



PB97-104889

Field Study of Local Exhaust Hood Performance

Final Report

December 29, 1993

NIOSH Grant 5 K01 OH00078-03

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REPORT DOCUMENTATION PAGE	1. REPORT NO.	2.	3. 		
4. Title and Subtitle Field Study of Local Exhaust Hood Performance	5. Report Date 1993/12/29		6.		
	8. Performing Organization Rept. No.		10. Project/Task/Work Unit No.		
7. Author(s) Conroy, L. M., R. Prodans, M. Lachman, and X. Yu		11. Contract (C) or Grant(G) No. (C) (G) K01-OH-00078			
9. Performing Organization Name and Address Department of Environmental and Occupational Health Sciences, School of Public Health, University of Illinois at Chicago, Chicago, Illinois		13. Type of Report & Period Covered			
12. Sponsoring Organization Name and Address		14.			
15. Supplementary Notes					
16. Abstract (Limit: 200 words) The performance of slot hoods to exhaust vapor degreasers was investigated, and a comparison was made of predicted and measured capture efficiencies. Sixteen degreasers were studied in facilities located in the Chicago area. The capture efficiency of the hoods was measured, along with the direction and magnitude of cross drafts in the vicinity of the local exhaust hood. A comparison was then made of field measurements with existing design recommendations. Measured cross drafts ranged from near 0 to more than 120 feet per minute. Measured workspace emission rates ranged from near 0 to 211 grams/minute. Measured duct emission rates ranged from near 0 to 258 grams/minute. Measured capture efficiencies ranged from 0.09 to 1.00. Predicted capture efficiencies ranged from 0.52 to 0.86. The measured hood flow rates ranged from 36% to 349% of the recommended flow rate of 50 cubic feet per minute/square foot. For some conditions the recommended flow rate appeared to be adequate, but it was inadequate for others.					
17. Document Analysis a. Descriptors b. Identifiers/Open-Ended Terms NIOSH-Publication, NIOSH-Grant, Grant-Number-K01-OH-00078, End-Date-09-29-1993, Control-technology, Air-flow, Exhaust-ventilation, Solvent-vapor-degreasing, Solvent-vapors c. COSATI Field/Group					
18. Availability Statement	19. Security Class (This Report)		21. No. of Pages 151		
	22. Security Class (This Page)		22. Price		

LIST OF ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
CMS	Completely mixed space model
D	Eddy diffusivity
hr	hour
LEV	Local exhaust ventilation
mg	milligrams
min	minute
ml	milliliters
NIOSH	National Institute for Occupational Safety and Health
ppm	parts per million
RR	rotameter reading
S	emission rate
SF ₆	Sulfur hexafluoride
2PT	Two-point diffusion model

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1 Significant Findings

Crossdrafts can be quantified under operating conditions. Measured crossdraft magnitudes ranged from 0.1 to 126 fpm. The range of crossdrafts observed in industrial settings are consistent with those used in laboratory experiments to develop predictive capture efficiency models.

The current hood design method⁽¹⁾, which recommends eliminating crossdrafts or other disturbances to air flow, is unrealistic. This research demonstrated that the effect of crossdrafts cannot be disregarded.

Emission rates averaged 12.1 g/min and 18.5 g/min using the completely mixed space model with $k=0.3$ and the two point diffusion model, respectively. On average, the two point diffusion model estimated emissions approximately twice as high as the completely mixed space model with $k=0.3$.

The predicted capture efficiencies did not agree well with those measured under operating conditions. This could be due to several factors: 1) turbulence was inadequately accounted for in the model; 2) the effects of the cooling condenser were not considered; 3) solvent was carried out of the degreaser to areas where the hood could not be expected to capture contaminants; and 4) the variability in emission rate due to degreaser activity is not adequately taken into account in the predictive capture efficiency model.

The ACGIH⁽¹⁾ recommended flow of 50 cfm/ft² of tank surface appears to be adequate for some conditions but inadequate for other conditions. An increase in flow, above design recommendations, did not necessarily improve hood performance.

2 Abstract

A field study was performed to determine the performance of slot hoods used to exhaust vapor degreasers. The study was performed on sixteen degreasers in facilities in the Chicago area. The measurements were conducted under normal operating conditions. The specific aims of the study were 1) to measure capture efficiency of slot hoods used to exhaust vapor degreasers under operating conditions; 2) to measure the direction and magnitude of

crossdrafts in the vicinity of the local exhaust hood; and 3) to compare field measurements with existing design recommendations and with a model developed for flanged slot hoods and area sources of contaminant release.

Measurements were conducted over two days at each location. Local exhaust and general ventilation flow rates as well as the physical dimensions of the workspace and the degreaser were measured. Solvent concentrations at several locations in the workspace and in the local exhaust duct were measured in one- hour intervals. Crossdraft velocity was measured simultaneously with concentration in two-minute intervals. The concentration results and the ventilation characteristics of the space were used to determine the rate of solvent emission into the workspace using two mass balance models. The local exhaust emission rate was calculated from the duct flow rate and concentration. The ratio of duct emission rate to total emission rate is the hood capture efficiency. The measured crossdrafts, local exhaust hood flow rate, and the area of the tank surface were used in the predictive capture efficiency model for each sampling interval. These were compared with the measured capture efficiencies.

Measured crossdrafts ranged from near 0 to more than 120 fpm. Measured workspace emission rates ranged from near 0 to 211 g/min. Measured duct emission rates ranged from near 0 to 258 g/min. Measured capture efficiencies ranged from 0.09 to 1.00. Predicted capture efficiencies ranged from 0.52 to 0.86.

Using overall averages, there appears to be reasonably good agreement between predicted and measured capture efficiency (0.76, 0.62, 0.79 measured vs. 0.76 predicted). However, examining the daily averages for each degreaser showed poor agreement between predicted and measured efficiency. This could be due to several factors: 1) turbulence was inadequately accounted for in the predictive model; 2) the effects of the cooling condenser on the degreaser were not considered; 3) solvent was carried out of the degreaser to areas where the hood could not be expected to capture contaminants; and 4) the variability in emission rate due to degreaser activity is not adequately taken into account in the predictive capture efficiency model.

The ACGIH recommended flow rate for vapor degreasers is 50 cfm/ft² of tank surface. The measured hood flow rates ranged from 36% to 349% of the recommended flow rate. The

recommended flow rate appears to be adequate for some conditions but inadequate for other conditions. An increase in flow, above design recommendations, did not necessarily improve hood performance.

3 Body of Report

3.1 Background and Significance

Vapor degreasers are used in many industries to remove surface grease and oils from metal parts prior to use or further surface treatment, such as plating. A vapor phase degreaser is a tank containing a solvent which is heated to its boiling point. Boiling the liquid solvent creates a vapor phase above the liquid. Parts are cleaned by lowering them into the vapor phase. The vapor condenses on the surface of the cooler parts and washes the oil from the surface. Heavily soiled parts can be lowered into the boiling liquid and/or sprayed with warm solvent.⁽²⁾ Several different solvents are commonly used in vapor degreasing. These include trichloroethylene, perchloroethylene, methyl chloroform, ethylene dichloride, and certain Freons.⁽²⁾ Without adequate control, the solvent is emitted into the workplace creating a potential exposure of employees in the area. Also without adequate control the solvent is eventually released into the atmosphere with no recovery. The solvent loss can create health and safety problems and is a considerable operating expense.

Adequate local exhaust ventilation serves two purposes: 1) it removes the contaminant at the source preventing exposure to workers, and 2) it concentrates the solvent into a smaller volume of air which allows for possible solvent recovery and reuse.

Slot hoods are commonly used to exhaust area sources of contaminant release. Typical uses include metal finishing, electroplating, and degreasing operations where slot hoods are used to control emissions from open surface tanks.

The current design technique⁽¹⁾ for open surface tanks relies on qualitative terms such as "adequate," "high hazard or low hazard material," and "still air or disturbing air currents." A design based on such qualitative parameters gives the designer no indication of the hood performance and in turn no way to know if the contaminant is being controlled to a safe level before the hood is constructed and tested.

Current design techniques, as given in the Industrial Ventilation Manual,⁽¹⁾ require the hazard potential and the contaminant evolution rate to be estimated. These are combined to give the "class" of contaminant, which in turn is used to determine the necessary air flow, Q (cfm/ft² source area). The maximum air flow specified is 250 cfm/ft² source area.⁽¹⁾ The recommendation for vapor degreasers is 50 cfm/ft². The design method does not account quantitatively for crossdrafts, but instead recommends eliminating crossdrafts.

The widespread availability and ease of use of small, fast, personal computers allows the use of advanced techniques for local exhaust ventilation design. Centerline velocity estimates used currently as the primary design parameter for exterior hoods can now be replaced by more complicated velocity models. Garrison and Wang,⁽³⁾ Esman et al.,⁽⁴⁾ Flynn and Ellenbecker,^(5,6) and Conroy, et al.⁽⁷⁾ have all developed models to predict velocity at any point in the flow field, not just the centerline velocity. Any such estimate of capture velocity, however, has an uncertain relationship with the true variable of interest, capture efficiency. Capture efficiency is defined as the fraction of contaminant generated which is captured directly by the hood.

Empirical studies of capture efficiency have been conducted. Ellenbecker, et al.⁽⁸⁾ developed a field method to measure capture efficiency of local exhaust hoods which used an oil mist release and a light scattering photometer. NIOSH⁽⁹⁾ examined the ventilation requirements for grinding, buffing, and polishing operations and Jansson⁽¹⁰⁾ looked at capture efficiency of hand grinding, drilling, and welding operations.

A method for measuring capture efficiency of local exhaust hoods during normal operation uses the ratio of workspace emission rate to local exhaust emission rate. Workspace emission rates are estimated from workspace concentrations and ventilation measurements using an appropriate mass balance model.⁽¹¹⁻¹³⁾

Roach,⁽¹⁴⁾ Fletcher and Johnson,⁽¹⁵⁾ Flynn and Ellenbecker,⁽¹⁶⁾ and Conroy and Ellenbecker^(17,18) have studied capture efficiency of local exhaust hoods. The models of Conroy and Ellenbecker^(17,18) predict capture efficiency of flanged slot hoods and point or area sources under the influence of a uniform crossdraft. The models were validated in the laboratory but no field validation has been done to determine if the parameters studied in the laboratory were representative of industrial conditions.

One major shortcoming of designs based on capture efficiency is a lack of knowledge of what capture efficiency is "high enough" (analogous to the question of what capture efficiency is "high enough"). The variable of interest, of course, is air concentration of the contaminant being emitted. Research must be done to relate hood capture efficiency with air concentrations for a variety of hood, worker, and extraneous air flow conditions.

An important component of any such research must be a better understanding of the nature of industrial crossdrafts which affect exterior hood performance and subsequent transport of contaminant away from the source and into the workplace. Capture efficiency model development and validation used a uniform crossdraft, uniform in direction and magnitude. Industrial crossdrafts are not expected to be uniform in direction or magnitude for extended lengths of time. The model allows for a distributions of crossdrafts and in turn will predict a capture efficiency distribution. Therefore, to the extent that crossdrafts can be quantified, capture efficiency can be predicted. However, the model has not been validated for crossdrafts other than those with uniform direction and magnitude.

3.2 Objectives

The broad, long term objective of this research is to determine if exterior hood design can be improved to adequately control emissions from open surface tanks. The specific aims are: 1) to measure capture efficiency of local exhaust hoods used to control vapor degreasing tanks during normal operations; 2) to measure crossdrafts in the vicinity of the vapor degreasing tanks; 3) to use the measured crossdrafts and hood and source parameters to predict capture efficiency using the model developed by Conroy and Ellenbecker;⁽¹⁸⁾ and 4) to compare predicted and measured capture efficiency.

3.3 Models

3.3.1 Predicted Capture Efficiency

Semi-empirical models for both point sources and area sources of contaminant release have been developed.^(17,18) The point source model uses potential flow theory to describe the flow field in front of a flanged slot hood and an empirical factor to describe the turbulent diffusion of contaminant around streamlines.

Potential flow theory can be used to predict the velocity components (V_x, V_y, V_z) at any point (x, y, z) in front of an elliptical opening. Modelling a flanged slot hood as an inscribed ellipse, the velocity at any point in front of the hood can be determined using the following equations:

$$V_x = \frac{dx}{dt} = \frac{\partial \phi}{\partial x} = \frac{Qx(\alpha^2 + \lambda)^{1/2}(b^2 + \lambda)^{3/2}\lambda^{3/2}}{2\pi E} \quad (1)$$

$$V_y = \frac{dy}{dt} = \frac{\partial \phi}{\partial y} = \frac{Qy(\alpha^2 + \lambda)^{3/2}(b^2 + \lambda)^{1/2}\lambda^{3/2}}{2\pi E} \quad (2)$$

$$V_z = \frac{dz}{dt} = \frac{\partial \phi}{\partial z} = \frac{Qz(\alpha^2 + \lambda)^{3/2}(b^2 + \lambda)^{3/2}\lambda^{1/2}}{2\pi E} x \frac{\ln \lambda - 11.8}{-10.7} \quad (3)$$

where

$$E = x^2\lambda^2(b^2 + \lambda)^2 + y^2\lambda^2(\alpha^2 + \lambda)^2 + z^2(\alpha^2 + \lambda)^2(b^2 + \lambda)^2 \quad (4)$$

and x is parallel to the hood length, y is parallel to the hood width, and z is perpendicular to the hood face. The hood air flow is Q ; a is the length of the major axis and b is the minor axis of the modelled ellipse; and λ is the positive root of

$$\frac{x^2}{\alpha^2 + \lambda} + \frac{y^2}{b^2 + \lambda} + \frac{z^2}{\lambda} = 1 \quad (5)$$

A crossdraft can be added to the velocity components given in Equations (1-3) through simple vector addition of the velocity generated by the hood and the crossdraft velocity. This model has been validated in the laboratory.(7)

A model for capture efficiency for a point source of contaminant release has been developed and validated in the laboratory.(17) The model utilizes the velocity field model for the xz -plane, (i.e., $y=0$), together with an empirical term to account for turbulent dispersion of contaminant around streamlines. Capture efficiency is given by:

$$\eta = \frac{\exp\left(\frac{z-\mu}{\omega}\right)}{1 + \exp\left(\frac{z-\mu}{\omega}\right)} \quad (6)$$

where η = capture efficiency; Z = distance, in the z-direction, from the hood face to the point of interest; μ = empirically corrected distance, in the z-direction to the dividing streamline; and ω = parameter to account for the spread of contaminant around streamlines. The dividing streamline is the streamline which just enters the hood.

The spread parameter, ω , is calculated from

$$\omega = -0.15Z_c + 0.004 \quad \text{for } Z_c \text{ in m} \quad (7a)$$

$$\omega = -0.15Z_c + 0.18 \quad \text{for } Z_c \text{ in inches} \quad (7b)$$

The empirically corrected dividing distance, μ , is calculated from

$$\mu = 0.83Z_c \quad (8)$$

The theoretical distance to the dividing streamline, Z_c , is a function of hood dimensions, hood face velocity, distance parallel to the hood face, and crossdraft velocity.

$$Z_c = f(L, W, X, V_o, V_c) \quad (9)$$

In the laboratory experiments the crossdraft velocity was held constant for each experimental condition. The location of each release point could be described by its x- and z-coordinates. For a constant hood face velocity and crossdraft velocity, Z_c could be determined using a computer program and capture efficiency calculated using Equations (6-8).

The capture efficiency of area sources of contaminant release, such as open surface tanks, can be calculated by integrating the point predictions over the surface of the source.⁽¹⁸⁾ For open surface tanks with liquid level very close to the bottom of the slot hood, the source in front of the hood prevents air from being drawn from below the slot, causing more air to be drawn from in front of the slot. The effect is to increase the distance to the dividing streamline. The velocity field, modified by the presence of the contaminant source, is modelled by an image source of suction below the slot. This would be the case for plating tanks or pickling or cleaning tanks. With vapor

degreasers, the liquid level is much lower than the bottom of the slot and does not interfere with air flow from below the slot. The assumption of an image source of suction is not necessary for predicting capture efficiency of hoods on vapor degreasers.

The integration is performed numerically. The geometry of the area source is specified, and capture efficiencies for a large number of points evenly spaced on the surface of the area source are calculated using Equations (6-8). The average of this large number of point source efficiencies is the overall efficiency. A computer program written in BASIC was developed to compute the capture efficiency of flanged slot hoods used to exhaust vapor degreasers.

3.3.2 Workspace Emission Rates

Workplace emission rates are calculated from the measured contaminant concentration profile in the space and the ventilation characteristics of the space using a mass balance model. Several mass balance model forms can be used. In this project two models were used, the completely mixed space at steady state and the two point diffusion models.

3.3.2.1 Completely Mixed Space (CMS)

The steady state mass balance on a completely mixed space is expressed mathematically as follows:

$$S_w = k C_{ss} Q \quad (10)$$

where S_w = workspace mass emission rate (mass/time), k = factor to account for incomplete mixing (dimensionless), C_{ss} = mass concentration at steady state (mass/volume), and Q = volumetric air flow through space (volume/time).⁽¹⁹⁾

Assumptions inherent to this model are given by Burgess, et al.⁽²⁰⁾ as follows:

- "1) There is perfect mixing in the area, both spatially and temporally.
- 2) The emission rate is constant.
- 3) The contaminant concentration in the dilution air is zero.
- 4) The contaminant is introduced to the space only through process emissions.
- 5) The contaminant is removed from the space only through general ventilation."

3.3.2.2 Two Point Diffusion (2PT)

Emission rates were determined from the observed variation in time of the solvent concentration gradient near the degreaser. This method assumes a point source emitting at a steady rate into an infinite hemispherical space. The model also assumes the contaminant diffusion follows Fick's Law and neglects deposition. A solution for the mass balance on a system of this type is given in Carslaw and Jaeger(21) as:

$$C = \left(\frac{S_w}{2\pi D r} \right) \text{erfc} \left(\frac{r}{(4Dt)^{0.5}} \right) \quad (11)$$

where C = concentration (mass/volume), r = distance from the point source (length), t = time, S_w = workspace emission rate (mass/time), D = eddy diffusivity (area/time), and erfc stands for the error function complement and is available in reference tables.(22)

The integral of Equation (11) is the appropriate form to characterize area concentrations, C_{av} , collected over averaging time, t_{av} . With simultaneous measurement of concentration at two different distances, r_1 and r_2 the integral form of Equation (11) give two independent equations:

$$C_{av, r_1} = \frac{\left(\frac{S_w}{2\pi D r_1} \right) \int_0^{t_{av}} \text{erfc} \left(\frac{r_1}{(4Dt)^{0.5}} \right) dt}{t_{av}} \quad (12a)$$

$$C_{av, r_2} = \frac{\left(\frac{S_w}{2\pi D r_2} \right) \int_0^{t_{av}} \text{erfc} \left(\frac{r_2}{(4Dt)^{0.5}} \right) dt}{t_{av}} \quad (12b)$$

Equations (12a) and (12b) can be solved simultaneously for eddy diffusivity, D , and emission rate, S .

This approach was tested on two vapor-phase degreasers, an open top manually loaded type and an enclosed conveyor type.(11)

3.3.3 Measured Capture Efficiency

Measured capture efficiency is the ratio of workspace emission rate to total emission rate (workspace plus local exhaust system). This is expressed mathematically as:

$$\eta = \frac{S_d}{S_w + S_d} \quad (13)$$

where η is capture efficiency (dimensionless), S_w is the workspace emission rate (g/min), and S_d is the local exhaust duct emission rate (g/min). Workspace emission rates are calculated using either Equation (10) or (12). Duct emission rates are calculated by multiplying the duct concentration (mass/volume) by the duct flow rate (volume/time).

3.4 Methods

This study looked specifically at vapor degreaser slot hoods. This type of hood was chosen because of the similarity of design from one hood to another. Solvent emission rates, crossdrafts, and local exhaust hood capture efficiencies were measured at sixteen vapor degreasers. The degreasers were located in private industrial settings and studied under normal operating conditions. Where possible, data was collected over two eight hour shifts for each degreaser. Table I shows the type of facility, degreaser dimensions, and solvent used for each degreaser. The industrial operations using degreasing included metal fabrication, metal finishing, electronics manufacturing, and electroplating. Thirteen degreasers used trichloroethylene. Methyl chloroform, perchloroethylene, and methylene chloride were used in the other three degreasers, respectively.

TABLE I: DEGREASER INFORMATION

Site	Dates of Study	Type of Facility	Solvent	Degreaser Opening Dimensions
1A	08/20-21/90	Metal Fabrication	Methyl Chloroform	55 in x 36.5 in (1.30 m ²)
2A	10/25-26/90	Metal Fabrication	Trichloroethylene	48 in x 28 in (0.74 m ²)
3A	11/08-09/90	Metal Fabrication	Trichloroethylene	60.5 in x 30 in (1.17 m ²)
4A	11/15/90	Metal Finishing	Trichloroethylene	44 in x 34 in (0.97 m ²)
6A	12/10-11/90	Electroplating	Trichloroethylene	48 in x 32 in (0.99 m ²)
6B	12/12-13/90	Electroplating	Trichloroethylene	47 in x 30 in (0.91 m ²)
7A	01/07-08/91	Metal Fabrication	Trichloroethylene	48 in x 30 in (0.93 m ²)
8A	02/14-15/91	Metal Fabrication	Trichloroethylene	124 in x 48.5 in (3.88 m ²)
8B	02/14-15/91	Metal Fabrication	Trichloroethylene	120 in x 48 in (3.72 m ²)
9A	03/25-26/91	Metal Fabrication	Perchloroethylene	60 in x 40 in (1.55 m ²)
10A	04/29-30/91	Metal Finishing	Trichloroethylene	48 in x 30 in (0.93 m ²)
10B	04/29-30/91	Metal Finishing	Trichloroethylene	48 in x 30 in (0.93 m ²)
11A	05/07-08/91	Electronics	Trichloroethylene	30 in x 9.875 in (0.19 m ²)
12A	06/13-14/91	Electronics	Methylene Chloride	78 in x 14 in (0.70 m ²)
13A	08/20-21/91	Metal Finishing	Trichloroethylene	36 in x 24 in (0.56 m ²)
14A	08/22-23/91	Electroplating	Trichloroethylene	69 in x 26 in (1.16 m ²)

3.4.1 Solvent Concentration Measurements

Solvent concentrations were measured during one hour intervals in the duct and at measured distances from the degreaser during working conditions. Solvent concentrations were measured during 30 minute intervals in the duct and at measured distances from the degreaser during idling conditions (when objects are not being degreased, i.e. lunch, end of shift). Samples were collected on charcoal tubes connected by Tygon tubing to portable sampling pumps. Air flows were controlled using each pump's internal needle valve. Flow rates were checked using a calibrated rotameter. Samples were analyzed by gas chromatograph/flame ionization detection following NIOSH Method 1022.⁽²³⁾ Sampling locations for each site are shown in Figures 5-23 in Appendix A.

3.4.2 Tracer Gas Measurements

Tracer gas was released through a series of copper tubes, with holes drilled in them. The tubes were configured to distribute an equal release of the tracer gas over the degreaser. Sulfur hexafluoride (SF_6) was released at a measured rate and the concentration of SF_6 was measured in the duct downstream of the hood using a Foxboro/Wilks Miran 1A General Purpose Gas Analyzer connected to a Rustrak Ranger data logger and a chart recorder. SF_6 release was limited to idling conditions (when objects were not being degreased, i.e. lunch, end of shift) to avoid interfering with the operation of the degreaser. SF_6 was released for approximately 30 minutes, twice a day, site permitting.

3.4.3 Ventilation Measurements

Local exhaust hood flow rate was measured in the duct using a Pitot tube and manometer. In some cases, the air velocity was too low to accurately measure with a Pitot tube and manometer. In those cases, the slot hood area and slot velocity was measured. Slot velocity was measured using a calibrated TSI Model 8350 Velocicalc hot-film anemometer.

Air velocity through all building or room openings was also measured using a calibrated TSI Model 8350 Velocicalc hot-film anemometer. In sites with mechanical supply and return systems, general ventilation supply and exhaust air flows were measured using an Alnor Balometer.

3.4.4 Crossdraft Measurements

Crossdraft velocity (magnitude and direction) near the local exhaust hood was measured simultaneously with measurements of solvent concentration. Measurements were made using a TSI, Inc. hot-wire anemometer with fast response suitable for turbulence measurements. Measured values were recorded through an analog-to-digital converter on a Toshiba T-5200 portable computer. A two-wire mutually perpendicular probe (model 1240-T15, TSI Corporation, St. Paul, Minn.), determined the direction as well as the magnitude of the crossdraft. The probe was used in the horizontal centerline plane (the xz-plane). Five measurements were made in each two-minute interval and the measurements were repeated approximately six times per hour.

3.4.5 Other Measurements

The location, along with the hood and tank dimensions of the degreaser were measured. Room dimensions, including doorways, windows, garage doors, and other openings in the room of the degreaser were measured.

3.5 Results and Discussion

The results of this study are presented in a series of tables. Table II shows the hood and tank dimensions, the measured hood air flow, and the air flow recommended by the ACGIH⁽¹⁾ for each degreaser. The degreasers were operated at an average of 120% of design, with a range of 36% of design at Site 13a to 349% of design at Site 11a.

Overall emission rates and capture efficiencies are shown in Table III. Tables IV-XXI show the interval emission rates and capture efficiencies for each site. Workspace emission rates were estimated using the completely mixed space model (Equation (10))

and the two point diffusion model (Equation (12)). The mixing factor for each space was not available. Commonly, mixing factors for industrial spaces range between 0.1 and 0.3.⁽¹⁹⁾ The model was used with mixing factors equal to 0.1 and 0.3.

The two point diffusion model was used for each pair of concentrations. The averages of all pairs where the model gave realistic diffusivities are presented in the "all" column of Tables IV-XXI and the "2-PT" column of Table III. The two point diffusion model was also run for concentration measurements at the closest two points to the center of the degreaser. These results are shown in the "closest 2 pts" column of Tables IV-XXI.

The local exhaust ventilation system emissions are shown in the "LEV" column of Tables III-XXI. Measured capture efficiency was calculated using Equation (13).

The details of the emission rate calculations are given in Tables LI-LIV in Appendix C. The average workspace emission rates were 12.1 and 18.5 g/min for the CMS and 2PT models, respectively. The highest workspace emissions were observed at site 6b and the lowest were observed at site 6a.

There is good correlation ($r^2=0.71$) between the average mission rates calculated using the two mass balance models. The agreement between the two point diffusion model and the completely mixed space model with $k=0.3$ is shown in Figure 1. The two point diffusion model gives emissions rates that are approximately twice those estimated by the completely mixed space model with $k=0.3$.

Predicted capture efficiency was calculated using the measured crossdrafts and Equations (1-9). Details of the calculations are given in Table LV in Appendix D. An example of the computer program output for one set of measurements is shown in Figure 2. The degreaser at Site 2A is shown. The crossdraft measurement occurred at 10:02 on the first day of sampling. Similar analyses were performed for each crossdraft measurement. The interval averages are presented in Tables IV-XXI.

A summary of the crossdraft measurement results is given in Tables XXII-XXIV. Results of crossdraft measurements for each sampling interval for each site are given in Tables XXV-XXXIV. The x-component of velocity is parallel to the hood face and the z-component is perpendicular to the hood face. The locations of the crossdraft measurements at each site are shown in Figures 5-23 (Appendix A). Anemometer problems prevented measurements at Sites 10a through 14a.

The average velocities for all sites measured were 19.7 fpm and 6.0 fpm for the z- and x-components, respectively. These averages include the direction (positive or negative) as well as the magnitude. The average magnitude of the velocity components were 22.3 fpm and 31.5 fpm for the z- and x-components, respectively. Crossdraft velocities ranged from -53.5 fpm to 125.6 fpm for the z-component and from -46.2 fpm to 111.2 fpm for the x-component. If only the magnitude of the crossdraft is considered, the range of the z-component is from 0.1 to 125.6 fpm and the range of the x-component is from 0.1 to 111.2 fpm. The magnitudes of the crossdrafts observed in these workspaces are consistent with crossdrafts used in laboratory experiments to develop predictive models.(5-7,14-18)

The experiments involving the release of SF₆ were unsuccessful. The Miran is an infrared (IR) analyzer which is non-specific. The preferred wavelength for absorbance of IR by SF₆ is 10.6 μm . This is also the preferred wavelength for absorbance by trichloroethylene (TCE) and other chlorinated solvents. Attempts were made to scan for other wavelengths where IR would be absorbed by SF₆, however, TCE interfered at all wavelengths identified. The measurements made in the duct represent the absorbance of SF₆ and TCE (or other chlorinated solvents).

The simultaneous charcoal tube sample concentration was used to correct the Miran measurements for TCE concentration. However, the Miran response is not always linear with concentration or with different chemicals and the correction gave unrealistic capture efficiencies. In some cases corrected efficiency was less than zero and in others it was greater than one.

Using overall averages (Table III), there appears to be reasonably good agreement between predicted and measured capture efficiency (0.76, 0.62, 0.79, and 0.76 for the completely mixed space with $k=0.1$, $k=0.3$, the two point model, and the predicted efficiency, respectively). However, examining the interval averages for each degreaser showed poor agreement (Figure 3).

The poor agreement could be due to several factors. Turbulence was inadequately accounted for in the predictive model. The model was developed from experimental data collected in wind tunnel experiments at one turbulence condition. This turbulence condition was different from those measured in the field. The effects of the cooling condensers on the degreasers are not considered in the predictive model. In many cases, solvent was carried out of the degreaser on parts to other areas of the workspace. The

solvent was released too far from the local exhaust hood to reasonably expect capture, but this released solvent would have been detected during workspace air sampling. The predictive model is not estimating variability in observed solvent release with activity. Several studies have shown workplace emission rates to be a function of throughput (number of parts, number of baskets) and part shape.^(11,12) These activities are not taken into account in the predictive capture efficiency model.

Measured capture efficiency, using the completely mixed space model with $k=0.3$, vs. hood flow, expressed as a percentage of design flow, is shown in Figure 4. There was no relationship between increasing hood flow and measured hood capture efficiency. Degreaser 9a had the highest measured capture efficiency and was operated as recommended by the ACGIH (97% of design). However, degreaser 3a was also operated near design and had a lower efficiency. Degreaser 13a had the lowest flow and the lowest efficiency, while degreaser 6a was operated at 163% of design and also had a low capture efficiency.

TABLE II: HOOD AND TANK DIMENSIONS AND HOOD AIR FLOWS FOR EACH SITE

Site	Hood		Tank		Measured	Design	Percentage
	Length in (m)	Width in (m)	Length in (m)	Width in (m)	Hood Flow cfm (m ³ /s)	Hood Flow cfm (m ³ /s)	of Design ^a %
1a	55 (1.40)	1.75 (0.04)	55 (1.40)	36.5 (0.93)	499 (0.24)	697 (0.33)	72
2a	48 (1.22)	1.75 (0.04)	48 (1.22)	28 (0.71)	757 (0.36)	467 (0.30)	162
3a	62 (1.57)	1.75 (0.04)	60.5 (1.54)	30 (0.76)	646 (0.30)	630 (0.30)	103
4a	44 (1.12)	2 (0.05)	44 (1.12)	34 (0.86)	838 (0.40)	519 (0.25)	161
6a	49 (1.24)	1.78 (0.05)	48 (1.22)	32 (0.81)	869 (0.41)	533 (0.25)	163
6b	48 (1.22)	1 (0.03)	47 (1.19)	30 (0.76)	416 (0.20)	490 (0.23)	85
7a	48 (1.22)	1.5 (0.04)	48 (1.22)	30 (0.76)	231 (0.11)	500 (0.24)	46
8a	124 (3.15)	2.5 (0.06)	124 (3.15)	48.5 (1.23)	2024 (0.96)	2088 (0.99)	97
8b	120 (3.05)	1 (0.03)	120 (3.05)	48 (1.22)	1556 (0.73)	2000 (0.94)	78
9a	62 (1.57)	1 (0.03)	60 (1.52)	40 (1.02)	810 (0.38)	833 (0.39)	97
10a	48 (1.22)	3 (0.08)	48 (1.22)	30 (0.76)	385 (0.18)	500 (0.24)	77
10b	48 (1.22)	3 (0.08)	48 (1.22)	30 (0.76)	743 (0.35)	500 (0.24)	149
11a	33 (0.84)	1.375 (0.03)	30 (0.76)	9.875 (0.25)	359 (0.17)	103 (0.05)	349
12a	78 (1.98)	1 (0.03)	78 (1.98)	14 (0.36)	526 (0.25)	379 (0.18)	139
13a	36 (0.91)	1.75 (0.04)	36 (0.91)	24 (0.61)	108 (0.05)	300 (0.14)	36
14a	69 (1.75)	1.625 (0.04)	69 (1.75)	26 (0.66)	595 (0.28)	623 (0.29)	96

^aACGIH, 1988

TABLE III: EMISSION RATES AND CAPTURE EFFICIENCIES FOR EACH SITE

Site	Emission Rates (g/min)				Emission Rates (g/m ² -min)				Tank Area (m ²)	Capture Efficiency			
	CMS		2-PT	LEV	CMS		2-PT	LEV		CMS		2-PT	Predicted
	k=0.1	k=0.3			k=0.1	k=0.3				k=0.1	k=0.3		
1a	4.14	12.4	19.9	20.8	3.18	9.52	15.3	15.98	1.302	0.69	0.47	0.44	0.67
2a	1.05	3.15	0.950	22.6	1.21	3.64	1.10	26.05	0.866	0.95	0.86	0.95	0.69
3a	1.46	4.39	2.79	11.2	1.25	3.75	2.38	9.57	1.170	0.88	0.71	0.84	0.83
4a	1.65	4.96	2.09	18.1	1.71	5.15	2.17	18.76	0.963	0.93	0.81	0.92	0.82
6a	0.680	2.03	0.280	3.29	0.69	2.06	0.283	3.33	0.988	0.57	0.33	0.79	0.86
6b	19.4	58.3	136	19.9	21.5	64.5	150	22.01	0.904	0.70	0.57	0.61	0.67
7a	0.690	2.07	0.640	9.53	0.744	2.23	0.690	10.28	0.927	0.93	0.81	0.91	0.54
8a	a	a	1.69	98.5	a	a	0.436	25.42	3.875	a	a	0.98	0.86
8b	a	a	2.34	109	a	a	0.629	29.29	3.721	a	a	0.97	0.84
8a&b	8.74	26.2	2.92	208	1.15	3.45	0.384	27.38	7.596	0.96	0.88	0.99	b
9a	0.030	0.090	0.290	17.5	0.019	0.058	0.187	11.29	1.550	1.00	0.99	0.98	0.83
10a	a	a	39.5	4.36	a	a	42.6	4.70	0.927	a	a	0.76	na
10b	a	a	2.97	3.52	a	a	3.20	3.80	0.927	a	a	0.56	na
10a&b	8.58	25.7	42.0	7.31	4.63	13.9	22.6	3.94	1.854	0.46	0.25	0.70	na
11a	c	c	0.930	9.53	c	c	4.89	50.16	0.190	c	c	0.95	na
12a	0.970	2.90	0.040	2.55	1.36	4.07	0.056	3.58	0.713	0.61	0.40	0.97	na
13a	3.84	11.5	77.3	1	6.92	20.8	139	1.80	0.555	0.22	0.09	0.10	na
14a	0.990	2.97	0.69	16.3	0.857	2.57	0.597	14.14	1.155	0.94	0.84	0.83	na
Average	4.02	12.1	18.5	32.4	3.48	10.4	21.5	15.64		0.76	0.62	0.79	0.76

a: CMS model will not distinguish emissions from individual degreasers in same workspace

b: predictive model will not give efficiency for two degreasers

c: workspace was too large to use CMS model

na: not available

TABLE IV: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 1A

Emission Rates (g/min)							
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
1a	1	79.9	8.0	24.0	20.7	20.7	na
	2	28.4	2.8	8.5	40.2	a	na
	3	65.6	6.6	19.7	a	a	117.2
	4	22.8	2.3	6.8	3.2	a	37.4
	5	58.2	5.8	17.5	15.1	a	16.7
	6	14.1	1.4	4.2	3.5	3.0	na
	7	10.8	1.1	3.2	a	a	4.7
	8	3.9	0.4	1.2	a	a	1.6
	9	79.7	8.0	23.9	40.6	8.4	8.3
	10	22.6	2.3	6.8	15.7	2.1	2.9
	11	91.9	9.2	27.6	a	a	13.8
	12	35.6	3.6	10.7	a	a	2.8
	13	24.5	2.5	7.4	a	a	2.3
Average		41.4	4.1	12.4	19.9	8.5	20.8

		Capture Efficiency					
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
1a	1	na	na	na	na	na	na
	2	na	na	na	na	na	na
	3	0.64	0.95	0.86	a	a	na
	4	0.62	0.94	0.85	0.92	a	na
	5	0.22	0.74	0.49	0.52	a	na
	6	na	na	na	na	na	na
	7	0.30	0.81	0.59	a	a	0.67
	8	0.30	0.81	0.59	a	a	0.65
	9	0.09	0.51	0.26	0.17	0.50	0.75
	10	0.11	0.56	0.30	0.16	0.58	0.73
	11	0.13	0.60	0.33	a	a	0.60
	12	0.07	0.44	0.21	a	a	na
	13	0.09	0.49	0.24	a	a	0.63
Average		0.26	0.69	0.47	0.44	0.54	0.67

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE V: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 2A

		Emission Rates (g/min)					
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
2a	1	11.9	1.2	3.6	1.3	2.2	17.7
	2	11.1	1.1	3.3	1.7	a	16.1
	3	2.7	0.3	0.8	0.1	a	14.6
	4	9.6	1.0	2.9	0.4	1.0	13.6
	5	16.4	1.6	4.9	4.5	a	21.0
	6	10.4	1.0	3.1	0.3	a	31.9
	7	18.9	1.9	5.7	0.2	0.3	32.4
	8	13.7	1.4	4.1	1.6	0.1	16.2
	9	7.5	0.8	2.3	0.1	0.1	5.2
	10	6.1	0.6	1.8	a	a	22.3
	11	5.0	0.5	1.5	0.1	0.1	11.0
	12	13.9	1.4	4.2	0.7	a	20.9
	13	11.6	1.2	3.5	a	a	70.6
	14	8.4	0.8	2.5	0.5	0.6	22.2
Average		10.52	1.05	3.15	0.95	0.62	22.56

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
2a	1	0.60	0.94	0.83	0.93	0.89	0.56
	2	0.59	0.94	0.83	0.91	a	0.60
	3	0.85	0.98	0.95	0.99	a	0.62
	4	0.59	0.93	0.83	0.97	0.93	na
	5	0.56	0.93	0.81	0.82	a	0.65
	6	0.75	0.97	0.91	0.99	a	na
	7	0.63	0.94	0.85	0.99	0.99	0.74
	8	0.54	0.92	0.80	0.91	0.99	0.72
	9	0.41	0.87	0.70	0.98	0.98	0.68
	10	0.79	0.97	0.92	a	a	0.81
	11	0.69	0.96	0.88	0.99	0.99	0.71
	12	0.60	0.94	0.83	0.97	a	0.71
	13	0.86	0.98	0.95	a	a	0.77
	14	0.73	0.96	0.90	0.98	0.97	0.73
Average		0.66	0.95	0.86	0.95	0.97	0.69

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE VI: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 3A

Emission Rates (g/min)							
Site	Interval	Completely Mixed Space		Two Point Diffusion		LEV	
		k=1	k=0.1	k=0.3	all		closest 2 pts
3a	1	16.4	1.6	4.9	0.8	50.0	6.6
	2	14.8	1.5	4.4	2.4	0.6	13.7
	3	25.1	2.5	7.5	a	a	18.1
	4	13.7	1.4	4.1	0.5	0.5	5.9
	5	18.3	1.8	5.5	1.5	0.4	15.5
	6	8.1	0.8	2.4	0.6	0.4	8.3
	7	11.6	1.2	3.5	0.9	a	12.7
	8	14.5	1.4	4.3	a	a	10.5
	9	14.8	1.5	4.4	1.4	a	10.7
	10	13.8	1.4	4.2	18.1	a	8.2
	11	13.4	1.3	4.0	0.9	0.9	13.5
	12	17.3	1.7	5.2	1.5	0.6	14.1
	13	8.7	0.9	2.6	2.0	a	7.7
Average		14.65	1.46	4.39	2.79	7.62	11.20

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
3a	1	0.29	0.80	0.57	0.90	0.12	na
	2	0.48	0.90	0.76	0.85	0.96	0.84
	3	0.42	0.88	0.71	a	a	0.82
	4	0.30	0.81	0.59	0.92	0.92	0.83
	5	0.46	0.89	0.74	0.91	0.97	0.82
	6	0.51	0.91	0.77	0.94	0.96	0.81
	7	0.52	0.92	0.78	0.94	a	0.82
	8	0.42	0.88	0.71	a	a	0.83
	9	0.42	0.88	0.71	0.88	a	0.83
	10	0.37	0.86	0.66	0.31	a	0.83
	11	0.50	0.91	0.77	0.94	0.94	
	12	0.45	0.89	0.73	0.90	0.96	0.86
	13	0.47	0.90	0.75	0.79	a	0.85
Average		0.43	0.88	0.71	0.84	0.83	0.83

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE VII: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 4A

Site	Interval	Emission Rates (g/min)					LEV
		Completely Mixed Space			Two Point Diffusion		
		k=1	k=0.1	k=0.3	all	closest 2 pts	
4a	1	16.1	1.6	4.8	1.2	1.2	17.7
	2	30.4	3.0	9.1	3.0	3.0	28.1
	3	3.1	0.3	0.9	a	a	8.4
	Average	16.54	1.65	4.96	2.09	2.09	18.07

Site	Interval	Capture Efficiency					Predicted
		Completely Mixed Space			Two Point Diffusion		
		k=1	k=0.1	k=0.3	all	closest 2 pts	
4a	1	0.52	0.92	0.79	0.94	0.94	0.81
	2	0.48	0.90	0.75	0.90	0.90	0.82
	3	0.73	0.96	0.90	a	a	0.82
	Average	0.58	0.93	0.81	0.92	0.92	0.82

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE VIII: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 6A

		Emission Rates (g/min)					
Site	Interval	Completely Mixed Space		Two Point Diffusion		LEV	
		k=1	k=0.1	k=0.3	all		closest 2 pts
6a	1	8.0	0.8	2.4	a	a	0.7
	2	11.0	1.1	3.3	0.3	0.3	0.7
	3	5.9	0.6	1.8	0.2	0.3	1.5
	4	11.4	1.1	3.4	0.7	1.1	1.5
	5	4.2	0.4	1.3	0.1	0.3	1.3
	6	1.3	0.1	0.4	0.1	0.1	0.3
	7	1.5	0.2	0.5	a	a	3.7
	8	6.5	0.7	2.0	0.1	0.1	2.5
	9	23.1	2.3	6.9	0.5	0.5	6.5
	10	10.5	1.0	3.1	0.5	0.2	5.5
	11	1.5	0.1	0.4	0.5	a	na
	12	3.9	0.4	1.2	a	a	2.1
	13	5.6	0.6	1.7	0.2	0.3	na
	14	5.4	0.5	1.6	0.1	0.1	1.1
	15	1.8	0.2	0.5	0.1	0.1	15.3
Average		6.77	0.68	2.03	0.28	0.30	3.29

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
6a	1	0.08	0.45	0.21	na	na	0.84
	2	0.06	0.38	0.17	0.71	0.69	0.84
	3	0.20	0.72	0.46	0.87	0.85	na
	4	0.12	0.57	0.30	0.69	0.59	0.85
	5	0.24	0.76	0.51	0.90	0.81	na
	6	0.21	0.72	0.47	0.85	0.74	na
	7	0.71	0.96	0.89	a	a	0.85
	8	0.27	0.79	0.56	0.96	0.96	0.85
	9	0.22	0.74	0.49	0.93	0.93	0.85
	10	0.35	0.84	0.64	0.92	0.97	na
	11	na	na	na	na	na	na
	12	0.35	0.84	0.64			0.84
	13	na	na	na	na	na	0.85
	14	0.18	0.68	0.42	0.92	0.93	na
	15	0.89	0.99	0.97	0.99	0.99	0.85
Average		0.14	0.57	0.33	0.79	0.73	0.85

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE IX: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 6B

Emission Rates (g/min)							
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
6b	1	11.7	1.2	3.5	a	a	15.6
	2	13.7	1.4	4.1	1.2	1.2	21.1
	3	28.4	2.8	8.5	0.2	0.2	31.2
	4	0.3	0.03	0.1	0.003	0.003	13.5
	5	7.0	0.7	2.1	0.7	0.7	14.6
	6	9.9	1.0	3.0	0.3	0.3	24.4
	7	16.4	1.6	4.9	0.8	0.8	22.5
	8	478	47.8	143.4	86.9	160.1	15.1
	9	609	60.9	182.8	172	328	18.4
	10	704	70.4	211.1	339	660	21.2
	11	332	33.2	99.6	894	1779	na
	12	168	16.8	50.4	22.5	40.9	18.9
	13	155	15.5	46.5	10.1	17.8	na
	14	184.7	18.5	55.4	245.6	488.3	22.4
Average		194.17	19.42	58.25	136.42	267.44	19.90

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
6b	1	0.57	0.93	0.82	a	a	0.65
	2	0.61	0.94	0.84	0.94	0.94	0.65
	3	0.52	0.92	0.79	0.99	0.99	0.66
	4	0.98	1.00	0.99	1.00	1.00	0.65
	5	0.67	0.95	0.87	0.96	0.96	na
	6	0.71	0.96	0.89	0.99	0.99	0.65
	7	0.58	0.93	0.82	0.97	0.97	na
	8	0.03	0.24	0.10	0.15	0.09	0.67
	9	0.03	0.23	0.09	0.10	0.05	0.68
	10	0.03	0.23	0.09	0.06	0.03	0.68
	11	na	na	na	na	na	na
	12	0.10	0.53	0.27	0.46	0.32	0.71
	13	na	na	na	na	na	na
	14	0.11	0.55	0.29	0.08	0.04	na
Average		0.41	0.70	0.57	0.61	0.58	0.67

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE X: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 7A

		Emission Rates (g/min)					
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
7a	1	5.6	0.6	1.7	a	a	12.1
	2	8.2	0.8	2.5	a	a	14.4
	3	8.0	0.8	2.4	a	a	12.4
	4	2.6	0.3	0.8	0.5	a	5.3
	5	9.3	0.9	2.8	a	a	10.6
	6	7.6	0.8	2.3	a	a	6.8
	7	7.2	0.7	2.2	a	a	12.2
	8	4.8	0.5	1.4	0.4	0.4	4.2
	9	2.2	0.2	0.7	a	a	6.1
	10	6.4	0.6	1.9	a	a	9.6
	11	11.1	1.1	3.3	a	a	15.3
	12	6.1	0.6	1.8	a	a	2.8
	13	10.5	1.1	3.2	1.0	1.0	12.0
Average		6.91	0.69	2.07	0.64	0.69	9.53

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
7a	1	0.68	0.96	0.88	a	a	na
	2	0.64	0.95	0.85	a	a	0.55
	3	0.61	0.94	0.84	a	a	0.54
	4	0.67	0.95	0.87	0.91	a	0.56
	5	0.53	0.92	0.79	a	a	0.56
	6	0.47	0.90	0.75	a	a	0.53
	7	0.63	0.94	0.85	a	a	na
	8	0.47	0.90	0.74	0.91	0.91	0.54
	9	0.73	0.96	0.90	a	a	0.54
	10	0.60	0.94	0.83	a	a	0.52
	11	0.58	0.93	0.82	a	a	0.54
	12	0.31	0.82	0.60	a	a	
	13	0.53	0.92	0.79	0.93	0.93	0.56
Average		0.57	0.93	0.81	0.91	0.92	0.54

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XI: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 8A

Site	Interval	Emission Rates (g/min)			Capture Efficiency			Predicted
		Two Point Diffusion		LEV	Two Point Diffusion			
		all	closest 2 pts		all	closest 2 pts		
8a	1	0.5	0.5	103.0	1.00	1.00	na	
	2	0.5	0.5	72.6	0.99	0.99	0.82	
	3	a	a	11.3	a	a	0.90	
	4	0.5	0.5	68.1	0.99	0.99	na	
	5	0.2	0.2	2.2	0.93	0.93	na	
	6	0.4	0.4	103.5	1.00	1.00	na	
	7	0.4	0.4	118.5	1.00	1.00	na	
	8	0.4	0.4	107.9	1.00	1.00	na	
	9	0.5	0.5	155.6	1.00	1.00	na	
	10	1.2	1.2	153.8	0.99	0.99	na	
	11	0.3	0.3	112.4	1.00	1.00	na	
	12	0.3	0.3	155.5	1.00	1.00	na	
	13	15.2	15.2	115.9	0.88	0.88	na	
Average		1.69	1.69	98.48	0.98	0.98	0.86	

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XII: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 8B

Site	Interval	Emission Rates (g/min)			Capture Efficiency		
		Two Point Diffusion		LEV	Two Point Diffusion		Predicted
		all	closest 2 pts		all	closest 2 pts	
8b	1	a	a	107.6	a	a	na
	2	a	a	128.5	a	a	na
	3	a	a	163.6	a	a	na
	4	a	a	170.3	a	a	0.85
	5	a	a	75.4	a	a	0.84
	6	2.6	2.6	128.6	0.98	0.98	0.86
	7	a	233	97.0	a	0.29	0.84
	8	a	a	102.5	a	a	0.84
	9	1.7	1.7	94.8	0.98	0.98	na
	10	4.2	4.2	60.0	0.93	0.93	0.83
	11	0.8	0.8	145.5	0.99	0.99	na
	12	a	123	78.5	a	0.39	na
	13	a	a	65.3	a	a	na
Average		2.34	61.01	109.05	0.97	0.76	0.84

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XIII: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITES 8A AND 8B

		Emission Rates (g/min)					
Site	Interval	Completely Mixed Space		Two Point Diffusion		LEV	
		k=1	k=0.1	k=0.3	all		closest 2 pts
8a&b	1	24.1	2.4	7.2	a	a	210.6
	2	31.1	3.1	9.3	a	a	201.1
	3	66.6	6.7	20.0	a	a	174.8
	4	104.9	10.5	31.5	a	a	238.4
	5	84.1	8.4	25.2	a	a	77.6
	6	95.9	9.6	28.8	3.0	3.0	232.1
	7	108.2	10.8	32.4	a	233.8	215.5
	8	120.4	12.0	36.1	a	a	210.4
	9	133.3	13.3	40.0	2.2	2.2	250.4
	10	107.2	10.7	32.2	5.4	5.4	213.8
	11	95.9	9.6	28.8	1.1	1.1	257.9
	12	98.1	9.8	29.4	a	123.6	234.0
	13	66.2	6.6	19.9	a	a	181.2
Average		87.39	8.74	26.22	2.92	61.51	207.53

		Capture Efficiency					
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
8a&b	1	0.90	0.99	0.97	a	a	na
	2	0.87	0.98	0.96	a	a	na
	3	0.72	0.96	0.90	a	a	na
	4	0.69	0.96	0.88	a	a	na
	5	0.48	0.90	0.75	a	a	na
	6	0.71	0.96	0.89	0.99	0.99	na
	7	0.67	0.95	0.87	a	0.48	na
	8	0.64	0.95	0.85	a	a	na
	9	0.65	0.95	0.86	0.99	0.99	na
	10	0.67	0.95	0.87	0.98	0.98	na
	11	0.73	0.96	0.90	1.00	1.00	na
	12	0.70	0.96	0.89	a	0.65	na
	13	0.73	0.96	0.90	a	a	na
Average		0.70	0.96	0.88	0.99	0.85	

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XIV: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 9A

		Emission Rates (g/min)					
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
9a	1	0.7	0.07	0.20	a	a	28.8
	2	0.3	0.03	0.08	a	a	26.2
	3	0.2	0.02	0.05	a	a	1.4
	4	0.2	0.02	0.05	0.3	0.5	6.6
	5	0.1	0.01	0.04	0.08	0.08	9.1
	6	0.5	0.05	0.15	0.5	0.4	39.3
	7	0.1	0.01	0.04	a	a	2.2
	8	0.3	0.03	0.09	a	a	26.6
Average		0.29	0.03	0.09	0.29	0.35	17.53

		Capture Efficiency					
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
9a	1	0.98	1.00	0.99	a	a	na
	2	0.99	1.00	1.00	a	a	0.84
	3	0.89	0.99	0.96	a	a	0.83
	4	0.98	1.00	0.99	0.96	0.92	0.84
	5	0.99	1.00	1.00	0.99	0.99	na
	6	0.99	1.00	1.00	0.99	0.99	0.83
	7	0.95	0.99	0.98	a	a	0.83
	8	0.99	1.00	1.00	a	a	0.83
Average		0.97	1.00	0.99	0.98	0.97	0.83

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XV: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 10A

Site	Interval	Emission Rates (g/min)			LEV	Capture Efficiency		
		Two Point Diffusion		Predicted		Two Point Diffusion		
		all	closest 2 pts			all	closest 2 pts	
10a	1	a	a	3.3	a	a	na	
	2	0.3	0.4	1.3	0.83	0.77	na	
	3	0.3	0.6	1.6	0.86	0.73	na	
	4	0.7	a	8.1	0.92	a	na	
	5	274	a	7.4	0.03	a	na	
	6	1.1	3.1	5.0	0.82	0.61	na	
	7	na	na	na	na	na	na	
	8	a	a	2.8	a	a	na	
	9	0.5	0.5	5.7	0.92	0.92	na	
	10	a	a	5.9	a	a	na	
	11	a	a	5.4	a	a	na	
	12	a	a	1.1	a	a	na	
	13	a	a	8.0	a	a	na	
	14	0.1	0.1	5.2	0.98	0.98	na	
	15	a	a	0.5	a	a	na	
Average		39.53	0.94	4.36	0.76	0.80		

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XVI: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 10B

Site	Interval	Emission Rates (g/min)			LEV	Capture Efficiency		
		Two Point Diffusion		Predicted				
		all	closest 2 pts			all	closest 2 pts	
10b	1	0.6	0.6	0.03	0.04	0.04	na	
	2	0.4	0.4	4.2	0.91	0.91	na	
	3	0.09	0.09	1.9	0.95	0.95	na	
	4	2.5	2.7	2.3	0.48	0.46	na	
	5	0.8	0.8	1.7	0.68	0.67	na	
	6	0.5	0.4	1.7	0.79	0.79	na	
	7	0.5	0.7	0.8	0.62	0.56	na	
	8	3.4	5.9	2.9	0.46	0.33	na	
	9	5.5	5.5	1.8	0.24	0.24	na	
	10	1.5	1.5	1.3	0.46	0.46	na	
	11	6.4	6.4	1.2	0.16	0.16	na	
	12	0.9	0.9	1.5	0.63	0.62	na	
	13	0.07	0.07	na	na	na	na	
	14	0.2	0.2	3.2	0.93	0.93	na	
	15	21.1	21.1	24.7	0.54	0.54	na	
Average		2.97	3.16	3.52	0.56	0.55		

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XVII: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITES 10A AND 10B

Emission Rates (g/min)							
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
10a&b	1	116	11.6	34.9	a	a	3.4
	2	237	23.7	71.0	0.7	0.8	5.5
	3	27.1	2.7	8.1	0.4	0.7	3.5
	4	199	19.9	59.7	3.2	2.7	10.4
	5	117	11.7	35.1	275	0.8	9.0
	6	107	10.7	32.0	1.6	3.6	6.7
	7	86.8	8.7	26.0	a	a	0.8
	8	97.0	9.7	29.1	a	a	5.7
	9	66.3	6.6	19.9	6.0	6.0	7.4
	10	48.5	4.9	14.6	a	a	7.2
	11	42.7	4.3	12.8	a	a	6.6
	12	31.5	3.2	9.5	a	a	2.6
	13	49.1	4.9	14.7	a	a	na
	14	24.2	2.4	7.3	0.3	0.3	8.4
	15	37.8	3.8	11.3	a	a	25.1
Average		85.76	8.58	25.73	40.96	2.13	7.31

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
10a&b	1	0.03	0.23	0.09	a	a	na
	2	0.02	0.19	0.07	0.89	0.88	na
	3	0.11	0.56	0.30	0.91	0.84	na
	4	0.05	0.34	0.15	0.77	0.79	na
	5	0.07	0.44	0.21	0.03	0.92	na
	6	0.06	0.38	0.17	0.81	0.65	na
	7	0.01	0.09	0.03	a	a	na
	8	0.06	0.37	0.16	a	a	na
	9	0.10	0.53	0.27	0.55	0.55	na
	10	0.13	0.60	0.33	a	a	na
	11	0.13	0.61	0.34	a	a	na
	12	0.08	0.45	0.21	a	a	na
	13	na	na	na	na	na	na
	14	0.26	0.78	0.54	0.96	0.96	na
	15	0.40	0.87	0.69	a	a	na
Average		0.11	0.46	0.25	0.70	0.80	

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XVIII: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 11A

Site	Interval	Emission Rates (g/min)		LEV
		Two Point Diffusion		
		all	closest 2 pts	
11a	1	0.01	0.01	4.7
	2	0.004	0.004	9.7
	3	0.02	0.0002	8.7
	4	0.002	0.002	9.6
	5	8.0	23.4	13.9
	6	0.00	0.01	16.2
	7	a	a	11.3
	8	0.1	a	2.6
	9	a	a	1.2
	10	0.1	0.2	5.3
	11	a	a	19.6
	12	0.3	0.2	9.0
	13	0.6	1.0	12.1
Average		0.93	2.75	9.53

Capture Efficiency				
Site	Interval	Two Point Diffusion		Predicted
		all	closest 2 pts	
11a	1	1.00	1.00	na
	2	1.00	1.00	na
	3	1.00	1.00	na
	4	1.00	1.00	na
	5	0.63	0.37	na
	6	1.00	1.00	na
	7	a	a	na
	8	0.96	a	na
	9	a	a	na
	10	0.97	0.97	na
	11	a	a	na
	12	0.96	0.98	na
	13	0.95	0.93	na
Average		0.95	0.92	

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XIX: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 12A

		Emission Rates (g/min)					
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
12a	1	4.7	0.5	1.4	0.01	0.002	0.3
	2	3.0	0.3	0.9	0.01	0.001	0.2
	3	6.3	0.6	1.9	0.01	0.002	1.4
	4	10.4	1.0	3.1	0.03	0.004	10.3
	5	20.4	2.0	6.1	0.1	0.01	3.8
	6	12.4	1.2	3.7	0.02	0.002	0.8
	7	44.2	4.4	13.3	0.2	0.5	3.9
	8	4.3	0.4	1.3	0.00	0.00	0.4
	9	2.5	0.3	0.8	0.02	0.00	0.3
	10	2.3	0.2	0.7	0.03	0.00	0.2
	11	2.3	0.2	0.7	0.0002	0.0005	1.8
	12	2.9	0.3	0.9	0.003	0.001	7.2
Average		9.65	0.97	2.90	0.04	0.04	2.55

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
12a	1	0.07	0.41	0.19	0.97	0.99	na
	2	0.07	0.44	0.21	0.97	1.00	na
	3	0.18	0.69	0.43	0.99	1.00	na
	4	0.50	0.91	0.77	1.00	1.00	na
	5	0.16	0.65	0.38	0.97	1.00	na
	6	0.06	0.38	0.17	0.98	1.00	na
	7	0.08	0.47	0.23	0.94	0.89	na
	8	0.09	0.50	0.25	1.00	1.00	na
	9	0.10	0.51	0.26	0.94	1.00	na
	10	0.09	0.49	0.24	0.89	1.00	na
	11	0.44	0.89	0.72	1.00	1.00	na
	12	0.71	0.96	0.89	1.00	1.00	na
Average		0.21	0.61	0.40	0.97	0.99	

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XX: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 13A

		Emission Rates (g/min)					
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
13a	1	25.0	2.5	7.5	22.1	65.9	0.8
	2	34.1	3.4	10.2	49.0	146.4	0.8
	3	40.2	4.0	12.1	81.6	243.7	1.3
	4	47.2	4.7	14.1	265.8	795.7	1.3
	5	33.4	3.3	10.0	44.9	133.8	1.1
	6	80.3	8.0	24.1	3.3	17800.0	1.3
	7	47.8	4.8	14.3	49.8	148.0	0.7
	8	47.9	4.8	14.4	76.3	226.7	0.9
	9	72.4	7.2	21.7	300.1	895.3	1.1
	10	10.8	1.1	3.2	1.0	2.8	0.3
	11	14.9	1.5	4.5	0.7	1.9	0.4
	12	21.0	2.1	6.3	3.1	8.8	1.1
	13	25.0	2.5	7.5	106.7	317.6	1.7
Average		38.44	3.84	11.53	77.27	1598.98	1.00

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
13a	1	0.03	0.23	0.09	0.03	0.01	na
	2	0.02	0.19	0.07	0.02	0.01	na
	3	0.03	0.24	0.10	0.02	0.01	na
	4	0.03	0.22	0.09	0.01	0.00	na
	5	0.03	0.25	0.10	0.02	0.01	na
	6	0.02	0.14	0.05	0.28	0.00	na
	7	0.02	0.13	0.05	0.01	0.00	na
	8	0.02	0.15	0.06	0.01	0.00	na
	9	0.02	0.14	0.05	0.00	0.00	na
	10	0.03	0.22	0.09	0.23	0.10	na
	11	0.03	0.23	0.09	0.38	0.19	na
	12	0.05	0.35	0.15	0.27	0.11	na
	13	0.06	0.41	0.19	0.02	0.01	na
Average		0.03	0.22	0.09	0.10	0.03	

a: model did not converge to a physically realistic diffusivity

na: not available

TABLE XXI: EMISSION RATES AND CAPTURE EFFICIENCIES FOR SITE 14A

Emission Rates (g/min)							
Site	Interval	Completely Mixed Space			Two Point Diffusion		LEV
		k=1	k=0.1	k=0.3	all	closest 2 pts	
14a	1	7.9	0.8	2.4	2.8	2.8	14.7
	2	9.4	0.9	2.8	0.5	0.2	17.0
	3	15.0	1.5	4.5	0.5	0.2	23.1
	4	3.5	0.4	1.1	a	a	24.5
	5	12.6	1.3	3.8	0.4	0.2	17.4
	6	13.1	1.3	3.9	0.4	0.2	18.2
	7	14.3	1.4	4.3	0.4	0.2	22.9
	8	9.1	0.9	2.7	0.4	0.1	19.7
	9	8.4	0.8	2.5	0.7	0.1	10.8
	10	9.9	1.0	3.0	0.4	0.1	15.8
	11	11.2	1.1	3.4	0.9	0.1	15.3
	12	12.3	1.2	3.7	0.5	0.2	13.8
	13	10.6	1.1	3.2	0.4	0.1	16.6
	14	3.2	0.3	1.0	a	a	9.7
	15	10.5	1.0	3.1	0.6	0.1	13.0
	16	7.1	0.7	2.1	2.2	0.1	8.6
Average		9.89	0.99	2.97	0.79	0.34	16.33

Capture Efficiency							
Site	Interval	Completely Mixed Space			Two Point Diffusion		Predicted
		k=1	k=0.1	k=0.3	all	closest 2 pts	
14a	1	0.65	0.95	0.86	0.84	0.84	na
	2	0.64	0.95	0.86	0.97	0.99	na
	3	0.61	0.94	0.84	0.98	0.99	na
	4	0.87	0.99	0.96	a	a	na
	5	0.58	0.93	0.82	0.98	0.99	na
	6	0.58	0.93	0.82	0.98	0.99	na
	7	0.62	0.94	0.84	0.98	0.99	na
	8	0.68	0.96	0.88	0.98	0.99	na
	9	0.56	0.93	0.81	0.94	0.99	na
	10	0.61	0.94	0.84	0.98	0.99	na
	11	0.58	0.93	0.82	0.94	0.99	na
	12	0.53	0.92	0.79	0.97	0.99	na
	13	0.61	0.94	0.84	0.97	0.99	na
	14	0.75	0.97	0.91	a	a	na
	15	0.55	0.93	0.80	0.96	0.99	na
	16	0.55	0.92	0.80	0.80	0.99	na
Average		0.62	0.94	0.84	0.95	0.98	

a: model did not converge to a physically realistic diffusivity

na: not available

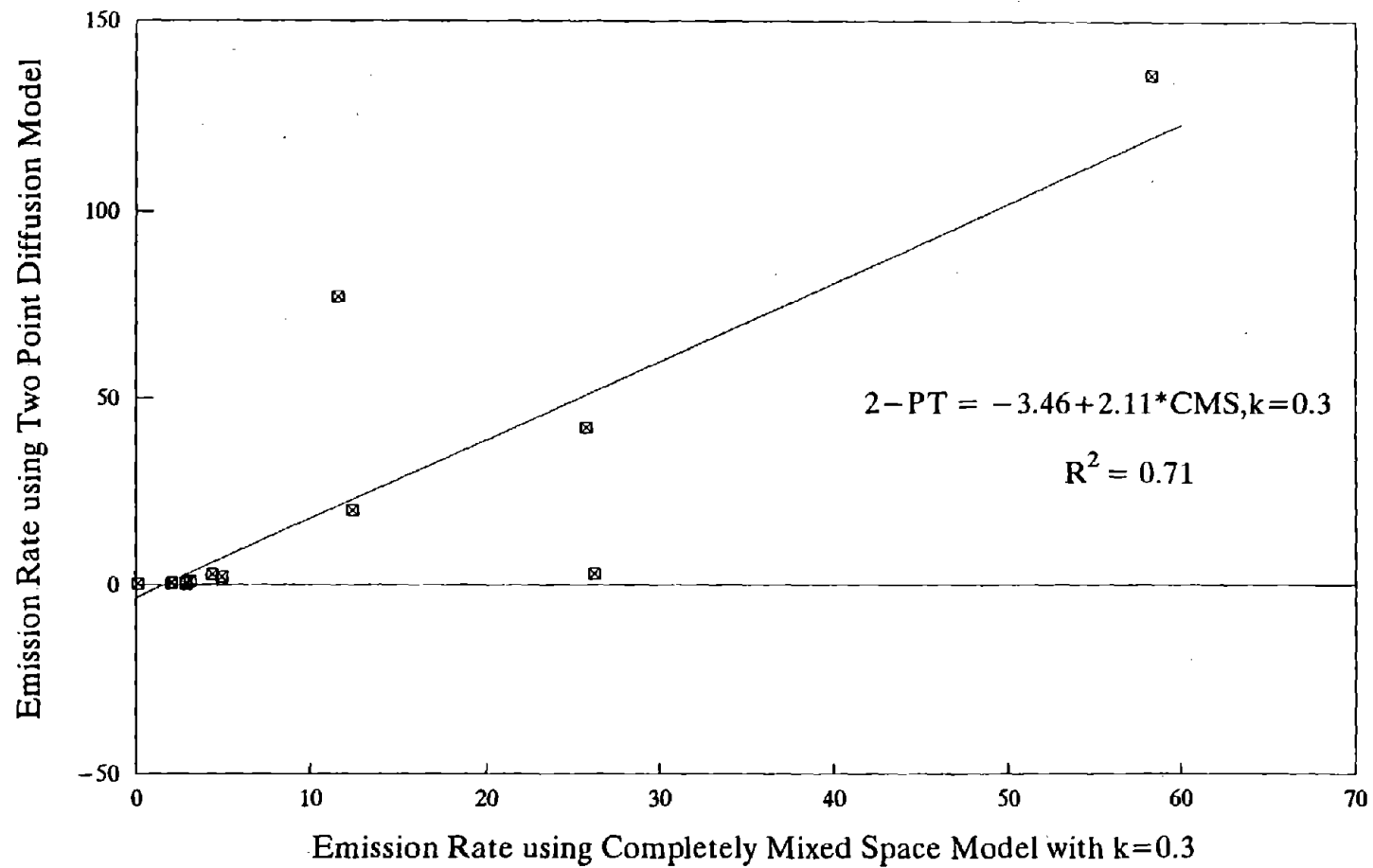


Figure 1. Emission Rate using Two Point Diffusion Model vs. Emission Rate using Completely Mixed Space Model with $k=0.3$.

Site 2A

Interval 1

Crossdraft Velocity

x-component = 106 fpm

z-component = 9.9 fpm

Capture Efficiency = 0.57

Hood

Length = 48 inches

Width = 1.75 inches

Source

Length = 48 inches

Width = 28 inches

Hood Flow = 757 cfm

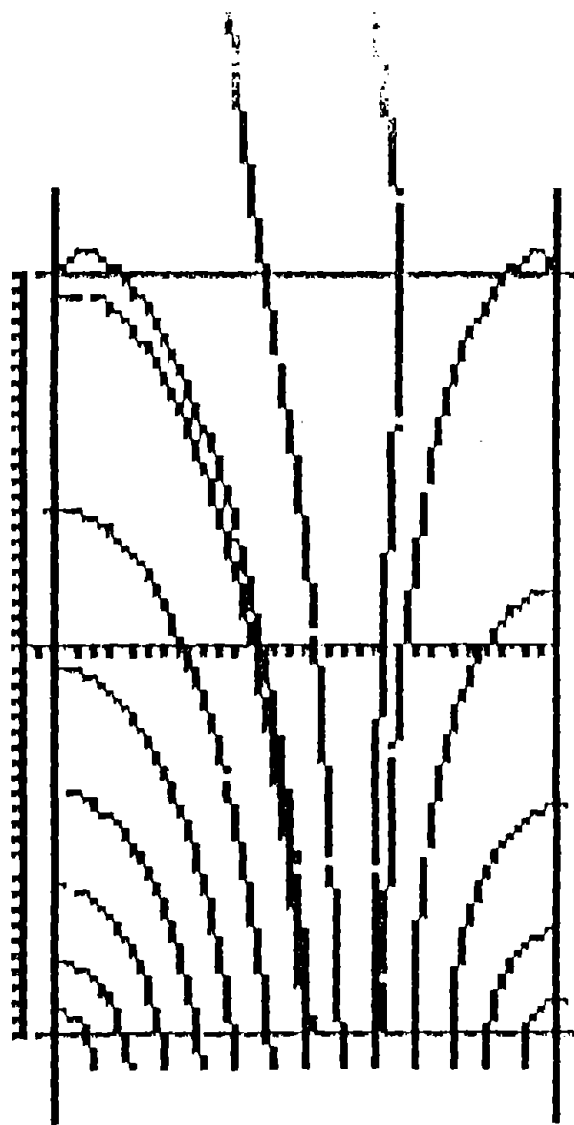


Figure 2. Example of BASIC Computer Program Output.

TABLE XXII: AVERAGE CROSSDRAFT VELOCITIES FOR EACH SITE

Site	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1a	19.3	39.9	0.098	0.203
2a	3.5	62.1	0.018	0.316
3a	21.1	-25.8	0.107	-0.131
4a	37.3	35.8	0.190	0.182
6a	21.3	27.6	0.108	0.140
6b	1.9	-33.7	0.010	-0.171
7a	2.4	-32.7	0.012	-0.166
8a	74.4	4.8	0.378	0.024
8b	21.4	0.1	0.109	0.000
9a	62.4	0.4	0.317	0.002
All Sites	19.7	6.0	0.100	0.030
All Sites (magnitude)	22.3	31.5	0.113	0.160

TABLE XXIII: MINIMUM CROSSDRAFT VELOCITIES FOR EACH SITE

Site	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1a	1.7	30.9	0.009	0.157
2a	-0.3	28.2	-0.001	0.143
3a	19.1	-28.9	0.097	-0.147
4a	36.4	35.3	0.185	0.179
6a	18.5	22.4	0.094	0.114
6b	-1.4	-37.7	-0.007	-0.191
7a	-1.7	-46.2	-0.009	-0.235
8a	97.5	-4.0	0.495	-0.020
8b	-53.5	-11.1	-0.272	-0.056
9a	61.9	0.1	0.315	0.000
All Sites	-53.5	-46.2	-0.272	-0.235
All Sites (magnitude)	0.1	0.1	0.000	0.000

TABLE XXIV: MAXIMUM CROSSDRAFT VELOCITIES FOR EACH SITE

Site	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1a	31.7	46.8	0.161	0.238
2a	12.8	111.2	0.065	0.565
3a	25.4	-18.4	0.129	-0.094
4a	39.1	36.4	0.198	0.185
6a	24.0	30.7	0.122	0.156
6b	4.0	-27.9	0.020	-0.142
7a	15.8	-29.1	0.080	-0.148
8a	125.6	18.4	0.638	0.093
8b	120.4	14.1	0.611	0.072
9a	62.8	1.2	0.319	0.006
All Sites	125.6	111.2	0.638	0.565
All Sites (magnitude)	125.6	111.2	0.638	0.565

TABLE XXV: CROSSDRAFT VELOCITIES FOR SITE 1A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	na	na	na	na
2	na	na	na	na
3	na	na	na	na
4	na	na	na	na
5	na	na	na	na
6	na	na	na	na
7	1.7	30.9	0.009	0.157
8	19.9	41.1	0.101	0.209
9	31.7	41.1	0.161	0.209
10	31.3	36.0	0.159	0.183
11	15.0	46.8	0.076	0.238
12	na	na	na	na
13	16.0	43.7	0.082	0.222
Range	1.7 to 31.7	30.9 to 46.8	0.009 to 0.161	0.157 to 0.238

na: not available

TABLE XXVI: CROSSDRAFT VELOCITIES FOR SITE 2A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	12.8	111.2	0.065	0.565
2	5.3	90.9	0.027	0.462
3	-0.1	84.2	-0.000	0.428
4	na	na	na	na
5	3.8	72.9	0.019	0.370
6	na	na	na	na
7	0.4	46.2	0.002	0.235
8	3.2	53.2	0.016	0.270
9	3.4	62.6	0.017	0.318
10	2.3	28.2	0.011	0.143
11	3.4	53.1	0.017	0.270
12	-0.3	54.5	-0.001	0.277
13	2.2	38.0	0.011	0.193
14	5.6	50.3	0.029	0.256
Range	-0.3 to 12.8	28.2 to 111.2	-0.001 to 0.065	0.143 to 0.565

na: not available

TABLE XXVII: CROSSDRAFT VELOCITIES FOR SITE 3A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	na	na	na	na
2	19.8	-25.9	0.101	-0.132
3	19.2	-27.6	0.098	-0.140
4	19.5	-26.6	0.099	-0.135
5	19.1	-27.0	0.097	-0.137
6	19.5	-28.9	0.099	-0.147
7	25.4	-27.4	0.129	-0.139
8	22.8	-27.6	0.116	-0.140
9	21.1	-27.0	0.107	-0.137
10	22.1	-27.0	0.112	-0.137
11	na	na	na	na
12	23.1	-20.2	0.117	-0.103
13	20.4	-18.4	0.103	-0.094
Range	19.1 to 25.4	-28.9 to -18.4	0.097 to 0.129	-0.147 to -0.094

na: not available

TABLE XXVIII: CROSSDRAFT VELOCITIES FOR SITE 4A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	36.4	35.6	0.185	0.181
2	36.5	35.3	0.186	0.179
3	39.1	36.4	0.198	0.185
Range	36.4 to 39.1	35.3 to 36.4	0.185 to 0.198	0.179 to 0.185

TABLE XXIX: CROSSDRAFT VELOCITIES FOR SITE 6A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	24.0	29.6	0.122	0.150
2	22.5	29.8	0.114	0.151
3	na	na	na	na
4	23.1	28.6	0.117	0.146
5	na	na	na	na
6	na	na	na	na
7	23.2	22.4	0.118	0.114
8	20.6	28.7	0.104	0.146
9	20.0	28.2	0.102	0.143
10	na	na	na	na
11	na	na	na	na
12	19.7	30.7	0.100	0.156
13	20.0	25.3	0.102	0.129
14	na	na	na	na
15	18.5	24.9	0.094	0.126
Range	18.5 to 24.0	22.4 to 30.7	0.094 to 0.122	0.114 to 0.156

na: not available

TABLE XXX: CROSSDRAFT VELOCITIES FOR SITE 6B

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	2.2	-36.4	0.011	-0.185
2	0.9	-35.3	0.005	-0.180
3	4.0	-34.7	0.020	-0.176
4	2.3	-36.5	0.012	-0.185
5	na	na	na	na
6	-1.4	-37.7	-0.007	-0.191
7	na	na	na	na
8	2.9	-32.5	0.015	-0.165
9	3.0	-31.4	0.015	-0.160
10	0.1	-31.3	0.001	-0.159
11	na	na	na	na
12	3.3	-27.9	0.017	-0.142
13	na	na	na	na
14	na	na	na	na
Range	-1.4 to 4.0	-37.7 to -27.9	-0.007 to 0.020	-0.191 to -0.142

na: not available

TABLE XXXI: CROSSDRAFT VELOCITIES FOR SITE 7A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	na	na	na	na
2	0.5	-30.6	0.003	-0.156
3	2.1	-31.8	0.011	-0.162
4	-0.5	-29.2	-0.003	-0.148
5	-1.7	-29.1	-0.009	-0.148
6	15.8	-46.2	0.080	-0.235
7	na	na	na	na
8	3.5	-33.7	0.018	-0.171
9	0.4	-31.2	0.002	-0.159
10	1.3	-34.6	0.006	-0.176
11	1.3	-31.1	0.007	-0.158
12	na	na	na	na
13	1.0	-29.5	0.005	-0.150
Range	-1.7 to 15.8	-46.2 to -29.1	-0.009 to 0.080	-0.235 to -0.148

na: not available

TABLE XXXII: CROSSDRAFT VELOCITIES FOR SITE 8A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	na	na	na	na
2	97.5	18.4	0.495	0.093
3	125.6	-4.0	0.638	-0.020
4	na	na	na	na
5	na	na	na	na
6	na	na	na	na
7	na	na	na	na
8	na	na	na	na
9	na	na	na	na
10	na	na	na	na
11	na	na	na	na
12	na	na	na	na
13	na	na	na	na
Range	97.5 to 125.6	-4.0 to 18.4	0.495 to 0.638	-0.020 to 0.093

na: not available

TABLE XXXIII: CROSSDRAFT VELOCITIES FOR SITE 8B

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	na	na	na	na
2	na	na	na	na
3	na	na	na	na
4	2.8	1.4	0.014	0.007
5	50.5	-7.5	0.257	-0.038
6	44.8	-5.4	0.228	-0.028
7	-36.7	8.8	-0.186	0.045
8	-53.5	14.1	-0.272	0.072
9	na	na	na	na
10	120.4	-11.1	0.611	-0.056
11	na	na	na	na
12	na	na	na	na
13	na	na	na	na
Range	-53.5 to 120.4	-11.1 to 14.1	-0.272 to 0.611	-0.056 to -0.072

na: not available

TABLE XXXIV: CROSSDRAFT VELOCITIES FOR SITE 9A

Interval	Crossdraft Velocity			
	z-component (fpm)	x-component (fpm)	z-component (m/s)	x-component (m/s)
1	na	na	na	na
2	62.4	0.2	0.317	0.001
3	62.3	0.1	0.317	0.000
4	62.8	0.2	0.319	0.001
5	na	na	na	na
6	62.8	0.1	0.319	0.001
7	62.0	0.4	0.315	0.002
8	61.9	1.2	0.315	0.006
Range	61.9 to 62.8	0.1 to 1.2	0.315 to 0.319	0.0002 to 0.006

na: not available

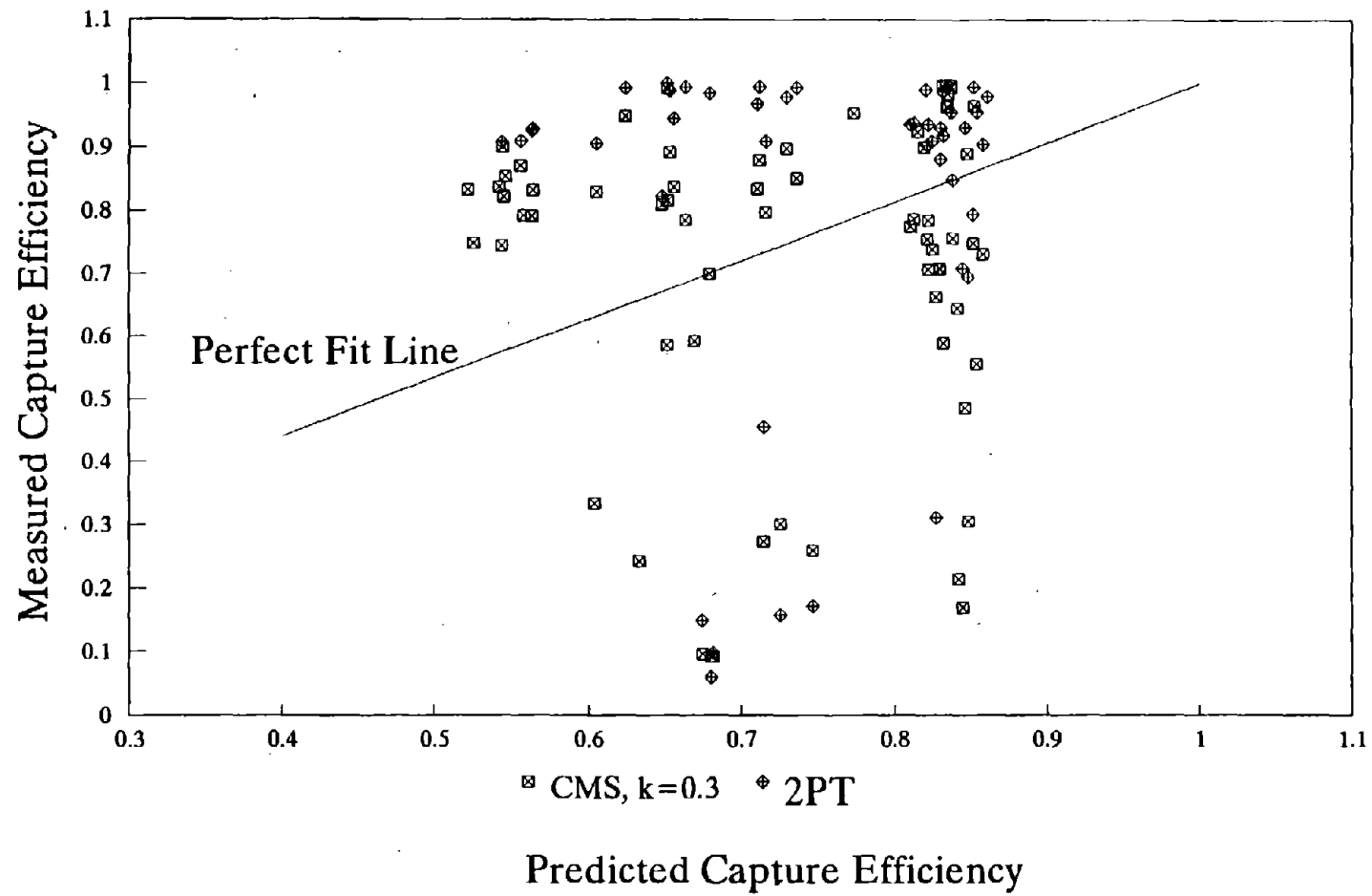


Figure 3. Measured vs. Predicted Capture Efficiency.

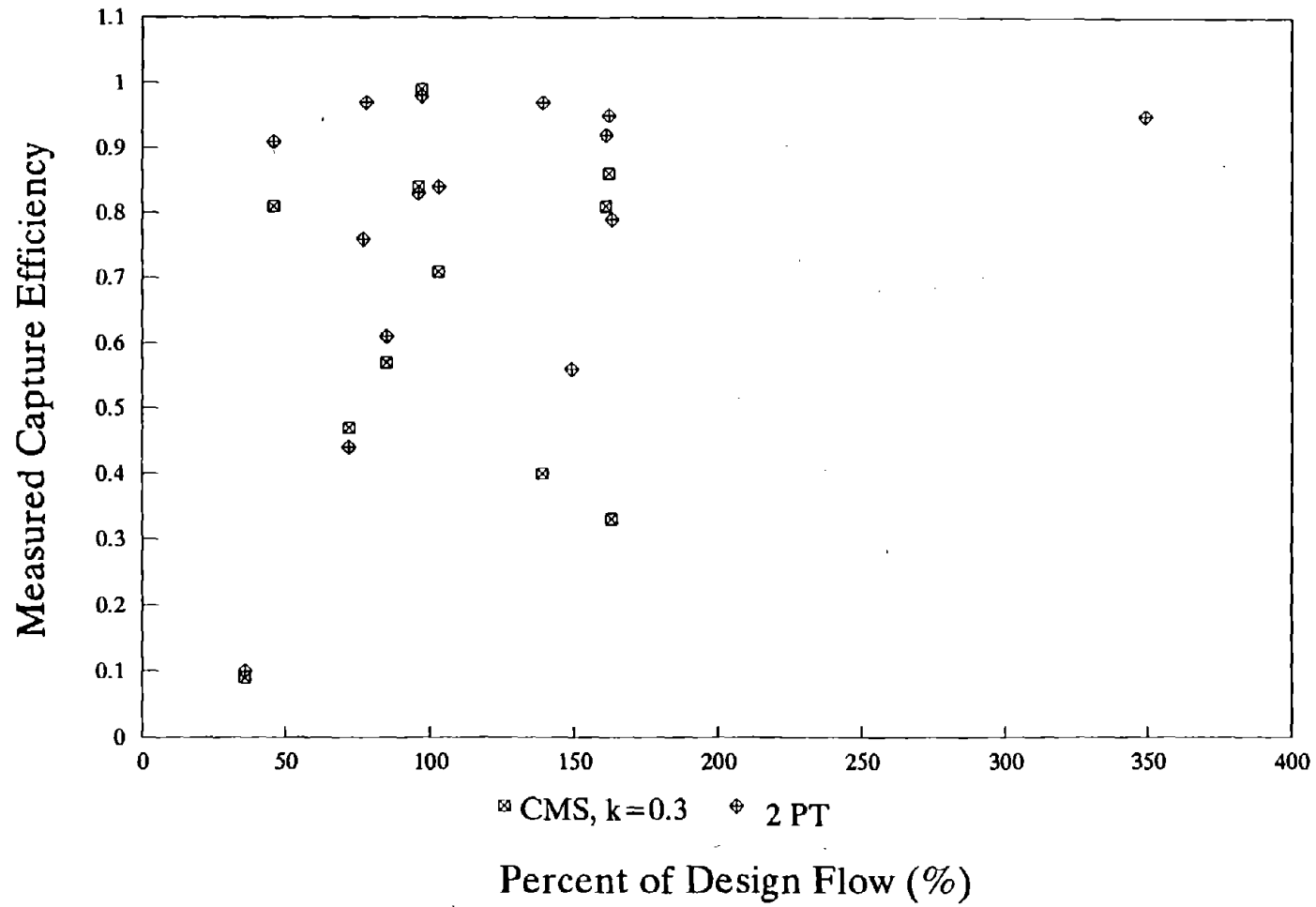


Figure 4. Measured Capture Efficiency vs. Percent of Design Flow.

3.6 Conclusions

Crossdrafts can be quantified under operating conditions. Measured crossdraft magnitude ranged from 0.1 to 126 fpm. The range of crossdrafts observed in industrial settings are consistent with those used in laboratory experiments to develop predictive capture efficiency models.

The current hood design method (1), which recommends eliminating crossdrafts or other disturbances to air flow, is unrealistic. This research demonstrated that the effect of crossdrafts cannot be disregarded.

Emission rates averaged 12.1 g/min and 18.5 g/min using the completely mixed space model with $k=0.3$ and the two point diffusion model, respectively. On average the two point diffusion model estimated emissions approximately twice as high as the completely mixed space model with $k=0.3$.

The predicted capture efficiencies did not agree well with those measured under operating conditions. This could be due to several factors: 1) turbulence was inadequately accounted for in the model; 2) the effects of the cooling condenser were not considered; 3) solvent was carried out of the degreaser to areas where the hood could not be expected to capture contaminants; and 4) the variability in emission rate due to degreaser activity is not adequately taken into account in the predictive capture efficiency model.

The ACGIH recommended flow of 50 cfm/ft² of tank surface appears to be adequate for some conditions but inadequate for other conditions. An increase in flow, above design recommendations, did not necessarily improve hood performance.

3.7 Recommendations

A predictive model which includes turbulence intensity has been developed and is being validated in the laboratory. The data collected in this study could be compared to the improved predictive model.

Little data on emission rates of industrial processes and no data on industrial crossdrafts is available in the literature. The collection of this data is difficult and expensive.

Although the predictive model tested in this study did not agree well with the measured capture efficiencies, future models developed by the authors, or models developed by other researchers could be validated using the data collected in this study.

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4 Acknowledgements

The research was supported by the National Institute for Occupational Safety and Health (NIOSH) grant 5 K01 OH00078. The researchers were supported in part by NIOSH grants 5 K01 OH00078, 5 T1 OH07104, 5 R03 OH02680, and an American Industrial Hygiene Foundation Fellowship. Although they wish to remain anonymous, we would like to thank the private companies for allowing us to perform this study in their plants. The following individuals were instrumental in the collection and preliminary analysis of the data: Scott Fergon, Jennifer Darrow, Rosanne Menezes Lindsay, Stephen Perez, Martha Barbiaux, Jamie White, and Larry Joswiak.

5 Appendices

5.1 Appendix A

Site Drawings for Each Site

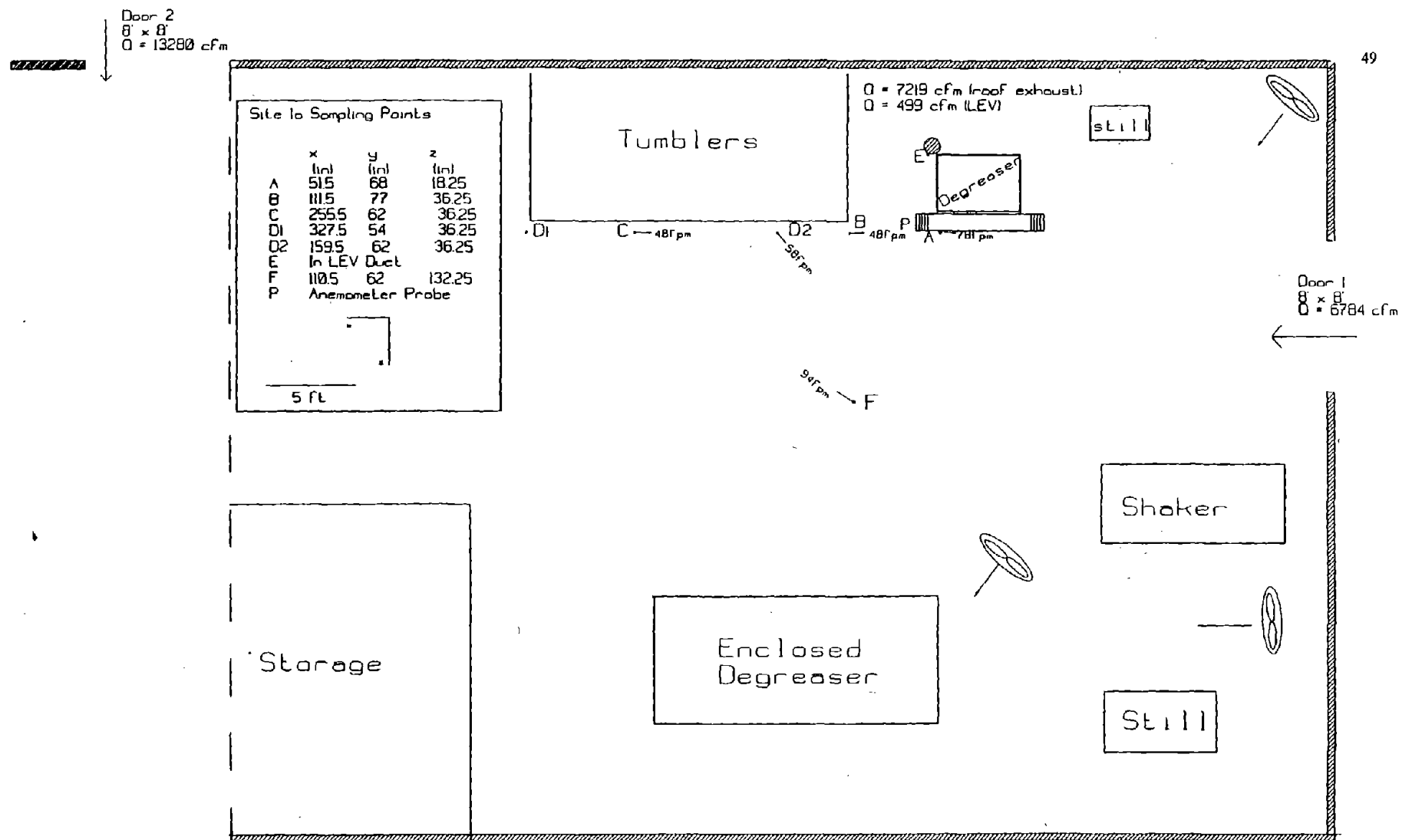


Figure 5. Plan View of Site 1A.

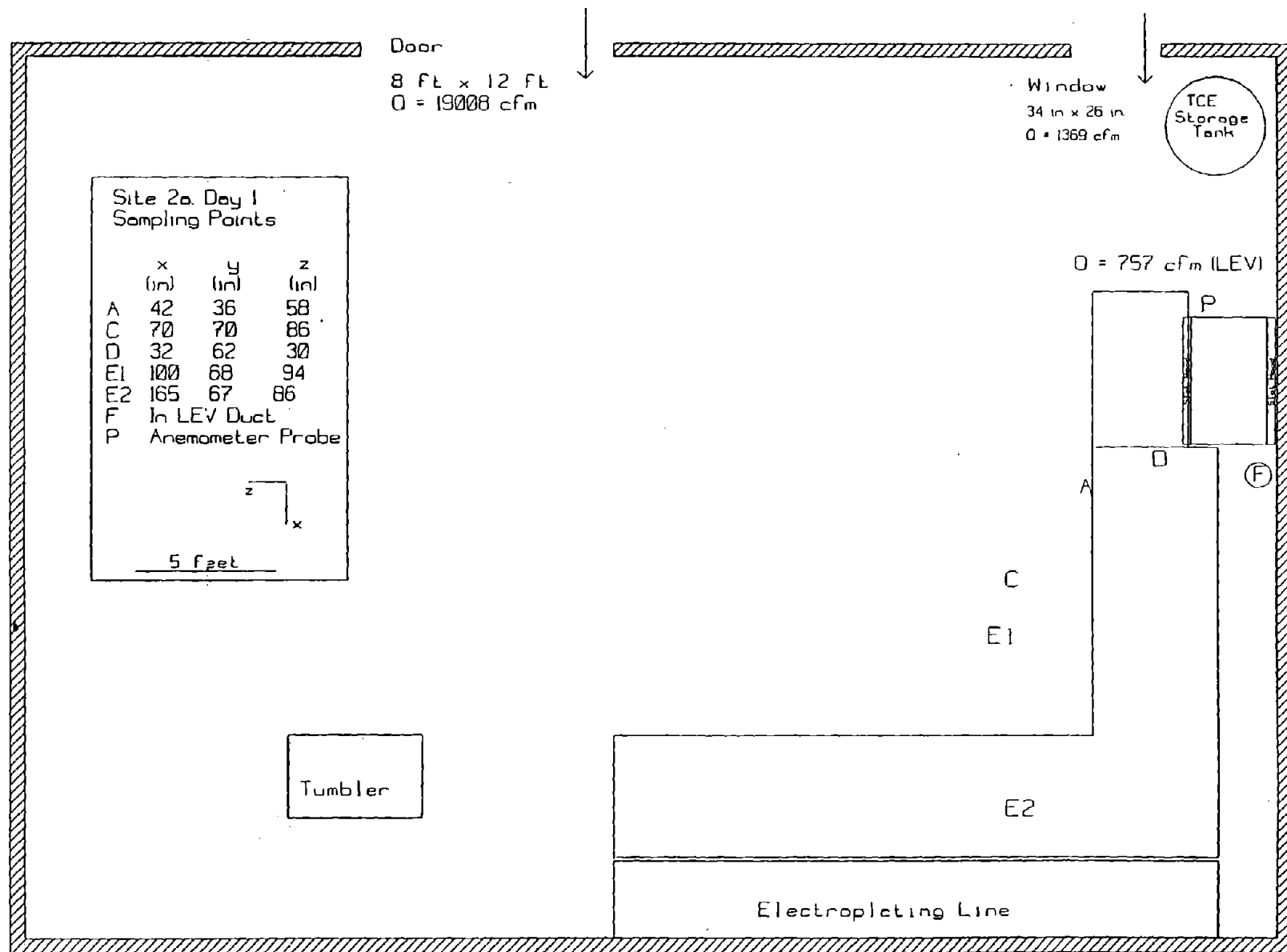


Figure 6. Plan View of Site 2A, Day 1.

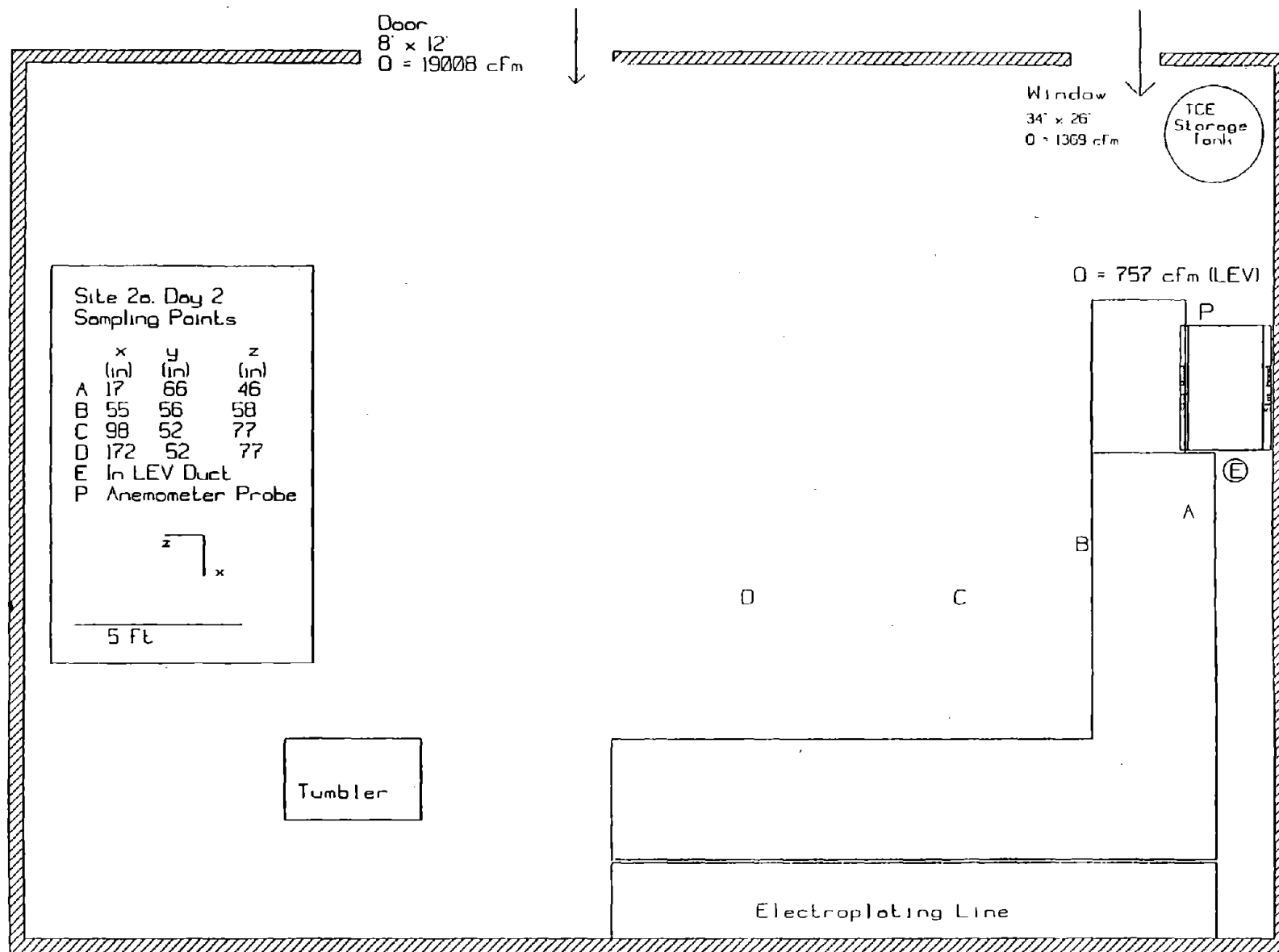


Figure 7. Plan View of Site 2A, Day 2.

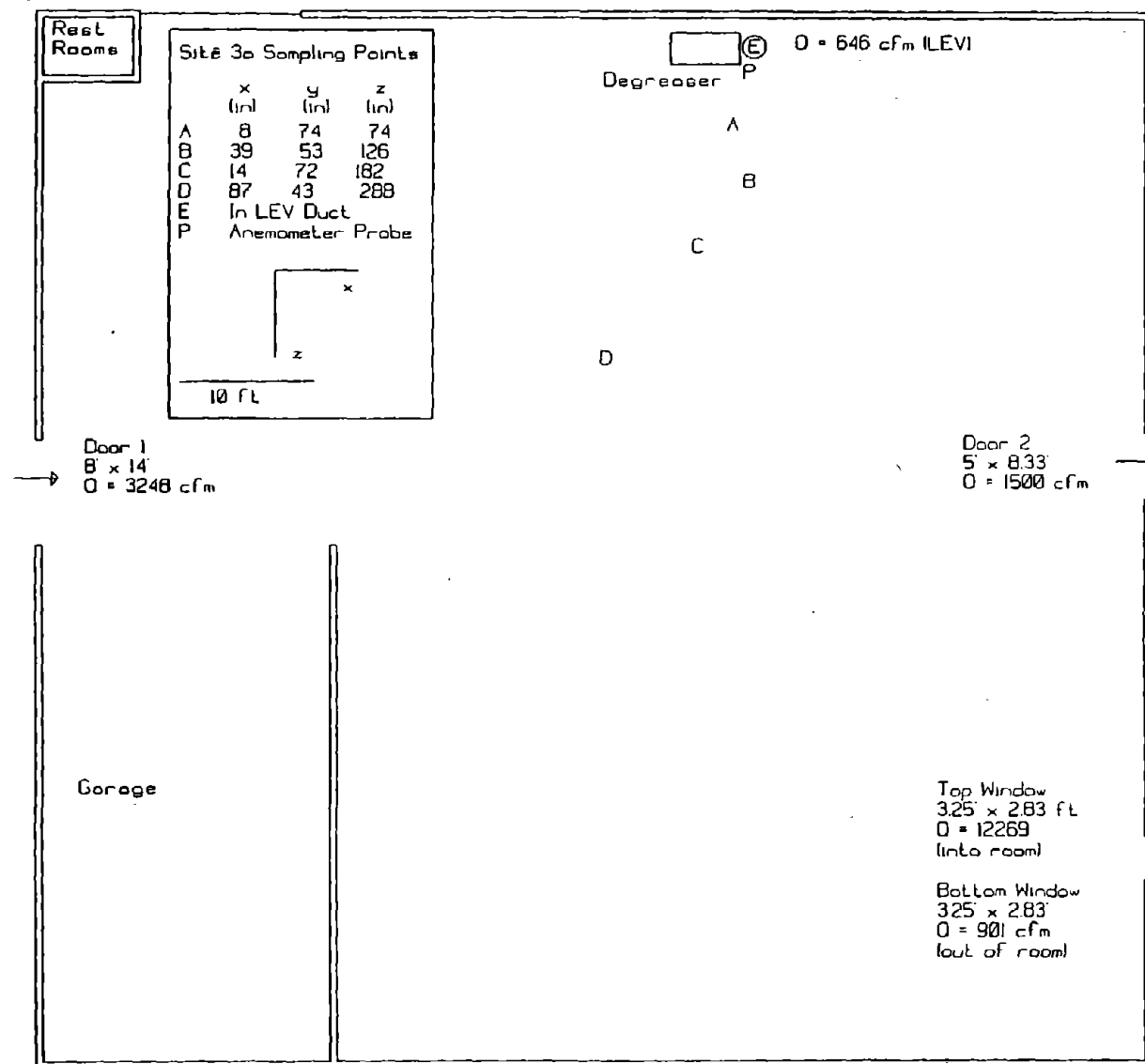


Figure 8. Plan View of Site 3A.

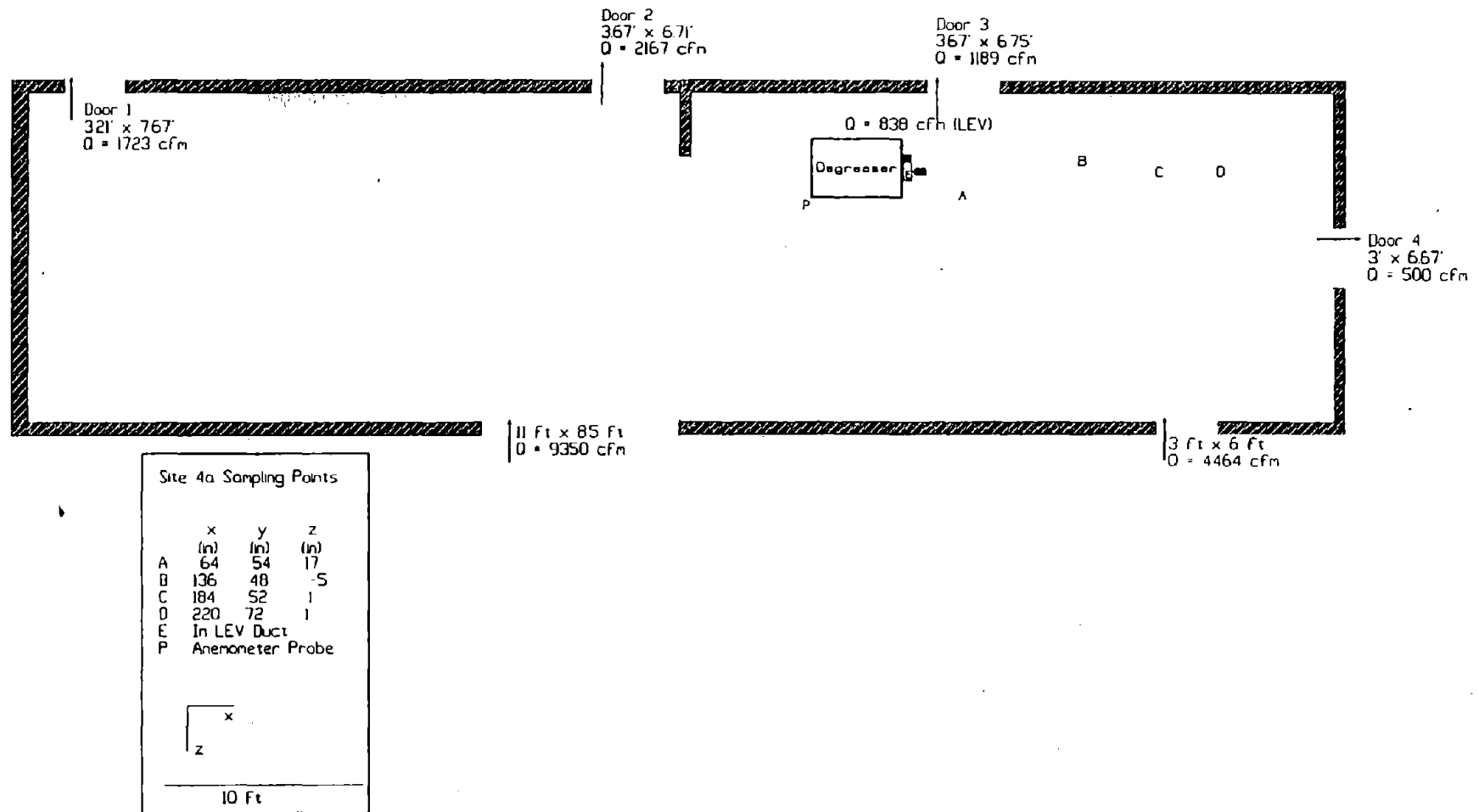


Figure 9. Plan View of Site 4A.

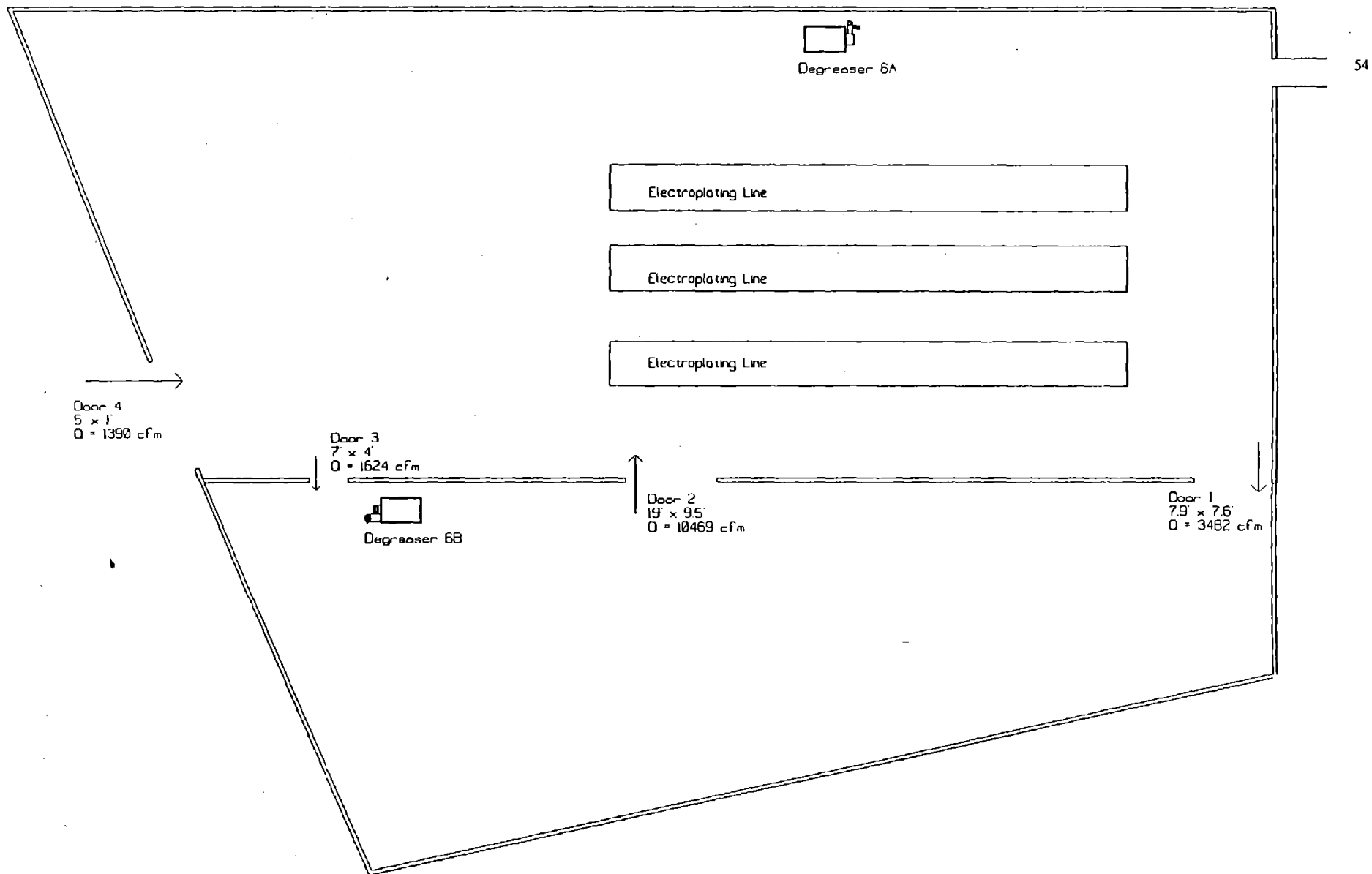


Figure 10. Plan View of Site 6A and 6B.

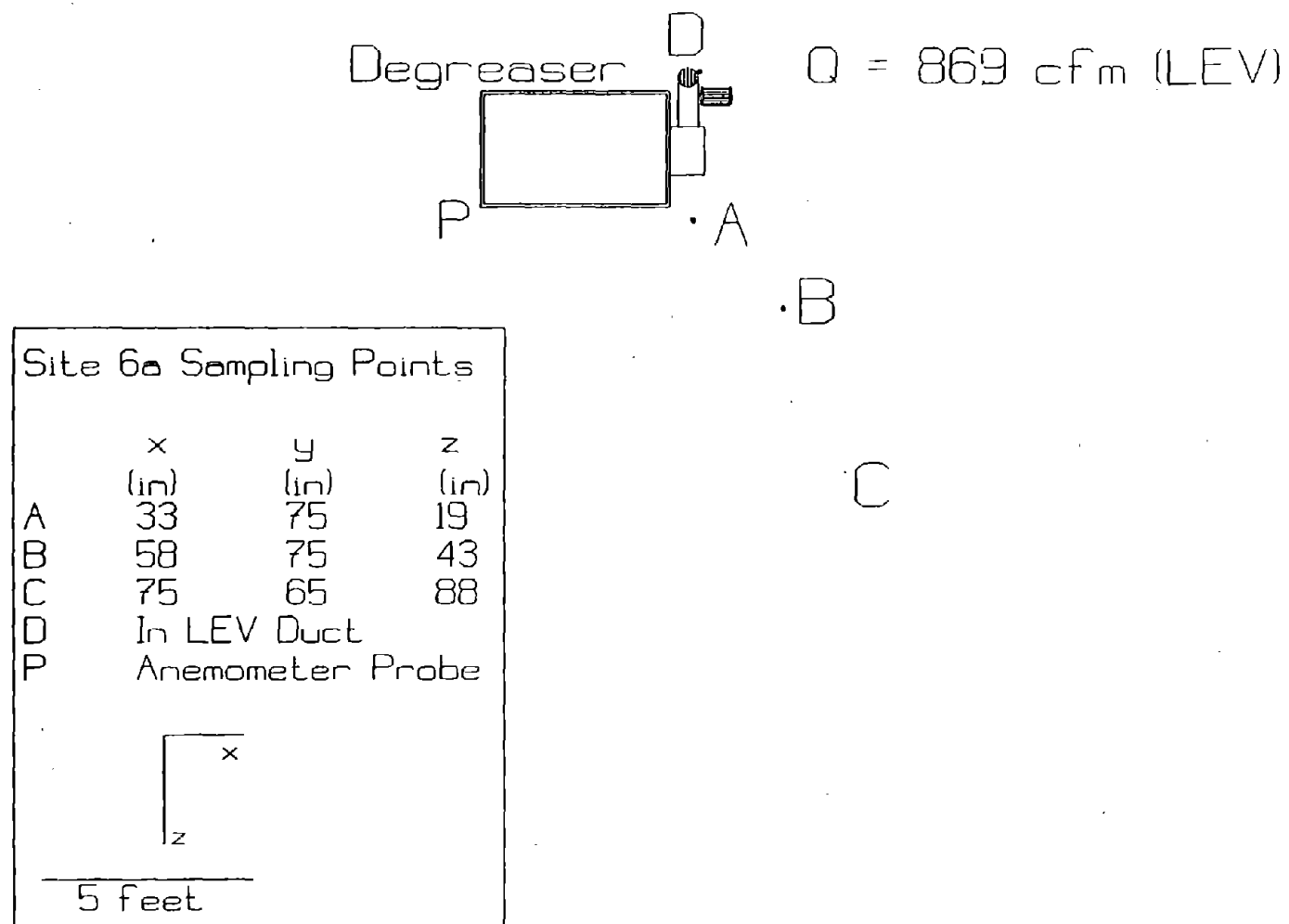
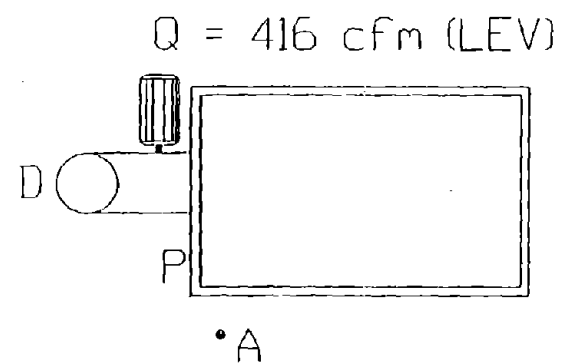
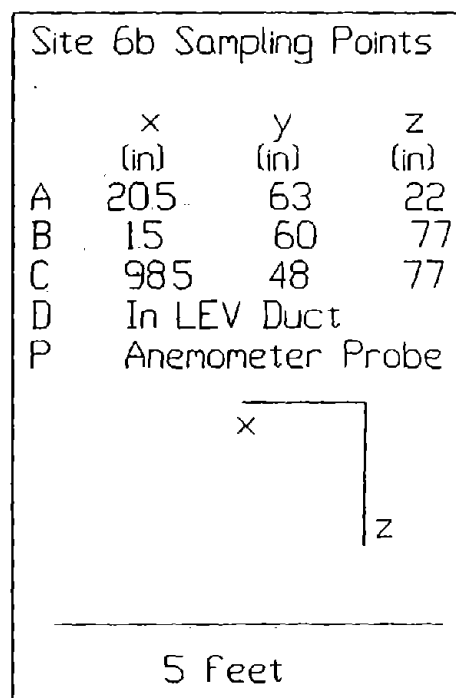


Figure 11. Plan View of Site 6A Degreaser.



•C

•B

Figure 12. Plan View of Site 6B Degreaser.

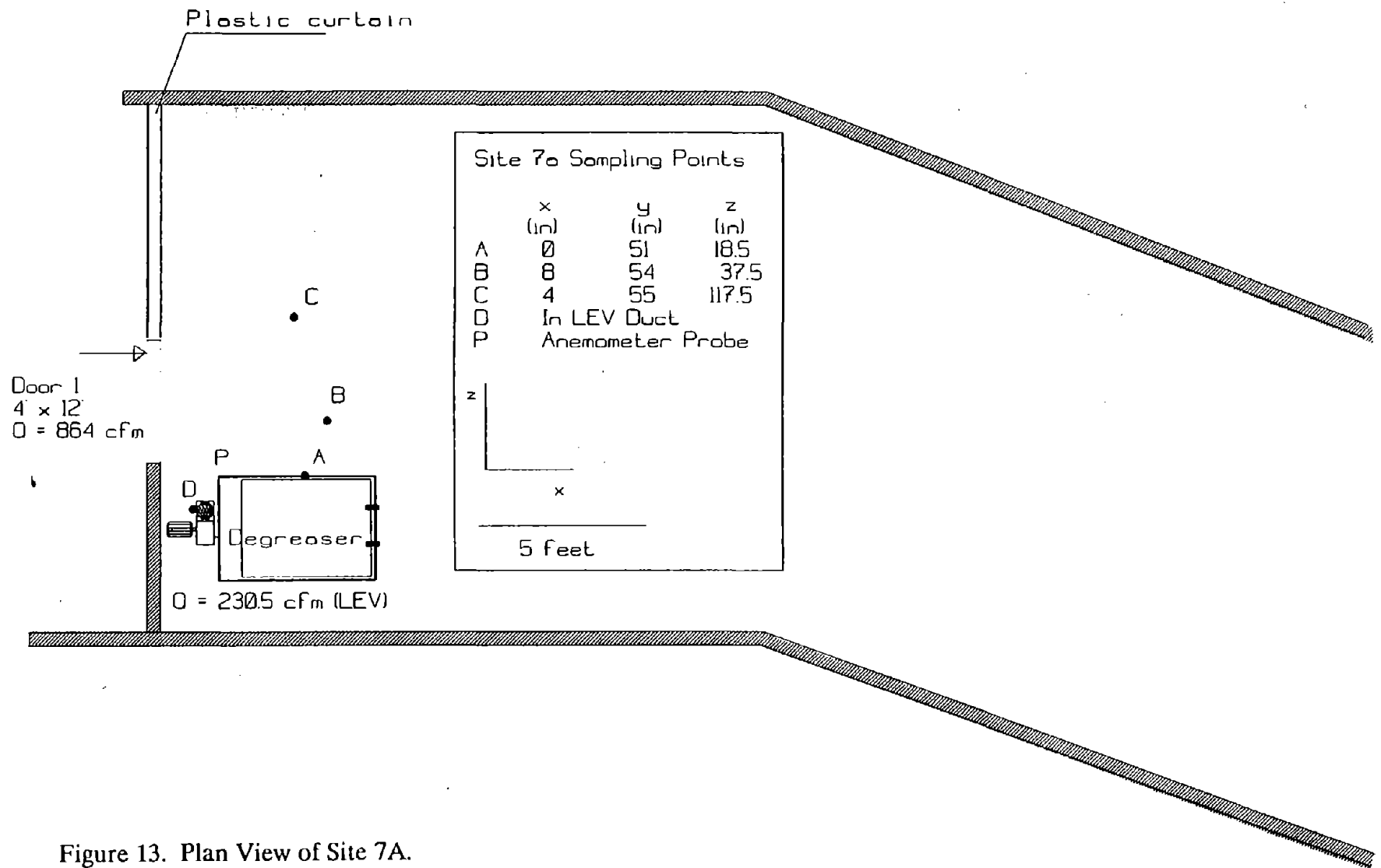


Figure 13. Plan View of Site 7A.

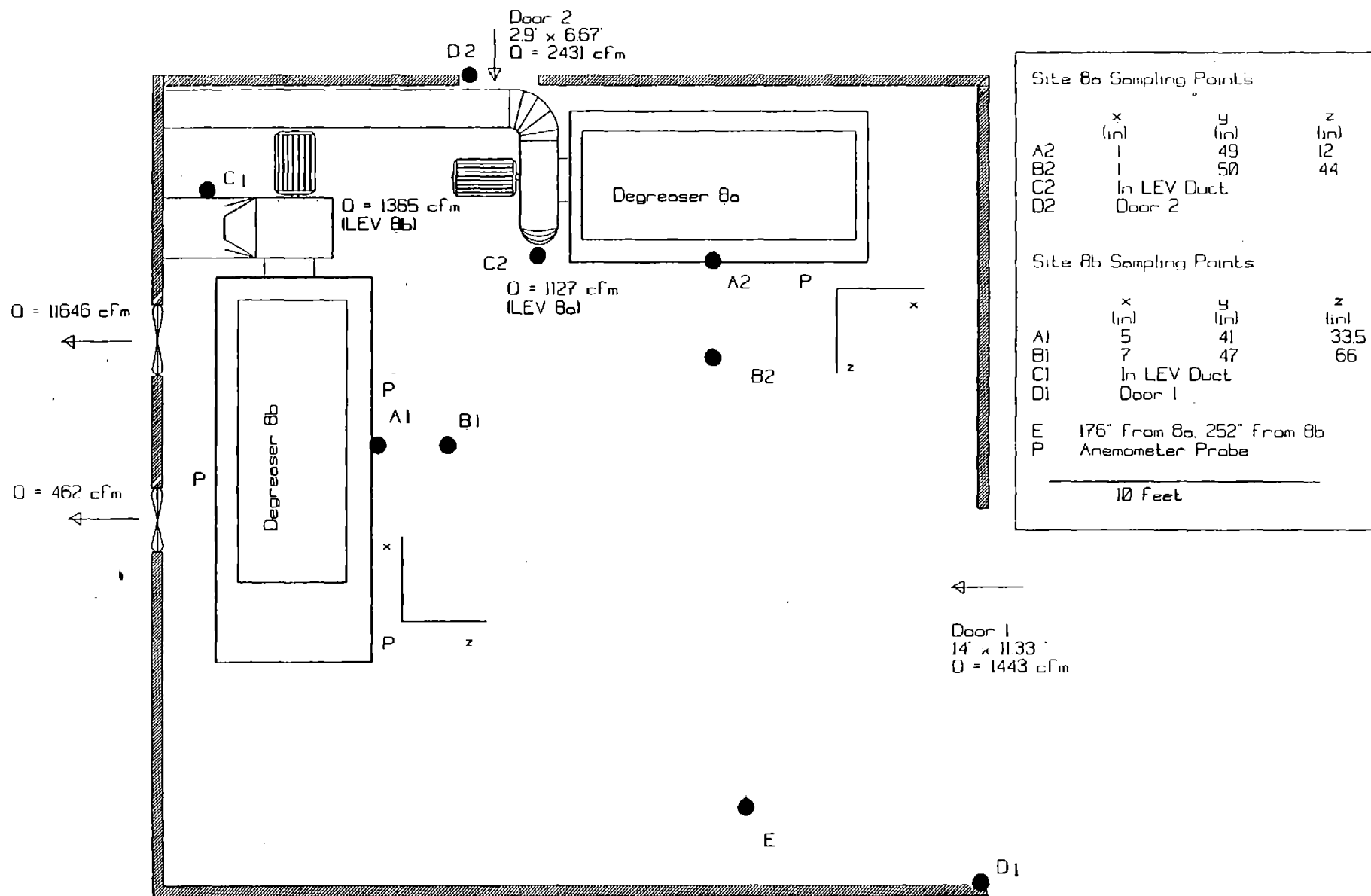


Figure 14. Plan View of Site 8A and 8B.

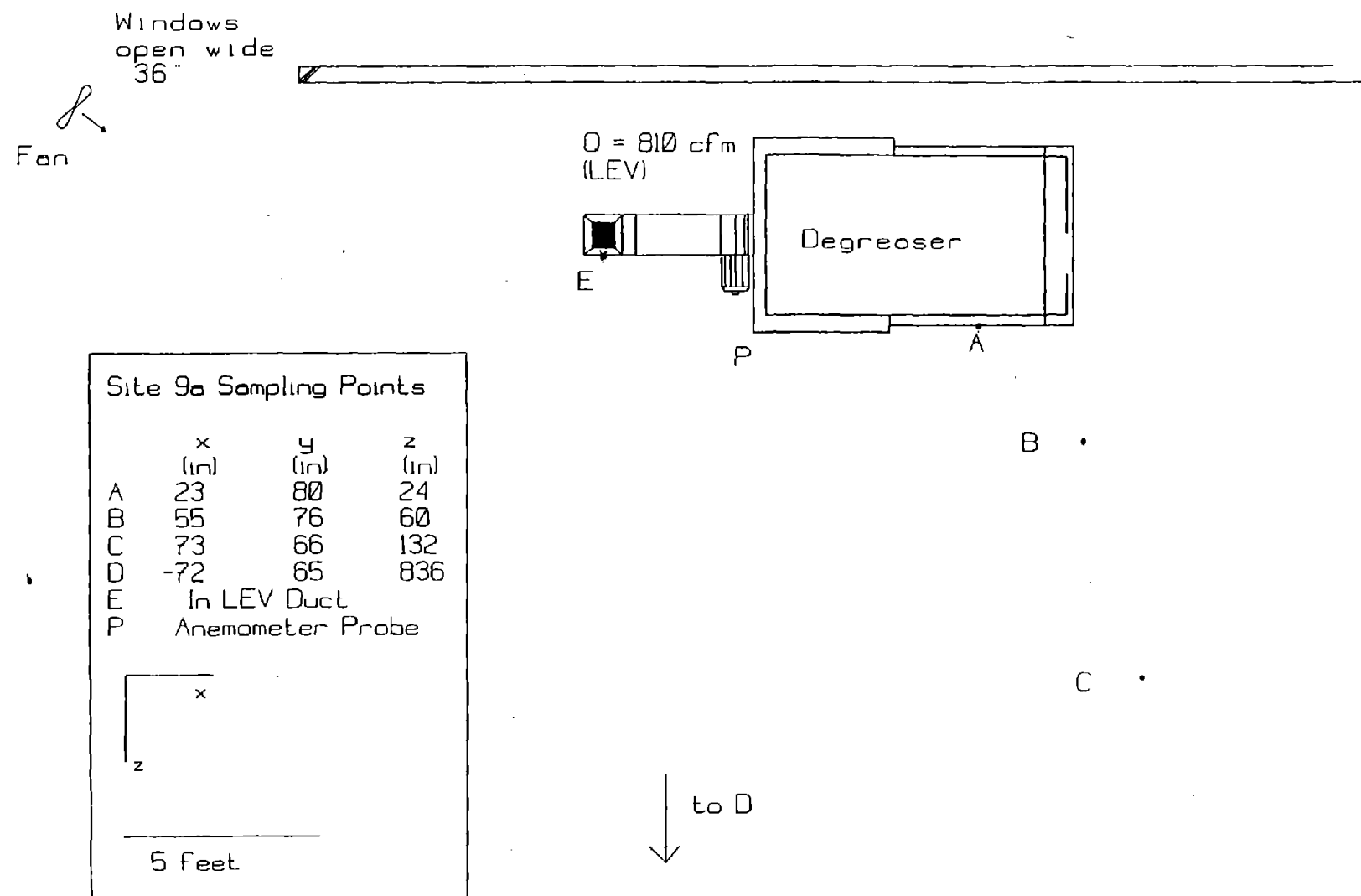


Figure 15. Plan View of Site 9A.

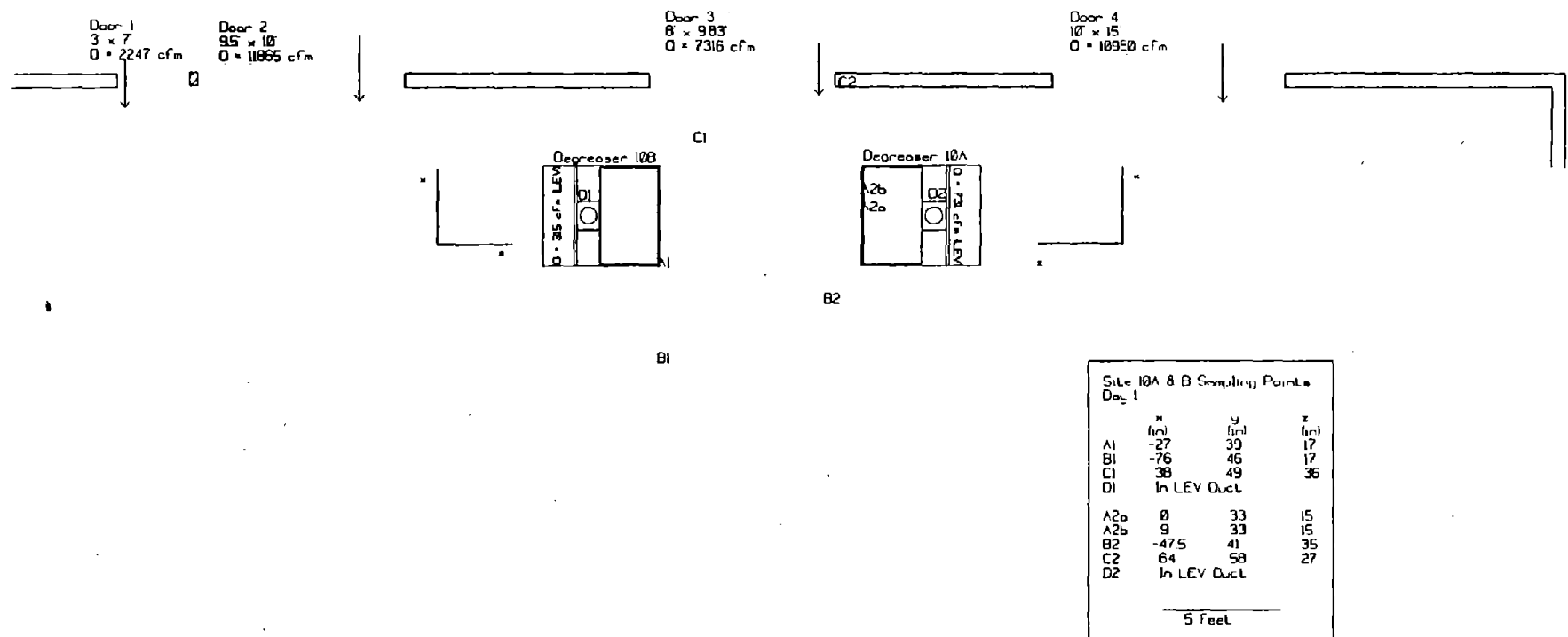


Figure 16. Plan View of Site 10A and 10B, Day 1.

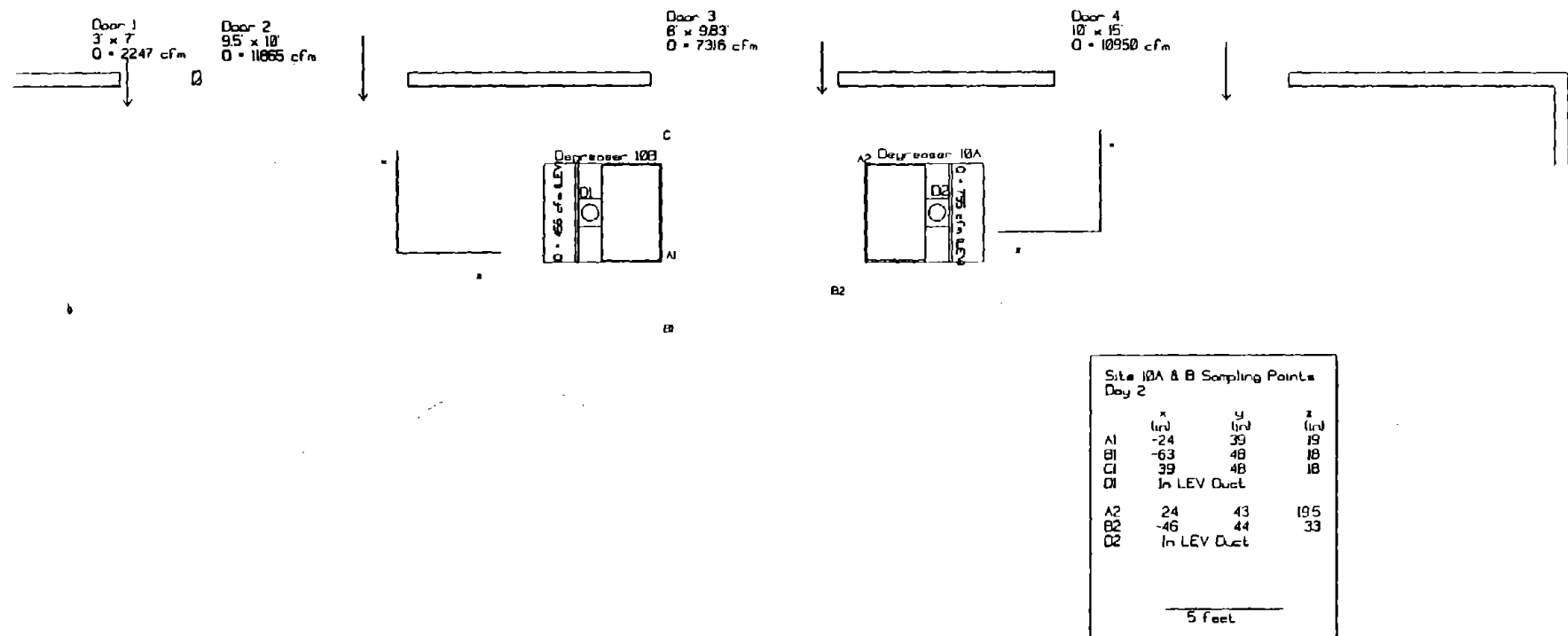


Figure 17. Plan View of Site 10A and 10B Degreasers, Day 2.

E

1200 cfm
Supply

1550 cfm
Supply

62

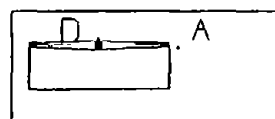
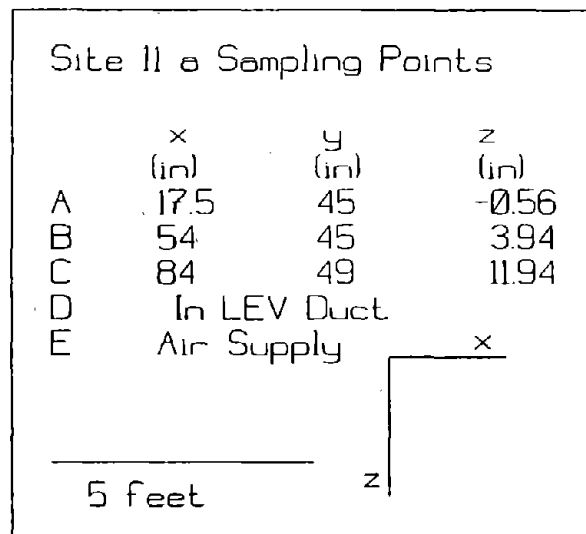


Figure 18. Plan View of Site 11A Degreaser.

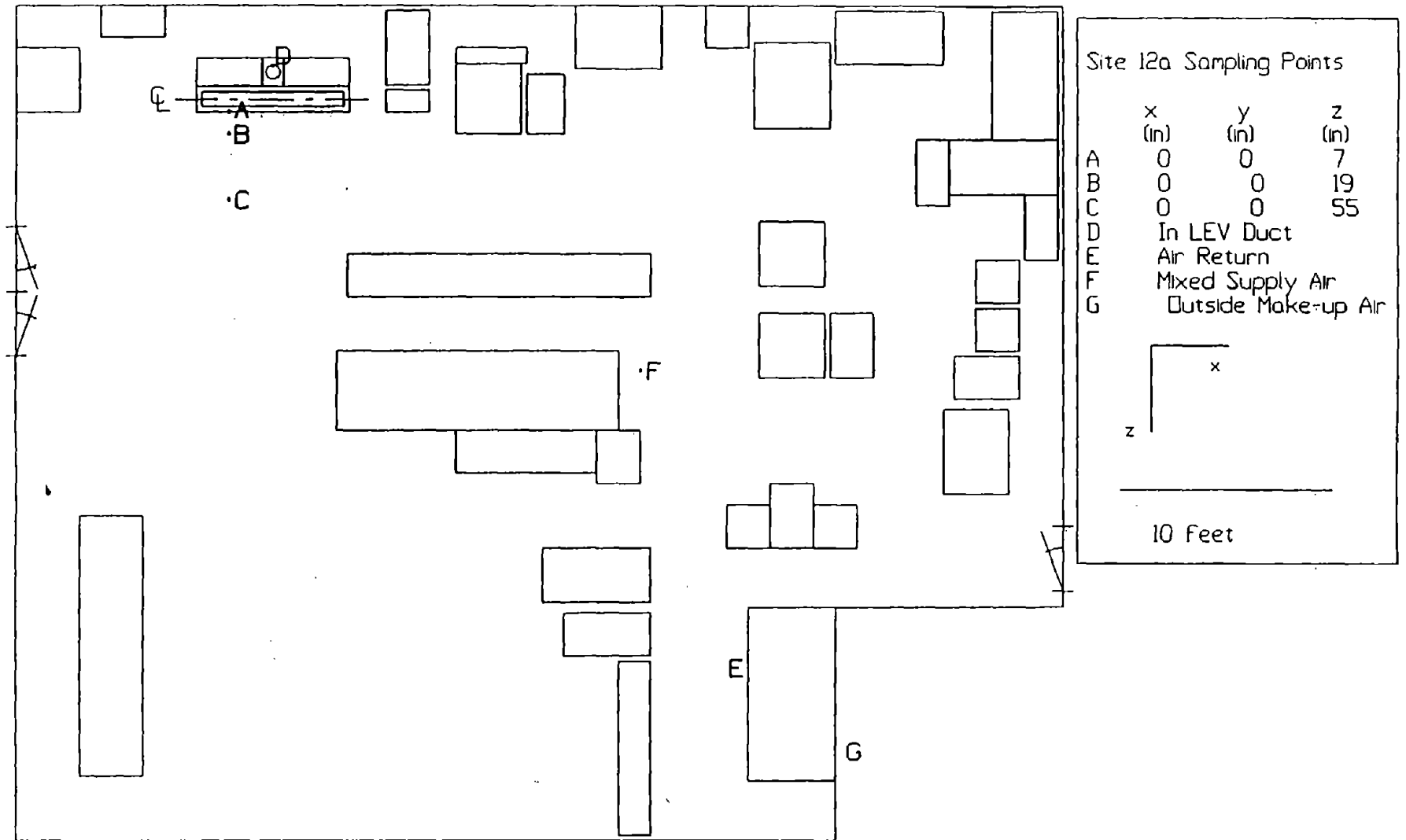


Figure 19. Plan View of Site 12A.

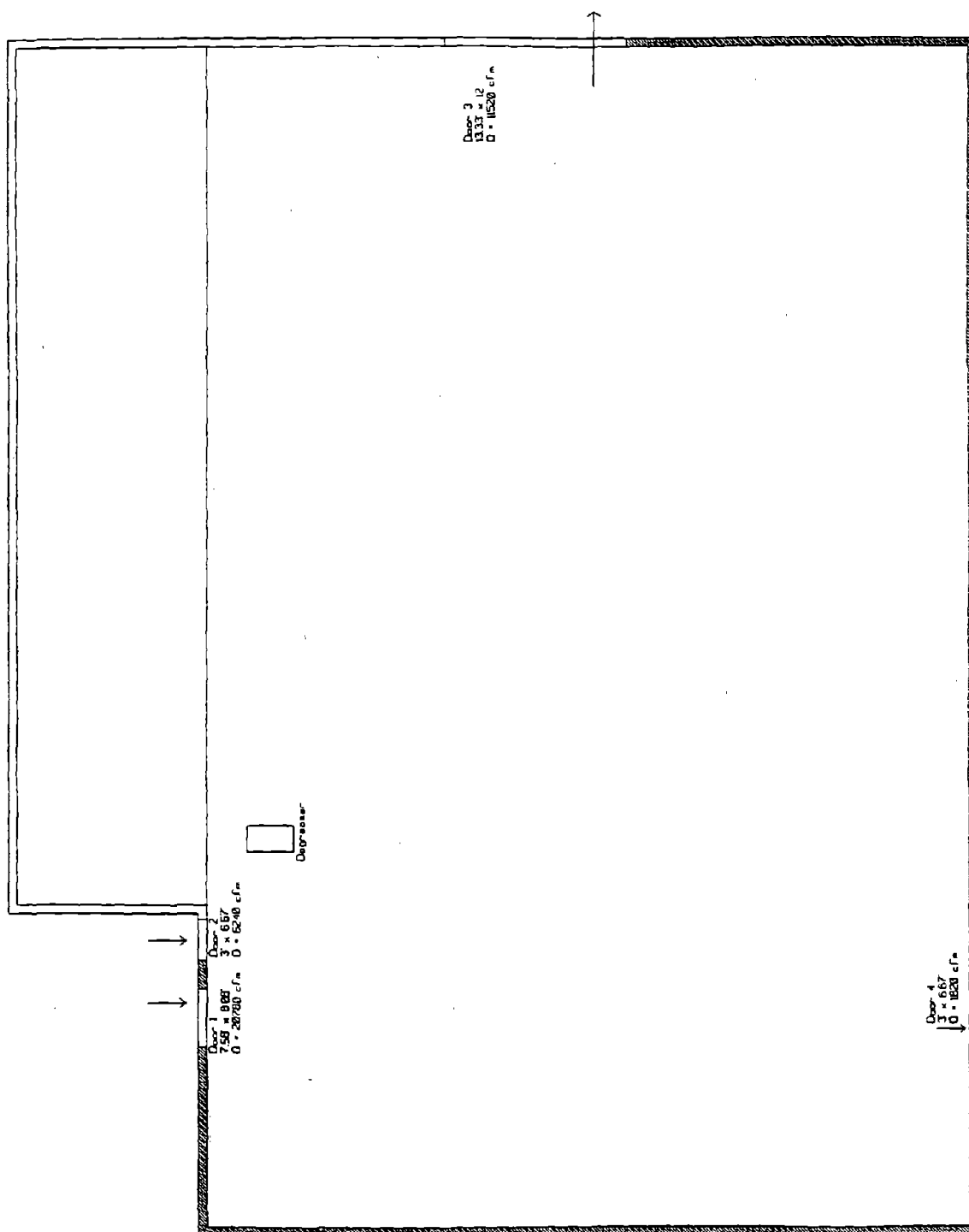


Figure 20. Plan View of Site 13A.

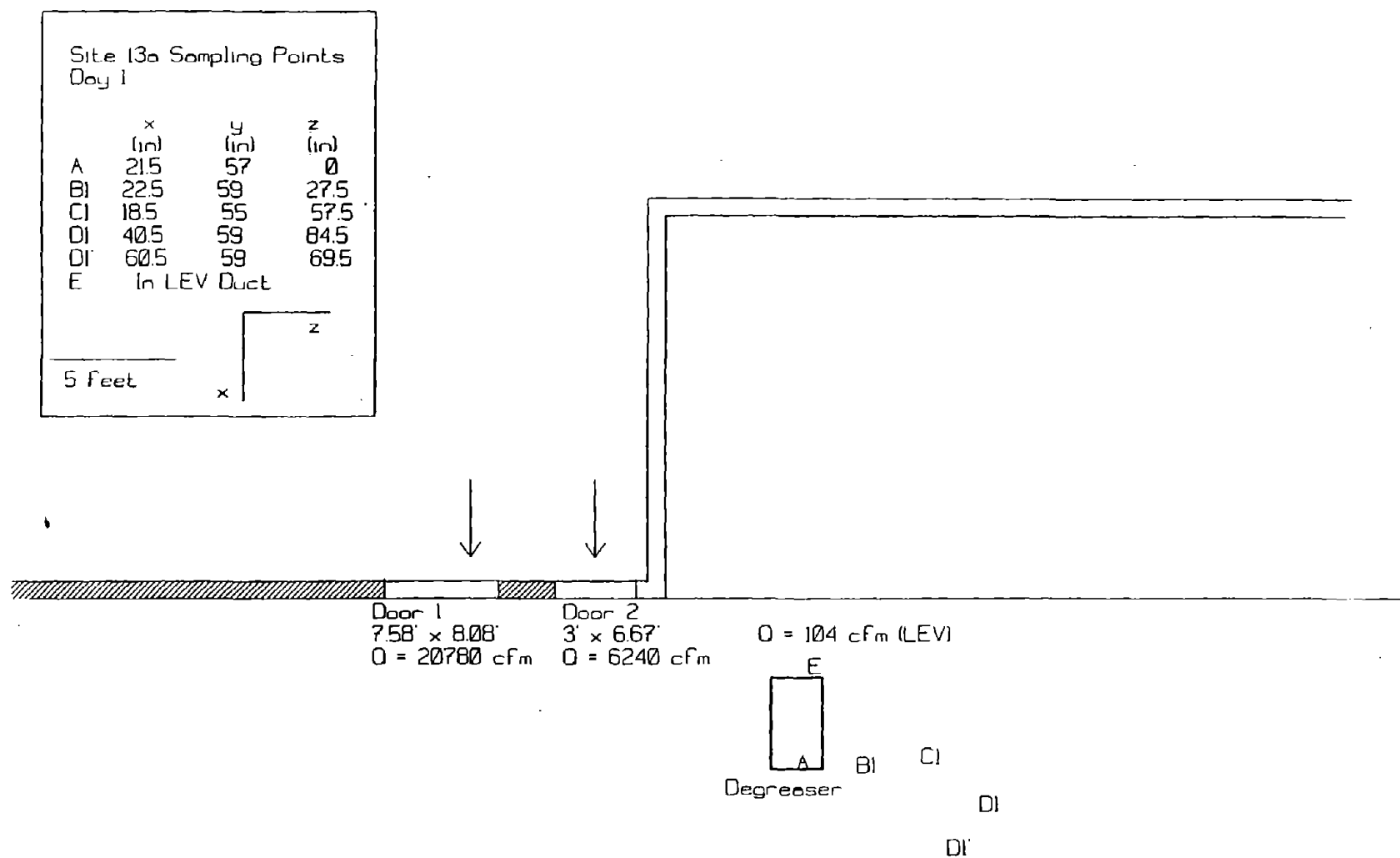


Figure 21. Plan View of Site 13A Degreaser, Day 1.

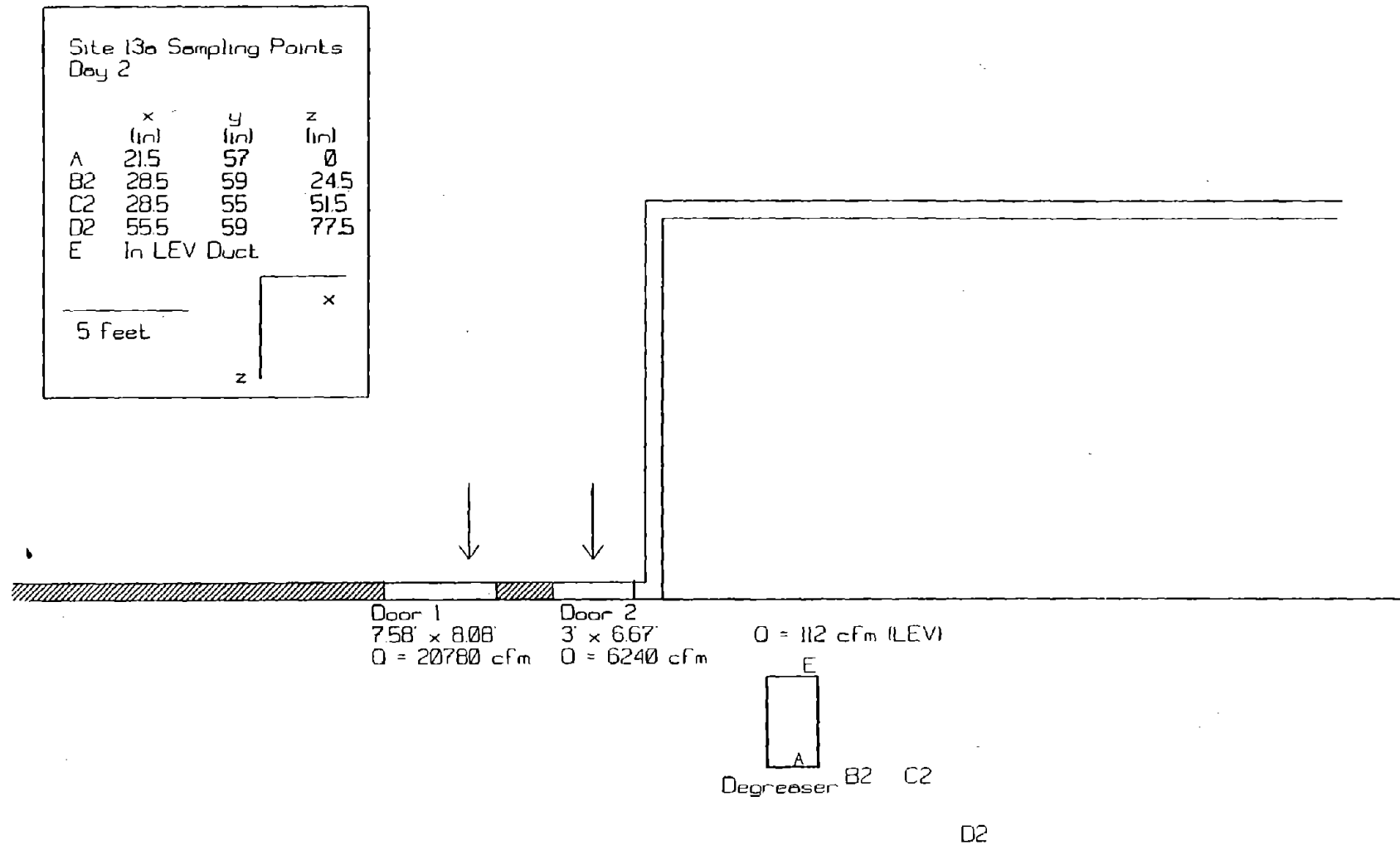


Figure 22. Plan View of Site 13A Degreaser, Day 2.

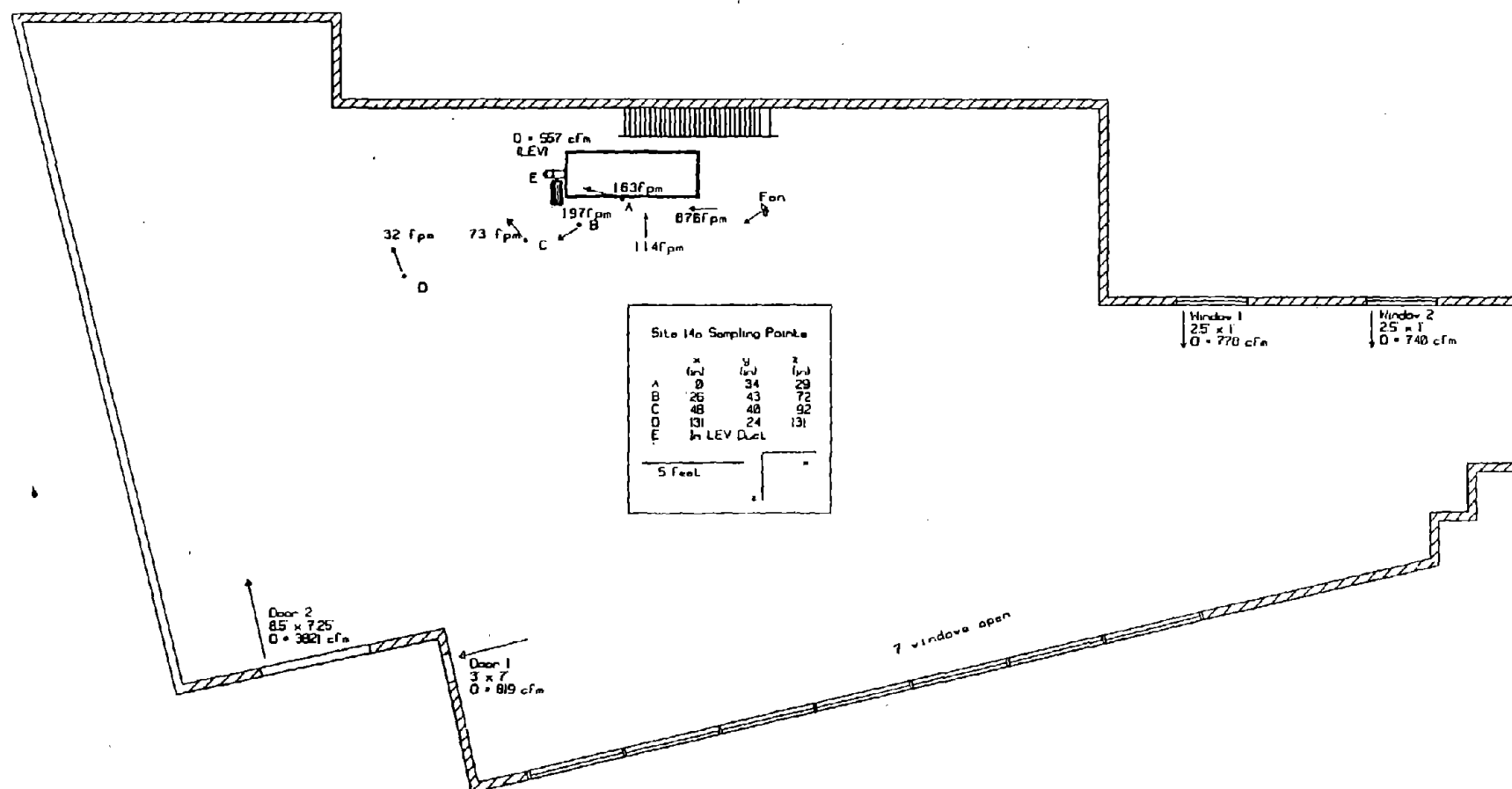


Figure 23. Plan View of Site 14A.

5.2 Appendix B

Field Data for Each Site

TABLE XXXV: FIELD DATA FOR SITE 1A

Degreaser: 1A
 Rotameter: 003766
 Rotameter Curve: ml/min=5.54*rr
 Solvent: Methyl Chloroform
 MW: 133.4

Location	Distance			
	x(ln)	y(ln)	z(ln)	r(m)
A	51.5	68	18.25	2.22
B	111.5	77	36.25	3.56
C	255.5	62	36.25	6.74
D	327.5	54	36.25	8.48
D	159.5	62	36.25	4.44
E	<----- duct ----->			
F	110.5	62	132.3	4.65

VP	V
0.08	1132
0.11	1327
0.14	1497
0.15	1550
0.16	1601
0.15	1550
0.15	1550
0.14	1497
0.13	1443
0.08	1132
Vav (fpm)	1428
d (in)	8
A (ft2)	0.349
Q (cfm)	498.5

Interval	Location	Sample	Time Start		End	Rotameter Reading		Time	Volume	Mass			
			(hr)	(min)		Start	End			front	back	Concentration	Concentration
					(hr)	(min)		(min)	(l)	(mg)	(mg)	(mg/m3)	(ppm)
1	A	1A	8	2	8	58	17	15	56	4.96	3.284	661.6	121.3
	B	1B	8	0	9	0	15	15	60	4.99	1.744	349.8	64.1
	C	1C	8	12	9	12	15	22	60	6.15	1.744	283.6	52.0
	D	1D	8	14	9	14	15	20	60	5.82	1.026	176.4	32.3
2	A	2A	8	58	9	58	15	15	60	4.99	0.985	197.6	36.2
	B	2B	9	0	10	0	15	16	60	5.15	0.825	160.1	29.3
	C	2C	9	12	10	14	22	18	62	6.87	0.781	113.7	20.8
	D	2D	9	14	10	14	20	22	60	6.98	0.364	52.1	9.6
3	A	3A	10	20	11	20	15	15	60	4.99	1.981	397.3	72.8
	B	3B	10	20	11	20	15	15	60	4.99	1.722	345.4	63.3
	C	3C	10	20	11	20	18	18	60	5.98	1.152	192.5	35.3
	D	3D	10	20	11	20	20	20	60	6.65	1.813	272.7	50.0
	E	1E	10	20	11	20	15	15	60	4.99	41.646	8352.6	1530.9
4	A	4A	11	32	11	33	15	15	1	0.08			
	B	4B	11	32	12	30	15	13	58	4.50	0.509	113.1	20.7
	C	4C	11	32	12	30	18	18	58	5.78	0.004	0.7	0.1
	D	4D	11	32	12	30	20	20	58	6.43	0.625	97.3	17.8
	E	2E	11	36	12	30	15	14	54	4.34	11.559	2664.7	488.4
5	A	5A	12	42	13	42	15	15	60	4.99	2.997	601.1	110.2
	B	5B	12	42	13	42	13	15	60	4.65	1.863	400.3	73.4

TABLE XXXV: FIELD DATA FOR SITE 1A (CONTINUED)

Interval	Location	Sample	Time		End		Rotameter Reading		Time	Volume	Mass		Concentration	Concentration
			Start	(min)	(hr)	(min)	Start	End			front	back		
			(hr)						(min)	(l)	(mg)	(mg)	(mg/m3)	(ppm)
6	C	5C	12	42	13	42	18	17	60	5.82	0.168		28.9	5.3
	D	5D	12	42	13	42	20	19	60	6.48	0.266		41.0	7.5
	E	3E	12	42	13	42	15	13	60	4.65	5.541		1190.7	218.2
	A	6A	13	48	14	48	15	16	60	5.15	0.708		137.4	25.2
	B	6B	13	48	14	48	15	16	60	5.15	0.359		69.7	12.8
	C	6C	13	48	14	48	17	10	60	4.49	0.002		0.4	0.1
	D	6D	13	48	14	48	19	18	60	6.15	0.314		51.1	9.4
7	E	4E	14	22	14	56	13	17	34	2.83				
	A	7A	7	24	8	24	12	12	60	3.99	0.193		48.4	8.9
	B	7B	7	24	8	24	10	10	60	3.32	0.172		51.7	9.5
	C	7C	7	24	8	24	13	13	60	4.32	0.219		50.7	9.3
	D	7D	7	24	8	24	14	14	60	4.65	0.219		47.1	8.6
8	E	7E	7	24	8	24	25	25	60	8.31	2.777		334.2	61.2
	A	8A	8	44	9	10	12	10	26	1.58	0.027		17.0	3.1
	B	8B	8	44	9	10	10	10	26	1.44	0.023		16.0	2.9
	C	8C	8	44	9	10	13	13	26	1.87	0.028		15.0	2.7
	D	8D	8	44	9	10	14	15	26	2.09	0.027		12.9	2.4
	E	8E	8	44	9	10	25	15	26	2.88	0.338		117.3	21.5
	F	1F	8	44	9	10	10	10	26	1.44	0.042		29.2	5.3
9	A	10A	9	22	10	22	10	10	60	3.32	2.135		642.3	117.7
	B	10B	9	22	10	22	10	11	60	3.49	1.049		300.6	55.1
	C	10C	9	22	10	22	13	14	60	4.49	0.758		168.9	31.0
	D	10D	9	22	10	22	15	10	60	4.16	0.994		239.2	43.8
	E	10E	9	22	10	22	15	14	60	4.82	2.862		593.8	108.8
10	F	3F	9	22	10	22	10	9	60	3.16	1.53		484.5	88.8
	A	9A	10	32	11	4	10	10	32	1.77	0.123		69.4	12.7
	B	9B	10	32	11	4	11	12	32	2.04	0.069		33.8	6.2
	C	9C	10	32	11	4	14	8	32	1.95	0.037		19.0	3.5
	D	9D	10	32	11	4	10	15	32	2.22	0.068		30.7	5.6
	E	9E	10	32	11	4	14	13	32	2.39	0.497		207.7	38.1
	F	2F	10	32	11	4	9	17	32	2.30	0.848		368.0	67.4
11	A	11A	11	14	12	6	10	10	52	2.88	1.308		454.0	83.2
	B	11B	11	14	12	6	12	10	52	3.17	1.18		372.4	68.2
	C	11C	11	14	12	6	8	8	52	2.30	1.181		512.4	93.9
	D	11D	11	14	12	6	15	15	52	4.32	1.529		353.8	64.9
	E	11E	11	14	12	6	13	12	52	3.60	3.538		982.5	180.1
12	F	4F	11	14	12	6	17	5	52	3.17	0.009		2.8	0.5
	A	12A	12	12	13	10	10	10	58	3.21	0.003		0.9	0.2

TABLE XXXV: FIELD DATA FOR SITE 1A (CONTINUED)

Interval	Location	Sample	Time		End		Rotameter Reading			Volume (l)	Mass		Concentration (mg/m3)	Concentration (ppm)
			Start (hr)	(min)	(hr)	(min)	Start	End	Time (min)		front (mg)	back (mg)		
13	B	12B	12	12	13	10	10	10	58	3.21	0.427		132.9	24.4
	C	12C	12	12	13	10	8	5	58	2.09	0.392		187.7	34.4
	D	12D	12	12	13	10	15	14	58	4.66	0.518		111.2	20.4
	E	12E	12	12	13	10	12	0	58	1.93	0.387		200.7	36.8
	F	5F	12	12	13	10	5	5	58	1.61	0.36		224.1	41.1
	A	13A	13	30	14	0	10	10	30	1.66	0.169		101.7	18.6
	B	13B	13	30	14	0	10	10	30	1.66	0.14		84.2	15.4
	C	13C	13	30	14	0	5	14	30	1.58	0.192		121.6	22.3
	D	13D	13	30	14	0	14	13	30	2.24	0.15		66.9	12.3
	E	13E	13	30	14	0	15	15	30	2.49	0.416		166.9	30.6
	F	6F	13	30	14	0	5	0	30	0.42	0.079		190.1	34.8

TABLE XXXVI: FIELD DATA FOR SITE 2A

Degreaser: 2A
 Rotameter: 003766
 Rotameter Curve: ml/min=5.54*rr
 Solvent: Trichloroethylene
 MW: 131.4

Day 1					Day 2				
Location	Distance					Distance			
	x(in)	y(in)	z(in)	r(m)		x(in)	y(in)	z(in)	r(m)
A	42	36	58	2.04		17	66	46	2.09
B						55	56	58	2.48
C	70	70	86	3.33		98	52	77	3.43
D	32	62	30	1.93		172	52	77	4.97
E	100	68	94	3.89		<---- duct ----->			
E2	165	67	86	5.02					
F(1-6)	<---- duct ----->								

VP	V
0.24	1961
0.28	2118
0.32	2264
0.33	2299
0.33	2299
0.34	2334
0.35	2368
0.35	2368
0.22	1877
0.2	1790
Vav (fpm)	2168
d (in)	8
A (ft2)	0.349
Q (cfm)	757

Interval	Location	Sample	Time Start (hr)	(min)	End (hr)	(min)	Rotameter Start	Reading End	Mass front (mg)	back (mg)	Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
1	A	1A	9	16	10	20	20	15	0.145	BDL	64	6.20	23.4	4.35
	C	1C	9	16	10	24	20	30	0.184		68	9.42	19.5	3.64
	D	1D	9	16	10	26	20	10	0.253	BDL	70	5.82	43.5	8.09
	E	1E	9	16	10	26	20	0	0.068	0.001	70	3.88	17.8	3.31
	F	1F	9	16	10	28	10	10	3.34	BDL	72	3.99	837.3	155.81
2	A	2A	10	34	11	42	15	16	0.145		68	5.84	24.8	4.62
	C	2C	10	36	11	44	20	20	0.133		68	7.53	17.7	3.28
	D	2D	10	44	11	42	20	22	0.165		58	6.75	24.5	4.55
	E	2E	10	52	11	44	20	44	0.102		52	9.22	11.1	2.06
	F	2F	10	44	11	40	10	8	2.13		56	2.79	762.9	141.95
3	A	3A	12	2	12	32	15	15	0.001		30	2.49	0.4	0.07
	C	3C	12	2	12	34	21	19	0.012		32	3.55	3.4	0.63
	D	3D	12	2	12	38	20	20	0.035		36	3.99	8.8	1.63
	E	3E	12	2	12	36	20	20	0.023		34	3.77	6.1	1.14
	F	3F	12	2	12	30	8	9	0.908		28	1.32	688.7	128.14
4	A	4A	12	48	13	50	15	21	0.107		62	6.18	17.3	3.22
	C	4C	12	48	13	52	20	15	0.116		64	6.20	18.7	3.48
	D	4D	12	46	13	50	16	16	0.172		64	5.67	30.3	5.64
	E2	4E	12	46	13	52	8	19	0.007		66	4.94	1.4	0.26
	F	4F	12	50	13	48	20	12	3.32		58	5.14	645.8	120.16
5	A	5A	13	56	14	58	15	11	0.155		62	4.47	34.7	6.46
	C	5C	13	56	14	58	15	0	0.084		62	2.58	32.6	6.07

TABLE XXXVI: FIELD DATA FOR SITE 2A (CONTINUED)

Interval	Location	Sample	Time		End		Rotameter Reading		Mass front (mg)	back (mg)	Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			Start (hr)	(min)	(hr)	(min)	Start	End						
	D	5D	13	56	14	56	20	19	0.23		60	6.48	35.5	6.60
	E2	5E	13	58	15	0	21	19	0.084		62	6.87	12.2	2.28
	F	5F	13	56	14	56	10	8	2.97		60	2.99	992.8	184.73
6 A		6A	15	2	15	56	14	3	0.074		54	2.54	29.1	5.41
	C	6C	15	2	15	58	20	0	0.04		56	3.10	12.9	2.40
	D	6D	15	2	15	56	17	18	0.143		54	5.24	27.3	5.08
	E2	6E	15	2	15	58	20	20	0.022		56	6.20	3.5	0.66
	F	6F	15	2	15	54	9	8	3.7		52	2.45	1511.0	281.16
7 A		7A	8	2	8	56	20	20	0.334		54	5.98	55.8	10.39
	B	7B	8	2	8	56	20	20	0.232		54	5.98	38.8	7.22
	C	7C	8	2	8	56	20	18	0.082		54	5.68	14.4	2.68
	D	7D	8	2	8	56	25	34	0.212		54	8.83	24.0	4.47
	E	7E	8	2	8	56	12	10	5.043		54	3.29	1532.5	285.15
8 A		8A	9	4	10	4	20	12	0.207		60	5.32	38.9	7.24
	B	8B	9	4	10	4	22	19	0.125		60	6.81	18.3	3.41
	C	8C	9	4	10	4	20	15	0.148		60	5.82	25.4	4.73
	D	8D	9	4	10	4	25	29	0.124		60	8.97	13.8	2.57
	E	8E	9	4	10	4	10	8	2.296		60	2.99	767.5	142.81
9 A		9A	10	6	11	4	20	20	0.106		58	6.43	16.5	3.07
	B	9B	10	6	11	4	20	20	0.076		58	6.43	11.8	2.20
	C	9C	10	6	11	4	20	16	0.082		58	5.78	14.2	2.64
	D	9D	10	6	11	4	25	25	0.082		58	8.03	10.2	1.90
	E	9E	10	6	11	4	10	5	0.598		58	2.41	248.1	46.17
10 A		10A	11	10	11	46	21	24	0.048		36	4.49	10.7	1.99
	B	10B	11	10	11	46	20	21	0.041		36	4.09	10.0	1.87
	C	10C	11	10	11	46	18	17	0.045		36	3.49	12.9	2.40
	D	10D	11	10	11	46	28	28	0.052		36	5.58	9.3	1.73
	E	10E	11	10	11	46	10	8	1.897		36	1.79	1056.8	196.65
11 A		11A	11	58	12	32	21	20	0.039		34	3.86	10.1	1.88
	B	11B	11	58	12	32	20	20	0.024		34	3.77	6.4	1.19
	C	11C	11	58	12	32	20	16	0.034		34	3.39	10.0	1.87
	D	11D	11	58	12	32	27	23	0.042		34	4.71	8.9	1.66
	E	11E	11	58	12	32	12	10	1.083		34	2.07	522.7	97.26
12 A		12A	12	42	13	40	20	10	0.078		58	4.82	16.2	3.01
	B	12B	12	42	13	40	20	0	0.065		58	3.21	20.2	3.76
	C	12C	12	42	13	40	20	0	0.153		58	3.21	47.6	8.86
	D	12D	12	42	13	40	25	21	0.101		58	7.39	13.7	2.54
	E	12E	12	42	13	40	10	26	5.73		58	5.78	990.7	184.34
13 A		13A	13	54	15	18	30	30	0.204		84	13.96	14.6	2.72
	B	13B	13	54	15	18	20	18	0.144		84	8.84	16.3	3.03
	C	13C	13	54	15	18	20	20	0.226		84	9.31	24.3	4.52

TABLE XXXVI: FIELD DATA FOR SITE 2A (CONTINUED)

Interval	Location	Sample	Time		End		Rotameter Reading		Mass front (mg)	back (mg)	Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			Start (hr)	(min)	(hr)	(min)	Start	End						
	D	13D	13	54	15	18	25	0	0.153		84	5.82	26.3	4.89
	E	13E	13	54	15	18	12	0	9.326		84	2.79	3340.1	621.50
14	A	14A	15	26	16	0	27	27	0.176		34	5.09	34.6	6.44
	B	14B	15	28	16	0	18	18	0.03		32	3.19	9.4	1.75
	C	14C	15	28	16	0	20	20	0.029		32	3.55	8.2	1.52
	D	14D	15	28	16	0	20	0	0.012		32	1.77	6.8	1.26
	E	14E	15	28	16	0	17	15	2.974		32	2.84	1048.5	195.09

TABLE XXXVII: FIELD DATA FOR SITE 3A

Degreaser: 3A
 Rotameter: 003766
 Rotameter Curve: $\text{ml/min} = 5.54 * r$
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	8	74	74	2.67
B	39	53	126	3.61
C	14	72	182	4.98
D	87	73	288	7.86
E	<----- DUCT ----->			

VP	V
0.13	1443
0.13	1443
0.18	1698
0.25	2001
0.25	2001
0.25	2001
0.25	2001
0.26	2041
0.26	2041
0.21	1834
Vav (fpm)	1850
d (in)	8
A (ft2)	0.349
Q (cfm)	645.9

Interval	Location	Sample	Time		End	Rotameter Reading		Mass front (mg)	back (mg)	Time (min)	Volume		Concentration (mg/m3)	Concentration (ppm)
			Start (hr)	(min)		Start	End				Total (l)			
1	A	17A	8	28	9	36	18	17	0.394	68	6.59		59.8	11.12
	B	17B	8	28	9	36	18	14	0.261	68	6.03		43.3	8.06
	C	17C	8	28	9	36	19	22	0.142	68	7.72		18.4	3.42
	D	17D	8	28	9	36	20	22	0.236	68	7.91		29.8	5.55
	E	17E	8	28	9	36	10	10	1.370	68	3.77		363.7	67.67
2	A	18A	9	36	10	42	15	17	0.415	66	5.85		70.9	13.20
	B	18B	9	36	10	40	16	17	0.209	64	5.85		35.7	6.65
	C	18C	9	36	10	38	22	21	0.093	62	7.38		12.6	2.34
	D	18D	9	36	10	34	22	23	0.125	58	7.23		17.3	3.22
	E	18E	9	36	10	46	10	10	2.955	70	3.88		762.0	141.79
3	A	19A	10	46	11	40	21	16	0.387	54	5.53		69.9	13.01
	B	19B	10	46	11	42	16	15	0.290	56	4.81		60.3	11.22
	C	19C	10	46	11	44	23	21	0.401	58	7.07		56.7	10.56
	D	19D	10	46	11	46	24	15	0.288	60	6.48		44.4	8.27
	E	19E	10	46	11	48	10	9	3.270	62	3.26		1002.1	186.47
4	A	20A	11	48	12	24	18	19	0.161	36	3.69		43.6	8.12
	B	20B	11	48	12	20	15	15	0.047	32	2.66		17.7	3.29
	C	20C	11	48	12	20	23	22	0.102	32	3.99		25.6	4.76

TABLE XXXVII: FIELD DATA FOR SITE 3A (CONTINUED)

Interval	Location	Sample	Time		End		Rotameter Reading		Mass front (mg)	back (mg)	Time (min)	Volume Total (l)	Concentration (mg/m3)	Concentration (ppm)
			Start (hr)	(min)	(hr)	(min)	Start	End						
	D	20D	11	48	12	16	15	0	0.046		28	1.16	39.5	7.36
	E	20E	11	48	12	26	9	9	0.616		38	1.89	325.1	60.50
5	A	21A	12	28	13	30	19	18	0.423		62	6.35	66.6	12.39
	B	21B	12	28	13	34	21	21	0.170		66	7.68	22.1	4.12
	C	21C	12	28	13	26	22	0	0.134		58	3.53	37.9	7.05
	D	21D	12	28	13	32	22	23	0.004		64	7.98	0.5	0.09
	E	21E	12	28	13	30	9	6	2.220		62	2.58	861.8	160.35
6	A	22A	13	36	14	38	22	21	0.230		62	7.38	31.1	5.80
	B	22B	13	36	14	38	19	22	0.123		62	7.04	17.5	3.25
	C	22C	13	36	14	40	25	0	0.100		64	4.43	22.6	4.20
	D	22D	13	36	14	42	22	22	0.026		66	8.04	3.2	0.60
	E	22E	13	36	14	38	15	8	1.822		62	3.95	461.3	85.83
7	A	23A	8	10	9	14	20	25	0.213		64	7.98	26.7	4.97
	B	23B	8	10	9	14	20	20	0.298		64	7.09	42.0	7.82
	C	23C	8	10	9	14	21	20	0.148		64	7.27	20.4	3.79
	D	23D	8	10	9	16	20	20	0.134		66	7.31	18.3	3.41
	E	23E	8	10	9	18	10	10	2.648		68	3.77	702.9	130.79
8	A	24A	9	20	10	22	20	22	0.241		62	7.21	33.4	6.22
	B	24B	9	24	10	24	20	20	0.269		60	6.65	40.5	7.53
	C	24C	9	26	10	24	20	25	0.231		58	7.23	32.0	5.95
	D	24D	9	26	10	24	20	20	0.178		58	6.43	27.7	5.15
	E	24E	9	28	10	24	10	11	1.902		56	3.26	583.9	108.64
9	A	25A	10	26	11	40	20	20	0.252		74	8.20	30.7	5.72
	B	25B	10	26	11	40	20	20	0.412		74	8.20	50.2	9.35
	C	25C	10	28	11	40	20	21	0.231		72	8.18	28.2	5.26
	D	25D	10	28	11	40	18	0	0.098		72	3.59	27.3	5.08
	E	25E	10	28	11	42	11	10	2.552		74	4.30	592.9	110.31
10	A	26A	11	50	12	24	20	18	0.137		34	3.58	38.3	7.12
	B	26B	11	50	12	24	20	20	0.125		34	3.77	33.2	6.17
	C	26C	11	50	12	26	23	6	0.106		36	2.89	36.7	6.82
	D	26D	11	50	12	28	21	22	0.089		38	4.53	19.7	3.66
	E	26E	11	50	12	30	10	3	0.652		40	1.44	452.7	84.23
11	A	27A	12	40	14	2	20	20	0.429		82	9.09	47.2	8.79
	B	27B	12	40	14	4	21	21	0.295		84	9.77	30.2	5.62
	C	27C	12	42	14	4	V=7680ML		0.219		82	7.68	28.5	5.31
	D	27D	12	42	14	6	22	21	0.179		84	10.01	17.9	3.33

TABLE XXXVII: FIELD DATA FOR SITE 3A (CONTINUED)

Interval	Location	Sample	Time		End		Rotameter Reading		Mass front (mg)	back (mg)	Time (min)	Volume		Concentration (mg/m3)	Concentration (ppm)
			Start (hr)	(min)	(hr)	(min)	Start	End				Total (l)			
E	27E		12	42	14	2	10	10	3.319		80	4.43		748.9	139.34
12 A	28A		14	10	15	34	20	0	0.315		84	4.65		67.7	12.60
B	28B		14	10	15	36	20	21	0.375		86	9.77		38.4	7.14
C	28C		14	12	15	36	V=7970ML		0.226		84	7.97		28.4	5.28
D	28D		14	12	15	36	20	0	0.116		84	4.65		24.9	4.64
E	28E		14	14	15	36	11	11	3.903		82	5.00		781.1	145.33
13 A	29A		15	50	16	20	V=1827ML		0.047		30	1.83		25.7	4.79
B	29B		15	50	16	20	22	21	0.072		30	3.57		20.1	3.75
C	29C		15	50	16	22	V=3003ML		0.033		32	3.00		11.0	2.04
D	29D		15	52	16	22	20	24	0.084		30	3.66		23.0	4.27
E	29E		15	54	16	22	10	10	0.664		28	1.55		428.1	79.65

TABLE XXXVIII: FIELD DATA FOR SITE 4A

Degreaser: 4A
 Rotameter: 003766
 Rotameter Curve: ml/min=5.23*rr
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	64	54	17	2.17
B	136	48	-5	3.67
C	184	52	1	4.86
D	220	72	1	5.88
E	<----- duct ----->			

VP	V
0.04	800
0.05	895
0.07	1059
0.07	1059
0.06	980
0.05	895
0.07	1059
0.1	1266
0.11	1327
0.11	1327
Vav (fpm)	1067
d (in)	12
A (ft2)	0.785
Q (cfm)	838

Interval	Location	Sample	Time		End		Rotameter Reading		Mass		Time	Volume	Concentration	Concentration
			Start	(min)	(hr)	(min)	Start	End	front	back				
1	A	30A	9	56	11	0	20	18	0.427		64	6.74	63.4	11.79
	B	30B	9	56	11	0	20	24	0.232		64	7.80	29.7	5.53
	C	30C	9	56	11	0	20	19	0.216		64	6.91	31.2	5.81
	D	30D	9	56	11	0	21	20	0.317		64	7.27	43.6	8.12
	E	30E	9	56	11	0	10	8	2.418		64	3.19	757.7	141.00
2	A	31A	11	10	11	34	20	13	0.257		24	2.19	117.1	21.80
	B	31B	11	8	11	34	20	18	0.133		26	2.74	48.6	9.04
	C	31C	11	8	11	32	20	16	0.144		24	2.39	60.2	11.20
	D	31D	11	8	11	32	20	20	0.243		24	2.66	91.4	17.00
	E	31E	11	10	11	34	10	9	1.515		24	1.26	1199.4	223.18
3	A	32A	11	44	12	48	20	18	0.032		64	6.74	4.8	0.88
	B	32B	11	44	12	50	20	16	0.059		66	6.58	9.0	1.67
	C	32C	11	44	12	50	20	20	0.066		66	7.31	9.0	1.68
	D	32D	11	44	12	50	20	17	0.066		66	6.76	9.8	1.82
	E	32E	11	44	12	48	10	7	1.081		64	3.01	358.7	66.74

TABLE XXXIX: FIELD DATA FOR SITE 6A

Degreaser: 6A
 Rotameter: 003766
 Rotameter Curve: $\text{ml/min} = 5.32 \cdot r$
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance			
	x(ln)	y(ln)	z(ln)	r(m)
A	33	75	19	2.14
B	58	75	43	2.64
C	75	65	88	3.37
D	<----- duct ----->			

VP	V
0.2	1790
0.21	1834
0.2	1790
0.21	1834
0.2	1790
0.06	980
0.1	1266
0.15	1550
0.16	1601
0.14	1497
Vav (fpm)	1593
d (in)	10
A (ft ²)	0.55
Q (cfm)	869

Slot 1 V (fpm)	377
Slot 1 A (ft ²)	0.82
Slot 2 V (fpm)	486
Slot 2 A (ft ²)	0.47
Q (cfm)	537

Interval	Location Sample	Time		Mid		End		Rotameter Reading				Mass		Time (min)	Volume		
		(hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front (mg)	back (mg)		Total (l)	Concentration (mg/m ³)	Concentration (ppm)
1 A	101A	9	8	9	34	10	4	20	25	25	23			56	6.94	0.0	0.00
B	101B	9	8	9	34	10	4	21	22	22	22	0.132		56	6.49	20.4	3.79
C	101C	9	8	9	34	10	4	20	20	20	20	0.132		56	5.96	22.2	4.12
D	101D	9	8	9	34	10	4	23	27	27	30	0.215		56	8.01	28.9	5.00
2 A	102A	10	6	10	26	11	2	24	24	24	21	0.373		56	6.86	54.4	10.11
B	102B	10	6	10	26	11	2	22	23	23	23	0.109		56	6.80	16.0	2.98
C	102C	10	6	10	26	11	2	26	24	24	25	0.127		56	7.35	17.3	3.21
D	102D	10	6	10	26	11	2	15	49	49	20	0.276		56	10.01	27.6	5.13
3 A	103A	11	4	11	28	11	44	24	23	23	22	0.154		40	4.92	31.3	5.83
B	103B	11	4	11	28	11	44	17	20	20	19	0.035		40	4.02	8.7	1.62
C	103C	11	4	11	28	11	44	26	28	28	26	0.041		40	5.75	7.1	1.33
D	103D	11	4	11	30	11	46	17	18	18	17	0.243		42	3.91	62.1	11.56
4 A	104A	11	48			12	40	25				0.430		52	6.41	67.1	12.49
B	104B	11	48			12	40	19				0.069		52	6.41	10.8	2.00
C	104C	11	48			12	40	24				0.079		52	5.96	13.3	2.47
D	104D	11	46			12	40	18				0.489		54	7.89	61.9	11.53
5 A	105A	12	46	13	22	13	56	23	20	20	23	0.219		70	8.01	27.4	5.09
B	105B	12	46	13	22	13	56	20	18	18	0	0.024		70	5.27	4.6	0.85
C	105C	12	46	13	20	13	56	18	7	7	0	0.005		70	2.93	1.7	0.32
D	105D	12	46	13	22	13	56	21	13	13	0	0.241		70	4.43	54.4	10.12
6 A	106A	14	10	14	38	15	4	24	27	27	25	0.061		54	7.39	8.2	1.53
B	106B	14	12	14	36	15	4	18	18	18	19	0.007		52	5.05	1.4	0.26

TABLE XXXIX: FIELD DATA FOR SITE 6A (CONTINUED)

Interval	Location	Sample	Time Start		Mid (hr)	End (hr)	Rotameter Reading Start	Mid	Mid	End	Mass		Time (min)	Volume			
			(hr)	(min)							(min)	front (mg)		back (mg)	Total (l)	Concentration (mg/m3)	Concentration (ppm)
	C	106C	14	16	14	36	15	2	19	15	15	17	0.002	46	4.02	0.5	0.09
	D	106D	14	40			15	4	15			5	0.052	24	3.80	13.7	2.55
7	A	107A	15	14			15	36	26			24	0.030	22	6.50	4.6	0.86
	B	107B	15	12			15	36	20			16	0.022	24	5.26	4.2	0.78
	C	107C	15	12			15	36	18			18	0.021	24	6.22	3.4	0.63
	D	107D	15	14			15	36	15			15	0.746	22	4.88	152.8	28.42
8	A	108A	8	4	8	28	9	6	20	23	23	24	0.170	62	7.50	22.7	4.22
	B	108B	8	4	8	28	8	58	20	12	12	19	0.066	54	4.52	14.6	2.72
	C	108C	8	6	8	26	8	58	20	24	24	25	0.096	52	6.51	14.7	2.74
	D	108D	8	6	8	30	9	6	15	12	12	12	0.406	60	4.02	100.9	18.78
9	A	109A	9	8	9	24	10	2	23	23	23	23	0.734	54	6.61	111.1	20.67
	B	109B	9	8	9	24	10	2	16	16	16	14	0.179	54	4.39	40.7	7.58
	C	109C	9	6	9	24	10	2	23	23	23	24	0.221	56	6.95	31.8	5.91
	D	109D	9	6	9	26	10	4	15	15	15	16	1.270	58	4.73	268.5	49.97
10	A	110A	10	6	10	30	11	0	27	27	27	25	0.332	54	7.60	43.7	8.13
	B	110B	10	6	10	30	11	0	15	15	15	18	0.105	54	4.55	23.1	4.30
	C	110C	10	6	10	28	11	0	26	24	24	25	0.118	54	7.10	16.6	3.09
	D	110D	10	6	10	30	11	2	17	15	15	16	1.070	56	4.68	228.6	42.53
11	A	111A	11	2	11	28	11	58	26	24	24	25	0.001	56	7.37	0.1	0.03
	B	111B	11	2	11	26	11	56	17	15	15	15	0.047	54	4.44	10.6	1.97
	C	111C	11	2	11	26	11	56	25	21	21	0	0.004	54	4.61	0.9	0.16
	D	111D	11	4	11	30	11	58	16	17	17	15		54	4.67	0.0	0.00
12	A	112A	12	2	12	16	12	32	24	23	23	17	0.006	30	3.45	1.7	0.32
	B	112B	12	2	12	16	12	32	20	20	20	17	0.046	30	3.06	15.0	2.79
	C	112C	12	2	12	14	12	30	19	20	20	16	0.039	28	2.78	14.0	2.61
	D	112D	12	2			12	32	14			0	0.413	30	4.78	86.4	16.07
13	A	113A	12	40	13	10	13	44	20	0	20	21	0.173	64	5.30	32.6	6.07
	B	113B	12	40	13	10	13	42	16	16	16	13	0.036	62	5.02	7.2	1.33
	C	113C	12	40	13	10	13	42	18	16	16	16	0.028	62	5.44	5.1	0.96
	D	113D	12	40	13	10	13	44	15	14	14	16		64	5.03	0.0	0.00
14	A	114A	13	46	14	14	14	42	17	22	22	17	0.136	56	5.81	23.4	4.36
	B	114B	13	44	14	12	14	42	15	15	15	16	0.050	58	4.71	10.6	1.98
	C	114C	13	44	14	12	14	42	16	16	16	15	0.042	58	4.86	8.6	1.61
	D	114D	13	46	14	14	14	42	15	15	15	15	0.210	56	4.47	47.0	8.74
15	A	115A	14	54			15	22	20			17	0.031	28	3.27	9.5	1.76
	B	115B	14	54			15	22	20			15	0.008	28	2.95	2.7	0.50
	C	115C	14	54			15	22	20			16	0.006	28	2.61	2.3	0.43
	D	115D	14	54			15	22	15			14	0.703	28	1.12	629.3	117.09

TABLE XL: FIELD DATA FOR SITE 6B

Degreaser: 6B
 Rotameter: 007699
 Rotameter Curve: ml/min=5.32*rr
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	20.5	63	22	1.77
B	1.5	60	77	2.48
C	98.5	48	77	3.40
D	<----- DUCT ----->			

VP	V
0.16	1601
0.17	1650
0.14	1497
0.09	1201
0.02	566
0.01	400.2
0.03	693.2
0.04	800.4
0.04	800.4
0.03	693.2
Vav (fpm)	990.2
d (in)	8
A (ft2)	0.349
Q (cfm)	345.7

Slot 1 V (fpm)	534
Slot 1 A (ft2)	0.333
Slot 2 V (fpm)	714
Slot 2 A (ft2)	0.333
Q (cfm)	415.6

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	
			Start	(min)			Start	Mid	Mid	End	front	back			(mg/m3)	(ppm)
1	A	116A	8	38		9	34	20		17	0.162		56	5.51	29.4	5.47
	B	116B	8	38		9	36	21		21	0.144		58	6.48	22.2	4.14
	C	116C	8	38		9	36	20		18	0.288		58	5.86	49.1	9.14
	D	116D	8	38		9	38	15		14	6.2		60	4.63	1339.6	249.26
2	A	117A	9	36	9	56	10	26	17	17	0.28		50	4.42	63.4	11.80
	B	117B	9	36	9	58	10	28	27	27	0.009		52	7.20	1.3	0.23
	C	117C	9	36	9	58	10	24	20	20	0.255		48	4.84	52.7	9.80
	D	117D	9	38	9	58	10	24	15	15	6.67		46	3.67	1817.0	338.10
3	A	118A	10	28	10	58	11	50	17	16	0.771		82	6.64	116.0	21.59
	B	118B	10	30	10	58	11	50	29	27	0.457		80	10.81	42.3	7.87
	C	118C	10	26	10	58	11	50	16	16	0.575		84	6.74	85.4	15.89
	D	118D	10	26	10	58	11	50	14	15	17.8		84	6.62	2689.6	500.46
4	A	119A	11	58			12	40	20		0.004		42	4.69	0.9	0.16
	B	119B	11	58			12	40	20		0.0005		42	3.91	0.1	0.02
	C	119C	12	2			12	40	19		0.007		38	3.74	1.9	0.35
	D	119D	11	58			12	40	18		4.56		42	3.91	1166.2	216.99
5	A	120A	12	46	13	20	13	42	22	22	0.226		56	6.61	34.2	6.36
	B	120B	12	46	13	20	13	42	18	17	0.003		56	4.98	0.6	0.11
	C	120C	12	46	13	20	13	44	17	21	0.157		58	6.12	25.7	4.78
	D	120D	12	46	13	20	13	42	20	21	7.61		56	6.05	1258.1	234.10
6	A	121A	13	44	14	14	14	48	23	20	0.248		64	7.23	34.3	6.38
	B	121B	13	44	14	14	14	50	16	15	0.006		66	4.77	1.3	0.23
	C	121C	13	46	14	14	14	50	18	18	0.313		64	6.32	49.5	9.22

TABLE XL: FIELD DATA FOR SITE 6B (CONTINUED)

Interval	Location	Sample	Time		Mid		End		Rotameter Reading				Mass		Time	Volume	Concentration	Concentration
			Start	(min)	(hr)	(min)	hr	min	Start	Mid	Mid	End	front	back	(min)	(l)	(mg/m3)	(ppm)
	D	121D	13	44	14	14	14	48	18	18	18	15	12.3		64	5.86	2099.9	390.74
7	A	122A	14	50	15	14	15	42	20	20	20	19	0.344		52	5.46	63.0	11.73
	B	122B	14	52	15	14	15	44	20	15	15	16	0.009		52	4.52	2.0	0.37
	C	122C	14	52	15	14	15	44	20	18	18	20	0.397		52	5.26	75.5	14.05
	D	122D	14	50	15	14	15	42	15	15	15	16	8.17		52	4.22	1934.1	359.89
8	A	123A	8	2	8	36	8	58	18	21	21	20	24		56	5.93	4049.6	753.53
	B	123B	8	2	8	36	8	58	20	18	18	14	0.195		56	5.31	36.7	6.83
	C	123C	8	2	8	36	9	2	19	21	21	21	0.118		60	6.52	18.1	3.37
	D	123D	8	2	8	36	8	58	14	16	16	0	4.73		56	3.65	1296.1	241.16
9	A	124A	9	0	9	18	10	2	21	18	18	19	32.1		62	6.20	5179.3	963.72
	B	124B	9	2	9	18	10	6	23	20	20	20	0.185		64	6.94	26.7	4.96
	C	124C	9	4	9	18	10	0	21	20	20	18	0.145		56	5.77	25.1	4.67
	D	124D	9	0	9	18	10	4	15	15	15	7	6.55		64	4.13	1586.6	295.22
10	A	125A	10	4	10	34	11	6	19	15	15	18	33.1		62	5.52	5994.0	1115.33
	B	125B	10	6	10	34	11	6	20	20	20	17	0.115		60	6.13	18.8	3.49
	C	125C	10	2	10	30	11	8	19	21	21	20	0.201		66	7.12	28.2	5.25
	D	125D	10	4	10	34	11	4	15	12	12	4	6.25		60	3.43	1821.4	338.92
11	A	126A	11	6	11	34	11	56	19	18	18	18	13.7		50	4.86	2817.5	524.26
	B	126B	11	6	11	34	11	54	16	15	15	14	0.008		48	3.85	2.1	0.39
	C	126C	11	8	11	34	11	54	20	20	20	20	0.15		46	4.89	30.6	5.70
	D	126D	11	4	11	34	11	58	15	9	9	9	5.84		54	3.06	1905.8	354.62
12	A	127A	11	56			12	36	23			22	6.61		40	4.79	1380.5	256.88
	B	127B	11	54			12	36	23			20	0.108		42	4.80	22.5	4.18
	C	127C	11	54			12	36	20			16	0.16		42	4.02	39.8	7.40
	D	127D	11	58			12	36	15			10	4.1		38	2.53	1622.5	301.90
13	A	128A	12	38	13	10	13	40	21	23	23	20	9.1		62	7.18	1268.0	235.94
	B	128B	12	38	13	10	13	44	20	19	19	18	0.186		66	6.67	27.9	5.19
	C	128C	12	38	13	8	13	46	20	18	18	19	0.237		68	6.77	35.0	6.51
	D	128D	12	38	13	10	13	40	15	11	11	0	5.66		62	3.09	1831.2	340.73
14	A	129A	13	42	14	14	14	46	20	20	20	18	10		64	6.64	1506.2	280.26
	B	129B	13	46	14	14	14	44	19	17	17	16	0.009		58	5.31	1.7	0.32
	C	129C	13	48	14	14	14	46	20	18	18	20	0.454		58	5.86	77.4	14.41
	D	129D	13	42	14	14	14	48	15	10	10	5	6.71		66	3.48	1925.6	358.31

TABLE XI: FIELD DATA FOR SITE 7A

Degreaser: 7A
 Rotameter: 007699
 Rotameter Curve: ml/min=5.32*rr
 Solvent: Trichloroethylene
 MW: 131.4

Slot 1 V (fpm) 231
 Slot 1 A (ft²) 0.5
 Slot 2 V (fpm) 230
 Slot 2 A (ft²) 0.5
 Q (cfm) 231

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	0	51	18.5	1.378
B	8	54	37.5	1.682
C	4	55	117.5	3.297
D	<--- DUCT --->			

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	Concentration
			Start	(min)			Start	Mid	Mid	End	front	back				
(hr)	(min)	(hr)	(min)	(hr)	(min)	(hr)	(min)	(min)	(min)	(min)	(mg)	(mg)	(min)	(l)	(mg/m ³)	(ppm)
1 A	130A	8	34	9	8	9	36	20	15	18	15	0.980	62	5.62	174.3	32.43
B	130B	8	37	9	10	9	46	20	20	20	20	2.000	69	7.34	272.4	50.69
C	130C	8	38	9	10	9	48	24	21	21	20	2.000	70	7.97	250.8	46.67
D	130D	8	36	9	8	9	40	15	15	15	17	9.900	64	5.28	1875.9	349.06
2 A	131A	9	37	10	4	10	38	20	20	20	20	1.500	61	6.49	231.1	43.00
B	131B	9	46	10	6	10	38	20	20	20	18	2.200	52	5.36	410.3	76.34
C	131C	9	48	10	6	10	40	20	20	20	20	2.100	52	5.53	379.6	70.62
D	131D	9	40	10	6	10	36	17	17	17	15	11.000	56	4.91	2242.6	417.29
3 A	132A	10	38	11	4	11	48	19	19	19	19	2.000	70	7.08	282.7	52.60
B	132B	10	38	11	4	11	49	19	20	20	19	2.800	71	7.37	380.1	70.74
C	132C	10	40	11	6	11	50	20	20	20	20	2.500	70	7.45	335.7	62.46
D	132D	10	36	11	4	11	51	15	15	15	21	13.000	75	6.74	1930.2	359.15
4 A	133A	11	58			12	32	19			19	1.000	34	5.77	173.2	32.24
B	133B	11	58			12	33	20			20	1.100	35	7.34	149.8	27.88
C	133C	12	0			12	12	19			0	0.047	12	8.19	5.7	1.07
D	133D	12	0			12	34	14			15	4.500	34	5.45	826.0	153.70
5 A	134A	12	39	13	10	13	39	19	19	19	17	1.900	60	5.91	321.5	59.62
B	134B	12	39	13	10	13	40	20	19	19	20	2.700	61	6.33	426.7	79.39
C	134C	12	39	13	10	13	42	21	24	24	22	3.100	63	7.63	406.5	75.64
D	134D	12	39	13	10	13	44	15	12	12	13	7.400	65	4.49	1649.1	306.84
6 A	135A	13	40	14	10	14	41	20	20	20	21	1.900	61	6.57	289.1	53.79
B	135B	13	42	14	10	14	43	19	20	20	19	2.200	61	6.33	347.7	64.69
C	135C	13	44	14	10	14	46	21	22	22	21	2.200	62	7.09	310.2	57.73
D	135D	13	44			14	0	13			12	1.000	16	7.18	139.2	25.91
D	135E	14	7			14	47	11			11	4.900	40	3.44	1425.8	265.30
7 A	136A	14	42	15	6	15	40	20	18	18	17	1.400	58	5.59	250.4	46.59
B	136B	14	44	15	6	15	42	19	19	19	19	1.900	58	5.86	324.1	60.30
C	136C	14	46	15	6	15	44	22	21	21	21	2.100	58	6.53	321.4	59.81

TABLE XL1: FIELD DATA FOR SITE 7A (CONTINUED)

Interval	Location	Sample	Time		Mid		End		Rotameter Reading				Mass front (mg)	back (mg)	Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			Start (hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End						
	D	136D	14	47	15	8	15	45	11	11	11	13	6.800		58	3.59	1893.6	352.35
8	A	137A	15	42			16	14	21			20	1.600		32	6.49	246.5	45.87
	B	137B	15	43			16	16	20			17	1.000		33	7.21	138.8	25.82
	C	137C	15	45			16	19	22			21	1.000		34	4.84	206.6	38.44
	D	137D	15	46			16	18	13			11	4.300		32	6.65	646.4	120.27
9	A	144A	8	2	8	36	9	4	20	20	20	20	0.470		62	6.60	71.2	13.26
	B	144B	8	2	8	36	9	4	19	18	18	19	0.640		62	6.10	104.9	19.52
	C	144C	8	2	8	36	9	6	22	22	22	22	0.750		64	7.49	100.1	18.63
	D	144D	8	2	8	36	9	6	10	10	10	10	3.200		64	3.40	939.8	174.88
10	A	145A	9	4	9	28	10	4	20	18	18	16	1.300		60	5.68	228.8	42.57
	B	145B	9	4	9	28	10	4	18	17	17	18	1.600		60	5.59	286.4	53.30
	C	145C	9	6	9	28	10	4	21	22	22	22	1.900		58	6.73	282.3	52.53
	D	145D	9	6	9	28	10	4	10	13	13	10	5.300		58	3.55	1493.6	277.92
11	A	146A	10	6	10	30	11	6	20	22	22	20	2.100		60	6.70	313.3	58.29
	B	146B	10	6	10	30	11	6	20	20	20	20	2.800		60	6.38	438.6	81.61
	C	146C	10	6	10	30	11	0	20	21	21	0	2.700		54	4.29	628.9	117.02
	D	146D	10	6	10	30	11	6	10	9	9	9	7.000		60	2.94	2383.7	443.54
12	A	147A	11	8	11	24	11	58	19	17	17	20	1.100		50	4.88	225.5	41.96
	B	147B	11	8	11	24	11	58	19	20	20	18	1.400		50	5.10	274.7	51.11
	C	147C	11	8	11	24	11	58	18	20	20	21	1.400		50	5.33	262.9	48.92
	D	147D	11	8	11	24	11	58	10	10	10	11	1.200		50	2.75	436.3	81.18
13	A	148A	12	0	12	26	12	52	18	18	18	19	3.700		52	5.05	732.9	136.37
	B	148B	12	0	12	26	12	52	19	19	19	21	1.500		52	5.39	278.1	51.74
	C	148C	12	0	12	26	12	52	21	20	20	21	1.700		52	5.67	299.8	55.78
	D	148D	12	0	12	26	12	52	11	10	10	11	5.400		52	2.90	1859.0	345.92

TABLE XLII: FIELD DATA FOR SITE 8A

Degreaser: 8A
 Rotameter:
 Rotameter Curve: ml/mln=6.036*rr-25.403
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance		z(in)	r(m)
	x(in)	y(in)		
A	1	49	12	1.282
B	1	50	44	1.692
C	<----- duct ----->			
D	<----- large doorway ----->			
E	<- 176" from BA, 252" from 8B ->			

VP	V
0.04	800.4
0.03	693.2
0.02	566
0.02	566
0.03	693.2
0.09	1201
0.08	1132
0.06	980.3
0.03	693.2
0.01	400.2
Vav (fpm)	772.5
d (in)	18
A (ft2)	1.767
Q (cfm)	1365

Slot 1 V (fpm)	427.5
Slot 1 A (ft2)	2.1528
Slot 2 V (fpm)	513
Slot 2 A (ft2)	2.1528
Q (cfm)	2024.7

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	Concentration		
			Start	(min)			Start	Mid	Mid	End	front	back						
			(hr)	(min)	(hr)	(min)					(mg)	(mg)	(min)	(l)	(mg/m3)	(ppm)		
disconnected from duct	1	A	160A	11	10		12	0	15		17	0.757	0.000	50	3.56	212.7	39.58	
		B	160B	11	10		12	0	15		14	0.031	0.000	50	3.11	10.0	1.86	
		C	160C	11	12		12	0	10		8	3.740	0.010	48	1.39	2701.3	502.63	
		E	160D	11	16		12	6	15		15	0.032	0.000	50	3.26	9.8	1.83	
	2	A	162A	12	16		12	34	16		16	0.216	0.011	18	1.28	177.2	32.97	
		B	162B	12	14		12	34	14		13	0.097	0.008	20	1.12	93.6	17.42	
		C	162C	12	16		12	36	13		13	2.010	0.010	20	1.06	1903.3	354.15	
		E	162E	12	18		12	38	15		16	0.020	0.008	20	1.36	20.5	3.82	
	3	A	164A	12	42	13	10	13	40	17	16	16	0.035	0.012	58	3.76	12.5	2.33
		B	164B	12	42	13	10	13	42	14	15	15	0.450		60	3.44	130.9	24.36
		C	164C	12	44	13	12	13	44	15	13	13	0.989	0.001	60	3.35	295.3	54.94
		E	164E	12	46	13	14	13	56	17	15	15	0.281		70	4.86	57.9	10.77
	4	A	166A	13	42			14	20	16		19	0.767	0.000	38	3.05	251.6	46.81
		B	166B	13	44			14	20	12		12	0.247	0.000	36	1.69	145.9	27.15
		C	166C	13	46			14	20	14		15	3.770	0.000	34	2.11	1785.0	332.14
		E	166E	13	58	14	28	15	28	15	15	15	7.470	0.000	90	5.86	1274.2	237.09
	5	A	168A	14	34			15	28	16		17	0.781	0.000	54	4.01	194.9	36.27
		B	168B	14	36			15	28	14		13	0.223	0.001	52	2.92	76.8	14.29
		C	168C	14	38			15	30	13		14	0.163	0.002	52	2.92	56.6	10.53
	1-5	D	160D	11	16	12	8	12	48	15	13	13	0.364	0.000	254	10.23	35.6	6.62
6	A	180A	8	0	8	34	9	4	15	14	14	1.670	0.003	64	3.89	430.6	80.12	
	B	180B	8	0	8	34	9	4	15	15	15	0.423	0.003	64	3.90	109.3	20.34	
	C	180C	8	0	8	34	9	6	15	15	15	11.400	0.004	66	4.20	2713.5	504.91	
	E	180E	8	0	8	34	9	0	15	17	17	0.319	0.000	60	4.11	77.5	14.43	

TABLE XLII: FIELD DATA FOR SITE 8A (CONTINUED)

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	Concentration		
			Start	(min)			(hr)	(min)	Start	Mid	Mid	End					front	back
7	A	182A	9	6	9	34	10	10	15	13	13	14	1.720	0.003	64	3.67	469.0	87.26
	B	182B	9	4	9	34	10	10	12	14	14	14	0.418	0.003	66	3.72	113.2	21.06
	C	182C	9	6	9	34	10	8	13	14	14	13	10.800	0.003	62	3.48	3106.7	578.08
	E	182E	9	4	9	34	10	2	15	15	15	17	0.324	0.003	58	3.95	82.8	15.42
8	A	184A	10	10	10	30	11	2	14	15	15	15	1.520		52	3.33	456.9	85.01
	B	184B	10	10	10	30	11	2	13	12	12	14	0.437	0.002	52	2.70	162.6	30.26
	C	184C	10	8	10	30	11	4	15	13	13	13	8.780	0.006	56	3.10	2830.0	526.59
	E	184E	10	2	10	30	11	0	14	15	15	15	0.428	0.002	58	3.69	116.4	21.66
9	A	186A	11	2	11	30	12	0	14	14	14	16	2.200	0.012	58	3.61	612.9	114.04
	B	186B	11	4	11	30	12	0	14	14	14	14	0.780	0.017	56	3.31	240.8	44.81
	C	186C	11	4	11	30	12	0	13	14	14	13	12.800	0.014	56	3.14	4079.9	759.15
	E	186E	11	2	11	30	12	0	15	15	15	15	0.272	0.013	58	3.78	75.4	14.04
10	A	188A	12	6			12	40	14			14	1.240	0.003	34	2.01	618.6	115.10
	B	188B	12	6			12	38	14			14	0.245	0.003	32	1.89	131.1	24.40
	C	188C	12	6			12	42	10			13	6.390	0.002	36	1.58	4034.3	750.67
	E	188E	12	6			12	36	17			16	0.174	0.002	30	2.23	79.1	14.71
11	A	190A	12	42	13	18	13	32	16	15	15	15	1.270	0.003	50	3.37	378.2	70.38
	B	190B	12	42	13	20	13	34	14	14	14	15	0.423	0.003	52	3.12	136.7	25.44
	C	190C	12	42			13	34	14			14	9.060	0.000	52	3.07	2948.0	548.54
	E	190E	12	42	13	16	13	30	15	15	15	15	0.251	0.000	48	3.13	80.3	14.94
12	A	192A	13	32	14	0	14	30	15	14	14	15	1.360	0.000	58	3.60	377.5	70.23
	B	192B	13	34	14	0	14	30	15	13	13	15	0.488	0.022	56	3.31	154.1	28.67
	C	192C	13	36	14	6	14	30	13	12	12	13	11.000	0.020	54	2.70	4077.4	758.70
	E	192E	13	32	14	0	14	38	15	17	17	15	0.349		66	4.70	74.3	13.82
13	A	194A	14	30			15	14	15			15	0.494	0.003	44	2.87	173.4	32.27
	B	194B	14	30			15	14	15			12	0.315	0.002	44	2.47	128.5	23.90
	C	194C	14	32			15	14	15			14	7.930	0.001	42	2.61	3039.8	565.63
	E	194E	14	38			15	14	15			14	0.252	0.004	36	2.24	114.5	21.30
6	D	180D	8	0	8	34	9	0	15	19	19	16	0.211	0.000	60	4.71	44.8	8.33
7-9	D	182D	9	34	10	2	10	30	20	20	20	20	0.456	0.010	146	12.65	36.8	6.86
			11	0	11	30	12	0	21	22	22	0						
10-13	D	188D	12	6	12	36	13	16	14	13	13	10	0.306	0.003	188	7.82	39.5	7.35
			14	0	14	38	15	14	11	11	11	8						

TABLE XLIII: FIELD DATA FOR SITE 8B

Degreaser: 8B
 Rotameter:
 Rotameter Curve: $\text{ml/min} = 6.036 \cdot \text{rr} - 25.403$
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	5.00	41.00	33.50	1.35
B	7.00	47.00	66.00	2.07
C	<--- duct ----->			
D	<--- small door --- ---->			

VP	V
0.01	400
0.02	566
0.025	633
0.035	749
0.06	980
0.11	1327
0.1	1266
0.07	1059
0.03	693
0.01	400
Vav (fpm)	807
d (in)	16
A (ft ²)	1.40
Q (cfm)	1127

Slot 1 V (fpm)	921
Slot 1 A (ft ²)	0.83
Slot 2 V (fpm)	946
Slot 2 A (ft ²)	0.83
Q (cfm)	1556

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	Concentration		
			Start	(min)			Start	Mid	Mid	End	front	back						
			(hr)	(min)	(hr)	(min)					(mg)	(mg)	(min)	(l)	(mg/m3)	(ppm)		
1	A	161A	11	18		12	4	15		15	0.032	0.008	46	3.00	13.3	2.48		
	B	161B	11	16		12	4	15		13	0.028	0.000	48	2.84	9.9	1.84		
	C	161C	11	14		12	4	10		11	6.480	0.008	50	1.90	3416.9	635.80		
2	A	163A	12	18		12	36	16		18	0.016	0.010	18	1.39	18.7	3.48		
	B	163B	12	18		12	38	13		14	0.015	0.007	20	1.12	19.6	3.65		
	C	163C	12	18		12	34	13		12	3.260	0.008	16	0.80	4081.1	759.38		
3	A	165A	12	44	13	12	13	46	15	16	15	1.280	0.000	62	4.23	302.9	56.36	
	B	165B	12	44	13	12	13	48	14	15	13	0.782	0.000	64	3.87	202.2	37.63	
	C	165C	12	42	13	14	13	52	10	12	11	15.500	0.000	70	2.98	5194.0	966.46	
4	A	167A	13	48		14	20	15		18	0.660	0.000	32	2.37	278.0	51.73		
	B	167B	13	50		14	20	13		15	0.362	0.000	30	1.77	204.2	37.99		
	C	167C	13	54		14	20	11		10	5.340	0.000	26	0.99	5408.3	1006.35		
5	A	169A	14	40		15	28	16		16	0.822	0.002	48	3.42	241.2	44.88		
	B	169B	14	42		15	28	13		13	0.482	0.009	46	2.44	201.1	37.43		
	C	169C	14	40		15	30	12		10	4.910		50	2.05	2395.5	445.74		
1-5	D	161D	11	14	12	8	12	50	15	30	30	12	0.869	0.008	186	10.68	82.1	15.28
			13	12	13	21	14	20	5	15	10	8						
6	A	181A	8	6	8	34	9	10	15	13	13	14	0.923	0.002	64	3.67	251.8	46.85
	B	181B	8	6	8	34	9	10	15	15	15	15	0.615	0.003	64	4.17	148.2	27.58
	C	181C	8	4	8	34	9	6	16	12	12	13	13.600	0.002	62	3.37	4030.7	750.01
7	A	183A	9	12	9	36	10	4	14	13	13	11	0.780	0.001	52	2.66	293.3	54.57
	B	183B	9	10	9	36	10	4	15	15	15	16	0.681	0.002	54	3.60	189.6	35.28
	C	183C	9	8	9	36	10	6	15	16	16	14	11.900	0.003	58	3.86	3081.7	573.42

TABLE XLIII: FIELD DATA FOR SITE 8B (CONTINUED)

Interval	Location	Sample	Time		Mid		End		Rotameter Reading				Mass		Time	Volume	Concentration	Concentration
			Start	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front	back				
			(hr)										(mg)	(mg)	(min)	(l)	(mg/m3)	(ppm)
8	A	185A	10	6	10	32	11	8	15	14	14	14	1.070	0.002	62	3.74	286.4	53.29
	B	185B	10	4	10	30	11	6	15	15	15	15	14.500	0.002	62	4.04	3590.9	668.17
	C	185C	10	6	10	30	11	6	14	13	13	15	11.300	0.002	60	3.47	3253.6	605.41
9	A	187A	11	8	11	34	12	2	14	15	15	13	1.010	0.014	54	3.27	313.2	58.27
	B	187B	11	6	11	34	12	2	15	17	17	16	0.689	0.014	56	4.07	172.7	32.14
	C	187C	11	6	11	32	12	2	15	15	15	14	10.700	0.014	56	3.56	3011.9	560.44
10	A	189A	12	6			12	44	14			13	0.410	0.003	38	2.13	193.8	36.06
	B	189B	12	6			12	44	15			16	0.297	0.002	38	2.59	115.4	21.48
	C	189C	12	6			12	42	15			10	3.430	0.002	36	1.80	1904.9	354.44
11	A	191A	12	44			13	38	15			14	0.948	0.000	54	3.35	282.6	52.59
	B	191B	12	44			13	38	17			16	0.562	0.000	54	4.01	140.3	26.10
	C	191C	12	44			13	38	13			11	11.300	0.000	52	2.45	4620.7	859.78
12	A	193A	13	38	14	4	14	36	14	12	12	12	0.738	0.020	58	2.88	262.8	48.89
	B	193B	13	38	14	2	14	36	17	15	15	15	0.654	0.024	58	3.92	172.8	32.16
	C	193C	13	38	14	4	14	34	15	14	14	13	8.200	0.020	56	3.30	2492.7	463.83
13	A	195A	14	36			15	16	12			14	0.345	0.019	40	2.12	171.5	31.91
	B	195B	14	38			15	16	15			18	0.316	0.022	38	2.82	119.9	22.31
	C	195C	14	36			15	16	13			15	4.870	0.032	40	2.36	2073.5	385.83
6-9	D	181D	8	6	8	34	9	6	15	12	12	14	1.230	0.017	234	9.23	135.1	25.14
			9	36	10	6	10	30	12	10	10	10						
			11	4	11	32	12	0	10	10	10	0						
10-13	D	189D	12	8	12	42	13	36	10	10	10	11	1.020	0.002	188	6.82	149.9	27.89
			14	4	14	34	15	16	10	10	10	10						

TABLE XLIV: FIELD DATA FOR SITE 9A

Degreaser: 9a
 Rotameter: 7699
 Rotameter Curve: $ml/min = 5.32 * r$
 Solvent: Perchloroethylene
 MW: 165.8

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	23	80	24	2.2
B	55	76	60	2.829
C	73	66	132	4.182
D	-72	65	836	21.38
E	<----- duct ----->			

VP	V
0.14	1497
0.145	1524
0.14	1497
0.15	1550
0.155	1576
0.15	1550
0.1	1266
Vav (fpm)	1494
d (in)	
A (ft ²)	0.51
Q (cfm)	764

Slot 1 V (fpm)	922.8
Slot 1 A (ft ²)	0.431
Slot 2 V (fpm)	957.5
Slot 2 A (ft ²)	0.431
Q (cfm)	809.6

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	
			Start	(min)	(hr)	(min)	Start	Mid	Mid	End	front	back			(mg/m ³)	(ppm)
1	A	200A	10	5	10	34	11	6	20	25	22	0.247	61	7.47	33.1	4.87
	B	200B	10	5	10	34	11	6	20	20	20	0.203	61	6.49	31.3	4.61
	C	200C	10	14	10	34	11	6	20	20	19	0.150	52	5.45	27.5	4.06
	D	200D	10	7	10	36	11	8	20	20	20	0.180	61	6.49	27.7	4.09
	E	200E	10	6	10	34	11	8	10	10	10	4.190	62	3.30	1270.3	187.33
2	A	201A	11	10	11	44	12	0	23	23	21	0.049	50	6.03	8.1	1.20
	B	201B	11	10	11	45	12	0	22	20	20	0.090	50	5.51	16.3	2.41
	C	201C	11	10	11	45	12	0	18	20	20	0.062	50	5.13	12.1	1.78
	D	201D	11	12	11	46	12	0	19	19	19	0.053	48	4.89	10.8	1.60
	E	201E	11	12	11	48	12	0	10	11	11	3.130	48	2.71	1153.6	170.12
3	A	202A	12	7	12	44	12	52	21	22	22	0.046	45	5.17	8.9	1.31
	B	202B	12	10	12	44	12	52	20	20	20	0.036	42	4.47	8.1	1.19
	C	202C	12	10	12	45	12	52	20	20	20	0.029	42	4.47	6.5	0.96
	D	202D	12	10	12	45	12	52	20	19	19	0.037	42	4.34	8.5	1.26
	E	202E	12	12	12	46	12	52	12	11	11	0.151	40	2.43	62.1	9.16
4	A	203A	12	56	13	26	13	56	20	19	19	0.088	60	6.06	14.5	2.14
	B	203B	12	56	13	26	13	56	18	20	20	0.035	60	6.22	5.6	0.83
	C	203C	12	56	13	26	13	58	20	26	26	0.028	62	8.10	3.5	0.51
	D	203D	12	56	13	26	13	58	20	20	20	0.028	62	6.60	4.2	0.63
	E	203E	12	56	13	26	13	58	10	10	11	0.988	62	3.38	292.0	43.06
5	A	204A	14	4	14	36	14	58	18	18	18	0.069	54	5.17	13.3	1.97
	B	204B	14	4	14	36	14	58	21	21	21	0.019	54	5.97	3.2	0.47
	C	204C	14	6	14	36	14	58	27	27	27	0.021	52	7.47	2.8	0.41
	D	204D	14	7	14	40	14	58	18	18	19	0.017	51	4.93	3.4	0.51
	E	204E	14	8	14	40	14	58	12	11	11	1.210	50	3.01	401.8	59.26
6	A	205A	15	4			15	30	18		16	0.111	26	2.35	47.2	6.96

TABLE XLIV: FIELD DATA FOR SITE 9A (CONTINUED)

Interval	Location	Sample	Time Start		Mid		End		Rotameter Reading				Mass		Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			(hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front (mg)	back (mg)				
7	B	205B	15	5			15	30	21			20	0.048		25	2.73	17.6	2.60
	C	205C	15	5			15	31	27			27	0.035		26	3.73	9.4	1.38
	D	205D	15	5			15	32	18			18	0.033		27	2.59	12.8	1.88
	E	205E	15	6			15	34	12			12	3.100		28	1.79	1734.2	255.74
	A	206A	8	48	9	22	9	46	20	20	20	20	0.038		58	6.17	6.2	0.91
	B	206B	8	48	9	22	9	46	20	21	21	23	0.037		58	6.52	5.7	0.84
	C	206C	8	50	9	22	9	46	20	22	22	20	0.032		56	6.26	5.1	0.75
	D	206D	8	52	9	22	9	46	20	20	20	20	0.034		54	5.75	5.9	0.87
	E	206E	8	48	9	22	9	46	10	10	10	12	0.318		58	3.21	99.0	14.59
	A	207A	10	4	10	30	11	34	20	22	22	22	0.136		90	10.40	13.1	1.93
8	B	207B	10	6	10	30	11	34	21	22	22	21	0.185		88	10.07	18.4	2.71
	C	207C	10	6	10	30	11	34	21	21	21	20	0.122		88	9.66	12.6	1.86
	D	207D	10	10	10	32	11	36	21	20	20	20	0.056		86	9.21	6.1	0.90
	E	207E	10	8	10	32	11	40	10	10	10	10	5.730		92	4.89	1170.7	172.64

TABLE XLV: FIELD DATA FOR SITE 10A

Degreaser: 10A
 Rotameter: 003766
 Rotameter Curve: $\text{ml/min} = 2.262258 \times \text{rr} - 16.0255$
 Solvent: Trichloroethylene
 MW: 131.4

Day 1					Day 2				
Location	Distance				Location	Distance			
	x(in)	y(in)	z(in)	r(m)		x(in)	y(in)	z(in)	r(m)
A (1-3)	0	33	15	0.921	A (1-3)	24	43	19.5	1.345
A (4-6)	9	33	15	0.949					
B	-47.5	41	35	1.825	B	-46	44	33	1.821
C	64	58	27	2.299					
D	<----- duct ----->				D	<----- duct ----->			

Slot 1 V (fpm)	day 1	315
Slot 1 A (ft ²)		1.00
Slot 2 V (fpm)	day 2	455
Slot 2 A (ft ²)		1.00
Q (cfm)	day 1	315
	day 2	455

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	Concentration		
			Start	(min)			(hr)	(min)	Start	Mid	Mid	End					front	back
1	A	210A	10	6	10	38	11	2	53	53	53	53	0.646	BDL	56	5.82	111.1	20.66
	B	210B	10	6	10	38	11	2	52	52	52	51			56	5.66	0.0	0.00
	C	210C	10	10	10	38	11	2	52	52	52	51	0.282	BDL	52	5.26	53.6	9.98
	D	210D	10	12	10	38	11	4	25	25	25	25	0.801	0.001	52	2.11	380.5	70.80
2	A	212A	11	6	11	38	12	2	53	53	53	53	7.020	BDL	56	5.82	1206.8	224.55
	B	212B	11	6	11	38	12	2	52	51	51	49	0.146		56	5.55	26.3	4.90
	C	212C	11	6	11	38	12	2	50	51	51	50	0.066	0.002	56	5.50	12.4	2.30
	D	212D	11	6	11	38	12	2	24	24	24	24	0.306		56	2.14	142.8	26.57
3	A	214A	12	4			12	34	53			52	0.340	0.002	30	5.82	58.8	10.94
	B	214B	12	4			12	34	52			51	0.139	0.003	30	5.63	25.2	4.70
	C	214C	12	4			12	34	50			50	0.043	0.001	30	5.23	8.4	1.57
	D	214D	12	4			12	36	24			25	0.374	0.001	32	2.11	177.9	33.10
4	A	216A	12	38	13	6	13	36	53	52	52	52	1.570	0.002	58	5.93	265.3	49.37
	B	216B	12	38	13	6	13	36	53	53	53	56	0.872	BDL	58	6.13	142.3	26.48
	C	216C	12	38	13	8	13	36	50	49	49	49	0.106	0.002	58	5.53	19.5	3.63
	D	216D	12	38	13	12	13	36	25	23	23	22	1.970	BDL	58	2.14	921.3	171.43
5	A	218A	13	44	14	8	14	32	52	52	52	51	0.721	BDL	48	4.85	148.6	27.66
	B	218B	13	44	14	4	14	32	55	55	55	56	0.403	0.002	48	5.23	77.4	14.40
	C	218C	13	44	14	8	14	32	49	48	48	47		0.001	48	4.44	0.2	0.04
	D	218D	13	44	14	4	14	32	24	15	15	23	1.100	0.001	48	1.32	836.2	155.59
6	A	220A	14	34	15	6	15	30	51	51	51	50	0.544	0.001	56	5.54	98.4	18.32
	B	220B	14	34	15	4	15	30	55	53	53	54	0.284	0.001	56	5.91	48.2	8.97
	C	220C	14	34	15	6	15	30	47	46	46	45	0.074	0.001	56	4.94	15.2	2.83
	D	220D	14	34	15	6	15	30	22	23	23	23	1.120	BDL	56	1.98	565.6	105.24
7	A	222A	8	0	8	30	9	4	53	52	52	50	0.249	BDL	64	6.46	38.5	7.17

TABLE XLV: FIELD DATA FOR SITE 10A (CONTINUED)

Interval	Location	Sample	Time Start		Mid		End		Rotameter Reading				Mass		Time	Volume	Concentration	Concentration
			(hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front (mg)	back (mg)				
B	222B	222B	8	0	8	30	9	4	52	53	53	53	0.459	0.001	64	6.61	69.5	12.94
D	222D	222D	8	0	8	30	9	4	25	25	25	24	0.566	0.001	64	2.56	221.9	41.28
8 A	224A	224A	9	6	9	34	10	2	53	53	53	52	0.641	0.001	56	5.79	111.0	20.65
B	224B	224B	9	6	9	32	10	2	53	50	50	50	0.367	0.001	56	5.53	66.6	12.39
D	224D	224D	9	6	9	34	10	2	21	23	23	25	0.896	0.001	56	2.02	444.8	82.77
9 A	226A	226A	10	4	10	30	11	2	51	50	50	50	0.197	0.002	58	5.66	35.2	6.54
B	226B	226B	10	4	10	30	11	2	51	54	54	52	0.345	0.002	58	6.00	57.9	10.77
D	226D	226D	10	4	10	30	11	4	24	22	22	22	0.960	0.001	60	2.08	461.2	85.82
10 A	228A	228A	11	4	11	30	11	54	51	50	50	51	0.133	BDL	50	4.91	27.1	5.04
B	228B	228B	11	4	11	30	11	54	52	52	52	53	0.122	0.001	50	5.11	24.1	4.48
D	228D	228D	11	4	11	30	11	54	25	24	24	23	0.817	0.001	50	1.92	427.0	79.45
11 A	230A	230A	12	0			12	28	51			51	0.084	BDL	28	5.63	14.9	2.78
B	230B	230B	12	0			12	28	52			52	0.079	BDL	28	2.02	39.2	7.29
D	230D	230D	12	0			12	30	23			24	0.471	0.001	30	5.70	82.9	15.42
12 A	232A	232A	12	38	13	8	13	36	52	51	51	51	0.314	BDL	58	5.80	54.2	10.08
B	232B	232B	12	38	13	8	13	36	56	57	57	57		BDL	58	6.52	0.0	0.00
D	232D	232D	12	38	13	8	13	36	24	22	22		0.832	0.001	58	1.33	627.1	116.68
13 A	234A	234A	13	44	14	10	14	18	53	53	53	52	0.281	0.001	34	3.52	80.1	14.90
B	234B	234B	13	44	14	10	14	18	52	52	52	53	0.104	BDL	34	3.46	30.0	5.59
D	234D	234D	13	44	14	10	14	18	25	25	25	24	0.559	0.001	34	1.37	409.0	76.11
14 A	236A	236A	14	20			14	56	53			55	0.114	BDL	36	2.85	40.1	7.46
B	236B	236B	14	20			14	56	53			55	0.123	BDL	36	1.11	110.4	20.54
D	236D	236D	14	20			14	56	23			25	0.211	0.001	36	5.83	36.4	6.77

TABLE XLVI: FIELD DATA FOR SITE 10B

Degreaser: 10B
 Rotameter: 003766
 Rotameter Curve: $\text{ml/min} = 2.262258 \times \text{rr} - 16.0255$
 Solvent: Trichloroethylene
 MW: 131.4

Day 1					Day 2				
Location	Distance				Location	Distance			
	x(in)	y(in)	z(in)	r(m)		x(in)	y(in)	z(in)	r(m)
A	-27	39	17	1.28	A	-24	39	19	1.259
B	-76	46	17	2.297	B	-63	48	18	2.063
C	38	49	36	1.821	C	39	48	18	1.636
D	<----- duct ----->				D	<----- duct ----->			

Slot 1 V (fpm)	day 1	731
Slot 1 A (ft2)		1.00
Slot 2 V (fpm)	day 2	755
Slot 2 A (ft2)		1.00
Q (cfm)	day 1	731
	day 2	755

Interval	Location	Sample	Time Start (hr)	(min)	Mid (hr)	(min)	End (hr)	(min)	Rotameter Reading				Mass front (mg)	back (mg)	Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
1	A	209A	10	0	10	36	11	0	52	52	52	53	1.780	0.002	60	6.12	291.0	54.14
	B	209B	10	4	10	36	11		53	53	53	52	0.980	0.003	56	5.79	169.8	31.59
	C	209C	10	6	10	36	11	0	52	52	52	53	0.092	0.001	54	5.51	16.9	3.14
	D	209D	10	4	10	36	11	2	25	25	25	24	*	0.003	58	2.32	1.3	0.24
2	A	211A	11	4	11	36	11	58	53	52	52	52	1.020	0.001	54	5.52	184.8	34.40
	B	211B	11	4	11	36	11	58	52	52	52	52	0.710	0.002	54	5.49	129.8	24.14
	C	211C	11	4	11	36	11	58	53	51	51	51	0.055		54	5.44	10.1	1.88
	D	211D	11	4	11	36	11	58	26	26	26	25	0.473		54	2.29	206.9	38.50
3	A	213A	12	0			12	30	53			51	0.351	0.002	30	6.16	57.3	10.65
	B	213B	12	0			12	30	50			50	0.256	0.001	30	5.75	44.7	8.31
	C	213C	12	0			12	30	51			51	0.073	0.002	30	5.55	13.5	2.52
	D	213D	12	0			12	30	25			26	0.215	0.002	30	2.29	95.0	17.67
4	A	215A	12	30	13	2	13	28	52	51	51	50	3.570	0.002	58	5.77	619.1	115.21
	B	215B	12	30	13	0	13	28	50	49	49	49	1.430		58	5.53	258.4	48.08
	C	215C	12	30	13	4	13	28	51	51	51	50	0.081	0.001	58	5.74	14.3	2.66
	D	215D	12	30	13	4	13	28	27	25	25	24	0.267	0.002	58	2.40	112.0	20.85
5	A	217A	13	30	14	2	14	30	51	50	50	50	2.290	0.001	60	5.86	390.8	72.73
	B	217B	13	30	14	2	14	30	50	51	51	51	0.822	0.001	60	5.92	138.9	25.85
	C	217C	13	30	14	2	14	30	52	50	50	50	0.115	bdl	60	5.90	19.5	3.63
	D	217D	13	30	14	2	14	30	25	26	26	25	0.205	0.002	60	2.50	82.8	15.41
6	A	219A	14	32	15	4	15	28	51	50	50	50	2.160	0.001	56	5.47	394.8	73.47
	B	219B	14	32	15	2	15	28	50	49	49	50	0.559	bdl	56	5.37	104.0	19.36
	C	219C	14	32	15	4	15	28	49	50	50	48	0.255	0.001	56	5.35	47.9	8.91
	D	219D	14	32	15	4	15	28	25	25	25	26	0.188	0.001	56	2.30	82.3	15.31
7	A	221A	15	30			15	58	51			50	1.390	bdl	28	5.89	235.9	43.89
	B	221B	15	30			15	58	50			50	0.177	0.002	28	5.89	30.4	5.65

TABLE XLVI: FIELD DATA FOR SITE 10B (CONTINUED)

Interval	Location	Sample	Time Start		Mid		End		Rotameter Reading				Mass		Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			(hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front (mg)	back (mg)				
	C	221C	15	32			15	58	49			48	0.128	0.001	26	5.96	21.6	4.03
	D	221D	15	34			15	58	25			27	0.101	bdl	24	2.43	41.5	7.73
8	A	223A	8	0	8	30	9	0	52	53	53	51	3.630	0.002	60	6.13	592.4	110.23
	B	223B	8	0	8	30	9	0	52	53	53	51	1.480	0.003	60	6.13	241.9	45.01
	C	223C	8	0	8	30	9	2	52	54	54	53	0.147	0.001	62	6.48	22.9	4.25
	D	223D	8	0	8	30	9	2	25	25	25	25	0.339	0.002	62	2.51	135.7	25.25
9	A	225A	9	6	9	30	10	0	52	52	52	51	1.500	0.002	54	5.45	275.4	51.25
	B	225B	9	6	9	30	10	0	52	52	52	51	1.090	0.001	54	5.45	200.1	37.23
	C	225C	9	6	9	30	10	0	52	52	52	52	0.038	0.001	54	5.49	7.1	1.32
	D	225D	9	6	9	30	10	0	25	25	25	25	0.182	0.002	54	2.19	84.1	15.64
10	A	227A	10	2	10	32	11	0	51	52	52	51	1.260	0.001	58	5.83	216.4	40.26
	B	227B	10	2	10	32	11	0	53	53	53	52	0.974	0.001	58	5.99	162.7	30.27
	C	227C	10	2	10	32	11	0	52	52	52	50	0.063	0.001	58	5.83	11.0	2.04
	D	227D	10	2	10	34	11	2	24	24	24	25	0.142	0.002	60	2.33	61.9	11.51
11	A	229A	11	2	11	28	11	48	51	51	51	51	0.785	0.002	46	4.57	172.2	32.04
	B	229B	11	2	11	28	11	48	52	52	52	49	0.913	0.001	46	4.61	198.4	36.92
	C	229C	11	2	11	30	11	50	51	50	50	51	0.014	0.001	48	4.71	3.2	0.59
	D	229D	11	2	11	30	11	52	25	25	25	20	0.109	0.001	50	1.90	57.8	10.76
12	A	231A	11	56			12	26	52			52	0.957	0.003	30	5.76	166.6	31.00
	B	231B	11	56			12	26	51			51	0.455	0.001	30	5.96	76.5	14.24
	C	231C	11	56			12	26	51			51	0.095	bdl	30	5.76	16.5	3.07
	D	231D	11	56			12	26	21			24	0.170	0.001	32	2.36	72.3	13.46
13	A	233A	12	36	13	6	13	32	51	50	50	53	0.424	0.002	56	5.56	76.6	14.26
	B	233B	12	36	13	4	13	34	52	52	52	52	1.410	0.002	58	5.89	239.6	44.58
	C	233C	12	36	13	6	13	34	52	51	51	50	0.118	0.001	58	5.76	20.6	3.84
	D	233D	12	36	13	6	13	34	26	23	23	24			58	2.22	0.0	0.00
14	A	235A	12	42	14	8	14	22	51	51	51	51	0.468	bdl	100	9.94	47.1	8.76
	B	235B	12	42	14	6	14	20	53	52	52	52	0.708	bdl	98	10.05	70.4	13.10
	C	235C	12	42	14	8	14	22	50	50	50	50	0.129	bdl	100	9.71	13.3	2.47
	D	235D	12	42	14	8	14	22	24	24	24	24	0.587	bdl	100	3.83	153.4	28.54
15	A	237A	12	24			14	52	51			51	0.678	0.001	148	5.69	119.3	22.20
	B	237B	12	24			14	52	52			51	0.627	bdl	148	5.89	106.4	19.80
	C	237C	12	24			14	52	50			50	*	0.002	148	5.76	0.3	0.06
	D	237D	12	24			14	52	22			22	2.750	0.001	148	2.35	1170.2	217.73

TABLE XLVII: FIELD DATA FOR SITE 11A

Degreaser: 11A
 Rotameter: 003766
 Rotameter Curve: $\text{ml/mln} = 2.262258 \times \text{rr} - 16.0255$
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	17.5	45	-0.56	1.226
B	54	45	3.938	1.788
C	84	49	11.94	2.489
D	<----- duct ----->			
E	-15	73	-249	6.602

VP	V
0	0
0.03	693
0.09	1201
0.08	1132
0	0
0	0
0	0
0.1	1266
0.08	1132
0.06	980
Vav (fpm)	640
d (in)	8
A (ft ²)	0.35
Q (cfm)	224

Slot 1 V (fpm)	1140
Slot 1 A (ft ²)	0.315
Slot 2 V (fpm)	
Slot 2 A (ft ²)	
Q (cfm)	359.2

Interval	Location	Sample	Time		Mid	End	Rotameter Reading				Mass		Time	Volume	Concentration	Concentration	
			Start	(min)			Start	Mid	Mid	End	front	back					
			(hr)	(min)	(hr)	(min)					(mg)	(mg)	(min)	(l)	(mg/m3)	(ppm)	
1	A	238A	8	34	9	0	9	26	52	46	46	48	0.001	52	4.81	0.2	0.04
	B	238B	8	34	9	0	9	26	52	51	51	49	0.001	52	5.14	0.2	0.03
	C	238C	8	34	9	0	9	26	52	52	52	52	0.001	52	5.28	0.1	0.02
	D	238D	8	34	9	0	9	26	25	29	29	28	1.150	52	2.43	473.0	88.01
	E	238E	8	34	9	0	9	26	100	100	100	104	0.002	52	11.05	0.2	0.03
2	A	239A	9	30	10	14	10	30	47	47	47	46	0.001	60	5.40	0.2	0.04
	B	239B	9	30	10	14	10	30	48	47	47	47	0.001	60	5.47	0.1	0.02
	C	239C	9	30	10	14	10	30	52	52	52	52	0.001	60	6.10	0.1	0.02
	D	239D	9	30	10	14	10	30	29	30	30	29	2.950	60	3.04	969.5	180.40
	E	239E	9	30	10	16	10	30	100	96	96	98	0.002	60	12.31	0.1	0.03
3	A	240A	10	30	10	58	11	30	47	45	45	45	0.001	60	5.21	0.2	0.03
	B	240B	10	30	10	58	11	30	50	50	50	50	0.001	60	5.83	0.1	0.02
	C	240C	10	30	10	58	11	30	53	52	52	51	0.001	60	6.09	0.1	0.02
	D	240D	10	30	10	58	11	30	29	29	29	25	2.460	60	2.83	869.2	161.73
	E	240E	10	30	10	58	11	30	95	92	92	100	0.001	60	11.91	0.1	0.02
4	A	241A	11	32	11	52	12	0	45	45	45	45	0.000	28	2.40	0.2	0.03
	B	241B	11	32	11	52	12	0	55	50	50	50	0.000	28	2.83	0.1	0.02
	C	241C	11	32	11	52	12	0	50	53	53	53	0.000	28	2.84	0.1	0.02
	D	241D	11	32	11	52	12	0	27	27	27	27	1.210	28	1.26	959.1	178.46
	E	241E	11	32	11	52	12	0	105	100	100	100	0.00729	28	6.00	5.4	1.01
5	A	242A	12	2	12	30	13	0	47	46	46	45	2.010	58	5.10	393.8	73.28
	B	242B	12	2	12	30	13	0	49	47	47	48	0.002	58	5.33	0.3	0.05
	C	242C	12	2	12	30	13	0	55	54	54	54	0.001	58	6.19	0.2	0.03

TABLE XLVII: FIELD DATA FOR SITE 11A (CONTINUED)

Interval	Location	Sample	Time Start		Mid		End		Rotameter Reading				Mass		Time	Volume	Concentration	Concentration
			(hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front (mg)	back (mg)				
D		242D	12	2	12	30	13	0	27	26	26	26	3.470		58	2.51	1380.4	256.85
E		242E	12	2	12	30	13	0	105	102	102	102	0.003		58	12.55	0.2	0.04
6 A		243A	13	2	13	36	14	0	46	45	45	45	0.017		58	5.01	3.3	0.62
B		243B	13	2	13	36	14	0	50	50	50	49	0.001		58	5.60	0.2	0.03
C		243C	13	2	13	36	14	0	54	55	55	55	0.001		58	6.25	0.2	0.04
D		243D	13	2	13	36	14	0	27	26	26	26	4.080		58	2.52	1618.6	301.18
E		243E	13	2	13	36	14	0	103	97	97	95	0.002		58	11.97	0.2	0.04
7 A		244A	14	2	14	34	15	0	47	46	46	45	0.001		58	5.11	0.2	0.04
B		244B	14	2	14	34	15	0	50	51	51	50	0.001		58	5.70	0.2	0.03
C		244C	14	2	14	34	15	0	54	53	53	53	0.001		58	6.06	0.1	0.03
D		244D	14	2	14	34	15	0	26	26	26	27	2.820		58	2.51	1122.8	208.92
E		244E	14	2	14	34	15	0	90	95	95	92	0.002		58	11.27	0.1	0.03
8 A		245A	8	0	8	28	8	54	46	45	45	46	0.160		54	4.69	34.1	6.34
B		245B	8	0	8	28	8	54	50	50	50	50	0.288		54	5.24	54.9	10.22
C		245C	8	0	8	28	8	54	53	53	53	54	0.095		54	5.64	16.9	3.14
D		245D	8	0	8	28	8	54	26	26	26	26	0.592		54	2.31	256.2	47.67
E		245E	8	0	8	28	8	54	100	94	94	100	0.113		54	10.98	10.3	1.91
9 A		246A	9	2	9	28	10	0	46	45	45	45	0.068		58	5.00	13.6	2.54
B		246B	9	2	9	28	10	0	49	50	50	47	0.058		58	5.49	10.5	1.95
C		246C	9	2	9	28	10	0	54	52	52	52	0.088		58	5.95	14.8	2.74
D		246D	9	2	9	28	10	0	26	26	26	25	0.289		58	2.45	118.2	21.99
E		246E	9	2	9	28	10	0	100	107	107	105	0.410		58	12.83	32.0	5.95
10 A		247A	10	0	10	30	11	26	45	45	45	45	1.130		86	7.38	153.2	28.50
B		247B	10	0	10	30	11	26	49	50	49	49.5	0.101		86	8.22	12.3	2.29
C		247C	10	0	10	30	11	26	55	55	55	54.5	0.133		86	9.29	14.3	2.66
D		247D	10	0	10	30	11	26	25	25	25	24.5	1.820		86	3.45	526.9	98.04
E		247E	10	0	10	30	11	26	104	100	93	100	0.238		86	17.77	13.4	2.49
11 A		248A	11	28			11	56	45			45	0.050		28	0.98	51.2	9.53
B		248B	11	28			11	56	50			50	0.089		28	1.13	78.2	14.54
C		248C	11	28			11	56	55			54	0.088		28	0.48	181.8	33.83
D		248D	11	28			11	56	25			25	0.670		28	0.34	1952.4	363.30
E		248E	11	28			11	56	105			105	ND		28	2.88	0.0	0.00
12 A		249A	11	58	12	28	13	0	45	45	45	46	1.160		62	5.35	216.6	40.31
B		249B	11	58	12	28	13	0	50	50	50	50	0.138		62	6.02	22.9	4.27
C		249C	11	58	12	28	13	0	55	54	54	55	0.102		62	6.65	15.3	2.85
D		249D	11	58	12	28	13	0	25	25	25	25	2.260		62	2.51	899.3	167.33
E		249E	11	58	12	28	13	0	103	103	103	108	0.311		62	13.63	22.8	4.24
13 A		250A	13	2	13	28	13	56	45	45	45	45	1.880		54	4.63	405.9	75.52
B		250B	13	2	13	28	13	56	50	49	49	50	0.068		54	5.18	13.0	2.43
C		250C	13	2	13	28	13	56	54	55	55	55	0.067		54	5.82	11.5	2.13
D		250D	13	2	13	28	13	56	25	24	24	25	2.560		54	2.13	1203.1	223.87
E		250E	13	2	13	28	13	56	105	106	106	104	0.180		54	11.99	15.0	2.79

TABLE XLVIII: FIELD DATA FOR SITE 12A (CONTINUED)

[illegible]

TABLE XLIX: FIELD DATA FOR SITE 13A

Degreaser: 13A
 Rotameter: 003766
 Rotameter Curve: ml/min=5.666938*RR-13.0884
 Solvent: Trichloroethylene
 MW: 131.4

Day 1					Day 2				
Location	Distance				Location	Distance			
	x(in)	y(in)	z(in)	r(m)		x(in)	y(in)	z(in)	r(m)
A	21.5	57	0	1.55	A	21.5	57	0	1.55
B	22.5	59	27.5	1.75	B	28.5	59	24.5	1.78
C	18.5	55	57.5	2.07	C	28.5	55	51.5	2.05
D	40.5	59	84.5	2.81	D	55.5	59	77.5	2.85
D'	60.5	59	69.5	2.78					
E	<----- duct ----->				E	<----- duct ----->			

VP	V
0.01	400.2
0.01	400.2
0.01	400.2
0.01	400.2
0.01	400.2
0.01	400.2
0.01	400.2
0.01	346.6
0.01	283
0	0
Vav (fpm)	343.1
d (in)	6
A (ft2)	0.196
Q (cfm)	67.37

	day1	day2
Slot 1 V (fpm)	102	111
Slot 1 A (ft2)	0.44	0.44
Slot 2 V (fpm)	135	146
Slot 2 A (ft2)	0.44	0.44
Q (cfm)	103.6875	112.4375

Interval	Location	Sample	Time Start		Mid	End		Rotameter Reading				Mass		Time	Volume			
			(hr)	(min)		(hr)	(min)	Start	Mid	Mid	End	front	back		Total	Concentration	Concentration	
			(hr)	(min)	(hr)	(min)	(hr)	(min)					(mg)	(mg)	(min)	(l)	(mg/m3)	(ppm)
1	A	251A	9	2	9	30	10	0	20	20	20	21	0.588	0.001	58	5.90	99.8	18.56
	B	251B	9	2	9	30	10	0	20	20	20	40	0.071	0.000	58	7.51	9.5	1.77
	C	251C	9	2	9	30	10	0	20	20	20	20	0.059	0.000	58	5.81	10.2	1.90
	D	251D	9	2	9	30	10	0	20	20	20	22	0.077	0.000	58	5.98	12.8	2.39
	E	251E	9	2	9	30	10	0	10	10	10	10	0.663	0.000	58	2.53	262.4	48.82
2	A	252A	10	2	10	30	11	0	20	21	21	20	0.850	0.000	58	5.98	142.2	26.46
	B	252B	10	2	10	30	11	0	20	20	20	20	0.070	0.000	58	5.81	12.0	2.23
	C	252C	10	4	10	30	11	2	20	18	18	18	0.066	0.000	58	5.30	12.5	2.33
	D	252D	10	4	10	30	11	2	20	17	17	16	0.068	0.000	58	4.96	13.8	2.57
	E	252E	10	4	10	30	11	2	10	10	10	10	0.709	0.000	58	2.53	280.5	52.20
3	A	253A	11	2	11	28	11	56	21	20	20	20	0.957	0.000	54	5.49	174.4	32.46
	B	253B	11	4	11	28	11	56	20	20	20	20	0.073	0.000	52	5.21	13.9	2.59
	C	253C	11	4	11	28	11	56	20	20	20	20	0.065	0.000	52	5.21	12.5	2.33
	D	253D	11	4	11	28	11	56	20	20	20	20	0.064	0.000	52	5.21	12.3	2.28
	E	253E	11	6	11	28	11	56	10	10	10	10	0.956	0.000	50	2.18	438.8	81.65
4	A	254A	11	58	12	30	12	56	20	20	20	20	1.240	0.000	58	5.81	213.3	39.69
	B	254B	11	58	12	30	12	56	20	19	19	20	0.071	0.000	58	5.65	12.6	2.35
	C	254C	11	58	12	30	12	56	20	19	19	20	0.068	0.000	58	5.65	12.0	2.24
	D	254D	11	58	12	30	12	56	20	20	20	20	0.069	0.000	58	5.81	11.9	2.22
	E	254E	12	0	12	30	12	56	10	9	9	10	1.060	0.000	56	2.28	464.6	86.45
5	A	255A	12	58	13	28	13	58	21	20	20	20	0.873	0.000	60	6.10	143.1	26.63
	B	255B	12	58	13	28	13	58	20	20	20	20	0.074	0.000	60	6.02	12.3	2.29
	C	255C	12	58	13	28	13	58	20	20	20	20	0.065	0.000	60	6.02	10.8	2.01

TABLE XLIX: FIELD DATA FOR SITE 13A (CONTINUED)

Interval	Location	Sample	Time		Mid	End		Rotameter Reading				Mass		Time	Volume		Concentration	Concentration
			Start	(min)		(min)	(hr)	Start	Mid	Mid	End	front	back		Total	(l)	(mg/m3)	(ppm)
	D	255D	12	58	13	28	13	58	20	20	20	20	0.065	0.000	60	6.02	10.9	2.02
	E	255E	13	0	13	28	13	58	10	10	10	10	0.973	0.000	58	2.53	385.0	71.63
6	A	256A	14	0	14	30	14	58	20	22	22	21	2.430	0.000	58	6.22	390.5	72.67
	B	256B	14	0	14	30	14	58	20	20	20	21	0.068	0.001	58	5.89	11.7	2.17
	C	256C	14	0	14	30	14	58	20	20	20	20	0.064	0.000	58	5.81	11.0	2.05
	D	256D	14	0	14	30	14	58	20	20	20	23	0.074	0.000	58	6.05	12.2	2.27
	E	256E	14	0	14	30	14	58	10	10	10	10	1.150	0.000	58	2.53	455.0	84.66
7	A	258A	7	58	8	44	8	58	20	20	20	20	1.260	0.000	60	6.02	209.5	38.98
	B	258B	8	0	8	44	8	58	20	20	20	21	0.081	0.000	58	5.85	13.9	2.59
	C	258C	8	0	8	44	8	58	20	18	18	20	0.090	0.000	58	5.49	16.4	3.05
	D	258D	8	0	8	44	8	58	20	20	20	20	0.078	0.000	58	5.81	13.4	2.50
	E	258E	8	0	8	44	8	58	10	10	10	10	0.585	0.011	58	2.53	235.7	43.86
8	A	259A	9	0	9	26	9	56	20	20	20	20	1.210	0.000	56	5.61	215.5	40.10
	B	259B	9	0	9	26	9	56	20	20	20	20	0.072	0.000	56	5.61	12.8	2.39
	C	259C	9	2	9	26	9	56	20	20	20	20	0.070	0.000	54	5.41	12.9	2.41
	D	259D	9	2	9	26	9	56	20	20	20	20	0.067	0.000	54	5.41	12.4	2.30
	E	259E	9	4	9	26	9	56	10	10	10	10	0.614	0.000	52	2.27	271.1	50.44
9	A	260A	10	0	10	34	10	58	20	20	20	22	2.030	0.000	58	5.95	341.2	63.48
	B	260B	10	0	10	34	10	58	20	20	20	20	0.088	0.000	58	5.81	15.1	2.81
	C	260C	10	0	10	34	10	58	20	20	20	20	0.081	0.000	58	5.81	13.9	2.58
	D	260D	10	0	10	34	10	58	20	20	20	19	0.076	0.000	58	5.75	13.3	2.47
	E	260E	10	0	10	34	10	58	10	10	10	10	0.910	0.000	58	2.53	360.1	67.00
10	A	261A	11	0			11	24	21			20	0.201	0.000	24	5.98	33.7	6.26
	B	261B	11	0			11	24	20			20	0.053	0.000	24	9.10	5.9	1.09
	C	261C	11	0			11	24	20			20	0.052	0.000	24	5.81	8.9	1.66
	D	261D	11	0			11	24	20			20	0.052	0.000	24	6.14	8.5	1.59
	E	261E	11	0			11	24	10			10	0.249	0.000	24	2.53	98.6	18.34
11	A	262A	11	24	12	4	12	22	22	20	20	20	0.323	0.000	58	6.04	53.5	9.95
	B	262B	11	24	12	4	12	22	20	20	20	20	0.053	0.000	58	5.81	9.2	1.71
	C	262C	11	24	12	10	12	22	20	35	20	20	0.053	0.000	58	7.77	6.8	1.27
	D	262D	11	24	12	4	12	22	20	19	19	20	0.052	0.000	58	5.65	9.3	1.73
	E	262E	11	24	12	4	12	22	10	9	9	10	0.473	0.000	58	2.36	200.2	37.26
12	A	263A	12	24	12	54	13	18	21	22	22	22	0.488	0.000	54	5.94	82.2	15.29
	B	263B	12	24	12	54	13	18	20	20	20	20	0.055	0.000	54	5.41	10.2	1.90
	C	263C	12	24	12	54	13	18	20	20	20	20	0.053	0.000	54	5.41	9.7	1.81
	D	263D	12	24	12	54	13	18	20	20	20	21	0.051	0.000	54	5.48	9.4	1.74
	E	263E	12	24	12	54	13	18	10	10	10	10	0.850	0.000	54	2.35	361.3	67.22
13	A	264A	13	22	13	52	14	24	22	21	21	22	1.570	0.000	62	6.74	232.9	43.33
	B	264B	13	22	13	52	14	24	20	20	20	19	0.076	0.000	62	6.12	12.4	2.30
	C	264C	13	22	13	52	14	24	20	20	20	20	0.069	0.000	62	6.22	11.1	2.06
	D	264D	13	22	13	52	14	24	20	19	19	18	0.059	0.000	62	5.86	10.1	1.88
	E	264E	13	22	13	52	14	24	10	9	9	10	1.870	0.000	62	2.53	740.3	137.75

TABLE L: FIELD DATA FOR SITE 14A

Degreaser: 14A
 Rotameter: 003766
 Rotameter Curve: ml/min = 5.666938 * RR - 13.0884
 Solvent: Trichloroethylene
 MW: 131.4

Location	Distance			
	x(in)	y(in)	z(in)	r(m)
A	0	34	29	1.135
B	26	43	72	2.23
C	48	40	92	2.825
D	131	24	131	4.745
E	<----- Duct ----->			

VP	V
0.21	1834
0.215	1856
0.22	1877
0.2	1790
0.175	1674
0.17	1650
0.19	1744
0.19	1744
0.135	1470
0.125	1415
Vav (fpm)	1705
d (in)	8
A (ft ²)	0.35
Q (cfm)	595

Slot 1 V (fpm)	289
Slot 1 A (ft ²)	0.779
Slot 2 V (fpm)	378
Slot 2 A (ft ²)	0.779
Q (cfm)	519.4

Interval	Location	Sample	Time	(min)	Mid	(min)	End	(min)	Rotameter Reading				Mass		Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			Start (hr)		(hr)		(hr)		Start	Mid	Mid	End	front (mg)	back (mg)				
1	A	265Ai	8	10	8	44	9	8	20	22	22	21	0.627	0.000	58	6.21	101.0	18.79
	B	265Bi	8	10	8	44	9	8	21	20	20	20	0.278	0.000	58	5.91	47.1	8.76
	C	265Ci	8	10	8	44	9	8	20	19	19	21	0.202	0.000	58	5.72	35.4	6.58
	D	265Di	8	10	8	44	9	8	20	21	21	18	0.167	0.000	58	5.84	28.6	5.32
	E	265Ei	8	10	8	44	9	8	10	10	10	10	2.240	0.000	58	2.53	886.3	164.92
2	A	264A	9	10	9	44	10	6	23	23	23	21	1.070	0.000	56	6.44	166.1	30.91
	B	264B	9	10	9	44	10	6	18	17	17	16	0.174	0.000	56	4.70	37.1	6.91
	C	264C	9	10	9	44	10	6	19	18	18	18	0.147	0.000	56	5.08	29.0	5.40
	D	264D	9	10	9	44	10	6	23	21	21	21	0.122	0.000	56	6.12	20.0	3.71
	E	264E	9	10	9	44	10	6	10	10	10	10	2.500	0.000	56	2.44	1024.5	190.63
3	A	266Ai	10	16	10	46	11	6	21	21	21	22	1.680	0.000	50	5.35	313.9	58.41
	B	266Bi	10	16	10	46	11	6	20	18	18	19	0.169	0.000	50	4.67	36.2	6.74
	C	266Ci	10	16	10	46	11	6	20	19	19	18	0.151	0.000	50	4.76	31.8	5.91
	D	266Di	10	16	10	46	11	6	21	21	21	22	0.101	0.001	50	5.35	19.1	3.55
	E	266Ei	10	16	10	46	11	6	11	10	10	10	2.950	0.196	50	2.26	1389.5	258.56
4	A	266Aii	11	12	11	40	12	6	22	22	22	21	0.000	0.000	54	5.95	0.0	0.00
	B	266Bii	11	12	11	40	12	6	20	19	19	19	0.156	0.000	54	5.19	30.1	5.60
	C	266Cii	11	12	11	40	12	6	20	18	18	20	0.123	0.000	54	5.11	24.1	4.49
	D	266Dii	11	12	11	40	12	6	22	21	21	21	0.096	0.000	54	5.80	16.6	3.09
	E	266Eii	11	12	11	40	12	6	10	10	10	10	3.470	0.001	54	2.35	1474.7	274.40
5	A	267Ai	12	10	12	44	13	6	22	22	22	22	1.630	0.000	56	6.25	260.9	48.54
	B	267Bi	12	10	12	44	13	6	18	18	18	16	0.157	0.000	56	4.85	32.4	6.03

TABLE L: FIELD DATA FOR SITE 14A (CONTINUED)

Interval	Location	Sample	Time Start		Mid		End		Rotameter Reading				Mass		Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			(hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front (mg)	back (mg)				
	C	267Ci	12	10	12	44	13	6	18	18	18	20	0.135	0.000	56	5.10	26.5	4.93
	D	267Di	12	10	12	44	13	6	21	21	21	21	0.108	0.000	56	5.93	18.3	3.40
	E	267Ei	12	10	12	44	13	6	10	10	10	10	2.560	0.000	56	2.44	1049.1	195.20
6	A	267Aii	13	10	13	46	14	4	23	21	21	22	1.640	0.000	54	5.97	274.5	51.09
	B	267Bii	13	10	13	46	14	4	20	18	18	20	0.156	0.000	54	5.11	30.6	5.69
	C	267Cii	13	10	13	46	14	4	21	19	19	11	0.134	0.000	54	4.90	27.3	5.09
	D	267Dii	13	10	13	46	14	4	21	21	21	21	0.112	0.000	54	5.72	19.6	3.65
	E	267Eii	13	10	13	46	14	4	10	10	10	10	2.580	0.000	54	2.35	1096.4	204.01
7	A	268Ai	14	8	14	40	15	8	21	22	22	21	1.960	0.000	60	6.53	300.4	55.90
	B	268Bi	14	8	14	40	15	8	19	18	18	20	0.182	0.000	60	5.58	32.6	6.07
	C	268Ci	14	8	14	40	15	8	20	20	20	21	0.164	0.000	60	6.09	26.9	5.01
	D	268Di	14	8	14	40	15	8	21	22	22	20	0.149	0.000	60	6.45	23.1	4.31
	E	268Ei	14	8	14	40	15	8	10	10	10	10	0.052	3.550	60	2.61	1377.4	256.29
8	A	268Aii	15	10	15	40	16	0	21	21	21	22	0.947	0.000	50	5.35	177.0	32.93
	B	268Bii	15	10	15	40	16	0	18	16	16	16	0.116	0.000	50	4.05	28.7	5.34
	C	268Cii	15	10	15	40	16	0	21	21	21	20	0.107	0.000	50	5.24	20.4	3.80
	D	268Dii	15	10	15	40	16	0	21	21	21	21	0.098	0.000	50	5.30	18.4	3.43
	E	268Eii	15	10	15	40	16	0	10	9	9	10	2.410	0.000	50	2.04	1182.9	220.10
9	A	269Ai	8	0	8	30	8	56	22	21	21	22	0.870	0.000	56	6.09	142.9	26.58
	B	269Bi	8	0	8	30	8	56	20	20	20	20	0.164	0.000	56	5.61	29.2	5.44
	C	269Ci	8	0	8	30	8	56	20	16	16	19	0.158	0.000	56	4.91	32.2	6.00
	D	269Di	8	0	8	30	8	56	20	21	21	20	0.122	0.000	56	5.77	21.1	3.93
	E	269Ei	8	0	8	30	8	56	10	13	13	10	1.890	0.000	56	2.92	648.1	120.59
10	A	269Aii	9	0	9	30	9	56	23	21	21	21	1.220	0.000	56	6.10	200.0	37.21
	B	269Bii	9	0	9	30	9	56	20	20	20	20	0.153	0.000	56	5.61	27.3	5.08
	C	269Cii	9	0	9	30	9	56	21	20	20	20	0.113	0.000	56	5.70	19.9	3.70
	D	269Dii	9	0	9	30	9	56	20	19	19	19	0.102	0.000	56	5.38	19.0	3.53
	E	269Eii	9	0	9	30	9	56	10	10	10	10	2.320	0.000	56	2.44	950.7	176.91
11	A	270Ai	10	0	10	30	10	58	21	20	20	21	1.250	0.000	58	5.98	209.1	38.91
	B	270Bi	10	2	10	30	10	58	20	20	20	20	0.183	0.000	56	5.61	32.6	6.07
	C	270Ci	10	0	10	30	10	58	22	22	22	20	0.180	0.000	58	6.31	28.5	5.31
	D	270Di	10	0	10	30	10	58	20	18	18	19	0.164	0.000	58	5.41	30.3	5.64
	E	270Ei	10	0	10	30	10	58	10	10	10	10	2.330	0.000	58	2.53	921.8	171.52
12	A	270Aii	11	0	11	30	11	56	21	20	20	20	1.410	0.000	56	5.70	247.4	46.04
	B	270Bii	11	0	11	30	11	56	20	20	20	20	0.191	0.000	56	5.61	34.0	6.33
	C	270Cii	11	0	11	30	11	56	22	21	21	21	0.165	0.000	56	6.02	27.4	5.11
	D	270Dii	11	0	11	30	11	56	20	18	18	18	0.115	0.000	56	5.15	22.3	4.16
	E	270Eii	11	0	11	30	11	56	10	12	12	13	2.470	0.000	56	2.98	829.2	154.29
13	A	271Ai	12	0	12	34	12	58	21	20	20	20	1.200	0.000	58	5.91	203.0	37.78
	B	271Bi	12	0	12	34	12	58	20	20	20	20	0.189	0.000	58	5.81	32.5	6.05
	C	271Ci	12	0	12	34	12	58	20	20	20	20	0.156	0.000	58	5.81	26.8	4.99
	D	271Di	12	0	12	34	12	58	20	18	18	19	0.112	0.000	58	5.42	20.7	3.85

TABLE L: FIELD DATA FOR SITE 14A (CONTINUED)

Interval	Location	Sample	Time Start		Mid		End		Rotameter Reading				Mass		Time (min)	Volume (l)	Concentration (mg/m3)	Concentration (ppm)
			(hr)	(min)	(hr)	(min)	(hr)	(min)	Start	Mid	Mid	End	front (mg)	back (mg)				
E		271Ei	12	0	12	34	12	58	10	10	10	9	2.450	0.000	58	2.46	996.1	185.34
14 A		271Aii	13	0	13	30	13	56	20	20	20	20	0.156	0.000	56	5.61	27.8	5.17
B		271Bii	13	0	13	30	13	56	20	20	20	20	0.116	0.000	56	5.61	20.7	3.85
C		271Cii	13	0	13	30	13	56	20	20	20	18	0.112	0.000	56	5.47	20.5	3.82
D		271Dii	13	0	13	30	13	56	21	20	20	20	0.101	0.000	56	5.70	17.7	3.30
E		271Eii	13	0	13	30	13	56	9	9	9	8	1.200	0.000	56	2.05	585.5	108.95
15 A		272Ai	14	2	14	32	14	56	22	20	20	20	1.120	0.000	54	5.58	200.6	37.33
B		272Bi	14	2	14	32	14	56	20	20	20	20	0.162	0.000	54	5.41	29.9	5.57
C		272Ci	14	2	14	32	14	56	20	20	20	20	0.150	0.000	54	5.41	27.7	5.16
D		272Di	14	2	14	32	14	56	20	18	18	20	0.119	0.000	54	5.11	23.3	4.34
E		272Ei	14	2	14	32	14	56	10	13	13	10	2.190	0.000	54	2.81	778.7	144.90
16 A		272Aii	15	8	15	36	15	58	20	20	20	21	0.597	0.000	50	5.07	117.7	21.89
B		272Bii	15	8	15	36	15	58	19	20	20	19	0.131	0.000	50	4.87	26.9	5.00
C		272Cii	15	8	15	36	15	58	20	20	20	19	0.117	0.000	50	4.95	23.6	4.40
D		272Dii	15	8	15	36	15	58	19	18	18	19	0.103	0.000	50	4.59	22.5	4.18
E		272Eii	15	8	15	36	15	58	12	12	12	10	1.360	0.000	50	2.62	518.9	96.56

5.3 Appendix C

Intermediate Data for Emission Rate Calculations

TABLE LI: EMISSION RATES USING THE COMPLETELY MIXED SPACE MODEL

Site	Interval	Workspace Concentration (ppm)	Workspace Flow Rate (cfm)	Mixing Factor k	Emission Rate (g/min)
1a	1	67.43	7718	1	79.9
	2	23.98	7718	1	28.4
	3	55.35	7718	1	65.6
	4	19.25	7718	1	22.8
	5	49.10	7718	1	58.2
	6	11.88	7718	1	14.1
	7	9.08	7718	1	10.8
	8	3.28	7718	1	3.89
	9	67.28	7718	1	79.7
	10	19.08	7718	1	22.6
	11	77.55	7718	1	91.9
	12	30.08	7718	1	35.6
	13	20.68	7718	1	24.5
2a	1	3.88	20377	1	11.9
	2	3.63	20377	1	11.1
	3	0.87	20377	1	2.66
	4	3.15	20377	1	9.64
	5	5.35	20377	1	16.4
	6	3.39	20377	1	10.4
	7	6.19	20377	1	18.9
	8	4.49	20377	1	13.7
	9	2.45	20377	1	7.50
	10	2.00	20377	1	6.11
	11	1.65	20377	1	5.04
	12	4.55	20377	1	13.9
	13	3.79	20377	1	11.6
3a	14	2.74	20377	1	8.39
	1	7.04	15517	1	16.4
	2	6.35	15517	1	14.8
	3	10.76	15517	1	25.1
	4	5.88	15517	1	13.7
	5	7.85	15517	1	18.3
	6	3.46	15517	1	8.06
	7	5.00	15517	1	11.6
	8	6.21	15517	1	14.5
	9	6.35	15517	1	14.8
	10	5.94	15517	1	13.8

TABLE LI: EMISSION RATES USING THE COMPLETELY MIXED SPACE MODEL (CONTINUED)

Site	Interval	Workspace Concentration (ppm)	Workspace Flow Rate (cfm)	Mixing Factor k	Emission Rate (g/min)
4a	11	5.76	15517	1	13.4
	12	7.41	15517	1	17.3
	13	3.71	15517	1	8.65
	1	7.81	13724	1	16.1
	2	14.76	13724	1	30.4
6a	3	1.51	13724	1	3.12
	1	3.96	13483	1	8.01
	2	5.44	13483	1	11.0
	3	2.93	13483	1	5.92
	4	5.65	13483	1	11.4
	5	2.09	13483	1	4.22
	6	0.63	13483	1	1.27
	7	0.76	13483	1	1.53
	8	3.23	13483	1	6.53
	9	11.39	13483	1	23.1
	10	5.17	13483	1	10.5
	11	0.72	13483	1	1.46
	12	1.91	13483	1	3.87
	13	2.79	13483	1	5.64
	14	2.65	13483	1	5.36
6b	15	0.90	13483	1	1.82
	1	6.25	12509	1	11.7
	2	7.28	12509	1	13.7
	3	15.11	12509	1	28.4
	4	0.18	12509	1	0.332
	5	3.75	12509	1	7.04
	6	5.28	12509	1	9.91
	7	8.72	12509	1	16.4
	8	254.58	12509	1	478
	9	324.45	12509	1	609
	10	374.69	12509	1	704
	11	176.78	12509	1	332
	12	89.49	12509	1	168
	13	82.55	12509	1	155
	14	98.33	12509	1	185
7a	1	43.26	864	1	5.61
	2	63.32	864	1	8.21

TABLE LI: EMISSION RATES USING THE COMPLETELY MIXED SPACE MODEL (CONTINUED)

Site	Interval	Workspace Concentration (ppm)	Workspace Flow Rate (cfm)	Mixing Factor k	Emission Rate (g/min)
8a&b	3	61.93	864	1	8.03
	4	20.39	864	1	2.65
	5	71.61	864	1	9.29
	6	58.73	864	1	7.62
	7	55.57	864	1	7.21
	8	36.71	864	1	4.76
	9	17.14	864	1	2.22
	10	49.47	864	1	6.42
	11	85.64	864	1	11.1
	12	47.33	864	1	6.14
	13	81.30	864	1	10.5
	1	9.52	16865	1	24.1
	2	12.27	16865	1	31.1
8b	3	26.29	16865	1	66.6
	4	41.42	16865	1	105
	5	33.22	16865	1	84.1
	6	37.87	16865	1	95.9
	7	42.72	16865	1	108
	8	47.56	16865	1	120
	9	52.66	16865	1	133
	10	42.35	16865	1	107
	11	37.89	16865	1	95.9
	12	38.76	16865	1	98.1
	13	26.16	16865	1	66.2
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				

TABLE LI: EMISSION RATES USING THE COMPLETELY MIXED SPACE MODEL (CONTINUED)

Site	Interval	Workspace Concentration (ppm)	Workspace Flow Rate (cfm)	Mixing Factor k	Emission Rate (g/min)
9a	1	4.41	810	1	0.678
	2	1.75	810	1	0.269
	3	1.18	810	1	0.181
	4	1.03	810	1	0.158
	5	0.84	810	1	0.129
	6	3.21	810	1	0.493
	7	0.84	810	1	0.130
	8	1.85	810	1	0.285
10a&b	1	23.90	32378	1	116
	2	48.70	32378	1	237
	3	5.57	32378	1	27.1
	4	40.91	32378	1	199
	5	24.05	32378	1	117
	6	21.97	32378	1	107
	7	17.86	32378	1	86.8
	8	35.92	17978	1	97.0
	9	24.57	17978	1	66.3
	10	17.98	17978	1	48.5
	11	15.82	17978	1	42.7
	12	11.67	17978	1	31.5
	13	18.19	17978	1	49.1
	14	8.97	17978	1	24.2
	15	14.01	17978	1	37.8
10b	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
	14				

TABLE LI: EMISSION RATES USING THE COMPLETELY MIXED SPACE MODEL (CONTINUED)

Site	Interval	Workspace Concentration (ppm)	Workspace Flow Rate (cfm)	Mixing Factor k	Emission Rate (g/min)
11a	15				
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	11				
	12				
	13				
12a	1	6.30	7743	1	4.75
	2	4.00	7743	1	3.01
	3	8.40	7743	1	6.33
	4	13.80	7743	1	10.4
	5	27.00	7743	1	20.4
	6	16.50	7743	1	12.4
	7	58.60	7743	1	44.2
	8	5.77	7743	1	4.35
	9	3.33	7743	1	2.51
	10	3.10	7743	1	2.34
	11	3.07	7743	1	2.31
	12	3.83	7743	1	2.89
13a	1	6.16	27020	1	25.0
	2	8.40	27020	1	34.1
	3	9.92	27020	1	40.2
	4	11.62	27020	1	47.2
	5	8.24	27020	1	33.4
	6	19.79	27020	1	80.3
	7	11.78	27020	1	47.8
	8	11.80	27020	1	47.9
	9	17.84	27020	1	72.4
	10	2.65	27020	1	10.8
	11	3.67	27020	1	14.9

TABLE LI: EMISSION RATES USING THE COMPLETELY MIXED SPACE MODEL (CONTINUED)

Site	Interval	Workspace Concentration (ppm)	Workspace Flow Rate (cfm)	Mixing Factor k	Emission Rate (g/min)
14a	12	5.19	27020	1	21.0
	13	6.16	27020	1	25.0
	1	9.87	5339	1	7.91
	2	11.73	5339	1	9.40
	3	18.65	5339	1	15.0
	4	4.40	5339	1	3.52
	5	15.73	5339	1	12.6
	6	16.38	5339	1	13.1
	7	17.82	5339	1	14.3
	8	11.37	5339	1	9.12
	9	10.49	5339	1	8.41
	10	12.38	5339	1	9.92
	11	13.98	5339	1	11.2
	12	15.41	5339	1	12.3
	13	13.17	5339	1	10.6
	14	4.03	5339	1	3.23
	15	13.10	5339	1	10.5
	16	8.87	5339	1	7.11

TABLE LII: WORKSPACE EMISSION RATES USING THE TWO POINT DIFFUSION MODEL

Site	Interval	Workspace Emission Rate For Each Pair of Concentration Measurements											Average	Average	Average
		a-b (g/min)	a-c (g/min)	a-d (g/min)	a-e (g/min)	b-c (g/min)	b-d (g/min)	b-e (g/min)	b-f (g/min)	c-d (g/min)	c-e (g/min)	d-e (g/min)	all pairs ¹ (g/min)	all pairs ² (g/min)	closest two points (g/min)
1a	1	20.7											20.7	20.7	20.7
	2						40.2						40.2	40.2	
	3						609.6						610		
	4					3.21							3.21	3.21	
	5		3.80	2.30		6.28	48.1						15.1	15.1	
	6	2.96		3.76		1.66	5.59						3.49	3.49	2.96
	7														
	8														
	9	8.35	96.0	17.3			1500						405	40.6	8.35
	10	2.12	29.6	15.3									15.7	15.7	2.12
	11								926				926		
	12														
	13						3960						3960		
2a	1			2.19						0.498		1.34	1.34	1.34	2.19
	2				1.17						0.266	3.61	1.68	1.68	
	3									0.105			0.105	0.105	
	4			0.972	0.067						0.324	0.086	0.362	0.362	0.972
	5				4.83						0.523	8.18	4.51	4.51	
	6		0.231							0.550	0.182	0.169	0.283	0.283	
	7	0.260	0.227		0.170	0.233							0.223	0.223	0.260
	8	0.141		3.77						0.999			1.64	1.64	0.141
	9	0.085											0.085	0.085	0.085
	10														
	11	0.059											0.059	0.059	0.059
	12									0.688			0.688	0.688	
	13														
3a	14	0.621	0.225	0.567									0.471	0.471	0.621
	1	50.0	0.809			0.692							17.2	0.751	50.0
	2	0.567	0.530	8.14		0.557							2.45	2.45	0.567
	3														

¹Average of all pairs.²Average of all pairs without unreasonably high values.

TABLE LII: WORKSPACE EMISSION RATES USING THE TWO POINT DIFFUSION MODEL (CONTINUED)

Site	Interval	Workspace Emission Rate For Each Pair of Concentration Measurements										Average	Average	Average	
		a-b (g/min)	a-c (g/min)	a-d (g/min)	a-e (g/min)	b-c (g/min)	b-d (g/min)	b-e (g/min)	b-f (g/min)	c-d (g/min)	c-e (g/min)	d-e (g/min)	all pairs ¹ (g/min)	all pairs ² (g/min)	closest two points (g/min)
4a	4	0.520											0.520	0.520	0.520
	5	0.409	648	0.434			0.333			5.02			131	1.55	0.409
	6	0.355		0.508			0.512			0.908			0.571	0.571	0.355
	7					0.863	135						67.9	0.863	
	8														
	9					1.44							1.44	1.44	
	10									18.1			18.1	18.1	
	11	0.924								1170			586	0.924	0.924
	12	0.590	2.37										1.48	1.48	0.590
	13		2.80			1.20							2.00	2.00	
	1	1.17											1.17	1.17	1.17
	2	3.00											3.00	3.00	3.00
6a	3														
	1														
	2	0.307	0.244										0.276	0.276	0.307
	3	0.270	0.162										0.216	0.216	0.270
	4	1.06	0.261										0.662	0.662	1.063
	5	0.302	0.107			0.026							0.145	0.145	0.302
	6	0.119	0.046			0.012							0.059	0.059	0.119
	7														
	8	0.115											0.115	0.115	0.115
	9	0.500	0.465			236							79.0	0.483	0.500
	10	0.166	0.262			1.02							0.482	0.482	0.166
	11					0.539							0.539	0.539	
	12														
	13	0.254	0.105			0.263							0.207	0.207	0.254
	14	0.084	0.126										0.105	0.105	0.084
15	0.112	0.072										0.092	0.092	0.112	
6b	1														
	2	1.25											1.25	1.25	1.25

¹Average of all pairs.²Average of all pairs without unreasonably high values.

TABLE LII: WORKSPACE EMISSION RATES USING THE TWO POINT DIFFUSION MODEL (CONTINUED)

Site	Interval	Workspace Emission Rate For Each Pair of Concentration Measurements										Average	Average	Average	
		a-b (g/min)	a-c (g/min)	a-d (g/min)	a-e (g/min)	b-c (g/min)	b-d (g/min)	b-e (g/min)	b-f (g/min)	c-d (g/min)	c-e (g/min)	d-e (g/min)	all pairs ¹ (g/min)	all pairs ² (g/min)	closest two points (g/min)
7a	3	0.171											0.171	0.171	0.171
	4	0.003											0.003	0.003	0.003
	5	0.684											0.684	0.684	0.684
	6	0.286											0.286	0.286	0.286
	7	0.759											0.759	0.759	0.759
	8	160	13.7										86.9	86.9	160
	9	328	16.8										172	172	328
	10	660	18.1										339	339	660
	11	1780	8.99										894	894	1780
	12	40.9	4.18										22.5	22.5	40.9
	13	17.8	2.44										10.1	10.1	17.8
	14	488	2.87										246	246	488
	1														
	2														
3															
4		0.427			0.638							0.533	0.533		
5															
6															
7															
8	0.422											0.422	0.422	0.422	
9															
10															
11															
12															
8a	13	0.961	1260										629	0.961	0.961
	1	0.487											0.487	0.487	0.487
	2	0.520											0.520	0.520	0.520
	3														
	4	0.494											0.494	0.494	0.494
	5	0.160											0.160	0.160	0.160

¹Average of all pairs.²Average of all pairs without unreasonably high values.

TABLE LII: WORKSPACE EMISSION RATES USING THE TWO POINT DIFFUSION MODEL (CONTINUED)

Site	Interval	Workspace Emission Rate For Each Pair of Concentration Measurements										Average	Average	Average	
		a-b (g/mln)	a-c (g/min)	a-d (g/min)	a-e (g/min)	b-c (g/min)	b-d (g/min)	b-e (g/min)	b-f (g/min)	c-d (g/min)	c-e (g/min)	d-e (g/min)	all pairs ¹ (g/min)	all pairs ² (g/min)	closest two points (g/min)
8b	6	0.356											0.356	0.356	0.356
	7	0.398											0.398	0.398	0.398
	8	0.387											0.387	0.387	0.387
	9	0.468											0.468	0.468	0.468
	10	1.16											1.16	1.16	1.16
	11	0.325											0.325	0.325	0.325
	12	0.290											0.290	0.290	0.290
	13	15.2											15.2	15.2	15.2
	1														
	2														
	3														
	4														
	5														
9a	6	2.62											2.62	2.62	2.62
	7	233											233		233
	8														
	9	1.74											1.74	1.74	1.74
	10	4.21											4.21	4.21	4.21
	11	0.790											0.790	0.790	0.790
	12	123											123		123
	13														
	1														
	2														
	3														
	4	0.540	0.078										0.309	0.309	0.540
	5	0.082	0.080										0.081	0.081	0.082
10a	6	0.422	0.550										0.486	0.486	0.422
	7														
	8														
	1														

¹Average of all pairs.²Average of all pairs without unreasonably high values.

TABLE LII: WORKSPACE EMISSION RATES USING THE TWO POINT DIFFUSION MODEL (CONTINUED)

Site	Interval	Workspace Emission Rate For Each Pair of Concentration Measurements											Average	Average	Average
		a-b	a-c	a-d	a-e	b-c	b-d	b-e	b-f	c-d	c-e	d-e	all pairs ¹	all pairs ²	closest two points
		(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)	(g/min)
10b	2	0.376	0.348			0.059							0.261	0.261	0.376
	3	0.581	0.071			0.127							0.260	0.260	0.581
	4		0.105			1.22							0.665	0.665	
	5		0.064			548							274	274	
	6	3.13	0.069			0.138							1.11	1.11	3.13
	7														
	8														
	9	0.485											0.485	0.485	0.485
	10														
	11														
	12														
	13														
	14	0.119											0.119	0.119	0.119
	15														
11a	1		0.592										0.592	0.592	0.592
	2		0.403										0.403	0.403	0.403
	3		0.093										0.093	0.093	0.093
	4	2.33	2.71										2.52	2.52	2.71
	5	0.764	0.830										0.797	0.797	0.830
	6	0.470	0.445										0.458	0.458	0.445
	7	0.374	0.675										0.525	0.525	0.675
	8	0.954	5.88										3.42	3.42	5.88
	9		5.49										5.49	5.49	5.49
	10		1.53										1.53	1.53	1.53
	11		6.38										6.38	6.38	6.38
	12	0.847	0.916										0.882	0.882	0.916
	13		0.069										0.069	0.069	0.069
	14		0.230										0.230	0.230	0.230
	15		21.1										21.1	21.1	21.1
11a	1	0.014											0.014	0.014	0.014

¹Average of all pairs.²Average of all pairs without unreasonably high values.

TABLE LII: WORKSPACE EMISSION RATES USING THE TWO POINT DIFFUSION MODEL (CONTINUED)

Site	Interval	Workspace Emission Rate For Each Pair of Concentration Measurements										Average	Average	Average	
		a-b (g/min)	a-c (g/min)	a-d (g/min)	a-e (g/min)	b-c (g/min)	b-d (g/min)	b-e (g/min)	b-f (g/min)	c-d (g/min)	c-e (g/min)	d-e (g/min)	all pairs ¹ (g/min)	all pairs ² (g/min)	closest two points (g/min)
12a	2	0.004											0.004	0.004	0.004
	3	0.000	0.045										0.023	0.023	0.000
	4	0.002											0.002	0.002	0.002
	5	23.4	0.690			0.001							8.02	8.02	23.4
	6	0.005	0.002										0.004	0.004	0.005
	7														
	8					0.120							0.120	0.120	
	9														
	10	0.170	0.109										0.140	0.140	0.170
	11														
	12	0.188	0.137			0.662							0.329	0.329	0.188
	13	0.965	0.293										0.629	0.629	0.965
13a	1	0.002	0.019										0.011	0.011	0.002
	2	0.001	0.016										0.008	0.008	0.001
	3	0.002	0.017										0.010	0.010	0.002
	4	0.004	0.059										0.032	0.032	0.004
	5	0.010	0.215										0.113	0.113	0.010
	6	0.002	0.035										0.019	0.019	0.002
	7	0.490											0.245	0.245	0.490
	8	0.002											0.001	0.001	0.002
	9	5E-04	0.033										0.017	0.017	0.000
	10	4E-04	0.058										0.029	0.029	0.000
	11	5E-04											0.000	0.000	0.000
	12	0.001	0.006										0.003	0.003	0.001

¹Average of all pairs.²Average of all pairs without unreasonably high values.

TABLE LII: WORKSPACE EMISSION RATES USING THE TWO POINT DIFFUSION MODEL (CONTINUED)

Site	Interval	Workspace Emission Rate For Each Pair of Concentration Measurements										Average	Average	Average	
		a-b (g/min)	a-c (g/min)	a-d (g/min)	a-e (g/min)	b-c (g/min)	b-d (g/min)	b-e (g/min)	b-f (g/min)	c-d (g/min)	c-e (g/min)	d-e (g/min)	all pairs ¹ (g/min)	all pairs ² (g/min)	closest two points (g/min)
14a	7	148	1.15	0.275									49.8	49.8	148
	8	227	1.76	0.307									76.3	76.3	227
	9	895	4.34	0.488									300	300	895
	10	2.81	0.126	0.172									1.04	1.04	2.81
	11	1.95	0.167	0.082									0.732	0.732	1.95
	12	8.85	0.301	0.119									3.09	3.09	8.85
	13	317.61	2.26	0.305									107	107	318
	1	2.82	2.79										2.80	2.80	2.82
	2	0.153	0.257	1.12									0.510	0.510	0.153
	3	0.209	0.311	0.843									0.454	0.454	0.209
	4														
	5	0.159	0.231	0.727									0.372	0.372	0.159
	6	0.168	0.249	0.812									0.410	0.410	0.168
	7	0.164	0.230	0.878									0.424	0.424	0.164
	8	0.138	0.193	0.991									0.441	0.441	0.138
	9	0.120	0.365	1.760									0.748	0.748	0.120
	10	0.127	0.175	0.848									0.383	0.383	0.127
	11	0.139	0.229	2.32									0.897	0.897	0.139
	12	0.157	0.234	0.968									0.453	0.453	0.157
	13	0.135	0.216	0.938									0.430	0.430	0.135
	14														
	15	0.138	0.239	1.30									0.558	0.558	0.138
	16	0.125	0.260	6.25									2.21	2.21	0.125

¹Average of all pairs.²Average of all pairs without unreasonably high values.

TABLE LIII: WORKSPACE DIFFUSIVITIES USING THE TWO POINT DIFFUSION MODEL

		Workspace Diffusivities For Each Pair of Concentration Measurements										
		a-b	a-c	a-d	a-e	b-c	b-d	b-e	b-f	c-d	c-e	d-e
Site	Interval	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)	(m ² /min)
1a	1	1.73										
	2						9.41					
	3						73.8					
	4					0.041						
	5		0.212	0.059		0.126	0.019					
	6	1.12		1.49		0.046	2.54					
	7											
	8											
	9	0.601	9.62	1.47			214					
	10	1.51	28.1	14.0								
	11								0.011			
	12											
	13						2060					
2a	1			0.004						0.681		2.13
	2				3.10						0.125	11.1
	3									0.590		
	4			0.004	0.124						0.038	0.084
	5				9.90						0.288	17.8
	6		0.389							1.27	0.160	0.285
	7	0.142	0.100		0.229	0.090						
	8	0.023		6.56						1.11		
	9	0.179										
	10											
	11	0.116										
	12									0.134		
	13											
3a	14	0.017	0.145	0.760								
	1	47.3	0.456			0.210						
	2	0.183	0.155	5.83		0.142						
	3											
	4	0.170										
	5	0.059	528	0.098			0.105			0.052		
	6	0.336		0.578			0.661			0.174		
	7					0.355	135					
	8											
	9					0.684						
	10									12.0		
	11	0.795										
	12	0.263	1.60									
13		5.08			1.32							
4a	1	0.989										
	2	1.17										
	3											
6a	1											
	2	0.017	0.119									
	3	0.022	0.090									
	4	0.010	0.057									
	5	0.008	0.016			0.040						
	6	0.010	0.022			0.052						
	7											
	8	0.160										
	9	0.025	0.097			341						
	10	0.062	0.203			1.98						
	11					0.012						

TABLE LIII: WORKSPACE DIFFUSIVITIES USING THE TWO POINT DIFFUSION MODEL (CONTINUED)

		Workspace Diffusivities For Each Pair of Concentration Measurements										
Site	Interval	a-b (m ² /min)	a-c (m ² /min)	a-d (m ² /min)	a-e (m ² /min)	b-c (m ² /min)	b-d (m ² /min)	b-e (m ² /min)	b-f (m ² /min)	c-d (m ² /min)	c-e (m ² /min)	d-e (m ² /min)
12a	1	0.001	0.018									
	2	0.001	0.065									
	3	0.001	0.016									
	4	0.001	0.053									
	5	0.006	0.195									
	6	0.001	0.029									
	7	0.582										
	8	0.007										
	9	0.002	0.211									
	10	0.002	0.489									
	11	0.006										
	12	2E-04	0.006									
13a	1	0.001	0.006	0.034								
	2	0.001	0.005	0.026								
	3	0.002	0.005	0.022								
	4	0.001	0.004	0.018								
	5	0.001	0.005	0.021								
	6	0.001	0.003	0.012								
	7	0.001	0.005	0.020								
	8	0.001	0.004	0.020								
	9	0.001	0.003	0.015								
	10	0.006	0.031	0.238								
	11	0.003	0.006	0.051								
	12	0.002	0.006	0.034								
14a	13	0.001	0.003	0.015								
	1	3.58	3.53									
	2	0.062	0.132	0.775								
	3	0.027	0.064	0.261								
	4											
	5	0.026	0.058	0.280								
	6	0.024	0.058	0.298								
	7	0.021	0.047	0.300								
	8	0.040	0.075	0.620								
	9	0.052	0.252	1.50								
	10	0.029	0.056	0.459								
	11	0.034	0.082	1.34								
	12	0.029	0.064	0.418								
	13	0.034	0.079	0.509								
	14											
	15	0.034	0.090	0.737								
	16	0.072	0.203	6.95								

TABLE LIV: LOCAL EXHAUST VENTILATION EMISSION RATES

Site	Interval	Concentration (ppm)	Flow Rate (cfm)	Emission Rate (g/min)
1a	1	na	499	na
	2	na	499	na
	3	1530.90	499	117
	4	488.40	499	37.4
	5	218.20	499	16.7
	6	na	499	na
	7	61.20	499	4.69
	8	21.50	499	1.65
	9	108.80	499	8.33
	10	38.10	499	2.92
	11	180.10	499	13.8
	12	36.80	499	2.82
	13	30.60	499	2.34
2a	1	155.81	757	17.7
	2	141.95	757	16.1
	3	128.14	757	14.6
	4	120.16	757	13.6
	5	184.72	757	21.0
	6	281.16	757	31.9
	7	285.15	757	32.4
	8	142.81	757	16.2
	9	46.17	757	5.24
	10	196.65	757	22.3
	11	97.26	757	11.0
	12	184.34	757	20.9
	13	621.50	757	70.6
3a	14	195.09	757	22.2
	1	67.67	646	6.56
	2	141.79	646	13.7
	3	186.47	646	18.1
	4	60.50	646	5.87
	5	160.35	646	15.5
	6	85.83	646	8.32
	7	130.79	646	12.7
	8	108.64	646	10.5
	9	110.31	646	10.7
	10	84.23	646	8.17

na: not available

TABLE LIV: LOCAL EXHAUST VENTILATION EMISSION RATES
(CONTINUED)

Site	Interval	Concentration (ppm)	Flow Rate (cfm)	Emission Rate (g/min)
4a	11	139.34	646	13.5
	12	145.33	646	14.1
	13	79.65	646	7.72
	1	141.00	838	17.7
	2	223.18	838	28.1
	3	66.74	838	8.40
6a	1	5.00	869	0.652
	2	5.13	869	0.669
	3	11.56	869	1.51
	4	11.53	869	1.50
	5	10.12	869	1.32
	6	2.55	869	0.332
	7	28.42	869	3.71
	8	18.78	869	2.45
	9	49.97	869	6.52
	10	42.53	869	5.55
	11	na	869	na
	12	16.07	869	2.10
	13	na	869	na
	14	8.74	869	1.14
6b	15	117.09	869	15.3
	1	249.26	416	15.6
	2	338.10	416	21.1
	3	500.46	416	31.2
	4	216.99	416	13.5
	5	234.10	416	14.6
	6	390.74	416	24.4
	7	359.89	416	22.5
	8	241.16	416	15.1
	9	295.22	416	18.4
	10	338.92	416	21.2
	11	354.62	416	
	12	301.90	416	18.9
	13	340.73	416	
7a	14	358.31	416	22.4
	1	349.06	231	12.1

na: not available

TABLE LIV: LOCAL EXHAUST VENTILATION EMISSION RATES
(CONTINUED)

Site	Interval	Concentration (ppm)	Flow Rate (cfm)	Emission Rate (g/min)
8a	2	417.29	231	14.4
	3	359.15	231	12.4
	4	153.70	231	5.32
	5	306.84	231	10.6
	6	196.90	231	6.81
	7	352.35	231	12.2
	8	120.27	231	4.16
	9	174.88	231	6.05
	10	277.92	231	9.62
	11	443.54	231	15.3
	12	81.18	231	2.81
	13	345.92	231	12.0
8b	1	502.63	1365	103
	2	354.15	1365	72.6
	3	54.94	1365	11.3
	4	332.14	1365	68.1
	5	10.53	1365	2.16
	6	504.91	1365	103
	7	578.08	1365	118
	8	526.59	1365	108
	9	759.15	1365	156
	10	750.67	1365	154
	11	548.54	1365	112
	12	758.70	1365	155
	13	565.63	1365	116
	1	635.80	1127	108
	2	759.38	1127	129
	3	966.46	1127	164
	4	1006.35	1127	170
	5	445.74	1127	75.4
	6	760.01	1127	129
	7	573.42	1127	97.0
	8	605.41	1127	102
	9	560.44	1127	94.8
	10	354.44	1127	60.0
	11	859.78	1127	146

na: not available

TABLE LIV: LOCAL EXHAUST VENTILATION EMISSION RATES
(CONTINUED)

Site	Interval	Concentration (ppm)	Flow Rate (cfm)	Emission Rate (g/min)
9a	12	463.83	1127	78.5
	13	385.83	1127	65.3
	1	187.33	810	28.8
	2	170.12	810	26.2
	3	9.16	810	1.41
	4	43.06	810	6.62
	5	59.26	810	9.11
	6	255.74	810	39.3
10a	7	14.59	810	2.24
	8	172.64	810	26.6
	1	70.80	315	3.35
	2	26.57	315	1.26
	3	33.10	315	1.57
	4	171.43	315	8.11
	5	155.59	315	7.36
	6	105.24	315	4.98
10b	7	na	na	na
	8	41.28	455	2.82
	9	82.77	455	5.65
	10	85.82	455	5.86
	11	79.45	455	5.43
	12	15.42	455	1.05
	13	116.68	455	7.97
	14	76.11	455	5.20
	15	6.77	455	0.46
	1	0.24	731	0.03
	2	38.50	731	4.23
	3	17.67	731	1.94
	4	20.85	731	2.29
	5	15.41	731	1.69
	6	15.31	731	1.68
	7	7.73	731	0.85
	8	25.25	755	2.86
	9	15.64	755	1.77
	10	11.51	755	1.30
	11	10.76	755	1.22

na: not available

TABLE LIV: LOCAL EXHAUST VENTILATION EMISSION RATES
(CONTINUED)

Site	Interval	Concentration (ppm)	Flow Rate (cfm)	Emission Rate (g/min)
11a	12	13.46	755	1.53
	13	na	755	na
	14	28.54	755	3.23
	15	217.73	755	24.7
	1	88.01	359	4.75
	2	180.40	359	9.73
	3	161.73	359	8.72
	4	178.46	359	9.62
	5	256.85	359	13.9
	6	301.18	359	16.2
	7	208.92	359	11.3
	8	47.67	359	2.57
	9	21.99	359	1.19
	10	98.04	359	5.29
12a	11	363.30	359	19.6
	12	167.33	359	9.02
	13	223.87	359	12.1
	1	6.50	526	0.33
	2	4.60	526	0.24
	3	28.00	526	1.43
	4	200.20	526	10.3
	5	74.40	526	3.81
	6	14.70	526	0.753
	7	76.10	526	3.90
	8	8.60	526	0.440
	9	5.20	526	0.266
	10	4.40	526	0.225
	11	34.80	526	1.78
13a	12	140.30	526	7.18
	1	48.82	104	0.760
	2	52.20	104	0.813
	3	81.65	104	1.27
	4	86.45	104	1.35
	5	71.63	104	1.12
	6	84.66	104	1.32
	7	43.86	112	0.740

na: not available

TABLE LIV: LOCAL EXHAUST VENTILATION EMISSION RATES
(CONTINUED)

Site	Interval	Concentration (ppm)	Flow Rate (cfm)	Emission Rate (g/min)
14a	8	50.44	112	0.851
	9	67.00	112	1.13
	10	18.34	112	0.310
	11	26.35	112	0.445
	12	67.22	112	1.13
	13	101.67	112	1.72
	1	164.92	595	14.7
	2	190.63	595	17.0
	3	258.56	595	23.1
	4	274.40	595	24.5
	5	195.20	595	17.4
	6	204.01	595	18.2
	7	256.29	595	22.9
	8	220.10	595	19.7
	9	120.59	595	10.8
	10	176.91	595	15.8
	11	171.52	595	15.3
	12	154.29	595	13.8
	13	185.34	595	16.6
	14	108.95	595	9.74
	15	144.90	595	13.0
	16	96.56	595	8.63

na: not available

5.4 Appendix D

Intermediate Data for Predicted Capture Efficiency Calculations

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
1a	1	7	816	-0.16	0.41	0.72
	2	7	820	0.08	0.38	0.72
	3	7	824	0.17	0.76	0.56
	4	8	846	0.48	0.82	0.66
	5	8	850	0.17	0.66	0.60
	6	8	854	0.24	0.78	0.58
	7	8	858	0.33	0.57	0.70
	8	8	902	0.34	0.65	0.66
	9	8	906	0.44	0.62	0.71
	10	9	918	0.18	0.53	0.67
	11	9	922	0.47	0.86	0.64
	12	9	926	0.62	1.08	0.61
	13	9	930	0.50	0.94	0.62
	14	9	934	0.31	0.51	0.72
	15	9	938	0.39	0.48	0.75
	16	9	948	0.28	0.86	0.56
	17	9	952	0.58	1.13	0.58
	18	9	956	0.51	1.13	0.56
	19	9	1000	0.63	0.49	0.79
	20	9	1004	0.40	0.65	0.68
	21	9	1008	0.95	0.31	1.65
	22	9	1012	0.92	0.27	0.80
	23	9	1020	0.67	0.45	0.82
	24	9	1024	0.51	0.58	0.75
	25	10	1028	0.24	0.80	0.59
	26	10	1032	0.24	0.66	0.65
	27	10	1048	0.53	0.51	0.77
	28	10	1052	0.52	0.58	0.75
	29	10	1056	0.87	0.47	0.82
	30	10	1100	0.74	0.58	0.77
	31	11	1136	0.21	0.53	0.68
	32	11	1140	0.16	0.75	0.58
	33	11	1152	0.25	0.85	0.57
	34	11	1156	0.38	0.99	0.57
	35	13	1328	0.39	0.51	0.76
	36	13	1332	0.10	0.70	0.60
	37	13	1336	0.21	0.85	0.56
	38	13	1340	0.13	0.73	0.58
	39	13	1344	0.35	0.84	0.61
	40	13	1348	0.26	0.59	0.68
	41	13	1352	0.37	0.92	0.59

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
2a	42	13	1356	0.31	0.69	0.67
	1	1	956	0.45	1.57	0.62
	2	1	1002	0.16	1.77	0.57
	3	1	1006	0.19	2.14	0.53
	4	1	1010	0.05	1.86	0.55
	5	1	1014	0.21	1.93	0.55
	6	2	1054	0.22	1.05	0.69
	7	2	1058	0.05	1.58	0.59
	8	2	1102	0.11	1.99	0.54
	9	2	1106	0.13	1.63	0.58
	10	2	1110	-0.07	1.33	0.62
	11	3	1210	0.04	1.95	0.54
	12	3	1214	-0.07	1.47	0.60
	13	3	1218	0.05	1.52	0.59
	14	3	1222	0.02	1.40	0.61
	15	3	1226	-0.04	0.67	0.76
	16	5	1400	-0.00	1.15	0.65
	17	5	1406	0.17	1.52	0.60
	18	5	1412	0.03	0.97	0.69
	19	7	848	0.02	0.68	0.76
	20	7	852	-0.03	0.86	0.71
	21	7	856	0.03	0.78	0.73
	22	8	902	0.05	1.26	0.64
	23	8	908	0.06	1.03	0.68
	24	8	914	0.07	0.74	0.75
	25	8	934	0.03	0.52	0.80
	26	9	1022	0.09	1.26	0.64
	27	9	1026	0.18	0.94	0.71
	28	9	1032	-0.03	0.91	0.70
	29	9	1036	-0.01	1.07	0.67
	30	10	1132	0.04	0.52	0.80
	31	10	1140	0.04	0.42	0.82
	32	11	1206	0.00	0.69	0.75
	33	11	1210	0.03	0.70	0.75
	34	11	1216	0.08	0.92	0.70
	35	11	1220	0.02	0.82	0.72
	36	11	1224	0.13	1.19	0.65
	37	11	1228	0.07	0.99	0.69
	38	12	1254	0.14	0.84	0.73
	39	12	1258	-0.08	0.94	0.70

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
3a	40	12	1304	-0.10	1.31	0.63
	41	12	1326	-0.05	0.72	0.75
	42	12	1332	0.08	0.81	0.73
	43	12	1336	-0.02	0.83	0.72
	44	13	1420	0.01	0.71	0.75
	45	13	1424	0.05	0.58	0.79
	46	13	1428	0.04	0.61	0.78
	47	14	1530	0.17	0.48	0.82
	48	14	1534	-0.01	1.02	0.68
	49	14	1538	0.13	1.00	0.69
	50	14	1544	0.11	0.95	0.70
	51	14	1548	0.11	1.03	0.69
	52	14	1552	0.05	0.56	0.79
	1	2	1038	0.33	-0.43	0.84
	2	3	1042	0.34	-0.43	0.83
	3	3	1046	0.33	-0.44	0.83
	4	3	1052	0.32	-0.45	0.82
	5	3	1056	0.31	-0.48	0.81
	6	3	1102	0.32	-0.47	0.81
	7	3	1108	0.31	-0.49	0.82
	8	4	1156	0.33	-0.44	0.83
	9	4	1200	0.33	-0.45	0.82
	10	4	1206	0.32	-0.44	0.83
	11	4	1210	0.32	-0.44	0.83
	12	4	1214	0.32	-0.45	0.83
	13	5	1232	0.33	-0.44	0.83
	14	5	1236	0.32	-0.43	0.84
	15	5	1240	0.33	-0.44	0.84
	16	5	1244	0.32	-0.43	0.84
	17	5	1248	0.31	-0.47	0.81
	18	5	1300	0.31	-0.47	0.81
	19	5	1308	0.31	-0.46	0.81
	20	6	1356	0.32	-0.47	0.81
	21	6	1400	0.34	-0.49	0.81
	22	6	1404	0.32	-0.48	0.81
	23	6	1408	0.31	-0.46	0.81
	24	6	1412	0.32	-0.49	0.81
	25	6	1416	0.32	-0.49	0.81
	26	6	1420	0.34	-0.48	0.81
	27	6	1424	0.33	-0.49	0.81

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
4a	28	7	852	0.42	-0.46	0.82
	29	8	856	0.41	-0.47	0.83
	30	8	900	0.35	-0.46	0.82
	31	8	904	0.37	-0.44	0.83
	32	9	1108	0.38	-0.46	0.83
	33	9	1112	0.34	-0.46	0.82
	34	9	1118	0.34	-0.43	0.83
	35	10	1158	0.35	-0.44	0.84
	36	10	1202	0.39	-0.48	0.82
	37	10	1206	0.38	-0.48	0.82
	38	10	1210	0.34	-0.43	0.82
	39	10	1216	0.38	-0.43	0.83
	40	12	1506	0.38	-0.34	0.86
	41	13	1600	0.38	-0.33	0.85
	42	13	1604	0.37	-0.33	0.85
	43	13	1608	0.36	-0.34	0.84
	44	13	1612	0.25	-0.23	0.86
	1	1	1018	0.58	0.53	0.83
	2	1	1022	0.61	0.56	0.81
	3	1	1026	0.60	0.58	0.82
	4	1	1030	0.61	0.63	0.81
	5	1	1034	0.64	0.66	0.79
	6	2	1114	0.60	0.57	0.83
	7	2	1118	0.65	0.59	0.82
	8	2	1126	0.58	0.61	0.81
	9	3	1146	0.58	0.52	0.84
6a	10	3	1150	0.77	0.68	0.81
	11	3	1154	0.58	0.57	0.82
	12	3	1158	0.69	0.66	0.81
	1	1	954	0.46	0.53	0.83
	2	1	958	0.33	0.48	0.84
	3	1	1000	0.43	0.52	0.84
	4	1	1004	0.37	0.44	0.86
	5	2	1008	0.37	0.49	0.84
	6	2	1012	0.38	0.51	0.85
	7	4	1158	0.36	0.43	0.86
	8	4	1202	0.39	0.52	0.85
	9	4	1206	0.38	0.41	0.85
	10	4	1210	0.36	0.46	0.84
	11	4	1214	0.39	0.47	0.86

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
	12	4	1216	0.41	0.51	0.84
	13	4	1220	0.42	0.55	0.83
	14	4	1224	0.40	0.48	0.86
	15	4	1230	0.35	0.43	0.86
	16	4	1234	0.39	0.52	0.85
	17	4	1238	0.38	0.46	0.84
	18	7	1514	0.37	0.45	0.85
	19	7	1520	0.41	0.36	0.84
	20	7	1526	0.38	0.34	0.85
	21	7	1534	0.39	0.35	0.86
	22	8	844	0.35	0.50	0.85
	23	8	902	0.34	0.46	0.86
	24	9	914	0.33	0.44	0.84
	25	9	916	0.34	0.50	0.85
	26	9	934	0.30	0.43	0.84
	27	9	1000	0.36	0.50	0.85
	28	12	1206	0.30	0.47	0.85
	29	12	1212	0.31	0.53	0.84
	30	12	1218	0.32	0.54	0.82
	31	12	1224	0.37	0.47	0.86
	32	12	1230	0.34	0.54	0.84
	33	13	1250	0.34	0.42	0.84
	34	13	1253	0.32	0.42	0.86
	35	15	1506	0.31	0.42	0.86
	36	15	1512	0.30	0.39	0.85
	37	15	1516	0.32	0.41	0.84
	38	15	1520	0.30	0.43	0.85
6b	1	1	910	0.03	-0.71	0.61
	2	1	916	0.02	-0.62	0.64
	3	1	926	0.06	-0.49	0.70
	4	2	1002	0.03	-0.57	0.66
	5	2	1008	0.05	-0.50	0.69
	6	2	1018	-0.01	-0.61	0.64
	7	2	1022	-0.02	-0.65	0.63
	8	2	1026	0.02	-0.61	0.65
	9	3	1032	0.09	-0.61	0.65
	10	3	1106	0.05	-0.61	0.65
	11	3	1110	0.06	-0.51	0.69
	12	4	1204	0.01	-0.67	0.62
	13	4	1210	0.06	-0.53	0.68

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
	14	4	1214	0.06	-0.51	0.69
	15	4	1218	0.02	-0.78	0.59
	16	4	1222	0.02	-0.56	0.66
	17	4	1226	0.07	-0.59	0.66
	18	6	1412	-0.18	-1.03	0.55
	19	6	1418	0.05	-0.51	0.69
	20	6	1426	-0.02	-0.55	0.67
	21	6	1430	0.02	-0.49	0.69
	22	6	1432	0.00	-0.56	0.66
	23	8	816	0.04	-0.53	0.68
	24	8	840	0.08	-0.55	0.67
	25	8	850	0.05	-0.57	0.66
	26	8	854	0.03	-0.52	0.68
	27	9	922	0.03	-0.52	0.68
	28	9	930	0.07	-0.53	0.68
	29	10	1024	0.01	-0.49	0.69
	30	10	1044	0.03	-0.51	0.68
	31	10	1046	-0.04	-0.56	0.66
	32	10	1050	0.01	-0.52	0.68
	33	12	1204	0.03	-0.50	0.69
	34	12	1210	0.05	-0.50	0.69
	35	12	1214	-0.01	-0.49	0.69
	36	12	1216	-0.01	-0.49	0.69
	37	12	1222	0.23	-0.34	0.81
7a	1	2	950	0.01	-0.53	0.54
	2	2	1000	0.01	-0.49	0.55
	3	2	1008	-0.01	-0.50	0.55
	4	2	1014	0.02	-0.52	0.54
	5	2	1020	0.03	-0.56	0.53
	6	2	1022	-0.01	-0.48	0.56
	7	2	1036	0.00	-0.49	0.55
	8	3	1054	0.01	-0.49	0.55
	9	3	1134	0.09	-0.59	0.53
	10	3	1138	0.01	-0.50	0.55
	11	4	1206	0.00	-0.48	0.56
	12	4	1212	-0.02	-0.50	0.55
	13	4	1218	-0.00	-0.48	0.56
	14	4	1222	-0.00	-0.49	0.55
	15	4	1228	-0.02	-0.48	0.56
	16	5	1302	-0.03	-0.48	0.56

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
	17	6	1402	0.26	-0.77	0.53
	18	8	1550	-0.01	-0.52	0.54
	19	8	1556	0.01	-0.49	0.55
	20	8	1602	0.24	-0.74	0.53
	21	8	1608	0.00	-0.50	0.55
	22	9	844	0.05	-0.59	0.52
	23	9	850	-0.01	-0.49	0.55
	24	9	904	-0.01	-0.48	0.56
	25	10	920	0.02	-0.58	0.52
	26	11	1008	0.05	-0.57	0.53
	27	11	1010	-0.01	-0.48	0.56
	28	11	1026	0.03	-0.51	0.55
	29	13	1202	0.02	-0.54	0.54
	30	13	1208	0.01	-0.49	0.55
	31	13	1214	-0.01	-0.48	0.56
	32	13	1220	0.02	-0.55	0.53
	33	13	1226	-0.00	-0.48	0.56
	34	13	1230	0.01	-0.53	0.54
	35	13	1236	0.05	-0.59	0.52
	36	13	1242	0.06	-0.56	0.53
	37	13	1248	-0.00	-0.20	0.74
8a	1	2	1216	1.67	0.26	0.81
	2	2	1220	1.60	0.58	0.88
	3	2	1224	1.60	0.07	1.00
	4	3	1250	2.39	-0.28	0.82
	5	3	1300	1.77	-0.09	0.82
	6	3	1324	2.12	0.16	0.82
8b	1	4	1406	0.64	-0.07	0.84
	2	4	1416	-0.55	0.11	0.85
	3	5	1442	0.68	0.03	0.84
	4	5	1446	0.95	-0.04	0.84
	5	5	1458	0.81	-0.12	0.84
	6	5	1504	1.03	-0.29	0.83
	7	5	1510	0.73	-0.12	0.85
	8	5	1516	0.85	-0.20	0.84
	9	6	810	1.24	-0.40	0.83
	10	6	812	1.59	-0.51	0.82
	11	6	814	0.64	-0.07	0.84
	12	6	816	1.23	-0.14	0.83
	13	6	818	1.10	-0.33	0.84

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
9a	14	6	822	0.86	-0.15	0.83
	15	6	830	-1.08	0.54	0.92
	16	6	844	0.27	0.34	0.94
	17	6	850	0.87	-0.10	0.84
	18	7	918	-0.65	0.15	0.85
	19	7	926	-0.57	0.15	0.84
	20	8	1026	-0.54	0.11	0.85
	21	8	1030	-1.27	0.26	0.84
	22	8	1032	-0.81	0.25	0.84
	23	8	1102	-0.95	0.32	0.82
	24	10	1216	1.15	-0.13	0.84
	25	10	1220	1.06	-0.14	0.83
	27	10	1228	1.18	-0.23	0.83
	28	10	1232	1.22	-0.14	0.83
	1	2	1114	1.04	0.00	0.83
	2	2	1118	1.04	0.00	0.84
	3	2	1126	1.04	0.01	0.84
	4	3	1208	1.03	-0.00	0.83
	5	3	1214	1.04	-0.00	0.83
	6	3	1218	1.04	0.00	0.83
	7	3	1224	1.04	-0.00	0.84
	8	3	1230	1.04	-0.00	0.84
	9	3	1240	1.04	0.01	0.83
	10	3	1250	1.04	0.01	0.84
	11	4	1336	1.04	0.00	0.84
	12	4	1340	1.05	0.00	0.84
	13	6	1510	1.05	0.00	0.83
	14	6	1514	1.05	0.00	0.84
	15	6	1518	1.04	-0.00	0.83
	16	6	1522	1.05	0.00	0.83
	17	6	1526	1.05	0.00	0.83
	18	6	1540	1.04	-0.00	0.83
	19	7	852	1.03	0.01	0.84
	20	7	856	1.04	0.01	0.83
	21	7	900	1.03	0.01	0.83
	22	7	906	1.03	0.01	0.83
	23	7	912	1.03	0.01	0.83
	24	7	918	1.03	0.01	0.83
	25	7	924	1.03	0.01	0.84
	26	7	930	1.04	0.01	0.84

TABLE LV: CROSSDRAFT VELOCITIES AND PREDICTED CAPTURE EFFICIENCIES
(CONTINUED)

Site	Number	Interval	Time	Crossdraft Velocity		Capture Efficiency
				z-component fps	x-component fps	
	27	7	936	1.03	0.01	0.84
	28	7	944	1.04	0.01	0.83
	29	8	1016	1.04	0.01	0.84
	30	8	1022	1.03	0.13	0.83
	31	8	1024	1.03	0.00	0.84
	32	8	1030	1.03	0.00	0.84
	33	8	1038	1.03	0.00	0.83
	34	8	1054	1.03	0.00	0.83
	35	8	1058	1.03	0.00	0.83
	36	8	1122	1.04	0.01	0.84

5.5 Appendix E

Intermediate Crossdraft Data

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Table with 13 columns: **NUMBER**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**, **UNIT**. The table contains numerical data organized in rows and columns, with some cells containing text like "UNIT" or "UNIT".

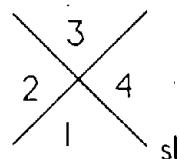
TABLE LV- INTERMEDIATE PROGRAM DATA (CONTINUED)

[illegible]

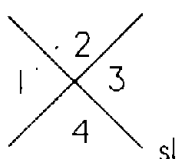
TABLE IV. ON-INTERMEDIATE CRYSTALLOGRAPHIC DATA (CONTINUED)

Table with 10 columns: Year, Value, Change, % Change, Value, Change, % Change, Value, Change, % Change. The table contains 100 rows of data, likely representing economic indicators over time.

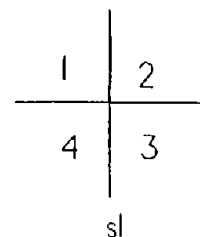
[illegible]



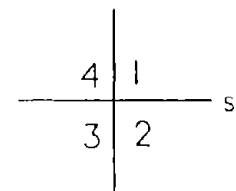
Site 1a



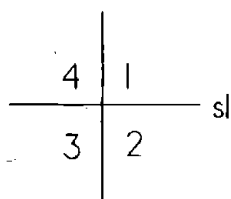
Site 2a



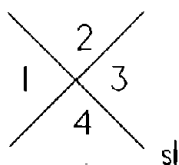
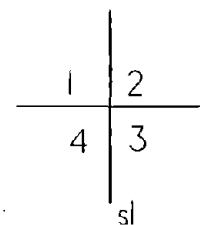
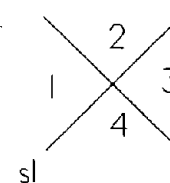
Site 3a



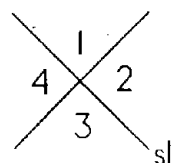
Site 4a



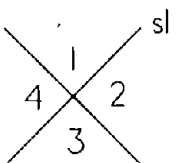
Site 6a

Site 6b
Day 1Site 6b
Day 2

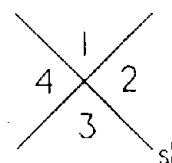
Site 7a



Site 8a



Site 8b



Site 9a

Figure 24. Anemometer Probe Orientations for Each Site.

6 Publications

- Conroy, L.M., R.S. Prodans, M. Lachman, X. Yu, and S. Perez: Field Study of Local Exhaust Hood Performance, in Ventilation '94, (in press)
- Conroy, L.M., R.S. Prodans, M. Lachman, and X. Yu: Emission Rates and Local Exhaust Hood Capture Efficiency for Vapor Degreasers under Operating Conditions. Abstract and presentation #155, American Industrial Hygiene Conference, Boston, MA, June 3, 1992.
- Conroy, L.M., R.S. Prodans, S.M. Fergon, M. Lachman, X. Yu, J.E. Franke, and M. Barbiaux: Field Study of Vapor Degreaser Local Exhaust Hood Performance. Presented at Ventilation '91, Cincinnati, OH, September 19, 1991.
- Conroy, L.M., M. Lachman, R.S. Prodans, and X. Yu: Quantification of Crossdrafts Near Local Exhaust Hoods Used to Exhaust Vapor Degreasers. Abstract and presentation #43, American Industrial Hygiene Conference, Salt Lake City, UT, May 21, 1991.
- Prodans, R.S., L.M. Conroy, S.M. Fergon, M. Lachman, J.E. Franke, and M. Barbiaux: Field Study of Local Exhaust Performance for Hoods Exhausting Vapor Degreasers. Abstract and presentation #196, American Industrial Hygiene Conference, Salt Lake City, UT, May 21, 1991.

