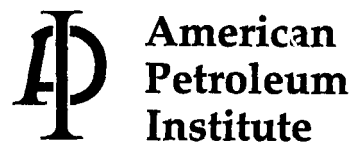


Wind Tunnel Testing of External Floating-Roof Storage Tanks

API PUBLICATION 2558
FIRST EDITION, JUNE 1993

Reaffirmed 2001



**Helping You
Get The Job
Done Right.SM**

SPECIAL NOTES

1. API PUBLICATIONS NECESSARILY ADDRESS PROBLEMS OF A GENERAL NATURE. WITH RESPECT TO PARTICULAR CIRCUMSTANCES, LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS SHOULD BE REVIEWED.
2. API IS NOT UNDERTAKING TO MEET THE DUTIES OF EMPLOYERS, MANUFACTURERS, OR SUPPLIERS TO WARN AND PROPERLY TRAIN AND EQUIP THEIR EMPLOYEES, AND OTHERS EXPOSED, CONCERNING HEALTH AND SAFETY RISKS AND PRECAUTIONS, NOR UNDERTAKING THEIR OBLIGATIONS UNDER LOCAL, STATE, OR FEDERAL LAWS.
3. INFORMATION CONCERNING SAFETY AND HEALTH RISKS AND PROPER PRECAUTIONS WITH RESPECT TO PARTICULAR MATERIALS AND CONDITIONS SHOULD BE OBTAINED FROM THE EMPLOYER, THE MANUFACTURER OR SUPPLIER OF THAT MATERIAL, OR THE MATERIAL SAFETY DATA SHEET.
4. NOTHING CONTAINED IN ANY API PUBLICATION IS TO BE CONSTRUED AS GRANTING ANY RIGHT, BY IMPLICATION OR OTHERWISE, FOR THE MANUFACTURE, SALE, OR USE OF ANY METHOD, APPARATUS, OR PRODUCT COVERED BY LETTERS PATENT. NEITHER SHOULD ANYTHING CONTAINED IN THE PUBLICATION BE CONSTRUED AS INSURING ANYONE AGAINST LIABILITY FOR INFRINGEMENT OF LETTERS PATENT.
5. GENERALLY, API STANDARDS ARE REVIEWED AND REVISED, REAFFIRMED, OR WITHDRAWN AT LEAST EVERY FIVE YEARS. SOMETIMES A ONE-TIME EXTENSION OF UP TO TWO YEARS WILL BE ADDED TO THIS REVIEW CYCLE. THIS PUBLICATION WILL NO LONGER BE IN EFFECT FIVE YEARS AFTER ITS PUBLICATION DATE AS AN OPERATIVE API STANDARD OR, WHERE AN EXTENSION HAS BEEN GRANTED, UPON REPUBLICATION. STATUS OF THE PUBLICATION CAN BE ASCERTAINED FROM THE API AUTHORIZING DEPARTMENT [TELEPHONE (202) 682-8000]. A CATALOG OF API PUBLICATIONS AND MATERIALS IS PUBLISHED ANNUALLY AND UPDATED QUARTERLY BY API, 1220 L STREET, N.W., WASHINGTON, D.C. 20005.

FOREWORD

This publication was prepared for the American Petroleum Institute by the Cermak Peterka Petersen, Incorporated.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any federal, state, or municipal regulation with which this publication may conflict.

Suggested revisions are invited and should be submitted to Measurement Coordination, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

TABLE OF CONTENTS

LIST OF APPENDICES	iii
LIST OF FIGURES	iv
LIST OF TABLES	vi
LIST OF SYMBOLS	vii
 1.0 INTRODUCTION	 1
 2.0 BACKGROUND	 3
2.1 <i>Evaporative Loss Equation</i>	3
2.2 <i>Air Flow Around Tanks</i>	5
2.3 <i>Wind Speeds in the Atmosphere</i>	6
 3.0 EXPERIMENTAL PROGRAM	 9
3.1 <i>Similarity Criteria</i>	9
3.2 <i>Model Construction</i>	9
3.3 <i>Wind Tunnel and Test Setup</i>	10
3.4 <i>Wind Direction</i>	10
3.5 <i>Wind Speed</i>	11
3.6 <i>Roof Pressures</i>	12
3.7 <i>Quality Control</i>	13
 4.0 RESULTS	 15
4.1 <i>General</i>	15
4.2 <i>Wind Speed</i>	15
4.3 <i>Wind Direction</i>	16
4.4 <i>Roof Top Pressures</i>	16
 5.0 REVISED METHOD FOR CALCULATING EVAPORATION FROM ROOF FITTINGS	 19
5.1 <i>General</i>	19
5.2 <i>Complex Method</i>	19
5.3 <i>Simple Method</i>	21
5.4 <i>Discussion</i>	22
 6.0 CONCLUSION AND RECOMMENDATIONS	 25
 7.0 REFERENCES	 27
 FIGURES	 31
TABLES	65

LIST OF APPENDICES

A	INSTRUMENTATION AND FACILITIES	A-1
B	EXPERIMENTAL METHODS	B-1
C	TABLE OF PRESSURE COEFFICIENTS	C-1
D	PRESSURE COEFFICIENT PLOTS AT MEASUREMENT LOCATIONS	D-1
E	PRESSURE COEFFICIENT CONTOURS BY WIND DIRECTION	E-1
F	WIND DIRECTION PHOTOGRAPHS	F-1
G	TABLE OF NON-DIMENSIONAL AND EQUIVALENT WIND VELOCITIES	G-1
H	WIND ROSE OF NON-DIMENSIONAL AND EQUIVALENT WIND VELOCITIES	H-1
I	NON-DIMENSIONAL MEAN VELOCITY CONTOURS	I-1

LIST OF FIGURES

1a.	Site Plan — 200 ft Tank	31
b.	Elevation — 200 ft Tank	32
2a.	Site Plan — 100 ft Tank	33
b.	Elevation — 100 ft Tank	34
3a.	Site Plan — 48 ft Tank	35
b.	Elevation — 48 ft Tank	36
4.	Velocity and Turbulent Approach Profiles	37
5a.	Wind Speed, Wind Direction and Roof Pressure Measurement Locations — 200 ft Tank	38
b.	Wind Speed, Wind Direction and Roof Pressure Measurement Locations — 100 ft Tank	39
c.	Wind Speed, Wind Direction and Roof Pressure Measurement Locations — 48 ft Tank	40
6a.	Non-dimensional Mean Velocity Centerline Profiles — 200 ft Tank	41
b.	Non-dimensional Mean Velocity Centerline Profiles — 100 ft Tank	42
c.	Non-dimensional Mean Velocity Centerline Profiles — 48 ft Tank	43
7a.	Average Non-dimensional Mean Velocity Contours — 200 ft Tank	44
b.	Average Non-dimensional Mean Velocity Contours — 100 ft Tank	45
c.	Average Non-dimensional Mean Velocity Contours — 48 ft Tank	46
8a.	Roof Top Wind Directions Relative to Approach Flow — 200 ft Tank	47
b.	Roof Top Wind Directions Relative to Approach Flow — 100 ft Tank	48
c.	Roof Top Wind Directions Relative to Approach Flow — 48 ft Tank	49
9a.	Centerline Pressure Coefficient Profiles — 200 ft Tank	50
b.	Centerline Pressure Coefficient Profiles — 100 ft Tank	51
c.	Centerline Pressure Coefficient Profiles — 48 ft Tank	52
10a.	Average Pressure Coefficient Contours — 200 ft Tank	53
b.	Average Pressure Coefficient Contours — 100 ft Tank	54
c.	Average Pressure Coefficient Contours — 48 ft Tank	55
11a.	Average Non-dimensional Mean Velocity Zones — 200 ft Tank	56
b.	Average Non-dimensional Mean Velocity Zones — 100 ft Tank	57
c.	Average Non-dimensional Mean Velocity Zones — 48 ft Tank	58

LIST OF FIGURES (Continued)

12a.	Average Non-dimensional Mean Velocity Centerline Profiles — 200 ft Tank	59
b.	Average Non-dimensional Mean Velocity Centerline Profiles — 100 ft Tank	60
c.	Average Non-dimensional Mean Velocity Centerline Profiles — 48 ft Tank	61

LIST OF TABLES

1.	List of External Roof Fittings	65
2.	Flow Visualization Test Plan	66
3.	Velocity Measurement Test Plan	69
4.	Pressure Measurement Test Plan	70
5.	Summary of Wind Directions on Tank Roof	71
6a.	Evaporative Loss Example Calculation — Complex Method Roof Manway	72
b.	Evaporative Loss Example Calculation — Complex Method Slotted Guide Pole	73
7.	Evaporative Loss Example Calculation — Simple Method	74

LIST OF SYMBOLS

<u>Symbol</u>	<u>Description</u>	
C_p	Coefficient of Pressure	(-)
D	Tank Diameter	(ft)
$f(\theta)$	Frequency of Wind Direction Sector	(-)
F	Evaporative Loss Factor	(lb mole/ft/yr)
H	Tank Height	(f)
K	Product Loss Factor	(-)
L	Stock Loss	(lb/yr)
m	Evaporative Loss Factor	(-)
M	Molecular Weight	(g/g-mole)
n	Wind Power Law Exponent	(-)
N	Number of Fittings	(-)
P^*	Vapor Pressure Function	(-)
q	Dynamic Pressure	(lb/ft ²)
r	Tank Radius	(ft)
R	Roof Height	(ft)
U_{mean}	Average Wind Speed at fitting	(mph)
U_{ref}	Reference Wind Speed	(mph)
U_{rms}	Root Mean Squared Wind Speed at fitting	(mph)
x	Distance from Center of Tank Roof	(ft)
z_o	Surface Roughness Height	(ft)
ρ_a	Density of Air	(lb/ft ³)
ν_a	Viscosity of Air	(ft ² /sec)

LIST OF SYMBOLS (Continued)**Subscript**

a	airport
e	effective
f	fitting, full scale
m	model scale
r	rim seal
s	standing; site
t	total
v	vapor

1.0 INTRODUCTION

The American Petroleum Institute (API) contracted with Cermak Peterka Petersen, Inc. (CPP) to conduct a wind tunnel study to determine the local wind velocities, wind directions, and roof pressures on External Floating Roof Tanks (EFRT). The results of this study are to be used to improve evaporative loss calculations for roof fittings on EFRT.

The third edition of API Publication 2517 (1989) is the first to include roof fittings as a potential source for evaporative loss. Previous publications have limited the scope to include rim seal and stock clingage losses, assuming roof fitting losses to be negligible in comparison. The loss factors used in the evaporative equations were derived from experimental data which correlated stock evaporation to the wind speed over the roof fitting.

The current procedure, as described in Section 2.2 of API 2517, specifies that an average wind speed at the tank site or from the nearest local weather station should be used as the wind speed over the roof fitting in the evaporative loss equations. This average approach wind speed may differ substantially from the actual wind speed over the fittings, from which the loss factors were derived. For lower roof levels, in particular, the inaccuracy in wind velocity may cause overestimates of the evaporative loss potential for the roof fittings.

The primary objective of this study is to develop a relationship between the airport wind speed and the wind speed at roof fittings. In addition to wind speed, the relative wind direction of air flow over the EFRT roof top will be analyzed as an aid to evaluating evaporation losses for fittings which exhibit some level of directional sensitivity. For documentation purposes and for use in future evaluations of evaporative loss, roof top pressures were also measured across the tank.

The following sections provide background into the current evaporative loss methodology and air flow characteristics, a description of the experimental program carried out during the study, results of the study, a revised method for calculating evaporation loss from roof fittings, and conclusion and recommendations.

2.0 BACKGROUND

2.1 Evaporative Loss Equation

Section 2 of API Publication 2517 describes the current procedures for estimating the total annual evaporative stock loss from EFRT. The total loss is defined as the sum of the standing storage loss, L_s , and the withdrawal loss, L_w . Withdrawal losses are primarily attributed to clingage of stock to the tank shell while the stock is withdrawn. Standing storage loss is attributed to evaporation of stock around rim seals and roof fittings. This study will focus on the latter.

The present equation for calculating standing stock losses from EFRT is as follows:

$$L_s = (F_r D + F_f) P^* M_v K_c \quad (1)$$

where:

L_s	=	Standing stock loss (lb/yr)
F_r	=	Rim-seal loss factor (lb-mole/ft/yr)
D	=	Tank diameter (ft)
F_f	=	Roof fitting loss factor (lb-mole/yr)
P^*	=	Vapor pressure function
M_v	=	Average molecular weight of stock vapor (lb/lb-mole)
K_c	=	Product factor

Equation 1 can be broken down into its two components, rim seal losses (L_r) and roof fitting losses (L_f), where:

$$L_r = F_r D P^* M_v K_c \quad (2)$$

$$L_f = F_f P^* M_v K_c \quad (3)$$

This study will concentrate its efforts on evaluating the roof fitting loss equation; however, two of the topics which will be discussed also apply to the rim seal loss equation. These include: 1) the comparison between roof top pressures measured in this study and previously published results from which F_r was derived; and 2) the relationship between the site and the nearby airport wind speeds.

The total roof fitting loss factor, F_f , from Equation 3, can be expressed as the sum of the individual loss factors for each fitting. Section 2.2.2.2 of API 2517 defines F_f as:

$$F_f = \sum_{i=1}^k N_{f_i} K_{f_i} \quad (4)$$

where:

N_{f_i}	=	Number of type i roof fittings
K_{f_i}	=	Loss factor for type i roof fitting (lb-mole/yr)
k	=	Total number of different types of roof fittings

and

$$K_{f_i} = K_{a_i} + K_{b_i} U_{\text{mean}}^{m_i} \quad (5)$$

where:

K_{a_i}	=	Loss factor for type i roof fitting (lb-mole/yr)
K_{b_i}	=	Loss factor for type i roof fitting (lb-mole/mph ^m /yr)
m_i	=	Loss factor for type i roof fitting
U_{mean}	=	Average wind speed above the fitting (mph)

The loss factors used in Equation 5 were developed using data obtained by CBI (1985) during a wind tunnel study specifically designed to measure evaporative losses from external floating

roof tank fittings. The wind tunnel tests used full scale roof fittings extending from a product reservoir into one of four 5 ft x 3 ft x 3 ft test sections. The evaporative losses from the stock reservoirs were recorded for the various roof fittings as a function of mean velocity within the wind tunnel. Exponential curve fits were applied to this data to provide the individual roof fitting loss factors.

2.2 *Air Flow Around Tanks*

A literature review was conducted to determine the current level of knowledge available concerning air flow around external floating roof tanks. The most noteworthy research (Marchmann, 1970) investigated pressure contours over open-top cylindrical tanks. It was from this data base that the rim seal equation relationship between differential pressure and approach velocity was developed. Little to no information was obtained which specifically addresses the air flow around and over EFRT.

A qualitative analysis of air flow over EFRT can be obtained using guidelines established by the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE, 1989) for air flow around buildings. This analysis predicts that a cavity region will form downwind of the leading edge of each tank. The cavity, caused by flow separation at the leading edge, will expand downwind as the roof is lowered. This expansion will occur because the cavity must project deeper into the tank before the flow can reattach to the roof. At some level, depending upon the tank diameter to height ratio, the flow will not be able to reattach to the roof before encountering the trailing edge of the tank shell, causing the entire roof to be encased in a recirculation cavity. Further lowering of the roof should have minimal impact on the subsequent air flow.

A review of Marchmann (1970) confirms this qualitative analysis. The tank used in the Marchmann study was 4 ft in diameter by 1 ft tall, roughly the same height to diameter ratio as the 200 ft tank modeled in this study. The tank was installed in the 6 ft x 6 ft wind tunnel of the Aerospace Engineering Department at Virginia Polytechnic Institute. During the tests a ground board was used to simulate the approach boundary layer at the tank. Roof top pressures were measured at 81 tap locations for 5 roof top heights. In Marchmann's results (see Figure 9a), for a roof height to tank height ratio between 1.0 and 0.67, the centerline pressure coefficient profiles rapidly evolved. A relatively flat portion of the curve, which is indicative of a recirculation

cavity, is almost non-existent for the 1.0 roof height ratio. This flat region of the curve develops and expands as the roof is lowered to a roof height ratio of approximately 0.67. From this height on down to a roof height ratio of 0.23 (the lowest height for which data is presented), the centerline pressure coefficients did not vary significantly. The similarity in the profiles indicates that the cavity is no longer affected by lowering the roof height. This leads to a conclusion that the flow for roof height ratios of 0.67 and lower did not reattach to the roof after separation at the leading edge of the tank.

2.3 Wind Speeds in the Atmosphere

The wind speed, U_{mean} , in Equation 5 is the wind speed at a particular roof fitting location which, in API Publication 2517, is assumed to be the wind speed upwind of the tank location. This, in turn, is typically assumed to be equal to the wind speed at the nearest National Weather Service (NWS) station. The assumption has two problems. First, the wind speeds at the airport may not be representative of the wind speed in the vicinity of the tank, and second, the wind speed upwind of the tank is not representative of the speed near each roof fitting.

With regard to the wind speeds at the site (i.e., upwind of the tank), the following equation can be used to estimate the wind speed upwind of the tank for a given wind speed at the airport:

$$U_s = \frac{U_a Z_s^{n_s} 2000^{n_a - n_s}}{Z_a^{n_a}} \quad (6)$$

where

Z_s	=	Wind speed measurement height at the site in feet (typically 33 ft)
Z_a	=	Wind speed measurement height at the airport in feet (typically 33 ft)
U_s	=	Wind speed at the site at height Z_s in mph
U_a	=	Wind speed at the airport at height Z_a in mph
2000	=	Top of atmospheric boundary layer in feet
n_s	=	Wind speed power law exponent at the site
n_a	=	Wind speed power law exponent at the airport

The wind power law exponent is a function of surface roughness and can be estimated using the following equation (EPA, 1981):

$$n_i = 0.24 + 0.096 \log_{10} z_{0i} + 0.016 (\log_{10} z_{0i})^2 \quad (7)$$

where z_0 is in meters and the subscript i represents the site or the airport. For the airport, z_0 is typically 0.03 m which gives n_a equal to 0.13 while for industrial areas such as around a tank farm z_0 equals about 0.5 m which gives n_s equal to 0.21. Substituting these roughness values into Equation 6 indicates that the wind speeds at typical tank farms may be 28 percent less than those at the airport.

With respect to the wind speeds near the fittings on the roof, the speeds will generally be less than those approaching the tank when the floating roof is lower than the main surrounding tank structure. When the tank is full, the wind speeds on the roof may equal or exceed those upwind of the tank.

3.0 EXPERIMENTAL PROGRAM

3.1 Similarity Criteria

At present, the best method available for estimating the wind speeds on the roof of external floating roof tanks is through the use of wind tunnel modeling. The wind tunnel is, in effect, an analog computer with near infinitesimal resolution and near infinite memory. The basic equations of motion are solved by simulating the flow at a reduced rate and measuring the desired quantity (in this case wind speed, wind direction and pressure). The methods for scaling wind tunnel measurements to full scale and for setting up wind tunnel experiments are summarized in EPA (1981). The criteria that were used for conducting the wind tunnel simulations to determine wind speed, wind direction and roof pressures on EFRT are as follows:

- ensure a fully turbulent wake flow — Reynolds number based on height of tank ($Re_b = U_H H_b / \nu_a$) greater than 11,000 (Actual $Re_b = \sim 60,000$);
- similar geometric dimensions;
- equality of dimensionless boundary and approach flow conditions;

where:

U_H	=	Ambient velocity at top of tank (m/s)
H_b	=	Tank height (m)
ν_a	=	Air viscosity (m^2/s)

3.2 Model Construction

Three 1:100 scale models of external pontoon floating roof storage tanks were constructed. Each model included such details that are common to all pontoon storage tanks (stairs to tank roof, wind breakers around the perimeter of the tank, and rolling ladders). The appropriate number of roof fittings were modeled for each size tank as deemed typical for EFRT in Tables 6 and 7 of API 2517. The actual number of each fitting modeled, shown in Table 1, varied slightly from the prescribed values in some instances in order to maintain geometric symmetry. The overall

full scale dimensions for the three tanks were as follows: 1) Tank 1 — 48 ft height and 200 ft outside diameter; 2) Tank 2 — 48 ft height and 100 ft outside diameter; and 3) Tank 3 — 48 ft height and 48 ft outside diameter. Figures 1 through 3 provide site and elevation plans for the three tanks. The tanks were constructed so that the roof could be adjusted to different heights.

3.3 *Wind Tunnel and Test Setup*

Appendix A describes CPP's atmospheric wind tunnel and the instrumentation that was used to collect the data. In brief, a hot-wire anemometer was used to measure the wind speed and turbulence intensity, miniature wind vanes were used to document the wind direction, and mean and fluctuating pressures were obtained using differential pressure transducers.

Prior to testing the tank models, a uniform roughness pattern was installed in the wind tunnel upwind of the location where the tank models were placed. The roughness was designed to simulate the roughness approaching a typical tank farm or industrial area (surface roughness length of 0.5 m). Mean velocity and turbulence intensity profiles were obtained using a hot-wire velocity sensor (see Appendix A for description) to verify that the profiles match those that would be observed in the atmosphere. The results of these profiles are shown in Figure 4.

Different wind directions were tested, since some of the roof details (i.e., stairs) will cause wind speeds to vary with wind direction at each point on the roof. Sixteen directions were selected to be consistent with typical wind frequency distribution summaries provided by the National Weather Service so that the results can be readily used to compute average speeds and directions on the roof for a given site climatology. North (0 degrees) was arbitrarily set for each tank as shown in Figures 1, 2 and 3, such that the gauger's platform was positioned in the southeastern quadrant.

3.4 *Wind Direction*

After the boundary layer approaching the model test area was documented, the tank models were installed, one at a time, in the wind tunnel. Initial flow visualization tests were conducted to develop a qualitative understanding of the flow over the tank roof. During the visualization tests, small flags were placed throughout the roof surface of the tanks at each of the measurement

locations shown in Figures 5a, b and c. Tests were conducted for each tank at three different roof heights for the 16 different wind directions. The local wind direction at each measurement location was recorded on videotape and still photographs. A listing of the flow visualization test plan is provided in Table 2. Subsequent placement of the velocity probes were based on the results of the visualization.

The roof top wind directions are reported in terms of the relative direction with respect to the approach flow with the tank orientated at 0 degrees (north). For example, a relative wind direction of 0 degrees indicates that the flow at that location is in the same general direction as the approach flow, while a wind direction of 180 degrees indicates complete flow reversal.

All wind direction analysis was based on visual interpretation of the still photographs. Multiple photos were reviewed to provide an estimate of the average wind direction at each location.

3.5 Wind Speed

Wind speed measurements were made at the measurement locations shown in Figures 5a, b and c using a hot-wire anemometer probe (see Appendix B for experimental procedures). Since the tanks are symmetric, except for the spiral stairway on the exterior of the tank shell, symmetry was used to reduce the total number of velocity measurements for the smaller two (100 ft and 48 ft) tanks. The tabular results presented in this report only include velocity data for locations where measurements were actually taken. The velocity profiles and contours, however, were generated by assuming that the velocity at locations where measurements were not obtained were equivalent to their symmetrical partner, where measurements were taken. On average, 20 locations were tested for each tank at each of the 16 wind directions and three roof heights. Table 3 lists the velocity measurement test plan for the three tanks.

All roof top velocities are reported in terms of a non-dimensional mean velocity. This parameter is the ratio of mean velocity at the fitting (U_{mean}) divided by the approach velocity at a nearby airport or NWS facility (U_a). The airport velocity was obtained from the reference velocity simulated in the wind tunnel using the following expression:

$$U_a = \frac{U_{ref} Z_a^{n_a} 2000^{n_s - n_a}}{Z_{ref}^{n_s}} \quad (8)$$

where:

Z_{ref}	=	Full scale reference height (328 ft)
Z_a	=	Wind speed measurement height at the airport in feet (typically 33 ft)
U_{ref}	=	Reference wind speed simulated in the wind tunnel in mph
U_a	=	Wind speed at the airport in mph
2000	=	Top of atmospheric boundary layer in feet
n_s	=	Wind speed power law exponent at the site
n_a	=	Wind speed power law exponent at the airport

The non-dimensional mean velocity (U_{mean}/U_a) is equivalent in model and full scale, therefore, the average full scale wind velocity at any location on the EFRT roof can be obtained by multiplying the average wind speed at the nearby weather station by the velocity ratio presented in this report. That is:

$$U_{mean_f} = U_{a_f} \left(\frac{U_{mean}}{U_a} \right)_m \quad (9)$$

where:

subscript f	=	full scale
subscript m	=	model scale

3.6 Roof Pressures

The pressure transducers used were Microswitch differential transducers. Reference pressures were obtained by connecting the reference sides of the 8 transducers to the static side of the pitot static probe. In this way, the transducer measured the instantaneous difference between the local pressures on the surface of the tank roofs and the static pressure at the reference velocity measurement location above the model.

All pressure measurements are reported in terms of the mean pressure coefficient:

$$C_{p_{mean}} = \frac{\Delta P_{mean}}{\frac{1}{2} \rho U_a^2} \quad (10)$$

where ΔP_{mean} is the pressure difference $(p - p_r)_{mean}$ measured by the pressure transducer and $\frac{1}{2} \rho U_a^2$ is the dynamic pressure at the airport. The mean pressure coefficient represents the mean of the instantaneous pressure differences between the roof top pressure tap and the static pressure in the wind tunnel, non-dimensionalized by the dynamic pressure at the nearby NWS facility.

The mean pressure coefficient can be used to calculate a full-scale pressure differential by multiplying the coefficient by the dynamic pressure at the nearby weather station, as:

$$\Delta P_f = C_{p_{mean}} \left(\frac{1}{2} \rho U_a^2 \right)_f \quad (11)$$

3.7 Quality Control

To ensure that accurate and reliable data were collected for the roof top velocity and pressure measurements, the following quality control steps were taken:

- calibration of flow measuring device with soap bubble meter;
- calibration of velocity device with mass flow meter (see Appendix B);
- calibration check between hot-wire and static pitot tube;
- calibration of pressure transducers with oil manometer (see Appendix B);
- comparison of wind tunnel velocity and turbulent intensity profiles with those observed in the atmosphere (see Figure 4);
- visual inspection of pressure data using X-Y plots of each measurement location to check data consistency (see Appendix E);

- visual inspection of velocity data using wind rose plots of each measurement location to check data consistency (see Appendix H).

4.0 RESULTS

4.1 General

The results of the pressure and velocity measurements collected during the course of this study are listed in Appendices C and G, respectively. Wind direction photographs are presented in Appendix F for each data set configuration at the 16 wind directions. The pressure data is reported in terms of a pressure coefficient with the nearby NWS facility used as the reference wind speed for calculating the dynamic pressure. The velocity data has been non-dimensionalized as a ratio of the measured velocity at each fitting divided by the corresponding approach wind speed at a nearby weather station. The following sections discuss the results in greater detail.

4.2 Wind Speed

Roof top contours of the non-dimensional mean velocity data are included in Appendix I. The contours provide a visual indication of the velocity distribution across the tanks. The recirculation region on each of the roof tops can be identified by large areas on the contour plots where the velocity is essentially constant. A comparison of the plots at different roof heights clearly depicts the growth of the recirculation region toward the downwind wall as the roof level is lowered.

Figures 6 and 7 are presented as a summary to Appendix I. In Figures 6a, b and c centerline velocity profiles are shown for each of the three tanks at the three roof levels. The three sets of curves depict the relative magnitude of the wind speed over the fittings from the leading edge of the tank, across the centerline, to the downwind edge of the tank. In Figures 7a, b and c the average velocity contours for the three tanks is depicted. The average contours were obtained using the average mean velocity measured at each point for the 16 wind directions.

The API literature provides no direct comparison for the centerline velocity profiles shown in Figures 6a, b and c. However, a review of the three sets of profiles produce rather interesting results. For all three tanks the wind speed across the roof top is consistently higher when the

roof is at tank height level than it is when the roof is lowered to the intermediate level. This trend does not persist when the roof top is further lowered to the lowest roof height. At this level, the velocities are generally greater than at the mid-level roof height. (A possible explanation for this behavior is presented in Section 4.3.) Figures 6b and c indicate that in certain areas the wind speeds at the lowest height actually exceed those measured at the tank top level.

If the velocity field of the EFRT roofs were independent of wind direction, each of the contours shown in Figures 7a, b and c would consist of concentric circles. It can be noted from the figures that overall the flow is fairly symmetric except for an area near the rolling ladder where the velocity is reduced.

4.3 Wind Direction

The relative roof top wind directions are shown graphically in Figures 8a, b and c and numerically in Table 5. A qualitative analysis of the results indicates that the air flowing over the top of the tanks when the roof height ratio is set at 1.0 (roof at tank height level) remains in the same general direction as the approach flow over the entire span of the roof. For the lowest roof heights the flow has completely reversed, but remains fairly constant over the entire roof. The flow on the intermediate roof heights is mixed. Some flow reversal has begun but it has not fully developed. This mixture of flow direction may result in the reduced wind speeds for the mid-level roof height discussed in Section 4.2. Along the sides of the tanks, for all roof heights and diameters, an annular flow exists where the air generally flows parallel to the tank shell. Exceptions to this are at the leading and trailing edge of the tank where the flow tends to be perpendicular to the tank shell.

4.4 Roof Top Pressures

Initial pressure measurements were made at five roof heights with the tanks orientated at 0 degrees (north) so that three representative roof heights could be selected for the remainder of the testing (see Table 4). The lowest roof height was established as the first height at which the pressure coefficient profiles remain relatively constant as the roof is moved to lower heights (see discussion in Section 2.2). The top roof height was established as the height of the tank, and the

third height was taken as an intermediate height. The results of these preliminary tests are shown in Figures 9a through 9c. The centerline pressure profiles for the 200 ft diameter tank, shown in Figure 9a, indicate that the profiles varied throughout the entire range of roof heights tested. Therefore, roof height ratios of 0.35, 0.8 and 1.0 were selected for all remaining tests of the 200 ft tank. Figure 9b shows a similar trend for the 100 ft tank. Roof height ratios of 0.5, 0.9 and 1.0 were selected for all remaining tests on this tank. With the smallest tank, 48 ft diameter, the centerline profiles for roof height ratios of 0.90, 0.75 and 0.50, as shown in Figure 9c, did not vary significantly. Therefore, roof height ratios of 1.0, 0.90 and 0.75 were selected for all remaining testing of the 48 ft tank.

The centerline pressure profiles shown in Figures 9a, b and c provide a direct comparison between the results presented in this report to those reported by Marchmann (1970). The pressure profiles in Figure 9a can be directly comparable with the profiles presented by Marchmann since the tank diameter to tank height ratios are similar. An evaluation of Figure 9a, which shows both sets of data, indicates that the general shape of the pressure coefficient profiles are equivalent but that the magnitudes differ. There are two possible explanations for this discrepancy. First, the pressure coefficient value is dependent upon the reference wind speed location. The pressure coefficients in this study are based on a wind speed at a nearby NWS facility assuming a 33 ft anemometer height. Marchmann does not specify the reference wind speed location. If it was obtained in an area of slower flow (at a lower anemometer height, for example) this would explain the higher coefficient values. Second, and a more likely explanation, is that Marchmann's tests were conducted using a ground board to simulate the presence of the ground induced boundary layer. While the ground board may replicate the shape of the mean velocity profile, it may not match the atmospheric turbulence intensity. Increased turbulence will enhance mixing of the flow over the top of the tanks, thereby reducing the magnitude of the gradients (and resulting pressure differentials). The atmospheric boundary layer wind tunnel used in this study is specifically designed to model both the velocity and turbulent intensity profiles characteristic of full scale flow.

Roof top pressure contours by wind direction are presented in Appendix D. Figures 10a, b and c summarize the results in terms of average pressure contours for each EFRT tank configuration. The average contours were obtained in a slightly different manner than the average velocity contours discussed earlier in this report. Since the pressure contours include both positive and

negative values, an average at each location over 16 wind directions will produce meaningless results. For example, an area near the edge of the tank that experiences large fluctuations in pressure from negative to positive could have the same overall average pressure as that of a central area which experiences little or no pressure differential at any wind direction. Therefore, the average pressure contours presented in this report were created by fixing the coordinate system to the approach flow rather than to the tank roof such that the approach wind direction was always classified as 0 degrees regardless of the orientation of the tank.

5.0 REVISED METHOD FOR CALCULATING EVAPORATION FROM ROOF FITTINGS

5.1 General

The normalized velocity data presented in this report are provided in two different formats to facilitate the calculation of evaporative losses using either the complex or simple methods described below. The complex method uses the tables of non-dimensional mean velocities provided in Appendix G to determine the appropriate wind speed at a given location for a specific wind direction. The simple method uses the average velocity zones presented in Figures 11a, b and c.

The following sections describe the procedures for calculating the evaporative losses from roof fittings using either the complex or simple method.

5.2 Complex Method

The complex method for calculating evaporative loss potential from roof fittings is an expansion of the current methodology presented in Equations 4 and 5. Instead of assuming that the air flow over the entire roof is equivalent to the approach flow at a nearby airport, as specified in the current procedure, the complex method uses a distinct velocity, calculated from the airport wind speed, for each location and wind direction. The resulting procedure requires a summation of the individual loss factors $(F_{f_{ij}})$, calculated for every fitting at each wind direction sector, to determine the total loss factor for the roof fittings as shown in the following equations:

$$F_{f_{ij}} = \sum_{w=1}^{16} f_w(\theta) \left[K_{a_i} + K_{b_i} U_{\text{mean}_{j_w}}^{m_i} \right] \quad (12)$$

and

$$F_f = \sum_{i=1}^k \sum_{j=1}^x F_{f_{ij}} \quad (13)$$

where:

w	=	Wind direction sector (1 - 16)
$F_{f_{ij}}$	=	Total Loss Factor for Fitting i at location j
$f_w(\theta)$	=	Frequency of wind direction sector w
$U_{\text{mean},jw}$	=	Average wind speed at j location from wind direction sector w
j	=	Fitting location number
x	=	Number of fitting locations

Example calculations for the complex method are presented in Tables 6a and b for a roof manway and slotted guide pole. The overall procedure for calculating the evaporative loss potential using the complex method is as follows:

- Determine which of the 9 EFRT configurations most represents the tank in question, in terms of tank diameter to height ratio and average roof height to tank height ratio.
- Determine the average approach wind speed and frequency of occurrence for each of the 16 wind direction sectors. This data is typically available from nearby NWS facilities. Calm data should be treated using the EPA established procedure (EPA, 1987) by recalculating the frequency of occurrence of all wind directions without the calm data.
- Determine the orientation of the full scale tank with that of the modeled tank and adjust all wind directions accordingly.
- Determine the measurement location from Figure 5 which most represents the location for each fitting on the roof.
- Obtain the K_a , K_b , and m roof fitting loss factors for each type of fitting from Table 5 of API 2517.
- Multiply the average approach wind speed for each wind direction sector by the non-dimensional mean velocity (U_{mean}/U_a) for each location from Appendix G to determine the average wind speed at the roof fitting.

- For wind directional sensitive fittings, consult Figure 8 to determine the wind direction at fitting for each approach wind direction and adjust loss factors as appropriate.
- Calculate the roof fitting loss factor for each fitting and sum together to obtain the total roof fitting loss factor using Equations 12 and 13.
- Calculate the total roof fitting loss potential using Equation 3.

At this time, the complex method is presented for illustrative purposes only and is not yet developed to the point where it can be simply implemented.

5.3 Simple Method

The simple method reduces the total number of calculations required by using an average wind speed for all wind directions, instead of a wind speed for each of the 16 wind direction sectors used in the complex method. Using an average measured wind speed at each fitting and assuming a symmetric velocity distribution over the roof tanks (i.e., neglecting ladder effects) leads to the development of wind speed zones. The average wind speed within each zone can then be used to calculate the loss for a particular fitting. The resulting equation is presented in Equation 14.

$$F_f = \sum_{i=1}^k \sum_{j=1}^l \left[K_{a_i} + K_{b_i} U_{\text{mean}_j}^{m_i} \right] n_{ij} \quad (14)$$

where:

i	=	Fitting type
j	=	Velocity zone
U_{mean_j}	=	Average Velocity in zone j
n_{ij}	=	number of type i fittings in zone j
k	=	number of fitting types
l	=	number of velocity zones

The average velocity zones (Figures 11a, b and c) were created for use with the simple method to determine the average velocity predicted to occur at locations on the roof surface. These zones

were obtained by slicing the average velocity contours (Figures 7a, b and c) along four axes: 0-180 degrees, 45-225 degrees, 270-90 degrees, and 315-135 degrees. The resulting profiles are shown in Figures 12a, b and c. From the average centerline velocity profiles the maximum wind speed at $0.2r$, $0.4r$, $0.6r$, $0.8r$ and $1.0r$, where r is the radius of the tank, for the four axes was established as the wind speed for that zone.

Using the simple method, evaporative loss for an entire set of roof fittings can be calculated from a single table as indicated in Table 7. The overall procedure for calculating evaporative loss potential using the simple method is as follows:

- Determine which of the 9 EFRT configurations presented in this report most represents the tank in question, in terms of tank diameter to height ratio and average roof height to tank height ratio.
- Determine the average wind speed at the nearest local weather station. Values from Table 4 in API Publication 2517 may be used as an approximation.
- Identify the total number of each type of fitting present in each of the velocity zones.
- Obtain the K_a , K_b , and m roof fitting loss factors for each type of fitting from Table 5 of API 2517.
- Multiply the average approach wind speed by the non-dimensional mean velocity (U_{mean}/U_a) for each zone as indicated in Figure 11. The value used should be the greater of the two values on the zone boundary.
- Calculate the total roof fitting loss factor using Equation 14.
- Calculate the total roof fitting loss potential using Equation 3.

5.4 Discussion

The example calculations shown in Tables 6 and 7 provide a direct comparison of the resulting loss factors for the roof manway and the slotted guide pole, using a wind frequency distribution for the Long Beach, California, area. The examples show a difference of 25 percent to 30 percent between the two methods. The loss factors obtained using the complex method in this example were lower than for the simple method, however, this trend may not hold for other types of fittings and wind frequency distributions.

A note of caution, the tanks used in this report all correspond to a full scale height of 48 ft. Using the presented results for tanks which deviate substantially from this height may not be valid due to the non-linearity in the approach boundary layer. It may be acceptable to scale the results for different tank heights, but an investigation into the possibility is beyond the scope of this study.

This study only investigated 9 different tank configurations (3 tank diameters x 3 roof heights). Obviously, the total number of possible configurations is limitless. To obtain conservative loss estimates (i.e., higher than expected) the user should not try to extrapolate wind speed values for tank configuration which fall between those presented in this study. Rather, the configuration on either side of the actual tank which produces the largest values should be used.

6.0 CONCLUSION AND RECOMMENDATIONS

This study has developed two new procedures for calculating evaporative loss potential for roof fittings on External Floating Roof Tanks (EFRT). The first method, identified as the complex method, converts the approach wind speed, as measured by a nearby National Weather Service (NWS) anemometer, to a wind speed at a particular roof fitting for each of the 16 different wind direction sectors. Using these wind speeds, the roof fitting evaporation loss may be obtained for each individual fitting using loss factors presented in the American Petroleum Institute (API) Publication 2517. The total roof fitting loss factor is then obtained as the summation of the individual fitting loss factors. The second method, referred to as the simple method, reduces the complexity of the calculations by establishing wind speed zones on the tank roof. The loss factors for all similar type fittings within each zone can be calculated from a single expression. A limited comparison of the two methods was conducted which showed a 25 percent to 30 percent difference, with the complex method providing lower loss factors. This trend may not occur for all fitting types and wind frequency distributions.

In addition to developing a method for determining the local wind speed over roof fittings, this report also investigated roof top pressure profiles for 9 different EFRT tank configurations. This effort was undertaken to provide preliminary data which may be used in the future to evaluate the current method for determining the rim seal loss factors. The pressure coefficient profiles presented in this report are similar to the results from Marchmann (1970) from which the rim seal loss equations were derived, however, the magnitudes differ. This is primarily attributed to the discrepancy between the turbulence intensity present in the Marchmann study as apposed to the turbulence which is present in a wind tunnel specifically designed to model the atmospheric boundary layer. These new results indicate that further analysis may be needed regarding the rim seal loss equations.

An overall evaluation of the data collected indicates a need for additional testing. An unanticipated phenomena was observed in which the magnitude of the wind speed over the roof top first decreased as the roof was lowered then increased as the roof was further depressed. Additional velocity measurements at various roof height to tank height ratios are necessary to

fully understand the flow characteristics as a function of roof height. With sufficient data, it may be possible to develop a generalized equation for predicting wind speeds at the roof fittings.

7.0 REFERENCES

American Petroleum Institute, "Evaporation Loss From External Floating-Roof Tanks," Publication 2517, Washington, D.C., 1989.

American Society of Heating, Refrigeration and Air Conditioning Engineers, "ASHRAE 1989 Fundamentals Handbook," Atlanta, Georgia, 1989.

CBI Industries, Inc., "Testing Program to Measure Hydrocarbon Evaporation Loss from External Floating-Roof Fittings" (CBI Contract 41851), Final report prepared for the Committee on Evaporation Loss Measurement, American Petroleum Institute, Washington, D.C., September 13, 1985.

EPA, "On-site Meteorological Program Guidance for Regulatory Modeling Applications," USEPA Office of Air Quality, Planning and Standards, Research Park, North Carolina, EPA-450/4-87-013, June 1987.

Laverman, R.J., "Evaporative Loss From External Floating-Roof Tanks," CBI Technical Publication CBT-5536, American Petroleum Institute, 1987 Pipeline Conference, Dallas, Texas, April 1989.

Marchmann, J.F., "Surface Loading in Open-Top Tanks," American Society of Civil Engineers, *Journal of the Structural Division*, Vol. 96, No. 11, pp. 2251-2256, December 1970.

Snyder, W.H., "Guideline for Fluid Modeling of Atmospheric Diffusion," USEPA, Environmental Sciences Research Laboratory, Office of Research and Development, Research Triangle Park, North Carolina, Report No. EPA600/8-81-009, 1981.

FIGURES

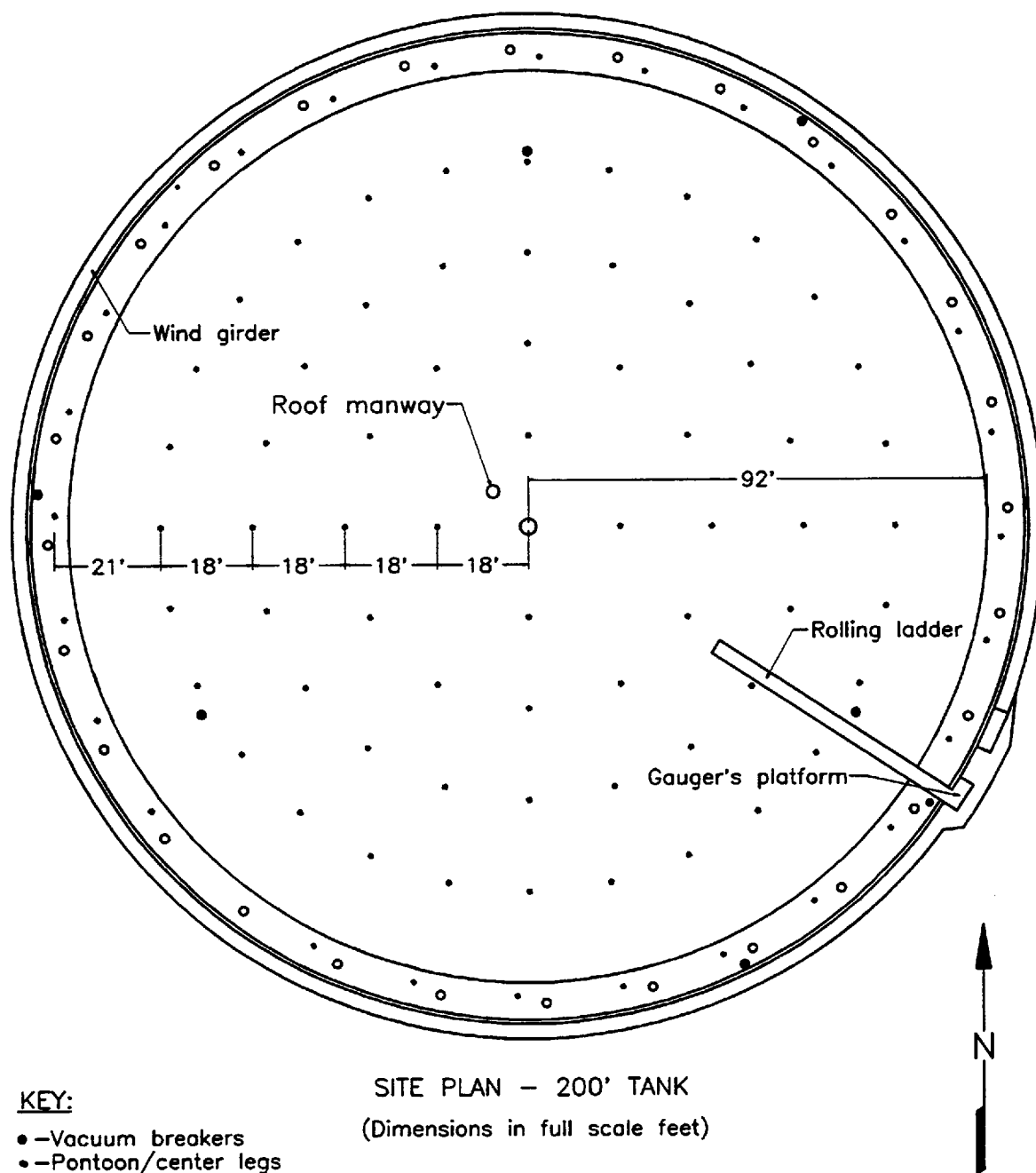


Figure 1a. Site Plan — 200 ft Tank.

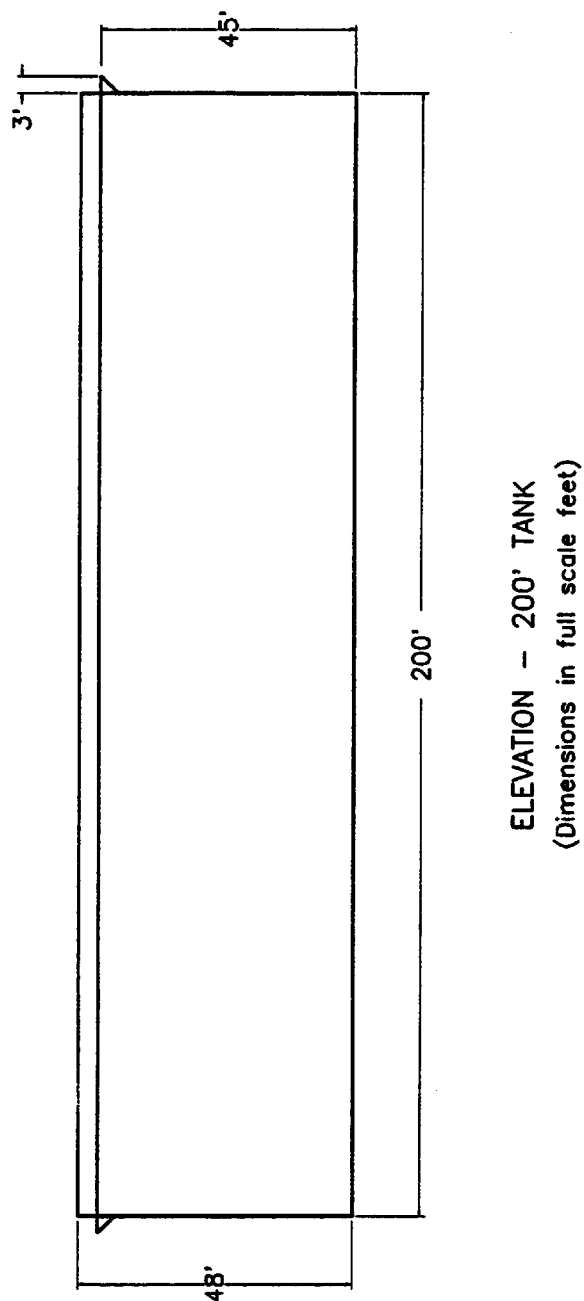
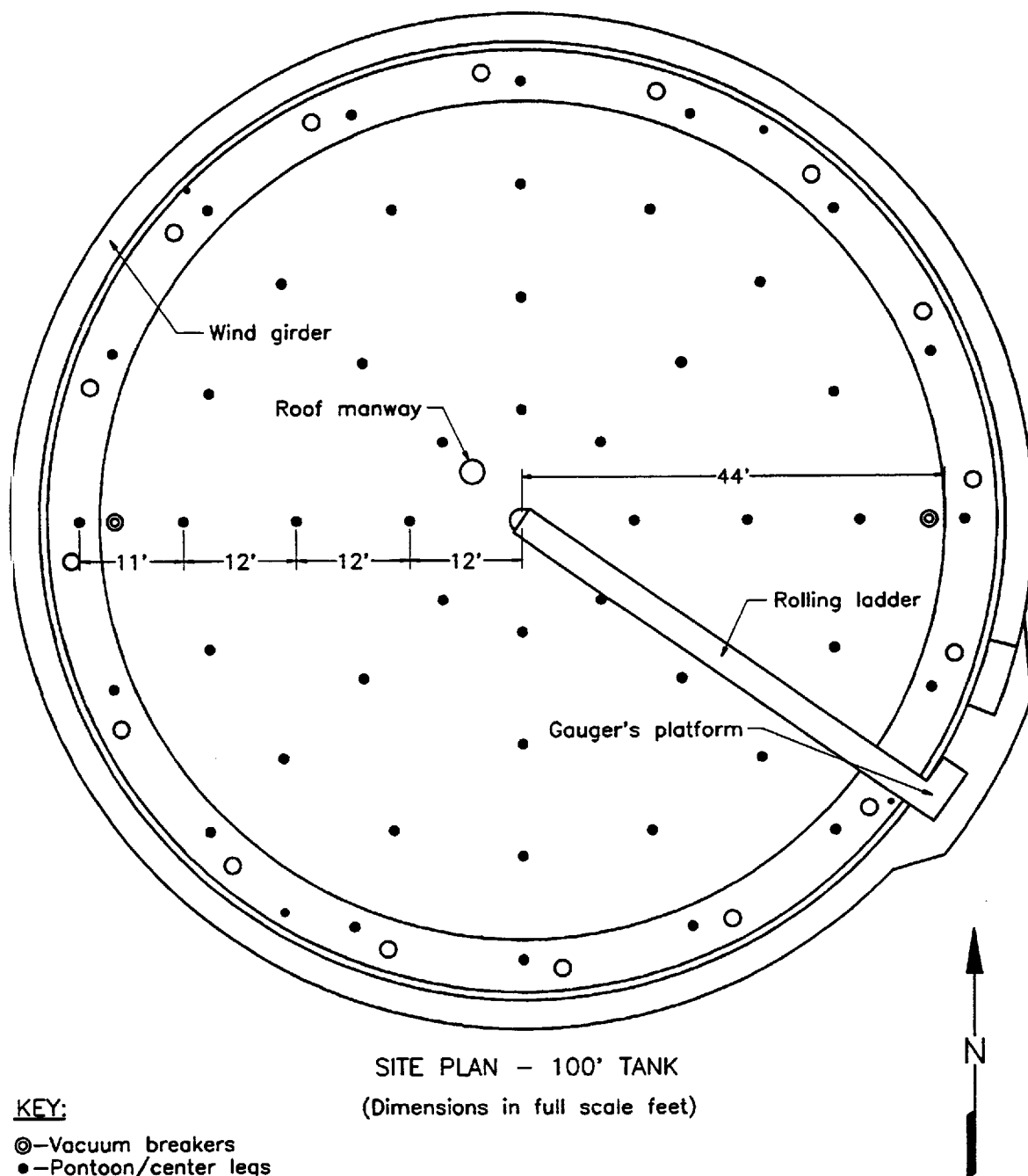


Figure 1b. Elevation — 200 ft Tank.



SITE PLAN - 100' TANK
(Dimensions in full scale feet)

KEY:

- ⊙—Vacuum breakers
- Pontoon/center legs
- Pontoon manways
- ⊙—Gauge well/guide pole
- Rim vent
- ⊕—Gauge hatch

Figure 2a. Site Plan — 100 ft Tank.

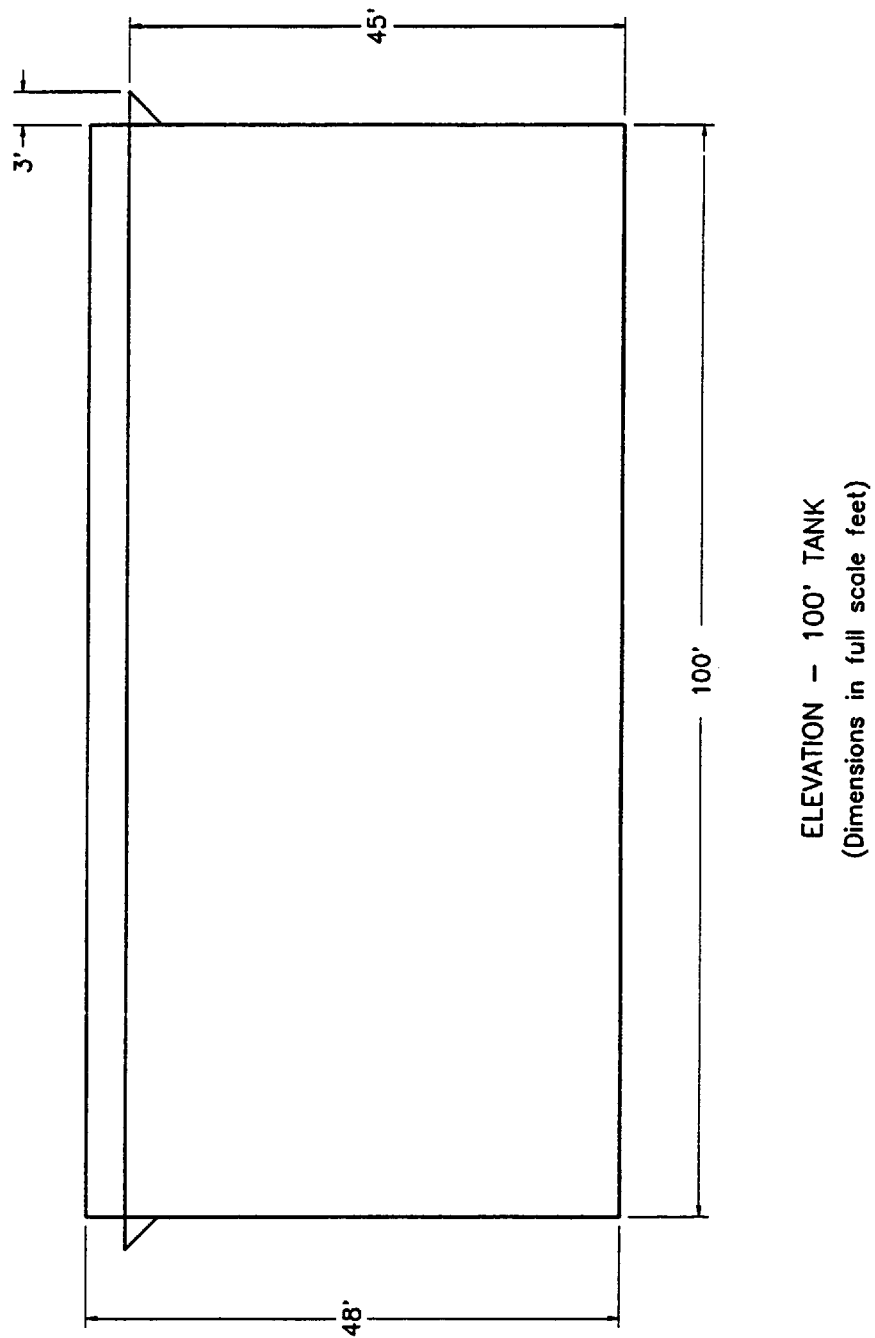


Figure 2b. Elevation — 100 ft Tank.

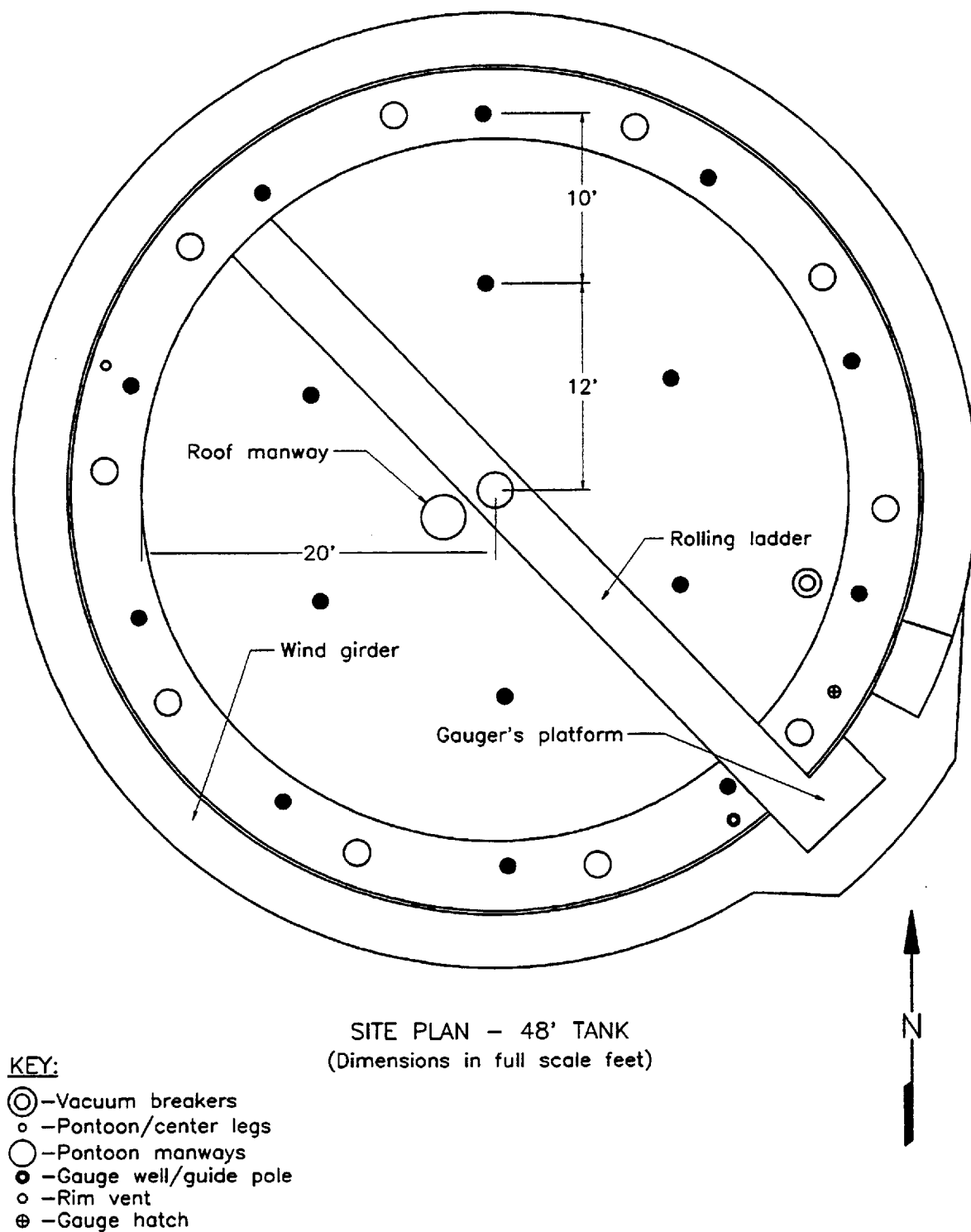


Figure 3a. Site Plan — 48 ft Tank.

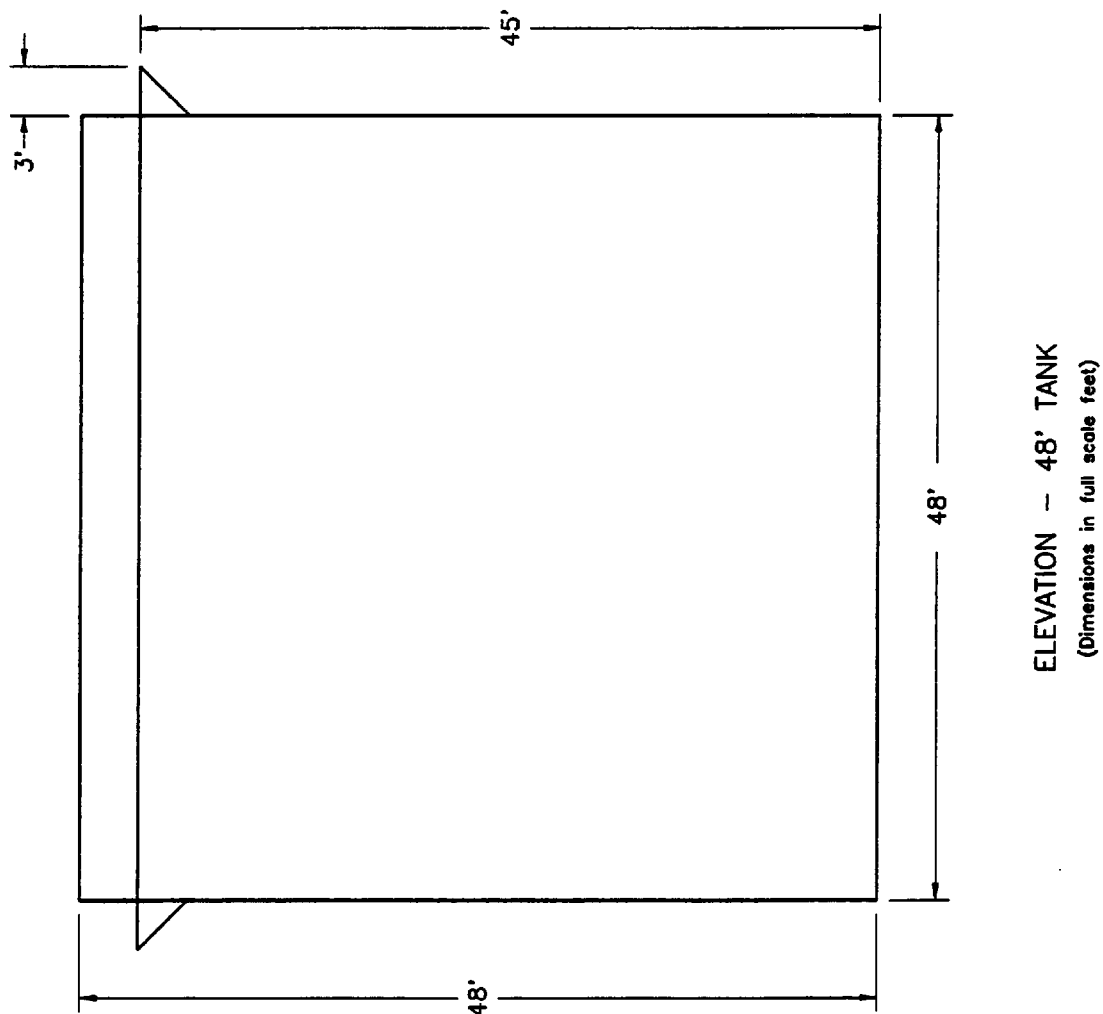


Figure 3b. Elevation — 48 ft Tank.

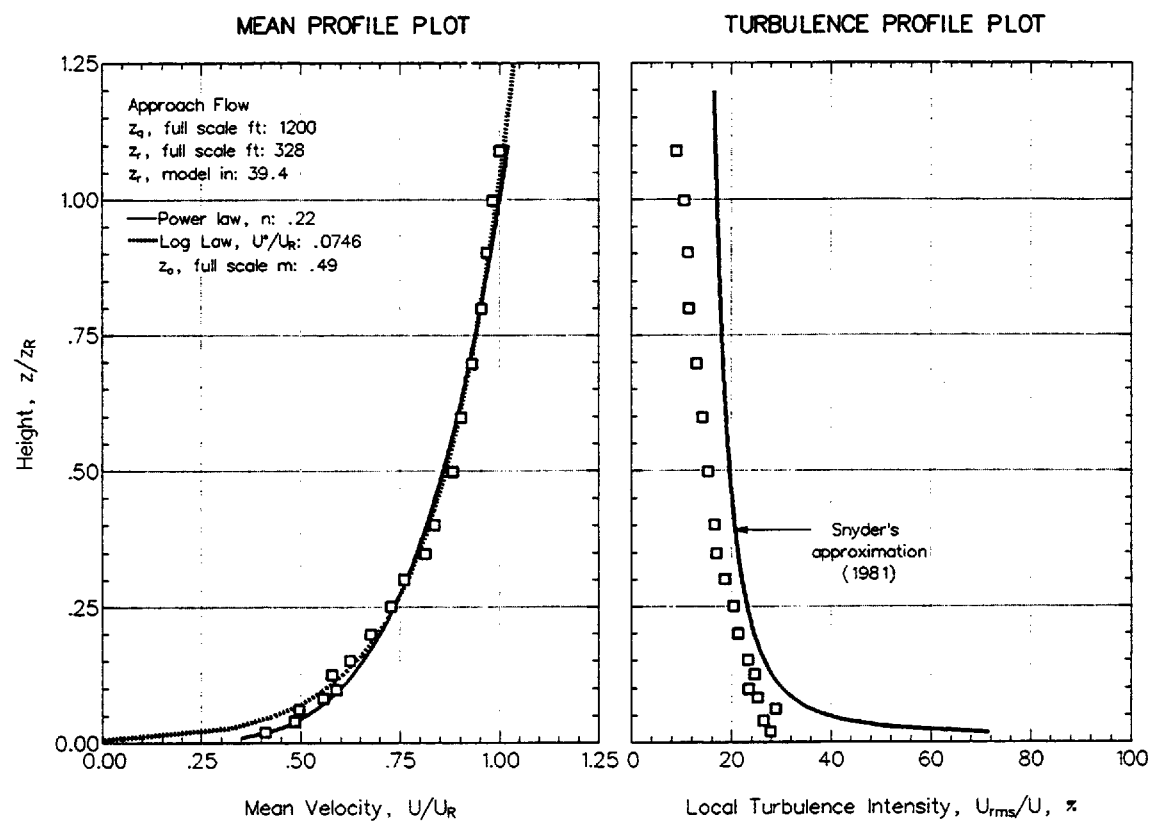


Figure 4. Velocity and Turbulent Approach Profiles.

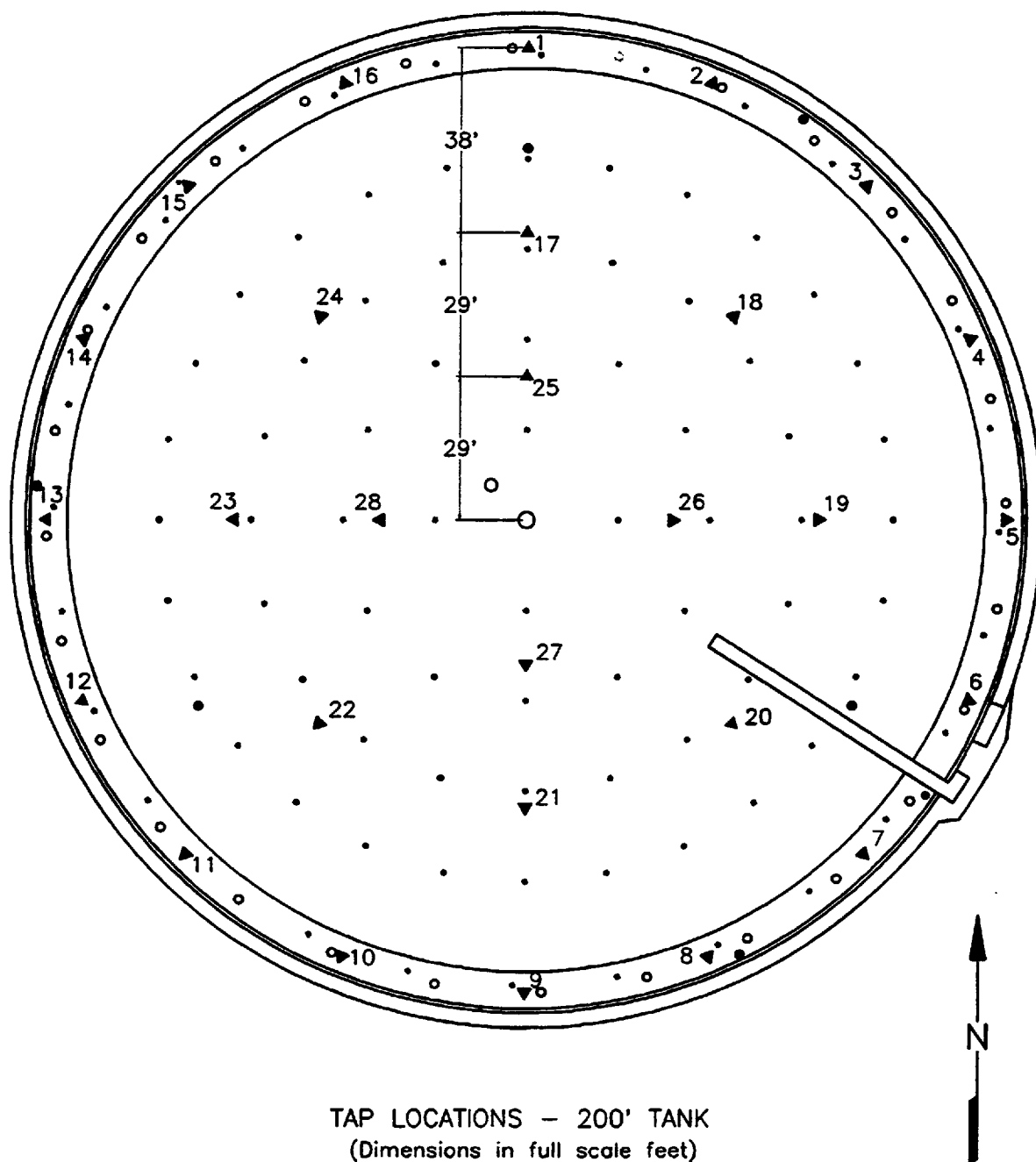


Figure 5a. Wind Speed, Wind Direction and Roof Pressure Measurement Locations — 200 ft Tank.

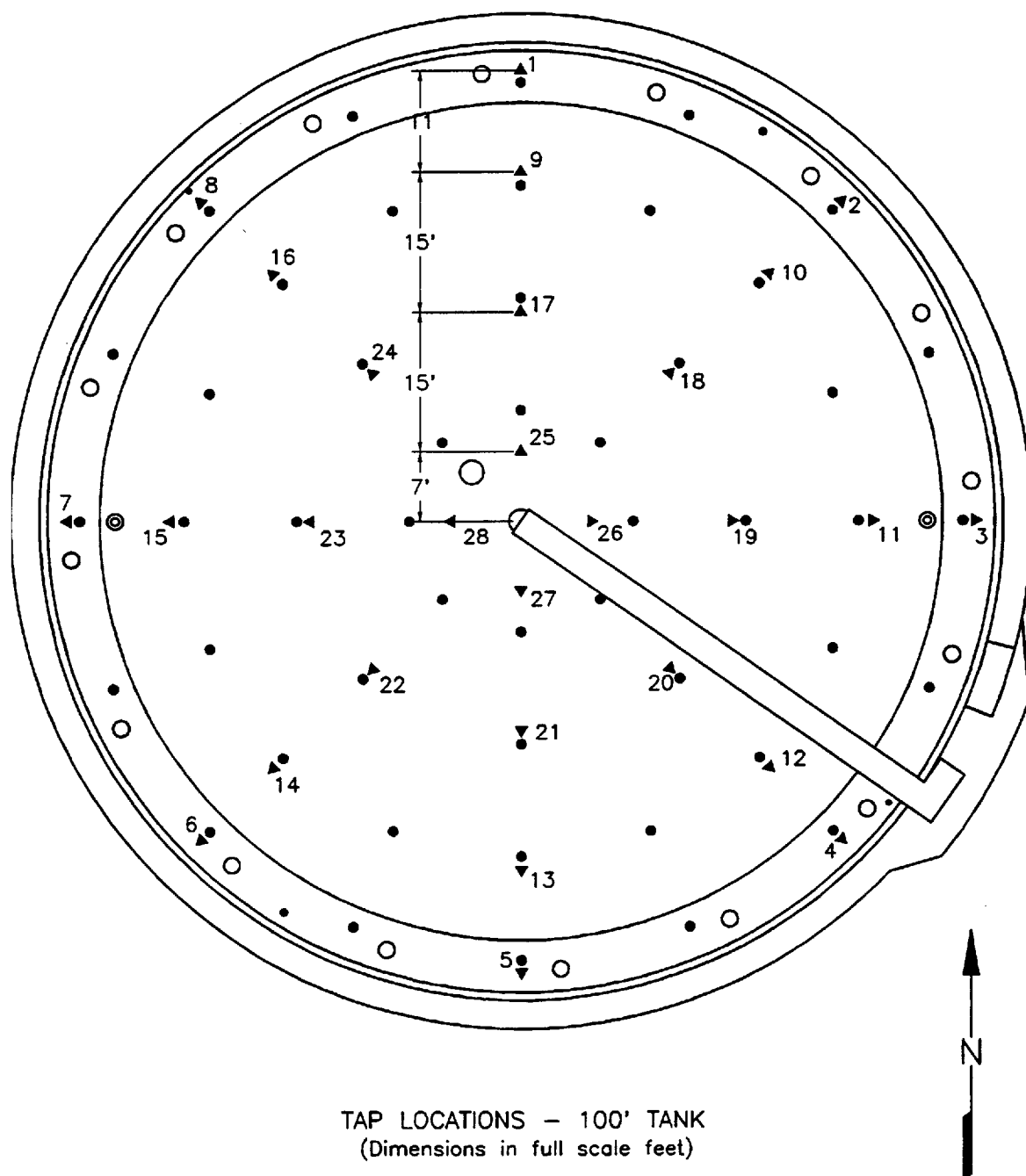


Figure 5b. Wind Speed, Wind Direction and Roof Pressure Measurement Locations — 100 ft Tank.

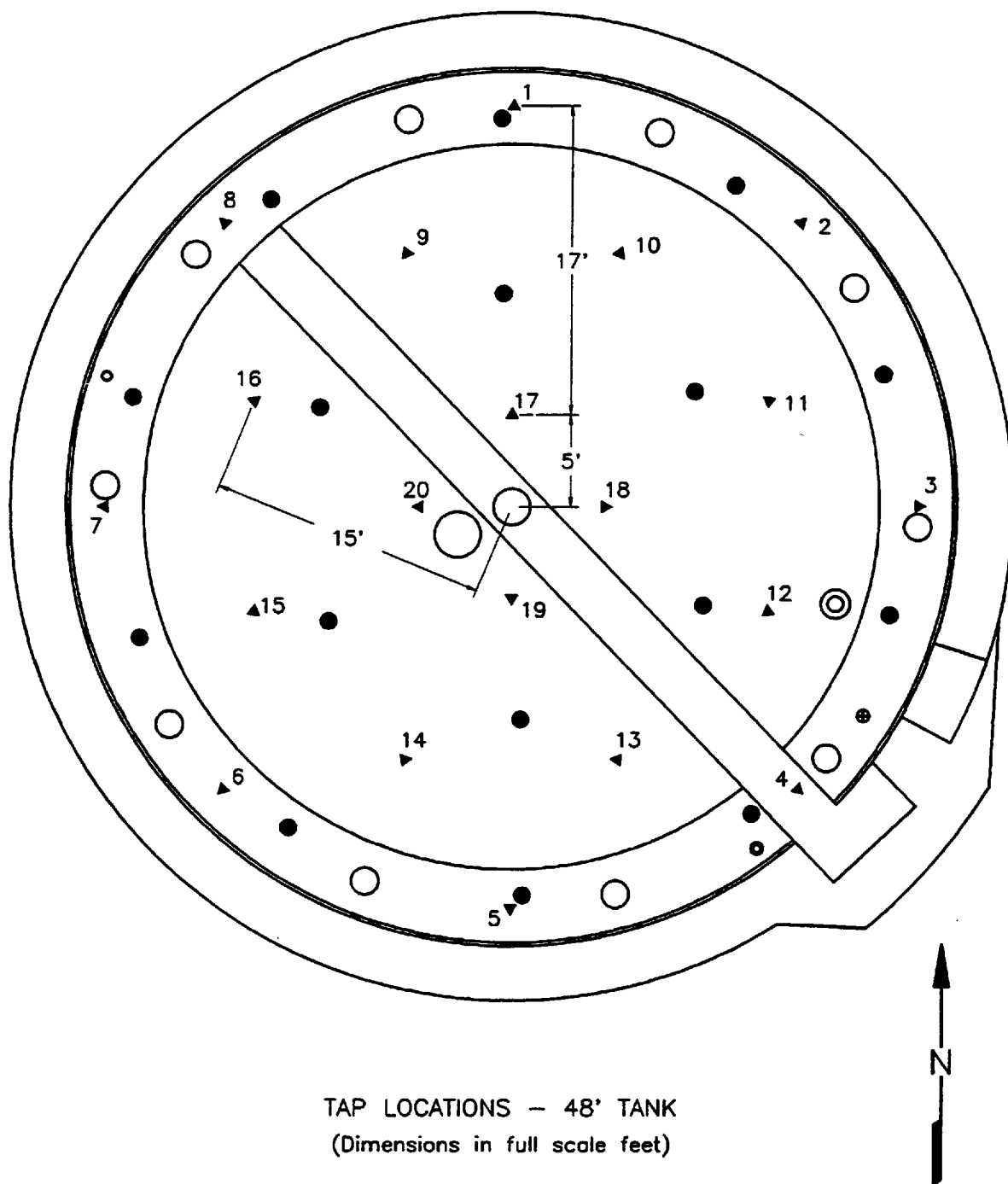


Figure 5c. Wind Speed, Wind Direction and Roof Pressure Measurement Locations — 48 ft Tank.

CENTERLINE VELOCITY PROFILES 200ft Dia Tank

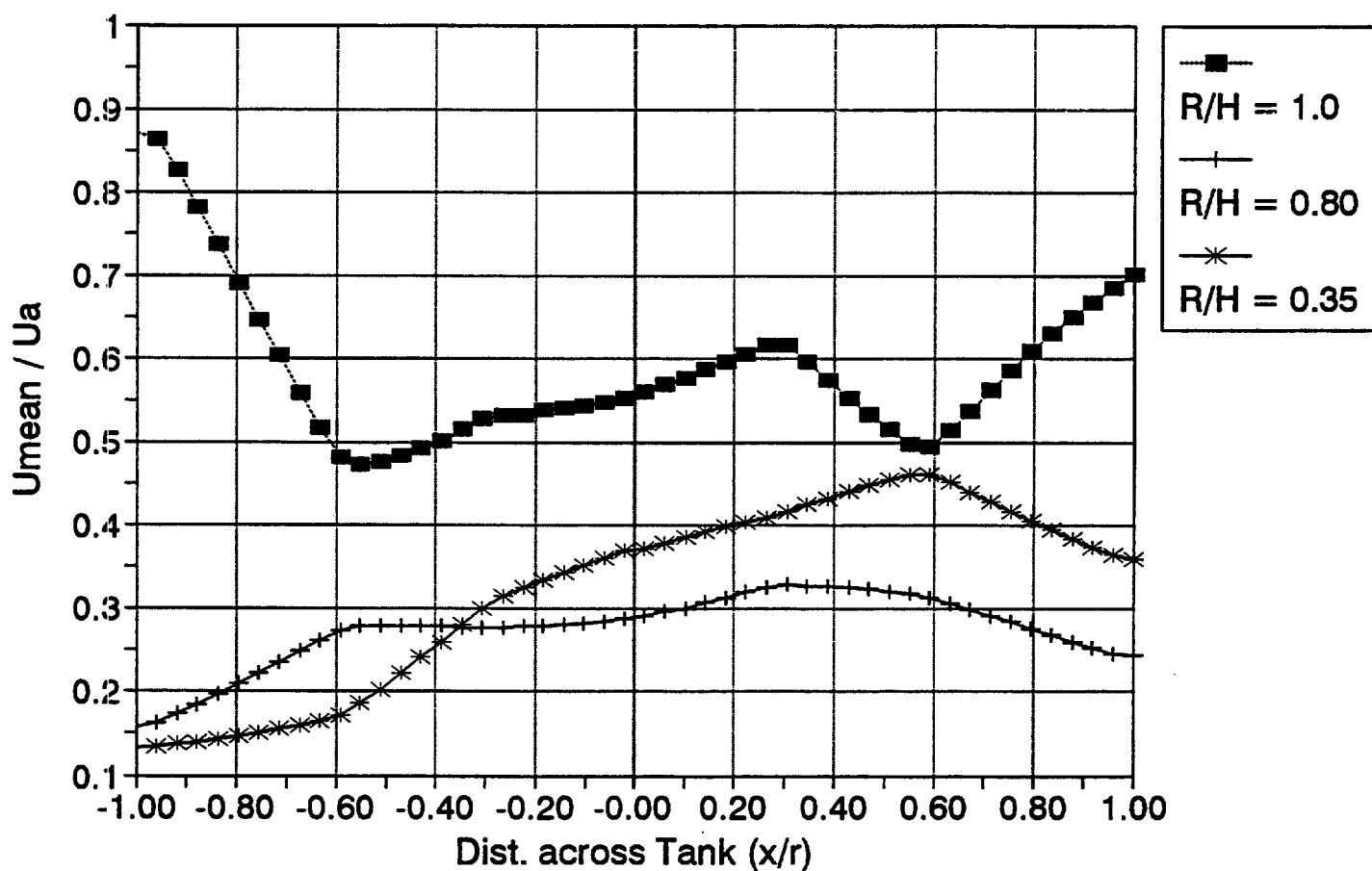


Figure 6a. Non-dimensional Mean Velocity Centerline Profiles — 200 ft Tank.

CENTERLINE VELOCITY PROFILES 100ft Dia Tank

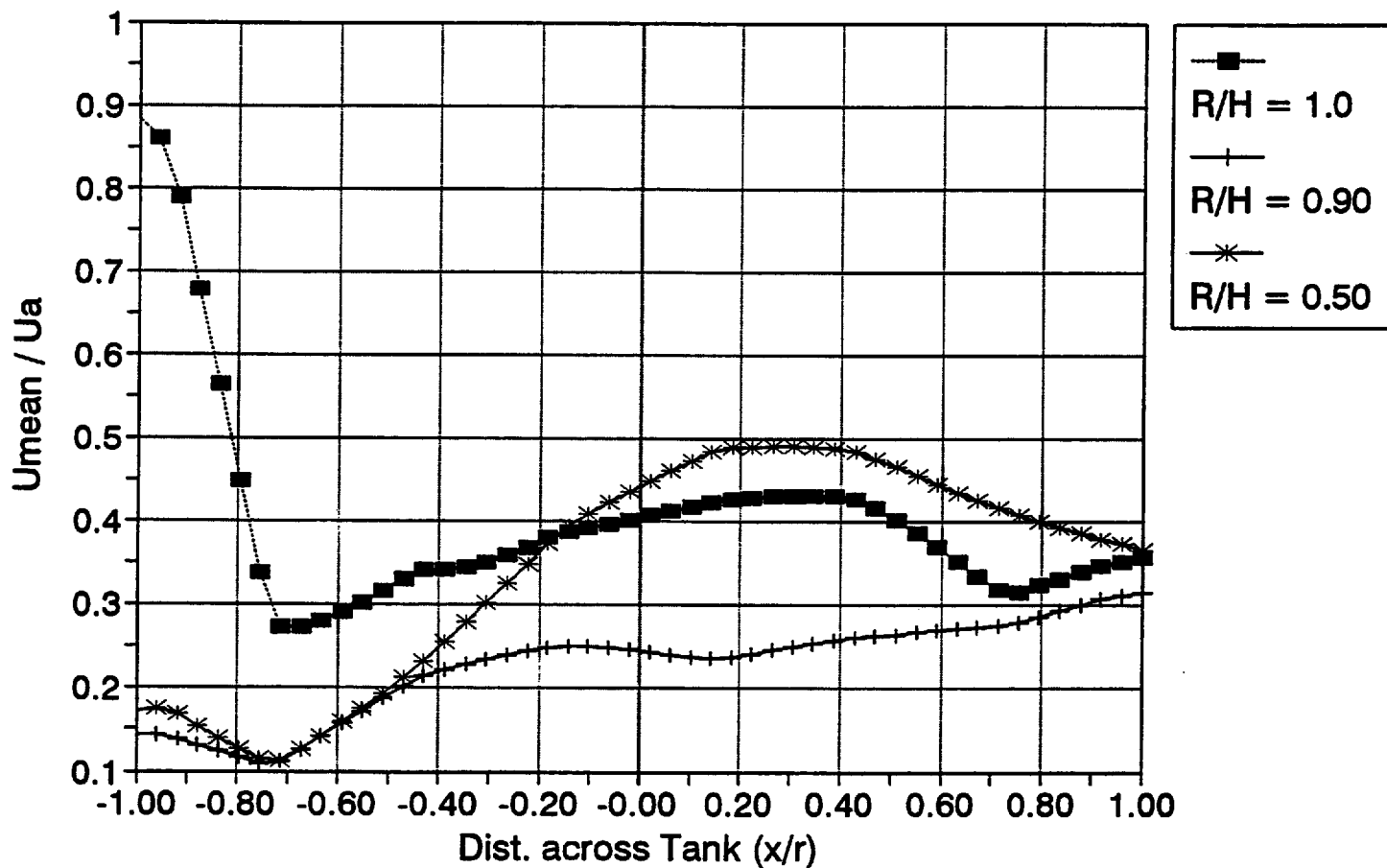


Figure 6b. Non-dimensional Mean Velocity Centerline Profiles — 100 ft Tank.

CENTERLINE VELOCITY PROFILES 48ft Dia Tank

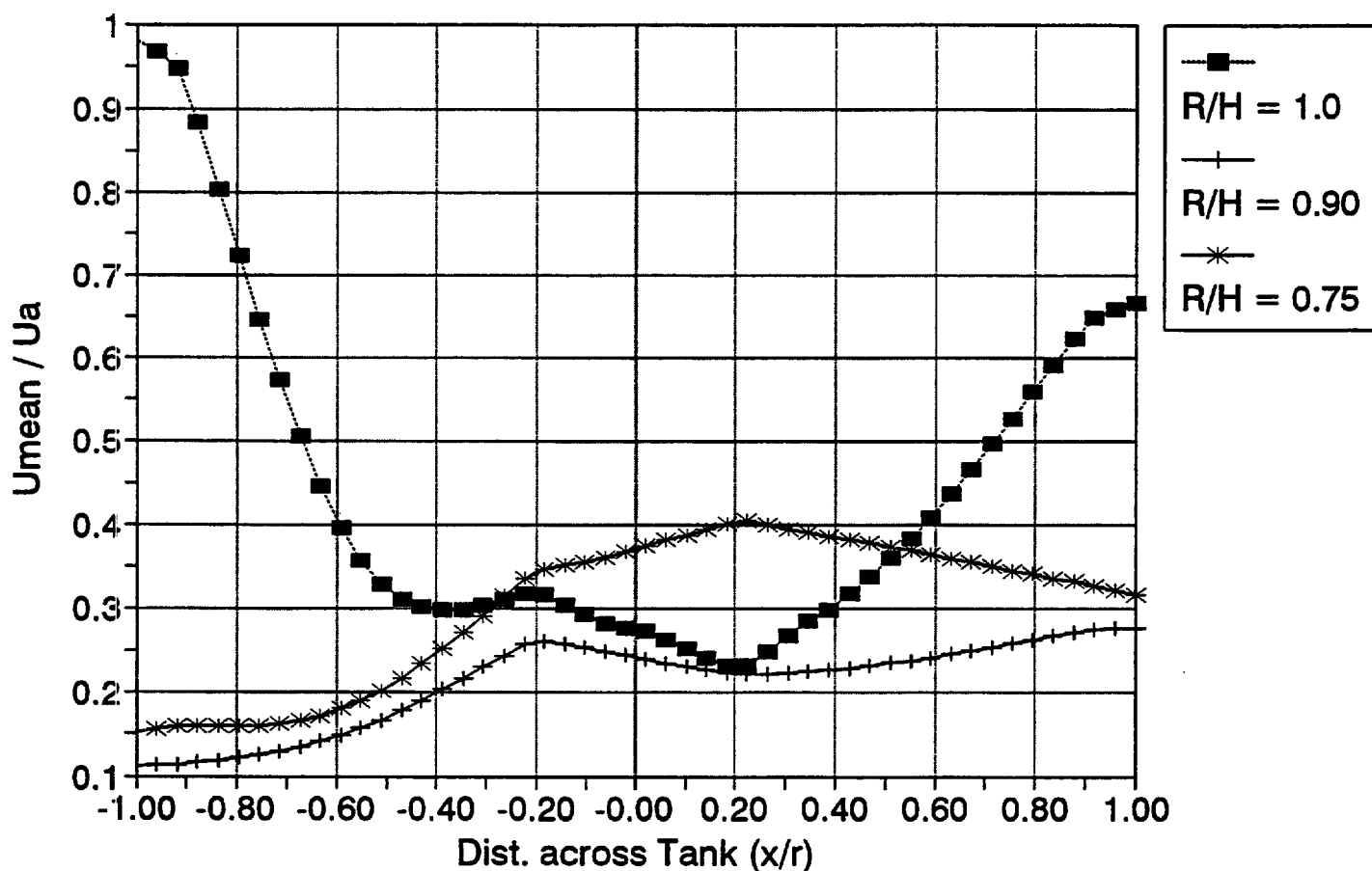


Figure 6c. Non-dimensional Mean Velocity Centerline Profiles — 48 ft Tank.

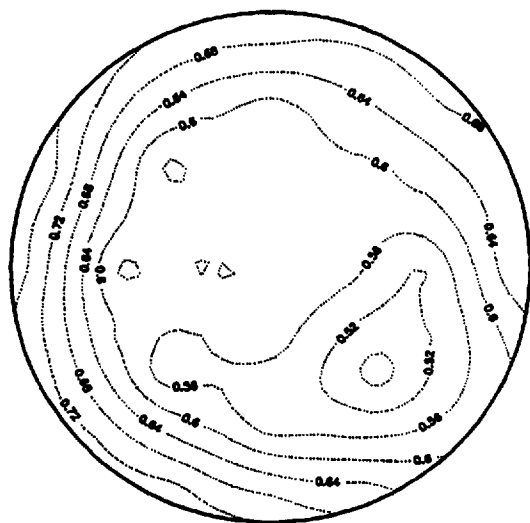
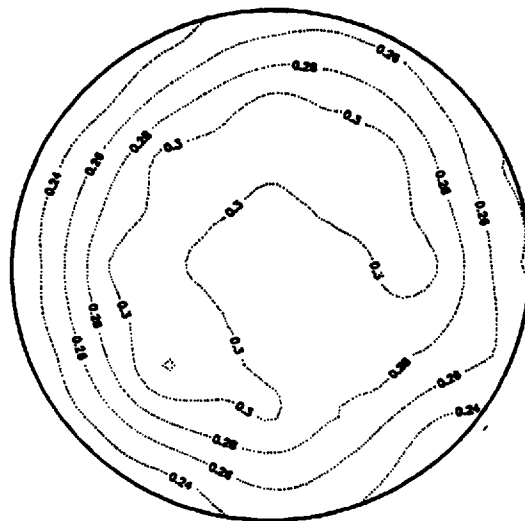
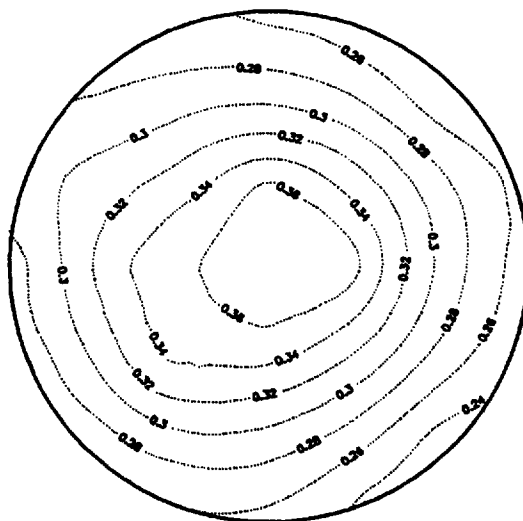
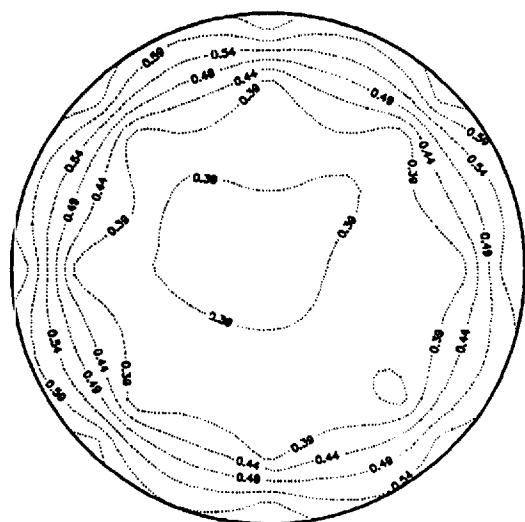
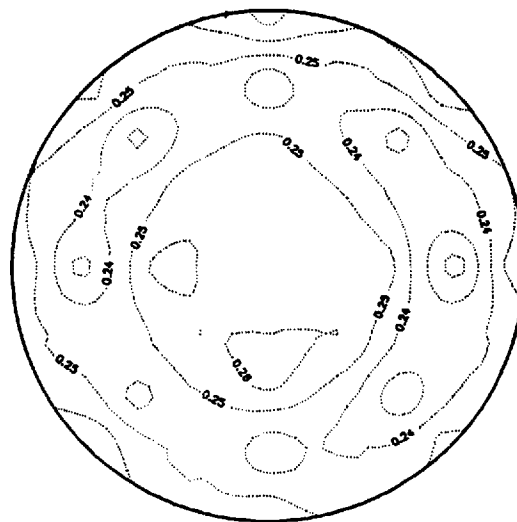

 $R/H = 1.00$

 $R/H = 0.80$

 $R/H = 0.35$

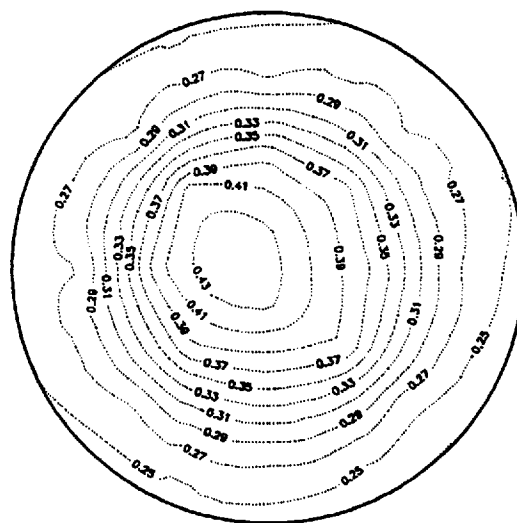
Figure 7a. Average Non-dimensional Mean Velocity Contours — 200 ft Tank.



$R/H = 1.00$

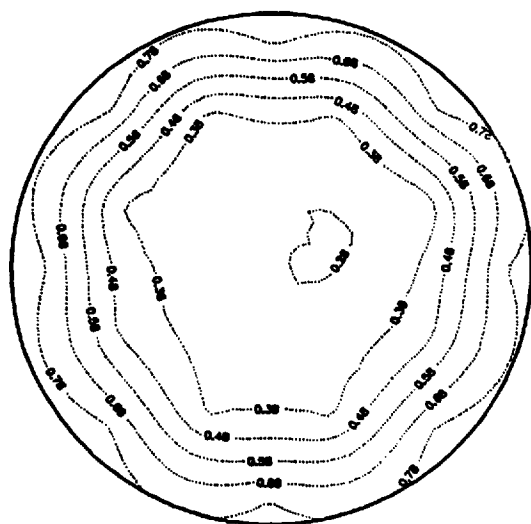


$R/H = 0.90$

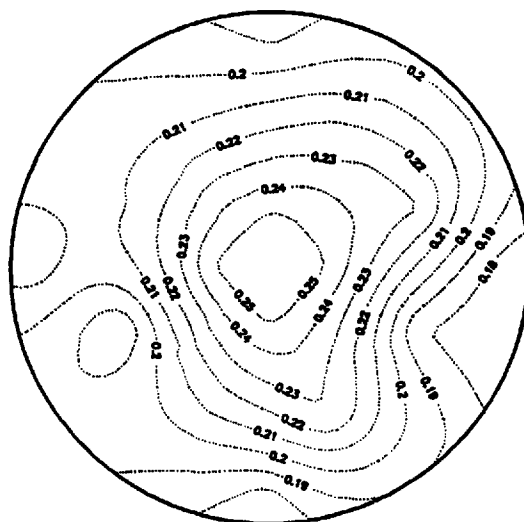


$R/H = 0.50$

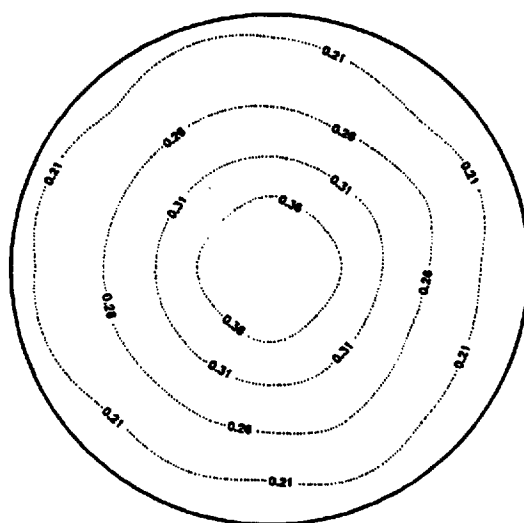
Figure 7b. Average Non-dimensional Mean Velocity Contours — 100 ft Tank.



$R/H = 1.00$

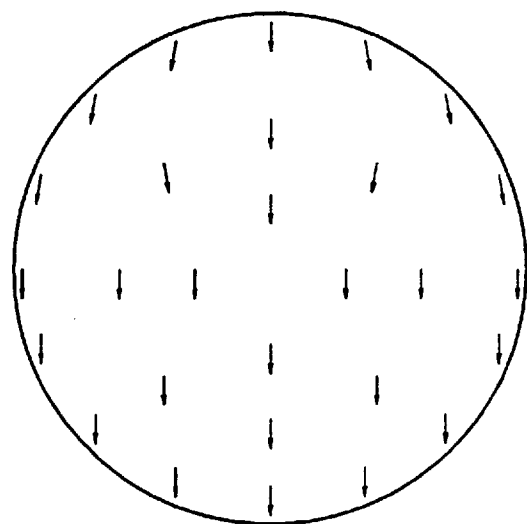


$R/H = 0.90$

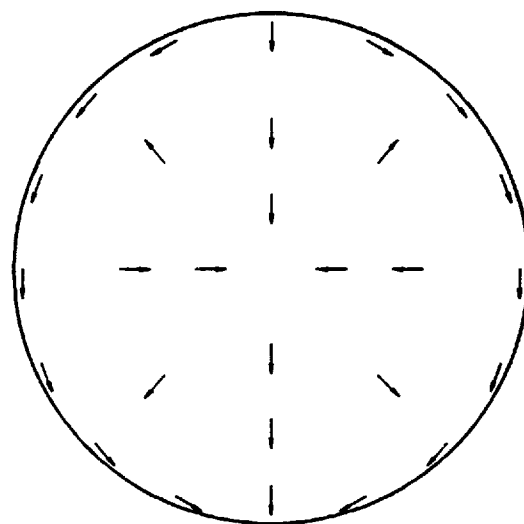


$R/H = 0.75$

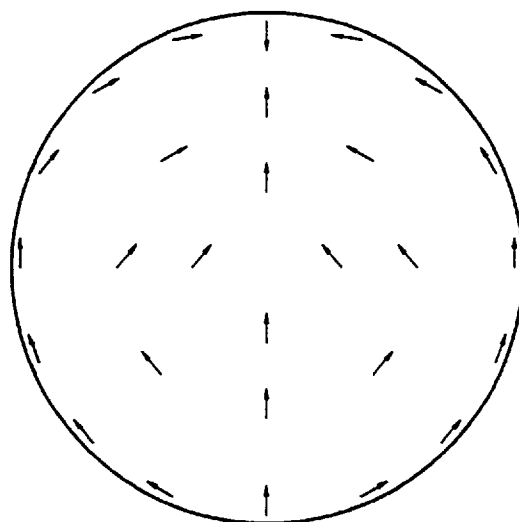
Figure 7c. Average Non-dimensional Mean Velocity Contours — 48 ft Tank.



$R/H = 1.00$

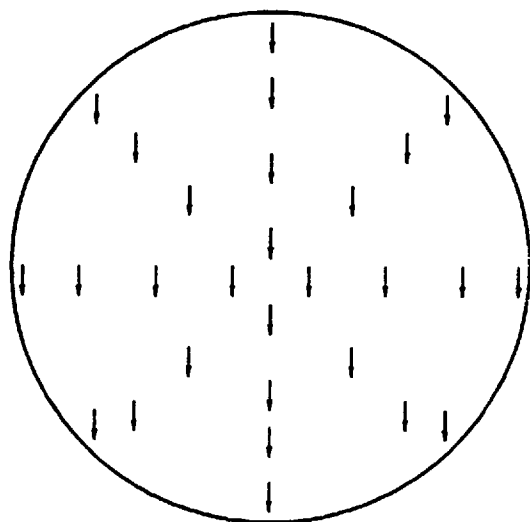


$R/H = 0.80$

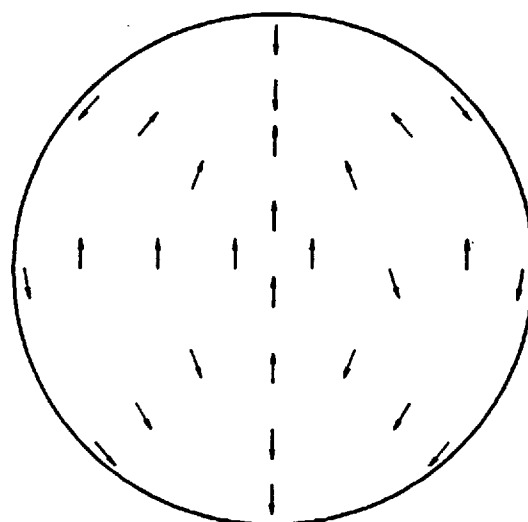


$R/H = 0.35$

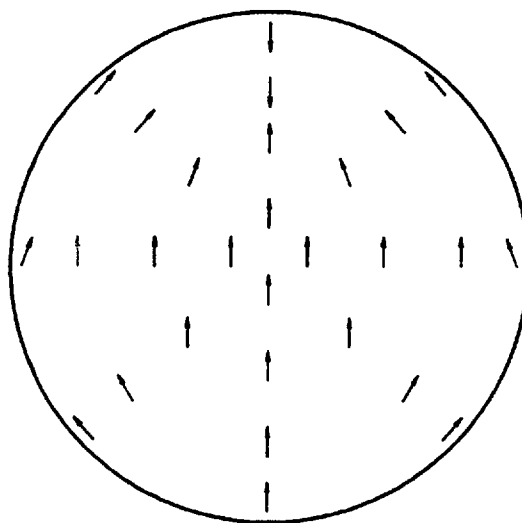
Figure 8a. Roof Top Wind Directions Relative to Approach Flow — 200 ft Tank.



$R/H = 1.00$



$R/H = 0.90$



$R/H = 0.50$

Figure 8b. Roof Top Wind Directions Relative to Approach Flow — 100 ft Tank.

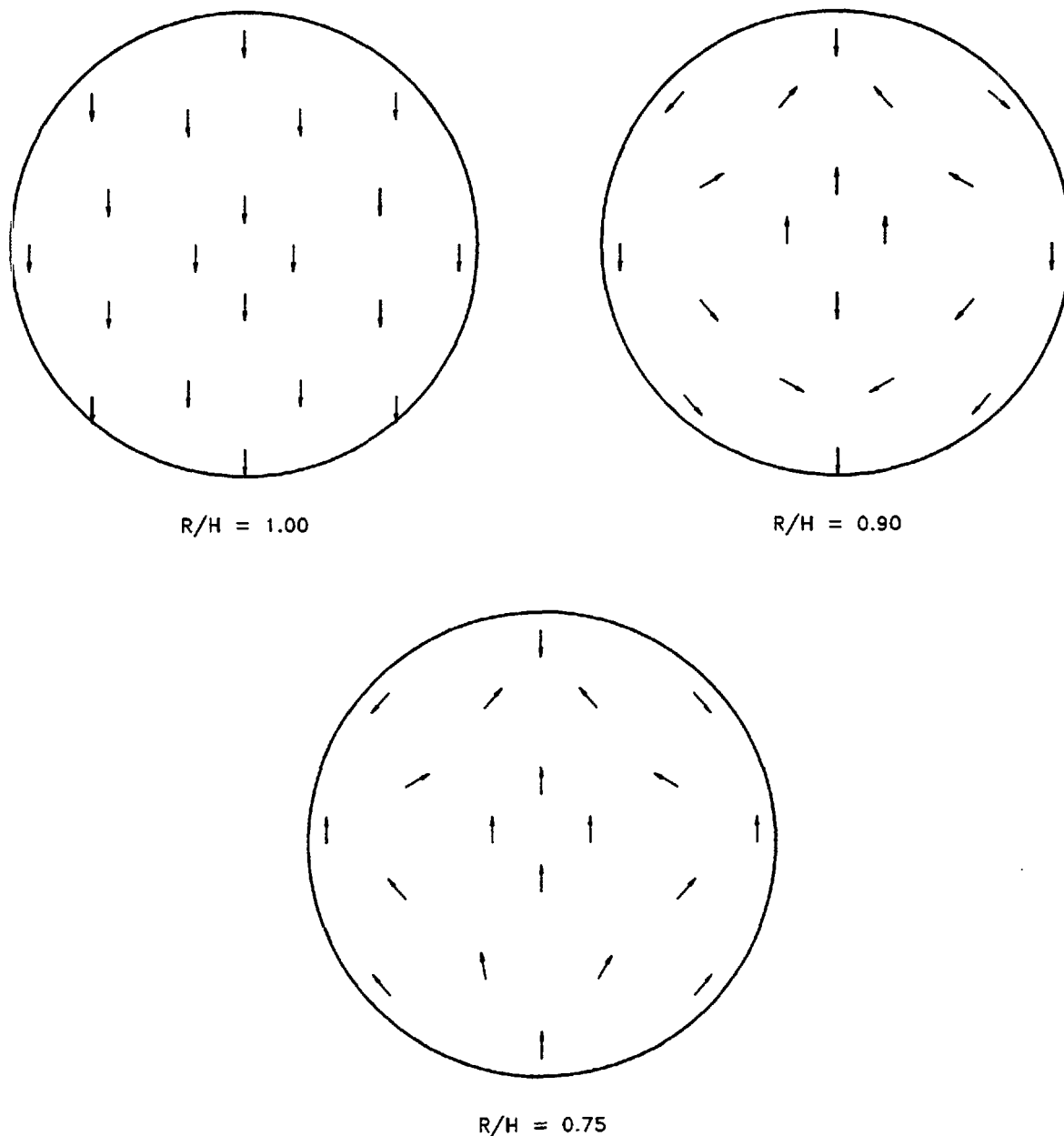


Figure 8c. Roof Top Wind Directions Relative to Approach Flow — 48 ft Tank.

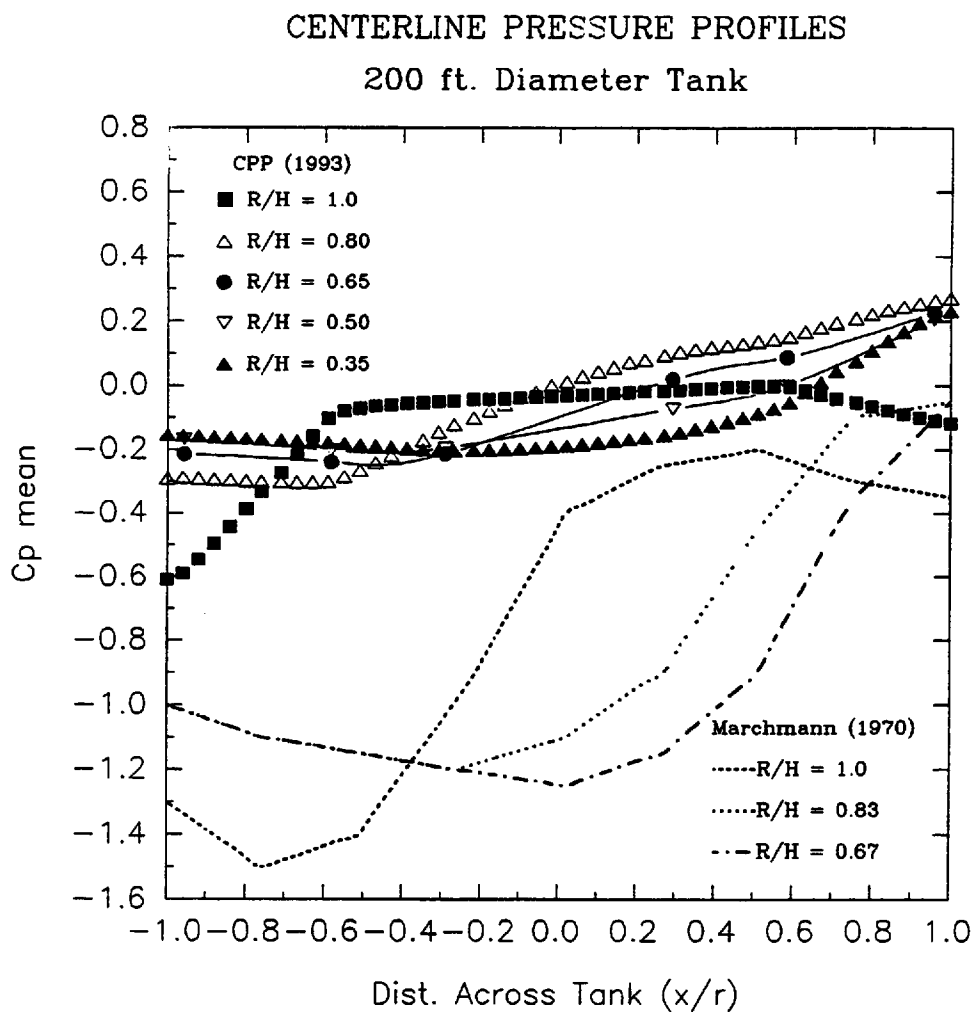


Figure 9a. Centerline Pressure Coefficient Profiles — 200 ft Tank.

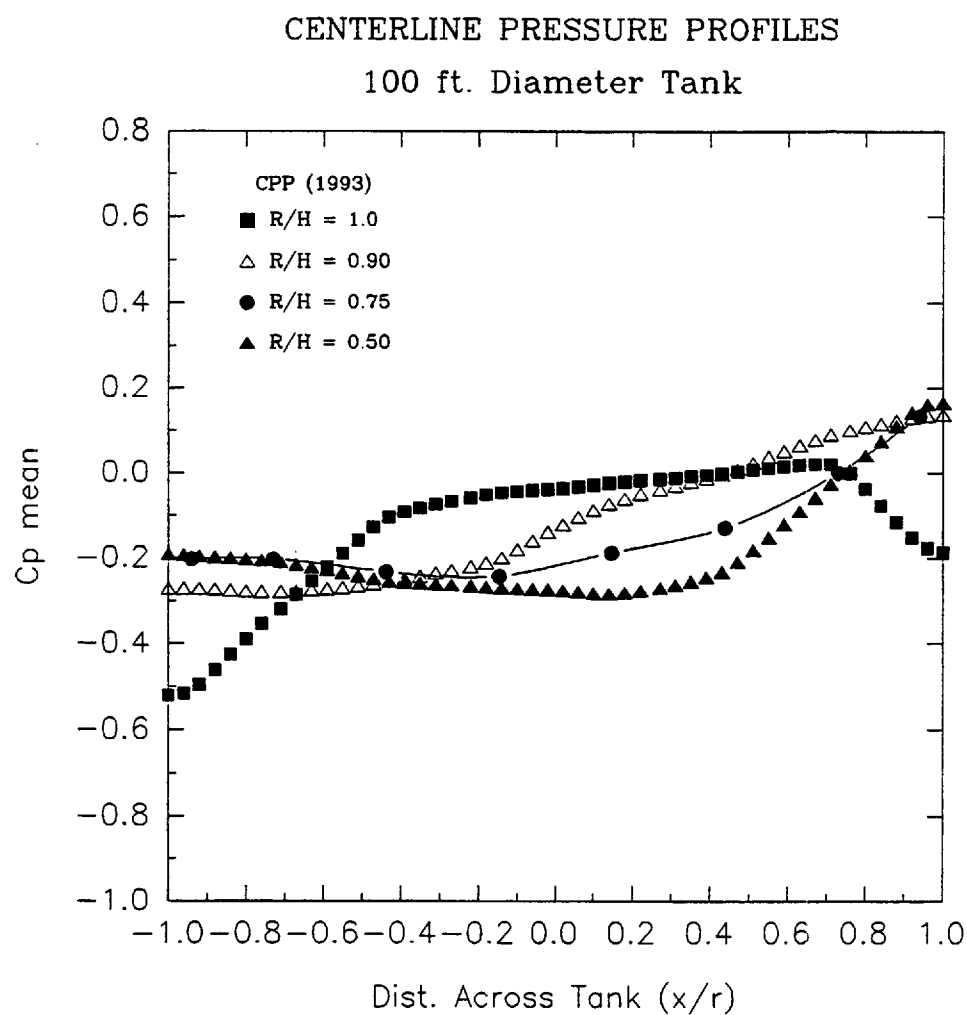


Figure 9b. Centerline Pressure Coefficient Profiles — 100 ft Tank.

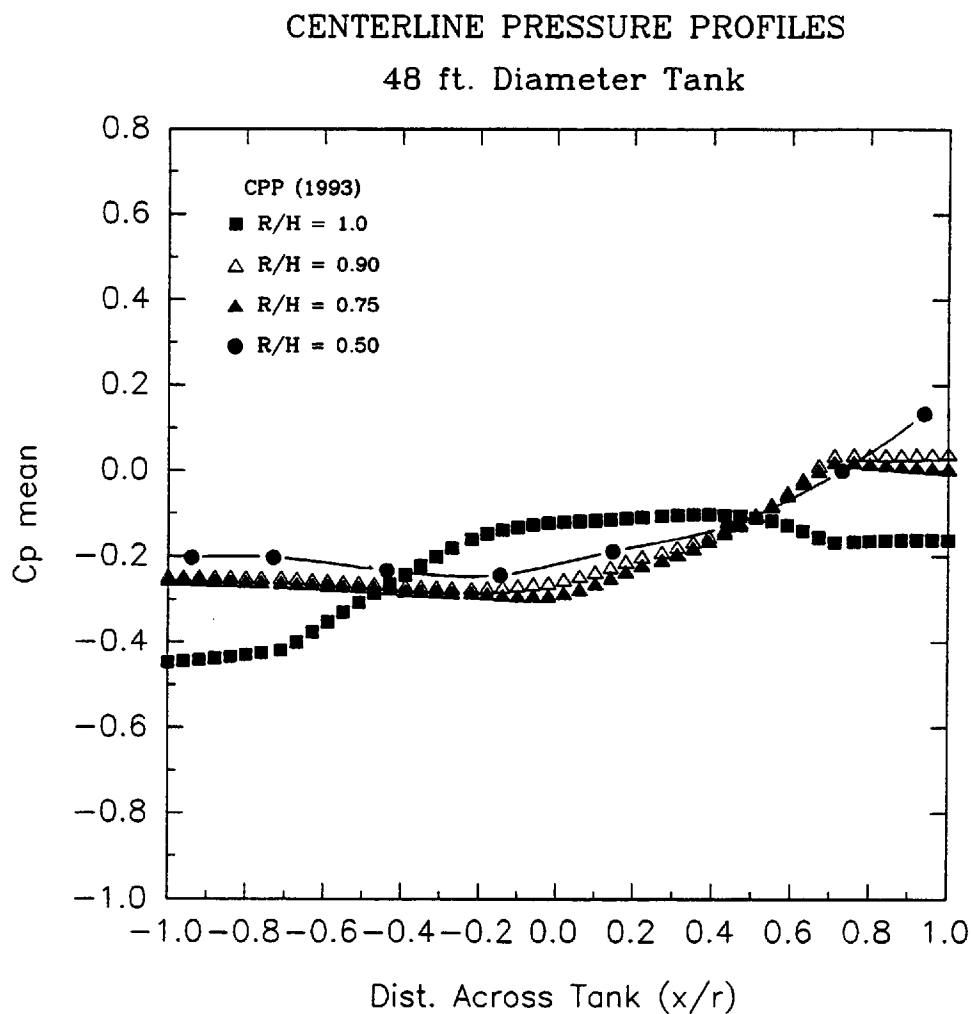
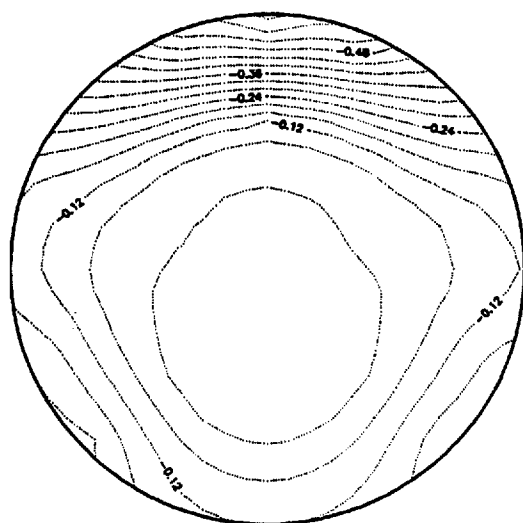
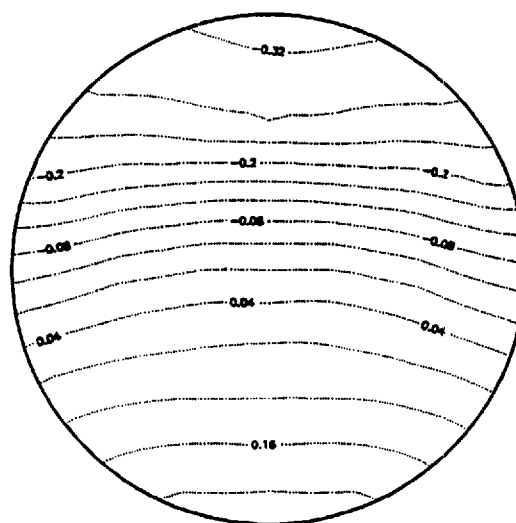


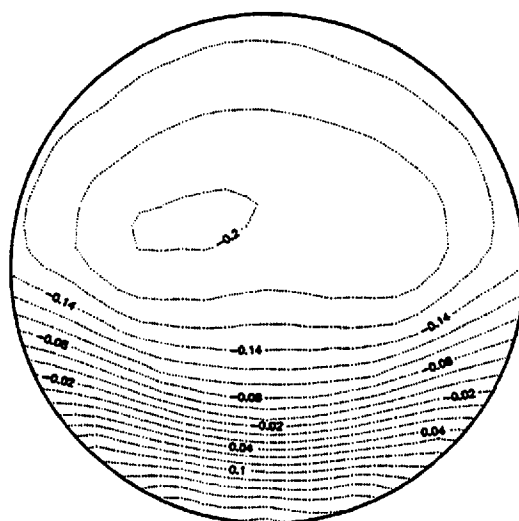
Figure 9c. Centerline Pressure Coefficient Profiles — 48 ft Tank.



$R/H = 1.00$

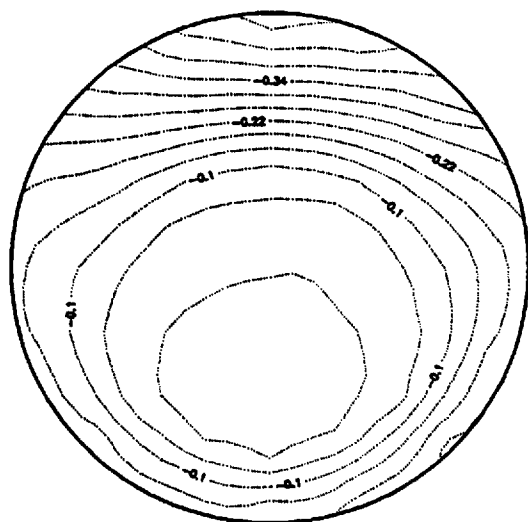


$R/H = 0.80$

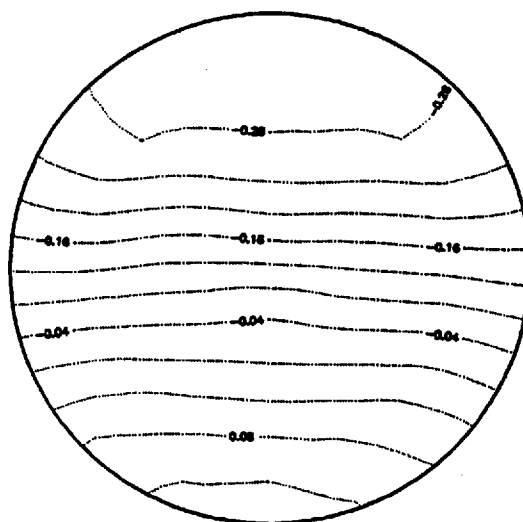


$R/H = 0.35$

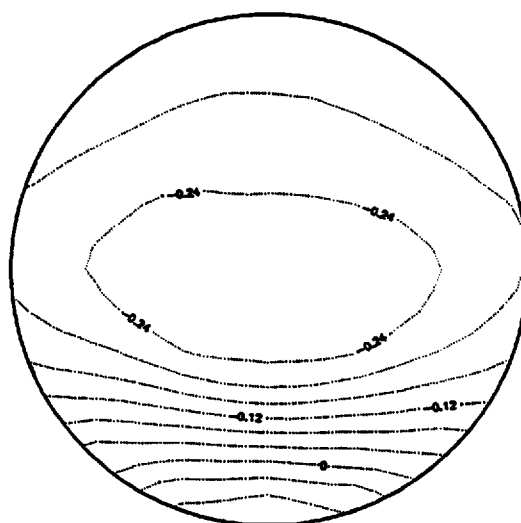
Figure 10a. Average Pressure Coefficient Contours — 200 ft Tank.



$R/H = 1.00$

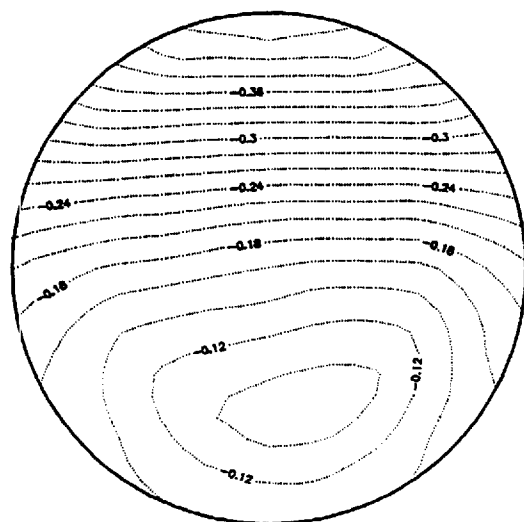


$R/H = 0.90$

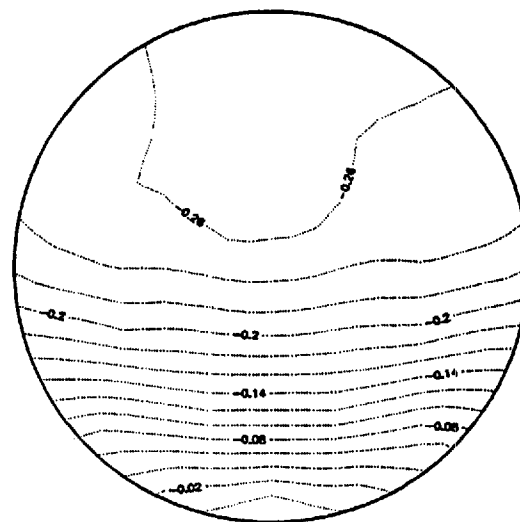


$R/H = 0.50$

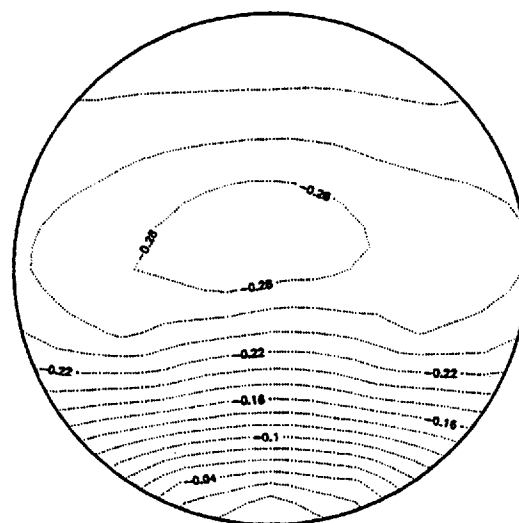
Figure 10b. Average Pressure Coefficient Contours — 100 ft Tank.



$R/H = 1.00$



$R/H = 0.90$



$R/H = 0.75$

Figure 10c. Average Pressure Coefficient Contours — 48 ft Tank.

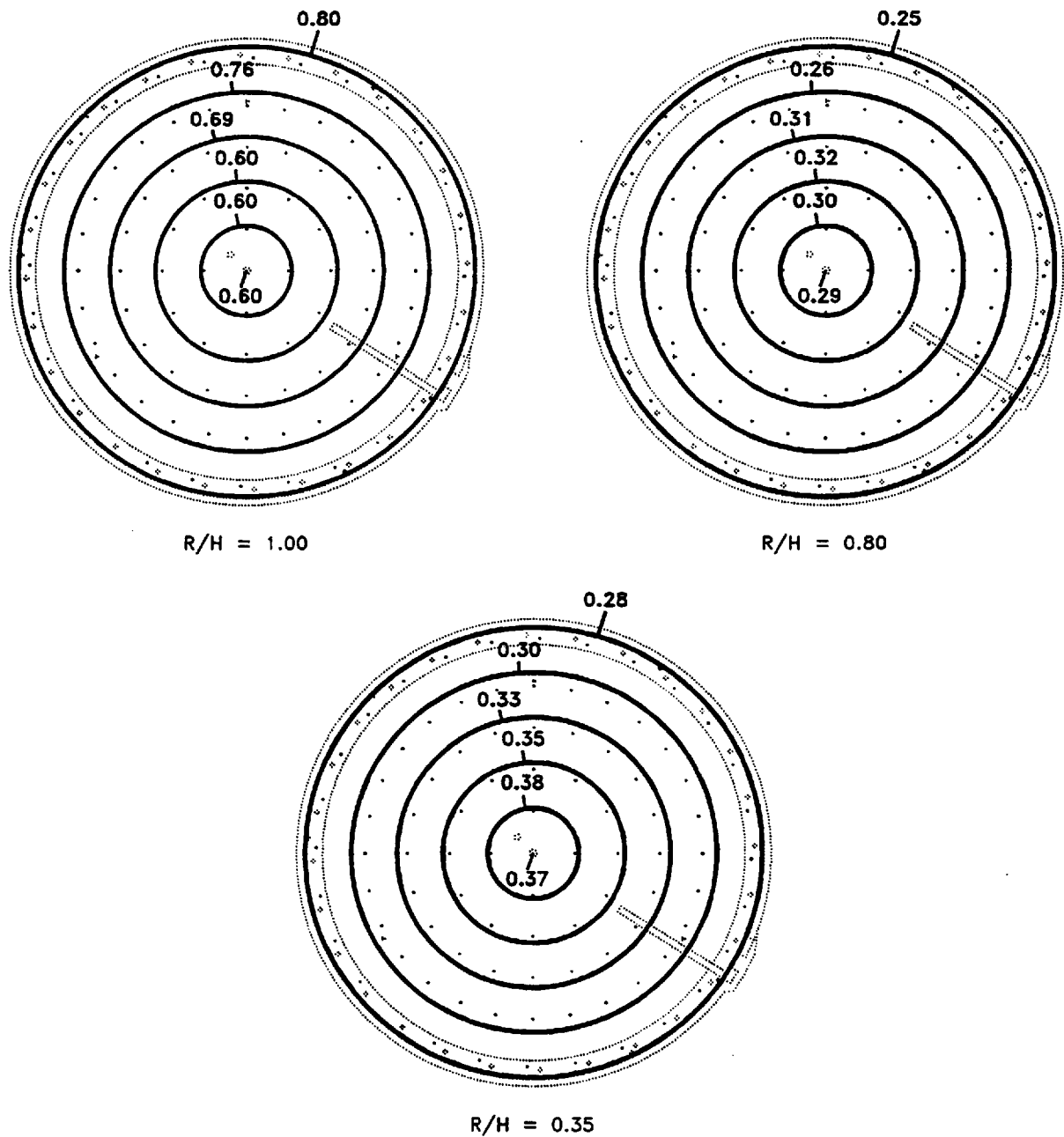


Figure 11a. Average Non-dimensional Mean Velocity Zones — 200 ft Tank.

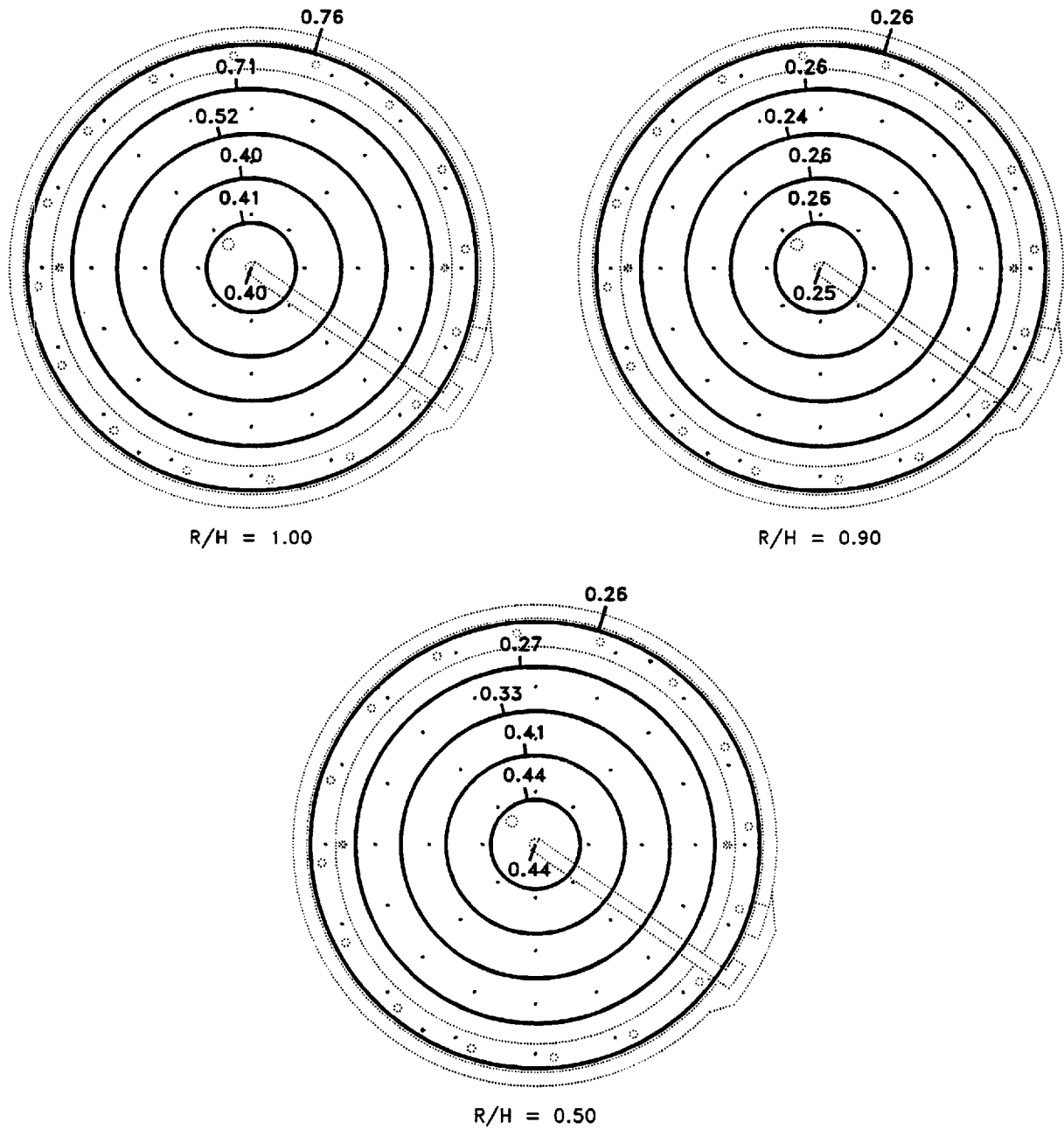


Figure 11b. Average Non-dimensional Mean Velocity Zones — 100 ft Tank.

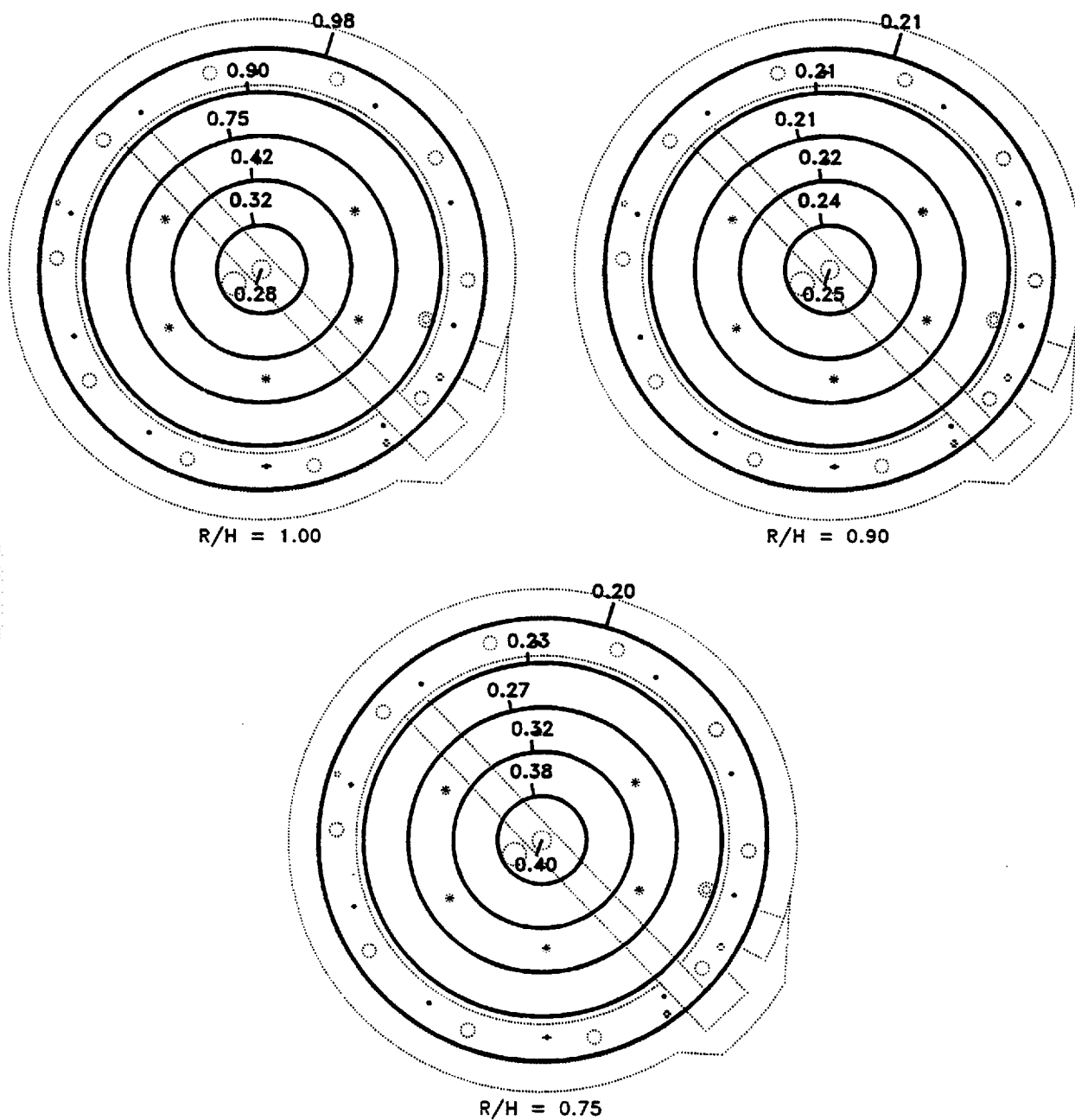


Figure 11c. Average Non-dimensional Mean Velocity Zones — 48 ft Tank.

AVERAGE CENTERLINE VELOCITY PROFILES 200ft Dia Tank

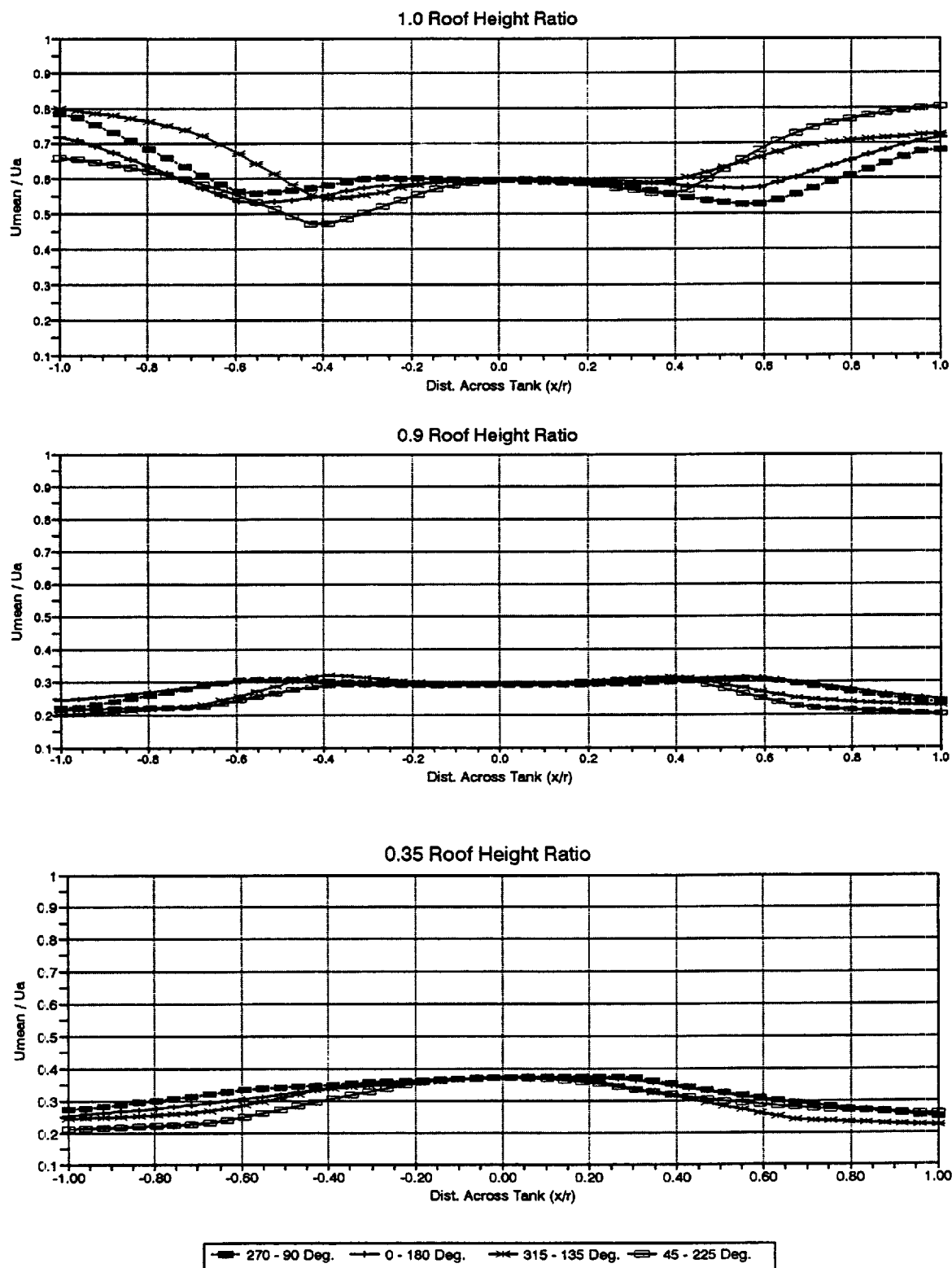


Figure 12a. Average Non-dimensional Mean Velocity Centerline Profiles — 200 ft Tank



AVERAGE CENTERLINE VELOCITY PROFILES 100ft Dia Tank

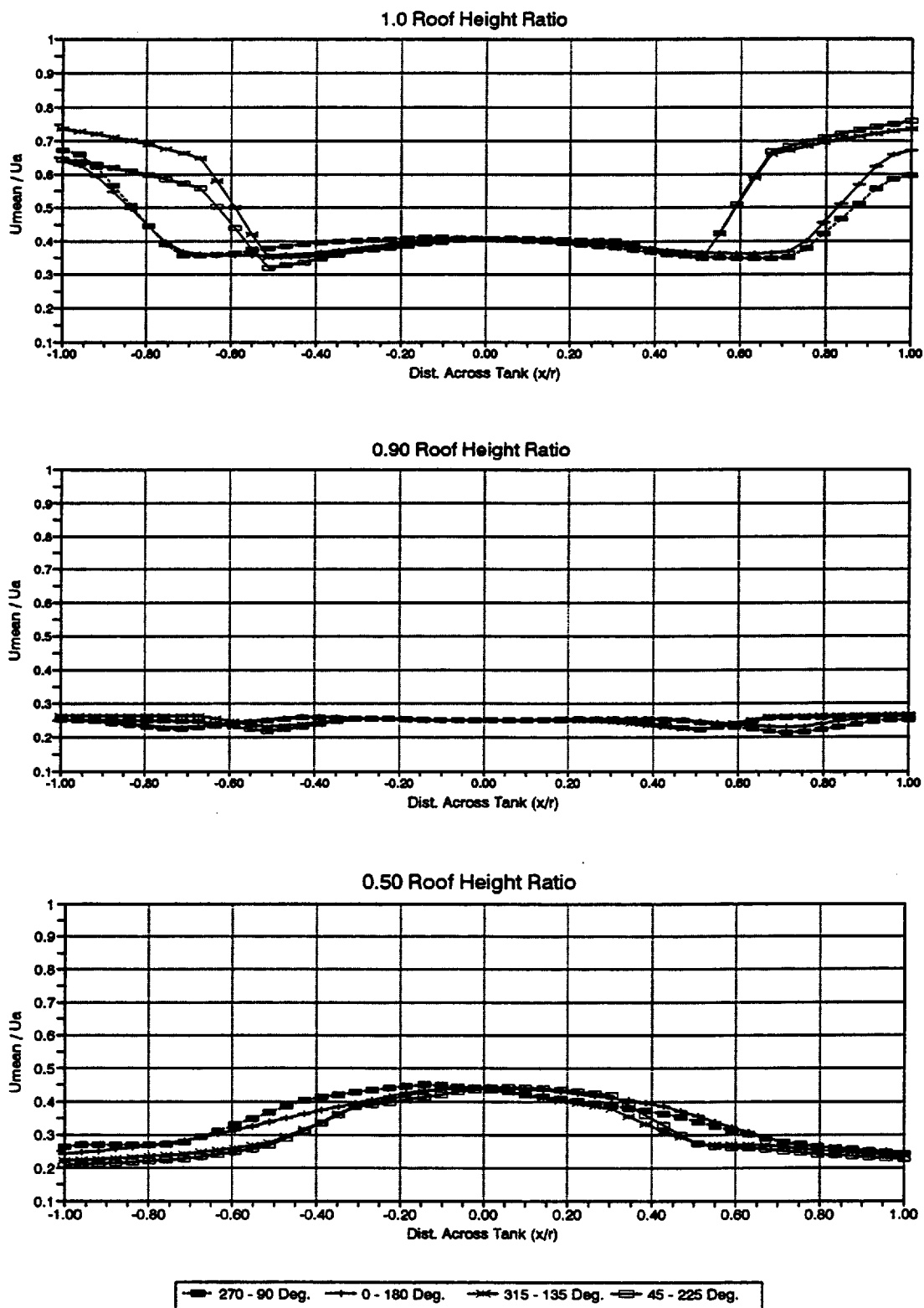


Figure 12b. Average Non-dimensional Mean Velocity Centerline Profiles — 100 ft Tank



AVERAGE CENTERLINE VELOCITY PROFILES 48ft Dia Tank

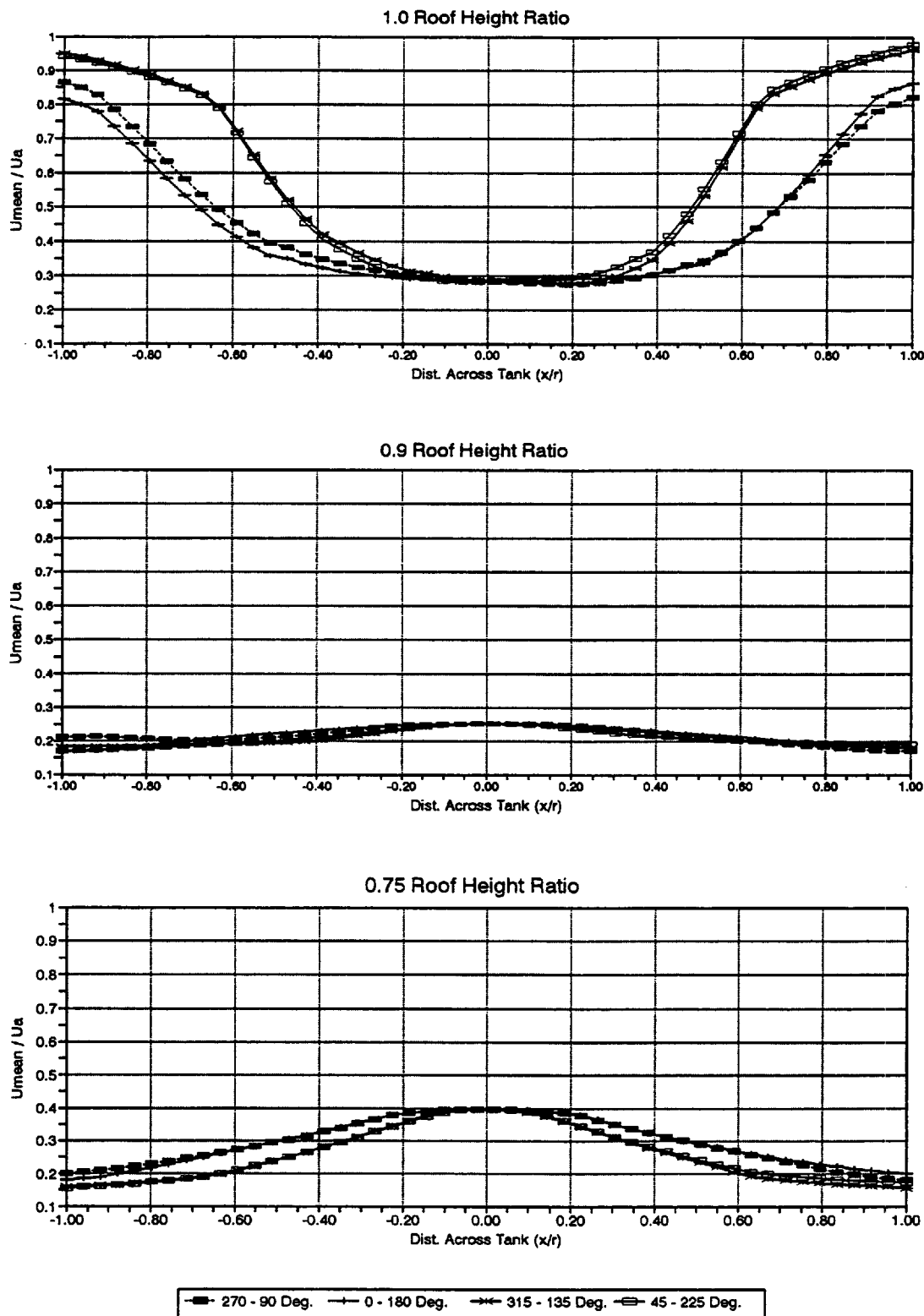


Figure 12c. Average Non-dimensional Mean Velocity Centerline Profiles — 48 ft Tank.

TABLES

TABLE 1
List of External Roof Fittings

**Pontoon Exterior Floating Roof
 Fittings List**

Scale 1:100

<u>Fitting Description</u>	<u>200' Dia. x 48' Tall</u>	<u>100' Dia. x 48' Tall</u>	<u>48' Dia. x 48' Tall</u>
Wind Girder	1	1	1
Spiral Stairway	1	1	1
Vacuum Breaker	3	2	1
Roof Drain	1	1	1
Pontoon Leg	28	16	10
Center Leg	64	32	6
Pontoon Manway	28	16	10
Gauge Well	1	1	1
Rolling Ladder	1	1	1
Rim Vent	1	1	1
Guide Pole	1	1	1
Gauge Hatch	3	2	1

TABLE 2
Flow Visualization Test Plan

Full Scale Tank Dia. (ft)	Run Letter	Run Number	Roof Height Ratio	Model Roof Height (in)	Number of Measurement Locations	Wind Direction (Deg.)
200	A	1	1.00	5.76	28	0
		2	1.00	5.76	28	22.5
		3	1.00	5.76	28	45
		4	1.00	5.76	28	67.5
		5	1.00	5.76	28	90
		6	1.00	5.76	28	112.5
		7	1.00	5.76	28	135
		8	1.00	5.76	28	157.5
		9	1.00	5.76	28	180
		10	1.00	5.76	28	202.5
		11	1.00	5.76	28	225
		12	1.00	5.76	28	247.5
		13	1.00	5.76	28	270
		14	1.00	5.76	28	292.5
		15	1.00	5.76	28	315
		16	1.00	5.76	28	337.5
200	A	17	0.80	4.61	28	0
		18	0.80	4.61	28	22.5
		19	0.80	4.61	28	45
		20	0.80	4.61	28	67.5
		21	0.80	4.61	28	90
		22	0.80	4.61	28	112.5
		23	0.80	4.61	28	135
		24	0.80	4.61	28	157.5
		25	0.80	4.61	28	180
		26	0.80	4.61	28	202.5
		27	0.80	4.61	28	225
		28	0.80	4.61	28	247.5
		29	0.80	4.61	28	270
		30	0.80	4.61	28	292.5
		31	0.80	4.61	28	315
		32	0.80	4.61	28	337.5
200	A	33	0.35	2.02	28	0
		34	0.35	2.02	28	22.5
		35	0.35	2.02	28	45
		36	0.35	2.02	28	67.5
		37	0.35	2.02	28	90
		38	0.35	2.02	28	112.5
		39	0.35	2.02	28	135
		40	0.35	2.02	28	157.5
		41	0.35	2.02	28	180
		42	0.35	2.02	28	202.5
		43	0.35	2.02	28	225
		44	0.35	2.02	28	247.5
		45	0.35	2.02	28	270
		46	0.35	2.02	28	292.5
		47	0.35	2.02	28	315
		48	0.35	2.02	28	337.5

TABLE 2
Flow Visualization Test Plan

Full Scale Tank Dia. (ft)	Run Letter	Run Number	Roof Height Ratio	Model Roof Height (in)	Number of Measurement Locations	Wind Direction (Deg.)
100	C	1	1.00	5.76	28	0
		2	1.00	5.76	28	22.5
		3	1.00	5.76	28	45
		4	1.00	5.76	28	67.5
		5	1.00	5.76	28	90
		6	1.00	5.76	28	112.5
		7	1.00	5.76	28	135
		8	1.00	5.76	28	157.5
		9	1.00	5.76	28	180
		10	1.00	5.76	28	202.5
		11	1.00	5.76	28	225
		12	1.00	5.76	28	247.5
		13	1.00	5.76	28	270
		14	1.00	5.76	28	292.5
		15	1.00	5.76	28	315
		16	1.00	5.76	28	337.5
100	C	17	0.90	5.18	28	0
		18	0.90	5.18	28	22.5
		19	0.90	5.18	28	45
		20	0.90	5.18	28	67.5
		21	0.90	5.18	28	90
		22	0.90	5.18	28	112.5
		23	0.90	5.18	28	135
		24	0.90	5.18	28	157.5
		25	0.90	5.18	28	180
		26	0.90	5.18	28	202.5
		27	0.90	5.18	28	225
		28	0.90	5.18	28	247.5
		29	0.90	5.18	28	270
		30	0.90	5.18	28	292.5
		31	0.90	5.18	28	315
		32	0.90	5.18	28	337.5
100	C	33	0.50	2.88	28	0
		34	0.50	2.88	28	22.5
		35	0.50	2.88	28	45
		36	0.50	2.88	28	67.5
		37	0.50	2.88	28	90
		38	0.50	2.88	28	112.5
		39	0.50	2.88	28	135
		40	0.50	2.88	28	157.5
		41	0.50	2.88	28	180
		42	0.50	2.88	28	202.5
		43	0.50	2.88	28	225
		44	0.50	2.88	28	247.5
		45	0.50	2.88	28	270
		46	0.50	2.88	28	292.5
		47	0.50	2.88	28	315
		48	0.50	2.88	28	337.5

TABLE 2
Flow Visualization Test Plan

Full Scale Tank Dia. (ft)	Run Letter	Run Number	Roof Height Ratio	Model Roof Height (in)	Number of Measurement Locations	Wind Direction (Deg.)
48	B	1	1.00	5.76	20	0
		2	1.00	5.76	20	22.5
		3	1.00	5.76	20	45
		4	1.00	5.76	20	67.5
		5	1.00	5.76	20	90
		6	1.00	5.76	20	112.5
		7	1.00	5.76	20	135
		8	1.00	5.76	20	157.5
		9	1.00	5.76	20	180
		10	1.00	5.76	20	202.5
		11	1.00	5.76	20	225
		12	1.00	5.76	20	247.5
		13	1.00	5.76	20	270
		14	1.00	5.76	20	292.5
		15	1.00	5.76	20	315
		16	1.00	5.76	20	337.5
48	B	17	0.90	5.18	20	0
		18	0.90	5.18	20	22.5
		19	0.90	5.18	20	45
		20	0.90	5.18	20	67.5
		21	0.90	5.18	20	90
		22	0.90	5.18	20	112.5
		23	0.90	5.18	20	135
		24	0.90	5.18	20	157.5
		25	0.90	5.18	20	180
		26	0.90	5.18	20	202.5
		27	0.90	5.18	20	225
		28	0.90	5.18	20	247.5
		29	0.90	5.18	20	270
		30	0.90	5.18	20	292.5
		31	0.90	5.18	20	315
		32	0.90	5.18	20	337.5
48	B	33	0.75	4.32	20	0
		34	0.75	4.32	20	22.5
		35	0.75	4.32	20	45
		36	0.75	4.32	20	67.5
		37	0.75	4.32	20	90
		38	0.75	4.32	20	112.5
		39	0.75	4.32	20	135
		40	0.75	4.32	20	157.5
		41	0.75	4.32	20	180
		42	0.75	4.32	20	202.5
		43	0.75	4.32	20	225
		44	0.75	4.32	20	247.5
		45	0.75	4.32	20	270
		46	0.75	4.32	20	292.5
		47	0.75	4.32	20	315
		48	0.75	4.32	20	337.5

TABLE 3
Velocity Measurement Test Plan

Full Scale Tank Dia. (ft)	Config.	Data Set	Roof Height Ratio	Model Roof Height (in)	Number of Measurement Locations	Wind Direction (Deg.)
200	A	5	1.00	5.76	28	0,22.5,45,67.5,...337.5
		6	0.80	4.61	28	0,22.5,45,67.5,...337.5
		7	0.35	2.02	28	0,22.5,45,67.5,...337.5
100	C	19	1.00	5.76	20	0,22.5,45,67.5,...337.5
		20	0.90	5.18	20	0,22.5,45,67.5,...337.5
		21	0.50	2.88	20	0,22.5,45,67.5,...337.5
48	B	12	1.00	5.76	12	0,22.5,45,67.5,...337.5
		13	0.90	5.18	12	0,22.5,45,67.5,...337.5
		14	0.75	4.32	12	0,22.5,45,67.5,...337.5

TABLE 4
Pressure Measurement Test Plan

Full Scale Tank Dia. (ft)	Config.	Data Set	Roof Height Ratio	Model Roof Height (in)	Number of Measurement Locations	Wind Direction (Deg.)
200	A	1	1.00	5.76	28	0
		2	0.80	4.61	28	0
		3	0.65	3.74	28	0
		4	0.35	2.02	28	0
		22	0.50	2.88	28	0
200	A	5	1.00	5.76	28	0,22.5,45,67.5,...337.5
		6	0.80	4.61	28	0,22.5,45,67.5,...337.5
		7	0.35	2.02	28	0,22.5,45,67.5,...337.5
100	C	15	1.00	5.76	28	0
		16	0.90	5.18	28	0
		17	0.75	4.32	28	0
		18	0.50	2.88	28	0
100	C	19	1.00	5.76	28	0,22.5,45,67.5,...337.5
		20	0.90	5.18	28	0,22.5,45,67.5,...337.5
		21	0.50	2.88	28	0,22.5,45,67.5,...337.5
48	B	8	1.00	5.76	20	0
		9	0.90	5.18	20	0
		10	0.75	4.32	20	0
		11	0.50	2.88	20	0
48	B	12	1.00	5.76	20	0,22.5,45,67.5,...337.5
		13	0.90	5.18	20	0,22.5,45,67.5,...337.5
		14	0.75	4.32	20	0,22.5,45,67.5,...337.5

TABLE 5

Summary of Wind Directions on Tank Roof

Relative Roof Top Wind Direction Approximation (Degrees from Approach Flow)									
Measurement Location	200' Tank Roof Height Ratio			100' Tank Roof Height Ratio			48' Tank Roof Height Ratio		
	1.00	0.80	0.35	1.00	0.90	0.50	1.00	0.90	0.75
1	0	0	0	0	0	0	0	0	0
2	350	300	100	0	320	140	0	320	320
3	350	320	120	0	10	160	0	0	180
4	350	340	150	0	40	220	0	40	220
5	0	0	180	0	0	180	0	0	180
6	0	20	200	0	320	140	0	320	140
7	0	40	220	0	350	200	0	0	180
8	0	60	240	0	40	220	0	40	40
9	0	0	180	0	0	0	0	220	220
10	0	300	120	0	140	140	0	140	140
11	0	320	140	0	180	180	0	120	120
12	0	340	160	0	30	210	0	40	220
13	0	0	180	0	0	180	0	60	210
14	10	20	220	0	330	150	0	300	170
15	10	40	240	0	180	180	0	320	140
16	10	60	260	0	220	220	0	240	240
17	0	0	180	0	180	180	0	180	180
18	10	220	120	0	160	160	0	180	180
19	0	90	140	0	180	180	0	0	180
20	0	315	220	0	20	180	0	180	180
21	0	0	180	0	180	180			
22	0	40	140	0	340	180			
23	0	270	220	0	180	180			
24	350	140	240	0	200	200			
25	0	0	180	0	180	180			
26	0	90	140	0	180	180			
27	0	0	180	0	180	180			
28	0	270	220	0	180	180			

TABLE 6a

Evaporative Loss Example Calculation - Complex Method

Roof Manway

Site:	Long Beach, CA
Tank Height (H):	50 ft
Tank Diameter (D):	100 ft
Avg. Roof Level (R):	25 ft

Fitting	Roof
Description	Manway
Location	28
Ka	2.70
Kb	7.10
m	1.00

Wind Directi	Ua (mph)	freq	Umean/ Ua	Umean (mph)	Kf (lb-m/yr)	f*Kf (lb-m/yr)
0	4.70	0.04	0.43	2.01	16.95	0.72
22.5	4.60	0.02	0.42	1.94	16.48	0.31
45	5.00	0.02	0.45	2.24	18.60	0.42
67.5	5.20	0.03	0.52	2.69	21.82	0.69
90	5.10	0.08	0.49	2.47	20.26	1.64
112.5	4.90	0.04	0.55	2.70	21.87	0.80
135	5.20	0.03	0.53	2.74	22.16	0.70
157.5	6.20	0.06	0.46	2.85	22.91	1.37
180	7.50	0.14	0.42	3.16	25.12	3.40
202.5	7.70	0.09	0.42	3.22	25.55	2.22
225	7.10	0.03	0.42	2.99	23.92	0.82
247.5	7.00	0.03	0.41	2.87	23.08	0.68
270	8.40	0.14	0.39	3.30	26.14	3.57
292.5	6.40	0.12	0.43	2.73	22.10	2.55
315	6.10	0.08	0.45	2.73	22.06	1.74
337.5	5.30	0.06	0.45	2.40	19.71	1.14
Kf Total =						18.19

TABLE 6b

Evaporative Loss Example Calculation - Complex Method
Slotted Guide Pole

Site:	Long Beach, CA
Tank Height (H):	50 ft
Tank Diameter (D):	100 ft
Avg. Roof Level (R):	25 ft

Fitting	Slotted
Description	Guide Pole
Location	4
Ka	0.00
Kb	310.0
m	1.20

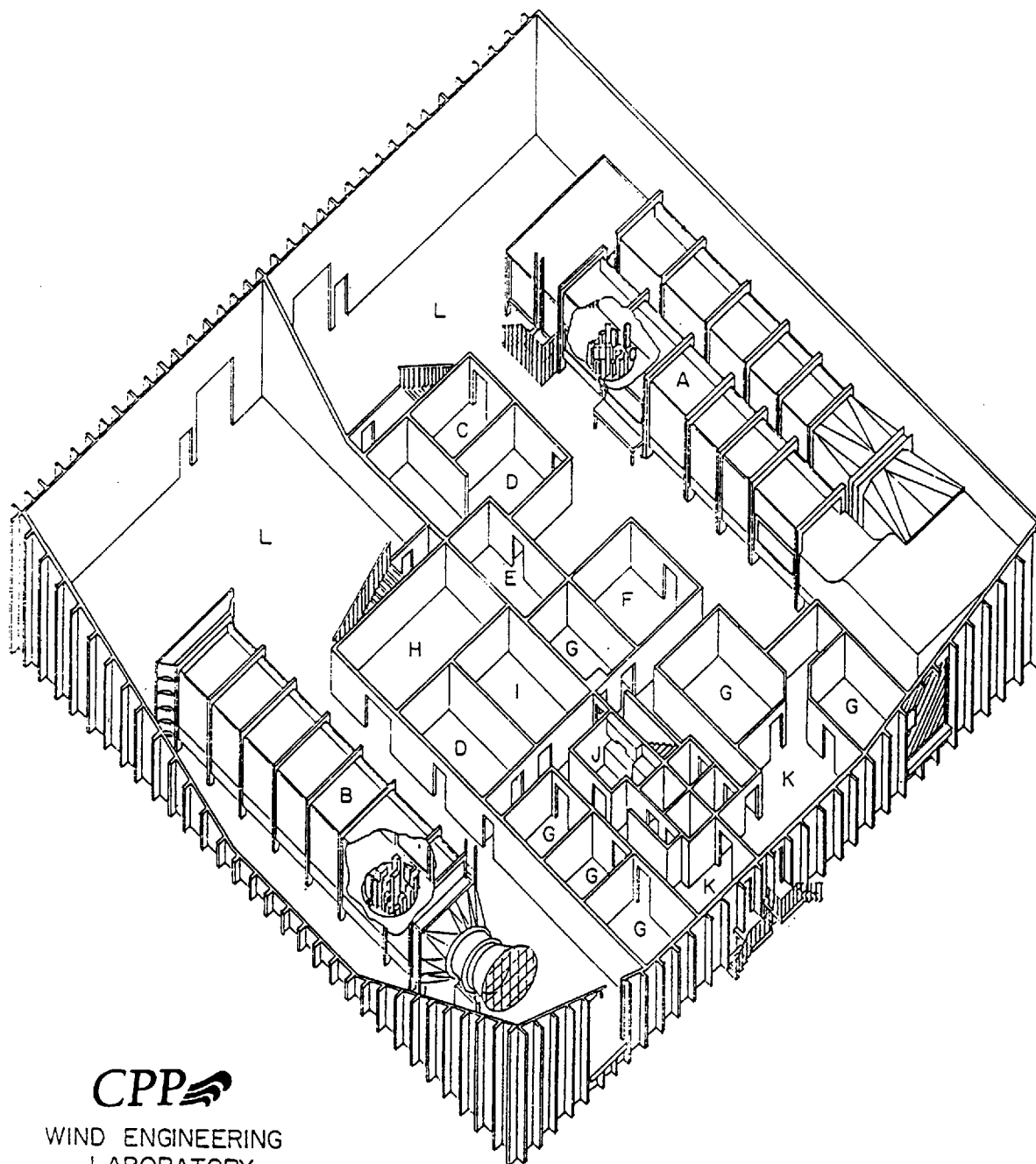
Wind Directi	Ua (mph)	freq	Umean/ Ua	Umean (mph)	Kf (lb-m/yr)	f*Kf (lb-m/yr)
0	4.70	0.04	0.29	1.35	445.81	18.88
22.5	4.60	0.02	0.27	1.26	409.23	7.70
45	5.00	0.02	0.20	1.01	313.72	7.01
67.5	5.20	0.03	0.18	0.93	282.53	8.97
90	5.10	0.08	0.17	0.87	263.05	21.35
112.5	4.90	0.04	0.19	0.92	280.92	10.25
135	5.20	0.03	0.19	1.00	311.34	9.89
157.5	6.20	0.06	0.18	1.11	351.28	21.08
180	7.50	0.14	0.18	1.34	441.43	59.72
202.5	7.70	0.09	0.13	0.99	304.65	26.52
225	7.10	0.03	0.23	1.61	549.67	18.75
247.5	7.00	0.03	0.27	1.88	659.54	19.40
270	8.40	0.14	0.29	2.44	906.08	123.65
292.5	6.40	0.12	0.32	2.05	732.75	84.48
315	6.10	0.08	0.36	2.21	804.72	63.43
337.5	5.30	0.06	0.31	1.64	560.33	32.30
Kf Total =						459.23

TABLE 7

Evaporative Loss Example Calculation - Simple Method

Site:		Long Beach, CA							
Tank Height (H):		50 ft							
Tank Diameter (D):		100 ft							
Avg. Roof Level (R):		25 ft							
Avg Airport Wind Speed:		6.4 mph							
Simple Method									Complex Method
Fitting Description	n	Zone	Umean/ Ua	Umean (mph)	Ka (lb-m/yr)	Kb (lb-m/U ^ m/yr)	m	Kf (lb-m/yr)	Kf (lb-m/yr)
Roof Manway	1	1	0.44	2.82	2.70	7.10	1.0	22.69	18.19
Center Leg	8	2	0.44	2.82	0.25	0.07	1.0	3.51	
Center Leg	8	3	0.41	2.62	0.25	0.07	1.0	3.41	
Center Leg	16	4	0.33	2.11	0.25	0.07	1.0	6.26	
Pontoon Leg	16	5	0.27	1.73	1.50	0.20	1.0	29.53	
Vacuum Breaker	2	5	0.27	1.73	1.10	3.00	1.0	12.57	
Slotted Guide Pole	1	5	0.27	1.73	0.00	310.00	1.2	597.60	459.23
Rim Vent	1	5	0.27	1.73	0.68	13.80	1.0	24.53	
Roof Drain	1	1	0.44	2.82	0.51	0.81	1.0	2.79	
Kf Total =								702.893	

APPENDIX A
INSTRUMENTATION AND FACILITIES



CPP

WIND ENGINEERING
LABORATORY

KEY

- | | | |
|---|---|---|
| A | - | Closed-circuit boundary-layer wind tunnel |
| B | - | Open-circuit boundary-layer wind tunnel |
| C | - | Data reduction |
| D | - | Computer room |
| E | - | Instrumentation room |
| F | - | Model technicians |
| G | - | Office |
| H | - | Machine shop |
| I | - | Conference room |
| J | - | Lounge |
| K | - | Reception area |
| L | - | Work area |

CPP

PERFORMANCE CHARACTERISTICS OF THE CLOSED-CIRCUIT WIND TUNNEL

1. Dimensions

Test-Section Length	70 ft
Test-Section Width	10 ft
Contraction Ratio	2.7:1

2. Wind-Tunnel Drive

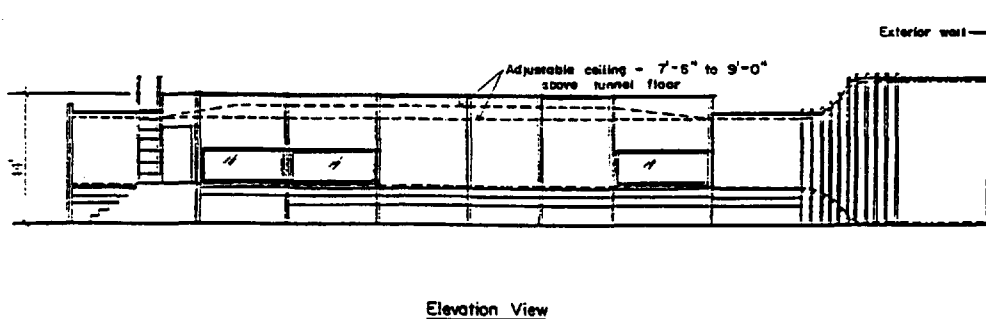
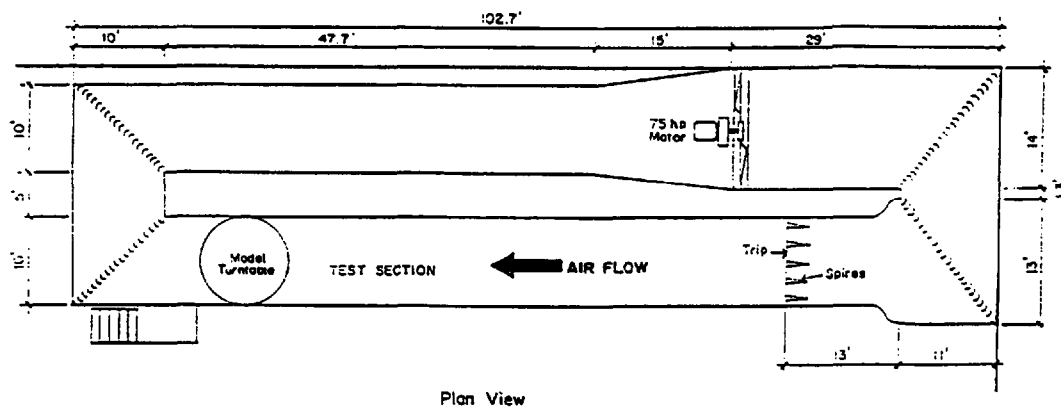
Total Power	75 hp
Type of Drive	6 blade axial fan, single-speed motor
Speed Control	Variable-pitch fan

3. Velocities

Mean Velocities	Approximately 0 to 50 fps
Boundary-Layer Thickness*	Up to 60 inches
Turbulence Level	About 2 percent at entrance

4. Longitudinal Pressure Gradient Zeroed by ceiling adjustment

* Function of boundary roughness and thickening devices at test-section entrance



CLOSED-CIRCUIT BOUNDARY-LAYER WIND TUNNEL

PERFORMANCE CHARACTERISTICS OF THE OPEN-CIRCUIT WIND TUNNEL

1. Dimensions

Test-Section Length	74.5 ft
Test-Section Width	12 ft
Contraction Ratio	Variable from 6.5 to 8.5 ft

2. Wind-Tunnel Drive

Total Power	20 hp
Type of Drive	8 blade axial fan, single-speed motor
Speed Control: Coarse	900/600 rpm, 2-speed motor
Speed Control: Fine	Pitch control

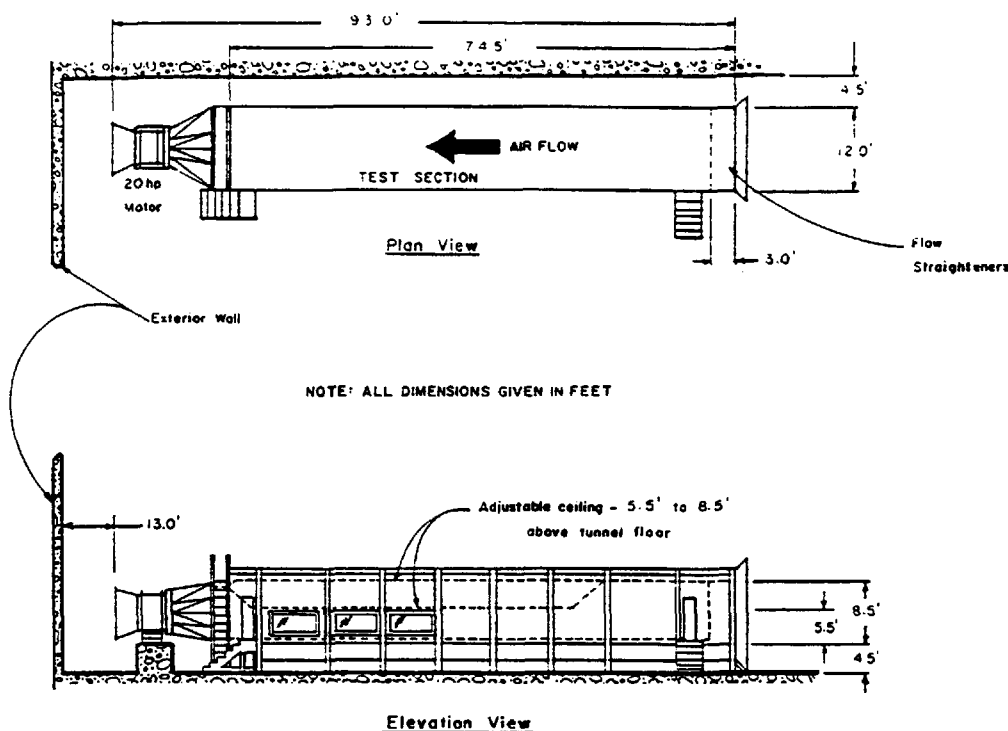
3. Temperature

Ambient Air	Not controlled
Surface	-50 to 120° F

4. Velocities

Mean Velocities	0 to 30 fps
Boundary-Layer Thickness	Up to 6 ft

5. Streamwise Pressure Gradient Zeroed by ceiling adjustment



OPEN-CIRCUIT BOUNDARY-LAYER WIND TUNNEL

DATA ACQUISITION AND ANALYSIS SYSTEM

The CPP data acquisition and analysis system utilizes a system of microcomputers. The system presently includes the following hardware:

- ☐ 16 bit, 512-640 KB RAM
- ☐ 20-30 MB hard disks
- ☐ 8-12 MHz clock speeds
- ☐ 160 cps dot matrix printers
- ☐ 1 color, 2 monochrome high resolution graphics monitors
- ☐ 16-channel 35 KHz 12 bit A/D converters
- ☐ 2-channel 12 bit D/A output, 4 channel digital input/output
- ☐ 32-channel digital input/output
- ☐ Fast Fourier Transform card

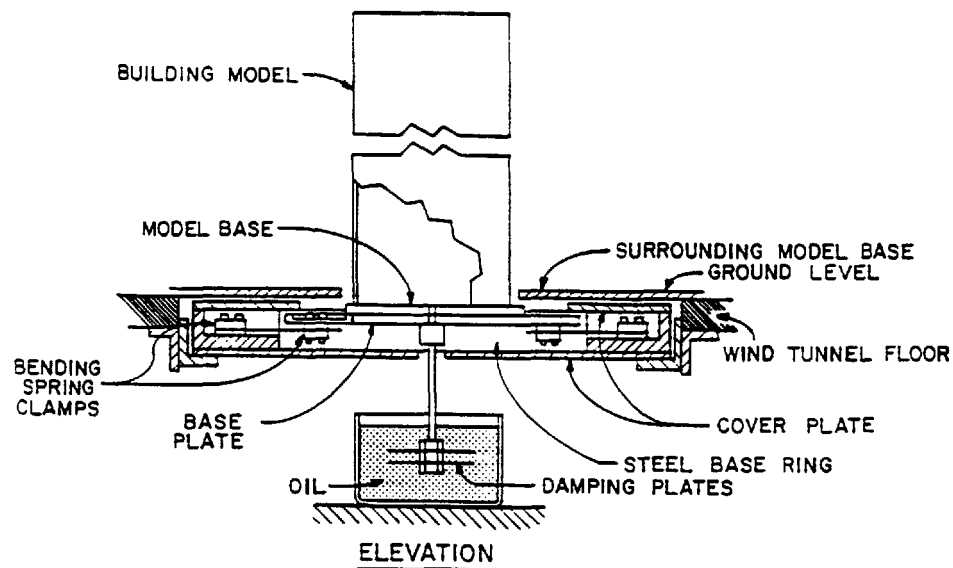
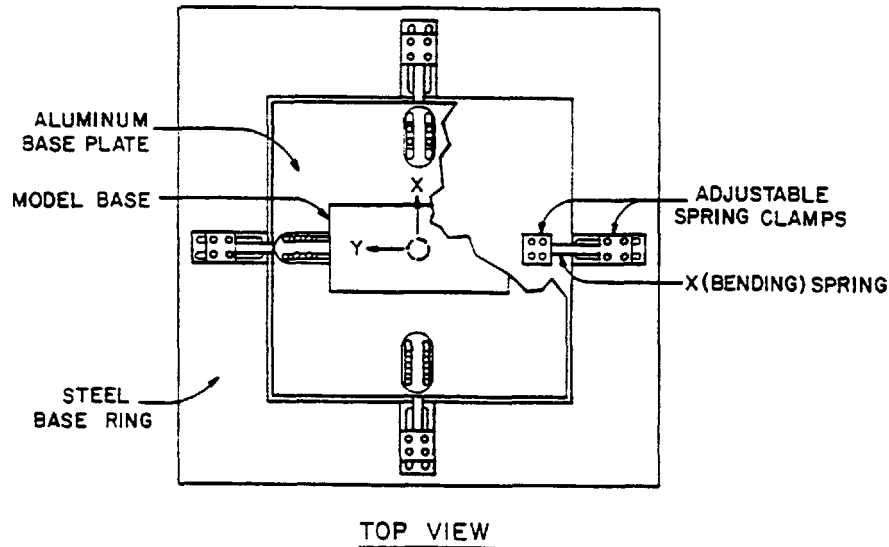
5 IBM PC-AT microcomputer based data analysis systems

- ☐ 16 bit, 512-640 KB RAM
- ☐ 20-30 MB hard disks
- ☐ 8-20 MHz clock speeds
- ☐ HP LaserJet Series II laser printers
- ☐ 3 color, 1 monochrome high resolution graphics monitors
- ☐ 6 pen plotter
- ☐ 9 track, 1600 cpi digital magnetic tape drive
- ☐ Cassette tape back-up system
- ☐ Microsoft Mouse

Telecommunications interface for communication with client computer facilities or commercial timesharing services.

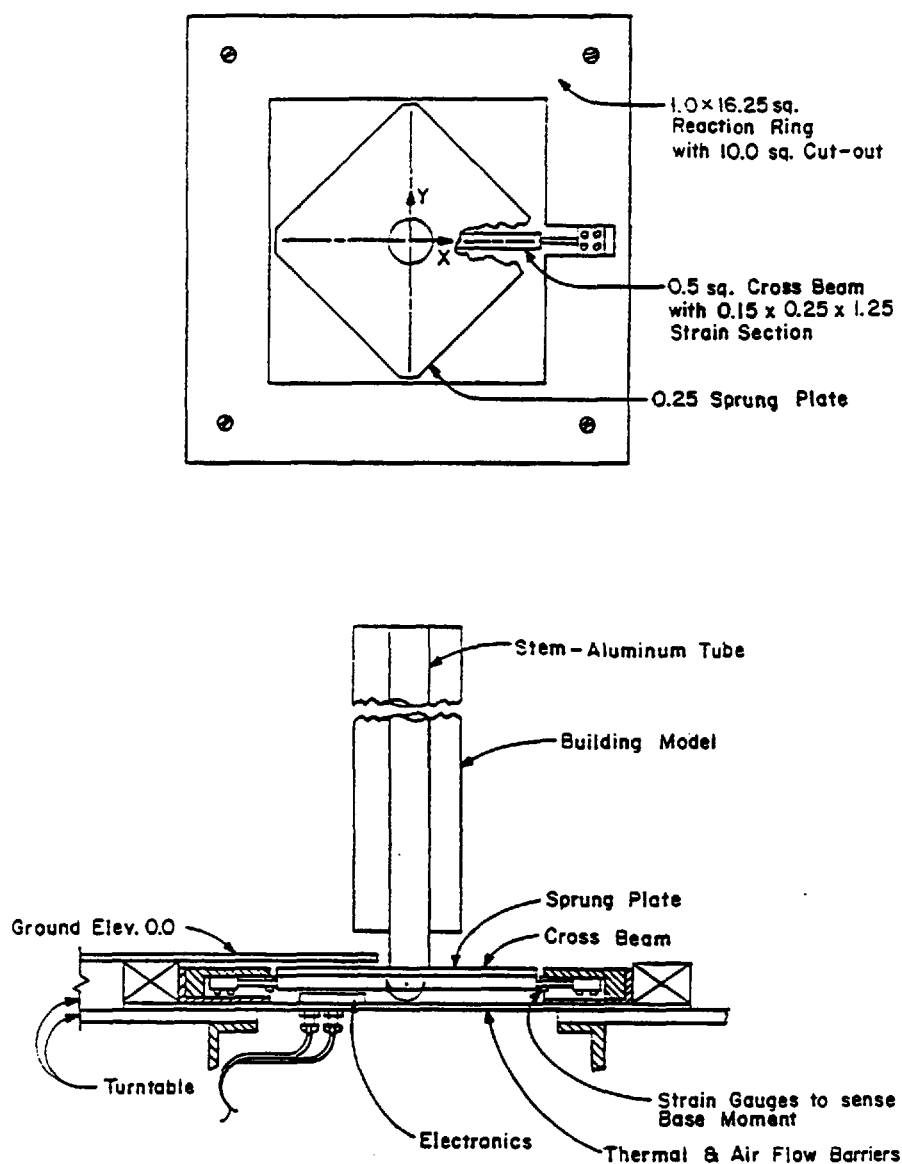
AEROELASTIC BALANCE

The aeroelastic balance is of a universal type on which various models can be easily mounted. Stiffness of the balance can be adjusted over a wide range to match the natural frequencies of the prototype. The balance is designed to model two fundamental rocking modes of motion and twisting motion about the vertical axis. Damping of the balance is adjustable over a range of expected prototype values. Strain gage bridges yield outputs for the data processing system which gives mean, rms and peak values of base moments and building-top deflections. Placement of accelerometers on the building enables direct measurement of rms and peak accelerations.



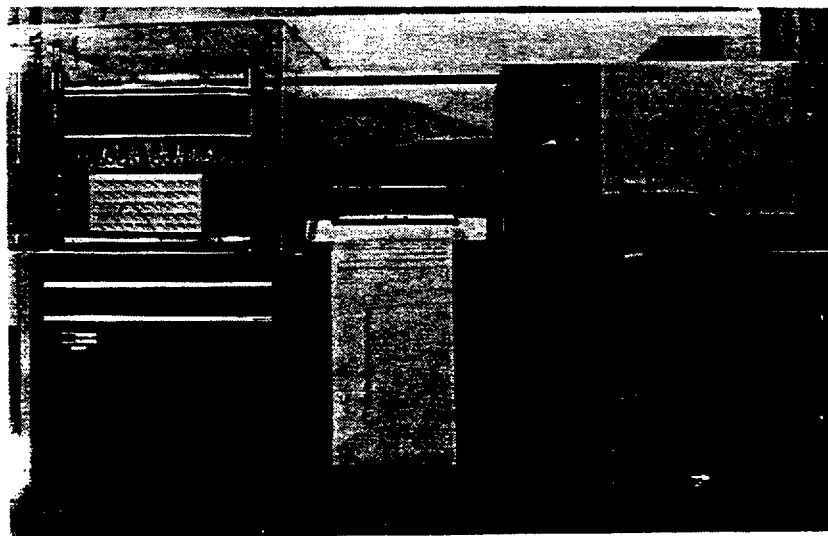
HIGH-FREQUENCY BASE BALANCE

The high-natural-frequency balance is used to measure overall fluctuating wind loads at the base of a model structure. The balance has fundamental natural frequencies of about 500 Hz, and can accommodate a model of nearly any size building at scales from 1:200 to 1:500, with resulting natural frequencies of about 80 Hz to 200 Hz. Together with associated instrumentation and computer software, this system can measure the power spectral density of the external dynamic wind load over a bandwidth from 0 Hz to 1/2 of the model's natural frequency. Additional computer software allows the dynamic response of the structure to be easily computed for a wide range of values for mass, stiffness and damping.



All Dimensions given in inches.

HYDROCARBON GAS TRACER SYSTEM



The Hydrocarbon Gas Tracer System consists of a Flame Ionization Gas Chromatograph and a CPP-designed gas-sampling system. The dual column gas chromatograph is equipped with:

- ☐ *Flame-ionization detector*
- ☐ *Automatic linear temperature programmer digital sensor pane (checks operating parameters)*
- ☐ *Automatic 2 cc sampling loops*

The gas chromatograph has the capability of operating four detectors simultaneously. These detectors are:

- ☐ *Flame ionization*
- ☐ *Flame photometric*
- ☐ *Electron capture*
- ☐ *Thermal conductivity*

Also in use at CPP is a High Frequency Response flame ionization detector which combines an accurate method of real time hydrocarbon measurement with the ability to track varying concentrations with an averaging time of less than 0.01 s. This equipment has two independent FID systems which can be used to determine concentration time series at two locations simultaneously.

The gas-sampling system is a state-of-the-art system. It features isokinetic withdrawal of up to fifty samples simultaneously. Its non-contaminating design and isothermal temperature control assure stable performance, resulting in reproducible samples with excellent accuracy over a wide range of sample concentrations. The sample reproducibility is ± 0.9 percent for 100 ppm and ± 0.4 percent for 1,000 ppm ethane in He. The contamination in the form of hydrocarbons (C1 through C8) is less than 0.001 ppm.

Both the gas chromatograph and the gas sampling systems are interfaced with the CPP data acquisition and analysis system. Real-time data analysis is thus provided.

All gas mixtures used in testing are commercially certified. Further verification is provided by our scientific staff with our own chromatograph, which is calibrated using certified primary standards. The linearity of the chromatograph is verified using a wide concentration range of certified primary standards.

PRESSURE MEASUREMENT SYSTEM

The Pressure Measurement System is designed to interface with software developed for the Data Acquisition and Analyzer System. The following hardware is presently available for pressure measurements:

Pressure Transducers

type: 15 differential pressure transducers

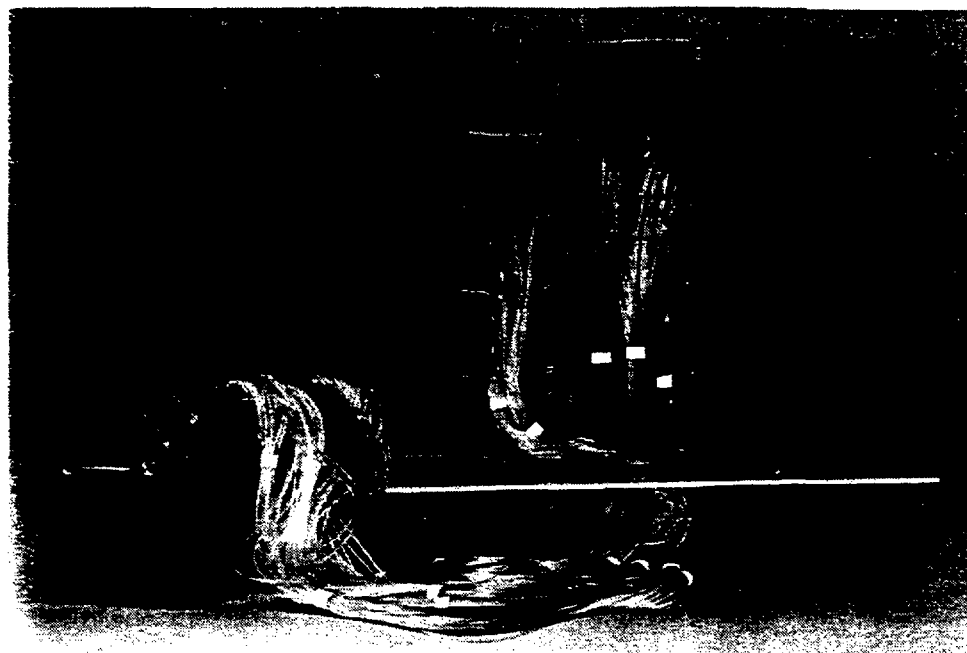
range: between ± 0.1 psi and ± 0.18 psi differential

accuracy: 0.25 percent of full-scale natural resonant

frequency: > 5000 Hz

Pressure-Tap Scanning Valve

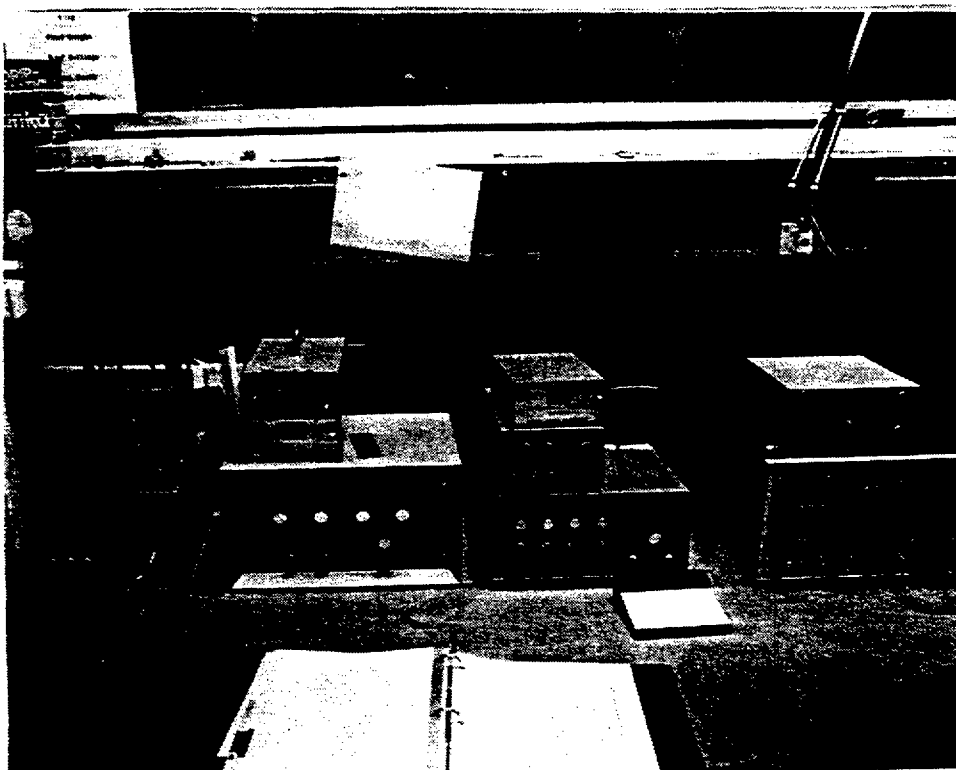
For pressure measurements, the data acquisition and analysis system software is capable of sampling and analyzing pressure data simultaneously at a rate of 5000 Hz. The Data Acquisition and Analyzer System also controls the positioning of the scanner which allows pressures to be sampled at sequential locations with a single transducer. Presently, 8 scanning valve systems are utilized, each allowing 48 pressures to be measured sequentially by one transducer.



VELOCITY / TEMPERATURE MEASUREMENT AND CALIBRATION SYSTEM

Complete instrumentation is available for the measurement of lateral, longitudinal, and vertical mean velocity and turbulence intensity, Reynolds stress, mean temperature, and turbulent temperature fluctuations. Prior to any measurement program, a detailed calibration of the velocity or temperature sensor is performed. The components of the system include:

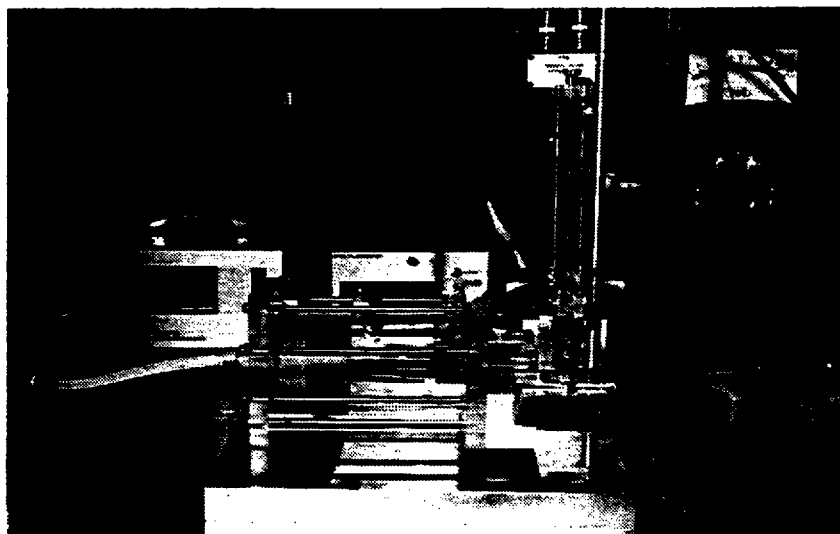
- ☐ *Five TSI model 1053B utility anemometers*
- ☐ *Five TSI model 1056 variable decade modules*
- ☐ *Five channel monitor and power supply*
- ☐ *Temperature switching module - TSI model 1125*
- ☐ *Model 1125 TSI velocity calibrator*
- ☐ *Model 1210 hot-film velocity sensors*
- ☐ *Model 1287 split-film two-component velocity sensors*
- ☐ *Model 1211 hot-film velocity sensor*

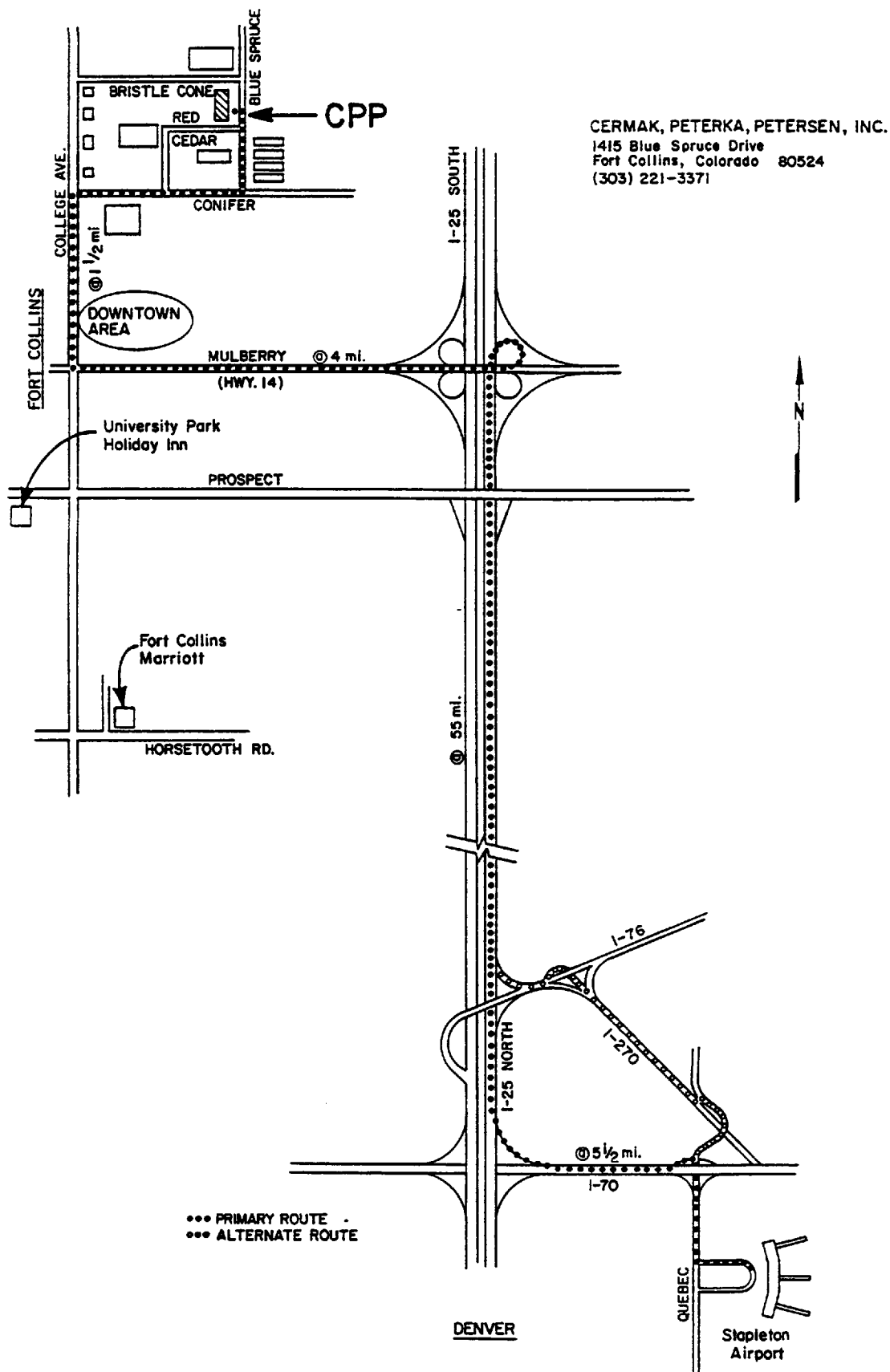


MISCELLANEOUS INSTRUMENTATION



- ☐ *Chart Recorders*
- ☐ *Digital Multimeters*
- ☐ *Oscilloscopes*
- ☐ *Function Generators*
- ☐ *Positive-Displacement Flow Meters*
- ☐ *Digital Mass-Flow Meters*
- ☐ *Linear Flow Meters*
- ☐ *Power Supplies*
- ☐ *Still Photography and Movie Camera Equipment*
- ☐ *Video Recording System*





January, 1989

CPP

APPENDIX B

EXPERIMENTAL METHODS

LIST OF FIGURES

APPENDIX B

<u>Figure</u>	<u>Description</u>	<u>Page</u>
B-1	Hot-Wire Calibration Curve	9
B-2	Pressure Transducer Calibration Curve	10

APPENDIX B

EXPERIMENTAL METHODS

B.1 Velocity Measurements

B.1.1 General

Split-film (dual hot-film sensor), hot-film or hot-wire (single sensor) and pitot-static probes are used to measure velocities. The split-film sensor probe is used to measure mean velocity, U and W , and fluctuating velocities U' , W' while the hot-film sensor is used to measure mean and fluctuating velocities, U and U' . The pitot-static probe is limited to measurements of mean velocity, U .

B.1.2 Split-film and Hot-film

The theory of operation for split-film and hot-film sensors is based on the physical principle that heat transferred from a sensor equals heat supplied to that sensor by an anemometer. This physical principle can be represented by the following equations:

For hot-film:

$$E^2 = A + BU^n \quad (\text{B.1})$$

For split-film:

$$\left(\frac{E_1^2}{K_1} \right) + \left(\frac{E_2^2}{K_2} \right) = [A + B (U)^n] \quad (\text{B.2})$$

and

$$\left(\frac{E_1^2}{K_1} \right) - \left(\frac{E_2^2}{K_1} \right) = (a + bU) (\theta_o - \theta) + c \quad (\text{B.3})$$

where:

E_i	=	Voltage across sensor i ,
K_i	=	$R_{Hi} (R_{Hi} - R_{ci})$,
U	=	Velocity,
A, B, n, a, b, c	=	Constants determined by calibration,
θ	=	Angle formed by plane of sensor and the velocity vector, and
θ_o	=	change in θ .

B.1.3 Pitot-static Probe

A pitot-static probe consists of two concentric tubes. The inner tube, orientated parallel to the flow, terminates at the front of the probe and senses the stagnation pressure of the flow. The outer tube has small holes around the periphery of the tube normal to the flow approximately 8 inner diameters from the front of the probe which sense the local static pressure. The difference between the two pressures, known as the dynamic pressure, is measured using a differential pressure transducer. The dynamic pressure can be related to the velocity of the flow using Bernoulli's equation for incompressible flow where:

$$q = \frac{1}{2} \rho U^2 \quad (\text{B.4})$$

or

$$U = \sqrt{\frac{\rho}{2q}} \quad (\text{B.5})$$

where:

q	=	Dynamic pressure,
U	=	Velocity, and
ρ	=	Ambient air density.

B.1.4 Calibration

Split-film and hot-film sensor calibrations are accomplished immediately prior to each velocity measurement activity involving the specific sensor by either a direct comparison of the velocity measurements from a pitot-static probe or utilizing a Thermo-Systems, Inc. (TSI) calibrator. The pitot-static probe does not require calibration other than for the pressure transducer (see Section B.2.2 for calibration procedures) which measures the dynamic pressure.

At high wind speed rates (> 1.5 m/s), the split-film and hot-film sensors are calibrated by mounting the sensors next to a pitot-static probe in the wind tunnel. The voltage across the sensor is correlated to the wind speed measured by the pitot-static probe at multiple air flow velocities within the tunnel.

At low wind speeds (< 1.5 m/s), the split-film and hot-film sensors are calibrated using a TSI calibration nozzle and a mass flow meter to provide metered air flow. The constants, A , B and n (or A , B , n , a , b and θ_0) are obtained by calibrating the sensors over a range of known velocities (or velocities and angles) and determined by a least squares analysis utilizing the appropriate, previously referenced, equations. A representative calibration curve of sensor output voltage versus sensed velocity is included in Figure B.1.

B.1.5 Data Collection

After calibration, the mean tunnel speed is measured and set using either a pitot-static probe or a hot-film sensor mounted at a reference height within the wind-tunnel. Mean and fluctuating velocities at specific locations are measured using either a hot-film probe (TSI Model 1205) for U and U' or a split-film probe (TSI Model 1287) for U , W , U' and W' . Vertical and lateral velocity profiles are obtained by affixing the appropriate probe to a two-dimensional traversing carriage. The traverse is mechanized such that the probe can be driven in either the lateral or vertical plane under manual or computer control from outside of the tunnel. All data are obtained by sampling the probe output at 250 Hz for 20 to 30 second intervals at each location. The data is reduced by real-time computer action and stored for later analysis.

B.2 Pressure Measurements

B.2.1 General

Mean and fluctuating pressures are measured using Microswitch differential pressure transducers with a 0-0.18 psid range. Short pieces of 1/16 inch I.D. plastic tubing were used to connect up to 368 pressure ports to eight 48-tap Scanivalve pressure switches mounted beneath the model under the wind tunnel turntable. Each of the 48 measurements ports on each switch was directed in turn by the switch to one of eight pressure transducers mounted close to the switches. Eight of the ports, one per switch, were used for monitoring transducer zero drift. The other eight pressure input taps (one per switch), not used for transmitting model surface pressures, were connected to a common tube leading to the dynamic pressure side of the Pitot-static probe mounted in the wind tunnel. This arrangement provides a means for automatically monitoring the wind speed using each of the eight transducers individually. The Scanivalve switches were operated by a solenoid drive under the control of the data acquisition computer. The computer kept track of the switch position; however, a digital readout position was also provided at the wind tunnel.

B.2.2 Calibration

Pressure transducer calibrations are performed on a biannual basis. A plexiglass plunger cylinder supplied a load to the transducers via compressed or expanded air with a sensitivity of 0.01 inches of water over a range of 0 to 5.0 inches of water. The reference pressure is measured using a Dwyer red oil manometer with a range of 0 to 5.0 inches of water. During calibration, pressure loads ranging from -4.00 to 1.0 inches of water are imposed on each transducer for three trials. A Least Absolute Deviation (LAD) algorithm is used to determine the "best fit" linear curve fit between the induced pressure load and the output voltage for each of the three trials plus their average, with the offset forced to zero. A typical calibration curve of pressure transducer output voltage versus pressure is presented in Figure B-2.

B.2.3 Data Collection

After installing the model into the wind tunnel, the reference pressures were obtained by connecting the reference side of the eight transducers, using plastic tubing, to the static side of the Pitot-static probe mounted in the tunnel above the model building. In this way, the

transducers measured the instantaneous difference between the local pressure on the surface of the model and the static pressure at the reference velocity measurement location above the model.

Voltage output from the pressure transducers was directed to an on-line data acquisition system consisting of an IBM PC-AT class computer. All eight transducers were recorded simultaneously for 16 seconds at a 250 sample-per-second rate. The data were processed into pressure coefficient form and stored for printout or further analysis.

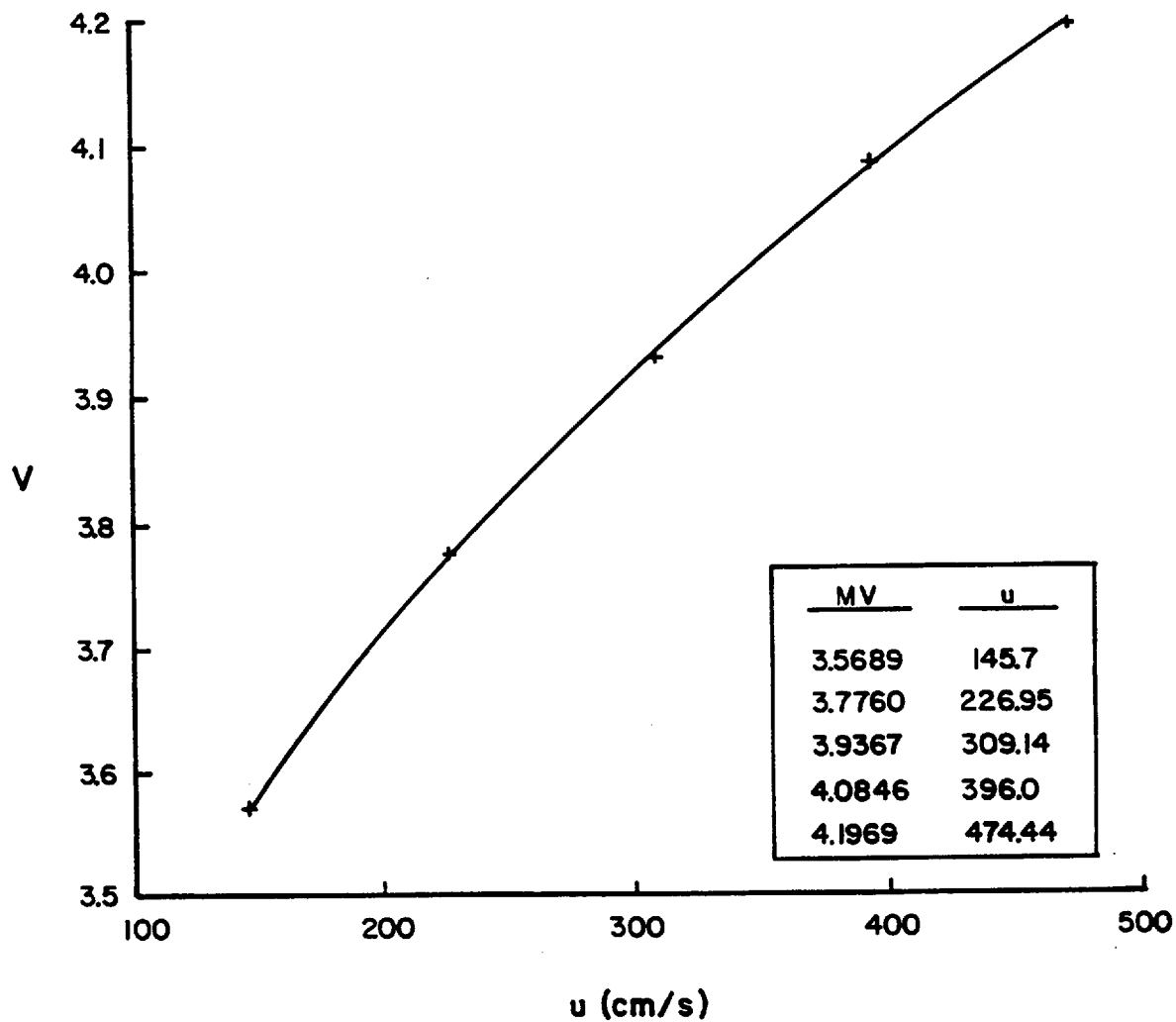


Figure B-1. Hot-wire calibration curve.

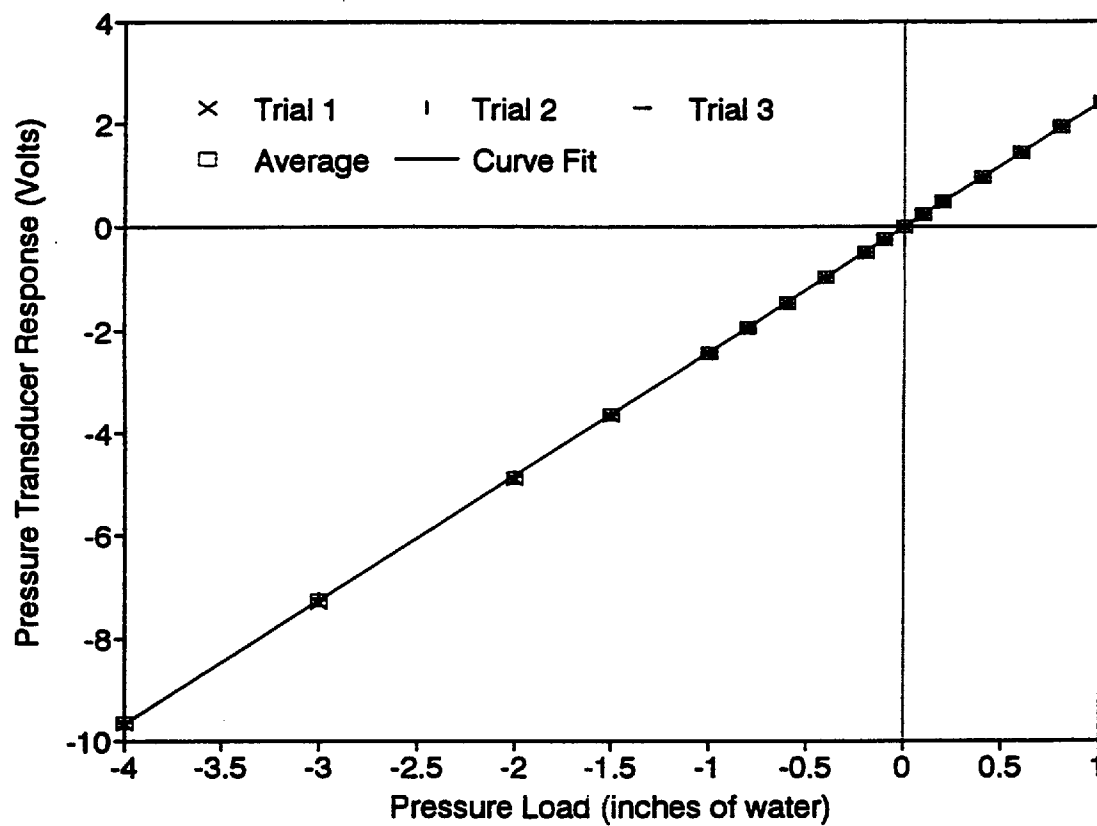


Figure B-2. Pressure Transducer Calibration Curve.

APPENDIX C

TABLE OF PRESSURE COEFFICIENTS

Cermak Peterka Petersen, Inc.

C-1

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
 Data Set 1 - 1.00 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.655	.202	-.117	-1.441	.0	-.549	.185	-.067	-1.425
Location 3					Location 4				
.0	-.369	.168	.085	-1.240	.0	-.200	.130	.133	-.989
Location 5					Location 6				
.0	-.123	.083	.178	-.470	.0	-.102	.099	.308	-.486
Location 7					Location 8				
.0	-.120	.085	.194	-.470	.0	-.099	.082	.178	-.421
Location 9					Location 10				
.0	-.098	.079	.178	-.371	.0	-.179	.092	.113	-.630
Location 11					Location 12				
.0	-.245	.104	.065	-.661	.0	-.218	.096	.113	-.630
Location 13					Location 14				
.0	-.110	.089	.196	-.439	.0	-.214	.099	.049	-.765
Location 15					Location 16				
.0	-.347	.163	.065	-1.090	.0	-.479	.178	.000	-1.302
Location 17					Location 18				
.0	-.086	.114	.384	-.568	.0	-.070	.099	.267	-.586
Location 19					Location 20				
.0	-.049	.092	.317	-.402	.0	-.062	.082	.285	-.384
Location 21					Location 22				
.0	-.009	.083	.351	-.285	.0	-.042	.080	.251	-.285
Location 23					Location 24				
.0	-.065	.093	.265	-.581	.0	-.076	.104	.282	-.648
Location 25					Location 26				
.0	-.039	.093	.300	-.383	.0	-.018	.092	.314	-.365
Location 27					Location 28				
.0	-.004	.090	.347	-.314	.0	-.036	.092	.298	-.347

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 2 - 0.80 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.265	.083	.000	-.525	.0	-.283	.086	.000	-.590
Location 3					Location 4				
.0	-.271	.107	.114	-.838	.0	-.212	.145	.362	-.804
Location 5					Location 6				
.0	-.034	.128	.528	-.512	.0	.086	.144	.670	-.319
Location 7					Location 8				
.0	.148	.139	.830	-.415	.0	.251	.166	.958	-.208
Location 9					Location 10				
.0	.248	.153	.939	-.191	.0	.222	.150	.827	-.255
Location 11					Location 12				
.0	.175	.151	.844	-.334	.0	.096	.135	.636	-.286
Location 13					Location 14				
.0	-.064	.136	.584	-.697	.0	-.206	.135	.259	-.844
Location 15					Location 16				
.0	-.288	.113	.114	-.909	.0	-.295	.098	.033	-.730
Location 17					Location 18				
.0	-.291	.114	.130	-.819	.0	-.237	.132	.230	-.672
Location 19					Location 20				
.0	-.021	.147	.525	-.934	.0	.093	.110	.577	-.297
Location 21					Location 22				
.0	.133	.120	.651	-.255	.0	.098	.116	.528	-.264
Location 23					Location 24				
.0	-.013	.135	.509	-.525	.0	-.230	.132	.377	-.721
Location 25					Location 26				
.0	-.125	.130	.476	-.820	.0	.018	.125	.491	-.393
Location 27					Location 28				
.0	.086	.119	.556	-.311	.0	.031	.129	.654	-.426

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 3 - 0.65 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.214	.076	.082	-.460	.0	-.211	.079	.082	-.460
Location 3					Location 4				
.0	-.216	.087	.098	-.690	.0	-.196	.116	.214	-.722
Location 5					Location 6				
.0	-.085	.147	.483	-.629	.0	.040	.153	.645	-.469
Location 7					Location 8				
.0	.139	.141	.743	-.242	.0	.206	.162	.807	-.338
Location 9					Location 10				
.0	.224	.160	1.081	-.159	.0	.208	.153	.922	-.239
Location 11					Location 12				
.0	.162	.163	.922	-.286	.0	.067	.157	.636	-.556
Location 13					Location 14				
.0	-.114	.151	.731	-.795	.0	-.182	.110	.292	-.811
Location 15					Location 16				
.0	-.222	.087	.065	-.778	.0	-.222	.083	.049	-.584
Location 17					Location 18				
.0	-.240	.102	.147	-.687	.0	-.227	.111	.114	-.719
Location 19					Location 20				
.0	-.079	.135	.523	-.621	.0	.036	.128	.529	-.363
Location 21					Location 22				
.0	.087	.130	.578	-.595	.0	.028	.138	.661	-.430
Location 23					Location 24				
.0	-.110	.147	.362	-.724	.0	-.234	.117	.214	-.658
Location 25					Location 26				
.0	-.215	.108	.214	-.608	.0	-.096	.128	.589	-.507
Location 27					Location 28				
.0	.019	.125	.474	-.377	.0	-.098	.128	.474	-.572

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 4 - 0.35 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.173	.067	.102	-.408	.0	-.172	.068	.119	-.458
Location 3					Location 4				
.0	-.171	.073	.102	-.442	.0	-.172	.086	.102	-.509
Location 5					Location 6				
.0	-.154	.113	.282	-.663	.0	-.095	.145	.647	-.778
Location 7					Location 8				
.0	.055	.150	.762	-.448	.0	.157	.159	.896	-.547
Location 9					Location 10				
.0	.216	.172	1.077	-.212	.0	.172	.159	.962	-.261
Location 11					Location 12				
.0	.070	.154	.881	-.473	.0	-.067	.123	.440	-.473
Location 13					Location 14				
.0	-.160	.119	.317	-.635	.0	-.157	.089	.216	-.568
Location 15					Location 16				
.0	-.173	.077	.083	-.483	.0	-.176	.070	.083	-.467
Location 17					Location 18				
.0	-.181	.087	.135	-.488	.0	-.182	.093	.117	-.520
Location 19					Location 20				
.0	-.211	.119	.268	-.706	.0	-.113	.116	.390	-.525
Location 21					Location 22				
.0	-.058	.129	.525	-.627	.0	-.122	.125	.322	-.644
Location 23					Location 24				
.0	-.193	.123	.236	-.743	.0	-.191	.096	.203	-.590
Location 25					Location 26				
.0	-.206	.098	.135	-.574	.0	-.200	.110	.337	-.605
Location 27					Location 28				
.0	-.141	.125	.369	-.571	.0	-.203	.110	.218	-.638

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 22 - 0.50 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.169	.074	.114	-.408	.0	-.176	.076	.065	-.473
Location 3					Location 4				
.0	-.166	.079	.098	-.440	.0	-.172	.095	.098	-.587
Location 5					Location 6				
.0	-.104	.113	.460	-.587	.0	-.012	.153	.682	-.682
Location 7					Location 8				
.0	.113	.145	.765	-.317	.0	.203	.165	1.094	-.270
Location 9					Location 10				
.0	.203	.157	1.010	-.205	.0	.179	.165	1.247	-.300
Location 11					Location 12				
.0	.110	.151	.801	-.295	.0	.024	.136	.553	-.332
Location 13					Location 14				
.0	-.113	.139	.559	-.863	.0	-.156	.093	.168	-.592
Location 15					Location 16				
.0	-.157	.082	.160	-.575	.0	-.162	.073	.111	-.448
Location 17					Location 18				
.0	-.203	.095	.114	-.654	.0	-.212	.101	.151	-.609
Location 19					Location 20				
.0	-.182	.125	.384	-.770	.0	-.028	.130	.704	-.492
Location 21					Location 22				
.0	.000	.136	.639	-.409	.0	-.031	.132	.492	-.704
Location 23					Location 24				
.0	-.156	.141	.555	-.767	.0	-.211	.105	.114	-.636
Location 25					Location 26				
.0	-.197	.107	.163	-.669	.0	-.156	.110	.227	-.586
Location 27					Location 28				
.0	-.073	.129	.633	-.586	.0	-.138	.114	.292	-.698

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.626	.216	-.116	-1.486	.0	-.507	.190	-.049	-1.619
22.5	-.477	.184	.130	-1.164	22.5	-.549	.193	-.082	-1.410
45.0	-.317	.160	.199	-1.240	45.0	-.498	.182	.099	-1.223
67.5	-.153	.120	.199	-.830	67.5	-.372	.175	.099	-1.180
90.0	-.114	.098	.219	-.556	90.0	-.216	.119	.085	-.961
112.5	-.205	.104	.117	-.617	112.5	-.196	.090	.083	-.568
135.0	-.191	.125	.225	-.692	135.0	-.254	.113	.070	-.675
167.5	-.133	.096	.270	-.523	167.5	-.162	.110	.135	-.592
180.0	-.125	.086	.171	-.492	180.0	-.085	.080	.271	-.374
202.5	-.197	.110	.151	-.641	202.5	-.104	.086	.203	-.439
225.0	-.313	.141	.138	-.950	225.0	-.171	.089	.138	-.501
247.5	-.236	.110	.102	-.669	247.5	-.221	.126	.138	-.773
270.0	-.114	.089	.205	-.565	270.0	-.136	.107	.222	-.565
292.5	-.160	.113	.154	-.685	292.5	-.070	.107	.377	-.479
315.0	-.326	.172	.123	-1.155	315.0	-.142	.138	.525	-.787
337.5	-.531	.216	.034	-1.373	337.5	-.316	.151	.138	-.961
Location 3					Location 4				
.0	-.375	.175	.116	-1.372	.0	-.168	.102	.132	-.727
22.5	-.547	.206	-.049	-1.919	22.5	-.341	.176	.148	-1.278
45.0	-.586	.200	.033	-1.389	45.0	-.568	.208	-.033	-1.455
67.5	-.549	.191	.099	-1.478	67.5	-.633	.211	-.099	-1.579
90.0	-.341	.173	.119	-1.180	90.0	-.532	.208	.050	-1.366
112.5	-.182	.110	.168	-.684	112.5	-.316	.166	.168	-1.185
135.0	-.138	.092	.138	-.537	135.0	-.160	.117	.173	-.796
167.5	-.218	.093	.050	-.592	167.5	-.122	.092	.203	-.507
180.0	-.145	.102	.203	-.645	180.0	-.151	.096	.136	-.663
202.5	-.071	.077	.203	-.388	202.5	-.111	.089	.236	-.439
225.0	-.107	.080	.190	-.380	225.0	-.077	.079	.237	-.337
247.5	-.157	.092	.138	-.498	247.5	-.128	.092	.154	-.583
270.0	-.196	.129	.205	-.667	270.0	-.087	.095	.257	-.393
292.5	-.168	.099	.120	-.531	292.5	-.294	.113	.034	-.856
315.0	-.090	.086	.211	-.595	315.0	-.181	.102	.157	-.578
337.5	-.168	.130	.188	-.875	337.5	-.104	.086	.138	-.583
Location 5					Location 6				
.0	-.133	.086	.243	-.503	.0	-.123	.107	.308	-.488
22.5	-.148	.104	.160	-.847	22.5	-.021	.108	.384	-.368
45.0	-.332	.163	.096	-1.109	45.0	-.080	.138	.418	-.724
67.5	-.520	.196	.049	-1.277	67.5	-.259	.171	.598	-1.050
90.0	-.595	.215	-.082	-1.462	90.0	-.504	.203	.016	-1.527
112.5	-.495	.191	.049	-1.391	112.5	-.546	.190	-.082	-1.375
135.0	-.328	.175	.254	-1.084	135.0	-.546	.203	-.050	-1.305
167.5	-.129	.108	.280	-.675	167.5	-.314	.138	.065	-.939
180.0	-.104	.089	.231	-.431	180.0	-.200	.108	.132	-.845
202.5	-.116	.092	.197	-.460	202.5	-.178	.083	.098	-.590
225.0	-.089	.092	.236	-.472	225.0	-.156	.092	.185	-.522
247.5	-.077	.087	.251	-.384	247.5	-.147	.110	.117	-.584
270.0	-.126	.095	.168	-.467	270.0	-.108	.104	.184	-.501
292.5	-.193	.099	.133	-.517	292.5	-.132	.104	.233	-.517
315.0	-.093	.090	.188	-.393	315.0	-.163	.102	.171	-.529
337.5	-.107	.099	.234	-.552	337.5	-.022	.077	.268	-.285

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	-.153	.085	.098	-.472	.0	-.123	.077	.163	-.406
22.5	-.114	.083	.208	-.399	22.5	-.105	.082	.208	-.399
45.0	-.130	.083	.160	-.531	45.0	-.171	.099	.145	-.563
67.5	-.175	.108	.178	-.663	67.5	-.126	.083	.145	-.647
90.0	-.314	.150	.082	-.970	90.0	-.176	.120	.151	-.891
112.5	-.500	.179	.049	-1.228	112.5	-.400	.178	.065	-1.211
135.0	-.620	.188	-.085	-1.355	135.0	-.599	.222	-.119	-1.661
167.5	-.457	.178	-.049	-1.219	167.5	-.598	.209	-.049	-1.581
180.0	-.305	.160	.199	-1.094	180.0	-.486	.182	.000	-1.342
202.5	-.136	.110	.181	-.755	202.5	-.276	.150	.181	-1.017
225.0	-.074	.089	.219	-.506	225.0	-.123	.108	.258	-.695
247.5	-.101	.086	.267	-.417	247.5	-.085	.086	.216	-.400
270.0	-.122	.111	.267	-.618	270.0	-.197	.120	.117	-.635
292.5	-.090	.096	.283	-.417	292.5	-.114	.092	.233	-.534
315.0	-.122	.085	.188	-.445	315.0	-.114	.104	.239	-.495
337.5	-.071	.096	.301	-.552	337.5	-.142	.082	.117	-.485
Location 9					Location 10				
.0	-.095	.080	.128	-.399	.0	-.165	.092	.160	-.512
22.5	-.090	.082	.159	-.383	22.5	-.114	.082	.128	-.445
45.0	-.163	.090	.128	-.512	45.0	-.074	.083	.208	-.417
67.5	-.188	.108	.129	-.595	67.5	-.116	.105	.225	-.515
90.0	-.130	.085	.147	-.474	90.0	-.130	.111	.359	-.638
112.5	-.176	.102	.178	-.888	112.5	-.064	.093	.371	-.420
135.0	-.371	.168	.085	-1.081	135.0	-.157	.123	.203	-.946
167.5	-.553	.184	.016	-1.312	167.5	-.316	.159	.230	-.919
180.0	-.621	.215	-.116	-1.587	180.0	-.480	.172	-.016	-1.272
202.5	-.480	.193	.196	-1.326	202.5	-.598	.202	-.033	-1.701
225.0	-.317	.169	.085	-1.074	225.0	-.504	.182	-.067	-1.409
247.5	-.130	.110	.182	-.715	247.5	-.340	.163	.083	-1.197
270.0	-.107	.093	.233	-.466	270.0	-.214	.110	.133	-.816
292.5	-.147	.105	.216	-.632	292.5	-.187	.095	.133	-.615
315.0	-.319	.125	.016	-.767	315.0	-.240	.117	.102	-.681
337.5	-.218	.090	.067	-.583	337.5	-.357	.128	-.016	-.916
Location 11					Location 12				
.0	-.254	.108	.080	-.799	.0	-.225	.104	.080	-.592
22.5	-.188	.090	.095	-.477	22.5	-.304	.110	.128	-.795
45.0	-.087	.079	.176	-.417	45.0	-.151	.086	.144	-.512
67.5	-.111	.092	.160	-.515	67.5	-.102	.080	.176	-.402
90.0	-.126	.090	.228	-.507	90.0	-.086	.085	.196	-.408
112.5	-.160	.086	.129	-.565	112.5	-.208	.117	.096	-.581
135.0	-.157	.087	.219	-.658	135.0	-.227	.098	.135	-.676
167.5	-.163	.105	.165	-.771	167.5	-.136	.079	.181	-.525
180.0	-.343	.165	.165	-1.157	180.0	-.193	.117	.148	-.810
202.5	-.540	.196	-.082	-1.717	202.5	-.362	.169	.049	-1.226
225.0	-.612	.199	-.117	-1.409	225.0	-.555	.196	-.034	-1.542
247.5	-.482	.185	.033	-1.312	247.5	-.595	.205	-.067	-1.679
270.0	-.305	.159	.200	-1.198	270.0	-.504	.200	.016	-1.514
292.5	-.150	.111	.233	-.715	292.5	-.313	.169	.083	-.980
315.0	-.135	.087	.187	-.477	315.0	-.148	.119	.171	-.817
337.5	-.227	.104	.083	-.615	337.5	-.135	.079	.133	-.433

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	-.130	.093	.212	-.501	.0	-.221	.102	.082	-.866
22.5	-.184	.101	.145	-.627	22.5	-.181	.090	.064	-.709
45.0	-.234	.126	.145	-.971	45.0	-.257	.108	.065	-.826
67.5	-.147	.099	.179	-.569	67.5	-.292	.108	.000	-.731
90.0	-.110	.092	.182	-.513	90.0	-.150	.098	.199	-.529
112.5	-.119	.101	.165	-.509	112.5	-.108	.083	.214	-.394
135.0	-.279	.147	.187	-.835	135.0	-.154	.111	.171	-.546
167.5	-.206	.110	.231	-.645	167.5	-.206	.132	.182	-.762
180.0	-.150	.095	.133	-.534	180.0	-.168	.104	.184	-.534
202.5	-.182	.119	.264	-.826	202.5	-.095	.102	.231	-.546
225.0	-.337	.163	.169	-1.063	225.0	-.120	.119	.304	-.727
247.5	-.516	.203	.083	-1.502	247.5	-.310	.173	.234	-1.136
270.0	-.580	.221	.000	-1.477	270.0	-.512	.196	.218	-1.241
292.5	-.519	.214	.067	-1.462	292.5	-.629	.205	-.135	-1.428
315.0	-.335	.175	.052	-1.207	315.0	-.544	.206	-.018	-1.673
337.5	-.142	.116	.254	-.844	337.5	-.335	.148	.016	-1.029
Location 15					Location 16				
.0	-.377	.185	.065	-1.241	.0	-.523	.188	.033	-1.355
22.5	-.154	.110	.113	-.789	22.5	-.311	.171	.193	-1.191
45.0	-.126	.092	.194	-.534	45.0	-.139	.111	.178	-.793
67.5	-.205	.096	.130	-.635	67.5	-.126	.086	.179	-.472
90.0	-.230	.116	.199	-.645	90.0	-.225	.117	.099	-.744
112.5	-.139	.093	.197	-.492	112.5	-.227	.128	.132	-.673
135.0	-.102	.080	.205	-.409	135.0	-.117	.096	.205	-.426
167.5	-.043	.073	.199	-.282	167.5	-.108	.085	.166	-.414
180.0	-.218	.119	.200	-.617	180.0	-.157	.087	.099	-.500
202.5	-.224	.098	.083	-.678	202.5	-.286	.128	.116	-.777
225.0	-.133	.085	.203	-.540	225.0	-.254	.108	.085	-.743
247.5	-.168	.119	.221	-.872	247.5	-.141	.086	.133	-.552
270.0	-.357	.175	.050	-1.259	270.0	-.162	.116	.151	-.773
292.5	-.509	.185	.034	-1.311	292.5	-.380	.182	.117	-1.176
315.0	-.605	.199	.018	-1.449	315.0	-.556	.225	-.070	-1.810
337.5	-.560	.208	-.050	-1.671	337.5	-.598	.209	-.034	-1.434
Location 17					Location 18				
.0	-.074	.110	.341	-.543	.0	-.055	.104	.313	-.510
22.5	-.079	.110	.362	-.608	22.5	-.083	.113	.329	-.657
45.0	-.077	.105	.280	-.446	45.0	-.086	.114	.347	-.512
67.5	-.070	.096	.265	-.516	67.5	-.090	.113	.300	-.666
90.0	-.068	.093	.254	-.405	90.0	-.083	.102	.237	-.574
112.5	-.071	.087	.252	-.353	112.5	-.074	.098	.268	-.420
135.0	-.042	.095	.279	-.365	135.0	-.065	.098	.331	-.434
167.5	-.015	.089	.304	-.288	167.5	-.036	.090	.288	-.304
180.0	-.004	.090	.323	-.307	180.0	-.025	.089	.341	-.341
202.5	-.031	.090	.286	-.337	202.5	-.009	.089	.320	-.437
225.0	-.050	.089	.310	-.380	225.0	-.007	.089	.362	-.310
247.5	-.065	.092	.307	-.375	247.5	-.010	.092	.325	-.325
270.0	-.043	.093	.273	-.375	270.0	-.019	.093	.273	-.409
292.5	-.062	.105	.393	-.497	292.5	-.039	.098	.411	-.393
315.0	-.050	.105	.368	-.437	315.0	-.049	.096	.314	-.420
337.5	-.073	.110	.431	-.483	337.5	-.053	.093	.276	-.431

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	-.044	.089	.280	-.329	.0	-.070	.083	.249	-.350
22.5	-.042	.098	.279	-.394	22.5	-.068	.080	.246	-.377
45.0	-.062	.098	.380	-.512	45.0	-.101	.085	.231	-.430
67.5	-.071	.108	.300	-.516	67.5	-.102	.090	.332	-.383
90.0	-.083	.110	.288	-.523	90.0	-.113	.098	.270	-.558
112.5	-.108	.107	.285	-.537	112.5	-.104	.099	.366	-.583
135.0	-.102	.110	.279	-.678	135.0	-.107	.101	.242	-.568
167.5	-.080	.093	.237	-.423	167.5	-.064	.095	.268	-.688
180.0	-.074	.095	.273	-.409	180.0	-.055	.099	.323	-.494
202.5	-.059	.090	.371	-.353	202.5	-.033	.093	.388	-.354
225.0	-.025	.092	.345	-.362	225.0	.003	.096	.328	-.345
247.5	-.009	.089	.375	-.341	247.5	.007	.087	.326	-.308
270.0	.001	.092	.325	-.307	270.0	-.009	.087	.292	-.308
292.5	-.004	.092	.308	-.343	292.5	.022	.087	.343	-.291
315.0	-.001	.090	.332	-.350	315.0	-.010	.087	.262	-.332
337.5	-.037	.092	.328	-.380	337.5	-.027	.087	.294	-.294
Location 21					Location 22				
.0	-.018	.086	.283	-.350	.0	-.049	.083	.249	-.316
22.5	-.009	.082	.360	-.279	22.5	-.016	.083	.279	-.360
45.0	-.025	.083	.347	-.298	45.0	.001	.085	.363	-.347
67.5	-.039	.082	.300	-.348	67.5	-.006	.086	.300	-.365
90.0	-.052	.092	.354	-.406	90.0	-.010	.085	.304	-.338
112.5	-.058	.086	.233	-.500	112.5	-.034	.083	.249	-.300
135.0	-.067	.093	.258	-.517	135.0	-.052	.086	.310	-.380
167.5	-.062	.098	.335	-.403	167.5	-.039	.087	.268	-.436
180.0	-.080	.098	.341	-.460	180.0	-.079	.101	.255	-.546
202.5	-.085	.107	.338	-.523	202.5	-.090	.105	.254	-.676
225.0	-.070	.096	.294	-.397	225.0	-.082	.111	.501	-.605
247.5	-.052	.092	.308	-.360	247.5	-.076	.107	.411	-.617
270.0	-.046	.089	.326	-.326	270.0	-.070	.098	.274	-.394
292.5	-.036	.085	.274	-.325	292.5	-.046	.096	.308	-.360
315.0	-.028	.085	.280	-.350	315.0	-.052	.086	.280	-.437
337.5	-.050	.080	.259	-.311	337.5	-.059	.087	.277	-.397
Location 23					Location 24				
.0	-.074	.093	.305	-.439	.0	-.070	.105	.298	-.546
22.5	-.068	.089	.280	-.363	22.5	-.067	.093	.248	-.380
45.0	-.037	.092	.329	-.378	45.0	-.042	.092	.297	-.345
67.5	-.006	.093	.313	-.297	67.5	-.043	.093	.297	-.380
90.0	.001	.090	.369	-.353	90.0	-.028	.096	.353	-.369
112.5	-.009	.093	.316	-.332	112.5	-.009	.096	.350	-.433
135.0	-.044	.098	.294	-.396	135.0	-.001	.096	.380	-.345
167.5	-.042	.092	.301	-.402	167.5	-.006	.093	.386	-.386
180.0	-.065	.093	.237	-.406	180.0	-.022	.093	.338	-.322
202.5	-.059	.104	.301	-.434	202.5	-.042	.095	.334	-.417
225.0	-.083	.110	.294	-.535	225.0	-.064	.093	.294	-.415
247.5	-.073	.116	.412	-.566	247.5	-.065	.102	.326	-.515
270.0	-.067	.119	.513	-.565	270.0	-.070	.102	.359	-.393
292.5	-.065	.123	.547	-.666	292.5	-.077	.119	.325	-.479
315.0	-.070	.111	.366	-.506	315.0	-.087	.117	.314	-.540
337.5	-.074	.102	.259	-.535	337.5	-.089	.104	.276	-.466

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 25					Location 26				
.0	-.046	.095	.397	-.397	.0	-.040	.093	.302	-.397
22.5	-.036	.099	.396	-.429	22.5	-.030	.095	.279	-.409
45.0	-.028	.095	.378	-.362	45.0	-.040	.093	.297	-.396
67.5	-.040	.092	.331	-.313	67.5	-.042	.096	.314	-.414
90.0	-.033	.093	.319	-.337	90.0	-.052	.095	.270	-.388
112.5	-.036	.092	.350	-.350	112.5	-.043	.098	.381	-.415
135.0	-.019	.096	.328	-.380	135.0	-.040	.105	.412	-.482
167.5	-.007	.089	.319	-.301	167.5	-.039	.093	.251	-.351
180.0	-.003	.095	.388	-.372	180.0	-.033	.093	.405	-.437
202.5	-.010	.092	.350	-.368	202.5	-.027	.095	.350	-.417
225.0	-.028	.095	.431	-.363	225.0	-.027	.096	.362	-.362
247.5	-.036	.095	.292	-.360	247.5	-.019	.093	.325	-.343
270.0	-.028	.095	.291	-.359	270.0	-.006	.099	.307	-.393
292.5	-.033	.096	.393	-.359	292.5	-.006	.099	.359	-.343
315.0	-.028	.098	.297	-.384	315.0	-.013	.096	.332	-.368
337.5	-.036	.099	.310	-.414	337.5	-.012	.096	.359	-.393
Location 27					Location 28				
.0	-.021	.098	.314	-.332	.0	-.056	.092	.348	-.381
22.5	-.018	.093	.377	-.377	22.5	-.031	.096	.344	-.393
45.0	-.027	.095	.280	-.345	45.0	-.021	.093	.280	-.329
67.5	-.033	.092	.298	-.381	67.5	-.021	.095	.314	-.365
90.0	-.040	.101	.320	-.405	90.0	-.016	.095	.372	-.320
112.5	-.037	.096	.365	-.365	112.5	-.015	.090	.381	-.365
135.0	-.049	.098	.362	-.362	135.0	-.027	.095	.310	-.378
167.5	-.034	.095	.368	-.368	167.5	-.015	.092	.334	-.334
180.0	-.033	.093	.302	-.337	180.0	-.034	.098	.286	-.371
202.5	-.028	.099	.334	-.400	202.5	-.037	.096	.283	-.366
225.0	-.043	.098	.466	-.414	225.0	-.043	.098	.345	-.414
247.5	-.036	.099	.325	-.427	247.5	-.040	.099	.377	-.393
270.0	-.024	.098	.393	-.393	270.0	-.037	.104	.291	-.443
292.5	-.018	.099	.411	-.343	292.5	-.025	.105	.343	-.411
315.0	-.022	.099	.332	-.368	315.0	-.040	.101	.298	-.403
337.5	-.022	.093	.291	-.359	337.5	-.036	.098	.359	-.359

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.314	.095	.033	-.700	.0	-.294	.096	.065	-.733
22.5	-.279	.087	.000	-.606	22.5	-.295	.092	.000	-.721
45.0	-.261	.101	.065	-.722	45.0	-.279	.093	.000	-.789
67.5	-.228	.150	.310	-.860	67.5	-.283	.117	.052	-.912
90.0	-.042	.141	.603	-.995	90.0	-.194	.139	.277	-.913
112.5	.108	.145	.768	-.409	112.5	-.034	.142	.443	-.598
135.0	.200	.157	.875	-.302	135.0	.102	.138	.657	-.286
167.5	.246	.151	.974	-.248	167.5	.168	.141	.907	-.412
180.0	.268	.162	1.090	-.119	180.0	.265	.159	.902	-.221
202.5	.240	.157	.870	-.257	202.5	.276	.169	.991	-.257
225.0	.206	.157	.879	-.310	225.0	.271	.176	1.103	-.258
247.5	.099	.126	.587	-.636	247.5	.194	.150	.948	-.261
270.0	-.047	.139	.470	-.890	270.0	.117	.153	.721	-.503
292.5	-.228	.151	.273	-.924	292.5	-.061	.147	.427	-.804
315.0	-.294	.111	.068	-.838	315.0	-.245	.147	.273	-1.008
337.5	-.305	.098	.099	-.698	337.5	-.291	.117	.067	-.698
Location 3					Location 4				
.0	-.292	.122	.098	-1.042	.0	-.212	.142	.228	-1.108
22.5	-.288	.093	.016	-.704	22.5	-.274	.104	.082	-.835
45.0	-.288	.085	-.016	-.575	45.0	-.289	.096	.181	-.756
67.5	-.307	.098	.000	-.688	67.5	-.301	.082	-.034	-.602
90.0	-.271	.110	.065	-.946	90.0	-.292	.085	.000	-.636
112.5	-.230	.159	.273	-.921	112.5	-.283	.107	.018	-.870
135.0	-.055	.138	.506	-.673	135.0	-.230	.160	.219	-1.010
167.5	-.096	.139	.577	-.611	167.5	-.052	.147	.528	-.824
180.0	.185	.144	.988	-.391	180.0	.111	.147	.681	-.323
202.5	.206	.142	1.007	-.136	202.5	.188	.150	1.007	-.205
225.0	.277	.166	.897	-.224	225.0	.231	.153	.949	-.190
247.5	.240	.153	.980	-.147	247.5	.276	.169	1.143	-.114
270.0	.182	.148	.906	-.285	270.0	.251	.162	.906	-.117
292.5	.089	.142	.667	-.359	292.5	.184	.148	.786	-.239
315.0	-.074	.154	.513	-.838	315.0	.082	.141	.598	-.377
337.5	-.248	.154	.283	-1.014	337.5	-.068	.139	.498	-.715
Location 5					Location 6				
.0	-.044	.156	.621	-.811	.0	.102	.162	.955	-.796
22.5	-.196	.135	.304	-.912	22.5	-.034	.160	.641	-.799
45.0	-.254	.095	.047	-.770	45.0	-.233	.166	.320	-1.106
67.5	-.300	.090	.016	-.621	67.5	-.300	.130	.050	-1.059
90.0	-.288	.080	.016	-.639	90.0	-.302	.086	.016	-.687
112.5	-.289	.086	.184	-.633	112.5	-.298	.098	.050	-.649
135.0	-.282	.111	.181	-.821	135.0	-.274	.090	.099	-.675
167.5	-.218	.153	.258	-1.130	167.5	-.249	.093	.049	-.598
180.0	-.059	.154	.765	-1.097	180.0	-.203	.128	.332	-.881
202.5	.083	.141	.684	-.433	202.5	-.058	.122	.350	-.684
225.0	.176	.154	.976	-.270	225.0	.082	.135	.623	-.403
247.5	.228	.163	.924	-.208	247.5	.162	.133	.685	-.319
270.0	.280	.168	.965	-.147	270.0	.254	.160	.833	-.245
292.5	.270	.162	.950	-.251	292.5	.258	.172	1.034	-.251
315.0	.187	.156	.965	-.249	315.0	.237	.154	.982	-.300
337.5	.092	.147	.712	-.356	337.5	.187	.150	.808	-.307

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	.185	.144	.875	-.222	.0	.237	.147	1.130	-.159
22.5	.073	.129	.560	-.400	22.5	.194	.141	.768	-.208
45.0	-.090	.132	.305	-.626	45.0	.079	.133	.657	-.466
67.5	-.230	.142	.151	-.857	67.5	-.079	.160	.537	-1.125
90.0	-.262	.101	.064	-.687	90.0	-.237	.150	.208	-1.069
112.5	-.295	.089	.000	-.617	112.5	-.283	.108	.166	-.734
135.0	-.291	.086	.000	-.608	135.0	-.301	.090	-.033	-.675
167.5	-.283	.087	.016	-.645	167.5	-.276	.089	.033	-.629
180.0	-.274	.107	.133	-.816	180.0	-.286	.085	.000	-.565
202.5	-.218	.153	.360	-.974	202.5	-.282	.117	.083	-.900
225.0	-.039	.154	.673	-.893	225.0	-.218	.151	.302	-.925
247.5	.099	.144	.652	-.366	247.5	-.034	.139	.574	-.558
270.0	.187	.162	.998	-.228	270.0	.093	.144	.933	-.474
292.5	.255	.160	.967	-.184	292.5	.196	.157	.817	-.317
315.0	.249	.169	.982	-.300	315.0	.245	.165	1.082	-.166
337.5	.236	.154	1.068	-.178	337.5	.259	.160	1.084	-.113
Location 9					Location 10				
.0	.294	.172	.983	-.111	.0	.251	.162	1.031	-.175
22.5	.243	.159	1.004	-.208	22.5	.267	.172	1.131	-.191
45.0	.178	.133	.862	-.175	45.0	.265	.157	1.102	-.111
67.5	.099	.151	.802	-.501	67.5	.219	.168	1.121	-.384
90.0	-.037	.142	.581	-.676	90.0	.113	.148	.707	-.314
112.5	-.218	.139	.265	-.881	112.5	-.061	.156	.549	-.798
135.0	-.288	.108	.033	-.770	135.0	-.225	.154	.311	-.999
167.5	-.288	.092	-.016	-.644	167.5	-.280	.102	.096	-.773
180.0	-.274	.087	.000	-.525	180.0	-.286	.092	.065	-.672
202.5	-.291	.087	.116	-.664	202.5	-.298	.089	.182	-.598
225.0	-.279	.122	.133	-.888	225.0	-.291	.095	.067	-.687
247.5	-.222	.142	.254	-1.047	247.5	-.262	.101	.031	-.618
270.0	-.050	.142	.602	-.716	270.0	-.221	.142	.343	-.863
292.5	.108	.145	.778	-.431	292.5	-.037	.135	.480	-.713
315.0	.209	.159	.945	-.249	315.0	.102	.141	.663	-.298
337.5	.268	.157	.885	-.145	337.5	.205	.145	.789	-.176
Location 11					Location 12				
.0	.191	.151	.697	-.222	.0	.086	.132	.587	-.412
22.5	.212	.153	1.115	-.335	22.5	.169	.144	.749	-.286
45.0	.252	.165	1.005	-.144	45.0	.237	.166	.942	-.271
67.5	.248	.165	1.071	-.200	67.5	.237	.157	.919	-.133
90.0	.208	.148	.755	-.252	90.0	.264	.145	.802	-.141
112.5	.080	.147	.632	-.466	112.5	.187	.150	.764	-.233
135.0	-.064	.139	.458	-.869	135.0	.098	.141	.804	-.295
167.5	-.222	.133	.209	-1.045	167.5	-.067	.139	.611	-.627
180.0	-.261	.110	.065	-.902	180.0	-.203	.141	.311	-.967
202.5	-.273	.085	.016	-.581	202.5	-.285	.105	.099	-.796
225.0	-.292	.086	.034	-.553	225.0	-.292	.085	-.016	-.553
247.5	-.277	.085	-.016	-.587	247.5	-.291	.082	-.016	-.602
270.0	-.280	.117	.098	-1.010	270.0	-.286	.079	-.033	-.618
292.5	-.200	.148	.414	-.928	292.5	-.277	.107	.033	-.845
315.0	-.053	.148	.480	-.746	315.0	-.206	.150	.397	-.928
337.5	.105	.150	.756	-.322	337.5	-.036	.147	.515	-.789

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	-.049	.147	.644	-.804	.0	-.209	.126	.257	-.853
22.5	.074	.130	.596	-.403	22.5	-.052	.136	.692	-.645
45.0	.157	.147	.728	-.243	45.0	.096	.126	.648	-.323
67.5	.254	.165	.933	-.203	67.5	.197	.151	.796	-.305
90.0	.264	.165	1.078	-.869	90.0	.258	.159	.804	-.289
112.5	.249	.156	.942	-.168	112.5	.286	.181	1.042	-.185
135.0	.191	.147	.991	-.297	135.0	.261	.166	.974	-.231
167.5	.096	.138	.695	-.452	167.5	.188	.150	.841	-.211
180.0	-.059	.135	.552	-.784	180.0	.085	.147	.701	-.368
202.5	-.227	.138	.418	-.836	202.5	-.056	.159	.618	-.836
225.0	-.282	.119	.135	-.810	225.0	-.237	.163	.304	-1.198
247.5	-.265	.085	-.016	-.592	247.5	-.279	.116	.111	-.847
270.0	-.291	.089	.033	-.639	270.0	-.302	.085	.000	-.623
292.5	-.292	.101	.067	-.687	292.5	-.283	.077	-.050	-.569
315.0	-.273	.107	.050	-.719	315.0	-.276	.090	.000	-.652
337.5	-.212	.153	.292	-.991	337.5	-.262	.111	.049	-.764
Location 15					Location 16				
.0	-.286	.116	.129	-.836	.0	-.285	.089	.064	-.675
22.5	-.214	.142	.261	-.925	22.5	-.267	.101	.064	-.709
45.0	-.058	.148	.810	-.826	45.0	-.225	.151	.356	-1.051
67.5	.086	.142	.780	-.322	67.5	-.070	.157	.474	-.762
90.0	.176	.135	.691	-.434	90.0	.102	.139	.627	-.434
112.5	.261	.165	.891	-.236	112.5	.182	.145	.875	-.319
135.0	.276	.176	1.106	-.116	135.0	.262	.165	.974	-.231
167.5	.234	.153	.937	-.258	167.5	.254	.156	.970	-.129
180.0	.181	.144	.869	-.200	180.0	.262	.165	1.152	-.184
202.5	.079	.141	.669	-.469	202.5	.181	.147	.786	-.267
225.0	-.042	.135	.455	-.556	225.0	.071	.135	.776	-.371
247.5	-.211	.145	.304	-.799	247.5	-.055	.159	.512	-.735
270.0	-.277	.114	.065	-.885	270.0	-.215	.139	.360	-.787
292.5	-.292	.095	.016	-.586	292.5	-.277	.119	.168	-.753
315.0	-.297	.085	-.016	-.652	315.0	-.286	.090	.067	-.618
337.5	-.289	.089	.016	-.633	337.5	-.283	.077	.000	-.552
Location 17					Location 18				
.0	-.354	.129	.049	-.950	.0	-.274	.138	.230	-.885
22.5	-.302	.128	.231	-.776	22.5	-.325	.129	.132	-.991
45.0	-.233	.132	.331	-.808	45.0	-.322	.122	.116	-.891
67.5	-.136	.160	.485	-.761	67.5	-.320	.130	.242	-.882
90.0	-.006	.133	.781	-.455	90.0	-.228	.145	.391	-.863
112.5	.064	.135	.512	-.443	112.5	-.126	.157	.494	-.682
135.0	.114	.130	.605	-.319	135.0	-.004	.139	.587	-.520
167.5	.141	.120	.642	-.297	167.5	.049	.125	.692	-.380
180.0	.150	.125	.647	-.221	180.0	.126	.126	.595	-.289
202.5	.139	.123	.630	-.323	202.5	.148	.132	.783	-.273
225.0	.122	.128	.635	-.377	225.0	.166	.129	.771	-.292
247.5	.065	.117	.617	-.423	247.5	.150	.122	.633	-.243
270.0	-.003	.138	.584	-.635	270.0	.139	.132	.617	-.301
292.5	-.116	.156	.528	-.647	292.5	.062	.123	.578	-.391
315.0	-.234	.138	.525	-.661	315.0	.000	.139	.492	-.543
337.5	-.313	.132	.199	-.793	337.5	-.104	.150	.446	-.678

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	.000	.139	.574	-.426	.0	.119	.123	.541	-.328
22.5	-.123	.159	.544	-.859	22.5	.044	.122	.578	-.412
45.0	-.254	.138	.264	-.859	45.0	-.027	.119	.448	-.430
67.5	-.325	.133	.311	-.864	67.5	-.133	.147	.469	-.676
90.0	-.304	.117	.163	-.814	90.0	-.236	.129	.344	-.802
112.5	-.313	.128	.119	-.835	112.5	-.294	.116	.205	-.767
135.0	-.245	.139	.302	-1.075	135.0	-.313	.120	.304	-.741
167.5	-.136	.151	.512	-.725	167.5	-.277	.122	.282	-.712
180.0	-.006	.135	.460	-.510	180.0	-.224	.130	.391	-.648
202.5	.044	.126	.544	-.426	202.5	-.113	.148	.546	-.614
225.0	.110	.126	.566	-.292	225.0	-.004	.144	.517	-.535
247.5	.126	.122	.633	-.259	247.5	.062	.129	.605	-.344
270.0	.154	.126	.651	-.216	270.0	.117	.125	.572	-.236
292.5	.154	.128	.612	-.273	292.5	.166	.128	.598	-.291
315.0	.114	.126	.661	-.424	315.0	.159	.123	.649	-.222
337.5	.064	.133	.678	-.414	337.5	.148	.117	.681	-.316
Location 21					Location 22				
.0	.139	.126	.590	-.393	.0	.111	.117	.590	-.344
22.5	.141	.125	.627	-.314	22.5	.113	.116	.611	-.347
45.0	.116	.123	.563	-.298	45.0	.147	.128	.647	-.331
67.5	.064	.129	.624	-.311	67.5	.130	.129	.642	-.311
90.0	-.004	.133	.572	-.540	90.0	.122	.123	.621	-.344
112.5	-.120	.156	.528	-.664	112.5	.068	.132	.664	-.733
135.0	-.227	.142	.590	-.859	135.0	-.009	.144	.641	-.556
167.5	-.282	.117	.248	-.844	167.5	-.107	.138	.580	-.529
180.0	-.317	.126	.205	-.783	180.0	-.227	.133	.391	-.919
202.5	-.302	.125	.257	-.784	202.5	-.283	.113	.052	-.750
225.0	-.225	.141	.500	-.845	225.0	-.320	.116	.172	-.759
247.5	-.092	.148	.458	-.721	247.5	-.294	.122	.212	-.802
270.0	-.009	.148	.623	-.420	270.0	-.212	.139	.286	-1.127
292.5	.076	.126	.615	-.547	292.5	-.093	.145	.445	-.666
315.0	.113	.120	.546	-.427	315.0	-.004	.142	.580	-.563
337.5	.148	.114	.664	-.265	337.5	.073	.133	.547	-.431
Location 23					Location 24				
.0	.001	.136	.651	-.520	.0	-.181	.169	.602	-.993
22.5	.049	.125	.572	-.491	22.5	-.129	.156	.409	-.737
45.0	.093	.122	.525	-.362	45.0	-.003	.132	.492	-.575
67.5	.144	.133	.638	-.276	67.5	.064	.135	.586	-.586
90.0	.148	.130	.768	-.310	90.0	.116	.129	.589	-.277
112.5	.139	.133	.651	-.308	112.5	.147	.138	.770	-.291
135.0	.105	.132	.676	-.338	135.0	.156	.132	.676	-.271
167.5	.064	.129	.644	-.412	167.5	.136	.123	.792	-.264
180.0	-.009	.139	.798	-.492	180.0	.116	.122	.577	-.340
202.5	-.125	.151	.544	-.918	202.5	.071	.144	.697	-.595
225.0	-.227	.147	.344	-.740	225.0	-.015	.156	.636	-.568
247.5	-.265	.126	.488	-.682	247.5	-.117	.151	.439	-.667
270.0	-.311	.129	.133	-.786	270.0	-.246	.150	.452	-.836
292.5	-.294	.132	.153	-.749	292.5	-.301	.122	.239	-.783
315.0	-.254	.148	.274	-.756	315.0	-.323	.125	.104	-.774
337.5	-.092	.160	.529	-.710	337.5	-.280	.133	.479	-.810

Cermak Peterka Petersen, Inc.

C-15

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 25					Location 26				
.0	-.135	.138	.586	-.618	.0	.018	.133	.488	-.504
22.5	-.122	.135	.393	-.606	22.5	-.024	.129	.507	-.540
45.0	-.099	.133	.492	-.525	45.0	-.085	.129	.443	-.509
67.5	-.025	.142	.550	-.500	67.5	-.126	.136	.464	-.584
90.0	.022	.129	.621	-.491	90.0	-.136	.129	.426	-.556
112.5	.053	.129	.615	-.497	112.5	-.142	.133	.443	-.649
135.0	.071	.123	.609	-.372	135.0	-.102	.141	.405	-.590
167.5	.092	.119	.528	-.380	167.5	-.033	.128	.477	-.526
180.0	.099	.119	.526	-.356	180.0	.012	.130	.494	-.477
202.5	.079	.120	.562	-.323	202.5	.037	.129	.546	-.477
225.0	.093	.130	.670	-.326	225.0	.077	.128	.586	-.396
247.5	.062	.126	.618	-.357	247.5	.082	.122	.589	-.391
270.0	.007	.129	.586	-.636	270.0	.099	.122	.587	-.436
292.5	-.034	.141	.494	-.510	292.5	.104	.123	.580	-.359
315.0	-.098	.138	.378	-.568	315.0	.079	.130	.801	-.357
337.5	-.117	.128	.363	-.578	337.5	.049	.126	.563	-.414
Location 27					Location 28				
.0	.080	.132	.504	-.569	.0	.022	.130	.520	-.455
22.5	.098	.126	.589	-.605	22.5	.036	.119	.426	-.344
45.0	.086	.128	.558	-.362	45.0	.070	.126	.624	-.345
67.5	.067	.132	.584	-.412	67.5	.093	.133	.584	-.326
90.0	.012	.136	.572	-.442	90.0	.102	.120	.572	-.261
112.5	-.049	.141	.529	-.529	112.5	.093	.129	.581	-.341
135.0	-.082	.147	.590	-.725	135.0	.080	.133	.606	-.472
167.5	-.119	.132	.429	-.675	167.5	.047	.120	.510	-.412
180.0	-.145	.142	.391	-.664	180.0	.007	.129	.546	-.460
202.5	-.133	.144	.495	-.682	202.5	-.056	.133	.461	-.700
225.0	-.076	.141	.482	-.638	225.0	-.080	.142	.466	-.552
247.5	-.019	.136	.489	-.457	247.5	-.111	.129	.621	-.605
270.0	.016	.142	.603	-.436	270.0	-.135	.144	.537	-.670
292.5	.044	.126	.632	-.393	292.5	-.119	.136	.477	-.666
315.0	.076	.123	.562	-.357	315.0	-.086	.142	.562	-.546
337.5	.098	.116	.547	-.282	337.5	-.030	.133	.630	-.448

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.150	.073	.205	-.443	.0	-.162	.071	.085	-.409
22.5	-.171	.079	.085	-.443	22.5	-.168	.068	.102	-.375
45.0	-.172	.079	.086	-.466	45.0	-.160	.077	.138	-.448
67.5	-.163	.087	.132	-.529	67.5	-.148	.080	.099	-.495
90.0	-.182	.130	.219	-.844	90.0	-.156	.090	.185	-.489
112.5	-.039	.139	.820	-.599	112.5	-.145	.117	.222	-.752
135.0	.076	.172	.988	-.519	135.0	-.019	.126	.486	-.418
167.5	.181	.166	1.001	-.374	167.5	.116	.148	.730	-.305
180.0	.200	.156	1.048	-.214	180.0	.200	.168	1.262	-.181
202.5	.175	.165	1.161	-.255	202.5	.205	.181	1.019	-.340
225.0	.093	.156	.814	-.311	225.0	.148	.173	1.246	-.710
247.5	-.042	.132	.504	-.504	247.5	.058	.154	.774	-.488
270.0	-.128	.126	.371	-.590	270.0	-.085	.153	.405	-.928
292.5	-.147	.098	.257	-.580	292.5	-.157	.128	.171	-.905
315.0	-.147	.086	.139	-.520	315.0	-.176	.107	.191	-.606
337.5	-.153	.079	.135	-.457	337.5	-.165	.077	.085	-.457
Location 3					Location 4				
.0	-.166	.079	.136	-.578	.0	-.163	.099	.171	-.578
22.5	-.160	.080	.153	-.391	22.5	-.160	.071	.119	-.477
45.0	-.172	.074	.068	-.448	45.0	-.162	.080	.120	-.534
67.5	-.151	.074	.116	-.446	67.5	-.162	.076	.099	-.414
90.0	-.162	.077	.101	-.473	90.0	-.168	.076	.085	-.473
112.5	-.168	.090	.171	-.684	112.5	-.175	.077	.136	-.461
135.0	-.150	.126	.402	-.905	135.0	-.171	.085	.133	-.535
167.5	-.056	.135	.661	-.764	167.5	-.169	.129	.305	-.781
180.0	.099	.156	.853	-.377	180.0	-.049	.135	.541	-.442
202.5	.179	.165	1.326	-.171	202.5	.099	.163	.900	-.340
225.0	.199	.151	1.160	-.225	225.0	.209	.173	1.090	-.277
247.5	.168	.157	1.143	-.268	247.5	.184	.157	.907	-.268
270.0	.077	.141	.658	-.388	270.0	.181	.171	1.081	-.354
292.5	-.067	.125	.495	-.580	292.5	.067	.154	.870	-.359
315.0	-.139	.120	.313	-.572	315.0	-.058	.125	.451	-.606
337.5	-.153	.086	.153	-.457	337.5	-.135	.116	.203	-.574
Location 5					Location 6				
.0	-.129	.114	.381	-.529	.0	-.076	.147	.762	-.961
22.5	-.166	.090	.148	-.497	22.5	-.181	.111	.199	-.645
45.0	-.160	.079	.117	-.418	45.0	-.165	.096	.184	-.451
67.5	-.142	.074	.113	-.402	67.5	-.150	.077	.160	-.449
90.0	-.156	.079	.130	-.409	90.0	-.153	.076	.114	-.442
112.5	-.154	.073	.148	-.414	112.5	-.153	.076	.199	-.529
135.0	-.157	.082	.113	-.437	135.0	-.147	.083	.211	-.421
167.5	-.169	.095	.130	-.558	167.5	-.142	.082	.230	-.474
180.0	-.157	.110	.257	-.577	180.0	-.141	.087	.273	-.417
202.5	-.043	.142	.612	-.513	202.5	-.126	.119	.430	-.546
225.0	.104	.159	.810	-.354	225.0	-.009	.133	.590	-.574
247.5	.188	.172	1.077	-.331	247.5	.113	.132	.728	-.265
270.0	.211	.178	1.361	-.332	270.0	.181	.173	1.062	-.233
292.5	.168	.176	1.361	-.252	292.5	.181	.181	1.226	-.268
315.0	.067	.159	.950	-.414	315.0	.133	.194	1.111	-.411
337.5	-.055	.135	.427	-.706	337.5	.028	.163	1.068	-.887

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	.079	.163	.943	-.480	.0	.185	.154	.844	-.231
22.5	-.047	.126	.446	-.497	22.5	.086	.154	1.091	-.397
45.0	-.150	.123	.251	-.635	45.0	-.039	.132	.552	-.535
67.5	-.138	.085	.144	-.513	67.5	-.139	.119	.273	-.626
90.0	-.145	.076	.130	-.393	90.0	-.151	.089	.163	-.474
112.5	-.150	.071	.148	-.397	112.5	-.150	.073	.083	-.463
135.0	-.145	.073	.178	-.405	135.0	-.148	.070	.098	-.405
167.5	-.144	.071	.130	-.426	167.5	-.145	.073	.165	-.409
180.0	-.154	.077	.160	-.417	180.0	-.142	.068	.080	-.353
202.5	-.151	.090	.199	-.463	202.5	-.156	.074	.116	-.430
225.0	-.153	.114	.203	-.642	225.0	-.166	.089	.119	-.574
247.5	-.058	.136	.663	-.695	247.5	-.175	.125	.215	-.728
270.0	.079	.156	.713	-.381	270.0	-.055	.139	.598	-.464
292.5	.157	.160	1.109	-.488	292.5	.101	.169	.958	-.337
315.0	.182	.165	1.026	-.308	315.0	.193	.181	1.197	-.427
337.5	.175	.160	1.084	-.181	337.5	.202	.160	1.232	-.148
Location 9					Location 10				
.0	.191	.168	1.071	-.313	.0	.159	.144	.857	-.181
22.5	.188	.187	1.432	-.280	22.5	.196	.163	1.103	-.329
45.0	.062	.147	.747	-.383	45.0	.166	.191	1.180	-.366
67.5	-.049	.126	.526	-.558	67.5	.071	.163	.750	-.383
90.0	-.141	.119	.228	-.765	90.0	-.085	.142	.635	-1.025
112.5	-.142	.087	.230	-.526	112.5	-.165	.132	.362	-.906
135.0	-.160	.077	.145	-.418	135.0	-.157	.090	.162	-.500
167.5	-.153	.074	.130	-.391	167.5	-.159	.077	.114	-.440
180.0	-.144	.068	.111	-.350	180.0	-.151	.074	.128	-.397
202.5	-.150	.073	.132	-.412	202.5	-.165	.076	.099	-.412
225.0	-.147	.085	.202	-.452	225.0	-.154	.071	.184	-.386
247.5	-.160	.093	.130	-.489	247.5	-.132	.082	.147	-.440
270.0	-.141	.128	.277	-.701	270.0	-.142	.087	.163	-.440
292.5	-.031	.156	.759	-.544	292.5	-.125	.107	.248	-.627
315.0	.101	.163	.967	-.543	315.0	-.016	.135	.543	-.474
337.5	.211	.181	1.253	-.248	337.5	.101	.148	.841	-.264
Location 11					Location 12				
.0	.074	.154	.790	-.461	.0	-.046	.129	.461	-.823
22.5	.171	.176	1.219	-.362	22.5	.077	.150	.839	-.264
45.0	.214	.176	1.180	-.249	45.0	.176	.162	1.031	-.249
67.5	.162	.151	.942	-.208	67.5	.178	.145	.893	-.335
90.0	.058	.139	.586	-.390	90.0	.173	.172	1.220	-.261
112.5	-.034	.128	.477	-.741	112.5	.076	.148	.691	-.345
135.0	-.145	.111	.258	-.596	135.0	-.055	.125	.525	-.605
167.5	-.144	.086	.228	-.473	167.5	-.129	.120	.391	-.701
180.0	-.145	.074	.095	-.397	180.0	-.142	.090	.128	-.494
202.5	-.142	.074	.116	-.445	202.5	-.153	.077	.116	-.510
225.0	-.148	.073	.184	-.369	225.0	-.147	.073	.151	-.452
247.5	-.147	.073	.098	-.375	247.5	-.145	.073	.114	-.391
270.0	-.138	.079	.130	-.391	270.0	-.156	.068	.163	-.408
292.5	-.153	.090	.165	-.512	292.5	-.157	.076	.132	-.429
315.0	-.172	.122	.169	-.780	315.0	-.172	.090	.153	-.474
337.5	-.053	.142	.495	-.956	337.5	-.154	.104	.313	-.611

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	-.159	.117	.249	-.716	.0	-.142	.080	.099	-.399
22.5	-.062	.147	.498	-.615	22.5	-.125	.113	.265	-.749
45.0	.095	.165	.842	-.371	45.0	-.006	.142	.826	-.472
67.5	.166	.160	1.066	-.340	67.5	.123	.151	1.115	-.436
90.0	.219	.171	1.005	-.165	90.0	.194	.168	.940	-.313
112.5	.171	.173	1.336	-.200	112.5	.196	.181	1.035	-.417
135.0	.074	.142	.817	-.391	135.0	.132	.176	.833	-.408
167.5	-.064	.130	.446	-.513	167.5	.044	.159	.793	-.578
180.0	-.125	.114	.500	-.549	180.0	-.079	.153	.678	-.790
202.5	-.151	.092	.151	-.602	202.5	-.166	.128	.452	-.970
225.0	-.153	.087	.154	-.513	225.0	-.173	.093	.136	-.633
247.5	-.160	.079	.132	-.397	247.5	-.154	.085	.116	-.415
270.0	-.159	.079	.150	-.383	270.0	-.157	.073	.083	-.448
292.5	-.159	.079	.119	-.405	292.5	-.160	.076	.135	-.455
315.0	-.165	.082	.102	-.480	315.0	-.173	.080	.154	-.446
337.5	-.184	.089	.099	-.566	337.5	-.169	.077	.133	-.417
Location 15					Location 16				
.0	-.154	.079	.117	-.433	.0	-.151	.071	.150	-.399
22.5	-.156	.096	.150	-.516	22.5	-.153	.071	.067	-.433
45.0	-.163	.123	.286	-.826	45.0	-.157	.092	.151	-.590
67.5	-.037	.123	.403	-.501	67.5	-.166	.119	.227	-.743
90.0	.071	.156	.776	-.380	90.0	-.034	.153	.660	-.560
112.5	.187	.154	.902	-.200	112.5	.093	.157	.851	-.368
135.0	.173	.156	1.143	-.294	135.0	.171	.168	1.029	-.245
167.5	.160	.168	1.207	-.347	167.5	.216	.179	1.158	-.248
180.0	.058	.160	.888	-.483	180.0	.172	.154	1.001	-.178
202.5	-.046	.135	.552	-.519	202.5	.065	.159	.887	-.335
225.0	-.150	.125	.359	-.718	225.0	-.039	.145	.581	-.461
247.5	-.157	.090	.150	-.647	247.5	-.142	.114	.316	-.647
270.0	-.150	.079	.116	-.399	270.0	-.159	.086	.133	-.632
292.5	-.159	.077	.101	-.472	292.5	-.166	.082	.135	-.506
315.0	-.160	.079	.138	-.480	315.0	-.156	.079	.102	-.515
337.5	-.160	.079	.099	-.433	337.5	-.163	.070	.067	-.400
Location 17					Location 18				
.0	-.162	.093	.304	-.457	.0	-.173	.095	.153	-.523
22.5	-.205	.099	.171	-.546	22.5	-.196	.092	.153	-.562
45.0	-.209	.102	.138	-.724	45.0	-.191	.098	.138	-.534
67.5	-.203	.105	.165	-.611	67.5	-.182	.098	.132	-.595
90.0	-.221	.132	.254	-.692	90.0	-.193	.098	.151	-.540
112.5	-.157	.133	.529	-.700	112.5	-.209	.110	.154	-.666
135.0	-.110	.132	.685	-.802	135.0	-.200	.123	.168	-.701
167.5	-.073	.130	.608	-.574	167.5	-.181	.133	.203	-.675
180.0	-.052	.119	.363	-.412	180.0	-.116	.133	.429	-.544
202.5	-.076	.138	.632	-.563	202.5	-.074	.133	.684	-.479
225.0	-.113	.138	.418	-.575	225.0	-.061	.135	.558	-.575
247.5	-.171	.129	.237	-.727	247.5	-.053	.136	.507	-.489
270.0	-.197	.126	.356	-.814	270.0	-.116	.142	.577	-.746
292.5	-.205	.117	.154	-.721	292.5	-.160	.130	.292	-.737
315.0	-.190	.108	.191	-.731	315.0	-.206	.133	.227	-.731
337.5	-.191	.099	.153	-.627	337.5	-.205	.110	.187	-.645

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	-.194	.114	.185	-.624	.0	-.095	.132	.411	-.649
22.5	-.206	.111	.205	-.664	22.5	-.175	.122	.257	-.684
45.0	-.206	.101	.172	-.586	45.0	-.209	.119	.225	-.778
67.5	-.173	.093	.148	-.495	67.5	-.173	.098	.148	-.657
90.0	-.179	.093	.135	-.658	90.0	-.197	.093	.135	-.558
112.5	-.190	.092	.120	-.495	112.5	-.188	.089	.120	-.565
135.0	-.188	.099	.133	-.618	135.0	-.185	.087	.251	-.469
167.5	-.203	.107	.169	-.624	167.5	-.188	.090	.135	-.491
180.0	-.215	.125	.231	-.710	180.0	-.178	.087	.132	-.497
202.5	-.173	.132	.529	-.718	202.5	-.200	.104	.206	-.701
225.0	-.101	.130	.470	-.593	225.0	-.199	.116	.209	-.593
247.5	-.068	.130	.473	-.795	247.5	-.171	.122	.289	-.765
270.0	-.049	.132	.509	-.559	270.0	-.093	.129	.391	-.733
292.5	-.085	.129	.549	-.755	292.5	-.061	.139	.602	-.602
315.0	-.116	.138	.574	-.558	315.0	-.056	.129	.611	-.523
337.5	-.162	.136	.526	-.695	337.5	-.086	.133	.458	-.526
Location 21					Location 22				
.0	-.056	.122	.563	-.513	.0	-.116	.126	.393	-.581
22.5	-.073	.126	.599	-.770	22.5	-.076	.139	.856	-.565
45.0	-.126	.147	.467	-.743	45.0	-.080	.136	.431	-.881
67.5	-.147	.119	.295	-.608	67.5	-.056	.126	.492	-.608
90.0	-.206	.113	.119	-.676	90.0	-.116	.126	.304	-.811
112.5	-.209	.104	.136	-.649	112.5	-.165	.125	.445	-.838
135.0	-.182	.095	.218	-.602	135.0	-.197	.117	.218	-.636
167.5	-.184	.087	.203	-.457	167.5	-.194	.102	.169	-.644
180.0	-.181	.089	.132	-.497	180.0	-.190	.087	.099	-.497
202.5	-.194	.090	.154	-.497	202.5	-.181	.090	.154	-.565
225.0	-.199	.093	.175	-.541	225.0	-.188	.090	.175	-.577
247.5	-.187	.107	.187	-.560	247.5	-.181	.090	.085	-.494
270.0	-.202	.117	.205	-.596	270.0	-.182	.096	.171	-.544
292.5	-.157	.123	.378	-.878	292.5	-.202	.104	.120	-.636
315.0	-.105	.132	.436	-.541	315.0	-.203	.125	.191	-.768
337.5	-.080	.120	.356	-.645	337.5	-.162	.125	.390	-.730
Location 23					Location 24				
.0	-.185	.120	.203	-.692	.0	-.176	.095	.169	-.558
22.5	-.178	.141	.393	-.836	22.5	-.209	.108	.120	-.598
45.0	-.110	.132	.380	-.672	45.0	-.212	.133	.362	-.724
67.5	-.076	.132	.580	-.513	67.5	-.162	.136	.397	-.730
90.0	-.062	.144	.556	-.574	90.0	-.111	.138	.608	-.624
112.5	-.076	.139	.614	-.580	112.5	-.082	.139	.768	-.546
135.0	-.120	.135	.301	-.667	135.0	-.065	.138	.451	-.718
167.5	-.173	.133	.489	-.626	167.5	-.076	.144	.489	-.592
180.0	-.197	.122	.215	-.743	180.0	-.122	.139	.560	-.627
202.5	-.199	.114	.188	-.838	202.5	-.166	.136	.411	-.581
225.0	-.182	.111	.209	-.556	225.0	-.203	.116	.225	-.626
247.5	-.185	.101	.185	-.541	247.5	-.191	.117	.169	-.879
270.0	-.187	.099	.237	-.525	270.0	-.184	.099	.169	-.611
292.5	-.184	.104	.172	-.497	292.5	-.175	.101	.240	-.549
315.0	-.187	.104	.191	-.592	315.0	-.190	.102	.227	-.522
337.5	-.212	.108	.219	-.609	337.5	-.185	.099	.185	-.525

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 25					Location 26				
.0	-.200	.101	.135	-.592	.0	-.187	.116	.271	-.612
22.5	-.205	.105	.188	-.563	22.5	-.216	.113	.169	-.611
45.0	-.227	.113	.156	-.638	45.0	-.212	.104	.239	-.667
67.5	-.194	.101	.132	-.647	67.5	-.188	.107	.163	-.558
90.0	-.199	.114	.219	-.675	90.0	-.206	.107	.218	-.569
112.5	-.197	.120	.222	-.700	112.5	-.197	.104	.171	-.647
135.0	-.157	.122	.317	-.635	135.0	-.208	.107	.166	-.647
167.5	-.153	.122	.338	-.558	167.5	-.214	.116	.168	-.690
180.0	-.160	.122	.313	-.676	180.0	-.194	.102	.181	-.590
202.5	-.154	.117	.547	-.649	202.5	-.185	.122	.424	-.730
225.0	-.166	.130	.365	-.731	225.0	-.153	.128	.380	-.587
247.5	-.199	.119	.288	-.644	247.5	-.147	.128	.403	-.773
270.0	-.193	.111	.254	-.661	270.0	-.142	.125	.354	-.556
292.5	-.202	.108	.154	-.685	292.5	-.154	.136	.378	-.636
315.0	-.205	.110	.157	-.679	315.0	-.185	.125	.332	-.753
337.5	-.199	.108	.153	-.592	337.5	-.190	.119	.286	-.589
Location 27					Location 28				
.0	-.138	.116	.323	-.578	.0	-.199	.111	.171	-.578
22.5	-.151	.119	.340	-.559	22.5	-.176	.126	.271	-.661
45.0	-.169	.138	.411	-.752	45.0	-.175	.128	.359	-.770
67.5	-.178	.111	.262	-.602	67.5	-.133	.113	.262	-.507
90.0	-.197	.114	.184	-.704	90.0	-.151	.123	.386	-.587
112.5	-.205	.110	.221	-.629	112.5	-.144	.122	.357	-.595
135.0	-.193	.105	.182	-.614	135.0	-.160	.117	.282	-.697
167.5	-.199	.108	.218	-.589	167.5	-.169	.116	.302	-.639
180.0	-.194	.104	.165	-.624	180.0	-.202	.111	.181	-.690
202.5	-.209	.105	.187	-.645	202.5	-.197	.108	.171	-.560
225.0	-.208	.107	.172	-.639	225.0	-.200	.113	.190	-.673
247.5	-.178	.114	.236	-.706	247.5	-.190	.104	.185	-.587
270.0	-.194	.120	.219	-.709	270.0	-.187	.102	.151	-.556
292.5	-.196	.120	.344	-.722	292.5	-.219	.104	.154	-.602
315.0	-.197	.128	.280	-.787	315.0	-.225	.117	.157	-.666
337.5	-.160	.117	.302	-.690	337.5	-.203	.111	.202	-.571

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 8 - 1.00 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.434	.165	.099	-1.330	.0	-.325	.148	.133	-.848
Location 3					Location 4				
.0	-.096	.122	.283	-.715	.0	-.033	.083	.259	-.341
Location 5					Location 6				
.0	-.145	.096	.147	-.535	.0	-.123	.101	.243	-.488
Location 7					Location 8				
.0	-.254	.113	.016	-.777	.0	-.323	.163	.178	-.988
Location 9					Location 10				
.0	-.292	.135	.162	-.842	.0	-.295	.130	.147	-.801
Location 11					Location 12				
.0	-.188	.128	.196	-.654	.0	-.039	.108	.326	-.687
Location 13					Location 14				
.0	-.021	.101	.283	-.399	.0	-.050	.105	.300	-.482
Location 15					Location 16				
.0	-.117	.110	.369	-.654	.0	-.202	.119	.218	-.721
Location 17					Location 18				
.0	-.148	.132	.397	-.629	.0	-.077	.128	.331	-.629
Location 19					Location 20				
.0	-.086	.110	.316	-.581	.0	-.129	.119	.249	-.615

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 9 - 0.90 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.239	.105	.086	-.635	.0	-.240	.105	.206	-.704
Location 3					Location 4				
.0	-.271	.147	.326	-1.029	.0	.034	.166	.735	-.418
Location 5					Location 6				
.0	.033	.132	.820	-.452	.0	-.052	.153	.552	-.669
Location 7					Location 8				
.0	-.215	.147	.300	-.866	.0	-.230	.096	.083	-.667
Location 9					Location 10				
.0	-.254	.096	.099	-.633	.0	-.254	.110	.101	-.691
Location 11					Location 12				
.0	-.264	.117	.202	-.774	.0	-.200	.123	.320	-.707
Location 13					Location 14				
.0	-.114	.126	.378	-.584	.0	-.120	.136	.550	-.618
Location 15					Location 16				
.0	-.231	.147	.311	-.847	.0	-.248	.117	.156	-.795
Location 17					Location 18				
.0	-.288	.133	.120	-.776	.0	-.273	.133	.310	-.862
Location 19					Location 20				
.0	-.216	.130	.257	-.701	.0	-.255	.132	.239	-.770

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 10 - 0.75 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.233	.099	.153	-.676	.0	-.267	.122	.185	-.709
Location 3					Location 4				
.0	-.258	.125	.153	-.793	.0	-.061	.156	.639	-.541
Location 5					Location 6				
.0	.040	.141	.902	-.311	.0	-.125	.132	.525	-.968
Location 7					Location 8				
.0	-.252	.116	.114	-.735	.0	-.211	.105	.328	-.703
Location 9					Location 10				
.0	-.218	.101	.163	-.670	.0	-.261	.107	.182	-.661
Location 11					Location 12				
.0	-.285	.129	.199	-.810	.0	-.239	.122	.215	-.777
Location 13					Location 14				
.0	-.141	.104	.286	-.472	.0	-.165	.125	.556	-.657
Location 15					Location 16				
.0	-.283	.129	.169	-.863	.0	-.243	.126	.356	-.778
Location 17					Location 18				
.0	-.308	.128	.102	-.832	.0	-.316	.142	.305	-.900
Location 19					Location 20				
.0	-.249	.120	.168	-.706	.0	-.302	.139	.218	-.857

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 11 - 0.50 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.224	.099	.144	-.649	.0	-.285	.119	.108	-.703
Location 3					Location 4				
.0	-.331	.120	.073	-.721	.0	-.178	.116	.264	-.635
Location 5					Location 6				
.0	-.047	.111	.635	-.440	.0	-.228	.119	.405	-.651
Location 7					Location 8				
.0	-.239	.108	.070	-.658	.0	-.215	.099	.104	-.572
Location 9					Location 10				
.0	-.265	.107	.052	-.728	.0	-.246	.104	.123	-.649
Location 11					Location 12				
.0	-.291	.116	.087	-.685	.0	-.282	.116	.141	-.721
Location 13					Location 14				
.0	-.150	.113	.254	-.578	.0	-.173	.117	.199	-.651
Location 15					Location 16				
.0	-.267	.119	.108	-.790	.0	-.252	.116	.126	-.629
Location 17					Location 18				
.0	-.302	.117	.107	-.770	.0	-.331	.136	.144	-.752
Location 19					Location 20				
.0	-.231	.120	.160	-.747	.0	-.304	.136	.178	-.820

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.460	.163	.102	-1.149	.0	-.353	.173	.292	-1.081
22.5	-.414	.171	.188	-1.117	22.5	-.357	.147	.138	-.961
45.0	-.353	.178	.258	-1.152	45.0	-.403	.151	.086	-1.050
67.5	-.243	.141	.138	-.866	67.5	-.418	.163	.052	-1.125
90.0	-.222	.132	.122	-.819	90.0	-.359	.178	.157	-1.323
112.5	-.200	.122	.191	-.814	112.5	-.264	.147	.156	-.936
135.0	-.178	.126	.157	-.770	135.0	-.190	.123	.157	-.700
157.5	-.162	.110	.156	-.759	157.5	-.153	.107	.208	-.587
180.0	-.130	.095	.154	-.479	180.0	-.125	.095	.188	-.461
202.5	-.153	.099	.154	-.534	202.5	-.139	.087	.138	-.534
225.0	-.169	.108	.156	-.730	225.0	-.156	.102	.173	-.695
247.5	-.214	.125	.178	-.744	247.5	-.162	.105	.196	-.798
270.0	-.219	.125	.154	-.903	270.0	-.166	.098	.179	-.611
292.5	-.295	.165	.099	-1.179	292.5	-.165	.107	.133	-.697
315.0	-.455	.199	.157	-1.480	315.0	-.184	.110	.173	-.697
337.5	-.477	.190	.120	-1.155	337.5	-.233	.144	.294	-.965
Location 3					Location 4				
.0	-.108	.128	.378	-.652	.0	-.049	.086	.283	-.384
22.5	-.125	.165	.446	-.859	22.5	-.082	.096	.354	-.523
45.0	-.307	.197	.550	-1.050	45.0	-.166	.108	.236	-.642
67.5	-.394	.182	.259	-1.056	67.5	-.236	.119	.119	-.780
90.0	-.423	.169	.087	-1.149	90.0	-.383	.169	.050	-1.194
112.5	-.406	.166	.104	-1.143	112.5	-.437	.166	.034	-1.117
135.0	-.372	.166	.087	-1.084	135.0	-.520	.211	.018	-1.401
157.5	-.285	.135	.086	-1.053	157.5	-.476	.173	.034	-1.096
180.0	-.178	.101	.120	-.684	180.0	-.335	.159	.184	-1.051
202.5	-.163	.095	.154	-.550	202.5	-.240	.135	.133	-.872
225.0	-.187	.119	.156	-.608	225.0	-.138	.107	.236	-.658
247.5	-.191	.111	.142	-.639	247.5	-.071	.089	.224	-.516
270.0	-.179	.105	.179	-.827	270.0	-.050	.086	.209	-.436
292.5	-.168	.107	.116	-.565	292.5	-.050	.079	.243	-.341
315.0	-.169	.108	.122	-.661	315.0	-.052	.082	.236	-.472
337.5	-.142	.116	.276	-.586	337.5	-.022	.085	.286	-.353
Location 5					Location 6				
.0	-.151	.108	.133	-.734	.0	-.148	.098	.168	-.618
22.5	-.153	.098	.169	-.574	22.5	-.120	.095	.185	-.473
45.0	-.172	.104	.151	-.709	45.0	-.135	.090	.151	-.506
67.5	-.169	.096	.203	-.595	67.5	-.151	.096	.136	-.509
90.0	-.199	.114	.187	-.750	90.0	-.142	.098	.153	-.614
112.5	-.288	.154	.169	-1.100	112.5	-.173	.110	.187	-.644
135.0	-.384	.181	.120	-1.247	135.0	-.200	.120	.205	-.768
157.5	-.430	.196	.101	-1.382	157.5	-.262	.153	.135	-1.247
180.0	-.439	.179	.200	-1.100	180.0	-.334	.159	.233	-1.001
202.5	-.426	.165	.151	-1.122	202.5	-.381	.151	.034	-1.039
225.0	-.383	.181	.151	-1.367	225.0	-.388	.160	.270	-1.148
247.5	-.267	.160	.154	-.980	247.5	-.406	.162	.034	-.964
270.0	-.154	.108	.173	-.661	270.0	-.381	.173	.087	-1.185
292.5	-.157	.104	.162	-.584	292.5	-.264	.147	.211	-.860
315.0	-.188	.129	.219	-.740	315.0	-.168	.123	.219	-.690
337.5	-.159	.111	.185	-.589	337.5	-.151	.114	.168	-.639

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	-.249	.119	.148	-.724	.0	-.326	.185	.197	-1.167
22.5	-.196	.111	.099	-.583	22.5	-.197	.144	.267	-.933
45.0	-.175	.105	.185	-.673	45.0	-.175	.119	.236	-.875
67.5	-.163	.093	.153	-.541	67.5	-.203	.117	.153	-.778
90.0	-.172	.102	.102	-.630	90.0	-.178	.111	.136	-.663
112.5	-.162	.098	.237	-.541	112.5	-.154	.098	.203	-.592
135.0	-.193	.125	.188	-.819	135.0	-.144	.090	.136	-.546
157.5	-.188	.107	.185	-.807	157.5	-.135	.101	.218	-.621
180.0	-.135	.114	.265	-.814	180.0	-.176	.113	.133	-.648
202.5	-.197	.147	.400	-.853	202.5	-.216	.111	.101	-.802
225.0	-.311	.165	.387	-1.060	225.0	-.264	.128	.085	-.891
247.5	-.408	.178	.102	-1.337	247.5	-.291	.130	.068	-.925
270.0	-.403	.168	.052	-1.216	270.0	-.397	.182	.156	-1.302
292.5	-.409	.166	.096	-1.277	292.5	-.445	.184	.000	-1.277
315.0	-.396	.171	.034	-1.174	315.0	-.472	.193	.067	-1.225
337.5	-.308	.141	.252	-.906	337.5	-.402	.165	.236	-1.091
Location 9					Location 10				
.0	-.298	.128	.181	-.740	.0	-.307	.132	.133	-.786
22.5	-.273	.147	.166	-.933	22.5	-.305	.136	.203	-.795
45.0	-.218	.145	.371	-.808	45.0	-.288	.141	.254	-.814
67.5	-.153	.128	.509	-.678	67.5	-.242	.133	.255	-.715
90.0	-.105	.116	.374	-.731	90.0	-.211	.144	.239	-.770
112.5	-.073	.098	.254	-.406	112.5	-.153	.120	.289	-.799
135.0	-.059	.098	.307	-.443	135.0	-.125	.111	.205	-.770
157.5	-.064	.092	.319	-.403	157.5	-.089	.095	.254	-.457
180.0	-.062	.085	.233	-.383	180.0	-.068	.087	.234	-.384
202.5	-.086	.089	.200	-.485	202.5	-.052	.086	.236	-.437
225.0	-.120	.089	.202	-.538	225.0	-.067	.087	.237	-.423
247.5	-.160	.099	.188	-.566	247.5	-.089	.092	.172	-.466
270.0	-.202	.116	.209	-.712	270.0	-.107	.102	.227	-.667
292.5	-.257	.128	.145	-.743	292.5	-.138	.117	.277	-.718
315.0	-.291	.138	.133	-.872	315.0	-.218	.138	.237	-.829
337.5	-.307	.139	.185	-.924	337.5	-.311	.150	.188	-.856
Location 11					Location 12				
.0	-.208	.150	.317	-.953	.0	-.031	.107	.368	-.469
22.5	-.257	.138	.219	-.845	22.5	-.080	.120	.304	-.609
45.0	-.311	.145	.187	-.965	45.0	-.187	.150	.390	-.796
67.5	-.322	.144	.136	-.902	67.5	-.274	.160	.289	-.936
90.0	-.305	.148	.171	-1.163	90.0	-.344	.153	.136	-.940
112.5	-.273	.138	.305	-.765	112.5	-.332	.142	.119	-.816
135.0	-.202	.120	.274	-.667	135.0	-.297	.133	.154	-.804
157.5	-.147	.101	.237	-.642	157.5	-.230	.120	.135	-.829
180.0	-.108	.092	.251	-.519	180.0	-.141	.095	.218	-.652
202.5	-.070	.076	.218	-.387	202.5	-.102	.098	.337	-.470
225.0	-.061	.087	.219	-.406	225.0	-.061	.089	.237	-.440
247.5	-.058	.087	.259	-.431	247.5	-.043	.086	.397	-.449
270.0	-.039	.090	.314	-.454	270.0	-.019	.092	.384	-.314
292.5	-.047	.095	.310	-.457	292.5	-.010	.090	.310	-.343
315.0	-.059	.101	.288	-.559	315.0	.007	.099	.491	-.338
337.5	-.133	.123	.308	-.735	337.5	-.018	.117	.513	-.513

Cermak Peterka Petersen, Inc.

C-27

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	-.049	.105	.274	-.427	.0	-.058	.110	.308	-.445
22.5	-.049	.108	.343	-.429	22.5	-.044	.104	.377	-.411
45.0	-.095	.105	.311	-.503	45.0	-.076	.107	.277	-.520
67.5	-.107	.107	.208	-.621	67.5	-.074	.101	.259	-.449
90.0	-.211	.122	.245	-.753	90.0	-.136	.113	.228	-.684
112.5	-.222	.122	.190	-.655	112.5	-.178	.128	.276	-.827
135.0	-.337	.157	.141	-.915	135.0	-.236	.136	.300	-.792
157.5	-.354	.145	.122	-.953	157.5	-.257	.150	.259	-1.109
180.0	-.292	.153	.187	-.952	180.0	-.294	.151	.119	-.884
202.5	-.297	.168	.242	-1.105	202.5	-.319	.141	.172	-.949
225.0	-.181	.144	.344	-.826	225.0	-.308	.156	.172	-.946
247.5	-.085	.139	.426	-.762	247.5	-.286	.156	.265	-.922
270.0	-.058	.132	.467	-.503	270.0	-.200	.150	.341	-.862
292.5	-.018	.110	.400	-.434	292.5	-.136	.135	.283	-.768
315.0	-.015	.117	.399	-.503	315.0	-.086	.125	.451	-.694
337.5	-.021	.111	.381	-.451	337.5	-.046	.114	.347	-.520
Location 15					Location 16				
.0	-.108	.114	.408	-.543	.0	-.200	.133	.203	-.814
22.5	-.095	.107	.331	-.470	22.5	-.163	.114	.243	-.869
45.0	-.085	.108	.295	-.538	45.0	-.139	.111	.225	-.695
67.5	-.056	.099	.294	-.431	67.5	-.087	.102	.242	-.586
90.0	-.083	.107	.243	-.538	90.0	-.076	.098	.295	-.504
112.5	-.086	.107	.297	-.558	112.5	-.068	.101	.279	-.454
135.0	-.151	.123	.248	-.652	135.0	-.058	.110	.371	-.424
157.5	-.147	.126	.310	-.655	157.5	-.042	.107	.362	-.483
180.0	-.181	.133	.291	-.854	180.0	-.077	.108	.393	-.477
202.5	-.259	.142	.274	-.924	202.5	-.132	.130	.308	-.735
225.0	-.283	.141	.276	-.879	225.0	-.214	.154	.344	-.931
247.5	-.311	.147	.196	-.922	247.5	-.277	.147	.231	-.940
270.0	-.304	.145	.215	-.789	270.0	-.305	.145	.197	-.933
292.5	-.267	.145	.234	-.918	292.5	-.307	.139	.184	-.867
315.0	-.237	.151	.365	-.973	315.0	-.311	.145	.104	-.991
337.5	-.148	.132	.277	-.743	337.5	-.249	.138	.225	-.761
Location 17					Location 18				
.0	-.172	.138	.391	-.749	.0	-.095	.138	.340	-.697
22.5	-.168	.147	.362	-.690	22.5	-.120	.130	.362	-.654
45.0	-.154	.145	.500	-.638	45.0	-.145	.139	.466	-.759
67.5	-.104	.133	.485	-.796	67.5	-.133	.135	.451	-.692
90.0	-.111	.133	.383	-.590	90.0	-.151	.136	.313	-.712
112.5	-.122	.123	.363	-.621	112.5	-.193	.132	.276	-.707
135.0	-.128	.117	.348	-.558	135.0	-.179	.123	.209	-.645
157.5	-.108	.110	.344	-.584	157.5	-.145	.120	.326	-.721
180.0	-.082	.107	.323	-.528	180.0	-.107	.111	.239	-.494
202.5	-.080	.107	.341	-.563	202.5	-.090	.102	.307	-.461
225.0	-.102	.105	.276	-.498	225.0	-.105	.111	.362	-.534
247.5	-.113	.110	.228	-.614	247.5	-.101	.111	.316	-.578
270.0	-.151	.120	.233	-.664	270.0	-.095	.113	.377	-.503
292.5	-.169	.123	.218	-.752	292.5	-.102	.108	.334	-.501
315.0	-.196	.144	.331	-.903	315.0	-.089	.120	.365	-.574
337.5	-.178	.147	.347	-.694	337.5	-.074	.129	.399	-.537

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	-.111	.110	.307	-.512	.0	-.154	.129	.257	-.700
22.5	-.110	.113	.259	-.483	22.5	-.138	.114	.259	-.621
45.0	-.101	.111	.326	-.515	45.0	-.117	.114	.291	-.669
67.5	-.092	.108	.362	-.498	67.5	-.096	.113	.344	-.550
90.0	-.138	.120	.294	-.605	90.0	-.110	.111	.277	-.553
112.5	-.169	.119	.258	-.636	112.5	-.130	.113	.240	-.688
135.0	-.208	.130	.208	-.730	135.0	-.125	.116	.295	-.572
157.5	-.168	.133	.360	-.685	157.5	-.101	.117	.308	-.531
180.0	-.130	.125	.340	-.611	180.0	-.101	.122	.374	-.560
202.5	-.141	.139	.393	-.632	202.5	-.119	.130	.393	-.648
225.0	-.154	.138	.347	-.608	225.0	-.172	.154	.486	-.850
247.5	-.099	.144	.437	-.612	247.5	-.160	.145	.420	-.770
270.0	-.093	.135	.566	-.655	270.0	-.132	.147	.479	-.691
292.5	-.086	.122	.334	-.535	292.5	-.169	.138	.267	-.735
315.0	-.105	.128	.399	-.710	315.0	-.185	.135	.363	-.710
337.5	-.085	.117	.377	-.532	337.5	-.136	.126	.258	-.617

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.255	.107	.107	-.694	.0	-.237	.116	.178	-.730
22.5	-.243	.105	.122	-.783	22.5	-.246	.111	.087	-.695
45.0	-.243	.114	.123	-.700	45.0	-.222	.099	.175	-.596
67.5	-.271	.123	.142	-.851	67.5	-.254	.108	.142	-.675
90.0	-.262	.160	.399	-.936	90.0	-.252	.117	.173	-.694
112.5	-.187	.171	.526	-.971	112.5	-.257	.128	.175	-.789
135.0	-.068	.139	.470	-.540	135.0	-.292	.160	.314	-1.011
157.5	.007	.154	.738	-.446	157.5	-.188	.142	.446	-.910
180.0	.009	.135	.635	-.463	180.0	-.114	.120	.412	-.583
202.5	.022	.147	.884	-.399	202.5	-.024	.129	.658	-.503
225.0	-.047	.154	.701	-.737	225.0	.039	.139	.684	-.467
247.5	-.162	.157	.403	-.808	247.5	.025	.147	.649	-.439
270.0	-.254	.165	.224	-.893	270.0	-.067	.154	.756	-.721
292.5	-.262	.132	.156	-.810	292.5	-.182	.175	.534	-.810
315.0	-.261	.117	.138	-.758	315.0	-.265	.156	.258	-1.017
337.5	-.231	.108	.175	-.645	337.5	-.276	.132	.105	-.872
Location 3					Location 4				
.0	-.292	.172	.391	-1.192	.0	.039	.172	.776	-.466
22.5	-.249	.135	.139	-.851	22.5	-.042	.168	.658	-.606
45.0	-.251	.111	.087	-.630	45.0	-.196	.142	.510	-.833
67.5	-.236	.107	.107	-.621	67.5	-.242	.110	.224	-.793
90.0	-.249	.114	.086	-.624	90.0	-.242	.120	.101	-.777
112.5	-.259	.113	.105	-.684	112.5	-.255	.114	.102	-.735
135.0	-.249	.113	.175	-.697	135.0	-.225	.096	.151	-.538
157.5	-.227	.110	.154	-.635	157.5	-.237	.098	.099	-.565
180.0	-.227	.129	.154	-.823	180.0	-.242	.105	.133	-.698
202.5	-.182	.123	.156	-.866	202.5	-.249	.117	.117	-.758
225.0	-.101	.110	.270	-.593	225.0	-.234	.141	.297	-.979
247.5	-.006	.125	.615	-.403	247.5	-.110	.148	.427	-.632
270.0	.033	.150	.790	-.550	270.0	.016	.153	.652	-.519
292.5	.006	.157	.792	-.568	292.5	.043	.132	.623	-.470
315.0	-.036	.156	.672	-.672	315.0	.053	.128	.642	-.338
337.5	-.138	.168	.506	-.749	337.5	.071	.145	.870	-.375
Location 5					Location 6				
.0	.043	.136	.638	-.448	.0	-.034	.165	.844	-.586
22.5	.006	.133	.810	-.455	22.5	.033	.144	.709	-.523
45.0	-.085	.116	.357	-.544	45.0	.061	.150	.833	-.374
67.5	-.194	.123	.156	-.948	67.5	-.001	.129	.621	-.431
90.0	-.246	.135	.135	-.946	90.0	-.070	.136	.658	-.624
112.5	-.243	.119	.154	-.735	112.5	-.188	.157	.411	-.856
135.0	-.255	.116	.117	-.740	135.0	-.246	.145	.268	-.942
157.5	-.221	.098	.083	-.598	157.5	-.228	.111	.116	-.681
180.0	-.215	.096	.067	-.583	180.0	-.237	.110	.182	-.632
202.5	-.228	.098	.085	-.589	202.5	-.243	.102	.101	-.673
225.0	-.245	.113	.105	-.664	225.0	-.231	.113	.157	-.682
247.5	-.274	.126	.188	-.734	247.5	-.240	.102	.086	-.700
270.0	-.282	.156	.335	-.937	270.0	-.236	.108	.101	-.602
292.5	-.181	.172	.504	-.790	292.5	-.255	.122	.151	-.655
315.0	-.071	.159	.540	-.844	315.0	-.245	.147	.254	-.996
337.5	.013	.153	.768	-.529	337.5	-.181	.156	.563	-.784

Cermak Peterka Petersen, Inc.

C-30

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	-.222	.145	.463	-.773	.0	-.216	.108	.138	-.669
22.5	-.120	.156	.555	-.807	22.5	-.245	.120	.185	-.672
45.0	-.025	.148	.796	-.543	45.0	-.216	.130	.474	-.730
67.5	.042	.157	.927	-.464	67.5	-.128	.157	.670	-.755
90.0	.043	.147	.790	-.403	90.0	-.034	.163	.572	-.909
112.5	.046	.179	.869	-.494	112.5	.009	.154	.890	-.464
135.0	-.068	.151	.670	-.587	135.0	.050	.151	.939	-.351
157.5	-.163	.157	.529	-.746	157.5	.033	.139	.778	-.381
180.0	-.265	.141	.282	-.910	180.0	-.009	.133	.778	-.448
202.5	-.264	.114	.117	-.738	202.5	-.133	.129	.503	-.805
225.0	-.252	.104	.070	-.715	225.0	-.216	.136	.470	-.731
247.5	-.240	.099	.119	-.614	247.5	-.246	.111	.153	-.630
270.0	-.249	.111	.117	-.667	270.0	-.254	.107	.083	-.684
292.5	-.245	.104	.168	-.636	292.5	-.254	.107	.101	-.636
315.0	-.255	.110	.085	-.621	315.0	-.236	.102	.135	-.605
337.5	-.234	.117	.153	-.747	337.5	-.248	.102	.119	-.578
Location 9					Location 10				
.0	-.262	.116	.102	-.703	.0	-.270	.108	.070	-.695
22.5	-.228	.117	.135	-.790	22.5	-.251	.105	.119	-.612
45.0	-.254	.111	.119	-.730	45.0	-.242	.108	.102	-.652
67.5	-.242	.123	.224	-.790	67.5	-.265	.107	.087	-.695
90.0	-.219	.130	.362	-.715	90.0	-.279	.136	.119	-.968
112.5	-.182	.136	.426	-.853	112.5	-.295	.142	.156	-1.034
135.0	-.122	.120	.503	-.603	135.0	-.234	.125	.254	-.728
157.5	-.110	.098	.298	-.464	157.5	-.196	.123	.267	-.783
180.0	-.122	.104	.231	-.513	180.0	-.159	.116	.334	-.817
202.5	-.154	.119	.319	-.755	202.5	-.111	.113	.507	-.541
225.0	-.209	.130	.297	-.924	225.0	-.119	.122	.560	-.614
247.5	-.243	.117	.153	-.715	247.5	-.162	.130	.497	-.599
270.0	-.249	.113	.184	-.684	270.0	-.230	.148	.252	-.839
292.5	-.251	.110	.168	-.636	292.5	-.265	.135	.135	-.808
315.0	-.243	.105	.135	-.638	315.0	-.288	.133	.219	-.810
337.5	-.246	.101	.119	-.681	337.5	-.251	.116	.119	-.664
Location 11					Location 12				
.0	-.258	.128	.173	-.801	.0	-.224	.147	.261	-.835
22.5	-.267	.120	.136	-.698	22.5	-.221	.130	.221	-.783
45.0	-.242	.105	.188	-.669	45.0	-.259	.120	.102	-.738
67.5	-.262	.108	.122	-.661	67.5	-.252	.113	.157	-.661
90.0	-.258	.116	.153	-.713	90.0	-.262	.120	.136	-.697
112.5	-.255	.114	.138	-.724	112.5	-.273	.113	.104	-.740
135.0	-.288	.138	.085	-.863	135.0	-.233	.108	.187	-.626
157.5	-.246	.120	.117	-.882	157.5	-.215	.098	.083	-.599
180.0	-.221	.114	.083	-.784	180.0	-.227	.114	.150	-.651
202.5	-.185	.107	.135	-.793	202.5	-.219	.123	.270	-.761
225.0	-.136	.114	.298	-.544	225.0	-.175	.122	.228	-.753
247.5	-.099	.116	.497	-.497	247.5	-.123	.108	.308	-.549
270.0	-.133	.126	.319	-.589	270.0	-.102	.110	.337	-.605
292.5	-.184	.147	.421	-.724	292.5	-.096	.107	.488	-.488
315.0	-.224	.135	.286	-.758	315.0	-.101	.114	.522	-.522
337.5	-.279	.139	.136	-.819	337.5	-.128	.123	.307	-.682

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	-.120	.129	.531	-.566	.0	-.110	.138	.566	-.725
22.5	-.133	.122	.397	-.553	22.5	-.108	.133	.433	-.623
45.0	-.169	.129	.298	-.718	45.0	-.126	.122	.368	-.614
67.5	-.227	.126	.426	-.728	67.5	-.205	.129	.267	-.728
90.0	-.261	.141	.225	-.851	90.0	-.242	.141	.243	-.799
112.5	-.279	.135	.105	-.758	112.5	-.267	.136	.194	-.792
135.0	-.254	.114	.138	-.692	135.0	-.294	.141	.156	-.814
157.5	-.265	.116	.172	-.753	157.5	-.252	.123	.188	-.805
180.0	-.265	.122	.120	-.721	180.0	-.243	.116	.120	-.669
202.5	-.270	.126	.138	-.778	202.5	-.251	.116	.122	-.709
225.0	-.280	.138	.234	-1.045	225.0	-.258	.128	.181	-.776
247.5	-.262	.136	.194	-.863	247.5	-.279	.125	.159	-.669
270.0	-.214	.153	.344	-.776	270.0	-.300	.142	.156	-.810
292.5	-.141	.142	.308	-.719	292.5	-.285	.159	.206	-.958
315.0	-.142	.135	.501	-.657	315.0	-.252	.151	.277	-.952
337.5	-.089	.126	.451	-.503	337.5	-.173	.157	.399	-.798
Location 15					Location 16				
.0	-.222	.145	.337	-.869	.0	-.227	.130	.142	-.762
22.5	-.163	.144	.402	-.805	22.5	-.257	.141	.280	-.841
45.0	-.122	.126	.476	-.652	45.0	-.199	.129	.317	-.724
67.5	-.111	.117	.408	-.602	67.5	-.141	.126	.372	-.709
90.0	-.147	.130	.434	-.694	90.0	-.119	.125	.383	-.572
112.5	-.193	.135	.335	-.792	112.5	-.108	.117	.335	-.599
135.0	-.236	.133	.208	-.780	135.0	-.144	.135	.555	-.641
157.5	-.279	.133	.239	-.820	157.5	-.141	.125	.409	-.718
180.0	-.279	.128	.274	-.891	180.0	-.190	.129	.343	-.753
202.5	-.261	.114	.156	-.728	202.5	-.248	.126	.156	-.832
225.0	-.257	.114	.126	-.771	225.0	-.254	.128	.179	-.735
247.5	-.254	.114	.141	-.703	247.5	-.257	.113	.123	-.685
270.0	-.259	.130	.120	-.773	270.0	-.262	.116	.154	-.618
292.5	-.267	.125	.156	-.761	292.5	-.265	.120	.156	-.727
315.0	-.285	.129	.104	-.744	315.0	-.252	.116	.173	-.692
337.5	-.255	.141	.421	-.807	337.5	-.258	.122	.141	-.701
Location 17					Location 18				
.0	-.282	.130	.141	-.778	.0	-.243	.144	.335	-.795
22.5	-.286	.133	.209	-.820	22.5	-.288	.148	.227	-.838
45.0	-.259	.136	.175	-.838	45.0	-.251	.132	.245	-.786
67.5	-.270	.130	.283	-.743	67.5	-.271	.133	.194	-.761
90.0	-.279	.154	.294	-.900	90.0	-.273	.139	.190	-.882
112.5	-.302	.151	.175	-.896	112.5	-.270	.130	.175	-.790
135.0	-.265	.132	.120	-.741	135.0	-.294	.144	.156	-.793
157.5	-.265	.130	.136	-.716	157.5	-.252	.123	.154	-.734
180.0	-.252	.128	.222	-.905	180.0	-.234	.123	.120	-.648
202.5	-.225	.126	.225	-.709	202.5	-.221	.120	.242	-.675
225.0	-.224	.128	.305	-.700	225.0	-.214	.128	.179	-.719
247.5	-.234	.126	.193	-.632	247.5	-.219	.126	.193	-.649
270.0	-.265	.144	.276	-.774	270.0	-.248	.139	.242	-.688
292.5	-.282	.138	.276	-.793	292.5	-.267	.150	.345	-.793
315.0	-.308	.142	.190	-.847	315.0	-.270	.139	.225	-.813
337.5	-.283	.133	.159	-.842	337.5	-.288	.148	.193	-.842

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	-.227	.136	.353	-.722	.0	-.243	.141	.212	-.811
22.5	-.215	.126	.208	-.676	22.5	-.252	.139	.225	-.746
45.0	-.194	.126	.227	-.679	45.0	-.194	.122	.261	-.626
67.5	-.251	.126	.267	-.784	67.5	-.227	.128	.196	-.695
90.0	-.257	.145	.190	-.878	90.0	-.203	.130	.276	-.774
112.5	-.292	.142	.193	-.839	112.5	-.211	.128	.280	-.770
135.0	-.270	.126	.154	-.738	135.0	-.249	.142	.258	-.790
157.5	-.274	.126	.135	-.695	157.5	-.224	.128	.169	-.881
180.0	-.273	.130	.203	-.795	180.0	-.230	.126	.288	-.676
202.5	-.268	.130	.188	-.790	202.5	-.255	.128	.154	-.722
225.0	-.268	.136	.160	-.979	225.0	-.262	.136	.267	-.765
247.5	-.268	.136	.191	-.838	247.5	-.276	.130	.227	-.750
270.0	-.274	.153	.237	-.816	270.0	-.298	.138	.171	-.747
292.5	-.262	.145	.239	-.820	292.5	-.310	.150	.222	-.854
315.0	-.273	.147	.274	-.805	315.0	-.294	.141	.222	-.805
337.5	-.227	.136	.261	-.764	337.5	-.292	.142	.104	-.885

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.206	.096	.120	-.581	.0	-.239	.114	.136	-.752
22.5	-.228	.120	.193	-.649	22.5	-.233	.108	.105	-.684
45.0	-.239	.125	.251	-.698	45.0	-.231	.101	.071	-.663
67.5	-.262	.111	.120	-.724	67.5	-.231	.101	.086	-.654
90.0	-.298	.147	.144	-1.060	90.0	-.254	.116	.108	-.700
112.5	-.295	.153	.215	-.931	112.5	-.280	.129	.053	-.716
135.0	-.133	.148	.602	-.688	135.0	-.268	.129	.086	-.722
157.5	-.013	.141	.716	-.525	157.5	-.257	.125	.193	-.839
180.0	.031	.129	.753	-.359	180.0	-.151	.123	.463	-.685
202.5	-.001	.147	.738	-.458	202.5	-.013	.132	.651	-.492
225.0	-.135	.148	.537	-.859	225.0	.067	.144	.734	-.501
247.5	-.262	.151	.196	-.821	247.5	-.007	.129	.626	-.464
270.0	-.254	.120	.157	-.684	270.0	-.162	.145	.578	-.735
292.5	-.264	.130	.160	-.733	292.5	-.245	.142	.268	-.893
315.0	-.242	.113	.086	-.635	315.0	-.298	.144	.206	-.943
337.5	-.236	.111	.230	-.690	337.5	-.270	.122	.176	-.690
Location 3					Location 4				
.0	-.277	.119	.291	-.802	.0	-.042	.142	.583	-.500
22.5	-.261	.126	.105	-.807	22.5	-.214	.147	.477	-.733
45.0	-.233	.113	.125	-.752	45.0	-.258	.132	.173	-.765
67.5	-.221	.101	.120	-.602	67.5	-.248	.110	.083	-.669
90.0	-.262	.116	.162	-.826	90.0	-.251	.123	.087	-.783
112.5	-.243	.119	.162	-.716	112.5	-.243	.114	.191	-.676
135.0	-.228	.130	.154	-.860	135.0	-.224	.105	.117	-.657
157.5	-.254	.132	.193	-.716	157.5	-.216	.113	.188	-.719
180.0	-.214	.119	.136	-.685	180.0	-.212	.107	.067	-.704
202.5	-.222	.122	.264	-.687	202.5	-.262	.123	.172	-.690
225.0	-.136	.129	.286	-.608	225.0	-.255	.130	.139	-1.013
247.5	-.006	.142	.733	-.517	247.5	-.234	.136	.558	-.783
270.0	.028	.145	.753	-.578	270.0	-.070	.139	.664	-.630
292.5	-.049	.150	.715	-.608	292.5	.019	.142	.747	-.452
315.0	-.153	.151	.446	-.737	315.0	.061	.138	.801	-.334
337.5	-.270	.144	.194	-.795	337.5	.070	.162	.979	-.412
Location 5					Location 6				
.0	.042	.135	.866	-.363	.0	-.162	.130	.500	-.816
22.5	-.021	.138	.835	-.546	22.5	-.036	.133	.698	-.528
45.0	-.154	.123	.418	-.713	45.0	.033	.132	.824	-.393
67.5	-.251	.119	.133	-.953	67.5	-.042	.130	.735	-.535
90.0	-.259	.126	.139	-.801	90.0	-.173	.148	.506	-.819
112.5	-.270	.122	.086	-.798	112.5	-.259	.133	.139	-.780
135.0	-.222	.105	.117	-.589	135.0	-.268	.136	.151	-.824
157.5	-.228	.099	.171	-.547	157.5	-.271	.123	.086	-.770
180.0	-.206	.096	.101	-.569	180.0	-.219	.104	.117	-.620
202.5	-.221	.107	.224	-.569	202.5	-.225	.101	.138	-.620
225.0	-.255	.116	.122	-.629	225.0	-.230	.111	.175	-.698
247.5	-.265	.123	.104	-.713	247.5	-.245	.120	.227	-.697
270.0	-.297	.132	.153	-.716	270.0	-.259	.113	.119	-.750
292.5	-.231	.141	.365	-.851	292.5	-.264	.126	.156	-.678
315.0	-.160	.165	.534	-.817	315.0	-.271	.122	.099	-.667
337.5	-.006	.129	.756	-.430	337.5	-.258	.133	.172	-.790

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	-.225	.116	.166	-.697	.0	-.205	.096	.083	-.647
22.5	-.230	.141	.305	-.850	22.5	-.239	.111	.171	-.629
45.0	-.116	.141	.503	-.710	45.0	-.264	.114	.052	-.866
67.5	.000	.125	.682	-.383	67.5	-.252	.126	.117	-.783
90.0	.027	.147	.780	-.606	90.0	-.126	.157	.606	-.710
112.5	.001	.160	.725	-.501	112.5	-.040	.139	.691	-.707
135.0	-.185	.151	.503	-.821	135.0	.039	.138	.939	-.369
157.5	-.274	.145	.307	-.801	157.5	-.013	.119	.630	-.391
180.0	-.271	.122	.083	-.750	180.0	-.093	.123	.517	-.584
202.5	-.276	.122	.222	-.789	202.5	-.228	.129	.222	-.721
225.0	-.237	.113	.104	-.713	225.0	-.257	.117	.225	-.695
247.5	-.227	.107	.139	-.624	247.5	-.221	.110	.139	-.676
270.0	-.221	.095	.169	-.560	270.0	-.230	.110	.136	-.577
292.5	-.245	.116	.122	-.641	292.5	-.194	.104	.225	-.623
315.0	-.227	.104	.067	-.632	315.0	-.218	.108	.150	-.648
337.5	-.222	.116	.136	-.651	337.5	-.200	.095	.154	-.633
Location 9					Location 10				
.0	-.231	.095	.265	-.630	.0	-.242	.104	.101	-.685
22.5	-.243	.113	.068	-.697	22.5	-.246	.122	.154	-.704
45.0	-.246	.107	.086	-.624	45.0	-.239	.117	.245	-.648
67.5	-.258	.113	.099	-.716	67.5	-.259	.105	.067	-.657
90.0	-.301	.129	.104	-.867	90.0	-.289	.133	.070	-.949
112.5	-.227	.125	.122	-.707	112.5	-.313	.135	.123	-.804
135.0	-.139	.101	.202	-.587	135.0	-.295	.132	.135	-.899
157.5	-.130	.098	.187	-.546	157.5	-.225	.129	.172	-.741
180.0	-.116	.096	.233	-.500	180.0	-.162	.102	.203	-.558
202.5	-.197	.111	.154	-.635	202.5	-.138	.104	.209	-.538
225.0	-.257	.128	.173	-.869	225.0	-.151	.105	.246	-.722
247.5	-.258	.123	.259	-.658	247.5	-.239	.130	.159	-.737
270.0	-.243	.107	.085	-.713	270.0	-.282	.120	.120	-.724
292.5	-.228	.108	.173	-.589	292.5	-.311	.136	.141	-.790
315.0	-.240	.105	.116	-.715	315.0	-.285	.114	.068	-.725
337.5	-.237	.104	.136	-.651	337.5	-.288	.117	.070	-.749
Location 11					Location 12				
.0	-.261	.119	.117	-.735	.0	-.258	.117	.267	-.735
22.5	-.262	.116	.086	-.704	22.5	-.273	.128	.086	-.945
45.0	-.255	.108	.052	-.718	45.0	-.259	.119	.070	-.701
67.5	-.236	.101	.050	-.606	67.5	-.242	.107	.085	-.657
90.0	-.254	.114	.123	-.721	90.0	-.288	.120	.105	-.738
112.5	-.270	.117	.052	-.664	112.5	-.255	.116	.139	-.682
135.0	-.276	.119	.068	-.661	135.0	-.240	.122	.135	-.796
157.5	-.289	.113	.138	-.690	157.5	-.265	.123	.086	-.741
180.0	-.265	.116	.068	-.710	180.0	-.231	.108	.068	-.626
202.5	-.230	.116	.225	-.660	202.5	-.274	.119	.070	-.765
225.0	-.156	.104	.282	-.528	225.0	-.280	.133	.123	-.774
247.5	-.123	.095	.228	-.526	247.5	-.215	.123	.264	-.685
270.0	-.163	.107	.206	-.603	270.0	-.154	.095	.172	-.620
292.5	-.211	.120	.264	-.738	292.5	-.130	.099	.211	-.492
315.0	-.289	.135	.151	-.945	315.0	-.157	.098	.151	-.540
337.5	-.298	.123	.191	-.715	337.5	-.211	.116	.173	-.679

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	-.130	.110	.240	-.549	.0	-.151	.117	.274	-.651
22.5	-.208	.139	.211	-.773	22.5	-.129	.110	.246	-.562
45.0	-.258	.141	.251	-.752	45.0	-.160	.114	.215	-.770
67.5	-.255	.125	.136	-.679	67.5	-.206	.125	.221	-.679
90.0	-.288	.145	.179	-.878	90.0	-.286	.144	.179	-.913
112.5	-.267	.133	.194	-.776	112.5	-.285	.138	.105	-.916
135.0	-.259	.126	.156	-.778	135.0	-.265	.128	.156	-.675
157.5	-.246	.128	.211	-.738	157.5	-.264	.125	.193	-.738
180.0	-.246	.123	.156	-.707	180.0	-.243	.119	.172	-.655
202.5	-.283	.135	.142	-.835	202.5	-.245	.122	.196	-.692
225.0	-.273	.139	.179	-1.025	225.0	-.270	.129	.179	-.701
247.5	-.298	.141	.215	-.823	247.5	-.280	.139	.107	-.805
270.0	-.270	.128	.211	-.826	270.0	-.310	.145	.123	-.790
292.5	-.222	.141	.251	-.716	292.5	-.282	.139	.215	-.876
315.0	-.141	.113	.274	-.532	315.0	-.300	.150	.172	-.943
337.5	-.117	.111	.301	-.549	337.5	-.222	.129	.301	-.848
Location 15					Location 16				
.0	-.252	.123	.120	-.770	.0	-.219	.114	.136	-.701
22.5	-.219	.139	.211	-.823	22.5	-.246	.125	.193	-.718
45.0	-.138	.123	.249	-.589	45.0	-.237	.117	.125	-.767
67.5	-.116	.101	.274	-.480	67.5	-.168	.111	.206	-.583
90.0	-.160	.122	.214	-.679	90.0	-.114	.110	.233	-.661
112.5	-.227	.129	.249	-.728	112.5	-.108	.108	.231	-.480
135.0	-.288	.139	.156	-.864	135.0	-.142	.108	.294	-.553
157.5	-.277	.136	.211	-.774	157.5	-.215	.113	.282	-.633
180.0	-.262	.126	.156	-.827	180.0	-.246	.122	.138	-.776
202.5	-.270	.126	.194	-.848	202.5	-.267	.125	.230	-.690
225.0	-.259	.125	.145	-.867	225.0	-.285	.120	.163	-.669
247.5	-.254	.125	.178	-.713	247.5	-.233	.113	.178	-.731
270.0	-.254	.111	.193	-.664	270.0	-.249	.120	.157	-.612
292.5	-.300	.135	.199	-.793	292.5	-.231	.116	.252	-.703
315.0	-.261	.117	.136	-.701	315.0	-.234	.119	.222	-.684
337.5	-.291	.129	.142	-.783	337.5	-.243	.111	.196	-.641
Location 17					Location 18				
.0	-.261	.122	.219	-.746	.0	-.279	.133	.153	-.778
22.5	-.288	.148	.173	-.799	22.5	-.298	.141	.156	-.939
45.0	-.291	.145	.214	-.851	45.0	-.298	.133	.125	-.869
67.5	-.305	.132	.136	-.783	67.5	-.274	.129	.153	-.767
90.0	-.326	.156	.107	-.959	90.0	-.283	.139	.160	-.817
112.5	-.334	.150	.196	-1.011	112.5	-.298	.136	.107	-.922
135.0	-.304	.141	.120	-.945	135.0	-.280	.129	.154	-.773
157.5	-.280	.142	.194	-.811	157.5	-.295	.125	.159	-.741
180.0	-.259	.130	.156	-.813	180.0	-.261	.120	.122	-.744
202.5	-.262	.132	.160	-.799	202.5	-.254	.128	.160	-.657
225.0	-.239	.129	.162	-.829	225.0	-.254	.126	.199	-.756
247.5	-.265	.135	.162	-.771	247.5	-.249	.130	.233	-.700
270.0	-.280	.123	.159	-.721	270.0	-.286	.138	.159	-.721
292.5	-.300	.139	.176	-.780	292.5	-.251	.135	.230	-.780
315.0	-.301	.128	.068	-.756	315.0	-.313	.144	.154	-.860
337.5	-.308	.132	.125	-.796	337.5	-.305	.133	.283	-.778

Cermak Peterka Petersen, Inc.

C-36

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	-.228	.120	.171	-.781	.0	-.277	.133	.136	-.850
22.5	-.233	.135	.209	-.731	22.5	-.262	.130	.157	-.731
45.0	-.234	.133	.214	-.747	45.0	-.240	.123	.160	-.819
67.5	-.267	.125	.136	-.685	67.5	-.212	.117	.188	-.651
90.0	-.300	.147	.196	-.998	90.0	-.222	.126	.196	-.838
112.5	-.313	.142	.142	-.851	112.5	-.249	.129	.160	-.710
135.0	-.302	.138	.172	-.863	135.0	-.255	.128	.156	-.725
157.5	-.279	.141	.280	-.805	157.5	-.279	.126	.175	-.700
180.0	-.285	.136	.138	-.875	180.0	-.276	.126	.188	-.789
202.5	-.322	.144	.176	-.881	202.5	-.298	.139	.212	-.776
225.0	-.300	.147	.142	-1.108	225.0	-.314	.136	.178	-.786
247.5	-.320	.148	.196	-.873	247.5	-.302	.141	.160	-.802
270.0	-.302	.129	.122	-.786	270.0	-.322	.150	.157	-.802
292.5	-.320	.145	.142	-.838	292.5	-.298	.142	.214	-.802
315.0	-.282	.126	.102	-.749	315.0	-.335	.153	.171	-.851
337.5	-.271	.130	.193	-.721	337.5	-.311	.139	.176	-.879

Cermak Peterka Petersen, Inc.

C-37

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
 Data Set 15 - 1.00 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.531	.159	.016	-1.182	.0	-.344	.178	.185	-1.097
Location 3					Location 4				
.0	-.139	.105	.254	-.592	.0	-.176	.113	.151	-.743
Location 5					Location 6				
.0	-.169	.101	.199	-.827	.0	-.227	.133	.215	-.927
Location 7					Location 8				
.0	-.130	.098	.265	-.546	.0	-.325	.178	.298	-1.059
Location 9					Location 10				
.0	-.387	.154	.114	-1.017	.0	-.222	.139	.262	-.967
Location 11					Location 12				
.0	-.073	.092	.393	-.525	.0	-.034	.073	.197	-.311
Location 13					Location 14				
.0	.012	.090	.334	-.317	.0	-.033	.077	.334	-.350
Location 15					Location 16				
.0	-.102	.086	.200	-.635	.0	-.271	.153	.283	-1.035
Location 17					Location 18				
.0	-.128	.141	.391	-.713	.0	-.065	.123	.391	-.560
Location 19					Location 20				
.0	-.004	.116	.357	-.526	.0	-.044	.093	.322	-.424
Location 21					Location 22				
.0	-.004	.092	.372	-.424	.0	-.009	.093	.322	-.338
Location 23					Location 24				
.0	-.053	.116	.408	-.494	.0	-.086	.122	.357	-.578
Location 25					Location 26				
.0	-.037	.111	.408	-.460	.0	.031	.133	.676	-.540
Location 27					Location 28				
.0	-.024	.108	.439	-.405	.0	-.021	.108	.388	-.405

Cermak Peterka Petersen, Inc.

C-38

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
 Data Set 16 - 0.90 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.254	.090	.052	-.617	.0	-.270	.114	.257	-.685
Location 3					Location 4				
.0	-.096	.172	.581	-.735	.0	.087	.120	.581	-.325
Location 5					Location 6				
.0	.153	.148	.805	-.268	.0	.089	.150	.638	-.436
Location 7					Location 8				
.0	-.125	.173	.603	-.906	.0	-.273	.120	.101	-.922
Location 9					Location 10				
.0	-.273	.093	.067	-.698	.0	-.294	.126	.216	-.781
Location 11					Location 12				
.0	-.092	.156	.466	-.682	.0	.052	.114	.532	-.267
Location 13					Location 14				
.0	.101	.130	.661	-.288	.0	.050	.136	.525	-.458
Location 15					Location 16				
.0	-.129	.163	.474	-.915	.0	-.298	.130	.187	-.881
Location 17					Location 18				
.0	-.265	.128	.172	-.758	.0	-.242	.145	.552	-.706
Location 19					Location 20				
.0	-.095	.145	.466	-.568	.0	-.004	.119	.568	-.396
Location 21					Location 22				
.0	.025	.125	.482	-.378	.0	-.004	.136	.498	-.550
Location 23					Location 24				
.0	-.108	.145	.519	-.709	.0	-.233	.142	.363	-.813
Location 25					Location 26				
.0	-.179	.138	.415	-.605	.0	-.099	.145	.480	-.669
Location 27					Location 28				
.0	-.044	.135	.601	-.480	.0	-.110	.138	.412	-.566

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 17 - 0.75 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.203	.087	.171	-.560	.0	-.206	.095	.119	-.544
Location 3					Location 4				
.0	-.184	.144	.731	-.902	.0	.028	.130	.697	-.526
Location 5					Location 6				
.0	.133	.163	.993	-.331	.0	.024	.163	.827	-.480
Location 7					Location 8				
.0	-.199	.141	.448	-1.060	.0	-.205	.087	.067	-.629
Location 9					Location 10				
.0	-.203	.086	.114	-.507	.0	-.211	.095	.130	-.541
Location 11					Location 12				
.0	-.206	.128	.279	-.902	.0	-.049	.117	.491	-.639
Location 13					Location 14				
.0	.000	.128	.583	-.415	.0	-.070	.141	.532	-.583
Location 15					Location 16				
.0	-.228	.132	.233	-1.048	.0	-.230	.093	.033	-.649
Location 17					Location 18				
.0	-.233	.110	.136	-.681	.0	-.243	.122	.255	-.715
Location 19					Location 20				
.0	-.224	.126	.239	-.733	.0	-.144	.113	.356	-.575
Location 21					Location 22				
.0	-.129	.129	.423	-.609	.0	-.160	.125	.338	-.626
Location 23					Location 24				
.0	-.225	.126	.187	-.747	.0	-.233	.116	.221	-.595
Location 25					Location 26				
.0	-.243	.117	.205	-.781	.0	-.239	.128	.322	-.795
Location 27					Location 28				
.0	-.188	.129	.237	-.609	.0	-.221	.120	.185	-.694

Cermak Peterka Petersen, Inc.

C-40

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
 Data Set 18 - 0.50 Roof Height Ratio - 0 deg data, all taps

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.169	.092	.221	-.492	.0	-.187	.092	.203	-.543
Location 3					Location 4				
.0	-.214	.108	.255	-.593	.0	-.061	.126	.424	-.645
Location 5					Location 6				
.0	.144	.160	1.062	-.316	.0	-.049	.156	.663	-.813
Location 7					Location 8				
.0	-.197	.110	.265	-.630	.0	-.179	.089	.166	-.547
Location 9					Location 10				
.0	-.187	.090	.148	-.476	.0	-.197	.093	.246	-.575
Location 11					Location 12				
.0	-.230	.107	.116	-.673	.0	-.130	.110	.230	-.673
Location 13					Location 14				
.0	.006	.102	.463	-.331	.0	-.133	.116	.314	-.678
Location 15					Location 16				
.0	-.214	.107	.199	-.695	.0	-.191	.093	.166	-.596
Location 17					Location 18				
.0	-.225	.111	.171	-.663	.0	-.231	.107	.205	-.612
Location 19					Location 20				
.0	-.255	.119	.119	-.697	.0	-.193	.108	.136	-.612
Location 21					Location 22				
.0	-.214	.111	.237	-.612	.0	-.245	.116	.221	-.900
Location 23					Location 24				
.0	-.261	.119	.221	-.713	.0	-.230	.108	.289	-.629
Location 25					Location 26				
.0	-.252	.116	.203	-.730	.0	-.285	.129	.135	-.746
Location 27					Location 28				
.0	-.251	.120	.203	-.695	.0	-.248	.116	.153	-.678

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.467	.165	.016	-1.133	.0	-.360	.176	.169	-1.200
22.5	-.463	.179	.237	-1.201	22.5	-.492	.187	.135	-1.251
45.0	-.314	.165	.169	-.980	45.0	-.494	.169	.153	-1.286
67.5	-.196	.135	.154	-.887	67.5	-.479	.182	.136	-1.314
90.0	-.160	.099	.135	-.644	90.0	-.291	.159	.153	-1.034
112.5	-.209	.125	.211	-.824	112.5	-.188	.138	.228	-1.087
135.0	-.221	.135	.178	-.959	135.0	-.133	.102	.249	-.568
157.5	-.176	.114	.190	-.741	157.5	-.173	.116	.156	-.725
180.0	-.219	.130	.193	-.910	180.0	-.162	.119	.211	-.718
202.5	-.276	.157	.138	-1.091	202.5	-.175	.119	.190	-.692
225.0	-.307	.169	.122	-.991	225.0	-.212	.128	.139	-.730
247.5	-.283	.160	.259	-1.056	247.5	-.300	.150	.156	-.934
270.0	-.154	.114	.265	-.730	270.0	-.338	.165	.132	-.946
292.5	-.233	.144	.188	-1.204	292.5	-.314	.162	.142	-.980
315.0	-.375	.175	.070	-1.174	315.0	-.166	.113	.242	-.777
337.5	-.494	.202	.136	-1.486	337.5	-.205	.129	.136	-1.042
Location 3					Location 4				
.0	-.148	.119	.203	-.727	.0	-.157	.113	.203	-.592
22.5	-.193	.119	.219	-.896	22.5	-.165	.104	.169	-.626
45.0	-.340	.178	.135	-1.099	45.0	-.166	.099	.169	-.541
67.5	-.498	.199	.120	-1.434	67.5	-.211	.104	.086	-.768
90.0	-.520	.184	.050	-1.389	90.0	-.331	.145	.068	-1.118
112.5	-.458	.181	.141	-1.174	112.5	-.474	.181	.193	-1.280
135.0	-.305	.169	.160	-1.118	135.0	-.532	.193	.053	-1.243
157.5	-.181	.123	.259	-.673	157.5	-.455	.188	.224	-1.415
180.0	-.145	.101	.245	-.525	180.0	-.274	.166	.245	-.998
202.5	-.111	.083	.173	-.415	202.5	-.119	.129	.347	-.727
225.0	-.119	.099	.225	-.590	225.0	-.059	.107	.295	-.695
247.5	-.129	.092	.156	-.519	247.5	-.080	.093	.225	-.503
270.0	-.132	.093	.166	-.563	270.0	-.135	.099	.182	-.614
292.5	-.214	.130	.196	-.836	292.5	-.144	.102	.249	-.712
315.0	-.288	.157	.138	-.933	315.0	-.133	.095	.156	-.517
337.5	-.245	.139	.086	-.906	337.5	-.142	.099	.171	-.547
Location 5					Location 6				
.0	-.135	.098	.165	-.623	.0	-.230	.136	.114	-1.066
22.5	-.176	.120	.214	-.870	22.5	-.248	.132	.116	-.805
45.0	-.182	.111	.130	-.706	45.0	-.187	.111	.181	-.672
67.5	-.182	.104	.166	-.612	67.5	-.236	.130	.116	-.894
90.0	-.166	.107	.214	-.606	90.0	-.203	.120	.147	-.655
112.5	-.231	.132	.135	-.982	112.5	-.221	.126	.153	-.796
135.0	-.383	.173	.156	-1.109	135.0	-.156	.113	.259	-.658
157.5	-.433	.157	.067	-1.091	157.5	-.219	.138	.151	-.991
180.0	-.486	.153	.136	-.971	180.0	-.343	.169	.153	-1.124
202.5	-.449	.176	.119	-1.292	202.5	-.442	.169	.221	-1.326
225.0	-.297	.181	.341	-1.176	225.0	-.446	.150	.085	-1.074
247.5	-.156	.147	.322	-.814	247.5	-.420	.153	.102	-1.152
270.0	-.096	.101	.292	-.568	270.0	-.294	.171	.325	-1.056
292.5	-.157	.110	.209	-.590	292.5	-.199	.171	.451	-.921
315.0	-.199	.117	.135	-.774	315.0	-.133	.107	.302	-.657
337.5	-.181	.110	.133	-.715	337.5	-.214	.126	.116	-.964

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	-.138	.108	.230	-.558	.0	-.285	.163	.279	-.887
22.5	-.215	.120	.181	-.756	22.5	-.148	.141	.476	-.805
45.0	-.171	.111	.181	-.672	45.0	-.128	.105	.197	-.574
67.5	-.175	.108	.132	-.761	67.5	-.179	.110	.166	-.629
90.0	-.176	.107	.114	-.672	90.0	-.214	.111	.098	-.787
112.5	-.230	.133	.169	-.778	112.5	-.156	.113	.187	-.710
135.0	-.276	.159	.173	-.953	135.0	-.169	.111	.122	-.658
157.5	-.224	.128	.117	-.722	157.5	-.202	.136	.151	-1.008
180.0	-.182	.113	.171	-.715	180.0	-.254	.147	.119	-1.039
202.5	-.222	.132	.171	-1.002	202.5	-.280	.141	.085	-.781
225.0	-.348	.169	.153	-.988	225.0	-.197	.120	.136	-.698
247.5	-.463	.165	.085	-1.152	247.5	-.258	.130	.119	-.899
270.0	-.430	.139	-.049	-1.103	270.0	-.394	.176	.065	-1.201
292.5	-.437	.175	.156	-1.128	292.5	-.492	.194	.034	-1.268
315.0	-.313	.188	.488	-1.111	315.0	-.509	.154	.067	-1.094
337.5	-.168	.147	.332	-.881	337.5	-.451	.179	.216	-1.097
Location 9					Location 10				
.0	-.329	.145	.114	-.962	.0	-.216	.138	.212	-.816
22.5	-.338	.159	.114	-1.173	22.5	-.322	.156	.294	-.879
45.0	-.230	.135	.196	-.716	45.0	-.347	.144	.082	-.945
67.5	-.157	.113	.262	-.706	67.5	-.326	.157	.279	-1.066
90.0	-.096	.086	.196	-.537	90.0	-.205	.123	.228	-.764
112.5	-.059	.086	.236	-.420	112.5	-.157	.110	.236	-.805
135.0	-.009	.087	.378	-.343	135.0	-.093	.090	.258	-.480
157.5	.009	.080	.320	-.286	157.5	-.070	.082	.169	-.388
180.0	.019	.093	.393	-.291	180.0	-.025	.090	.479	-.325
202.5	.001	.083	.371	-.270	202.5	.004	.085	.405	-.387
225.0	-.037	.082	.288	-.354	225.0	.007	.090	.388	-.388
247.5	-.080	.077	.185	-.556	247.5	-.007	.085	.353	-.286
270.0	-.104	.089	.162	-.515	270.0	-.024	.083	.274	-.305
292.5	-.160	.123	.279	-.821	292.5	-.080	.083	.276	-.380
315.0	-.240	.135	.234	-.802	315.0	-.101	.090	.218	-.719
337.5	-.319	.160	.264	-.974	337.5	-.135	.114	.231	-.676
Location 11					Location 12				
.0	-.065	.095	.261	-.489	.0	-.028	.074	.277	-.326
22.5	-.093	.108	.277	-.506	22.5	-.064	.073	.245	-.343
45.0	-.178	.123	.245	-.602	45.0	-.114	.076	.130	-.457
67.5	-.273	.151	.262	-.919	67.5	-.150	.086	.132	-.509
90.0	-.332	.142	.082	-.910	90.0	-.206	.101	.130	-.586
112.5	-.300	.141	.168	-.823	112.5	-.295	.120	.085	-.856
135.0	-.231	.120	.292	-.687	135.0	-.345	.142	.120	-.875
157.5	-.179	.099	.101	-.658	157.5	-.325	.154	.219	-1.013
180.0	-.128	.085	.188	-.495	180.0	-.202	.147	.445	-.752
202.5	-.073	.077	.219	-.371	202.5	-.101	.119	.337	-.675
225.0	-.037	.080	.320	-.338	225.0	-.039	.104	.371	-.642
247.5	-.006	.082	.302	-.387	247.5	-.007	.086	.320	-.371
270.0	.016	.080	.305	-.274	270.0	.013	.079	.305	-.274
292.5	.016	.099	.397	-.328	292.5	.027	.083	.414	-.276
315.0	-.010	.083	.317	-.301	315.0	.033	.086	.402	-.234
337.5	-.039	.085	.297	-.363	337.5	.013	.079	.396	-.248

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	.022	.085	.380	-.248	.0	-.022	.080	.248	-.313
22.5	.003	.083	.314	-.331	22.5	.001	.085	.363	-.331
45.0	-.031	.079	.231	-.380	45.0	.025	.085	.380	-.280
67.5	-.077	.079	.233	-.399	67.5	.015	.087	.316	-.300
90.0	-.104	.090	.297	-.544	90.0	-.018	.074	.280	-.280
112.5	-.168	.122	.221	-.765	112.5	-.062	.080	.205	-.391
135.0	-.255	.150	.261	-.992	135.0	-.096	.098	.261	-.645
157.5	-.328	.147	.270	-.980	157.5	-.160	.128	.236	-.896
180.0	-.405	.166	.274	-.977	180.0	-.243	.150	.222	-.993
202.5	-.328	.162	.270	-1.066	202.5	-.328	.159	.185	-.964
225.0	-.193	.147	.374	-.830	225.0	-.345	.156	.135	-1.051
247.5	-.136	.123	.356	-.728	247.5	-.317	.150	.254	-.897
270.0	-.076	.095	.242	-.614	270.0	-.211	.141	.565	-.808
292.5	-.052	.086	.243	-.417	292.5	-.171	.142	.383	-.817
315.0	-.016	.080	.302	-.302	315.0	-.093	.089	.252	-.437
337.5	.027	.082	.365	-.265	337.5	-.064	.077	.216	-.383
Location 15					Location 16				
.0	-.104	.101	.248	-.627	.0	-.227	.141	.197	-.891
22.5	-.077	.086	.231	-.430	22.5	-.160	.128	.396	-.777
45.0	-.015	.080	.347	-.329	45.0	-.092	.092	.181	-.461
67.5	.021	.086	.366	-.283	67.5	-.061	.079	.249	-.332
90.0	.027	.077	.280	-.248	90.0	-.016	.082	.297	-.429
112.5	.030	.087	.391	-.289	112.5	.030	.085	.340	-.271
135.0	-.012	.086	.313	-.331	135.0	.037	.082	.297	-.348
157.5	-.052	.080	.270	-.558	157.5	.018	.083	.372	-.338
180.0	-.105	.099	.360	-.497	180.0	-.021	.080	.291	-.377
202.5	-.148	.119	.185	-.761	202.5	-.062	.085	.288	-.406
225.0	-.231	.142	.288	-.780	225.0	-.108	.105	.237	-.627
247.5	-.326	.154	.203	-.964	247.5	-.160	.122	.219	-.710
270.0	-.335	.141	.049	-.970	270.0	-.251	.154	.403	-.872
292.5	-.331	.165	.243	-1.112	292.5	-.340	.171	.156	-1.094
315.0	-.239	.151	.369	-.907	315.0	-.396	.160	.202	-1.042
337.5	-.156	.123	.316	-.780	337.5	-.338	.165	.150	-1.013
Location 17					Location 18				
.0	-.099	.122	.387	-.624	.0	-.056	.125	.387	-.657
22.5	-.110	.136	.270	-.724	22.5	-.089	.133	.387	-.740
45.0	-.076	.119	.405	-.540	45.0	-.102	.129	.304	-.641
67.5	-.065	.108	.271	-.526	67.5	-.089	.128	.442	-.713
90.0	-.046	.101	.337	-.455	90.0	-.077	.111	.270	-.606
112.5	-.030	.104	.365	-.488	112.5	-.079	.110	.279	-.488
135.0	-.001	.107	.391	-.356	135.0	-.046	.105	.356	-.391
157.5	-.004	.095	.345	-.483	157.5	-.042	.101	.362	-.397
180.0	-.001	.107	.386	-.368	180.0	-.033	.105	.403	-.386
202.5	-.003	.101	.451	-.381	202.5	-.016	.101	.363	-.415
225.0	-.012	.098	.381	-.347	225.0	-.009	.107	.363	-.381
247.5	-.024	.099	.310	-.466	247.5	-.006	.099	.414	-.310
270.0	-.028	.099	.313	-.396	270.0	.006	.101	.363	-.329
292.5	-.043	.116	.388	-.761	292.5	-.018	.108	.424	-.406
315.0	-.062	.117	.343	-.635	315.0	-.024	.104	.531	-.497
337.5	-.074	.129	.356	-.676	337.5	-.022	.111	.372	-.525

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	.003	.114	.387	-.421	.0	-.034	.089	.302	-.320
22.5	-.003	.122	.421	-.403	22.5	-.061	.092	.254	-.371
45.0	-.036	.122	.489	-.606	45.0	-.079	.087	.320	-.489
67.5	-.068	.128	.323	-.612	67.5	-.099	.093	.273	-.476
90.0	-.105	.119	.270	-.673	90.0	-.110	.098	.219	-.522
112.5	-.128	.123	.313	-.695	112.5	-.125	.110	.191	-.520
135.0	-.105	.114	.249	-.569	135.0	-.120	.123	.394	-.609
157.5	-.107	.102	.259	-.483	157.5	-.093	.119	.279	-.523
180.0	-.089	.102	.298	-.455	180.0	-.058	.135	.458	-.618
202.5	-.059	.098	.363	-.537	202.5	-.001	.135	.608	-.434
225.0	-.049	.096	.415	-.467	225.0	.031	.126	.540	-.384
247.5	-.028	.095	.344	-.414	247.5	.033	.114	.504	-.365
270.0	-.006	.092	.297	-.297	270.0	.027	.102	.399	-.316
292.5	.003	.113	.477	-.406	292.5	.024	.101	.446	-.338
315.0	.010	.101	.360	-.411	315.0	.007	.093	.431	-.328
337.5	.016	.113	.474	-.423	337.5	-.010	.093	.359	-.359
Location 21					Location 22				
.0	-.001	.096	.371	-.302	.0	-.001	.098	.286	-.387
22.5	-.027	.095	.354	-.371	22.5	-.006	.099	.387	-.405
45.0	-.043	.092	.337	-.388	45.0	-.007	.095	.337	-.439
67.5	-.061	.095	.273	-.374	67.5	-.013	.093	.323	-.340
90.0	-.062	.093	.320	-.437	90.0	-.015	.092	.387	-.337
112.5	-.067	.102	.277	-.469	112.5	-.009	.099	.381	-.399
135.0	-.089	.114	.359	-.592	135.0	-.053	.107	.430	-.574
157.5	-.107	.119	.314	-.593	157.5	-.070	.107	.366	-.540
180.0	-.117	.129	.371	-.635	180.0	-.096	.126	.335	-.618
202.5	-.090	.129	.313	-.661	202.5	-.098	.126	.434	-.731
225.0	-.056	.125	.436	-.506	225.0	-.108	.133	.418	-.679
247.5	-.033	.119	.470	-.452	247.5	-.087	.128	.365	-.678
270.0	-.009	.105	.348	-.383	270.0	-.064	.116	.399	-.681
292.5	-.012	.107	.464	-.429	292.5	-.055	.116	.446	-.446
315.0	-.004	.090	.345	-.328	315.0	-.036	.102	.466	-.414
337.5	.004	.093	.375	-.393	337.5	-.022	.101	.409	-.427
Location 23					Location 24				
.0	-.039	.107	.420	-.555	.0	-.082	.125	.403	-.638
22.5	-.028	.104	.319	-.437	22.5	-.065	.120	.387	-.639
45.0	-.012	.098	.405	-.405	45.0	-.040	.107	.371	-.437
67.5	-.006	.098	.374	-.374	67.5	-.028	.108	.374	-.424
90.0	.000	.102	.354	-.387	90.0	-.018	.098	.387	-.387
112.5	-.003	.105	.331	-.365	112.5	-.003	.101	.331	-.365
135.0	-.003	.111	.480	-.445	135.0	.015	.104	.391	-.480
157.5	-.024	.102	.328	-.431	157.5	.004	.104	.431	-.345
180.0	-.047	.122	.421	-.596	180.0	-.013	.108	.437	-.473
202.5	-.065	.120	.396	-.569	202.5	-.025	.105	.414	-.466
225.0	-.064	.119	.415	-.466	225.0	-.037	.113	.363	-.431
247.5	-.105	.128	.279	-.661	247.5	-.061	.117	.365	-.540
270.0	-.108	.128	.366	-.698	270.0	-.071	.128	.366	-.516
292.5	-.111	.142	.320	-.854	292.5	-.111	.132	.320	-.712
315.0	-.082	.125	.345	-.655	315.0	-.110	.135	.362	-.759
337.5	-.047	.119	.426	-.562	337.5	-.098	.129	.357	-.851

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 25					Location 26				
.0	-.027	.117	.337	-.688	.0	.028	.128	.586	-.469
22.5	-.031	.117	.421	-.387	22.5	.024	.133	.486	-.537
45.0	-.030	.111	.371	-.437	45.0	.009	.125	.522	-.472
67.5	-.024	.111	.440	-.374	67.5	-.028	.120	.457	-.558
90.0	-.027	.102	.354	-.439	90.0	-.047	.107	.320	-.437
112.5	-.013	.110	.400	-.434	112.5	-.065	.113	.383	-.504
135.0	-.022	.107	.480	-.409	135.0	-.071	.113	.320	-.534
157.5	-.024	.104	.431	-.483	157.5	-.077	.101	.242	-.466
180.0	-.024	.108	.473	-.403	180.0	-.067	.108	.332	-.455
202.5	-.016	.107	.414	-.380	202.5	-.047	.104	.294	-.483
225.0	-.006	.113	.501	-.431	225.0	-.031	.104	.415	-.380
247.5	-.016	.113	.434	-.452	247.5	-.012	.107	.448	-.380
270.0	-.019	.105	.449	-.583	270.0	.009	.108	.512	-.347
292.5	-.034	.122	.480	-.534	292.5	.012	.113	.494	-.442
315.0	-.025	.110	.380	-.449	315.0	.013	.111	.480	-.412
337.5	-.037	.111	.426	-.562	337.5	.030	.117	.558	-.423
Location 27					Location 28				
.0	-.013	.111	.368	-.436	.0	-.018	.114	.386	-.586
22.5	-.037	.108	.470	-.403	22.5	-.015	.113	.486	-.403
45.0	-.062	.102	.371	-.421	45.0	-.022	.107	.403	-.387
67.5	-.071	.104	.304	-.439	67.5	-.022	.105	.457	-.406
90.0	-.068	.101	.337	-.455	90.0	-.024	.101	.337	-.421
112.5	-.061	.108	.331	-.469	112.5	-.015	.110	.434	-.434
135.0	-.043	.111	.302	-.480	135.0	-.016	.111	.409	-.409
157.5	-.047	.111	.414	-.517	157.5	-.022	.107	.431	-.431
180.0	-.049	.119	.368	-.507	180.0	-.028	.114	.332	-.525
202.5	-.030	.120	.397	-.605	202.5	-.024	.114	.397	-.535
225.0	-.013	.123	.535	-.501	225.0	-.027	.117	.467	-.467
247.5	.000	.120	.414	-.431	247.5	-.022	.120	.483	-.448
270.0	.013	.114	.479	-.412	270.0	-.031	.110	.412	-.560
292.5	.001	.117	.442	-.424	292.5	-.030	.123	.494	-.424
315.0	-.001	.108	.429	-.343	315.0	-.028	.114	.360	-.429
337.5	.004	.105	.388	-.372	337.5	-.024	.113	.457	-.489

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.285	.104	.141	-.844	.0	-.277	.117	.105	-1.020
22.5	-.297	.111	.053	-.973	22.5	-.288	.107	.144	-.685
45.0	-.292	.116	.087	-.853	45.0	-.286	.104	.122	-.644
67.5	-.302	.169	.359	-1.059	67.5	-.304	.108	.071	-.664
90.0	-.153	.175	.538	-.919	90.0	-.285	.119	.087	-.971
112.5	-.015	.145	.611	-.595	112.5	-.273	.163	.437	-1.206
135.0	.058	.142	.645	-.506	135.0	-.133	.165	.558	-.976
157.5	.107	.130	.601	-.377	157.5	-.037	.147	.601	-.601
180.0	.153	.142	.758	-.380	180.0	.068	.141	.687	-.560
202.5	.130	.132	.786	-.279	202.5	.129	.129	.716	-.262
225.0	.068	.136	.624	-.399	225.0	.142	.141	.728	-.243
247.5	-.004	.133	.469	-.676	247.5	.107	.129	.642	-.295
270.0	-.129	.156	.418	-.988	270.0	.073	.139	.670	-.418
292.5	-.254	.159	.437	-1.014	292.5	-.015	.144	.489	-.804
315.0	-.297	.128	.175	-.979	315.0	-.145	.182	.611	-.961
337.5	-.298	.105	.142	-.746	337.5	-.292	.172	.461	-1.278
Location 3					Location 4				
.0	-.135	.166	.492	-.738	.0	.071	.116	.580	-.282
22.5	-.271	.168	.396	-.973	22.5	.000	.123	.486	-.469
45.0	-.291	.120	.209	-.783	45.0	-.116	.107	.261	-.558
67.5	-.283	.119	.053	-.773	67.5	-.205	.113	.252	-.700
90.0	-.270	.098	.034	-.624	90.0	-.254	.104	.087	-.642
112.5	-.265	.101	.193	-.698	112.5	-.274	.101	.070	-.611
135.0	-.270	.116	.139	-.767	135.0	-.262	.099	.105	-.645
157.5	-.237	.129	.154	-.823	157.5	-.271	.101	.068	-.669
180.0	-.169	.133	.307	-.704	180.0	-.291	.129	.181	-.993
202.5	-.033	.129	.506	-.733	202.5	-.262	.166	.314	-1.309
225.0	.086	.136	.796	-.503	225.0	-.107	.181	.503	-1.022
247.5	.132	.142	.746	-.485	247.5	.052	.166	.642	-.798
270.0	.133	.139	.719	-.268	270.0	.119	.159	.905	-.368
292.5	.136	.141	.821	-.262	292.5	.151	.150	.770	-.227
315.0	.064	.139	.698	-.366	315.0	.135	.145	.768	-.332
337.5	-.013	.148	.586	-.675	337.5	.122	.130	.746	-.319
Location 5					Location 6				
.0	.150	.157	1.077	-.273	.0	.085	.148	.684	-.581
22.5	.142	.151	.753	-.350	22.5	.128	.153	.807	-.298
45.0	.083	.141	.746	-.424	45.0	.168	.159	.866	-.289
67.5	-.036	.150	.560	-.666	67.5	.147	.166	.893	-.368
90.0	-.142	.157	.593	-.780	90.0	.092	.150	.780	-.509
112.5	-.252	.150	.291	-1.059	112.5	-.001	.150	.854	-.547
135.0	-.276	.117	.120	-.973	135.0	-.142	.163	.563	-.922
157.5	-.258	.096	.085	-.621	157.5	-.262	.148	.335	-.890
180.0	-.304	.101	.053	-.655	180.0	-.292	.125	.159	-.867
202.5	-.280	.102	.136	-.669	202.5	-.273	.101	.052	-.633
225.0	-.277	.125	.102	-.768	225.0	-.279	.099	.136	-.614
247.5	-.259	.160	.254	-1.165	247.5	-.249	.099	.153	-.642
270.0	-.105	.163	.523	-.899	270.0	-.276	.114	.098	-.996
292.5	.037	.154	.700	-.734	292.5	-.264	.165	.512	-1.023
315.0	.095	.153	.810	-.540	315.0	-.125	.179	.506	-1.198
337.5	.157	.156	.959	-.326	337.5	.016	.162	.669	-.617

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	-.130	.168	.495	-.872	.0	-.276	.117	.120	-.786
22.5	-.013	.159	.753	-.544	22.5	-.279	.162	.403	-1.069
45.0	.079	.145	.679	-.356	45.0	-.132	.169	.713	-.916
67.5	.135	.150	.998	-.298	67.5	-.016	.156	.735	-.648
90.0	.135	.142	.695	-.305	90.0	.085	.141	.780	-.408
112.5	.113	.142	.906	-.393	112.5	.136	.159	.820	-.495
135.0	.079	.136	.666	-.409	135.0	.135	.147	.786	-.239
157.5	-.004	.139	.605	-.722	157.5	.116	.144	.789	-.319
180.0	-.142	.179	.531	-.814	180.0	.071	.139	.655	-.354
202.5	-.254	.153	.291	-.857	202.5	-.019	.144	.583	-.669
225.0	-.295	.120	.120	-.870	225.0	-.142	.157	.546	-.784
247.5	-.268	.102	.203	-.827	247.5	-.248	.156	.457	-1.099
270.0	-.252	.099	.065	-.621	270.0	-.262	.125	.130	-.833
292.5	-.270	.101	.068	-.716	292.5	-.259	.093	.052	-.632
315.0	-.270	.122	.101	-.945	315.0	-.258	.093	.016	-.608
337.5	-.255	.160	.291	-1.062	337.5	-.282	.102	.052	-.669
Location 9					Location 10				
.0	-.292	.108	.068	-1.001	.0	-.286	.125	.169	-.764
22.5	-.302	.116	.122	-.817	22.5	-.298	.113	.139	-.799
45.0	-.297	.120	.085	-.857	45.0	-.292	.105	.135	-.639
67.5	-.274	.151	.417	-.885	67.5	-.314	.113	.052	-.816
90.0	-.142	.153	.455	-.641	90.0	-.297	.122	.067	-.927
112.5	-.034	.141	.644	-.762	112.5	-.254	.144	.474	-.881
135.0	.031	.139	.626	-.491	135.0	-.130	.147	.440	-.678
157.5	.064	.126	.534	-.384	157.5	-.062	.145	.601	-.633
180.0	.104	.136	.721	-.316	180.0	.034	.132	.544	-.421
202.5	.087	.129	.647	-.374	202.5	.085	.126	.629	-.271
225.0	.042	.133	.525	-.440	225.0	.098	.136	.744	-.304
247.5	-.007	.132	.553	-.603	247.5	.086	.126	.603	-.285
270.0	-.116	.139	.388	-.777	270.0	.059	.139	.550	-.405
292.5	-.246	.145	.271	-.813	292.5	-.018	.148	.559	-.644
315.0	-.291	.128	.101	-.820	315.0	-.117	.159	.703	-.687
337.5	-.294	.108	.171	-.765	337.5	-.257	.159	.663	-.867
Location 11					Location 12				
.0	-.111	.144	.442	-.577	.0	.053	.116	.474	-.374
22.5	-.239	.160	.400	-.939	22.5	-.006	.122	.486	-.400
45.0	-.294	.126	.151	-.991	45.0	-.108	.108	.268	-.520
67.5	-.291	.125	.104	-.867	67.5	-.209	.113	.225	-.642
90.0	-.280	.099	.085	-.641	90.0	-.270	.105	.101	-.707
112.5	-.277	.104	.068	-.796	112.5	-.291	.102	.050	-.694
135.0	-.283	.117	.068	-.795	135.0	-.276	.099	.016	-.609
157.5	-.249	.120	.166	-.718	157.5	-.286	.104	.016	-.667
180.0	-.187	.123	.246	-.685	180.0	-.301	.129	.105	-1.020
202.5	-.044	.125	.647	-.560	202.5	-.225	.148	.460	-.902
225.0	.049	.128	.660	-.356	225.0	-.098	.160	.457	-.813
247.5	.104	.133	.738	-.353	247.5	.031	.154	.571	-.621
270.0	.099	.129	.664	-.340	270.0	.082	.142	.681	-.308
292.5	.105	.133	.660	-.288	292.5	.105	.128	.626	-.322
315.0	.059	.132	.618	-.317	315.0	.110	.125	.719	-.301
337.5	-.003	.148	.731	-.629	337.5	.101	.123	.560	-.221

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	.098	.133	.807	-.344	.0	.056	.132	.566	-.652
22.5	.092	.132	.615	-.387	22.5	.080	.133	.687	-.387
45.0	.042	.130	.614	-.546	45.0	.116	.138	.784	-.359
67.5	-.068	.141	.562	-.598	67.5	.099	.144	.685	-.351
90.0	-.148	.150	.426	-.663	90.0	.059	.136	.562	-.442
112.5	-.246	.151	.377	-.907	112.5	-.019	.144	.667	-.531
135.0	-.291	.122	.154	-.870	135.0	-.136	.151	.615	-.870
157.5	-.271	.105	.085	-.756	157.5	-.242	.150	.486	-.890
180.0	-.316	.110	.071	-.778	180.0	-.301	.136	.283	-.937
202.5	-.297	.117	.172	-.753	202.5	-.289	.113	.068	-.719
225.0	-.289	.136	.171	-.853	225.0	-.291	.110	.058	-.813
247.5	-.258	.157	.291	-1.042	247.5	-.289	.110	.120	-.804
270.0	-.113	.151	.593	-.807	270.0	-.313	.126	.083	-.906
292.5	.009	.142	.652	-.722	292.5	-.261	.159	.464	-.808
315.0	.052	.135	.528	-.580	315.0	-.133	.163	.546	-.903
337.5	.098	.141	.762	-.415	337.5	-.018	.153	.606	-.641
Location 15					Location 16				
.0	-.125	.151	.464	-.807	.0	-.295	.129	.120	-1.048
22.5	-.027	.148	.633	-.599	22.5	-.270	.162	.387	-.968
45.0	.047	.133	.546	-.443	45.0	-.132	.151	.409	-.819
67.5	.096	.133	.773	-.264	67.5	-.028	.144	.580	-.598
90.0	.096	.128	.595	-.289	90.0	.052	.122	.510	-.340
112.5	.077	.129	.703	-.394	112.5	.089	.141	.667	-.325
135.0	.055	.123	.563	-.443	135.0	.089	.128	.632	-.359
157.5	-.007	.135	.486	-.605	157.5	.077	.130	.688	-.486
180.0	-.130	.173	.654	-.796	180.0	.050	.132	.531	-.354
202.5	-.240	.151	.360	-.907	202.5	-.027	.142	.549	-.633
225.0	-.314	.133	.171	-.939	225.0	-.128	.154	.427	-.768
247.5	-.304	.117	.205	-1.077	247.5	-.252	.156	.495	-1.111
270.0	-.282	.108	.065	-.692	270.0	-.298	.136	.099	-.922
292.5	-.300	.113	.052	-.790	292.5	-.292	.107	.018	-.722
315.0	-.294	.130	.187	-.869	315.0	-.285	.104	.016	-.749
337.5	-.248	.160	.277	-.970	337.5	-.316	.114	.018	-.744
Location 17					Location 18				
.0	-.265	.136	.193	-.768	.0	-.209	.142	.384	-.734
22.5	-.277	.144	.215	-.824	22.5	-.249	.141	.286	-.842
45.0	-.236	.136	.259	-.692	45.0	-.268	.136	.173	-.848
67.5	-.202	.153	.429	-.964	67.5	-.274	.144	.304	-.821
90.0	-.128	.142	.329	-.692	90.0	-.225	.136	.311	-.866
112.5	-.067	.141	.400	-.767	112.5	-.190	.145	.314	-.836
135.0	-.031	.135	.540	-.574	135.0	-.125	.141	.418	-.835
157.5	-.012	.129	.531	-.531	157.5	-.087	.141	.429	-.701
180.0	.013	.136	.667	-.469	180.0	-.016	.135	.488	-.488
202.5	.013	.129	.647	-.472	202.5	.013	.129	.489	-.506
225.0	-.015	.139	.642	-.469	225.0	.024	.130	.520	-.383
247.5	-.053	.142	.522	-.558	247.5	.010	.129	.679	-.558
270.0	-.110	.138	.437	-.623	270.0	-.018	.138	.488	-.472
292.5	-.199	.153	.421	-.824	292.5	-.061	.151	.474	-.649
315.0	-.237	.145	.277	-.764	315.0	-.119	.154	.556	-.746
337.5	-.268	.150	.264	-.900	337.5	-.184	.154	.635	-.741

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	-.095	.135	.454	-.559	.0	-.006	.126	.457	-.439
22.5	-.159	.157	.592	-.913	22.5	-.047	.125	.467	-.449
45.0	-.209	.135	.399	-.710	45.0	-.108	.128	.488	-.575
67.5	-.243	.142	.304	-.713	67.5	-.196	.126	.288	-.737
90.0	-.258	.130	.345	-.796	90.0	-.240	.128	.297	-.749
112.5	-.258	.129	.245	-.767	112.5	-.259	.133	.246	-1.054
135.0	-.246	.132	.313	-.783	135.0	-.262	.120	.139	-.770
157.5	-.199	.128	.206	-.667	157.5	-.237	.117	.396	-.688
180.0	-.142	.136	.433	-.632	180.0	-.227	.141	.455	-.728
202.5	-.053	.130	.454	-.593	202.5	-.153	.136	.580	-.703
225.0	-.016	.130	.486	-.556	225.0	-.077	.145	.537	-.589
247.5	.007	.135	.558	-.592	247.5	-.036	.142	.538	-.678
270.0	.013	.129	.488	-.472	270.0	.009	.133	.569	-.452
292.5	.018	.133	.580	-.421	292.5	.028	.135	.707	-.460
315.0	-.006	.135	.624	-.434	315.0	.019	.125	.541	-.507
337.5	-.043	.147	.529	-.601	337.5	.016	.130	.515	-.497
Location 21					Location 22				
.0	.028	.128	.544	-.439	.0	-.016	.132	.439	-.439
22.5	.007	.126	.648	-.540	22.5	.021	.135	.737	-.414
45.0	-.006	.135	.592	-.470	45.0	.015	.128	.540	-.366
67.5	-.074	.142	.504	-.504	67.5	.007	.129	.666	-.449
90.0	-.139	.141	.454	-.697	90.0	-.028	.132	.454	-.436
112.5	-.191	.148	.387	-.738	112.5	-.074	.138	.439	-.667
135.0	-.243	.130	.472	-.821	135.0	-.120	.136	.402	-.647
157.5	-.261	.129	.240	-.722	157.5	-.171	.142	.396	-.792
180.0	-.277	.133	.291	-.801	180.0	-.257	.147	.273	-.893
202.5	-.255	.133	.246	-.896	202.5	-.261	.133	.421	-.738
225.0	-.209	.141	.242	-.884	225.0	-.265	.132	.259	-.796
247.5	-.156	.145	.469	-.642	247.5	-.265	.136	.295	-.885
270.0	-.107	.145	.503	-.586	270.0	-.206	.138	.301	-.787
292.5	-.049	.153	.566	-.531	292.5	-.182	.145	.371	-.796
315.0	-.015	.142	.629	-.523	315.0	-.111	.148	.523	-.752
337.5	.012	.139	.532	-.461	337.5	-.061	.142	.479	-.550
Location 23					Location 24				
.0	-.111	.145	.541	-.629	.0	-.216	.147	.314	-.786
22.5	-.058	.151	.501	-.627	22.5	-.182	.151	.430	-.716
45.0	-.025	.138	.520	-.589	45.0	-.113	.148	.363	-.641
67.5	.009	.141	.592	-.483	67.5	-.062	.156	.556	-.609
90.0	-.003	.133	.606	-.538	90.0	-.010	.142	.433	-.538
112.5	.001	.139	.595	-.630	112.5	.001	.147	.718	-.473
135.0	-.025	.139	.454	-.559	135.0	-.001	.139	.734	-.577
157.5	-.074	.128	.464	-.568	157.5	.000	.133	.482	-.414
180.0	-.145	.157	.544	-.762	180.0	-.018	.141	.672	-.454
202.5	-.182	.141	.316	-.701	202.5	-.049	.138	.491	-.649
225.0	-.227	.144	.366	-.681	225.0	-.122	.150	.472	-.595
247.5	-.267	.141	.298	-.752	247.5	-.181	.141	.455	-.805
270.0	-.259	.130	.288	-.795	270.0	-.249	.136	.322	-.728
292.5	-.289	.141	.212	-.882	292.5	-.286	.139	.212	-.847
315.0	-.237	.150	.331	-.820	315.0	-.288	.141	.209	-1.029
337.5	-.175	.154	.332	-.856	337.5	-.264	.145	.420	-.856

Cermak Peterka Petersen, Inc.

C-50

CPP Project 92-0869

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 25					Location 26				
.0	-.171	.132	.348	-.629	.0	-.104	.150	.559	-.682
22.5	-.160	.144	.430	-.681	22.5	-.136	.148	.412	-.682
45.0	-.148	.136	.363	-.624	45.0	-.141	.141	.480	-.617
67.5	-.130	.135	.483	-.716	67.5	-.182	.147	.608	-.859
90.0	-.119	.141	.538	-.606	90.0	-.205	.135	.277	-.694
112.5	-.113	.133	.402	-.560	112.5	-.169	.133	.380	-.673
135.0	-.092	.141	.420	-.577	135.0	-.184	.133	.280	-.682
157.5	-.065	.136	.430	-.534	157.5	-.139	.125	.323	-.731
180.0	-.065	.147	.526	-.672	180.0	-.129	.145	.452	-.796
202.5	-.047	.142	.596	-.526	202.5	-.079	.133	.491	-.596
225.0	-.074	.138	.507	-.559	225.0	-.039	.132	.534	-.466
247.5	-.095	.148	.595	-.577	247.5	-.053	.132	.454	-.472
270.0	-.120	.142	.457	-.644	270.0	-.042	.130	.538	-.437
292.5	-.138	.141	.583	-.636	292.5	-.042	.144	.486	-.556
315.0	-.160	.141	.663	-.697	315.0	-.067	.145	.434	-.695
337.5	-.165	.144	.366	-.856	337.5	-.055	.160	.627	-.681
Location 27					Location 28				
.0	-.040	.138	.559	-.489	.0	-.114	.135	.559	-.630
22.5	-.061	.136	.520	-.611	22.5	-.076	.145	.592	-.753
45.0	-.050	.141	.601	-.531	45.0	-.055	.136	.463	-.531
67.5	-.108	.145	.501	-.679	67.5	-.058	.138	.464	-.572
90.0	-.130	.141	.451	-.624	90.0	-.071	.139	.572	-.642
112.5	-.138	.150	.483	-.691	112.5	-.062	.136	.483	-.657
135.0	-.184	.136	.454	-.716	135.0	-.092	.138	.437	-.611
157.5	-.168	.141	.340	-.833	157.5	-.074	.136	.408	-.526
180.0	-.188	.142	.362	-.778	180.0	-.128	.154	.525	-.706
202.5	-.175	.141	.332	-.771	202.5	-.133	.150	.612	-.718
225.0	-.136	.144	.448	-.827	225.0	-.151	.141	.396	-.706
247.5	-.138	.144	.541	-.664	247.5	-.190	.151	.577	-.734
270.0	-.125	.144	.455	-.589	270.0	-.184	.138	.353	-.673
292.5	-.071	.153	.556	-.608	292.5	-.159	.142	.592	-.747
315.0	-.070	.151	.538	-.660	315.0	-.160	.141	.417	-.660
337.5	-.036	.145	.611	-.575	337.5	-.128	.147	.418	-.611

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 1					Location 2				
.0	-.176	.089	.185	-.540	.0	-.184	.093	.135	-.523
22.5	-.157	.086	.153	-.458	22.5	-.173	.090	.169	-.458
45.0	-.172	.096	.191	-.541	45.0	-.185	.083	.139	-.506
67.5	-.193	.101	.187	-.544	67.5	-.169	.079	.136	-.460
90.0	-.216	.120	.176	-.744	90.0	-.185	.095	.212	-.531
112.5	-.185	.132	.325	-.599	112.5	-.188	.104	.274	-.649
135.0	-.043	.151	.663	-.611	135.0	-.236	.114	.209	-.663
157.5	.126	.165	1.074	-.623	157.5	-.222	.126	.173	-.832
180.0	.162	.157	.887	-.279	180.0	-.049	.168	.713	-.608
202.5	.083	.144	.740	-.498	202.5	.105	.165	1.066	-.568
225.0	-.056	.141	.555	-.900	225.0	.133	.136	.778	-.294
247.5	-.194	.126	.289	-.814	247.5	.089	.145	.967	-.374
270.0	-.215	.114	.173	-.609	270.0	-.039	.128	.540	-.592
292.5	-.182	.102	.138	-.517	292.5	-.187	.129	.380	-.690
315.0	-.191	.093	.162	-.519	315.0	-.255	.120	.107	-.752
337.5	-.194	.089	.173	-.535	337.5	-.219	.096	.086	-.553
Location 3					Location 4				
.0	-.209	.105	.119	-.590	.0	-.034	.125	.507	-.423
22.5	-.193	.099	.119	-.474	22.5	-.159	.120	.305	-.645
45.0	-.168	.092	.157	-.454	45.0	-.209	.105	.070	-.629
67.5	-.182	.085	.102	-.512	67.5	-.205	.099	.171	-.512
90.0	-.194	.090	.142	-.602	90.0	-.200	.101	.142	-.566
112.5	-.181	.086	.120	-.565	112.5	-.160	.083	.205	-.479
135.0	-.181	.089	.139	-.488	135.0	-.172	.087	.227	-.506
157.5	-.206	.104	.259	-.658	157.5	-.175	.083	.086	-.503
180.0	-.228	.105	.173	-.713	180.0	-.188	.096	.122	-.644
202.5	-.212	.133	.240	-1.066	202.5	-.175	.090	.104	-.498
225.0	-.018	.173	.710	-.762	225.0	-.219	.113	.156	-.658
247.5	.089	.162	.866	-.374	247.5	-.184	.135	.458	-.950
270.0	.116	.142	1.045	-.366	270.0	-.012	.163	.767	-.609
292.5	.093	.148	1.103	-.328	292.5	.136	.181	.913	-.500
315.0	-.047	.150	.681	-.556	315.0	.130	.145	.913	-.286
337.5	-.202	.138	.380	-.881	337.5	.077	.129	.709	-.415
Location 5					Location 6				
.0	.148	.166	.873	-.280	.0	-.052	.150	.626	-.741
22.5	.122	.156	1.041	-.264	22.5	.074	.160	.925	-.380
45.0	-.028	.151	.614	-.512	45.0	.166	.157	1.023	-.255
67.5	-.196	.120	.150	-.830	67.5	.102	.148	1.013	-.282
90.0	-.221	.108	.208	-.603	90.0	-.047	.157	.793	-.621
112.5	-.172	.102	.249	-.500	112.5	-.176	.120	.267	-.682
135.0	-.176	.093	.153	-.526	135.0	-.233	.111	.205	-.749
157.5	-.178	.090	.151	-.506	157.5	-.203	.099	.135	-.540
180.0	-.179	.080	.119	-.457	180.0	-.178	.087	.169	-.474
202.5	-.184	.083	.117	-.503	202.5	-.168	.083	.151	-.469
225.0	-.190	.087	.169	-.488	225.0	-.171	.080	.085	-.455
247.5	-.208	.093	.148	-.512	247.5	-.179	.089	.199	-.479
270.0	-.224	.104	.101	-.609	270.0	-.165	.090	.135	-.474
292.5	-.208	.123	.335	-.786	292.5	-.190	.098	.168	-.569
315.0	-.033	.196	.991	-.644	315.0	-.240	.117	.156	-.695
337.5	.080	.173	1.039	-.418	337.5	-.211	.125	.202	-.872

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 7					Location 8				
.0	-.202	.108	.181	-.676	.0	-.162	.082	.099	-.429
22.5	-.199	.126	.331	-.810	22.5	-.168	.098	.165	-.513
45.0	-.049	.154	.887	-.835	45.0	-.222	.111	.153	-.664
67.5	.086	.165	.780	-.482	67.5	-.225	.135	.199	-.913
90.0	.166	.176	.967	-.328	90.0	-.076	.168	.759	-.673
112.5	.087	.141	.783	-.283	112.5	.104	.162	.916	-.350
135.0	-.037	.147	.799	-.510	135.0	.166	.172	1.020	-.340
157.5	-.200	.126	.337	-.876	157.5	.111	.145	.961	-.320
180.0	-.206	.111	.169	-.694	180.0	-.042	.139	.813	-.559
202.5	-.173	.093	.133	-.535	202.5	-.159	.114	.285	-.670
225.0	-.157	.090	.135	-.522	225.0	-.179	.114	.270	-.606
247.5	-.157	.080	.132	-.446	247.5	-.169	.098	.264	-.528
270.0	-.159	.086	.101	-.474	270.0	-.160	.089	.135	-.491
292.5	-.190	.086	.151	-.485	292.5	-.176	.087	.200	-.485
315.0	-.178	.098	.243	-.556	315.0	-.160	.077	.104	-.452
337.5	-.190	.101	.117	-.519	337.5	-.156	.080	.168	-.436
Location 9					Location 10				
.0	-.199	.090	.114	-.555	.0	-.196	.092	.147	-.538
22.5	-.176	.085	.114	-.476	22.5	-.187	.090	.246	-.458
45.0	-.196	.095	.169	-.558	45.0	-.208	.083	.135	-.473
67.5	-.212	.093	.132	-.560	67.5	-.188	.080	.083	-.544
90.0	-.246	.111	.136	-.770	90.0	-.206	.093	.239	-.513
112.5	-.222	.114	.199	-.627	112.5	-.202	.099	.264	-.562
135.0	-.144	.120	.337	-.572	135.0	-.261	.108	.119	-.707
157.5	-.030	.120	.485	-.602	157.5	-.243	.114	.150	-.752
180.0	-.001	.098	.470	-.369	180.0	-.138	.122	.285	-.605
202.5	-.049	.107	.348	-.498	202.5	-.027	.114	.549	-.697
225.0	-.142	.119	.301	-.701	225.0	-.001	.092	.418	-.301
247.5	-.237	.116	.147	-.672	247.5	-.044	.104	.458	-.426
270.0	-.233	.107	.151	-.571	270.0	-.117	.111	.285	-.537
292.5	-.200	.095	.083	-.565	292.5	-.227	.119	.199	-.697
315.0	-.203	.090	.156	-.500	315.0	-.273	.113	.068	-.688
337.5	-.202	.089	.083	-.515	337.5	-.225	.095	.083	-.515
Location 11					Location 12				
.0	-.227	.099	.228	-.587	.0	-.110	.104	.261	-.473
22.5	-.202	.093	.098	-.492	22.5	-.194	.110	.165	-.623
45.0	-.179	.089	.135	-.455	45.0	-.231	.099	.050	-.658
67.5	-.193	.083	.099	-.510	67.5	-.215	.090	.165	-.494
90.0	-.208	.089	.120	-.581	90.0	-.212	.098	.120	-.667
112.5	-.197	.089	.067	-.495	112.5	-.176	.080	.132	-.446
135.0	-.199	.090	.135	-.641	135.0	-.187	.089	.236	-.439
157.5	-.222	.101	.117	-.636	157.5	-.190	.080	.083	-.485
180.0	-.240	.098	.085	-.605	180.0	-.200	.093	.101	-.621
202.5	-.221	.114	.169	-.860	202.5	-.184	.087	.067	-.531
225.0	-.105	.122	.368	-.584	225.0	-.218	.102	.101	-.601
247.5	-.028	.104	.442	-.360	247.5	-.202	.110	.147	-.737
270.0	-.001	.098	.470	-.335	270.0	-.092	.114	.403	-.537
292.5	-.046	.107	.448	-.482	292.5	.000	.116	.482	-.431
315.0	-.133	.128	.414	-.654	315.0	.015	.095	.516	-.276
337.5	-.231	.119	.099	-.747	337.5	-.015	.099	.415	-.431

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 13					Location 14				
.0	.000	.108	.498	-.332	.0	-.144	.117	.233	-.598
22.5	-.030	.113	.384	-.534	22.5	-.050	.108	.534	-.483
45.0	-.144	.126	.344	-.584	45.0	-.007	.102	.480	-.480
67.5	-.258	.119	.151	-.771	67.5	-.042	.102	.402	-.386
90.0	-.265	.110	.122	-.697	90.0	-.160	.132	.261	-.731
112.5	-.206	.099	.185	-.605	112.5	-.236	.117	.236	-.740
135.0	-.212	.095	.102	-.617	135.0	-.277	.107	.052	-.687
157.5	-.215	.093	.119	-.614	157.5	-.233	.098	.085	-.647
180.0	-.215	.082	.120	-.515	180.0	-.215	.090	.154	-.599
202.5	-.219	.090	.085	-.558	202.5	-.200	.087	.101	-.574
225.0	-.221	.093	.102	-.562	225.0	-.202	.083	.050	-.528
247.5	-.236	.096	.016	-.568	247.5	-.214	.096	.168	-.534
270.0	-.259	.108	.068	-.669	270.0	-.196	.096	.120	-.549
292.5	-.234	.113	.101	-.658	292.5	-.222	.098	.101	-.608
315.0	-.141	.130	.649	-.580	315.0	-.280	.119	.053	-.738
337.5	-.056	.107	.356	-.424	337.5	-.255	.119	.068	-.848
Location 15					Location 16				
.0	-.236	.107	.116	-.648	.0	-.193	.085	.083	-.515
22.5	-.237	.119	.150	-.734	22.5	-.199	.098	.133	-.566
45.0	-.141	.119	.274	-.704	45.0	-.257	.110	.154	-.687
67.5	-.064	.111	.553	-.654	67.5	-.257	.119	.151	-.821
90.0	-.013	.110	.436	-.348	90.0	-.166	.133	.313	-.715
112.5	-.070	.104	.286	-.488	112.5	-.036	.108	.387	-.387
135.0	-.163	.119	.222	-.841	135.0	-.003	.107	.497	-.343
157.5	-.274	.123	.136	-.851	157.5	-.043	.107	.409	-.596
180.0	-.252	.108	.154	-.737	180.0	-.159	.125	.240	-.821
202.5	-.212	.095	.068	-.608	202.5	-.227	.110	.135	-.811
225.0	-.197	.092	.068	-.546	225.0	-.233	.108	.136	-.715
247.5	-.193	.083	.083	-.601	247.5	-.209	.096	.150	-.584
270.0	-.190	.090	.102	-.515	270.0	-.199	.089	.068	-.531
292.5	-.222	.093	.101	-.592	292.5	-.214	.092	.101	-.592
315.0	-.215	.105	.228	-.862	315.0	-.191	.082	.070	-.492
337.5	-.228	.102	.102	-.695	337.5	-.187	.085	.136	-.526
Location 17					Location 18				
.0	-.245	.113	.237	-.627	.0	-.233	.110	.169	-.611
22.5	-.225	.108	.153	-.612	22.5	-.219	.110	.255	-.630
45.0	-.246	.114	.157	-.684	45.0	-.243	.105	.123	-.596
67.5	-.254	.111	.119	-.676	67.5	-.209	.099	.151	-.540
90.0	-.300	.123	.107	-.854	90.0	-.261	.119	.214	-.747
112.5	-.270	.123	.206	-.737	112.5	-.254	.117	.257	-.651
135.0	-.276	.125	.105	-.701	135.0	-.302	.117	.087	-.771
157.5	-.267	.123	.191	-.712	157.5	-.286	.120	.122	-.712
180.0	-.233	.114	.138	-.691	180.0	-.259	.125	.172	-.725
202.5	-.254	.120	.242	-.673	202.5	-.245	.123	.156	-.829
225.0	-.261	.119	.104	-.781	225.0	-.227	.114	.191	-.678
247.5	-.261	.117	.085	-.675	247.5	-.227	.125	.151	-.675
270.0	-.271	.117	.105	-.664	270.0	-.242	.126	.175	-.857
292.5	-.261	.108	.086	-.657	292.5	-.280	.122	.104	-.761
315.0	-.261	.108	.126	-.627	315.0	-.319	.125	.108	-.807
337.5	-.245	.110	.156	-.605	337.5	-.271	.108	.104	-.709

PRESSURE COEFFICIENTS

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 19					Location 20				
.0	-.268	.114	.169	-.661	.0	-.205	.113	.151	-.690
22.5	-.252	.110	.068	-.612	22.5	-.197	.107	.153	-.611
45.0	-.219	.108	.211	-.667	45.0	-.236	.108	.105	-.635
67.5	-.214	.105	.135	-.608	67.5	-.234	.099	.119	-.730
90.0	-.255	.111	.142	-.641	90.0	-.231	.099	.123	-.602
112.5	-.236	.111	.120	-.635	112.5	-.208	.096	.086	-.531
135.0	-.246	.110	.157	-.666	135.0	-.219	.099	.087	-.645
157.5	-.271	.113	.156	-.730	157.5	-.231	.102	.138	-.623
180.0	-.243	.108	.138	-.709	180.0	-.245	.102	.104	-.660
202.5	-.252	.122	.156	-.707	202.5	-.255	.111	.120	-.687
225.0	-.230	.116	.173	-.642	225.0	-.271	.111	.122	-.691
247.5	-.190	.107	.169	-.606	247.5	-.270	.117	.135	-.847
270.0	-.211	.116	.139	-.629	270.0	-.270	.120	.139	-.735
292.5	-.271	.130	.138	-.743	292.5	-.230	.110	.139	-.642
315.0	-.286	.129	.179	-.735	315.0	-.218	.116	.304	-.661
337.5	-.304	.123	.034	-.863	337.5	-.206	.113	.344	-.652
Location 21					Location 22				
.0	-.205	.113	.202	-.707	.0	-.237	.113	.185	-.724
22.5	-.208	.114	.271	-.661	22.5	-.228	.110	.322	-.678
45.0	-.274	.116	.071	-.722	45.0	-.214	.111	.194	-.581
67.5	-.257	.111	.153	-.816	67.5	-.233	.114	.171	-.679
90.0	-.271	.120	.230	-.743	90.0	-.264	.122	.212	-.814
112.5	-.234	.104	.188	-.599	112.5	-.261	.113	.086	-.651
135.0	-.257	.099	.191	-.593	135.0	-.267	.117	.087	-.681
157.5	-.230	.105	.122	-.623	157.5	-.268	.108	.086	-.657
180.0	-.227	.101	.122	-.626	180.0	-.225	.096	.122	-.626
202.5	-.211	.105	.138	-.602	202.5	-.219	.101	.104	-.618
225.0	-.221	.095	.104	-.621	225.0	-.215	.098	.122	-.639
247.5	-.245	.111	.219	-.644	247.5	-.212	.098	.135	-.694
270.0	-.251	.111	.087	-.648	270.0	-.225	.105	.105	-.578
292.5	-.279	.117	.086	-.762	292.5	-.300	.111	.070	-.728
315.0	-.285	.120	.107	-.804	315.0	-.273	.120	.197	-.750
337.5	-.239	.110	.120	-.670	337.5	-.277	.119	.068	-.790
Location 23					Location 24				
.0	-.259	.122	.218	-.756	.0	-.215	.110	.185	-.672
22.5	-.246	.125	.169	-.793	22.5	-.224	.114	.236	-.624
45.0	-.264	.135	.228	-.719	45.0	-.292	.122	.141	-.753
67.5	-.259	.126	.222	-.666	67.5	-.279	.119	.188	-.684
90.0	-.231	.128	.282	-.810	90.0	-.262	.136	.282	-.756
112.5	-.248	.120	.222	-.687	112.5	-.240	.128	.498	-.823
135.0	-.270	.125	.211	-.771	135.0	-.259	.128	.280	-.684
157.5	-.297	.122	.139	-.746	157.5	-.251	.123	.156	-.798
180.0	-.291	.117	.087	-.802	180.0	-.283	.128	.105	-.802
202.5	-.257	.107	.120	-.638	202.5	-.273	.128	.138	-.931
225.0	-.234	.108	.225	-.660	225.0	-.262	.114	.122	-.642
247.5	-.222	.105	.169	-.608	247.5	-.233	.111	.169	-.608
270.0	-.211	.108	.208	-.589	270.0	-.202	.108	.259	-.571
292.5	-.231	.105	.156	-.605	292.5	-.228	.110	.122	-.587
315.0	-.265	.117	.179	-.735	315.0	-.262	.116	.162	-.682
337.5	-.273	.123	.138	-.691	337.5	-.243	.108	.104	-.709

Cermak Peterka Petersen, Inc.

C-55

CPP Project 92-0869

PRESSURE COEFFICIENTS

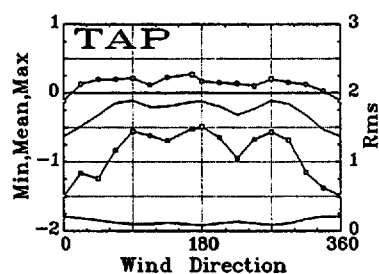
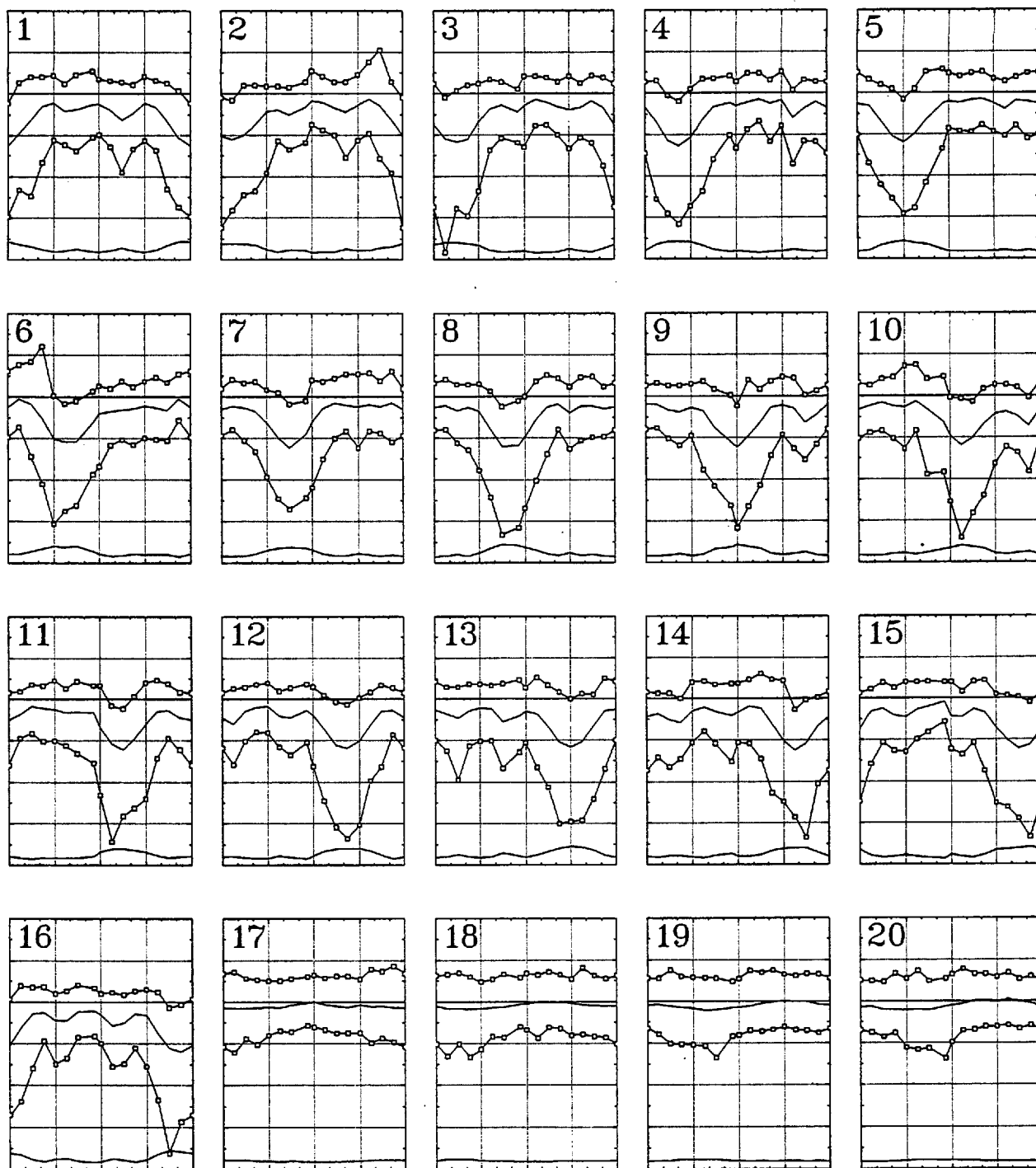
API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)	Azimuth (deg)	Cpmean (-)	Cprms (-)	Cpmin (-)	Cpmax (-)
Location 25					Location 26				
.0	-.237	.111	.218	-.655	.0	-.288	.126	.117	-.740
22.5	-.243	.110	.119	-.590	22.5	-.274	.125	.153	-.661
45.0	-.240	.113	.193	-.614	45.0	-.274	.128	.173	-.887
67.5	-.265	.111	.136	-.632	67.5	-.276	.119	.171	-.765
90.0	-.270	.119	.194	-.756	90.0	-.271	.117	.176	-.670
112.5	-.282	.122	.120	-.721	112.5	-.239	.111	.136	-.698
135.0	-.291	.125	.123	-.894	135.0	-.249	.114	.173	-.661
157.5	-.307	.125	.104	-.833	157.5	-.246	.113	.120	-.638
180.0	-.279	.116	.122	-.681	180.0	-.233	.111	.190	-.658
202.5	-.265	.123	.138	-.724	202.5	-.221	.113	.222	-.635
225.0	-.254	.116	.139	-.694	225.0	-.221	.113	.242	-.706
247.5	-.225	.110	.151	-.709	247.5	-.245	.114	.119	-.709
270.0	-.224	.114	.122	-.641	270.0	-.249	.122	.173	-.710
292.5	-.292	.117	.122	-.725	292.5	-.268	.116	.188	-.635
315.0	-.273	.120	.179	-.718	315.0	-.298	.125	.142	-.730
337.5	-.280	.113	.138	-.675	337.5	-.298	.129	.224	-.722
Location 27					Location 28				
.0	-.243	.123	.219	-.690	.0	-.246	.114	.151	-.724
22.5	-.242	.122	.254	-.695	22.5	-.259	.113	.102	-.627
45.0	-.268	.117	.139	-.695	45.0	-.239	.117	.173	-.644
67.5	-.255	.117	.187	-.697	67.5	-.267	.120	.153	-.697
90.0	-.274	.128	.248	-.777	90.0	-.286	.125	.212	-.777
112.5	-.251	.117	.205	-.648	112.5	-.271	.123	.187	-.733
135.0	-.280	.113	.191	-.645	135.0	-.283	.126	.104	-.767
157.5	-.257	.114	.156	-.603	157.5	-.298	.122	.086	-.741
180.0	-.257	.116	.086	-.658	180.0	-.265	.114	.138	-.710
202.5	-.237	.116	.172	-.617	202.5	-.248	.114	.086	-.635
225.0	-.243	.111	.206	-.672	225.0	-.242	.113	.138	-.654
247.5	-.258	.122	.203	-.692	247.5	-.237	.114	.185	-.624
270.0	-.245	.117	.225	-.641	270.0	-.230	.113	.138	-.675
292.5	-.268	.122	.120	-.687	292.5	-.274	.119	.138	-.703
315.0	-.310	.129	.196	-.925	315.0	-.267	.122	.267	-.694
337.5	-.274	.119	.120	-.704	337.5	-.271	.116	.138	-.654

APPENDIX D

PRESSURE COEFFICIENT PLOTS AT MEASUREMENT LOCATIONS



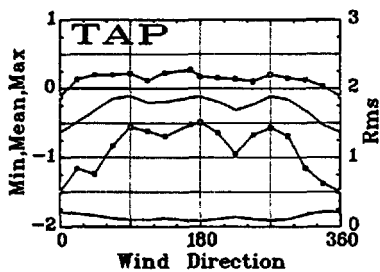
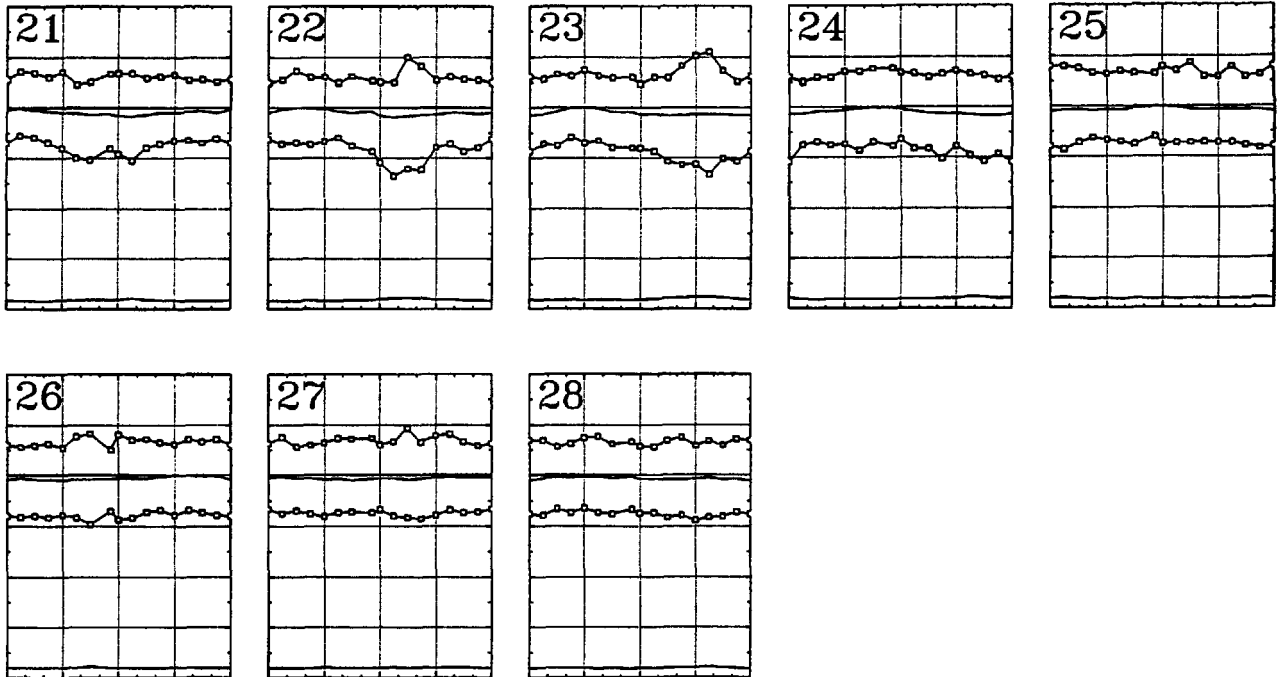
Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 5 - 1.00 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-2

CPP Project 92-0869



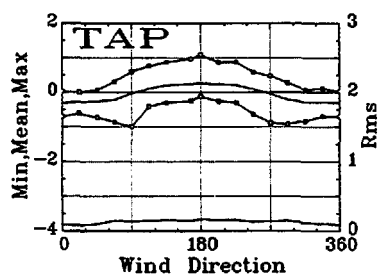
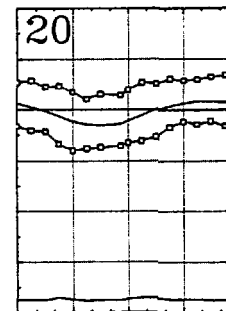
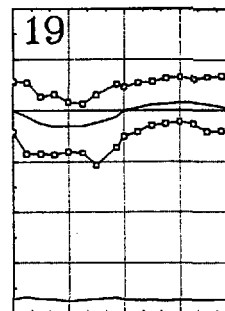
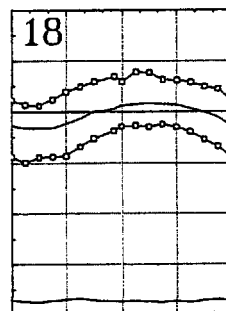
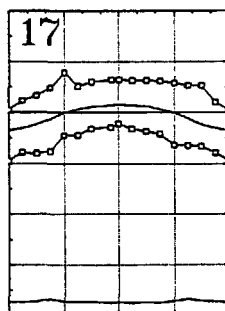
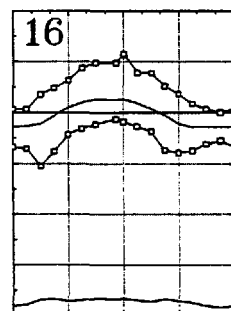
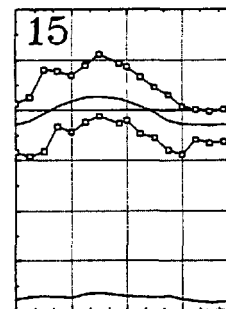
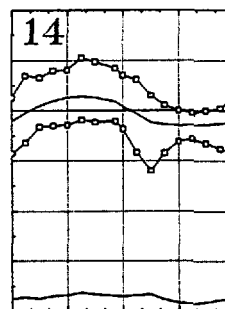
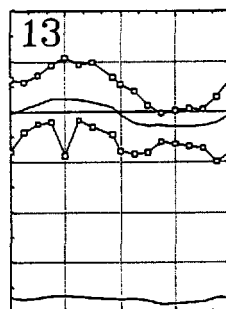
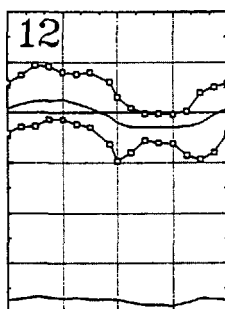
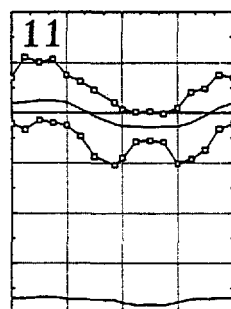
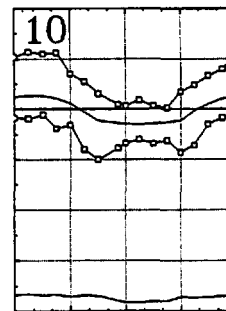
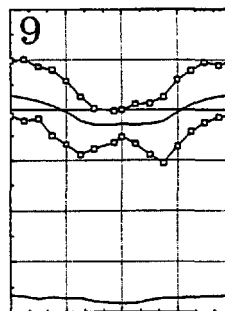
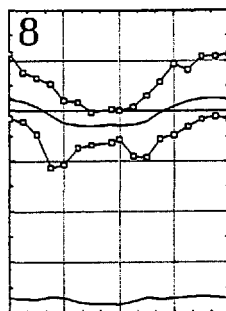
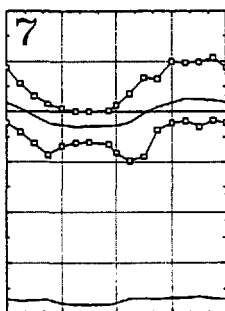
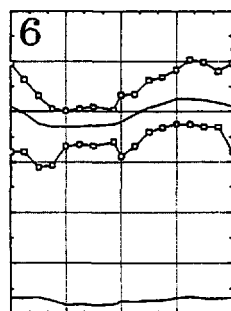
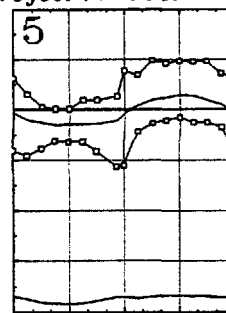
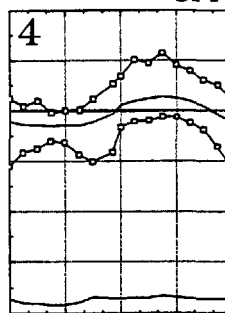
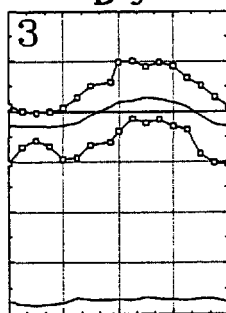
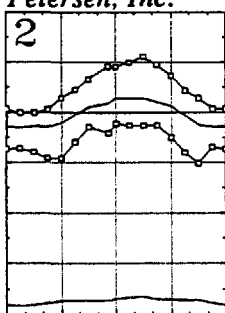
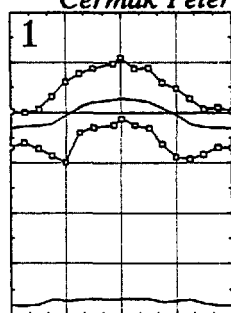
Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 5 - 1.00 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-3

CPP Project 92-0869



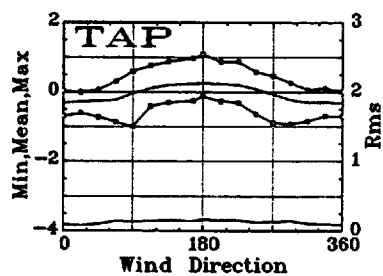
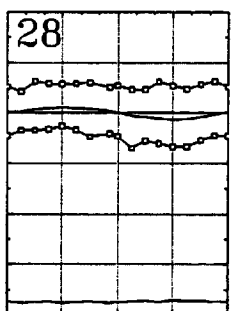
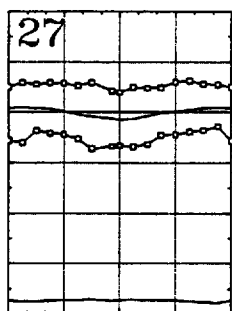
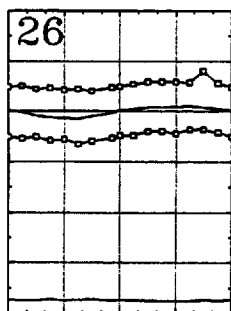
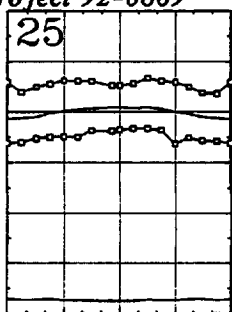
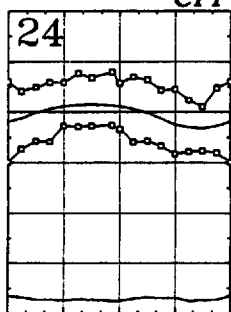
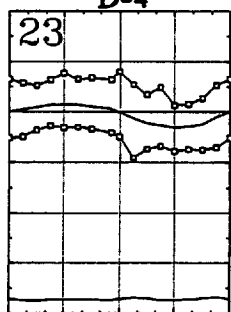
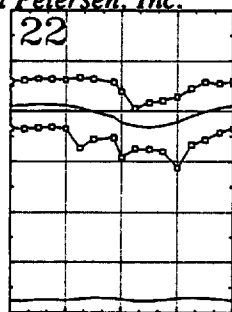
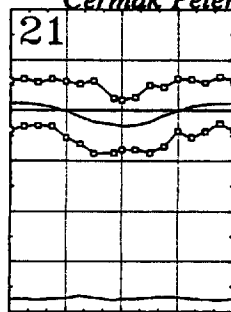
Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 6 - 0.80 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-4

CPP Project 92-0869



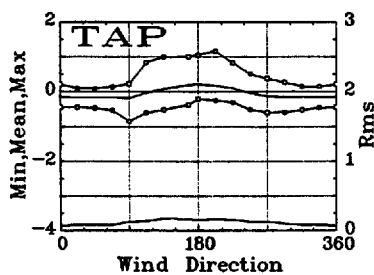
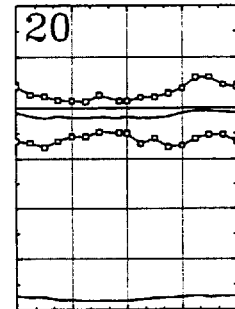
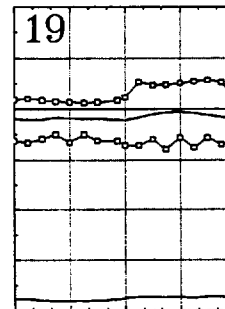
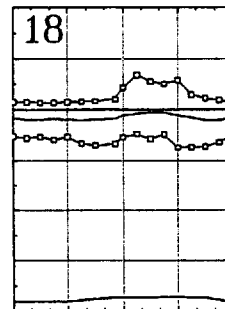
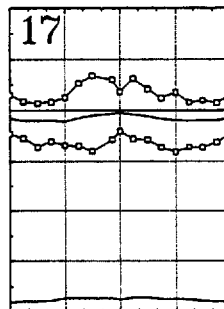
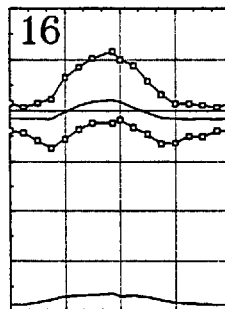
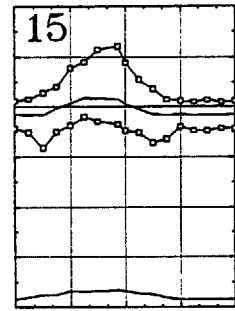
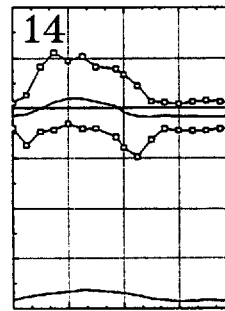
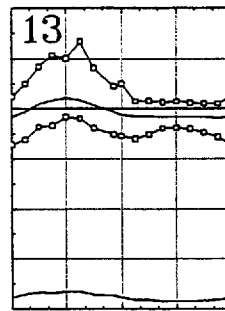
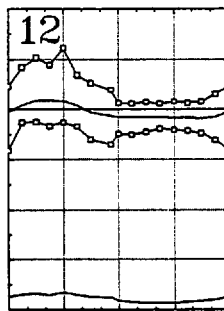
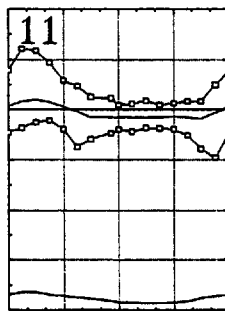
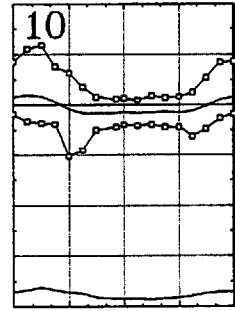
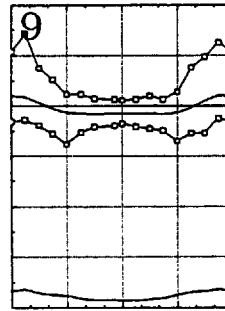
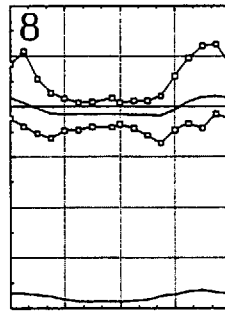
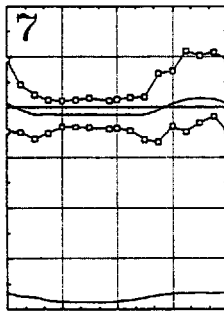
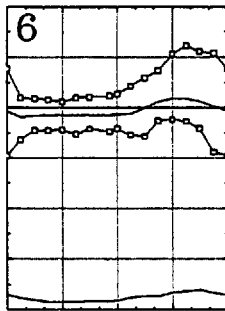
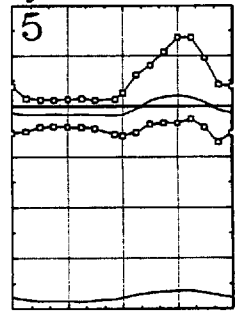
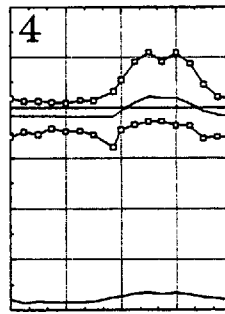
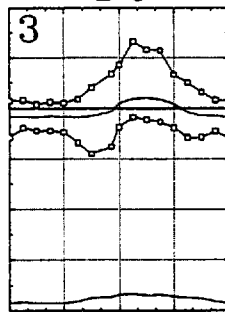
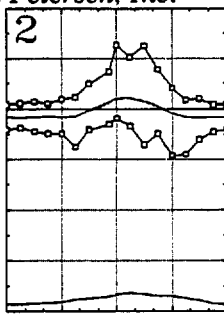
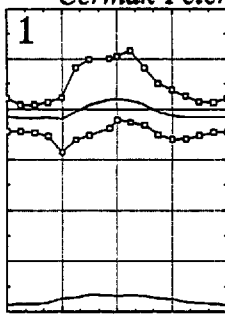
Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 6 - 0.80 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-5

CPP Project 92-0869



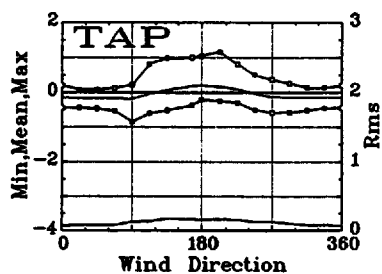
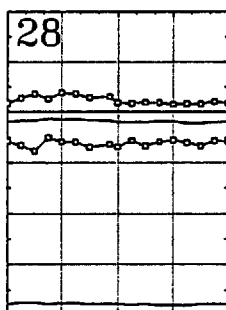
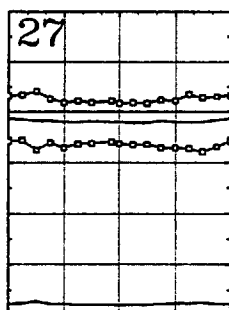
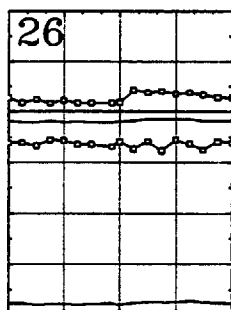
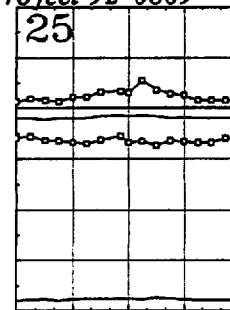
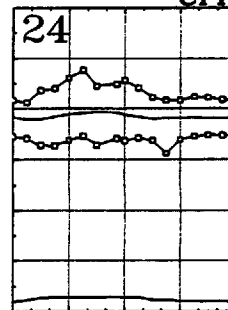
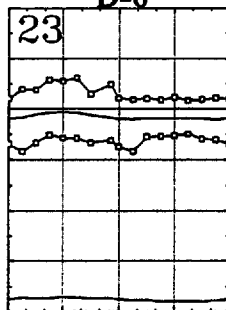
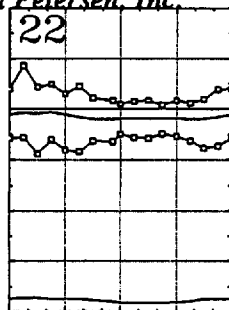
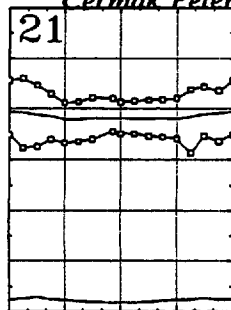
Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 7 - 0.35 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-6

CPP Project 92-0869



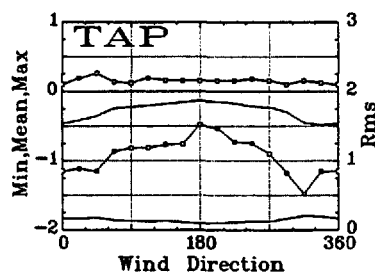
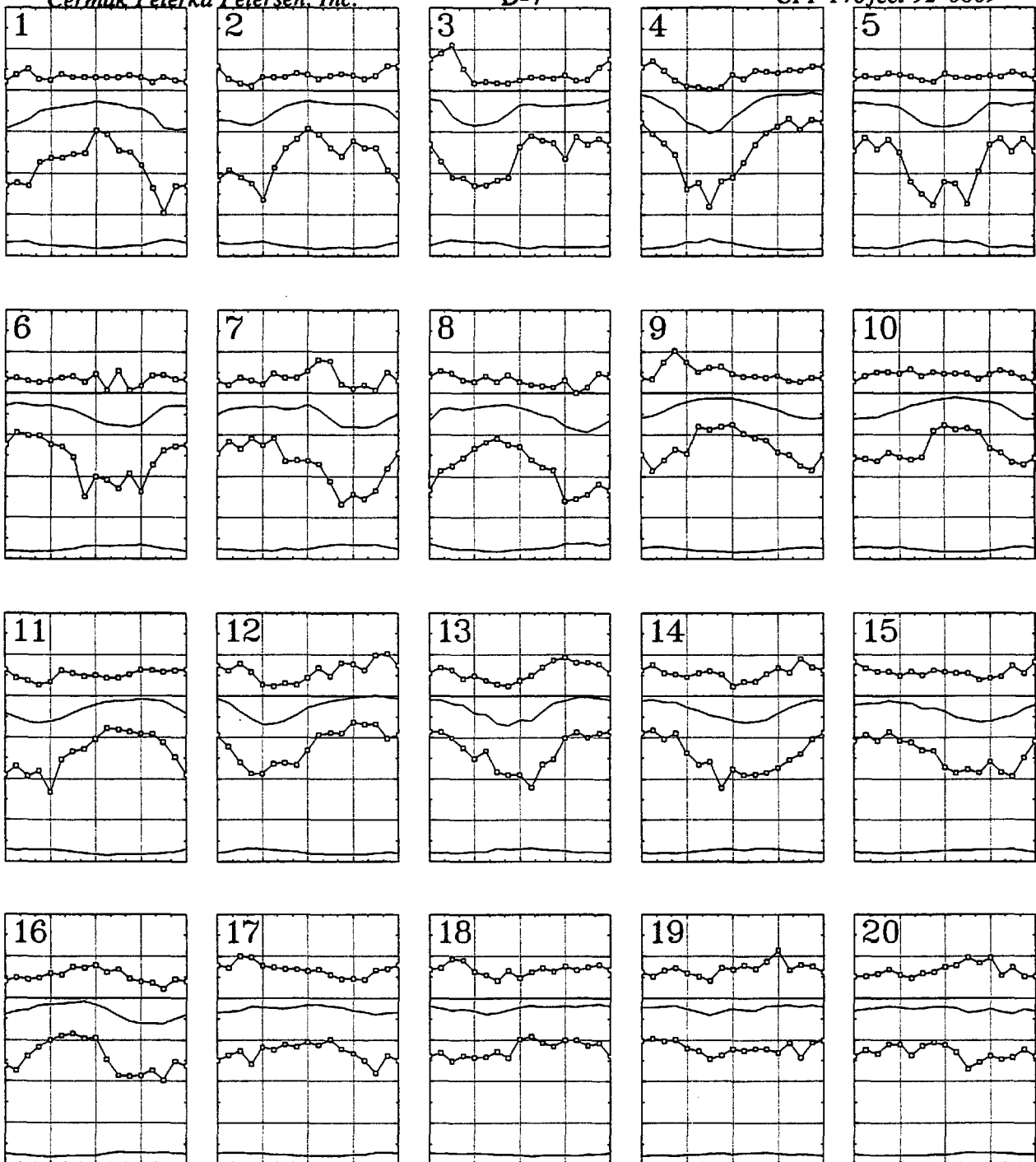
Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 7 - 0.35 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-7

CPP Project 92-0869



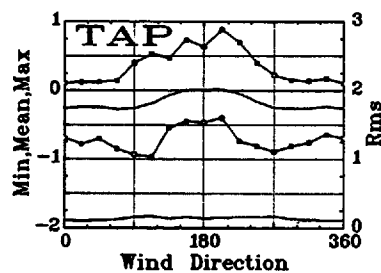
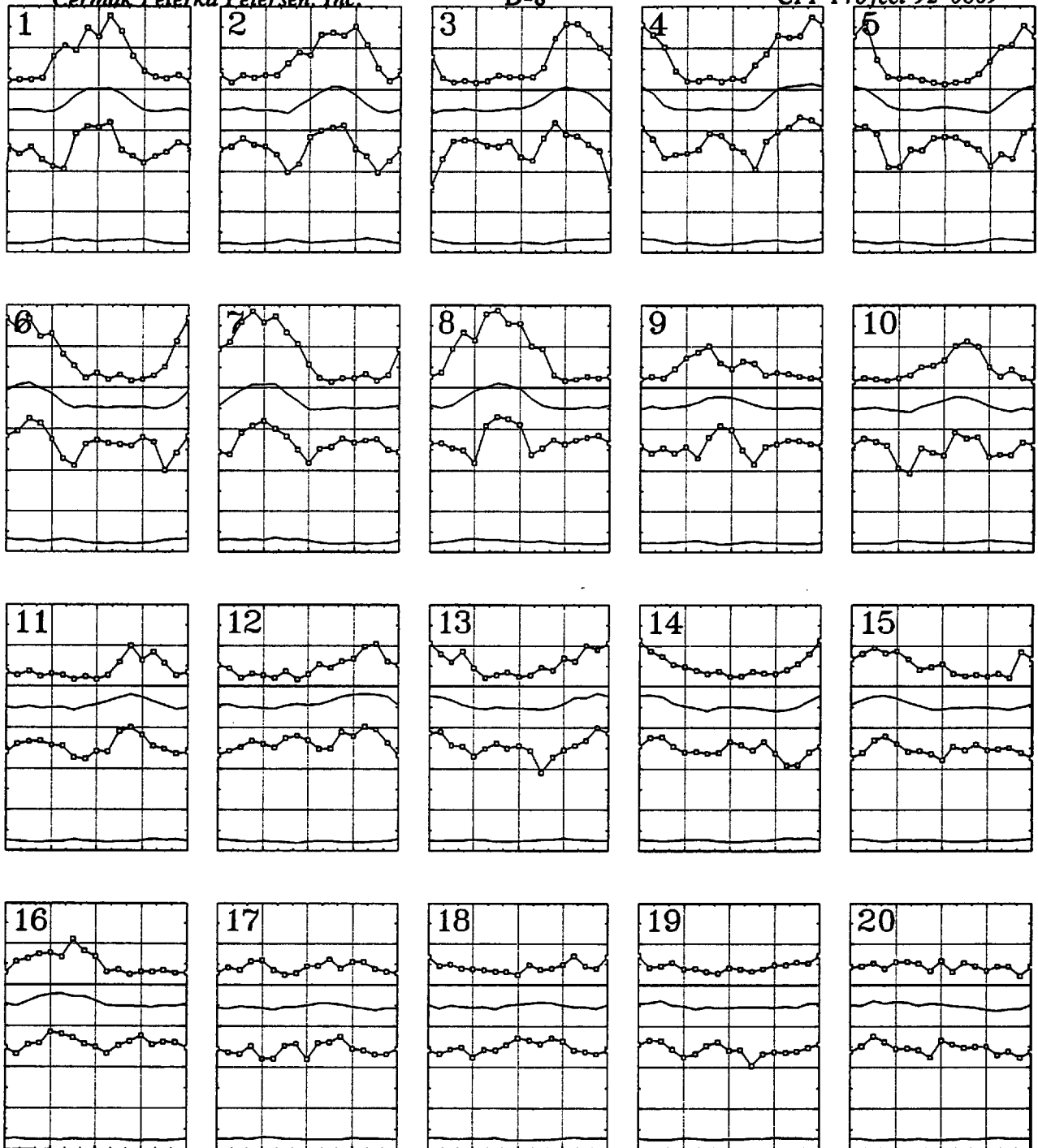
Configuration B - Tank B - 48' Dia x 48' Tall

Data Set 12 - 1.00 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-8

CPP Project 92-0869

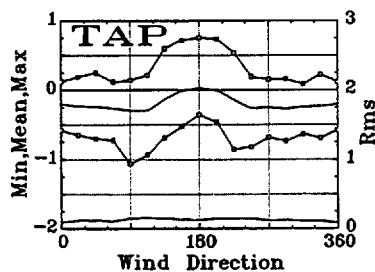
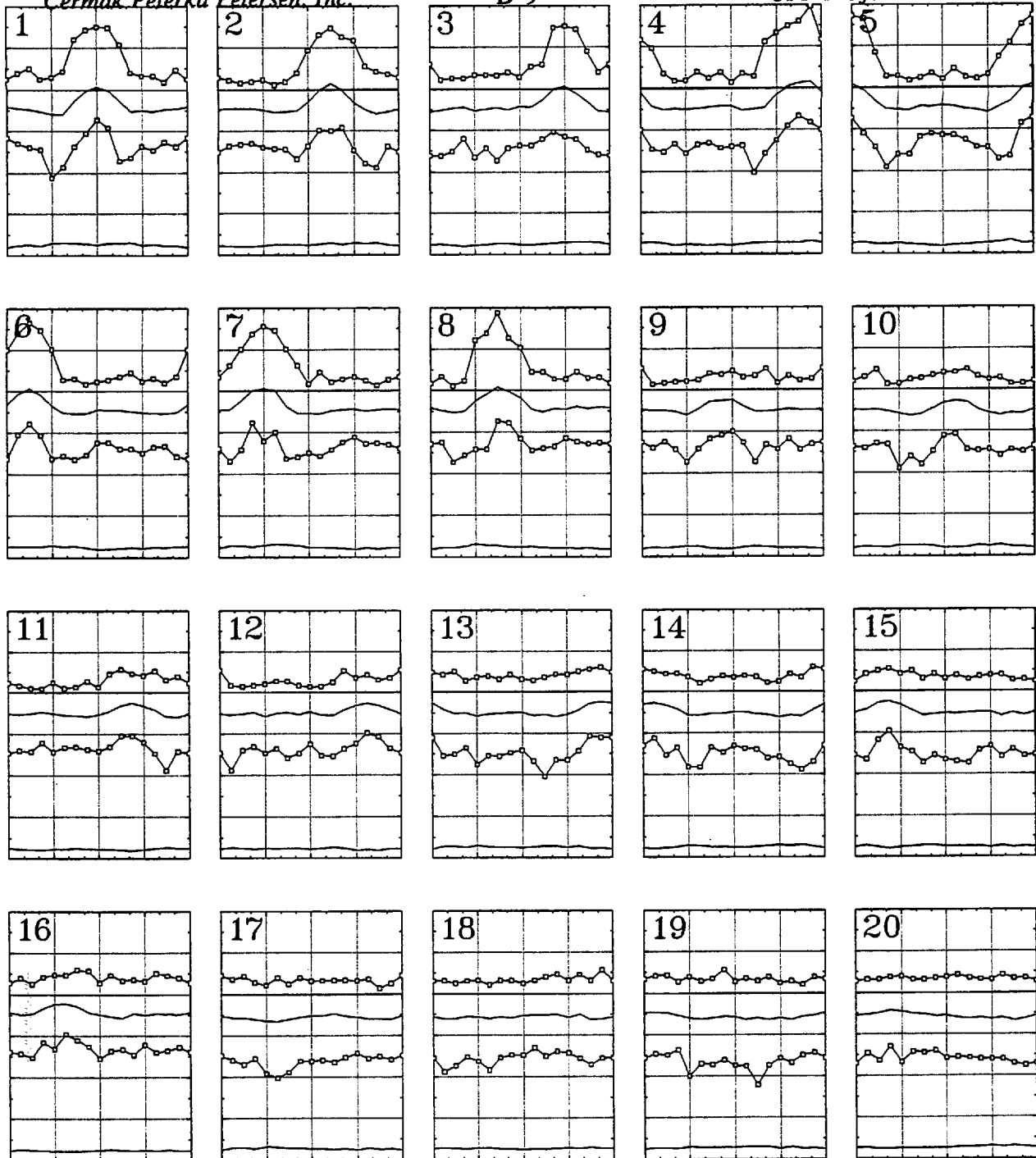


Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-9

CPP Project 92-0869



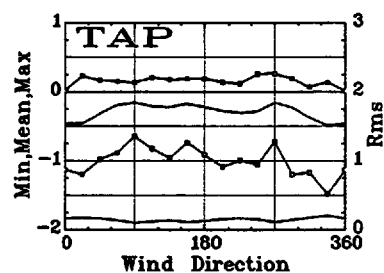
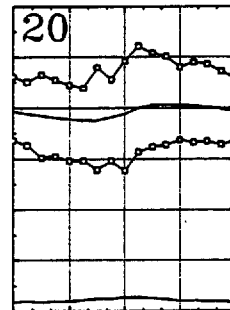
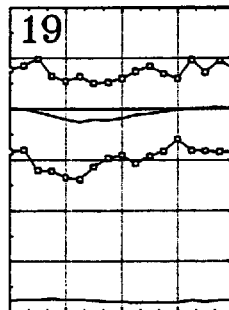
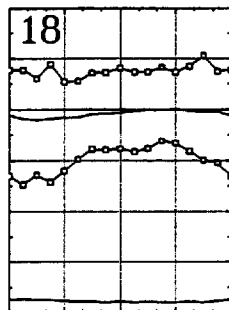
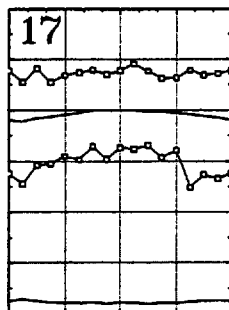
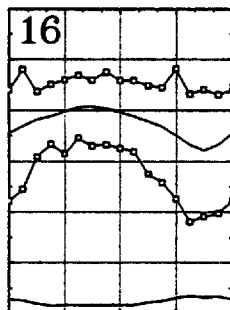
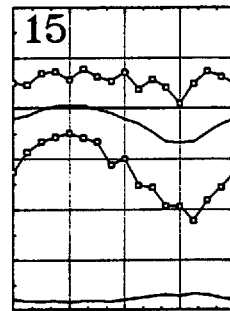
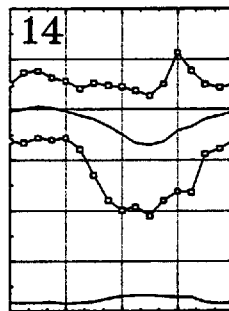
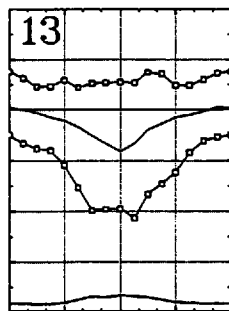
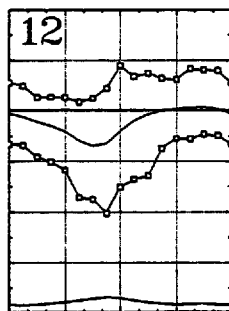
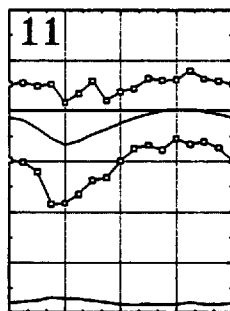
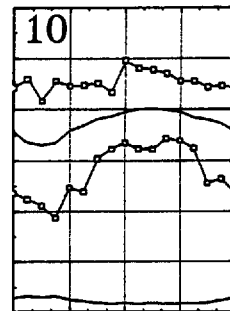
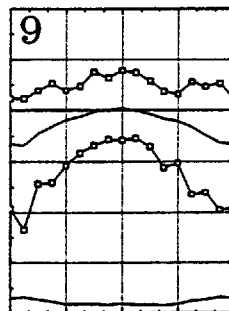
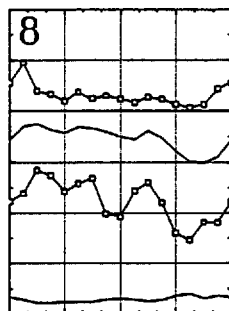
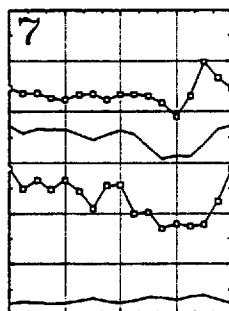
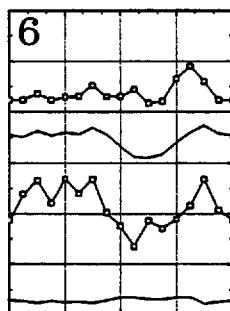
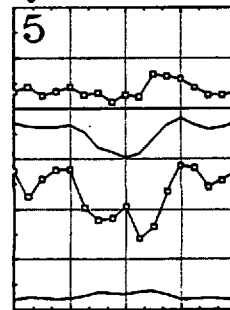
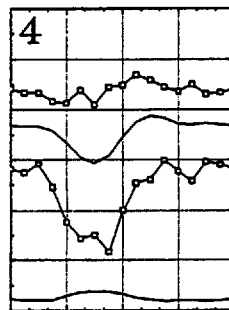
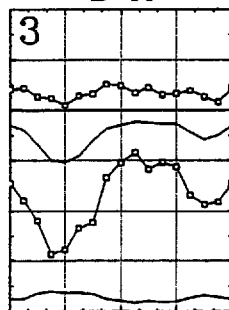
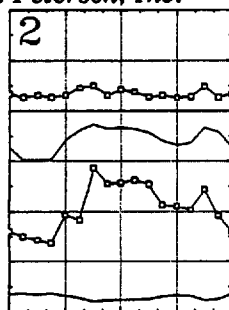
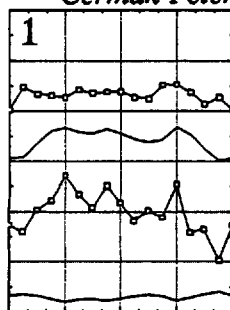
Configuration B - Tank B - 48' Dia x 48' Tall

Data Set 14 - 0.75 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-10

CPP Project 92-0869



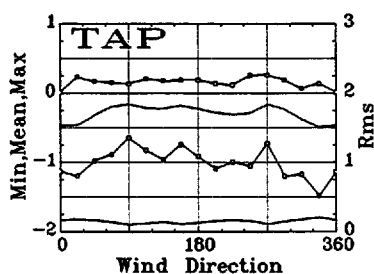
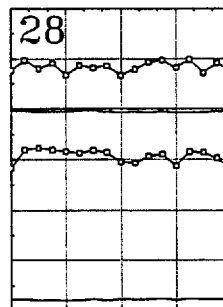
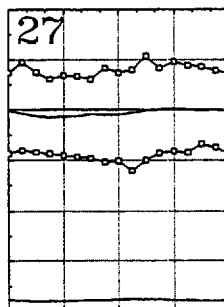
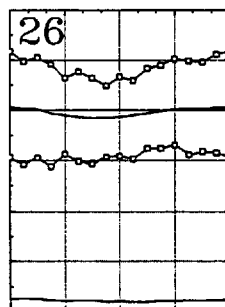
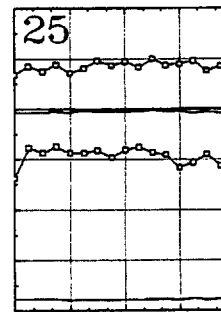
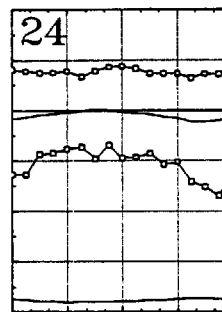
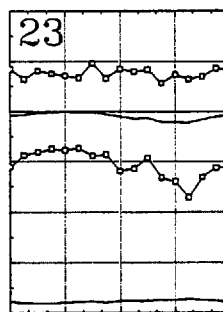
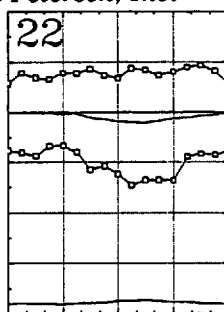
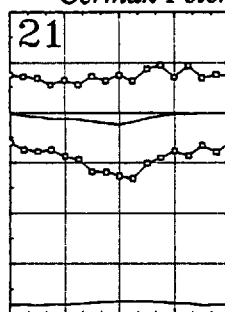
Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 19 - 1.00 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-11

CPP Project 92-0869



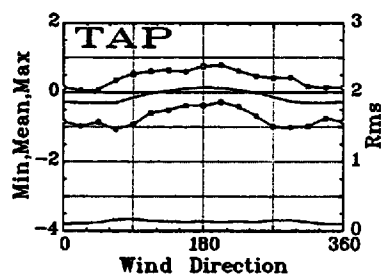
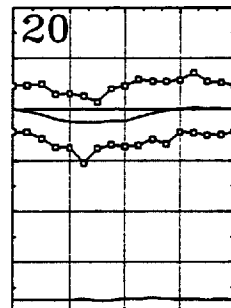
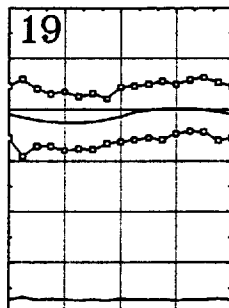
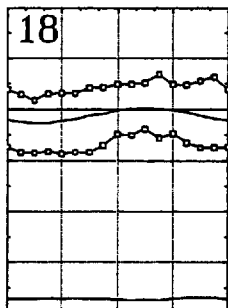
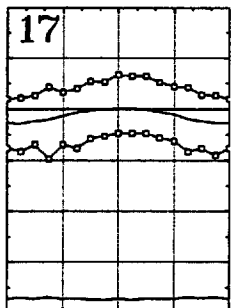
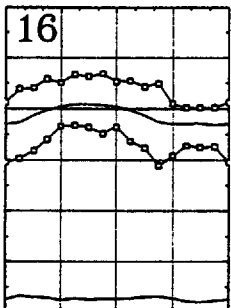
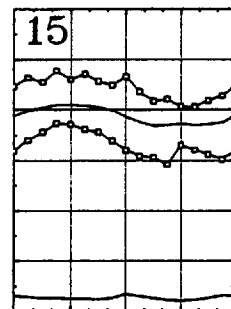
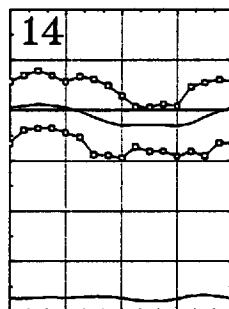
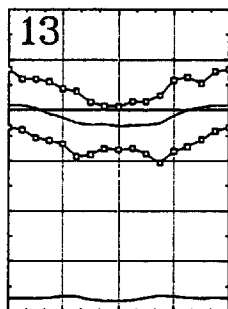
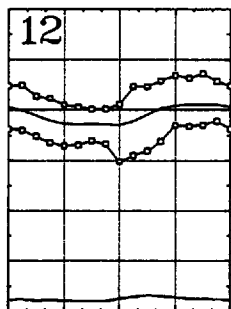
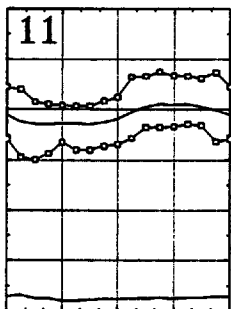
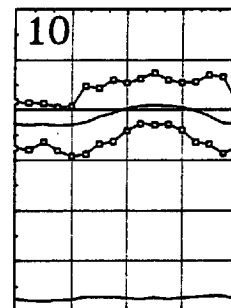
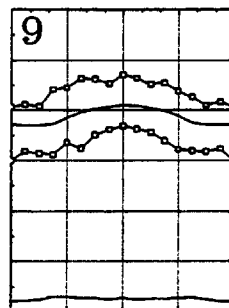
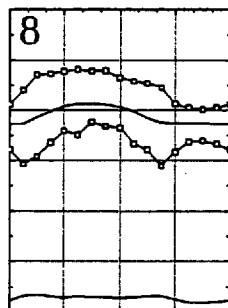
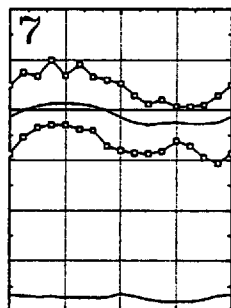
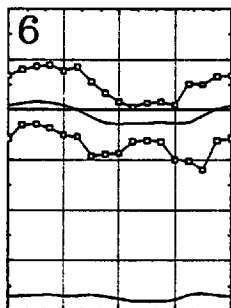
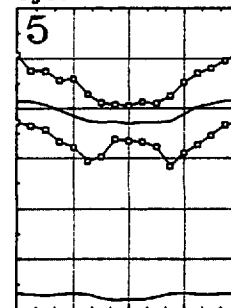
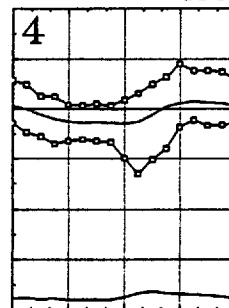
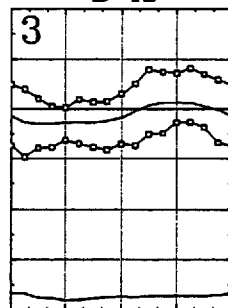
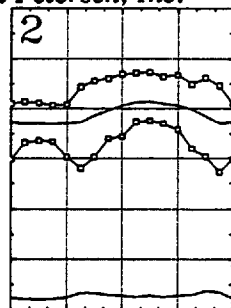
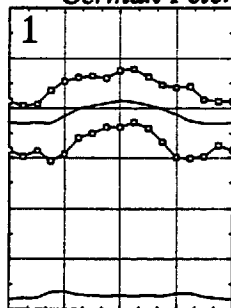
Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 19 - 1.00 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-12

CPP Project 92-0869



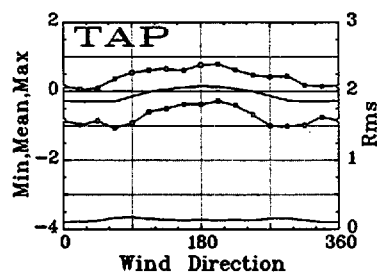
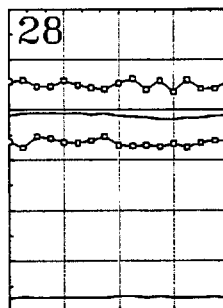
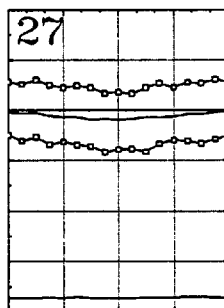
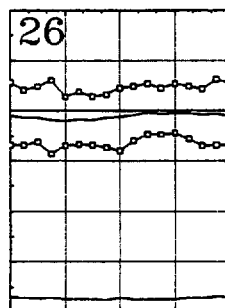
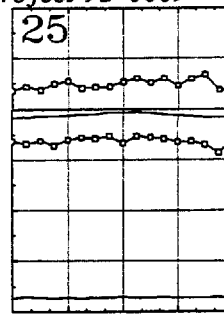
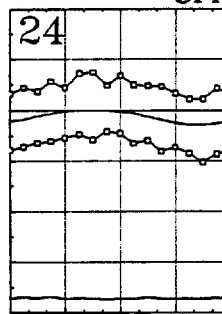
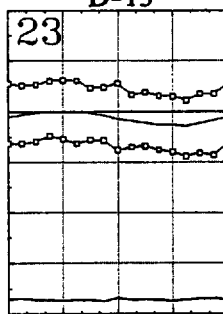
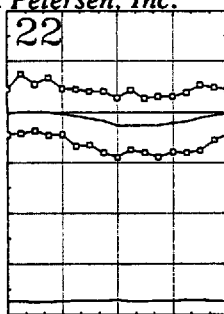
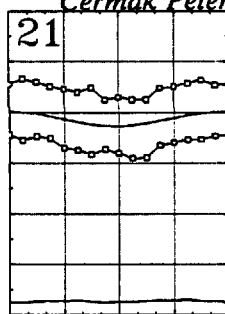
Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 20 - 0.90 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-13

CPP Project 92-0869



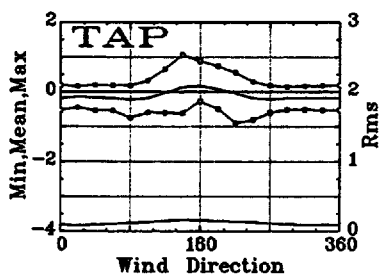
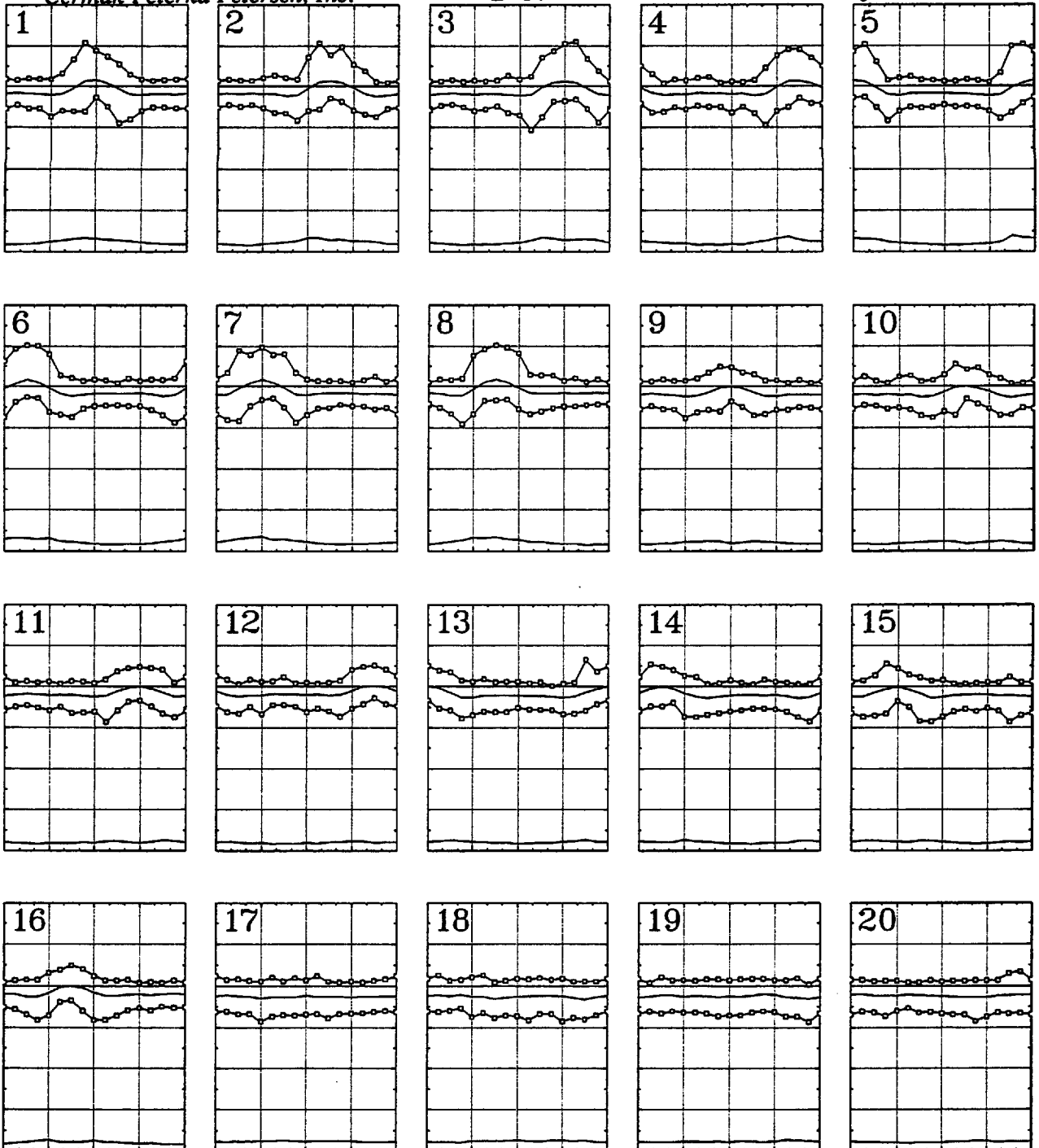
Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 20 - 0.90 Roof Height Ratio

Cermak, Peterka Petersen, Inc.

D-14

CPP Project 92-0869



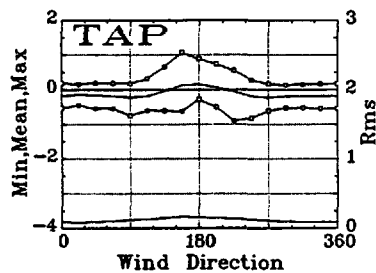
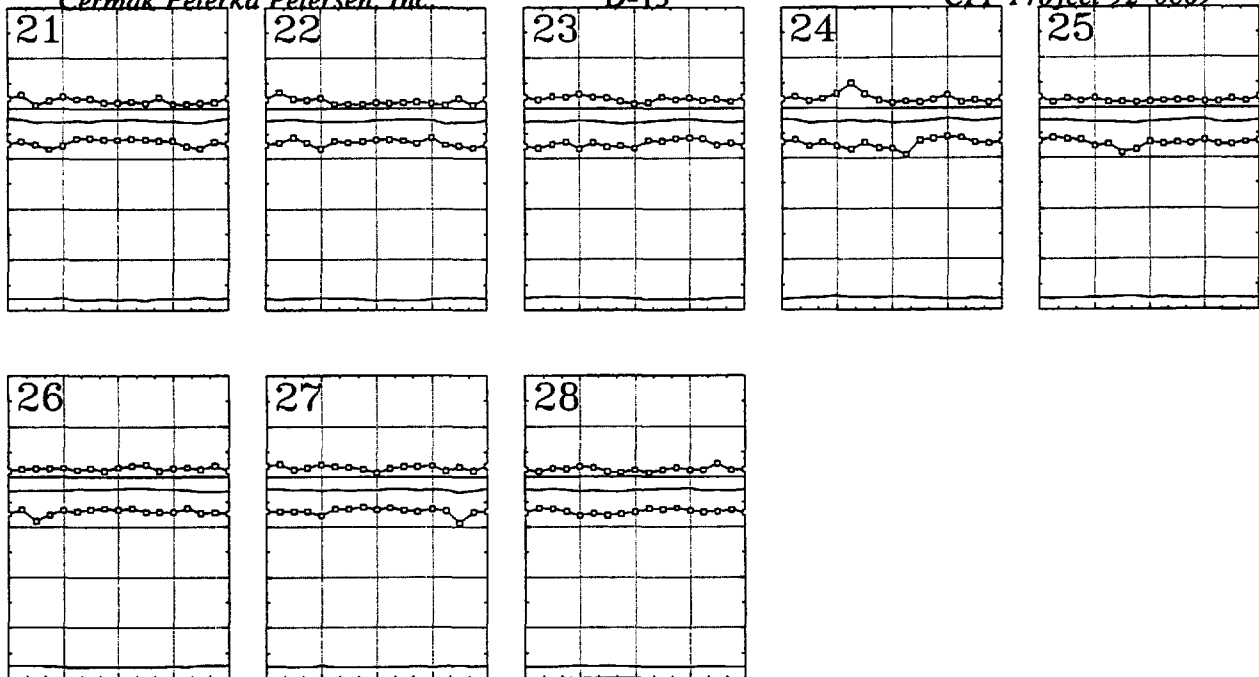
Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 21 - 0.50 Roof Height Ratio

Cermak Peterka Petersen, Inc.

D-15

CPP Project 92-0869

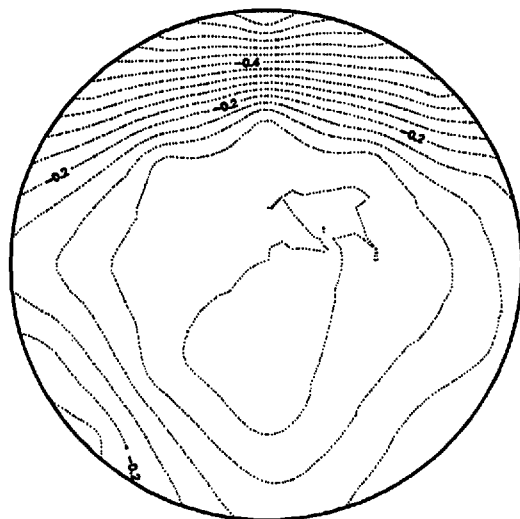


Configuration C - Tank C - 100' Dia x 48' Tall

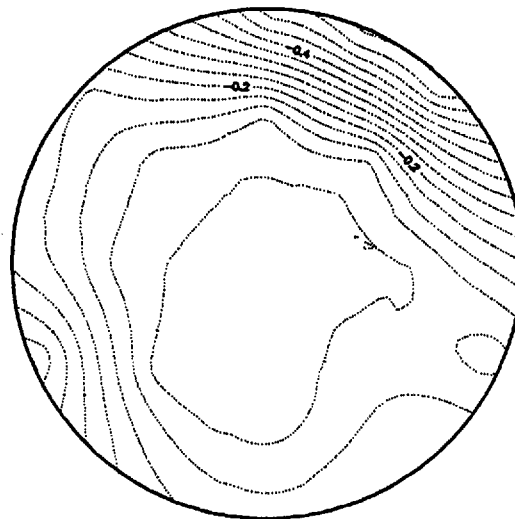
Data Set 21 - 0.50 Roof Height Ratio

APPENDIX E

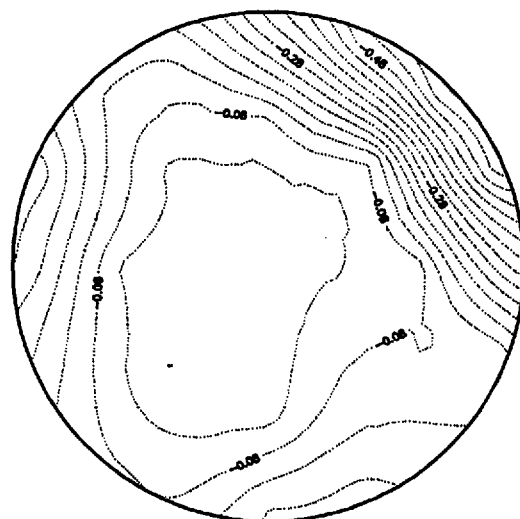
PRESSURE COEFFICIENT CONTOURS BY WIND DIRECTION



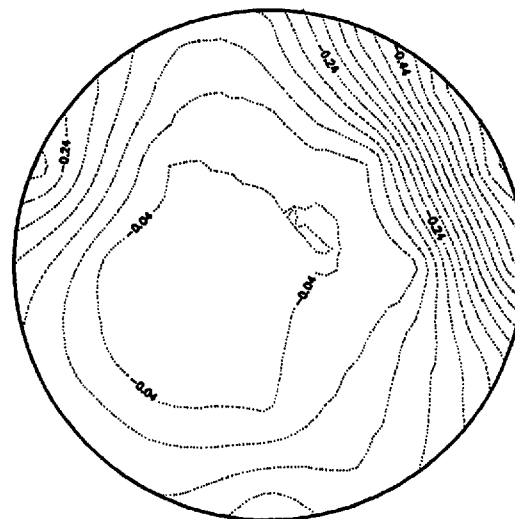
WIND DIRECTION 0



WIND DIRECTION 22.5



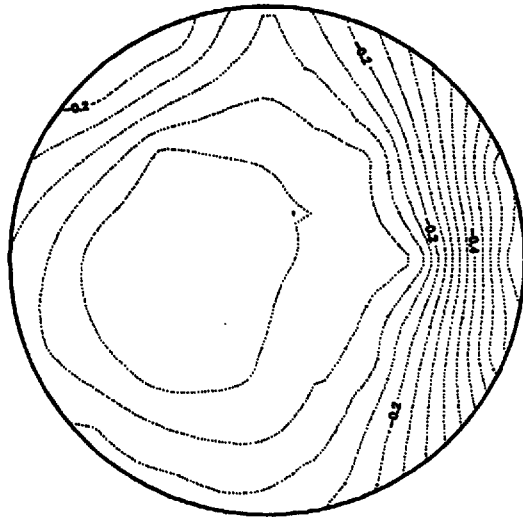
WIND DIRECTION 45



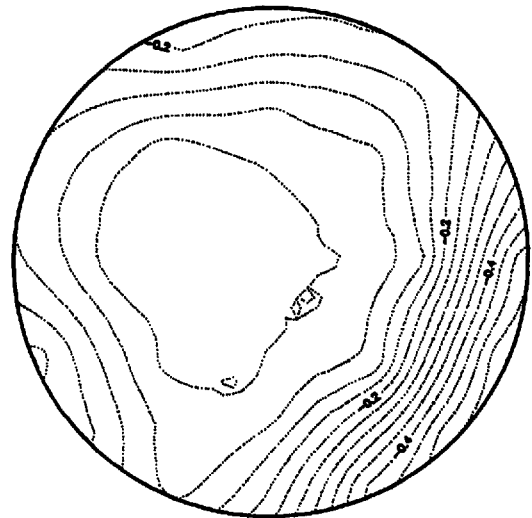
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

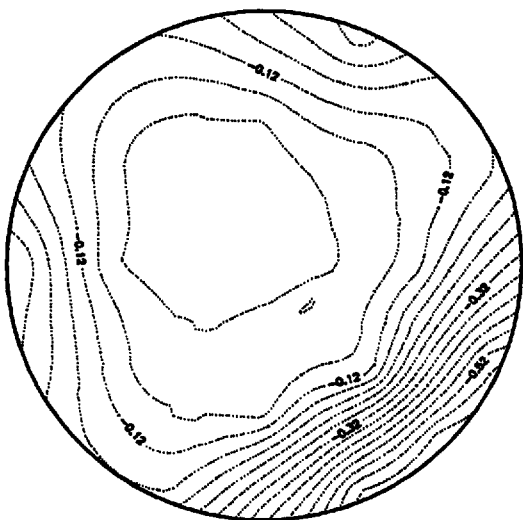
Data Set 5 — 1.00 Roof Height Ratio



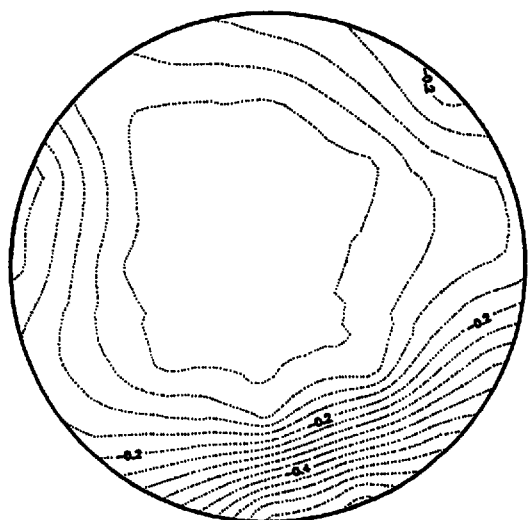
WIND DIRECTION 90



WIND DIRECTION 112.5



WIND DIRECTION 135

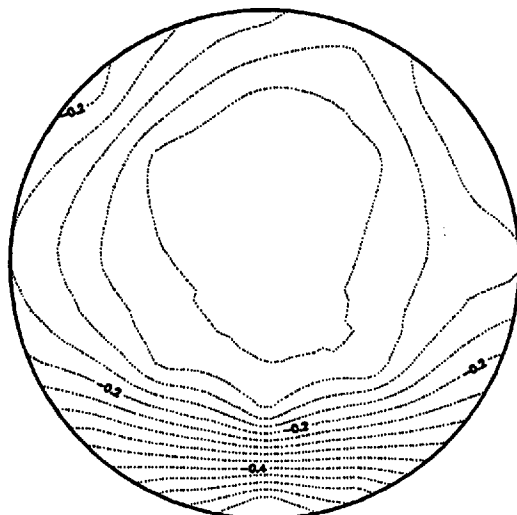


WIND DIRECTION 157.5

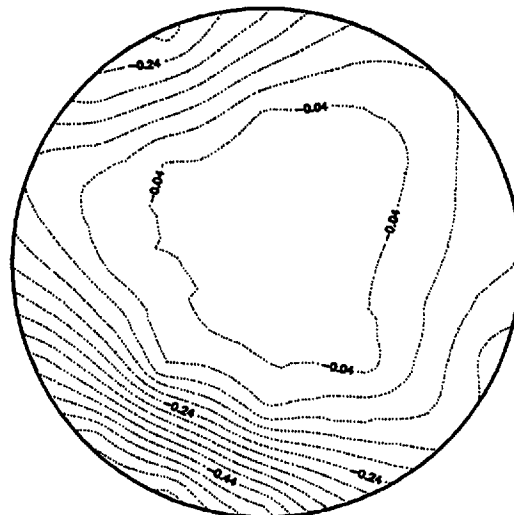
**Pressure Coefficient Contours by Wind Direction
Configuration A**

200 ft Diameter x 58 ft Tall Tank

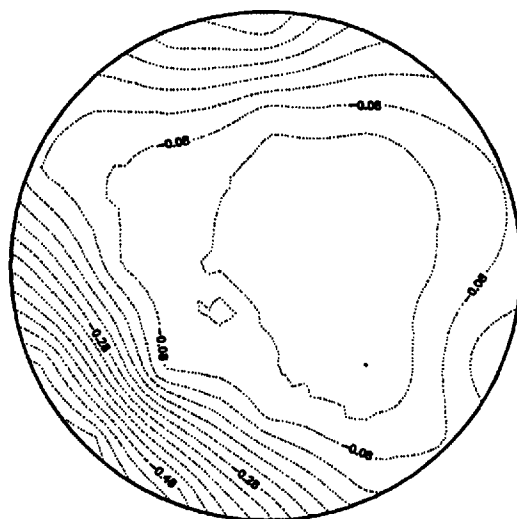
Data Set 5 — 1.00 Roof Height Ratio



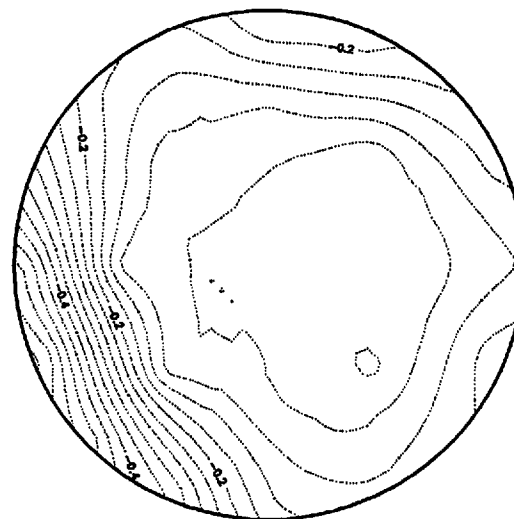
WIND DIRECTION 180



WIND DIRECTION 202.5



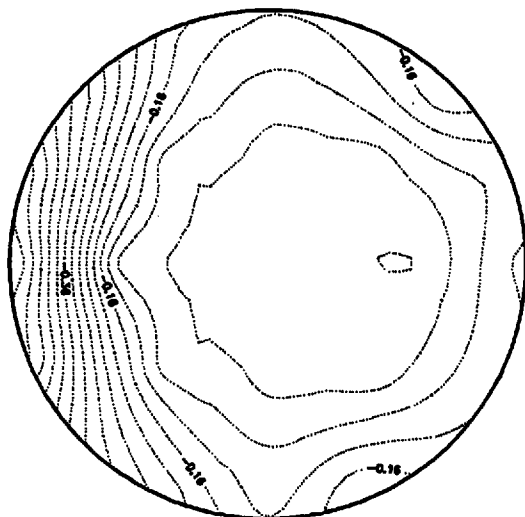
WIND DIRECTION 225



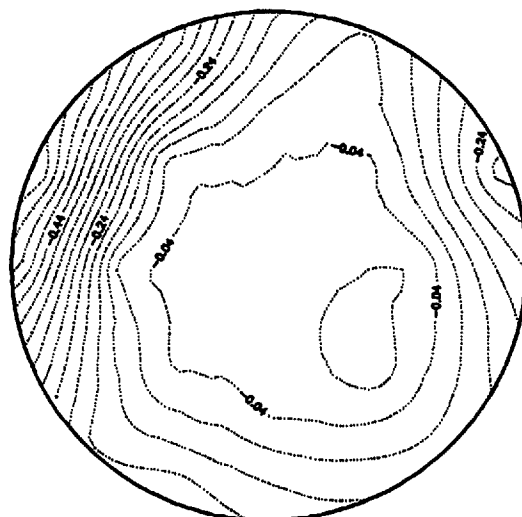
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

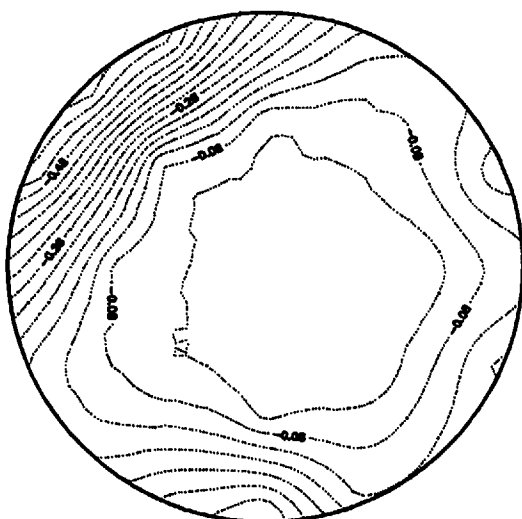
Data Set 5 — 1.00 Roof Height Ratio



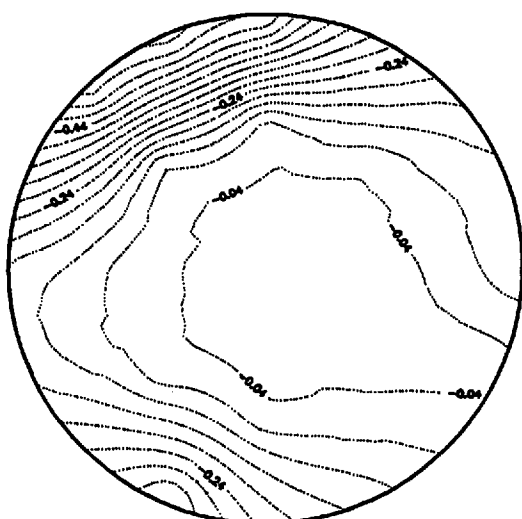
WIND DIRECTION 270



WIND DIRECTION 292.5



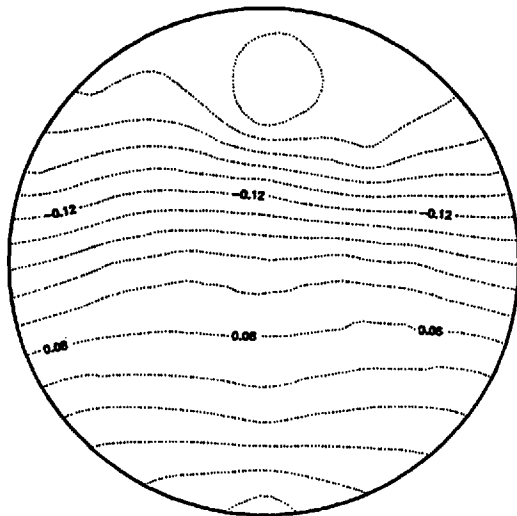
WIND DIRECTION 315



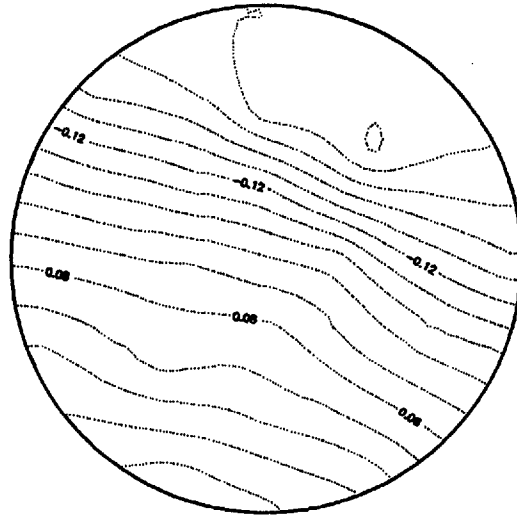
WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

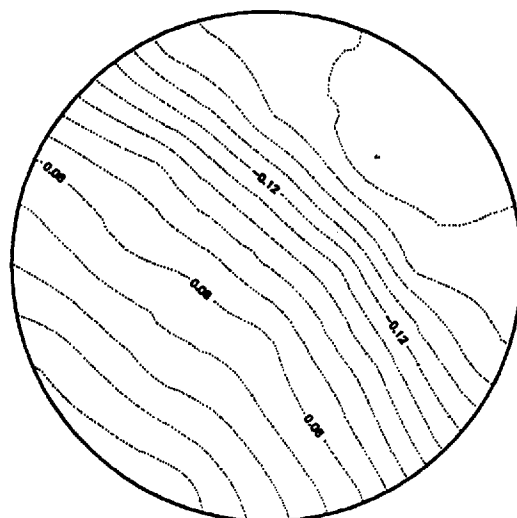
Data Set 5 — 1.00 Roof Height Ratio



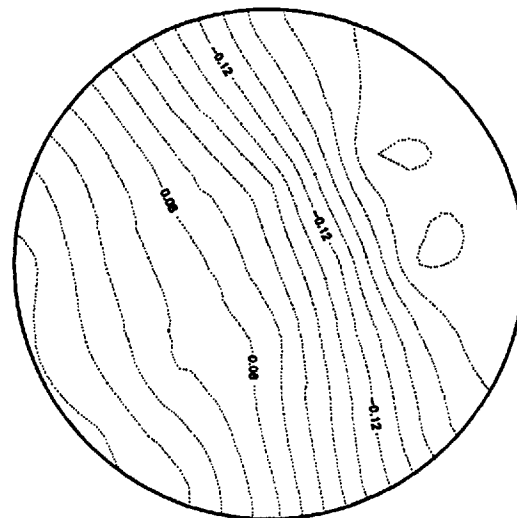
WIND DIRECTION 0



WIND DIRECTION 22.5



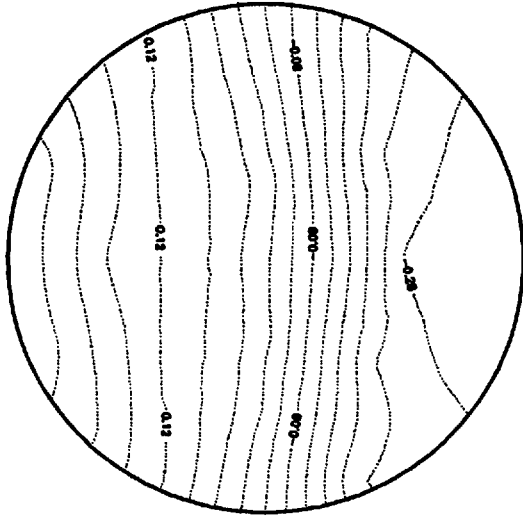
WIND DIRECTION 45



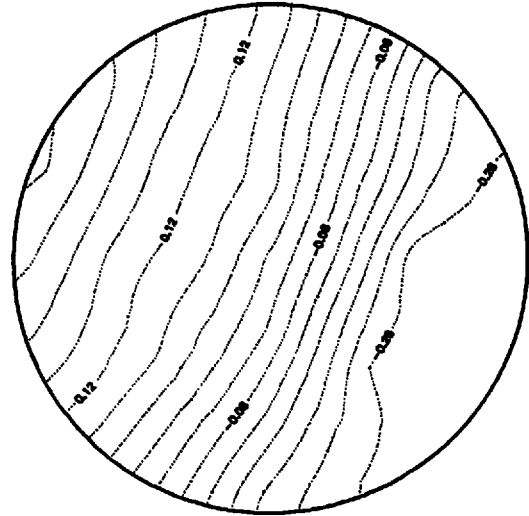
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

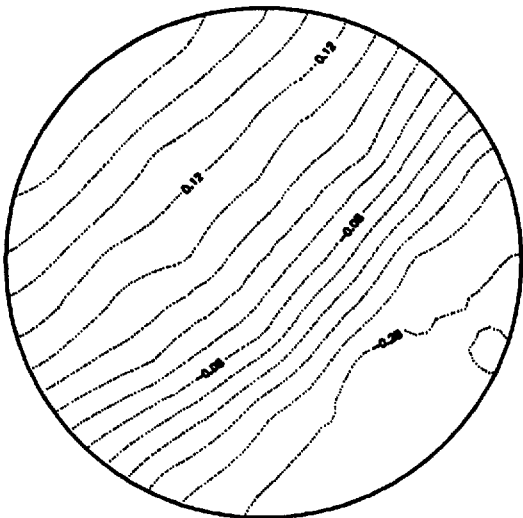
Data Set 6 — 0.80 Roof Height Ratio



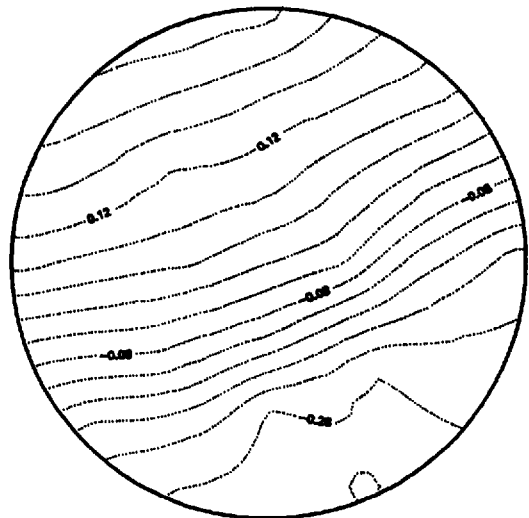
WIND DIRECTION 90



WIND DIRECTION 112.5



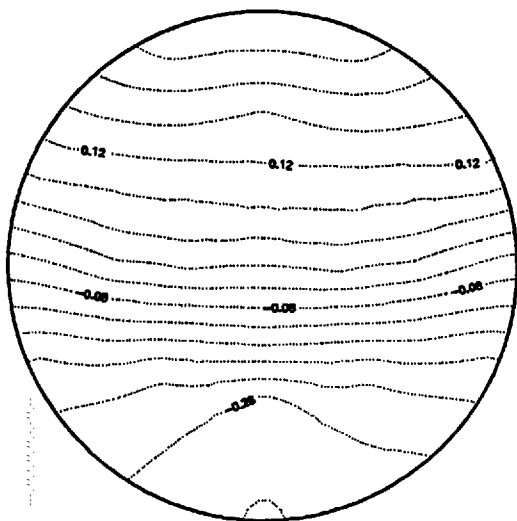
WIND DIRECTION 135



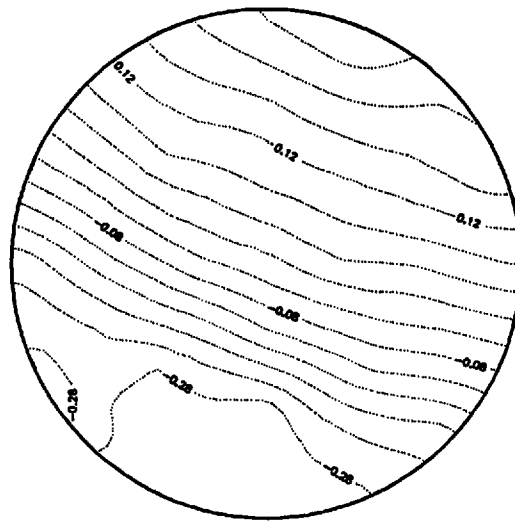
WIND DIRECTION 157.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

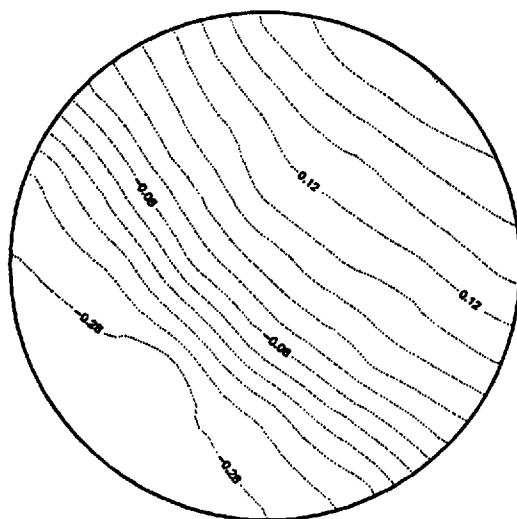
Data Set 6 — 0.80 Roof Height Ratio



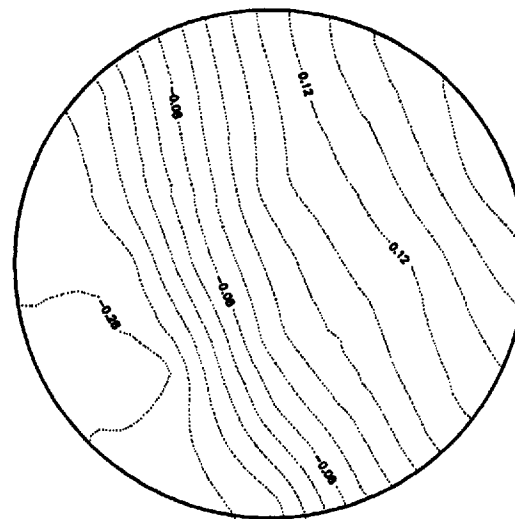
WIND DIRECTION 180



WIND DIRECTION 202.5



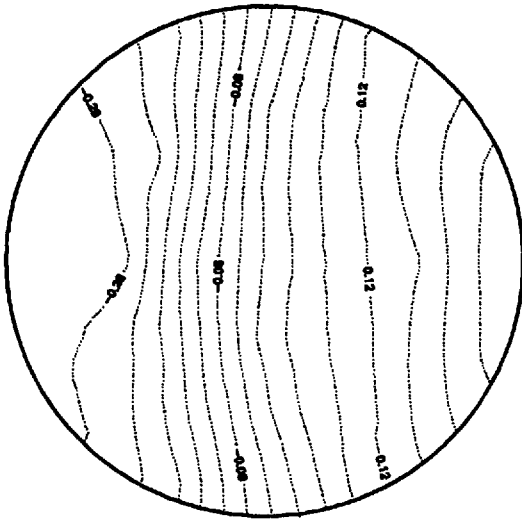
WIND DIRECTION 225



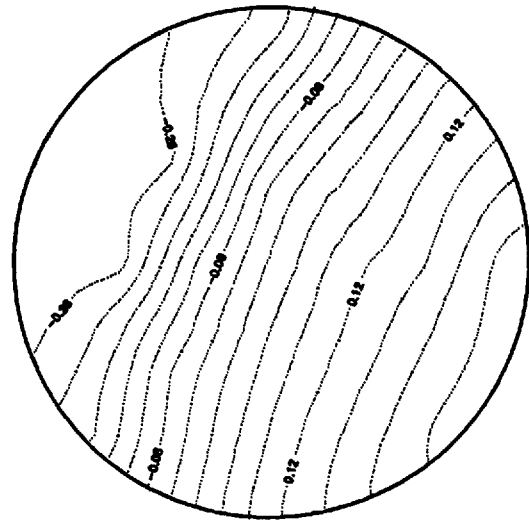
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

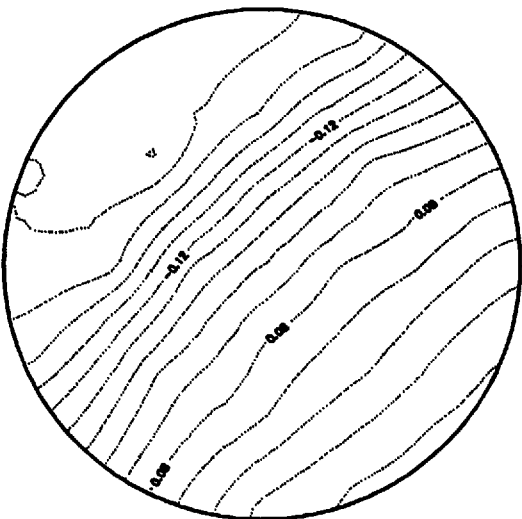
Data Set 6 — 0.80 Roof Height Ratio



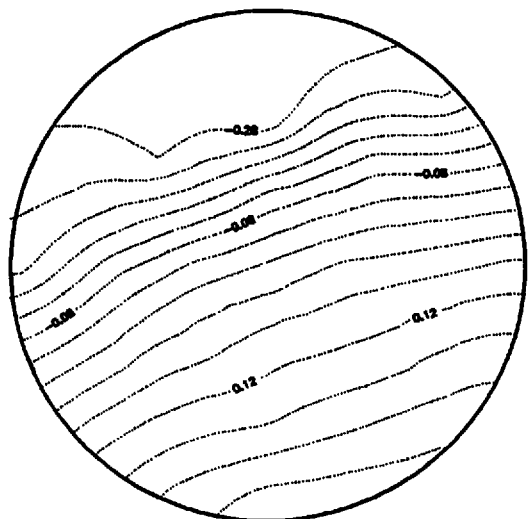
WIND DIRECTION 270



WIND DIRECTION 292.5



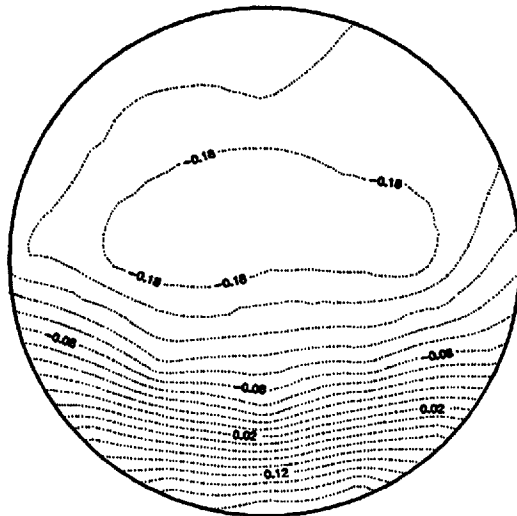
WIND DIRECTION 315



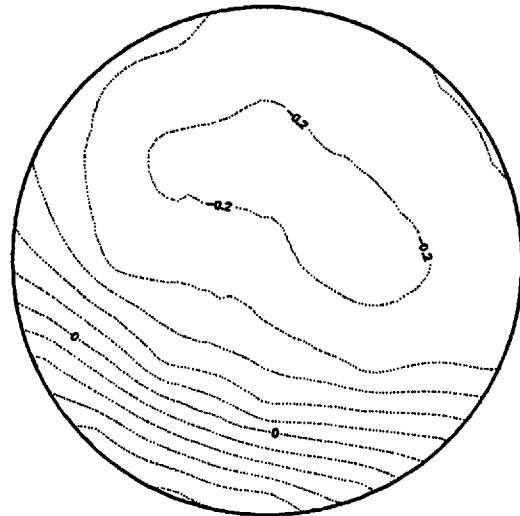
WIND DIRECTION 337.5

Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank

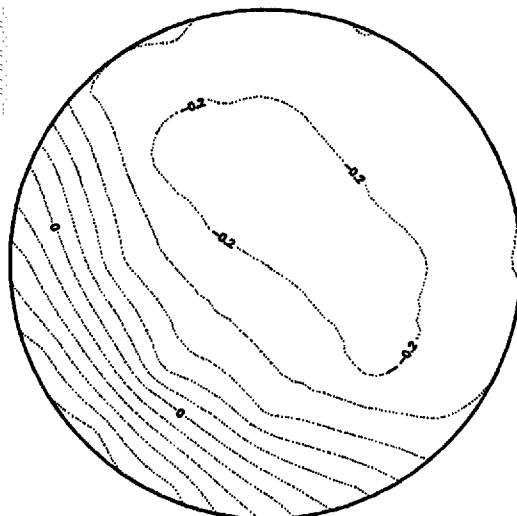
Data Set 6 — 0.80 Roof Height Ratio



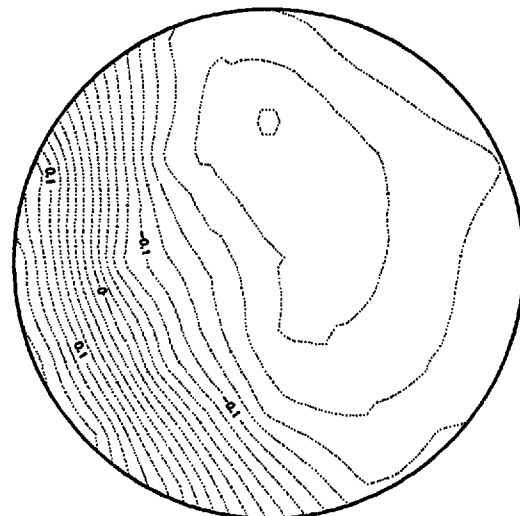
WIND DIRECTION 0



WIND DIRECTION 22.5



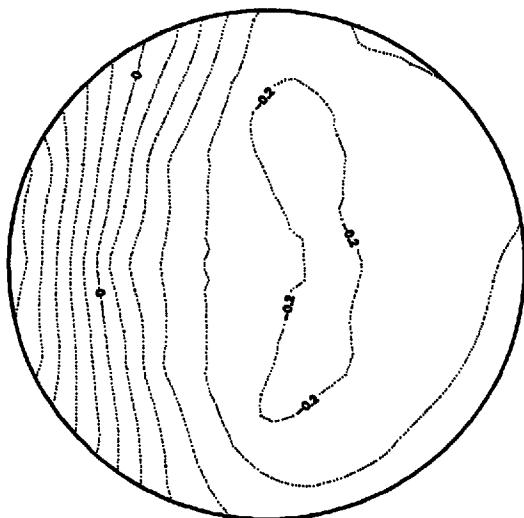
WIND DIRECTION 45



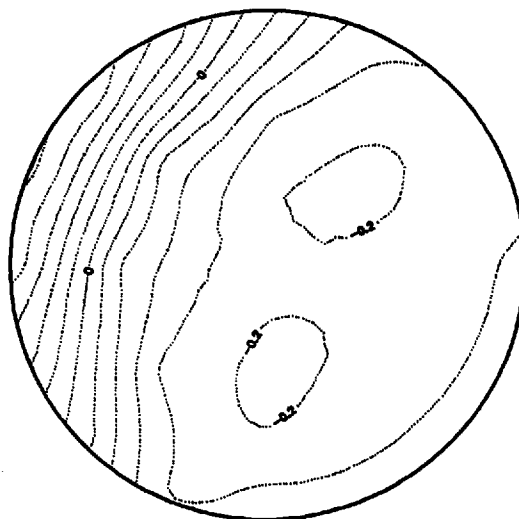
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

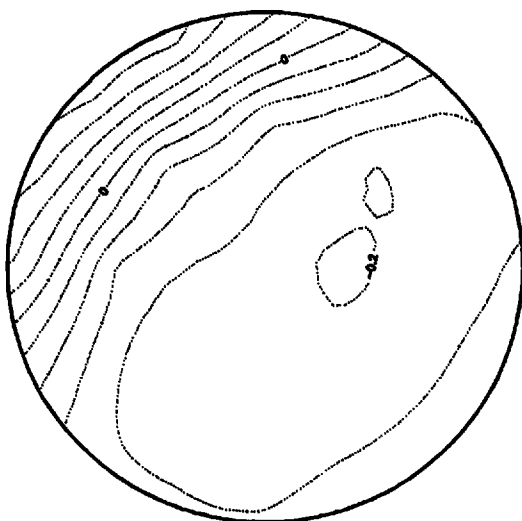
Data Set 7 — 0.35 Roof Height Ratio



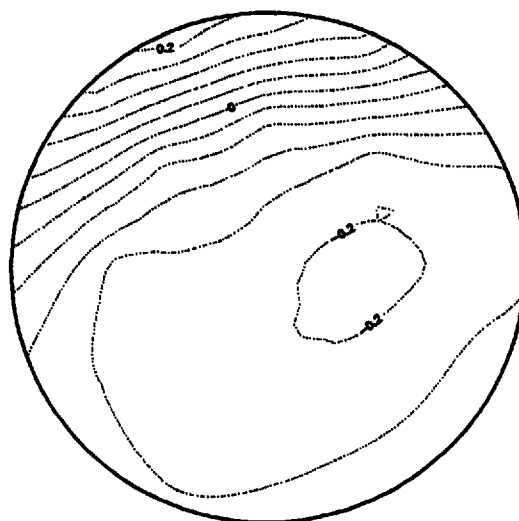
WIND DIRECTION 90



WIND DIRECTION 112.5



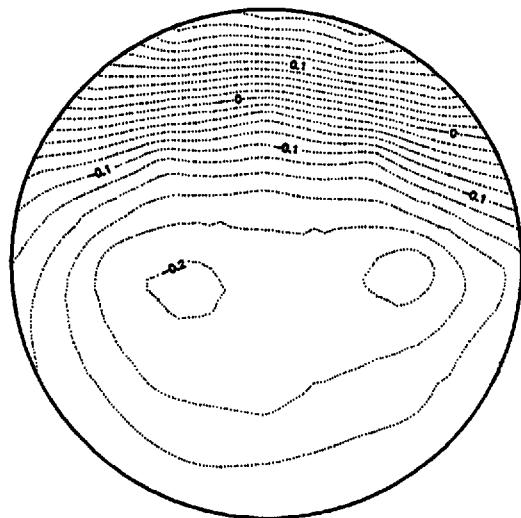
WIND DIRECTION 135



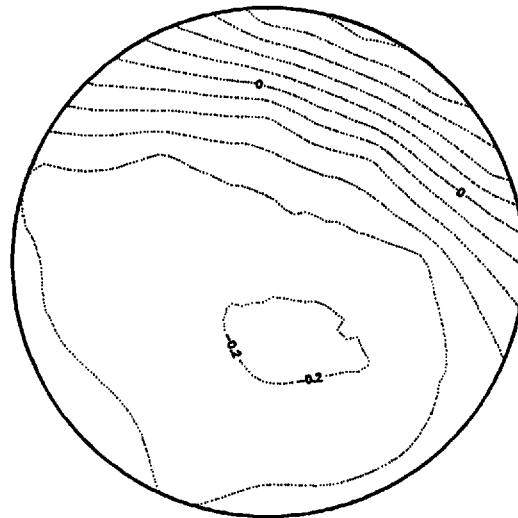
WIND DIRECTION 157.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

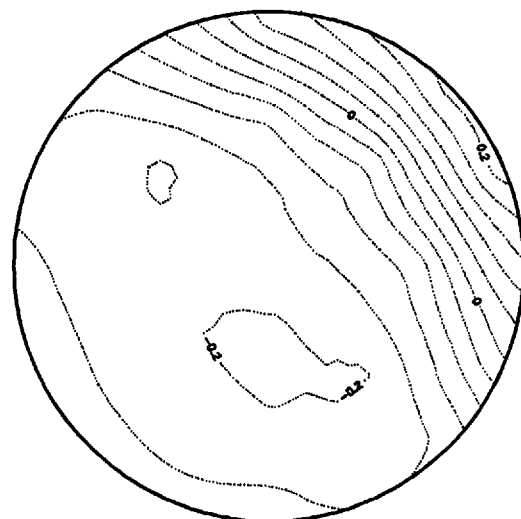
Data Set 7 — 0.35 Roof Height Ratio



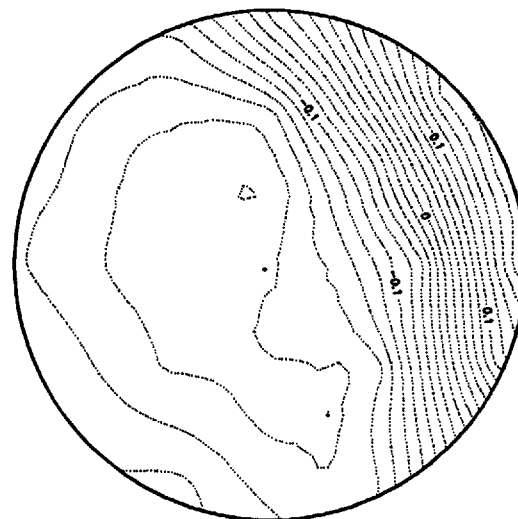
WIND DIRECTION 180



WIND DIRECTION 202.5



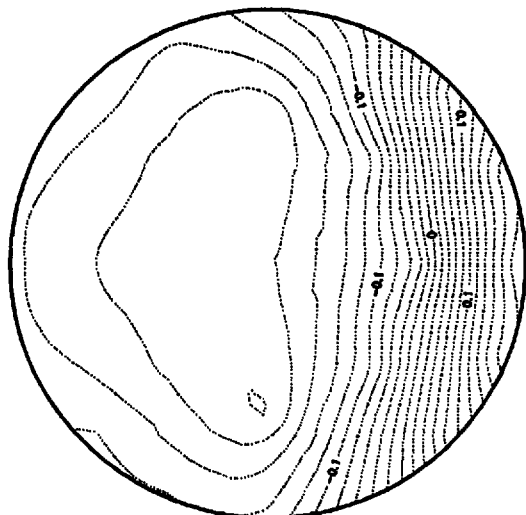
WIND DIRECTION 225



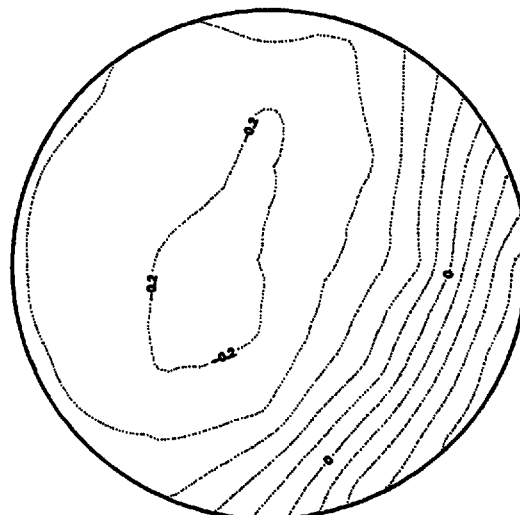
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

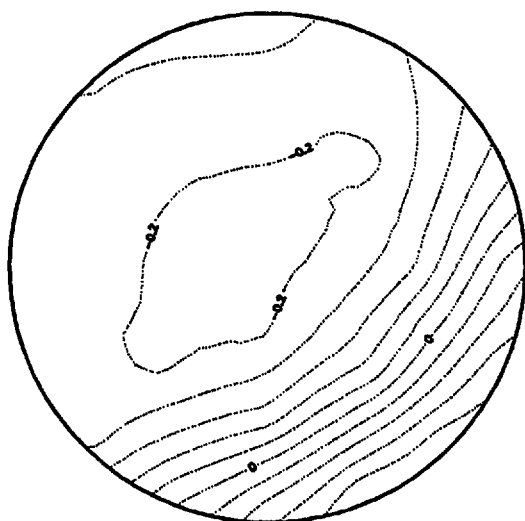
Data Set 7 — 0.35 Roof Height Ratio



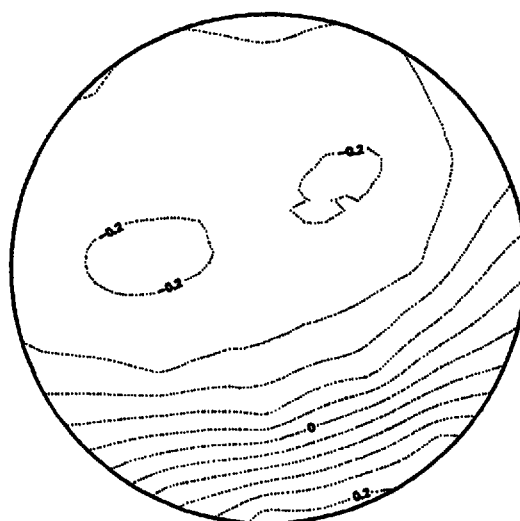
WIND DIRECTION 270



WIND DIRECTION 292.5



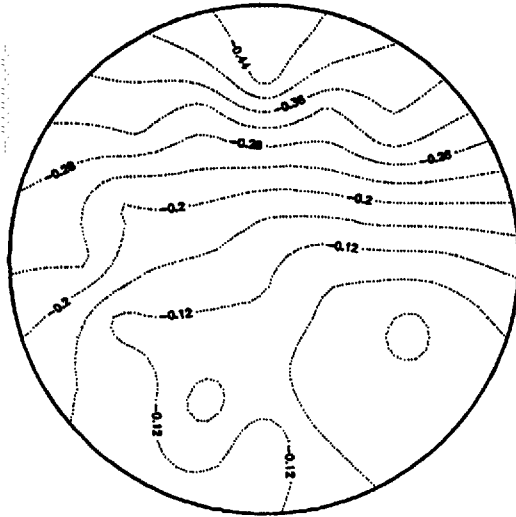
WIND DIRECTION 315



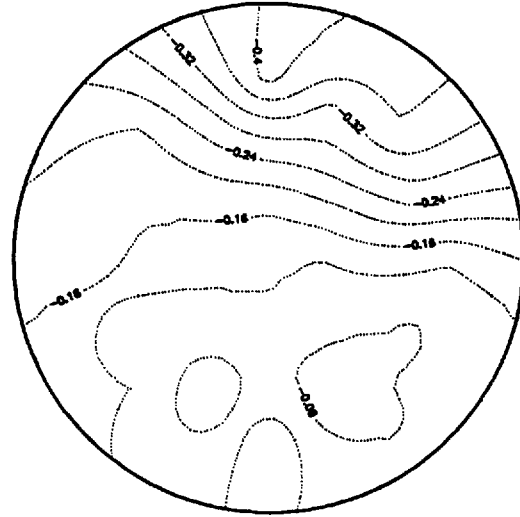
WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration A
200 ft Diameter x 58 ft Tall Tank**

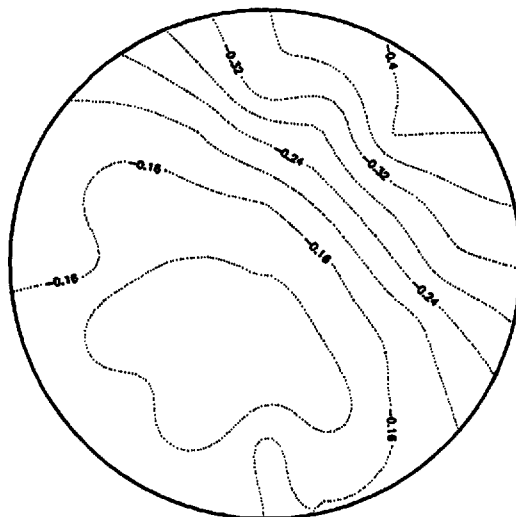
Data Set 7 — 0.35 Roof Height Ratio



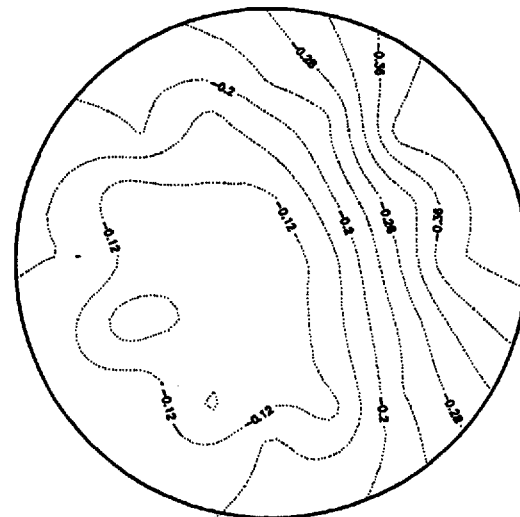
WIND DIRECTION 0



WIND DIRECTION 22.5



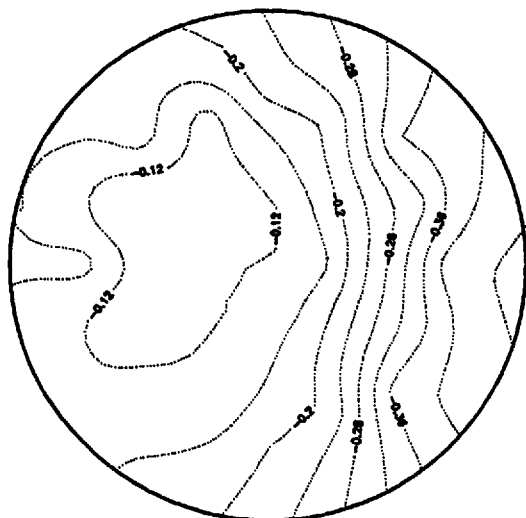
WIND DIRECTION 45



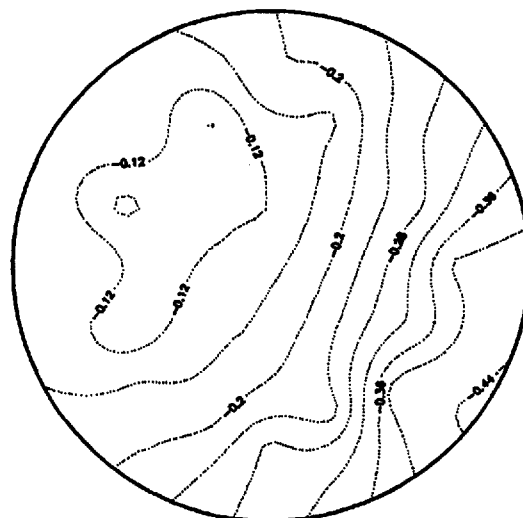
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

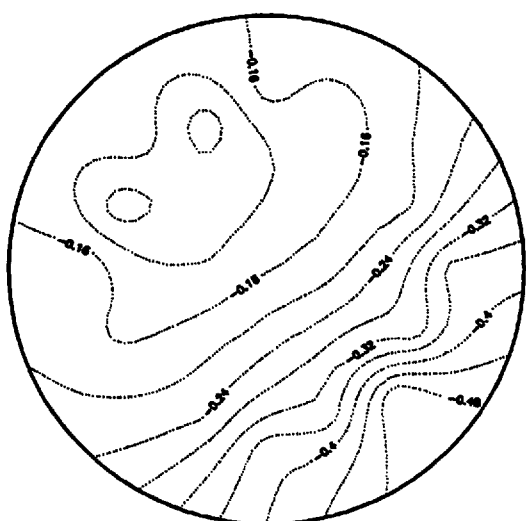
Data Set 12 — 1.00 Roof Height Ratio



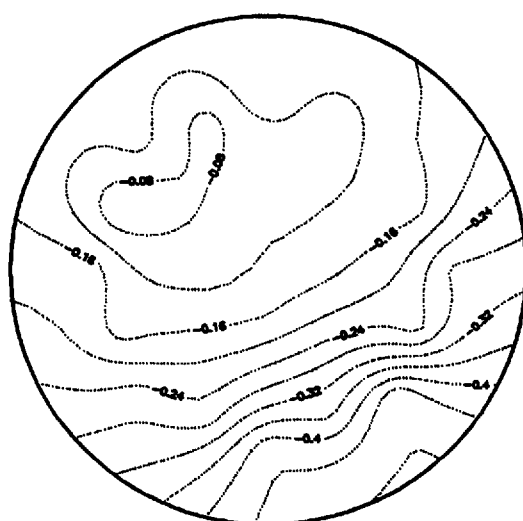
WIND DIRECTION 90



WIND DIRECTION 112.5



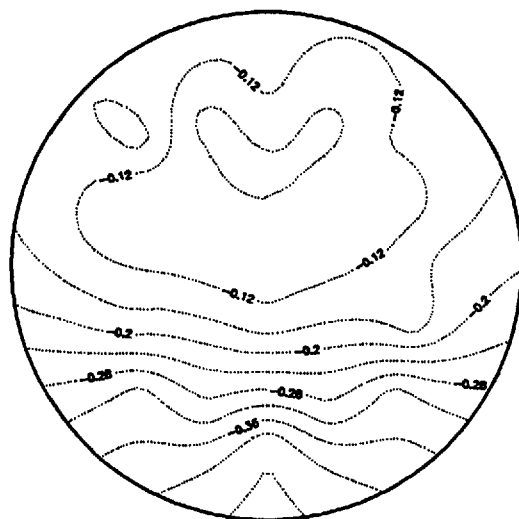
WIND DIRECTION 135



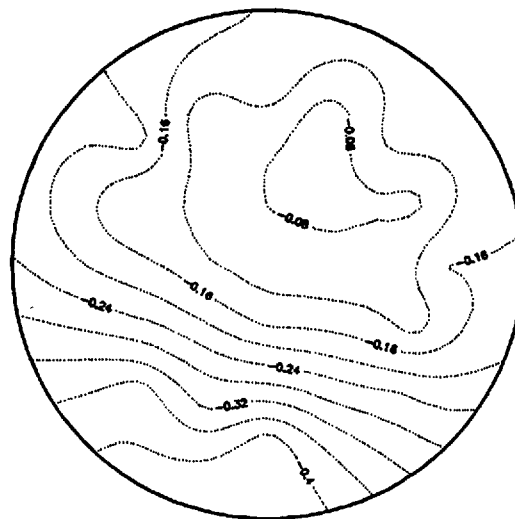
WIND DIRECTION 157.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

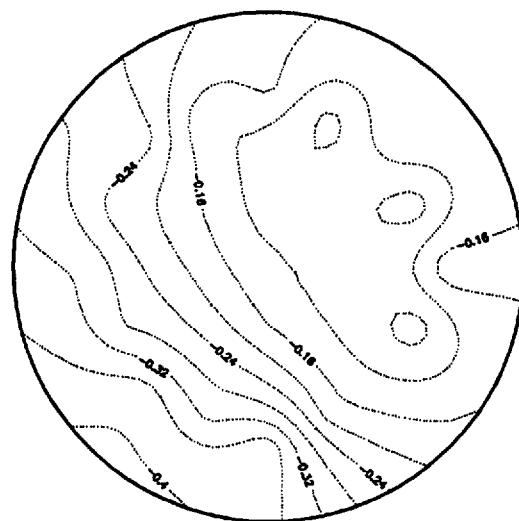
Data Set 12 — 1.00 Roof Height Ratio



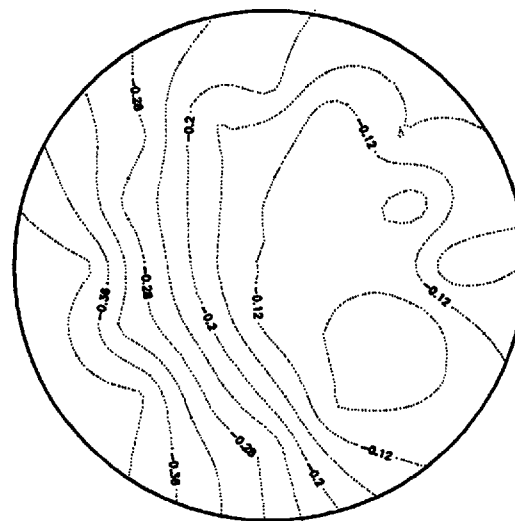
WIND DIRECTION 180



WIND DIRECTION 202.5



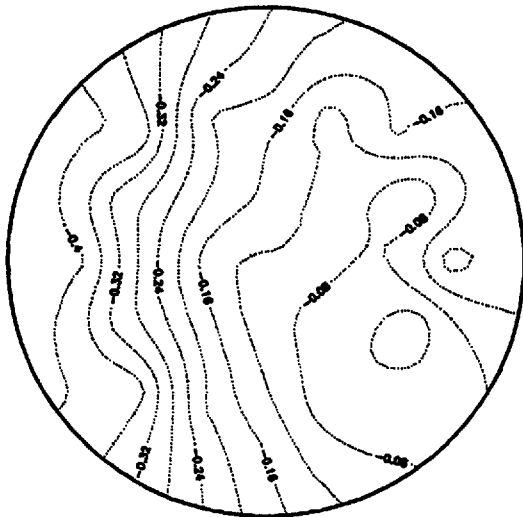
WIND DIRECTION 225



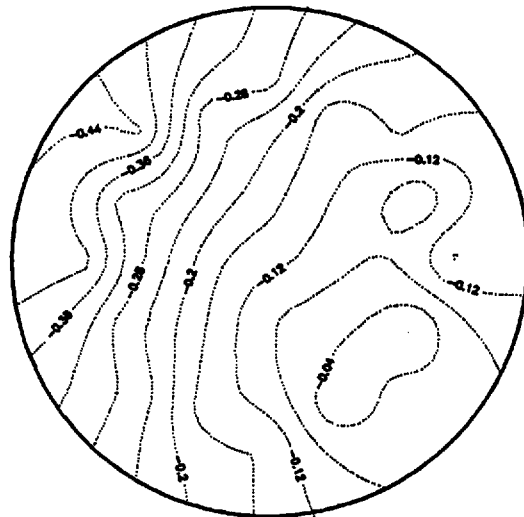
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

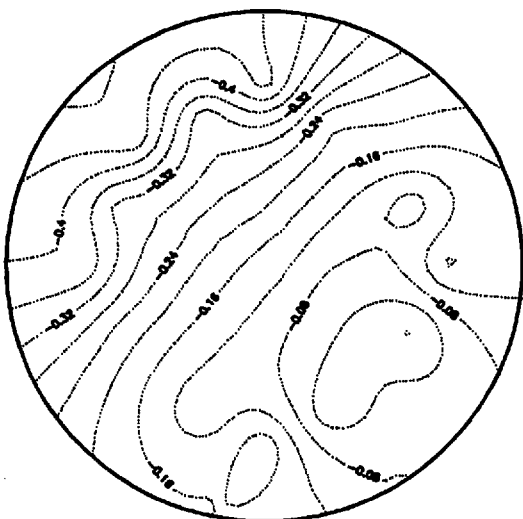
Data Set 12 — 1.00 Roof Height Ratio



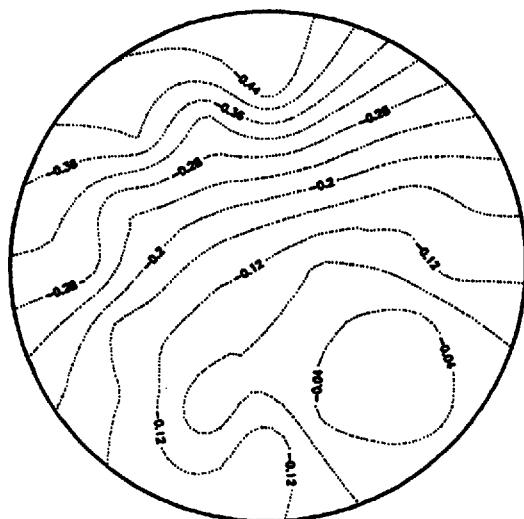
WIND DIRECTION 270



WIND DIRECTION 292.5



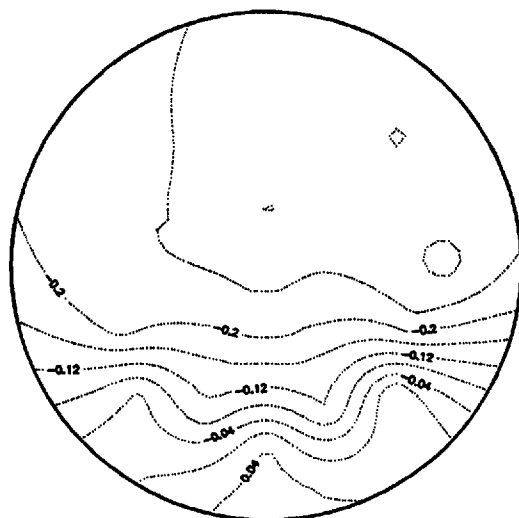
WIND DIRECTION 315



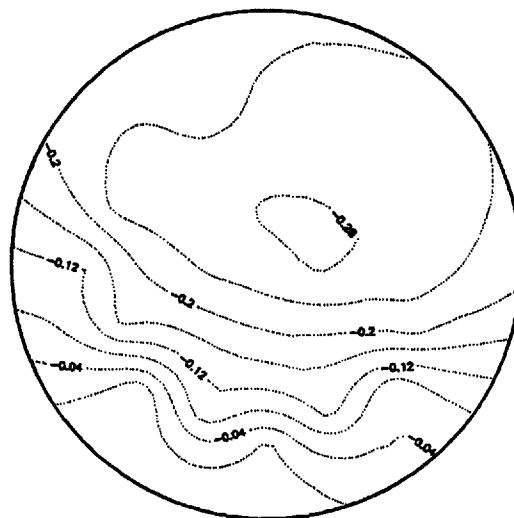
WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

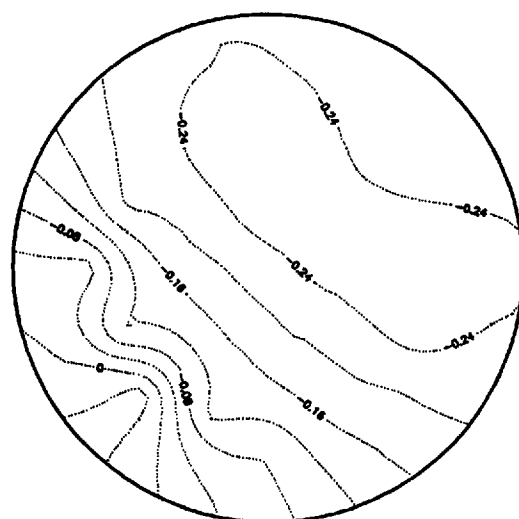
Data Set 12 — 1.00 Roof Height Ratio



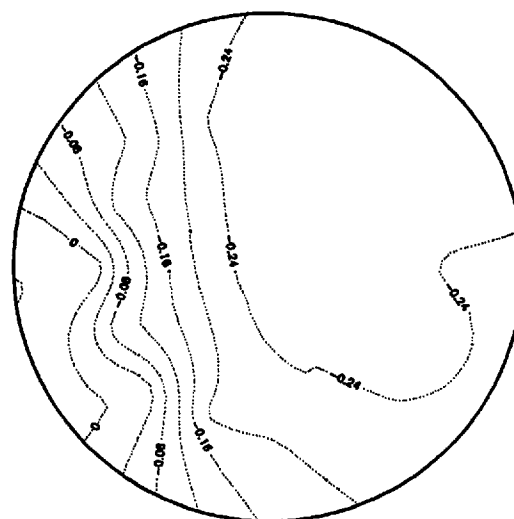
WIND DIRECTION 0



WIND DIRECTION 22.5



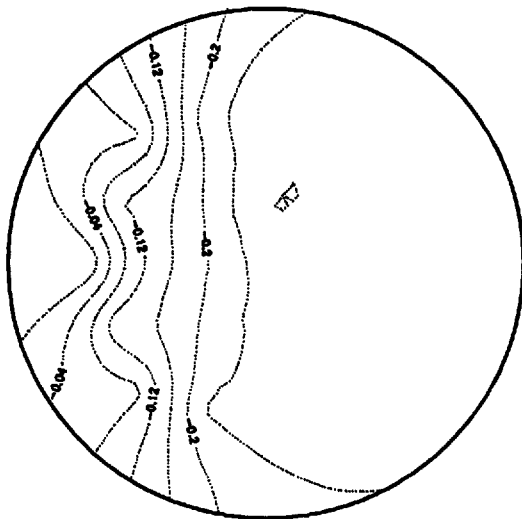
WIND DIRECTION 45



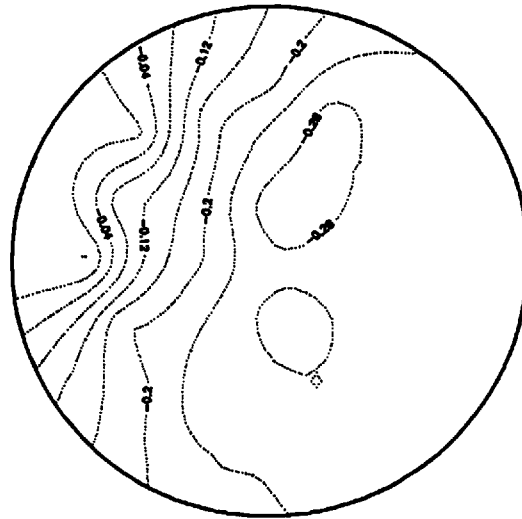
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

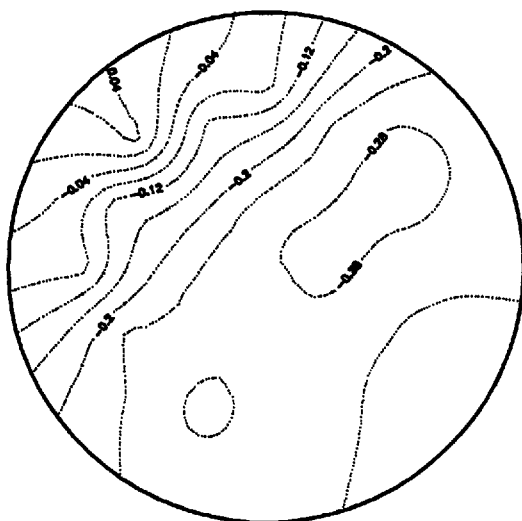
Data Set 13 – 0.90 Roof Height Ratio



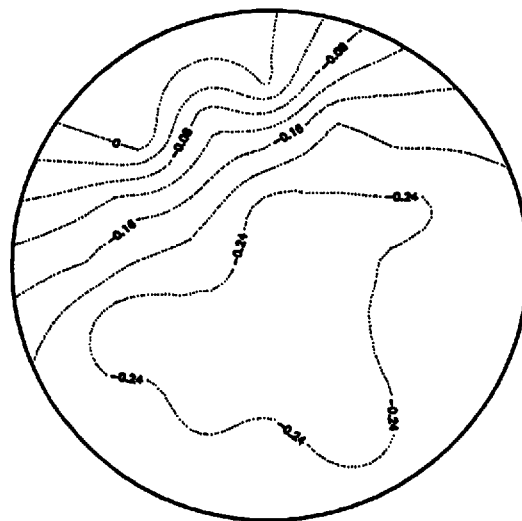
WIND DIRECTION 90



WIND DIRECTION 112.5



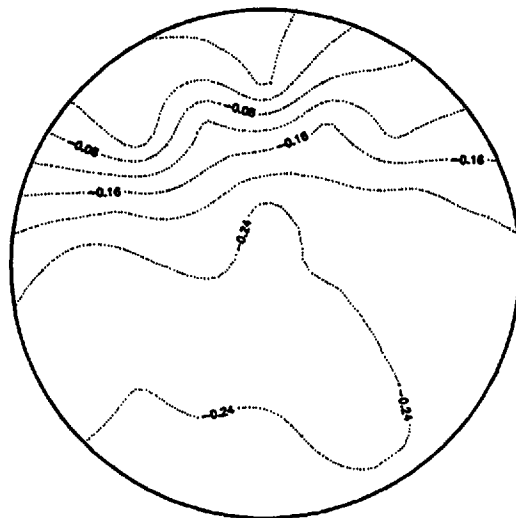
WIND DIRECTION 135



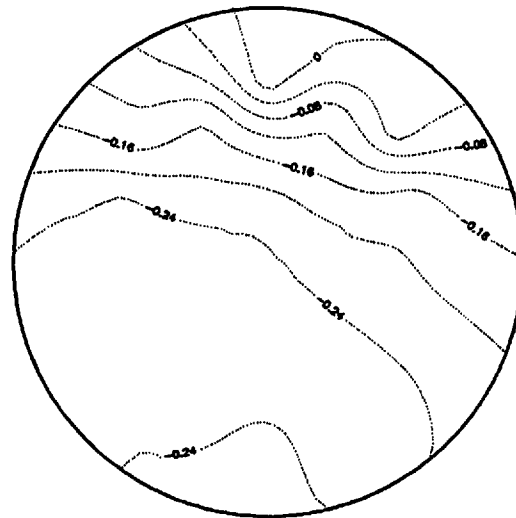
WIND DIRECTION 157.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

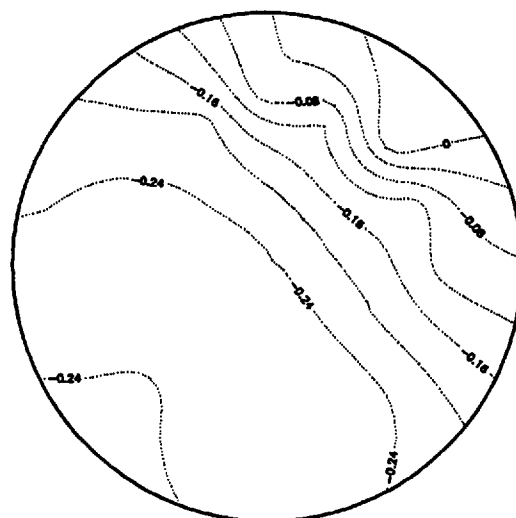
Data Set 13 — 0.90 Roof Height Ratio



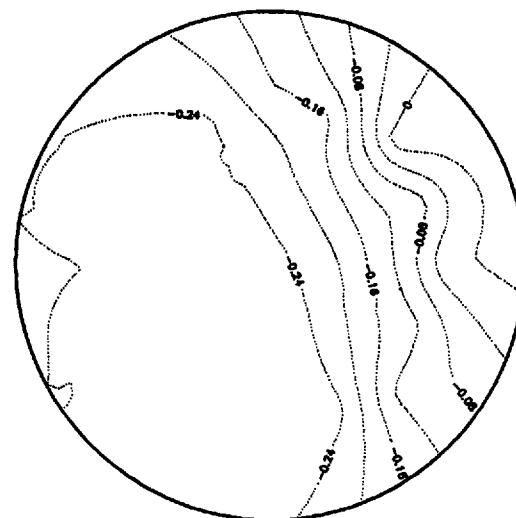
WIND DIRECTION 180



WIND DIRECTION 202.5



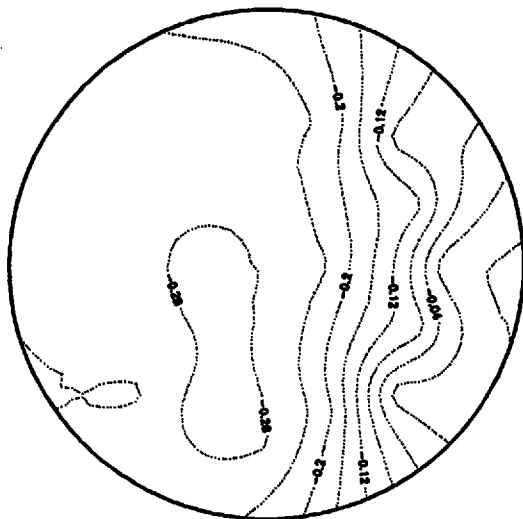
WIND DIRECTION 225



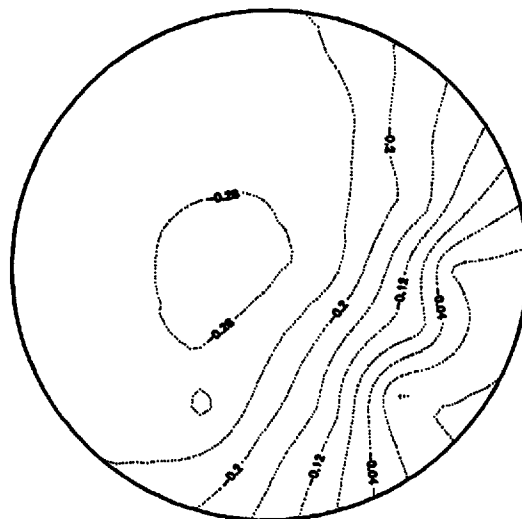
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

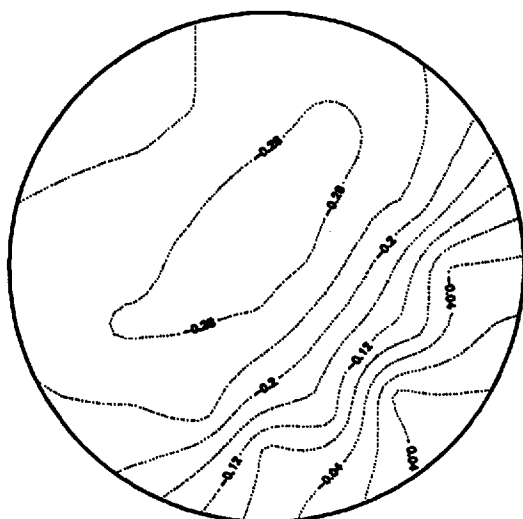
Data Set 13 — 0.90 Roof Height Ratio



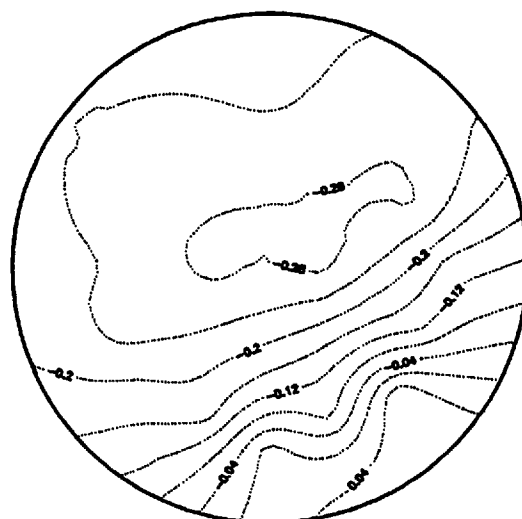
WIND DIRECTION 270



WIND DIRECTION 292.5



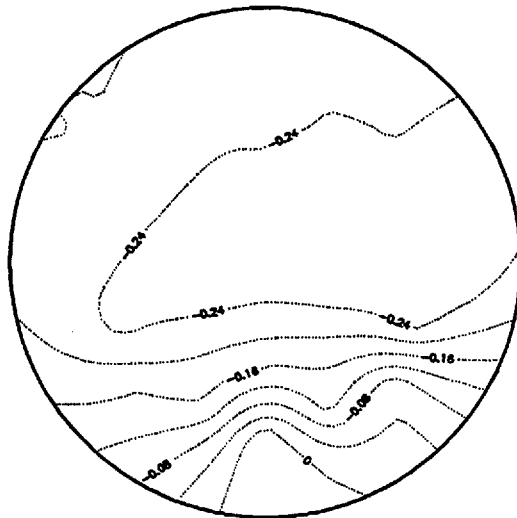
WIND DIRECTION 315



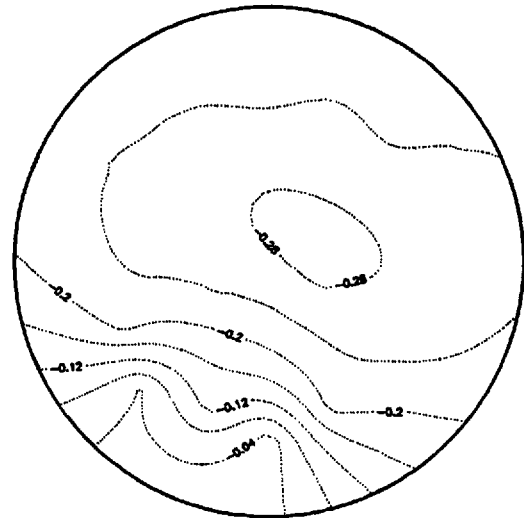
WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

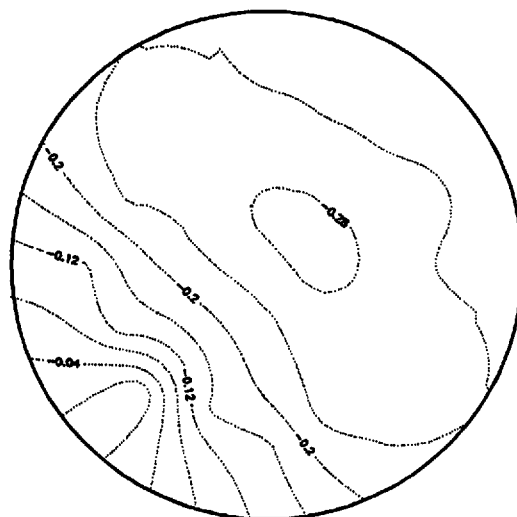
Data Set 13 — 0.90 Roof Height Ratio



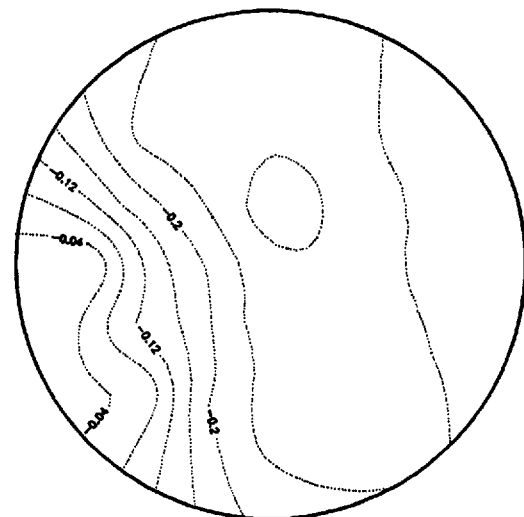
WIND DIRECTION 0



WIND DIRECTION 22.5



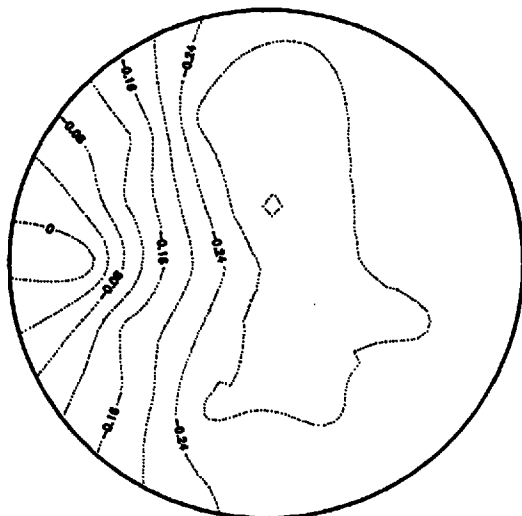
WIND DIRECTION 45



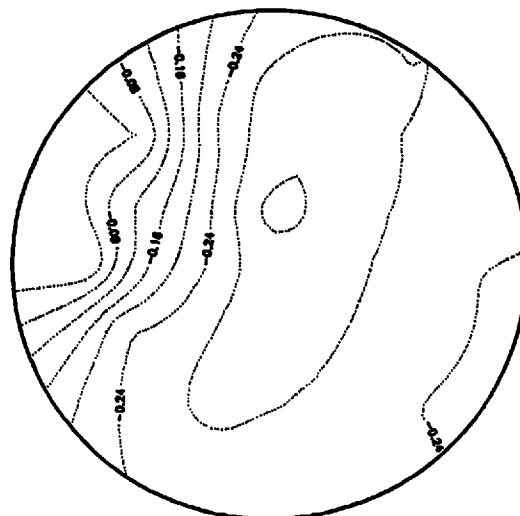
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

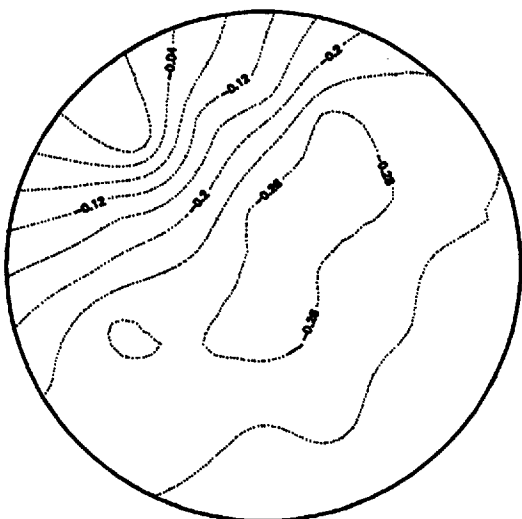
Data Set 14 — 0.75 Roof Height Ratio



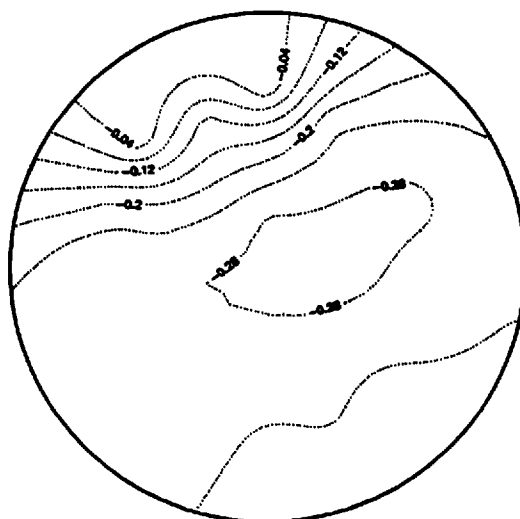
WIND DIRECTION 90



WIND DIRECTION 112.5



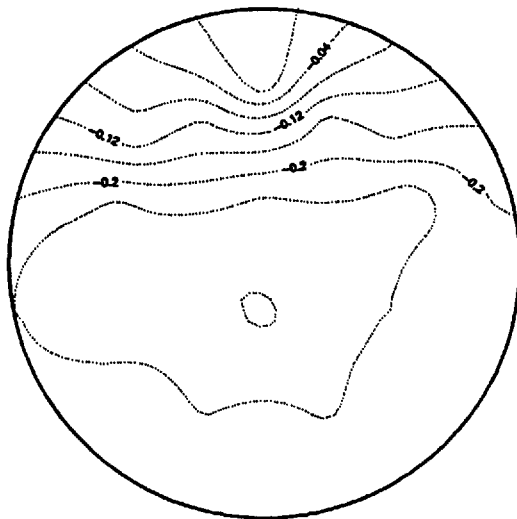
WIND DIRECTION 135



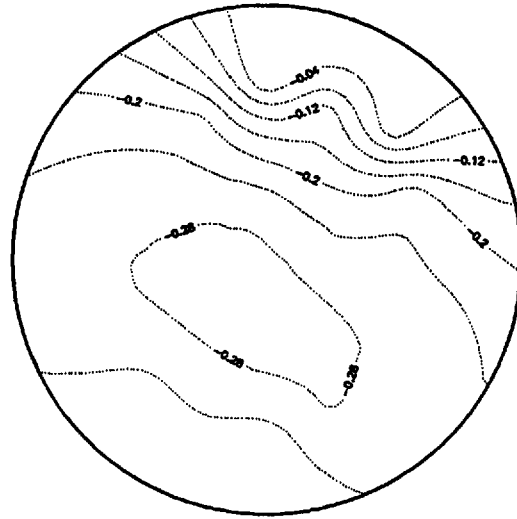
WIND DIRECTION 157.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

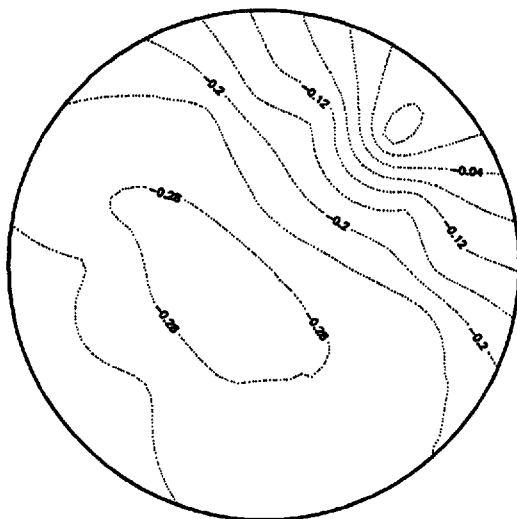
Data Set 14 — 0.75 Roof Height Ratio



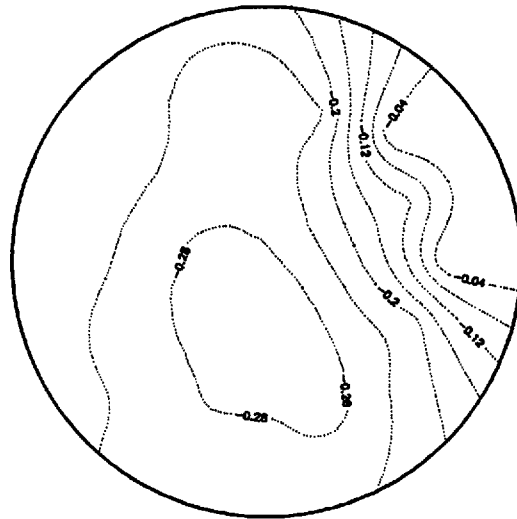
WIND DIRECTION 180



WIND DIRECTION 202.5



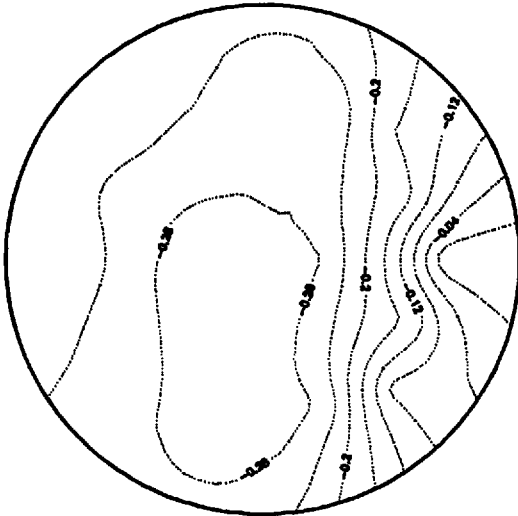
WIND DIRECTION 225



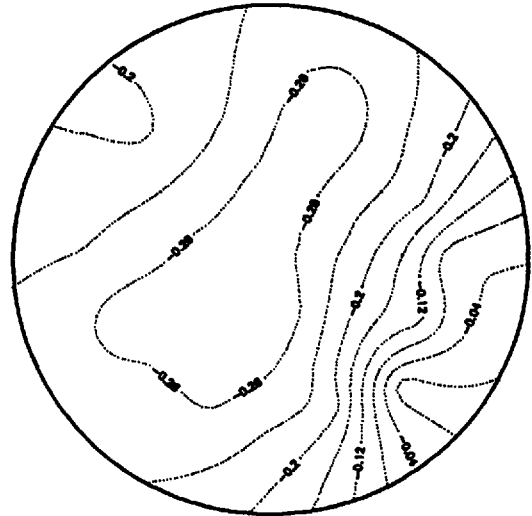
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

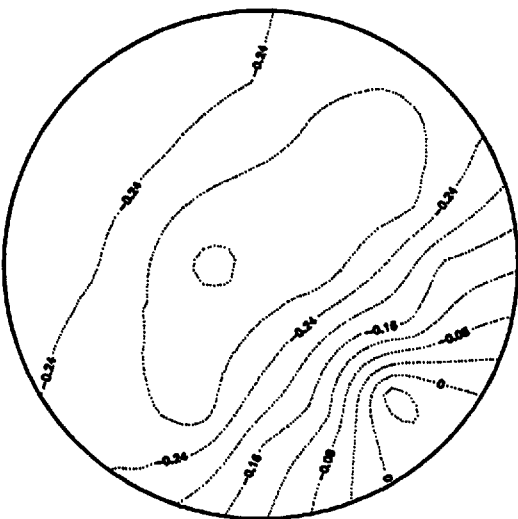
Data Set 14 — 0.75 Roof Height Ratio



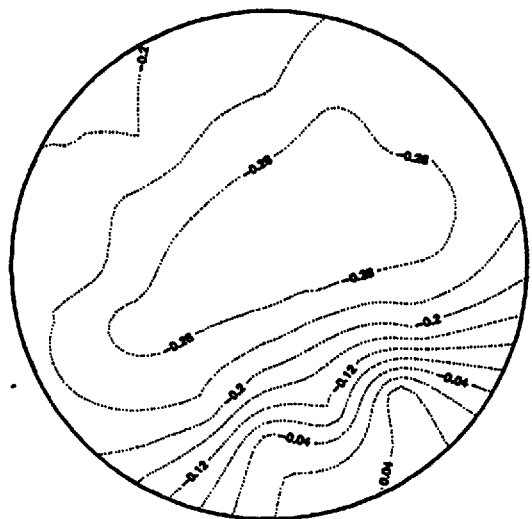
WIND DIRECTION 270



WIND DIRECTION 292.5



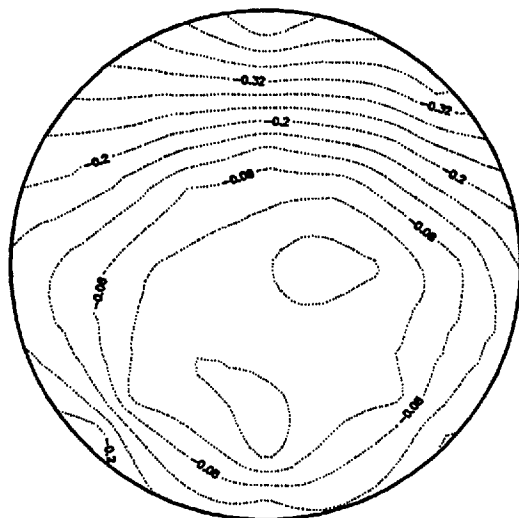
WIND DIRECTION 315



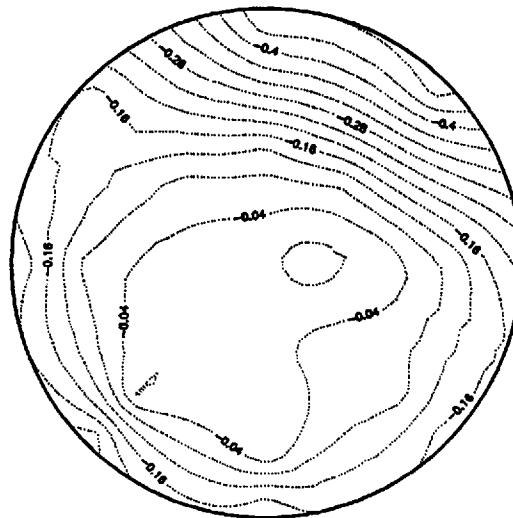
WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration B
48 ft Diameter x 48 ft Tall Tank**

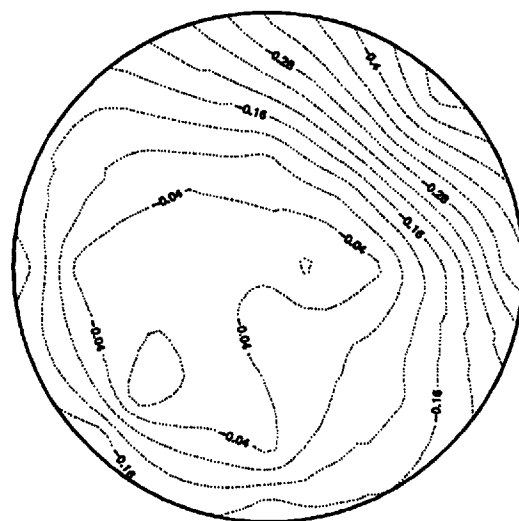
Data Set 14 — 0.75 Roof Height Ratio



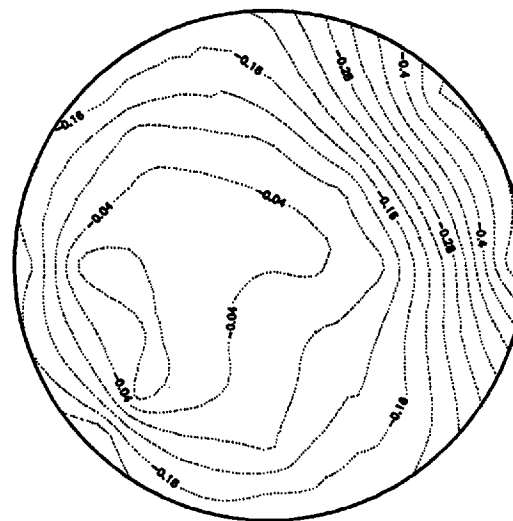
WIND DIRECTION 0



WIND DIRECTION 22.5



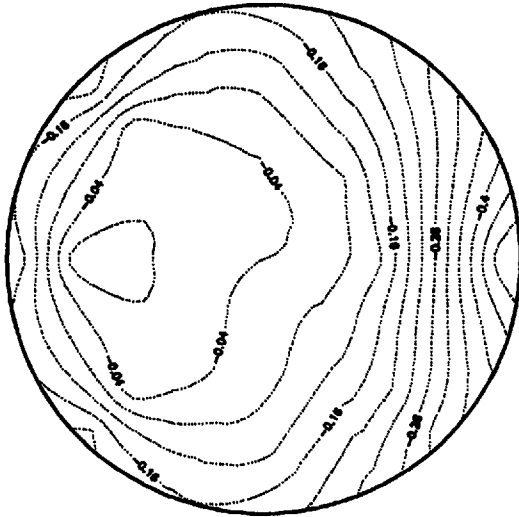
WIND DIRECTION 45



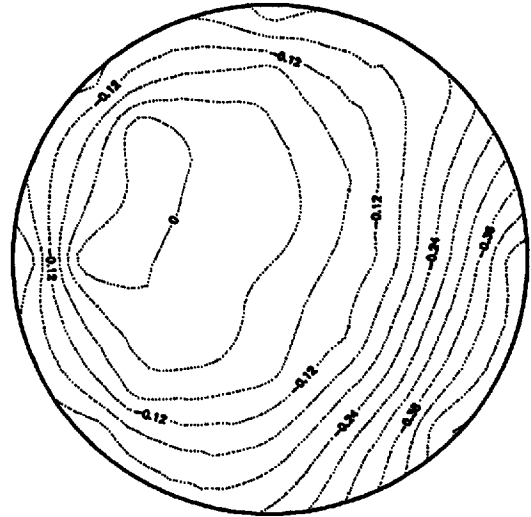
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

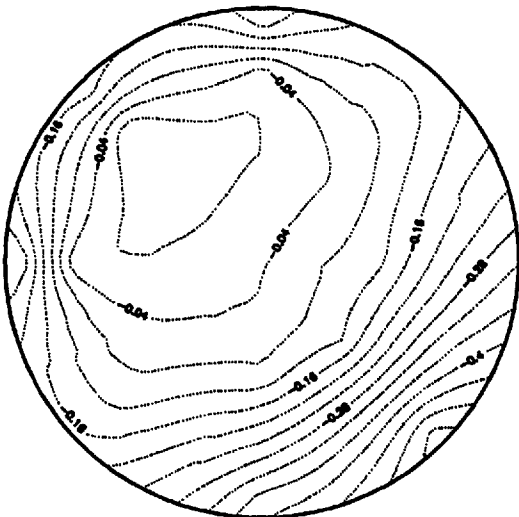
Data Set 19 — 1.00 Roof Height Ratio



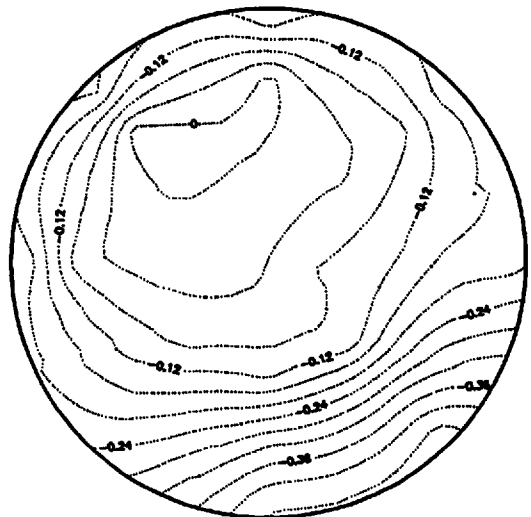
WIND DIRECTION 90



WIND DIRECTION 112.5



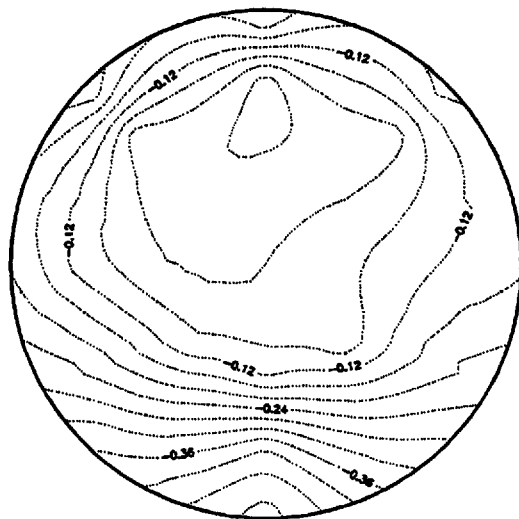
WIND DIRECTION 135



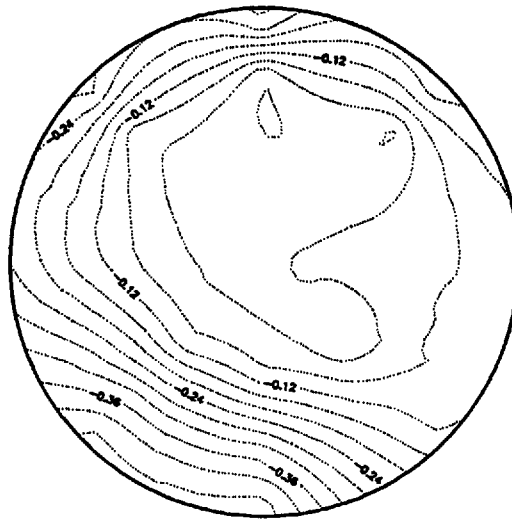
WIND DIRECTION 157.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

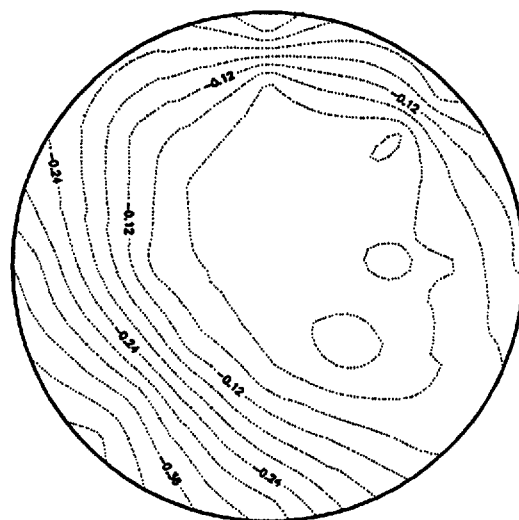
Data Set 19 — 1.00 Roof Height Ratio



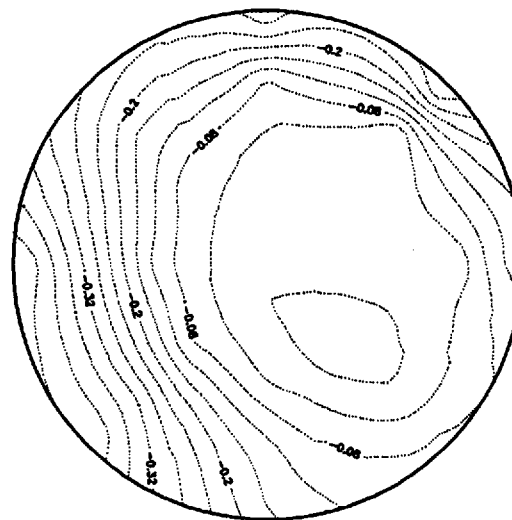
WIND DIRECTION 180



WIND DIRECTION 202.5



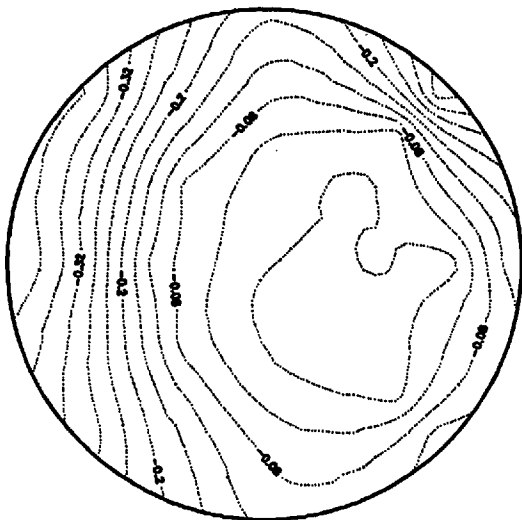
WIND DIRECTION 225



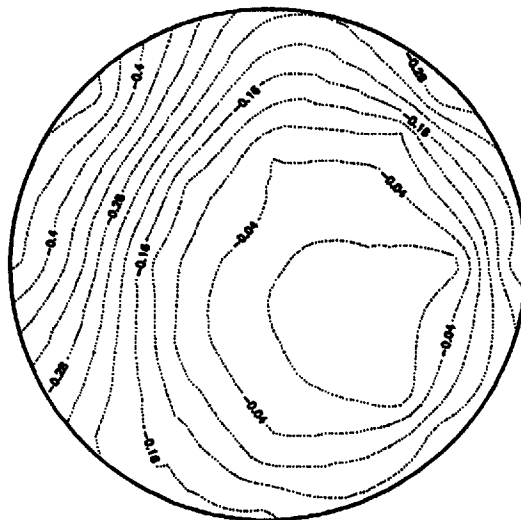
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

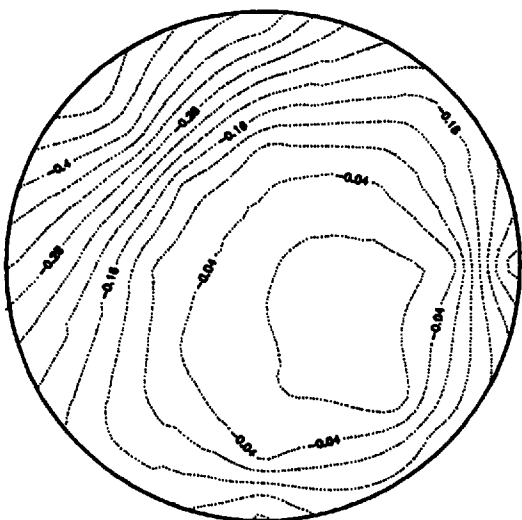
Data Set 19 — 1.00 Roof Height Ratio



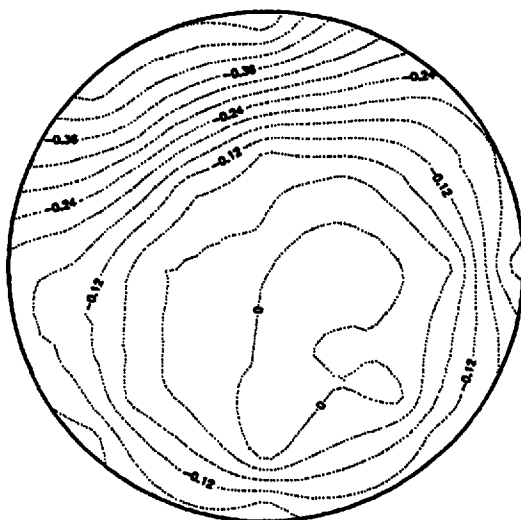
WIND DIRECTION 270



WIND DIRECTION 292.5



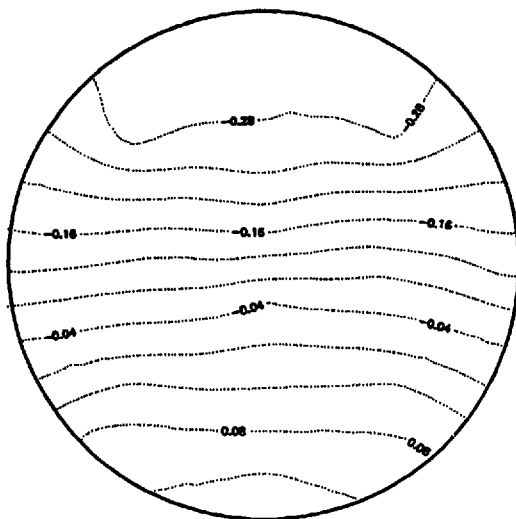
WIND DIRECTION 315



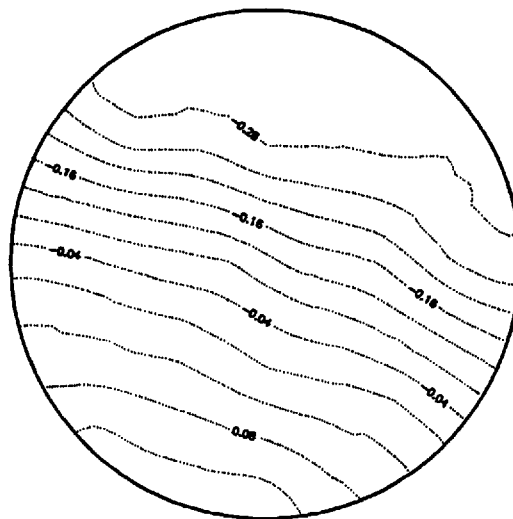
WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

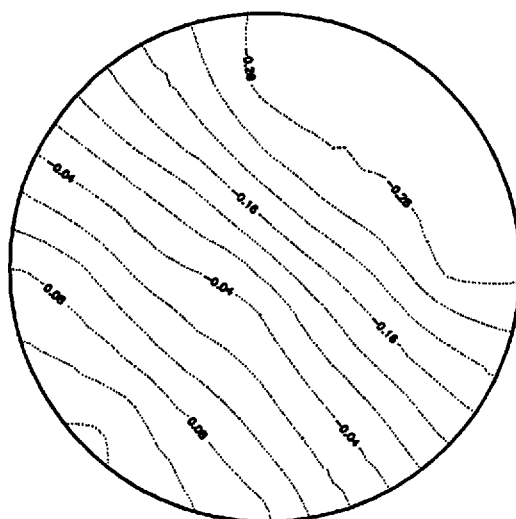
Data Set 19 — 1.00 Roof Height Ratio



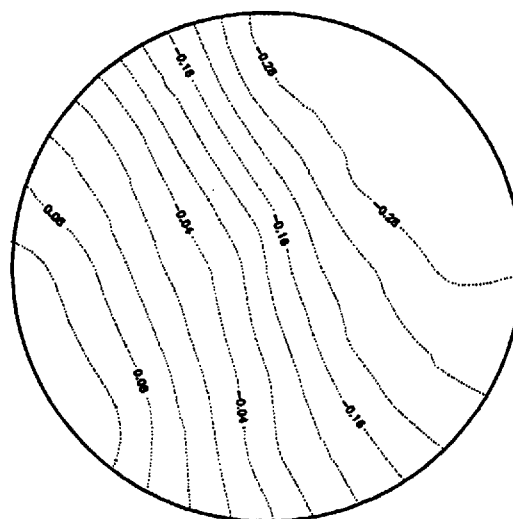
WIND DIRECTION 0



WIND DIRECTION 22.5



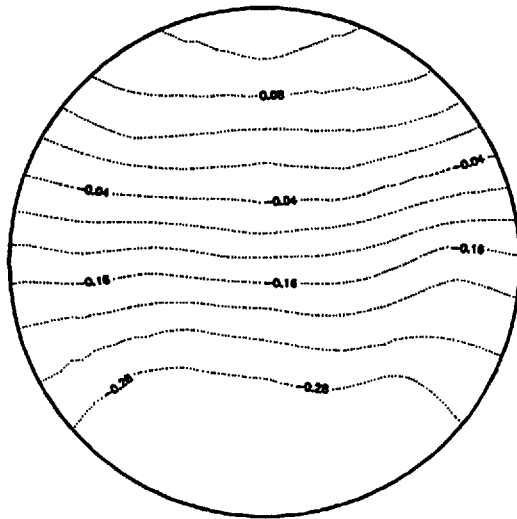
WIND DIRECTION 45



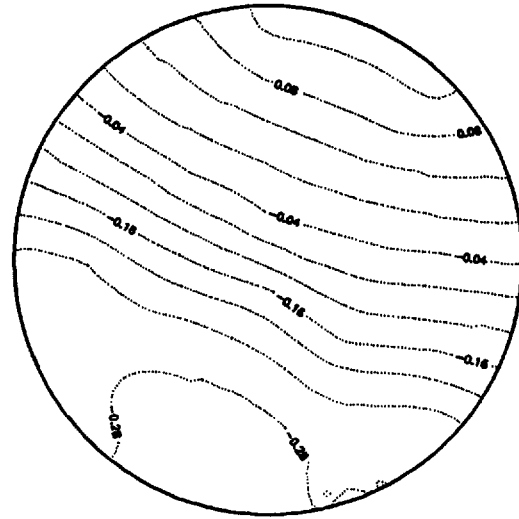
WIND DIRECTION 67.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

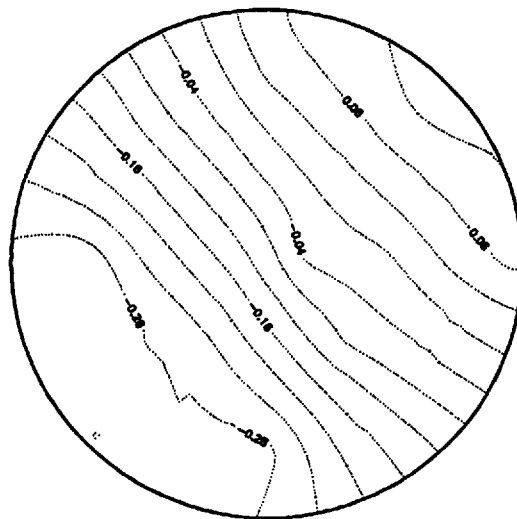
Data Set 20 — 0.90 Roof Height Ratio



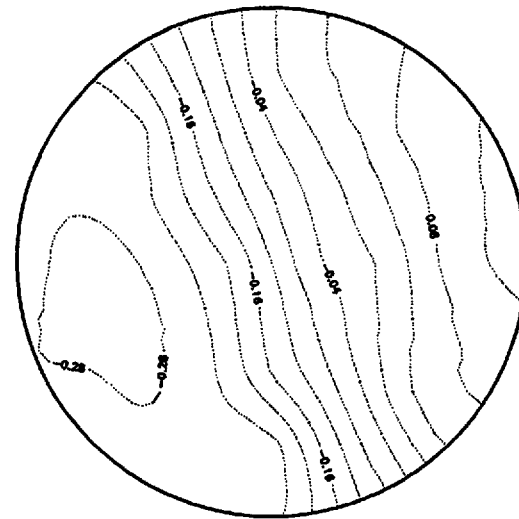
WIND DIRECTION 180



WIND DIRECTION 202.5



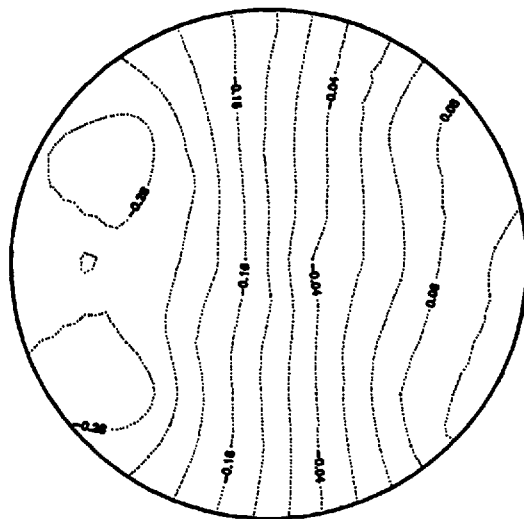
WIND DIRECTION 225



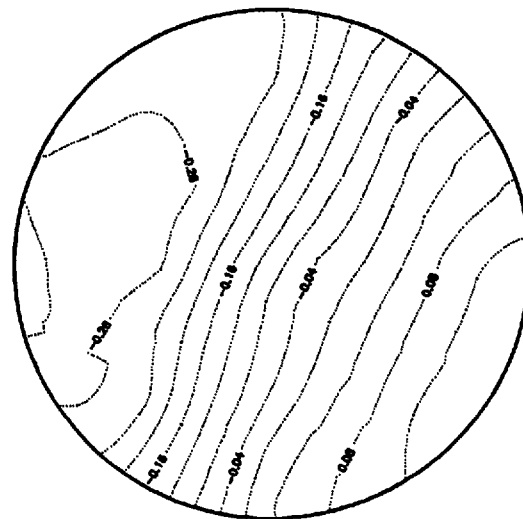
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

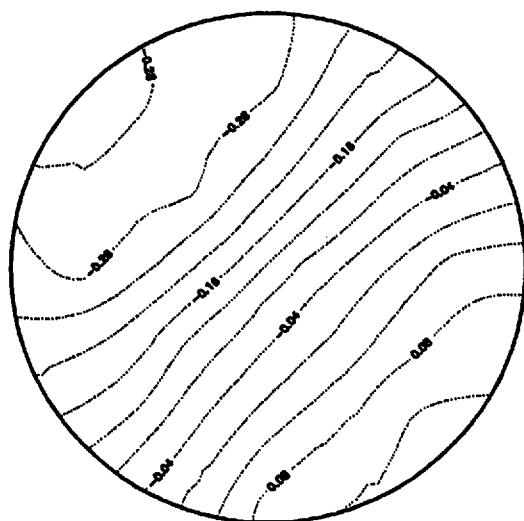
Data Set 20 — 0.90 Roof Height Ratio



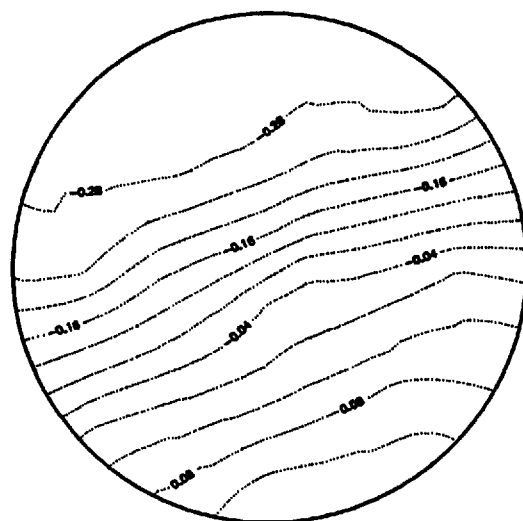
WIND DIRECTION 270



WIND DIRECTION 292.5



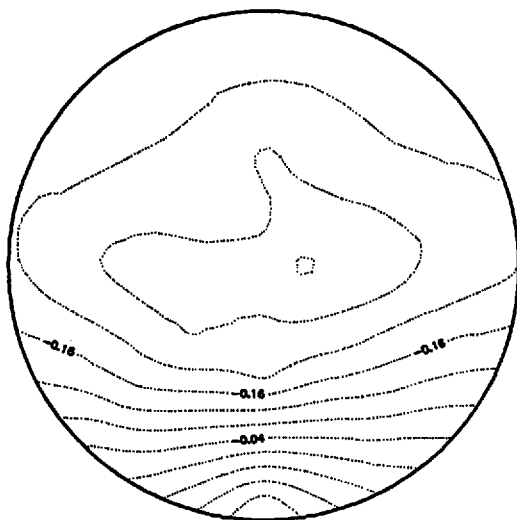
WIND DIRECTION 315



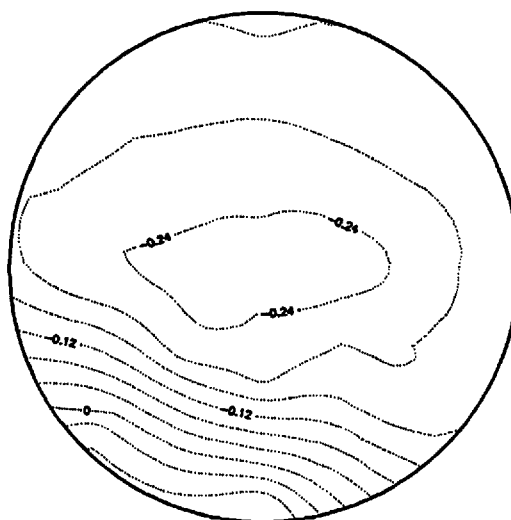
WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

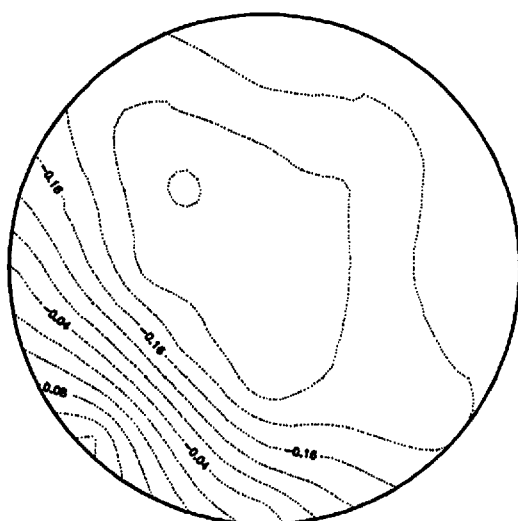
Data Set 20 — 0.90 Roof Height Ratio



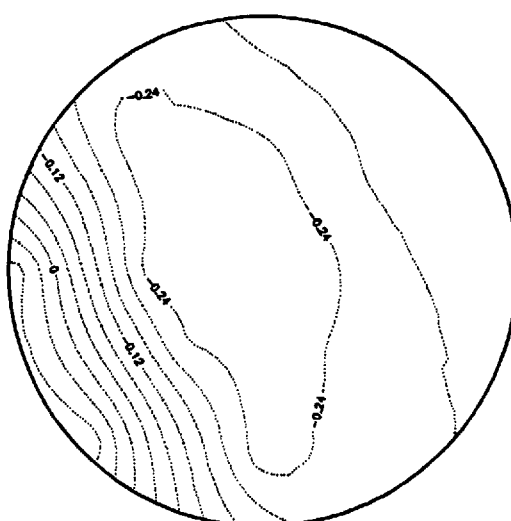
WIND DIRECTION 0



WIND DIRECTION 22.5



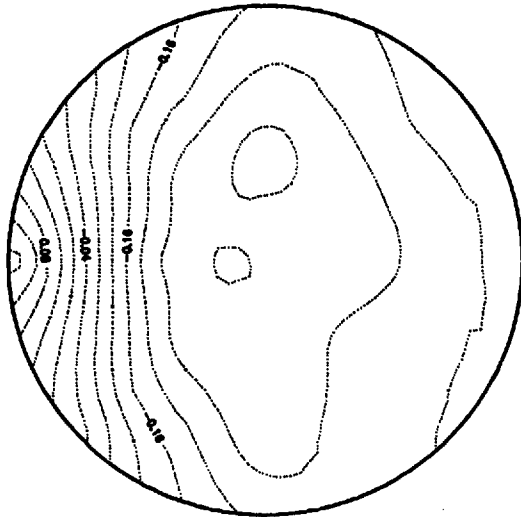
WIND DIRECTION 45



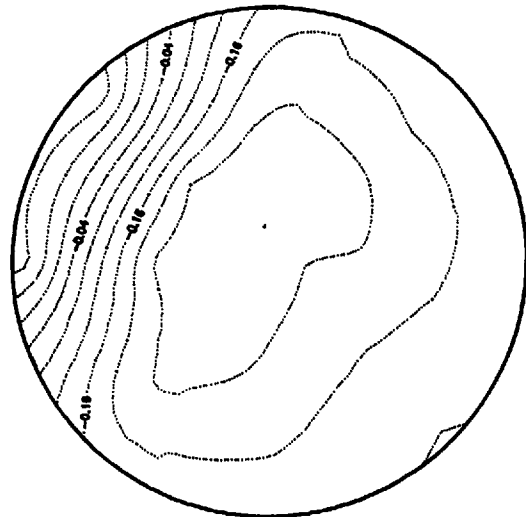
WIND DIRECTION 67.5

Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank

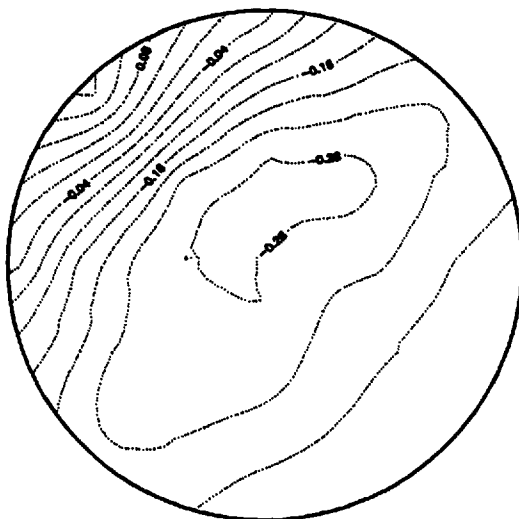
Data Set 21 — 0.50 Roof Height Ratio



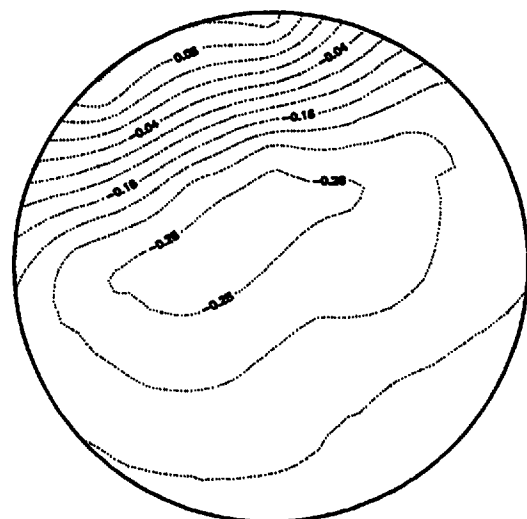
WIND DIRECTION 90



WIND DIRECTION 112.5



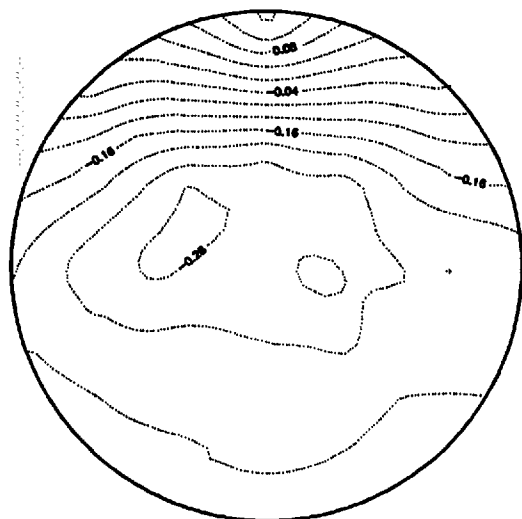
WIND DIRECTION 135



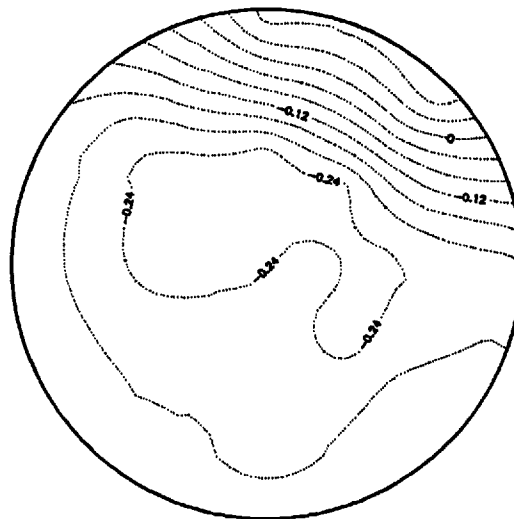
WIND DIRECTION 157.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

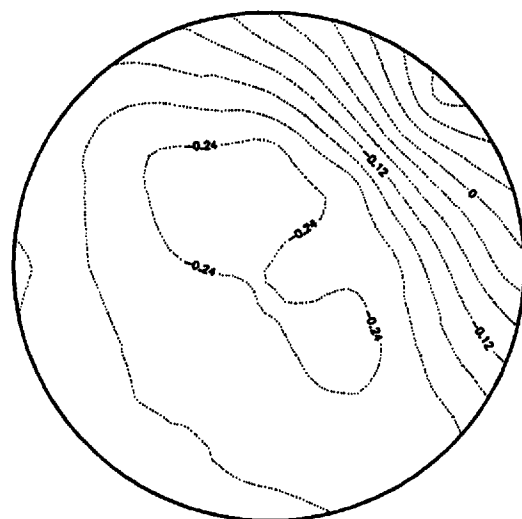
Data Set 21 — 0.50 Roof Height Ratio



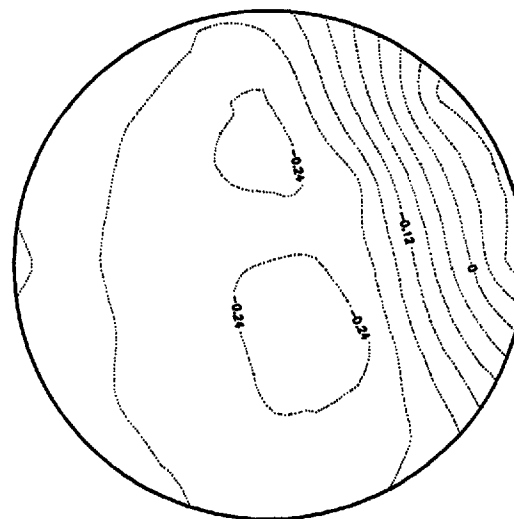
WIND DIRECTION 180



WIND DIRECTION 202.5



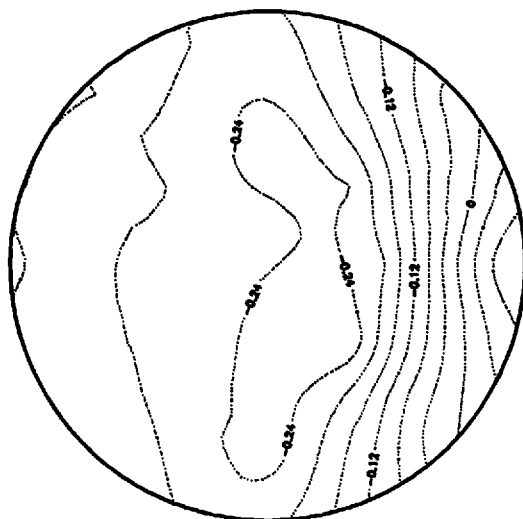
WIND DIRECTION 225



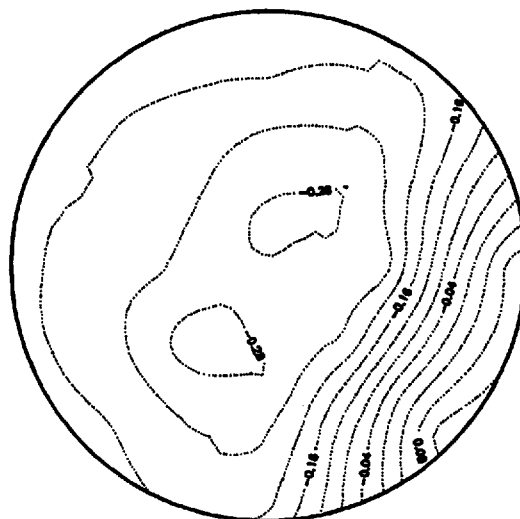
WIND DIRECTION 247.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

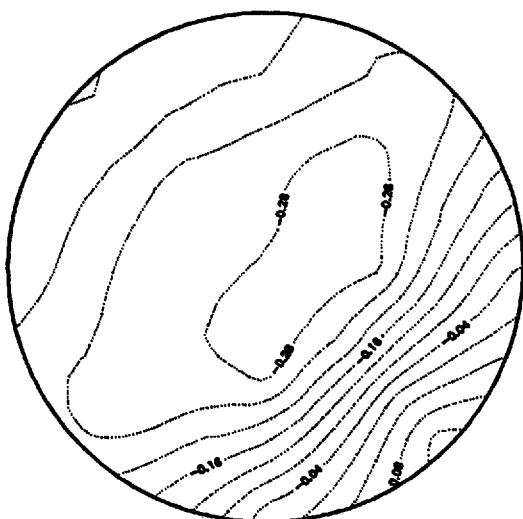
Data Set 21 — 0.50 Roof Height Ratio



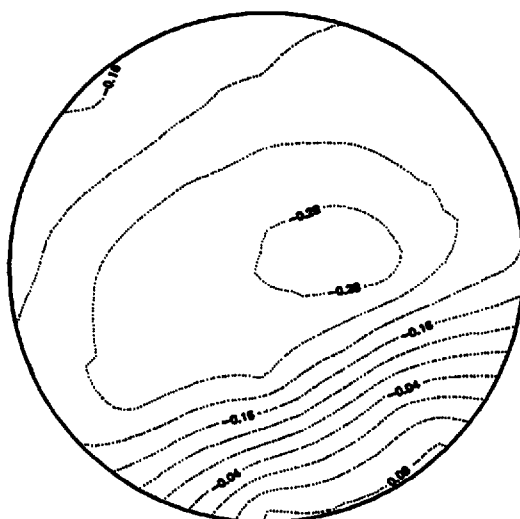
WIND DIRECTION 270



WIND DIRECTION 292.5



WIND DIRECTION 315



WIND DIRECTION 337.5

**Pressure Coefficient Contours by Wind Direction
Configuration C
100 ft Diameter x 48 ft Tall Tank**

Data Set 21 — 0.50 Roof Height Ratio

APPENDIX F
WIND DIRECTION PHOTOGRAPHS

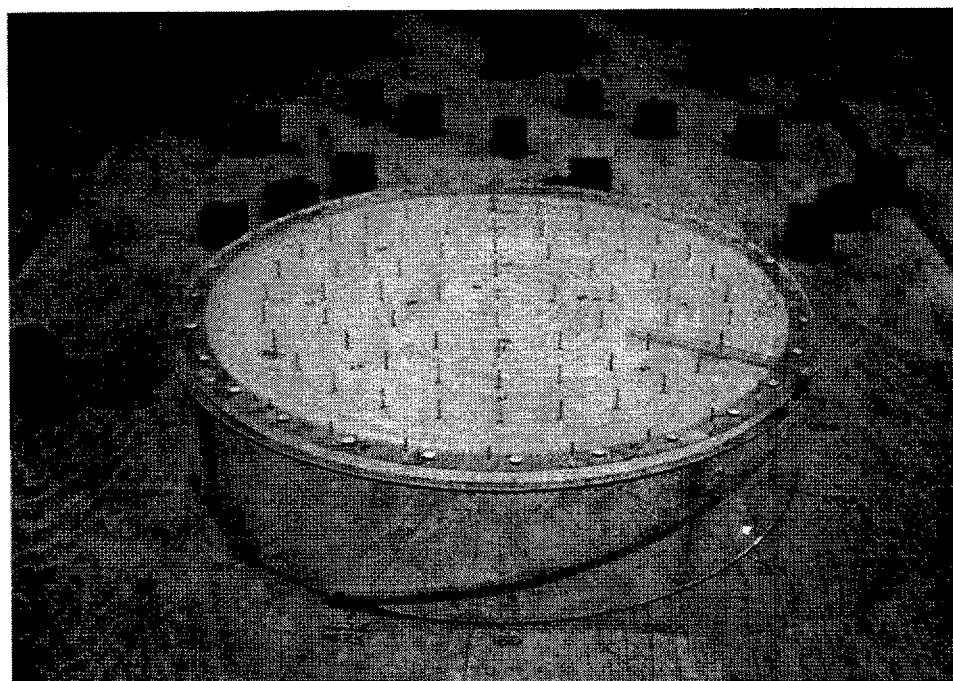
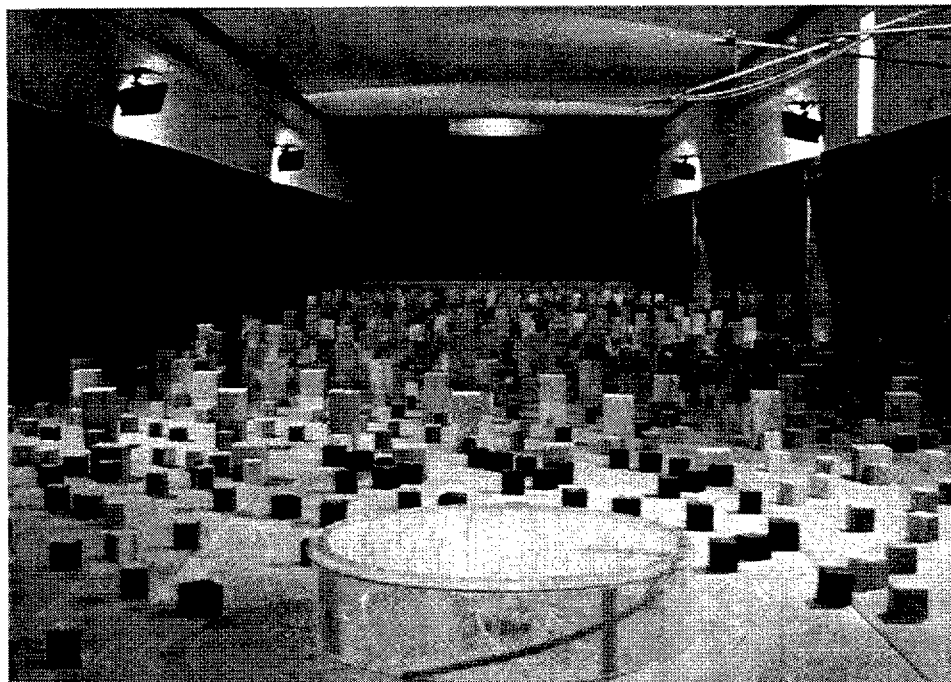
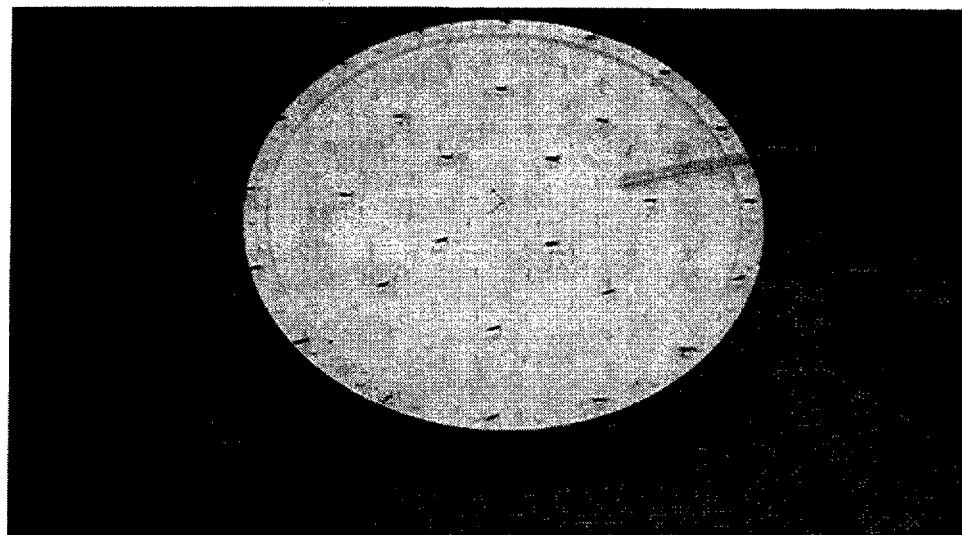


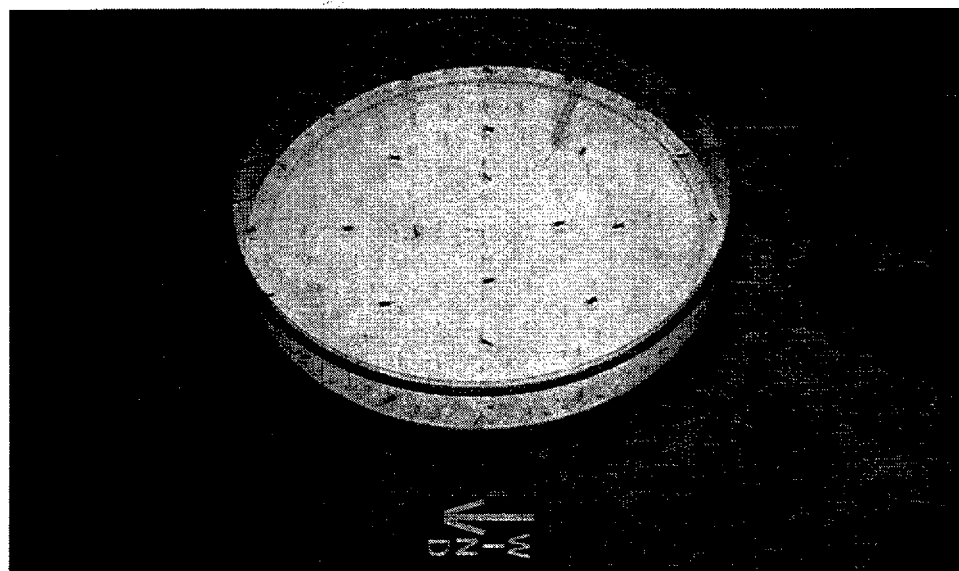
Figure F-1. Photographs of 200 ft diameter tank in open-circuit boundary layer wind tunnel.



a)

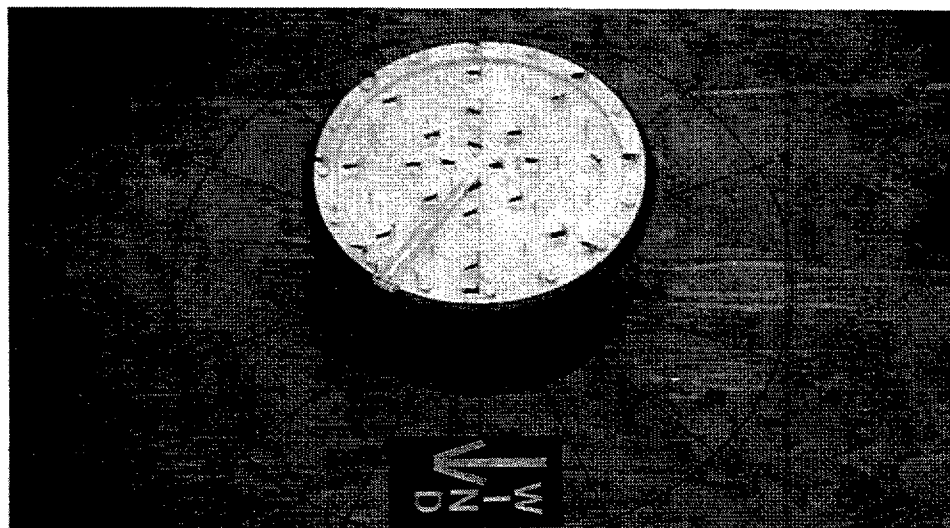


b)

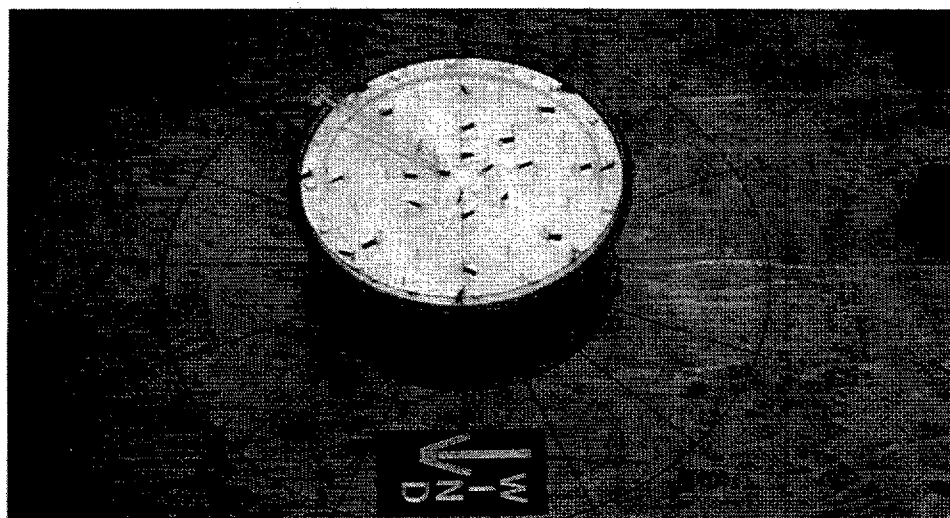


c)

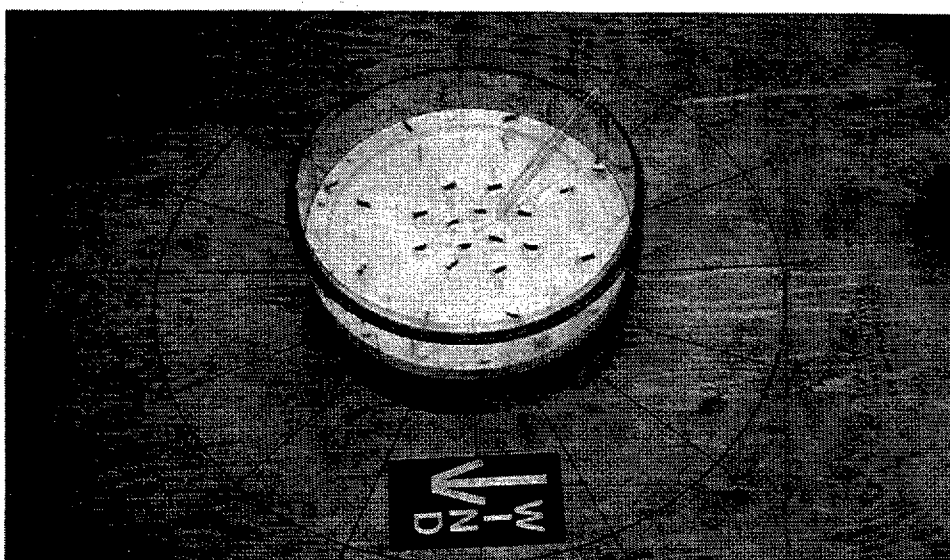
Figure F-2. Photographs of 200 ft diameter tank at three roof heights with small flags indicating wind direction at each measurement location — a) $R/H = 1.00$; b) $R/H = 0.80$; and c) $R/H = 0.35$.



a)

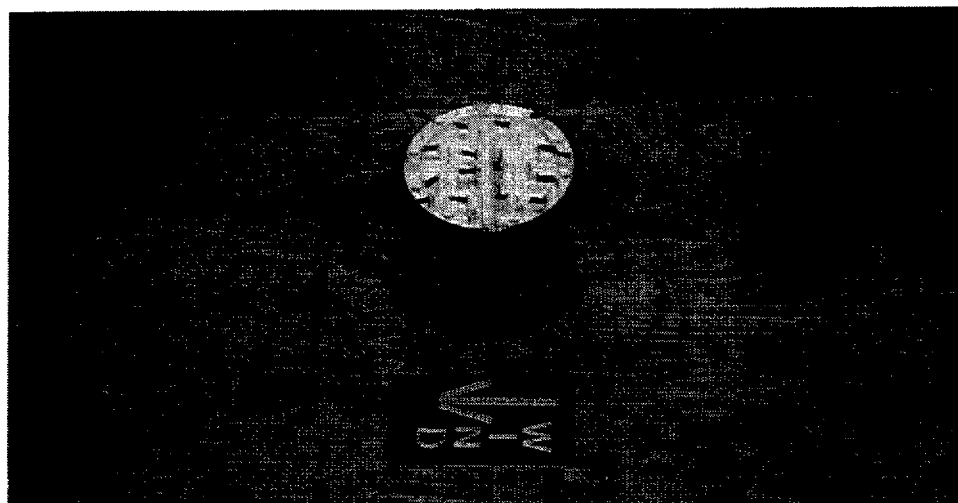


b)

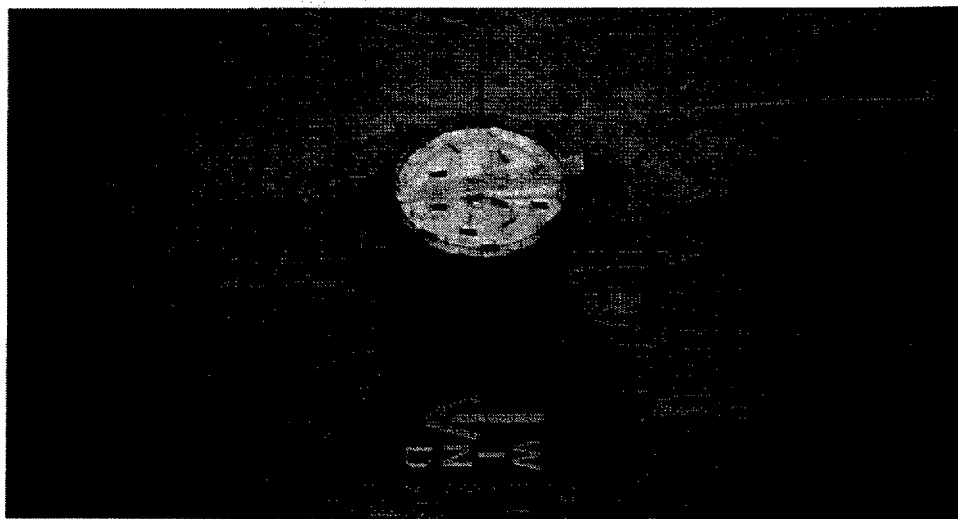


c)

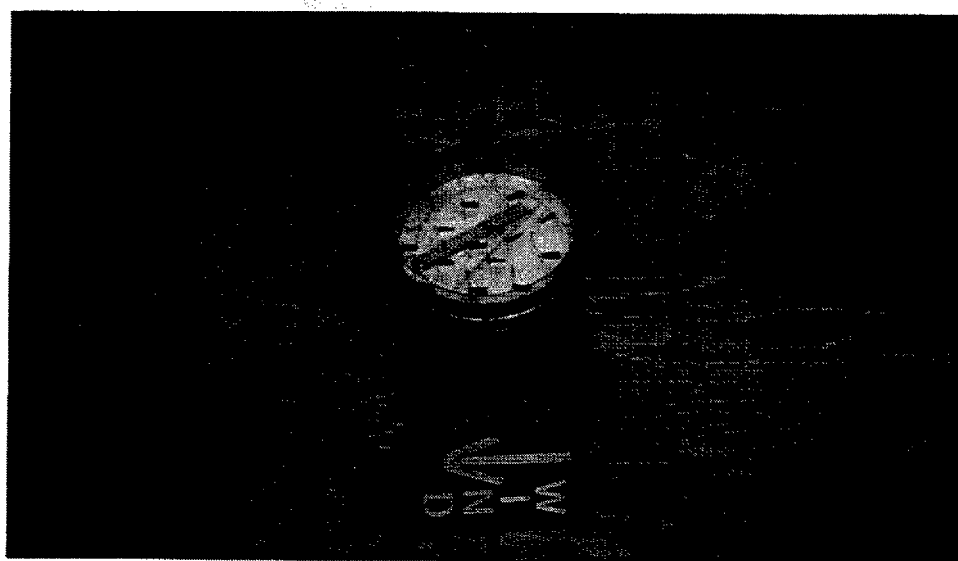
Figure F-3. Photographs of 100 ft diameter tank at three roof heights with small flags indicating wind direction at each measurement location — a) $R/H = 1.00$; b) $R/H = 0.90$; and c) $R/H = 0.50$.



a)



b)



c)

Figure F-4. Photographs of 48 ft diameter tank at three roof heights with small flags indicating wind direction at each measurement location — a) $R/H = 1.00$; b) $R/H = 0.90$; and c) $R/H = 0.75$.

APPENDIX G

TABLE OF NON-DIMENSIONAL AND EQUIVALENT WIND VELOCITIES

Cermak Peterka Petersen, Inc.

G-1

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	88.7	27.9	157.9	.0	71.8	28.0	142.7
22.5	88.9	25.9	152.9	22.5	81.8	27.5	150.7
45.0	75.2	24.6	136.6	45.0	76.7	28.1	147.6
67.5	63.8	22.7	121.0	67.5	68.0	25.1	131.4
90.0	53.2	19.0	101.0	90.0	59.9	23.0	118.3
112.5	74.3	20.2	123.8	112.5	62.7	20.9	115.1
135.0	65.1	18.7	111.1	135.0	74.4	21.0	125.9
157.5	62.6	18.8	109.1	157.5	70.3	18.5	115.3
180.0	64.6	17.6	107.6	180.0	63.5	17.9	107.5
202.5	72.5	17.7	115.3	202.5	63.6	16.6	103.8
225.0	81.9	18.3	125.6	225.0	70.5	16.0	108.7
247.5	69.6	19.9	118.6	247.5	78.0	19.0	123.8
270.0	59.3	19.5	108.2	270.0	69.9	20.3	120.1
292.5	59.1	22.7	116.6	292.5	59.2	19.3	107.4
315.0	73.8	26.1	139.5	315.0	59.3	22.4	116.0
337.5	82.0	28.3	153.1	337.5	66.1	27.1	135.3
Location 3				Location 4			
.0	65.3	27.1	134.3	.0	59.7	24.3	121.5
22.5	76.8	28.7	149.4	22.5	69.3	27.1	138.1
45.0	81.7	27.9	151.6	45.0	79.6	26.6	146.1
67.5	77.8	28.3	149.2	67.5	85.4	25.7	149.0
90.0	68.1	26.1	134.3	90.0	72.5	25.0	135.3
112.5	60.0	22.4	116.5	112.5	69.8	23.9	129.7
135.0	61.0	19.6	109.9	135.0	65.3	22.3	121.2
157.5	68.7	21.0	120.9	157.5	59.7	20.3	110.6
180.0	63.3	17.4	105.8	180.0	66.6	18.7	112.6
202.5	64.2	16.1	103.2	202.5	65.2	17.2	107.1
225.0	66.9	16.8	107.5	225.0	63.8	16.9	104.9
247.5	80.6	15.2	115.8	247.5	67.6	16.5	107.3
270.0	85.4	19.1	130.8	270.0	69.1	16.7	109.4
292.5	71.6	20.1	121.0	292.5	70.5	21.7	124.3
315.0	55.3	20.0	105.8	315.0	52.5	19.2	100.9
337.5	58.9	23.7	119.1	337.5	49.7	21.3	104.3
Location 5				Location 6			
.0	55.6	20.3	106.7	.0	60.3	19.1	107.9
22.5	62.3	22.1	117.8	22.5	52.8	17.9	97.6
45.0	73.2	25.5	137.2	45.0	57.1	21.6	111.7
67.5	81.6	26.0	146.4	67.5	60.8	25.8	126.7
90.0	87.3	26.6	153.1	90.0	70.7	28.1	142.1
112.5	83.0	25.1	145.1	112.5	76.6	26.0	141.9
135.0	67.6	23.7	127.3	135.0	71.7	26.1	137.4
157.5	60.1	22.4	116.7	157.5	59.0	24.4	121.2
180.0	49.0	19.4	98.2	180.0	41.2	18.1	87.7
202.5	52.2	18.1	97.6	202.5	36.4	13.8	71.3
225.0	60.9	18.1	105.7	225.0	47.1	15.2	85.0
247.5	66.4	17.2	108.2	247.5	48.6	14.6	84.6
270.0	63.2	15.9	101.6	270.0	60.3	16.8	101.4
292.5	72.4	15.7	109.6	292.5	58.4	15.7	96.7
315.0	79.6	17.6	121.3	315.0	70.9	15.9	108.6
337.5	69.1	20.0	118.4	337.5	70.7	16.4	110.0

Cermak Peterka Petersen, Inc.

G-2

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 7				Location 8			
.0	47.6	14.9	84.7	.0	64.8	17.9	108.8
22.5	40.3	14.3	76.5	22.5	54.1	18.8	101.4
45.0	36.5	14.9	74.4	45.0	43.6	16.8	86.3
67.5	44.8	20.2	96.7	67.5	49.5	22.1	106.2
90.0	59.5	24.4	121.7	90.0	63.5	23.0	121.5
112.5	73.9	25.1	136.7	112.5	71.5	24.8	133.9
135.0	82.0	25.7	145.9	135.0	83.2	27.0	150.6
157.5	68.9	28.1	140.5	157.5	88.0	26.6	153.7
180.0	65.5	24.2	126.8	180.0	78.8	26.2	144.4
202.5	56.3	21.3	110.3	202.5	66.7	23.7	126.2
225.0	49.3	16.8	91.5	225.0	56.1	19.0	103.6
247.5	61.6	18.5	107.3	247.5	56.2	19.1	104.1
270.0	69.3	17.2	111.0	270.0	69.4	18.9	115.7
292.5	59.4	16.6	100.2	292.5	74.0	19.3	120.9
315.0	63.7	16.3	103.1	315.0	74.4	17.4	116.0
337.5	58.1	16.7	99.1	337.5	62.6	16.8	103.6
Location 9				Location 10			
.0	65.0	17.2	106.8	.0	75.1	16.9	115.3
22.5	71.4	19.1	118.0	22.5	70.5	18.3	115.1
45.0	78.9	19.4	125.6	45.0	66.8	18.4	111.7
67.5	69.6	21.5	123.1	67.5	74.9	19.1	121.2
90.0	62.9	20.6	114.4	90.0	74.0	21.7	127.6
112.5	68.0	21.5	121.5	112.5	60.0	19.7	109.2
135.0	76.9	24.7	138.5	135.0	62.8	23.2	121.5
157.5	87.7	27.0	154.6	157.5	72.5	26.8	140.3
180.0	85.3	28.7	157.2	180.0	82.6	29.1	155.7
202.5	73.7	28.8	146.7	202.5	91.7	28.3	162.0
225.0	67.6	26.1	133.8	225.0	89.5	28.3	159.8
247.5	61.2	21.6	115.7	247.5	74.8	24.8	136.8
270.0	52.5	18.9	100.2	270.0	65.2	23.9	125.6
292.5	73.6	20.1	122.7	292.5	62.4	19.6	111.0
315.0	71.5	18.3	115.9	315.0	74.2	22.2	129.1
337.5	68.3	18.5	113.6	337.5	85.8	19.3	131.8
Location 11				Location 12			
.0	83.1	19.3	129.2	.0	83.9	21.4	135.9
22.5	75.3	17.9	118.4	22.5	85.2	18.7	129.6
45.0	67.5	18.3	112.3	45.0	75.2	16.7	115.1
67.5	69.4	18.9	115.5	67.5	70.4	18.2	114.5
90.0	81.9	18.8	126.8	90.0	68.1	19.0	114.7
112.5	73.2	21.5	126.3	112.5	74.9	23.6	133.7
135.0	58.5	19.6	107.4	135.0	55.4	21.7	110.7
157.5	59.7	23.6	119.6	157.5	53.5	23.0	112.3
180.0	69.0	27.9	140.1	180.0	65.8	24.4	127.5
202.5	75.9	29.7	151.4	202.5	74.1	27.7	144.3
225.0	85.9	31.3	164.9	225.0	89.7	29.8	164.2
247.5	81.8	28.0	152.0	247.5	95.8	29.2	168.3
270.0	75.1	25.8	139.8	270.0	81.5	26.4	147.3
292.5	65.6	22.2	121.3	292.5	72.1	24.2	132.5
315.0	61.6	19.7	110.7	315.0	62.8	21.7	117.2
337.5	77.7	20.8	128.4	337.5	67.1	20.9	119.0

Cermak Peterka Petersen, Inc.

G-3

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 13				Location 14			
.0	61.3	21.4	115.0	.0	65.9	22.7	123.0
22.5	74.8	20.8	125.8	22.5	69.1	21.3	122.1
45.0	81.1	19.8	128.7	45.0	85.7	23.3	142.6
67.5	71.8	19.3	118.9	67.5	86.1	19.7	133.1
90.0	68.1	17.9	111.9	90.0	79.4	18.7	124.2
112.5	80.1	19.6	127.5	112.5	64.5	18.9	111.3
135.0	86.9	20.7	136.5	135.0	84.6	18.9	129.6
157.5	76.5	21.8	130.1	157.5	90.2	21.1	140.8
180.0	64.2	20.0	113.8	180.0	78.9	21.5	131.4
202.5	69.6	23.6	128.7	202.5	65.1	20.9	117.3
225.0	79.3	24.8	141.0	225.0	63.7	23.2	122.1
247.5	92.6	27.8	161.4	247.5	73.3	27.8	143.8
270.0	94.3	26.2	158.4	270.0	85.6	30.1	161.3
292.5	88.5	27.6	156.9	292.5	93.5	27.6	161.7
315.0	79.4	24.8	141.0	315.0	93.4	26.3	158.0
337.5	71.1	23.3	129.3	337.5	83.4	25.7	147.2
Location 15				Location 16			
.0	75.7	25.2	138.6	.0	71.5	26.4	138.1
22.5	69.0	23.8	128.8	22.5	66.1	24.2	127.3
45.0	64.1	20.2	114.3	45.0	58.0	20.4	109.3
67.5	79.5	20.0	127.9	67.5	58.5	19.2	106.6
90.0	78.3	18.7	123.2	90.0	75.4	20.3	125.0
112.5	68.7	18.3	113.4	112.5	76.5	19.0	122.3
135.0	64.7	18.3	109.8	135.0	69.2	17.5	111.6
157.5	71.2	18.6	116.5	157.5	66.2	17.6	109.0
180.0	79.6	18.4	123.6	180.0	71.7	17.9	115.0
202.5	75.3	20.2	124.5	202.5	78.5	19.4	125.4
225.0	56.2	19.9	106.2	225.0	59.4	18.4	105.1
247.5	58.7	22.5	115.7	247.5	56.1	21.4	110.3
270.0	68.2	26.8	136.1	270.0	67.9	24.6	129.9
292.5	78.4	28.7	150.9	292.5	73.3	25.9	138.4
315.0	97.3	28.1	166.5	315.0	92.2	29.0	164.3
337.5	85.4	27.0	152.6	337.5	93.7	28.4	164.0
Location 17				Location 18			
.0	49.6	21.1	103.6	.0	51.8	22.3	108.7
22.5	50.6	22.0	106.8	22.5	55.1	23.4	115.0
45.0	51.0	20.4	102.8	45.0	54.6	24.3	116.9
67.5	54.4	19.8	104.4	67.5	53.6	22.7	111.7
90.0	58.9	17.9	103.4	90.0	58.1	20.4	109.4
112.5	61.5	17.8	105.2	112.5	62.7	20.7	114.5
135.0	61.3	19.0	108.4	135.0	63.0	21.1	115.8
157.5	52.4	18.1	97.9	157.5	64.9	18.9	111.5
180.0	55.3	19.4	104.0	180.0	66.6	19.6	115.1
202.5	62.7	21.4	116.4	202.5	65.5	17.1	107.1
225.0	67.7	17.8	110.9	225.0	65.4	17.0	106.6
247.5	66.5	17.7	109.8	247.5	62.4	16.1	101.6
270.0	61.7	19.2	109.4	270.0	57.6	16.1	97.2
292.5	54.5	19.2	102.7	292.5	56.6	17.1	98.9
315.0	53.6	19.4	102.4	315.0	58.4	20.5	109.9
337.5	48.8	20.8	101.9	337.5	60.1	21.1	113.3

Cermak Peterka Petersen, Inc.

G-4

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 19				Location 20			
.0	53.2	18.2	98.8	.0	42.5	17.6	87.5
22.5	52.0	20.8	104.9	22.5	34.3	15.6	74.3
45.0	49.5	21.0	103.2	45.0	27.7	11.8	57.8
67.5	50.1	21.9	106.1	67.5	29.8	13.8	65.2
90.0	46.2	19.4	95.8	90.0	33.3	15.9	74.4
112.5	41.6	20.2	93.6	112.5	37.1	18.7	85.5
135.0	42.6	20.1	94.4	135.0	46.0	21.3	100.8
157.5	43.9	18.2	90.4	157.5	48.4	21.1	102.4
180.0	42.0	16.7	84.5	180.0	52.5	20.7	105.1
202.5	51.0	19.2	99.4	202.5	55.3	20.7	107.7
225.0	63.9	18.6	109.8	225.0	53.0	18.5	99.4
247.5	58.8	19.9	108.8	247.5	51.1	16.4	92.1
270.0	51.7	17.8	96.4	270.0	54.4	16.0	93.7
292.5	54.0	18.4	100.1	292.5	56.1	16.0	95.4
315.0	62.8	17.3	105.2	315.0	59.1	16.8	100.4
337.5	59.3	17.2	101.7	337.5	56.6	17.3	99.4
Location 21				Location 22			
.0	50.2	17.5	94.2	.0	58.9	17.5	102.2
22.5	49.4	17.7	94.0	22.5	59.5	17.2	101.8
45.0	52.0	17.1	94.7	45.0	59.4	16.5	99.8
67.5	59.5	17.9	103.8	67.5	59.8	16.7	100.6
90.0	53.6	18.8	101.0	90.0	52.3	16.1	92.1
112.5	54.5	18.9	101.8	112.5	52.6	17.4	96.1
135.0	50.9	19.4	99.9	135.0	59.2	20.8	111.5
157.5	48.0	20.1	99.4	157.5	59.8	21.8	114.7
180.0	43.6	20.3	95.7	180.0	51.2	21.1	104.9
202.5	46.7	21.2	101.2	202.5	48.4	20.6	101.0
225.0	51.4	19.8	101.6	225.0	45.6	19.7	96.0
247.5	51.8	18.1	97.3	247.5	44.0	19.7	94.6
270.0	52.5	17.2	95.3	270.0	46.6	18.7	94.3
292.5	56.5	15.9	95.5	292.5	53.3	19.1	101.5
315.0	61.7	16.8	102.7	315.0	56.8	18.7	103.4
337.5	58.6	18.0	103.3	337.5	59.0	17.5	102.3
Location 23				Location 24			
.0	58.3	17.3	101.2	.0	52.6	22.1	108.9
22.5	64.0	17.4	106.5	22.5	48.3	20.4	100.2
45.0	64.9	17.3	107.1	45.0	53.2	19.3	101.8
67.5	56.1	19.3	104.6	67.5	55.0	19.1	103.0
90.0	48.0	16.4	89.2	90.0	55.5	15.4	93.2
112.5	56.7	19.5	105.6	112.5	58.8	16.5	99.3
135.0	63.8	18.0	107.9	135.0	62.8	17.5	105.8
157.5	59.9	17.8	103.8	157.5	63.9	17.0	105.2
180.0	57.5	18.3	103.2	180.0	62.1	17.5	105.2
202.5	53.7	19.3	102.3	202.5	62.9	19.0	110.0
225.0	53.3	20.9	106.5	225.0	57.6	18.2	102.9
247.5	51.3	22.2	108.0	247.5	56.7	19.0	104.4
270.0	46.9	22.0	103.5	270.0	49.2	19.2	98.1
292.5	46.7	20.6	99.4	292.5	45.9	19.5	95.9
315.0	48.6	19.4	97.9	315.0	50.7	22.9	109.4
337.5	52.7	19.0	100.7	337.5	53.4	22.7	111.4

Cermak Peterka Petersen, Inc.

G-5

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES
API - Floating RoofConfiguration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 25				Location 26			
.0	55.9	19.4	104.5	.0	56.0	17.1	98.3
22.5	58.6	19.6	107.6	22.5	56.7	18.4	102.5
45.0	61.9	19.6	110.7	45.0	57.6	20.5	109.3
67.5	60.7	18.9	107.6	67.5	57.5	20.0	107.9
90.0	56.6	17.0	98.5	90.0	53.1	17.9	97.9
112.5	58.9	17.6	102.5	112.5	52.9	19.8	103.0
135.0	58.4	18.0	103.1	135.0	50.0	18.2	96.0
157.5	62.3	17.6	105.6	157.5	48.2	17.2	91.6
180.0	59.0	17.2	101.3	180.0	55.6	18.1	100.6
202.5	64.2	17.9	108.2	202.5	58.8	16.8	100.0
225.0	66.4	17.7	109.7	225.0	64.2	18.5	109.6
247.5	61.5	17.5	104.5	247.5	64.0	17.9	107.8
270.0	58.6	18.1	103.6	270.0	61.8	18.0	106.2
292.5	56.5	18.4	102.3	292.5	64.1	17.3	106.4
315.0	55.6	18.4	101.6	315.0	61.8	17.5	104.9
337.5	55.7	19.0	103.5	337.5	59.6	17.2	102.0
Location 27				Location 28			
.0	62.2	16.7	102.9	.0	58.5	17.0	100.4
22.5	64.3	17.8	108.0	22.5	62.3	17.7	105.9
45.0	65.5	18.1	109.8	45.0	63.4	17.5	106.3
67.5	56.1	16.5	96.9	67.5	64.5	18.3	109.5
90.0	48.9	16.3	89.6	90.0	62.6	17.4	105.3
112.5	49.6	17.1	92.6	112.5	63.8	18.2	108.7
135.0	54.1	18.9	101.5	135.0	66.4	18.6	111.9
157.5	56.7	19.1	104.5	157.5	62.7	17.1	104.6
180.0	57.3	19.2	105.5	180.0	56.3	16.8	97.9
202.5	60.9	21.2	114.2	202.5	58.0	18.0	102.8
225.0	59.2	19.4	107.6	225.0	61.3	19.6	110.3
247.5	56.9	18.8	103.9	247.5	61.2	21.2	114.4
270.0	54.9	17.0	97.2	270.0	59.0	20.5	110.6
292.5	54.6	17.0	96.9	292.5	53.3	18.3	99.2
315.0	62.0	17.4	104.7	315.0	55.8	18.0	100.7
337.5	61.6	17.4	104.4	337.5	55.9	17.1	98.4

Cermak Peterka Petersen, Inc.

G-6
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

>> AVERAGE VALUES <<

Location	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
1	70.9	21.8	124.9
2	68.5	21.9	123.1
3	69.1	21.8	123.4
4	66.6	21.5	120.1
5	67.7	20.8	119.4
6	58.9	19.7	108.2
7	58.6	19.7	107.9
8	66.0	21.1	118.6
9	70.9	22.0	125.5
10	73.9	22.5	129.6
11	72.6	22.7	129.0
12	73.5	22.9	130.4
13	77.5	22.5	132.8
14	78.9	23.0	135.6
15	73.1	22.2	128.0
16	70.9	21.9	125.1
17	56.9	19.4	105.6
18	59.8	19.9	109.6
19	51.4	19.1	99.6
20	46.1	17.4	90.1
21	52.6	18.4	98.8
22	54.1	18.7	101.1
23	55.2	19.0	103.0
24	55.5	19.1	103.4
25	59.4	18.2	104.7
26	57.6	18.1	102.8
27	57.8	18.0	102.5
28	60.3	18.2	105.4

Cermak Peterka Petersen, Inc.

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

G-7

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	16.1	5.8	30.9	.0	17.2	6.2	32.9
22.5	18.8	7.2	37.0	22.5	16.8	6.2	32.5
45.0	25.6	10.5	52.3	45.0	19.6	7.1	37.4
67.5	27.8	11.7	57.7	67.5	25.8	10.6	52.8
90.0	25.1	10.1	50.7	90.0	28.4	11.4	57.5
112.5	26.3	10.3	52.5	112.5	27.4	11.1	55.6
135.0	27.3	11.4	56.5	135.0	28.3	12.0	59.0
157.5	28.8	12.0	59.4	157.5	29.4	13.3	63.5
180.0	28.3	11.7	58.2	180.0	28.9	12.8	61.6
202.5	29.2	12.6	61.4	202.5	29.7	13.2	63.7
225.0	29.5	12.2	60.5	225.0	30.6	13.3	64.6
247.5	28.9	12.0	59.5	247.5	28.3	11.3	57.1
270.0	26.5	11.2	55.1	270.0	28.6	11.4	57.5
292.5	26.1	11.0	54.0	292.5	24.7	10.2	50.6
315.0	21.9	8.8	44.3	315.0	26.6	10.5	53.3
337.5	15.2	5.7	29.6	337.5	21.8	8.3	42.7
Location 3				Location 4			
.0	21.5	8.4	43.0	.0	26.5	10.6	53.6
22.5	16.2	6.1	31.6	22.5	23.9	9.8	48.9
45.0	16.8	5.7	31.2	45.0	17.3	6.4	33.6
67.5	18.4	7.7	38.0	67.5	15.7	5.6	29.8
90.0	24.9	10.1	50.6	90.0	16.1	5.3	29.4
112.5	27.9	11.7	57.8	112.5	18.1	7.1	36.2
135.0	26.1	10.4	52.6	135.0	24.3	10.2	50.2
157.5	27.8	11.6	57.3	157.5	23.9	10.0	49.6
180.0	29.2	12.8	62.0	180.0	27.3	11.2	55.7
202.5	28.7	12.4	60.4	202.5	27.6	11.5	57.0
225.0	29.2	12.8	61.9	225.0	27.4	11.6	56.9
247.5	29.1	12.3	60.6	247.5	27.8	11.3	56.6
270.0	29.3	12.1	60.0	270.0	27.8	11.4	56.8
292.5	26.7	11.8	56.9	292.5	28.5	11.2	56.8
315.0	23.8	10.0	49.3	315.0	27.2	10.7	54.5
337.5	25.1	10.1	50.9	337.5	26.1	10.1	51.6
Location 5				Location 6			
.0	26.0	11.0	54.1	.0	29.4	11.7	59.1
22.5	28.1	11.5	57.5	22.5	27.1	11.1	55.4
45.0	22.2	9.2	45.8	45.0	28.3	11.5	57.7
67.5	18.4	6.9	35.8	67.5	25.6	9.8	50.3
90.0	16.3	5.8	31.0	90.0	18.2	6.9	35.7
112.5	16.0	5.7	30.4	112.5	16.1	5.6	30.3
135.0	21.0	8.6	43.0	135.0	17.1	5.9	31.9
157.5	26.9	11.1	55.2	157.5	22.4	8.6	44.1
180.0	23.4	9.5	47.7	180.0	26.8	10.8	54.2
202.5	24.1	9.4	47.8	202.5	26.4	10.0	51.7
225.0	23.7	9.6	48.2	225.0	26.9	10.7	54.0
247.5	25.4	10.3	51.7	247.5	29.8	12.2	61.0
270.0	25.1	10.1	50.9	270.0	29.0	12.2	60.2
292.5	28.0	11.7	57.8	292.5	29.1	11.8	59.3
315.0	29.5	12.4	61.1	315.0	29.8	12.3	61.1
337.5	29.6	11.8	59.7	337.5	30.4	12.6	62.5

Cermak Peterka Petersen, Inc.

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

G-8

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 7				Location 8			
.0	26.6	13.3	61.0	.0	25.8	13.1	59.6
22.5	24.8	12.9	58.3	22.5	24.0	12.1	55.3
45.0	22.8	11.0	51.2	45.0	24.3	12.3	56.3
67.5	22.9	11.1	51.6	67.5	21.9	11.1	50.6
90.0	14.8	7.8	34.9	90.0	22.5	11.7	52.7
112.5	12.4	6.6	29.6	112.5	18.3	10.3	45.1
135.0	12.6	7.3	31.5	135.0	14.0	7.7	34.1
157.5	15.4	8.3	37.1	157.5	13.4	7.0	31.4
180.0	23.5	11.9	54.2	180.0	14.8	7.6	34.5
202.5	26.0	12.9	59.4	202.5	21.4	11.5	51.2
225.0	24.1	12.8	57.4	225.0	22.7	12.7	55.9
247.5	26.5	14.4	64.0	247.5	21.2	11.5	51.1
270.0	25.5	13.3	59.9	270.0	23.1	11.8	53.8
292.5	26.3	14.6	64.2	292.5	22.8	11.8	53.3
315.0	28.3	14.9	66.9	315.0	24.8	12.7	57.8
337.5	25.1	12.8	58.2	337.5	25.6	12.8	58.8
Location 9				Location 10			
.0	22.7	11.7	53.0	.0	27.4	14.4	64.9
22.5	24.1	12.9	57.6	22.5	27.4	14.6	65.4
45.0	25.7	13.2	59.9	45.0	26.2	13.8	61.9
67.5	25.2	13.1	59.0	67.5	26.4	13.2	60.5
90.0	23.0	12.0	54.2	90.0	26.2	12.9	59.7
112.5	21.4	10.8	49.4	112.5	22.9	12.3	54.8
135.0	18.3	9.3	42.4	135.0	24.9	13.4	59.6
157.5	13.8	7.4	33.0	157.5	17.7	11.3	47.2
180.0	11.2	6.6	28.6	180.0	15.2	8.1	36.2
202.5	13.3	7.5	32.8	202.5	13.4	7.0	31.4
225.0	20.2	9.9	45.7	225.0	16.3	8.7	38.8
247.5	23.4	11.7	53.5	247.5	20.8	11.0	49.2
270.0	21.9	12.1	53.2	270.0	23.6	11.6	53.6
292.5	22.2	12.5	54.8	292.5	23.3	12.0	54.3
315.0	22.4	12.5	54.8	315.0	24.6	12.9	58.2
337.5	21.8	11.5	51.7	337.5	26.2	13.6	61.4
Location 11				Location 12			
.0	27.6	13.4	62.1	.0	26.6	13.3	61.0
22.5	27.2	13.2	61.3	22.5	25.5	11.8	55.7
45.0	26.6	13.1	60.4	45.0	25.4	12.1	56.5
67.5	24.7	12.0	55.5	67.5	26.7	12.2	58.1
90.0	25.1	12.1	56.3	90.0	26.9	13.1	60.6
112.5	25.7	13.1	59.6	112.5	27.3	12.9	60.5
135.0	25.5	12.0	56.3	135.0	26.8	12.8	59.7
157.5	25.7	12.8	58.8	157.5	23.7	11.6	53.6
180.0	21.7	10.7	49.2	180.0	23.7	11.5	53.4
202.5	15.8	8.0	36.6	202.5	21.0	10.5	48.2
225.0	14.5	7.1	32.9	225.0	15.9	7.7	35.8
247.5	15.6	7.9	36.2	247.5	14.2	6.8	31.6
270.0	20.3	10.2	46.6	270.0	15.2	7.5	34.4
292.5	24.0	12.0	55.1	292.5	20.1	10.3	46.7
315.0	24.8	12.1	56.1	315.0	22.1	12.2	53.9
337.5	27.4	13.3	61.7	337.5	22.4	12.1	53.7

Cermak Peterka Petersen, Inc.

G-9
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 13				Location 14			
.0	24.4	11.8	54.7	.0	23.2	11.2	52.0
22.5	24.6	12.1	55.9	22.5	22.0	10.5	48.9
45.0	25.3	12.5	57.7	45.0	27.7	13.2	61.8
67.5	24.2	12.1	55.4	67.5	27.7	13.7	63.0
90.0	24.5	12.2	56.2	90.0	25.8	12.6	58.2
112.5	26.4	13.2	60.5	112.5	26.2	12.1	57.4
135.0	26.0	13.0	59.7	135.0	25.1	12.5	57.5
157.5	28.0	14.2	64.8	157.5	23.9	11.5	53.6
180.0	24.4	11.7	54.5	180.0	28.4	12.8	61.2
202.5	23.2	11.5	53.0	202.5	25.4	11.7	55.6
225.0	20.3	10.1	46.4	225.0	25.4	12.6	57.9
247.5	15.6	7.8	35.9	247.5	22.3	10.7	50.0
270.0	14.3	7.3	33.2	270.0	16.8	7.7	36.6
292.5	14.4	7.4	33.5	292.5	14.9	7.4	33.9
315.0	19.8	10.2	46.2	315.0	15.7	7.8	35.7
337.5	24.2	12.2	55.8	337.5	19.9	10.1	46.0
Location 15				Location 16			
.0	20.3	11.3	49.6	.0	13.7	7.5	33.1
22.5	23.8	12.5	56.4	22.5	18.6	10.4	45.5
45.0	23.8	12.2	55.5	45.0	22.3	11.9	53.3
67.5	25.8	13.3	60.1	67.5	23.3	12.0	54.3
90.0	24.9	13.4	59.6	90.0	24.9	12.4	57.0
112.5	28.3	15.0	67.2	112.5	25.3	13.1	59.2
135.0	26.9	14.9	65.8	135.0	25.6	13.7	61.3
157.5	26.9	13.9	62.9	157.5	24.6	12.8	57.7
180.0	28.2	13.8	63.9	180.0	25.4	13.1	59.2
202.5	26.4	13.1	60.1	202.5	22.5	13.3	57.1
225.0	21.9	11.4	51.4	225.0	23.1	13.7	58.8
247.5	26.6	14.6	64.5	247.5	21.6	11.6	51.7
270.0	19.3	11.2	48.4	270.0	22.0	10.9	50.2
292.5	13.4	8.1	34.6	292.5	16.5	8.9	39.7
315.0	10.8	5.9	26.2	315.0	12.1	6.5	29.1
337.5	12.8	7.0	31.0	337.5	11.7	6.4	28.3
Location 17				Location 18			
.0	28.5	10.0	53.7	.0	29.3	11.1	57.4
22.5	28.3	10.8	55.6	22.5	31.3	11.9	61.5
45.0	28.4	11.0	56.3	45.0	32.2	11.6	61.4
67.5	29.0	12.8	61.9	67.5	31.7	11.5	60.6
90.0	31.4	15.1	70.3	90.0	27.6	10.5	54.2
112.5	36.3	17.1	80.3	112.5	27.8	11.3	56.5
135.0	32.7	14.1	68.8	135.0	29.3	13.4	63.8
157.5	29.8	12.7	62.3	157.5	33.7	14.7	71.5
180.0	36.5	14.8	74.3	180.0	35.9	14.9	73.9
202.5	35.3	14.5	72.3	202.5	35.2	14.8	73.0
225.0	38.4	16.2	79.7	225.0	33.9	13.4	67.9
247.5	38.2	17.5	83.1	247.5	32.5	13.2	66.1
270.0	31.2	14.0	67.1	270.0	33.3	13.0	66.4
292.5	26.9	10.4	53.2	292.5	33.1	13.6	67.9
315.0	29.0	10.9	56.6	315.0	31.8	13.6	66.5
337.5	28.8	10.4	54.9	337.5	28.5	11.1	56.8

Cermak Peterka Petersen, Inc.

G-10
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 19				Location 20			
.0	31.8	13.8	67.0	.0	31.0	14.3	67.9
22.5	28.0	11.3	56.8	22.5	27.9	12.9	61.2
45.0	27.6	10.9	55.3	45.0	27.3	13.0	60.7
67.5	28.4	10.5	54.8	67.5	26.8	12.7	59.5
90.0	27.9	10.3	54.0	90.0	28.2	12.9	61.5
112.5	29.5	11.4	58.3	112.5	29.7	13.2	63.6
135.0	30.2	11.4	58.9	135.0	30.2	13.2	64.1
157.5	28.4	11.4	57.3	157.5	27.6	12.5	59.8
180.0	31.4	14.7	69.1	180.0	27.2	12.4	59.1
202.5	34.6	17.6	80.1	202.5	25.7	12.3	57.4
225.0	35.8	17.2	80.2	225.0	27.4	14.7	65.5
247.5	32.6	14.7	70.4	247.5	28.4	13.9	64.4
270.0	31.6	13.9	67.1	270.0	30.2	14.5	67.5
292.5	31.5	13.1	64.8	292.5	29.3	13.7	64.5
315.0	35.3	15.3	74.5	315.0	33.1	14.7	70.7
337.5	34.4	15.1	73.1	337.5	31.3	14.3	68.1
Location 21				Location 22			
.0	33.7	14.8	71.6	.0	34.7	16.6	77.5
22.5	32.3	16.2	74.1	22.5	34.3	16.0	75.6
45.0	36.8	18.7	85.1	45.0	37.7	17.0	81.5
67.5	34.6	18.6	82.8	67.5	37.6	17.8	83.4
90.0	27.7	15.5	68.0	90.0	34.6	16.4	76.8
112.5	24.7	12.3	56.5	112.5	32.6	15.7	73.1
135.0	26.3	12.7	59.1	135.0	30.1	14.5	67.6
157.5	26.9	12.2	58.2	157.5	28.9	13.6	63.8
180.0	28.0	12.5	60.2	180.0	30.0	12.9	63.1
202.5	29.9	13.4	64.3	202.5	31.6	12.8	64.0
225.0	28.0	13.6	63.0	225.0	32.6	11.7	62.1
247.5	25.3	13.3	59.9	247.5	31.6	12.4	63.0
270.0	30.4	18.1	77.6	270.0	31.8	13.1	65.1
292.5	32.9	16.7	76.1	292.5	26.6	12.6	59.0
315.0	32.7	15.6	72.9	315.0	29.7	15.2	68.9
337.5	35.7	16.5	78.3	337.5	32.9	16.1	74.5
Location 23				Location 24			
.0	28.6	15.8	69.7	.0	29.2	13.4	63.7
22.5	31.3	18.3	79.1	22.5	27.1	13.8	62.9
45.0	31.1	17.5	76.6	45.0	31.1	17.1	75.5
67.5	30.2	15.1	69.2	67.5	30.3	15.3	69.8
90.0	31.6	15.8	72.5	90.0	30.4	13.8	65.7
112.5	36.6	16.2	78.2	112.5	31.5	15.4	71.3
135.0	36.1	17.0	79.8	135.0	35.3	16.6	77.9
157.5	33.3	16.6	76.3	157.5	35.5	18.2	82.6
180.0	29.9	15.2	69.3	180.0	36.0	16.4	78.2
202.5	27.2	13.0	60.6	202.5	31.8	16.0	73.1
225.0	30.0	12.7	62.5	225.0	29.7	14.9	68.1
247.5	32.8	13.1	66.1	247.5	28.1	13.3	62.3
270.0	32.2	12.9	65.0	270.0	28.2	13.1	61.8
292.5	31.5	12.8	64.0	292.5	30.8	13.0	64.1
315.0	28.2	14.5	65.6	315.0	30.0	13.0	63.2
337.5	26.0	14.0	62.5	337.5	30.3	13.2	64.2

Cermak Peterka Petersen, Inc.

G-11

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 6 - 0.80 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 25				Location 26			
.0	27.0	12.6	59.4	.0	28.7	12.1	59.8
22.5	25.9	12.1	57.0	22.5	28.2	11.8	58.5
45.0	27.5	12.7	60.2	45.0	26.0	10.6	53.1
67.5	28.2	13.5	63.0	67.5	27.1	10.7	54.3
90.0	28.5	14.9	67.1	90.0	27.6	10.8	54.9
112.5	29.8	15.6	70.3	112.5	27.6	10.3	53.7
135.0	31.5	16.1	73.1	135.0	27.9	10.9	55.7
157.5	35.5	17.3	80.1	157.5	27.0	11.6	56.6
180.0	33.2	16.6	76.2	180.0	29.0	13.0	62.3
202.5	34.4	16.4	76.7	202.5	29.3	12.8	62.2
225.0	33.1	17.2	77.6	225.0	31.7	13.2	65.4
247.5	32.5	16.1	73.9	247.5	31.2	13.4	65.4
270.0	29.6	14.7	67.7	270.0	31.9	13.3	65.7
292.5	26.3	13.5	61.1	292.5	30.7	12.2	61.8
315.0	25.6	12.4	57.7	315.0	31.8	13.6	66.5
337.5	26.3	12.4	58.1	337.5	30.3	13.2	64.1
Location 27				Location 28			
.0	33.3	15.9	74.3	.0	28.5	14.7	66.5
22.5	32.4	15.1	71.3	22.5	32.2	16.9	76.1
45.0	31.0	14.9	69.3	45.0	32.5	16.4	74.8
67.5	28.1	15.3	67.8	67.5	35.3	17.0	79.1
90.0	26.9	14.0	63.2	90.0	33.0	16.6	75.9
112.5	25.5	12.6	57.9	112.5	34.8	17.0	78.8
135.0	26.5	12.4	58.5	135.0	30.8	15.8	71.8
157.5	26.2	12.0	57.0	157.5	28.6	14.5	66.2
180.0	26.8	12.2	58.1	180.0	27.4	13.8	63.1
202.5	27.2	12.8	60.2	202.5	27.0	13.3	61.3
225.0	26.5	12.9	59.8	225.0	27.3	13.1	61.0
247.5	27.8	13.5	62.7	247.5	28.2	13.4	62.9
270.0	28.4	15.0	67.2	270.0	27.9	12.7	60.6
292.5	30.8	16.5	73.6	292.5	27.7	12.7	60.2
315.0	31.8	15.6	72.2	315.0	26.4	12.4	58.3
337.5	31.8	15.7	72.4	337.5	26.3	12.7	59.0

Cermak Peterka Petersen, Inc.

G-12

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
 Data Set 6 - 0.80 Roof Height Ratio

>> AVERAGE VALUES <<

Location	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
1	25.1	10.3	51.2
2	25.8	10.5	52.6
3	25.1	10.4	51.5
4	24.1	9.6	48.6
5	24.0	9.7	48.6
6	25.8	10.2	51.8
7	22.4	11.6	52.5
8	21.3	11.1	50.1
9	20.6	10.9	49.0
10	22.7	11.9	53.6
11	23.3	11.4	52.8
12	22.7	11.1	51.5
13	22.5	11.2	51.4
14	23.1	11.1	51.8
15	22.5	12.0	53.6
16	20.8	11.1	49.7
17	31.8	13.3	65.7
18	31.7	12.7	64.1
19	31.2	13.3	65.1
20	28.8	13.5	63.5
21	30.4	15.0	69.2
22	32.3	14.6	69.9
23	31.0	15.0	69.8
24	30.9	14.8	69.0
25	29.7	14.6	67.4
26	29.1	12.1	60.0
27	28.8	14.1	65.3
28	29.6	14.6	67.2

Cermak Peterka Petersen, Inc.

G-13

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	14.0	8.4	36.1	.0	16.2	10.3	43.1
22.5	15.6	10.6	43.5	22.5	13.6	8.9	36.8
45.0	18.9	12.2	50.8	45.0	14.3	9.2	38.4
67.5	23.9	14.5	61.7	67.5	18.2	12.0	49.6
90.0	29.5	14.1	65.8	90.0	22.7	14.5	60.6
112.5	28.6	14.1	65.0	112.5	29.9	14.0	66.0
135.0	29.0	15.9	70.4	135.0	23.9	15.0	63.1
157.5	35.7	19.4	86.1	157.5	27.2	17.0	71.7
180.0	34.6	19.2	84.4	180.0	32.7	19.5	83.7
202.5	34.8	19.9	86.6	202.5	35.5	19.2	85.5
225.0	32.3	18.6	80.7	225.0	35.1	19.8	86.5
247.5	31.0	15.0	69.8	247.5	31.6	17.5	77.3
270.0	30.7	14.9	69.2	270.0	32.5	16.2	74.5
292.5	23.2	15.3	63.3	292.5	30.0	15.3	69.7
315.0	17.9	11.2	47.3	315.0	22.1	14.1	59.0
337.5	13.8	9.0	37.5	337.5	17.2	10.4	44.3
Location 3				Location 4			
.0	16.8	11.3	46.6	.0	21.4	14.9	60.6
22.5	11.8	8.6	34.3	22.5	18.7	12.3	51.1
45.0	11.6	7.7	31.7	45.0	16.3	10.5	43.7
67.5	13.4	9.4	38.0	67.5	14.9	9.6	40.1
90.0	14.4	9.7	39.9	90.0	15.7	9.9	41.6
112.5	19.2	12.1	51.0	112.5	16.3	10.6	44.0
135.0	28.9	15.1	68.1	135.0	19.4	12.8	52.9
157.5	30.8	15.3	70.4	157.5	26.1	14.2	63.1
180.0	28.4	16.2	70.5	180.0	30.4	15.1	69.4
202.5	31.5	17.8	77.8	202.5	28.9	16.4	71.7
225.0	31.6	17.7	77.6	225.0	34.1	18.3	81.7
247.5	33.0	19.4	83.6	247.5	35.4	19.2	85.4
270.0	30.7	17.2	75.4	270.0	36.7	20.1	89.0
292.5	31.8	16.5	74.6	292.5	34.7	19.7	86.1
315.0	30.4	16.3	72.6	315.0	34.9	16.7	78.1
337.5	22.0	14.6	60.2	337.5	31.8	17.4	77.1
Location 5				Location 6			
.0	28.8	15.3	68.5	.0	35.7	17.6	81.0
22.5	19.4	12.2	51.4	22.5	32.3	15.9	73.4
45.0	15.3	10.4	42.5	45.0	21.5	15.1	61.4
67.5	15.2	9.3	39.6	67.5	18.3	12.6	51.5
90.0	13.1	8.2	34.5	90.0	15.2	9.3	39.5
112.5	13.4	9.0	37.0	112.5	14.7	9.5	39.7
135.0	16.9	11.0	45.7	135.0	14.2	9.7	39.6
157.5	20.9	12.5	53.6	157.5	15.6	10.1	42.2
180.0	31.4	15.1	70.3	180.0	18.3	11.4	48.1
202.5	33.0	16.0	74.1	202.5	26.3	13.0	59.8
225.0	30.2	16.4	72.8	225.0	26.0	12.7	58.9
247.5	30.1	18.4	78.2	247.5	27.8	15.7	68.6
270.0	37.0	20.5	90.2	270.0	32.0	18.4	79.8
292.5	35.9	20.5	89.4	292.5	36.7	19.7	87.8
315.0	32.5	17.9	79.0	315.0	33.3	19.4	83.8
337.5	32.0	15.3	71.4	337.5	31.8	18.3	79.6

Cermak Peterka Petersen, Inc.

G-14
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 7				Location 8			
.0	20.8	10.8	48.8	.0	27.9	16.2	70.1
22.5	32.6	14.6	70.2	22.5	29.1	15.4	69.0
45.0	29.5	15.0	68.3	45.0	32.4	16.0	73.7
67.5	21.3	14.0	58.1	67.5	30.6	14.9	69.1
90.0	19.0	11.9	50.1	90.0	20.0	12.5	52.7
112.5	18.2	11.1	47.2	112.5	17.2	10.8	45.6
135.0	14.9	9.5	39.8	135.0	11.6	8.4	33.8
157.5	18.2	11.1	47.2	157.5	14.3	8.7	37.0
180.0	15.5	11.1	44.7	180.0	15.4	9.5	40.2
202.5	18.2	12.0	49.6	202.5	16.3	10.9	45.1
225.0	27.1	13.4	61.7	225.0	20.4	14.1	57.6
247.5	26.9	12.9	60.1	247.5	35.8	17.3	80.4
270.0	26.8	14.7	64.9	270.0	32.1	16.5	74.7
292.5	26.6	15.8	67.9	292.5	27.3	15.3	67.1
315.0	27.6	16.8	71.5	315.0	26.6	14.7	64.9
337.5	23.4	12.6	56.1	337.5	27.8	15.3	67.6
Location 9				Location 10			
.0	27.2	15.3	67.1	.0	35.9	20.4	89.0
22.5	27.5	16.9	71.7	22.5	38.4	21.1	93.2
45.0	26.4	14.8	64.9	45.0	36.7	20.5	90.0
67.5	27.8	12.6	60.1	67.5	31.8	18.8	80.9
90.0	28.2	13.3	62.6	90.0	32.6	16.2	74.5
112.5	19.7	12.1	51.4	112.5	28.9	13.4	63.3
135.0	19.7	11.3	49.0	135.0	19.2	13.1	53.8
157.5	15.8	9.7	41.1	157.5	15.0	10.1	41.5
180.0	12.1	7.3	31.1	180.0	12.4	8.6	35.1
202.5	11.8	8.0	32.9	202.5	15.1	9.1	38.8
225.0	14.5	8.8	37.6	225.0	14.1	9.4	39.0
247.5	22.2	13.9	58.6	247.5	17.6	11.6	48.0
270.0	32.9	16.5	75.4	270.0	25.6	16.4	68.6
292.5	19.5	10.7	47.2	292.5	32.5	16.5	75.3
315.0	19.8	10.5	47.0	315.0	34.6	16.3	76.6
337.5	24.1	13.1	58.1	337.5	32.9	18.5	81.0
Location 11				Location 12			
.0	34.3	18.5	82.2	.0	37.9	17.9	83.9
22.5	35.2	20.0	87.2	22.5	32.3	17.6	78.2
45.0	35.8	19.1	85.5	45.0	35.8	19.0	85.1
67.5	30.8	17.0	74.9	67.5	38.9	20.9	93.1
90.0	28.6	15.7	69.4	90.0	34.9	18.2	82.2
112.5	34.8	15.7	75.0	112.5	33.7	18.4	81.6
135.0	29.8	13.8	65.4	135.0	30.9	14.4	67.9
157.5	22.6	13.2	57.1	157.5	30.5	14.7	68.3
180.0	16.7	11.1	45.9	180.0	22.1	12.8	55.5
202.5	15.6	9.8	41.3	202.5	20.0	12.2	52.0
225.0	13.4	8.3	35.1	225.0	16.8	10.9	45.3
247.5	14.7	9.4	39.4	247.5	14.8	8.7	37.6
270.0	18.8	11.4	48.7	270.0	15.9	9.2	40.0
292.5	27.3	15.2	66.8	292.5	17.3	10.6	45.0
315.0	35.1	15.9	75.8	315.0	23.7	17.0	68.6
337.5	35.0	16.4	77.1	337.5	33.1	18.5	81.2

Cermak Peterka Petersen, Inc.

G-15
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 13				Location 14			
.0	35.6	15.6	75.5	.0	27.6	16.6	71.1
22.5	35.5	17.0	79.3	22.5	37.3	16.6	79.9
45.0	35.3	18.5	83.2	45.0	36.3	16.7	79.3
67.5	37.8	20.4	90.8	67.5	36.3	19.8	87.8
90.0	38.0	20.4	90.9	90.0	39.9	20.6	93.4
112.5	36.3	19.7	87.5	112.5	38.3	21.0	92.8
135.0	31.6	16.9	75.6	135.0	40.3	21.8	96.9
157.5	33.4	16.0	74.6	157.5	36.0	19.2	85.9
180.0	29.3	13.5	64.0	180.0	37.5	17.2	81.8
202.5	19.9	13.0	54.1	202.5	35.4	16.4	77.4
225.0	17.0	11.1	46.0	225.0	29.1	16.7	72.7
247.5	15.6	9.3	39.8	247.5	22.3	14.2	59.5
270.0	15.0	8.6	37.4	270.0	15.1	10.3	42.2
292.5	15.9	9.5	40.7	292.5	11.9	8.4	34.0
315.0	18.7	11.7	49.3	315.0	12.9	8.7	35.8
337.5	25.3	15.5	65.8	337.5	16.1	11.0	45.1
Location 15				Location 16			
.0	18.0	12.6	51.1	.0	15.8	10.4	43.0
22.5	25.8	14.9	64.6	22.5	17.4	12.2	49.4
45.0	34.4	15.5	74.3	45.0	19.8	14.4	57.7
67.5	35.0	17.4	80.1	67.5	29.0	17.5	74.6
90.0	31.1	17.7	77.2	90.0	33.4	16.2	75.1
112.5	35.8	19.8	87.4	112.5	30.9	18.2	78.5
135.0	35.1	20.2	87.7	135.0	33.7	18.6	82.1
157.5	35.3	20.4	88.5	157.5	37.5	21.0	92.1
180.0	36.9	20.5	90.3	180.0	36.1	20.6	89.9
202.5	36.0	18.8	84.6	202.5	35.5	18.4	83.1
225.0	31.4	16.2	73.3	225.0	33.6	16.9	77.3
247.5	24.1	15.1	63.6	247.5	33.1	16.0	74.4
270.0	19.5	12.8	53.1	270.0	23.7	14.9	62.7
292.5	17.2	11.0	46.1	292.5	19.0	11.9	50.3
315.0	15.3	9.0	38.7	315.0	15.8	10.3	42.8
337.5	15.2	10.2	42.0	337.5	14.1	9.1	38.0
Location 17				Location 18			
.0	14.1	8.2	35.5	.0	18.1	9.8	43.6
22.5	16.4	8.7	39.0	22.5	16.9	9.2	40.9
45.0	20.3	11.3	49.7	45.0	17.0	9.4	41.5
67.5	27.1	12.9	60.3	67.5	17.0	9.5	41.7
90.0	35.0	14.8	72.7	90.0	19.6	10.3	46.3
112.5	38.1	15.5	77.5	112.5	26.4	12.4	58.3
135.0	41.7	17.2	85.4	135.0	36.7	15.7	76.7
157.5	44.2	16.5	85.8	157.5	39.9	16.1	80.8
180.0	43.5	18.0	89.5	180.0	42.1	17.3	86.2
202.5	42.6	17.0	85.9	202.5	43.9	17.0	87.2
225.0	39.7	16.2	80.9	225.0	43.9	17.9	89.4
247.5	37.2	15.7	77.2	247.5	42.9	17.7	88.1
270.0	32.2	14.7	69.9	270.0	39.4	16.3	81.1
292.5	25.4	13.1	59.3	292.5	36.2	14.9	74.2
315.0	19.2	10.4	46.2	315.0	31.8	13.5	66.4
337.5	16.6	9.0	39.9	337.5	24.8	13.0	58.4

Cermak Peterka Petersen, Inc.

G-16
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 19				Location 20			
.0	33.3	14.0	69.1	.0	40.8	16.8	83.6
22.5	25.0	13.0	58.7	22.5	38.6	15.7	78.5
45.0	18.0	9.9	43.9	45.0	31.6	14.7	69.5
67.5	15.6	8.2	36.8	67.5	24.1	11.7	54.4
90.0	15.5	8.0	36.2	90.0	18.5	9.8	44.1
112.5	16.9	9.4	41.5	112.5	16.4	8.6	38.8
135.0	20.2	10.6	47.7	135.0	15.1	8.2	36.5
157.5	27.7	13.2	61.7	157.5	16.0	8.6	38.3
180.0	34.8	14.8	72.7	180.0	19.3	10.8	47.4
202.5	39.6	15.2	78.2	202.5	23.2	11.6	53.1
225.0	40.6	16.5	82.6	225.0	31.2	13.7	66.4
247.5	43.2	16.6	85.3	247.5	38.9	16.4	80.8
270.0	44.5	17.7	89.4	270.0	39.3	15.2	77.9
292.5	43.2	17.7	88.2	292.5	42.6	15.5	81.8
315.0	40.1	16.6	82.3	315.0	42.8	16.2	83.8
337.5	37.0	15.2	75.7	337.5	41.5	16.3	83.0
Location 21				Location 22			
.0	44.1	17.8	89.3	.0	46.0	18.0	91.6
22.5	43.4	18.1	89.6	22.5	48.3	18.3	94.8
45.0	40.7	16.6	83.0	45.0	46.7	18.3	93.1
67.5	37.7	14.6	74.7	67.5	45.6	18.7	93.3
90.0	31.8	13.3	65.8	90.0	42.7	16.9	85.7
112.5	24.9	12.0	56.0	112.5	40.4	16.6	82.7
135.0	19.4	10.4	46.3	135.0	36.4	15.8	76.8
157.5	16.4	8.8	39.1	157.5	26.7	13.9	62.9
180.0	15.2	8.4	37.1	180.0	20.8	11.9	51.9
202.5	16.3	8.6	38.6	202.5	18.2	9.7	43.3
225.0	18.1	9.8	43.6	225.0	17.2	9.2	40.9
247.5	26.5	12.6	59.0	247.5	18.9	9.9	44.7
270.0	33.9	13.9	69.4	270.0	22.1	11.4	51.5
292.5	37.6	15.0	75.7	292.5	28.7	14.0	64.8
315.0	40.5	16.1	81.5	315.0	38.5	15.2	77.2
337.5	43.9	17.5	88.5	337.5	40.3	15.8	80.3
Location 23				Location 24			
.0	39.6	16.5	81.7	.0	21.2	10.1	47.3
22.5	43.3	16.3	84.6	22.5	25.7	12.9	59.0
45.0	45.0	17.5	89.3	45.0	33.9	14.0	69.7
67.5	46.9	18.9	95.0	67.5	40.1	15.7	80.0
90.0	44.9	17.4	89.1	90.0	45.2	18.1	91.2
112.5	46.5	18.0	92.1	112.5	46.4	17.8	91.4
135.0	44.1	17.4	88.3	135.0	45.9	18.4	92.6
157.5	40.9	16.8	83.6	157.5	43.6	17.6	88.3
180.0	37.4	16.1	78.6	180.0	40.2	16.2	81.3
202.5	27.3	12.8	60.4	202.5	35.7	14.4	72.3
225.0	21.0	10.8	48.9	225.0	31.3	13.7	66.3
247.5	17.4	9.1	41.0	247.5	23.8	12.8	57.0
270.0	16.0	8.1	36.9	270.0	19.3	10.4	46.3
292.5	17.6	9.9	43.4	292.5	16.9	8.7	39.4
315.0	21.8	11.8	52.5	315.0	16.3	8.0	37.0
337.5	29.7	13.4	64.2	337.5	16.6	8.8	39.3

Cermak Peterka Petersen, Inc.

G-17

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 25				Location 26			
.0	29.5	13.5	64.1	.0	37.8	16.2	79.2
22.5	31.8	14.5	69.0	22.5	35.1	16.0	76.2
45.0	32.4	14.8	70.4	45.0	34.3	15.6	74.4
67.5	35.3	15.4	74.6	67.5	29.4	14.3	66.2
90.0	39.1	15.2	77.8	90.0	27.5	13.8	63.0
112.5	40.1	15.9	80.6	112.5	30.7	14.4	67.7
135.0	38.7	15.0	76.9	135.0	34.2	15.3	73.5
157.5	40.3	14.9	78.0	157.5	37.3	15.9	78.1
180.0	41.7	16.7	84.1	180.0	41.0	15.9	81.3
202.5	42.5	16.1	83.3	202.5	40.4	16.6	82.6
225.0	41.0	15.6	80.4	225.0	41.4	16.3	82.9
247.5	41.7	16.2	82.8	247.5	41.5	16.5	83.5
270.0	37.3	15.8	77.5	270.0	43.5	16.9	86.4
292.5	34.5	14.6	71.8	292.5	41.6	16.7	84.2
315.0	31.9	14.1	68.1	315.0	43.0	17.2	86.8
337.5	31.2	14.8	69.2	337.5	41.7	16.4	83.4
Location 27				Location 28			
.0	40.9	16.4	82.6	.0	38.0	14.5	74.7
22.5	41.1	15.8	81.0	22.5	39.0	15.2	77.5
45.0	39.9	14.8	77.4	45.0	42.3	15.5	81.5
67.5	39.7	15.8	79.9	67.5	41.9	16.7	84.3
90.0	37.3	14.3	73.6	90.0	43.4	17.0	86.5
112.5	33.3	14.6	70.6	112.5	41.0	16.1	82.0
135.0	30.9	13.5	65.5	135.0	40.6	15.5	79.9
157.5	27.6	12.3	59.1	157.5	38.8	15.3	77.8
180.0	26.8	12.1	57.8	180.0	37.0	15.0	75.2
202.5	27.4	12.1	58.3	202.5	32.8	14.0	68.6
225.0	32.2	14.0	68.0	225.0	29.7	12.7	62.2
247.5	34.8	14.5	71.8	247.5	28.5	12.3	60.0
270.0	38.0	14.1	73.7	270.0	27.0	12.5	59.0
292.5	41.1	15.1	79.3	292.5	28.1	12.8	60.9
315.0	41.1	15.8	81.1	315.0	32.3	13.2	65.9
337.5	40.3	15.1	78.5	337.5	33.6	13.9	69.1

Cermak Peterka Petersen, Inc.

G-18

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall
 Data Set 7 - 0.35 Roof Height Ratio

>> AVERAGE VALUES <<

Location	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
1	25.9	14.5	63.6
2	25.2	14.6	63.1
3	24.1	14.0	60.8
4	26.0	14.9	64.7
5	25.3	14.2	62.4
6	25.0	14.3	62.2
7	22.9	12.9	56.6
8	24.1	13.5	59.3
9	21.8	12.2	53.5
10	26.4	15.0	65.5
11	26.8	14.4	64.2
12	27.4	15.1	66.6
13	27.5	14.8	65.9
14	29.5	16.0	71.0
15	27.9	15.8	68.9
16	26.8	15.4	66.9
17	30.8	13.7	65.9
18	31.0	13.8	66.3
19	31.0	13.5	65.6
20	30.0	13.1	63.6
21	30.6	13.3	64.8
22	33.6	14.6	71.0
23	33.7	14.4	70.6
24	31.4	13.6	66.1
25	36.8	15.2	75.5
26	37.5	15.9	78.1
27	35.8	14.4	72.4
28	35.9	14.5	72.8

Cermak Peterka Petersen, Inc.

G-19

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall

Data Set 12 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	96.6	20.3	144.3	.0	92.2	20.5	141.0
22.5	79.8	16.3	117.9	22.5	80.4	17.3	121.3
45.0	81.1	17.5	122.4	45.0	89.9	17.5	130.7
67.5	81.1	17.4	122.3	67.5	108.0	23.7	164.3
90.0	71.4	20.5	122.0	90.0	105.5	21.0	154.4
112.5	32.8	18.0	79.5	112.5	96.5	24.5	155.9
135.0	50.2	25.9	117.2	135.0	82.5	26.2	147.7
157.5	63.3	27.3	133.3	157.5	54.7	23.1	113.7
180.0	75.0	27.4	144.2	180.0	52.2	24.3	114.7
202.5	77.3	25.7	141.5	202.5	61.9	24.4	123.9
225.0	88.0	31.0	166.1	225.0	73.4	24.3	134.1
247.5	102.8	30.1	177.0	247.5	63.1	23.3	121.9
270.0	108.2	26.2	171.2	270.0	58.7	25.0	122.7
292.5	109.4	25.0	169.2	292.5	95.4	28.2	164.9
315.0	109.8	23.5	165.3	315.0	100.0	23.6	156.6
337.5	101.7	22.2	154.2	337.5	90.4	21.9	143.1
Location 3				Location 5			
.0	84.3	26.0	148.8	.0	86.0	28.8	158.1
22.5	105.2	23.7	161.6	22.5	59.4	25.4	124.3
45.0	99.5	22.8	153.9	45.0	39.4	15.2	78.1
67.5	102.9	19.7	148.6	67.5	45.7	19.0	94.0
90.0	95.6	20.7	144.6	90.0	63.0	22.9	120.8
112.5	95.6	21.1	145.6	112.5	87.4	21.4	139.0
135.0	102.3	22.2	154.9	135.0	92.7	19.4	138.3
157.5	105.1	24.9	164.9	157.5	86.9	19.2	132.5
180.0	69.7	25.8	134.8	180.0	85.5	18.3	128.7
202.5	46.2	19.5	96.0	202.5	90.8	21.4	142.0
225.0	43.8	16.8	86.5	225.0	96.2	21.0	145.9
247.5	51.3	18.5	98.0	247.5	95.4	22.7	149.9
270.0	58.2	20.7	110.4	270.0	92.4	23.7	149.9
292.5	65.8	22.3	121.6	292.5	80.0	26.7	146.8
315.0	61.6	22.5	118.3	315.0	75.8	26.2	141.6
337.5	73.3	27.3	142.2	337.5	76.1	27.7	146.0
Location 6				Location 7			
.0	64.8	24.4	126.6	.0	81.9	23.4	139.5
22.5	59.4	21.3	113.2	22.5	69.0	24.8	131.4
45.0	58.6	21.8	113.6	45.0	69.0	25.6	133.8
67.5	52.2	19.7	102.0	67.5	66.1	22.7	123.0
90.0	62.7	26.2	129.5	90.0	65.2	22.1	120.7
112.5	65.6	26.3	132.5	112.5	62.6	25.1	126.5
135.0	84.3	22.4	139.0	135.0	57.8	23.3	117.1
157.5	92.5	20.4	140.8	157.5	63.2	24.0	123.9
180.0	87.4	18.7	131.5	180.0	101.7	24.0	159.2
202.5	84.7	16.7	123.6	202.5	106.7	25.1	166.7
225.0	89.4	17.8	131.1	225.0	105.6	23.4	161.3
247.5	89.1	17.8	130.6	247.5	99.7	21.8	151.3
270.0	89.1	18.7	133.3	270.0	91.0	20.0	138.5
292.5	89.6	20.4	138.3	292.5	101.1	20.6	149.4
315.0	86.7	24.3	146.4	315.0	98.8	20.9	148.0
337.5	69.6	24.7	131.7	337.5	94.5	22.9	149.6

Cermak Peterka Petersen, Inc.

G-20

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 8				Location 9			
.0	96.0	21.1	146.0	.0	46.7	23.6	107.8
22.5	104.0	26.1	167.1	22.5	26.4	14.8	64.9
45.0	75.0	26.1	140.6	45.0	37.1	20.4	90.2
67.5	61.0	23.1	119.6	67.5	38.6	18.2	85.4
90.0	55.1	21.0	108.3	90.0	42.5	18.8	90.8
112.5	54.3	19.2	102.5	112.5	34.4	16.2	76.3
135.0	53.8	20.2	105.0	135.0	39.3	20.0	91.1
157.5	57.1	22.0	112.9	157.5	37.4	15.7	77.4
180.0	76.6	27.6	146.1	180.0	21.9	8.5	43.6
202.5	83.5	27.8	153.0	202.5	23.9	9.3	47.6
225.0	95.4	23.1	151.0	225.0	24.0	9.9	49.3
247.5	90.1	22.3	143.9	247.5	28.4	13.1	62.1
270.0	87.6	19.8	134.7	270.0	34.8	18.6	83.2
292.5	79.3	17.7	121.5	292.5	29.7	16.4	72.4
315.0	75.7	15.9	113.1	315.0	28.4	15.9	69.8
337.5	85.5	20.2	133.9	337.5	32.3	17.5	77.7
Location 10				Location 11			
.0	31.6	17.1	76.1	.0	38.6	19.8	89.9
22.5	33.5	18.1	80.6	22.5	29.3	15.3	68.8
45.0	31.0	17.7	77.1	45.0	29.0	16.0	70.6
67.5	33.9	19.0	83.3	67.5	24.1	13.5	59.1
90.0	43.1	23.0	102.8	90.0	24.7	15.0	63.8
112.5	39.1	19.4	89.4	112.5	32.3	18.5	80.6
135.0	37.2	18.6	85.4	135.0	29.4	17.0	73.8
157.5	33.3	18.2	80.5	157.5	29.2	15.1	68.3
180.0	27.0	13.0	60.7	180.0	26.2	13.5	61.3
202.5	28.4	12.3	59.8	202.5	24.3	10.9	52.2
225.0	32.3	13.1	65.6	225.0	25.8	10.8	53.3
247.5	27.5	13.4	62.1	247.5	23.0	10.4	49.6
270.0	42.1	20.4	94.6	270.0	29.2	13.3	63.4
292.5	44.0	21.5	99.6	292.5	34.8	17.1	78.9
315.0	39.8	19.9	91.3	315.0	43.2	20.9	97.2
337.5	37.0	20.1	89.2	337.5	44.6	22.3	102.2
Location 12				Location 14			
.0	46.7	21.4	101.6	.0	36.1	15.2	75.0
22.5	47.9	22.7	106.4	22.5	35.8	14.9	73.9
45.0	48.9	23.4	109.3	45.0	30.3	12.7	62.6
67.5	52.8	25.9	119.8	67.5	27.0	12.0	57.7
90.0	36.1	17.7	81.8	90.0	34.9	19.5	85.7
112.5	28.9	16.7	72.5	112.5	36.5	19.5	87.0
135.0	44.1	21.6	99.8	135.0	35.6	20.1	87.9
157.5	42.9	16.9	86.0	157.5	36.3	20.6	89.8
180.0	43.9	24.1	106.6	180.0	34.4	18.5	82.5
202.5	51.1	23.0	110.0	202.5	34.4	18.3	82.0
225.0	44.0	21.8	100.4	225.0	31.8	17.6	77.6
247.5	39.2	19.0	88.3	247.5	34.1	18.2	81.2
270.0	31.5	15.6	71.7	270.0	46.9	26.3	115.3
292.5	29.4	14.1	65.7	292.5	48.3	23.4	108.7
315.0	41.1	19.8	92.1	315.0	48.6	22.1	105.3
337.5	51.4	20.8	104.4	337.5	42.6	18.4	89.8

Cermak Peterka Petersen, Inc.

G-21

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 16				Location 18			
.0	49.8	23.5	110.4	.0	29.5	14.9	67.9
22.5	47.9	22.9	106.9	22.5	28.0	13.7	63.3
45.0	38.3	16.6	80.7	45.0	27.3	13.6	62.5
67.5	35.6	13.6	70.0	67.5	28.5	13.7	63.8
90.0	35.1	13.8	70.1	90.0	32.7	16.4	75.0
112.5	36.7	19.0	86.1	112.5	29.5	15.3	69.2
135.0	47.1	22.8	105.8	135.0	28.2	15.9	69.5
157.5	50.7	23.1	110.0	157.5	20.0	11.3	49.5
180.0	52.5	23.8	113.6	180.0	26.3	14.5	64.0
202.5	45.5	22.0	102.1	202.5	28.4	14.9	66.9
225.0	45.8	22.3	103.3	225.0	25.8	13.3	60.2
247.5	50.5	24.7	114.2	247.5	24.9	12.0	55.9
270.0	49.6	23.5	110.1	270.0	21.9	10.8	49.8
292.5	42.7	21.3	97.8	292.5	19.8	9.6	44.6
315.0	46.9	24.2	109.4	315.0	32.5	16.4	74.9
337.5	55.7	28.5	129.4	337.5	35.2	16.8	78.5
Location 20							
.0	33.6	12.7	65.6				
22.5	27.0	14.5	64.7				
45.0	26.1	13.8	61.9				
67.5	23.6	11.5	53.1				
90.0	22.0	10.7	49.7				
112.5	25.7	14.1	62.5				
135.0	28.1	14.3	65.1				
157.5	33.8	16.7	76.8				
180.0	40.4	19.5	90.6				
202.5	31.4	15.1	70.3				
225.0	29.7	14.4	66.7				
247.5	30.7	16.3	73.1				
270.0	38.9	18.8	87.3				
292.5	37.7	18.7	86.0				
315.0	34.9	17.0	78.8				
337.5	30.7	13.6	65.5				

Cermak Peterka Petersen, Inc.

G-22

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall

Data Set 12 - 1.00 Roof Height Ratio

>> AVERAGE VALUES <<

Location	U _{mean} /U _a (%)	U _{rms} /U _a (%)	U _e /U _a (%)
1	83.0	23.4	140.5
2	81.5	23.0	138.2
3	78.8	22.2	133.2
5	78.3	22.4	133.5
6	76.6	21.4	129.0
7	83.4	23.1	140.0
8	76.9	22.1	131.2
9	32.9	16.1	74.3
10	35.1	17.8	81.1
11	30.5	15.6	70.8
12	42.5	20.3	94.8
14	37.1	18.6	85.1
16	45.6	21.6	101.2
18	27.4	13.9	63.5
20	30.9	15.1	69.9

Cermak Peterka Petersen, Inc.

G-23

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	11.4	5.2	24.9	.0	13.8	6.7	31.1
22.5	10.5	5.2	23.8	22.5	13.6	6.5	30.4
45.0	10.2	5.9	25.6	45.0	14.1	6.4	30.7
67.5	14.5	8.9	37.8	67.5	13.2	6.0	28.7
90.0	21.9	11.8	52.5	90.0	13.1	6.6	30.2
112.5	23.2	12.6	55.9	112.5	18.3	9.3	42.3
135.0	20.0	11.3	49.3	135.0	24.9	13.9	61.2
157.5	26.2	13.8	62.0	157.5	25.5	13.9	61.5
180.0	24.9	12.7	57.8	180.0	26.0	14.9	64.7
202.5	27.2	15.7	68.3	202.5	20.7	10.9	49.0
225.0	27.3	15.9	68.7	225.0	22.2	11.6	52.2
247.5	22.5	12.0	53.6	247.5	23.9	12.3	55.7
270.0	19.4	10.1	45.7	270.0	24.5	13.0	58.2
292.5	15.3	7.9	35.7	292.5	24.3	13.0	57.9
315.0	10.3	6.4	27.1	315.0	23.8	13.3	58.5
337.5	12.2	6.3	28.4	337.5	17.4	8.4	39.2
Location 3				Location 5			
.0	22.8	12.1	54.3	.0	20.1	10.0	46.1
22.5	15.8	8.4	37.5	22.5	19.4	10.5	46.7
45.0	13.0	6.6	29.9	45.0	18.3	9.9	44.1
67.5	12.2	5.7	27.0	67.5	16.5	9.3	40.7
90.0	11.4	4.7	23.4	90.0	13.6	7.5	33.3
112.5	11.2	4.9	23.6	112.5	15.1	6.7	32.3
135.0	10.2	5.2	23.7	135.0	12.5	5.3	26.0
157.5	12.4	7.3	31.4	157.5	12.3	5.0	25.2
180.0	14.9	8.3	36.6	180.0	8.7	4.9	21.4
202.5	15.5	8.5	37.6	202.5	8.8	4.8	21.4
225.0	21.0	12.0	52.1	225.0	8.8	5.5	23.1
247.5	25.1	15.1	64.4	247.5	12.3	6.7	29.8
270.0	21.3	10.8	49.1	270.0	17.1	10.0	43.2
292.5	21.4	10.6	48.7	292.5	21.9	12.5	54.4
315.0	22.5	11.2	51.4	315.0	17.3	9.2	41.1
337.5	23.0	11.8	53.4	337.5	19.0	9.3	42.9
Location 6				Location 7			
.0	28.0	14.3	65.0	.0	24.7	12.1	55.9
22.5	24.4	12.2	56.0	22.5	28.2	13.4	62.7
45.0	23.6	11.0	51.8	45.0	28.2	14.0	64.3
67.5	25.6	12.7	58.4	67.5	24.9	12.5	57.3
90.0	24.0	12.9	57.4	90.0	27.7	15.5	68.0
112.5	22.7	11.1	51.4	112.5	25.2	12.0	56.2
135.0	22.5	10.9	50.6	135.0	28.0	14.4	65.2
157.5	16.5	7.9	36.9	157.5	27.5	13.3	61.7
180.0	13.6	6.1	29.2	180.0	18.8	10.1	45.0
202.5	14.3	5.9	29.3	202.5	13.1	7.5	32.6
225.0	14.1	6.1	29.7	225.0	13.5	6.5	30.3
247.5	10.6	5.3	24.2	247.5	15.4	6.5	31.8
270.0	11.5	5.7	26.2	270.0	14.3	6.3	30.6
292.5	15.3	8.1	36.3	292.5	15.5	7.0	33.4
315.0	20.6	10.5	47.9	315.0	17.4	8.2	38.5
337.5	20.6	10.6	48.1	337.5	20.2	9.9	45.6

Cermak Peterka Petersen, Inc.

G-24

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 8				Location 9			
.0	14.8	7.6	34.6	.0	19.2	9.0	42.4
22.5	15.0	8.6	37.5	22.5	17.9	8.6	40.0
45.0	20.0	10.4	47.0	45.0	14.4	8.1	35.6
67.5	20.9	10.8	49.0	67.5	16.2	9.3	40.4
90.0	25.0	13.5	60.0	90.0	19.9	10.4	46.9
112.5	25.5	14.3	62.8	112.5	23.4	11.8	53.8
135.0	25.1	13.7	60.7	135.0	25.9	12.3	57.6
157.5	23.4	12.6	56.1	157.5	27.8	13.1	61.6
180.0	24.3	13.3	58.9	180.0	25.6	12.4	57.5
202.5	23.8	13.3	58.3	202.5	23.6	11.5	53.3
225.0	22.2	11.7	52.5	225.0	22.9	11.3	52.2
247.5	19.1	8.9	41.9	247.5	22.7	11.6	52.7
270.0	16.7	8.1	37.7	270.0	20.4	10.4	47.2
292.5	14.5	7.3	33.3	292.5	18.1	9.3	42.2
315.0	15.3	7.4	34.4	315.0	19.7	10.0	45.4
337.5	14.2	7.2	32.8	337.5	18.0	8.8	40.6
Location 10				Location 11			
.0	14.4	7.9	34.8	.0	22.0	10.3	48.5
22.5	17.6	9.1	41.3	22.5	18.9	9.1	42.3
45.0	21.3	9.7	46.1	45.0	18.3	8.1	39.0
67.5	18.2	9.2	42.0	67.5	18.9	8.1	39.5
90.0	18.7	9.4	43.0	90.0	15.4	7.6	34.9
112.5	22.6	11.5	52.5	112.5	17.1	8.8	39.8
135.0	26.3	12.4	58.2	135.0	21.9	11.0	50.4
157.5	27.4	12.8	60.4	157.5	23.0	10.9	51.0
180.0	26.9	13.1	60.8	180.0	27.5	12.4	59.3
202.5	23.9	11.6	53.7	202.5	25.3	11.8	55.7
225.0	24.0	11.3	53.2	225.0	25.2	11.6	55.0
247.5	25.8	12.5	58.0	247.5	27.5	12.7	60.0
270.0	23.1	11.6	53.1	270.0	27.5	12.6	59.8
292.5	22.9	11.6	53.0	292.5	28.4	12.6	60.6
315.0	19.2	10.0	45.2	315.0	25.1	11.5	54.6
337.5	16.7	8.6	39.0	337.5	23.3	10.7	51.0
Location 12				Location 14			
.0	19.3	9.8	44.7	.0	30.0	14.4	67.1
22.5	18.4	9.0	41.6	22.5	28.5	13.0	61.9
45.0	15.9	8.4	37.8	45.0	25.9	11.7	55.8
67.5	11.9	6.0	27.4	67.5	25.6	11.8	56.0
90.0	11.9	5.9	27.3	90.0	23.3	11.1	51.9
112.5	11.5	6.1	27.4	112.5	22.8	10.7	50.4
135.0	14.1	6.7	31.3	135.0	20.4	9.7	45.3
157.5	14.6	7.3	33.5	157.5	16.8	8.1	37.6
180.0	15.4	7.5	34.6	180.0	15.6	7.5	35.1
202.5	15.7	7.7	35.5	202.5	18.3	8.1	39.0
225.0	19.5	10.3	46.2	225.0	16.6	8.1	37.4
247.5	24.5	12.4	56.6	247.5	16.5	8.6	38.8
270.0	24.5	12.2	55.9	270.0	21.1	10.1	47.1
292.5	24.6	11.9	55.3	292.5	25.6	11.9	56.1
315.0	24.6	11.7	54.6	315.0	27.9	12.9	61.0
337.5	21.7	11.1	50.5	337.5	31.4	14.2	68.0

Cermak Peterka Petersen, Inc.

G-25

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 16				Location 18			
.0	18.5	9.1	42.1	.0	27.8	11.9	58.1
22.5	18.7	9.3	42.7	22.5	27.2	11.8	57.3
45.0	19.7	9.4	43.8	45.0	28.0	10.4	54.3
67.5	21.5	10.4	48.2	67.5	27.0	10.6	53.9
90.0	23.4	11.9	54.3	90.0	26.5	10.8	53.9
112.5	23.4	12.0	54.4	112.5	28.2	11.0	56.1
135.0	24.1	11.7	54.2	135.0	29.2	11.1	57.4
157.5	22.1	11.2	51.2	157.5	29.1	11.0	57.0
180.0	18.8	9.7	43.9	180.0	27.0	10.9	54.7
202.5	15.6	8.4	37.4	202.5	24.9	10.9	52.8
225.0	11.3	6.4	28.0	225.0	25.5	10.9	53.3
247.5	10.4	5.2	24.0	247.5	28.0	11.8	58.3
270.0	10.5	5.2	24.0	270.0	29.1	11.4	58.0
292.5	15.3	7.4	34.5	292.5	30.5	12.4	62.2
315.0	16.9	7.9	37.2	315.0	30.9	12.5	62.7
337.5	17.3	8.2	38.4	337.5	29.5	11.8	59.5
Location 20							
.0	22.2	9.6	46.6				
22.5	21.9	9.6	46.6				
45.0	19.4	8.6	41.5				
67.5	19.8	9.4	44.2				
90.0	22.1	10.0	47.6				
112.5	23.4	10.5	50.4				
135.0	23.0	10.0	48.7				
157.5	19.0	9.0	42.1				
180.0	17.2	8.6	39.3				
202.5	20.0	9.5	44.6				
225.0	21.8	9.7	46.7				
247.5	23.3	9.9	48.5				
270.0	21.7	9.4	45.7				
292.5	24.1	9.9	49.3				
315.0	25.4	9.7	50.1				
337.5	23.0	9.8	48.1				

Cermak Peterka Petersen, Inc.

G-26
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

>> AVERAGE VALUES <<

Location	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
1	18.6	10.1	44.8
2	20.0	10.4	47.0
3	17.1	8.9	40.3
5	15.1	7.9	35.7
6	19.2	9.5	43.7
7	21.4	10.6	48.7
8	20.0	10.5	47.3
9	21.0	10.5	48.1
10	21.8	10.8	49.6
11	22.8	10.6	50.1
12	18.0	9.0	41.3
14	22.9	10.7	50.5
16	18.0	9.0	41.1
18	28.0	11.3	56.8
20	21.7	9.6	46.3

Cermak Peterka Petersen, Inc.

G-27

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	8.5	6.7	26.2	.0	13.3	7.4	32.4
22.5	13.5	7.7	33.5	22.5	14.0	7.7	33.9
45.0	11.1	7.0	29.5	45.0	15.5	7.3	34.3
67.5	11.0	7.5	30.7	67.5	15.0	7.7	34.8
90.0	16.5	10.1	42.9	90.0	13.7	7.2	32.4
112.5	26.8	14.8	65.2	112.5	16.2	27.8	91.4
135.0	22.2	10.0	48.0	135.0	16.4	8.4	38.2
157.5	22.1	10.2	48.2	157.5	20.5	11.8	51.2
180.0	20.9	10.4	47.9	180.0	23.9	12.7	56.9
202.5	21.6	10.5	48.7	202.5	25.6	11.9	56.3
225.0	24.5	12.8	57.6	225.0	24.8	12.1	56.0
247.5	23.0	12.9	56.7	247.5	29.2	13.5	64.0
270.0	14.9	8.9	38.2	270.0	26.5	13.2	60.6
292.5	15.3	7.8	35.4	292.5	20.6	10.7	48.3
315.0	12.1	6.9	30.0	315.0	13.4	7.4	32.7
337.5	12.2	7.5	31.7	337.5	11.9	7.0	30.1
Location 3				Location 5			
.0	16.0	8.7	38.6	.0	22.5	10.8	50.4
22.5	15.4	7.5	34.9	22.5	20.2	10.1	46.4
45.0	14.6	7.1	33.0	45.0	19.0	9.3	42.9
67.5	13.6	6.8	31.2	67.5	16.3	8.3	37.7
90.0	16.1	7.7	35.9	90.0	12.4	6.9	30.5
112.5	15.0	7.6	34.6	112.5	14.5	7.6	34.2
135.0	14.5	7.7	34.6	135.0	12.9	7.8	33.2
157.5	15.2	8.7	37.9	157.5	13.7	7.4	33.0
180.0	18.5	10.1	44.7	180.0	12.1	6.7	29.5
202.5	21.8	11.3	51.1	202.5	11.9	6.6	29.1
225.0	23.9	12.4	56.1	225.0	13.6	7.3	32.5
247.5	28.4	13.4	63.0	247.5	9.0	5.4	23.2
270.0	24.8	10.8	52.5	270.0	17.3	8.2	38.4
292.5	24.4	11.0	52.6	292.5	17.7	8.5	39.6
315.0	22.2	10.5	49.3	315.0	21.9	9.4	46.0
337.5	17.7	8.9	40.8	337.5	26.2	11.3	55.1
Location 6				Location 7			
.0	23.0	10.8	50.9	.0	15.4	8.4	37.2
22.5	26.5	12.2	57.7	22.5	19.6	9.8	45.0
45.0	27.4	11.4	56.5	45.0	29.1	12.9	62.3
67.5	24.1	11.1	52.5	67.5	32.0	13.8	67.4
90.0	21.4	11.0	49.9	90.0	32.9	14.3	69.5
112.5	19.9	9.8	45.2	112.5	28.3	11.9	58.7
135.0	16.9	8.9	39.9	135.0	28.5	13.1	62.1
157.5	14.1	7.4	33.2	157.5	19.6	11.1	48.5
180.0	13.9	6.7	31.1	180.0	14.7	8.3	36.3
202.5	15.9	6.9	33.7	202.5	13.1	7.2	31.8
225.0	15.9	7.4	34.8	225.0	14.6	7.4	33.7
247.5	17.4	7.8	37.4	247.5	16.2	7.8	36.2
270.0	16.6	7.8	36.8	270.0	18.8	8.8	41.5
292.5	16.4	8.9	39.6	292.5	18.0	8.3	39.3
315.0	16.9	9.1	40.5	315.0	16.2	7.8	36.2
337.5	21.4	10.7	49.1	337.5	17.0	8.5	38.9

Cermak Peterka Petersen, Inc.

G-28

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 16				Location 18			
.0	25.4	11.7	55.4	.0	36.1	12.3	67.0
22.5	25.1	13.1	59.1	22.5	35.3	11.5	63.9
45.0	29.7	14.6	67.4	45.0	36.3	11.9	66.0
67.5	32.8	13.7	67.9	67.5	35.9	11.6	64.9
90.0	37.0	14.3	73.3	90.0	34.8	11.7	64.1
112.5	38.5	14.3	74.6	112.5	35.4	12.1	65.7
135.0	34.3	12.8	66.5	135.0	38.7	11.5	67.1
157.5	32.3	12.0	62.6	157.5	38.0	10.9	64.9
180.0	29.6	11.2	58.0	180.0	37.1	11.0	64.2
202.5	15.5	8.8	38.4	202.5	35.9	11.5	64.6
225.0	14.9	9.2	38.9	225.0	38.9	12.1	69.0
247.5	19.0	9.8	44.5	247.5	42.1	13.0	74.5
270.0	15.1	7.5	34.4	270.0	43.7	12.0	73.0
292.5	21.7	9.4	45.8	292.5	46.6	13.1	78.7
315.0	27.0	10.5	53.8	315.0	42.1	12.3	72.5
337.5	26.8	10.3	53.1	337.5	36.8	13.5	70.9
Location 20							
.0	42.4	14.2	77.9				
22.5	37.5	13.6	71.7				
45.0	35.4	11.8	64.8				
67.5	38.1	12.0	67.9				
90.0	41.0	12.2	71.2				
112.5	40.3	12.6	71.5				
135.0	36.1	11.6	65.1				
157.5	36.7	11.8	66.1				
180.0	35.7	11.3	63.8				
202.5	38.2	11.2	65.8				
225.0	37.3	10.7	63.5				
247.5	36.6	10.8	63.4				
270.0	33.9	10.3	59.6				
292.5	39.9	12.5	70.9				
315.0	43.8	13.7	77.8				
337.5	44.4	14.1	79.6				

Cermak Peterka Petersen, Inc.

G-29

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration B - Tank B - 48' Dia x 48' Tall
 Data Set 14 - 0.75 Roof Height Ratio

>> AVERAGE VALUES <<

Location	U_{mean}/U_a (%)	U_{rms}/U_a (%)	U_e/U_a (%)
1	17.3	9.5	41.9
2	18.8	10.9	47.1
3	18.9	9.4	43.2
5	16.3	8.2	37.6
6	19.2	9.2	43.0
7	20.9	10.0	46.5
8	20.2	10.4	47.3
9	26.4	11.4	55.5
10	25.3	10.4	51.8
11	27.0	11.0	55.0
12	25.1	10.8	52.8
14	27.4	11.1	55.7
16	26.5	11.5	55.9
18	38.4	12.0	68.2
20	38.6	12.1	68.8

Cermak Peterka Petersen, Inc.

G-30

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	94.3	21.2	144.8	.0	85.2	22.7	140.7
22.5	86.6	21.1	137.5	22.5	90.2	22.5	144.6
45.0	82.4	22.3	136.8	45.0	91.8	20.2	139.9
67.5	73.7	24.1	133.7	67.5	85.2	21.6	137.5
90.0	67.4	26.0	133.5	90.0	83.8	20.3	132.6
112.5	61.4	28.4	134.4	112.5	77.4	22.8	133.7
135.0	43.6	26.2	112.1	135.0	65.3	27.2	134.8
157.5	31.6	19.0	81.4	157.5	49.3	26.0	116.8
180.0	41.0	21.2	95.8	180.0	36.7	19.6	87.7
202.5	40.5	19.5	90.7	202.5	37.4	21.0	92.2
225.0	51.3	25.3	116.7	225.0	47.1	25.3	112.9
247.5	57.3	26.4	125.2	247.5	43.1	20.2	95.0
270.0	66.4	25.7	131.7	270.0	55.2	26.0	122.0
292.5	76.5	23.5	134.7	292.5	60.6	27.3	130.7
315.0	85.3	24.0	144.3	315.0	67.1	25.7	132.1
337.5	94.9	22.4	148.5	337.5	78.0	24.0	137.5
Location 3				Location 4			
.0	68.8	27.5	138.8	.0	36.5	18.2	83.6
22.5	78.6	24.9	140.5	22.5	38.9	17.6	84.0
45.0	82.4	22.1	136.5	45.0	41.6	18.4	88.8
67.5	80.6	18.8	125.7	67.5	41.4	22.7	100.4
90.0	85.9	21.2	137.2	90.0	78.7	26.4	144.9
112.5	84.3	22.0	137.9	112.5	86.9	21.2	137.9
135.0	80.5	23.3	137.8	135.0	93.8	21.5	145.2
157.5	68.4	24.5	130.0	157.5	87.4	25.4	150.1
180.0	45.8	21.8	102.0	180.0	77.9	24.5	138.9
202.5	36.6	21.8	93.4	202.5	69.5	24.7	131.7
225.0	31.6	19.2	81.8	225.0	58.4	24.7	121.4
247.5	27.7	16.8	71.7	247.5	44.6	25.9	112.0
270.0	21.3	12.3	53.5	270.0	33.8	20.7	88.0
292.5	29.8	20.7	84.2	292.5	30.5	17.3	75.6
315.0	50.6	31.0	131.8	315.0	36.2	20.8	90.5
337.5	60.6	29.9	137.9	337.5	30.5	15.8	71.5
Location 5				Location 6			
.0	42.8	22.1	100.1	.0	47.4	28.1	120.8
22.5	38.3	19.2	87.9	22.5	31.4	18.8	80.6
45.0	43.4	21.7	99.5	45.0	32.4	18.5	80.6
67.5	45.7	23.9	107.5	67.5	40.4	18.8	88.8
90.0	62.1	27.4	132.4	90.0	45.5	22.7	104.2
112.5	78.2	27.0	146.0	112.5	53.1	27.5	124.3
135.0	83.5	26.0	148.1	135.0	73.2	26.7	140.6
157.5	88.2	25.9	152.1	157.5	85.2	26.2	150.3
180.0	83.2	22.9	139.3	180.0	85.1	24.4	145.2
202.5	86.4	24.8	147.5	202.5	92.9	24.1	151.6
225.0	81.5	26.5	147.5	225.0	92.0	24.4	151.5
247.5	73.2	25.3	136.7	247.5	83.1	24.6	143.9
270.0	65.5	26.2	132.0	270.0	79.6	25.9	144.2
292.5	54.3	28.1	127.1	292.5	71.5	26.0	137.1
315.0	42.9	25.1	108.4	315.0	62.9	27.0	132.1
337.5	34.2	18.8	83.0	337.5	58.7	29.5	135.0

Cermak Peterka Petersen, Inc.

G-31
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 7				Location 8			
.0	63.1	25.6	128.3	.0	77.4	23.5	135.5
22.5	61.6	29.1	136.4	22.5	69.4	24.9	132.0
45.0	47.7	26.3	116.0	45.0	65.8	25.3	130.1
67.5	35.7	19.2	85.5	67.5	57.5	28.6	131.3
90.0	35.1	19.4	85.5	90.0	43.2	25.0	108.3
112.5	35.6	18.1	82.4	112.5	32.2	17.9	78.7
135.0	45.4	24.9	110.0	135.0	36.9	20.3	89.7
157.5	62.0	30.6	140.9	157.5	43.0	19.5	93.1
180.0	72.8	26.3	139.0	180.0	53.4	24.9	117.5
202.5	80.9	25.4	144.1	202.5	62.0	25.1	125.8
225.0	88.2	23.6	145.8	225.0	74.8	25.5	138.8
247.5	92.1	23.4	148.8	247.5	79.8	24.9	141.6
270.0	90.2	21.3	141.4	270.0	90.2	24.2	149.1
292.5	87.4	22.7	142.4	292.5	96.9	22.5	150.7
315.0	81.7	23.8	140.2	315.0	99.5	23.5	156.0
337.5	75.8	24.6	137.3	337.5	83.7	24.1	143.1
Location 9				Location 11			
.0	27.1	15.0	66.1	.0	28.3	37.9	130.1
22.5	31.0	17.5	76.5	22.5	41.9	21.5	97.5
45.0	37.7	20.1	89.9	45.0	36.0	19.4	86.3
67.5	38.6	19.2	88.2	67.5	30.2	16.8	73.8
90.0	48.0	20.4	100.1	90.0	25.0	13.4	59.7
112.5	51.2	20.8	104.2	112.5	28.8	16.6	72.0
135.0	49.2	23.0	108.5	135.0	28.7	17.6	74.7
157.5	37.9	19.9	89.3	157.5	26.9	14.5	64.6
180.0	29.7	16.8	73.4	180.0	28.2	13.6	63.3
202.5	41.7	20.6	94.9	202.5	34.3	15.9	75.1
225.0	57.1	23.6	117.4	225.0	39.8	16.8	82.7
247.5	53.6	21.5	108.2	247.5	29.7	15.6	70.2
270.0	50.0	21.0	103.6	270.0	31.5	15.9	72.5
292.5	39.6	19.5	90.1	292.5	38.3	19.8	89.6
315.0	33.8	18.6	82.3	315.0	50.0	23.1	109.5
337.5	31.8	18.1	78.9	337.5	54.4	22.8	112.8
Location 12				Location 14			
.0	34.6	14.1	70.5	.0	51.3	20.4	103.3
22.5	32.6	13.5	67.0	22.5	45.3	20.6	98.1
45.0	30.2	13.5	64.7	45.0	33.7	16.2	75.4
67.5	24.3	14.5	62.1	67.5	35.7	18.6	83.8
90.0	17.5	9.8	43.1	90.0	44.1	20.4	96.6
112.5	19.8	11.0	48.5	112.5	43.7	19.9	94.9
135.0	24.2	13.0	58.1	135.0	39.4	19.6	90.1
157.5	28.0	15.7	69.0	157.5	30.6	16.6	73.7
180.0	34.1	18.6	82.3	180.0	24.6	13.4	59.6
202.5	35.7	17.8	81.8	202.5	21.6	11.6	51.8
225.0	39.8	19.2	89.4	225.0	20.7	11.2	49.8
247.5	44.5	19.3	93.9	247.5	21.7	12.3	53.7
270.0	47.7	20.7	100.8	270.0	25.6	14.7	63.9
292.5	38.3	18.2	85.3	292.5	28.8	16.0	70.3
315.0	29.8	14.3	66.7	315.0	43.2	19.2	92.3
337.5	30.4	13.3	64.5	337.5	49.8	20.3	101.5

Cermak Peterka Petersen, Inc.

G-32

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 15				Location 18			
.0	42.6	19.5	92.6	.0	42.2	20.4	94.9
22.5	51.4	20.1	102.5	22.5	38.2	19.3	88.1
45.0	46.0	20.7	99.0	45.0	33.4	17.6	79.2
67.5	38.1	18.8	86.7	67.5	36.6	18.7	85.1
90.0	30.7	15.3	70.3	90.0	37.9	18.4	85.5
112.5	38.8	21.2	94.1	112.5	35.3	17.5	80.5
135.0	47.2	22.0	103.7	135.0	36.0	17.5	81.1
157.5	49.9	20.7	102.9	157.5	34.2	16.5	76.8
180.0	46.0	20.6	98.8	180.0	37.5	16.3	79.2
202.5	35.8	18.0	82.2	202.5	41.8	17.2	85.5
225.0	27.8	15.5	68.3	225.0	43.6	16.8	86.2
247.5	21.9	12.3	54.0	247.5	43.2	16.4	84.7
270.0	20.1	10.6	47.6	270.0	45.9	17.1	89.0
292.5	23.5	13.6	59.0	292.5	46.1	17.6	90.7
315.0	28.6	16.5	71.6	315.0	47.4	19.0	95.8
337.5	33.5	18.4	81.4	337.5	44.6	20.7	97.7
Location 19				Location 21			
.0	38.1	16.4	80.0	.0	44.7	17.4	88.9
22.5	35.2	16.5	77.6	22.5	40.3	17.0	83.7
45.0	33.5	17.2	78.0	45.0	33.3	14.3	70.0
67.5	33.2	17.1	77.6	67.5	32.6	14.8	70.7
90.0	33.9	17.1	78.1	90.0	30.5	15.6	70.9
112.5	29.4	16.1	71.2	112.5	30.5	16.2	72.5
135.0	30.2	16.4	72.9	135.0	31.6	16.7	74.8
157.5	28.5	13.2	62.4	157.5	29.5	16.3	71.9
180.0	30.3	13.5	65.0	180.0	27.9	14.9	66.7
202.5	30.9	14.1	67.0	202.5	32.7	16.9	76.5
225.0	34.1	15.2	73.1	225.0	38.2	19.4	88.4
247.5	41.4	17.7	86.7	247.5	35.5	18.2	82.7
270.0	44.4	17.4	88.6	270.0	37.8	17.1	81.8
292.5	43.1	17.0	86.2	292.5	40.7	16.9	83.7
315.0	43.1	16.3	84.4	315.0	44.0	17.0	87.3
337.5	42.5	17.4	86.7	337.5	45.9	16.7	88.0
Location 23				Location 24			
.0	43.6	17.5	88.0	.0	37.0	17.5	82.0
22.5	44.9	17.6	89.6	22.5	39.0	17.6	84.2
45.0	45.2	17.1	88.5	45.0	44.2	17.6	88.9
67.5	49.1	18.2	94.9	67.5	48.8	18.5	95.5
90.0	42.7	16.8	85.4	90.0	46.2	18.7	93.7
112.5	40.1	17.1	83.7	112.5	41.1	16.8	84.0
135.0	42.5	17.5	87.1	135.0	38.2	15.9	78.6
157.5	40.8	17.4	85.3	157.5	41.7	17.3	85.9
180.0	38.9	17.2	82.8	180.0	41.7	17.1	85.2
202.5	36.8	17.0	80.6	202.5	44.1	17.3	88.1
225.0	34.7	17.5	80.0	225.0	40.8	18.1	87.3
247.5	31.3	16.9	75.1	247.5	38.6	19.2	88.3
270.0	28.5	15.5	68.9	270.0	40.3	20.3	92.7
292.5	32.3	17.5	77.6	292.5	34.8	17.5	80.1
315.0	36.7	18.3	84.1	315.0	31.7	16.0	73.2
337.5	41.8	18.7	89.9	337.5	34.2	17.2	78.8

Cermak Peterka Petersen, Inc.

G-33

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 26				Location 28			
.0	39.1	16.6	81.6	.0	46.8	40.7	154.8
22.5	42.8	18.7	90.6	22.5	45.9	17.6	90.4
45.0	44.9	19.9	95.9	45.0	49.1	18.6	96.3
67.5	43.6	19.7	94.0	67.5	48.7	19.8	99.2
90.0	38.4	18.6	86.3	90.0	42.2	18.6	89.8
112.5	33.3	17.1	77.7	112.5	39.1	16.8	82.2
135.0	29.6	15.9	70.7	135.0	39.1	17.3	83.3
157.5	26.7	12.8	59.7	157.5	39.0	17.1	82.8
180.0	28.3	13.7	63.8	180.0	38.2	17.3	82.5
202.5	37.5	17.1	81.6	202.5	38.5	17.7	83.9
225.0	44.9	19.8	95.5	225.0	39.8	18.9	88.6
247.5	46.7	19.5	96.6	247.5	36.6	18.3	83.8
270.0	49.0	17.8	93.9	270.0	35.2	17.1	79.3
292.5	47.5	18.3	93.8	292.5	39.4	18.6	87.2
315.0	44.9	17.9	90.5	315.0	40.6	19.5	91.0
337.5	42.0	17.3	86.1	337.5	41.1	17.9	87.1

Cermak Peterka Petersen, Inc.

G-34
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

>> AVERAGE VALUES <<

Location	U _{mean} /U _a (%)	U _{rms} /U _a (%)	U _e /U _a (%)
1	65.9	23.5	125.1
2	65.8	23.3	124.4
3	58.3	22.4	115.0
4	55.4	21.6	110.3
5	62.7	24.4	124.7
6	64.7	24.6	126.9
7	65.9	24.0	126.5
8	66.6	23.7	126.3
9	41.1	19.7	92.0
11	34.5	18.8	83.4
12	32.0	15.4	71.7
14	35.0	16.9	78.7
15	36.4	17.7	82.2
18	40.2	17.9	86.2
19	35.7	16.2	77.2
21	36.0	16.6	78.7
23	39.4	17.4	83.8
24	40.2	17.7	85.4
26	40.0	17.5	84.9
28	41.2	19.5	91.4

Cermak Peterka Petersen, Inc.

G-35
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	14.1	6.8	31.8	.0	20.0	9.7	45.0
22.5	14.5	7.3	33.3	22.5	16.0	8.0	36.7
45.0	18.6	9.3	42.7	45.0	13.6	6.8	31.1
67.5	23.8	11.9	54.6	67.5	14.7	7.4	33.8
90.0	29.9	14.8	68.0	90.0	18.2	9.0	41.4
112.5	32.9	16.2	74.8	112.5	23.6	11.4	53.0
135.0	33.5	16.8	77.1	135.0	27.4	12.9	60.7
157.5	32.7	16.2	74.6	157.5	31.6	15.6	71.8
180.0	31.9	15.1	70.9	180.0	30.7	15.1	69.7
202.5	34.4	15.4	73.7	202.5	31.8	16.0	73.2
225.0	34.8	15.3	74.1	225.0	30.4	14.6	68.1
247.5	34.0	15.7	74.4	247.5	34.5	16.2	76.0
270.0	33.1	17.3	78.1	270.0	35.0	15.3	74.1
292.5	25.0	13.5	60.0	292.5	34.4	15.9	75.2
315.0	20.5	9.6	45.1	315.0	30.1	14.7	67.9
337.5	16.3	8.2	37.4	337.5	24.7	12.6	57.3
Location 3				Location 4			
.0	30.2	15.5	70.3	.0	30.6	14.6	68.4
22.5	24.6	12.0	55.7	22.5	31.6	16.7	74.9
45.0	19.9	9.7	44.9	45.0	24.4	13.6	59.7
67.5	15.8	7.7	35.6	67.5	18.8	8.6	41.0
90.0	14.4	7.2	33.1	90.0	17.9	8.3	39.1
112.5	14.4	7.3	33.4	112.5	14.1	6.6	31.2
135.0	18.1	8.7	40.4	135.0	12.8	6.1	28.6
157.5	20.9	9.7	45.8	157.5	14.4	7.0	32.6
180.0	24.9	12.4	57.1	180.0	18.1	9.0	41.4
202.5	26.8	13.6	61.9	202.5	26.2	13.6	61.5
225.0	29.2	15.0	68.1	225.0	31.2	16.5	73.9
247.5	30.3	15.0	69.1	247.5	30.8	16.5	73.7
270.0	30.6	14.3	67.4	270.0	31.5	15.8	72.3
292.5	32.4	15.0	71.0	292.5	33.1	15.9	74.0
315.0	34.4	15.6	74.4	315.0	31.1	15.1	70.0
337.5	34.4	16.6	77.1	337.5	29.1	13.9	65.0
Location 5				Location 6			
.0	30.5	15.5	70.6	.0	32.9	16.1	74.3
22.5	29.3	14.4	66.5	22.5	32.1	16.0	73.3
45.0	31.3	14.2	67.8	45.0	31.1	15.4	71.0
67.5	28.1	13.3	62.4	67.5	29.4	14.4	66.6
90.0	26.0	12.4	57.9	90.0	32.6	15.6	72.8
112.5	22.9	11.3	52.1	112.5	32.4	14.9	70.8
135.0	17.3	8.9	40.4	135.0	33.4	18.6	81.8
157.5	14.9	7.1	33.2	157.5	24.5	12.7	57.3
180.0	13.5	6.5	30.3	180.0	18.8	8.9	41.8
202.5	15.3	7.4	34.4	202.5	14.5	7.3	33.4
225.0	19.7	10.0	45.5	225.0	13.0	6.5	30.0
247.5	24.1	12.1	55.3	247.5	14.8	7.9	35.2
270.0	29.8	15.9	71.0	270.0	19.9	10.2	46.4
292.5	32.8	16.7	75.9	292.5	24.7	13.0	58.3
315.0	33.5	17.1	77.9	315.0	33.4	17.7	79.2
337.5	31.8	16.6	74.8	337.5	33.7	17.2	78.3

Cermak Peterka Petersen, Inc.

G-36
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 7				Location 8			
.0	31.0	16.5	73.8	.0	16.2	8.8	39.2
22.5	31.9	16.6	74.9	22.5	21.7	12.5	54.3
45.0	32.5	16.9	76.2	45.0	25.8	14.7	64.0
67.5	30.5	16.0	72.0	67.5	27.0	15.2	66.6
90.0	31.2	15.8	72.0	90.0	29.5	16.5	72.5
112.5	30.5	14.9	68.9	112.5	31.7	17.2	76.4
135.0	31.2	14.8	69.3	135.0	30.4	16.5	73.3
157.5	30.9	14.2	67.5	157.5	29.3	16.1	71.1
180.0	28.3	14.2	65.1	180.0	27.0	14.2	63.9
202.5	23.5	11.6	53.4	202.5	29.1	14.6	66.9
225.0	19.1	9.2	42.7	225.0	26.0	14.9	65.0
247.5	14.1	7.3	33.1	247.5	19.8	11.3	49.2
270.0	13.2	6.6	30.3	270.0	14.1	8.0	35.0
292.5	13.4	6.7	30.8	292.5	10.6	5.7	25.3
315.0	17.9	9.5	42.5	315.0	11.4	6.1	27.2
337.5	23.4	11.4	52.8	337.5	12.6	6.9	30.4
Location 9				Location 11			
.0	15.3	9.2	39.2	.0	22.0	11.2	51.0
22.5	17.9	9.8	43.4	22.5	22.5	10.5	49.6
45.0	22.1	10.9	50.4	45.0	20.2	10.0	46.0
67.5	23.1	11.0	51.4	67.5	14.7	8.4	36.6
90.0	25.5	13.1	59.5	90.0	10.3	6.5	27.3
112.5	25.3	14.3	62.5	112.5	10.7	6.6	28.0
135.0	26.6	15.2	66.3	135.0	20.1	10.4	47.1
157.5	27.9	16.4	70.8	157.5	21.7	10.7	49.3
180.0	27.2	16.2	69.5	180.0	24.1	12.3	56.0
202.5	28.1	15.9	69.4	202.5	22.9	12.8	56.1
225.0	26.1	14.7	64.4	225.0	23.9	13.9	60.2
247.5	25.9	14.0	62.2	247.5	25.1	15.0	64.2
270.0	24.1	12.6	56.9	270.0	26.2	15.4	66.5
292.5	23.4	11.3	52.5	292.5	22.4	13.2	56.9
315.0	21.3	10.7	49.0	315.0	24.9	14.6	63.0
337.5	18.4	9.9	44.1	337.5	23.9	13.5	59.0
Location 12				Location 14			
.0	21.8	13.5	57.0	.0	27.3	15.9	68.9
22.5	20.8	12.5	53.5	22.5	25.2	15.1	64.8
45.0	19.7	11.4	49.3	45.0	25.6	15.7	66.8
67.5	20.0	10.5	47.3	67.5	27.0	15.5	67.3
90.0	19.3	10.3	46.1	90.0	29.8	16.3	72.3
112.5	16.5	9.7	41.9	112.5	27.7	15.7	68.6
135.0	13.8	8.6	36.2	135.0	24.6	12.6	57.1
157.5	17.6	9.5	42.2	157.5	23.4	11.4	52.7
180.0	20.4	10.1	46.6	180.0	20.0	9.9	45.7
202.5	22.7	11.1	51.4	202.5	17.5	9.7	42.8
225.0	25.0	13.8	60.8	225.0	14.4	8.7	37.0
247.5	25.9	15.4	66.2	247.5	18.5	10.2	45.0
270.0	29.7	16.8	73.5	270.0	20.8	10.5	47.8
292.5	26.6	16.1	68.6	292.5	21.5	10.3	48.0
315.0	25.7	15.8	67.1	315.0	22.2	11.7	52.6
337.5	21.9	13.7	57.7	337.5	24.9	13.7	60.4

Cermak Peterka Petersen, Inc.

G-37

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 15				Location 18			
.0	25.1	13.8	60.9	.0	25.9	12.3	57.7
22.5	28.6	17.0	73.0	22.5	25.0	12.3	56.9
45.0	27.6	16.0	69.2	45.0	24.5	11.6	54.4
67.5	28.6	17.3	73.8	67.5	23.8	11.2	52.6
90.0	27.5	16.8	71.5	90.0	24.4	11.7	54.5
112.5	24.7	15.0	63.9	112.5	24.8	12.0	55.7
135.0	24.5	14.6	62.5	135.0	24.5	12.5	57.0
157.5	25.4	14.1	62.1	157.5	24.2	12.7	57.1
180.0	23.4	12.2	55.0	180.0	23.1	13.2	57.5
202.5	23.2	10.9	51.1	202.5	23.3	13.9	59.5
225.0	21.4	10.7	49.2	225.0	24.6	14.7	63.1
247.5	18.6	10.7	46.5	247.5	24.8	14.8	63.6
270.0	17.0	10.1	43.5	270.0	24.7	13.9	60.9
292.5	20.3	11.2	49.5	292.5	23.7	12.6	56.3
315.0	23.6	12.5	55.9	315.0	24.8	12.8	57.8
337.5	26.8	13.2	60.9	337.5	25.2	12.3	56.8
Location 19				Location 21			
.0	26.5	13.2	60.5	.0	27.4	14.9	66.2
22.5	25.9	12.7	58.6	22.5	25.8	14.7	64.2
45.0	23.7	11.4	53.1	45.0	24.9	13.7	60.4
67.5	22.3	11.5	52.0	67.5	26.2	13.8	62.1
90.0	21.4	10.6	48.7	90.0	26.5	13.2	60.7
112.5	23.9	11.0	52.3	112.5	26.8	13.0	60.3
135.0	24.0	11.4	53.3	135.0	25.2	12.0	56.2
157.5	24.3	11.3	53.4	157.5	24.1	11.0	52.4
180.0	23.5	12.4	55.6	180.0	23.7	11.6	53.5
202.5	23.1	12.5	55.5	202.5	26.1	11.9	56.6
225.0	23.2	12.9	56.6	225.0	26.6	12.2	57.9
247.5	23.8	13.1	57.9	247.5	26.9	13.3	61.4
270.0	25.2	14.6	63.3	270.0	26.7	13.7	62.1
292.5	23.8	13.1	57.8	292.5	26.9	14.7	65.1
315.0	26.0	13.9	62.2	315.0	27.4	15.1	66.7
337.5	24.6	13.0	58.4	337.5	27.5	15.8	68.7
Location 23				Location 24			
.0	25.9	12.7	58.7	.0	26.4	12.0	57.2
22.5	25.2	13.4	59.8	22.5	25.8	12.3	57.6
45.0	27.0	14.9	65.7	45.0	25.4	12.6	57.9
67.5	26.7	14.9	65.6	67.5	26.7	14.3	64.0
90.0	26.2	14.5	64.1	90.0	25.8	14.1	62.5
112.5	26.8	14.4	64.3	112.5	26.4	14.6	64.4
135.0	26.3	14.5	64.0	135.0	26.1	14.2	63.0
157.5	25.6	13.9	61.7	157.5	25.5	14.4	63.0
180.0	25.5	12.9	58.9	180.0	27.4	15.2	66.8
202.5	25.6	12.5	57.8	202.5	26.3	14.3	63.6
225.0	25.2	11.9	56.0	225.0	25.6	13.0	59.2
247.5	25.3	11.6	55.2	247.5	26.5	12.8	59.5
270.0	25.3	11.5	54.9	270.0	26.2	12.2	57.5
292.5	25.3	11.7	55.4	292.5	26.6	12.3	58.2
315.0	26.6	12.2	58.1	315.0	26.2	11.8	56.4
337.5	25.6	12.4	57.6	337.5	26.5	12.1	57.6

Cermak Peterka Petersen, Inc.

G-38

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 26				Location 28			
.0	23.2	12.9	56.7	.0	26.8	13.4	61.5
22.5	23.6	13.6	59.0	22.5	26.1	13.5	61.2
45.0	23.2	12.5	55.7	45.0	24.9	13.3	59.5
67.5	24.3	11.7	54.6	67.5	24.4	13.1	58.3
90.0	25.2	12.1	56.4	90.0	23.4	12.8	56.6
112.5	25.0	11.8	55.4	112.5	24.3	12.9	57.8
135.0	25.4	12.4	57.4	135.0	24.9	12.8	58.2
157.5	23.2	11.7	53.6	157.5	24.4	12.8	57.7
180.0	23.2	12.6	55.8	180.0	24.8	12.7	57.8
202.5	23.5	12.1	54.9	202.5	24.7	11.9	55.3
225.0	23.0	12.5	55.3	225.0	25.7	13.1	59.7
247.5	22.6	12.1	54.0	247.5	26.7	12.7	59.4
270.0	23.8	13.3	58.6	270.0	27.8	12.5	60.0
292.5	22.1	11.9	53.0	292.5	26.8	12.7	59.6
315.0	23.9	12.6	56.5	315.0	27.5	12.6	59.7
337.5	23.7	12.9	57.1	337.5	25.6	13.3	60.0

Cermak Peterka Petersen, Inc.

G-39

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
 Data Set 20 - 0.90 Roof Height Ratio

>> AVERAGE VALUES <<

Location	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
1	26.9	13.1	60.7
2	26.0	12.6	58.4
3	25.1	12.2	56.6
4	24.7	12.4	56.7
5	25.1	12.5	57.3
6	26.3	13.3	60.7
7	25.2	12.6	57.8
8	22.6	12.5	55.0
9	23.6	12.8	57.0
11	21.0	11.6	51.0
12	21.7	12.4	54.1
14	23.1	12.7	56.1
15	24.1	13.5	59.3
18	24.5	12.8	57.6
19	24.1	12.4	56.2
21	26.2	13.4	60.9
23	25.9	13.1	59.9
24	26.2	13.3	60.5
26	23.7	12.4	55.9
28	25.5	12.9	58.9

Cermak Peterka Petersen, Inc.

G-40
NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

CPP Project 92-0869

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 1				Location 2			
.0	17.9	10.4	45.2	.0	16.0	9.8	41.6
22.5	16.8	9.8	42.4	22.5	17.9	10.7	45.8
45.0	18.1	10.4	45.2	45.0	18.7	10.7	46.6
67.5	19.7	10.6	47.3	67.5	18.3	10.3	45.1
90.0	24.3	12.6	57.0	90.0	18.4	10.6	46.0
112.5	32.7	16.3	74.9	112.5	21.0	11.4	50.7
135.0	33.5	17.9	80.0	135.0	27.6	14.5	65.2
157.5	32.3	16.1	73.7	157.5	32.0	16.5	74.7
180.0	32.5	14.5	69.8	180.0	33.6	16.7	76.8
202.5	32.3	14.0	68.2	202.5	36.6	17.4	81.4
225.0	34.3	15.1	72.9	225.0	39.5	19.0	88.4
247.5	28.5	13.2	62.4	247.5	36.9	17.4	81.6
270.0	23.3	11.9	54.1	270.0	37.6	18.0	84.0
292.5	18.9	10.1	45.1	292.5	37.8	16.9	81.2
315.0	18.2	10.7	46.2	315.0	24.8	13.8	60.6
337.5	18.6	10.5	45.9	337.5	16.1	9.1	39.9
Location 3				Location 4			
.0	17.6	10.0	43.6	.0	28.8	13.3	62.9
22.5	13.9	8.0	34.8	22.5	27.4	12.9	60.7
45.0	17.7	10.1	44.0	45.0	20.2	10.9	48.4
67.5	17.8	10.6	45.5	67.5	17.8	9.6	42.8
90.0	17.8	11.0	46.5	90.0	17.1	9.4	41.7
112.5	18.4	10.5	45.7	112.5	18.8	11.5	48.9
135.0	18.3	9.7	43.4	135.0	19.3	10.7	47.2
157.5	19.5	10.7	47.3	157.5	17.9	10.8	46.2
180.0	27.3	13.6	62.4	180.0	17.9	10.0	44.1
202.5	31.6	13.0	64.7	202.5	12.8	7.8	33.2
225.0	29.3	12.7	61.7	225.0	22.7	12.4	54.8
247.5	31.0	13.4	65.2	247.5	26.8	11.6	56.5
270.0	37.4	17.0	81.0	270.0	29.1	12.7	61.6
292.5	38.1	17.6	83.4	292.5	32.0	16.4	74.3
315.0	31.4	14.6	68.9	315.0	36.3	17.2	80.6
337.5	30.1	13.9	65.9	337.5	30.9	16.0	72.2
Location 5				Location 6			
.0	36.9	16.8	79.9	.0	37.1	17.2	81.4
22.5	34.8	17.0	78.7	22.5	36.9	16.3	78.8
45.0	33.1	15.6	73.3	45.0	35.9	16.7	78.8
67.5	34.4	15.8	75.1	67.5	34.3	17.2	78.7
90.0	24.6	12.3	56.5	90.0	29.6	14.7	67.5
112.5	18.7	10.0	44.5	112.5	26.1	12.4	58.1
135.0	16.2	9.6	41.2	135.0	23.7	13.1	57.9
157.5	17.0	9.6	42.1	157.5	19.5	10.1	45.6
180.0	18.7	10.8	46.8	180.0	18.4	10.4	45.5
202.5	18.8	11.1	47.8	202.5	18.2	10.4	45.2
225.0	10.3	6.0	26.0	225.0	21.1	11.6	51.3
247.5	15.3	8.3	36.9	247.5	9.9	6.5	26.9
270.0	24.1	11.4	53.4	270.0	13.8	8.3	35.7
292.5	28.4	11.6	58.0	292.5	16.9	9.3	41.0
315.0	31.0	14.4	68.0	315.0	23.1	12.5	55.6
337.5	35.1	14.6	72.4	337.5	33.1	16.7	76.4

Cermak Peterka Petersen, Inc.

G-41

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 7				Location 8			
.0	29.0	14.6	66.7	.0	10.5	7.4	29.9
22.5	33.9	13.9	69.4	22.5	13.7	7.7	33.8
45.0	35.3	17.5	80.6	45.0	19.7	10.6	47.3
67.5	38.0	17.8	83.7	67.5	28.3	12.2	59.5
90.0	37.6	17.1	81.5	90.0	29.3	13.4	63.7
112.5	38.6	18.3	85.7	112.5	25.1	12.2	56.7
135.0	33.1	15.7	73.5	135.0	27.9	14.9	66.7
157.5	35.0	15.2	73.8	157.5	27.7	16.0	69.4
180.0	29.0	15.2	68.3	180.0	26.9	13.2	61.1
202.5	22.1	12.6	54.9	202.5	25.7	11.4	55.0
225.0	18.2	10.4	45.3	225.0	18.9	9.6	43.7
247.5	19.2	12.0	50.6	247.5	13.7	8.8	36.7
270.0	17.1	10.3	44.0	270.0	13.1	8.4	35.0
292.5	16.9	11.4	46.8	292.5	13.4	7.8	33.7
315.0	14.0	8.4	35.9	315.0	8.5	4.8	20.9
337.5	17.0	9.3	41.3	337.5	12.2	8.0	33.3
Location 9				Location 11			
.0	12.2	8.0	33.2	.0	26.6	12.3	58.2
22.5	13.2	8.5	35.5	22.5	15.3	9.1	39.0
45.0	17.4	10.4	44.6	45.0	12.6	7.9	33.4
67.5	24.4	12.4	56.5	67.5	10.1	6.3	26.5
90.0	33.4	13.8	68.5	90.0	10.3	6.4	27.0
112.5	35.7	15.3	74.9	112.5	12.7	8.0	33.6
135.0	36.5	14.9	74.4	135.0	17.2	10.5	44.7
157.5	39.5	15.5	79.0	157.5	20.7	10.7	48.5
180.0	39.6	14.7	76.6	180.0	30.5	12.7	62.9
202.5	38.2	15.6	77.9	202.5	29.4	10.2	55.1
225.0	37.8	13.9	72.8	225.0	31.5	12.0	61.9
247.5	33.8	13.7	68.7	247.5	35.8	13.3	69.4
270.0	25.0	10.8	52.7	270.0	36.3	14.2	72.4
292.5	20.2	9.9	45.9	292.5	37.4	15.7	77.5
315.0	15.3	9.1	39.2	315.0	33.1	13.9	68.7
337.5	11.0	7.0	29.2	337.5	32.4	13.5	66.7
Location 12				Location 14			
.0	33.5	12.4	64.9	.0	38.8	16.7	81.5
22.5	26.9	11.0	54.9	22.5	38.8	15.6	78.3
45.0	24.2	11.5	54.0	45.0	38.6	15.1	76.9
67.5	18.7	11.2	48.0	67.5	37.1	14.6	74.3
90.0	13.6	10.1	40.2	90.0	33.4	12.9	66.1
112.5	15.3	9.2	39.4	112.5	33.1	12.7	65.3
135.0	12.6	7.3	31.7	135.0	32.7	13.0	65.8
157.5	11.6	6.4	28.2	157.5	24.4	12.8	57.5
180.0	17.0	9.6	41.9	180.0	17.5	10.8	45.9
202.5	21.0	11.7	51.3	202.5	12.8	8.2	34.3
225.0	33.4	14.2	69.6	225.0	11.3	7.0	29.5
247.5	37.2	15.0	75.4	247.5	10.5	7.0	28.8
270.0	40.7	15.7	80.6	270.0	13.1	8.2	34.5
292.5	40.6	13.9	75.5	292.5	22.7	12.4	54.9
315.0	41.0	13.8	75.4	315.0	32.6	14.4	69.6
337.5	37.5	13.7	72.1	337.5	41.9	16.5	83.8

Cermak Peterka Petersen, Inc.

G-42

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 15				Location 18			
.0	29.5	12.7	61.9	.0	25.1	12.4	57.0
22.5	38.3	15.6	78.0	22.5	20.8	10.4	47.6
45.0	38.5	16.5	80.7	45.0	22.1	11.1	50.7
67.5	41.5	16.0	82.2	67.5	24.8	10.2	50.9
90.0	41.2	16.2	82.3	90.0	32.1	12.0	62.5
112.5	41.7	17.1	85.2	112.5	35.0	11.4	63.3
135.0	39.4	17.2	83.4	135.0	39.6	13.1	72.5
157.5	35.0	14.6	72.4	157.5	42.2	12.9	74.1
180.0	29.4	12.1	60.2	180.0	46.1	15.6	85.3
202.5	19.7	11.6	49.8	202.5	42.7	14.5	79.2
225.0	16.7	10.2	43.4	225.0	44.3	14.6	80.8
247.5	12.8	8.3	34.6	247.5	50.9	15.0	88.1
270.0	10.7	7.3	29.8	270.0	51.3	15.3	89.1
292.5	10.9	7.7	31.4	292.5	46.4	13.6	80.0
315.0	15.6	10.1	42.1	315.0	41.8	13.5	75.4
337.5	22.4	11.6	52.6	337.5	35.1	13.8	70.1
Location 19				Location 21			
.0	41.8	13.8	76.4	.0	44.8	14.9	82.0
22.5	28.6	12.8	61.6	22.5	43.1	15.5	82.3
45.0	19.5	11.1	48.4	45.0	45.4	14.0	80.1
67.5	20.9	12.5	53.4	67.5	42.0	13.6	76.0
90.0	22.5	11.5	52.3	90.0	37.7	12.7	69.6
112.5	26.2	11.0	54.4	112.5	34.4	11.9	64.2
135.0	29.6	11.1	57.7	135.0	29.6	10.8	56.8
157.5	35.6	11.8	65.2	157.5	25.3	10.3	51.4
180.0	38.2	12.5	69.3	180.0	22.5	10.5	49.5
202.5	40.2	13.4	73.7	202.5	20.6	10.4	47.6
225.0	41.3	12.8	73.1	225.0	23.4	11.9	54.2
247.5	44.0	13.9	78.7	247.5	31.0	10.9	58.5
270.0	46.2	14.8	83.1	270.0	39.6	12.8	71.6
292.5	50.0	16.7	91.8	292.5	43.6	13.0	75.8
315.0	48.2	14.9	85.3	315.0	47.2	13.4	80.3
337.5	45.5	14.3	81.0	337.5	46.2	15.3	84.5
Location 23				Location 24			
.0	44.6	15.4	83.2	.0	36.1	13.0	68.9
22.5	47.6	14.9	84.6	22.5	39.3	14.4	75.7
45.0	50.6	16.0	90.2	45.0	42.9	14.5	79.2
67.5	50.2	17.2	93.3	67.5	49.1	16.0	89.1
90.0	48.1	16.4	89.2	90.0	52.0	17.0	94.4
112.5	47.3	15.9	87.1	112.5	48.3	14.9	85.2
135.0	47.7	15.1	85.3	135.0	50.0	15.8	89.3
157.5	47.4	14.3	82.9	157.5	51.2	18.3	97.3
180.0	44.4	14.2	79.7	180.0	49.3	17.5	93.5
202.5	37.3	12.5	68.5	202.5	46.4	15.1	84.1
225.0	31.2	11.6	60.4	225.0	45.5	15.7	84.9
247.5	26.9	10.7	54.2	247.5	38.6	12.3	69.3
270.0	23.9	10.6	51.1	270.0	34.0	12.3	65.0
292.5	26.9	11.5	56.2	292.5	28.0	11.4	57.0
315.0	32.5	11.5	61.3	315.0	27.1	10.9	54.9
337.5	35.7	12.8	67.9	337.5	28.0	11.8	58.1

Cermak Peterka Petersen, Inc.

G-43

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)	Azimuth (deg)	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
Location 26				Location 28			
.0	43.1	14.0	78.0	.0	42.7	13.9	77.3
22.5	45.2	14.5	81.2	22.5	42.2	12.9	74.1
45.0	42.9	13.8	77.4	45.0	44.8	14.3	80.5
67.5	38.4	12.4	69.3	67.5	51.8	16.2	92.0
90.0	39.4	13.7	73.8	90.0	48.5	15.3	86.6
112.5	38.9	12.8	71.0	112.5	55.1	16.9	97.2
135.0	40.4	13.0	72.9	135.0	52.7	16.5	93.7
157.5	39.8	13.4	73.4	157.5	45.9	14.4	81.8
180.0	39.4	13.2	72.5	180.0	42.1	14.0	77.0
202.5	40.9	13.1	73.5	202.5	41.8	13.6	75.8
225.0	43.3	13.7	77.4	225.0	42.1	14.7	79.1
247.5	39.1	14.4	75.4	247.5	41.0	13.7	75.2
270.0	45.4	14.9	82.7	270.0	39.3	12.6	70.8
292.5	44.9	16.5	86.7	292.5	42.7	14.4	78.7
315.0	42.4	14.8	79.5	315.0	44.7	13.6	78.3
337.5	37.5	13.5	71.6	337.5	45.2	14.3	80.8

Cermak Peterka Petersen, Inc.

G-44

CPP Project 92-0869

NON-DIMENSIONAL MEAN AND EFFECTIVE WIND VELOCITIES

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 21 - 0.50 Roof Height Ratio

>> AVERAGE VALUES <<

Location	Umean/Ua (%)	Urms/Ua (%)	Ue/Ua (%)
1	25.1	12.8	58.1
2	27.0	13.9	63.1
3	24.8	12.3	56.5
4	23.5	12.1	54.8
5	24.8	12.2	56.3
6	24.9	12.7	57.8
7	27.1	13.7	62.6
8	19.7	10.4	46.7
9	27.1	12.1	58.1
11	24.5	11.0	52.8
12	26.6	11.7	56.4
14	27.4	12.4	59.2
15	27.7	12.8	60.6
18	37.5	13.1	70.4
19	36.1	13.1	69.1
21	36.0	12.6	67.8
23	40.1	13.8	74.7
24	41.6	14.4	77.9
26	41.3	13.9	76.0
28	45.2	14.5	81.2

APPENDIX H

WIND ROSE OF NON-DIMENSIONAL AND EQUIVALENT WIND VELOCITIES

Cermak Peterka Petersen, Inc.

H-3

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

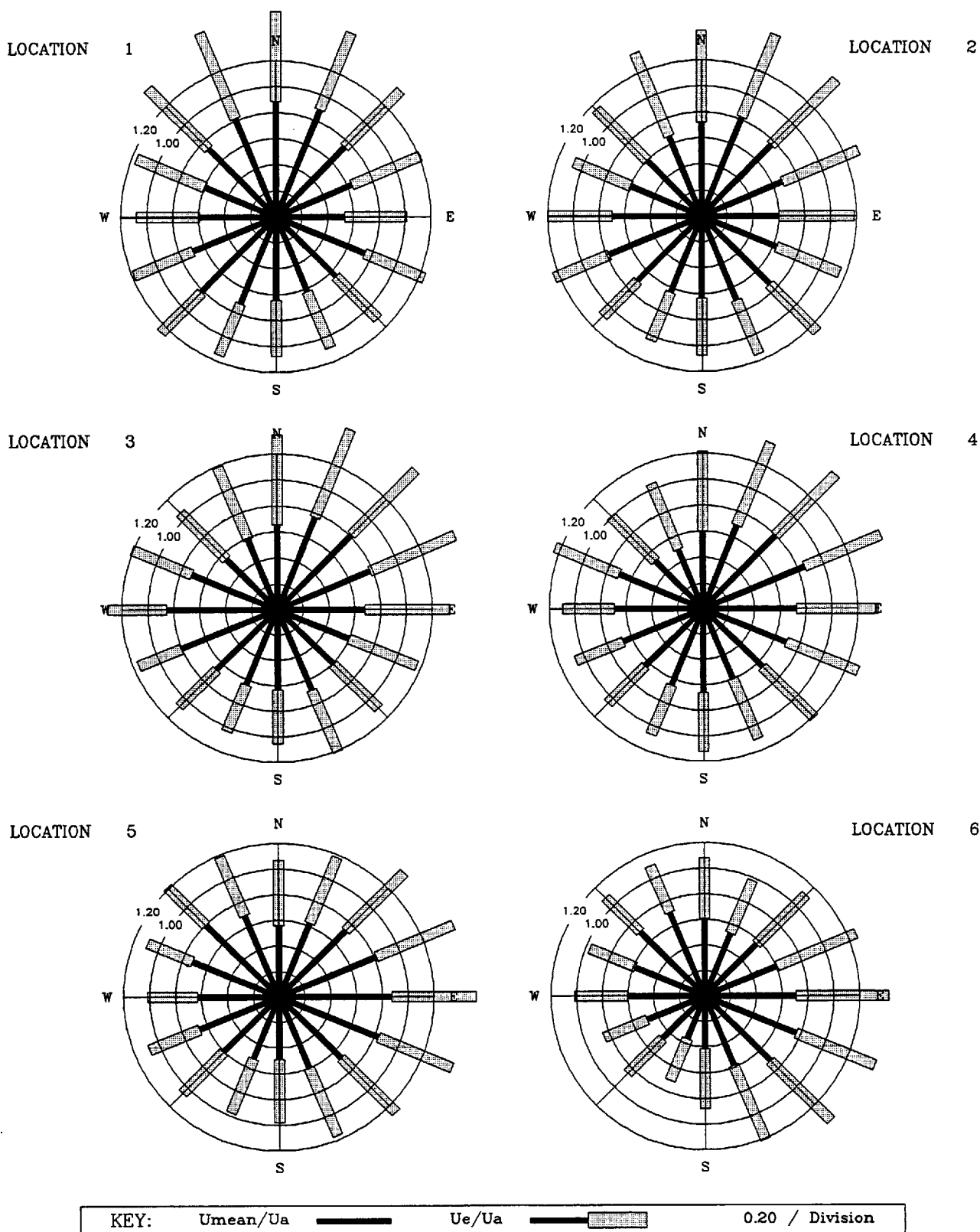


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

CPP

Cermak Peterka Petersen, Inc.

H-4

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 5 - 1.00 Roof Height Ratio

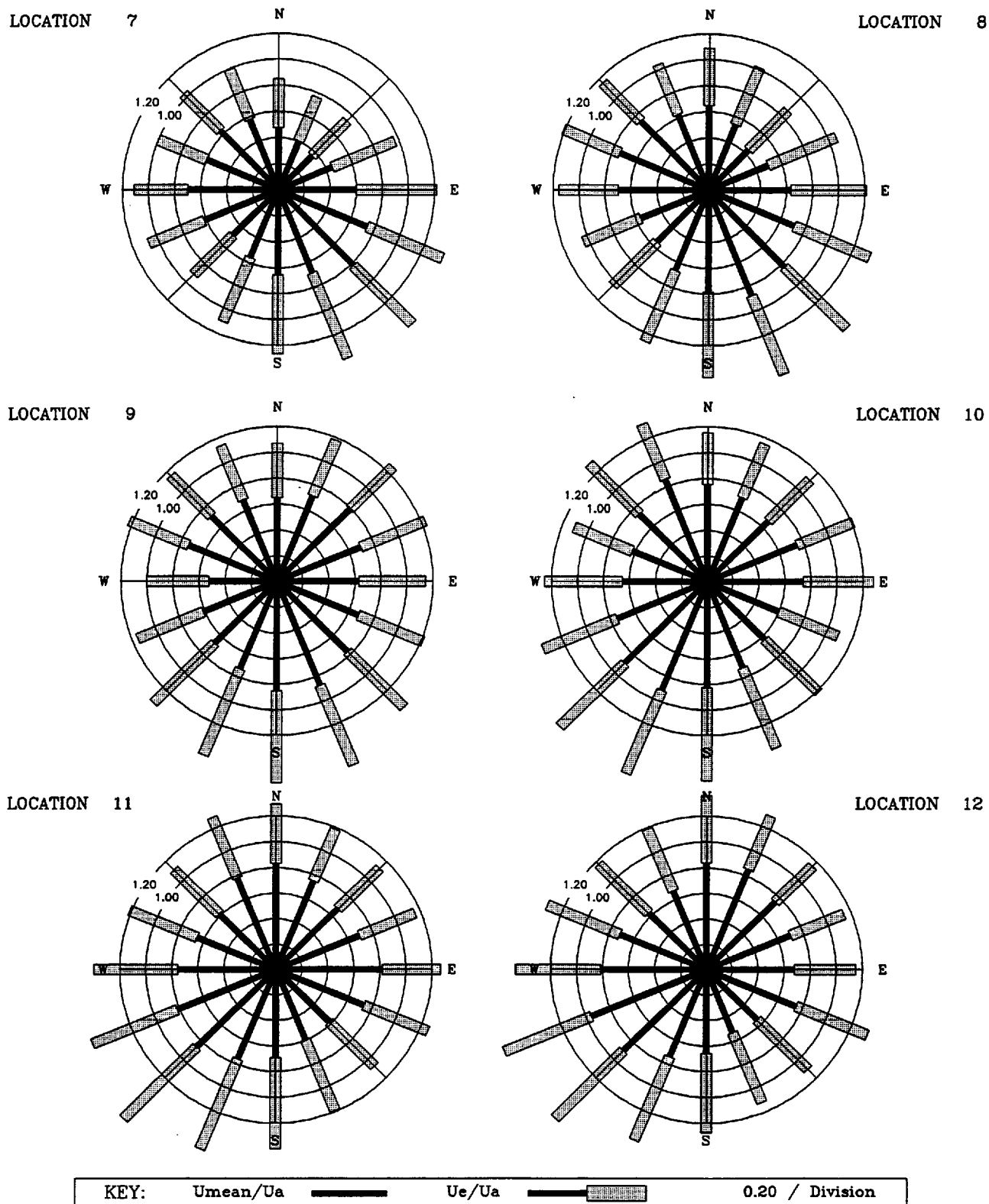


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-5

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 6 - 0.80 Roof Height Ratio

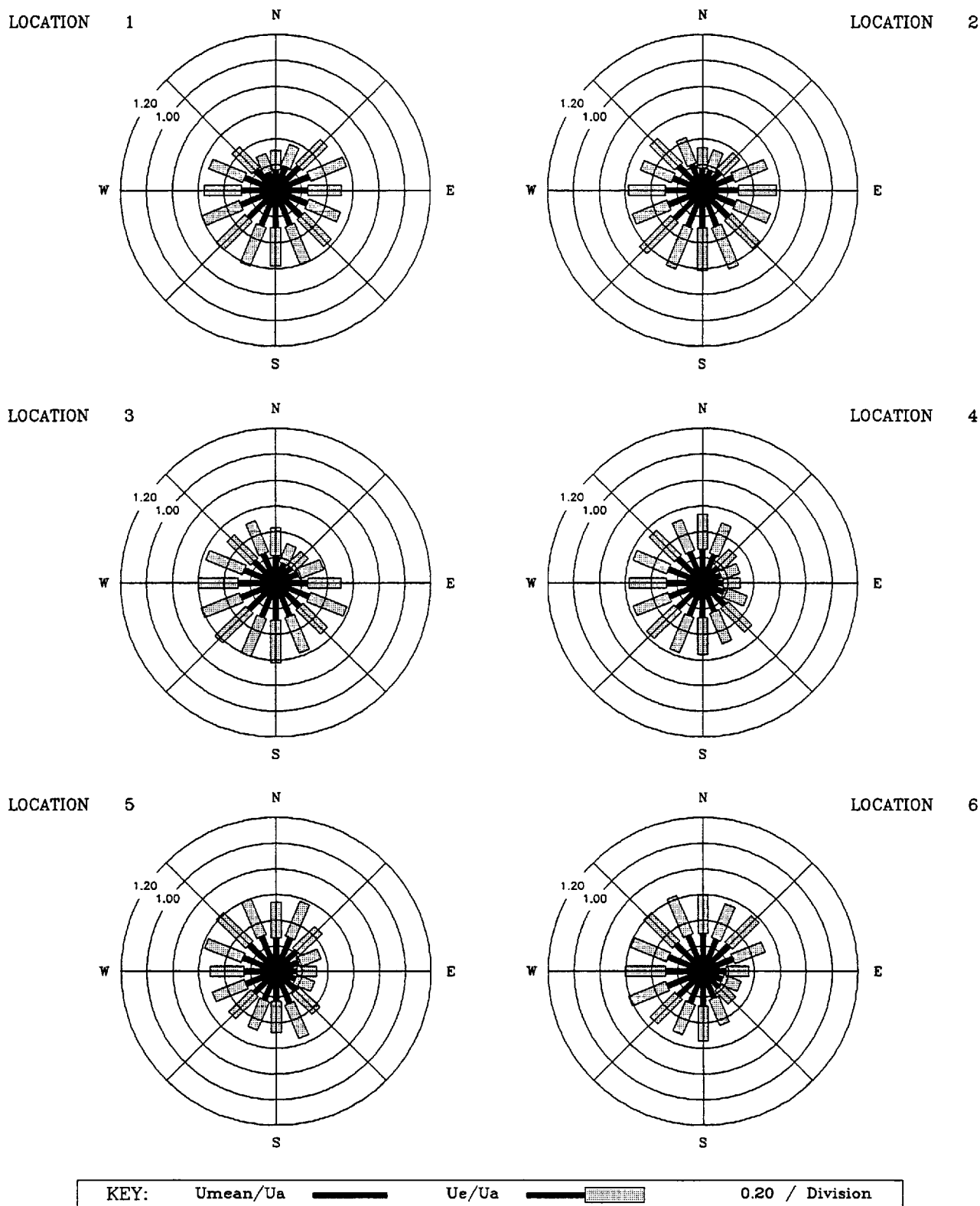


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

CPP

Cermak Peterka Petersen, Inc.

H-6

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

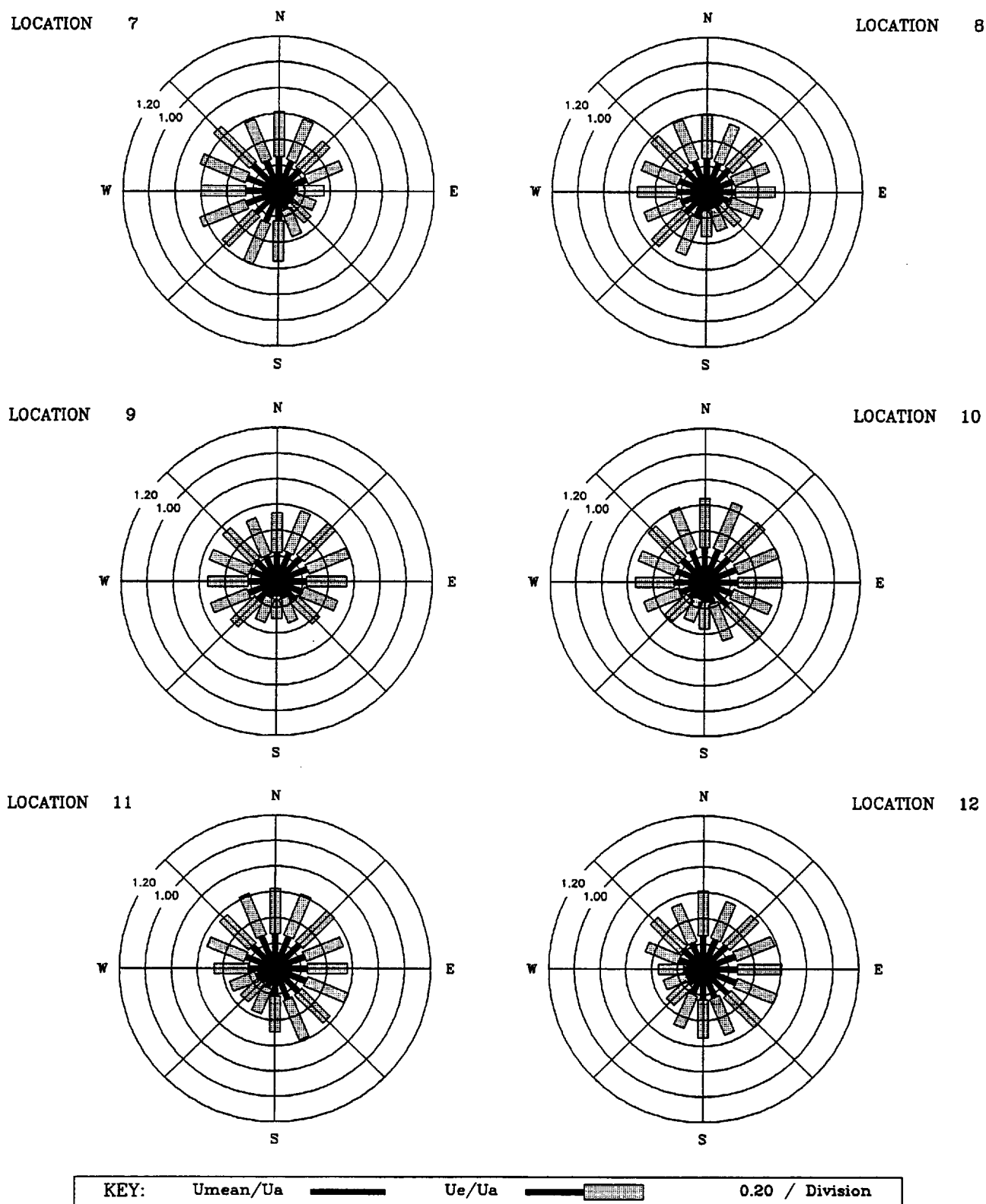


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-7

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

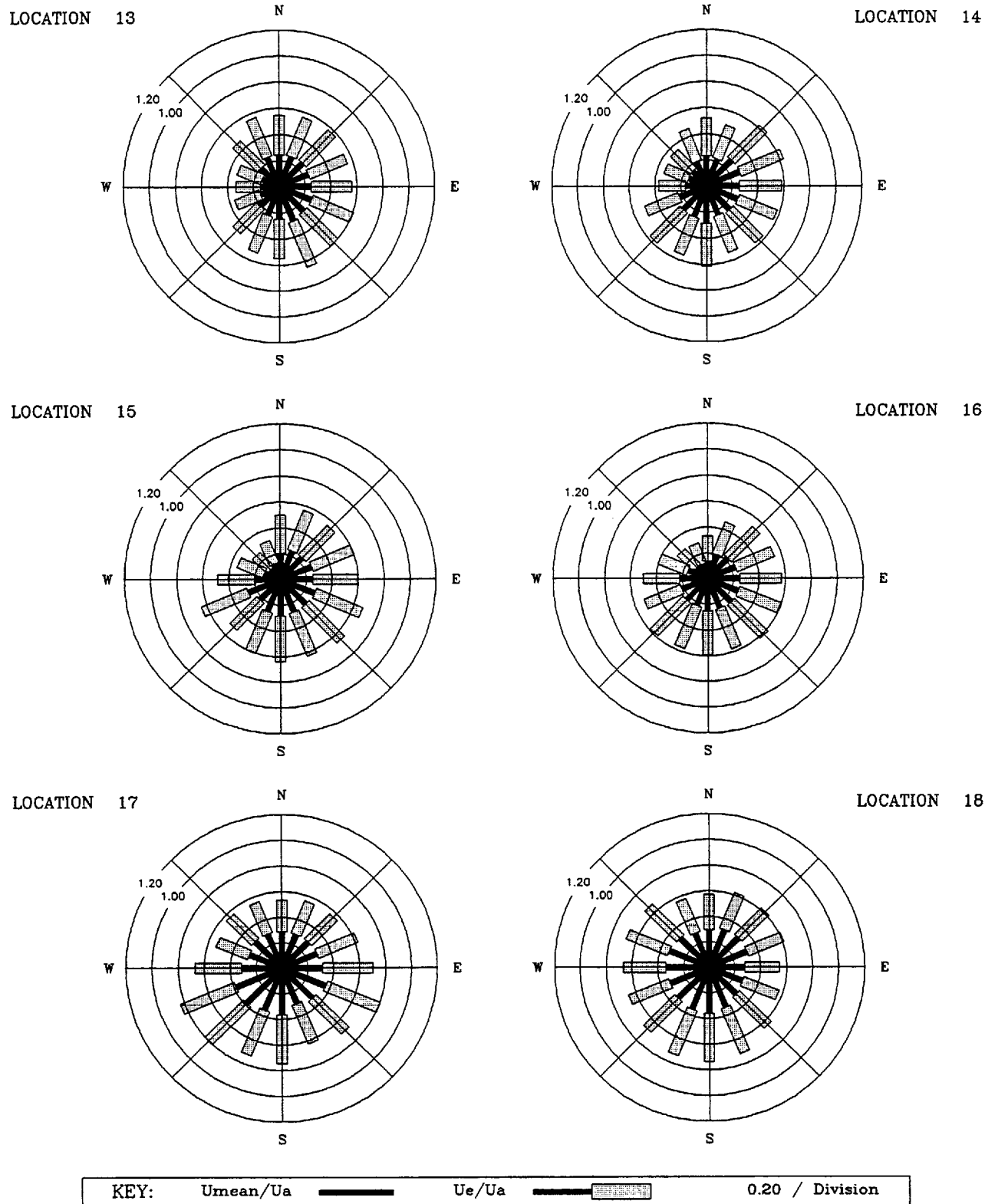


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-8

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio

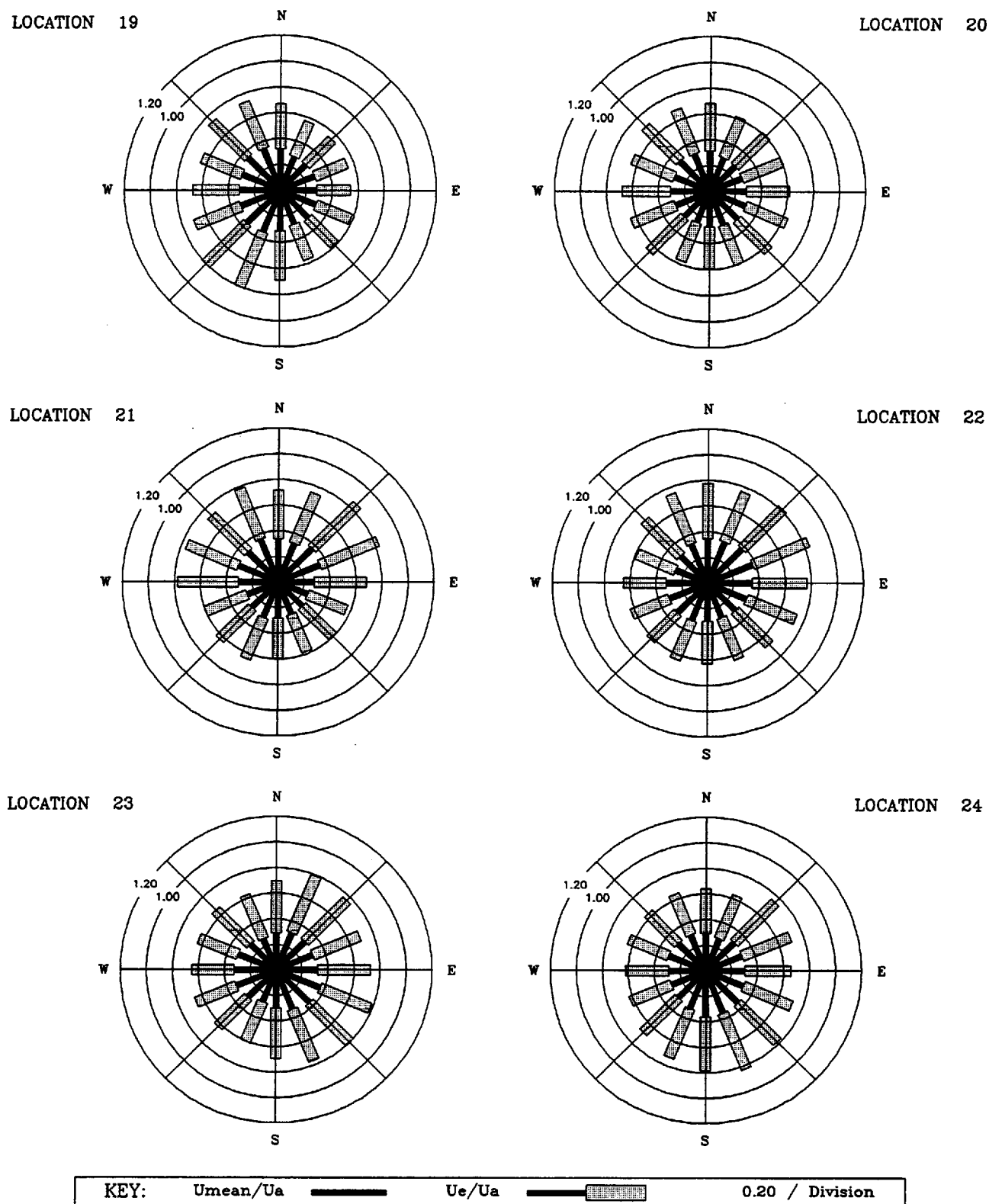


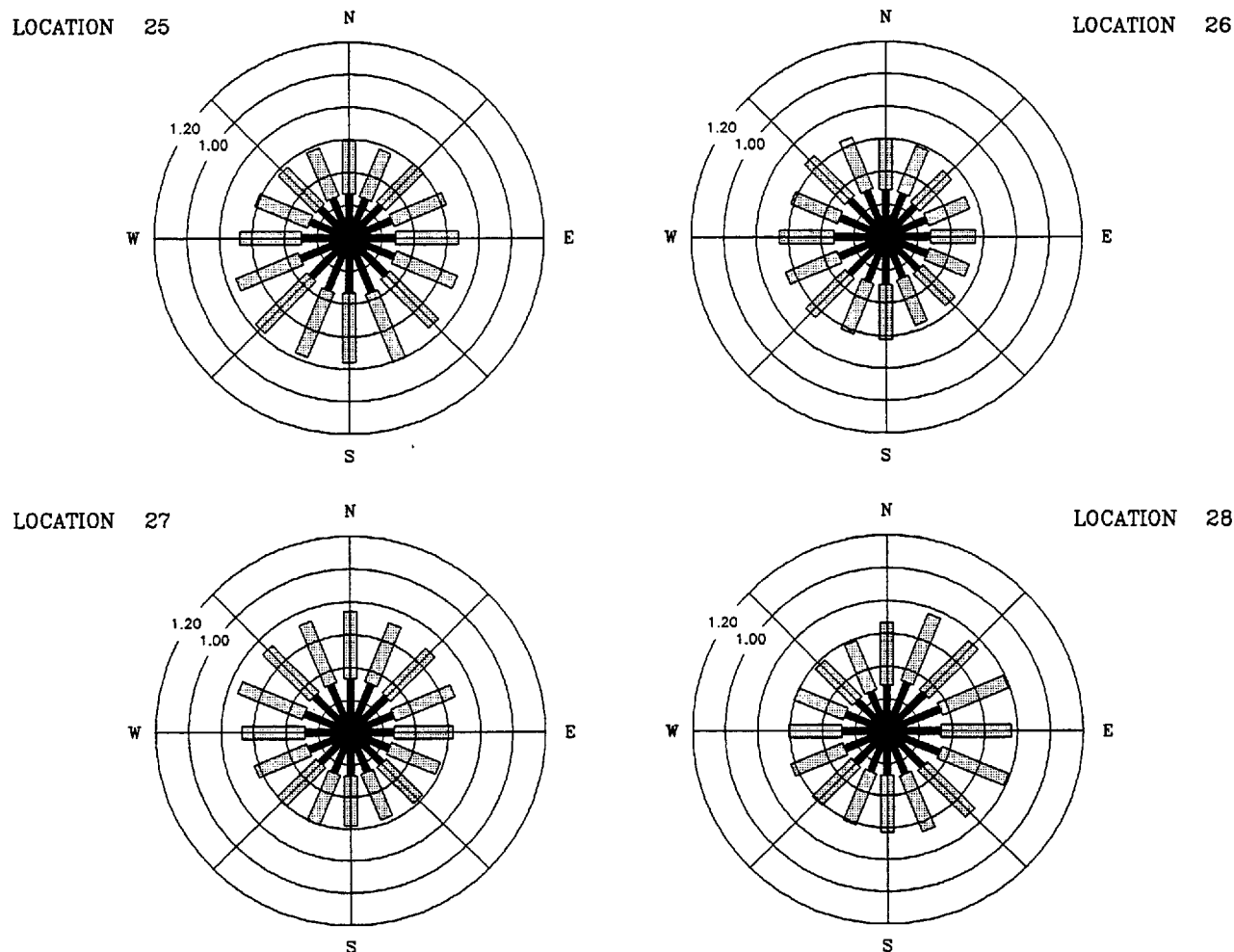
Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-9

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 6 - 0.80 Roof Height Ratio



KEY: U_{mean}/U_a U_e/U_a 0.20 / Division

Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

CPP

Cermak Peterka Petersen, Inc.

H-10

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

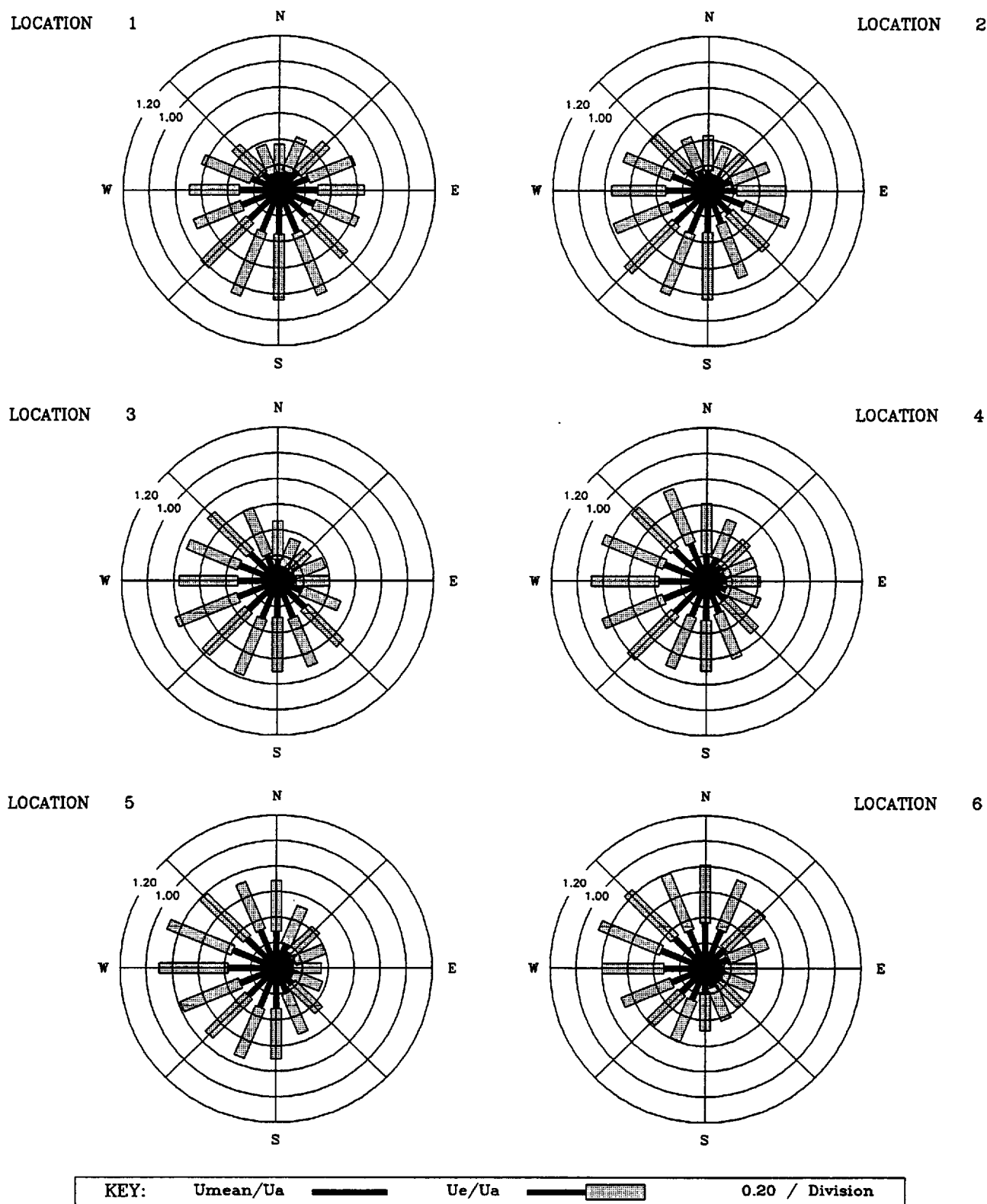


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-11

CPP Project 92-0869

API - Floating Roof

Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 7 - 0.35 Roof Height Ratio

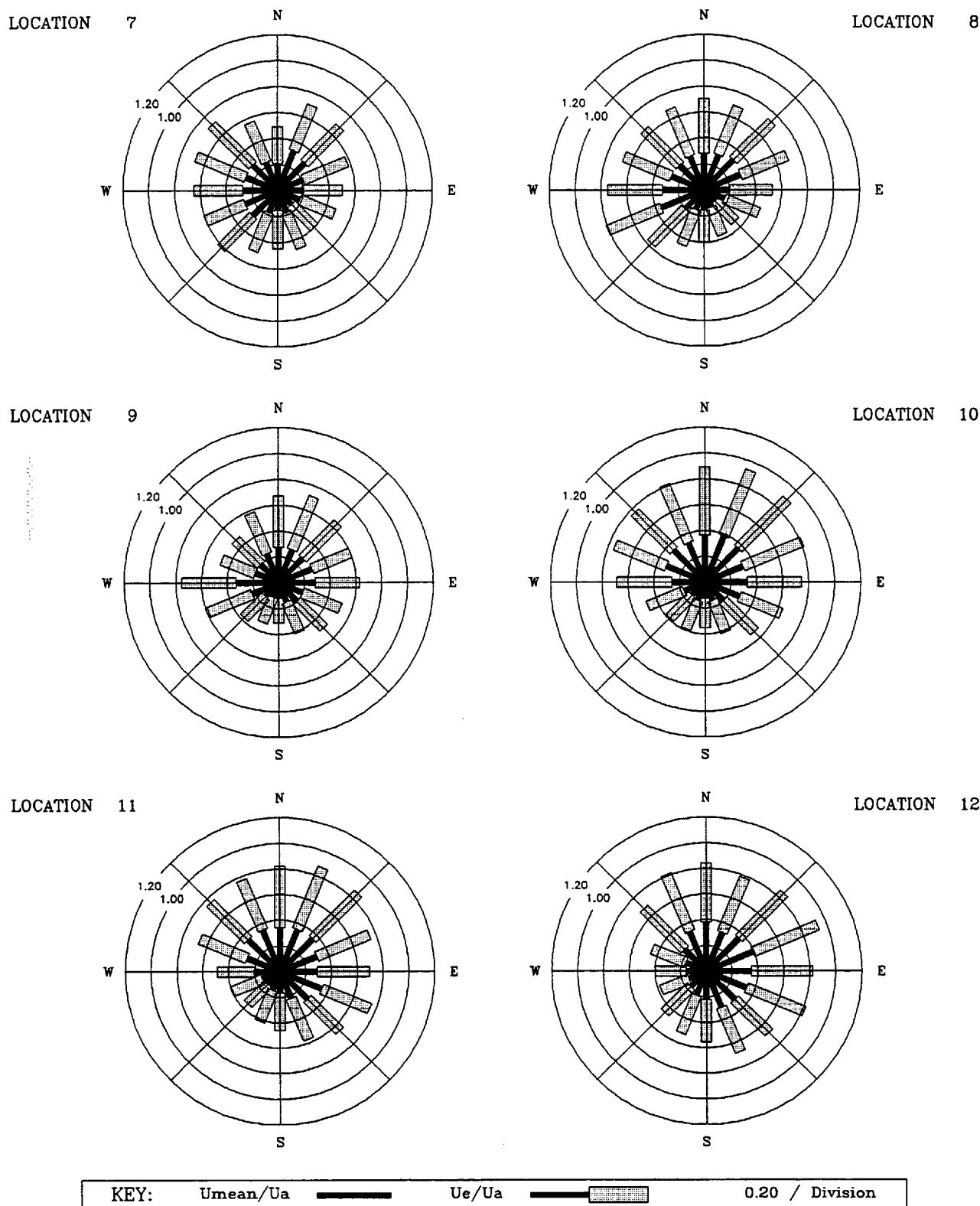


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

CPP

Cermak Peterka Petersen, Inc.

H-12

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio

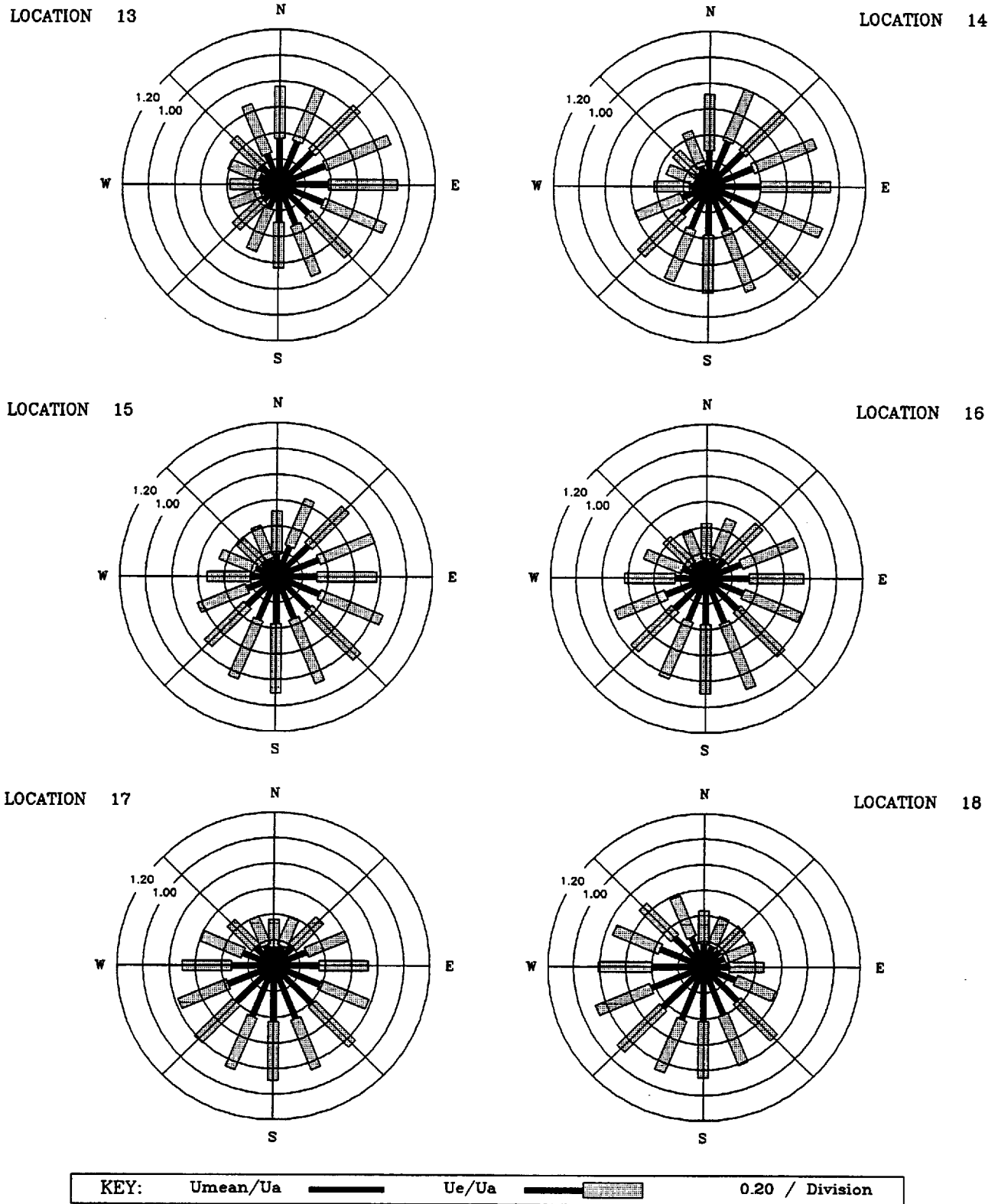


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-13

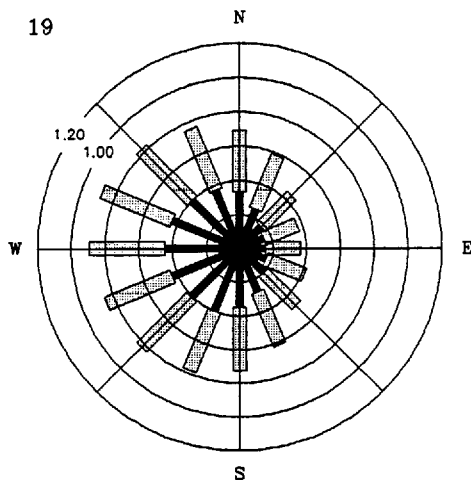
CPP Project 92-0869

API - Floating Roof

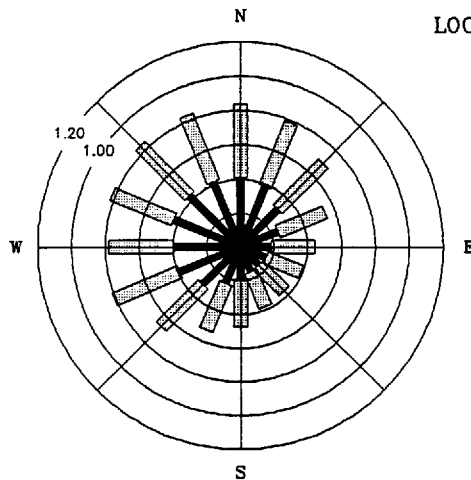
Configuration A - Tank A - 200' Dia x 48' Tall

Data Set 7 - 0.35 Roof Height Ratio

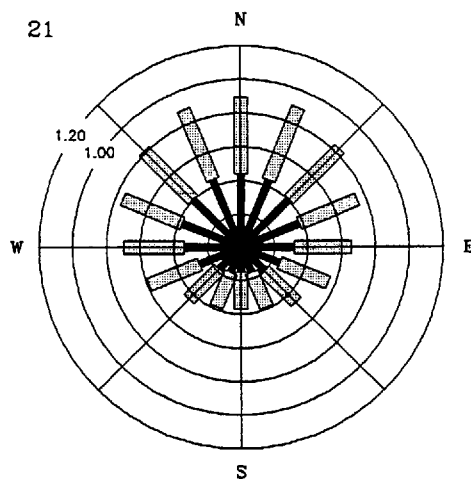
LOCATION 19



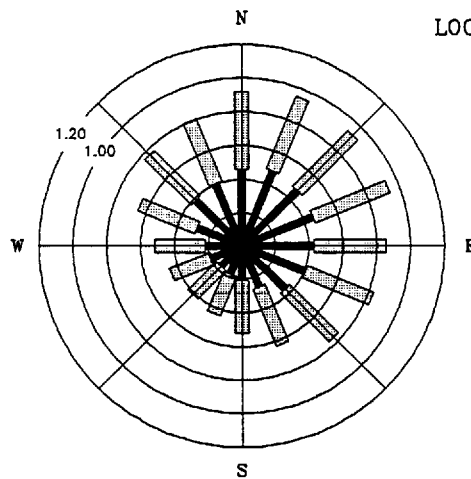
LOCATION 20



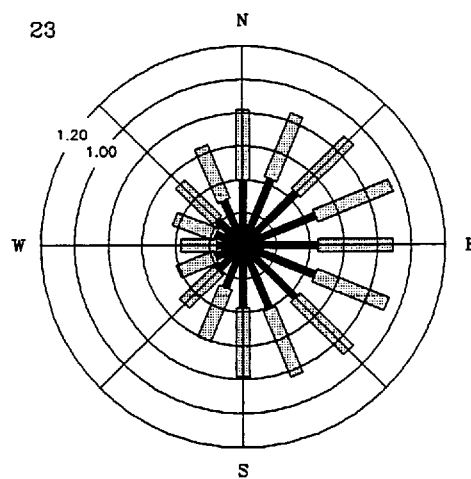
LOCATION 21



LOCATION 22



LOCATION 23



LOCATION 24

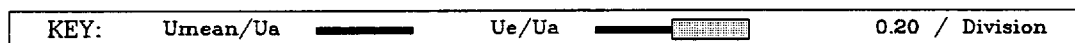
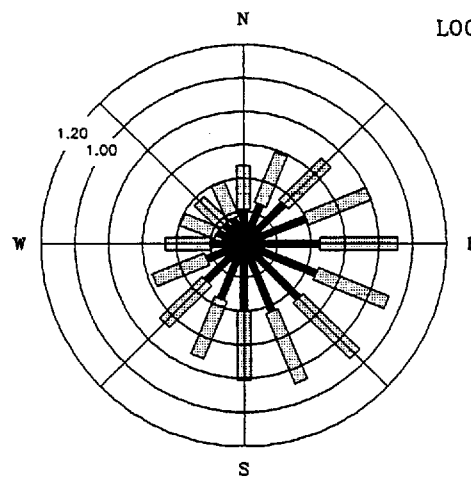


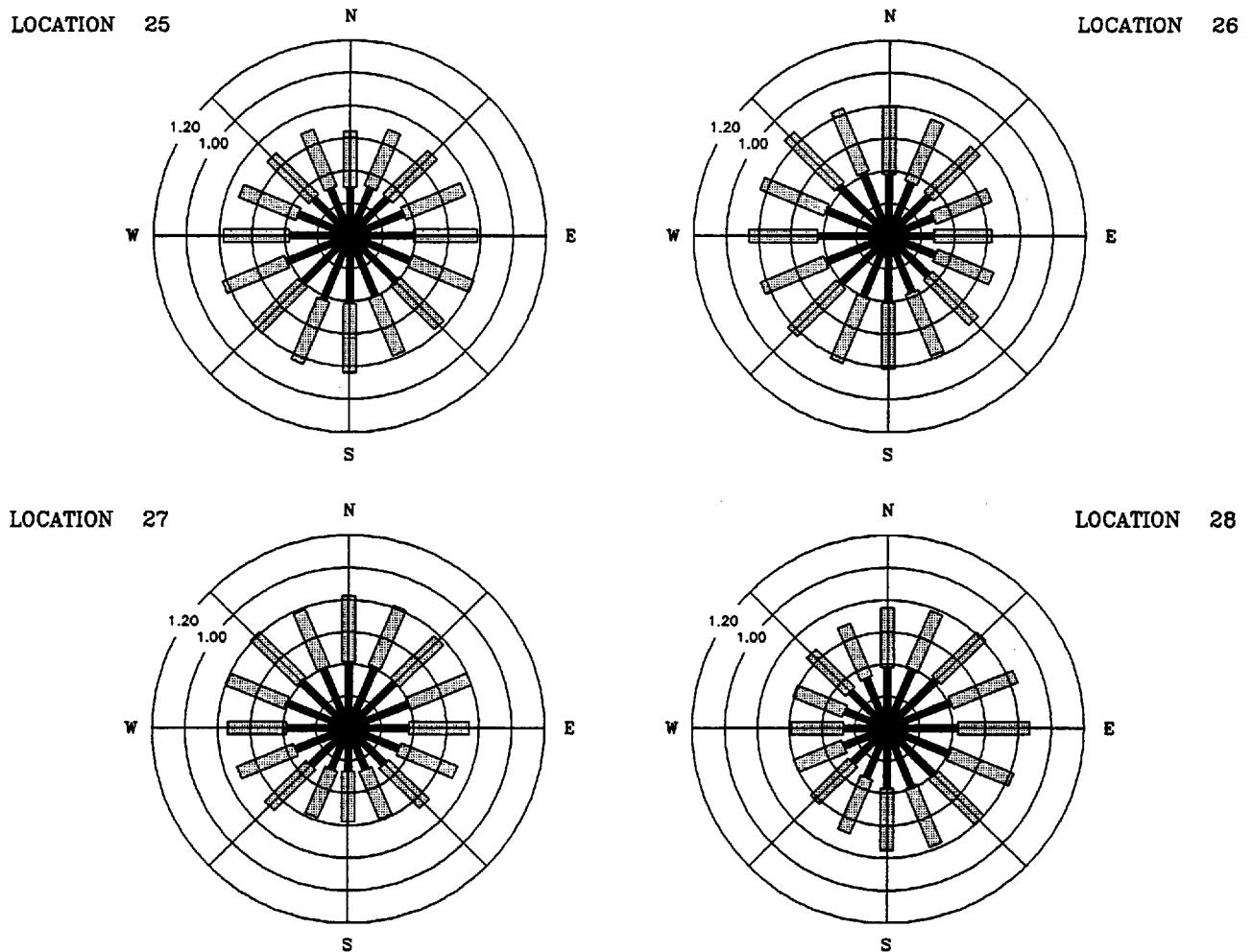
Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-14

CPP Project 92-0869

API - Floating Roof
Configuration A - Tank A - 200' Dia x 48' Tall
Data Set 7 - 0.35 Roof Height Ratio



KEY: U_{mean}/U_a ——— U_e/U_a [shaded] 0.20 / Division

Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-15

CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

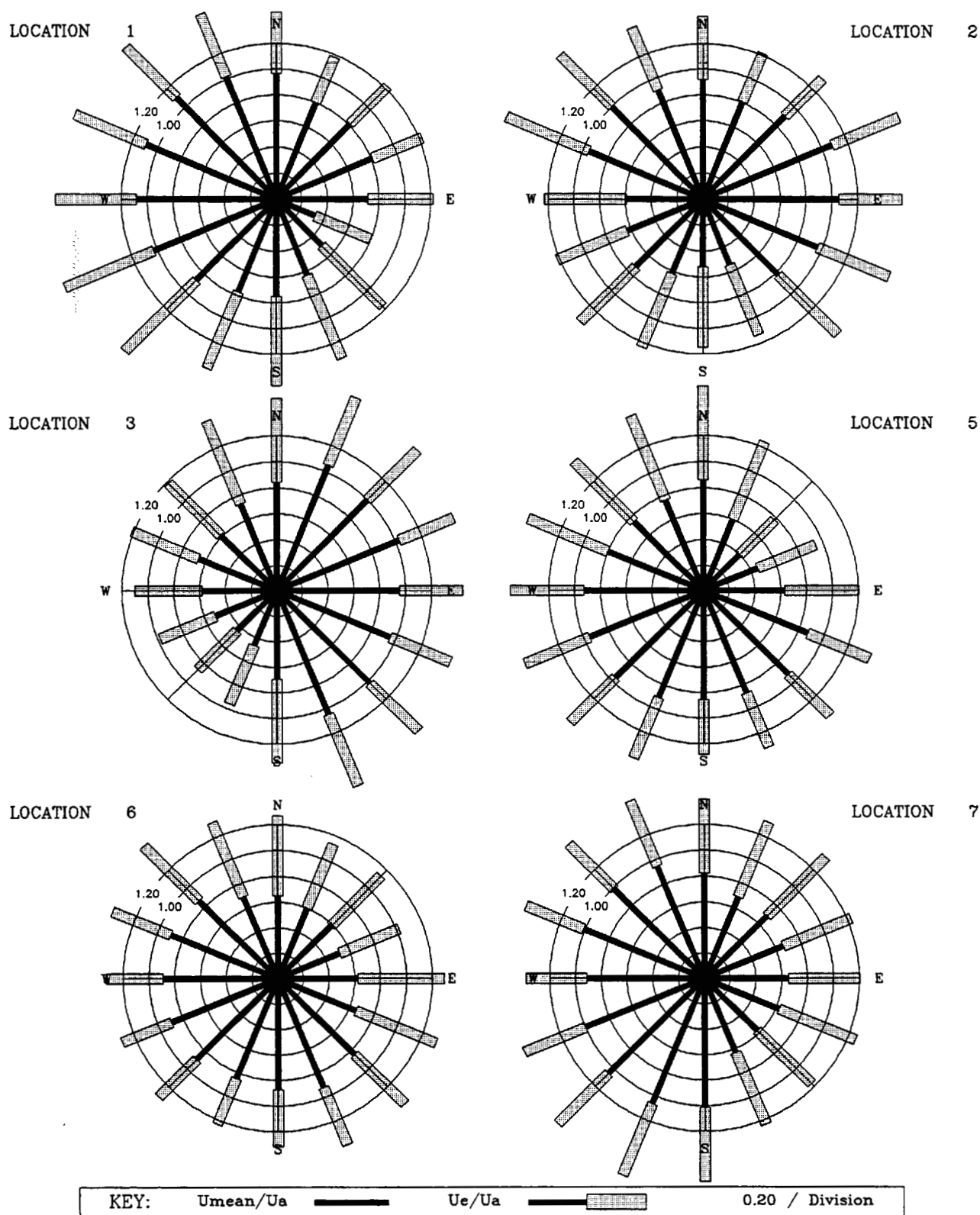


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-16

CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

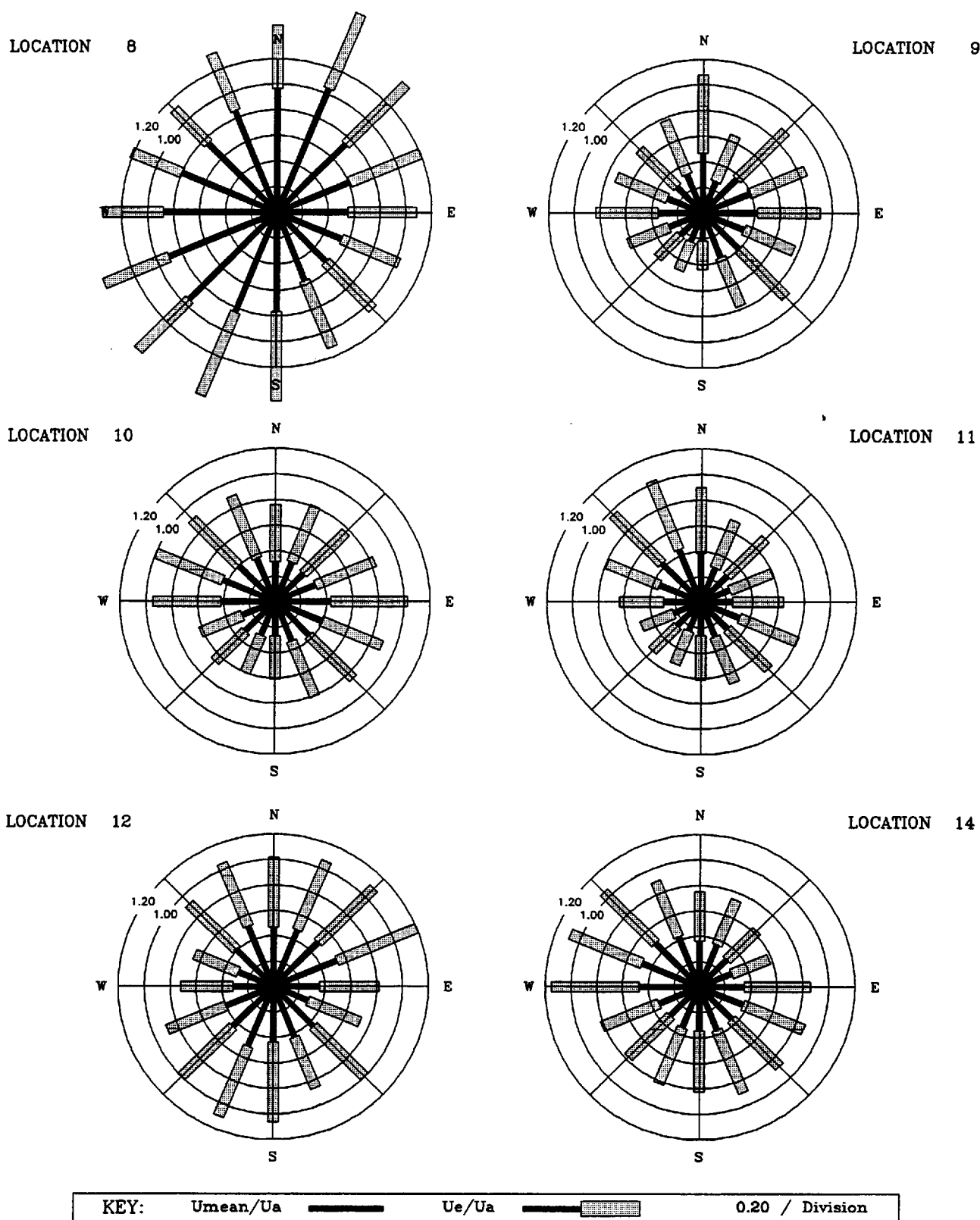


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

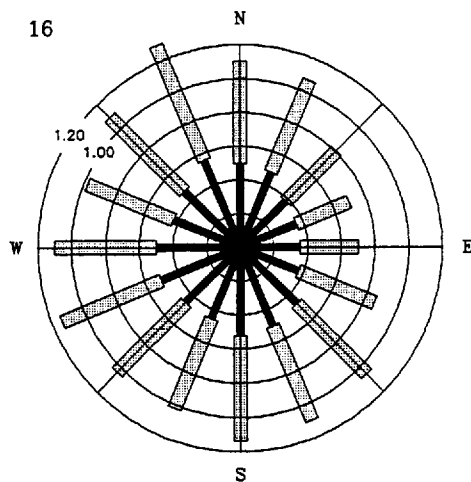
Cermak Peterka Petersen, Inc.

H-17

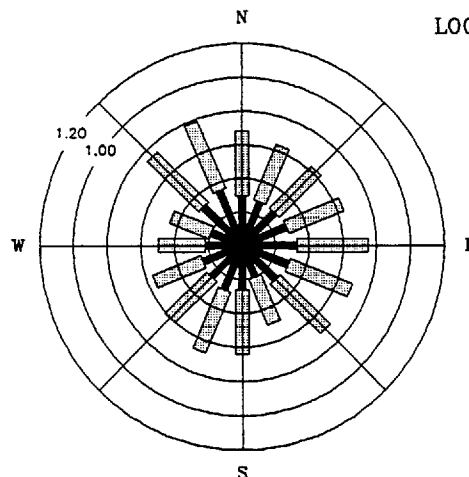
CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 12 - 1.00 Roof Height Ratio

LOCATION 16



LOCATION 18



LOCATION 20

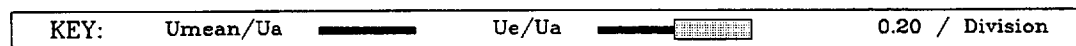
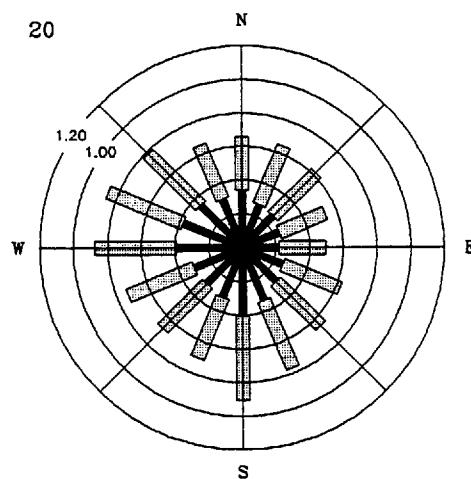


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-18

CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

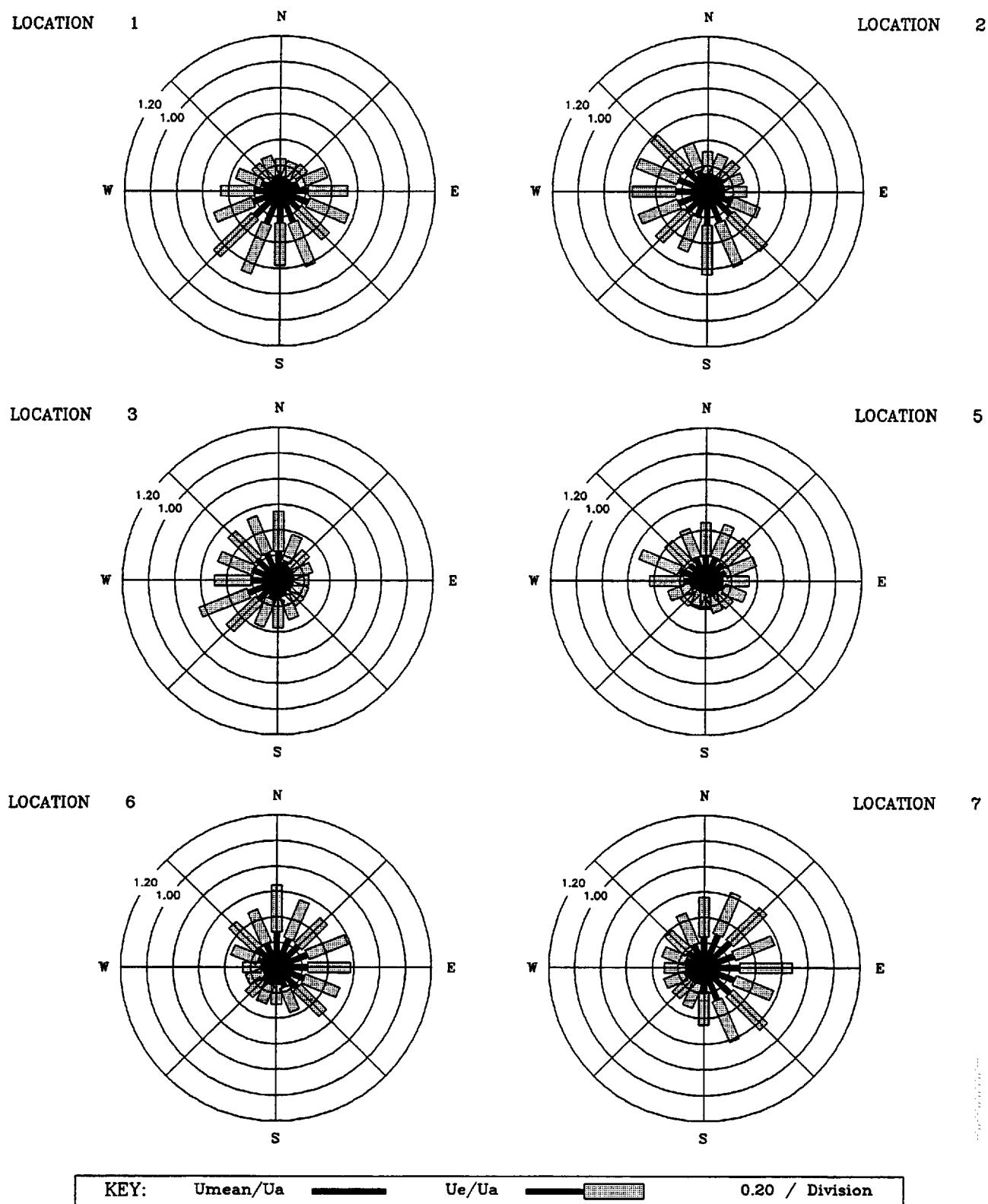


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-19

CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

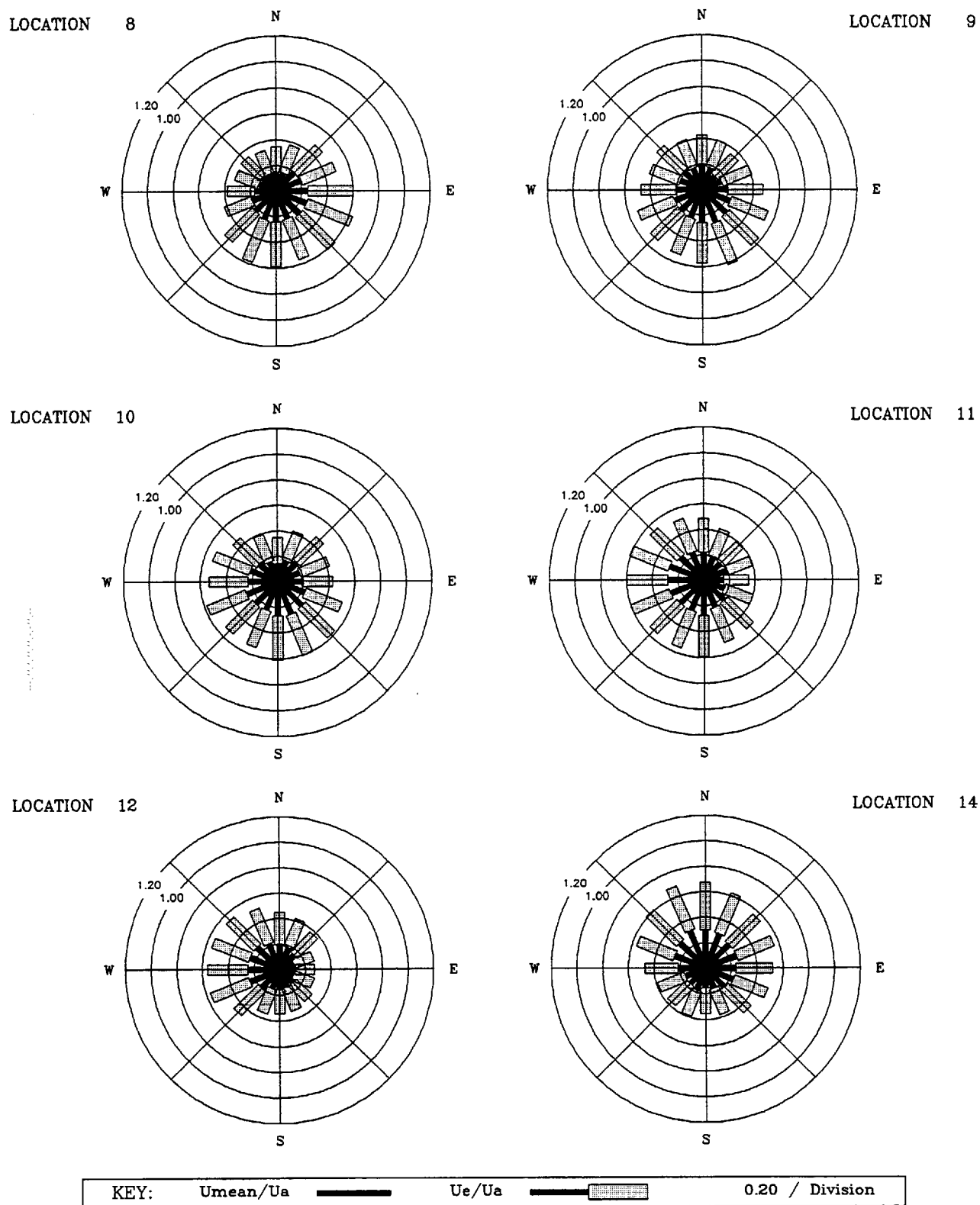


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-20

CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 13 - 0.90 Roof Height Ratio

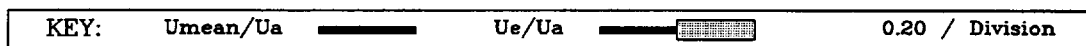
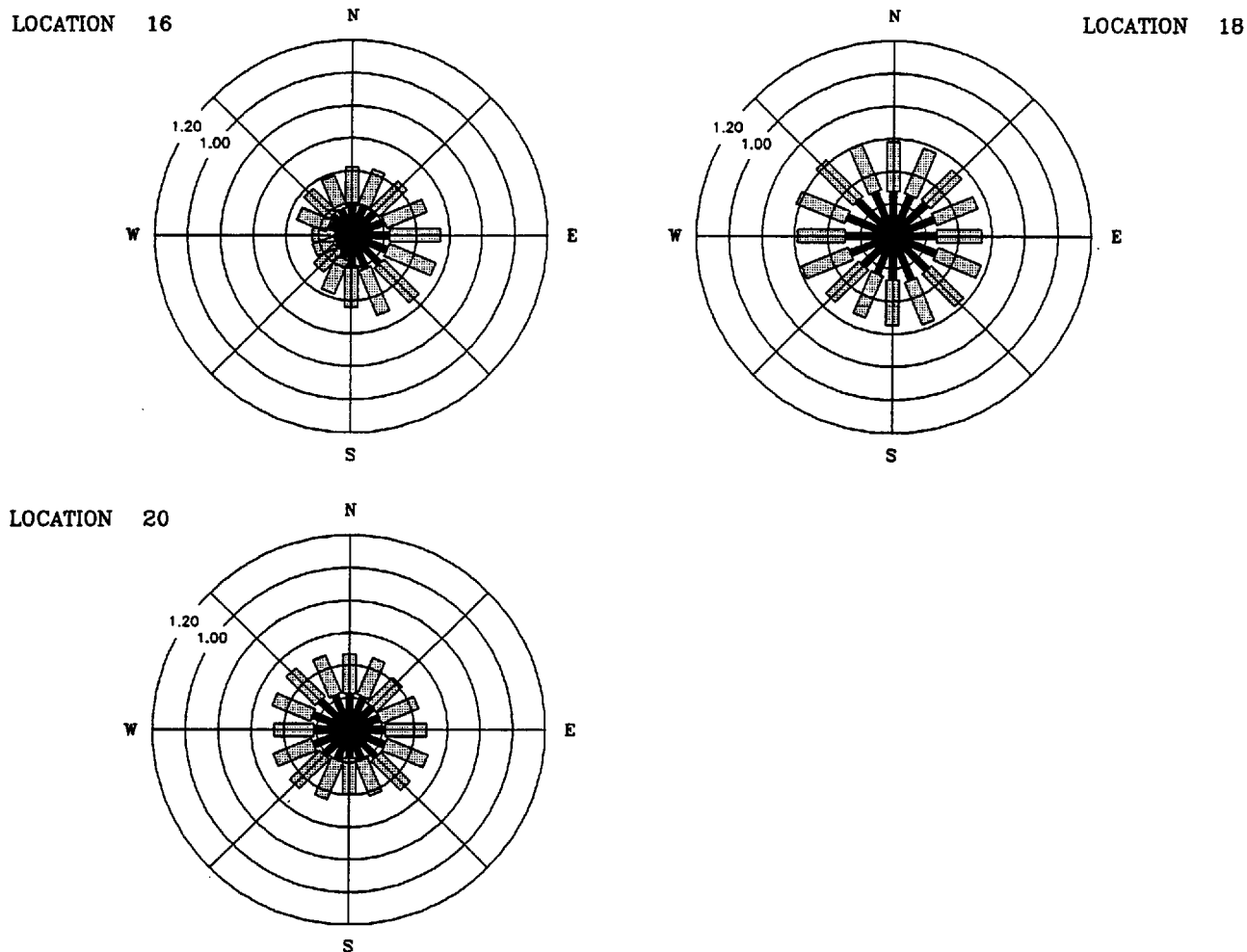


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-21

CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

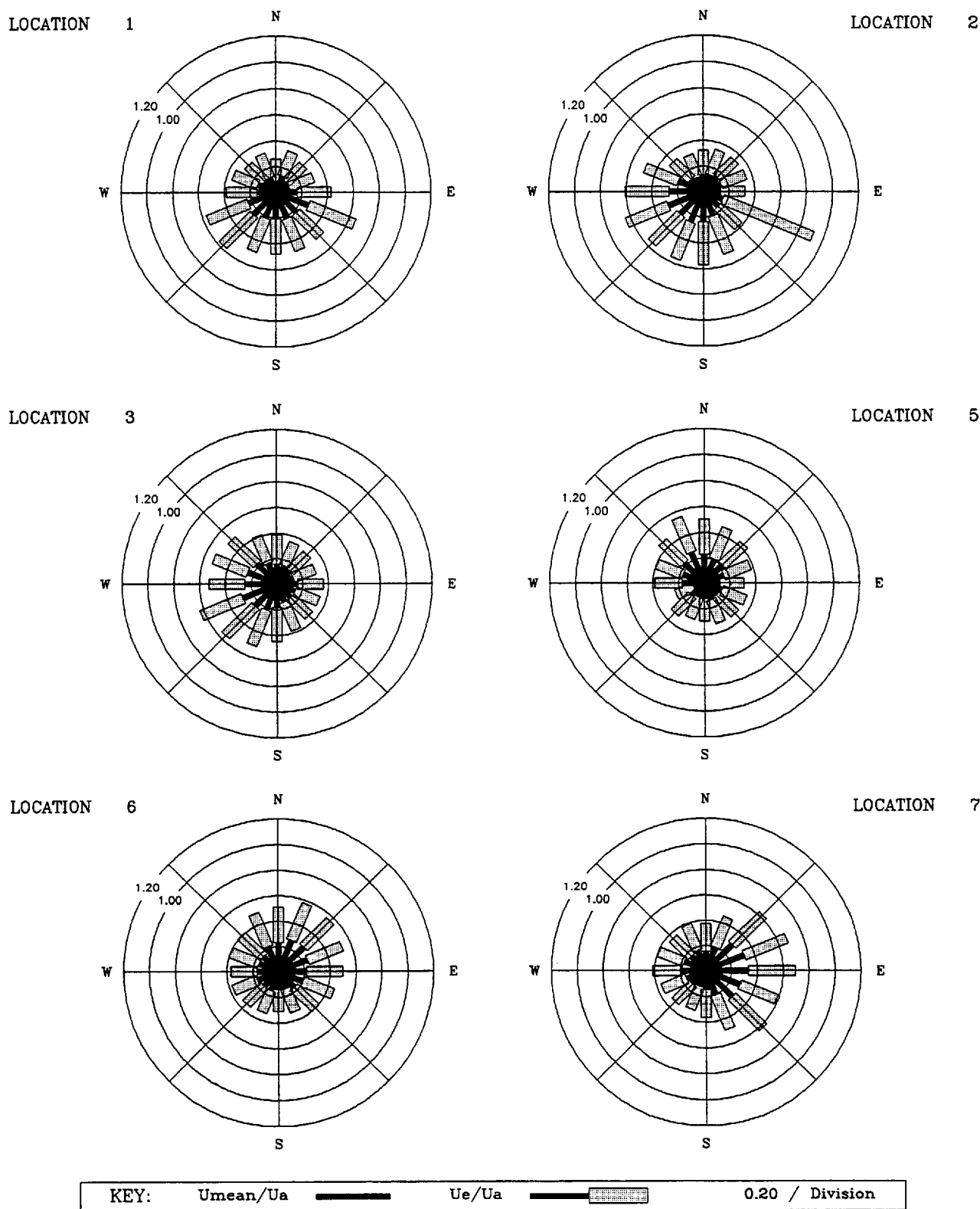


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-22

CPP Project 92-0869

API - Floating Roof
Configuration B - Tank B - 48' Dia x 48' Tall
Data Set 14 - 0.75 Roof Height Ratio

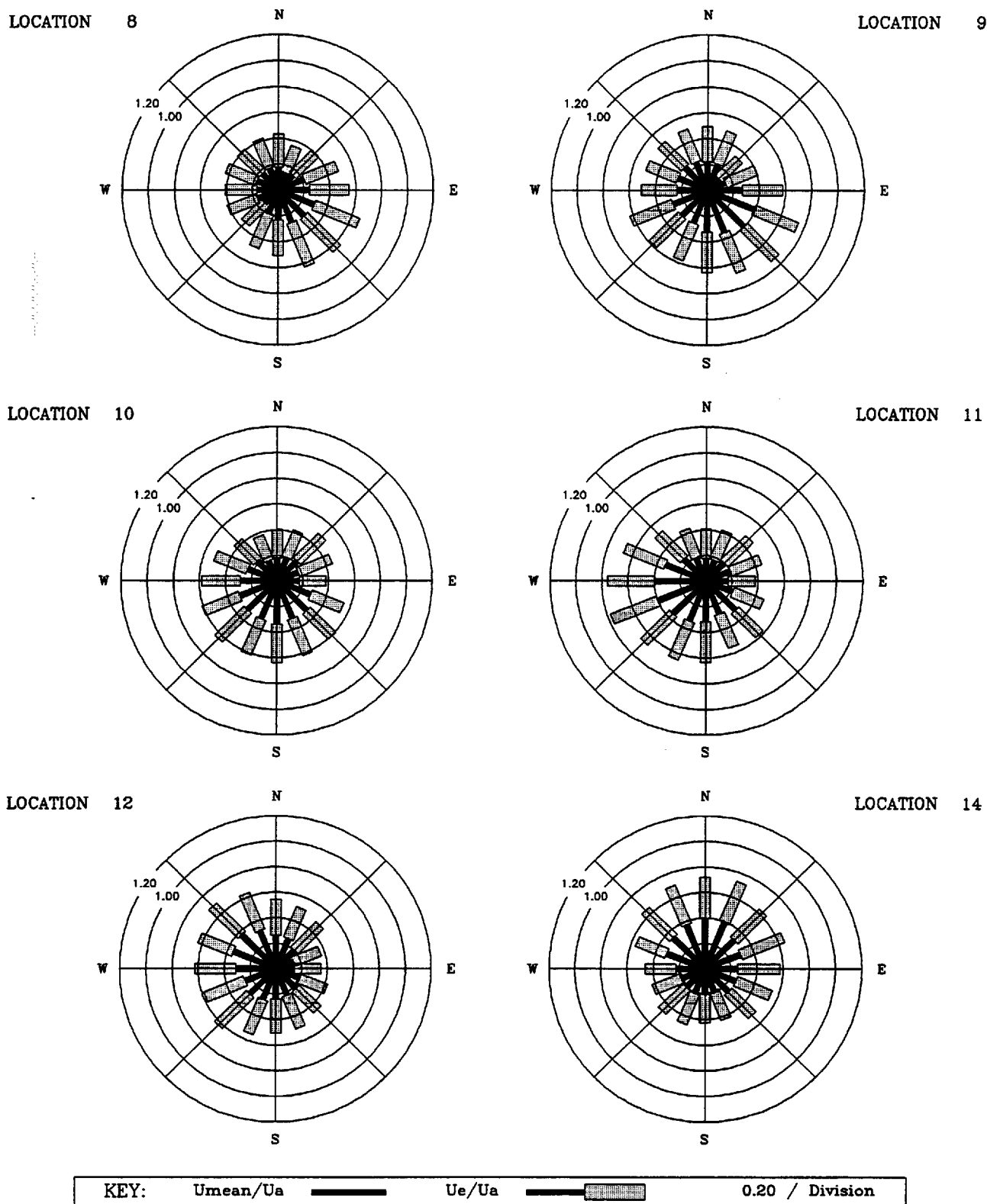


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-23

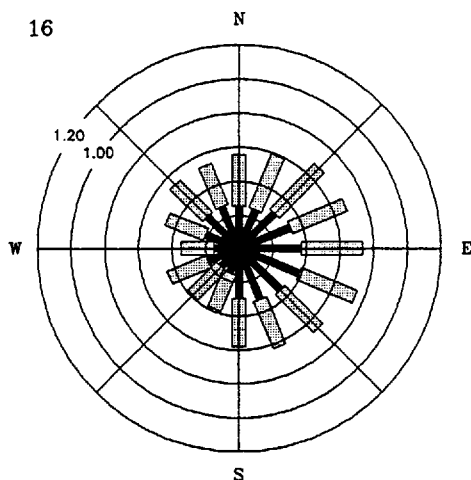
CPP Project 92-0869

API - Floating Roof

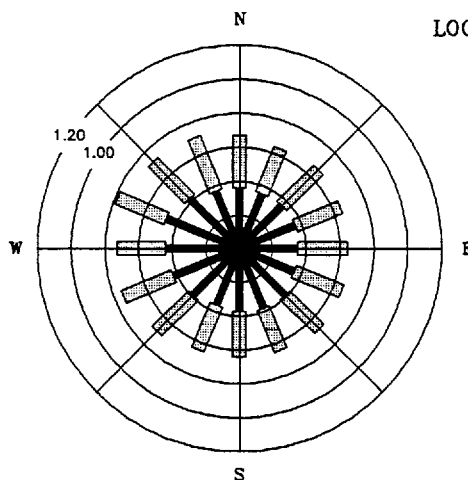
Configuration B - Tank B - 48' Dia x 48' Tall

Data Set 14 - 0.75 Roof Height Ratio

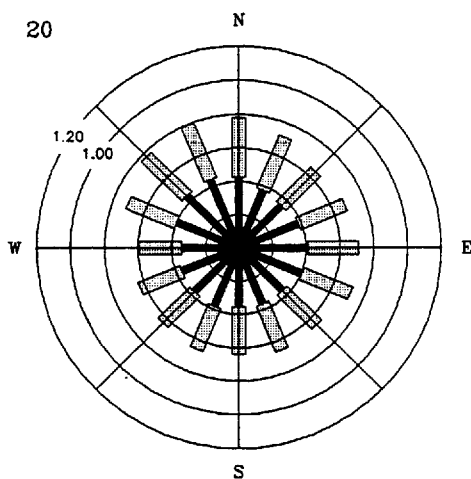
LOCATION 16



LOCATION 18



LOCATION 20



KEY: U_{mean}/U_a  U_e/U_a  0.20 / Division

Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

CPP 

Cermak Peterka Petersen, Inc.

H-24

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

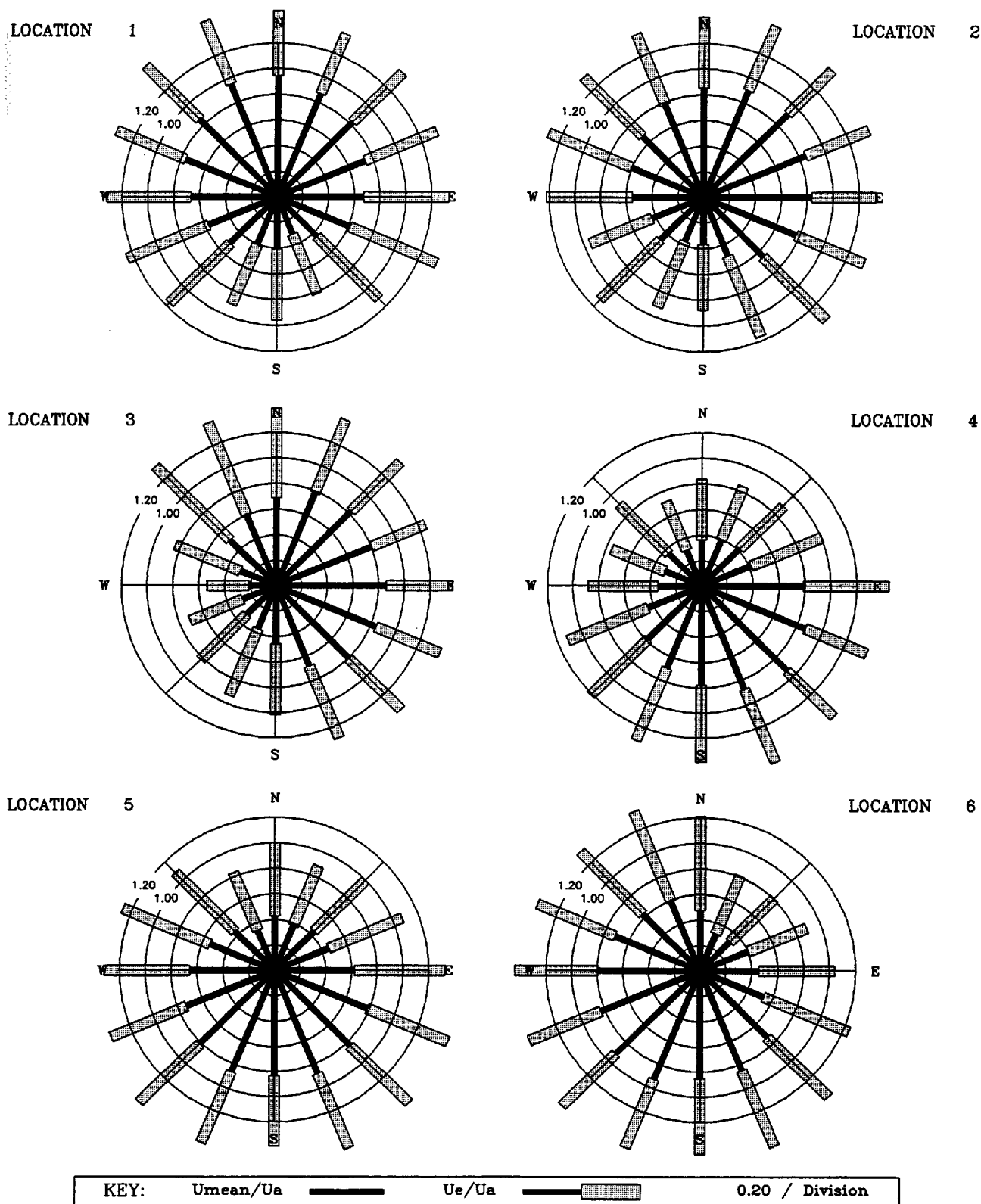


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

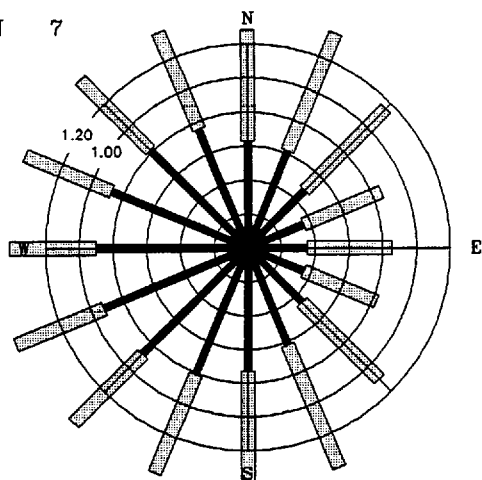
Cermak Peterka Petersen, Inc.

H-25

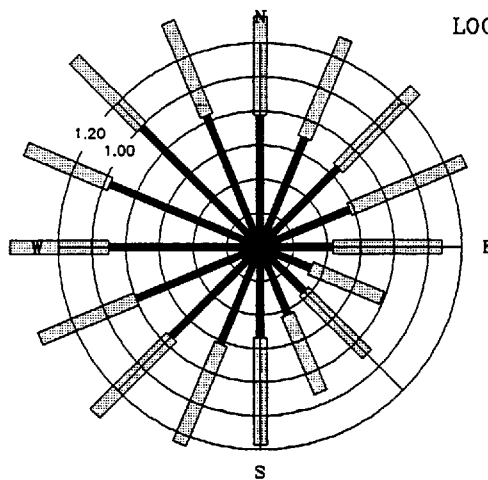
CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

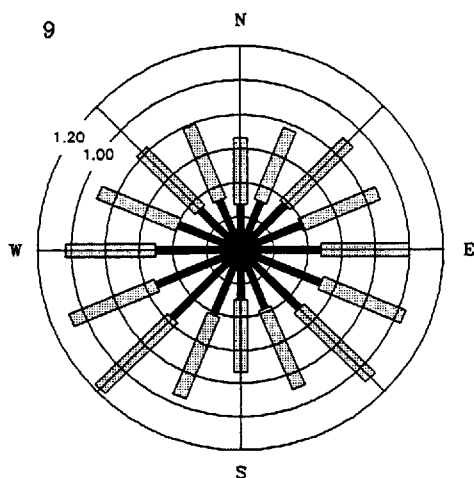
LOCATION 7



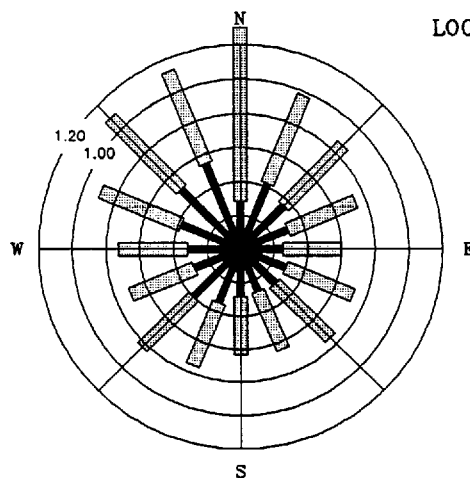
LOCATION 8



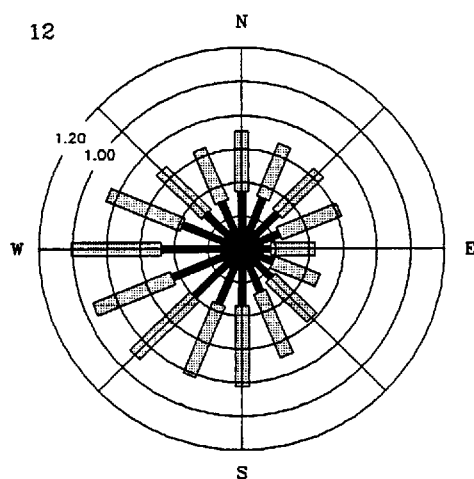
LOCATION 9



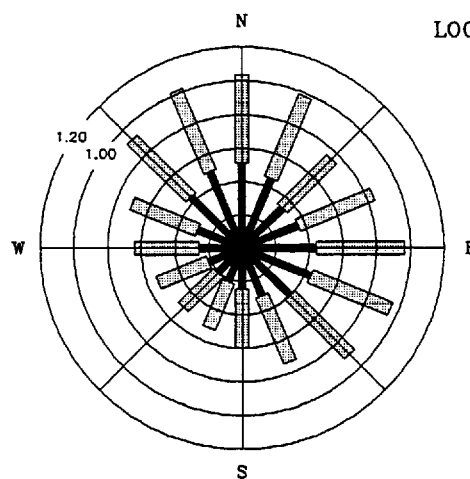
LOCATION 11



LOCATION 12



LOCATION 14



KEY: U_{mean}/U_a ——— U_e/U_a ——— 0.20 / Division

Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-26

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

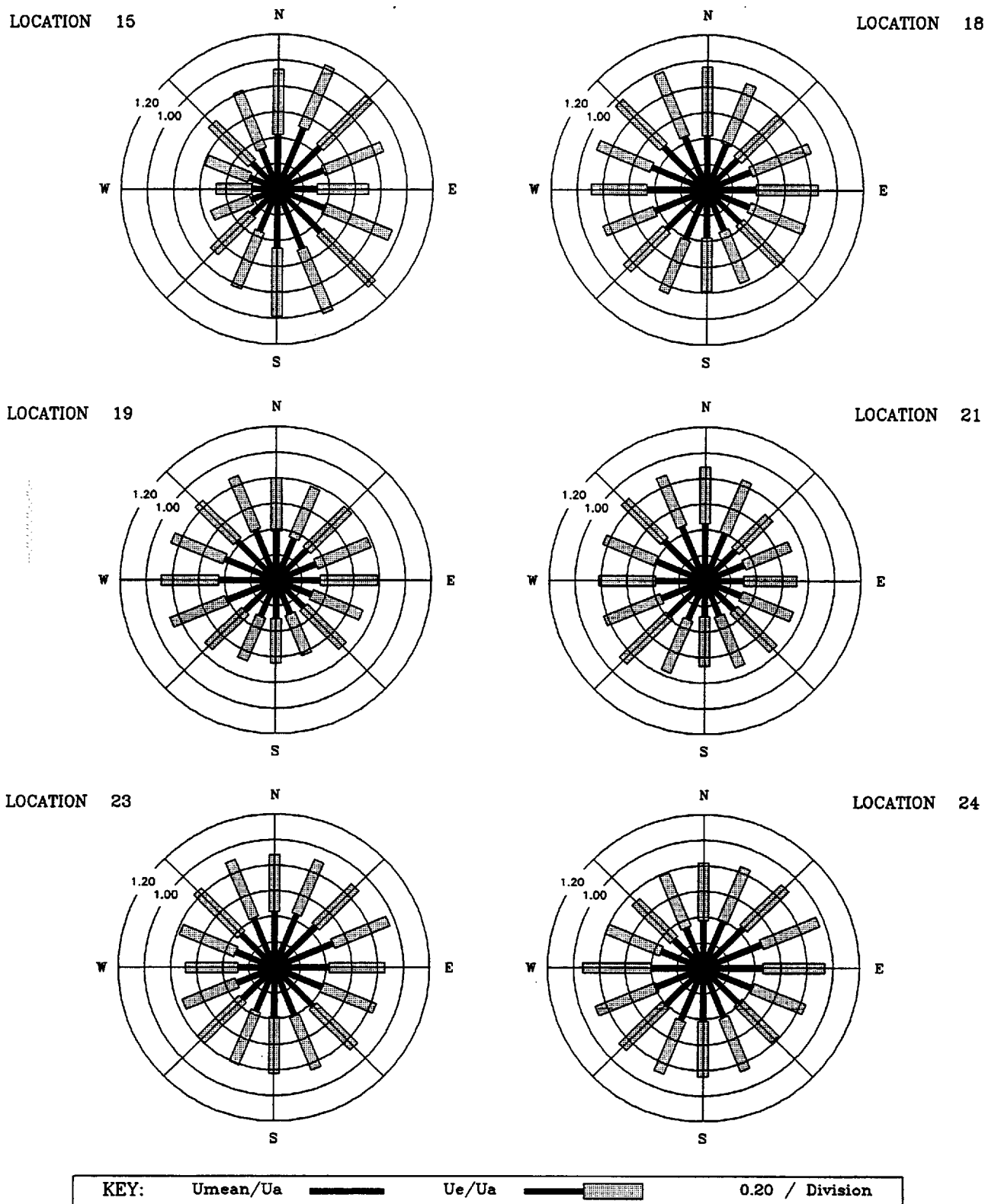


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

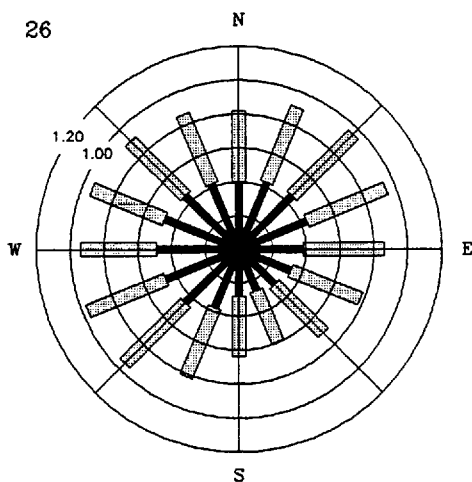
Cermak Peterka Petersen, Inc.

H-27

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 19 - 1.00 Roof Height Ratio

LOCATION 26



LOCATION 28

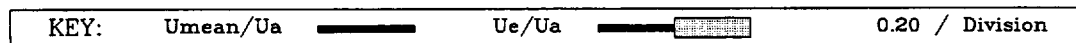
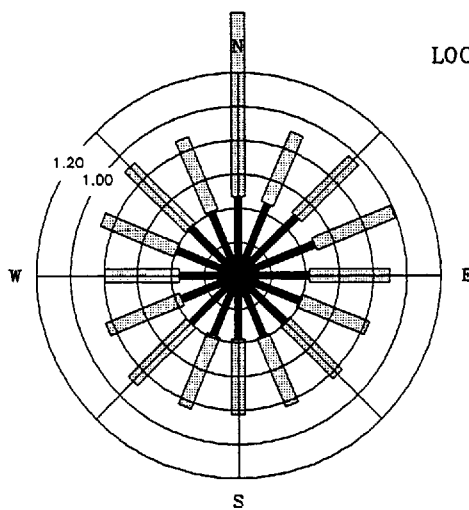


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

CPP

Cermak Peterka Petersen, Inc.

H-28

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

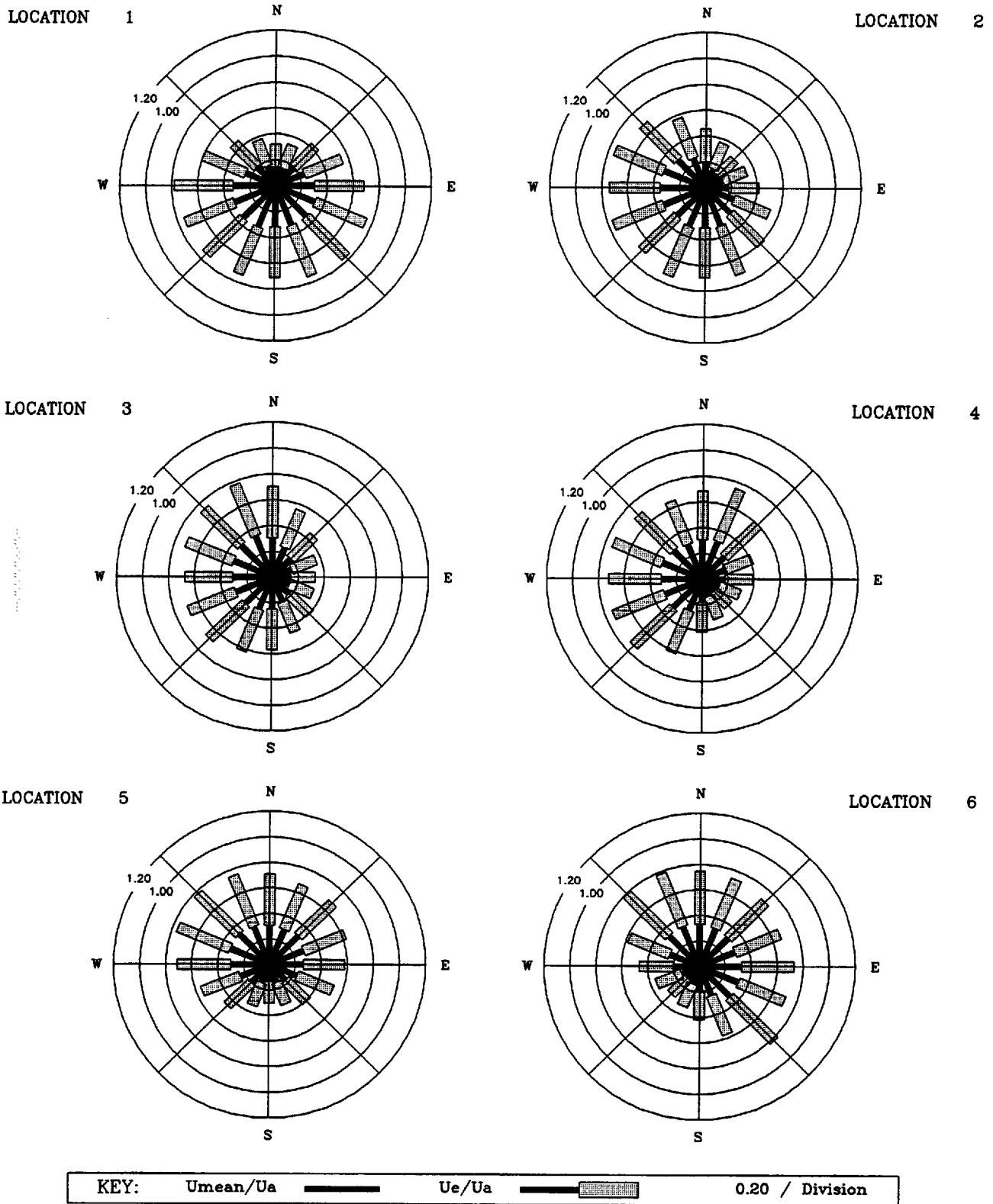


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-29

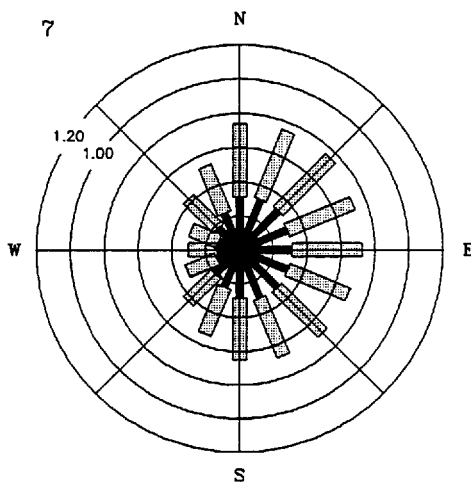
CPP Project 92-0869

API - Floating Roof

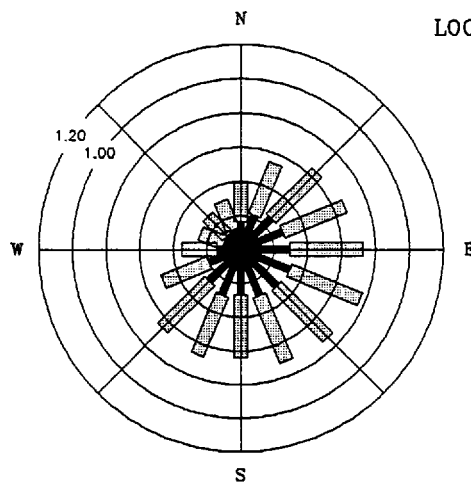
Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 20 - 0.90 Roof Height Ratio

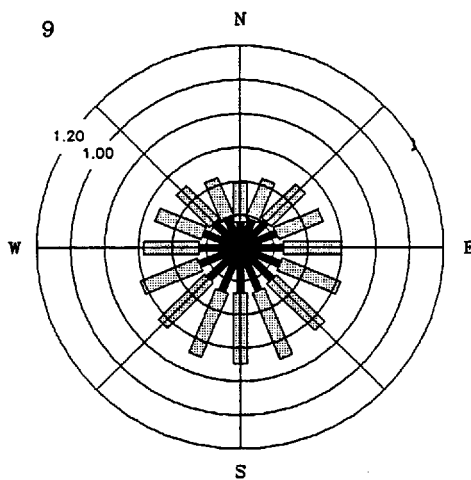
LOCATION 7



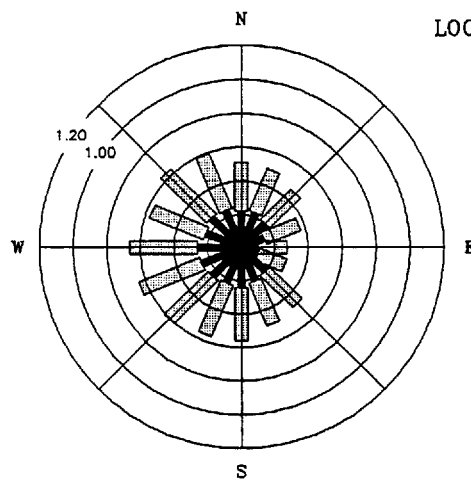
LOCATION 8



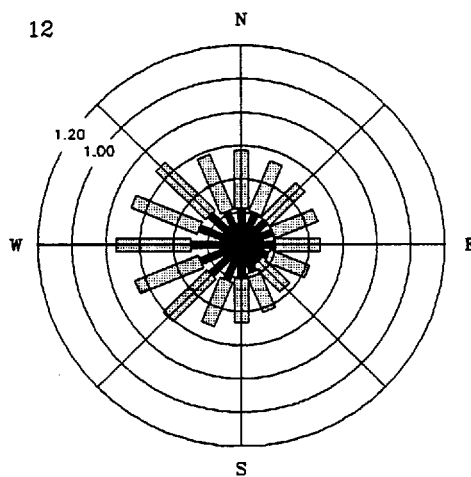
LOCATION 9



LOCATION 11



LOCATION 12



LOCATION 14

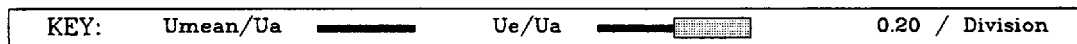
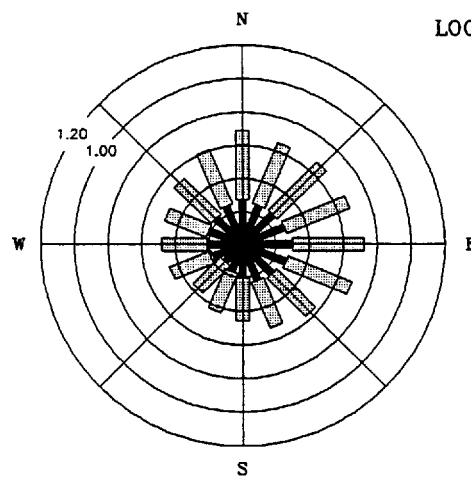


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-30

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

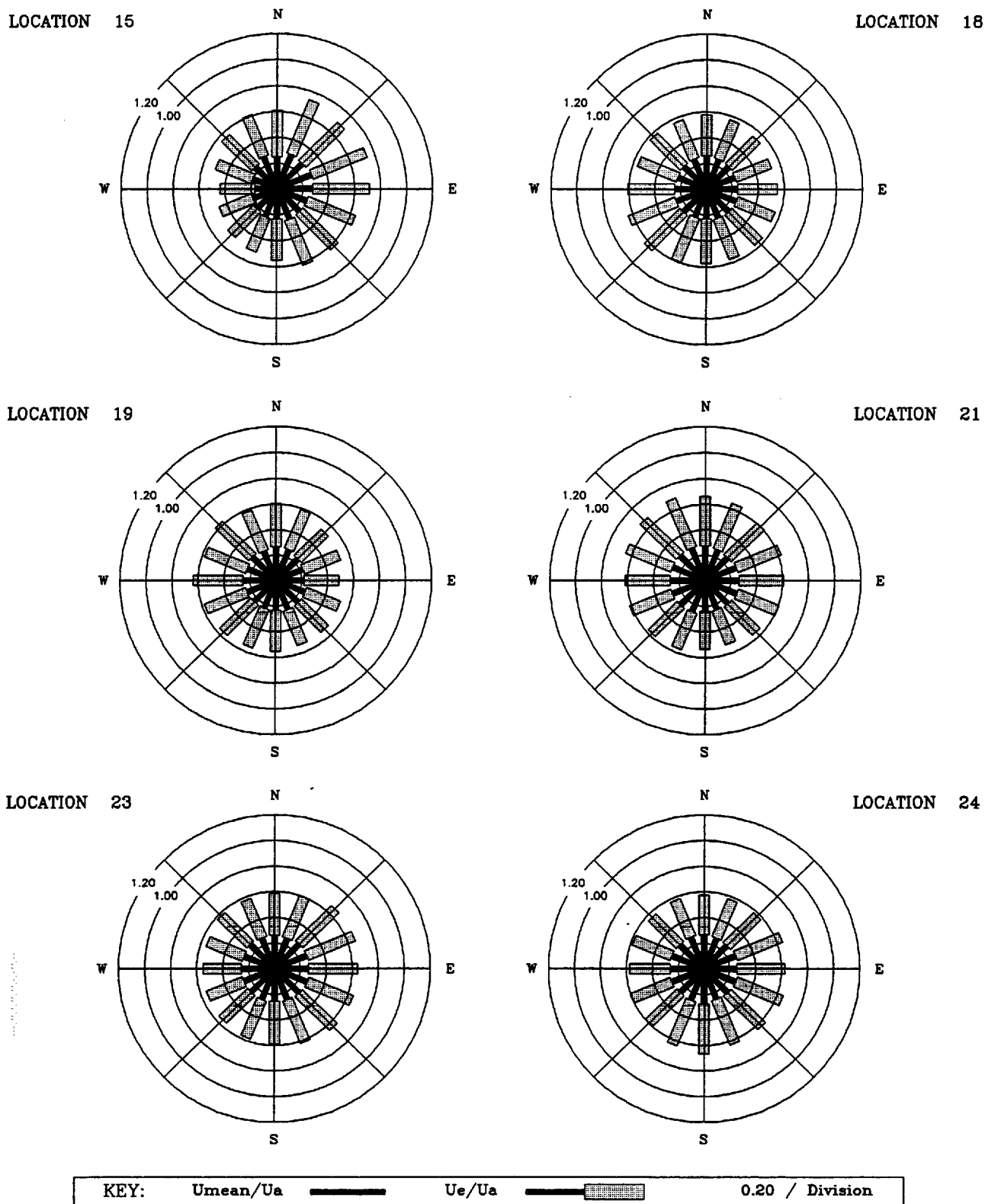


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

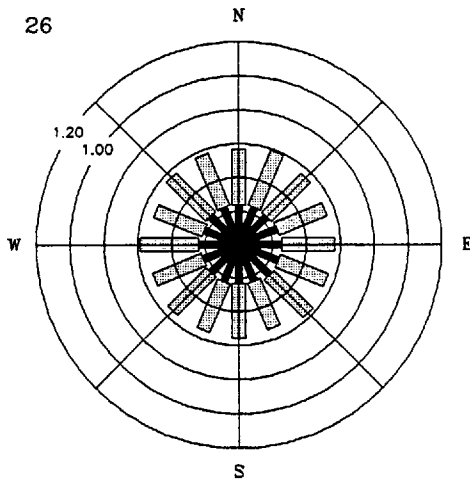
Cermak Peterka Petersen, Inc.

H-31

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 20 - 0.90 Roof Height Ratio

LOCATION 26



LOCATION 28

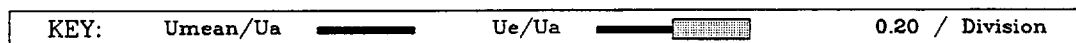
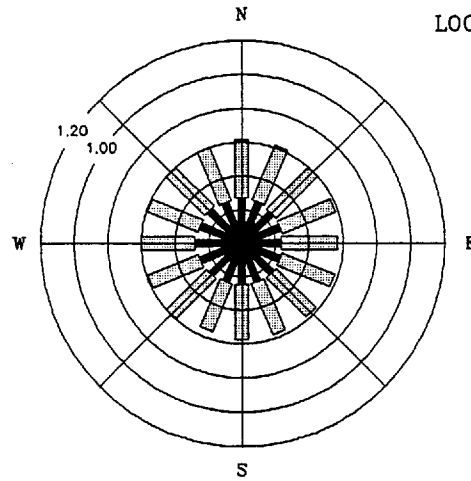


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-32

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

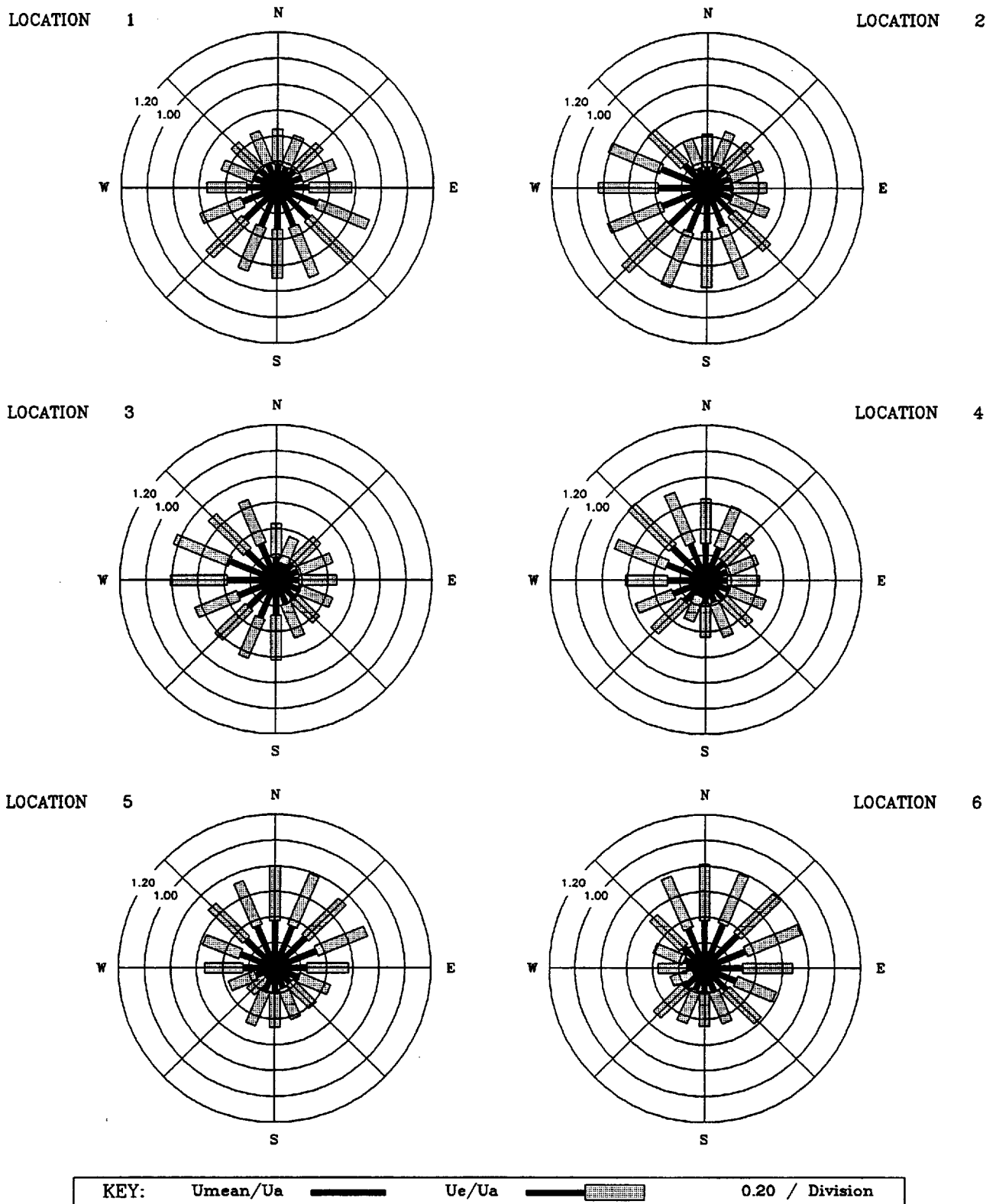


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-33

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

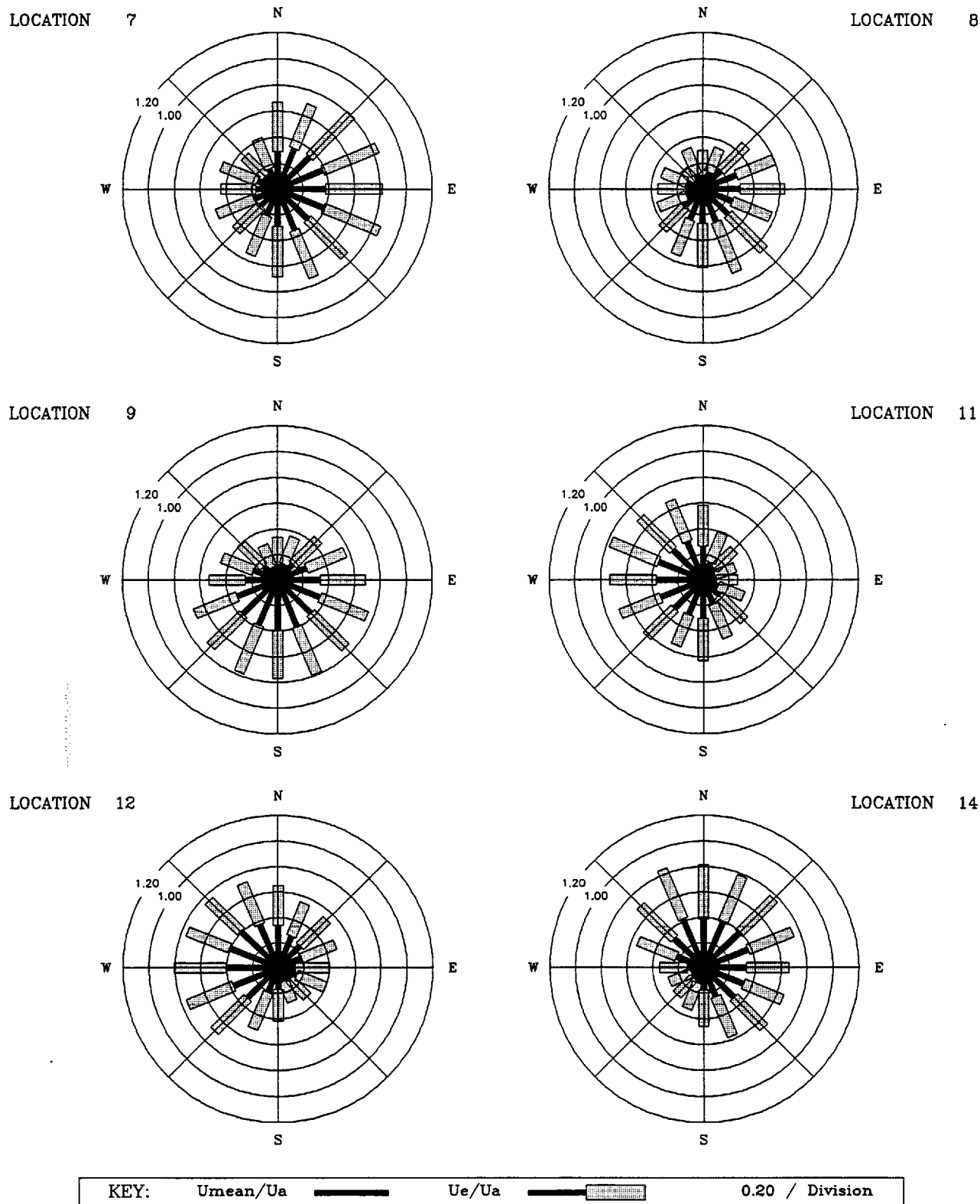


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

CPP

Cermak Peterka Petersen, Inc.

H-34

CPP Project 92-0869

API - Floating Roof
Configuration C - Tank C - 100' Dia x 48' Tall
Data Set 21 - 0.50 Roof Height Ratio

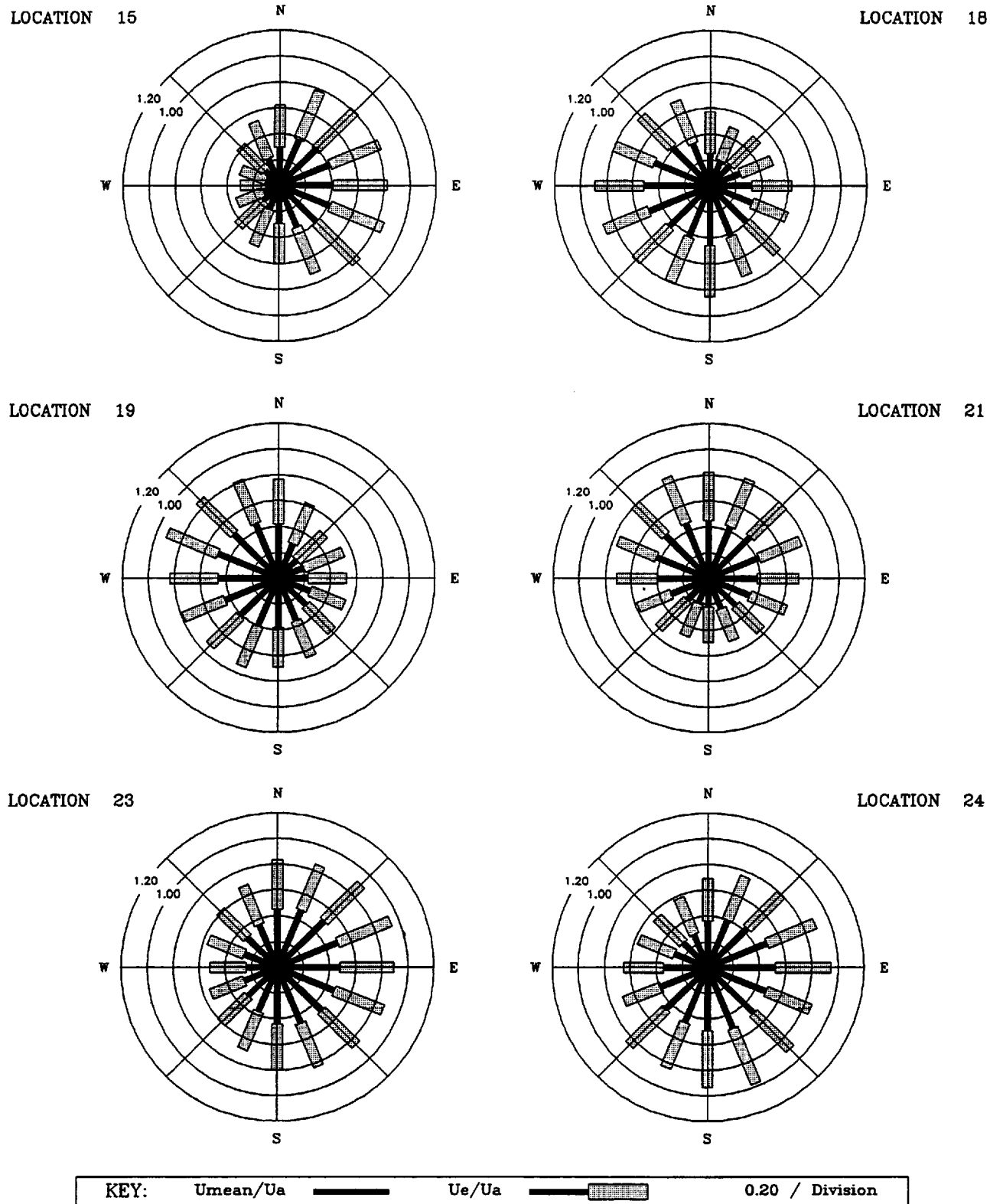


Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

Cermak Peterka Petersen, Inc.

H-35

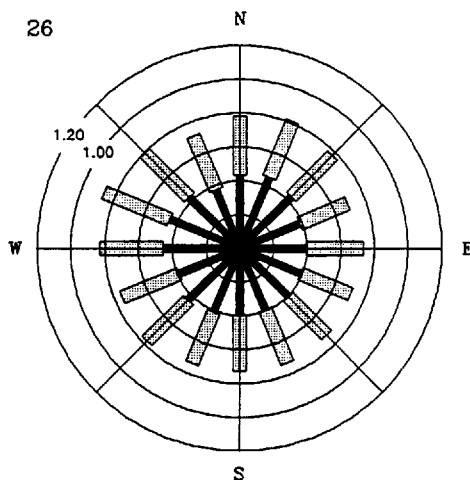
CPP Project 92-0869

API - Floating Roof

Configuration C - Tank C - 100' Dia x 48' Tall

Data Set 21 - 0.50 Roof Height Ratio

LOCATION 26



LOCATION 28

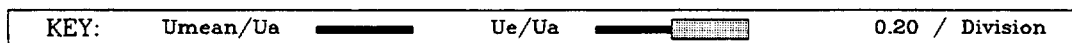
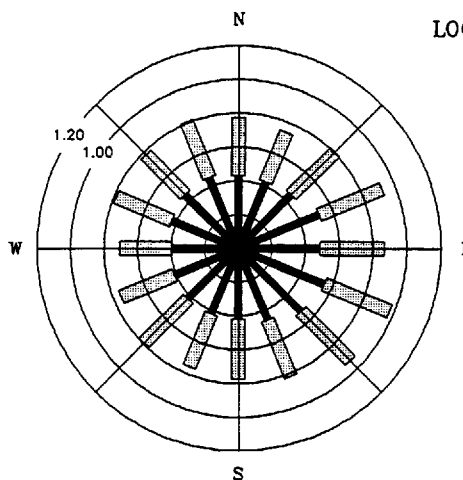
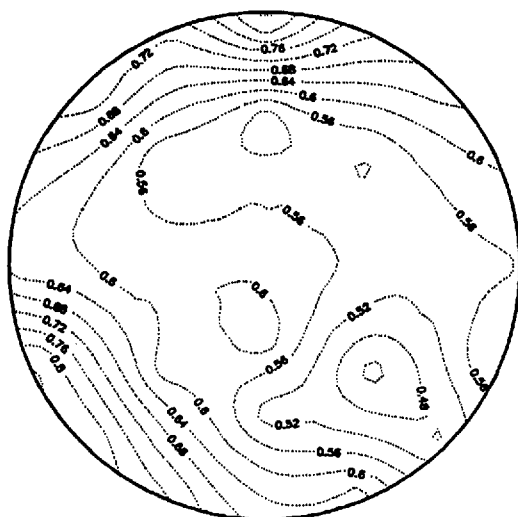


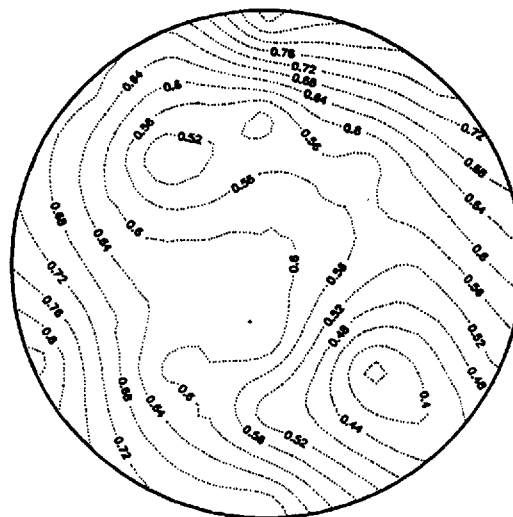
Figure 5. Non-dimensional mean and equivalent velocities at measurement locations.

APPENDIX I

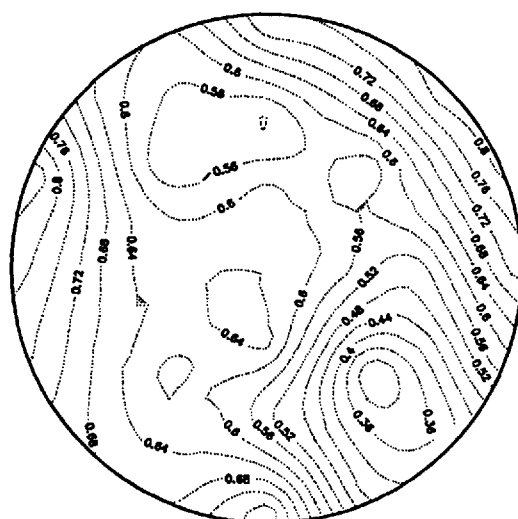
NON-DIMENSIONAL MEAN VELOCITY CONTOURS



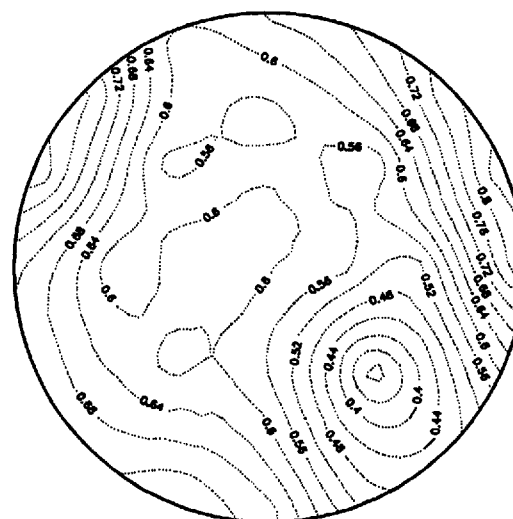
WIND DIRECTION 0



WIND DIRECTION 22.5



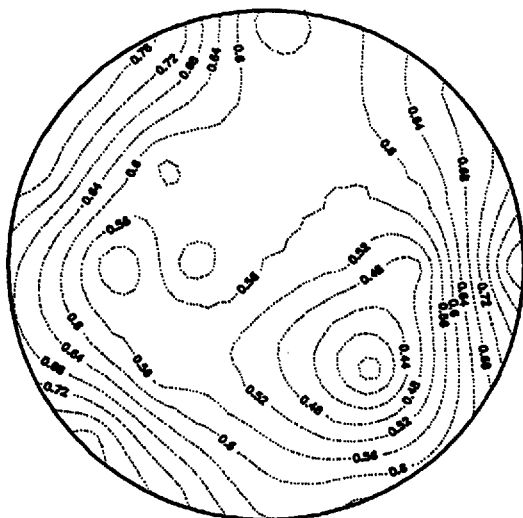
WIND DIRECTION 45



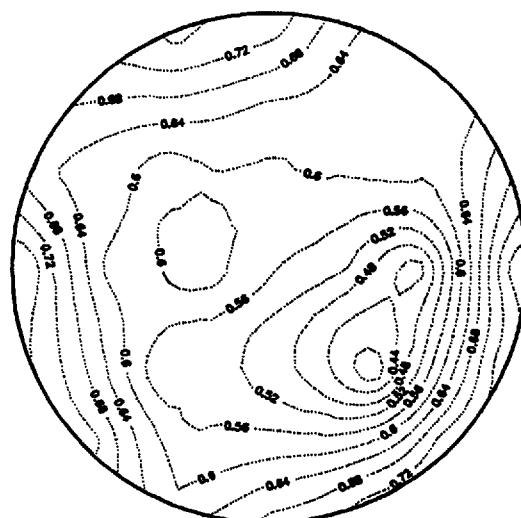
WIND DIRECTION 67.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

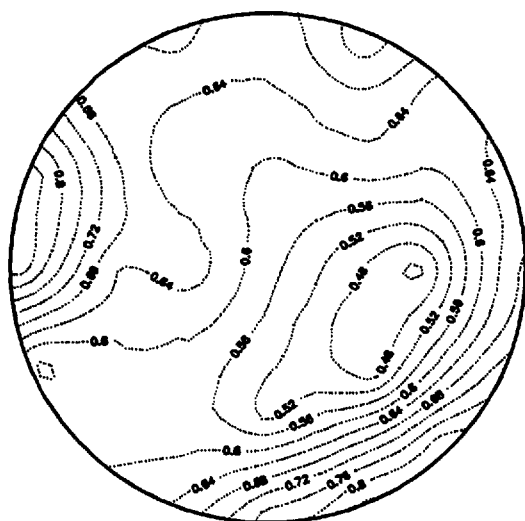
Data Set 5 — 1.00 Roof Height Ratio



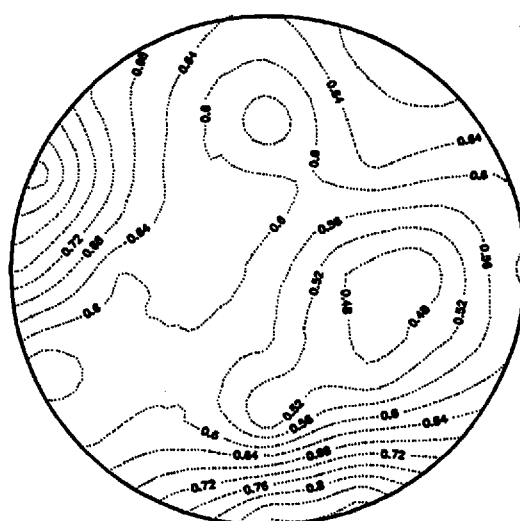
WIND DIRECTION 90



WIND DIRECTION 112.5



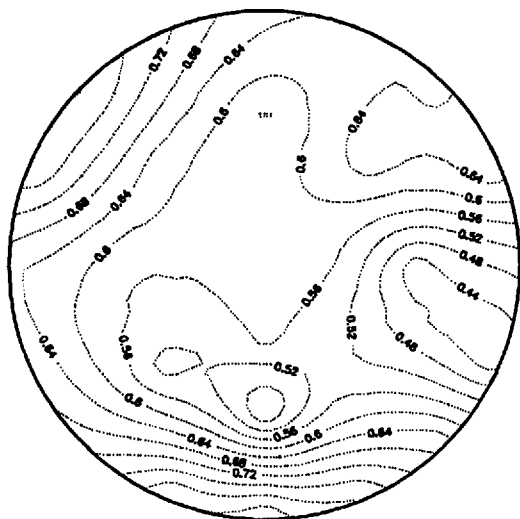
WIND DIRECTION 135



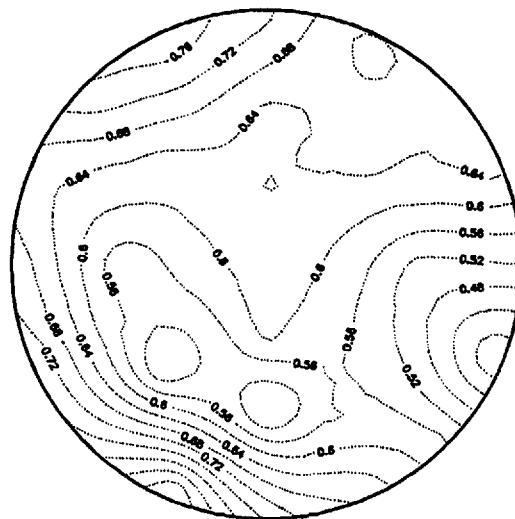
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

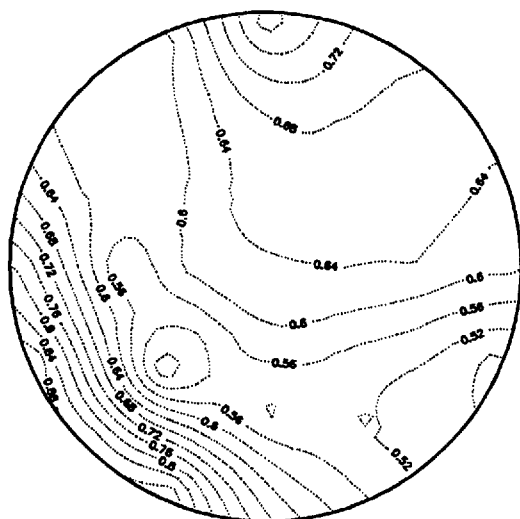
Data Set 5 — 1.00 Roof Height Ratio



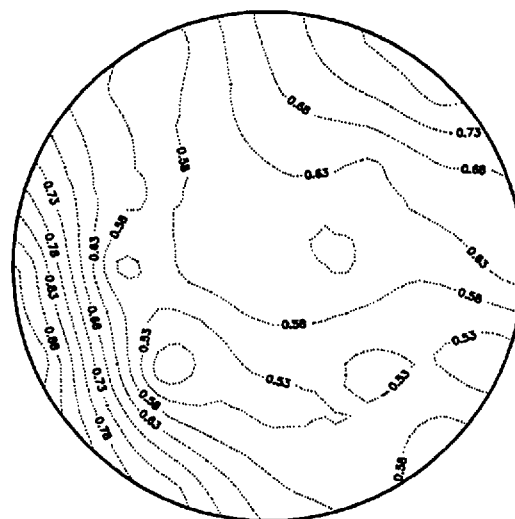
WIND DIRECTION 180



WIND DIRECTION 202.5



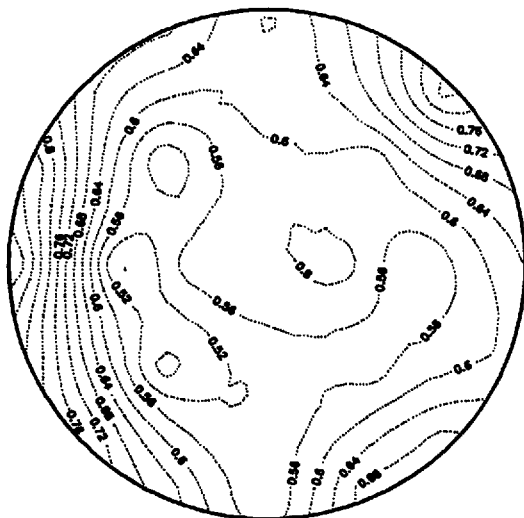
WIND DIRECTION 225



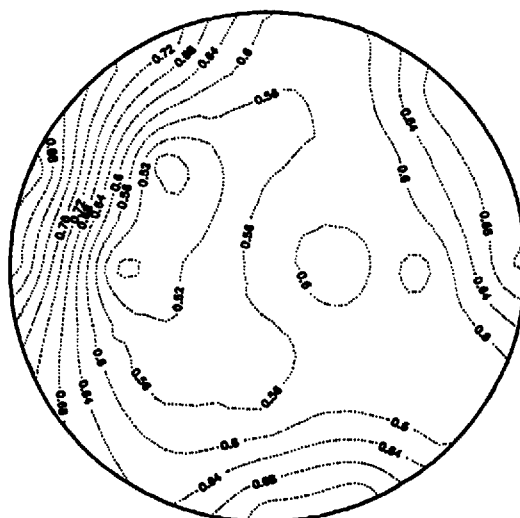
WIND DIRECTION 247.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

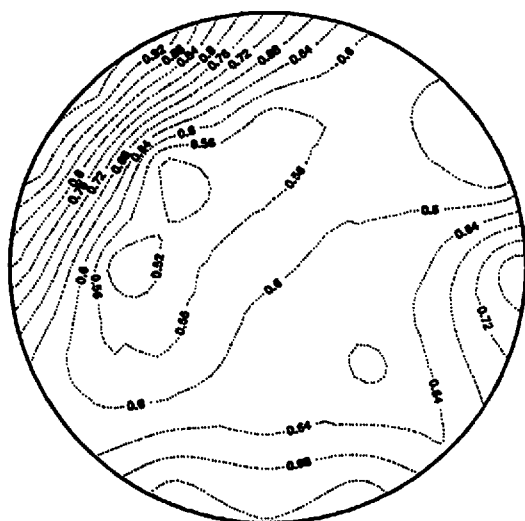
Data Set 5 — 1.00 Roof Height Ratio



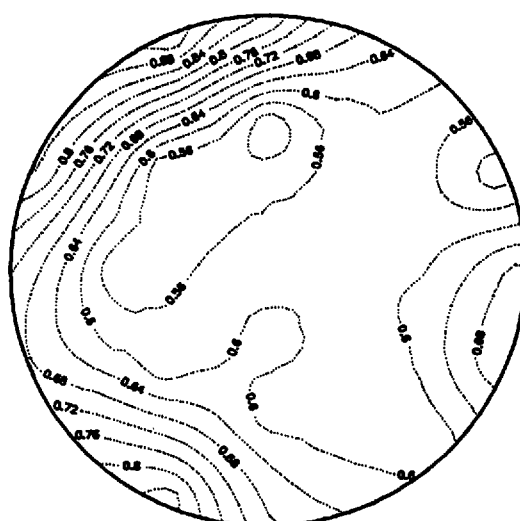
WIND DIRECTION 270



WIND DIRECTION 292.5



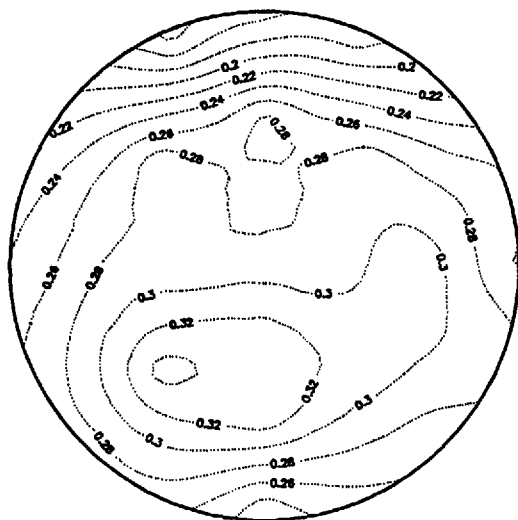
WIND DIRECTION 315



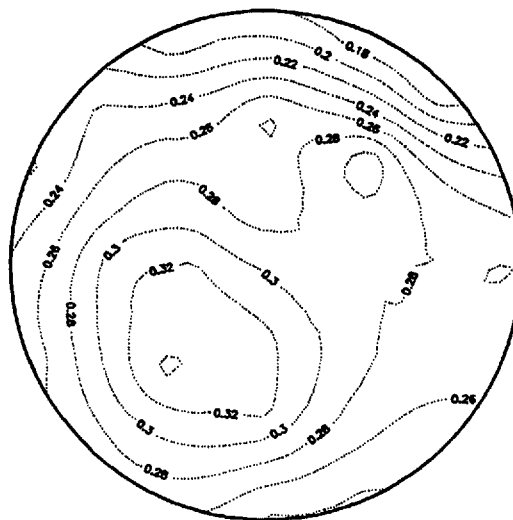
WIND DIRECTION 337.5

Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank

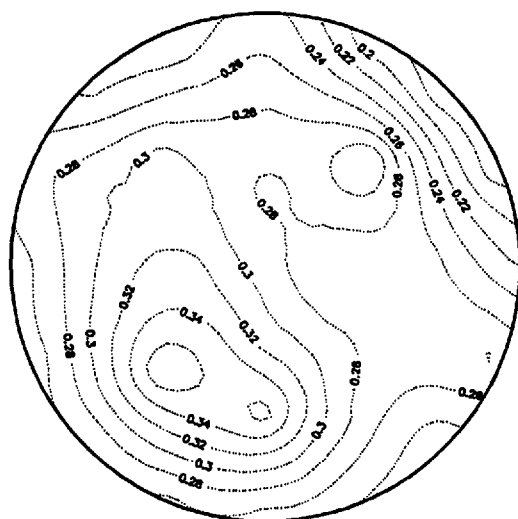
Data Set 5 — 1.00 Roof Height Ratio



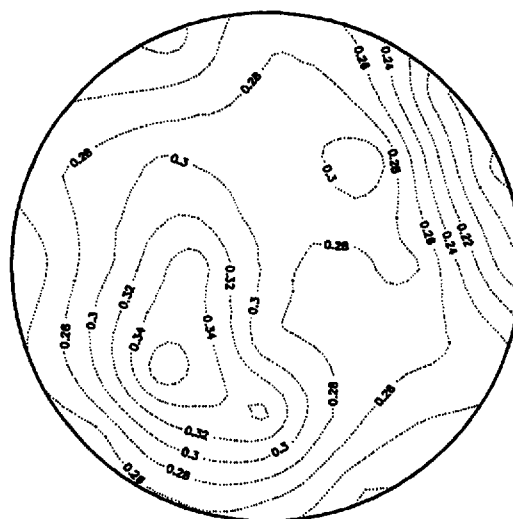
WIND DIRECTION 0



WIND DIRECTION 22.5



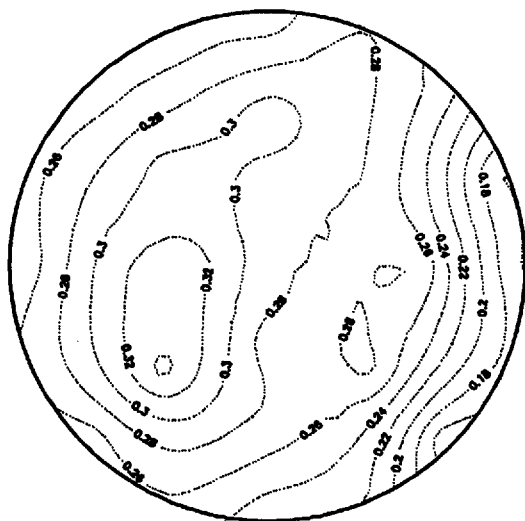
WIND DIRECTION 45



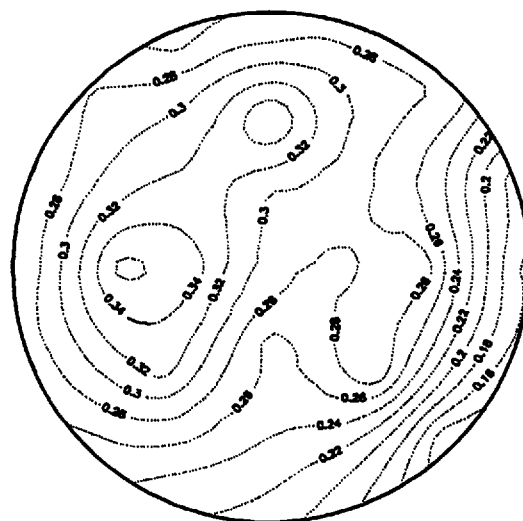
WIND DIRECTION 67.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

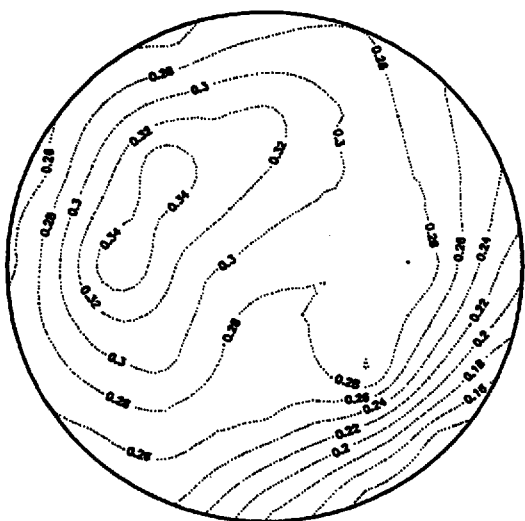
Data Set 6 — 0.80 Roof Height Ratio



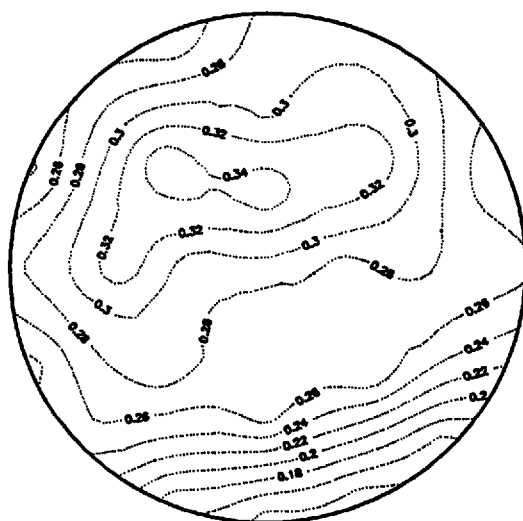
WIND DIRECTION 90



WIND DIRECTION 112.5



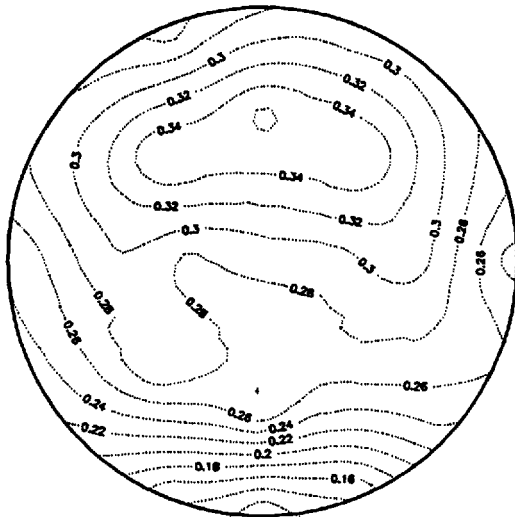
WIND DIRECTION 135



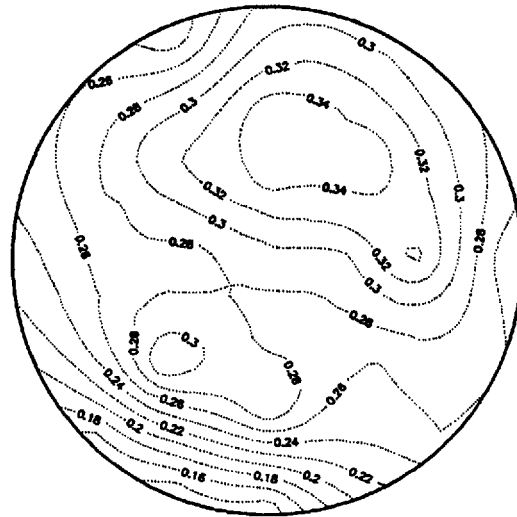
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

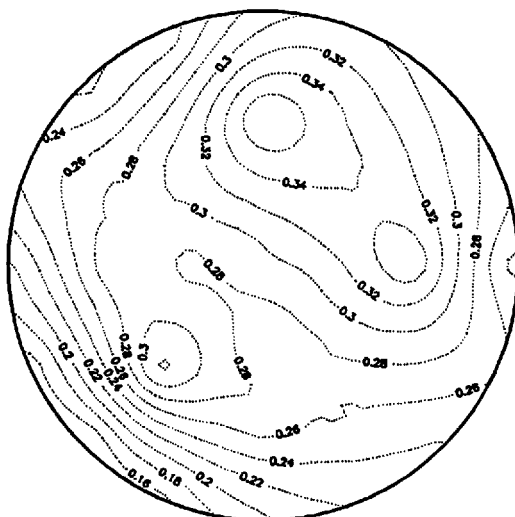
Data Set 6 — 0.80 Roof Height Ratio



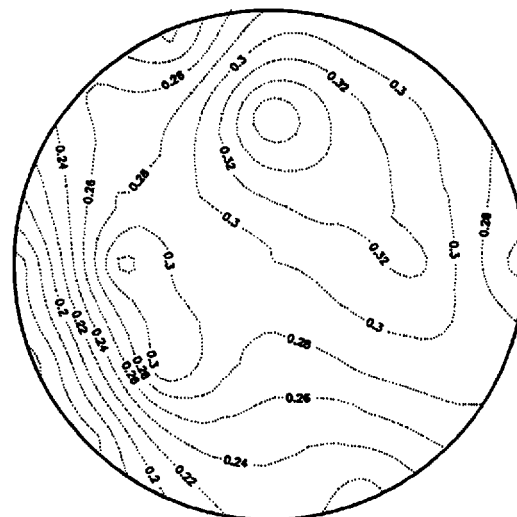
WIND DIRECTION 180



WIND DIRECTION 202.5



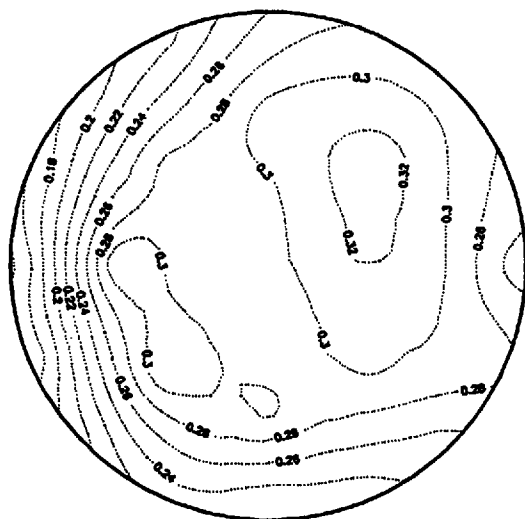
WIND DIRECTION 225



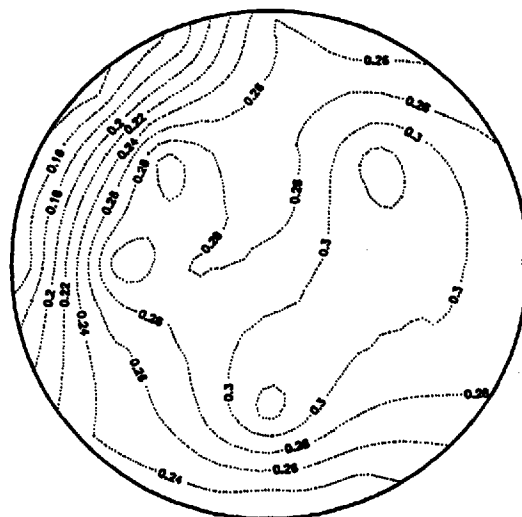
WIND DIRECTION 247.5

Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank

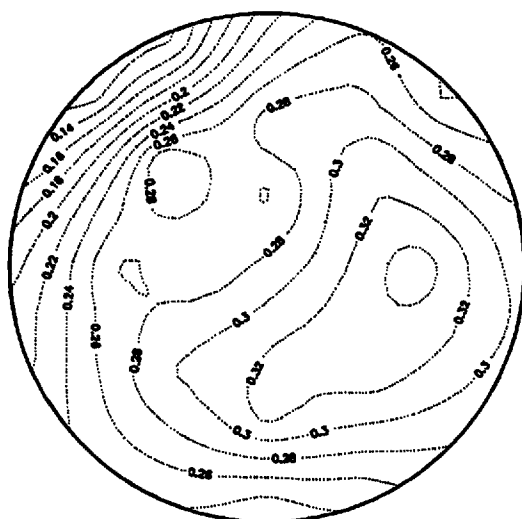
Data Set 6 — 0.80 Roof Height Ratio



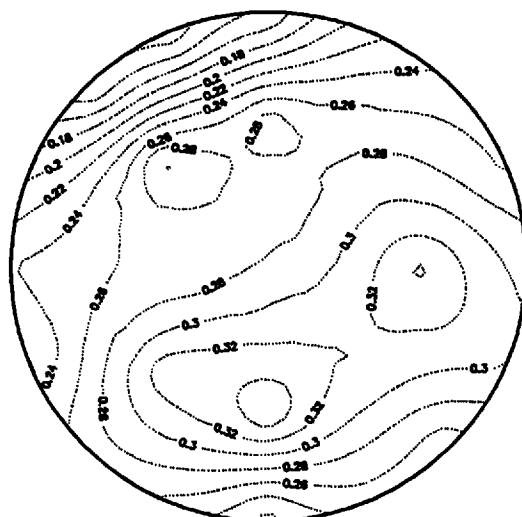
WIND DIRECTION 270



WIND DIRECTION 292.5



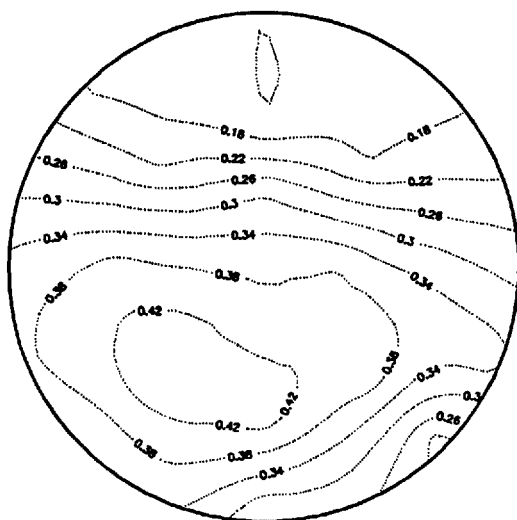
WIND DIRECTION 315



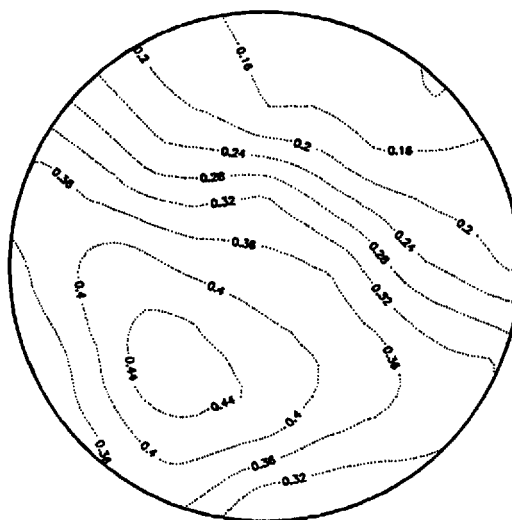
WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

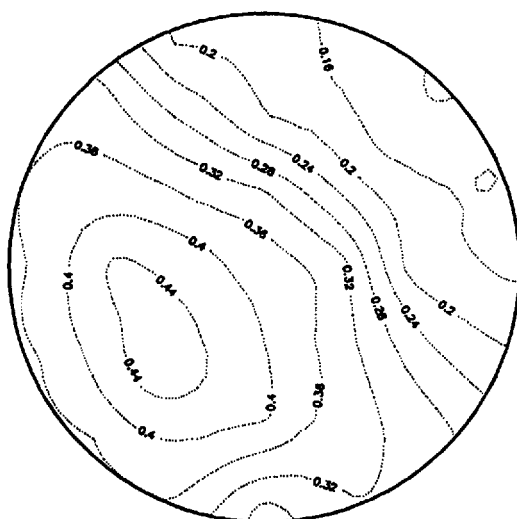
Data Set 6 — 0.80 Roof Height Ratio



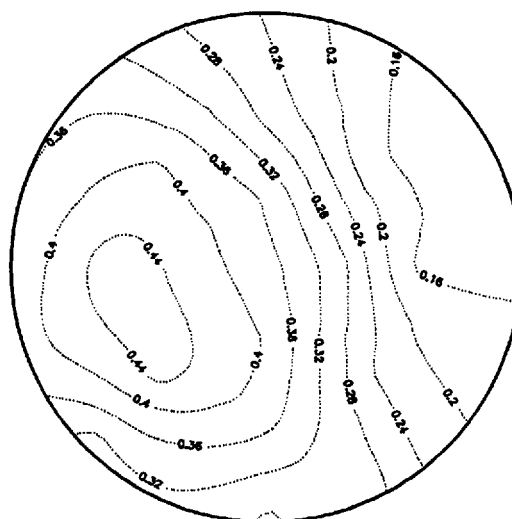
WIND DIRECTION 0



WIND DIRECTION 22.5



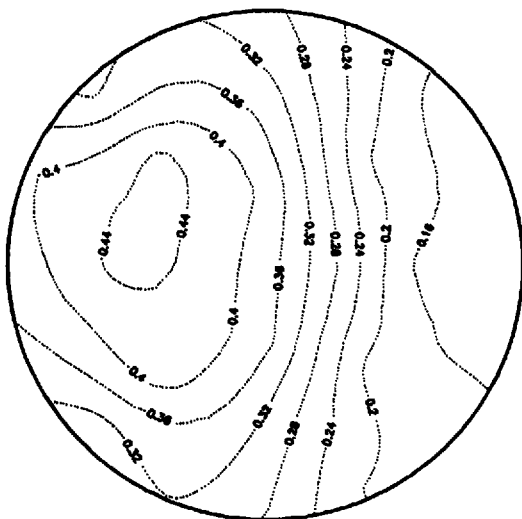
WIND DIRECTION 45



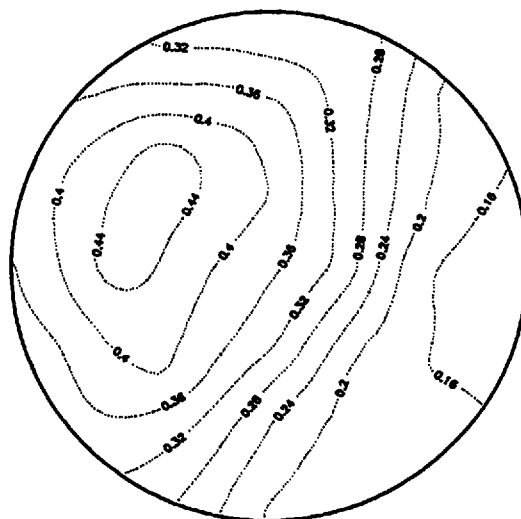
WIND DIRECTION 67.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

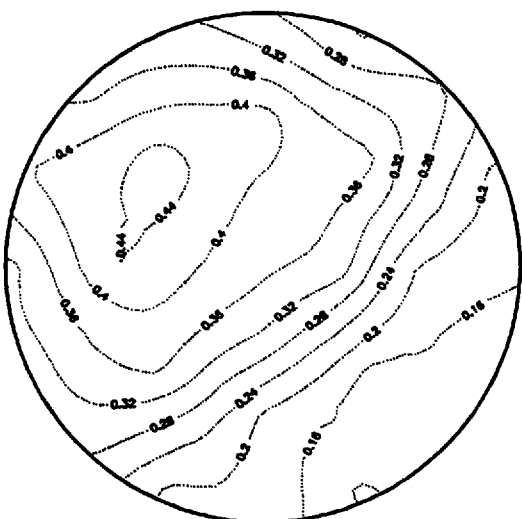
Data Set 7 — 0.35 Roof Height Ratio



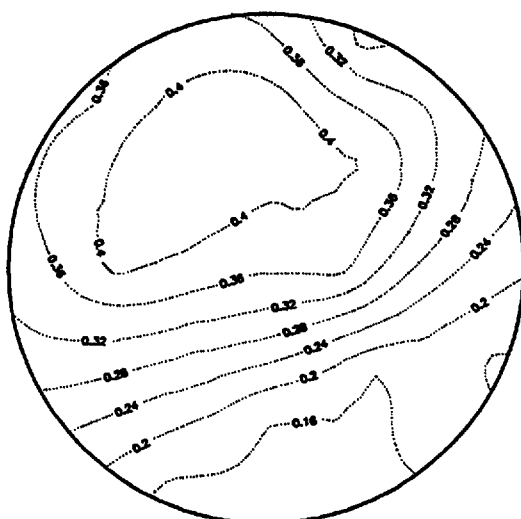
WIND DIRECTION 90



WIND DIRECTION 112.5

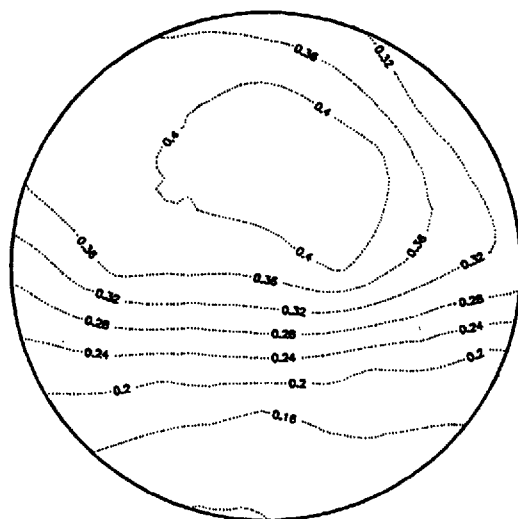


WIND DIRECTION 135

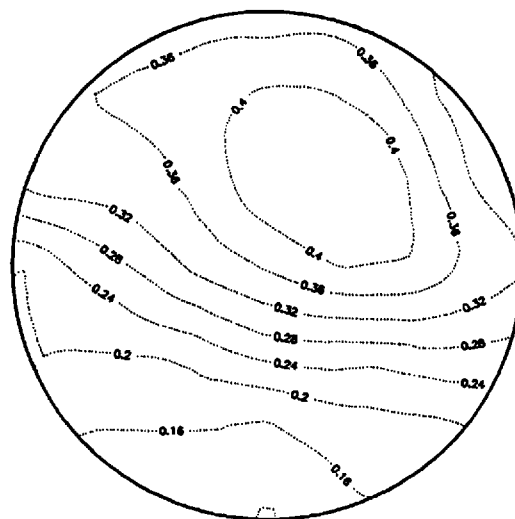


WIND DIRECTION 157.5

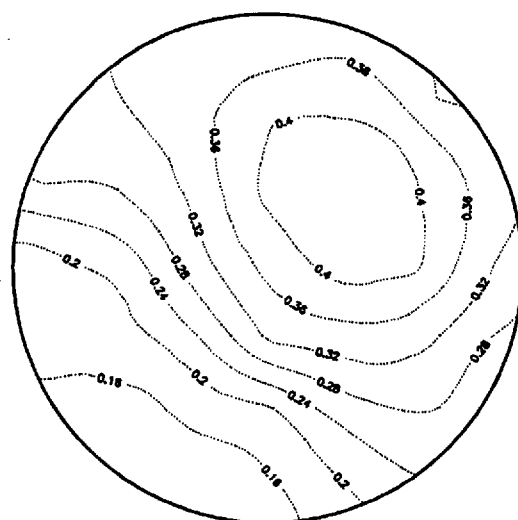
Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank
Data Set 7 — 0.35 Roof Height Ratio



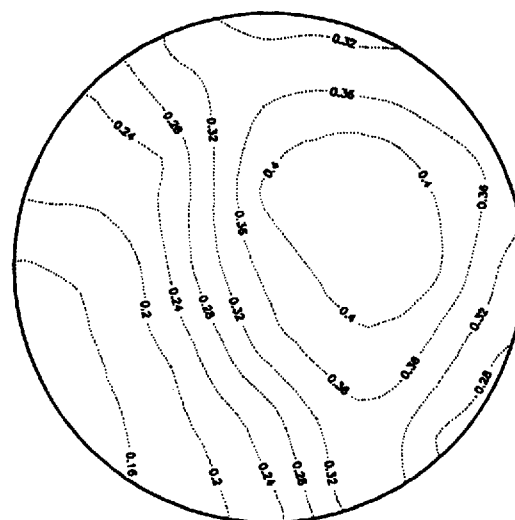
WIND DIRECTION 180



WIND DIRECTION 202.5

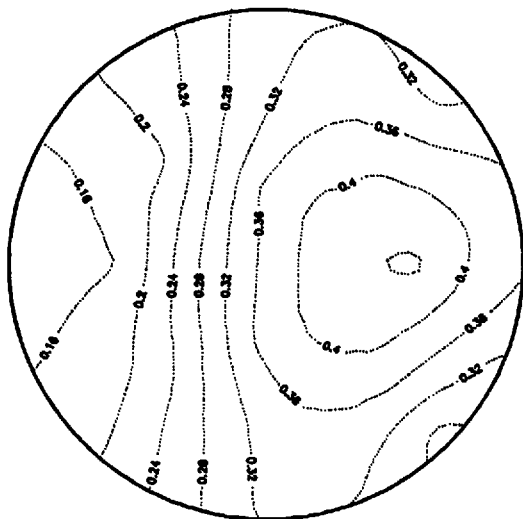


WIND DIRECTION 225

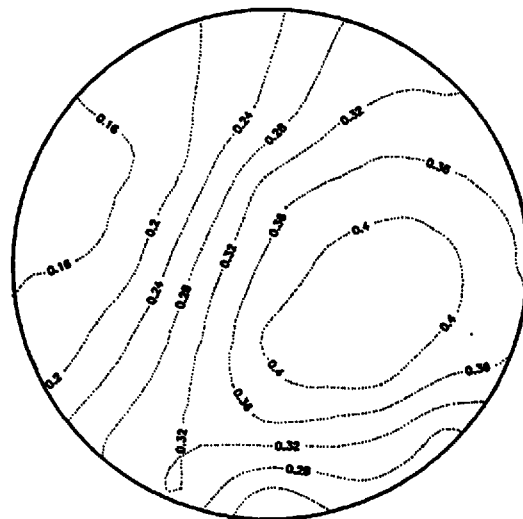


WIND DIRECTION 247.5

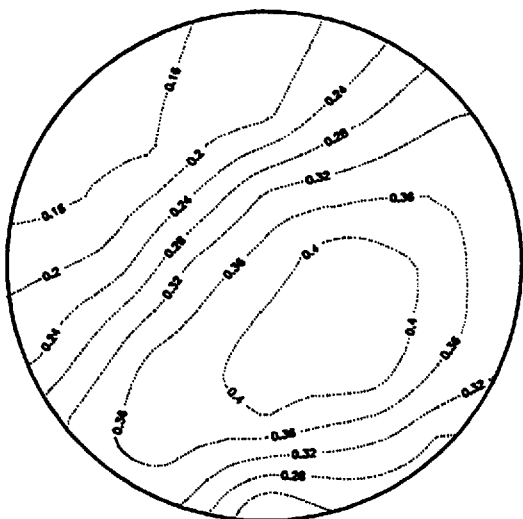
**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank
Data Set 7 — 0.35 Roof Height Ratio**



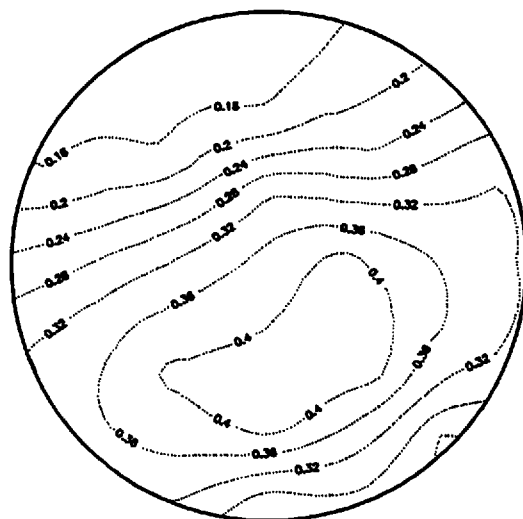
WIND DIRECTION 270



WIND DIRECTION 292.5



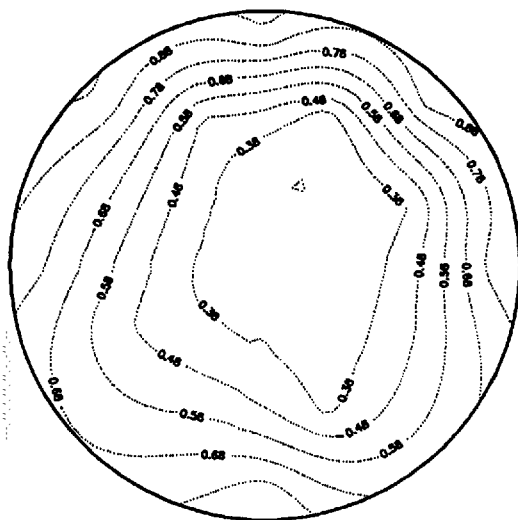
WIND DIRECTION 315



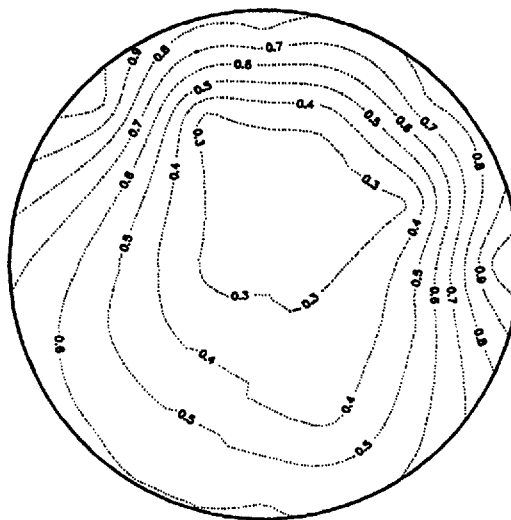
WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration A
200 ft Diameter x 48 ft Tall Tank**

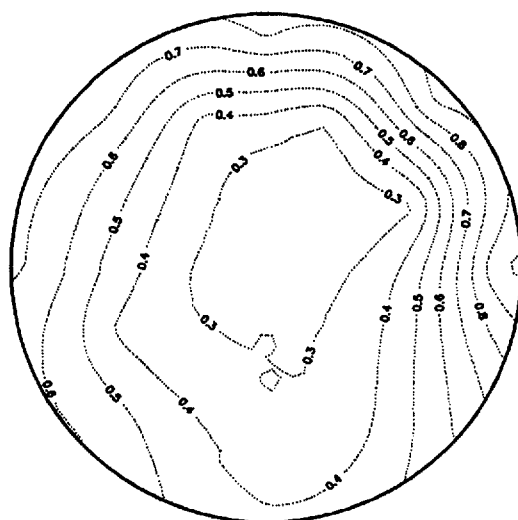
Data Set 7 — 0.35 Roof Height Ratio



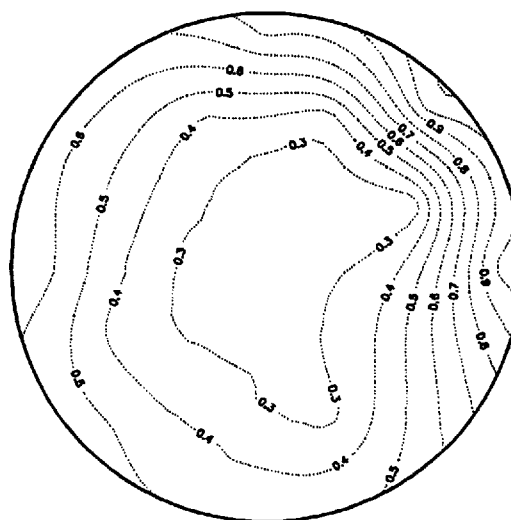
WIND DIRECTION 0



WIND DIRECTION 22.5



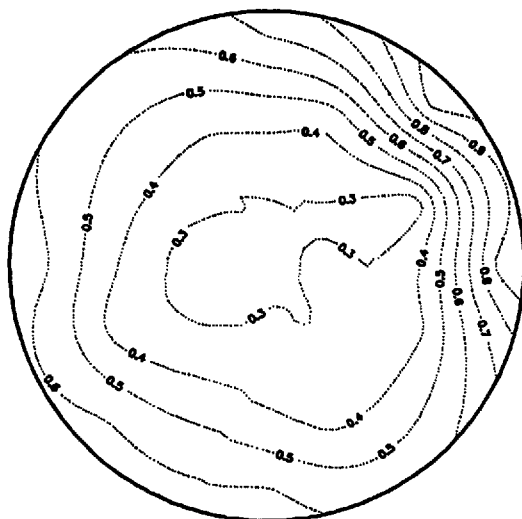
WIND DIRECTION 45



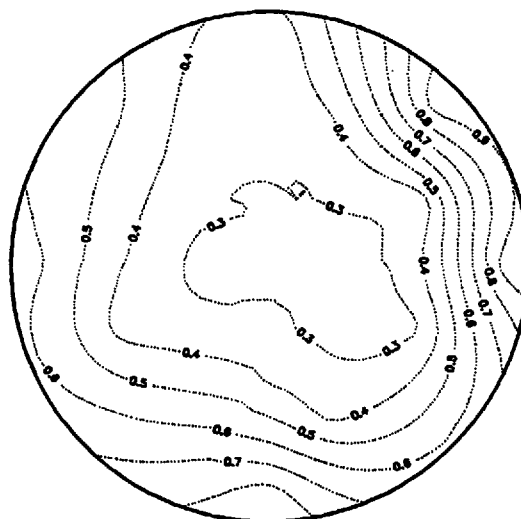
WIND DIRECTION 67.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

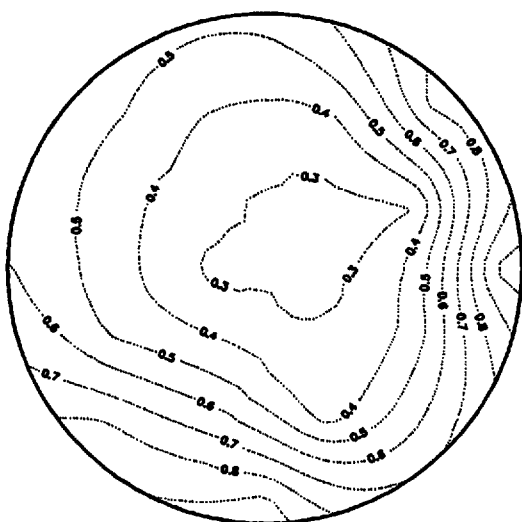
Data Set 12 — 1.00 Roof Height Ratio



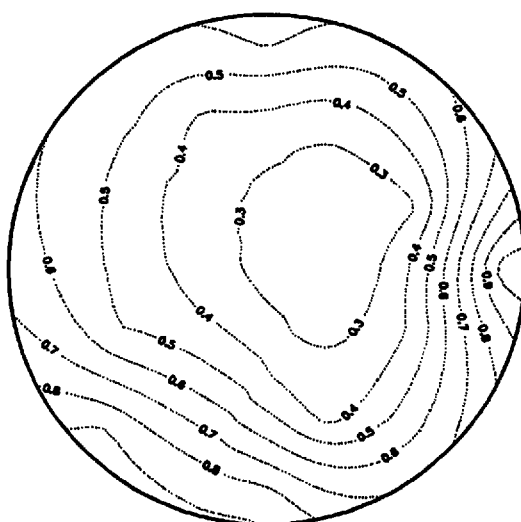
WIND DIRECTION 90



WIND DIRECTION 112.5



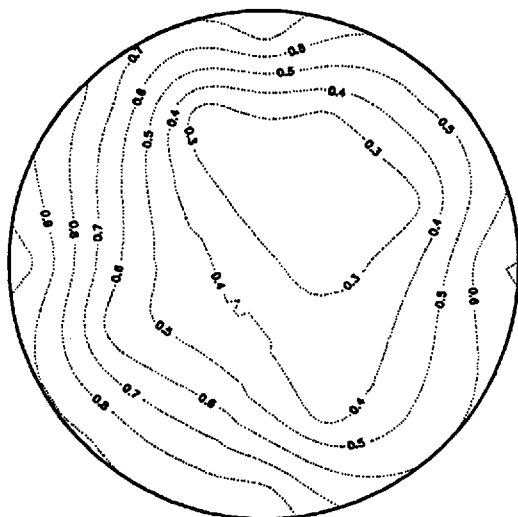
WIND DIRECTION 135



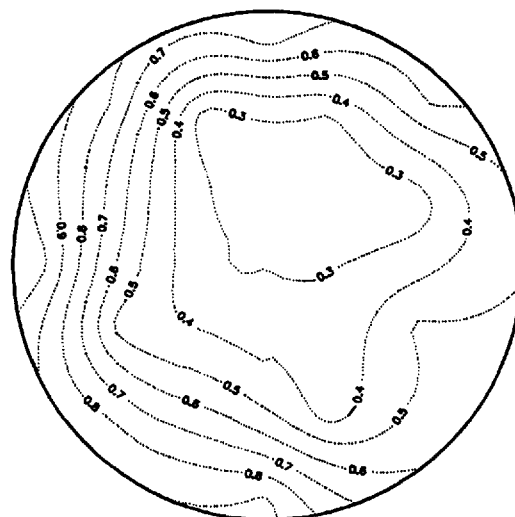
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

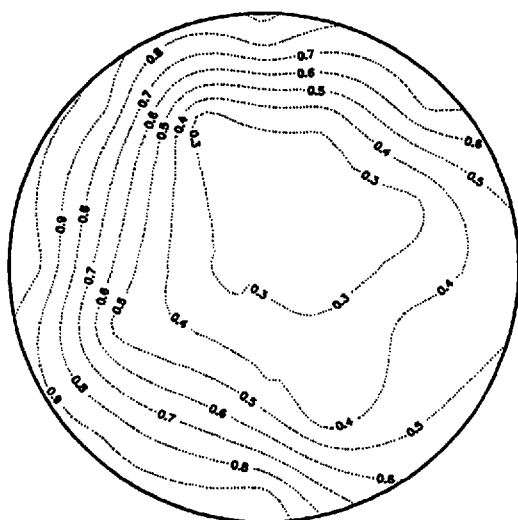
Data Set 12 — 1.00 Roof Height Ratio



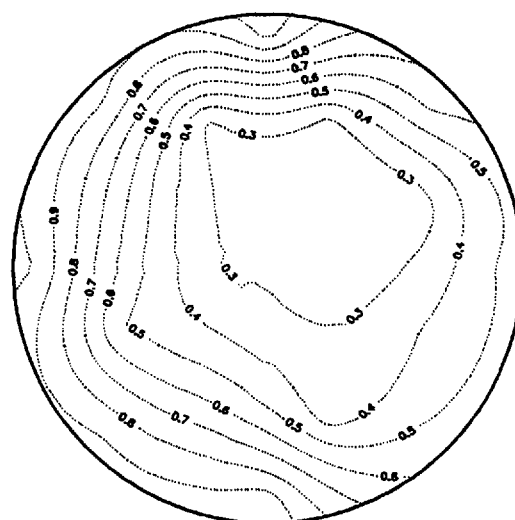
WIND DIRECTION 180



WIND DIRECTION 202.5



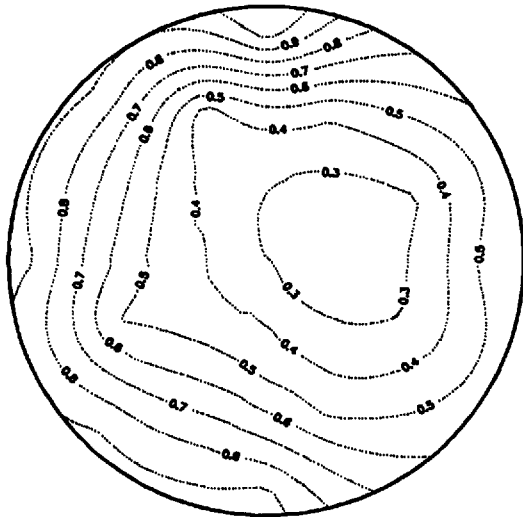
WIND DIRECTION 225



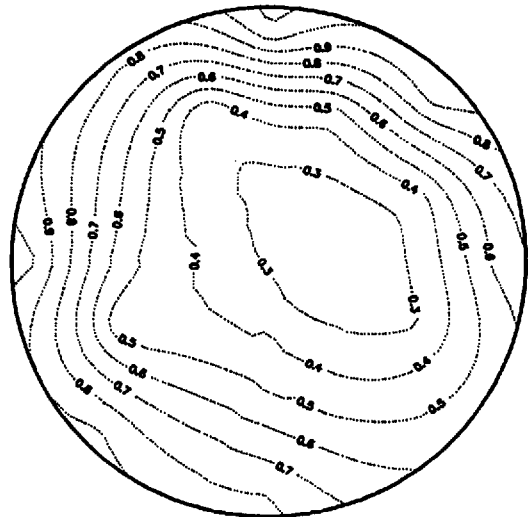
WIND DIRECTION 247.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

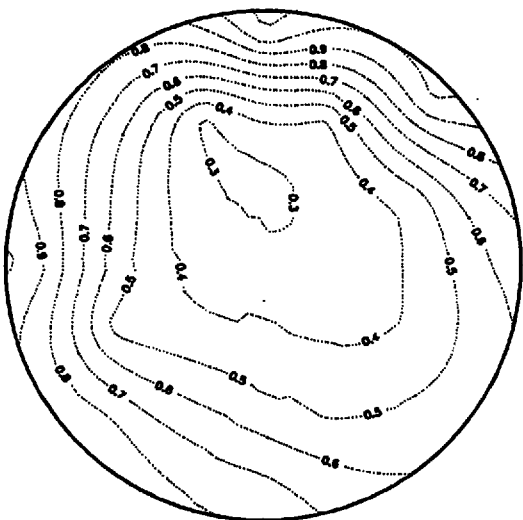
Data Set 12 — 1.00 Roof Height Ratio



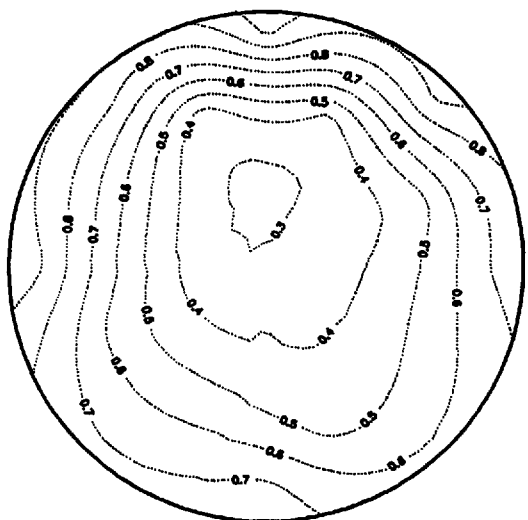
WIND DIRECTION 270



WIND DIRECTION 292.5



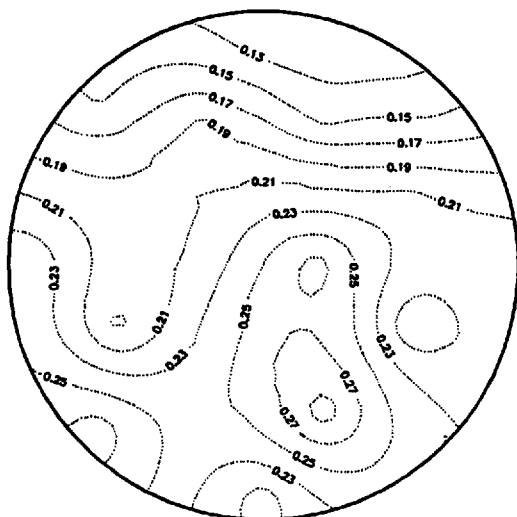
WIND DIRECTION 315



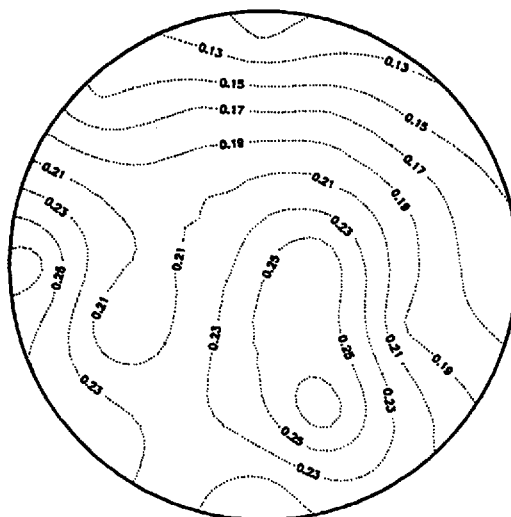
WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

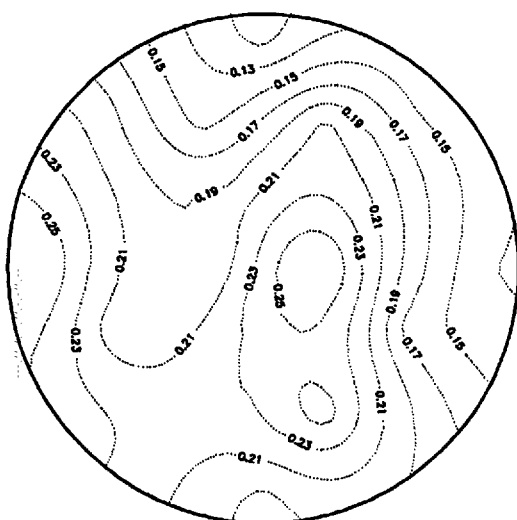
Data Set 12 — 1.00 Roof Height Ratio



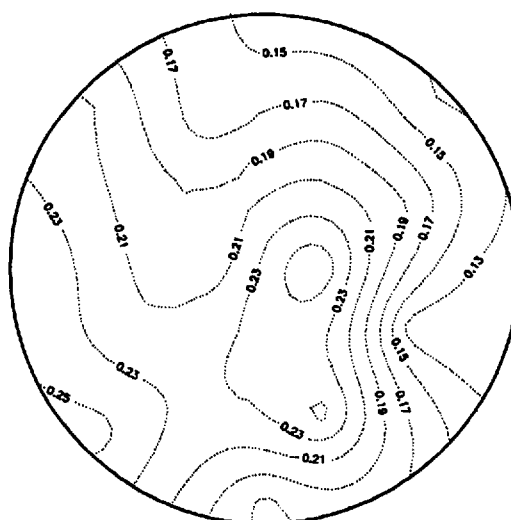
WIND DIRECTION 0



WIND DIRECTION 22.5



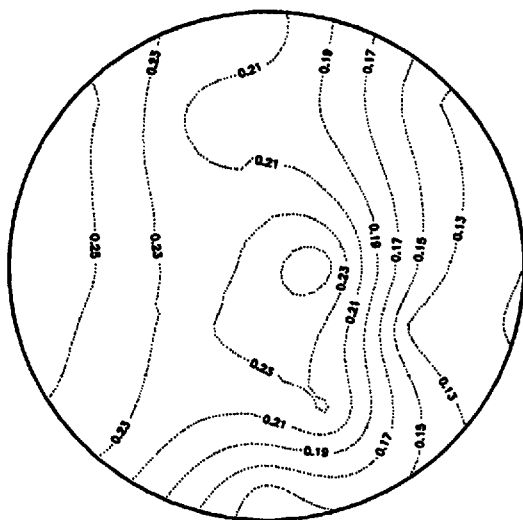
WIND DIRECTION 45



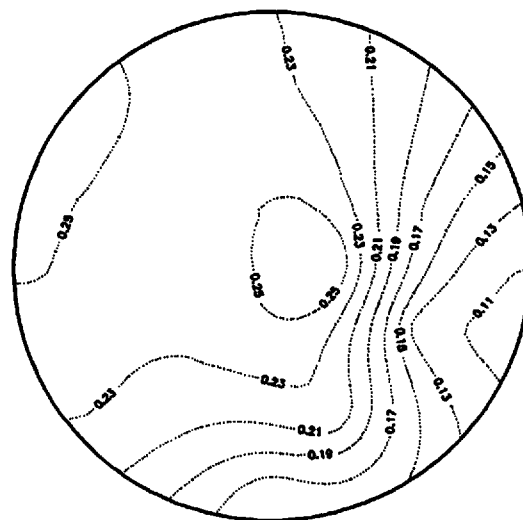
WIND DIRECTION 67.5

Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank

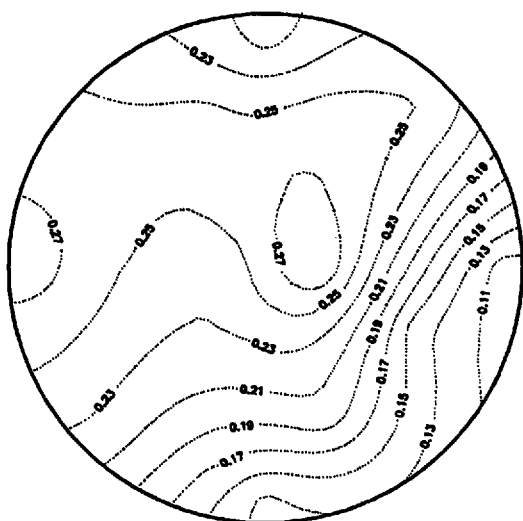
Data Set 13 — 0.90 Roof Height Ratio



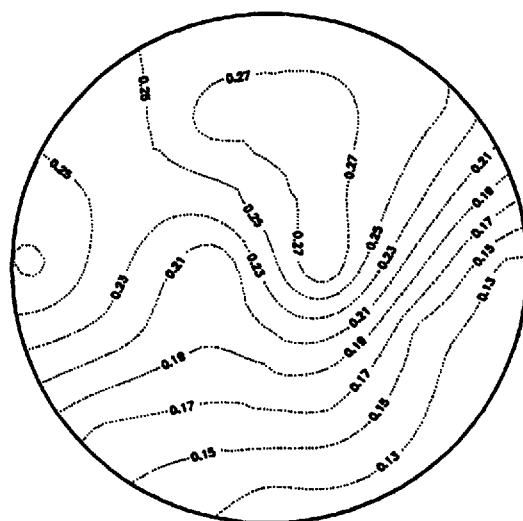
WIND DIRECTION 90



WIND DIRECTION 112.5



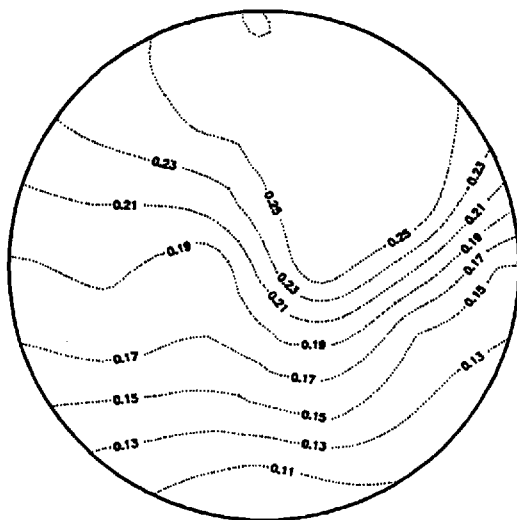
WIND DIRECTION 135



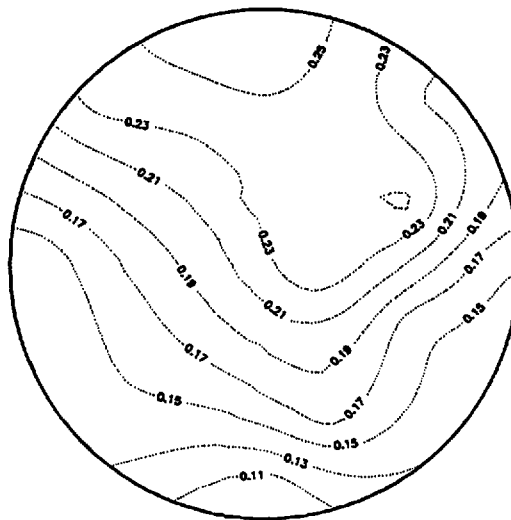
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

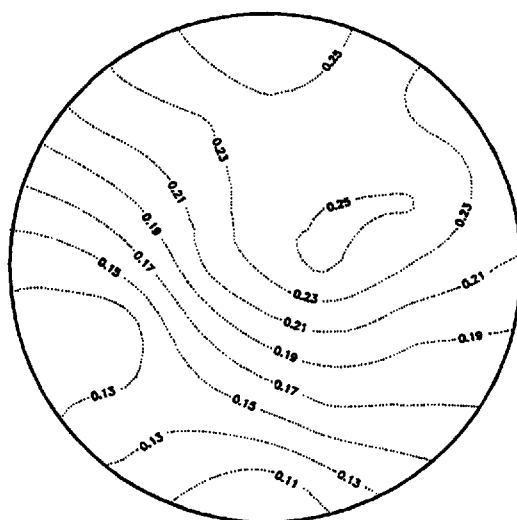
Data Set 13 — 0.90 Roof Height Ratio



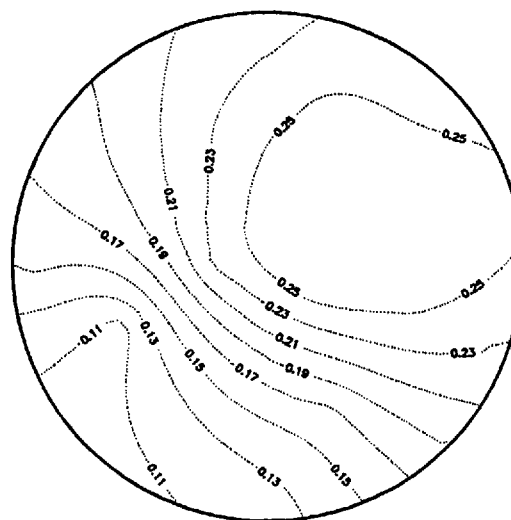
WIND DIRECTION 180



WIND DIRECTION 202.5



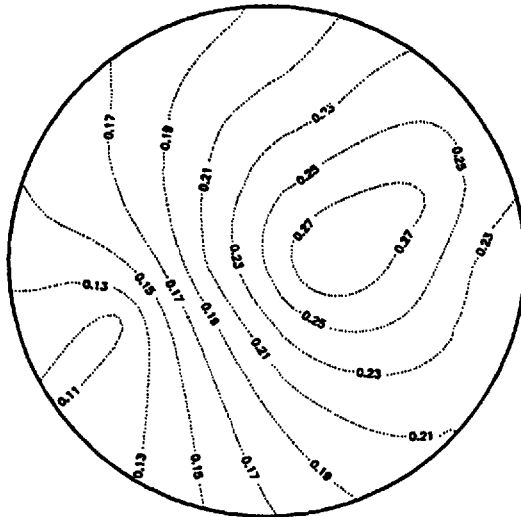
WIND DIRECTION 225



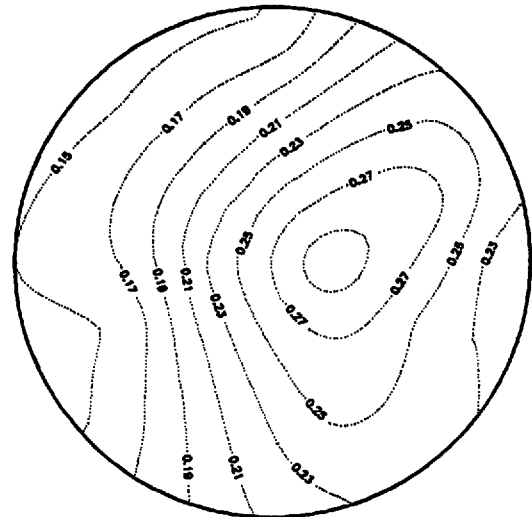
WIND DIRECTION 247.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

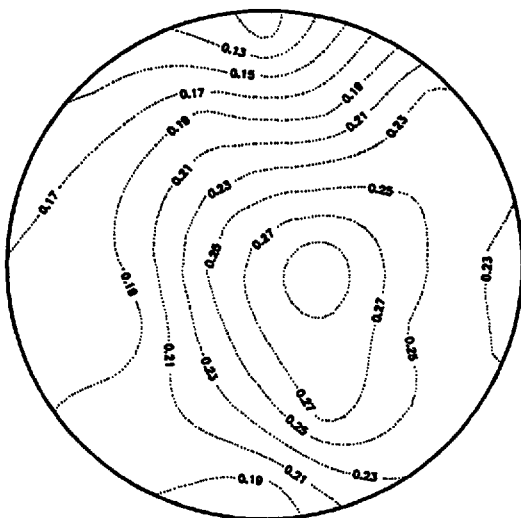
Data Set 13 — 0.90 Roof Height Ratio



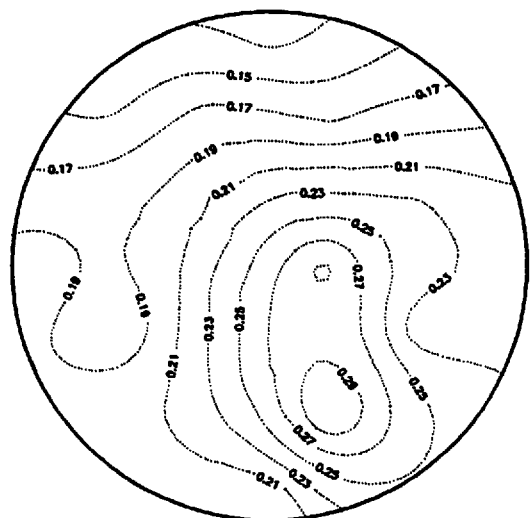
WIND DIRECTION 270



WIND DIRECTION 292.5



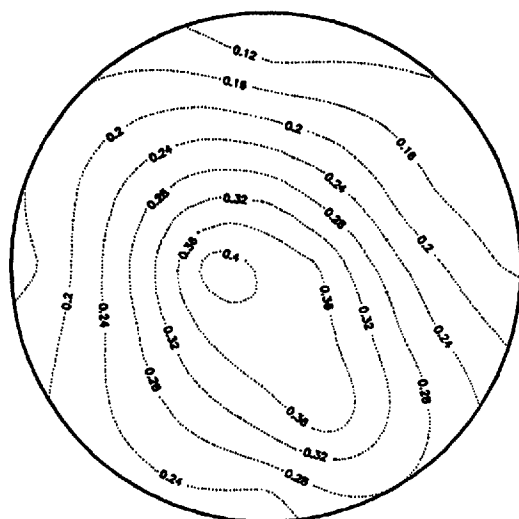
WIND DIRECTION 315



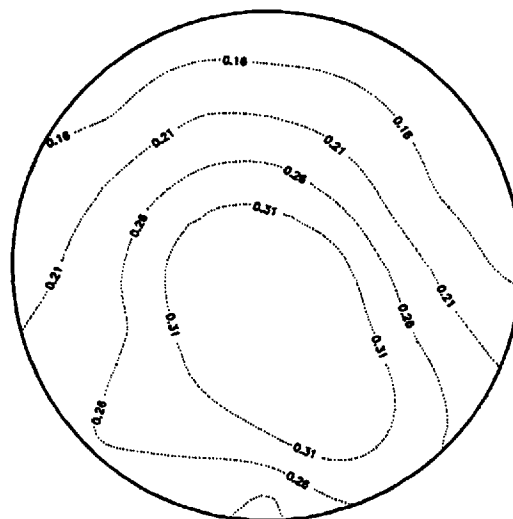
WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

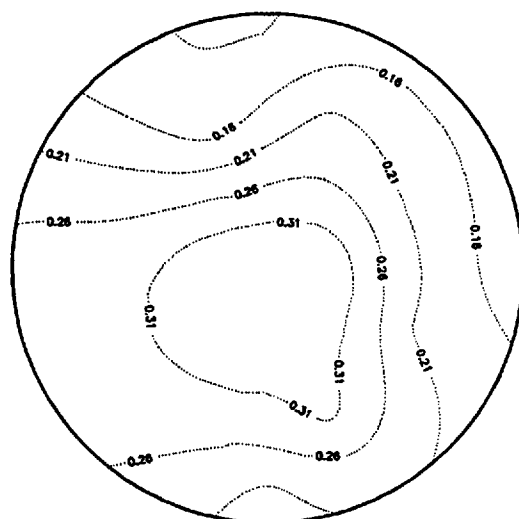
Data Set 13 — 0.90 Roof Height Ratio



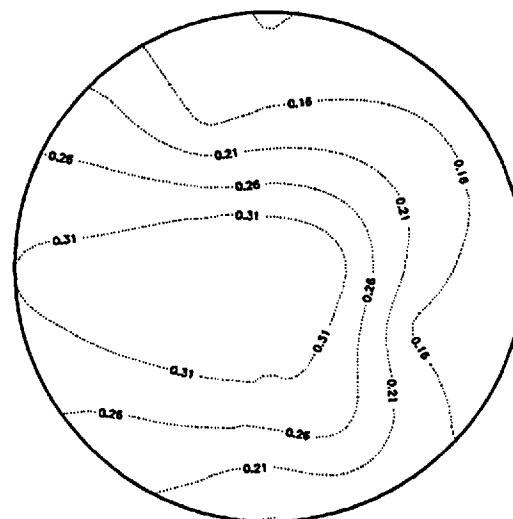
WIND DIRECTION 0



WIND DIRECTION 22.5



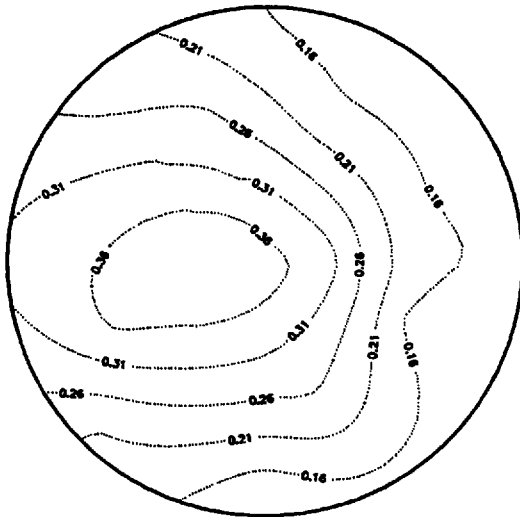
WIND DIRECTION 45



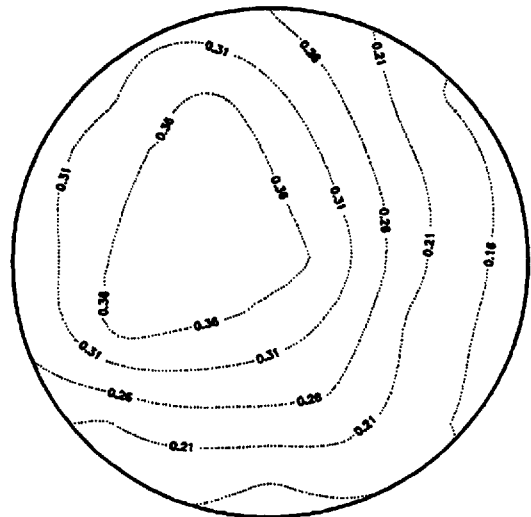
WIND DIRECTION 67.5

Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank

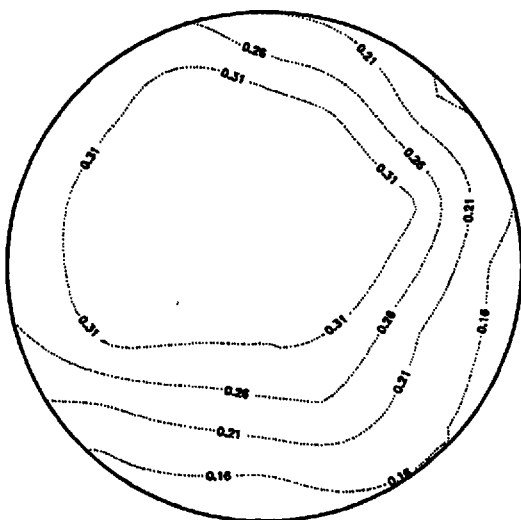
Data Set 14 — 0.75 Roof Height Ratio



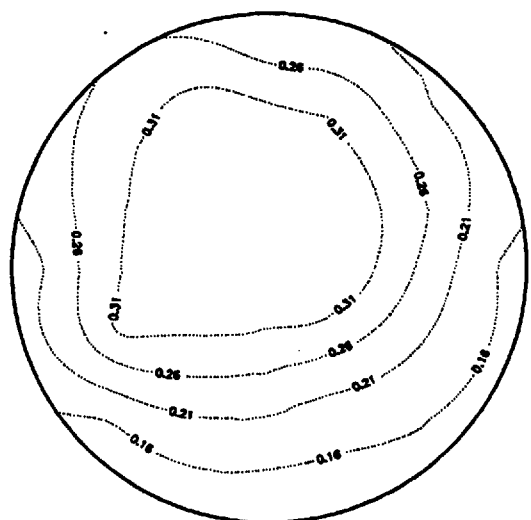
WIND DIRECTION 90



WIND DIRECTION 112.5



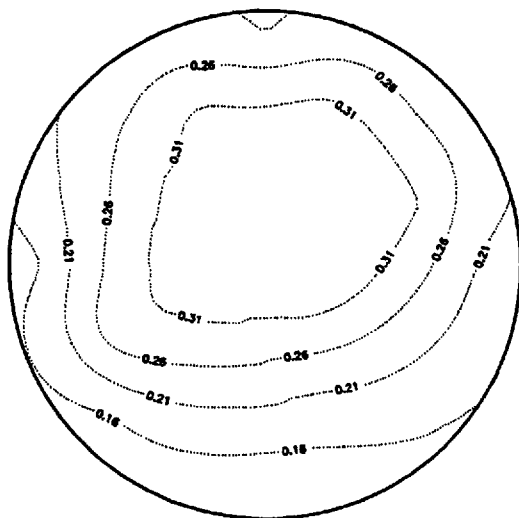
WIND DIRECTION 135



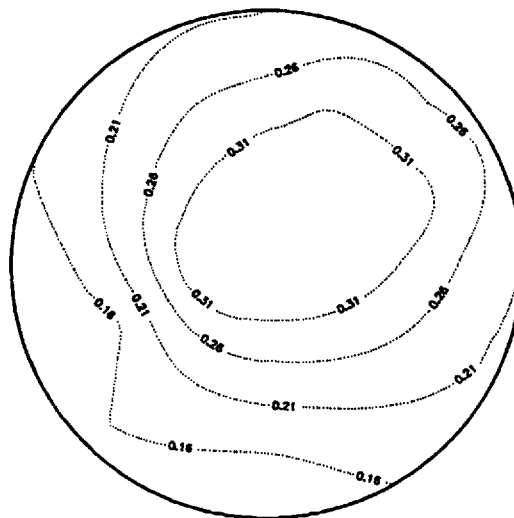
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

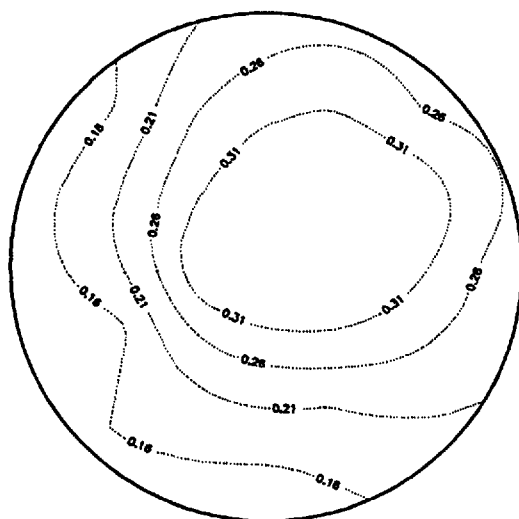
Data Set 14 — 0.75 Roof Height Ratio



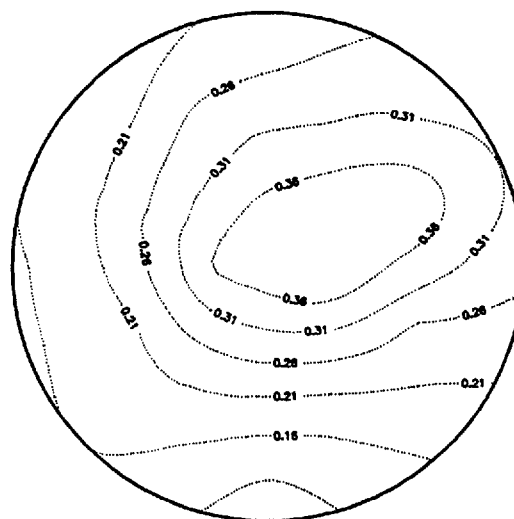
WIND DIRECTION 180



WIND DIRECTION 202.5



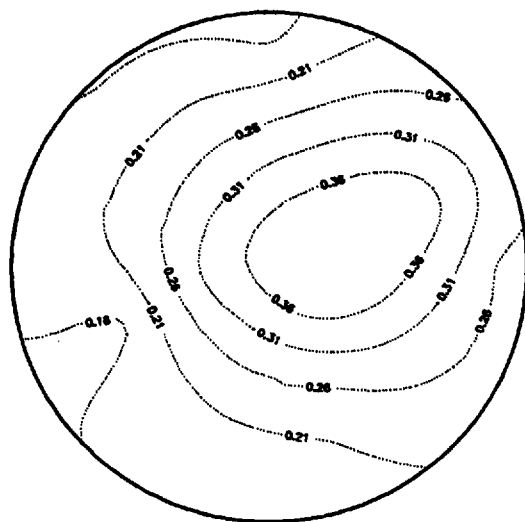
WIND DIRECTION 225



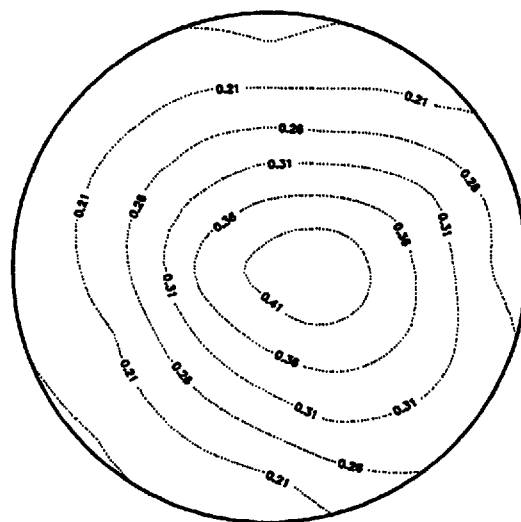
WIND DIRECTION 247.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

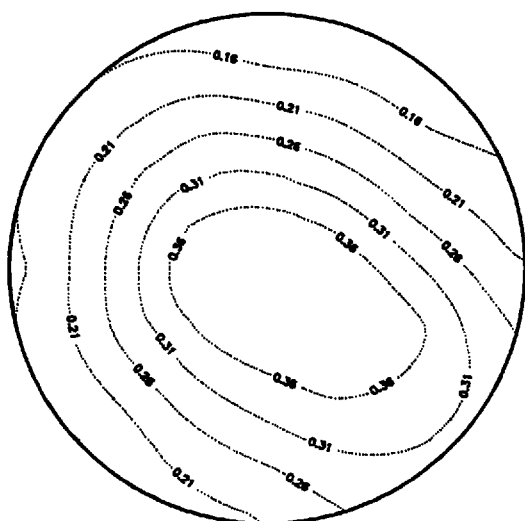
Data Set 14 — 0.75 Roof Height Ratio



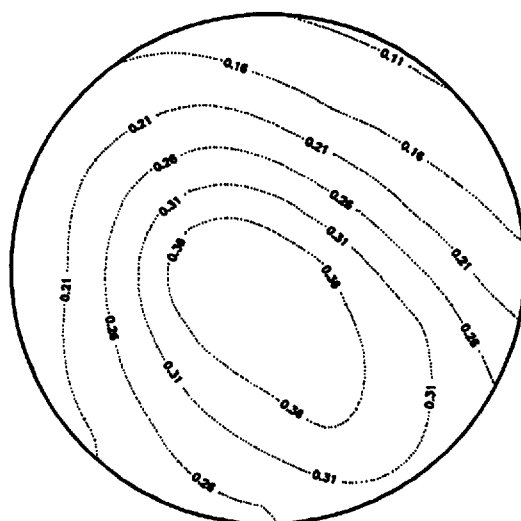
WIND DIRECTION 270



WIND DIRECTION 292.5



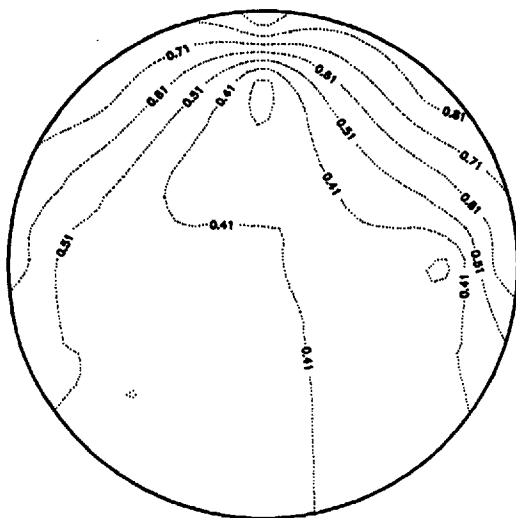
WIND DIRECTION 315



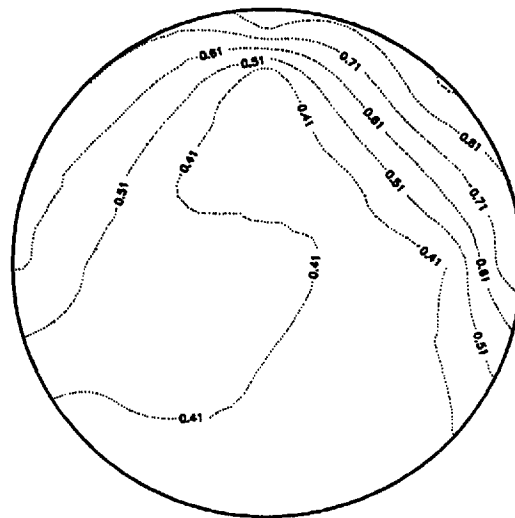
WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration B
48 ft Diameter x 48 ft Tall Tank**

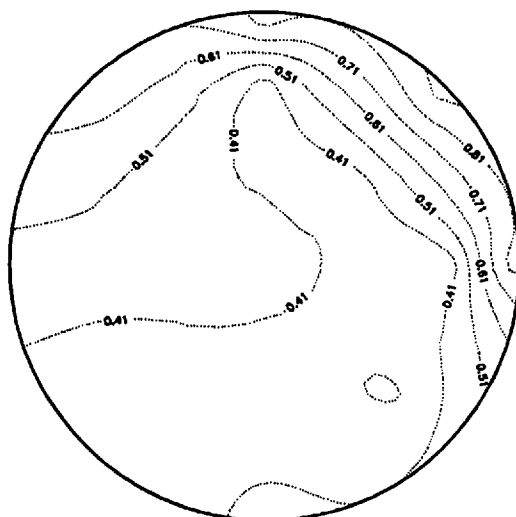
Data Set 14 — 0.75 Roof Height Ratio



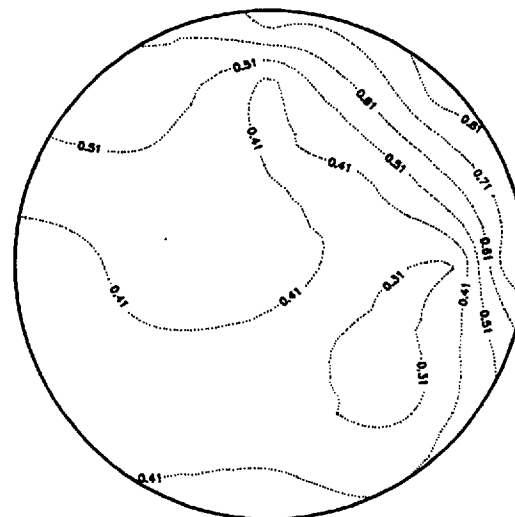
WIND DIRECTION 0



WIND DIRECTION 22.5



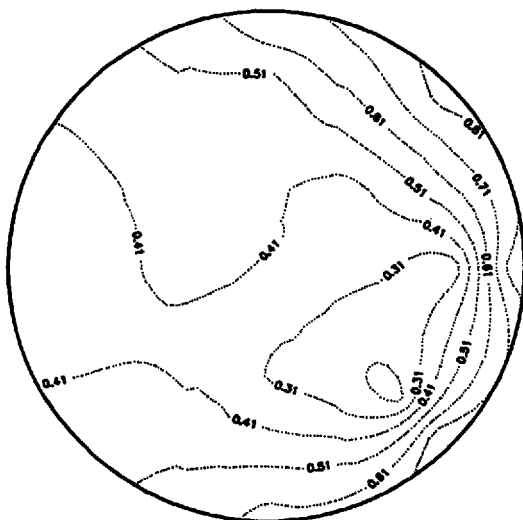
WIND DIRECTION 45



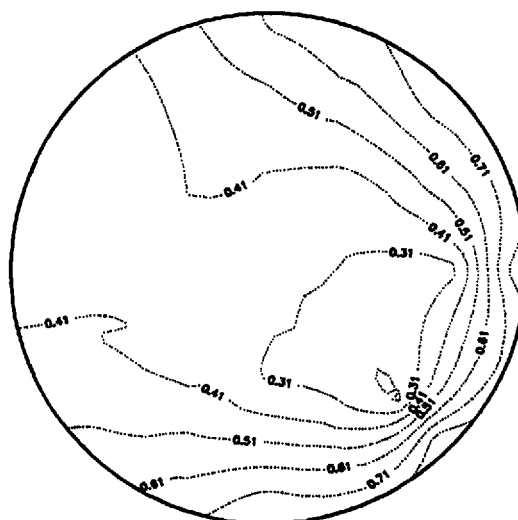
WIND DIRECTION 67.5

Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank

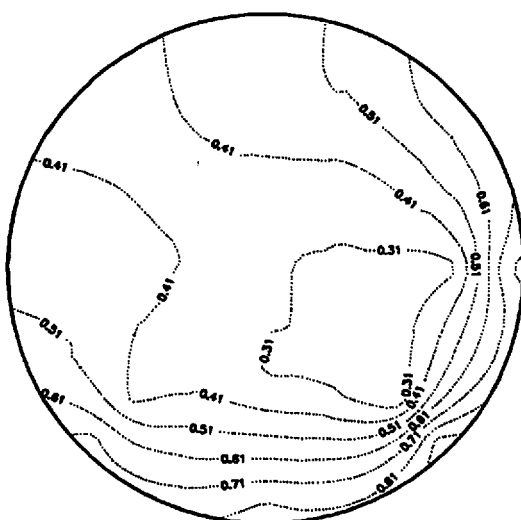
Data Set 19 — 1.00 Roof Height Ratio



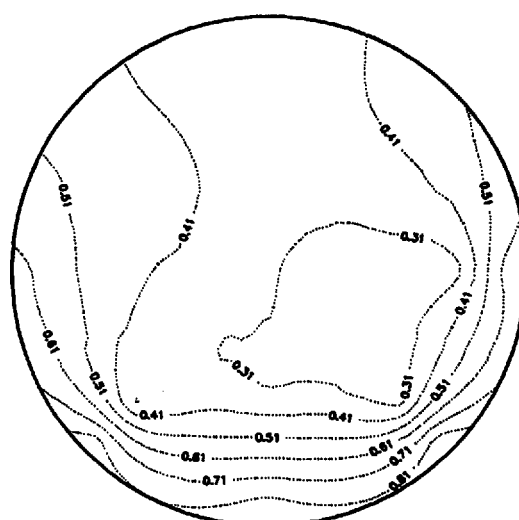
WIND DIRECTION 90



WIND DIRECTION 112.5



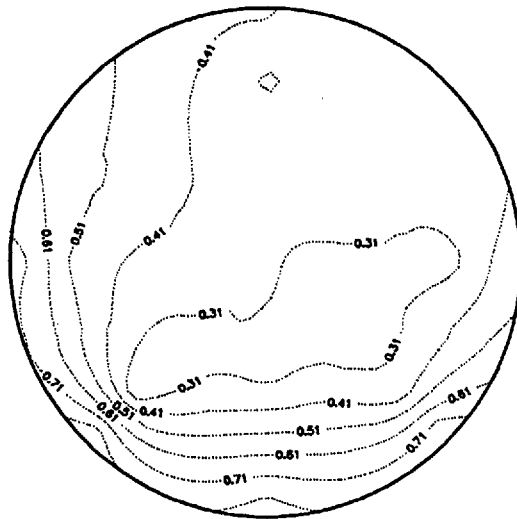
WIND DIRECTION 135



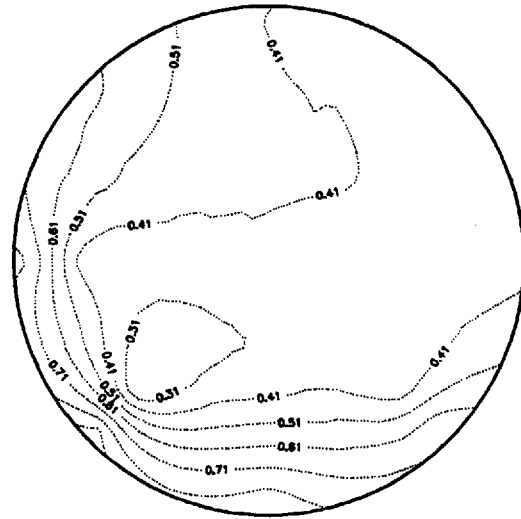
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

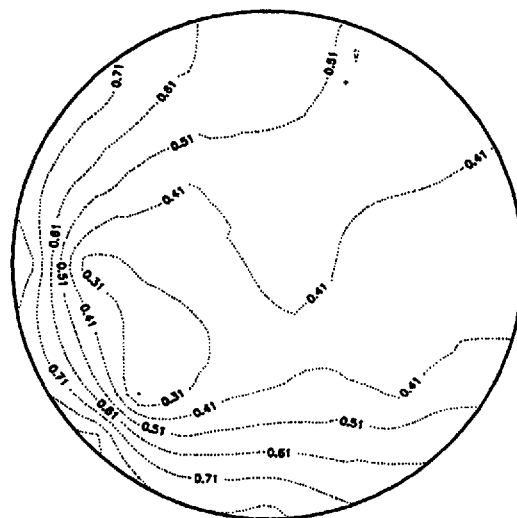
Data Set 19 — 1.00 Roof Height Ratio



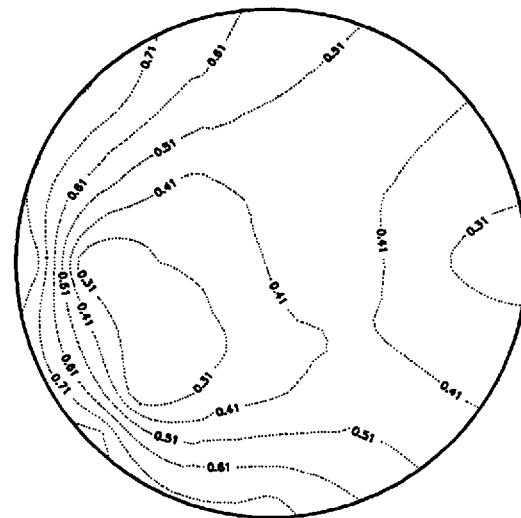
WIND DIRECTION 180



WIND DIRECTION 202.5



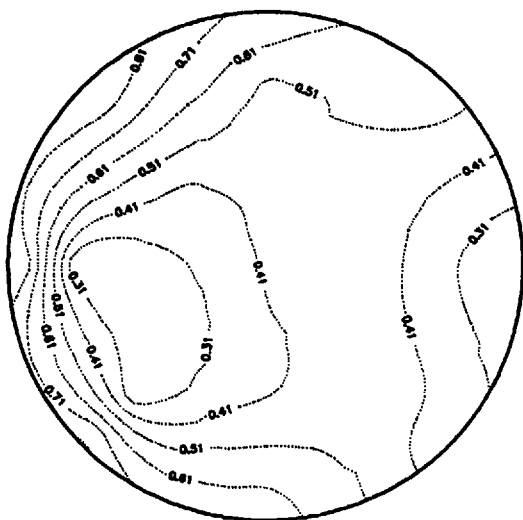
WIND DIRECTION 225



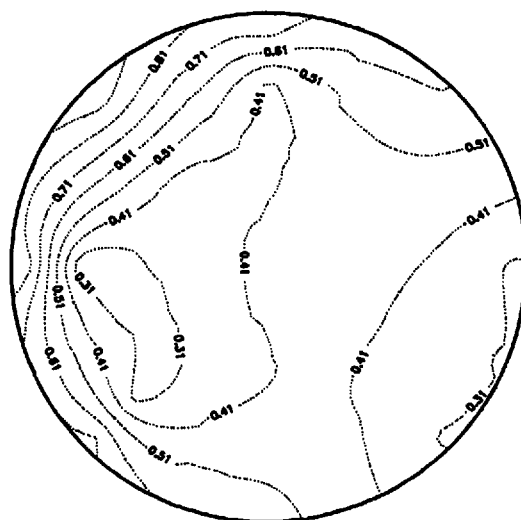
WIND DIRECTION 247.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

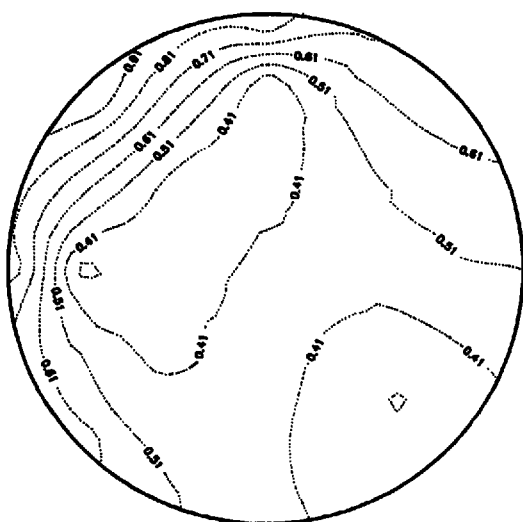
Data Set 19 — 1.00 Roof Height Ratio



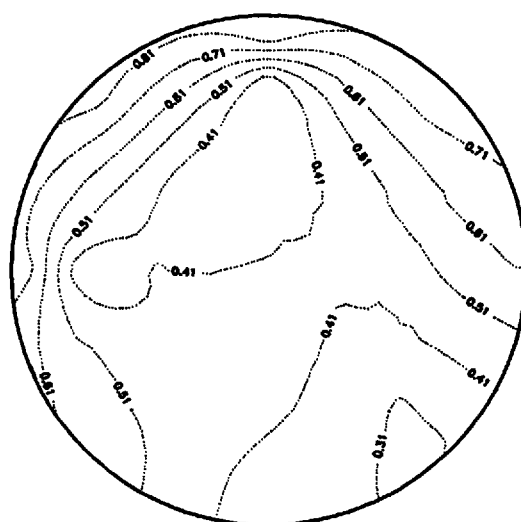
WIND DIRECTION 270



WIND DIRECTION 292.5



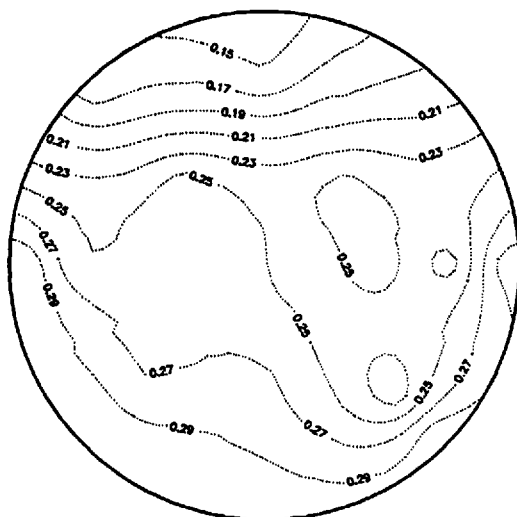
WIND DIRECTION 315



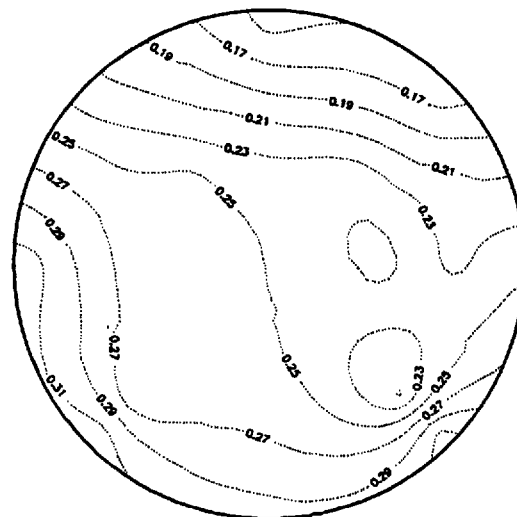
WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

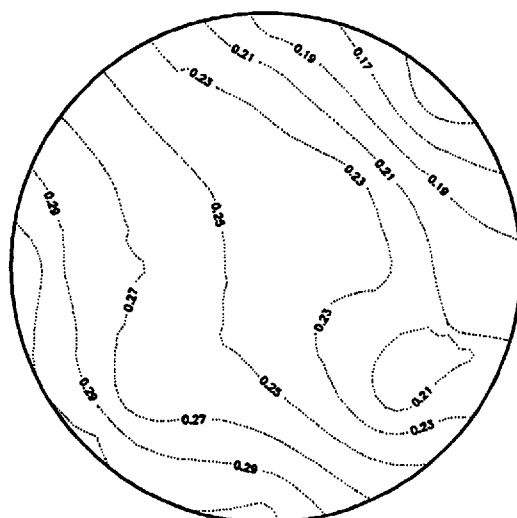
Data Set 19 — 1.00 Roof Height Ratio



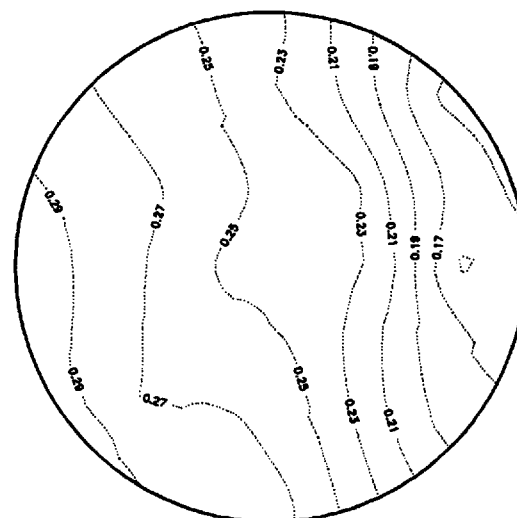
WIND DIRECTION 0



WIND DIRECTION 22.5



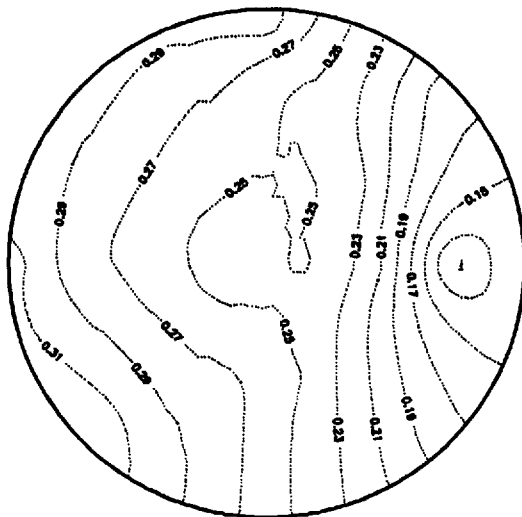
WIND DIRECTION 45



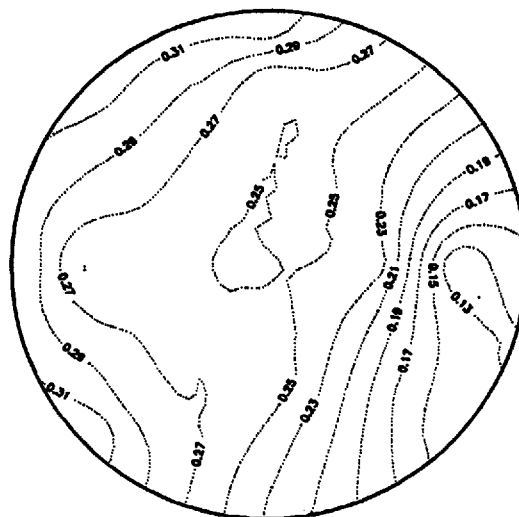
WIND DIRECTION 67.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

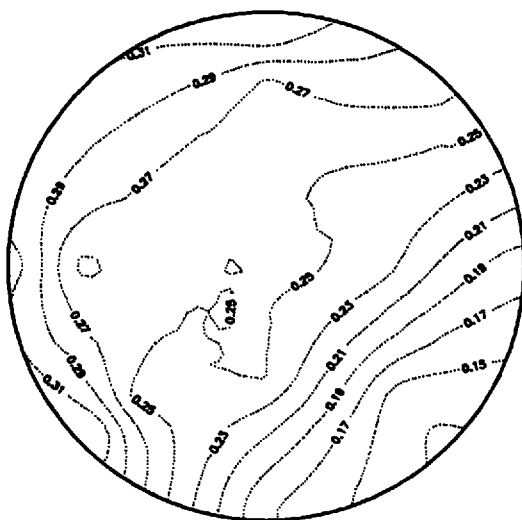
Data Set 20 — 0.90 Roof Height Ratio



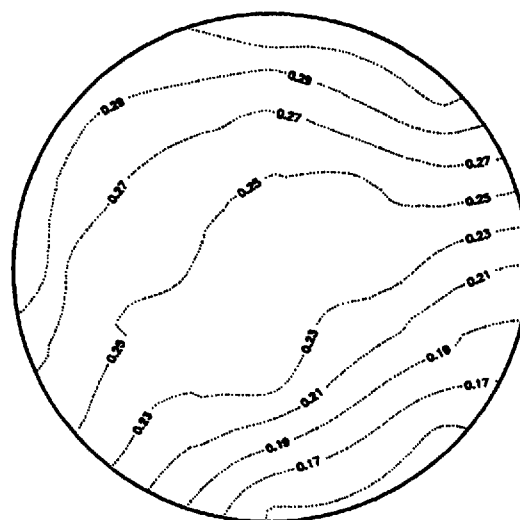
WIND DIRECTION 90



WIND DIRECTION 112.5



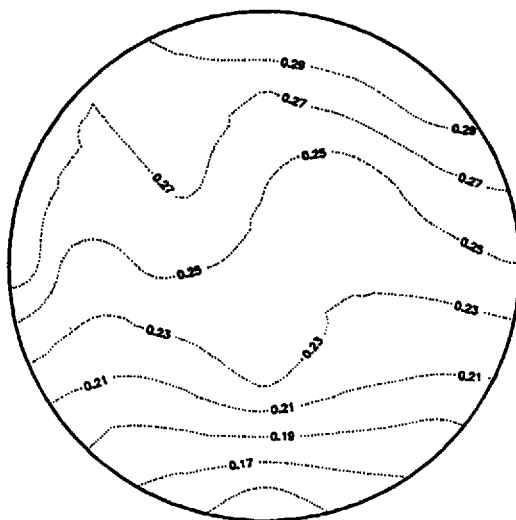
WIND DIRECTION 135



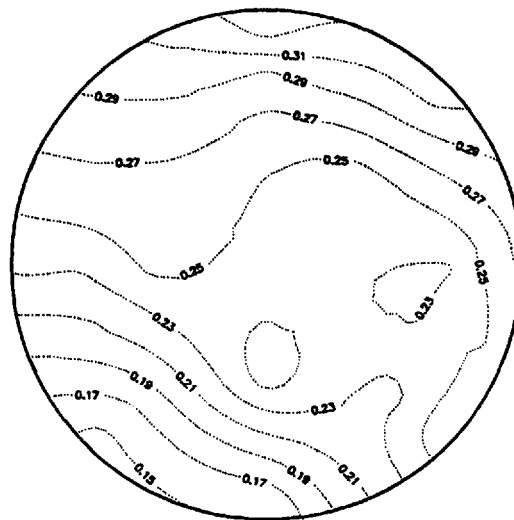
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

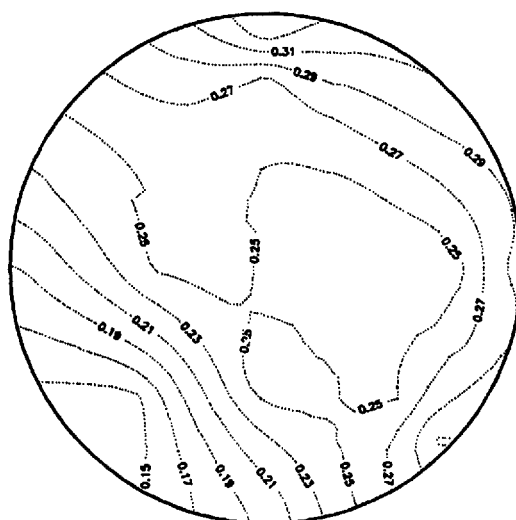
Data Set 20 — 0.90 Roof Height Ratio



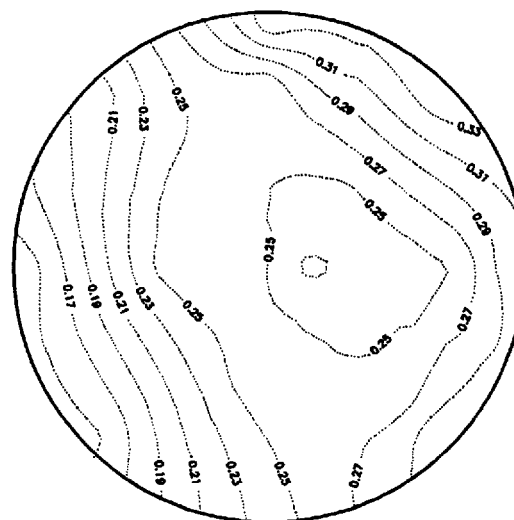
WIND DIRECTION 180



WIND DIRECTION 202.5



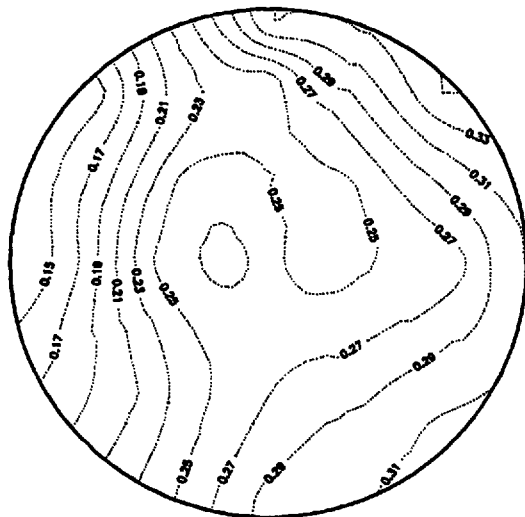
WIND DIRECTION 225



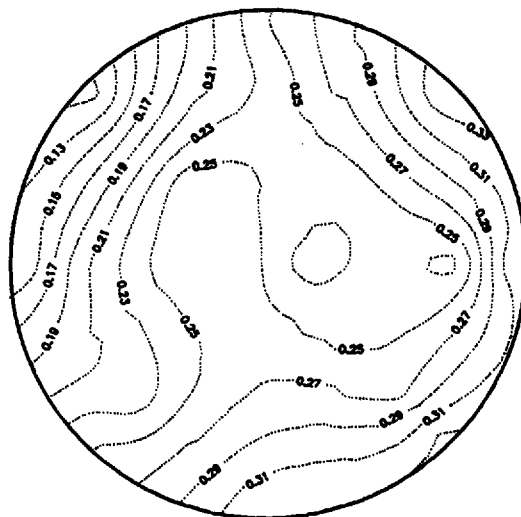
WIND DIRECTION 247.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

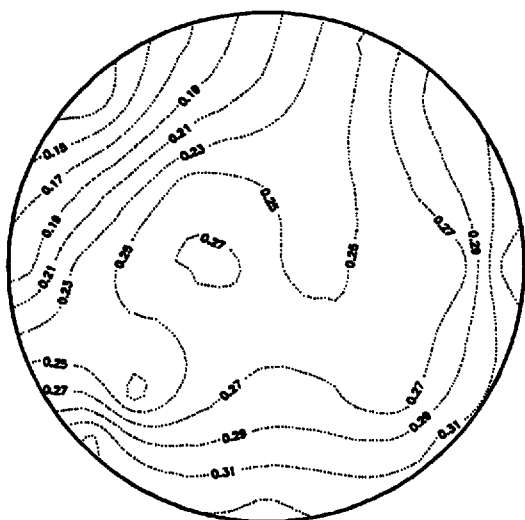
Data Set 20 — 0.90 Roof Height Ratio



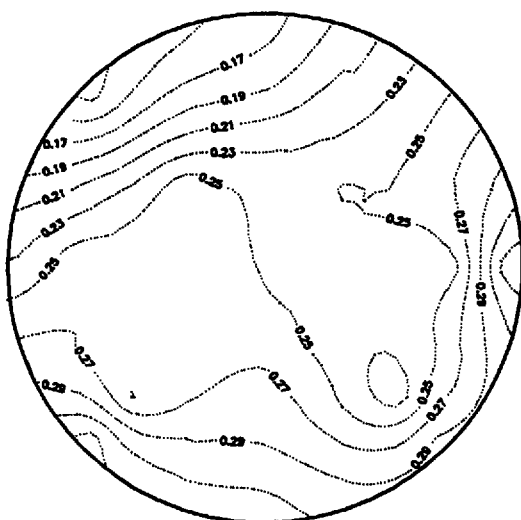
WIND DIRECTION 270



WIND DIRECTION 292.5



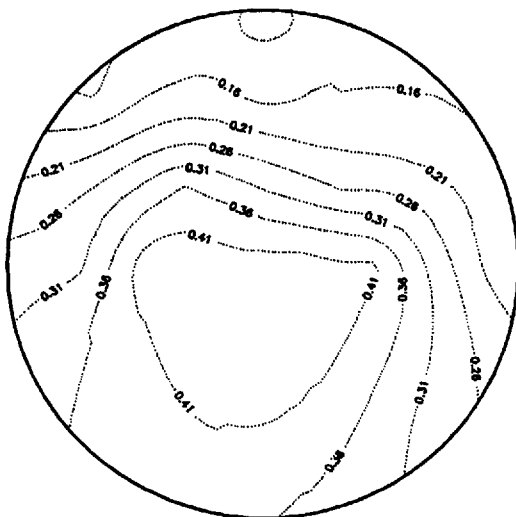
WIND DIRECTION 315



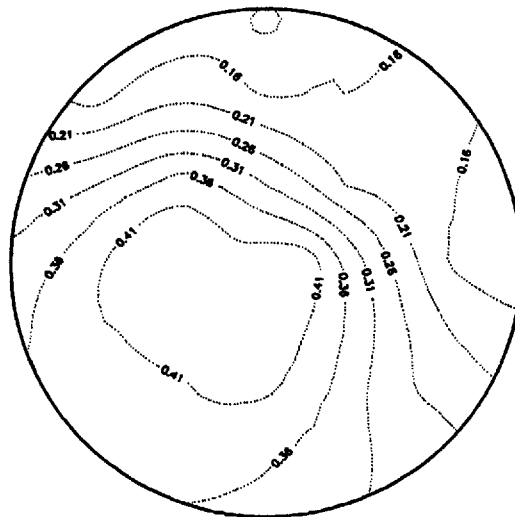
WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

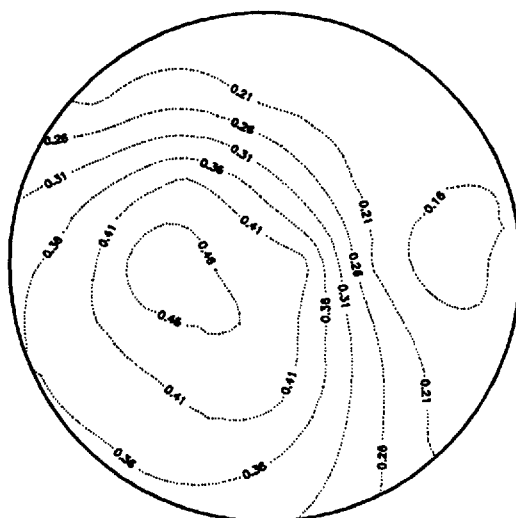
Data Set 20 — 0.90 Roof Height Ratio



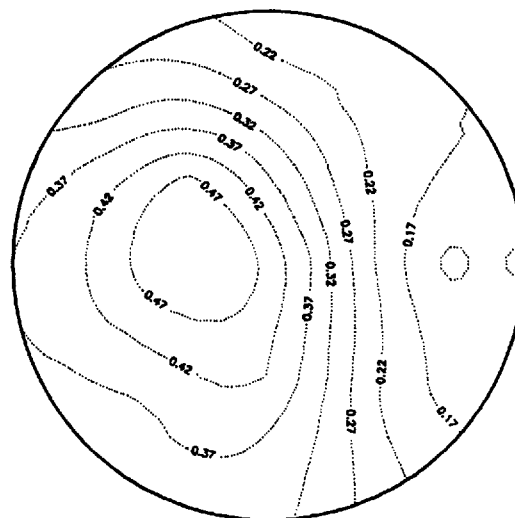
WIND DIRECTION 0



WIND DIRECTION 22.5



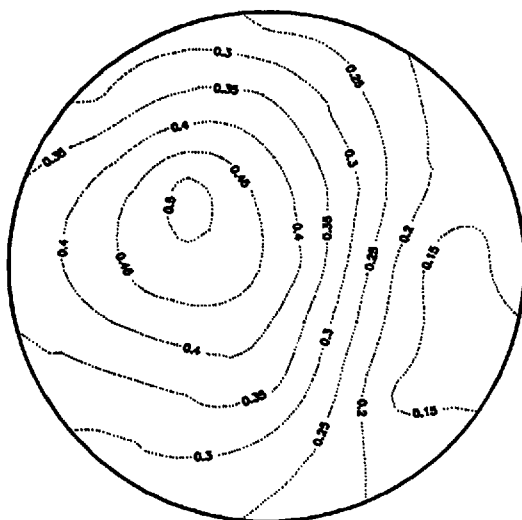
WIND DIRECTION 45



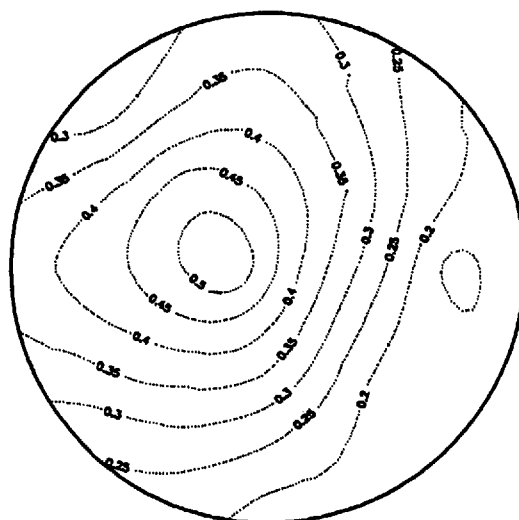
WIND DIRECTION 67.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

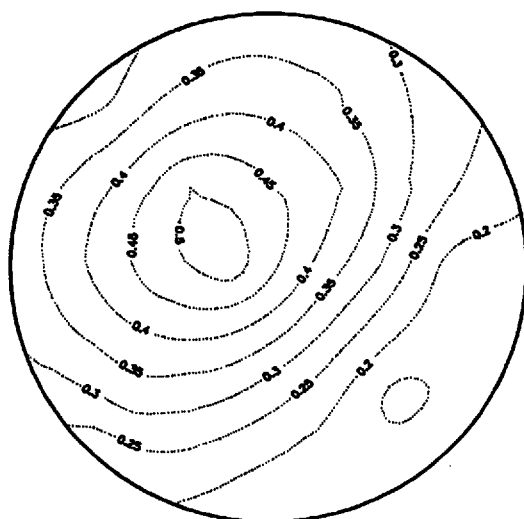
Data Set 21 — 0.50 Roof Height Ratio



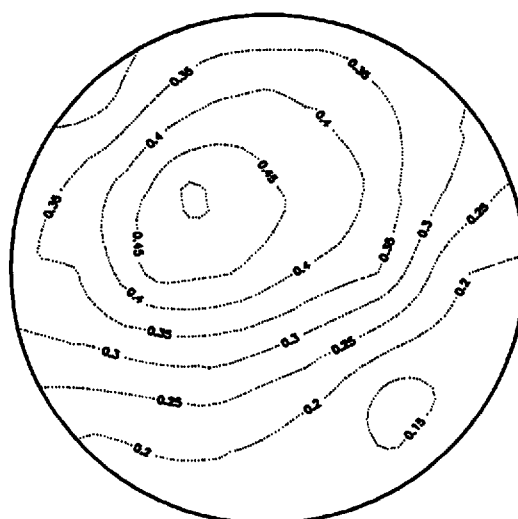
WIND DIRECTION 90



WIND DIRECTION 112.5



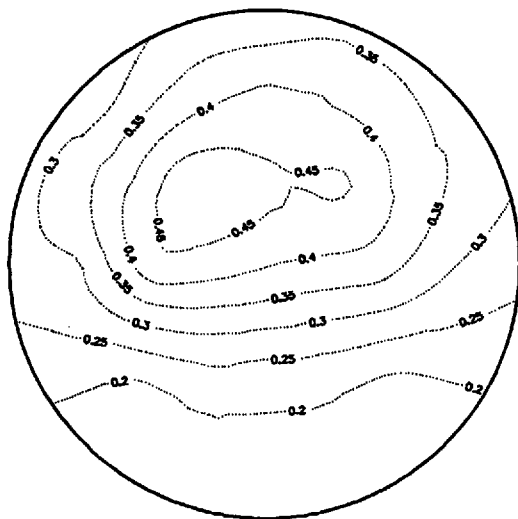
WIND DIRECTION 135



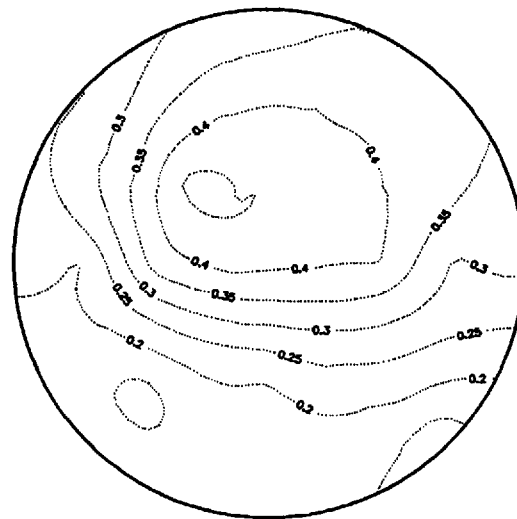
WIND DIRECTION 157.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

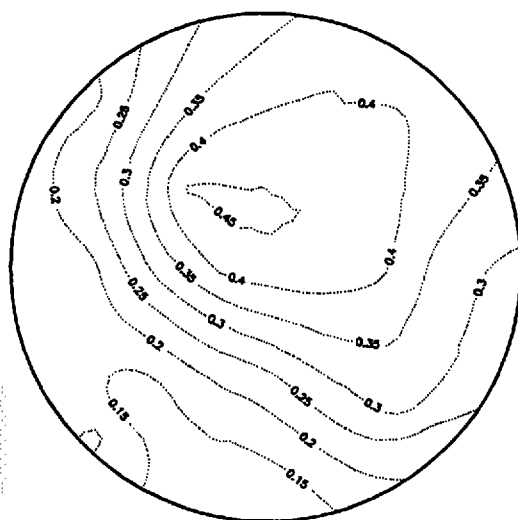
Data Set 21 — 0.50 Roof Height Ratio



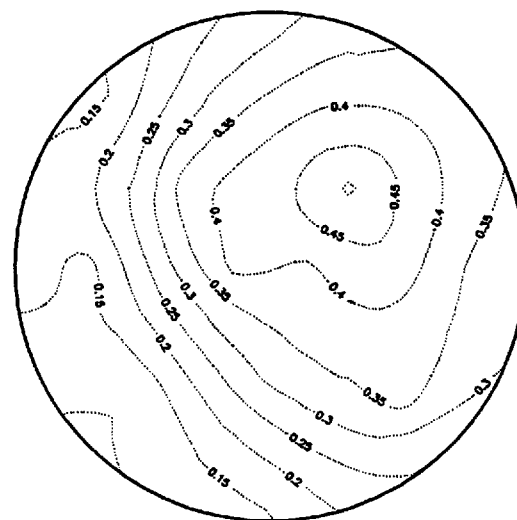
WIND DIRECTION 180



WIND DIRECTION 202.5



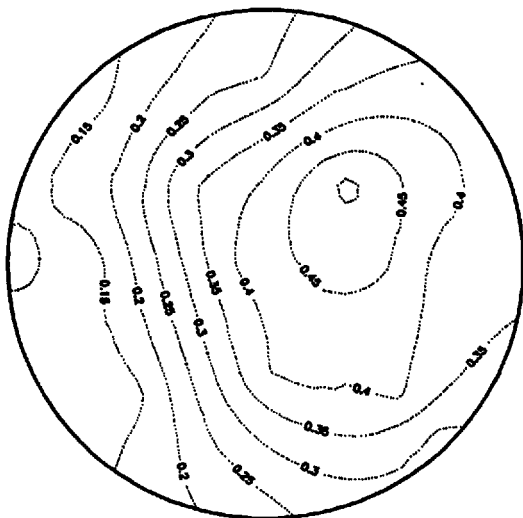
WIND DIRECTION 225



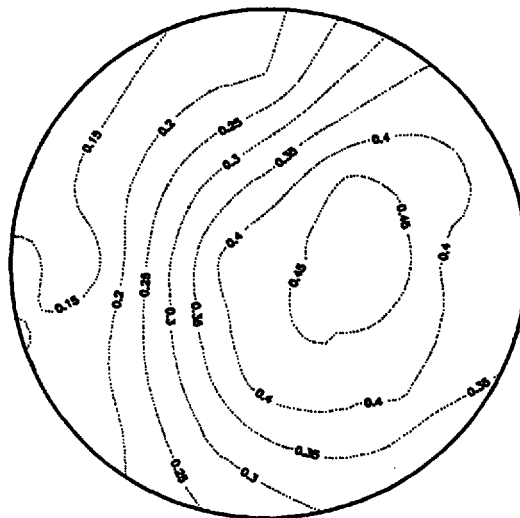
WIND DIRECTION 247.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

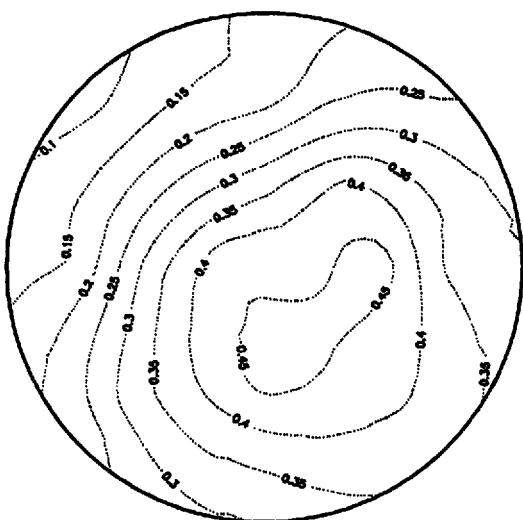
Data Set 21 — 0.50 Roof Height Ratio



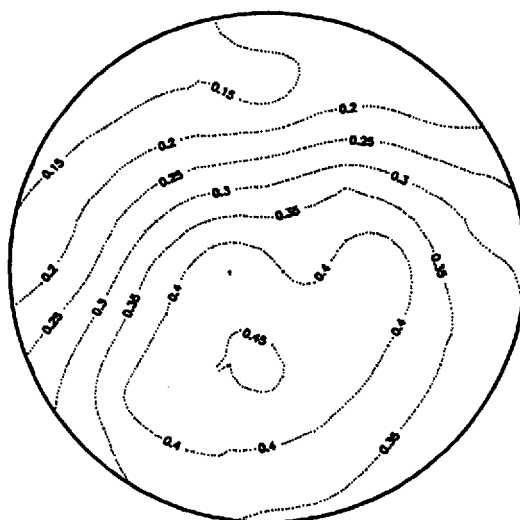
WIND DIRECTION 270



WIND DIRECTION 292.5



WIND DIRECTION 315



WIND DIRECTION 337.5

**Non-Dimensional Mean Velocity Contours
Configuration C
100 ft Diameter x 48 ft Tall Tank**

Data Set 21 — 0.50 Roof Height Ratio

Order No. 852-25580

1-01103-6/93-1C (3E)

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005

