



Tornado  
Preparedness  
GUIDE

# Basic Preparation

**Y**ou can't stop a tornado. With as quickly as tornadoes can develop, most people won't even have sufficient time to evacuate the area — and it's not the time to get into your car. There are steps people can take to make sure they and their families are better equipped to make it through a tornado.

**Have a plan and an emergency kit for everyone in your household.** There are safe rooms or tornado shelters for sale; they are meant to withstand not only the storm but also the flying debris. Without that, identify places in your home or office that offer the most protection — sturdy construction, away from windows, glass and sharp objects. Have bottled water, food, flashlights and other necessary goods available. Teach children to cover their heads and necks with their arms, cover up with a blanket or coat or otherwise protect their bodies.

**Make sure family members know where to go, what to do and how to reconnect after a storm.** Young children should know phone numbers for parents, grandparents or other adults.

**Know which weather patterns indicate a tornado is possible.** According to Ready.gov, look for a dark, often green-looking sky; large hail; a large, dark, low-lying cloud; and a roar similar to that of a freight train. The barometric pressure may drop. If you see a funnel cloud, immediately seek shelter. Additionally, you can listen to NOAA weather radio for frequent updates on thunderstorm activity in your area.

## **Know the difference**



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**between a watch and a warning.** A tornado watch means tornadoes are possible, but it doesn't mean any have been confirmed. If you get an alert for a tornado watch, get close to a sturdy building or other

shelter, pay attention to the sky and what incoming storms are doing and check in with NOAA Weather Radio, commercial radio or broadcast television, all of which provide emergency weather

alerts. A tornado warning means a tornado has been seen. Get to shelter immediately.

**Be aware of your surroundings.** If you're not at work or home when you get a tornado

watch, assess the safest place to go wherever you are. Ask a manager if there is a storm shelter, a basement or even a closet. You want as many walls as possible between you and the outside.

# Tornado Basics

Everyone who's seen "Twister" can relate to Ready.gov's definition of a tornado: a violently rotating column of air that extends from a thunderstorm to the ground and often appears as a funnel cloud. Anyone who's seen "Twister" also knows to be afraid if a funnel cloud shows up on a horizon.

According to the Federal Emergency Management Agency, they are the most violent storms.

There are ways Americans can prepare for a tornado, including knowing warnings signs, having an emergency plan in place and reacting calmly. Ready.gov, the U.S. government's program for emergency preparation, is full of helpful hints.

## HOW MUCH DAMAGE CAN TORNADOES DO?

Wind from tornadoes can get up to 300 mph, causing paths of damage a mile wide. Regular objects can be turned into dangerous projectiles. In the United States, tornadoes have wiped out entire neighborhoods, destroying houses, roads and electrical poles, uprooting trees and disrupting utility services. They're frequently accompanied by lightning, heavy rains, flash flooding and hail as well, all of which can cause significant damage.

Tornadoes also can shift direction or appear in the sky with almost no warning, leaving people little time to evacuate or take precautions in the moment, making early preparation all the more important.

## WHO'S IN A TORNADO'S PATH?

All of the United States is at risk, according to Ready.gov, though areas east of the Rocky Mountains, the central and southern plains and states adjacent to the Gulf of Mexico are most likely to see one of the 1,200 tornadoes that hit the United States every year. Tornado Alley, the area that tends to be hardest hit each year, is the south-central United States — roughly from central Texas to northern Iowa and from central Kansas and Nebraska to western Ohio. This region is more prone to supercell thunderstorms, which are frequent producers of strong tornadoes.

## WHEN IS TORNADO SEASON?

Tornadoes can be produced anytime during the year, but they're more common during the spring and summer. Tornado Alley typically sees its worst storms during late spring and early fall, according to the National Centers for Environmental Information. The Gulf Coast, which has a strip known as Dixie Alley, has a higher frequency of tornadoes from October through December.

Scientists have found that tornadoes can happen any time of day but are most common from 3 to 9 p.m.



# Building a Safe Room

There basically are not tornado-proof buildings, and for most people, having a completely tornado-proof safe room is prohibitively expensive.

Building a house or office building to code, even in a tornado-prone area, doesn't necessarily mean it is well equipped to withstand the strong winds and flying debris that comes with tornadoes.

Safe rooms that are built according to FEMA's criteria or a storm shelter that accords with International Code Council 500 standards can provide a place for people to hide during a tornado or hurricane. These can be above or below ground and can be large or small depending on your needs.

## WHERE TO PUT A SAFE ROOM

Safe rooms can effectively be built in a basement or on a concrete foundation or interior room on the first floor, according to Ready.gov. The basement is generally the best option; being below ground provides the greatest protection against flying debris. However, basement rooms must be built to avoid accumulating water, so people aren't flooded out during the rainstorms that frequently accompany the storms that produce tornadoes.

If you don't have a basement, your safe room should be on the lowest floor of the building. According to the Federal Emergency Management Agency's "Are You Ready? An

In-depth Guide to Citizen Awareness," safe rooms should be away from corners, windows, doors and outside walls.

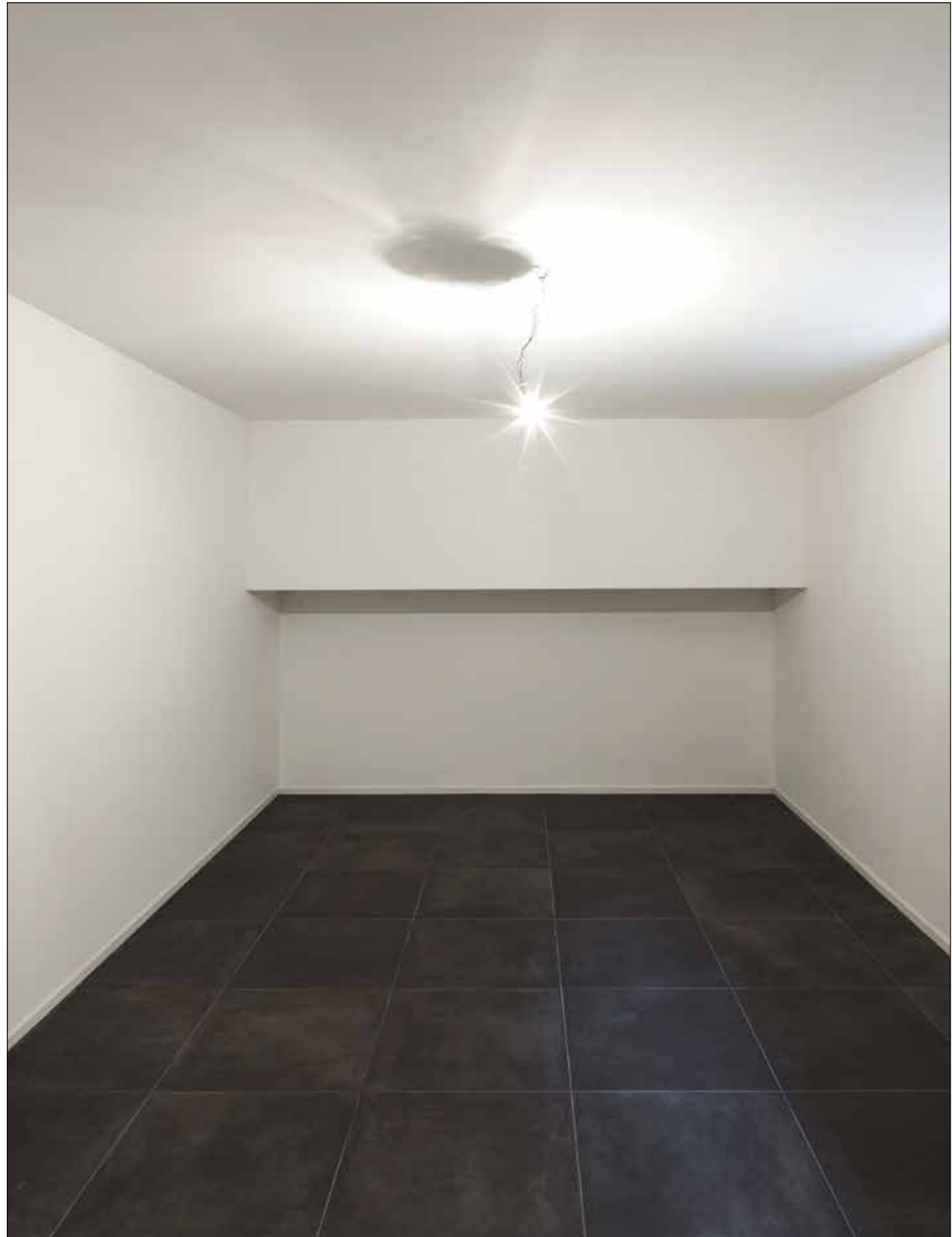
## HOW TO BUILD A SAFE ROOM

Safe rooms must be adequately anchored to a solid foundation to withstand the high winds, so it won't be overturned or picked up by a tornado. Walls, ceilings and doors should be built to withstand wind pressure and be strong enough to not be pierced by flying debris. The safe room walls and other parts of the room must be connected with sufficient strength that the room won't fall apart when the winds get strong.

Finally, if your house's regular walls make up part of the structure of the safe room, sections of those walls must be separated from the main structure so the safe room can withstand the damage the house may sustain.

For additional information about building a safe room, look up documents FEMA-320 or I-223, "Taking Shelter from the Storm: Building a Safe Room Inside Your House."

Keep water, food, a radio and other necessities either in your safe room or in an accessible place so you can grab supplies on your way into the room.



# Sheltering Outdoors

If you're outside when a tornado hits, the best course to take is to get inside a sturdy building.

Mobile homes, even those that are tied down, do not provide much protection from tornadoes, and it's generally safer to leave for a sturdier building.

If there is time, actually driving to such a building can be a good idea, according to the Department of Homeland Security's Ready.gov. Since that's not always feasible, there are a number of last-resort actions to increase chances of survival when a tornado hits. All are based on tornado research and survivability.

## **IF DRIVING IS SAFE, DRIVE TO A SAFE PLACE**

Driving away from a tornado is not recommended in urban or congested areas, but in rural areas where the tornado is visible. If it's far away and the roads are clear, NOAA recommends driving out of its path by moving at right angles to the tornado.

## **HIDE IN A STATIONARY VEHICLE**

Evidence suggests taking refuge in a vehicle provides some safety. Put on your seat belt, cover your head and neck with a coat, blanket or other covering or cushion and crouch down. Be aware that flying debris can break windows, and do what you can to protect yourself from shattered glass.

## **DON'T SEEK SHELTER UNDER AN OVERPASS**

Research suggests that getting to a low, flat location and lying down is safer than hiding under a bridge or an



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overpass, which don't provide much protection from debris but can create traffic hazards. Cover your head with your hands or a jacket or blanket if you have one. However, pay attention to your surroundings; the rain that often accompanies tornadoes can cause

flooding in these low-lying areas.

## **WATCH FOR DEBRIS**

The biggest risk during a tornado is flying debris, which, depending on the wind speeds of the tornado, could make objects into missiles, which

actually cause most injuries and fatalities from tornadoes. Be aware of your surroundings. This includes paying attention to potential hazards such as flammable materials. Seek the best shelter you can and protect your body as best you can.

# What Causes a Tornado?

**E**very thunderstorm that rolls through your city isn't capable of producing a tornado. Certain factors must be in place for a funnel cloud to form. Knowing those factors can help you know when you should be concerned and when you're just looking at a standard thunderstorm.

According to the Center for Science Education, part of the National Center for Atmospheric Research, only about one in 1,000 storms can produce a tornado. Most of these are rotating supercell thunderstorms, which can be caused by the cold, dry air moving south from Canada meeting the warm, wet air coming north from the Gulf of Mexico. (This is a major reason why Tornado Alley is roughly in the middle of the United States.) Rotation seems to begin when winds at different altitudes blow at various speeds, which can create a horizontal rotating column of air at the boundary between these two winds.

Even that doesn't always lead to a

tornado. The rotating column of air has to get caught in the updraft, or flow of air moving up into the storm. As this happens, the spin tightens and speeds up; NCAR compared it to a skater spinning faster when her arms are pulled close to her body. As the rotating column of air does this, it picks up speed and creates a funnel cloud.

It still isn't a tornado, although at this point people start to prepare for a possible tornado. Other contributors to the storm system, such as rain and hail, cause the funnel to bend downward. The moment it touches the ground, we have a tornado.

We tend to think of tornadoes as being big, brown funnel clouds, but

they don't start out that way, which can put people in danger because they can't see it. The cloud becomes visible as it moves and picks up dirt and debris.

According to the National Centers for Environmental Information, Florida's tornadoes are a product of the high frequency of near-daily thunderstorms, as well as the frequency of tropical storms and hurricanes that impact the state. As the systems move onto land, the convective storms in the rain bands can produce tornadoes. Although frequent, these tornadoes — or water spouts, if the storm doesn't quite make it to shore — tend to be weaker than more typical tornadoes.

# After a Tornado

**A**fter a tornado has passed through your area, the danger might not be over yet.

Whether the damage was large or small, it's important to move carefully through those areas, to protect from incoming weather such as rainstorms and to be sure you and your family have sufficient resources if you were forced from your home or your home sustained significant damage.

## GET AWAY FROM DAMAGED BUILDINGS AND CHECK IN

If you can get out of your house safely, do so. If your family or household got separated during the storm, go to a predetermined meeting place and ensure everyone is accounted for. Check in via texting or social media with other family members who were not in the area. Check for injuries and provide whatever first aid you can. As you're moving around, watch out for downed power lines and other hazards.

If you are trapped in your home or another building, don't move around, kick up dust or try to shift unstable materials. Tap on a pipe or wall, use a whistle or yell so rescuers can find you.

## WORK WITH YOUR INSURANCE COMPANY

Before beginning cleanup of your home or business, take pictures and video and talk with your insurance company so you get the correct information to file a claim. You may also need to take steps to prevent further damage, such as covering the roof with a tarp. Insurance may not cover damage that occurs after the tornado and associated thunderstorm.

## DON'T HURRY BACK INTO YOUR HOME

Even after the storm has passed, pay attention to local emergency crews and city and building officials. They can offer guidance on when it's safe to get back into your home or business and how to do so in a way that minimizes further damage or injury to people cleaning up.

If your home did not sustain significant damage but you lost power or water, ensure you have the necessary supplies to stay there safely. If you don't have power, use flashlights or lanterns rather than candles, as open flames could lead to fires.

## USE CAUTION CLEANING UP

Be careful when moving debris and

working around buildings. Wear protective clothing (long-sleeved shirt and long pants, work gloves and work boots or sturdy shoes).

The same objects that turn into dangerous debris with tornado-speed winds propelling them can cause injury if you're not paying attention to your surroundings and acting with caution.



# 10 Worst Tornadoes

Only one of the 10 worst tornadoes in U.S. history (based on injuries and deaths), occurred during this century.

According to the National Centers for Environmental Information (NCEI), the tornado that hit Joplin, Missouri, in 2011 — an EF 5 on the Enhanced Fujita Scale now used to measure tornado strength — killed 158 people and injured 1,000 more. It ranked seventh in terms of death toll. Take a look at some of the others.

**Tri-State Tornado:** On March 18, 1925, an EF-5 (as estimated according to the damage), hit 13 counties in Missouri, Illinois and Indiana. It was the deadliest tornado in U.S. history, with 695 deaths and an additional 2,027 people injured. According to TornadoFacts.net, the tornado's path was 235 miles and at one point was more than a mile in width. It lasted for three and a half hours.

**Great Natchez Tornado:** On May 6, 1840, a tornado, the strength of which remains unknown, swept through Louisiana and Mississippi, with Natchez, Mississippi, seeing the most damage. More than 100 people were injured, and 317 people died. According to the Concordia Sentinel, a severe thunderstorm hit the area at about noon, and minutes later the storm system produced a violent tornado, which increased in size and strength immediately upon touching down.

**The Great St. Louis Tornado:** A thousand people were injured and 255 died in the EF-4 tornado that hit St. Louis on May 27, 1896. NCEI reported the tornado took less than half an hour to do more than \$25 million in damages, flatten entire neighborhoods, wipe out utility infrastructure and destroy boats in the Mississippi River. The “tornado-proof” Eads Bridge remained standing, but not unscathed; huge chunks of its eastern approach was ripped away.

**Tupelo, Miss.:** An EF-5 tornado tore through Tupelo, Mississippi, on April 5, 1936, killing 216 people and injuring 700. The storm had winds reported up to 261 mph, strong enough to embed pine needles into trunks of trees.

**Gainesville, Ga.:** The day after a tornado struck Tupelo in 1936, the second, third and fourth twisters from the same system hit nearby Gainesville, Georgia. According to History.com, 70 workers were killed at the Cooper Pants factory when the building collapsed. In all, 466 people were killed and 3,500 were injured over four days of tornadoes in the region.