EARTHQUAKES

INTRODUCTION

An earthquake is a sudden slipping or movement of a portion of the Earth's crust or plates, caused by a sudden release of stresses. Earthquake epicenters are usually less than 25 miles below the Earth's surface and are accompanied and followed by a series of vibrations. Earthquakes occur without any obvious warning.

DAMAGE CAUSED BY EARTHQUAKES

Earthquakes are such a risk because shaking ground can:

- Cause buildings to move off their foundations or collapse.
- Damage utilities, structures, and roads.
- Cause fires and explosions.
- Cause structural instability, such as dam failures that can trigger flash floods.

Earthquakes can also trigger landslides and avalanches or tsunamis. After an earthquake, it is important to listen for emergency instructions.

Together, all of these types of damage threaten lives, property, and the environment.

LIKELIHOOD OF AN EARTHQUAKE

Twenty-six urban areas in all parts of the United States are identified as carrying significant risk of earthquake:

- The Western United States, particularly along the San Andreas Fault in California, the Cascadia Subduction Zone in western Oregon and Washington, and up the Alaskan coast
- The New Madrid Fault Zone in Missouri
- A few pockets on the east coast, including coastal South Carolina and New England

EARTHQUAKE STATISTICS

- More than 75 million Americans in 39 states face significant risk from earthquakes.
- California's 17 million people face the highest risk, followed by the residents of western Washington State.
- Four million people are within the destructive reaches of the New Madrid Fault.

Hundreds of tremors are felt each year, particularly in California. Major earthquakes are rare, however. Five major earthquakes have occurred in the last century in the United States. They occurred in:

- San Francisco, 1906 (700 - 800 lives lost)
- Alaska, 1964 (131 lives lost)
- San Fernando, California, 1971 (65 lives lost)
- Loma Prieta (Northern California), 1989 (66 lives lost)
- Northridge (Southern California), 1994 (61 lives lost)

There is no seasonal or yearly cycle of earthquake occurrence; earthquakes can happen at any time. Major earthquakes appear to occur in cycles of between 50 and 275 years.

An earthquake may last for seconds or minutes, while aftershocks may occur for months after the main earthquake.

THE RICHTER SCALE

Earthquakes are classified, based on the Richter Scale, as:

- Small: 5.0-5.9
- Moderate: 6.0-6.9
- Major: 7.0-7.9
- Great: 8.0 or greater

The Richter Scale measures earth movement caused by an earthquake. The Richter Scale has a logarithmic base, so each increment on the scale is multiplied by a factor of 10.

For example, an earthquake of magnitude 8.6 would not be twice as violent as one of 4.3, but rather would be 10,000 times worse. The 10 fold is in regard to amplitude. The actual energy released by an earthquake increases 31 times for each whole number increment.

EARTHQUAKE PREPAREDNESS

- Develop a home earthquake plan so that you know what to do during and after an earthquake.
- Conduct earthquake drills with your family or coworkers. Locate safe spots (e.g., under a sturdy table), and identify danger zones (e.g., near windows).
- Develop a plan for reuniting all family members after an earthquake occurs.
- Develop a family communication plan. This includes identifying an out of state contact, informing that person of the duties and expectations that duty entails.
- Keep supplies on hand, including food and water for 3 days, a flashlight with extra batteries, a portable radio, a fire extinguisher, and tools (see Assembling and Storing a Disaster Supply Kit in Unit 1).

To continue with preparedness:

- Store heavy and breakable objects on low shelves. Weed killers, pesticides, and flammable products should be stored on bottom shelves or in closed cabinets with latches. Chemicals will be less likely to create hazards if they are stored in lower, confined locations.
- Secure bookshelves, water heaters, and tall furniture to wall studs. Install latches on all cabinets, and anchor overhead lighting fixtures. Secure items that might fall, such as televisions.
- Have a licensed professional install flexible pipe to avoid gas or water leaks. This pipe should be inspected regularly, and replaced every ten years.
- Move beds away from windows.
- Move or secure hanging objects over beds, couches, and other places where people sit or lie.
- Keep shoes and a flashlight under the bed. Keeping shoes under the bed ensures quick access to prevent cutting feet on glass and reduces the risk that glass could fall into them.

It is a good idea to consult a structural engineer to evaluate your home. Ask questions about home repair and strengthening for exterior features, such as porches, decks, sliding doors, canopies, carports, and garage doors.

DURING AN EARTHQUAKE

During earthquakes, most injuries result from people being hit by falling objects and shattered glass, rather than being hurt in collapsing buildings. Many injuries can be avoided if people take appropriate steps to prepare.

Follow these measures to stay safe during an earthquake:

- Drop, cover, and hold. Move only as far as necessary to reach a safe place. Most persons injured in earthquakes move more than 5 feet during the shaking.
- If indoors, stay there until the shaking stops. Many fatalities occur when people run outside, only to be killed by falling debris from collapsing walls. It is safer to stay indoors until the shaking stops and it is safe to exit. When going outdoors, move quickly away from the building to prevent injury from falling debris.

  There is a 20% chance of an equal or larger quake in the 2 hours following an earthquake.

- If outdoors, find a spot away from buildings, trees, streetlights and power lines, and overpasses. Drop to the ground and stay there until the shaking stops. Injuries can occur from falling trees, street lights and power lines, or building debris.
- If in a vehicle, pull over at a clear location free of hazards and stop. Stay in the vehicle with seatbelt fastened until the shaking stops. Turn on the radio to get information regarding the quake and any damage to roadways that may have occurred.

Tips based on the area in which you live:

- If in a high-rise building, expect the fire alarms and sprinklers to go off during an earthquake. Check for and extinguish small fires. Do not use the elevators.
- If in a coastal area, move to higher ground. Earthquakes often generate tsunamis.
- If in a mountainous area or near unstable slopes or cliffs, be alert for falling rocks and other debris that could be loosened by the earthquake. Also, watch for landslides that could be triggered by the earthquake.

Immediately following an earthquake, you should:

- Check yourself for injuries. Often, people tend to check on others without checking themselves. You will be better able to help others if you are not injured or if you have received first aid for your injuries.
- Protect yourself from further danger by putting on long pants, a long-sleeved shirt, sturdy shoes or work boots, and work gloves.

AFTER AN EARTHQUAKE

After you have taken care of yourself, you should:

- Look for and extinguish small fires. Fire is the most common hazard following earthquakes. Extinguishing small fires and eliminating fire hazards will minimize the risk of a fire getting out of control.
- Clean up spills. By cleaning up medicines, bleaches, flammables, and other spills, it is possible to prevent many small but potentially dangerous hazardous materials emergencies.
- Inspect the home for damage. Aftershocks can cause additional damage to unstable buildings. If there are major cracks in the chimney or foundation or if the home or utilities have been moved by the earthquake, get everyone out of the home. Take photographs of the home and its contents to document insurance claims.
- Help neighbors who may require assistance.
- Tune to the Emergency Alert System (EAS) for emergency information and instructions.
- Expect aftershocks. Aftershocks often occur minutes, days, or weeks following an earthquake. When aftershocks occur, drop, cover, and hold. Remember that there is a 20% chance of an equal or larger quake within a few hours.

EARTHQUAKE MYTHS AND FACTS

Myth:	**"Mega-Quakes" can happen.**
Fact:	Strictly speaking, mega-quakes of magnitude 10 or more are possible; however, scientists agree that they are implausible. The magnitude of an earthquake is related to the length of the fault on which it occurs—the longer the fault, the larger the earthquake. The San Andreas Fault is only 800 miles long. To generate an earthquake of 10.5 magnitude would require the rupture of a fault that is many times the length of the San Andreas Fault. No fault long enough to generate a magnitude 10.5 earthquake is known to exist. The largest earthquake ever recorded was a magnitude 9.5 on May 22, 1960 in Chile on a fault that is almost 1,000 miles long.
Myth:	**Earthquakes only occur on the West Coast in the United States.**
Fact:	Earthquakes can strike any location at any time. But history shows they occur in the same general patterns over time, principally in three large zones of the earth. The world's greatest earthquake zone, the circum-Pacific seismic belt, is found along the rim of the Pacific Ocean, where about 81 percent of the world's largest earthquakes occur. That belt extends from Chile, northward along the South American coast through Central America, Mexico, the West Coast of the United States, the southern part of Alaska, through the Aleutian Islands to Japan, the Philippine Islands, New Guinea, the island groups of the Southwest Pacific, and to New Zealand. The second important belt, the Alpide, extends from Java to Sumatra through the Himalayas, the Mediterranean, and out into the Atlantic. This belt accounts for about 17 percent of the world's largest earthquakes, including some of the most destructive. The third prominent belt follows the submerged mid-Atlantic ridge. The remaining shocks are scattered in various areas of the world. Earthquakes in these prominent seismic zones are taken for granted, but damaging shocks occur occasionally outside these areas. Examples in the United States are New Madrid, Missouri, and Charleston, South Carolina. Many decades to centuries, however, usually elapse between such destructive shocks.

Myth:	**The 1906 San Francisco earthquake was the deadliest ever.**
Fact:	Though well known, the magnitude 7.8 San Francisco earthquake and ensuing fire killed 700 - 800 and razed large sections of the city. It was the most deadly in U.S. history, but that doesn't make it the worst the world has seen, by far. The deadliest earthquake in recorded history struck Shensi province in China in 1556, killing about 830,000 people. The 1976 magnitude 7.8 earthquake which struck Tangshan, China killed somewhere between 250,000 and 800,000 people. In 2003, the magnitude 6.5 earthquake in Bam, Iran killed more than 40,000 people. The earthquake in Chile on May 22, 1960, is the strongest to be recorded in the world with magnitude 9.5, and killed more than 4,000. For the record, the largest U.S. earthquake occurred on March 28, 1964, in Alaska. It was a magnitude 9.2 quake and took 131 lives.
Myth:	**California has the most earthquakes in the country.**
Fact:	Alaska registers the most earthquakes in a given year, with California placing second. California, however, has the highest risk and most damaging earthquakes because of its greater population and extensive infrastructure. Florida and North Dakota have the fewest earthquakes each year.
Myth:	**The ground can open up during an earthquake**.
Fact:	A popular cinematic device is a fault that opens during an earthquake to swallow up an inconvenient character, but gaping faults exist only in movies and novels. The ground moves across a fault during an earthquake, not away from it. If the fault could open, there would be no friction. Without friction, there would be no earthquake. Shallow crevasses can form during earthquake induced landslides or other types of ground failures. Faults, however, do not gape open during an earthquake.

Myth:	**California will eventually fall into the ocean.**
Fact:	The ocean is not a great hole into which California can fall, but it is itself land at a somewhat lower elevation with water above it. It's absolutely impossible that California will be swept out to sea. Instead, southwestern California is moving horizontally northward towards Alaska as it slides past central and eastern California. The dividing point is the San Andreas fault system, which extends from the Salton Sea in the south to Cape Mendocino in the north. This 800 mile long fault is the boundary between the Pacific Plate and North American Plate. The Pacific Plate is moving to the northwest with respect to the North American Plate at approximately 46 millimeters (2 inches) per year (the rate your fingernails grow). At this rate, Los Angeles and San Francisco will one day (about 15 million years from now) be next-door neighbors, and in an additional 70 million years, Los Angeles residents will find themselves with an Alaska zip code!
Myth:	**People can stop earthquakes.**
Fact:	We cannot prevent earthquakes from happening (or stop them once they've started). However, we can significantly mitigate their effects by characterizing the hazard (e.g., identifying earthquake faults, unconsolidated sediment likely to amplify earthquake waves, and unstable land prone to sliding or liquefying during strong shaking), building safer structures, and preparing in advance by taking preventative measures and knowing how to respond.

Myth:	**Lots of small earthquakes can prevent large earthquakes.**
Fact:	Seismologists have observed that for every magnitude 6 earthquake there are about 10 of magnitude 5, 100 of magnitude 4, 1,000 of magnitude 3, and so forth as the events get smaller and smaller. This sounds like a lot of small earthquakes, but there are never enough small ones to eliminate the occasional large event. It would take 32 magnitude 5's, 1000 magnitude 4's, and 32,000 magnitude 3's to equal the energy of one magnitude 6 event. So, even though we always record many more small events than large ones, there are far too few to eliminate the need for the occasional large earthquake.
Myth:	**We can predict earthquakes.**
Fact:	Earthquake prediction is the holy grail for earthquake scientists, but there currently is no accepted method to accomplish the goal of predicting the time, place, and magnitude of an impending quake. Research into earthquake prediction continues. However, the USGS approach has been to focus on providing long-range forecasts of the likelihood locations and impacts of damaging earthquakes. For example, scientists estimate that over the next 30 years the probability of a major earthquake occurring in the San Francisco Bay area is 62% and 60% in Southern California. Scientists are also able to predict the type of ground motion to expect based on the geology and the history of earthquake activity of the region. Engineers and building code developers use these models of site response to improve the safety of structures, thereby reducing the ultimate earthquake risk.

Myth:	**Animals can predict earthquakes.**
Fact:	Changes in animal behavior cannot be used to predict earthquakes. Even though there have been documented cases of unusual animal behavior prior to earthquakes, a reproducible connection between a specific behavior and the occurrence of an earthquake has not been made. Because of their finely tuned senses, animals can often feel the earthquake at its earliest stages before the humans around it can. This feeds the myth that the animal knew the earthquake was coming. But animals also change their behavior for many reasons, and given that an earthquake can shake millions of people, it is likely that a few of their pets will, by chance, be acting strangely before an earthquake.
Myth:	**It's been raining a lot, or very hot--it must be earthquake weather!**
Fact:	Many people believe that earthquakes are more common in certain kinds of weather. In fact, no correlation with weather has been found. Earthquakes begin many kilometers (miles) below the region affected by surface weather. People tend to notice earthquakes that fit the pattern and forget the ones that don't. Also, every region of the world has a story about earthquake weather, but the type of weather is whatever they had for their most memorable earthquake. It is also a myth that big earthquakes always happen at a particular time of day.
Myth:	**Good building codes mean safe buildings.**
Fact:	Architects and engineers are using knowledge learned from past earthquakes to make roads, bridges, and buildings safer in the event of major earthquakes. Local officials are also enacting new building codes to ensure new buildings are built with earthquake safety in mind. This includes both improving the design of new buildings and bridges as well as strengthening older units to incorporate the latest advances in seismic and structural engineering. But the best building codes in the world do nothing for buildings built before that code was enacted. While the codes have been updated, the older buildings are still in place. Fixing problems in older buildings—also known as retrofitting—is the responsibility of the building's owner.

Myth:	**Earthquakes kill people**.
Fact:	In an earthquake, the severity of the shaking can cause manmade and natural structures and the contents within these to fail or fall and injure or kill people. There have been large earthquakes with very little damage because they caused little shaking and/or buildings were built to withstand that shaking. In other cases, smaller earthquakes have caused great shaking and/or buildings collapsed that were never designed or built to survive shaking. Much depends on 2 variables: geology and engineering. From place to place, there are great differences in the geology at and below the ground surface. Different kinds of geology will do different things in earthquakes. For example, shaking at a site with soft sediments can last 3 times as long as shaking at a stable bedrock site such as one composed of granite. Local soil conditions also play a role, as certain soils greatly amplify the shaking in an earthquake. A soft, loose soil will shake more intensely than hard rock at the same distance from the same earthquake. Fires are another major risk during earthquakes as gas lines may be damaged and particularly hazardous.
Myth:	**During an earthquake you should head for the doorway.**
Fact:	That's outdated advice. In past earthquakes in unreinforced masonry structures and adobe homes, the door frame may have been the only thing left standing in the aftermath of an earthquake. Hence, it was thought that safety could be found by standing in doorways. In modern homes doorways are no stronger than any other parts of the house and usually have doors that will swing and can injure you. YOU ARE SAFER PRACTICING THE "DROP, COVER, AND HOLD" maneuver under a sturdy piece of furniture like a strong desk or table. If indoors, stay there. Drop to the floor, make yourself small, and get under a desk or table or stand in a corner. If outdoors, get into an open area away from trees, buildings, walls, and power lines. If in a high-rise building, stay away from windows and outside walls, stay out of elevators, and get under a table. If driving, pull over to the side of the road and stop. Avoid overpasses and power lines. Stay inside your car until the shaking is over. If in a crowded public place, do not rush for the doors. Crouch and cover your head and neck with your hands and arms. You should practice the "DROP, COVER, AND HOLD" method at work and at home at least twice a year.

Myth:	**Everyone will panic during the Big One.**
Fact:	A common belief is that people always panic and run around madly during and after earthquakes, creating more danger for themselves and others. Actually, research shows that people usually take protective actions and help others both during and after the shaking. Most people don't get too shaken up about being shaken up!

FIRE

INTRODUCTION

In 2006 fire killed more Americans than all natural disasters combined. Additionally, fire resulted in direct property damages in excess of 11 billion dollars.

Fires pose the following dangers:

- Asphyxiation: Asphyxiation is the leading cause of death in a fire, by a three-to-one ratio over burns.
- Heat: A fully developed room fire has temperatures over 1,100 degrees Fahrenheit.
- Smoke: Fire generates black, impenetrable smoke that blocks the vision, stings the eyes, and clogs the lungs. It may be impossible to navigate through such smoke.

FIRES IN THE HOME

Roughly 85 percent of all fire deaths occur where people sleep, such as in homes, dormitories, barracks, or hotels. The majority of fatal fires occur when people are less likely to be alert, such as during nighttime sleeping hours.

Nearly all home and other building fires are preventable, even arson fires. The majority of arson fires are caused by juveniles who often respond to counseling, and the rest can be deterred in a number of ways. No fire is inevitable.

In 2006, 2,620 people died in reported home fires in the United States—about 7 people per day. In addition, thousands of people were injured in home fires, many with severe burns (USFA).

Fire victims are disproportionately children or the elderly. One out of every four fires that kill young children is started by children playing with fire (NFPA 2003).

Approximately 900 senior citizens die in fires annually.

The key to fire preparedness is a family fire plan. Every family fire plan should include:

- Smoke alarms on every level of the home and near all sleeping areas.
- Two escape routes from every room in the home. Escape ladders should be a consideration for sleeping areas on upper floors. These ladders should be stored near windows.
- Practice the escape plan at least twice each year. Practice getting out both day and night. Practice escapes should include low-crawl escapes, ensuring that all family members' heads are one to two feet above the floor. As part of escape planning, select a safe area outside the home for the family to gather after escaping the fire. Ensure that all know to meet at that place so, when firefighters arrive, they can be notified quickly of family status.
- Practice alerting family members by yelling "Fire!" several times. In a real fire, this alert may help family members escape.
- Learn the fire department's emergency number, especially if the community does not have 9-1-1 service. Make sure that all family members know to escape the fire first, then call the fire department from a neighbor's home.

It is very important to discuss with the entire family what to do in a fire. Every family member needs to know what to do in case the entire family is not together when a fire occurs. Also, awareness helps to reduce fear and ensures that all family members know what to do.

If you see a fire or hear the smoke alarm, you should:

- Yell "Fire!" several times and exit quickly. Never use an elevator when escaping a fire. Other points to remember include:
  - If escaping through smoke, crawl low, under the smoke.
  - If escaping through a closed door, look first at the door. If air is being sucked under the door or smoke is seeping out the top of the door, do not open the door.
  - If there is no sucking air or escaping smoke, feel the door with the back of the hand, as well as the space between the door and its frame and the doorknob before opening the door. Never open a door that feels hot.
- Go to the agreed upon meeting place, then send one person to call the fire department. Gathering at the meeting place first will quickly indicate who is outside and allow family members to advise firefighters immediately when they arrive.

If smoke, heat, or flames block all exit routes, you should stay in the room with the door closed.

- Stop up areas where smoke could come in using wet towels, sheets, or clothes under doors and in vents.
- Call the fire department and tell them where you are—even if the fire department has already been called.
- Open windows slightly at top and bottom to allow smoke to exit and fresh air to enter the room.
- Stay low and near a window to breathe fresh air.
- Hang or wave a bright-colored or white cloth at the window to signal the fire department when they arrive.

To help prevent fires in your home:

- Conduct a home hazard hunt. Many items and conditions around the home can present fire hazards. Taking time to look for and eliminate hazards will reduce the risk.
- Inspect wood stoves and chimneys annually. Burning wood leaves creosote deposits which are flammable in the firebox, flue, and chimney. These buildups must be removed professionally to minimize the risk of fire.
- Purchase heaters only if they have been laboratory tested and approved. Follow the manufacturer's directions for use. Keep blankets, clothing, curtains, furniture, and any other flammable items at least 3 feet away from heat sources. Plug heaters directly into a wall socket, and unplug them when they are not in use.
- Keep matches and lighters away from children. Children are fascinated by fire and will play with matches and lighters if they are available.
- Check electrical wiring, and replace frayed extension cords, exposed wires, or loose plugs. Ensure that all outlets have cover plates, and avoid overloading outlets or extension cords.
- Keep combustible materials away from the stove, including towels, clothing, curtains, bags, boxes, and other appliances. Combustible materials near stoves can catch fire quickly while the cook's attention is elsewhere.

These are only a few suggestions for preventing fires. Additional suggestions, including how to select and use fire extinguishers, will be covered in Unit 2, Fire Safety.

WILDFIRES

There are three classes of wildfires:

- A surface fire is the most common type of fire and burns along the floor of a forest, moving slowly and killing or damaging trees.
- A ground fire is usually started by lightning and burns on or below the forest floor in the humus layer down to the mineral soil.
- Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees.

Wildfires often begin unnoticed and many fires can spread quickly, igniting brush, trees, and homes.

Because more people are choosing to make their homes in woodland settings in or near forests, rural areas, or remote mountain sites, a greater percentage of the population is becoming vulnerable to the hazards of wildfire.

More than four out of every five forest fires are started by people. Negligent human behavior, such as smoking in forested areas or improperly extinguishing campfires, is the cause of many forest fires.

Improper design, combustible materials and landscaping, and lack of attention to weed abatement in woodland residential areas, contribute to the hazard to humans and animals.

Some of the strategies for wildfire preparedness are the same as for fires in the home, and developing a family fire escape plan will be helpful for wildfires as well as fires in the home. In the case of wildfires, some additional strategies are required.

To prepare for a possible wildfire, you should:

- Keep a garden hose that is long enough to reach any area of the home and other structures. Buy a ladder that is high enough to reach the roof.
- If a pool, lake, or stream is available, consider obtaining a portable gasoline-powered water pump.
- Equip chimneys and stovepipes with spark arresters.
- Keep fire tools handy. Fire tools include shovels, rakes, axes, chain or handsaws, buckets, and one or more fire extinguishers.
- Use proper building and landscape design. Wildland fire experts recommend that flammable vegetation be cleared to a distance of at least 30 feet around the home. This is commonly referred to as a “defensible space” or “safety zone.” Experts also recommend the use of fireproof or fire resistant roofing in areas where wildfires are a hazard.

Additional strategies for wildfire preparedness include:

- Marking all driveway entrances so that firefighters are aware that the home is there and can find it quickly during a fire.
- Following all local burning laws. Never burn during dry weather or within 75 feet of a structure or combustibles. Never leave a fire unattended, not even a cigarette.

Despite best efforts, wildfires will still occur.

There are several measures that you should take inside the home to prevent damage from wildfire:

- Listen for emergency information on radio or television stations or the Emergency Alert System (EAS). If advised to evacuate, do so immediately. Delay increases the risk of being trapped by the fire and can interfere with fire department response.
- Confine pets to one room or arrange for them to stay with a friend or relative.
- Move flammable furniture to the center of the home, away from windows and sliding glass doors.
- Remove flammable drapes and curtains. Close venetian blinds and noncombustible window treatments.
- Close all doors and windows to reduce air flow.

If trapped by a wildfire, you should try to find a body of water in which to crouch. If possible, cover the head and upper body with wet clothing. If a body of water is not accessible, look for shelter in a cleared area or within a rock bed. Breathe the air close to the ground, preferably through a dry cloth.

- Use caution when reentering the area after a wildfire. Hazards may still exist, including hot spots, which can flare up without warning.
- Inspect the roof immediately and extinguish sparks or embers that could reignite the fire.
- Have propane or heating oil tanks inspected by the supplier before using the system. Tanks may shift or fall from their stands or fuel lines may have kinked or weakened. Heat from the fire may have caused the tank to warp or bulge (especially if the tank is not vented).
- Check the stability of trees around the home. They may have lost stability as a result of fire damage. Also, identify and mark ash pits (created by burned trees and stumps). Falling into a hot ash pit can cause serious burns.
- If there is no power, check the main breaker. Fires may cause breakers to trip. If the breakers are on and power is still not available, call the utility company.

You must take precautions while cleaning the property following a fire by:

- Wetting down debris to reduce dust in the air
- Using an N-95 mask with nose clip
- Wearing coverall and leather gloves to protect the hands
- Checking with local authorities before disposing of household hazardous materials

FLOODS

INTRODUCTION

Floods are one of the most common hazards in the United States. A flood occurs any time a body of water rises to cover what is usually dry land. Flood effects can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states. While some floods develop slowly, over a period of days; some may develop quickly, and cause flash floods. Floods are the most frequent and costly natural disasters in terms of human hardship and economic loss. According to a 2007 report by the U. S. Geological Survey (USGS), over 75 percent of declared Federal disasters are related to floods.

CAUSES

Floods and flood damage have many causes:

- Heavy rain, which may occur over several days or as intense rainfall over a short period of time.
- Spring snowmelt or ice or debris jams that cause a river or stream to overflow its banks and flood the surrounding area.
- Dam and levee failure. While dam and levee failure occurs relatively infrequently, it can be a risk especially following prolonged heavy rain, such as occurred throughout the Midwest in 1993 and 2008.
- Low absorption or no soil percolation. As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff 2-6 times over what would occur on natural terrain. In areas with rocky geology, rainfall or snowmelt cannot be absorbed. The result can be flash flooding with little or no warning.
- Business and residential growth in flood areas. Homes and businesses located on flood plains are at significantly greater risk for serious flood damage.

Each of these causes can be factored to several key elements.

- Rainfall intensity is the rate of rainfall (in inches per hour).
- Duration is how long the rain lasts.
- Topography is the overall configuration of the Earth's surface, including natural and manmade features.
- Soil conditions include the type of soil, the amount of moisture in the soil, and the amount of soil relative to the amount of rock.
- Ground cover includes vegetation as well as manmade covers. Ground that includes larger amounts of vegetation can absorb greater amounts of water. Ground that is paved or has structures on it will result in runoff.

FLOOD HAZARDS

The reasons floods pose such a risk are that:

- Heavy rainfall can exacerbate problems with runoff, absorption, and flood-control measures.
- Ravine flooding can potentially inundate downstream areas when protection fails.
- In rocky and heavily paved areas, lack of absorption can cause flash flooding.

Every major drainage basin in the United States has a floodplain surrounding it. Two areas where inundation is very likely are:

- Along the Mississippi River
- The central valley of California

Most areas of the United States are subject to some degree of flooding. Floodplain areas are widespread in the South Atlantic, the Gulf Coast, and the Missouri and Arkansas River basins.

The costs associated with flooding are increasing as more development occurs in coastal areas and floodplains. Each year, flood losses and damages reach into the billions of dollars. During the 10-year period from 1992 to 2001, floods cost, on average, $4.1 billion annually. The long-term (30-year) annual average lives lost is 99 per year; most of these fatalities are a result of flash floods.

In 2005, Hurricane Katrina wreaked havoc on the Gulf states, causing an estimated $150 billion dollars in damage, and resulting in nearly 2,000 fatalities. Much of this damage occurred after the hurricane during the resulting flood.

Floods are measured according to the height that the waters reach. Their magnitude is based on the chances that water levels will equal or exceed a certain point on a recurring basis. Intervals of probability are classified into hazard zones.

FLOOD AWARENESS

"Rule number one" is to move quickly to higher ground. Flood waters can carry debris, scour soil and asphalt, and trigger landslides. Even shallow-depth, fast-moving flood waters of 24 inches can produce enough force to carry away a vehicle, and six inches of swiftly moving water can knock someone off his or her feet. Never try to walk, swim, or drive through flood waters!

The risk of flood will be reported by radio and television, as well as NOAA Weather Radio using EAS (Emergency Alert System), as soon as the National Weather Service (NWS) issues a flood or flash flood watch or warning.

Flood watches alert the public that flooding is possible within the watch area. If you are in a watch area, you should:

- Keep informed.
- Be ready to act if the watch is upgraded to a warning or if you see flooding.

There are two types of flood warnings:

- A flood warning is issued when flooding is expected to occur more than 6 hours after heavy precipitation, snowmelt, ice jams, or dam failures, or when a river is expected to exceed flood stage in the next 48 hours.
- A flash-flood warning is issued when the potential exists for heavy precipitation to create flash flooding in the next 6 – 24 hours.

Whether the National Weather Service (NWS) issues a flood warning or a flash-flood warning, persons within the warning area should take precautions immediately! Both watches and warnings will include protective measures that are recommended by NWS.

FLOOD PREPAREDNESS

It is important to:

- Know the flood risk in the area, including the elevation above flood stage and the history of flooding in the area.
- Prepare a flood evacuation plan and practice the route. Be aware of which roads become flooded and which remain passable. The entire family should know where to go if they have to evacuate.
- Obtain flood insurance if living in a floodplain (Special Flood Hazard Area). Homeowner's policies do not cover flooding! Check with the city or county government to review the Flood Insurance Rate Maps (FIRMs). Then, check with an insurance agent to obtain coverage under the National Flood Insurance Program (NFIP).
- Keep important documents in a water-proof box. Most documents can be replaced, but some are more difficult to replace than others. Protecting them in a water- (and fire-) proof container is the safest plan of action.
- Check emergency messages using a portable radio. NWS and local officials update watches and warnings as necessary. Listen often for up-to-date information.

The best way to protect your property from flood damage is to avoid building in a flood plain unless the home is elevated and other flood protection measures are taken. If an existing home is in a floodplain, there are some steps that can help reduce potential damage:

- Elevate the furnace, water heater, and electric panel to at least one foot above the level of the floodplain (also called the Base Flood Elevation). In some areas, elevating these appliances and utilities may mean relocating them to a higher floor or even to the attic.
- Move furniture and other items to a higher level. Even if the main floor of the home is flood damaged, moving furniture and other items to a higher level will reduce flood losses.
- Install check valves in plumbing to prevent flood water from backing up into the drains of the home.
- Waterproof the basement floor and walls to prevent seepage through cracks.

In some cases, even these suggestions will not be enough to prevent serious damage from flooding. Those who live in floodplains should consult building professionals if they think they need more elaborate mitigation measures (such as elevation).

If you must evacuate, you should:

- Not walk, swim, or drive through flood waters. Learn and practice driving the local flood evacuation routes. They have been selected because they are safe and provide the best means of escaping flood waters. Flood waters move swiftly and may carry debris that can cause injuries. Remember that 24 inches of water can wash a car away and 6 inches of fast moving water can knock a person off his or her feet.
- Stay off bridges over fast-moving water. Fast-moving water can wash bridges away without warning, especially if the water contains heavy debris.
- Keep away from waterways. If you are driving and come upon rapidly rising waters, turn around and find another route. Move to higher ground away from rivers, streams, and creeks.
- Pay attention to barricades. Local responders place barricades to warn of flooding ahead or to direct traffic safely out of the area. Never drive around barricades.
- Avoid storm drains and irrigation ditches. During a flood, storm drains and irrigation ditches fill quickly with fast-moving water. Walking in or near storm drains or irrigation ditches is nearly a sure way to drown.
- Keep family together. As always, family is most important in the event of a flood. Do not lose track of family members.

The best thing to do is listen to EAS information to determine whether it is safe to return and if there are special instructions to follow such as boiling water.

Precautions to follow after a flood.

- Stay out of flooded areas. Flooded areas remain unsafe. Entering a flooded area places you—and the individuals who may need to rescue you—at risk.
- Reserve the telephone for emergencies only. Telecommunication lines (both land line and cellular) will be busy following a flood. A nonemergency call may prevent an emergency call from getting through. It is best not to use the phone unless it is necessary.
- Avoid driving, except in emergencies. Reserve the roads for those who must evacuate and for emergency vehicles.
- Wait for authorities to issue a clear message that it is safe to return to evacuated areas.
- Be aware that snakes and other animals may be in your house in the aftermath of a flood. Look for loose boards and dark spaces, and investigate with care.

This page intentionally left blank.

EXCESSIVE HEAT

INTRODUCTION

A heat wave is a prolonged period of excessive heat, often combined with excessive humidity. Extreme heat is defined as temperatures that hover 10 ° F or more above the average high temperature for the region and last for prolonged periods of time.

Under normal conditions, the body's internal thermostat produces perspiration that evaporates and cools the body. In abnormal heat and high humidity, however, evaporation is slowed and the body must work extra hard to maintain its normal temperature. The elderly, the very young, and those who are disabled are at risk from extreme heat. Also, because men sweat more than women, they are more likely to have difficulty with extreme heat as a result of dehydration.

Studies indicate that excessive heat that continues for periods longer than 2 days causes a significant rise in heat-related illnesses. Spending several hours each day in air conditioning, however, can reduce the risk of heat-related illness.

People living in urban areas may be at greater risk from the effects of a prolonged heat wave than people living in rural regions. Stagnant atmospheric conditions can trap pollutants in urban areas, and asphalt and concrete stay warm longer. This phenomenon is known as the "urban heat island effect."

The risks associated with a heat wave can include:

- Heat cramps: Muscular pains and spasms resulting from heavy exertion. Heat cramps are often the first signal that the body is suffering from excessive heat.
- Heat exhaustion: A form of mild shock that typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating.
- Heat/Sun stroke: A life-threatening condition in which the victim's temperature control system that produces sweating to cool the body stops working. The body temperature can rise to the extent that brain damage and death may result if the body is not cooled quickly.

During a heat wave, you should:

- Seek air conditioning. If the home does not have air conditioning, persons should seek areas that do. Schools, libraries, shopping malls, community centers, and many other public places offer good refuges during extreme heat.
- Avoid strenuous activities during the hottest period of the day. Heat-related illnesses can strike quickly, especially for those who perform strenuous work during the heat of the day.
- Wear lightweight, light-colored clothing. Light colors reflect the sun's rays better

than dark colors, which absorb the heat. Protect the face and head by wearing a wide-brimmed hat.

- Check on family members and neighbors who do not have air conditioning or who have medical problems that make them particularly susceptible to heat-related illnesses.
- Drink plenty of fluids. Dehydration can occur quickly and can be unnoticed or mistaken for other illnesses. Increasing fluid intake, even if not thirsty, can reduce the risk of dehydration.

  Remember, however, that persons who are on fluid-restrictive diets (e.g., those with kidney disease) should consult their doctors before increasing fluid intake.
- Take frequent breaks. Taking frequent breaks and seeking shade allows the body to cool down.

To protect against excessive heat in the home:

- Install additional insulation. Insulation helps to keep heat out in the summer as well as to keep heat in during the winter months.
- Protect windows and glass doors. Consider keeping storm windows installed throughout the year.
- Use attic fans. Because heat rises, attic fans can help clear the hottest air from the home.

EXCESSIVE HEAT MYTHS AND FACTS

MYTH:	**Stay in the home during a heat wave.**
FACT:	Air conditioning in homes and other buildings markedly reduces danger from the heat. If you must stay in a home where air conditioning is not available, stay on the lowest floor, out of the sunshine. If possible, however, choose other places to get relief from the heat during the hottest part of the day.
MYTH:	**Beer and alcoholic beverages are best to satisfy thirst in extreme heat.**
FACT:	Although beer and alcohol appear to satisfy thirst, they actually cause additional dehydration. Unless you are on a fluid-restricted diet, drink water during a heat wave, even if you don't feel thirsty.
MYTH:	**During extreme heat, the best time to exercise is during the late morning and early afternoon.**
FACT:	Many heat emergencies occur in those who exercise or work during the hottest part of the day. Reduce, eliminate, or reschedule strenuous activities. If you must do strenuous activity, do it during the coolest part of the day, which is usually in the morning between 4 a.m. and 7 a.m.
MYTH:	**A sunstroke is not life-threatening.**
FACT:	A heat stroke or sunstroke is life-threatening. The victim's temperature control system, which produces sweating to cool the body, stops working. The body temperature can rise so high that brain damage and death may result if the body is not cooled quickly.
MYTH:	**You can only get a sunburn on really hot days.**
FACT:	Sunburn (and tanning) result from exposure to ultraviolet (UV) radiation, which is distinct from the light and heat emitted by the sun. You cannot see or feel UV rays, but they can be quite damaging. UV exposure has been linked to skin cancer and other skin disorders, cataracts and other eye damage, and immune system suppression. UV exposure is a year-round issue, and clouds provide only partial protection.

[This page intentionally left blank]

HURRICANES AND COASTAL STORMS

HURRICANES

A hurricane is a violent area of low pressure forming in the tropical Atlantic Ocean from June to November. August and September are peak months. (Similar Western Pacific Ocean storms are called typhoons.) Hurricanes have winds of 75 miles per hour or more and are accompanied by torrential rains and – along coastal areas – a storm surge.

Although coastal storms may have hurricane-force winds and may cause similar kinds and amounts of damage, they are not classified as hurricanes because they do not originate in the tropics. Coastal storms typically form along the east coast from December through March.

HURRICANE AND COASTAL STORM RISKS

Hurricanes and coastal storms pose a risk because powerful winds and storm surges can:

- Damage or destroy structures
- Lift and move unstable structures and objects
- Damage utility and sewage lines
- Give rise to tornadoes
- Cause coastal erosion
- Cause floods
- Threaten lives
- Make roads impassable
- Disrupt communication lines, including 911
- Overwhelm first responders

The accompanying heavy rains can inundate coastal areas and inland communities, presenting another risk to life and property.

SAFFIR-SIMPSON HURRICANE SCALE

Hurricanes are classified according to the Saffir-Simpson Hurricane Scale, which measures wind speed. The chart below also includes the anticipated barometric pressure (in inches) and storm surge for each category of storm.

HURRICANE CLASSIFICATIONS

Category	Barometric Pressure (Inches)	Windspeed (Miles Per Hour)	Storm Surge (Feet)
I - Minimal	Above 28.94	74-95	4-5
II - Moderate	28.50-28.91	96-110	6-8
III - Extensive	27.91-28.47	111-130	9-12
IV - Extreme	27.17-27.88	131-155	13-18
V - Catastrophic	Less Than 27.17	More Than 155	More than 18

FREQUENCY OF HURRICANES

The greatest likelihood of a hurricane striking land is along the Gulf Coast and the southeastern seaboard. However, hurricanes also have hit central Pennsylvania and the coasts of New Jersey, New York, and New England.

Each year an average of 11 storm-strength weather disturbances develop over the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Of these, half may grow to hurricane proportion. Two hurricanes are likely to strike the U.S. coast each year.

STATISTICS

Nearly 100 million Americans are at risk from hurricanes. Specifically:

- Almost 14 million live in the area where winds greater than 125 mph have been recorded (i.e., the tip of Florida to the North Carolina coast).
- More than 6 million live in storm surge areas.

Although deaths from hurricanes are decreasing as hurricane warning systems improve, property damage is on the rise.

PREPARING FOR A HURRICANE OR COASTAL STORM

Many people do not realize the threat that hurricanes can present – even if they live in hurricane-prone areas – because they have not experienced a major hurricane.

There are certain preparations that people who live in high-risk areas should take to prepare for a hurricane or coastal storm before one occurs:

- Know the risk and evacuation routes. Being aware of the risk and how to get out of the area as quickly as possible should an evacuation order be issued is one of the key preparedness steps to take. Driving the evacuation routes to ensure familiarity before a storm and identifying shelter locations will make an evacuation smoother.
- Develop an action plan. When will you begin preparing your home for possible high winds and storm surge? How much time will it take you to evacuate, if necessary? Does your evacuation route change based on the direction of the storm? Will you go to a shelter or a hotel? These are all questions that anyone who lives in a high-risk area should answer as part of hurricane or coastal storm planning. While creating this plan, keep in mind any provisions that might be necessary to accommodate the elderly, those with special needs, and pets.
- Secure needed supplies. If you assemble your disaster supply kits as suggested in this unit, you will have everything that you need for hurricane and coastal storm preparedness.
- Flood-proof property. Flood-proofing can range from using a water sealer in areas that have basements to sandbagging to elevating utilities to moving furniture to the second floor.
- Create a personal disaster supply kit for your family. Keep in mind the needs of the elderly, those with special needs, and your pets. Include up to 2 weeks of non-perishable food.
- Secure mobile homes and any outdoor items that could be picked up by the wind or washed away.

Everyone should have flood insurance, even if they're not in a flood zone. It might also be beneficial to have insurance for windstorms and homeowner's insurance for internal belongings.

You should know the details of your insurance plans, including deductibles and what is and is not included. Take photos and videos of your property at least once a year.

BEFORE A HURRICANE

Steps that everyone who is at risk should take before a hurricane strikes:

- Board up all windows and glass doors. Studies have shown that if the wind can be kept out of a structure, the structure will withstand high winds relatively well. If wind is allowed inside, however, additional structural and nonstructural damage will occur very quickly. The best way to prevent wind from getting into a structure is to cover all windows and glass doors with plywood or to close hurricane shutters. Have tarps available for temporary roof repairs.
- Check batteries. Often electricity is disrupted by hurricanes (and coastal storms) and, depending on the extent of damage, may not be restored immediately. Check batteries for flashlights and portable radios to ensure that they are fresh. Replace old batteries, and have extra on hand.
- Stock up on nonperishable food. A 3-day supply of food and water for each family member is a must.
- Listen to the Emergency Alert System (EAS) for local emergency information. Local officials will have the most current emergency information about the storm (including watch and warning information from the National Weather Service) and will provide information and instructions via EAS.

DECIDING TO STAY OR GO

If you are in an evacuation zone, LEAVE IMMEDIATELY. As CERT members, you set the example for your community.

If you are evacuating:

- Determine where you will go. Identify a family member's or friend's house, or a public shelter, where you will go if you evacuate. Keep in mind those with special needs, including the elderly, and pets. Preregistration and approval at shelters is often required. Check with the shelter to determine what supplies you should bring.
- Leave as early as possible.

If you are NOT in an evacuation zone and decide to stay:

- Follow the sheltering guidelines.
- Determine a safe room in your home.
- Fortify your house. Consult www.flash.org for information on window protection, garage door protection, roof protection, and door protection. Secure outdoor items that could be blown away and cause damage.
- Assist those with special needs. A wheelchair dependent person who lives in a high rise, for instance, might be "shut-in" if the electricity goes out and the building's elevator is inoperable. He/she will require food, water, and possibly medicine.

DURING A HURRICANE

- Stay indoors. If advised to evacuate, do so. However, do not assume that because an evacuation order is not issued that the situation is safe. Even Category 1 hurricanes are dangerous. Stay indoors and listen to EAS for up-to-date information.
- If advised to take shelter:
    - Take the family disaster supply kit.
    - Go to an interior "safe" room without windows, if possible.
    - Stay in the safe room and listen to EAS for additional instructions.
- Stay away from flood waters. If the home begins to flood, go to a higher level, if possible.
- Be aware of the "eye." The "eye" of a hurricane is typically 20 to 30 miles wide in relation to the storm, which may have a diameter of 400 miles. During the "eye," there are very few clouds, but it is important to remember that the storm is not over.
- Be alert for tornadoes. Tornadoes are frequently associated with hurricanes, and are most common in the right-front quadrant of the storm.

AFTER A HURRICANE

- Do not reenter the area until it is declared safe. Reentry to the area too soon may cause unnecessary risk—and may keep first responders and utility workers from doing their jobs.
- Use a flashlight to inspect for damage. Do not assume that utilities are undamaged following a hurricane or coastal storm. Checking for damage with a flashlight reduces the risk of injury, especially from a damaged electric supply.
- Wear protective clothing, sunscreen, and bug repellant.
- Be aware that lost pets may be scared and more inclined to bite.
- Be aware of traffic hazards. Do not drive through flooded areas. Watch for traffic signals that may be out of service.
- Check on neighbors.
- If you use a generator, take safety precautions. Follow proper directions for use and never use a generator indoors, including garages. Keep the generator at least 10 feet from any opening of anyone's home or business. Consult your local fire marshal for more information.
- Stay away from downed power lines. The only sure way to limit risk from downed power lines is to avoid them completely.
- Turn off utilities, if necessary. If there is a gas smell or a fire, turn off the gas valve. If there is damage to electric lines or supply, shut off the electricity by turning off small circuit breakers (or unscrewing fuses) first, then turning off the main breaker (or fuse).
- Reserve the telephone for emergency use. Telephone lines are invariably overloaded following a disaster or emergency. Reserving telephone use (both landline and cellular) for emergency use helps to ensure that those calls that must go through do so.
- Listen to Emergency Alert System (EAS) for updated information. Local officials will use EAS extensively to provide emergency information and instructions. Be sure to tune in often for updates.

LANDSLIDES AND MUDFLOWS

A landslide is a rapid shift in land mass that is typically associated with periods of heavy rainfall or rapid snowmelt. Landslides tend to worsen the effects of flooding that often accompanies them. In areas that have been burned by forest and brush fires, a lower threshold of precipitation may initiate landslides.

While some landslides move slowly and cause damage gradually, others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

Areas that are generally prone to landslide hazards include:

- Existing old landslides
- The bases of steep slopes
- The bases of drainage channels
- Developed hillsides where leach-field septic systems are used

Debris flows — sometimes referred to as mudslides, mudflows, lahars, or debris avalanches — are common types of fast-moving landslides. They usually start on steep hillsides as shallow landslides that accelerate to speeds that are typically about 10 miles per hour, but can exceed 35 miles per hour.

The consistency of debris flows range from watery mud to thick, rocky mud that can carry away items such as boulders, trees, and cars. When the flows reach flatter ground, the debris spreads over a broad area.

The most destructive types of debris flows are those that accompany volcanic eruptions.

One of the most important steps that you can take is to become familiar with the landslide history in the area. You are at lower risk if you are in areas that:

- Have not moved in the past
- Are relatively flat and away from sudden changes in slope
- Are along ridge lines but set back from the tops of slopes

Look for patterns of storm-water drainage on slopes around your homes, noting especially:

- Places where runoff water converges, increasing the flow over soil-covered slopes
- Signs of land movement, such as small landslides, debris flows, or progressively tilting trees

If you see signs that indicate a risk of landslide, you should seek a professional site analysis and assistance with mitigation measures.

SEVERE THUNDERSTORMS

While all thunderstorms are dangerous, the National Weather Service (NWS) defines a severe thunderstorm as one that:

- Produces hail at least three-quarters of an inch in diameter.
- Has winds of 58 miles per hour or greater.
- Produces a tornado.

Thunderstorms may occur singly, in clusters, or in lines. Some of the most severe weather occurs when a single thunderstorm affects one location for an extended time.

The risks associated with severe thunderstorms include:

- Lightning. Although most individuals survive lightning strikes, 75 to 100 people in the United States are killed each year by lightning—more than are killed each year by tornadoes. Lightning also causes an estimated 5 billion dollars in economic losses each year in the United States.
- Hail. Hail can be smaller than a tear or as large as a softball and can cause destruction to automobiles, glass surfaces, roofs, plants, and crops. Pets and livestock are particularly vulnerable to hail.
- Downbursts and straight-line winds. Thunderstorms can produce winds as high as 150 miles per hour, strong enough to flip cars, vans, and trucks. These winds can have disastrous effects on air travel.
- Flash floods. Heavy rain from thunderstorms can cause flash flooding. Flash floods are the number one cause of death associated with thunderstorms.
- Tornadoes. Some thunderstorms may spawn tornadoes.

The National Weather Service (NWS) Storm Prediction Center issues watches and warnings of hazardous weather, including severe thunderstorms. Keep your NOAA Weather Radio handy!

- A watch is issued when severe thunderstorms are possible in and near the watch area. Citizens should be alert for approaching storms.
- A warning is issued when severe weather has been reported by spotters or indicated by radar. Warnings indicate imminent danger to life and property to those in the path of the storm.

LIGHTNING

Lightning often strikes outside areas of heavy rain and can occur as far as 10 miles away from any rainfall.

You are in danger from lightning if you can hear thunder. In fact, more than 50 percent of lightning deaths occur after the thunderstorm has passed.

There is a need to prepare for severe thunderstorms and there are steps that you can take.

Key steps in thunderstorm preparedness:

- Understand the risk. Severe thunderstorms can occur year-round and at any hour. Take time to learn about the severe thunderstorm risk in your area—including whether and how often severe thunderstorms are accompanied by tornadoes.
- Learn to make a small target. Practice squatting low to the ground, making the smallest target possible while minimizing contact with the ground.
- Pay attention to warnings. Use a NOAA Weather Radio with a tone-alert feature or listen to local radio or television for Emergency Alert System (EAS) broadcasts. Learn the community's warning system and never ignore warnings.

You can also take measures to protect their property, including those measures that are required for high wind:

- Check for hazards in your yard. Be aware of potential lightening rods – swing sets, trees, etc.
- Bring outdoor furniture inside or otherwise secure it to keep it from blowing. Small objects can become deadly projectiles in a high wind.
- Remove dead or overhanging limbs from trees and shrubbery. Strategically remove branches to allow the wind to pass through. Strong winds can break weak limbs and carry them at high speed, causing damage to property or injury to humans and animals. And lightening can and will strike the weakest part of a tree.

If the community is at high risk for severe thunderstorms, or if sections of the community are particularly vulnerable, you should purchase and install lightning rods. Lightning detectors can also help protect you.

During a thunderstorm, you should avoid:

- Water sources. If boating or swimming, get to land immediately. Stay away from bodies of water and wet sand. If indoors, stay away from running water. Electricity from lightning can travel through plumbing.
- The telephone. Electricity from lightning can also travel through phone lines. Note that cell phones are considered safe to use indoors, though there is some risk when used outdoors during a storm.
- The outdoors. A sturdy building is the safest place to be during a severe thunderstorm. Avoid unprotected areas and unprotected shelters in open areas.

It is a good idea to turn off air conditioning and appliances. Electricity from lightning can enter a room through appliances. Also, turning off and unplugging appliances can eliminate the risk of damage from surges that accompany lightning strikes in close proximity to the home.

If caught outdoors in a severe thunderstorm, you should:

- Avoid water sources. Get out of pools or lakes. Get off the beach.
- Seek shelter in a substantial, permanent, enclosed structure. Avoid unprotected shelters, such as golf carts and baseball dugouts. Remember that isolated shelters in otherwise open areas are a target for lightning. Temporary shelters, such as gazebos, are subject to being blown in a strong wind and offer little protection from hail.
- If there are no permanent shelters within reach, take shelter in a car. Keep all windows closed and do not touch anything that is metal. If in the woods, find an area that is protected by low trees (not a single tall tree in the open). As a last resort, go to a low-lying area, away from trees, poles, and metal objects. (Avoid areas that are subject to flooding.) Squat low to the ground, and place your hands on your knees with your head between them. Make as small a target as possible. Do not lie flat on the ground.
- Avoid natural lightning rods, such as golf clubs, tractors, fishing rods, and camping equipment. Lightning is attracted to all of these items.
- Pull safely to the side of the road, keeping a good distance from trees or other tall objects that could fall on the vehicle, and ensuring that the emergency flashers are on.
- Avoid contact with metal surfaces inside the vehicle.
- Avoid flooded roadways. Most flood fatalities are caused by people attempting to drive through high water. The depth of water is not always obvious. The roadbed may be washed out or rapidly rising water could stall the engine or engulf the vehicle.

- Listen to EAS for updated information. Some areas may be inaccessible and there may be damage in others. Local EAS broadcasts will provide current information on continuing risks and protective measures to take.
- Avoid storm-damaged areas. These areas are not safe immediately following a severe thunderstorm. Entry may increase personal risk and interfere with professional responders.
- Watch for fallen power lines and trees, and report them immediately.

TORNADOES

Tornadoes are powerful, circular windstorms that may be accompanied by winds in excess of 200 miles per hour. Tornadoes typically develop during severe thunderstorms and may range in width from several hundred yards to more than a mile across.

TORNADO RISKS

Tornadoes pose a high risk because the low atmospheric pressure, combined with high wind velocity, can:

- Rip trees apart
- Destroy buildings
- Uproot structures and objects
- Send debris and glass flying
- Overturn cars and mobile homes

TORNADO FACTS

While tornadoes have been reported in every state, they are most prevalent east of the Colorado-Wyoming-New Mexico area. Most frequently, tornadoes are found in the area from Kansas to Kentucky, the Great Plains, and the Upper Midwest. "Tornado Alley" includes Texas, Oklahoma, and Kansas.

More than 800 tornadoes are reported nationwide in an average year. Tornadoes can happen any time of the year and any time of day.

Tornado season lasts from March to August, but can occur year-round. More than 80 percent of tornadoes occur between noon and midnight, and one quarter occur from 4:00 p.m. to 6:00 p.m. Tornadoes are most likely to occur between 3:00 p.m. and 9:00 p.m.

About 9,000 deaths have been attributed to tornadoes in the past 50 years—an average of about 180 people each year. Annual damage from tornadoes can run into the hundreds of millions of dollars.

The population in the ten tornado-prone states is increasing because of more rapid urban development, which increases the likelihood of injuries and deaths.

FUJITA WIND-DAMAGE SCALE

Tornado strength is measured on the Fujita Wind-Damage Scale, which correlates damage with wind speed. There are six wind-damage levels on the scale:

- F0:
  - Winds: Up to 72 miles per hour (mph)
  - Damage: Light
- F1:
  - Winds: 73–112 mph
  - Damage: Moderate
- F2:
  - Winds: 113–157 mph
  - Damage: Considerable
- F3:
  - Winds: 158–206 mph
  - Damage: Severe
- F4:
  - Winds: 207–260 mph
  - Damage: Devastating
- F5:
  - Winds: 261 mph or greater
  - Damage: Incredible

Fujita Wind Damage Scale

Wind-Damage Level	Wind Speed and Anticipated Damage
F0	▪ Winds: Up to 72 miles per hour (mph) ▪ Damage: Light
F1	▪ Winds: 73–112 mph ▪ Damage: Moderate
F2	▪ Winds: 113–157 mph ▪ Damage: Considerable
F3	▪ Winds: 158–206 mph ▪ Damage: Severe
F4	▪ Winds: 207–260 mph ▪ Damage: Devastating
F5	▪ Winds: 261 mph or greater ▪ Damage: Incredible

Although the Midwest and sections of the Southeast have the highest risk of tornadoes, with the help of sophisticated radar and other measures, meteorologists are now able to predict when conditions favorable for tornado formation exist and are able to warn the public better.

Many tornadoes (usually F0 and F1) are still unreported or unconfirmed.

PREPARING FOR A TORNADO

- Know the risk for tornadoes in the area. Although tornadoes have been reported throughout the United States, some areas are clearly at higher risk than others.
- Identify potential shelter areas where family members can gather during a tornado.

  The best shelter from a tornado is to be underground.

  If an underground shelter or tornado-safe room is not available, move to an interior room or hallway on the lowest floor and get under a sturdy piece of furniture. The idea is to get as many walls and roofs between you and the outside as possible. Avoid rooms with large free-span roofs.

  Mobile homes, even if tied down, offer little protection from tornadoes and should be abandoned in favor of more substantial shelter.
- Learn the community's warning system. Many areas use Emergency Alert System (EAS) to warn of imminent hazards. Within these areas, though, communities may have other warning systems for tornadoes, including sirens that are also used to signal fires and other hazards. For those who live in communities that use sirens, it is critical to learn the siren warning tone to ensure recognition. Also, when severe weather threatens, NOAA weather radio carries current information and instructions.
- Conduct periodic tornado drills with the family to ensure that all family members know what to do and where to go during a tornado emergency.

The "obvious" is not always as obvious as we think.

- Tornadoes may appear nearly transparent until they pick up dust and debris.
- Tornadoes can be wrapped in heavy rain, which may limit visibility; however, because tornadoes are associated with powerful updrafts, rain does not always fall in or near tornadoes.

TORNADO CLUES

Occasionally tornadoes develop so rapidly that advance warning is not possible. Remain alert to signs of an approaching tornado, notably the sound that is something like an approaching freight train.

The most obvious clues that a tornado may be forming or has formed are high winds and very large hail. Be alert for these clues and to take protective action, even if no tornado warning is issued.

DURING A TORNADO

- Damage often occurs when wind gets inside a home. Keep all windows and doors closed. Houses do not explode because of air pressure differences.
- Go immediately to an underground shelter or tornado-safe room, or interior room or hallway on the lowest floor.
- Put as much shielding material (such as furniture, blankets, bike helmets, etc.) as you can around you.
- Listen to EAS or NOAA Weather Radio for current emergency information and instructions.

If you are driving and see a tornado go to a nearby sturdy building and seek an area on the lowest level, without windows. If there are no buildings nearby, get out and away from the vehicle and lie down in a low spot on the ground. Protect the head and neck.

Following a tornado, citizens should continue listening to EAS or NOAA weather radio for updated information and instructions. As with many other hazards, post-tornado actions include:

- Avoiding fallen power lines or broken utility lines and immediately reporting those you see
- Staying out of damaged areas until told that it is safe to enter
- Staying out of damaged buildings
- Using a flashlight to look for damage and fire hazards and documenting damage for insurance purposes
- Turning off utilities, if necessary
- Reserving the telephone for emergencies

Myth:	**Areas near lakes, rivers, and mountains are safe from tornadoes**.
Fact:	No place is safe from tornadoes. A tornado near Yellowstone National Park left a path of destruction up and down a 10,000-foot mountain.
Myth:	**The low pressure with a tornado causes buildings to explode as the tornado passes overhead.**
Fact:	Violent winds and debris slamming into buildings cause most structural damage.
Myth:	**Windows should be opened before a tornado approaches to equalize pressure and minimize damage.**
Fact:	Windows should be left closed to minimize damage from flying debris and to keep the high wind out of the structure.
Myth:	**If you are driving and see a tornado, you should drive at a right angle to the storm.**
Fact:	The best thing to do is seek the best available shelter. Many people are injured or killed by remaining in their vehicles.
Myth:	**People caught in the open should seek shelter under highway overpasses.**
Fact:	Do not seek shelter under highway overpasses or under bridges. If possible, take shelter in a sturdy, reinforced building.

TSUNAMIS

Tsunamis are ocean waves that are produced by underwater earthquakes or landslides. The word is Japanese and means "harbor wave" because of the devastating effects that these waves have had on low-lying Japanese coastal communities. Tsunamis are often incorrectly referred to as tidal waves.

RISK POSED BY TSUNAMIS

Tsunamis pose the greatest risk to areas less than 25 feet above sea level and within one mile of the shoreline. They can cause:

- Flooding
- Contamination of drinking water
- Fires from ruptured tanks or gas lines
- Loss of vital community infrastructure
- Complete devastation of coastal areas
- Death

Most deaths caused by tsunamis result from drowning.

Since 1945, six tsunamis have killed more than 350 people and caused 500 million dollars worth of property damage in Hawaii, Alaska, and the West Coast. In the United States and its territories 24 tsunamis have caused damage during the past 224 years.

The common scientific definition of tsunami wave height ranges between a few inches and about 100 feet (30 meters). Some tsunamis have produced wave heights of up to 200 feet (60 meters), for example, the 1964 Alaska subduction earthquake. Tsunamis can travel upstream in coastal estuaries and rivers, with damaging waves as high as sixty feet extending farther inland than the immediate coast. A tsunami can occur during any season of the year and at any time, day or night.

The first wave of a tsunami is usually not the largest in a series of waves, nor is it the most significant. One coastal community may experience no damaging waves, while another, not far away, may experience destructive deadly waves. Depending on a number of factors, some low-lying areas could experience severe inundation of water and debris several miles or more inland.

Tsunami warnings originate from two agencies:

- The West Coast/Alaska Tsunami Warning Center (WC/ATWC) is responsible for tsunami warnings for California, Oregon, Washington, British Columbia, and Alaska.
- The Pacific Tsunami Warning Center (PTWC) is responsible for providing warnings to international authorities, Hawaii, and U.S. territories within the Pacific basin.

The two Tsunami Warning Centers coordinate the information that is being disseminated.

TSUNAMI PREPAREDNESS

To prepare for Tsunamis:

- Know the risk for tsunamis in the area. Know the height of your street above sea level and the distance of your street from the coast or other high-risk waters. Evacuation orders may be based on these numbers.
- Be aware of coastal clues. The waterline will withdraw and disappear out to sea, followed by a series of high waves reaching further and further inland. Remember that the series of tsunami waves won't necessarily occur at regular intervals.
- Plan and practice evacuation routes. If possible, pick an area 100 feet or more above sea level, or go at least 2 miles inland, away from the coastline. You should be able to reach your safe location on foot within 15 minutes. Be able to follow your escape route at night and during inclement weather.

  If you are visiting an area at risk from tsunamis, check with the hotel, motel, or campground operators for evacuation information.
- Discuss tsunamis with your family. Discussing tsunamis ahead of time will help reduce fear and anxiety and let everyone know how to respond. Review flood safety and preparedness measures with your family.
- Talk to your insurance agent. Homeowners' policies do not cover flooding from a tsunami. Ask your agent about the National Flood Insurance Program (NFIP).
- Use a NOAA Weather Radio with a tone-alert feature to keep you informed of local watches and warnings.

You can protect property by:

- Avoid building or living in buildings within several hundred feet of the coastline. These areas are most likely to experience damage from tsunamis, strong winds, or coastal storms.
- Elevate coastal homes. Most tsunami waves are less than 10 feet high.
- Consult with a professional for advice about ways to make your home more resistant to tsunami. Also, there may be ways to divert waves away from your property.

If a strong, coastal earthquake occurs:

- Drop, cover, and hold. You should protect yourself from the earthquake first.
- When the shaking stops, gather your family members and evacuate quickly. Leave everything else behind. A tsunami could occur within minutes. Move quickly to higher ground away from the coast, up to two miles inland.
- Avoid downed power lines, and stay away from buildings and bridges from which heavy objects might fall during an aftershock.
- If you are in a tsunami risk area and you hear an official tsunami warning or detect signs of a tsunami, evacuate at once. A tsunami warning is issued when authorities are certain that a tsunami threat exists, and there may be little time to get out.
- Follow instructions issued by local authorities. Recommended evacuation routes may be different from the one you planned, or you may be advised to move to higher ground than you had planned.

If a warning is issued:

- Get to higher ground as far inland as possible. Officials cannot reliably predict either the height or local effects of tsunamis.
- Listen to a NOAA Weather Radio or Coast Guard emergency frequency station for updated emergency information.
- Return home only after local officials tell you that it is safe. A tsunami is a series of waves that may continue for hours. Do not assume that after one wave, the danger is over. The next wave may be larger than the first one.
- If you are out on a boat when the warning is issued, move as far out from the coast as possible. This action could prevent the waves from carrying your craft inland where it is likely to sustain damage and the risk of fatality is great.

Following a tsunami, citizens should continue listening to a NOAA Weather Radio or Coast Guard emergency frequency station for updated emergency information and instructions. As with many other hazards, post-tsunami actions include:

- Avoiding fallen power lines or broken utility lines and immediately reporting those that you see
- Staying out of damaged areas until told that it is safe to enter. The risk of contamination and disease is very high
- Staying out of damaged buildings
- Using a flashlight to look for damage and fire hazards, and documenting damage for insurance purposes
- Turning off utilities, if necessary
- Reserving the telephone for emergencies

TSUNAMI MYTHS AND FACTS

Myth:	**Tsunamis are giant walls of water.**
Fact:	Tsunamis normally have the appearance of a fast-rising and receding flood. They can be similar to a tide cycle occurring over 10-60 minutes instead of 12 hours. Occasionally, tsunamis can form walls of water, known as tsunami bores, when the waves are high enough and the shoreline configuration is appropriate.
Myth:	**Tsunamis are a single wave.**
Fact:	Tsunamis are a series of waves. Often the initial wave is not the largest. The largest wave may occur several hours after the initial activity has started at a coastal location.
Myth:	**Boats should seek protection of a bay or harbor during a tsunami.**
Fact:	Tsunamis are often most destructive in bays and harbors. Tsunamis are least destructive in deep, open ocean waters. Boats already out to sea should travel as far out as possible to prevent being carried to shore.

[This page intentionally left blank]

VOLCANOES

INTRODUCTION

A volcano is a vent through which molten rock escapes to the Earth's surface. Unlike other mountains, which are pushed up from below, volcanoes are built by surface accumulation of their eruptive products—layers of lava, ashflows, and ash. When pressure from gases within the molten rock becomes too great, an eruption occurs.

The United States is third in the world, after Japan and Indonesia, for the number of active volcanoes. Since 1980, as many as five volcanoes have erupted each year in the United States.

Eruptions are most likely to occur in Hawaii and Alaska. For the Cascade Range in Washington, Oregon, and California, volcanoes erupt on the average of one to two each century.

In addition, when Cascade volcanoes do erupt, high-speed avalanches of pyroclastic flows (hot ash and rock), lava flows, and landslides can devastate areas 10 or more miles away. Lahars--a type of mudflow or landslide composed of volcanic material, debris and water that flows down from a volcano, typically along a river valley—can inundate valleys more than 50 miles downstream.

The island of Hawaii (the largest of the Hawaiian Islands) experiences thousands of earthquakes associated with active volcanoes each year. While most of these are too small to feel, about once a decade a large quake shakes the entire island and causes widespread damage.

Volcanoes produce a wide variety of hazards that can kill people and destroy property. Large explosive eruptions can endanger people and property hundreds of miles away and can even affect the global climate.

VOLCANIC HAZARDS

Volcanic hazards include:

- Toxic gases
- Lava and pyroclastic flows
- Landslides
- Earthquakes
- Explosive eruptions

Eruptions can be relatively quiet, producing lava flows that creep across the land at 2 to 10 miles per hour (mph). Explosive eruptions can shoot columns of gases and rock fragments tens of miles into the atmosphere, spreading ash hundreds of miles downwind.

Lava flows are streams of molten rock that either pour from a vent quietly or erupt explosively as lava fountains. Because of their intense heat, lava flows are also great fire hazards. Lava flows destroy everything in their path, but most move slowly enough that people can move out of the way.

It is, however, almost impossible to channel the lava flow away from towns and neighborhoods. Do not attempt to divert a lava flow; ultimately, it will destroy anything in its path. The speed at which lava moves across the ground depends on several factors, including the:

- Type of lava that has erupted
- Steepness of the ground
- Rate of lava production at the vent

The lava flow on the surface cools faster than the lava trapped inside the crust. NEVER climb on a lava crust unless it has been deemed safe by a proper authority.

ACCOMPANYING HAZARDS

Volcanic eruptions can be accompanied by other natural hazards, including:

- Mudflows (including lahars)
- Flash floods
- Wildland fires
- Tsunamis (under special conditions)
- Earthquakes

Historically, lahars have been one of the deadliest volcano hazards. Lahars are mudflows or debris flows composed mostly of volcanic materials on the flanks of a volcano. These flows of mud, rock, and water can rush down valley and stream channels at speeds of 20 to 40 miles per hour and can travel more than 50 miles.

Lahars can occur both during an eruption and when a volcano is quiet. The water that creates lahars can come from melting snow and ice, intense rainfall, or the breakout of a summit crater lake.

VOLCANIC ASH

Volcanic ash is fine, glassy rock fragments that can affect people and equipment hundreds of miles away from the cone of the volcano. Volcanic ash will:

- Cause severe respiratory problems
- Diminish visibility
- Contaminate water supplies
- Cause electrical storms
- Disrupt the operation of all machinery and cause engine failure, which is particularly problematic for aircraft
- Collapse roofs

VOLCANIC ERUPTION PREPAREDNESS

Key steps in volcanic eruption preparedness:

- Understand the risk. Take time to learn about the risk from volcanic eruption in your area.
- Talk to your insurance agent. Find out what your homeowner's policy will or will not cover in the event of a volcanic eruption.
- Prepare a disaster supply kit, including goggles and dust mask for every family member.
- Develop an evacuation plan. Everyone in your family should know where to go if they have to leave.
- Develop a shelter-in-place plan if you determine that the central risk relates to ash rather than lava flows.

DURING A VOLCANIC ERUPTION

- Follow evacuation orders. Staying at home to wait out an eruption, if you are in a hazardous zone, could be very dangerous. Take the advice of local authorities.
- Avoid areas downwind and river valleys downstream of the volcano. Debris and ash will be carried by wind and gravity. Stay in areas where you will not be exposed further to volcanic eruption hazards.
- If outside, protect yourself from ashfall. Volcanic ash will cause severe injury to breathing passages, eyes, and open wounds, and irritation to skin. In addition, ashfall will often make travel impossible as it limits visibility and can cause engine failure.
- Be prepared for accompanying hazards. Know how to respond to reduce your risk.

AFTER AN ERUPTION

- Stay away from volcanic ashfall areas. The fine, glassy particles of volcanic ash will increase the health risk to children and people with existing respiratory conditions such as asthma, chronic bronchitis, or emphysema.
- Avoid driving in heavy ashfall. Driving will stir up volcanic ash that can clog engines and stall vehicles. Moving parts, including bearings, brakes, and transmissions, can be damaged from abrasion.
- If you have a respiratory ailment, avoid contact with any amount of ash. Stay indoors until local health officials advise that it is safe to go outside.

[This page intentionally left blank]

WINTER STORMS

INTRODUCTION

A winter storm can range from a moderate snow over a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Many winter storms are accompanied by low temperatures and heavy or blowing snow, which can severely reduce visibility.

Some winter storms may be large enough to affect several states, while others may affect only a single community.

Winter storms are defined differently in various parts of the country. You should check with your local emergency management office, the National Weather Service (NWS) office, or local chapter of the American Red Cross for terms and definitions specific to your area.

WINTER STORM RISK

Winter storms are considered deceptive killers because most deaths are indirectly related to the storm.

Risks to human life caused by winter storms.

- Automobile or other transportation accidents: This is the leading cause of death during winter storms.
- Exhaustion and heart attacks: Caused by overexertion, these are the two most likely causes of winter storm-related deaths.
- Hypothermia and frostbite: Elderly people account for the largest percentage of hypothermia victims. Many older Americans literally freeze to death in their own homes after being exposed to dangerously cold indoor temperatures.
- House fires: These occur more frequently in the winter because of the lack of proper safety precautions when using alternate heating sources (unattended fires, disposal of ashes too soon, improperly placed space heaters, etc.). Fire during winter storms presents a great danger because water supplies may freeze, and it may be difficult for firefighting equipment to get to the fire.
- Asphyxiation: In an effort to get warm, people asphyxiate because of improper use of fuels such as charcoal briquettes, which produce carbon monoxide.

ELEMENTS OF WINTER STORMS

The elements of winter storms include:

- Heavy snow
- Ice – perhaps the greatest danger of all!
- Winter flooding
- Cold

HEAVY SNOW

Heavy snow can:

- Immobilize regions and paralyze cities.
- Strand commuters.
- Close airports.
- Disrupt emergency and medical services.

Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Homes and farms may be isolated for days, and unprotected livestock may be lost. The cost of removing snow and repairing damage, and the resulting loss of business, can have severe economic impacts on cities and towns.

In the mountains, heavy snow can lead to masses of tumbling snow called avalanches. More than 80 percent of midwinter avalanches are triggered by a rapid accumulation of snow, and 90 percent of those occur within 24 hours of snowfall.

An avalanche may reach a mass of a million tons and travel at speeds of up to 200 miles per hour (mph).

TYPES OF SNOW

Different kinds of snowfall:

- Blizzards are accompanied by winds of 35 mph or more with snow and blowing snow, reducing visibility to less than one-quarter mile for at least 3 hours.
- Blowing snow is wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground that is picked up by the wind.
- Snow squalls are brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.
- Snow showers are a short duration of moderate snowfall. Some accumulation is possible.

ICE

Heavy accumulations of ice can disrupt communications and power for days while utility companies repair extensive damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces.

Different kinds of ice:

- Sleet: Raindrops that freeze into ice pellets before reaching the ground are called sleet. Sleet usually bounces when hitting a surface and does not stick to objects. Sleet, however, can accumulate like snow and cause a hazard to motorists.
- Freezing rain: Rain that falls onto surfaces with temperatures below freezing—causing it to freeze to those surfaces is called freezing rain. Even small accumulations of ice can cause a significant hazard.
- Ice storm: Ice storms occur when freezing rain falls and freezes immediately on impact. Communications and power can be disrupted for days.

WINTER FLOODING

Winter storms can generate flooding, resulting in significant damage and loss of life.

Winter flooding includes:

- Coastal floods: Winds generated from intense winter storms can cause widespread tidal flooding and severe beach erosion along coastal areas.
- Ice jams: Long cold spells can cause rivers and lakes to freeze. A rise in the water level or a thaw breaks the ice into large chunks that become jammed at manmade and natural obstructions. An ice jam can act as a dam, resulting in severe flooding.
- Snowmelt: A sudden thaw of a heavy snow pack that often leads to flooding.

COLD

Exposure to cold can cause frostbite or hypothermia and become life threatening. Infants and the elderly are the most susceptible.

What constitutes extreme cold varies in different parts of the country:

- In the south, near-freezing temperatures are considered extreme cold. Vegetation may be damaged and pipes may freeze and burst.
- In the north, extreme temperatures are well below zero.

When talking about cold, you should consider:

- Wind chill: Wind chill is not the actual temperature, but rather how wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at a faster rate, driving down the body's temperature.
- Frostbite: Frostbite is damage to body tissue caused by extreme cold and resulting in a loss of feeling and a white or pale appearance in extremities, such as fingers, toes, ear lobes, or the tip of the nose. People with frostbite require immediate medical treatment. If you must wait for help, slowly rewarm the affected areas. If signs of hypothermia appear, however, warm the body core before the extremities.
- Hypothermia: Hypothermia occurs when the body temperature drops below 95 degrees Fahrenheit. Hypothermia can kill. For those who survive, there are likely to be lasting kidney, liver, and pancreas problems. If you suspect hypothermia, take the person's temperature. If it is below 95 degrees Fahrenheit, seek medical care immediately! If medical care is not available, warm the person slowly, starting with the body core. Warming the arms and legs first drives cold blood toward the heart and can lead to heart failure. Dress the person in dry clothing and wrap him or her in a warm blanket, covering the head and neck. Do not provide alcohol, drugs, coffee, or any hot beverage or food. Warm broth is the first food to offer.

Warning signs of hypothermia include:

- Uncontrollable shivering
- Memory loss
- Disorientation
- Incoherence
- Slurred speech
- Drowsiness
- Apparent exhaustion

The National Weather Service (NWS) Storm Prediction Center issues watches and warnings of hazardous weather, including winter storms.

- A watch is issued when winter storm conditions are possible within the next 36-48 hours. Citizens should prepare for hazardous weather at this time.
- A winter weather advisory is issued when a low pressure system produces a combination of winter weather that presents a hazard, but not enough to warrant a winter storm warning.
- A warning is issued when life-threatening severe winter conditions have begun or will begin within 24 hours. Citizens should put their preparations into action at this time.
- A blizzard warning means sustained winds or frequent gusts of 35 miles per hour or greater and considerable falling or blowing snow (reducing visibility to less than a quarter mile) are expected to last for a period of 3 hours or longer.

WINTER STORM PREPAREDNESS

Key steps in winter storm preparedness:

- Understand the risk. Take time to learn about the winter storm risk in your area. Realize the seriousness of such storms; they may leave you on your own for a long period of time.
- Prepare your home with insulation, caulking, and weatherstripping. Learn how to keep pipes from freezing and how to thaw frozen pipes. Store sufficient fuel (or emergency heating equipment). Install and test smoke alarms on all levels of your home. Contact your local utility company about conducting an energy audit. Most will perform a basic audit free of charge.
- Service snow removal equipment before the winter storm season. Maintain the equipment in good working order, and ensure that you have an adequate supply of gas. Clearing snow can be dangerous; use caution!
- Keep your car's gas tank full for emergency use and to keep the fuel line from freezing.
- Pay attention to warnings. Use a NOAA Weather Radio with a tone-alert feature or listen to local radio or television for Emergency Alert System (EAS) broadcasts

During a winter storm:

- Stay indoors and dress warmly. Wear layers of loose-fitting, lightweight, warm clothing. When necessary, remove layers to avoid perspiration and subsequent chill.
- Eat and drink regularly. Food provides the body with energy for producing its own heat. Drink liquids such as warm broth or juices to prevent dehydration.
- Avoid caffeine and alcohol. Caffeine, a stimulant, accelerates the symptoms of hypothermia. Alcohol is a depressant and hastens the effects of cold on the body. Alcohol also slows circulation and can make you less aware of the effects of cold. Both caffeine and alcohol can cause dehydration.
- Conserve fuel. Great demand may be placed on electric, gas, and other fuel distribution systems (fuel oil, propane, etc.). Suppliers may not be able to replenish depleted supplies during severe weather. Lower the thermostat to 65 degrees Fahrenheit during the day and 55 degrees at night. Close off unused rooms, stuff towels or rags in cracks under doors, and cover windows at night.
- If outside, protect yourself from hazards. Dress warmly, keep dry, and watch for signs of hypothermia and frostbite. Avoid overexertion. Walk carefully when on snowy, icy sidewalks, and use public transportation, if possible.

WINTER TRAVEL

DO NOT travel if advised against it or if not necessary.

You should also take measures to protect yourself if you must drive during a winter storm:

- Winterize your car before the winter storm season. Have a mechanic check your car's systems and install good winter tires with adequate tread. Keep snow and ice removal equipment in the car.
- Keep a cell phone or two-way radio with you when traveling in winter weather. Make sure that the batteries are charged.
- Keep a disaster supplies kit in the trunk of each car used by household members.
- Plan long trips carefully and notify someone of your destination, route, and expected time of arrival.
- If you get stuck, stay with the vehicle, display a trouble sign, and occasionally run the engine to keep warm, keeping the exhaust pipe clear of snow and a downwind window open slightly for ventilation. Use available material, such as newspapers, maps, and removable car mats for added insulation. Avoid overexertion, drink fluids, and watch for signs of frostbite and hypothermia. Venturing away from your vehicle can be very disorientating in a severe storm!

Check the forecast when venturing outside. Major winter storms are often followed by even colder temperatures.

Keep children indoors during the most severe part of the storm. If allowed to play outdoors during the storm, be sure to check on them frequently.

DO NOT travel if advised against it or if not necessary.

You should also take measures to protect yourself if you must drive during a winter storm:

- Winterize your car before the winter storm season. Have a mechanic check your car's systems and install good winter tires with adequate tread. Keep snow and ice removal equipment in the car.
- Keep a cell phone or two-way radio with you when traveling in winter weather. Make sure that the batteries are charged.
- Keep a disaster supplies kit in the trunk of each car used by household members.
- Plan long trips carefully and notify someone of your destination, route, and expected time of arrival.
- If you get stuck, stay with the vehicle, display a trouble sign, and occasionally run the engine to keep warm, keeping the exhaust pipe clear of snow and a downwind window open slightly for ventilation. Use available material, such as newspapers, maps, and removable car mats for added insulation. Avoid overexertion, drink fluids, and watch for signs of frostbite and hypothermia. Venturing away from your vehicle can be very disorientating in a severe storm!

Check the forecast when venturing outside. Major winter storms are often followed by even colder temperatures.

Keep children indoors during the most severe part of the storm. If allowed to play outdoors during the storm, be sure to check on them frequently.

NUCLEAR POWER PLANT EMERGENCIES

INTRODUCTION

The construction and operation of nuclear power plants are closely monitored and regulated by the Nuclear Regulatory Commission (NRC). The Federal Emergency Management Agency (FEMA) also regulates emergency planning requirements for nuclear power plants. However, accidents at these plants are possible.

An accident could result in dangerous levels of radiation that could affect the health and safety of the public living near the nuclear power plant.

WHAT IS RADIATION?

Radioactive materials are composed of unstable atoms. These atoms give off excess energy until they become stable. The energy emitted is radiation.

Each of us is exposed daily to radiation from natural sources, including the sun and the Earth. Small traces of radiation are present in food and water. Radiation also is released from manmade sources, such as x-ray machines, television sets, and microwave ovens.

Nuclear power plants use the heat generated from nuclear fission in a contained environment to convert water to steam, which powers generators to produce electricity.

Radiation has a cumulative effect. The longer a person is exposed to radiation, the greater the risk of adverse effects. A high exposure to radiation can cause serious illness or death.

The potential danger from an accident at a nuclear power plant is exposure to radiation. This exposure could come from the release of radioactive material from the plant into the environment, usually characterized by a plume (cloud-like) formation of radioactive gases and particles.

The area affected by radioactive material release is determined by:

- The amount of radiation released from the plant.
- Wind direction and speed.
- Weather conditions.

HAZARDS

The major hazards to people in the vicinity of the radiation plume include:

- Radiation exposure to the body from the cloud and particles deposited on the ground.
- Inhalation of radioactive materials.
- Ingestion of radioactive materials.

If an accident occurred involving a radioactive material release at a nuclear power plant, local authorities would:

- Activate warning sirens or another approved alert method.
- Provide instructions through the Emergency Alert System (EAS) on local television and radio stations.

EMERGENCY PLANNING ZONES

Local and State governments, Federal agencies, and the electric utilities have emergency response plans in the event of a nuclear power plant emergency. The plans define two Emergency Planning Zones (EPZs):

- One EPZ covers an area within a 10-mile radius of the plant where it is possible that people could be harmed by direct radiation exposure.
- The other EPZ covers a broader area, usually up to a 50-mile radius from the plant, where radioactive materials could contaminate water supplies, food crops, and livestock.

MINIMIZING RADIATION EXPOSURE

Exposure can be minimized by:

- Time. Limit your time exposed to radioactive material. Most radioactivity loses its strength fairly quickly. In a nuclear power plant accident, local authorities will monitor any release of radiation and determine when the threat has passed.
- Distance. The more distance between you and the source of the radiation, the better. In a serious nuclear power plant accident, local authorities will call for an evacuation to increase the distance between you and the radiation. (Evacuation also reduces the period of time of exposure.)
- Shielding. The more heavy and dense material between you and the source of the radiation, the better. This is why local authorities could advise you to remain indoors if an accident occurs. In some cases, the walls in your home would be sufficient shielding to protect you.

NUCLEAR EMERGENCY TERMS

It is important to know the following terms used to describe nuclear emergencies:

- Notification of Unusual Event: A small problem has occurred at the plant. No radiation material release is expected. Federal, State, and county officials will be told right away. No action on your part will be necessary.
- Alert: A small problem has occurred, and small amounts of radiation material could leak inside the plant. This will not affect you, and you should not have to do anything.
- Site Area Emergency: A more serious problem has occurred, and small amounts of radiation material could leak from the plant. If necessary, State and county officials will act to assure public safety. Area sirens may be sounded. Listen to your radio or television for safety information.
- General Emergency: This is the most serious problem. Radiation material could leak outside the plant and off the plant site. The sirens will sound. Tune to your local radio or television station for emergency information reports. State and county officials will act to protect the public. Be prepared to follow instructions promptly.

DURING A NUCLEAR POWER PLANT EMERGENCY

- Listen to the warning. Not all incidents result in the release of radiation. The incident could be contained inside the plant and pose no danger to the public.
- Stay tuned to local radio or television. Local authorities will provide specific information and instructions.
  - The advice given will depend on the nature of the emergency, how quickly it is evolving, and how much radiation, if any, is likely to be released.
  - Local instructions should take precedence over any advice given on national broadcasts or in books.
  - Review the public information materials that you received from the power company or government officials.
- Evacuate, if you are advised to do so.
  - Close and lock doors and windows.
  - Keep car windows and vents closed. Use recirculated air.
  - Listen to the radio for evacuation routes and other instructions.
- If you are not advised to evacuate, shelter in place.
  - Close doors and windows.
  - Turn off the air-conditioner, ventilation fans, furnace, and other air intakes.
  - Go to a basement or other underground area if possible.
  - Keep a battery-powered radio with you at all times.
- Shelter livestock and give them stored feed, if time permits.
- Do not use the telephone unless it is absolutely necessary. Lines will be needed for emergency calls.
- If you suspect exposure, shower thoroughly.
  - Change clothes and shoes.
  - Put exposed clothing in a plastic bag.
  - Seal the bag and place it out of the way.

Put food in covered containers or in the refrigerator. Food not previously covered should be washed before being put in containers.

AFTER A NUCLEAR POWER PLANT EMERGENCY

- If told to evacuate, return home only when local authorities say that it safe to do so.
- If advised to stay in the home, remain inside until local authorities indicate that it is safe.
- Get medical treatment for any unusual symptoms, such as the rapid onset of vomiting that may be related to radiation exposure.

[This page intentionally left blank]

PANDEMIC INFLUENZA

INTRODUCTION AND OVERVIEW

A pandemic is a global disease outbreak. Pandemics are characterized by the sudden onset of an extremely virulent pathogen with potentially lethal results. Though historically pandemics have been caused by a wide variety of diseases, today influenza poses the greatest risk to reach pandemic proportions.

Pandemic influenza differs from seasonal influenza. While the threat of a global flu pandemic is relatively remote, preparedness is essential to managing a pandemic.

PANDEMIC FLU AND YOUR COMMUNITY

Like any other community-wide disaster, the most important step in pandemic flu preparedness is to have a sound plan. Research and experience has shown that the implementation of a community strategy can significantly delay or reduce the impact of a pandemic.

It is the job of your local community to establish a sound plan to enact in the event of pandemic. Individuals can, however, help by preparing in their homes and workplaces.

ASSESSING THE RISK

The likelihood of a pandemic influenza event occurring is nearly impossible to predict with any certainty. Hindsight indicates that a pandemic is likely to occur at least once every century, although recent advances in medicine may decrease that statistic in the future.

Regardless of the statistical likelihood, almost all competent sources suggest that the practical likelihood of pandemic flu occurring in the future is approaching 100 percent.

Historically, pandemics tend to have the greatest affect on the members of society with weakened immune systems. Those groups include:

- Infants
- Adults with autoimmune diseases
- Elderly

The Great Influenza Pandemic of 1918 was an exception to this general rule. In the 1918 event, the virus proved most deadly to the young adult population. There is no sure understanding of why this was so, but it serves as an apt reminder that an influenza pandemic is unpredictable, and can affect anyone and everyone in a given population.

The "Pandemic Influenza Storybook" is a resource of narratives from survivors, families, and friends who experienced the 1918 and 1957 pandemics. The online narratives are available at www.pandemicflue.gov/storybook/introduction.

PERSONAL AND FAMILY PREPAREDNESS

Though relatively unlikely, should a pandemic occur, individuals should be aware of and prepared for widespread effects. Like many disasters, a flu pandemic would alter many aspects of society and would drastically influence how the world operates.

ESSENTIAL SERVICES DISRUPTED

You should plan for the possibility that usual services may be disrupted. These could include services provided by:

- Hospitals and other healthcare facilities
- Banks
- Restaurants
- Government offices
- Telephone and cellular phone companies
- Post offices

For example:

- Stores may close or have limited supplies. Make sure you have your disaster supply kit ready!
- Transportation services may be disrupted and you may not be able to rely on public transportation. Plan to take fewer trips and store essential supplies.
- Public gatherings, such as volunteer meetings and worship services, may be canceled. Prepare contact lists including conference calls, telephone chains, and email distribution lists, to access or distribute necessary information.
- The ability to travel, even by car if there are fuel shortages, may be limited.
- You may not be able to communicate with family and loved ones. You should also talk to your family about where family members and loved ones will go in an emergency and how they will receive care.

- In a pandemic, there may be widespread illness that could result in the shudown of local ATMs and banks. Keep a small amount of cash or traveler's checks in small denominations for easy use.

ACCESS TO FOOD AND WATER LIMITED

In a disaster environment, food and water are often the most vulnerable to failure and are often the first supplies to be depleted. A pandemic event would be no different.

To prepare for the possibility that access to fresh food and water may be limited, the Centers for Disease Control and Prevention (CDC) recommends keeping a two-week supply of non-perishable food and water available at all times.

Food

- Store two weeks of non-perishable food.
  - Select foods that do not require refrigeration, preparation (including the use of water), or cooking.
- Ensure that formulas for infants and any child's or older person's special nutritional needs are a part of your planning.

Water

- Store two weeks of water.
  - 1 gallon of water per person per day (2 quarts for drinking, 2 quarts for food preparation/sanitation), in clean plastic containers.
  - Avoid using containers that will decompose or break, such as plastic milk jugs or glass bottles.

PANDEMIC AND THE WORKPLACE

Tips for preparing for pandemic in your workplace:

- Ask your employer how business will continue during a pandemic.
  - Discuss staggered shifts or working at home with your employer.
  - Discuss telecommuting possibilities and needs, accessing remote networks, and using portable computers.
  - Discuss the possibility of on-site daycare if needed and not already available.
- Discuss possible flexibility in leave policies. Discuss with your employer how much leave you can take to care for yourself or a family member.
- Plan for possible loss of income if you are unable to work or the company you work for temporarily closes.

PANDEMIC PREPAREDNESS IN SCHOOLS

Schools, including public and private preschool, childcare, trade schools, and colleges and universities, may be closed to limit the spread of flu in the community and to help prevent children from becoming sick. Other school-related activities and services could also be disrupted or cancelled including: clubs, sports/sporting events, music activities, and school meals. School closings would likely happen very early in a pandemic and could occur on short notice.

How to prepare for extended school closures:

- Talk to teachers, administrators, and parent-teacher organizations about your school's pandemic plan, and offer your help.
- Plan now for children staying at home for extended periods of time, as school closings may occur along with restrictions on public gatherings, such as at malls and movie theaters.
- Plan home learning activities and exercises that your children can do at home. Have learning materials, such as books, school supplies, and educational computer activities and movies on hand.
- Talk to teachers, administrators, and parent-teacher organizations about possible activities, lesson plans, and exercises that children can do at home if schools are closed. This could include continuing courses by TV or the Internet.
- Plan entertainment and recreational activities that your children can do at home. Have materials, such as reading books, coloring books, and games, on hand for your children to use.

PREVENTION AND TREATMENT

The best ways to prevent and mitigate an outbreak of pandemic flu are to stay healthy and be prepared. The previous topic covered how individuals might prepare for the possibility of a pandemic event. This topic will discuss ways to stay healthy.

These steps may help prevent the spread of respiratory illnesses such as the flu:

- Cover your nose and mouth with a tissue when you cough or sneeze. Throw the tissue away immediately after you use it.
- Wash your hands often with soap and water, especially after you cough or sneeze. If you are not near water, use an alcohol-based (60-95%) hand cleaner.
- Avoid close contact with people who are sick. When you are sick, keep your distance from others to protect them from getting sick too.
- If you get the flu, stay home from work, school, and social gatherings. In this way you will help prevent others from catching your illness.
- Try not to touch your eyes, nose, or mouth. Germs often spread this way.

VACCINATION

Vaccines are used to protect people from contracting a virus once a particular threat is identified.

- After an individual has been infected by a virus, a vaccine generally cannot help to combat it.
- Unfortunately, a specific pandemic influenza vaccine cannot be produced until a particular pandemic influenza virus emerges and is identified.
- Once a pandemic influenza virus has been identified, it will likely take 4-6 months to develop, test, and begin producing a vaccine.

Supply of pandemic vaccine will be limited, particularly in the early stages of a pandemic.

- Efforts are being made to increase vaccine-manufacturing capacity in the United States so that supplies of vaccines would be more readily available.
- In addition, research is underway to develop new ways to produce vaccines more quickly.

While promising for future use, a vaccine cure-all for pandemic influenza is still many years away.

ANTIVIRAL MEDICATION

The Federal Food and Drug Administration (FDA) has approved several antiviral medications to treat seasonal influenza.

- Such medications may be effective in mitigating the impact and spread of a pandemic influenza virus.
- With little awareness of how a pandemic flu virus will look and act, the success of using these antivirals is difficult to predict.
- Doctors and experts in the community warn that their effect may be moderate to minimal.

These antivirals are currently available by prescription only.

GET INFORMED AND STAY INFORMED

Knowing the facts is the best preparation. Identify sources you can count on for reliable information. If a pandemic occurs, having accurate and reliable information will be critical.

- Reliable, accurate, and timely information is available at www.pandemicflu.gov.
- Another source for information on pandemic influenza is the Centers for Disease Control and Prevention (CDC) Hotline at 1-800-CDC-INFO (1-800-232-4636).
- Look for information on your local and state government Web sites. Links are available to each state department of public health at www.pandemicflu.gov.
- Listen to local and national radio, watch news reports on television, and read your newspaper and other sources of printed and web-based information.
- Talk to your local health care providers and public health officials.

[This page intentionally left blank]