DEVELOPMENT OF WIND SPEED CONTOUR MAP FOR TEXAS COASTLINE

Prepared by

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Submitted to:
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INTRODUCTION

The specific objectives for Task 6 set forth in the Interagency Cooperation Contract and subsequent discussions with representatives from the Windstorm Section of TDI are:

- Review existing Wind Speed Maps;
- Define methodology to be used;
- Produce two coastal contour maps, a 50-yr. map and a 100-yr. map defining the basic wind speeds for coastal counties in Texas; and
- Define highways which would be suitable for use as dividing lines between 95 mph areas and 100 mph areas in the first tier counties only.

The end products produced are Coastal Contour Maps defining the basic wind speeds for coastal counties in Texas for both 50-yr. and 100-yr. return periods. A proposed description of the 95mph contour line for both maps is given in terms of:

- Gulf Intracoastal Waterway,
- Highways,
- Farm/Ranch Roads, and
- County Lines

as appropriate.

REVIEW OF EXISTING WIND SPEED MAPS, CURRENT LITERATURE

The literature reviewed in connection with completing this task is given in **Appendix A: Literature Cited.** A brief discussion of those articles which directly impact on this report follows.

ASCE 7-93 (revision of ANSI/ASCE 7-88)

The basic wind speed map given in Fig. 1 of the National Wind Load Standard ASCE 7-93 (ASCE 1993) was developed by the Wind Loads Subcommittee of ANSI A58.1 and first published in 1982 (Fig. 1 of this report). The values correspond to the annual, extreme, fastest-mile speeds having an annual probability of exceedence of 0.02 (50-yr mean return interval) for 10 m (33 ft) above ground level in flat, open country terrain (Exposure C category). The common terminology used in U.S. codes and standards for defining wind speeds, exposure categories, etc., are given in Appendix B (Marshall 1990). The wind speed shown for a given location on the 50-yr map has a 2% probability of being exceeded in any given year and a 64% probability of being exceeded once in 50 years (see Table 1).

The wind speeds for the interior of the contiguous United States shown on the map were established from data collected at 129 weather stations. The data were statistically reduced using extreme value analysis procedures based on the Fisher-Tippett Type 1 (Gumbel) distribution (Simiu et al., 1979). Locations of the stations from which data were obtained are shown in Fig. 2. For Texas, the data base utilized data collected at Abilene, Amarillo, Austin, Brownsville, Corpus Christi, Dallas, El Paso, Port Arthur and San Antonio. Even though the National Climatic Data Center in Asheville, North Carolina archives wind speed data from approximately 2000 stations around the country (Changery, 1979), data from only 129 stations were utilized in the analysis to guarantee reasonable homogeneity of the data. Simiu et al. (1979) used only the data from stations for which a minimum of ten years of continuous records were available, the terrain surrounding the recording station was representative of Exposure C category (airports), the wind speeds recorded were fastest mile, the anemometers were located in open, unobstructed areas, and the history of anemometer height was known (Church, 1979). These restrictions on the recorded data eliminated data from a large number of stations but assured consistency of the data that were analyzed. In developing the wind speed map, it was necessary to temporize the values of individual stations and to smooth the wind contours. A decision was also made by the Subcommittee for Wind Loads to use a minimum basic wind speed of 70 mph; hence, the areas for which the minimum basic wind speed value of 70 mph is to be used are shown shaded on the map.

Because of the lack of data for hurricanes, the wind speed contours in the hurricane-prone region of Fig. 1 are based on a Monte Carlo simulation of hurricane storms striking the coastal region by Batts et al. (1980). The coastline was divided into discrete points spaced at 50 nautical miles. Thus, the total coastline of 2900 nautical miles had 58 points. The results of the analysis provided wind speeds at each point for various probabilities of being exceeded. The wind speed values correspond to smooth terrain (Exposure C category) at a 10 m (33 ft) height above ground . Subsequently, the prediction of hurricane wind speeds was addressed by Georgiou (1983), Vickery and Twisdale (1993, 1994) and Peterka and Shahid (1992, 1993, 1994).

The simulation estimates by Georgiou (1983) showed substantial agreement with the wind speeds generated by Batts, et al (1980) except along the Florida panhandle extending from Tampa to Jacksonville and for large return periods (500-2000 yrs). The research reported by Vickery and Twisdale (1992) appeared to indicate that ASCE 7-93 map underestimates the speeds for the Texas coastline. This research was a very limited study, however, and considered only two locations in the Gulf area (Galveston, TX and Mobile, AL).

ASCE 7-95 (proposed revision of ASCE 7-93)

The proposed revision of the National Standard (ASCE 7-95) presents a wind speed map (Fig. 3) for the contiguous United States, Alaska and other selected locations. The wind speeds correspond to **3-second gust speeds** at 33 ft (10m) above ground for exposure category C and are associated with an annual probability of 0.02 that they will be equaled or exceeded (50-yr mean recurrence interval). The proposed map of Fig. 3 was recently revised (10 February 1995); the 90 and 100 mph regions shown in the previous draft for Oregon and Washington, respectively, were removed and the coastlines of Oregon and Washington and Puget Sound denoted as **Special Wind Regions.**

The wind speed map was prepared from peak gust data collected at 485 weather stations where at least 5 years of data were available (Peterka and Shahid 1993, Peterka 1992), and as in ASCE 7-93 for the Gulf and Atlantic coasts, the contours are based on predictions of hurricane speeds on the U.S. Gulf and Atlantic coasts. For non-hurricane regions, measured gust data were assembled from a number of stations in state-sized areas to decrease sampling error, and the assembled data were fit using a Fisher-Tippet Type I extreme value distribution. This procedure gives the same speed as area-averaging the 50-yr speeds from the set of stations. There was insufficient variation in 50-yr speeds over the eastern 3/4 of the lower 48 states to justify contours. The division between the 90 and 85 mph (40.2 and 38.0 m/s) regions, which follows state lines, was sufficiently close to the 85 mph (38.0 m/s) contour that there was no statistical basis for placing the division off political boundaries.

The wind speed contours in the hurricane-prone region are based on analyses of hurricane winds (Batts et at. 1980, Georgiou 1983, Vickery and Twisdale 1994). The analyses involved Monte Carlo simulations of hurricanes striking the coastal region. The coastline was divided into discrete points spaced at 50 nautical miles (Batts et al. 1980, Georgiou 1983), or at specific locations of interest (Vickery and Twisdale 1994). The results of the analyses provided wind speeds at each point for various probabilities of being exceeded. Speeds in the three studies were converted from specified time durations to peak gusts using appropriate gust factors (Durst 1960, Krayer and Marshall 1992). Hurricane speed contours over the Atlantic were placed there only for interpolation and represent values for exposure C over land. The wind speed map and associated Table 2 providing conversion factors for other return periods have been approved by the full Wind Load Subcommittee of ASCE 7-95.

In comparing the wind speeds given in the proposed revision it is important to note the ASCE 7-93 specifies **fastest-mile wind speeds** whereas ASCE 7-95 (proposed) provides the basic design wind speeds in terms of **3-second gust speeds.** Thus, to compare the wind speeds of Fig. 3 with those of Fig. 1 (ASCE 7-93), one must divide the wind speeds of Fig. 3 by a factor of 1.22. A comparison of the 50-yr. wind speeds for three of the coastal cities provides:

Site	ASCE 7-93	ASCE 7-95 (proposed)
Galveston	98 mph	$\frac{123}{1.22}$ =101 mph
Corpus Christi	90 mph	$\frac{120}{1.22}$ = 98 mph
Brownsville	90 mph	$\frac{130}{1.22}$ = 107 mph

Thus, it is seen that the proposed new wind speeds along the Texas coastline are only slightly higher than those specified in the current National Standard ASCE 7-93.

Probability of Exceeding Design Wind Speed During Reference Period

It is essential that design professionals understand the mean recurrence interval in terms of probability of occurrence of design wind speeds during the service life of a structure. The probability, P, that the design wind speed will be exceeded at least once during this period is given by the expression:

$$P = 1 - (1-P_a)^n$$

where,

P_a = annual probability of being exceeded (reciprocal of the mean recurrence interval)

n = exposure period in years

The probability that wind speed of a given magnitude will be exceeded increases or decreases with the period of time that the structure is exposed to the wind environment and the mean recurrence interval used in the design. Values of probability of exceeding the design wind speed for a given mean recurrence interval and a given exposure period are shown in Table 1. As an example, if a design wind speed is based upon $P_a = 0.02$ (50-yr mean recurrence interval), there exists a probability of 0.64 that the design wind speed will be exceeded at least once during a 50-yr exposure period. If the design wind speed is based on $P_a = 0.01$ (100-yr mean recurrence interval), the probability of exceeding the design wind speed at least once during a 50-yr period reduces to 0.40.

In order to conduct the benefit-cost analysis of Task 5 it was necessary to create a table providing the probability that a hurricane of a given magnitude would strike locations along the Texas coastline. To create the appropriate hurricane risk models for selected coastal cities, the conversion factors for other mean recurrence intervals (Table 2) were first taken from ASCE 7-95 (proposed) based on the research of Peterka and Shahid (1992, 1994) and approved for publication in the Commentary of the National Standard by the ASCE 7-95 Wind Loads Subcommittee (ASCE 1994). Using these factors, Table 3 was created providing the annual, extreme fastest-mile wind speeds for Brownsville, Corpus Christi and Galveston based on 50-yr wind speeds of 95, 95 and 100 mph selected from Figs. 1, 3. As an example, the basic wind speed for Corpus Christi from Figs. 1, 3 is seen have an average value of 95 mph for a 50-yr return period. To obtain the annual extreme wind speed for a 500-yr mean recurrence interval (0.002 probability of exceedence), the 95 mph is multiplied by the factor 1.33 of Table 2 to yield (95)(1.33) = 126 mph.

COASTAL WIND SPEED CONTOUR MAP

The **Basic Wind Speed Map of ASCE 7-93** was selected for providing the wind speed contours along the coastal regions of Texas. This map was used because:

- the provisions of ASCE 7-93 formed the basis for developing the new prescriptive provisions, and as
- ASCE 7-95 (proposed) has not, as yet, been validated in the consensus process (the deadline for submission of ballot No. 6 is 27 March 1995).

From a code enforcement perspective, the official wind speeds for a 50-yr return period are currently given by the 8 1/2 in x 11 in map of Fig. 1. Thus, the first step involved enlarging the ASCE 7-93 map (utilizing proper mapping procedures) such that the contours could be digitized with respect to longitudinal and latitudinal coordinates. Once this was accomplished, a final large scale map of the coastal counties was constructed from the GIS data base. Two maps are presented in Figs. 4 and 5 which provide the 50-yr and 100-yr basic wind speeds for just the tier counties along the coast. The 50-yr contours for the entire state of Texas are shown in Fig. 6.

The 50-yr map of Fig. 4 provides the following information:

- wind speed contours (fastest-mile) of 90, 95 and 100 mph,
- county boundaries for the coastal tier counties and the first adjacent counties,
- highway locations,
- city boundaries for Brownsville, Corpus Christi, Freeport, Galveston, Texas City, Houston, and Port Arthur (shown cross hatched), and
- demarcation lines (shown in red) suitable for use as dividing lines between the 95 and 100 mph areas in the first tier counties regions (see Appendix C).

Figure 5 provides information identical to Fig. 4 for a return period of 100-yrs. The basic wind speed contours of Fig. 5 are based on Table 5 of ASCE 7-93 that provides the necessary factors for converting the 50-yr wind speeds to 100-yr wind speeds:

Return Period	100 mi from coast	50 mi from coast	At coastline
50-yr	1.00	1.025	1.05
100-yr	1.07	1.090	1.11

Thus, the 50-yr fastest-mile contours of 100, 95, 90, 80 and 70 mph of Fig. 4 (based on Fig. 1) convert to:

50-yr	x	factor	=	100-yr
100	x	$\left(\frac{1.11}{1.05}\right)$	=	106 mph
95	x	$\left(\frac{1.11}{1.05}\right)$	=	100 mph
90	x	$\left(\frac{1.11}{1.05}\right)$	=	95 mph

50-yr	x	factor	=	100-yr
80	x	$\left(\frac{1.090}{1.025}\right)$	=	85 mph
70	x	$\left(\frac{1.07}{1.00}\right)$	=	75 mph

The 50-yr map of Fig. 6 (entire State of Texas) provides

- wind speed contours (fastest-mile) for 70, 80, 90 and 100 mph,
- county boundaries, and
- highway locations.

Figures 4, 5 and 6 have also been enlarged to a much larger scale (map size 30 in x 42 in) and are included as separate attachments to this report.

Table 1
Probability of Exceeding Design Wind Speed During Period of Exposure

Annual Probability P_a	Mean Recurrence Interval Years	Exposure Period (Life of Structure) n (years)					
		1	5	10	25	50	100
0.04	25	0.04	0.18	0.34	0.64	0.87	0.98
0.02	50	0.02	0.10	0.18	0.40	0.64	0.87
0.01	100	0.01	0.05	0.10	0.22	0.40	0.64
0.005	200	0.005	0.02	0.05	0.10	0.22	0.39

Table 2
Conversion Factors For Other Mean Recurrence Intervals
Based On 3 Sec. Gust
(ASCE 7-95 Proposed)

MRI (yrs.)	Continental U.S.		Alaska
	V = 85 - 100mph	V> 100mph (hurricane)	
500	1.23	1.33	1.18
200	1.14	1.21	1.12
100	1.07	1.105	1.06
50	1.00	1.00	1.00
25	0.93	0.89 (84 mph minimum)	0.94
10	0.84	0.73 (76 mph minimum)	0.87
5	0.78	0.52 (70 mph minimum)	0.81
1	0.61	0.48 (55 mph minimum)	0.67

Table 3
Hurricane Risk Model For Selected Coastal Cities in Texas

Annual Probability of Exceedence	MRI (yrs)	Annual Extreme Fastest-mile Wind Speeds (mph)	
		Brownsville & Corpus Christi	Galveston/Texas City
0.002	500	126	133
0.005	200	115	121
0.010	100	105	111
0.020	50	95	100
0.040	25	85	89
0.100	10	69	73
0.200	5	49	52
1.000	1	46	48

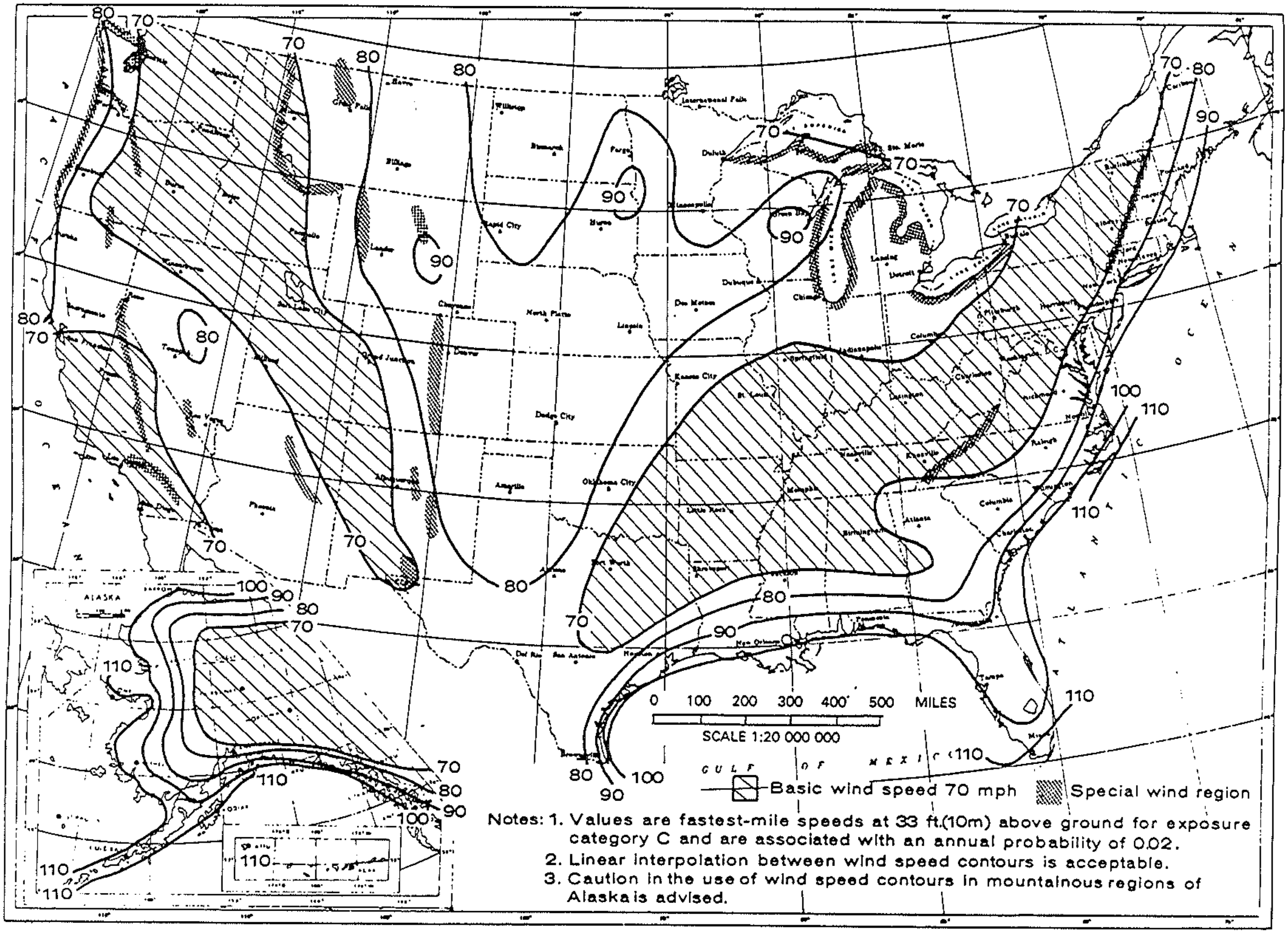


Fig. 1 Basic Design Wind Speed (mph) (From ASCE 7-93)

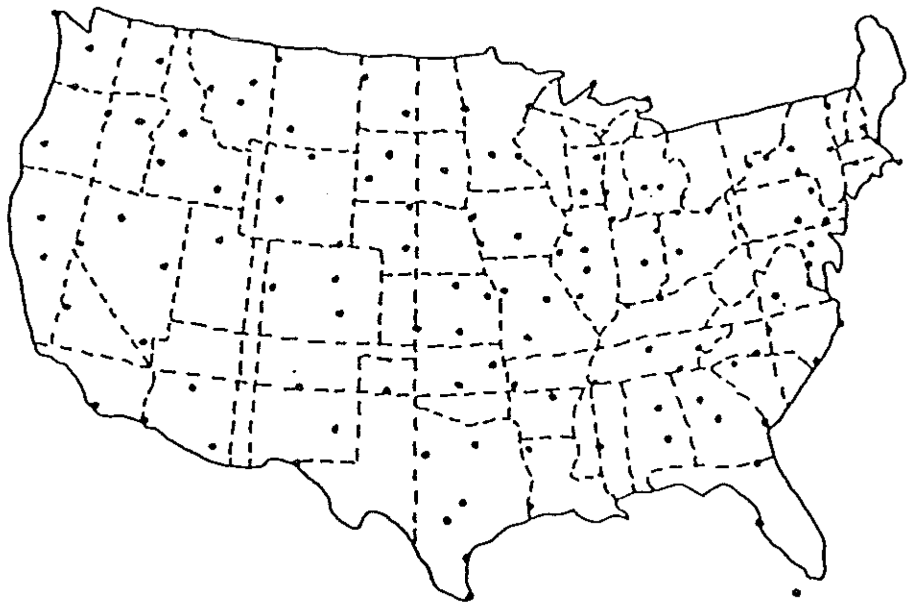
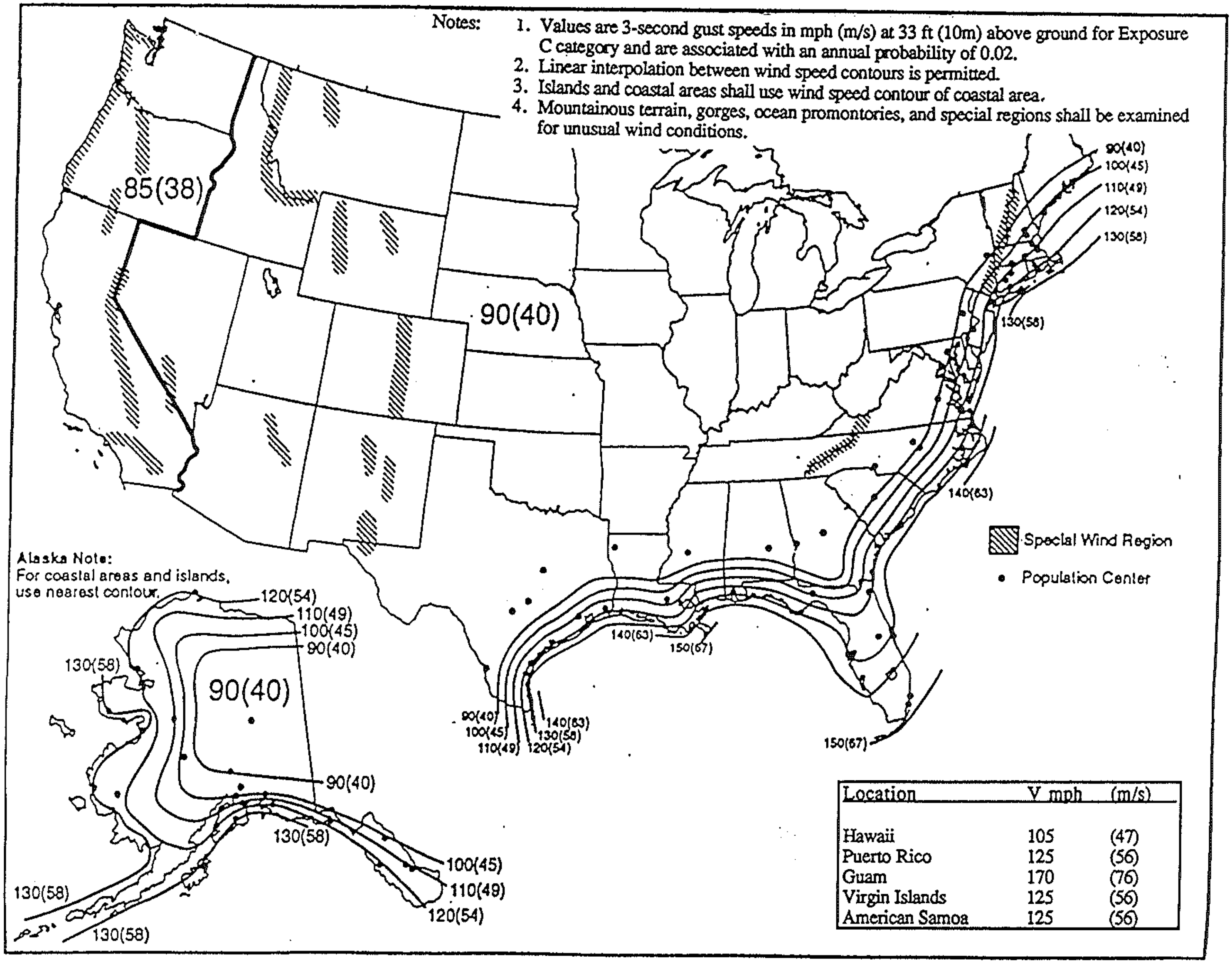


Fig. 2 Locations of 129 U.S. Weather Stations (after Mehta, Marshall and Perry, 1991)



Notes:
1. Values are 3-second gust speeds in mph (m/s) at 33 ft (10m) above ground for Exposure C category and are associated with an annual probability of 0.02.
2. Linear interpolation between wind speed contours is permitted.
3. Islands and coastal areas shall use wind speed contour of coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special regions shall be examined for unusual wind conditions.

Location	V mph	(m/s)
Hawaii	105	(47)
Puerto Rico	125	(56)
Guam	170	(76)
Virgin Islands	125	(56)
American Samoa	125	(56)

Fig. 3 Basic Wind Speed in mph (m/s)
(from ASCE 7-95 proposed)

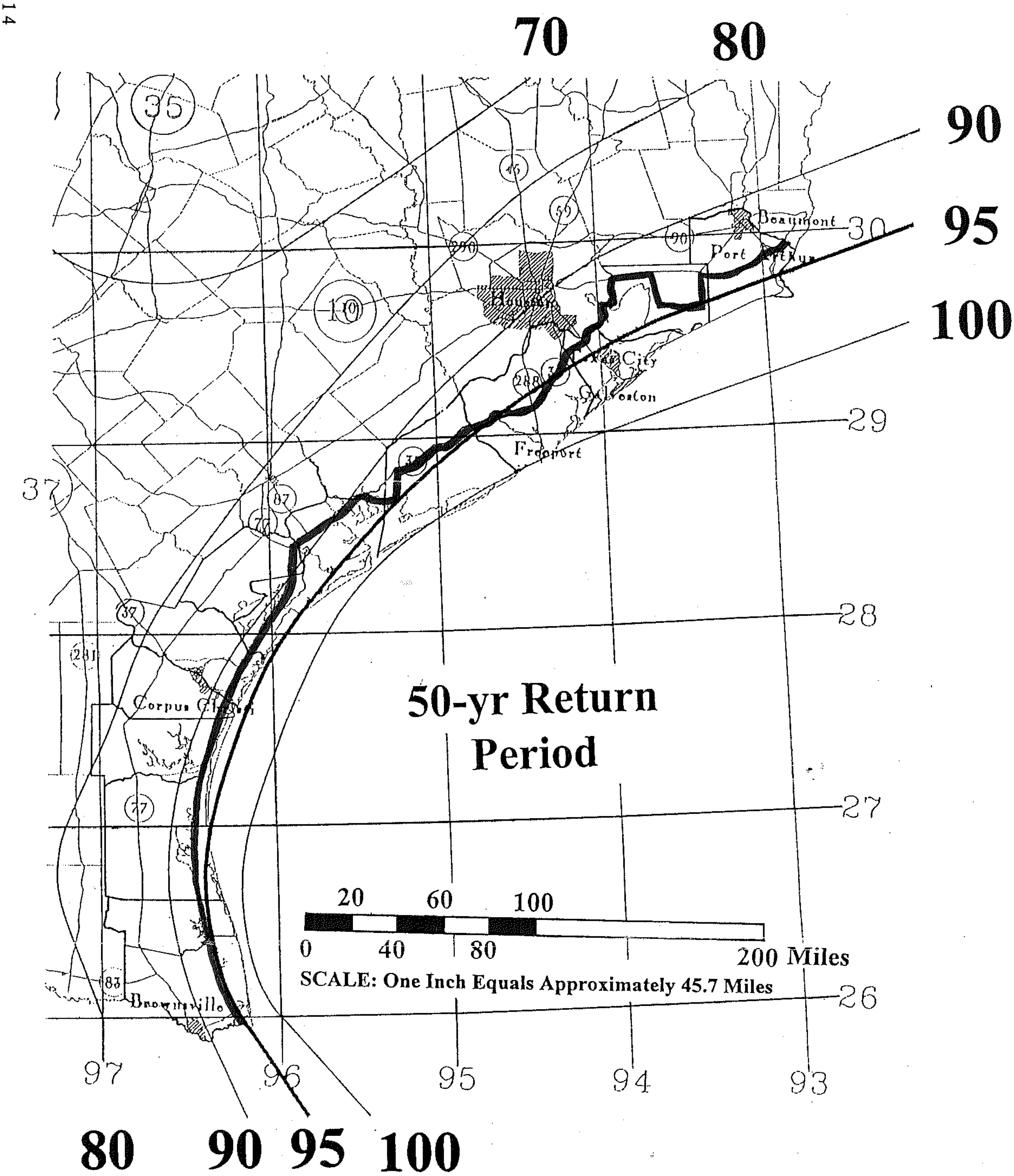


Fig. 4. Texas Coastal 50-yr Fastest-mile Wind Speed Map (mph)
(from ASCE 7-93)

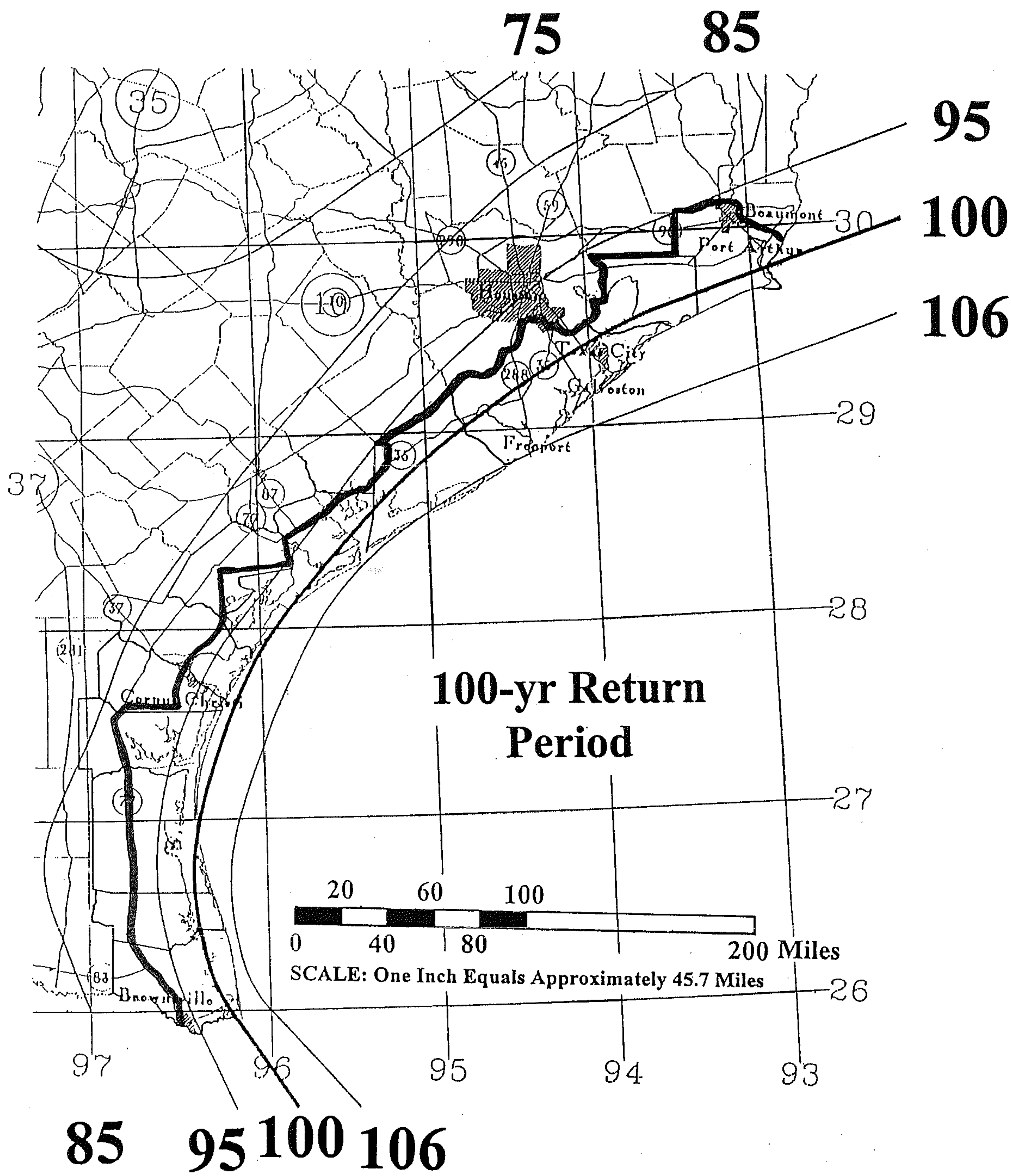


Fig. 5. Texas Coastal 100-yr Fastest-mile Wind Speed Map (mph) (from ASCE 7-93)

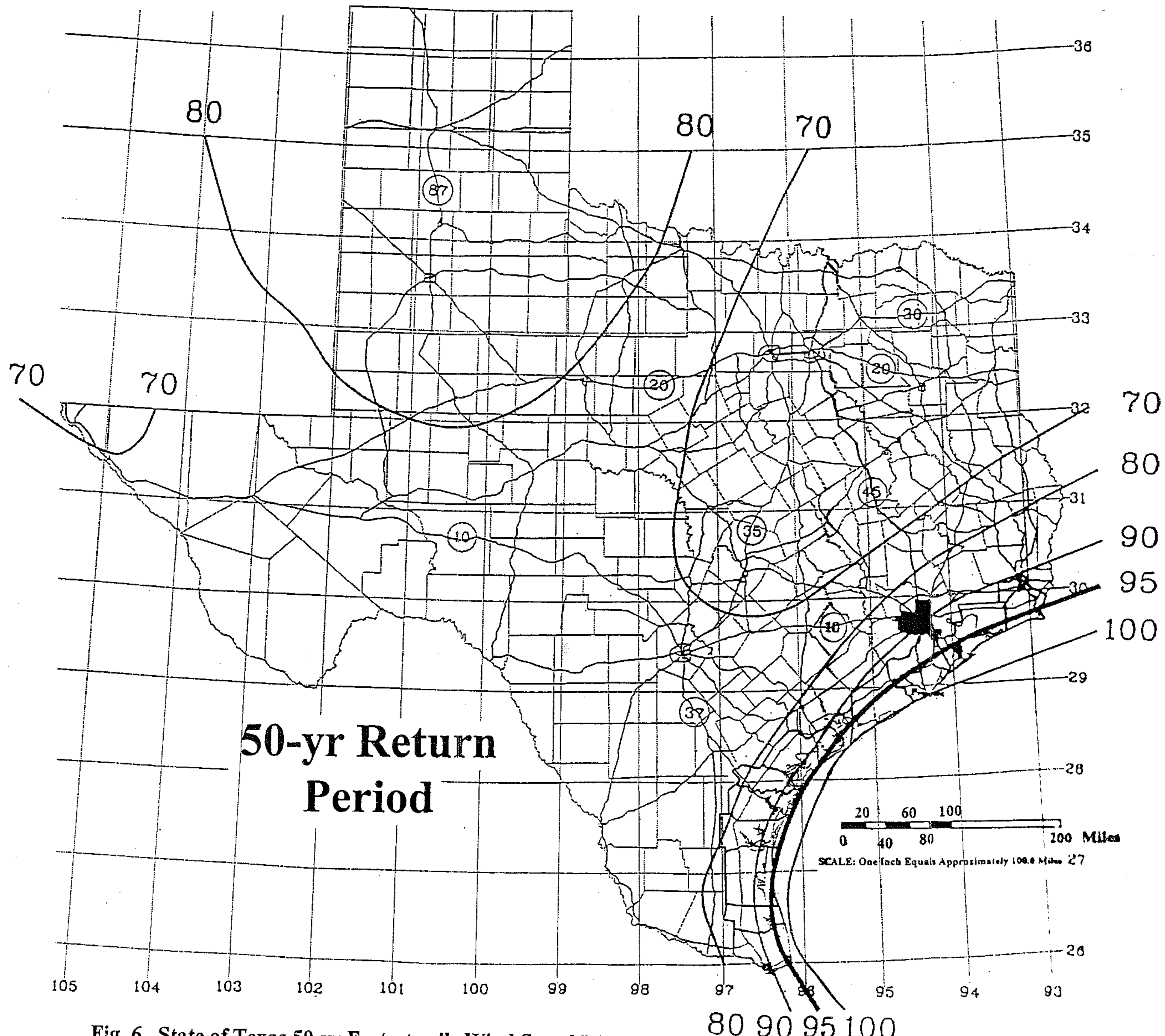


Fig. 6. State of Texas 50-yr Fastest-mile Wind Speed Map (mph)
(from ASCE 7-93)

APPENDIX A - LITERATURE CITED

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APPENDIX B: "A REPORTER'S HURRICANE SURVIVAL KIT OR EVEN IF YOU CAN'T SEE THE WIND YOU CAN REPORT IT ACCURATELY," (PREPARED BY R.D. MARSHALL FOR WERC)

A Reporter's Hurricane Survival Kit

or

Even if you can't see the wind you can report it accurately

Prepared by the Wind Engineering Research Council, August 1990

BACKGROUND:

In response to numerous inaccuracies that have characterized the reporting of past hurricanes, particularly Hurricane Hugo in 1989, the Wind Engineering Research Council (WERC) has prepared this guide for use by the news media. The guide defines certain terms regularly used by meteorologists and engineers to describe extreme events such as a hurricane. The guide also points out some common misconceptions and certain items that one should be aware of when reporting on wind speeds and damage.

WERC is a non-profit professional organization whose mission is the promotion of wind engineering research and the dissemination of research findings. The discipline of wind engineering encompasses problems related to wind loads on buildings and structures, societal impact of wind storms such as hurricanes and tornadoes, dispersion of urban and industrial pollution, wind energy and related topics.

SOME USEFUL DEFINITIONS:

ANEMOMETER - An instrument used to measure wind speed. Several types of anemometers are in use, the most common being mechanical anemometers that employ either a propeller or a set of rotating cups. Most of these devices will not survive wind speeds in excess of 150 mph. Some specially designed mechanical anemometers are rated at wind speeds up to 200 mph.

BOUNDARY LAYER - A region extending upward from the ground surface to a height of several hundred feet in which the wind speed is slowed by the ground roughness (buildings, trees, hills, etc.). In fact, the wind speed becomes zero right at the ground surface. Beyond the top of the boundary layer the wind speed is fairly uniform. Typically, the wind speed at a height of 30 feet is 60-70 percent of the speed near the top of the boundary layer.

GUST SPEED — The maximum speed averaged over a period of from 1 to 5 seconds. Generally, the gust speed is 20 to 30 percent higher than the corresponding sustained speed.

HURRICANE - A tropical cyclone in the North Atlantic region with wind speeds in excess of 73 mph. Hurricanes are known as typhoons in the Western North Pacific and as cyclones in the Bay of Bengal, the South Pacific (Australia) and the Western Indian Ocean.

MEAN RECURRENCE INTERVAL — The number of years, on average, that would elapse before a hurricane of approximately the same intensity would revisit a given location.

SAFFIR-SIMPSON HURRICANE SCALE — A numerical scale used to rate the intensity of hurricanes from 1 (least intense) to 5 (most intense). The scale considers factors such as wind speed, type and intensity of damage, and height of storm surge.

STANDARD EXPOSURE — The conditions under which official wind speed measurements are made. In particular, standard exposure means an anemometer height of 10 meters (33 feet) in flat, open terrain typical of airport locations.

STORM SURGE — The gradual increase in coastal water depth as a hurricane approaches land. The increase in depth depends on several factors such as wind speed and direction, barometric pressure, coast-line geometry and normal water depth.

SUSTAINED SPEED — The wind speed averaged over a period of one minute. Unless stated otherwise, a reported wind speed is assumed to be a sustained speed.

TORNADO — A very intense funnel-shaped storm (vortex) with a diameter that is typically less than 1,000 feet. The tangential speeds in a tornado are the highest known wind speeds and may exceed 200 mph. Although tornadoes usually are associated with intense thunderstorms, they can be spawned by hurricanes.

SOME USEFUL TIPS:

1. Hurricane forecasts often refer to wind speeds measured by aircraft at heights well above the atmospheric boundary layer. Therefore, the effects of ground roughness are not accounted for and the actual near surface winds may be significantly less.
2. There is a strong tendency for people experiencing hurricane winds to grossly overestimate the speeds. As an example, many people on St. Croix in the U.S. Virgin Islands believe the gust speeds in Hurricane Hugo were 250 mph or higher. Post-storm investigations by experts in meteorology and wind engineering indicate these speeds did not exceed 155 mph. Likewise, wind speeds based on actual measurements in Charleston, South Carolina, are substantially less than the speeds reported by the news media and widely believed by the residents of that city.
3. In general, wind damage in typical built-up areas will commence at gust speeds of about 70 mph. Shingles and siding will come off, trees will begin to lose limbs or be uprooted, and overhead traffic lights and signs may come down.
4. Wind loads increase with the square of the wind speed. Therefore, if damage commences at gust speeds of 70 mph, the wind load will double at a speed of about 100 mph, not 140 mph. For speeds of 250 mph, the corresponding wind load would be almost 13 times greater. At this speed one would not expect to find anything but bare ground after the storm.
5. Because of their large variation from one location to another, it is all but impossible to characterize surface wind speeds in a hurricane on the basis of a single measurement. Only from careful post-storm assessments of anemometer records and wind damage can the true distribution of surface wind speeds be ascertained. For this reason the Saffir-Simpson scale is the preferred preliminary measure of hurricane intensity.
6. If someone tells you they measured speeds in excess of 150 mph, or if they tell you the sustained speeds were higher than the gust speeds, be prepared to ask some questions. Ask to see the measurement site, the anemometer and the stripchart record if such a record is available. Ask about their qualifications as a weather observer and who calibrated the anemometer. Unless the site exhibits the characteristics of a standard exposure, the readings are automatically suspect.
7. There is a widespread misconception of mean recurrence interval, sometimes called the "return period." A 300-yr storm means that a storm of this intensity would be expected

to happen about once every 300 years. It could happen more frequently or less frequently. It could happen more than once in the same year. Many people believe such a storm cannot happen within the next 300 years. Not true!

8. Contrary to popular belief, storm surge does not take the form of a large wave suddenly engulfing a coastal area. The rise in water level may extend over several hours. However, wind-generated waves are superimposed on the storm surge and normal astronomical tides may increase the net water depth.
9. Remember, if the wind speeds sound too high for a hurricane, they probably are.

WIND SPEED CONVERSION TABLE

miles per hour (mph)	knots (kt)	meters per second (m/s)
60	52	27
80	70	36
100	87	45
120	104	54
140	122	63
160	139	72
180	156	80
200	174	89

8th International Conference on Wind Engineering

July 8-12, 1991, London, Ontario, Canada

The International Association of Wind Engineering is sponsoring the 8th International Conference on Wind Engineering. The Wind Engineering Research Council, Inc. is Co-sponsor of this Conference.

Hosted by the Boundary Layer Wind Tunnel Laboratory of the University of Western Ontario, the Conference will focus on: wind forces on structures such as bridges, towers, building and transmission lines; the structure of wind in the boundary layer; the climate of extreme winds; the action of wind and waves on offshore structures; reliability and risk; windstorm disaster reduction; codes and standards for wind loading; the suppression of wind-induced vibration; case studies; model/full-scale comparisons; wind tunnel techniques; applications of computational fluid dynamics; air infiltration/energy conservation; atmospheric pollutants; pedestrian level winds and effects on people; behaviour of glass under wind loading; acceleration of buildings and occupant comfort; snow loading and drifting.

Authors are invited to submit 2-page summary papers by October 1, 1990, and will be notified of acceptance prior to February 1, 1991. Full papers must be submitted by May 31, 1991.

For further information about the program and submission of papers, contact:

Dr. A.G. Davenport, Director
The Boundary Layer Wind Tunnel Laboratory
The University of Western Ontario
London, Ontario N6A 5B9, Canada
Telephone: (519) 661-3338
Fax: (519) 661-3339

"Nothing Beats Long-Term Mutual Respect and Coordination...."

Marilyn Quayle, wife of the Vice President, summed up good natural disaster preparedness by saying, "Hurricane Hugo proved that nothing beats long-term, mutual respect and coordination in responding to natural disasters." Speaking at the National Hurricane Conference, held at the Hyatt Regency Hotel in Houston, Texas, on 18 April, Mrs. Quayle cited time and again instances where cooperation among all levels of public and private sector had served to minimize, if not avert, the human suffering, damage, and destruction of natural disaster.

In attaining the level of coordination necessary, Mrs. Quayle urged ongoing and cooperative efforts among local, state, and federal governments and businesses and individuals and upgrading of technology for predicting, identifying, and reporting natural disasters. She was quick to point out that even a child renders an invaluable service when he or she takes home information acquired at school and passes it on to the rest of the family. Businesses, she pointed out, should coordinate the acquisition and storage of contingency response materials and the availability of engineers to assess damage in order that citizens would not re-enter dangerous structures. On the governmental level, she asked for a continuation and enhancement of identification, communication, and reaction programs, pointing out that successful implementation would require complete coordination among the various agencies involved.

The greatest element of risk in a matter of natural disaster, Mrs. Quayle said, is the element of surprise. While no one can predict when and where an earthquake or tornado will strike, contingency response methods can be worked out. She urged all involved not to complacently resign themselves to the finality of such unpredictable disasters, but to think toward response and restoration. None of these efforts, she went on, can be possible without the efforts of researchers, engineers, and other professionals who devote their lives to searching for new methods for predicting, identifying, and reporting data to service officials who have direct contact with the public.

Solicitation for Host for 7th US National Wind Conference 1993

WERC is actively seeking interest from university researchers and educators in wind engineering to host and administer the 7th US National Wind Conference to be held in 1993.

Traditionally, this national conference is held once every four years at a university involved in wind engineering research. The host institute administers the conference, with costs being paid mainly through registration fees. In the past, the National Science Foundation also has contributed to the conference by providing funds for a selected group of speakers and attenders. Normal enrollment is approximately two hundred people, for the three-to-four-day conference. The format of the conference will be left to the discretion of the conference chairman, who will receive advice and input from the WERC Board.

Individuals interested in hosting the conference should forward a request for particulars to:

Dr. Dale C. Perry, President
Wind Engineering Research Council
Post Office Box 10029
College Station, Texas 77842

APPENDIX C

PROPOSED BOUNDARY LINE DIVIDING SEAWARD AND INWARD REGIONS

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The 95 mph basic wind speed contour has been proposed as the dividing line between the Inland and Seaward regions by the Committee on Building Codes and in subsequent discussions with representatives of the Windstorm Section of TDI. A proposed description for this dividing line is given below for both the 50-yr and 100-yr maps.

50-yr Proposed Dividing Line

CAMERON, WILLACY, KENEDY, KLEBERG, NUECES, and SAN PATRICIO COUNTIES

Beginning at the intersection of the Rio Grande River and the Gulf of Mexico, follow the coastline northerly to the intersection of the bridge connecting South Padre Island to the mainland with the Gulf Intracoastal Waterway. Continue northerly along the Gulf Intracoastal Waterway to the intersection of State Highway 35 and the southerly Aransas County Line. All property sited on barrier islands shall be considered in the Seaward Region.

ARANSAS, REFUGIO, CALHOUN and MATAGORA COUNTIES

At the intersection of State Highway 35 and the southerly Aransas County Line, continue northeasterly on State Highway 35 through Refugio, Calhoun and Matagora Counties to the Brazoria County Line. Whenever Highway 35 runs through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

BRAZORIA COUNTY

At the intersection of State Highway 35 and the Matagora County Line, continue northeasterly on State Highway 35 to FM 517, thence northerly on FM 517 to the Galveston Country Line. Whenever Highway 35 or FM 517 run through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

GALVESTON COUNTY

All of Galveston County shall be included in the Seaward Region.

HARRIS COUNTRY

At the intersection of U.S. Interstate Highway I-45 and the Galveston County Line, continue northwesterly on I-45 to NASA Road 1, thence north on NASA Road 1 to the Chambers County Line. Whenever Interstate Highway I-45 or NASA Road 1 run through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

CHAMBERS COUNTY

All of Chambers County shall be included in the Seaward Region.

JEFFERSON COUNTY

At the intersection of State Highway 73 and the Chambers County line, continue easterly on State Highway 73 to the intersection with State Highway 87, thence northerly on Highway 87 to the intersection with Highway I-10. Continue east on I-10 to the Louisiana Border. All property sited in the corporate limits of the City of Port Arthur shall be included in the Seaward Region. Wherever portions of Highways 73, 87 and I-10 define the boundary line and run through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

100-yr. Proposed Dividing Line

CAMERON, WILLACY, KENEDY, and KLEBERG COUNTIES

Beginning at the intersection of the Rio Grande River and the toll bridge connecting the cities of Brownsville, Texas and Matamoros, Mexico, follow State Highway 48 northeasterly to the intersection with U.S. Highway 77. All property sited in the corporate limits of the City of Brownsville shall be included in the Seaward Region. Continue north on U.S. Highway 77 through Cameron, Willacy, Kenedy and Kleberg Counties to the Nueces County Line. Whenever U.S. Highway 77 runs through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

NUECES COUNTY

At the intersection of U.S. Highway 77 and the Kleberg County Line, continue north to FM 70, thence west on FM 70 to the intersection of State Highway 286. Continue north on State Highway 286 to U.S. Highway 181, thence north to San Patricia County Line. Whenever State Highway 286 runs through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

SAN PATRICIO

At the intersection of State Highway 181 and the Nueces County Line, continue north to FM 136 which becomes FM 2678 at the Refugio County Line.

REFUGIO

At the intersection of FM 2678 and the San Patricio County Line, continue north to FM 774, thence east and northeasterly on FM 774 to Texas State Highway 35. Continue northeasterly on State Highway 35 to the Calhoun County Line. Whenever FM 2678, FM 774 or Texas Highway 35 run through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

ARANSAS COUNTY

All properties sited in Aransas County shall be considered as in the Seaward Region.

CALHOUN COUNTY

At the intersection of State Highway 35 and the Refugio County Line continue northeasterly to the Matagora County Line. Whenever State Highway 35 runs through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

MATAGORA COUNTY

At the intersection of State Highway 35 and the Calhoun County Line continue northeasterly to FM 1862, thence north on FM 1862 to State Highway 111. Continue east on State Highway 111 to the intersection of State Highway 71, thence north to Wharton County Line and northeasterly along the Matagora/Wharton County Line to intersection with the Brazoria County Line. Whenever State Highway 35, FM 1862, State Highway 111, and State Highway 71 run through incorporated towns or cities, all property within the corporate limits of said towns or cities shall be considered in the Seaward Region.

BRAZORIA, GALVESTON, HARRIS, CHAMBERS and JEFFERSON COUNTIES

Continue along northernmost county lines to State of Louisiana. All of Brazoria, Galveston, Chambers, and Jefferson Counties shall be included in the Seaward Region.