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Safe Shelters & Indoor Safety

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What is a Safe Shelter?

A house or other substantial building offers the best protection from lightning. In assessing the safety provided by a particular structure, it is more important to consider what happens if the structure gets struck by lightning, rather than whether the structure will be hit by lightning. For a shelter to provide protection from lightning, it must contain a mechanism for conducting the electrical current from the point of contact to the ground. These mechanisms may be on the outside of the structure, may be contained within the walls of the structure, or may be a combination of the two. On the outside, lightning can travel along the outer shell of the building or may follow metal gutters and downspouts to the ground. Inside a structure, lightning can follow conductors such as the electrical wiring, plumbing, and telephone lines to the ground.

Avoid Unsafe Shelters!

Unless specifically designed to be lightning safe, small structures do little, if anything, to protect occupants from lightning. Many small open shelters on athletic fields, golf courses, parks, roadside picnic areas, schoolyards and elsewhere are designed to protect people from rain and sun, but not lightning. A shelter that does not contain plumbing or wiring throughout, or some other mechanism for grounding from the roof to ground is not safe. Small wooden, vinyl, or metal sheds offer little or no protection from lightning and should be avoided during thunderstorms.

How Lightning Enters a House or Building

There are three main ways lightning enters homes and buildings: (1) a direct strike, (2) through wires or pipes that extend outside the structure, and (3) through the ground. Regardless of the method of entrance, once in a structure, the lightning can travel through the electrical, phone, plumbing, and radio/television reception systems. Lightning can also travel through any metal wires or bars in concrete walls or flooring.

Stay Safe While Inside

Phone use is the leading cause of indoor lightning injuries in the United States. Lightning can travel long distances in both phone and electrical wires, particularly in rural areas. Stay away from windows and doors as these can provide the path for a direct strike to enter a home. Do not lie on the concrete floor of a garage as it likely contains a wire mesh. In general, basements are a safe place to go during thunderstorms. However, there are some things to keep in mind. Avoid contact with concrete walls which may contain metal reinforcing bars. Avoid washers and dryers since they not only have contacts with the plumbing and electrical systems, but also contain an electrical path to the outside through the dryer vent.

Remember Your Pets

You may want to consider the safety of your family pets during thunderstorms. Dog houses are not lightning-safe. Dogs that are chained to trees or chained to wire runners can easily fall victim to a lightning strike.

Protect Your Personal Property

Lightning also causes significant damage to personal property each year. In addition to direct strikes, lightning generates electrical surges that can damage electronic equipment some distance from the actual strike. Typical surge protectors will NOT protect equipment from a lightning strike. To the extent possible, unplug any appliances or electronic equipment from all conductors well before a thunderstorm threatens. This includes not only the electrical system, but also the reception system. If you plan to be away from your home when thunderstorms are possible, be sure to unplug unneeded equipment before you leave.

Summary of Lightning Safety Tips for Inside the Home

1. Avoid contact with corded phones
2. Avoid contact with electrical equipment or cords. If you plan to unplug any electronic equipment, do so well before the storm arrives.
3. Avoid contact with plumbing. Do not wash your hands, do not take a shower, do not wash dishes, and do not do laundry.
4. Stay away from windows and doors, and stay off porches.
5. Do not lie on concrete floors and do not lean against concrete walls.

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Lightning Safety Outdoors

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The capricious nature of thunderstorms makes them extremely dangerous, however, following proven lightning safety guidelines can reduce your risk of injury or death. You are ultimately responsible for your personal safety. You have the responsibility to act when threatened by lightning.

This document has two main sections: lightning safety [outdoors when a safe location](#) is nearby and when a [safe location is NOT close](#).

No place is absolutely safe from lightning; however, some places are much safer than others. The safest location during lightning activity is an enclosed building. The second safest location is an enclosed metal vehicle, car, truck, van, etc., but NOT a convertible, bike or other topless or soft top vehicle.

Safe Buildings

A safe building is one that is fully enclosed with a roof, walls and floor, such as a home, school, office building or a shopping center. Even [inside](#), you should take precautions. Picnic shelters, dugouts and other partially open structures are **NOT** safe.

Enclosed buildings are safe because of wiring and plumbing. If lightning strikes these types of buildings, or an outside telephone pole, the electrical current from the flash will typically travel through the wiring or the plumbing into the ground. This is why you should stay away from showers, sinks, hot tubs, etc., and electronic equipment such as TVs, radios, and computers.

Lightning can damage or destroy electronics so its important to have a proper lightning protection system connected to your electronic equipment. The [American Meteorological Society](#) has tips for protecting your electronics from lightning.

Unsafe Buildings

Examples of buildings which are unsafe include car ports, covered but open garages, covered patio, picnic shelters, beach shacks/pavilions, golf shelters, camping tents, large outdoor tents, baseball dugouts and other partially open structures.

Safe Vehicle

A safe vehicle is a hard-topped car, SUV, minivan, bus, tractor, etc. (soft-topped convertibles are not safe) . If you seek shelter in your vehicle, make sure all doors are closed and windows rolled up. Do not touch any metal surfaces.

If you're driving when a thunderstorm starts, pull off the roadway. A lightning flash hitting the vehicle could startle you and cause temporary blindness, especially at night.

Do not use electronic devices such as HAM radios or cell phones during a thunderstorm. Lightning striking the vehicle, especially the antennae, could cause serious injury if you are talking on the radio or holding the microphone at the time of the flash. Emergency officials such as police officers, firefighters, security officers, etc., should use extreme caution using radio equipment when lightning is in the area.

Your vehicle and its electronics may be damaged if hit by lightning. Vehicles struck by lightning are known to have flat tires the next day. This occurs because the lightning punctures tiny holes in the tires. Vehicles have caught fire after being struck by lightning; however, there is no modern day documented cases of vehicles "exploding" due to a lightning flash.

Bolts from the Blue

There are times when a lightning flash can travel horizontally many miles away from the thunderstorm cloud itself and then strike the ground. These types of lightning flashes are called "[Bolts from the Blue](#)" because they seem to come out of a clear blue sky. Although these flashes are rare, they have been known to cause fatalities.

When a Safe Location is Nearby

When a safe location is nearby, follow the "**30/30 Rule**."

- Seek safe shelter when you first hear thunder, see dark threatening clouds developing overhead or lightning. Count the seconds between the time you see lightning and hear the thunder. You should already be in a safe location if that time is less than 30 seconds.
- Stay inside until 30 minutes after you last hear thunder.

[Click here to calculate how far lightning is away from you](#)

Plan Ahead! Your best source of up-to-date weather information is a [NOAA Weather Radio \(NWR\)](#). Portable weather radios are handy for outdoor activities. If you don't have NWR, stay up to date via internet, TV, local radio or cell phone. If you are in a group, make sure all leaders or members of the group have a lightning safety plan and are ready to use it.

Determine how far you are from a [safe enclosed building](#) or a [safe vehicle](#). As soon as you hear thunder, see lightning or see dark threatening clouds, get to a safe location. Then wait 30 minutes after the last rumble of thunder before you leave the safe location. If you are part of a group, particularly a large one, you will need more time to get all group members to safety. NWS recommends having professional lightning detection equipment so your group can be alerted from significant distances from the event site.

When groups are involved, the time needed to get to safety increases. So you need to start leaving sooner. Your entire group should already be in a safe location when the approaching storm reaches within 5 miles from your location.

Here some two common scenarios with suggestions on how to safely respond.

Coach of Outdoor Sports Team

You are a manager of a little league team and have a game this evening at the local recreational park. The weather forecast for the day calls for a partly cloudy skies, with a chance of thunderstorms by early evening. You arrive in your vehicle while the kids arrive with their parents. Once arriving at the park, you notice the only buildings are the the restrooms, an enclosed building. Shortly after sunset, the skies start to cloud up and you see bright flashes in the sky to the west. The local radio station mentions storms are on the way.

In this case, the safest locations are the [vehicles](#) the kids came in or the [rest rooms](#). You should have a choice of allowing the kids to go back to their vehicles or bring everyone into the restrooms. It is important **NOT** to stay in the dugouts as they are not safe place during lightning activity. Once at a safe place, wait 30 minutes after the last rumble of thunder before going back outside.

Family at the Beach

You plan to go to the beach or lake later this morning with the kids. The weather forecast calls for a nice morning followed by a 30 percent chance of afternoon thunderstorms. You decide to head for the beach in your minivan. The beach is about 5 minutes from the parking lot. The only nearby buildings are picnic shelters. By early afternoon you notice the skies darkening and hear distant thunder. What would be your lightning safety plan of action?

In this case, the best place to go is your [car](#). Do NOT seek shelter under the beach [picnic shacks](#) because these are not safe in lightning storms. Wait 30 minutes until after the last thunder crack before going back to the beach or driving home.

When a Safe Location Is Not Nearby

The lightning safety community reminds you that there is NO safe place to be outside in a thunderstorm. If you absolutely can't get to safety, this section is designed to help you lessen the threat of being struck by lightning while outside.

Being stranded outdoors when lightning is striking nearby is a harrowing experience. Your first and only truly safe choice is to get to a safe building or vehicle. If you are [camping](#), [climbing](#), on a [motorcycle or bicycle](#), [boating](#), [scuba diving](#), or enjoying other outdoor activities and cannot get to a safe vehicle or shelter, follow these last resort tips.

- Do **NOT** seek shelter under tall isolated trees! The tree may help you stay dry but will significantly increase your risk of being struck by lightning. Rain will not kill you, but the lightning can!
- Do **NOT** seek shelter under partially enclosed buildings
- Stay away from tall, isolated objects. Lightning typically strikes the tallest object. That may be you in an open field or clearing.
- Know the weather patterns of the area. For example, in mountainous areas, thunderstorms typically develop in the early afternoon, so plan to hike early in the day and be down the mountain by noon.
- Know the weather forecast. If there is a high chance of thunderstorms, curtail your outdoor activities.
- Do not place your campsite in an open field on the top of a hill or on a ridge top. Keep your site away from tall isolated trees or other tall objects. If you are in a forest, stay near a lower stand of trees. If you are camping in an open area, set up camp in a valley, ravine, or other low area. A tent offers NO protection from lightning.
- Wet ropes can make excellent conductors. This is BAD news when it comes to lightning activity. If you are mountain climbing and see lightning, and can do safely, remove unnecessary ropes extended or attached to you. If a rope is extended across a mountain face and lightning makes contact with it, the electrical current will likely travel along the rope, especially if it is wet.
- Stay away from metal objects, such as fences, poles and backpacks. Metal is an excellent conductor. The current from a lightning flash will easily travel for long distances (See Figure 1)



Figure 1 Dead cows lined up along a metallic fence. Lightning struck the fence, and the current traveled along the fence killing the cows. *Photo Courtesy Ruth Lyon-Bateman*

If lightning is in the immediate area, and there is no safe location nearby, get into the lightning desperation position. Crouch down but do NOT lay down. Bend your knees down while [keeping your feet together](#) (see Figure 2).



Figure 2: Lightning Desperation Position

Motorcyclist/Bicyclist

- Carry a portable NWR or listen to the radio.
- If you see threatening skies in the distance and you are passing a safe location, pull over and wait 30 minutes after the last thunder crack.
- If you can turn around and get away from the storm, do so!
- DO NOT ride into a lightning storm!

If you absolutely cannot get to a safe building or vehicle, here are some last resort choices:

- Wait out the storm below an overpass. DO NOT touch steel girders. Move away from your bike. Remain on the dry surfaces if possible. Overpasses are engineered structures and are likely to be properly grounded. Although an overpass is likely to be higher than the surrounding landscape, if it is struck by lightning, the electrical current will likely be channeled safely into the ground.
- Look for a bridge. Stay away from water. Stay away from any metal surfaces. Be alert for rapidly rising water if under a bridge.
- High tension wires: If high voltage electrical tension wires cross the road, you may want to seek shelter directly underneath these wires. Do not get too close to the large metal towers which hold up these wires. Stay at least 50 feet away. Electric companies design these high tension wires for lightning strikes. If lightning should strike the wires or towers, the current is designed to safely go deep into the ground.

IMPORTANT: These recommendations are a last resort. You are NOT safe in these places just marginally safer than in the open.

- If you are caught in the open and lightning is occurring within 5 miles, **STOP** riding, get off of your motorcycle/bicycle, find a ditch or other low spot and get into the lightning desperation position.
- Motorcyclists should move at least 50 feet away from their bike. Bicyclist should lay their bikes on the ground.
- [Click here to read a story about a motorcyclist killed while riding in lightning.](#)

On the Water

The vast majority of lightning injuries and deaths on boats occur on [small boats with NO cabin](#). It is crucial to listen to the weather on a small aquatic vessel without a cabin. If thunderstorms are forecast, don't go out or remain relatively close to land. If you are out on the water and skies are threatening on the horizon, get back to land and find a safe building or vehicle.

Boats with cabins offer a safer but not perfect environment. Safety is increased further if the boat has a properly installed lightning protection system. If you are inside the cabin, stay away from metal and all electrical components. **STAY OFF THE RADIO UNLESS IT IS AN ABSOLUTE EMERGENCY!**

What should you do if you are on a small vessel and lightning becomes a threat? If the vessel has an anchor, then you should properly anchor the boat then get as low as possible.

Large boats with cabins, especially those with lightning protection systems properly installed or metal marine vessels are relatively safe. Remember to stay inside the cabin and away from any metal surfaces.

Scuba Divers

If the boat you are in does not have a safe cabin to be in during lightning activity, then you are safer diving deep into the water for the duration of the storm or as long as possible. Your first choice is to head in and get in safe building or vehicle.

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