FINAL REPORT

EXHAUST DISPERSION ASSESSMENT

PLASTICAIR INC.

MISSISSAUGA, ONTARIO

Project Number: 04-1506B2

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1. EXECUTIVE SUMMARY

Rowan Williams Davies & Irwin Inc. (RWDI) was retained by Plasticair Inc. to assess the performance of a revised air-induction stack design by conducting concentration and velocity profile measurements through the use of physical modelling in a boundary-layer wind tunnel. These tests were performed in continuation to a previous assessment conducted in 2004, for which a final report was issued on August 3, 2004 (RWDI Report #04-1506A). In addition to the above, concentration and velocity measurements were also conducted for a second Plasticair stack design.

The stacks' performances were assessed by calculating dilution ratios (DR) while varying inlet and outlet flow conditions such as discharge velocities, wind speeds and wind approach angle to the stacks. Performance was also assessed by measuring the discharge velocities at the top of the stack and by using smoke to visually observe inlet and outlet flows.

Based on our findings, we conclude that on average, a DR of 1.89 is expected for Design #1 independently of the wind speed (provided the nozzle velocity is greater than two times the cross wind speed), approach angle of the wind and nozzle velocity (between 3,500 and 4,000 fpm). For this design, we expect that DRs calculated would fall within a range of 1.80 to 1.97 approximately 99% of the time.

Similar DRs were calculated for Design #2, where an average DR of 2.05 was calculated. It is expected that measured DR's for this design would fall between 1.92 and 2.18 approximately 99% of the time.

2. INTRODUCTION

RWDI was retained by Plasticair Inc. to assess the performance of two Plasticair nozzle designs. Photographs of each stack configuration as installed and tested in our wind tunnel are shown in Figures 1 and 2 for Designs #1 and #2, respectively. The measurement points sampled are shown in Figures 3 and 4 for the two different wind approach angles evaluated. While the nozzles for Designs #1 and #2 remained the same, Design #2 included increased porosity of the wind foils and the addition of a baseboard and blockage at the base of the stack, as shown in Figure 1.

3. PROJECT OBJECTIVES

The main objectives of this project were to:

- Assess the performance of the Plasticair stack designs by calculating DRs.
- Determine how DRs vary with wind speed, wind approach angle and nozzle velocity; and
- Conduct visual observations of the stacks using smoke.

4. METHODOLOGY

The same test protocols and methodologies as those described in our previous final report (RWDI Report #04-1506A) were used for this round of tests. Tests were conducted using both tracer gas and velocity measurements. Tests were conducted for two inlet speeds of 3,500 and 4,000 fpm for Plasticair Design #1 and at an inlet speed of 4,000 fpm for Plasticair Design #2. Tests were conducted for three wind conditions (i.e., 0, 10 and 20 mph) and for two wind approach angles (i.e., P1 and P2) as shown in Figures 3 to 4 for both designs. The performance of each nozzle design was assessed by calculating the dilution ratio (DR), which represents the ratio between the total air volume at the top of the stack and total air volume coming into the stack through the fan.

5. FINDINGS AND DISCUSSION

Raw data for the tracer gas measurements (in parts per million (ppm) of carbon monoxide) obtained at the top of the stacks and for each stack design tested are presented in Appendix A. Velocity measurements (in feet per minute) are presented in Appendix B.

5.1 Dilution Ratios (DRs)

A summary of the DRs calculated using concentration measurements are presented in Table 1 for each of the scenarios tested.

Table 1: Summary of Dilution Ratios (based on concentration measurements)

Tested Wind Speed (mph)	Plasticair Design #1				Plasticair Design #2	
	3,500 fpm		4,000 fpm		4,000 fpm	
	P1	P2	P1	P2	P1	P2
0	2.03		1.83		1.87	
10	1.88	1.88	1.90	1.90	2.09	1.99
20	1.92	1.93	1.86	1.84	2.10	2.04

As shown in Table 1, DRs calculated with concentrations varied between 1.83 and 2.03 for Plasticair Design #1, while those calculated for Plasticair Design #2 varied between 1.87 and 2.10. DRs calculated with velocities varied within similar ranges; between 1.58 and 2.24 for Plasticair Design #1, and between 1.79 and 2.23 for Plasticair Design #2 .

One of the notable features of these tests was the high degree of variability found within the velocity data. Velocity measurements were highly sensitive to location of the sampling point; in some instances, velocities more than doubled when moving the sampling port less than ½ inch from one location to another. We believe that this large degree of variability is due to the complex nature of the velocity profile at the top of the stack. This variability also increased with discharge velocity. Large variability of the velocity measurements resulted in lower repeatability of the calculated DRs than was the case for the concentration measurements.

5.2 Data Interpretation

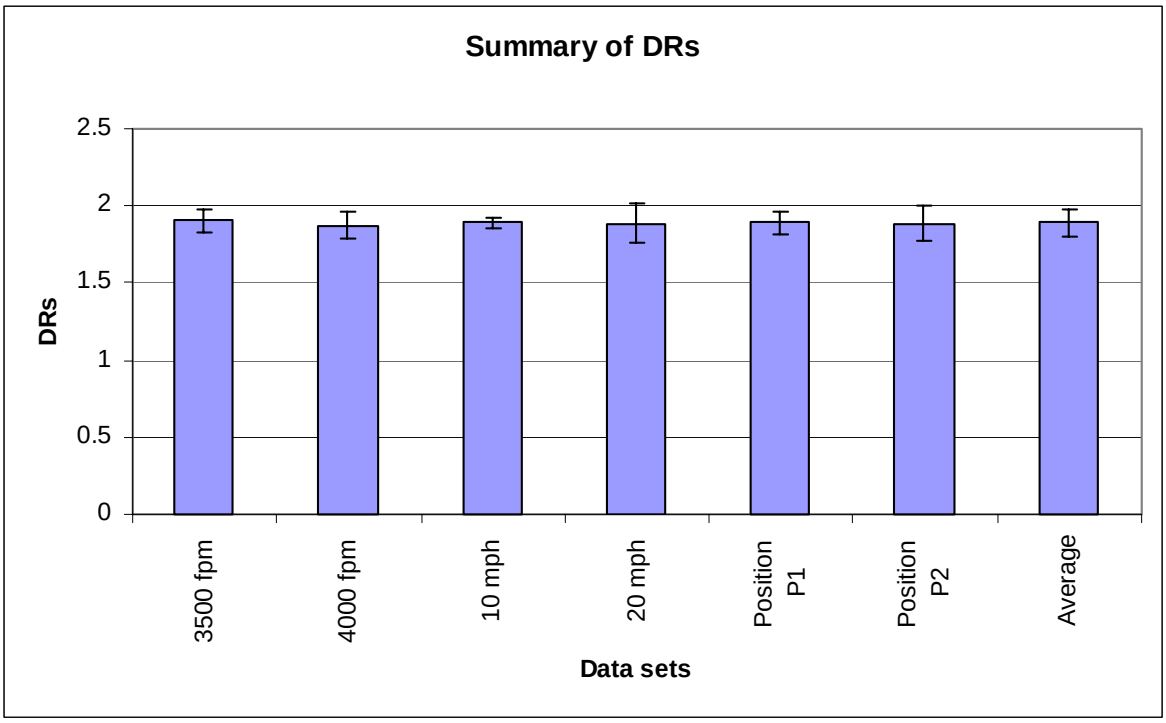
When comparing data sets against each other, it is important to statistically analyse the data to determine if the differences between measurements are simply the result of variability of the measurements or are actually caused by changes in the test parameters.

Several statistical tests are available to determine if variability within data sets is statistically meaningful. Of the methods available, RWDI selected and conducted Student t-tests for the concentration DRs shown in Table 1 to determine if the differences observed between data collected for inlet velocities of 3,500 and 4,000 fpm; approaching wind speeds of 10 and 20 mph; and between wind positions P1 and P2 are indeed from the changes in test parameters or from repeatability variations in the measured data. Data sets collected between the Plasticair Design #1 and #2 were also compared against each other. The Student t-test method is well suited to compare the above data sets against each other.

The results of these statistical analyses showed that differences observed between DRs calculated for 3,500 and 4,000 fpm can be attributed to repeatability of the test method. In other words, operating the stack at 3,500 or 4,000 fpm does not significantly change DRs. The same is also true for DRs calculated for 10 and 20 mph, and for DRs calculated for wind angles P1 and P2. Thus, changes in inlet velocities, wind speeds or approach angles within the ranges tested can be attributed to repeatability variations in the measured data.

Average concentration DRs calculated for each of the data sets are presented in Figure 5 below. The associated error bands shown at the top of each bar represent a 99% interval, which means that DRs for each of the different scenarios would fall within each of the ranges shown approximately 99% of the time. Since differences between data sets were not significant, an overall average DR was calculated for Design #1. Based on these results, we expect that on average, a DR of 1.89 would be obtained for Design #1 independently of the wind speed (provided the nozzle velocity is greater than two times the cross wind speed), approach angle of the wind and nozzle velocity (between 3,500 and 4,000 fpm). Approximately 99% of the time, we expect that DRs calculated would fall within a range of 1.80 to 1.97.

Figure 5: Summary of Concentration DRs Calculated for Each of the Data Sets (Plasticair Design #1)



The concentration DRs calculated for 4,000 fpm and for Plasticair Designs #1 and #2 were also statistically compared against each other. In this case, differences between the two data sets were found to be statistically meaningful; indicating that DRs were different between the designs. While an average DR of 1.89 was calculated for Design #1, an average DR of 2.05 was calculated for Design #2 (which was only tested at a velocity of 4,000 fpm). Approximately 99% of the time, we expect that DRs calculated for Design #2 would fall within a range of 1.92 to 2.18.

Dilution Ratios were also calculated based on the velocity measurements and showed similar results, though with a higher degree of variability.

5.3 Smoke Flow Visualization and Downwash

Smoke flow visualization was conducted for each of the two stack designs tested to help evaluate potential downwash effects. As shown in Appendix A, downwash of tracer gas on the downwind side of the nozzle (see Receptor 24) was observed for Plasticair Design #1, especially

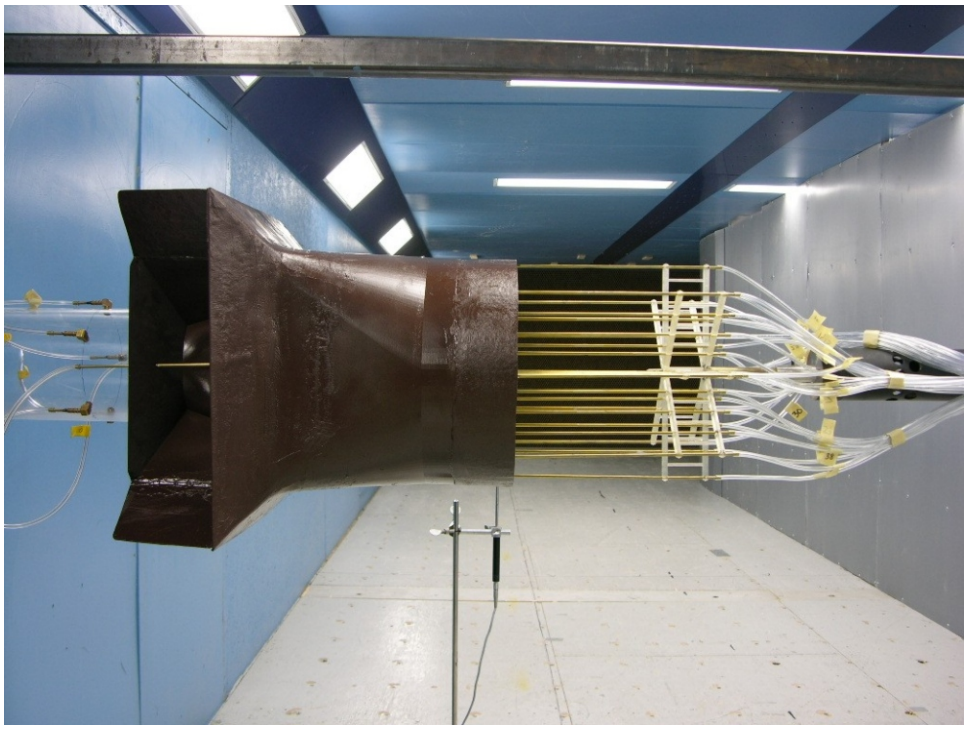
under higher winds, and was found to decrease with increased nozzle speeds. Downwash of an exhaust in a strong wind is a normal phenomenon and typically begins to occur when the stack exit velocity is less than two times the cross wind speed. Small amounts of downwash were observed in localized areas in Design #2 using smoke; however, tracer gas was not detected in the measurements. It is recommended that the potential for downwash always be considered when evaluating exhaust stack designs to verify that it is not a concern.

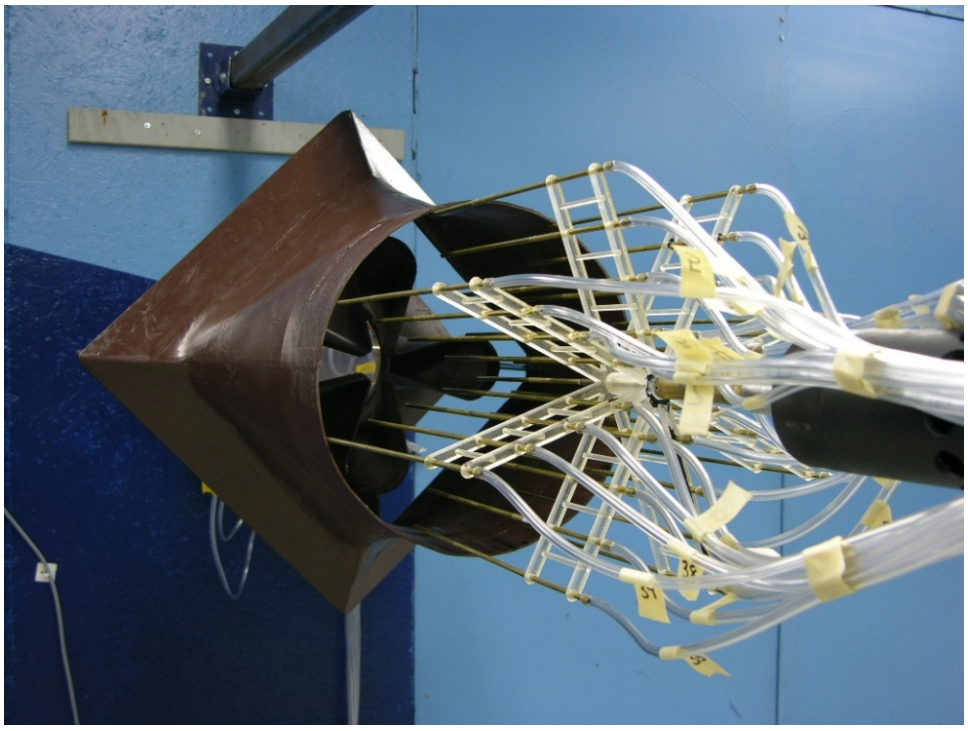
6. CONCLUSIONS

Based on our findings, we conclude that on average, a DR of 1.89 is expected for Design #1 independently of the wind speed (provided the nozzle velocity is greater than two times the cross wind speed), approach angle of the wind and nozzle velocity (between 3,500 and 4,000 fpm). For this design, we expect that calculated DRs would fall within a range of 1.80 to 1.97 approximately 99% of the time. Similar results were obtained using velocity measurements, although with a higher degree of variability.

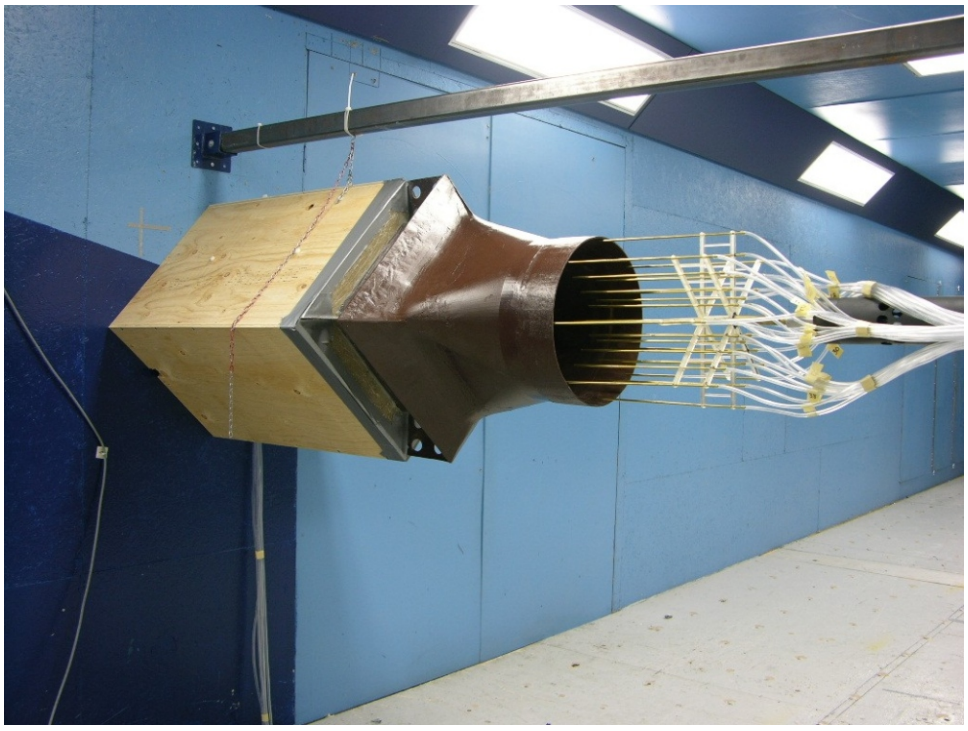
Similar DRs were calculated for Design #2, where an average DR of 2.05 was calculated. It is expected that measured DR's for this design would fall between 1.92 and 2.18 approximately 99% of the time. Again, velocity measurements showed similar results, but with more variability.

FIGURES

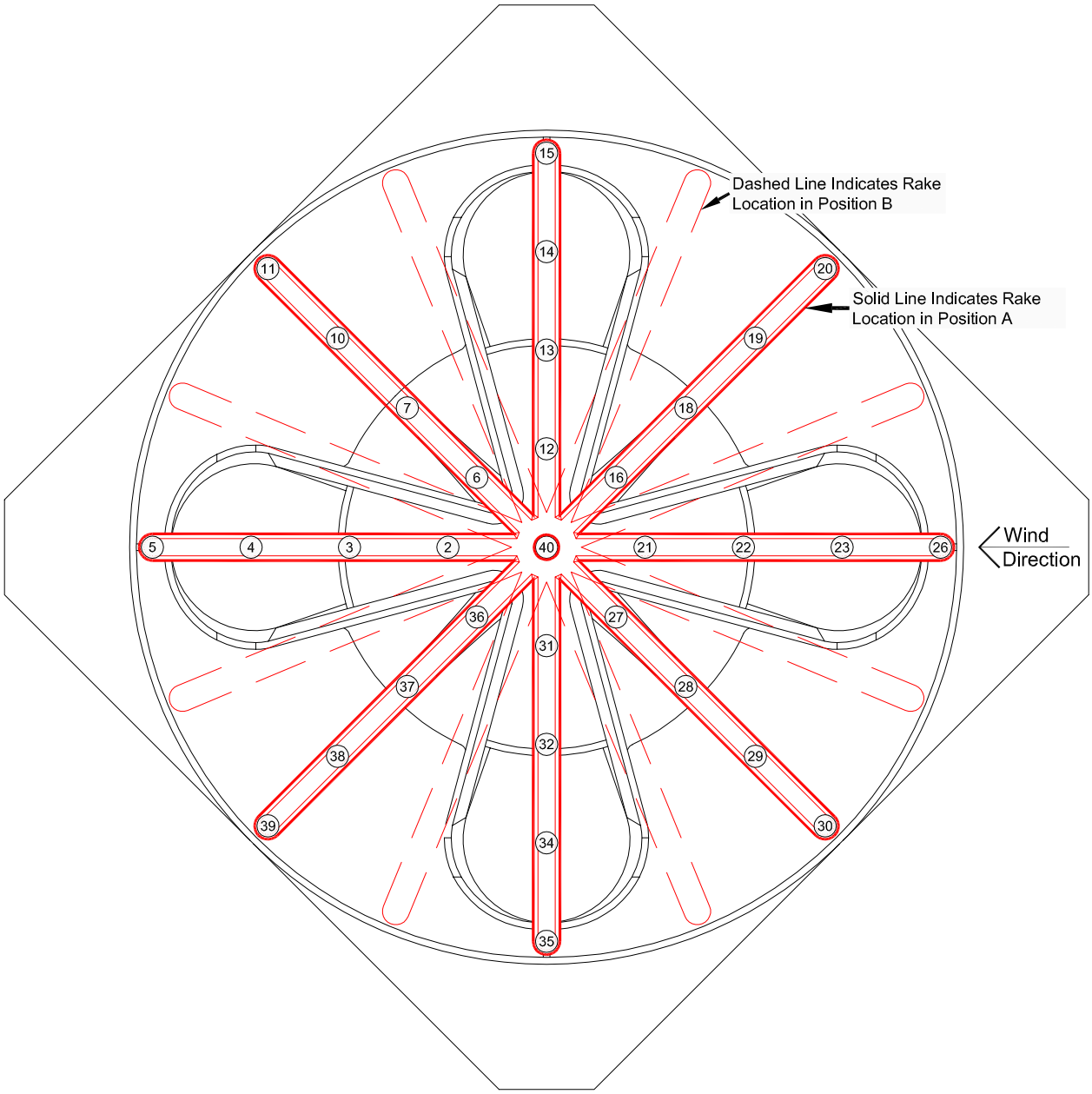




Wind Tunnel Study Model **Plasticair Design #1** Plasticair - Mississauga, Ontario Project #04-1506	Figure No. 1 Date: March 14, 2005	RWDI



Wind Tunnel Study Model **Plasticair Design #2** Plasticair - Mississauga, Ontario Project #04-1506	Figure No. 2 Date: March 14, 2005	RWDI



0 1.25 2.5in

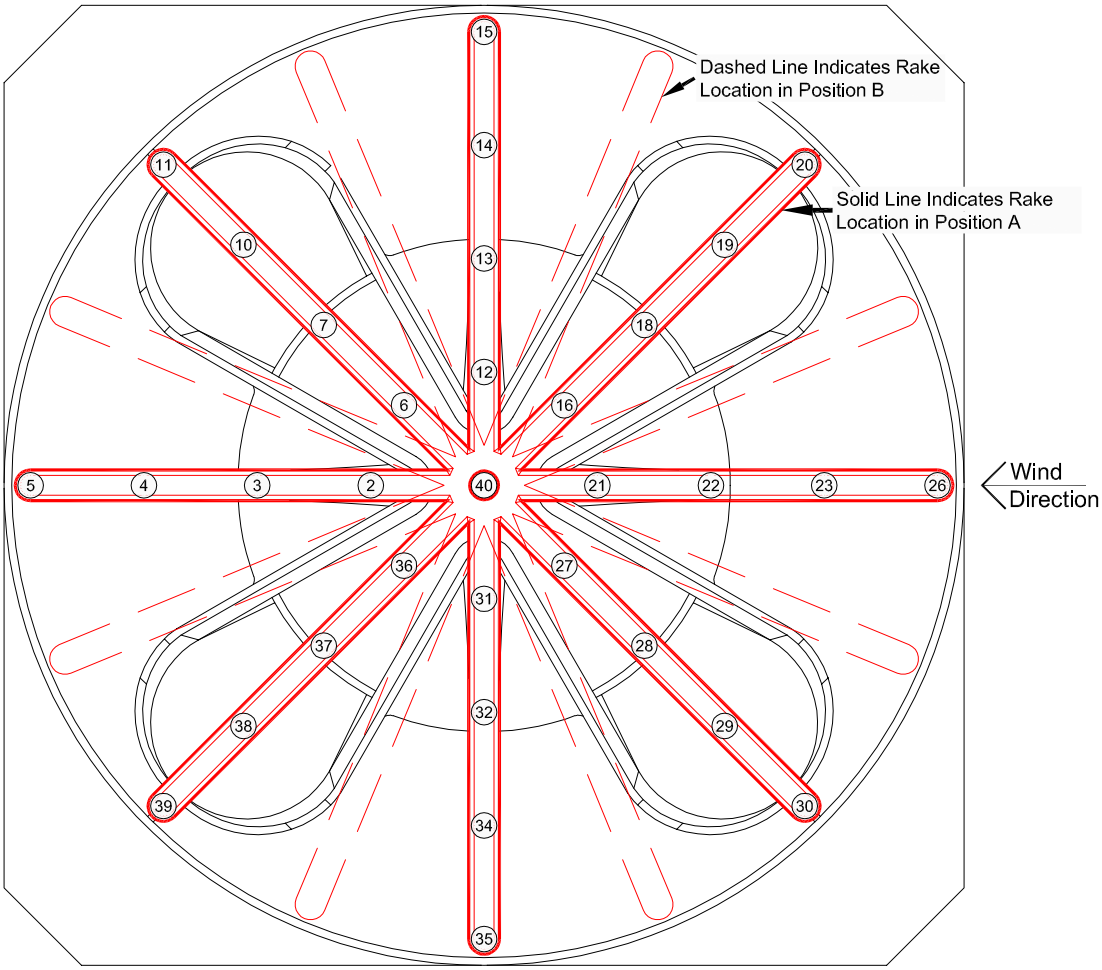
Receptor Location at Stack Tip - Position 1

Plasticair - Mississauga, Ontario

Project #04-1506

Drawn by:	KO	Figure:	3
Approx. Scale:			1"=2.5"
Date Revised:			Mar. 7, 2005

RWDI



0 1.25 2.5in

Receptor Location at Stack Tip - Position 2

Plasticair - Mississauga, Ontario

Project #04-1506

Drawn by:	KO	Figure:	4
Approx. Scale:			1"=2.5"
Date Revised:			Mar. 7, 2005

RWDI

APPENDIX A

Table A1 - Concentration Measurements (ppm of CO) for Inlet Velocity of ~3,500 fpm for Plasticair Design #1

	0 mph wind speed				*10 mph wind speed*				*20 mph wind speed*			
Receptor	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B
1	–	–	78.9	76.6	79.4	79.2	80.3	79.1	80.5	80.0	80.4	79.2
9	–	–	75.4	79.3	78.8	78.4	79.8	78.3	79.8	79.5	79.5	78.5
17	–	–	74.5	78.3	78.9	78.7	80.1	79.0	80.4	79.9	80.3	79.1
25	–	–	73.5	79.0	78.7	78.5	79.8	78.9	80.3	80.0	79.9	78.9
33	–	–	73.9	80.3	79.1	78.7	79.9	79.0	80.1	79.7	79.9	78.7
8	–	–	***	2.0	***	***	***	***	***	***	***	***
24	–	–	9.8	4.1	***	***	***	***	34.4	48.4	2.3	2.4
2	–	–	33.3	34.5	37.2	37.4	37.8	32.9	37.9	33.7	45.6	42.0
3	–	–	30.3	30.6	45.8	45.6	33.9	37.7	56.3	46.9	54.7	53.3
4	–	–	11.4	33.3	55.2	52.5	35.0	31.5	71.0	66.7	54.8	54.8
5	–	–	29.9	47.2	66.4	63.0	41.6	49.0	76.8	69.8	59.8	66.5
6	–	–	27.3	28.5	37.7	36.5	37.4	37.0	26.0	14.2	39.0	30.9
7	–	–	28.7	27.3	42.7	39.6	45.6	42.2	52.5	38.6	50.2	47.3
10	–	–	51.7	48.9	43.9	49.4	57.5	53.5	63.5	66.6	58.7	57.1
11	–	–	60.3	59.5	46.7	48.3	55.8	50.8	46.9	36.7	71.5	66.7
12	–	–	22.6	29.5	33.0	31.8	34.2	36.7	12.6	18.1	25.1	13.8
13	–	–	26.4	29.1	35.5	25.0	38.7	38.6	19.6	18.1	43.2	33.7
14	–	–	37.1	51.1	59.6	31.0	34.8	42.9	61.7	8.3	54.1	60.1
15	–	–	42.0	54.7	56.8	38.4	44.0	61.0	46.3	***	51.6	44.3
16	–	–	28.4	36.3	31.1	34.7	30.4	28.8	21.6	27.2	7.2	2.2
18	–	–	25.7	28.8	22.6	35.8	42.9	22.8	32.1	45.6	24.2	2.9
19	–	–	58.6	48.4	12.2	47.9	58.4	23.1	14.8	41.5	63.8	2.6
20	–	–	56.2	56.5	8.8	45.6	44.8	50.4	6.9	36.2	17.4	1.2
21	–	–	31.6	32.7	36.5	34.6	22.4	29.0	28.9	28.1	***	***
22	–	–	15.8	29.2	41.3	35.9	13.1	17.0	49.0	43.4	***	***
23	–	–	7.1	40.4	62.7	52.1	9.1	28.2	63.6	56.1	***	25.2
26	–	–	13.0	50.7	51.2	47.6	7.5	60.5	47.5	50.4	***	***
27	–	–	34.8	36.6	34.4	34.6	21.3	28.2	25.9	19.1	3.0	12.0
28	–	–	31.9	26.0	21.0	22.4	29.3	33.2	34.6	15.5	16.5	38.1
29	–	–	54.3	50.8	15.5	29.2	55.6	49.7	34.2	5.5	67.0	62.6
30	–	–	50.7	56.9	9.0	32.1	64.4	65.2	37.7	1.1	7.1	42.5
31	–	–	19.4	18.3	34.9	37.5	44.6	36.0	17.4	20.2	25.2	37.3
32	–	–	24.6	21.2	34.2	37.4	39.4	31.7	13.9	36.5	44.3	51.1
34	–	–	33.3	48.7	56.9	49.7	39.1	36.1	30.9	61.6	57.9	62.4
35	–	–	40.0	53.9	61.4	55.4	51.7	52.2	49.6	57.0	59.3	63.7
36	–	–	24.4	29.7	36.1	36.6	41.7	33.8	22.7	31.4	41.3	44.9
37	–	–	26.9	30.1	37.7	39.2	37.4	37.9	43.7	50.4	51.3	49.6
38	–	–	50.3	44.3	44.8	50.8	53.5	50.6	64.6	69.3	64.1	57.1
39	–	–	57.8	62.6	49.2	57.0	69.0	60.0	67.2	75.3	72.2	68.4
40	–	–	34.3	36.9	42.4	42.2	39.3	37.2	24.6	24.2	15.6	17.3

Table A2 - Concentration Measurements (ppm of CO) for Inlet Velocity of ~4,000 fpm for Plasticair Design #1

	0 mph wind speed				*10 mph wind speed*				*20 mph wind speed*			
Receptor	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B
1	–	–	81.2	79.3	78.9	80.7	79.8	79.8	80.3	80.7	80.0	80.3
9	–	–	81.3	78.2	77.8	79.6	78.8	78.8	79.7	79.8	78.9	79.1
17	–	–	80.4	78.2	78.8	80.7	79.7	79.8	80.4	80.5	80.1	80.2
25	–	–	80.3	78.5	78.5	80.5	79.6	79.8	80.3	80.6	80.0	79.7
33	–	–	80.2	78.0	78.3	80.4	79.6	79.6	80.3	80.2	80.2	79.8
8	–	–	10.9	11.1	***	***	***	***	***	***	***	***
24	–	–	8.2	6.8	***	***	***	***	23.7	24.5	***	1.4
2	–	–	40.5	39.4	36.7	37.1	38.0	40.5	46.6	46.6	41.1	38.4
3	–	–	39.5	43.5	42.6	42.2	38.3	37.4	60.8	60.8	51.1	52.4
4	–	–	36.3	53.2	56.9	49.3	36.4	38.7	67.8	68.3	52.8	58.7
5	–	–	43.1	57.8	60.8	61.2	36.3	57.8	71.9	70.4	55.1	63.3
6	–	–	45.7	45.9	35.0	33.9	42.2	41.6	33.1	40.3	41.6	42.9
7	–	–	47.5	43.2	39.5	40.6	42.9	44.0	47.5	54.8	52.9	51.6
10	–	–	61.5	46.1	38.1	53.9	54.6	52.9	57.2	58.6	61.3	54.1
11	–	–	69.1	64.3	38.8	47.9	68.2	55.1	49.6	59.2	72.4	64.4
12	–	–	45.8	43.3	29.1	28.4	37.7	29.1	20.0	22.8	27.1	34.9
13	–	–	42.5	40.8	36.9	23.7	39.7	35.8	22.6	35.9	47.7	52.3
14	–	–	42.5	52.0	61.8	26.9	44.4	46.3	56.5	66.0	58.8	64.5
15	–	–	49.3	57.3	60.8	38.3	46.8	62.9	47.3	46.7	60.8	68.4
16	–	–	46.1	40.7	28.6	32.7	24.1	16.4	26.6	23.5	11.3	18.8
18	–	–	41.9	37.6	22.7	35.9	31.6	19.7	33.6	18.4	40.8	42.5
19	–	–	59.6	45.8	13.6	52.1	58.3	37.7	18.2	8.7	61.1	59.0
20	–	–	72.4	59.9	6.8	46.2	68.4	38.0	17.5	2.9	37.1	63.5
21	–	–	41.7	37.3	35.6	37.9	15.1	19.4	31.5	29.5	3.2	7.3
22	–	–	33.0	33.3	36.9	34.7	9.1	13.4	48.8	49.1	3.9	25.8
23	–	–	38.9	47.4	59.8	45.9	12.8	23.4	63.4	52.4	1.7	32.9
26	–	–	42.6	58.2	59.4	54.2	12.0	48.1	51.7	43.6	3.7	6.6
27	–	–	37.5	39.5	35.7	36.6	25.1	31.1	25.0	29.7	4.1	2.2
28	–	–	45.2	39.0	22.0	25.8	27.7	38.3	26.8	36.8	6.8	1.2
29	–	–	58.9	42.0	8.8	34.3	40.8	51.1	27.7	55.3	46.5	11.6
30	–	–	68.9	55.7	6.0	42.6	61.3	64.3	24.8	51.9	48.8	7.0
31	–	–	33.2	39.3	39.1	40.5	33.7	35.3	20.3	20.8	23.1	11.4
32	–	–	23.4	40.3	35.1	39.0	32.8	31.8	20.6	12.6	38.5	23.1
34	–	–	33.9	45.3	54.1	48.6	35.7	39.1	55.1	7.8	52.7	51.8
35	–	–	42.4	55.7	59.0	56.5	48.9	47.2	49.0	2.6	60.8	59.8
36	–	–	36.5	32.5	37.0	37.7	34.1	35.9	36.8	27.4	35.0	27.3
37	–	–	44.0	27.4	37.5	41.3	35.0	38.7	51.3	41.0	48.6	43.3
38	–	–	58.1	35.1	43.9	55.3	49.3	52.0	66.2	63.9	63.4	58.5
39	–	–	66.0	58.8	47.7	51.0	57.9	51.8	64.7	56.3	67.7	60.1
40	–	–	41.1	42.1	40.8	42.1	32.5	32.9	32.8	32.2	13.6	11.8

Table A3 - Concentration Measurements (ppm of CO) for Inlet Velocity of ~4,000 fpm for Plasticair Design #2

	0 mph wind speed				*10 mph wind speed*				*20 mph wind speed*			
Receptor	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B
1	79.4	79.8	–	–	80.1	79.1	78.1	79.3	78.6	79.4	79.2	78.6
9	79.0	78.5	–	–	79.0	78.3	77.5	78.0	77.8	78.5	78.4	77.9
17	80.0	79.8	–	–	79.8	79.2	78.0	79.1	78.3	79.4	79.3	78.3
25	80.4	80.2	–	–	79.6	79.0	78.0	78.7	78.1	79.3	79.2	78.4
33	80.7	81.9	–	–	79.5	78.8	78.1	78.7	78.4	79.3	79.2	78.4
8	11.3	8.1	–	–	***	***	***	***	***	***	***	***
24	22.6	23.2	–	–	***	***	***	***	***	***	***	***
2	41.1	40.6	–	–	32.6	31.0	36.7	36.9	39.5	36.6	41.5	41.1
3	54.4	52.9	–	–	36.0	35.0	31.0	34.9	47.5	47.8	44.5	45.6
4	63.5	57.7	–	–	58.9	47.8	24.5	39.1	59.9	56.7	46.1	49.0
5	60.8	59.9	–	–	59.5	53.9	31.3	50.0	64.7	59.8	51.1	57.6
6	40.9	34.9	–	–	31.4	28.5	35.2	35.4	30.0	22.2	39.1	34.8
7	37.8	40.2	–	–	33.3	35.7	38.9	42.1	42.7	37.3	47.6	45.3
10	40.3	55.0	–	–	34.1	50.8	57.1	52.8	50.7	57.3	60.0	56.6
11	52.8	58.6	–	–	39.7	44.3	57.0	53.5	42.5	39.9	66.8	60.8
12	42.1	41.7	–	–	26.3	22.1	30.2	28.4	12.2	6.6	26.2	20.3
13	46.7	39.8	–	–	36.7	21.7	36.8	35.3	20.0	3.8	40.7	37.0
14	64.0	42.3	–	–	63.0	26.6	43.1	50.5	46.9	***	52.9	56.7
15	65.4	57.0	–	–	53.4	29.0	46.9	51.1	38.9	***	50.8	36.0
16	44.8	41.6	–	–	21.6	23.1	24.0	20.1	7.8	12.3	14.7	9.3
18	36.3	42.9	–	–	13.4	22.2	33.1	20.7	28.0	29.7	31.1	10.4
19	31.7	57.3	–	–	8.8	48.2	57.6	31.7	23.4	52.0	59.6	15.1
20	34.0	56.5	–	–	8.0	52.2	52.5	30.3	29.6	46.3	23.7	***
21	44.2	43.0	–	–	28.4	24.6	17.5	20.6	17.8	17.2	4.9	6.5
22	46.0	37.2	–	–	29.2	22.2	5.2	13.9	24.0	20.7	***	11.5
23	65.1	52.4	–	–	58.5	47.5	1.8	31.8	56.9	47.0	***	20.1
26	64.8	59.6	–	–	59.5	58.9	5.8	31.3	54.5	58.9	***	***
27	39.3	48.2	–	–	19.4	21.9	24.6	28.0	13.6	12.8	12.5	18.9
28	33.8	41.4	–	–	10.9	22.5	29.1	32.8	14.4	7.0	27.1	32.6
29	40.3	59.1	–	–	15.7	36.5	56.9	53.0	29.1	4.6	59.1	58.3
30	40.1	54.5	–	–	30.4	28.7	50.9	52.5	45.5	3.9	15.4	31.9
31	45.5	46.0	–	–	28.8	31.7	32.1	35.4	19.9	27.0	26.8	32.5
32	46.6	44.3	–	–	32.9	30.1	32.2	35.7	25.6	39.2	37.7	40.9
34	65.7	56.2	–	–	60.0	40.1	39.1	47.2	52.6	55.1	49.3	52.4
35	69.2	63.7	–	–	48.7	50.7	42.6	49.6	41.8	39.8	52.1	53.6
36	47.9	49.5	–	–	31.9	31.7	33.7	35.0	33.0	36.8	34.7	37.5
37	43.9	50.3	–	–	28.7	33.0	34.8	33.3	41.7	44.1	41.3	41.5
38	39.7	52.4	–	–	26.1	47.0	54.1	46.3	52.2	58.5	56.6	52.5
39	43.6	60.7	–	–	38.3	53.7	58.1	58.4	48.5	57.8	64.0	63.2
40	50.5	52.2	–	–	33.8	33.8	34.1	35.0	26.5	26.7	21.2	22.4

APPENDIX B

Table B1 - Velocity Measurements (in fpm) for Inlet Velocity of ~3,500 fpm for Plasticair Design #1

	0 mph wind speed				*10 mph wind speed*				*20 mph wind speed*			
Receptor	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B
2	1082	1019	–	–	1237	2174	1352	1415	1983	1988	1449	1459
3	1362	1248	–	–	1655	1477	797	1343	1211	1184	0	421
4	2144	1483	–	–	2468	1655	962	2058	1530	1252	0	572
5	1827	1254	–	–	2591	1556	1115	1691	1854	1485	0	953
6	1292	1253	–	–	1536	1375	1759	1374	1477	1642	1641	1549
7	1024	1193	–	–	1097	1345	1615	1000	1275	1097	1007	719
10	729	1480	–	–	1036	1705	2607	1546	1138	968	1791	884
11	1096	2154	–	–	1594	2583	2099	2456	1587	1296	1595	1758
12	1541	1348	–	–	2026	1766	2056	1922	1222	1354	1743	1673
13	1158	1021	–	–	2010	1371	1559	1796	1540	1542	1401	1062
14	1927	1690	–	–	2771	1951	1488	2344	2324	2079	1195	1437
15	2350	1608	–	–	3232	2299	1614	1931	2453	2230	1705	1289
16	1724	1656	–	–	2040	2116	1654	1968	1288	1280	1597	1685
18	1188	1390	–	–	1414	1689	1845	1862	1537	1238	1773	1923
19	965	1518	–	–	1381	1905	3064	2317	1383	1640	2799	2425
20	1346	2390	–	–	1133	2737	2303	2638	1246	1569	1690	2007
21	1737	1690	–	–	2414	2203	1301	1441	1761	1547	1549	1537
22	1462	1241	–	–	2447	1697	716	1145	2217	2113	1079	984
23	2208	1863	–	–	3403	2795	577	1895	2208	1680	1196	1173
26	2089	2031	–	–	2426	2214	746	1599	1299	961	1075	925
27	1611	1678	–	–	2011	2161	1805	1460	1720	2065	1724	1643
28	1178	1201	–	–	1243	1782	1971	1396	1485	2116	1763	1469
29	721	1576	–	–	1321	2515	2855	1814	1521	2440	2468	2292
30	1337	2322	–	–	1436	2890	2562	2391	1092	1599	1726	1236
31	1225	1480	–	–	1979	1916	1763	1845	1284	1331	1665	1725
32	1502	1552	–	–	2331	1854	1068	1618	1567	1191	1041	1687
34	2225	1610	–	–	3015	1942	862	1984	2558	1723	633	1631
35	1667	1498	–	–	2126	1728	1498	2194	2525	1804	1388	2199
36	923	1031	–	–	1356	1677	1529	1722	1870	1826	1476	1596
37	778	1068	–	–	1286	1633	1468	1163	1614	1938	600	756
38	835	1737	–	–	1060	2149	2361	1546	1415	2107	1569	1219
39	1380	1809	–	–	1874	2262	2368	2238	1883	2026	1544	1743
40	1622	1652	–	–	2223	2174	2178	2239	2137	2041	1811	1786

Note: Receptors 1, 9, 17, 25, 33 were used to measure the inlet conditions. Therefore, no velocity measurements were recorded at those receptors.
Receptors 8 and 24 were used to measure downwash along the side of the stack. No velocity measurements were recorded.

Table B2 - Velocity Measurements (in fpm) for Inlet Velocity of ~4,000 fpm for Plasticair Design #1

	0 mph wind speed				*10 mph wind speed*				*20 mph wind speed*			
Receptor	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B
2	2078	2247	–	–	1696	2708	2064	2001	2178	2326	2103	2122
3	2643	2323	–	–	2011	2052	1171	1905	1622	1751	1385	1422
4	3232	2490	–	–	3121	2543	1085	2517	2352	1788	442	1834
5	2202	1914	–	–	2253	1913	1446	2461	2214	1457	1431	2612
6	1689	1823	–	–	1525	1531	2346	2418	2107	2124	1896	1929
7	1166	1826	–	–	1065	1467	2029	1858	1355	1388	1007	1303
10	1003	2302	–	–	1130	2206	3297	2385	986	1495	2494	1925
11	1115	2606	–	–	1594	2693	2335	2958	1795	1813	2402	2894
12	1874	1789	–	–	2010	1825	2091	2298	1795	1953	1863	1890
13	2203	1788	–	–	2288	1702	1656	1798	2143	2103	1747	1170
14	3288	2403	–	–	3315	2408	1575	2478	3130	2522	1529	2052
15	2692	1862	–	–	3081	2129	1934	2487	3286	2691	1931	1878
16	1910	1900	–	–	1989	2036	1503	1789	1571	1572	1398	1609
18	1338	1819	–	–	1500	1777	2083	2292	1982	1677	1822	2399
19	1062	2278	–	–	1475	1903	3440	3106	1784	1913	3183	3129
20	1641	2964	–	–	1243	2349	2176	2742	1346	1850	1730	1998
21	2342	2096	–	–	2541	2163	1022	992	2237	1718	1207	1041
22	2261	1670	–	–	2405	1801	0	1195	2860	2455	805	510
23	3436	2757	–	–	3473	2981	292	1936	3314	2669	851	805
26	3058	2599	–	–	2663	2035	756	1320	1935	1475	693	564
27	2632	2529	–	–	2573	2751	1543	1286	2114	2545	1589	1275
28	1770	2240	–	–	1584	2254	2424	1399	1606	2417	1793	1289
29	1094	2315	–	–	1382	2603	3347	2298	1800	3248	3283	1939
30	1508	2880	–	–	1386	2980	2522	2138	1478	2466	2292	1018
31	2338	2406	–	–	2463	2537	1908	1947	2041	1918	1912	1792
32	2280	1954	–	–	2442	2057	1477	2203	2416	1560	1699	2192
34	3482	2532	–	–	3575	2352	1187	2562	3419	1948	1265	2878
35	2837	2903	–	–	2955	2521	1484	2134	2996	2076	1837	2348
36	2023	2224	–	–	2149	2278	2150	1969	2400	2411	2062	2323
37	1456	1677	–	–	1601	1737	1902	1622	1841	2450	1165	1234
38	1033	2387	–	–	1398	2400	3196	2008	1535	2605	2687	1920
39	1893	3042	–	–	2278	2791	2215	2412	2274	2628	2053	2037
40	2558	2614	–	–	2668	2708	2182	2035	2818	2813	1847	1760

Note: Receptors 1, 9, 17, 25, 33 were used to measure the inlet conditions. Therefore, no velocity measurements were recorded at those receptors.
Receptors 8 and 24 were used to measure downwash along the side of the stack. No velocity measurements were recorded.

Table B3 - Velocity Measurements (in fpm) for Inlet Velocity of ~4,000 fpm for Plasticair Design #2

	0 mph wind speed				*10 mph wind speed*				*20 mph wind speed*			
Receptor	Position 2A	Position 2B	Position 1A	Position 1B	Position 1A	Position 1B	Position 2A	Position 2B	Position 1A	Position 1B	Position 2A	Position 2B
2	–	–	2079	2249	1697	2720	2065	2002	2180	2327	2105	2124
3	–	–	2654	2335	2025	2066	1196	1920	1640	1767	1406	1442
4	–	–	3242	2504	3132	2556	1115	2530	2366	1806	513	1852
5	–	–	2215	1929	2266	1928	1466	2473	2228	1477	1451	2623
6	–	–	1691	1825	1527	1533	2348	2420	2108	2126	1897	1931
7	–	–	1187	1839	1087	1483	2041	1871	1373	1406	1031	1322
10	–	–	1006	2304	1133	2208	3298	2386	989	1498	2495	1927
11	–	–	1118	2607	1596	2694	2337	2959	1797	1815	2404	2895
12	–	–	1892	1808	2026	1843	2107	2313	1813	1970	1881	1908
13	–	–	2216	1804	2300	1719	1674	1814	2156	2117	1764	1195
14	–	–	3289	2404	3316	2409	1577	2479	3131	2523	1531	2053
15	–	–	2701	1875	3088	2141	1946	2497	3293	2700	1944	1891
16	–	–	1928	1917	2006	2053	1525	1808	1592	1593	1422	1629
18	–	–	1340	1821	1502	1778	2084	2293	1984	1679	1824	2400
19	–	–	1085	2288	1491	1916	3447	3114	1798	1926	3190	3137
20	–	–	1661	2976	1270	2363	2192	2754	1371	1868	1750	2015
21	–	–	2354	2110	2552	2176	1050	1021	2250	1735	1231	1069
22	–	–	2262	1672	2406	1803	0	1197	2862	2456	809	516
23	–	–	3444	2765	3480	2989	367	1949	3322	2678	879	835
26	–	–	3059	2600	2664	2037	760	1322	1937	1477	697	569
27	–	–	2645	2543	2586	2763	1564	1312	2130	2558	1610	1301
28	–	–	1789	2255	1605	2269	2438	1423	1627	2431	1811	1315
29	–	–	1121	2327	1403	2614	3355	2311	1816	3257	3292	1953
30	–	–	1510	2881	1388	2981	2523	2139	1480	2468	2293	1021
31	–	–	2348	2416	2473	2547	1921	1960	2053	1931	1925	1806
32	–	–	2294	1971	2456	2073	1500	2218	2430	1582	1719	2207
34	–	–	3483	2534	3576	2354	1189	2564	3420	1950	1268	2879
35	–	–	2847	2913	2964	2532	1504	2148	3006	2090	1852	2360
36	–	–	2039	2239	2165	2292	2166	1986	2414	2425	2079	2337
37	–	–	1476	1694	1619	1753	1917	1640	1856	2461	1189	1257
38	–	–	1036	2388	1401	2401	3197	2010	1537	2606	2688	1922
39	–	–	1906	3050	2289	2799	2226	2422	2284	2637	2065	2049
40	–	–	2571	2627	2681	2720	2198	2052	2830	2825	1865	1779