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STORM DATA PREPARATION

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SUMMARY OF REVISIONS: Supersedes Weather Service Operations Manual (WSOM) Chapter F-42, "*Storm Data* and Related Reports," Issuance 94-5, dated July 1, 1994; and Operations Manual Letters 5-95, 3-96, and 09-01 (also filed with C-75).

signed by December 23, 2002
Gregory A. Mandt Date
Director, Office of Climate,
Water, and Weather Services

Storm Data Preparation

Table of Contents: Page

1. *Storm Data* Disclaimer. *Storm Data* is an official publication of the National Oceanic and Atmospheric Administration (NOAA) which documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. In addition, it is a partial record of other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with another event.

Some information appearing in *Storm Data* may be provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, private companies, individuals, etc. An effort is made to use the best available information but because of time and resource constraints, information from these sources may be unverified by the NWS. Therefore, when using information from *Storm Data*, customers should be cautious as the NWS does not guarantee the accuracy or validity of the information. Further, when it is apparent information appearing in *Storm Data* originated from a source outside the NWS (frequently credit is provided), *Storm Data* customers requiring additional information should contact that source directly. In most cases, NWS employees will not have the knowledge to respond to such requests. In cases of legal proceedings, Federal regulations generally prohibit NWS employees from appearing as witnesses in litigation not involving the United States.

2. *Storm Data* Preparation. The *Storm Data* preparer should allocate a sufficient amount of preparation time to ensure that documentation and verification of significant weather phenomena is as accurate and complete as possible. The preparer should carefully coordinate the time and

location of events that cross county warning and forecast areas (CWFA) to prevent inconsistencies in the *Storm Data* database.

Preparation will be done using the currently authorized electronic method. Software methodology and hardware requirements are provided on the Office of Services internal StormDat/Verification Web site. Transmittal of the monthly report and upgrades to the software will be accomplished electronically. Inclusion of pictures in the monthly reports should be limited to unusual or highly significant events in order to keep *Storm Data* at a reasonable size.

The *only* events permitted in *Storm Data* are listed below. The chosen event name should be the one that predominately describes the meteorological event that led to fatalities, injuries, damage, etc. However, significant events having no impact (all tornadoes or flash floods causing no damage, etc.) also should be included in *Storm Data*. See Appendix A for detailed examples. Additional details about record values of temperature, precipitation, etc., may be included in the narrative of an appropriate *Storm Data* event. However, only the more significant values should be summarized, such as monthly, seasonal, or yearly records. For example, a new monthly single-storm, snowfall record can be included in the narrative of a heavy snow event, or a new all-time, 4-hour rainfall record value can appear in the narrative of a flash flood event.

Event Name	**Designator**	**Event Name**	**Designator**
Astronomical High Tide	Z	Landslide	Z
Avalanche	Z	Lightning	C
Blizzard	Z	Marine Hail	M
Dense Fog	Z	Marine Thunderstorm Wind	M
Drought	Z	Rip Current	M
Dust Devil	C	Seiche	Z
Dust Storm	Z	Sleet Storm	Z
Excessive Heat	Z	Storm Surge	Z
Extreme Cold/Wind Chill	Z	Strong Wind	Z
Flash Flood	C	Thunderstorm Wind	C
Flood	Z	Tornado	C
Frost/Freeze	Z	Tropical Depression	Z
Funnel Cloud	C	Tropical Storm	Z
Hail	C	Tsunami	Z
Heavy Rain	C	Volcanic Ash	Z
Heavy Snow	Z	Waterspout	M
Heavy Surf/High Surf	Z	Wildfire	Z
High Wind	Z	Winter Storm	Z
Hurricane (Typhoon)	Z	Winter Weather/Mix	Z
Ice Storm	Z		

Legend: There are three designators: C - County/Parish; Z - Zone; and M - Marine.

2.1 Aircraft/Marine Incidents. It is the responsibility of the National Transportation Safety Board (NTSB) to investigate and file reports on the probable causes of aviation and marine-related incidents. A *Storm Data* preparer, however, can include events that may have resulted in an incident in *Storm Data* as long as associated NWS operational performance is not discussed. See examples in Appendix A under funnel cloud, marine thunderstorm wind, and seiche.

2.2 Time. The beginning and ending time for each event will be entered as accurate as possible. Use local standard time in 24-hour clock throughout the year, such as 0600 Eastern Standard Time (EST), 0925 Central Standard Time (CST), 1800 Mountain Standard Time (MST), etc. Forecast offices having a CWFA responsibility in multiple time zones should enter data in the appropriate time zone for the event's location.

Establishing the time of an event to the nearest minute will be difficult in certain situations. To minimize this problem, the *Storm Data* preparer should carefully compare all storm reports to available radar data, using unique radar signatures to make adjustments in the event time.

2.2.1 Events that Span More than One Month. Events that span more than one month will be entered for each month they occur. Directly-related fatalities, injuries, and damages will be given in the appropriate column for the month currently being prepared. Additional summary information on cumulative fatalities, injuries, or damages from previous months can be explained in the narrative portion of the *Storm Data* entry for the final month of the event.

2.3 Location. A hydrometeorological event will be referenced to the particular village/city, airport, or inland lake, providing that the reference point is documented in the StormDat location database. Additional detailed information on the exact location of an event can be included in the narrative paragraph. This detailed information would be useful when the event occurs within the boundaries of a large city. For example, if a tornado occurred just inside the northern border of Chicago, the location would be listed as Chicago. The narrative paragraph might include a statement "the tornado moved along the northern border of the city," or "touched down 8 miles north of city center." In some cases, if the event is relatively widespread, it may be referenced to geographical portions of a county/parish (e.g., northern portion or countywide/parishwide).

For marine zones, a hydrometeorological event will be referenced (azimuth and range) to the reference points documented in the StormDat location database.

2.4 Event Source. The source of each *Storm Data* event will be entered in the software program. Possible sources of reports include "trained spotter," "law enforcement," and "emergency management." In those cases where the source of the event report is not obvious, the preparer should use professional judgment as to what source is appropriate. Even though the event source does not appear in the final *Storm Data* publication, this information is used in related NWS statistical studies.

2.5 Fatalities/Injuries. The determination of direct versus indirect causes of weather-related fatalities or injuries is one of the most difficult aspects of *Storm Data* preparation. Determining whether a fatality or injury was direct or indirect has to be examined on a case-by-case basis. It is impossible to include all possible cases in this directive. The preparer should include the word "indirect" in all references to indirect fatalities or injuries in the narrative. This will minimize any potential confusion as to what fatalities and injuries referenced in the narrative were direct or indirect. A narrative example follows.

> "Powerful thunderstorm winds leveled trees and power lines in and around Morristown, TN. One of the toppled trees struck and killed two men running for shelter. During the clean-up operations after the storm, a person on an ATV was injured (indirect) when their vehicle struck a tree that blocked a road."

Special care must be exercised when dealing with situations in which vehicles leave a road surface (due to a non-weather reason) *not* covered with flood waters and go into river/canals *not* above flood stage. Any fatalities, injuries, or damage in these cases will *not* be entered into *Storm Data*, since they are not weather related.

2.5.1 Direct Fatalities/Injuries. A direct fatality or injury is defined as a fatality or injury directly attributable to the hydrometeorological event itself, or impact by airborne/falling/moving debris, i.e., missiles generated by wind, water, ice, lightning, tornado, etc. In these cases, the weather event was an "active" agent or generated debris became an active agent. A fatality or injury resulting from an unavoidable encounter with a weather hazard may be classified as direct. Generalized examples of direct fatalities/injuries would include:

a. Thunderstorm wind gust causes a moving vehicle to roll over;

b. Vehicle goes over crest of hill and unknowingly into a blinding, local, snow squall. Loss of vehicle control results in a fatality/injury;

c. Blizzard winds topple a tree onto a person; and

d. Vehicle is parked on a road, adjacent to a dry arroyo. A flash flood comes down the arroyo and flips over the car. The driver drowns.

An injury shall be reported on the header line if a person suffers a weather-related injury requiring treatment by a first responder or subsequent treatment at a medical facility. Injured persons who deny medical treatment also may be included. Persons who are not considered injured but who are affected by the phenomenon may be discussed in the narrative.

Fatalities and injuries directly caused by the weather event will be entered in the StormDat software "fatality" and "injury" entry tables, respectively. For direct fatalities, enter the specific data as queried by the software, i.e., number of individuals, age, sex, location, etc. Obtain information from sources usually regarded as reliable. The alphanumeric fatality code trailing the narrative is automatically inserted by the software. See Appendix A for detailed examples.

When specifying the location of the direct fatality, only the following choices are to be used:

BF	Ball Field	MH	Mobile Home
BO	Boating	OT	Other
BU	Business	OU	Outside/Open Areas
CA	Camping	PH	Permanent Home
EQ	Heavy Equipment/Construction	SC	School
GF	Golfing	TE	Telephone
IW	In Water	UT	Under Tree
LS	Long Span Roof	VE	Vehicle

2.5.2 Indirect Fatalities/Injuries. Fatalities and injuries, occurring in the vicinity of a hydrometeorological event, or after it has ended, but are not directly caused by impact or debris from the event (weather event is a passive entity), are classified as indirect. Any available indirect fatalities and injuries should be discussed in the narrative paragraph, but will not be entered in the software "fatality" or "injury" entry tables. Indirect fatalities/injuries will not be tallied in official *Storm Data* statistics.

Fatalities and injuries due to motor vehicle accidents on slippery, rain, or ice covered roads are indirect. Ice, snow, and water on road surfaces are "passive" agents that do not directly impact a person or property, even though they induce conditions that trigger another event causing a fatality and injury.

If the hydrometeorological event induced conditions that triggered another event resulting in the fatality/injury, then it is indirect. Heart attacks, resulting from overexertion during or following winter storms, or electrocution caused by contact with a downed power line after a storm has ended, are indirect.

Fatalities and injuries resulting from driving into dense fog or a blinding blizzard or dust/sandstorm that was in plain view down the road, or already widespread, are indirect. Generalized examples of indirect fatalities/injuries follow (see Appendix A for detailed examples).

a. Widespread dense fog reduces visibilities from zero to 1/8 mile. A 20-vehicle pile-up occurs;

b. Thunderstorm winds topple trees onto a road. A motorist runs into a tree 30 minutes after the storm occurred;

c. Heavy snow is in progress and roads become icy/snow-covered. A vehicle slides across road into another vehicle; and

d. Lightning starts a fire which destroys a home, killing its occupants.

2.5.3 Delayed Fatalities. On occasion, a fatality will occur a few days after the end of a meteorological event, due to weather-related injuries or the effects of the event. This is most common with long-duration, excessive heat episodes in which individuals never recover from the initial effects of the heat wave. The *Storm Data* preparer has two methods to include these fatalities.

a. Enter the post-event fatality information as part of the meteorological event that just ended, but enter the actual date of delayed fatality in the fatality entry table. This is the preferred method. An explanation can be given in the narrative; or

b. Enter the post-event fatality information as part of a new meteorological event, if appropriate. An explanation can be given in the narrative.

2.6 Damage. Property damage estimates should be entered as actual dollar amounts, if a reasonably accurate estimate from an insurance company or other qualified individual is available. The *Storm Data* preparer should not estimate the damage but should make a good faith attempt to obtain the information. Estimates also can be obtained from emergency managers, U.S. Geological Survey, U.S. Army Corps of Engineers, power utility companies, and newspaper articles. If the estimates provided are rough guesses, then this should be stated as such in the narrative. Estimates should be rounded to three significant digits, followed by an alphabetical character signifying the magnitude of the number, i.e., 1.55B for $1,550,000,000. Alphabetical characters used to signify magnitude include "K" for thousands, "M" for millions, "B" for billions, and "T" for trillions. If additional precision is available, it may be provided in the narrative part of the entry. When damage is due to more than one element of the storm, indicate, when possible, the amount of damage caused by each element. If the dollar amount of damage is unknown, or not available, leave the entry blank.

In order to determine if the damage is directly related or indirectly related to the hydrometeorological event, the *Storm Data* preparer will use the same guidelines for fatalities and injuries provided in Sections 2.5.1 and 2.5.2.

2.6.1 Flood-Related Damage. Damage resulting from flash floods or floods should be reported by each office in whose CWFA responsibility the damage was reported. The Service Hydrologist should assist in the collection and assessment of flood/flash flood information that pertains to *Storm Data*.

2.6.2 Crop Damage Data. Crop damage information may be obtained from reliable sources, such as the U.S. Department of Agriculture, the county/parish agricultural extension agent, the state department of agriculture, crop insurance agencies, or any other reliable authority.

2.6.3 Other Related Costs. The cost of such items as snow removal, debris clearing/moving, fire fighting, personnel overtime charges, public housing assistance, etc., will not be tallied as part of the storm/crop damage. If "other related" cost estimates are available, they may be included in the narrative as a separate item.

2.6.4 Delayed Damage. On occasion, vegetative or structural damage will occur within a few days, or even a couple weeks, after a meteorological event. This is most common after a very heavy snowfall, or very heavy rain due to weight loading on roofs or buildings, tree branches, or power lines. Windy conditions after a heavy snow or heavy rain event may amplify the damage. In these cases, the *Storm Data* has two methods to include this damage.

a. Enter the post-event damage information as part of the meteorological event that just ended and explain the situation in the narrative; or

b. Enter the post-event damage information as part of a new meteorological event, if appropriate, and explain the situation in the narrative.

2.7 Character of Storm. Enter the type of storm or phenomena in accordance with the look-up table provided in the software. If known, maximum gusts will be encoded as "measured," otherwise they will be an estimate (gusts are given in knots). Hail size will be given in hundredths of an inch (0.50, 0.75, 0.88, 1.00, 1.50, etc., are the most common). Data regarding multiple severe phenomena within a single event will be provided separately, except for tornadoes. A single narrative may be used to describe the multiple severe phenomena within single severe weather episodes. A separate narrative will be composed for every tornado event.

2.8 Textual Description of Storm (Narrative). Only the more complex events require narratives. For example, lightning strikes or hail occurrences, as a single phenomena, should not necessitate narratives unless they are part of a more complex weather event or cause fatality/injury or significant damage. The narrative should expand on the information in the quantitative data, especially casualties. For lightning fatalities or injuries, include weather conditions at the time of occurrence, if known or determinable. Include times, locations, and destruction of trees, crops, power lines, roads, bridges, etc. Storm characteristics, such as the intermittence of tornado paths, may be included.

Additional remarks (or an electronically inserted picture) may serve to locate storms more precisely and may give the areal extent and the directional movement or speed. Such additional detail should be prepared as support documentation to Outstanding Storms of the Month (see Section 4, Outstanding Storms of the Month [OSM]).

The narrative should be concise and not repeat information provided in the quantitative data. When used properly, the narrative integrates the numerical data into a cohesive meteorological event.

When writing the narrative, always indicate when and where tornadoes and thunderstorm wind events cross county, parish, and state lines, and boundaries of WFO CWFA responsibility. *Storm Data* preparers will coordinate with other affected offices to determine time and location of border-crossing tornadoes or other events.

2.9 Speed-Distance Conversion. On occasion, the *Storm Data* preparer may need to calculate beginning and ending times, time of arrival, or validity of storm report times, based on a known thunderstorm speed from radar. To assist in this task, see Table 1.

2.10 Pictures. Inclusion of electronic images (.gif, .tif, .jpg, etc.) into the monthly reports should be limited to unusual or highly significant events in order to minimize the size of the *Storm Data* publication.

Table 1. Speed to Distance Conversion.

KTS/MPH	1 Mile in X Minutes	KTS/MPH	1 Mile in X Minutes
52/60	1 mile in 1.0 min	**26/30**	1 mile in 2.0 min
48/55	1 mile in 1.1 min	**22/25**	1 mile in 2.4 min
43/50	1 mile in 1.2 min	**17/20**	1 mile in 3.0 min
39/45	1 mile in 1.3 min	**13/15**	1 mile in 4.0 min
35/40	1 mile in 1.5 min	**9/10**	1 mile in 6.0 min
30/35	1 mile in 1.7 min	**4/5**	1 mile in 12.0 min

3. Event Types. This section provides guidelines for entering event type in StormDat (*Storm Data*). This is not a complete list. Only those events that may result in confusion are discussed here.

3.1 Wind Gusts. A maximum wind gust value, whether estimated or measured, will always be entered for "thunderstorm wind," "marine thunderstorm wind," and "high wind" events. If the high wind event is based on maximum sustained wind equal to, or greater than, 35 knots (40 mph) for 1 hour or more, then enter that value instead. Maximum wind gust values will be entered for severe and non-severe convective *Storm Data* events ("thunderstorm wind" and "marine thunderstorm wind").

The *Storm Data* preparer must use professional judgment to determine the estimated maximum wind value based on observed structural or tree damage. For example, a rotted tree that is toppled by "thunderstorm winds" would not support an estimated wind gust of 50 knots (58 mph). On the other hand, numerous large trees, power lines, and road signs toppled by "high winds" would support an estimated gust value over 50 knots (58 mph).

The StormDat software program requires the preparer to indicate whether the wind gust value is measured or estimated. The fact that a particular maximum wind gust value is estimated should be indicated in the event narrative. A similar distinction is not needed for measured maximum wind gust values since the StormDat software automatically "marks" the gust values, in the *Storm Data* publication, with the "M" superscript in the event header strip.

To assist in estimating wind gusts, guidelines relating maximum wind gusts to damage follows in Table 2.

Table 2. Estimating Wind Speed from Damage.

Wind Speed	Observations
26-38 kts (30-44 mph)	Trees in motion. Light-weight loose objects (e.g., lawn furniture) tossed or toppled.
39-49 kts (45-57 mph)	Large trees bend; twigs, small limbs break, and a few larger dead or weak branches may break. Old/weak structures (e.g., sheds, barns) may sustain minor damage (roof, doors). Building partially under construction may be damaged. A few loose shingles removed from houses. Carports may be uplifted; minor cosmetic damage to mobile homes and pool lanai cages.
50-64 kts (58-74 mph)	Large limbs break; shallow rooted trees pushed over. Semi-trucks overturned. More significant damage to old/weak structures. Shingles, awnings removed from houses; damage to chimneys and antennas; mobile homes, carports incur minor structural damage; large billboard signs may be toppled.
65-77 kts (75-89 mph)	Widespread damage to trees with trees broken/uprooted. Mobile homes may incur more significant structural damage; be pushed off foundations or overturned. Roof may be partially peeled off industrial/commercial/ warehouse buildings. Some minor roof damage to homes. Weak structures (e.g., farm buildings, airplane hangars) may be severely damaged.
78+ kts (90+ mph)	Many large trees broken and uprooted. Mobile homes severely damaged; moderate roof damage to homes. Roofs partially peeled off homes and buildings. Moving automobiles pushed off dry roads. Barns, sheds demolished.

Note: All references to trees are for trees with foliage. Significantly higher winds may be required to cause similar damage to trees without foliage. In addition, very wet soil conditions may allow weaker winds of 26 to 49 knots (30 to 57 mph) to uproot trees.

Tables 3 and 4 will assist in conversion of wind speed values between knots and miles per hour.

Table 3. Knots to miles per hour. (Example...45 knots equals 52 mph)

KTS	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	5	6	7	8	9	10
10	12	13	14	15	16	17	18	20	21	22
20	23	24	25	26	28	29	30	31	32	33
30	35	36	37	38	39	40	41	43	44	45
40	46	47	48	49	51	52	53	54	55	56
50	58	59	60	61	62	63	64	66	67	68
60	69	70	71	72	74	75	76	77	78	79
70	81	82	83	84	85	86	87	89	90	91
80	92	93	94	96	97	98	99	100	101	102
90	104	105	106	107	108	109	110	112	113	114

Table 4. Miles per hour to knots. (Example...45 mph equals 39 knots)

MPH	0	1	2	3	4	5	6	7	8	9
0	0	1	2	3	3	4	5	6	7	8
10	9	10	10	11	12	13	14	15	16	17
20	17	18	19	20	21	22	23	23	24	25
30	26	27	28	29	30	30	31	32	33	34
40	35	36	36	37	38	39	40	41	42	43
50	43	44	45	46	47	48	49	49	50	51
60	52	53	54	55	56	56	57	58	59	60
70	61	62	63	63	64	65	66	67	68	69
80	70	70	71	72	73	74	75	76	76	77
90	78	79	80	81	82	83	83	84	85	86

3.1.1 Thunderstorm Wind Events. StormDat software permits only one event name for encoding severe and non-severe "thunderstorm winds." Maximum wind gusts (measured or estimated) equal to or greater than 50 knots (58 mph) always will be entered. Events with maximum wind gust values less than 50 knots (58 mph) should be entered as a *Storm Data* event only if it results in fatalities, injuries, or significant property damage.

Note that damage alone does not automatically imply wind speeds of 50 knots (58 mph) or greater. When estimating a wind speed value, the preparer should take into account the amount and degree of severity, and condition of the damaged property. The resultant damage must support such a value. Refer to Section 3.1 for guidelines on estimating wind speeds. Estimated or measured wind gusts below 50 knots (58 mph), regardless of extent and/or severity of fatalities, injuries, and property damage, will not initiate the verification process. However, when significant damage is reported, the *Storm Data* preparer should consider entering estimated winds of 50 knots or greater for consistency. Encoded wind values of 50 knots (58 mph) or more will initiate the verification process for "thunderstorm wind" events.

Downbursts, including dry or wet microbursts or macrobursts, will be classified as "thunderstorm wind" events. In some cases, the downburst may travel several miles away from the parent thunderstorm, or the parent thunderstorm/convective shower may dissipate. However, since the initiation of the downburst event was related to a convective shower/thunderstorm, "thunderstorm wind" is the appropriate event to use.

Gustnadoes will be classified as "thunderstorm wind" events. The scientific community generally recognizes gustnadoes as short-lived vortices, not attached to a convective cloud base, that develop in response to eddies along a gust front or gust front intersection.

3.1.2 Marine Thunderstorm Wind Events. StormDat software permits only one event name for encoding severe and non-severe "marine thunderstorm winds." Maximum wind gusts (measured or estimated) equal to or greater than 34 knots (39 mph) always will be entered. Values less than 34 knots (39 mph) should be entered only if it results in fatalities, injuries, or significant property damage.

Note that damage alone does not automatically imply wind speeds of 34 knots (39 mph) or greater. When estimating a wind speed value, the preparer should take into account the amount and degree of severity, and condition of the damaged property. The resultant damage must support such a value. Refer to Section 3.1 for guidelines on estimating wind speeds. Estimated or measured wind gusts below 34 knots (39 mph), regardless of extent and/or severity of fatalities, injuries, and property damage, will not initiate the verification process. Wind values of 34 knots (39 mph) or more will initiate the verification process for "marine thunderstorm wind" events.

3.1.3 High Wind Events. Use of the "high wind" event name will be reserved for non-convective, widespread, gradient strong winds (sustained winds equal to or greater than 35 knots[1] (40 mph) for 1 hour or more, or sustained winds/maximum gusts of any duration equal to or greater than 50 knots (58 mph)[1]. When these wind conditions are satisfied, a *Storm Data* event entry is required, and the preparer will indicate in the entry table whether the wind value represents a maximum wind gust or a maximum sustained wind. Depending on the choice, the software will place an S or G in front of the wind value that appears in the *Storm Data* publication.

Events with winds less than the threshold numbers, resulting in fatalities, injuries, or significant property damage, will be encoded as a "strong wind" event. Similar to the high wind event, the preparer will indicate whether the strong wind event is based on a maximum wind gust or maximum sustained wind value.

The StormDat software program requires the preparer to indicate whether the wind gust value, or sustained wind value, is measured or estimated.

The "high wind" event name will also be used for wind damage reports from inland counties/ parishes that experienced a tropical cyclone. Refer to Section 3.6 for details.

3.2 Hail Events. StormDat software permits only one event name for encoding severe and non-severe hail events. If hail diameters are equal to, or greater than, 3/4 inch, a hail event always will be encoded. If hail stones with diameters less than 3/4 inch result in fatalities, injuries, or significant damage, encoding a hail event is recommended. Encoded values of estimated or measured hail diameters below 3/4 inch (non-severe), regardless of extent and/or severity of fatalities, injuries, and damage, will not initiate the verification process.

3.2.1 Marine Hail Events. StormDat software permits only one event name for encoding severe and non-severe marine hail events. If hail diameters over water surfaces with an assigned marine zone number are equal to, or greater than, 3/4 inch, a marine hail event always will be encoded. It is recognized that a number of marine hail events will never be documented.

If hail stones with diameters less than 3/4 inch result in fatalities, injuries, or significant damage, encoding a marine hail event is recommended. Encoded values of estimated or measured marine hail diameters below 3/4 inch (non-severe), regardless of extent and/or severity of fatalities, injuries, and property damage, will not initiate the verification process.

To assist in the task of converting spotter hail reports to actual hail diameter, a guideline follows in Table 5.

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[1] Note: Threshold values for some western mountain states are 43 knots (50 mph) instead of 35 knots (40 mph), and 65 knots (75 mph) instead of 50 knots (58 mph).

Table 5. Hail Conversion Chart.

Pea	0.25 - .375 inch	Golf ball	1.75 inch
-	0.50 inch	Hen Egg	2.00 inch
Penny	0.75 inch	Tennis Ball	2.50 inch
Nickel/Mothball	0.88 inch	Baseball	2.75 inch
Quarter	1.00 inch (15/16")	Tea Cup	3.00 inch
Half dollar	1.25 inch	Grapefruit	4.00 inch
Walnut/Ping Pong	1.50 inch	Softball	4.50 inch

Note: For many years, dime-size hail was the coin type associated with 0.75-inch diameter hail stones. However, the diameter of a dime is 11/16 inch, slightly smaller than a penny, which is 12/16 inch (0.75 inch). Also, for many years, marble-size hail was associated with hail stones ½ inch in diameter. However, marbles come in different sizes. Therefore, use of the term “marble-size” or “dime-size” hail is not recommended.

3.3 Lightning Events. Fatalities and injuries related to lightning strikes will be included in *Storm Data*. If reliable, significant lightning-related damage reports (such as structural fires or loss of electrical power and/or communications) are available, they may be entered. Often, the preparer is unaware of a lightning incident unless it is reported by the broadcast or print media, or by a governmental or law enforcement agency. Therefore, a number of lightning incidents will never be documented.

Over the western states, lightning may start hundreds of wildfires in a single CWFA. In these cases, the preparer will have to limit the number of incidents appearing in *Storm Data* by arbitrarily setting a threshold value based on minimum burned acreage, or some other parameter. In other situations, lightning may cause a fire that ultimately leads to fatalities and/or injuries. In these cases, the fatalities and/or injuries will be classified as indirectly related. Refer to Section 2.5.2 for additional information.

3.4 Winter Weather Events. Heavy snow, ice storm, and sleet storm will be the event name for those weather systems producing respective accumulations that meet or exceed nationally or regionally established threshold values. This is regardless of wind speed value/duration, or reduced visibilities, and one of the three above mentioned event types was the primary precipitation type.

In order to be classified as a “winter storm” event, the winter weather event must satisfy criteria in one of these two groups:

a. Heavy snow and blowing snow event - accumulations meet or exceed locally defined 12 and/or 24-hour, nationally or regionally established warning threshold values, and sustained wind or frequent gusts of 22 to 30 knots (25 to 34 mph) accompanied by falling and blowing snow, occasionally reducing visibilities to 1/4 mile or less for three hours or more, or

b. Mixed event - the weather system must have consisted of at least two of the following precipitation types: snow, freezing rain, or sleet, and the accumulation of the precipitation types must meet or exceed nationally or regionally-established warning threshold values.

As with classification of other events, the preparer must use care in classifying an event as a "winter storm." For example, if the winter event initially consists of a brief mixture of snow and freezing rain, but changes to sleet for most of its duration, and ends with a brief period of freezing rain, it should be classified as a "sleet" event.

3.5 Coastal Flooding Events. "Storm surge," "seiche," or "astronomical high tide" will be the event names for flooding of those portions of coastal land zones (coastal county/parish) adjacent to the waters and bays of the oceans, Great Lakes, Lake Okeechobee, or Lake Pontchartrain. Further inland, in a coastal or inland county/parish adjacent or near the oceanic waters and bays, the *Storm Data* preparer must determine when and where to encode a flood event as "Flash Flood" or "Flood." Terrain (elevation) features will determine how far inland the coastal flooding extends.

3.6 Tropical Cyclone Events. After a tropical cyclone event, offices will: (a) have an entry for "tropical cyclone," summarizing the total impact, and (b) list the impacts attributed to individual hazards events (storm surge, freshwater flooding, tornadoes, inland high winds, rip currents, etc.) These separate events (i.e., their associated fatalities, injuries, and damage amounts) are not included/encoded as part of the header strip of the tropical cyclone event. Additionally, the name of the tropical cyclone will be included in the narrative of all associated individual hazards/events.

The only individual hazard that will be encoded as one of the three tropical cyclone events is wind damage in coastal counties/parishes. This restriction prevents a "double-count" from occurring in the national report entitled "*A Summary of Natural Hazard Fatalities for [Year] in the United States*," which is based upon the header strips of *Storm Data* events. In other words, the fatalities, injuries, and damage amounts appearing in the above header strip of a tropical cyclone are attributed only to wind damage experienced in the coastal counties/parishes listed in the header strip. The effects from the other individual hazards associated with a tropical cyclone can be found in other cyclone-related events.

In order to provide complete documentation of the tropical cyclone effects, the *Storm Data* preparer will do two additional things:

a. Insert into the tropical cyclone narrative the *total* fatalities, injuries, and damage amounts attributed to *all* tropical cyclone hazards, for affected coastal and inland counties/ parishes within a CWFA (e.g., "The collective effects of Hurricane Alpha during the period of August 1-3, resulted in 10 fatalities, 50 injuries, $800M in property damage, and $200M in crop damage in the counties of S, T, U, V, W, X, Y, and Z"). This will ensure that all tropical cyclone effects are summarized in one phrase; and

b. Provide in the tropical cyclone narrative, a general breakdown of fatalities, injuries, and damage amounts attributed to individual hazards/events, for both coastal and inland counties/parishes (e.g., "During the passage of Hurricane Alpha in the counties of S, T, U, V, W, X, Y, and Z, five tornadoes killed 3 people and resulted in $1.0M in property damage, flash floods injured 20 people and resulted in $175M in crop damage, rip currents resulted in 5 fatalities," etc.).

In addition, the following information will be included in the narrative for tropical cyclones at coastal locations:

- Tropical cyclone name;
- For coastal locations, the point of landfall;
- Storm surge/storm tide;
- Minimum surface pressure; and
- Saffir/Simpson Hurricane Scale category, when appropriate.

The following information will be included for both coastal and inland locations:

- Maximum sustained wind speed/peak gusts;
- rainfall totals; and
- record-breaking data.

Effects that occur well outside the circulation of the tropical cyclone, such as swell that may occur hundreds of miles away, will be listed under another specific event, such as "Rip Current" or "Heavy Surf," with its narrative mentioning the tropical cyclone as a secondary effect.

In some situations, there may be tropical cyclone-related hazards, as mentioned above, occurring prior to or after the beginning/ending time of the tropical cyclone event. Professional judgment must be exercised in determining if these related hazards are part of the cyclone. Refer to Sections 2.5.2 and 2.6.4 for the decision process.

Damage listed in the header strip of the individual hazards, or the tropical cyclone, should not include such things as business losses from reduced tourism, etc.

Table 6 depicts the Saffir-Simpson Hurricane Scale.

3.7 <u>Tornado, Funnel Cloud, and Waterspout Events</u>. The terms "tornado," "funnel cloud," and "waterspout" are defined below.

a. <u>Tornado</u>. A violent rotating column of air, usually pendant to a cumulus/ cumulonimbus, with circulation reaching the ground. On a local scale, it is the most destructive of all atmospheric phenomena.

b. Waterspout. A violently rotating column of air usually pendant to a cumulus/ cumulonimbus, over a body of water, with its circulation reaching the water.

c. Funnel Cloud. A rotating visible extension of cloud pendant to a cumulus/ cumulonimbus with circulation not reaching the ground or water.

Table 6. Saffir-Simpson Hurricane Scale.

CATEGORY (SCALE NUMBER)	WIND SPEED	STORM SURGE (FT)	DAMAGE
1	64-83 kts (74-95 mph)	4-5	Minor
2	84-96 kts (96-110 mph)	6-8	Moderate
3	97-113 kts (111-130 mph)	9-12	Major
4	114-135 kts (131-155 mph)	13-18	Severe
5	Greater than 135 kts (Greater than 155 mph)	Greater than 18	Catastrophic

Note: A scale ranging from 1 to 5 based on a hurricane's intensity. This can be used to give an estimate of the potential property damage and flooding expected. In practice, wind speed is the parameter that determines the category since storm surge is highly dependent on the slope of the continental shelf.

WFOs are responsible for identifying, investigating, and confirming storms occurring in their warning areas. To accomplish this, the *Storm Data* preparer should use all available severe weather reports, including information from newspapers, letters and photographs, airborne surveys and pilot reports, state/local emergency management, and personal inspections.

When available information includes a reliable report that a tornado vortex was distinctly visible (condensation funnel pendant from a cloud—usually a cumulonimbus), and in contact with the ground, or a rotating dust/dirt/debris column at the ground is overlaid with a condensation funnel cloud pendant above, identification of a tornado is a simple matter. This is particularly true when reports have been investigated by the responsible NWS official and found to be reliable. However, tornadoes, funnel clouds, and waterspouts can be hidden by precipitation, low clouds, or dust. Darkness or lack of observers also may result in a tornado or waterspout not being observed. The WFO must exercise professional judgment to identify a tornado or waterspout from its effects.

If a tornado develops on, or moves over, an inland lake that does not have an assigned marine zone number, it is classified as a tornado during its time over those waters. If a tornado moves over a body of water with a marine zone assigned to it, the event will be classified as a waterspout for that portion of its trajectory over water. One can describe the characteristics of the tornado, over land or water surfaces, in the narrative.

Tornadoes crossing state lines or boundaries of WFO CWFA responsibility will be coordinated between WFOs. The preparer will ensure that the exact location, where a tornado crosses a county, parish, or state line, is incorporated into the narrative. Sharp-turning tornadoes may need to be segmented into individual pieces in order to adequately describe the path of that event. However, segmenting a tornado within the same county/parish is not encouraged since this practice may lead to confusion and over-counting of tornadoes by *Storm Data* customers. It is recommended that the preparer encode only one beginning and ending point for the tornado path within each county/parish affected, and provide detailed information in the narrative about the intermediate locations where the tornado turned sharply. Additional instructional information regarding these "border-crossing" tornadoes can be found in the "tornado" event examples in Appendix A.

In some situations, many public and spotter reports of funnel clouds are passed on to a WFO. In these cases, the preparer should document only the most significant funnel clouds, especially those that generate public or media attention.

"Landspouts" will be classified as tornadoes, assuming the preparer has reliable reports meeting the criteria outlined in Section 3.7.2. Similarly, "cold-air funnels," meeting the criteria outlined in Section 3.7.2, will be classified as a tornado event.

On the other hand, dust devils shall not be classified as tornadoes since they are a ground-based whirlwind that doesn't meet the tornado criteria outlined in Section 3.7.2. A dust devil is an allowable *Storm Data* event name as indicated in Section 2.

3.7.1 On-site Inspections (Surveys). WFO tornado/waterspout and significant downburst damage surveys are desirable in those cases when the Meteorologist in Charge (MIC) believes additional information is needed for *Storm Data* preparation. A survey should be done as soon as possible before clean-up operations remove too much evidence.

3.7.2 Objective Criteria for Tornadoes. An event will be characterized as a tornado if the type or intensity of the structural and vegetative damage and/or scarring of the ground only could have been tornadic, or if any two of the following guidelines are satisfied:

a. Fairly well-defined lateral boundaries of the damage path;

b. Evidence of cross-path wind component, e.g., trees lying 30 degrees or more to the left/right of the path axis (suggesting the presence of a circulation);

c. Evidence of suction vortices, ground striations, and extreme missiles; or

d. Evidence of surface wind convergence as suggested by debris-fall pattern and distribution. In fast-moving storms, the convergence pattern may not be present and debris pattern may appear to fall in the same direction.

Additionally, an event will be characterized as a tornado if:

a. Eyewitness reports from credible sources, even with little or no structural or vegetative damage, and/or little or no scarring of the ground, indicate that a violent circulation extended from the convective cloud base to the ground; or

b. Videotapes or photographs from credible sources, even with little or no structural or vegetative damage, and/or little or no scarring of the ground, indicate that a violent circulation extended from the convective cloud base to the ground.

There may be situations, especially in the central or western parts of the United States, where verification of tornadoes will be difficult. However, if available evidence establishes that it was highly likely a tornado event occurred, then the preparer will enter the event in *Storm Data*.

3.7.3 Criteria for a Waterspout. A vortex in contact with the water surface that develops on, or moves over, the waters and bays of the oceans, Great Lakes, Lake Okeechobee, or Lake Pontchartrain will be characterized as a waterspout for that portion of its path over those water surfaces.

3.7.4 Determining Path Length and Width. Path length (in miles and tenths) and maximum path width (in yards) will be indicated for all tornadoes, including each member of families of tornadoes, or for all segments of multi-segmented tornadoes. The length in the header strip is the length of that particular segment in that particular county/parish. A *Storm Data* customer can determine the entire length of a multi-segmented tornado by adding the lengths from each segment.

Path length excludes sections without surface damage or burn marks, unless other evidence of a ground-based circulation exists, e.g., a trained spotter report, or a videotape of the tornado over plowed field. The excluded section will not exceed 2 continuous miles or 4 consecutive minutes of travel time. Otherwise, the path will be categorized as consisting of separate tornado events.

The width in the header strip is the maximum observed through the entire length of a tornado, or of each segment in a multi-segment tornado. To determine the tornado's maximum width, a *Storm Data* customer must check each segment which is entered as a separate event.

The preparer is encouraged to include in the narrative the average path width (in yards) of all tornadoes. Availability of average path width information in *Storm Data* benefits the scientific research community and other customers.

3.7.5 Determining F-Scale Values. The F-scale values will be assigned to every documented tornado. The *Storm Data* preparer must exercise professional judgment to determine the F-scale rating. Eyewitness verbal accounts, newspaper or personal photographs, and videotapes of the tornado(s) may be relied upon when an inspection/survey is not possible. In cases where there is damage to numerous structures, damage to a single structure should not be used as the deciding factor for the appropriate F-scale rating. Experience has shown that the F-scale of a tornado cannot be determined, consistently and reliably, solely on appearance. Due to the difficulty in judging the F-scale, the assigned value may be off by one (+/-) F value.

To assist the WFO, a set of uniform objective guidelines are listed in Table 7 followed by pictures of related damage. Table 8 correlates observed structural damage with types of construction and the resultant F-scale value.

3.7.6 Simultaneously Occurring Tornadoes. On occasions, especially over the Plains states, a single cumulonimbus may have several, separate, tornadoes occurring simultaneously. They may be separated by a distance as little as ½ to 1 mile; and each may have a distinct, separate trajectory. In these cases, the Storm Data preparer should classify the tornadoes as separate events, each with a unique start/end location/time combination. The preparer will have to rely on credible evidence such as eyewitness reports, video tapes, and damage along the path in order to determine how many tornadoes actually existed. Existing *Storm Data* indicates that “landspout” tornadic situations have resulted in several simultaneously occurring tornadoes.

If evidence suggests that a multiple-vortex tornado occurred, the *Storm Data* preparer shall document this situation as a single tornado event, even though each vortex created a distinct damage path. The multiple vortices rotate around a common center—the tornado center. Conversely, separate tornadoes, even if they are closely spaced, will not rotate around a common center.

A brief detailed explanation of simultaneously occurring tornadoes can be included in the narrative associated with each tornado event.

Table 7. Fujita Tornado Intensity Scale.

F-Scale	Tornado Intensity	Damage Intensity	Wind Speed	Typical Damage
F0	**Weak**	**Gale Tornado**	**35-63 kts (40-72 mph)**	**Tree branches broken, chimneys damaged, shallow-rooted trees pushed over; sign boards damaged or destroyed, outbuildings and sheds destroyed.**
F1	**Weak**	**Moderate**	**64-97 kts (73-112 mph)**	**Roof surfaces peeled off, mobile homes pushed off foundations or overturned, moving autos pushed off the roads, garages may be destroyed.**
F2	**Strong**	**Significant**	**98-136 kts (113-157 mph)**	**Roofs blown off frame houses; mobile homes demolished and/or destroyed, train boxcars pushed over; large trees snapped or uprooted; airborne debris can cause damage.**
F3	**Strong**	**Severe**	**137-179 kts (158-206 mph)**	**Roofs and walls torn off well constructed houses; train cars are overturned; large trees are uprooted, can knock down entire forest of trees; heavy cars lifted off the ground and thrown.**
F4	**Violent**	**Devastating**	**180-226 kts (207-260 mph)**	**Well-constructed frame houses leveled, but debris remains close by; structures with weak foundations blown off some distance; automobiles thrown and disintegrated, large airborne objects can cause significant damage.**
F5	**Violent**	**Incredible**	**227-276 kts (261-318 mph)**	**Brick, stone, and cinder-block buildings destroyed, most debris is carried away by tornadic winds, large and heavy objects can be hurled in excess of 300 feet, trees debarked, asphalt peeled off of roads, steel reinforced concrete structures badly damaged.**

(Aerial photographs courtesy of Brian Smith, Meteorologist, National Weather Service, Valley, Nebraska. Ground photographs courtesy of Tim Marshall, Structural Engineer, Haag Engineering, Dallas, Texas.)

Typical F0 Tornado Damage
Note the trees have been stripped of leaves, but the trees remain standing. Only light roof damage with a few missing shingles.

Typical F0 Tornado Damage
A poorly anchored home is pushed off its foundation.

Typical F1 Tornado Damage
Shallow-rooted trees are uprooted and shingles are ripped from the roof with significant roof damage.

Typical F1 Tornado Damage
Structural damage can occur to well built structures as shown in this photograph. The garage wall supports have been pushed in.

Typical F2 Tornado Damage
This home has had the entire roof blown off, yet the exterior walls remain intact. Some of the stronger hardwood trees remain standing.

Typical F2 Tornado Damage
More significant structural damage occurs. Note the severe damage to this home's roof and exterior walls.

Typical F3 Tornado Damage
This home is missing the entire roof as well as some of the exterior walls. Trees are blown over or snapped near the base and outbuildings are destroyed.

Typical F3 Tornado Damage
Most walls of a home can be knocked down. Only an interior wall of this home remains standing.

Typical F4 Tornado Damage
This home is completely obliterated, with no walls left standing. The debris from the home remain at the location where the house once stood.

Typical F4 Tornado Damage
All walls of well-built structures are blown down, including most of those made of brick or stone.

Typical F5 Tornado Damage
These homes have been completely removed from their original locations. The debris field has been scattered some distance from their foundation.

Typical F5 Tornado Damage
Debris created by the destroyed house has been scattered from the homesite. Only the foundation remains to indicate the structures' original location.

Typical F5 Tornado Damage
Most homes in a wide area are destroyed, leaving only foundations. The debris seen in the foreground is most likely debris from other homes in the area.

Table 8. Estimate of F-Scale Wind from Structure Type and Damage Category By Fujita (1989).

Structure Type	Damage Categories						
	No Damage	Minor Damage	Roofing Blown Off	Whole Roof Blown Off	Some Walls Standing	Flattened to Ground	Blown Off Foundation
Outbuilding Mobile Home	F0	F0	F0	F1	F1	F1	F2+
Weak Frame House	F0	F0	F1	F1	F2	F2	F3+
Strong Frame House	F0	F0	F1	F2	F3	F4	F5+
Brick Building	F0	F1	F2	F3	F4	F5+	F5++
Concrete Building	F1	F2	F3	F4	F5+	F5++	F5+++

Minimum wind speeds: F0 (35 kts/40 mph); F1 (64 kts/73 mph); F2 (98 kts/113 mph); F3 (137 kts/158 mph); F4 (180 kts/207 mph); F5 (227 kts/261 mph).

4. Disposition of *Storm Data*. *Storm Data* files will be transferred electronically to the Performance Branch (W/OS52), using the currently authorized software, no later than 60 days after the end of the month for which the data is valid. Negative reports are required, and simply require one to transmit a "blank" month in compressed format (no entries or text needed, just type in beginning and ending dates). Additional related reports may be needed prior to, or after, 60 days after the end of the month for which the data is valid, depending on local, regional, or national requirements. The *Storm Data* preparer will refer to appropriate directives, and their MIC, for preparation instructions and distribution requirements.

5. Outstanding Storms of the Month (OSM). An important feature of the publication *Storm Data* is the OSM section. The OSM may be any type of event (tornadoes, hurricanes, snow, ice, hail, etc.). Events may be selected for this section for their meteorological significance even if damage or casualties are minimal. Tornadoes of F4 intensity or greater should be submitted for the OSM. Otherwise, providing information for the OSM is optional but highly desirable.

Although the Warning Coordination Meteorologist or *Storm Data* focal point prepares the OSM, the MIC is ultimately responsible for OSM contributions from the field office. This includes all forensic discovery (data gathering, fact finding, development of statistics, etc.), drafting graphics and tables, supplying photographs, and preparing the narrative.

5.1 Requirements for Outstanding Storms of the Month. The OSM material is used to enhance the cover appearance of the *Storm Data* publication, as well as provide additional detail not found in a documented event.

5.1.1 Text Format. The OSM should be prepared using any American Standard Code for Information Interchange (ASCII)-based software.

5.1.2 Disposition Dates. NCDC should be contacted within 60 days following the end of the month in which the event occurred, if a WFO wishes to have material considered for the OSM. The OSM material will be submitted to NCDC within 90 days following the end of the month in which the event occurred. The OSM material submitted beyond 90 days will not be considered.

5.1.3 Copyrights. Permission or credit for the use of each item must be obtained from the original source before mailing or E-mailing to NCDC. Make sure that the submitted materials are accompanied by a description and name of photographer.

5.1.4 Final Editing. NCDC will be responsible for final editing of the narrative and any necessary assembly of multiple OSM products. In addition, NCDC may produce additional OSM features.

5.1.5 Write-up/Discussion. The OSM will include a one or two-page write-up which incorporates the following: synoptic discussion of events leading up to the "Storm," warnings and watches in effect, notable information about the storm, storm statistics: (F-scale, hail size, wind gusts, snow amounts, etc.), aftermath (fatalities, injuries, damage).

5.1.6 Pictures. Photographs, charts, or maps of the storm or the damage/aftermath should conform to the following guidelines:

a. Hand drawn or computer generated maps may be sent to depict damage amounts and/or location;

b. 35 mm photographs (or slides), images, maps, or charts may be sent via mail to NCDC, scanned and returned to sender;

c. 35 mm photographs (or slides), images, maps, or charts may be scanned by sender, and sent via E-mail or FTP to NCDC;

d. Scan at original size;

e. Scan at 150 - 300 dpi (dots per inch);

f. Save as .jpg or .tif formats; and

g. Digital camera images may be used if they have a 1024x768 or greater resolution, or 144 or greater dpi.

6. Tornado and Severe Thunderstorm Confirmation Reports. Four Advanced Weather Interactive Processing System (AWIPS) alphanumeric text products are produced by the Storm Prediction Center (SPC). These products summarize unofficial (preliminary) tornado and severe

thunderstorm reports that were processed at SPC and originated from each WFO's CWFA responsibility. Each field office should compare the appropriate message with its local records. Any change in event information should be noted, but corrections will be made via *Storm Data*. Additional severe weather statistics and graphics can be found on the SPC Web page.

STADTS WWUS60 - Listing of tornado and severe thunderstorm reports for previous calendar day;

STAHRY WWUS60 - Listing of tornado and severe thunderstorm reports for current day, and updated on an hourly accumulative basis;

STAMTS WWUS61 - Statistics for tornado totals, tornado-related fatalities, and number of killer tornadoes on a monthly and yearly basis (current year and previous 3 years); and

STATIJ WWUS63 - Listing of killer tornadoes for current year.

7. Weekly Warning Reports. A weekly listing of all short-fuse severe weather warnings, categorized by WFO, are posted on the StormDat/Verification Web site. A *Storm Data* preparer should note any discrepancies in this report, and E-mail copies of warning/text changes to W/OS52 as soon as possible. Photocopies will suffice.

APPENDIX A - *Storm Data* Preparer's Guide

Table of Contents: Page

This Appendix will enable *Storm Data* preparers to properly enter events into the StormDat software program. Special emphasis is placed on expansion of the basic event definition, the beginning and ending times, and the differentiation of direct versus indirect fatalities. In addition, specific examples are given to depict how the event might appear in the *Storm Data* publication. Many of the specific examples were based on actual occurrences, but some of the numbers, names, etc., were changed in order to better illustrate a concept.

There are three designators indicated after the event type: C for County/Parish; Z for Zone; and M for Marine.

Event Name	**Designator**	**Event Name**	**Designator**
Astronomical High Tide	Z	Landslide	Z
Avalanche	Z	Lightning	C
Blizzard	Z	Marine Hail	M
Dense Fog	Z	Marine Thunderstorm Wind	M
Drought	Z	Rip Current	M
Dust Devil	C	Seiche	Z
Dust Storm	Z	Sleet Storm	Z
Excessive Heat	Z	Storm Surge	Z
Extreme Cold/Wind Chill	Z	Strong Wind	Z
Flash Flood	C	Thunderstorm Wind	C
Flood	Z	Tornado	C
Frost/Freeze	Z	Tropical Depression	Z
Funnel Cloud	C	Tropical Storm	Z
Hail	C	Tsunami	Z
Heavy Rain	C	Volcanic Ash	Z
Heavy Snow	Z	Waterspout	M
Heavy Surf/High Surf	Z	Wildfire	Z
High Wind	Z	Winter Storm	Z
Hurricane (Typhoon)	Z	Winter Weather/Mix	Z
Ice Storm	Z		

1. **Astronomical High Tide (Z).** Abnormal, or extremely high tide levels, produced without any unusually heavy surf, that results in a coastal flood.

Beginning Time - When the coastal flooding began.
Ending Time - When the coastal flooding ended.
Direct Fatalities/Injuries
- ❑ A child wandered into a flooded area and drowned.

Indirect Fatalities/Injuries
- ❑ A car, driving along a flooded roadway, swerved and crashed into a tree.

Example:

GAZ166 Camden Coastal
15 0800EST 1500EST 0 0 20K Astronomical High Tide
Perigean spring tides in combination with onshore winds of 10 to 15 knots produced flooding of Cumberland Island National Seashore, damaging several seaside cabanas.

2. **Avalanche (Z).** A mass of snow, often containing rocks, ice, trees, or other debris, that moves rapidly down a steep slope, resulting in a fatality, injury, or significant damage. If a search team inadvertently starts another avalanche, it will be entered as a new Avalanche event.

Beginning Time - When the snow mass started to descend.
Ending Time - When the snow mass ceased motion.
Direct Fatalities/Injuries

- ❏ People struck by the snow mass or any debris contained within.
- ❏ People struck by debris tossed clear of the avalanche.
- ❏ People buried by the avalanche.

Indirect Fatalities/Injuries

- ❏ People who ran into (in a motor vehicle, on skis, etc.) the snow mass or debris *after* it stopped moving.

Example:

COZ012 West Elk and Sawatch Mountains/Taylor Park
06 1900MST 5 1 Avalanche
1915MST

Four college students were caught in an avalanche, triggered when one of the students crossed a slope just below the summit on Cumberland Pass, which is about 25 miles east-northeast of Gunnison in the Sawatch Mountain Range. The entire slope at the 12,000-foot elevation fractured 6-feet deep and 1500 feet across and ran 400 vertical feet, with the resulting avalanche scouring the slope all the way to the 9,000-foot level. The skier who triggered the avalanche was buried next to a tree which provided an air space that was crucial to his survival. The other three students, including a snowmobiler, a snow-boarder, and another skier, perished in the snow. The avalanche also destroyed a cabin, killing the occupant. Boulders dislodged by the avalanche struck a car, killing the driver. M19OU, M20OU, M22OU, M43PH, F37VE

3. **Blizzard (Z).** A winter storm which produces the following conditions for 3 hours or longer: (1) sustained winds or frequent gusts to 30 knots (35 mph) or greater, and (2) considerable falling and/or blowing snow reducing visibility frequently to less than 1/4 mile.

Beginning Time - When blizzard conditions began.
Ending Time - When blizzard conditions ended.

(In *Storm Data*, no blizzard should cover a time period of less than 3 hours. If blizzard conditions occur for less than 3 hours, the event should be entered as Heavy Snow, or Winter Weather/Mix, perhaps noting in the narrative that near-blizzard conditions were observed at the height of the storm.)

Direct Fatalities/Injuries

- ❑ People who became trapped or disoriented in a blizzard and died from exposure.
- ❑ People who were struck by objects borne or toppled in blizzard wind.
- ❑ A roof collapsed due to the weight of snow.
- ❑ A vehicle stalled in a blizzard. The occupant died of exposure.

Indirect Fatalities/Injuries

- ❑ Vehicle accidents caused by poor visibility and/or slippery roads.

Example:

MIZ049-055 Huron - Sanilac
02 2200EST 2 0 Blizzard
03 0300EST

A massive low pressure system moving up the East Coast brought very cold air south across the Great Lakes. This produced an unusually active lake effect snow event in the Thumb area. Aided by sustained north winds of 35 to 43 knots (40 to 50 mph), with gusts to 56 knots (65 mph), the snow and blowing snow reduced visibilities to near zero across much of Huron and Sanilac Counties. Snow accumulations were very difficult to measure due to the high winds, but were commonly cited in the 12- to 17-inch range. Up to 10-foot snow drifts were observed. Most of the area was essentially shut down for the next 3 days. Two people in Huron County froze to death after they left their snow-covered vehicle and attempted to walk to a nearby farm home. M55OU, F60OU

4. **Dense Fog (Z).** Water droplets suspended in the air at the Earth's surface reducing visibility to values equal to or below regionally established values for dense fog (usually 1/4 mile or less) and significantly impacts transportation or commerce.

Beginning Time - When dense fog criteria were first met.
Ending Time - When dense fog criteria were no longer met.
Direct Fatalities/Injuries

- ❑ A vehicle accident where the driver suddenly encountered dense fog that was unavoidable. (Rare)

Indirect Fatalities/Injuries

- ❑ Almost all fatalities and injuries resulting from vehicular accidents caused by widespread dense fog.
- ❑ During extremely dense fog, a construction worker lifted a metal pipe which touched a power line, resulting in electrocution.

Example:

NCZ053-065 Buncombe - Henderson
30 0400EST 0 0 Dense Fog
1000EST

Dense fog developed in the early morning hours in the French Broad River valley. The fog played havoc with the morning commute, and contributed to several accidents in and south of Asheville. At 0900 EST, the fog contributed to a 25-car pile-up on Interstate 40 on the south side of Asheville. The accident claimed 4 lives (indirect fatalities) and injured 17 (indirect). Asheville Regional Airport was closed for most of the morning. The North Carolina State Police shut down Interstate 26 between the airport and the city as a precautionary measure.

5. **Drought (Z).** A period of abnormally dry weather, sufficiently prolonged, causing a serious hydrologic imbalance (i.e., crop damage, water supply shortage, etc.) in the affected area. Determination of whether or not to include a drought in *Storm Data* and establishment of beginning and ending times can be made using locally defined values.

Beginning Time - When water shortages and/or crop damage due to unusually dry weather became significant.
Ending Time - When hydrologic balance was restored, and/or water supply problems were no longer serious.
Direct Fatalities/Injuries

- Extremely rare.

Indirect Fatalities/Injuries

- None.

Example:

NEZ006-011-012-015>018-030>034-042>045-050-053>065>068-078-088>093	**Keya Paha - Knox - Cedar - Thurston - Antelope - Pierce - Wayne - Boone - Madison - Stanton - Cuming - Burt - Platte - Colfax - Dodge - Washington - Butler - Saunders - Douglas - Sarpy - Seward - Lancaster - Cass - Otoe - Saline - Jefferson - Gage - Johnson - Nemaha - Pawnee - Richardson**				
	01 0000CST 22 1800CST	**0**	**0**	**55K**	**Drought**

A drought, which began in early September, ended for much of eastern Nebraska, on November 22 when 3 to 5 inches of precipitation fell. For many locations, this was the first significant rain of over a quarter of an inch since September 4. The drought's effect was especially felt during the first 3 weeks of November after numerous grass fires prompted many towns and villages to ban any type of outdoor burning. Among the largest fires reported were: 180-200 acres of grassland and timber near Indian Cave State Park near Falls City, 300 acres of prairie grass east of Wymore, 100 acres of prairie grass near Hickman, 100 acres of a harvested corn field south of Elkhorn, 60 acres of grass north of Omaha, and 40 to 50 acres of grassland near Ashland. The most costly reported fire was when smoldering leaves ignited dry grass near Woodcliff, south of Fremont, eventually spreading to two homes and causing $55,000 worth of damage. Damage amounts do not include costs to individual fire departments for fire containment.

Note: This example would have been entered in September and October *Storm Data* as well. Damage amounts in the header are for the current month only. Grand totals for the entire drought episode should be mentioned in the narrative. In some cases the effects and cost of a drought may not be known for some time.

6. **Dust Devil (C).** A vigorous whirlwind, usually of short duration, rendered visible by dust, sand, or other debris picked up from the ground, resulting in a fatality, injury, or significant damage. Dust devils that don't produce a fatality, injury, or damage can be entered if they are unusually large, noteworthy, or create strong public interest.

Beginning Time - When dust, dirt, sand, or debris was first seen in the whirlwind.
Ending Time - When dust, dirt, sand, or debris was last seen in the whirlwind.
Direct Fatalities/Injuries
- People who were asphyxiated due to high dust/sand content in the air. (Rare)
- People who were hit by flying debris.
- Vehicle was tipped over or blown off a road.

Indirect Fatalities/Injuries
- Vehicular accidents caused by reduced visibility during a dust devil, or vehicular accidents caused by debris left on a road after a dust devil passed by.

Example:

Maricopa County

4 W Gila Bend	**12**	**1400MST** **1420MST**	**0**	**2**	**Dust Devil**

A sunny, hot day caused many dust devils to form. One became quite strong and moved directly along Interstate 8, according to amateur radio reports. Visibility was severely reduced in the dust devil. One motorist drove into the dust devil, which pushed and flipped the vehicle off the road. The driver and one passenger were injured. Winds were estimated at 56 knots (65 mph).

7. **Dust Storm (Z).** Strong winds over dry ground, with little or no vegetation, that lifts particles of dust or sand, reducing visibility below regionally established values (usually 1/4 mile or less), and results in a fatality, injury, significant damage, or significant disruption of transportation.

Beginning Time - When an area of blowing dust or sand first reduced visibility to regionally established values or dust storm began to cause significant impact.
Ending Time - When an area of blowing dust or sand diminished so that visibility was above regionally established values or dust storm no longer had significant impact.

Direct Fatalities/Injuries

- ❏ People who were asphyxiated due to high dust/sand content in the air. (Rare)
- ❏ People who were hit by flying debris.
- ❏ Vehicle tipped/pushed over or blown off a road by the strong winds, resulting in an accident and associated fatalities/injuries.

Indirect Fatalities/Injuries

- ❏ Vehicular accidents caused by reduced visibility during a dust storm, or vehicular accidents caused by debris left on a road after a dust storm has passed.

Example:

KSZ061 Hamilton
24 1600MST 0 2 Dust Storm
1645MST
A strong cold front caused wind gusts to around 43 knots (50 mph) across far western Kansas. An area of dust and dirt was lifted hundreds of feet into the air, reducing the visibility to near zero across U.S. Highway 50, west of Syracuse. A wind gust pushed and overturned an empty semi-trailer, injuring the two occupants.

8. **Excessive Heat (Z).** A period of high temperatures, often with high humidity (significantly above normal), causing a fatality or significant impact on human health. Normally, heat index values should meet or exceed locally established thresholds for an excessive heat event to be included in *Storm Data*. However, if heat-related fatalities occur under abnormally hot conditions, but excessive heat criteria are not met, the event should also be included as an Excessive Heat event in *Storm Data* and the fatalities are direct. In some heat waves, fatalities occur in the few days following the meteorological end of the event. The preparer should include these fatalities in the Heat Wave event, but encode the actual date of the directly related fatalities in the fatality entry table.

Beginning Time - When local thresholds for excessive heat are first met or when abnormally hot conditions begin.
Ending Time - When local thresholds for excessive heat are no longer met or abnormally hot conditions end.
Direct Fatalities/Injuries

- ❏ Fatality where heat-related illness or heat stress was the primary, secondary, or major contributing factor as determined by a medical examiner or coroner.
- ❏ An elderly person suffered heat stroke and died inside a stuffy apartment during a heat wave.
- ❏ A toddler was left inside a car while a parent went inside a grocery store on a hot day where ambient conditions *met* the local definition of excessive heat. The windows were left rolled up, and the toddler died. In this case the *Storm Data* preparer must use good judgment, look at ambient conditions, the length of time the child was in the car, and the medical examiner's determination before deciding whether to enter this as a direct or indirect fatality. The child

may have survived if the windows were down. But under extreme heat conditions, weather may have been a significant contributing factor.

- ❑ There are no heat-related injuries. They are considered an illness.

Indirect Fatalities/Injuries

- ❑ Fatality where heat stress was the primary, secondary, or major contributing factor, but the heat was primarily man-made and ambient conditions are not abnormally hot or extreme. The heat fatality was not weather related. (See examples below.)
- ❑ A toddler was left inside a car while a parent went inside a grocery store on a sunny day where ambient conditions *did not meet* the local definition of excessive heat (heat index only in the 80s.) The windows were left rolled up, and the toddler died. In this case the toddler clearly would have survived in the ambient conditions if the windows were down.
- ❑ The medical examiner reported a man working at a steel mill died of heat stress. The outside temperature was only 80 degrees.

Examples:

MIZ068>070-075-076-082-083 Livingston - Oakland - Macomb - Washtenaw - Wayne - Lenawee - Monroe

02 1300EST 4 Excessive Heat
05 2000EST

Very hot and humid weather moved into southeast Michigan just in time for the Fourth of July weekend. High temperatures were in the middle to upper 90s across metro Detroit all 4 days, with Detroit City Airport reaching 100 degrees on July 4. The high of 97 degrees at Detroit Metropolitan Airport on July 5 set a new record for that date. Heat indices were in the 105- to 115-degree range all four afternoons. Dozens of people were treated at area hospitals for heat-related illnesses over the weekend, and four elderly people died from heat stroke based on medical reports. Two of the fatalities occurred on July 4, one on July 5, and one person died on July 7 after being hospitalized for heat stroke for 2 days. The heat wave finally broke when a cold front moved through lower Michigan late in the day on July 5. M89PH, F77PH, M95PH, F72PH

MOZ037 Jackson

11 1300CST 1 Excessive Heat
11 2000CST

The high temperature reached 92 degrees with a heat index of 99 on the afternoon of June 11. The medical examiner reported an elderly woman died from heat stress. She was found dead in her apartment. F84PH

9. **Extreme Cold/Wind Chill (Z).** Period of extremely low temperatures or wind chill equivalent temperatures (significantly below normal), that causes significant human and/or economic impact. Normally, temperatures/wind chills should meet locally established values for

extreme cold or wind chill to be entered as a *Storm Data* event. However, if fatalities occur with abnormally cold temperatures/wind chills but extreme cold/wind chill criteria are not met, the event should also be included in *Storm Data* as an Extreme Cold/Wind Chill event and the fatalities are direct.

Beginning Time - When extreme or abnormally cold temperatures or wind chill equivalent temperatures began.
Ending Time - When extreme or abnormally cold temperatures or wind chill equivalent temperatures ended.
Direct Fatalities/Injuries

- ❏ A fatality where hypothermia was ruled as the primary, secondary, or major contributing factor as determined by a medical examiner or coroner. If other weather factors, such as freezing/frozen precipitation, disorient the person, trap the person, or cause the person to collapse, but cause of fatality was exposure or hypothermia, the fatality may be entered under the event type Winter Storm, Winter Weather/Mix, etc. The *Storm Data* preparer must use sound judgment and work with the local medical examiner or coroner.
- ❏ Elderly person wandered away from a nursing home, became disoriented, and froze. Medical examiner ruled that the major cause of death was hypothermia.
- ❏ Medically treated frostbite or hypothermia can be considered an injury.

Indirect Fatalities/Injuries

- ❏ After shoveling snow, a man collapsed in the driveway. The medical examiner determined the primary cause of fatality was heart attack.

Examples:

WYZ054>058 Gillette - South Campbell - Moorcroft - Wyoming Black Hills - Weston
01 1200MST 4 0 500K 50K Extreme Cold/Wind Chill
03 1000MST
Bitter cold arctic air settled over parts of northeast Wyoming. Temperatures fell to 35 below to 45 below zero (-45 in Gillette) on the 2nd. Four fisherman were found frozen at their campsite near Pine Haven at Keyhole State Park in Crook County. The medical examiner classified the fatalities to cold-hypothermia. The extreme cold caused water mains and pipes to freeze and burst in Gillette and Newcastle, resulting in water damage to homes and businesses. In addition, a couple of ranchers reported losses. M44OU, F42OU, F57OU, M59OU

NDZ050 Mcintosh
15 1000CST 1 0 Extreme Cold/Wind Chill
15 2200CST
An 84-year-old Lehr man died of exposure when he went to visit the grave of his wife. The man was found 1 mile from his house. Temperatures that day were around 20 below and wind speeds of 17 to 22 knots (20-25 mph). Wind chills were estimated to be around 60 below. The man was not wearing a coat or gloves when he was found. M84OU

INZ001	**Lake**			
	11 2000CST	**1**	**0**	**Extreme Cold/Wind Chill**
	12 1400CST			

A homeless man was found dead in Gary, Indiana. The cause of death was exposure. It was raining on this cold October day with winds of 17 to 26 knots (20 to 30 mph) and temperatures in the 30s. M42OU

10. **Flash Flood (C).** A flood caused by heavy rainfall, a dam break, or ice jam, occurring within 6 hours of the causative event, and poses a threat to life or property. The *Storm Data* preparer must use good judgment in determining when the event is no longer characteristic of a flash flood and becomes a flood. Flash floods do not exist for two or three consecutive days.

Beginning Time - When flood waters begin to threaten life or property. In some cases, a flash flood may begin when water left the banks of a river; in others it may be when the water level was 2 to 3 feet above bank-full. It may also be when raging currents of water only 1-foot deep on urban streets sweep people off their feet, resulting in a fatality/injury. Professional judgment is needed by the *Storm Data* preparer.

It is possible for a flash flood event to occur during a flood event due to intense rainfall in a short period of time. The beginning time of the flash flood event should correspond to the rapid rise in water levels following the causative event (6 hours or less).

Ending Time - When flood waters receded to a point where there was no longer any threat to life or property. Keep in mind that flash flooding may continue to threaten life or property many hours after the rain ends.

Direct Fatalities/Injuries

- ❏ A person drowned in a flash flood or struck by an object in flash flood waters.
- ❏ A motorist drowned in an overturned car after driving around a barricade down a hill onto a flooded stretch of highway that has flood waters 4 feet deep (doesn’t matter how irresponsible the driver was).
- ❏ A group of people having a party in an apartment located in a flood plain drown when flood waters trapped them.
- ❏ Several campers drowned when a thunderstorm 10 miles away in an adjacent county/parish sent a flash flood wave down an arroyo where they camped.
- ❏ Debris or missiles caught in flood waters struck and injured a person walking along a flooding river.
- ❏ A child playing near a stream or storm sewer was swept away by flood waters and drowned
- ❏ Drowning due to collapse of a levee or retaining wall from flood waters.

Indirect Fatalities/Indirect Injuries

- ❑ Vehicular accidents and incidents that the flash flood contributed to but did not directly cause.
- ❑ Children playing in debris or workers cleaning up debris left by flood. Debris shifted and child or worker was struck, pinned, or crushed by debris.
- ❑ A flash flood loosened rocks on a mountainside. After the water receded, a rock climber fell to his death after grabbing onto one of the loosened rocks for a handhold.
- ❑ A remote mountain pass road was undermined in a flash flood by a nearby creek. After the water receded, a vehicle drove into the hole in the road, killing the passenger and injuring the driver.

Examples:

Milwaukee County

Wauwatosa to Milwaukee	**06 1000CST** **07 1600CST**	**2**	**0**	**2.5M**	**Flash Flood**

Tropical-like thunderstorms dumped rainfall amounts of 8 to 12 inches between 1200 and 1900 CST on July 6 in a 7-mile-wide band from the city of Waukesha (Waukesha Co.) east to downtown Milwaukee (Milwaukee Co.). Flash flooding killed two people who drowned when their car was swept away by flood waters at the intersection of I-94 and I-43. Widespread flood damage occurred to 2000 homes and 500 businesses. The maximum rainfall total in Milwaukee County was 11.25 inches which was measured at the downtown Public Safety Building. The Menomonee River in Wauwatosa (Milwaukee Co.) quickly crested at 19.5 feet at 2200 CST on the 6th, or 8.5 feet above flood stage. This is a new record crest and about a 150-year flood. M25IW, F24IW

Waukesha County

Waukesha to Elm Grove	**06 1000CST** **07 1600CST**	**4**	**10**	**2.0M**	**Flash Flood**

Tropical-like thunderstorms dumped rainfall amounts of 8 to 12 inches between 1200 and 1900 CST on July 6 in a 7-mile-wide band from the city of Waukesha (Waukesha Co.) east to downtown Milwaukee (Milwaukee Co.). Widespread flood damage occurred to 500 homes and 150 businesses from the city of Waukesha east through Brookfield and Elm Grove. Four people in a vehicle drowned when flash flood waters up to 5 feet deep flipped their car over at the intersection of I-94 and Moorland Road. Ten people were injured in the city of Waukesha by tree debris in Fox River. A coop observer in the southern part of Brookfield (Waukesha Co.) measured 11.98 inches of rain between 1100 and 1900 CST on the 6th. M48IW, F46IW, M14IW, F15IW

Herkimer County

Dolgeville	**28 0930EST**	**0**	**0**	**4K**	**Flash Flood**
	1500EST				

An ice jam developed during the morning of February 28 along East Canada Creek at the State Highway 29 bridge in the village of Dolgeville. The water rapidly backed up, flooding the cellars of nearby buildings. The ice jam broke up in the late afternoon without any further flooding downstream.

Cannon County

Woodbury	**07 0830CST**	**0**	**0**	**100K**	**Flash Flood**
	1300CST				

A dam broke and the resultant flash flood damaged a dozen homes downstream.*
(* This example would apply to levees, retaining walls, and other structures.)

10.1 Examples of a Flash Flood that Evolved into a Flood.

Kern County

Frazier	**10 1900PST**	**0**	**0**	**1.0M**	**Flash Flood**
Park	**11 0100PST**				

A powerful storm dropped 3 to 4 inches of rain over portions of Kern County during the afternoon of the 10th. The heavy rains caused flash flooding on several creeks. Frazier Mountain Road between I-5 and Shallock Road and Highway 66 near Maricopa were all washed out by overflowing creeks.

CAZ095	**Kern County Mountains**				
	11 0100PST	**0**	**0**		**Flood**
	11 1000PST				

A powerful storm dropped 3 to 4 inches of rain over portions of Kern County during the afternoon of the 10th. The heavy rains caused flash flooding on several creeks. Frazier Mountain Road between I-5 and Shallock Road and Highway 66 near Maricopa were all washed out by overflowing creeks. Additional 1 to 2 inches of rain caused creeks to stay in flood and roads to remain closed through the night. Flood waters subsided by late morning on the 11th.

11. **Flood (Z).** The inundation of a normally dry area caused by an increased water level in an established watercourse, or ponding of water, occurring more than 6 hours after the causative event, and posing a threat to life or property.

Beginning Time - When flood waters began to threaten life or property. In some cases, a flood may have been when water left the banks of a river, in others it may not have been until the water level was two 2 to 3 feet above bank-full. Professional judgment is needed by the *Storm Data* preparer.

Ending Time - When flood waters receded to a point where there was no longer any threat to life or property. Keep in mind that flooding may continue to threaten life or property many days after the rain ends.

Direct Fatalities/Injuries

- ❑ A fatality as a result of drowning in a flood or being struck by an object in flood waters.
- ❑ A person walked around a barricade into 3-foot deep flood waters near a river. The current swept him off his feet and he drowned.
- ❑ Two people rafting down a flooded street hanging on to inner tubes. Water turbulence flips them over, hitting their heads on a curb, and both drown.
- ❑ Debris or missiles caught in flood waters struck and injured a person walking along a flooded river.

Indirect Fatalities/Injuries

- ❑ Vehicular accidents the flood contributed to but did not directly cause.

Example:

RIZ001 Northwest Providence
17 0200EST 0 2 3.5M 5.7M Flood
18 1500EST

Widespread low-land flooding occurred in northwest Providence County, resulting in considerable flood damage to 1500 homes, 400 businesses, and 200 agricultural farms. Two men near South Foster were injured by floating debris in the Ponaganset River when they rescued a dog. The flood was initiated by rainfall amounts of 4 to 5 inches (on top of wet ground) that fell between 1800 CST on the 16th and 1800 CST on the 17th.

12. **Frost/Freeze (Z).** Surface air temperature of 32° Fahrenheit (F) or lower, or the formation of ice crystals on the ground or other surfaces, over a widespread area, for a climatologically significant period of time, causing significant human/economic impact.

Beginning Time - When temperature first fell below freezing or frost began to form.
Ending Time - When temperature rose above freezing or when frost melted.

Direct Fatalities/Injuries

- ❑ None. This *Storm Data* event type applies to agricultural losses. Any fatality in which the medical examiner determined that the primary cause was hypothermia should be entered under the event type Extreme Cold/Wind Chill.

Indirect Fatalities/Injuries

- ❑ Any traffic casualties due to ice formation on roads or bridges and any pedestrian casualties due to icy walkways.

Examples:

FLZ039-042 -048 **Levy - Citrus - Hernando**
18 0500EST 0 0 50K Frost/Freeze
18 0800EST
Freezing temperatures between 30 and 32 degrees occurred. The average duration was around 1 hour with up to 3 hours in isolated locations. Some crop damage was noted in Levy County.

GAZ028-029 **Hart - Elbert**
06 0500EST 0 0 Frost/Freeze
06 0800EST
Near record low temperatures in the lower to middle 30s with clear skies and light winds resulted in widespread frost. No crop damage was reported but frost formation on roads and bridges resulted in several traffic accidents, including one fatality (indirect fatality) on Highway 72 at the Broad River bridge.

13. **Funnel Cloud (C).** A rotating visible extension of a cloud pendant to a convective cloud with circulation not reaching the ground. The funnel cloud should be large, noteworthy, or create strong public interest to be entered.

Beginning Time - When the funnel cloud was first observed.
Ending Time - When the funnel cloud was no longer visible.
Direct Fatalities/Injuries
- ❑ A fatality or injury directly caused by the circulating winds of a funnel cloud. Note that by definition, a funnel cloud fatality can't occur on the ground, so fatalities or injuries can only be associated with aviation mishaps. (Rare)

Indirect Fatalities/Injuries
- ❑ All fatalities/injuries that resulted from distress brought on by the sight of the funnel cloud, or any telecommunication to those individuals of the possibility of funnel clouds.

Examples:

Tolland County
Gilead **10 1800EST 0 0 Funnel Cloud**
1805EST
A funnel cloud was observed by local law enforcement officials and Amateur Radio operators. It extended about half way from the cloud base to the ground as it passed over town.

Power County
13 E American Falls **30 1300MST 0 1 150K Funnel Cloud**
1302MST
A small airplane flew into a funnel cloud west of Pocatello; and based on reports from highway motorists, the pilot lost control. The pilot crash-landed at

the Pocatello Municipal Airport, and was injured. The plane was a total loss based on the insurance claim.

14. **Hail (C).** Frozen precipitation in the form of balls or irregular lumps of ice. Hail 3/4 inch or larger in diameter will be entered. Hail accumulations of smaller size which causes significant property and/or crop damage, or casualties, should be entered. Maximum hail size will be encoded for all hail reports entered.

Beginning Time - When hail first occurred.
Ending Time - When hail ended.

Note: When a series of hail reports occur within 10 miles or 15 minutes of each other, within a county/parish, from the same storm or storm complex, the beginning time can be the time of the first report and the ending time can be the time of the last report.

Direct Fatalities/Injuries
- ❑ Baseball-size hail struck a person in the head, causing a fatality/injury.
- ❑ A fatality/injury directly caused by wind driven hail where both the hail size and winds were below severe criteria. This would be an extremely rare event.
- ❑ Hail falls with sufficient intensity to restrict visibility causing a driver to lose control of a vehicle. The vehicle rolls over or hits an object, resulting in a fatality/injury.

Indirect Fatalities/Injuries
- ❑ Hail covered the road. A vehicle lost control on the slippery road and crashed into a tree, killing or injuring the driver.

Examples:

Medina County

Brunswick	**20**	**1730EST 1735EST**	**1**	**3**	**1.3M**	**50K**	**Hail (4.00)**

A prolific hailstorm sat over Brunswick, Ohio, for 5 minutes, resulting in a fatality, injuries, and considerable property damage. A 10-year old boy died on a ball field due to head injuries sustained in a barrage of 4-inch diameter hail. Three other boys suffered head injuries. The large hail damaged at least 500 vehicles, and 700 homes reported broken windows or awnings. The ground was covered white, and the hail didn't melt until the following afternoon.
M10BF

King County

Guthrie	**02**	**2240CST 2245CST**	**0**	**0**		**500K**	**Hail (0.50)**

Hail up to ½ inch in diameter accumulated to several inches. The hail completely flattened and shredded young corn crops at several farms near Guthrie. Insurance company officials declared the corn crop a total loss.

15. **Heavy Rain (C).** Unusual heavy fall of rain which does not cause a flash flood, or flood, but causes locally significant damage, e.g., roof collapse or other human/economic impact.

Beginning Time - When heavy rain that lead to damage began.
Ending Time - When heavy rain diminished to the degree that it no longer posed a threat to life or property.
Direct Fatalities/Injuries
- ❑ A fatality or injury caused by debris from a structural collapse resulting from water loading.

Indirect Fatalities/Injuries
- ❑ All fatalities/injuries that resulted from vehicle accidents due to hydroplaning, or from sliding on slippery road surfaces, or from poor visibility.

Example:

Minnehaha County

Sioux Falls	**03**	**1100CST** **1200CST**	**2**	**7**	**300K**	**Heavy Rain**

A short-lived but intense thunderstorm dumped 2 inches of rain between 1100 and 1130 CST, resulting in the collapse of a roof of an old school building at noon. Two students were crushed by roof debris, and 7 others were injured. Apparently, the rain came down so hard that water loading on the roof lead to the roof collapse. Minor street flooding occurred elsewhere in Sioux Falls, but in general the city's drainage system was up to the task. M8SC, M9SC

16. **Heavy Snow (Z).** Snowfall equal to or exceeding regionally established values (such as 4, 6, or 8 inches or more in 12 hours or less; or 6, or 8, or 10 inches in 24 hours or less). In some heavy snow events, structural damage, due to the excessive weight of snow accumulations, may occur in the few days following the meteorological end of the event. The preparer should include this damage as part of the original event and give details in the narrative.

Beginning Time - When regionally established heavy snow values were first reached. The beginning time of the snow storm should be included in the narrative.
Ending Time - When snow accumulation ended.
Direct Fatalities/Injuries
- ❑ A fatality/injury from a mass of snow sliding off a roof or falling through a structure.
- ❑ A tree toppled from heavy snow and landed on someone, killing him.
- ❑ A person walking through deep snow, fell down, and died of exposure.

Indirect Fatalities/Injuries
- ❑ Any fatality from a vehicle accident related to deep snow on the roads or slippery roads.
- ❑ Any vehicle accident involved with a snow plow.
- ❑ Any fatality related to shoveling or moving snow.

Examples:

IAZ013-014 **Fayette - Clayton**
25 1400CST **0** **0** **Heavy Snow**
25 1800CST
Snow began at 1000 CST and reached 6 inches at 1400 CST and tapered off to flurries by 1800 CST. A total of 6 to 8 inches of snow fell from Oelwein to Strawberry Point.

VTZ013-014 **Bennington - Windham**
11 2200EST **1** **0** **Heavy Snow**
12 1800EST
Record-breaking heavy snow pounded the southern part of Vermont. Accumulations of 30 to 40 inches paralyzed the region. Travel and commerce came to halt, and there were numerous reports of downed power lines and structural damage due to the weight of snow on roofs. Some roofs of businesses collapsed during the 2 days following the end of the heavy snow since clean-up crews were unable to reach those buildings. One person died from exposure after he left his snow-covered vehicle and attempted to walk to a nearby residence during the height of the storm. Accumulating snow and lower visibilities began at 1500 EST on the 11th, and reached 6 inches at 2200 EST. Thereafter, accumulation rates increased to 2 to 3 inches per hour through the overnight and morning hours. M70OU

17. **Heavy/High Surf (Z).** Large waves breaking on or near shore, usually resulting from swell spawned by a distant storm, causing a fatality, injury or damage. In addition, if accompanied by anomalous high tides, heavy/high surf may produce beach erosion and possible damage to beachfront structures. Heavy surf conditions may be accompanied by rip currents and shore breaks.

Beginning Time - When near-shore wave heights met locally developed criteria (usually 7 to 10 feet).
Ending Time - When near-shore waves subsided below locally developed criteria.
Direct Fatalities/Injuries
- ❏ A surfer ventured out into severe wave conditions and was injured or drowned.
- ❏ A man fishing off a pier was swept into the sea.
- ❏ A boat traversing an ocean inlet foundered on the rocks and the boaters drowned.

Indirect Fatalities/Injuries
- ❏ A swimmer, struggling to get out of the heavy surf, suffered a heart attack.

Examples:

CAZ042-043 **Orange County Coast - San Diego County Coast**
09 2000PST **0** **2** **2M** **Heavy/High Surf**
10 0600PST
A powerful Pacific storm generated towering surf and swell that battered beachfront buildings. Waves which occasionally reached 15 to 20 feet damaged 32 homes in San Clemente. A Solana Beach lifeguard was injured while rescuing a drowning teen who also suffered minor injuries.

VAZ098>100 **Virginia Beach - Northampton - Accomack**
15 1500EST **0** **0** **10M** **Heavy/High Surf**
16 1200EST
A strong nor'easter caused significant beach and property damage along the Atlantic coast from Virginia Beach, VA, to Ocean City, MD. At least 100 vacation homes reported damage.

18. **High Wind (Z).** Non-convective sustained winds of 35 knots (40 mph) or greater lasting for 1 hour or longer, or winds of 50 knots (58 mph) or greater for any duration. Consistent with regional guidelines, mountain states may have higher criteria. A peak wind gust (estimated or measured) or maximum sustained wind will be entered.

Beginning Time - When sustained winds or wind gusts first equaled or exceeded regionally established criteria for high wind. Wind speed values can be inferred from damage reports.
Ending Time - When sustained wind or wind gusts dropped below high wind criteria.
Direct Fatalities/Injuries

- ❏ Fatalities or injuries caused by being struck by falling debris associated with structural failure (including falling trees, utility poles, and power lines).
- ❏ Fatalities or injuries associated with vehicles that were blown over, or vehicles that were blown into a structure or other vehicle.
- ❏ Fatalities or injuries caused by people or vehicles that were struck by airborne objects.
- ❏ Drownings due to boats capsized by wind.

Indirect Fatalities/Injuries

- ❏ Fatalities or injuries when vehicles collided with stationary obstructions/debris placed in roadways by high wind.
- ❏ Any fatalities or injuries incurred during the clean-up process.
- ❏ Fatalities or injuries associated with contact with power lines after they fell.
- ❏ Any fatalities or injuries that loss of electrical power contributed to, including lack of heat, cooling, or light, or failure of medical equipment.

Examples:

MNZ088-095	**Fillmore - Winona**					
	30 0100CST 0900CST	**0**	**0**	**2.5K**		**High Wind (G56)**

Winds gusting to an estimated 56 knots (65 mph) for about 8 hours blew down numerous trees and toppled dozens of signs in Spring Valley and Lewiston. A young girl in Spring Valley was killed when she touched a downed power line (indirect fatality). The high winds were generated by a deep low pressure moving northeast through the Minnesota Arrowhead region.

SDZ001-002-012-013	**Butte - Harding - Meade - Perkins**					
	06 0900MST 1300MST	**0**	**0**			**Strong Wind (S39)[M]**

Sustained west winds reached 39 knots (40 to 45 mph) for several hours across northwest South Dakota behind a fast-moving cold front. Uncharacteristically, there were no gusts of 50 knots (58 mph) or higher.

19. **Hurricane/Typhoon (Z).** A tropical cyclone in the Atlantic or northeast Pacific Ocean east of the International Date Line (hurricane), or in the north Pacific Ocean west of the International Dateline (typhoon), with 1-minute sustained wind speeds equal to or greater than 64 knots (74 mph). The hurricane/typhoon should be included as an entry when its effects, such as wind, storm surge, freshwater flooding, and tornadoes are experienced in the WFO's county warning and forecast area (CWFA), including the coastal waters. The eye/center of the hurricane/typhoon may not actually move ashore and hurricane-force winds may not be observed in the CWFA.

The hurricane/typhoon will usually include many individual hazards, such as storm surge, freshwater flooding, tornadoes, rip currents, etc. Refer to Section 3.6 for detailed information on how and what to encode with regards to the hurricane/typhoon event, as well as its associated individual hazards.

Beginning Time - When the direct effects of the hurricane/typhoon were first experienced.
Ending Time - When the direct effects of the hurricane/typhoon were no longer experienced.
Direct Fatalities/Injuries

- ❏ Casualties caused by storm surge, rough surf, freshwater flooding, or wind-driven debris or structural collapse.
- ❏ The wind caused a house to collapse or blew a tree onto someone.
- ❏ A person drowned while surfing in rough waters.
- ❏ The storm surge drowned people in a beach house.
- ❏ Someone drowned when flood-waters swept a vehicle into a river.

Indirect Fatalities/Injuries

- ❏ Someone suffered a heart attack while removing debris.

- ❏ Someone was electrocuted by touching downed power lines.
- ❏ Someone drowned when a vehicle was driven into a canal.
- ❏ Someone was killed in a vehicle accident caused by a hurricane-related missing traffic signal.

Examples:

FLZ018-021	**Broward - Collier - Dade - Monroe**						
>023	**24 0325EST**	**2**	**25**	**10B**	**250M**	**Hurricane/Typhoon**	
	0900EST						

The eye of Hurricane Andrew moved ashore in south Dade County near Homestead with a minimum central pressure of 922 mb and maximum storm surge of 16.9 feet. Maximum sustained winds were estimated at 126 knots (145 mph) with gusts to at least 152 knots (175 mph). Andrew was a Category 4 storm and was the third strongest in U.S. history. In Broward, Collier, Dade, and Monroe Counties, the winds killed 2 people (trees falling on moving vehicles). All of the associated effects of Andrew in southeast Florida resulted in 15 fatalities, 250 injuries, \$25.0B in property damage, and around \$1.0B in crop damage. Specifically in southeast Florida, Andrew's inland flood waters resulted in 5 fatalities, 100 injuries, \$15B in property damage, and \$250M in crop damage. The eight associated tornadoes resulted in 2 fatalities, 25 injuries, and \$1B in property damage. The powerful winds resulted in 4 fatalities, 50 injuries, \$13B in property damage, and \$750M in crop damage. The storm surge along the coast resulted in 4 fatalities, 75 injuries, \$6M in property damage. Besides the 15 direct fatalities, at least 26 indirect fatalities occurred, during clean-up activities. M35VE, F56VE

GUZ001	**Guam**				
	15 1700SST	**0**	**1**	**300M**	**Hurricane/Typhoon**
	16 1200SST				
GUZ002	**Rota**				
	15 1700SST	**0**	**0**	**2.4M**	**Hurricane/Typhoon**
	16 1700SST				

Typhoon Paka formed in the central Pacific southwest of the Hawaiian Islands on November 28 and tracked westward crossing the International Dateline around 1200 SST December 7. Paka entered the Marshall Islands as a tropical storm on December 10 became a typhoon on December 11 and crossed through the Marshall Islands until December 14, damaging structures and crops. Paka became a super typhoon on December 15 and passed 5 miles north of Guam. The lowest pressure observed on Guam was 948 mb and the highest wind was measured at 100 knots (115 mph) with a gust to 152 knots (175 mph). On Guam, the typhoon winds resulted in 1 injury (debris hit a person on the head), and damaged numerous businesses and homes. Similar damage was noted on Rota. Collectively, all of the effects of Typhoon Paka resulted in no fatalities, 2 people injured, and over \$504M in property damage. Specifically, Paka's flood waters resulted in 1 injury, and $200M in property damage; and associated powerful winds resulted in 1 injury, and over $254M in property damage. The storm surge along the coast resulted in $50M in property damage.

20. **Ice Storm (Z).** Damaging accumulation of ice equal to or exceeding regionally established values during a freezing rain event.

Beginning Time - When ice accumulations exceeded regionally established values or as inferred by damage reports.
Ending Time - When ice accumulation stopped.
Direct Fatalities/Injuries
- ❑ A large chunk of ice falls off a structure and strikes and kills someone.
- ❑ Large tree or other structure falls or collapses (due to ice load) and kills someone.

Indirect Fatalities/Injuries
- ❑ All vehicle related fatalities due to ice covered roads and hazardous driving conditions.
- ❑ Someone suffers a heart attack or dies while removing or cleaning up downed trees or other structural debris.
- ❑ Power is lost and people die from extreme cold.
- ❑ A man dies from hypothermia after falling down a flight of stairs in his dark, unheated home.

Example:

MEZ007-022 Northern Oxford - Northern Franklin - Central Somerset - Southern Oxford
06 0300EST 1 0 304M Ice Storm
08 1100EST
A severe ice storm hit sections of central and southern Maine where 1 to 3 inches of ice accumulated on trees, power lines, and other exposed surfaces. Nearly everyone in the region experienced power loss. Due to the added weight of ice, an ice-covered tree limb broke and fell on a man who was walking underneath a tree. The man died from head injuries. M36OU

21. **Landslide (Z).** The dislodging and fall of a mass of earth or rock, resulting in a fatality, injury, or significant damage. Mudslides will be entered as a landslide.

Beginning Time - When the earth and rock mass started to descend.
Ending Time - When the earth and rock mass ceased motion.
Direct Fatalities/Injuries
- ❑ People were struck by the earth or rocks.
- ❑ People killed or injured when a vehicle was struck by moving earth or rocks.

Indirect Fatalities/Injuries
- ❑ People who ran into the mass of earth and rocks in the road with a vehicle after the mass stopped moving.

Example:

COZ067 Teller County/Rampart Range/Pikes Peak
15 0620MST 1 1 Landslide
0630MST
A thunderstorm produced very heavy rain early in the morning over Ute Pass. A slide of large rocks and earth cascaded onto U.S. Highway 24 about 12 miles west-northwest of Colorado Springs. A large rock hit a moving vehicle and killed one of the occupants instantly. The driver was seriously injured. M36VE

22. **Lightning (C).** A sudden visible flash caused by an electrical discharge from a thunderstorm, resulting in a fatality, injury, and/or significant damage.

Beginning Time - Exact time that lightning strikes.
Ending Time - Same as beginning time—same moment that lightning strikes.
Direct Fatalities/Injuries
- ❑ Lightning directly struck a person, resulting in a fatality or injury.
- ❑ Lightning traveled along a structure or body of water, resulting in a fatality or injury.
- ❑ Lightning hit a tree and knocked it over, resulting in a fatality or injury.
- ❑ Lightning hit the ground or an object and traveled underground, resulting in a fatality/injury.

Indirect Fatalities/Injuries
- ❑ Any traffic accident that lead to a fatality or injury, caused by traffic signals being out.
- ❑ Someone suffered a heart attack and died while removing or cleaning up debris caused by a lightning strike.
- ❑ Any fatality or injury caused by a lightning-initiated fire.

Example:

Tioga County
3 SW Tioga 06 1900EST 0 10 Lightning
Two people were knocked unconscious when they were struck by lightning while fishing on the Hammond Reservoir during a fishing contest. One of them suffered 2nd degree burns to his face, chest, and feet. In addition, eight other people suffered minor, lightning-related injuries that required medical treatment. At least another 20 individuals felt the lightning shock waves but did not require treatment.

23. **Marine Hail (M).** Hail 3/4 inch in diameter or larger, occurring over the waters and bays of the ocean, Great Lakes, Lake Okeechobee, or Lake Pontchartrain (those assigned specific Marine Forecast Zones), will be entered. Hail of smaller size, causing damage to water-craft or fixed platforms, should be entered. A maximum hail size will be entered.

Beginning Time - When hail began.
Ending Time - When hail ended.
Direct Fatalities/Injuries
- ❑ Hail injured a boater.
- ❑ Wind-driven hail shredded the sail of a sail boat, causing the boat to overturn, drowning the boater.

Indirect Fatalities/Injuries
- ❑ A boater panicked in a hail storm and ran into a breakwater.

Examples:

ANZ230 **Boston Harbor MA**
10 1530EST **0** **0** **Marine Hail (1.00)**
1532EST
A boater reported quarter-size hail.

LEZ149 **Conneaut OH to Ripley NY**
18 1604EST **0** **0** **5K** **Marine Hail (0.50)**
1608EST
One-half-inch diameter hail driven by 30 knot (35 mph) winds damaged two sailboats near Erie, PA.

24. **Marine Thunderstorm Wind (M).** Winds, arising from convection, occurring over the waters and bays of the ocean, Great Lakes, Lake Okeechobee, or Lake Pontchartrain (those assigned specific Marine Forecast Zones), with speeds of at least 34 knots (39 mph), or winds of any speed that result in a fatality, injury, or damage to water-craft or fixed platforms. A maximum wind speed will be entered in knots (measured or estimated).

Beginning Time - When winds of 34 knots or greater first occurred or when a fatality, injury, or damage began.
Ending Time - When wind diminished to less than 34 knots or the when a fatality, injury, or damage ended.
Direct Fatalities/Injuries
- ❑ A wind gust, associated with a shower or thunderstorm, overturned a canoe and the canoeist drowned.
- ❑ A jet-skier, jumping large waves created by thunderstorm winds was killed when the craft flipped over.
- ❑ A wave hit a boat broadside, and a boater lost his balance, fell overboard and drowned.

Indirect Fatalities/Injuries

- ❑ Thunderstorm winds uprooted a tree that fell in the water. An hour later a water skier ran into the tree and was killed.

Examples:

ANZ531 **Chesapeake Bay from Pooles Island to Sandy Point MD**
10 1530EST 1 0 Marine Tstm Wind (G25)
1532EST
A one-person catamaran sailing in Chesapeake Bay just offshore Sandy Point State Park capsized when an estimated wind gust of 25 knots (30 mph) caught it broadside. The sailor drowned after hitting his head on the mast. M20IW

LMZ741 **Wilmette Harbor to Meigs Field IL**
18 1604CST 0 0 Marine Tstm Wind (G42)^{M}
1606CST
A squall line moved through the Chicago area and off the lakefront. A peak gust to 42 knots (48 mph) was recorded at the Harrison Street Crib.

25. **Rip Current (M).** A narrow channel of water flowing seaward from the beach through areas of breaking waves, occurring over the waters and bays of the ocean, Great Lakes, Lake Okeechobee or Lake Pontchartrain (those assigned specific Marine Forecast Zones). They often form when the gradient wind is strong and directly onshore or when swell from a distant extratropical or tropical cyclone impinge on the coast. Rip currents will only be listed in *Storm Data* when they cause drownings, near-drownings, rescues, or damage to shoreline property or water-craft. A current not directly associated with winds or waves, such as those associated with tidal currents, or other currents such as long-shore or deep-water currents, will not be included in *Storm Data* as Rip Current events.

Beginning Time - The time when a rip current drowning, near-drowning, or rescue incident began or damage began.
Ending Time - The time that the rip current drowning, near-drowning, or rescue incident ended or damage ended.
Direct Fatalities/Injuries
- ❑ A fatality due to a drowning from a rip current that was caused by wind or wave activity.
- ❑ A near-drowning that required medical treatment (either on-site or at a hospital) is considered an injury.

Indirect Fatalities/Injuries
- ❑ None

Examples:

AMZ651 **Coastal Waters from Deerfield Beach to Ocean Reef FL**
25 1400EST 1 1 Rip Current
1630EST
A 78-year old tourist swimming in the Atlantic behind his condominium near Fort Lauderdale drowned in a rip current. The beach patrol rescued four others, one of whom was transported to the hospital for medical treatment. M78IW

PZZ655 **Inner Waters from Pt. Mugu to San Mateo Pt CA**
05 0900PST 2 2 Rip Current
1600PST
A 25-year-old male and a 24-year-old female drowned in a rip current near a pier at Huntington Beach. Lifeguards made over two dozen rescues with two near-drownings as 10-foot swells from Hurricane Angelo swept north. M25IW, F24IW

26. **Seiche (Z).** A standing wave oscillation in any enclosed lake which continues after a forcing mechanism has ceased and results in shoreline flooding. In the Great Lakes and large inland lakes, large pressure differences, high winds, or fast-moving squall lines may act as the forcing mechanism. In addition, earthquakes or landslides can initiate a seiche. When the forcing mechanism ends, the water sloshes back and forth from one end of the lake to the other, causing water level fluctuations of up to several feet before damping out.

Beginning Time - When water began to rise or fall.
Ending Time - When water returned to pre-seiche levels.
Direct Fatalities/Injuries
- ❏ Persons near shore were swept away by the large wave and drowned.
- ❏ A boat was overturned by the large wave, drowning those on board.
- ❏ A structure was damaged or flooded by the wave killing those inside.

Indirect Fatalities/Injuries
- ❏ Person died when cleaning up seiche-generated debris after the seiche ended.
- ❏ Person died from a building that collapsed from beach erosion after a seiche ended.

Example:

MIZ071 **Van Buren**
28 0300EST 0 0 250K Seiche
0315EST
An early morning seiche of 3 feet accompanied an impressive thunderstorm squall line which crossed Lake Michigan into western Lower Michigan. The rising water damaged boats and docks at South Haven. At least $250,000 in damage occurred along the shoreline.

27. **Sleet Storm (Z).** Significant accumulations of sleet equal to or exceeding regionally established values.

Beginning Time - When sleet accumulations equaled regional/local established threshold values, or as inferred by damage reports.
Ending Time - When sleet accumulation stopped.
Direct Fatalities/Injuries
- ❑ The weight of sleet on a roof or other structure causes it to collapse, killing someone. (Rare)

Indirect Fatalities/Injuries
- ❑ Any automobile-related accident due to sleet or poor driving conditions.
- ❑ Any fatality or injury related to someone falling or slipping on sleet.

Example:

WYZ015-062 Natrona - North Carbon
03 1400MST 0 0 65K Sleet Storm
04 0200MST
Sleet accumulated to as much as 8 inches in the central foothills of Wyoming, causing extensive ice conditions and drifts of sleet. Driving was hazardous at best with numerous accidents along Highway 54. The slippery road surface resulted in one accident involving two trucks in which four people were injured (indirectly).

28. **Storm Surge (Z).** For coastal areas, a rise above the normal water level along a shore caused by strong onshore winds and/or reduced atmospheric pressure, resulting in damage, flooding, fatalities, or injuries. A storm surge can be related to a tropical or extratropical storm system. On the Great Lakes, a combination of high winds and waves and high lake water levels results in lakeshore flooding, posing a threat to life or property.

Beginning Time - When the water level began to cause damage or flooding.
Ending Time - When the water level dropped to a point where damage or flooding ended.
Direct Fatalities/Injuries
- ❑ A coastal dwelling was washed away injuring/killing the occupants.
- ❑ A person drowned when vehicle was swept away by the storm surge.

Indirect Fatalities/Injuries
- ❑ A person suffered a heart attack while evacuating from a storm surge.
- ❑ A person died in a vehicle accident caused by the storm surge washing away a traffic signal.
- ❑ A person died in a vehicle accident after losing control in standing water on a road.

Coastal Example:

ORZ022	**Curry County Coast**				
	07 0600PST 1000PST	**0**	**0**	**100K**	**Storm Surge**

A large slow-moving low pressure area off the northwest U.S. coast caused a 4-foot storm surge to a portion of the Oregon coast. The storm surge washed away part of Port Orford's sewage treatment plant.

Great Lakes Example:

ILZ014	**Cook**				
	27 0600CST 1200CST	**0**	**0**	**25K**	**Storm Surge**

Strong low pressure produced northeast winds of 26 to 39 knots (30 to 45 mph) down Lake Michigan and 10- to 15-foot waves along the Chicago lakefront. Lake Shore Drive was closed due to water and sand on the pavement. Damage occurred to a marina's pier.

29. **Strong Wind (Z).** Non-convective winds gusting less than 50 knots (58 mph), or sustained winds less than 35 knots (40 mph), resulting in a fatality, injury, or significant damage. Consistent with regional guidelines, mountain states may have higher criteria. A peak wind gust (estimated or measured) or maximum sustained wind will be entered.

Beginning Time - When the wind started to cause a fatality, injury, or damage.
Ending Time - When the wind no longer caused a fatality, injury, or damage.
Direct Fatalities/Injuries

- ❑ Fatalities or injuries caused by falling debris associated with structural failure (includes falling trees, utility poles, and power lines).
- ❑ Fatalities or injuries associated with vehicles that were blown over, or vehicles were blown into a structure or other vehicles.
- ❑ Fatalities or injuries caused by airborne objects striking people or vehicles.
- ❑ Drownings due to boats capsizing from wind on inland lakes without an assigned Marine Forecast Zone.

Indirect Fatalities/Injuries

- ❑ Fatalities or injuries when a vehicle collided with debris scattered on a roadway.
- ❑ Any fatalities or injuries incurred during the clean-up process.
- ❑ Fatalities or injuries associated with making contact with power lines after they fell.
- ❑ Any fatalities or injuries from loss of electrical power, including lack of heat, cooling, or light, or failure of medical equipment.

Example:

TXZ252-253-255	**Starr - Hidalgo - Cameron**					
	22	**1000CST 2100CST**	**1**	**0**	**15K**	**Strong Wind (G45)^{M}**

Gusty winds to 45 knots (52 mph) occurred in the Rio Grande Valley of Deep South Texas behind a passing cold front. Power lines and store signs were downed in Rio Grande City, Mercedes, and Brownsville. A large store sign fell on a passing car on US 281 in Brownsville, killing the driver. M27VE

30. **Thunderstorm Wind (C).** Winds, arising from convection (with or without lightning), with speeds of at least 50 knots (58 mph), or winds of any speed producing a fatality, injury, or damage. A maximum wind speed in knots (measured or estimated) will be entered. Downbursts (including dry or wet microbursts) and gustnadoes will be reported as Thunderstorm Wind events.

Beginning Time - When damage first occurred or winds 50 knots (58 mph) or greater were first reported.
Ending Time - When damage ended or winds of 50 knots (58 mph) were last reported.

Note: When a series of severe wind reports or damage reports occur within 10 miles or 15 minutes of each other, within a county/parish from the same storm or storm complex, the beginning time can be the time of the first report and the ending time can be the time of the last report.

Direct Fatalities/Injuries
- ❏ A thunderstorm wind gust snapped a large tree limb. The limb fell on a passing car, killing or injuring the driver.

Indirect Fatalities/Injuries
- ❏ A wind gust snapped a large tree limb which fell on the road. A few minutes later a car drove into the tree limb and the driver was killed or injured.
- ❏ A wind gust downed numerous trees and limbs. The next morning a person cleaning up the debris in his yard died or is injured from a chainsaw accident.
- ❏ A thunderstorm gust toppled a tree on a home's gas meter which exploded. The resultant fire killed two people who were in the home.

Examples:

El Paso County						
Colorado Spgs	**23**	**1730MST**	**0**	**0**		**Thunderstorm Wind (G70)^{M}**

A small, dry-microburst struck the 5100 block of North Nevada Avenue in Colorado Springs. The downburst winds tore down power lines (but left the poles standing), ripped 40 square feet of roofing off a building, blew a pontoon boat 30 feet off its trailer, damaged billboards, and brought down tree limbs 6 to 8 inches in diameter.

DeKalb County

Malta	**12 1505CST**	**0**	**0**	**15K**	**10K**	**Thunderstorm Wind (G65)**

Thunderstorm winds downed numerous large trees, ripped off several barn roofs, and blew over a fuel storage tank. Two people were injured (indirectly related) when their vehicle struck a large tree on a road about 1 hour after the storm ended.

Langlade County

Antigo	**10 1309CST**	**0**	**0**	**3K**		**Thunderstorm Wind (G45)[M]**

A wind gust from a thunderstorm blew a home-built aircraft onto its side, resulting in damage to the airplane.

Waukesha County

Genesee	**15 1915CST**	**0**	**0**	**50K**		**Thunderstorm Wind (G50)**

A gustnado along the leading edge of a downburst damaged a barn and farm house along Highway 59 near Genesee. Interaction between the downburst and outflow from another thunderstorm just south of the city of Waukesha generated the gustnado.

31. **Tornado (C).** A violently rotating column of air, pendant to a convective cloud, with circulation reaching the ground. The tornado path length in miles and tenths, width in yards, and Fujita-scale will be entered. The tornado path length excludes sections without surface damage, unless other evidence of the touchdown (e.g., a trained spotter report, videotape of the tornado over a plowed field, etc.) is available. The excluded section will not exceed 2 continuous miles or 4 consecutive minutes of travel time; otherwise, the path will be categorized as consisting of separate tornado events. Path width in the entry header is the maximum width over the entire path, or of each segment in a multi-segment tornado. It is desirable to include the average path width in the narrative, especially for significant tornadoes. When discernable, wind damage from the rear flank downdraft should not be considered part of the tornado path but should be entered as a Thunderstorm Wind event. Gustnadoes will be reported as Thunderstorm Wind events. Landspouts and cold-air funnels, meeting the objective tornado criteria listed in Section 3.7.2, will be classified as Tornado events.

A vortex that moves over both water and land will be characterized as a waterspout for that portion of its path over the waters and bays of the ocean, Great Lakes, Lake Okeechobee, or Lake Pontchartrain (those assigned Marine Forecast Zones), and a tornado for that portion of its path over land or inland bodies of water that are not assigned Marine Forecast Zones.

Beginning Time - When the tornado first contacted the ground.
Ending Time - When the tornado lost contact with the ground.
Direct Fatalities/Injuries

- ❏ Structures or trees were blown over and landed on someone, resulting in a fatality/injury.
- ❏ People became airborne and struck the ground or objects, resulting in a fatality/injury.

- ❑ High voltage power lines were blown onto a car, killing or injuring those inside.
- ❑ A high-profile vehicle was blown over, resulting in a fatality/injury.
- ❑ A vehicle was blown into a structure or oncoming traffic, resulting in a fatality/injury.
- ❑ Objects became airborne (debris, missiles), resulting in a fatality/injury.
- ❑ A boat on an inland lake or river was blown over or capsized, resulting in a drowning.

Indirect Fatalities/Injuries

- ❑ A person was killed or injured after running into a tree downed by the tornado.
- ❑ Someone was electrocuted by touching downed power lines.
- ❑ Someone suffered a heart attack and died as a result of removing debris.

31.1 Single-Segment (Non Border-crossing) Tornado Entries.

31.1.1 Example of a Tornado Within One County/Parish.

Page County

Bingham to 2 NE Norwich	**22**	**1905CST 1917CST**	**6**	**75**	**0**	**0**	**5K**	**5K**	**Tornado (F1)**

At 1905 CST, a tornado touched down near Bingham, and moved east to Norwich before lifting off the ground 2 miles northeast of Norwich. Two homes in Bingham and one in Norwich sustained minor damage. The tornado track was not continuous; there were two areas (both about one-half-mile long) east of Bingham where damage was not discernable. Average path width was 30 yards.

31.1.2 Example of a Tornado that Changed Direction Within One County/Parish. A tornado that affects only one county/parish should be entered as only one segment, even if the tornado changed direction within a county/parish. The end points should be entered in the heading and the complete description of the tornado's path, including any variation from a straight line, should be described in the narrative.

Jackson County

5 W Vernon to 5 NNE Vernon	**14**	**2308CST 2326CST**	**10**	**150**	**0**	**0**	**150K**		**Tornado (F1)**

A tornado touched down 5 miles west of Vernon. The tornado moved east through the city of Vernon, and then veered left at the center of the city. It finally dissipated about 5 miles north-northeast of town. Trees and power lines were blown down and several barns were damaged. A business and a home were partially unroofed in Vernon. Based on damage, the tornado winds were around 83 knots (95 mph). Average path width was 75 yards.

31.1.3 Example of a Tornado over an Inland Body of Water (Without an Assigned Marine Forecast Zone).

Davis County

7SW Layton	**01**	**1738MST 1741MST**	**1**	**30**	**0**	**0**		**Tornado (F0)**

State Police spotted a tornado over Great Salt Lake. It dissipated before reaching shore.

31.1.4 Examples of a Tornado that Became a Waterspout (Body of Water with Assigned Marine Forecast Zone).

St. Louis County

2E Arnold to French River	**28**	**1651CST 1655CST**	**4.4**	**60**	**0**	**0**		**Tornado (F1)**

A tornado touched down 2 miles east of Arnold. A barn and an outbuilding were destroyed and trees were damaged. The tornado traveled until it reached the shore of Lake Superior near French River where it continued as a waterspout.

LSZ144

Two Harbors to Duluth MN	**28**	**1655CST 1657CST**			**0**	**0**		**Waterspout**

The St. Louis County tornado event reached the shores of Lake Superior. This waterspout lasted another 2 minutes before dissipating.

31.1.5 Examples of a Waterspout (Body of Water with Assigned Marine Forecast Zone) that Became a Tornado.

LMZ645

5NE Wind Pt to Wind Pt WI	**15**	**1700CST 1705CST**			**0**	**1**	**100K**	**Waterspout**

A waterspout developed northeast of Wind Point and moved slowly southwest. Three sail boats about 2 miles offshore were destroyed and one person was injured. The waterspout moved onshore at Wind Point and continued as a tornado in Racine County.

Racine County

Wind Pt to 3SW Wind Pt	**15**	**1705CST 1707CST**			**0**	**0**	**200K**	**Tornado (F1)**

A waterspout moved onshore as a tornado at Wind Point. The vortex weakened but still managed to cause significant damage to two piers, a yacht club building, and two small boats. Estimated wind speeds of the tornado were about 65 knots (75 mph).

31.2 Segmented and Border-crossing Tornado Entries.

31.2.1 Examples of a County/Parish Line-crossing Tornado Within a CWFA. Tornadoes that cross county/parish lines must be entered as segments with one segment per county/parish. *Storm Data* preparers must coordinate entries for tornadoes that cross state lines or CWFAs. Consistency between *Storm Data* entries of border crossing tornadoes is needed to assure an accurate tornado path. Otherwise a single tornado may be misinterpreted as being two separate tornadoes. This can easily occur when external customers, not familiar with *Storm Data* practices, use the National Climatic Data Center's (NCDC) Web site query feature. It is critical that all counties/parishes affected by a single tornado, and the exact location that a tornado exits or enters a county/parish, be mentioned in the narrative that discusses that tornado. Do not segment a tornado within a county/parish (an entry for each portion of a tornado that appreciably changes directions). In the example below, the first line of the narrative makes it clear that the tornado moved across a county/parish line, and indicates exactly where the tornado exited the first county/parish.

Coal County

4 SE Coalgate 2.5 ENE Cairo	**11**	**0425CST 0434CST**	**8**	**200**	**1**	**1**	**75K**	**Tornado (F2)**

This tornado formed 4 miles southeast of Coalgate and tracked northeastward for 8 miles before exiting Coal County about 2.5 miles east-northeast of Cairo at 0434 CST. The tornado continued in Atoka County for another 5 miles, before dissipating at 0440 CST. In Coal County, 1 fatality and injuries to another person occurred when a mobile home was thrown approximately 200 yards and disintegrated 4 miles east of Coalgate. In addition, a well-constructed frame home suffered severe roof damage and exterior wall damage in extreme eastern Coal County. While in Coal County it was rated as F2, but in Atoka County it was rated as F0. Average path width in Coal County was 100 yards, while the maximum width was 200 yards.

Atoka County

1.5 NW Wardville to 5.5 SE Wardville	**11**	**0434CST 0440CST**	**5**	**100**	**0**	**0**	**6K**	**Tornado (F0)**

This tornado formed 4 miles southeast of Coalgate in Coal County and entered Atoka County about 1.5 miles northwest of Wardville at 0434 CST. The tornado then continued for another 5 miles before dissipating 5.5 miles southeast of Wardville at 0440 CST. In Atoka County, minor roof damage was inflicted on a mobile home, and numerous trees were damaged. While in Coal County, it was rated as F2, but in Atoka County it was rated as F0. Average path width in Coal County was 50 yards.

31.2.2 Examples of a County/Parish Line-crossing Tornado With Other Embedded Severe Events. Referring to the example below, keep in mind that when entering several individual events into *Storm Data* for a specific episode, if a tornado crosses a county/parish line (multi-segmented) and there are several other events (i.e., hail, thunderstorm winds, etc.) falling between the beginning time of the first segment and the beginning times of subsequent segments of the tornado, these events will be inserted between the tornado segments, breaking up the tornado. The best way to convey a tornado is a county/parish line crossing, segmented tornado is to combine all segments of the tornado into its own episode. Then clear the screen and enter the remaining events, including those that fell in between the segments of the tornado, as a separate episode. Therefore, when people use the *Storm Data* publication, they will see a nice orderly list of events with no breakup of a multi-segmented tornado (in the CWFA), thus making it easier to find the information that they need (see example below). This is what the episode feature was developed for—to create a more orderly list of events. A separate narrative will be composed for each tornado. This will minimize the possibility that tornado information is lost in a large narrative. Simply writing a two or three sentence narrative, even for a brief tornado touchdown, will get the information across about that tornado.

Calhoun County

Shepherd to 5 SE Sarepta	**01**	**0047CST 0100CST**	**10**	**200**	**1**	**4**	**800K**		**Tornado (F1)**

A tornado spun up in the western part of Calhoun County in the village of Shepherd and tracked northeast, crossing into Pontotoc County 5 miles southeast of Sarepta. It continued for 15 miles in Pontotoc County. In Calhoun County, one man was killed in Randolph when his mobile home was destroyed. Elsewhere in Randolph, two homes were damaged, and four people were injured by airborne debris. Ten barns were destroyed and two horses were killed. Average path width was 125 yards. M50MH

Pontotoc County

2 SW Robbs to 2 W Sherman	**01**	**0100CST 0125CST**	**15**	**200**	**0**	**0**	**1.5M**	**300K**	**Tornado (F1)**

A tornado spun up in the western part of Calhoun County in the village of Shepherd and tracked northeast, crossing into Pontotoc County 2 miles southwest of Robbs at 0100 CST. It continued for 15 miles to a point about 2 miles west of the city of Sherman. Luckily, there were no fatalities or injuries in Pontotoc County. However, nine homes sustained moderate damage, and one mobile home was destroyed in or near the village of Robbs. In addition, fifteen barns were destroyed, two horses were killed, and several fields of corn were damaged. Average path width was 125 yards.

Pontotoc County

2 W Pontotoc	**01**	**0052CST**			**0**	**0**			**Hail (0.75)**

Pontotoc County

Pontotoc	**01**	**0057CST 0002CST**			**0**	**0**	**10K**		**Thunderstorm Wind (G50)**

Trees and power lines were blown down. Two vehicles sustained tree damage.

31.2.3 Examples of CWFA Boundary-crossing Tornado. WFOs must coordinate the beginning and ending locations of tornadoes that move from one CWFA into another. This will assure that all affected counties/parishes are mentioned. In the following example, both segments mention that the tornado crossed from one county/parish into another one.

TEXAS, North

Cooke County

4 NW Gainesville to 6 N Gainesville	**11**	**0255CST 0258CST**	**2.6**	**150**	**0**	**0**	**30K**		**Tornado (F1)**

A tornado touched down 4 miles northwest of Gainesville. It then moved into Love County, Oklahoma, 6 miles north of Gainesville (see *Storm Data* for Oklahoma, Western, Central and Southeast). In Cooke County, a mobile home and a storage pole barn were heavily damaged northwest of Gainesville. Average path width for the Texas portion was 75 yards.

OKLAHOMA, Western, Central, and Southeast

Love County

5 S Thackerville to 3 ESE Thackerville	**11**	**0258CST 0304CST**	**5**	**100**	**0**	**0**	**100K**	**100K**	**Tornado (F1)**

This tornado developed in Cooke County, Texas, about 4 miles northwest of Gainesville, and tracked northeastward before crossing the Red River into Love County in Oklahoma (see *Storm Data* for Texas, North, for more information on the beginning portion of this tornado in Texas) at 0258 CST at a point 3 miles east-southeast of Thackerville. In Oklahoma, the most significant damage, rated F1, occurred 3 miles southeast of Thackerville where a barn was destroyed, and some soy bean crop was uprooted. Nearby, a mobile home was severely damaged with debris scattered for 2 miles. Average path width for the Oklahoma portion was 50 yards.

31.3 Multiple Tornadoes in One Episode.

31.3.1 Examples of Grouping Multiple Tornadoes. In the example below, if there are multiple tornadoes in one severe weather episode, each tornado has its own narrative. In addition, if the tornadoes are not separated by a large time span, they can be entered together as a group in one episode. This will keep them separated from other severe weather events for easier publication reading.

Sevier County

7 SW DeQueen to 4 SE DeQueen	**23**	**1557CST 1620CST**	**9.7**	**50**	**0**	**0**			**Tornado (F1)**

This tornado occurred over a wooded region with few homes or structures in the area.

Howard County

3 S Mineral Spgs	**23**	**1601CST**	**3.8**	**200**	**0**	**0**	**10K**	**Tornado (F0)**
Tollette		**1609CST**						

Damage was primarily broken and downed trees with one home suffering minor roof damage.

Hempstead County

DeAnn to	**23**	**1625CST**	**2.4**	**200**	**0**	**0**	**22K**	**Tornado (F0)**
2.4 NE DeAnn		**1629CST**						

Two homes were damaged by falling trees. One barn lost siding and roofing material. Many trees were toppled or snapped. Average path width was 75 yards.

32. **Tropical Depression (Z).** A tropical cyclone with 1-minute sustained wind speeds up to 33 knots (38 mph). The tropical depression number will be included in the narrative section. The tropical depression should be included as an entry if its effects, such as gradient wind, freshwater flooding, and along the coast, storm surge, are experienced within the WFO's CWFA, including its coastal waters. The center of the tropical depression may not actually move off shore.

The tropical depression will usually include many individual hazards, such as storm surge, freshwater flooding, tornadoes, rip currents, etc. Refer to Section 3.6 for detailed information on how and what to encode with regards to the tropical depression event, as well as its associated individual hazards.

Beginning Time - When the direct effects of the tropical depression were first experienced.
Ending Time - When the direct effects of the tropical depression were no longer experienced.
Direct Fatalities/Injuries
- ❑ Casualties caused by storm surge, rough surf, freshwater flooding, or wind-driven debris.
- ❑ Wind caused a tree to blow onto someone.
- ❑ A person drowned while surfing in rough waters.
- ❑ Someone drowned when flood waters swept a vehicle into a river.

Indirect Fatalities/Injuries
- ❑ Someone suffered a heart attack while removing debris.
- ❑ Someone was electrocuted by touching downed power lines.
- ❑ Someone drowned when a vehicle was driven into a canal.

Example:

TXZ183	**Val Verde**				
	23	**2200CST**	**0**	**0**	**Tropical Depression**
		1000CST			

Tropical Depression Two and its remnants stalled over the Big Bend area and produced up to 18 inches of rain in Del Rio. Winds gusts of 35 knots (40 mph) and minimum sea-level pressure of 1015 mb were reported at Del Rio. The main effect of T.D. #2, namely flash flooding on San Felipe Creek, resulted in 9 fatalities (drownings), 150 injuries, \$40.0M in property damage, and around \$100K in crop damage.

33. **Tropical Storm (Z).** A tropical cyclone with 1-minute sustained wind speeds of 34 to 63 knots (39 to 73 mph). The tropical storm should be included as an entry when its effects, such as wind, storm surge, freshwater flooding, and tornadoes, are experienced in the WFO's CWFA, including the coastal waters. The center of the tropical storm may not actually move ashore and tropical storm-force winds may not actually be observed in the CWFA.

The tropical storm will usually include many individual hazards such as storm surge, freshwater flooding, tornadoes, rip currents, etc. Refer to Section 3.6 for detailed information on how and what to encode with regards to the tropical storm event, as well as its associated individual hazards.

Beginning Time - When the direct effects of the tropical storm were first experienced.
Ending Time - When the direct effects of the tropical storm were no longer experienced.
Direct Fatalities/Injuries

- ❑ Casualties caused by storm surge, rough surf, freshwater flooding, or wind-driven debris or structural collapse.
- ❑ Wind caused a tree to blow onto someone.
- ❑ Someone drowned while surfing in rough waters.
- ❑ Someone drowned when flood waters swept a vehicle into a river.

Indirect Fatalities/Injuries

- ❑ Someone suffered a heart attack while removing debris.
- ❑ Someone was electrocuted by touching downed power lines.
- ❑ Someone drowned when a vehicle was driven into a canal.
- ❑ Someone was killed in a vehicle accident caused by a tropical storm-related missing traffic signal.

Example:

FLZ007>019-026>028 **Coastal Walton - Bay - Gulf - Franklin - Jefferson - Taylor - Wakulla**
21 1800EST 0 0 600K Tropical Storm
23 0000EST
Tropical Storm Helene made landfall near Fort Walton Beach during the late morning hours of September 22. Storm total rainfall ranged from a half inch at Perry to 9.56 inches at Apalachicola. The highest sustained wind of 39 knots (45 mph) with a peak gust of 56 knots (65 mph) was recorded at Cape San Blas. The lowest sea-level pressure was 1011 mb at Panama City. Coastal storm tides of 2 feet or less above astronomical tide levels were common, with only minor beach erosion reported. Near the coast, as well as inland, many properties,

homes, and businesses sustained wind damage. No fatalities or injuries were attributed to the winds. All of the associated effects of Helene resulted in 4 fatalities, 13 injuries, $3.5M in property damage, and around $1.0M in crop damage. Specifically, Helene's flood waters in the Florida Panhandle resulted in 2 fatalities, 3 injuries, $1.0M in property damage, and $750K in crop damage. The nine associated tornadoes resulted in 2 fatalities, 10 injuries, $1M in property damage, and $150K in crop damage. The powerful winds caused $1M in property damage and $100K in crop damage. The storm surge along the coast resulted in $500K in property damage.

34. **Tsunami (Z).** An ocean wave produced by a sub-marine earthquake, landslide, or volcanic eruption, resulting in a fatality, injury or damage. When the wave reaches the coast, a tsunami may appear as a rapidly rising or falling tide, a series of breaking waves, or even a bore.

Beginning Time - When the water level first began to change rapidly.
Ending Time - When the water level returned to near normal.
Direct Fatalities/Injuries

- ❑ A coastal dwelling was washed away injuring or killing the occupants.
- ❑ A person drowned when vehicle was swept away.

Indirect Fatalities/Injuries

- ❑ A person suffered a heart attack while evacuating.
- ❑ A person died when the house he returned to collapsed.

Example:

HIZ008 South Hawaii including Kau
07 0600HST 0 0 5M Tsunami
1000HST
A 20-foot high tsunami inundated coastal sections of the south shore of the Big Island of Hawaii. Several marinas were heavily damaged and coastal roads were flooded.

35. **Volcanic Ash (Z).** Fine particles of mineral matter from a volcanic eruption which can be dispersed long distances by winds aloft, resulting in significant disruption of transportation, commerce, fatality, injury, or significant damage.

Beginning Time - When volcanic ash began to cause disruption to transportation, commerce, fatality, injury, or damage.
Ending Time - When volcanic ash stopped falling.
Direct Fatalities/Injuries

- ❑ People who were asphyxiated due to high ash content in the air. (Rare)
- ❑ People who were involved in aircraft accidents due to ash being ingested into the engines.

Indirect Fatalities/Injuries

- ❑ Vehicular accidents caused by reduced visibility and slippery roads due to volcanic ash fall, or due to falls while walking through volcanic ash.

Example:

WAZ040 **Southern Cascade Foothills**
10 1800PST 0 0 Volcanic Ash
2100PST
A minor eruption of Mt. St. Helens caused ash to rise about 10,000 feet into the atmosphere. The ash drifted to the southwest and fell in the southern Cascade foothills. State Highway 503 became slippery when it was covered with ash, which caused a head-on collision of two vehicles. One person was killed (indirect fatality) and the other seriously injured (indirect injury).

36. **Waterspout (M).** A rotating column of air, pendant from a convective cloud, with its circulation extending from cloud base to water surface over the waters and bays of the ocean, Great Lakes, Lake Okeechobee, or Lake Pontchartrain (those assigned specific Marine Forecast Zones). A vortex over any other water surface will be entered as a tornado. A vortex that moves over both water and land will be characterized as a waterspout for that portion of its path over the water surface (waters and bays of the ocean, Great Lakes, Lake Okeechobee, or Lake Pontchartrain - those assigned Marine Forecast Zones), and a tornado for that portion of its path over land, or inland bodies of water (not assigned Marine Forecast Zones).

Beginning Time - When a waterspout was first reported in contact with the water.
Ending Time - When a waterspout was last reported in contact with the water.
Direct Fatalities/Injuries

- ❑ A waterspout capsized a small boat, drowning the occupant.
- ❑ A waterspout blew a vehicle off a bridge and the driver drowned.

Indirect Fatalities/Injuries

- ❑ A boater fleeing a waterspout crashed into a breakwater.
- ❑ A boater suffered a heart attack after sighting a waterspout.

Examples:

LMZ654 **Port Washington to North Point Light WI**
18 1835CST 0 0 Waterspout
1900CST
Several waterspouts were spotted over Lake Michigan a few miles offshore from north of Milwaukee to near Port Washington.

GMZ053 **Craig Key to the west end of the 7 mile bridge FL**
10 1200EST 0 2 50K Waterspout
A large waterspout from the Florida Straits moved across a marina at Marathon damaging three sail boats and injuring two people.

36.1 Examples of a Tornado that Became a Waterspout (Body of Water with Assigned Marine Forecast Zone).

St. Louis County

2 E Arnold to 1 S French River **28 1651CST 1655CST 4.4 60 0 0 100K Tornado (F1)**

A tornado touched down north of Duluth. A barn and an outbuilding were destroyed and trees were damaged. The tornado reached the shore of Lake Superior just south of French River, and then curved northeast as a waterspout moving toward Two Harbors.

LSZ144 **1S French River to 1E Two Harbors**

28 1655CST 1705CST 0 0 Waterspout

This waterspout initially began as a tornado in St. Louis County near Arnold. It crossed over the Lake Superior shoreline just south of the village of French River, and then curved northeast toward Two Harbors. Luckily, no marine-related damage was noted.

37. **Wildfire (Z).** Any free burning and (at one time) out of control forest fire, grassland fire, rangeland fire, or urban-interface fire which consumes the natural fuels and spreads in response to its environment. The fire causes a fatality, injury, or significant property or resource damage (including equipment damaged in fighting the fire). Human activities can start wildfires, but they usually occur as a result of, or are exacerbated by, natural phenomena, such as lightning strikes, volcanic eruptions, inordinately dry conditions, and wind. Professional judgment is needed when deciding to include a wildfire in *Storm Data*.

Beginning Time - When a wildfire became out of control.
Ending Time - When a wildfire became under control.
Direct Fatalities/Injuries

- ❑ A wildfire swept through a campground. Two campers died when their RV was consumed by fire.
- ❑ A man drove into an evacuated area to try to save belongings from a cabin that was threatened by a wildfire. The man died when fire burned the cabin to the ground.
- ❑ A vehicle accident where the driver suddenly encountered thick smoke that was unavoidable. (Rare)

Indirect Fatalities/Injuries

- ❑ Almost all vehicular accidents caused by reduced visibility due to smoke.

Example:

MTZ005-006 **Missoula/Bitterroot Valleys-Bitteroot**

06 1500MST 0 0 8M Wildfire
31 1500MST

Dry lightning and strong winds started fires which spread into urban areas of the southern part of the county. Structural damage from fires occurred from August 6-8, but fires raged to the end of the month with a total of 335,356 acres burned. Sixty-four residences and cabins were destroyed, and five were partially destroyed. A total of 164 outbuildings and 87 vehicles were destroyed.

38. **Winter Storm (Z).** A winter weather event that satisfies one of the following two categories: (1) significant accumulation of at least two of the following elements: snow, freezing rain, or sleet, that pose a threat to life or property, and meets or exceeds nationally or regionally established warning threshold values; or (2) heavy snow and blowing snow where snow amounts meet or exceed locally defined 12- and/or 24-hour nationally or regionally established warning threshold values and sustained wind or frequent gusts of 22 to 30 knots (25-34 mph) occasionally reducing visibilities to 1/4 mile or less for 3 hours or more.

Beginning Time - The time when the winter storm first posed a threat to life and property.
Ending Time - The time when the winter storm no longer posed a threat to life and property.
Direct Fatalities/Injuries

- ❑ The weight of snow and ice caused a machine shed roof to collapse, killing a farmer.
- ❑ A vehicle slid into a ditch. The driver attempted to find help and died of exposure.

Indirect Fatalities/Injuries

- ❑ A vehicle slid into a ditch, killing the driver.

Example:

WVZ033>035- McDowell - Mercer - Monroe - Raleigh - Summers - Wyoming
042>044 01 1800EST 0 0 Winter Storm
02 1800EST
The new year started off with a major winter storm. A combination of snow, sleet, and freezing rain left about 4 inches of frozen precipitation on the ground across the area. Transportation came to a stop for much of the holiday weekend.

39. **Winter Weather/Mix (Z).** An accumulation of freezing rain or drizzle, sleet, or snow, less than regionally established warning values, but resulting in significant impact on commerce or transportation. Elements may occur singly or in combination. Blowing and drifting snow is also entered as a Winter Weather/Mix event. *Storm Data* preparer must use judgment in determining when a winter weather/mix event is significant enough to enter into *Storm Data*.

Beginning Time - When winter weather began to cause significant impact on commerce or transportation.

Ending Time - When the winter weather no longer posed a significant impact.
Direct Fatalities/Injuries

- ❑ A vehicle accident where the driver suddenly encountered an intense snow squall that was unavoidable. (Rare)

Indirect Fatalities/Injuries

- ❑ Almost all vehicle related fatalities/injuries due to ice covered roads, hazardous driving conditions, and visibility restrictions.
- ❑ A vehicle on a glazed road slid into a ditch, killing the driver.
- ❑ Any vehicle accident involving a snow plow.

Examples:

MAZ001>004 Berkshire - Western Franklin - Eastern Franklin - Northern - Worcester
06 0500EST 0 0 Winter Weather/Mix
1900EST
A period of freezing drizzle and freezing rain led to a thin layer of ice or glaze over northwest Massachusetts. There were numerous car accidents with minor injuries (indirect) due to the icy conditions, especially along Highway 2 and 202.

SCZ047>049 Jasper - Beaufort - Southern Colleton
01 1800EST 0 0 Winter Weather/Mix
2200EST
A mixture of freezing rain, sleet, and snow brought hazardous travel conditions to sections of southern South Carolina. While ice accumulation was small, under 1/8 inch, the combination of elements led to numerous school closings and accidents, especially along Interstate 95.

NDZ014-015 Benson - Ramsey
12 2200CST 0 0 Winter Weather/Mix
13 0300CST
A strong low pressure area and fresh snow led to a round of blowing snow that lowered visibilities to 1/4 to ½ mile at times overnight. Several cars were stranded along County Road 5.

KYZ004-005 Ballard - McCracken
16 1300CST 0 0 Winter Weather/Mix
2200CST
An extended period of sleet fell across extreme western Kentucky which led to numerous car accidents and some glazing. The worst conditions were around Paducah where slick streets led to multi-car accidents and the closing of some highways around town.

PAZ001-002 Northern Erie - Southern Erie
25 1400EST 0 0 Winter Weather/Mix
2000EST

A period of snow, totaling 4 to 5 inches, led to numerous accidents and minor injuries across Erie County in northwest Pennsylvania. Fairfield reported 5 inches. Two school buses collided on a snow covered hill just east of town. Wind speeds were in the 9 to 17 kts (10 to 20 mph) range, consequently blowing snow was minor or non-existent.

APPENDIX B - Glossary of Terms

County Warning and Forecast Area (CWFA) - The geographical area of responsibility assigned to a WFO for providing warnings, forecasts, and other weather information.

Fujita-Scale - A 0 to 5 rating based on a tornado's intensity, indirectly related to observed damage. Since structural design determines damage, probable wind speeds are associated with each F-scale number.

Header Strip - A bold-faced line of text at the beginning of each *Storm Data* entry, providing specific information on the time and character of the weather event. This includes location, beginning and ending times, deaths, injuries, property damage, type of event. In some cases, it also includes the Universal Geographic Code and the magnitude of the event, i.e., hail size and tornado F-scale.

Saffir/Simpson Hurricane Scale - A 1 to 5 rating based on a hurricane's intensity. This scale designates sustained wind speeds and estimates potential property damage. It sometimes provides estimated associated storm surge.

StormDat - The Paradox-based computer software program documents specifics and narratives of significant weather events. StormDat transfers data from WFOs to the Performance Branch in OCWWS for use in the NWS verification program and to the NCDC for publication of *Storm Data*.

Storm Data - NOAA's official publication which documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, disruption to commerce, and other noteworthy meteorological events.