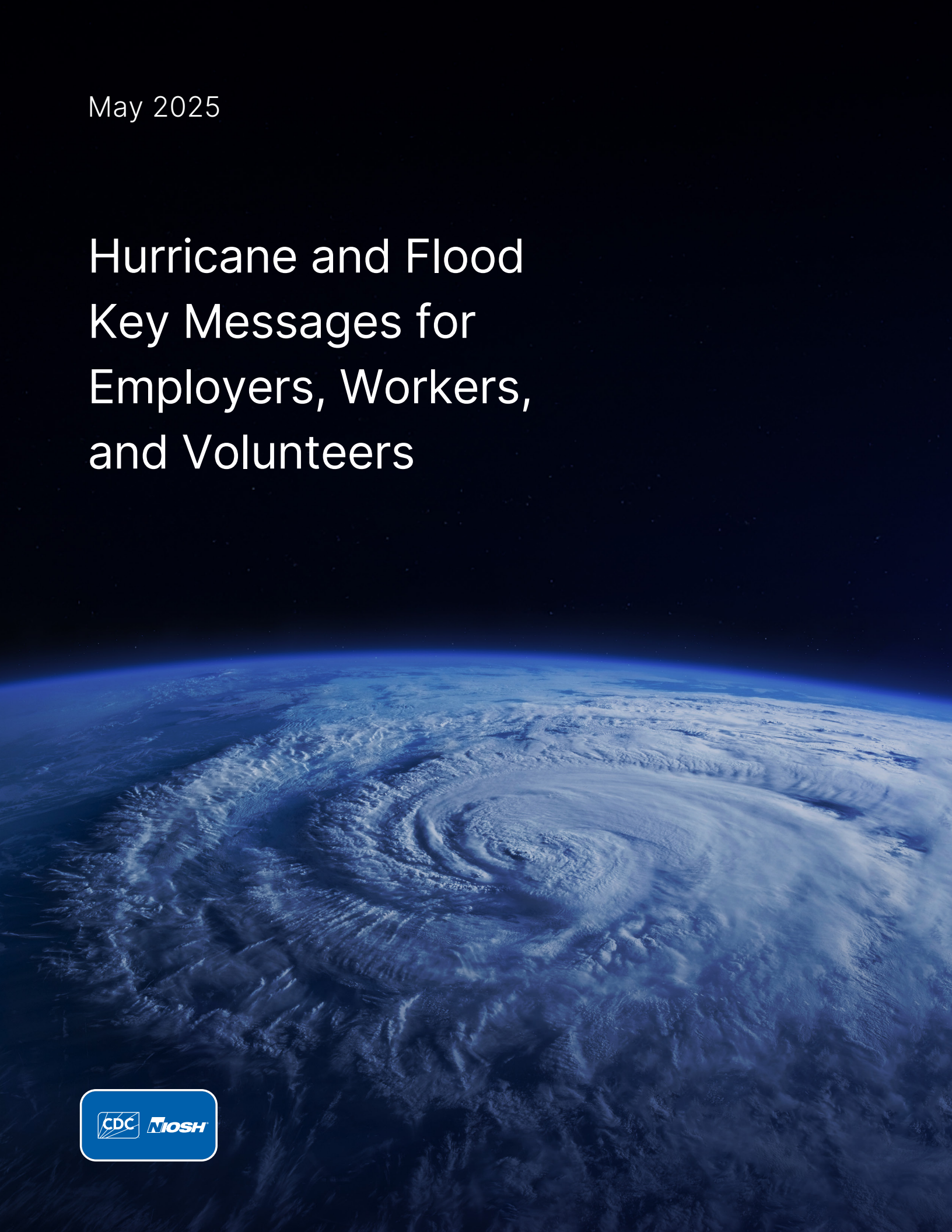
May 2025

Hurricane and Flood Key Messages for Employers, Workers, and Volunteers



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Get More Information

Find NIOSH products and get answers to workplace safety and health questions:

1-800-CDC-INFO (1-800-232-4636) | TTY: 1-888-232-6348
cdc.gov/cdc-info | cdc.gov/niosh
NIOSH monthly newsletter: cdc.gov/niosh/eNews

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Background

The purpose of this document is to provide a preparedness and response resource for all employers, workers, and NIOSH partners to use before, during, and after a response. It includes information on disaster-related hazards about flood water, mold, carbon monoxide, and much more. This document is an update and expansion of the 2024 Hurricane and Flood Key Messages for Employers, Workers, and Volunteers release. **Moving forward in this document, worker is defined as including employees and volunteers.** Over 35 NIOSH subject matter experts have contributed to this document that focuses on key messaging information for those responding to hurricanes, floods, and similar disasters.

A key message document was also created specifically for public health jurisdictions. English and Spanish language versions of this document can be found on the CDC Preparedness and Safety Messaging for Hurricanes, Flooding, and Similar Disasters (Second Edition | 2022) website.

How to Use this Document

Employers, worker and volunteer organizations, public health, emergency management, and other NIOSH partners can add this key messages document as a resource to their communication plans that address hazards expected from extreme weather involving strong wind and high water. Additionally, the messaging within this document can be adapted for web, press releases, media talking points, social media, fact sheets, and other communications materials to provide information on work hazards and ways to mitigate them for diverse audiences before, during, and after a hurricane, flood, or similar disaster.

Overall Safety and Health

Emergency Responder Health Monitoring and Surveillance Framework

Response and recovery workers will be involved in responding to any disaster or emergency, and it is important for them to be protected from hazardous conditions. The Emergency Responder Health Monitoring and Surveillance (ERHMS) framework provides information for protecting response and recovery workers during small and large emergencies in any setting. ERHMS covers the pre-deployment, deployment, and post-deployment phases of a response. It is flexible and scalable and can be implemented piecemeal as your organizational structure allows. The ERHMS Technical Assistance Document is an in-depth document that describes how to implement activities in each phase and provides examples and tools that can be used or modified for use within your organization.

Considerations for Employers and Worker Organizations

- Review the ERHMS Technical Assistance Document and ERHMS Primer to identify information, examples, and tools that apply to your organization
- Consider a rostering and credentialing system to maintain accountability for your responders to ensure only qualified individuals are deployed
- Identify relevant health and safety training for responders and provide site-specific training during each response
- Ensure workers are provided with and know how to use the appropriate personal protective equipment (PPE) and equipment for the type of emergency to which they are responding
- Conduct necessary health and safety monitoring and surveillance during deployment and post-deployment
- Conduct after-action assessments to identify where operations went well, gaps and lessons learned, and ways to improve processes and outcomes for future responses
- Ensure all data collected is stored in a secure database according to relevant laws, regulations, and statutes to protect workers' private information

Considerations for Workers and Volunteers

- Maintain your health and safety credentials and complete trainings required by your organization
- Participate in pre-deployment assessments for mental and physical health, so all existing medications, vaccinations, conditions, and limitations are documented
- Properly document the response activities you participated in for appropriate health monitoring and follow-up
- Participate in recommended deployment and post-deployment monitoring and surveillance
- Participate in after-action assessments

For More Information

- NIOSH Emergency Responder Health Monitoring and Surveillance (ERHMS) (https://www.cdc.gov/niosh/erhms/about/index.html)
- NIOSH Emergency Responder Health Monitoring and Surveillance Primer (https://www.cdc.gov/niosh/docs/2025-107/)
- NRT Emergency Responder Health Monitoring and Surveillance National Response Team Technical Assistance Document (TAD) (https://www.nrt.org/sites/2/files/ERHMS_Final_060512.pdf)
- CDC Emergency Action Plan (Template) (https://www.cdc.gov/niosh/docs/2004-101/emrgact/files/emrgact.pdf)

Food and Water Safety

Please see the following links for general information on this topic:

- CDC Keep Food Safe After a Disaster or Emergency (https://www.cdc.gov/food-safety/foods/keep-food-safe-after-emergency.html)
- CDC How to Make Water Safe in an Emergency (https://www.cdc.gov/water-emergency/about/)
- CDC Water, Sanitation, and Hygiene (WASH)- related Emergencies and Outbreaks (https://www.cdc.gov/water-emergency/)
- FEMA Food and Water in an Emergency (https://www.fema.gov/pdf/library/f&web.pdf)

Medical Considerations for Relief Workers and Emergency Responders Pre- and Post- Exposure

Pre-Deployment Medical Screening

It is important for workers deployed for disaster work to undergo pre-deployment medical screening. The goal of this screening is to evaluate a worker's physical and mental fitness to perform potentially hazardous or stressful work safely.

Considerations for Employers and Worker Organizations

- Pre-deployment screening information includes:
  - Contact information and relevant physical and mental health information (e.g., current or pre-existing medical conditions, medications and medical devices, immunizations, pregnancy status) from responders
  - Anticipated response work from the responder's agency, organization, or employer
  - Medical determination of worker's ability to safely operate in the response environment and conduct anticipated tasks

Considerations for Workers and Volunteers

- Required immunizations for disaster responders, in addition to routine vaccines, include:
  - Tetanus: In accordance with current CDC guidelines, it is best practice that responders receive a tetanus booster (Td or Tdap) if they have not been vaccinated for tetanus during the past 10 years
  - Hepatitis B: For responders, who will be performing direct patient care or will otherwise be expected to have contact with blood or bodily fluids, it is best practice that they receive the Hepatitis B vaccines series
  - Additional immunizations might be recommended when responding to disasters outside of the continental United States: https://wwwnc.cdc.gov/travel

For More Information

- NIOSH Medical Screening for Hurricane and Flood Response and Recovery Workers (https://www.cdc.gov/niosh/emres/php/guidance/index.html)
- NIOSH Emergency Responder Health Monitoring and Surveillance Primer (https://www.cdc.gov/niosh/docs/2025-107/)
- NIOSH ERHMS Pre-Deployment Health Screening for Emergency Responders (https://www.cdc.gov/niosh/erhms/pdf/PredeploymentHealthScreening.pdf)

Post-Deployment Medical Screening

- It is best practice that workers deployed for disaster work also undergo post-deployment medical screening. The goals of this screening are to:
  - Determine if individual responders have been adversely affected mentally or physically by their work during the response
  - Identify those responders needing further surveillance or medical evaluation and treatment

Considerations for Employers, Workers, and Worker Organizations

Post-deployment screening information for consideration includes:

- Type of response work, exposures or environmental conditions, work practices, and protective measures
- Illnesses, injuries, or symptoms experienced during response work

For More Information

- NIOSH Medical Screening for Hurricane and Flood Response and Recovery Workers (https://www.cdc.gov/niosh/emres/php/guidance/index.html)

Pregnant Responders

Pregnant workers might have special medical considerations and are at higher risk for some medical complications including heat-related illness, carbon monoxide poisoning, and some infectious diseases.

Considerations for Employers, Workers, and Worker Organizations

- Ask female responders about pregnancy status as part of pre-deployment medical screening
- Best practice suggests that risks to the developing fetus be discussed by pregnant responders and healthcare providers

For More Information

- NIOSH About Reproductive Health in the Workplace (https://www.cdc.gov/niosh/reproductive-health/about/index.html)
- CDC Safety Messages for Pregnant, Postpartum, and Breastfeeding People During Natural Disasters and Severe Weather (https://www.cdc.gov/reproductive-health/emergency-preparation-response/safety-messages.html)
- NIOSH N95 Respirator Use During Pregnancy – Findings from Recent NIOSH Research (https://blogs.cdc.gov/niosh-science-blog/2015/06/18/respirators-pregnancy/)

Personal Hygiene and Handwashing

Please see the following links for general information on this topic:

- CDC Guidelines for Personal Hygiene During an Emergency (https://www.cdc.gov/water-emergency/safety/guidelines-for-personal-hygiene-during-an-emergency.html)
- CDC Fact Sheet: Wash Your Hands (https://www.cdc.gov/water-emergency/communication-resources/fact-sheet-wash-your-hands.html)
- NIOSH MRSA and the Workplace (https://www.cdc.gov/niosh/docs/2013-112/default.html)

Personal Protective Equipment

Emergency responders and recovery workers can be exposed to a wide variety of hazards during and following hurricane and flooding events. The routes of exposure to hazards include inhalation, skin absorption, ingestion, and punctures. Chemical and biological contaminants can be released to the environment from various sources such as industrial and commercial facilities, households, sewage plants, and sewer or waste lines. Response workers can also be exposed to bodily fluids that may contain infectious disease agents during victim recovery and while handling human remains. Flooded buildings often provide an ideal environment for mold that can cause health effects such as nasal, eye, and skin irritation, as well as respiratory problems such as bronchitis and asthma attacks. Debris and unstable surfaces can cause worker injuries by slips, trips, falls, cuts, punctures, and abrasions.

Considerations for Employers and Worker Organizations

- PPE selection and use are site and task specific. Conduct a hazard assessment and provide workers the appropriate PPE depending on the potential hazards your workers might face
- Ensure workers understand which PPE are appropriate for each task and how to use it and that PPE is fitted properly for each worker

Considerations for Workers and Volunteers

- Use cut resistant gloves when handling debris to minimize cuts, scrapes, and puncture wounds
- Wear safety glasses, goggles or face shields, and protective head cover (helmets) appropriate for the hazard
- Use slip and puncture resistant safety shoes to prevent slips, trips, falls, and foot injuries
- Wear hearing protection (such as earplugs or earmuffs) during work in high noise areas (e.g., chain saw work, heavy equipment operations, kennels)
- Use nitrile gloves and liquid resistant gowns, aprons, or garments or ensembles to minimize and prevent exposures to blood and bodily fluids if conducting activities with potential for exposure
- Use NIOSH Approved® respirators that are designated as appropriate for the expected chemical, biological, and particulate hazards
- Wear rubber boots or waders of an appropriate height to protect feet, legs, and torso from contaminated flood waters
- Wear liquid-resistant dry suits to protect the neck, torso, arms, and legs when it is necessary to work in contaminated flood waters
- Be aware of electrical shock hazards. It is best practice for recovery workers to use insulated PPE when working on electrical equipment
- Wear appropriate chemical protective garments or ensembles to protect the skin against liquid or vapor chemical hazards

For More Information

- NIOSH Responding to Natural Disasters and Extreme Weather (https://www.cdc.gov/niosh/emres/response/)
- NIOSH Personal Protective Equipment (https://www.cdc.gov/niosh/emres/safety/ppe.html)
- CDC Guidelines for Cleaning Up Safely After a Disaster (https://www.cdc.gov/natural-disasters/safety/)
- Occupational Safety and Health Administration (OSHA) Fact Sheet: Keeping Workers Safe during Disaster Cleanup and Recovery (https://www.osha.gov/sites/default/files/publications/OSHA_FS-3698.pdf)
- NIOSH Bloodborne Infectious Disease Risk Factors (https://www.cdc.gov/niosh/healthcare/risk-factors/bloodborne-infectious-diseases.html)
- OSHA Factsheet: Disaster Cleanup and Recovery PPE Matrix (https://www.osha.gov/sites/default/files/publications/OSHA3898.pdf)

Respirator Selection and Use

Emergency responders and recovery workers involved in clean-up activities after a hurricane or flooding event can be exposed to a wide variety of chemical and biological respiratory hazards. Sources of exposure can include industrial chemicals, commercial and household chemicals, sewage, other hazardous waste, and biological sources, such as mold, which is common in flooded buildings.

NIOSH tests and approves respirators for use by workers to protect against workplace hazards when utilized within a respiratory protection program that conforms with the Occupational Safety and Health Administration's (OSHA) requirements found within the Respiratory Protection Standard (29 CFR 1910.134). Respirators that have been approved by NIOSH for specific hazards have been assigned an approval number and are provided to the end user with a NIOSH approval label outlining their approved protections and limitations of use. Employers and workers can help protect against inhalation hazards by selecting and using appropriate respiratory protection for each response situation.

Considerations for Employers and Worker Organizations

- Identify hazards by conducting a hazard assessment of the workplace. If a respirator is required, make appropriate respirator selections to provide to your workers. Just because a respirator is NIOSH Approved does not mean it will offer protection from ALL hazards
- Beware of respirators that falsely claim NIOSH approval; if NIOSH approval is suspect, consult the NIOSH Certified Equipment List (CEL)
- Set up a respiratory protection program for workers required to wear respirators. At a minimum, this will include:
  - Yearly medical evaluation for fitness to wear a respirator
  - Yearly OSHA recognized qualitative or quantitative fit testing (or more frequently if someone has significant weight change or surgical procedure to the face)
  - Training on how to use, store, and clean (if applicable) the respirator in accordance with the manufacturer's user instructions and special considerations when wearing PPE, like increased risk of heat-related illness and altered or decreased visual acuity and peripheral vision

Considerations for Workers and Volunteers

- Participate in all required medical evaluation, fit testing, and training
- Understand what hazards are associated with a task and wear the appropriate respirator. Just because a respirator is NIOSH Approved does not mean it will offer protection from ALL hazards. It is best practice for your employer or volunteer organization to assist with this process if needed
- Do not use surgical or medical procedure masks in place of a NIOSH Approved particulate respirator (for example N95® filtering facepiece respirator [FFR]) as they do not provide adequate protection
- Prior to each use, inspect the respirator for any defects or missing or broken components and do not use if any of those conditions are present
- At the beginning of each use, conduct a user seal check to determine if the respirator is being properly worn, even if not fit-tested (see user seal check FAQ below under For More Information)
- Avoid touching the contaminated surface of an FFR or a respirator where there are replaceable cartridges, so you do not transfer potentially harmful contaminants to your hands
- When done using the respirator, remove it carefully to avoid contaminating yourself and dispose of it properly so that others (for example, children) cannot come in contact with it. If it is reusable, place the respirator aside and clean and disinfect it after each use
- Use A Self-Contained Breathing Apparatus for entry into oxygen deficient environments (see Confined Spaces Section)

During Pregnancy

Pregnant women involved with a natural disaster response where respiratory protection is needed should consider the following suggestions that are based on NIOSH research findings:

- If necessary, use administrative controls such as changing job tasks to avoid certain hazards during pregnancy; it is best practice that this not affect the standing or pay of the worker. Depending on the location and hazards present, the safest option for you and your baby may be to remove yourself from the area. This option should be discussed with your physician
- Consult with your physician before wearing a respirator to ensure you can safely and comfortably use the respirator during all stages of the pregnancy
- If a respirator is needed, you can safely wear a fit-tested NIOSH Approved respirator at one-hour intervals

For More Information

- NIOSH Responding to Natural Disasters and Extreme Weather (https://www.cdc.gov/niosh/emres/response)
- NIOSH Filtering Facepiece Respirators (https://www.cdc.gov/niosh/ppe/respirators/ffr.html)
- NIOSH Find Filtering Facepiece Respirators on the Certified Equipment List (https://www.cdc.gov/niosh/ppe/niosh-approved-respirators/ffr-cel.html)
- NIOSH Facial hair and respirator fit infographic (https://www.cdc.gov/niosh/media/images/2024/12/npptl_info_facialhairstylesandffrs_2017.jpg)
- NIOSH Respirator Types and Use (https://www.cdc.gov/niosh/ppe/respirators/index.html)
- NIOSH Respirator Selection and Use (https://www.cdc.gov/niosh/ppe/respirators/selection.html)
- NIOSH Pocket Guide to Chemical Hazards (https://www.cdc.gov/niosh/npg/)
- NIOSH N95 Respirator Use During Pregnancy – Findings from Recent NIOSH Research (https://blogs.cdc.gov/niosh-science-blog/2015/06/18/respirators-pregnancy/)
- OSHA Respiratory Protection Standard – addresses respiratory protection programs (https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.134)
- OSHA Respiratory Protection eTool (https://www.osha.gov/SLTC/etools/respiratory/index.html)
- OSHA Respiratory Protection eTool – Respirator Basics (https://www.osha.gov/etools/respiratory-protection/respirator-basics)
- American Journal of Infection Control: N95 respirator use during advanced pregnancy (http://www.sciencedirect.com/science/article/pii/S0196655314009407?via%3Dihub)

Animals

Displaced Animals

Evacuations due to natural disasters and other emergencies may result in a large number of displaced animals. Many human shelters may not accept pets because of health and safety regulations, so some domestic animals will be abandoned or placed in shelters set up post-disaster. Therefore, responders may encounter displaced pets, production animals, or wildlife outdoors or in residences or facilities. Displaced animals may be without food, water, or care for days or longer. Fear, separation anxiety, and other behavioral disorders are common in displaced animals. Displaced wildlife often have unpredictable or aggressive behavior and should be handled only by trained experts.

Considerations for Employers and Worker Organizations

- Ensure that only trained, properly equipped workers are assigned to tasks involving direct animal handling and care
- Provide handwashing and sanitation facilities
- Provide appropriate PPE as described below
- Provide pre-exposure rabies vaccination for workers with direct animal contact
- Ensure that a bite injury is washed, and the worker is immediately evaluated by a healthcare provider for wound care and rabies risk and possible post-exposure treatment and vaccination
    - When possible, identify and quarantine the animal that caused the bite injury for observation and follow up as needed
- Emphasize to workers who are exposed to animals the importance of immediate reporting of all injuries and symptoms of illness

Considerations for Workers and Volunteers

- Complete rabies pre-exposure vaccination series before directly handling dogs, cats, ferrets, or other mammals including cattle, horses, and wildlife that may be infected
    - Consult a healthcare provider after a bite injury
    - When possible, help identify the animal that caused the bite injury for observation and follow up as needed
    - Complete rabies post-exposure prophylaxis if directed to do so by a healthcare provider
- Follow basic hygiene practices:
    - Wash hands with soap and water frequently, and immediately after contact with animals, contaminated materials, wastewater, or floodwater. If soap and water is not available, use alcohol-based sanitizer
    - Wash hands after removing gloves and before eating, drinking, smoking, vaping, chewing tabaco or gum, taking a break, or leaving work
    - Do not smoke, vape, or chew tobacco or gum while working
    - Keep all wounds clean, dry, and covered with waterproof bandages
- Wear PPE to protect yourself from hazards in the work environment:
    - Wear latex-free medical examination gloves when handling animals, animal waste, cages, equipment, and pesticides. Wear two pairs of gloves if one pair alone might tear. Wear cotton or leather work gloves as the outer pair as needed
    - Wear safety glasses with side shields or face shields, sturdy clothing and protective footwear with non-slip soles
    - Wear hearing protection in loud environments, such as enclosed spaces with barking dogs
- Use appropriate restraint and established procedures for displaced animals
- Dispose of needles and other sharps immediately after use in appropriate disposal containers
- Take care when lifting heavy or awkward loads (e.g., reduce weight of loads, work together)
- Follow label instructions when working with cleaners, disinfectants, and other chemicals
- Immediately report sharps-related injuries such as needlesticks, other injuries such as bites and scratches, or disease symptoms to a supervisor and seek medical evaluation. For wounds, immediately wash thoroughly with soap and water
- Avoid contact with cat feces and pet rodents if pregnant or immunocompromised

For More Information

- NIOSH Veterinary Safety and Health Hazard Prevention and Control (https://www.cdc.gov/niosh/veterinary/prevention/index.html)
- CDC Pets in Evacuation Centers (https://www.cdc.gov/healthy-pets/emergency-preparedness/pets-in-evacuation-centers.html)
- CDC Rabies pre- and post-exposure prophylaxis (https://www.cdc.gov/rabies/hcp/prep-pep/index.html)
- CDC What to Do to Protect Yourself From Animals After a Disaster
- (https://www.cdc.gov/natural-disasters/response/what-to-do-protect-yourself-from-animals-after-a-disaster.html)
- OSHA Quick Card: Rescue of Animals (Dogs) by Disaster Relief Personnel (https://www.osha.gov/sites/default/files/publications/rescuers_of_animals.pdf)
- FEMA Training: Animals in Disasters: Awareness and Preparedness (https://training.fema.gov/is/courseoverview.aspx?code=IS-10.a&lang=en)
- FEMA Training: Livestock in Disasters (https://training.fema.gov/is/courseoverview.aspx?code=IS-111.a&lang=en)
- American Veterinary Medical Association (AVMA) Disaster Preparedness (https://www.avma.org/resources-tools/animal-health-and-welfare/disaster-preparedness)
- National Alliance of State Animal and Agricultural Emergency Programs (NASAAEP) Current Best Practices in Animal Emergency Management, Animal Search and Rescue (https://www.thenasaaep.com/_files/ugd/8b3e05_be83b85c5ecc44bbbb7069d353d1df98.pdf)
- AVMA Guidelines for the euthanasia of animals (https://www.avma.org/resources-tools/avma-policies/avma-guidelines-euthanasia-animals)

Insects and Arachnids

Wasps, Hornets, and Bees

Responders may encounter wasps, hornets, and bees, especially outdoors. Injuries from these insects may range from mild discomfort or pain to a lethal reaction for those allergic to the insect's venom. Anaphylactic shock is the body's severe allergic reaction to a sting and requires immediate emergency care.

Considerations for Employers and Worker Organizations

- Train workers about the risk of exposure to stinging insects, how to prevent stings, and what to do if stung

Considerations for Workers and Volunteers

- Avoid using perfumed soaps, shampoos, and deodorants
- Wear clothing to cover as much of the body as possible
- Avoid flowering plants when possible
- Take care working in areas with discarded food that might attract insects
- Remain calm and still if a single stinging insect is flying around (swatting may cause it to sting)
- If you are attacked by several stinging insects at once, run to get away from them
  - Go indoors or to a shaded area to get away
  - Physically move out of the area. Jumping into water may be hazardous for other reasons and some insects will hover until you surface

- If a stinging insect comes inside while driving, stop the vehicle, and open the windows
- Carry an epinephrine auto injector (EpiPen®) and wear medical identification jewelry if there is a history of severe allergic reactions to insect stings

For More Information

- NIOSH Insects & Scorpions at Work – Bees, wasps, and hornets (https://www.cdc.gov/niosh/outdoor-workers/about/insects-and-scorpions.html)

Fire ants

Fire ants are often disturbed during hurricanes and floods. They can cling together and float along in floodwaters. If disturbed, they will bite and sting. They are aggressive when stinging and inject venom, which causes a burning sensation. Red bumps form at the sting site, and within a day or two they become white fluid-filled pustules.

If stung or bitten take the following steps:

1. Rub off ants briskly, as they will attach to the skin with their jaws
2. Taking antihistamines may help (use caution as drowsiness may occur)
3. Seek medical attention immediately if experiencing severe chest pain, nausea, severe sweating, loss of breath, serious swelling, or slurred speech

Considerations for Employers and Worker Organizations

- Train workers about risks of exposure to fire ants: how to identify fire ants and their nests, how to prevent exposure, what to do if bitten or stung
- Provide PPE including: cuffed gloves, rain gear, and rubber boots
- Provide insect repellents containing DEET

Considerations for Workers and Volunteers

- Do not disturb or stand on or near ant mounds
- Be careful when lifting items (including animal carcasses) off the ground, as they may be covered in ants
- Fire ants may also be found on trees or in water, so always look over the area before starting to work
- Wear long sleeves, long pants, socks, cuffed gloves, rain gear, and rubber boots. In warm climates, be aware of the risk of heat stress
- Spray insect repellent containing DEET onto shoes and pant legs to deter wandering ants
- Carry an epinephrine auto injector (EpiPen) and wear medical identification jewelry if there is a history of severe allergic reactions to insect stings

For More Information

- NIOSH Insects & Scorpions at Work – Fire ants (https://www.cdc.gov/niosh/outdoor-workers/about/insects-and-scorpions.html)
- OSHA FactSheet – Fire Ants (fire_ants.pdf (osha.gov)
- Texas A&M Agrilife Extension – Flooding and Fire Ants (https://agrilifeextension.tamu.edu/asset-external/flooding-and-fire-ants/)

Scorpions

Scorpions usually hide during the day and are active at night. They may be hiding under rocks, wood, or anything else lying on the ground. Some species may also burrow into the ground. In the United States, scorpions live mostly in dry, desert areas in the Southern and Southwestern U.S. However, some species can be found in grasslands, forests, and inside caves.

If stung, take the following steps:

1. Contact a qualified health care provider or poison control center for advice and medical instructions
2. Remain relaxed and calm. Ice may be applied directly to the sting site (never submerge the affected limb in ice water)
3. Do not take any sedatives
4. Capture the scorpion, if possible to do so safely, or take a picture for identification

Considerations for Employers and Worker Organizations

- Train workers about the risk of exposure to scorpions, how to prevent stings, and what to do if stung

Considerations for Workers and Volunteers

- Wear long sleeves and pants
- Wear leather gloves
- Shake out clothing or shoes before putting them on
- Carry an epinephrine auto injector (EpiPen) and wear medical identification jewelry if there is a history of severe allergic reactions to insect stings

For More Information

- NIOSH Insects & Scorpions at Work – Scorpions (https://www.cdc.gov/niosh/outdoor-workers/about/insects-and-scorpions.html)

Mosquitoes and Ticks

Responders may be exposed to vector-borne diseases spread from the bites of infected mosquitoes and ticks. Ticks and mosquitoes may carry bacteria, parasites, or viruses. One of the most common diseases carried by mosquitoes in the U.S. is West Nile virus infection. One of the most common tickborne diseases in the U.S. is Lyme disease. Mosquitoes can be found almost everywhere, but especially near standing water, or in weedy or wooded areas. Ticks are most commonly found in bushes, leaf litter, high grass, or woods; they can also be found on domestic and wild animals. Symptoms of vector-borne diseases may include body/muscle aches, joint pain, fever, rash, headaches, stiff neck, fatigue, and paralysis.

Considerations for Employers and Worker Organizations

- Provide training on vector-borne diseases and how to prevent them, symptoms, safe use of repellents, and the importance of the timely reporting of symptoms
- Reduce mosquito populations by removing areas and items that collect standing water or placing drain holes in containers that collect water and cannot be discarded
- Provide workers with, and encourage them to wear, clothing that covers their hands, arms, legs, and other exposed skin
- Provide Environmental Protection Agency (EPA)-registered insect repellent with one of these active ingredients: DEET, picaridin (known as KBR 3023 and picaridin outside the U.S.), IR3535, oil of lemon eucalyptus (OLE), para-menthane-diol (PMD), or 2-undecanone
- Provide permethrin for application to clothing and gear

Considerations for Workers and Volunteers

- Remove standing water to reduce places where mosquitoes lay eggs
- Wear long-sleeved shirts and long pants tucked into boots or socks
- Use Environmental Protection Agency (EPA)-registered insect repellents containing DEET, picaridin, IR3535, Oil of Lemon Eucalyptus (OLE), para-menthane-diol (PMD), or 2-undecanone
  - If also using sunscreen, apply sunscreen first and insect repellent second
- Treat clothing and gear (not skin) with products containing 0.5% permethrin
- Check your skin and clothes for ticks every day. Young ticks are small and hard to see
  - Immediately remove ticks from your body using fine-tipped tweezers. Handling the tick with bare hands is not suggested
  - Clean your hands and the area with soap and water
- Wash and then dry work clothes in a hot dryer to kill any ticks present
- Immediately report vector-borne disease symptoms to a supervisor and seek medical attention

For More Information

- NIOSH Mosquito-borne Diseases in Workers (https://www.cdc.gov/niosh/outdoor-workers/about/mosquito-borne-diseases.html)
- NIOSH Tickborne Diseases in Workers (https://www.cdc.gov/niosh/outdoor-workers/about/tick-borne-diseases.html)
- NIOSH Protecting Yourself from Ticks and Mosquitoes (https://www.cdc.gov/niosh/docs/2010-119/pdfs/2010-119.pdf)
- CDC What to Do After a Tick Bite (https://www.cdc.gov/ticks/after-a-tick-bite/)
- EPA Find the Repellent that is Right for You (https://www.epa.gov/insect-repellents/find-repellent-right-you)

Livestock and Poultry Wastewater and Sludge

Farms, animal production sites, and processing plants contain animal waste or manure. Workers may be at risk of exposure to animal diseases that can be passed from animal manure through contact with workers' broken skin, eyes, nose, mouth, or mucous membranes. Manure and wastewater may also contain additional hazardous compounds such as chemicals, hormones, antibiotics, metals, and allergens.

Considerations for Employers and Worker Organizations

- Before responding to an animal facility, check with state and local authorities for current guidance and requirements
- Ensure that all workers are up-to-date on immunizations (e.g., tetanus-diphtheria)
- Provide appropriate guidance and controls for all hazards present while working in the complex and highly variable environments that are likely to contain animal waste or manure. These could include musculoskeletal hazards (e.g., heavy lifting), physical hazards (e.g., unsafe buildings and structures, confined spaces, flooding), chemical hazards (e.g., carbon monoxide, fuels, fertilizers, pesticides, cleaning agents, hydrogen sulfide), and allergens (e.g., latex, animal saliva, skin, urine)
- Provide workers appropriate PPE and train them on what PPE is needed; when PPE is needed; PPE limitations; how to put on, use, and take off PPE correctly; and how to maintain and dispose of PPE
- If using a respirator, the worker should be part of a respiratory protection program (see Respirator Selection and Use section)
- Provide workers supplies for basic hygiene (e.g., soap and clean water or alcohol-based sanitizer)

- Train workers in the restraint, handling, and care of displaced animals. (See Displaced Animals section)
- Instruct workers to watch for symptoms of illness (see list below in Considerations for Workers and Volunteers), and if illness or injury occurs, report it to a supervisor and seek medical evaluation

Considerations for Workers and Volunteers

- When working in or near flood water follow proper precautions including wearing a Coast Guard-approved personal flotation device and avoiding downed or exposed power lines and driving through standing water (see Electricity and Flood Water sections)
- Before entering flooded buildings, check for structural damage, shut off electrical power, disable machinery, and ventilate the building to decrease exposure to ammonia and hydrogen sulfide
- Wear appropriate PPE for each activity (e.g., goggles or face shield, face mask or respirator, impermeable coveralls, waterproof gloves, and rubber boots) (see Personal Protective Equipment, Respirator Selection and Use, and Heat Stress sections)
- Follow basic hygiene practices:
    - Wash hands with soap and water frequently. If soap and water is not available, use alcohol-based sanitizer
    - Wash hands immediately after removing gloves or having contact with animals, contaminated materials, wastewater, or floodwater and before eating, drinking, smoking, vaping, taking a break, or leaving work. Do not smoke, vape, or chew tobacco or gum while working
    - Keep wounds clean, dry, and covered with waterproof bandages
    - When dealing with displaced animals proper training is necessary (see Displaced Animals section)
    - Conduct carcass handling and disposal according to employer guidance
        - Wear task appropriate PPE (including an N95 FFR or one with a higher filter efficiency) and use duct tape to seal tops of gloves and boots
        - Decontaminate equipment, materials, and facilities
    - Do not work in confined spaces unless specially trained, and be aware of hydrogen sulfide, a deadly manure-related gas (see Confined Spaces section)
    - Be aware of the potential chemical hazards on the site (e.g., fuels, fertilizer, pesticides, herbicides, cleaning agents) (see Chemical Safety and Carbon Monoxide sections)
    - Watch for symptoms of illness (e.g., diarrhea, vomiting, fever, cough, fever with cough or sore throat, rash, dermatitis, wound infections, pink eye, neurological signs, or other indications of infection). If illness or injury occurs, report it to a supervisor and seek medical evaluation

For More Information

- NIOSH/USDA Interim Guidance for Protecting Workers from Livestock and Poultry Wastewater and Sludge During and After Floods (https://www.cdc.gov/niosh/emres/php/wastewater/)
- NIOSH Working With Displaced Domestic Animals (https://www.cdc.gov/niosh/emres/response/animals.html)
- Understanding concentrated animal feeding operations and their impact on communities (https://stacks.cdc.gov/view/cdc/59792)

Biological Agents

Human Remains

Please see the following links for general information on this topic:

- OSHA Fact Sheet on Health and Safety Recommendations for Personnel Who Handle Human Remains (https://www.osha.gov/sites/default/files/publications/OSHA4448.pdf)
- DHA Public Health Fact Sheet Handling of Human Remains from Natural Disasters (https://ph.health.mil/PHC%20Resource%20Library/ehse-wm-handling-human-remains-natural-disasters.pdf)
- WHO/PAHO Management of Dead Bodies After Disasters: A Field Manual for First Responders, Second Edition (https://iris.paho.org/handle/10665.2/31295)
- U.S. Army Safety and Health Guidance for Mortuary Affairs Operations: Infectious Materials (https://phc.amedd.army.mil/PHC%20Resource%20Library/TG195A_SafetyandHealthGuidanceforMortuaryAffairsOperations.pdf)
- Health and Safety Executive (HSE) Managing infection risks when handling the deceased: guidance for the mortuary, post-mortem room and funeral premises, and during exhumation (https://www.hse.gov.uk/pubns/priced/hsg283.pdf)
- CDC Standard Precautions for All Patient Care (https://www.cdc.gov/infection-control/hcp/basics/standard-precautions.html)
- OSHA Standard Precautions Hospitals eTool (https://www.osha.gov/SLTC/etools/hospital/hazards/univprec/univ.html)

Infectious Diseases

Workers deployed for hurricane and flood disaster work can be at risk for infectious diseases such as:

- Diarrheal diseases
- Acute respiratory infections
- Tetanus
- Wound, skin, and soft tissue infections (e.g., methicillin-resistant Staphylococcus aureus, Vibrio spp.)
- Leptospirosis (not common)
- Melioidosis (along Gulf Coast, not common)
- Vector-borne diseases from mosquito bites such as West Nile virus infection, dengue, and Zika virus disease (depending on the location) (see Insects and Arachnids – Mosquitoes and Ticks section)

Considerations for Employers and Worker Organizations

- Provide training on the risks of infectious diseases and how to prevent them
- Offer workers immunizations in accordance with current CDC guidelines
- Provide workers with permethrin for application to clothing and EPA-registered insect repellents
- Provide access to handwashing facilities
- Ensure workers have access to safe food and drinking water
- Encourage workers to seek medical evaluation when needed
- Encourage workers not to work while sick, and provide areas for isolation of ill workers if necessary
- Provide flexible, non-punitive sick leave

Considerations for Workers and Volunteers

- Obtain immunizations including tetanus in accordance with current CDC guidelines
- Practice good personal hygiene, cough etiquette, and handwashing
- Follow food and drinking water safety precautions
- Do not work if sick with a contagious illness
- Seek medical evaluation and treatment for injuries especially open wounds. Keep wounds clean, covered, and dry and seek immediate care if a wound develops signs of working infection
- Protect yourself from mosquito bites by wearing long-sleeved shirts and long pants, applying permethrin to clothing, and using EPA-registered insect repellents

For More Information

- CDC Adult Immunization Schedule by Age (Addendum updated June 27, 2024) (https://www.cdc.gov/vaccines/hcp/imz-schedules/adult-age.html)
- CDC What You Can Do to Prevent Diarrheal Illness After a Disaster (https://www.cdc.gov/water-emergency/safety/index.html)
- CDC Emergency Wound Care After a Natural Disaster Factsheet (https://www.cdc.gov/natural-disasters/communication-resources/emergency-wound-care-after-a-natural-disaster-factsheet.html)
- NIOSH MRSA and the Workplace (https://www.cdc.gov/niosh/docs/2013-112/default.html)
- CDC About Vibrio Infection (https://www.cdc.gov/vibrio/about/)
- CDC Preventing Leptospirosis after Hurricanes or Flooding (https://www.cdc.gov/leptospirosis/prevention/)
- CDC About Melioidosis (https://www.cdc.gov/melioidosis/about/)
- NIOSH Mosquito-Borne Diseases in Workers (https://www.cdc.gov/niosh/outdoor-workers/about/mosquito-borne-diseases.html)

Mold

Mold Clean-Up

Mold exposure and damp indoor environments have been associated with a wide variety of health issues including asthma, allergies, and respiratory infections. Individuals who are immunocompromised or have pre-existing conditions such as asthma may be at increased risk of mold infections and health problems if they perform mold clean-up activities.

Control of moisture is the most important step in stopping mold growth. If possible, remove or dry water-damaged material within 24 to 48 hours to prevent or limit mold growth. The amount of mold growth and type of material determines which clean-up methods and engineering controls to use.

Considerations for Employers and Worker Organizations

Ensure that proper PPE is available and used during mold clean-up (for more details, see For More Information section below)

- Conduct a hazard assessment of the workplace and provide appropriate PPE to workers for all hazards present. For mold include:
  - NIOSH Approved N95 FFRs to workers. See “Respirator Selection and Use” section for additional guidance on the correct use of respirators, because in this situation workers might need a respirator with a combination filter to protect against mold (particulate) and cleaning chemicals (vapor)
  - Eye protection such as goggles

- Ensure workers are wearing clothing that is protective (e.g., long pants, long-sleeved shirts)
- In large clean-up projects provide engineering controls such as negative air pressure, and sealing vents and doorways with plastic sheeting to prevent contamination of other occupied spaces
- Provide training regarding proper use of cleaning agents and methods and engineering controls, proper disposal of debris and used materials, and what PPE is needed, when PPE is needed, and how to proper use and maintain it

Considerations for Workers and Volunteers

- Wear provided PPE appropriate for each task, these can include a NIOSH Approved N95 FFR, gloves, eye protection such as goggles
- Wear protective clothing such as long pants and long-sleeved shirts
- Use available engineering controls
- Conducted clean-up methods as directed. A variety of cleanup methods can be used depending upon the building materials affected. These include wet vacuuming of hard surfaces, damp wiping hard surfaces with water and detergent, and using vacuums with HEPA (High-Efficiency Particulate Air) filters for final cleanup after contaminated materials are removed
- Seal mold-damaged materials in bags or closed containers to avoid additional exposures. These can be discarded in the regular waste stream

Mold in the Workplace

After a major storm or other weather-related event, the interior of the building may have water damage. Controlling the moisture in an indoor environment is the most practical way to control mold growth. Mold spores are present in both indoor and outdoor environments. People may have potential health effects and symptoms from mold exposures, such as allergic reactions, asthma, and other respiratory complaints.

Considerations for Employers and Worker Organizations

- It is important to do an inspection of the building to assess the water damage and see if structural and ventilation repairs are needed
- Repair or eliminate the source of water. Control of moisture is the most important step in stopping mold growth
- Clean up and dry out the affected areas within 24 to 48 hours to prevent mold growth. This can be done by using:
  - A wet vacuum to suck up moisture
  - Increased ventilation
  - Exhaust fans
  - Dehumidifiers
- Absorbent materials such as carpet, ceiling tiles or wallboard may need to be replaced. If porous materials such as drywall, carpet, insulation, or ceiling tiles are wet for over 48 hours, remove and replace them
- Sampling for mold is not standard of practice. It does not matter what type of mold is present because the health effects vary by individual. The mold needs to be removed
- Additional information on remediation and appropriate PPE to use can be found in the Mold Clean-up subsection of this document

Considerations for Workers and Volunteers

- It is important to use the right PPE to reduce exposure during the clean-up process, i.e., NIOSH Approved N95 FFR or higher level respirator, eye protection, waterproof boots, and protective clothing
- More detailed information on remediation and PPE can be found in the Mold Clean-up subsection of this document

For More Information

- NIOSH Workplace Mold and Your Health (https://www.cdc.gov/niosh/mold/about/)
- Mold: Worker and Employer Guide to Hazards and Recommended Controls (https://19january2021snapshot.epa.gov/sites/static/files/2017-08/documents/mold_worker_and_employer_guide._disaster-flood_cleanup.pdf)
- EPA Moisture Control Guidance for Building Design, Construction, and Maintenance (contains information on respiratory disease related to indoor dampness and considerations for preventing and remediating damp buildings) (https://www.epa.gov/sites/default/files/2014-08/documents/moisture-control.pdf)
- NIOSH Alert: Preventing Occupational Respiratory Disease from Exposures Caused by Dampness in Office Buildings, Schools, and Other Nonindustrial Buildings (https://www.cdc.gov/niosh/docs/2013-102/)
- CDC What to Wear Before Entering a Home or Building with Mold Damage (https://www.cdc.gov/mold-health/communication-resources/what-to-wear.html)
- NIOSH has developed assessment tools to identify areas with dampness and mold issues and to determine which areas to repair and remediate. These tools may help identify and determine the severity of known and unknown areas of dampness and mold, prioritize repair and remediation, and track past and present problems
  - NIOSH Dampness and Mold Assessment Tool – Schools Buildings (https://www.epa.gov/sites/default/files/2019-02/documents/2019-114-508.pdf)
  - NIOSH Dampness and Mold Assessment Tool – General Buildings (https://www.epa.gov/sites/default/files/2019-02/documents/2019-115.pdf)
- FEMA Post-disaster Building Safety Evaluation Guidance – Report on the Current State of Practice, including Recommendations Related to Structural and Nonstructural Safety and Habitability (https://www.fema.gov/sites/default/files/2020-07/fema_p-2055_post-disaster_buildingsafety_evaluation_2019.pdf)
- OSHA Preventing mold-related problems in the indoor workplace (https://www.osha.gov/sites/default/files/publications/preventing_mold.pdf)
- OSHA A Brief Guide to Mold in the Workplace (https://www.osha.gov/publications/shib101003)

Poisonous Plants

Please see the following link for general information on this topic:

- NIOSH Poisonous Plants and Work (https://www.cdc.gov/niosh/outdoor-workers/about/poisonous-plants.html)

Chemical

Asbestos

Asbestos is a naturally occurring mineral fiber that in the past was used for industrial processes and products and is associated with adverse effects on human health. The most common asbestos containing building materials (ACBM) include thermal pipe insulation, cementitious shingles and siding, vinyl floor tiles and mastic, and linoleum felt backing. ACBM are more common in older buildings and homes. Buildings constructed after the 1980s are much less likely to contain ACBM.

When buildings with ACBM are damaged during floods, wind, and hailstorms, these materials can become damaged causing a health risk to homeowners, property managers, first responders, recovery workers, and the community.

Considerations for Employers and Worker Organizations

- Remove or flag significant hazards before cleanup crews arrive
- Provide asbestos awareness training if work will occur in older neighborhoods. First responders are at greater risk, because they can happen upon sources of asbestos unexpectedly
- Buildings with ACBM might be flagged for hazards by the EPA or state
  - Avoid these lots until they are cleared of hazards
- ACBM should remain wet. Once dry they can cause a high risk to health if fibers are released that can become airborne and be inhaled. They can contaminate surfaces, tools, vehicles and land requiring professional remediation
- Develop a plan to mark ACBM encountered away from damaged buildings
- Provide PPE appropriate for all expected hazards
- In each state, there are regulations that govern the removal and management of asbestos-containing materials after a natural disaster
  - You can find these requirements by locating the local EPA in your state (see For More Information below for link)
  - Remember, asbestos must be managed and disposed of safely in accordance with regulations

Considerations for Workers and Volunteers

- Attend all provided training. First responders are at greater risk of happening upon sources of asbestos unexpectedly
- Avoid contact with any suspected ACBM
  - When in doubt, flag it and inform your supervisor
- Follow all guidelines for workplace safety
  - Use the provided PPE appropriate for the environment and tasks performed as determined by your employer

For More Information

- NIOSH Asbestos (https://archive.cdc.gov/www_cdc_gov/niosh/topics/asbestos/default.html)
- EPA Dealing with Debris and Damaged Buildings (https://www.epa.gov/natural-disasters/dealing-debris-and-damaged-buildings)
- ATSDR Who Is at Risk of Exposure to Asbestos? (https://archive.cdc.gov/www_atsdr_cdc_gov/csem/asbestos/who_is_at_risk.html)
- NIOSH Hazard Based Guidelines: Personal Protective Equipment for Workers in Hurricane Flood Response (https://archive.cdc.gov/www_cdc_gov/niosh/topics/emres/pre-workers.html)

- EPA Managing Materials and Wastes for Homeland Security Incident (https://www.epa.gov/homeland-security-waste)
- EPA in Your State (https://www.epa.gov/aboutepa/epa-your-state)

Carbon Monoxide

Workers deployed for disaster work need to be aware of the dangers of carbon monoxide (CO) poisonings. CO is an odorless, colorless gas that can cause sudden illness and death if inhaled. When power outages occur during natural disasters and other emergencies, the use of alternative sources of fuel or electricity for heating or cooking can cause CO to build up in a home, garage, camper, or semi-enclosed and outdoor space with poor air exchange and poison the people and animals exposed. Generators, grills, camp stoves, or other gasoline, diesel, propane, natural gas, or charcoal-burning devices are never to be used inside a home, basement, garage, camper, or semi-enclosed spaces – or even outside near an open window or window air conditioner.

Considerations for Employers and Worker Organizations

- Provide training to workers on hazards associated with the use of small gasoline-powered engines, tools, and potential CO poisoning, and how to prevent it
- Learn to recognize the signs and symptoms of CO overexposure in workers: headache, nausea, weakness, dizziness, visual disturbances, changes in personality, and loss of consciousness. Any of these signs and symptoms can occur within as little as a few minutes of CO exposure
- Use personal CO monitors where potential sources of CO exist. Choose monitors that are equipped with audible alarms to warn workers when CO concentrations are too high
- Ensure workers are aware of the need to establish adequate ventilation and air exchange when activities known to generate CO are conducted

Considerations for Workers and Volunteers

- Never use a generator, pressure washer, or any gasoline engine-driven tool (such as a concrete saw, water pump, or compressor) indoors or while outside and less than 20 feet from any window, door, or vent. One generator produces as much CO as hundreds of cars
- Never run a generator, pressure washer, or any gasoline-powered engine inside a basement, garage, or other enclosed structure, even if the doors and windows are open
- Never use a charcoal grill, hibachi, lantern, or portable camping stove inside a home, garage, tent, or camper, even if the doors and windows are open
- Never leave the motor running in a vehicle parked in an enclosed or partially enclosed space, such as a garage
- Learn to recognize the signs and symptoms of CO overexposure: headache, nausea, weakness, dizziness, visual disturbances, changes in personality, and loss of consciousness. Any of these signs and symptoms can occur within as little as a few minutes of CO exposure

For More Information

- NIOSH Workplace Carbon Monoxide Hazards (https://www.cdc.gov/niosh/carbon-monoxide/about/)
- CDC Carbon Monoxide Poisoning Basics (http://www.cdc.gov/co)
- CDC CO Fact Sheet (https://www.cdc.gov/carbon-monoxide/factsheets/co-poisoning-fact-sheet.html)
- CDC Prevent Carbon Monoxide Poisoning (https://www.cdc.gov/natural-disasters/psa-toolkit/prevent-carbon-monoxide-poisoning.html)

Chemical Safety

Storms can create a hazardous working environment for emergency responders and other disaster relief workers. Chemicals that would normally be stored safely could be released to the environment due to flooding or other storm damage. Industrial and agricultural settings could be a large source of potential chemical exposure. Chemicals stored in residences, retail establishments, or other places could also contribute to the hazardous conditions.

Considerations for Employers and Worker Organizations

- Educate workers about the potential chemical hazards. The types and amounts of chemicals released depend on:
  - Types of facilities in the area
  - Types of chemicals produced or kept at affected facilities and residences
  - Types and magnitude of structural damage to facilities and residences
- Provide chemical agent information to workers
- Provide appropriate PPE to workers for all hazards present and train them on its proper use
- Set priorities for cleanup tasks, focusing upon the most dangerous and imminent chemical hazards

Considerations for Workers and Volunteers

- Stay out of floodwaters, if present. If you have to enter flood waters wear appropriate PPE and know your flood water hazards and how to stay safe (see Flood Water section)
- Review chemical agent and hazard information to understand risks and how to protect yourself
- Wear appropriate PPE for all hazards present in the work area
- Wash skin that may have come in contact with chemicals or floodwater with soap and clean water as soon as possible. You may need to remove and dispose of your clothing, then decontaminate yourself to reduce or remove the chemical so that it is no longer a hazard
- Do not operate gasoline- or diesel-powered equipment indoors. If you experience warning symptoms of CO poisoning, turn off equipment and go outdoors or to a place with clean air
- If hazardous chemical containers are found or leaking materials are detected, move away a safe distance upwind and contact hazardous material response personnel for evaluation before continuing to work in the area

For More Information

- NIOSH Pocket Guide to Chemical Hazards (https://www.cdc.gov/niosh/npg/)
- NIOSH Chemical Hazards (https://www.cdc.gov/niosh/learning/safetyculturehc/module-2/5.html)
- NIOSH Chemical Safety in the Workplace (https://www.cdc.gov/niosh/chemicals/about/)
- OSHA Emergency Preparedness and Response (OSHA Emergency Preparedness and Response)
  - Chemical Reactivity Hazards (https://www.osha.gov/chemical-reactivity)
  - Oil Spills (https://www.osha.gov/emergency-preparedness/oil-spills)
- Chemical Hazards Emergency Medical Management (https://chemm.hhs.gov/index.html)

Lead

The most common way for workers to be exposed to lead is through breathing in or swallowing lead dust through hand-to-mouth contact. It can also be absorbed through the skin. Tasks including demolition, renovation, removal, sweeping, vacuuming, painting, or cleanup in buildings with lead-based paint can generate significant lead hazards. Workers who are exposed to lead may inadvertently take home lead on their shoes, skin, or clothing. This can contribute to the exposure of workers' families, especially unborn children and children under 6 years of age, those most vulnerable to permanent brain and nervous system damage. There are often no symptoms from lead poisoning, and many early signs of lead poisoning (such as abdominal pain, muscle aches, muscle fatigue, headaches, sleep problems, aggressive behavior) are non-specific. Lead exposures in adults affect the central nervous system, blood-forming and cardiovascular systems, kidneys, and can cause male infertility as well as still births and miscarriages in pregnant women.

The most common source of lead in residences and commercial buildings is lead-based paint. Approximately three-quarters of the nation's housing built before 1978 contains some lead-based paint, as do many public and commercial buildings built in that period. Most steel structures (bridges, water towers, billboard supports, fire escapes, etc.) built or repainted in the U.S. before 1978 also were coated with lead-based paint. Exterior lead-based paint on buildings or steel structures that is highly deteriorated, with loose or fallen paint chips, represents an environmental hazard. The street dust and soils adjacent to these structures may be contaminated with hazardous levels of lead. Additionally, in brownfields, former industrial sites in urban areas, lead is the most reported contaminant. This results from previous mining, and manufacture or use of fuel, paint, inks, piping, batteries, and ammunition. Soil contamination near building, steel structures, or in brownfields may be disturbed and spread by hurricanes and floods. A second common source of lead in residences and buildings is plumbing. Pre-1980 copper and brass pipes and fixtures were usually joined with lead solder, and older brass fixtures contain about 5% lead. Water delivery pipes in municipal water systems laid in the early-to-mid-20th century may have been made entirely of lead. Lead water pipes can be encountered in any state but are more common in the upper Midwest, New England, Missouri, Nebraska, Kansas, Texas, and Florida. In these areas it is important to carefully monitor and control the corrosivity of municipal water systems to prevent lead and copper pipes from leaching dangerous amounts of lead into the drinking water.

Considerations for Employers and Worker Organizations

- Conduct hazard assessment of the work environment and if needed, provide medical and biological monitoring of workers
- Educate workers on the symptoms of lead exposure and the potential health risks, including take-home lead exposures
- Train workers on recognition of lead exposure hazards, appropriate methods to deal with lead hazards, and proper PPE selection and use
- Provide appropriate PPE to workers. PPE required can vary depending on the environment and tasks and may include clothing, boots, gloves, shoe covers, eye protection, hearing protection, and respiratory protection
- Provide appropriate equipment, engineering controls, and protocols to deal with lead hazards, including housekeeping and hygiene facilities and practices to prevent exposures and the further spread of lead within the workplace or to workers' homes
- Certain tasks with lead-based paint, including hand or power sanding, scraping, sawing, burning, and torch cutting, have been found to be particularly hazardous and are to be avoided wherever possible. When these tasks are necessary, use additional controls and PPE

Considerations for Workers and Volunteers

- Know and understand the symptoms of lead exposure and the potential health risks, including take-home lead exposures
- Be able to recognize and address lead hazards, and be able to appropriately select and use PPE
- Use the provided appropriate equipment, engineering controls, and protocols to deal with lead hazards, including housekeeping and hygiene facilities and practices
- Take steps that will prevent the further spread of lead within the workplace or to your home
- Eat, drink, use tobacco products, vape, and chew gum only in approved places away from lead dust
- Before you eat, drink, use tobacco products, vape, chew gum, or got to the bathroom, always wash your hands with water and soap designed to remove lead (if that is not available, use wipes designed to remove lead—NIOSH-licensed lead wipes are commercially available). Washing your skin with standard soap and water is not enough to completely remove lead dust
- Use wet cleaning methods or a vacuum with a high-efficiency particulate air (HEPA) filter. Never use compressed air or dry sweep
- Work in areas that are well-ventilated and use local exhaust ventilation where provided. Open windows or work outside when possible to improve airflow
- Avoid touching your face and mouth

For more information

- NIOSH About Lead in the Workplace (https://www.cdc.gov/niosh/lead/about/)
- U.S. Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing. Includes risk assessment and worker protection guidance (https://www.hud.gov/program_offices/healthy_homes/lbp/hudguidelines)
- OSHA, Lead in Construction (https://www.osha.gov/Publications/osha3142.pdf)
- OSHA Quick Card – If You Work Around Lead, Don't Take It Home! (https://www.osha.gov/sites/default/files/publications/OSHA3680.pdf)
- EPA Lead Renovation, Repair and Painting Program Rules (https://www.epa.gov/lead/lead-renovation-repair-and-painting-program-rules)
- EPA Brownfields Program (https://www.epa.gov/brownfields)

Silica

This section addresses respirable crystalline silica hazards encountered during response and recovery operations. Crystalline silica, usually in the form of quartz, is found in many construction materials including concrete; stones (both natural and engineered stone); bricks, blocks, and mortar; and asphalt pavement. When workers cut, grind, drill, or crush these materials, very small particles of crystalline silica dust get in the air. Breathing in these very small (respirable) crystalline silica particles can lead to silicosis, a disease that causes irreversible scarring in the lungs, trouble breathing, permanent disability, and death. Respirable crystalline silica dust can also increase the risk for developing other serious diseases including lung cancer, chronic obstructive pulmonary disease, kidney damage, and autoimmune disease. To protect workers exposed to respirable crystalline silica, OSHA has issued two respirable crystalline silica standards: one for construction, and the other for general industry and maritime.

Considerations for Employers and Worker Organizations

- Ensure that you are following mandatory OSHA standards regarding crystalline silica
- For construction tasks, follow the compliance requirement mandated by OSHA's Respirable Crystalline Silica Standard for Construction and refer to the OSHA factsheet
- In addition to providing proper dust controls, provide appropriate respirators following the OSHA Respiratory Protection Program standards (see Respirator Selection and Use section) as required in Table 1 for covered tasks, and at minimum an N95 FFR for tasks not covered in Table 1
- Assess exposure by following the OSHA's Respirable Crystalline Silica Standard for Construction or with the aid of direct reading instruments in time-sensitive situations, and adjust the required respirator and work schedules as appropriate based on the exposure
- For non-construction related silica exposures during emergency response work, follow the compliance requirements mandated by OSHA's Respirable Crystalline Silica Standard for General Industry and Maritime

Considerations for Workers and Volunteers

- For tasks covered in Table 1 of the OSHA's Respirable Crystalline Silica Standard for Construction, choose tools listed in Table 1 with associated engineering and work practice control methods
- For tasks not covered in Table 1, choose tools with dust controls like water sprays or local exhaust ventilation provided by vacuum cleaners and on-tool vacuum attachments (exhaust hoods)
- In addition to dust controls, wear an appropriate respirator following the OSHA Respiratory Protection Program standards (see Respirator Selection and Use section) as required in Table 1 for covered tasks, and at minimum an N95 FFR for tasks not covered in Table 1
- Use and maintain the tools and dust controls as directed by the tool manufacturer to suppress or capture the dust

For More Information

- NIOSH Silica Exposure Assessment: describes effective dust controls for several types of tools (https://www.cdc.gov/niosh/silica/exposure/)
- OSHA Respirable crystalline silica Standard for Construction 1926.1153 (https://www.osha.gov/laws-regs/regulations/standardnumber/1926/1926.1153)
- OSHA Respirable crystalline silica Standard for General Industry and Maritime 1910.1053 (https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.1053)
- OSHA Crystalline Silica Overview (https://www.osha.gov/silica-crystalline)
- OSHA Crystalline Silica in Construction: provides a variety of resources, including fact sheets for controlling silica dust in construction (https://www.osha.gov/silica-crystalline/construction)
- OSHA's Respirable Crystalline Silica Standard for Construction Factsheet (https://www.osha.gov/sites/default/files/publications/OSHA3681.pdf)
- OSHA Crystalline Silica in General Industry and Maritime (https://www.osha.gov/silica-crystalline/general-industry-maritime)
- Center for Construction Research and Training (CPWR) Work Safety with Silica: resource for protecting workers from silica in construction (https://www.silica-safe.org/)

Physical

Chain Saws and Tree Removal

Chain saws are an important tool for clearing downed or dangerous trees after natural disasters. However, misuse of chain saws can cause serious injuries or death to the operator, or to others working around them.

Considerations for Employers and Worker Organizations

- Only allow individuals who are trained in safe chain saw operation to use a chain saw
- Provide chain saw operators with proper protective clothing including chain saw chaps, heavy boots, work gloves, hard hat, face shield, and hearing protection
- Provide the right type of chain saw with the power and features needed
- Inspect the saw to make sure the bar, chain, chain-brake, hand guards, and anti-kickback features are properly maintained
- Ensure the chain is made for the saw, sharp, and properly adjusted according to the operator's manual
- Provide workers with wedges to help prevent the saw from pinching when cutting downed trees
- Confirm that workers know how to correctly release tension in bent or twisted tree limbs that are under stress prior to cutting
- Keep co-workers a safe distance from the chain saw operator—30 feet when cutting downed trees, and 2 times the height of the tree when felling trees

Considerations for Workers and Volunteers

- Operate chain saw only within your skill level and wear proper protective clothing
- Operate, adjust, and maintain chain saws according to the operators' manual
- Confirm that the bar, chain, chain-brake, hand guards, and anti-kickback features are properly maintained and in working order
- Make sure the chain saw has a sharp and properly lubricated chain
- Maintain correct chain tension
- Plan each cut. Use proper technique to control tension release and log limb movement
- Cut at or below waist level
- Clear debris on ground, remove cut wood as you work, and maintain a clear escape path
- Anticipate the saw's reactive forces and position yourself so that you do not lose your balance while cutting
  - Pushback—Cutting with the top side of the bar will push the saw back toward the operator
  - Pulling—cutting with the bottom of the bar will pull the saw and the operator toward the log
  - Kickback—the top of the tip of the bar is the site where kickback will occur if the tip contacts the log or other solid object. This will cause the tip of the bar to move violently back and up toward the operator
- Ensure co-workers are a safe distance from the chain saw operating area before beginning work—30 feet when cutting downed trees, and 2 times the height of the tree when felling trees

For More Information

- CDC Chain Saw Safety (https://www.cdc.gov/natural-disasters/safety/chain-saw-safety.html)
- OSHA Fact Sheet – Working Safely with Chain Saws (https://www.osha.gov/OshDoc/data_Hurricane_Facts/chainsaws.pdf)

Confined Spaces

Natural disasters, specifically flooding events, can create hazardous spaces and areas, such as confined spaces and permit required confined spaces. Flooding can make these spaces even more hazardous for recovery workers. Examples of confined and permit required confined spaces include underground vaults, tanks, storage bins, manholes, pits, silos, swimming pools, and pipelines.

Confined space: is defined as a space that meets all the following physical characteristics: 1) large enough and so configured that an individual can completely enter; 2) has limited or restricted means for entry or exit; and 3) is not designed for continuous worker occupancy.

Permit-required confined space: has one or more of the following hazards: 1) contains or has the potential to contain a hazardous atmosphere; 2) contains a material that has the potential to engulf a person; 3) has an internal configuration such that a person could be trapped or asphyxiated by inwardly sloping or converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or 4) contains any other recognized serious safety or health hazard such as mechanical equipment.

Considerations for Employers and Worker Organizations

- Ensure you are in compliance with appropriate OSHA confined space standards
- Develop and implement a training program to ensure that workers understand the characteristics of confined and permit required confined spaces
- Make sure workers do not enter a confined or permit required confined space until a trained and authorized entry supervisor or designated competent person has designated the space safe for entry
- Develop procedures for entry:
  - Test atmospheric conditions prior to entry and continuously monitor while occupied
  - Use a properly calibrated, direct-reading instrument and test for oxygen content, flammable gases and vapors, and potential toxic air contaminants
  - Never trust your senses to determine if the air in a confined space is safe
  - Ensure an attendant is present immediately outside the space and capable of providing assistance, if needed
  - Maintain communication between the entrant(s) and the attendant
- Provide workers access to an industrial hygienist or other trained professional versed in safe confined space entry procedures

Considerations for Workers and Volunteers

- Develop an understanding of physical and atmospheric conditions in structures and work areas that may be considered confined or permit required confined spaces
- Consider all confined spaces hazardous until ruled safe for entry by a trained and authorized entry supervisor or designated competent person
- Do not enter a confined or permit required confined space until it is safe for entry
- Recognize that the space may contain a hazardous atmosphere that could be dangerous to life and health
- Never trust your senses to determine if the air in a confined space is safe to enter
- Follow established entry procedures:
  - Test atmospheric conditions prior to entry and continuously monitor while occupied
  - Utilize a properly calibrated, direct-reading instrument and test for oxygen content, flammable gases and vapors, and potential toxic air contaminants
  - Ensure that an attendant is present immediately outside the space and capable of providing assistance
  - Maintain communication between the entrant(s) and the attendant

- Exit the space immediately if an unsafe condition develops
- Never enter a confined space to attempt an emergency rescue unless you have been trained in safe confined space entry and rescue procedures

For More Information

- NIOSH A Guide to Safety in Confined Spaces (https://www.cdc.gov/niosh/docs/87-113/default.html)
- OSHA Quick Card – Permit-Required confined Spaces (https://www.osha.gov/OshDoc/data_Hurricane_Facts/confined_space_permit.pdf)

Electricity

Electrocution

Natural disasters, specifically hurricanes, tornados, severe storms, and flooding events can cause severe damage to power lines and electrical systems in commercial and residential structures. It is important for response and recovery workers to protect themselves from electrical hazards.

Considerations for Employers and Worker Organizations

- Ensure only those workers who are trained to recognize electrical hazards perform recovery work where electrical hazards could be present
- Instruct workers to never touch a downed power line
- Instruct unqualified workers to maintain a distance of at least 10 feet from power lines
- Instruct workers to keep long handled tools, equipment, and ladders at least 10 feet from power lines
- Establish a system to ensure electrical power is off at the main source before starting cleanup work in structures (e.g., the pulling of electric meter by a qualified electrical worker who is authorized by the utility)
- Train workers to never touch or activate water-damaged electrical equipment and overcurrent protective devices (e.g., breakers, fuses, outlets, and outlets equipped with ground fault circuit interrupters)
- Ensure a qualified electrician inspects electrical equipment and overcurrent protective devices before restoring energy

Considerations for Workers and Volunteers

- Develop an understanding of the potential electrical hazards – Never touch a downed power line
- Do not clean up or work near a downed power line unless it is confirmed that utility workers have turned off the power
- Maintain a distance of at least 10 feet from power lines when using long handled tools, equipment, and ladders
- Unless conducting lifesaving rescue missions as a qualified responder, do not enter flooded areas, structures, or buildings. Do not enter or work in areas or structures that were previously flooded until the electrical utility has been de-energized. Even though water is no longer present, circuits and devices inside building walls may still be wet, causing an electrocution hazard
- Consider everything electrical as energized until tested
- Ensure electrical power is off at the main source
- Never touch or activate water-damaged electrical equipment and overcurrent protective devices (e.g., breakers, fuses, outlets, and outlets equipped with ground fault circuit interrupters)

- Always have electrical equipment and overcurrent protective devices inspected by a qualified electrician before restoring energy
- Only restore power to a building when electrical devices and circuits have been inspected, repaired, or replaced by a qualified electrician

For More Information

- NIOSH Electrical Safety in the Workplace (https://www.cdc.gov/niosh/electrical-safety/about/index.html)
- OSHA Factsheet – Working Safely Around Downed Electrical Wires (https://www.osha.gov/OshDoc/data_General_Facts/downed_electrical_wires.pdf)
- OSHA Quick Card – Electrical Safety (https://www.osha.gov/OshDoc/data_Hurricane_Facts/electrical_safety.pdf)

Backfeeding Power from Portable Generators

Residents may have connected a portable generator directly to an outlet in a building, which can create an electrocution hazard, commonly known as backfeeding. Backfeeding is a flow of electric energy in the reverse direction of a circuit's design, from the circuit to the source. A single generator that is backfeeding is capable of energizing miles of electrical lines in the power grid as the transformer connected to the building will step-up electrical current from the generator up to 7,200 Volts.

Considerations for Employers and Worker Organizations

- Ensure that portable generators are installed and inspected by a qualified electrician prior to use
- Provide safety controls that include transfer switches and panel interlocks to prevent backfeeding
- If engineering controls such as a transfer switch or panel interlock are not used, instruct workers to use the generator power outlets only, and provide appropriate electrical cords that are free from damage, properly rated for anticipated electrical load, and equipped with a grounding prong

Considerations for Workers and Volunteers

- Listen for the sound of running generators
- Verify generators are not directly plugged into the structure's electrical system
- Look for a transfer switch or panel interlock and make sure it was installed by a qualified electrician. Transfer switches and panel interlocks are safety controls to prevent backfeeding by the isolation of main circuit from the generator
- If engineering controls such as transfer switch or panel interlock are not used, use the generator power outlets only, as well as appropriate electrical cords that are free from damage, properly rated for anticipated electrical load, and equipped with a grounding prong
- Ensure that the generator is properly grounded

For More Information

- NIOSH Electrical Safety in the Workplace (https://www.cdc.gov/niosh/electrical-safety/about/)
- OSHA Fact Sheet – Using Portable Generators Safety (https://www.osha.gov/OshDoc/data_Hurricane_Facts/portable_generator_safety.pdf)
- CDC What to Do to Protect Yourself From Electrical Hazards (https://www.cdc.gov/natural-disasters/response/what-to-do-protect-yourself-from-electrical-hazards.html)

Fall Prevention

Injuries caused by falls can happen after a hurricane or flood during clean-up work in muddy, slippery, and debris-covered conditions. Falls from heights, such as falling off a ladder, from the back of a pickup truck, or from a roof are more likely to result in death than a same-level fall. However, same-level falls (which can be caused by slips or trips) are more common and can still cause serious injury, even death.

Falls from heights. Follow safe ladder use rules and only use ladders in good working order. When climbing or walking at heights, pay attention to unsecure or damaged structures and unstable surfaces. Use fall protection equipment, and when possible an aerial lift.

Same-level falls. To reduce the risk of slipping, choose slip-resistant shoes suited for the conditions (for example: indoors, outdoors, thick mud, a thin layer of water). Choose shoes with good traction and newer tread. As much as possible, keep the tread of shoes clear of mud. To reduce the risk of tripping, remove debris, clutter, cords, and hoses from working areas.

Considerations for Employers and Worker Organizations

- Provide training in safe ladder use and only use ladders that are in good working order
- Provide aerial lift and fall protection training and necessary equipment
- Help workers get slip-resistant shoes designed for use in slippery or muddy areas and make sure tread on shoes is newer
- To the extent possible, ensure work areas are clear of debris and other tripping hazards

Considerations for Workers and Volunteers

- Follow these guidelines for safe ladder use:
  - All ladders:
    - Do not use metal ladder close to live electrical wires
    - Place ladder on firm, level, non-slippery surface
    - Face ladder and use both hands when climbing up and down
    - Do not overreach to either side when working from ladders
    - Do not pull or push too much when working from ladders
  - Extension ladders:
    - Set at the proper angle (use the NIOSH Ladder Safety app)
    - Use a shoulder strap or backpack to carry materials while climbing
  - Stepladders:
    - Never climb in the closed position or when leaning against something
    - Do not stand higher than the second step from the top
- Use fall protection and equipment according to manufacturer guidelines
- Use slip-resistant shoes with good traction when working in slippery or muddy conditions, and keep treads of shoes clear of mud
- To the extent possible, ensure work areas are clear of debris and other tripping hazards

For More Information

- NIOSH About Falls in the Workplace (https://www.cdc.gov/niosh/falls/about/index.html)
- NIOSH Ladder Safety App (https://www.cdc.gov/niosh/falls/ladder/ladder-safety-app.html)
- NIOSH Slip, Trip, and Fall Prevention for Healthcare Workers (http://www.cdc.gov/niosh/docs/2011-123/pdfs/2011-123.pdf)

Fires – Open Air Burning of Debris after a Disaster

The large amounts of debris resulting from hurricanes and floods can lead to clean-up activities involving many methods of debris removal and disposal, including open-air burning and fire curtain. Workers engaged in open-air burning can be at risk for smoke inhalation and heat stress. They are also at risk for injuries from the fire and from safety hazards associated with the operation of chain saws, chippers, grinders, or heavy equipment.

In certain areas, open-air burning may be banned by local, state, and federal regulations. However, in some disaster situations with large amounts of debris, open-air burning may be allowed. If permitted, it is important to conduct open-air burning under the supervision of trained officials or their designees and in accordance with all local, state, and federal regulations and emergency orders.

Considerations for Employers and Worker Organizations

- Develop an action plan for the safety of your response workers who may encounter hazards related to open-air burning, including pre-establishing response plans for medical situations such as heat stress (see Heat Stress section), burns, injuries from fire or equipment use; establish what emergency services are available and how to contact them
- Plan hurricane and flood debris burning to minimize impact
  - Coordinate with local officials, including the local fire department, health department, and state permitting authority. Follow the requirements outlined in the burn permit
  - Notify the general public about when and where burns will occur
  - Consider the use of an air curtain burner to decrease impact on air quality, worker exposures, and likelihood of accidental fires
  - Check local weather forecasts to select optimal burn conditions or identify when burns should not be conducted
  - Clear vegetation and other flammable and combustible materials from the area around the burn site
  - Follow federal, state, and local regulations when cleaning up burned debris
- Make sure fire extinguishers are available at the burn site and on heavy equipment

Considerations for Workers and Volunteers

- Avoid respiratory and dermal exposure to the smoke from the fire
  - Stay upwind of burn piles and smoke
  - Remain at a safe distance from the fire
  - Keep exposed skin covered as much as possible
- Consult with the site safety officer regarding potential safety hazards
- Ensure you are wearing clothing and PPE appropriate for the task and environment; examples include
  - Wearing safety glasses or goggles, protective footwear, and hand protection
  - Wearing fire-retardant or thermal protective clothing, gloves, footwear, and headgear, as appropriate for workers who might come into contact with heated debris
  - Using respiratory protection, as appropriate (see Respirator Selection and Use section)
    - Particulate-filtering respirators can effectively remove dust from inhaled air, but not gases or vapors; thus, particulate-filtering respirators are not effective for protection against all components of the smoke or fire

For More Information

- NIOSH Emergency Action Plan (Template) (https://www.cdc.gov/niosh/docs/2004-101/emrgact/files/emrgact.pdf)
- EPA Planning for Natural Disaster Debris (https://www.epa.gov/homeland-security-waste/guidance-about-planning-natural-disaster-debris)
- OSHA Hurricane eMatrix - List of Activity Sheets - Waste debris removal and reduction: Debris Reduction, Recycling, and Disposal (https://www.osha.gov/etools/hurricane/activity-sheets/waste-debris-removal/reduction-recycle-disposal)
- CDC Worker Safety During Fire Cleanup (https://stacks.cdc.gov/view/cdc/40063)

Flood Water

Floodwaters pose hazards to workers involved in responding to a disaster and those assessing and cleaning up the damage after a disaster. Some workers—such as workers involved in utility restoration, cleaning up spills of hazardous materials, search and rescue, and other work tasks—may have the proper training, equipment, and experience to properly address these hazards. Risks posed by floodwaters can be minimized by staying out of floodwater if possible.

Considerations for Employers and Worker Organizations

- Provide proper training regarding the dangers of flood waters and a wet work environment
- Establish appropriate controls and provide required equipment for the work environment to help prevent injury and death, including engineering (e.g., equipment especially designed to perform safely in wet environments), administrative (e.g., prohibit driving into flood waters), and PPE (e.g., personal flotation devices)

Drowning

Floodwater can pose a drowning risk for everyone regardless of their ability to swim. Drowning is a leading cause of storm related death. Swiftly moving shallow water can be deadly; cars or other vehicles won't protect you from floodwaters.

- Always follow warnings about flooded roads
- Don't drive in flooded areas
- Be wary of unknown road conditions. Do not try to cross flooded roadways if you do not know the depth of the water
- Always wear your Coast Guard-approved personal flotation device and do not work alone if you must work in or near flood water

Unseen Physical Hazards

Floodwater can contain dangerous debris, sharp objects, downed power lines, and unexpected water depth changes, as well as snakes, rodents, allegators, and other animals.

- Watch where you place your hands and feet when removing debris. If possible, don't place your fingers under debris you are moving
- Wear heavy gloves if handling debris, depending on the amount of water, you might need water-repellent or waterproof styles
- Safety footwear with slip-resistant and anti-puncture soles would be appropriate where there are piles of debris and unstable or slippery work surfaces, and depending on the amount of water, you might need water-repellent or waterproof styles

Exposure to Biological Organisms and Chemicals

Floodwater and its residues can contain toxic materials, bacteria, sewage, pesticides, and other substances. Floods can cause chemicals to move from their normal storage spots. It will generally not be possible to know exactly what substances are in floodwater at any given point in time.

- Before entering a contaminated area that has been flooded, wear plastic or rubber boots to avoid contact with floodwater. Hip waders and gloves may also be appropriate to help prevent contact with flood waters
- If you come in contact with floodwater, wash the area with soap and clean water as soon as possible. If you don't have soap or water, use alcohol-based wipes or liquid sanitizer

For More Information

- CDC Safety Guidelines: Floodwater (https://www.cdc.gov/floods/safety/floodwater-after-a-disaster-or-emergency-safety.html)
- National Weather Service: Flood Safety Tips and Resources (https://www.weather.gov/safety/flood)
- OSHA Flood Preparedness and Response (https://www.osha.gov/flood/response)
- International Brotherhood of Teamsters: How to Protect Workers in Flood Areas (https://teamster.org/how-protect-workers-flooded-areas/)
- U.S. Army Corps of Engineers Flood Response Manual (https://www.mvp.usace.army.mil/Portals/57/docs/Operations%20Center/USACE%20Flood%20Response%20Manual%202023.pdf)

Motor Vehicle Safety

Most emergency responders drive or ride in a motor vehicle during a disaster response. Extreme weather, road conditions, and fatigue may increase their risk of being injured in a crash. All workers and types of vehicles are at risk.

Considerations for Employers and Worker Organizations

- Plan all trips and routes, considering potential road hazards before each trip
  - Make sure that drivers and supervisors agree on the route, destination, and schedule
  - Establish procedures to inform supervisors that drivers have arrived safely
  - Tell workers about the local road system, road construction and closures, roadways likely to flood, washed-out bridges, and downed trees and power lines
  - Request workers to stop driving if weather and road conditions are too bad
  - Combine trips and loads when possible. This reduces time on the road and saves fuel
- Prevent driver fatigue
  - Plan work schedules so drivers can get 7 to 9 hours of sleep between shifts
  - Avoid having workers drive in the late night and early morning hours, if possible
  - Encourage workers to take rest breaks during their work shift
- Prevent distracted driving
  - Require drivers to pull over and park in a safe location if they must text, make a call, or look up directions. Hands-free phones are not necessarily safer than hand-held devices
  - Assign someone else in the vehicle to take care of communications when there are passengers
- Provide workers with an emergency kit with food, water, flares, jumper cables, maps, tools, a fire extinguisher, flashlight, and extra batteries. Consider adding a portable phone charger

Considerations for Workers and Volunteers

- Do not drive if you are too tired. Being tired impairs your ability to use good judgment when responding to hazards
- Keep speeds low so you can react quickly to unexpected hazards. Allow extra time to get to your destination
- Watch for traffic signals and lighting that may not be working. If you come to an intersection with a traffic signal out, proceed as if it were a 4-way stop
- Watch for fallen objects, downed power lines, and weakened walls, bridges, roads, and sidewalks that might collapse
- Do not drive over downed power lines or through water that is in contact with them
- Turn around if you come to a flooded road or bridge
- 12 inches of moving water can carry off a small car, and 18 to 24 inches of moving water can carry away larger vehicles

For More Information

- NIOSH Motor Vehicle Resources (https://www.cdc.gov/niosh/motor-vehicle/resources/index.html)
- NIOSH Fact Sheet – Preventing work-related motor vehicle crashes (https://www.cdc.gov/niosh/docs/2015-111/default.html)
- NIOSH Behind the Wheel at Work – Tips for Driving in Hurricane Season (https://archive.cdc.gov/#/details?url=https://www.cdc.gov/niosh/motorvehicle/ncmvs/newsletter/ncmvsnewsletterv4n2.html)
- National Weather Service Flood Safety Fact Sheet (https://www.weather.gov/media/owlie/FloodSafety-OnePager-11-29-2018.pdf)
- NIOSH Driver Fatigue on the Job (https://www.cdc.gov/niosh/motor-vehicle/driver-fatigue/)

Noise

Noise exposure during hurricane and flood response and recovery operations can happen in a variety of settings and activities. High noise levels produced by equipment and power tools are potentially hazardous and can put workers at risk of hearing loss. Noise sources include power saws, chain saws, pneumatic tools, electrical generators, light towers, and compressors. Bulldozers, skid steer loaders, and other heavy equipment also expose workers to noise. Using hearing protection, such as earmuffs or earplugs, can help protect against hazardous noise exposures. Use tactical communication and protection systems during flight operations and around the vehicles when conducting air evacuation with helicopters. As a rule of thumb, if you must raise your voice to communicate with someone close to you, then the noise levels are likely at or above 85 decibels and can damage hearing. If so, always wear hearing protection.

Considerations for Employers and Worker Organizations

- Reduce noise exposures by moving equipment and noisy activities farther away from workers, isolating loud noise sources with properly designed enclosures or barriers, and if feasible providing signage to indicate areas or activities here hearing protection is required
- The NIOSH recommended exposure limit (REL) for occupational noise exposure is 85 A-weighted decibels (dBA) over an eight-hour shift. The use of sound level meters can assist in this evaluation (see the For More Information section below)
- If workers are repeatedly exposed to noise at or above the REL, employers are to provide hearing protection and have a hearing loss prevention program
- Do not hand out hearing protection without providing training about its proper use

- Make sure workers know how to properly fit earplugs and earmuffs
- One-on-one training in the use of hearing protection is better than video or written training
- Hearing protector fit-testing systems are available to help ensure earplugs fit well and to help with training on properly wearing them

Considerations for Workers and Volunteers

- If possible, move farther away from loud noise sources, turn down the volume, and isolate loud noise sources by using properly designed enclosures and barriers
- Wear hearing protection when it's noisy. If you need to raise your voice or shout to communicate to someone nearby, then the noise levels are likely too loud
- Select hearing protection that is comfortable and fits your head or ears well
- Earplugs:
  - Wash your hands before rolling and inserting earplugs and replace if dirty
  - Use the roll, pull, and insert technique (see For More Information below)
- Earmuffs:
  - Anything that disrupts a good seal with the sides of your head (e.g., safety glasses, hats, ear jewelry) can reduce the earmuff's protection
  - Avoid wearing hats that might affect the seal. Wear hats over, not under, the head band
  - If safety glasses have thick temple pieces that might disrupt an earmuff's seal, then consider wearing earplugs
- Watch out for your co-workers. If they are not wearing protection, gently remind them that they only get one pair of ears. Hearing loss can be permanent
- If you suffer from ringing in the ears or feel like you have stuffed ears after a work shift, then it is possible that you have been overexposed to noise. Get further instruction on wearing hearing protectors

For More Information

- CDC About Noise-Induced Hearing Loss (https://www.cdc.gov/hearing-loss/about/)
- NIOSH Preventing Occupational Noise-Induced Hearing Loss (https://www.cdc.gov/niosh/noise/prevent/index.html)
- NIOSH Sound Level Meter App (https://www.cdc.gov/niosh/noise/about/app.html)
- Dangerous Decibels Information Center – Resources and Guides about Noise-induced Hearing Loss (http://dangerousdecibels.org/education/information-center/)
- NIOSH How To Wear Soft Foam Earplugs (https://www.cdc.gov/niosh/docs/mining/UserFiles/content/hearingloss/earplug.pdf and https://www.youtube.com/watch?v=VJRc0wtiLzQ)

Stress Associated with Traumatic Incidents and Emergency Response

A traumatic event is one that is psychologically distressing and outside the usual range of human experiences (or work exposure). For emergency response and recovery workers this may include witnessing severe injury or death, especially to children or loved ones; serious injury to oneself; handling dead bodies or body parts; sudden and unexpected loss of colleagues; and managing the distress of others who were harmed or trying to find or help their loved ones. Disasters and other public health emergencies can include unpredictable hazards that cannot be easily controlled or planned for. To increase the possibility of

mitigating the effect of traumatic events that might occur in these situations, it is best practice for employers and workers to remain alert to conditions throughout the emergency response and recovery, and monitor the well-being of responders and other exposed workers.

Considerations for Employers and Worker Organizations

Responder organizations cannot predict all the hazards that might be encountered in a particular emergency, especially the psychological impacts that can arise from a particular hazard. However, organizations can support their workers with the following activities:

- Ensure responders are well trained in the recognition and basic prevention of the physical, cognitive, emotional, and behavioral symptoms of stress. Provide workers with pre-deployment training and just-in-time training that focuses on the specific event to recognize, monitor, and support or refer others who are coping in ways that are not adaptive or safe. This includes self-recognition as a basic tenet of field readiness that can minimize the impact of both acute and cumulative traumatic stress, as well as peer support techniques
- Monitor responder health and well-being during emergency operations and track periodically, through check-ins, after operations have concluded
- Emphasize responder wellness and safety in your operations and open and timely communication between all responders. It is best practice for communication between responders to include candid, supportive discussion to understand any potential difficulties experienced during and after emergency response work
- Use a management approach and structure that is supportive of responders' health and operational stability; examples include high reliability organization principles and the National Incident Management System

Considerations for Workers and Volunteers

- Control the organization and pace of the rescue and recovery efforts
  - Pace yourself. Rescue and recovery efforts at the site may continue for days or weeks
  - Watch out for each other. Coworkers may be so focused on a task that they do not notice another hazard nearby or behind
  - Be conscious of those around you. Responders who are exhausted, stressed, or even temporarily distracted may place themselves and others at risk
  - Take frequent rest breaks. Mental fatigue, particularly over long shifts, can greatly increase emergency workers' risk of injury
- Maintain adequate nutrition and rest
  - Eat healthy food and sleep regularly. Maintain as normal a schedule as possible and adhere to the team schedule and rotation. Monitor for fatigue and ability for a worker to safely transport themselves home after their shift
  - Drink plenty of fluids to maintain hydration and electrolyte balance
  - Whenever possible, take breaks away from the work area
- Monitor mental and emotional health
  - Have a support plan. Communicate with your family and loved ones at home as frequently as possible
  - Have a self-care plan. Also, if needed, give yourself permission to feel rotten; you are in a difficult situation
  - Recognize and accept what you cannot change (if it is not a danger to you or others), (e.g., the chain of command, organizational structure, waiting for assignments or other delays, equipment failures, etc.)
  - Be aware of any behavioral changes in you or your coworkers, (e.g., unusual quickness to anger or avoidance of social contact). This might be signal that you or a coworker are overwhelmed

- If your employer provides you with formal mental or behavioral health support, use it! There is also the Substance Abuse and Mental Health Services Administration (SAMHSA) Disaster Distress Helpline — Call or text 1-800-985-5990 to speak with a trained crisis counselor (accessible 24/7, 365-days-a-year)
- Talk to people when you feel like it. Choose your own comfort level. Talking about an event before you are ready can be harmful
- Individuals who experience traumatic events may have recurring thoughts, dreams, or even episodes when they feel like they are reliving the event. While these experiences often decrease over time, seeking mental health treatment early on can help reduce symptoms and mitigate the chance of future difficulties
- Some individuals may become withdrawn or feel emotionally numb after experiencing a traumatic event. This is normal but if it persists, causes them concern, or interferes with day-to-day functioning, seek professional assistance

If you, or someone you care about, are feeling overwhelmed with emotions like sadness, depression, or anxiety, or feel like you want to harm yourself or others, you or they can reach out to one of the following available resources:

- Call 911
- Call 988 — Lifeline (988lifeline.org)
- Visit the Disaster Distress Helpline, call 1-800-985-5990, or text TalkWithUs to 66746
- Visit the National Domestic Violence Hotline or call 1-800-799-7233/TTY 1-800-787-3224

For More Information

- NIOSH Traumatic Incident Stress (https://www.cdc.gov/niosh/stress/traumaticincidentstress/index.html)
- CDC How to Cope with Your Feelings (https://www.cdc.gov/disability-emergency-preparedness/communication-resources/coping-easy-read.html)
- Substance Abuse and Mental Health Services Administration Disaster Preparedness, Response, and Recovery (https://www.samhsa.gov/disaster-preparedness)
- Substance Abuse and Mental Health Services Administration First Responders and Disaster Responders Resource Portal (https://www.samhsa.gov/dtac/disaster-responders)
- Center for the Study of Traumatic Stress, Uniformed Services University, Disaster Fact Sheets (https://www.cstsonline.org/fact-sheet-menu/disasters)
- NIH National Institute of Environmental Health Sciences, Responder and Community Resilience (https://tools.niehs.nih.gov/wetp/index.cfm?id=2528)
- OSHA Resilience Resources for Emergency Response (https://www.osha.gov/emergency-preparedness/resilience-resources)
- NIH National Institute of Mental Health, Coping with Traumatic Events (https://www.nimh.nih.gov/health/topics/coping-with-traumatic-events)

Structural Damage and Integrity

Please see the following links for general information on this topic:

- CDC Staying Safe Around Buildings Damaged After a Disaster (https://www.cdc.gov/natural-disasters/psa-toolkit/staying-safe-around-buildings-damaged-after-a-disaster.html)
- FEMA Post-disaster Building Safety Evaluation Guidance – Report on the Current State of Practice, including Recommendations Related to Structural and Nonstructural Safety and Habitability (https://www.fema.gov/sites/default/files/2020-07/fema_p-2055_post-disaster_buildingsafety_evaluation_2019.pdf)
- OSHA Structural Collapse Guide (https://www.osha.gov/emergency-preparedness/guides/structural-collapse)

Temperature Extremes

Cold Stress

Cold stress can be a concern during emergency responses, as workers may be exposed to flood waters that are cool enough to cause trench foot or immersion hypothermia. Trench foot, also known as immersion foot, is an injury of the feet resulting from prolonged exposure to wet and cold conditions which can occur at temperatures as high as 60°F, if the feet are constantly wet. Immersion hypothermia develops much more quickly than standard hypothermia because water conducts heat away from the body faster than air, and can occur in any water temperature below 70°F. A low body temperature affects the brain, making the victim unable to think clearly or move well.

Considerations for Employers and Worker Organizations

- Train workers to recognize, prevent, and treat cold-related illness and injury (see For More Information below)
- Reduce workers' time spent in cold or wet environments
- Ensure access to warm areas and a place to change out of wet socks, clothes, and footwear
- Encourage workers to take breaks to warm up and dry off when needed
- Monitor workers in cold conditions and initiate a buddy system
- Include a medical and environmental thermometer and chemical hot packs in first aid kits
- Provide prompt medical attention to workers who show signs of cold-related illness or injury

Considerations for Workers and Volunteers

- Know the symptoms of cold-related injuries and illnesses and what to do about them (see For More Information below)
- Take regular breaks to warm up and dry off
- Work with a buddy and observe each other for signs and symptoms of illness or injury
- Stay hydrated and well nourished; warm beverages may help increase body temperature
- Carry an extra change of clothes, socks, and footwear, in case clothing gets wet

For More Information

- NIOSH Working in the Cold (https://www.cdc.gov/niosh/cold-stress/about/)
- NIOSH Workplace Solutions – Preventing Cold-related Illness, Injury, and Death among Workers (https://www.cdc.gov/niosh/docs/wp-solutions/2019-113)
- NIOSH Fast Facts – Protecting Yourself from Cold Stress (https://www.cdc.gov/niosh/docs/2010-115/pdfs/2010-115.pdf)

Heat Stress

Heat stress is a concern during responses, because workers are often exposed to hot and humid temperatures, wear protective clothing and equipment, and have physically difficult tasks. Excessive heat stress can result in a range of heat-related illnesses (HRI) from heat cramps or heat rash to potentially life-threatening heat stroke and rhabdomyolysis (muscle breakdown). Additional risk factors for HRI include dehydration, physical condition and health problems, medications, pregnancy, lack of recent heat exposure, and advanced age. Symptoms and first aid information can be found at the NIOSH Heat Stress topic page (see For More Information below). In addition, injuries may result from accidents caused by heat-related conditions such as, sweaty palms, fogged-up safety glasses, or mental confusion.

Considerations for Employers and Worker Organizations

- Conduct medical screening of all responders for medical conditions and medications that would place them at increased risk of HRI
- Provide training on the symptoms, risk factors, first aid, and prevention for HRI
- Acclimatize new and returning workers by gradually increasing their time working in hot conditions over 1 to 2 weeks
- Assign everyone a buddy and instruct them to observe each other for signs of HRI
- Ensure everyone takes appropriate hydration breaks. If in the heat more than 2 hours, drink 1 cup (8 oz.) of water every 15 to 20 minutes. If sweating for several hours, drink low sugar sports drinks
- Enforce work/rest cycles. Provide a cooling area with access to hydration fluids and monitored by a supervisor trained in identifying early signs of heat stroke
- Instruct workers that rhabdomyolysis symptoms may not start until several days after heat exposure, and prompt medical evaluation is necessary should symptoms occur

Considerations for Workers and Volunteers

- Learn the symptoms and risk factors, first aid, and prevention for HRI
- Take time to acclimatize. Gradually increase time working in hot conditions over 1 to 2 weeks
- Work with a buddy and observe each other for signs of HRI
- Stay hydrated. If in the heat more than 2 hours, drink 1 cup (8 oz.) of water every 15 to 20 minutes. If sweating for several hours, drink low sugar sports drinks. Avoid alcohol even during off-work hours, as it can cause dehydration
- Take frequent rest and hydration breaks in a cool area (air conditioning, vehicle, misting fans)
- Rhabdomyolysis symptoms may not start until several days after heat exposure. Seek medical evaluation immediately if you start to experience symptoms

For More Information

- NIOSH Heat Stress and Workers (https://www.cdc.gov/niosh/heat-stress/about/)
- OSHA-NIOSH Heat Safety Tool App (https://www.cdc.gov/niosh/heat-stress/communication-resources/app.html)
- NIOSH Fast Facts: Protecting Yourself from Heat Stress (https://www.cdc.gov/niosh/docs/2010-114/)
- NIOSH Protect Your Workers from Heat Stress Infographic (https://www.cdc.gov/niosh/heat-stress/communication-resources/infographic.html)
- NIOSH Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments (https://www.cdc.gov/niosh/docs/2016-106/default.html)
- PPE Heat Burden (https://www.cdc.gov/niosh/heat-stress/recommendations/ppe.html)

Traffic – Controlling Traffic along the Roadway

Workers who direct traffic are at risk of serious injury or death from being hit by a passing vehicle. Following disasters, workers without traffic control training may find themselves directing traffic for roadway incidents.

Considerations for Employers and Worker Organizations

- Follow the seven fundamental principles of temporary traffic control:
  1. Develop general plans or guidelines that provide safety for motorists, bicyclists, pedestrians, workers, and enforcement and emergency personnel
  2. Maintain traffic movement to the extent possible
  3. Give clear guidance to motorists, bicyclists, and pedestrians approaching and traveling through temporary traffic control zones and incident sites
  4. Conduct routine day and night inspections of temporary traffic control to provide acceptable levels of operations
  5. Maintain roadside safety during the life of the temporary traffic control zone by establishing clear zones and channelizing road users using signs, pavement markings, and approved traffic control devices
  6. Provide appropriate training for each person who affects temporary traffic control
  7. Maintain good public relations by keeping the motoring public well informed
- Provide workers with appropriate safety clothing and equipment (e.g., high visibility retro-reflective clothing, flags, flagging flashlights, stop/slow paddle)

Considerations for Workers and Volunteers

- Alert motorists with advance warning of incident scene and traffic conditions
- Wear high-visibility retro-reflective clothing
- Identify and maintain a safe location while working in or near moving traffic
- Provide adequate lighting to the flagger station during night work
- Use a stop/slow paddle as the primary hand-signaling device
  - If a flag must be used instead of a slow/stop paddle, then flags shall be red or fluorescent orange/red in color, and be a minimum of 24 inches square
  - Use a flashlight with a red glow cone at night. This is especially important if the flagger station is not well lit
  - When a flashlight is used for flagging at night, when the flagger station is not well lit, the flagger will hold the flashlight in the left hand and the paddle or flag in the right hand to tell approaching road users what they need to do

For More Information

- NIOSH Death in the Line of Duty: volunteer fire chief struck and killed on interstate highway while directing traffic—Pennsylvania (https://stacks.cdc.gov/view/cdc/163440)
- NIOSH Science Blog: Using Internal Traffic Control Plans to Prevent Construction Worker Injuries and Fatalities in Work Zones (https://blogs.cdc.gov/niosh-science-blog/2024/04/10/struck-by-2024/)
- Federal Highway Administration Manual on Uniform Traffic Control Devices for Streets and Highways: temporary traffic control (https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part6.pdf)
- National Academies of Sciences Guidebook for Nighttime Construction: impacts on safety, quality, and productivity (https://www.nap.edu/catalog/22723/a-guidebook-for-nighttime-construction-impacts-on-safety-quality-and-productivity)

Violence

During natural disasters and other catastrophic events, basic necessities such as water, food, medicine, and gas can become scarce, and the local economy often increasingly relies on cash. Under these conditions safety and health may be compromised and hostility, looting, and violence may increase.

Considerations for Employers and Worker Organizations

- Develop standard operating procedures (SOPs) for responding to potentially violent situations, such as simultaneous dispatch of police and emergency medical services (EMS). Establish an incident command structure necessary to protect all responders working in the area
- Develop integrated emergency communication systems that include the ability to directly relay real-time information between the caller, dispatch, and all responding emergency workers
- Ensure all emergency response workers have the capability for continuous radio contact and consider providing portable communication equipment that has hands-free capabilities
- Remain a safe distance from the scene any time weapons are mentioned and until police declare the area safe, including fire and EMS
- Provide body armor or bullet-resistant PPE to response workers and consistently enforce its use when responding to a potentially violent situation
- Requiring dispatch to archive details (e.g., locations and individuals involved) about calls where violence previously occurred and providing this detail to responding emergency workers is an option
- Develop coordinated response guidelines for violent situations for all response workers, and hold joint training sessions with law enforcement, mutual-aid, and emergency response
- Implement policies to prevent crime, such as buddy systems, driving on secure roads, leaving personal items in secure locations when not in use
- Provide training in violence de-escalation techniques, including the Power of Hello, and in mental health first aid

Considerations for Workers and Volunteers

- Protect yourself first and foremost. A responder will generally be considered a person with resources and a potential target. Do not be an easy target
    - Be aware of your surroundings and be vigilant. Do not openly carry or rely on a smartphone in public
        - Make eye contact and acknowledge those around you
        - Take training in the Power of Hello (see For More Information) to better assess those around you
    - Take training in mental health first aid and violence de-escalation to identify and de-escalate potentially violent situations
    - Be conscious that the relief supplies in your possession (food, water, medical supplies, and medications) may be incredibly valuable in the present circumstances. Keep them out of sight and in a secure location (locked or guarded) when not in use
    - Do not put yourself at risk to protect supplies, anything you have can be replaced. Remember, you cannot help anyone if you are hurt or killed
- Know who is in charge. A central incident command is necessary to protect all area responders
- Maintain frequent contact with co-workers and incident command (those in charge)
- Work in teams for awareness of your environment and those around you (safety in numbers)
- Work in secure and approved areas and be visible to patrolling security. Respect curfews in place to keep everyone safe. Also, lack of a curfew does not mean the environment is safe

For More Information

- NIOSH About Workplace Violence (https://www.cdc.gov/niosh/violence/about/index.html)
- FEMA Mitigation of Occupational Violence to Firefighters and EMS Responders (https://www.usfa.fema.gov/downloads/pdf/publications/mitigation_of_occupational_violence.pdf)
- NIOSH Career fire fighter killed and volunteer fire fighter seriously wounded when shot during a civilian welfare check – Maryland (https://www.cdc.gov/niosh/firefighters/programs/pdfs/face201606.pdf)
- Cybersecurity and Infrastructure Security Agency (CISA) Power of Hello (https://www.cisa.gov/topics/physical-security/non-confrontational-techniques/power-hello)

Work Hours and Fatigue

Disaster response often means working long shifts and many hours per week. Recognize that working long hours, irregular hours, and at night can lead to sleep deprivation and as a result many risks to health and safety including deaths from worker errors, injuries, vehicle crashes, and development of chronic illnesses.

Sleep is a biological need for life and health affecting mental and physical performance as well as long-term health. Sleep is also a critical logistical item, just like water, food, and the supplies needed to carry out operations, so it is important to make sleep a priority. Not getting enough sleep over a series of days builds up sleep debt that will seriously impair performance. The only way to pay off this debt is to get enough sleep. Most adults need 7 to 8 hours of good-quality sleep every 24 hours to perform during emergency operations.

Considerations for Employers and Worker Organizations

- Plan regular rest schedules. Establish at least 10 consecutive hours per day of protected time off-duty in order to obtain 7 to 8 hours of sleep
- Shift Lengths. Five 8-hour shifts, or four 10-hour shifts per week are usually tolerable. Depending on the workload, twelve-hour days may be tolerable with more frequent interspersed rest days. Shorter shifts (for example 8 hours), during the evening and night, are better tolerated than longer shifts
- Workload. Examine work demands with respect to shift length. Twelve-hour shifts are more tolerable for “lighter” tasks (for example desk work)
- Rest Days. Plan one or two full days of rest to follow five consecutive 8-hour shifts or four 10-hour shifts. Consider two rest days after three consecutive 12-hour shifts. At minimum, plan one full day of rest per week for each team member (including the team leader)
- Training. Provide training to make workers aware of strategies to reduce health and safety risks of long work hours and fatigue and the resources available to help with any difficulties
- Incident Analysis. Examine near misses and incidents to determine the role, if any, of fatigue as a root cause or contributing cause to the incident

Considerations for Workers and Volunteers

- Take frequent brief rest breaks (for example every 1 to 2 hours) during demanding work. These are more effective against fatigue than a few longer breaks. Allow longer breaks for meals
- Make yourself aware of the available strategies, resources, and training to prevent fatigue. Follow sleep hygiene best practices

For More Information

- About Fatigue and Work (https://www.cdc.gov/niosh/fatigue/about/)
- Interim NIOSH Training for Emergency Responders: Reducing Risks Associated with Long Work Hours (https://archive.cdc.gov/#/details?url=https://www.cdc.gov/niosh/emres/longhourstraining/default.html)

- NIOSH/OSHA Preventing Worker Fatigue Among Ebola Healthcare Workers and Responders (https://stacks.cdc.gov/view/cdc/26742)
- NIOSH Training for Nurses on Shift Work and Long Work Hours (https://doi.org/10.26616/NIOSHPUB2015115revised102019)

Workers-on-foot Hazards

Workers clearing debris following hurricanes or floods are at risk of serious injury or death when working near large operating vehicles and equipment. The visibility limitations of large vehicles and equipment make it hard for an operator to see workers-on-foot.

Considerations for Employers and Worker Organizations

- Train workers-on-foot to recognize visibility limitations of large vehicles and equipment
- Train equipment operators how to work safely around workers-on-foot
- Schedule work tasks to keep workers-on-foot out of areas where large equipment is operating
- Maintain communication between truck drivers, equipment operators, and workers-on-foot
- Train site supervisors in traffic control principles and how to apply those principles to operations involving large vehicles, equipment, and workers-on-foot

Considerations for Workers and Volunteers

- Wear high-visibility clothing
- Be aware of blind areas around vehicles and equipment
- Keep eye contact and positive communication with equipment operators
- Avoid being in areas designated for large vehicles and equipment unless required to be there and do not climb on or ride on large vehicles or equipment
- When operating large vehicles and equipment, avoid backing up vehicles and equipment whenever possible
- Stop driving the vehicle or equipment if a worker-on-foot is out of view
- Control movement of equipment and vehicles through an on-site internal traffic control plan that coordinates the flow of vehicles, equipment, and workers operating in close proximity
    - Create a simple drawing depicting movement of workers, vehicles, and equipment at the work site
    - Make a checklist of site-specific hazards, for example a downed power line or damaged culvert
    - Establish separate worker-on-foot and vehicle and equipment paths
    - Share on-site internal traffic control plan with workers-on-foot, truck and equipment operators, and anyone entering the site

For More Information

- NIOSH Construction Equipment Visibility (https://www.cdc.gov/niosh/motor-vehicle/constructionequipmentvisibilitydiagram/)
- NIOSH Building Safer Work Zones: measures to prevent worker injuries from vehicles and equipment (https://www.cdc.gov/niosh/docs/2001-128/default.html)
- NIOSH About Motor Vehicle Safety at Work (https://www.cdc.gov/niosh/motor-vehicle/about/index.html)

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For More Information Centers for Disease Control and Prevention
National Center for Occupational Safety and Health
Emergency Preparedness and Response Program Web: https://www.cdc.gov/niosh/research-programs/portfolio/epr.html

CDC-Info
Web: https://www.cdc.gov/cdc-info/
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