THE NEW TORNADO RATING SYSTEM

The Enhanced Fujita Scale

The Enhanced Fujita Scale (EF) to rate tornadoes went into effect on February 1, 2007. The original Fujita Scale (F) was developed in 1971 by Dr. T. Theodore Fujita. Over the years, National Weather Service personnel recognized that improvements to the scale were necessary due to some limitations. The primary limitations were the lack of damage indicators, no account of construction quality and variability, and no definitive correlation between damage and wind speed. This sometimes resulted in inconsistent ratings of tornadoes and in some cases an overestimate of tornado wind speeds.

The Enhanced Fujita Scale is a more precise way to assess the damage from a tornado. It classifies tornado damage (EF0-EF5) as calibrated by those from the meteorological and engineering communities. The proposal was led by the Texas Tech University Wind Science and Engineering Research Center. The Enhanced Fujita Scale is a set of wind estimates, not measurements, based on damage. It uses a three-second gust estimated at the point of damage. The damage is based on a judgment of up to 12 levels of damage or Degrees of Damage (DOD) to 28 Damage Indicators (DI). Examples of Damage Indicators are buildings, structures, and trees. By observing the Degree of Damage to each Indicator, the person conducting the survey can assign an estimate of wind speed. The estimated wind speed then determines the EF-Scale category appropriate for the observed damage.

—Leonard Vaughan, National Weather Service Meteorologist

Table 3.

Enhanced F Scale for Tornado Damage

Fujita scale			Derived EF scale		Operational EF scale	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	**EF Number**	**3 Second Gust (mph)**
0	40-72	45-78	0	65-85	**0**	**65-85**
1	73-112	79-117	1	86-109	**1**	**86-110**
2	113-157	118-161	2	110-137	**2**	**111-135**
3	158-207	162-209	3	138-167	**3**	**136-165**
4	208-260	210-261	4	168-199	**4**	**166-200**
5	261-318	262-317	5	200-234	**5**	**Over 200**

How Strong Was That Tornado?

These pictures are from an actual tornado that hit a double-wide mobile home in South Carolina.

1. The observer would determine the type of structure damaged based on Table 1. Table 1 only shows a partial list of the 28 structure types. This tornado hit a double-wide mobile home.
2. The observer would determine the degree of damage based on Table 2. In this example complete destruction occurred to the mobile home, which has winds estimated between 110 mph and 148 mph. The observer used his or her judgement and estimated winds near the upper bound of 148 mph.
3. The observer now takes the 148 mph and rates the tornado using the Enhanced Fujita Scale shown in Table 3. According to the Operational EF Scale, 3 second gust, 148 mph is an EF3 Tornado!

Leonard Vaughan

Important: The 3 second gust is not the same wind as in standard surface observations. Standard measurements are taken by weather stations in open exposures, using a directly measured "one minute mile" speed.

Table 1. Structure damage indicator

Enhanced F Scale Damage Indicators

Number (Details Linked)	Damage Indicator	Abbreviation
1	Small barns, farm outbuildings	SBO
2	One- or two-family residences	FR12
3	Single-wide mobile home (MHSW)	MHSW
4	Double-wide mobile home	MHDW
5	Apt, condo, townhouse (3 stories or less)	ACT
24	Transmission line tower	TLT
25	Free-standing tower	FST
26	Free standing pole (light, flag, luminary)	FSP
27	Tree - hardwood	TH
28	Tree - softwood	TS

Table 2.

DOD* Degree of Damage Scale

DOD*	Damage description	Expected wind (mph)	Lower bound of wind (mph)	Upper bound of wind (mph)
1	Threshold of visible damage	61	51	76
2	Loss of shingles or partial uplift of one-piece metal roof covering	74	61	92
3	Unit slides off block piers but remains upright	87	72	103
4	Complete uplift of roof; most walls remain standing	89	73	112
5	Unit rolls on its side or upside down; remains essentially intact	98	84	114
6	Destruction of roof and walls leaving floor and undercarriage in place	105	87	123
7	Unit rolls or vaults; roof and walls separate from floor and undercarriage	109	96	128
8	Undercarriage separates from unit; rolls, tumbles and is badly bent	118	101	136
9	Complete destruction of unit; debris blown away	127	110	148

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