WIND TUNNEL STUDY OF STACK GAS DISPERSAL AT HARRINGTON POWER STATION

by

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ABSTRACT

Tests were conducted in the Colorado State University Meteorological Wind Tunnel facility, to study the gaseous plumes released from stacks associated with the Harrington Power Station of the Southwestern Public Service Company. The tests were conducted over a model power plant to scale 1/250 including all significant structures, topography, and roughness elements in the vicinity. Effects of wind orientation, stack height, plant operation load, and wind velocity were established. Data obtained included photographs and color motion pictures of smoke plume trajectories and contaminant concentration downwind of the power plant at ground level sampling positions.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS

Symbol	Definition	
A	Area of the projection of the power station building on a plane transverse to the upstream flow direction	(L^2)
C	Entrainment parameter	(-)
C_p	Specific heat capacity	$(L^2T^{-2}\theta^{-1})$
D	Stack diameter	(L)
E	Gas Chromatograph Response	(mvs)
Fr	Froude number $\frac{V^2}{g\frac{\Delta\rho}{\rho_a}D}$	(-)
g	Gravitational constant	(L/T^2)
H	Stack height	(L)
ΔH	Plume rise	(L)
k	von Karman constant	(-)
K	Concentration isopleth or Calibration constant	(-)
M	Molecular weight	(-)
Q	Source strength	(M/T)
R	Exhaust velocity ratio V_s/V_a	(-)
Re	Reynolds number $\frac{VL}{\nu}$	(-)
U_*	Friction velocity	(L/T)
V	Mean velocity	(L/T)
x,y,z	General coordinates--downwind, lateral, upwind	(L)
z_o	Surface roughness parameter	(L)

Greek symbols

Symbol	Definition	
χ	Local concentration	$(M/L^3$ or ppm)
τ	Sampling time	(T)
θ	Azimuth angle of upwind direction measured from plant north	(-)

Symbol	Definition	
σ	Standard deviation of either plume dispersion or wind angle fluctuations	(L) (-)
ν	Kinematic viscosity	(L^2/T)
δ	Boundary layer thickness	(L)
γ	Specific weight	$M(T^2L^2)$
ρ	Density	(M/L^3)
Ω	Angular velocity	(1/T)
μ	Dynamic viscosity	M/(TL)

Subscripts

a	Free stream
s	Stack
m	Model
p	Prototype
max	Maximum

CONVERSION TABLE (English to Metric Units)

Multiply units	by	to obtain
inches	2.540	centimeters
square inches	6.452	square centimeters
cubic inches	16.39	cubic centimeters
feet	0.3048	meters
square feet	0.0929	square meters
cubic feet	0.02832	cubic meters
feet/second	0.3048	meters/second
miles/hour	0.4470	meters/second
cubic feet/minute	0.02832	cubic meters/minute
cubic feet/minute	0.00047	cubic meters/second

1.0 INTRODUCTION

A wind tunnel study of the Harrington Power Station, Southwestern Public Service Company, near Amarillo, Texas was performed to determine the optimum stack height which would eliminate plume downwash and reduce the concentration of sulfur dioxide at ground level such that the plant can meet state and federal ambient air quality standards. The power plant is located on a site north-northeast of Amarillo, Texas.

Commercial fossil fuel steam electric generating stations generally require an anlaysis of the potential behavior of gaseous effluents emitted to the atmosphere as a result of combustion processes. The proposed new design incorporates processes to reduce particulate emissions and ground-level concentrations of gaseous chemical effluents to a minimum. Used wisely the atmospheric reservoir permits disposal without damage or nuisance; used without due consideration for its widely varying dispersion capacity, pollutants may at times remain at sufficiently high concentrations near the ground to cause annoyance.

A primary factor in determining whether these gaseous products are to be a nuisance is the stack design. Under certain conditions it may be necessary to make a release in meteorologically unfavorable situations. Hence, it is necessary to design gas exhaust systems such that adequate dispersal of gaseous materials will occur under any realistic meteorological condition.

It has been a traditional design technique to release the various gases through the top of a tall stack located near the power station, where the stack is at least two and one-half times taller than nearby buildings. Calculation of peak and mean ground concentrations of these gases are then based on some semiempirical model which relates the release rate from an elevated point source to the concentration at some point downwind. Mathematical models have been suggested by Sutton (1947), Hay and Pasquill (1962), Roberts and Cramer (1957). These mathematical models require the assumptions of plane homogeneous atmospheric turbulence and constant mean lateral and mean vertical velocities. These assumptions are satisfied for a point release over a flat undisturbed terrain.

In addition, considerable effort has been made to determine the effects of vertical stack velocity and gas buoyancy on the effective stack release height. Carson and Moses (1967) have reviewed over 15 plume rise formulas constructed to calculate effective stack heights for conditions where there are no effects from local terrain or buildings. They concluded that no available plume rise equation can be expected to accurately predict short-term plume rise. Recent results produced by Briggs (1969) are more optimistic concerning isolated plumes suggesting error bounds for plume rise of ± 20 percent.

Often, it is necessary, due to aesthetics, cost, and public relation reasons, to utilize a short to medium height stack. In these cases plume dispersion is sufficiently modified by the presence of the local building structure or ground topography that the only approach available is one of wind tunnel model tests (Moses, et al. (1964), Halitsky, et al. (1963)).

A number of wind tunnel studies have considered the effects of variations in a single building geometry on plume entrainment and dispersion (Halitsky (1963), Strom et al. (1957), Dickson et al. (1967), Jensen and Frank (1963)). These studies have permitted the specification of pertinent scaling criteria for model studies of plume excursions near buildings. Model laws will be discussed in greater detail in Section 2.

Since each arrangement of the power plant and auxiliary buildings or terrain may have separate effects on the generation of mechanical turbulence and mean flow movement, any specific gas dispersion problem will require individual tests. Hence, there exist in the literature descriptions of a variety of different model studies on reactor and industrial plants (Halitsky et al. (1963), Halitsky (1975), Kalinske (1945), Davies et al. (1964), Sherlock and Stalker (1940), Hohenleiten and Wolf (1942), Martin (1965), Meroney et al. (1967), Meroney et al. (1968), Cermak and Nayak (1973), Isyumov, et al. (1974), Smith (1975), Cagnetti (1974), etc.). These studies are significant in that their results have been essentially confirmed by either direct prototype measurements or the absence of the gases or dusts the study was directed to remove. Kalinske (1945), Davies and Moore (1964), Hohenleiten and Wolf (1942), and Martin (1965), incorporate such comparisons within their text. Halitsky et al. (1963) and Halitsky (1975) have recently been compared with prototype measurements at the National Reactor Testing Station in southeast Idaho (Dickson et al. (1967)). Agreement of the diffusion concentration results were very satisfactory. Martin (1965) favorably compared his wind tunnel study measurements about a model of the Ford Nuclear Reactor at the University of Michigan with prototype measurements. Munn and Cole (1967) have taken diffusion measurements on a power station complex at the National Research Council, Ottawa, Canada, to confirm the general entrainment criteria suggested by the model studies of Davies and Moore (1964). Isyumov, et al. (1974) compared predicted wind tunnel model results for SO_2 concentrations resulting from the operation of a tall stack in hilly terrain with available full scale data for two comparable stacks. Wind tunnel and full scale data showed close agreement, the wind tunnel bounding the measured behavior of the full scale situations.

Smith (1975) compared near wake behavior of a field dispersion experiment near a small (3m x 3m x 2m high) industrial building with wind tunnel measurements about similar geometries, (Meroney and Yang, 1971). Similar trends were detected; however field results suggested care must be taken to appropriately simulate atmospheric turbulence and aerodynamic roughness of upstream surfaces.

The purpose of this study is to determine the behavior of plumes created by gases discharged from an existing stack for Unit 1 and a proposed new stack for a second unit for the Southwestern Public Service Company Harrington Power Station (Figs. 3-1 and 3-2). Using a 1:250 scale model of the plant in a wind tunnel capable of simulating the appropriate meteorological conditions downwind ground-level stack-gas concentrations were determined by sampling concentrations of tracer gas (Propane) released from the model stacks and overall plume geometry was obtained by photographing smoke plumes created by releasing smoke (titanium oxide) from the model stacks.

The general scope includes determination of how plume behavior is affected by stack height by loading level, wind direction, and wind speed of the atmosphere. A wide range of meteorological conditions can be simulated in the Meteorological Wind Tunnel (MWT) of the Fluid Dynamics and Diffusion Laboratory (FDDL) at Colorado State University. The conditions simulated for this study are limited to the adiabatic lapse rate (thermally neutral flow) case.

The modeling criteria necessary to simulate atmospheric motions over such a site are presented in Section 2. Details of the model construction and the experimental equipment are described in Section 3.

Finally, Sections 4 and 5 discuss the results obtained and their significance.

This report is supplemented by a motion picture (in color) which shows the plume behavior for all stacks for all operating levels, wind directions and meteorological conditions investigated during the course of this study. A set of black-and-white photographs and color slides of each plume realization further supplements the material presented in this report.

2.0 SIMULATION OF ATMOSPHERIC MOTION

The use of wind tunnel for model tests of gas diffusion by the atmosphere is based upon the concept that nondimensional concentration coefficients will be the same at contiguous points in the model and the prototype and will not be a function of the length scale ratio. Concentration coefficients will only be independent of scale if the wind tunnel boundary layer is made similar to the atmospheric boundary layer by satisfying certain similarity criteria. These criteria are obtained by inspectional analysis of physical statements for conservation of mass, momentum and energy. Detailed discussions have been given by Halitsky (1963), Martin (1965), and Cermak et al. (1966). Basically the model laws may be divided into requirements for geometric, dynamic, thermic and kinematic similarity. In addition, similarity of upwind flow characteristics and ground boundary conditions must be achieved.

For the Harrington Power Station study, geometric similarity is satisfied by an undistorted model of length ratio 1:250. This scale was chosen to facilitate ease of measurements, provide a boundary layer equivalent to 1000 ft for the atmosphere and minimize wind tunnel blockage. (The ratio of projected area to the area of the wind tunnel cross section should not exceed five percent. The model of the Harrington Power Station at a scale of 1:250 produced a blockage of less than 3.0 percent in the MWT.)

When interest is focused on the vertical motion of plumes of heated gases emitted from stacks into a thermally neutral atmosphere the following variables are of primary significance:

ρ_a = density of ambient air

$\Delta\gamma$ = $(\rho_a - \rho_s)g$--difference in specific weight of ambient air and stack gas

Ω = local angular velocity component of earth

μ_a = dynamic viscosity of ambient air

V_a = speed of ambient wind at stack height

V_s = speed of stack gas emission

H = stack height

D = stack diameter

δ_a = thickness of planetary boundary layer

z_o = roughness heights for upward surface

Grouping the independent variables into dimensionless parameters with ρ_a, V_a and H as reference variables yields the following parameters upon which the dependent quantities of interest must depend:

$$\frac{V_a}{H\Omega}, \frac{\delta_a}{H}, \frac{z_o}{H}, \frac{D}{H}, \frac{V_a \rho_a H}{\mu_a}, \frac{\rho_s V_s^2}{\rho_a V_a^2}, \frac{\rho_a V_a^2}{\Delta\gamma D}, \frac{\Delta\gamma}{g\rho}$$

The laboratory boundary-layer-thickness parameter δ_a/H was made approximately equal to that for the atmosphere. A value for this ratio of at least 1.5 was established for the highest stacks. Equality of the surface parameter z_o/H for model and prototype was achieved through geometrical scaling of the stacks and upwind roughness. Likewise the stack parameter D/H was equal for model and prototype.

Dynamic similarity is achieved in a strict sense if a Reynolds number $\frac{\rho_a V_a H}{\mu_a}$ and a Rossby number $\frac{V_a}{H\Omega}$ for the model is equal to its counterpart for the atmosphere. The model Rossby number cannot be made equal to the atmospheric value. However, over the short distances considered (up to 15,000 ft), the Coriolis acceleration has little influence upon the flow. Accordingly, the standard practice is to relax the requirement of equal Rossby numbers.

Kinematic similarity requires the scaled equivalence of streamline movement of the air over prototype and model. It has been shown in Halitsky et al. (1963) that flow around geometrically similar sharp-edged buildings at ambient temperatures in a neutrally stratified atmosphere should be dynamically and kinematically similar when the approaching flow is kinematically similar. This approach depends upon producing flows in which the flow characteristics become independent of Reynolds number if a lower limit of the Reynolds number is exceeded. For example, the resistance coefficient for flow in a sufficiently rough pipe as shown in Schlichting (1960, p. 521) is constant for a Reynolds number larger than 2×10^4. This implies that surface or drag forces are directly proportional to the mean flow speed squared. In turn, this condition is the necessary condition for mean turbulence statistics such as root-mean square value and correlation coefficient of the turbulence velocity components to be equal for the model and the prototype flow.

Golden, as cited by Halitsky et al. (1963), found that for flow about a cube for Reynolds numbers above 11,000, there was no change in concentration measurements. The minimum Reynolds number encountered in the present study was 9,300 based on the model scale of 1.0 ft and a minimum velocity of 1.4 fps. Correlation tests of flow about the Rock of Gibraltar flow over Pt. Arguello, California, and flow over San Nicolas Island, California, may be cited as examples of large Reynolds number flows which have been modeled successfully in a wind tunnel (Field and Warden (1933), Cermak and Peterka (1966), Meroney and Cermak (1965)).

Buildings and building complexes produce nonuniform fields of flow which perturb the regular upstream atmospheric wind profiles. Around each building a boundary layer exists, where the velocity is zero at the surface but increases rapidly to a relatively constant value a short distance from the building wall. Outside of the boundary layer and downstream there exists a region of low velocities and pressures called the cavity. In this region circulations are such that flow may actually reverse with respect to the upstream winds. Surrounding the cavity but extending further downstream is a parabolic region called the wake in which the presence of the building is still evident in terms of deviations of velocity, turbulence, and pressure from conditions found in the upstream atmospheric boundary layer.

The formation of the wake and cavity regions are associated with a phenomena called boundary-layer separation. Under certain conditions the boundary layer actually detaches and enters the flow streaming about the building. This may occur at the corner of a sharp-edged building or on a curved surface if the pressure increases due to a decelerating flow field. The separated boundary layer forms a sheet which completely surrounds the cavity region which contains relatively stagnant fluid. The extent of the cavity region for the Harrington Power Station building may be approximated by $5H \cong 1000$ ft. Based on the measurements of Evans (1957) the effect of alternate wind approach angles to an elongated rectangular complex may extend this to $6H \cong 1200$ ft.

The need for scaling of the atmospheric mean wind profile was demonstrated by Jensen (1963). Substitutions of a uniform velocity profile for a logarithmic profile results in threefold variation in the dimensionless pressure coefficient downstream of a model building. Such variance in the pressure fields indicates a strong effect of the upstream wind profile on the kinematic behavior of the fluid near the building complex. One of the few tunnels currently capable of generating a turbulent boundary layer thick enough for a 1:250 model scale is the Meteorological Wind Tunnel at Colorado State University. Other investigators have attempted to generate logarithmic profiles in short tunnels by inserting special grids upstream of the test section; however, this technique normally creates a nontypical turbulence field which decays rapidly downstream.

The length of scale used for scaling the velocity profile is the roughness height z_o. For the Harrington Power Station site a typical roughness length is assumed to be less than 0.33 ft. This means the critical wind velocities could be modeled in the wind tunnel by a roughness length of less than 1/400 in., or essentially a smooth upstream surface. A turbulent boundary layer approximately 4.0 ft thick was produced by an upstream fetch of 40 ft and a tailored vortex grid in the Meteorological Wind Tunnel. Considering the flat terrain with intermittent covering of trees and shrubs it was decided to simulate the upstream wind profile by a power law exponent of approximately 0.14. This shape profile is characteristic of flow over flat terrain essentially free of trees and obstructions.

Equality of the parameter $\rho_a V_a^2/(\Delta\gamma D)$ for model and prototype in essence determines the relationship between the atmospheric wind speed and the model wind speed once the geometric scale has been selected (1:250 in this case). Often this criteria results in $(V_a)_m$ being too small to satisfy the minimum Reynolds number requirement.

When this happens the specific weight difference for the model $(\Delta\gamma)_m$ can be made larger than $(\Delta\gamma)_p$ to compensate for the effect of small geometric scale. However, equality of the density difference ratio for model and prototype will be maintained in this study. This equality ensures that the initial plume behavior where acceleration of the stack gases is maximum will be modeled correctly. This is particularly important if downwash behavior is to be correctly indicated by a small scale model.

Using the lowest wind speed of 15 mph or 22.0 ft/sec and a scale of 1:250, the Froude number equality gives

$$\frac{(V_a)_m^2}{(V_a)_p^2} = \left(\frac{1}{250}\right)$$

or

$$(V_a)_m = 22 \left(\frac{1}{250}\right)^{1/2}$$

$$(V_a)_m = 1.39 \text{ ft/sec.}$$

The corresponding model Reynolds number then becomes approximately

$$\left(\frac{V_a \rho_a H}{\mu_a}\right)_m = \frac{1.39 \times 1}{1.5 \times 10^{-4}}$$

$$= 9266 < 11{,}000.$$

Since minimum Reynolds number for the 30 and 45 mph cases seem sufficiently high no corrections are recommended. Inaccuracies in near field behavior resulting from adjustment in density ratios do not appear to justify any improvements expected at long distance downwind.

Rather than heat the model stack gases to obtain the same specific-weight-difference ratio as for the prototype, helium may be used to attain the proper density differences $(\Delta\gamma)_m$. This approach will be used since the helium-air mixture can be accurately metered to provide better monitoring and adjustment of the stack gas.

To summarize the following scaling criteria were applied for the neutral boundary layer situation:

1/ $$\mathrm{Re} = \frac{\rho_a V_a H}{\mu_a} > 11{,}000$$

2/ $$\mathrm{Fr} = \frac{\rho_a V_a^2}{\Delta\gamma D} \; ; \; (\mathrm{Fr})_m = (\mathrm{Fr})_p$$

3/ $$R = \frac{V_s}{V_a} \; ; \; R_m = R_p$$

4/ $$(z_o)_m = (z_o)_p$$

5/ Similar velocity and turbulence profiles upwind.

Operating conditions for the Harrington Power Station have been supplied by Southwestern Public Service for the various units. (See Table 4-1 and 5-1.) Meteorological data converted to the form of wind rose patterns (Fig. 3-3) suggest tests at eight primary wind orientations. Modeled wind velocities, stack velocities, and plume densities based upon the selected scaling criteria are tabulated together in Tables 4-2 and 5-2.

3.0 TEST APPARATUS

3.1 Wind-Tunnels

The meteorological wind tunnel (MWT) shown in Fig. 3-4 was used for this neutral flow study. This wind tunnel, specially designed to study atmospheric flow phenomena, incorporates special features such as adjustable ceiling, rotating turntables, transparent boundary walls, and a long test section to permit adequate reproduction of micro-meteorological behavior. Mean wind speeds of 0.2 to 120 ft/sec (0.14 to 80 mi/hr) in the MWT can be obtained. In the MWT boundary layers four feet thick over the downstream 40 ft can be obtained with the use of the vortex generators at the test section entrance. The flexible test section roof on the MWT is adjustable in height to permit the longitudinal pressure gradient to be set at zero.

3.1.1 Test Configuration in the MWT

Vortex generators were installed at the tunnel entrance together with an initial roughness to accelerate the preliminary growth of the modeled boundary layer.

The Harrington Power Station model (see Section 3.2) was constructed to represent a swath 1750 ft to the right and left of the wind orientation chosen. The floor of the tunnel was equipped with 25 taps arranged in sampling arrays to measure ground level concentrations.

3.2 Model

The model consisted of the power station, the stacks, and the auxiliary buildings constructed from lucite to a linear scale of 1:250 (see Fig. 3-2).

The model was built at a 1:250 scale to dimensions taken from drawings supplied by Southwestern Public Service Company. Four stacks were constructed for each unit, 250 ft, 300 ft, 350 ft, 375 ft, and 400 ft in height. All connections to the stacks were made by the addition of fittings at the base of each stack.

Metered quantities of gas were allowed to flow from each stack to simulate the exit velocity and also account for buoyancy effects due to the temperature difference between the stack gas and the ambient atmosphere. Helium and compressed air were mixed in metered amounts to adjust the specific weight as proposed in Section 2. Fischer-Porter flow rator settings were adjusted for pressure, temperature, and molecular weight effects as necessary. When a visible plume was required the gas was bubbled through titanium tetrachloride before emission. When a traceable plume was required a high pressure mixture of propane and air was used in place of the compressed air.

3.3 Flow Visualization Techniques

Smoke was used to define plume behavior over the power plant complex. The smoke was produced by passing the air mixture through a container of titanium tetrachloride located outside the wind tunnel and transported through the tunnel wall by means of a tygon tube terminating at the stack inlet within the model complex. The plume was illuminated with arc-lamp beams. A visible record was obtained by means of pictures taken with a Speed Graphic camera utilizing Polaroid film for immediate examination. Additional still pictures were obtained with a Hasselblad camera. Stills were taken with camera speeds of both 1/30 and 1 seconds--the first to capture characteristic plume excursions on the short time scale, the second to identify mean plume boundaries. A series of color motion pictures were also taken with a Bolex motion picture camera mounted on a movable dolly which was traversed the length of the tunnel parallel to the plume trajectory at the average wind speed.

3.4 Wind Profiles and Temperature Measurements

A standard pitot-static tube was utilized to measure the up and downstream velocity profiles in the MWT for neutral flow fields. In addition a Datametrics Series 800-L Linear Flow Anemometer was used to set and monitor tunnel velocities.

3.5 Gas Tracer Technique

After the flow in the tunnel was stabilized, a mixture of propane, helium, and air of predetermined concentration was released from model stacks at the required rate. Samples of air were withdrawn from the sample points and analyzed. The flow rate of propane mixture was controlled by a pressure regulator at the supply cylinder outlet and monitored by Fischer and Porter precision flow meters. The sampling and detection systems are shown in Figs. 3-5a and 3-5b.

3.5.1 Analysis of Data

Propane is an excellent tracer gas in wind tunnel dispersion studies. It is a gas that is readily obtainable and of which concentration measurements are easily obtained using gas chromatography techniques.

The procedure for analyzing the samples was as follows:

1) A sample volume drawn from the wind-tunnel of 2 cc was introduced into the Flame Ionization Detector.
2) The output from the electrometer (in millivolt seconds) was integrated and then the readings were recorded for each sample.

3) These readings were transformed into concentration values by the following steps:

$\chi(\text{ppm}) = K(\text{ppm/mvs})\ E(\text{mvs})$

where K was determined from a calibration gas of known concentration

$K = (\text{ppm/mvs})_{\text{calibration gas}}$

The values of the concentration parameter initially determined apply to the model and it is desirable to express these values in terms of the field. At the present time there is no set procedure for accomplishing this transformation. The simplest and most straightforward procedure is to make this transformation using the scaling factor of the model. Since

$$1 \text{ ft} \,|_m = 250 \text{ ft} \,|_p \; (= 76 \text{ m} \,|_p),$$

one can write

$$\frac{\chi V}{Q}\Big|_p \,(\text{ft}^{-2}) = \frac{1}{250^2} \times \frac{\chi V}{Q}\Big|_m \,(\text{ft}^{-2})$$

or

$$\frac{\chi V}{Q}\Big|_p \,(\text{m}^{-2}) = \frac{1}{250^2} \times \frac{\chi V}{Q}\Big|_m \,(\text{m}^{-2})$$

The sample scaling of the concentration parameter from model to field appears to give reasonable results. All data reported herein are in terms of their equivalent prototype value $\frac{\chi V}{Q}\Big|_p$ and again as ppm SO_2.

3.5.2 Errors in Concentration Measurement

Each sample as it passes through the flame-ionization detector is separated from its neighbors by a period during which nitrogen flows. During this time the detector is at its baseline, or zero level. When the sample passes through the detector the output rises to a value equal to the baseline plus a level proportional to the amount of tracer gas flowing through the detector. The baseline signal is set to zero and monitored for drift. Since the chromatograph used features a temperature control on the flame and electrometer there is very low drift. The integrator circuit is designed for linear response over the range considered. A total system error can be evaluated by considering the standard deviation found for a set of measurements where a precalibrated gas mixture is monitored. For a gas of ~ 100 ppm propane ± 1 ppm the average standard deviation from the electrometer was two percent.

Since the source gas was premixed to the appropriate molecular weight and repetitive measurements were made of its source strength the confidence in source strength concentration is similar. The flow rate of the source gas was monitored by Fischer-Price Flowmeters which are expected to be accurate to ± two percent including calibration and scale fraction error. The wind tunnel velocity was constant to ± 10 percent at such low settings. Hence the cumulative confidence in the measured values of $\chi V/Q$ will be a standard deviation of about ± 11 percent, whereas the worst cumulative scenario suggests an error of no more than ± 20 percent.

The lower limit of measurement is imposed by the instrument sensitivity and the background concentrations of hydrocarbons in the air within the wind tunnel. Background concentrations were measured and subtracted from all measurements quoted herein; however, a lower limit of 1 to 2 ppm of propane is available as a result of background methane levels plus previous propane releases. An upper limit for propane with the instrument used is 10 percent propane by volume;

however, chromatograph columns are necessary to avoid overwhelming the detector at flowrates above 5-6 percent. A recent report on the flame ionization detector for sampling gases in atmospheric wind tunnels prepared by Dear and Robins (1974) arrives at similar figures.

3.5.3 Test Results: Concentration Measurements

Since the conventional point-source diffusion equations cannot be used for predicting diffusion near objects which cause the wind to be nonuniform and nonhomogeneous in velocity and turbulence, it is necessary to calculate gaseous concentrations on the basis of experimental data. It is convenient to report dilution results in terms of a nondimensional factor independent of model to prototype scale.

In Cermak et al. (1966) and Halitsky (1963) the problem of similarity for diffusion plumes is discussed in detail. It is suggested that concentration measurements be transformed to K-isopleths by the formula

$$K = \frac{\chi}{Q/AV_a}$$

where

χ = sample volume concentration

A = frontally projected area of power plant complex

V_a = mean wind velocity at some references height

Q = gas source release rate

This expression is specifically suitable for measurements within the near-wake and cavity region. Data reported herein, however, represent measurements made at equivalent distances of 5000 ft from the power plant.

Concentration measurements were made at various downwind distances in the horizontal plane. Count rates were corrected to concentration in ppm and compensation was made for background. Since measurements were made at a variety of wind approach angles, wind velocities, and stack heights, the ground-level concentration data has been reported in terms of the ratio $\chi V_a/Q$ which has units of length squared. For dispersion in a homogeneous flow this should produce similarity for various V_a and Q values. The significance of all results is discussed in the following section.

When interpreting model diffusion measurements it is important to remember that there can be considerable difference between the instantaneous concentration in a plume and the average concentration due to horizontal meandering. The average dilution factors near a building complex will correlate well with wind tunnel dilution factors since the mechanical turbulence of the wake and cavity region dominate the dispersion. In the wind tunnel a plume does not generally meander due to the absence of large-scale eddies. Thus, it is found that field measurements of peak concentrations which effectively eliminate horizontal meandering, should correlate with the wind tunnel data (Hino (1968)). In order to compare downwind measurements of dispersion to predict average field concentrations it is necessary to use data on peak-to-mean concentration ratio as gathered by Singer, et al. (1953, 1963). Their data is correlated in terms of the gustiness categories suggested by Pasquill for a variety of terrain conditions. It is possible to determine the frequency of different gustiness categories for a specific site. Direct use of wind tunnel data at points removed from the building cavity region may underestimate the dilution capacity of a site by a factor of four unless these adjustments are considered (Martin (1965)).

An alternate technique has also been suggested by Hino (1968) who argues the relationship between the maximum of time-mean ground concentration χ_{max} and the sampling time is $\chi_{max} \sim \tau^{-1/2}$. Field experiments may be compared with wind tunnel data by the formula:

$$(\chi_a)_p = \frac{(\chi_a)_m Q_p V_p^{-1} H_p^{-2}}{Q_m V_m^{-1} H_m^{-2}} \left(\frac{\tau_p}{\tau_m}\right)^{-1/2}$$

where χ_a is the maximum axial concentration, Q discharge rate of gases from a stack, V wind speed at, H effective height of stack, τ sampling time, and subscripts p and m represent values for a prototype and model respectively. One may assume that τ_m corresponds to three to five minutes in the atmosphere for the wind tunnel experiment. Pasquill's suggested values for the standard deviations σ_z and σ_y correspond to 10 minute averages (Turner (1969)). Hence tunnel concentrations could be high by a factor of 1.7 if a 10 minute average is desired, or by a factor of 21.9 if a 24-hour average is desired.

An examination of Singer's results for peak-to-mean concentration ratios suggests the ratio is a function of both stability and boundary surface roughness. Hence for a variation of stratification from unstable to moderately stable the peak/mean concentration ratio may be nearly equal though the sampling time might vary from 30 minutes to three minutes respectively and the power law coefficient in Hino's equation above would vary from -0.6 to -0.3. It is not likely that a decisive interpretation of the effects of plume meandering will be available in the near future; hence, the conservative assumption is recommended that the wind tunnel measurements correspond to a 30 minute averaging time and, when correcting results to alter sampling periods, a power law coefficient of -1/2 be utilized. (A five minute wind tunnel equivalent sampling time results in 24 hour equivalent concentrations 50 percent smaller.) The values presented herein have not been corrected to alternative time average periods.

4.0 TEST PROGRAM AND RESULTS: UNIT 1

4.1 Test Program

The test program consisted of (1) a qualitative study of the flow field around the power plant by visual observation of the smoke plume trajectory released from the stacks; and (2) a quantitative study of gas concentrations produced by the release of a propane tracer from the stacks. The test conditions are summarized in Table 4-2. Angular locations of the approach winds are referred to in terms of angles from a nominal north. Downwind distances refer to lengths as measured from the center of the complex as marked in Fig. 3-6. Unless otherwise noted, the term wind velocity refers to the velocity in the undisturbed free stream at an equivalent height of 250 feet; however, a velocity at any reference height is available by referring to the velocity profiles (Fig. 3-7).

4.2 Test Results: Characteristics of Flow

All the experiments were carried out in the MWT over the range of conditions shown in Table 4-2. The atmospheric boundary layer was modeled to produce a velocity profile equivalent to flow typical of irregular terrain. Figure 3-7 shows the development of the velocity profile over the model for a neutral situation. No comparison of model velocity data with that in the prototype is possible because the latter is not available over a range of height. However, as the model velocity profiles were carefully produced over roughness tailored to reflect the characteristics of the site, it is expected that the prototype flow is adequately represented in the model. The power law exponent for the upstream velocity profile was 0.13.

4.3 Test Results: Visualization

The test results consist of photographs and movies showing the general nature of airflow and diffusion in the vicinity of the power station (Figs. 4-1 to 4-4). A general understanding of wake and cavity flows is necessary for an interpretation of the plume behavior (see Halitsky, 1963).

The sequences of photographs shown in Figs. 4-1 and 4-2 show side views of the behavior of a smoke plume released from Unit 1 for 50 percent load at 15 mph for various wind angles. Observation of plume behavior suggests that SE and SW wind approach angles develop flow fields about the plant buildings which encourage plume downwash. These orientations of the wind to the plant complex seem to develop a venturi-like behavior between the boiler units. As a result of the insuing low pressure region the plumes from Unit 1 are swept to the surface very near the plant and gases are sucked upwind into the center of the plant area.

At low wind speeds the plume lofts high above the separation cavity and aerodynamic wake generated by the power plant complex. The gas behaves as a plume released at an elevated point and is convected well downstream. As the wind speed increases (see Fig. 4-4) the stack effluent plume is bent over and behaves as though it were released at increasingly lower effective heights. At a sufficiently large free stream velocity the plume intermittently entrains behind the stack itself and the plume intersects the building wake. For such a short stack at high wind speeds the plume becomes entrained in the building complex cavity. Entrainment, as utilized herein, will be understood as the presence of any of the gas released from the stack in the power station cavity. A small amount of entrainment usually first occurs under conditions where the gas plume follows the cavity separation streamline to the downstream cavity stagnation point from which it diffuses upstream into the cavity proper. Downwash will be understood as severe entrainment where the plume does not penetrate the separation streamline but rather ventilates directly into the cavity region. A decrease in load from full to one-half has the same effect on the plume behavior as an increase in wind speed. In general lower load aggravates plume behavior; however one must consider the reduced pollutant burden in any assessment of the net significance. Figure 4-3 displays the effect of change in load for Unit 1, wind angle SW, when the mean effective wind speed is 15 mph.

Since the Unit 1 stack diameter is fairly large and the exit velocity is modest the velocity ratio R drops below 1.5 for most combinations of wind speed and load studied. As a result downwash behind the stack body is probable; this effect tends to aggravate pollution levels in the vicinity of the plant. It is instructive to consider the plume behavior for both instantaneous effluent boundary location and when averaged over a larger time period. In an instantaneous sense a plume may contact the ground yet result in rather low ground average concentrations. The longer averaging time tends to emphasize locations beyond which extensive ground contact will occur.

The observed "touchdown" distances evaluated from the flow visualization tests are summarized in Table 4-3. Touchdown is defined during observation as that point where the plume encounters the ground more than 10 percent of the time. Such an interpretation is necessarily qualitative but different observers do not vary by more than

500 ft. Smoke photographs tend to confirm the initial opinion. Complete sets of still photographs supplement this report. Color motion pictures have been arranged into titled sequences and the sets available are summarized in Table 4-3.

4.4 Test Results: Concentration Measurements

Turbulent diffusion of gaseous effluent released for three different stack heights was studied. Propane concentrations at ground level were measured at distances equivalent to 500 ft to 5000 ft downwind.

Twenty-five samples were taken over the model distributed at ground level over the topography in the matrix shown in Fig. 3-6. The stack for Unit 1 was sometimes displaced to the right or left of the concentration grid centerline, the zero coordinate rests due west of Unit 1 stack centered between Unit 1 and 2 boilers. All concentration data have been converted to the prototype scale levels as explained in Section 3.5.1. The data is recorded herein in dimensional form as $\frac{\chi V_a}{Q}$ where χ is the concentration over the assumed equivalent averaging time for laboratory measurements, Q is the source strength, and V_a is the mean wind velocity at stack height (250 ft). The source flow rate and thermal condition assumed for each stack and load condition are summarized in Tables 4-1 and 4-2. Data in Table 4-1 were provided by Southwestern Public Service Company.

The results for various loads, wind directions, and wind velocities are presented in Table 4-5. Sample positions shown in the tables are located on the definition sketch (Fig. 3-6). The maximum concentration measured and its respective downwind location for each situation has been gathered together in Table 4-4.

A series of figures have been prepared from the bulk data to enable some general conclusions to be made concerning the influence of wind approach angle, load, and wind velocity on the plume behavior over the Harrington Power Station model. The influence of wind approach angle for Unit 1 is displayed in Fig. 4-5. Plume downwash is apparently enhanced for winds approaching the plant from the SE and SW wind directions. Once entrained into the wake however, the plume dispersion rate seems very similar. Wind speed or load variation appears to effect the plume trajectory in a similar manner. Figure 4-6 displays the degrading influence of increased wind speed or decreased load on plume rise and subsequent ground level concentrations.

5.0 TEST PROGRAM AND RESULTS: UNIT 2

5.1 Test Program

The test program consists of (1) a qualitative study of the flow field around the power plant by visual observation of the smoke plume trajectory released from the stacks, and (2) a quantitative study of gas concentrations produced by the release of a propane tracer from the stacks. The test conditions are summarized in Table 5-2. Angular locations of the approach winds are referred to in terms of angles from a nominal north. Downwind distances refer to lengths as measured from the center of the complex as marked in Fig. 3-6. Unless otherwise noted, the term wind velocity refers to the velocity in the undisturbed free stream at an equivalent height of 250 feet; however, a velocity at any reference height is available by referring to the velocity profiles (Fig. 3-7).

5.2 Test Results: Characteristics of Flow

All the experiments were carried out in the MWT over the range of conditions shown in Table 5-2. The atmospheric boundary layer was modeled to produce a velocity profile equivalent to flow typical of irregular terrain. Figure 3-7 shows the development of the velocity profile over the model for a neutral situation. No comparison of model velocity data with that in the prototype is possible because the latter is not available over a range of height. However, as the model velocity profiles were carefully produced over roughness tailored to reflect the characteristics of the site, it is expected that the prototype flow is adequately represented in the model. The power law exponent for the upstream velocity profile was 0.13.

5.3 Test Results: Visualization

The test results consist of photographs and sketches showing the general nature of airflow and diffusion in the vicinity of the power station (Figs. 5-1 to 5-6). A general understanding of wake and cavity flows is necessary for an interpretation of the plume behavior (see Halitsky, 1963).

The sequences of photographs shown in Figs. 5-1 and 5-2 show side views of the behavior of a smoke plume released from Unit 2 for 50 percent load at 15 mph for various wind angles. Since Unit 2 stack sets some distance from the tall boiler units of the complex the plume is not strongly influenced by the immediate cavity and wake of these buildings. Nevertheless it was the opinion of those observing the visualization experiments that plumes spread more rapidly downward to the surface for wind approach angles from the W, NW, and SW. In no case did the plume appear to travel upwind on the ground surface or become directly entrained into the building complex wake cavity.

At low wind speeds the plume lofts high above the separation cavity and aerodynamic wake generated by the power plant complex. The gas behaves as a plume released at an elevated point and is convected well downstream. As the wind speed increases the stack effluent plume is bent over and behaves as though it were released at increasingly lower effective heights. At a sufficiently large free stream velocity the plume intermittently entrains behind the stack itself (see Fig. 5-4) and the plume may intersect the building wake. For a short stack at high wind speeds the plume may become entrained in the building complex cavity. Entrainment, as utilized herein, will be understood as the presence of any of the gas released from the stack in the power station cavity. A small amount of entrainment usually first occurs under conditions where the gas plume follows the cavity separation streamline to the downstream cavity stagnation point from which it diffuses upstream into the cavity proper. Downwash will be understood as severe entrainment where the plume does not penetrate the separation streamline but rather ventilates directly into the cavity region. A decrease in load from full to one-half has the same effect on the plume behavior as an increase in wind speed. In general lower load aggravates plume behavior; however one must consider the reduced pollutant burden in any assessment of the net significance. Figure 5-4 displays the effect of change in load for Unit 2, wind angle W, when the mean effective wind speed is 30 mph.

As a result of low stack velocity ratio, R, resulting from the large stack diameter, low exit velocities, and range of wind speeds and loads examined plume downwash behind the stack occurred frequently. Indeed the advantages associated with taller stacks (see Fig. 5-3) were to a large extent diminished by the progressive decrease in R which occurs with increasing wind velocities found at greater elevations.

A series of tests were performed on a 300 ft stack for Unit 2 with an exit area one-half that used in earlier tests (runs 70-81). This change increased the velocity ratio R by two for equivalent wind speed and load scenarios. Plume behavior in Figs. 5-5 and 5-6 may be compared with corresponding plates from Figs. 5-1 to 5-4. Increased stack velocity definitely decreases a tendency toward plume downwash; thus it increases effective stack height. It is instructive to consider the plume behavior for both instantaneous effluent boundary location and when averaged over a larger time period. In an instantaneous sense a plume may contact the ground yet result in rather low ground average concentrations. The longer averaging time tends to emphasize locations beyond which extensive ground contact will occur.

The observed "touchdown" distances evaluated from the flow visualization tests are summarized in Table 5-3. Touchdown is defined during observation as that point where the plume encounters the ground more than 10 percent of the time. Such an interpretation is necessarily qualitative but different observers do not vary by more than 500 ft. Smoke photographs tend to confirm the initial opinion. Complete sets of still photographs supplement this report. Color motion pictures have been arranged into titled sequences and the sets available are summarized in Table 5-3.

5.4 Test Results: Concentration Measurements

Turbulent diffusion of gaseous effluent released for three different stack heights was studied. Propane concentrations at ground level were measured at distances equivalent to 500 ft to 5000 ft downwind.

Twenty-five samples were taken over the model distributed at ground level over the topography in the matrix shown in Fig. 3-6. Since the stack for Unit 2 was sometimes displaced to the right or left of the concentration grid centerline, the zero coordinate rests due west of Unit 1 stack centered between Unit 1 and 2 boilers. All concentration data have been converted to the prototype scale levels as explained in Section 3.5.1. The data is recorded herein in dimensional form as $\frac{\chi V_a}{Q}$ where χ is the concentration over the assumed equivalent averaging time for laboratory measurements, Q is the source strength, and V_a is the mean wind velocity at stack height (250 ft). The source flow rate and thermal condition assumed for each stack and load condition are summarized in Tables 5-1 and 5-2. Data in Table 5-1 were provided by Southwestern Public Service Company.

The results for various loads, wind directions, and wind velocities are presented in Table 5-5. Sample positions shown in the tables are explained in the definition sketch in Fig. 3-6. The maximum concentration measured and its respective downwind location for each situation has been gathered together in Table 5-4.

A series of figures have been prepared from the bulk data to enable some general conclusions to be made concerning the influence of wind approach angle, stack height, load, and wind velocity on the plume behavior over the Harrington Power Station model. The influence of wind approach angle for a single unit is indicated in Table 5-4, runs 25-39. Unit 2 stack is far enough from the boiler that wind angle is not a dominant factor in plume behavior here. Plume downwash is apparently enhanced for winds exceeding 30 mph for all loads. Once entrained into the wake however, the plume dispersion rate seems very similar. Wind speed or load variation appears to effect the plume trajectory in a similar manner. Figure 5-8 displays the degrading influence of increased wind speed or decreased load on plume rise and subsequent ground level concentrations.

Increase in stack height definitely provides some site protection. Figure 5-7 depicts the advantages of increased stack height with respect to ground level concentration profiles. Increase of the units stacks from 300 to 350 ft decreases maximum observed concentration by about 25 percent. A further increase in stack height to 400 ft reduces the ground concentrations to about 50 percent of the maximums observed for a 300 ft stack. Unfortunately the advantage of added stack height is degraded by the strong stack downwash associated with low exit velocities. A series of measurements were made for conditions which increase R by two in runs 71-81. A marked improvement is noted on Fig. 5-8 and photograph Figs. 5-5 and 5-6.

6.0 CONCLUSIONS

The investigation was undertaken to determine the dispersion of exhaust gases released from stacks of the Harrington Power Station operated by the Southwestern Public Service Company, Texas. The primary aim of the study was to determine the optimum height of stack to utilize for a new boiler unit and effect of building-complex wake on ground-level concentration of sulfur dioxide.

On the basis of the experimental measurements reported herein, the following comments may be made:

6.1 Unit 1 Stack

1) Plumes from Unit 1 do entrain directly into the building complex cavity for a number of the wind angles, velocities, and loads studied.

2) For a 250 ft stack on Unit 1, there is significant visual evidence of ground contact within 500 ft of the plant when the wind speed exceeds 30 mph.

3) The plume-building wake influence for all plumes is a maximum for the SE and SW wind approach directions and a minimum for the E to NE orientation.

4) Concentration measurements show that maximum SO_2 ground-level concentrations of .404 ppm will result from a 250 ft stack at 50 percent load for a 15 mph and approaching from the SW.

6.2 Unit 2 Stack

1) Plumes from Unit 2 do not appear to entrain directly into the building complex cavity for any wind angle, velocity, load, or stack height considered.

2) For a 27 ft I.D. stack significant stack downwash occurred for most wind velocity and load combinations studied. This influence decreased the value of increasing stack height since downwash was more frequent at the higher velocities found at greater elevations.

3) For a 19 ft I.D. stack the probability of stack downwash decreased due to the increased momentum of exhaust gases at stack exit.

4) Concentration measurements show that maximum SO_2 ground-level concentrations of .210 ppm will result from a 300 ft 27 ft diameter stack at 50 percent load for a 30 mph wind approaching from the SW.

Since specific maximum source levels may vary depending on the source of coal or the load, dimensional prediction tables have been prepared in the manner of Pasquill for the Harrington Power Station configuration. If percent frequency of winds and stability conditions at various wind approach angles are known for the Harrington site, average annual concentrations or 24-hour averages including the effects of wind angle frequency distribution may be calculated in the manner of Turner (1969) or Sherlock and Stalker (1940). If one desires the meteorological significant situations such as looping, fanning, fumigation, or trapping one may combine the experimental results developed herein with the expressions suggested by Bierly and Hewson (1962) or Slade (1968, Chapter 3, Section 3.1.5).

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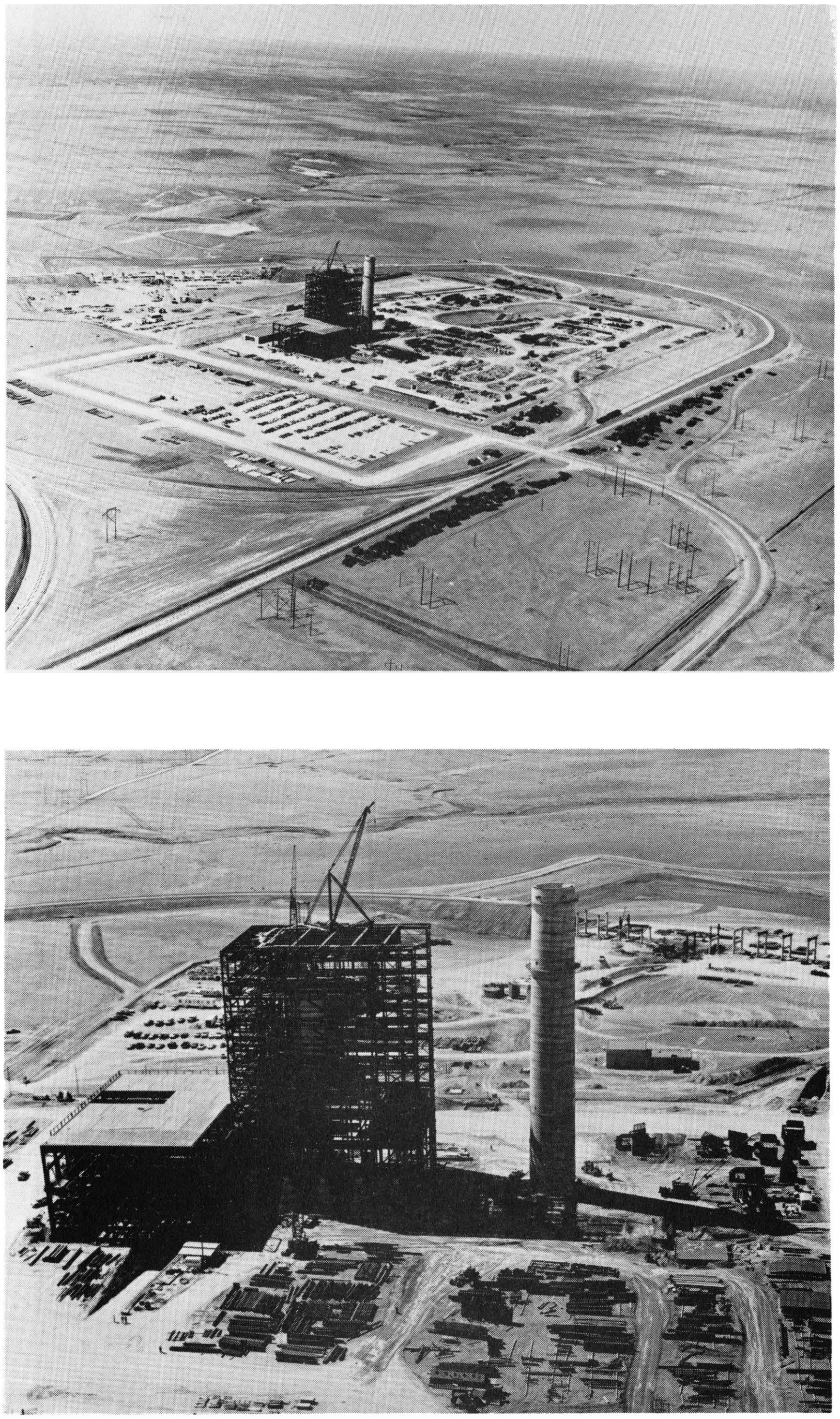


Figure 3-1. Views of Harrington Power Station Site.

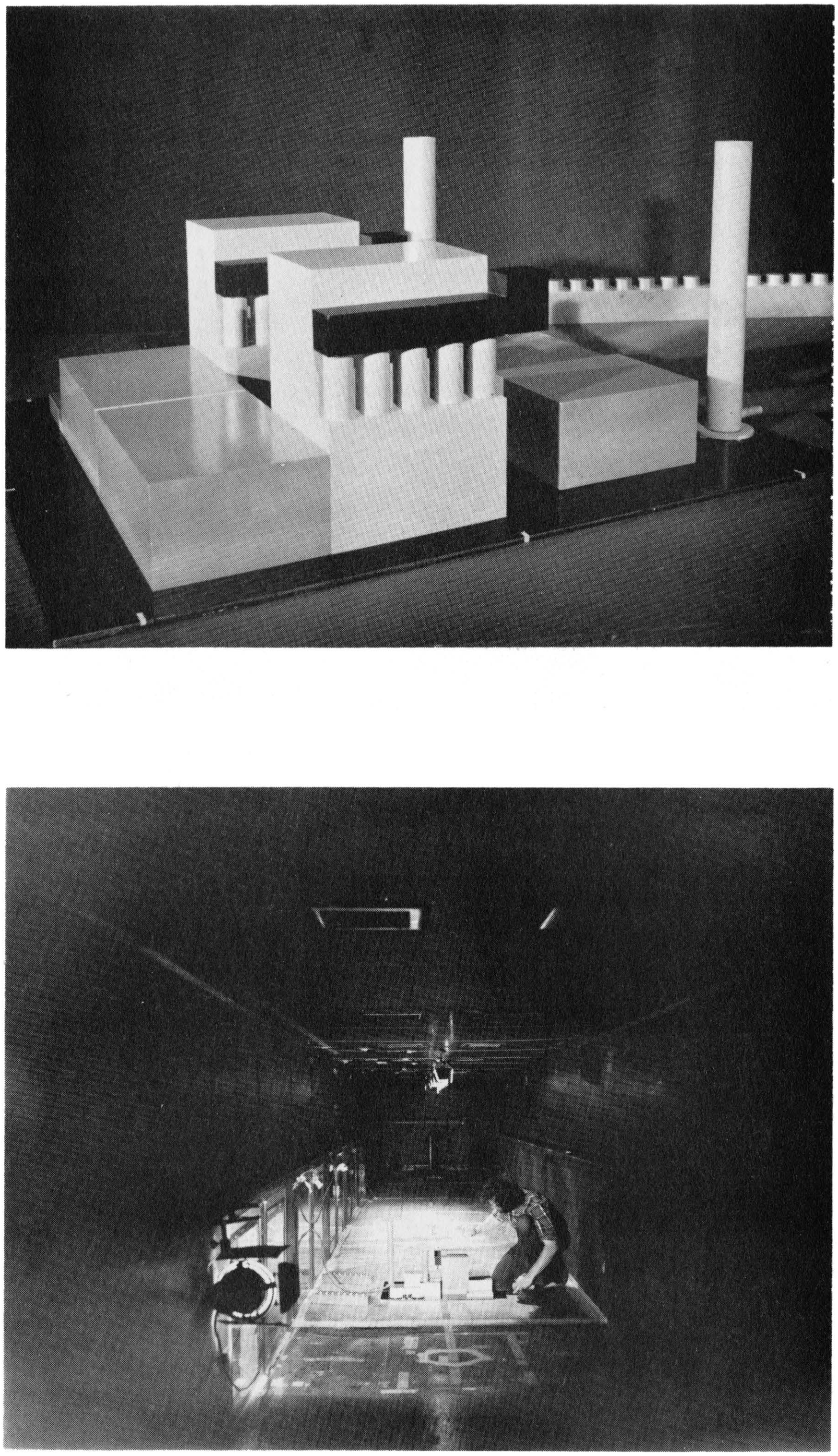
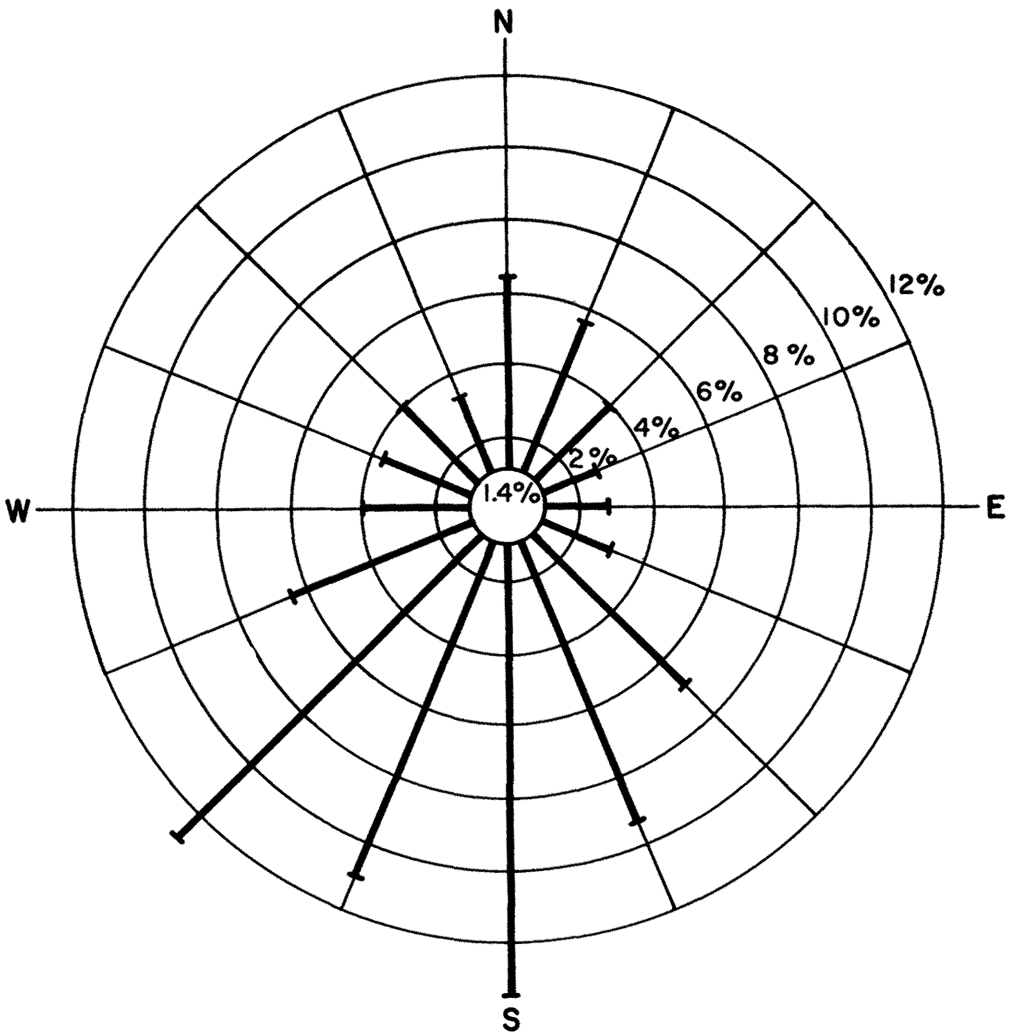


Figure 3-2. Harington Power Station, Model Scale 1:250.



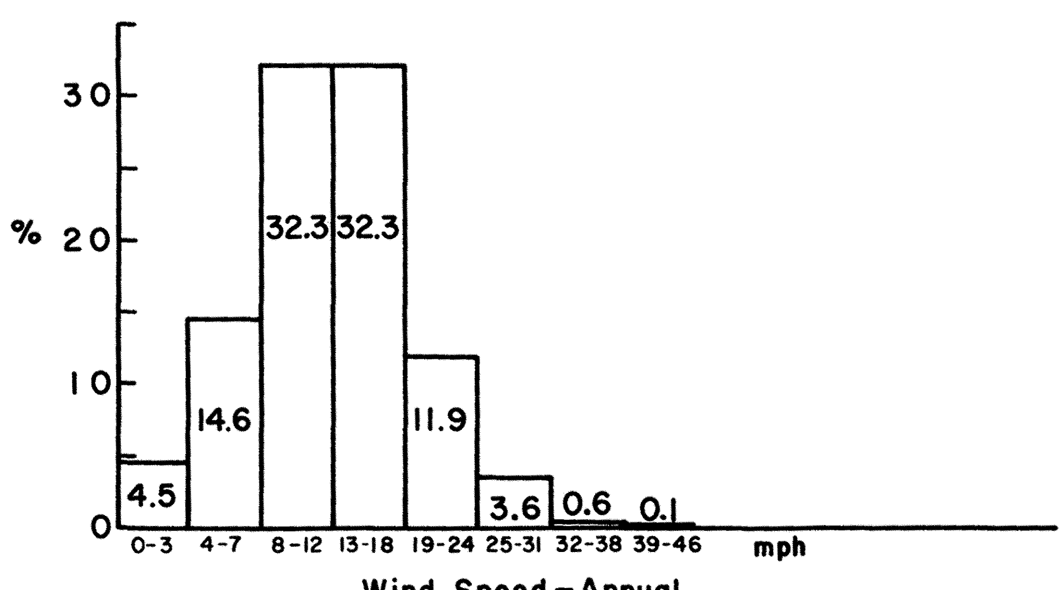


Figure 3-3. Wind Rose and Wind Speed Occurrence Amarillo, Texas (Haragan, 1974).

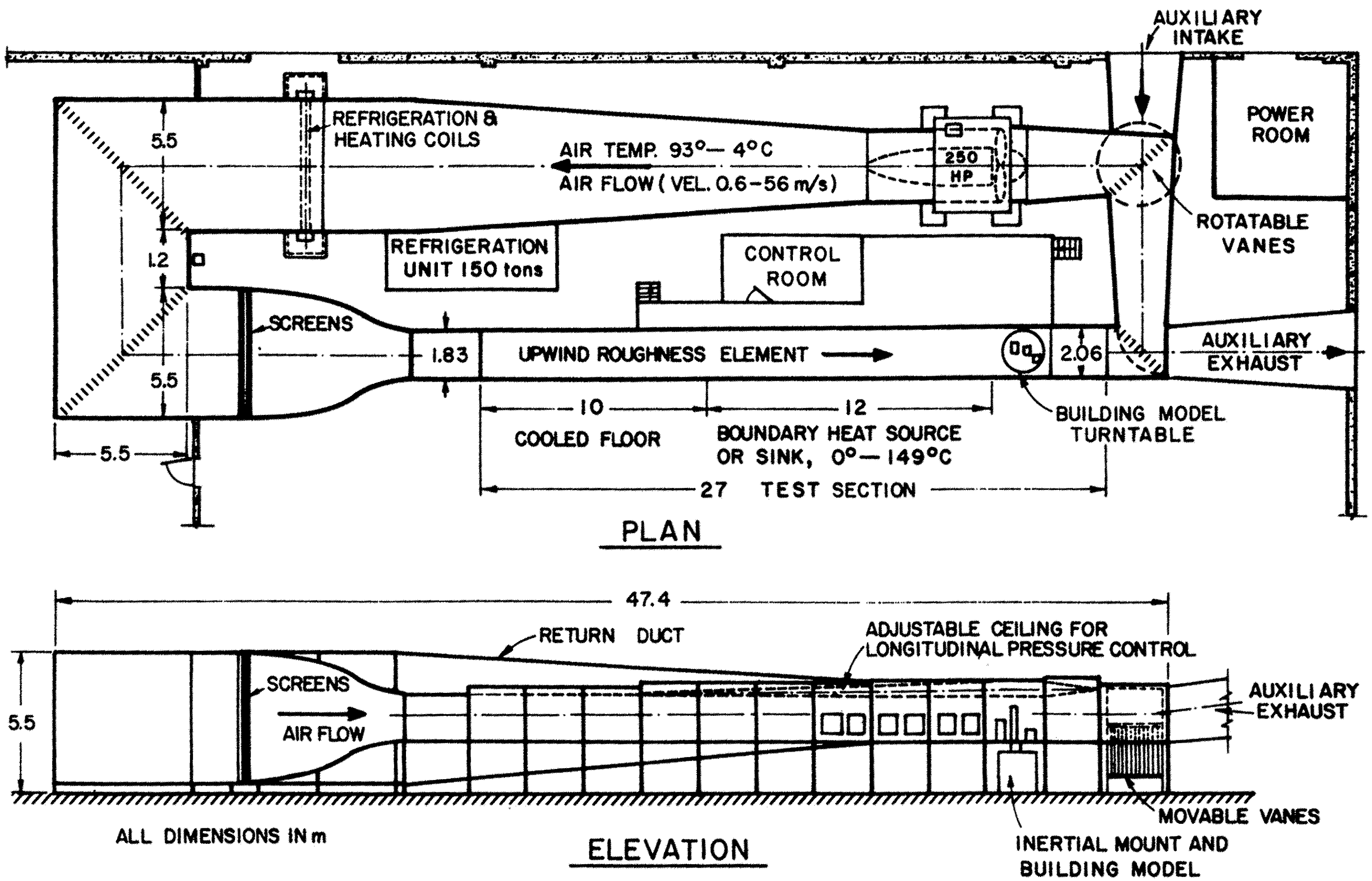


Figure 3-4. METEOROLOGICAL WIND TUNNEL (Completed in 1963)
FLUID DYNAMICS & DIFFUSION LABORATORY
COLORADO STATE UNIVERSITY

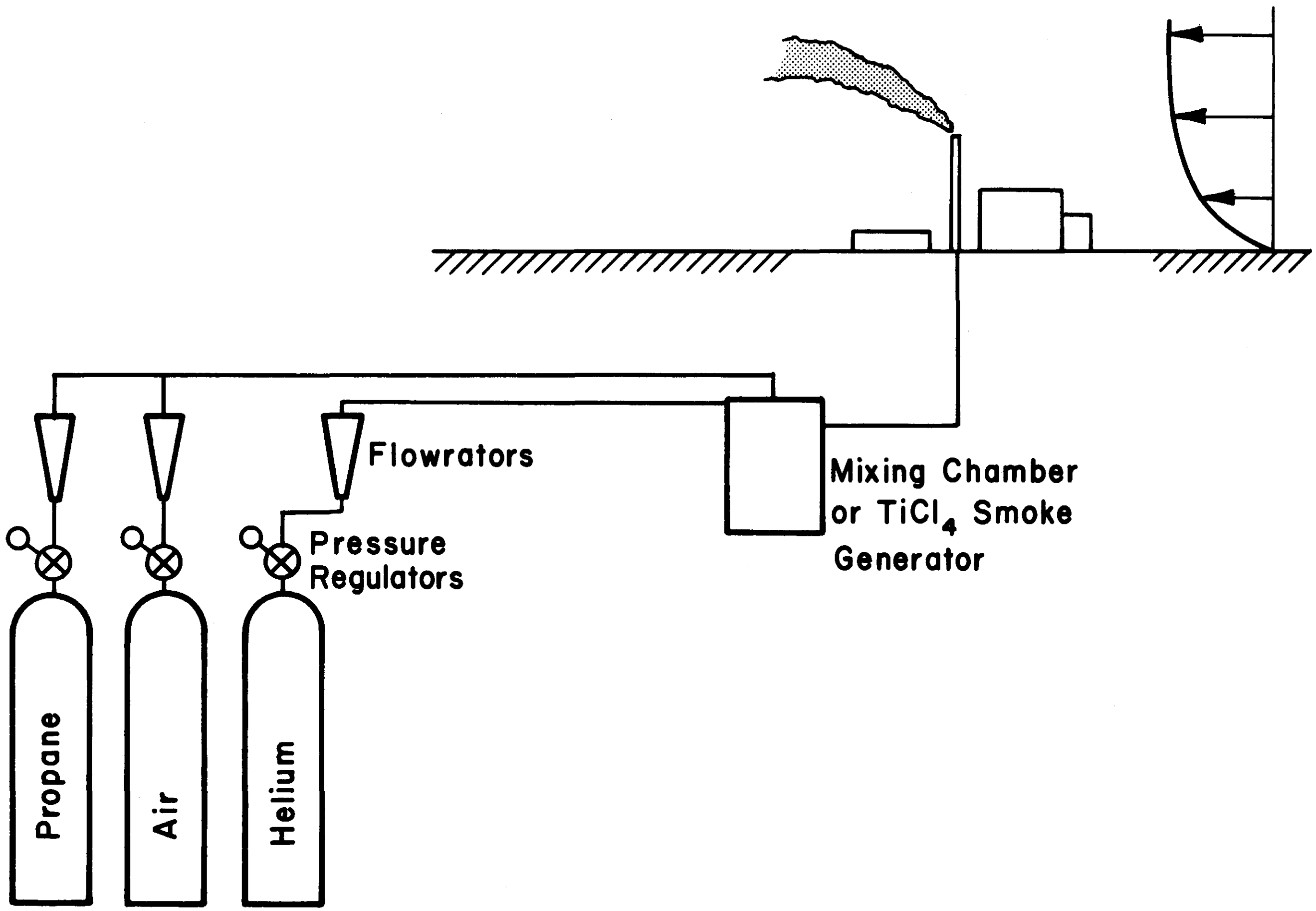


Figure 3-5a. Model Gas Source and Visualization System.

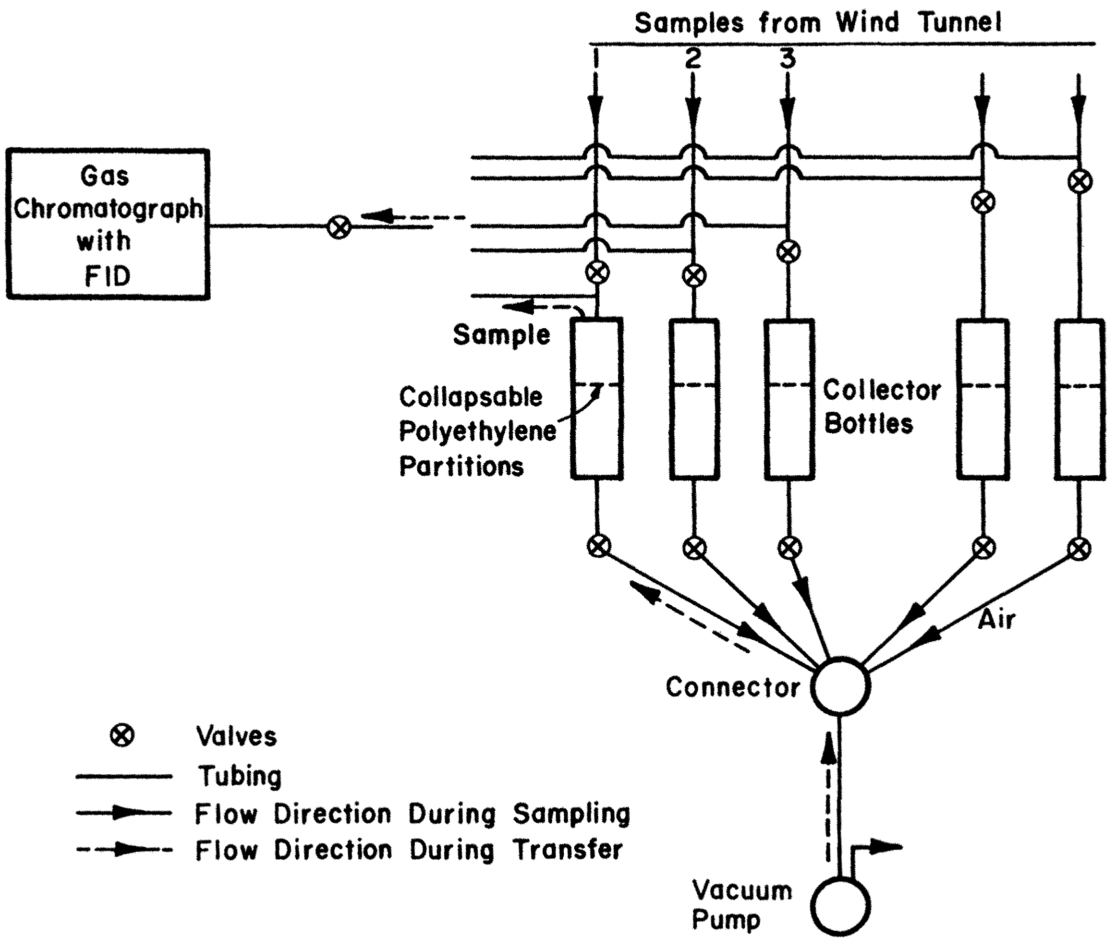


Figure 3-5b. Tracer Gas Sampling and Analysis System.

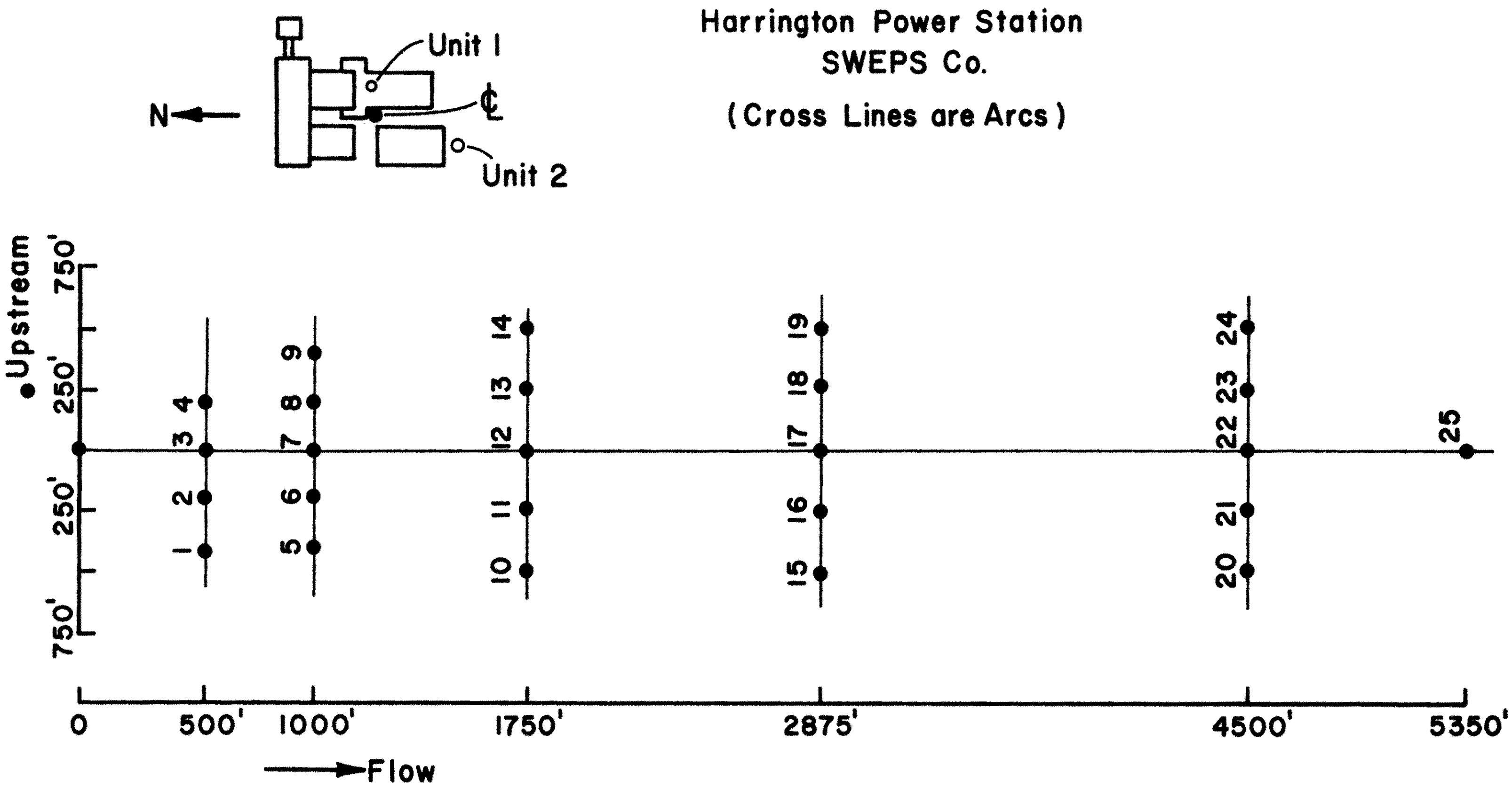


Figure 3-6. Coordinator for Concentration Measuring Locations in Meteorological Wind Tunnel.

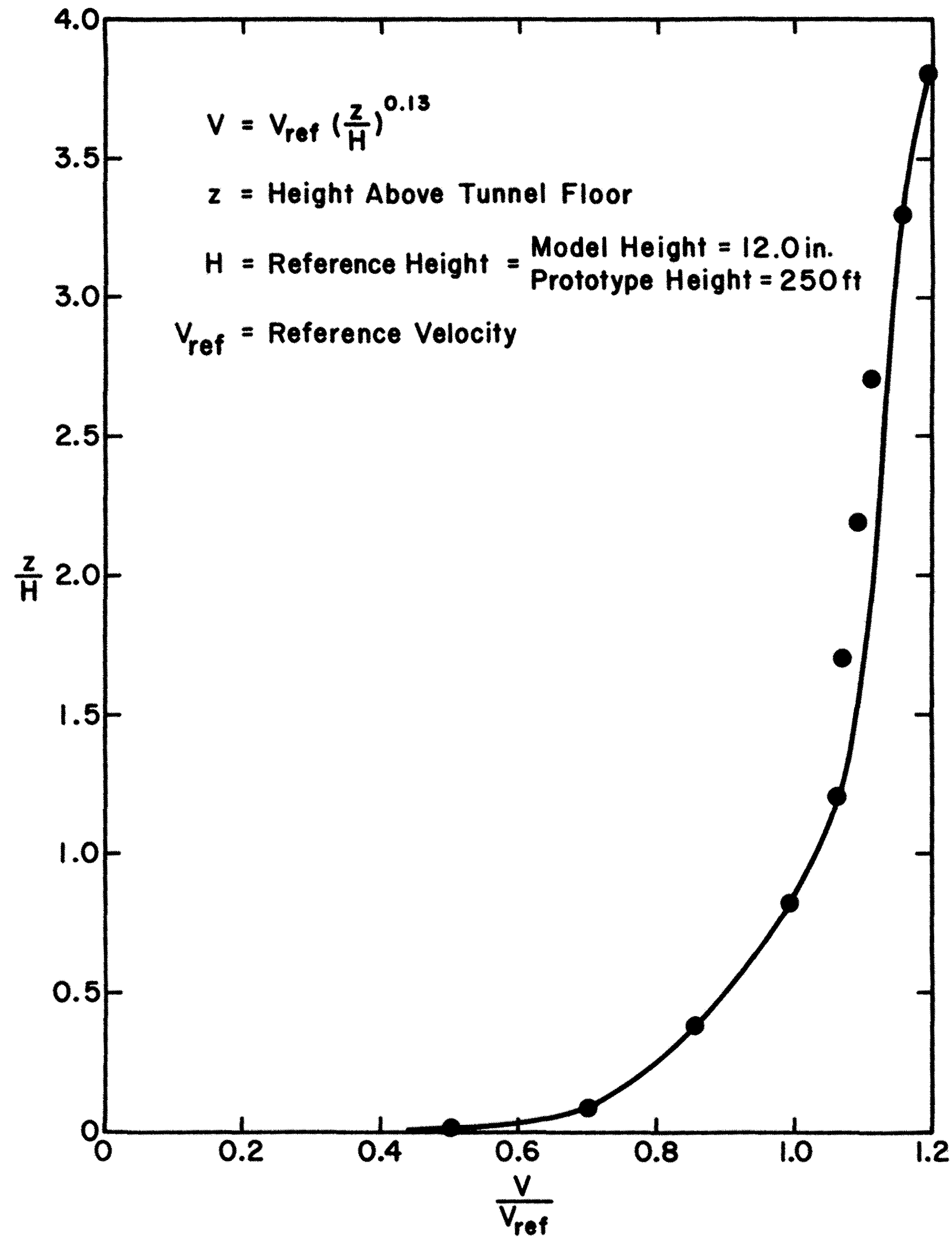


Figure 3-7. Approach Velocity Profiles, Neutral Flow, Meteorological Wind Tunnel.

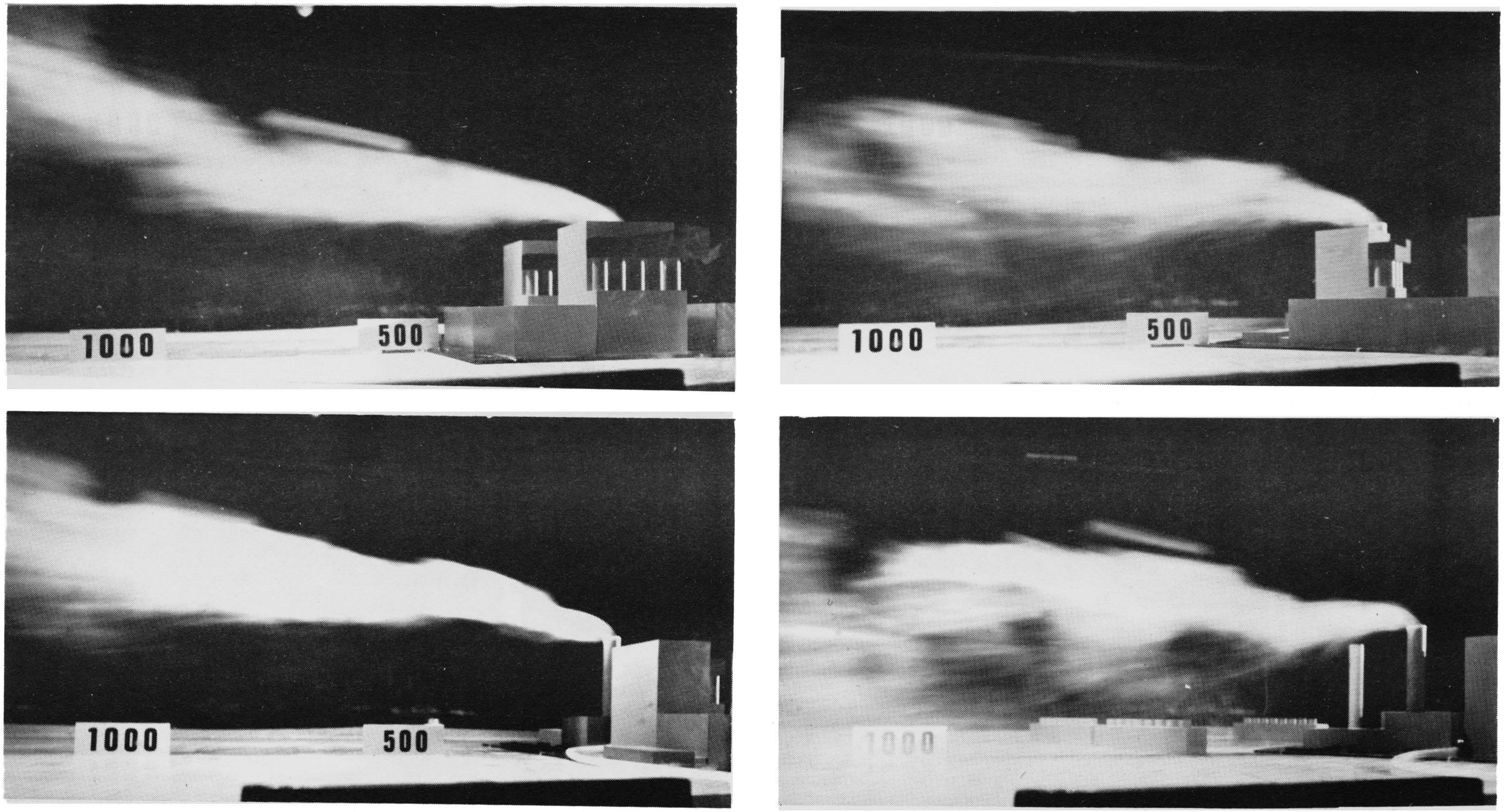


Figure 4-1. Flow Visualization: Unit 1, 250 ft Stack, 15 mph, 50% Load, N, NE, E, SE Wind Directions

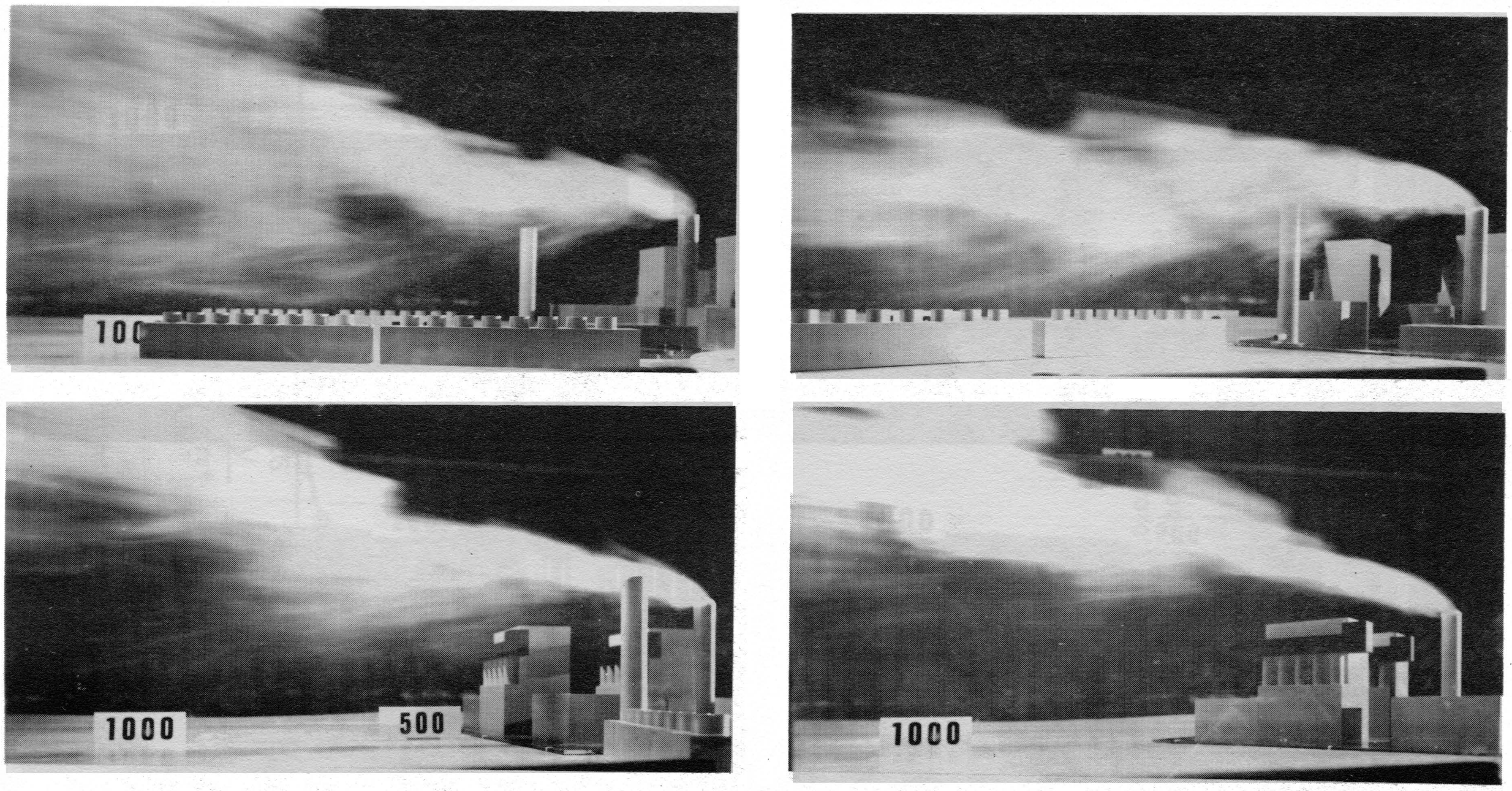


Figure 4-2. Flow Visualization: Unit 1, 250 ft Stack, 15 mph 50% Load, S, SW, W, NW Wind Directions

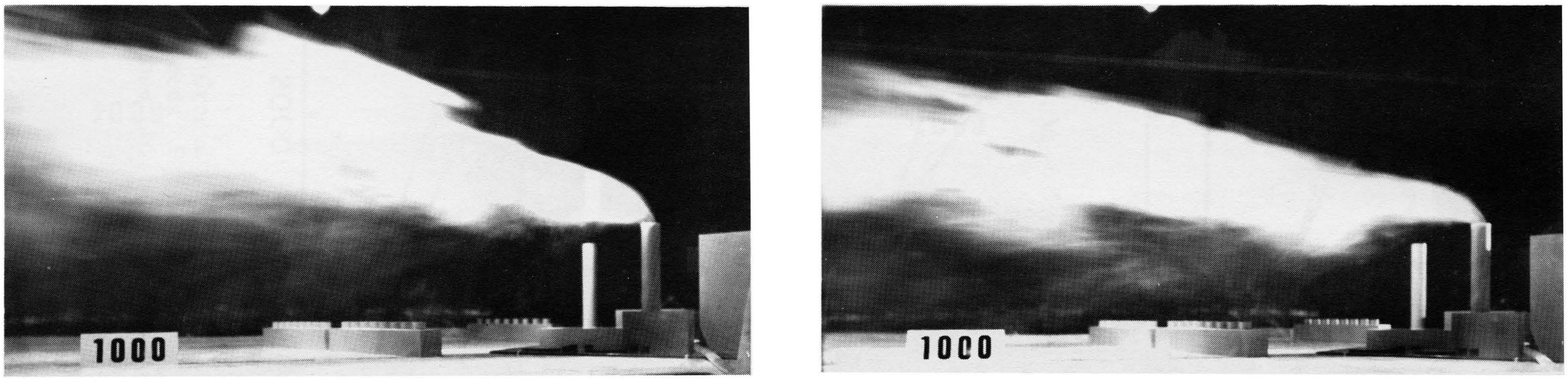


Figure 4-3. Flow Visualization: Unit 1, SW Wind Direction, 250 ft Stack 15 mph, 50, 80, 100% Load

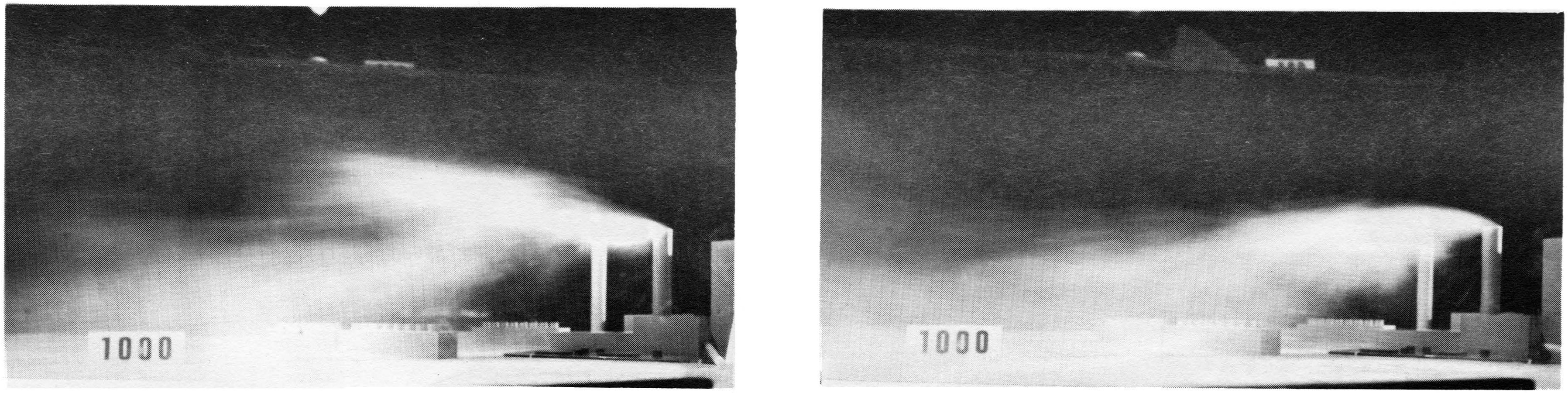


Figure 4-4. Flow Visualization: Unit 1, SE Wind Direction, 50% Load, 250 ft Stack, 15, 30, 45 mph

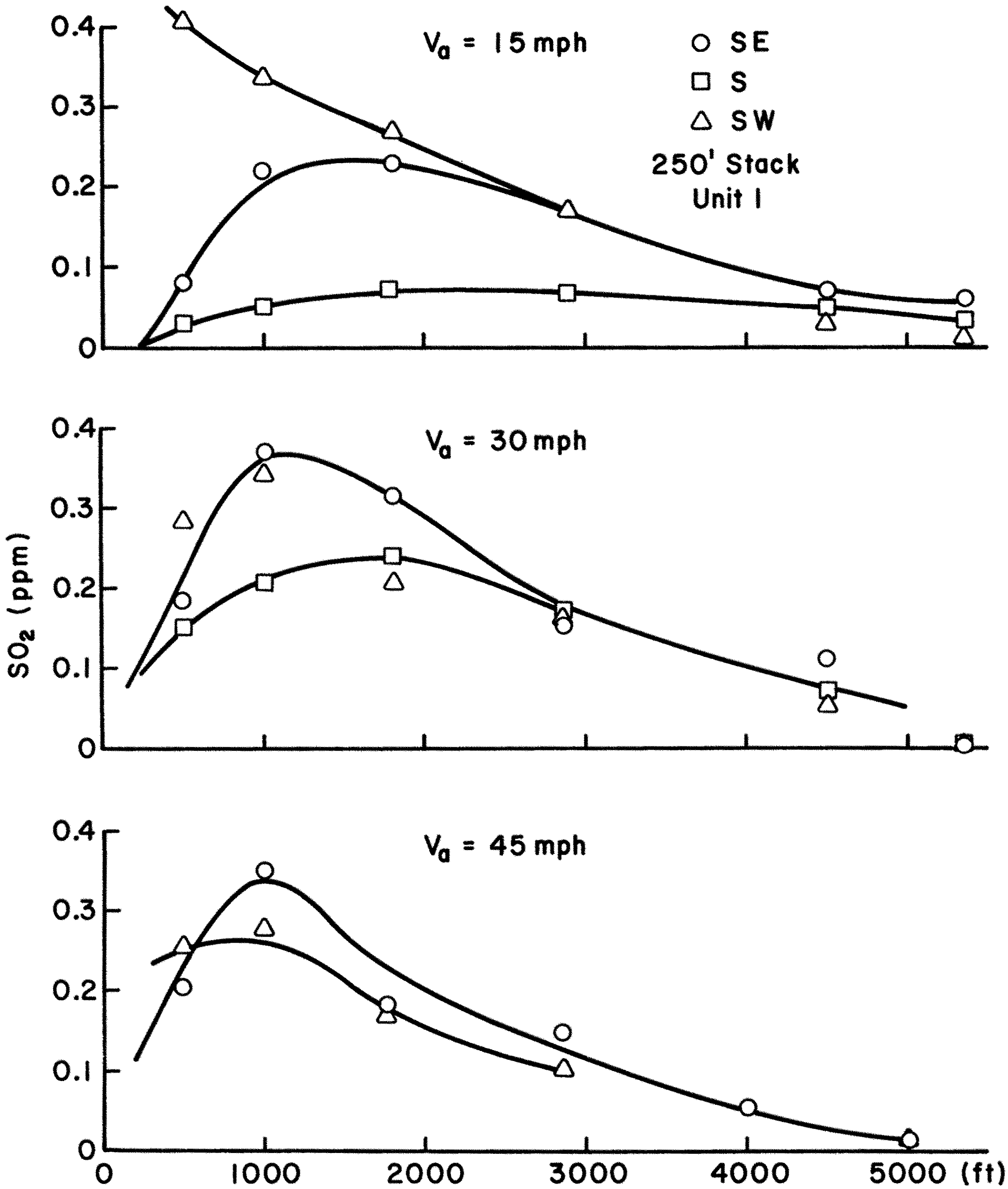


Figure 4-5. Maximum Ground Concentration Profiles for Various Wind Speeds, SE, S, SW Wind Approach Angle and for a 50% Load Emitted from Unit 1 Stack.

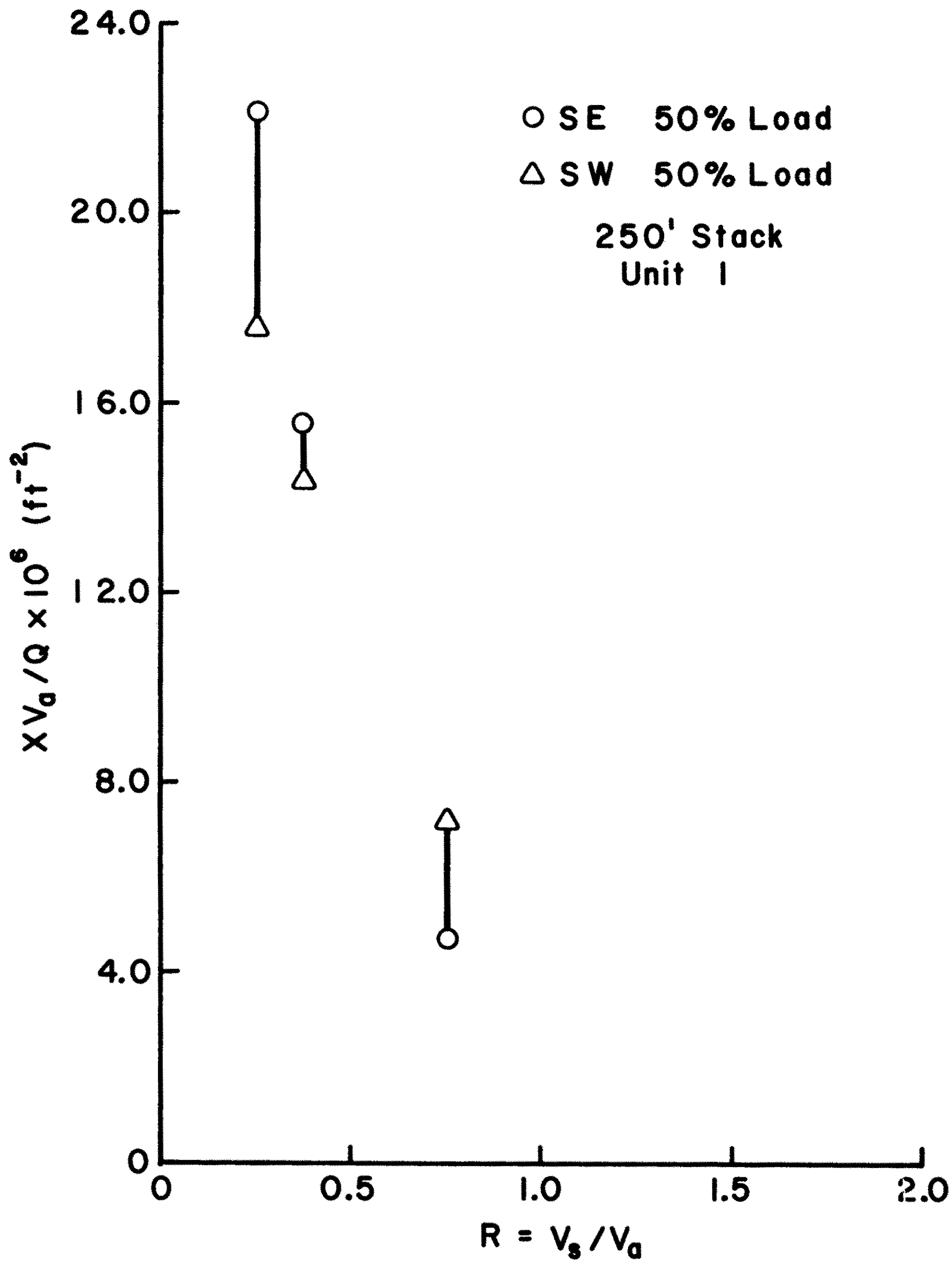


Figure 4-6. Maximum Ground Concentration as Influenced by Load and Wind Speed, SE, SW Wind Directions.

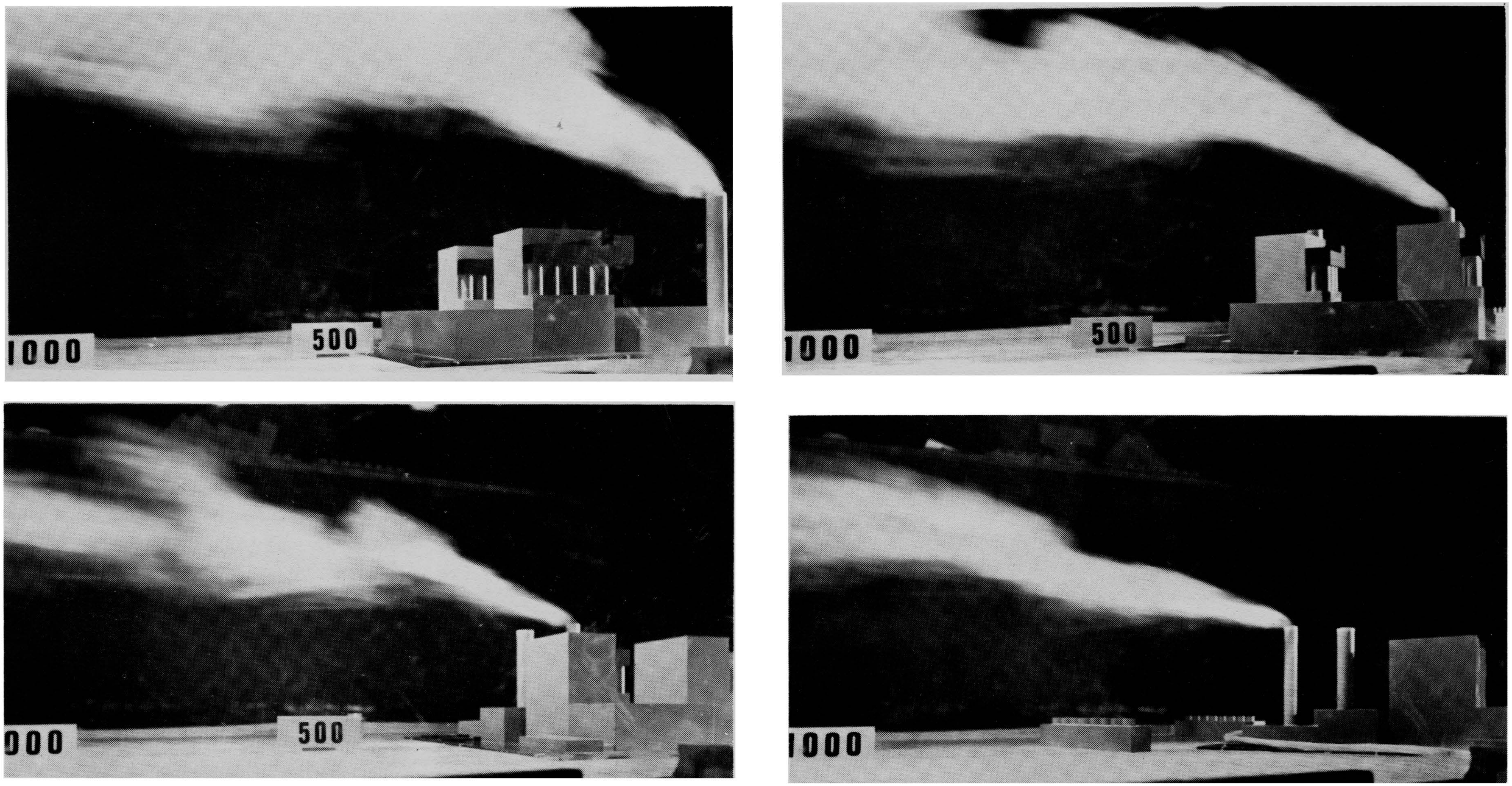


Figure 5-1. Flow Visualization: Unit 2, 300 ft Stack, 50% Load, 15 mph, N, NE, E, SE Wind Directions

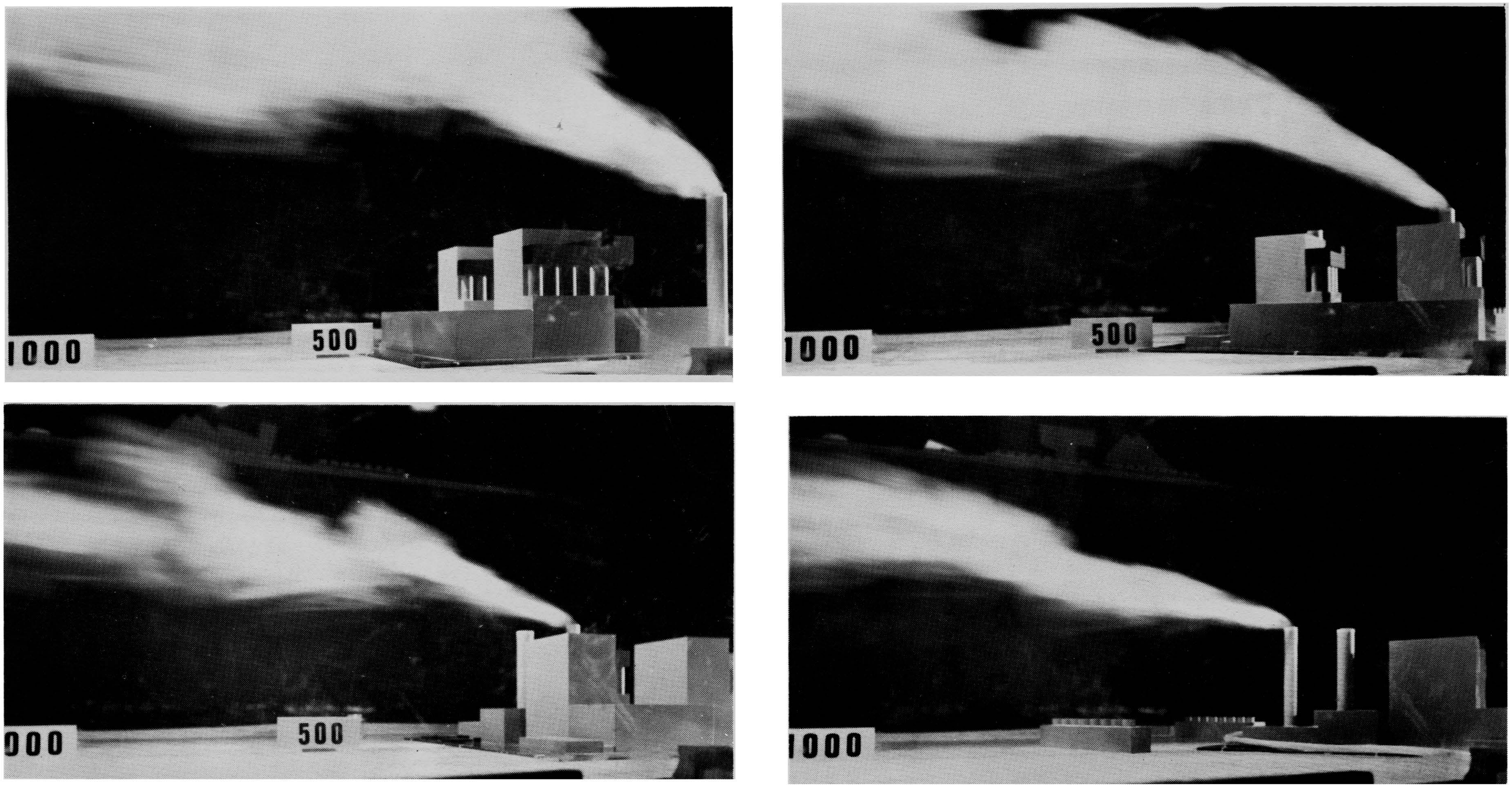


Figure 5-2. Flow Visualization: Unit 2, 300 ft Stack, 50% Load 15 mph, S, SW, W, NW Wind Directions

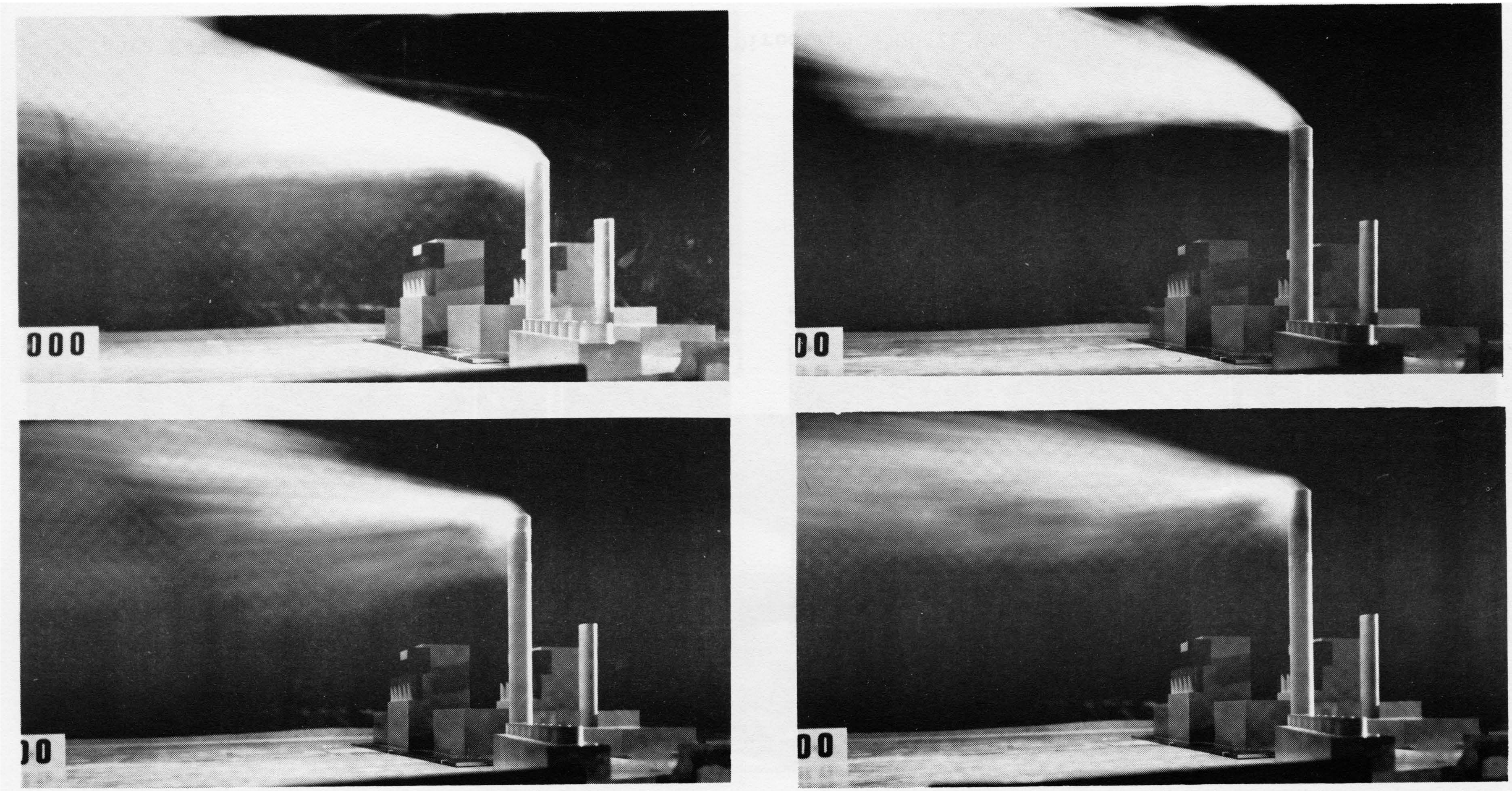


Figure 5-3. Flow Visualization: Unit 2, 80% Load, 30 mph, W Wind Direction, 300, 350, 375, 400 ft Stacks

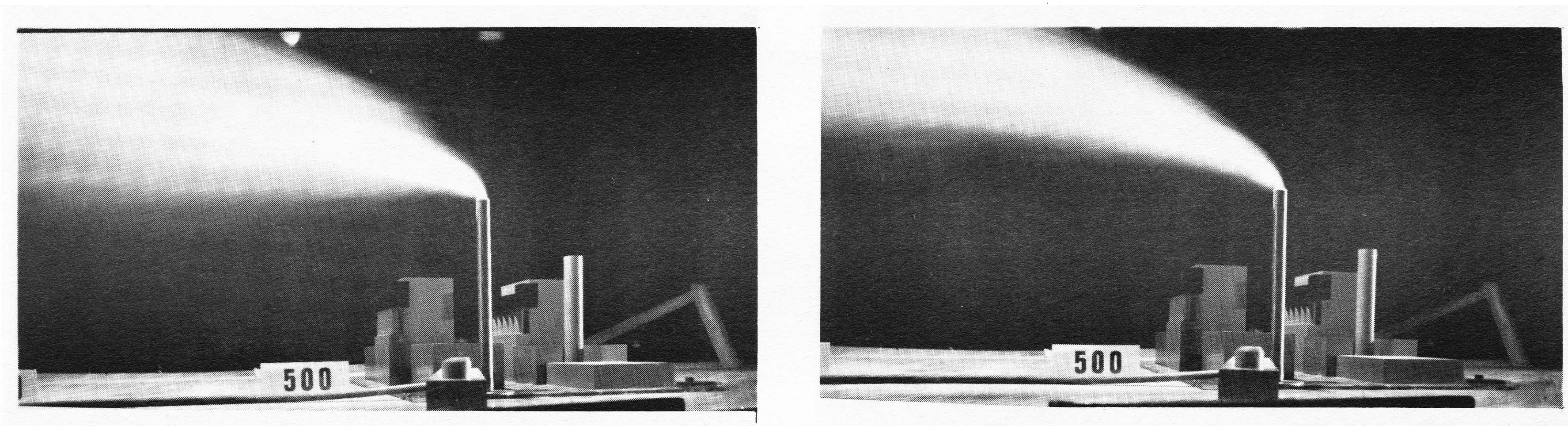
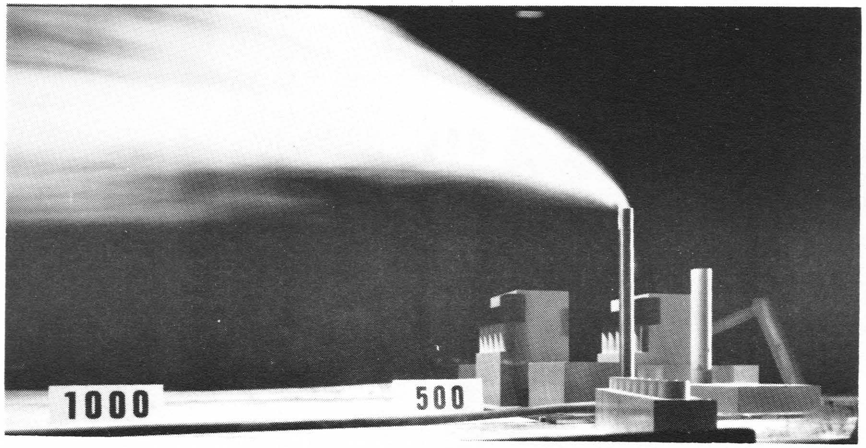
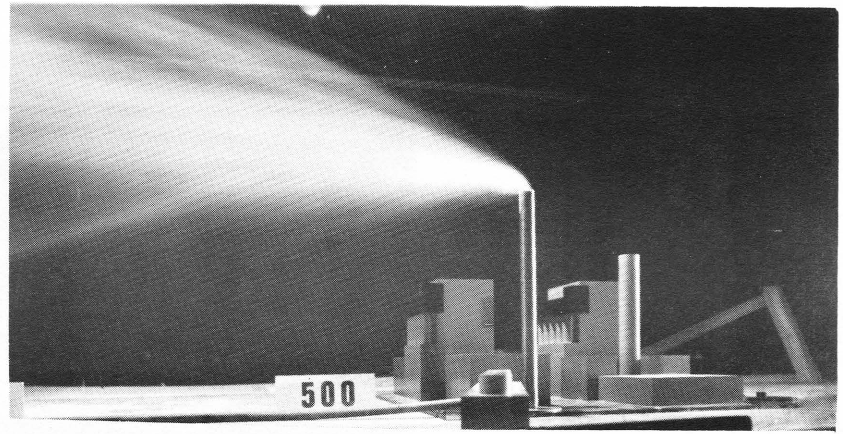
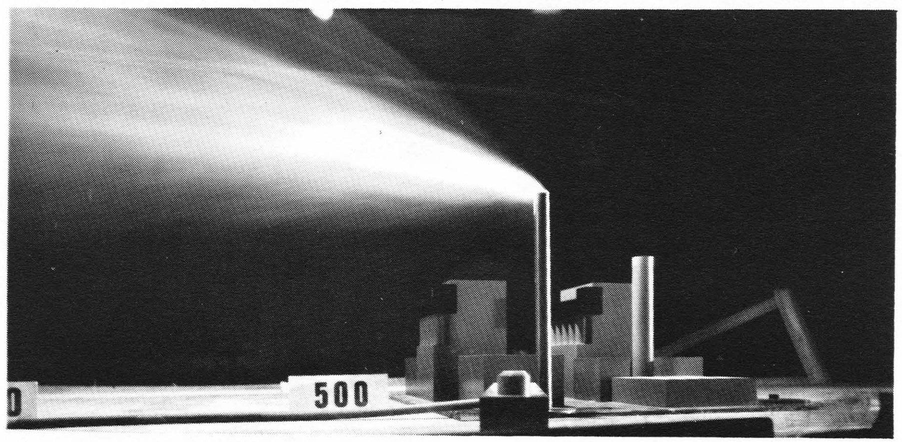


Figure 5-4. Flow Visualization: Unit 2, W Wind Direction, 300 ft Stack, 30 mph, 50, 80, 100% Load


1000
500


500


500

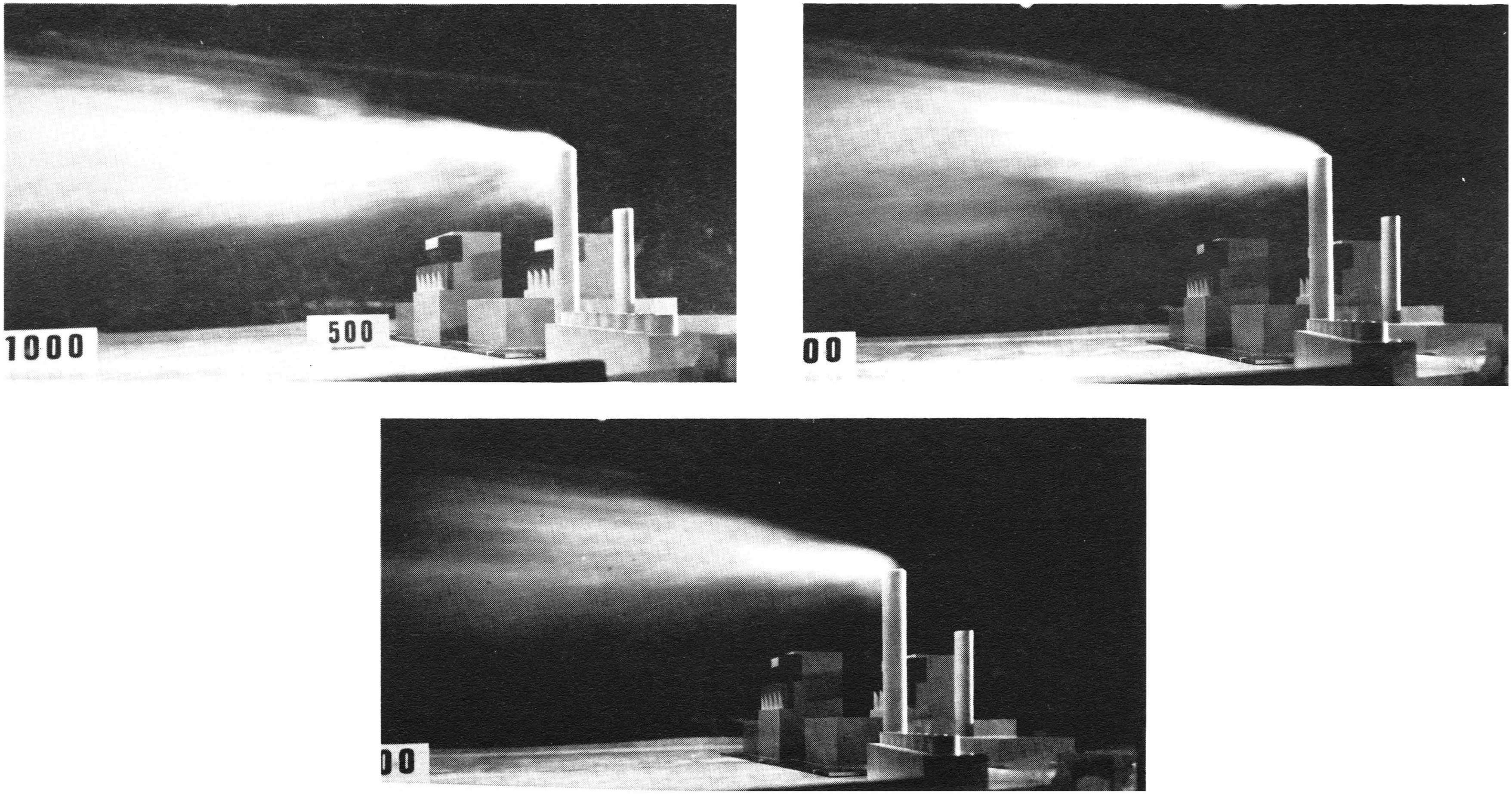


Figure 5-6. Flow Visualization: Unit 2, W Wind Direction, 300 ft Stack, 30 mph, 50, 80, 100% Loads

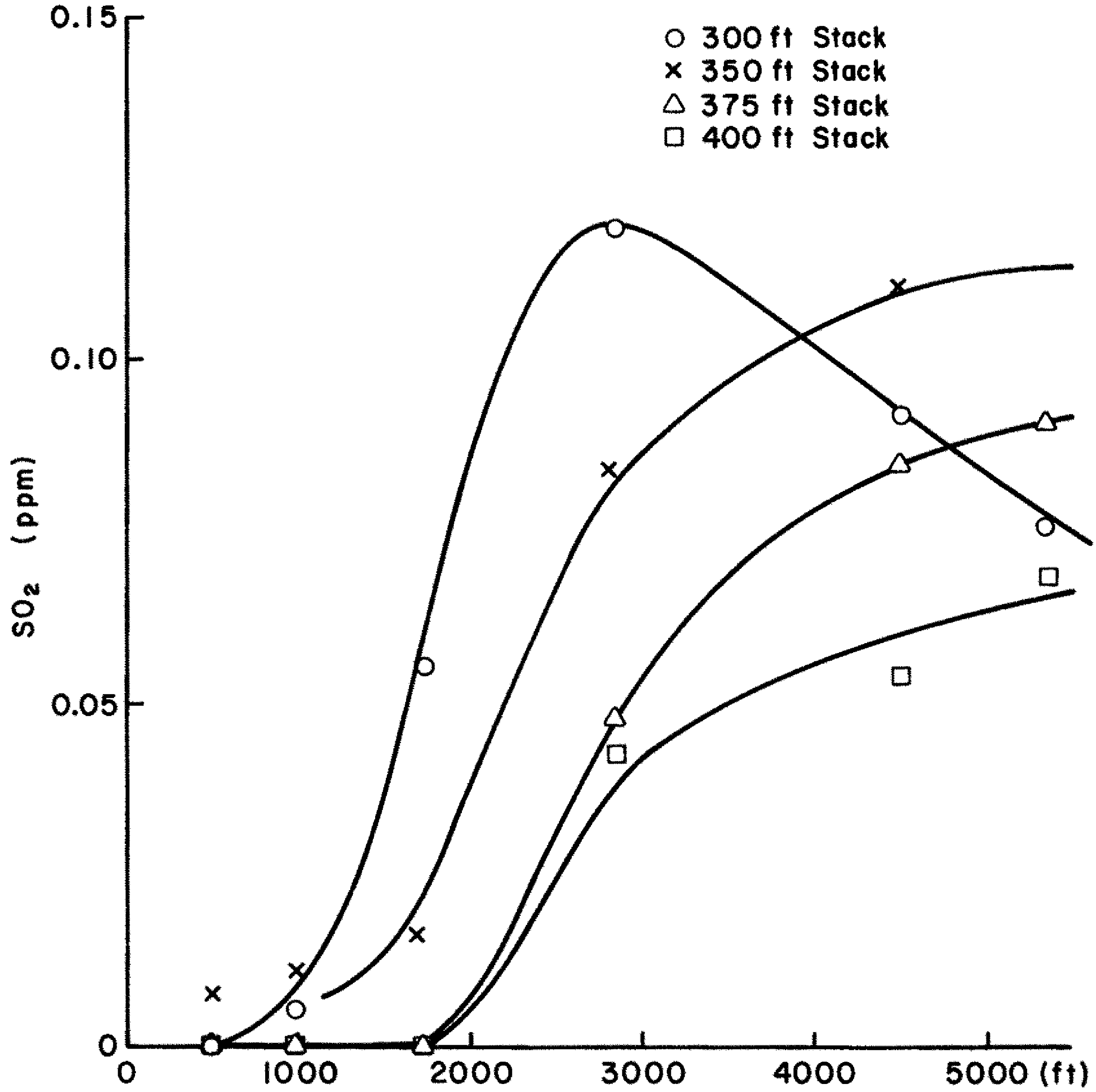


Figure 5-7. Maximum Ground Concentration Profiles for Various Stack Heights, 80% Load and W Wind Approach Angle.

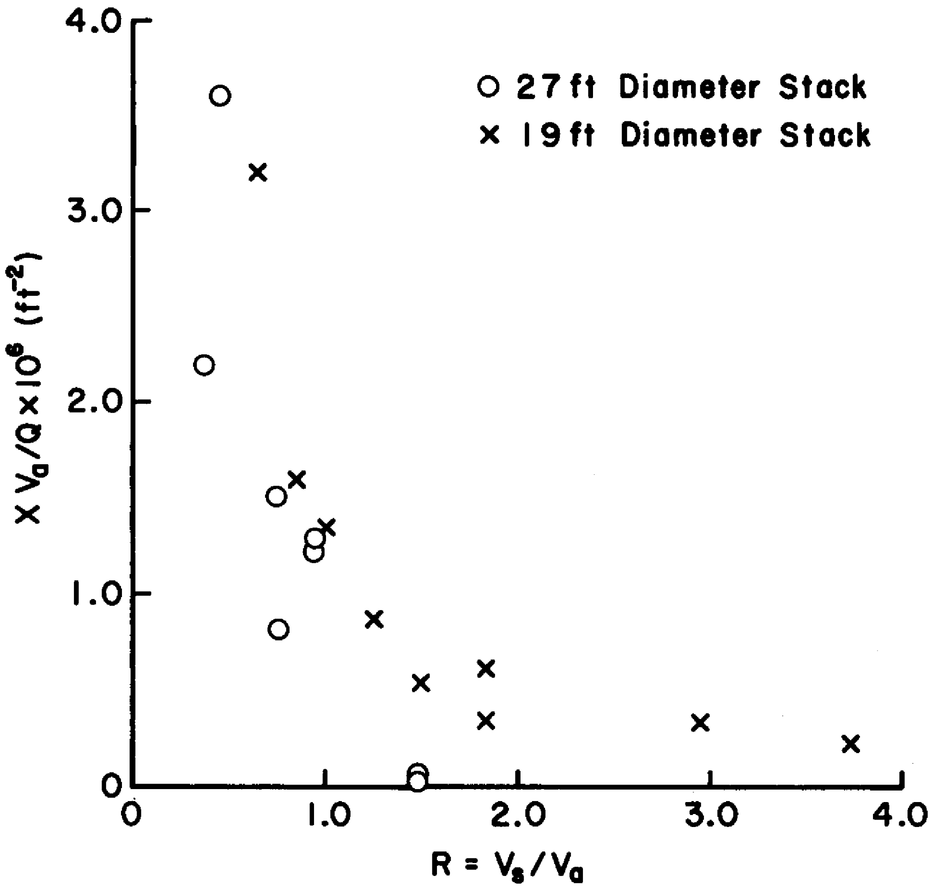


Figure 5-8. Maximum Ground Concentration as Influenced by Load and Wind Speed, NW, W Wind Approach Angle, 300 ft Stack.

Table 3-1. Instrumentation and Materials Employed

Camera	movie:	Bolex 16 mm camera lens
	still:	Speed Graphic Camera 4" x 5" & Hasselblad 2" x 3"
Film	movie:	Extachrome - 7242, ASA 125 - Forced developed ASA 500
	still:	Tri-X-Pan-4164 Kodak film, Polaroid
Exposure	movie:	f-1.9, 18 frames per second
	still:	f = 8-11, t = 1/30 sec or 1 sec
Flow Meters		Fischer & Porter Co. Precision flow rator No B4-21-10 float B SVT-45

Concentration System

Hewlett-Packard Model 5711-A Gas Chromatograph; dual flame ionization detector; electrometer isothermal oven controller; 1/2 cc dual sampling loops.

Sampling Panels: CSU design; 16 sample volumes; transfer equipment; and flow rators.

Hewlett-Packard Integrating Digital Voltmeter Model 2401C

Velocity Control System

Trans-Sonics type 120B Equibar Pressure Meter-Serial 44801
United Sensor Pitot-Static Probe
Datametric 800-L Linear Flowmeter

Table 4-1. Prototype Emission Parameters.
Unit 1: Harrington Station*

	Load	100%	80%	50%
Stack Size (ft)		27	27	27
Stack Area (ft^2)		573	573	573
Stack Height (ft)		250	250	250
Gas Temperature (°F) @ (26.57" Hg)		160	160	160
Gas Velocity (ft/sec)		33.6	26.8	16.8
Actual Source Strength (SO_2) Q_s (gm/sec)	(50% removal)	156.0	124.5	78.0
Free Stream Velocity (ft/sec) (15,30,45 mph)		22,44,66	22,44,66	22,44,66
R		1.52,0.76,0.50	1.22,0.61,0.41	0.76,0.38,0.25
$\Delta\rho/\rho_a = (\frac{T_s - T_a}{T_a})^{\Delta}$		0.15	0.15	0.15
$Fr_s = \frac{V^2}{g\frac{\Delta\rho}{\rho_a}D}$		8.77	5.58	2.19

*Taken from tables proved by K. Ladd, August 25, 1975 and Haragan Report, July 20, 1974 (Table 3).

$^{\Delta}T_a = 68°F + 460 = 528°R$

Table 4-2. Model Emission Parameters.
Unit 1: Harrington Station

Load	100%	80%	50%
Stack size (in.)	1.30	1.30	1.30
Stack area (in.^{2})	1.33	1.33	1.33
Stack height (in.)	12	12	12
R	1.52,0.76,0.50	1.22,0.61,0.41	0.76,0.38,0.75
$\Delta\rho/\rho_a$	.150	.150	.150
Fr_s	8.77	5.58	2.19
V_{am}(ft/sec) = V_{sm}/R	1.39,2.79,4.25	1.39,2.79,4.25	1.39,2.79,4.25
V_{sm}(ft/sec)	2.13	1.70	1.06
Q_{sm}(cfm)	1.18	0.94	0.59
Mol Wts = $29(1-\Delta\rho/\rho_a)$	24.7	24.7	24.7
χ_{He_s}	0.20	0.20	0.20
χ_{Prop_s}	0.05	0.05	0.05

Table 4-3. Observed Touchdown Distances from Flow Visualization Tests (ft).

Unit 1: Harrington Station

Run	Wind Speed (mph)	Direction	Load	Stack Height (ft)	Distance to Touchdown (ft)
1	15	N	50%	250	5000+
2		NE			1000
3		E			2000 occ 3500
4		SE			500
5		S			1000
6		SW			700
7		W			1200
8		NW			1000 -- 2200
9	30	N			750
10		NE			700
11		E			500 -- 1000
12		SE			0
13		S			1000
14		SW			400
15		W			500
16		NW			500
17	45	SE			0
18		SW			500
19	15	SE	100%	250	1000 occ 2000
20			80%	250	500
21	30	SE	100%	250	0
22			80%	250	0
23	45	SE	100%	250	0
24			80%	250	0

Table 4-4. Maximum Ground Concentration (ppm) and Distance to Maximum (ft).

Unit 1: Harrington Station

Run	Wind Speed (mph)	Direction	Load	Stack Height (ft)	Distance to Maximum Ground Concentration (ft)	Maximum Concentration (~ 10 min avg)(ppm)
1	15	N	50%	250	2875	.075
2		NE			4500	.048
3		E			2875	.075
4		SE			1000	.220
5		S			1750	.078
6		SW			500	.404
7		W			5350	.057
8		NW			1000	.115
9	30	N			1000	.310
10		NE			1750	.175
11		E			1750	.150
12		SE			1000	.367
13		S			1750	.242
14		SW			1000	.283
15		W			1750	.205
16		NW			1000	.403
17	45	SE			1000	.346
18		SW			1000	.274

Table 4-5.

RUN NUMBER 1
UNIT NUMBER 1
WIND DIRECTION N
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 78
STACK LOCATION (FT) X= 0
Y= 100
STACK HEIGHT (FT) 250
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	.277	34.63	.0130
500	-210	0.000	0.00	0.0000
915	420	.069	8.66	.0032
915	210	1.453	181.83	.0682
915	0	.553	69.27	.0260
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.138	17.32	.0065
1750	270	1.384	173.17	.0649
1750	0	.346	43.29	.0162
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	.623	77.93	.0292
2875	270	1.591	199.15	.0747
2875	0	.761	95.25	.0357
2875	-270	.484	60.61	.0227
2875	-540	.415	51.95	.0195
4500	540	1.522	190.49	.0714
4500	270	1.384	173.17	.0649
4500	0	.969	121.22	.0455
4500	-270	.623	77.93	.0292
4500	-540	.138	17.32	.0065
5355	0	1.107	138.54	.0520
MAXIMUM VALUES		1.591	199.15	.0747

RUN NUMBER	2
UNIT NUMBER	1
WIND DIRECTION	NE
WIND SPEED (FT/S)	22
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	78
STACK LOCATION (FT) X=	68
Y=	68
STACK HEIGHT (FT)	250
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.479	60.00	.0225
500	0	.274	34.28	.0129
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	.342	42.85	.0161
915	0	.548	68.57	.0257
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.068	8.57	.0032
1750	270	0.000	0.00	0.0000
1750	0	.137	17.14	.0064
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	.822	102.85	.0386
2875	0	.411	51.43	.0193
2875	-270	.205	25.71	.0096
2875	-540	.205	25.71	.0096
4500	540	.685	85.71	.0321
4500	270	1.027	128.56	.0482
4500	0	.548	68.57	.0257
4500	-270	.342	42.85	.0161
4500	-540	0.000	0.00	0.0000
5355	0	.753	94.28	.0354
MAXIMUM VALUES		1.027	128.56	.0482

RUN NUMBER		3
UNIT NUMBER		1
WIND DIRECTION		E
WIND SPEED (FT/S)		22
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		78
STACK LOCATION (FT)	X=	100
	Y=	0
STACK HEIGHT (FT)		250
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	.205	25.71	.0096
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	.479	60.00	.0225
915	0	.479	60.00	.0225
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.205	25.71	.0096
1750	270	1.575	197.13	.0739
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	.137	17.14	.0064
2875	540	1.575	197.13	.0739
2875	270	.890	111.42	.0418
2875	0	.342	42.85	.0161
2875	-270	.137	17.14	.0064
2875	-540	.137	17.14	.0064
4500	540	.685	85.71	.0321
4500	270	.616	77.14	.0289
4500	0	.274	34.28	.0129
4500	-270	.274	34.28	.0129
4500	-540	.137	17.14	.0064
5355	0	.685	85.71	.0321
MAXIMUM VALUES		1.575	197.13	.0739

RUN NUMBER 4
UNIT NUMBER 1
WIND DIRECTION SE
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 78
STACK LOCATION (FT) X= 68
Y= -68
STACK HEIGHT (FT) 250
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.274	34.28	.0129
500	0	1.712	214.27	.0804
500	-210	1.438	179.99	.0675
915	420	.753	94.28	.0354
915	210	4.657	582.82	.2186
915	0	4.246	531.39	.1993
915	-210	.479	60.00	.0225
915	-420	0.000	0.00	0.0000
1750	540	2.260	282.84	.1061
1750	270	4.725	591.39	.2218
1750	0	.753	94.28	.0354
1750	-270	.411	51.43	.0193
1750	-540	.548	68.57	.0257
2875	540	3.561	445.68	.1671
2875	270	2.328	291.41	.1093
2875	0	1.096	137.13	.0514
2875	-270	.616	77.14	.0289
2875	-540	.616	77.14	.0289
4500	540	1.507	188.56	.0707
4500	270	1.233	154.28	.0579
4500	0	.890	111.42	.0418
4500	-270	.959	119.99	.0450
4500	-540	.616	77.14	.0289
5355	0	1.301	162.85	.0611
MAXIMUM VALUES		4.725	591.39	.2218

RUN NUMBER 5
UNIT NUMBER 1
WIND DIRECTION S
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 78
STACK LOCATION (FT) X= 0
Y= -100
STACK HEIGHT (FT) 250
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.214	26.77	.0100
500	210	.285	35.69	.0134
500	0	.570	71.37	.0268
500	-210	.071	8.92	.0033
915	420	.285	35.69	.0134
915	210	1.141	142.75	.0535
915	0	.855	107.06	.0401
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.214	26.77	.0100
1750	270	1.640	205.20	.0770
1750	0	.784	98.14	.0368
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	1.283	160.59	.0602
2875	270	1.640	205.20	.0770
2875	0	.784	98.14	.0368
2875	-270	.214	26.77	.0100
2875	-540	.214	26.77	.0100
4500	540	.998	124.90	.0468
4500	270	.998	124.90	.0468
4500	0	.356	44.61	.0167
4500	-270	.428	53.53	.0201
4500	-540	.356	44.61	.0167
5355	0	.784	98.14	.0368
MAXIMUM VALUES		1.640	205.20	.0770

RUN NUMBER 6
UNIT NUMBER 1
WIND DIRECTION SW
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 78
STACK LOCATION (FT) X= -68
Y= -68
STACK HEIGHT (FT) 250
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	1.782	223.04	.0836
500	210	8.554	1070.61	.4015
500	0	3.208	401.48	.1506
500	-210	0.000	0.00	0.0000
915	420	6.701	838.65	.3145
915	210	7.200	901.10	.3379
915	0	1.426	178.44	.0669
915	-210	1.069	133.83	.0502
915	-420	0.000	0.00	0.0000
1750	540	5.845	731.59	.2743
1750	270	3.493	437.17	.1639
1750	0	.428	53.53	.0201
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	3.636	455.01	.1706
2875	270	1.925	240.89	.0903
2875	0	.570	71.37	.0268
2875	-270	0.000	0.00	0.0000
2875	-540	.071	8.92	.0033
4500	540	.570	71.37	.0268
4500	270	.214	26.77	.0100
4500	0	.214	26.77	.0100
4500	-270	0.000	0.00	0.0000
4500	-540	0.000	0.00	0.0000
5355	0	.214	26.77	.0100
MAXIMUM VALUES		8.554	1070.61	.4015

RUN NUMBER		7
UNIT NUMBER		1
WIND DIRECTION		W
WIND SPEED (FT/S)		22
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		78
STACK LOCATION (FT)	X=	-100
	Y=	0
STACK HEIGHT (FT)		250
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		16.90

SAMPLE POSITION X	SAMPLE POSITION Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.071	8.92	.0033
500	210	.570	71.37	.0268
500	0	.143	17.84	.0067
500	-210	0.000	0.00	0.0000
915	420	.071	8.92	.0033
915	210	.428	53.53	.0201
915	0	.071	8.92	.0033
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.356	44.61	.0167
1750	270	.713	89.22	.0335
1750	0	.071	8.92	.0033
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	.570	71.37	.0268
2875	270	1.069	133.83	.0502
2875	0	.642	80.30	.0301
2875	-270	.285	35.69	.0134
2875	-540	.214	26.77	.0100
4500	540	.927	115.98	.0435
4500	270	.998	124.90	.0468
4500	0	.642	80.30	.0301
4500	-270	.570	71.37	.0268
4500	-540	.214	26.77	.0100
5355	0	1.212	151.67	.0569
MAXIMUM VALUES		1.212	151.67	.0569

RUN NUMBER 8
UNIT NUMBER 1
WIND DIRECTION NW
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 78
STACK LOCATION (FT) X= -55
Y= 48
STACK HEIGHT (FT) 250
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.428	53.53	.0201
500	0	.713	89.22	.0335
500	-210	0.000	0.00	0.0000
915	420	.214	26.77	.0100
915	210	2.424	303.34	.1138
915	0	.927	115.98	.0435
915	-210	.071	8.92	.0033
915	-420	0.000	0.00	0.0000
1750	540	.784	98.14	.0368
1750	270	1.568	196.28	.0736
1750	0	.713	89.22	.0335
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	1.640	205.20	.0770
2875	270	2.424	303.34	.1138
2875	0	1.141	142.75	.0535
2875	-270	.356	44.61	.0167
2875	-540	.428	53.53	.0201
4500	540	1.426	178.44	.0669
4500	270	.784	98.14	.0368
4500	0	.570	71.37	.0268
4500	-270	.428	53.53	.0201
4500	-540	.356	44.61	.0167
5355	0	.998	124.90	.0468
MAXIMUM VALUES		2.424	303.34	.1138

RUN NUMBER		9
UNIT NUMBER		1
WIND DIRECTION		N
WIND SPEED (FT/S)		44
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		78
STACK LOCATION (FT)	X=	0
	Y=	100
STACK HEIGHT (FT)		250
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.715	44.77	.0168
500	0	3.434	214.89	.0806
500	-210	.859	53.72	.0201
915	420	2.719	170.12	.0638
915	210	13.164	823.76	.3089
915	0	5.437	340.25	.1276
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	3.291	205.94	.0772
1750	270	13.307	832.71	.3123
1750	0	2.719	170.12	.0638
1750	-270	.286	17.91	.0067
1750	-540	.429	26.86	.0101
2875	540	8.299	519.32	.1947
2875	270	6.439	402.92	.1511
2875	0	5.151	322.34	.1209
2875	-270	0.000	0.00	0.0000
2875	-540	.429	26.86	.0101
4500	540	3.291	205.94	.0772
4500	270	.572	35.82	.0134
4500	0	.143	8.95	.0034
4500	-270	.429	26.86	.0101
4500	-540	0.000	0.00	0.0000
5355	0	.143	8.95	.0034
MAXIMUM VALUES		13.307	832.71	.3123

RUN NUMBER	10
UNIT NUMBER	1
WIND DIRECTION	NE
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	78
STACK LOCATION (FT) X=	68
Y=	68
STACK HEIGHT (FT)	250
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	2.289	143.26	.0537
500	-210	1.002	62.68	.0235
915	420	0.000	0.00	0.0000
915	210	1.860	116.40	.0437
915	0	5.008	313.39	.1175
915	-210	1.717	107.45	.0403
915	-420	.286	17.91	.0067
1750	540	.286	17.91	.0067
1750	270	7.440	465.60	.1746
1750	0	4.149	259.66	.0974
1750	-270	.859	53.72	.0201
1750	-540	.572	35.82	.0134
2875	540	3.720	232.80	.0873
2875	270	2.862	179.08	.0672
2875	0	4.006	250.71	.0940
2875	-270	.572	35.82	.0134
2875	-540	.715	44.77	.0168
4500	540	2.432	152.22	.0571
4500	270	1.002	62.68	.0235
4500	0	.429	26.86	.0101
4500	-270	.572	35.82	.0134
4500	-540	.286	17.91	.0067
5355	0	.429	26.86	.0101
MAXIMUM VALUES		7.440	465.60	.1746

RUN NUMBER	11
UNIT NUMBER	1
WIND DIRECTION	E
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	78
STACK LOCATION (FT) X=	100
Y=	0
STACK HEIGHT (FT)	250
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	.715	44.77	.0168
500	-210	2.146	134.31	.0504
915	420	0.000	0.00	0.0000
915	210	.286	17.91	.0067
915	0	8.442	528.28	.1981
915	-210	1.002	62.68	.0235
915	-420	0.000	0.00	0.0000
1750	540	.143	8.95	.0034
1750	270	5.723	358.16	.1343
1750	0	6.439	402.92	.1511
1750	-270	.429	26.86	.0101
1750	-540	.429	26.86	.0101
2875	540	4.149	259.66	.0974
2875	270	6.439	402.92	.1511
2875	0	7.584	474.56	.1780
2875	-270	.286	17.91	.0067
2875	-540	1.002	62.68	.0235
4500	540	4.149	259.66	.0974
4500	270	1.145	71.63	.0269
4500	0	.143	8.95	.0034
4500	-270	.859	53.72	.0201
4500	-540	0.000	0.00	0.0000
5355	0	0.000	0.00	0.0000
MAXIMUM VALUES		8.442	528.28	.1981

RUN NUMBER		12
UNIT NUMBER		1
WIND DIRECTION		SE
WIND SPEED (FT/S)		44
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		78
STACK LOCATION (FT)	X=	68
	Y=	-68
STACK HEIGHT (FT)		250
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	1.145	71.63	.0269
500	0	5.437	340.25	.1276
500	-210	7.870	492.46	.1847
915	420	2.576	161.17	.0604
915	210	11.018	689.45	.2585
915	0	15.596	975.97	.3660
915	-210	5.723	358.16	.1343
915	-420	1.288	80.58	.0302
1750	540	3.291	205.94	.0772
1750	270	12.019	752.13	.2820
1750	0	13.307	832.71	.3123
1750	-270	3.005	188.03	.0705
1750	-540	1.717	107.45	.0403
2875	540	6.296	393.97	.1477
2875	270	4.722	295.48	.1108
2875	0	6.153	385.02	.1444
2875	-270	.859	53.72	.0201
2875	-540	1.002	62.68	.0235
4500	540	4.579	286.52	.1074
4500	270	1.431	89.54	.0336
4500	0	.429	26.86	.0101
4500	-270	.429	26.86	.0101
4500	-540	0.000	0.00	0.0000
5355	0	.286	17.91	.0067
MAXIMUM VALUES		15.596	975.97	.3660

RUN NUMBER 13
UNIT NUMBER 1
WIND DIRECTION S
WIND SPEED (FT/S) 44
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 78
STACK LOCATION (FT) X= 0
Y= -100
STACK HEIGHT (FT) 250
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 16.80

SAMPLE POSITION X	SAMPLE POSITION Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	1.738	108.73	.0408
500	0	6.683	418.21	.1568
500	-210	.267	16.73	.0063
915	420	1.203	75.28	.0282
915	210	8.554	535.30	.2007
915	0	6.817	426.57	.1600
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.936	58.55	.0220
1750	270	10.292	644.04	.2415
1750	0	3.208	200.74	.0753
1750	-270	.802	50.18	.0188
1750	-540	1.069	66.91	.0251
2875	540	7.084	443.30	.1662
2875	270	6.950	434.94	.1631
2875	0	5.747	359.66	.1349
2875	-270	0.000	0.00	0.0000
2875	-540	.668	41.82	.0157
4500	540	3.208	200.74	.0753
4500	270	.535	33.46	.0125
4500	0	.134	8.36	.0031
4500	-270	.401	25.09	.0094
4500	-540	0.000	0.00	0.0000
5355	0	0.000	0.00	0.0000
MAXIMUM VALUES		10.292	644.04	.2415

RUN NUMBER	14
UNIT NUMBER	1
WIND DIRECTION	SW
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	78
STACK LOCATION (FT) X=	-68
Y=	-68
STACK HEIGHT (FT)	250
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	1.604	100.37	.0376
500	210	6.817	426.57	.1600
500	0	12.163	761.14	.2854
500	-210	.401	25.09	.0094
915	420	4.411	276.02	.1035
915	210	12.029	752.77	.2823
915	0	14.302	894.96	.3356
915	-210	10.827	677.50	.2541
915	-420	.535	33.46	.0125
1750	540	2.673	167.28	.0627
1750	270	10.292	644.04	.2415
1750	0	9.891	618.95	.2321
1750	-270	4.544	284.38	.1066
1750	-540	2.540	158.92	.0596
2875	540	6.416	401.48	.1506
2875	270	4.143	259.29	.0972
2875	0	6.950	434.94	.1631
2875	-270	1.069	66.91	.0251
2875	-540	1.069	66.91	.0251
4500	540	4.143	259.29	.0972
4500	270	1.470	92.01	.0345
4500	0	.267	16.73	.0063
4500	-270	.535	33.46	.0125
4500	-540	.134	8.36	.0031
5355	0	.267	16.73	.0063
MAXIMUM VALUES		14.302	894.96	.3356

RUN NUMBER 15
UNIT NUMBER 1
WIND DIRECTION W
WIND SPEED (FT/S) 44
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 78
STACK LOCATION (FT) X= -100
Y= 0
STACK HEIGHT (FT) 250
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.401	25.09	.0094
500	210	3.609	225.83	.0847
500	0	1.337	83.64	.0314
500	-210	.134	8.36	.0031
915	420	2.807	175.65	.0659
915	210	6.416	401.48	.1506
915	0	1.604	100.37	.0376
915	-210	.134	8.36	.0031
915	-420	0.000	0.00	0.0000
1750	540	2.005	125.46	.0470
1750	270	8.688	543.67	.2039
1750	0	2.272	142.19	.0533
1750	-270	.535	33.46	.0125
1750	-540	.401	25.09	.0094
2875	540	6.950	434.94	.1631
2875	270	3.609	225.83	.0847
2875	0	3.609	225.83	.0847
2875	-270	.134	8.36	.0031
2875	-540	1.871	117.10	.0439
4500	540	1.871	117.10	.0439
4500	270	.401	25.09	.0094
4500	0	.267	16.73	.0063
4500	-270	.401	25.09	.0094
4500	-540	0.000	0.00	0.0000
5355	0	.134	8.36	.0031
MAXIMUM VALUES		8.688	543.67	.2039

RUN NUMBER		16
UNIT NUMBER		1
WIND DIRECTION		NW
WIND SPEED (FT/S)		44
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		78
STACK LOCATION (FT)	X=	-68
	Y=	68
STACK HEIGHT (FT)		250
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	1.069	66.91	.0251
500	210	8.020	501.85	.1882
500	0	4.544	284.38	.1066
500	-210	0.000	0.00	0.0000
915	420	8.554	535.30	.2007
915	210	17.109	1070.61	.4015
915	0	4.010	250.92	.0941
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	6.817	426.57	.1600
1750	270	9.757	610.58	.2290
1750	0	3.743	234.20	.0878
1750	-270	.936	58.55	.0220
1750	-540	.802	50.18	.0188
2875	540	6.683	418.21	.1568
2875	270	3.475	217.47	.0816
2875	0	4.143	259.29	.0972
2875	-270	.802	50.18	.0188
2875	-540	.668	41.82	.0157
4500	540	2.941	184.01	.0690
4500	270	1.203	75.28	.0282
4500	0	1.470	92.01	.0345
4500	-270	1.069	66.91	.0251
4500	-540	.134	8.36	.0031
5355	0	.802	50.18	.0188
MAXIMUM VALUES		17.109	1070.61	.4015

RUN NUMBER		17
UNIT NUMBER		1
WIND DIRECTION		SE
WIND SPEED (FT/S)		66
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		78
STACK LOCATION (FT)	X=	68
	Y=	-68
STACK HEIGHT (FT)		250
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	1.222	50.96	.0191
500	0	6.923	288.80	.1083
500	-210	13.234	552.11	.2070
915	420	12.624	526.63	.1975
915	210	13.438	560.61	.2102
915	0	22.397	934.35	.3504
915	-210	17.917	747.48	.2803
915	-420	5.090	212.35	.0796
1750	540	3.665	152.89	.0573
1750	270	11.809	492.65	.1847
1750	0	9.773	407.71	.1529
1750	-270	9.773	407.71	.1529
1750	-540	1.832	76.45	.0287
2875	540	5.294	220.85	.0828
2875	270	2.647	110.42	.0414
2875	0	9.773	407.71	.1529
2875	-270	3.461	144.40	.0541
2875	-540	1.832	76.45	.0287
4500	540	3.054	127.41	.0478
4500	270	2.240	93.43	.0350
4500	0	.814	33.98	.0127
4500	-270	.611	25.48	.0096
4500	-540	0.000	0.00	0.0000
5355	0	1.018	42.47	.0159
MAXIMUM VALUES		22.397	934.35	.3504

RUN NUMBER	18
UNIT NUMBER	1
WIND DIRECTION	SW
WIND SPEED (FT/S)	66
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	78
STACK LOCATION (FT) X=	-68
Y=	-68
STACK HEIGHT (FT)	250
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	16.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	3.258	135.90	.0510
500	210	10.384	433.20	.1624
500	0	16.085	671.03	.2516
500	-210	0.000	0.00	0.0000
915	420	7.941	331.27	.1242
915	210	17.714	738.98	.2771
915	0	7.941	331.27	.1242
915	-210	12.827	535.13	.2007
915	-420	.204	8.49	.0032
1750	540	4.276	178.38	.0669
1750	270	10.791	450.18	.1688
1750	0	9.773	407.71	.1529
1750	-270	3.869	161.39	.0605
1750	-540	.814	33.98	.0127
2875	540	5.294	220.85	.0828
2875	270	6.515	271.81	.1019
2875	0	5.294	220.85	.0828
2875	-270	.814	33.98	.0127
2875	-540	1.018	42.47	.0159
4500	540	2.443	101.93	.0382
4500	270	1.018	42.47	.0159
4500	0	0.000	0.00	0.0000
4500	-270	0.000	0.00	0.0000
4500	-540	0.000	0.00	0.0000
5355	0	0.000	0.00	0.0000
MAXIMUM VALUES		17.714	738.98	.2771

Table 5-1. Prototype Emission Parameters.
Unit 2: Harrington Station*

	Load	100%	80%	50%
Stack size (ft)		27,19	27,19	27,19
Stack area (ft^2)		573,287	573,287	573,287
Stack height (ft)		300,350,375,400	300,350,375,400	300,350,375,400
Gas temperature (°F) @ (26.57" Hg)		313	313	313
Gas velocity (ft/sec)		40.9,81.8	32.7,65.4	20.5,41.0
Actual source strength (SO_2) Q_s (gm/sec)	(0% removal)	331.0	264.8	165.5
Free stream velocity (ft/sec) (15,30,45 mph)		22,44,66	22,44,66	22,44,66
R		1.86,0.93,0.62; 3.72,1.86,1.24	1.49,0.74,0.50; 2.97,1.49,1.00	0.93,0.47,0.31; 1.86,0.93,0.62
$\Delta\rho/\rho_a = (\frac{T_s - T_a}{T_s})^{\Delta}$		0.32	0.32	0.32
$Fr_s = \frac{V_s^2}{g\frac{\Delta\rho}{\rho_a}D}$		6.06	3.88	1.52

*Taken from tables proved by K. Ladd, August 25, 1975 and Haragan Report, July 20, 1974 (Table 3).

$^{\Delta}T_a = 68°F + 460 = 528°R$

Table 5-2. Model Emission Parameters.
Unit 2: Harrington Station

Load	100%	80%	50%
Stack size (in.)	1.30,0.92	1.30,0.92	0.30,0.92
Stack area (in.^{2})	1.33,0.665	1.33,0.665	1.33,0.665
Stack height (in.)	14.4,16.8 18.0,19.2	14.4,16.8 18.0,19.2	14.4,16.8 18.0,19.2
R	1.86,0.93,0.62; 3.72,1.86,1.24	1.49,0.74,0.50; 2.97,1.49,1.00	0.93,0.47,0.31; 1.86,0.93,0.62
$\Delta\rho/\rho_a$	.32	.32	.32
Fr_s	6.06	3.88	1.52
V_{am}(ft/sec)	1.39,2.79,4.25	1.39,2.79,4.25	1.39,2.79,4.25
V_{sm}(ft/sec)	2.59	2.07	1.30
Q_{sm}(cfm)	1.43	1.14	0.72
Mol Wts = $29(1-\Delta\rho/\rho_a)$	19.8	19.8	19.8
χ_{He_s}	0.40	0.40	0.40
χ_{Prop_s}	0.05	0.05	0.05

Table 5-3. Observed Touchdown Distances from Flow Visualization Tests (ft).

Unit 2: Harrington Station

Run	Wind Speed (mph)	Direction	Load	Stack Height (ft)	Distance to Touchdown (ft)
25	15	N	50%	300	>5000
26		NE			>5000
27		E			>5000
28		SE			4000>5000
29		S			>5000
30		SW			4000
31		W			3000-5000
32		NW			3000-4200
33	30	N			1500-2000
34		NE			1500
35		E			1000-1500
36		SE			1000-1500
37		S			1000-2000
38		SW			1000-1200
39		W			500-1000
40		NW			700-1500
41	15	W	80%	300	3500
42		NW	80%	300	3500
43	30	W	80%	300	1500-2000
44		NW	80%	300	2000
45	15	W	80%	350	4500
46		NW	80%	350	2000(occ)-3500
47	30	W	80%	350	1500
48		NW	80%	350	700-1500
49	15	W	80%	375	2000(occ)->5000
50			80%	400	3000(occ)->5000
51	30	W	80%	375	1000(occ)-2000
52			80%	400	1800-2500
53	45	W	50%	375	1000-1500
53A			50%	400	1000-2000
54	15	W	100%	300	2500(occ)-4000
55			80%	300	3000
56	30	W	100%	300	1000-2000
57			80%	300	1000-1500
58	15	W	100%	350	4000
59			80%	350	3500-5000
60	30	W	100%	350	2000-2500
61			80%	350	1500-2000
70	15	W	50%	300(SD)*	4500
71			80%	300(SD)	3000
72			100%	300(SD)	2500
73	30		50%	300(SD)	1000
74			80%	300(SD)	1500
75			100%	300(SD)	2000

Table 5-3 (continued)

Run	Wind Speed (mph)	Direction	Load	Stack Height (ft)	Distance to Touchdown (ft)
76	45		50%	300(SD)	1000
77			80%	300(SD)	1000
78			100%	300(SD)	1000
79	30	SW	50%	300(SD)	1500
80			80%	300(SD)	1500
81			100%	300(SD)	2000

*(SD) refers to Unit 2 stack diameter of 19 ft.

Table 5-4. Maximum Ground Concentration (ppm) and Distance to Maximum

Unit 2: Harrington Station

Run	Wind Speed (mph)	Direction	Load	Stack Height (ft)	Distance to Maximum Ground Concentration (ft)	Maximum Concentration (~ 10 min avg)(ppm)
25	15	N	50%	300	5350	.095
26		NE			4500	.069
27		E			4500	.037
28		SE			2875	.038
29		S			1750	.134
30		SW			4500	.115
31		W			2875	.120
32		NW			5350	.127
33	30	N			2875	.086
34		NE			2875	.081
35		E			1750	.086
36		SE			2875	.090
37		S			2875	.050
38		SW			2875	.210
39		W			1000	.180
40		NW			2875	.108
41	15	W	80%	300	5350	.005
42		NW	80%	300	5350	.005
43	30	W	80%	300	4500	.065
44		NW	80%	300	2875	.120
45	15	W	80%	350	2875	.037
46		NW	80%	350	2875	.005
47	30	W	80%	350	4500	.124
48		NW	80%	350	4500	.096
49	15	W	80%	375	2875	.011
50			80%	400	2875	.011
51	30	W	80%	375	5350	.091
52			80%	400	5350	.069
53	45	W	50%	375	1750	.121
53A			50%	400	2875	.126
70	15	W	50%	300(SD)*	4500	.036
71			80%	300(SD)	4500	.056
72			100%	300(SD)	2875	.041
73	30		50%	300(SD)	2875	.076
74			80%	300(SD)	4500	.044
75			100%	300(SD)	4500	.051
76	45		50%	300(SD)	4500	.103
77			80%	300(SD)	4500	.053
78			100%	300(SD)	4500	.039
79	30	SW	50%	300(SD)	4500	.100
80			80%	300(SD)	4500	.051
81			100%	300(SD)	4500	.053

*(SD) refers to Unit 2 stack diameter of 19 ft.

Table 5-5.

RUN NUMBER 25
UNIT NUMBER 2
WIND DIRECTION N
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= -210
Y= -165
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.158	41.95	.0157
500	210	.211	55.94	.0210
500	0	.264	69.92	.0262
500	-210	.158	41.95	.0157
915	420	.158	41.95	.0157
915	210	.211	55.94	.0210
915	0	.211	55.94	.0210
915	-210	.158	41.95	.0157
915	-420	.053	13.98	.0052
1750	540	.423	111.87	.0420
1750	270	.053	13.98	.0052
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	.158	41.95	.0157
2875	0	.211	55.94	.0210
2875	-270	.581	153.82	.0577
2875	-540	.211	55.94	.0210
4500	540	.370	97.89	.0367
4500	270	.475	125.86	.0472
4500	0	.687	181.79	.0682
4500	-270	.739	195.78	.0734
4500	-540	.423	111.87	.0420
5355	0	.951	251.71	.0944
MAXIMUM VALUES		.951	251.71	.0944

RUN NUMBER	26
UNIT NUMBER	2
WIND DIRECTION	NE
WIND SPEED (FT/S)	22
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	-260
Y=	35
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	.158	41.95	.0157
500	-210	.053	13.98	.0052
915	420	0.000	0.00	0.0000
915	210	.158	41.95	.0157
915	0	.158	41.95	.0157
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.370	97.89	.0367
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	0.000	0.00	0.0000
2875	0	0.000	0.00	0.0000
2875	-270	.370	97.89	.0367
2875	-540	.370	97.89	.0367
4500	540	.581	153.82	.0577
4500	270	.687	181.79	.0682
4500	0	.475	125.86	.0472
4500	-270	.475	125.86	.0472
4500	-540	.317	83.90	.0315
5355	0	.423	111.87	.0420
MAXIMUM VALUES		.687	181.79	.0682

RUN NUMBER		27
UNIT NUMBER		2
WIND DIRECTION		E
WIND SPEED (FT/S)		22
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		165
STACK LOCATION (FT)	X=	-165
	Y=	210
STACK HEIGHT (FT)		300
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.106	27.97	.0105
500	210	.106	27.97	.0105
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	.106	27.97	.0105
915	210	.053	13.98	.0052
915	0	0.000	0.00	0.0000
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.317	83.90	.0315
1750	270	.053	13.98	.0052
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	.211	55.94	.0210
2875	270	0.000	0.00	0.0000
2875	0	0.000	0.00	0.0000
2875	-270	.158	41.95	.0157
2875	-540	.158	41.95	.0157
4500	540	.370	97.89	.0367
4500	270	.370	97.89	.0367
4500	0	.211	55.94	.0210
4500	-270	.370	97.89	.0367
4500	-540	.158	41.95	.0157
5355	0	.106	27.97	.0105
MAXIMUM VALUES		.370	97.89	.0367

RUN NUMBER 28
UNIT NUMBER 2
WIND DIRECTION SE
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= 35
Y= 260
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.215	57.00	.0214
500	210	.054	14.25	.0053
500	0	.377	99.75	.0374
500	-210	.269	71.25	.0267
915	420	.054	14.25	.0053
915	210	.269	71.25	.0267
915	0	.215	57.00	.0214
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.269	71.25	.0267
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	.215	57.00	.0214
2875	270	0.000	0.00	0.0000
2875	0	0.000	0.00	0.0000
2875	-270	.377	99.75	.0374
2875	-540	.108	28.50	.0107
4500	540	.377	99.75	.0374
4500	270	.323	85.50	.0321
4500	0	.161	42.75	.0160
4500	-270	.269	71.25	.0267
4500	-540	.054	14.25	.0053
5355	0	.054	14.25	.0053
MAXIMUM VALUES		.377	99.75	.0374

RUN NUMBER	29
UNIT NUMBER	2
WIND DIRECTION	S
WIND SPEED (FT/S)	22
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	210
Y=	165
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	.048	12.68	.0048
915	420	.048	12.68	.0048
915	210	.287	76.07	.0285
915	0	.527	139.47	.0523
915	-210	.048	12.68	.0048
915	-420	0.000	0.00	0.0000
1750	540	.383	101.43	.0380
1750	270	1.341	355.01	.1331
1750	0	.670	177.50	.0666
1750	-270	.383	101.43	.0380
1750	-540	.096	25.36	.0095
2875	540	.862	228.22	.0856
2875	270	.335	88.75	.0333
2875	0	1.245	329.65	.1236
2875	-270	1.197	316.97	.1189
2875	-540	.718	190.18	.0713
4500	540	1.054	278.93	.1046
4500	270	1.149	304.29	.1141
4500	0	1.293	342.33	.1284
4500	-270	1.197	316.97	.1189
4500	-540	.862	228.22	.0856
5355	0	.766	202.86	.0761
MAXIMUM VALUES		1.341	355.01	.1331

RUN NUMBER 30
UNIT NUMBER 2
WIND DIRECTION SW
WIND SPEED (FT/S) 22
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= 260
Y= -35
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.048	12.68	.0048
500	0	.048	12.68	.0048
500	-210	0.000	0.00	0.0000
915	420	.096	25.36	.0095
915	210	.527	139.47	.0523
915	0	.479	126.79	.0475
915	-210	.287	76.07	.0285
915	-420	0.000	0.00	0.0000
1750	540	.192	50.72	.0190
1750	270	.527	139.47	.0523
1750	0	.958	253.58	.0951
1750	-270	1.006	266.26	.0998
1750	-540	.239	63.39	.0238
2875	540	.670	177.50	.0666
2875	270	.670	177.50	.0666
2875	0	.814	215.54	.0808
2875	-270	.862	228.22	.0856
2875	-540	1.006	266.26	.0998
4500	540	1.006	266.26	.0998
4500	270	1.149	304.29	.1141
4500	0	1.149	304.29	.1141
4500	-270	.862	228.22	.0856
4500	-540	.958	253.58	.0951
5355	0	.383	101.43	.0380
MAXIMUM VALUES		1.149	304.29	.1141

RUN NUMBER		31
UNIT NUMBER		2
WIND DIRECTION		W
WIND SPEED (FT/S)		22
PERCENT LOAD		50
SO2 RELEASE RATE (GM/S)		165
STACK LOCATION (FT)	X=	165
	Y=	-210
STACK HEIGHT (FT)		300
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.048	12.68	.0048
500	210	.048	12.68	.0048
500	0	.048	12.68	.0048
500	-210	.048	12.68	.0048
915	420	.048	12.68	.0048
915	210	.144	38.04	.0143
915	0	.239	63.39	.0238
915	-210	.096	25.36	.0095
915	-420	.048	12.68	.0048
1750	540	.144	38.04	.0143
1750	270	.383	101.43	.0380
1750	0	.670	177.50	.0666
1750	-270	.670	177.50	.0666
1750	-540	.718	190.18	.0713
2875	540	.239	63.39	.0238
2875	270	.623	164.82	.0618
2875	0	1.149	304.29	.1141
2875	-270	1.054	278.93	.1046
2875	-540	1.197	316.97	.1189
4500	540	.718	190.18	.0713
4500	270	.718	190.18	.0713
4500	0	.910	240.90	.0903
4500	-270	1.101	291.61	.1094
4500	-540	.862	228.22	.0856
5355	0	.623	164.82	.0618
MAXIMUM VALUES		1.197	316.97	.1189

RUN NUMBER	32
UNIT NUMBER	2
WIND DIRECTION	NW
WIND SPEED (FT/S)	22
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	155
STACK LOCATION (FT) X=	-35
Y=	-260
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.158	41.95	.0157
500	210	.158	41.95	.0157
500	0	.158	41.95	.0157
500	-210	.053	13.98	.0052
915	420	0.000	0.00	0.0000
915	210	.053	13.98	.0052
915	0	.106	27.97	.0105
915	-210	.158	41.95	.0157
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	.475	125.86	.0472
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	0.000	0.00	0.0000
2875	0	.211	55.94	.0210
2875	-270	.845	223.74	.0839
2875	-540	.845	223.74	.0839
4500	540	.370	97.89	.0367
4500	270	.528	139.84	.0524
4500	0	.634	167.81	.0629
4500	-270	1.056	279.68	.1049
4500	-540	1.004	265.70	.0996
5355	0	1.268	335.62	.1259
MAXIMUM VALUES		1.268	335.62	.1259

RUN NUMBER	33
UNIT NUMBER	2
WIND DIRECTION	N
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	-210
Y=	-165
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.096	12.72	.0048
500	210	.384	50.90	.0191
500	0	1.538	203.59	.0763
500	-210	1.250	165.42	.0620
915	420	0.000	0.00	0.0000
915	210	.288	38.17	.0143
915	0	1.346	178.14	.0668
915	-210	1.057	139.97	.0525
915	-420	.481	63.62	.0239
1750	540	.288	38.17	.0143
1750	270	.288	38.17	.0143
1750	0	.961	127.24	.0477
1750	-270	1.538	203.59	.0763
1750	-540	.961	127.24	.0477
2875	540	.481	63.62	.0239
2875	270	.384	50.90	.0191
2875	0	1.153	152.69	.0573
2875	-270	1.057	139.97	.0525
2875	-540	1.730	229.04	.0859
4500	540	.865	114.52	.0429
4500	270	.865	114.52	.0429
4500	0	1.057	139.97	.0525
4500	-270	1.250	165.42	.0620
4500	-540	1.153	152.69	.0573
5355	0	.673	89.07	.0334
MAXIMUM VALUES		1.730	229.04	.0859

RUN NUMBER	34
UNIT NUMBER	2
WIND DIRECTION	NE
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	-260
Y=	35
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.288	38.17	.0143
500	0	.769	101.80	.0382
500	-210	.481	63.62	.0239
915	420	.192	25.45	.0095
915	210	.961	127.24	.0477
915	0	1.346	178.14	.0668
915	-210	1.057	139.97	.0525
915	-420	.577	76.35	.0286
1750	540	.384	50.90	.0191
1750	270	.673	89.07	.0334
1750	0	1.730	229.04	.0859
1750	-270	1.250	165.42	.0620
1750	-540	.769	101.80	.0382
2875	540	.384	50.90	.0191
2875	270	.577	76.35	.0286
2875	0	1.346	178.14	.0668
2875	-270	1.250	165.42	.0620
2875	-540	1.634	216.32	.0811
4500	540	1.057	139.97	.0525
4500	270	.961	127.24	.0477
4500	0	1.250	165.42	.0620
4500	-270	1.153	152.69	.0573
4500	-540	1.250	165.42	.0620
5355	0	.769	101.80	.0382
MAXIMUM VALUES		1.730	229.04	.0859

RUN NUMBER 35
UNIT NUMBER 2
WIND DIRECTION E
WIND SPEED (FT/S) 44
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= -165
Y= 210
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.192	25.45	.0095
500	0	1.057	139.97	.0525
500	-210	.288	38.17	.0143
915	420	.288	38.17	.0143
915	210	.577	76.35	.0286
915	0	.961	127.24	.0477
915	-210	.384	50.90	.0191
915	-420	0.000	0.00	0.0000
1750	540	.865	114.52	.0429
1750	270	1.730	229.04	.0859
1750	0	1.153	152.69	.0573
1750	-270	.577	76.35	.0286
1750	-540	.192	25.45	.0095
2875	540	.961	127.24	.0477
2875	270	.577	76.35	.0286
2875	0	1.057	139.97	.0525
2875	-270	1.057	139.97	.0525
2875	-540	.865	114.52	.0429
4500	540	1.057	139.97	.0525
4500	270	.961	127.24	.0477
4500	0	1.057	139.97	.0525
4500	-270	1.057	139.97	.0525
4500	-540	.384	50.90	.0191
5355	0	.481	63.62	.0239
MAXIMUM VALUES		1.730	229.04	.0859

RUN NUMBER	36
UNIT NUMBER	2
WIND DIRECTION	SE
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	35
Y=	260
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	.101	13.33	.0050
915	210	.302	39.98	.0150
915	0	.101	13.33	.0050
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	1.107	146.59	.0550
1750	270	1.208	159.91	.0600
1750	0	.201	26.65	.0100
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	1.812	239.87	.0900
2875	270	.906	119.93	.0450
2875	0	.201	26.65	.0100
2875	-270	.101	13.33	.0050
2875	-540	0.000	0.00	0.0000
4500	540	.805	106.61	.0400
4500	270	.302	39.98	.0150
4500	0	.302	39.98	.0150
4500	-270	.201	26.65	.0100
4500	-540	0.000	0.00	0.0000
5355	0	.101	13.33	.0050
MAXIMUM VALUES		1.812	239.87	.0900

RUN NUMBER 37
UNIT NUMBER 2
WIND DIRECTION S
WIND SPEED (FT/S) 44
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= 210
Y= 165
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	.101	13.33	.0050
915	0	0.000	0.00	0.0000
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.201	26.65	.0100
1750	270	.403	53.30	.0200
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	1.007	133.26	.0500
2875	270	.503	66.63	.0250
2875	0	.201	26.65	.0100
2875	-270	.201	26.65	.0100
2875	-540	.201	26.65	.0100
4500	540	1.007	133.26	.0500
4500	270	.302	39.98	.0150
4500	0	.302	39.98	.0150
4500	-270	.302	39.98	.0150
4500	-540	.101	13.33	.0050
5355	0	.101	13.33	.0050
MAXIMUM VALUES		1.007	133.26	.0500

RUN NUMBER 38
UNIT NUMBER 2
WIND DIRECTION SW
WIND SPEED (FT/S) 44
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= 260
Y= -35
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 20.50

SAMPLE POSITION X	SAMPLE POSITION Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	.201	26.65	.0100
915	0	1.208	159.91	.0600
915	-210	.201	26.65	.0100
915	-420	0.000	0.00	0.0000
1750	540	.302	39.98	.0150
1750	270	2.517	333.15	.1249
1750	0	3.725	493.06	.1849
1750	-270	.805	106.61	.0400
1750	-540	.302	39.98	.0150
2875	540	3.020	399.78	.1499
2875	270	4.228	559.69	.2099
2875	0	1.913	253.19	.0949
2875	-270	.403	53.30	.0200
2875	-540	.201	26.65	.0100
4500	540	2.919	386.45	.1449
4500	270	1.309	173.24	.0650
4500	0	.805	106.61	.0400
4500	-270	.503	66.63	.0250
4500	-540	0.000	0.00	0.0000
5355	0	.101	13.33	.0050
MAXIMUM VALUES		4.228	559.69	.2099

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RUN NUMBER                      39
UNIT NUMBER                      2
WIND DIRECTION                   W
WIND SPEED (FT/S)               44
PERCENT LOAD                    50
SO2 RELEASE RATE (GM/S)        165
STACK LOCATION (FT)     X=     165
                        Y=    -210
STACK HEIGHT (FT)              300
STRATIFICATION             NEUTRAL
STACK VELOCITY (FT/S)        20.50
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SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.103	13.61	.0051
500	210	.308	40.83	.0153
500	0	1.439	190.54	.0715
500	-210	.411	54.44	.0204
915	420	.411	54.44	.0204
915	210	2.365	313.04	.1174
915	0	2.262	299.43	.1123
915	-210	1.954	258.60	.0970
915	-420	3.599	476.36	.1786
1750	540	0.000	0.00	0.0000
1750	270	.514	68.05	.0255
1750	0	1.439	190.54	.0715
1750	-270	3.187	421.92	.1582
1750	-540	1.748	231.38	.0868
2875	540	.206	27.22	.0102
2875	270	.925	122.49	.0459
2875	0	1.645	217.77	.0817
2875	-270	1.542	204.15	.0766
2875	-540	2.570	340.26	.1276
4500	540	1.028	136.10	.0510
4500	270	1.234	163.32	.0612
4500	0	1.439	190.54	.0715
4500	-270	1.748	231.38	.0868
4500	-540	1.851	244.99	.0919
5355	0	.617	81.66	.0306
MAXIMUM VALUES		3.599	476.36	.1786

RUN NUMBER	40
UNIT NUMBER	2
WIND DIRECTION	NW
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	-35
Y=	-260
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	.308	40.83	.0153
500	0	.617	81.66	.0306
500	-210	.308	40.83	.0153
915	420	.103	13.61	.0051
915	210	.925	122.49	.0459
915	0	1.748	231.38	.0868
915	-210	1.851	244.99	.0919
915	-420	.823	108.88	.0408
1750	540	.411	54.44	.0204
1750	270	.823	108.88	.0408
1750	0	1.131	149.71	.0561
1750	-270	1.337	176.93	.0664
1750	-540	1.337	176.93	.0664
2875	540	.514	68.05	.0255
2875	270	.925	122.49	.0459
2875	0	2.159	285.82	.1072
2875	-270	1.954	258.60	.0970
2875	-540	1.851	244.99	.0919
4500	540	1.028	136.10	.0510
4500	270	.925	122.49	.0459
4500	0	1.337	176.93	.0664
4500	-270	1.439	190.54	.0715
4500	-540	1.234	163.32	.0612
5355	0	.720	95.27	.0357
MAXIMUM VALUES		2.159	285.82	.1072

RUN NUMBER		41
UNIT NUMBER		2
WIND DIRECTION		W
WIND SPEED (FT/S)		22
PERCENT LOAD		80
SO2 RELEASE RATE (GM/S)		265
STACK LOCATION (FT)	X=	165
	Y=	-210
STACK HEIGHT (FT)		300
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	0.000	0.00	0.0000
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	0.000	0.00	0.0000
2875	0	.032	13.47	.0051
2875	-270	.032	13.47	.0051
2875	-540	.032	13.47	.0051
4500	540	0.000	0.00	0.0000
4500	270	0.000	0.00	0.0000
4500	0	0.000	0.00	0.0000
4500	-270	.032	13.47	.0051
4500	-540	.032	13.47	.0051
5355	0	.032	13.47	.0051
MAXIMUM VALUES		.032	13.47	.0051

RUN NUMBER 42
UNIT NUMBER 2
WIND DIRECTION NW
WIND SPEED (FT/S) 22
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= -35
Y= -260
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	0.000	0.00	0.0000
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	0.000	0.00	0.0000
2875	0	.063	26.94	.0101
2875	-270	.032	13.47	.0051
2875	-540	0.000	0.00	0.0000
4500	540	.032	13.47	.0051
4500	270	.032	13.47	.0051
4500	0	.032	13.47	.0051
4500	-270	.032	13.47	.0051
4500	-540	.032	13.47	.0051
5355	0	.032	13.47	.0051
MAXIMUM VALUES		.063	26.94	.0101

RUN NUMBER	43
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	44
PERCENT LOAD	80
SO2 RELEASE RATE (GM/S)	265
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.068	14.46	.0054
500	210	.068	14.46	.0054
500	0	.068	14.46	.0054
500	-210	.068	14.46	.0054
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	.068	14.46	.0054
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	.204	43.37	.0163
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	.068	14.46	.0054
2875	270	.340	72.29	.0271
2875	0	.340	72.29	.0271
2875	-270	.068	14.46	.0054
2875	-540	.068	14.46	.0054
4500	540	.816	173.50	.0651
4500	270	.408	86.75	.0325
4500	0	.340	72.29	.0271
4500	-270	.204	43.37	.0163
4500	-540	.068	14.46	.0054
5355	0	.272	57.83	.0217
MAXIMUM VALUES		.816	173.50	.0651

RUN NUMBER 44
UNIT NUMBER 2
WIND DIRECTION NW
WIND SPEED (FT/S) 44
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= -35
Y= -260
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	.068	14.46	.0054
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	.136	28.92	.0108
1750	0	.680	144.58	.0542
1750	-270	.136	28.92	.0108
1750	-540	0.000	0.00	0.0000
2875	540	.136	28.92	.0108
2875	270	.340	72.29	.0271
2875	0	1.496	318.08	.1193
2875	-270	.408	86.75	.0325
2875	-540	.068	14.46	.0054
4500	540	.748	159.04	.0596
4500	270	1.156	245.79	.0922
4500	0	.884	187.96	.0705
4500	-270	.612	130.12	.0488
4500	-540	.204	43.37	.0163
5355	0	.952	202.42	.0759
MAXIMUM VALUES		1.496	318.08	.1193

RUN NUMBER 45
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 22
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 350
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	.033	14.12	.0053
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	.033	14.12	.0053
2875	0	.232	98.82	.0371
2875	-270	.133	56.47	.0212
2875	-540	.066	28.24	.0106
4500	540	.066	28.24	.0106
4500	270	.100	42.35	.0159
4500	0	.100	42.35	.0159
4500	-270	.100	42.35	.0159
4500	-540	.066	28.24	.0106
5355	0	.100	42.35	.0159
MAXIMUM VALUES		.232	98.82	.0371

RUN NUMBER 46
UNIT NUMBER 2
WIND DIRECTION NW
WIND SPEED (FT/S) 22
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= -35
Y= -260
STACK HEIGHT (FT) 350
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 32.70

SAMPLE POSITION X	SAMPLE POSITION Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	.034	14.41	.0054
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.034	14.41	.0054
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	.034	14.41	.0054
2875	0	.034	14.41	.0054
2875	-270	.034	14.41	.0054
2875	-540	.034	14.41	.0054
4500	540	.034	14.41	.0054
4500	270	.034	14.41	.0054
4500	0	.034	14.41	.0054
4500	-270	.034	14.41	.0054
4500	-540	.034	14.41	.0054
5355	0	.034	14.41	.0054
MAXIMUM VALUES		.034	14.41	.0054

RUN NUMBER 47
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 44
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 350
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.101	21.48	.0081
500	210	.101	21.48	.0081
500	0	.101	21.48	.0081
500	-210	0.000	0.00	0.0000
915	420	.101	21.48	.0081
915	210	.101	21.48	.0081
915	0	.101	21.48	.0081
915	-210	.101	21.48	.0081
915	-420	.152	32.23	.0121
1750	540	.202	42.97	.0161
1750	270	.152	32.23	.0121
1750	0	.202	42.97	.0161
1750	-270	.152	32.23	.0121
1750	-540	.101	21.48	.0081
2875	540	.051	10.74	.0040
2875	270	.152	32.23	.0121
2875	0	.606	128.90	.0483
2875	-270	1.061	225.58	.0846
2875	-540	1.061	225.58	.0846
4500	540	.960	204.10	.0765
4500	270	.909	193.36	.0725
4500	0	1.112	236.32	.0886
4500	-270	1.566	333.00	.1249
4500	-540	.303	64.45	.0242
5355	0	.657	139.65	.0524
MAXIMUM VALUES		1.566	333.00	.1249

RUN NUMBER	48
UNIT NUMBER	2
WIND DIRECTION	NW
WIND SPEED (FT/S)	44
PERCENT LOAD	80
SO2 RELEASE RATE (GM/S)	265
STACK LOCATION (FT) X=	-35
Y=	-260
STACK HEIGHT (FT)	350
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.101	21.48	.0081
500	210	.152	32.23	.0121
500	0	.101	21.48	.0081
500	-210	0.000	0.00	0.0000
915	420	.101	21.48	.0081
915	210	.101	21.48	.0081
915	0	.101	21.48	.0081
915	-210	.253	53.71	.0201
915	-420	.152	32.23	.0121
1750	540	.202	42.97	.0161
1750	270	.202	42.97	.0161
1750	0	.354	75.19	.0282
1750	-270	.202	42.97	.0161
1750	-540	.101	21.48	.0081
2875	540	.101	21.48	.0081
2875	270	.354	75.19	.0282
2875	0	.758	161.13	.0604
2875	-270	.909	193.36	.0725
2875	-540	.556	118.16	.0443
4500	540	.606	128.90	.0483
4500	270	.808	171.87	.0645
4500	0	1.011	214.84	.0806
4500	-270	1.213	257.81	.0967
4500	-540	.303	64.45	.0242
5355	0	.859	182.61	.0685
MAXIMUM VALUES		1.213	257.81	.0967

RUN NUMBER	49
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	22
PERCENT LOAD	80
SO2 RELEASE RATE (GM/S)	265
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	375
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	.033	14.12	.0053
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	0.000	0.00	0.0000
2875	0	.066	28.24	.0106
2875	-270	.066	28.24	.0106
2875	-540	0.000	0.00	0.0000
4500	540	.033	14.12	.0053
4500	270	.033	14.12	.0053
4500	0	.066	28.24	.0106
4500	-270	.066	28.24	.0106
4500	-540	.033	14.12	.0053
5355	0	.066	28.24	.0106
MAXIMUM VALUES		.066	28.24	.0106

RUN NUMBER 50
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 22
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 400
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.033	14.12	.0053
500	210	.033	14.12	.0053
500	0	.033	14.12	.0053
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	.033	14.12	.0053
915	0	.033	14.12	.0053
915	-210	0.000	0.00	0.0000
915	-420	.033	14.12	.0053
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	.033	14.12	.0053
1750	-270	.033	14.12	.0053
1750	-540	0.000	0.00	0.0000
2875	540	.033	14.12	.0053
2875	270	.033	14.12	.0053
2875	0	.066	28.24	.0106
2875	-270	.066	28.24	.0106
2875	-540	.066	28.24	.0106
4500	540	.033	14.12	.0053
4500	270	.066	28.24	.0106
4500	0	.066	28.24	.0106
4500	-270	.066	28.24	.0106
4500	-540	.066	28.24	.0106
5355	0	.033	14.12	.0053
MAXIMUM VALUES		.066	28.24	.0106

RUN NUMBER	51
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	44
PERCENT LOAD	80
SO2 RELEASE RATE (GM/S)	265
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	375
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	0.000	0.00	0.0000
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	.267	56.67	.0213
2875	0	.600	127.51	.0478
2875	-270	.333	70.84	.0266
2875	-540	0.000	0.00	0.0000
4500	540	.333	70.84	.0266
4500	270	1.066	226.69	.0850
4500	0	.866	184.19	.0691
4500	-270	.600	127.51	.0478
4500	-540	.133	28.34	.0106
5355	0	1.133	240.86	.0903
MAXIMUM VALUES		1.133	240.86	.0903

RUN NUMBER 52
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 44
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 400
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 32.70

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	0.000	0.00	0.0000
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	0.000	0.00	0.0000
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	.200	42.50	.0159
2875	0	.533	113.35	.0425
2875	-270	.200	42.50	.0159
2875	-540	.067	14.17	.0053
4500	540	.333	70.84	.0266
4500	270	.666	141.68	.0531
4500	0	.533	113.35	.0425
4500	-270	.333	70.84	.0266
4500	-540	.067	14.17	.0053
5355	0	.866	184.19	.0691
MAXIMUM VALUES		.866	184.19	.0691

RUN NUMBER 53
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 66
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 375
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.161	14.18	.0053
500	210	.161	14.18	.0053
500	0	.161	14.18	.0053
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	.161	14.18	.0053
915	0	.161	14.18	.0053
915	-210	.161	14.18	.0053
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	.321	28.37	.0106
1750	0	1.447	127.66	.0479
1750	-270	.804	70.92	.0266
1750	-540	.161	14.18	.0053
2875	540	.321	28.37	.0106
2875	270	1.929	170.22	.0638
2875	0	3.697	326.25	.1223
2875	-270	2.893	255.33	.0957
2875	-540	.643	56.74	.0213
4500	540	1.607	141.85	.0532
4500	270	2.893	255.33	.0957
4500	0	2.732	241.14	.0904
4500	-270	2.732	241.14	.0904
4500	-540	.643	56.74	.0213
5355	0	2.572	226.96	.0851
MAXIMUM VALUES		3.697	326.25	.1223

RUN NUMBER	54
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	66
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	400
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	20.50

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	0.000	0.00	0.0000
500	210	0.000	0.00	0.0000
500	0	0.000	0.00	0.0000
500	-210	0.000	0.00	0.0000
915	420	0.000	0.00	0.0000
915	210	0.000	0.00	0.0000
915	0	.161	14.18	.0053
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	0.000	0.00	0.0000
1750	270	.161	14.18	.0053
1750	0	1.125	99.29	.0372
1750	-270	.804	70.92	.0266
1750	-540	.321	28.37	.0106
2875	540	.321	28.37	.0106
2875	270	1.607	141.85	.0532
2875	0	3.858	340.43	.1277
2875	-270	2.090	184.40	.0692
2875	-540	.804	70.92	.0266
4500	540	1.447	127.66	.0479
4500	270	3.697	326.25	.1223
4500	0	2.893	255.33	.0957
4500	-270	1.768	156.03	.0585
4500	-540	.643	56.74	.0213
5355	0	2.411	212.77	.0798
MAXIMUM VALUES		3.858	340.43	.1277

RUN NUMBER	70
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	22
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	41.00

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.104	27.63	.0104
500	210	.200	52.96	.0199
500	0	.691	183.05	.0686
500	-210	0.000	0.00	0.0000
915	420	.170	44.90	.0168
915	210	.170	44.90	.0168
915	0	.261	69.08	.0259
915	-210	0.000	0.00	0.0000
915	-420	0.000	0.00	0.0000
1750	540	.048	12.66	.0047
1750	270	.017	4.61	.0017
1750	0	0.000	0.00	0.0000
1750	-270	0.000	0.00	0.0000
1750	-540	0.000	0.00	0.0000
2875	540	0.000	0.00	0.0000
2875	270	.157	41.45	.0155
2875	0	.139	36.84	.0138
2875	-270	.170	44.90	.0168
2875	-540	.265	70.23	.0263
4500	540	.239	63.32	.0237
4500	270	.213	56.41	.0212
4500	0	.222	58.71	.0220
4500	-270	.226	59.87	.0224
4500	-540	.361	95.56	.0358
5355	0	.117	31.08	.0117
MAXIMUM VALUES		.691	183.05	.0686

RUN NUMBER 71
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 22
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 65.40

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.269	114.44	.0429
500	210	.294	124.95	.0469
500	0	.330	140.14	.0526
500	-210	0.000	0.00	0.0000
915	420	.239	101.60	.0381
915	210	.291	123.79	.0464
915	0	.332	141.30	.0530
915	-210	.154	65.40	.0245
915	-420	.096	40.87	.0153
1750	540	.113	47.88	.0180
1750	270	.107	45.54	.0171
1750	0	.102	43.21	.0162
1750	-270	.107	45.54	.0171
1750	-540	.096	40.87	.0153
2875	540	.102	43.21	.0162
2875	270	.088	37.37	.0140
2875	0	.115	49.05	.0184
2875	-270	.135	57.22	.0215
2875	-540	.236	100.43	.0377
4500	540	.239	101.60	.0381
4500	270	.209	88.75	.0333
4500	0	.228	96.93	.0363
4500	-270	.220	93.42	.0350
4500	-540	.352	149.48	.0561
5355	0	.220	93.42	.0350
MAXIMUM VALUES		.352	149.48	.0561

RUN NUMBER	72
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	22
PERCENT LOAD	100
SO2 RELEASE RATE (GM/S)	331
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	81.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.088	46.51	.0174
500	210	.077	40.70	.0153
500	0	.074	39.54	.0148
500	-210	0.000	0.00	0.0000
915	420	.070	37.21	.0140
915	210	.070	37.21	.0140
915	0	.083	44.19	.0166
915	-210	.057	30.23	.0113
915	-420	.024	12.79	.0048
1750	540	.057	30.23	.0113
1750	270	.057	30.23	.0113
1750	0	.057	30.23	.0113
1750	-270	.055	29.07	.0109
1750	-540	.057	30.23	.0113
2875	540	.055	29.07	.0109
2875	270	.077	40.70	.0153
2875	0	.109	58.14	.0218
2875	-270	.142	75.58	.0283
2875	-540	.210	111.63	.0419
4500	540	.155	82.56	.0310
4500	270	.142	75.58	.0283
4500	0	.149	79.07	.0297
4500	-270	.153	81.40	.0305
4500	-540	.088	46.51	.0174
5355	0	.068	36.05	.0135
MAXIMUM VALUES		.210	111.63	.0419

RUN NUMBER 73
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 44
PERCENT LOAD 50
SO2 RELEASE RATE (GM/S) 165
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 41.00

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.415	54.87	.0206
500	210	.456	60.36	.0226
500	0	.464	61.46	.0230
500	-210	0.000	0.00	0.0000
915	420	.340	45.00	.0169
915	210	.340	45.00	.0169
915	0	.506	66.95	.0251
915	-210	.166	21.95	.0082
915	-420	.116	15.36	.0058
1750	540	.133	17.56	.0066
1750	270	.075	9.88	.0037
1750	0	.058	7.68	.0029
1750	-270	.133	17.56	.0066
1750	-540	.075	9.89	.0037
2875	540	.050	6.58	.0025
2875	270	.091	12.07	.0045
2875	0	.390	51.58	.0193
2875	-270	.415	54.87	.0206
2875	-540	1.525	201.93	.0757
4500	540	.854	113.04	.0424
4500	270	1.227	162.43	.0609
4500	0	1.376	182.18	.0683
4500	-270	1.600	211.81	.0794
4500	-540	.473	62.56	.0235
5355	0	.282	37.31	.0140
MAXIMUM VALUES		1.600	211.81	.0794

RUN NUMBER 74
UNIT NUMBER 2
WIND DIRECTION W
WIND SPEED (FT/S) 44
PERCENT LOAD .80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= 165
Y= -210
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 65.40

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.429	91.28	.0342
500	210	.406	86.83	.0326
500	0	.398	84.60	.0317
500	-210	0.000	0.00	0.0000
915	420	.398	84.60	.0317
915	210	.393	83.49	.0313
915	0	.414	87.94	.0330
915	-210	.272	57.89	.0217
915	-420	.194	41.19	.0154
1750	540	.236	50.10	.0188
1750	270	.262	55.66	.0209
1750	0	.283	60.11	.0225
1750	-270	.351	74.59	.0280
1750	-540	.340	72.36	.0271
2875	540	.283	60.11	.0225
2875	270	.461	97.96	.0367
2875	0	.487	103.53	.0388
2875	-270	.508	107.98	.0405
2875	-540	.503	106.87	.0401
4500	540	.340	72.36	.0271
4500	270	.461	97.96	.0367
4500	0	.461	97.96	.0367
4500	-270	.518	110.21	.0413
4500	-540	.550	116.89	.0438
5355	0	.356	75.70	.0284
MAXIMUM VALUES		.550	116.89	.0438

RUN NUMBER		75
UNIT NUMBER		2
WIND DIRECTION		W
WIND SPEED (FT/S)		44
PERCENT LOAD		100
SO2 RELEASE RATE (GM/S)		331
STACK LOCATION (FT)	X=	165
	Y=	-210
STACK HEIGHT (FT)		300
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		81.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.480	127.48	.0478
500	210	.455	120.83	.0453
500	0	.459	121.93	.0457
500	-210	0.000	0.00	0.0000
915	420	.430	114.17	.0428
915	210	.413	109.74	.0412
915	0	.447	118.61	.0445
915	-210	.409	108.63	.0407
915	-420	.250	66.51	.0249
1750	540	.363	96.44	.0362
1750	270	.367	97.55	.0366
1750	0	.376	99.76	.0374
1750	-270	.430	114.17	.0428
1750	-540	.401	106.42	.0399
2875	540	.338	89.79	.0337
2875	270	.392	104.20	.0391
2875	0	.488	129.69	.0486
2875	-270	.538	143.00	.0536
2875	-540	.614	162.95	.0611
4500	540	.413	109.74	.0412
4500	270	.430	114.17	.0428
4500	0	.472	125.26	.0470
4500	-270	.501	133.02	.0499
4500	-540	.509	135.24	.0507
5355	0	.434	115.28	.0432
MAXIMUM VALUES		.614	162.95	.0611

RUN NUMBER	76
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	66
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	41.00

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	1.099	96.96	.0364
500	210	1.288	113.68	.0426
500	0	1.326	117.02	.0439
500	-210	0.000	0.00	0.0000
915	420	1.124	99.19	.0372
915	210	1.187	104.76	.0393
915	0	4.168	367.79	.1379
915	-210	.972	85.82	.0322
915	-420	.530	46.81	.0176
1750	540	.897	79.13	.0297
1750	270	.935	82.47	.0309
1750	0	1.099	96.96	.0364
1750	-270	1.061	93.62	.0351
1750	-540	1.036	91.39	.0343
2875	540	.935	82.47	.0309
2875	270	1.339	118.14	.0443
2875	0	2.033	179.44	.0673
2875	-270	2.450	216.22	.0811
2875	-540	1.263	111.45	.0418
4500	540	.846	74.67	.0280
4500	270	1.086	95.85	.0359
4500	0	2.501	220.67	.0828
4500	-270	3.119	275.29	.1032
4500	-540	1.225	108.11	.0405
5355	0	1.137	100.31	.0376
MAXIMUM VALUES		4.168	367.79	.1379

RUN NUMBER		77
UNIT NUMBER		2
WIND DIRECTION		W
WIND SPEED (FT/S)		66
PERCENT LOAD		80
SO2 RELEASE RATE (GM/S)		265
STACK LOCATION (FT)	X=	165
	Y=	-210
STACK HEIGHT (FT)		300
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		65.40

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.351	49.74	.0187
500	210	.335	47.48	.0178
500	0	.367	52.00	.0195
500	-210	0.000	0.00	0.0000
915	420	.295	41.83	.0157
915	210	.319	45.22	.0170
915	0	1.316	186.53	.0700
915	-210	.271	38.44	.0144
915	-420	.104	14.70	.0055
1750	540	.263	37.31	.0140
1750	270	.231	32.78	.0123
1750	0	.239	33.92	.0127
1750	-270	.295	41.83	.0157
1750	-540	.231	32.78	.0123
2875	540	.255	36.18	.0136
2875	270	.343	48.61	.0182
2875	0	.526	74.61	.0280
2875	-270	.646	91.57	.0343
2875	-540	.670	94.96	.0356
4500	540	.407	57.66	.0216
4500	270	.510	72.35	.0271
4500	0	.638	90.44	.0339
4500	-270	1.005	142.44	.0534
4500	-540	.383	54.26	.0203
5355	0	.295	41.83	.0157
MAXIMUM VALUES		1.316	186.53	.0700

RUN NUMBER	78
UNIT NUMBER	2
WIND DIRECTION	W
WIND SPEED (FT/S)	66
PERCENT LOAD	100
SO2 RELEASE RATE (GM/S)	331
STACK LOCATION (FT) X=	165
Y=	-210
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	81.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.191	33.77	.0127
500	210	.223	39.40	.0148
500	0	.235	41.65	.0156
500	-210	0.000	0.00	0.0000
915	420	.191	33.77	.0127
915	210	.191	33.77	.0127
915	0	.871	154.22	.0578
915	-210	.165	29.27	.0110
915	-420	.013	2.25	.0008
1750	540	.140	24.77	.0093
1750	270	.127	22.51	.0084
1750	0	.127	22.51	.0084
1750	-270	.134	23.64	.0089
1750	-540	.114	20.26	.0076
2875	540	.108	19.14	.0072
2875	270	.350	61.91	.0232
2875	0	.401	70.92	.0266
2875	-270	.426	75.42	.0283
2875	-540	.337	59.66	.0224
4500	540	.178	31.52	.0118
4500	270	.184	32.65	.0122
4500	0	.439	77.67	.0291
4500	-270	.591	104.69	.0393
4500	-540	.273	48.41	.0182
5355	0	.191	33.77	.0127
MAXIMUM VALUES		.871	154.22	.0578

RUN NUMBER	79
UNIT NUMBER	2
WIND DIRECTION	SW
WIND SPEED (FT/S)	44
PERCENT LOAD	50
SO2 RELEASE RATE (GM/S)	165
STACK LOCATION (FT) X=	260
Y=	-35
STACK HEIGHT (FT)	300
STRATIFICATION	NEUTRAL
STACK VELOCITY (FT/S)	41.00

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.204	27.04	.0101
500	210	.179	23.66	.0089
500	0	.587	77.75	.0292
500	-210	0.000	0.00	0.0000
915	420	.111	14.65	.0055
915	210	.119	15.78	.0059
915	0	3.439	455.25	.1707
915	-210	.119	15.78	.0059
915	-420	.009	1.13	.0004
1750	540	.077	10.14	.0038
1750	270	.392	51.84	.0194
1750	0	1.158	153.25	.0575
1750	-270	.477	63.10	.0237
1750	-540	.162	21.41	.0080
2875	540	.170	22.54	.0085
2875	270	1.268	167.90	.0630
2875	0	2.639	349.32	.1310
2875	-270	1.430	189.31	.0710
2875	-540	.782	103.67	.0389
4500	540	.741	98.04	.0368
4500	270	1.694	224.24	.0841
4500	0	2.017	267.06	.1001
4500	-270	1.771	234.39	.0879
4500	-540	.366	48.45	.0182
5355	0	.162	21.41	.0080
MAXIMUM VALUES		3.439	455.25	.1707

RUN NUMBER 80
UNIT NUMBER 2
WIND DIRECTION SW
WIND SPEED (FT/S) 44
PERCENT LOAD 80
SO2 RELEASE RATE (GM/S) 265
STACK LOCATION (FT) X= 260
Y= -35
STACK HEIGHT (FT) 300
STRATIFICATION NEUTRAL
STACK VELOCITY (FT/S) 65.40

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.059	12.57	.0047
500	210	.118	25.15	.0094
500	0	.220	46.86	.0176
500	-210	0.000	0.00	0.0000
915	420	.081	17.15	.0064
915	210	.118	25.15	.0094
915	0	.984	209.17	.0784
915	-210	.081	17.15	.0064
915	-420	.016	3.43	.0013
1750	540	.038	8.00	.0030
1750	270	.102	21.72	.0081
1750	0	.210	44.58	.0167
1750	-270	.118	25.15	.0094
1750	-540	.043	9.14	.0034
2875	540	.097	20.57	.0077
2875	270	.414	88.01	.0330
2875	0	.866	184.03	.0690
2875	-270	.392	83.44	.0313
2875	-540	.247	52.58	.0197
4500	540	.194	41.15	.0154
4500	270	.452	96.01	.0360
4500	0	.634	134.88	.0506
4500	-270	.473	100.59	.0377
4500	-540	.134	28.58	.0107
5355	0	.108	22.86	.0086
MAXIMUM VALUES		.984	209.17	.0784

RUN NUMBER		81
UNIT NUMBER		2
WIND DIRECTION		SW
WIND SPEED (FT/S)		44
PERCENT LOAD		100
SO2 RELEASE RATE (GM/S)		331
STACK LOCATION (FT)	X=	260
	Y=	-35
STACK HEIGHT (FT)		300
STRATIFICATION		NEUTRAL
STACK VELOCITY (FT/S)		81.80

SAMPLE POSITION X	Y	CONCENTRATION COEFFICIENT K*10**6 (FT)**-2	SO2 CONCENTRATION MICRO GM PER CU.M	SO2 CONCENTRATION PPM
500	420	.056	14.80	.0055
500	210	.047	12.52	.0047
500	0	.073	19.35	.0073
500	-210	0.000	0.00	0.0000
915	420	.026	6.83	.0026
915	210	.039	10.24	.0038
915	0	.836	221.94	.0832
915	-210	.034	9.11	.0034
915	-420	0.000	0.00	0.0000
1750	540	.009	2.28	.0009
1750	270	.047	12.52	.0047
1750	0	.184	48.94	.0184
1750	-270	.064	17.07	.0064
1750	-540	.026	6.83	.0026
2875	540	.030	7.97	.0030
2875	270	.236	62.60	.0235
2875	0	.591	157.07	.0589
2875	-270	.300	79.67	.0299
2875	-540	.287	76.26	.0286
4500	540	.236	62.60	.0235
4500	270	.429	113.82	.0427
4500	0	.536	142.27	.0534
4500	-270	.343	91.05	.0341
4500	-540	.064	17.07	.0064
5355	0	.039	10.24	.0038
MAXIMUM VALUES		.836	221.94	.0832