cracked, broken, or defective parts.
- Use only ladders that comply with OSHA standards.

Photo courtesy IUOE National Hazmat Training Program

Noise Exposure: some of the tasks you may conduct will create un-healthy levels of noise

- Wear appropriate hearing protection in noisy work environments
  - Examples: working around chainsaws, heavy equipment, and blowers
- A worksite is considered noisy if you have to shout to be heard within three feet
- The OSHA PEL for noise is 90dB

Ear plugs

Ear muffs

Module 3–Controlling Radiological Hazards from Fukushima Daiichi Nuclear Power Plant

Radiation hazards from Fukushima Daiichi plant—this is a volatile situation—*MAKE SURE YOU RECEIVE CONSTANT UPDATES*

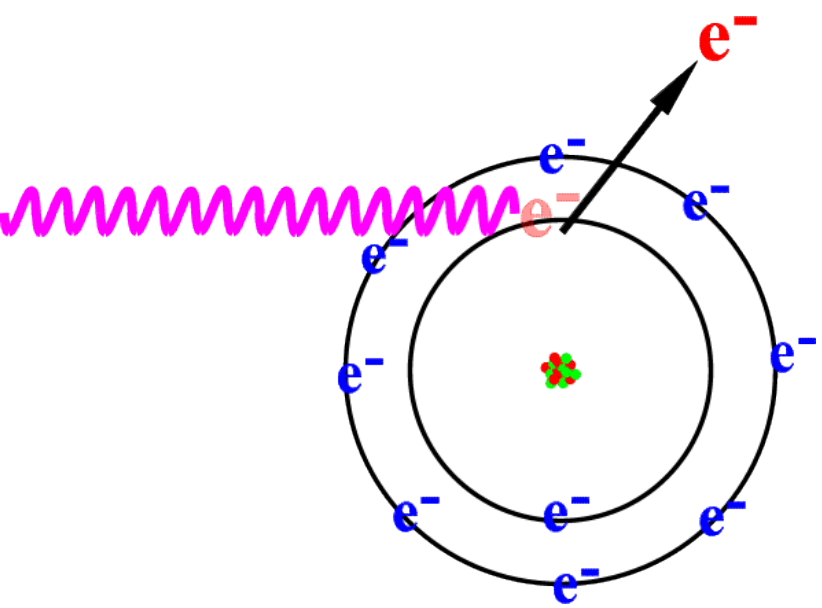
- The dispersion of radioactive material will depend on many factors; primarily the physical form of the radioactive material, wind, precipitation and potential reactor failure.
- The greatest amount of dust will settle close to the nuclear plant but small amounts can travel large distances.

What is Radiation?

- Radiation is energy in motion
- Radiation may be in the form of particles or rays/waves
- There are two types of radiation:
  - Non-ionizing radiation
  - Ionizing radiation

For the Japan response, we are most concerned about ionizing radiation.

What is Ionization?



- Ionization occurs when atoms absorb sufficient energy from particle or wave radiation to break their molecular bonds and give off an electron
- This causes changes or destruction of molecules
- Ionization can damage living tissue

Ionizing Radiation

The energy given off by the nucleus is called ionizing radiation

- It is strong enough to detach an electron from an atom.
- When an atom loses an electron, it has a positive charge and is called an ion.
- The ion and its lost electron are called an ion pair.
- Ionizing radiation can damage living tissue.

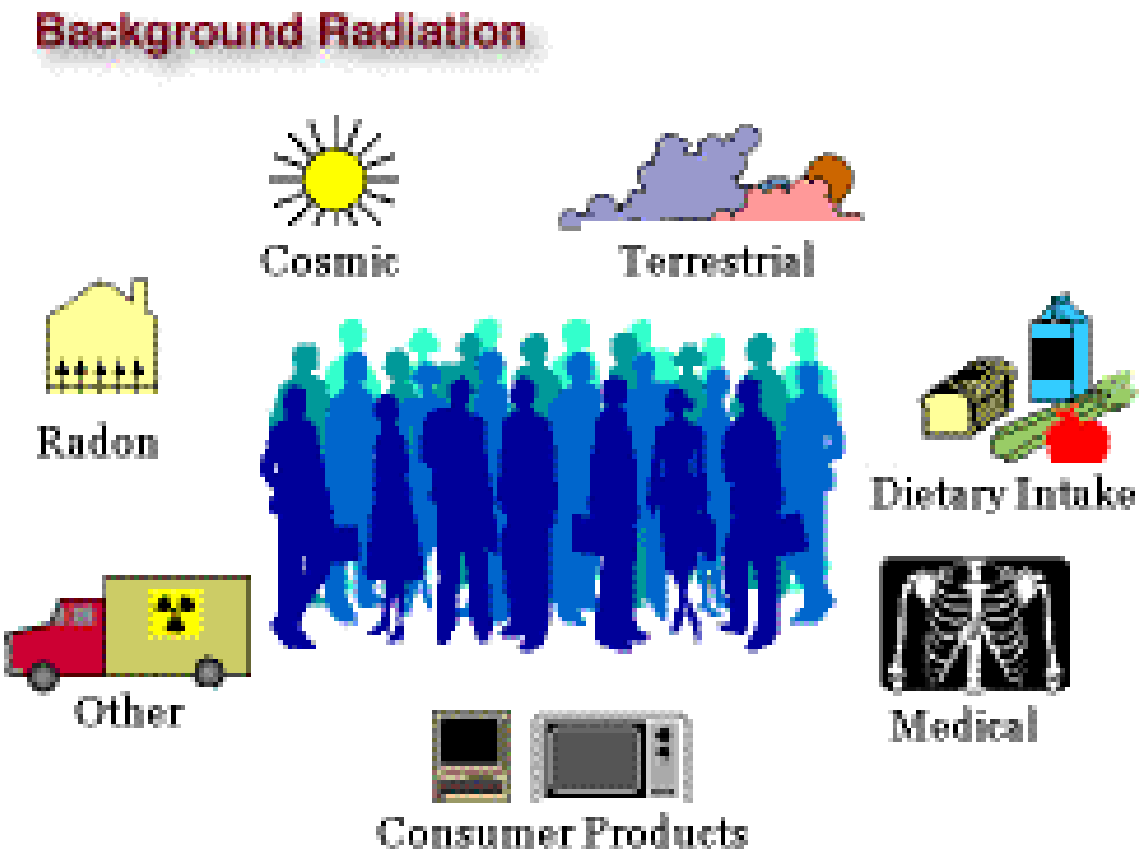
How does ionizing radiation harm me?

- Destroys cells
- May produce genetic effects
- Affects embryo and fetus
- Increases cancer risk

Embryo and fetus cells rapidly divide, making them sensitive to ionizing radiation.

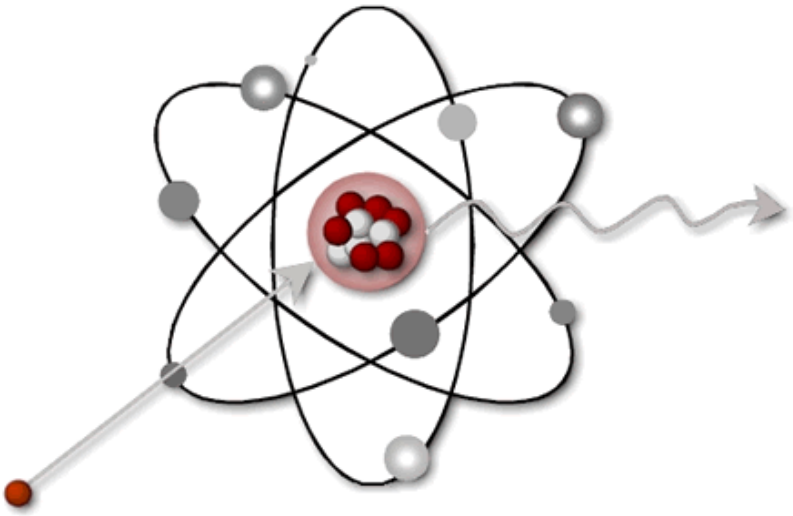
If you are pregnant, think you are pregnant or are trying to conceive, consult your physician (or other appropriate professional).

We are exposed to ionizing radiation every day



Radiation Basics

- Four types of ionizing radiation we are concerned with are:
  - Alpha (α)-internal hazard
  - Beta (β)-internal/external hazard
  - Gamma (γ) and xray-whole body external hazard
  - Neutron (n)- whole body external hazard



Summary of Ionizing Radiation

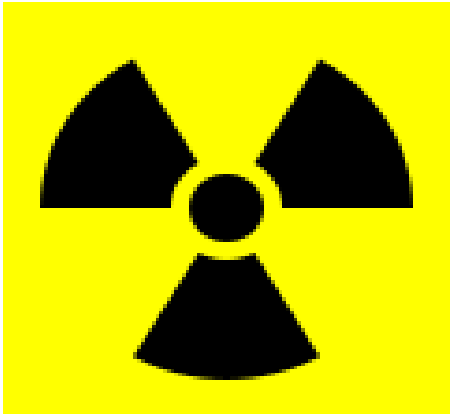
Type of Radiation	Alpha (α)	Beta (β)	Gamma (γ) and X-ray	Neutron(n)
Physical Characteristic	Large mass with a +2 charge	Small mass with a -1 or +1 charge	• No mass or charge • Electromagnetic wave or photon • Similar to one another (difference is the place of origin)	• No charge • Has mass
Range	• Very short (about 1-2 inches in air) • Deposits large amount of energy in a short distance of travel	Short distance - 1 inch to 20 feet	• Range in air is very far • It will easily go several hundred feet • Very high penetrating power since it has no mass and no charge	• Range in air is very far • Easily can go several hundred feet • High penetrating power • Difficult to stop
Shielding	Few centimeters of air, sheet of paper, intact skin (outer layer)	Plastic, glass, safety glasses	Concrete, water, lead	Water, concrete, plastic (high hydrogen content)
Biological hazard	Internal hazard; it can deposit large amounts of energy in a small amount of body tissue	Internal hazard (this is due to short range). Externally, may be hazardous to skin and eyes.	Whole body exposure. The hazard may be external and/or internal. Depends on whether the source is inside or outside the body.	Whole body exposure. The hazard is generally external.

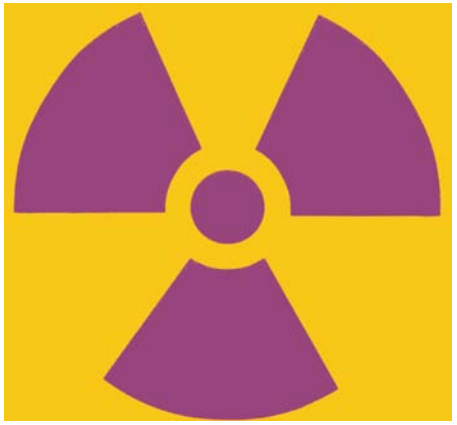
Radioactive material is material that is unstable and spontaneously emits radiation

- Radioactive material can be dispersed in the form of dust from an explosion, fire or steam. This dust will contaminate what it lands on and will contaminate your lungs if you breath it in.
- Examples of radioactive material that may be released from the Fukushima Daiichi plant :
  - Iodine 131
  - Cesium 137
  - Sodium 24 (from sea water coolant)
  - Chlorine 38 (from sea water coolant)

Radiation released from radioactive material does not have a smell or taste and cannot be seen so you must use a detector such as a Geiger Counter with proper survey technique.

Areas and materials controlled for radiological purposes will be designated with a magenta or black standard three-bladed radiological warning symbol (trefoil) on a yellow background or with the new triangle with red background and black pictures





Examples of radioactive materials in everyday items

Bananas with potassium 40

1970's tape dispenser with thorium sand

Fiesta Ware with uranium paint

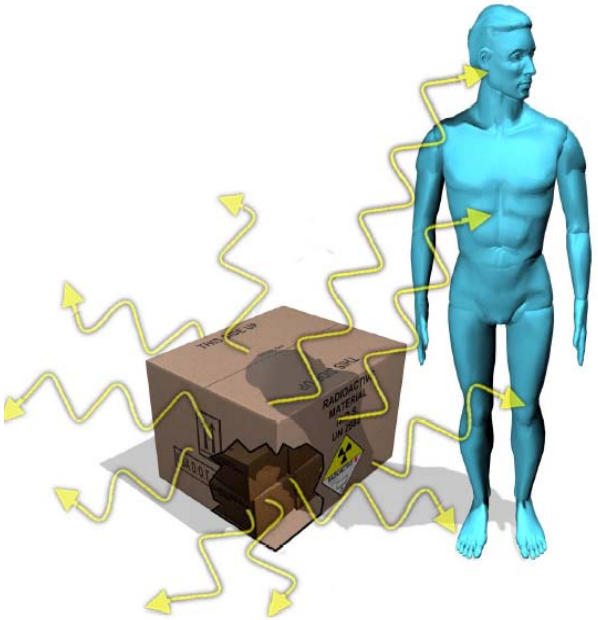
Exit signs with tritium

Lantern mantles with thorium

Smoke detectors with americium

Radiation Exposure

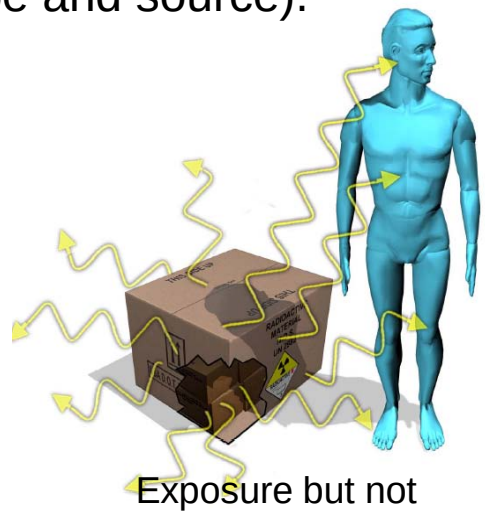
Radiation exposure to response workers will come from radioactive dust released into the air or from large pieces of the reactor if it exploded. You do not have to touch radioactive material to be exposed to it.



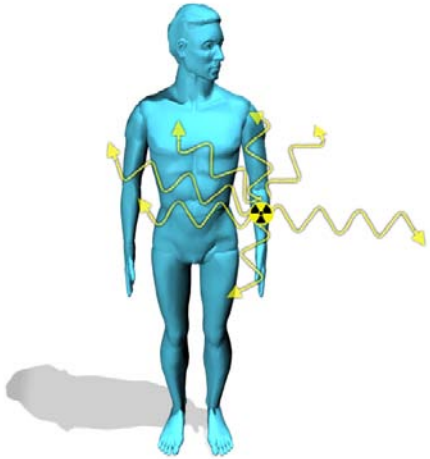
Large piece of radioactive material exposing worker

Exposure vs. Contamination

- Exposure to radiation occurs when a person or an object is close enough to radioactive material to be affected by it without touching it (depends on radiation type and source).
- Contamination takes place when contact is made with radioactive material and it is deposited on the skin, clothing, surfaces, internally etc; Contamination does not always mean exposure (depends on radiation type and source).



Exposure but not contamination



Contamination with possible exposure (beta and gamma)

Internal Contamination with exposure (alpha, beta and gamma)

Contamination and Exposure (continued)

- If radioactive contamination gets onto your clothes, intact skin or surfaces it can be removed through decontamination procedures.
- If radioactive contamination gets into your body through inhalation (lungs), digestive system (through eating or mucus) or goes directly into your blood stream (through a cut), it becomes an internal contamination hazard and may lead to high exposure.

There are different types of radioactive contamination

Types of contamination	Definition
Fixed	Cannot be removed by casual contact. It may be released when the surface is disturbed.
Removable	May be transferred by casual contact. Any object that makes contact with it may in turn become contaminated.
Airborne	Airborne radioactivity is radioactive contamination suspended in the air.

Workers should be aware of potential radioactive contamination problems

- Leaks, spills, or standing water
- Damaged or leaking containers
- Open radioactive systems with no observable controls
- Dust/dirt accumulation
- Torn or damaged tents and glove bags or containments on radioactive systems
- Notify radiological control personnel or supervisor

Workers need to wear personal dosimeters and follow procedures outlined in radiological control plan for the response including:

- Wear outside clothing at all times in the field and in controlled radiological areas
- Primary dosimeters are worn on the chest area
- Use PAIN if dosimeter is lost or damaged
- Know storage location
- Return for periodic processing
- Do not remove to other areas without authorization
- ***Request a dosimeter you can read in the field***

Use radiation detection devices to track your potential radiation exposure and actual radiation dose

Radiation detection meter with pancake probe (Geiger Counter) used to detect alpha, beta and gamma radiation

Direct reading dosimeters measure gamma and xray radiation and current dose can be viewed in real time

Film badge measures beta, gamma, xray and neutron radiation

Thermoluminescent detector measures beta, gamma and neutron radiation

Primary dosimeters are worn on the chest area

This TLD dosimeter is properly worn on a worker between his neck and waist

Take proper actions if dosimeter is lost, off-scale, damaged or contaminated while in the field

- **P**—Place work activities in a safe condition
- **A**—Alert others
- **I**—Immediately exit the area
- **N**—Notify Radiological Control personnel

When using detectors to survey for alpha radiation, probe must be held ¼ to ½ inches (without contact) from surface and moved slowly

Monitoring (frisking) using a radioactive contamination survey instrument

- Verify the instrument is on, set to the proper scale, and enter the calibration date (do not touch probe yet)
- Verify instrument response by source check
- Ensure the audible function of the instrument is on and can be heard
- Determine the instrument background
- Know levels you are looking for (currently 100,000 cpm)

Frisking (continued)

- Survey hands before picking up probe
- Move probe slowly over the surface, making sure to straighten out all loose clothing
- If the count rate increases during frisking, pause for 5 to 10 seconds for meter to stabilize
- Report all readings (counts per minute "cpm") above 100,000 to your supervisor and have person surveyed report back to decon.

Photo courtesy IUOE National Hazmat Training Program

How can I protect myself from radiation?

- Prevent inhalation or ingestion of radioactive dust or deposition of radioactive dust on skin or a wound
- Use the Hierarchy of Controls:
  - Eliminate the hazard (leave the area)
  - Engineer the hazard out (use wet methods to control dust)
  - Administrative (use standard operating procedures (SOPs))
  - Personal Protective Equipment (PPE) (i.e., respirators)

How can I protect myself? (continued)

- Avoid areas with radioactive contamination
- Decontaminate yourself in accordance with your site decontamination plan
- Use radiation detection devices
- Use ALARA principles

How can I protect myself from radioactive dust?

- Dust can be both contamination on your skin or contamination breathed or ingested into your body.
- Ensure that all measures are taken to minimize dust generation (use wet methods, etc.).
- As a final step, wear the appropriate respirator to avoid inhaling dust and protective outer clothing to prevent skin contamination.
- Take all required steps to remove dust if contaminated.

The use of ALARA

- **A**—As
- **L**—Low
- **A**—As
- **R**—Reasonably
- **A**—Achievable

Japanese nuclear plant emergency workers; source unknown

ALARA employs techniques of TIME, DISTANCE and Shielding

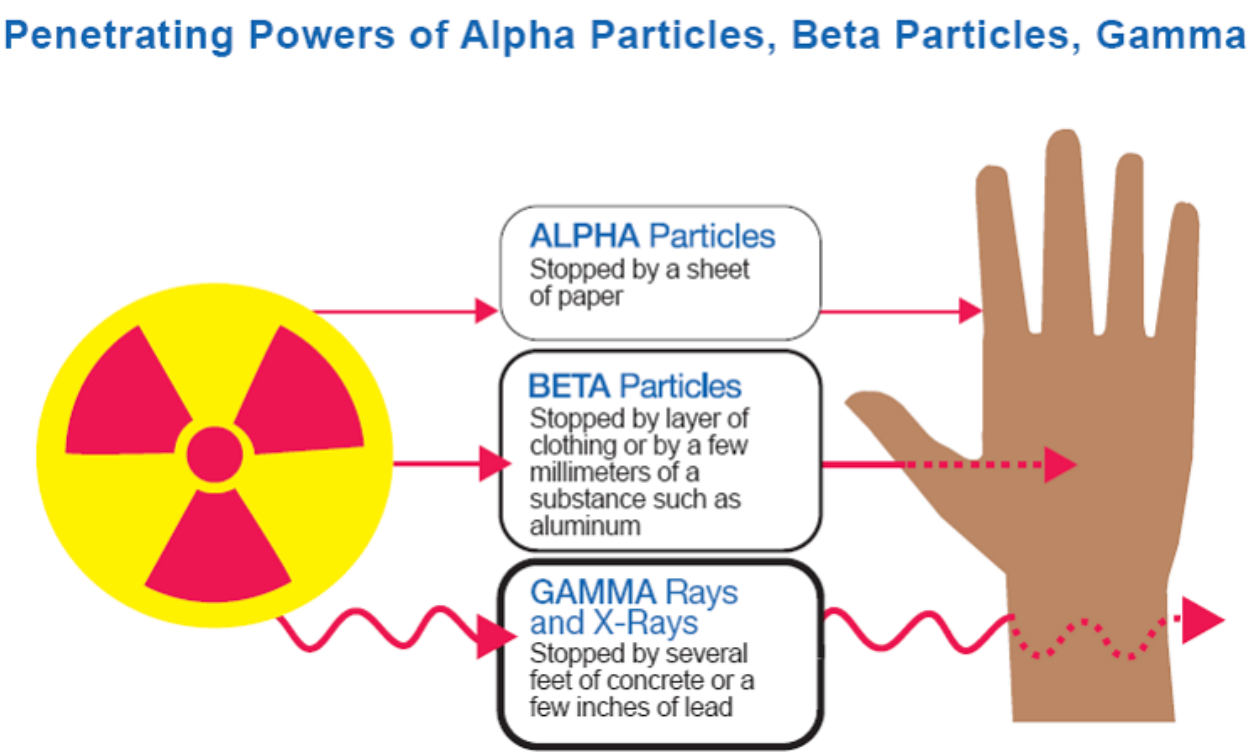
More on Time

- Limit your exposure to the radioactive source
- By limiting your time, you limit your dose

More on Distance—STAND BACK!

- By increasing the distance between you and the radioactive material, you will reduce your dose-rate.
- In fact, if you double your distance from the source, you will reduce your dose-rate to one/fourth of original amount.

Intact skin will effectively shield only alpha particles. Radioactive material from the reactor will also include beta and gamma emitters.



Minimum response for discovery of radioactive material

- Stop current operation
- Warn others in the area
- Leave area
- Minimize exposure to radiation and contamination by using ALARA principles
- Notify Radiological Control personnel

Units to Measure Ionizing Radiation

The following are units used to measure radiation dose. These are some of the terms you might hear on site:

- **Rad**—Units for absorbed doses of all radiation
- **Roentgen**—Units of exposure to gamma radiation
- **Rem (mrem)**—Unit of dose related to biological risk
- G**ray (Gy)**—SI unit of absorbed dose of all radiation
- **Sievert (Sv)**—SI unit of dose related to biological risk

Note: 1000 mrem = 1 rem = 0.01 Sv

Radiation Dose vs. Dose Rate

Radiation Dose (cumulative):

- The ***amount*** of radiation energy deposited in the body
- Often measured in millirem or milliSv

Dose Rate:

- The ***rate*** at which radiation energy is deposited in the body
- Often measured in millirem per hour or milliSv per hour

Radiation Dose

Acute

- High dose rate
- Short period of exposure
- Visible signs of exposure
  - Nausea
  - Fatigue
  - Hair loss
  - Burns
- Very damaging to tissue
  - Cells have less time to repair
  - Immune system damaged

Chronic

- Low dose rate
- Long period of exposure
- Less immediately damaging to tissue
- No immediate visible effects
- May cause cancer

At what dose does radiation harm me?

Health Effect	Dose (rem)
Temporary sterility in testis	15
Nausea	35
Bone marrow depression	20-50
Reversible skin damage	200
Permanent sterility in ovaries	250
Vomiting, fatigue, moderate bone marrow depression	300
Permanent sterility in testis	350
Lethal dose	450 and up

Radiation dose levels for ionizing radiation during the 2011 Japan earthquake

Protective action guidelines (PAGs): voluntary dose limits set by EPA and DHS for emergency response situations

- **10 rems/year for protecting valuable property**
- **25 rems/year for lifesaving or protection of large populations**

At PAG levels, you may have acute (immediate) and chronic (gradual, long-term) health effects

For comparison, a U.S. radiological workers annual dose limit is 5 rem (whole body)

What if I get internal radioactive exposure?

There are some medical treatments available that may be used before you receive, or if you receive a high internal exposure of radiation:

- Potassium Iodide
- Neupogen
- Prussian Blue
- Diethylenetriaminepentaacetate (DTPA)

You should see a doctor for these treatments. Some treatments have side effects.

Only eat and drink provided food and beverages. Japanese food and water supplies close to the nuclear plant may have unsafe levels of radioactive contamination

Minimum protective requirements for responders

- Be aware of evacuation distances (safe zones) from nuclear plant and how long it will take you to reach the safe zone
- Understand the use and wear personal dosimeters as directed
- Use Geiger counter or other radiation detection device to detect radioactive contamination and radiation levels as directed
- Wear respirator with OV/HEPA cartridge if airborne contamination is possible.
- Understand and use decontamination procedures
- Only eat and drink provided food and drinks
- ***Follow all procedures as outlined by U.S. command staff***

If you have any concerns or questions about radiological hazards you may face during the response, contact your supervisor immediately. Don't wait!

Module 4–Incident Stress

Photo: Øyvind Hagen / StatoilHydro

Traumatic stress is natural and affects many responders

- Pace yourself and take frequent rest breaks.
- Be conscious of those around you who may be exhausted, feeling stressed or even temporarily distracted - they may put themselves and you at risk.
- Maintain as normal a schedule as possible: regular eating and sleeping are crucial.
- Make sure that you drink plenty of fluids.

VA TF-1, Ofunato, Japan, 3-15-11

Take care of yourself so you can help others

- Whenever possible, take breaks away from the work area.
- Recognize and accept what you cannot change.
- Give yourself permission to feel rotten: You are in a difficult situation.
- Recurring thoughts, dreams, or flashbacks are normal—do not try to fight them. They will decrease over time.
- Communicate with your loved ones at home as frequently as possible.

Take precautions at home, too

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

Remember that "getting back to normal" takes time

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

Help children feel better

- Reassure children they are safe
- Encourage children to talk and ask questions
- Carry out daily routines and outings (when possible)
- Screen what children are watching on TV

Photo courtesy FEMA

Pay attention to fatigue! 17 hours awake impairs performance similar to being drunk.

Responders can not recognize their own decline or have enough training or experience to avoid it

Arendt et al., 2005; Van Dongen et al., 2003

The National Response Team has guidance that recommends Fatigue Management Plans be written for each response

Ask to see your organization's plan!