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PAVAN: An Atmospheric-Dispersion Program for Evaluating Design-Basis Accidental Releases of Radioactive Materials from Nuclear Power Stations

Prepared by T. J. Bander

Pacific Northwest Laboratory
Operated by
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U.S. Nuclear Regulatory Commission

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ABSTRACT

This report provides a user's guide for the NRC computer program, PAVAN, which is a program used by the U.S. Nuclear Regulatory Commission to estimate downwind ground-level air concentrations for potential accidental releases of radioactive material from nuclear facilities. Such an assessment is required by 10 CFR Part 100 and 10 CFR Part 50. The program implements the guidance provided in Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants."

Using joint frequency distributions of wind direction and wind speed by atmospheric stability, the program provides relative air concentration (X/Q) values as functions of direction for various time periods at the exclusion area boundary (EAB) and the outer boundary of the low population zone (LPZ). Calculations of X/Q values can be made for assumed ground-level releases (e.g., through building penetrations and vents) or elevated releases from free-standing stacks.

Various options may be selected by the user. They can account for variation in the location of release points, additional plume dispersion due to building wakes, plume meander under low wind speed conditions, and adjustments to consider non-straight trajectories. It computes an effective plume height using the physical release height which can be reduced by inputted terrain features. It cannot handle multiple emission sources.

A description of the main program and all subroutines is provided. Also included as appendices are a complete listing of the program and two test cases with the required data inputs and the resulting program outputs.

SUMMARY

This report provides a user's guide for the NRC computer program PAVAN. PAVAN is used by the U.S. Nuclear Regulatory Commission to estimate relative ground-level air concentrations (X/Q) for potential accidental releases of radioactive material from nuclear facilities. Such an assessment is required by 10 CFR Part 100 and 10 CFR Part 50. The program implements the guidance provided in Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants." The technical basis for Regulatory Guide 1.145 is given by Snell and Jubach (1981).

Using joint frequency distributions of wind direction and wind speed by atmospheric stability, the program provides relative air concentration (X/Q) values as functions of direction for various time periods at the exclusion area boundary (EAB) and the outer boundary of the low population zone (LPZ). Calculations of X/Q values can be made for assumed ground-level releases (e.g., through building penetrations and vents) or elevated releases from free-standing stacks.

The X/Q calculations are based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and all distances for which X/Q values are calculated.

Various options may be selected by the user. They can account for variation in the location of release points, additional plume dispersion due to building wakes, plume meander under low wind speed conditions, and adjustments to consider non-straight trajectories. It computes an effective plume height using the physical release height which can be reduced by inputted terrain features. It cannot handle multiple emission sources.

A description of the main program and all subroutines is provided. Also included as appendices are a complete listing of the program and two test cases with the required data inputs and the resulting program outputs.

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The support and assistance of Bill Sandusky of Pacific Northwest Laboratory in preparing this document is greatly appreciated. Mr. William G. Snell was the NRC Technical Monitor and Mr. Earl H. Markee, Jr., the Project Manager.

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1.0 INTRODUCTION

This report describes the computer program PAVAN which is used to provide atmospheric dispersion conditions for assessments of the consequences of design basis accidents for nuclear power stations. Such assessments are required by 10 CFR Part 100 and 10 CFR Part 50. The computer program implements the guidance provided in Regulatory Guide 1.145, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," (USNRC, 1979). The technical basis for this regulatory guide, including differences between X/Q values calculated by this program and X/Q values calculated under guidance of earlier staff positions, is given by Snell and Jubach (1981).

Using joint frequency distributions of wind direction and wind speed by atmospheric stability, the program provides relative air concentration (X/Q) values as functions of direction for various time periods at the exclusion area boundary (EAB) and the outer boundary of the low population zone (LPZ). Calculations of X/Q values can be made for assumed ground-level releases (e.g., through building penetrations and vents) or elevated releases from free-standing stacks. Three procedures for calculation of X/Q values are utilized for the EAB and LPZ; a direction-dependent approach, a direction-independent approach, and an overall site X/Q approach.

The X/Q calculations are based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. A straight-line trajectory is assumed between the point of release and all distances for which X/Q values are calculated.

The program operates in a batch-input mode and has various options that a user may select. They can account for variation in the location of release points, additional plume dispersion due to building wakes, plume meander under low wind speed conditions, and adjustments to consider non-straight trajectories. It computes an effective plume height using the physical release height which can be reduced by inputted terrain features. It cannot handle multiple emission sources.

This user's guide provides information on basic program features, format of the required input data, a description of the program and subroutines, and a description of the expected output. Appendices to this guide include a listing of the program, sample data inputs and the resulting program outputs.

The program described in this guide is written in FORTRAN IV computer language and is compatible with a CDC 7600 computer system under the NOS 1.0 operating system. Any questions regarding the program or problems encountered should be directed or reported to the Meteorology Staff, U.S. Nuclear Regulatory Commission, Washington, D.C.

2.0 PROGRAM DESCRIPTION

The PAVAN program uses meteorological data in the form of joint frequency distributions of hourly averages of wind direction and wind speed by atmospheric stability class. The number of wind-speed categories is variable up to a maximum of 14. The wind-speed category "CALM" is always taken as the first category. Wind direction is distributed into 16 sectors (N, NNE, NE ...), and atmospheric stability is distributed into 7 classes (A-G). The joint frequency distributions could contain a maximum of 1568 (16x14x7) combinations of wind direction, wind speed, and atmospheric stability. The joint frequency distribution can be input as hours of occurrence or as frequency of occurrence in percent. If wind-speed categories are specified in units of miles per hour, the program will convert to units of meters per second.

For each of the 16 downwind direction sectors, the program calculates X/Q values for each combination of wind speed and atmospheric stability at two distances. These distances are usually the exclusion area boundary (EAB) and the outer boundary of the low population zone (LPZ). The X/Q values calculated for each sector are then ordered from greatest to smallest and an associated cumulative frequency distribution is derived based on the frequency distribution of wind speed and stabilities for that sector. The smallest X/Q value in the distribution will have a corresponding cumulative frequency equal to the wind-direction frequency for that sector. The program then determines for each sector an upper envelope curve based on these data (plotted as X/Q versus probability of being exceeded) such that no plotted point is above the curve. From this upper envelope the X/Q value which is equalled or exceeded 0.5% of the total time is obtained. The maximum 0.5% X/Q value from the 16 sectors becomes the maximum sector X/Q value (see Section 2.1.1 of Regulatory Guide 1.145). This is done for both the EAB and LPZ.

Using the same approach, the program also combines all X/Q values independent of wind direction into a cumulative frequency distribution for the entire site. An upper envelope curve is then determined, and the program selects the X/Q value which is equalled or exceeded 5.0% of the total time.

The larger of the two X/Q values, the maximum sector value and the overall site value, is used to represent the X/Q value for a 0-2 hour time period. This is done for both the EAB and LPZ. For determination of X/Q values for longer time periods, the program calculates an annual average X/Q value using the procedures described in Regulatory Guide 1.111. The annual average X/Q value is then used with the 0-2 hour X/Q value in a logarithmic interpolation scheme to determine X/Q values representative of intermediate time periods (i.e., 8 hours, 16 hours, 72 hours and 624 hours).

ANY USER OF THIS PROGRAM MUST BE FAMILIAR WITH THE DISCUSSION AND REGULATORY POSITION OF REGULATORY GUIDE 1.145. THIS REGULATORY GUIDE GIVES A MORE COMPLETE DESCRIPTION OF THE ASSUMPTIONS AND INPUT DATA USED IN THIS PROGRAM.

The program has the following options:

1. The release mode may be

   a) elevated, or
   b) ground level.

2. Ground-level releases can have additional dispersion due to

   a) plume-meander, and/or
   b) entrainment into the wake of building structures.

3. Plume dispersion parameters (σ_y and σ_z) can be described by

   a) Pasquill-Gifford curves (Slade, 1968), or
   b) desert curves by Markee (Yanskey, 1966) for appropriate sites.

4. For elevated releases, terrain height can be incorporated into a calculation of effective plume height.

5. Site specific or default correction factors to account for non-straight trajectories may be used in the calculation of the annual average X/Q values.

3.0 INPUT DATA FORMATS

Table 3.1 contains the card format for input into PAVAN. Specified are the card type, columns to be punched, the variable name, card format and a description for inputting values of the variable. Parenthetical remarks at the end of each description give the most commonly assigned values.

TABLE 3.1. List of Input Data

Card Type	Columns	Variable Name	Format	Descriptions
Card Type 1 is an array, KOPT, of options:				
KOPT(I) = 1 means apply this option; KOPT(I) = 0 means do not apply this option.				
1	1	KOPT(1)	I1	Calculate σ_y and σ_z values based on desert diffusion conditions and Pasquill-Gifford diffusion parameters. See Subroutine POLYN description. (Normally = 0).
1	2	KOPT(2)	I1	X/Q values calculated both with and without building wake credit. Otherwise program does calculations with building wake. Note: KOPT(1) and KOPT(2) should not both be equal to 1. See Main Program PAVAN description. (Normally = 0).
1	3	KOPT(3)	I1	Print Subroutine ENVLOP calculations which describe upper envelope curve. See Subroutine ENVLOP description. (Normally = 0).
1	4	KOPT(4)	I1	Print points used in upper envelope curve and calculations used to determine the number of hours the maximum X/Q is exceeded. See Subroutines ENVLOP and ONEOUT descriptions. (Normally = 0).
1	6	KOPT(6)	I1	Joint frequency distribution data input is in percent frequency summing to 100%. (Normally = 0 and data input in hours).
1	7	KOPT(7)	I1	Print the X/Q calculations. This option will print for each stability class and wind-speed combination the following: the percent occurrence; distance; terrain height; effective plume height; σ_y; σ_z; meander σ_y; X/Q values calculated assuming meander and building wake; and which X/Q value is used. See Subroutine CHIQ description. (Normally = 0).

TABLE 3.1. List of Input Data (contd)

Card Type	Columns	Variable Name	Format	Descriptions
1	8	KOPT(8)	I1	Distribute CALM array, see Card Type 8, into first wind-speed category.
1	9	KOPT(9)	I1	Use site-specific terrain adjustment factors for the annual average calculations. See Card Type 12.
1	10	KOPT(10)	I1	Assume a default terrain adjustment factor for the annual average calculations. See Subroutine OPENTR description. If both KOPT(9) and KOPT(10) equal 1, the site-specific factors will be applied to all boundary distances. The printed output will state whether the site-specific or default adjustment factors have been used.
Card Types 2-5 are title cards to describe the data for the run.				
2	1-20	TITLD(1-5)	5A4	Plant name.
2	21-40	TITLD(6-10)	5A4	Period of Data record.
2	41-60	TITLD(11-15)	5A4	Type of release (e.g. GROUND-LEVEL RELEASE). For elevated release, give release height. (Should be the same as HS in Card Type 7.)
3	1-20	TITLD(16-20)	5A4	Height of wind sensors at which the data were measured. (Should be the same as TOWERH in Card Type 7.)
3	21-40	TITLD(21-25)	5A4	Heights between which the vertical temperature difference was measured.
4	1-80	TITLD(26-45)	20A4	Reference for the data.

TABLE 3.1. List of Input Data (contd)

Card Type	Columns	Variable Name	Format	Descriptions
5	1-80	TITLD(46-65)	20A4	Any special comments concerning the data or run. (Write NONE, if none).
6	1-5	NVEL	I5	Number of wind-speed categories into which the joint frequency data are classified. See Card Type 10. (Maximum of 14).
6	6-10	NDIS	I5	Number of distances with terrain data for each sector. The number of distances must be the same for each sector. For stack releases at least one value must be inputted. If a ground-level release, set NDIS = 0.
7	1-5	A	F5.0	Minimum cross-sectional area (square meters) of the containment structure, for use in the building-wake term. See Equation (6).
7	6-10	D	F5.0	Height (meters) above plant grade of the containment structure used in the building-wake term for the annual-average calculations. See Equation (2).
7	11-15	HS	F5.0	Height (meters) above plant grade of the release point. This variable also defines the type of release: To assume a Ground-Level Release, set HS = 10.0 . A ground-level release is defined as any release whose plume can be influenced by the airflow wake of the building structures. This is generally all release points that are effectively less than two and one-half times the height of adjacent solid structures. To assume a Stack Release, set HS equal to the effective stack height, but HS must be greater than 10.1. A stack (totally elevated) release is defined as any release not influenced by building wake effects and is generally all release points at least two and one-half times the height of adjacent solid structures.

TABLE 3.1. List of Input Data (contd)

Card Type	Columns	Variable Name	Format	Descriptions
7	16-20	TOWERH	F5.0	Height (meters) above ground-level at which the wind speed was measured. If TOWERH is not equal to HS, then Subroutine ADJWND will adjust the wind speed (either up or down) to be representative of HS. See Subroutine ADJWND description for the wind-speed adjustments made.
8	1-35	CALM(J) J = 1,7	7F5.0	Number of hours or percent of calm for each stability category. Note: J = 1 is A, 2 is B, ... , 7 is G; A to G are Pasquill stability categories. These values will be distributed into the first wind-speed class (I = 1) of FREQ (K,I,J), if KOPT(8) = 1. If KOPT(8) = 0, the CALM array should all be zero. See Main Program PAVAN description.
9	1-80	FREQ(K,I,J) K = 1,16 I = 1 or 2,NVEL J = 1,7	16F5.0	Joint frequency distribution in hours or percent; see KOPT(6). The index on wind-speed category, I, starts at 1 or 2, depending on whether calms are already distributed, see Card Type 8. Seven stability categories, index J, must be used. The loop to read these values cycles first on wind direction (starting with north and continuing in a clockwise fashion), then on wind speed, and finally on stability. If the input is in hours, the integer values must be right justified in the five spaces provided for each element of the array. Note that the wind direction index K represents the direction that the wind is blowing from.
10	1-5	UCOR	F5.0	Correction factor applied to UMAX array. If no corrections are needed, set UCOR to less than zero. If wind-speed categories are inputted in miles/ hour, set UCOR to greater than 100 to convert the wind speeds to meters/second.

TABLE 3.1. List of Input Data (contd)

Card Type	Columns	Variable Name	Format	Descriptions
10	6-75	UMAX(I) I = 1,NVEL	14F5.0	Maximum wind speed in each wind-speed category, in either miles/hour or meters/second. (If in miles/hour, set UCOR greater than 100). So that calms can be properly apportioned a direction,it is preferable that the first wind-speed category have a maximum wind speed less than 1.5 meters/second.
11	1-80	BDY(K,I) K = 1,16 I = 1,2	16F5.0	Downwind distances (meters) by sector at which X/Q estimates will be made. Two sets of distances must be input (usually the EAB and LPZ boundary). K = 1 is the distance to the south boundary, K = 2 to the SSW, ..., K = 16 to the SSE. If BDY (K,I) equals 0, that direction will be ignored. If BDY (1,2) is less than 0, the second set of boundaries will be ignored. (See Regulatory Guide 1.145 for the method to determine distances for evaluations using that Guide.)
Card Type 12 read in only if KOPT(9) = 1				
12	1-80	TAF(K,I) K = 1,16 I = 1,2	16F5.0	Site-specific terrain correction factors to be inputted if KOPT(9) = 1. Two sets of factors must be input. These values correspond to the downwind distances defined on Card Type 11. For directions where no correction is desired, these elements of TAF should be set equal to 1.0. If TAF(1,1) or TAF (1,2) is less than 0, PAVAN will set

TABLE 3.1. List of Input Data (contd)

Card Type	Columns	Variable Name	Format	Descriptions
				all the factors for that boundary equal to 1.0 (i.e., no correction factors will be applied). Note, one could have site-specific correction factors for one boundary and default correction factors for the other boundary by setting KOPT(9) and KOPT(10) equal to 1 and appropriate values of TAF(1,1) and TAF(1,2).
Card Types 13 and 14 read in only if HS > 10.1. They are for each pair of terrain distance and height.				
13	1-80	DIST(K,I) K = 1,16	16F5.0	The distance (meters) at which terrain heights are given for each downwind sector (a maximum of ten). K = 1 is for the south, K = 2 for SSW, ..., K = 16 for SSE.
14	1-80	HT(K,I) K = 1,16	16F5.0	Terrain heights (meters, above plant grade level) corresponding to the distance specified in the DIST array (Card Type 13) for each downwind sector. These values are read in the same order as the DIST array. For a given direction and distance, the terrain height should be the highest elevation between the source and that distance anywhere within the direction sector.
Card Types 13 and 14 are repeated for the remaining distances and heights; i.e., I = 1,NDIS				

4.0 DESCRIPTION OF THE MAIN PROGRAM PAVAN AND SUBROUTINES

The program PAVAN is composed of the main program and seventeen subroutines. Eleven systems routines are also called. Data transfer is performed primarily through an unlabeled COMMON block.

The hierarchy of the program PAVAN is shown in Figure 4.1. The diagram indicates the calling sequence and gives a brief description of the purpose of each subroutine. Control logic is not indicated in the figure. The unlabeled COMMON block is used in the main program PAVAN and Subroutines ADJWND, ANNUAL, CHIQ, ENVLOP, ONEOUT, and OUTPUT.

In addition to the calling sequence shown in Figure 4.1, eleven system routines are used by PAVAN. These routines are standard FORTRAN functions except for the functions DATE and TIME. The function DATE returns a ten-character word giving the current day-of-year (month/day/year). The function TIME returns a ten-character word giving the current time-of-run (hour/min/sec). Both of these functions are unique to the CDC 7600 computer system. Implementation of the program on other computer systems will probably require these functions to be changed.

4.1 MAIN PROGRAM PAVAN

The main program PAVAN is the principal control routine of the program. The routine reads in the data, organizes it for use within the program, and calls the remaining subroutines to calculate and print out the X/Q values.

The data are read in at the beginning of the routine in the form described in Section 3.0. Each input card is printed out so that the user has a complete record of the input data. If calm winds have not already been distributed into the joint frequency distribution, then for each stability class, the routine distributes occurrences of calm wind by assigning them in proportion to the directional distribution of noncalm winds with speeds less than 1.5 meters per second. If there is no occurrence of winds at speeds less than 1.5 meters per second, then the calms are distributed equally in all directions. Subroutine ADJWND is called to extrapolate the wind speeds to the release height, if different from the height at which the wind speed was measured.

As noted in Section 3.0, the program uses meteorological data in the form of a joint frequency distribution of wind direction, wind speed, and atmospheric stability. The routine converts all input frequencies into "percent" values if not already in percent. It then sums and prints these frequencies, by stability class, and also prints building and release height characteristics, terrain data (if an elevated release), the boundary distances for which calculations will be made, and site-specific correction factors (if any). PAVAN calls Subroutine OUTWND to calculate and print wind-speed percentiles.

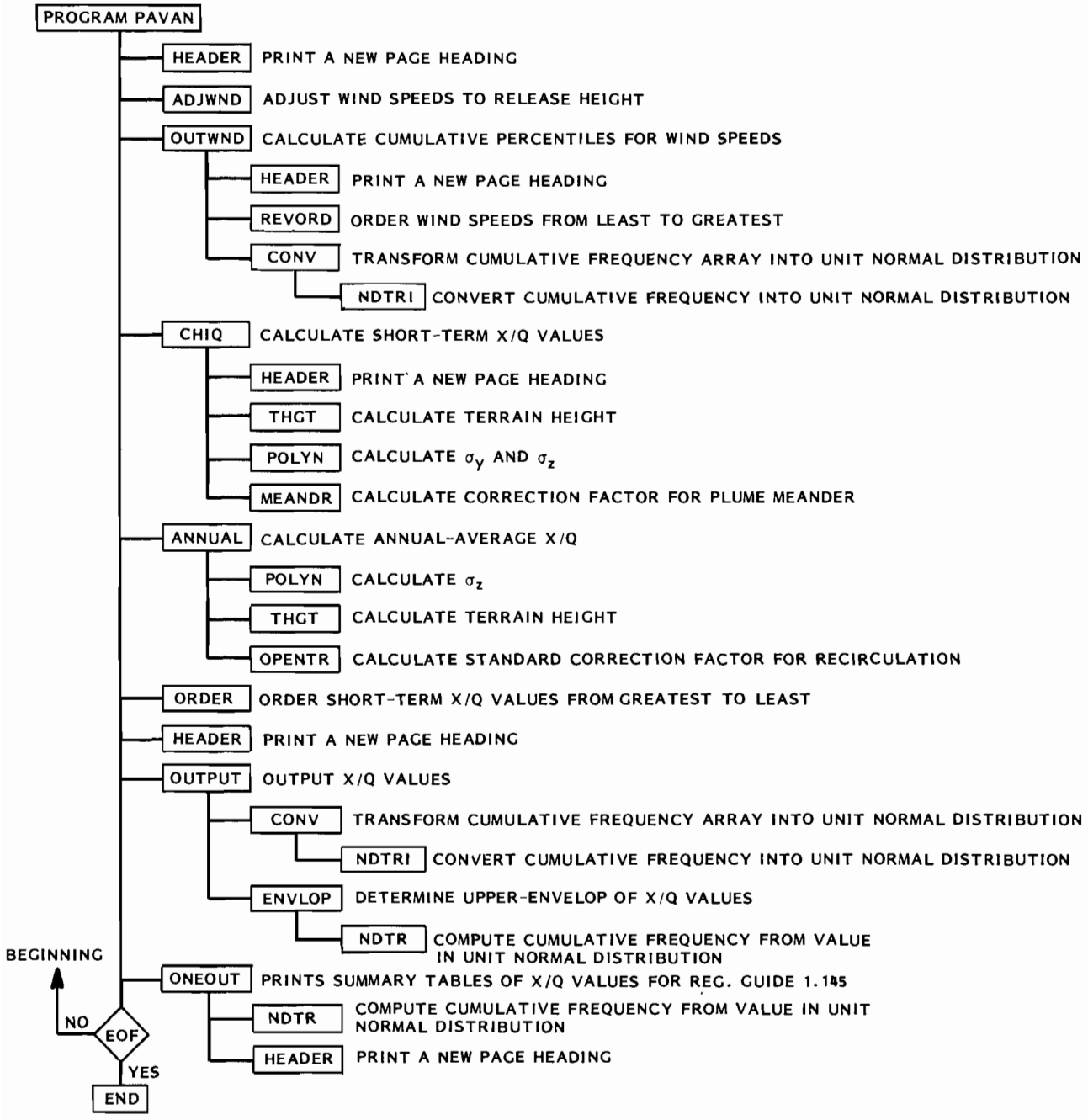

FIGURE 4.1. Hierarchy Diagram for PAVAN

PAVAN controls the various specified options used to calculate the appropriate X/Q values described in Regulatory Guide 1.145 (USNRC, 1979). The program calculates X/Q values at two sets of distances, labeled Boundary 1 and Boundary 2. Usually Boundary 1 will be the Exclusion Area Boundary distances and Boundary 2 will be the Low Population Zone Boundary distances. For both sets of boundaries, three procedures for calculation of X/Q values are utilized:

- Procedure One utilizes the direction-dependent approach described in Regulatory Guide 1.145 (USNRC, 1979). The joint frequency distribution used in calculating the X/Q distribution is that which occurs in each downwind sector. The X/Q value in each sector that is exceeded 0.5% of the total time is calculated.

- Procedure Two utilizes the direction-independent approach described in Sagendorf (1974) and labeled as the S.R.P.(Standard Review Plan) 2.3.4 model. This procedure uses the minimum distance of Boundary 1 for the first boundary and the minimum distance of Boundary 2 for the second boundary. Plume meander is not utilized in this procedure. The frequency distribution of wind speed and atmospheric stability, independent of wind direction, is used for developing the X/Q distribution. The X/Q value which is exceeded 5% of the total time is calculated.

- Procedure Three is computation of the 5% Overall Site X/Q approach described in Regulatory Guide 1.145 (USNRC, 1979). This procedure uses the X/Q values calculated in Procedure One with their frequency of occurrence for each sector to develop a single X/Q distribution for each entire boundary. The X/Q value calculated is that value which is exceeded 5% of the total time.

If KOPT(1) is set equal to 1, the program will generate X/Q values based on σ_y's and σ_z's for <u>both</u> desert (Yanskey, 1966) and Pasquill-Gifford (Slade, 1968) diffusion parameters. The X/Q values calculated using the Pasquill-Gifford parameters will utilize the meander correction factors described in Regulatory Guide 1.145 where appropriate. The meander factors are <u>not</u> included in calculations using the desert sigma parameters or for elevated releases.

If KOPT(2) is set equal to 1, the program will generate X/Q values assuming both building-wake credit and no building-wake credit. For calculations using desert sigmas, plume meander is not allowed and building-wake credit is generally not included. The atmospheric dispersion tests (Fuquay, 1963; Islitzer, 1963) on which the desert sigmas are based (Yanskey, 1966) were conducted in open areas without buildings and the sampling time for data collection was 15 to 60 minutes. Therefore, desert sigmas include plume meander while the Pasquill-Gifford parameters, which are based on 3 to 10 minute sampling times, do not. Also, in comparing the Idaho tests with EBR-II test data (Dickson, 1969) that were similar and used 30-minute sampling times, but with a building present, little difference in the results was found. This implies that additional atmospheric dispersion due to the building wake is

neglible compared to plume meander for the longer sampling times. For elevated releases no additional atmospheric dispersion due to building wake is allowed.

4.2 SUBROUTINE ADJWND

ADJWND adjusts the wind speeds input on Card Type 10 to be representative of the release height. ADJWND assumes the power-law relationship of wind speed with height as a function of atmospheric stability described by Smith (1968). The relationship is

$$U_R = U_M(HR/TH)^P \qquad (1)$$

where

U_R = wind speed adjusted to the height of release (meters/sec).

U_M = wind speed at the level of measurement (meters/sec). (See Card Type 10.)

HR = height of release (meters). (See Card Type 7.)

TH = height at which wind speed U_M was measured (meters). See Card Type 7.)

P = 0.25 for unstable and neutral atmospheric conditions and 0.50, for stable conditions.

The argument list for ADJWND has four parameters:

RLSHT = release height (meters).
TOWERH = height of wind-speed measurement (meters).
UMAX(I) = maximum wind speed in each wind-speed Category I (meters/sec).
UAVE(I) = average wind speed for each wind-speed Category I (meters/sec).

Note that for a ground-level release, HR is set at 10.0 meters.

The adjusted wind speeds are transferred to the main program through the COMMON statement in the arrays UMAXAD and UAVEAD:

UMAXAD(I,J) = adjusted maximum wind speed for wind-speed Category I and stability J (meters/sec).

UAVEAD(I,J) = adjusted average wind speed for wind-speed Category I and stability J (meters/sec).

4.3 SUBROUTINE ANNUAL

ANNUAL calculates the annual average X/Q value for each location (sector-distance combination). The routine uses the method described in XOQDOQ (Sagendorf et al., 1982) with several simplifying assumptions made to assure conservative X/Q estimates. These assumptions include no plume rise, no deposition or depletion, and no radioactive decay. The routine assumes a long-term continuous release whose effluent is distributed evenly over a 22-1/2 degree directional sector. The routine considers elevated or ground-level releases only.

Ground level release concentrations are calculated using the following two equations modified from Slade (1968):

$$\frac{\overline{X}}{Q}(x,k) = \frac{2.032}{x} RF_k(x) \sum_{ij} F_{ijk} \left\{ U_{ij}(10) \left[\sigma_{zj}^2(x) + cD^2/\pi \right]^{1/2} \right\}^{-1} \qquad (2)$$

$$\frac{\overline{X}}{Q}(x,k) = \frac{2.032}{x} RF_k(x) \sum_{ij} F_{ijk} \left\{ \sqrt{3}\ U_{ij}(10)\ \sigma_{zj}(x) \right\}^{-1} \qquad (3)$$

where

$\frac{\overline{X}}{Q}(x,k)$ = annual average relative concentration at distance x and downwind sector k (sec/cubic meter).

x = downwind distance (meters).

$RF_k(x)$ = correction factor for air recirculation and stagnation at distance x and k^{th} downwind sector. (See KOPT(9) and KOPT(10) and Subroutine OPENTR.)

F_{ijk} = joint frequency of the i^{th} wind-speed catgory, the j^{th} stability category, and the k^{th} wind direction.

$U_{ij}(10)$ = average wind speed for wind-speed category i and stability category j adjusted to 10.0 meters (meters/sec). (See Subroutine ADJWND.)

$\sigma_{zj}(x)$ = vertical dispersion of plume for stability category j at distance x (meters). (See Subroutine POLYN.)

c = mixing volume coefficient in the building-wake term (internally set to 0.5).

D = building height used to describe dilution due to the building wake (meters).

π = 3.1416.

2.032 = factor attained from the term $\frac{2N}{(2\pi)^{3/2}}$ in the general sector-spread Gaussian plume model where N = 16, the number of wind-direction sectors.

Equation (3) reflects the maximum building-wake dilution allowed. ANNUAL uses the larger value for each direction and distance of $\overline{X/Q}$ calculated from Equations (2) and (3).

For elevated releases, the following basic equation, modified from Slade (1968), is used:

$$\frac{\overline{X}}{Q}(x,k) = \frac{2.032\ RF_k(x)}{x} \sum_{ij} \frac{F_{ijk} \exp\left\{-\frac{1}{2}\left[\frac{h_{ek}(x)}{\sigma_{zj}(x)}\right]^2\right\}}{U_{ij}(hs)\ \ \sigma_{zj}(x)} \qquad (4)$$

where

$U_{ij}(hs)$ = average wind speed for wind-speed category i and stability j adjusted to release height (meters/sec).

The effective plume height is obtained from:

$$h_{ek}(x) = hs - ht_k(x) \qquad (5)$$

where

hs = height of elevated release above plant grade (meters).

$ht_k(x)$ = maximum terrain height above plant grade between release point and distance x in downwind sector k (meters).

For $ht_k(x)$ greater than hs, $h_{ek}(x)$ is set to zero.

All the other parameters are as defined for Equation (2).

The argument list for ANNUAL has six parameters:

K = downwind sector (K = 1 is S, 2 is SSW, ..., 16 is SSE).

DIS = downwind distance in sector K (meters).

TAF(K,I) = array of site-specific terrain correction factors for downwind direction K and boundary I. (See Card Type 12.)

HS = height of elevated release above plant grade (meters).

NDIS = number of distances for which terrain data is given.

FREQ(K,I,J) = joint frequency distribution in percent. (See Card Type 9.)

The annual-average X/Q values are transferred to the main program through the COMMON statement in the array SVANN.

SVANN(K) = annual-average X/Q in downwind sector K at distance DIS (sec/cubic meter).

4.4 SUBROUTINE CHIQ

CHIQ calculates all the short-term X/Q values for each location (sector-distance combination). The routine calculates ground-level relative concentrations at the plume centerline. CHIQ calculates a X/Q value for every combination of atmospheric stability and wind-speed category, and keeps track of the frequency of occurrence of each X/Q value.

For Ground-Level Releases, the following basic equations are used:

$$\frac{X}{Q}(x,i,j) = \left\{ U_{ij}(10) \left[\pi \, \sigma_{yj}(x) \, \sigma_{zj}(x) + cA \right] \right\}^{-1} \qquad (6)$$

$$\frac{X}{Q}(x,i,j) = \left\{ 3U_{ij}(10) \, \pi \, \sigma_{yj}(x) \, \sigma_{zj}(x) \right\}^{-1} \qquad (7)$$

$$\frac{X}{Q}(x,i,j) = \left\{ U_{ij}(10) \, \pi \, M_{ij}(x) \, \sigma_{yj}(x) \, \sigma_{zj}(x) \right\}^{-1} \qquad (8)$$

where

$\frac{X}{Q}(x,i,j)$ = relative concentration at distance x for i^{th} wind-speed category and k^{th} stability category (sec/cubic meter).

$\sigma_{yj}(x)$ = lateral dispersion of plume for stability category j at distance x (meters). (See Subroutine POLYN.)

A = minimum cross-sectional area of the building used to describe dilution due to the building wake (square meters).

$M_{ij}(x)$ = meander factor for lateral plume spread for wind-speed category i and stability category j at distance x. (See Subroutine MEANDR.)

The parameters $U_{ij}(10)$, π, $\sigma_{zj}(x)$ and c are as defined for Equation (2).

For distances beyond 800 meters, the product of meander factor and lateral dispersion of plume is adjusted to

$$M_{ij}(x)\,\sigma_{yj}(x) = \sigma_{yj}(x) + \left[M_{ij}(x) - 1\right]\sigma_{yj}(800) \qquad (9)$$

where

$\sigma_{yj}(800)$ = lateral dispersion of plume for stability category j at 800 meters distance (meters).

Ground-level releases include all release points or areas that are lower than two and one-half times the height of adjacent solid structures (Snyder and Lawson, 1976). For this type of release, two sets of conditions are considered:

1. During neutral (D) or stable (E, F, or G) atmospheric stability conditions, and when the wind speed at the 10-meter level is less than 6 meters per second, horizontal plume meander is considered. X/Q values are determined through selective use of Equations (6), (7), and (8). The values from Equations (6) and (7) are compared and the larger value selected. This value is compared with the value from Equation (8), and the smaller value of these two is selected as the appropriate X/Q value.

2. During unstable (A, B, or C) atmospheric stability or when the wind speed at the 10-meter level is 6 meters per second or greater, plume meander is not considered. The appropriate X/Q value is the higher value calculated from Equation (6) or (7).

By setting KOPT(7) = 1, CHIQ lists the X/Q values for Equations (6) through (8). It also lists $U_{ij}(10)$, j, x, $\sigma_{yj}(x)$, $\sigma_{zj}(x)$, $M_{ij}(x)\,\sigma_{yj}(x)$, and the frequency of occurrence of the X/Q value. This is carried out for every sector and is a useful option to check that the program is operating correctly.

Elevated Releases include all release points at levels that are at least two and one-half times the height of adjacent solid structures (Snyder and Lawson, 1976). The following basic equation is for nonfumigation conditions:

$$\frac{X}{Q}(x,i,j,k) = \frac{\exp\left\{-\frac{1}{2}\left[\frac{h_{ek}(x)}{\sigma_{zj}(x)}\right]^2\right\}}{\pi U_{ij}(h_s)\,\sigma_{yj}(x)\,\sigma_{zj}(x)} \qquad (10)$$

where

$\frac{X}{Q}(x,i,j,k)$ = relative concentration at distance x for i^{th} wind-speed category, j^{th} stability category, and k^{th} downwind sector (sec/cubic meter).

$U_{ij}(hs)$ = maximum wind speed for wind-speed category i and stability category j adjusted to release height (meters/sec).

$h_{ek}(x)$ = effective plume height in downwind sector k at distance x (meters). (See Equation (5).)

$\sigma_{yj}(x)$ = lateral dispersion of plume for stability category j at distance x (meters).

π = 3.1416.

The relative concentration, X/Q, calculated at the given boundary distance is compared to concentrations calculated at selected distances to assure that the maximum X/Q does not occur outside the boundary. If the maximum X/Q does occur outside the boundary, it is used in the distribution of X/Q concentrations. That is, the maximum value at or beyond the boundary is used.

For fumigation conditions, which are calculated for both boundaries, the basic equation is

$$\frac{X}{Q}(x,6,k) = \left[\sqrt{2\pi}\,U(h_e)\,\sigma_{y6}(x)\,h_{ek}(x)\right]^{-1} \qquad (11)$$

where

$\frac{X}{Q}(x,6,k)$ = relative concentration at distance x for the 6^{th} stability category (Pasquill stability F, moderately stable), and k^{th} downwind sector (sec/cubic meter).

$U(h_e)$ = wind speed representative of the moderately stable layer of atmosphere of depth h_e (meters/second); CHIQ assumes $U(h_e)$ = 2 meters/sec, a reasonably conservative assumption for an h_e of about 100 meters. (See Regulatory Guide 1.145.)

The parameters π, $\sigma_{y6}(x)$, and $h_{ek}(x)$ are as defined for Equation (10).

Nonfumigation and fumigation conditions are treated as follows:

a. For nonfumigation conditions, X/Q values are calculated using Equation (10). Note that CHIQ does not calculate the 0-2 hour X/Q values for each stability wind-speed combination at the same distance in a sector. Rather it calculates X/Q values at various predetermined distances, to a maximum of 90,000 meters, at or beyond the desired boundary distance for each sector. The maximum of these X/Q values is the controlling 0-2 hour X/Q value for the given sector. The distance at which this maximum value occurs is a function of stability and terrain height. The predetermined distances are close enough together so that, if the maximum value were actually to occur between two distances, any differences would be fairly small.

b. For fumigation conditions, a "fumigation X/Q" is calculated for each sector at the boundary using Equation (11). X/Q values calculated using Equation (11) become unrealistically large as h_{ek} approaches zero. To limit the fumigation X/Q value, CHIQ uses Equation (10) assuming F stability, a wind speed of 2 meters per second, and $h_{ek} = 0$. The X/Q values calculated using both equations are compared and the lower value is selected as the fumigation X/Q value.

To check elevated release calculations, the KOPT(7) option prints terrain height ht_k, effective plume height h_{ek}, and the distance at which the maximum X/Q occurs in addition to the parameters listed for ground-level releases.

The argument list for CHIQ has eight parameters:

HS = release height above plant grade (meters).

NDIS = number of distances for which terrain data is given.

DIS = downwind distance in Sector K (meters).

MM = total number of wind-speed stability combinations for which a value of X/Q is calculated.

K = parameter used to indicate k^{th} downwind sector (K = 1 to 16) in Procedure One X/Q's; X/Q's in Procedure Two (K = 17); and X/Q's in Procedure Three (K = 18).

COMP(K) = sector direction array (S, SSW, ..., SE, SSE, ALL).

SCLASS(J) = stability designation array (A, B, ..., G).

TITLD(65) = array describing data for this run (Card Types 2 to 5).

The short-term X/Q values and related parameters are transferred to the main program through the COMMON statement in the variables DMX, ORDX, XMX, XPO, XQFUM:

DMX = distance at which maximum X/Q occurs for elevated release (meters).

ORDX(MM) = short-term X/Q value for particular wind-speed stability combination (sec/cubic meter).

XMX = maximum short-term X/Q at distance DMX (sec/cubic meter).

XPO(MM) = exponential factor in X/Q calculation.

XQFUM(K) = short-term X/Q value at the boundary for fumigation conditions (sec/cubic meter).

4.5 SUBROUTINE CONV

CONV transforms a cumulative frequency array into the unit normal distribution.

The argument list for CONV has two parameters:

A(NUM) = on input: array of cumulative frequencies
on output: array of cumulative frequencies converted into the unit normal distribution.

NUM = number of elements in array A.

4.6 SUBROUTINE ENVLOP

ENVLOP derives equations for an upper envelope of the X/Q values calculated in Subroutine CHIQ versus their cumulative frequency of occurrence. The X/Q and frequency values are effectively "plotted" on log-normal paper. Starting with the highest X/Q value, ENVLOP compares the slope of the line drawn from this point to every other point within an increment containing ten X/Q values. If there are fewer than ten values, only the number available are used. The coefficients that produce the line with the least negative slope (i.e., the slope closest to horizontal) are saved. The endpoint of this line (i.e., the point giving the least negative slope) is used as the next starting point, from which slopes to the points within the next increment, containing ten X/Q values, are compared. When more than half the X/Q values have been used in the increments or the smallest X/Q value has been used, then the enveloping is discontinued. The coefficients of all upper-envelope lines are saved and used in Subroutines OUTPUT and ONEOUT to give X/Q percentiles and an estimate of the number of hours the maximum X/Q of the 16 sectors is exceeded. In the event the cumulative frequency distribution for a given sector has a starting value greater than 0.5%, ENVLOP will back extrapolate the first slope computed so that the 0.5% value can be obtained.

The enveloping of the data points depends on the distribution of the points. For this reason, ENVLOP can only be considered to give approximations; when precision is needed, the plots should be handchecked. It has been found that

ENVLOP produces the best results near the 0.5 percentile if the wind-speed data are classified into a large number of categories at the lower wind speeds; e.g., calm speed, 0.5, 0.75, 1.0, 1.25, 1.5, 2.0, 3.0, 4.0, 5.0, 6.0, 8.0 and 10.0 meters/second (see Card Type 11). The important aspect of having a large number of lower wind-speed categories is to generate more X/Q values at the lower values of the cumulative frequency since the 0.5% value is required.

Setting KOPT(3) = 1, ENVLOP will print the calculations which describe the enveloping lines. Setting KOPT(4) = 1, ENVLOP will print the points saved and the calculations used to determine the number of hours the maximum X/Q is exceeded.

The argument list for ENVLOP has eleven parameters:

X(NNN) = array of cumulative frequency values, for X/Q values calculated, converted to a unit normal distribution.

Y(NNN) = array of the natural logarithm of X/Q values calculated.

XX(21) = array of unit normal distribution values for particular percents. (See FORTRAN IV Listing of Subroutine OUTPUT, array XX.)

YY(21) = array of the natural logarithm of X/Q values interpolated or extrapolated from the enveloping lines for the unit normal distribution values in XX.

XS = cumulative frequency value converted to unit normal distribution of X/Q value YS (0.5% for Procedure One X/Q values and 5.0% for Procedure Two and Procedure Three X/Q values discussed in Section 4.1).

YS = natural logarithm of X/Q value interpolated or extrapolated from enveloping lines for the cumulative frequency value XS.

ICOUNT = the number of interpolated or extrapolated X/Q values in array YY.

ERR = error flag:

if ERR > 0, no error was detected
ERR < 0, error was detected.

The types of error checked for are the following:

1) the maximum cumulative frequency value in X is less than XS. (Subroutine can extrapolate to lower cumulative frequencies but cannot extrapolate to higher cumulative frequencies.)

2) the total number of values in the arrays X and Y used in obtaining upper-enveloping lines exceeds 98. This will overflow arrays X and Y.

3) the slope of an upper envelope line is greater than zero. This means an increase occurs in X/Q with increasing cumulative frequency. This should not be possible.

4) the number of increments used in obtaining the upper-envelope exceeds 30. This will overflow some of the working arrays in ENVLOP.

NNN = the number of elements in arrays X and Y.

K = parameter used to indicate k^{th} downwind sector (K = 1 to 16) in Procedure One X/Q's; X/Q's in Procedure Two (K = 17); and X/Q's in Procedure Three (K = 18). (See Section 4.1.)

NDUM = parameter which indicates which set of X/Q values is being enveloped. (See Section 4.1).

The parameters YY and YS used by Subroutine OUTPUT are passed through the CALL statement to Subroutine ENVLOP. Other parameters calculated by ENVLOP are transferred through the COMMON statement in the variables NUMXQ, XQINT, XQSAVE, XQSLOP:

NUMXQ(K) = number of increments used in obtaining the upper-envelope.

XQINT(K,I) = intercept of ordinate axis for i^{th} increment of upper-envelope.

XQSAVE(K,I) = natural logarithm of X/Q values at end points of increments of upper-envelope.

XQSLOP(K,I) = slope of i^{th} increment of upper-envelope.

where K is defined in the argument list.

4.7 SUBROUTINE HEADER

HEADER prints on each page of output necessary information read in by the user to identify the run. Card Types 2 to 5 are used. This information includes the following:

Plant Name
Data Period
Date and Time of Computer Run
Source of Data
Wind Sensor Heights
Temperature Difference Heights

Comments
Program Name and Revision Date.

Since the output may be referred to in the future, the user should provide on Card Types 2 to 5 as much information as necessary to document the run.

The argument list for HEADER has one parameter:

TITLD(65) = title card (Card Types 2 to 5).

4.8 SUBROUTINE MEANDR

MEANDR calculates the correction factor applied to the Pasquill-Gifford σ_y value to account for plume meander (see Figure 3 of Regulatory Guide 1.145). Because these values are based on classification of atmospheric stability by the temperature-difference method described in Regulatory Guide 1.23 (USNRC, 1972), the meander correction factor is only used for Pasquill-Gifford σ_y values classified by this method. Thus, when other sigma values (such as desert sigmas) are used, MEANDER is not to be called.

The argument list of MEANDR has three parameters:

WIND = wind speed (meter/sec).
J = j^{th} atmospheric stability category.
AMNDR = correction factor.

4.9 SUBROUTINE NDTR

NDTR computes y = P(x) = Prob (X<x), where X is a random variable distributed normally with mean zero and variance one.

The argument list of NDTR has three parameters:

X = cumulative frequency converted to a unit normal distribution.
P = cumulative frequency for the point value X.
D = normal probability density function.

4.10 SUBROUTINE NDTRI

NDTRI is the inverse of Subroutine NDTR. That is, it converts a cumulative frequency value into a unit normal distribution value.

The argument list of NDTRI has four parameters:

P = cumulative frequency value.
X = cumulative frequency P converted to a unit normal distribution.
D = normal probability density function.

IE = error flag
if IE = 0, no error
if IE = -1, P is negative.

4.11 SUBROUTINE ONEOUT

ONEOUT lists summaries for the three X/Q calculation methods: the direction-dependent approach (Procedure One), the direction-independent approach (Procedure Two), and the 5% overall site limit approach (Procedure Three).

For each of these approaches, ONEOUT provides X/Q values for the following averaging time periods: 0-2 hrs, 0-8 hrs, 8-24 hrs, 1-4 days, 4-30 days, and annual average. The 0-2 hour values are calculated using Subroutines CHIQ, ENVLOP, and OUTPUT. The annual average value is calculated in Subroutine ANNUAL. The intermediate averaging time period X/Q values are calculated by logarithmically interpolating between the two-hour X/Q value and the annual average X/Q value.

For the direction-dependent approach, ONEOUT determines the maximum 0-2 hour X/Q value of the 16 downwind sectors. Using this value, it estimates the number of hours of the year that the maximum X/Q value could be exceeded in each directional sector. The enveloped frequency distribution of X/Q values generated in Subroutines OUTPUT and ENVLOP are stored in the COMMON statement, and Subroutine ONEOUT calculates from these curves the number of hours the maximum X/Q is exceeded.

For Stack Releases, ONEOUT also lists for each sector the fumigation X/Q values calculated in Subroutine CHIQ.

N.B.: The values calculated in ONEOUT must be considered as approximations only. The enveloped frequency distributions generated in Subroutine ENVLOP may not always be reasonable. These should <u>always</u> be checked and the values listed by ONEOUT adjusted accordingly.

The argument list for ONEOUT has six parameters:

TITLD(65) = title cards (Card Types 2 to 5).

COMP(K) = sector direction array (S, SSW, ..., SE, SSE, ALL).

GRNDVT(K) = overall wind direction frequency for k^{th} wind direction (sums all velocity and stability categories for given wind direction).

LBDY = parameter designating which boundary

LBDY = 1: Boundary 1, Exclusion Area Boundary
LBDY = 2: Boundary 2, Low Population Zone boundary.

HS = release height above plant grade (meters).

BDYDIS = downwind distance of boundary in directional Sector K (meters).

4.12 SUBROUTINE OPENTR

OPENTR determines a default correction factor that can be applied to the X/Q values calculated in Subroutine ANNUAL for sites located in open terrain (using KOPT(10) = 1). Figure 4.2 shows a plot of the default correction factor as a function of downwind distance from Regulatory Guide 1.111. This factor need be applied only if the spatial and temporal variations in the airflow in the site vicinity are such that Equations (2), (3), and (4) would underestimate the annual average X/Q value. (See Regulatory Guide 1.111, Section C.1.c, for a discussion on use of these correction factors.)

Site-specific correction factors may be read as input (see KOPT(9)), in which case the default factors would not be used (see description of Card Type 12).

The argument list for OPENTR has two parameters:

DIS = downwind distance (meters).
FAC = default correction factor (e.g., recirculation).

4.13 SUBROUTINE ORDER

ORDER uses the shell method to order an array of values of a variable from the greatest to the least. It also sums the associated frequencies.

The argument list for ORDER has four parameters:

N = total number of values of variable OX to be ordered.

KK = total number of values of the ordered variable OX (only unique values are retained in the array OX).

OX = array of variable values
on input: contains N unordered values of variable
on output: contains KK ordered values of variable.

OF = array of frequencies
on input: contains frequency of N unordered values of variable
on output: contains cumulative frequency of KK ordered values of variable.

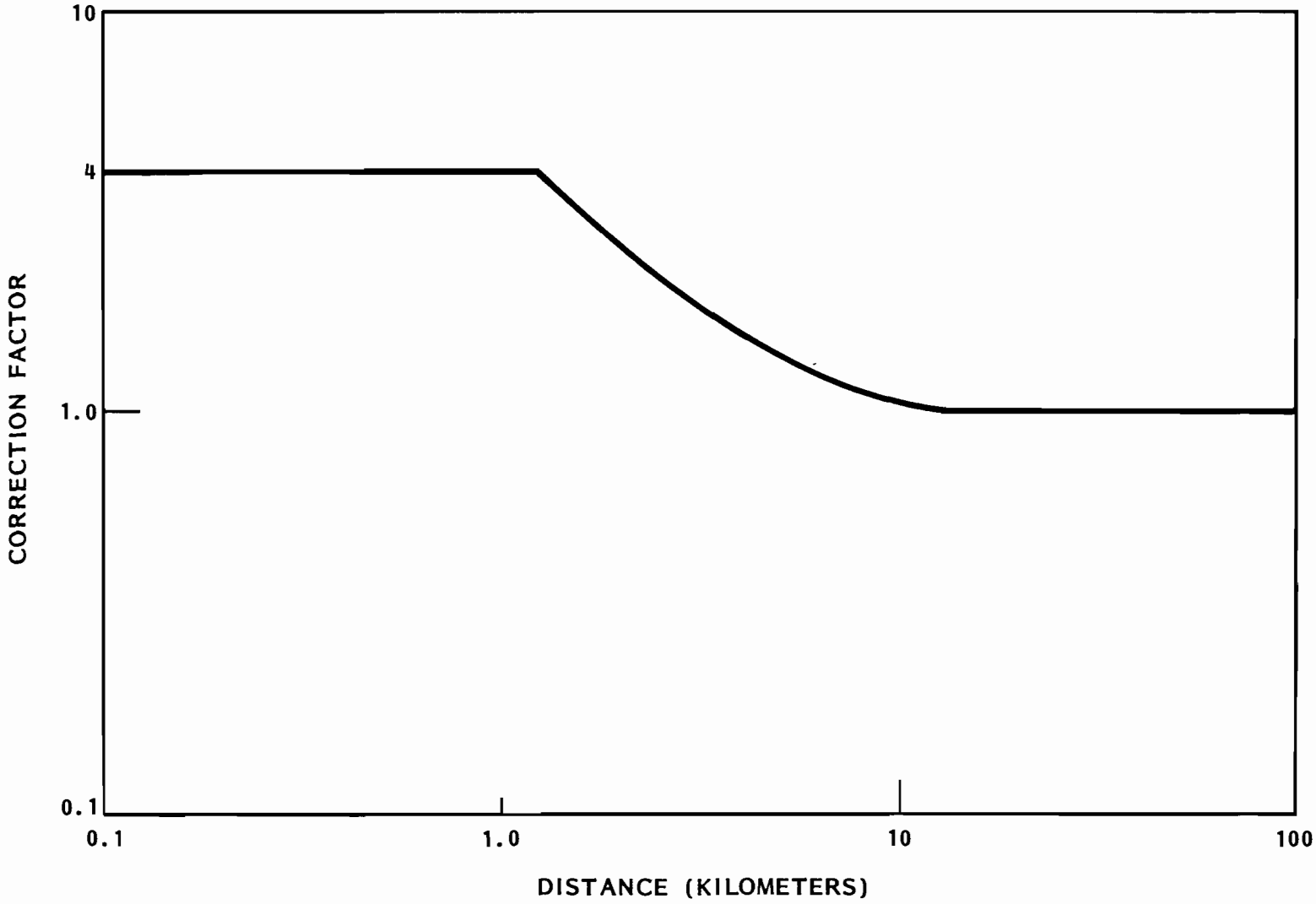

FIGURE 4.2. Open Terrain Correction Factor as a Function of Downwind Distance (From Sagendorf, 1982)

4.14 SUBROUTINE OUTPUT

OUTPUT lists all the X/Q values calculated in Subroutine CHIQ and their cumulative frequency of occurrence. A separate list is made for each sector-distance combination using the direction-dependent approach, the direction-independent approach, and the 5% overall site limit approach.

For each X/Q distribution, OUTPUT calls Subroutines CONV and ENVLOP to compute an upper-envelope of the X/Q cumulative distribution by assuming a log-normal distribution. OUTPUT then lists the X/Q values at the 1, 3, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, and 90 percentile levels. Because Subroutine ENVLOP may not always give reasonable values, these X/Q values are approximations only. OUTPUT also prints the annual-average X/Q value calculated in Subroutine ANNUAL.

For a stack release, OUTPUT prints the fumigation X/Q value calculated in Subroutine CHIQ. It also identifies the distance from the stack at which the greatest 0-2 hour X/Q value occurs, even though this distance may be within the boundary of interest. This value results from the combination of atmospheric stability, wind speed, and terrain height which maximizes the X/Q value.

OUTPUT also identifies any special options used to calculate the X/Q values. It identifies whether meander, building-wake, or desert-sigma parameters were assumed.

The argument list for OUTPUT has five parameters:

NUM = total number of ordered values of X/Q.

NNN = total number of ordered values of exponential factors used in the X/Q calculations.

HS = release height above plant grade (meters).

XS = cumulative frequency value of short term X/Q (0-2 hours). (0.5% for Procedure One X/Q values, 5.0% for Procedure Two and Procedure Three X/Q values; see Section 4.1.)

K = parameter used to indicate k^{th} downwind sector (K = 1 to 16) in Procedure One X/Q's; X/Q's in Procedure Two (K = 17); and X/Q's in Procedure Three (K = 18).

4.15 SUBROUTINE OUTWND

OUTWND calculates cumulative percentiles for wind speeds at the assumed release height HS (see card Type 7).

Each wind-speed category represents a range of wind speeds, the range being the maximum wind speed in a particular category (see Card Type 10) to the maximum wind speed in the previous category. Subroutine ADJWND uses the power-law relationship to adjust the maximum wind speed in each wind-speed category to the release height. For unstable and neutral stabilities (Pasquill categories A, B, C, and D) the power used is 0.25, and for stable stabilities (Pasquill categories E, F, and G) the power used is 0.5. Therefore ADJWND obtains different adjusted maximum wind speeds depending on which of the two stability ranges the wind speed is in. OUTWND calculates a weighted average value between the two adjusted wind speeds based on the frequency distribution in each of the two stability ranges:

$$U_A(I) = \frac{\text{UMAXAD}(I,1)\sum_{J=1}^{4} F_S(I,J) + \text{UMAXAD}(I,7)\sum_{J=5}^{7} F_S(I,J)}{\sum_{J=1}^{7} F_S(I,J)} \qquad (12)$$

where

$U_A(I)$ = weighted average of the maximum wind speed for wind-speed category I (meters/sec).

UMAXAD(I,1) = adjusted maximum wind speed for wind-speed category I and stability 1 (Pasquill category A)(meters/sec).

UMAXAD(I,7) = adjusted maximum wind speed for wind-speed category I and stability 7 (Pasquill category G)(meters/sec).

$F_S(I,J)$ = joint frequency distribution summed over all wind directions.

The percentage of occurrence of the average wind speed $U_A(I)$ is obtained by summing the joint frequency distribution over all wind directions and all stabilities.

OUTWND assumes a "quasi" log-normal distribution to compute the wind-speed percentiles. Effectively, the routine plots the wind speeds, $U_A(I)$, on a logarithmic scale with the associated cumulative frequency on a normal probability scale. Percentiles away from the plotted points are linearly interpolated or extrapolated using a linear slope.

The argument list for OUTWND has six parameters:

UMAXAD(I,J) = array of adjusted maximum wind speeds for each wind-speed category I and stability category J (meters/sec).

HORSUM(I,J) = joint frequency distribution FREQ (Card Type 9) summed over all wind directions for wind-speed category I and stability category J.

NVEL = number of velocity categories (Card Type 6).

NSTA = number of atmospheric stability categories (7).

TITLE(65) = title cards (Card Types 2 to 5).

HS = release height above plant grade (meters).

4.16 SUBROUTINE POLYN

POLYN calculates values of σ_y and σ_z versus downwind distance, using equations of the form

$$\sigma = ax^b + c \qquad (13)$$

where

σ = horizontal crosswind (y) or vertical (z) standard deviation of material in the plume (meters).

x = downwind distance (meters).

a, b, c = coefficients which depend on stability class and distance.

Both σ_y and σ_z are limited to 1000 meters, a conservative mixing limit.

POLYN calculates two types of sigma values. The first as described by Pasquill and Gifford (Slade, 1968), uses the coefficients of Eimutis and Konicek (1972). These dispersion curves do not include plume meander (see Figures 1 and 2 of Regulory Guide 1.145). These values are generally applicable to sites in most continental, non-arid areas.

The second type of sigma is that described by Markee (Yanskey, 1966) for sites in desert terrain (KOPT(1) = 1). These desert sigmas include the effects of plume meander.

For sites where the diffusion is not described by these parameters (such as areas where plumes may travel over water), POLYN should be modified to reflect the proper diffusion. For example, see the discussion on coastal sites by Raynor, et al. (1979).

The argument list for POLYN has four parameters:

IC = parameter indicating whether σ_z or σ_y is called for. (IC = 1 to 7 indicates σ_z; IC = 8 to 14 indicates σ_y.)

AVAL = downwind distance (meters).

RESULT = variable name used to return value of σ_z or σ_y to calling program (meters).

LDSRT = parameter indicating whether desert sigmas are called for.
LDSRT = 0 indicates Pasquill-Gifford sigmas
LDSRT = 1(KOPT(1) = 1) indicates desert sigmas.

4.17 SUBROUTINE REVORD

REVORD uses the shell method to order an array of values of a variable from the least to the greatest. This is the opposite order from that of Subroutine ORDER. It also sums the associated frequencies.

The argument list for REVORD has four parameters:

N = total number of values of variable OX to be ordered.

KK = total number of values of the ordered variable OX (only unique values are retained in the array OX).

OX = array of variable values
on input: contains N unordered values of variable
on output: contains KK ordered values of variable.

OF = array of frequencies
on input: contains frequency of N unordered values of variable
on output: contains cumulative frequency of KK ordered values of variable.

4.18 SUBROUTINE THGT

THGT calculates a terrain height for a specific location, i.e. for a given direction and distance. It uses the terrain height input (see Card Types 13 and 14). For a boundary distance (see Card Type 11) between the terrain distances, THGT linearly interpolates the terrain height for the specified location.

The argument list for THGT has six parameters:

HT(K,NDIS) = array of terrain heights (see Card Type 14)(meters).

DIST(K,NDIS) = array of distances at which terrain heights are given (meters).

DIS = distance at which terrain height is to be calculated (meters).

HGT = terrain height at specific location (direction K, distance DIS) returned to calling program (meters).

NDIS = number of distances for which terrain data is given.

K = downwind sector in which terrain height is to be calculated.

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APPENDIX A

PAVAN PROGRAM

FORTRAN IV LISTING

APPENDIX A

PAVAN PROGRAM

FORTRAN IV Listing

The following computer listing is in the form which utilizes the UPDATE utility of the CDC computer system. The COMMON block is listed following card number 1, *COMDECK BLANK. This COMMON block is inserted in the program whenever the card *CALL BLANK appears in the listing. The main program and each subroutine is preceded by a card labeled with *DECK and the program name or subroutine name following.

The starting line number of the main program and each subroutine is:

9	PROGRAM PAVAN
417	CHIQ
598	ANNUAL
636	ADJWND
647	POLYN
707	MEANDR
723	THGT
743	OPENTR
758	ORDER
795	REVORD
831	CONV
843	NDTR
855	NDTRI
880	ENVLOP
993	HEADER
1011	OUTWND
1094	OUTPUT
1213	ONEOUT

```
1.      *COMDECK BLANK
2.            COMMON XQ(14,7),FQ(14,7),HT(17,10),DIST(17,10),FQQ(14,7)
3.           2       ,XQSAVE(16,30),XQINT(16,29),XQSLOP(16,29),XQFUM(18)
4.           3      ,ORDX(1568),ORDF(1568),XPO(98),FX(98),ORDF2(1568)
5.           4      ,KOPT(80),NUMXQ(18),FIVEXQ(18),BDY(16,2)
6.           5      ,FIVEPR(18),XMX,DMX,A,C,D,KOUNT,MNDRYS
7.           6      ,NVEL,NSTA,         SCA2,SVANN(18),UMAXAD(14,7),UAVEAD(14,7)
8.      *DECK PAVAN
9.            PROGRAM PAVAN(INPUT,OUTPUT,PUNCH,TAPE5=INPUT,TAPE6=OUTPUT,
10.          1TAPE7=PUNCH)
11.     C$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
12.     C$$$$$$$$$                                                              $$
13.     C$$$$$$$$$                          PAVAN                               $$
14.     C$$$$$$$$$          PROGRAM FOR THE METEOROLOGICAL EVALUATION            $$
15.     C$$$$$$$$$            OF NON-ROUTINE RELEASES FROM NUCLEAR               $$
16.     C$$$$$$$$$                       POWER STATIONS                         $$
17.     C$$$$$$$$$                                                              $$
18.     C$$$$$$$$$                            - J. GOLL          USNRC          $$
19.     C$$$$$$$$$                              AUGUST 1979                     $$
20.     C$$$$$$$$$                                                              $$
21.     C$$$$$$$$$                            - MODIFIED BY PNL                 $$
22.     C$$$$$$$$$                              TJ BANDER  JULY 1982            $$
23.     C$$$$$$$$$                                                              $$
24.     C$$$$$$$$$                              (BASED ON SEP CODE, 1974,       $$
25.     C$$$$$$$$$                               BY J. SAGENDORF, NOAA)         $$
26.     C$$$$$$$$$                                                              $$
27.     C$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
28.     *CALL BLANK
29.           DIMENSION CALM(7),UMAX(14),UAVE(14),UMIN(14),TOT(7)
30.          1         ,TITLD(65),TAF(16,2),COMP(17),DIRTOT(7,16),KOPTCT(15)
31.           DIMENSION SCLASS(7),HORSUM(14,7),VERSUM(16,7),TOTSUM(7),GRNDHR(14)
32.          1         ,GRNDVT(16),FREQ(16,14,7)
33.           DIMENSION QX(1568),QF(1568)
34.           DATA COMP/"   S"," SSW","  SW"," WSW","   W"," WNW","  NW"," NNW"
35.          X,"   N"," NNE","  NE"," ENE","   E"," ESE","  SE"," SSE"," ALL"/
36.           DATA KOPTCT/1,2,3,4,5,6,7,8,9,10,11,12,13,14,15/
37.           DATA SCLASS/"A","B","C","D","E","F","G"/
38.         1 FORMAT(80I1)
39.         2 FORMAT(16I5)
40.         4 FORMAT(16F5.0)
41.         5 FORMAT(20A4)
42.        41 NDIR=16
43.           NSTA=7
44.     C***      NDIR  THE NUMBER OF WIND DIRECTIONS.
45.     C***      NSTA  THE NUMBER OF STABILITY CATEGORIES.
46.     C*************************************************************************
47.     C*****************************  READ IN DATA  ****************************
48.     C*************************************************************************
49.           READ (5,1)   KOPT
50.     C**** KOPT IS THE OPTION ARRAY. A VALUE OF 1 IS YES, A 0 MEANS BYPASS.
51.     C         KOPT(1) FOR DESERT SIGMAS
52.     C         KOPT(2) FOR CALCULATIONS BOTH WITH AND WITHOUT BULDING WAKE
53.     C         KOPT(3) CHECK ENVELOPE POINTS IN ENVLOP
54.     C         KOPT(4) CHECK ENVELOPE LINES SAVED IN ENVLOP AND HOURS
55.     C                   EXCEEDED IN ONEOUT/OUTPUT
56.     C         KOPT(6) TO INPUT JFD DATA AS PERCENT FREQUENCY
57.     C         KOPT(7) FOR PRINTOUT OF INDIVIDUAL CHI/Q CALCULATIONS.
58.     C         KOPT(8) TO DISTRIBUTE INPUT CALMS INTO FIRST WIND SPEED CLASS.
59.     C         KOPT(9) USE SITE SPECIFIC RECIRCULATION FACTORS
60.     C         KOPT(10)  FOR RICIRCULATION CORRECTION OF ANNUAL AVERAGES
```

```
      IF(EOF(5).NE.0)   GO TO 40
      CALL DATE(TODAY)
      CALL TIME(CLOCK)
      PRINT 960 , TODAY,CLOCK
  960 FORMAT(1H1,"USNRC COMPUTER CODE-PAVAN, VERSION 2.0",10X,"RUN DATE
     *",A10,10X,"RUN TIME",A10)
      PRINT 501, KOPTCT(1),KOPT
  501 FORMAT(1H0,"PRINTOUT OF INPUT CARDS",//T4,I2,T11,16(5I1,1X))
      DO 400 L=1,10
      DO 400   K=1,17
  400 HT(K,L)=0.
      READ 5, (TITLD(I),I= 1,15)
C        COLS. 1-20: PLANT NAME
C        COLS.21-40: PERIOD OF RECORD
C        COLS.41-60: TYPE OF RELEASE
      READ 5, (TITLD(I),I= 16,25)
C        COLS. 1-20: WIND SENSORS HEIGHT
C        COLS.21-40: DELTA-T HEIGHTS
      READ 5, (TITLD(I),I= 26,45)
C        COLS. 1-80: REFERENCE FOR DATA
      READ 5, (TITLD(I),I= 46,65)
C        COLS. 1-80: SPECIAL COMMENTS.  (WRITE NONE IF NONE9)
      PRINT 502, KOPTCT(2),(TITLD(I),I= 1,15)
      PRINT 502, KOPTCT(3),(TITLD(I),I=16,25)
      PRINT 502, KOPTCT(4),(TITLD(I),I=26,45)
      PRINT 502, KOPTCT(5),(TITLD(I),I=46,65)
  502 FORMAT(1H ,T4,I2,T11,20A4)
      READ 2 , NVEL,NDIS
C**** NVEL = THE NUMBER OF VELOCITY CATAGORIES.
C**** NDIS = THE NUMBER OF DISTANCES FOR WHICH TERRAIN DATA IS GIVEN.
C   FOR ELEVATED RELEASE NDIS CANNOT BE ZERO
      READ 4 , A,D,HS,TOWERH
      C=0.5
C**** C = THE CONSTANT IN THE BUILDING WAKE TERM. (.5)
C**** A AND D ARE THE BUILDING WAKE VARIABLES.
C          HS IS THE HEIGHT OF RELEASE (METERS).
C             FOR ASSUMED GROUND/BUILDING WAKE RELEASES, HS=10.
C             FOR TOTALLY ELEVATED RELEASES, HS .GT. 10.
C          TOWERH IS THE HEIGHT AT WHICH THE WIND VELOCITIES WERE
C             MEASURED(METERS). ADJUSTMENTS TO WINDSPEEDS WILL BE MADE.
      READ 4,CALM
C**** CALM CONTAINS THE FREQUENCY OF CALM FOR EACH STABILITY CLASS.
C     DATA CARD REQUIRED
C     KOPT(6)=0  FREQUENCY IN HOURS
C     KOPT(6)=1  FREQUENCY IN PERCENT
C   IF KOPT(8)=0 : THERE ARE NO CALMS OR
C                  CALMS ARE ALREADY DISTRIBUTED AND READ IN DO LOOP 10
      IST=1
      IF(KOPT(8).EQ.1) IST=2
      NCALM=1
      DO 61 J=1,NSTA
   61 IF(CALM(J).GE.0.0001) GO TO 62
      NCALM=0
   62 CONTINUE
      DO 63   J=1,NSTA
      DO 63   K=1,NDIR
      DIRTOT(J,K)=0.
   63 FREQ(K,1,J)=0.
C***  FIRST WINDSPEED CATEGORY IS ALWAYS CALM
      NHRS = 0
```

```
      DO 10   J=1,NSTA
      NHRS = NHRS+IFIX(CALM(J))
      DO 10 I=IST,NVEL
      READ 4,  (FREQ(K,I,J),K=1,NDIR)
      DO 10 K=1,NDIR
      NHRS = NHRS+IFIX(FREQ(K,I,J))
C**** FREQ IS THE JOINT FREQUENCY DISTRIBUTION AS A FUNCTION OF VELOCITY
C     CATEGORIES, STABILITY CATEGORIES AND DIRECTIONS(STARTING WITH N).
C**** NHRS = THE TOTAL NUMBER OF HOURS IN FREQUENCY TABLE
   10 CONTINUE
      PRINT 506, KOPTCT(6),NVEL,NHRS,NDIS
  506 FORMAT(1H ,T4,I2,T11,16I6)
      PRINT 507, KOPTCT(7),C,A,D,HS,TOWERH
  507 FORMAT(1H ,T4,I2,T11,8F10.3)
      PRINT 508, KOPTCT(8),CALM
  508 FORMAT(1H ,T4,I2,T11,16F7.3)
      DO  110 J=1,NSTA
      DO 110 I=IST,NVEL
  110 PRINT 508, KOPTCT(9),(FREQ(K,I,J),K=1,NDIR)
      READ 4,UCOR,UMAX
C**** UCOR IS A CORRECTION FACTOR TO BE APPLIED TO THE VELOCITIES.
C        IF UCOR IS LESS THAN OR EQUAL TO ZERO NO CORRECTION IS NEEDED.
C        IF UCOR IS GREATER THAN 100 A CONVERSION FROM MILES/HOUR TO
C        METERS/ SECOND WILL BE MADE.
C**** UMAX IS THE ARRAY OF MAXIMUM VELOCITIES IN THE WIND SPEED CATAGORI
C        THE UMAX VALUES MAY BE READ IN AS EITHER MILES/HR OR METERS /SE
C        BY USING THE PROPER VALUE OF UCOR.
      PRINT 510, KOPTCT(10),UCOR,UMAX
  510 FORMAT(1H ,T4,I2,T11,F7.0,14F7.3)
      DO 3    I=1,2
      READ 4,  (BDY(K,I),K=1,NDIR)
C        BDY ARE THE DOWNWIND DISTANCES AT WHICH CALCULATIONS WILL BE
C            MADE.  TWO SETS OF DISTANCES BY SECTOR CAN BE INPUTTED.
C            (USUALLY THE EXCLUSION AND LPZ BOUNDARIES.)  K=1 IS THE
C            DISTANCE TO THE SOUTH BOUNDARY, K=2 TO THE SSW, ..., TO
C            K=16 TO THE SSE.  IF BDY IS LESS THAN 1, THAT DIRECTION
C            WILL BE IGNORED.  IF BDY(1,2) IS LESS THAN 0, THE SECOND
C            SET OF BOUNDARIES WILL BE IGNORED.
    3 PRINT 511, KOPTCT(11),(BDY(K,I),K=1,NDIR)
  511 FORMAT(1H ,T4,I2,T11,16F7.0)
      DO 27 I=1,2
   27 TAF(1,I) = -1.0
      IF(KOPT(9).NE.1) GO TO 951
      DO 25 I=1,2
   25 READ(5,4) (TAF(K,I),K=1,16)
C**** TAF ARE THE SITE SPECIFIC TERRAIN ADJUSTMENT FACTORS TO BE USED
C        IN THE CALCULATION OF THE ANNUAL AVERAGE X/Q VALUES.  K=1 IS
C        THE CORRECTION FOR THE SOUTH DIRECTION, K=2 FOR THE SSW,...,
C        TO K=16 FOR THE SSE DIRECTION.
C        IF TAF(1,1) OR TAF(1,2) IS LESS THAN 0, PAVAN WILL SET ALL
C        THE VALUES FOR THAT BOUNDARY EQUAL TO 1.0 .  (I.E., NO
C        CORRECTION FACTORS WILL BE APPLIED.)
      DO 26 I=1,2
   26 PRINT 512, KOPTCT(12),(TAF(K,I),K=1,NDIR)
  512 FORMAT(1H ,T4,I2,T11,16F7.1)
  951 CONTINUE
      IF(HS.LT.10.1)   GO TO 100
      IF(NDIS.EQ.0) GO TO 100
      DO 47 I=1,NDIS
      READ 4,  (DIST(K,I),K=1,NDIR)
```

```
181.            READ 4,  (HT(K,I), K=1,NDIR)
182.      C        DIST AND HT ARE READ IN ONLY FOR STACK RELEASES.
183.      C     DIST(K,N) CONTAINES THE DISTANCES CORRESPONDING TO THE ELEVATIONS
184.      C        IN THE HT MATRIX. K=1 IS FOR THE SOUTH AS IN BDY
185.      C**** HT ARE THE TERRAIN HEIGHTS AS A FUNCTION OF DIRECTION AND DISTANCE
186.            PRINT 511, KOPTCT(13),(DIST(K,I),K=1,NDIR)
187.         47 PRINT 511, KOPTCT(14),(HT(K,I),K=1,NDIR)
188.      C*************************************************************************
189.      C*************************************************************************
190.      C*************************************************************************
191.        100 CALL HEADER(TITLD)
192.            UMIN(1)=0.
193.            IF(UCOR.LE.0.) GO TO 15
194.            IF(UCOR.GT.100) UCOR=.44704
195.            DO 16 I=1,NVEL
196.         16 UMAX(I)=UMAX(I)*UCOR
197.         15 DO 14 I=1,NVEL
198.            UAVE(I)=(UMAX(I)+UMIN(I))*.5
199.            IF(I.EQ.NVEL) GO TO 14
200.            UMIN(I+1)=UMAX(I)
201.         14 CONTINUE
202.            IF(NCALM.EQ.0) GO TO 391
203.            IF(KOPT(8).EQ.0) GO TO 391
204.            DO 11   J=1,NSTA
205.            TOT(J) = 0.0
206.            DO 12   I=2,NVEL
207.            IF(UMAX(I).GT.1.5.AND.I.GT.2) GO TO 11
208.            DO 12   K=1,NDIR
209.            TOT(J)=TOT(J) + FREQ(K,I,J)
210.         12 DIRTOT(J,K)=DIRTOT(J,K) + FREQ(K,I,J)
211.         11 CONTINUE
212.            DO 17   J=1,NSTA
213.            IF(TOT(J).GT.0.)   GO TO 17
214.            TOT(J)=16.
215.            DO 21   K=1,NDIR
216.         21 DIRTOT(J,K)=1.
217.         17 CONTINUE
218.            DO 19   J=1,NSTA
219.            DO 19   K=1,NDIR
220.         19 FREQ(K,1,J)=CALM(J) * DIRTOT(J,K) / TOT(J)
221.        391 CONTINUE
222.            CALL ADJWND(HS,TOWERH,UMAX,UAVE)
223.            FAC=100./NHRS
224.         42 DO 13 J=1,NSTA
225.            DO 13 I=1,NVEL
226.            DO 13 K=1,NDIR
227.         13 FREQ(K,I,J) = FAC*FREQ(K,I,J)
228.         18 CONTINUE
229.            DO 20   K=1,NDIR
230.            GRNDVT(K)=0.
231.            DO 20   J=1,NSTA
232.            VERSUM(K,J)=0.
233.         20 CONTINUE
234.            DO 24   I=1,NVEL
235.            GRNDHR(I)=0.
236.            DO 24   J=1,NSTA
237.            HORSUM(I,J)=0.
238.         24 CONTINUE
239.            DO 38   J=1,NSTA
240.         38 TOTSUM(J)=0.
```

```
      DO 1000   J=1,NSTA
      PRINT 1001,  SCLASS(J), (COMP(K),K=9,16), (COMP(K),K=1,8)
 1001 FORMAT("0JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION
     1          ATMOSPHERIC STABILITY CLASS ",A1/" WIND SPEED (M/S)"/
     2       " TOWER RELEASE",16(3X,A4),"  TOTAL")
      DO 1012   I=1,NVEL
      DO 1002   K=1,NDIR
      HORSUM(I,J)=FREQ(K,I,J)+HORSUM(I,J)
 1002 VERSUM(K,J)=FREQ(K,I,J)+VERSUM(K,J)
      TOTSUM(J)=HORSUM(I,J)+TOTSUM(J)
 1012 GRNDHR(I)=HORSUM(I,J)+GRNDHR(I)
      DO 1022   K=1,NDIR
 1022 GRNDVT(K)=VERSUM(K,J)+GRNDVT(K)
      DO 1003   I=1,NVEL
      PRINT 1004,  UMAX(I),UMAXAD(I,J),(FREQ(K,I,J),K=1,16),HORSUM(I,J)
 1004 FORMAT(" ",F5.2,F6.2,2X,17F7.3)
 1003 CONTINUE
      PRINT 1005,   (VERSUM(K,J),K=1,16), TOTSUM(J)
 1005 FORMAT(" TOTAL",7X,17F7.2/" ")
 1000 CONTINUE
      PRINT 1009,  TOWERH,HS
 1009 FORMAT("0WIND MEASURED AT ", F5.1, " METERS."/
     1       " WIND SPEED CORRECTED TO THE RELEASE HEIGHT OF ", F5.1,
     2       " METERS.")
      PRINT 1006,  (COMP(K),K=9,16), (COMP(K),K=1,8),(GRNDVT(K),K=1,16)
 1006 FORMAT("0OVERALL WIND DIRECTION FREQUENCY"/
     1       " WIND DIRECTION:     ",16(2X,A4)/
     2       " FREQUENCY:          ",16F6.1)
      PRINT 1007,  (UMAX(I),I=1,NVEL)
 1007 FORMAT("0OVERALL WIND SPEED FREQUENCY AS MEASURED ON THE TOWER:"/
     1       " MAX.WIND SPEED (M/S):   ", 14F7.3)
      PRINT 1008,  (GRNDHR(I),I=1,NVEL)
 1008 FORMAT(" WIND SPEED FREQUENCY:  ", 14F7.2)
      PRINT 34,  HS,C,A
   34 FORMAT("0BUILDING AND RELEASE CHARACTERISTICS:"/
     1       " RELEASE HEIGHT:                ", F8.2, " METERS"/
     2       " MIXING VOLUME COEFFICIENT:     ",  F8.2/
     3       " BUILDING CROSS-SECTIONAL AREA:",  F8.2, " SQUARE METERS")
      PRINT 48,(COMP(K),K=1,16)
   48 FORMAT("0BOUNDARY DISTANCES (METERS) FROM THE SOURCE FOR EACH"
     1       " DOWNWIND SECTOR:"/
     2      ," DOWNWIND SECTOR", 16(3X,A4))
      DO 6    I=1,2
    6 PRINT 49,  I, (BDY(K,I),K=1,16)
   49 FORMAT(" BOUNDARY", I2, 5X, 16F7.0)
      IF(HS.LT.10.1)   GO TO 320
      PRINT 31,  (COMP(K), K=1,16)
   31 FORMAT("0DISTANCES AND TERRAIN HEIGHTS (IN METERS) AS A FUNCTION"
     1      ," OF THE DOWNWIND SECTOR:"/
     2       " SECTOR", 5X, 16(A4,2X))
      DO 32 I=1,NDIS
      PRINT 35,  (DIST(K,I),K=1,NDIR),  (HT(K,I),K=1,NDIR)
   35 FORMAT(" DISTANCE ",16F6.0/" ELEVATION",16F6.0)
   32 CONTINUE
  320 CONTINUE
      IF(UCOR.GT.0.) PRINT 36,UCOR
   36 FORMAT(" THE CONVERSION FACTOR APPLIED TO THE WIND SPEED CLASSES I
     XS ",F8.3)
      CALL OUTWND(UMAXAD,HORSUM,NVEL,NSTA,TITLD,HS)
      NNN=0
```

```
      CF=C
      NKL = 1+1*KOPT(2)
      NKM = 1+1*KOPT(1)
      IF(HS.GE.10.1) NKL=1
C     KOPT(1)=0  DO NOT USE DESERT SIGMAS
C     KOPT(1)=1  USE DESERT SIGMAS
      DO 326 KM=1,NKM
      IF(KM.EQ.2)   KOPT(1)=0
      DO 327 KL=1,NKL
C  GROUND LEVEL RELEASE
C     KL=1  WITH BUILDING WAKE
C     KL=2  WITHOUT BUILDING WAKE
C  ELEVATED RELEASE - NO BUILDING WAKE
      C=CF
      IF(KL.EQ.2)   C=0.0
      DO 322 KT=1,6
      KOUNT = KT
      LBDY=1
      IF(KOUNT.GT.3)   LBDY=2
      ND1=1
      IF(KOUNT.EQ.1 .OR. KOUNT.EQ.4)   ND1=2
      IF(KOUNT.EQ.3 .OR. KOUNT.EQ.6)   ND1=3
      IF(ND1.EQ.2) IQ=0
C***     KOUNT    MODEL
C***       1      RG 1.145   BOUNDARY 1     (EXCLUSION AREA BOUNDARY)
C***       2      SRP 2.3.4  BOUNDARY 1     (MINIMUM EXCLUSION BDRY)
C***       3      RG 1.145   BOUNDARY 1     (FIVE PERCENT SITE LIMIT)
C***       4      RG 1.145   BOUNDARY 2     (LPZ BOUNDARY)
C***       5      SRP 2.3.4  BOUNDARY 2     (MINIMUM LPZ BOUNDARY)
C***       6      RG 1.145   BOUNDARY 2     ((FIVE PERCENT SITE LIMIT)
      IF(BDY(1,2).LT.0. .AND. KOUNT.GT.3)   GO TO 322
      DO 7   KK=1,NDIR
      K=KK
      IF(ND1.EQ.3)   GO TO 72
      IF(ND1.EQ.1)   K=17
      SUM=0.
      NUMXQ(K)=0
      FIVEXQ(K)=0.
      FIVEPR(K)=0.
      SVANN(K)=0.
      XQFUM(K) = 0.0
      DO 22 J=1,NSTA
      DO 22 I=1,NVEL
      FQQ(I,J)=0
   22 FQ(I,J)=0.
      IF(ND1.EQ.1)   GO TO 323
      BDYDIS=BDY(K,LBDY)
      IF(BDYDIS.LT.1.0)   GO TO 7
      DO 8 I=1,NVEL
      DO 8 J=1,NSTA
      FQ(I,J) = FREQ(K,I,J)
    8 SUM=SUM+FREQ(K,I,J)
      GO TO 324
  323 BDYDIS=20000.
      DO 28   L=1,16
      IF(BDY(L,LBDY).LT.1.)   GO TO 28
      IF(BDY(L,LBDY).LT.BDYDIS)   BDYDIS=BDY(L,LBDY)
      DO 23   I=1,NVEL
      DO 23   J=1,NSTA
      FQ(I,J)=FQ(I,J) + FREQ(L,I,J)
```

```
361.        23 SUM=SUM + FREQ(L,I,J)
362.        28 CONTINUE
363.       324 SCA=100./SUM
364.           SCA2=SUM/100.0
365.           XS=50.00/SUM
366.           IF(ND1.EQ.1)   XS=SCA*5.
367.           DO 9 I=1,NVEL
368.           DO 9 J=1,NSTA
369.           FQQ(I,J)=FQ(I,J)
370.         9 FQ(I,J)=SCA*FQ(I,J)
371.           MNDRYS=0
372.           IF(ND1.EQ.2   .AND. HS.LT.10.1)   MNDRYS=1
373.     C   IF USING DESERT SIGMAS, NO PLUME MEANDER ALLOWED
374.           IF(KOPT(1).EQ.1)   MNDRYS=0
375.           CALL CHIQ(HS,NDIS,BDYDIS,NTOT,K,COMP,SCLASS,TITLD)
376.           IF(K.LE.16) CALL ANNUAL(K,BDYDIS,TAF,HS,NDIS,FREQ)
377.           IF(ND1.EQ.1)   GO TO 79
378.           DO 71 I=1,NTOT
379.           IQ = IQ+1
380.           QX(IQ)=ORDX(I)
381.        71 QF(IQ)=ORDF2(I)
382.        79 CONTINUE
383.           CALL ORDER(NTOT,NUM,ORDX,ORDF)
384.           IF(HS.GE.10.1)   CALL ORDER(NTOT,NNN,XPO,FX)
385.        72 CONTINUE
386.           IF(ND1.NE.3)   GO TO 70
387.           K=18
388.           CALL ORDER(IQ,NUM,QX,QF)
389.           DO 75   I=1,NUM
390.           ORDX(I)=QX(I)
391.        75 ORDF(I) = QF(I)*SCA
392.        70 CALL HEADER(TITLD)
393.           IF(LBDY.EQ.1)   PRINT 66
394.           IF(LBDY.EQ.2)   PRINT 67
395.        66 FORMAT("0SITE EXCLUSION BOUNDARY CALCULATIONS:")
396.        67 FORMAT("0LOW POPULATION ZONE CALCULATIONS:")
397.           IF(ND1.EQ.2)     PRINT 65,  COMP(K),  BDYDIS
398.           IF(ND1.EQ.1)     PRINT 68,            BDYDIS
399.           IF(ND1.EQ.3)   PRINT 73
400.        73 FORMAT("0FIVE PERCENT OVERALL SITE LIMIT")
401.        65 FORMAT(1H0,A4," SECTOR",5X,"BOUNDARY DISTANCE =",F7.1," METERS")
402.        68 FORMAT(" DIRECTION-INDEPENDENT (S.R.P 2.3.4) MODEL."/
403.          1       " MINIMUM BOUNDARY DISTANCE =",F7.1," METERS.")
404.           CALL OUTPUT(NUM,NNN,HS,XS,K)
405.           IF(ND1.NE.2)   GO TO 328
406.         7 CONTINUE
407.       328 CONTINUE
408.           IF(ND1.EQ.3)     CALL ONEOUT(TITLD,COMP,GRNDVT,LBDY,HS,BDYDIS)
409.       322 CONTINUE
410.       327 CONTINUE
411.       326 CONTINUE
412.           GO TO 41
413.        40 CONTINUE
414.           STOP
415.           END
416.     *DECK CHIQ
417.           SUBROUTINE CHIQ(HS,NDIS,DIS,MM,K,COMP,SCLASS,TITLD)
418.     *CALL BLANK
419.           DIMENSION X(27),XDT(28,7),DSHMX(10),COMP(17),SCLASS(7),TITLD(65)
420.           DATA DSHMX/400.,800.,1200.,1600.,2400.,3200.,4800.,8000.,
```

```
     1           16000.,32000./
      DATA X/100.,200.,300.,400.,500.,600.,700.,800.,900.,1000.,2000.
     X,3000.,4000.,5000.,6000.,7000.,8000.,9000.,10000.,20000.,30000.
     X,40000.,50000.,60000.,70000.,80000.,90000./
      IF(KOPT(7).NE.1)   GO TO 5
      CALL HEADER(TITLD)
      AC=C*A
      PRINT 31,   COMP(K),HS,AC
   31 FORMAT("0PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE"
     1      ,A4," SECTOR."/
     2       " STABILITY WINDSPEED FREQUENCY DISTANCE TERRAIN HT "
     3      ,"EFF PLUME HT  SIGMA-Y SIGMA-Z MEANDER-SY  ** CHI/Q VALUES"
     4      ," (SEC/CUBIC METER)"/
     5      ,"   CLASS   METER/SEC  PERCENT   METERS    METERS      "
     6      ,"METERS      METERS  METERS   METERS        MEANDER   "
     7      ,"BLDG WAKE        USED"/
     8       " ",T11,"AT", F6.1, " METERS",T105,"CA=",F5.0,"SQ.METERS")
    5 CONTINUE
      PI=3.1416
      LDSRT=0
      IF(KOPT(1).EQ.1)   LDSRT=1
      IF(HS.LT.10.1)   GO TO 104
      IF(K.LE.16)   GO TO 104
      DO 20   L=1,10
      HT(17,L) = 0.0
      DIST(17,L) = DSHMX(L)
      DOS=DSHMX(L)
      DO 20   KH=1,16
      CALL THGT(HT,DIST,DOS,HGT,NDIS,KH)
      IF(HGT.GT.HT(17,L))   HT(17,L)=HGT
   20 CONTINUE
  104 MM=0
      XMX=0.
      DMX = 0.0
      IF(DIS.LE.0.) GO TO 95
      DO 99   J=1,NSTA
      IF(KOPT(7).EQ.1)   PRINT 32
   32 FORMAT(" ")
      IZ=J
      IY=IZ+7
      CALL POLYN(IZ,DIS,SZB,LDSRT)
      CALL POLYN(IY,DIS,SYB,LDSRT)
      IF(DIS.GT.800.)   CALL POLYN(IY,800.,SY8,LDSRT)
      DO 99   I=1,NVEL
      U=UMAXAD(I,J)
      AMNDR=1.0
      IF(MNDRYS.EQ.1) CALL MEANDR(U,J,AMNDR)
      SYM = SYB*AMNDR
      IF(DIS.GT.800.0) SYM=SYB+AMNDR*SY8-SY8
      IF(FQ(I,J).LE.0.) GO TO 99
      MM=MM+1
      IF(HS.GE.10.1)   GO TO 101
      UPSS = U*PI*SYB*SZB
      BASE=1./UPSS
      XQ(I,J)=1./(UPSS + (U*C*A))
      XLIM = 0.3333 * BASE
      XQM = 1.0/(U*PI*SYM*SZB)
      IF(XQ(I,J).LT.XLIM)   XQ(I,J)=XLIM
      XQBW=XQ(I,J)
      IF(XQM.LT.XQ(I,J))   XQ(I,J)=XQM
```

```
481.            ORDX(MM)=XQ(I,J)
482.            ORDF(MM)=FQ(I,J)
483.            IF(K.LE.16) ORDF2(MM) = FQQ(I,J)
484.            XDIS=DIS
485.            TERR=0.
486.            EFF=0.
487.            SY = SYB
488.            SZ = SZB
489.            GO TO 94
490.          101 CALL THGT(HT,DIST,DIS,HGT,NDIS,K)
491.            IF(K.EQ.17) CALL THGT(HT,DIST,DIS,HGT,10,K)
492.            H=HS-HGT
493.            IF(H.LT.0.) H=0.
494.            B = H/SZB
495.            LLL=28
496.            IF(B.LT.15.) GO TO 1
497.            XDT(LLL,1)=0.
498.            XDT(LLL,4)=0.
499.            GO TO 2
500.            1 XDT(LLL,4)=EXP(-.5*B*B)
501.              XDT(LLL,1) = XDT(LLL,4)/(U*PI*SYB*SZB)
502.            2 XDT(LLL,2)=DIS
503.              XDT(LLL,3)=HGT
504.              XDT(LLL,5)=H
505.              XDT(LLL,6) = SYB
506.              XDT(LLL,7) = SZB
507.              DO 111 L=1,27
508.              DISTX=X(L)
509.              IF(K.LE.16)   GO TO 96
510.              HGT=HT(17,10)
511.              IF(X(L).GT.DIST(17,10))   GO TO 97
512.              HN=0.
513.              DN=0.
514.              DO 1102   M=1,10
515.              IF(DIST(17,M).GE.X(L))   GO TO 1105
516.          1102 CONTINUE
517.              M=10
518.          1105 IF(M.EQ.1) GO TO 1103
519.              HN=HT(17,M-1)
520.              DN=DIST(17,M-1)
521.          1103 HF=HT(17,M)
522.              DF=DIST(17,M)
523.              HGT=HN+(HF-HN)*(X(L)-DN)/(DF-DN)
524.              GO TO 97
525.            96 HGT=HT(K,NDIS)
526.              IF(X(L).GE.DIST(K,NDIS)) GO TO 97
527.              HN=0.
528.              DN=0.
529.              DO 102 M=1,NDIS
530.              IF(DIST(K,M).GE.X(L)) GO TO 105
531.           102 CONTINUE
532.              M=NDIS
533.           105 IF(M.EQ.1) GO TO 103
534.              HN=HT(K,M-1)
535.              DN=DIST(K,M-1)
536.           103 HF=HT(K,M)
537.              DF=DIST(K,M)
538.              HGT=HN+(HF-HN)*(X(L)-DN)/(DF-DN)
539.            97 H=HS-HGT
540.              IF(H.LT.0.) H=0.
```

```
541.            CALL POLYN(IZ,DISTX,SZ,LDSRT)
542.            CALL POLYN(IY,DISTX,SY,LDSRT)
543.            B=H/SZ
544.            IF(B.LT.15.) GO TO 3
545.            XDT(L,1)=0.
546.            XDT(L,4)=0.
547.            GO TO 4
548.          3 XDT(L,4)=EXP(-.5*B*B)
549.            XDT(L,1)=XDT(L,4)/(U*SY*SZ*PI)
550.          4 XDT(L,2)=X(L)
551.            XDT(L,3)=HGT
552.            XDT(L,5)=H
553.            XDT(L,6)=SY
554.            XDT(L,7)=SZ
555.        111 CONTINUE
556.            XQ(I,J)=XDT(LLL,1)
557.            DO 98   L=1,28
558.            IF(XDT(L,1).LT.XMX)   GO TO 201
559.            XMX=XDT(L,1)
560.            DMX=XDT(L,2)
561.        201 IF(XDT(L,1).LT.XQ(I,J) .OR. XDT(L,2).LT.DIS)   GO TO 98
562.            XQ(I,J)=XDT(L,1)
563.            LLL=L
564.         98 CONTINUE
565.            XDIS=XDT(LLL,2)
566.            TERR=XDT(LLL,3)
567.            XPO(MM)=XDT(LLL,4)
568.            EFF=XDT(LLL,5)
569.            SY=XDT(LLL,6)
570.            SZ=XDT(LLL,7)
571.            SYM=0.
572.            XQM=0.
573.            XQBW=0.
574.            ORDX(MM)=XQ(I,J)
575.            FX(MM)=FQ(I,J)
576.            ORDF(MM)=FQ(I,J)
577.            IF(K.LE.16) ORDF2(MM) = FQQ(I,J)
578.         94 IF(KOPT(7).EQ.1)   PRINT 30, SCLASS(J),U,FQ(I,J),XDIS,TERR,EFF
579.           1           ,SY,SZ,SYM,XQM,XQBW,XQ(I,J)
580.         30 FORMAT(4X,A1,7X,F5.1,6X,F5.2,4X,F6.0,5X,F5.0,7X,F5.0,6X
581.           1       ,2(F6.1,2X),F7.1,3X,1P3E12.3)
582.         99 CONTINUE
583.            IF(HS.LT.10.1)   GO TO 95
584.      C   FUMIGATION CALCULATION
585.            CALL POLYN(6,DIS,SZF,LDSRT)
586.            CALL POLYN(13,DIS,SYF,LDSRT)
587.            CALL THGT(HT,DIST,DIS,HGT,NDIS,K)
588.            H=HS-HGT
589.            IF(H.LE.0.)   H =0.1
590.            FUM=0.19947/(SYF*H)
591.            FUM2=0.15915      /(SYF*SZF)
592.            IF(FUM.GT.FUM2)   FUM=FUM2
593.            XQFUM(K)=FUM
594.         95 CONTINUE
595.            RETURN
596.            END
597.      *DECK ANNUAL
598.            SUBROUTINE ANNUAL(K,DIS,TAF,HS,NDIS,FREQ)
599.      *CALL BLANK
600.            DIMENSION FREQ(16,14,7),TAF(16,2)
```

```
601.            FAC=0.02032
602.            EXPO=1.
603.            H=0.0
604.            X=0.0
605.            LDSRT=0
606.            IF(KOPT(1).EQ.1)   LDSRT=1
607.            KK = 1
608.            IF(KOUNT.GT.3) KK=2
609.            DO 3   J=1,NSTA
610.            CALL POLYN(J,DIS,SZ,LDSRT)
611.            DO 3   I=1,NVEL
612.            U=UAVEAD(I,J)
613.            IF(HS.LT.10.1)   GO TO 1
614.            CALL THGT(HT,DIST,DIS,HGT,NDIS,K)
615.            XOQP=FAC/(DIS*SZ*U)
616.            H=HS-HGT
617.            IF(H.LT.0.)   H=0.
618.            B=H/SZ
619.            EXPO=0.
620.            IF(B.LT.15.)   EXPO=EXP(-0.5*B*B)
621.            GO TO 2
622.          1 ARG= (SZ*SZ) + (C*D*D*0.31831)
623.            DEN = U*DIS*SQRT(ARG)
624.            DEN2 = 1.73205 *U*DIS*SZ
625.            IF(DEN2.LT.DEN)   DEN=DEN2
626.            XOQP=FAC/DEN
627.          2 X=X + (FREQ(K,I,J) * EXPO * XOQP)
628.          3 CONTINUE
629.            RECIRC=1.0
630.            IF(KOPT(10).EQ.1)   CALL OPENTR(DIS,RECIRC)
631.            IF(KOPT(9).EQ.1.AND.TAF(1,KK).GT.0) RECIRC=TAF(K,KK)
632.            SVANN(K)=X*RECIRC
633.            RETURN
634.            END
635.      *DECK ADJWND
636.            SUBROUTINE ADJWND(RLSHT,TOWERH,UMAX,UAVE)
637.      *CALL BLANK
638.            DIMENSION CE(7),E(7),UMAX(14),UAVE(14)
639.            DATA E/4*0.25,3*0.5/
640.            DO 1   I=1,NVEL
641.            DO 1   J=1,NSTA
642.            CE(J)=(RLSHT/TOWERH)**E(J)
643.            UMAXAD(I,J)=UMAX(I)*CE(J)
644.          1 UAVEAD(I,J)=UAVE(I)*CE(J)
645.            RETURN
646.            END
647.      *DECK POLYN
648.            SUBROUTINE POLYN(IC,AVAL,RESULT,LDSRT)
649.            DIMENSION AY(6),AZ(6,3),BZ(6,3),CZ(6,3),DIS(2)
650.            DIMENSION SZ(7,3),AK(11),EX(11),X(7)
651.            DATA SZ/1.114,1.322,1.633,2.0,2.431,2.889,3.398,0.982,1.230,1.519,
652.           1         1.845,2.255,2.69,3.114,0.903,1.130,1.398,1.708,2.079,
653.           2        2.462,2.903/
654.            DATA AK,EX,X/.144,.443,.78,1.38,.519,.348,.297,.449,.279,.294,.303
655.           1             ,.826,.517,.314,.11,.921,.901,.891,.731,.865,.916,.975
656.           2             ,2.0,2.301,2.602,2.903,3.204,3.505,3.806/
657.            DATA AY/.3658,.2751,.2089,.1471,.1046,.0722/
658.            DATA AZ/.192,.156,.116,.079,.063,.053,     .00066,.0382,.113,.222
659.           X,.211,.086,    .00024,.055,.113,1.26,6.73,18.05/
660.            DATA BZ/.936,.922,.905,.881,.871,.814,    1.941,1.149,.911,.725
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661.          X,.678,.74,    2.094,1.098,.911,.516,.305,.18/
662.           DATA CZ/6*0.,9.27,3.3,0.,-1.7,-1.3,-.35,    -9.6,2.,0.,-13.,-34.
663.          X,-48.6/
664.           DATA DIS/100.,1000./,BY/.9031/
665.           IF(LDSRT.EQ.1)   GO TO 100
666.           IF(IC.LE.7) GO TO 20
667.           IF(IC.EQ.14) GO TO 25
668.           IX=IC-7
669.           RESULT=AY(IX)*AVAL**BY
670.           GO TO 999
671.        25 F=AY(6)*AVAL**BY
672.           E=AY(5)*AVAL**BY
673.           RESULT=2.*ALOG10(F)-ALOG10(E)
674.           GO TO 500
675.        20 DO 2 L=1,2
676.           IF(AVAL.LT.DIS(L)) GO TO 3
677.         2 CONTINUE
678.           L=3
679.         3 IF(IC.EQ.7) GO TO 30
680.           RESULT=AZ(IC,L)*AVAL**BZ(IC,L)+CZ(IC,L)
681.           GO TO 999
682.        30 F=AZ(6,L)*AVAL**BZ(6,L)+CZ(6,L)
683.           E=AZ(5,L)*AVAL**BZ(5,L)+CZ(5,L)
684.           RESULT=2.*ALOG10(F)-ALOG10(E)
685.           GO TO 500
686.     C**** DESERT TYPE SIGMA"S
687.       100 IF(IC.LE.3)   GO TO 10
688.           II=IC-3
689.           RESULT=AK(II)*AVAL**EX(II)
690.           GO TO 999
691.        10 RESULT=0.
692.           AVLG=ALOG10(AVAL)
693.           DO 1 J=1,7
694.           XN=1.
695.           XD=1.
696.           DO 4 K=1,7
697.           IF(K.EQ.J) GO TO 4
698.           XN=XN*(AVLG-X(K))
699.           XD=XD*(X(J)-X(K))
700.         4 CONTINUE
701.         1 RESULT=RESULT+SZ(J,IC)*XN/XD
702.       500 RESULT=10.**RESULT
703.       999 IF(RESULT.GT.1000.) RESULT=1000.
704.           RETURN
705.           END
706.     *DECK MEANDR
707.           SUBROUTINE MEANDR(WIND,J,    AMNDR)
708.           DIMENSION SLOPE(7),CEPT(7),TOP(7)
709.           DATA SLOPE,CEPT,TOP/3*0.0,-0.6309,-1.0,-1.2619,-1.6309,3*0.0,
710.          1                    1.1304,1.7918,2.2610,2.9222,3*1.0,2.0,
711.          2                    3.0,4.0,6.0/
712.           AMNDR=1.0
713.           IF(J.LT.4)   RETURN
714.     C   ***NO MEANDER FOR STABILITIES A,B, AND C***
715.           IF(WIND.GE.6.0) RETURN
716.           WINDLN=ALOG(WIND)
717.           ANS=(SLOPE(J)*WINDLN) + CEPT(J)
718.           AMNDR=EXP(ANS)
719.           IF(AMNDR.GT.TOP(J))   AMNDR=TOP(J)
720.           IF(AMNDR.LT.1.0)      AMNDR=1.0
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      RETURN
      END
*DECK THGT
      SUBROUTINE THGT(HT,DIST,DIS,HGT,NDIS,K)
      DIMENSION HT(17,10),DIST(17,10)
      HGT = HT(K,NDIS)
      IF(DIS.GE.DIST(K,NDIS))  RETURN
      HN = 0.0
      DN = 0.0
      DO 108  M=1,NDIS
      IF(DIST(K,M).GE.DIS)  GO TO 109
108   CONTINUE
      M = NDIS
109   IF(M.EQ.1)  GO TO 112
      HN = HT(K,M-1)
      DN = DIST(K,M-1)
112   HF = HT(K,M)
      DF = DIST(K,M)
      HGT = HN + (HF-HN) * (DIS-DN)/(DF-DN)
      RETURN
      END
*DECK OPENTR
      SUBROUTINE OPENTR (DIS,FAC)
      X = ALOG(DIS)
      IF(DIS.GE.10000.0)  GO TO 1
      FAC = EXP(16.125 - (3.18951* X) + (0.1569306 * X * X))
      IF (FAC.GT.4.00)  GO TO 3
      RETURN
1     IF(DIS.GE.16090.0)  GO TO 2
      FAC = EXP(1.1865 - (0.1225 * X))
      RETURN
2     FAC = 1.00
      RETURN
    3 FAC= 4.00
      RETURN
      END
*DECK ORDER
      SUBROUTINE ORDER(N,KK,OX,OF)
      DIMENSION OX(1),OF(1)
C**** THIS ROUTINE USES THE SHELL METHOD TO ORDER AN ARRAY.
      M=N
  104 M=M/2
      IF(M.EQ.0) GO TO 100
      K=N-M
      J=1
  103 I=J
  102 L=M+I
      IF(OX(I).GE.OX(L)) GO TO 101
      X=OX(I)
      Y=OF(I)
      OX(I)=OX(L)
      OF(I)=OF(L)
      OX(L)=X
      OF(L)=Y
      I=I-M
      IF(I.GE.1) GO TO 102
  101 J=J+1
      IF(J.LE.K) GO TO 103
      GO TO 104
  100 KK=1
```

```
781.           II=1
782.         200 II=II+1
783.           IF(II.GT.N) GO TO 201
784.           IF(OX(KK).GT.OX(II)) GO TO 202
785.           OF(KK)=OF(KK)+OF(II)
786.           GO TO 200
787.         202 KK=KK+1
788.           OX(KK)=OX(II)
789.           OF(KK)=OF(II)+OF(KK-1)
790.           GO TO 200
791.         201 CONTINUE
792.           RETURN
793.           END
794.       *DECK REVORD
795.           SUBROUTINE REVORD(N,KK,OX,OF)
796.           DIMENSION OX(1),OF(1)
797.           M=N
798.         104 M=M/2
799.           IF(M.EQ.0) GO TO 100
800.           K=N-M
801.           J=1
802.         103 I=J
803.         102 L=M+I
804.           IF(OX(I).LE.OX(L)) GO TO 101
805.           X=OX(I)
806.           Y=OF(I)
807.           OX(I)=OX(L)
808.           OF(I)=OF(L)
809.           OX(L)=X
810.           OF(L)=Y
811.           I=I-M
812.           IF(I.GE.1) GO TO 102
813.         101 J=J+1
814.           IF(J.LE.K) GO TO 103
815.           GO TO 104
816.         100 KK=1
817.           II=1
818.         200 II=II+1
819.           IF(II.GT.N) GO TO 201
820.           IF(OX(KK).LT.OX(II)) GO TO 202
821.           OF(KK)=OF(KK)+OF(II)
822.           GO TO 200
823.         202 KK=KK+1
824.           OX(KK)=OX(II)
825.           OF(KK)=OF(II)+OF(KK-1)
826.           GO TO 200
827.         201 CONTINUE
828.           RETURN
829.           END
830.       *DECK CONV
831.           SUBROUTINE CONV(A,NUM)
832.           DIMENSION A(1)
833.           DO 1   J=1,NUM
834.           AS=A(J)
835.           CALL NDTRI(AS,X,D,IE)
836.           IF(IE.LT.0)   PRINT 100,  J,A(J)
837.         100 FORMAT(1H0,T60,"ERROR IN NORMAL TRANSFORMATION FOR A(",I3,")=",
838.          1 F10.5)
839.           1 A(J)=X
840.           RETURN
```

```
      END
*DECK NDTR
      SUBROUTINE NDTR(X,P,D)
      AX=ABS(X)
      T=1.0/(1.0 + 0.2316419*AX)
      D=0.3989423 * EXP(-X*X/2.0)
      P= 1.0 - D*T* (((( 1.330274*T - 1.821256)*T + 1.781478)*T
     1                  - 0.3565638)*T + 0.3193815)
      IF(X)   1,2,2
    1 P=1.0-P
    2 P=P*100.
      RETURN
      END
*DECK NDTRI
      SUBROUTINE NDTRI(P,X,D,IE)
      P=P/100.
      IE=0
      X=.99999E+74
      D=X
      IF(P)  1,4,2
    1 IE=-1
      GO TO 12
    2 IF(P-1.0)  7,5,1
    4 X=-.999999E+74
    5 D=0.0
      GO TO 12
    7 D=P
      IF(D-0.5)  9,9,8
    8 D=1.0-D
    9 T2=ALOG(1.0/(D*D))
      T=SQRT(T2)
      X=T - (2.515517 + 0.802853*T + 0.010328*T2) /
     1      (1.0      + 1.432788*T + 0.189269*T2 + 0.001308*T*T2)
      IF(P-0.5)  10,10,11
   10 X=-X
   11 D=0.3989423 * EXP(-X*X/2.0)
   12 RETURN
      END
*DECK ENVLOP
      SUBROUTINE ENVLOP(X,Y,XX,YY,XS,YS,ICOUNT,ERR,NNN,K)
*CALL BLANK
C          TAKE OUT CALL BLANK IN XOQDOQ
      DIMENSION X(98),Y(98),XX(21),YY(21),XSAVE(30),YSAVE(30),
     1          B(30),SLSAVE(30),NUM(20)
      DATA NUM/1,3,5,10,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,90/
      ERR=1.
      NNL = NNN-1
      IF(X(NNL).LT.XS) GO TO 200
      N=1
      ISAVE=1
      XSAVE(1)=X(1)
      YSAVE(1)=Y(1)
   10 XA=XSAVE(N)
      YA=YSAVE(N)
      SAVESL= -1.0E+10
      I=ISAVE
      NL = I+9
      IF(I.GT.NNN/2) NL=NNL
      IF(NL.GE.NNN) NL=NNL
      XLIM = X(NL)
```

```
901.           IF(KOPT(3).EQ.1)  PRINT 502, N,XA,YA,SAVESL,I,XLIM
902.         502 FORMAT("0    N       XA        YA      SAVESL       I      XLIM"/
903.            1       " ",I5,2F10.5,1X,1PE10.3,I8 ,0PF10.5)
904.       C     IF(XLIM.GT.1.29)   GO TO 12     DELETE ABOVE AND USE THIS IN XOQDO
905.           2 I=I+1
906.             IF(I.GT.98) GO TO 200
907.             IF(KOPT(3).EQ.1)  PRINT 503, I,X(I),SAVESL,ISAVE
908.         503 FORMAT("0    I      X(I)     SAVESL    ISAVE"/
909.            1       " ",I5,F10.5,1X,1PE10.3,I9 )
910.             IF(X(I).GT.XLIM)   GO TO 3
911.             SLOPE=(Y(I)-YA)/(X(I)-XA)
912.             IF(SLOPE.GT.0.0) GO TO 200
913.             IF(KOPT(3).EQ.1)  PRINT 504, Y(I),YA,X(I),XA,SLOPE
914.         504 FORMAT("0    ( Y(I)  -     YA )/(  X(I)   -    XA ) = SLOPE"/
915.            1       " ",4F10.5,4X,1PE10.3)
916.             IF(SLOPE.LT.SAVESL)   GO TO 2
917.             SAVESL=SLOPE
918.             ISAVE=I
919.             GO TO 2
920.           3 N=N+1
921.             IF(N.GT.30) GO TO 200
922.             XSAVE(N)=X(ISAVE)
923.             IF(XSAVE(N).EQ.XSAVE(N-1))   GO TO 102
924.             YSAVE(N)=Y(ISAVE)
925.             SLSAVE(N-1)=SAVESL
926.             B(N-1) = YSAVE(N) - (SAVESL * XSAVE(N) )
927.             IF(KOPT(3).EQ.1)  PRINT 505, N,YSAVE(N),SAVESL,XSAVE(N),B(N-1)
928.         505 FORMAT("0    N (YSAVE(N))- (SAVESL *XSAVE(N) ) = B(N-1)"/
929.            1       " ",I5,F10.5,1PE11.3,0PF10.5,3X,1PE10.3)
930.             IF(XSAVE(N).GE.-0.75 .OR. SAVESL.GT.-1.0)   GO TO 104
931.             SAVEX=XSAVE(N)
932.             CALL NDTR(SAVEX,PROBX,DENS)
933.             PRINT 100, N, PROBX
934.         100 FORMAT(T60, " HANDCHECK GRAPH:  SLOPE LT -1.0 FOR LOW PERCENTAGES"
935.            1      ,".  XSAVE(",I2,")=",F8.3)
936.         104 CONTINUE
937.             IF(X(ISAVE).LT.XS) GO TO 10
938.             IF(NL.GE.NNL) GO TO 4
939.             GO TO 10
940.       C   FOR XOQDOQ DELETE ALL CARDS TO LABEL 12
941.           4 IF(K.EQ.17) GO TO 12
942.             N1=N-1
943.             IF(KOPT(4).EQ.1)  PRINT 110
944.         110 FORMAT("0  K  I   XQSAVE(K,I)  XQINT(K,I) XQSLOP(K,I)")
945.             DO 11   I=1,N1
946.             XQSAVE(K,I)=YSAVE(I)
947.             XQINT(K,I)=B(I)
948.             XQSLOP(K,I)=SLSAVE(I)
949.             IF(KOPT(4).EQ.1) PRINT 111, K,I,XQSAVE(K,I),XQINT(K,I),XQSLOP(K,I)
950.         111 FORMAT(" ",2I3, 4X8 F10.5, 1P2E12.3)
951.          11 CONTINUE
952.             NUMXQ(K)=N
953.             XQSAVE(K,N)=YSAVE(N)
954.             IF(KOPT(4).EQ.1)  PRINT 112, K,N,XQSAVE(K,N),NUMXQ(K)
955.         112 FORMAT(1H ,2I3, 4X, F10.5, 5X, "NUMXQ(K)=", I3)
956.          12 XX(21)=XS
957.             ICOUNT=0
958.             DO 8    I=1,21
959.             YY(I)=0.0
960.             IF (XX(I).LT.XSAVE(1))  GO TO 6
```

```
      IF(XX(I).GT.XSAVE(N))   GO TO 8
      IF(KOPT(3).EQ.1)  PRINT 506
  506 FORMAT("0    I     XX(I)  XSAVE(J)  XSAVE(J+1)    J")
      DO 5    J=1,N
      IF(KOPT(3).EQ.1)  PRINT 507, I,XX(I),XSAVE(J),XSAVE(J+1),J
  507 FORMAT(" ", I5, 3F10.5, I7)
      IF(XX(I).GT.XSAVE(J) .AND. XX(I).LE.XSAVE(J+1))  GO TO 7
    5 CONTINUE
      GO TO 13
    6 PRINT 101,  NUM(I)
  101 FORMAT(T60, " BACK EXTRAPOLATION FOR", I3, " PERCENTILE.")
   13 YY(I)=(SLSAVE(1) * XX(I) ) + B(1)
      GO TO 9
    7 YY(I) = (SLSAVE(J) * XX(I) ) + B(J)
      IF(KOPT(3).EQ.1)  PRINT 508, I,YY(I),SLSAVE(J),XX(I),B(J),J
     1                             ,ICOUNT
  508 FORMAT("0    I     YY(I)=SLSAVE(J) *   XX(I)   +  B(J)    J",
     1       "    ICOUNT"/
     2       " ",I5,F10.5,1PE11.3,0PF9.4,1PE11.3,I4,I10)
    9 ICOUNT=ICOUNT+1
    8 CONTINUE
      YS=YY(21)
      RETURN
  102 CONTINUE
      I=I-1
      N=N-1
      GO TO 10
  200 CONTINUE
      ERR = -1.0
      RETURN
      END
*DECK HEADER
      SUBROUTINE HEADER(TITLD)
      DIMENSION TITLD(65)
      CALL DATE(TODAY)
      CALL TIME(CLOCK)
      PRINT 950 , TODAY,CLOCK
  950 FORMAT(1H1,"USNRC COMPUTER CODE-PAVAN, VERSION 2.0",10X,"RUN DATE
     *",A10,10X,"RUN TIME",A10,/)
      PRINT1, (TITLD(I),I= 1,10), (TITLD(I), I=16,20)
     1       ,(TITLD(I),I=11,15), (TITLD(I), I=21,65)
    1 FORMAT("/PLANT NAME: ",5A4,T50,"METEOROLOGICAL INSTRUMENTATION"/
     1       " DATA PERIOD: ", 5A4, T50,"WIND SENSORS HEIGHT: ", 5A4/
     2       " TYPE OF RELEASE: ", 5A4, T50,"DELTA-T HEIGHTS: ",5A4/
     3      " SOURCE OF DATA: ", 20A4/" COMMENTS: ",20A4/
     4      " PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF "
     5     ,"REGULATORY GUIDE 1.145")
      RETURN
      END
*DECK OUTWND
      SUBROUTINE OUTWND(UMAXAD,HORSUM,NVEL,NSTA,TITLE,HS)
      DIMENSION UMAXAD(14,7),HORSUM(14,7),USPD(98),UFREQ(98),TITLE(65)
     1         ,SLOPE(28),B(28),XP(20),XX(20)
      DATA XX/1.0,3.0,5.0,10.0,15.0,20.0,25.0,30.0,35.0,40.0,45.0,
     1       50.0,55.0,60.0,65.0,70.0,75.0,80.0,85.0,90.0/
      DATA XP/-2.32635,-1.88081,-1.64485,-1.28155,-1.03644,-0.84163,
     1        -0.67499,-0.52440,-0.38532,-0.25335,-0.12566, 0.00000,
     2         0.12566, 0.25335, 0.38532, 0.52440, 0.67499, 0.84163,
     2         1.08032, 1.28155/
      NUMAX=NVEL*NSTA
```

```
      L=0
      DO 1   I=1,NVEL
      DO 1   J=1,NSTA
      L=L+1
      USPD(L)=UMAXAD(I,J)
    1 UFREQ(L)=HORSUM(I,J)
      CALL HEADER(TITLE)
      CALL REVORD(NUMAX,NN,USPD,UFREQ)
      PRINT 100, HS
  100 FORMAT("0WINDSPEEDS ADJUSTED TO ", F5.1, " METERS."/
     1       "0PERCENT OF THE TIME A GIVEN WINDSPEED IS LOWER:")
      PRINT 101
  101 FORMAT("0WINDSPEED    CUMULATIVE FREQUENCY"/
     1       " (METER/SEC)        (PERCENT)")
      DO 2   I=1,NN
    2 PRINT 102,   USPD(I), UFREQ(I)
  102 FORMAT(" ",F9.2,10X,F6.2)
C  ***INTERPOLATED WINDSPEED VS CUM FREQ.
C  ***ASSUMES ADJWND CONVERTS EACH WINDSPEED MAX INTO TWO MAXIMUMS.
      IF(NN.EQ.NVEL) GO TO 30
      UFREQP = 0.0
      USPDP = 0.0
      DO 20 I=1,NVEL
      SMIN = AMIN1(UMAXAD(I,1),UMAXAD(I,7))
      USPD(I) = AMAX1(USPDP,SMIN)
      SABCD = 0.0
      SEFG = 0.0
      DO 12 J=1,4
   12 SABCD = SABCD+HORSUM(I,J)
      DO 13 J=5,7
   13 SEFG = SEFG+HORSUM(I,J)
      SATG = SABCD+SEFG
      IF(SATG.LE.0.0) GO TO 14
      USPD(I) = (UMAXAD(I,1)*SABCD+UMAXAD(I,7)*SEFG)/SATG
   14 UFREQ(I) = UFREQP+SATG
      UFREQP = UFREQ(I)
      USPDP = USPD(I)
   20 CONTINUE
      PRINT 201
  201 FORMAT(1H0,"WINDSPEED",4X,"CUMULATIVE FREQUENCY",/,
     1 " (INTERPOLATED)",/," (METER/SEC)",8X,"(PERCENT)")
      DO 22 I=1,NVEL
   22 PRINT 102, USPD(I),UFREQ(I)
   30 CONTINUE
      DO 3 I=1,NVEL
    3 USPD(I)=ALOG(USPD(I))
      CALL CONV(UFREQ,NVEL)
      NN1 = NVEL-1
      DO 4   I=1,NN1
      B(I) = USPD(I)
      DELFQ = UFREQ(I+1)-UFREQ(I)
      IF(DELFQ.LE.1.0E-20) GO TO 4
      SLOPE(I) = (USPD(I+1)-USPD(I))/DELFQ
      B(I) = USPD(I)-SLOPE(I)*UFREQ(I)
    4 CONTINUE
      PRINT 103
  103 FORMAT("0"/"0LOG-NORMAL INTERPOLATION PERCENTILES")
      PRINT 101
      DO 9   I=1,20
      IF(XP(I).LT.UFREQ(2))   GO TO 6
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1081.           IF(XP(I).GT.UFREQ(NVEL-1)) GO TO 9
1082.           DO 5   J=2,NN1
1083.           IF(XP(I).GT.UFREQ(J) .AND. XP(I).LE.UFREQ(J+1))   GO TO 7
1084.         5 CONTINUE
1085.         6 YY=(SLOPE(1) * XP(I)) + B(1)
1086.           GO TO 8
1087.         7 YY=(SLOPE(J) * XP(I)) + B(J)
1088.         8 YY=EXP(YY)
1089.           PRINT 102,  YY,XX(I)
1090.         9 CONTINUE
1091.           RETURN
1092.           END
1093.      *DECK OUTPUT
1094.           SUBROUTINE OUTPUT(NUM,NNN,HS,XS,K)
1095.      *CALL BLANK
1096.           DIMENSION XP(25),XX(25),YY(25),XRN(25)
1097.           DATA XX/1.0,3.0,5.0,10.0,15.0,20.0,25.0,30.0,35.0,40.0,45.0,
1098.          1       50.0,55.0,60.0,65.0,70.0,75.0,80.0,85.0,90.0/
1099.           DATA XP/-2.32635,-1.88081,-1.64485,-1.28155,-1.03644,-0.84163,
1100.          1        -0.67499,-0.52440,-0.38532,-0.25335,-0.12566, 0.00000,
1101.          2         0.12566, 0.25335, 0.38532, 0.52440, 0.67499, 0.84163,
1102.          3         1.03644, 1.28155/
1103.           IF(MNDRYS.EQ.1)     PRINT 400
1104.       400 FORMAT("0LATERAL PLUME MEANDER/BUILDING WAKE CREDIT ALLOWED"/
1105.          1       " AS A FUNCTION OF DOWNWIND DISTANCE."/
1106.          2       " MEANDER CREDIT IS FOR WINDSPEEDS LESS THAN 6 MPS.")
1107.           IF(KOPT(1).EQ.1)   PRINT 18
1108.        18 FORMAT("0DESERT SIGMA VALUES USED.  MEANDER IS INCLUDED IN THESE"
1109.          1      ," VALUES\ RG 1.145 MEANDER FACTORS ARE NOT USED.")
1110.           IF(C.GT.0.0 .AND. HS.LT.10.1)   PRINT 19,  C,A,D
1111.        19 FORMAT(" BUILDING WAKE CREDIT ALLOWED:   C=",F5.1,"     A=",F7.0
1112.          1      ,"     D=",F7.1)
1113.           IF(C.LE.0.0 .OR. HS.GT.10.1)   PRINT 21
1114.        21 FORMAT(" BUILDING WAKE CREDIT IS NOT INCLUDED.")
1115.           IF(KOPT(10).EQ.1)   PRINT 401
1116.       401 FORMAT(" CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULA"
1117.          1      ,"TIONS.")
1118.           PRINT 11
1119.        11 FORMAT("0BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FRE
1120.          1QUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED."/
1121.          2       " THE TOP NUMBER IS THE CHI/Q.  THE MIDDLE NUMBER IS THE "
1122.          3      ,"FREQUENCY NORMALIZED TO THIS SECTOR."/
1123.          4       " THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL "
1124.          5      ,"TIME.")
1125.           DO 77 I=1,NUM
1126.        77 ORDF2(I)=ORDF(I)*SCA2
1127.           I=1
1128.        12 LST=I+9
1129.           IF(LST.GE.NUM) GO TO 13
1130.           PRINT 23, (ORDX(NN),NN=I,LST),(ORDF(NN),NN=I,LST),
1131.          1 (ORDF2(NN),NN=I,LST)
1132.        23 FORMAT(1H0,1P10E12.3/1H ,0P10F12.3/1H ,0P10F12.5)
1133.           I=I+10
1134.           GO TO 12
1135.        13 CONTINUE
1136.           LST = NUM
1137.           PRINT 42, (ORDX(NN),NN=I,LST)
1138.        42 FORMAT(1H0,1P10E12.3)
1139.           PRINT 43, (ORDF(NN),NN=I,LST)
1140.        43 FORMAT(1H ,10F12.3)
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1141.          PRINT 44, (ORDF2(NN),NN=I,LST)
1142.       44 FORMAT(1H ,10F12.5)
1143.          IF(HS.LT.10.1)  GO TO 17
1144.          PRINT 20
1145.       20 FORMAT("0  BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DIS
1146.         XTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED."/" THI
1147.         XS DISTANCE MAY BE WITHIN THE SITE BOUNDARY."/)
1148.          PRINT 104,  XMX,DMX
1149.      104 FORMAT(1H0," CHI/Q = ",1PE10.3,5X," DISTANCE = ",0PF10.3,/)
1150.       17 CONTINUE
1151.          PRINT 24
1152.       24 FORMAT("0",10X,"X/Q PERCENTILES"/
1153.         1       " (BASED ON THE UPPER ENVELOPE OF THE"/
1154.         2       " ORDERED X/Q-FREQUENCY VALUES, AND AS"/
1155.         3       " PLOTTED ON A LOG-NORMAL GRAPH.)")
1156.          PRINT 22
1157.       22 FORMAT(1H0," PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED",/
1158.         1       " ",7X, "CHI/Q", 6X, "WITH RESPECT TO     WHEN THE WIND "
1159.         2      ,"BLOWS"/
1160.         3       " SEC/CUBIC METER  THE TOTAL TIME      INTO THIS SECTOR "
1161.         4      "ONLY",/)
1162.          DO 32   L=1,NUM
1163.          IF(ORDX(L).LT.1.0E-50)   ORDX(L)=1.0E-50
1164.       32 ORDX(L)=ALOG(ORDX(L))
1165.          CALL CONV(ORDF2,NUM)
1166.          SS = XS*SCA2
1167.          DO 33 J=1,20
1168.       33 XRN(J) = XX(J)*SCA2
1169.          CALL CONV(XRN,20)
1170.          IF(SS.GT.100.)   SS=99.99
1171.          CALL CONV(SS,1)
1172.          CALL ENVLOP(ORDF2,ORDX,XRN,YY,SS,YS,IC,ERR,NUM,K)
1173.          IF(ERR.LT.0.0) PRINT 800
1174.      800 FORMAT(1H0," ***ERROR IN SUBROUTINE ENVLOP***")
1175.          IF(ERR.LT.0.0)   RETURN
1176.          IC1 = IC-1
1177.          DO 6 I=1,IC1
1178.          YYY=EXP(YY(I))
1179.          XUNORM=SCA2*XX(I)
1180.        6 PRINT 26,  YYY, XUNORM,  XX(I)
1181.          YYS=EXP(YS)
1182.          IF(K.GT.16) PRINT 27, YYS,XS
1183.       27 FORMAT(1H0,1PE13.3,T29,"5.0",T46,0PF6.2)
1184.          IF(K.LE.16) PRINT 25, YYS,XS
1185.       25 FORMAT(1H0,1PE13.3,T29,"0.5",T46,0PF6.2)
1186.          IF(K.LE.16)   PRINT 102,  SVANN(K)
1187.      102 FORMAT("0ANNUAL AVERAGE = ", 1PE10.2)
1188.          FIVEXQ(K)=YYS
1189.          FIVEPR(K)=XS
1190.          IF(KOPT(4).EQ.1)  PRINT 120, K,FIVEXQ(K),FIVEPR(K)
1191.      120 FORMAT(1H0,"K=",I3,5X,"FIVEXQ(K)=",1PE10.3,5X,"FIVEPR(K)=",0PF6.3)
1192.          IF(HS.LT.10.1) GO TO 29
1193.          IF(K.GT.17) GO TO 29
1194.          PRINT 103,  XQFUM(K)
1195.      103 FORMAT("0FUMIGATION X/Q AT THE BOUNDARY: ", 1PE10.2)
1196.          PRINT 15
1197.       15 FORMAT(1H0," EXPONENTIAL TERM AND FREQUENCIES")
1198.          I=1
1199.      112 LST=I+9
1200.          IF(LST.GE.NNN) GO TO 113
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      PRINT 23,(XPO(NN),NN=I,LST),(FX(NN),NN=I,LST)
      I=I+10
      GO TO 112
  113 CONTINUE
      LST = NNN
      PRINT 42, (XPO(NN),NN=I,LST)
      PRINT 43, (FX(NN),NN=I,LST)
   29 CONTINUE
   26 FORMAT(1H ,1PE13.3,0P2F19.3)
      RETURN
      END
*DECK ONEOUT
      SUBROUTINE ONEOUT(TITLD,COMP,GRNDVT,LBDY,HS,BDYDIS)
*CALL BLANK
      DIMENSION TITLD(65),COMP(17),HOURS(16),GRNDVT(16),TIME(4)
     1          ,XQTIME(18,4),CMODE(6)
      DATA CMODE/"SRP ","2.3.","4 ","SITE"," LIM","IT"/
      DATA TIME/8.,16.,72.,624./
      HIXQ=FIVEXQ(1)
      HIANN=SVANN(1)
      DO 1   K=2,16
      IF(FIVEXQ(K).GT.HIXQ)   HIXQ=FIVEXQ(K)
      IF(SVANN(K).GT.HIANN)   HIANN=SVANN(K)
    1 CONTINUE
      SVANN(17)=HIANN
      SVANN(18)=HIANN
      HIGHXQ=ALOG(HIXQ)
      IF(KOPT(4).EQ.1)  PRINT 1001
 1001 FORMAT("0  K         HIGHPR             PR      GRNDVT(K)")
      DO 22  K=1,16
      IF(FIVEXQ(K).EQ.0.)   GO TO 21
      IN=NUMXQ(K)
      IF(HIGHXQ.GT.XQSAVE(K,1))   GO TO 3
      IF(HIGHXQ.LT.XQSAVE(K,IN))   GO TO 5
      DO 2   J=1,IN
      IF(HIGHXQ.LE.XQSAVE(K,J) .AND. HIGHXQ.GT.XQSAVE(K,J+1))   GO TO 4
    2 CONTINUE
    3 HIGHPR   =(HIGHXQ - XQINT(K,1)) / XQSLOP(K,1)
      GO TO 6
    4 HIGHPR = (HIGHXQ - XQINT(K,J)) / XQSLOP(K,J)
      GO TO 6
    5 HIGHPR=3.73
    6 CALL NDTR(HIGHPR,PR,DENS)
      IF(KOPT(4).EQ.1)  PRINT 1000, K,HIGHPR,PR,GRNDVT(K)
 1000 FORMAT(" ", I3, 5X, F10.5, 5X, F10.5, 5X, F10.5)
      GO TO 22
   21 PR=0.
   22 HOURS(K) = PR*87.6
      TOTHRS=0.
      IF(KOPT(4).EQ.1)  PRINT 1002
 1002 FORMAT("0  K       HOURS(K)          TOTHRS")
      DO 7   K=1,16
      TOTHRS = TOTHRS+HOURS(K)
      IF(KOPT(4).EQ.1)  PRINT 1003, K,HOURS(K),TOTHRS
 1003 FORMAT(" ", I3, 5X, F10.5, 5X, F10.5)
    7 CONTINUE
      DO 11   K=1,18
      DO 11   J=1,4
   11 XQTIME(K,J)=0.
      IF(KOPT(4).EQ.1)  PRINT 1004
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1004 FORMAT("0 K    FIVEXQ     SVANN    SLTIME    TIMINT  I   TIME"
     1      ,"         XQT")
       DO 12  K=1,18
       IF(FIVEXQ(K).EQ.0.)   GO TO 12
       SLTIME=(ALOG(FIVEXQ(K)) - ALOG(SVANN(K))) * (-0.11926)
       TIMINT=ALOG(FIVEXQ(K)) - (SLTIME * 0.69315)
       IF(KOPT(4).EQ.1)  PRINT 1005, K,FIVEXQ(K),SVANN(K),SLTIME,TIMINT
1005 FORMAT(" ",I2,1P2E10.3,0P2F10.4)
       DO 9   I=1,4
       XQT=(SLTIME * ALOG(TIME(I))) + TIMINT
       IF(KOPT(4).EQ.1)  PRINT 1006, I,TIME(I),XQT
1006 FORMAT(" ",T44,I3,F7.1,F12.5)
   9 XQTIME(K,I)=EXP(XQT)
  12 CONTINUE
       CALL HEADER(TITLD)
       PRINT 101
 101 FORMAT("0",T39,"RELATIVE CONCENTRATION (X/Q) VALUES (SEC/CUBIC "
     1      ,"METER)"/" ",T63,"VERSUS",T103,"HOURS PER YEAR MAX"/
     2       " ",T59,"AVERAGING TIME",T108,"0-2 HR X/Q IS"/
     3       " DOWNWIND DISTANCE", T113,"EXCEEDED  DOWNWIND"/
     4      ," SECTOR   (METERS)",T27,"0-2 HOURS",T42,"0-8 HOURS",T56
     5      ,"8-24 HOURS",T73,"1-4 DAYS",T87,"4-30 DAYS ANNUAL AVERAGE"
     6      ," IN SECTOR    SECTOR")
       DO 8   I=1,16
       DIS=BDY(I,LBDY)
   8 PRINT 102, COMP(I),DIS,FIVEXQ(I),(XQTIME(I,J),J=1,4),SVANN(I)
     1         , HOURS(I),COMP(I)
 102 FORMAT("   ",A4,4X,F6.0,3X,6(5X,1PE10.2),4X,0PF6.1,6X,A4)
       PRINT 103, HIXQ, TOTHRS
 103 FORMAT(" MAX X/Q", T28, 1PE8.2, T89, "TOTAL HOURS AROUND SITE:"
     1      ,3X, 0PF5.1)
       PRINT 108
 108 FORMAT(" ")
       PRINT 109, (CMODE(I),I=1,3),BDYDIS,FIVEXQ(17),
     1 (XQTIME(17,J),J=1,4),SVANN(17)
 109 FORMAT(1H ,2A4,A2,F6.0,3X,6(5X,1PE10.2))
       PRINT 110, (CMODE(I),I=4,6),FIVEXQ(18),
     1 (XQTIME(18,J),J=1,4),SVANN(18)
 110 FORMAT(1H ,2A4,A2,9X,6(5X,1PE10.2))
       IF(TOTHRS.LE.446.0)   PRINT 104
       IF(TOTHRS.GT.446.0)   PRINT 105
 104 FORMAT("00.5 PERCENT X/Q TO AN INDIVIDUAL IS LIMITING.")
 105 FORMAT("0THE FIVE-PERCENT-FOR-THE-ENTIRE-SITE X/Q IS LIMITING.")
       IF(HS.LT.10.1)   GO TO 14
       PRINT 106
 106 FORMAT("0X/Q VALUES (SEC/CUBIC METER) FOR FUMIGATION AT THE ",
     1       "BOUNDARY:"/" DOWNWIND DISTANCE FUMIGATION"/
     2       " SECTOR   (METERS)     X/Q")
       DO 15   I=1,16
       DIS=BDY(I,LBDY)
  15 PRINT 107,  COMP(I),DIS,XQFUM(I)
 107 FORMAT("   ", A4, 4X, F6.0, 2X, 1PE10.2)
  14 PRINT 100
 100 FORMAT("0**NOTE**: VALUES ON THIS PAGE ARE APPROXIMATIONS ONLY."/
     1       "           CHECK THE REASONABLENESS OF THE ENVELOPES"/
     2       "           COMPUTED FOR THE 0-2 HOUR VALUES.  FOR ANY"/
     3       "           FAULTY ENVELOPES, ADJUST THE ABOVE VALUES.")
       RETURN
       END
```

APPENDIX B

Test Case #1

APPENDIX B

TEST CASE #1

This sample run is for a ground level release. The KOPT array, Card Type 1, has KOPT(4), KOPT(7), KOPT(8), and KOPT(10) set equal to one. Only three distances for the EAB and LPZ have been set to nonzero, Card Type 11.

The 39 cards of the input data are listed on page B-2 and the resulting program output is shown starting on page B-3.

```
 1.        1  11 1
 2.       TEST CASE NUMBER 1                          GROUND LEVEL RELEASE
 3.       10.0 METER
 4.
 5.       NONE
 6.          5     0
 7.       900. 25.0  10.0  10.0
 8.          0     0     4     4     4     4     4
 9.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
10.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
11.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
12.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
13.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
14.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
15.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
16.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
17.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
18.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
19.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
20.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
21.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
22.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
23.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
24.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
25.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
26.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
27.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
28.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
29.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
30.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
31.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
32.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
33.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
34.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
35.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
36.          1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     1
37.         -1.   1.0   2.0   4.0   8.0  16.0
38.        805.  0.0   0.0   0.0   0.0   0.0  0.04989.  0.0   0.0   0.0   0.0   0.0   0.0  0.01127.
39.       1931.  0.0   0.0   0.0   0.0   0.0  0.06437.  0.0   0.0   0.0   0.0   0.0   0.0  0.04345.
```

USNRC COMPUTER CODE-PAVAN, VERSION 2.0   RUN DATE: MONDAY   AUGUST 30, 1982

PRINTOUT OF INPUT CARDS

```
  1     00010 01101 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
  2      TEST CASE NUMBER 1                         GROUND LEVEL RELEASE
  3      10.0 METER
  4
  5      NONE
  6          5   100     0
  7          0.500    900.000     25.000     10.000     10.000
  8       0.0     0.0     4.000   4.000   4.000   4.000   4.000
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
  9       1.000   0.0     0.0     0.0     0.0     0.0     0.0     2.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     1.000
 10         -1.   1.000   2.000   4.000   8.000  16.000   0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 11        805.      0.      0.      0.      0.      0.      0.  4989.      0.      0.      0.      0.      0.      0.      0.  1127.
 11       1931.      0.      0.      0.      0.      0.      0.  6437.      0.      0.      0.      0.      0.      0.      0.  4345.
```

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS A
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00	2.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.00	4.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.00	8.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16.00	16.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS B
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00	2.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.00	4.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.00	8.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16.00	16.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS C
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	2.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	4.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	8.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	16.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS D
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	2.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	4.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	8.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	16.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS E
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	2.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	4.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	8.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000

16.00	16.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS F

WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	2.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	4.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	8.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	16.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS G

WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	2.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	4.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	8.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	16.00	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

WIND MEASURED AT 10.0 METERS.
WIND SPEED CORRECTED TO THE RELEASE HEIGHT OF 10.0 METERS.

OVERALL WIND DIRECTION FREQUENCY

WIND DIRECTION:	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
FREQUENCY:	25.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0

OVERALL WIND SPEED FREQUENCY AS MEASURED ON THE TOWER:

MAX.WIND SPEED (M/S):	1.000	2.000	4.000	8.000	16.000
WIND SPEED FREQUENCY:	20.00	20.00	20.00	20.00	20.00

BUILDING AND RELEASE CHARACTERISTICS:

RELEASE HEIGHT:	10.00 METERS
MIXING VOLUME COEFFICIENT:	0.50
BUILDING CROSS-SECTIONAL AREA:	900.00 SQUARE METERS

BOUNDARY DISTANCES (METERS) FROM THE SOURCE FOR EACH DOWNWIND SECTOR:

DOWNWIND SECTOR	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE
BOUNDARY 1	805.	0.	0.	0.	0.	0.	0.	4989.	0.	0.	0.	0.	0.	0.	0.	1127.
BOUNDARY 2	1931.	0.	0.	0.	0.	0.	0.	6437.	0.	0.	0.	0.	0.	0.	0.	4345.

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

WINDSPEEDS ADJUSTED TO 10.0 METERS.

PERCENT OF THE TIME A GIVEN WINDSPEED IS LOWER:

WINDSPEED (METER/SEC)	CUMULATIVE FREQUENCY (PERCENT)
1.00	20.00
2.00	40.00
4.00	60.00
8.00	80.00
16.00	100.00

LOG-NORMAL INTERPOLATION PERCENTILES

WINDSPEED (METER/SEC)	CUMULATIVE FREQUENCY (PERCENT)
0.17	1.00
0.29	3.00
0.39	5.00
0.60	10.00
0.79	15.00
1.00	20.00
1.22	25.00
1.45	30.00
1.71	35.00
2.00	40.00
2.38	45.00
2.83	50.00
3.36	55.00
4.00	60.00
4.67	65.00
5.51	70.00
6.58	75.00

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE S SECTOR.

STABILITY CLASS	WINDSPEED AT 10.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	805.	0.	0.	87.9	50.1	87.9	7.218E-05	6.991E-05	6.991E-05
C	2.0	4.00	805.	0.	0.	87.9	50.1	87.9	3.609E-05	3.496E-05	3.496E-05
C	4.0	4.00	805.	0.	0.	87.9	50.1	87.9	1.805E-05	1.748E-05	1.748E-05
C	8.0	4.00	805.	0.	0.	87.9	50.1	87.9	9.023E-06	8.739E-06	8.739E-06
C	16.0	4.00	805.	0.	0.	87.9	50.1	87.9	4.511E-06	4.369E-06	4.369E-06
D	1.0	4.00	805.	0.	0.	61.9	26.7	123.5	9.660E-05	1.773E-04	9.660E-05
D	2.0	4.00	805.	0.	0.	61.9	26.7	123.5	4.830E-05	8.864E-05	4.830E-05
D	4.0	4.00	805.	0.	0.	61.9	26.7	79.9	3.734E-05	4.432E-05	3.734E-05
D	8.0	4.00	805.	0.	0.	61.9	26.7	61.9	2.408E-05	2.216E-05	2.216E-05
D	16.0	4.00	805.	0.	0.	61.9	26.7	61.9	1.204E-05	1.108E-05	1.108E-05
E	1.0	4.00	805.	0.	0.	44.0	18.4	131.6	1.315E-04	3.339E-04	1.315E-04
E	2.0	4.00	805.	0.	0.	44.0	18.4	131.6	6.574E-05	1.670E-04	6.574E-05
E	4.0	4.00	805.	0.	0.	44.0	18.4	65.9	6.561E-05	8.348E-05	6.561E-05
E	8.0	4.00	805.	0.	0.	44.0	18.4	44.0	4.912E-05	4.174E-05	4.174E-05
E	16.0	4.00	805.	0.	0.	44.0	18.4	44.0	2.456E-05	2.087E-05	2.087E-05
F	1.0	4.00	805.	0.	0.	30.4	11.8	121.1	2.227E-04	6.340E-04	2.227E-04
F	2.0	4.00	805.	0.	0.	30.4	11.8	121.1	1.114E-04	3.170E-04	1.114E-04
F	4.0	4.00	805.	0.	0.	30.4	11.8	50.6	1.333E-04	1.585E-04	1.333E-04
F	8.0	4.00	805.	0.	0.	30.4	11.8	30.4	1.109E-04	7.925E-05	7.925E-05
F	16.0	4.00	805.	0.	0.	30.4	11.8	30.4	5.545E-05	3.963E-05	3.963E-05
G	1.0	4.00	805.	0.	0.	21.0	7.6	125.3	3.354E-04	1.053E-03	3.354E-04
G	2.0	4.00	805.	0.	0.	21.0	7.6	125.3	1.677E-04	5.267E-04	1.677E-04
G	4.0	4.00	805.	0.	0.	21.0	7.6	40.5	2.592E-04	2.634E-04	2.592E-04
G	8.0	4.00	805.	0.	0.	21.0	7.6	21.0	2.504E-04	1.317E-04	1.317E-04
G	16.0	4.00	805.	0.	0.	21.0	7.6	21.0	1.252E-04	6.584E-05	6.584E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:

S SECTOR BOUNDARY DISTANCE = 805.0 METERS

LATERAL PLUME MEANDER/BUILDING WAKE CREDIT ALLOWED
AS A FUNCTION OF DOWNWIND DISTANCE.
MEANDER CREDIT IS FOR WINDSPEEDS LESS THAN 6 MPS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

3.354E-04	2.592E-04	2.227E-04	1.677E-04	1.333E-04	1.317E-04	1.315E-04	1.114E-04	9.660E-05	7.925E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
6.991E-05	6.584E-05	6.574E-05	6.561E-05	4.830E-05	4.174E-05	3.963E-05	3.734E-05	3.496E-05	2.216E-05
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
2.087E-05	1.748E-05	1.108E-05	8.739E-06	4.369E-06					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY
5.215E-04	0.250	1.000
3.697E-04	0.750	3.000
3.102E-04	1.250	5.000

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 6.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 13.999
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 19.004

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
1	1	-8.00026	-10.13779	-0.91866
1	2	-8.40959	-10.85718	-1.30107
1	3	-8.93670	-11.52932	-1.75643
1	4	-9.63176	-12.98960	-3.10810
1	5	-10.26143	NUMXQ(K)= 5	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

2.395E-04	2.500	10.000
1.955E-04	3.750	15.000
1.638E-04	5.000	20.000
1.418E-04	6.250	25.000
1.234E-04	7.500	30.000
1.066E-04	8.750	35.000
9.345E-05	10.000	40.000
8.289E-05	11.250	45.000
7.421E-05	12.500	50.000
6.693E-05	13.750	55.000
5.724E-05	15.000	60.000
4.866E-05	16.250	65.000
4.170E-05	17.500	70.000
3.598E-05	18.750	75.000
4.217E-04	0.5	2.00

ANNUAL AVERAGE = 8.11E-05

K= 1 FIVEXQ(K)= 4.217E-04 FIVEPR(K)= 2.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE NNW SECTOR.

STABILITY CLASS	WINDSPEED METER/SEC AT 10.0 METERS	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	4989.	0.	0.	456.7	264.2	456.7	2.638E-06	2.635E-06	2.635E-06
C	2.0	4.00	4989.	0.	0.	456.7	264.2	456.7	1.319E-06	1.317E-06	1.317E-06
C	4.0	4.00	4989.	0.	0.	456.7	264.2	456.7	6.595E-07	6.587E-07	6.587E-07
C	8.0	4.00	4989.	0.	0.	456.7	264.2	456.7	3.297E-07	3.294E-07	3.294E-07
C	16.0	4.00	4989.	0.	0.	456.7	264.2	456.7	1.649E-07	1.647E-07	1.647E-07
D	1.0	4.00	4989.	0.	0.	321.6	89.0	383.2	9.336E-06	1.107E-05	9.336E-06
D	2.0	4.00	4989.	0.	0.	321.6	89.0	383.1	4.668E-06	5.534E-06	4.668E-06
D	4.0	4.00	4989.	0.	0.	321.6	89.0	339.5	2.634E-06	2.767E-06	2.634E-06
D	8.0	4.00	4989.	0.	0.	321.6	89.0	321.6	1.390E-06	1.383E-06	1.383E-06
D	16.0	4.00	4989.	0.	0.	321.6	89.0	321.6	6.952E-07	6.917E-07	6.917E-07
E	1.0	4.00	4989.	0.	0.	228.7	56.3	316.2	1.786E-05	2.443E-05	1.786E-05
E	2.0	4.00	4989.	0.	0.	228.7	56.3	316.2	8.932E-06	1.222E-05	8.932E-06
E	4.0	4.00	4989.	0.	0.	228.7	56.3	250.6	5.636E-06	6.108E-06	5.636E-06
E	8.0	4.00	4989.	0.	0.	228.7	56.3	228.7	3.088E-06	3.054E-06	3.054E-06
E	16.0	4.00	4989.	0.	0.	228.7	56.3	228.7	1.544E-06	1.527E-06	1.527E-06
F	1.0	4.00	4989.	0.	0.	157.8	35.0	248.5	3.661E-05	5.619E-05	3.661E-05
F	2.0	4.00	4989.	0.	0.	157.8	35.0	248.5	1.831E-05	2.809E-05	1.831E-05
F	4.0	4.00	4989.	0.	0.	157.8	35.0	178.0	1.278E-05	1.405E-05	1.278E-05
F	8.0	4.00	4989.	0.	0.	157.8	35.0	157.8	7.206E-06	7.024E-06	7.024E-06
F	16.0	4.00	4989.	0.	0.	157.8	35.0	157.8	3.603E-06	3.512E-06	3.512E-06
G	1.0	4.00	4989.	0.	0.	108.9	21.7	213.2	6.872E-05	1.268E-04	6.872E-05
G	2.0	4.00	4989.	0.	0.	108.9	21.7	213.2	3.436E-05	6.342E-05	3.436E-05
G	4.0	4.00	4989.	0.	0.	108.9	21.7	128.5	2.851E-05	3.171E-05	2.851E-05
G	8.0	4.00	4989.	0.	0.	108.9	21.7	108.9	1.681E-05	1.585E-05	1.585E-05
G	16.0	4.00	4989.	0.	0.	108.9	21.7	108.9	8.407E-06	7.927E-06	7.927E-06

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:

NNW SECTOR BOUNDARY DISTANCE = 4989.0 METERS

LATERAL PLUME MEANDER/BUILDING WAKE CREDIT ALLOWED
AS A FUNCTION OF DOWNWIND DISTANCE.
MEANDER CREDIT IS FOR WINDSPEEDS LESS THAN 6 MPS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

6.872E-05	3.661E-05	3.436E-05	2.851E-05	1.831E-05	1.786E-05	1.585E-05	1.278E-05	9.336E-06	8.932E-06
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
2.00000	4.00000	6.00000	8.00000	10.00000	12.00000	14.00000	16.00000	18.00000	20.00000
7.927E-06	7.024E-06	5.636E-06	4.668E-06	3.512E-06	3.054E-06	2.635E-06	2.634E-06	1.527E-06	1.383E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
22.00000	24.00000	26.00000	28.00000	30.00000	32.00000	34.00000	36.00000	38.00000	40.00000
1.317E-06	6.917E-07	6.587E-07	3.294E-07	1.647E-07					
84.000	88.000	92.000	96.000	100.000					
42.00000	44.00000	46.00000	48.00000	50.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY
1.395E-04	0.500	1.000
8.047E-05	1.500	3.000
6.052E-05	2.500	5.000

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 7.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 13.999

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
8	1	-9.58542	-12.37057	-1.35584
8	2	-10.46518	-13.00304	-1.80589
8	3	-11.05204	-13.40189	-2.17508
8	4	-11.86623	-13.85611	-2.81843
8	5	-12.84707	-14.43191	-4.42675
8	6	-13.53984	NUMXQ(K)=	6

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

3.947E-05	5.000	10.000
2.988E-05	7.500	15.000
2.281E-05	10.000	20.000
1.799E-05	12.500	25.000
1.441E-05	15.000	30.000
1.154E-05	17.500	35.000
9.430E-06	20.000	40.000
7.816E-06	22.500	45.000
6.421E-06	25.000	50.000
5.171E-06	27.500	55.000
4.205E-06	30.000	60.000
3.446E-06	32.500	65.000
2.841E-06	35.000	70.000
2.208E-06	37.500	75.000
1.654E-06	40.000	80.000
1.395E-04	0.5	1.00

ANNUAL AVERAGE = 3.80E-06

K= 8 FIVEXQ(K)= 1.395E-04 FIVEPR(K)= 1.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE SSE SECTOR.

STABILITY CLASS	WINDSPEED AT 10.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	1127.	0.	0.	119.2	68.1	119.2	3.920E-05	3.852E-05	3.852E-05
C	2.0	4.00	1127.	0.	0.	119.2	68.1	119.2	1.960E-05	1.926E-05	1.926E-05
C	4.0	4.00	1127.	0.	0.	119.2	68.1	119.2	9.801E-06	9.631E-06	9.631E-06
C	8.0	4.00	1127.	0.	0.	119.2	68.1	119.2	4.901E-06	4.816E-06	4.816E-06
C	16.0	4.00	1127.	0.	0.	119.2	68.1	119.2	2.450E-06	2.408E-06	2.408E-06
D	1.0	4.00	1127.	0.	0.	83.9	34.3	145.5	6.373E-05	1.053E-04	6.373E-05
D	2.0	4.00	1127.	0.	0.	83.9	34.3	145.5	3.187E-05	5.263E-05	3.187E-05
D	4.0	4.00	1127.	0.	0.	83.9	34.3	101.9	2.276E-05	2.631E-05	2.276E-05
D	8.0	4.00	1127.	0.	0.	83.9	34.3	83.9	1.381E-05	1.316E-05	1.316E-05
D	16.0	4.00	1127.	0.	0.	83.9	34.3	83.9	6.906E-06	6.579E-06	6.579E-06
E	1.0	4.00	1127.	0.	0.	59.7	23.4	147.2	9.242E-05	2.068E-04	9.242E-05
E	2.0	4.00	1127.	0.	0.	59.7	23.4	147.2	4.621E-05	1.034E-04	4.621E-05
E	4.0	4.00	1127.	0.	0.	59.7	23.4	81.6	4.171E-05	5.171E-05	4.171E-05
E	8.0	4.00	1127.	0.	0.	59.7	23.4	59.7	2.851E-05	2.585E-05	2.585E-05
E	16.0	4.00	1127.	0.	0.	59.7	23.4	59.7	1.425E-05	1.293E-05	1.293E-05
F	1.0	4.00	1127.	0.	0.	41.2	15.3	131.8	1.573E-04	4.106E-04	1.573E-04
F	2.0	4.00	1127.	0.	0.	41.2	15.3	131.8	7.865E-05	2.053E-04	7.865E-05
F	4.0	4.00	1127.	0.	0.	41.2	15.3	61.4	8.448E-05	1.026E-04	8.448E-05
F	8.0	4.00	1127.	0.	0.	41.2	15.3	41.2	6.295E-05	5.132E-05	5.132E-05
F	16.0	4.00	1127.	0.	0.	41.2	15.3	41.2	3.147E-05	2.566E-05	2.566E-05
G	1.0	4.00	1127.	0.	0.	28.4	10.1	132.7	2.382E-04	7.411E-04	2.382E-04
G	2.0	4.00	1127.	0.	0.	28.4	10.1	132.7	1.191E-04	3.706E-04	1.191E-04
G	4.0	4.00	1127.	0.	0.	28.4	10.1	48.0	1.647E-04	1.853E-04	1.647E-04
G	8.0	4.00	1127.	0.	0.	28.4	10.1	28.4	1.390E-04	9.264E-05	9.264E-05
G	16.0	4.00	1127.	0.	0.	28.4	10.1	28.4	6.950E-05	4.632E-05	4.632E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:

SSE SECTOR BOUNDARY DISTANCE = 1127.0 METERS

LATERAL PLUME MEANDER/BUILDING WAKE CREDIT ALLOWED
AS A FUNCTION OF DOWNWIND DISTANCE.
MEANDER CREDIT IS FOR WINDSPEEDS LESS THAN 6 MPS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.382E-04	1.647E-04	1.573E-04	1.191E-04	9.264E-05	9.242E-05	8.448E-05	7.865E-05	6.373E-05	5.132E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
4.632E-05	4.621E-05	4.171E-05	3.852E-05	3.187E-05	2.585E-05	2.566E-05	2.276E-05	1.926E-05	1.316E-05
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
1.293E-05	9.631E-06	6.579E-06	4.816E-06	2.408E-06					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY
3.726E-04	0.250	1.000
2.629E-04	0.750	3.000
2.201E-04	1.250	5.000

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 7.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 13.999
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 18.003

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
16	1	-8.34255	-10.50860	-0.93092
16	2	-8.75734	-11.49737	-1.45652
16	3	-9.45049	-12.53695	-2.19627
16	4	-10.16420	-13.60953	-3.18907
16	5	-10.69069	NUMXQ(K)= 5	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

1.693E-04	2.500	10.000
1.359E-04	3.750	15.000
1.115E-04	5.000	20.000
9.492E-05	6.250	25.000
8.270E-05	7.500	30.000
7.066E-05	8.750	35.000
5.995E-05	10.000	40.000
5.161E-05	11.250	45.000
4.494E-05	12.500	50.000
3.949E-05	13.750	55.000
3.349E-05	15.000	60.000
2.835E-05	16.250	65.000
2.420E-05	17.500	70.000
3.004E-04	0.5	2.00

ANNUAL AVERAGE = 4.85E-05

K= 16 FIVEXQ(K)= 3.004E-04 FIVEPR(K)= 2.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE ALL SECTOR.

STABILITY CLASS	WINDSPEED AT 10.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	805.	0.	0.	87.9	50.1	87.9	7.218E-05	6.991E-05	6.991E-05
C	2.0	4.00	805.	0.	0.	87.9	50.1	87.9	3.609E-05	3.496E-05	3.496E-05
C	4.0	4.00	805.	0.	0.	87.9	50.1	87.9	1.805E-05	1.748E-05	1.748E-05
C	8.0	4.00	805.	0.	0.	87.9	50.1	87.9	9.023E-06	8.739E-06	8.739E-06
C	16.0	4.00	805.	0.	0.	87.9	50.1	87.9	4.511E-06	4.369E-06	4.369E-06
D	1.0	4.00	805.	0.	0.	61.9	26.7	61.9	1.927E-04	1.773E-04	1.773E-04
D	2.0	4.00	805.	0.	0.	61.9	26.7	61.9	9.633E-05	8.864E-05	8.864E-05
D	4.0	4.00	805.	0.	0.	61.9	26.7	61.9	4.816E-05	4.432E-05	4.432E-05
D	8.0	4.00	805.	0.	0.	61.9	26.7	61.9	2.408E-05	2.216E-05	2.216E-05
D	16.0	4.00	805.	0.	0.	61.9	26.7	61.9	1.204E-05	1.108E-05	1.108E-05
E	1.0	4.00	805.	0.	0.	44.0	18.4	44.0	3.929E-04	3.339E-04	3.339E-04
E	2.0	4.00	805.	0.	0.	44.0	18.4	44.0	1.965E-04	1.670E-04	1.670E-04
E	4.0	4.00	805.	0.	0.	44.0	18.4	44.0	9.824E-05	8.348E-05	8.348E-05
E	8.0	4.00	805.	0.	0.	44.0	18.4	44.0	4.912E-05	4.174E-05	4.174E-05
E	16.0	4.00	805.	0.	0.	44.0	18.4	44.0	2.456E-05	2.087E-05	2.087E-05
F	1.0	4.00	805.	0.	0.	30.4	11.8	30.4	8.871E-04	6.340E-04	6.340E-04
F	2.0	4.00	805.	0.	0.	30.4	11.8	30.4	4.436E-04	3.170E-04	3.170E-04
F	4.0	4.00	805.	0.	0.	30.4	11.8	30.4	2.218E-04	1.585E-04	1.585E-04
F	8.0	4.00	805.	0.	0.	30.4	11.8	30.4	1.109E-04	7.925E-05	7.925E-05
F	16.0	4.00	805.	0.	0.	30.4	11.8	30.4	5.545E-05	3.963E-05	3.963E-05
G	1.0	4.00	805.	0.	0.	21.0	7.6	21.0	2.003E-03	1.053E-03	1.053E-03
G	2.0	4.00	805.	0.	0.	21.0	7.6	21.0	1.001E-03	5.267E-04	5.267E-04
G	4.0	4.00	805.	0.	0.	21.0	7.6	21.0	5.007E-04	2.634E-04	2.634E-04
G	8.0	4.00	805.	0.	0.	21.0	7.6	21.0	2.504E-04	1.317E-04	1.317E-04
G	16.0	4.00	805.	0.	0.	21.0	7.6	21.0	1.252E-04	6.584E-05	6.584E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:
DIRECTION-INDEPENDENT (S.R.P 2.3.4) MODEL.
MINIMUM BOUNDARY DISTANCE = 805.0 METERS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

1.053E-03	6.340E-04	5.267E-04	3.339E-04	3.170E-04	2.634E-04	1.773E-04	1.670E-04	1.585E-04	1.317E-04
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
4.00000	8.00000	12.00000	16.00000	20.00000	24.00000	28.00000	32.00000	36.00000	40.00000
8.864E-05	8.348E-05	7.925E-05	6.991E-05	6.584E-05	4.432E-05	4.174E-05	3.963E-05	3.496E-05	2.216E-05
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
44.00000	48.00000	52.00000	56.00000	60.00000	64.00000	68.00000	72.00000	76.00000	80.00000
2.087E-05	1.748E-05	1.108E-05	8.739E-06	4.369E-06					
84.000	88.000	92.000	96.000	100.000					
84.00000	88.00000	92.00000	96.00000	100.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 11.998
BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q SEC/CUBIC METER	WITH RESPECT TO THE TOTAL TIME	WHEN THE WIND BLOWS INTO THIS SECTOR ONLY
2.106E-03	1.000	1.000
1.232E-03	3.000	3.000
9.274E-04	5.000	5.000
5.988E-04	10.000	10.000
4.296E-04	15.000	15.000
3.226E-04	20.000	20.000
2.523E-04	25.000	25.000
2.023E-04	30.000	30.000
1.649E-04	35.000	35.000
1.363E-04	40.000	40.000
1.134E-04	45.000	45.000
9.472E-05	50.000	50.000
7.909E-05	55.000	55.000
6.584E-05	60.000	60.000
5.511E-05	65.000	65.000
4.569E-05	70.000	70.000
3.731E-05	75.000	75.000

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    2.978E-05              80.000              80.000
    2.290E-05              85.000              85.000
    1.645E-05              90.000              90.000

    9.274E-04               5.0                 5.00

K= 17      FIVEXQ(K)= 9.274E-04      FIVEPR(K)= 5.000
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USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:

FIVE PERCENT OVERALL SITE LIMIT
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

3.354E-04	2.592E-04	2.382E-04	2.227E-04	1.677E-04	1.647E-04	1.573E-04	1.333E-04	1.317E-04	1.315E-04
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
1.191E-04	1.114E-04	9.660E-05	9.264E-05	9.242E-05	8.448E-05	7.925E-05	7.865E-05	6.991E-05	6.872E-05
11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000	21.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	21.00000
6.584E-05	6.574E-05	6.561E-05	6.373E-05	5.132E-05	4.830E-05	4.632E-05	4.621E-05	4.174E-05	4.171E-05
22.000	23.000	24.000	25.000	26.000	27.000	28.000	29.000	30.000	31.000
22.00000	23.00000	24.00000	25.00000	26.00000	27.00000	28.00000	29.00000	30.00000	31.00000
3.963E-05	3.852E-05	3.734E-05	3.661E-05	3.496E-05	3.436E-05	3.187E-05	2.851E-05	2.585E-05	2.566E-05
32.000	33.000	34.000	36.000	37.000	39.000	40.000	42.000	43.000	44.000
32.00000	33.00000	34.00000	36.00000	37.00000	39.00000	40.00000	42.00000	43.00000	44.00000
2.276E-05	2.216E-05	2.087E-05	1.926E-05	1.831E-05	1.786E-05	1.748E-05	1.585E-05	1.316E-05	1.293E-05
45.000	46.000	47.000	48.000	50.000	52.000	53.000	55.000	56.000	57.000
45.00000	46.00000	47.00000	48.00000	50.00000	52.00000	53.00000	55.00000	56.00000	57.00000
1.278E-05	1.108E-05	9.631E-06	9.336E-06	8.932E-06	8.739E-06	7.927E-06	7.024E-06	6.579E-06	5.636E-06
59.000	60.000	61.000	63.000	65.000	66.000	68.000	70.000	71.000	73.000
59.00000	60.00000	61.00000	63.00000	65.00000	66.00000	68.00000	70.00000	71.00000	73.00000
4.816E-06	4.668E-06	4.369E-06	3.512E-06	3.054E-06	2.635E-06	2.634E-06	2.408E-06	1.527E-06	1.383E-06
74.000	76.000	77.000	79.000	81.000	83.000	85.000	86.000	88.000	90.000
74.00000	76.00000	77.00000	79.00000	81.00000	83.00000	85.00000	86.00000	88.00000	90.00000
1.317E-06	6.917E-07	6.587E-07	3.294E-07	1.647E-07					
92.000	94.000	96.000	98.000	100.000					
92.00000	94.00000	96.00000	98.00000	100.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY

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HANDCHECK GRAPH:  SLOPE LT -1.0 FOR LOW PERCENTAGES.  XSAVE( 3)=   9.997
HANDCHECK GRAPH:  SLOPE LT -1.0 FOR LOW PERCENTAGES.  XSAVE( 4)=  18.003

 K  I   XQSAVE(K,I)  XQINT(K,I) XQSLOP(K,I)
18  1      -8.00026  -9.65461  -0.71100
18  2      -8.40959 -10.37616  -1.12306
18  3      -8.93670 -10.73369  -1.40200
18  4      -9.45049 -10.24344  -0.86637
18  5      -9.63176 -10.27762  -0.91477
18  6      -9.66089 -11.03550  -2.03892
18  7     -10.19542 -10.34523  -0.36359
18  8     -10.21506 -10.50238  -0.80253
18  9     -10.27856 -10.90821  -2.25768
18 10     -10.90821 -10.90821  -0.49035
18 11     -10.93273     NUMXQ(K)= 11
   3.354E-04              1.000              1.000
   2.443E-04              3.000              3.000
   1.978E-04              5.000              5.000
   1.315E-04             10.000             10.000
   9.321E-05             15.000             15.000
   7.378E-05             20.000             20.000
   6.373E-05             25.000             25.000
   4.692E-05             30.000             30.000
   3.697E-05             35.000             35.000
   3.241E-05             40.000             40.000
   2.430E-05             45.000             45.000
   1.831E-05             50.000             50.000

   1.978E-04               5.0                5.00

K= 18      FIVEXQ(K)= 1.978E-04      FIVEPR(K)= 5.000

 K          HIGHPR              PR       GRNDVT(K)
 1        -2.57623         0.49942        25.00000
 8        -3.39234         0.03465        50.00000
16        -2.94063         0.16378        25.00000

 K        HOURS(K)          TOTHRS
 1        43.74878        43.74878
 2         0.0            43.74878
 3         0.0            43.74878
 4         0.0            43.74878
 5         0.0            43.74878
 6         0.0            43.74878
 7         0.0            43.74878
 8         3.03570        46.78447
 9         0.0            46.78447
10         0.0            46.78447
11         0.0            46.78447
12         0.0            46.78447
13         0.0            46.78447
14         0.0            46.78447
15         0.0            46.78447
16        14.34675        61.13121

 K     FIVEXQ      SVANN     SLTIME     TIMINT  I    TIME          XQT
 1 4.217E-04 8.105E-05    -0.1967    -7.6348
                                                 1     8.0     -8.04378
                                                 2    16.0     -8.18013
                                                 3    72.0     -8.47598
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				4	624.0	-8.90074
8	1.395E-04	3.802E-06	-0.4296	-8.5798		
				1	8.0	-9.47317
				2	16.0	-9.77095
				3	72.0	-10.41712
				4	624.0	-11.34485
16	3.004E-04	4.852E-05	-0.2174	-7.9596		
				1	8.0	-8.41175
				2	16.0	-8.56246
				3	72.0	-8.88950
				4	624.0	-9.35904
17	9.274E-04	8.105E-05	-0.2907	-6.7816		
				1	8.0	-7.38608
				2	16.0	-7.58755
				3	72.0	-8.02475
				4	624.0	-8.65246
18	1.978E-04	8.105E-05	-0.1064	-8.4548		
				1	8.0	-8.67595
				2	16.0	-8.74968
				3	72.0	-8.90968
				4	624.0	-9.13939

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

RELATIVE CONCENTRATION (X/Q) VALUES (SEC/CUBIC METER) VERSUS AVERAGING TIME

DOWNWIND SECTOR	DISTANCE (METERS)	0-2 HOURS	0-8 HOURS	8-24 HOURS	1-4 DAYS	4-30 DAYS	ANNUAL AVERAGE	HOURS PER YEAR MAX 0-2 HR X/Q IS EXCEEDED IN SECTOR	DOWNWIND SECTOR
S	805.	4.22E-04	3.21E-04	2.80E-04	2.08E-04	1.36E-04	8.11E-05	43.7	S
SSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SSW
SW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SW
WSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WSW
W	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	W
WNW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WNW
NW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NW
NNW	4989.	1.39E-04	7.69E-05	5.71E-05	2.99E-05	1.18E-05	3.80E-06	3.0	NNW
N	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N
NNE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NNE
NE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE
ENE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ENE
E	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	E
ESE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ESE
SE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SE
SSE	1127.	3.00E-04	2.22E-04	1.91E-04	1.38E-04	8.62E-05	4.85E-05	14.3	SSE
MAX X/Q		4.22E-04				TOTAL HOURS AROUND SITE:		61.1	
SRP 2.3.4	805.	9.27E-04	6.20E-04	5.07E-04	3.27E-04	1.75E-04	8.11E-05		
SITE LIMIT		1.98E-04	1.71E-04	1.59E-04	1.35E-04	1.07E-04	8.11E-05		

0.5 PERCENT X/Q TO AN INDIVIDUAL IS LIMITING.

NOTE: VALUES ON THIS PAGE ARE APPROXIMATIONS ONLY.
CHECK THE REASONABLENESS OF THE ENVELOPES
COMPUTED FOR THE 0-2 HOUR VALUES. FOR ANY
FAULTY ENVELOPES, ADJUST THE ABOVE VALUES.

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE S SECTOR.

STABILITY CLASS	WINDSPEED METER/SEC AT 10.0 METERS	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	1931.	0.	0.	193.8	111.3	193.8	1.476E-05	1.466E-05	1.466E-05
C	2.0	4.00	1931.	0.	0.	193.8	111.3	193.8	7.380E-06	7.331E-06	7.331E-06
C	4.0	4.00	1931.	0.	0.	193.8	111.3	193.8	3.690E-06	3.666E-06	3.666E-06
C	8.0	4.00	1931.	0.	0.	193.8	111.3	193.8	1.845E-06	1.833E-06	1.833E-06
C	16.0	4.00	1931.	0.	0.	193.8	111.3	193.8	9.225E-07	9.164E-07	9.164E-07
D	1.0	4.00	1931.	0.	0.	136.5	49.5	198.0	3.248E-05	4.615E-05	3.248E-05
D	2.0	4.00	1931.	0.	0.	136.5	49.5	198.0	1.624E-05	2.308E-05	1.624E-05
D	4.0	4.00	1931.	0.	0.	136.5	49.5	154.4	1.041E-05	1.154E-05	1.041E-05
D	8.0	4.00	1931.	0.	0.	136.5	49.5	136.5	5.891E-06	5.769E-06	5.769E-06
D	16.0	4.00	1931.	0.	0.	136.5	49.5	136.5	2.946E-06	2.884E-06	2.884E-06
E	1.0	4.00	1931.	0.	0.	97.0	33.6	184.6	5.126E-05	9.343E-05	5.126E-05
E	2.0	4.00	1931.	0.	0.	97.0	33.6	184.6	2.563E-05	4.671E-05	2.563E-05
E	4.0	4.00	1931.	0.	0.	97.0	33.6	118.9	1.989E-05	2.336E-05	1.989E-05
E	8.0	4.00	1931.	0.	0.	97.0	33.6	97.0	1.219E-05	1.168E-05	1.168E-05
E	16.0	4.00	1931.	0.	0.	97.0	33.6	97.0	6.095E-06	5.839E-06	5.839E-06
F	1.0	4.00	1931.	0.	0.	67.0	21.9	157.6	9.239E-05	1.981E-04	9.239E-05
F	2.0	4.00	1931.	0.	0.	67.0	21.9	157.6	4.619E-05	9.903E-05	4.619E-05
F	4.0	4.00	1931.	0.	0.	67.0	21.9	87.2	4.177E-05	4.952E-05	4.177E-05
F	8.0	4.00	1931.	0.	0.	67.0	21.9	67.0	2.718E-05	2.476E-05	2.476E-05
F	16.0	4.00	1931.	0.	0.	67.0	21.9	67.0	1.359E-05	1.238E-05	1.238E-05
G	1.0	4.00	1931.	0.	0.	46.2	14.2	150.5	1.489E-04	3.980E-04	1.489E-04
G	2.0	4.00	1931.	0.	0.	46.2	14.2	150.5	7.445E-05	1.990E-04	7.445E-05
G	4.0	4.00	1931.	0.	0.	46.2	14.2	65.8	8.518E-05	9.950E-05	8.518E-05
G	8.0	4.00	1931.	0.	0.	46.2	14.2	46.2	6.060E-05	4.975E-05	4.975E-05
G	16.0	4.00	1931.	0.	0.	46.2	14.2	46.2	3.030E-05	2.487E-05	2.487E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: GROUND LEVEL RELEASE DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

LOW POPULATION ZONE CALCULATIONS:

S SECTOR BOUNDARY DISTANCE = 1931.0 METERS

LATERAL PLUME MEANDER/BUILDING WAKE CREDIT ALLOWED
AS A FUNCTION OF DOWNWIND DISTANCE.
MEANDER CREDIT IS FOR WINDSPEEDS LESS THAN 6 MPS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

1.489E-04	9.239E-05	8.518E-05	7.445E-05	5.126E-05	4.975E-05	4.619E-05	4.177E-05	3.248E-05	2.563E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
2.487E-05	2.476E-05	1.989E-05	1.624E-05	1.466E-05	1.238E-05	1.168E-05	1.041E-05	7.331E-06	5.839E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
5.769E-06	3.666E-06	2.884E-06	1.833E-06	9.164E-07					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED
CHI/Q WITH RESPECT TO WHEN THE WIND BLOWS
SEC/CUBIC METER THE TOTAL TIME INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 3.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 7.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 11.998
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 18.003
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(6)= 21.006

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
1	1	-8.81226	-11.61364	-1.20397
1	2	-9.50539	-12.43225	-1.67146
1	3	-10.08331	-13.27595	-2.27182
1	4	-10.60635	-14.52335	-3.33336
1	5	-11.47245	-16.42978	-5.41629
1	6	-12.06302	NUMXQ(K)= 6	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

2.656E-04	0.250	1.000
1.692E-04	0.750	3.000
1.344E-04	1.250	5.000
9.579E-05	2.500	10.000
7.717E-05	3.750	15.000
6.238E-05	5.000	20.000
5.183E-05	6.250	25.000
4.425E-05	7.500	30.000
3.739E-05	8.750	35.000
3.155E-05	10.000	40.000
2.701E-05	11.250	45.000
2.280E-05	12.500	50.000
1.875E-05	13.750	55.000
1.560E-05	15.000	60.000
1.310E-05	16.250	65.000
1.110E-05	17.500	70.000
8.936E-06	18.750	75.000
6.982E-06	20.000	80.000
2.011E-04	0.5	2.00

ANNUAL AVERAGE = 1.42E-05

K= 1 FIVEXQ(K)= 2.011E-04 FIVEPR(K)= 2.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE NNW SECTOR.

STABILITY CLASS	WINDSPEED AT 10.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	6437.	0.	0.	574.9	333.3	574.9	1.661E-06	1.660E-06	1.660E-06
C	2.0	4.00	6437.	0.	0.	574.9	333.3	574.9	8.307E-07	8.301E-07	8.301E-07
C	4.0	4.00	6437.	0.	0.	574.9	333.3	574.9	4.154E-07	4.151E-07	4.151E-07
C	8.0	4.00	6437.	0.	0.	574.9	333.3	574.9	2.077E-07	2.075E-07	2.075E-07
C	16.0	4.00	6437.	0.	0.	574.9	333.3	574.9	1.038E-07	1.038E-07	1.038E-07
D	1.0	4.00	6437.	0.	0.	404.8	103.3	466.4	6.606E-06	7.585E-06	6.606E-06
D	2.0	4.00	6437.	0.	0.	404.8	103.3	466.4	3.303E-06	3.792E-06	3.303E-06
D	4.0	4.00	6437.	0.	0.	404.8	103.3	422.7	1.822E-06	1.896E-06	1.822E-06
D	8.0	4.00	6437.	0.	0.	404.8	103.3	404.8	9.514E-07	9.481E-07	9.481E-07
D	16.0	4.00	6437.	0.	0.	404.8	103.3	404.8	4.757E-07	4.741E-07	4.741E-07
E	1.0	4.00	6437.	0.	0.	287.8	63.6	375.4	1.332E-05	1.724E-05	1.332E-05
E	2.0	4.00	6437.	0.	0.	287.8	63.6	375.4	6.661E-06	8.620E-06	6.661E-06
E	4.0	4.00	6437.	0.	0.	287.8	63.6	309.7	4.037E-06	4.310E-06	4.037E-06
E	8.0	4.00	6437.	0.	0.	287.8	63.6	287.8	2.172E-06	2.155E-06	2.155E-06
E	16.0	4.00	6437.	0.	0.	287.8	63.6	287.8	1.086E-06	1.077E-06	1.077E-06
F	1.0	4.00	6437.	0.	0.	198.7	38.9	289.3	2.828E-05	4.043E-05	2.828E-05
F	2.0	4.00	6437.	0.	0.	198.7	38.9	289.3	1.414E-05	2.021E-05	1.414E-05
F	4.0	4.00	6437.	0.	0.	198.7	38.9	218.9	9.345E-06	1.011E-05	9.345E-06
F	8.0	4.00	6437.	0.	0.	198.7	38.9	198.7	5.147E-06	5.054E-06	5.054E-06
F	16.0	4.00	6437.	0.	0.	198.7	38.9	198.7	2.574E-06	2.527E-06	2.527E-06
G	1.0	4.00	6437.	0.	0.	137.1	23.8	241.4	5.543E-05	9.349E-05	5.543E-05
G	2.0	4.00	6437.	0.	0.	137.1	23.8	241.4	2.772E-05	4.674E-05	2.772E-05
G	4.0	4.00	6437.	0.	0.	137.1	23.8	156.7	2.135E-05	2.337E-05	2.135E-05
G	8.0	4.00	6437.	0.	0.	137.1	23.8	137.1	1.220E-05	1.169E-05	1.169E-05
G	16.0	4.00	6437.	0.	0.	137.1	23.8	137.1	6.100E-06	5.843E-06	5.843E-06

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

LOW POPULATION ZONE CALCULATIONS:

NNW SECTOR BOUNDARY DISTANCE = 6437.0 METERS

LATERAL PLUME MEANDER/BUILDING WAKE CREDIT ALLOWED
AS A FUNCTION OF DOWNWIND DISTANCE.
MEANDER CREDIT IS FOR WINDSPEEDS LESS THAN 6 MPS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

5.543E-05	2.828E-05	2.772E-05	2.135E-05	1.414E-05	1.332E-05	1.169E-05	9.345E-06	6.661E-06	6.606E-06
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
2.00000	4.00000	6.00000	8.00000	10.00000	12.00000	14.00000	16.00000	18.00000	20.00000
5.843E-06	5.054E-06	4.037E-06	3.303E-06	2.527E-06	2.155E-06	1.822E-06	1.660E-06	1.077E-06	9.481E-07
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
22.00000	24.00000	26.00000	28.00000	30.00000	32.00000	34.00000	36.00000	38.00000	40.00000
8.301E-07	4.741E-07	4.151E-07	2.075E-07	1.038E-07					
84.000	88.000	92.000	96.000	100.000					
42.00000	44.00000	46.00000	48.00000	50.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 5.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 7.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 13.999

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
8	1	-9.80031	-12.65318	-1.38880
8	2	-10.49345	-13.20142	-1.74135
8	3	-10.75426	-13.36126	-1.85509
8	4	-11.35711	-13.77652	-2.23946
8	5	-12.19540	-14.45368	-3.19857
8	6	-13.30854	-14.89424	-4.42914
8	7	-14.00169	NUMXQ(K)= 7	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

1.145E-04 0.500 1.000

6.516E-05	1.500	3.000
4.866E-05	2.500	5.000
3.141E-05	5.000	10.000
2.268E-05	7.500	15.000
1.698E-05	10.000	20.000
1.331E-05	12.500	25.000
1.059E-05	15.000	30.000
8.430E-06	17.500	35.000
6.844E-06	20.000	40.000
5.642E-06	22.500	45.000
4.564E-06	25.000	50.000
3.570E-06	27.500	55.000
2.823E-06	30.000	60.000
2.252E-06	32.500	65.000
1.809E-06	35.000	70.000
1.392E-06	37.500	75.000
1.042E-06	40.000	80.000
1.145E-04	0.5	1.00

ANNUAL AVERAGE = 2.36E-06

K= 8 FIVEXQ(K)= 1.145E-04 FIVEPR(K)= 1.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE SSE SECTOR.

STABILITY CLASS	WINDSPEED METER/SEC AT 10.0 METERS	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	4345.	0.	0.	403.1	233.0	403.1	3.390E-06	3.384E-06	3.384E-06
C	2.0	4.00	4345.	0.	0.	403.1	233.0	403.1	1.695E-06	1.692E-06	1.692E-06
C	4.0	4.00	4345.	0.	0.	403.1	233.0	403.1	8.474E-07	8.461E-07	8.461E-07
C	8.0	4.00	4345.	0.	0.	403.1	233.0	403.1	4.237E-07	4.231E-07	4.231E-07
C	16.0	4.00	4345.	0.	0.	403.1	233.0	403.1	2.119E-07	2.115E-07	2.115E-07
D	1.0	4.00	4345.	0.	0.	283.8	82.0	345.4	1.124E-05	1.360E-05	1.124E-05
D	2.0	4.00	4345.	0.	0.	283.8	82.0	345.4	5.621E-06	6.799E-06	5.621E-06
D	4.0	4.00	4345.	0.	0.	283.8	82.0	301.8	3.217E-06	3.399E-06	3.217E-06
D	8.0	4.00	4345.	0.	0.	283.8	82.0	283.8	1.710E-06	1.700E-06	1.700E-06
D	16.0	4.00	4345.	0.	0.	283.8	82.0	283.8	8.551E-07	8.499E-07	8.499E-07
E	1.0	4.00	4345.	0.	0.	201.8	52.6	289.4	2.090E-05	2.957E-05	2.090E-05
E	2.0	4.00	4345.	0.	0.	201.8	52.6	289.4	1.045E-05	1.479E-05	1.045E-05
E	4.0	4.00	4345.	0.	0.	201.8	52.6	223.7	6.760E-06	7.393E-06	6.760E-06
E	8.0	4.00	4345.	0.	0.	201.8	52.6	201.8	3.747E-06	3.697E-06	3.697E-06
E	16.0	4.00	4345.	0.	0.	201.8	52.6	201.8	1.873E-06	1.848E-06	1.848E-06
F	1.0	4.00	4345.	0.	0.	139.3	32.9	230.0	4.203E-05	6.728E-05	4.203E-05
F	2.0	4.00	4345.	0.	0.	139.3	32.9	230.0	2.102E-05	3.364E-05	2.102E-05
F	4.0	4.00	4345.	0.	0.	139.3	32.9	159.5	1.515E-05	1.682E-05	1.515E-05
F	8.0	4.00	4345.	0.	0.	139.3	32.9	139.3	8.673E-06	8.410E-06	8.410E-06
F	16.0	4.00	4345.	0.	0.	139.3	32.9	139.3	4.336E-06	4.205E-06	4.205E-06
G	1.0	4.00	4345.	0.	0.	96.2	20.6	200.5	7.705E-05	1.498E-04	7.705E-05
G	2.0	4.00	4345.	0.	0.	96.2	20.6	200.5	3.852E-05	7.490E-05	3.852E-05
G	4.0	4.00	4345.	0.	0.	96.2	20.6	115.7	3.337E-05	3.745E-05	3.337E-05
G	8.0	4.00	4345.	0.	0.	96.2	20.6	96.2	2.008E-05	1.872E-05	1.872E-05
G	16.0	4.00	4345.	0.	0.	96.2	20.6	96.2	1.004E-05	9.362E-06	9.362E-06

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

LOW POPULATION ZONE CALCULATIONS:

SSE SECTOR BOUNDARY DISTANCE = 4345.0 METERS

LATERAL PLUME MEANDER/BUILDING WAKE CREDIT ALLOWED
AS A FUNCTION OF DOWNWIND DISTANCE.
MEANDER CREDIT IS FOR WINDSPEEDS LESS THAN 6 MPS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

7.705E-05	4.203E-05	3.852E-05	3.337E-05	2.102E-05	2.090E-05	1.872E-05	1.515E-05	1.124E-05	1.045E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
9.362E-06	8.410E-06	6.760E-06	5.621E-06	4.205E-06	3.697E-06	3.384E-06	3.217E-06	1.848E-06	1.700E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
1.692E-06	8.499E-07	8.461E-07	4.231E-07	2.115E-07					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 3.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 6.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 11.998
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 18.003
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(6)= 21.006

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
16	1	-9.47108	-12.85306	-1.45350
16	2	-10.30787	-13.98735	-2.10127
16	3	-10.88572	-14.81063	-2.65901
16	4	-11.68605	-16.03239	-3.69875
16	5	-12.64708	-18.03923	-5.89138
16	6	-13.28946	NUMXQ(K)= 6	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

1.549E-04	0.250	1.000
8.989E-05	0.750	3.000
6.810E-05	1.250	5.000
4.524E-05	2.500	10.000
3.485E-05	3.750	15.000
2.671E-05	5.000	20.000
2.117E-05	6.250	25.000
1.700E-05	7.500	30.000
1.363E-05	8.750	35.000
1.117E-05	10.000	40.000
9.314E-06	11.250	45.000
7.677E-06	12.500	50.000
6.177E-06	13.750	55.000
5.036E-06	15.000	60.000
4.151E-06	16.250	65.000
3.454E-06	17.500	70.000
2.724E-06	18.750	75.000
2.083E-06	20.000	80.000
1.107E-04	0.5	2.00

ANNUAL AVERAGE = 2.49E-06

K= 16 FIVEXQ(K)= 1.107E-04 FIVEPR(K)= 2.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE ALL SECTOR.

STABILITY CLASS	WINDSPEED AT 10.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA= 450.SQ.METERS	USED
C	1.0	4.00	1931.	0.	0.	193.8	111.3	193.8	1.476E-05	1.466E-05	1.466E-05
C	2.0	4.00	1931.	0.	0.	193.8	111.3	193.8	7.380E-06	7.331E-06	7.331E-06
C	4.0	4.00	1931.	0.	0.	193.8	111.3	193.8	3.690E-06	3.666E-06	3.666E-06
C	8.0	4.00	1931.	0.	0.	193.8	111.3	193.8	1.845E-06	1.833E-06	1.833E-06
C	16.0	4.00	1931.	0.	0.	193.8	111.3	193.8	9.225E-07	9.164E-07	9.164E-07
D	1.0	4.00	1931.	0.	0.	136.5	49.5	136.5	4.713E-05	4.615E-05	4.615E-05
D	2.0	4.00	1931.	0.	0.	136.5	49.5	136.5	2.357E-05	2.308E-05	2.308E-05
D	4.0	4.00	1931.	0.	0.	136.5	49.5	136.5	1.178E-05	1.154E-05	1.154E-05
D	8.0	4.00	1931.	0.	0.	136.5	49.5	136.5	5.891E-06	5.769E-06	5.769E-06
D	16.0	4.00	1931.	0.	0.	136.5	49.5	136.5	2.946E-06	2.884E-06	2.884E-06
E	1.0	4.00	1931.	0.	0.	97.0	33.6	97.0	9.753E-05	9.343E-05	9.343E-05
E	2.0	4.00	1931.	0.	0.	97.0	33.6	97.0	4.876E-05	4.671E-05	4.671E-05
E	4.0	4.00	1931.	0.	0.	97.0	33.6	97.0	2.438E-05	2.336E-05	2.336E-05
E	8.0	4.00	1931.	0.	0.	97.0	33.6	97.0	1.219E-05	1.168E-05	1.168E-05
E	16.0	4.00	1931.	0.	0.	97.0	33.6	97.0	6.095E-06	5.839E-06	5.839E-06
F	1.0	4.00	1931.	0.	0.	67.0	21.9	67.0	2.174E-04	1.981E-04	1.981E-04
F	2.0	4.00	1931.	0.	0.	67.0	21.9	67.0	1.087E-04	9.903E-05	9.903E-05
F	4.0	4.00	1931.	0.	0.	67.0	21.9	67.0	5.436E-05	4.952E-05	4.952E-05
F	8.0	4.00	1931.	0.	0.	67.0	21.9	67.0	2.718E-05	2.476E-05	2.476E-05
F	16.0	4.00	1931.	0.	0.	67.0	21.9	67.0	1.359E-05	1.238E-05	1.238E-05
G	1.0	4.00	1931.	0.	0.	46.2	14.2	46.2	4.848E-04	3.980E-04	3.980E-04
G	2.0	4.00	1931.	0.	0.	46.2	14.2	46.2	2.424E-04	1.990E-04	1.990E-04
G	4.0	4.00	1931.	0.	0.	46.2	14.2	46.2	1.212E-04	9.950E-05	9.950E-05
G	8.0	4.00	1931.	0.	0.	46.2	14.2	46.2	6.060E-05	4.975E-05	4.975E-05
G	16.0	4.00	1931.	0.	0.	46.2	14.2	46.2	3.030E-05	2.487E-05	2.487E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

LOW POPULATION ZONE CALCULATIONS:
DIRECTION-INDEPENDENT (S.R.P 2.3.4) MODEL.
MINIMUM BOUNDARY DISTANCE = 1931.0 METERS.
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

3.980E-04	1.990E-04	1.981E-04	9.950E-05	9.903E-05	9.343E-05	4.975E-05	4.952E-05	4.671E-05	4.615E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
4.00000	8.00000	12.00000	16.00000	20.00000	24.00000	28.00000	32.00000	36.00000	40.00000
2.487E-05	2.476E-05	2.336E-05	2.308E-05	1.466E-05	1.238E-05	1.168E-05	1.154E-05	7.331E-06	5.839E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
44.00000	48.00000	52.00000	56.00000	60.00000	64.00000	68.00000	72.00000	76.00000	80.00000
5.769E-06	3.666E-06	2.884E-06	1.833E-06	9.164E-07					
84.000	88.000	92.000	96.000	100.000					
84.00000	88.00000	92.00000	96.00000	100.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 11.998
BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY
7.995E-04	1.000	1.000
4.660E-04	3.000	3.000
3.501E-04	5.000	5.000
2.254E-04	10.000	10.000
1.591E-04	15.000	15.000
1.169E-04	20.000	20.000
8.978E-05	25.000	25.000
7.082E-05	30.000	30.000
5.685E-05	35.000	35.000
4.615E-05	40.000	40.000
3.735E-05	45.000	45.000
3.033E-05	50.000	50.000
2.463E-05	55.000	55.000
1.994E-05	60.000	60.000
1.602E-05	65.000	65.000
1.271E-05	70.000	70.000
9.987E-06	75.000	75.000

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     7.675E-06              80.000              80.000
     5.646E-06              85.000              85.000
     3.837E-06              90.000              90.000

     3.501E-04               5.0                 5.00

K= 17      FIVEXQ(K)= 3.501E-04      FIVEPR(K)= 5.000
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USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

LOW POPULATION ZONE CALCULATIONS:

FIVE PERCENT OVERALL SITE LIMIT
BUILDING WAKE CREDIT ALLOWED: C= 0.5 A= 900. D= 25.0
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

1.489E-04	9.239E-05	8.518E-05	7.705E-05	7.445E-05	5.543E-05	5.126E-05	4.975E-05	4.619E-05	4.203E-05
1.000	2.000	3.000	4.000	5.000	7.000	8.000	9.000	10.000	11.000
1.00000	2.00000	3.00000	4.00000	5.00000	7.00000	8.00000	9.00000	10.00000	11.00000
4.177E-05	3.852E-05	3.337E-05	3.248E-05	2.828E-05	2.772E-05	2.563E-05	2.487E-05	2.476E-05	2.135E-05
12.000	13.000	14.000	15.000	17.000	19.000	20.000	21.000	22.000	24.000
12.00000	13.00000	14.00000	15.00000	17.00000	19.00000	20.00000	21.00000	22.00000	24.00000
2.102E-05	2.090E-05	1.989E-05	1.872E-05	1.624E-05	1.515E-05	1.466E-05	1.414E-05	1.332E-05	1.238E-05
25.000	26.000	27.000	28.000	29.000	30.000	31.000	33.000	35.000	36.000
25.00000	26.00000	27.00000	28.00000	29.00000	30.00000	31.00000	33.00000	35.00000	36.00000
1.169E-05	1.168E-05	1.124E-05	1.045E-05	1.041E-05	9.362E-06	9.345E-06	8.410E-06	7.331E-06	6.760E-06
38.000	39.000	40.000	41.000	42.000	43.000	45.000	46.000	47.000	48.000
38.00000	39.00000	40.00000	41.00000	42.00000	43.00000	45.00000	46.00000	47.00000	48.00000
6.661E-06	6.606E-06	5.843E-06	5.839E-06	5.769E-06	5.621E-06	5.054E-06	4.205E-06	4.037E-06	3.697E-06
50.000	52.000	54.000	55.000	56.000	57.000	59.000	60.000	62.000	63.000
50.00000	52.00000	54.00000	55.00000	56.00000	57.00000	59.00000	60.00000	62.00000	63.00000
3.666E-06	3.384E-06	3.303E-06	3.217E-06	2.884E-06	2.527E-06	2.155E-06	1.848E-06	1.833E-06	1.822E-06
64.000	65.000	67.000	68.000	69.000	71.000	73.000	74.000	75.000	77.000
64.00000	65.00000	67.00000	68.00000	69.00000	71.00000	73.00000	74.00000	75.00000	77.00000
1.700E-06	1.692E-06	1.660E-06	1.077E-06	9.481E-07	9.164E-07	8.499E-07	8.461E-07	8.301E-07	4.741E-07
78.000	79.000	81.000	83.000	85.000	86.000	87.000	88.000	90.000	92.000
78.00000	79.00000	81.00000	83.00000	85.00000	86.00000	87.00000	88.00000	90.00000	92.00000
4.231E-07	4.151E-07	2.115E-07	2.075E-07	1.038E-07					
93.000	95.000	96.000	98.000	100.000					
93.00000	95.00000	96.00000	98.00000	100.00000					

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY

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HANDCHECK GRAPH:  SLOPE LT -1.0 FOR LOW PERCENTAGES.  XSAVE( 2)=   4.996
HANDCHECK GRAPH:  SLOPE LT -1.0 FOR LOW PERCENTAGES.  XSAVE( 3)=  11.998
HANDCHECK GRAPH:  SLOPE LT -1.0 FOR LOW PERCENTAGES.  XSAVE( 4)=  22.007
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K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
18	1	-8.81226	-11.17851	-1.01696
18	2	-9.50539	-11.52785	-1.22930
18	3	-10.08331	-11.60797	-1.29749
18	4	-10.60635	-11.61952	-1.31244
18	5	-10.77559	-11.81847	-1.62184
18	6	-10.82514	-11.80310	-1.59674
18	7	-11.35778	-11.76271	-1.45194
18	8	-11.58067	-11.79210	-1.68631
18	9	-12.08893	-11.78443	-1.72990
18	10	-14.00169	NUMXQ(K)= 10	

1.489E-04	1.000	1.000
9.464E-05	3.000	3.000
7.445E-05	5.000	5.000
4.762E-05	10.000	10.000
3.489E-05	15.000	15.000
2.709E-05	20.000	20.000
2.178E-05	25.000	25.000
1.727E-05	30.000	30.000
1.383E-05	35.000	35.000
1.125E-05	40.000	40.000
9.345E-06	45.000	45.000
7.564E-06	50.000	50.000
6.123E-06	55.000	55.000
4.921E-06	60.000	60.000
3.917E-06	65.000	65.000
3.079E-06	70.000	70.000
2.375E-06	75.000	75.000
1.778E-06	80.000	80.000
1.269E-06	85.000	85.000
8.301E-07	90.000	90.000
7.445E-05	5.0	5.00

K= 18 FIVEXQ(K)= 7.445E-05 FIVEPR(K)= 5.000

K	HIGHPR	PR	GRNDVT(K)
1	-2.57623	0.49942	25.00000
8	-2.98188	0.14325	50.00000
16	-2.98668	0.14102	25.00000

K	HOURS(K)	TOTHRS
1	43.74878	43.74878
2	0.0	43.74878
3	0.0	43.74878
4	0.0	43.74878
5	0.0	43.74878
6	0.0	43.74878
7	0.0	43.74878
8	12.54851	56.29729
9	0.0	56.29729
10	0.0	56.29729
11	0.0	56.29729
12	0.0	56.29729
13	0.0	56.29729
14	0.0	56.29729

15	0.0	56.29729
16	12.35323	68.65051

K	FIVEXQ	SVANN	SLTIME	TIMINT	I	TIME	XQT
1	2.011E-04	1.422E-05	-0.3160	-8.2929			
					1	8.0	-8.94993
					2	16.0	-9.16893
					3	72.0	-9.64414
					4	624.0	-10.32643
8	1.145E-04	2.355E-06	-0.4632	-8.7542			
					1	8.0	-9.71737
					2	16.0	-10.03841
					3	72.0	-10.73504
					4	624.0	-11.73524
16	1.107E-04	2.492E-06	-0.4525	-8.7949			
					1	8.0	-9.73577
					2	16.0	-10.04941
					3	72.0	-10.72997
					4	624.0	-11.70709
17	3.501E-04	1.422E-05	-0.3821	-7.6925			
					1	8.0	-8.48703
					2	16.0	-8.75187
					3	72.0	-9.32657
					4	624.0	-10.15169
18	7.445E-05	1.422E-05	-0.1975	-9.3685			
					1	8.0	-9.77914
					2	16.0	-9.91602
					3	72.0	-10.21303
					4	624.0	-10.63947

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 1
DATA PERIOD:
TYPE OF RELEASE: GROUND LEVEL RELEASE
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

RELATIVE CONCENTRATION (X/Q) VALUES (SEC/CUBIC METER) VERSUS AVERAGING TIME

DOWNWIND SECTOR	DISTANCE (METERS)	0-2 HOURS	0-8 HOURS	8-24 HOURS	1-4 DAYS	4-30 DAYS	ANNUAL AVERAGE	HOURS PER YEAR MAX 0-2 HR X/Q IS EXCEEDED IN SECTOR	DOWNWIND SECTOR
S	1931.	2.01E-04	1.30E-04	1.04E-04	6.48E-05	3.28E-05	1.42E-05	43.7	S
SSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SSW
SW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SW
WSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WSW
W	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	W
WNW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WNW
NW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NW
NNW	6437.	1.14E-04	6.02E-05	4.37E-05	2.18E-05	8.01E-06	2.36E-06	12.5	NNW
N	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N
NNE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NNE
NE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE
ENE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ENE
E	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	E
ESE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ESE
SE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SE
SSE	4345.	1.11E-04	5.91E-05	4.32E-05	2.19E-05	8.24E-06	2.49E-06	12.4	SSE
MAX X/Q		2.01E-04				TOTAL HOURS AROUND SITE:		68.7	
SRP 2.3.4	1931.	3.50E-04	2.06E-04	1.58E-04	8.90E-05	3.90E-05	1.42E-05		
SITE LIMIT		7.44E-05	5.66E-05	4.94E-05	3.67E-05	2.40E-05	1.42E-05		

0.5 PERCENT X/Q TO AN INDIVIDUAL IS LIMITING.

NOTE: VALUES ON THIS PAGE ARE APPROXIMATIONS ONLY.
CHECK THE REASONABLENESS OF THE ENVELOPES
COMPUTED FOR THE 0-2 HOUR VALUES. FOR ANY
FAULTY ENVELOPES, ADJUST THE ABOVE VALUES.

APPENDIX C

TEST CASE #2

APPENDIX C

TEST CASE 2

This sample run is for an elevated releases. The KOPT array, Card Type 1, and the distances for the EAB and LPZ, Card Type 11, are the same as Test Case #1. Some terrain heights are included, Card Types 13 and 14.

The 45 cards of the input data are listed on page C-2 and the resulting program output is shown starting on page C-3.

```
1.        1  11 1
2.       TEST CASE NUMBER 2                              ELEVATED 45.0 METER
3.       10.0 METER
4.
5.       NONE
6.          5     3
7.      2000. 40.0 45.0 10.0
8.          0     0     4     4     4     4     4
9.          0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
10.         0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
11.         0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
12.         0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
13.         0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
14.         0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
15.         0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
16.         0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
17.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
18.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
19.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
20.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
21.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
22.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
23.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
24.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
25.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
26.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
27.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
28.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
29.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
30.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
31.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
32.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
33.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
34.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
35.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
36.         1     0     0     0     0     0     0     2     0     0     0     0     0     0     0     0     1
37.        -1.   1.0   2.0   4.0   8.0  16.0
38.       805.   0.0   0.0   0.0   0.0   0.0   0.0  0.04989.   0.0   0.0   0.0   0.0   0.0   0.0   0.0  0.01127.
39.      1931.   0.0   0.0   0.0   0.0   0.0   0.0  0.06437.   0.0   0.0   0.0   0.0   0.0   0.0   0.0  0.04345.
40.       100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.  100.
41.       0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
42.       800.  800.  800.  800.  800.  800.  800.  800.  800.  800.  800.  800.  800.  800.  800.  800.  800.
43.        16.   16.   16.   16.   16.   16.   16.   16.   16.   16.   16.   16.   16.   16.   16.   16.   16.
44.     10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000 10000
45.       200.  200.  200.  200.  200.  200.  200.  200.  200.  200.  200.  200.  200.  200.  200.  200.  200.
```

USNRC COMPUTER CODE-PAVAN, VERSION 2.0   RUN DATE: MONDAY   AUGUST 30, 1982

PRINTOUT OF INPUT CARDS

```
  1      00010 01101 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000 00000
  2       TEST CASE NUMBER 2                       ELEVATED 45.0 METER
  3       10.0 METER
  4
  5       NONE
  6           5   100     3
  7           0.500  2000.000    40.000    45.000    10.000
  8        0.0    0.0    4.000  4.000  4.000  4.000  4.000
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
  9        1.000  0.0    0.0    0.0    0.0    0.0    0.0    2.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    1.000
 10          -1.  1.000  2.000  4.000  8.000 16.000  0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0    0.0
 11         805.     0.     0.     0.     0.     0.     0.  4989.     0.     0.     0.     0.     0.     0.     0.  1127.
 11        1931.     0.     0.     0.     0.     0.     0.  6437.     0.     0.     0.     0.     0.     0.     0.  4345.
 13         100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.   100.
 14           0.     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.     0.
 13         800.   800.   800.   800.   800.   800.   800.   800.   800.   800.   800.   800.   800.   800.   800.   800.
 14          16.    16.    16.    16.    16.    16.    16.    16.    16.    16.    16.    16.    16.    16.    16.    16.
 13       10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000. 10000.
 14         200.   200.   200.   200.   200.   200.   200.   200.   200.   200.   200.   200.   200.   200.   200.   200.
```

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS A
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00	2.91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.00	5.83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.00	11.65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16.00	23.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS B
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00	2.91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.00	5.83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8.00	11.65	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16.00	23.30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

C-14

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS C
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.46	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	2.91	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	5.83	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	11.65	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	23.30	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS D
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	1.46	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	2.91	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	5.83	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	11.65	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	23.30	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS E
WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	2.12	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	4.24	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	8.49	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	16.97	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000

16.00	33.94	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS F

WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	2.12	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	4.24	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	8.49	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	16.97	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	33.94	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION ATMOSPHERIC STABILITY CLASS G

WIND SPEED (M/S)

TOWER	RELEASE	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
1.00	2.12	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
2.00	4.24	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
4.00	8.49	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
8.00	16.97	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
16.00	33.94	1.000	0.0	0.0	0.0	0.0	0.0	0.0	2.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.000	4.000
TOTAL		5.00	0.0	0.0	0.0	0.0	0.0	0.0	10.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.00	20.00

WIND MEASURED AT 10.0 METERS.
WIND SPEED CORRECTED TO THE RELEASE HEIGHT OF 45.0 METERS.

OVERALL WIND DIRECTION FREQUENCY

WIND DIRECTION:	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW
FREQUENCY:	25.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0

OVERALL WIND SPEED FREQUENCY AS MEASURED ON THE TOWER:

MAX.WIND SPEED (M/S):	1.000	2.000	4.000	8.000	16.000
WIND SPEED FREQUENCY:	20.00	20.00	20.00	20.00	20.00

BUILDING AND RELEASE CHARACTERISTICS:

RELEASE HEIGHT:	45.00 METERS
MIXING VOLUME COEFFICIENT:	0.50
BUILDING CROSS-SECTIONAL AREA:	2000.00 SQUARE METERS

BOUNDARY DISTANCES (METERS) FROM THE SOURCE FOR EACH DOWNWIND SECTOR:

DOWNWIND SECTOR	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE
BOUNDARY 1	805.	0.	0.	0.	0.	0.	0.	4989.	0.	0.	0.	0.	0.	0.	0.	1127.
BOUNDARY 2	1931.	0.	0.	0.	0.	0.	0.	6437.	0.	0.	0.	0.	0.	0.	0.	4345.

DISTANCES AND TERRAIN HEIGHTS (IN METERS) AS A FUNCTION OF THE DOWNWIND SECTOR:

SECTOR	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE
DISTANCE	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
ELEVATION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DISTANCE	800.	800.	800.	800.	800.	800.	800.	800.	800.	800.	800.	800.	800.	800.	800.	800.
ELEVATION	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.	16.
DISTANCE	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.	10000.
ELEVATION	200.	200.	200.	200.	200.	200.	200.	200.	200.	200.	200.	200.	200.	200.	200.	200.

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

WINDSPEEDS ADJUSTED TO 45.0 METERS.

PERCENT OF THE TIME A GIVEN WINDSPEED IS LOWER:

WINDSPEED (METER/SEC)	CUMULATIVE FREQUENCY (PERCENT)
1.46	8.00
2.12	20.00
2.91	28.00
4.24	40.00
5.83	48.00
8.49	60.00
11.65	68.00
16.97	80.00
23.30	88.00
33.94	100.00

WINDSPEED (INTERPOLATED) (METER/SEC)	CUMULATIVE FREQUENCY (PERCENT)
1.86	20.00
3.71	40.00
7.42	60.00
14.84	80.00
29.69	100.00

C-9

LOG-NORMAL INTERPOLATION PERCENTILES

WINDSPEED (METER/SEC)	CUMULATIVE FREQUENCY (PERCENT)
0.32	1.00
0.55	3.00
0.72	5.00
1.10	10.00
1.47	15.00
1.86	20.00
2.26	25.00
2.70	30.00
3.18	35.00
3.71	40.00
4.42	45.00
5.25	50.00
6.23	55.00
7.43	60.00
8.67	65.00
10.22	70.00
12.20	75.00

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE S SECTOR.

STABILITY CLASS	WINDSPEED AT 45.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	4.198E-05
C	2.9	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	2.099E-05
C	5.8	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	1.049E-05
C	11.7	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	5.247E-06
C	23.3	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	2.624E-06
D	1.5	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	7.358E-05
D	2.9	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	3.679E-05
D	5.8	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	1.839E-05
D	11.7	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	9.197E-06
D	23.3	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	4.599E-06
E	2.1	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	6.610E-05
E	4.2	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	3.305E-05
E	8.5	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	1.652E-05
E	17.0	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	8.262E-06
E	33.9	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	4.131E-06
F	2.1	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	9.490E-05
F	4.2	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	4.745E-05
F	8.5	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	2.373E-05
F	17.0	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	1.186E-05
F	33.9	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	5.931E-06
G	2.1	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	2.047E-04
G	4.2	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	1.023E-04
G	8.5	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	5.116E-05
G	17.0	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	2.558E-05
G	33.9	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	1.279E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

SITE EXCLUSION BOUNDARY CALCULATIONS:

S SECTOR BOUNDARY DISTANCE = 805.0 METERS
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.047E-04	1.023E-04	9.490E-05	7.358E-05	6.610E-05	5.116E-05	4.745E-05	4.198E-05	3.679E-05	3.305E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
2.558E-05	2.373E-05	2.099E-05	1.839E-05	1.652E-05	1.279E-05	1.186E-05	1.049E-05	9.197E-06	8.262E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
5.931E-06	5.247E-06	4.599E-06	4.131E-06	2.624E-06					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.047E-04 DISTANCE = 2000.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 4.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 7.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 9.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 15.000
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(6)= 20.005

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
1	1	-8.49418	-12.35259	-1.65826
1	2	-9.62441	-12.73794	-1.89248
1	3	-10.07839	-12.79778	-1.93507
1	4	-10.31755	-13.93937	-2.82573
1	5	-11.01070	-14.69529	-3.55508
1	6	-11.70385	NUMXQ(K)= 6	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

4.541E-04	0.250	1.000
2.440E-04	0.750	3.000
1.778E-04	1.250	5.000
1.115E-04	2.500	10.000
8.277E-05	3.750	15.000
6.610E-05	5.000	20.000
5.360E-05	6.250	25.000
4.481E-05	7.500	30.000
3.820E-05	8.750	35.000
3.305E-05	10.000	40.000
2.725E-05	11.250	45.000
2.280E-05	12.500	50.000
1.931E-05	13.750	55.000
1.652E-05	15.000	60.000
1.372E-05	16.250	65.000
1.150E-05	17.500	70.000
9.715E-06	18.750	75.000
8.262E-06	20.000	80.000
3.095E-04	0.5	2.00

ANNUAL AVERAGE = 1.16E-05

K= 1 FIVEXQ(K)= 3.095E-04 FIVEPR(K)= 2.000

FUMIGATION X/Q AT THE BOUNDARY: 2.27E-04

EXPONENTIAL TERM AND FREQUENCIES

9.752E-01	9.421E-01	8.470E-01	5.562E-01	5.034E-01
20.000	40.000	60.000	80.000	100.000

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TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE NNW SECTOR.

STABILITY CLASS	WINDSPEED AT 45.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	4989.	100.	0.	456.7	264.2	0.0	0.0	0.0	1.811E-06
C	2.9	4.00	4989.	100.	0.	456.7	264.2	0.0	0.0	0.0	9.056E-07
C	5.8	4.00	4989.	100.	0.	456.7	264.2	0.0	0.0	0.0	4.528E-07
C	11.7	4.00	4989.	100.	0.	456.7	264.2	0.0	0.0	0.0	2.264E-07
C	23.3	4.00	4989.	100.	0.	456.7	264.2	0.0	0.0	0.0	1.132E-07
D	1.5	4.00	4989.	100.	0.	321.6	89.0	0.0	0.0	0.0	7.637E-06
D	2.9	4.00	4989.	100.	0.	321.6	89.0	0.0	0.0	0.0	3.819E-06
D	5.8	4.00	4989.	100.	0.	321.6	89.0	0.0	0.0	0.0	1.909E-06
D	11.7	4.00	4989.	100.	0.	321.6	89.0	0.0	0.0	0.0	9.546E-07
D	23.3	4.00	4989.	100.	0.	321.6	89.0	0.0	0.0	0.0	4.773E-07
E	2.1	4.00	4989.	100.	0.	228.7	56.3	0.0	0.0	0.0	1.165E-05
E	4.2	4.00	4989.	100.	0.	228.7	56.3	0.0	0.0	0.0	5.823E-06
E	8.5	4.00	4989.	100.	0.	228.7	56.3	0.0	0.0	0.0	2.911E-06
E	17.0	4.00	4989.	100.	0.	228.7	56.3	0.0	0.0	0.0	1.456E-06
E	33.9	4.00	4989.	100.	0.	228.7	56.3	0.0	0.0	0.0	7.279E-07
F	2.1	4.00	4989.	100.	0.	157.8	35.0	0.0	0.0	0.0	2.717E-05
F	4.2	4.00	4989.	100.	0.	157.8	35.0	0.0	0.0	0.0	1.359E-05
F	8.5	4.00	4989.	100.	0.	157.8	35.0	0.0	0.0	0.0	6.794E-06
F	17.0	4.00	4989.	100.	0.	157.8	35.0	0.0	0.0	0.0	3.397E-06
F	33.9	4.00	4989.	100.	0.	157.8	35.0	0.0	0.0	0.0	1.698E-06
G	2.1	4.00	4989.	100.	0.	108.9	21.7	0.0	0.0	0.0	6.341E-05
G	4.2	4.00	4989.	100.	0.	108.9	21.7	0.0	0.0	0.0	3.171E-05
G	8.5	4.00	4989.	100.	0.	108.9	21.7	0.0	0.0	0.0	1.585E-05
G	17.0	4.00	4989.	100.	0.	108.9	21.7	0.0	0.0	0.0	7.926E-06
G	33.9	4.00	4989.	100.	0.	108.9	21.7	0.0	0.0	0.0	3.963E-06

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

SITE EXCLUSION BOUNDARY CALCULATIONS:

NNW SECTOR BOUNDARY DISTANCE = 4989.0 METERS
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

6.341E-05	3.171E-05	2.717E-05	1.585E-05	1.359E-05	1.165E-05	7.926E-06	7.637E-06	6.794E-06	5.823E-06
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
2.00000	4.00000	6.00000	8.00000	10.00000	12.00000	14.00000	16.00000	18.00000	20.00000
3.963E-06	3.819E-06	3.397E-06	2.911E-06	1.909E-06	1.811E-06	1.698E-06	1.456E-06	9.546E-07	9.056E-07
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
22.00000	24.00000	26.00000	28.00000	30.00000	32.00000	34.00000	36.00000	38.00000	40.00000
7.279E-07	4.773E-07	4.528E-07	2.264E-07	1.132E-07					
84.000	88.000	92.000	96.000	100.000					
42.00000	44.00000	46.00000	48.00000	50.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.047E-04 DISTANCE = 2000.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED
CHI/Q WITH RESPECT TO WHEN THE WIND BLOWS
SEC/CUBIC METER THE TOTAL TIME INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 5.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 20.005

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
8	1	-9.66586	-13.15345	-1.69779
8	2	-10.51321	-13.87010	-2.15864
8	3	-12.05371	-14.30582	-2.67645
8	4	-12.74685	-14.54556	-3.08804
8	5	-13.44000	NUMXQ(K)= 5	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

1.539E-04 0.500 1.000

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    7.726E-05              1.500              3.000
    5.408E-05              2.500              5.000
    3.167E-05              5.000             10.000
    2.119E-05              7.500             15.000
    1.506E-05             10.000             20.000
    1.135E-05             12.500             25.000
    8.870E-06             15.000             30.000
    7.118E-06             17.500             35.000
    5.823E-06             20.000             40.000
    4.622E-06             22.500             45.000
    3.721E-06             25.000             50.000
    3.030E-06             27.500             55.000
    2.430E-06             30.000             60.000
    1.954E-06             32.500             65.000
    1.582E-06             35.000             70.000

    1.539E-04              0.5                1.00

ANNUAL AVERAGE =   2.01E-06

K=  8     FIVEXQ(K)= 1.539E-04     FIVEPR(K)= 1.000

FUMIGATION X/Q AT THE BOUNDARY:   2.88E-05

 EXPONENTIAL TERM AND FREQUENCIES

   1.000E+00
     100.000
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USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE SSE SECTOR.

STABILITY CLASS	WINDSPEED METER/SEC AT 45.0 METERS	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	1127.	23.	22.	119.2	68.1	0.0	0.0	0.0	2.549E-05
C	2.9	4.00	1127.	23.	22.	119.2	68.1	0.0	0.0	0.0	1.275E-05
C	5.8	4.00	1127.	23.	22.	119.2	68.1	0.0	0.0	0.0	6.374E-06
C	11.7	4.00	1127.	23.	22.	119.2	68.1	0.0	0.0	0.0	3.187E-06
C	23.3	4.00	1127.	23.	22.	119.2	68.1	0.0	0.0	0.0	1.593E-06
D	1.5	4.00	1127.	23.	22.	83.9	34.3	0.0	0.0	0.0	6.125E-05
D	2.9	4.00	1127.	23.	22.	83.9	34.3	0.0	0.0	0.0	3.062E-05
D	5.8	4.00	1127.	23.	22.	83.9	34.3	0.0	0.0	0.0	1.531E-05
D	11.7	4.00	1127.	23.	22.	83.9	34.3	0.0	0.0	0.0	7.656E-06
D	23.3	4.00	1127.	23.	22.	83.9	34.3	0.0	0.0	0.0	3.828E-06
E	2.1	4.00	1127.	23.	22.	59.7	23.4	0.0	0.0	0.0	6.781E-05
E	4.2	4.00	1127.	23.	22.	59.7	23.4	0.0	0.0	0.0	3.390E-05
E	8.5	4.00	1127.	23.	22.	59.7	23.4	0.0	0.0	0.0	1.695E-05
E	17.0	4.00	1127.	23.	22.	59.7	23.4	0.0	0.0	0.0	8.476E-06
E	33.9	4.00	1127.	23.	22.	59.7	23.4	0.0	0.0	0.0	4.238E-06
F	2.1	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	9.490E-05
F	4.2	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	4.745E-05
F	8.5	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	2.373E-05
F	17.0	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	1.186E-05
F	33.9	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	5.931E-06
G	2.1	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	2.047E-04
G	4.2	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	1.023E-04
G	8.5	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	5.116E-05
G	17.0	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	2.558E-05
G	33.9	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	1.279E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:

SSE SECTOR BOUNDARY DISTANCE = 1127.0 METERS
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.047E-04	1.023E-04	9.490E-05	6.781E-05	6.125E-05	5.116E-05	4.745E-05	3.390E-05	3.062E-05	2.558E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
2.549E-05	2.373E-05	1.695E-05	1.531E-05	1.279E-05	1.275E-05	1.186E-05	8.476E-06	7.656E-06	6.374E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
5.931E-06	4.238E-06	3.828E-06	3.187E-06	1.593E-06					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.047E-04 DISTANCE = 2000.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED
CHI/Q WITH RESPECT TO WHEN THE WIND BLOWS
SEC/CUBIC METER THE TOTAL TIME INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 6.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 11.998
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 17.002
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 21.006

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
16	1	-8.49418	-12.49192	-1.71814
16	2	-9.95581	-13.35509	-2.30291
16	3	-10.64896	-14.33461	-3.13648
16	4	-11.34211	-15.81452	-4.68759
16	5	-12.03525	NUMXQ(K)= 5	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.

BACK EXTRAPOLATION FOR*** PERCENTILE.

4.674E-04	0.250	1.000
2.455E-04	0.750	3.000
1.769E-04	1.250	5.000
1.091E-04	2.500	10.000
8.011E-05	3.750	15.000
6.345E-05	5.000	20.000
5.246E-05	6.250	25.000
4.365E-05	7.500	30.000
3.603E-05	8.750	35.000
3.033E-05	10.000	40.000
2.592E-05	11.250	45.000
2.196E-05	12.500	50.000
1.826E-05	13.750	55.000
1.536E-05	15.000	60.000
1.304E-05	16.250	65.000
1.082E-05	17.500	70.000
8.662E-06	18.750	75.000
6.996E-06	20.000	80.000
3.142E-04	0.5	2.00

ANNUAL AVERAGE = 1.24E-05

K= 16 FIVEXQ(K)= 3.142E-04 FIVEPR(K)= 2.000

FUMIGATION X/Q AT THE BOUNDARY: 2.16E-04

EXPONENTIAL TERM AND FREQUENCIES

9.752E-01	9.471E-01	9.421E-01	8.074E-01	6.307E-01
20.000	40.000	60.000	80.000	100.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE ALL SECTOR.

STABILITY CLASS	WINDSPEED AT 45.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	4.198E-05
C	2.9	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	2.099E-05
C	5.8	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	1.049E-05
C	11.7	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	5.247E-06
C	23.3	4.00	805.	16.	29.	87.9	50.1	0.0	0.0	0.0	2.624E-06
D	1.5	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	7.358E-05
D	2.9	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	3.679E-05
D	5.8	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	1.839E-05
D	11.7	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	9.197E-06
D	23.3	4.00	805.	16.	29.	61.9	26.7	0.0	0.0	0.0	4.599E-06
E	2.1	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	6.610E-05
E	4.2	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	3.305E-05
E	8.5	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	1.652E-05
E	17.0	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	8.262E-06
E	33.9	4.00	1000.	20.	25.	53.6	21.3	0.0	0.0	0.0	4.131E-06
F	2.1	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	9.490E-05
F	4.2	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	4.745E-05
F	8.5	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	2.373E-05
F	17.0	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	1.186E-05
F	33.9	4.00	2000.	40.	5.	69.1	22.3	0.0	0.0	0.0	5.931E-06
G	2.1	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	2.047E-04
G	4.2	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	1.023E-04
G	8.5	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	5.116E-05
G	17.0	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	2.558E-05
G	33.9	4.00	2000.	40.	5.	47.7	14.5	0.0	0.0	0.0	1.279E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:
DIRECTION-INDEPENDENT (S.R.P 2.3.4) MODEL.
MINIMUM BOUNDARY DISTANCE = 805.0 METERS.
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.047E-04	1.023E-04	9.490E-05	7.358E-05	6.610E-05	5.116E-05	4.745E-05	4.198E-05	3.679E-05	3.305E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
4.00000	8.00000	12.00000	16.00000	20.00000	24.00000	28.00000	32.00000	36.00000	40.00000
2.558E-05	2.373E-05	2.099E-05	1.839E-05	1.652E-05	1.279E-05	1.186E-05	1.049E-05	9.197E-06	8.262E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
44.00000	48.00000	52.00000	56.00000	60.00000	64.00000	68.00000	72.00000	76.00000	80.00000
5.931E-06	5.247E-06	4.599E-06	4.131E-06	2.624E-06					
84.000	88.000	92.000	96.000	100.000					
84.00000	88.00000	92.00000	96.00000	100.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.047E-04 DISTANCE = 2000.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY
		BACK EXTRAPOLATION FOR 1 PERCENTILE.
		BACK EXTRAPOLATION FOR 3 PERCENTILE.
4.124E-04	1.000	1.000
2.398E-04	3.000	3.000
1.799E-04	5.000	5.000
1.156E-04	10.000	10.000
8.576E-05	15.000	15.000
6.764E-05	20.000	20.000
5.518E-05	25.000	25.000
4.596E-05	30.000	30.000
3.880E-05	35.000	35.000
3.305E-05	40.000	40.000
2.788E-05	45.000	45.000

2.358E-05	50.000	50.000
1.995E-05	55.000	55.000
1.683E-05	60.000	60.000
1.412E-05	65.000	65.000
1.172E-05	70.000	70.000
9.596E-06	75.000	75.000
8.291E-06	80.000	80.000
7.141E-06	85.000	85.000
5.918E-06	90.000	90.000
1.799E-04	5.0	5.00

K= 17 FIVEXQ(K)= 1.799E-04 FIVEPR(K)= 5.000

FUMIGATION X/Q AT THE BOUNDARY: 2.27E-04

EXPONENTIAL TERM AND FREQUENCIES

9.752E-01	9.421E-01	8.470E-01	5.562E-01	5.034E-01
20.000	40.000	60.000	80.000	100.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

SITE EXCLUSION BOUNDARY CALCULATIONS:

FIVE PERCENT OVERALL SITE LIMIT
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.047E-04	1.023E-04	9.490E-05	7.358E-05	6.781E-05	6.610E-05	6.341E-05	6.125E-05	5.116E-05	4.745E-05
2.000	4.000	6.000	7.000	8.000	9.000	11.000	12.000	14.000	16.000
2.00000	4.00000	6.00000	7.00000	8.00000	9.00000	11.00000	12.00000	14.00000	16.00000
4.198E-05	3.679E-05	3.390E-05	3.305E-05	3.171E-05	3.062E-05	2.717E-05	2.558E-05	2.549E-05	2.373E-05
17.000	18.000	19.000	20.000	22.000	23.000	25.000	27.000	28.000	30.000
17.00000	18.00000	19.00000	20.00000	22.00000	23.00000	25.00000	27.00000	28.00000	30.00000
2.099E-05	1.839E-05	1.695E-05	1.652E-05	1.585E-05	1.531E-05	1.359E-05	1.279E-05	1.275E-05	1.186E-05
31.000	32.000	33.000	34.000	36.000	37.000	39.000	41.000	42.000	44.000
31.00000	32.00000	33.00000	34.00000	36.00000	37.00000	39.00000	41.00000	42.00000	44.00000
1.165E-05	1.049E-05	9.197E-06	8.476E-06	8.262E-06	7.926E-06	7.656E-06	7.637E-06	6.794E-06	6.374E-06
46.000	47.000	48.000	49.000	50.000	52.000	53.000	55.000	57.000	58.000
46.00000	47.00000	48.00000	49.00000	50.00000	52.00000	53.00000	55.00000	57.00000	58.00000
5.931E-06	5.823E-06	5.247E-06	4.599E-06	4.238E-06	4.131E-06	3.963E-06	3.828E-06	3.819E-06	3.397E-06
60.000	62.000	63.000	64.000	65.000	66.000	68.000	69.000	71.000	73.000
60.00000	62.00000	63.00000	64.00000	65.00000	66.00000	68.00000	69.00000	71.00000	73.00000
3.187E-06	2.911E-06	2.624E-06	1.909E-06	1.811E-06	1.698E-06	1.593E-06	1.456E-06	9.546E-07	9.056E-07
74.000	76.000	77.000	79.000	81.000	83.000	84.000	86.000	88.000	90.000
74.00000	76.00000	77.00000	79.00000	81.00000	83.00000	84.00000	86.00000	88.00000	90.00000
7.279E-07	4.773E-07	4.528E-07	2.264E-07	1.132E-07					
92.000	94.000	96.000	98.000	100.000					
92.00000	94.00000	96.00000	98.00000	100.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.047E-04 DISTANCE = 2000.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED

CHI/Q WITH RESPECT TO WHEN THE WIND BLOWS
SEC/CUBIC METER THE TOTAL TIME INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 11.998
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 16.001

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
18	1	-8.49418	-11.31313	-1.37229
18	2	-9.70056	-11.36075	-1.41282
18	3	-9.95581	-11.45549	-1.50810
18	4	-10.57706	-11.29323	-1.22952
18	5	-10.64896	-11.65843	-1.92645
18	6	-11.27021	-11.44990	-0.89169
18	7	-11.36056	-11.54797	-1.87044
18	8	-11.78249	-11.59321	-1.50959
18	9	-12.05371	NUMXQ(K)= 9	

BACK EXTRAPOLATION FOR 1 PERCENTILE.

2.975E-04	1.000	1.000
1.614E-04	3.000	3.000
1.168E-04	5.000	5.000
7.090E-05	10.000	10.000
5.035E-05	15.000	15.000
3.768E-05	20.000	20.000
2.928E-05	25.000	25.000
2.373E-05	30.000	30.000
1.815E-05	35.000	35.000
1.407E-05	40.000	40.000
1.191E-05	45.000	45.000
9.656E-06	50.000	50.000
7.637E-06	55.000	55.000
6.300E-06	60.000	60.000
1.168E-04	5.0	5.00

K= 18 FIVEXQ(K)= 1.168E-04 FIVEPR(K)= 5.000

K	HIGHPR	PR	GRNDVT(K)
1	-2.58524	0.48655	25.00000
8	-2.99675	0.13644	50.00000
16	-2.57623	0.49942	25.00000

K	HOURS(K)	TOTHRS
1	42.62201	42.62201
2	0.0	42.62201
3	0.0	42.62201
4	0.0	42.62201
5	0.0	42.62201
6	0.0	42.62201
7	0.0	42.62201
8	11.95223	54.57423
9	0.0	54.57423
10	0.0	54.57423
11	0.0	54.57423
12	0.0	54.57423
13	0.0	54.57423
14	0.0	54.57423
15	0.0	54.57423
16	43.74878	98.32301

K	FIVEXQ	SVANN	SLTIME	TIMINT	I	TIME	XQT

1	3.095E-04	1.162E-05	-0.3914	-7.8092		
					1	8.0 -8.62319
					2	16.0 -8.89452
					3	72.0 -9.48328
					4	624.0 -10.32861
8	1.539E-04	2.013E-06	-0.5172	-8.4210		
					1	8.0 -9.49649
					2	16.0 -9.85497
					3	72.0 -10.63285
					4	624.0 -11.74969
16	3.142E-04	1.238E-05	-0.3857	-7.7983		
					1	8.0 -8.60024
					2	16.0 -8.86756
					3	72.0 -9.44764
					4	624.0 -10.28048
17	1.799E-04	1.238E-05	-0.3192	-8.4018		
					1	8.0 -9.06552
					2	16.0 -9.28676
					3	72.0 -9.76684
					4	624.0 -10.45613
18	1.168E-04	1.238E-05	-0.2676	-8.8699		
					1	8.0 -9.42642
					2	16.0 -9.61192
					3	72.0 -10.01444
					4	624.0 -10.59237

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

RELATIVE CONCENTRATION (X/Q) VALUES (SEC/CUBIC METER) VERSUS AVERAGING TIME

DOWNWIND SECTOR	DISTANCE (METERS)	0-2 HOURS	0-8 HOURS	8-24 HOURS	1-4 DAYS	4-30 DAYS	ANNUAL AVERAGE	HOURS PER YEAR MAX 0-2 HR X/Q IS EXCEEDED IN SECTOR	DOWNWIND SECTOR
S	805.	3.10E-04	1.80E-04	1.37E-04	7.61E-05	3.27E-05	1.16E-05	42.6	S
SSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SSW
SW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SW
WSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WSW
W	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	W
WNW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WNW
NW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NW
NNW	4989.	1.54E-04	7.51E-05	5.25E-05	2.41E-05	7.89E-06	2.01E-06	12.0	NNW
N	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N
NNE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NNE
NE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE
ENE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ENE
E	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	E
ESE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ESE
SE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SE
SSE	1127.	3.14E-04	1.84E-04	1.41E-04	7.89E-05	3.43E-05	1.24E-05	43.7	SSE
MAX X/Q		3.14E-04				TOTAL HOURS AROUND SITE:		98.3	
SRP 2.3.4	805.	1.80E-04	1.16E-04	9.26E-05	5.73E-05	2.88E-05	1.24E-05		
SITE LIMIT		1.17E-04	8.06E-05	6.69E-05	4.47E-05	2.51E-05	1.24E-05		

0.5 PERCENT X/Q TO AN INDIVIDUAL IS LIMITING.

X/Q VALUES (SEC/CUBIC METER) FOR FUMIGATION AT THE BOUNDARY:

DOWNWIND SECTOR	DISTANCE (METERS)	X/Q
S	805.	2.27E-04
SSW	0.	0.0
SW	0.	0.0
WSW	0.	0.0
W	0.	0.0
WNW	0.	0.0
NW	0.	0.0
NNW	4989.	2.88E-05
N	0.	0.0
NNE	0.	0.0
NE	0.	0.0
ENE	0.	0.0
E	0.	0.0
ESE	0.	0.0
SE	0.	0.0
SSE	1127.	2.16E-04

NOTE: VALUES ON THIS PAGE ARE APPROXIMATIONS ONLY.
CHECK THE REASONABLENESS OF THE ENVELOPES
COMPUTED FOR THE 0-2 HOUR VALUES. FOR ANY

FAULTY ENVELOPES, ADJUST THE ABOVE VALUES.

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE S SECTOR.

STABILITY CLASS	WINDSPEED AT 45.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	1.012E-05
C	2.9	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	5.059E-06
C	5.8	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	2.529E-06
C	11.7	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	1.265E-06
C	23.3	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	6.324E-07
D	1.5	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	3.209E-05
D	2.9	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	1.605E-05
D	5.8	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	8.023E-06
D	11.7	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	4.011E-06
D	23.3	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	2.006E-06
E	2.1	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	4.515E-05
E	4.2	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	2.258E-05
E	8.5	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	1.129E-05
E	17.0	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	5.644E-06
E	33.9	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	2.822E-06
F	2.1	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	9.823E-05
F	4.2	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	4.911E-05
F	8.5	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	2.456E-05
F	17.0	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	1.228E-05
F	33.9	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	6.139E-06
G	2.1	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	2.066E-04
G	4.2	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	1.033E-04
G	8.5	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	5.165E-05
G	17.0	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	2.583E-05
G	33.9	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	1.291E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

LOW POPULATION ZONE CALCULATIONS:

S SECTOR BOUNDARY DISTANCE = 1931.0 METERS
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.066E-04	1.033E-04	9.823E-05	5.165E-05	4.911E-05	4.515E-05	3.209E-05	2.583E-05	2.456E-05	2.258E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
1.605E-05	1.291E-05	1.228E-05	1.129E-05	1.012E-05	8.023E-06	6.139E-06	5.644E-06	5.059E-06	4.011E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
2.822E-06	2.529E-06	2.006E-06	1.265E-06	6.324E-07					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.066E-04 DISTANCE = 1931.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 2.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 5.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 9.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 15.000
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(6)= 19.004

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
1	1	-8.48467	-12.36738	-1.66870
1	2	-9.22820	-13.71158	-2.38324
1	3	-10.00541	-13.94849	-2.53559
1	4	-10.69856	-14.89266	-3.27222
1	5	-11.50123	-16.02892	-4.36854
1	6	-12.19438	NUMXQ(K)= 6	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.
BACK EXTRAPOLATION FOR*** PERCENTILE.

4.607E-04	0.250	1.000
2.466E-04	0.750	3.000
1.793E-04	1.250	5.000
1.121E-04	2.500	10.000
7.734E-05	3.750	15.000
5.597E-05	5.000	20.000
4.285E-05	6.250	25.000
3.371E-05	7.500	30.000
2.729E-05	8.750	35.000
2.258E-05	10.000	40.000
1.806E-05	11.250	45.000
1.469E-05	12.500	50.000
1.212E-05	13.750	55.000
1.012E-05	15.000	60.000
8.053E-06	16.250	65.000
6.482E-06	17.500	70.000
5.268E-06	18.750	75.000
3.133E-04	0.5	2.00

ANNUAL AVERAGE = 7.66E-06

K= 1 FIVEXQ(K)= 3.133E-04 FIVEPR(K)= 2.000

FUMIGATION X/Q AT THE BOUNDARY: 1.09E-04

EXPONENTIAL TERM AND FREQUENCIES

9.984E-01	9.917E-01	9.822E-01	9.583E-01	9.040E-01
20.000	40.000	60.000	80.000	100.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE NNW SECTOR.

STABILITY CLASS	WINDSPEED AT 45.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	6437.	129.	0.	574.9	333.3	0.0	0.0	0.0	1.141E-06
C	2.9	4.00	6437.	129.	0.	574.9	333.3	0.0	0.0	0.0	5.704E-07
C	5.8	4.00	6437.	129.	0.	574.9	333.3	0.0	0.0	0.0	2.852E-07
C	11.7	4.00	6437.	129.	0.	574.9	333.3	0.0	0.0	0.0	1.426E-07
C	23.3	4.00	6437.	129.	0.	574.9	333.3	0.0	0.0	0.0	7.130E-08
D	1.5	4.00	6437.	129.	0.	404.8	103.3	0.0	0.0	0.0	5.226E-06
D	2.9	4.00	6437.	129.	0.	404.8	103.3	0.0	0.0	0.0	2.613E-06
D	5.8	4.00	6437.	129.	0.	404.8	103.3	0.0	0.0	0.0	1.306E-06
D	11.7	4.00	6437.	129.	0.	404.8	103.3	0.0	0.0	0.0	6.532E-07
D	23.3	4.00	6437.	129.	0.	404.8	103.3	0.0	0.0	0.0	3.266E-07
E	2.1	4.00	6437.	129.	0.	287.8	63.6	0.0	0.0	0.0	8.190E-06
E	4.2	4.00	6437.	129.	0.	287.8	63.6	0.0	0.0	0.0	4.095E-06
E	8.5	4.00	6437.	129.	0.	287.8	63.6	0.0	0.0	0.0	2.048E-06
E	17.0	4.00	6437.	129.	0.	287.8	63.6	0.0	0.0	0.0	1.024E-06
E	33.9	4.00	6437.	129.	0.	287.8	63.6	0.0	0.0	0.0	5.119E-07
F	2.1	4.00	6437.	129.	0.	198.7	38.9	0.0	0.0	0.0	1.941E-05
F	4.2	4.00	6437.	129.	0.	198.7	38.9	0.0	0.0	0.0	9.706E-06
F	8.5	4.00	6437.	129.	0.	198.7	38.9	0.0	0.0	0.0	4.853E-06
F	17.0	4.00	6437.	129.	0.	198.7	38.9	0.0	0.0	0.0	2.426E-06
F	33.9	4.00	6437.	129.	0.	198.7	38.9	0.0	0.0	0.0	1.213E-06
G	2.1	4.00	6437.	129.	0.	137.1	23.8	0.0	0.0	0.0	4.601E-05
G	4.2	4.00	6437.	129.	0.	137.1	23.8	0.0	0.0	0.0	2.300E-05
G	8.5	4.00	6437.	129.	0.	137.1	23.8	0.0	0.0	0.0	1.150E-05
G	17.0	4.00	6437.	129.	0.	137.1	23.8	0.0	0.0	0.0	5.751E-06
G	33.9	4.00	6437.	129.	0.	137.1	23.8	0.0	0.0	0.0	2.875E-06

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

LOW POPULATION ZONE CALCULATIONS:

NNW SECTOR BOUNDARY DISTANCE = 6437.0 METERS
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

4.601E-05	2.300E-05	1.941E-05	1.150E-05	9.706E-06	8.190E-06	5.751E-06	5.226E-06	4.853E-06	4.095E-06
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
2.00000	4.00000	6.00000	8.00000	10.00000	12.00000	14.00000	16.00000	18.00000	20.00000
2.875E-06	2.613E-06	2.426E-06	2.048E-06	1.306E-06	1.213E-06	1.141E-06	1.024E-06	6.532E-07	5.704E-07
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
22.00000	24.00000	26.00000	28.00000	30.00000	32.00000	34.00000	36.00000	38.00000	40.00000
5.119E-07	3.266E-07	2.852E-07	1.426E-07	7.130E-08					
84.000	88.000	92.000	96.000	100.000					
42.00000	44.00000	46.00000	48.00000	50.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.047E-04 DISTANCE = 2000.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED

CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 5.996
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 18.003
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 20.005

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
8	1	-9.98673	-13.53835	-1.72897
8	2	-10.84964	-14.21898	-2.16665
8	3	-12.23593	-14.34115	-2.30013
8	4	-12.40570	-14.62509	-2.63756
8	5	-12.92908	-14.73207	-2.80393
8	6	-13.09884	NUMXQ(K)= 6	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.

BACK EXTRAPOLATION FOR*** PERCENTILE.

1.135E-04	0.500	1.000
5.626E-05	1.500	3.000
3.912E-05	2.500	5.000
2.268E-05	5.000	10.000
1.512E-05	7.500	15.000
1.074E-05	10.000	20.000
8.078E-06	12.500	25.000
6.310E-06	15.000	30.000
5.059E-06	17.500	35.000
4.095E-06	20.000	40.000
3.262E-06	22.500	45.000
2.634E-06	25.000	50.000
2.135E-06	27.500	55.000

1.135E-04 0.5 1.00

ANNUAL AVERAGE = 1.23E-06

K= 8 FIVEXQ(K)= 1.135E-04 FIVEPR(K)= 1.000

FUMIGATION X/Q AT THE BOUNDARY: 2.06E-05

EXPONENTIAL TERM AND FREQUENCIES

1.000E+00
100.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE SSE SECTOR.

STABILITY CLASS	WINDSPEED AT 45.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	4345.	87.	0.	403.1	233.0	0.0	0.0	0.0	2.327E-06
C	2.9	4.00	4345.	87.	0.	403.1	233.0	0.0	0.0	0.0	1.164E-06
C	5.8	4.00	4345.	87.	0.	403.1	233.0	0.0	0.0	0.0	5.818E-07
C	11.7	4.00	4345.	87.	0.	403.1	233.0	0.0	0.0	0.0	2.909E-07
C	23.3	4.00	4345.	87.	0.	403.1	233.0	0.0	0.0	0.0	1.455E-07
D	1.5	4.00	4345.	87.	0.	283.8	82.0	0.0	0.0	0.0	9.393E-06
D	2.9	4.00	4345.	87.	0.	283.8	82.0	0.0	0.0	0.0	4.697E-06
D	5.8	4.00	4345.	87.	0.	283.8	82.0	0.0	0.0	0.0	2.348E-06
D	11.7	4.00	4345.	87.	0.	283.8	82.0	0.0	0.0	0.0	1.174E-06
D	23.3	4.00	4345.	87.	0.	283.8	82.0	0.0	0.0	0.0	5.871E-07
E	2.1	4.00	4345.	87.	0.	201.8	52.6	0.0	0.0	0.0	1.413E-05
E	4.2	4.00	4345.	87.	0.	201.8	52.6	0.0	0.0	0.0	7.065E-06
E	8.5	4.00	4345.	87.	0.	201.8	52.6	0.0	0.0	0.0	3.532E-06
E	17.0	4.00	4345.	87.	0.	201.8	52.6	0.0	0.0	0.0	1.766E-06
E	33.9	4.00	4345.	87.	0.	201.8	52.6	0.0	0.0	0.0	8.831E-07
F	2.1	4.00	4345.	87.	0.	139.3	32.9	0.0	0.0	0.0	3.271E-05
F	4.2	4.00	4345.	87.	0.	139.3	32.9	0.0	0.0	0.0	1.635E-05
F	8.5	4.00	4345.	87.	0.	139.3	32.9	0.0	0.0	0.0	8.177E-06
F	17.0	4.00	4345.	87.	0.	139.3	32.9	0.0	0.0	0.0	4.088E-06
F	33.9	4.00	4345.	87.	0.	139.3	32.9	0.0	0.0	0.0	2.044E-06
G	2.1	4.00	4345.	87.	0.	96.2	20.6	0.0	0.0	0.0	7.572E-05
G	4.2	4.00	4345.	87.	0.	96.2	20.6	0.0	0.0	0.0	3.786E-05
G	8.5	4.00	4345.	87.	0.	96.2	20.6	0.0	0.0	0.0	1.893E-05
G	17.0	4.00	4345.	87.	0.	96.2	20.6	0.0	0.0	0.0	9.464E-06
G	33.9	4.00	4345.	87.	0.	96.2	20.6	0.0	0.0	0.0	4.732E-06

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

LOW POPULATION ZONE CALCULATIONS:

SSE SECTOR BOUNDARY DISTANCE = 4345.0 METERS
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

7.572E-05	3.786E-05	3.271E-05	1.893E-05	1.635E-05	1.413E-05	9.464E-06	9.393E-06	8.177E-06	7.065E-06
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	7.00000	8.00000	9.00000	10.00000
4.732E-06	4.697E-06	4.088E-06	3.532E-06	2.348E-06	2.327E-06	2.044E-06	1.766E-06	1.174E-06	1.164E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
11.00000	12.00000	13.00000	14.00000	15.00000	16.00000	17.00000	18.00000	19.00000	20.00000
8.831E-07	5.871E-07	5.818E-07	2.909E-07	1.455E-07					
84.000	88.000	92.000	96.000	100.000					
21.00000	22.00000	23.00000	24.00000	25.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.047E-04 DISTANCE = 2000.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED

CHI/Q SEC/CUBIC METER	WITH RESPECT TO THE TOTAL TIME	WHEN THE WIND BLOWS INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 2.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 9.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(4)= 13.999
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(5)= 18.003

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
16	1	-9.48853	-13.87173	-1.88380
16	2	-10.32790	-15.13701	-2.55639
16	3	-11.86041	-16.27219	-3.44206
16	4	-12.55356	-17.08952	-4.19861
16	5	-13.24671	NUMXQ(K)= 5	

BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.

BACK EXTRAPOLATION FOR*** PERCENTILE.

1.872E-04	0.250	1.000
9.245E-05	0.750	3.000
6.452E-05	1.250	5.000
3.797E-05	2.500	10.000
2.531E-05	3.750	15.000
1.789E-05	5.000	20.000
1.348E-05	6.250	25.000
1.058E-05	7.500	30.000
8.553E-06	8.750	35.000
7.065E-06	10.000	40.000
5.585E-06	11.250	45.000
4.496E-06	12.500	50.000
3.673E-06	13.750	55.000
2.937E-06	15.000	60.000
2.359E-06	16.250	65.000
1.915E-06	17.500	70.000
1.211E-04	0.5	2.00

ANNUAL AVERAGE = 1.33E-06

K= 16 FIVEXQ(K)= 1.211E-04 FIVEPR(K)= 2.000

FUMIGATION X/Q AT THE BOUNDARY: 3.47E-05

EXPONENTIAL TERM AND FREQUENCIES

1.000E+00
100.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2 METEOROLOGICAL INSTRUMENTATION
DATA PERIOD: WIND SENSORS HEIGHT: 10.0 METER
TYPE OF RELEASE: ELEVATED 45.0 METER DELTA-T HEIGHTS:
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

PARAMETER VALUES FOR THE CHI/Q CALCULATIONS FOR THE ALL SECTOR.

STABILITY CLASS	WINDSPEED AT 45.0 METERS METER/SEC	FREQUENCY PERCENT	DISTANCE METERS	TERRAIN HT METERS	EFF PLUME HT METERS	SIGMA-Y METERS	SIGMA-Z METERS	MEANDER-SY METERS	** CHI/Q VALUES (SEC/CUBIC METER) MEANDER	BLDG WAKE CA=1000.SQ.METERS	USED
C	1.5	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	1.012E-05
C	2.9	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	5.059E-06
C	5.8	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	2.529E-06
C	11.7	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	1.265E-06
C	23.3	4.00	1931.	39.	6.	193.8	111.3	0.0	0.0	0.0	6.324E-07
D	1.5	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	3.209E-05
D	2.9	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	1.605E-05
D	5.8	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	8.023E-06
D	11.7	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	4.011E-06
D	23.3	4.00	1931.	39.	6.	136.5	49.5	0.0	0.0	0.0	2.006E-06
E	2.1	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	4.515E-05
E	4.2	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	2.258E-05
E	8.5	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	1.129E-05
E	17.0	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	5.644E-06
E	33.9	4.00	1931.	39.	6.	97.0	33.6	0.0	0.0	0.0	2.822E-06
F	2.1	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	9.823E-05
F	4.2	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	4.911E-05
F	8.5	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	2.456E-05
F	17.0	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	1.228E-05
F	33.9	4.00	1931.	39.	6.	67.0	21.9	0.0	0.0	0.0	6.139E-06
G	2.1	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	2.066E-04
G	4.2	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	1.033E-04
G	8.5	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	5.165E-05
G	17.0	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	2.583E-05
G	33.9	4.00	1931.	39.	6.	46.2	14.2	0.0	0.0	0.0	1.291E-05

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

LOW POPULATION ZONE CALCULATIONS:
DIRECTION-INDEPENDENT (S.R.P 2.3.4) MODEL.
MINIMUM BOUNDARY DISTANCE = 1931.0 METERS.
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.066E-04	1.033E-04	9.823E-05	5.165E-05	4.911E-05	4.515E-05	3.209E-05	2.583E-05	2.456E-05	2.258E-05
4.000	8.000	12.000	16.000	20.000	24.000	28.000	32.000	36.000	40.000
4.00000	8.00000	12.00000	16.00000	20.00000	24.00000	28.00000	32.00000	36.00000	40.00000
1.605E-05	1.291E-05	1.228E-05	1.129E-05	1.012E-05	8.023E-06	6.139E-06	5.644E-06	5.059E-06	4.011E-06
44.000	48.000	52.000	56.000	60.000	64.000	68.000	72.000	76.000	80.000
44.00000	48.00000	52.00000	56.00000	60.00000	64.00000	68.00000	72.00000	76.00000	80.00000
2.822E-06	2.529E-06	2.006E-06	1.265E-06	6.324E-07					
84.000	88.000	92.000	96.000	100.000					
84.00000	88.00000	92.00000	96.00000	100.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.066E-04 DISTANCE = 1931.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE
ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED		
CHI/Q	WITH RESPECT TO	WHEN THE WIND BLOWS
SEC/CUBIC METER	THE TOTAL TIME	INTO THIS SECTOR ONLY
4.344E-04	1.000	1.000
2.444E-04	3.000	3.000
1.802E-04	5.000	5.000
1.127E-04	10.000	10.000
7.875E-05	15.000	15.000
5.770E-05	20.000	20.000
4.420E-05	25.000	25.000
3.478E-05	30.000	30.000
2.786E-05	35.000	35.000
2.258E-05	40.000	40.000

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 11.998
BACK EXTRAPOLATION FOR 1 PERCENTILE.
BACK EXTRAPOLATION FOR 3 PERCENTILE.

1.850E-05	45.000	45.000
1.522E-05	50.000	50.000
1.251E-05	55.000	55.000
1.026E-05	60.000	60.000
8.348E-06	65.000	65.000
6.720E-06	70.000	70.000
5.316E-06	75.000	75.000
4.229E-06	80.000	80.000
3.267E-06	85.000	85.000
2.362E-06	90.000	90.000
1.802E-04	5.0	5.00

K= 17 FIVEXQ(K)= 1.802E-04 FIVEPR(K)= 5.000

FUMIGATION X/Q AT THE BOUNDARY: 1.09E-04

EXPONENTIAL TERM AND FREQUENCIES

9.984E-01	9.917E-01	9.822E-01	9.583E-01	9.040E-01
20.000	40.000	60.000	80.000	100.000

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

LOW POPULATION ZONE CALCULATIONS:

FIVE PERCENT OVERALL SITE LIMIT
BUILDING WAKE CREDIT IS NOT INCLUDED.
CORRECTION FACTORS USED IN THE ANNUAL AVERAGE CALCULATIONS.

BELOW ARE PRINTED THE ORDERED VALUES OF CHI/Q AND THE FREQUENCY WITH WHICH THAT VALUE IS REACHED OR EXCEEDED.
THE TOP NUMBER IS THE CHI/Q. THE MIDDLE NUMBER IS THE FREQUENCY NORMALIZED TO THIS SECTOR.
THE THIRD NUMBER IS THE FREQUENCY WITH RESPECT TO ALL TIME.

2.066E-04	1.033E-04	9.823E-05	7.572E-05	5.165E-05	4.911E-05	4.601E-05	4.515E-05	3.786E-05	3.271E-05
1.000	2.000	3.000	4.000	5.000	6.000	8.000	9.000	10.000	11.000
1.00000	2.00000	3.00000	4.00000	5.00000	6.00000	8.00000	9.00000	10.00000	11.00000
3.209E-05	2.583E-05	2.456E-05	2.300E-05	2.258E-05	1.941E-05	1.893E-05	1.635E-05	1.605E-05	1.413E-05
12.000	13.000	14.000	16.000	17.000	19.000	20.000	21.000	22.000	23.000
12.00000	13.00000	14.00000	16.00000	17.00000	19.00000	20.00000	21.00000	22.00000	23.00000
1.291E-05	1.228E-05	1.150E-05	1.129E-05	1.012E-05	9.706E-06	9.464E-06	9.393E-06	8.190E-06	8.177E-06
24.000	25.000	27.000	28.000	29.000	31.000	32.000	33.000	35.000	36.000
24.00000	25.00000	27.00000	28.00000	29.00000	31.00000	32.00000	33.00000	35.00000	36.00000
8.023E-06	7.065E-06	6.139E-06	5.751E-06	5.644E-06	5.226E-06	5.059E-06	4.853E-06	4.732E-06	4.697E-06
37.000	38.000	39.000	41.000	42.000	44.000	45.000	47.000	48.000	49.000
37.00000	38.00000	39.00000	41.00000	42.00000	44.00000	45.00000	47.00000	48.00000	49.00000
4.095E-06	4.088E-06	4.011E-06	3.532E-06	2.875E-06	2.822E-06	2.613E-06	2.529E-06	2.426E-06	2.348E-06
51.000	52.000	53.000	54.000	56.000	57.000	59.000	60.000	62.000	63.000
51.00000	52.00000	53.00000	54.00000	56.00000	57.00000	59.00000	60.00000	62.00000	63.00000
2.327E-06	2.048E-06	2.044E-06	2.006E-06	1.766E-06	1.306E-06	1.265E-06	1.213E-06	1.174E-06	1.164E-06
64.000	66.000	67.000	68.000	69.000	71.000	72.000	74.000	75.000	76.000
64.00000	66.00000	67.00000	68.00000	69.00000	71.00000	72.00000	74.00000	75.00000	76.00000
1.141E-06	1.024E-06	8.831E-07	6.532E-07	6.324E-07	5.871E-07	5.818E-07	5.704E-07	5.119E-07	3.266E-07
78.000	80.000	81.000	83.000	84.000	85.000	86.000	88.000	90.000	92.000
78.00000	80.00000	81.00000	83.00000	84.00000	85.00000	86.00000	88.00000	90.00000	92.00000
2.909E-07	2.852E-07	1.455E-07	1.426E-07	7.130E-08					
93.000	95.000	96.000	98.000	100.000					
93.00000	95.00000	96.00000	98.00000	100.00000					

BELOW IS PRINTED THE MAXIMUM VALUE OF CHI/Q AND THE DISTANCE IN METERS FROM THE STACK AT WHICH THE VALUE OCCURRED.
THIS DISTANCE MAY BE WITHIN THE SITE BOUNDARY.

CHI/Q = 2.066E-04 DISTANCE = 1931.000

X/Q PERCENTILES
(BASED ON THE UPPER ENVELOPE OF THE

ORDERED X/Q-FREQUENCY VALUES, AND AS
PLOTTED ON A LOG-NORMAL GRAPH.)

PERCENT OF TIME CHI/Q IS EQUALED OR EXCEEDED
CHI/Q WITH RESPECT TO WHEN THE WIND BLOWS
SEC/CUBIC METER THE TOTAL TIME INTO THIS SECTOR ONLY

HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(2)= 8.997
HANDCHECK GRAPH: SLOPE LT -1.0 FOR LOW PERCENTAGES. XSAVE(3)= 20.005

K	I	XQSAVE(K,I)	XQINT(K,I)	XQSLOP(K,I)
18	1	-8.48467	-12.07402	-1.54262
18	2	-10.00541	-12.33939	-1.74051
18	3	-10.87482	-12.49920	-1.93043
18	4	-11.54279	-11.83240	-0.58457
18	5	-11.57550	-12.21690	-1.45945
18	6	-11.73322	-12.31233	-1.74740
18	7	-12.26864	-12.30804	-1.57594
18	8	-12.42636	NUMXQ(K)= 8	

2.066E-04	1.000	1.000
1.039E-04	3.000	3.000
7.220E-05	5.000	5.000
4.073E-05	10.000	10.000
2.658E-05	15.000	15.000
1.893E-05	20.000	20.000
1.371E-05	25.000	25.000
1.026E-05	30.000	30.000
8.674E-06	35.000	35.000
6.995E-06	40.000	40.000
5.597E-06	45.000	45.000
4.515E-06	50.000	50.000
7.220E-05	5.0	5.00

K= 18 FIVEXQ(K)= 7.220E-05 FIVEPR(K)= 5.000

K	HIGHPR	PR	GRNDVT(K)
1	-2.57623	0.49942	25.00000
8	-3.16370	0.07789	50.00000
16	-3.08064	0.10328	25.00000

K	HOURS(K)	TOTHRS
1	43.74878	43.74878
2	0.0	43.74878
3	0.0	43.74878
4	0.0	43.74878
5	0.0	43.74878
6	0.0	43.74878
7	0.0	43.74878
8	6.82328	50.57205
9	0.0	50.57205
10	0.0	50.57205
11	0.0	50.57205
12	0.0	50.57205
13	0.0	50.57205
14	0.0	50.57205
15	0.0	50.57205
16	9.04758	59.61963

K	FIVEXQ	SVANN	SLTIME	TIMINT	I	TIME	XQT

1	3.133E-04	7.662E-06	-0.4426	-7.7617		
					1	8.0 -8.68192
					2	16.0 -8.98867
					3	72.0 -9.65431
					4	624.0 -10.60999
8	1.135E-04	1.232E-06	-0.5394	-8.7103		
					1	8.0 -9.83182
					2	16.0 -10.20567
					3	72.0 -11.01690
					4	624.0 -12.18163
16	1.211E-04	1.328E-06	-0.5382	-8.6455		
					1	8.0 -9.76475
					2	16.0 -10.13782
					3	72.0 -10.94735
					4	624.0 -12.10964
17	1.802E-04	7.662E-06	-0.3766	-8.3603		
					1	8.0 -9.14342
					2	16.0 -9.40447
					3	72.0 -9.97092
					4	624.0 -10.78421
18	7.220E-05	7.662E-06	-0.2675	-9.3507		
					1	8.0 -9.90694
					2	16.0 -10.09237
					3	72.0 -10.49474
					4	624.0 -11.07244

USNRC COMPUTER CODE-PAVAN, VERSION 2.0 RUN DATE: MONDAY AUGUST 30, 1982

PLANT NAME: TEST CASE NUMBER 2
DATA PERIOD:
TYPE OF RELEASE: ELEVATED 45.0 METER
SOURCE OF DATA:
COMMENTS: NONE
PROGRAM: PAVAN, 10/76, 8/79 REVISION, IMPLEMENTATION OF REGULATORY GUIDE 1.145

METEOROLOGICAL INSTRUMENTATION
WIND SENSORS HEIGHT: 10.0 METER
DELTA-T HEIGHTS:

RELATIVE CONCENTRATION (X/Q) VALUES (SEC/CUBIC METER) VERSUS AVERAGING TIME

DOWNWIND SECTOR	DISTANCE (METERS)	0-2 HOURS	0-8 HOURS	8-24 HOURS	1-4 DAYS	4-30 DAYS	ANNUAL AVERAGE	HOURS PER YEAR MAX 0-2 HR X/Q IS EXCEEDED IN SECTOR	DOWNWIND SECTOR
S	1931.	3.13E-04	1.70E-04	1.25E-04	6.41E-05	2.47E-05	7.66E-06	43.7	S
SSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SSW
SW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SW
WSW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WSW
W	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	W
WNW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	WNW
NW	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NW
NNW	6437.	1.13E-04	5.37E-05	3.70E-05	1.64E-05	5.12E-06	1.23E-06	6.8	NNW
N	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	N
NNE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NNE
NE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NE
ENE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ENE
E	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	E
ESE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ESE
SE	0.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SE
SSE	4345.	1.21E-04	5.74E-05	3.96E-05	1.76E-05	5.51E-06	1.33E-06	9.0	SSE
MAX X/Q		3.13E-04				TOTAL HOURS AROUND SITE:		59.6	
SRP 2.3.4	1931.	1.80E-04	1.07E-04	8.24E-05	4.67E-05	2.07E-05	7.66E-06		
SITE LIMIT		7.22E-05	4.98E-05	4.14E-05	2.77E-05	1.55E-05	7.66E-06		

0.5 PERCENT X/Q TO AN INDIVIDUAL IS LIMITING.

X/Q VALUES (SEC/CUBIC METER) FOR FUMIGATION AT THE BOUNDARY:

DOWNWIND SECTOR	DISTANCE (METERS)	FUMIGATION X/Q
S	1931.	1.09E-04
SSW	0.	0.0
SW	0.	0.0
WSW	0.	0.0
W	0.	0.0
WNW	0.	0.0
NW	0.	0.0
NNW	6437.	2.06E-05
N	0.	0.0
NNE	0.	0.0
NE	0.	0.0
ENE	0.	0.0
E	0.	0.0
ESE	0.	0.0
SE	0.	0.0
SSE	4345.	3.47E-05

NOTE: VALUES ON THIS PAGE ARE APPROXIMATIONS ONLY.
CHECK THE REASONABLENESS OF THE ENVELOPES
COMPUTED FOR THE 0-2 HOUR VALUES. FOR ANY

FAULTY ENVELOPES, ADJUST THE ABOVE VALUES.