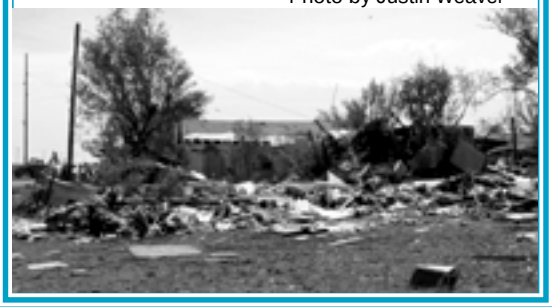
Tornado Magnets? Maybe Not, But...

Some folks still say manufactured homes are "tornado magnets." While this is unlikely, it is true that a disproportionately high number of tornado deaths occur in manufactured (or mobile) homes. Of the 348 tornado deaths across the US since 1998, almost half (172) occurred in mobile homes. Site built housing accounted for only a third (106) over that time period, although most people live in site built housing. Vehicles and other locations accounted for the rest.[1] These statistics became real here in Texas last May when Eduardo Joven Castillo, 37, and his wife, Yolanda Castillo, 35, were killed in their mobile home when a twister struck Happy, Texas.[2]

Photo by Jody James

In Happy, Texas, a tornado this year picked up a mobile home and dropped it fifty feet away killing two people.

Photo by Justin Weaver



Manufactured home occupants die as a result of tornados at 20 times the rate of people in of site built homes, according to a study from National Severe Storms Laboratory researchers. The study expresses concern that the growing population of mobile home residents will lead to a reversal of years of decline in the national tornado death rate. More disturbingly, despite revisions of the HUD building code to increase wind resistance of the structures, the death rate from tornadoes has not fallen over the last 25 years.[3]

In 1992 Hurricane Andrew slammed into Florida, destroyed over 10,000 manufactured homes in its 25 billion dollar rampage.[4] This widespread destruction led to revisions of the wind-resistance standards for manufactured homes in coastal and high-wind prone areas. Today, these improved standards are cited by manufacturers and retailers in promotional materials as certification of the safety of manufactured homes. However, parts of the industry fought the standards, unsuccessfully suing to block implementation in 1994.

The lawsuit was won by HUD, partially on the grounds that the primary purpose of the HUD code was to reduce the injuries and deaths associated with manufactured housing.[5] In 2000 Congress revised the preface to the federal statute to make affordability an equal goal of the standards along with safety.[6] HUD stated at the time of the 1994 changes they would also consider raising wind standards for manufactured homes in the rest of the country as well.[7] The political climate leading to the 2000 rewrite favoring cheap construction appears to have ended any such plans.

In fact, the wind standards for manufactured homes in most of the country (HUD's "Wind Zone I"), including Texas' "tornado alley" and all non-coastal Texas counties, are lower than model code provisions for conventional site built housing for the same areas. For homes in Wind Zone I, HUD recognized in 1996 that "the wind standards were significantly below those specified for site-built and modular housing in moderate wind areas."[8]

The Federal Emergency Management Agency (FEMA) estimates the minimum HUD code standard for Wind Zone I is equivalent to about a 65 mph fastest wind speed.[9] The Uniform Building Code minimum wind speed (for site built homes) varies in the non-coastal areas of Texas from 70 to 90 mph.[10] The Castillios' 1980 14 x 66 manufactured home was built to the basic standard (Wind Zone I).[11]

Thus, while the new code provisions increase protection for hurricane prone coastal areas, there is little reason to expect improvement in the wide swaths of middle America in HUDs "Wind Zone I" which are also prone to high winds.

Meanwhile, the aging stock of existing homes are becoming even more susceptible to damage. FEMA did find that multi-section manufactured homes performed better in high winds, and that double-wide manufactured homes on permanent foundations seemed to perform similarly to site construction.[12]

This is promising, as multi-wide shipments are up, and permanent foundations are increasingly popular. In fact, as of this year in Texas, all new homes not in parks are required to have a permanent foundation system. (The

There are several theories to explain the high wind related death toll for manufactured homes. According to the industry, tornados appear more often in the suburbs and rural areas where more manufactured homes are located. Wind experts focus on other factors. Photographic evidence from Texas (above) points to failed tie down systems--straps break, anchors pull out, blocks tip. A Florida survey of tie downs in existing homes found that more than 80 percent were inadequate. Texas does not

implementation of that bill may change the definition of "permanent," however). But 33 percent of new sales are still single-wide units, many of which are placed in rental communities.[13]

Orange County, Florida was galvanized to action when 34 manufactured home dwellers were killed in a single night of tornadoes in 1998. Concerned that the deaths were related to the tie-downs of the homes, officials began an inspection program offering free inspections to elderly and low-income residents. The program kicked off with 550 inspections – which turned up over 450 homes with problems. These problems ranged from loose, rusty or missing steel straps to unstable foundation piers.[14]

This is consistent with research from the International Hurricane Center, which found that manufactured housing anchoring capacity degrades over a period of months or years. Unlike the permanent foundations of site built housing, manufactured housing tiedowns, straps, and anchors may become loose and are subject to corrosion.[15]

John Taylor, a citizen activist who advocates through the American Internet Society of Manufactured Home Owners (TAISMHO) has focused his energy on the failure of manufactured home soil auger anchors in high stress events. His research has led him to conclude most manufactured homes anchored with this type of anchoring system don't meet the federal windstorm protection standards. He cites studies by both the government and industry, which Taylor says show the current performance design loads used by the manufacturers of this product are significantly higher than the actual field performance for this type of anchoring system, despite their approval by HUD. He calls for elected officials to protect the public by ensuring proper standards are enforced.[16]

Recommendations

- Consumers in tornado prone areas should consider upgrading to a higher windzone home.
- Consumers should get their anchoring systems periodically inspected.
- Texas and other high wind prone states should develop programs to assist low-income and elderly residents inspect and replace degrading straps. Not only will this help protect from wind, but will help maintain these homes.
- Tornado shelters should be available in high density manufactured home areas such as parks.

Photo by John Taylor

Wind picked up this home but left the porch.

[1] National Weather Service Storm Prediction Center,"Killer Tornado Statistics," 1998-2002, Internet Source: http://www.spc.noaa.gov/climo

[2] Blaney, Betsy, "Residents of Texas town begin cleanup after tornado kills two, injures four," Associated Press, 5/6/2002.

[3] Brooks, Harold E and Doswell, Charles A. "A Brief History of Deaths from Tornadoes in the United States" NOAA/National Severe Storms Laboratory, January 2001. Internet source: http://www.nssl.noaa.gov/~brooks/deathtrivia/

[4] Rappaport, Ed, "Preliminary Report, Hurricane Andrew," 12/10/1993 Internet Source: http://www.nhc.noaa.gov/1992andrew.html; Opinion, United Circuit Court of Appeals, 11th Circuit, No. 94-2307 "Florida Manufactured Housing Assciation vs. Henry G. Cisneros. 6/12/1995. Internet Source: http://www.law.emory.edu/11circuit/june95/94-2307.opa.html

[5] Opinion, United Circuit Court of Appeals, 11th Circuit, No. 94-2307 "Florida Manufactured Housing Assciation vs. Henry G. Cisneros. 6/12/1995. Internet Source: http://www.law.emory.edu/11circuit/june95/94-2307.opa.html

[6] 42 USC Sec. 5401 as of 1/16/1996; Public Law 106-569 effective 12/27/2000.

[7] HUD, "Ninth Report to Congress on the Manufactured Housing Program," 1996, p. II-6 - II - 8.

[8] ibid.

[9] FEMA, "Building Performance Assessment: Oklahoma and Kansas Tornadoes, Preliminary Report," Chp. 7, p 6-9.

[10] ANSI/ASCE 7-93 UBC windspeed map, Simpson Strong-Tie Co.

[11] Swisher County Apprasial District, Title Detail and Commentary, via fax from Denise Nolan, 7/8/2002.

[12] "Recommendations to Better Protect from Tornado Damage" FEMA. Internet Source: http://www.fema.gov/hazards/tornadoes/presskit3.sht

[13] "2001 New Manufactured Homes Placed by Size of Home, By State," U.S Dept. of Commerce's Census Bureau.

[14] Schultheis, Kurt D. "Anchors will help secure mobile homes," The Orlando Sentinel, June 2, 2002.

[15] The International Hurricane Center, "Hurricane Loss Reduction for Residences and Mobile Homes in Florida," June 29, 2001.

[16] Taylor, John, email 7/18/2002. See also Internet Source: http://www.geocities.com/taismho/

Photos by John Taylor

systematically inspect all home tie downs, and inspects no anchoring systems after initial installation.

Harold Brooks of the National Severe Storms lab in Norman, Ok. believes manufactured homes collapse due to designs that create weak interior walls. When one wall gives way, the whole structure can collapse. "Whereas one section of a site-built home can be wiped out but internal framing holds the rest together," Brooks told an Illinois reporter.