

Safe Rooms Survey Report

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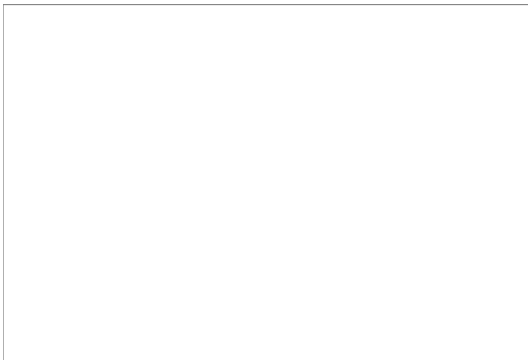
August 2002

Although the general public is very much aware of the potential danger of severe weather, they are not jumping at the chance to have a 'safe room' installed in their houses. The risk of a tornado or a hurricane hitting a house directly to the point of destruction is very minimal, and for the hefty price tag on average of between \$5,000 and \$6,000 many consumers see the safe room as something they can live without. Less than 1% of the United States population has made the decision to purchase or build a safe room. Our goal is to educate the public about what's available and what safe alternatives there are to the well known, more expensive models. We tried to find shelters that we believed would appeal to the average person, something that people can feel safe in when severe weather hits, but at the same time something that they can afford.



Collecting research materials on safe rooms is a relatively easy process, as there are many companies providing facts, trying to convince the consumer to believe that their safe room is the best. For straight facts on storm shelters the best resource by far is the Federal Emergency Management Agency (FEMA). FEMA gives basic storm shelter information, helpful links, and a list of publications that can be purchased to help the consumer make a more informed decision. The National Storm Shelter Association (NSSA) has their own set of guidelines and test procedures which can be used to make sure that storm shelters are safe and are tested to meet certain

standards. Another web site with useful information is the Texas Tech University Wind Engineering Center. This center was established as a permanent laboratory to study wind effects on structures and how well the shelters are able to hold up in the presents of projectiles generated by severe weather. Texas Tech has conducted much of the present day research concerning safe rooms and have available a very easy to read overview of all the information they have collected. Texas Techs website also contains the building standards for a structure to be considered a safe room that would be acknowledged by FEMA and NSSA. These three sites serve as hug influences on each and every resource concerning safe rooms.



There are certain criteria that consumers should take into consideration when choosing which safe room is right for them. For in-depth information on these criteria the consumer should visit The Blue Sky Foundation webpage and read the “In Home Protection against High

Winds” manual.

The biggest factor for most consumers is of course cost. How much the consumer is willing to spend will greatly change the variety of safe room they will look at and eventually purchase. Safe rooms usually cost between \$2,000 and \$16,000 depending on materials used. Doors tend to be the most expensive part of the room and can increase the price of the room greatly. Whether or not it is installed above ground or below ground can change production costs, the price of instillation can cost from very little in the case of self instillation which are usually the above ground model, all the way up to

approximately \$1,200. In some cases it is up to the consumer to provide a cement truck and backhoe which will also add greatly to the cost.

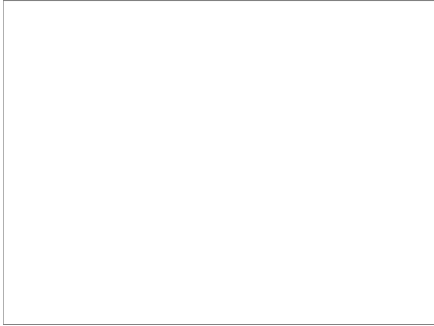
Warranty is a huge factor on which safe room is chosen. Warranties can range from protection against any defect for one year from the purchase date all the way to a lifetime warranty against defects in material and workmanship to the original purchaser. Some warranties cover storm damage. If the consumer is in an area that is prone to tornadoes and other severe weather they should look for warranties to protect them through multiple disasters. No one is going to want to have to replace their safe room, and the cost would be enormous.

Other issues to consider should be whether or not the owner would have to leave the house in case of a storm; how the safe room provides fresh air; whether or not it is handicapped accessible; if there are more than one exit in case one is blocked; what system the storm rooms have to contact authorities so that the family can be rescued after a disaster. All of these are up to the consumer's personal preferences and again the amount that they are willing to spend on a safe room.

How the safe room is locked is very important. For example, if it locks only from the inside and a child or someone who might be unable to unlock a door got in and locked it, they would have no way out and no one on the outside could easily retrieve them. At the same time the door needs to be easily enough opened that in the case of a tornado everyone can enter safely and in a speedy manner, especially if the shelter is located outdoors.

The materials and structures differ depending on the company producing the safe room. All safe rooms must be anchored to a concrete slab no less than 4 inches thick, and reinforced with bidirectional steel bars, mesh or cable. Some safe rooms are completely

made of concrete, some are a combination of fiberglass and pressure treated plywood. Polythene, polycarbonate, plastic and steel are other alternative building materials. Each has their own advantages and disadvantages and should be researched carefully by the consumer.



Concrete safe rooms are what most people think of when they picture what is safe. When F5 tornados come through and destroy everything, the one thing that remains are the concrete foundations, it seems logical to build a safe room out of such durable material.

Concrete safe rooms can be made from insulating concrete forms, concrete masonry, or conventionally cast concrete, each of which has been tested and approved by Texas Tech University. Some of the less positive aspects of concrete are that concrete walls sometimes sweat and become moldy inside. Another danger is that concrete can cracks and seep in water. However many of these problems are completely covered by companies who offer good warranties.

Fiberglass shelters are cheaper, lighter, and easier to install. There are however drawbacks. Fiberglass has such a light weight; a lot of care has to be taken into how the safe room is secured into the foundation, if improperly done the integrity of the room might be compromised. Fiberglass shelters tend to only falter when it comes to very strong wind such as F5 tornados, which are very rare occurrences. Another major advantage of fiberglass safe rooms are the fact that they are so practical, because of their reduced price they come in fairly big sizes and can be used year round as an extra room in a house.



Steel safe rooms, if coated properly, are safe and long-lasting with the ability to stay dry inside thus reducing the risk of molding. Steel's design flexibility allows easy incorporation into most structural plans without requiring additional design or architectural expense. One concern that consumers tend to have about steel is whether or not it can protect them from lightning. Experts say that the steel will not become a lightning conductor as long as it is well grounded to the house, so this should not be something that deters the consumer from considering a steel safe room.

Consumers should focus on safe rooms that have been tested in accordance with the guidelines of the specification set forth by Texas Tech University. Some safe rooms have been tested directly by Texas Tech University and have their seal of approval. The National Storm Shelter Guidelines can be found on their website, they follow in accordance to the FEMA 320 and the NSSA criteria.

Consumers need to choose what is best for them personally. They need a safe room in which they can feel comfortable and safe, but at the same time will still be practical. There are many options out there and we at Blue Sky Foundation have attempted to help give the basic information a consumer will need before investing in a safe room.

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APPENDIX A

APPENDIX B

Company	Canton Shelter	Comfort Enterprises	Hasuners Shelter	Heartland Sheleter	Life Pod Shleter
Price (\$)	1950- 2250	2695-4495	1600-1900	Depending on state and ground conditions	2300- 3000
Warranty	Lifetime Leak Protection	Lifetime Structure Warranty	Leak protection 10 yrs	Lifetime warrenty on manufacturing defects	20 yrs against leakage
Materials	4" thick concrete reinforced with 3/8" rebar	¼" Fiberglass over ½" treated plywood	2 piece pre cast concrete unit bolted together on both sides with steel strap sealed with silicone	Fiberglass	Polyethelene
Access	Both	Outside or inside during construction of house	Outside/ underground	Both	Outside/ underground
Fresh Air	8" turbine ventilator	Two Ventilators	8" wind turbine on top	Patented flow through door rail system	
Dimensions	6'X 8'X 6'2" tall	6'X6' 10" long 6'10 ½" tall	- (1200 LBS)	8' long x6' wide x 6' high small: 6'long x4' wide x 5'high	110" x 55" x 78"
Instillation and delivery	Included-delivery outside of KS extra Fee	Out of GA and AL no instillation	Manufacturer installs	Client or distributor	Two vents one turbine
Exits	1	1	1	1 with evacuation jack	1
Handicapped access	Yes	NO	-	In development	No- they must be lowered in
Testing	Yes 5000 lbs per square inch of pressure	-	Engineer stamp of approval but NO testing	Yes, shelter Met and/or exceeds FEMA shelter criteria	Yes, 10,000 lbs placed on unburied structure
Locks	None only latch	-	-	-	Yes

Company	Safe Haven Shelter	Storm Chaser Shelter	Damar Safe bed	Twister Pit
Price (\$)	Depends on contractor and installation situation	3,850- 6,000	3,600-4,000	-
Warranty	Hatch 10 years, everything else lifetime	5 years leakage if installed by professional	-	-
Materials	Impact plastic	Steel (10 Ga, and 3/16 Pl) welded hot dipped galvanized.	Steel outer skin welded to an all steel frame	Made of 6-inch steel channel with 5/8 grade 5 bolts
Access	Outside below	Outside below ground	From top/ lift up mattress	Both available
Fresh Air	2 2" PVC pipes	Open air vents steel and screened	Steel mesh filters	
Dimensions	84" or 7' x 7' x 7'	6'6" tall, 6' wide, 5' to 14' long	King, queen or twin bed	Unit is available in 18 different sizes
Instillation and delivery	Delivered and installed by licensed dealer	Contract with delivery company, installed by local dealer	Self instillation	-
Exits	1	1 or 2	2	1
Handicapped access	Can be lowered	Yes	Yes	Yes
Testing	-	Approved by state of Texas engineers association and have passed impact testing at Texas Tech	Approved by Texas Tech University according to FEMA standards	Approved by Texas Tech University according to FEMA standards
Locks	Always locked from outside, can be locked from inside	Inside OR out	Three hook latches	Yes

Company	Tornado Shelter Enclosure	Storm Closet	Keep Safe Shelter	American Storm Shelter
Price (\$)	9,776-16,000	4500-5000 Uninstalled	2785 +instillation (300-500)	6,000-6,400
Warranty	-	Defect free for 1 yr	Lifetime warranty for original owner	10 years
Materials	3 ½” square tube, 5/16” thick polycarbonate skin	Cold formed steel tubes and panels, connected with structural adhesive screws, impact shield and doors	Galvanized steel	Concrete blocks, concrete and ½ to ¾” steel rebar, walls are 8” thick
Access	Above ground	Above ground, can be used as a room	Above ground	Inside the home
Fresh Air	Not air tight, air flows through the connection plates	Fire damped vent with 12 gauge steel vault door	Passive system	Not needed, but can be provided
Dimensions	Four options: 7’ square, 3’8” x 7’, 3’8” square or custom built	4’x7’4” and 7’4” x7’4”, custom can be made	4’x 6’ or 8’x10’	6’ x 6’ or 8’x 8’
Instillation and delivery	Certified installers available	Dealer/installer or customer	Designed so customer can do it	Subcontractors outside of Dallas/Fort Worth- built into the house no shipping
Exits	10 accesses	1, 2 nd can be ordered	1, however Panels can be removed	1
Handicapped access	yes	Available not standard	yes	yes
Testing	Yes, FEMA 320 at Texas Tech	Hurricane and tornado tested at Texas Tech, FEMA passed	Tested by Texas Tech	Tested by Texas Tech
Locks	Comes with indoor can install outside	Lockable to entry only locks have exit device lock overrides	Can be locked	Can be locked

Company	Storm Shelters of Odessa	Storm Shelters of America	The Refuge Shelter	CMI Tornado Shelters
Price (\$)	3,950-7,950 +	2,995-10,000	4,000 – 4,600 +	2695- 8,400 + instillation

	instillation (1,000)		instillation (1,200)	(1,000)
Warranty	5 years "acts" of nature included	5 years	10 year limited warranty	-
Materials	Fiberglass	Ten gauge steel- floor is 7 gauge	Fiberglass	Heavy 10 gauge solid steel
Access	Underground unless constructed with the house	depends	underground	underground
Fresh Air	Two vents are molded to either side of the unit	12" flap on each end of the shelter	dual ventilation pipes	CMI Engineered Ventilation System
Dimensions		6'x 8, 6'x 12', 8'x 12', 8'x 16', 8'x 20' 6' high unless other wise specified	5' Wide x 6' Long x 6'-6" or 6' 8" Wide x 8' 4" Long x 6' 10"	6' - 6'6" height
Instillation and delivery	Own shipping line with installers	Custom trailers for delivery	-	-
Exits	2	1	1	1, option for 2
Handicapped access	no	depends	no	-
Testing	-	Texas Tech testing, FEMA passed	Door tested at Texas Tech	-
Locks	No	Locking T handle	Double door latches	Padlock hasp on door exterior, Door chains to hold door open and lock securely from inside

Last updated July 2002

Canton	(316) 628- 4848
Comfort Enterprises	(800) 919-9529
Hasuners	(800) 533- 9509
Heartland	(877)-57-STORM
Safe Haven Shelter	(618) 262- 2488
Tornado Shelter Enclosure	David G. Abare 415 River Street Haverhill MA 01832
Storm Closet	(888) 397-7142
Keep Safe Shelter	(800)300-5868
American Storm Shelter	(877) FUNNEL-1
Storm Shelters of Odessa	steveo@tshelters.com
Damar Tornado Safe Bed	DAMART@DAMARTornadosafebed.com
Twister Pit	(800) 461-3005

APPENDIX C

TORNADO ACTIVITY IN THE UNITED STATES*

Summary Per 1,000 Square Miles

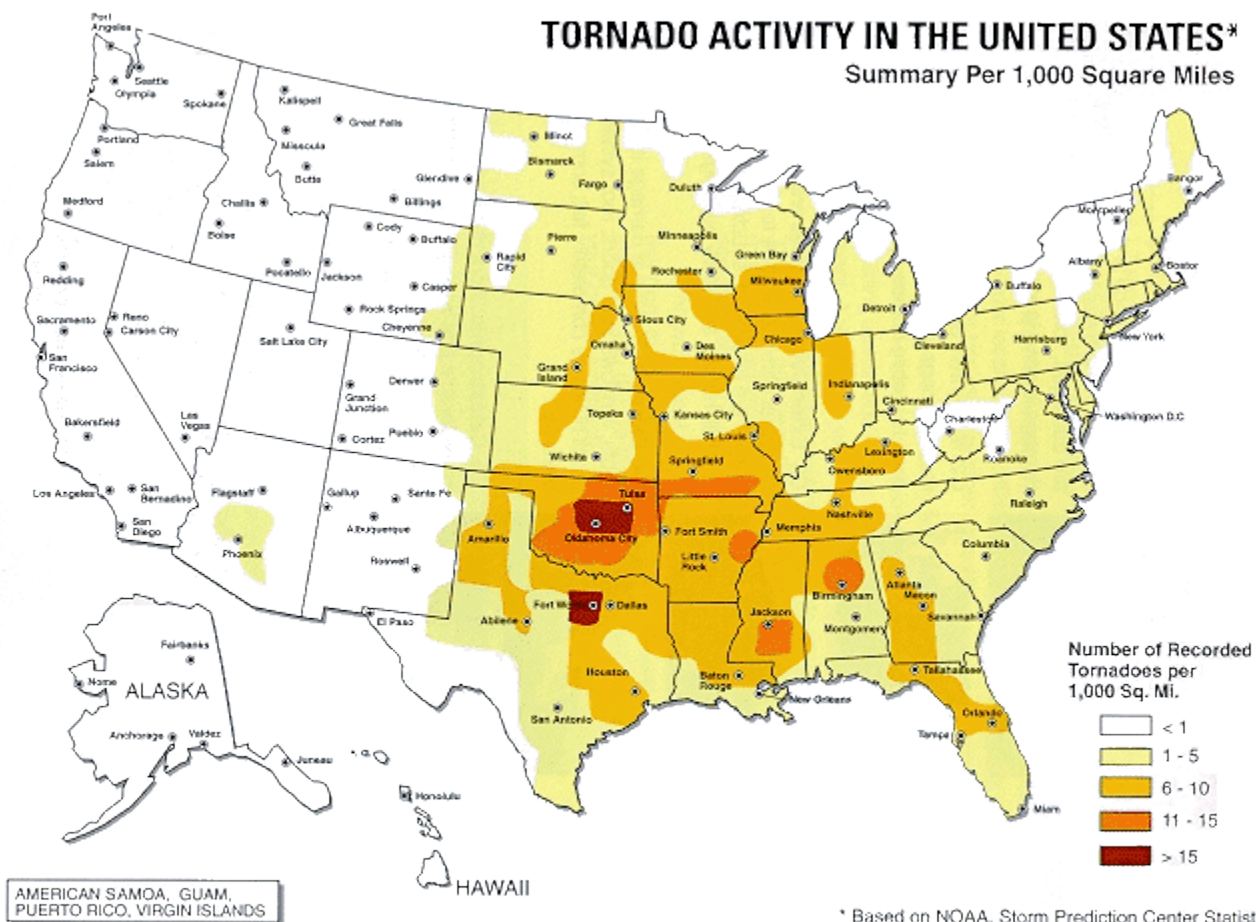


Figure 1.1 The number of tornadoes recorded per 1,000 square miles

WIND ZONES IN THE UNITED STATES*

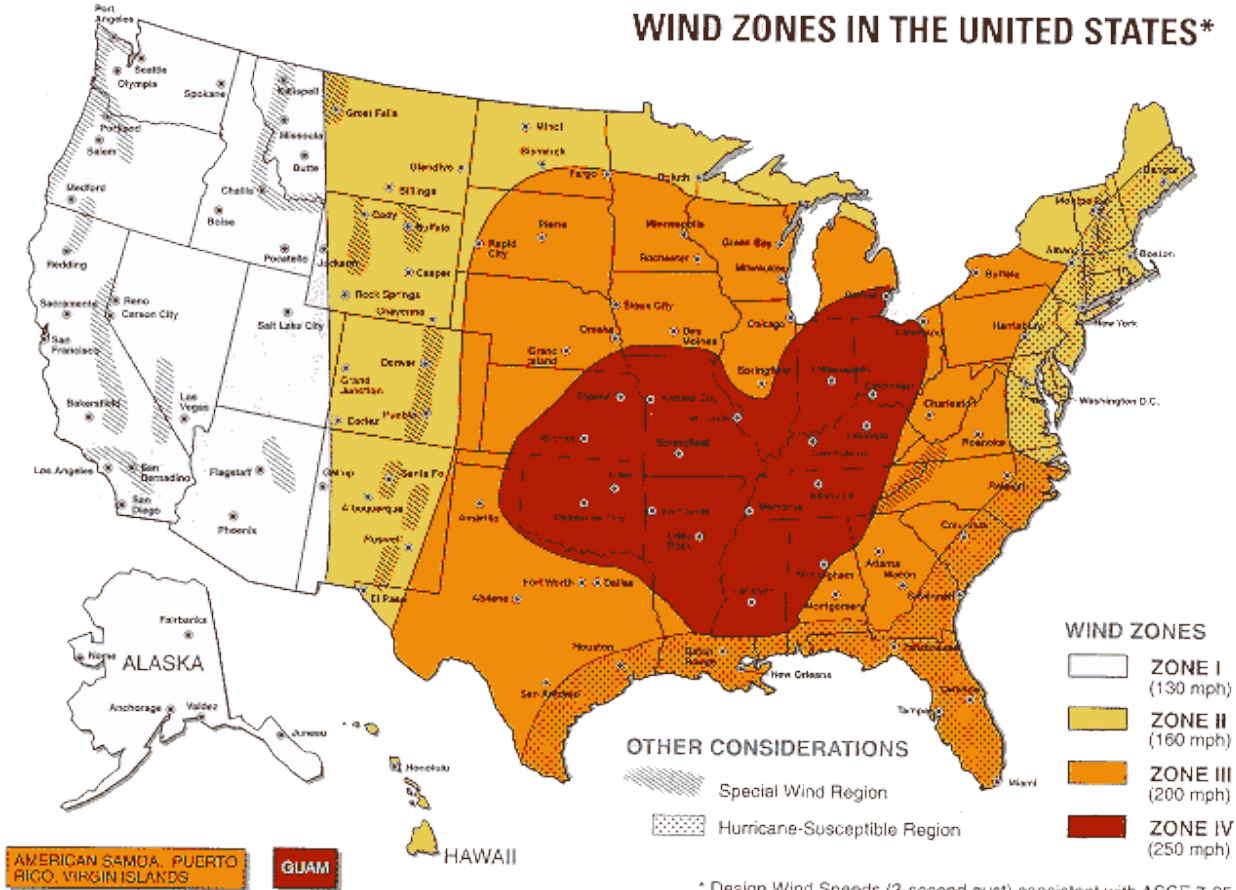
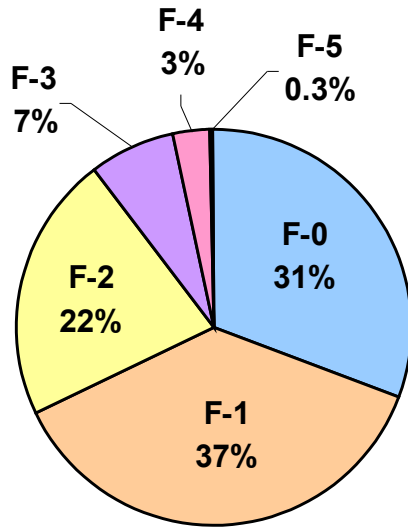


Figure I.2 Wind zones in the United States

		WIND ZONE (See Figure I.2)			
		I	II	III	IV
NUMBER OF TORNADOES PER 1,000 SQUARE MILES (See Figure I.1)	<1	LOW RISK	LOW RISK ★	LOW RISK ★	MODERATE RISK
	1 - 5	LOW RISK	MODERATE RISK ★	HIGH RISK	HIGH RISK
	6 - 10	LOW RISK	MODERATE RISK ★	HIGH RISK	HIGH RISK
	11 - 15	HIGH RISK	HIGH RISK	HIGH RISK	HIGH RISK
	>15	HIGH RISK	HIGH RISK	HIGH RISK	HIGH RISK

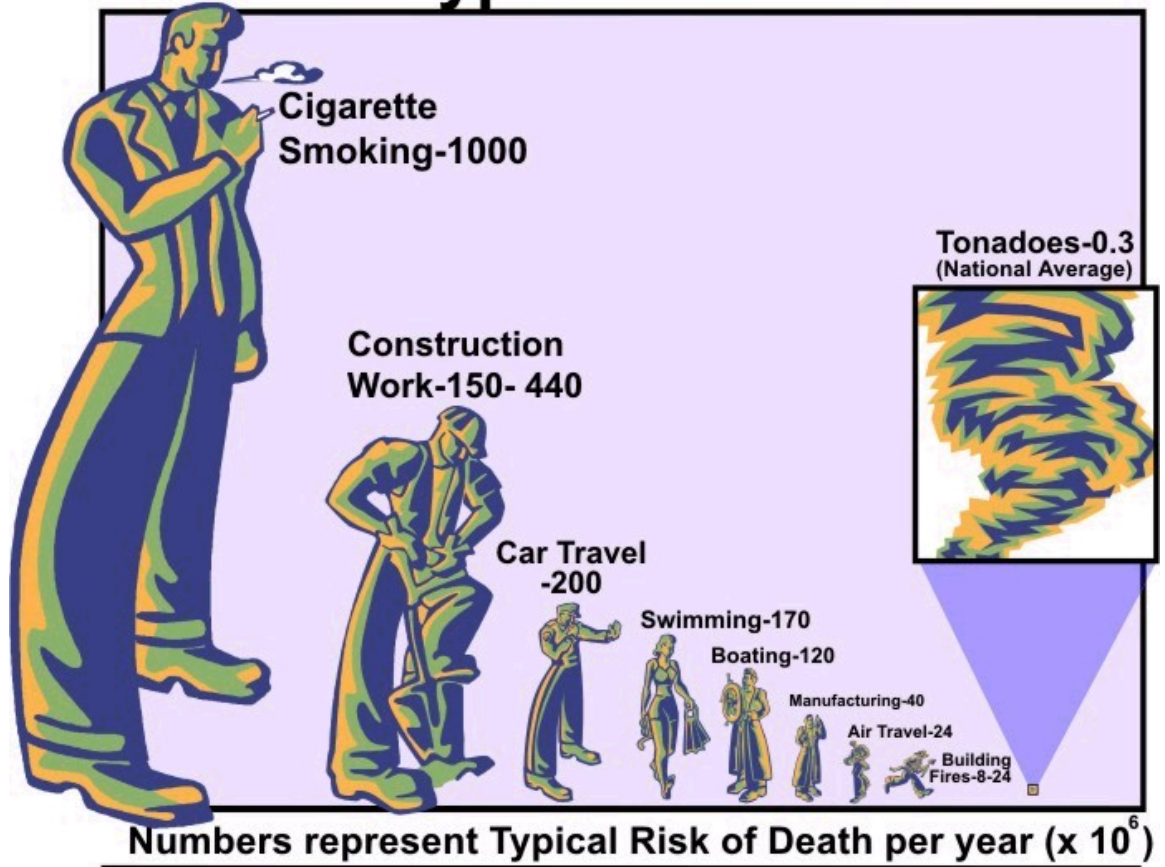
LOW RISK	MODERATE RISK	HIGH RISK
Need for high-wind shelter is a matter of homeowner preference	Shelter should be considered for protection from high winds	Shelter is preferred method of protection from high winds

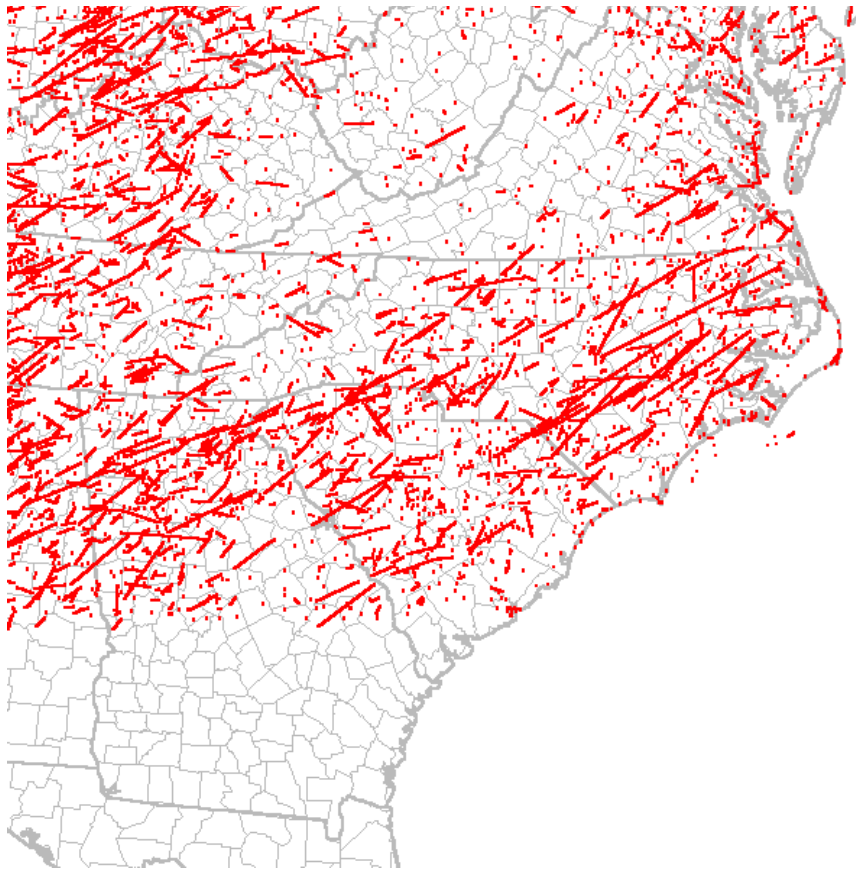
★ Shelter is preferred method of protection from high winds if house is in hurricane-susceptible region



Frequency of each Level of Tornado in the United States

Selected Typical Risk Estimates





Mid-Atlantic Tornado Occurrences in Recorded History