



National Institute of  
Environmental Health Sciences  
*Worker Training Program*

# Protecting Yourself While Removing Post-Disaster Debris from Your Home or Business



NIEHS Awareness for Post-Disaster Property Debris Cleanup

WORKER TRAINING PROGRAM

## This training tool is broken down into four modules

1. Introduction
2. Life safety hazards
3. Post disaster hazards associated with debris cleanup
4. Incident stress



WORKER TRAINING PROGRAM

# MODULE 1- INTRODUCTION



**This training tool is for small business owners, residents and community/faith-based volunteer groups conducting post disaster cleanup activities. It provides awareness level information on post-disaster hazards associated with cleanup activities.**

**This training tool outlines the main hazards associated with post-disaster cleanup and provides basic hazard control methods. The main focus is on hazard awareness; identifying hazards before they harm you and either instituting basic controls or staying clear of them and calling in professional help. When in doubt, seek the advice of a certified professional.**

**Do not attempt actions which may put you in danger. Contact local emergency services and evacuate to a safe location until the hazard is removed by an authorized/trained professional.**

**This training tool does not replace face-to-face training.**

## **Contact the Occupational Safety and Health Association (OSHA) when you have health and safety concerns**

**(OSHA) 800-321-OSHA (6742); <http://www.osha.gov>**



**OSHA sets and enforces workplace health and safety laws. Most workers in the nation come under OSHA's jurisdiction. OSHA covers private sector employers and employees in all 50 states, the District of Columbia, and other U.S. jurisdictions either directly through Federal OSHA or through an OSHA-approved state program.**

## Employer and Worker Responsibilities

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 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.

**You may also contact the Federal Emergency Management Agency (FEMA) with concerns related to the disaster**

**800-621-FEMA (3362); <http://www.fema.gov>**



**FEMA's mission is to support citizens and responders during disasters. Contact FEMA if you have questions about debris cleanup procedures or disaster assistance and recovery procedures.**

# In emergencies, or situations where you think danger is imminent, dial **911**

- Hazardous situations that could be immediately hazardous to life
- Unsecured hazardous chemicals (damaged containers, strange odors, etc.)
- Discovery of trapped person
- Damaged utilities
- Unstable structures



Firefighters moving an injured victim, courtesy IAFF

## Advanced/additional training required for those involved in post-disaster cleanup

- This training tool does not replace hazard specific or specialized training such as asbestos abatement, 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.
- Keep in mind that when in doubt about the safety of an activity, stop what you are doing. Be sure you are safe before continuing. Contact your local government authority, OSHA area office or FEMA field officer.

**Contact the NIEHS National Clearinghouse for Worker Safety and Health Training (202-331-7733) for information regarding advanced training for post-disaster cleanup.**

# MODULE 2– LIFE SAFETY



**Your first concern is life safety! Protect yourself and family first, before protection of property. Do not attempt actions which may put you in danger, such as entering an unstable building to search for valuables or crossing flood waters.**



Biloxi Mississippi, hurricane Katrina survivors look at a salvaged family photo

# Keep your children safe! Do not let children participate in post disaster cleanup!



**A paramedic wraps the foot of a little girl from Denning, AR after she cut her foot trying to salvage toys from her home that was damaged by a tornado**



**Eight year old Rebecca helps with clean up following the flooding in Lodi, NJ**

**Roads and traffic control may be non-existent due to the disaster; Traffic accidents are often the leading cause of post-disaster fatalities and injuries**



## Structural integrity hazards can be deadly - use extreme caution!

- Disasters 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 they are safe
- Assume all stairs, floors, and roofs are unsafe until inspected
- Look up and be aware of hidden and/or overhead/falling 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

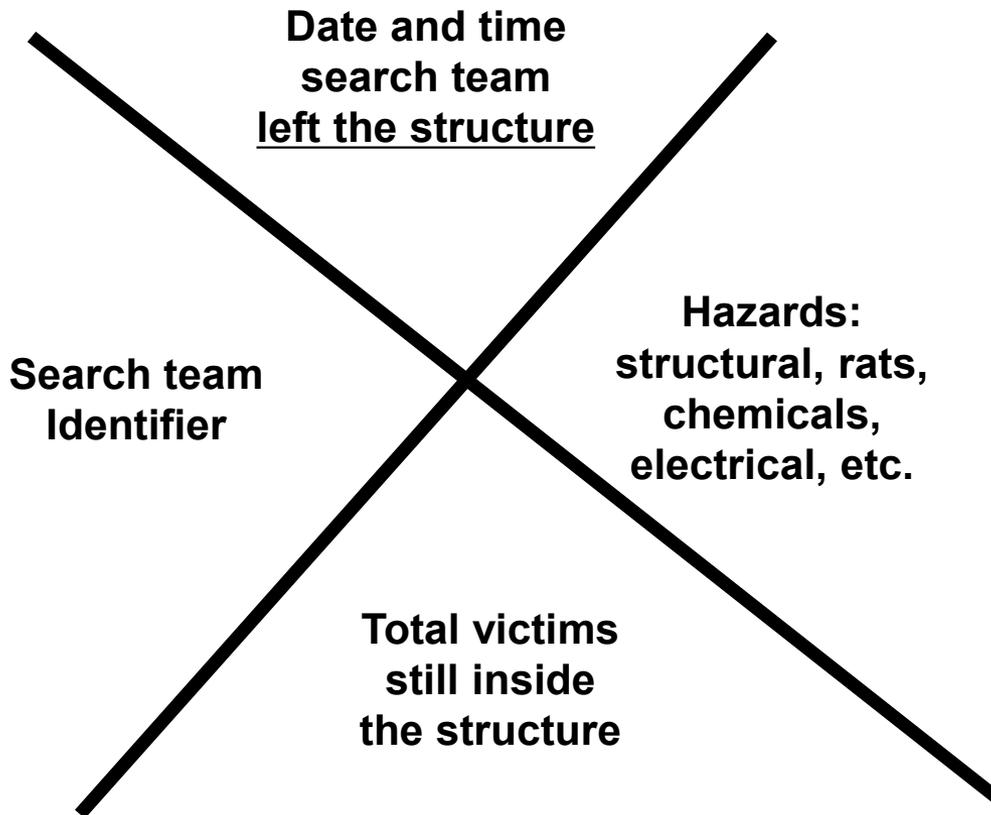


Leave immediately if you hear shifting or unusual noises - A COLLAPSE MAY BE OCCURING

**If you find a trapped person, call 911 IMMEDIATELY and do not attempt rescue as you could become the victim – a rescue team will be sent**



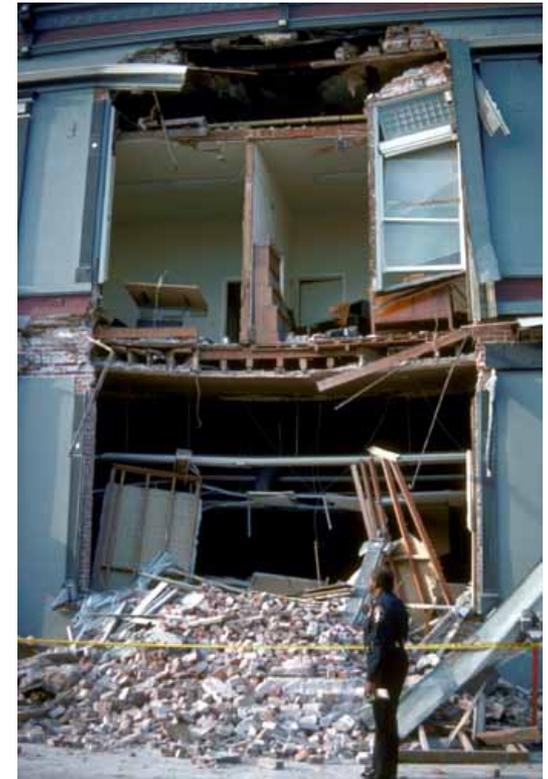
# FEMA search marking system can warn you of danger



**If you do not see a FEMA search marking or other FEMA postings your building has not been evaluated**

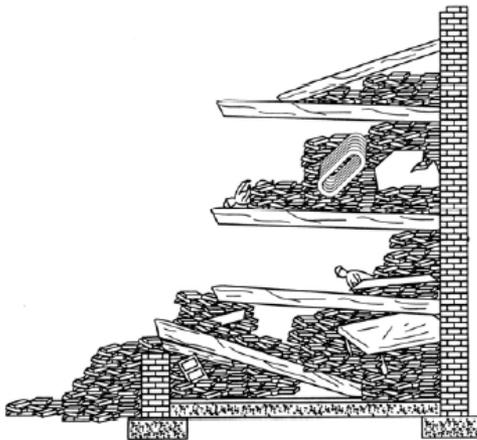
## Structural integrity issues and demolition is highly skilled, hazardous work

- OSHA requires walls or floor to be reinforced or stabilized 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 found 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

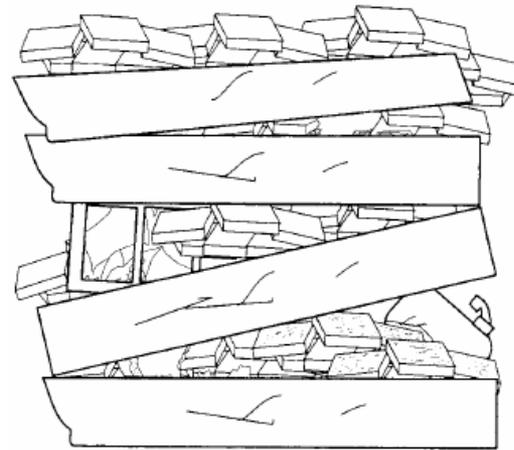


Damaged structure from California's 1989 earthquake

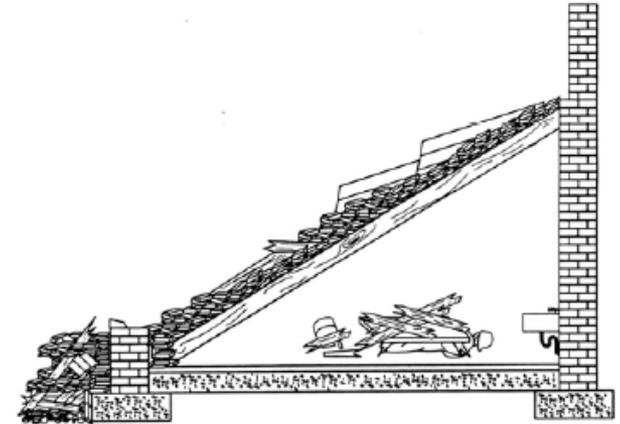
# Examples of unstable structures you should avoid - contact a structural assessment team



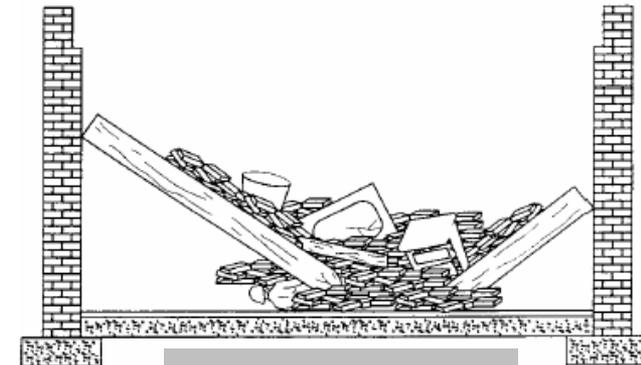
**Cantilever**



**Pancake**



**Lean to**



**V-shape**

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

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



# Look for structural integrity inspection postings to help determine if a structure is safe to enter

**INSPECTED  
LAWFUL OCCUPANCY PERMITTED**

This structure has been inspected (as indicated below) and no apparent structural hazards has been found.

Date: \_\_\_\_\_  
Time: \_\_\_\_\_

Inspected Exterior Only  
 Inspected Exterior and Interior

**(Caution:** Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for: \_\_\_\_\_  
(Jurisdiction)

Report any unsafe condition to the local authorities; reinspection may be required.

Inspector comments:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Inspector ID / Agency: \_\_\_\_\_

Facility Name and Address: \_\_\_\_\_  
\_\_\_\_\_

Do Not Remove, Alter or Cover this Placard until Authorized by Governing Authority

**UNSAFE  
DO NOT ENTER OR OCCUPY  
(THIS PLACARD IS NOT A DEMOLITION ORDER)**

This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below:

Date: \_\_\_\_\_  
Time: \_\_\_\_\_

This facility was inspected under emergency conditions for: \_\_\_\_\_  
(Jurisdiction)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.**

Inspector ID / Agency: \_\_\_\_\_

Facility Name and Address: \_\_\_\_\_  
\_\_\_\_\_

Do Not Remove, Alter, or Cover this Placard until Authorized by Governing Authority

**RESTRICTED USE**

**Caution:** This structure has been inspected and found to be damaged as described below:

Date: \_\_\_\_\_  
Time: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**(Caution:** Aftershocks since inspection may increase damage and risk.)

This facility was inspected under emergency conditions for: \_\_\_\_\_  
(Jurisdiction)

**Entry, occupancy and lawful use are restricted as indicated below:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

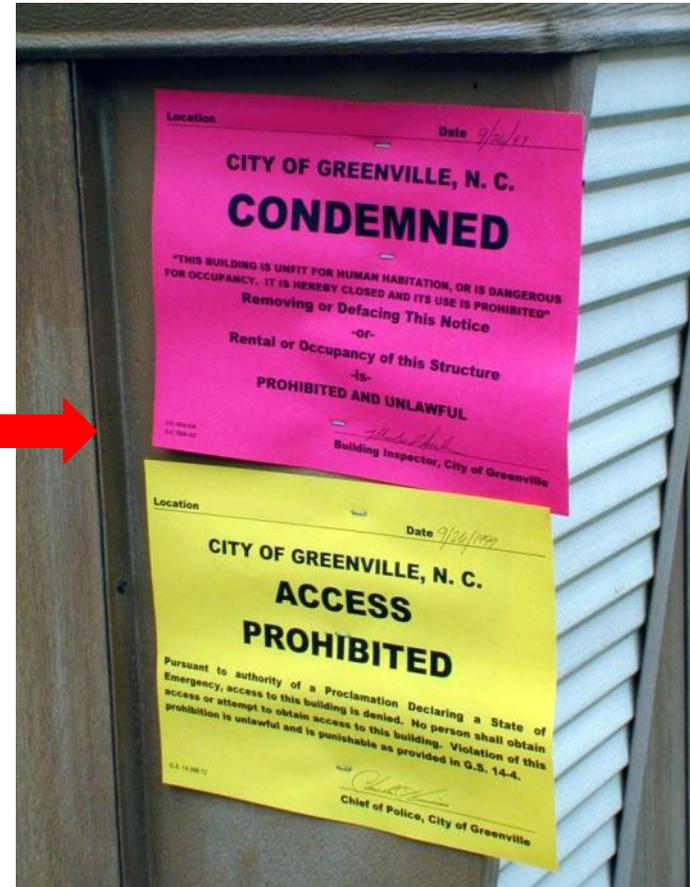
Inspector ID/Agency: \_\_\_\_\_

Facility Name and Address: \_\_\_\_\_  
\_\_\_\_\_

Do Not Remove, Alter or Cover this Placard until Authorized by Governing Authority

**If you do not find postings then the structure has not been professionally evaluated for structural stability and you should assume it is not safe to enter**

# An example of structural inspection postings where it is not safe to enter



## Structural Integrity

**UNSAFE**  
**DO NOT ENTER OR OCCUPY**  
**(THIS PLACARD IS NOT A DEMOLITION ORDER)**

This structure has been inspected, found to be seriously damaged and is unsafe to occupy, as described below:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_  
Time: \_\_\_\_\_

This facility was inspected under emergency conditions for:

\_\_\_\_\_

(Jurisdiction)

**Do not enter, except as specifically authorized in writing by jurisdiction. Entry may result in death or injury.**

Inspector ID / Agency: \_\_\_\_\_

Facility Name and Address: \_\_\_\_\_

Do Not Remove, Alter, or Cover this Placard  
until Authorized by Governing Authority



## Stabilizing structures by reinforcing and supporting, 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 concerns a collapsed or unstable structure

**DO NOT ATTEMPT TO STABILIZE DAMAGED STRUCTURES! If you think this is needed, seek the advice of a certified professional**

## Stay away/report damaged utilities-call 911

- 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.
- Other protective measures include guarding or insulating the lines.
- Use non-conductive wood or fiberglass ladders when working near power lines.



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

## **Damaged utilities can cause electric shock, poisoning, explosions, fires, burns, and death**

- **Call 911 if you suspect damaged utilities, do not enter area.**
- **Fuel leaks will have a distinct odor (gasoline, oil, rotten eggs).**
- **Electrical contact can cause falls.**
- **Stay away from downed power lines. Report downed lines and assume they are live.**

**Stay clear of downed or overhead power lines, electrical wires and cables. Treat all power lines and cables as energized until proven otherwise.**



## 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.

**Drowning hazard! When working near water, regardless of how it got there, use a personal floatation device. Do not cross ground that is saturated with mud/water without a means of rescue.**



# Confined Spaces



## What hazards make it a permit required CS?

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

## 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



**Confined Spaces may only be entered by Authorized Personnel. Do not attempt to enter into a confined space!!!!**

# Carbon Monoxide (CO) poisoning

**Carbon Monoxide has no warning properties; it is a colorless, odorless gas! People are injured or die from CO poisoning.**

- **CO may be present with:**
  - Any activity using gasoline, diesel, or propane-powered machinery
  - Work near operating equipment
  - Burning debris
  - 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.**

## 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

# MODULE 3 – POST DISASTER HAZARDS ASSOCIATED WITH DEBRIS CLEANUP



## Debris removal

- Wear safety shoes with slip-resistant soles, safety glasses, leather work gloves, hard hat, long pants and shirt
- Do not handle broken chemical containers
- Do not remove debris that may destabilize piles or structures
- Do not lift too much, call for heavy equipment
- Segregate debris according to FEMA, U.S. Army Corps of Engineers, or Local/State requirements
- Special precautions are necessary when dealing with asbestos, lead, PCBs and mold

# Debris segregation example from FEMA. This can increase cleanup safety through material/hazard identification

**Debris removal guidelines**  
In efforts to expedite the debris removal process, please follow these rules

Placing debris **near or on trees, poles or other structures** makes removal difficult. This includes fire hydrants and meters.

**Debris separation**  
Please separate debris into the **six categories**, shown below.

**Electronics**  
Television, computer, stereo, phone, DVD player

**Large Appliances**  
Refrigerator, washer/dryer, air conditioner, stove, water heater, dishwasher

**Hazardous waste**  
Oil, battery, pesticide, paint, cleaning supplies, compressed gas

**Vegetative debris**  
Tree branches, leaves, logs, plants

**Construction debris**  
Building materials, drywall, lumber, carpet, furniture, plumbing

**Household garbage**  
Bagged garbage, discarded food, paper, packaging.

Do not leave doors **unsealed or unsecured**

Debris should be placed curbside

Debris should not **block roadway**

10 feet

**FEMA**  
www.fema.gov

**Alabama EMA**  
Emergency Management Agency  
www.ema.alabama.gov

**US Army Corps of Engineers**  
www.usace.army.mil

## Special disposal of the following items may be required

- Pool chemicals
- Tires
- Automobile batteries
- Bicycles
- PVC pipe
- Explosives (ammunition, re-loading equipment, black powder, military ordinance, fireworks)
- Fuel containers, metal or plastic
- Pressurized gas cylinders/tanks (propane tanks, acetylene tanks, refrigerant containers)
- Containers of petroleum based liquids, solvents, chemicals, etc.
- Large household appliances (refrigerators, freezers, stoves, washers, dryers, etc.)
- Off-road gas-powered equipment (lawn mowers, tractors, edgers, leaf blowers and other lawn equipment, chainsaws, 4-wheelers, etc.)
- Lawn and garden supplies (fertilizers, pesticides, etc.)
- Radioactive waste
- Industrial/commercial hazardous waste
- Medical waste
- Automobiles
- Electrical transformers

## Hazardous materials that may be found in commercial and residential debris

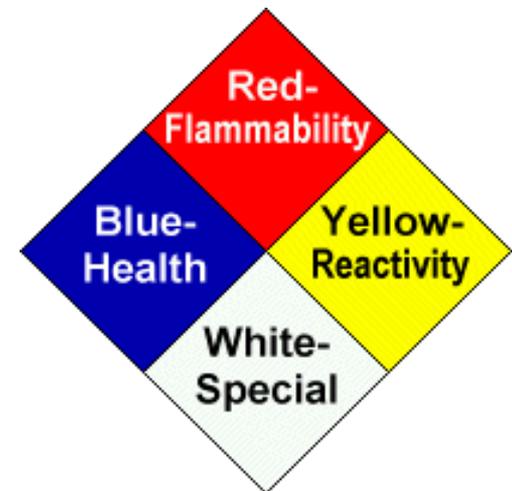
- **Asbestos**
- **Ash**
- **Compressed gas cylinders and propane cylinders**
- **Gasoline cans (& other fuel containers)**
- **Bulk chemicals & chemical containers**
- **Lead acid batteries**
- **Paints and thinners**
- **Bulk pesticides**
- **Bulk fertilizers**
- **PCBs**
- **Moldy materials**
- **Munitions**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

## Hazardous chemicals

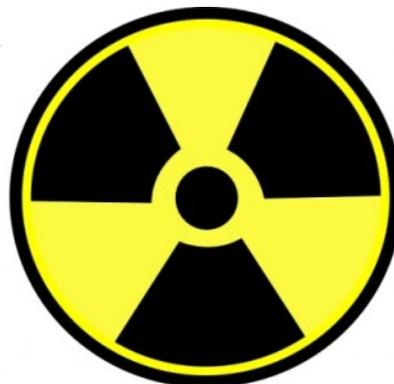
- Include household and industrial (small business use or displaced from other property) chemicals
- Do not handle any containers that are damaged/leaking
- Do not handle any chemical containers if you are unsure of contents
- Do not handle any industrial chemical containers
- Use gloves and safety glasses when handling household hazardous chemicals
- Do not mix chemicals
- Do not place chemicals near open flames/hot surfaces (running motor)

# Hazardous Materials and Hazard Communication

- The disaster 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 local authorities or call 911 if threat is immediately dangerous



**Look for any suspicious labels to identify hazardous materials and stay clear--report these to your local authorities or call 911 if threat is immediately dangerous**



**DANGER**  
**HAZARDOUS**  
**CHEMICALS**



# If you suspect a hazardous building material, contact your local authorities or a certified professional to evaluate the hazard

## RESTRICTED USE

<p><b>Caution:</b> This structure has been inspected and found to be damaged as described below:</p> <p>_____</p> <p>_____</p> <p>_____</p> <p><b>Entry, occupancy and lawful use are restricted as indicated below:</b></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Facility Name and Address:</p> <p>_____</p> <p>_____</p>	<p>Date: _____</p> <p>Time: _____</p> <p><b>(Caution:</b> Aftershocks since inspection may increase damage and risk.)</p> <p>This facility was inspected under emergency conditions for:</p> <p>_____</p> <p style="text-align: center;">(Jurisdiction)</p> <p>Inspector ID/Agency</p> <p>_____</p> <p>_____</p>
---	--

Do not Remove, Alter or Cover this Placard until Authorized by Governing Authority

## **Assume asbestos is present in your home if it was build in or before 1979**

- A naturally occurring, fibrous material that is hazardous
- It is most dangerous if it is damaged/broken and uncontained because it can get into the air
- Microscopic fibers can become airborne during cleanup/demolition and can be inhaled into the lungs or swallowed
- If it gets in your body it can cause cancer or the lung disease known as asbestosis
- Requires strict Local, State and Federal training, removal and disposal requirements - **THIS MUST BE DONE BY LICENSED PROFESSIONALS**

# You can't tell whether a material contains asbestos simply by looking at it - it must be tested in a lab by a professional



**Duct insulation**



**Asbestos "cement" board**



**Old electrical wire sheathing**



**Pipe and boiler insulation**



**Floor and ceiling tiles**



**Sprayed-on/  
Troweled-on  
surfacing material**

## **Asbestos was used in many different building materials including:**

- Steam pipes, boilers, and furnace ducts
- Resilient floor tiles
- Cement sheet, millboard and paper used as insulation
- Door gaskets used on stoves and furnaces
- Soundproofing materials
- Patching and joint compounds
- Asbestos cement roofing, shingles and siding
- Artificial ashes and embers for decorative fireplaces
- Vermiculite insulation
- Hot/cold water pipe wrap
- Textured paints and wall coatings

## **Assume lead is present in your home or business if it was built in or before 1978**

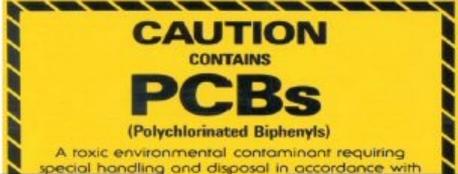
- Lead is a metal that has been used for thousands of years
- Used as a paint additive and in plumbing products
- It is most dangerous if it is damaged/deteriorating and in a dust form which can become airborne and you breath it in or swallow it
- Very toxic to humans
- Most harmful to children and pregnant women
- Can affect the blood, kidneys, nervous system, and reproductive system
- You cannot tell if paint has lead in it by looking at it, it must be tested by a professional

## Polychlorinated biphenyls (PCBs) may be present in your home or business if it was built in or before 1977

- PCBs are either oily liquids or solids that are colorless to light yellow
- Dangerous if contact is made through touch or inhaled (from burning)
- Exposure to PCBs may cause:
  - Rashes, acne, liver damage

# ALERT!

## PCBs THREATEN YOU






Leaking PCB electrical equipment.

### WHY ARE PCBs IMPORTANT TO YOU? THEY CAN COST YOU MONEY!

- PCBs can result in shutdowns when PCB equipment fails, health risks to your employees and nearby communities, and regulatory noncompliance.
  - Spills can disrupt operations and production.

#### PCBs CAN HARM HUMAN HEALTH AND THE ENVIRONMENT

- PCBs are one of 12 Worldwide Persistent Organic Pollutants designed for reduction or elimination under the United Nations Stockholm Convention with 151 signatory nations.
  - PCBs can get into ground water, streams, and lakes and accumulate in fish.
- Consumption of PCB contaminated fish is the major route of human exposure and can result in impairments in memory and learning in children and adults.
  - PCB exposure can harm mothers and their unborn children.



For more information contact the Mining PCB Hotline at 303-312-7090 (USA), [bench.dan@epa.gov](mailto:bench.dan@epa.gov) or consult: [www.epa.gov/pcb](http://www.epa.gov/pcb) (U.S. Environmental Protection Agency) [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov) (U.S. Agency for Toxic Substances and Disease Registry)

## PCBs may be found in:

- Transformers
- Capacitors
- Electrical equipment
- Lubricating/cutting fluids
- Pesticides
- Paints
- Plastics
- Sealants
- Adhesives
- Fire retardants



Transformers and other electrical equipment wrapped in bags to prevent oils from leaking

**You can not determine if a material has PCBs without a test by a professional**

## **Mold growth experienced after a disaster strikes can be harmful to your health. It should be removed by a professional.**

- Mold is everywhere, but the aftermath of a disaster can greatly increase its presence
- Mold needs water, food and low light to grow
- Grows on almost any building material
- If mold spores become airborne and spores get into or contact your body, it can cause health issues including allergic reactions, infections and nasal, eye and skin irritation

**If handling materials that contain mold protect yourself by wearing an N-95 NIOSH approved respirator, goggles, protective gloves (nitrile, pvc, natural rubber) and coveralls**

**If you decide to clean materials, be aware of any chemical hazards from disinfectants**

**You need to remove your protective equipment before moving to a clean area because mold can spread**

**When in doubt-throw it out!**



# Personal Protective Equipment (PPE) can help protect you from chemicals and some other hazardous situations

**Depending on the type of work you are doing, 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



Safety glasses



Safety Goggles



Face Shield



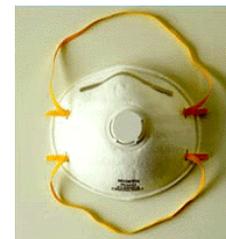
Level C PPE with tyvek splash suit and APR respirators



Example of Leather gloves  
Courtesy Kirkwood



Example of Nitrile gloves  
Courtesy Kirkwood



N-95 respirator



1/2 face APR



Full face APR



PAPR

## Reduce dusty environments first!

- 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

- Wearing NIOSH-approved respirators:
  - **If in doubt about respirators, contact a certified professional**
  - **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 take it off**
- **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 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)



## Decontamination

**After being in contact with hazardous materials, you should:**

- Wash your hands thoroughly with soap and warm water
- Bathe
- Change outer clothing (or clothing that has been in contact with the materials)
- Keep and wash contaminated clothes separately

## 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**



## Debris Piles and Unstable Surfaces

- Debris piles, standing water, cracks/voids in ground, recent fire
- Walk and work on surfaces you know are stable
- Look for fire/smoldering material on or beneath the surface
- Watch for hazardous materials
- Use other ways to get to work surfaces, such as bucket trucks
- Wear protective equipment including hard hats, safety glasses, leather gloves and safety shoes with slip resistant soles
- Watch for fall hazards to other levels



## Fire and smoldering debris-call 911

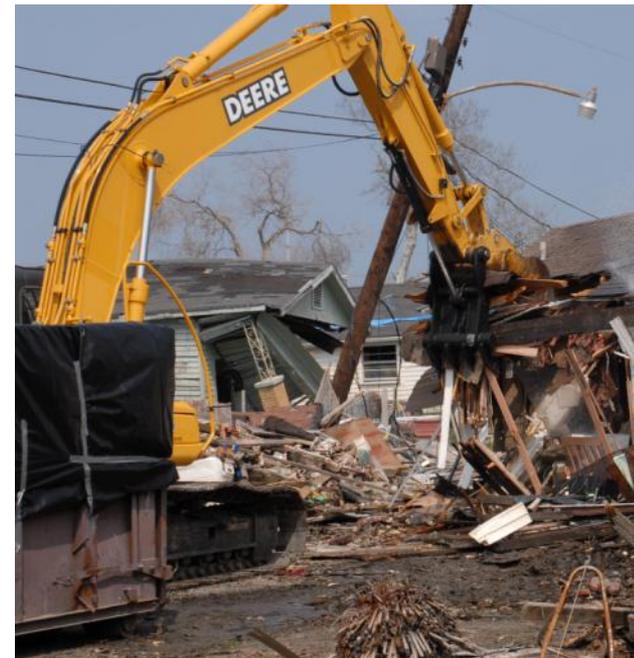


**Smoldering debris left in the wake of the 2007 California wildfires**

- 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)
- Have at least two UL rated 10A-cooling fire extinguishers at every cleanup activity

## Demolishing Structures

- **If a structure needs to be demolished, contact a certified professional**
- **Only participate in demolition if you are trained to do so and know the associated hazards**



**See OSHA 1926 Subpart T, Demolition, for further information**

## Overhead hazards and falling debris

- **Injuries on disaster sites 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.**

## Water Issues

### Reservoirs

Natural or artificial areas which collect and store water for later use. Created using cement, earth, rock, or a mixture. Once completed a stream flows behind it, eventually filling it to capacity. Reservoir failures can cause widespread flooding to adjacent areas.

### Dams

Barriers constructed across waterways to control the flow or raise the level of water. Dam failures are generally catastrophic if the structure is breached or damaged. Main causes of dam failure include spillway design error, geological instability caused by changes to water levels during filling or poor surveying, poor maintenance, especially of outlet pipes, extreme rainfall, and human, computer or design error.

### Floodgates or Water Gates

Adjustable gates used to control water flow of bodies of water, like reservoirs or levees. May be designed to set spillway crest heights in dams, adjust flow rates in sluices and canals, or stop water flow entirely as part of a levee or storm surge system. Floodgates may also be used to lower the water levels in a main river or canal channels by diverting the flow of water into a flood bypass or detention basin during a flood stage.



## Water Issues (continued)

### 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. A breach can be a sudden or gradual failure caused either by surface erosion or by a subsurface failure of the levee. Levee breaches are often accompanied by sand or sand boils.



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.

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



## Bloodborne Hazards

- Do not handle human remains. If you see human remains, call 911 or contact your local authority
- Only assist those with injuries if you are trained. If assisting those with injuries:
  - Use disposable nitrile or similar gloves
  - Replace gloves if punctured or torn
  - Do not assist those with injuries if you have skin cuts or punctures

***OSHA Blood Borne Pathogen Standard: 29 CFR 1910.1030***



## 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 lifting postures (such as lifting with a straight back, keep loads close to your body and drive with the legs) when mechanical lifting is not available. Use partners to move heavy loads.**



## Ergonomics

Ergonomics is arranging work environment and task methods to reduce injury and fatigue in workers. An example is using dollies to move heavy objects instead of lifting them.

To help prevent injury during disaster cleanup, if possible:

- Use proper machinery to assist in lifting materials
- If proper equipment is not available, use teams of two or more to move bulky objects
- Avoid lifting materials that weigh more than 50 pounds on your own
- Avoid repetitive motions
- Avoid use of excessive force
- Avoid awkward postures
- Avoid excessive heat or cold



# Heat Stress



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

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

## Heat Stress (continued)



- **When conditions are very hot, take frequent breaks and drink plenty of fluids**
- **Avoid alcohol, caffeinated drinks, or heavy meals**
- **Know the signs of heat-related illnesses**
- **Monitor yourself and coworkers, 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**

# Cold Stress - the climate you are working in may be cold enough for you to develop cold related illnesses



## Cold Related Illnesses and Symptoms

<u>Hypothermia</u>	<u>Frost bite</u>	<u>Trench foot</u>	<u>Chillblains</u>
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, waterproof 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**

## Do not attempt to operate a heavy machinery unless you are trained and certified.



If heavy equipment is needed to assist with cleanup, contact a certified professional.

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

- **Follow all traffic signs and flag persons or flaggers at points of hazards.**
- Drivers and 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**



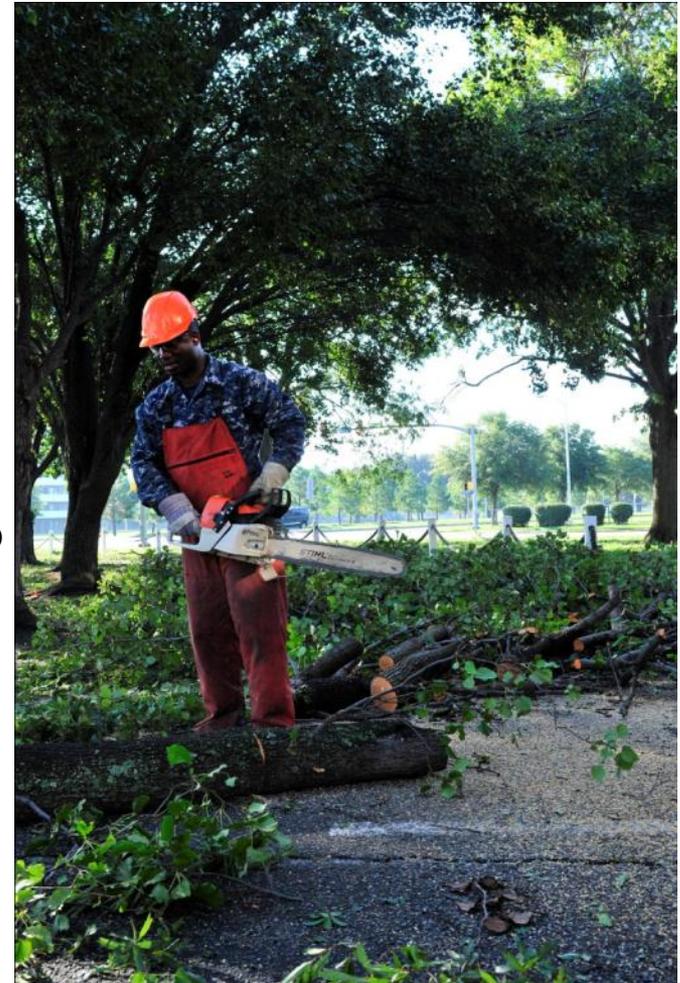
# Hot Work, Jackhammers, and Concrete Saws

- Only perform hot work and use jackhammers, and concrete saws if trained to do so. Follow all established hot work permit requirements
- Wear appropriate PPE, including safety glasses, face shield, hard hat, safety shoes, durable work clothes, and gloves.



## 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
- Take damaged electrical cords out of service
- Use double insulated tools

## Animals, Insects and Plants

- **To protect yourself from mosquitoes:**

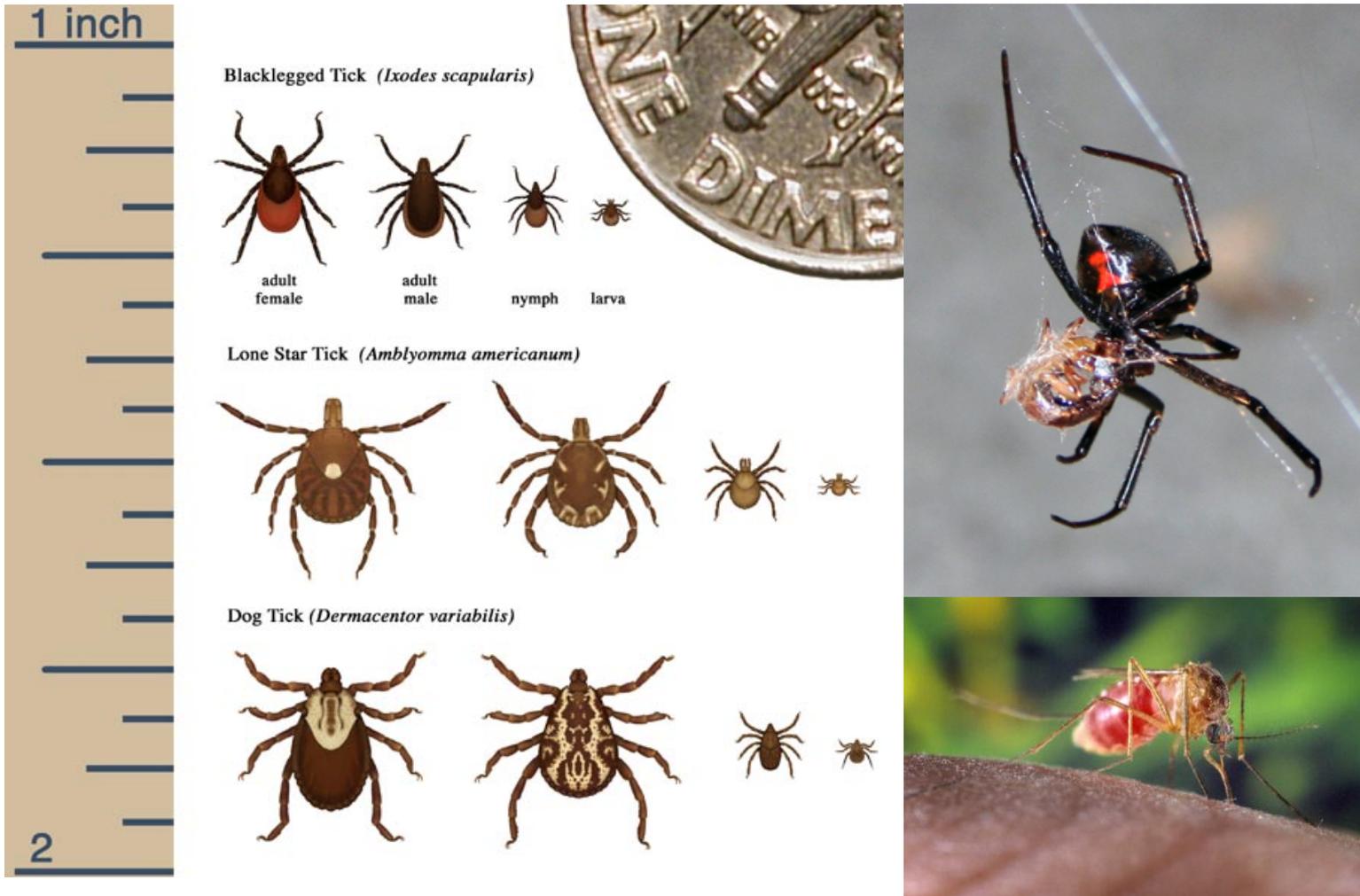
- Use screens on dwellings
- Wear long pants, socks, and long-sleeved shirts
- Use insect repellents that contain DEET or Picaridin



- **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**

# Insects can expose you to disease and other hazards!



## Animal, Insects and Plants (continued)

- **Be 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 your given the correct antivenin**
  - **Do not cut the wound or attempt to suck the venom out; contact your local emergency department for further care**



Cottonmouth/water moccasin

**Protect your skin with impenetrable clothing layer!**

## 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

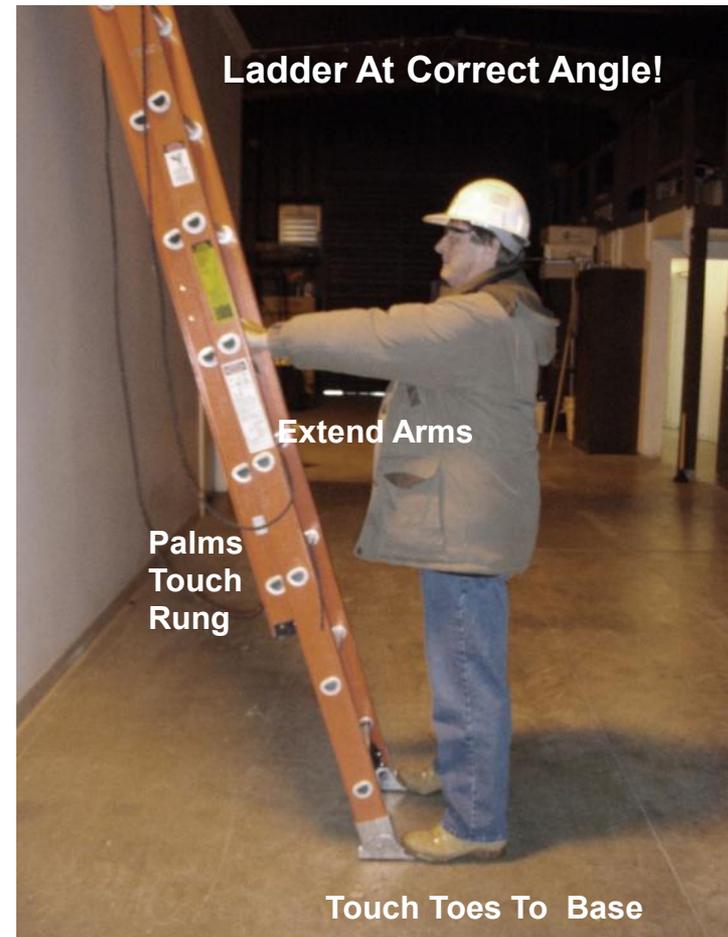


Photo courtesy IUOE National Hazmat Training Program

## 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

# 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 and other appropriate vaccinations**
  - **Revaccinate for a dirty wound if current vaccination is over five years old**
- **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**

# MODULE 4-INCIDENT STRESS



## Traumatic stress is natural and affects many people during and after a disaster

- 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



A Red Cross volunteer comforts a Denning, AR tornado survivor

## Take care of yourself so you can help others

- When 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 frequently



AmeriCorps workers take a much needed rest

# 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



WORKER TRAINING PROGRAM

## 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 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



## References and Additional Information

- CDC Disaster Safety: Electrical Safety and Generators Factsheet:  
<http://www.bt.cdc.gov/disasters/pdf/elecgenerators.pdf>
- EPA **Dealing with Debris and Damaged Buildings** Webpage  
<http://www.epa.gov/naturaldisasters/returnhomeadvisory.htm>
- National Response Team: Fatigue for Emergency Workers  
<http://www.cdc.gov/niosh/topics/oilspillresponse/pdfs/NRT-Fatigue-for-Emergency-Workers.pdf>
- NIOSH Structural Collapse topic page  
<http://www.cdc.gov/niosh/docs/99-146/>
- OSHA Standards  
[www.osha.gov](http://www.osha.gov)

## Why This Presentation was Created

- This guidance was created by the National Clearinghouse for Worker Safety and Health Training under a contract with the NIEHS Worker Education and Training Program (WETP). WETP has trained more than two million emergency responders and hazardous waste workers since 1987 to do their jobs safely. WETP is a part of the U.S. Department of Health and Human Services (HHS), which is a cooperating agency under the Worker Safety and Health Support Annex of the National Response Plan and under the National Disaster Recovery Framework. Recovery efforts following Hurricane Sandy prompted the need for guidance for those engaged in mold remediation. Additional materials pertaining to the health and safety of those cleaning up following hurricanes and floods are available at <http://tools.niehs.nih.gov/wetp>