Surviving the Storm

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FEMA photo by Manny Garcia

Tornado victims search for belongings in the rubble.

Know Your Tornado Risks

Every year, tornadoes, hurricanes and other extreme windstorms injure and kill people and damage millions of dollars worth of property in the United States. Even so, more and more people build houses in tornado- and hurricane-prone areas each year, possibly putting themselves in harm's way.

One of FEMA Director James Lee Witt's priorities is to find better ways to live with nature and reduce the suffering from disaster. "We must do more than just respond to disasters after they occur," Witt says. "We must prepare in advance so communities can continue to function and individuals can avoid the traumatic disruption of their daily lives. We have found that every dollar spent on disaster preparedness and mitigation saves two or more dollars in future costs."

The preparedness information in this newsletter could help save your life or property in the event a tornado threatens. It will help you make decisions on how best to protect yourself and your family. It also provides information about shelter designs that will show you and your builder/contractor how to construct *safe rooms* that protect from the high winds expected during tornadoes and hurricanes and from flying debris, such as wood studs, that tornadoes and hurricanes usually create.

This publication contains valuable information – actions you can take to reduce the risks you face from tornadoes. By following this guidance, you can take action now to help protect your family, your property and your community.

The Power of Tornadoes

Tornadoes are nature's most violent storms. In an average year, 800 tornadoes are reported nationwide, resulting in 80 deaths and more than 1,500 injuries. In May 1999, tornadoes swept through Oklahoma, Kansas, Iowa, Texas and Tennessee killing 57 people and leaving thousands homeless.

A tornado is defined as a violently rotating column of air extending from a thunderstorm to the ground.

Virtually every state has experienced tornadoes strong enough to damage roofs, destroy mobile homes, snap or uproot large trees and turn debris into damaging windborne missiles.

Weak tornadoes, with winds less than 110 miles per hour, typically last less than 10 minutes and make up 69 percent of all tornadoes.

Strong tornadoes, with winds of 110 to 205 miles per hour, cause nearly 30 percent of all tornado deaths.

Violent tornadoes pack winds greater than 205 miles per hour and cause 70 percent of all tornado deaths.

Damage paths can be in excess of one mile wide and 50 miles long. Once a tornado in Broken Bow, Oklahoma carried a motel sign 30 miles and dropped it in Arkansas!

Even states not normally considered susceptible to extreme windstorms have areas threatened by dangerous high winds.

Planning: Key to Survival

The National Weather Service continuously broadcasts updated weather warnings and forecasts that can be received by the National Oceanic and Atmospheric Administration (NOAA) weather radios sold in many stores. The average range is 40 miles, depending on topography. Your National Weather Service recommends purchasing a radio that has both a battery backup and a tone-alert feature that automatically alerts you when a watch or warning is issued.

Discuss with family members the difference between a "tornado watch" and a "tornado warning."

What to listen for . . .

TORNADO WATCH: Tornadoes are possible in your area. Remain alert for approaching storms.

TORNADO WARNING: A tornado was sighted or indicated by weather radar. If a tornado warning is issued and the sky becomes threatening, move to your pre-designated place of safety.

SEVERE THUNDERSTORM WATCH: Severe thunderstorms are possible.

SEVERE THUNDERSTORM WARNING: Severe thunderstorms are occurring.

Remember, tornadoes occasionally develop in areas where a severe thunderstorm watch or warning is in effect. Remain alert to signs of an approaching tornado and seek shelter if threatening conditions exist.

Prepare a Family Disaster Plan

Conduct tornado drills each tornado season. Designate an area in the home as a shelter and practice having everyone in the family go there in response to a tornado threat.

Have disaster supplies on hand.

- **Flashlight and extra batteries**
- **Portable, battery-operated radio and extra batteries**
- **First aid kit and manual**
- **Emergency food and water**
- **Nonelectric can openers**
- **Essential medicines**
- **Cash and credit cards**
- **Sturdy shoes**

Be familiar with escape routes. It may be necessary to evacuate your neighborhood. Plan several escape routes for different contingencies.

Post emergency phone numbers (fire, police, ambulance) by the telephone.

Teach children how to call 911 for help.

Know how to turn off utilities.

Identify family meeting places in case your family is separated. Choose a place in a building or park outside your neighborhood. Everyone should be clear about this location.

Develop an emergency communication plan. Ask an out-of-state relative or friend to serve as the family's contact. Make sure everyone knows the telephone number of the contact.

Make Plans for Your Pets

Shelters and some hotels/motels may not let your bring your pet. Keep a list of "pet friendly" places, and phone numbers.

- **In a disaster warning, keep your pets inside and make sure they are wearing collars and identification tags.**
- **Can't take your pet with you? Put it in a safe, secure room without windows but with enough air, food and water for three days.**
- **Never leave your pets tied up outside.**
- **Put a notice on your front door saying where your pets are in the house and a phone number where you will be.**

When a Tornado Strikes

If you are *at home:*

- Go at once to the basement, storm cellar or the lowest level of the building. No basement? Go to an inner hallway or a smaller inner room without windows, such as a bathroom or closet.
- Get away from windows.
- Go to the center of the room. Stay away from corners because they tend to attract debris.
- Get under a sturdy piece of furniture such as a workbench or heavy table and hold on to it.
- Protect your head and arms.
- Get out and find shelter elsewhere if you are in a mobile home.

If you are *at work:*

- Go to the basement or to an inside hallway at the lowest level.
- Avoid places with wide-span roofs such as auditoriums, cafeterias or shopping malls.

If you are *outdoors:*

- Get inside a building, if possible.
- Lie in a ditch or low-lying area or crouch near a strong building if shelter isn't available.

If you are *in a car:*

- Never try to outdrive a tornado in a car or truck. Tornadoes can change direction quickly and can lift up a car or truck and toss it through the air.
- Get out of the car immediately and take shelter in a nearby building.
- Lie in a ditch or low-lying area or crouch near a strong building if shelter isn't available.

Tornado-related information on the FEMA website at http://www.fema.gov

Protection Tips for Wind Storms

- Remove trees and things that could become potential wind-borne missiles from the area immediately surrounding your home.
- Secure sheds and other outbuildings either by constructing a permanent foundation or using straps or ground anchors.
- Reinforce double-entry doors by adding heavy-duty dead bolts or slide bolts at the top and bottom.

FEMA photo Manny Garcia

This house was completely destroyed by a tornado.

Strengthen Your Home

Your house may be built "to code," but that may not mean that it can withstand winds from extreme events. Local building codes consider the effects of minimum *design winds* that your house must be able to withstand. However, a tornado or hurricane often can cause winds much greater.

Four areas should be checked for weakness: the roof, windows, doors and garage doors. Measures can be taken to strengthen each of these areas of your home.

Roof

The roof is most vulnerable to damage from high winds. Proper roof contruction is essential. A few dollars spent before a storm hits can save thousands in future damage.

The connection between the roof and walls must be strong enough to resist the "uplift" effect of strong winds. Roof trusses or rafters should be tied properly to exterior walls with metal strapping or connectors.

Have a building professional use specially designed metal connectors to attach the roof to wall plates, which are already well connected to wall studs (see figure 1).

You may choose instead to use metal strapping or connectors to tie the roof rafters to both the wall top plate and the wall studs (see figure 2).

Special connectors also are available to attach a roof to a masonry wall.

Gable-end roofs are more susceptible to damage from high winds than hip or flat roofs. Bracing for trusses and rafters can add protection to your home.

In choosing the appropriate connectors for your walls, check with lumber supply outlets, a building professional or local building and planning officials.

Windows

Installing storm shutters over all exposed windows and other glass surfaces is one of the easiest and most effective ways to protect your home. Cover all windows, French doors, sliding glass doors and skylights.

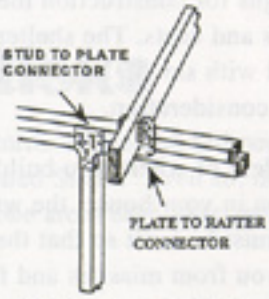

FIGURE 1. Connect the rafters to the top plate and connect the top plate to the wall studs using the proper connectors.

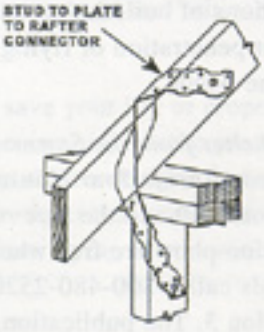

FIGURE 2. Connect the rafters to the top plate and to the studs using the proper connector.

Many types of manufactured storm shutters are available. Before installing shutters, check with local building officials to find out if a permit is required.

Plywood shutters that you make yourself, if installed properly, can offer a high level of protection from flying debris during a hurricane or tornado. Plywood shutters can be installed on all types of homes.

Doors

If you have double-entry doors, but one door is active and one inactive, or fixed, check to see how the fixed half is secured top and bottom. The bolts or pins that secure most doors are not strong enough to withstand extreme winds.

Check with your local building supplies retailer to find out what kind of bolt system will work for your door. Doors with windows will need additional protection from flying debris.

Garage Doors

Two-car garage doors can pose a problem during extreme windstorms because they are so large. They wobble as high winds blow and can pull out of their tracks or collapse from wind pressure.

Certain parts of the country have building codes requiring garage doors that withstand high winds. Some garage doors can be strengthened with retrofit kits. Check with your local building supplies dealer.

FEMA Offers Plans for Tornado *Safe Room*

Residents of tornado-prone areas can get protection against deadly tornadoes by building a *safe room* in their home. The Federal Emergency Management Agency (FEMA) offers a 25-page illustrated publication, *Taking Shelter from the Storm: Building a Safe Room Inside Your House*.

The booklet outlines the basics of in-house *safe room* shelter design, including construction plans, materials and construction cost estimates.

"The *safe room* project is part of an ongoing FEMA initiative to encourage people to take measures to protect themselves and their property before disasters occur," FEMA Director James Lee Witt said. "When constructed according to the plans, the safe room can provide protection against winds of up to 250 miles per hour and projectiles travelling at 100 miles an hour.

Developed in collaboration with the Wind Engineering Research Center of Texas Tech University in Lubbock, Texas. The booklet draws on 25 years of field research by the Texas Tech researchers. Their work has included studies of the performance of buildings following dozens of tornadoes throughout the United States and laboratory testing on the performance of building materials and systems when impacted by airborne debris. The National Association of Homebuilders Research Center evaluated the designs for construction methods, materials and costs. The shelters are designed with saving lives as the primary consideration.

FEMA photo by Andrea Booher

This safe room survived intact, though the rest of the house was destroyed.

"Regardless of where you build your *safe room* in your house, the walls and ceiling must be built so that they will protect you from missiles and falling debris and remain standing if your house is severely damaged," Witt said. The *safe room* designs in *Taking Shelter from the Storm* specify building materials and combinations of building materials that will resist penetration of flying objects in extreme winds.

Taking Shelter from the Storm: Building a Safe Room Inside Your House (FEMA Publication 320) and the *safe room* construction plans are free when individuals call 1-800-480-2520 and press option 3. The publication, but not the construction plans, can be downloaded from the FEMA website (www.fema.gov/mit/tsfs01.htm).

Mobile Homes Vulnerable

Mobile homes are highly vulnerable to damage from tornadoes and high winds.

Do not stay in a mobile home during a tornado. Even homes with a secure tie-down system cannot withstand the force of tornado winds.

If you live in a mobile home, plan ahead. Make arrangements to stay with friends or neighbors who have basements or *safe rooms*. Go there if a tornado watch is issued.

If a tornado warning is given, leave your mobile home and seek shelter nearby. Lie flat in a ditch or ravine and put your arms over your head. Do not take shelter under your home.

Encourage your mobile home community to build a tornado shelter if you live in a tornado-prone area.

To help you, FEMA will ...

- Provide you with access to disaster assistance.
- Provide you with an opportunity to tell your story to a responsive FEMA representative.
- Treat you with respect and caring.
- Give you clear, accurate information about available assistance and how to apply for it.
- Explain clearly what you need to do after registration, what you can expect from government agencies and how long the process should take.
- If you are eligible, provide you with disaster housing assistance as promptly as possible and give you an estimate of when you will receive assistance.
- Advise you on how to protect against future losses.
- Use your suggestions to improve our service.