WIND TUNNEL STUDY
OF SEARS TOWER, CHICAGO

by

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June 1977

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CER76-77JAP-JEC65

ACKNOWLEDGMENTS

Support for this investigation was provided by Sears, Roebuck and Company. Valuable input to the project was provided by R. J. Hansen of Hansen, Holley and Biggs Inc., and by F. Durgin of MIT. Construction of the building model was accomplished by personnel of the Engineering Research Center Machine Shop. Mr. James A. Garrison made the motion pictures of flow visualization. Data acquisition and reduction involved a number of individuals including T. Zambrano, J. Templin, R. Ewald, J. Durgin, and M. Petago.

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LIST OF SYMBOLS

Symbol	Definition
A	Constant
B	Constant
$C_{p_{max}}$	Peak maximum pressure coefficient $\frac{(p-p_\infty)_{max}}{\frac{1}{2}\rho U_\infty^2}$
$C_{p_{min}}$	Peak minimum pressure coefficient $\frac{(p-p_\infty)_{min}}{\frac{1}{2}\rho U_\infty^2}$
$C_{p_{mean}}$	Mean pressure coefficient $\frac{(p-p_\infty)_{mean}}{\frac{1}{2}\rho U_\infty^2}$
$C_{p_{rms}}$	Root-mean-square pressure coefficient $\frac{(p-p_\infty) - (p-p_\infty)_{mean\ rms}}{\frac{1}{2}\rho U_\infty^2}$
D	Characteristic dimension (building height, width, etc.)
E	Mean voltage
E_{rms}	Root-mean-square of fluctuating voltage
$F(n)$	Power spectral density of velocity or pressure
n	Constant or frequency
p	Fluctuating pressure at a pressure tap on the structure
P_∞	Static pressure in the wind tunnel above the model
T_u	Turbulence intensity $\frac{U_{rms}}{U}$
U	Local mean velocity
U_∞	Reference mean velocity outside the boundary layer
$\frac{UD}{\nu}$	Reynolds number
U_{rms}	Root-mean-square of fluctuating velocity

Symbol	Definition
X,Y	Horizontal coordinates
Z	Height above surface

Subscripts

$( )_{min}$	Minimum value during data record
$( )_{max}$	Maximum value during data record

Greek Symbols

δ	Height of boundary layer
ν	Kinematic viscosity of approach flow
ρ	Density of approach flow

1. INTRODUCTION

1.1 General

The vulnerability to wind action of structures clad predominantly with glass has been highlighted in recent years by highly-publicized glass failures in several structures. Prototype measurements of wind pressures and other field investigations provide valuable information on the causes and solutions to these problems. The high cost of field measurements, however, do not permit the extensive coverage of wind loads on the structure that a complete analysis of the problem requires. Laboratory measurements provide an economical means of providing the extensive surface and wind-direction coverage of local wind forces needed for a complete analysis of the existence or extent of the problem. Techniques have been developed during the past 15 years for wind tunnel modeling of structures which allow the prediction of wind pressures on cladding. In this study, a boundary-layer wind tunnel was used to measure wind pressures at numerous locations on a model of the Sears Tower in order to determine whether or not excessive wind loads were acting at any location on the structure and to provide a data base against which field data now in the acquisition process on the structure can be compared. In addition, flow visualization experiments were performed to guide the interpretation of the quantitative pressures measured.

Modeling the aerodynamic loading on a structure requires special consideration of flow conditions in order to guarantee similitude between model and prototype. A detailed discussion of the similarity requirements and their wind tunnel implementation can be found in References [1], [2], and [3]. In general, the requirements are that the model and prototype be scaled in geometry, that the approach mean

velocity at the building site have a vertical profile shape similar to the full-scale flow, that the turbulence characteristics of the flows be similar, and that the Reynolds number for the model and prototype be equal.

These criteria are satisfied by constructing a scale model of the structure and its surroundings and performing the wind tests in a wind tunnel specifically designed to model atmospheric boundary-layer flows. Reynolds number similarity requires that the quantity UD/ν be similar for model and prototype. Since ν, the kinematic viscosity of air, is identical for both, Reynolds numbers cannot be made precisely equal with reasonable wind velocities. Wind velocity in the wind tunnel would have to be the model scale factor times the prototype wind. However, for sufficiently high Reynolds number ($> 2 \times 10^4$) a pressure coefficient at any location on the structure will be essentially constant with Reynolds number. Typical values encountered are 10^7 to 10^8 for the full-scale and 10^5 to 10^6 for the wind tunnel model. Thus acceptable flow similarity is achieved without precise Reynolds number equality.

1.2 The Structure and Surroundings

The Sears Tower is approximately 1450 ft tall and 230 ft square at the base. The structure has setbacks at three levels which provide opportunity for unusual flows to develop. The structure is located at the southwest edge of the downtown Chicago highrise area between Adams and Jackson Streets and between Wacker and Franklin Streets. The primary corridor of tall buildings lies to the northeast, Figure 1, with nearby structures of significant height located from the north to east directions. Nearby structures from east through south and west to north are moderately low with the distant approach areas populated primarily with low structures.

The objectives of the model study were to determine flow patterns about the structure with flow visualization and to measure quantitatively the mean and fluctuating pressure acting locally on the structure cladding for a range of wind directions.

2. EXPERIMENTAL CONFIGURATION

2.1 Wind Tunnel

The wind-tunnel study was performed in the Environmental Wind Tunnel located in the Fluid Dynamics and Diffusion Laboratory at Colorado State University. The wind tunnel is an open-circuit facility driven by a 50 h.p. variable-speed propeller. The test section is nominally 12 ft wide, 8 ft high and 57 ft long, fed through a 3.35:1 contraction ratio. The roof is adjustable to maintain a zero pressure gradient along the test section. The mean velocity can be adjusted continuously from 1 to 40 fps. A 12-ft diameter turntable centered 45 ft from the test section entrance was used to mount the model.

2.2 Model

In order to obtain an accurate assessment of local pressures using piezometer taps, the model was constructed to the largest scale that would not produce significant blockage in the wind tunnel. A 1:400 scale model of the Sears Tower was constructed from 1/2 in. Lucite plastic. Care was taken to accurately model mullions at the corners and 1/3 points on the structure. Parapet walls and window-washer housings were also modeled. Details on the plaza including plaza slope were represented. Piezometer taps (1/16 in. dia) were drilled normal to the exterior surface to permit pressure measurements at 1182 locations on the building. The location of the taps on the structure is shown in Figures 3a to 3f. Dimensions and elevations are given both in full-scale feet and model inches. Because taps were added after initial data was obtained, the added-tap numbers do not interlace with the original tap numbers.

An area of approximately 2400 ft radius surrounding the building site was modeled in detail. Structures in this region were modeled from styrofoam insuring that the overall building shape was accurately modeled. The model was mounted on a 12 ft diameter turntable centered 45 ft from the test-section entrance. The turntable indicated azimuthal orientation to ±0.1 degree.

The region upstream from the modeled area was covered with a randomized roughness constructed from 1 in. or 3 in. cubes to simulate the upstream area. Three in. cubes were used for wind azimuths from 20 to 70 degrees where the density of upstream buildings is greatest. Spires at the test section entrance provided a thicker boundary layer than would otherwise be available. The distribution of roughness was designed to provide a boundary-layer thickness of approximately 4½ ft, a velocity profile approaching the modeled area with a power-law exponent similar to that for the surrounding area, and a logarithmic velocity profile with a realistic roughness length. A photograph of the complete model is shown in Figure 4. The wind tunnel ceiling was adjusted after placement of the model to obtain a zero pressure gradient along the test section.

3. INSTRUMENTATION AND DATA ACQUISITION

3.1 Flow Visualization

Visualization of the flow in the vicinity of the model is helpful in understanding and interpreting mean and fluctuating pressures, in defining zones of separated flow and reattachment where pressure coefficients may be expected to be high, and in identifying discrete, well-developed vortices which may induce large pressures. Titanium tetrachloride smoke was released from sources on and near the model and motion picture records made. Conclusions obtained from these smoke studies are discussed in section 4.1.

3.2 Pressures

Mean and fluctuating pressures were obtained at each of the 1182 pressure ports on the wind tunnel model. Data was obtained for 72 wind directions (5 degree intervals). An 18 in. length of 1/16 in. I.D. plastic tubing connected 76 pressure ports on the model at a time to an 80 tap pressure switch mounted inside the model. The switch was designed and fabricated in the Fluid Dynamics and Diffusion Laboratory to minimize the attenuation of pressure fluctuations across the switch. Each of the 76 measurement ports was directed in turn by the switch to one of four pressure transducers mounted close to the switch. The switch was operated manually by means of a shaft projecting through the floor of the wind tunnel. A mechanical indexing feature locked the switch into each of the 20 required positions while a potentiometer provided an indication of the switch position on a digital voltmeter. The four pressure taps on the switch not used for transmitting building pressures were connected to a common tube leading outside the wind tunnel. This arrangement provided both a means of performing in-place

calibration of the transducers and, by connecting this tube to the total-head side of a pitot tube placed in the wind tunnel, a means of automatically monitoring the tunnel speed using this valve position. For many data runs, two pressure switches were used so that 152 ports on the model were connected to the switches.

The pressure transducers used were Statham differential strain-gage transducers (Model PM283TC) with a 0.15 psid range. They were selected for the stability and linearity in the working range required. The resonant frequency of the transducers was approximately 2,000 Hz so that transducer resonance effects could be ignored. The frequency response of the transducers with the 18 in tubes is shown in Figure 5. This response was determined in a test (4) in which building pressure spectra for this transducer were compared with spectra for a flush-mounted transducer in a wind-tunnel test. A reference pressure was obtained by connecting the reference side of the transducer with plastic tubing to the static side of a pitot tube mounted in the wind tunnel free stream above the model building. In this way the transducer measured the instantaneous difference between the local surface pressure and the static pressure in the free stream above the model.

Each pressure transducer bridge was monitored by a Honeywell Accudata 118 Gage Control/Amplifier unit which provided excitation to the transducer bridge and amplified the bridge output. These instruments are characterized by a very stable excitation voltage and amplifier gain. Output from the Honeywell signal conditioners was fed to an on-line, eight channel, System Development, Inc., analog-to-digital conversion unit. The data was processed onto digital tape for later data analysis by computer. Resolution of conversion was approximately ±0.0016 in

pressure coefficient. All four transducers were recorded simultaneously for 16 seconds at a 250 sample per second rate. The results of an experiment to determine the length of record required to obtain stable mean and rms pressures and to determine overall accuracy of the pressure data acquisition system is shown in Figure 6. A typical pressure port record was integrated for a number of time periods to obtain the data shown. Examination of a large number of pressure taps showed that the overall accuracy for a 16 second average is, in pressure coefficient form, 0.03 for mean pressures, 0.1 for peak pressures (except for the largest peaks which may experience a somewhat larger variation due to inherent statistical variations), and 0.01 for rms pressures. Pressure coefficients are defined in section 4.3.

In order to more closely examine the nature of fluctuating pressures on the structure, additional, longer records were obtained at selected taps for selected wind directions in order to calculate spectra, probability distributions, and probability distributions of the largest peak in a specified time.

Reduction of the raw data to usable form was performed on the Colorado State University CDC 6400 computer as described in section 4.3.

3.3 Velocity

Velocity and turbulence intensity profiles were measured upstream of the model to confirm that the approach velocity profile was appropriate for the site. In addition, several profiles were made at the building site without the building in place. To permit evaluation of the building influence on the field anemometer at the site, velocity and turbulence profiles were made above the east antenna on top of the structure for 15 degree wind azimuths.

Measurements were made with a single hot-wire anemometer mounted with its axis horizontal. The instrumentation used was a Thermo Systems constant temperature anemometer (Model 1050) with a 0.001 in. diameter platinum film sensing element 0.020 in. long. Mean voltage output was read from a digital voltmeter with a time-constant circuit while rms voltage was obtained from a DISA RMS meter (Model 55D35) and was read from a digital voltmeter.

Calibration of the hot-wire anemometer was performed using a Thermo Systems calibrator (Model 1125). The calibration data were fit to a variable exponent King's Law relationship

$$E^2 = A + BU^n$$

where E is the hot-wire output voltage, U the approach velocity and A, B, and n are coefficients selected to fit the data. The above relationship was used to recover the mean velocity at measurement points from the measured mean voltage. The fluctuating velocity in the form U_{rms} (root-mean-square velocity) was obtained from

$$U_{rms} = \frac{2 E E_{rms}}{B n U^{n-1}}$$

where E_{rms} is the root-mean-square voltage output from the anemometer. All turbulence measurements were divided by the local mean velocity U to obtain turbulence intensity.

4. RESULTS

4.1 Flow Visualization

A 2000 ft film is included as part of the report showing the characteristics of flow about the structure using smoke to make the flow visible. A listing of contents of the film is shown in Table 1. Several features can be noted from the visualization. As with all large structures, wind approaching the Sears Tower building was deflected down to the plaza level, up over the structure and around the sides. The flow about most areas of the structure did not indicate unusual flow conditions which would be expected to result in unusually large pressures. Three categories of flows were identified, however, which could result in large local wind loads. The first category of unusual flows was a vortice observed originating at the outward corner of the upwind setbacks and trailing downwind along the side of the structure. Large negative pressures may be found on the side face below the setback in the region of the vortex formation.

The second category of unusual flows was observed near corners about midway between ground level and the first setback level. For critical wind directions, flow separating from the corner was observed to curl rapidly back to the face of the structure and roll up almost into a vortex with a vertical axis. These regions of high streamline curvature may experience high negative mean and large fluctuating pressures. This phenomena was observed for all corners but seemed to be worse for the northeast corner of the east face and for the southwest corner of the south face. The angle of flow relative to the structure for which the rollup was most severe differed for each corner and appeared to be related to height and location of nearby buildings.

The third area where flow conditions were observed which could cause large negative pressures was related to flow passing up the building face and over the top of the uppermost setbacks. High velocity flows were observed to curve rapidly as they passed over the setback leading to possible high pressures on the building face adjacent to the setback.

4.2 Velocity

Approach velocity profiles are shown in Figures 7a and 7b. These profiles were taken one ft upstream from the model turntable (2800 ft from the building location) and are characteristic of the boundary-layer approaching the model for each of the two approach configurations. The boundary-layer thickness δ was taken as a constant 50 in. corresponding to a prototype value of 1667 ft. This δ was used for both upstream roughness configurations (one inch and three inch cubes) as a matter of convenience. Both profiles maintained their power-law relationship to about 60 inches where roof boundary layer effects began. The mean velocity profiles of Figure 7 obeyed power-law relationships of the form

$$\frac{U}{U_\infty} = \left(\frac{z}{\delta}\right)^n$$

where the velocity profiles had exponents n of 0.28 and 0.36 for the approach flow. These profiles were considered acceptable for the boundary layer flow approaching the 2400 ft radius around the Sears Tower within which buildings were individually modeled.

The profile of longitudinal turbulence intensity approaching the model is shown in Figure 7b. The turbulence intensities are typical of those which might be expected for that area. The spectral characteristics of the wind-tunnel approach flow is shown in Figure 8 and is

compared to curves proposed by Davenport (5) and Harris (6) for best fits to atmosphoric spectra. The comparison is excellent in the frequency region of importance for pressure fluctuations.

The velocity profiles at the building site were quite different from the approach profiles of Figure 7 due to the influence of individual nearby buildings. Five profiles of mean velocity and turbulence intensity obtained at the Sears Tower site with the structure removed are shown in Figure 9. Both mean velocity profiles (9a and 9c) and turbulence intensity profiles (9b and 9d) are characteristic of flows measured in the near wakes of structures. The flow up to elevations somewhat above adjacent building heights is severely disturbed with the profiles above the adjacent buildings tending toward the approach profile shapes at higher elevations. Because of the highly three-dimensional and turbulent nature of these wake flows, the profiles below the adjacent building heights can be considered only as a semi-quantitative measurement of these winds.

In order to calibrate the anemometer site for the prototype measurement program, velocity measurements were obtained for a range of elevations above the east antenna base on the tower and compared to the approach wind profiles. These data, obtained at 15 degree azimuthal intervals, are presented in various forms in Figures 10 - 14. Figure 10 shows the anemometer location above the structure and the vertical coordinate used for model velocity measurements. Figure 11 shows profiles of mean velocity and turbulence intensity above the building with the building removed and with the building in place for an approach wind azimuth of 105 degrees. The profile with building removed is the same as for the upwind approach flow. The structure causes an accelerated

flow, particularly in the 50 to 100 ft region above the top of the structure.

Comparisons of mean velocity and turbulence profiles above the model with those of the approach flow are shown in Figure 12a to 12h for each 15 degree azimuthal orientation. Immediately above the antenna base, the modification to the flow by the building varies rapidly with height. The prototype anemometer lies within this disturbed region, but not within the most severely disturbed portion.

Comparison of model and full-scale pressure data on the structure requires that a correction be made between model and prototype reference wind velocity measurements. Wind-tunnel reference velocity was at a 50 in. height (1667 ft prototype) in the approach flow. Full scale measurements were at 30 ft above the top of the antenna base. Figure 13 shows the ratio of model mean velocity at various positions above the east antenna base to the approach mean velocity at 50 in. This ratio is from 102 to 112 percent. In Figure 14 are turbulence intensities at various elevations plotted as a function of azimuth. A large increase in turbulence is noted for Az = 270 degrees for elevations just above the antenna base. This is due to the wake of the west antenna base.

4.3 Pressures

For each of the pressure ports examined (1182 taps at 72 wind directions = 85,104 total), the data record was analyzed to obtain four separate pressure coefficients. The first was the mean pressure coefficient

$$C_{p_{mean}} = \frac{(p-p_\infty)_{mean}}{\frac{1}{2}\rho U_\infty^2}$$

where the symbols are as defined in the List of Symbols. It represents

the mean of the instantaneous pressure difference between building pressure port and static pressure in the wind tunnel outside the boundary-layer nondimensionalized by the dynamic pressure $\frac{1}{2} \rho U_\infty^2$ outside the boundary-layer. The magnitude of the fluctuating pressure was obtained by the rms pressure coefficient

$$C_{p_{rms}} = \frac{\left((p-p_\infty) - (p-p_\infty)_{mean} \right)_{rms}}{\frac{1}{2} \rho U_\infty^2}$$

in which the numerator is the root-mean-square of the instantaneous pressure difference about the mean.

If the pressure fluctuations followed a Gaussian probability distribution, no additional data would be required to predict the frequency with which any given pressure level would be observed. However, the pressure fluctuations do not follow a Gaussian probability distribution so that additional information is required to show the extreme values of pressure expected. The peak maximum and peak minimum pressure coefficients are used to determine these values:

$$C_{p_{max}} = \frac{(p-p_\infty)_{max}}{\frac{1}{2} \rho U_\infty^2}$$

$$C_{p_{min}} = \frac{(p-p_\infty)_{min}}{\frac{1}{2} \rho U_\infty^2}$$

The values of $p-p_\infty$ which were digitized at 250 samples per second for 16 seconds were examined individually by the computer to obtain the most positive and most negative values during the 16 second period. These were converted to $C_{p_{max}}$ and $C_{p_{min}}$ by nondimensionalizing with the free-stream dynamic pressure.

The four pressure coefficients were calculated using the Colorado State University CDC 6400 computer and tabulated. The list of coefficients is included as Appendix A under separate cover. The tap code number in the Appendix is given in Figure 3. In addition, the Appendix includes the approach wind azimuth in degrees from true north.

In order to determine the largest coefficients acting at any point on the structure, the data for all wind directions was searched to obtain, at each pressure tap, the largest positive and negative mean values, the largest root-mean-square value, and the largest positive and negative peak values. Table 2 provides these pressure coefficients and associated wind directions. The largest peak negative pressure coefficients were about - 4.4 and occurred at several setbacks where vortex action was observed. Other large coefficient values were negative and were observed at the base of the building at the corners and near corners above base level.

The pressure coefficients of Table 2 can be converted to full-scale loads by multiplication by a suitable reference pressure selected for the field site. The elevation of the reference pressure measurement in the wind tunnel was arbitrarily set at 50 in. (1667 ft) and effectively measured the approach wind velocity of that elevation.

Visualization of the load distribution represented by the largest peak pressures at each tap is aided by a contour plot of these peaks, Figure 15. The plots of each face of the structure show contours of the largest of the absolute value of peak positive or peak negative pressure. For most taps, the peak negative pressure coefficient was the one selected. Contours between the taps closest to the building edge and the building edge itself were obtained by linear extrapolation of the first two interior points to the edge. Contours on the interior

portion of the side were obtained by linear interpolation in two directions. Areas of highest pressure coefficients were located just below the setbacks at the 50th and 66th floors and at ground level on the west end of the south face. High pressures were also noted near the building edges between the 10th and 25th floors as predicted by the smoke visualization. The largest coefficients for these areas were on the north and west faces.

Contour plots of mean, rms, and peak minimum pressure coefficients for the east face for a wind azimuth of 345 degrees is shown in Figure 16. This plot shows high pressure areas as seen for one wind direction where pressure loads on the north edge of the east face are high. A relatively large area low on the east face has peak minimum coefficients greater than -2.0 in magnitude while coefficients high on the structure are rather moderate.

One of the largest peak negative coefficients measured during the wind-tunnel tests occurred at tap 4210 for a wind azimuth of 340 degrees. This value (-4.4) is associated with a vortex flow originating at the 50th floor setback on the northwest corner. This vortex is similar to those acting at other setbacks. Evidence of the persistence of the vortex with changing wind direction is shown in Figure 17. It is evident that the vortex action is strong for a 20-30 degree wind azimuth range. This was also observed with the smoke flow results. The large negative peaks are associated with unusually large negative mean pressures and with unusually large rms pressures.

Development of the peak pressures in the region of the setback on the west side due to vortex formation is shown in Figure 18. Contour plots for wind azimuths from 320 to 360 are shown. The data show that

although the vortex was observed to originate at the setback corner and to trail down and to the right across the face, the highest pressures were observed on either side of the vortex axis along separation corners. For this flow, the vortex action may provide accelerated flow past the separation corner, a rapid curvature of the flow back toward the surface and a more rapid reattachment of the flow to the surface than would occur without the vortex. Moderate pressures along the vortex axis provide indications of the tendency of the vortex to promote reattachment of the flow in that region.

The distribution of mean, rms, and peak minimum coefficients in the same region of the structure for a wind azimuth of 340 degrees is shown in Figure 19. The regions of highest peaks are associated with regions of high negative mean and rms values as shown for a single tap in Figure 17.

Two comparisons of the wind-tunnel data obtained in this investigation can be made with data from other studies of the Sears Tower. The first is a comparison with preliminary field data obtained on the full-scale building (7). Field data is currently being obtained from 35 pressure taps on the Sears Tower corresponding to similar locations on the wind-tunnel model, Table 3. A preliminary comparison of prototype data at four pressure taps with wind-tunnel data is shown in Figure 20. While insufficient prototype data is available to make comparisons where the wind-tunnel results show the highest peak pressures, the agreement in Figure 20 is excellent. The second data comparison is with wind-tunnel data obtained on the lower east face of the tower at the University of Western Ontario (UWO) (8). Figures 21a and 21b show a comparison of mean and rms pressure coefficients on the lower east face

for two wind directions. These comparisons are typical of other wind directions examined. Although the Colorado State University study tended to find slightly higher pressure values in some areas, the overall agreement is good. Because measured peaks were not reported in the UWO tests, a comparison of peaks was not presented.

As indicated in Section 3.2 data were obtained at selected taps and wind directions to obtain the characteristics of the spectra and probability distributions. In addition, a few very long data runs were obtained to determine the probability distribution of the peak maximum and peak minimum values listed in Appendix A. Figure 22 shows the spectral distribution for tap 4210 (refer to Figs 12-14 and earlier discussion) for wind azimuths of 340 and zero degrees. The abscissa is frequency in Hz in the wind-tunnel. These wind directions are for cases of maximum vortex development at the setback (340 degrees) and for a more normal separated flow where vortex development is weak. While some redistribution of energy is evident at the lower frequencies, both curves are remarkably similar and both reach very small energy levels by 60-80 Hz. These data were obtained with a U_∞ of about 39 fps. For the zero degree case where the rms level is lower, a small-amplitude spike at the fan-frequency is evident. The minor peak to the left of the fan-frequency peak appeared on a number of spectra at the same frequency. Its source (real flow effects on the building or wind-tunnel induced peak) has not been established. The spectra obtained on the structure at 26 tap locations and the corresponding autocorrelation functions are contained in plotted form in Appendix B. The distinguishing feature of these spectra is the similarity of each to the next.

The probability distribution of pressure fluctuations for tap 4210 at azimuths 340 and zero degrees is shown in Figure 23. The distribution

for wind azimuth zero where vortex action is weak is characteristic of those measured previously by Peterka and Cermak (9) for separated flow regions with moderately large negative mean pressure.

The distribution for azimuth 340, where vortex action was intense, showed a Gaussian distribution which has been found (9) to be characteristic of pressure fluctuations in regions of positive mean pressure. A comparison of

$$g = \frac{C_{p_{peak}} - C_{p_{mean}}}{C_{p_{rms}}}$$

values in Appendix A for other areas on the building where vortex action is intense leads to the conclusion that a Gaussian distribution is expected in those areas as well (see (9) for a detailed discussion of why the amplitude of these g factors can imply the nature of the probability distribution of pressure fluctuations). This finding is new and has not previously been reported in the literature.

Figure 24 shows probability distributions for tap 4224 for a 265 degree wind and for tap 2265 for a 345 degree wind. These illustrate characteristic probability distributions for taps with positive means (4224) and negative means (2265). These are expected results and are consistent with the results of Peterka and Cermak (9). A listing of probability distributions for additional taps and wind directions is provided in Appendix C. Some taps in separated regions with negative means have probability distributions which appear to be a mix between the two types shown in Figure 24. This feature has been found previously (9) and is expected.

Each peak positive or peak negative pressure coefficient listed in Appendix A was obtained by selecting the largest positive or negative

reading from a single 16 second record. Davenport (10) showed that if the probability distribution of the fluctuating pressures was Gaussian, then little variation in the value of these peaks would be expected if peaks were selected from additional records.

However, when the probability distribution is not Gaussian as is the case for most pressure taps experiencing moderately large negative mean pressures, Peterka and Cermak (9) showed that the probability distribution of these peaks is significantly wider and more variability in measured peak pressure can be expected. It is not practical to determine this distribution for each pressure tap since several hundred samples are required to define each distribution. Very long records (about 1½ hours allowing about 350 samples to be measured) were obtained for 8 taps to show the nature of these probability distributions. Plots of the positive and negative peak distributions for these 8 taps are shown in Figure 25a to 25h. All positive peaks show a narrow distribution, regardless of mean pressure acting on the tap. Negative peaks for taps with negative means show a wide distribution with a tail tending to large negative values as expected.

5. CONCLUSIONS

A simulated atmospheric boundary-layer flow over a model of the Sears Tower, Chicago and its surroundings was established whose characteristics compared favorably with the expected flow over that area. Flow visualization showed areas on the structure, principally at the setbacks and near corners somewhat above the base, where high pressures might be expected.

Pressure measurements were made at 1182 locations on the structure to determine mean and fluctuating pressure magnitudes. The largest peak pressures measured on the structure were negative (outward acting) and ranged up to -4.5 times the reference dynamic pressure. The largest pressures were concentrated near the setbacks. Most locations had peak pressures less than -2.25 times the dynamic pressure. Measurements of fluctuating pressure spectra and probability densities at selected locations showed that, for most areas of the structure, the pressure fluctuations had characteristics similar to measurements made on other structures. The one exception was that the probability distribution for areas near the setbacks when vortex action was intense showed characteristics not previously reported for pressure in separated flow regions with large negative mean pressures.

Comparison of pressure measurements with preliminary full scale data and with other wind-tunnel data showed good agreement.

Velocity measurements above the tower showed that the anemometer used for field measurements experiences changes of 2 to 12 percent from the wind-tunnel reference velocity depending on wind direction due to the presence of the building and due to the elevation difference between the two measurement positions.

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TABLES

TABLE 1

MOTION PICTURE SCENE GUIDE
SEARS TOWER FLOW VISUALIZATION

Scene	Wind Azimuth	Scene Content
0		Titles and general views
1	350	Lower east face separation
2	000	Lower east face separation
3	010	Lower east face separation
4	190	Lower east face separation
5	180	Lower east face separation
6	170	Lower east face separation
7	100	Lower north face separation
8	90	Lower north face separation
9	260	Lower north face separation
10	270	Lower north face separation
11	10	Lower west face separation
12	000	Lower west face separation
13	350	Lower west face separation
14	170	Lower west face separation
15	180	Lower west face separation
16	280	Lower south face separation
End Reel 1		
Reel 2		
17	270	Lower south face separation
18	80	Lower south face separation
19	90	Lower south face separation
20	150	Lower setback separation
21	160	Lower setback separation
22	170	Lower setback separation
23	180	Lower setback separation
24	60	Middle setback separation
25	70	Middle setback separation
26	80	Middle setback separation
27	90	Middle setback separation
28	90	Upper setback separation
29	105	Upper setback separation
30	135	Upper setback separation
31	180	Upper setback separation
32	225	Upper setback separation
33	260	Upper setback separation
34	10	Added building--lower west face
35	000	Added building--lower west face
36	260	Added building--lower north face
37	280	

Model wind velocity = 10 fps
Movie length: approximately 2200 ft
Movie speed: 24 frames per second
Running time: approximately one hour

TABLE 2- 1 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
1001	.836	15	-.892	65	.417	60	1.279	15	-2.326	65
1002	.783	0	-.644	130	.299	70	1.214	0	-1.735	125
1003	.779	340	-.891	300	.262	290	1.249	340	-2.037	300
1004	.894	15	-.868	130	.297	55	1.391	15	-2.145	130
1005	.850	5	-.766	295	.408	65	1.346	15	-1.959	65
1006	.828	340	-.791	300	.259	70	1.338	335	-1.776	85
1007	.860	15	-.736	65	.300	55	1.342	15	-1.823	60
1008	.835	5	-.752	295	.386	60	1.266	15	-1.908	290
1009	.814	340	-.750	300	.267	65	1.301	345	-1.795	70
1010	.820	15	-.737	65	.318	55	1.339	10	-1.871	60
1011	.797	5	-.722	295	.347	60	1.296	0	-2.025	295
1012	.776	340	-.751	295	.245	65	1.284	345	-2.396	295
1013	.733	20	-.988	65	.373	65	1.293	355	-2.757	65
1014	.772	345	-.717	70	.289	300	1.327	335	-1.657	65
1015	.793	345	-.743	295	.247	315	1.392	340	-2.869	295
1016	.836	15	-.790	65	.365	50	1.377	5	-2.097	60
1017	.845	355	-.776	290	.366	60	1.361	5	-2.077	280
1018	.818	345	-.800	295	.260	65	1.324	335	-1.889	290
1101	.697	20	-.708	90	.369	55	1.273	45	-2.037	60
1102	.726	20	-.722	90	.523	55	1.369	45	-2.710	60
1103	.730	20	-1.196	70	.565	60	1.258	25	-2.967	65
1104	.747	5	-.866	70	.342	60	1.338	355	-2.170	60
1105	.834	350	-.720	70	.334	305	1.339	350	-1.890	285
1106	.799	350	-.745	295	.248	315	1.294	350	-2.137	295
1107	.694	35	-1.622	85	.571	65	1.407	45	-3.423	90
1108	.762	20	-.972	90	.417	85	1.301	15	-2.086	95
1109	.772	15	-.578	280	.223	295	1.356	20	-1.472	95
1110	.768	350	-.621	285	.266	295	1.335	20	-1.636	295
1111	.803	350	-.685	290	.329	305	1.379	350	-1.901	285
1112	.768	350	-.688	295	.248	315	1.393	350	-1.866	305
1113	.627	20	-.841	85	.341	60	1.346	20	-1.693	85
1114	.723	20	-.890	85	.353	60	1.411	25	-1.842	60
1115	.736	20	-.906	85	.305	70	1.397	40	-1.819	275
1116	.737	350	-.692	275	.252	295	1.342	40	-1.550	270
1117	.768	350	-.676	290	.277	305	1.325	350	-2.056	285
1118	.722	350	-.694	290	.265	320	1.317	340	-1.907	290
1119	.567	20	-.622	85	.305	60	1.328	45	-1.564	275
1120	.660	20	-.662	85	.290	60	1.311	15	-1.795	85
1121	.660	20	-.653	275	.253	70	1.266	10	-1.577	90
1122	.715	350	-.678	275	.227	75	1.348	350	-1.386	85
1123	.748	350	-.808	285	.255	295	1.426	350	-1.623	280
1124	.735	350	-1.041	290	.329	300	1.312	350	-3.053	290
1125	.776	15	-.989	80	.666	60	1.375	20	-3.383	60
1126	.700	30	-1.902	85	.635	75	1.403	25	-3.443	85
1127	.738	15	-.732	90	.316	90	1.390	20	-1.921	95
1128	.771	15	-.656	95	.297	90	1.388	20	-1.621	95

TABLE 2- 2 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
1129	.799	15	-.580	110	.328	50	1.419	15	-1.709	50
1130	.784	15	-.615	95	.261	90	1.477	30	-1.562	280
1131	.654	30	-1.354	85	.447	60	1.356	30	-3.022	65
1132	.731	15	-1.300	85	.438	70	1.399	30	-2.293	85
1133	.760	20	-.765	90	.340	85	1.397	30	-2.036	80
1134	.657	20	-1.187	80	.430	60	1.320	35	-2.316	80
1135	.729	20	-1.285	80	.442	65	1.287	20	-2.539	80
1136	.727	20	-.614	90	.263	85	1.306	10	-1.545	270
1137	.624	20	-1.008	85	.382	60	1.328	40	-1.911	270
1138	.700	20	-1.090	85	.382	60	1.327	25	-1.927	80
1139	.724	355	-.850	85	.331	80	1.293	5	-1.837	80
1140	.751	355	-.728	270	.262	295	1.474	5	-1.491	85
1141	.733	345	-.809	285	.265	295	1.259	5	-1.796	280
1142	.719	345	-.816	285	.242	315	1.291	345	-2.033	260
1201	.550	20	-.625	265	.275	60	1.367	40	-1.738	70
1202	.625	20	-.636	265	.263	65	1.268	35	-1.797	70
1203	.609	25	-.646	270	.252	70	1.232	30	-1.501	90
1204	.626	5	-.706	270	.237	75	1.293	355	-1.703	80
1205	.643	355	-.723	270	.237	295	1.258	355	-1.445	275
1206	.635	355	-.820	285	.293	295	1.215	355	-1.716	290
1207	.609	350	-1.206	285	.484	295	1.206	340	-2.942	290
1208	.550	325	-.947	275	.388	285	1.197	340	-2.755	285
1209	.570	325	-.804	270	.291	275	1.217	315	-2.141	270
1210	.579	25	-.599	260	.247	55	1.220	35	-1.557	95
1211	.603	25	-.624	260	.270	65	1.206	30	-1.838	75
1212	.582	25	-.656	260	.251	75	1.172	25	-1.686	90
1213	.624	0	-.647	270	.239	75	1.160	340	-1.556	85
1214	.644	355	-.639	270	.217	80	1.220	350	-1.482	275
1215	.603	355	-.650	265	.205	85	1.161	15	-1.442	285
1216	.559	355	-.622	260	.204	320	1.214	340	-1.519	265
1217	.552	325	-.900	275	.352	280	1.129	330	-1.745	275
1218	.620	325	-1.277	285	.517	290	1.225	335	-3.335	290
1219	.517	325	-.928	275	.333	290	1.191	335	-2.275	285
1220	.445	25	-.584	85	.251	70	1.177	40	-2.143	85
1221	.492	25	-.612	90	.283	70	1.164	20	-2.018	85
1222	.502	25	-.588	90	.289	75	1.122	15	-1.993	90
1223	.525	0	-.602	90	.293	75	1.220	25	-1.915	90
1224	.569	0	-.607	255	.266	80	1.228	25	-1.455	90
1225	.580	0	-.664	255	.247	85	1.136	5	-1.527	255
1226	.578	0	-.622	255	.237	90	1.113	5	-1.452	270
1227	.550	350	-.660	275	.260	290	1.110	350	-1.418	260
1228	.507	350	-.696	275	.272	295	1.118	350	-1.494	285
1229	.467	325	-.683	275	.270	300	1.061	330	-1.587	265
1230	.526	325	-.623	170	.249	305	1.161	320	-1.718	280
1231	.384	25	-.583	90	.269	75	1.020	25	-2.409	95
1232	.428	25	-.589	90	.291	75	1.038	25	-3.071	95

TABLE 2- 3 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
1233	.462	0	-.616	105	.285	85	1.022	0	-1.736	90
1234	.513	0	-.625	110	.264	85	1.017	15	-1.597	110
1235	.523	5	-.650	110	.250	90	1.169	5	-1.709	260
1236	.506	5	-.728	255	.225	95	1.098	340	-1.670	260
1237	.437	0	-.742	265	.237	290	1.050	350	-1.684	260
1238	.434	325	-.722	265	.236	295	1.095	325	-1.794	265
1239	.431	325	-.686	265	.224	305	1.073	325	-1.847	265
1240	.256	30	-.574	105	.241	90	1.016	355	-2.092	90
1241	.297	25	-.592	105	.275	90	.961	25	-2.746	85
1242	.360	5	-.637	105	.260	90	.873	340	-2.149	105
1243	.397	5	-.560	115	.223	250	.914	350	-1.560	125
1244	.403	5	-.615	230	.257	255	.940	345	-1.422	95
1245	.383	355	-.653	230	.262	260	1.010	345	-1.516	245
1246	.310	355	-.718	255	.278	260	.824	0	-2.471	260
1247	.196	325	-.740	260	.268	255	.660	325	-2.203	255
1248	.224	325	-.715	260	.253	260	.817	325	-2.640	260
1249	.219	25	-.583	110	.238	110	.940	295	-2.456	120
1250	.238	25	-.612	110	.248	110	.869	25	-2.949	105
1251	.299	0	-.665	110	.254	95	.815	25	-1.837	115
1252	.333	0	-.584	125	.236	95	.830	25	-1.429	125
1253	.349	0	-.576	230	.247	250	1.097	70	-1.375	190
1254	.313	0	-.624	225	.250	260	.892	0	-1.495	255
1255	.244	5	-.678	220	.291	260	.774	0	-2.178	250
1256	.105	350	-.736	260	.308	260	.665	115	-2.539	260
1257	.082	325	-.734	265	.270	265	.555	120	-2.372	260
1258	.153	30	-.563	110	.244	105	.756	45	-2.302	105
1259	.169	30	-.603	110	.260	105	.737	50	-2.447	120
1260	.255	0	-.640	110	.280	105	.781	350	-2.354	115
1261	.287	355	-.545	125	.245	105	.780	0	-1.550	115
1262	.294	355	-.442	230	.220	255	.795	355	-1.566	115
1263	.276	5	-.557	225	.233	255	.815	355	-1.445	225
1264	.214	5	-.675	220	.268	255	.745	5	-2.300	250
1265	.105	345	-.675	220	.277	260	.678	130	-2.613	260
1266	.218	340	-.575	220	.228	260	.502	315	-2.317	260
1267	.120	30	-.520	110	.257	110	.808	25	-2.612	105
1268	.142	30	-.591	110	.293	110	.857	30	-2.788	125
1269	.236	5	-.584	125	.293	110	.875	270	-1.989	125
1270	.245	5	-.364	130	.217	110	.665	110	-1.507	120
1271	.268	0	-.602	235	.237	220	.765	345	-1.528	245
1272	.206	5	-.544	225	.220	220	.674	340	-1.440	225
1273	.295	95	-.532	220	.238	260	.676	95	-1.818	220
1274	.046	5	-.718	215	.283	215	.475	100	-2.435	220
1275	0.000	20	-.729	215	.288	215	.628	335	-2.466	265
1276	.114	40	-.497	110	.296	115	.724	20	-2.719	130
1277	.126	40	-.423	115	.284	115	.686	40	-2.201	115
1278	.150	350	-.632	130	.282	110	.712	110	-2.382	130

TABLE 2- 4 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
1279	.161	0	-.459	145	.234	115	1.109	330	-1.329	125
1280	.158	0	-.518	165	.225	130	.779	130	-1.161	240
1281	.253	75	-.472	165	.204	220	.667	135	-1.245	225
1282	.092	5	-.589	225	.243	220	.551	5	-1.760	250
1283	.071	35	-.669	220	.290	215	.840	40	-2.310	225
1284	.065	35	-.648	220	.287	215	.390	35	-2.728	215
1285	.089	40	-.408	150	.247	115	.592	45	-1.647	95
1286	.083	40	-.523	150	.276	115	.570	45	-2.347	105
1287	.125	0	-.608	150	.245	120	.630	100	-1.817	125
1288	.119	355	-.557	150	.211	130	.540	105	-1.168	120
1289	.244	95	-.423	240	.210	130	.828	130	-1.293	235
1290	.098	15	-.541	165	.210	220	.740	135	-1.312	230
1291	.061	35	-.578	230	.244	220	.714	5	-1.806	250
1292	.057	35	-.586	220	.263	215	.368	35	-2.129	250
1293	.145	100	-.574	220	.259	215	.432	100	-2.634	225
1294	.070	45	-.561	145	.239	125	.527	40	-2.713	130
1295	.066	60	-.638	150	.256	115	.842	10	-3.378	125
1296	.071	60	-.710	150	.245	125	.638	115	-2.215	130
1297	.175	105	-.519	145	.190	130	.672	125	-1.131	150
1298	.060	60	-.475	145	.223	130	.710	130	-1.169	165
1299	.062	120	-.524	235	.227	225	.771	35	-1.661	235
1300	.050	350	-.598	230	.230	220	.474	350	-1.755	230
1301	.296	105	-.596	230	.240	220	.510	105	-1.901	180
1302	.029	120	-.575	230	.230	220	.506	150	-2.247	215
1303	.043	45	-.650	150	.279	125	.505	320	-2.761	125
1304	.049	65	-.708	150	.319	130	.436	65	-4.295	130
1305	.041	65	-.645	140	.255	125	.949	0	-2.189	130
1306	.047	90	-.534	140	.215	150	.677	125	-1.498	140
1307	.061	320	-.352	140	.195	130	.552	115	-.936	130
1308	.055	120	-.441	170	.204	225	.654	150	-1.117	250
1309	.033	65	-.564	235	.266	225	.533	5	-1.624	225
1310	.048	125	-.592	240	.256	225	.504	320	-2.170	245
1311	.065	130	-.528	240	.239	220	.504	140	-2.146	225
1312	.032	65	-.631	145	.236	155	.359	45	-2.327	125
1313	.035	60	-.671	145	.296	130	.508	15	-4.318	130
1314	.066	320	-.583	140	.244	130	.633	120	-2.153	130
1315	.115	320	-.393	140	.208	130	.582	120	-1.373	130
1316	.087	320	-.246	170	.180	130	.527	120	-.952	140
1317	.051	320	-.394	170	.222	160	.650	160	-1.092	160
1318	.057	130	-.528	170	.248	160	.621	220	-1.368	225
1319	.112	140	-.641	235	.292	225	.561	140	-2.214	220
1320	.158	140	-.574	235	.244	220	.818	210	-2.046	220
1321	.041	30	-.671	145	.251	125	.461	320	-2.161	130
1322	.083	320	-.715	145	.266	125	.557	320	-2.631	130
1323	.164	320	-.482	140	.214	155	.657	320	-1.923	130
1324	.166	320	-.294	140	.179	130	.667	320	-.929	145

TABLE 2- 5 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
1325	.141	320	-.224	170	.162	160	.596	320	-1.125	90
1326	.134	320	-.341	170	.205	160	.581	150	-.956	160
1327	.117	320	-.457	170	.239	155	.705	240	-1.181	190
1328	.142	140	-.678	235	.302	225	.510	145	-2.244	230
1329	.170	140	-.637	240	.266	225	.700	330	-2.301	240
1330	.199	0	-.647	145	.296	125	.726	355	-2.408	130
1331	.220	0	-.580	140	.231	145	.761	355	-1.732	145
1332	.228	0	-.400	140	.198	150	.771	40	-1.196	140
1333	.220	0	-.271	135	.190	135	.908	320	-1.046	130
1334	.228	325	-.198	170	.172	135	.739	0	-.790	145
1335	.224	325	-.320	165	.174	160	.759	320	-.945	165
1336	.165	325	-.406	165	.197	155	.707	0	-1.079	160
1337	.135	140	-.481	170	.329	235	1.004	285	-1.756	250
1338	.187	135	-.543	190	.257	230	.603	135	-1.705	230
1339	.641	345	-1.114	280	.530	290	1.300	345	-3.065	285
1340	.672	345	-.709	265	.257	315	1.281	335	-1.681	270
1341	.855	325	-.698	265	.292	270	1.328	340	-1.885	270
1342	.716	325	-.745	265	.271	270	1.381	340	-1.995	270
1343	.660	325	-1.393	275	.599	285	1.322	325	-3.130	265
1344	.637	345	-.681	265	.238	270	1.315	335	-1.556	270
1345	.859	325	-.769	270	.285	275	1.340	345	-1.650	265
1346	.740	325	-1.079	275	.410	290	1.300	345	-2.324	270
1347	.601	325	-1.117	285	.440	295	1.243	325	-2.867	285
1348	.633	350	-.658	265	.238	275	1.415	345	-1.409	260
1349	.898	310	-1.050	275	.354	290	1.247	345	-1.964	265
1350	.752	325	-.810	270	.250	285	1.228	320	-1.643	270
1351	.604	325	-.869	270	.374	290	1.210	320	-1.931	290
1352	.602	325	-.841	270	.283	300	1.288	325	-1.630	285
1353	.210	310	-.901	140	.380	150	.549	310	-2.758	145
1354	.155	355	-.660	140	.338	145	.627	25	-1.806	130
1355	.175	140	-.683	235	.285	250	.694	140	-2.174	255
1356	.179	135	-.801	240	.379	225	.647	140	-3.289	225
1501	.687	30	-.770	85	.240	60	1.186	30	-2.226	80
1502	.567	30	-.784	85	.194	70	1.001	30	-1.539	90
1503	.530	355	-.730	90	.189	80	.932	10	-1.428	95
1504	.544	355	-.654	95	.204	95	1.009	355	-1.651	95
1505	.538	330	-.547	100	.208	95	.958	335	-1.657	100
1506	.631	330	-.484	275	.198	300	1.097	330	-1.370	95
1507	.877	30	-.831	85	.286	60	1.481	50	-1.510	75
1508	.925	20	-.858	85	.314	70	1.485	30	-1.740	85
1509	.928	10	-.803	90	.259	80	1.438	5	-1.767	95
1510	.964	355	-.690	95	.282	275	1.436	355	-1.631	270
1511	.954	340	-.830	275	.265	290	1.451	340	-1.860	275
1512	.897	325	-.753	275	.196	300	1.358	325	-1.971	275
1513	.855	30	-1.128	80	.324	60	1.515	30	-3.076	85
1514	.922	20	-1.059	85	.367	80	1.517	30	-2.082	85

TABLE 2- 6 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
1515	.951	355	-.882	95	.310	85	1.499	355	-1.805	85
1516	.945	355	-.717	265	.324	270	1.441	340	-1.737	265
1517	.948	340	-.793	270	.356	280	1.451	340	-2.135	270
1518	.892	315	-.841	270	.280	280	1.364	325	-2.704	270
1519	.558	355	-1.217	90	.481	85	1.331	30	-3.115	85
1520	.767	20	-.920	95	.278	95	1.451	20	-1.838	100
1521	.926	355	-.709	105	.241	95	1.455	355	-1.657	105
1522	.938	355	-.557	240	.248	280	1.653	355	-1.406	270
1523	.883	330	-.559	245	.256	280	1.383	330	-1.489	265
1524	.867	320	-.537	245	.244	280	1.377	320	-2.351	265
1601	.641	50	-.797	120	.211	115	1.162	50	-1.595	125
1602	.590	10	-.775	120	.267	340	1.176	15	-1.517	125
1603	.549	65	-.785	335	.266	340	1.115	15	-2.057	335
1604	.760	40	-.747	130	.234	345	1.369	355	-1.467	285
1605	.803	15	-.764	130	.323	340	1.556	45	-1.377	130
1606	.806	40	-.716	130	.198	45	1.561	45	-1.240	130
1607	.711	40	-.584	325	.266	355	1.462	45	-1.304	290
1608	.776	40	-.619	330	.244	0	1.474	45	-1.169	335
1609	.792	65	-.586	140	.229	55	1.448	55	-1.132	335
1610	.693	65	-.552	145	.263	340	1.368	35	-1.532	290
1611	.730	65	-.575	330	.226	55	1.426	35	-1.264	290
1612	.755	40	-.603	330	.223	55	1.426	35	-1.189	335
1613	.660	65	-.619	160	.274	70	1.327	60	-1.599	110
1614	.674	45	-.610	160	.235	65	1.467	60	-1.582	110
1615	.763	45	-.585	165	.228	55	1.715	45	-1.173	160
1616	.517	20	-.757	325	.240	105	1.149	5	-1.471	120
1701	.866	340	-.607	245	.245	30	1.447	5	-1.737	40
1702	.852	320	-.590	245	.212	280	1.435	330	-1.296	75
1703	.841	320	-.565	245	.200	280	1.379	320	-1.294	80
1704	.855	330	-.587	240	.248	10	1.348	345	-1.661	35
1705	.818	310	-.570	240	.250	15	1.348	15	-1.244	70
1706	.829	310	-.572	240	.255	40	1.305	310	-1.409	70
1707	.850	330	-.556	240	.175	340	1.327	340	-1.088	30
1708	.814	310	-.567	240	.332	15	1.312	340	-1.376	25
1709	.808	310	-.565	240	.427	15	1.443	15	-1.657	65
1710	.825	320	-.659	25	.174	335	1.315	310	-1.320	30
1711	.790	305	-.595	30	.303	10	1.389	0	-1.435	30
1712	.774	310	-.565	240	.329	15	1.267	320	-1.533	70
1713	.772	325	-.563	55	.178	340	1.408	335	-1.238	80
1714	.734	305	-.555	55	.206	5	1.401	350	-1.406	70
1715	.736	305	-.572	65	.246	15	1.242	305	-1.970	65
1716	.791	305	-.624	60	.191	55	1.357	310	-1.567	50
1717	.762	305	-.644	60	.207	350	1.408	350	-1.441	40
1718	.714	305	-.644	65	.256	15	1.290	350	-1.850	65
1719	.744	325	-.645	60	.201	60	1.236	325	-1.602	75
1720	.721	305	-.659	60	.212	350	1.446	350	-1.694	60

TABLE 2- 7 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
1721	.700	305	-.656	65	.232	15	1.357	350	-1.879	65
1722	.705	305	-.663	65	.223	65	1.413	330	-1.553	60
1723	.676	305	-.722	65	.232	55	1.329	330	-1.793	60
1724	.705	305	-.686	65	.250	55	1.207	315	-1.695	70
1725	.711	325	-.597	180	.194	10	1.427	315	-1.577	45
1726	.697	310	-.677	195	.256	40	1.317	320	-1.601	190
1727	.638	300	-.693	195	.359	40	1.357	35	-1.997	195
1728	.858	340	-1.739	220	.302	30	1.350	350	-2.098	220
2001	.707	95	-.961	155	.277	140	1.188	95	-2.548	155
2002	.707	90	-.739	15	.278	25	1.194	90	-1.640	205
2003	.707	75	-.993	25	.385	40	1.289	50	-2.393	30
2004	.820	95	-.859	155	.241	25	1.309	90	-2.016	210
2005	.831	90	-.853	20	.395	30	1.325	90	-1.937	165
2006	.834	80	-.913	325	.357	50	1.331	60	-1.902	330
2007	.797	100	-.793	155	.244	25	1.376	105	-2.004	15
2008	.802	85	-.794	20	.315	35	1.317	105	-1.816	20
2009	.792	75	-.777	25	.355	55	1.448	70	-2.092	30
2010	.779	100	-.791	155	.246	130	1.429	120	-1.707	200
2011	.771	85	-.822	20	.325	145	1.303	90	-2.159	20
2012	.785	75	-.774	20	.337	55	1.332	70	-2.127	25
2013	.733	115	-.763	155	.241	130	1.290	120	-1.992	160
2014	.742	85	-.873	20	.287	145	1.257	95	-2.027	160
2015	.742	85	-1.169	25	.449	30	1.298	75	-3.644	30
2016	.802	105	-.844	155	.247	130	1.263	95	-1.912	150
2017	.817	90	-.849	20	.334	35	1.377	90	-2.047	160
2018	.815	75	-.847	25	.358	55	1.380	75	-2.520	25
2101	.849	110	-.816	155	.251	135	1.418	105	-1.942	155
2102	.813	95	-.855	20	.336	145	1.513	95	-1.918	160
2103	.790	90	-1.070	20	.378	30	1.478	100	-2.560	10
2104	.771	75	-1.456	20	.617	25	1.480	65	-3.405	25
2105	.738	75	-.923	5	.394	55	1.474	65	-2.241	25
2106	.669	70	-.808	355	.352	55	1.440	65	-2.359	50
2107	.744	95	-.790	155	.255	135	1.377	105	-2.566	150
2108	.808	95	-.768	155	.315	145	1.402	95	-2.085	155
2109	.801	95	-.730	165	.284	155	1.357	105	-1.578	170
2110	.780	80	-.695	355	.262	155	1.427	65	-1.600	165
2111	.737	75	-1.097	0	.450	5	1.409	80	-2.773	5
2112	.618	70	-2.053	10	.539	5	1.481	70	-4.419	5
2113	.728	110	-.826	165	.264	125	1.322	110	-1.925	155
2114	.770	95	-.870	165	.278	145	1.350	95	-1.963	165
2115	.765	95	-.803	165	.299	155	1.350	95	-1.678	170
2116	.729	75	-1.138	5	.328	15	1.346	75	-2.443	5
2117	.687	75	-1.100	5	.347	25	1.388	75	-2.212	5
2118	.579	75	-1.040	5	.333	35	1.345	35	-2.033	5
2119	.659	100	-1.244	160	.398	155	1.298	90	-3.217	175
2120	.665	90	-.911	170	.289	155	1.391	90	-1.772	165

TABLE 2- 8 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
2121	.683	90	-.827	175	.247	15	1.390	110	-1.625	5
2122	.676	80	-.792	5	.286	20	1.291	75	-1.631	15
2123	.632	75	-.779	5	.331	25	1.275	75	-1.518	15
2124	.528	75	-.786	5	.308	40	1.278	40	-1.728	10
2125	.755	75	-.950	10	.475	25	1.404	55	-2.624	25
2126	.773	75	-.625	355	.276	60	1.289	80	-1.506	170
2127	.792	75	-.674	355	.270	0	1.377	70	-1.749	0
2128	.743	75	-.713	355	.286	0	1.390	70	-1.950	355
2129	.630	75	-1.749	5	.610	10	1.323	70	-3.335	10
2130	.774	75	-.660	355	.249	5	1.343	70	-2.429	5
2131	.759	75	-.785	0	.296	5	1.280	65	-1.521	0
2132	.708	75	-1.311	5	.450	15	1.335	65	-2.515	10
2133	.595	75	-1.488	10	.415	15	1.245	60	-3.163	10
2134	.742	75	-.644	0	.255	155	1.313	60	-1.485	160
2135	.704	75	-1.393	10	.433	25	1.419	75	-2.630	5
2136	.572	75	-1.293	10	.346	30	1.272	50	-2.378	10
2137	.730	85	-.876	5	.335	10	1.299	85	-1.612	5
2138	.676	75	-1.192	10	.368	25	1.370	65	-2.311	15
2139	.585	75	-1.047	10	.329	35	1.362	40	-2.128	10
2140	.666	110	-.949	160	.426	200	1.307	110	-2.818	200
2141	.646	95	-.839	160	.303	145	1.227	110	-1.858	170
2142	.660	75	-.750	175	.276	155	1.284	80	-1.532	185
2201	.621	135	-.855	180	.315	170	1.218	115	-2.032	175
2202	.550	110	-1.008	175	.453	170	1.285	105	-2.954	170
2203	.567	90	-1.394	165	.520	155	1.474	95	-3.211	165
2204	.585	90	-1.039	165	.318	155	1.281	105	-2.223	165
2205	.592	90	-.893	170	.250	155	1.176	105	-1.737	165
2206	.586	90	-.810	180	.259	15	1.152	80	-1.711	10
2207	.582	80	-.738	180	.287	20	1.155	75	-1.661	5
2208	.545	75	-.726	10	.323	25	1.119	65	-2.051	15
2209	.448	75	-.700	10	.318	35	1.044	60	-2.155	10
2210	.559	130	-1.210	165	.494	155	1.098	120	-2.640	165
2211	.520	145	-.876	175	.388	165	1.170	100	-2.070	170
2212	.547	105	-.693	185	.200	180	1.164	75	-1.683	185
2213	.578	90	-.711	185	.213	10	1.189	75	-1.592	185
2214	.587	90	-.755	180	.227	10	1.216	90	-1.709	185
2215	.585	90	-.702	185	.253	15	1.235	70	-1.599	185
2216	.546	75	-.701	0	.269	25	1.168	100	-2.183	15
2217	.500	75	-.714	10	.315	25	1.227	80	-2.331	15
2218	.413	75	-.735	10	.295	35	1.086	80	-2.218	25
2219	.587	125	-.687	170	.257	140	1.098	130	-1.646	175
2220	.463	130	-.711	185	.272	150	1.072	100	-1.556	0
2221	.419	130	-.711	185	.279	155	1.082	100	-1.567	185
2222	.417	105	-.731	185	.262	160	1.044	100	-1.640	185
2223	.420	90	-.725	185	.236	165	1.067	105	-1.577	185
2224	.431	80	-.689	185	.258	10	1.116	95	-1.582	10

TABLE 2- 9 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
2225	.451	80	-.668	0	.256	15	1.131	95	-1.598	10
2226	.445	80	-.727	5	.286	15	1.108	95	-1.780	355
2227	.434	80	-.691	5	.280	15	1.093	95	-1.830	15
2228	.400	75	-.707	10	.331	25	1.161	85	-1.926	15
2229	.328	70	-.688	10	.302	35	1.103	35	-2.109	25
2230	.350	130	-.670	185	.258	145	1.007	125	-1.587	270
2231	.372	135	-.690	185	.265	145	.939	110	-1.606	185
2232	.334	100	-.718	185	.238	155	.984	110	-2.257	310
2233	.332	100	-.704	185	.208	10	.963	105	-1.514	190
2234	.320	100	-.733	0	.234	10	.836	75	-1.762	0
2235	.499	90	-.707	0	.245	10	.927	65	-1.745	0
2236	.362	75	-.648	0	.268	15	.995	70	-1.741	5
2237	.322	75	-.633	5	.270	30	1.155	70	-1.999	295
2238	.269	75	-.609	355	.283	190	1.101	70	-2.042	280
2239	.290	130	-.644	180	.252	140	.973	130	-1.535	190
2240	.304	130	-.653	185	.270	150	.877	110	-1.644	160
2241	.281	105	-.664	185	.247	160	.888	110	-2.005	180
2242	.281	105	-.662	185	.229	165	.902	105	-1.633	235
2243	.259	105	-.698	355	.233	5	.835	105	-1.714	0
2244	.252	80	-.702	350	.239	5	.915	85	-1.917	5
2245	.244	80	-.712	355	.239	10	.868	85	-1.941	5
2246	.232	80	-.684	355	.235	25	1.010	70	-1.751	5
2247	.194	65	-.680	355	.279	195	.986	70	-2.120	200
2248	.240	125	-.681	185	.269	190	.964	130	-1.872	185
2249	.253	130	-.683	185	.277	190	.827	95	-2.012	185
2250	.238	110	-.697	185	.286	190	.824	110	-1.952	190
2251	.231	110	-.665	185	.275	190	.817	110	-1.800	190
2252	.243	110	-.655	345	.262	180	.849	115	-1.734	190
2253	.220	110	-.718	355	.256	5	.811	115	-1.722	0
2254	.205	85	-.724	355	.257	5	.736	75	-1.978	350
2255	.171	75	-.717	350	.242	10	.747	75	-1.894	5
2256	.187	65	-.700	0	.310	220	.864	70	-2.218	210
2257	.173	125	-.744	185	.255	185	.912	135	-2.270	195
2258	.216	130	-.765	185	.276	185	.742	135	-2.477	185
2259	.197	105	-.738	185	.287	170	.801	105	-2.483	190
2260	.185	105	-.639	190	.282	185	.652	105	-1.681	190
2261	.172	95	-.585	215	.267	350	.620	120	-1.476	190
2262	.177	95	-.674	350	.260	0	.667	120	-1.601	0
2263	.157	80	-.769	350	.270	0	.759	120	-2.068	0
2264	.157	75	-.742	0	.252	5	.675	80	-2.214	5
2265	.123	60	-.821	0	.350	215	.833	15	-2.563	215
2266	.139	105	-.804	185	.286	185	.739	135	-2.392	175
2267	.123	105	-.833	180	.355	190	.591	135	-2.720	190
2268	.134	110	-.719	190	.320	185	.621	95	-2.363	185
2269	.146	95	-.597	220	.291	190	.617	350	-1.588	195
2270	.123	95	-.729	210	.278	345	.932	305	-1.591	210

TABLE 2-10 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
2271	.121	95	-.675	210	.344	345	.688	345	-1.737	305
2272	.125	95	-.819	345	.363	345	.613	355	-2.624	305
2273	.133	60	-.908	345	.362	305	.863	305	-3.467	315
2274	.154	60	-.858	345	.324	305	.727	60	-2.933	355
2275	.086	120	-.919	185	.351	185	.589	145	-3.030	185
2276	.116	135	-.893	190	.431	185	.626	110	-2.841	190
2277	.099	130	-.782	210	.415	185	.710	305	-2.106	185
2278	.095	95	-.789	210	.334	190	.733	310	-1.725	215
2279	.096	95	-.756	210	.282	190	.585	305	-1.425	210
2280	.113	100	-.551	210	.232	355	1.018	140	-1.320	310
2281	.092	60	-.680	320	.384	355	.578	355	-2.174	315
2282	.119	60	-.877	345	.370	345	.540	65	-3.034	310
2283	.111	60	-.816	345	.331	305	.564	60	-3.646	320
2284	.080	125	-.820	185	.397	185	1.130	90	-3.181	190
2285	.108	135	-.795	195	.440	185	.669	185	-3.022	190
2286	.094	125	-.801	210	.363	190	.699	190	-2.023	210
2287	.074	100	-.802	210	.335	195	.675	185	-1.792	190
2288	.099	100	-.635	210	.269	195	1.000	150	-1.402	210
2289	.088	95	-.384	210	.236	315	.686	305	-1.622	305
2290	.087	60	-.482	320	.292	325	.783	350	-2.328	305
2291	.078	60	-.707	345	.406	355	.774	325	-3.110	355
2292	.066	55	-.735	325	.385	315	.778	80	-3.427	325
2293	.081	130	-.779	210	.362	185	.523	135	-2.797	190
2294	.099	130	-.801	210	.377	185	.533	190	-2.787	195
2295	.075	125	-.856	210	.352	195	.659	195	-2.241	215
2296	.093	100	-.734	210	.294	195	.638	310	-1.734	185
2297	.087	100	-.453	210	.236	210	.604	195	-1.276	210
2298	.090	100	-.212	300	.187	210	.678	315	-.993	315
2299	.079	100	-.323	315	.232	315	.689	355	-1.786	300
2300	.069	100	-.501	5	.363	355	1.176	350	-2.408	5
2301	.051	60	-.612	345	.386	345	.458	345	-3.376	0
2302	.111	125	-.814	210	.297	185	.468	135	-2.576	185
2303	.098	125	-.898	210	.331	195	.505	190	-2.809	185
2304	.070	100	-.706	210	.262	195	.449	215	-1.905	210
2305	.088	100	-.449	210	.231	210	.405	210	-1.231	200
2306	.103	100	-.222	205	.182	210	.470	200	-.948	205
2307	.101	100	-.166	300	.129	205	.520	195	-.736	305
2308	.090	100	-.209	300	.164	300	.541	5	-1.310	310
2309	.066	100	-.241	320	.250	5	.632	0	-2.258	300
2310	.037	95	-.442	5	.320	5	.648	5	-2.390	355
2311	.096	130	-.692	210	.245	200	.437	125	-2.595	195
2312	.098	100	-.731	210	.286	200	.404	110	-2.712	220
2313	.136	100	-.526	215	.268	210	.545	215	-1.846	205
2314	.165	100	-.240	215	.192	215	.833	90	-1.244	15
2315	.170	100	-.171	285	.127	215	.579	115	-.764	220
2316	.165	100	-.144	285	.106	300	.579	90	-.680	295

TABLE 2-11 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
2317	.150	100	-.184	300	.155	300	.547	115	-1.214	295
2318	.113	100	-.170	310	.164	305	.786	110	-2.246	300
2319	.083	90	-.157	320	.186	10	.413	115	-1.687	300
2320	.130	100	-.611	210	.244	200	.458	135	-2.572	210
2321	.163	100	-.719	210	.289	200	.523	205	-2.291	200
2322	.207	100	-.369	210	.225	205	.812	185	-1.567	215
2323	.220	100	-.193	235	.150	215	.599	205	-.888	195
2324	.227	100	-.158	285	.111	215	.650	115	-.622	205
2325	.226	95	-.139	285	.111	300	.631	115	-1.000	300
2326	.204	100	-.168	300	.156	300	.856	80	-1.180	305
2327	.163	95	-.165	305	.177	300	.535	85	-1.668	305
2328	.131	95	-.142	315	.161	305	.492	95	-1.561	300
2329	.192	95	-.640	215	.311	215	.624	95	-2.661	195
2330	.215	100	-.518	215	.215	205	.790	205	-1.345	205
2331	.265	90	-.351	235	.178	200	.688	95	-1.326	210
2332	.285	90	-.189	235	.135	200	.719	80	-.932	195
2333	.302	90	-.150	285	.125	75	.858	80	-.573	295
2334	.297	100	-.127	285	.114	75	.837	80	-.789	320
2335	.277	100	-.133	305	.132	305	.722	100	-1.143	295
2336	.239	90	-.127	320	.132	305	.719	90	-.909	305
2337	.220	90	-.153	315	.173	305	.681	100	-1.965	310
2338	.582	110	-1.161	170	.495	160	1.223	110	-2.955	160
2339	.618	125	-1.358	170	.578	160	1.362	120	-3.056	160
2340	.558	110	-.715	180	.221	170	1.261	120	-1.426	180
2341	.583	110	-.632	180	.232	180	1.312	120	-1.558	180
2342	.590	110	-.751	180	.258	170	1.368	120	-1.805	185
2343	.592	110	-.649	180	.206	175	1.275	110	-1.394	180
2344	.630	130	-.994	175	.364	150	1.154	130	-2.272	160
2345	.582	130	-1.012	175	.408	155	1.197	100	-1.888	165
2346	.566	110	-.760	175	.293	165	1.254	100	-1.540	170
2347	.598	130	-.883	175	.315	155	1.212	135	-1.989	155
2348	.542	130	-.920	170	.394	155	1.195	110	-1.954	160
2349	.553	110	-.685	180	.247	165	1.202	110	-1.368	180
2350	.564	130	-.777	175	.246	135	1.156	135	-1.543	175
2351	.519	125	-.759	175	.303	155	1.245	110	-1.620	165
2352	.488	110	-.733	175	.293	160	1.218	85	-1.410	170
2353	.166	105	-.761	185	.279	190	.841	135	-2.805	175
2354	.179	130	-.784	185	.307	190	.673	140	-2.526	175
2355	.121	100	-.725	180	.336	190	.606	90	-2.446	190
2356	.154	95	-.604	195	.305	185	.588	100	-1.511	185
2357	.165	95	-.589	210	.265	350	.588	95	-1.595	215
2358	.145	95	-.608	345	.290	355	.591	95	-1.549	320
2359	.100	90	-.866	340	.318	355	.591	60	-2.643	310
2360	.136	60	-.764	350	.251	5	.695	60	-2.227	340
2361	.140	60	-.708	350	.242	215	.734	75	-2.150	345
2362	.294	285	-.850	185	.335	185	.584	125	-2.853	180

TABLE 2-12 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
2363	.119	135	-.801	190	.385	180	.635	185	-2.815	185
2364	.153	20	-.723	215	.350	180	.518	170	-2.051	200
2365	.081	95	-.732	215	.300	190	.655	305	-1.714	195
2366	.508	285	-.673	210	.274	195	.928	305	-1.652	205
2367	.145	90	-.519	210	.279	350	.568	350	-1.336	355
2368	.477	90	-.694	350	.360	350	.720	90	-2.679	315
2369	.096	60	-.853	350	.330	350	.626	55	-2.890	350
2370	.677	280	-.814	330	.297	355	.928	305	-2.659	355
2371	.288	80	-.782	240	.347	195	.523	80	-2.611	200
2372	.331	80	-.544	240	.213	195	.612	90	-1.457	200
2373	.228	90	-.261	305	.205	295	.586	95	-2.506	305
2374	.432	280	-.306	310	.269	310	.641	280	-2.116	305
2501	.690	115	-.798	160	.251	145	1.145	115	-1.725	165
2502	.582	100	-.593	165	.210	155	.988	75	-1.392	175
2503	.637	75	-.724	15	.227	20	1.112	75	-1.494	20
2504	.705	65	-.812	20	.279	35	1.199	70	-1.869	20
2505	.884	120	-.741	160	.236	145	1.348	110	-1.625	165
2506	.867	95	-.696	15	.272	155	1.275	95	-1.323	10
2507	.899	80	-.769	15	.312	25	1.406	70	-1.582	160
2508	.891	65	-.744	15	.280	40	1.397	70	-1.548	20
2509	.863	120	-.959	160	.260	170	1.347	115	-2.099	165
2510	.873	95	-.724	165	.318	160	1.329	95	-1.736	175
2511	.880	80	-.881	15	.326	25	1.358	80	-2.142	10
2512	.840	60	-.933	15	.313	40	1.393	60	-3.006	10
2513	.406	75	-.830	170	.330	165	1.165	110	-2.274	165
2514	.630	75	-.736	155	.261	130	1.210	70	-1.837	195
2515	.598	70	-.717	20	.238	50	1.242	70	-1.727	195
2516	.526	60	-1.076	20	.381	25	1.335	70	-2.501	10
2601	.652	140	-1.076	210	.277	205	1.191	85	-1.902	210
2602	.581	95	-1.157	210	.269	205	1.189	90	-2.031	210
2603	.588	160	-.932	215	.298	75	1.035	160	-2.500	70
2604	.807	135	-.839	210	.255	80	1.319	140	-2.324	205
2605	.800	130	-1.107	210	.332	75	1.520	75	-2.245	210
2606	.810	130	-.732	215	.234	210	1.281	105	-1.532	40
2607	.806	145	-.635	50	.283	80	1.348	140	-1.954	20
2608	.858	130	-.727	215	.238	85	1.365	140	-1.550	55
2609	.869	120	-.649	210	.210	205	1.438	120	-1.433	210
2610	.800	140	-.652	40	.275	70	1.270	140	-1.954	20
2611	.795	140	-.654	215	.231	85	1.316	120	-1.560	20
2612	.862	120	-.695	210	.175	105	1.436	120	-1.321	210
2613	.762	145	-.662	20	.251	15	1.301	150	-1.562	30
2614	.747	145	-.653	20	.209	90	1.295	150	-1.384	30
2615	.796	120	-.638	20	.182	105	1.365	120	-1.322	50
2616	.734	145	-.662	20	.238	85	1.334	145	-1.851	30
2617	.799	130	-.654	20	.223	85	1.396	100	-1.338	35
2618	.789	120	-.624	15	.186	105	1.432	120	-1.395	45

TABLE 2-13 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
2619	.744	140	-.655	15	.226	85	1.317	140	-1.672	45
2620	.736	140	-.641	15	.209	85	1.292	110	-1.718	45
2621	.794	120	-.639	15	.175	120	1.352	120	-1.375	45
2622	.752	145	-.775	25	.318	50	1.499	90	-1.777	265
2623	.779	140	-.812	20	.276	55	1.684	100	-1.693	50
2624	.800	125	-.759	20	.209	50	1.360	125	-1.567	50
2625	.724	145	-.686	255	.351	55	1.408	50	-2.372	255
2626	.742	135	-.720	255	.317	55	1.321	140	-1.728	250
2627	.782	135	-.644	20	.214	80	1.415	125	-1.631	50
2628	.512	155	-1.092	215	.299	70	1.122	100	-2.561	65
2701	.579	20	-.812	330	.257	110	1.155	55	-1.686	110
2702	.582	50	-.900	330	.227	100	1.328	85	-1.565	330
2703	.633	50	-.774	335	.371	330	1.258	50	-1.658	335
2704	.761	55	-.715	145	.215	60	1.417	50	-1.460	330
2705	.794	75	-.775	335	.305	110	1.386	80	-1.615	335
2706	.737	35	-.726	330	.341	45	1.520	40	-1.823	335
2707	.815	65	-.592	145	.217	45	1.436	65	-1.070	140
2708	.759	40	-.638	145	.222	95	1.476	85	-1.295	0
2709	.754	40	-.639	145	.273	105	1.360	50	-1.348	130
2710	.740	40	-.619	145	.217	60	1.411	60	-1.203	130
2711	.738	40	-.647	145	.225	95	1.387	45	-1.406	285
2712	.717	40	-.650	140	.254	110	1.340	90	-1.620	190
2713	.743	20	-.571	160	.227	50	1.665	55	-1.361	165
2714	.674	35	-.579	165	.236	50	1.435	55	-1.991	165
2715	.655	20	-.550	165	.232	130	1.271	45	-1.794	160
2716	.571	20	-.751	325	.254	105	1.195	55	-1.961	100
3001	.759	190	-.872	245	.257	225	1.224	195	-1.956	245
3002	.752	180	-.654	255	.280	115	1.220	175	-1.538	55
3003	.757	160	-.957	115	.287	110	1.319	145	-2.422	110
3004	.835	195	-.761	240	.225	225	1.357	195	-1.774	245
3005	.817	180	-.772	115	.335	120	1.336	180	-2.119	100
3006	.815	160	-.818	115	.236	55	1.390	145	-1.879	260
3007	.831	200	-.738	245	.258	250	1.331	200	-1.542	270
3008	.822	180	-.760	245	.296	125	1.385	160	-2.032	100
3009	.810	160	-.787	120	.232	140	1.335	155	-1.690	115
3010	.811	200	-.718	245	.229	220	1.264	200	-1.796	275
3011	.766	180	-.763	115	.296	120	1.244	185	-1.824	100
3012	.807	160	-.782	120	.243	140	1.246	165	-1.656	120
3013	.750	190	-1.284	240	.383	240	1.186	195	-2.891	245
3014	.763	180	-.728	115	.364	120	1.218	165	-1.851	120
3015	.770	165	-.781	120	.243	120	1.307	155	-1.868	110
3016	.802	185	-1.442	240	.263	240	1.245	185	-2.537	240
3017	.825	185	-1.347	240	.343	240	1.296	185	-2.522	240
3018	.825	170	-.907	240	.254	240	1.308	160	-1.760	240
3101	.742	210	-.775	270	.269	265	1.308	220	-2.086	270
3102	.719	200	-.763	270	.293	260	1.281	205	-2.042	260

TABLE 2-14 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
3103	.745	200	-1.081	255	.491	245	1.226	200	-2.714	245
3104	.731	200	-.863	245	.321	240	1.234	185	-1.983	240
3105	.789	185	-.775	110	.339	125	1.359	175	-2.401	110
3106	.764	170	-.766	115	.272	125	1.276	175	-2.380	110
3107	.767	215	-1.980	265	.540	265	1.409	210	-4.529	265
3108	.780	210	-1.143	270	.469	265	1.353	210	-2.680	265
3109	.780	190	-.611	100	.251	110	1.367	185	-1.663	275
3110	.787	185	-.692	105	.306	115	1.328	185	-1.670	70
3111	.768	170	-.727	110	.344	120	1.417	185	-3.112	60
3112	.749	170	-.769	115	.269	55	1.330	185	-2.147	115
3113	.744	215	-1.019	265	.249	235	1.336	210	-1.938	345
3114	.792	210	-1.093	265	.304	245	1.372	210	-2.325	255
3115	.729	190	-1.109	265	.306	255	1.250	190	-1.993	265
3116	.742	185	-.761	265	.294	115	1.321	185	-1.744	265
3117	.724	180	-.789	110	.304	120	1.308	185	-2.206	110
3118	.739	160	-.788	110	.268	125	1.304	170	-2.329	110
3119	.733	215	-.798	265	.260	235	1.341	220	-1.886	90
3120	.719	210	-.803	265	.291	240	1.311	210	-1.758	265
3121	.688	185	-.806	265	.274	245	1.292	210	-1.628	265
3122	.726	185	-.797	265	.234	110	1.281	190	-1.586	265
3123	.734	185	-.817	100	.260	115	1.318	190	-1.874	110
3124	.663	165	-1.018	105	.342	115	1.309	165	-2.452	105
3125	.777	210	-1.027	255	.390	250	1.336	195	-2.560	240
3126	.812	220	-1.977	265	.649	255	1.393	220	-3.768	265
3127	.787	210	-.856	270	.291	270	1.282	210	-2.241	265
3128	.769	210	-.695	270	.272	270	1.346	195	-2.058	270
3129	.757	190	-.611	270	.217	110	1.300	200	-1.511	270
3130	.773	205	-.709	270	.252	265	1.302	200	-1.671	270
3131	.764	215	-1.502	260	.413	255	1.269	220	-3.632	270
3132	.766	205	-1.453	265	.454	255	1.290	200	-3.116	265
3133	.759	210	-.888	270	.333	260	1.326	195	-1.956	270
3134	.797	215	-1.322	265	.349	240	1.373	215	-2.463	260
3135	.769	210	-1.427	265	.392	250	1.287	210	-2.570	270
3136	.731	190	-.758	105	.262	265	1.269	195	-1.644	270
3137	.758	210	-1.150	265	.313	240	1.390	210	-2.256	260
3138	.771	210	-1.240	265	.380	240	1.278	210	-2.800	260
3139	.754	200	-1.005	265	.314	255	1.255	190	-2.005	265
3140	.713	170	-.837	265	.249	110	1.325	170	-1.665	255
3141	.741	170	-.785	105	.305	120	1.260	175	-1.729	270
3142	.746	155	-.798	105	.312	60	1.281	155	-2.338	70
3201	.697	210	-.782	265	.299	235	1.325	215	-2.139	255
3202	.735	210	-.786	265	.316	240	1.266	210	-2.085	255
3203	.663	200	-.725	265	.270	245	1.201	185	-1.761	265
3204	.656	185	-.679	265	.232	250	1.208	185	-1.466	260
3205	.652	180	-.720	100	.271	110	1.235	185	-1.594	270
3206	.656	165	-.914	105	.303	115	1.224	170	-1.932	105

TABLE 2-15 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
3207	.653	155	-1.247	105	.521	120	1.279	165	-2.635	110
3208	.658	145	-.898	95	.521	100	1.280	130	-3.212	115
3209	.664	145	-.773	90	.333	100	1.164	140	-2.579	95
3210	.655	215	-.704	265	.251	230	1.196	205	-1.644	265
3211	.647	210	-.703	260	.315	240	1.368	200	-1.913	255
3212	.657	200	-.695	260	.259	250	1.333	200	-1.632	260
3213	.647	185	-.672	265	.235	250	1.260	185	-1.570	260
3214	.662	170	-.661	90	.230	260	1.281	185	-1.509	270
3215	.661	170	-.615	90	.234	115	1.274	185	-1.555	110
3216	.655	155	-.572	80	.204	260	1.252	170	-1.471	100
3217	.611	140	-.760	90	.280	100	1.227	165	-1.834	90
3218	.635	140	-1.095	100	.466	110	1.181	140	-3.561	110
3219	.628	145	-.753	100	.350	115	1.141	130	-1.802	85
3220	.543	215	-.692	260	.260	230	1.157	220	-2.057	275
3221	.572	210	-.718	265	.289	240	1.171	205	-2.030	270
3222	.585	200	-.723	265	.267	240	1.219	205	-2.117	270
3223	.600	205	-.710	265	.264	245	1.199	185	-1.894	265
3224	.592	200	-.636	265	.256	260	1.151	185	-1.701	260
3225	.603	175	-.610	270	.254	260	1.251	170	-1.687	265
3226	.613	175	-.602	275	.226	260	1.272	160	-1.309	265
3227	.604	165	-.580	90	.221	265	1.192	155	-1.449	275
3228	.599	155	-.598	90	.248	110	1.146	155	-1.404	100
3229	.588	145	-.603	90	.259	115	1.114	140	-1.400	110
3230	.597	140	-.594	280	.253	115	1.160	140	-1.850	10
3231	.462	210	-.755	260	.316	350	.992	210	-2.905	350
3232	.524	210	-.739	265	.252	265	1.040	210	-2.344	275
3233	.543	210	-.680	265	.258	265	1.107	180	-1.915	275
3234	.550	195	-.624	275	.248	265	1.179	180	-1.633	265
3235	.548	175	-.617	275	.240	265	1.195	180	-1.524	270
3236	.547	175	-.593	275	.212	265	1.157	180	-1.452	300
3237	.542	165	-.582	275	.193	270	1.096	180	-1.532	85
3238	.562	145	-.559	275	.196	120	1.085	150	-1.823	10
3239	.551	145	-.568	290	.226	120	1.080	140	-1.951	90
3240	.331	200	-.707	260	.256	265	.836	190	-2.611	270
3241	.466	200	-.705	265	.262	265	1.004	195	-2.093	265
3242	.507	200	-.633	270	.244	265	1.170	190	-1.704	270
3243	.502	200	-.589	275	.219	265	1.059	190	-1.386	270
3244	.494	180	-.589	275	.221	270	1.050	165	-1.529	275
3245	.481	165	-.567	285	.247	85	1.050	155	-1.523	305
3246	.493	165	-.587	75	.253	85	1.038	160	-1.600	75
3247	.532	140	-.570	310	.231	85	1.044	160	-2.406	80
3248	.539	140	-.603	285	.214	85	1.024	140	-2.353	80
3249	.343	205	-.700	260	.267	260	.985	160	-2.459	345
3250	.431	205	-.641	260	.254	260	.939	200	-2.251	260
3251	.482	205	-.623	275	.219	270	1.005	175	-1.744	270
3252	.489	205	-.620	275	.214	270	1.046	175	-1.372	275

TABLE 2-16 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
3253	.466	210	-.604	280	.228	80	1.072	200	-1.379	80
3254	.438	170	-.579	285	.238	80	1.089	200	-1.631	75
3255	.457	145	-.600	350	.256	85	.995	180	-1.689	75
3256	.496	145	-.602	315	.247	90	1.104	140	-2.450	75
3257	.486	145	-.645	310	.221	80	1.108	140	-1.873	85
3258	.303	205	-.651	270	.238	260	.954	170	-2.286	265
3259	.386	205	-.645	270	.230	265	1.109	170	-2.082	270
3260	.452	210	-.643	275	.234	270	1.193	170	-1.826	280
3261	.465	195	-.594	275	.206	270	1.065	200	-1.358	275
3262	.407	200	-.582	285	.189	85	.856	200	-1.436	280
3263	.399	175	-.581	285	.238	85	1.014	180	-1.264	80
3264	.397	165	-.603	345	.262	80	.917	165	-1.872	80
3265	.520	140	-.654	310	.248	80	1.057	140	-2.537	75
3266	.526	140	-.656	310	.218	310	1.072	140	-2.108	80
3267	.287	205	-.648	275	.242	260	.746	210	-2.360	280
3268	.372	205	-.676	275	.241	270	.909	200	-2.347	275
3269	.520	200	-.583	275	.220	275	1.048	200	-1.614	275
3270	.438	200	-.519	285	.206	275	.858	170	-1.480	275
3271	.413	175	-.661	280	.236	270	1.006	210	-1.351	275
3272	.381	170	-.646	305	.268	80	.847	185	-2.096	80
3273	.390	170	-.667	345	.279	80	.955	80	-1.786	355
3274	.425	140	-.759	315	.298	80	.946	170	-2.447	90
3275	.436	140	-.816	315	.279	75	1.046	165	-2.637	70
3276	.276	210	-.676	270	.289	270	.890	185	-2.931	270
3277	.356	210	-.667	275	.278	270	.904	185	-2.247	275
3278	.390	210	-.662	280	.259	270	.974	185	-1.994	275
3279	.408	210	-.700	285	.235	275	1.067	205	-2.603	300
3280	.371	210	-.693	285	.226	275	1.008	205	-1.481	280
3281	.327	210	-.627	290	.226	75	.900	205	-1.502	300
3282	.308	170	-.590	345	.261	355	.743	205	-2.094	80
3283	.344	135	-.761	320	.298	355	.849	175	-2.745	75
3284	.377	135	-.794	315	.296	75	.903	150	-2.484	350
3285	.275	210	-.606	285	.273	270	.811	215	-2.492	270
3286	.322	210	-.643	285	.282	270	.949	215	-2.585	270
3287	.352	210	-.701	285	.263	275	.966	220	-1.809	280
3288	.334	210	-.709	285	.252	275	.962	215	-2.167	280
3289	.306	205	-.659	305	.227	280	.899	215	-1.434	300
3290	.251	205	-.592	305	.216	280	.761	220	-1.376	305
3291	.223	170	-.546	345	.267	345	.701	210	-1.726	345
3292	.274	140	-.700	325	.299	355	.727	140	-2.275	345
3293	.330	140	-.732	325	.276	315	.838	145	-2.480	80
3294	.229	210	-.632	285	.236	275	.809	215	-2.575	285
3295	.271	215	-.647	285	.258	275	.926	165	-2.460	305
3296	.282	205	-.703	285	.249	275	.789	215	-2.247	305
3297	.274	205	-.694	305	.229	275	.860	210	-1.604	285
3298	.235	205	-.646	305	.220	280	.887	230	-1.604	285

TABLE 2-17 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
3299	.209	210	-.503	305	.207	280	1.068	215	-1.838	55
3300	.152	175	-.494	345	.249	355	.714	215	-1.659	355
3301	.239	135	-.598	325	.305	355	.755	135	-2.423	355
3302	.303	135	-.626	325	.279	355	.963	145	-2.487	325
3303	.219	210	-.660	285	.230	280	.819	215	-2.581	265
3304	.235	210	-.689	285	.234	280	.819	215	-2.264	285
3305	.202	215	-.738	285	.258	275	.928	180	-2.057	305
3306	.182	215	-.606	285	.217	275	.668	215	-1.591	275
3307	.159	170	-.454	310	.200	285	.622	225	-1.322	310
3308	.141	170	-.366	325	.169	285	.558	215	-1.130	70
3309	.110	130	-.391	345	.194	350	.712	230	-1.582	65
3310	.168	135	-.452	350	.238	355	.661	145	-1.551	350
3311	.229	135	-.401	350	.231	355	.807	145	-1.886	355
3312	.164	210	-.689	285	.232	275	.652	215	-2.251	305
3313	.177	210	-.721	285	.291	280	1.026	195	-2.448	280
3314	.215	170	-.707	285	.270	280	.672	215	-1.791	280
3315	.249	165	-.509	305	.209	285	.647	170	-1.562	320
3316	.264	170	-.423	325	.186	285	.662	240	-1.625	320
3317	.235	170	-.309	330	.155	65	.871	130	-1.051	320
3318	.177	170	-.375	65	.196	70	.539	165	-1.376	65
3319	.136	130	-.362	350	.216	355	.505	130	-1.454	355
3320	.190	130	-.347	350	.197	355	.625	130	-1.313	330
3321	.182	210	-.670	285	.282	285	.694	205	-2.557	290
3322	.211	210	-.744	285	.319	285	.653	210	-2.761	310
3323	.280	160	-.617	305	.241	280	.755	155	-2.009	320
3324	.319	165	-.454	305	.200	310	.735	170	-1.590	305
3325	.356	175	-.404	325	.190	310	1.002	200	-1.437	320
3326	.344	175	-.265	325	.160	65	.839	165	-1.085	35
3327	.288	175	-.346	65	.205	70	.715	165	-1.528	60
3328	.193	175	-.377	350	.206	335	.581	165	-1.597	355
3329	.168	130	-.379	350	.183	355	.765	155	-1.304	355
3330	.254	215	-.825	285	.413	280	1.019	155	-3.924	280
3331	.313	155	-.684	285	.306	280	1.017	155	-2.448	280
3332	.399	165	-.469	305	.256	285	1.055	155	-1.981	275
3333	.419	165	-.387	325	.219	305	1.039	145	-1.401	275
3334	.428	170	-.334	320	.190	305	1.066	180	-1.327	315
3335	.411	175	-.237	330	.193	65	1.048	180	-1.158	65
3336	.381	175	-.310	350	.192	65	.958	180	-1.127	65
3337	.316	175	-.364	350	.181	70	.979	175	-1.403	70
3338	.151	175	-.341	340	.194	330	.655	130	-1.232	65
3339	.711	155	-1.172	100	.592	115	1.249	155	-3.264	110
3340	.711	155	-.689	90	.308	115	1.226	170	-1.662	95
3341	.730	155	-.644	90	.252	90	1.336	155	-1.629	100
3342	.721	155	-.670	90	.242	90	1.308	155	-1.782	85
3343	.706	135	-1.070	95	.510	110	1.348	135	-2.654	95
3344	.719	155	-.578	275	.215	90	1.301	155	-1.398	95

TABLE 2-18 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
3345	.719	155	-.666	90	.241	95	1.305	160	-1.613	90
3346	.706	155	-.850	90	.366	105	1.266	155	-2.042	90
3347	.695	140	-.939	95	.397	115	1.194	135	-2.877	100
3348	.702	160	-.593	85	.200	95	1.317	160	-1.407	275
3349	.681	155	-.848	95	.387	110	1.291	155	-2.035	90
3350	.681	155	-.612	90	.229	265	1.298	155	-1.450	265
3351	.666	155	-.691	95	.336	110	1.271	155	-1.740	100
3352	.656	135	-.666	95	.310	115	1.194	135	-1.757	295
3353	.606	10	-.610	315	.237	275	.893	10	-1.834	320
3354	.639	10	-.815	285	.310	275	.923	10	-2.431	295
3355	.250	175	-.419	335	.231	330	.735	175	-1.822	65
3356	.470	280	-.389	350	.232	330	.798	270	-1.307	330
3501	.652	215	-.510	265	.191	240	1.183	215	-1.168	260
3502	.529	210	-.530	80	.182	85	1.010	210	-1.302	275
3503	.486	190	-.613	85	.177	90	1.027	185	-1.342	85
3504	.482	175	-.776	90	.169	100	1.041	210	-1.429	90
3505	.515	160	-.787	95	.183	110	.976	155	-1.504	90
3506	.642	145	-.754	95	.183	120	1.120	145	-1.571	90
3507	.927	215	-.744	265	.201	240	1.385	220	-1.713	265
3508	.876	195	-.852	265	.241	250	1.424	200	-1.844	265
3509	.897	180	-.684	90	.252	260	1.399	200	-1.517	265
3510	.894	180	-.825	90	.246	100	1.366	170	-1.515	95
3511	.870	155	-.849	95	.261	110	1.319	170	-1.610	90
3512	.903	145	-.834	95	.218	120	1.343	145	-1.602	90
3513	.876	220	-.880	265	.239	260	1.307	215	-2.055	260
3514	.870	195	-.880	265	.347	260	1.375	200	-2.251	270
3515	.941	190	-.880	270	.377	265	1.406	180	-1.987	275
3516	.895	175	-.798	85	.271	95	1.393	180	-1.805	90
3517	.876	155	-1.113	90	.374	100	1.309	175	-1.986	90
3518	.904	145	-1.078	100	.254	100	1.382	145	-2.335	100
3519	.864	225	-.536	310	.234	250	1.336	215	-1.806	265
3520	.863	190	-.633	270	.290	265	1.318	215	-1.717	270
3521	.908	190	-.655	270	.266	260	1.411	180	-1.711	270
3522	.847	175	-.739	80	.241	85	1.370	175	-1.526	110
3523	.750	180	-.884	85	.291	85	1.341	160	-2.082	245
3524	.499	180	-1.254	90	.465	95	1.191	160	-2.913	90
3601	.844	225	-.557	310	.216	255	1.345	190	-1.247	275
3602	.826	215	-.560	310	.234	255	1.445	190	-1.262	275
3603	.831	190	-.573	310	.253	260	1.440	190	-1.461	260
3604	.858	235	-.597	310	.298	165	1.341	230	-1.396	40
3605	.868	225	-.626	315	.389	165	1.660	175	-1.169	340
3606	.855	225	-.654	140	.279	170	1.394	190	-1.404	110
3607	.782	230	-.588	310	.349	170	1.326	235	-1.477	110
3608	.798	220	-.576	310	.289	175	1.332	190	-1.371	340
3609	.819	220	-.599	310	.174	185	1.406	200	-1.062	340
3610	.757	230	-.583	120	.267	170	1.321	240	-1.494	110

TABLE 2-19 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
3611	.794	230	-.562	310	.249	175	1.295	220	-1.187	340
3612	.810	210	-.571	310	.168	260	1.332	210	-1.060	340
3613	.690	230	-.612	340	.212	115	1.181	240	-1.477	340
3614	.759	230	-.616	340	.262	255	1.279	210	-1.722	90
3615	.789	210	-.578	340	.195	260	1.392	240	-1.286	110
3616	.865	185	-.856	140	.402	165	1.492	170	-1.842	150
3701	.522	110	-1.115	205	.417	205	1.011	150	-3.458	210
3702	.592	180	-.828	55	.275	205	1.177	180	-1.976	55
3703	.640	130	-.871	55	.279	55	1.147	130	-2.048	55
3704	.819	130	-.763	220	.254	210	1.374	155	-1.387	215
3705	.799	140	-.836	50	.317	205	1.549	180	-1.797	55
3706	.788	120	-.779	50	.257	215	1.281	145	-1.606	255
3707	.848	125	-.726	210	.179	165	1.376	120	-1.319	210
3708	.844	125	-.828	210	.243	185	1.331	110	-1.456	215
3709	.838	125	-.777	215	.362	200	1.329	110	-1.687	210
3710	.847	125	-.764	210	.176	110	1.391	160	-1.465	210
3711	.829	120	-.799	210	.237	205	1.312	130	-1.582	215
3712	.831	120	-.709	215	.320	200	1.290	120	-1.645	250
3713	.806	120	-.660	210	.176	105	1.463	130	-1.325	210
3714	.793	120	-.647	215	.207	180	1.375	130	-1.326	215
3715	.783	125	-.655	245	.243	200	1.373	130	-1.887	245
3716	.839	125	-.691	215	.201	95	1.373	120	-1.702	50
3717	.851	125	-.687	245	.236	185	1.352	120	-1.434	50
3718	.831	125	-.662	20	.256	195	1.330	125	-1.895	240
3719	.799	125	-.686	20	.232	125	1.367	155	-1.414	55
3720	.795	125	-.689	20	.230	185	1.499	165	-1.387	235
3721	.790	125	-.684	250	.260	195	1.334	115	-1.897	245
3722	.761	145	-.712	20	.194	50	1.380	130	-1.496	20
3723	.742	125	-.756	20	.212	180	1.344	130	-1.745	250
3724	.736	125	-.736	245	.249	200	1.318	130	-1.854	250
3725	.830	125	-.635	210	.209	50	1.467	140	-1.342	5
3726	.802	125	-.775	20	.297	55	1.432	115	-2.401	55
3727	.775	125	-.776	10	.372	210	1.340	115	-3.404	55
3728	.467	95	-1.017	210	.298	200	1.122	100	-2.327	215
4001	.724	80	-1.333	20	.570	25	1.324	55	-3.034	25
4002	.673	75	-.903	5	.401	50	1.459	55	-2.619	10
4003	.604	255	-.742	200	.257	205	1.107	255	-1.680	195
4004	.696	240	-.893	200	.253	215	1.224	240	-1.938	190
4005	.893	300	-.824	335	.218	320	1.345	290	-1.929	340
4006	.925	280	-.836	340	.299	330	1.359	280	-1.893	190
4007	.914	260	-.853	205	.311	335	1.531	275	-2.277	340
4008	.916	245	-.864	205	.247	220	1.476	240	-1.678	200
4009	.890	290	-.875	335	.242	325	1.372	290	-1.861	335
4010	.909	280	-.852	335	.367	330	1.360	275	-2.174	340
4011	.902	265	-.858	205	.332	210	1.422	265	-2.041	200
4012	.859	245	-.869	205	.247	220	1.342	250	-1.866	205

TABLE 2-20 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
4013	.869	290	-.886	335	.282	325	1.365	280	-1.830	330
4014	.889	280	-.899	335	.394	330	1.449	280	-2.203	200
4015	.885	260	-.793	205	.373	210	1.439	275	-1.822	205
4016	.875	250	-.840	205	.275	220	1.454	250	-2.619	195
4017	.857	290	-.874	335	.280	320	1.323	280	-1.824	185
4018	.869	270	-.808	335	.352	330	1.379	270	-1.951	195
4019	.835	245	-.773	205	.257	115	1.330	235	-2.209	190
4020	.836	290	-.835	335	.246	50	1.293	275	-2.363	50
4021	.840	265	-.823	335	.326	330	1.382	255	-2.075	125
4022	.856	250	-.778	205	.277	120	1.457	255	-1.829	125
4023	.823	285	-.767	335	.235	30	1.275	285	-1.866	15
4024	.810	265	-.811	335	.296	325	1.289	260	-2.098	340
4025	.810	250	-.746	205	.234	340	1.334	245	-2.126	345
4026	.786	285	-.812	335	.212	315	1.344	285	-2.020	350
4027	.788	265	-.815	340	.302	325	1.256	285	-1.927	345
4028	.776	250	-.769	340	.238	340	1.275	250	-1.931	200
4029	.742	285	-.878	335	.244	320	1.259	285	-2.030	330
4030	.719	265	-.856	335	.310	325	1.250	260	-1.949	335
4031	.735	255	-1.382	210	.440	205	1.360	250	-3.529	200
4032	.812	290	-.889	335	.250	315	1.366	280	-1.891	335
4033	.841	270	-.901	335	.328	325	1.441	270	-2.237	335
4034	.849	255	-.917	205	.246	225	1.487	250	-2.344	200
4101	.760	275	-.803	335	.256	50	1.377	285	-2.602	335
4102	.810	265	-.823	340	.340	325	1.341	275	-2.030	335
4103	.776	265	-.870	205	.319	205	1.380	265	-2.053	200
4104	.762	250	-1.133	200	.543	205	1.340	250	-3.185	205
4105	.736	250	-.966	180	.305	195	1.307	250	-2.343	195
4106	.738	240	-.927	180	.278	185	1.328	240	-2.065	180
4107	.723	285	-.785	340	.256	320	1.298	290	-2.257	330
4108	.760	265	-.785	340	.325	325	1.295	265	-1.996	340
4109	.777	265	-.751	350	.277	330	1.277	265	-1.775	350
4110	.790	250	-.734	350	.243	340	1.383	265	-1.750	350
4111	.753	250	-1.193	185	.466	190	1.398	265	-2.591	190
4112	.714	235	-1.864	190	.499	200	1.404	245	-3.877	190
4113	.688	285	-.813	340	.250	320	1.184	275	-2.152	335
4114	.743	275	-.845	340	.303	325	1.288	275	-2.038	340
4115	.766	265	-.897	180	.278	195	1.334	270	-1.981	340
4116	.699	260	-1.079	185	.336	200	1.327	275	-2.155	190
4117	.741	240	-1.010	190	.298	210	1.400	240	-2.173	195
4118	.712	240	-.980	185	.256	215	1.380	240	-2.026	355
4119	.661	285	-1.043	340	.330	335	1.379	285	-2.562	340
4120	.703	265	-.884	350	.254	335	1.342	265	-1.763	340
4121	.716	265	-.833	350	.253	200	1.348	270	-1.780	185
4122	.694	250	-.794	190	.275	205	1.242	270	-1.626	190
4123	.670	250	-.798	190	.319	210	1.171	265	-1.852	195
4124	.651	230	-.797	190	.276	215	1.243	245	-1.937	355

TABLE 2-21 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
4125	.776	245	-.956	195	.413	200	1.416	245	-3.241	200
4126	.793	250	-.731	345	.269	335	1.379	245	-1.805	335
4127	.815	250	-.738	180	.308	180	1.427	250	-2.148	180
4128	.792	250	-.880	180	.316	180	1.440	245	-2.082	180
4129	.819	230	-2.162	185	.701	195	1.485	230	-3.733	190
4130	.811	250	-.738	180	.367	190	1.448	250	-3.018	190
4131	.816	250	-.998	180	.361	185	1.412	240	-2.084	350
4132	.797	240	-1.595	185	.472	195	1.440	240	-2.851	185
4133	.814	230	-1.677	190	.443	200	1.396	240	-3.467	185
4134	.799	250	-.838	180	.296	185	1.347	255	-2.007	350
4135	.784	250	-1.629	185	.451	195	1.372	245	-3.033	185
4136	.800	230	-1.451	185	.368	195	1.329	235	-3.058	195
4137	.792	250	-1.159	185	.374	195	1.299	270	-2.088	185
4138	.767	250	-1.348	185	.367	195	1.371	240	-2.624	185
4139	.781	230	-1.230	185	.288	180	1.382	230	-2.198	190
4140	.769	285	-.913	340	.261	335	1.274	285	-2.233	335
4141	.739	285	-.904	340	.293	335	1.231	280	-2.139	340
4142	.718	260	-.909	185	.314	195	1.266	260	-1.713	185
4201	.610	310	-.862	355	.312	340	1.175	300	-2.539	340
4202	.576	300	-1.052	350	.693	340	1.186	290	-3.553	335
4203	.634	290	-1.436	340	.511	330	1.255	290	-3.425	340
4204	.586	280	-1.041	340	.294	335	1.201	275	-2.143	335
4205	.557	270	-.819	340	.251	335	1.205	260	-1.806	185
4206	.583	260	-.774	185	.274	200	1.253	260	-1.532	185
4207	.641	260	-.762	185	.281	205	1.280	260	-1.574	195
4208	.609	235	-.736	190	.312	210	1.300	255	-1.541	10
4209	.576	235	-.749	190	.269	215	1.161	255	-1.952	180
4210	.518	300	-1.677	345	.687	340	1.130	310	-4.389	340
4211	.616	295	-.951	355	.346	345	1.200	290	-2.200	345
4212	.610	280	-.674	5	.192	190	1.138	280	-1.500	5
4213	.590	280	-.710	180	.240	340	1.139	275	-1.643	345
4214	.583	280	-.759	355	.252	340	1.139	265	-1.551	180
4215	.615	265	-.744	355	.263	200	1.159	255	-1.541	190
4216	.603	255	-.750	190	.293	205	1.258	250	-1.943	190
4217	.559	240	-.776	190	.287	210	1.238	250	-1.766	190
4218	.563	230	-.746	190	.278	215	1.262	230	-1.675	200
4219	.524	300	-.878	340	.406	335	1.173	300	-2.606	335
4220	.556	285	-.813	345	.355	335	1.283	300	-1.814	335
4221	.592	285	-.838	345	.341	335	1.231	300	-1.918	340
4222	.593	285	-.836	345	.296	340	1.182	285	-1.739	345
4223	.581	285	-.705	0	.228	195	1.222	285	-1.645	180
4224	.501	285	-.714	180	.256	195	1.114	260	-1.696	180
4225	.472	245	-.752	185	.256	200	1.017	240	-1.638	185
4226	.528	245	-.748	185	.290	205	1.092	240	-1.873	180
4227	.588	240	-.729	190	.308	205	1.167	240	-1.919	195
4228	.538	240	-.735	190	.326	210	1.211	255	-2.291	180

TABLE 2-22 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
4229	.510	230	-.752	190	.312	215	1.104	225	-2.273	185
4230	.329	300	-.694	165	.240	335	.953	310	-1.870	345
4231	.469	280	-.686	170	.281	335	1.090	295	-1.677	350
4232	.479	285	-.709	170	.252	340	1.098	275	-1.532	345
4233	.446	285	-.747	170	.229	190	1.028	275	-1.590	185
4234	.428	285	-.735	180	.237	190	1.013	275	-1.610	185
4235	.491	245	-.720	185	.259	205	1.113	250	-1.667	185
4236	.575	240	-.800	185	.354	205	1.407	245	-1.988	185
4237	.584	240	-.773	185	.392	210	1.308	235	-2.000	200
4238	.547	230	-.750	185	.317	215	1.241	235	-2.541	190
4239	.325	280	-.778	125	.270	125	1.006	275	-2.094	120
4240	.411	275	-.740	10	.256	335	1.082	275	-2.175	115
4241	.471	280	-.764	10	.261	180	1.055	275	-1.859	345
4242	.477	285	-.769	165	.259	190	1.050	280	-1.739	0
4243	.456	285	-.795	175	.271	190	1.103	255	-1.701	185
4244	.462	245	-.838	180	.252	195	1.169	240	-2.032	180
4245	.504	250	-.831	180	.285	205	1.286	240	-1.988	185
4246	.498	250	-.797	180	.383	210	1.329	240	-1.979	180
4247	.424	245	-.780	180	.335	215	1.205	240	-1.827	180
4248	.268	275	-.761	5	.302	120	.988	280	-2.590	120
4249	.382	275	-.772	5	.273	115	1.148	280	-2.063	15
4250	.436	280	-.820	10	.265	180	1.133	285	-2.046	30
4251	.457	285	-.807	5	.266	180	1.229	285	-1.744	350
4252	.440	280	-.836	170	.297	185	1.070	280	-1.749	185
4253	.434	235	-.877	180	.268	190	.985	255	-2.090	180
4254	.468	235	-.883	180	.254	190	1.100	235	-2.059	200
4255	.471	235	-.845	180	.306	210	1.277	250	-2.435	180
4256	.409	235	-.821	180	.326	215	1.142	255	-2.561	195
4257	.247	275	-.780	5	.325	120	.903	275	-2.772	125
4258	.352	275	-.812	5	.283	115	1.020	275	-2.722	30
4259	.407	280	-.885	5	.247	175	1.052	275	-2.038	10
4260	.424	280	-.802	5	.294	180	1.088	270	-1.695	30
4261	.392	280	-.802	165	.313	185	1.072	285	-1.554	180
4262	.401	240	-.860	180	.279	190	1.049	235	-2.058	180
4263	.433	245	-.913	180	.273	190	1.234	235	-2.763	180
4264	.445	245	-.905	180	.274	215	1.118	235	-2.242	185
4265	.377	245	-.861	180	.284	215	1.141	240	-2.305	185
4266	.217	275	-.777	5	.328	120	.903	265	-3.203	15
4267	.347	275	-.898	5	.290	15	1.208	275	-2.603	15
4268	.389	275	-.875	5	.283	15	1.211	275	-2.251	15
4269	.374	275	-.687	160	.277	175	1.089	275	-1.614	30
4270	.312	250	-.730	165	.323	180	.856	275	-1.862	165
4271	.340	235	-.944	165	.349	180	.885	225	-2.264	35
4272	.348	240	-.947	175	.340	180	.957	255	-2.509	180
4273	.343	240	-.974	180	.282	180	1.103	255	-2.454	180
4274	.299	240	-.910	180	.242	180	1.012	255	-2.087	185

TABLE 2-23 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
4275	.181	275	-.715	5	.268	25	.852	275	-3.109	25
4276	.264	275	-.769	5	.312	20	.955	270	-2.833	20
4277	.285	280	-.551	0	.276	20	.869	275	-1.757	20
4278	.276	280	-.585	130	.260	165	.859	285	-1.335	145
4279	.279	250	-.706	150	.305	165	.821	285	-1.618	150
4280	.301	250	-.741	160	.303	175	.888	290	-1.929	35
4281	.315	250	-.923	165	.365	180	.903	225	-2.164	185
4282	.290	240	-.994	180	.297	185	.909	240	-2.878	180
4283	.275	235	-.934	180	.270	185	.925	240	-2.908	160
4284	.154	275	-.640	5	.293	355	.908	260	-2.655	355
4285	.208	275	-.615	5	.278	355	.986	265	-2.179	15
4286	.222	275	-.398	355	.235	150	.971	265	-1.883	40
4287	.216	280	-.545	135	.267	150	.858	265	-1.354	40
4288	.216	250	-.678	135	.289	165	.973	320	-1.578	130
4289	.237	250	-.724	130	.369	165	.865	240	-1.621	135
4290	.230	250	-.843	165	.395	170	.851	240	-2.450	165
4291	.213	240	-1.069	165	.391	180	.871	260	-3.590	180
4292	.200	235	-.942	165	.321	180	.893	260	-3.021	180
4293	.134	275	-.589	0	.253	350	.679	265	-2.152	350
4294	.170	280	-.407	5	.205	0	.643	280	-2.040	25
4295	.180	280	-.319	25	.213	140	.616	270	-1.344	40
4296	.183	250	-.402	135	.242	140	.990	250	-1.250	25
4297	.179	250	-.587	135	.285	150	.770	145	-1.519	135
4298	.181	250	-.702	135	.292	150	.806	265	-1.599	135
4299	.177	250	-.762	130	.382	165	.855	160	-2.089	140
4300	.148	230	-1.024	165	.430	180	.945	145	-3.294	165
4301	.142	230	-1.005	165	.368	180	.783	225	-2.874	165
4302	.092	275	-.303	350	.180	70	.505	285	-1.677	20
4303	.121	275	-.300	350	.200	70	.691	180	-1.767	70
4304	.129	260	-.306	50	.160	30	.536	255	-1.613	255
4305	.125	260	-.250	30	.204	140	.590	125	-.947	135
4306	.123	255	-.411	135	.252	145	1.092	130	-1.170	145
4307	.131	255	-.595	130	.271	150	.688	120	-1.532	140
4308	.133	230	-.728	130	.315	155	.647	155	-2.360	125
4309	.119	230	-.695	145	.343	160	.673	180	-2.305	150
4310	.101	230	-.728	170	.344	170	.831	300	-3.200	155
4311	.145	135	-.267	355	.163	70	.589	140	-1.893	40
4312	.112	135	-.267	355	.172	40	.610	140	-2.476	40
4313	.130	260	-.283	50	.160	40	.589	140	-1.327	45
4314	.142	260	-.248	45	.168	135	.811	250	-1.067	30
4315	.156	265	-.182	30	.224	140	.637	160	-1.161	140
4316	.162	265	-.403	130	.267	145	.606	140	-1.381	130
4317	.124	225	-.726	130	.309	145	.548	185	-2.127	150
4318	.111	230	-.708	140	.292	145	.952	315	-4.171	115
4319	.128	230	-.626	140	.278	200	.685	230	-2.099	145
4320	.168	135	-.267	0	.166	45	.604	140	-1.249	30

TABLE 2-24 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
4321	.133	135	-.276	0	.189	45	.542	140	-1.586	50
4322	.176	255	-.252	50	.161	40	.682	245	-1.255	30
4323	.215	255	-.209	40	.132	40	.620	255	-.870	25
4324	.238	255	-.159	30	.172	135	.738	255	-.966	130
4325	.199	255	-.250	130	.233	140	.773	150	-1.144	140
4326	.145	260	-.647	130	.300	140	.512	200	-2.062	130
4327	.143	225	-.707	140	.317	145	.477	230	-2.574	125
4328	.162	225	-.597	140	.259	145	.636	225	-2.220	125
4329	.177	140	-.291	0	.177	45	.612	140	-1.520	25
4330	.200	280	-.252	50	.175	40	.690	280	-1.286	35
4331	.264	280	-.242	45	.169	40	.769	280	-1.395	50
4332	.300	280	-.186	45	.128	40	.769	280	-.896	25
4333	.280	280	-.142	40	.158	140	.801	255	-1.009	140
4334	.270	250	-.170	105	.205	130	.825	250	-1.035	125
4335	.239	250	-.436	130	.363	140	1.039	145	-1.934	160
4336	.200	250	-.645	140	.320	140	.736	250	-3.007	135
4337	.194	225	-.655	140	.345	140	.695	225	-3.053	130
4338	.665	285	-1.396	345	.679	335	1.330	300	-3.101	340
4339	.653	310	-1.598	350	.738	345	1.219	305	-4.522	345
4340	.668	295	-.804	0	.229	350	1.311	285	-1.880	5
4341	.693	285	-.773	5	.250	335	1.351	270	-2.072	5
4342	.711	285	-.776	0	.365	335	1.439	270	-2.157	335
4343	.695	290	-.804	5	.227	355	1.323	290	-1.664	355
4344	.641	300	-1.455	340	.602	335	1.218	290	-4.272	340
4345	.660	300	-1.226	350	.495	340	1.283	290	-2.327	350
4346	.678	290	-.846	0	.279	345	1.250	290	-1.691	355
4347	.624	305	-1.256	340	.481	335	1.298	295	-3.282	335
4348	.625	295	-1.242	350	.541	340	1.394	295	-2.753	340
4349	.680	280	-.754	5	.233	350	1.283	285	-1.610	5
4350	.587	305	-.990	350	.363	335	1.276	295	-2.749	340
4351	.620	300	-1.136	345	.462	340	1.297	270	-2.825	340
4352	.656	285	-.867	355	.362	345	1.490	270	-2.908	345
4353	.234	275	-.815	5	.317	120	.951	270	-3.007	35
4354	.331	275	-.864	5	.276	35	1.109	270	-2.312	40
4355	.399	280	-.879	5	.271	20	1.019	260	-1.997	20
4356	.401	280	-.679	165	.289	180	1.054	280	-1.620	5
4357	.372	280	-.804	165	.316	180	.992	255	-1.684	165
4358	.379	250	-.868	170	.310	185	1.031	250	-1.758	170
4359	.381	240	-.929	175	.290	185	1.008	255	-2.186	190
4360	.385	240	-.877	175	.253	185	1.123	240	-2.208	190
4361	.333	240	-.866	180	.229	185	1.208	240	-2.244	180
4362	.177	275	-.809	0	.267	10	.805	275	-2.988	0
4363	.430	325	-.875	5	.293	10	.850	265	-2.488	0
4364	.302	280	-.663	190	.297	190	.866	270	-2.062	190
4365	.291	280	-.730	190	.258	190	.860	280	-1.805	190
4366	.947	295	-.710	190	.304	170	1.283	295	-2.031	190

TABLE 2-25 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
4367	.272	245	-.755	155	.351	180	.922	255	-1.651	165
4368	.270	245	-.944	170	.380	180	.954	255	-2.529	180
4369	.257	240	-1.046	180	.315	180	.975	255	-2.504	180
4370	.848	310	-1.010	175	.274	175	1.084	310	-2.536	170
4371	.199	140	-.617	190	.187	45	.676	150	-1.590	35
4372	.183	270	-.572	190	.204	45	.616	140	-1.793	35
4373	.169	230	-.733	130	.323	125	.578	250	-2.777	135
4374	.850	295	-.661	130	.287	140	1.107	295	-2.587	140
4901	.749	330	-.926	40	.489	10	1.289	260	-2.560	10
4902	.740	340	-1.015	35	.446	10	1.193	270	-2.366	30
4903	.791	340	-.778	40	.386	15	1.332	0	-2.005	30
4904	.842	330	-.996	25	.404	15	1.399	265	-2.060	25
4905	.823	325	-1.020	30	.332	25	1.341	285	-2.143	25
4906	.829	330	-.607	245	.248	40	1.329	300	-1.322	70
4907	.808	325	-.537	235	.326	255	1.337	255	-1.764	200
4908	.807	325	-.601	245	.283	260	1.364	270	-1.334	195
4909	.836	290	-.562	245	.175	15	1.336	310	-1.214	235
4910	.787	325	-.592	235	.298	255	1.283	260	-1.479	195
4911	.785	330	-.581	235	.262	260	1.295	310	-1.383	235
4912	.803	290	-.577	235	.165	270	1.336	310	-1.280	235
4913	.751	325	-.569	235	.248	260	1.291	315	-1.433	205
4914	.759	315	-.572	235	.228	265	1.283	315	-1.269	25
4915	.780	315	-.569	235	.176	285	1.301	315	-1.147	60
4916	.737	325	-.588	185	.243	260	1.285	315	-1.602	200
4917	.752	310	-.588	185	.229	265	1.323	315	-1.321	60
4918	.778	325	-.566	60	.170	345	1.288	305	-1.348	60
4919	.757	325	-.597	230	.235	255	1.248	320	-1.893	170
4920	.758	325	-.580	230	.218	265	1.285	320	-1.428	170
4921	.776	325	-.581	230	.172	55	1.282	325	-1.308	55
4922	.685	325	-.627	180	.243	265	1.317	265	-1.472	85
4923	.695	315	-.697	60	.228	265	1.318	310	-1.568	60
4924	.716	305	-.621	180	.196	60	1.341	325	-1.444	60
4925	.662	330	-.612	75	.299	245	1.296	320	-2.522	45
4926	.688	330	-.710	65	.266	50	1.376	330	-2.287	40
4927	.740	305	-.591	180	.213	265	1.511	320	-1.528	45
4928	.879	340	-1.361	225	.457	165	2.021	165	-2.217	35
4601	.820	185	-.952	145	.439	165	1.450	185	-2.016	165
4602	.705	205	-1.136	145	.478	170	1.230	195	-1.998	170
4603	.726	220	-.968	140	.437	170	1.187	270	-2.422	170
4604	.892	235	-.641	135	.242	170	1.430	250	-1.221	145
4605	.875	235	-.901	155	.287	165	1.397	260	-1.661	155
4606	.805	225	-.713	155	.284	165	1.294	225	-2.091	345
4607	.896	235	-.582	320	.175	255	1.392	235	-1.031	340
4608	.860	235	-.630	320	.271	275	1.428	235	-1.338	340
4609	.797	215	-.615	325	.278	285	1.355	225	-2.109	345
4610	.825	235	-.575	315	.180	265	1.352	220	-1.303	340

TABLE 2-26 LARGEST PRESSURE COEFFICIENTS FOR SEARS TOWER -- CHICAGO, ILLINOIS

TAP NUMBER	MAXIMUM MEAN	WIND AZIMUTH	MINIMUM MEAN	WIND AZIMUTH	MAXIMUM RMS	WIND AZIMUTH	PEAK MAXIMUM	WIND AZIMUTH	PEAK MINIMUM	WIND AZIMUTH
4611	.795	215	-.564	340	.283	280	1.359	260	-1.373	340
4612	.788	215	-.610	340	.291	285	1.313	220	-2.401	355
4613	.802	230	-.636	325	.205	275	1.340	215	-2.094	50
4614	.715	220	-.653	335	.256	200	1.267	220	-1.631	345
4615	.671	210	-.620	340	.231	310	1.202	220	-1.786	345
4616	.848	185	-1.329	265	.534	165	1.512	185	-2.847	160
5001	.709	315	-.567	170	.324	265	1.430	320	-1.447	75
5002	.768	320	-.653	65	.245	55	1.442	315	-3.090	50
5003	.437	170	-.845	120	.291	220	.994	170	-1.624	105
5004	.296	200	-.870	240	.476	170	1.094	200	-4.397	170
5005	.720	215	-.623	340	.249	260	1.306	225	-1.920	350
5006	.674	225	-.605	340	.259	270	1.131	215	-1.872	350
5007	.757	315	-.724	245	.247	265	1.555	305	-2.802	190
5008	.835	175	-.679	75	.228	195	1.411	180	-1.597	260
5009	.714	225	-.593	340	.206	255	1.245	225	-1.602	335
5010	.229	100	-.850	150	.289	190	.835	115	-1.626	180
5011	-.339	255	-1.070	140	.288	130	.311	125	-1.699	140
5012	-.299	110	-1.059	220	.291	230	.402	230	-1.829	215
5013	-.242	60	-.649	215	.126	105	.113	70	-1.129	190
5014	.162	80	-.898	25	.287	355	.941	65	-2.127	10
5015	.525	95	-.927	20	.303	5	1.080	100	-1.976	20
5016	-.173	50	-.915	40	.317	50	.484	55	-2.007	45
5017	-.227	310	-.878	320	.277	315	.371	310	-1.491	315
5018	.646	65	-.586	160	.229	60	1.757	55	-1.433	290
5019	.623	20	-.781	70	.283	30	1.278	10	-2.379	70
5020	.706	135	-.611	350	.298	180	1.239	135	-1.391	185
5021	.602	40	-.613	160	.264	350	1.332	45	-2.153	155
5022	.699	20	-.627	160	.240	50	1.636	45	-1.822	170
5023	.472	10	-.849	65	.276	60	.988	10	-1.734	70
5024	.392	340	-.875	300	.410	10	1.111	335	-3.229	15
5025	.759	135	-.673	250	.263	60	1.645	125	-1.899	260
5026	.755	135	-.748	15	.350	55	1.512	130	-3.172	50

Table 3. Full-Scale Pressure Tap Locations

	Face			
Floor	North	East	South	West
50				4121
49	1206			4201 4206
	1207			
	1208			
	1209			
47	1217			
	1218			
45	1219			
41	1222	2221	3222	4221
	1225	2224	3225	4224
	1228	2227	3228	4227
24		2263		
		2264		
		2265		
21		2272		
		2273		
		2274		
18		2275		
		2277		
15		2284		
		2285		
		2291		
		2292		
13		2293		

FIGURES

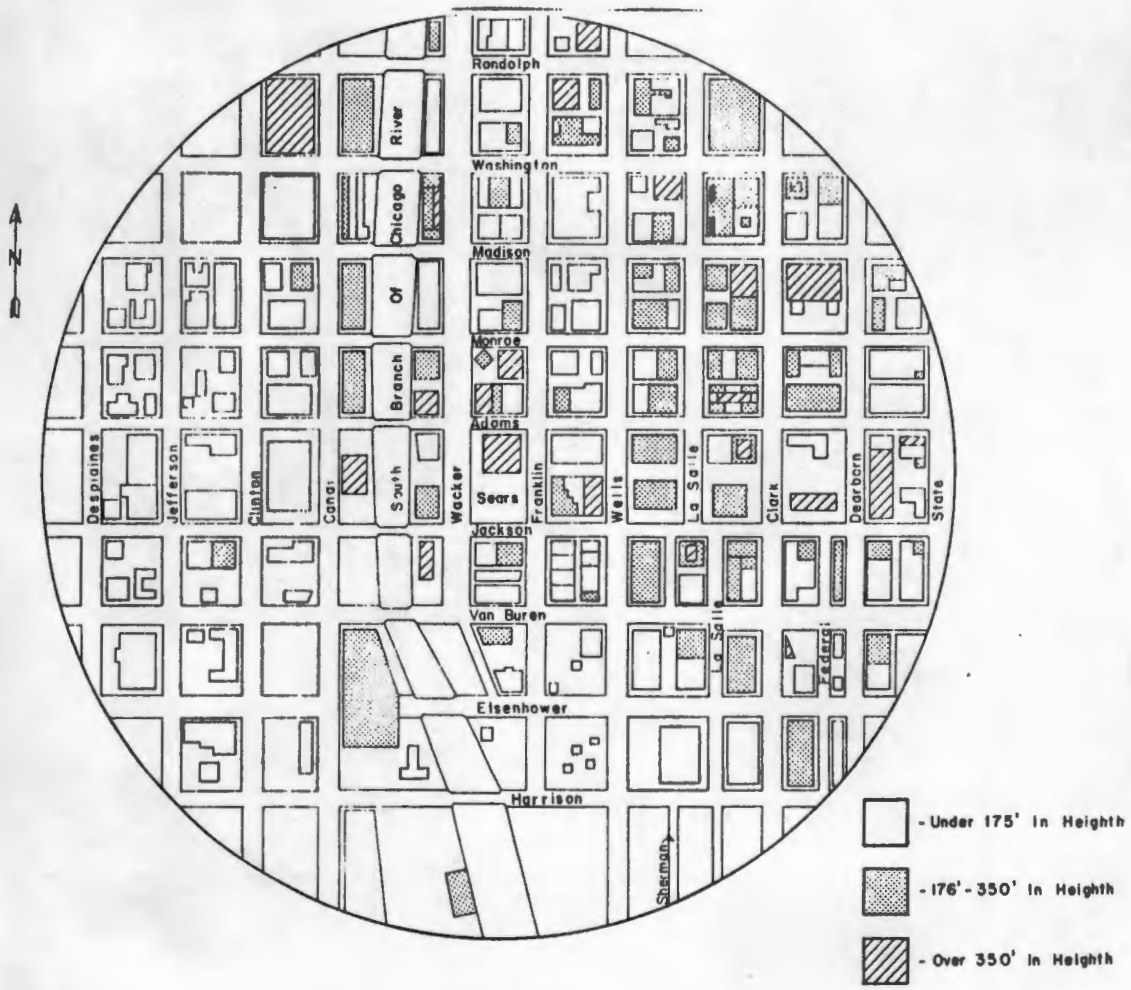


Figure 1a. Surrounding Building Configurations

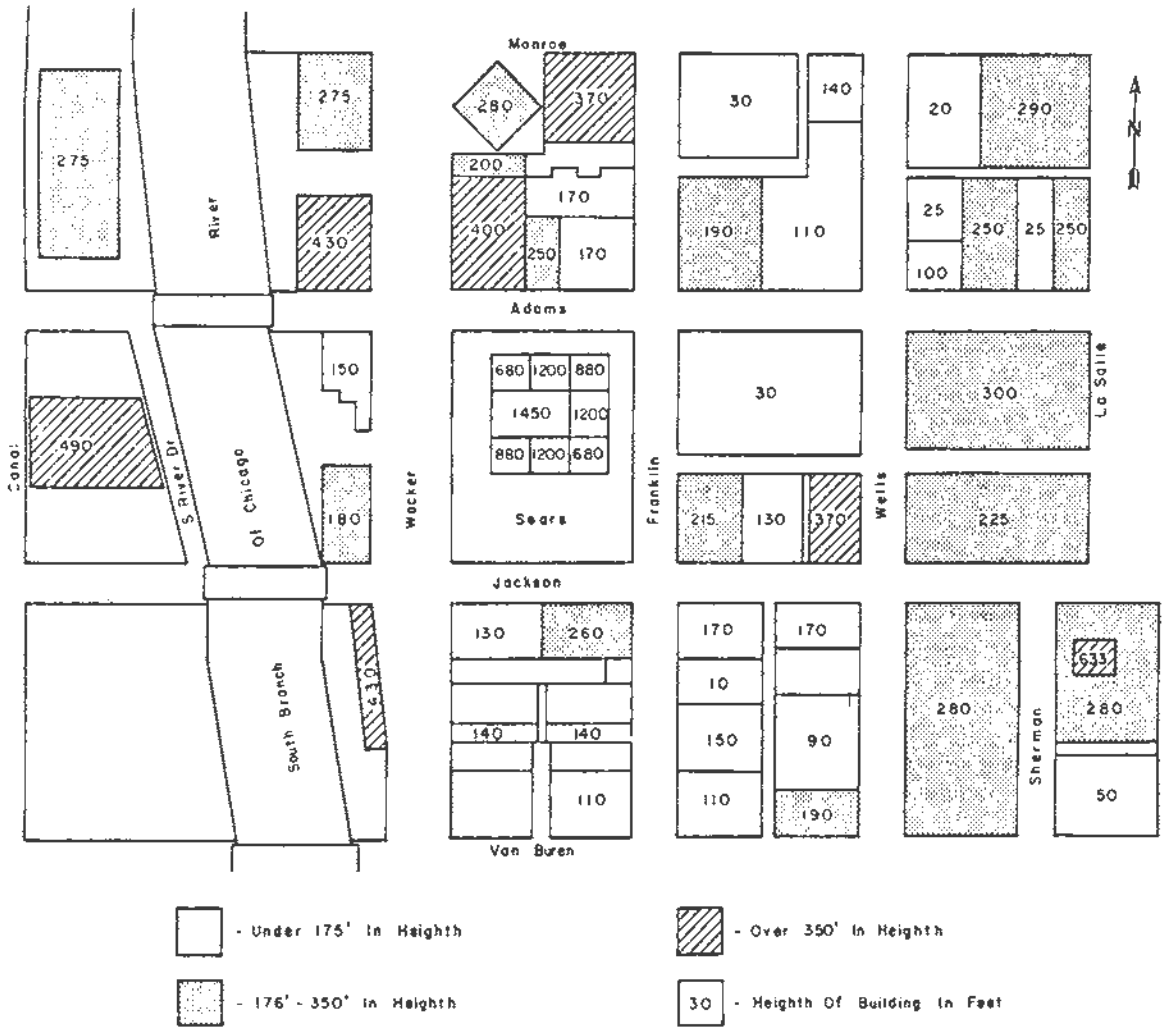


Figure 1b. Surrounding Building Configurations

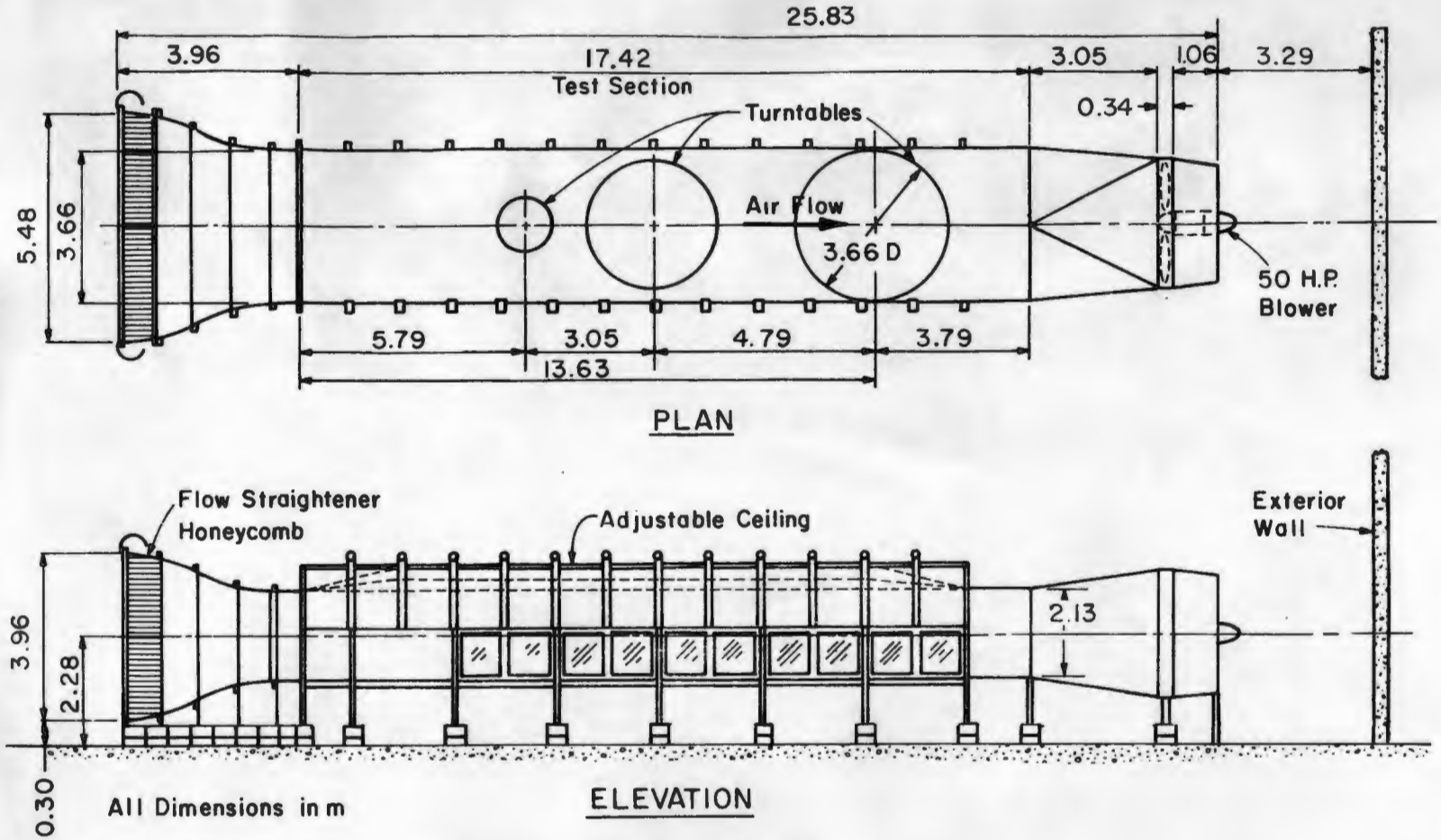


Figure 2. ENVIRONMENTAL WIND TUNNEL
FLUID DYNAMICS & DIFFUSION LABORATORY
COLORADO STATE UNIVERSITY

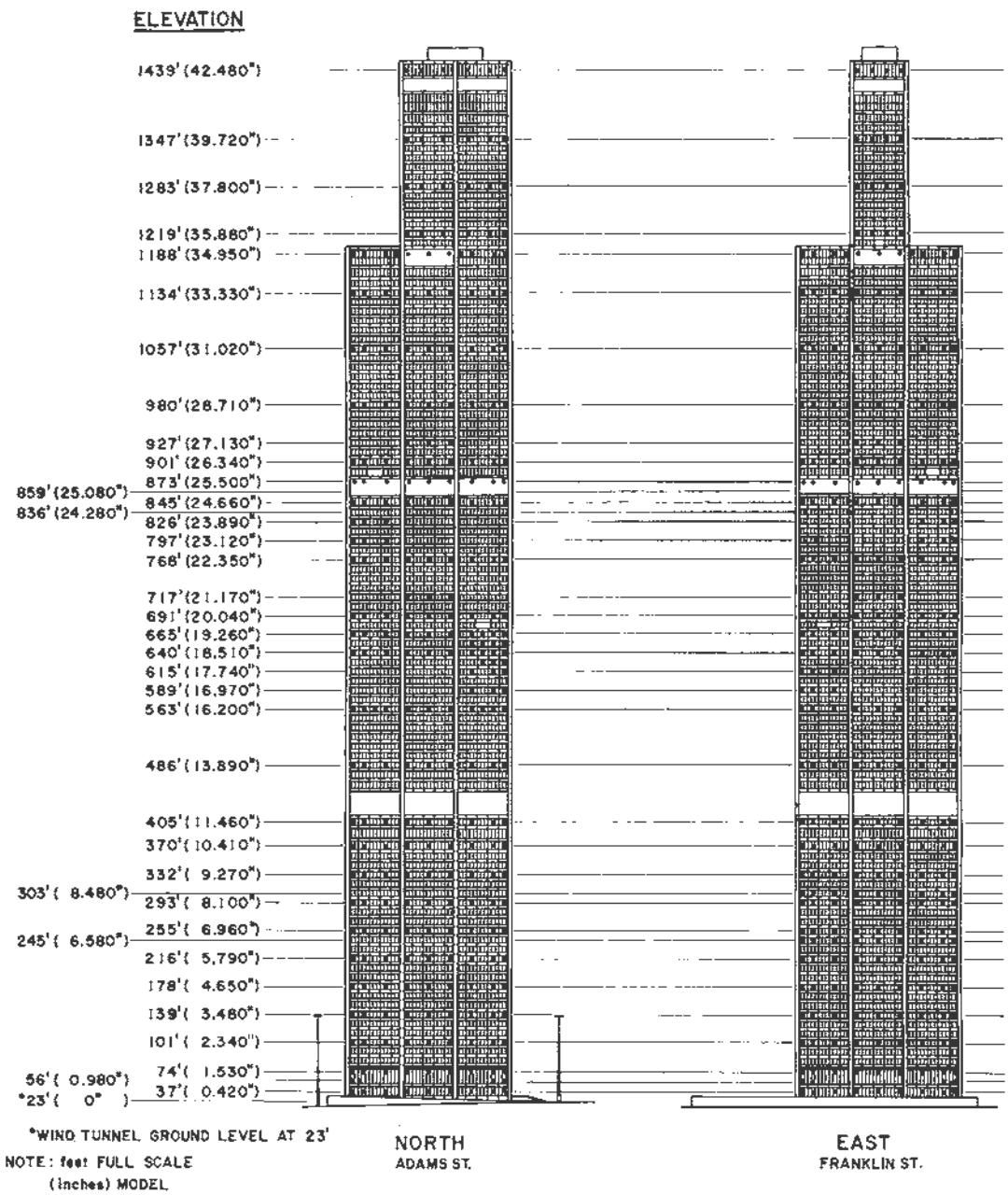


Figure 3a. Pressure Tap Locations

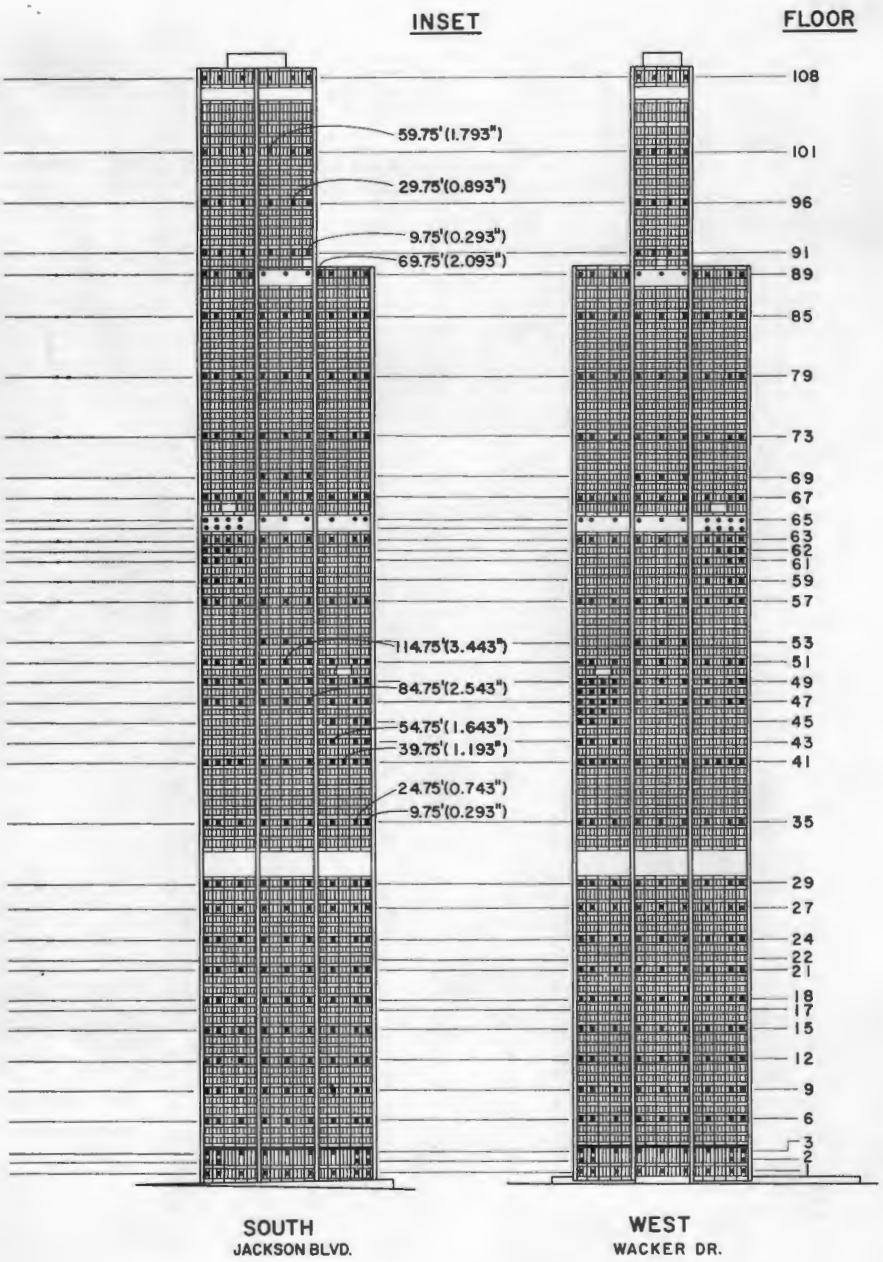


Figure 3a (continued)

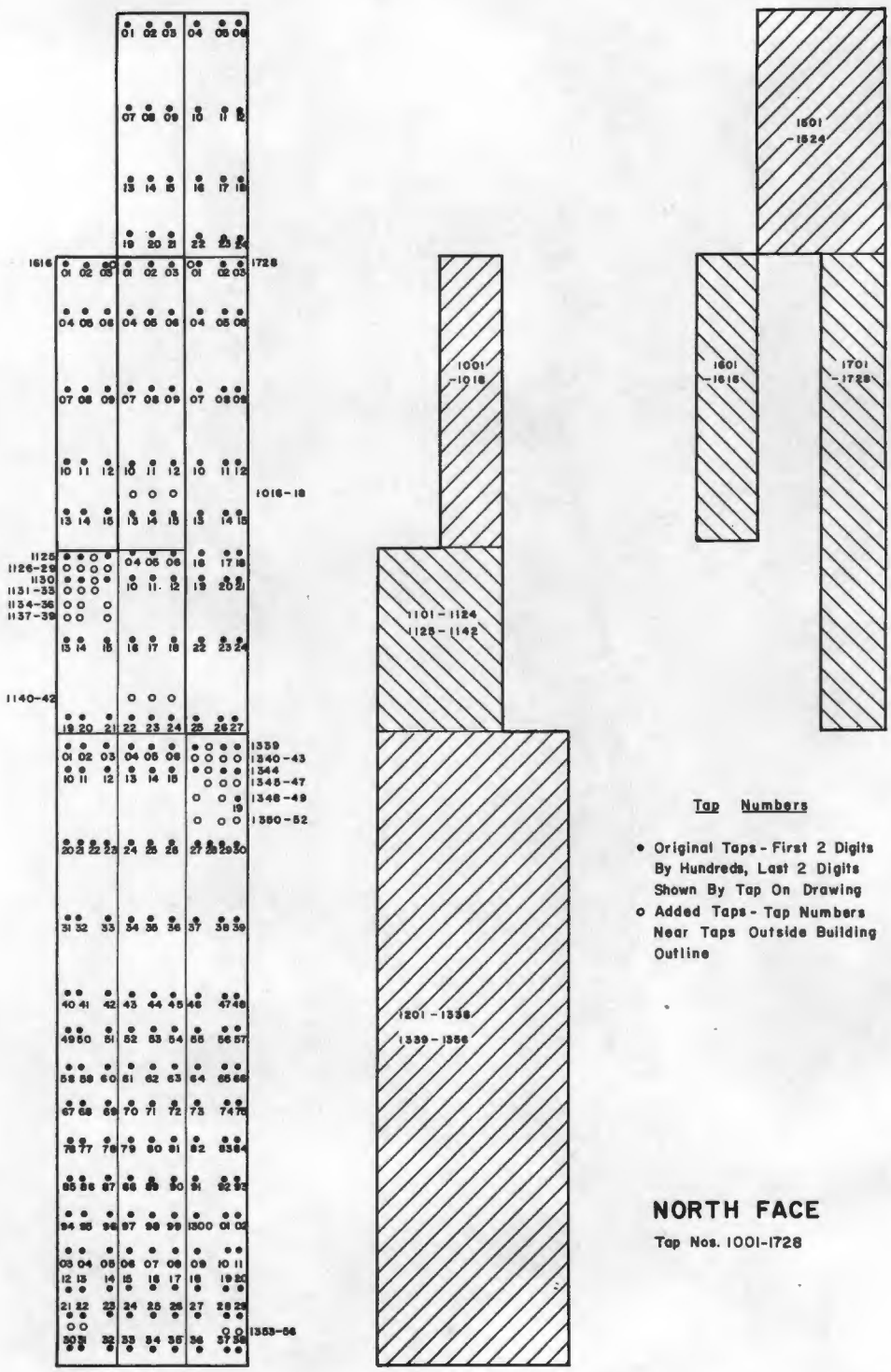


Figure 3b. Pressure Tap Locations

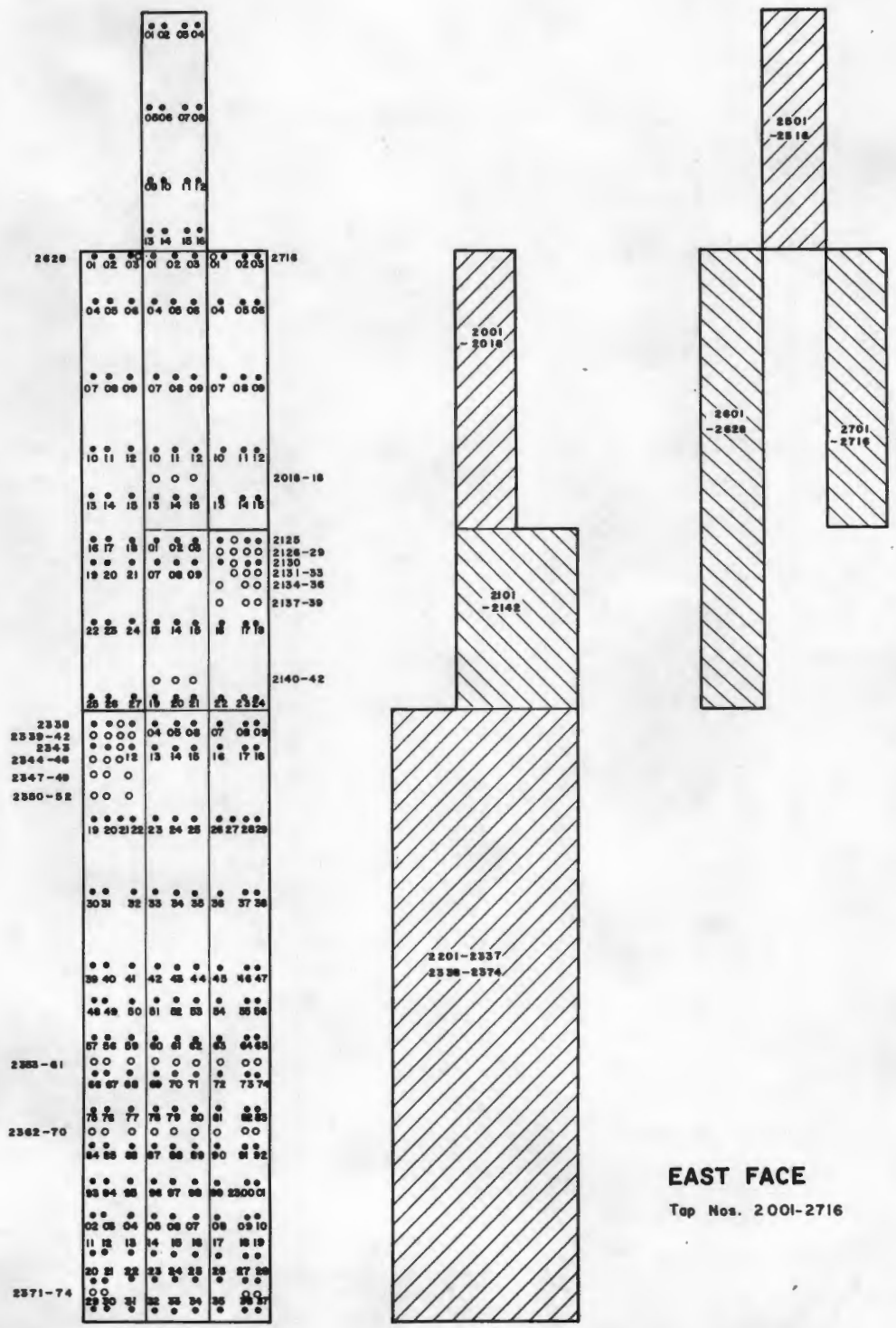


Figure 3c. Pressure Tap Locations

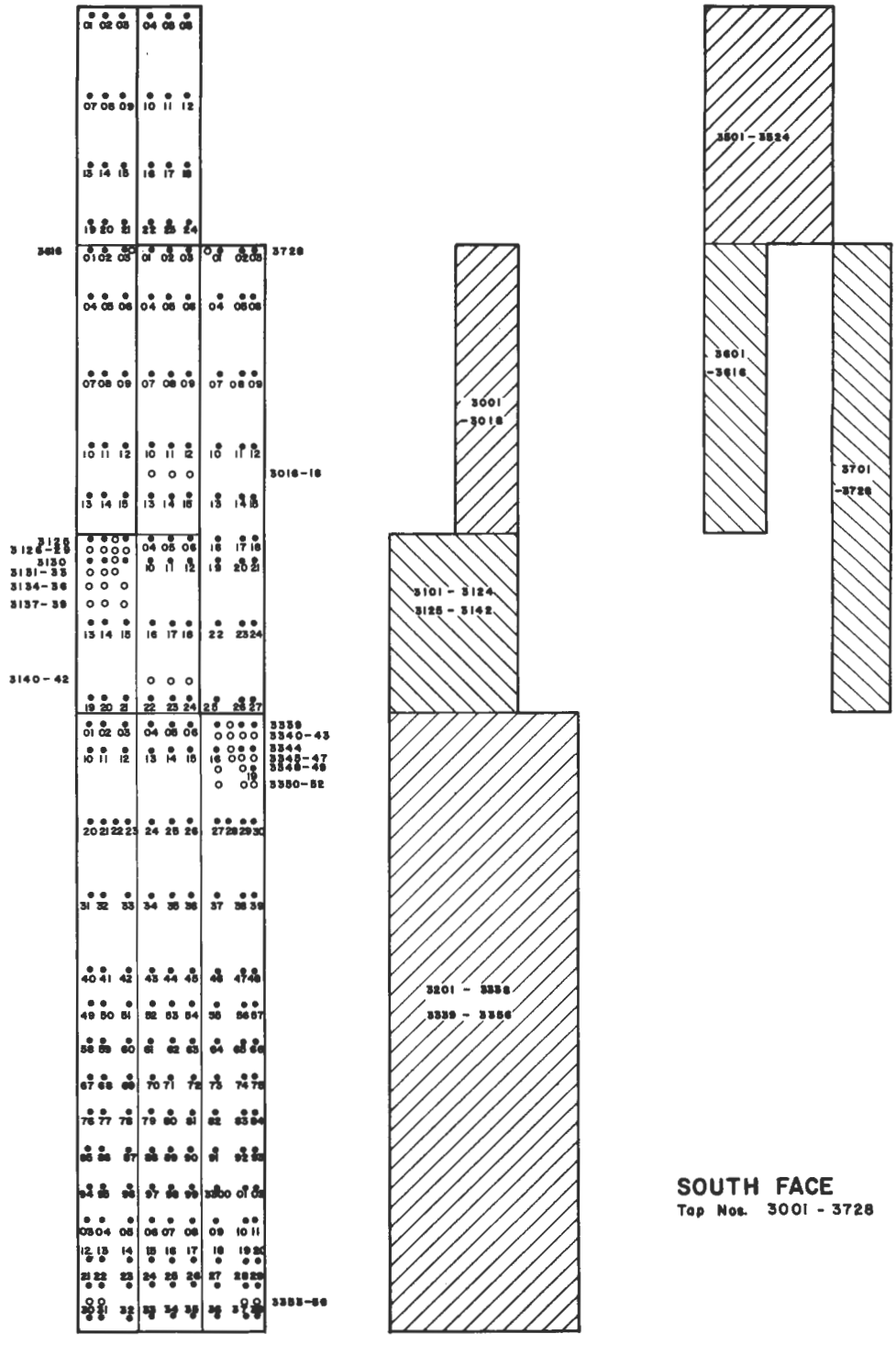


Figure 3d. Pressure Tap Locations

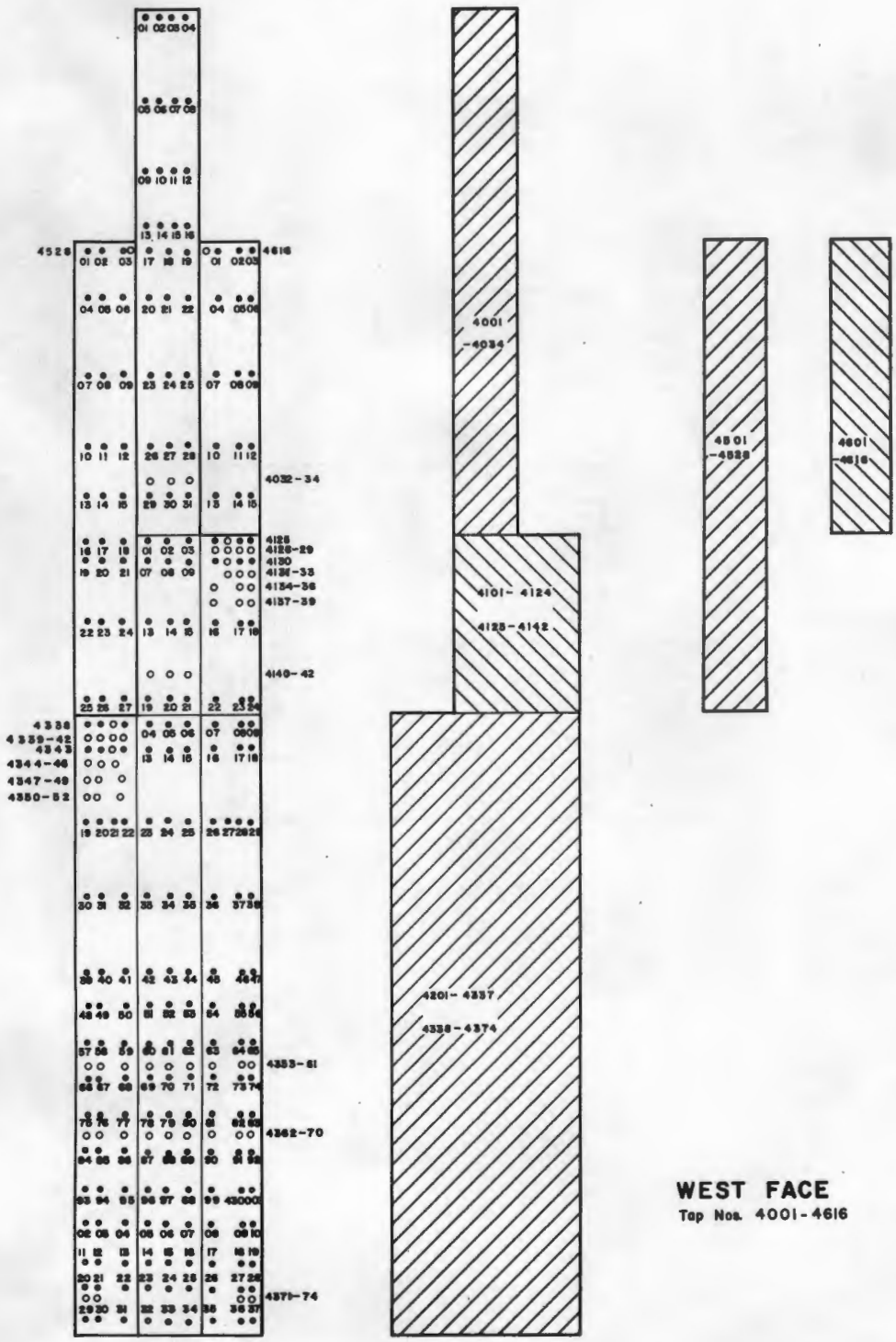
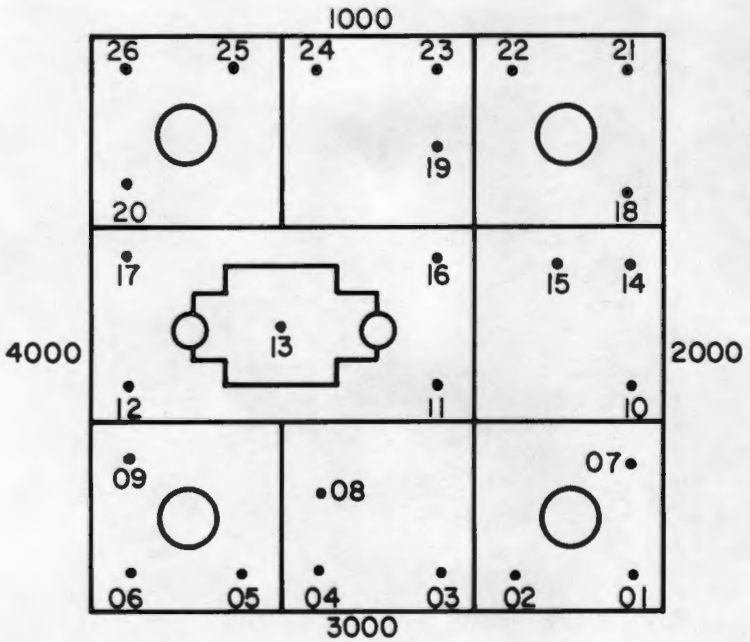


Figure 3e. Pressure Tap Locations



Top View
Taps 5001-5026

Figure 3f. Pressure Tap Locations

Figure 4. Completed Model

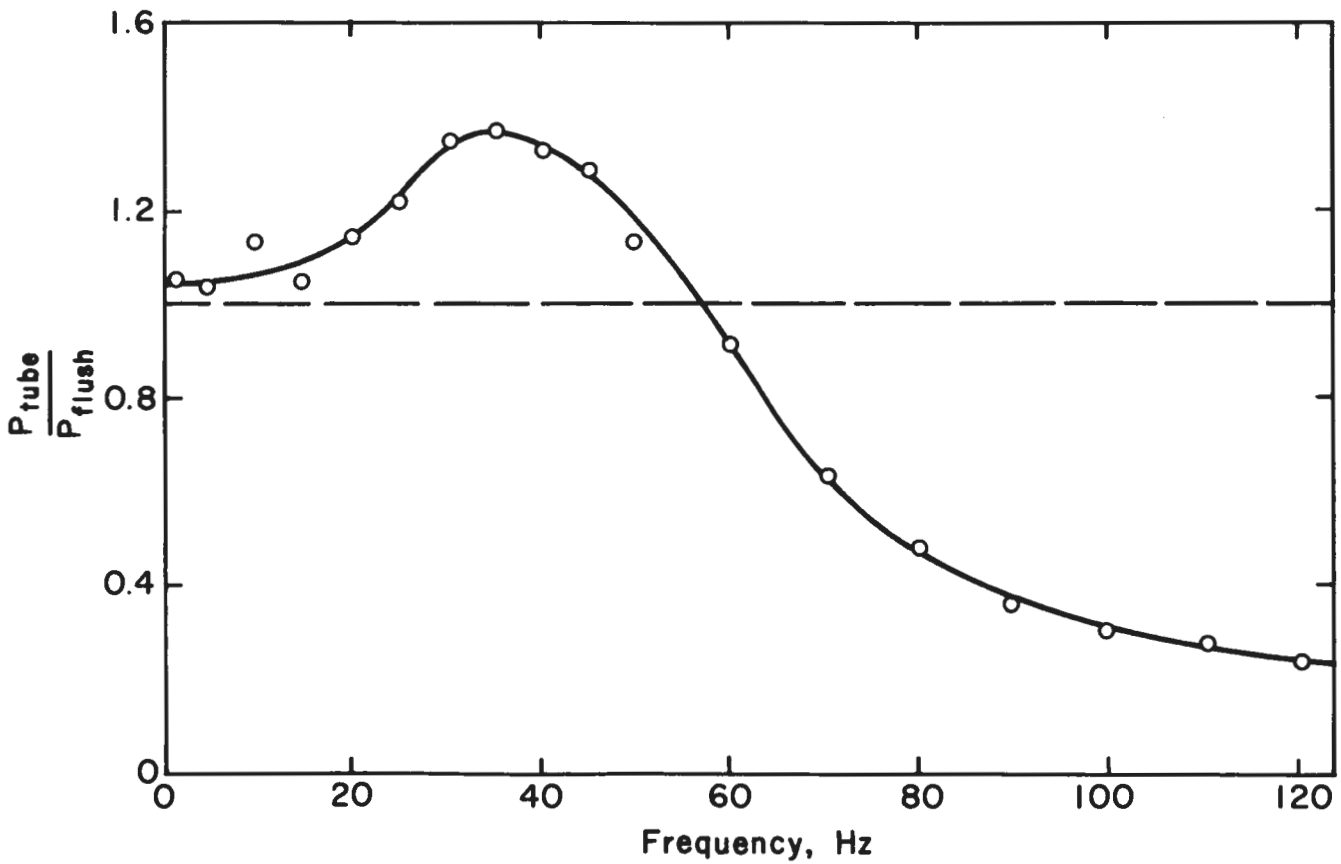


Figure 5. Pressure Transducer Frequency Response

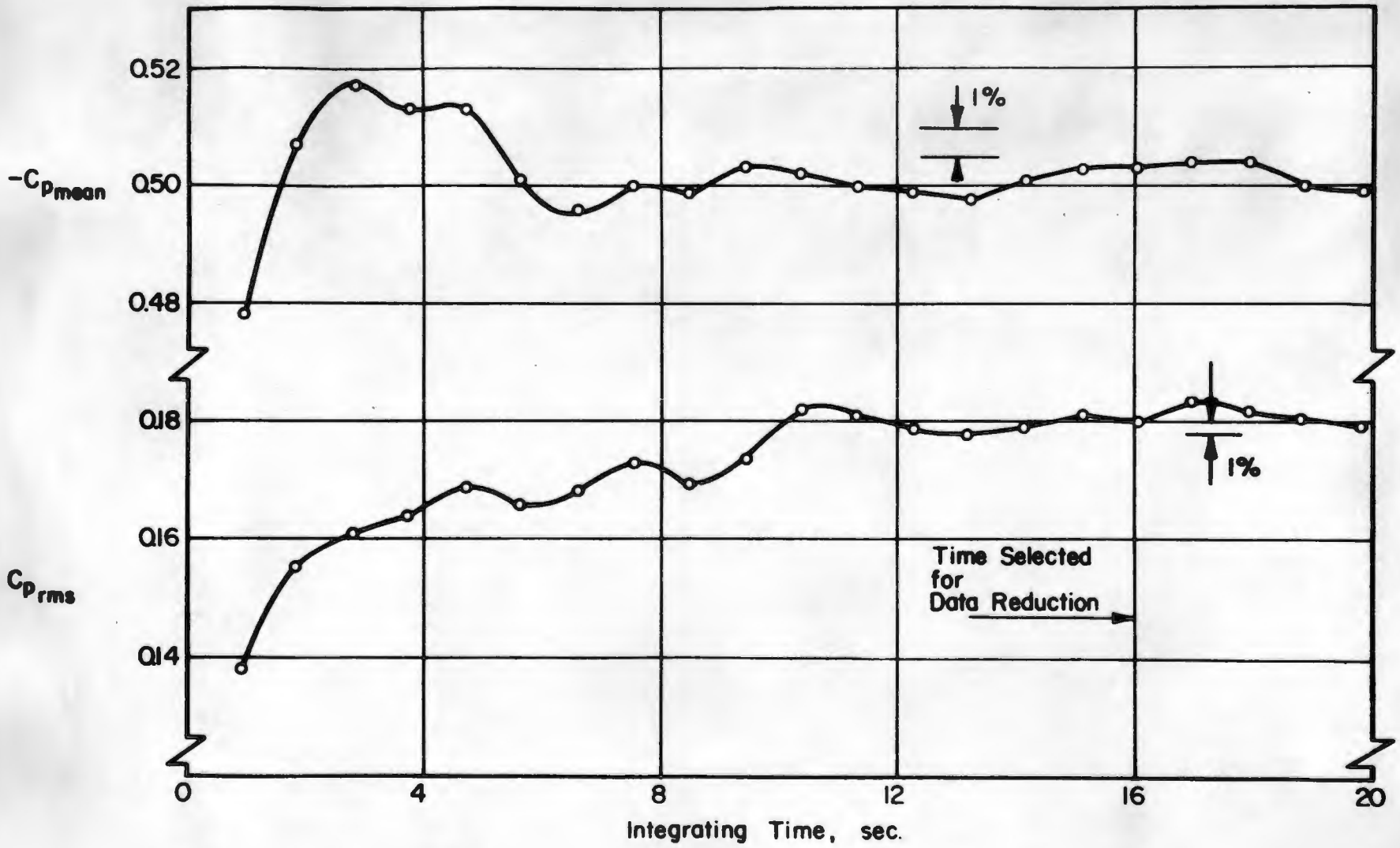


Figure 6. Data Sampling Time Verification

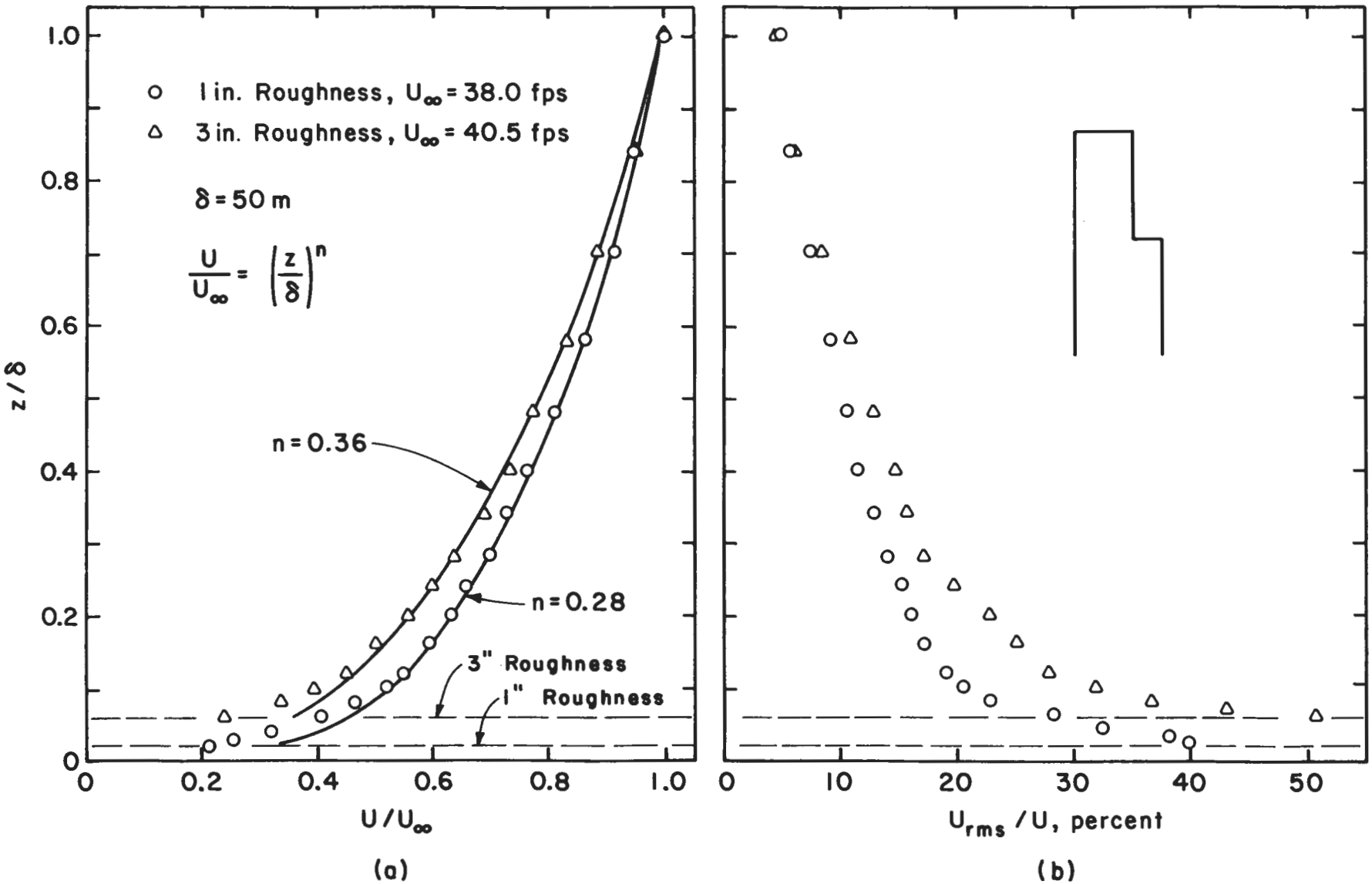


Figure 7. Velocity and Turbulence Profiles Approaching the Model

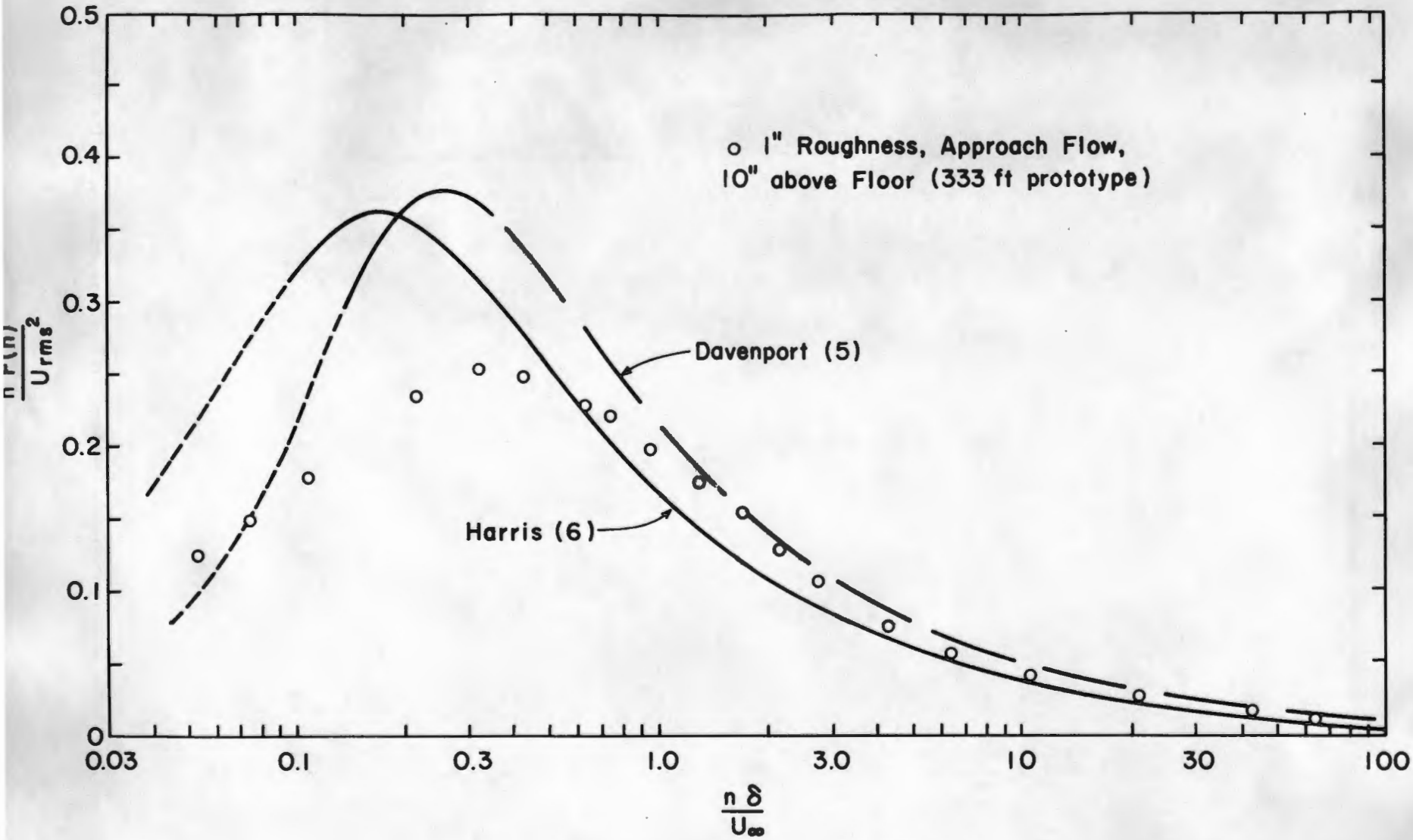


Figure 8. Power Spectrum of Approach Wind

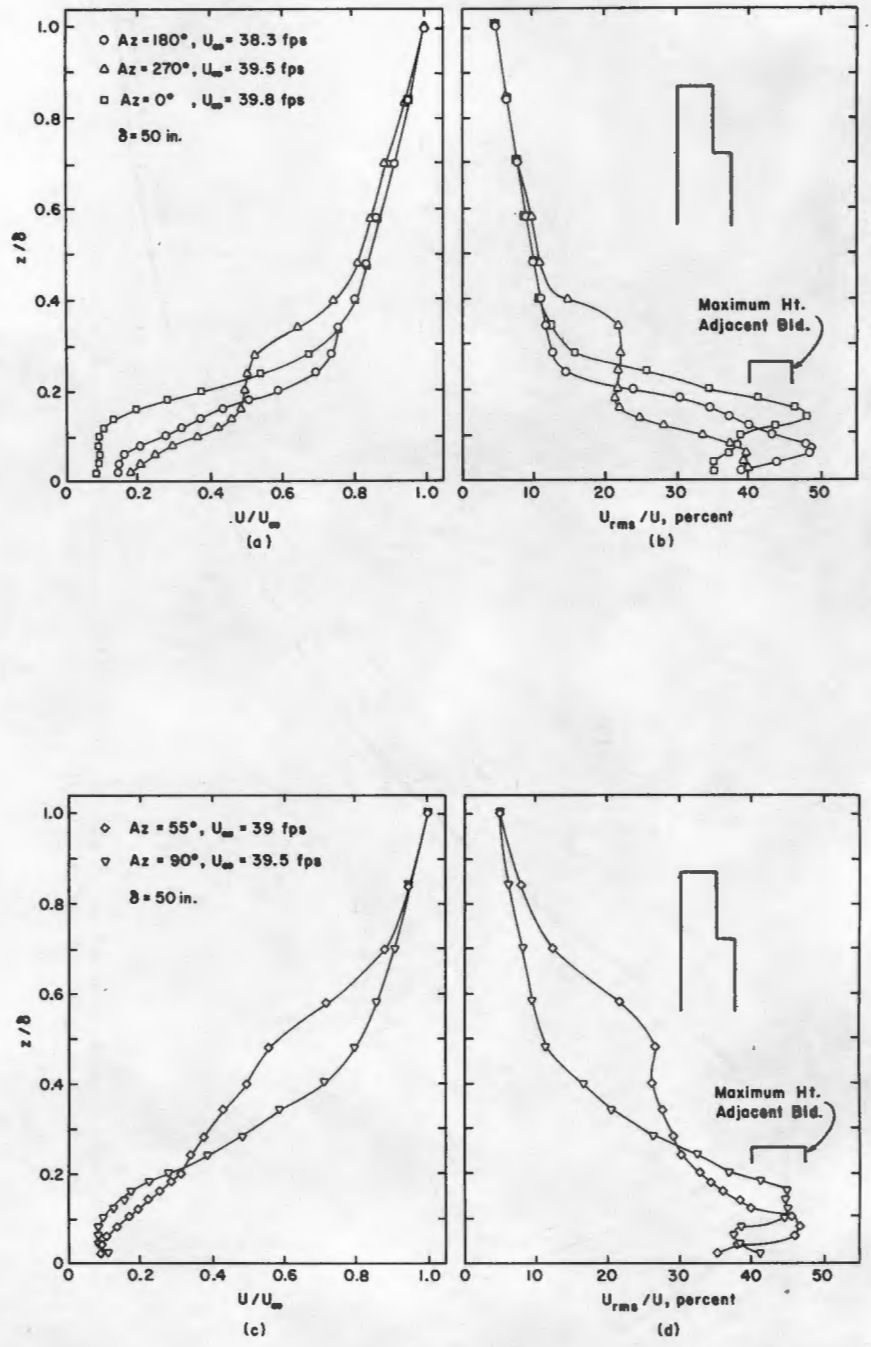


Figure 9. Velocity and Turbulence Profiles at the Building Location

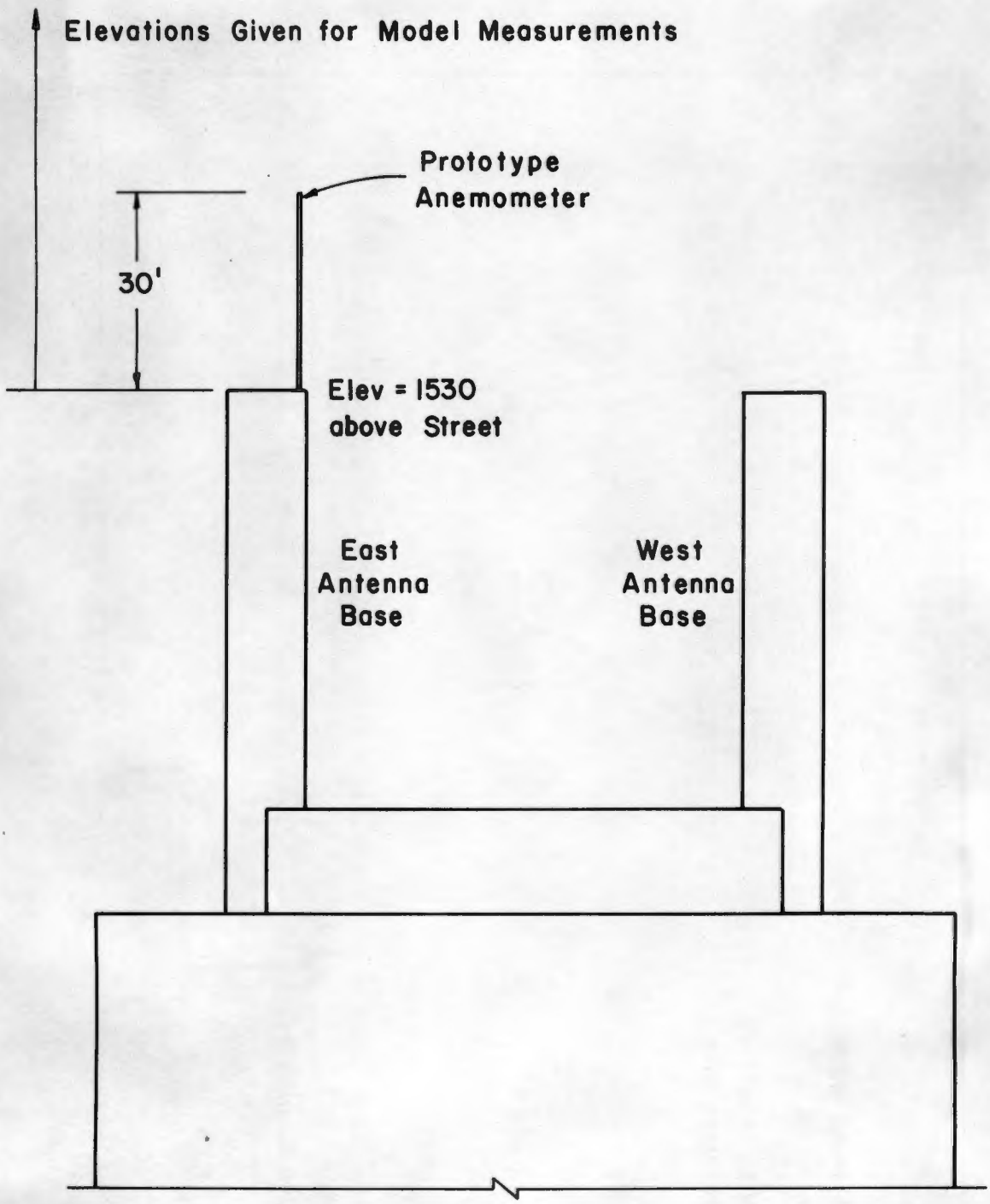


Figure 10. Location of Prototype Anemometer

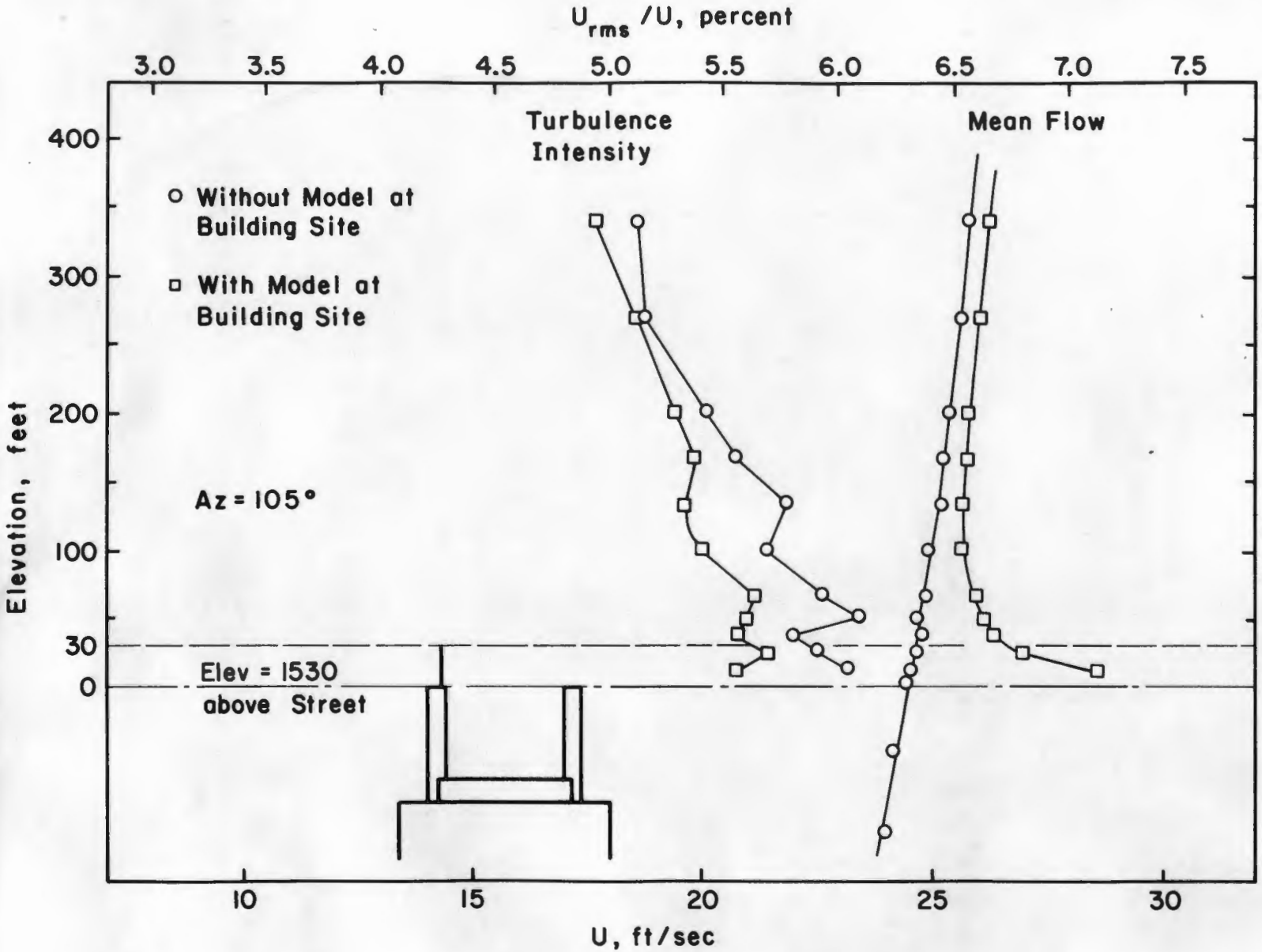


Figure 11. Mean Velocity and Turbulence Profile Above the Tower for Az = 105 Degrees

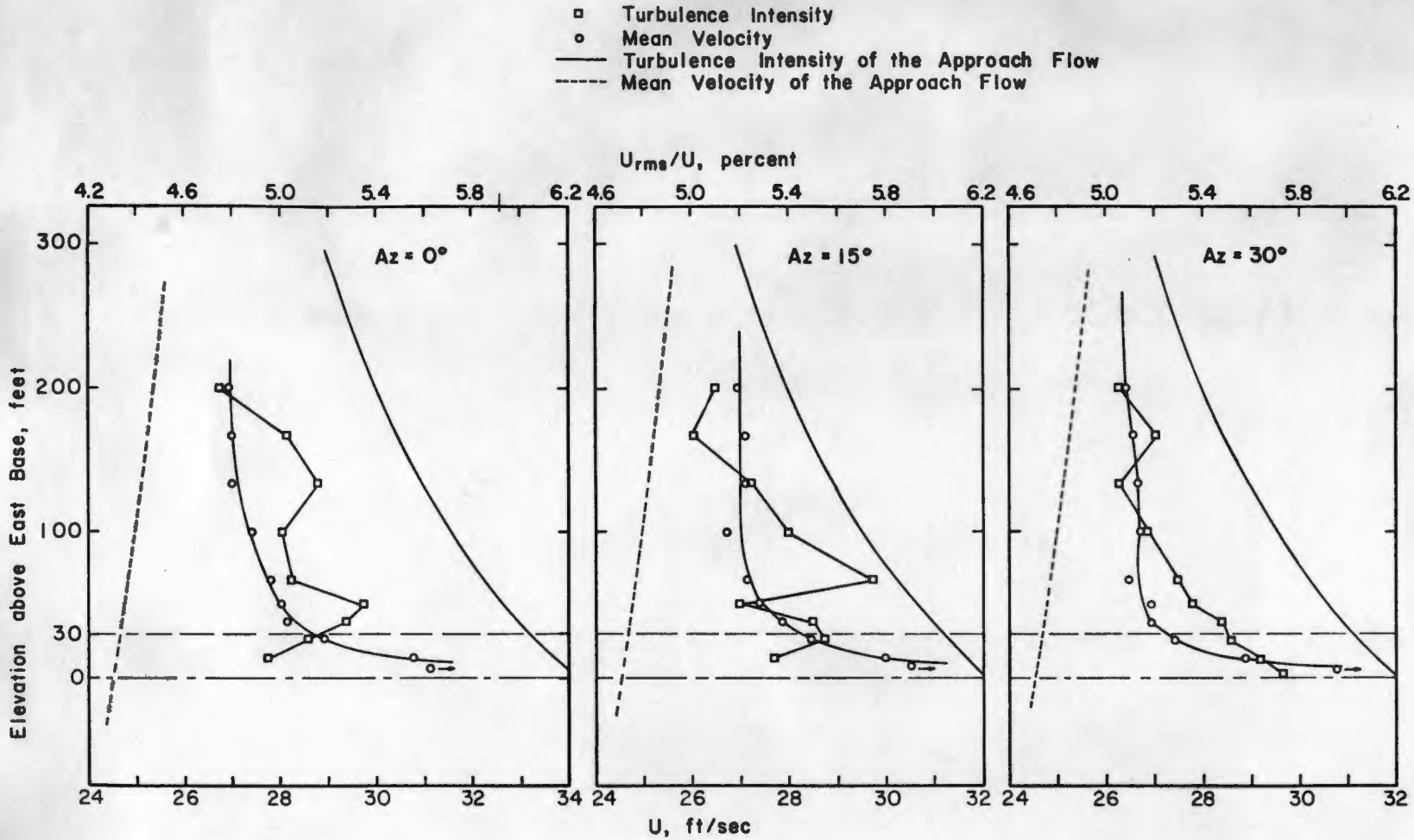


Figure 12a. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

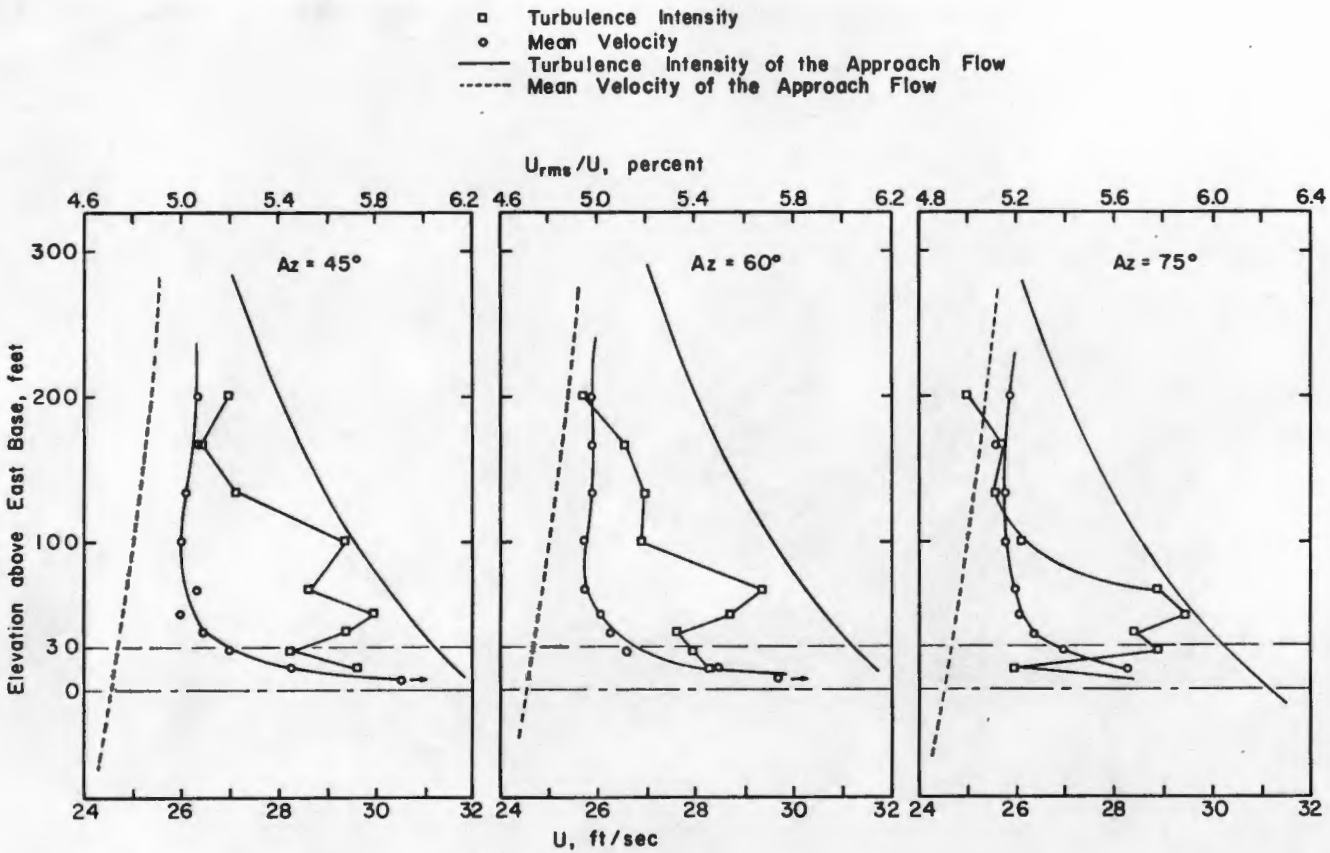


Figure 12b. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

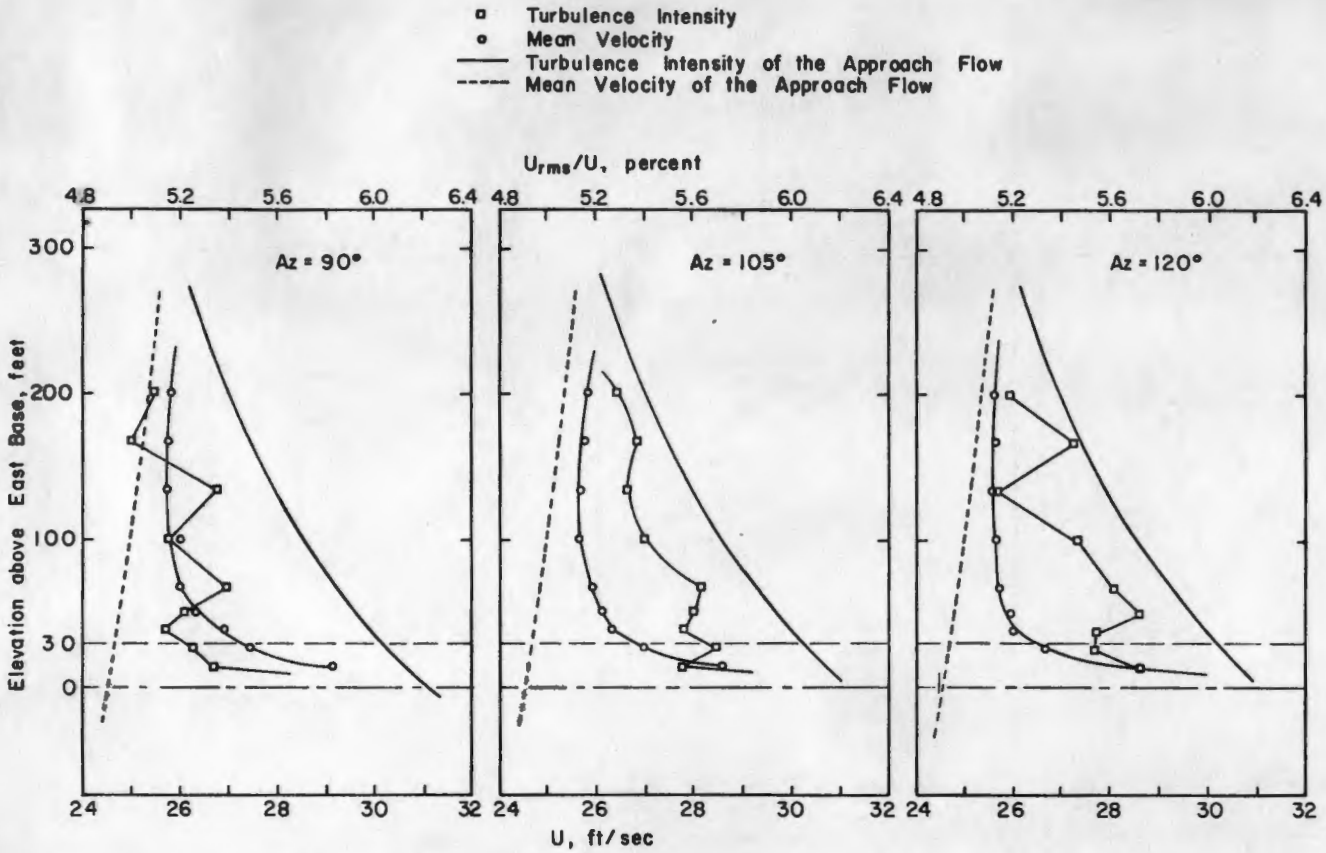


Figure 12c. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

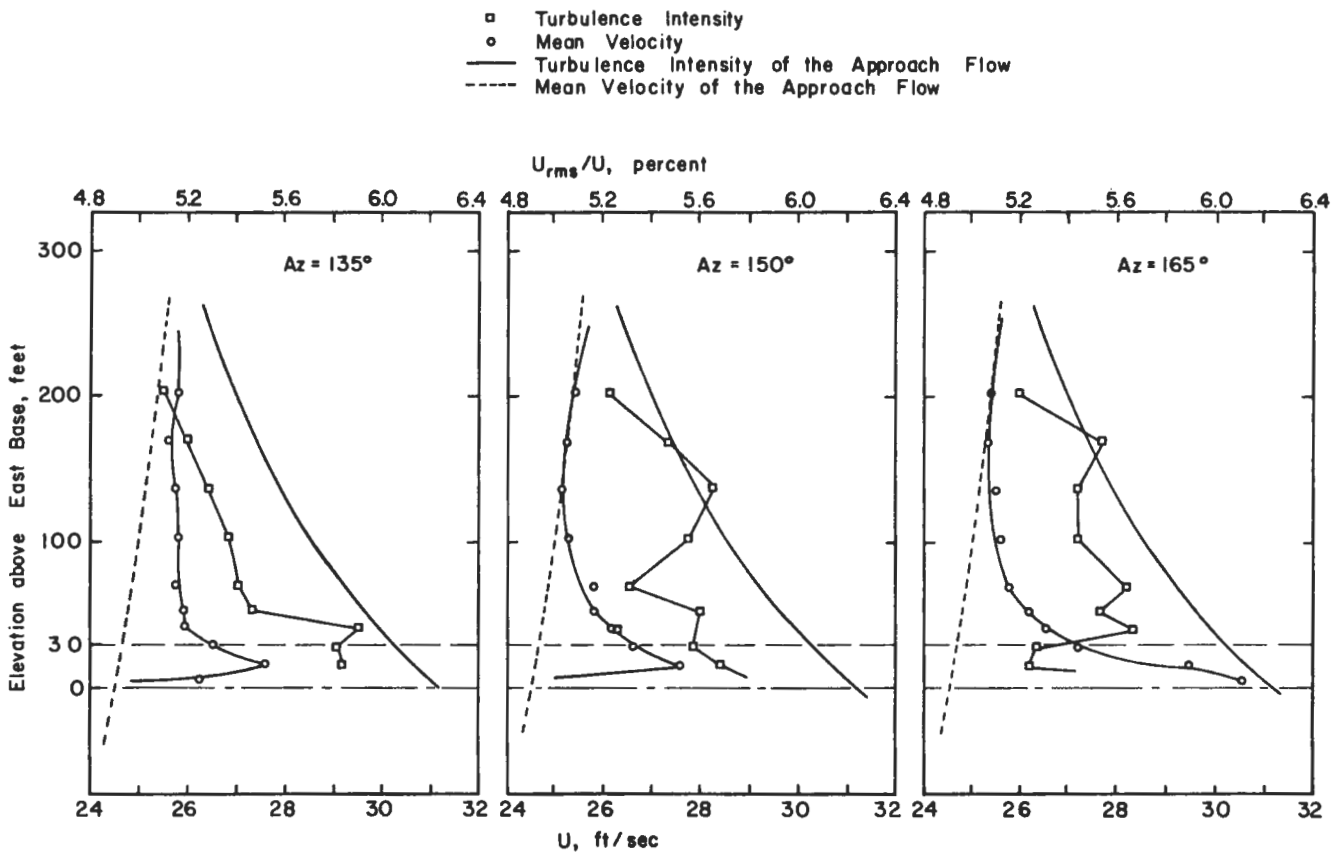


Figure 12d. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

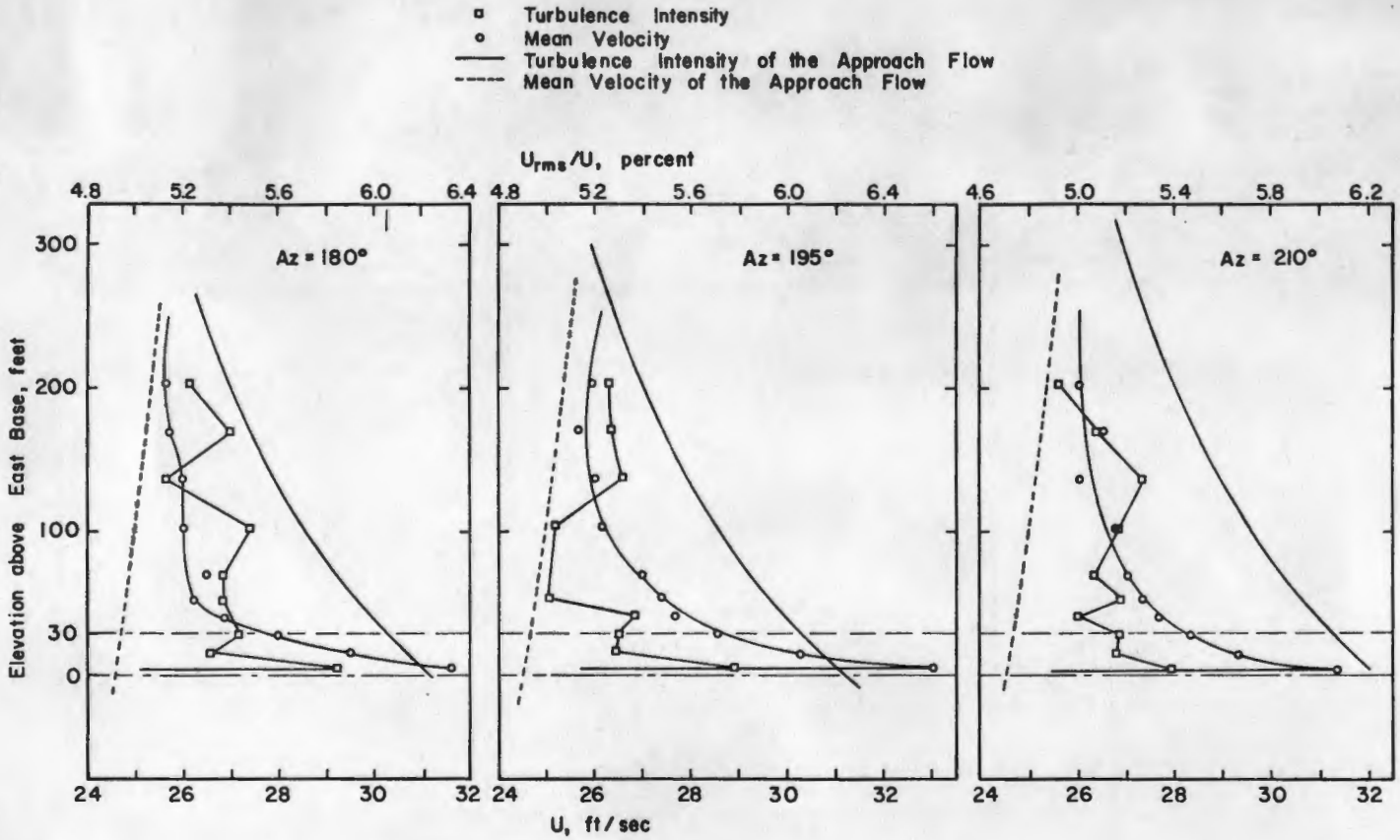


Figure 12e. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

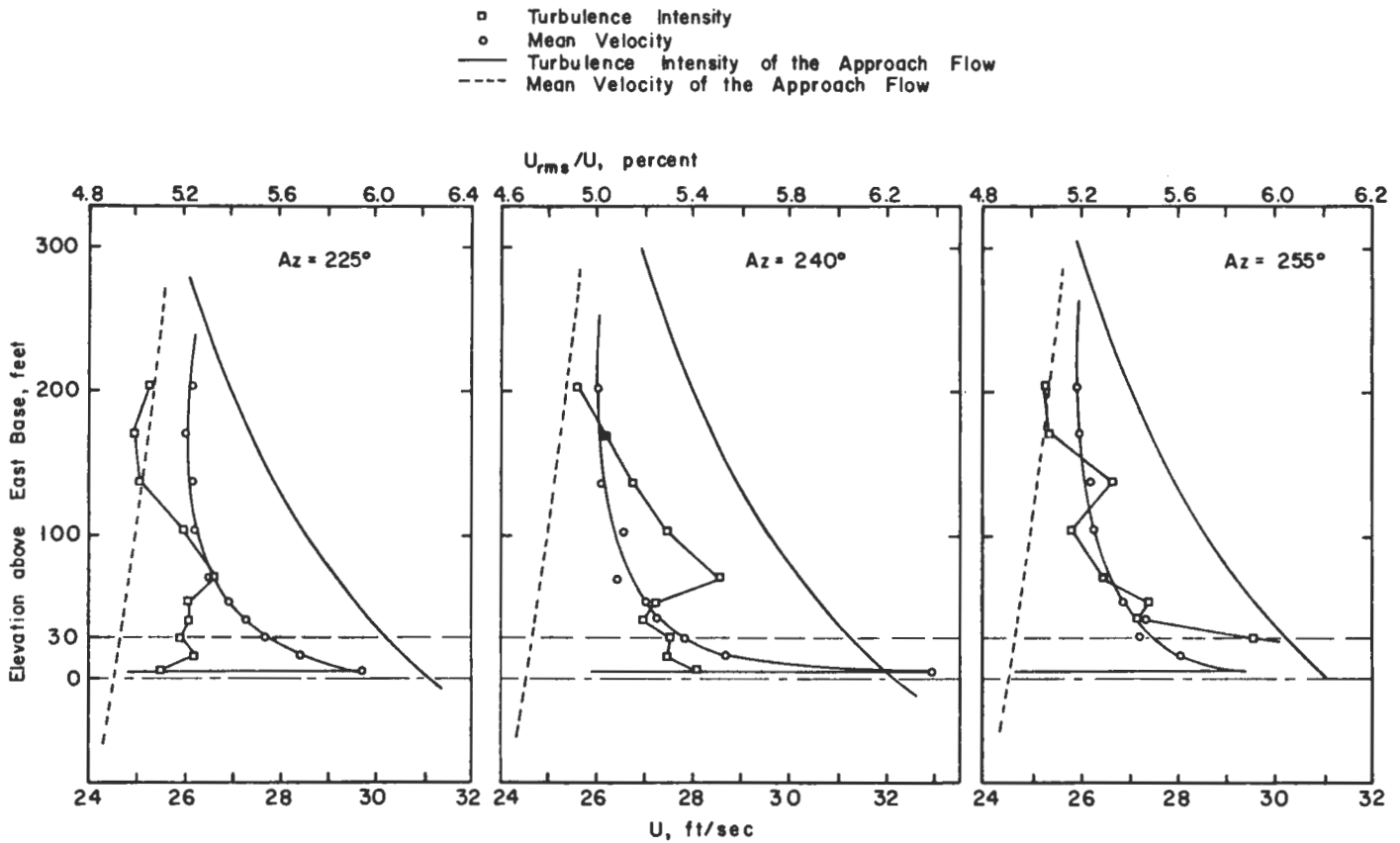


Figure 12f. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

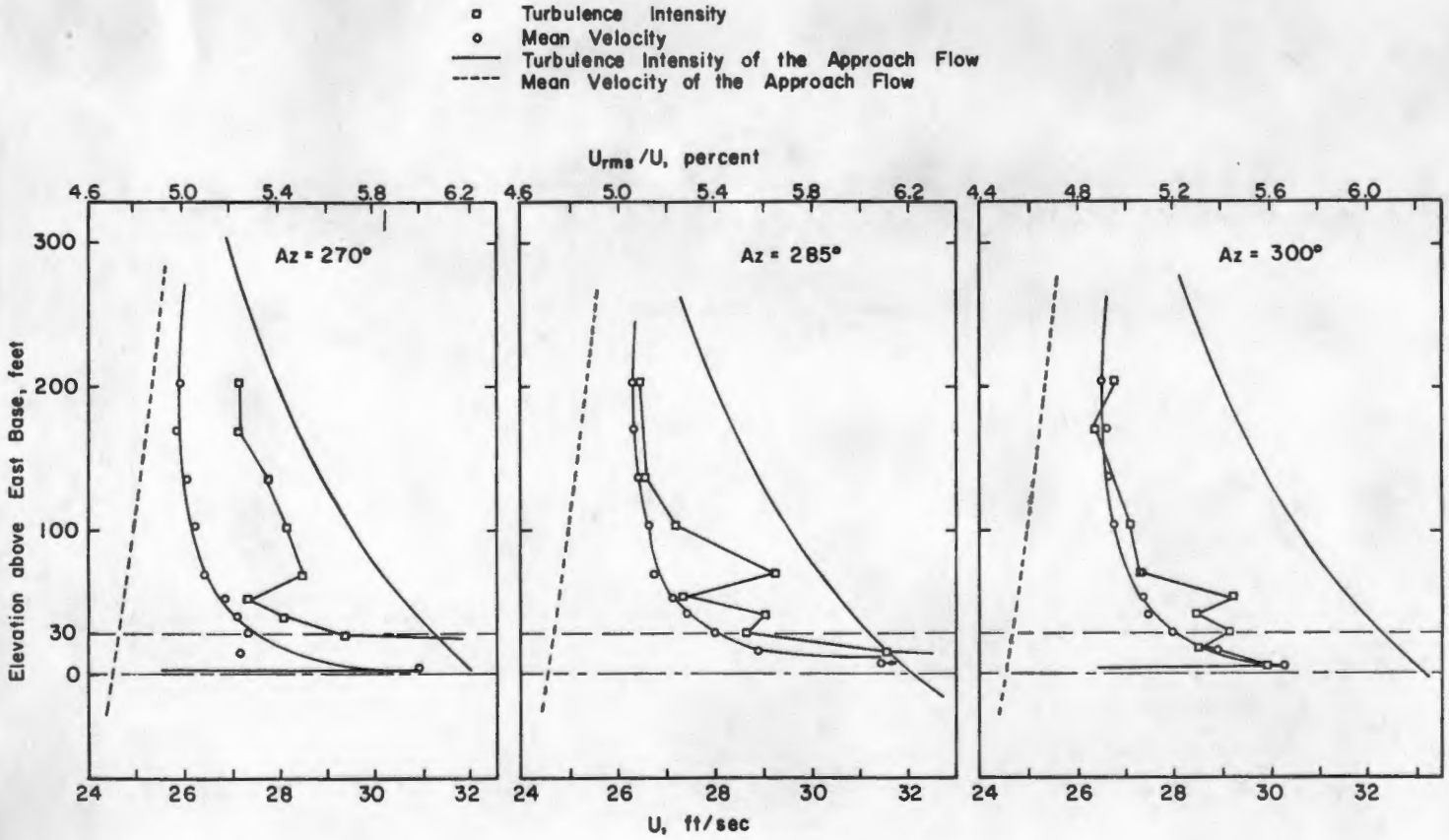


Figure 12g. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

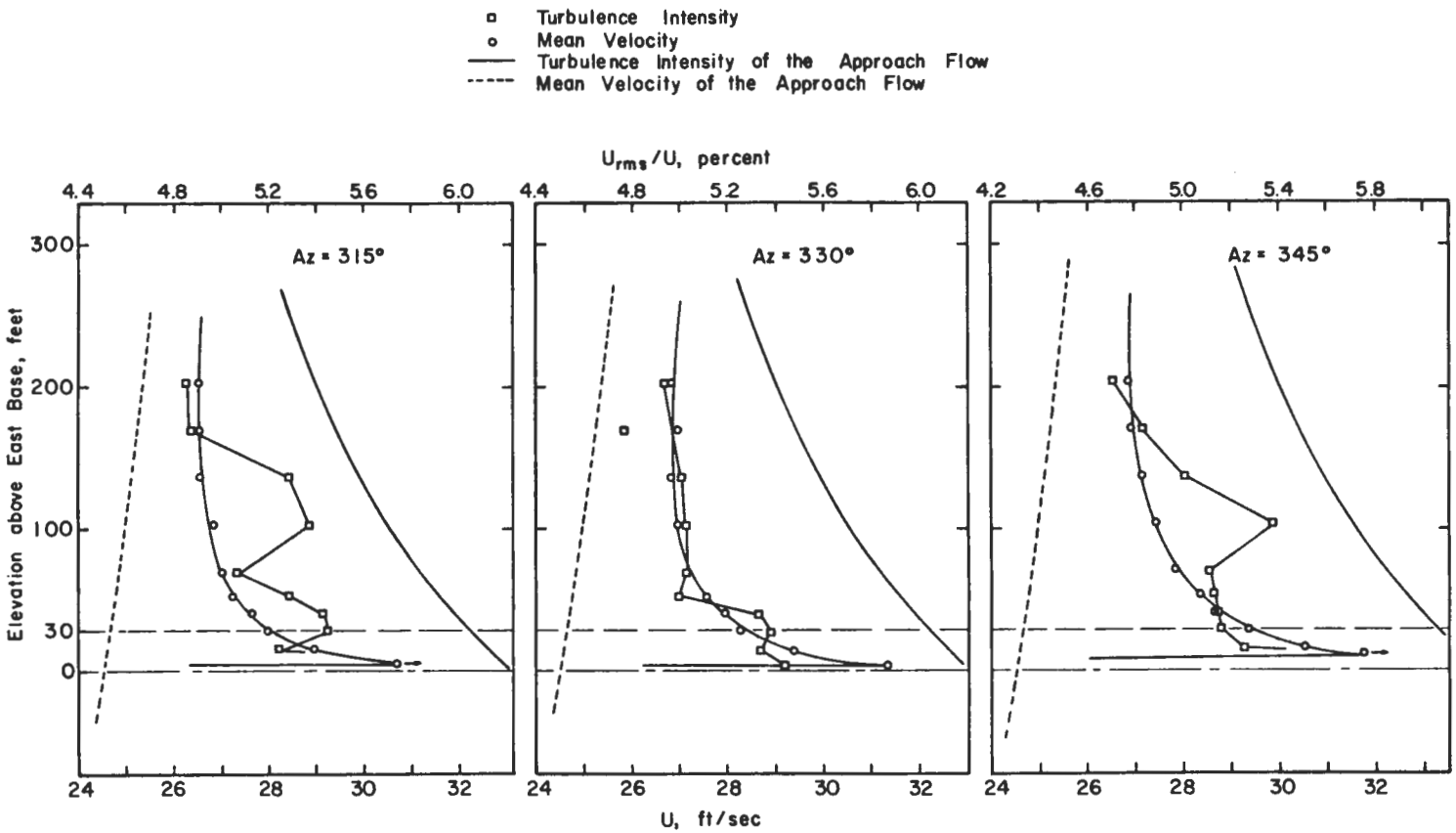


Figure 12h. Mean Velocity and Turbulence Profiles above the Tower at 15 Degree Intervals

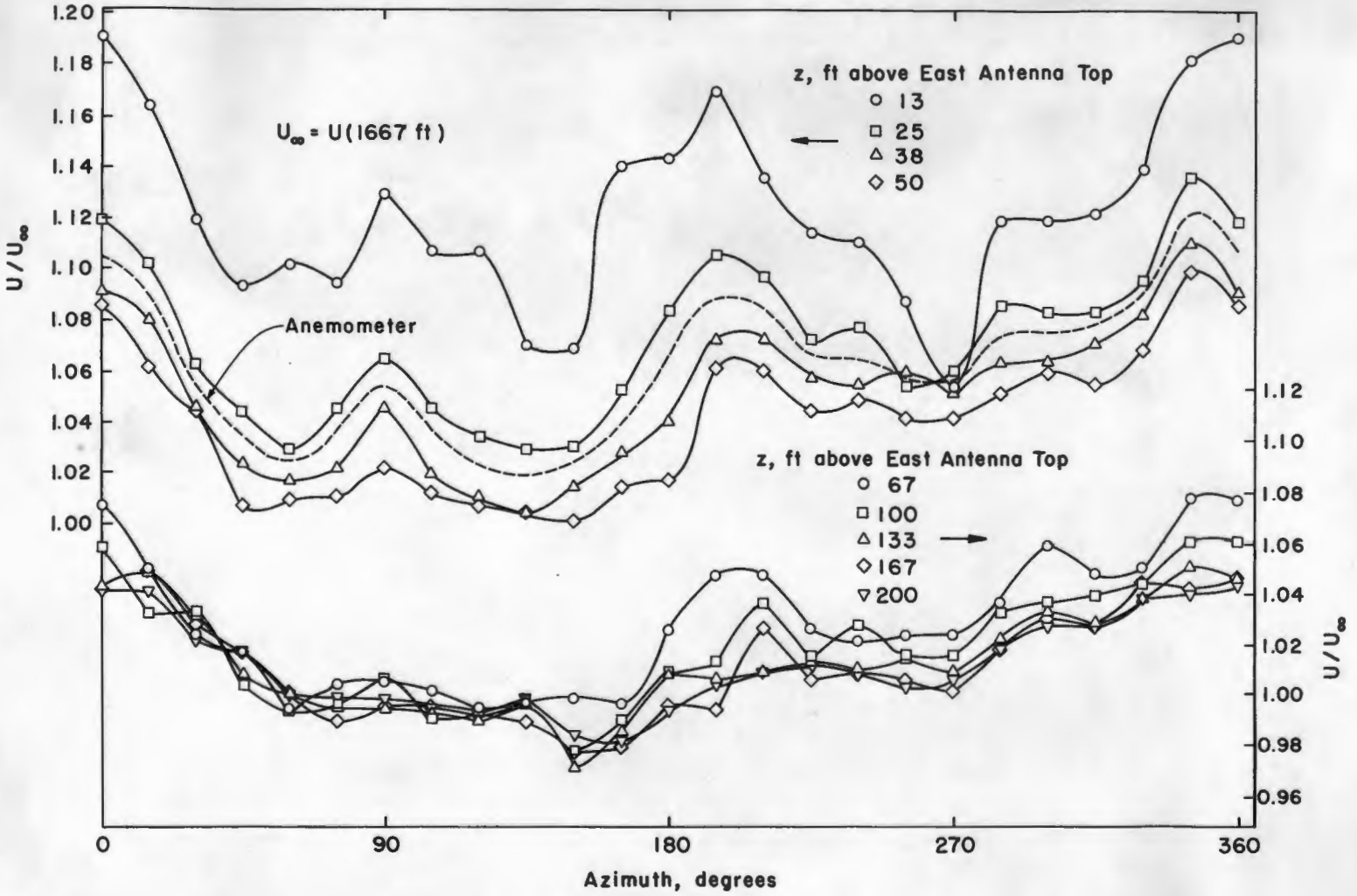


Figure 13. Ratio of Velocities above the Tower to Wind-Tunnel Reference Velocity

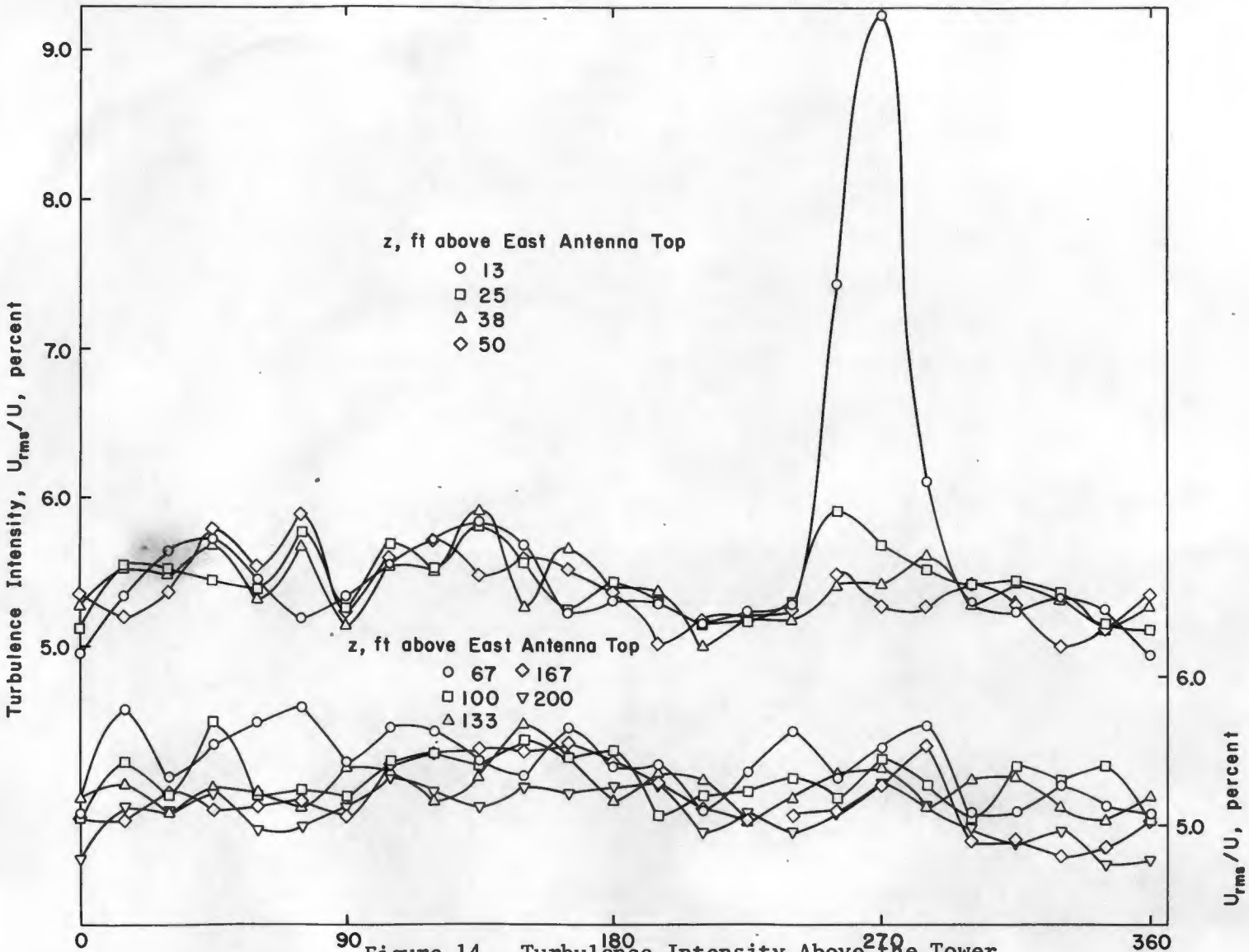


Figure 14. Turbulence Intensity Above the Tower

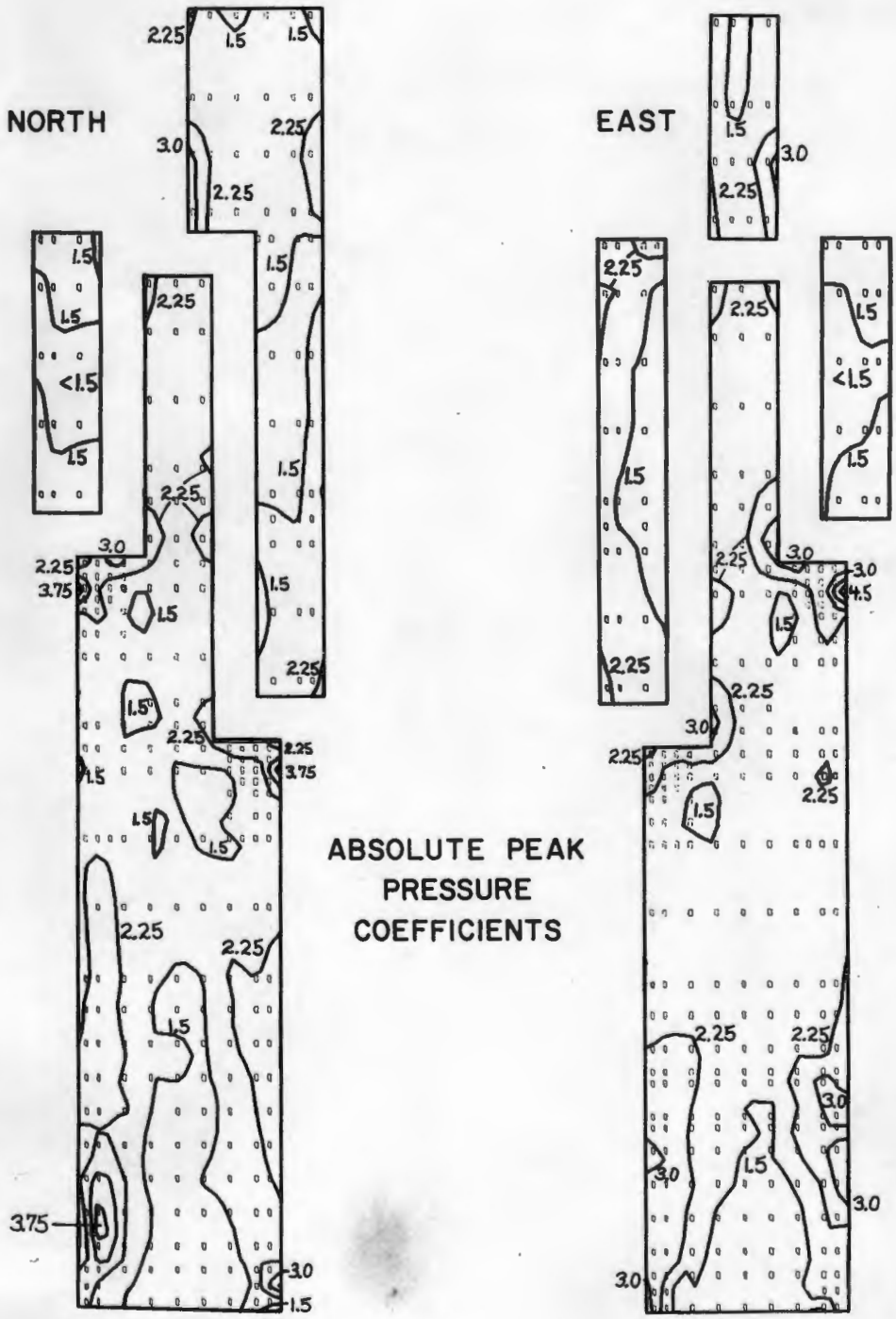


Figure 15a. Contours of Absolute Peak Pressure Coefficients

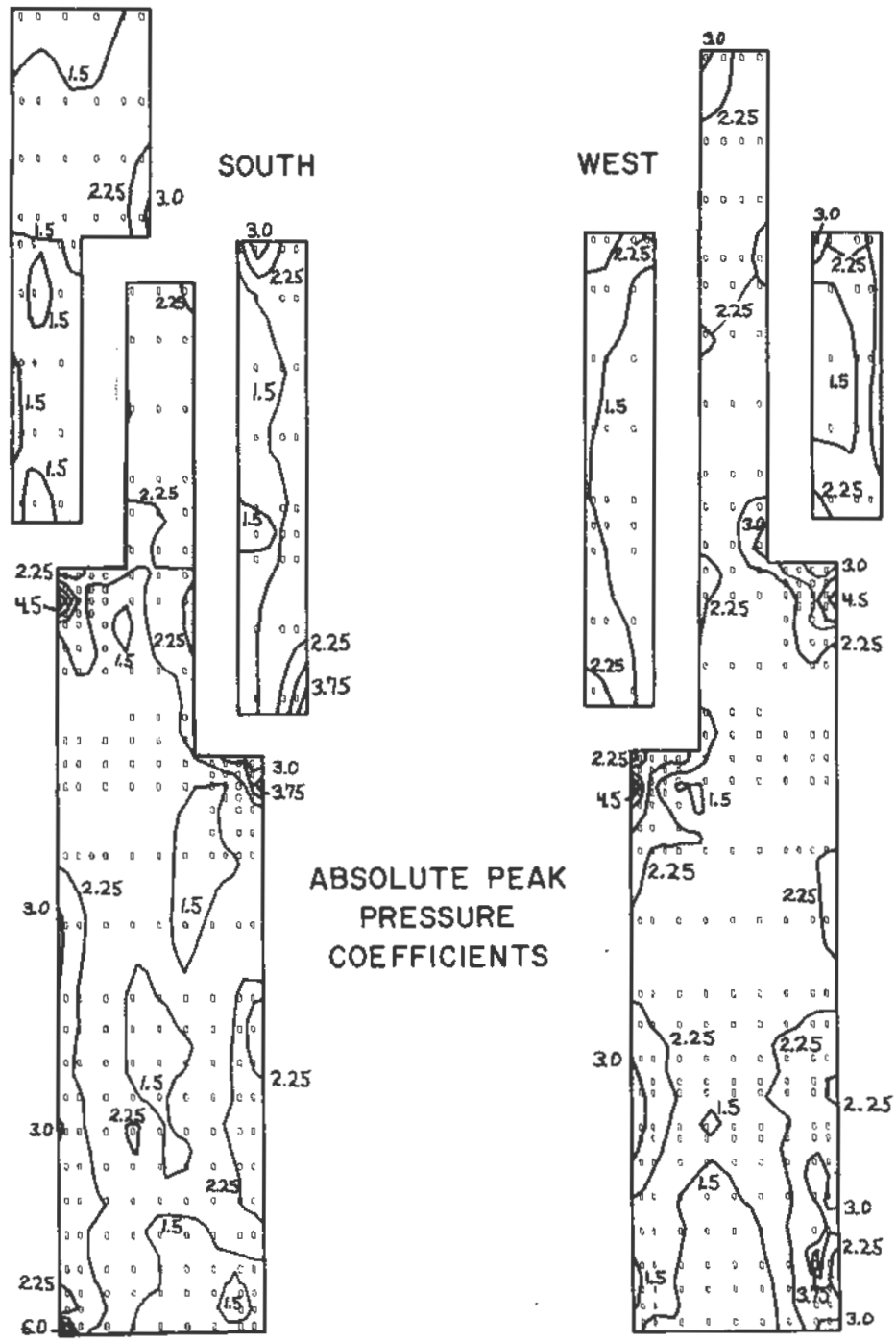


Figure 15b. Contours of Absolute Peak Pressure Coefficients

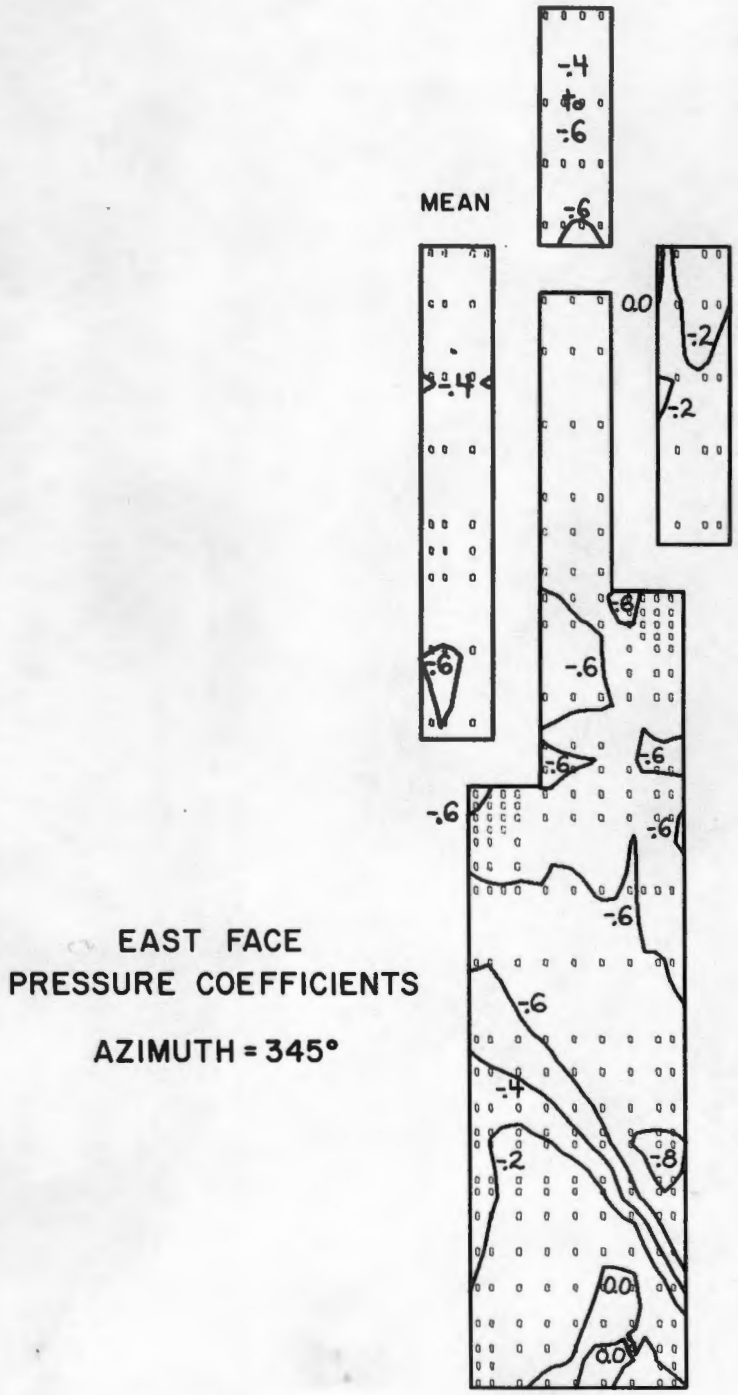


Figure 16a. Pressure Contours for the East Face for Az = 345 Degrees

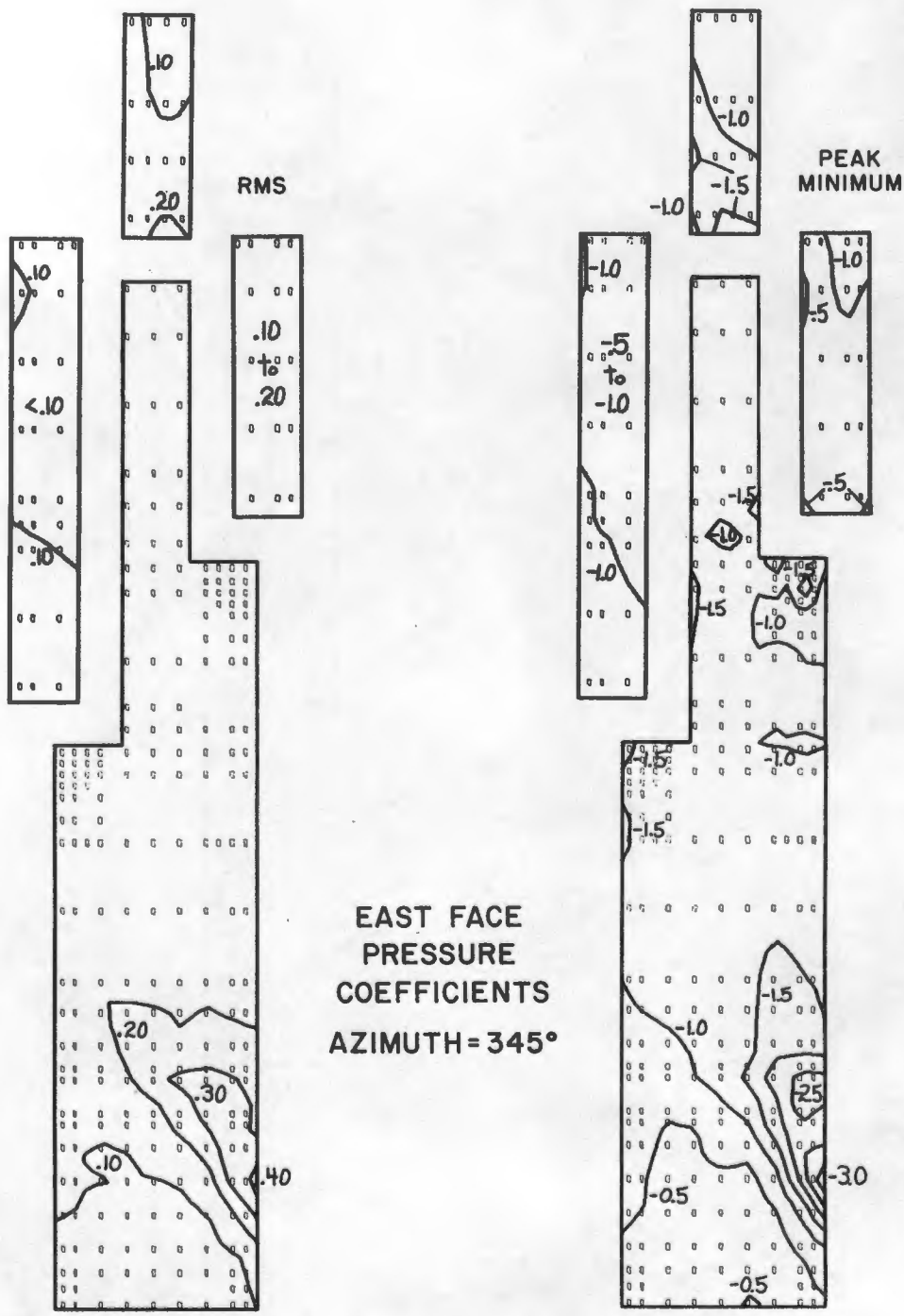


Figure 16b. Pressure Contours for the East Face for Az = 345 Degrees

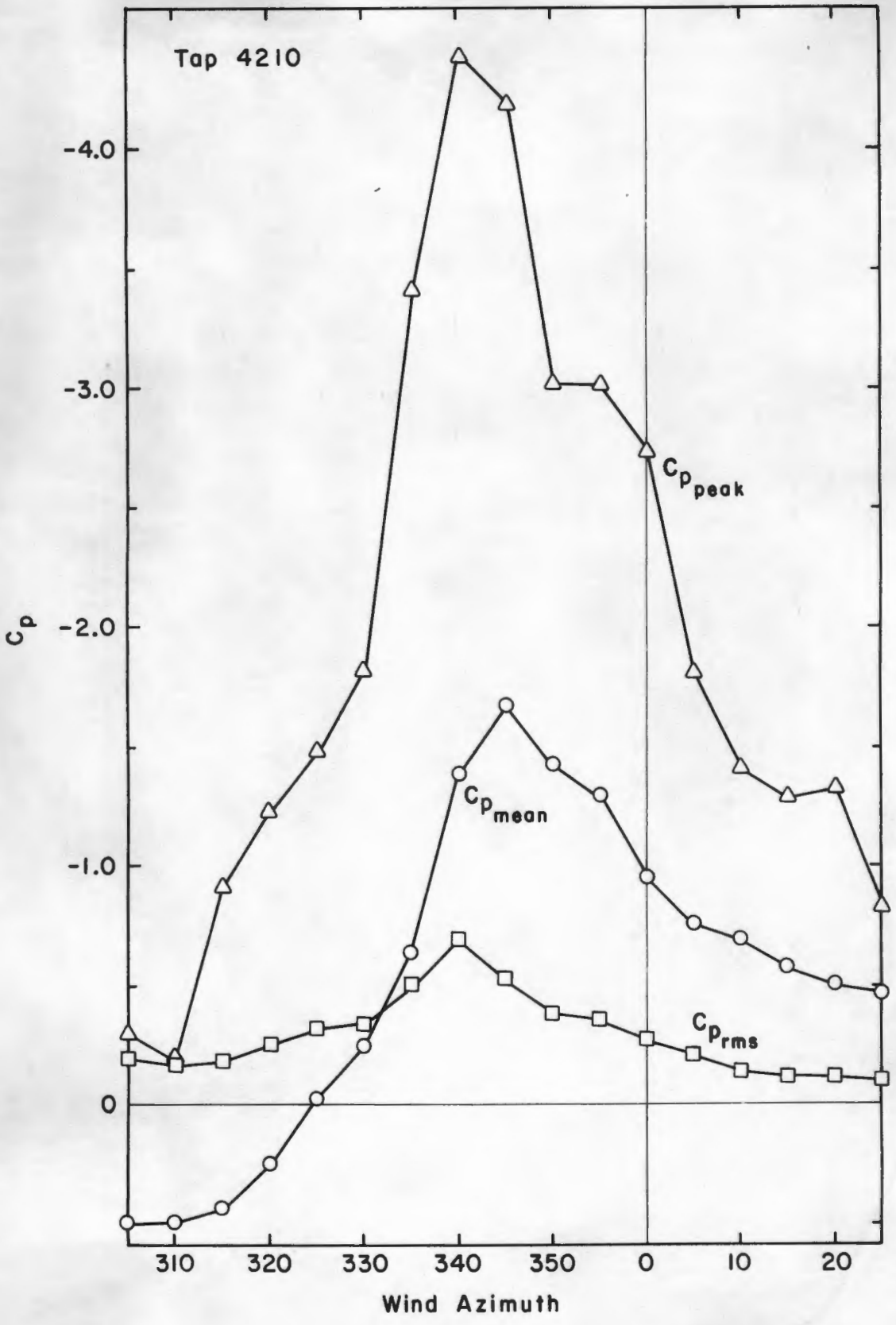


Figure 17. Pressure Coefficients for Tap 4210

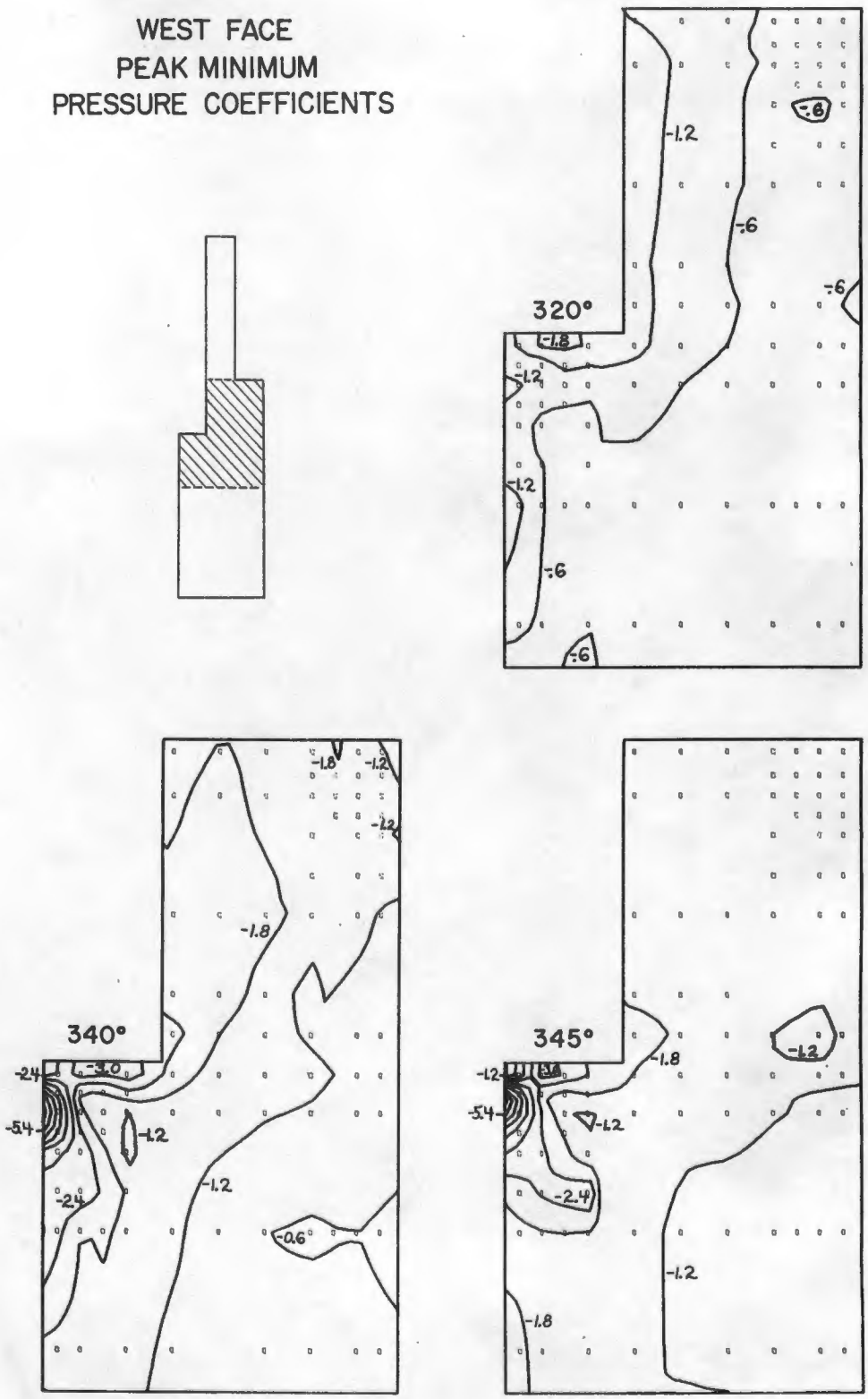


Figure 18a. Peak Minimum Contours Associated with Vortex Development

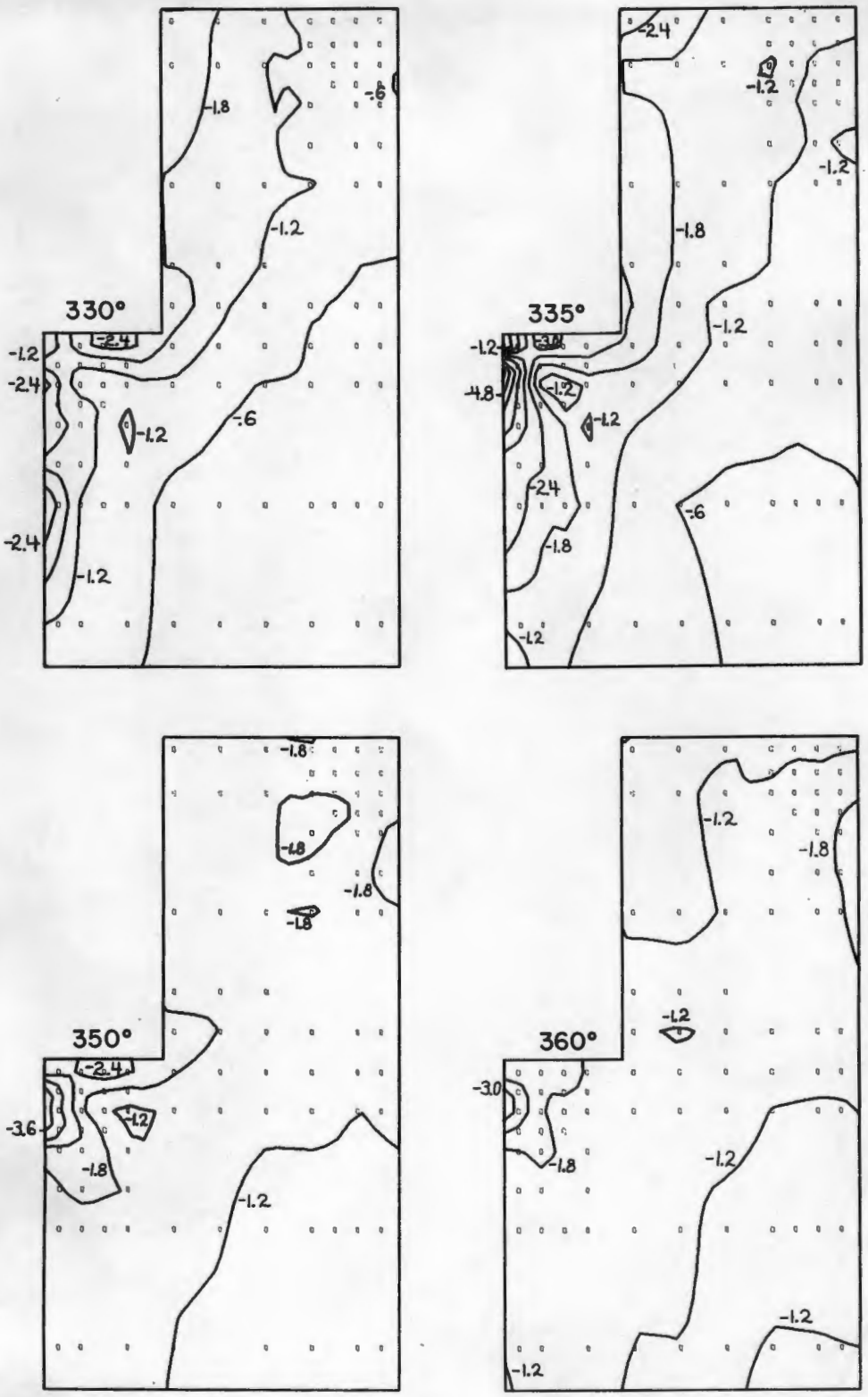


Figure 18b. Peak Minimum Contours Associated with Vortex Development

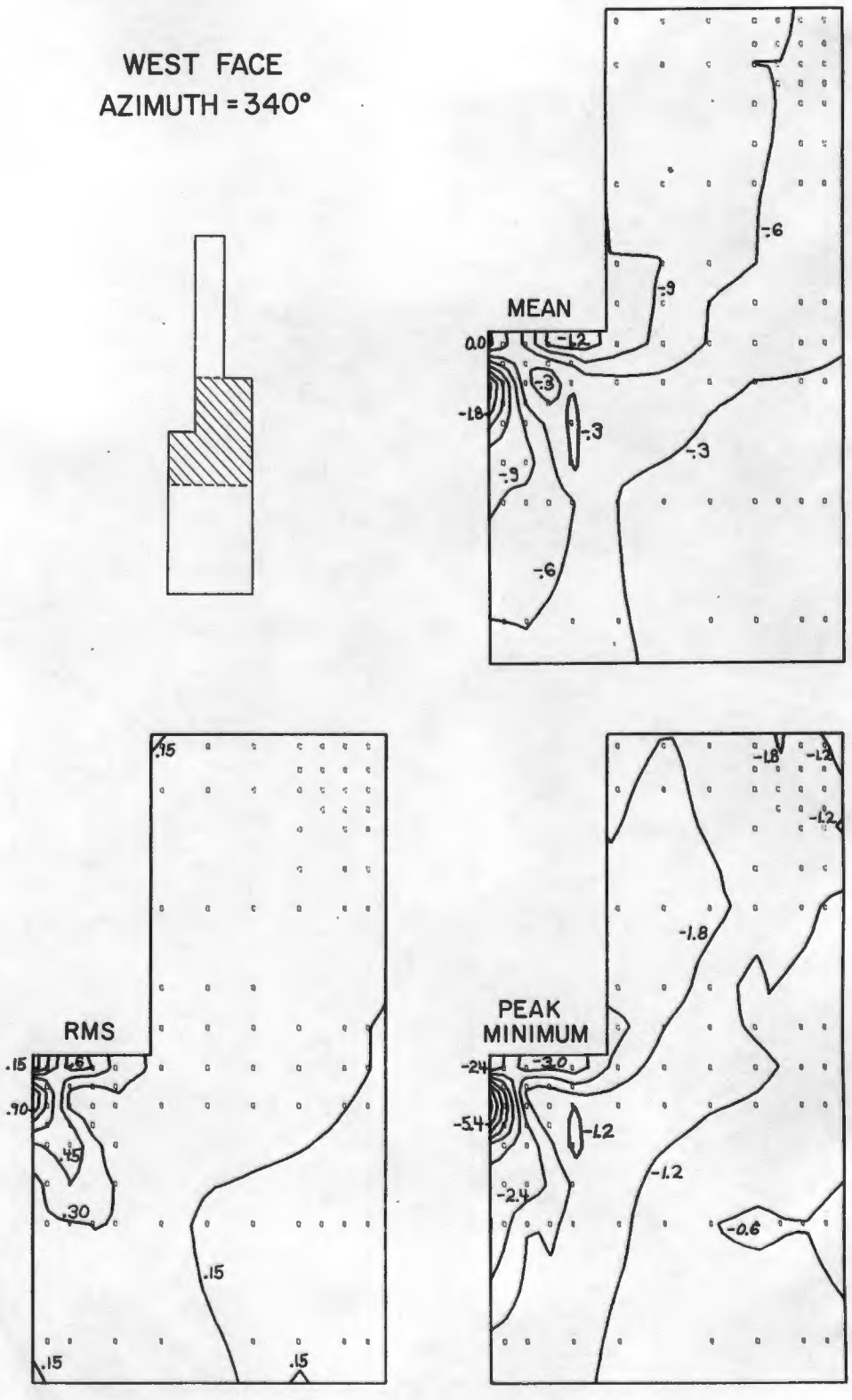


Figure 19. Pressure Coefficient Distributions Associated with Vortex Development

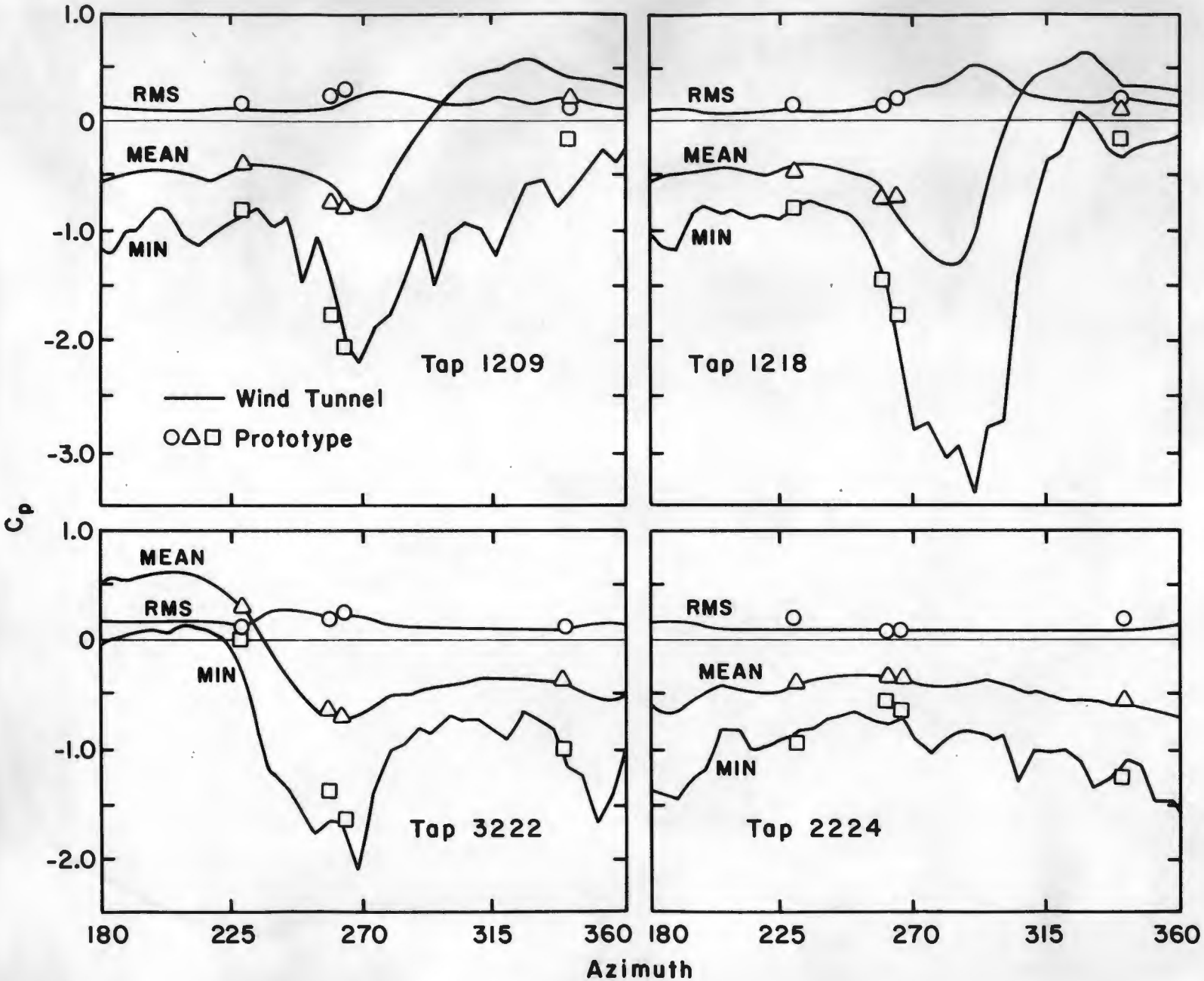


Figure 20. Preliminary Wind-Tunnel--Prototype Data Comparison

AZIMUTH = 340°
LOWER EAST FACE (Up to first setback)

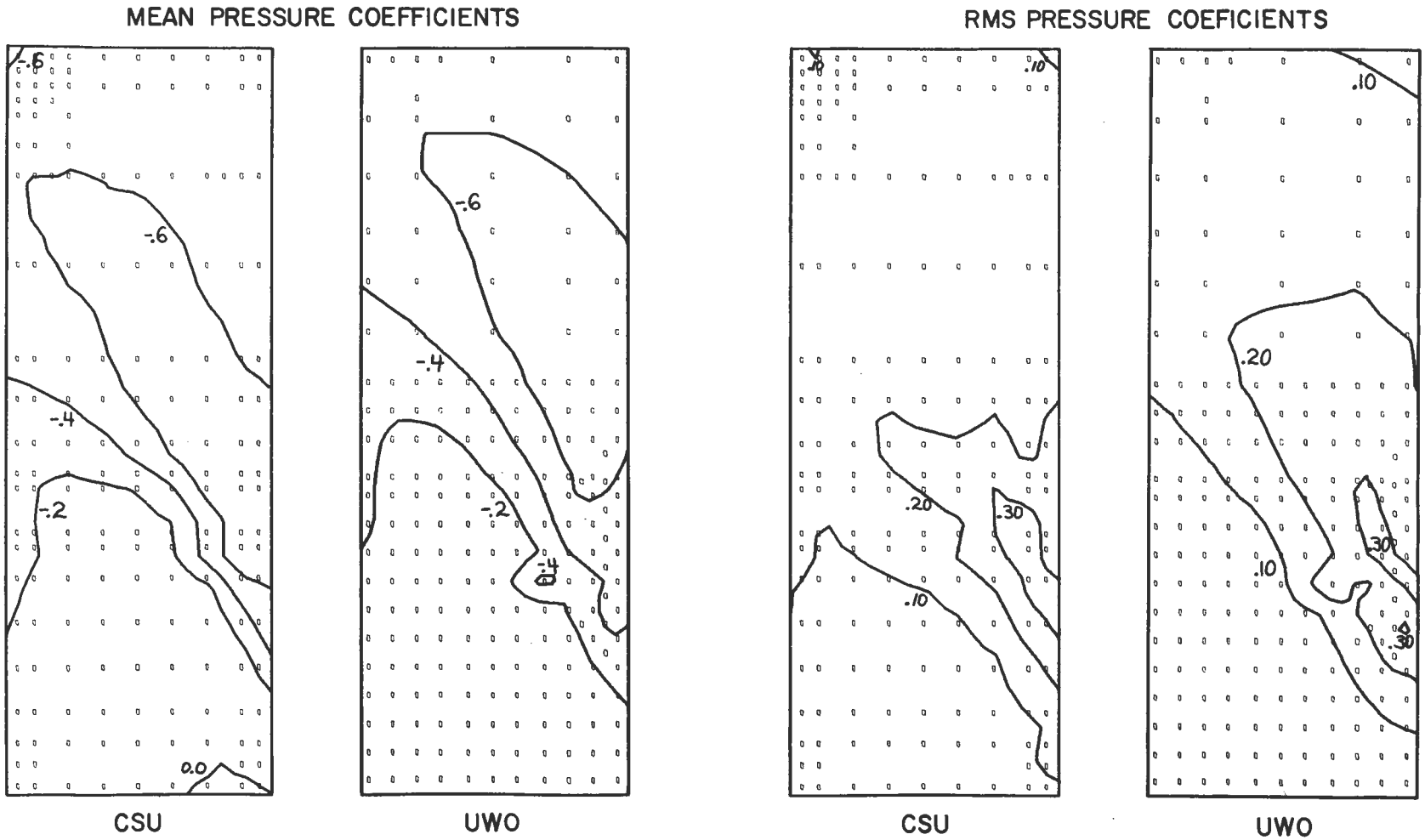


Figure 21a. Comparison of Two Wind-Tunnel Tests

AZIMUTH = 180°

LOWER EAST FACE (Up to first setback)

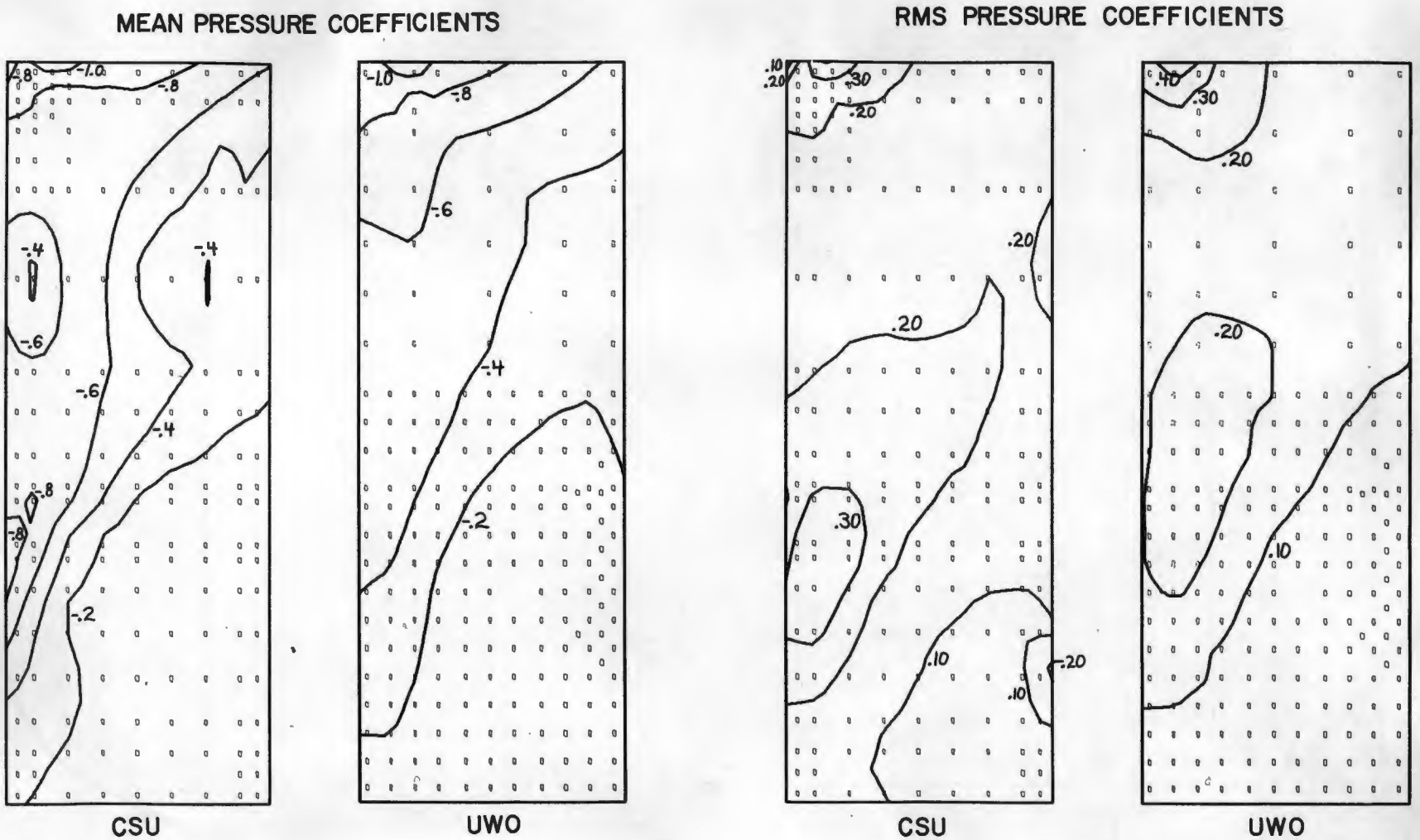


Figure 21b. Comparison of Two Wind-Tunnel Tests

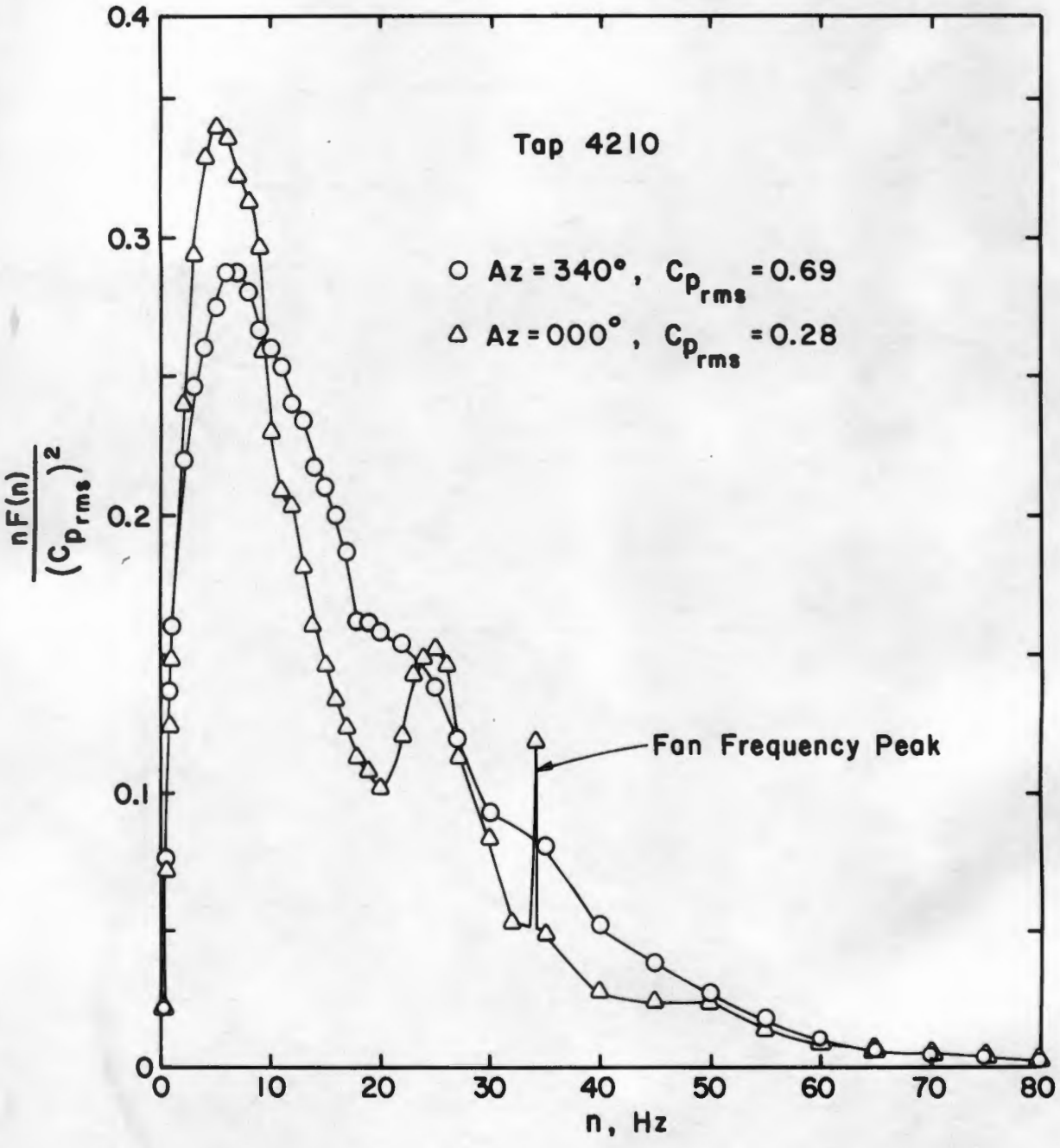


Figure 22. Spectra of Pressure Fluctuations at Tap 4210

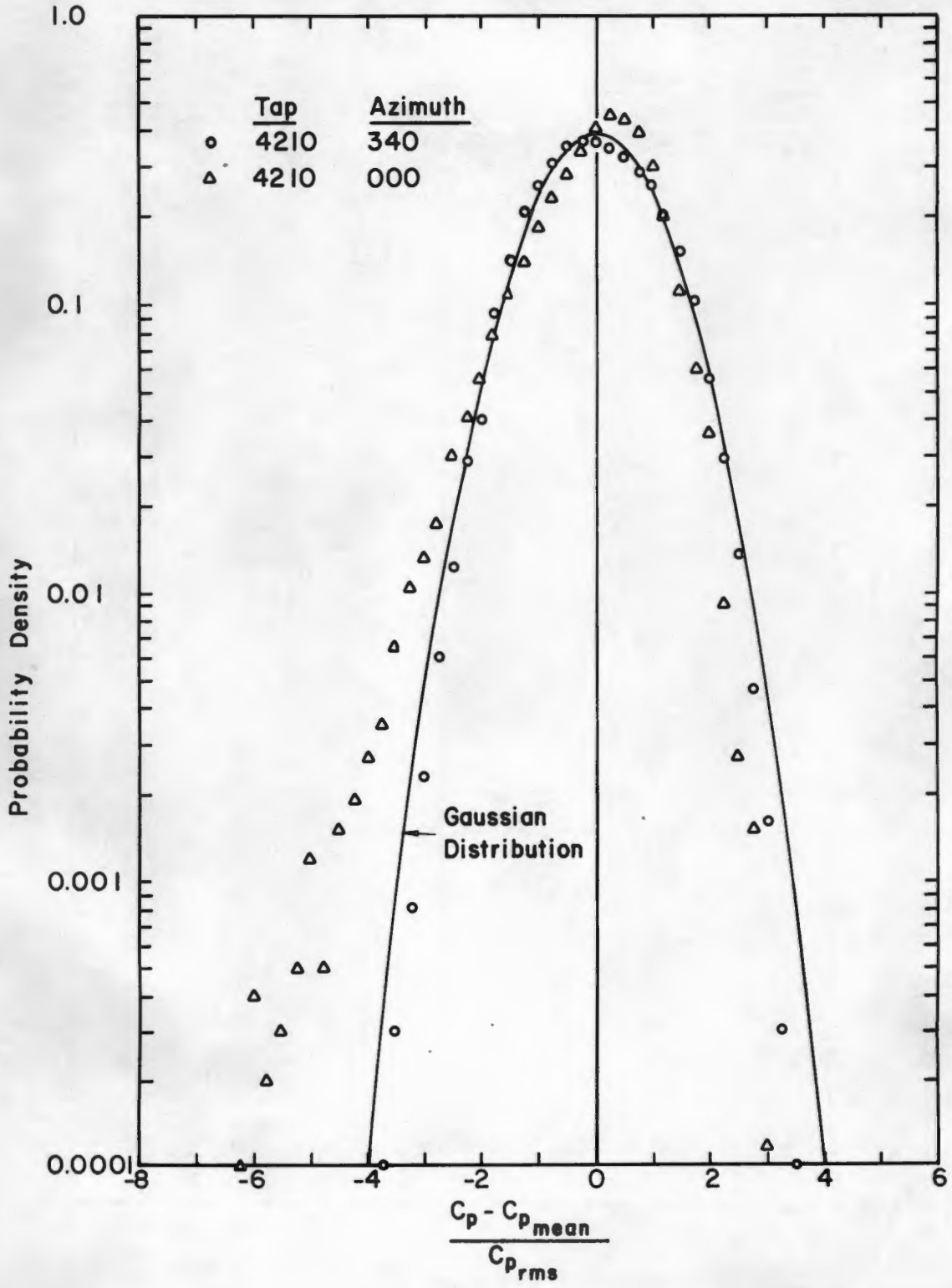


Figure 23. Probability Density of Pressure Fluctuations at Tap 4210

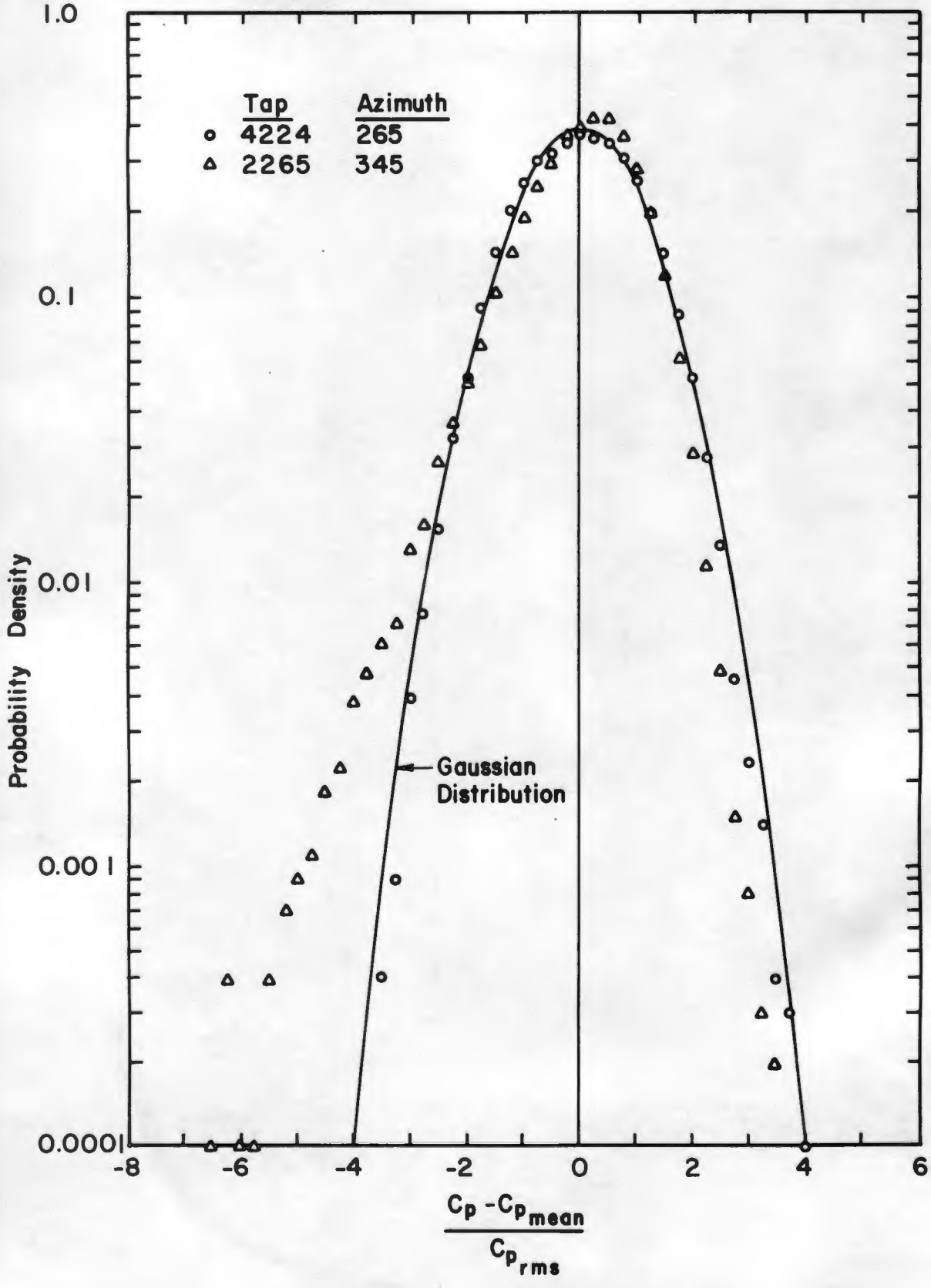
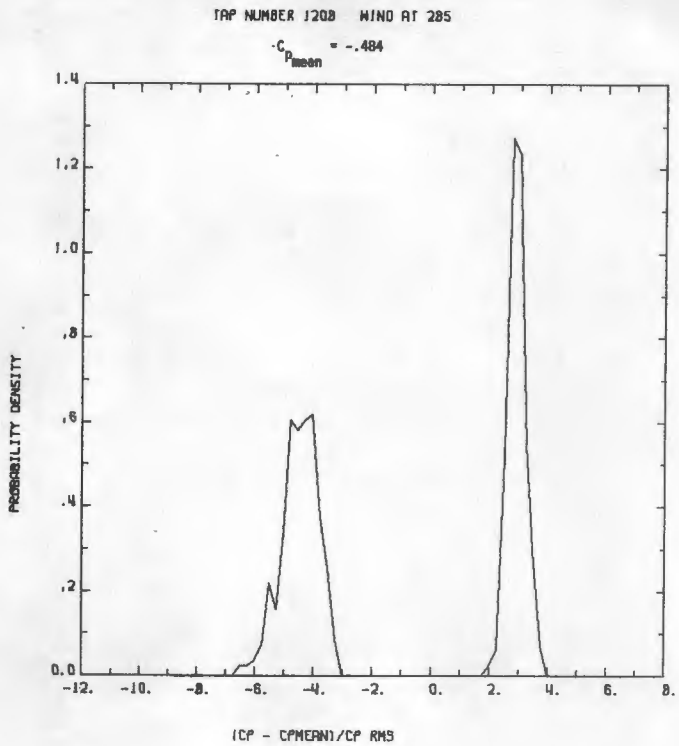


Figure 24. Probability Density of Pressure Fluctuations at Taps 4224 and 2265



TAP NUMBER 1208 WIND AT 285

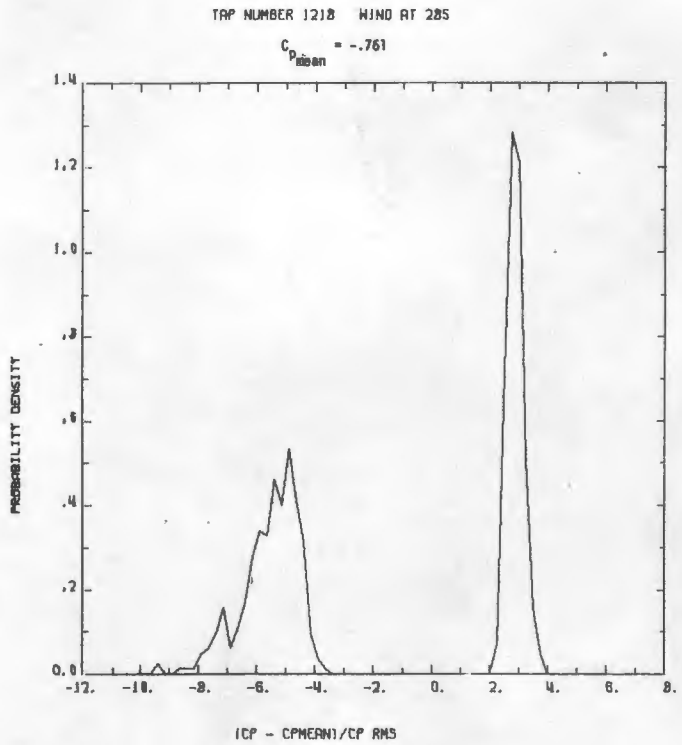
PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	.0242	-6.25	.0242
-6.00	.0364	-5.75	.0727	-5.50	.2182	-5.25	.1576
-5.00	.3394	-4.75	.6061	-4.50	.5818	-4.25	.6061
-4.00	.6182	-3.75	.3758	-3.50	.2545	-3.25	.0848
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	.0242	2.25	.0606	2.50	.5212	2.75	1.2727
3.00	1.2364	3.25	.5455	3.50	.2667	3.75	.0727
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25a. Probability Distribution of Peak Positive and Peak Negative Pressures



TAP NUMBER 1218 WIND AT 285

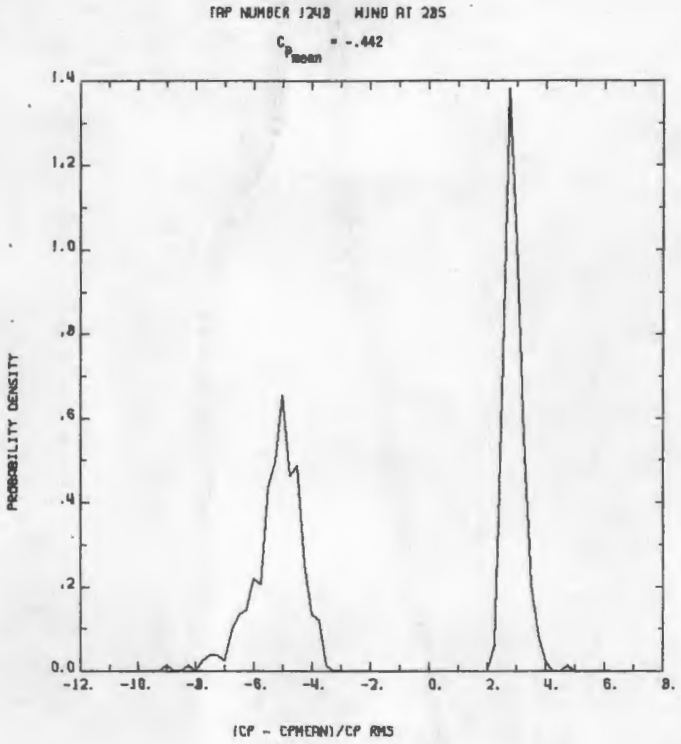
PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	.0242
-9.00	0.0000	-8.75	0.0000	-8.50	.0121	-8.25	.0121
-8.00	.0121	-7.75	.0485	-7.50	.0606	-7.25	.0970
-7.00	.1576	-6.75	.0606	-6.50	.1091	-6.25	.1697
-6.00	.2788	-5.75	.3394	-5.50	.3273	-5.25	.4606
-5.00	.4000	-4.75	.5333	-4.50	.4121	-4.25	.3152
-4.00	.0970	-3.75	.0364	-3.50	.0121	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	.0727	2.50	.7152	2.75	1.2848
3.00	1.2121	3.25	.5091	3.50	.1576	3.75	.0485
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25b. Probability Distribution of Peak Positive and Peak Negative Pressures



TAP NUMBER 3248 WIND AT 285

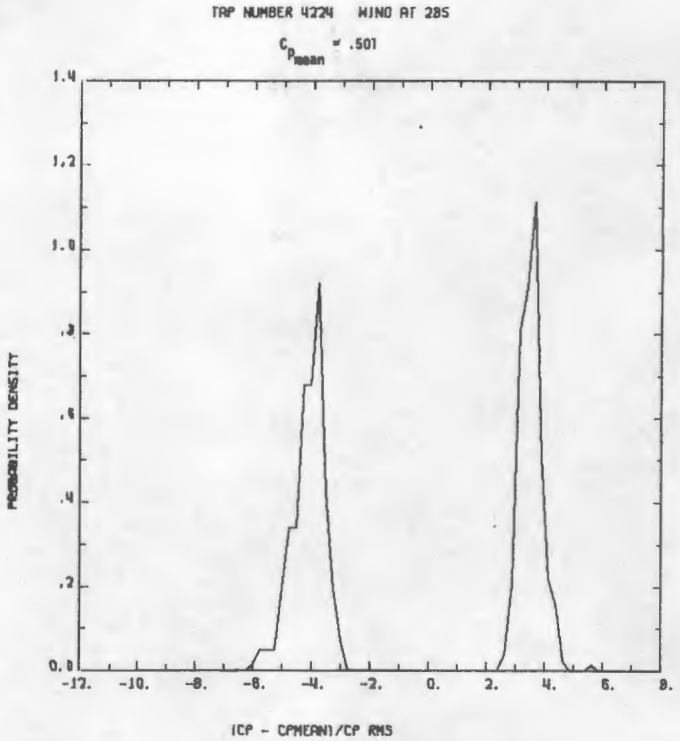
PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	.0121	-8.75	0.0000	-8.50	0.0000	-8.25	.0121
-8.00	0.0000	-7.75	.0242	-7.50	.0364	-7.25	.0364
-7.00	.0242	-6.75	.0970	-6.50	.1333	-6.25	.1455
-6.00	.2182	-5.75	.2061	-5.50	.4364	-5.25	.4970
-5.00	.6545	-4.75	.4606	-4.50	.4848	-4.25	.2545
-4.00	.1333	-3.75	.3212	-3.50	.0121	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	.0606	2.50	.0545	2.75	1.3818
3.00	1.8182	3.25	.9576	3.50	.2061	3.75	.0848
4.00	.0242	4.25	0.0000	4.50	0.0000	4.75	.0121
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25c. Probability Distribution of Peak Positive and Peak Negative Pressures



TAP NUMBER 4224 WIND AT 285

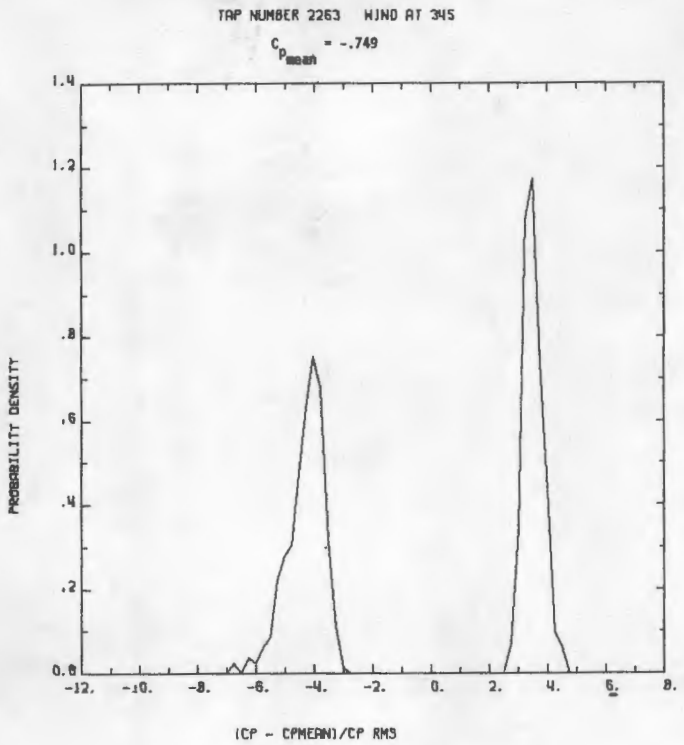
PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	.0121	-5.75	.0485	-5.50	.0485	-5.25	.0485
-5.00	.1939	-4.75	.3394	-4.50	.3394	-4.25	.6788
-4.00	.6788	-3.75	.9212	-3.50	.4242	-3.25	.1939
-3.00	.0727	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	.0364	2.75	.2061
3.00	.0121	3.25	.9091	3.50	1.1152	3.75	.5091
4.00	.2182	4.25	.1576	4.50	.0242	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	.0121	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25d. Probability Distribution of Peak Positive and Peak Negative Pressures



TAP NUMBER 2263 WIND AT 345

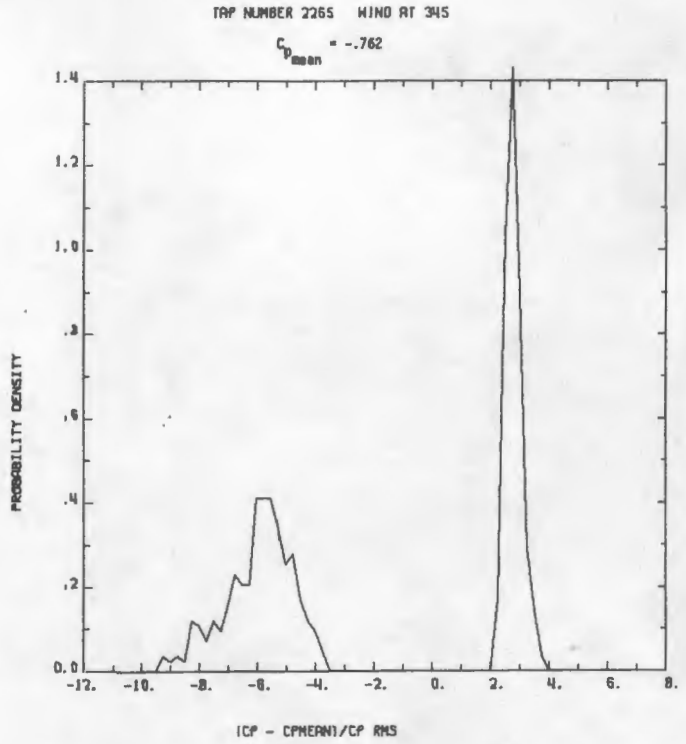
PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	.0242	-6.50	0.0000	-6.25	.0364
-6.00	.0242	-5.75	.0606	-5.50	.0848	-5.25	.2182
-5.00	.2788	-4.75	.3030	-4.50	.4727	-4.25	.6303
-4.00	.7515	-3.75	.0788	-3.50	.3152	-3.25	.1091
-3.00	.0121	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	.0727
3.00	.3394	3.25	1.0788	3.50	1.1758	3.75	.7394
4.00	.4364	4.25	.0970	4.50	.0606	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25e. Probability Distribution of Peak Positive and Peak Negative Pressures



TAP NUMBER 2265 WIND AT 345

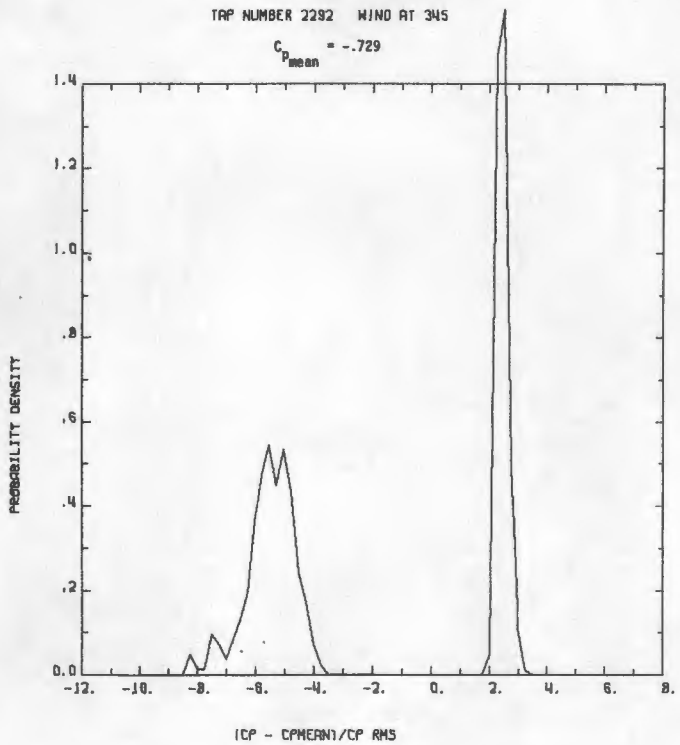
PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	.0364
-9.00	.0242	-8.75	.0364	-8.50	.0242	-8.25	.1212
-8.00	.1091	-7.75	.0727	-7.50	.1212	-7.25	.0970
-7.00	.1576	-6.75	.2303	-6.50	.2061	-6.25	.2061
-6.00	.4121	-5.75	.4121	-5.50	.4121	-5.25	.3394
-5.00	.2545	-4.75	.2788	-4.50	.1697	-4.25	.1212
-4.00	.0970	-3.75	.0485	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	.1697	2.50	1.0303	2.75	1.4303
3.00	.8970	3.25	.2909	3.50	.1455	3.75	.0364
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25f. Probability Distribution of Peak Positive and Peak Negative Pressures



TAP NUMBER 2292 WIND AT 345

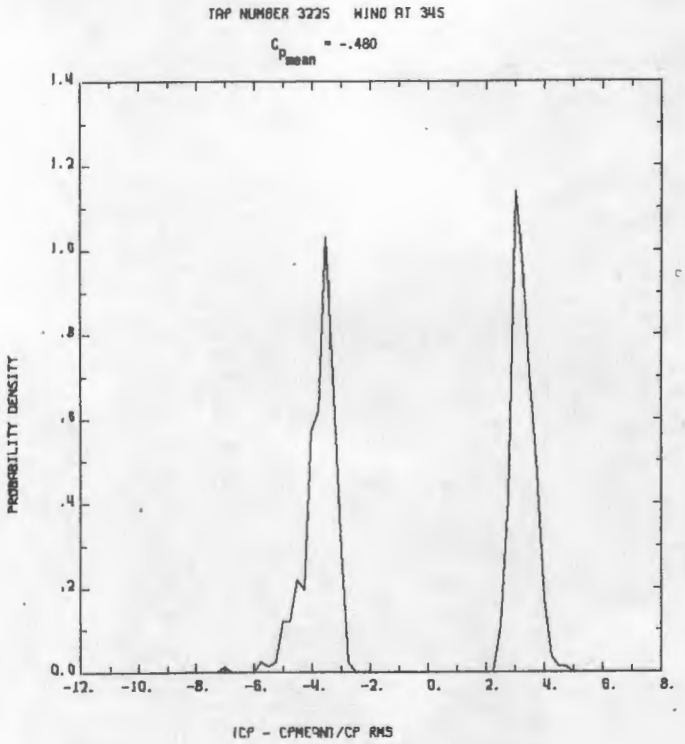
PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	.0485
-8.00	.0121	-7.75	.0121	-7.50	.0970	-7.25	.0727
-7.00	.0364	-6.75	.0848	-6.50	.1333	-6.25	.1939
-6.00	.3636	-5.75	.4727	-5.50	.5455	-5.25	.4485
-5.00	.5333	-4.75	.4364	-4.50	.2424	-4.25	.1697
-4.00	.0727	-3.75	.0242	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	.0485	2.25	1.4667	2.50	1.0667	2.75	.4970
3.00	.1091	3.25	.0121	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25g. Probability Distribution of Peak Positive and Peak Negative Pressures



TAP NUMBER 3225 WIND AT 345

PROBABILITY DENSITY NEGATIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	.0121	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	.0242	-5.50	.0121	-5.25	.0242
-5.00	.1212	-4.75	.1212	-4.50	.2182	-4.25	.1939
-4.00	.5697	-3.75	.6182	-3.50	1.0303	-3.25	.7030
-3.00	.3273	-2.75	.0242	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	0.0000	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

PROBABILITY DENSITY POSITIVE PEAKS

-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	0.0000	-3.25	0.0000
-3.00	0.0000	-2.75	0.0000	-2.50	0.0000	-2.25	0.0000
-2.00	0.0000	-1.75	0.0000	-1.50	0.0000	-1.25	0.0000
-1.00	0.0000	-.75	0.0000	-.50	0.0000	-.25	0.0000
0.00	0.0000	.25	0.0000	.50	0.0000	.75	0.0000
1.00	0.0000	1.25	0.0000	1.50	0.0000	1.75	0.0000
2.00	0.0000	2.25	0.0000	2.50	.1091	2.75	.4121
3.00	1.1394	3.25	.9576	3.50	.6788	3.75	.4727
4.00	.1697	4.25	.0364	4.50	.0121	4.75	.0121
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

Figure 25h. Probability Distribution of Peak Positive and Peak Negative Pressures

APPENDIX B

Spectra and Correlations of Pressure Fluctuations

APPENDIX B - Spectra and Correlations of Pressure Fluctuations

Wind Azmuth	Tap No.	C_p Mean	C_p rms	C_p pk max	C_p pk min
0	1248	.052	.101	.426	- .301
	2263	- .712	.270	.181	-2.068
	2265	- .821	.272	-.060	-2.196
	4210	- .952	.276	-.382	-2.740
260	2274	- .177	.105	.099	- .958
	2284	- .332	.121	.059	- .919
265	1206	- .666	.158	-.214	-1.160
	1208	- .787	.244	-.014	-1.900
	1218	- .761	.218	-.210	-1.933
	1219	- .734	.189	-.171	-1.805
	1248	- .683	.223	.207	-1.895
	4224	.444	.162	1.061	- .014
285	1206	- .820	.244	-.090	-1.675
	1208	- .484	.388	.469	-2.755
	1218	-1.277	.424	-.099	-2.908
	1219	- .905	.269	.169	-2.275
	1248	- .442	.156	.226	-1.495
	4224	.501	.151	1.080	.044
340	4201	- .240	.312	.522	-2.539
	4210	-1.398	.687	.367	-4.389
345	2263	- .749	.224	.095	-1.943
	2265	- .762	.225	-.164	-1.787
	2272	- .819	.363	.393	-2.305
	2274	- .858	.283	-.019	-2.683
	2292	- .729	.378	.132	-2.551
	3225	- .480	.113	-.058	- .935

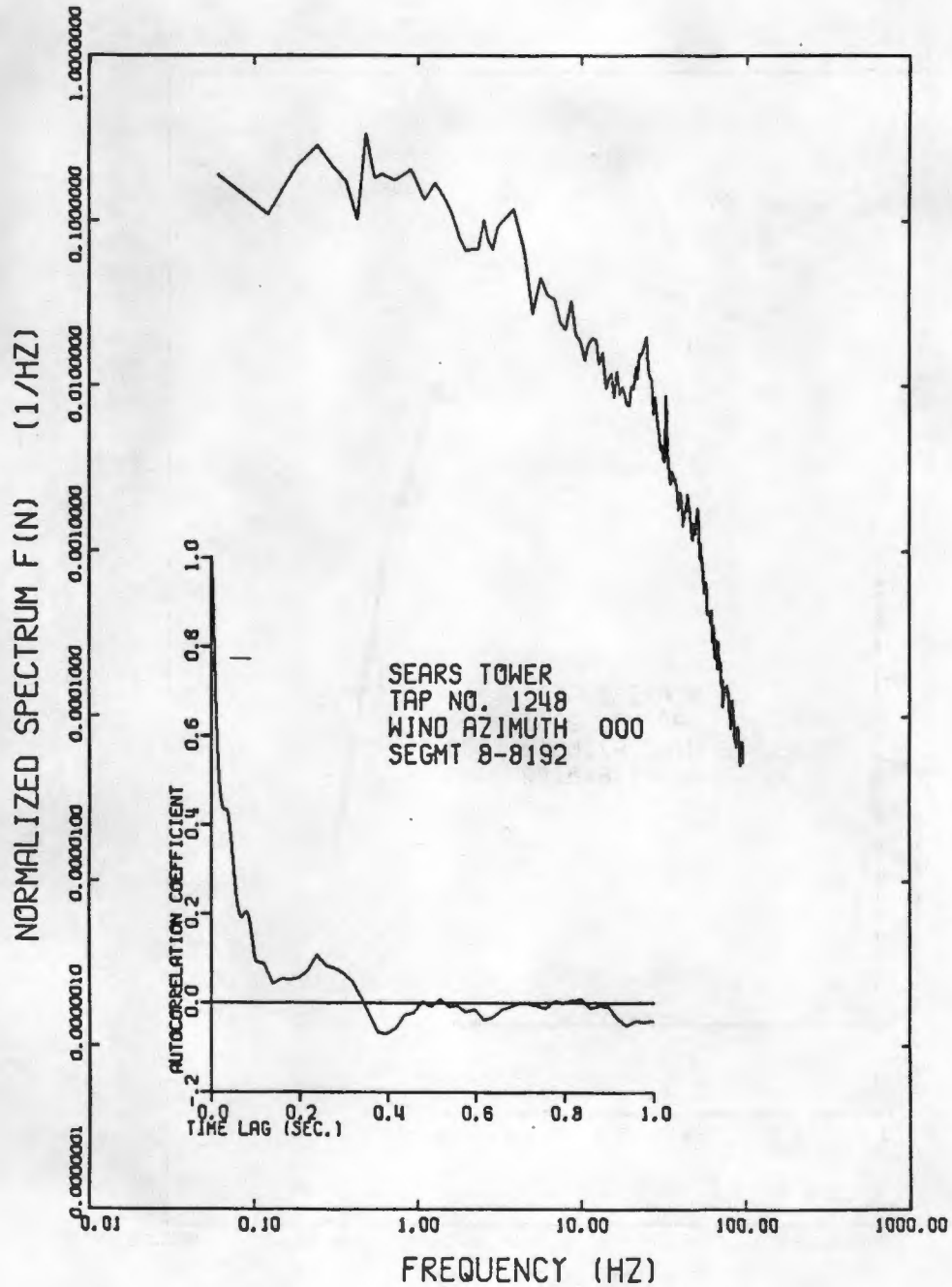

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1248
WIND AZIMUTH 000
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B1

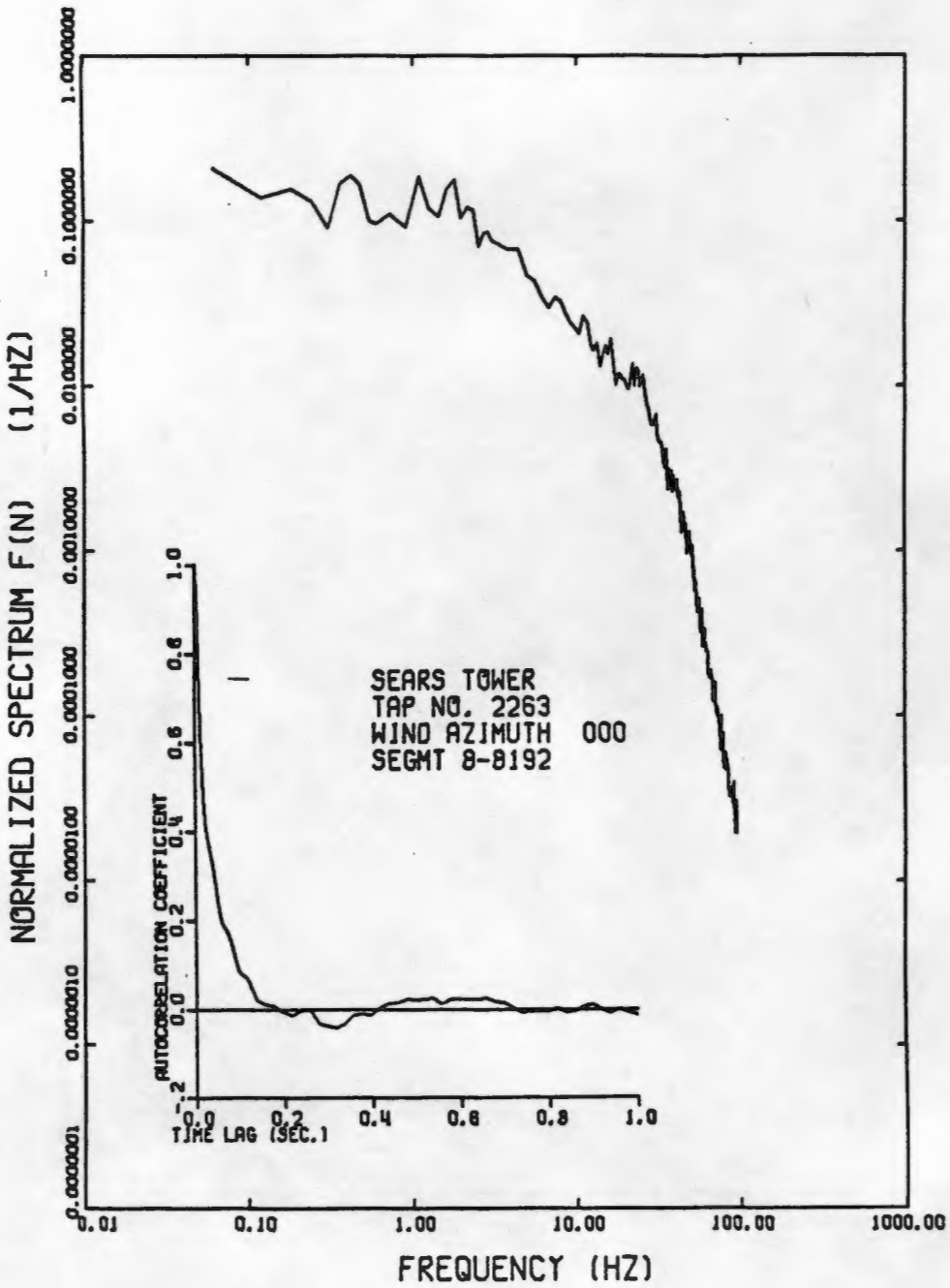
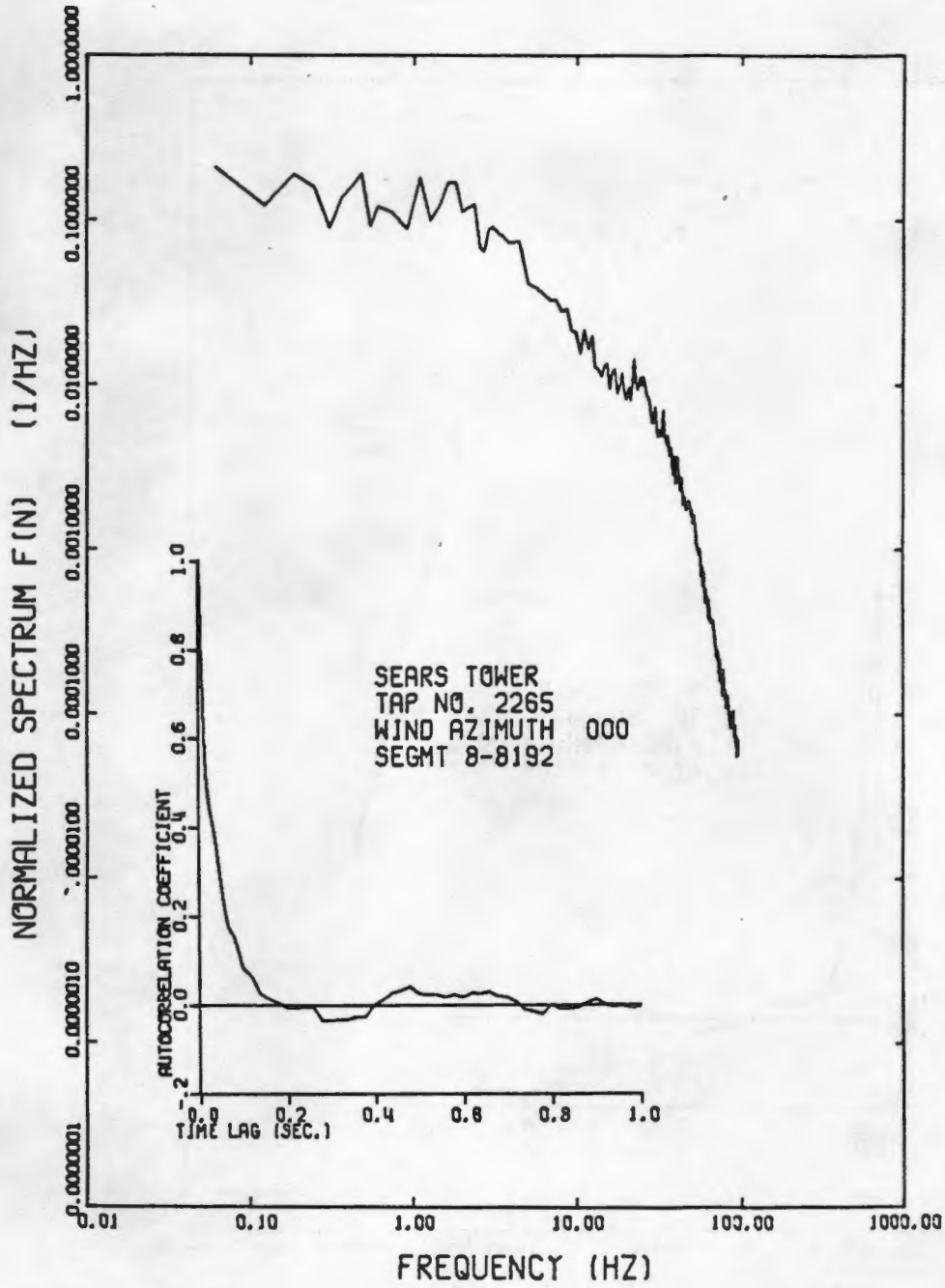

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2263
WIND AZIMUTH 000
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B2


NORMALIZED SPECTRUM F(N) (1/HZ)
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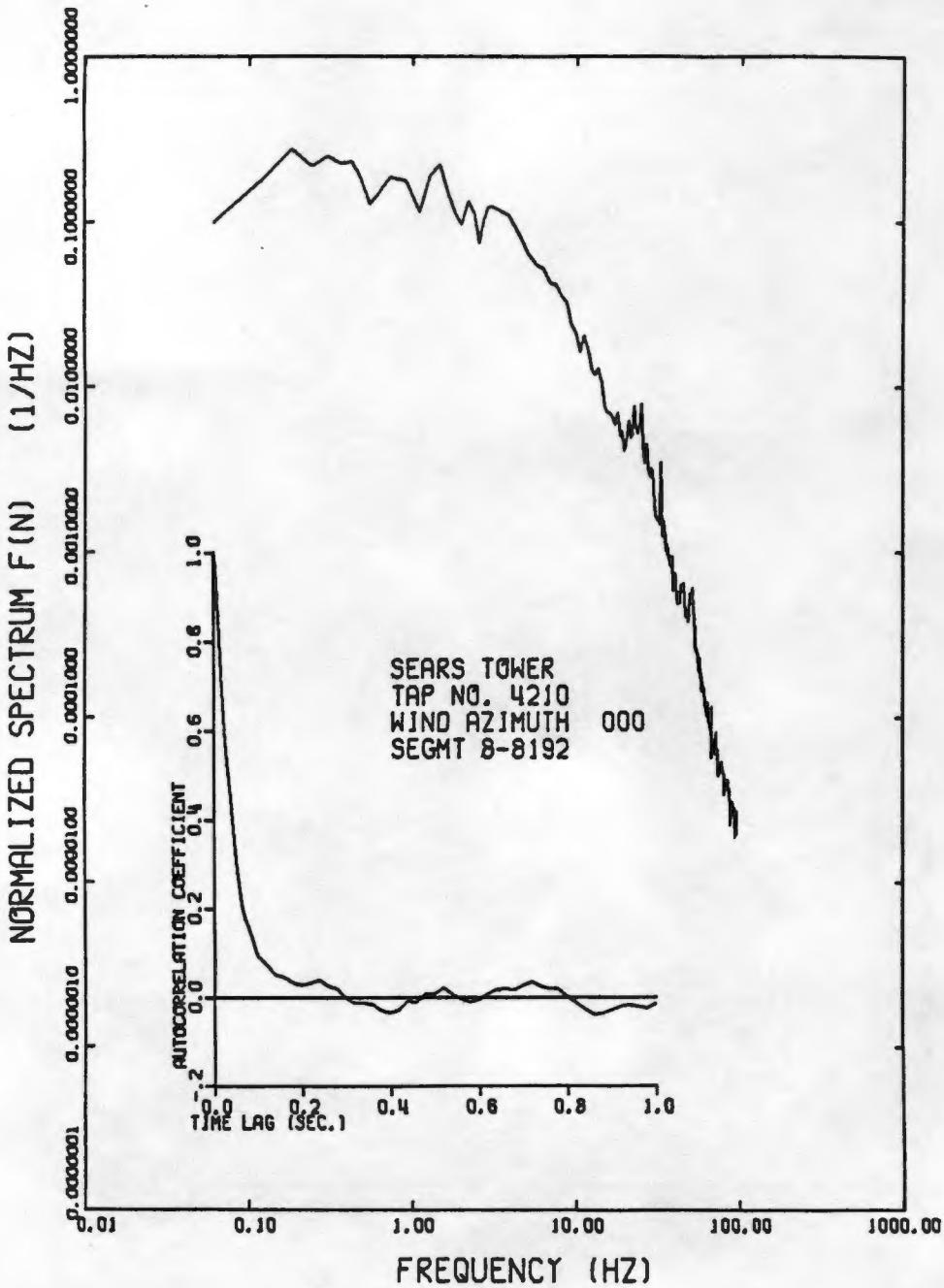
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2265
WIND AZIMUTH 000
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B3


NORMALIZED SPECTRUM F(N) (1/HZ)
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0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 4210
WIND AZIMUTH 000
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B4

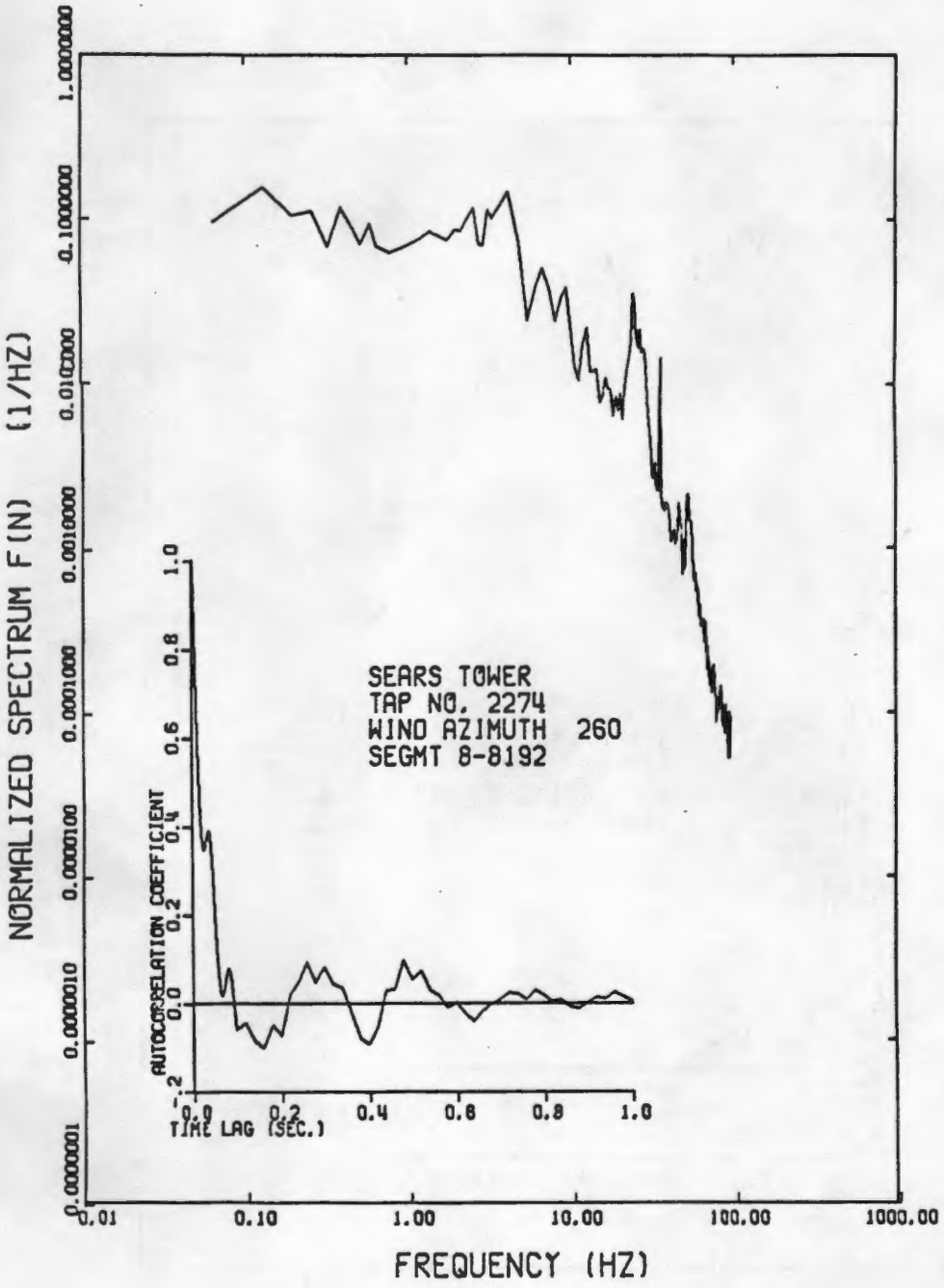
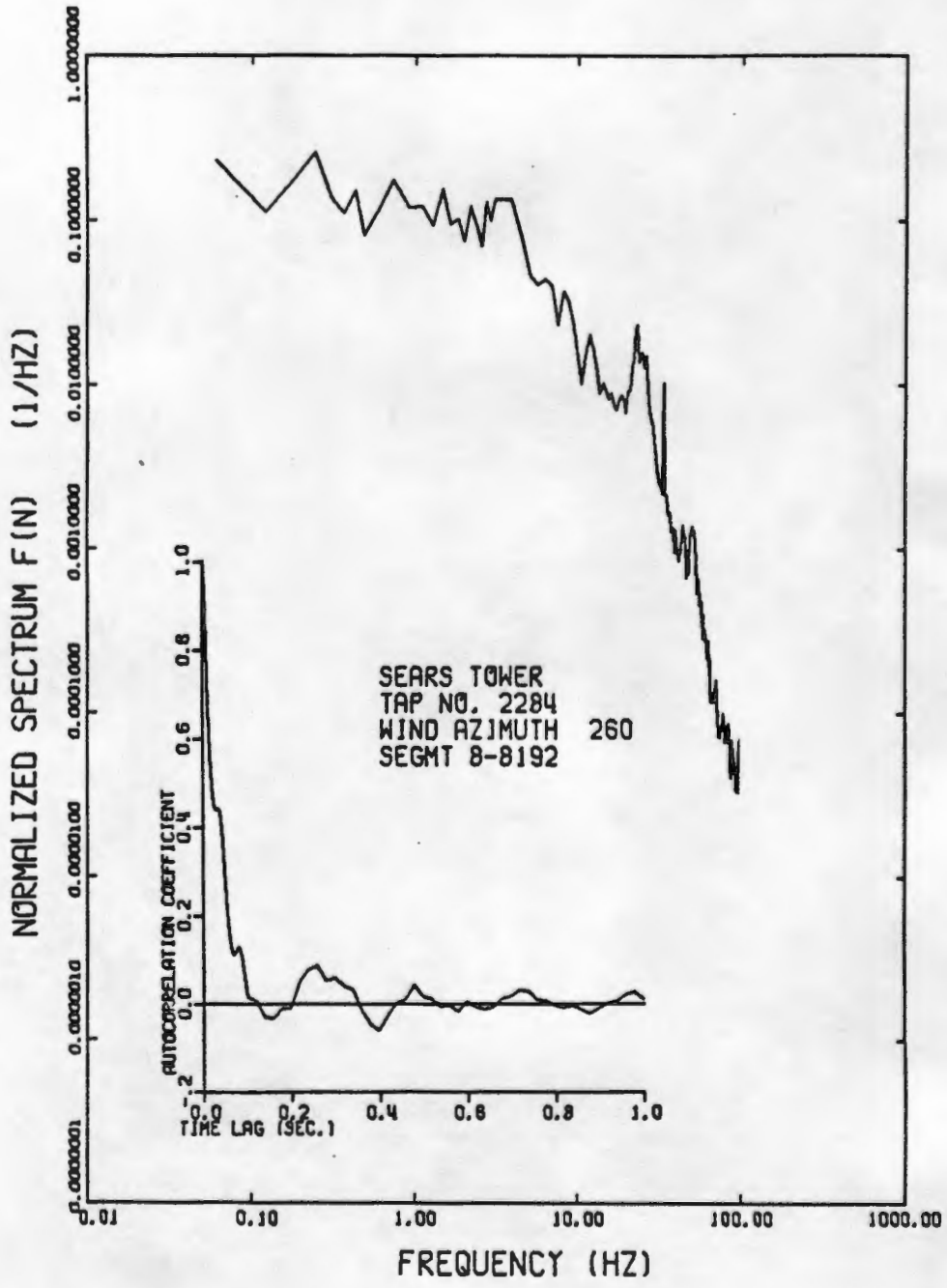

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2274
WIND AZIMUTH 260
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B5


NORMALIZED SPECTRUM F(N) (1/HZ)
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0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2284
WIND AZIMUTH 260
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B6

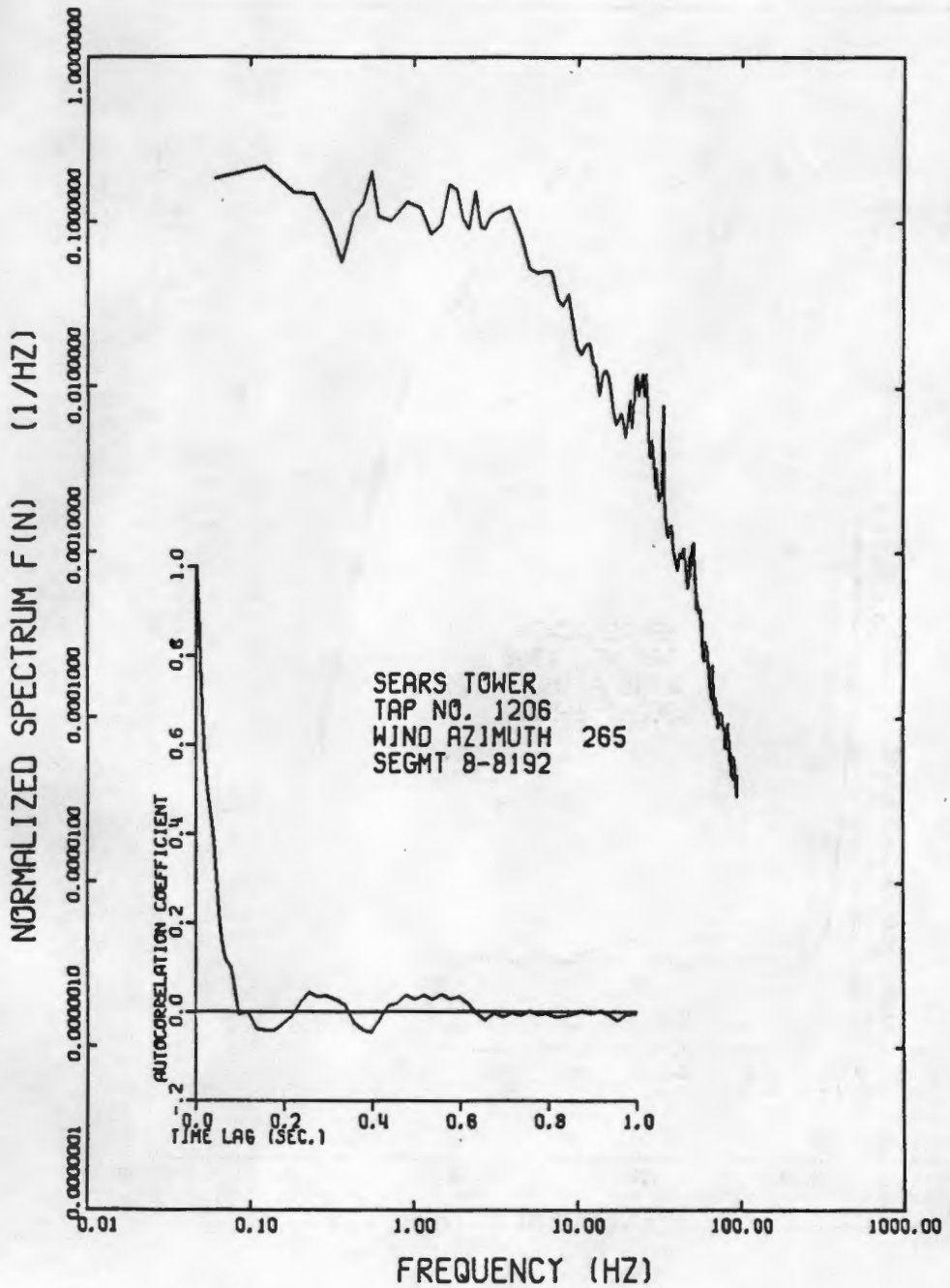

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1206
WIND AZIMUTH 265
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B7

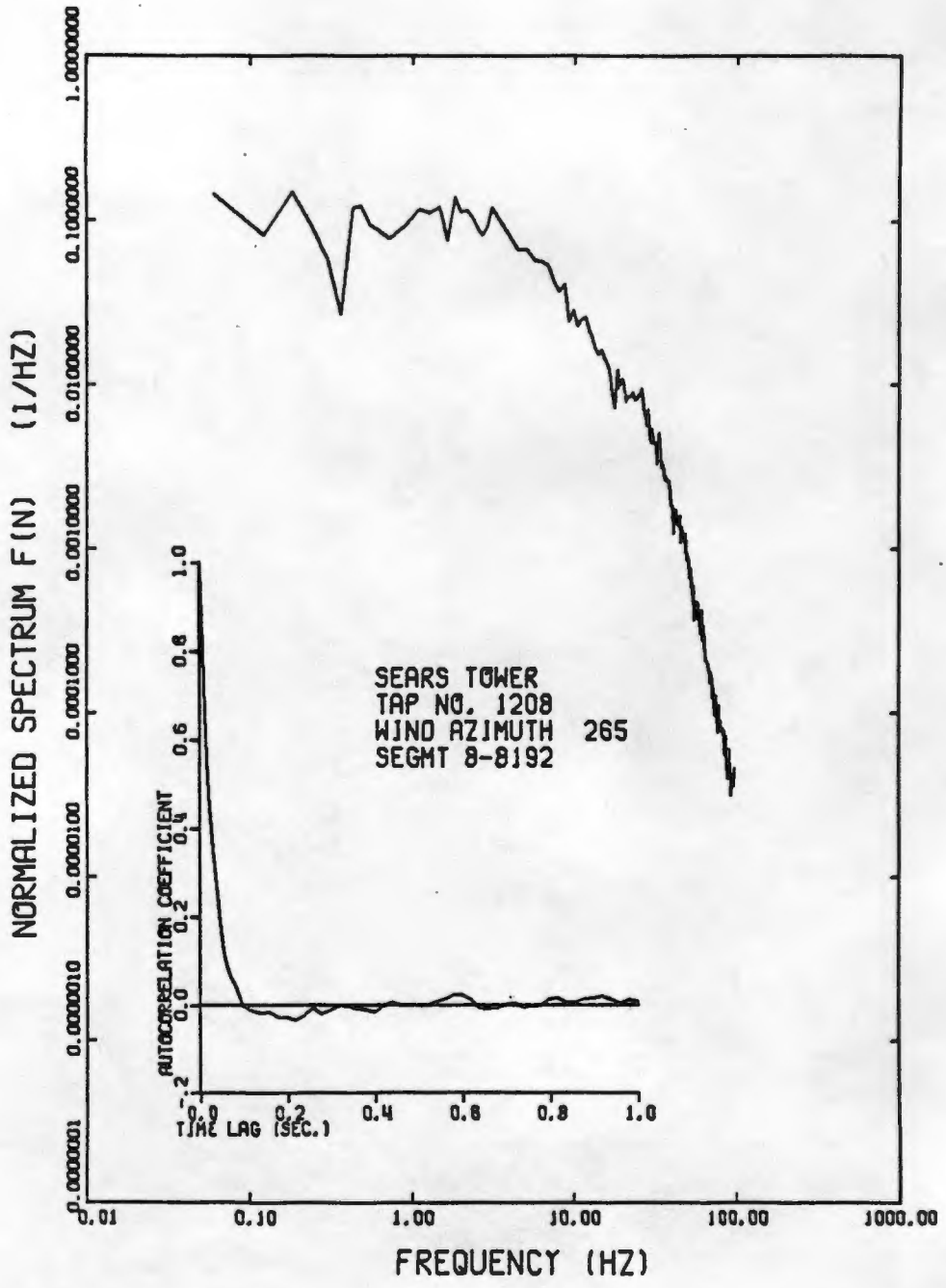

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1208
WIND AZIMUTH 265
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B8

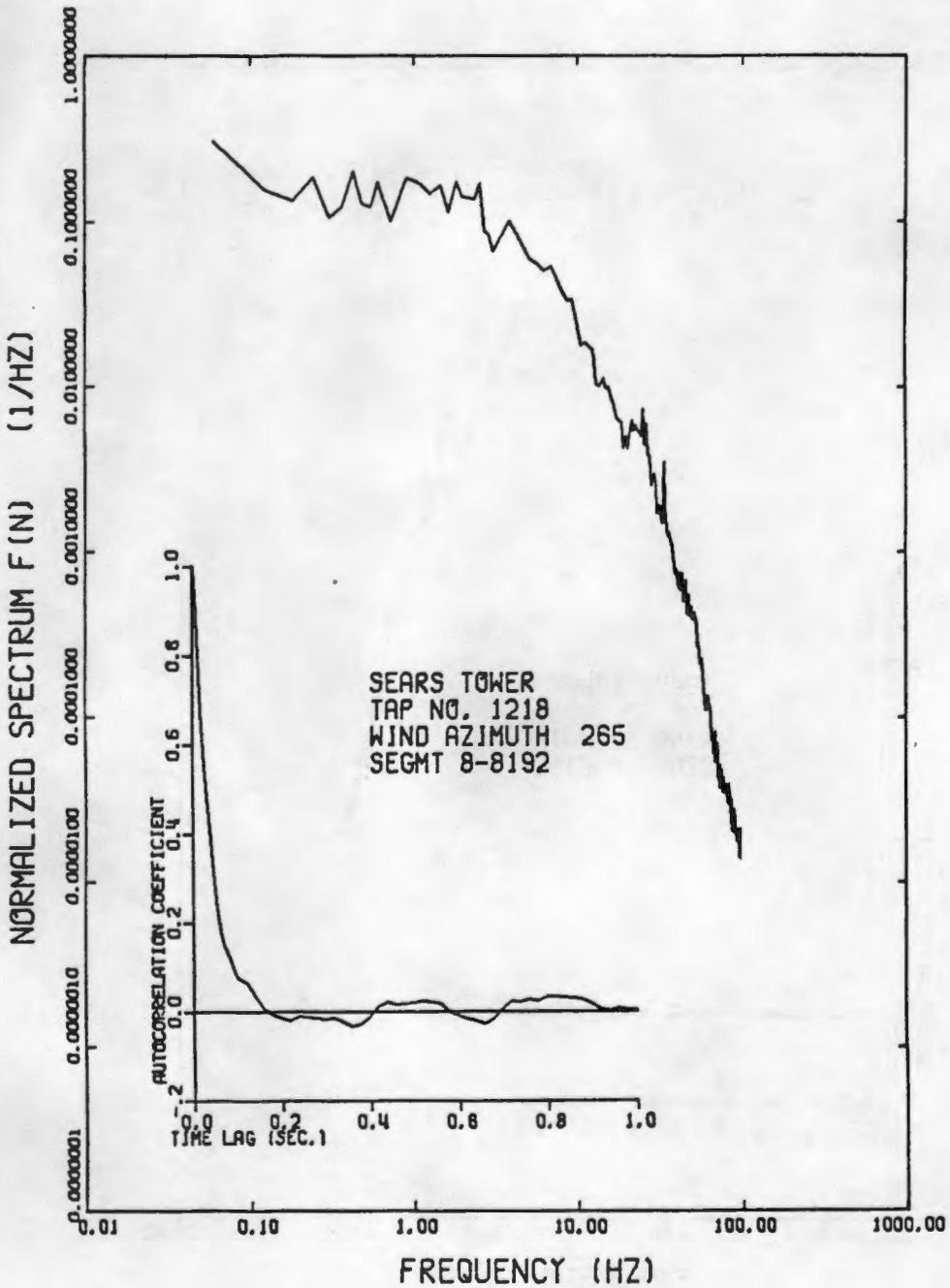

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1218
WIND AZIMUTH 265
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B9

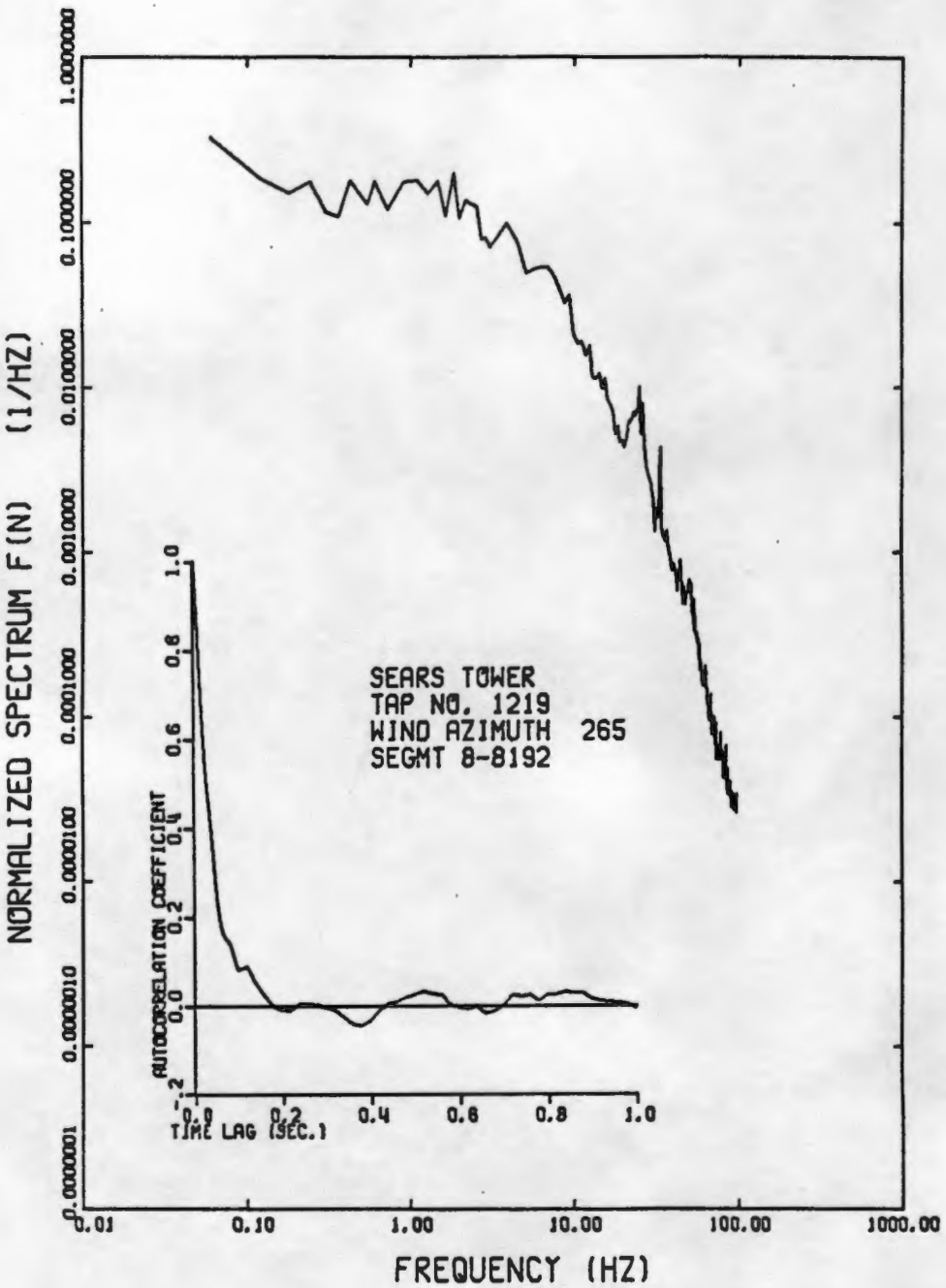

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1219
WIND AZIMUTH 265
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B10

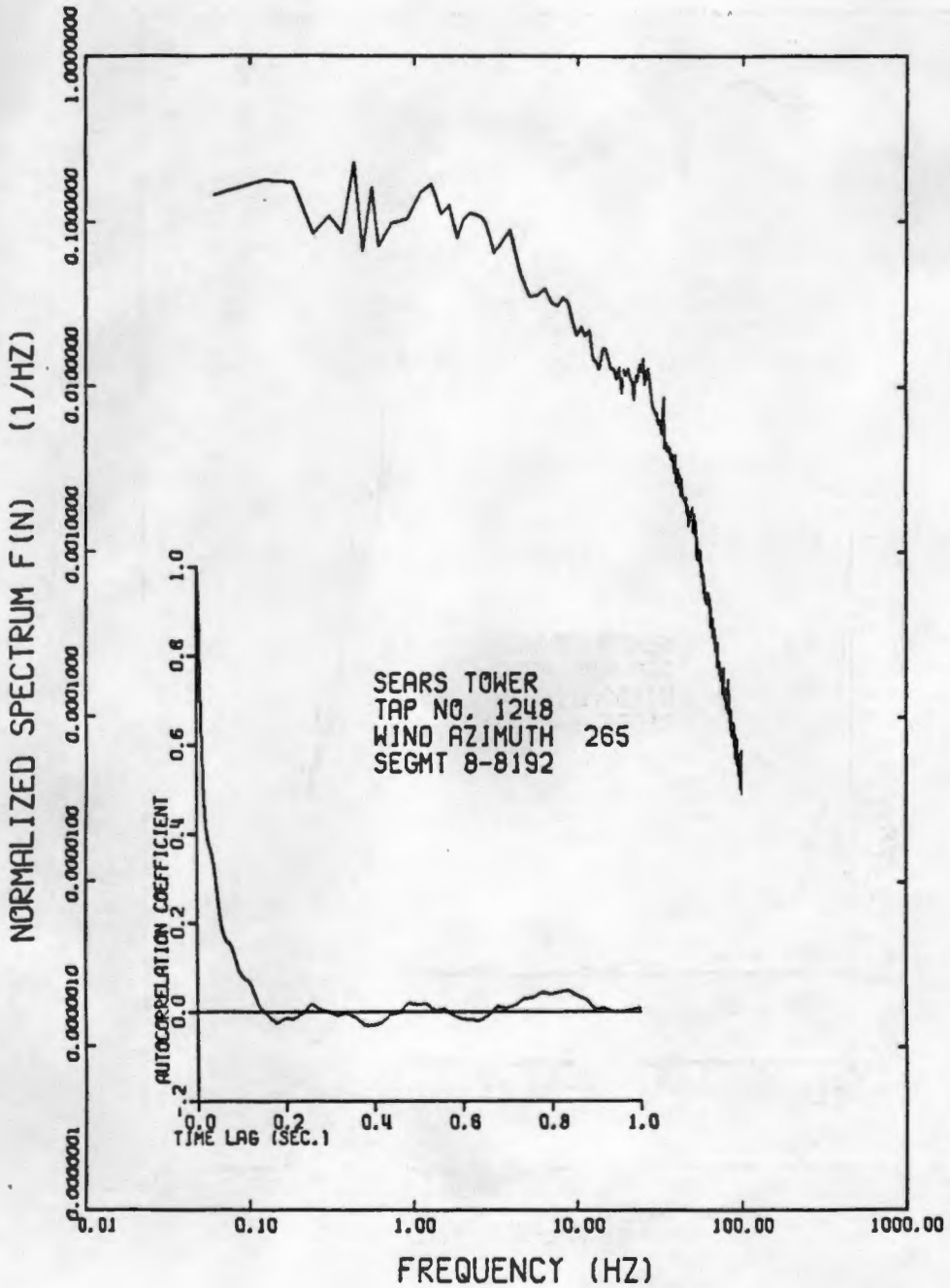
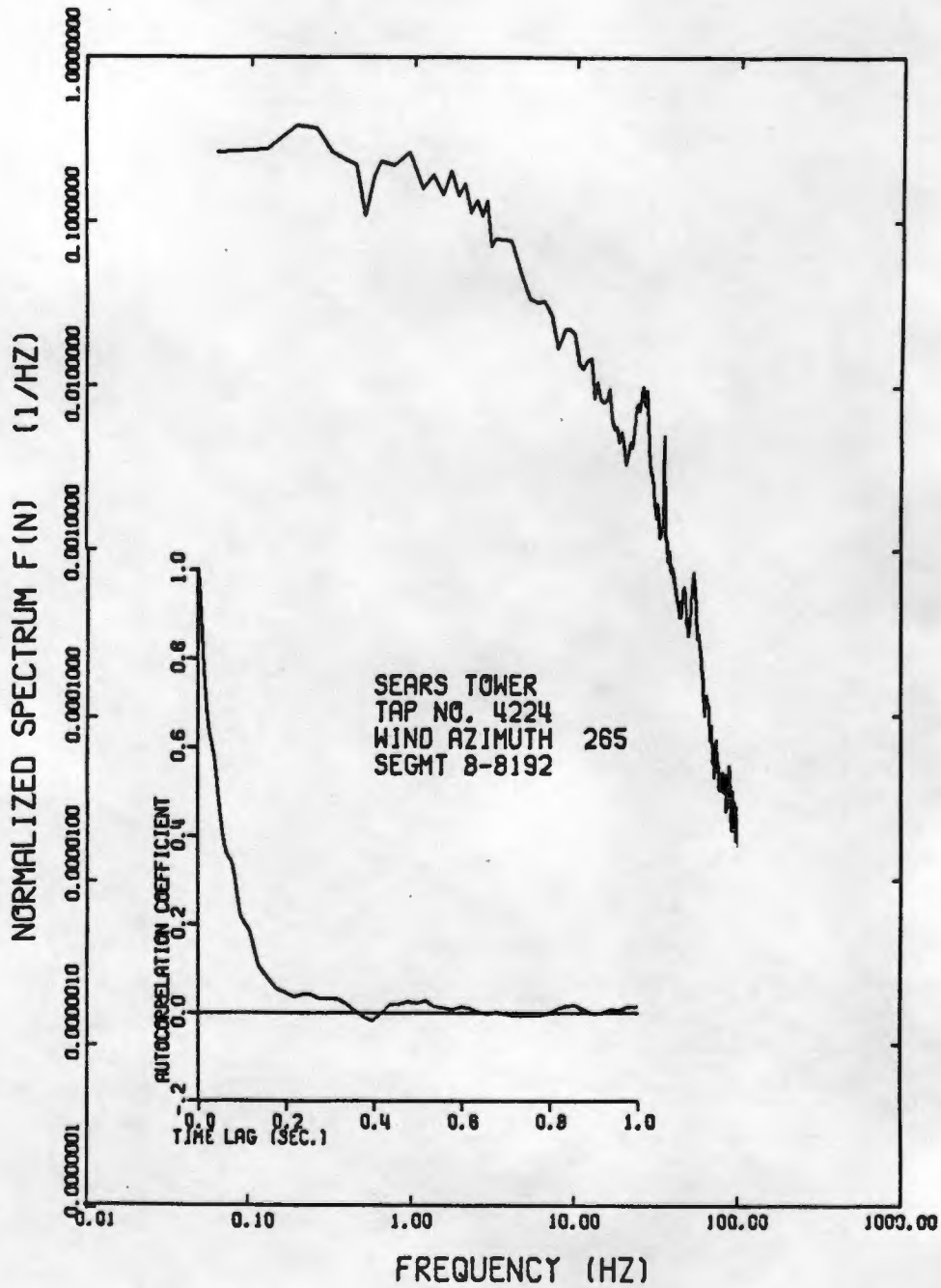

NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1248
WIND AZIMUTH 265
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B11


NORMALIZED SPECTRUM F(N) (1/HZ)
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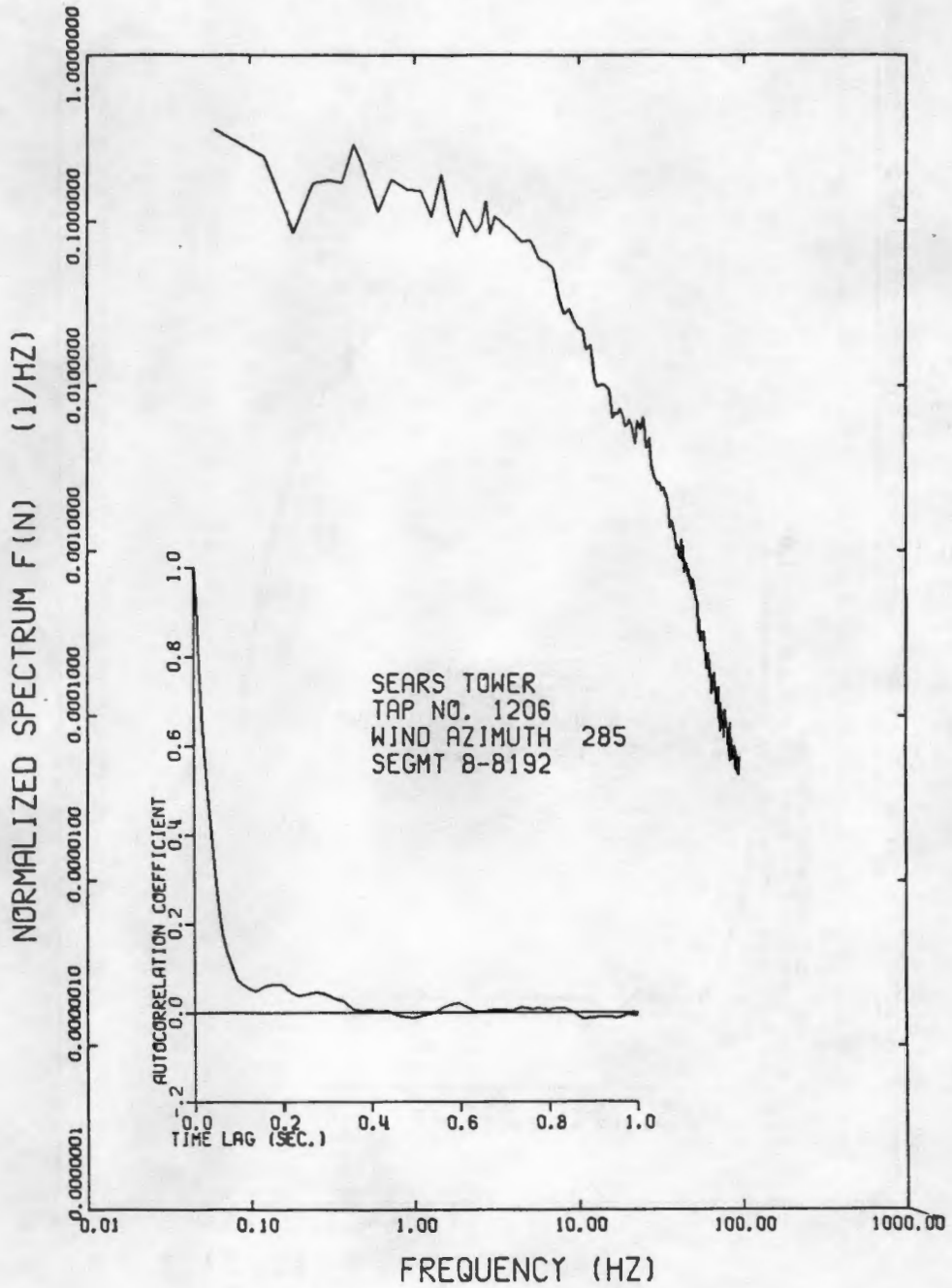
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 4224
WIND AZIMUTH 265
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B12


NORMALIZED SPECTRUM F(N) (1/HZ)
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0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1206
WIND AZIMUTH 285
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B13

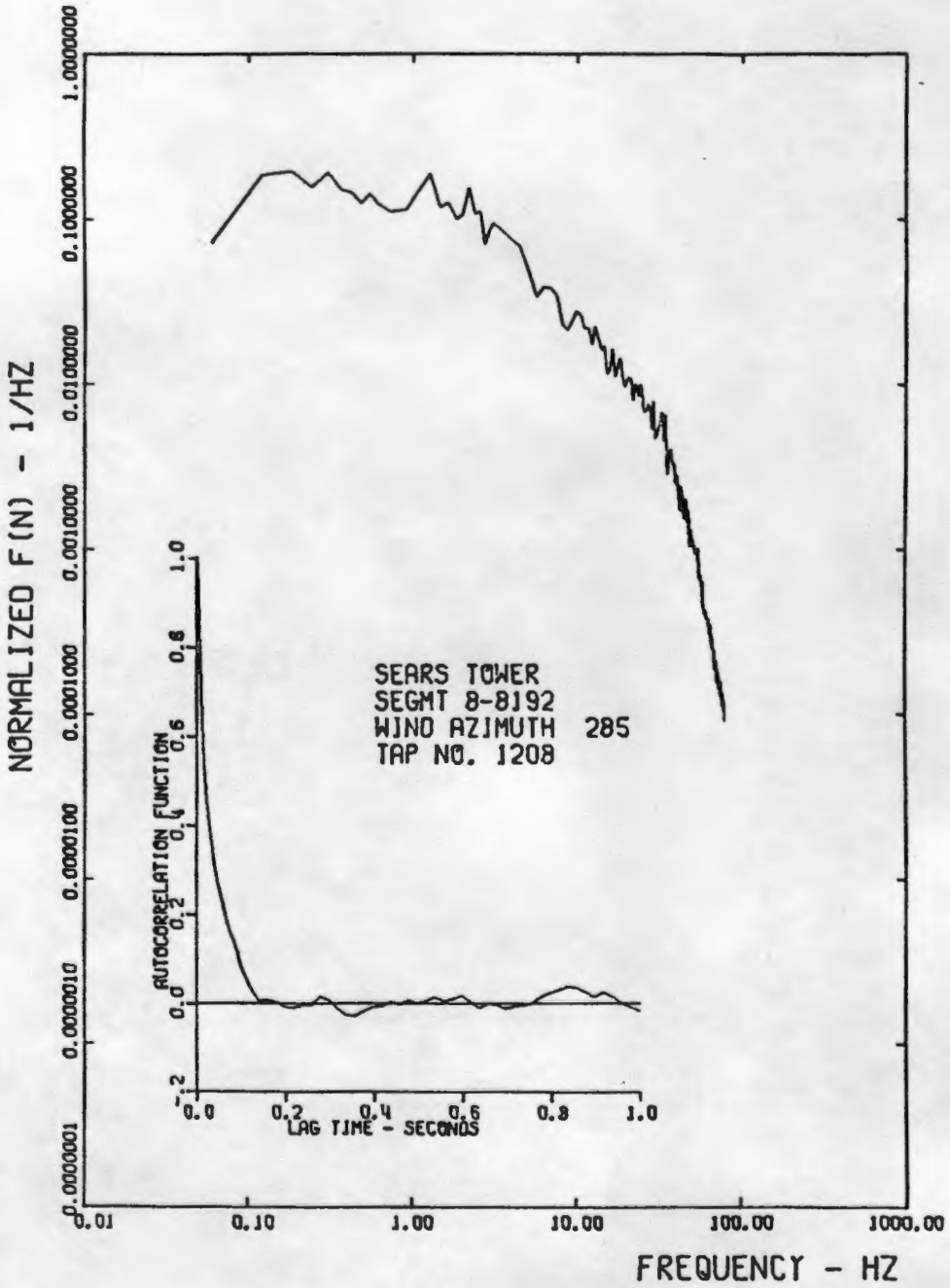
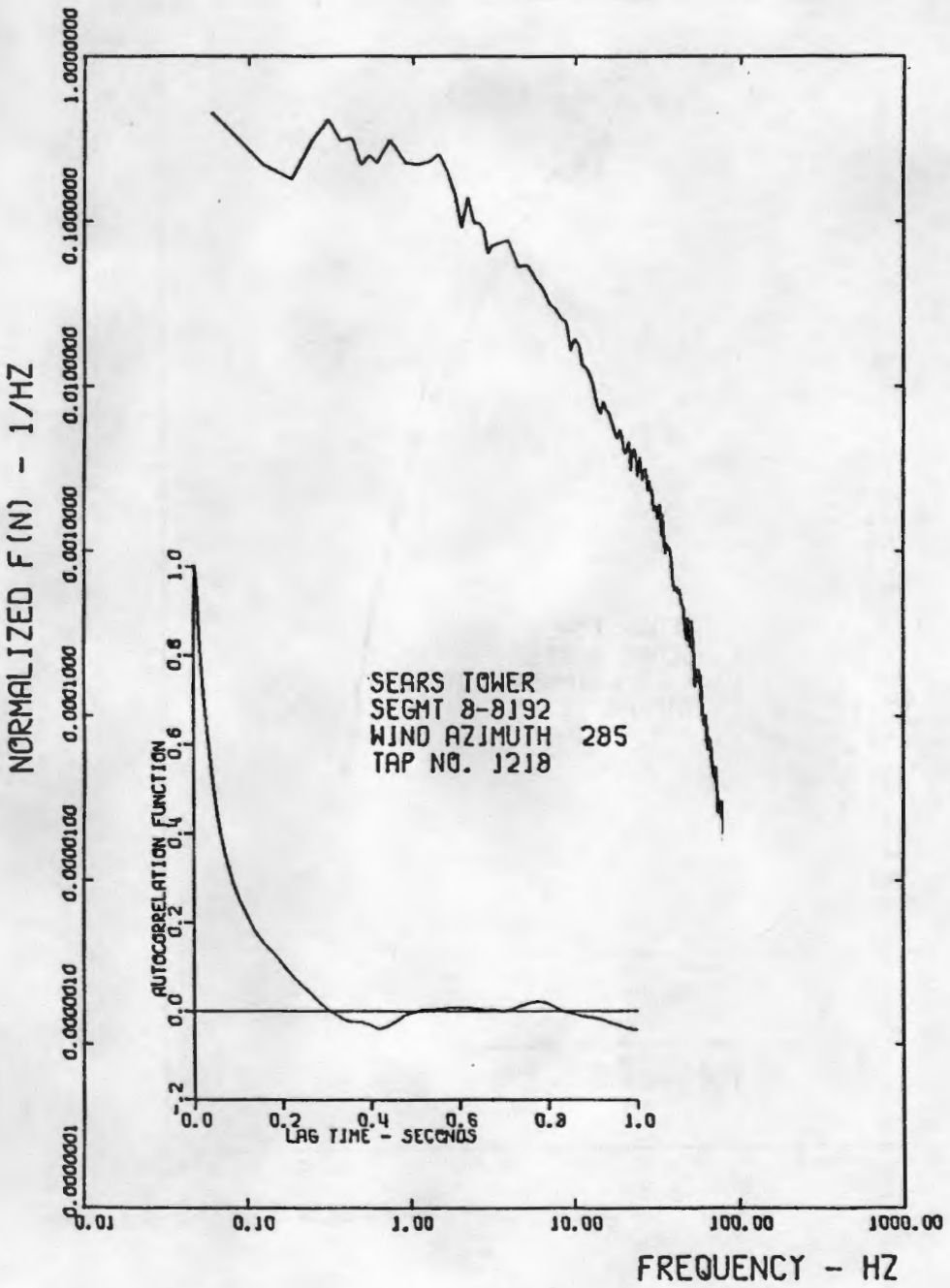

NORMALIZED F(N) - 1/HZ
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY - HZ
SEARS TOWER
SEGMT 8-8192
WIND AZIMUTH 285
TAP NO. 1208
AUTOCORRELATION FUNCTION
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
LAG TIME - SECONDS

Figure B14


NORMALIZED F(N) - 1/HZ
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0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY - HZ
SEARS TOWER
SEGMT 8-8192
WIND AZIMUTH 285
TAP NO. 1218
AUTOCORRELATION FUNCTION
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
LAG TIME - SECONDS

Figure B15

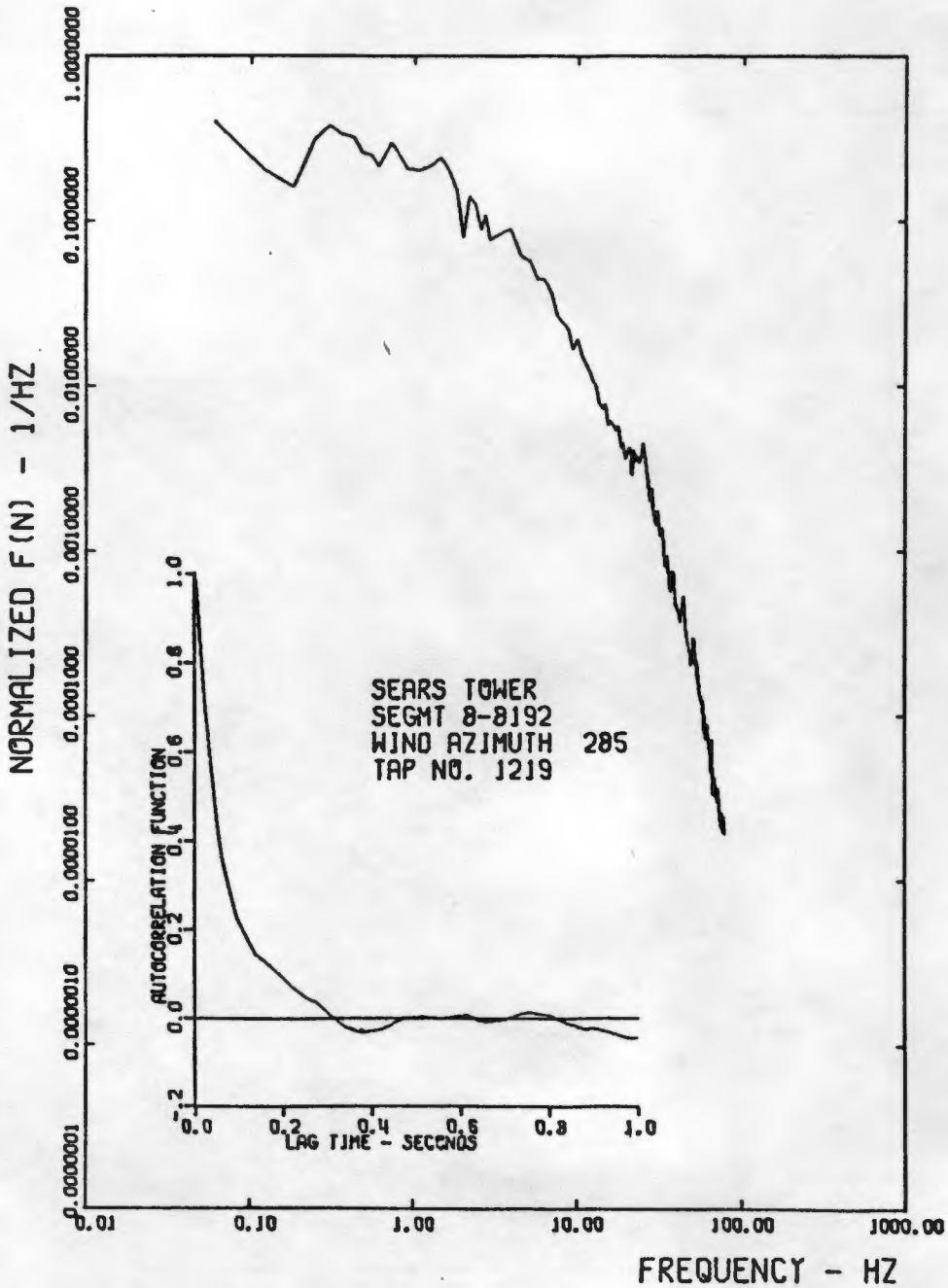
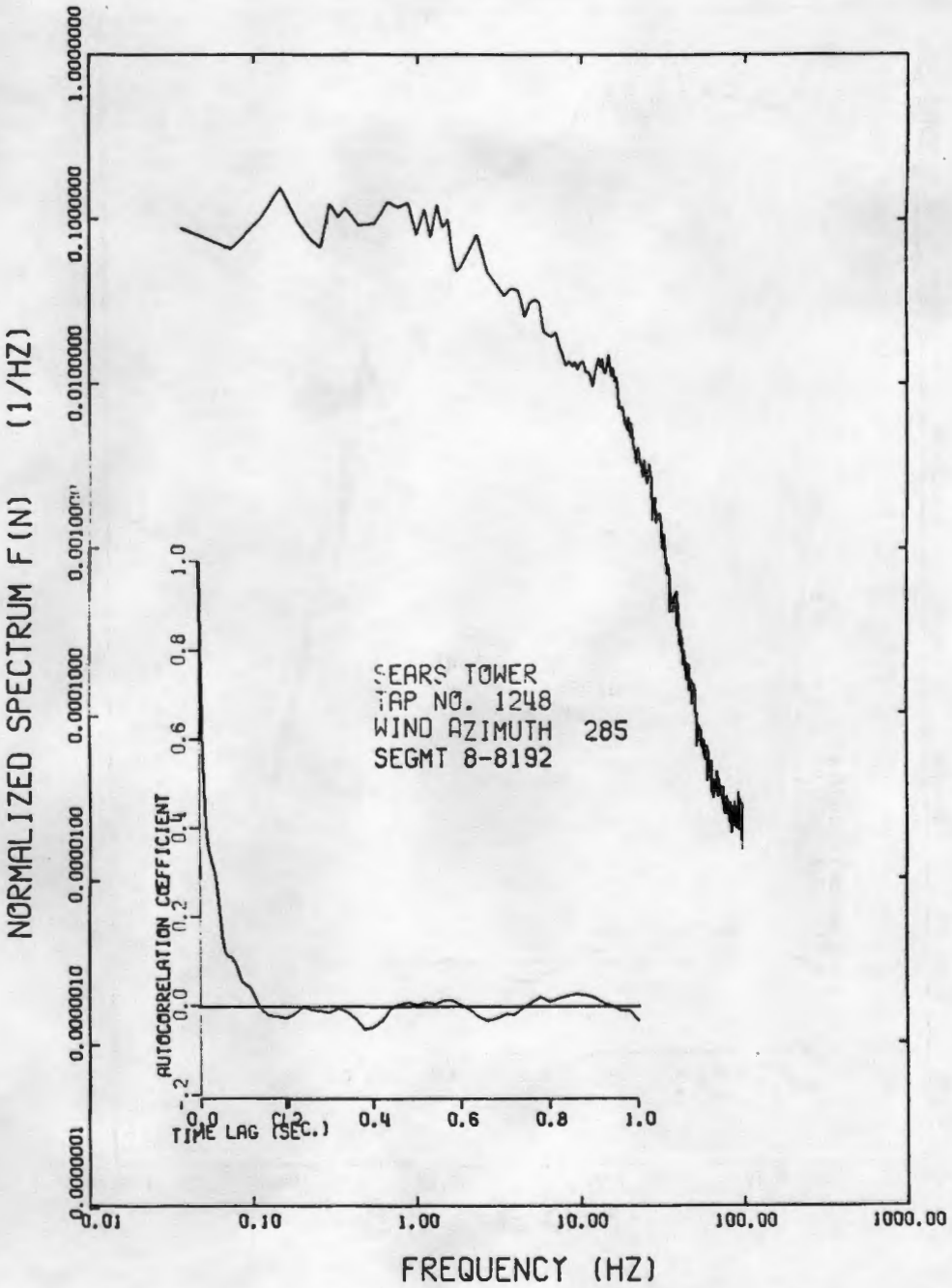

NORMALIZED F(N) - 1/HZ
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY - HZ
SEARS TOWER
SEGMT 8-8192
WIND AZIMUTH 285
TAP NO. 1219
AUTOCORRELATION FUNCTION
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
LAG TIME - SECONDS

Figure B16


NORMALIZED SPECTRUM F(N) (1/HZ)
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0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 1248
WIND AZIMUTH 285
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B17

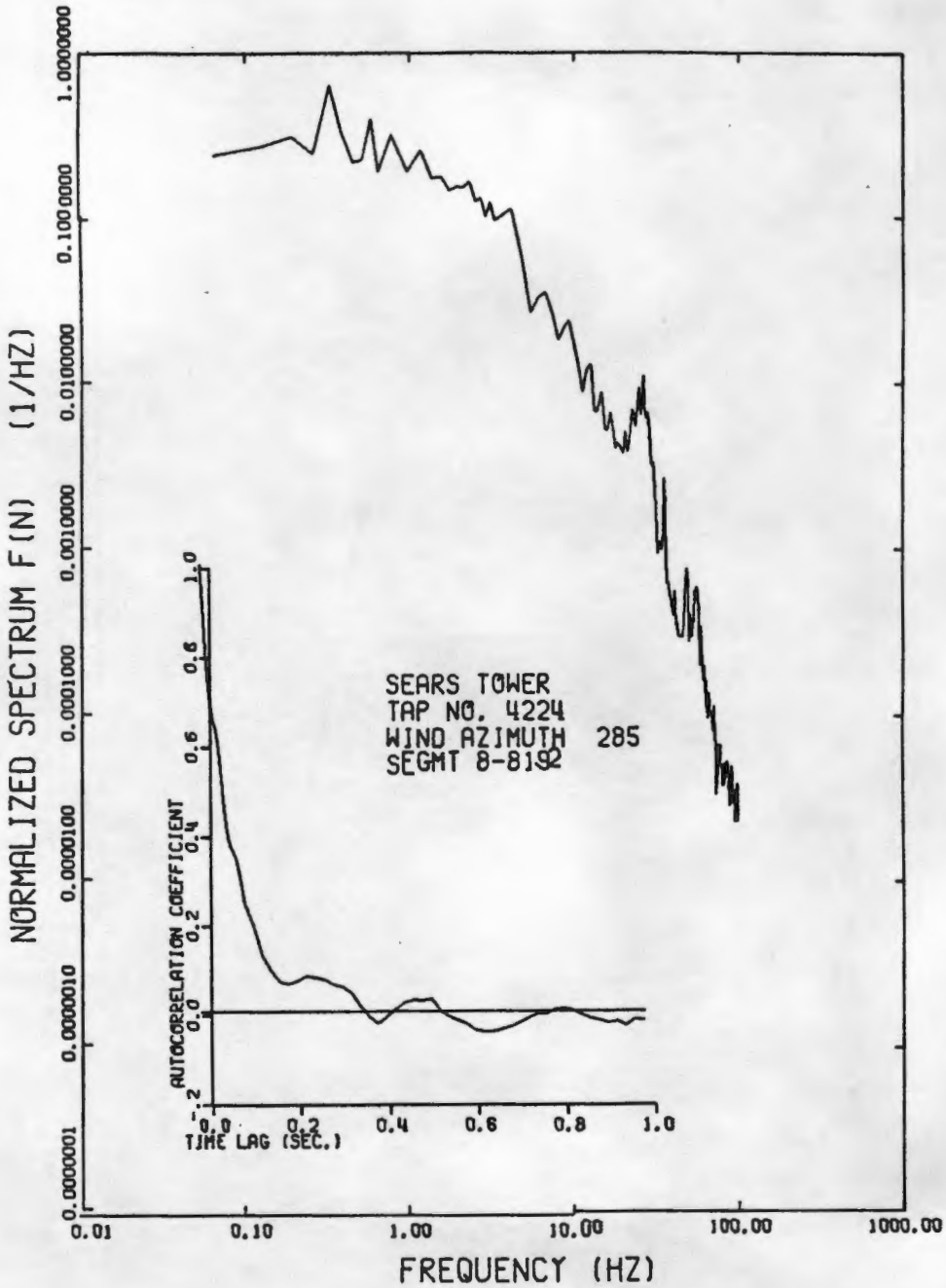
NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 4224
WIND AZIMUTH 285
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B18

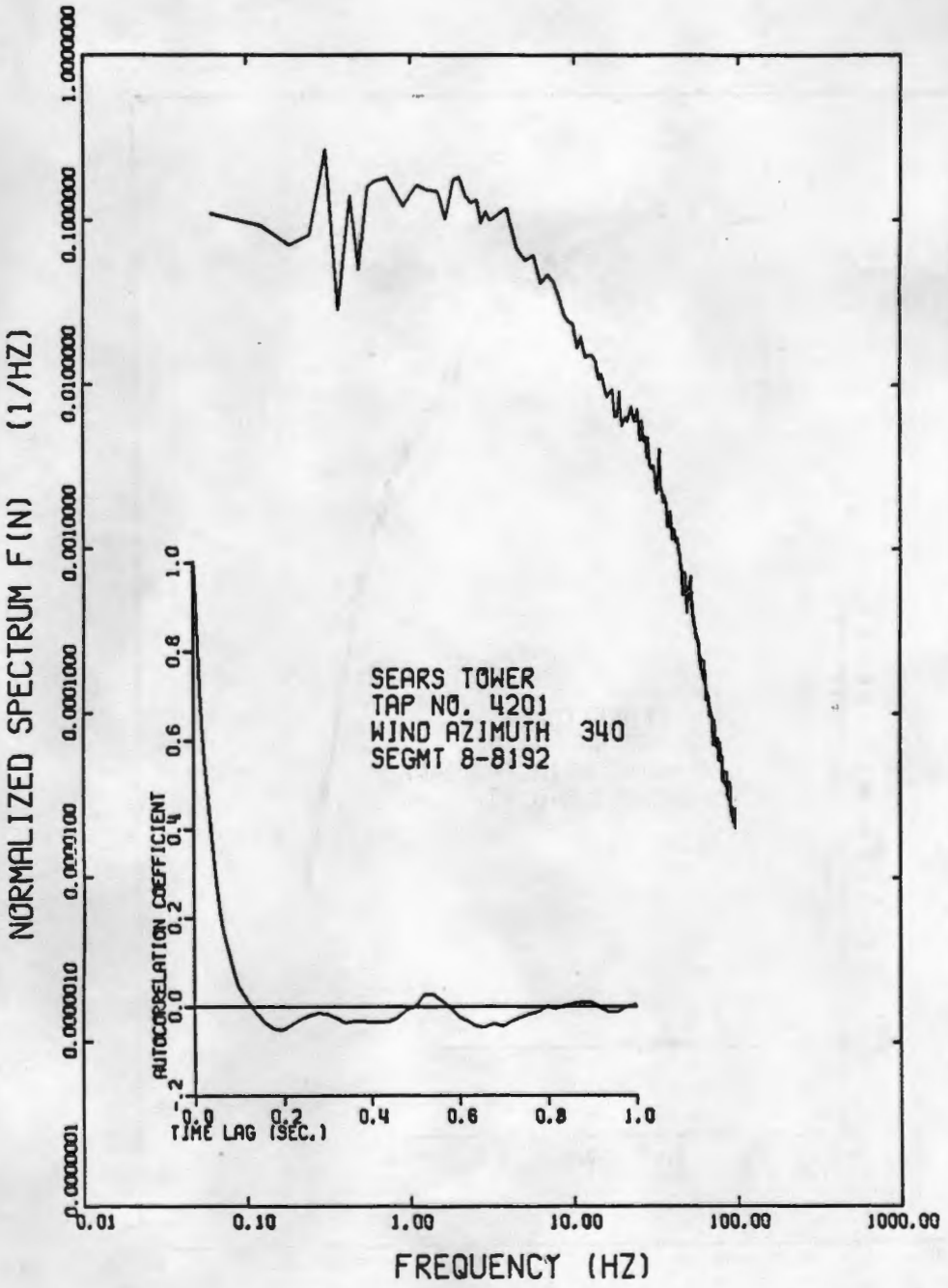
NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 4201
WIND AZIMUTH 340
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B19

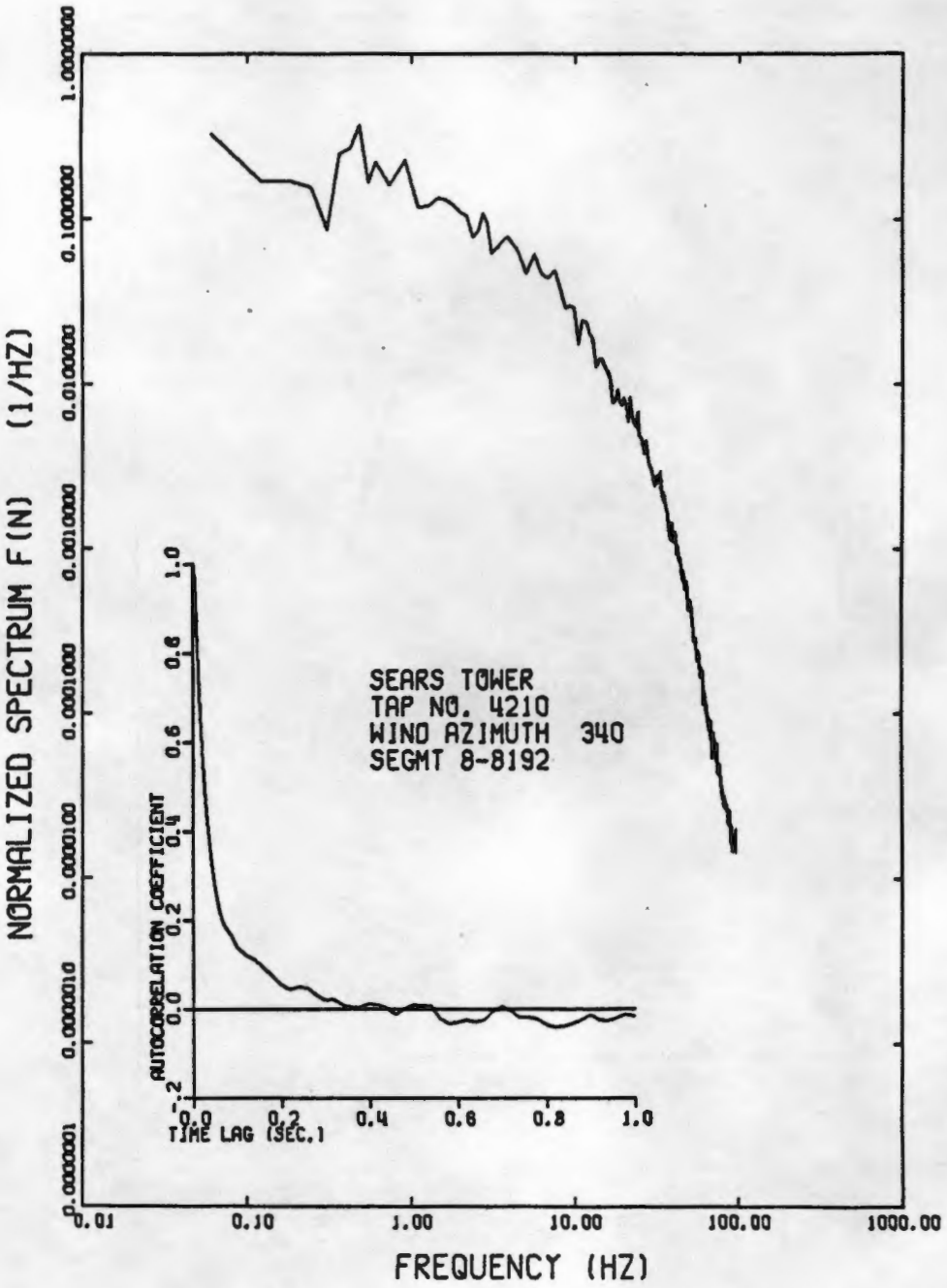
NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 4210
WIND AZIMUTH 340
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B20

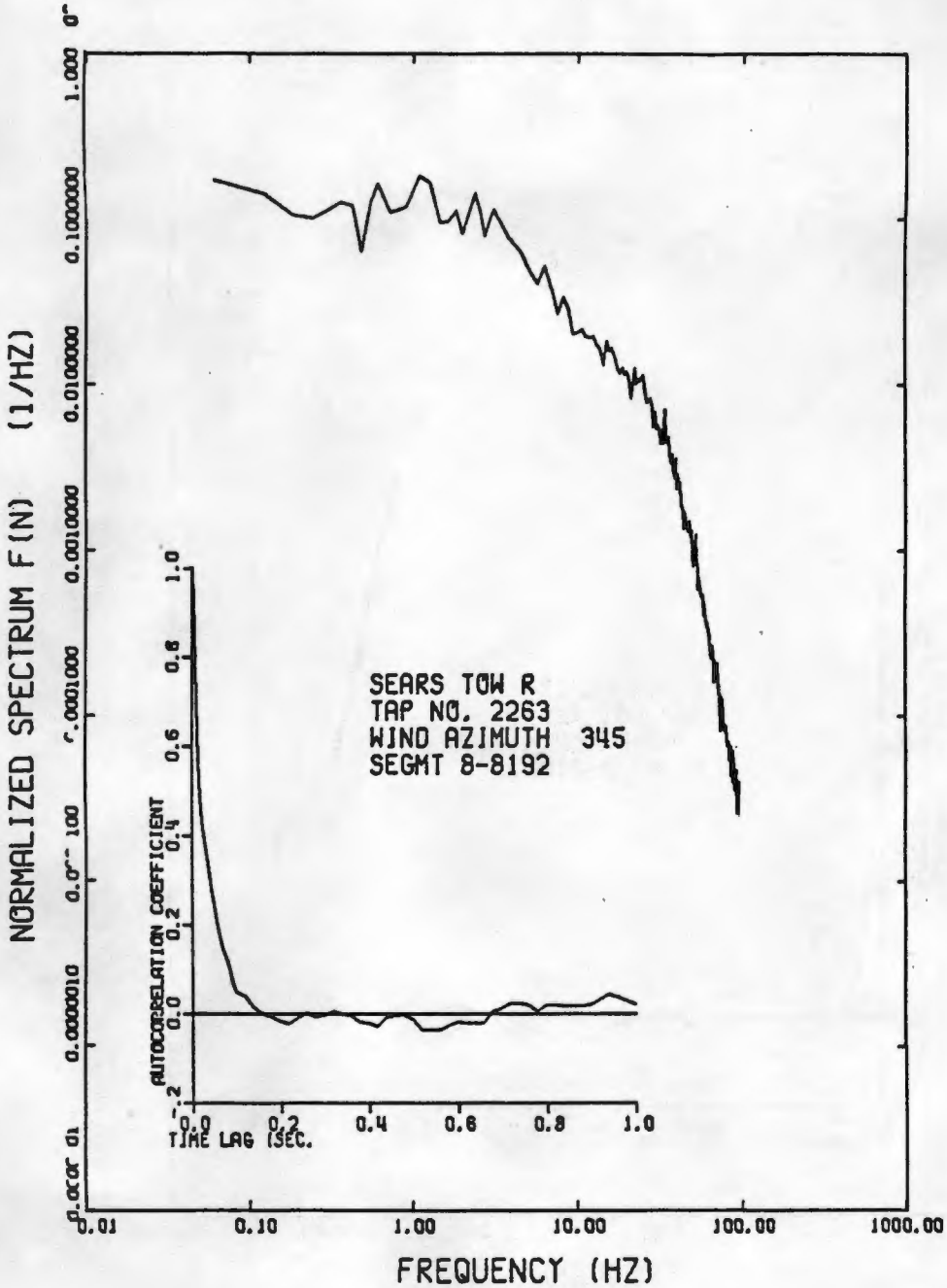
NORMALIZED SPECTRUM F(N) (1/HZ)
FREQUENCY (HZ)
0.01
0.10
1.00
10.00
100.00
1000.00
SEARS TOW R
TAP NO. 2263
WIND AZIMUTH 345
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
TIME LAG (SEC.

Figure B21

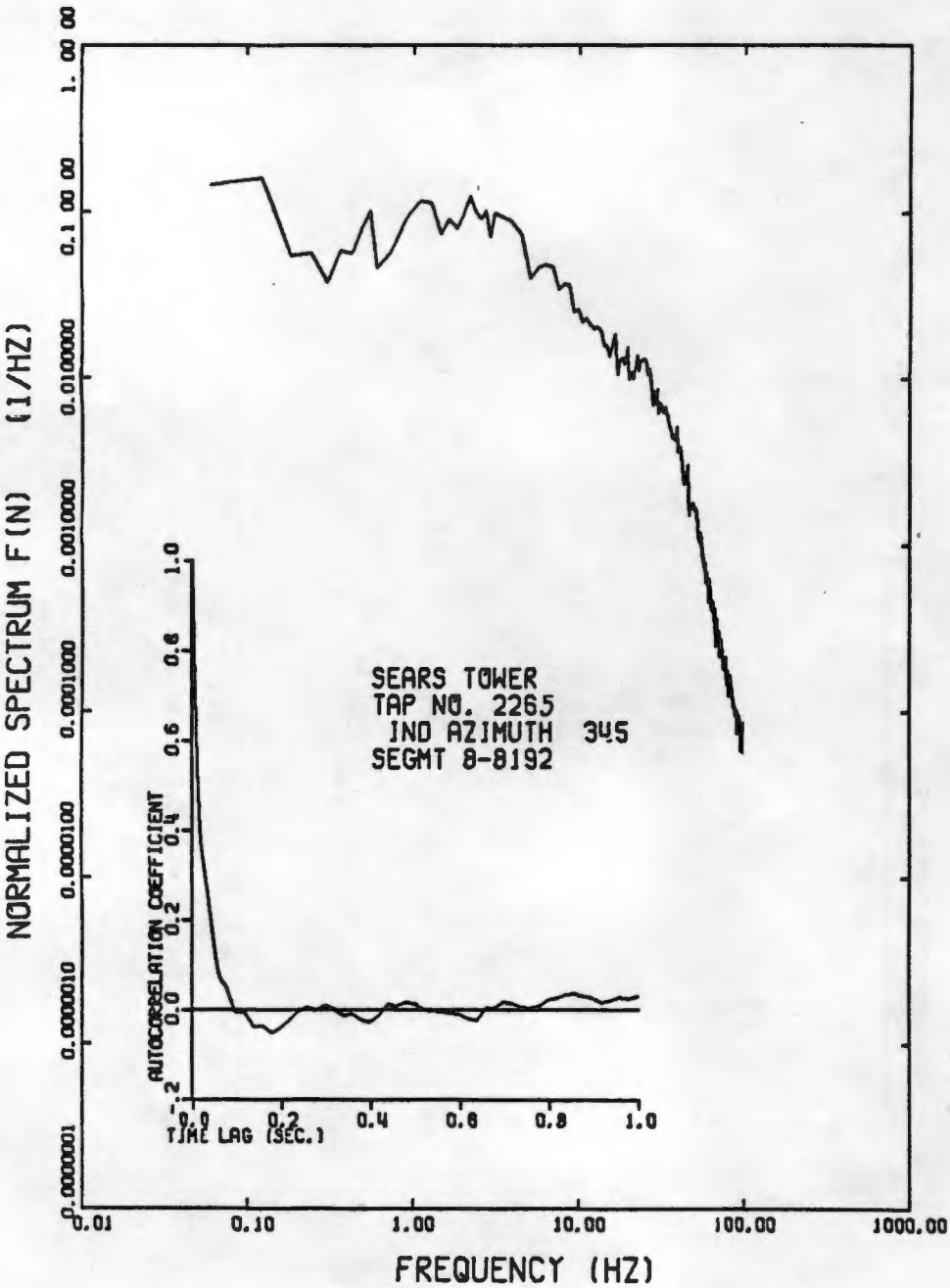
NORMALIZED SPECTRUM F(N) (1/HZ)
1.00
0.10000
0.01000
0.00100
0.00010
0.00001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2265
IND AZIMUTH 345
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B22

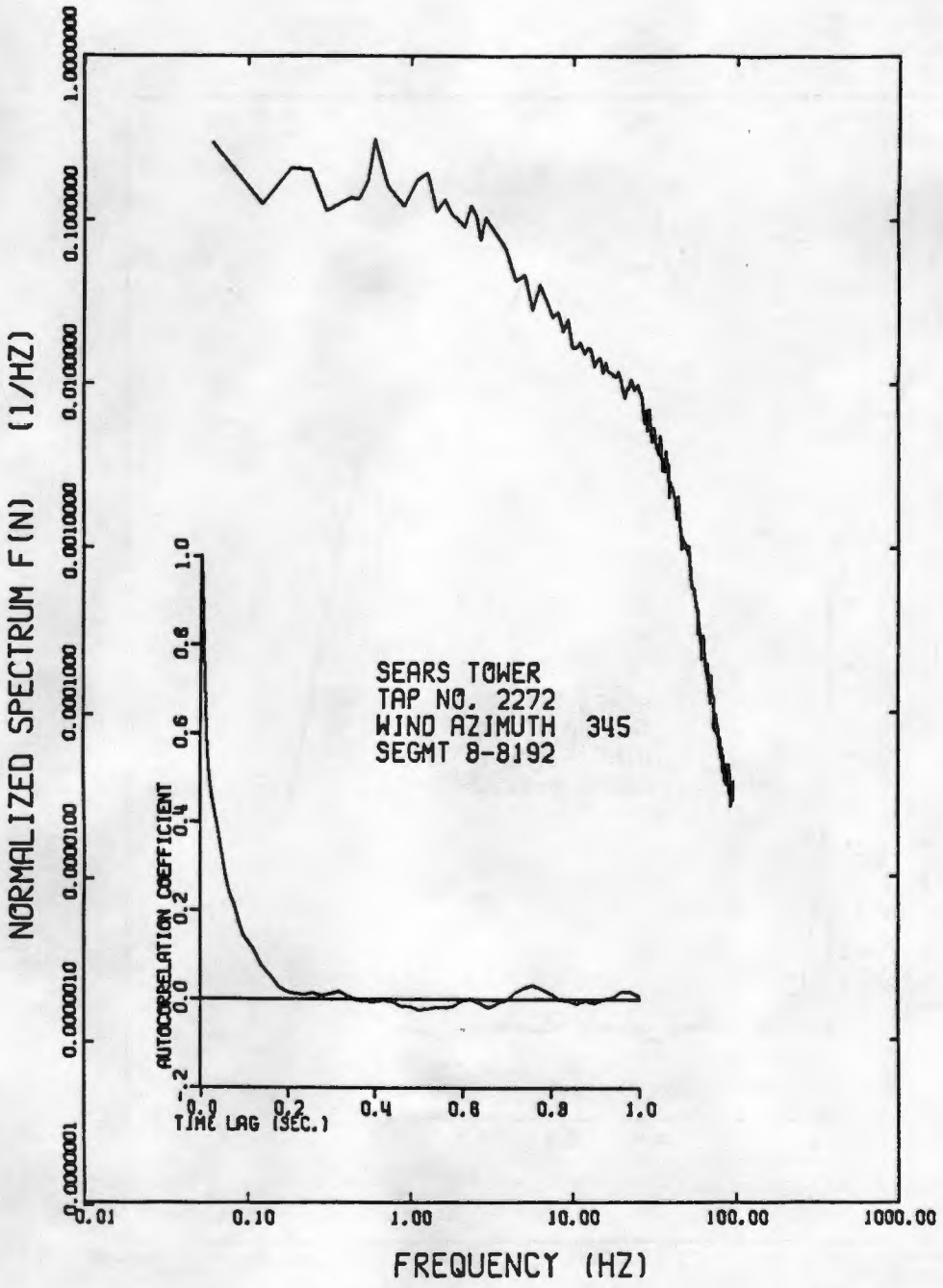
NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2272
WIND AZIMUTH 345
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B23

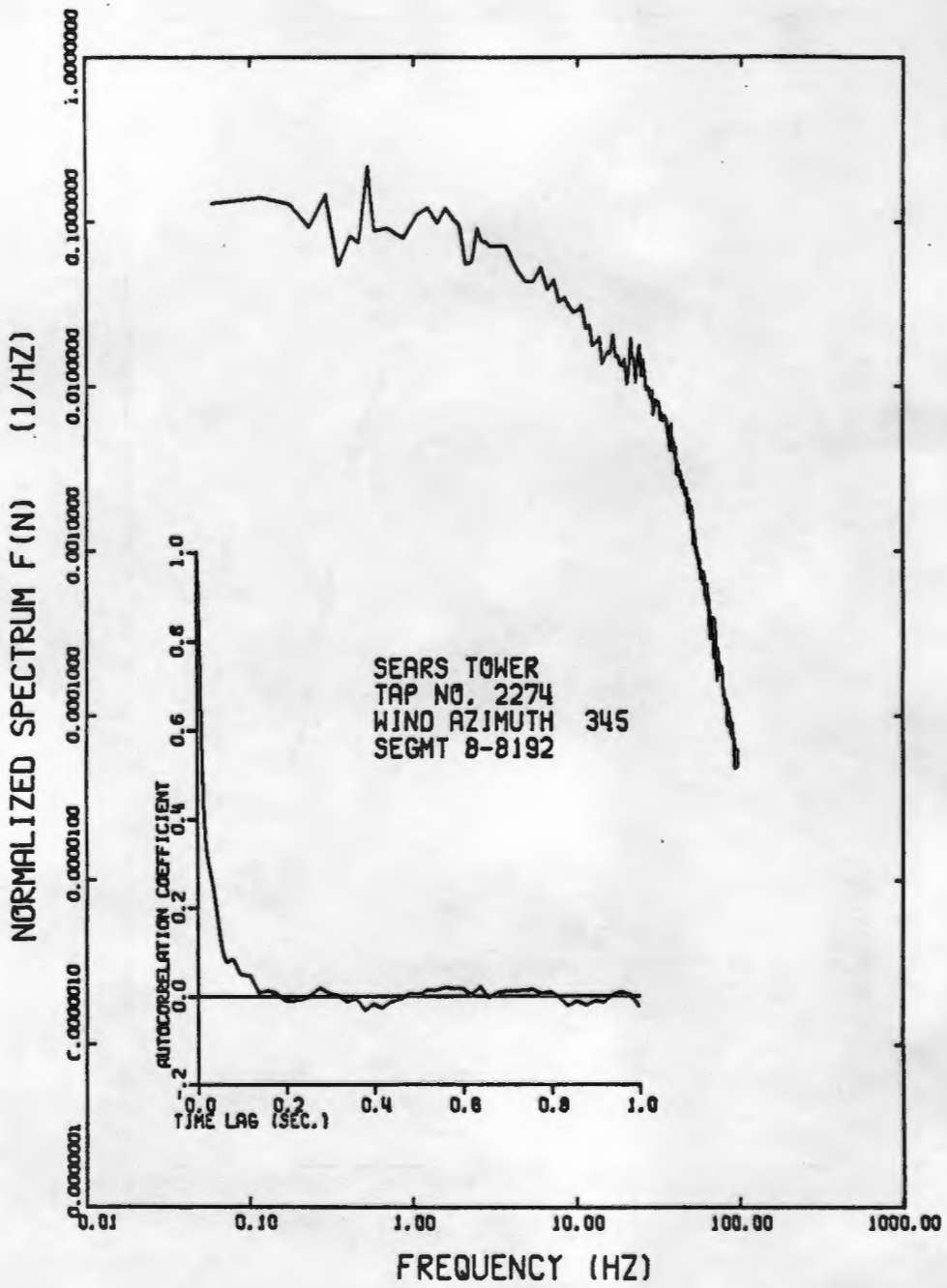
NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2274
WIND AZIMUTH 345
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B24

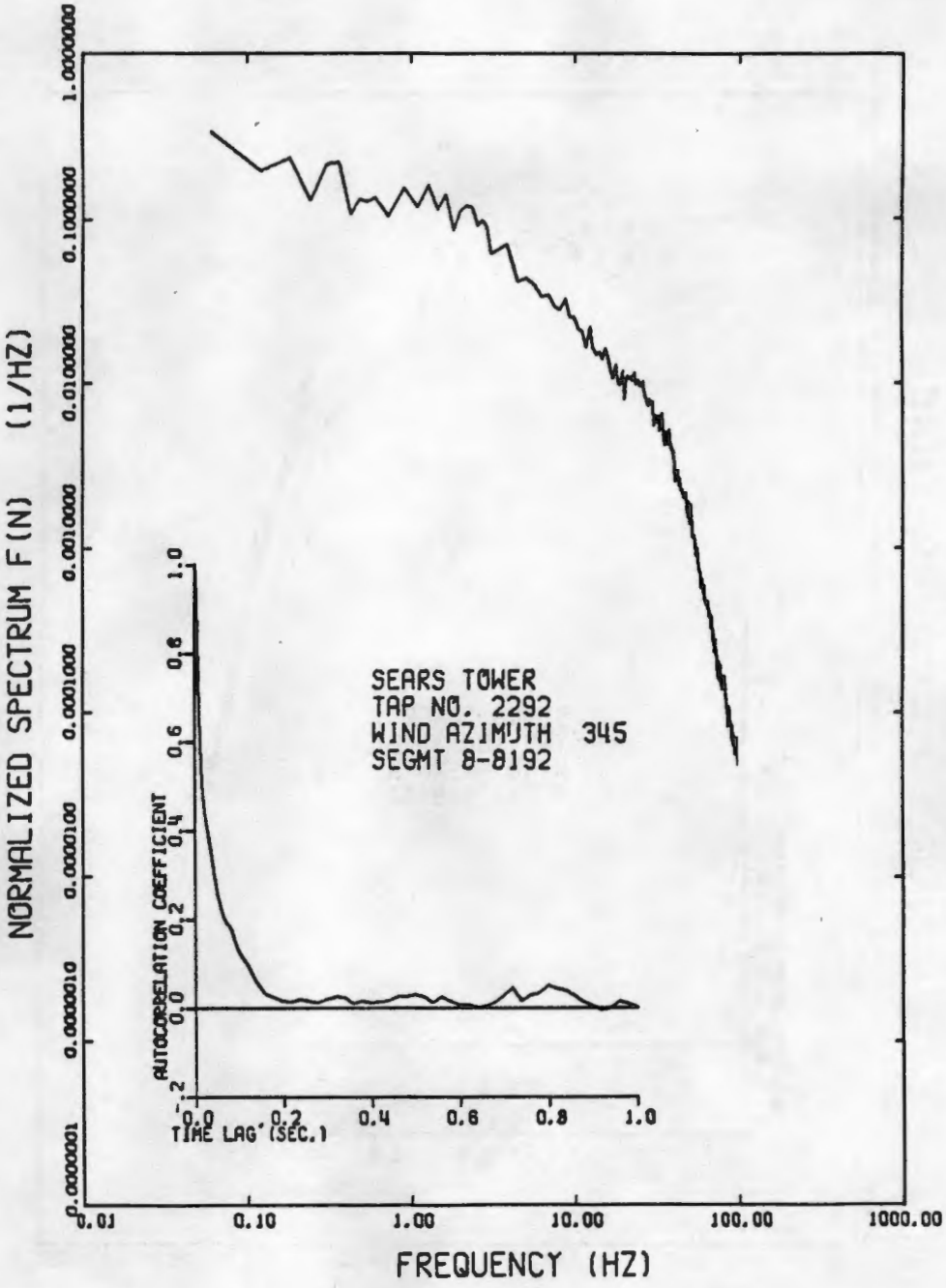
NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 2292
WIND AZIMUTH 345
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B25

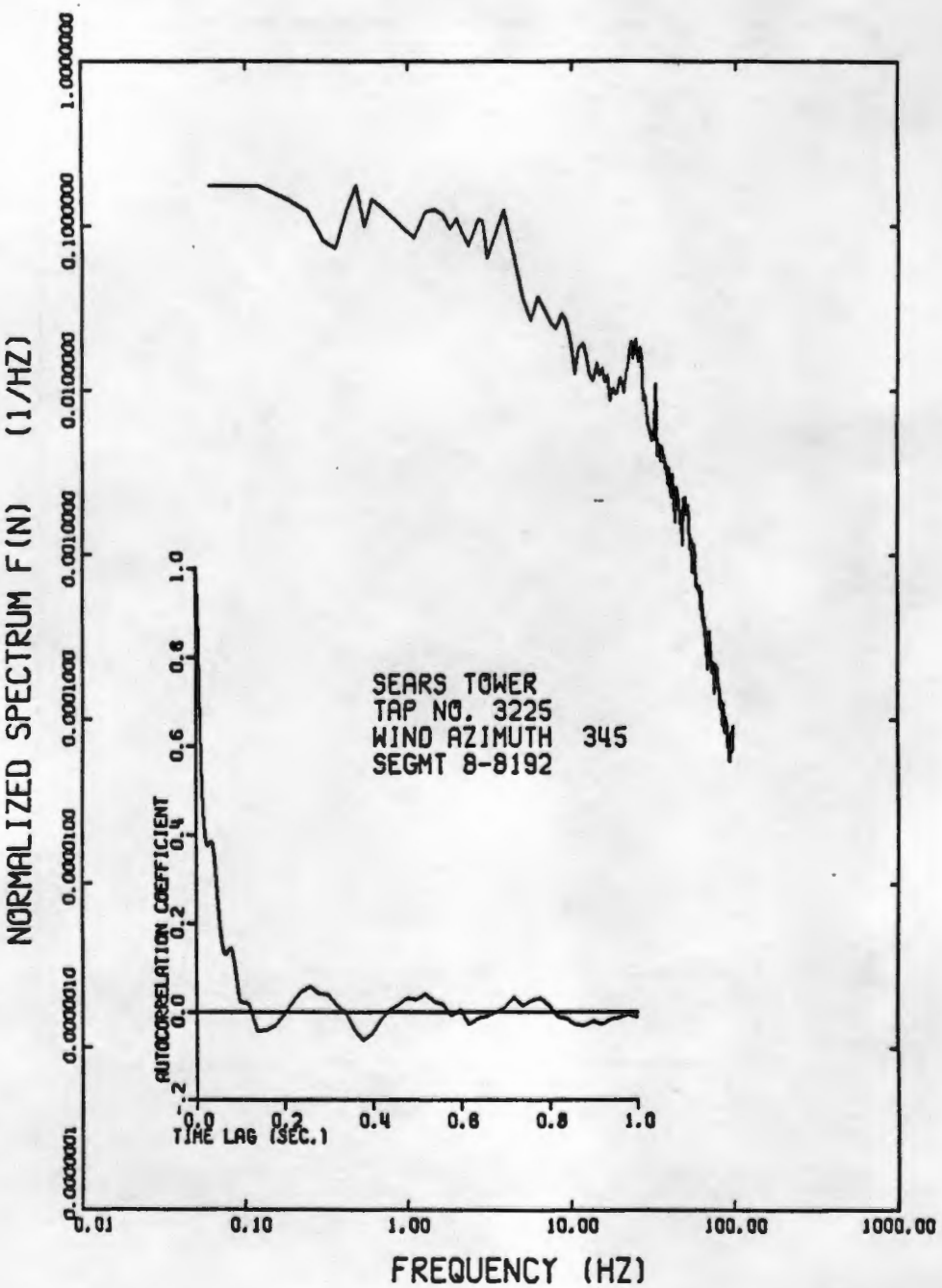
NORMALIZED SPECTRUM F(N) (1/HZ)
1.0000000
0.1000000
0.0100000
0.0010000
0.0001000
0.0000100
0.0000010
0.0000001
0.01
0.10
1.00
10.00
100.00
1000.00
FREQUENCY (HZ)
SEARS TOWER
TAP NO. 3225
WIND AZIMUTH 345
SEGMT 8-8192
AUTOCORRELATION COEFFICIENT
1.0
0.8
0.6
0.4
0.2
0.0
-.2
0.0
0.2
0.4
0.6
0.8
1.0
TIME LAG (SEC.)

Figure B26

APPENDIX C

Probability Distributions of Pressure Fluctuations

APPENDIX C - Probability Distributions of Pressure Fluctuations

See the first page of Appendix B (p. 104) for a listing of taps and wind directions contained in this Appendix.

x in this Appendix is

$$x = \frac{C_p - C_{p_{mean}}}{C_{p_{rms}}}$$

TAP NUMBER ?248 WIND AT 0

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	.0001
-4.00	.0001	-3.75	.0001	-3.50	.0009	-3.25	.0010
-3.00	.0021	-2.75	.0079	-2.50	.0153	-2.25	.0288
-2.00	.0492	-1.75	.0846	-1.50	.1339	-1.25	.1940
-1.00	.2527	-.75	.3135	-.50	.3536	-.25	.3783
0.00	.4081	.25	.3865	.50	.3518	.75	.2921
1.00	.2297	1.25	.1699	1.50	.1227	1.75	.0811
2.00	.0550	2.25	.0404	2.50	.0245	2.75	.0110
3.00	.0057	3.25	.0026	3.50	.0012	3.75	.0011
4.00	.0002	4.25	.0003	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2263 WIND AT 000

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	.0001	-4.50	.0003	-4.25	.0003
-4.00	.0003	-3.75	.0006	-3.50	.0019	-3.25	.0051
-3.00	.0087	-2.75	.0178	-2.50	.0277	-2.25	.0413
-2.00	.0577	-1.75	.0883	-1.50	.1174	-1.25	.1557
-1.00	.2165	-.75	.2698	-.50	.3133	-.25	.3676
0.00	.4193	.25	.4187	.50	.3887	.75	.3386
1.00	.2635	1.25	.1905	1.50	.1247	1.75	.0752
2.00	.0439	2.25	.0248	2.50	.0116	2.75	.0065
3.00	.0018	3.25	.0012	3.50	.0005	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2265 WIND AT 000

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	.0001
-9.00	0.0000	-8.75	.0001	-8.50	0.0000	-8.25	.0001
-8.00	.0001	-7.75	0.0000	-7.50	0.0000	-7.25	.0002
-7.00	.0002	-6.75	.0003	-6.50	.0001	-6.25	.0001
-6.00	.0001	-5.75	.0004	-5.50	.0004	-5.25	.0005
-5.00	.0004	-4.75	.0008	-4.50	.0013	-4.25	.0008
-4.00	.0026	-3.75	.0039	-3.50	.0053	-3.25	.0081
-3.00	.0122	-2.75	.0179	-2.50	.0275	-2.25	.0347
-2.00	.0546	-1.75	.0748	-1.50	.1063	-1.25	.1531
-1.00	.1951	-.75	.2450	-.50	.3071	-.25	.3641
0.00	.4135	.25	.4355	.50	.4291	.75	.3678
1.00	.3017	1.25	.1978	1.50	.1243	1.75	.0643
2.00	.0309	2.25	.0115	2.50	.0043	2.75	.0007
3.00	.0003	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 4210 WIND AT 0

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	.0001
-6.00	.0004	-5.75	.0002	-5.50	.0003	-5.25	.0005
-5.00	.0012	-4.75	.0005	-4.50	.0015	-4.25	.0019
-4.00	.0027	-3.75	.0035	-3.50	.0065	-3.25	.0105
-3.00	.0131	-2.75	.0175	-2.50	.0302	-2.25	.0401
-2.00	.0547	-1.75	.0779	-1.50	.1087	-1.25	.1411
-1.00	.1866	-.75	.2361	-.50	.2867	-.25	.3473
0.00	.4187	.25	.4566	.50	.4450	.75	.3921
1.00	.3009	1.25	.2048	1.50	.1125	1.75	.0601
2.00	.0259	2.25	.0091	2.50	.0027	2.75	.0015
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2274 WIND AT 260

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	.0001	-6.25	.0002
-6.00	.0003	-5.75	.0001	-5.50	.0001	-5.25	.0003
-5.00	.0003	-4.75	.0005	-4.50	.0009	-4.25	.0008
-4.00	.0019	-3.75	.0017	-3.50	.0027	-3.25	.0047
-3.00	.0090	-2.75	.0140	-2.50	.0190	-2.25	.0307
-2.00	.0505	-1.75	.0833	-1.50	.1209	-1.25	.1643
-1.00	.2185	-.75	.2839	-.50	.3409	-.25	.3799
0.00	.4151	.25	.4107	.50	.3697	.75	.3220
1.00	.2575	1.25	.1915	1.50	.1305	1.75	.0806
2.00	.0500	2.25	.0231	2.50	.0105	2.75	.0063
3.00	.0020	3.25	.0005	3.50	.0004	3.75	.0001
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2284 WIND AT 260

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	.0001	-5.75	.0001	-5.50	.0001	-5.25	.0001
-5.00	.0001	-4.75	.0004	-4.50	.0009	-4.25	.0012
-4.00	.0019	-3.75	.0019	-3.50	.0037	-3.25	.0076
-3.00	.0091	-2.75	.0146	-2.50	.0244	-2.25	.0415
-2.00	.0535	-1.75	.0759	-1.50	.1183	-1.25	.1585
-1.00	.2149	-.75	.2677	-.50	.3256	-.25	.3625
0.00	.4041	.25	.4233	.50	.3800	.75	.3533
1.00	.2765	1.25	.1957	1.50	.1304	1.75	.0770
2.00	.0417	2.25	.0223	2.50	.0081	2.75	.0023
3.00	.0006	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 1206 WIND 265

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	.0001	-4.50	.0001	-4.25	.0003
-4.00	.0005	-3.75	.0007	-3.50	.0011	-3.25	.0032
-3.00	.0060	-2.75	.0103	-2.50	.0195	-2.25	.0333
-2.00	.0562	-1.75	.0837	-1.50	.1278	-1.25	.1787
-1.00	.2363	-.75	.2937	-.50	.3594	-.25	.3976
0.00	.3939	.25	.3698	.50	.3266	.75	.2917
1.00	.2482	1.25	.2130	1.50	.1589	1.75	.0969
2.00	.0549	2.25	.0205	2.50	.0061	2.75	.0061
3.00	.0049	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 1208 WIND 265

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	.0007	-3.50	.0012	-3.25	.0029
-3.00	.0040	-2.75	.0078	-2.50	.0187	-2.25	.0365
-2.00	.0547	-1.75	.0905	-1.50	.1408	-1.25	.1967
-1.00	.2430	-.75	.2888	-.50	.3205	-.25	.3391
0.00	.3791	.25	.4039	.50	.3839	.75	.3151
1.00	.2617	1.25	.1833	1.50	.1359	1.75	.0883
2.00	.0498	2.25	.0281	2.50	.0145	2.75	.0066
3.00	.0027	3.25	.0010	3.50	.0003	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 1218 WIND 265

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	.0001	-3.75	.0001	-3.50	.0005	-3.25	.0007
-3.00	.0032	-2.75	.0074	-2.50	.0171	-2.25	.0349
-2.00	.0582	-1.75	.0909	-1.50	.1422	-1.25	.2004
-1.00	.2483	-.75	.2933	-.50	.3267	-.25	.3513
0.00	.3792	.25	.3707	.50	.3585	.75	.3264
1.00	.2611	1.25	.2027	1.50	.1318	1.75	.0897
2.00	.0499	2.25	.0291	2.50	.0148	2.75	.0071
3.00	.0021	3.25	.0015	3.50	.0001	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 1219 WIND 265

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	.0001	-3.75	.0002	-3.50	.0005	-3.25	.0011
-3.00	.0020	-2.75	.0076	-2.50	.0177	-2.25	.0311
-2.00	.0632	-1.75	.0953	-1.50	.1384	-1.25	.2029
-1.00	.2492	-.75	.2884	-.50	.3275	-.25	.3540
0.00	.3718	.25	.3800	.50	.3561	.75	.3223
1.00	.2632	1.25	.1983	1.50	.1387	1.75	.0875
2.00	.0504	2.25	.0295	2.50	.0129	2.75	.0065
3.00	.0027	3.25	.0007	3.50	.0002	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER ¥248 WIND AT 265

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	.0002	-4.25	.0004
-4.00	.0004	-3.75	.0011	-3.50	.0025	-3.25	.0034
-3.00	.0058	-2.75	.0119	-2.50	.0205	-2.25	.0339
-2.00	.0559	-1.75	.0849	-1.50	.1249	-1.25	.1699
-1.00	.2379	-.75	.2863	-.50	.3445	-.25	.3813
0.00	.3993	.25	.3893	.50	.3688	.75	.3265
1.00	.2502	1.25	.1883	1.50	.1207	1.75	.0845
2.00	.0490	2.25	.0271	2.50	.0161	2.75	.0079
3.00	.0038	3.25	.0017	3.50	.0005	3.75	.0005
4.00	.0001	4.25	.0001	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 4224 WIND 265

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	.0004	-3.25	.0009
-3.00	.0039	-2.75	.0078	-2.50	.0153	-2.25	.0321
-2.00	.0529	-1.75	.0941	-1.50	.1451	-1.25	.2041
-1.00	.2535	-.75	.3099	-.50	.3247	-.25	.3429
0.00	.3777	.25	.3679	.50	.3519	.75	.3183
1.00	.2605	1.25	.2005	1.50	.1427	1.75	.0891
2.00	.0537	2.25	.0277	2.50	.0135	2.75	.0046
3.00	.0023	3.25	.0014	3.50	.0004	3.75	.0003
4.00	.0001	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 1206 WIND 285

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	.0001	-4.25	.0001
-4.00	.0001	-3.75	.0003	-3.50	.0014	-3.25	.0034
-3.00	.0065	-2.75	.0123	-2.50	.0199	-2.25	.0347
-2.00	.0559	-1.75	.0957	-1.50	.1301	-1.25	.1729
-1.00	.2177	-.75	.2889	-.50	.3417	-.25	.3754
0.00	.3966	.25	.3945	.50	.3683	.75	.3163
1.00	.2614	1.25	.1863	1.50	.1352	1.75	.0804
2.00	.0495	2.25	.0284	2.50	.0132	2.75	.0075
3.00	.0029	3.25	.0014	3.50	.0005	3.75	.0003
4.00	.0001	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 1208 WIND 285

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	.0001	-6.25	.0002
-6.00	.0001	-5.75	.0003	-5.50	.0007	-5.25	.0009
-5.00	.0011	-4.75	.0013	-4.50	.0033	-4.25	.0046
-4.00	.0059	-3.75	.0092	-3.50	.0101	-3.25	.0137
-3.00	.0195	-2.75	.0225	-2.50	.0269	-2.25	.0346
-2.00	.0492	-1.75	.0655	-1.50	.0867	-1.25	.1169
-1.00	.1623	-.75	.2125	-.50	.2757	-.25	.3476
0.00	.4313	.25	.4965	.50	.5053	.75	.4381
1.00	.3251	1.25	.1928	1.50	.0915	1.75	.0319
2.00	.0108	2.25	.0035	2.50	.0015	2.75	.0004
3.00	.0001	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000

TAP NUMBER 1218 WIND AT 285

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	.0001	-3.75	.0003	-3.50	.0012	-3.25	.0024
-3.00	.0049	-2.75	.0109	-2.50	.0221	-2.25	.0365
-2.00	.0598	-1.75	.0911	-1.50	.1389	-1.25	.1795
-1.00	.2478	-.75	.2889	-.50	.3219	-.25	.3493
0.00	.3654	.25	.3826	.50	.3629	.75	.3291
1.00	.2662	1.25	.2186	1.50	.1511	1.75	.0907
2.00	.0410	2.25	.0251	2.50	.0082	2.75	.0027
3.00	.0008	3.25	.0002	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 1219 WIND AT 285

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	.0013	-3.50	.0017	-3.25	.0029
-3.00	.0062	-2.75	.0105	-2.50	.0184	-2.25	.0370
-2.00	.0563	-1.75	.0923	-1.50	.1367	-1.25	.1807
-1.00	.2384	-.75	.2879	-.50	.3340	-.25	.3534
0.00	.3735	.25	.3739	.50	.3728	.75	.3328
1.00	.2607	1.25	.2073	1.50	.1489	1.75	.0878
2.00	.0445	2.25	.0223	2.50	.0099	2.75	.0048
3.00	.0024	3.25	.0005	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER ‡248 WIND AT 285

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	.0001	-7.50	0.0000	-7.25	.0001
-7.00	.0001	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	.0001	-5.75	0.0000	-5.50	.0001	-5.25	.0004
-5.00	.0003	-4.75	.0011	-4.50	.0013	-4.25	.0017
-4.00	.0023	-3.75	.0031	-3.50	.0042	-3.25	.0070
-3.00	.0097	-2.75	.0174	-2.50	.0239	-2.25	.0347
-2.00	.0512	-1.75	.0725	-1.50	.1071	-1.25	.1517
-1.00	.2055	-.75	.2661	-.50	.3314	-.25	.3841
0.00	.4387	.25	.4339	.50	.3901	.75	.3415
1.00	.2662	1.25	.1780	1.50	.1254	1.75	.0706
2.00	.0377	2.25	.0180	2.50	.0093	2.75	.0048
3.00	.0037	3.25	.0027	3.50	.0014	3.75	.0005
4.00	.0001	4.25	.0001	4.50	.0001	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 4224 WIND AT 285

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	.0001	-3.25	.0009
-3.00	.0019	-2.75	.0053	-2.50	.0129	-2.25	.0276
-2.00	.0476	-1.75	.0935	-1.50	.1503	-1.25	.1940
-1.00	.2486	-.75	.3169	-.50	.3632	-.25	.3784
0.00	.3875	.25	.3705	.50	.3296	.75	.2856
1.00	.2308	1.25	.1936	1.50	.1459	1.75	.0920
2.00	.0543	2.25	.0332	2.50	.0181	2.75	.0077
3.00	.0052	3.25	.0025	3.50	.0019	3.75	.0005
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 4201 WIND AT 340

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	.0003	-3.25	.0009
-3.00	.0024	-2.75	.0065	-2.50	.0137	-2.25	.0315
-2.00	.0545	-1.75	.0978	-1.50	.1423	-1.25	.1979
-1.00	.2609	-.75	.3098	-.50	.3426	-.25	.3539
0.00	.3633	.25	.3697	.50	.3483	.75	.2928
1.00	.2462	1.25	.2135	1.50	.1475	1.75	.0993
2.00	.0551	2.25	.0280	2.50	.0143	2.75	.0043
3.00	.0019	3.25	.0006	3.50	.0001	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 4210 WIND AT 340

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	.0001	-3.50	.0003	-3.25	.0008
-3.00	.0023	-2.75	.0060	-2.50	.0123	-2.25	.0287
-2.00	.0506	-1.75	.0941	-1.50	.1413	-1.25	.2121
-1.00	.2627	-.75	.3127	-.50	.3505	-.25	.3665
0.00	.3658	.25	.3437	.50	.3273	.75	.2909
1.00	.2616	1.25	.2072	1.50	.1533	1.75	.1045
2.00	.0550	2.25	.0295	2.50	.0134	2.75	.0047
3.00	.0016	3.25	.0003	3.50	.0001	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2263 WIND AT 345

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	0.0000	-5.25	0.0000
-5.00	.0001	-4.75	0.0000	-4.50	.0001	-4.25	.0003
-4.00	.0004	-3.75	.0009	-3.50	.0023	-3.25	.0042
-3.00	.0080	-2.75	.0131	-2.50	.0257	-2.25	.0373
-2.00	.0531	-1.75	.0833	-1.50	.1163	-1.25	.1739
-1.00	.2259	-.75	.2778	-.50	.3245	-.25	.3766
0.00	.4024	.25	.4259	.50	.3959	.75	.3305
1.00	.2495	1.25	.1738	1.50	.1151	1.75	.0761
2.00	.0474	2.25	.0263	2.50	.0154	2.75	.0076
3.00	.0046	3.25	.0029	3.50	.0017	3.75	.0009
4.00	.0003	4.25	0.0000	4.50	.0001	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2265 WIND AT 345

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	.0001
-7.00	0.0000	-6.75	0.0000	-6.50	.0001	-6.25	.0004
-6.00	.0001	-5.75	.0001	-5.50	.0004	-5.25	.0007
-5.00	.0009	-4.75	.0011	-4.50	.0018	-4.25	.0022
-4.00	.0038	-3.75	.0048	-3.50	.0061	-3.25	.0071
-3.00	.0131	-2.75	.0161	-2.50	.0270	-2.25	.0369
-2.00	.0516	-1.75	.0688	-1.50	.1045	-1.25	.1463
-1.00	.1938	-.75	.2503	-.50	.3101	-.25	.3759
0.00	.4121	.25	.4380	.50	.4264	.75	.3723
1.00	.2925	1.25	.2025	1.50	.1219	1.75	.0625
2.00	.0286	2.25	.0113	2.50	.0049	2.75	.0015
3.00	.0008	3.25	.0003	3.50	.0002	3.75	0.0000
4.00	.0001	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2272 WIND AT 345

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	.0001	-5.25	0.0000
-5.00	.0001	-4.75	0.0000	-4.50	.0001	-4.25	0.0000
-4.00	.0005	-3.75	.0005	-3.50	.0017	-3.25	.0025
-3.00	.0065	-2.75	.0089	-2.50	.0165	-2.25	.0269
-2.00	.0554	-1.75	.0791	-1.50	.1230	-1.25	.1746
-1.00	.2406	-.75	.3078	-.50	.3690	-.25	.4097
0.00	.4087	.25	.3870	.50	.3469	.75	.2894
1.00	.2289	1.25	.1670	1.50	.1293	1.75	.0915
2.00	.0508	2.25	.0355	2.50	.0204	2.75	.0122
3.00	.0040	3.25	.0027	3.50	.0013	3.75	.0006
4.00	.0003	4.25	.0002	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2274 WIND AT 345

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	.0001	-5.50	.0001	-5.25	.0005
-5.00	.0005	-4.75	.0010	-4.50	.0012	-4.25	.0015
-4.00	.0031	-3.75	.0045	-3.50	.0059	-3.25	.0088
-3.00	.0122	-2.75	.0184	-2.50	.0252	-2.25	.0359
-2.00	.0523	-1.75	.0727	-1.50	.1053	-1.25	.1448
-1.00	.1997	-.75	.2609	-.50	.3165	-.25	.3789
0.00	.4105	.25	.4352	.50	.4163	.75	.3442
1.00	.2859	1.25	.2053	1.50	.1221	1.75	.0731
2.00	.0356	2.25	.0157	2.50	.0044	2.75	.0015
3.00	.0002	3.25	.0001	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 2292 WIND AT 345

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	0.0000
-6.00	0.0000	-5.75	0.0000	-5.50	.0001	-5.25	.0001
-5.00	.0001	-4.75	.0009	-4.50	.0012	-4.25	.0012
-4.00	.0023	-3.75	.0037	-3.50	.0065	-3.25	.0113
-3.00	.0154	-2.75	.0219	-2.50	.0260	-2.25	.0430
-2.00	.0578	-1.75	.0809	-1.50	.1129	-1.25	.1449
-1.00	.1850	-.75	.2416	-.50	.2912	-.25	.3398
0.00	.3911	.25	.4205	.50	.4379	.75	.4019
1.00	.3223	1.25	.2360	1.50	.1277	1.75	.0526
2.00	.0173	2.25	.0043	2.50	.0009	2.75	0.0000
3.00	0.0000	3.25	0.0000	3.50	0.0000	3.75	0.0000
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000

TAP NUMBER 3225 WIND AT 345

X	PROB	X	PROB	X	PROB	X	PROB
-10.00	0.0000	-9.75	0.0000	-9.50	0.0000	-9.25	0.0000
-9.00	0.0000	-8.75	0.0000	-8.50	0.0000	-8.25	0.0000
-8.00	0.0000	-7.75	0.0000	-7.50	0.0000	-7.25	0.0000
-7.00	0.0000	-6.75	0.0000	-6.50	0.0000	-6.25	.0005
-6.00	.0006	-5.75	.0005	-5.50	.0005	-5.25	0.0000
-5.00	0.0000	-4.75	0.0000	-4.50	0.0000	-4.25	0.0000
-4.00	0.0000	-3.75	0.0000	-3.50	.0001	-3.25	.0004
-3.00	.0016	-2.75	.0045	-2.50	.0129	-2.25	.0318
-2.00	.0650	-1.75	.1037	-1.50	.1541	-1.25	.1924
-1.00	.2407	-.75	.2771	-.50	.3081	-.25	.3561
0.00	.3716	.25	.4059	.50	.3517	.75	.3258
1.00	.2660	1.25	.2031	1.50	.1436	1.75	.0897
2.00	.0523	2.25	.0221	2.50	.0105	2.75	.0042
3.00	.0021	3.25	.0006	3.50	.0001	3.75	.0001
4.00	0.0000	4.25	0.0000	4.50	0.0000	4.75	0.0000
5.00	0.0000	5.25	0.0000	5.50	0.0000	5.75	0.0000
6.00	0.0000	6.25	0.0000	6.50	0.0000	6.75	0.0000