

Thunderstorms



Thunderstorms are very common and affect great numbers of people each year. Despite their small size in comparison to hurricanes and winter storms, all thunderstorms are dangerous. Every thunderstorm produces lightning. Other associated dangers of thunderstorms include tornadoes, strong winds, hail, and flash flooding. Flash flooding is responsible for more fatalities— more than 140 annually— than any other thunderstorm-associated hazard.

Some thunderstorms do not produce rain that reaches the ground. These are generically referred to as dry thunderstorms and are most prevalent in the western United States. Known to spawn wildfires, these storms occur when there is a large layer of dry air between the base of the cloud and the ground. The falling raindrops evaporate, but lightning can still reach the ground.

When thunderstorms threaten your area, get inside a home, building or hard top automobile and stay away from metallic objects and fixtures.

What to do before thunderstorms approach

1. Know the terms used by weather forecasters:

- **Severe Thunderstorm Watch**— Tells you when and where severe thunderstorms are likely to occur. Watch the sky and stay tuned to radio or television to know when warnings are issued.
- **Severe Thunderstorm Warning**— 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.

2. Know thunderstorm facts:

- 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.
 - Thunderstorms typically produce heavy rain for a brief period, anywhere from 30 minutes to an hour.
 - Warm, humid conditions are very favorable for thunderstorm development.
 - A typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes.
 - Of the estimated 100,000 thunderstorms each year in the United States, about 10 percent are classified as severe.
- A thunderstorm is classified as severe if it produces hail at least three-quarters of an inch in diameter, has winds of 58 miles per hour or higher, or produces a tornado.

3. Know the calculation to determine how close you are to a thunderstorm:
 - Count the number of seconds between a flash of lightning and the next clap of thunder. Divide this number by 5 to determine the distance to the lightning in miles.
4. Remove dead or rotting trees and branches that could fall and cause injury or damage during a severe thunderstorm.
5. When a thunderstorm approaches, secure outdoor objects that could blow away or cause damage. Shutter windows, if possible, and secure outside doors. If shutters are not available, close window blinds, shades, or curtains.

If a Tornado Warning is issued, take shelter immediately.

Lightning

The ingredient that defines a thunderstorm is lightning. Since lightning creates thunder, a storm producing lightning is called a thunderstorm.

Lightning occurs during all thunderstorms. Lightning results from the buildup and discharge of electrical energy between positively and negatively charged areas.

The unpredictability of lightning increases the risk to individuals and property. In the United States, an average of 300 people are injured and 80 people are killed each year by lightning. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms, including memory loss, attention deficits, sleep

disorders, numbness, dizziness, stiffness in joints, irritability, fatigue, weakness, muscle spasms, depression, and an inability to sit for a long period of time.

When thunderstorms threaten your area, get inside a home, building or hard top automobile (not a convertible) and stay away from metallic objects and fixtures.

1. If you are **inside** a home:
 - Avoid showering or bathing. Plumbing and bathroom fixtures can conduct electricity.
 - Avoid using a corded telephone, except for emergencies. Cordless and cellular telephones are safe to use.
 - Unplug appliances and other electrical items such as computers and turn off air conditioners. Power surges from lightning can cause serious damage.
 - Use your battery operated NOAA Weather Radio for updates from local officials.
2. If **outside**, with no time to reach a safe location, follow these recommendations:
 - In a **forest**, seek shelter in a low area under a thick growth of small trees.
 - In **open areas**, go to a low place such as a ravine or valley. Be alert for flash floods.
 - Do not stand under a natural lightning rod, such as a tall, isolated tree in an open area.
 - Do not stand on a hilltop, in an open field, on the beach or in a boat on the water.
 - Avoid isolated sheds or other small structures in open areas.

- Get away from open water. If you are boating or swimming, get to land and find shelter immediately.
 - Get away from anything metal—tractors, farm equipment, motor-cycles, golf carts, golf clubs and bicycles.
 - Stay away from wire fences, clothes-lines, metal pipes, rails and other metallic paths that could carry lightning to you from some distance away.
 - If you feel your hair stand on end (which indicates that lightning is about to strike), squat low to the ground on the balls of your feet. Place your hands over your ears and your head between your knees. Make yourself the smallest target possible and minimize your contact with the ground. DO NOT lie flat on the ground.
3. Remember the following facts and safety tips about lightning.

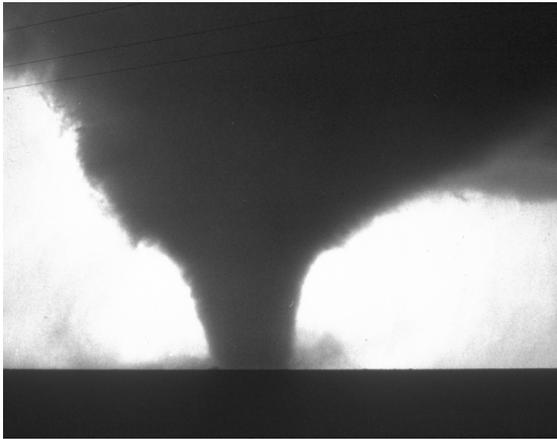
Facts:

- Lightning often strikes outside of heavy rain and may occur as far as 10 miles away from any rainfall.
- Lightning-strike victims carry no electrical charge and should be attended to immediately. If breathing has stopped, begin mouth-to-mouth resuscitation. If the heart has stopped, a trained person should administer CPR. If the victim has a pulse and is breathing, look for other possible injuries. Check for burns where the lightning entered and left the body. Be alert also for nervous system damage, broken bones, and loss of hearing or eyesight. Contact your local emergency management office or American Red Cross chapter for information on CPR and first aid classes.
- “Heat lightning” is actually lightning from a thunderstorm too far away for thunder to be heard. However, the storm may be moving in your direction!
- Most lightning deaths and injuries occur when people are caught outdoors in the summer months during the afternoon and evening.
- Many fires in the western United States and Alaska are started by lightning.
- Lightning can occur from cloud-to-cloud, within a cloud, cloud-to-ground, or cloud-to-air.
- Your chances of being struck by lightning are estimated to be 1 in 600,000 but could be even less by following safety tips.

Safety Tips:

- Postpone outdoor activities if thunderstorms are likely.
- Remember the 30/30 lightning safety rule – Go indoors if, after seeing lightning, you cannot count to 30 before hearing thunder. Stay indoors for 30 minutes after hearing the last clap of thunder.
- Rubber-soled shoes and rubber tires provide NO protection from lightning. However, the steel frame of a hard-topped vehicle provides increased protection if you are not touching metal. Although you may be injured if lightning strikes your car, you are much safer inside a vehicle than outside.

Tornadoes



Tornadoes are nature's most violent storms. Spawned from powerful thunderstorms, tornadoes can uproot trees, destroy buildings and turn harmless objects into deadly missiles. They can devastate a neighborhood in seconds.

A tornado appears as a rotating, funnel-shaped cloud that extends to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long. Every state is at some risk from this hazard.

Tornado facts

1. A tornado is a violently rotating column of air extending from a thunderstorm to the ground.
2. Tornadoes are capable of destroying homes and vehicles and can cause fatalities.
3. Tornadoes may strike quickly, with little or no warning.
4. Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms in the funnel. The average tornado moves SW to NE but

tornadoes have been known to move in any direction.

5. The average forward speed is 30 mph but may vary from stationary to 70 mph with rotating winds that can reach 300 miles per hour.
6. Tornadoes can accompany tropical storms and hurricanes as they move onto land.
7. Waterspouts are tornadoes that form over water.
8. Tornadoes are most frequently reported east of the Rocky Mountains during spring and summer months but can occur in any state at any time of year.
9. In the southern states, peak tornado season is March through May, while peak months in the northern states are during the late spring and early summer.
10. Tornadoes are most likely to occur between 3 p.m. and 9 p.m., but can occur at any time of the day or night.

What to do before tornadoes threaten

1. Know the terms used to describe tornado threats:
 - **Tornado Watch**— Tornadoes are possible. Remain alert for approaching storms. Listen to your battery-operated NOAA Weather Radio or local radio/television outlets for updated reports.
 - **Tornado Warning** — A tornado has been sighted or indicated by weather radar. Take shelter immediately.
2. Ask your local emergency management office or American Red Cross chapter about the tornado threat in

- your area. Ask about community warning signals.
3. Purchase a NOAA Weather Radio with a battery backup and tone-alert feature that automatically alerts you when a Watch or Warning is issued (tone alert not available in some areas). Purchase a battery-powered commercial radio and extra batteries as well.
 4. Know the county or parish in which you live. Counties and parishes are used in Watches and Warnings to identify the location of tornadoes.
 5. Determine places to seek shelter, such as a basement or storm cellar. If an underground shelter is not available, identify an interior room or hallway on the lowest floor.
 6. Practice going to your shelter with your household.
 7. Know the locations of designated shelters in places where you and your household spend time, such as public buildings, nursing homes and shopping centers. Ask local officials whether a registered engineer or architect has inspected your children's schools for shelter space.
 8. Ask your local emergency manager or American Red Cross chapter if there are any public safe rooms or shelters nearby. See the "Safe Room and Shelter" section at the end of this chapter for more information.
 9. Assemble a disaster supply kit. Keep a stock of food and extra drinking water. See the "Emergency Planning

and Disaster Supplies" and "Evacuation" chapters for more information.

10. Make a record of your personal property. Take photographs or videotapes of your belongings. Store these documents in a safe place.

What to do during a tornado watch

1. Listen to NOAA Weather Radio or to commercial radio or television newscasts for the latest information.

2. Be alert for approaching storms. If you see any revolving funnel shaped clouds, report them immediately by telephone to your local police department or sheriff's office.

3. Watch for tornado danger signs:

- Dark, often greenish sky
- Large hail
- A large, dark, low-lying cloud (particularly if rotating)
- Loud roar, similar to a freight train

With your household, determine where you would take shelter in case a Tornado Warning was issued. Storm cellars or basements provide the best protection. If underground shelter is not available seek shelter in an interior room or hallway on the lowest floor.

Caution:

- Some tornadoes are clearly visible, while rain or nearby low-hanging clouds obscure others.
- Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.
- Before a tornado hits, the wind may die down and the air may become very still.
- A cloud of debris can mark the location of a tornado even if a funnel is not visible.
- Tornadoes generally occur near the trailing edge of a thunderstorm. It is

not uncommon to see clear, sunlit skies behind a tornado.

4. Avoid places with wide-span roofs such as auditoriums, cafeterias, large hallways, supermarkets or shopping malls.
5. Be prepared to take shelter immediately. Gather household members and pets. Assemble supplies to take to the shelter such as flashlight, battery-powered radio, water, and first aid kit.
6. In a high-rise building, go to a small, interior room or hallway on the lowest floor possible.
7. Get out of vehicles, trailers and mobile homes immediately and go to the lowest floor of a sturdy nearby building or a storm shelter. Mobile homes, even if tied down, offer little protection from tornadoes.

What to do during a tornado warning

When a tornado has been sighted, go to your shelter immediately.

1. In a residence or small building, move to a pre-designated shelter, such as a basement, storm cellar or "Safe Room or Shelter."
2. If there is no basement, go to an interior room on the lower level (closets, interior hallways). Put as many walls as possible between you and the outside. Get under a sturdy table and use arms to protect head and neck. Stay there until the danger has passed.
3. Do not open windows. Use the time to seek shelter.
4. Stay away from windows, doors and outside walls. Go to the center of the room. Stay away from corners because they attract debris.
5. In a school, nursing home, hospital, factory or shopping center, go to predetermined shelter areas. Interior hallways on the lowest floor are usually safest. Stay away from windows and open spaces.
8. If caught outside with no shelter, lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of potential for flooding.
9. Do not get under an overpass or bridge. You are safer in a low, flat location.
10. Never try to outrun a tornado in urban or congested areas in a car or truck; instead, leave the vehicle immediately for safe shelter. Tornadoes are erratic and move swiftly.
11. Watch out for flying debris. Flying debris from tornadoes causes most fatalities and injuries.

If caught outside with no shelter when a tornado hits, lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of potential for flooding.

What to do after a tornado

1. Look out for broken glass and downed power lines.
2. Check for injuries. Do not attempt to move seriously injured persons unless they are in immediate danger of death or further injury. If you must move an unconscious person, first stabilize the neck and back, then call for help immediately.
 - If the victim is not breathing, carefully position the victim for artificial respiration, clear the airway and commence mouth-to-mouth resuscitation.

- Maintain body temperature with blankets. Be sure the victim does not become overheated.
 - Never try to feed liquids to an unconscious person.
3. Use caution when entering a damaged building. Be sure that walls, ceiling and roof are in place and that the structure rests firmly on the foundation. Wear sturdy work boots and gloves.
 4. See the “Recovering From Disaster” chapter for more important information.

Wind “Safe Room and Shelter”



Extreme windstorms in many parts of the country pose a serious threat to buildings and their occupants.

Your residence may be built “to code,” but that does not mean that it can withstand winds from extreme events like tornadoes or major hurricanes.

The purpose of a wind shelter or “Safe Room” is to provide a space where you and your household can seek refuge that provides a high level of protection. You can build a shelter in one of the several places in your home:

- In your basement
- Beneath a concrete slab-on-grade foundation or garage floor
- In an interior room on the first floor

Shelters built below ground level provide the greatest protection, but a shelter built in a first-floor interior room can also provide the necessary protection. Below-ground shelters must be designed to avoid accumulating water during the heavy rains that often accompany severe windstorms.

To protect its occupants, an in-house shelter must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed. Therefore:

- The shelter must be adequately anchored to resist overturning and uplift.
- The walls, ceiling, and door of the shelter must withstand wind pressure and resist penetration by windborne objects and falling debris.
- The connections between all parts of the shelter must be strong enough to resist the wind.
- If sections of either interior or exterior residence walls are used as walls of the shelter, they must be separated from the structure of the residence, so that damage to the residence will not cause damage to the shelter.

If you are concerned about wind hazards where you live, especially if you live in high-risk areas, you should consider building a shelter. Publications are available from FEMA to assist in determining if you need a shelter and how to construct a shelter. Contact the FEMA distribution center for a copy of *Taking Shelter from the Storm* (L-233 for the brochure and FEMA-320 for the booklet with complete construction plans).