

A letter from your local  
Emergency Management Office  
605-394-2185

**Attention Administrators and Teachers;**

At the end of this month the National Weather Service will be conducting a tornado drill. The following release will be sent out to the general public through radio, print and television.

A statewide tornado drill will be conducted by the National Weather Service between 9:00 and 9:30 am MDT on **Wednesday, April 28**. Because the exercise is used to ensure communications and warning systems are functioning properly before storm season, people will see and hear the alerts.

Outdoor warning sirens will be sounded in Rapid City, Box Elder, Ellsworth Air Force Base, New Underwood, Wall, Hill City, and Hermosa. The sirens may not be heard inside homes and buildings, especially large office buildings, as they are intended to alert people who are outdoors away from radio or TV.

The drill will also include the Emergency Alert System, which will interrupt local media broadcasts. The public should be aware that the scroll on broadcast television and cable TV channels will look like a real warning, while the NOAA Weather Radio and broadcast radio audio will be identified as a test.

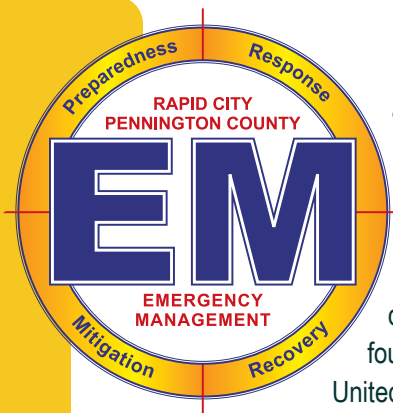
Local emergency response agencies may practice their response procedures and schools will conduct safety drills for their students.

Individuals do not need to take any action during the drill, but they are encouraged to make plans to protect themselves and their families before storms develop. Don't wait until the storm is headed toward you as there won't be time. Learn how to "Make a Plan, Build a Kit, and Get Involved" online with Rapid City—Pennington County Emergency Management [www.rcpcem.com](http://www.rcpcem.com) or visit the American Red Cross [www.blackhillsredcross.org](http://www.blackhillsredcross.org) and Rapid City National Weather Service at [www.weather.gov/RapidCity](http://www.weather.gov/RapidCity) for more information.

The goal of this event during Severe Weather Preparedness Week (Apr. 26-30) is to raise awareness and to encourage preparedness activities. The following pages will provide you with information to pass onto staff and students of all ages. Classrooms are encouraged to plan exercises or drills to coincide with the tornado warning. Please contact us if we can help you plan.

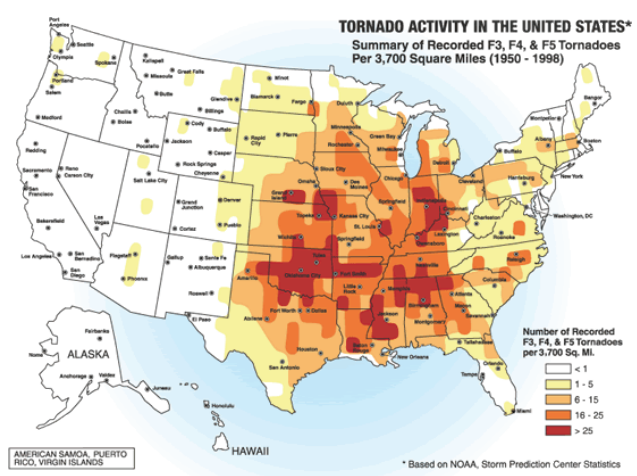
*Rapid City-Pennington County Emergency Management Office,*

Anthony Carbajal, Director  
Alexa White, Asst. Coordinator



# Tornadoes

Although tornadoes occur in many parts of the world, these destructive forces of nature are found most frequently in the United States east of the Rocky Mountains during spring and summer months. In an average year, 800 tornadoes are reported nationwide, resulting in 80 deaths and over 1,500 injuries. A tornado is defined as a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be miles long. Once a tornado in Broken Bow, Oklahoma, carried a motel sign 30 miles and dropped it in Arkansas.



## What causes Tornadoes?

Thunderstorms develop in warm, moist air in advance of eastward moving cold fronts. These thunderstorms often produce large hail, strong winds, and tornadoes. Tornadoes in the winter and early spring are often associated with strong, frontal systems that move east. Occasionally, large outbreaks of tornadoes occur with this type of weather pattern. Several states may be affected by numerous severe thunderstorms and tornadoes. Tornadoes occasionally accompany tropical storms and hurricanes that move over land. Tornadoes are most commonly to the right and ahead of the storm path as it comes onshore.

## Tornado Variations

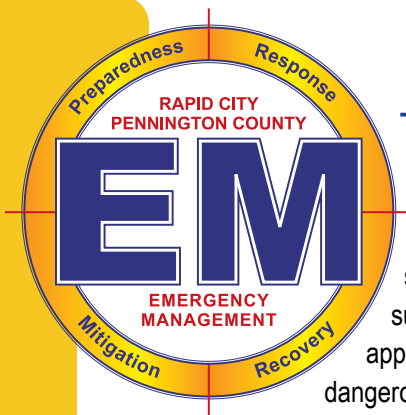
Some tornadoes may form during the early stages of rapidly developing thunderstorms. This type of tornado is most common along the front range of the Rocky Mountains, the Plains, and the Western States. Tornadoes may appear nearly transparent until dust and debris are picked up. Raising air within the thunderstorm updraft tilts the rotating air from horizontal to vertical. An area of rotation, 2-6 miles wide, now extends through much of the storm. Most strong and violent tornadoes form within this area of strong rotation.

## Frequency of Tornadoes

Tornadoes can occur at any time of year. Months of peak tornado occurrence in South Dakota are from May-July. In some states, a secondary tornado maximum occurs in the fall. Tornadoes are most likely to occur between 3pm and 9pm but have been known to occur at all hours of the day and night. The average tornado moves from southwest to northeast, but tornadoes have been known to move in any direction. The average forward speed is 30 mph, but may vary from nearly stationary to 70 mph.

## Tornado Myth vs. Fact

- Myth:** Areas near rivers, lakes and mountains are safe from tornadoes.
- Fact:** No place is safe from tornadoes. In the late 1980s, a tornado swept through Yellowstone National Park leaving a path of destruction up and down a 10,000 ft. 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:** Opening windows allows damaging winds to enter the structure. Leave the windows alone; instead, immediately go to a safe area, away from windows.



## Tornado Safety for schools

The most important part of tornado safety in schools is to develop a good tornado safety plan *tailored to your building design and ability to move people*. Damage surveys have shown that a lot of schools settle for a cookbook-style, "one size fits all" approach to tornado safety -- often based on outdated literature -- which can be dangerous when considering the fact that every school is built differently.

Ideally, the lowest possible level is the safest. However, in some large schools, there may not be enough time to direct all occupants of the upper floors into safe areas, or enough space in those lowest-floor safe areas to hold everyone. Ultimately, the school administrators need to evaluate the time, space, traffic flow and coordination needed to direct all the kids and staff down into safe areas in an organized manner. That will require a *customized drill* which will vary from building to building.

- **SECONDS COUNT.** If it takes more than 2 or 3 minutes to move all upper-floor people down, things get really risky! Though the average lead (advance) time on tornado warnings has gone up in recent years, the average still includes some warnings with NO lead time, or just a minute or two. Warnings are not absolutely perfect, radars can't see everything, and tornadoes don't always touch down miles away and make themselves visible before hitting. Plan for a *reasonable worst-case scenario* -- a tornado is spotted very close-by, and hits with little or no warning. That way, during the majority of cases when there are warnings with several minutes of lead time, the plan can be executed and those people are all in a safe place within one or two minutes of the first alert. That is the ultimate goal. Now, how do you define a "safe place?" There is no guaranteed "safe place" in a tornado; but...
- **FLYING DEBRIS** is the biggest tornado hazard. That's why one needs to put as many walls as possible between oneself and the tornado. Are there interior hallways, rooms or corridors on the second floor which are NOT exposed to the outside through windows, doors or walls of glass? If not, then it can turn into a death trap of flying broken glass. If there are enough enclosed places on the second floor with no direct exposure to the exterior, *perhaps* you can save the time needed to move people down one floor. But even then...
- **BUILDING STRENGTH:** Architecturally, how sound is the construction of the main building? What interior parts can stay intact during total structural loads created by 150-200 mph winds (which exceed the speeds found in most tornadoes) from any direction? Is *anyplace* on an upper floor safe enough in such structural stresses?
- **NEW CONSTRUCTION:** Although this guide is intended for existing facilities, many of the same concepts can be applied to making tornado-safe schools from the blueprint stage. This is when a licensed engineer with *wind engineering specialization* would be the most beneficial.
- **PORTABLE CLASSROOMS:** These can be death traps. Portable classrooms are most often constructed like mobile homes; and they are just as dangerous. Any sound tornado safety plan must include getting students out of portable classrooms and into a safe area in the main building, as quickly as possible, to minimize the time spent outside and exposed to the elements. While the seconds spent outside will pose considerable risk, the danger inside the trailer is just as great. If feasible, students should be evacuated from portable classrooms *before the storm threatens* -- before the warning, when a tornado or severe thunderstorm watch is issued. Remember: Tornadoes can occur with little or no advance warning. Moving those students inside the main building for every storm watch may be a hassle; but it may also save precious seconds and the lives of students if a tornado or extremely severe thunderstorm hits later.
- **DANGER - GYMS and AUDITORIUMS:** Large, open-span areas, such as gymnasiums, auditoriums and most lunchrooms, can be very dangerous even in weak tornadoes, and should not be used for sheltering people. This sort of room has inherent structural weaknesses with lack of roof support, makes them especially prone to

## Tornado Safety for schools cont.

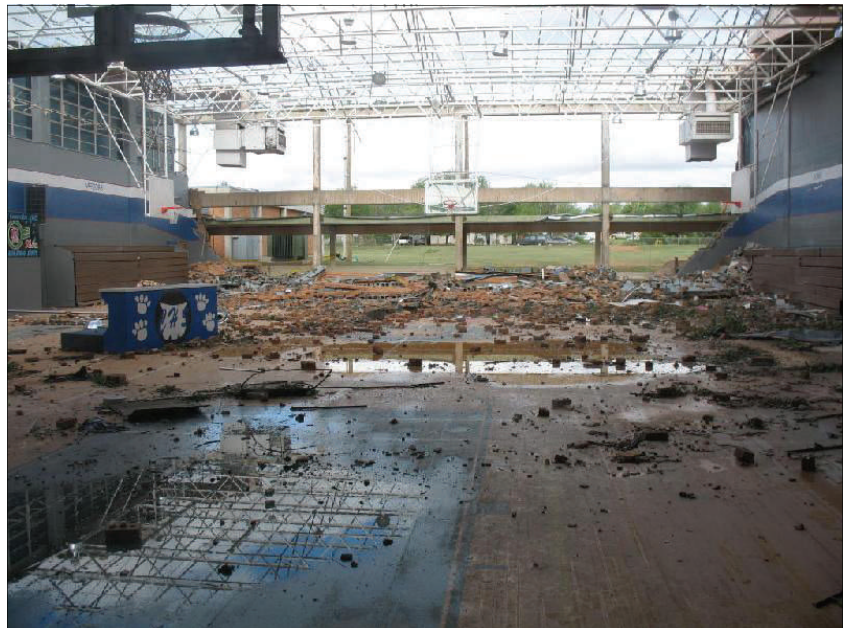
collapse with weaker wind loading than more compact areas of the same school building. Consider the aerial photo of Caledonia (MS) High School (right) as an outstanding example of this, when the near side was hit by a tornado in January 2008. The next photo (below) shows the inside of Childress (TX) High School gym after a May 2006 tornado. The tornado was rated F1 (weak, on the original F-scale) at the school. This further illustrates the hazard of indoor areas with larger roof spans, even in “weak” tornadoes.



### SOME ADVANCE STRATEGIES

A carefully developed tornado drill should be run several times a year to keep students and staff in good practice, and to work out any kinks in the drill before it is needed for real. Also, large and easy to read maps or signs with arrows should be posted throughout the hallways directing people to the safe areas. Here are some other important tips:

- If the school's alarm system relies on electricity, have a compressed air horn or megaphone to sound the alert in case of power failure.
- Make special provisions for disabled students and those in portable classrooms. Portable classrooms are like mobile homes -- exceptionally dangerous in a tornado.
- Make sure someone knows how to turn off electricity and gas in the event the school is damaged.
- Keep children at school beyond regular hours if threatening weather is expected; and inform parents of this policy. Children are safer deep within a school than in a bus or car. Students should not be sent home early if severe weather is approaching, because they may still be out on the roads when it hits.
- Lunches or assemblies in large rooms should be postponed if severe weather is approaching. Gymnasiums, cafeterias, and auditoriums offer no meaningful protection from tornado-strength winds. Also, even if there is no



## Tornado Safety for schools cont.

tornado, severe thunderstorms can generate winds strong enough to cause major damage.

- Know the county/parish in which your school sits, and keep a highway map nearby to follow storm movement from weather bulletins. Online maps and weather sources can be valuable, but if the power is out, it helps to have paper maps.
- Have a **NOAA Weather Radio** with a warning alarm tone and battery back-up to receive warnings quickly and directly from your local National Weather Service office. A technology called SAME (Specific Area Message Encoding) allows you to set such weather radios to alarm for your county and surrounding counties; so look for the SAME feature when purchasing weather radio units.
- Listen to radio and television for information when severe weather is likely. Outlooks and watches from them can also help you be aware of the possibility of severe weather during the school day.



### When the tornado threatens or a tornado warning is being issued...

- Seconds count. Follow the drill according to the plan you have developed. This should include bringing students who are outside, to the inside. Lead all students to the designated safe places in a calm, orderly and firm manner. Everyone should then crouch low, head down, protecting the back of the head with the arms. Stay away from windows and large open rooms like gyms and auditoriums.

### After the Tornado...

- Keep students assembled in an orderly manner, in a safe area away from broken glass and other sharp debris, and away from power lines, puddles containing power lines, and emergency traffic areas.
- While waiting for emergency personnel to arrive, carefully render first aid to those who may be injured.
- Keep everyone out of damaged parts of the school; chunks of debris or even that whole section of the building as it may have been weakened and could fall down.
- Ensure nobody is using matches or lighters, in case of leaking natural gas pipes or fuel tanks nearby.
- It is very important for teachers, principals and other adult authority figures to set a calm example for students at the disaster scene, and reassure those who are shaken.