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PNNL-31230, Rev 2
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Hanford Waste Treatment Plant LAB Facility Stack Effluent Monitoring

Sampling Probe Location Qualification Evaluation

January 2024

Julia E Flaherty
Ernest J Antonio

U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
under Contract DE-AC05-76RL01830

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Richland, Washington 99354

Revision History

Revision Number	Effective Date	Description of Change
2	January 22, 2024	Correction applied to Table 2 6DV value for LB-C2. Correction applied to Table 12 maximum DV, velocity, and flow value for LB-C2. Modification of tables to include DV values, to incorporate corrections to data, and DFLAW and HLW design flow rates. Updates to text as needed to reflect updated table content, as well as editorial changes. Incorporate additional verification test results from tests performed in April and June 2023.
1	February 28, 2022	Incorporated corrections to velocity, flow, and diameter × velocity (DV) values in the tables in the report body, and all flow angle and velocity data sheets in the appendix. Corrections to the velocity conversions included the addition of the pitot tube factor and use of total stack pressure as well as conversions from actual to standard velocity and flow units.
0	July 7, 2021	Initial Issue

Summary

The Waste Treatment Plant laboratory (LAB) facility stack monitor locations were qualified using scale model stacks to mitigate the risk of identifying that sampling locations do not meet the qualification criteria on the full-scale stack. As required by the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999 standard, the scale model and its sampling location were geometrically similar to the actual stack, and the Reynolds numbers for both the actual and model stacks were >10,000. An additional criterion is that the product of the hydraulic diameter and mean velocity (DV) of the full-scale stack must be between 1/6 DV and 6 DV of the scale model stack tests. Verification tests of the LAB stacks were performed during 2019, and in 2023 to provide additional data at flow rates that more closely aligned with the most current expected operating flow rates.

The minimum 1/6 DV value, along with the maximum 6 DV value from the scale model testing, determines the range of conditions for which the full-scale stack may be operated and remain in compliance with the stack verification criterion. The range from the average DV through 6 DV from the scale model tests was used in this analysis to compute the corresponding qualified flow rates. Table S1 lists the operating flow rates along with the average and maximum qualified stack flow rates for each of the LAB facility stacks. For each stack, the operating flow is below the maximum qualified stack flow, which means that the scale model test results are acceptable for stack qualification.

Table S1. LAB Facility Stack Operating and Qualified Flow Rates

	LB-C2	LB-S1	LB-S2
DFLAW Operating Flow (scfm)	35,450	59,380	14,100
Average Qualified Stack Flow (scfm)	5,249	14,376	2,789
Maximum Qualified Stack Flow (scfm)	46,176	102,741	18,019

scfm = standard cubic feet per minute

The remaining criteria for the stack verification to be considered valid involve the flow angle and velocity uniformity results. First, the flow angle at the full-scale stack must be ≤20°. Second, the velocity uniformity at the full-scale stack must be ≤20% coefficient of variance (COV). Finally, the velocity uniformity results for the actual and scale model stack tests must agree within 5% COV. These criteria were met through the full-scale stack tests at the LAB facility. Flow angle results were primarily less than 10°, except for the LB-C2 Fan A results, which were an average of 13.7°; all flow angle results were within the ≤20° criterion. The velocity uniformity results for each test condition averaged between 1.5 and 4.1% COV, which were all within the range of the target percent coefficient of variation values from the scale model tests.

Based on these stack verification test results, the three LAB filtered exhaust stack sampling locations meet the qualification criteria provided in the ANSI/HPS N13.1-1999 standard for all fan operating configurations. This includes single-fan as well as dual-fan operations for LB-C2, each of the dual-fan operating conditions for LB-S1, and each single-fan operating condition for LB-S2. Further changes to the system configuration or operating conditions that are outside the bounds described in this report may require additional tests or analyses to determine compliance with the standard.

Acknowledgments

This effort was performed under the project management of Mike Wentink of Waste Treatment Completion Company (WTCC). We acknowledge support from Ryan Cioli, Bill Jackson, Clarke Respess, Mark Clements, and Greg Pinkerton from WTCC in facilitating Pacific Northwest National Laboratory (PNNL) staff in observing the stack tests at the LAB facility. We also acknowledge Zach Harding, Connor Everly, Jacob Rankine, Adam Bender, and Kelly Dorsi from Bison Engineering, Inc., who accommodated PNNL observers during testing.

The quality assurance measures employed to produce this document include oversight and guidance from our quality engineer, David MacPherson, reviews and data entries from Jennifer Yao and retired staff member Carmen Arimescu, reviews from Carolyne Burns and Richard Daniel. Chrissy Charron provided administrative support for this effort. Finally, Cary Counts served as the technical editor for this document.

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Acronyms and Abbreviations

% COV	percent coefficient of variation
Bison	Bison Engineering, Inc.
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
DFLAW	direct-feed low activity waste
DOE	U.S. Department of Energy
DV	product of the hydraulic diameter and the mean velocity
EPA	Environmental Protection Agency
HLW	high-level waste
HPS	Health Physics Society
LAB	WTP Laboratory
LB-C2	WTP laboratory zone C2V ventilation system exhaust stack
LB-S1	WTP laboratory zone C3V ventilation system exhaust stack
LB-S2	WTP laboratory zone C5V ventilation system exhaust stack
M&TE	measuring and test equipment
PNNL	Pacific Northwest National Laboratory
QA	quality assurance
scfm	standard cubic feet per minute, an air volume flow unit at standard air density (standard conditions used here are 68°F and 14.7 psia)
sfpm	standard feet per minute, an air velocity unit at standard air density (standard conditions used here are 68°F and 14.7 psia)
WTCC	Waste Treatment Closure Company LLC
WTP	Hanford Tank Waste Treatment and Immobilization Plant
WTPSP	Waste Treatment Plant Support Project

Contents

Figures

Tables

1.0 Introduction

Stack verification tests were performed by a Waste Treatment Completion Company (WTCC) contractor at the exhaust stack monitoring locations of each of the Hanford Tank Waste Treatment and Immobilization Plant (WTP) laboratory facility (LAB) stacks to evaluate whether they meet applicable regulatory criteria (i.e., Washington Administrative Code, Chapter 246-247) governing effluent monitoring systems.

Emissions from the LAB facility air exhaust stacks are expected to remain below the 0.1-millirem per year threshold limit given in Title 40 of the Code of Federal Regulations (CFR), Part 61, National Emissions Standards for Hazardous Air Pollutants, Subpart H, National Emissions Standard for Emissions of Radionuclides Other than Radon from Department of Energy Facilities, during the first year of stack operations. The rule requires that a sampling probe be located in the exhaust stack according to criteria established by the American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stack and Ducts of Nuclear Facilities. Compliance with the standard is demonstrated through a series of tests as described in the standard. This standard allows, under certain conditions, for results from previously tested stacks to be used instead of a full series of tests. For the LAB stacks, existing scale model test results were used, and verification tests were performed on the full-scale stack.

While a contractor to WTCC performed the verification tests, Pacific Northwest National Laboratory (PNNL) staff provided guidance for the tests, performed data reduction following the tests, and produced this report to provide an assessment of the compliance of the stack sampling locations. PNNL had performed the scale model tests that served as the basis for these full-scale stack verification tests. This prior involvement put PNNL in a unique position to provide the data reduction rigor and process insight to evaluate these stack verification results. This document provides stack flow information, details of the stack qualification criteria, and a review of the scale model tests. Section 2.0 describes the verification test methods, while Section 3.0 describes the results of these tests.

The three LAB facility stacks exhaust air from general building ventilation and laboratory spaces. Stack LB-C2 ventilates non-process (C2) areas; stack LB-S1 ventilates hoods, shops, and maintenance (C3) areas; and stack LB-S2 ventilates hot cells and glovebox (C5) areas. Table 1 provides information about each of the LAB facility stack operations. The ventilation system for stacks LB-S1 and LB-S2 have an extra fan available on standby for back-up or maintenance needs. Stack LB-C2 uses both fans under normal operations. The latest design flow rates for the high-level waste (HLW) and direct-feed low activity waste (DFLAW) configurations for WTP are listed in Table 1. These values have changed relative to the initial PNNL Test Input Document (Peterson 2019) and the scale model stack test reports (Glissmeyer, Flaherty, and Piepel 2011, Glissmeyer and Geeting 2013). The impacts of these changes will be described in subsequent sections of this document. Velocity and flow values presented in this document use standard units, and standard conditions used is 68°F and 14.7 psia.

Table 1. LAB Facility Stack Design Parameters as of February 2018

Stack Parameter	LB-C2	LB-S1	LB-S2
Discharge diameter (in.)	48	60	28
Duct diameter at sampling probes (in.)	48	60	28
Number of duct diameters from sampling probes to upstream disturbance[a]	14.0	10.2	24.4
Total available fans	2	3	2
Number of operating fans	2[b]	2	1
HLW configuration design flow rates (standard cubic feet per second [scfm])[c]	35,450	71,080	14,100
DFLAW configuration design flow rates (scfm)[c]	35,450	59,380	14,100

a. Based on as-built drawings.
b. Prior stack configurations indicated that one fan will be operating, while one would be in standby for the LB-C2 stack. WTCC states that normal operation now uses both fans; however, single-fan operations is expected to occur infrequently.
c. Dwg No 24590-LAB-M8-SDJ-00001, Rev 5. LB-S1 DFLAW flow rate is based on best estimate from de-rated C3 fans and 40 hoods.

1.1 Qualification Criteria

The qualification criteria for an air monitoring probe location are taken from ANSI/HPS N13.1-1999 and are paraphrased as follows:

1. *Angular Flow* – Sampling nozzles usually are aligned with the axis of the stack. If the air travels up the stack in cyclonic fashion, the air velocity vector approaching a sampling nozzle could be sufficiently misaligned with the nozzle to impair extraction of particles. The average of the flow angle measurements, made at the several discrete points in the duct cross section at the position of the sampling nozzle, should not exceed 20° relative to the sampling nozzle axis.
2. *Velocity Uniformity* – The air velocity must be uniform across the stack cross section where the sample is extracted. The air velocity is measured at the same grid of points as the flow angle measurements. Uniformity is expressed as the variability of the measurements about the mean. This is expressed using the percent coefficient of variation (% COV),[1] which is the standard deviation divided by the mean and expressed as a percentage. The lower the % COV value, the more uniform the velocity. The acceptance criterion is that the air velocity must be ≤20% COV in the center two-thirds of the duct cross section at the sampling probe location.
3. *Gaseous Tracer Uniformity* – A uniform contaminant concentration in the sampling plane enables the extraction of samples that represent the true concentration within the duct. The uniformity of the concentration is first tested using a tracer gas to represent gaseous effluents. The fan is a good mixer, so injecting the tracer downstream of the fan provides worst-case results. The qualification criteria are that 1) the measured tracer gas concentration is ≤20% COV across the center two-thirds of the duct cross section at the sampling location and 2) the concentrations at any of the measurement points cannot deviate from the mean by >30%.

[1] *Coefficient of variation* also is known as *percent relative standard deviation*. ANSI/HPS N13.1-1999 uses the term *coefficient of variation* so that term is used in this report.

4. *Particulate Tracer Uniformity* – The second set of tests addressing contaminant concentration uniformity at the sampling position uses tracer particles large enough to exhibit inertial effects. Tracer particles of 10-µm aerodynamic diameter are used by default unless it is known that larger contaminant particles will be present in the airstream. The acceptance criterion is that the particle concentration is ≤20% COV across the center two-thirds of the duct at the sampling location.

Tests to determine if Criteria 1 through 4 are met have been conducted on scale models of the exhaust ductwork and stacks from the fans to the planned position of the sampling probes. Scale model test results are documented in Glissmeyer, Flaherty, and Piepel (2011) and Glissmeyer and Geeting (2013). The ANSI/HPS N13.1-1999 standard sets additional acceptance criteria for the use of a scale model (or another, similar stack) as a substitute for the actual stack. The criteria for the use of substitute stacks are:

- The scale model and its sampling location must be geometrically similar to the actual stack.
- The product of the hydraulic diameter and the mean velocity (DV) for the candidate stack is within a factor of six of that of the tested stack, and the hydraulic diameter of the stack is at least 250 mm at the sampling location. For clarity, the DV requirement can be expressed as follows: 1/6 DV of scale model stack ≤DV of full scale stack ≤6 DV of scale model stack
- The Reynolds number for the actual and model stacks must be >10,000.

Finally, the scale model results are considered valid if measurements on the full-scale stack show:

- The flow angle criterion (with a mean value ≤20°) is met.
- The velocity uniformity criterion (with ≤20% COV) is met.
- The velocity uniformity results for the actual and model stacks agree within 5% COV.

1.2 Scale Model Tests

Scale model tests have been performed at PNNL using primarily 12-in. diameter ducting to represent each of the LAB stacks. Glissmeyer, Flaherty, and Piepel (2011) and Glissmeyer and Geeting (2013) report on the complete set of tests that were performed using the scale model stacks. This includes tests of flow angle, velocity uniformity, gaseous tracer uniformity, and particulate tracer uniformity. Tests were performed for a range of conditions, including different combinations of fans and flow rates to account for the range of operating conditions that were reported by WTCC at the time of the scale model tests. The test matrices for the scale model tests were designed to provide information concerning the well-mixed nature of the sampling location for each stack. That is, different stack operating condition attributes were varied with different fixed operating conditions so that, in total, the full range of conditions were considered. For example, while three port locations may have been tested, each port location may not have been tested with every fan condition or operating flow rate. The resultant data across all test conditions were therefore often used in aggregate to confirm that the stack location is qualified for well-mixed sampling and monitoring.

Table 2 presents a summary of the duct diameter and range of velocity values measured during the velocity uniformity tests performed with the LAB scale model stacks. For consistency with the stack data sheets for these stacks, as well as with the verification test results, the velocity values are presented in standard units, where the standard temperature is 68°F.

Table 2. Summary of the Acceptable Ranges of Diameter x Velocity Products from LAB Scale Model Stacks

Stack	Diameter (in.)	Velocity Range (sfpm)[a]	Average DV (ft^2/min)	Maximum 6 DV (ft^2/min)
LB-C2	12	1,165–2,450	1,671	14,698
LB-S1	12	2,592–4,360	3,661	26,163
LB-S2	12	982–1,639	1,522	9,833

a. The velocity measurement is standard feet per minute (sfpm). These are ranges of velocities from velocity uniformity tests on the scale model stack. Because the stack diameter is 1 ft, this column is equivalent to the DV.

The full range of acceptable DV values for the full-scale stack qualification is 1/6 DV through 6 DV; the average DV through 6 DV was used in this analysis. Because the scale model stack diameter is 1 ft, the velocity value is equal to the DV value, and the values in the average DV column of Table 2 are the average of the velocity values.

1.3 Quality Assurance

Work performed by PNNL staff documented in this report was performed in accordance with the Waste Treatment Plant Support Program (WTPSP) Quality Assurance Plan and associated procedures. The WTPSP implements the requirements of ASME NQA-1-2000, Quality Assurance Requirements for Nuclear Facility Applications, graded on the approach presented in NQA-1-2000, Subpart 4.2, Guidance on Graded Application of Quality Assurance (QA) for Nuclear-Related Research and Development.

The WTPSP works in conjunction with PNNL's laboratory-level Quality Management Program, which is based upon the requirements as defined in U.S. Department of Energy (DOE) Order 414.1D, Quality Assurance, and 10 CFR 830, Nuclear Safety Management, Subpart A, Quality Assurance Requirements. PNNL implements these requirements with a graded approach using the consensus standard ASME NQA-1-2000, Quality Assurance Requirements for Nuclear Facility Applications, graded on the approach presented in NQA-1-2000, Subpart 4.2, Guidance on Graded Application of Quality Assurance (QA) for Nuclear-Related Research and Development.

The WTPSP QA Plan describes the technology life-cycle stages, which include the progression of technology development, commercialization, and retirement in process phases of basic and applied research and development, engineering and production, and operation until process completion. The work described in this report has been completed under the QA Technology Level of Development Work.

2.0 Verification Test Methods

Bison Engineering, Inc. (Bison), performed an initial series of tests of the three LAB facility stacks during the week-long period of October 15–19, 2019. The test plan[2] provided the test matrix of stack fan configurations to be used for the tests (see Table 3). Tests in support of 40 CFR 52, Appendix E, were also performed during this test period, which dictated that 14 stack flow tests be performed as an independent measurement for comparison with the stack flow monitor for each of the three stacks.

Table 3. LAB Stack Test Matrix for October 2019 Tests. All tests performed at normal operating flow conditions. The same number of tests were performed for flow angle and velocity uniformity.

Stack	Fan Configuration	Target Flow Rate (scfm)	Number of Flow Angle, Velocity Uniformity Tests
LB-C2	Fan A Only	35,450	5
	Fan B Only		5
	Fans A and B		4
LB-S1	Fans A and B	73,350	5
	Fans B and C		5
	Fans A and C		4
LB-S2	Fan A Only	14,800	7
	Fan B Only		7

Additional LAB stack tests were performed by Bison during two 2023 test periods: April 11-17, 2023, and June 21, 2023. The purpose of these tests was to provide additional data at flow rates that more closely align with the expected operating flow rates as described by the test plan.[3] For the LB-C2 stack, a series of tests was identified to support single-fan operations at 32,000 scfm, which is beyond 6DV of the scale model tests. Single fan tests at 22,000 scfm (which is within 6DV of the scale model tests) and dual-fan tests at 32,000 scfm (which is within 6 DV of scale model dual-fan tests), were planned to evaluate test results against the single-fan tests at 32,000 scfm to determine whether it is valid to conclude that the stack sampling location is insensitive to flow rate and fan configuration. The test matrix for the additional LAB tests performed in 2023 is shown in Table 4.

[2] Bison Engineering Inc. 2019. *Bechtel National, Inc., Laboratory Flow Verification Test Plan: Prevention of Significant Deterioration (PSD) Air Permit: PSD-02-01, Amendment 3. Nonradioactive Air Emissions Notice of Construction Permit, Approval: DE02NWP-002. 2019.* Prepared for Bechtel National, Inc., 2435 Stevens Center Place, Richland, Washington, by Bison Engineering, Inc., 1400 11th Avenue, Helena, Montana. Unpublished test plan.

[3] Bison Engineering Inc. 2023. *Bechtel National, Inc: Hanford Tank Waste Treatment and Immobilization Plant Analytical Laboratory Facility Flow Verification Test Plan.* Prepared for Bechtel National, Inc., 2435 Stevens Center Place, Richland, Washington, by Bison Engineering, Inc., 3143 E Lyndale Ave., Helena, Montana. Unpublished test plan.

Table 4. LAB Stack Test Matrix for 2023 Tests. Tests were performed at flow conditions as indicated. The same number of tests were performed for flow angle and velocity uniformity.

Stack	Fan Configuration	Target Flow Rate (scfm)	Number of Flow Angle, Velocity Uniformity Tests
LB-C2	Fan A Only	22.000	2
	Fan A Only	32,000	2
	Fan B Only	22.000	2
	Fan B Only	32,000	2
	Fans A and B	32,000	2
	Fans A and B	35,450	2
	Fans A and B	42,500	2
LB-S1	Fans A and B	50,000	2
	Fans A and B	59,400	2
	Fans B and C	50,000	2
	Fans B and C	59,400	2
	Fans A and C	50,000	2
	Fans A and C	59,400	2
LB-S2	Fan A Only	8,000	3
	Fan A Only	15,000	3
	Fan B Only	8,000	3
	Fan B Only	15,000	3

Bison followed test measurement practices as guided by Environmental Protection Agency (EPA) Methods 1 and 2 (40 CFR 60, Appendix A) and did not follow a separate Test Instruction or Test Procedure. Flow angle tests were performed with an S-type pitot tube, a digital level, and an oil-filled slant-tube manometer. Velocity uniformity tests were performed with a standard pitot tube and an electronic manometer, along with a desktop weather station for ambient temperature and pressure measurements and a thermocouple for in-stack temperature measurements. Each stack traverse comprised eight discrete measurement points across the diameter of the duct, plus the center point. Two traverses, positioned 90° apart, were used to complete each measurement set. Figure 1 shows one of the three LAB stacks with the two ports for the two traverse measurements.

Figure 1. LAB LB-C2 Stack. In this photograph, each port is covered with a large plate secured by eight bolts. The stack flow meter is visible as the large collection of equipment located slightly left of stack center in this photograph.

For each traverse, the probe (S-type or standard pitot tube) was inserted completely into the stack such that the tip contacted the far wall. It then was backed away from that wall the necessary distance to measure point 1. During tests performed in 2019, triplicate measurements were made at each point before moving to the next point. Method 1 does not specify how measurements should be made and making three measurements at the traverse point is adequate but perhaps not as comprehensive in its coverage of uncertainty as some alternatives. For example, PNNL practice is to perform three separate traverses with one measurement at each point. This allows three opportunities to position the probe tip at the measurement location and captures the variability associated with the measurement position itself. Tests performed by Bison in 2023 used three separate traverses. Because of obstructions in the test area (e.g., railings, ports on neighboring stacks), the pitot tube may not have been longitudinally level during all portions of the test. As a result, measurements in the stack may not have been completely co-planar, but this is not expected to have any substantive impact on the measurement results. During tests performed in 2019, the port cover plate was rotated out of the way of the port opening during each traverse, and a burlap sack, folded several times to be slightly larger than the port opening, was used to cover the opening during measurements. With this configuration, the pitot tube rested along the bottom edge of the port opening, rather than at the centerline of the opening. For tests performed in 2023, the port cover plate was removed completely and a temporary port cover with a small opening (approximately 2 in. diameter, large enough to accommodate the probe) in the center of the temporary port cover was taped to the port flange. With this configuration, the pitot tube was aligned more closely to the centerline of the port opening.

While Bison performed the tests under a subcontract from WTCC, PNNL staff observed most tests to understand how they were executed. In addition to comments about the test process described above, PNNL also noted that test staff did not appear to consistently record the sign (positive or negative) associated with the flow angle value during the 2019 tests. For the 2023 tests, all flow angles recorded were positive numbers. This does not impact the results because the absolute value is used but is listed here to indicate that this may be why many of the flow angle test results from 2019, which are presented in the appendices of this report, often change in sign across the center of the traverse. Figure 2 shows a Bison Engineering, Inc. staff member and WTCC crafts support staff member performing a flow angle test in the LB-C2 stack in 2019.

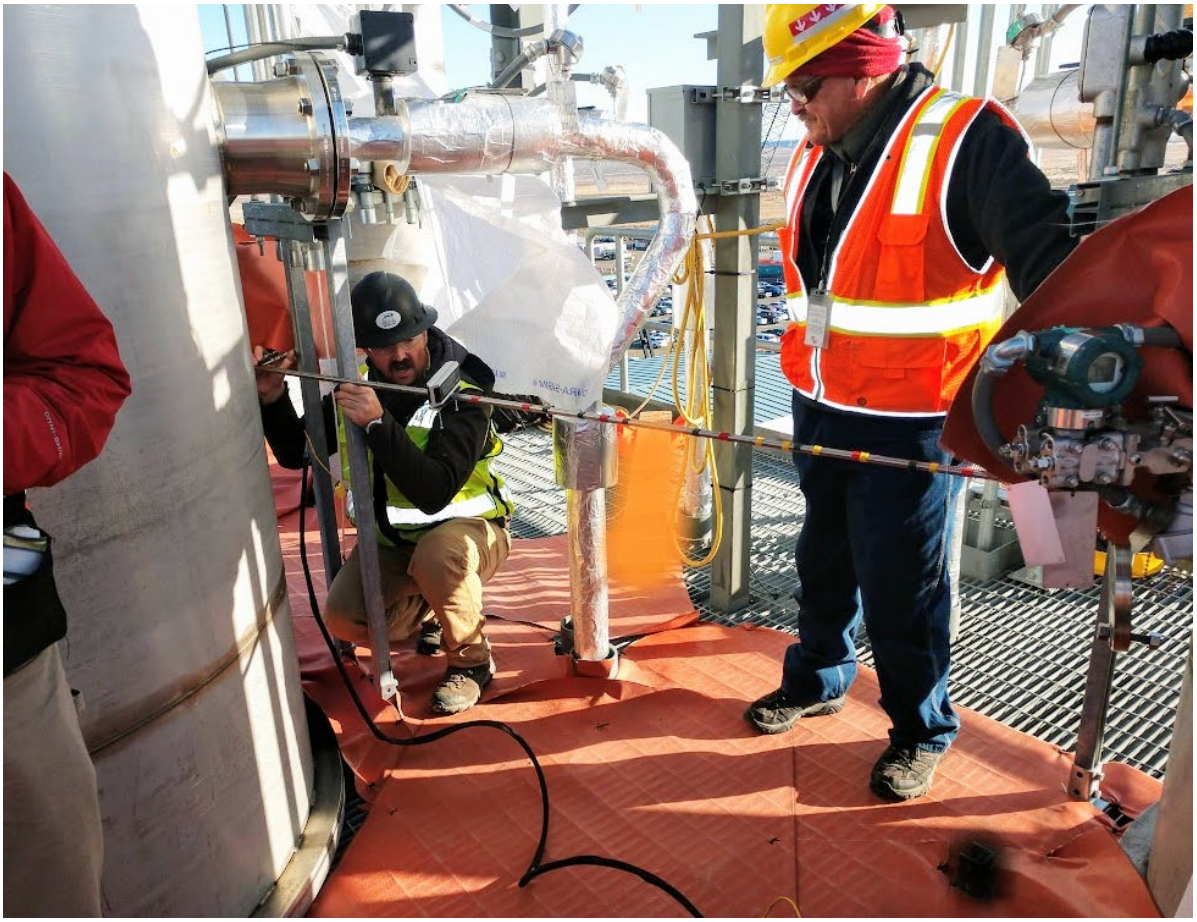


Figure 2. Flow Angle Testing on the LB-C2 Stack, with Probe Maneuvered around the LB-S1 Pitot Support

Finally, we note that equipment used for these tests generally were marked with calibration information. The exception to this is that Bison determined that the slant-tube manometer is calibrated on site, and therefore did not need separate calibration information.

3.0 Verification Test Results

PNNL was directed by WTCC to use data collected by Bison to perform the LAB verification testing data reduction. PNNL staff were observers during most of the testing so that the equipment used, the measurement techniques, and data recording process could be evaluated. PNNL staff also recorded a subset of measurements from each test when observation was performed to provide secondary quality assurance for the data. The QA process at PNNL included following the procedure for qualification of existing data through data corroboration and sponsor-directed use of data. Test Data Packages were developed to document the observation forms completed by PNNL staff, data sheets provided through the Bison report (2022[4]), and data sheets developed through PNNL data entry into controlled Excel worksheets.

Velocity-uniformity measurements collected by Bison were the delta-pressure values, which were then converted to velocity values by Bison to complete the velocity uniformity data sheets. PNNL performed a spot-check of the conversions from delta-pressure to velocity for these velocity uniformity tests. Data in the Bison report then were used as input to PNNL-controlled Excel spreadsheets to eliminate the possibility that unexpected calculation modifications were made in the spreadsheets transmitted to Bison. These spreadsheets then were subject to calculation reviews to document the accuracy of the calculations from both a theoretical and numerical perspective.

As a result, there are some minor differences between the values calculated in the Bison report and the values calculated by PNNL. In one instance, there was a typo in one Bison-produced flow angle sheet, which meant that value was not included in their calculation. Additionally, Bison also provided velocity values to one decimal point in the data sheets, but the value in the cells appear to have more digits (from the conversion from in. H_2O). The PNNL data sheets used the single decimal point values in the subsequent calculations. Appendix A, Appendix B, and Appendix C contain the flow angle and velocity data sheets that were produced by PNNL to support this analysis. Due to errors discovered in the 2019 data after the initial issue of this PNNL report, the use of the original velocity data as the starting point for corrections to the velocity values, and the small differences that exist due to the rounding that results from those velocity data, there are instances where new average velocities or average flow rates differ by less than 0.1% between the Bison and PNNL velocity data sheets from the 2019 dataset.

Appendix D contains a table that summarizes the quality assurance documents that have been produced by PNNL as part of this LAB verification effort.

3.1 LB-C2 (LAB C2V) Verification Tests

Table 5 summarizes the flow angle and velocity uniformity test results from the LB-C2 stack verification tests. The DV values, calculated from the stack nominal diameter and the velocity computed from the EPA Method 1 measurement points is included in Table 5 for reference.

[4] Bison Engineering, Inc. 2022. *Laboratory Facility Flow Verification. 24590-CM-HC4-HX00-00007-01-00003 Rev 00C*. Helena, Montana. Unpublished report.

Table 5. LB-C2 Verification Test Results

Fan Configuration	Test Number	Flow Angle (°)	Velocity Uniformity Test Flow (scfm)	Velocity Uniformity (% COV)	DV (ft^2/min)
Fan A Only	2023-1	2.2	21,757	2.5	6,926
	2023-4	5.0	23,313	1.9	7,421
	2023-2	12.6	32,313	1.4	10,286
	2023-3	15.4	32,401	1.7	10,314
	2019-3	16.6	33,091	3.9	10,532
	2019-4	19.0	33,220	1.9	10,573
	2019-2	18.0	34,083	3.0	10,849
	2019-1	17.1	34,586	2.6	11,010
	2019-14	17.3	35,860	2.4	11,414
Fan B Only	2023-12	3.2	22,954	2.9	7,306
	2023-11	2.5	23,247	3.2	7,400
	2023-14	2.5	31,919	2.3	10,160
	2023-13	3.3	31,993	2.2	10,184
	2019-5	5.8	32,351	2.4	10,298
	2019-6	4.0	32,400	3.5	10,313
	2019-9	5.4	32,828	1.7	10,450
	2019-7	5.2	33,221	2.0	10,573
	2019-8	5.6	33,288	2.0	10,598
Fans A and B	2023-6	3.1	31,586	1.6	10,054
	2023-5	3.6	32,510	1.5	10,348
	2023-8	3.4	35,435	1.9	11,279
	2023-7	3.1	35,489	2.2	11,297
	2019-10	3.1	35,583	1.9	11,327
	2019-11	2.8	35,739	1.8	11,375
	2019-13	2.8	36,254	1.2	11,542
	2019-12	3.6	36,399	1.6	11,588
	2023-10	3.3	42,154	2.3	13,418
	2023-9	2.9	42,421	1.9	13,503

Note that the flow angle and velocity uniformity tests for each numbered test were performed in sequence so the velocity uniformity test flow and DV value is expected to be representative of the flow during the flow angle test as well. All test results meet the criterion of flow angle values ≤20°and velocity uniformity values ≤20% COV.

3.2 LB-S1 (LAB C3V) Verification Tests

Table 6 summarizes the flow angle and velocity uniformity test results from the LB-S1 stack verification tests, along with the DV values. Note that the flow angle and velocity uniformity tests for each numbered test were performed in sequence so the velocity uniformity test flow and DV is expected to be representative of the flow during the flow angle test as well. All test results meet the criterion of flow angle values ≤20° and velocity uniformity values ≤20% COV.

Table 6. LB-S1 Verification Test Results

Fan Configuration	Test Number	Flow Angle (°)	Velocity Uniformity Test Flow (scfm)	Velocity Uniformity (% COV)	DV (ft^2/min)
Fans A and B	2023-6	9.5	49,322	3.5	12,560
	2023-5	9.8	49,817	3.5	12,686
	2023-8	9.3	57,562	3.8	14,658
	2023-7	9.0	57,579	4.5	14,662
	2019-4	9.4	73,703	2.8	18,766
	2019-3	9.3	75,051	2.2	19,114
	2019-1	10.4	75,260	2.1	19,165
	2019-2	9.6	75,737	2.0	19,288
	2019-14	9.5	77,346	1.8	19,695
Fans B and C	2023-10	3.2	49,404	2.3	12,581
	2023-9	3.1	49,647	2.8	12,642
	2023-12	3.7	59,071	2.6	15,042
	2023-11	3.5	59,458	2.5	15,141
	2019-6	4.4	72,732	2.4	18,519
	2019-9	4.8	72,898	1.8	18,561
	2019-5	5.4	72,988	2.7	18,587
	2019-7	4.9	73,375	1.5	18,687
	2019-8	5.4	73,691	1.8	18,766
Fans A and C	2023-2	3.7	50,790	2.7	12,934
	2023-1	3.7	51,707	2.2	13,167
	2023-3	1.6	58,520	2.5	14,902
	2023-4	2.7	59,315	1.6	15,104
	2019-11	3.6	74,771	1.3	19,040
	2019-10	2.1	75,035	2.0	19,109
	2019-13	1.3	75,817	1.5	19,307
	2019-12	3.3	76,678	1.6	19,526

3.3 LB-S2 (LAB C5V) Verification Tests

Table 7 summarizes the flow angle and velocity uniformity test results from the LB-S2 stack verification tests, along with the DV values. Note that the flow angle and velocity uniformity tests for each numbered test were performed in sequence so the velocity uniformity test flow and DV is expected to be representative of the flow during the flow angle test as well. All test results meet the criterion of flow angle values ≤20° and velocity uniformity values ≤20% COV.

Table 7. LB-S2 Verification Test Results

Fan Configuration	Test Number	Flow Angle (°)	Velocity Uniformity Test Flow (scfm)	Velocity Uniformity (% COV)	DV (ft^2/min)
Fan A	2023-1	3.6	10,223	3.0	5,578
	2023-3	4.1	10,230	3.9	5,582
	2023-2	3.2	10,383	3.1	5,666
	2023-4	4.6	14,861	3.2	8,109
	2023-5	3.9	14,902	3.4	8,131
	2023-6	4.2	14,974	3.5	8,171
	2019-6	2.8	16,544	3.3	9,027
	2019-5	3.3	16,600	3.4	9,059
	2019-7	2.6	16,648	3.4	9,085
	2019-3	2.9	16,747	3.9	9,139
	2019-4	2.7	16,780	3.5	9,157
	2019-1	2.2	16,820	3.8	9,178
	2019-2	2.6	16,914	3.4	9,229
Fan B	2023-9	4.1	10,365	3.5	5,656
	2023-8	4.6	10,406	3.2	5,678
	2023-7	4.6	10,410	3.3	5,680
	2023-11	4.0	14,822	3.7	8,088
	2023-12	3.9	14,872	2.9	8,115
	2023-10	4.0	14,954	3.2	8,160
	2019-10	3.7	17,105	2.7	9,333
	2019-14	3.9	17,161	3.4	9,364
	2019-11	3.3	17,210	4.0	9,392
	2019-8	4.2	17,335	3.3	9,459
	2019-9	3.5	17,404	3.2	9,496
	2019-12	3.7	17,440	3.0	9,518
	2019-13	3.7	17,453	3.0	9,523

4.0 Comparisons of Verification Test and Scale Model Test Results

While the stack verification test results demonstrate that both the flow angle and velocity uniformity values are acceptable compared with the qualification criteria, the velocity uniformity values must be compared with the scale model test results to accept the full suite of stack qualification test results from the scale model tests. Table 8 presents a summary of the normal operating velocities for each stack, along with the corresponding DV values. Additionally, Table 8 includes the scale model DVs and 6 DV range, which provides the upper limit of the full-scale stack DV values for which the surrogate stack may be used to represent the full-scale stack.

Table 8. Calculation of Acceptable DV Ranges

Stack	Stack Diameter (in.)	Stack Data Sheet		Bison Test Condition		Scale Model	
		DFLAW Operating Velocity[a] (sfpm)	DV (ft^2/min)	Test Velocity[b] (sfpm)	DV (ft^2/min)	DV (ft^2/min)	6 DV (ft^2/min)
LB-C2	48	2,821	11,284	1,734–3,378	6,926–13,503	1,165–2,450	6,992–14,698
LB-S1	60	3,024	15,121	2,514–3,939	12,560–19,695	2,592–4,360	15,553–26,163
LB-S2	28	3,297	7,694	2,392–4,081	5,578–9,523	982–1,639	5,894–9,833

a. Velocity for LB-C2 and LB-S2 based on DFLAW design flow from dwg no 24590-LAB-M8-SDJ-00001, Rev 5. LB-S1 based best estimate from de-rated C3 fans and 40 hoods.
b. Velocity range from the average velocities measured during velocity uniformity tests performed by Bison.

Note that there were some differences between the Bison test conditions and the stack design conditions during the 2019 tests. The Bison 2019 test conditions were performed under normal operating flow conditions according to the operators at the time of the tests. The Bison test velocity exceeded the velocity of the LB-S1 DFLAW design velocity (3024 sfpm) and exceeded the LB-S2 DFLAW design velocity (3297 sfpm). Bison 2023 test conditions were varied as described in Section 2.0. The range of velocity and DV values over all of the Bison test conditions is listed in Table 8. Note that the verification of each scale model data point is not required to qualify the sampling location for specific operating configurations or conditions. As noted in Section 1.2, the scale model tests are used to confirm the overall range of conditions for which the stack location is qualified.

Figure 3 graphically presents the DV data from Table 8. The total range of scale model DV and 6DV values, along with the average of each set (open square and circle for DV and 6DV, respectively) is shown along with the individual 6DV values from the scale model tests (dark blue filled circles). (The individual DV values are not shown due to the smaller range on the figure.) The individual verification test DV values from the 2019 measurements also are presented separately from the 2023 values in Figure 3. A sub-set of LB-C2 tests in 2023 were performed at DV values comparable to the tests performed in 2019, but additional tests were performed at lower and higher DV values. LB-S1 and LB-S2 verification tests in 2023 were performed at two sets of lower DV values compared with the 2019 tests.

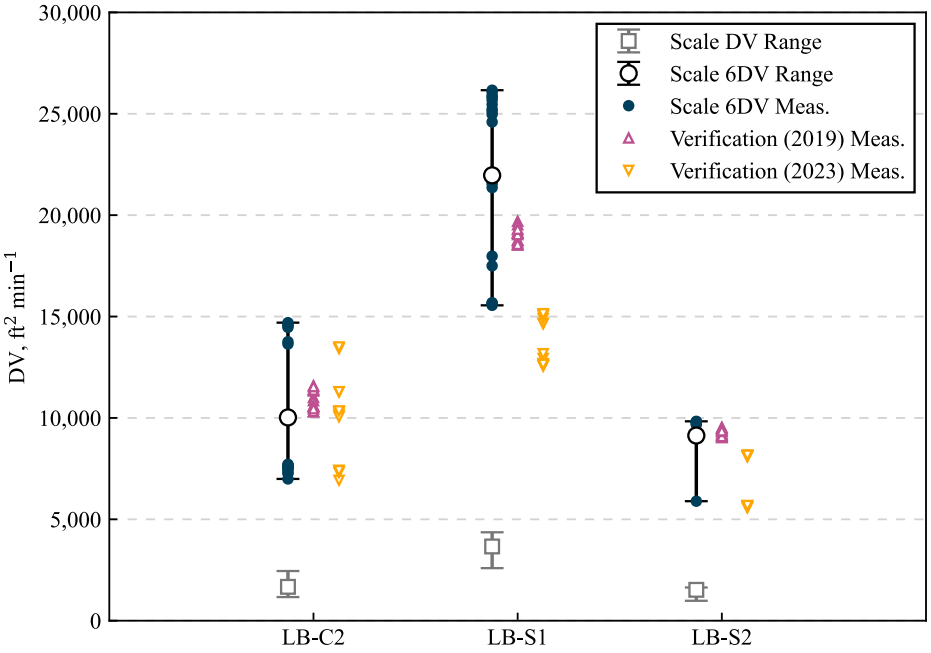


Figure 3. Scale Model DV to 6 DV Ranges and Stack Verification DV Results

4.1 LB-C2 (LAB C2V) Qualification

The LB-C2 stack qualification tests were performed on a scale model of the stack constructed at a PNNL outdoor facility, and the results were reported in Glissmeyer, Flaherty, and Piepel (2011) (document number PNNL-20154, WTP-RPT-209). At the time of these tests, the design flow rate for the stack was 35,450 scfm, with a maximum flow of 40,400 scfm. The latest design flow rate for this stack (24590-LAB-M8-SDJ-00001, Rev 5) is 35,450 scfm for both the HLW and DFLAW configurations. Scale model tests with this stack were performed with each fan individually, as well as with both fans operating.

The single-fan cases shown in Table 9 were performed only for minimum flow conditions; therefore, the 6 DV values from the scale model tests were below both the stack data sheet and most of the Bison test condition DV values shown in Table 8. However, the test results (% COV) for the single-fan and dual-fan tests are similar, suggesting that the stack sampling location well-mixed condition is independent of flow rate and fan configuration. The velocity uniformity results from the verification tests were less than 4% COV during Fan A operations, and less than or equal to 3.5% COV during Fan B operations, which are both within the range of the target values for these single-fan conditions.

Table 9 also lists results from the scale model stack tests with both fans operating simultaneously. These tests were performed with the then-maximum flow condition, and as a result, the DV values from both the stack data sheet and Bison test conditions were within the range of 1/6 to 6 DV of the scale model stack tests. The average velocity uniformity from the scale model tests with both fans in operation was 3.5% COV, which means that full-scale verification test results with a velocity uniformity value of less than or equal to 8.5% COV are acceptable. Tests performed by Bison ranged from 1.2 to 2.3% COV, which meets the criterion.

Table 9. Summary of LB-C2 Scale Model Velocity Uniformity Tests. Adapted from Table 4.2 of Glissmeyer, Flaherty, and Piepel (2011).

Operating Fan(s)	Test Port	Flow Condition[a]	Test Number	Velocity (sfpm)[b]	6 DV[c] (ft^2/min)	% COV	Average % COV	Target % COV
A	1	Min	VT-11	1245	7,472[B]	4.6	4.3	≤9.3
		Min	VT-7	1262	7,571[B]	4.2		
		Min	VT-9	1273	7,640[B]	4.1		
	2	Min	VT-8	1286	7,715[B]	3.6	3.6	≤8.6
	3	Min	VT-10	1280	7,680[B]	1.3	1.3	≤6.3
B	1	Min	VT-12	1210	7,259[B]	1.9	1.9	≤6.9
	2	Min	VT-13	1249	7,496[B]	2.4	2.4	≤7.4
	3	Min	VT-16	1165	6,992[B]	1.9	2.0	≤7.0
		Min	VT-15	1219	7,317[B]	2.5		
		Min	VT-14	1257	7,541[B]	1.6		
A and B	1	Max	VT-2	2450	14,698[D/B]	3.4	3.4	≤8.4
	2	Max	VT-3	2274	13,645[D/B]	3.1	3.5	≤8.5
		Max	VT-17	2293	13,760[D/B]	4.2		
		Max	VT-5	2411	14,465[D/B]	3.3		
		Max	VT-6	2427	14,563[D/B]	3.2		
	3	Max	VT-4	2430	14,582[D/B]	2.0	2.0	≤7.0

a. Minimum or Maximum flow condition labeling is based on the data provided at the time of the scale model tests and may not reflect current minimum or maximum design flow rates.
b. Velocity values previously reported in units of actual feet per minute were converted to sfpm using 68°F as the standard temperature.
c. Superscripts in this column denote whether the listed DV value meets the criterion of exceeding the DV for the design flow rate (D), the Bison test conditions (B), or both (D/B). Design flow rate and Bison test condition DV values are presented in Table 8.

Scale model tests of gaseous and particulate tracer uniformity were performed at conditions like the velocity uniformity tests. Single fan operations were at minimum conditions, while dual-fan operations were at maximum conditions.

4.2 LB-S1 (LAB C3V) Qualification

The LB-S1 stack qualification tests were performed on a scale model of the stack constructed at a PNNL outdoor facility, and the results were reported in Glissmeyer and Geeting (2013) (document number PNNL-22167, WTP-RPT-227). At the time of these tests, the design flow rate for the stack was 74,150 actual cubic feet per minute,[5] with a maximum flow of 88,800 actual cubic feet per minute. The latest design flow rate for this stack (24590-LAB-M8-SDJ-00001, Rev 5) is 71,080 scfm and 59,380 scfm for the HLW and DFLAW configurations, respectively. Scale model tests with this stack were performed with three combinations of two-fan operations.

[5] Actual cubic feet per minute is air volume flow unit at actual conditions.

Table 10 presents the results of tests performed with all three fan combinations of two-fan operations: A and B, A and C, and B and C. Fans A and B were tested for then-minimum, then-normal, and then-maximum flow conditions, while Fans A and C and Fans B and C were tested at only then-minimum and then-maximum flow conditions.

Table 10. Summary of LB-S1 Scale Model Velocity Uniformity Tests

Operating Fan(s)	Test Port	Flow Condition[a]	Test Number	Velocity (sfpm)	6 DV[b] (ft^2/min)	% COV	Average % COV	Target % COV
A and B	1	Max	VT-1	4,315	25,888$^{D/B}$	5.9	5.4	0.4 ≤ x ≤ 10.4
		Max	VT-2	4,360	26,163$^{D/B}$	7.6		
		Max	VT-3	4,186	25,117$^{D/B}$	5.2		
		Max	VT-4	4,244	25,463$^{D/B}$	5.6		
		Max	VT-19	4,304	25,822$^{D/B}$	4.0		
		Max	VT-20	4,281	25,685$^{D/B}$	4.3		
A and B	1	Norm	VT-5	3,609	21,656$^{D/B}$	3.9	3.9	≤8.9
		Norm	VT-6	3,619	21,716$^{D/B}$	3.4		
		Norm	VT-7	3,591	21,548$^{D/B}$	4.2		
		Norm	VT-8	3,560	21,357$^{D/B}$	4.2		
A and B	1	Min	VT-9	2,592	15,553$^{D/B}$	3.5	3.3	≤8.3
		Min	VT-10	2,614	15,685$^{D/B}$	3.3		
		Min	VT-11	2,609	15,655$^{D/B}$	3.3		
		Min	VT-12	2,606	15,637$^{D/B}$	3.1		
A and C	1	Max	VT-13	4,162	24,973$^{D/B}$	7.2	7.3	2.3 ≤ x ≤ 12.3
		Max	VT-14	4,099	24,597$^{D/B}$	7.4		
		Min	VT-15	2,917	17,502$^{D/B}$	6.4	6.4	1.4 ≤ x ≤ 11.4
B and C	1	Max	VT-16	4,206	25,236$^{D/B}$	3.4	3.7	≤8.7
		Max	VT-17	4,345	26,067$^{D/B}$	4.0		
		Min	VT-18	2,997	17,980^{D}	3.4	3.4	≤8.4

a. Minimum, Normal, or Maximum flow condition labeling is based on 83%, 100%, or 115%, respectively, of the normal stack flow data provided at the time of the scale model tests, which may not reflect current design flow rates.
b. Superscripts in this column denote whether the listed DV value meets the criterion of exceeding the DV for the design flow rate (D), the Bison test conditions (B), or both (D/B). Design flow rate and Bison test condition DV values are presented in Table 8.

The minimum flow conditions that were tested with the scale model results in a 6 DV value that is below the DV value of the 2019 Bison test condition flow rates but above the 2023 Bison test conditions. The average velocity uniformity from the scale model tests for the various fan combinations at normal or maximum flow conditions was nominally between 3.7 and 7.3% COV. This means that, to be conservative, full-scale verification test results with a velocity uniformity value of less than or equal to 8.7% COV (3.7% COV + 5%, as shown in the Target % COV column of Table 10) are acceptable. Tests performed by Bison ranged from 1.3 to 4.5% COV, which meets the criterion.

4.3 LB-S2 (LAB C5V) Qualification

The LB-S2 stack qualification tests were performed on a scale model of the stack constructed at a PNNL outdoor facility, and the results were reported in Glissmeyer, Flaherty, and Piepel (2011) (document number PNNL-20154, WTP-RPT-209). At the time of these tests, the design flow rate for the stack was 14,800 scfm, with a maximum flow of 17,020 scfm, which was an assumed value based on 115% of the normal flow rate. The latest design flow rate for this stack (24590-LAB-M8-SDJ-00001, Rev 5) is 14,100 scfm for both the HLW and DFLAW configurations. The differences between the scale model stack conditions and the new design flow conditions are small, and the DV value from the design flow and the DV values from the Bison test conditions are generally within the DV range from the scale model stack tests.

Table 11 presents the results of tests performed with each fan at the then-maximum flow conditions. The average velocity uniformity from the scale model tests with either Fan A or Fan B in operation was nominally 5% COV. This means that full-scale verification test results with a velocity uniformity value of less than or equal to approximately 10% COV are acceptable. Tests performed by Bison ranged from 2.7 to 4.0% COV, which meets the criterion.

Table 11. Summary of LB-S2 Scale Model Velocity Uniformity Tests

Operating Fan(s)	Test Port	Flow Condition[a]	Test Number	Velocity (sfpm)	6 DV[b] (ft^2/min)	% COV	Average % COV	Target % COV
A	2	Max	VT-2	1,533	9,199$^{D/B}$	5.2	4.8	≤9.8
		Max	VT-8	1,525	9,151$^{D/B}$	4.3		
B	1	Max	VT-6	1,612	9,671$^{D/B}$	6.6	6.1	1.1 ≤ x ≤ 11.1
		Min	VT-9	982	5,894^{B}	5.5		
	3	Max	VT-7	1,626	9,755$^{D/B}$	4.5	4.5	≤9.5
	2	Max	VT-3	1,636	9,815$^{D/B}$	5.4	5.4	0.4 ≤ x ≤ 10.4
		Max	VT-4	1,639	9,833$^{D/B}$	5.3		
		Max	VT-5	1,623	9,737$^{D/B}$	5.6		

a. Maximum flow condition labeling is based on 115% of the normal stack flow data provided at the time of the scale model tests, which may not reflect current design flow rates.
b. Superscripts in this column denote whether the listed DV value meets the criterion of exceeding the DV for the design flow rate (D), the Bison test conditions (B), or both (D/B). Design flow rate and Bison test condition DV values are presented in Table 8.

5.0 Summary/Discussion

The WTP LAB exhaust stack sampling and monitoring locations were qualified using scale model stacks to mitigate the risk of identifying that sampling locations do not meet the qualification criteria on the full-scale stack. As required by the ANSI/HPS N13.1-1999 standard, the scale model and its sampling locations were geometrically similar to the actual stack, and the Reynolds numbers for both the actual and model stacks were >10,000. Table 12 summarizes the stack design conditions, including the duct diameter, the distance to the nearest upstream disturbance, operating fans, and design flow rates.

Table 12. LAB Stack Design Summary

Stack Parameter	LB-C2	LB-S1	LB-S2
Duct diameter at sampling probe (in)	48	60	28
Number of duct diameters from sampling probe to upstream disturbance[a]	14.0	10.2	24.4
Total available fans	2	3	2
Number of operating fans	2[b]	2	1
HLW configuration design flow rate (scfm)[c]	35,450	71,080	14,100
DFLAW configuration design flow rate (scfm)[c]	35,450	59,380	14,100

a. Based on as-built drawings
b. Prior stack configurations indicated that one fan will be operating, while one would be in standby for the LB-C2 stack. WTCC states that normal operation now uses both fans; however, single-fan operation is expected to occur infrequently.
c. Dwg No: 24590-LAB-M8-SDJ-00001, Rev 5. LB-S1 DFLAW flow rate is based on best estimate from de-rated C3 fans and 40 hoods.

An additional criterion for the use of the scale model test results is that the DV of the full-scale stack must be between 1/6 DV and 6 DV of the scale model stack tests. The range from the average DV through 6 DV from the scale model stack tests was used in this analysis. Table 13 summarizes the stack flow conditions from the verification tests (separated by year) along with the range of DV values from the qualification tests and the corresponding velocity and flow rates for the full-scale stacks. Verification tests were performed at normal operating conditions during 2019 and did not specifically address maximum or minimum flows (as was done for the scale model tests). As a result, the average flow rate represents the typical flow rate from the 2019 verification tests. Table 13 lists the range of flow rates and DV values from the 2023 verification tests because those tests were performed at multiple flow conditions. The average and maximum qualified stack flow values are based on the DV values from the scale model tests and do not address other constraints, such as the rated velocity range of the shrouded probe or deposition on the probe. Based on the range of DV values and the corresponding stack flow rate range, the average verification test flow rate was within the acceptable range and the design flow rates (from Table 12) are also within the acceptable range.

Table 13. LAB Stack Sampling/Monitoring Location Verification/Qualification Summary

Stack Parameter	LB-C2	LB-S1	LB-S2
2019 Verification Test Average flow rate (scfm)	34,207	74,649	17,011
2019 Verification Test Average DV (ft^2/min)	10,889	19,009	9,283
2023 Verification Test flow rates (scfm)	21,786–42,450	49,362–59,504	10,230–14,984
2023 Verification Test DVs (ft^2/min)	6,926–13,503	12,560–15,141	5,578–8,171
Average Scale Model DV (ft^2/min)[a]	1,671	3,661	1,522
Maximum Scale Model DV (6DV, ft^2/min)[b]	14,698	26,163	9,833
Average Qualified Stack Velocity (sfpm)	418	732	652
Maximum Qualified Stack Velocity (sfpm)	3,675	5,233	4,214
Average Qualified Stack Flow (scfm)	5,249	14,376	2,789
Maximum Qualified Stack Flow (scfm)	46,176	102,741	18,019

a. Average DV values at the LAB stacks based on DV from scale model tests; also found in Table 2.
b. Maximum DV values at the LAB stacks based on 6 DV from scale model tests; also found in Table 2 and Table 7.

The remaining criteria for the stack verification to be considered valid involve the flow angle and velocity uniformity results. First, the flow angle at the full-scale stack must be ≤20°. Second, the velocity uniformity at the full-scale stack must be ≤20% COV. Finally, the velocity uniformity results for the actual and scale model stack tests must agree within 5% COV. In general, these criteria were met through the full-scale stack tests at the LAB facility, as shown in Table 14.

Table 14 lists the nominal flow rate for each grouping of target flow rate tests, which were listed in Table 3 and Table 4. In some cases, the nominal flow rate differs slightly from the intended target flow rate. For example, the higher flow for the LB-S1 tests in 2023 were meant to be 59,400 scfm; however, for the Fan A and B combination, the test flow rates were nominally 57,500 scfm instead. The main conclusions from the results of executing the test matrix for each stack are described below.

For the LB-C2 stack, the primary objective was to collect data to support single-fan operations. While single-fan operations are expected at 32,000 scfm, this is beyond the 6DV from the scale model tests, so the combined results of single-fan operations at 22,000 scfm and dual-fan operations at 32,000 scfm are used to determine whether the stack well-mixed condition appears to be supported for the 32,000 scfm single-fan operation. Fan A at 22,000 scfm had an average velocity uniformity result of 2.2% COV, while Fan B at 22,000 scfm had an average velocity uniformity result of 3.0% COV. At a higher flow rate of 32,000 scfm, Fan A alone had a 1.5% COV result, while Fan B alone was 2.3% COV. These four results agree within 1.5% COV, which indicates that the velocity uniformity is insensitive to a specific operating fan and flow rate in this range. Fan A and B operating together at 32,000 scfm had a velocity uniformity result of 1.5% COV, which is the same as the Fan A test result at 32,000 scfm, further supporting the conclusion that the velocity uniformity result is insensitive to fan configuration. Each of these results is lower than the target % COV from the scale model tests, and the flow angle from these additional verification tests were less than 20°.

Table 14. LAB Stack Sampling/Monitoring Location Verification/Qualification Test Result Summary

Stack	Operating Fan(s)	Nominal Flow Rate (scfm)[a]	Average Flow Angle (°)	Average Velocity Uniformity (% COV)	Target % COV[b]
LB-C2	A	22,000[2023]	3.6	2.2	≤8.6
	A	32,000[2023]	14.0	1.5	≤8.6
	A	34,000[2019]	17.6	2.8	≤8.6
	B	22,000[2023]	2.8	3.0	≤7.4
	B	32,000[2023]	2.9	2.3	≤7.4
	B	33,000[2019]	5.2	2.3	≤7.4
	A and B	32,000[2023]	3.3	1.5	≤8.5
	A and B	35,450[2023]	3.3	2.0	≤8.5
	A and B	36,000[2019]	3.1	1.6	≤8.5
	A and B	42,500[2023]	3.1	2.1	≤8.5
LB-S1	A and B	50,000[2023]	9.6	3.5	≤8.3
	A and B	57,500[2023]	9.1	4.1	≤8.3
	A and B	75,000[2019]	9.6	2.2	0.4 ≤ x ≤ 10.4
	B and C	50,000[2023]	3.2	2.5	≤8.4
	B and C	59,400[2023]	3.6	2.6	≤8.4
	B and C	73,000[2019]	5.0	2.0	≤8.7
	A and C	50,000[2023]	3.7	2.4	1.4 ≤ x ≤ 11.4
	A and C	59,000[2023]	2.2	2.0	1.4 ≤ x ≤ 11.4
	A and C	75,000[2019]	2.6	1.6	1.4 ≤ x ≤ 11.4
LB-S2	A	10,000[2023]	3.6	3.4	≤9.8
	A	15,000[2023]	4.2	3.4	≤9.8
	A	17,000[2019]	2.7	3.5	≤9.8
	B	10,000[2023]	4.4	3.3	0.4 ≤ x ≤ 10.4
	B	15,000[2023]	3.9	3.3	0.4 ≤ x ≤ 10.4
	B	17,000[2019]	3.7	3.2	0.4 ≤ x ≤ 10.4

a. Superscript indicates the year that the tests were performed.
b. The % COV values are based on the most comparable scale model test conditions.

Flow rates from additional Fan A and B tests for the LB-C2 stack were at 35,450 and 42,500 scfm. These represent the planned operating flow and the upper bound of the stack flow. These results also met the qualification criteria with averaged flow angles of 3.3° or lower and velocity uniformity of 2.1% COV or lower (and within the target % COV). Combined with the test results obtained in 2019, these additional 2023 tests demonstrate that the expected LB-C2 stack conditions (i.e., flow rate and fan configuration) result in a well-mixed stack sampling probe location and meet the qualification criteria in the ANSI/HPS N13.1-1999 standard.

For the LB-S1 stack, the primary objective of the additional tests was to collect data that were more closely aligned with the operating flow rate. In 2019, the flow rates tested were nominally 73,000 to 75,000 scfm. In the DFLAW configuration, the operating flow rate is 59,380 scfm, and may be as low as 50,000 scfm under certain maintenance conditions. The additional tests performed at the lower flow rates in 2023 had comparable results to the test performed in 2019.

Fan A and B had the highest flow angle results and velocity uniformity results among the three fan combinations, with flow angles of ≤9.6°, and velocity uniformity values of ≤4.1% COV. In all cases, the flow angle test results were less than the required 20° by a significant margin, and velocity uniformity results were less than 5% COV and within 5% COV of the most comparable scale model test results.

Finally, the additional 2023 LB-S2 stack tests were performed to collect data that are more closely aligned with the operating flow rate. In 2019, the tested flow rate was nominally 17,000 scfm, which is significantly higher than the operating flow rate of approximately 14,100 scfm. One set of additional tests in 2023 were performed at flow rates of 15,000 scfm to represent an upper range of the normal operating flows. Tests at 8,000 scfm were planned as well, but stack operations at the time of the tests were limited to flow rates greater than 10,000 scfm. The additional data from 2023 were comparable to the data collected in 2019, indicating that the LB-S2 stack sampling location is well-mixed and insensitive to fan configuration or flow rate.

Based on these stack verification test results, the three LAB filtered exhaust stack sampling locations meet the qualification criteria provided in the ANSI/HPS N13.1-1999 standard for all fan operating configurations and the HLW and DFLAW design flow rates. This includes single-fan operation as well as dual-fan operations for LB-C2, each of the dual-fan operating conditions for LB-S1, and each single-fan operating condition for LB-S2. Further changes to the system configuration or operating conditions that are outside the bounds described in this report may require additional tests or analyses to determine compliance with the standard.

6.0 References

10 CFR 830, Subpart A. “Quality Assurance Requirements.” *Code of Federal Regulations*, U.S. Department of Energy.

40 CFR 60, Appendix A, Method 1. “Method 1—Sample and Velocity Traverses for Stationary Sources.” *Code of Federal Regulations,* U.S. Environmental Protection Agency.

40 CFR 61, Subpart H. “National Emission Standard for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities.” *Code of Federal Regulations,* U.S. Environmental Protection Agency.

ANSI/HPS N13.1-1999. *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and ducts of Nuclear Facilities*. American National Standards Institute and the Health Physics Society, McLean, VA (reaffirmed in 2011 as ANSI/HPS N13.1-2011).

Antonio E and JE Flaherty. 2017. *Test Plan: Verification Testing Activities for the Waste Treatment Plant LAB Facility Exhaust Stack Air Monitor Locations*. TP-WTPSP-149, Pacific Northwest National Laboratory, Richland, Washington.

Flaherty JE. 2019. *Verification Testing Activities for the Waste Treatment Plant LAB, LAW and EMF Facility Exhaust Stack Air Monitor Locations*. RP-WTPSP-162 Rev 0, Pacific Northwest National Laboratory, Richland, Washington.

Glissmeyer JA, JE Flaherty, and GF Piepel. 2011. *Assessment of the Group 5-6 (LB-C2, LB-S2, LV-S1) Stack Sampling Probe Locations for Compliance with ANSI/HPS N13.1-1999*. PNNL-20154, WTP-RPT-209 Rev 0., Pacific Northwest National Laboratory, Richland Washington.

Glissmeyer JA and JGH Geeting. 2013. *Assessment of Waste Treatment Plant LAB C3V (LB-S1) Stack Sampling Probe Location for Compliance with ANSI/HPS N13.1-1999*. PNNL-22167, WTP-RPT-227 Rev 0, Pacific Northwest National Laboratory, Richland, Washington.

Peterson R. to C Luchi. September 13, 2017. *Subcontract No. 24590-QL-HC9-WA49-00001, Project No. 53024 (WA#09) Transmittal of Revised LAB Verification Test Input Document*. [Memorandum] WTP/RPP-MOA-PNNL-00970, Rev 0.0, Pacific Northwest National Laboratory, Richland, Washington.

Washington Administrative Code, Chapter 246-247, Radiation Protection – Air Emissions.

Appendix A – LB-C2 Stack Verification Data Sheets

A.1 Flow Angle Data Forms - 2019

FLOW ANGLE DATA FORM

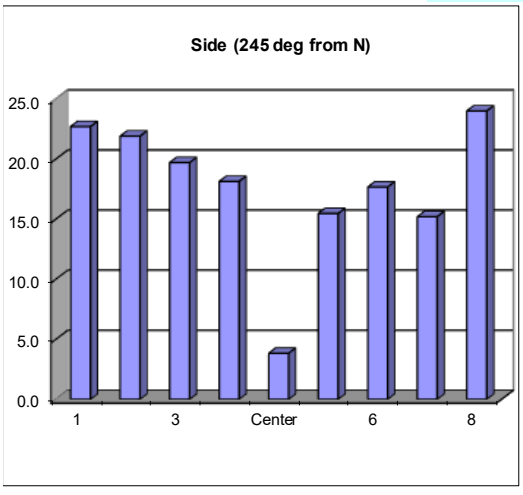
Stack	LB-C2		Run No.	FA-1	
Date	10/15/2019		Fan Setting	N/A	Hz
Start/End Time	11:20	11:50	Fan Configuration	Fan A only	
Testers	ZDH/LCE		Stack Temp	61	deg F
Stack Dia.	48	in			
Stack X-Area	1809.6	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	753	ft	Port	2	
Distance to disturbance	53.3	ft			

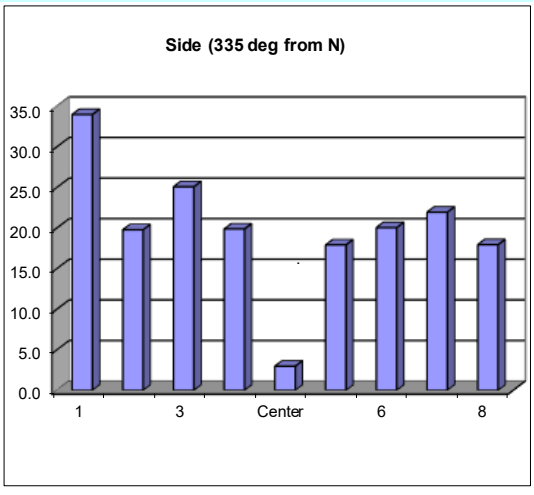
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	24.7	20.1	23.3	22.7	33.3	34.4	34.2	34.0
2	42.96	29.3	18.5	17.9	21.9	20.8	21.6	16.9	19.8
3	38.69	19.7	19.9	19.5	19.7	27.3	23.9	24.0	25.1
4	32.50	22.7	15.6	16.1	18.1	21.7	19.5	18.4	19.9
Center	24.00	5.5	4.3	1.7	3.8	6.6	1.0	1.3	3.0
5	15.50	13.8	16.1	16.5	15.5	16.1	17.7	19.9	17.9
6	9.31	17.3	18.9	16.8	17.7	21.9	22.6	15.6	20.0
7	5.04	14.5	15.3	15.8	15.2	23.8	22.0	20.0	21.9
8	1.54	21.0	25.7	25.3	24.0	17.5	17.8	18.5	17.9
Mean of absolute values:					17.6				19.9
" " w/o points by wall:					16.0				18.2
								Grand mean ABS	18.8
								Grand mean ABS w/o wall pts	17.1

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Did not record the sign of angles for the first run, Starded doing that for run 2.
Approx. air velocity was derived from all points on the Velocity Traverse Forms.





FLOW ANGLE DATA FORM

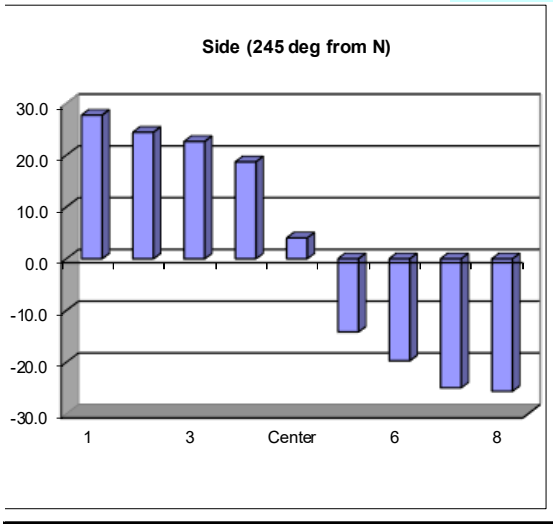
Stack	LB-C2	Run No.	FA-2
Date	10/15/2019	Fan Setting	N/A Hz
Start/End Time	14:57 15:10	Fan Configuration	Fan A only
Testers	ZDH/LCE	Stack Temp	66.6 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

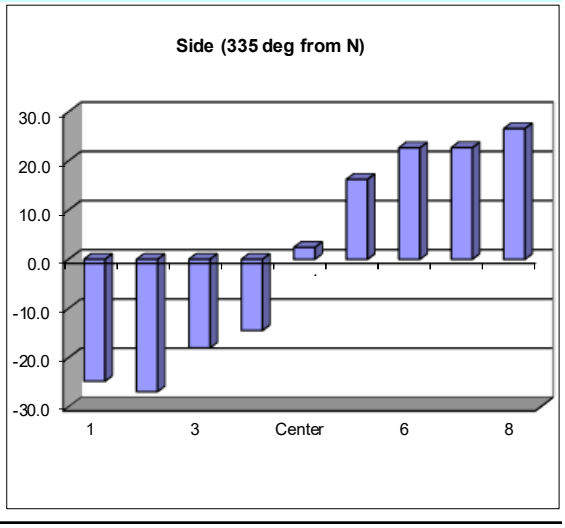
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	28.1	27.7	27.4	27.7	-26.9	-24.3	-23.1	-24.8
2	42.96	25.5	23.0	24.8	24.4	-27.0	-26.8	-26.9	-26.9
3	38.69	21.7	23.4	22.9	22.7	-19.1	-18.2	-16.7	-18.0
4	32.50	20.4	17.7	18.1	18.7	-13.3	-15.1	-15.0	-14.5
Center	24.00	5.8	3.5	2.8	4.0	3.1	2.2	2.0	2.4
5	15.50	-13.8	-14.2	-14.4	-14.1	16.9	16.7	15.1	16.2
6	9.31	-20.0	-19.8	-19.3	-19.7	22.8	23.4	21.8	22.7
7	5.04	-25.3	-24.7	-24.8	-24.9	23.8	23.0	21.3	22.7
8	1.54	-25.8	-24.3	-26.7	-25.6	26.9	26.3	26.5	26.6
Mean of absolute values:					20.2				19.4
" " w/o points by wall:					18.4				17.6
								Grand mean ABS	19.8
								Grand mean ABS w/o wall pts	18.0

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
- Traverse point depth = the distance from inside stack wall to each point.
- Sign on flow angle indicates which direction the pitot was turned to achieve null angle
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- PNNL- Side 1, 2nd traverse, Point 4 entered as 17.7, Bison had "17..7". This changes the Point 4 Mean, the Mean of abolute values & " "w/o points by w all values





FLOW ANGLE DATA FORM

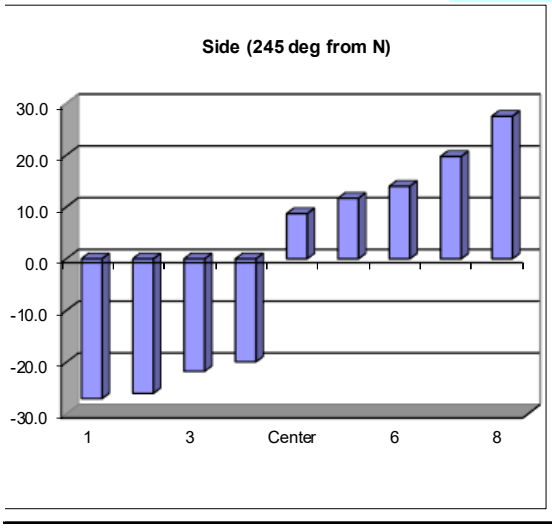
Stack	LB-C2	Run No.	FA-3
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	9:04 9:17	Fan Configuration	Fan A only
Testers	ZDH/LCE	Stack Temp	63.7 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

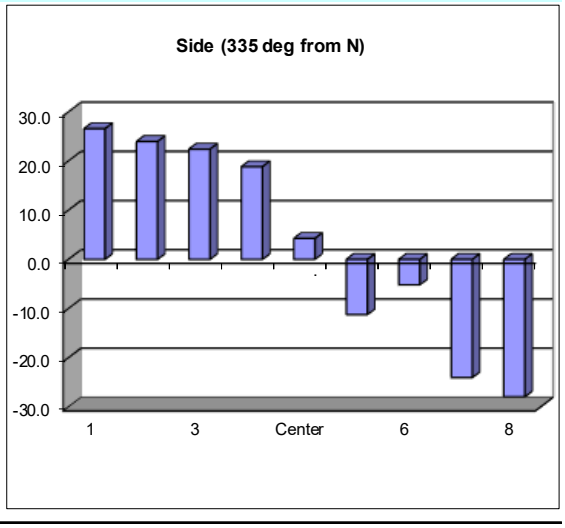
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	-28.6	-26.5	-25.9	-27.0	25.3	26.8	27.6	26.6
2	42.96	-24.2	-27.5	-26.3	-26.0	26.5	22.2	23.2	24.0
3	38.69	-21.8	-21.9	-21.5	-21.7	23.3	22.9	21.0	22.4
4	32.50	-19.7	-19.5	-20.5	-19.9	19.0	18.7	18.8	18.8
Center	24.00	9.5	8.3	8.4	8.7	5.0	3.7	4.1	4.3
5	15.50	11.9	11.5	11.7	11.7	-13.3	-10.3	-10.1	-11.2
6	9.31	13.5	13.6	14.9	14.0	-15.2	-14.7	14.4	-5.2
7	5.04	20.8	18.8	19.7	19.8	-24.1	-24.8	-23.2	-24.0
8	1.54	27.2	27.3	28.1	27.5	-28.9	-27.7	-27.2	-27.9
Mean of absolute values:					19.6				18.3
" " w/o points by wall:					17.4				15.7
								Grand mean ABS	18.9
								Grand mean ABS w/o wall pts	16.6

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

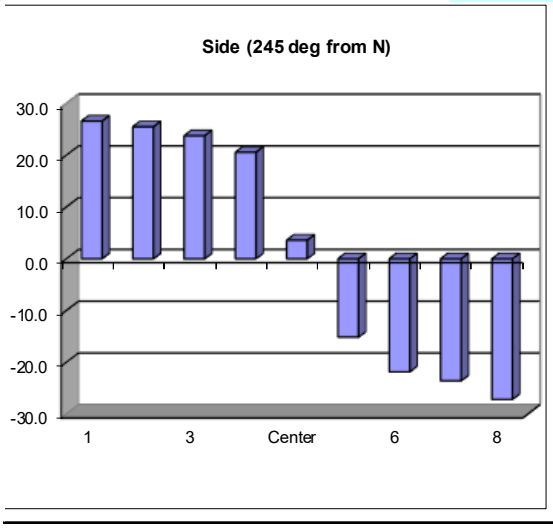
Stack	LB-C2	Run No.	FA-4
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	10:24 10:35	Fan Configuration	Fan A only
Testers	ZDH/LCE	Stack Temp	65.4 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

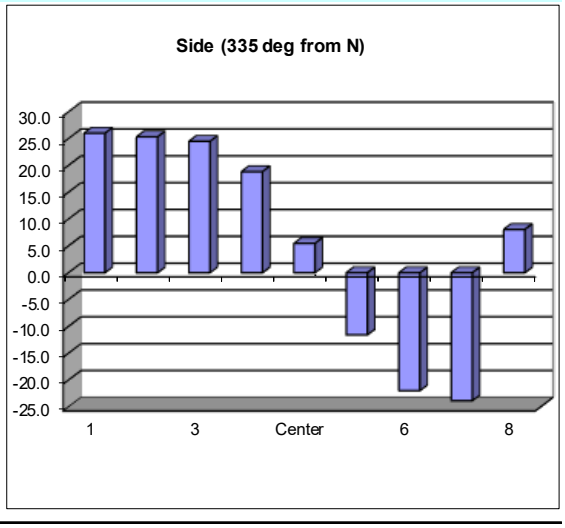
Order -->	First				Second			
Traverse-->	Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 46.46	26.7	26.5	26.6	26.6	26.5	25.7	25.8	26.0
2 / 42.96	25.7	25.9	24.9	25.5	24.8	25.3	25.9	25.3
3 / 38.69	24.7	23.6	23.0	23.8	24.5	24.4	24.6	24.5
4 / 32.50	22.3	20.0	19.4	20.6	18.7	18.9	18.9	18.8
Center / 24.00	3.1	3.8	3.9	3.6	5.8	5.4	5.2	5.5
5 / 15.50	-17.2	-14.4	-13.8	-15.1	-11.6	-11.4	-11.7	-11.6
6 / 9.31	-21.9	-21.9	-21.7	-21.8	-23.4	-21.3	-21.2	-22.0
7 / 5.04	-23.6	-23.6	-23.5	-23.6	-24.0	-24.0	-23.5	-23.8
8 / 1.54	-27.1	-27.5	-26.9	-27.2	-25.0	24.3	24.9	8.1
Mean of absolute values:				20.9				18.4
" " w/o points by wall:				19.1				18.8
							Grand mean ABS	19.6
							Grand mean ABS w/o wall pts	19.0

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

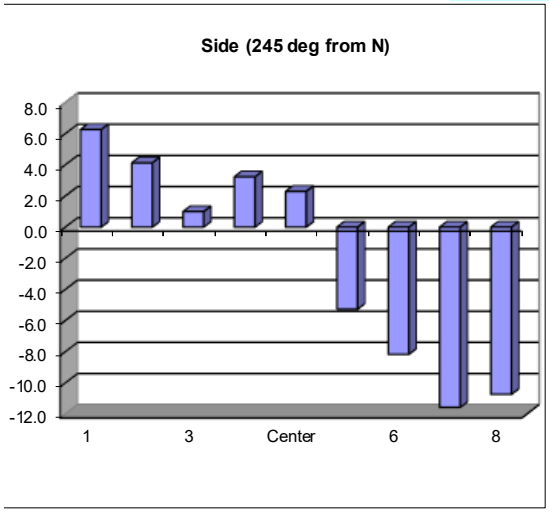
Stack	LB-C2	Run No.	FA-5
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	12:49 12:58	Fan Configuration	Fan B only
Testers	ZDH/LCE	Stack Temp	68.5 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

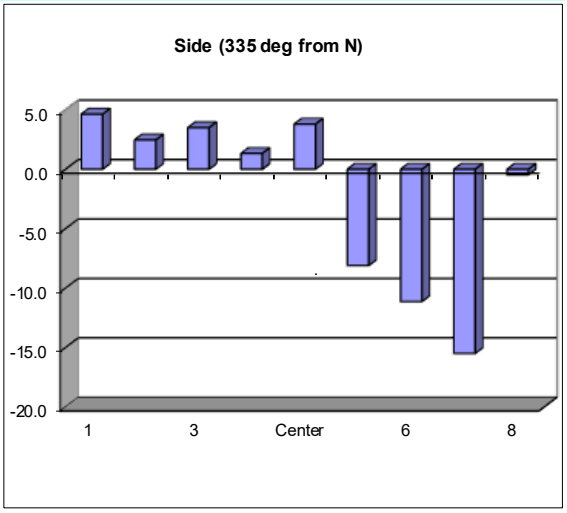
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	6.9	6.5	5.4	6.3	5.1	4.3	4.5	4.6
2	42.96	3.0	4.0	5.4	4.1	3.6	1.2	2.6	2.5
3	38.69	1.6	0.8	0.6	1.0	3.8	3.5	3.2	3.5
4	32.50	3.4	3.2	3.1	3.2	1.4	1.6	1.0	1.3
Center	24.00	1.4	1.6	3.9	2.3	3.9	3.7	3.8	3.8
5	15.50	-6.9	-4.6	-4.3	-5.3	-8.1	-7.9	-8.3	-8.1
6	9.31	-7.7	-8.2	-8.6	-8.2	-11.7	-11.5	-10.2	-11.1
7	5.04	-11.7	-11.8	-11.2	-11.6	-15.5	-15.8	-15.2	-15.5
8	1.54	-10.8	-10.9	-10.5	-10.7	-0.1	-0.8	-0.5	-0.5
Mean of absolute values:					5.9				5.7
" " w/o points by wall:					5.1				6.5
								Grand mean ABS	5.8
								Grand mean ABS w/o wall pts	5.8

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

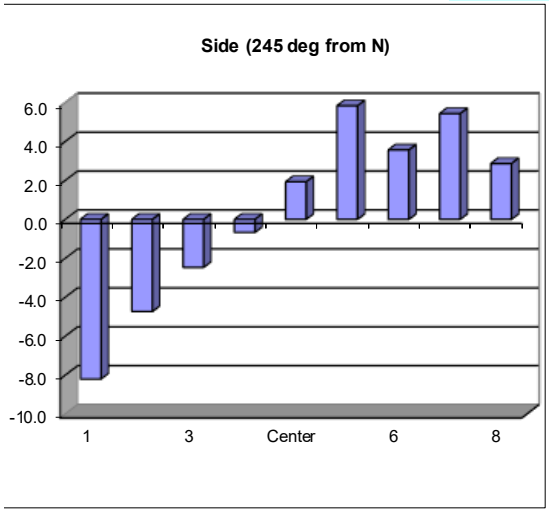
Stack	LB-C2	Run No.	FA-6
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	13:55 14:00	Fan Configuration	Fan B only
Testers	ZDH/LCE	Stack Temp	68.5 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

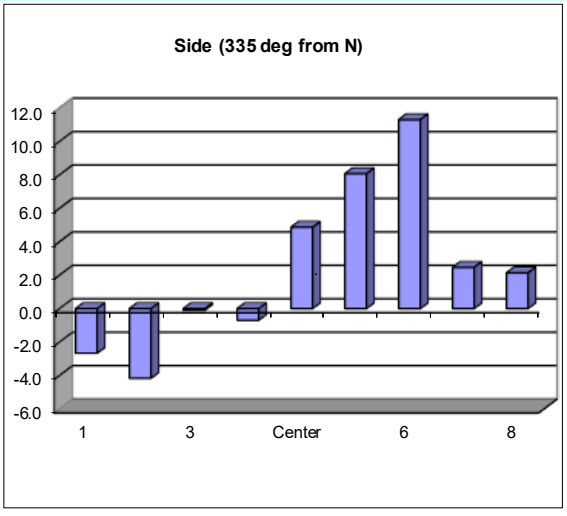
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	-7.4	-8.8	-8.4	-8.2	-3.0	-2.9	-2.1	-2.7
2	42.96	-4.3	-4.6	-5.3	-4.7	-7.8	-2.4	-2.3	-4.2
3	38.69	-2.7	-2.4	-2.3	-2.5	-0.3	0.0	0.0	-0.1
4	32.50	-0.5	-0.7	-0.8	-0.7	-0.7	-0.8	-0.6	-0.7
Center	24.00	2.1	1.9	1.8	1.9	4.6	4.9	5.1	4.9
5	15.50	5.6	5.8	6.1	5.8	8.3	8.2	7.7	8.1
6	9.31	3.6	3.5	3.6	3.6	11.6	11.1	11.2	11.3
7	5.04	5.2	5.8	5.3	5.4	2.1	2.3	3.0	2.5
8	1.54	2.9	3.0	2.7	2.9	2.3	2.7	1.4	2.1
Mean of absolute values:					4.0				4.1
" " w/o points by wall:					3.5				4.5
								Grand mean ABS	4.0
								Grand mean ABS w/o wall pts	4.0

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

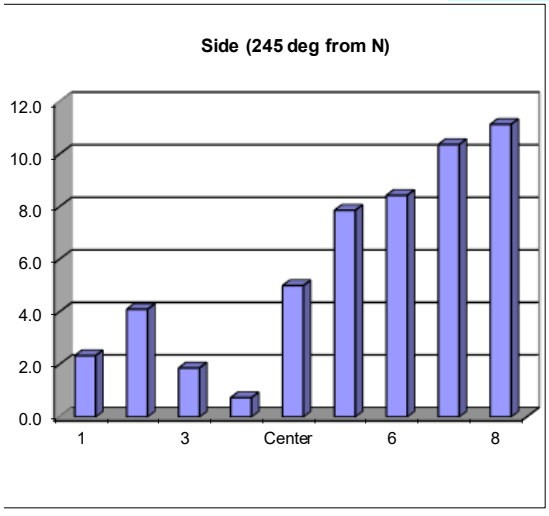
Stack	LB-C2	Run No.	FA-7
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	9:00 9:10	Fan Configuration	Fan B only
Testers	ZDH/LCE	Stack Temp	66.5 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

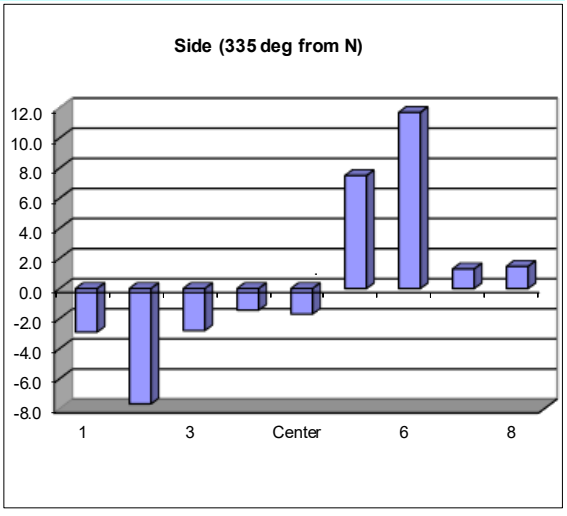
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	1.4	2.8	2.8	2.3	-2.5	-3.3	-2.9	-2.9
2	42.96	5.6	4.5	2.2	4.1	-10.7	-6.5	-5.8	-7.7
3	38.69	2.7	2.1	0.8	1.9	-3.6	-3.1	-1.7	-2.8
4	32.50	0.2	0.9	1.1	0.7	-1.4	-1.6	-1.3	-1.4
Center	24.00	5.0	5.4	4.6	5.0	-5.4	4.8	-4.5	-1.7
5	15.50	7.9	8.1	7.6	7.9	7.8	7.1	7.6	7.5
6	9.31	9.8	7.6	7.9	8.4	12.0	11.7	11.4	11.7
7	5.04	10.4	10.4	10.3	10.4	0.7	1.3	1.9	1.3
8	1.54	11.2	11.3	10.9	11.1	2.2	1.3	0.9	1.5
Mean of absolute values:					5.8				4.3
" " w/o points by wall:					5.5				4.9
								Grand mean ABS	5.0
								Grand mean ABS w/o wall pts	5.2

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

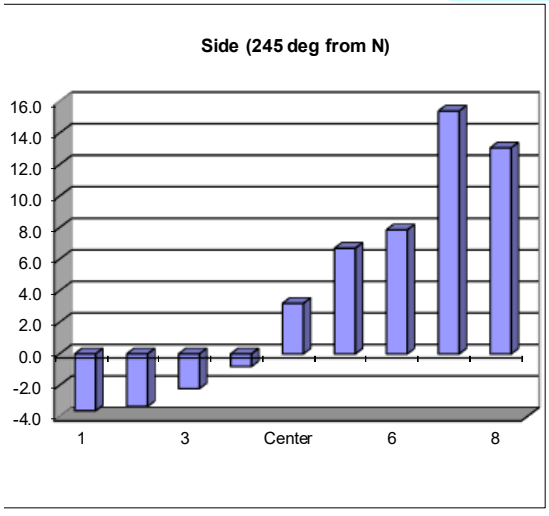
Stack	LB-C2	Run No.	FA-8
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	10:05 10:17	Fan Configuration	Fan B only
Testers	ZDH/LCE	Stack Temp	68.4 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

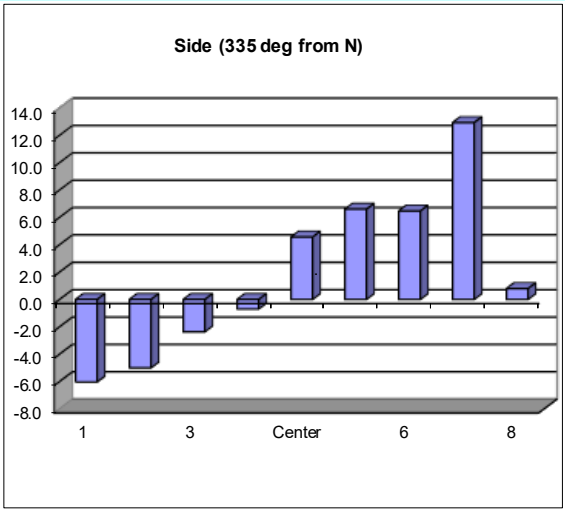
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	-3.8	-3.4	-3.6	-3.6	-6.9	-5.5	-5.7	-6.0
2	42.96	-3.7	-3.9	-2.4	-3.3	-5.5	-4.2	-5.3	-5.0
3	38.69	-2.5	-2.4	-1.7	-2.2	-2.9	-2.0	-2.2	-2.4
4	32.50	-0.4	-1.2	-0.8	-0.8	-1.5	-0.5	-0.1	-0.7
Center	24.00	2.6	4.2	2.8	3.2	5.0	4.4	4.3	4.6
5	15.50	7.5	6.4	6.2	6.7	4.8	7.4	7.6	6.6
6	9.31	7.9	7.9	7.8	7.9	5.9	7.0	6.5	6.5
7	5.04	15.7	15.3	15.2	15.4	12.8	13.3	12.7	12.9
8	1.54	13.1	13.3	12.8	13.1	1.2	0.9	0.3	0.8
Mean of absolute values:					6.2				5.1
" " w/o points by wall:					5.6				5.5
								Grand mean ABS	5.6
								Grand mean ABS w/o wall pts	5.6

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

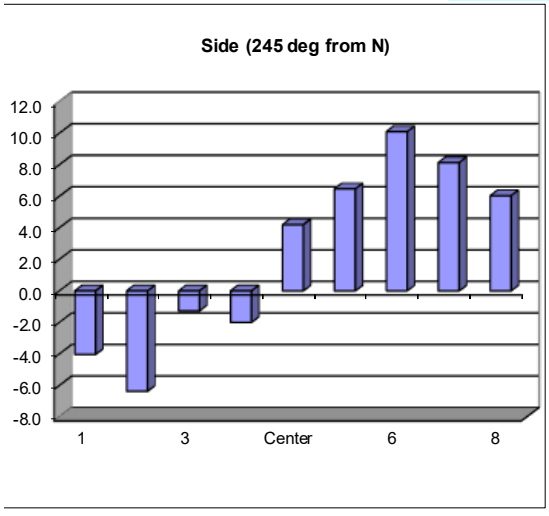
Stack	LB-C2	Run No.	FA-9
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	11:13 11:20	Fan Configuration	Fan B only
Testers	ZDH/LCE	Stack Temp	71.4 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

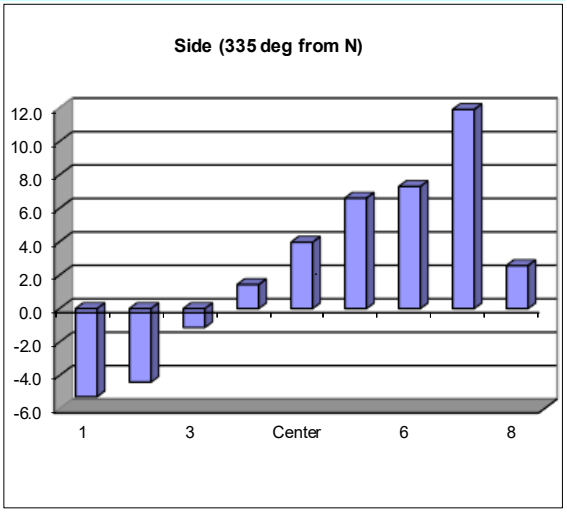
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	-5.3	-3.2	-3.6	-4.0	-6.4	-4.3	-5.1	-5.3
2	42.96	-6.9	-6.1	-6.1	-6.4	-5.4	-4.9	-2.9	-4.4
3	38.69	-0.7	-0.5	-2.6	-1.3	-0.9	-1.1	-1.4	-1.1
4	32.50	-2.0	-1.9	-2.1	-2.0	1.5	1.1	1.7	1.4
Center	24.00	3.9	3.8	4.9	4.2	4.2	3.8	3.9	4.0
5	15.50	5.9	6.6	6.9	6.5	6.2	6.7	6.9	6.6
6	9.31	13.4	8.2	8.7	10.1	7.3	7.4	7.2	7.3
7	5.04	7.9	8.2	8.3	8.1	12.6	11.7	11.4	11.9
8	1.54	5.6	6.3	6.2	6.0	2.6	2.7	2.4	2.6
Mean of absolute values:					5.4				5.0
" " w/o points by wall:					5.5				5.2
								Grand mean ABS	5.2
								Grand mean ABS w/o wall pts	5.4

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

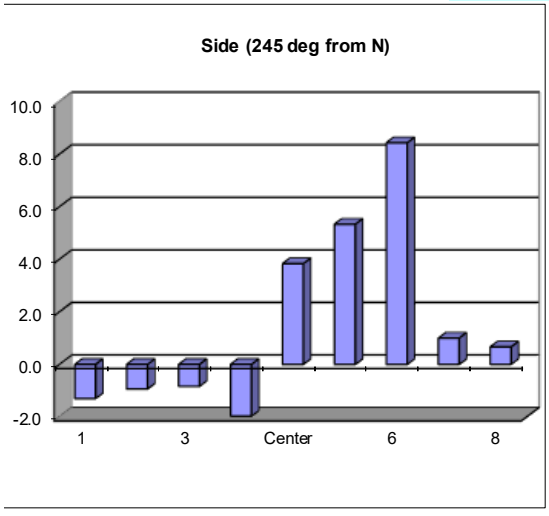
Stack	LB-C2	Run No.	FA-10
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	14:09 14:16	Fan Configuration	Fans A & B
Testers	ZDH/LCE	Stack Temp	68.1 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

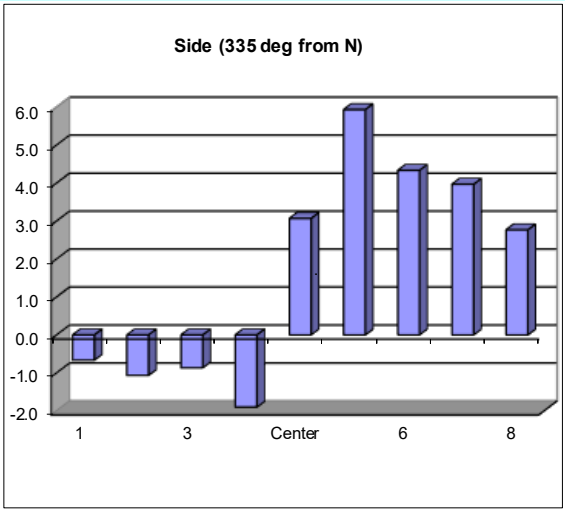
Order -->	First				Second			
Traverse-->	Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 46.46	-1.0	-2.2	-0.7	-1.3	-0.4	-1.2	-0.4	-0.7
2 / 42.96	-0.5	-1.1	-1.2	-0.9	-1.1	-0.9	-1.2	-1.1
3 / 38.69	-1.0	-0.7	-0.8	-0.8	-1.3	-0.6	-0.7	-0.9
4 / 32.50	-1.9	-2.2	-1.8	-2.0	-2.6	-1.8	-1.3	-1.9
Center / 24.00	4.5	2.7	4.3	3.8	3.3	2.9	3.0	3.1
5 / 15.50	6.2	5.9	3.9	5.3	7.0	5.2	5.6	5.9
6 / 9.31	8.7	8.4	8.2	8.4	4.5	4.4	4.1	4.3
7 / 5.04	1.0	1.2	0.8	1.0	4.1	4.0	3.8	4.0
8 / 1.54	0.5	0.7	0.8	0.7	3.0	2.8	2.5	2.8
Mean of absolute values:				2.7				2.7
" " w/o points by wall:				3.2				3.0
							Grand mean ABS	2.7
							Grand mean ABS w/o wall pts	3.1

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

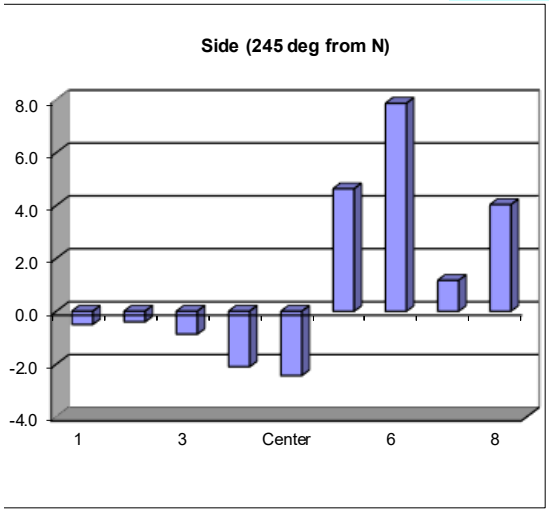
Stack	LB-C2	Run No.	FA-11
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	15:15 15:21	Fan Configuration	Fans A & B
Testers	ZDH/LCE	Stack Temp	68.9 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

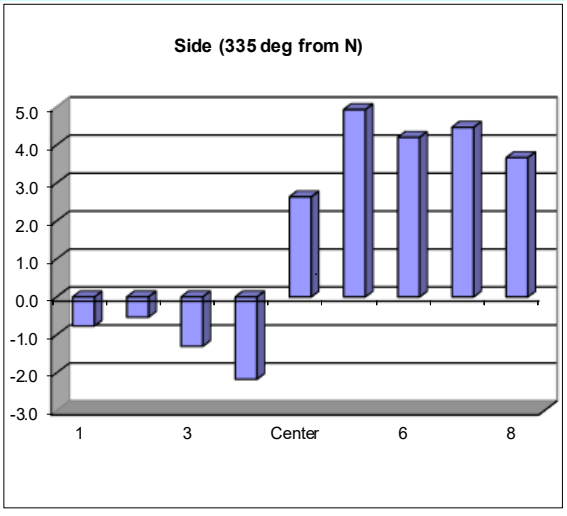
Order -->	First				Second			
Traverse-->	Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 46.46	-1.0	-0.2	-0.3	-0.5	-0.8	-0.7	-0.8	-0.8
2 / 42.96	-0.1	-0.5	-0.6	-0.4	-0.7	-0.3	-0.6	-0.5
3 / 38.69	-1.9	-0.4	-0.3	-0.9	-1.1	-1.8	-1.0	-1.3
4 / 32.50	-2.9	-1.2	-2.2	-2.1	-1.9	-1.8	-2.8	-2.2
Center / 24.00	-2.5	-2.3	-2.5	-2.4	2.0	2.2	3.7	2.6
5 / 15.50	4.8	4.5	4.6	4.6	6.8	2.8	5.2	4.9
6 / 9.31	8.4	7.8	7.4	7.9	3.9	4.1	4.6	4.2
7 / 5.04	1.2	1.0	1.3	1.2	4.2	4.5	4.7	4.5
8 / 1.54	4.2	3.8	4.1	4.0	5.1	3.0	2.9	3.7
Mean of absolute values:				2.7				2.7
" " w/o points by wall:				2.8				2.9
							Grand mean ABS	2.7
							Grand mean ABS w/o wall pts	2.8

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

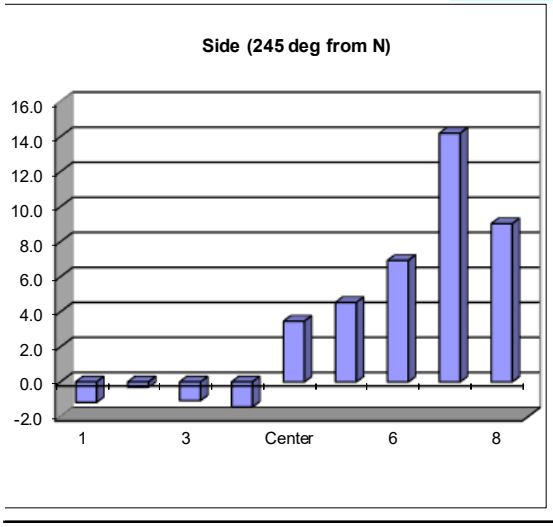
Stack	LB-C2	Run No.	FA-12
Date	10/18/2019	Fan Setting	N/A Hz
Start/End Time	8:56 9:04	Fan Configuration	Fans A & B
Testers	ZDH/LCE	Stack Temp	62.8 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

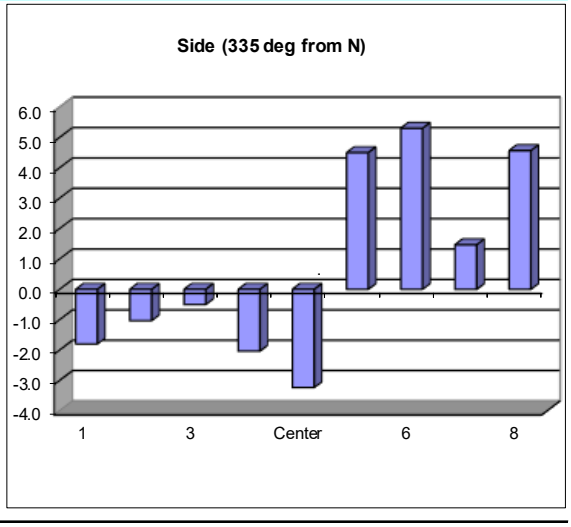
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	-1.6	-0.6	-1.3	-1.2	-2.7	-2.0	-0.7	-1.8
2	42.96	0.0	-0.5	-0.4	-0.3	-1.1	-1.0	-1.0	-1.0
3	38.69	-0.9	-1.2	-1.1	-1.1	-0.6	-0.7	-0.2	-0.5
4	32.50	-1.8	-1.2	-1.3	-1.4	-2.7	-1.8	-1.6	-2.0
Center	24.00	3.8	2.7	3.9	3.5	-3.0	-2.8	-3.9	-3.2
5	15.50	4.1	4.3	5.2	4.5	4.2	4.7	4.6	4.5
6	9.31	7.9	6.5	6.4	6.9	5.4	4.9	5.6	5.3
7	5.04	14.2	14.3	14.1	14.2	1.6	1.3	1.5	1.5
8	1.54	9.6	8.7	8.8	9.0	5.2	4.7	3.8	4.6
Mean of absolute values:					4.7				2.7
" " w/o points by wall:					4.6				2.6
								Grand mean ABS	3.7
								Grand mean ABS w/o wall pts	3.6

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

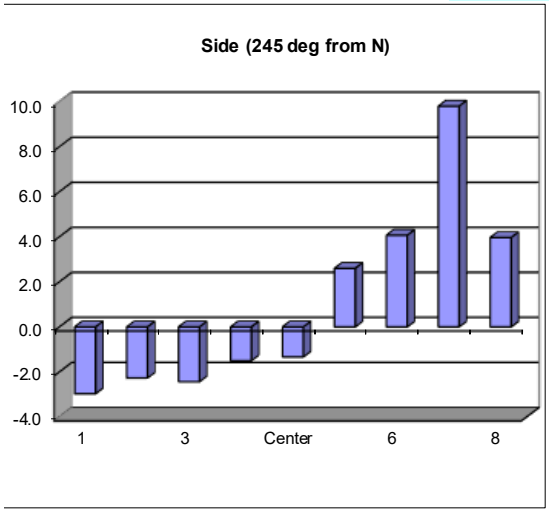
Stack	LB-C2	Run No.	FA-13
Date	10/18/2019	Fan Setting	N/A Hz
Start/End Time	10:02 10:10	Fan Configuration	Fans A & B
Testers	ZDH/LCE	Stack Temp	64.9 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

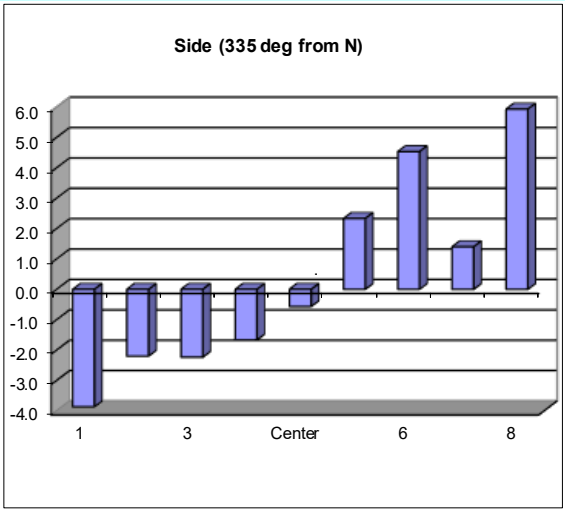
Order -->	First				Second			
Traverse-->	Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 46.46	-2.6	-3.4	-2.9	-3.0	-4.6	-3.6	-3.4	-3.9
2 / 42.96	-1.5	-1.8	-3.5	-2.3	-2.2	-2.3	-2.1	-2.2
3 / 38.69	-2.4	-2.2	-2.7	-2.4	-2.8	-1.7	-2.2	-2.2
4 / 32.50	-1.3	-1.5	-1.7	-1.5	-1.9	-1.9	-1.2	-1.7
Center / 24.00	-1.5	-1.1	-1.4	-1.3	-0.1	-1.0	-0.6	-0.6
5 / 15.50	3.0	2.8	2.0	2.6	2.1	2.4	2.5	2.3
6 / 9.31	4.1	4.1	4.0	4.1	6.1	3.5	4.0	4.5
7 / 5.04	9.6	9.8	10.0	9.8	1.5	1.2	1.5	1.4
8 / 1.54	4.1	4.0	3.8	4.0	6.2	5.6	6.0	5.9
Mean of absolute values:				3.4				2.7
" " w/o points by wall:				3.4				2.1
							Grand mean ABS	3.1
							Grand mean ABS w/o wall pts	2.8

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

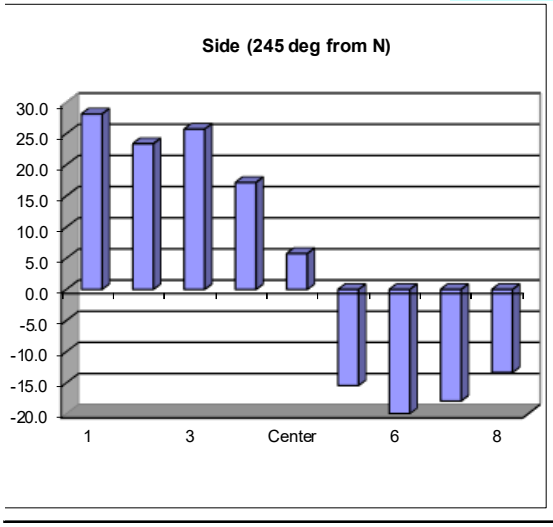
Stack	LB-C2	Run No.	FA-14
Date	10/19/2019	Fan Setting	N/A Hz
Start/End Time	9:06 9:15	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	61.9 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	53.3 ft		

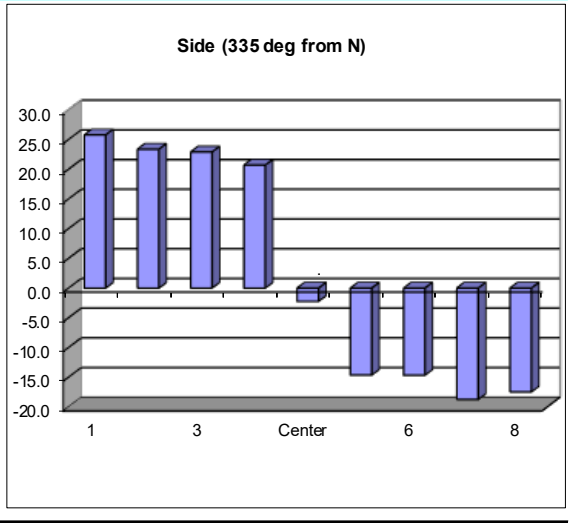
Order -->		First				Second			
Traverse-->		Side 1 (245 deg from N)				Side 2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	46.46	27.6	28.2	28.7	28.2	26.5	26.0	24.8	25.8
2	42.96	23.3	23.3	23.6	23.4	23.6	23.0	23.5	23.4
3	38.69	26.0	25.7	25.5	25.7	23.1	22.9	22.7	22.9
4	32.50	16.9	17.4	17.2	17.2	21.8	20.8	19.5	20.7
Center	24.00	6.0	5.8	5.5	5.8	-4.7	-0.8	-1.2	-2.2
5	15.50	-17.1	-14.4	-14.8	-15.4	-15.5	-13.1	-15.3	-14.6
6	9.31	-20.8	-19.2	-19.8	-19.9	-14.2	-15.0	-14.8	-14.7
7	5.04	-21.1	-16.4	-16.2	-17.9	-18.3	-19.0	-18.9	-18.7
8	1.54	-14.3	-12.9	-12.8	-13.3	-17.6	-17.4	-17.4	-17.5
Mean of absolute values:					18.5				17.8
" " w/o points by wall:					17.9				16.7
								Grand mean ABS	18.2
								Grand mean ABS w/o wall pts	17.3

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point.
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





A.2 Flow Angle Data Forms – 2023

FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-1
Date	4/11/2023	Fan Setting	70 %
Start/End Time	10:55 11:07	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	80.3 deg F
Stack Dia.	48 in	Approx. air vel.	1827 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

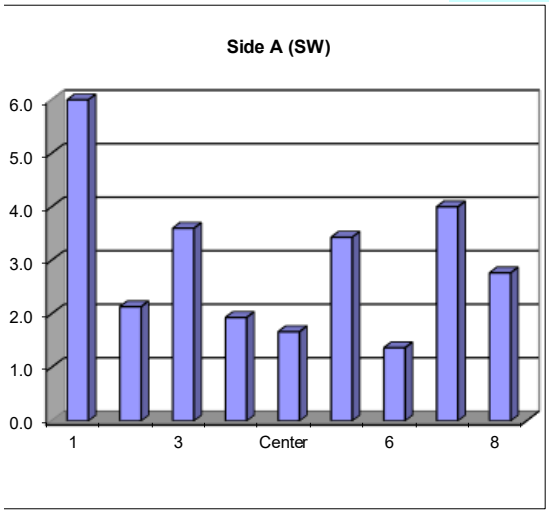
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	11.0	4.9	2.1	6.0	0.7	5.0	0.0	1.9
2	5.04	0.5	4.5	1.4	2.1	0.4	3.6	1.0	1.7
3	9.31	1.1	4.5	5.2	3.6	0.3	2.0	1.9	1.4
4	15.50	1.2	1.1	3.5	1.9	2.9	1.4	0.5	1.6
Center	24.00	1.2	1.9	1.9	1.7	0.9	0.4	0.6	0.6
5	32.50	3.7	3.7	2.9	3.4	4.3	1.9	1.1	2.4
6	38.69	1.9	1.3	0.9	1.4	2.4	0.6	3.1	2.0
7	42.96	8.2	1.2	2.6	4.0	2.5	5.2	0.0	2.6
8	46.46	3.5	4.0	0.8	2.8	3.0	7.2	1.0	3.7
Mean of absolute values:					3.0				2.0
" " w/o points by wall:					2.6				1.8
								Grand mean ABS	2.5
								Grand mean ABS w/o wall pts	2.2

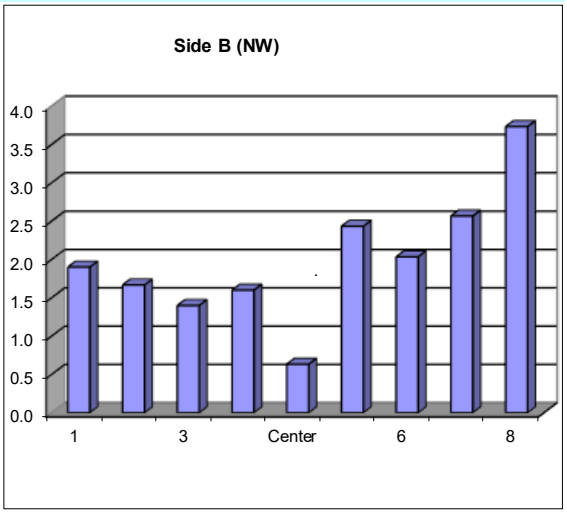
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-2
Date	4/11/2023	Fan Setting	99 %
Start/End Time	13:28 13:44	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	82.1 deg F
Stack Dia.	48 in	Approx. air vel.	2708 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

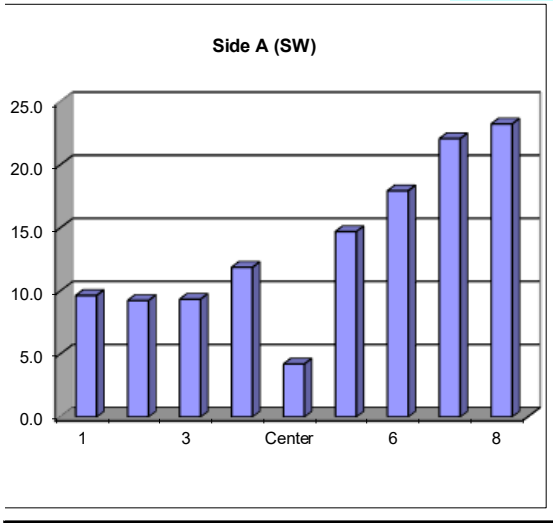
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	2.9	11.3	14.7	9.6	6.5	5.0	3.1	4.9
2	5.04	8.8	12.4	6.5	9.2	4.2	10.4	10.3	8.3
3	9.31	12.0	8.5	7.5	9.3	17.0	13.2	11.3	13.8
4	15.50	17.7	7.8	10.1	11.9	15.1	11.1	7.7	11.3
Center	24.00	1.4	4.0	7.2	4.2	1.1	2.7	5.6	3.1
5	32.50	17.4	15.0	11.7	14.7	7.5	16.3	18.2	14.0
6	38.69	18.0	18.3	17.5	17.9	15.6	22.2	20.0	19.3
7	42.96	24.3	18.8	23.1	22.1	18.8	18.2	16.4	17.8
8	46.46	25.5	21.0	23.2	23.2	23.0	26.1	28.5	25.9
Mean of absolute values:					13.6				13.2
" " w/o points by wall:					12.8				12.5
								Grand mean ABS	13.4
								Grand mean ABS w/o wall pts	12.6

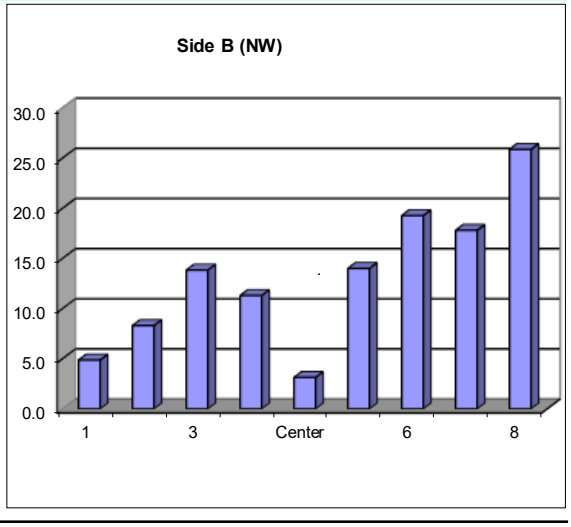
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-3
Date	4/11/2023	Fan Setting	99 %
Start/End Time	14:21 14:37	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	83.5 deg F
Stack Dia.	48 in	Approx. air vel.	2732 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

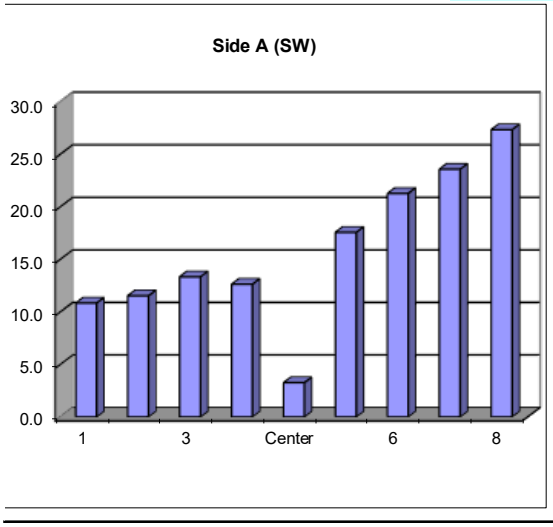
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	2.8	21.8	7.9	10.8	5.2	12.0	4.6	7.3
2	5.04	7.3	14.2	13.1	11.5	11.2	17.9	14.3	14.5
3	9.31	12.4	18.5	9.1	13.3	19.0	17.2	15.6	17.3
4	15.50	15.9	11.6	10.4	12.6	14.9	11.5	14.7	13.7
Center	24.00	1.8	3.6	4.4	3.3	0.8	10.1	0.7	3.9
5	32.50	15.8	21.7	15.2	17.6	19.5	15.5	20.7	18.6
6	38.69	19.2	24.2	20.4	21.3	20.1	19.2	25.4	21.6
7	42.96	23.4	26.1	21.2	23.6	23.4	24.8	20.7	23.0
8	46.46	30.3	27.5	24.2	27.3	27.1	27.6	29.4	28.0
Mean of absolute values:					15.7				16.4
" " w/o points by wall:					14.7				16.1
								Grand mean ABS	16.1
								Grand mean ABS w/o wall pts	15.4

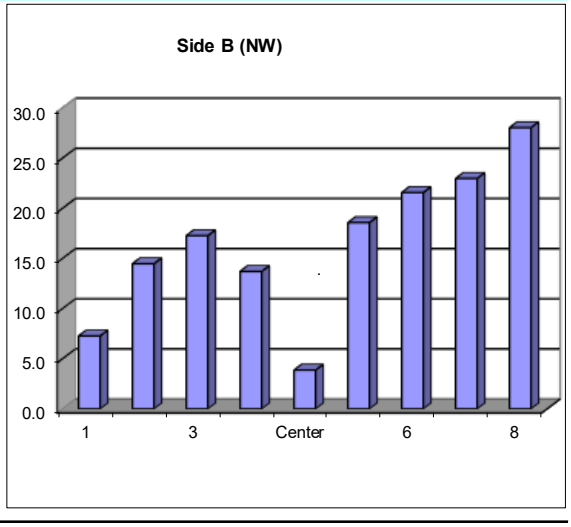
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-4
Date	4/11/2023	Fan Setting	75 %
Start/End Time	15:40 15:48	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	81.0 deg F
Stack Dia.	48 in	Approx. air vel.	1958 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

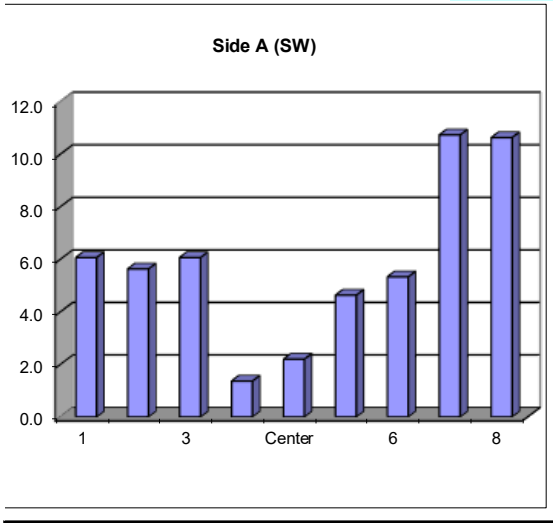
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	4.2	6.6	7.4	6.1	0.6	0.9	0.3	0.6
2	5.04	4.2	3.1	9.6	5.6	0.6	6.1	4.1	3.6
3	9.31	4.0	5.4	8.8	6.1	1.5	0.6	1.1	1.1
4	15.50	0.7	0.3	3.1	1.4	1.0	5.9	10.1	5.7
Center	24.00	1.5	4.4	0.7	2.2	4.8	3.7	3.2	3.9
5	32.50	2.6	2.8	8.5	4.6	7.8	4.7	9.9	7.5
6	38.69	5.4	2.1	8.5	5.3	8.2	5.6	6.1	6.6
7	42.96	9.2	9.9	13.1	10.7	7.6	2.4	5.1	5.0
8	46.46	9.1	11.8	11.0	10.6	4.1	4.0	11.6	6.6
Mean of absolute values:					5.9				4.5
" " w/o points by wall:					5.1				4.8
								Grand mean ABS	5.2
								Grand mean ABS w/o wall pts	5.0

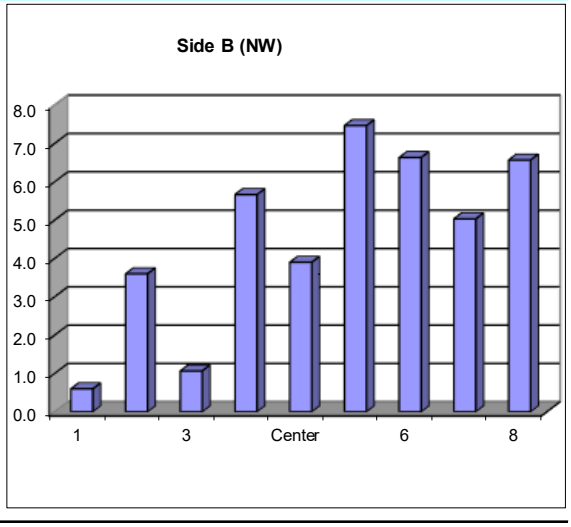
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-5
Date	4/11/2023	Fan Setting	69/69 %
Start/End Time	16:31 16:40	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Stack Temp	79.2 deg F
Stack Dia.	48 in	Approx. air vel.	2716 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

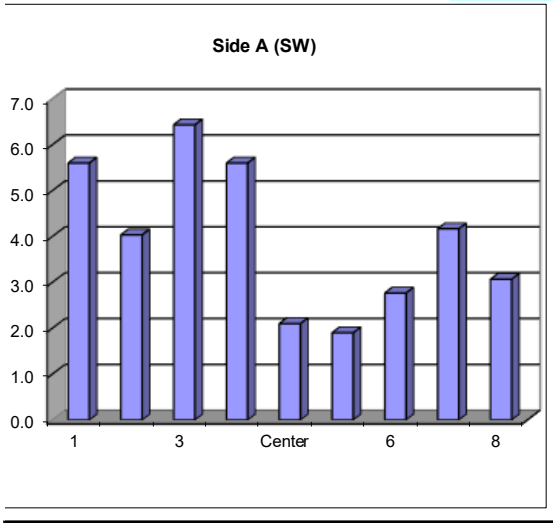
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	2.9	9.8	4.1	5.6	3.8	1.9	1.8	2.5
2	5.04	5.3	3.2	3.6	4.0	1.3	0.3	5.8	2.5
3	9.31	5.8	6.0	7.5	6.4	3.7	9.1	6.5	6.4
4	15.50	6.1	3.9	6.8	5.6	5.4	5.1	5.5	5.3
Center	24.00	2.5	0.9	2.9	2.1	4.0	3.1	3.1	3.4
5	32.50	3.2	1.7	0.8	1.9	0.2	4.3	0.4	1.6
6	38.69	2.2	4.6	1.5	2.8	1.1	2.7	1.1	1.6
7	42.96	1.5	8.3	2.7	4.2	0.5	2.3	2.7	1.8
8	46.46	2.7	5.4	1.1	3.1	4.3	5.1	0.4	3.3
Mean of absolute values:					4.0				3.2
" " w/o points by wall:					3.9				3.2
								Grand mean ABS	3.6
								Grand mean ABS w/o wall pts	3.6

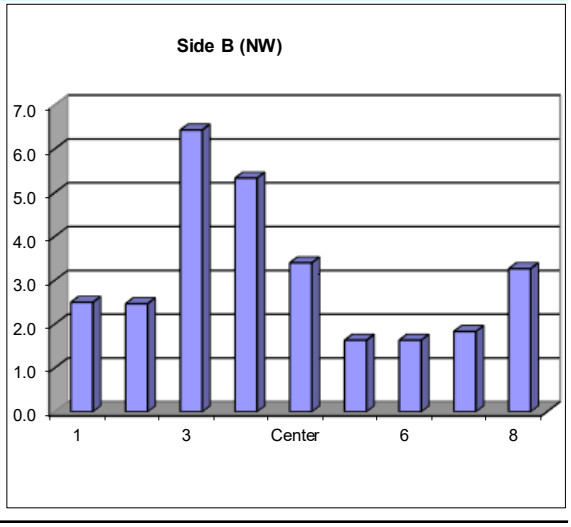
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Primary standard; leveled and zeroed prior to each use.

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-6
Date	4/12/2023	Fan Setting	67/65 %
Start/End Time	8:54 9:03	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Stack Temp	79.1 deg F
Stack Dia.	48 in	Approx. air vel.	2640 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

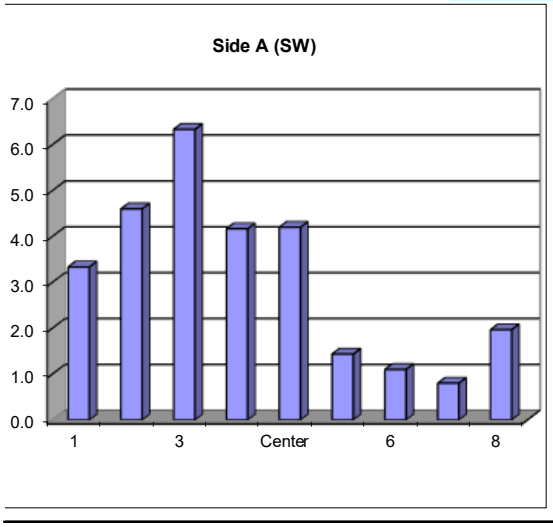
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	1.8	4.4	3.8	3.3	1.1	6.5	2.7	3.4
2	5.04	5.3	5.1	3.4	4.6	2.0	5.5	0.7	2.7
3	9.31	7.2	5.4	6.4	6.3	3.0	4.4	6.6	4.7
4	15.50	1.3	6.1	5.1	4.2	4.7	5.4	6.1	5.4
Center	24.00	6.7	4.4	1.5	4.2	4.4	1.9	3.6	3.3
5	32.50	1.8	1.2	1.3	1.4	0.6	2.9	1.0	1.5
6	38.69	1.1	0.5	1.7	1.1	0.4	2.4	2.4	1.7
7	42.96	0.4	1.4	0.6	0.8	0.9	0.4	2.7	1.3
8	46.46	2.2	1.6	2.1	2.0	0.6	2.9	3.3	2.3
Mean of absolute values:					3.1				2.9
" " w/o points by wall:					3.2				3.0
								Grand mean ABS	3.0
								Grand mean ABS w/o wall pts	3.1

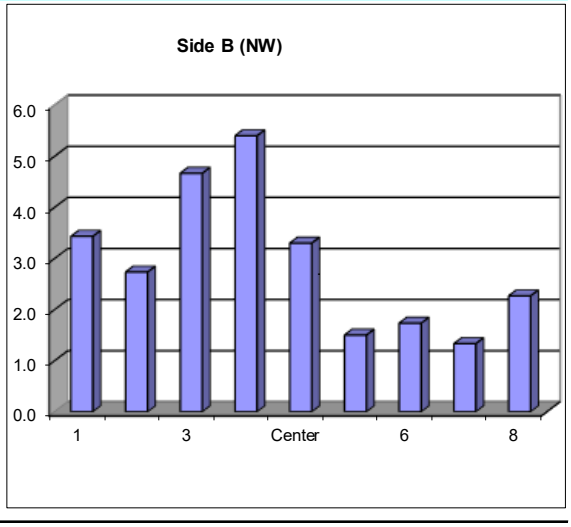
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-7
Date	4/12/2023	Fan Setting	74/74 %
Start/End Time	9:41 9:51	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Stack Temp	79.3 deg F
Stack Dia.	48 in	Approx. air vel.	2967 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

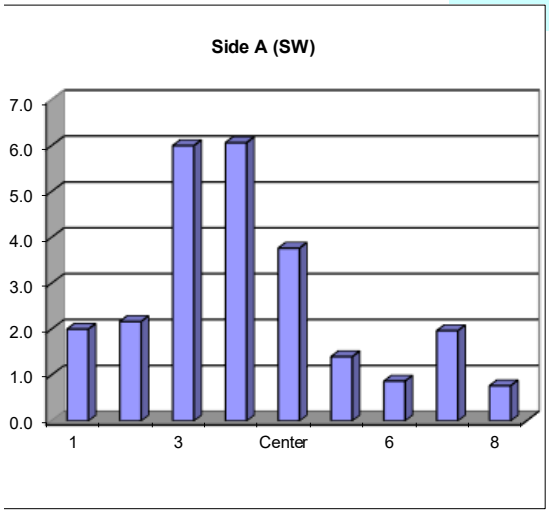
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	1.6	2.1	2.3	2.0	1.9	4.7	8.1	4.9
2	5.04	0.3	4.4	1.8	2.2	3.9	6.2	0.8	3.6
3	9.31	6.4	6.2	5.4	6.0	4.2	6.1	8.1	6.1
4	15.50	6.6	6.3	5.3	6.1	5.0	4.9	5.0	5.0
Center	24.00	4.0	3.1	4.2	3.8	4.8	2.4	3.1	3.4
5	32.50	2.8	0.6	0.8	1.4	2.2	0.8	0.6	1.2
6	38.69	1.2	0.8	0.6	0.9	0.4	1.8	0.9	1.0
7	42.96	2.1	2.2	1.6	2.0	0.9	0.1	1.6	0.9
8	46.46	0.3	0.6	1.4	0.8	0.4	2.3	2.0	1.6
Mean of absolute values:					2.8				3.1
" " w/o points by wall:					3.2				3.0
								Grand mean ABS	2.9
								Grand mean ABS w/o wall pts	3.1

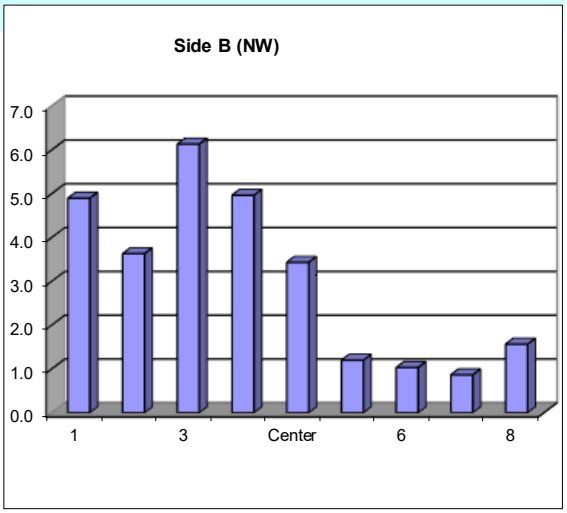
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-8
Date	4/12/2023	Fan Setting	74/74 %
Start/End Time	10:24 10:32	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Stack Temp	78.8 deg F
Stack Dia.	48 in	Approx. air vel.	2959 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

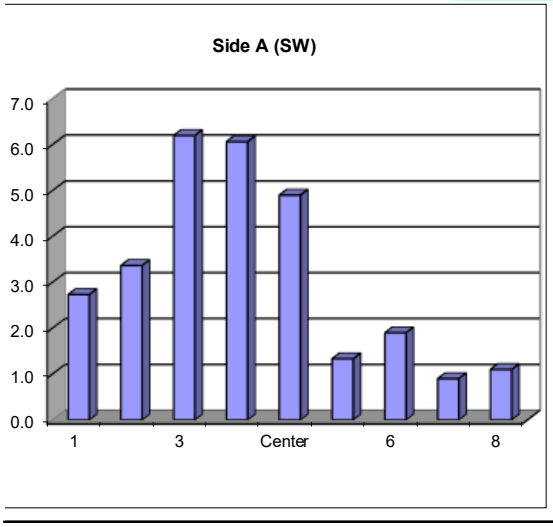
Order -->	First				Second			
Traverse-->	Side A (SW)				Side B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Degrees				Degrees			
1 / 1.54	0.4	4.1	3.7	2.7	0.9	1.1	0.1	0.7
2 / 5.04	5.3	3.4	1.4	3.4	1.0	7.3	0.4	2.9
3 / 9.31	6.6	7.2	4.8	6.2	4.7	7.4	7.4	6.5
4 / 15.50	5.8	6.3	6.1	6.1	6.9	5.9	5.6	6.1
Center / 24.00	5.3	5.1	4.3	4.9	3.1	4.1	5.2	4.1
5 / 32.50	2.3	0.3	1.4	1.3	3.8	0.1	1.4	1.8
6 / 38.69	3.1	0.3	2.3	1.9	1.0	0.3	0.8	0.7
7 / 42.96	1.6	0.6	0.5	0.9	0.3	2.1	0.7	1.0
8 / 46.46	1.2	1.5	0.6	1.1	2.4	1.6	2.6	2.2
Mean of absolute values:				3.2				2.9
" " w/o points by wall:				3.5				3.3
							Grand mean ABS	3.0
							Grand mean ABS w/o wall pts	3.4

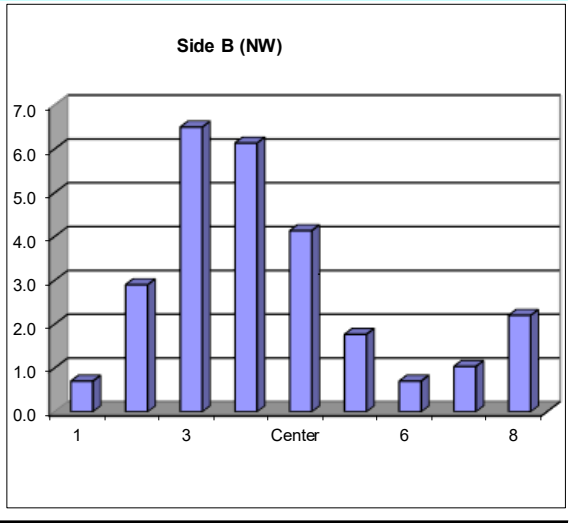
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-9
Date	4/12/2023	Fan Setting	89/86 %
Start/End Time	11:52 12:01	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Stack Temp	78.3 deg F
Stack Dia.	48 in	Approx. air vel.	3543 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

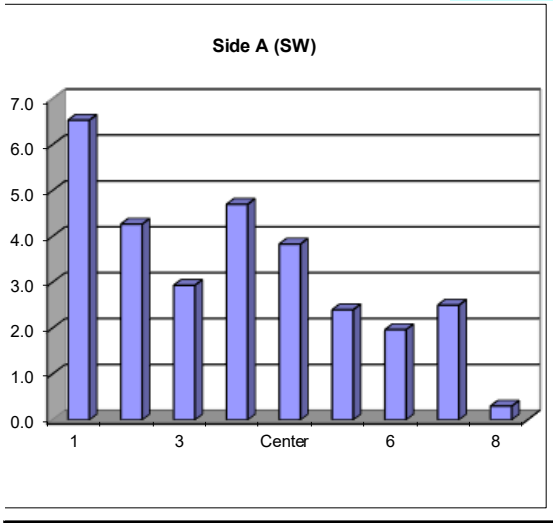
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	3.9	9.4	6.3	6.5	4.0	4.3	8.1	5.5
2	5.04	4.6	5.9	2.3	4.3	3.4	2.9	0.5	2.3
3	9.31	2.7	4.7	1.4	2.9	3.0	5.5	4.1	4.2
4	15.50	6.9	2.9	4.3	4.7	5.4	4.8	3.0	4.4
Center	24.00	2.9	3.2	5.4	3.8	1.5	2.8	2.9	2.4
5	32.50	2.0	1.4	3.8	2.4	0.7	1.9	2.3	1.6
6	38.69	2.3	0.7	2.9	2.0	1.8	1.4	0.4	1.2
7	42.96	3.0	1.9	2.6	2.5	1.7	0.6	1.3	1.2
8	46.46	0.2	0.1	0.6	0.3	1.5	1.4	0.4	1.1
Mean of absolute values:					3.3				2.7
" " w/o points by wall:					3.2				2.5
								Grand mean ABS	3.0
								Grand mean ABS w/o wall pts	2.9

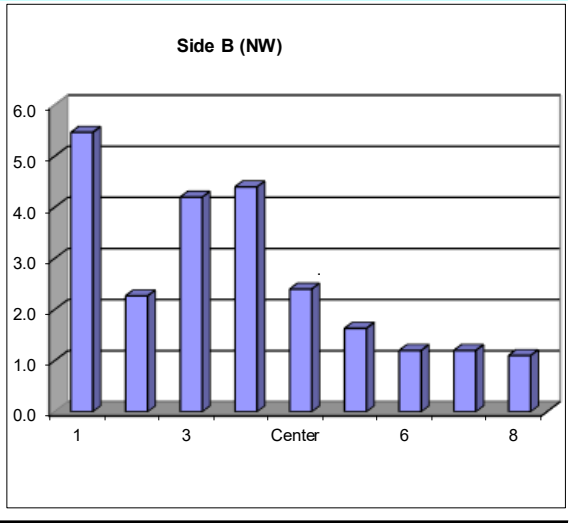
Instuments Used:		Cal. Due
S-type pitot	(ID: A10019, 60")	Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-10
Date	4/12/2023	Fan Setting	89/86 %
Start/End Time	12:30 12:39	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Stack Temp	78.7 deg F
Stack Dia.	48 in	Approx. air vel.	3526 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

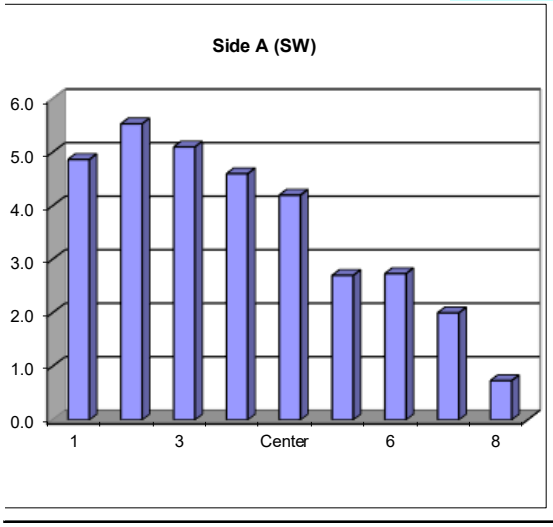
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	3.9	5.1	5.6	4.9	2.7	6.1	4.8	4.5
2	5.04	5.6	5.1	5.9	5.5	0.6	6.2	3.3	3.4
3	9.31	5.3	6.5	3.5	5.1	2.6	3.5	3.7	3.3
4	15.50	4.8	5.3	3.7	4.6	4.7	4.3	3.5	4.2
Center	24.00	5.2	4.2	3.2	4.2	3.0	2.4	2.1	2.5
5	32.50	3.1	2.3	2.7	2.7	2.4	0.7	1.5	1.5
6	38.69	1.9	2.8	3.5	2.7	2.0	3.7	1.0	2.2
7	42.96	2.2	1.7	2.1	2.0	0.5	1.4	3.7	1.9
8	46.46	0.5	1.1	0.6	0.7	0.8	0.1	0.7	0.5
Mean of absolute values:					3.6				2.7
" " w/o points by wall:					3.8				2.7
								Grand mean ABS	3.1
								Grand mean ABS w/o wall pts	3.3

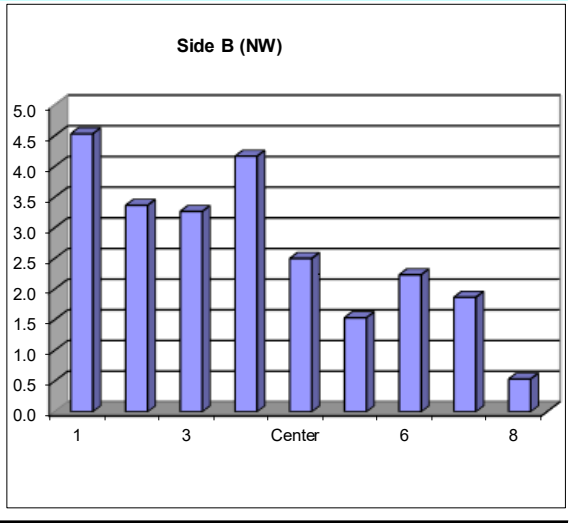
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-11
Date	4/12/2023	Fan Setting	72 %
Start/End Time	13:14 13:23	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	77.4 deg F
Stack Dia.	48 in	Approx. air vel.	1940 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

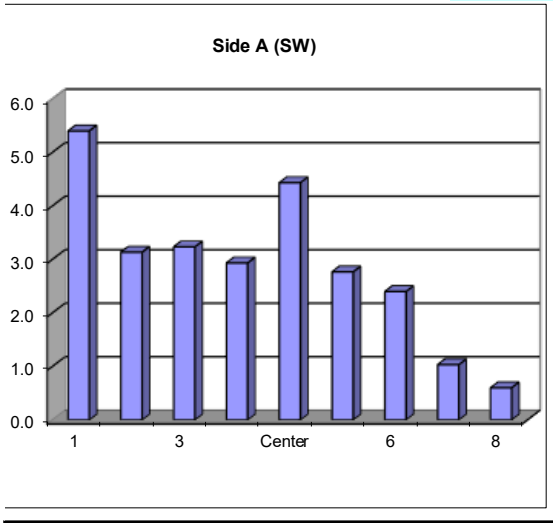
Order -->	First				Second			
Traverse-->	Side A (SW)				Side B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Degrees				Degrees			
1 / 1.54	2.2	7.7	6.3	5.4	2.0	4.8	3.5	3.4
2 / 5.04	2.6	2.3	4.5	3.1	0.7	1.8	0.1	0.9
3 / 9.31	4.5	1.9	3.3	3.2	0.3	1.0	7.4	2.9
4 / 15.50	3.7	1.6	3.5	2.9	1.1	2.0	1.6	1.6
Center / 24.00	5.8	3.6	3.9	4.4	0.0	4.2	2.8	2.3
5 / 32.50	3.6	3.5	1.2	2.8	0.5	1.0	2.9	1.5
6 / 38.69	4.2	1.9	1.1	2.4	0.9	2.5	4.0	2.5
7 / 42.96	2.0	0.1	1.0	1.0	3.1	1.8	4.2	3.0
8 / 46.46	0.9	0.4	0.5	0.6	1.2	2.1	2.7	2.0
Mean of absolute values:				2.9				2.2
" " w/o points by wall:				2.8				2.1
							Grand mean ABS	2.6
							Grand mean ABS w/o wall pts	2.5

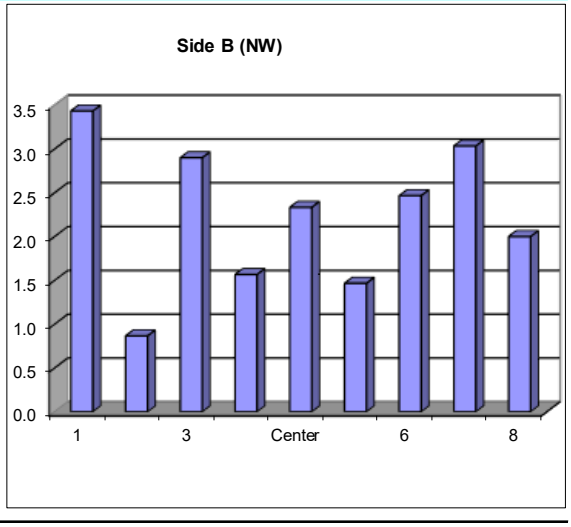
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-12
Date	4/12/2023	Fan Setting	72 %
Start/End Time	13:45 13:53	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	80.6 deg F
Stack Dia.	48 in	Approx. air vel.	1930 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

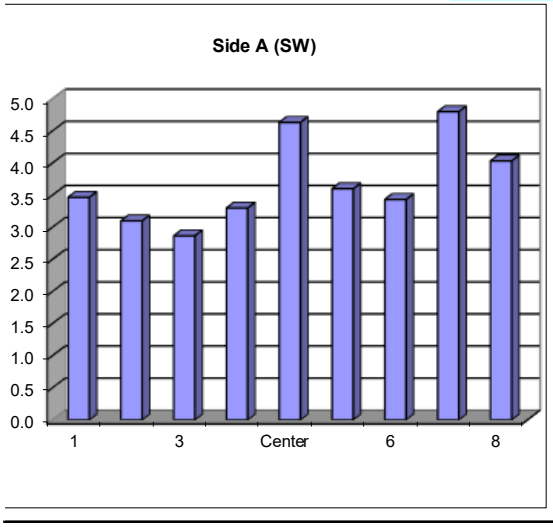
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	1.2	5.4	3.8	3.5	2.0	2.9	4.5	3.1
2	5.04	2.2	4.8	2.3	3.1	2.5	6.3	1.4	3.4
3	9.31	0.5	4.3	3.8	2.9	0.5	2.5	4.3	2.4
4	15.50	2.3	4.0	3.6	3.3	2.0	4.0	4.4	3.5
Center	24.00	6.2	2.9	4.8	4.6	2.9	5.2	6.3	4.8
5	32.50	5.5	3.6	1.7	3.6	0.2	3.8	1.1	1.7
6	38.69	1.8	4.2	4.3	3.4	1.4	1.9	2.3	1.9
7	42.96	4.1	6.9	3.4	4.8	0.2	1.0	0.9	0.7
8	46.46	3.3	8.5	0.3	4.0	4.4	4.1	8.2	5.6
Mean of absolute values:					3.7				3.0
" " w/o points by wall:					3.7				2.6
								Grand mean ABS	3.4
								Grand mean ABS w/o wall pts	3.2

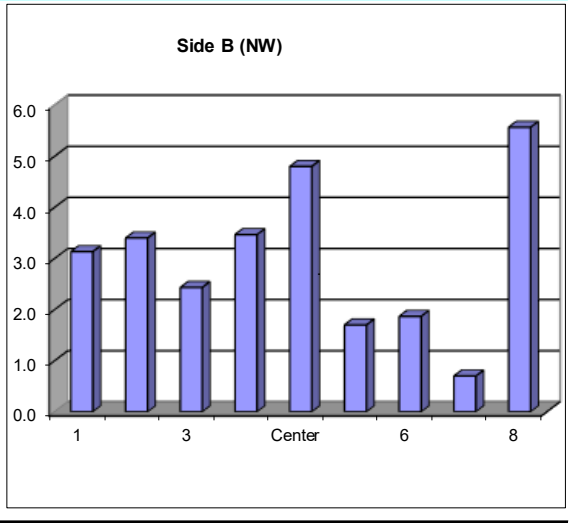
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-13
Date	4/12/2023	Fan Setting	99 %
Start/End Time	14:24 14:33	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	79.5 deg F
Stack Dia.	48 in	Approx. air vel.	2678 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

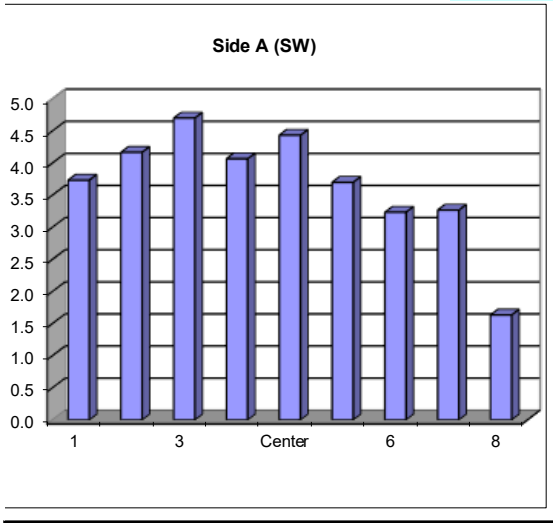
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	2.7	3.9	4.6	3.7	2.5	0.3	0.0	0.9
2	5.04	0.5	7.1	4.9	4.2	1.4	0.6	3.2	1.7
3	9.31	2.1	6.5	5.5	4.7	4.0	5.8	2.5	4.1
4	15.50	4.3	3.5	4.4	4.1	4.0	5.1	3.3	4.1
Center	24.00	4.4	3.8	5.1	4.4	3.1	1.9	4.3	3.1
5	32.50	2.3	2.6	6.2	3.7	0.7	1.7	2.5	1.6
6	38.69	2.7	2.2	4.8	3.2	1.7	1.9	1.8	1.8
7	42.96	3.3	1.6	4.9	3.3	1.3	1.5	2.4	1.7
8	46.46	2.0	2.4	0.5	1.6	0.3	2.7	1.4	1.5
Mean of absolute values:					3.7				2.3
" " w/o points by wall:					3.9				2.6
								Grand mean ABS	3.0
								Grand mean ABS w/o wall pts	3.3

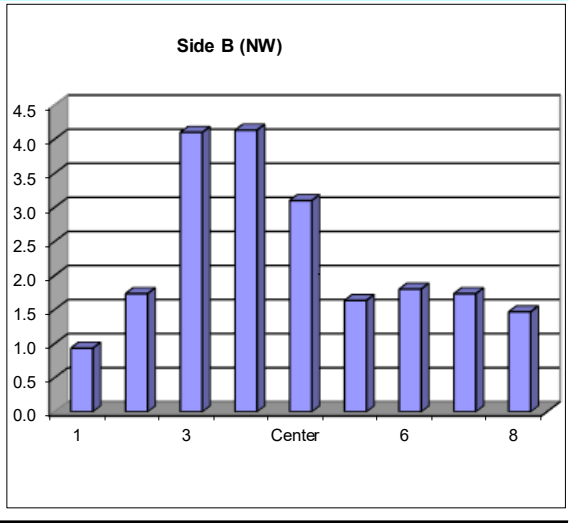
Instuments Used:		Cal. Due
S-type pitot	(ID: A10019, 60")	Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-C2 (C2V)	Run No.	FA-14
Date	4/12/2023	Fan Setting	99 %
Start/End Time	14:50 14:58	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	82.8 deg F
Stack Dia.	48 in	Approx. air vel.	2687 afpm at point Mean All
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	674.00 in		

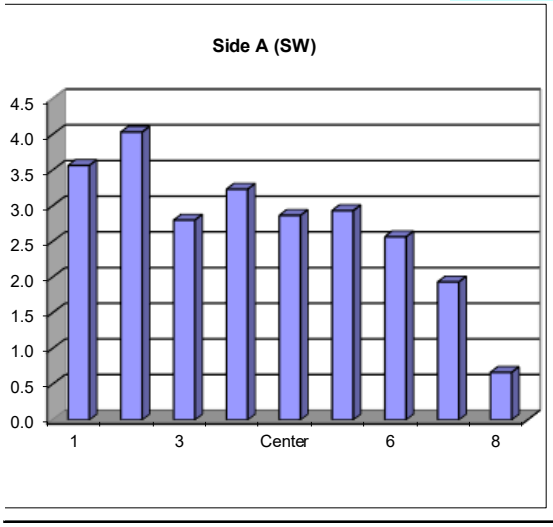
Order -->		First				Second			
Traverse-->		Side A (SW)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.54	1.5	5.6	3.6	3.6	1.3	3.7	3.3	2.8
2	5.04	1.0	5.4	5.7	4.0	1.4	4.4	0.9	2.2
3	9.31	2.1	2.8	3.5	2.8	1.1	0.3	7.2	2.9
4	15.50	2.8	3.8	3.1	3.2	2.5	2.2	2.7	2.5
Center	24.00	3.0	4.0	1.6	2.9	0.8	3.4	1.8	2.0
5	32.50	3.1	2.5	3.2	2.9	3.9	1.4	0.3	1.9
6	38.69	2.9	1.4	3.4	2.6	1.5	1.6	0.3	1.1
7	42.96	1.8	0.6	3.4	1.9	4.1	2.1	0.2	2.1
8	46.46	0.5	1.3	0.2	0.7	1.4	1.4	0.0	0.9
Mean of absolute values:					2.7				2.0
" " w/o points by wall:					2.9				2.1
								Grand mean ABS	2.4
								Grand mean ABS w/o wall pts	2.5

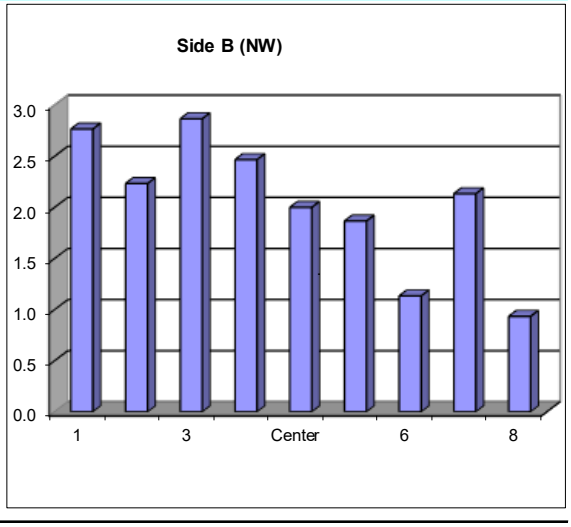
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





A.3 Velocity Transverse Data Forms - 2019

VELOCITY TRAVERSE DATA FORM

Stack	**LB-C2**	Run No.	**VT-1**
Date	**10/15/19**	Fan Configuration	**Fan A only**
Testers	ZDH/LCE	Fan Setting	**N/A** **Hz**
Stack Dia.	48 in.	Stack Temp	61.30 deg F
Stack X-Area	1809.6 in.2	Start/End Time	11:10 11:18
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		**Side1 (245 deg from N)**				**Side2 (335 deg from N)**			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,637.1	2,545.6	2,576.5	2,586.4	2,696.4	2,545.6	2,607.0	2,616.3
2	42.96	2,811.2	2,811.2	2,839.2	2,820.5	2,894.3	2,754.4	2,725.5	2,791.4
3	38.69	2,866.9	2,839.2	2,921.5	2,875.9	2,894.3	2,866.9	2,866.9	2,876.0
4	32.50	2,975.0	2,948.4	2,975.0	2,966.2	2,839.2	2,894.3	2,921.5	2,885.0
Center	24.00	2,894.3	2,839.2	2,811.2	2,848.2	3,001.5	2,921.5	2,782.9	2,902.0
5	15.50	2,921.5	2,754.4	2,811.2	2,829.0	2,811.2	2,866.9	2,811.2	2,829.7
6	9.31	2,839.2	2,754.4	2,839.2	2,810.9	2,839.2	2,811.2	2,782.9	2,811.1
7	5.04	2,725.5	2,696.4	2,666.9	2,696.3	2,725.5	2,754.4	2,576.5	2,685.5
8	1.54	2,666.9	2,637.1	2,576.5	2,626.8	2,666.9	2,514.3	2,696.4	2,625.9
Averages ---------->		2,815.3	2,758.4	2,779.7	2,784.5	2,818.7	2,769.9	2,752.3	2,780.3

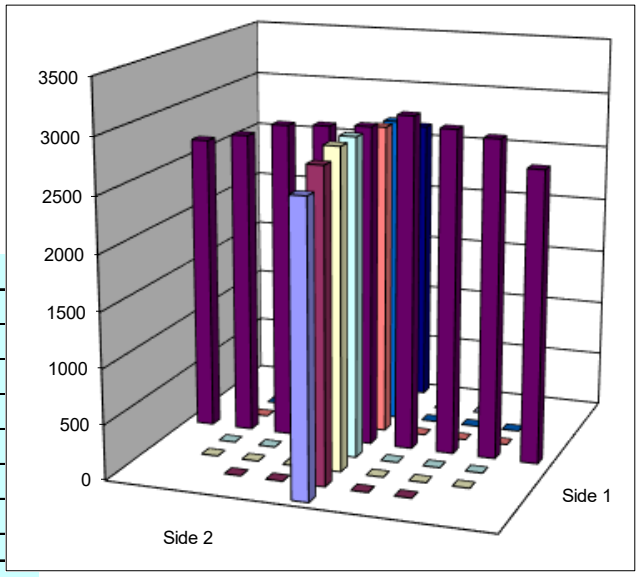
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2782.4		Mean	2835.3	2825.8	2830.5
Min Point	2586.4	-7.0%	Std. Dev.	80.7	74.1	74.6
Max Point	2966.2	6.6%	COV as %	2.8	2.6	**2.6**

Flow w/o C-Pt 34819 cfm

Vel Avg w/o C-Pt 2771 fpm

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	60.70	61.90	F
Equipment temp	58.30	64.60	F
Ambient temp	58.30	64.60	F
Stack static	1.29	1.32	mbars
Ambient pressure	992.55	992.21	mbars
Total Stack pressure	993.8	993.5	mbars
Ambient humidity	40%	33%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-2
Date	10/15/19	Fan Configuration	Fan A only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	67.50 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:35 14:53
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,739.3	2,620.1	2,768.3	2,709.2	2,620.1	2,650.4	2,680.4	2,650.3
2	42.96	2,739.3	2,796.9	2,853.5	2,796.6	2,768.3	2,680.4	2,739.3	2,729.3
3	38.69	2,963.2	2,853.5	2,768.3	2,861.6	2,825.3	2,768.3	2,796.9	2,796.8
4	32.50	2,908.8	2,881.2	2,990.1	2,926.7	2,936.2	2,963.2	2,796.9	2,898.8
Center	24.00	3,095.0	2,908.8	2,853.5	2,952.4	2,990.1	2,881.2	2,853.5	2,908.3
5	15.50	2,825.3	2,739.3	2,768.3	2,777.6	2,908.8	2,825.3	3,016.7	2,916.9
6	9.31	2,680.4	2,825.3	2,796.9	2,767.5	2,881.2	2,825.3	2,853.5	2,853.3
7	5.04	2,709.9	2,796.9	2,709.9	2,738.9	2,680.4	2,650.4	2,709.9	2,680.2
8	1.54	2,589.4	2,650.4	2,589.4	2,609.8	2,260.2	2,527.0	2,463.1	2,416.8
Averages ---------->		2,805.6	2,785.8	2,788.7	2,793.4	2,763.4	2,752.4	2,767.8	2,761.2

All	ft/min	Dev. from mean
Mean	2777.3	
Min Point	2416.8	-13.0%
Max Point	2952.4	6.3%

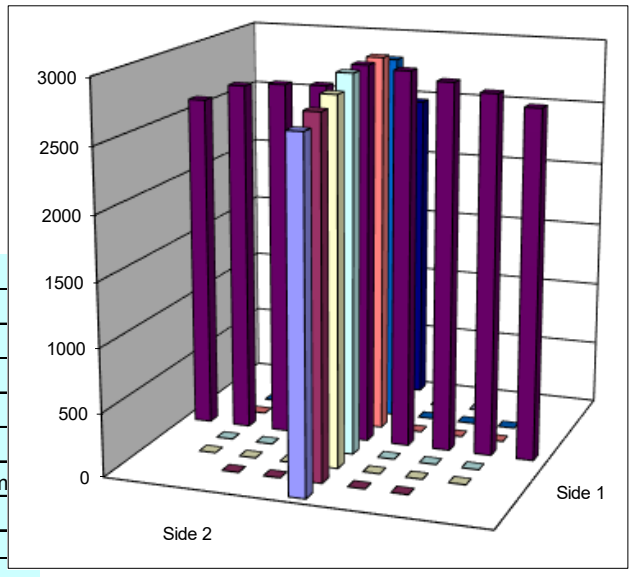
Center 2/3	Side	Bottom	All
Mean	2831.6	2826.2	2828.9
Std. Dev.	83.1	93.6	85.0
COV as %	2.9	3.3	**3.0**

Flow w/o C-Pt 34660 cfm

Vel Avg w/o C-Pt 2758 fpm

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	68.40	66.60	F
Equipment temp	67.10	66.60	F
Ambient temp	67.10	63.50	F
Stack static	2.04	5.45	mbars
Ambient pressure	992.55	990.86	mbars
Total Stack pressure	994.59	996.31	mbars
Ambient humidity	30%	33%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-3
Date	10/16/19	Fan Configuration	Fan A only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	63.75 deg F
Stack X-Area	1809.6 in.2	Start/End Time	8:53 9:00
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,560.2	2,528.7	2,591.2	2,560.0	2,497.0	2,591.2	2,560.2	2,549.5
2	42.96	2,741.1	2,798.8	2,855.4	2,798.4	2,741.1	2,741.1	2,770.1	2,750.8
3	38.69	2,827.2	2,910.8	2,910.8	2,882.9	2,741.1	2,855.4	2,770.1	2,788.9
4	32.50	2,883.2	2,798.8	2,883.2	2,855.1	2,652.2	2,770.1	2,798.8	2,740.4
Center	24.00	2,938.2	2,910.8	2,938.2	2,929.0	2,798.8	2,965.2	2,827.2	2,863.7
5	15.50	2,855.4	2,770.1	2,741.1	2,788.9	2,741.1	2,883.2	2,741.1	2,788.4
6	9.31	2,682.1	2,652.2	2,621.9	2,652.1	2,711.8	2,741.1	2,682.1	2,711.7
7	5.04	2,497.0	2,560.2	2,528.7	2,528.6	2,591.2	2,652.2	2,621.9	2,621.8
8	1.54	2,464.7	2,365.4	2,497.0	2,442.4	2,464.7	2,399.0	2,464.7	2,442.8
Averages ---------->		2,716.6	2,699.5	2,729.7	2,715.3	2,659.9	2,733.2	2,692.9	2,695.3

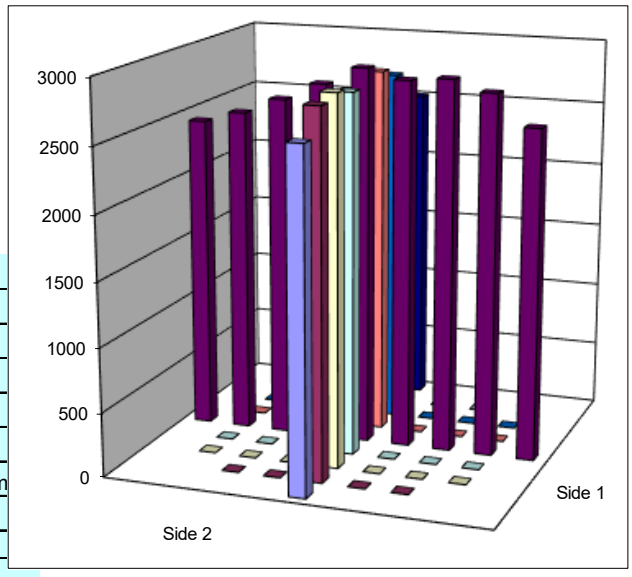
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2705.3		Mean	2776.4	2752.2	2764.3
Min Point	2442.4	-9.7%	Std. Dev.	140.4	75.2	108.9
Max Point	2929.0	8.3%	COV as %	5.1	2.7	**3.9**

Flow w/o C-Pt 33696 cfm

Vel Avg w/o C-Pt 2681 fpm

	Start	Finish	
Stack temp	63.80	63.70	F
Equipment temp	54.50	63.70	F
Ambient temp	54.50	54.60	F
Stack static	1.69	2.22	mbars
Ambient pressure	985.10	985.10	mbars
Total Stack pressure	986.8	987.3	mbars
Ambient humidity	52%	51%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-4
Date	10/16/19	Fan Configuration	Fan A only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	65.15 deg F
Stack X-Area	1809.6 in.2	Start/End Time	10:15 10:23
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,532.2	2,594.8	2,532.2	2,553.1	2,300.0	2,368.7	2,468.1	2,378.9
2	42.96	2,802.7	2,802.7	2,859.3	2,821.6	2,859.3	2,744.8	2,802.7	2,802.3
3	38.69	2,831.1	2,802.7	2,773.9	2,802.6	2,802.7	2,831.1	2,802.7	2,812.2
4	32.50	2,831.1	2,773.9	2,831.1	2,812.0	2,887.2	2,773.9	2,802.7	2,821.3
Center	24.00	2,744.8	2,887.2	2,802.7	2,811.6	2,802.7	2,715.5	2,887.2	2,801.8
5	15.50	2,685.8	2,802.7	2,859.3	2,782.6	2,887.2	2,831.1	2,802.7	2,840.3
6	9.31	2,773.9	2,563.6	2,715.5	2,684.3	2,773.9	2,802.7	2,802.7	2,793.1
7	5.04	2,625.5	2,685.8	2,685.8	2,665.7	2,715.5	2,685.8	2,744.8	2,715.4
8	1.54	2,402.3	2,468.1	2,500.3	2,456.9	2,532.2	2,402.3	2,402.3	2,445.6
Averages ---------->		2,692.2	2,709.1	2,728.9	2,710.0	2,729.0	2,684.0	2,724.0	2,712.3

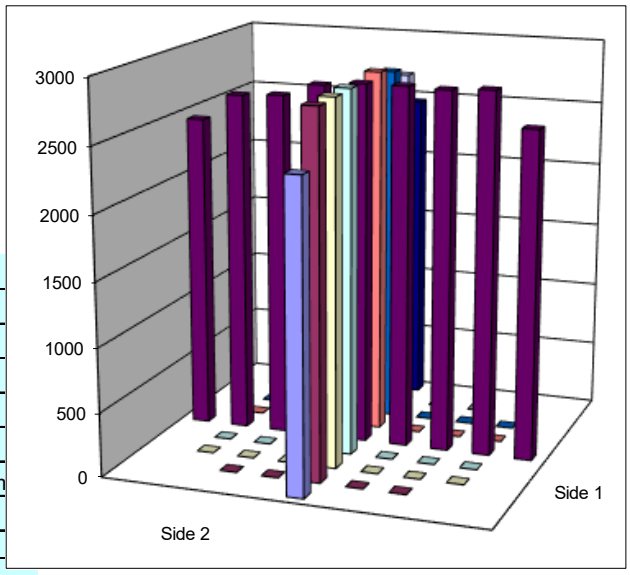
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	2711.2		Mean	2768.6	2798.0	2783.3
Min Point	2378.9	-12.3%	Std. Dev.	65.3	39.6	54.1
Max Point	2840.3	4.8%	COV as %	2.4	1.4	**1.9**

Flow w/o C-Pt 33920 cfm

Vel Avg w/o C-Pt 2699 fpm

	Start	Finish	
Stack temp	64.90	65.40	F
Equipment temp	60.00	65.40	F
Ambient temp	60.00	62.60	F
Stack static	1.97	2.12	mbars
Ambient pressure	985.10	984.76	mbars
Total Stack pressure	987.1	986.9	mbars
Ambient humidity	44%	40%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-5
Date	10/16/19	Fan Configuration	Fan B only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	68.55 deg F
Stack X-Area	1809.6 in.2	Start/End Time	12:40 12:47
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,443.4	2,540.5	2,410.2	2,464.7	2,376.5	2,272.3	2,200.1	2,283.0
2	42.96	2,664.6	2,603.3	2,476.2	2,581.4	2,694.6	2,840.4	2,540.5	2,691.9
3	38.69	2,896.7	2,753.8	2,811.9	2,820.8	2,753.8	2,868.7	2,443.4	2,688.7
4	32.50	2,694.6	2,753.8	2,811.9	2,753.4	2,694.6	2,840.4	2,753.8	2,763.0
Center	24.00	2,811.9	2,724.4	2,840.4	2,792.2	2,603.3	2,783.0	2,753.8	2,713.4
5	15.50	2,753.8	2,840.4	2,868.7	2,821.0	2,840.4	2,664.6	2,840.4	2,781.8
6	9.31	2,811.9	2,868.7	2,443.4	2,708.0	2,753.8	2,694.6	2,724.4	2,724.3
7	5.04	2,724.4	2,634.1	2,694.6	2,684.4	2,664.6	2,634.1	2,783.0	2,693.9
8	1.54	2,342.3	2,443.4	2,410.2	2,398.6	2,443.4	2,443.4	2,540.5	2,475.8
Averages ---------->		2,682.6	2,684.7	2,640.8	2,669.4	2,647.2	2,671.3	2,620.0	2,646.2

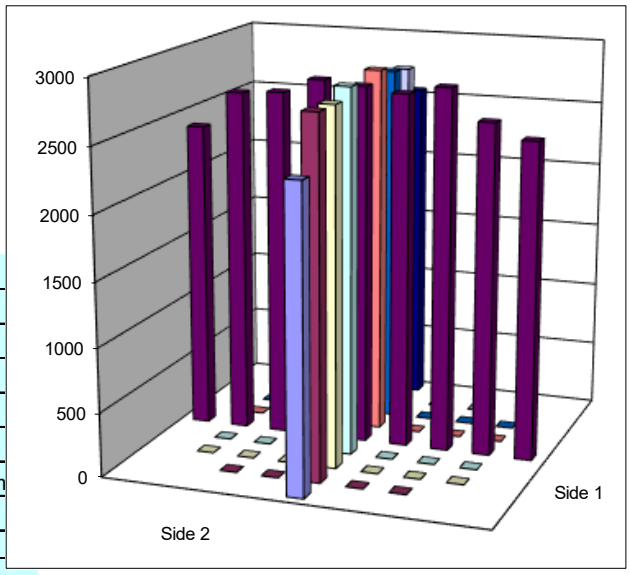
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	2657.8		Mean	2737.3	2722.4	2729.9
Min Point	2283.0	-14.1%	Std. Dev.	86.8	36.8	64.5
Max Point	2821.0	6.1%	COV as %	3.2	1.4	**2.4**

Flow w/o C-Pt 33250 cfm

Vel Avg w/o C-Pt 2646 fpm

	Start	Finish	
Stack temp	68.60	68.50	F
Equipment temp	62.30	68.50	F
Ambient temp	62.30	66.30	F
Stack static	2.56	3.01	mbars
Ambient pressure	984.08	984.08	mbars
Total Stack pressure	986.6	987.1	mbars
Ambient humidity	42%	43%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-6
Date	10/16/19	Fan Configuration	Fan B only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	69.25 deg F
Stack X-Area	1809.6 in.2	Start/End Time	13:47 13:54
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,575.5	2,479.5	2,511.9	2,522.3	2,413.3	2,379.6	2,413.3	2,402.1
2	42.96	2,786.7	2,757.5	2,698.2	2,747.5	2,310.6	2,379.6	2,575.5	2,421.9
3	38.69	2,698.2	2,728.0	2,757.5	2,727.9	2,575.5	2,728.0	2,786.7	2,696.7
4	32.50	2,728.0	2,786.7	2,637.5	2,717.4	2,637.5	2,815.5	2,757.5	2,736.8
Center	24.00	2,844.2	2,728.0	2,815.5	2,795.9	2,786.7	2,728.0	2,575.5	2,696.7
5	15.50	2,698.2	2,606.7	2,815.5	2,706.8	2,786.7	2,815.5	2,815.5	2,805.9
6	9.31	2,757.5	2,786.7	2,872.5	2,805.5	2,757.5	2,757.5	2,698.2	2,737.7
7	5.04	2,757.5	2,698.2	2,606.7	2,687.5	2,698.2	2,698.2	2,575.5	2,657.3
8	1.54	2,479.5	2,310.6	2,413.3	2,401.1	2,698.2	2,757.5	2,757.5	2,737.7
Averages ---------->		2,702.8	2,653.5	2,681.0	2,679.1	2,629.4	2,673.3	2,661.7	2,654.8

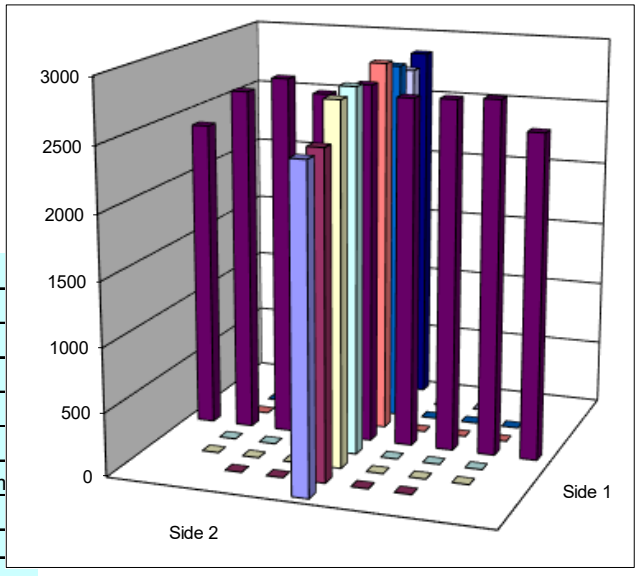
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2666.9		Mean	2741.2	2679.0	2710.1
Min Point	2401.1	-10.0%	Std. Dev.	44.7	122.5	94.3
Max Point	2805.9	5.2%	COV as %	1.6	4.6	**3.5**

Flow w/o C-Pt 33389 cfm

Vel Avg w/o C-Pt 2657 fpm

	Start	Finish	
Stack temp	69.50	69.00	F
Equipment temp	70.80	69.00	F
Ambient temp	70.80	70.80	F
Stack static	3.14	1.19	mbars
Ambient pressure	983.41	983.41	mbars
Total Stack pressure	986.5	984.6	mbars
Ambient humidity	31%	32%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-7
Date	10/17/19	Fan Configuration	Fan B only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	66.50 deg F
Stack X-Area	1809.6 in.2	Start/End Time	8:52 8:58
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,344.1	2,344.1	2,412.1	2,366.8	2,636.1	2,726.5	2,378.3	2,580.3
2	42.96	2,870.9	2,756.0	2,785.2	2,804.0	2,842.6	2,814.0	2,785.2	2,813.9
3	38.69	2,814.0	2,785.2	2,756.0	2,785.1	2,814.0	2,814.0	2,785.2	2,804.4
4	32.50	2,870.9	2,870.9	2,842.6	2,861.4	2,898.9	2,785.2	2,926.7	2,870.3
Center	24.00	2,785.2	2,842.6	2,954.2	2,860.7	2,785.2	2,814.0	2,785.2	2,794.8
5	15.50	2,870.9	2,814.0	2,756.0	2,813.6	2,756.0	2,842.6	2,756.0	2,784.9
6	9.31	2,842.6	2,898.9	2,870.9	2,870.8	2,666.6	2,842.6	2,696.8	2,735.3
7	5.04	2,814.0	2,785.2	2,666.6	2,755.3	2,666.6	2,636.1	2,696.8	2,666.5
8	1.54	2,574.1	2,666.6	2,478.1	2,573.0	2,344.1	2,478.1	2,542.5	2,454.9
Averages ---------->		2,754.1	2,751.5	2,724.6	2,743.4	2,712.2	2,750.4	2,705.9	2,722.8

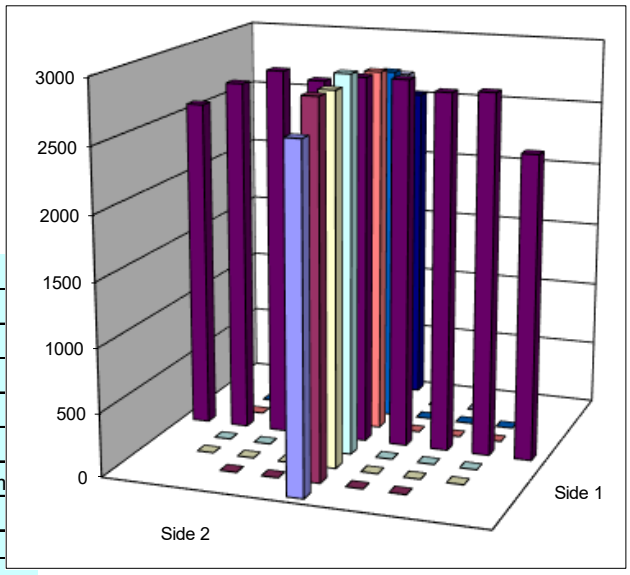
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	2733.1		Mean	2821.6	2781.4	2801.5
Min Point	2366.8	-13.4%	Std. Dev.	44.0	64.5	57.0
Max Point	2870.8	5.0%	COV as %	1.6	2.3	**2.0**

Flow w/o C-Pt 34197 cfm

Vel Avg w/o C-Pt 2721 fpm

	Start	Finish	
Stack temp	66.20	66.80	F
Equipment temp	53.00	66.80	F
Ambient temp	53.00	56.60	F
Stack static	1.97	2.39	mbars
Ambient pressure	980.02	978.67	mbars
Total Stack pressure	982.0	981.1	mbars
Ambient humidity	57%	53%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-8
Date	10/17/19	Fan Configuration	Fan B only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	69.5 deg F
Stack X-Area	1809.6 in.2	Start/End Time	9:59 10:05
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,484.4	2,451.5	2,516.8	2,484.2	2,703.5	2,548.9	2,642.8	2,631.7
2	42.96	2,703.5	2,762.9	2,792.2	2,752.9	2,792.2	2,673.3	2,733.4	2,733.0
3	38.69	2,878.1	2,703.5	2,849.8	2,810.4	2,849.8	2,849.8	2,849.8	2,849.8
4	32.50	2,762.9	2,703.5	2,878.1	2,781.5	2,792.2	2,703.5	2,849.8	2,781.8
Center	24.00	2,906.2	2,906.2	2,849.8	2,887.4	2,878.1	2,878.1	2,792.2	2,849.4
5	15.50	2,906.2	2,906.2	2,878.1	2,896.8	2,703.5	2,821.1	2,878.1	2,800.9
6	9.31	2,878.1	2,906.2	2,961.5	2,915.3	2,792.2	2,878.1	2,849.8	2,840.0
7	5.04	2,821.1	2,703.5	2,792.2	2,772.3	2,733.4	2,762.9	2,849.8	2,782.0
8	1.54	2,642.8	2,548.9	2,484.4	2,558.7	2,642.8	2,451.5	2,279.8	2,458.0
Averages ---------->		2,775.9	2,732.5	2,778.1	2,762.2	2,765.3	2,729.7	2,747.3	2,747.4

All	ft/min	Dev. from mean
Mean	2754.8	
Min Point	2458.0	-10.8%
Max Point	2915.3	5.8%

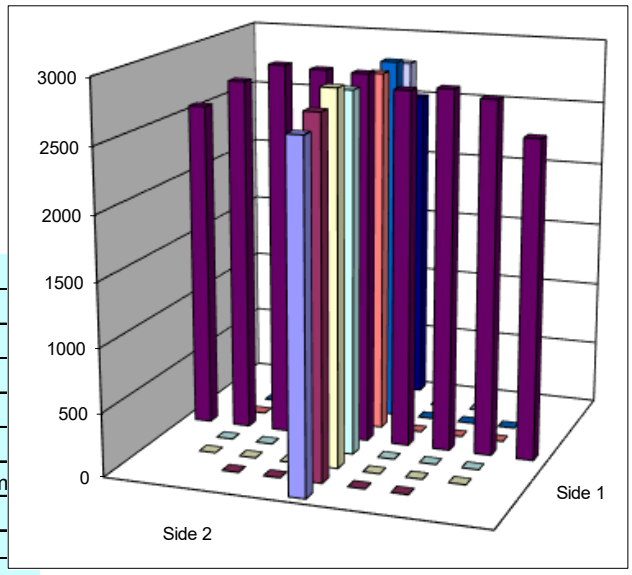
Center 2/3	Side	Bottom	All
Mean	2830.9	2805.3	2818.1
Std. Dev.	67.1	43.7	56.0
COV as %	2.4	1.6	**2.0**

Flow w/o C-Pt 34439 cfm

Vel Avg w/o C-Pt 2741 fpm

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	70.50	68.40	F
Equipment temp	59.10	68.40	F
Ambient temp	59.10	58.50	F
Stack static	2.12	1.34	mbars
Ambient pressure	980.36	980.36	mbars
Total Stack pressure	982.5	981.7	mbars
Ambient humidity	44%	44%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-9
Date	10/17/19	Fan Configuration	Fan B only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	71.40 deg F
Stack X-Area	1809.6 in.2	Start/End Time	11:06 11:11
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,456.5	2,423.0	2,585.9	2,488.5	2,554.1	2,585.9	2,389.2	2,509.7
2	42.96	2,709.1	2,739.0	2,797.9	2,748.7	2,797.9	2,826.9	2,797.9	2,807.6
3	38.69	2,678.8	2,739.0	2,768.6	2,728.8	2,797.9	2,855.6	2,884.0	2,845.9
4	32.50	2,826.9	2,678.8	2,855.6	2,787.1	2,739.0	2,940.0	2,797.9	2,825.6
Center	24.00	2,855.6	2,826.9	2,826.9	2,836.5	2,768.6	2,739.0	2,855.6	2,787.7
5	15.50	2,826.9	2,585.9	2,855.6	2,756.1	2,855.6	2,768.6	2,739.0	2,787.7
6	9.31	2,855.6	2,855.6	2,855.6	2,855.6	2,797.9	2,797.9	2,826.9	2,807.6
7	5.04	2,678.8	2,678.8	2,768.6	2,708.8	2,709.1	2,739.0	2,709.1	2,719.0
8	1.54	2,554.1	2,522.0	2,585.9	2,554.0	2,522.0	2,489.4	2,456.5	2,489.3
erages ---------->		2,715.8	2,672.1	2,766.8	2,718.2	2,726.9	2,749.2	2,717.3	2,731.1

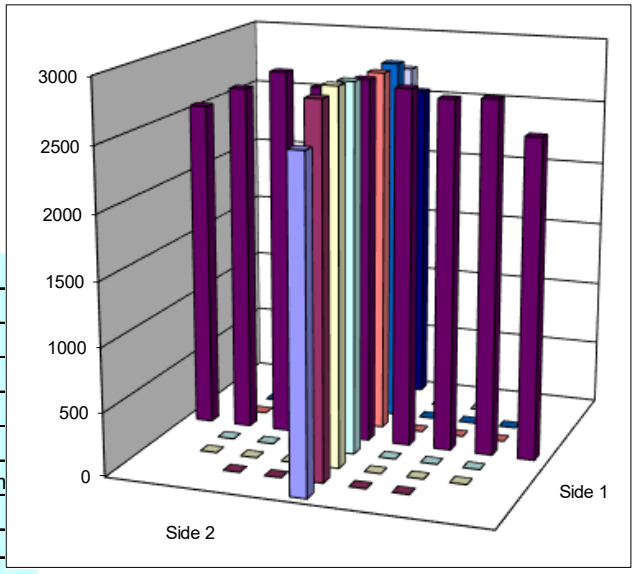
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2724.7		Mean	2774.5	2797.3	2785.9
Min Point	2488.5	-8.7%	Std. Dev.	54.7721	40.2	47.6
Max Point	2855.6	4.8%	COV as %	2.0	1.4	**1.7**

Flow w/o C-Pt 34102 cfm

Vel Avg w/o C-Pt 2714 fpm

	Start	Finish	
Stack temp	71.90	70.90	F
Equipment temp	61.40	70.90	F
Ambient temp	61.40	61.80	F
Stack static	0.90	1.05	mbars
Ambient pressure	980.70	980.70	mbars
Total Stack pressure	981.6	981.7	mbars
Ambient humidity	41%	39%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-10
Date	10/17/19	Fan Configuration	Fan A&B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	68.80 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:02 14:08
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,610.3	2,671.7	2,610.3	2,630.8	2,579.0	2,515.3	2,547.4	2,547.2
2	42.96	2,987.0	3,014.0	3,014.0	3,005.0	2,932.2	2,819.4	3,040.8	2,930.8
3	38.69	3,171.4	3,093.8	3,171.4	3,145.5	2,987.0	3,014.0	2,987.0	2,996.0
4	32.50	3,067.5	3,119.9	3,067.5	3,084.9	3,067.5	3,040.8	3,119.9	3,076.1
Center	24.00	3,040.8	3,093.8	3,067.5	3,067.4	3,014.0	3,067.5	3,040.8	3,040.8
5	15.50	3,014.0	3,014.0	3,040.8	3,023.0	3,014.0	3,040.8	2,987.0	3,014.0
6	9.31	2,987.0	3,067.5	3,040.8	3,031.8	3,014.0	3,040.8	3,067.5	3,040.8
7	5.04	2,959.7	3,014.0	2,959.7	2,977.8	3,040.8	2,904.4	2,904.4	2,949.9
8	1.54	2,671.7	2,610.3	2,579.0	2,620.4	2,848.0	2,671.7	2,701.9	2,740.6
Averages ---------->		2,945.5	2,966.6	2,950.1	2,954.1	2,944.1	2,901.7	2,933.0	2,926.2

All	ft/min	Dev. from mean
Mean	2940.1	
Min Point	2547.2	-13.4%
Max Point	3145.5	7.0%

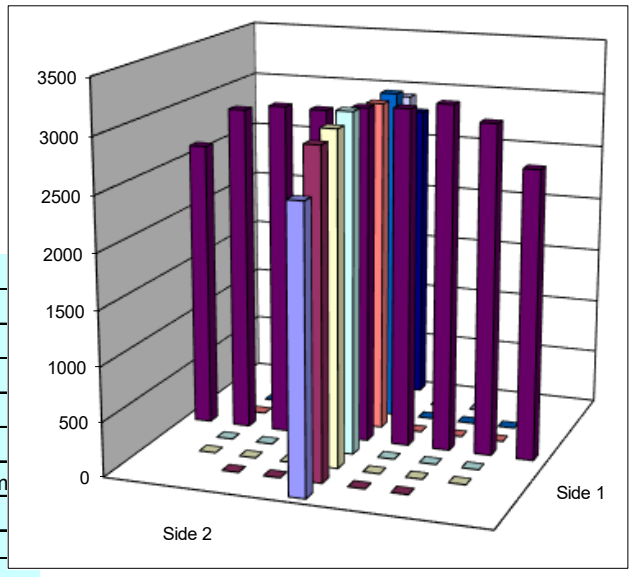
Center 2/3	Side	Bottom	All
Mean	3047.9	3006.9	3027.4
Std. Dev.	56.1	52.1	56.2
COV as %	1.8	1.7	**1.9**

Flow w/o C-Pt 36768 cfm

Vel Avg w/o C-Pt 2926 fpm

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	69.50	68.10	F
Equipment temp	59.90	68.10	F
Ambient temp	59.80	60.10	F
Stack static	1.44	1.29	mbars
Ambient pressure	980.70	980.70	mbars
Total Stack pressure	982.14	981.99	mbars
Ambient humidity	45%	45%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-11
Date	10/17/19	Fan Configuration	Fan A&B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	68.95 deg F
Stack X-Area	1809.6 in.2	Start/End Time	15:09 15:14
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,672.0	2,702.2	2,610.5	2,661.6	2,610.5	2,515.6	2,547.6	2,557.9
2	42.96	3,094.1	3,014.3	2,819.7	2,976.0	3,067.8	2,987.3	2,876.7	2,977.3
3	38.69	3,146.0	3,067.8	3,094.1	3,102.6	3,146.0	3,041.1	2,960.0	3,049.1
4	32.50	3,094.1	3,041.1	3,120.2	3,085.1	3,067.8	3,094.1	3,146.0	3,102.6
Center	24.00	3,067.8	3,120.2	3,120.2	3,102.7	3,041.1	3,067.8	3,094.1	3,067.7
5	15.50	3,146.0	3,094.1	3,094.1	3,111.4	3,041.1	3,067.8	3,041.1	3,050.0
6	9.31	3,120.2	3,014.3	2,960.0	3,031.5	2,987.3	3,014.3	3,094.1	3,031.9
7	5.04	2,932.5	2,904.7	3,014.3	2,950.5	2,960.0	2,987.3	2,960.0	2,969.1
8	1.54	2,610.5	2,672.0	2,610.5	2,631.0	2,732.0	2,790.7	2,702.2	2,741.6
Averages ---------->		2,987.0	2,959.0	2,938.2	2,961.4	2,961.5	2,951.8	2,935.8	2,949.7

All	ft/min	Dev. from mean
Mean	2955.5	
Min Point	2557.9	-13.5%
Max Point	3111.4	5.3%

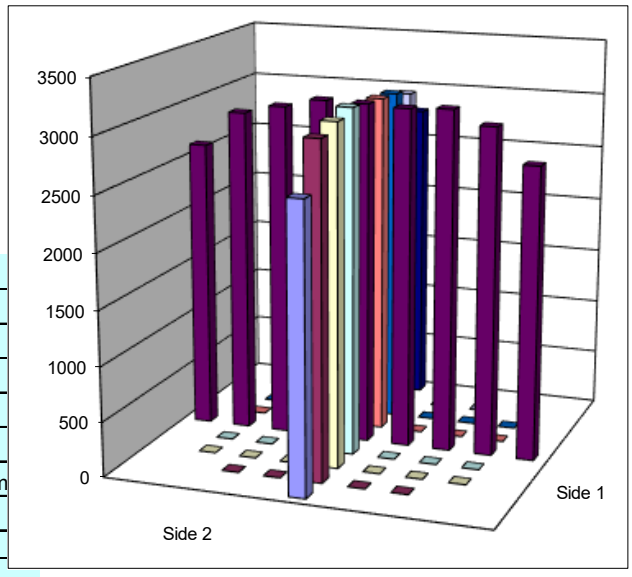
Center 2/3	Side	Bottom	All
Mean	3051.4	3035.4	3043.4
Std. Dev.	66.1	47.9	56.1
COV as %	2.2	1.6	**1.8**

Flow w/o C-Pt 36937 cfm

Vel Avg w/o C-Pt 2939 fpm

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	69.00	68.90	F
Equipment temp	61.80	68.90	F
Ambient temp	61.80	62.00	F
Stack static	1.34	1.22	mbars
Ambient pressure	981.04	980.70	mbars
Total Stack pressure	982.4	981.9	mbars
Ambient humidity	42%	42%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-12
Date	10/18/19	Fan Configuration	Fan A&B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	61.80 deg F
Stack X-Area	1809.6 in.2	Start/End Time	8:49 8:55
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,524.0	2,647.2	2,555.3	2,575.5	2,706.7	2,677.1	2,677.1	2,686.9
2	42.96	2,932.6	3,013.0	3,013.0	2,986.2	2,905.3	2,959.6	3,039.3	2,968.1
3	38.69	3,039.3	3,142.3	3,091.3	3,091.0	2,986.4	3,065.3	3,039.3	3,030.4
4	32.50	3,091.3	3,065.3	3,065.3	3,074.0	3,091.3	3,039.3	3,091.3	3,073.9
Center	24.00	3,091.3	3,039.3	3,091.3	3,073.9	3,065.3	3,091.3	3,142.3	3,099.6
5	15.50	3,065.3	3,039.3	3,116.9	3,073.8	3,039.3	3,065.3	3,065.3	3,056.7
6	9.31	3,013.0	3,116.9	3,039.3	3,056.4	3,039.3	3,065.3	3,091.3	3,065.3
7	5.04	2,986.4	3,091.3	2,850.0	2,975.9	2,877.8	2,959.6	3,039.3	2,958.9
8	1.54	2,647.2	2,586.3	2,647.2	2,626.9	2,706.7	2,735.9	2,706.7	2,716.4
Averages ---------->		2,932.3	2,971.2	2,941.1	2,948.2	2,935.3	2,962.1	2,988.0	2,961.8

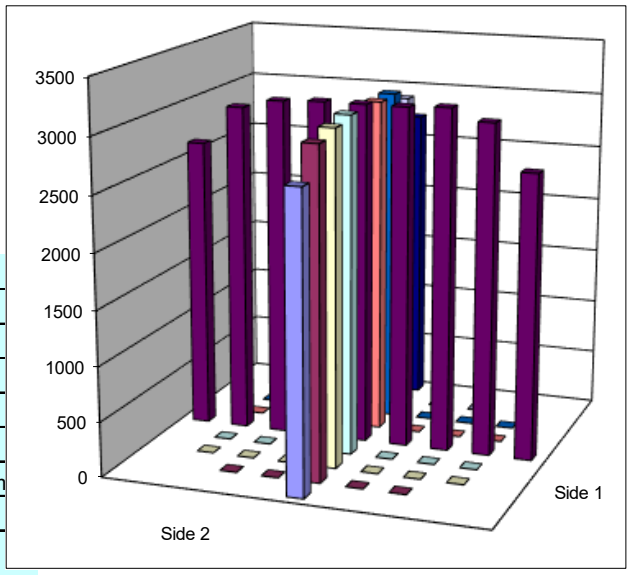
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2955.0		Mean	3047.3	3036.1	3041.7
Min Point	2575.5	-12.8%	Std. Dev.	46.5	53.8	48.6
Max Point	3099.6	4.9%	COV as %	1.5	1.8	**1.6**

Flow w/o C-Pt 36926 cfm

Vel Avg w/o C-Pt 2939 fpm

	Start	Finish	
Stack temp	60.8	62.8	F
Equipment temp	50.3	53.7	F
Ambient temp	50.3	53.7	F
Stack static	1.6	1.3	mbars
Ambient pressure	985.4	985.8	mbars
Total Stack pressure	987.0	987.1	mbars
Ambient humidity	50%	45%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-13
Date	10/18/19	Fan Configuration	Fan A&B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	64.5 deg F
Stack X-Area	1809.6 in.2	Start/End Time	9:55 10:01
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	2,653.2	2,799.9	2,742.1	2,731.7	2,529.7	2,683.1	2,742.1	2,651.6
2	42.96	2,939.2	3,072.2	2,993.2	3,001.5	3,072.2	3,019.7	2,993.2	3,028.4
3	38.69	3,098.2	3,019.7	3,098.2	3,072.0	3,072.2	3,046.1	3,046.1	3,054.8
4	32.50	3,098.2	3,046.1	3,123.9	3,089.4	3,019.7	2,966.3	3,046.1	3,010.7
Center	24.00	3,046.1	3,046.1	2,993.2	3,028.5	3,019.7	3,072.2	3,046.1	3,046.0
5	15.50	3,072.2	3,046.1	3,072.2	3,063.5	3,072.2	3,046.1	2,993.2	3,037.2
6	9.31	3,072.2	2,966.3	3,046.1	3,028.2	3,019.7	3,072.2	3,019.7	3,037.2
7	5.04	2,966.3	2,911.9	2,939.2	2,939.1	3,019.7	2,966.3	3,019.7	3,001.9
8	1.54	2,622.8	2,561.1	2,592.1	2,592.0	2,712.8	2,653.2	2,712.8	2,692.9
Averages ---------->		2,952.0	2,941.1	2,955.6	2,949.6	2,948.7	2,947.3	2,957.7	2,951.2

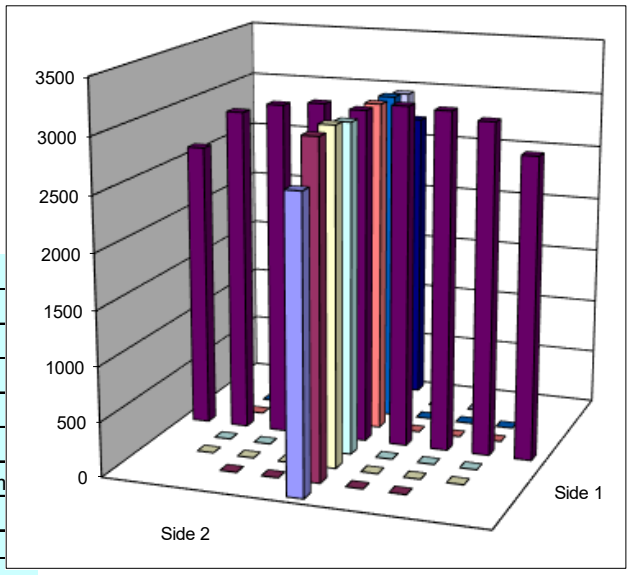
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2950.4		Mean	3031.8	3030.9	3031.3
Min Point	2592.0	-12.1%	Std. Dev.	50.8	18.9	36.8
Max Point	3089.4	4.7%	COV as %	1.7	0.6	**1.2**

Flow w/o C-Pt 36939 cfm

Vel Avg w/o C-Pt 2940 fpm

	Start	Finish	
Stack temp	64	64.9	F
Equipment temp	56.8	64.9	F
Ambient temp	56.8	56.4	F
Stack static	1.2	1.3	mbars
Ambient pressure	986.5	986.5	mbars
Total Stack pressure	987.7	987.8	mbars
Ambient humidity	38%	37%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2	Run No.	VT-14
Date	10/19/19	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	48 in.	Stack Temp	61.80 deg F
Stack X-Area	1809.6 in.2	Start/End Time	8:55 9:05
Test Port	2	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	53.3 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (245 deg from N)				Side2 (335 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	46.46	3,081.4	2,864.9	2,975.2	2,973.8	2,750.3	2,691.2	2,599.8	2,680.4
2	42.96	3,055.2	2,975.2	2,975.2	3,001.8	2,808.2	2,864.9	2,864.9	2,846.0
3	38.69	3,055.2	3,055.2	3,055.2	3,055.2	2,920.5	2,975.2	2,892.9	2,929.5
4	32.50	3,055.2	3,081.4	3,055.2	3,063.9	2,779.4	2,920.5	2,779.4	2,826.4
Center	24.00	2,975.2	2,864.9	3,028.8	2,956.3	3,055.2	2,920.5	3,002.1	2,992.6
5	15.50	3,028.8	2,836.7	3,002.1	2,955.8	2,892.9	2,920.5	2,975.2	2,929.5
6	9.31	3,081.4	3,055.2	3,002.1	3,046.2	2,947.9	2,975.2	2,975.2	2,966.1
7	5.04	2,920.5	2,947.9	3,028.8	2,965.8	2,920.5	2,836.7	2,947.9	2,901.7
8	1.54	2,947.9	2,836.7	2,892.9	2,892.5	2,720.8	2,720.8	2,864.9	2,768.8
Averages ---------->		3,022.3	2,946.4	3,001.7	2,990.1	2,866.2	2,869.5	2,878.0	2,871.2

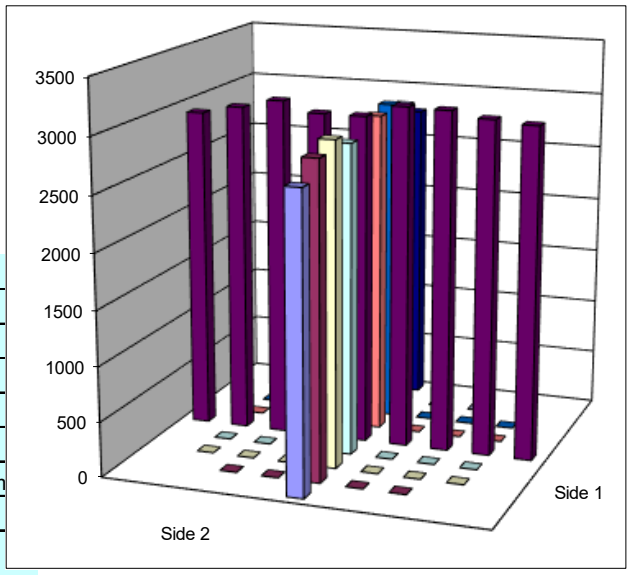
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	2930.7		Mean	3006.4	2913.1	2959.8
Min Point	2680.4	-8.5%	Std. Dev.	48.3	60.3	71.4
Max Point	3063.9	4.5%	COV as %	1.6	2.1	**2.4**

Flow w/o C-Pt 36759 cfm

Vel Avg w/o C-Pt 2925 fpm

	Start	Finish	
Stack temp	61.7	61.9	F
Equipment temp	45.8	47.1	F
Ambient temp	45.8	47.1	F
Stack static	1.6	1.5	mbars
Ambient pressure	975.3	975.3	mbars
Total Stack pressure	976.9	976.8	mbars
Ambient humidity	87%	86%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST5, 5ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

A.4 Velocity Transverse Data Forms - 2023

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-1
Date	04/11/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	70 %
Stack Dia.	48 in.	Stack Temp	80.3 deg F
Stack X-Area	1809.6 in.2	Start/End Time	10:33 10:52
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port					Second port				
Traverse-->	Port A (SW)					Port B (NW)				
Trial ---->		1	2	3	Mean		1	2	3	Mean
Point	Depth, in.	Velocity					Velocity			
1	1.54	1613.5	1700.6	1584.6	1632.9		1924.5	1818.7	1548.3	1763.8
2	5.04	1659.4	1765.4	1730.4	1718.4		1940.7	1831.4	1820.6	1864.2
3	9.31	1921.5	1846.7	1780.2	1849.5		1930.9	1844.0	1817.8	1864.2
4	15.50	1855.1	1904.3	1942.0	1900.5		1918.1	1945.8	1880.7	1914.9
Center	24.00	1906.9	1818.3	1924.5	1883.2		1938.2	1806.0	1880.3	1874.8
5	32.50	1899.1	1830.5	1924.1	1884.6		1803.3	1908.6	1864.4	1858.8
6	38.69	1852.0	1985.7	1801.4	1879.7		1925.8	1896.0	1873.7	1898.5
7	42.96	1871.1	1793.2	1938.2	1867.5		1827.3	1786.3	1871.9	1828.5
8	46.46	1742.8	1619.6	1733.8	1698.7		1724.2	1567.9	1821.5	1704.5
Averages ---------->		1813.5	1807.1	1817.7	1812.8		1881.4	1822.7	1819.9	1841.4

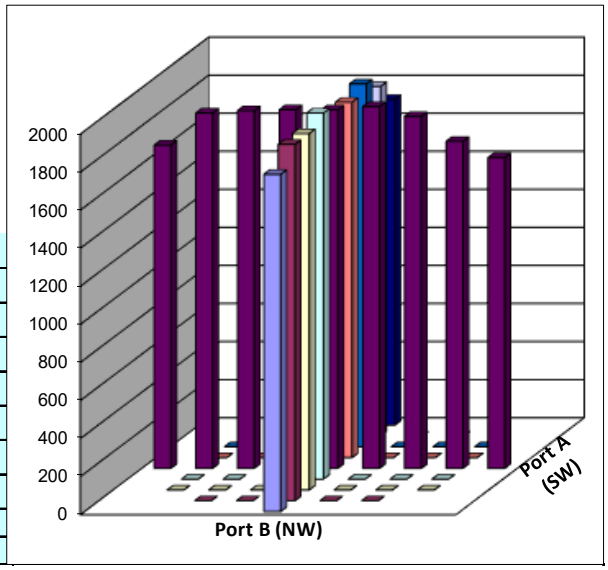
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	1827.1		Mean	1854.8	1872.0	1863.4
Min Point	1632.9	-10.6%	Std. Dev.	62.2	28.1	47.2
Max Point	1914.9	4.8%	COV as %	3.4	1.5	**2.5**

Flow w/o C-Pt 22878 cfm

Vel Avg w/o C-Pt 1821 fpm

	Start	Finish	
Stack temp	80.2	80.4	F
Equipment temp	56.0	55.0	F
Ambient temp	56.0	55.0	F
Stack static	-1.01	-0.45	mbars
Ambient pressure	986.79	986.79	mbars
Total Stack pressure	985.79	986.35	mbars
Ambient humidity	47%	47%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-2
Date	04/11/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	99 %
Stack Dia.	48 in.	Stack Temp	82.1 deg F
Stack X-Area	1809.6 in.2	Start/End Time	13:07 13:27
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2453.1	2403.1	2427.0	2427.7	2526.4	2619.7	2588.0	2578.0
2	5.04	2734.2	2749.5	2558.5	2680.7	2695.8	2684.8	2755.2	2711.9
3	9.31	2751.3	2782.4	2735.7	2756.5	2838.2	2825.6	2732.0	2798.6
4	15.50	2755.8	2789.5	2793.9	2779.7	2797.2	2719.6	2788.8	2768.5
Center	24.00	2792.1	2757.6	2660.4	2736.7	2708.7	2757.6	2673.4	2713.2
5	32.50	2801.6	2834.4	2818.0	2818.0	2805.7	2751.0	2751.0	2769.2
6	38.69	2778.8	2797.2	2808.9	2795.0	2810.7	2706.5	2791.5	2769.6
7	42.96	2787.7	2799.5	2734.2	2773.8	2815.1	2673.1	2737.2	2741.8
8	46.46	2522.4	2553.0	2557.5	2544.3	2621.3	2566.6	2578.8	2588.9
Averages ---------->		2708.6	2718.5	2677.1	2701.4	2735.5	2700.5	2710.7	2715.5

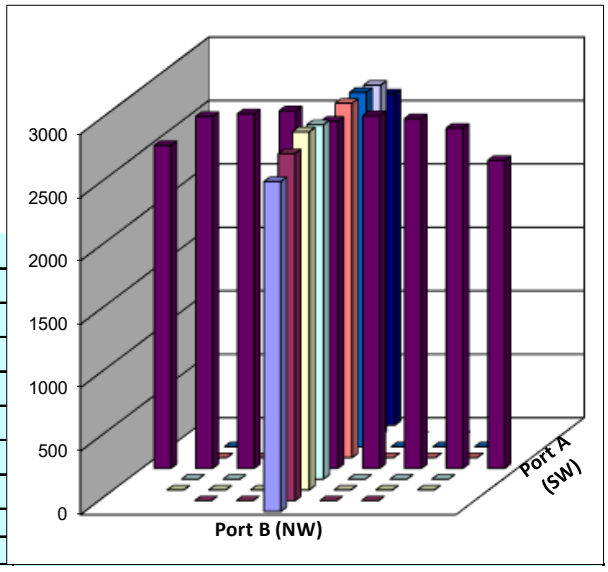
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2708.5		Mean	2762.9	2753.3	2758.1
Min Point	2427.7	-10.4%	Std. Dev.	44.6	32.3	37.7
Max Point	2818.0	4.0%	COV as %	1.6	1.2	**1.4**

Flow w/o C-Pt 34010 cfm

Vel Avg w/o C-Pt 2706 fpm

	Start	Finish	
Stack temp	81.5	82.7	F
Equipment temp	55.0	55.0	F
Ambient temp	57.0	57.0	F
Stack static	1.37	1.22	mbars
Ambient pressure	987.13	987.13	mbars
Total Stack pressure	988.50	988.35	mbars
Ambient humidity	36%	36%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-3
Date	04/11/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	99 %
Stack Dia.	48 in.	Stack Temp	83.5 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:02 14:20
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2512.8	2406.8	2425.3	2448.3	2550.0	2451.7	2476.6	2492.8
2	5.04	2772.7	2618.0	2689.4	2693.4	2654.4	2778.4	2673.6	2702.1
3	9.31	2819.2	2608.8	2835.6	2754.5	2761.7	2780.8	2755.1	2765.9
4	15.50	2833.6	2830.1	2681.1	2781.6	2762.9	2763.8	2799.5	2775.4
Center	24.00	2822.4	2768.6	2898.5	2829.8	2771.8	2789.1	2875.6	2812.2
5	32.50	2906.0	2828.9	2853.4	2862.8	2769.7	2823.3	2660.0	2751.0
6	38.69	2901.4	2806.6	2782.6	2830.2	2708.4	2829.2	2769.1	2768.9
7	42.96	2798.9	2803.0	2796.8	2799.6	2749.0	2809.2	2762.9	2773.7
8	46.46	2721.8	2773.3	2573.0	2689.4	2550.7	2604.1	2763.8	2639.5
Averages ---------->		2787.6	2716.0	2726.2	2743.3	2697.6	2736.6	2726.2	2720.2

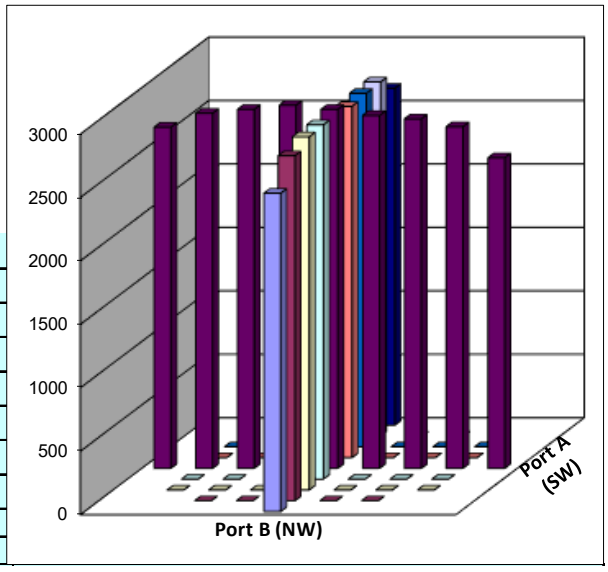
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	2731.7		Mean	2793.1	2764.2	2778.6
Min Point	2448.3	-10.4%	Std. Dev.	56.5	33.1	47.0
Max Point	2862.8	4.8%	COV as %	2.0	1.2	**1.7**

Flow w/o C-Pt 34188 cfm

Vel Avg w/o C-Pt 2721 fpm

	Start	Finish	
Stack temp	84.7	82.2	F
Equipment temp	60.0	60.0	F
Ambient temp	58.0	58.0	F
Stack static	1.05	1.52	mbars
Ambient pressure	987.13	987.13	mbars
Total Stack pressure	988.18	988.65	mbars
Ambient humidity	34%	34%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-4
Date	04/11/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	75 %
Stack Dia.	48 in.	Stack Temp	81.0 deg F
Stack X-Area	1809.6 in.2	Start/End Time	15:26 15:39
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	1850.0	1707.7	1690.2	1749.3	1790.6	1687.8	1710.1	1729.5
2	5.04	2015.8	1914.3	1948.9	1959.7	2053.9	1932.8	1931.1	1972.6
3	9.31	2092.5	2034.2	1990.7	2039.1	1979.1	1998.2	1925.5	1967.6
4	15.50	2068.7	2073.9	1988.3	2043.6	2010.5	1889.6	2028.5	1976.2
Center	24.00	2004.8	2000.7	2016.7	2007.4	2076.7	1942.1	2124.5	2047.8
5	32.50	1936.6	1914.3	2047.1	1966.0	1993.2	1976.6	1906.6	1958.8
6	38.69	1935.7	1937.0	2005.2	1959.3	2128.4	2055.9	1937.0	2040.4
7	42.96	2029.3	1916.5	1961.1	1969.0	2075.1	2083.0	1992.4	2050.2
8	46.46	1982.0	1951.0	1780.5	1904.5	1925.9	1878.7	1904.8	1903.1
Averages ---------->		1990.6	1938.8	1936.5	1955.3	2003.7	1938.3	1940.1	1960.7

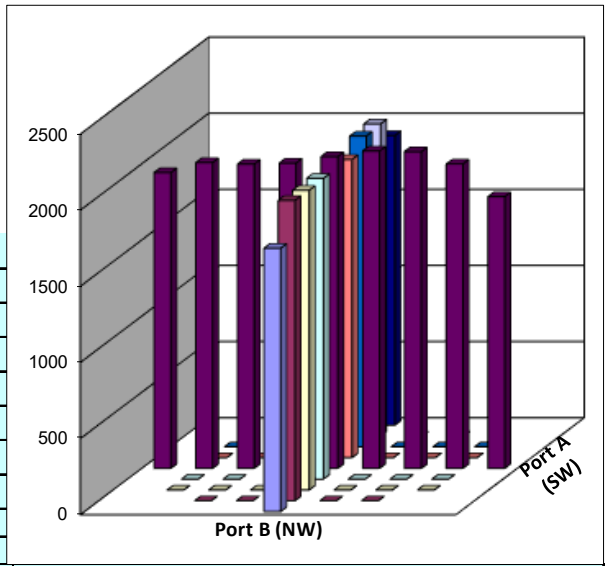
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	1958.0		Mean	1992.0	2001.9	1997.0
Min Point	1729.5	-11.7%	Std. Dev.	37.5	41.8	38.5
Max Point	2050.2	4.7%	COV as %	1.9	2.1	**1.9**

Flow w/o C-Pt 24496 cfm

Vel Avg w/o C-Pt 1949 fpm

	Start	Finish	
Stack temp	80.4	81.6	F
Equipment temp	57.0	57.0	F
Ambient temp	57.0	57.0	F
Stack static	0.65	0.62	mbars
Ambient pressure	987.47	987.47	mbars
Total Stack pressure	988.12	988.09	mbars
Ambient humidity	31%	31%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-5
Date	04/11/2023	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Fan Setting	69/69 %
Stack Dia.	48 in.	Stack Temp	79.2 deg F
Stack X-Area	1809.6 in.2	Start/End Time	16:20 16:30
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2407.4	2411.1	2314.5	2377.7	2629.4	2471.7	2433.8	2511.6
2	5.04	2674.6	2817.6	2672.8	2721.7	2666.6	2640.6	2774.1	2693.8
3	9.31	2663.5	2819.0	2824.2	2768.9	2783.8	2722.4	2859.5	2788.6
4	15.50	2798.5	2777.9	2719.4	2765.3	2837.3	2804.4	2835.0	2825.6
Center	24.00	2722.1	2815.2	2775.9	2771.1	2836.4	2750.3	2773.5	2786.7
5	32.50	2836.7	2810.0	2844.5	2830.4	2767.9	2716.7	2706.1	2730.2
6	38.69	2864.7	2768.2	2779.7	2804.2	2825.1	2791.5	2862.4	2826.3
7	42.96	2715.5	2790.9	2842.8	2783.1	2831.5	2746.4	2793.0	2790.3
8	46.46	2493.2	2581.8	2555.9	2543.6	2611.9	2586.9	2497.8	2565.5
Averages ---------->		2686.2	2732.4	2703.3	2707.3	2754.4	2692.3	2726.1	2724.3

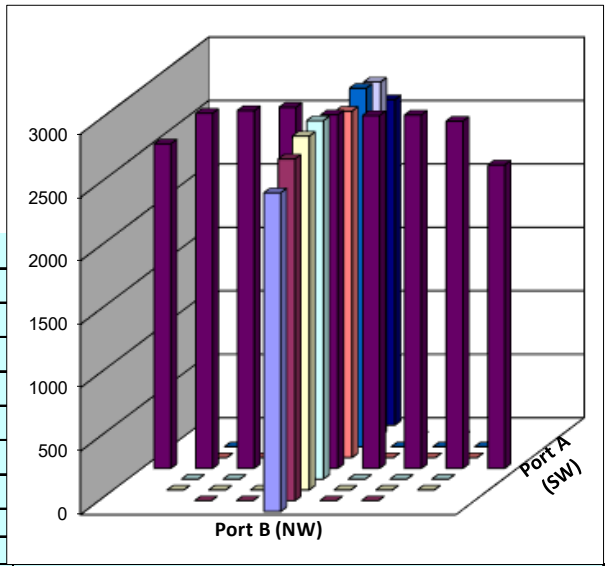
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2715.8		Mean	2777.8	2777.4	2777.6
Min Point	2377.7	-12.5%	Std. Dev.	34.0	48.8	40.4
Max Point	2830.4	4.2%	COV as %	1.2	1.8	**1.5**

Flow w/o C-Pt 34029 cfm

Vel Avg w/o C-Pt 2708 fpm

	Start	Finish	
Stack temp	79.5	78.9	F
Equipment temp	57.0	56.0	F
Ambient temp	56.0	56.0	F
Stack static	1.24	1.32	mbars
Ambient pressure	987.47	987.13	mbars
Total Stack pressure	988.72	988.45	mbars
Ambient humidity	29%	29%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-6
Date	04/12/2023	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Fan Setting	67/65 %
Stack Dia.	48 in.	Stack Temp	79.1 deg F
Stack X-Area	1809.6 in.2	Start/End Time	8:43 8:54
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2276.8	2410.6	2430.0	2372.5	2432.7	2367.0	2412.7	2404.1
2	5.04	2675.6	2637.9	2655.6	2656.4	2718.8	2675.0	2651.2	2681.7
3	9.31	2719.7	2752.4	2679.0	2717.0	2782.4	2688.1	2723.9	2731.5
4	15.50	2697.6	2716.4	2640.4	2684.8	2715.8	2691.8	2655.9	2687.8
Center	24.00	2711.6	2676.8	2737.2	2708.5	2684.2	2780.0	2742.6	2735.6
5	32.50	2693.0	2742.0	2724.5	2719.8	2718.5	2749.4	2675.3	2714.4
6	38.69	2765.5	2718.5	2729.7	2737.9	2690.3	2718.2	2755.7	2721.4
7	42.96	2714.9	2696.1	2687.2	2699.4	2580.7	2517.2	2615.1	2571.0
8	46.46	2450.1	2433.0	2417.4	2433.5	2552.2	2545.1	2534.1	2543.8
Averages ---------->		2633.9	2642.6	2633.4	2636.6	2652.8	2636.9	2640.7	2643.5

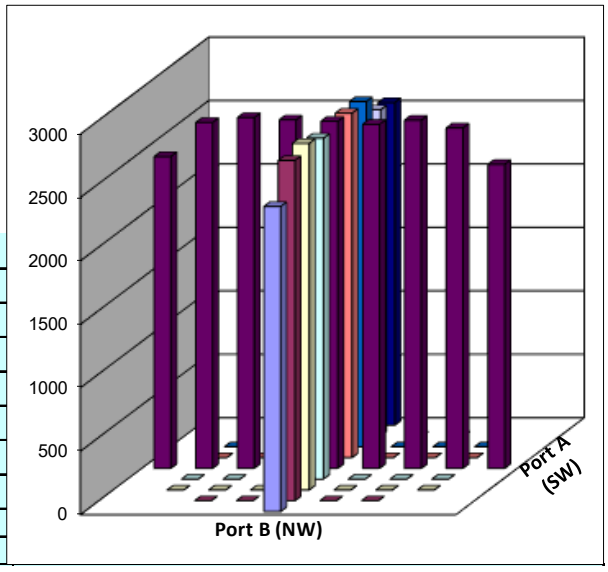
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2640.1		Mean	2703.4	2691.9	2697.7
Min Point	2372.5	-10.1%	Std. Dev.	26.6	57.1	43.2
Max Point	2737.9	3.7%	COV as %	1.0	2.1	**1.6**

Flow w/o C-Pt 33047 cfm

Vel Avg w/o C-Pt 2630 fpm

	Start	Finish	
Stack temp	79.8	78.4	F
Equipment temp	40.0	40.0	F
Ambient temp	39.0	39.0	F
Stack static	1.00	1.02	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	988.81	988.83	mbars
Ambient humidity	64%	64%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-7
Date	04/12/2023	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Fan Setting	74/74 %
Stack Dia.	48 in.	Stack Temp	79.3 deg F
Stack X-Area	1809.6 in.2	Start/End Time	9:32 9:41
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2429.3	2567.6	2519.5	2505.5	2604.4	2764.3	2893.4	2754.0
2	5.04	2966.0	2927.3	2775.9	2889.7	2958.5	2893.4	3048.7	2966.9
3	9.31	3043.3	2895.1	2992.4	2976.9	3128.9	3108.1	3113.9	3117.0
4	15.50	3095.7	3059.2	3022.5	3059.1	3041.7	3036.3	3175.0	3084.3
Center	24.00	3159.5	3084.8	3014.8	3086.4	2982.3	3085.9	3048.7	3039.0
5	32.50	3053.3	3141.0	3128.9	3107.7	3156.4	3148.0	2992.7	3099.0
6	38.69	3152.2	3073.4	3002.3	3076.0	3150.9	3103.4	3027.3	3093.9
7	42.96	3117.9	3002.6	3091.2	3070.6	3000.7	2951.6	3052.5	3001.6
8	46.46	2733.6	2756.9	2814.9	2768.5	2827.7	2622.0	2669.1	2706.3
Averages ---------->		2972.3	2945.3	2929.2	2948.9	2983.5	2968.1	3002.4	2984.7

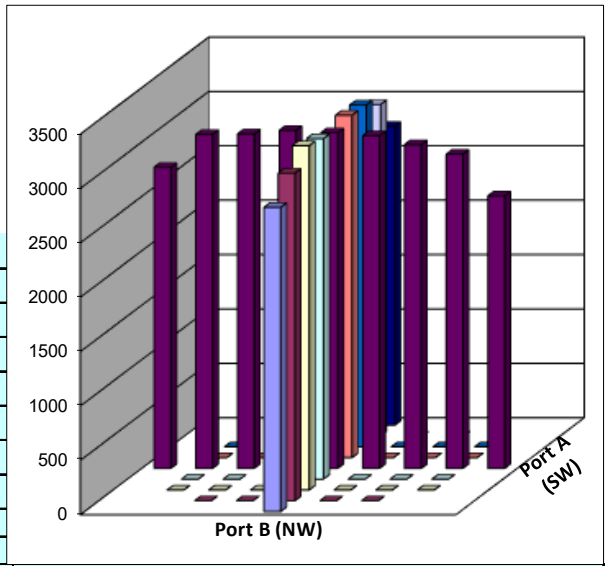
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2966.8		Mean	3038.1	3057.4	3047.7
Min Point	2505.5	-15.5%	Std. Dev.	77.3	56.3	65.7
Max Point	3117.0	5.1%	COV as %	2.5	1.8	**2.2**

Flow w/o C-Pt 37131 cfm

Vel Avg w/o C-Pt 2955 fpm

	Start	Finish	
Stack temp	79.7	78.8	F
Equipment temp	40.0	40.0	F
Ambient temp	41.0	41.0	F
Stack static	1.27	1.29	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	989.08	989.10	mbars
Ambient humidity	62%	62%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-8
Date	04/12/2023	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Fan Setting	74/74 %
Stack Dia.	48 in.	Stack Temp	78.8 deg F
Stack X-Area	1809.6 in.2	Start/End Time	10:14 10:24
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2564.2	2675.9	2651.0	2630.4	2710.0	2586.2	2769.0	2688.4
2	5.04	2926.2	2909.1	2938.5	2924.6	3048.1	2839.2	2851.0	2912.8
3	9.31	3065.8	2945.8	3119.1	3043.6	3017.0	3012.9	3046.8	3025.6
4	15.50	3014.0	3055.4	3171.8	3080.4	3091.9	3075.2	3074.1	3080.4
Center	24.00	3012.4	3024.3	3029.2	3022.0	3029.2	3142.4	3068.0	3079.9
5	32.50	3024.9	3031.9	3100.1	3052.3	3017.0	2988.6	3002.6	3002.7
6	38.69	3026.2	3076.0	3123.8	3075.3	2958.8	3004.2	2972.7	2978.6
7	42.96	3096.2	3058.1	3135.9	3096.7	3048.7	2977.6	2961.6	2996.0
8	46.46	2646.3	2754.7	2812.5	2737.8	2822.4	2788.8	2899.2	2836.8
Averages ---------->		2930.7	2947.9	3009.1	2962.6	2971.5	2935.0	2960.6	2955.7

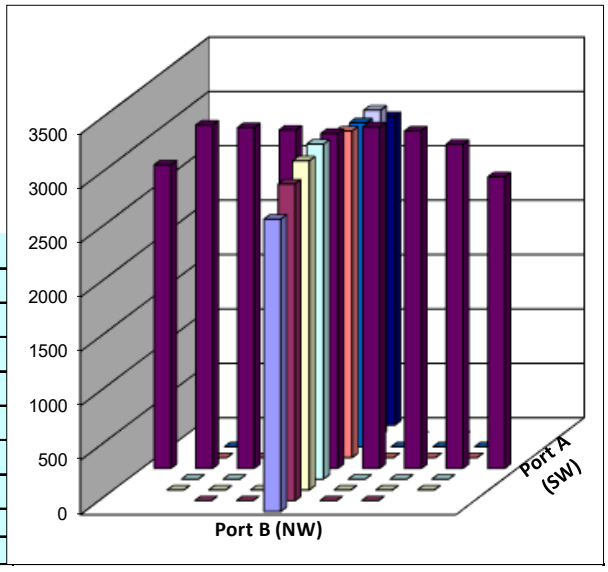
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2959.1		Mean	3042.1	3010.8	3026.5
Min Point	2630.4	-11.1%	Std. Dev.	57.6	58.8	58.2
Max Point	3096.7	4.7%	COV as %	1.9	2.0	**1.9**

Flow w/o C-Pt 37041 cfm

Vel Avg w/o C-Pt 2948 fpm

	Start	Finish	
Stack temp	78.9	78.6	F
Equipment temp	43.0	44.0	F
Ambient temp	44.0	44.0	F
Stack static	1.27	1.24	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	989.08	989.05	mbars
Ambient humidity	56%	56%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-9
Date	04/12/2023	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Fan Setting	89/86 %
Stack Dia.	48 in.	Stack Temp	78.3 deg F
Stack X-Area	1809.6 in.2	Start/End Time	11:41 11:51
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2910.5	2985.0	3121.2	3005.6	3060.6	3107.0	2918.9	3028.8
2	5.04	3581.4	3644.6	3530.2	3585.4	3618.9	3462.8	3386.7	3489.5
3	9.31	3724.6	3625.7	3646.2	3665.5	3639.9	3437.6	3632.0	3569.8
4	15.50	3703.5	3656.3	3751.1	3703.6	3770.3	3643.9	3614.6	3676.3
Center	24.00	3628.8	3724.8	3752.2	3701.9	3699.5	3654.9	3704.6	3686.3
5	32.50	3676.4	3649.5	3660.3	3662.1	3732.7	3748.1	3650.4	3710.4
6	38.69	3711.8	3768.6	3686.4	3722.3	3698.8	3704.1	3663.4	3688.8
7	42.96	3675.3	3642.6	3508.4	3608.8	3665.9	3544.6	3456.4	3555.6
8	46.46	3373.9	3315.9	3228.5	3306.1	3397.4	3517.0	3303.0	3405.8
Averages ---------->		3554.0	3557.0	3542.7	3551.2	3587.1	3535.6	3481.1	3534.6

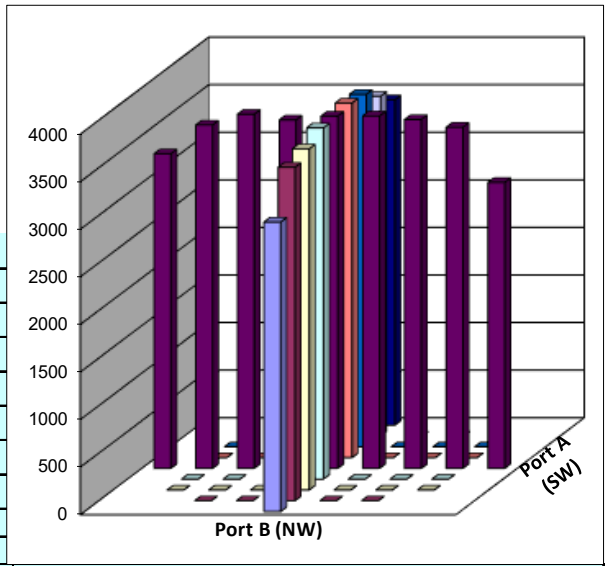
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3542.9		Mean	3664.2	3625.2	3644.7
Min Point	3005.6	-15.2%	Std. Dev.	51.1	85.6	70.7
Max Point	3722.3	5.1%	COV as %	1.4	2.4	**1.9**

Flow w/o C-Pt 44284 cfm

Vel Avg w/o C-Pt 3524 fpm

	Start	Finish	
Stack temp	78.4	78.2	F
Equipment temp	45.0	45.0	F
Ambient temp	47.0	47.0	F
Stack static	1.69	1.82	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	989.50	989.63	mbars
Ambient humidity	50%	50%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-10
Date	04/12/2023	Fan Configuration	Both Fan A & B
Testers	JCR/ARB	Fan Setting	89/86 %
Stack Dia.	48 in.	Stack Temp	78.7 deg F
Stack X-Area	1809.6 in.2	Start/End Time	12:19 12:29
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2992.0	2990.1	3081.6	3021.2	3044.2	3037.2	2919.6	3000.3
2	5.04	3473.7	3455.8	3492.1	3473.9	3467.1	3456.7	3381.7	3435.2
3	9.31	3574.2	3746.0	3678.6	3666.3	3635.4	3577.9	3590.2	3601.2
4	15.50	3624.3	3723.4	3755.6	3701.1	3623.4	3752.1	3662.1	3679.2
Center	24.00	3689.3	3687.1	3601.2	3659.2	3737.0	3782.8	3667.5	3729.1
5	32.50	3675.5	3687.1	3714.6	3692.4	3688.0	3732.8	3662.1	3694.3
6	38.69	3566.9	3691.1	3705.5	3654.5	3687.5	3643.9	3559.7	3630.4
7	42.96	3631.5	3530.8	3626.4	3596.2	3553.1	3732.8	3537.1	3607.7
8	46.46	3284.5	3302.5	3172.8	3253.3	3374.6	3457.2	3281.3	3371.0
Averages ---------->		3501.3	3534.9	3536.5	3524.2	3534.5	3574.8	3473.5	3527.6

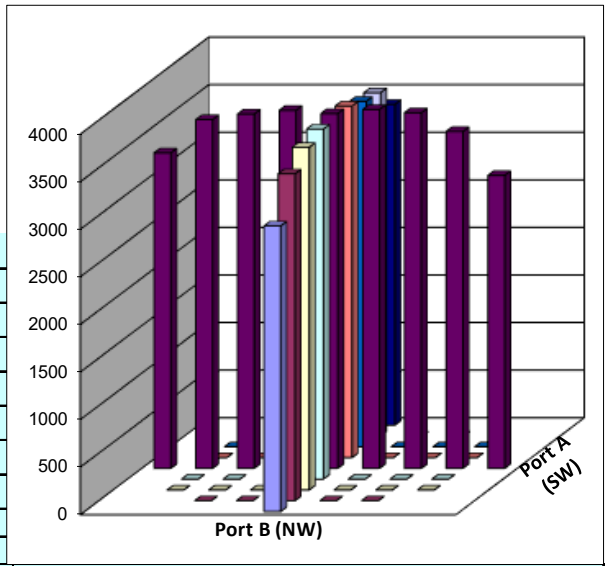
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3525.9		Mean	3634.8	3625.3	3630.0
Min Point	3000.3	-14.9%	Std. Dev.	78.6	96.2	84.5
Max Point	3729.1	5.8%	COV as %	2.2	2.7	**2.3**

Flow w/o C-Pt 44044 cfm

Vel Avg w/o C-Pt 3505 fpm

	Start	Finish	
Stack temp	78.4	78.9	F
Equipment temp	48.0	48.0	F
Ambient temp	49.0	48.0	F
Stack static	1.72	2.04	mbars
Ambient pressure	987.47	987.47	mbars
Total Stack pressure	989.19	989.51	mbars
Ambient humidity	43%	42%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-11
Date	04/12/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	72 %
Stack Dia.	48 in.	Stack Temp	77.4 deg F
Stack X-Area	1809.6 in.2	Start/End Time	13:04 13:14
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	1661.9	1807.3	1772.6	1747.3	1422.9	1585.2	1710.0	1572.7
2	5.04	1838.3	1914.3	1885.4	1879.3	1922.8	1868.8	1839.7	1877.1
3	9.31	2016.0	1960.4	1996.4	1990.9	2006.2	2067.7	2016.8	2030.2
4	15.50	2031.0	2048.2	2066.2	2048.5	2000.1	2070.1	1986.1	2018.8
Center	24.00	2038.2	2063.0	1990.7	2030.6	1986.9	1950.3	1994.4	1977.2
5	32.50	1934.3	2044.6	2093.7	2024.2	2052.2	2089.0	2078.4	2073.2
6	38.69	1876.7	2120.9	2101.9	2033.2	2009.9	1944.4	2000.9	1985.1
7	42.96	1979.9	2047.8	2047.8	2025.2	1950.8	1812.3	1919.9	1894.3
8	46.46	1811.4	1876.7	1881.1	1856.4	1874.1	1822.2	1846.3	1847.5
Averages ---------->		1909.7	1987.0	1981.8	1959.5	1914.0	1912.2	1932.5	1919.6

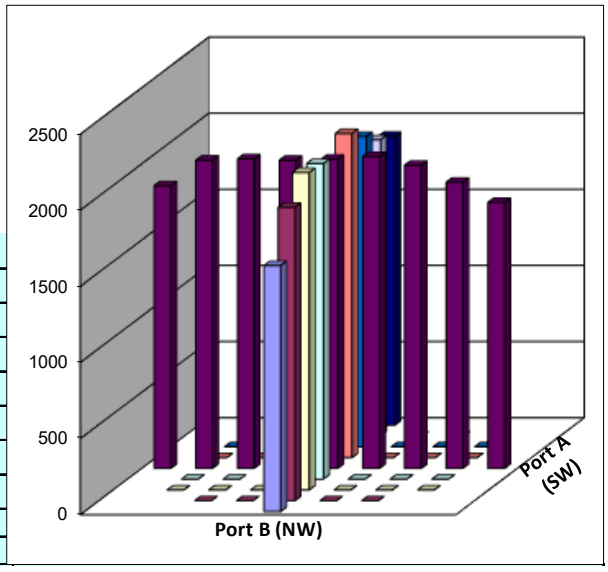
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	1939.5		Mean	2004.6	1979.4	1992.0
Min Point	1572.7	-18.9%	Std. Dev.	57.9	71.5	63.8
Max Point	2073.2	6.9%	COV as %	2.9	3.6	**3.2**

Flow w/o C-Pt 24272 cfm

Vel Avg w/o C-Pt 1931 fpm

	Start	Finish	
Stack temp	77.1	77.7	F
Equipment temp	49.0	49.0	F
Ambient temp	49.0	49.0	F
Stack static	0.57	0.65	mbars
Ambient pressure	987.13	987.13	mbars
Total Stack pressure	987.71	987.78	mbars
Ambient humidity	40%	40%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-12
Date	04/12/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	72 %
Stack Dia.	48 in.	Stack Temp	80.6 deg F
Stack X-Area	1809.6 in.2	Start/End Time	13:35 13:44
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	1789.2	1639.2	1693.6	1707.3	1656.7	1616.9	1634.7	1636.1
2	5.04	1879.1	1979.9	1779.1	1879.4	1867.2	1849.5	2024.0	1913.6
3	9.31	1926.8	1932.3	1916.5	1925.2	2008.0	2002.7	1980.8	1997.2
4	15.50	2042.2	2020.3	2029.7	2030.7	1992.4	2000.2	2021.5	2004.7
Center	24.00	2055.5	2030.9	2045.1	2043.8	1951.8	2030.9	2001.1	1994.6
5	32.50	2049.5	2011.3	2063.5	2041.4	2068.7	2067.9	2095.6	2077.4
6	38.69	1997.8	2051.9	2084.2	2044.6	2044.2	1948.9	1964.9	1986.0
7	42.96	1982.0	2021.1	1946.3	1983.1	2033.7	1890.5	1899.2	1941.1
8	46.46	1671.1	1785.1	1760.9	1739.0	1879.1	1868.1	1653.2	1800.1
Averages ---------->		1932.6	1941.3	1924.3	1932.7	1944.6	1919.5	1919.4	1927.9

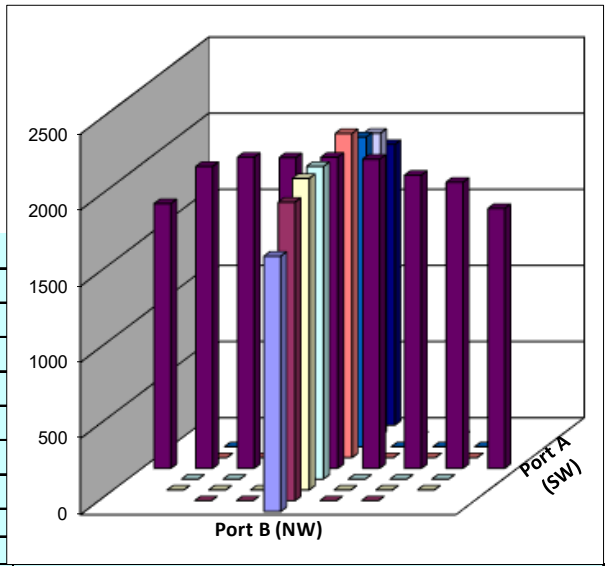
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	1930.3		Mean	1992.6	1987.8	1990.2
Min Point	1636.1	-15.2%	Std. Dev.	66.6	51.9	57.4
Max Point	2077.4	7.6%	COV as %	3.3	2.6	**2.9**

Flow w/o C-Pt 24117 cfm

Vel Avg w/o C-Pt 1919 fpm

	Start	Finish	
Stack temp	79.7	81.5	F
Equipment temp	50.0	50.0	F
Ambient temp	49.0	49.0	F
Stack static	0.55	0.65	mbars
Ambient pressure	986.79	986.79	mbars
Total Stack pressure	987.34	987.44	mbars
Ambient humidity	40%	40%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-13
Date	04/12/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	99 %
Stack Dia.	48 in.	Stack Temp	79.5 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:14 14:23
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2391.6	2387.8	2263.0	2347.5	2384.0	2292.2	2306.9	2327.7
2	5.04	2510.0	2641.8	2684.3	2612.0	2714.2	2668.7	2690.8	2691.2
3	9.31	2880.2	2852.4	2816.4	2849.7	2838.5	2812.1	2747.3	2799.3
4	15.50	2852.4	2726.0	2665.9	2748.1	2788.9	2809.4	2803.0	2800.4
Center	24.00	2792.4	2753.0	2715.7	2753.7	2744.6	2748.8	2833.0	2775.5
5	32.50	2725.4	2883.9	2805.0	2804.8	2763.4	2743.7	2829.3	2778.8
6	38.69	2777.4	2790.1	2852.1	2806.5	2771.1	2809.4	2663.8	2748.1
7	42.96	2778.0	2699.0	2565.7	2680.9	2667.1	2779.7	2737.1	2728.0
8	46.46	2342.2	2580.0	2478.6	2466.9	2456.7	2437.5	2586.4	2493.5
Averages ---------->		2672.2	2701.6	2649.6	2674.5	2680.9	2677.9	2688.6	2682.5

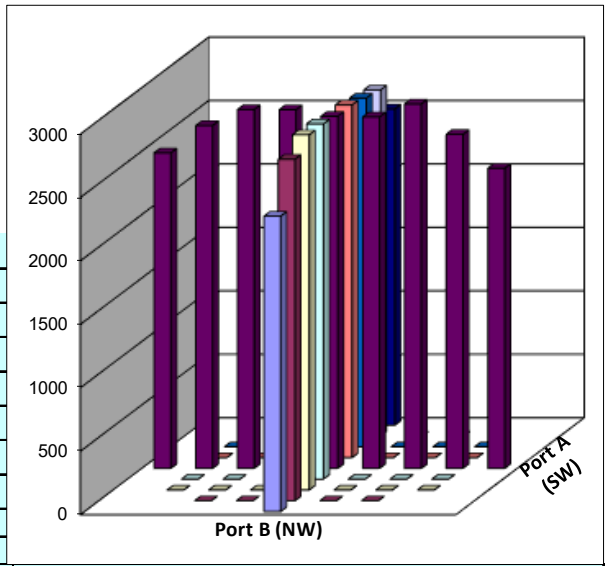
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2678.5		Mean	2750.8	2760.2	2755.5
Min Point	2327.7	-13.1%	Std. Dev.	81.6	40.1	62.0
Max Point	2849.7	6.4%	COV as %	3.0	1.5	**2.2**

Flow w/o C-Pt 33524 cfm

Vel Avg w/o C-Pt 2668 fpm

	Start	Finish	
Stack temp	78.9	80.0	F
Equipment temp	50.0	50.0	F
Ambient temp	51.0	51.0	F
Stack static	1.14	1.22	mbars
Ambient pressure	986.79	986.79	mbars
Total Stack pressure	987.94	988.01	mbars
Ambient humidity	37%	37%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-C2 (C2V)	Run No.	VT-14
Date	04/12/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	99 %
Stack Dia.	48 in.	Stack Temp	82.8 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:41 14:49
Test Port	A&B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	674 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (SW)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2269.0	2494.4	2390.8	2384.7	2327.7	2285.3	2140.3	2251.1
2	5.04	2650.0	2664.1	2667.8	2660.6	2659.1	2773.0	2621.2	2684.4
3	9.31	2745.7	2840.2	2755.6	2780.5	2792.3	2797.3	2929.6	2839.7
4	15.50	2840.8	2816.2	2905.5	2854.2	2789.3	2770.6	2730.3	2763.4
Center	24.00	2681.4	2807.1	2800.0	2762.8	2737.0	2706.0	2783.4	2742.1
5	32.50	2790.5	2859.3	2930.8	2860.2	2705.3	2841.3	2742.7	2763.1
6	38.69	2814.7	2697.7	2657.5	2723.3	2797.6	2822.4	2884.1	2834.7
7	42.96	2780.1	2679.8	2651.9	2703.9	2701.1	2801.8	2804.1	2769.0
8	46.46	2480.1	2416.6	2453.6	2450.1	2564.7	2442.5	2581.4	2529.5
Averages ---------->		2672.5	2697.3	2690.4	2686.7	2674.9	2693.4	2690.8	2686.3

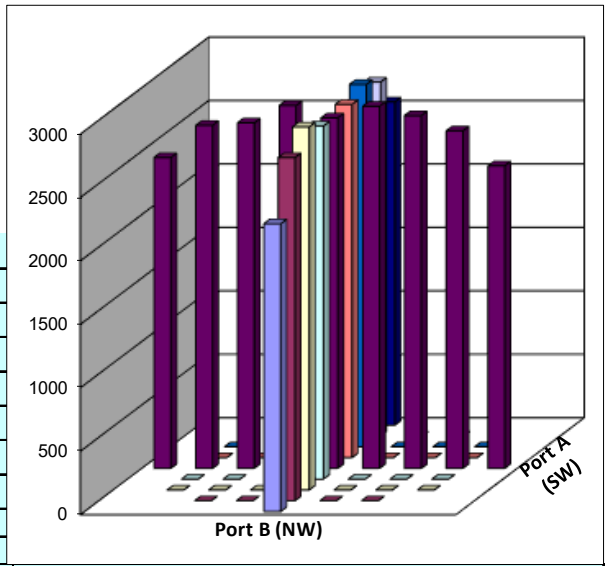
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	2686.5		Mean	2763.7	2770.9	2767.3
Min Point	2251.1	-16.2%	Std. Dev.	74.8	53.6	62.6
Max Point	2860.2	6.5%	COV as %	2.7	1.9	**2.3**

Flow w/o C-Pt 33656 cfm

Vel Avg w/o C-Pt 2678 fpm

	Start	Finish	
Stack temp	82.5	83.1	F
Equipment temp	50.0	50.0	F
Ambient temp	51.0	51.0	F
Stack static	1.07	1.14	mbars
Ambient pressure	986.79	986.79	mbars
Total Stack pressure	987.86	987.94	mbars
Ambient humidity	37%	37%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

Appendix B – LB-S1 Stack Verification Data Sheets

B.1 Flow Angle Data Forms - 2019

FLOW ANGLE DATA FORM

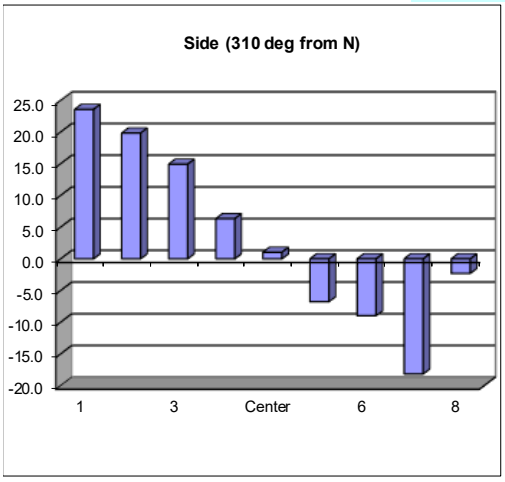
Stack	LB-S1	Run No.	FA-1
Date	10/15/2019	Fan Setting	N/A Hz
Start/End Time	13:26 13:42	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Stack Temp	66.5 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

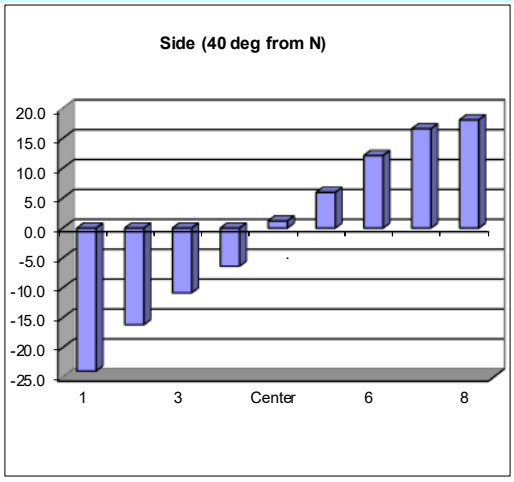
Order -->		First				Second			
Traverse-->		Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	58.08	22.8	25.0	22.9	23.6	-28.4	-21.7	-21.6	-23.9
2	53.70	20.8	18.0	20.7	19.8	-16.1	-16.3	-16.1	-16.2
3	48.36	14.9	14.3	15.6	14.9	-12.0	-8.4	-12.1	-10.8
4	40.62	6.8	7.9	4.3	6.3	-6.1	-6.4	-6.6	-6.4
Center	30.00	1.7	0.8	0.6	1.0	1.9	1.2	0.5	1.2
5	19.38	-8.6	-6.8	-4.9	-6.8	6.2	5.4	6.3	6.0
6	11.64	-9.5	-7.9	-9.5	-9.0	12.9	12.1	11.4	12.1
7	6.30	-16.4	-19.0	-19.1	-18.2	17.4	16.4	16.0	16.6
8	1.92	-2.7	-2.9	-1.3	-2.3	18.2	17.7	18.4	18.1
Mean of absolute values:					11.3				12.4
" " w/o points by wall:					10.9				9.9
								Grand mean ABS	11.8
								Grand mean ABS w/o wall pts	10.4

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessar
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Forr





FLOW ANGLE DATA FORM

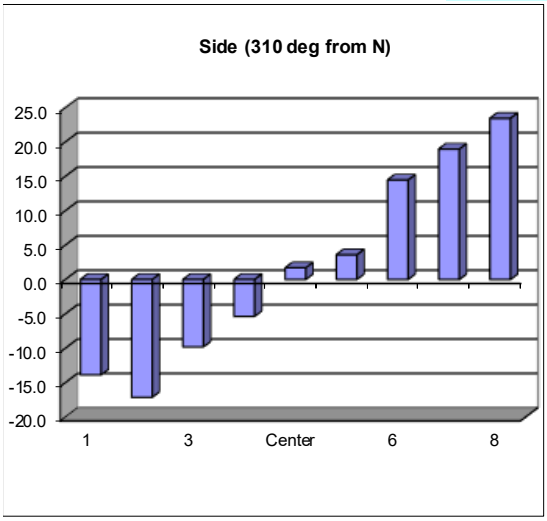
Stack	LB-S1	Run No.	FA-2
Date	10/15/2019	Fan Setting	N/A Hz
Start/End Time	15:32 15:42	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Stack Temp	67 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

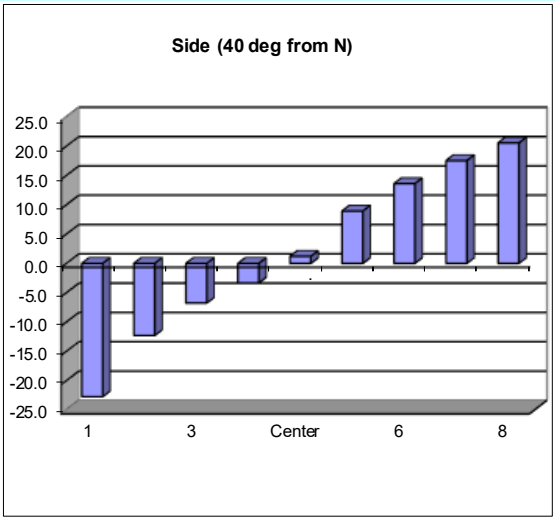
Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 58.08	-14.0	-13.9	-13.7	-13.9	-23.2	-22.8	-22.2	-22.7
2 / 53.70	-17.4	-17.1	-16.9	-17.1	-13.5	-12.4	-11.0	-12.3
3 / 48.36	-10.1	-9.7	-9.6	-9.8	-7.0	-6.8	-6.5	-6.8
4 / 40.62	-6.1	-5.1	-4.9	-5.4	-3.2	-3.6	-3.2	-3.3
Center / 30.00	2.9	1.0	1.2	1.7	2.0	0.6	1.0	1.2
5 / 19.38	3.0	4.1	3.7	3.6	9.8	8.3	8.7	8.9
6 / 11.64	14.2	14.3	14.9	14.5	12.9	13.4	14.5	13.6
7 / 6.30	19.7	18.4	18.8	19.0	18.7	16.2	17.7	17.5
8 / 1.92	23.3	24.0	23.0	23.4	21.1	20.6	19.9	20.5
Mean of absolute values:				12.0				11.9
" " w/o points by wall:				10.1				9.1
							Grand mean ABS	12.0
							Grand mean ABS w/o wall pts	9.6

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessar
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





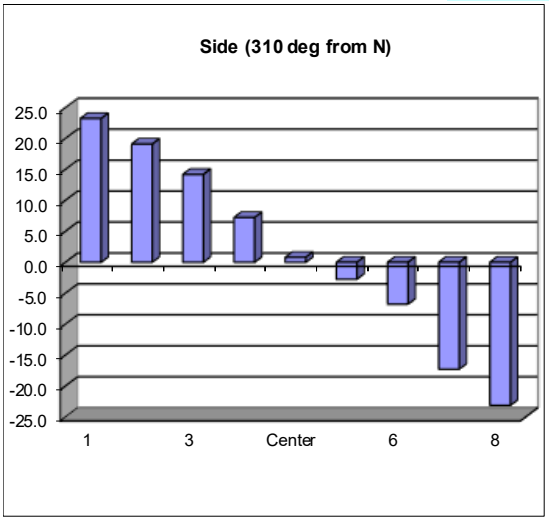
FLOW ANGLE DATA FORM

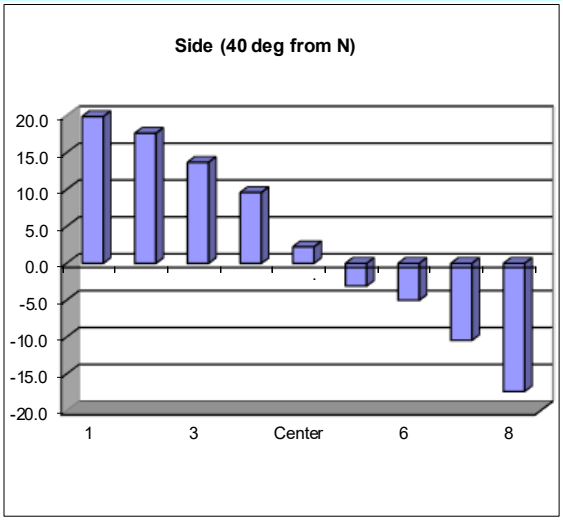
Stack	LB-S1	Run No.	FA-3
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	9:30 9:41	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Stack Temp	63.6 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

Order -->		First				Second			
Traverse-->		Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	58.08	23.3	23.1	23.3	23.2	21.6	18.3	19.8	19.9
2	53.70	19.4	19.3	18.6	19.1	18.0	17.7	17.2	17.6
3	48.36	15.2	13.9	13.5	14.2	14.2	13.4	13.5	13.7
4	40.62	9.0	7.1	5.6	7.2	9.8	8.3	10.7	9.6
Center	30.00	0.5	1.2	0.7	0.8	3.2	1.8	1.7	2.2
5	19.38	-2.7	-3.2	-2.3	-2.7	-3.2	-3.3	-2.7	-3.1
6	11.64	-6.3	-7.2	-6.8	-6.8	-5.2	-4.6	-5.2	-5.0
7	6.30	-18.3	-17.7	-15.8	-17.3	-10.5	-10.6	-10.2	-10.4
8	1.92	-23.2	-23.1	-23.0	-23.1	-17.7	-17.5	-16.9	-17.4
Mean of absolute values:					12.7				11.0
" " w/o points by wall:					9.7				8.8
								Grand mean ABS	11.9
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	9.3
S-type pitot (ID: 7A)					Post-test				
Angle indicator		SPI Tronic PRO 360 (SN 31-038-3)			Accuacy check prior to each use; field recalibration as necessary				
Manometer		5D			Primary standard				

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

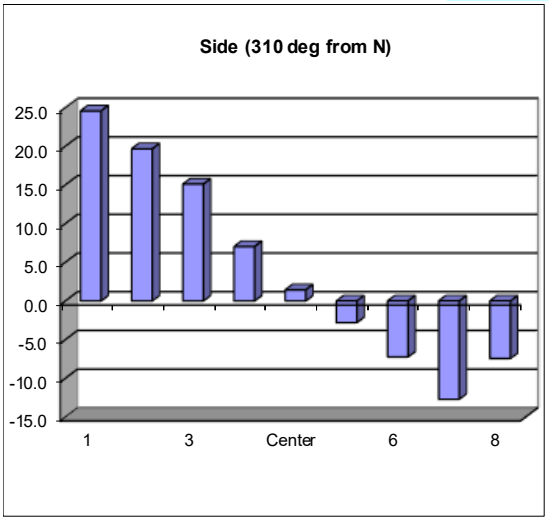
Stack	LB-S1	Run No.	FA-4
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	10:56 11:08	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Stack Temp	66.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

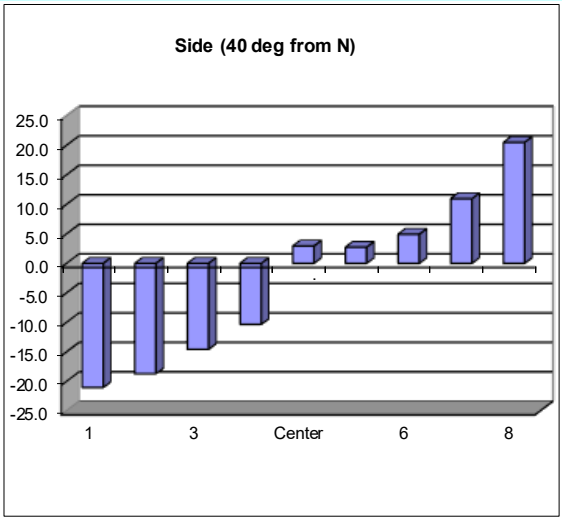
Order -->		First				Second			
Traverse-->		Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	58.08	24.8	24.5	24.4	24.6	-21.1	-21.5	-20.5	-21.0
2	53.70	18.9	20.6	19.5	19.7	-19.2	-19.4	-17.5	-18.7
3	48.36	15.4	13.8	16.1	15.1	-14.9	-14.5	-14.3	-14.6
4	40.62	6.7	7.1	7.3	7.0	-9.8	-10.5	-10.7	-10.3
Center	30.00	1.5	1.2	1.6	1.4	3.8	2.5	2.5	2.9
5	19.38	-2.8	-2.5	-3.1	-2.8	2.6	2.7	2.9	2.7
6	11.64	-7.4	-7.2	-7.1	-7.2	5.1	4.9	4.8	4.9
7	6.30	-12.1	-13.2	-12.8	-12.7	11.0	10.9	11.0	11.0
8	1.92	-7.9	-7.3	-7.1	-7.4	21.1	20.6	19.8	20.5
Mean of absolute values:					10.9				11.9
" " w/o points by wall:					9.4				9.3
								Grand mean ABS	11.4
								Grand mean ABS w/o wall pts	9.4

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

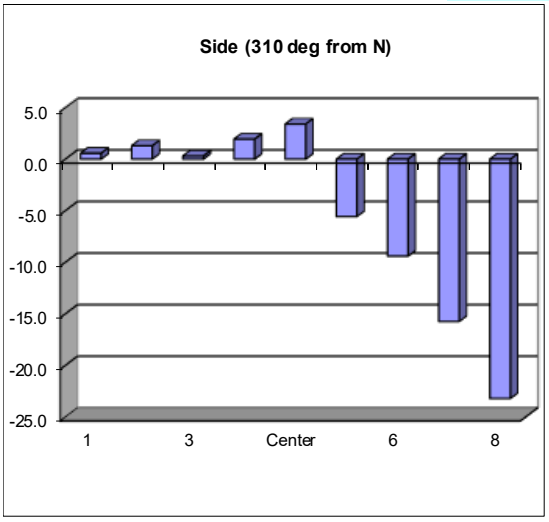
Stack	LB-S1	Run No.	FA-5
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	13:10 13:20	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Stack Temp	67.8 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

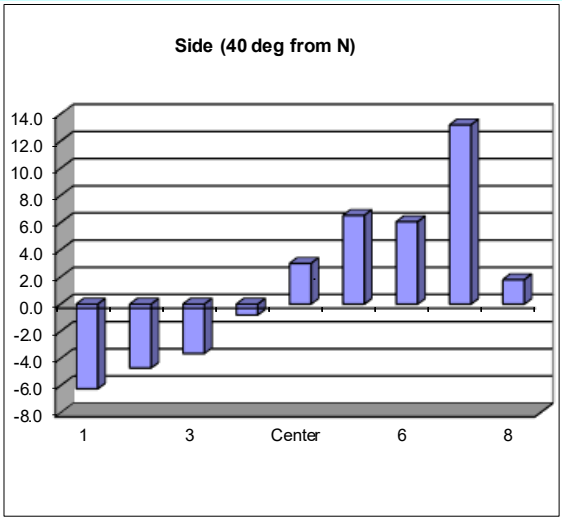
Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	58.08	0.4	0.7	0.6	0.6	-7.1	-5.9	-5.7	-6.2
2	53.70	0.8	1.2	1.9	1.3	-3.5	-5.4	-5.2	-4.7
3	48.36	0.3	0.5	0.1	0.3	-5.0	-3.6	-2.3	-3.6
4	40.62	1.7	1.9	2.2	1.9	-1.5	-0.4	-0.5	-0.8
Center	30.00	3.3	3.5	3.4	3.4	3.1	2.6	3.3	3.0
5	19.38	-5.5	-5.6	-5.6	-5.6	6.5	6.3	6.8	6.5
6	11.64	-9.3	-9.3	-9.6	-9.4	6.0	5.9	6.3	6.1
7	6.30	-15.7	-16.1	-15.4	-15.7	13.7	13.6	12.3	13.2
8	1.92	-21.5	-24.2	-23.9	-23.2	2.0	1.6	1.8	1.8
Mean of absolute values:					6.8				5.1
" " w/o points by wall:					5.4				5.4
								Grand mean ABS	6.0
								Grand mean ABS w/o wall pts	5.4

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

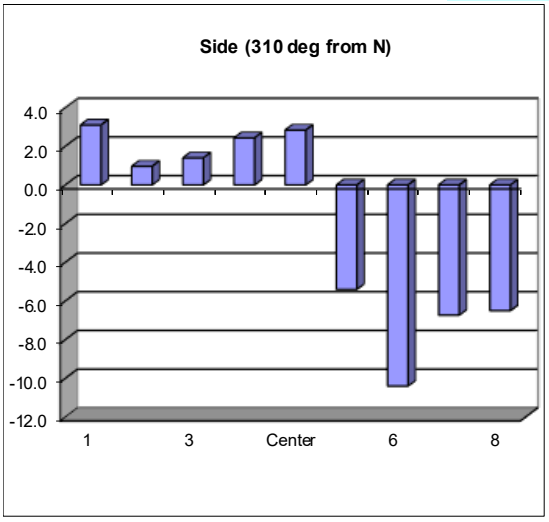
Stack	LB-S1	Run No.	FA-6
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	14:15 14:24	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Stack Temp	68.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

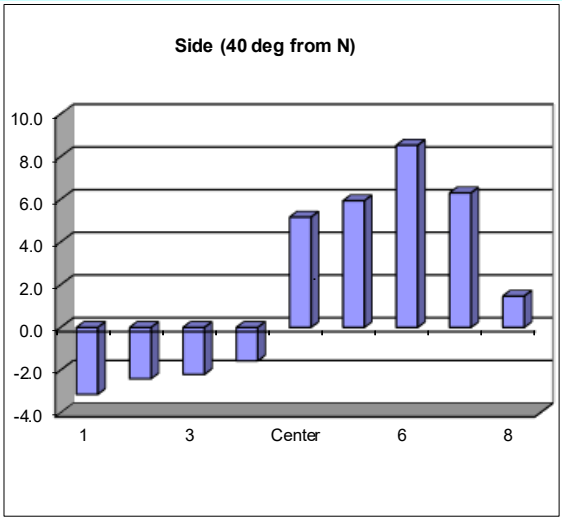
Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	58.08	3.0	2.7	3.6	3.1	-1.7	-2.1	-5.6	-3.1
2	53.70	1.2	1.2	0.5	1.0	-2.6	-2.1	-2.5	-2.4
3	48.36	1.2	2.2	0.8	1.4	-1.2	-2.0	-3.4	-2.2
4	40.62	2.8	2.8	1.7	2.4	-1.7	-1.5	-1.5	-1.6
Center	30.00	3.0	2.8	2.7	2.8	5.4	5.6	4.5	5.2
5	19.38	-6.4	-3.7	-6.1	-5.4	5.9	5.7	6.2	5.9
6	11.64	-11.9	-9.9	-9.4	-10.4	9.5	8.2	7.9	8.5
7	6.30	-7.0	-6.5	-6.7	-6.7	5.8	6.3	6.8	6.3
8	1.92	-7.1	-5.6	-6.8	-6.5	1.3	1.2	1.9	1.5
Mean of absolute values:					4.4				4.1
" " w/o points by wall:					4.3				4.6
								Grand mean ABS	4.2
								Grand mean ABS w/o wall pts	4.4

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

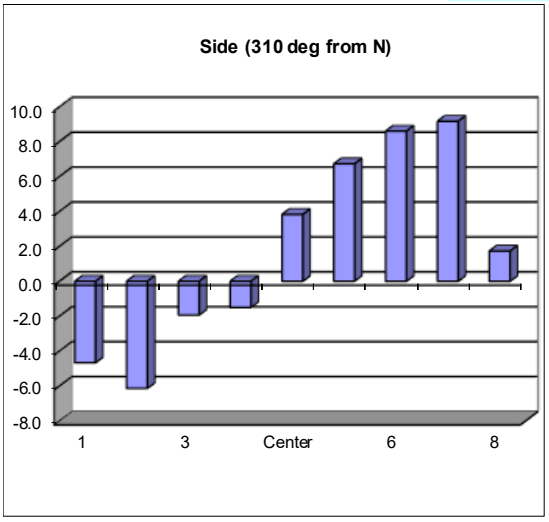
Stack	LB-S1	Run No.	FA-7
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	9:23 9:32	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Stack Temp	65.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

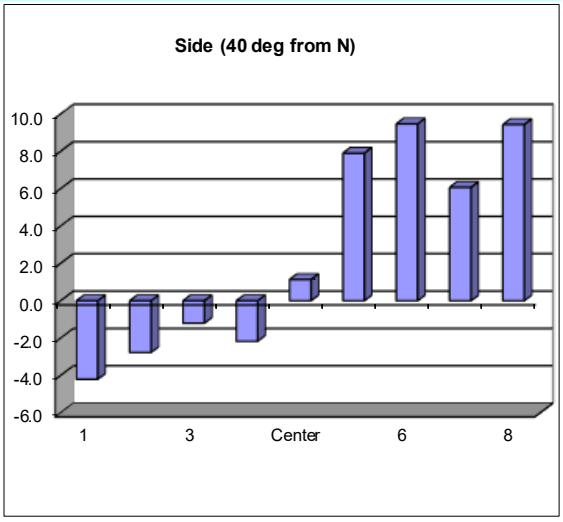
Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 58.08	-4.0	-5.2	-4.8	-4.7	-3.9	-4.4	-4.3	-4.2
2 / 53.70	-6.1	-6.6	-5.7	-6.1	-2.9	-2.9	-2.5	-2.8
3 / 48.36	-1.5	-2.0	-2.3	-1.9	-0.2	-1.6	-1.8	-1.2
4 / 40.62	-1.5	-1.4	-1.6	-1.5	-2.4	-2.3	-1.8	-2.2
Center / 30.00	3.8	3.6	4.1	3.8	1.4	1.0	1.0	1.1
5 / 19.38	6.7	6.9	6.6	6.7	8.1	7.8	7.8	7.9
6 / 11.64	8.1	9.1	8.6	8.6	9.5	9.6	9.3	9.5
7 / 6.30	9.3	8.8	9.4	9.2	5.7	6.1	6.4	6.1
8 / 1.92	2.2	1.8	1.2	1.7	9.7	9.3	9.3	9.4
Mean of absolute values:				4.9				4.9
" " w/o points by wall:				5.4				4.4
							Grand mean ABS	4.9
							Grand mean ABS w/o wall pts	4.9

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

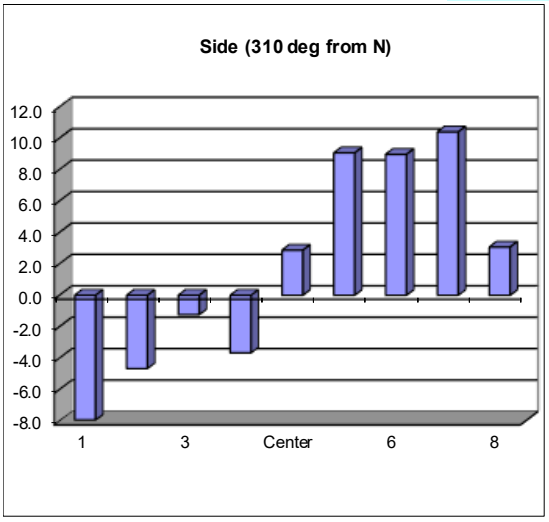
Stack	LB-S1	Run No.	FA-8
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	10:31 10:40	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Stack Temp	68.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

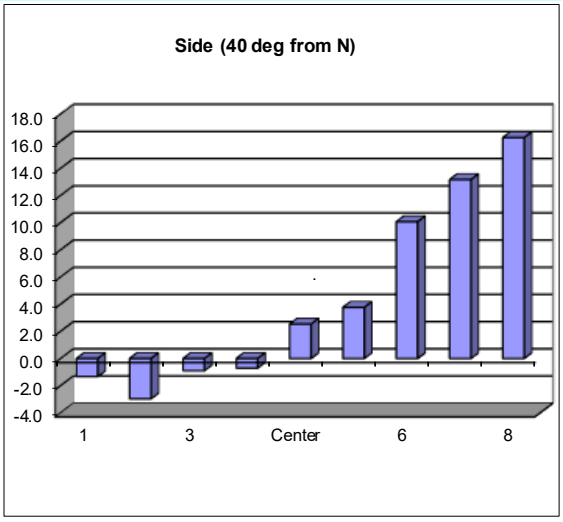
Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 58.08	-8.2	-7.9	-7.7	-7.9	-1.5	-1.6	-0.9	-1.3
2 / 53.70	-5.0	-4.2	-4.8	-4.7	-3.2	-2.9	-2.8	-3.0
3 / 48.36	-1.4	-1.1	-1.2	-1.2	-0.8	-1.2	-0.7	-0.9
4 / 40.62	-4.3	-3.4	-3.3	-3.7	-1.5	-0.2	-0.4	-0.7
Center / 30.00	3.0	2.8	2.8	2.9	2.7	2.6	2.3	2.5
5 / 19.38	9.1	9.4	8.7	9.1	3.5	3.7	4.1	3.8
6 / 11.64	9.1	9.2	8.6	9.0	9.9	9.7	10.6	10.1
7 / 6.30	10.1	10.7	10.4	10.4	13.4	13.3	12.8	13.2
8 / 1.92	3.1	3.2	2.9	3.1	16.3	16.1	16.4	16.3
Mean of absolute values:				5.8				5.7
" " w/o points by wall:				5.8				4.9
							Grand mean ABS	5.8
							Grand mean ABS w/o wall pts	5.4

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

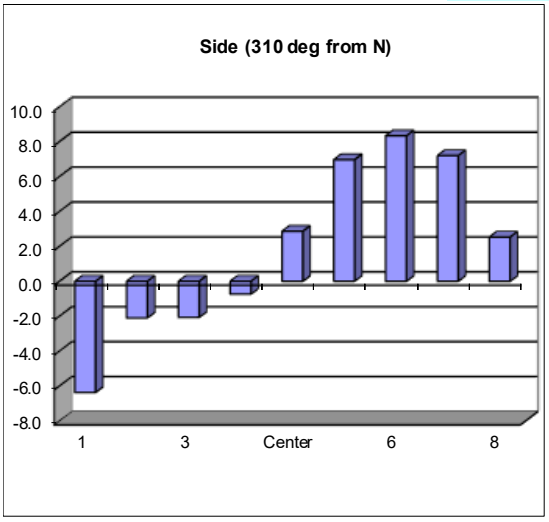
Stack	LB-S1	Run No.	FA-9
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	11:39 11:47	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Stack Temp	70.2 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

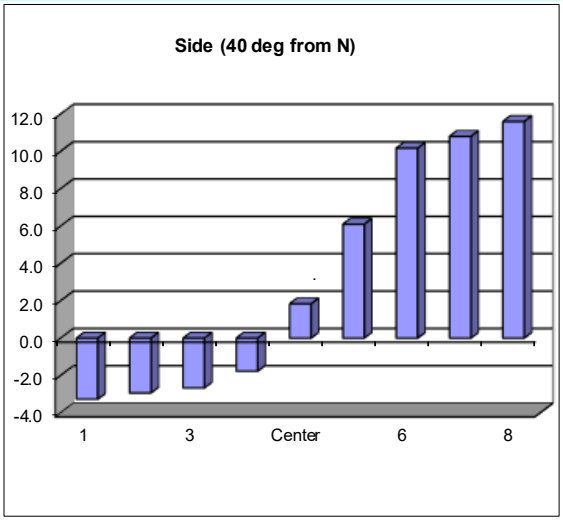
Order -->		First				Second			
Traverse-->		Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	58.08	-7.0	-6.1	-6.0	-6.4	-2.7	-3.6	-3.5	-3.3
2	53.70	-1.8	-1.9	-2.6	-2.1	-1.2	-3.5	-4.1	-2.9
3	48.36	-1.6	-2.7	-1.9	-2.1	-2.5	-2.9	-2.6	-2.7
4	40.62	-1.0	-0.7	-0.5	-0.7	-2.1	-1.7	-1.5	-1.8
Center	30.00	2.9	2.4	3.3	2.9	1.8	1.8	1.9	1.8
5	19.38	8.0	6.5	6.4	7.0	6.4	5.9	6.0	6.1
6	11.64	9.1	7.5	8.4	8.3	9.9	10.8	9.8	10.2
7	6.30	7.4	6.5	7.7	7.2	10.5	10.9	11.0	10.8
8	1.92	2.9	2.4	2.3	2.5	12.3	11.9	10.6	11.6
Mean of absolute values:					4.4				5.7
" " w/o points by wall:					4.3				5.2
								Grand mean ABS	5.0
								Grand mean ABS w/o wall pts	4.8

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

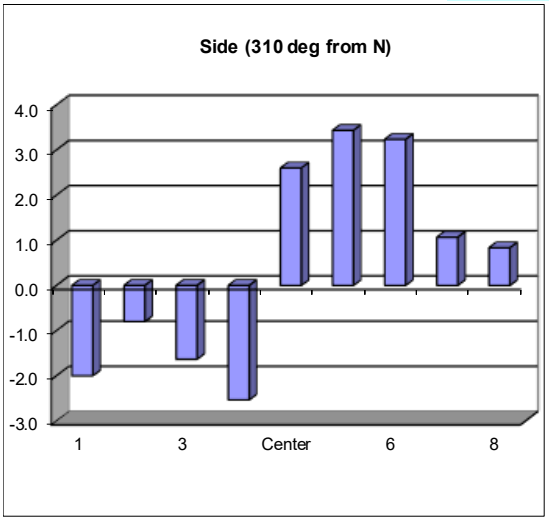
Stack	LB-S1	Run No.	FA-10
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	14:26 14:36	Fan Configuration	Fan A&C
Testers	ZDH/LCE	Stack Temp	69.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

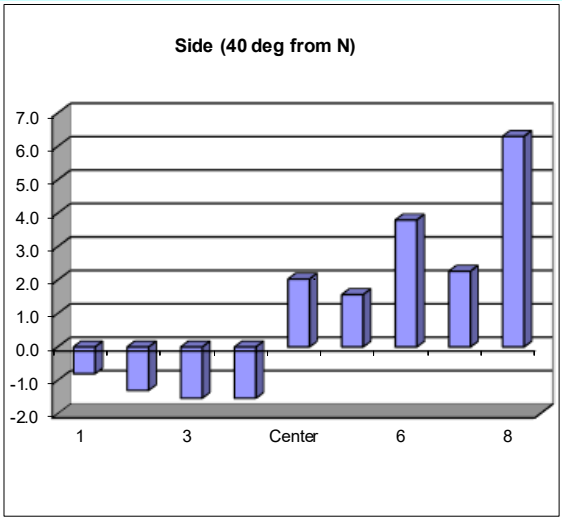
Order -->		First				Second			
Traverse-->		Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	58.08	-2.2	-2.0	-1.8	-2.0	-0.8	-0.6	-1.0	-0.8
2	53.70	-0.5	-0.5	-1.4	-0.8	-1.7	-0.9	-1.3	-1.3
3	48.36	-1.2	-1.7	-2.0	-1.6	-1.0	-2.6	-1.0	-1.5
4	40.62	-2.0	-3.2	-2.4	-2.5	-0.7	-2.1	-1.8	-1.5
Center	30.00	3.0	2.4	2.4	2.6	2.2	2.1	1.8	2.0
5	19.38	2.5	3.8	4.0	3.4	0.6	2.3	1.8	1.6
6	11.64	3.3	3.7	2.7	3.2	4.5	3.8	3.1	3.8
7	6.30	0.4	1.1	1.7	1.1	3.2	1.6	2.0	2.3
8	1.92	0.2	1.1	1.2	0.8	6.8	5.9	6.2	6.3
Mean of absolute values:					2.0				2.3
" " w/o points by wall:					2.2				2.0
								Grand mean ABS	2.2
								Grand mean ABS w/o wall pts	2.1

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

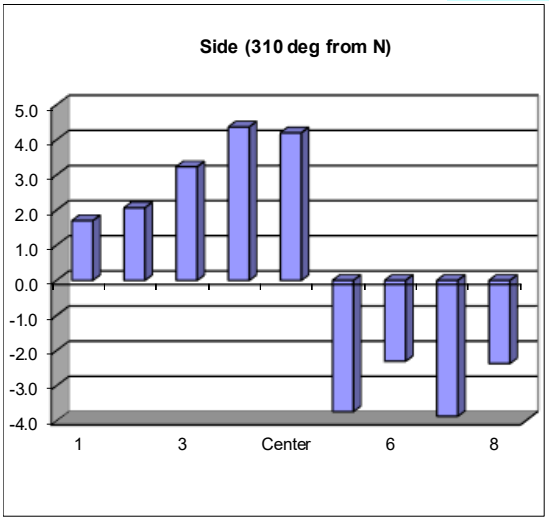
Stack	LB-S1	Run No.	FA-11
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	15:34 15:41	Fan Configuration	Fan A&C
Testers	ZDH/LCE	Stack Temp	70.5 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

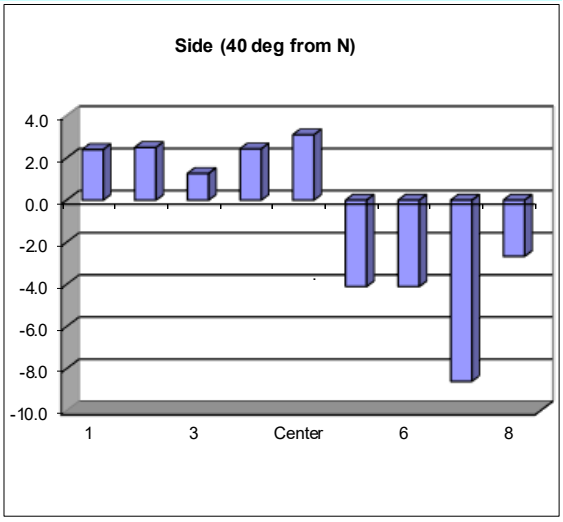
Order -->		First				Second			
Traverse-->		Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	58.08	1.2	2.5	1.4	1.7	1.7	2.8	2.7	2.4
2	53.70	4.4	0.4	1.4	2.1	2.6	2.8	2.1	2.5
3	48.36	2.3	4.2	3.2	3.2	1.6	0.9	1.3	1.3
4	40.62	4.5	4.6	4.0	4.4	2.4	2.4	2.5	2.4
Center	30.00	4.3	4.5	3.8	4.2	3.2	3.2	2.9	3.1
5	19.38	-4.0	-3.7	-3.5	-3.7	-4.0	-4.3	-4.0	-4.1
6	11.64	-1.4	-2.4	-3.1	-2.3	-3.4	-3.9	-5.0	-4.1
7	6.30	-3.9	-4.0	-3.7	-3.9	-9.2	-8.6	-8.0	-8.6
8	1.92	-3.3	-1.9	-1.9	-2.4	-2.0	-2.7	-3.3	-2.7
Mean of absolute values:					3.1				3.5
" " w/o points by wall:					3.4				3.7
								Grand mean ABS	3.3
								Grand mean ABS w/o wall pts	3.6

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





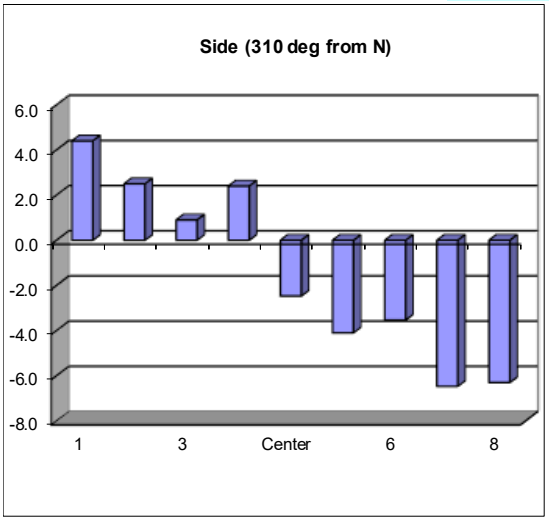
FLOW ANGLE DATA FORM

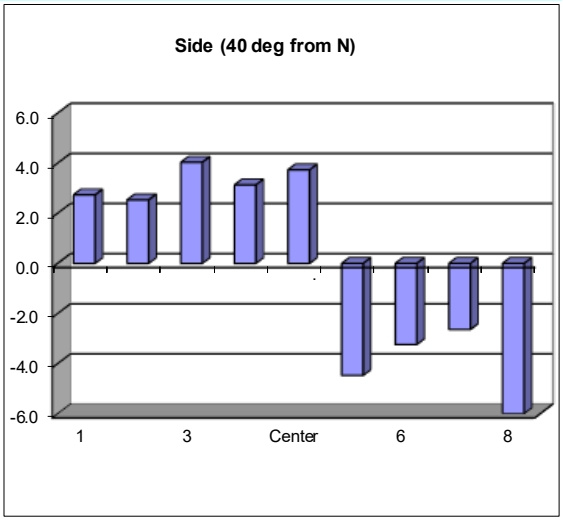
Stack	LB-S1	Run No.	FA-12
Date	10/18/2019	Fan Setting	N/A Hz
Start/End Time	9:14 9:22	Fan Configuration	Fan A&C
Testers	ZDH/LCE	Stack Temp	63.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	58.08	4.3	4.4	4.5	4.4	3.2	2.3	2.7	2.7
2	53.70	2.9	2.2	2.4	2.5	4.0	2.4	1.2	2.5
3	48.36	0.8	0.8	1.1	0.9	4.5	3.9	3.7	4.0
4	40.62	1.8	2.6	2.8	2.4	2.9	3.6	2.9	3.1
Center	30.00	-2.3	-2.7	-2.4	-2.5	3.5	3.5	4.2	3.7
5	19.38	-3.9	-4.3	-4.1	-4.1	-4.4	-4.8	-4.2	-4.5
6	11.64	-3.5	-3.5	-3.6	-3.5	-3.6	-2.9	-3.2	-3.2
7	6.30	-6.3	-6.6	-6.5	-6.5	-2.1	-3.0	-2.8	-2.6
8	1.92	-6.9	-6.1	-5.9	-6.3	-6.0	-6.1	-5.9	-6.0
Mean of absolute values:					3.7				3.6
" " w/o points by wall:					3.2				3.4
								Grand mean ABS	3.6
Instuments Used:				**Cal. Due**				Grand mean ABS w/o wall pts	3.3
S-type pitot (ID: 7A)				Post-test					
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)			Accuacy check prior to each use; field recalibration as necessary					
Manometer	5D			Primary standard					

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

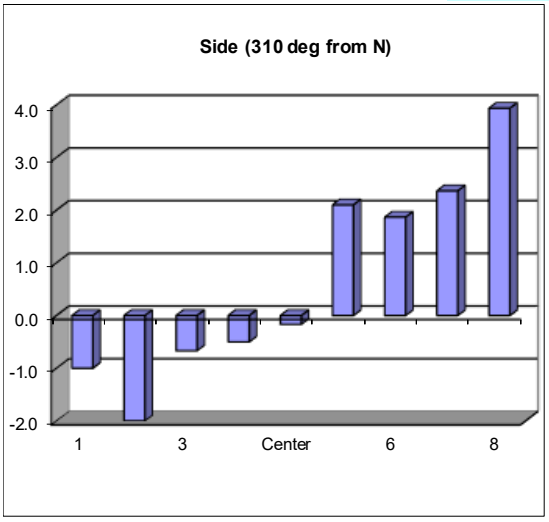
Stack	LB-S1	Run No.	FA-13
Date	10/18/2019	Fan Setting	N/A Hz
Start/End Time	10:22 10:31	Fan Configuration	Fan A&C
Testers	ZDH/LCE	Stack Temp	66 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

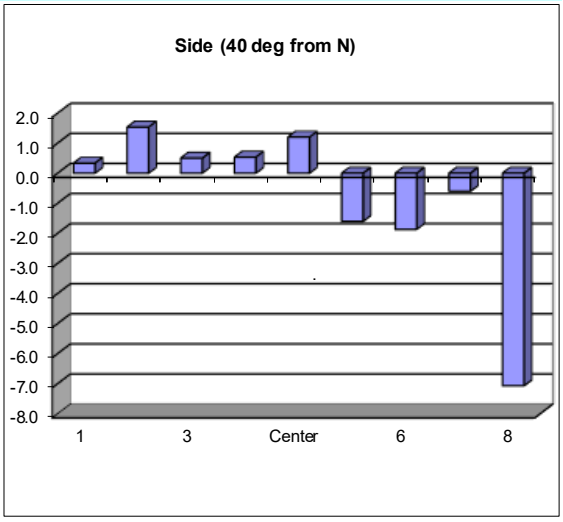
Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	58.08	-0.5	-1.1	-1.4	-1.0	0.1	0.1	0.8	0.3
2	53.70	-2.3	-1.8	-1.9	-2.0	1.6	1.4	1.6	1.5
3	48.36	-0.5	-0.7	-0.8	-0.7	0.4	0.5	0.6	0.5
4	40.62	-0.6	-0.3	-0.6	-0.5	0.7	0.3	0.6	0.5
Center	30.00	-0.2	-0.3	0.0	-0.2	1.2	1.4	1.0	1.2
5	19.38	2.3	2.1	1.9	2.1	-1.2	-2.1	-1.5	-1.6
6	11.64	2.2	2.0	1.4	1.9	-2.2	-1.8	-1.6	-1.9
7	6.30	2.5	2.3	2.3	2.4	-1.1	-0.5	-0.2	-0.6
8	1.92	3.8	4.0	4.0	3.9	-7.1	-7.2	-6.9	-7.1
Mean of absolute values:					1.6				1.7
" " w/o points by wall:					1.4				1.1
								Grand mean ABS	1.7
								Grand mean ABS w/o wall pts	1.3

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





FLOW ANGLE DATA FORM

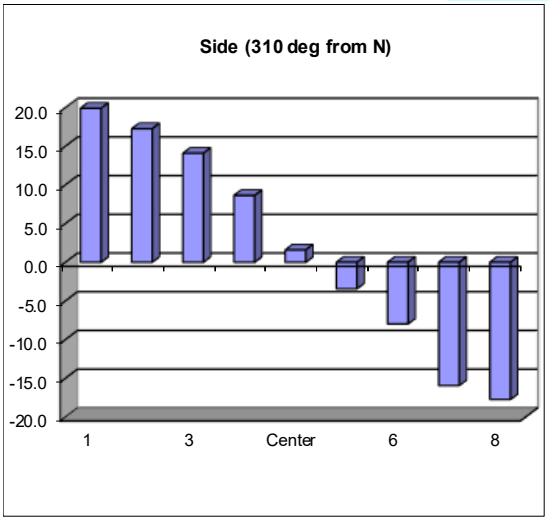
Stack	LB-S1	Run No.	FA-14
Date	10/19/2019	Fan Setting	N/A Hz
Start/End Time	9:26 9:33	Fan Configuration	Fan A &B
Testers	ZDH/LCE	Stack Temp	61.8 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	1
Distance to disturbance	56.5 ft		

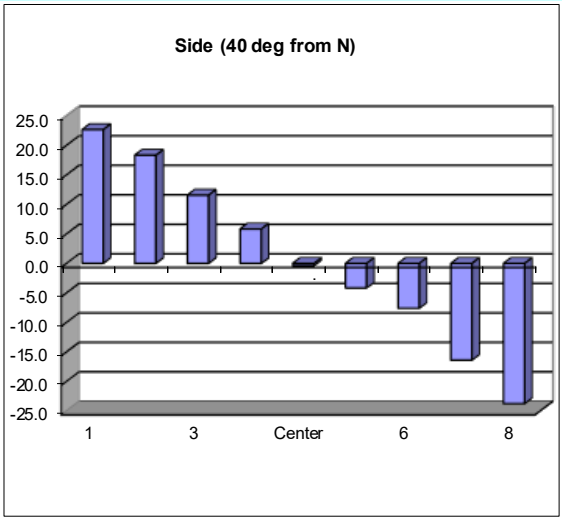
Order -->	First				Second			
Traverse-->	Side 1 (310 deg from N)				Side 2 (40 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	58.08	19.4	19.8	20.5	19.9	23.3	21.9	22.8	22.7
2	53.70	15.9	17.9	18.0	17.3	18.6	18.6	17.8	18.3
3	48.36	14.3	14.2	13.8	14.1	11.8	11.4	11.5	11.6
4	40.62	9.4	8.4	8.1	8.6	5.4	5.9	6.2	5.8
Center	30.00	2.2	1.6	1.0	1.6	0.0	-0.1	-1.1	-0.4
5	19.38	-4.3	-3.2	-2.8	-3.4	-4.1	-4.4	-4.0	-4.2
6	11.64	-8.0	-8.1	-7.8	-8.0	-7.1	-7.8	-7.9	-7.6
7	6.30	-16.3	-15.8	-15.7	-15.9	-15.8	-16.6	-16.8	-16.4
8	1.92	-17.5	-17.8	-17.9	-17.7	-23.5	-24.1	-23.7	-23.8
Mean of absolute values:					11.8				12.3
" " w/o points by wall:					9.8				9.2
								Grand mean ABS	12.1
								Grand mean ABS w/o wall pts	9.5

Instuments Used:		Cal. Due
S-type pitot (ID: 7A)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuacy check prior to each use; field recalibration as necessary
Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle
Approx. air velocity was derived from all points on the Velocity Transverse Form





B.2 Flow Angle Data Forms – 2023

FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-1
Date	4/17/2023	Fan Setting	NA %
Start/End Time	9:57 10:06	Fan Configuration	Fan A & C
Testers	JCR/ARB	Stack Temp	73.9 deg F
Stack Dia.	60 in	Approx. air vel.	2737 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

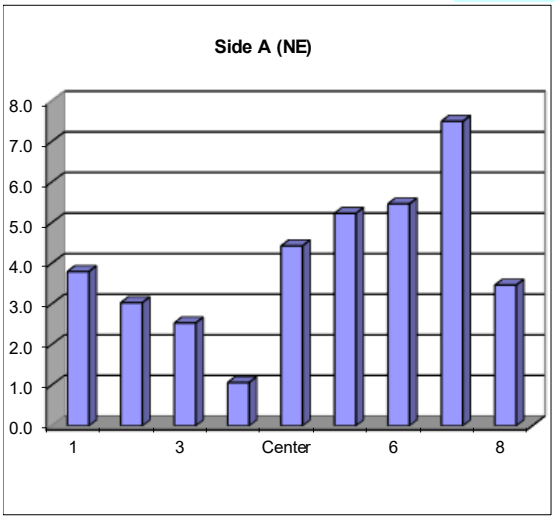
Order -->		First				Second			
Traverse-->		Side A (NE)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	4.9	3.4	3.1	3.8	5.3	4.4	2.3	4.0
2	6.30	4.3	1.5	3.3	3.0	6.1	1.7	3.2	3.7
3	11.64	4.4	0.3	2.9	2.5	7.1	0.7	5.1	4.3
4	19.38	0.2	0.4	2.6	1.1	3.3	2.7	4.8	3.6
Center	30.00	2.9	7.5	2.9	4.4	1.6	1.6	0.4	1.2
5	40.62	6.2	3.7	5.8	5.2	3.5	2.3	0.6	2.1
6	48.36	6.5	5.5	4.4	5.5	2.2	2.7	2.2	2.4
7	53.70	9.8	6.2	6.5	7.5	5.4	5.4	6.7	5.8
8	58.08	2.7	2.9	4.8	3.5	6.1	5.8	7.1	6.3
Mean of absolute values:					4.1				3.7
" " w/o points by wall:					4.2				3.3
								Grand mean ABS	3.9
								Grand mean ABS w/o wall pts	3.7

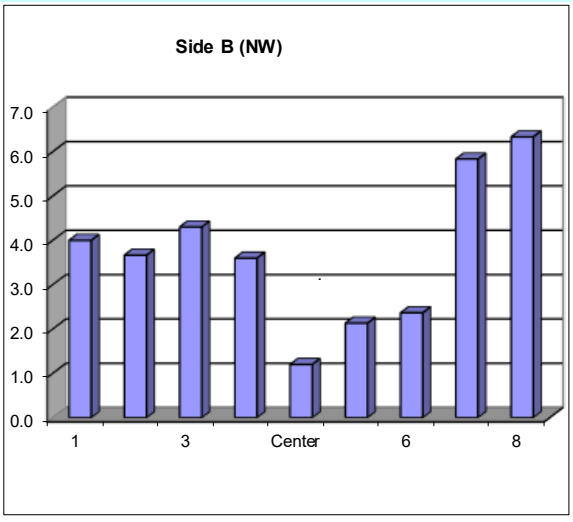
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-2
Date	4/17/2023	Fan Setting	NA %
Start/End Time	10:23 10:30	Fan Configuration	Fan A & C
Testers	JCR/ARB	Stack Temp	77.0 deg F
Stack Dia.	60 in	Approx. air vel.	2724 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

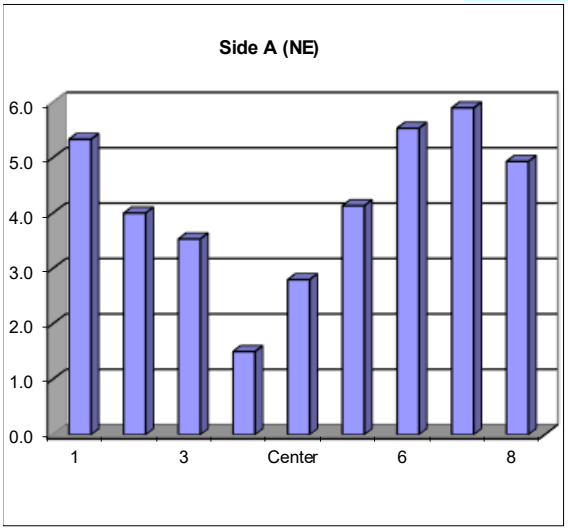
Order -->		First				Second			
Traverse-->		Side A (NE)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	2.5	7.1	6.4	5.3	3.7	0.7	1.3	1.9
2	6.30	1.8	4.4	5.8	4.0	3.2	4.2	2.0	3.1
3	11.64	3.8	2.5	4.3	3.5	1.3	1.7	2.9	2.0
4	19.38	0.6	3.0	0.9	1.5	1.1	1.3	0.7	1.0
Center	30.00	2.7	3.5	2.2	2.8	0.9	4.2	1.2	2.1
5	40.62	3.9	4.1	4.4	4.1	4.2	6.8	3.6	4.9
6	48.36	5.2	4.9	6.5	5.5	4.6	7.6	5.8	6.0
7	53.70	6.8	3.8	7.1	5.9	7.6	5.8	2.4	5.3
8	58.08	5.6	5.3	3.9	4.9	4.8	4.6	4.1	4.5
Mean of absolute values:					4.2				3.4
" " w/o points by wall:					3.9				3.5
								Grand mean ABS	3.8
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	3.7

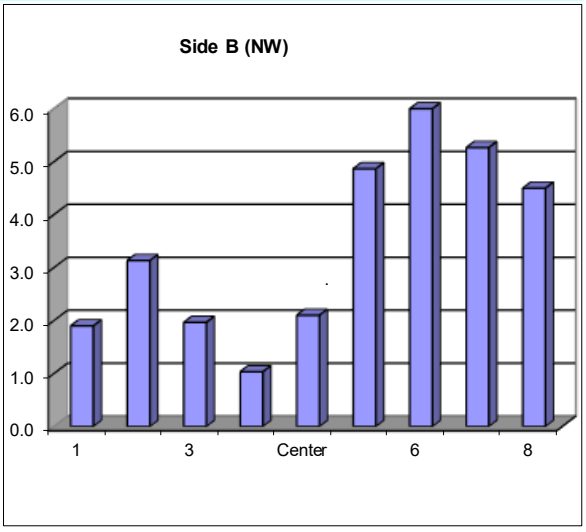
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-3
Date	4/17/2023	Fan Setting	NA %
Start/End Time	10:57 11:03	Fan Configuration	Fan A & C
Testers	JCR/ARB	Stack Temp	78.2 deg F
Stack Dia.	60 in	Approx. air vel.	3135 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

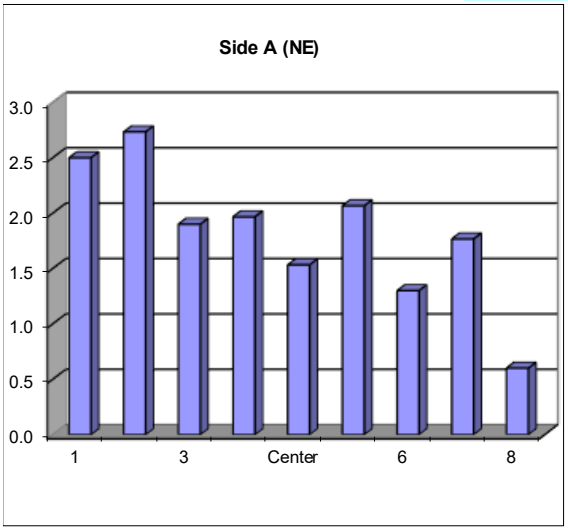
Order -->		First				Second			
Traverse-->		Side A (NE)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	3.8	1.8	1.9	2.5	5.6	2.9	0.6	3.0
2	6.30	4.3	0.6	3.3	2.7	3.6	0.5	1.1	1.7
3	11.64	2.8	2.3	0.6	1.9	2.2	0.7	0.7	1.2
4	19.38	3.4	0.7	1.8	2.0	1.6	0.2	0.1	0.6
Center	30.00	1.1	2.9	0.6	1.5	0.8	3.4	1.0	1.7
5	40.62	1.3	3.2	1.7	2.1	3.3	1.9	0.4	1.9
6	48.36	0.4	2.2	1.3	1.3	0.7	2.5	0.6	1.3
7	53.70	1.4	3.1	0.8	1.8	0.2	2.6	1.2	1.3
8	58.08	0.5	1.1	0.2	0.6	1.5	1.3	0.6	1.1
Mean of absolute values:					1.8				1.5
" " w/o points by wall:					1.9				1.4
								Grand mean ABS	1.7
								Grand mean ABS w/o wall pts	1.6

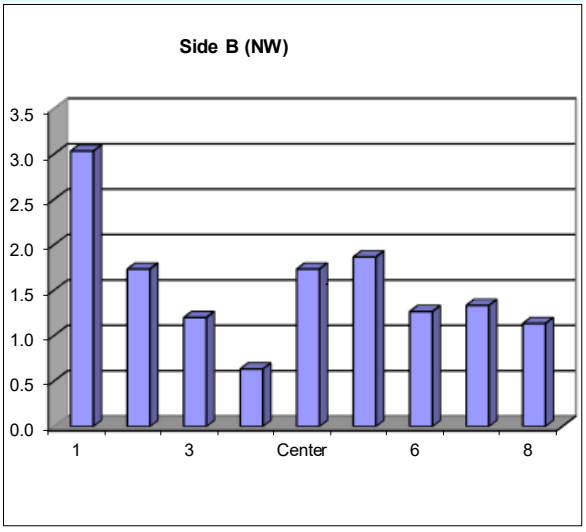
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-4
Date	4/17/2023	Fan Setting	NA %
Start/End Time	11:16 11:23	Fan Configuration	Fan A & C
Testers	JCR/ARB	Stack Temp	76.7 deg F
Stack Dia.	60 in	Approx. air vel.	3174 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

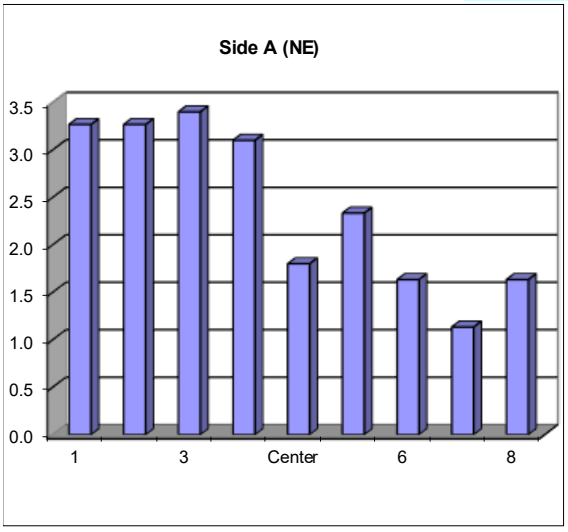
Order -->		First				Second			
Traverse-->		Side A (NE)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	5.6	1.9	2.3	3.3	2.5	0.9	1.4	1.6
2	6.30	3.1	2.9	3.8	3.3	4.5	3.5	4.0	4.0
3	11.64	1.9	5.6	2.7	3.4	1.8	2.7	1.7	2.1
4	19.38	2.6	2.6	4.1	3.1	3.0	3.6	4.3	3.6
Center	30.00	0.8	1.4	3.2	1.8	3.9	1.5	1.3	2.2
5	40.62	1.2	3.9	1.9	2.3	2.9	1.9	2.6	2.5
6	48.36	1.7	1.7	1.5	1.6	7.3	2.0	1.7	3.7
7	53.70	0.7	0.6	2.1	1.1	6.4	1.4	3.0	3.6
8	58.08	0.5	1.3	3.1	1.6	0.7	1.7	2.6	1.7
Mean of absolute values:					2.4				2.8
" " w/o points by wall:					2.4				3.1
								Grand mean ABS	2.6
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	2.7

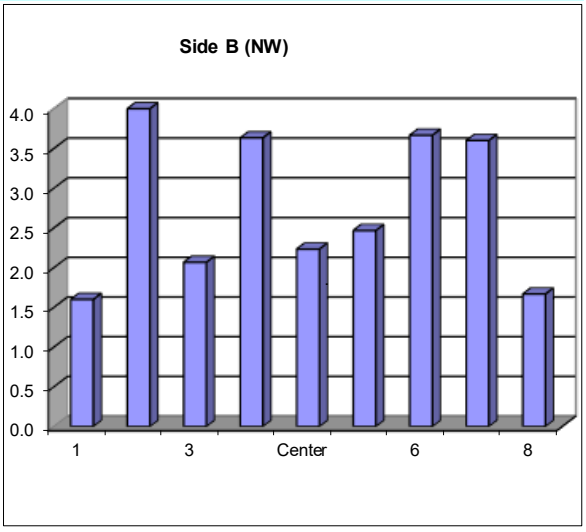
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-5
Date	6/21/2023	Fan Setting	69% 69%
Start/End Time	9:18 9:36	Fan Configuration	Fan A & B
Testers	JCR/AJV	Stack Temp	70.4 deg F
Stack Dia.	60 in	Approx. air vel.	2594 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

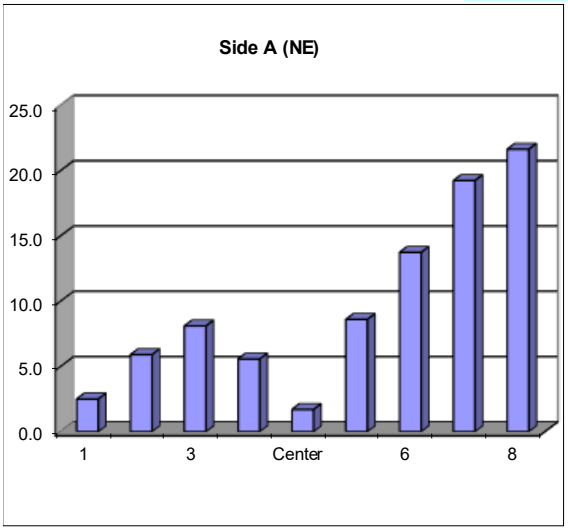
Order -->		First				Second			
Traverse-->		Side A (NE)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	0.5	3.0	4.0	2.5	9.4	8.0	8.7	8.7
2	6.30	6.6	7.0	4.1	5.9	9.5	13.1	13.3	12.0
3	11.64	8.6	7.1	8.6	8.1	10.4	13.1	12.0	11.8
4	19.38	5.2	4.5	7.0	5.6	4.5	3.2	3.2	3.6
Center	30.00	1.3	1.8	2.0	1.7	4.8	5.3	6.0	5.4
5	40.62	7.5	11.3	7.0	8.6	8.0	10.6	10.7	9.8
6	48.36	13.1	15.0	13.1	13.7	13.4	14.5	14.6	14.2
7	53.70	20.9	17.4	19.4	19.2	19.3	13.7	17.8	16.9
8	58.08	22.0	22.7	20.2	21.6	20.2	18.2	17.6	18.7
Mean of absolute values:					9.7				11.2
" " w/o points by wall:					9.0				10.5
								Grand mean ABS	10.4
								Grand mean ABS w/o wall pts	9.8

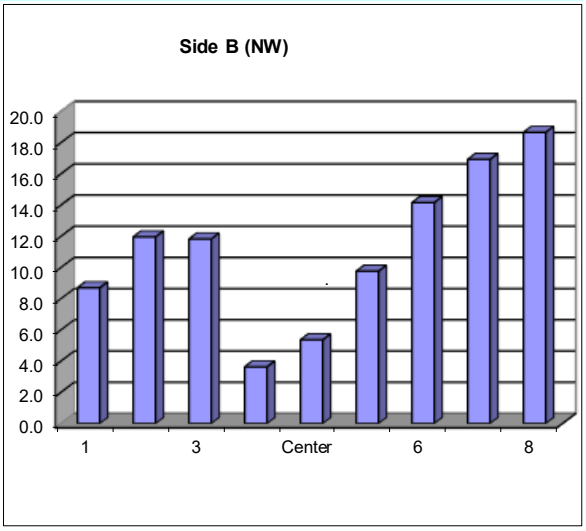
Instuments Used:		Cal. Due
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

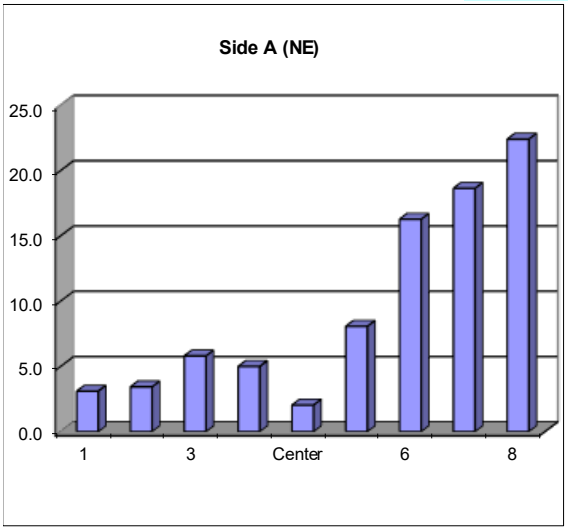
Stack	LB-S1 (C3V)	Run No.	FA-6
Date	6/21/2023	Fan Setting	69% 69%
Start/End Time	9:52 10:13	Fan Configuration	Fan A & B
Testers	JCR/AJV	Stack Temp	71.6 deg F
Stack Dia.	60 in	Approx. air vel.	2578 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

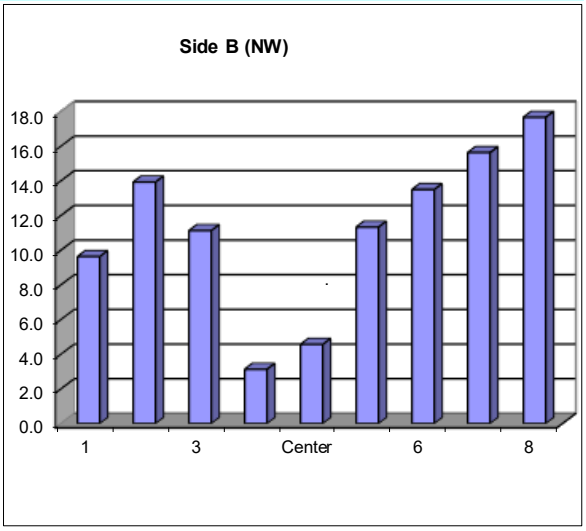
Order -->		First				Second			
Traverse-->		Side A (NE)				Side B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	4.2	2.5	2.6	3.1	8.3	11.0	9.6	9.6
2	6.30	4.0	2.0	4.3	3.4	14.0	14.0	13.8	13.9
3	11.64	8.1	0.9	8.4	5.8	11.7	10.3	11.4	11.1
4	19.38	6.6	3.2	5.2	5.0	4.6	1.8	3.0	3.1
Center	30.00	1.4	4.4	0.3	2.0	3.3	5.5	4.9	4.6
5	40.62	4.5	9.8	9.9	8.1	12.3	11.4	10.3	11.3
6	48.36	15.9	13.6	19.3	16.3	13.1	14.1	13.3	13.5
7	53.70	16.9	19.9	19.1	18.6	15.6	15.3	16.0	15.6
8	58.08	23.0	21.3	22.9	22.4	18.1	17.7	17.2	17.7
Mean of absolute values:					9.4				11.2
" " w/o points by wall:					8.5				10.5
								Grand mean ABS	10.3
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	9.5
S-type pitot (ID: A100-19, 60")					Pre-test calibration; post-test inspection.				
Angle indicator		SPI Tronic PRO 360 (SN 31-038-3)			Accuracy check prior to each use; field recalibration as necessary				
Digital Manometer		Digisense Manometer (ID: DM1)			Post-test verification				

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-7
Date	6/21/2023	Fan Setting	79% 79%
Start/End Time	10:47 11:06	Fan Configuration	Fan A & B
Testers	JCR/AJV	Stack Temp	73.4 deg F
Stack Dia.	60 in	Approx. air vel.	3008 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

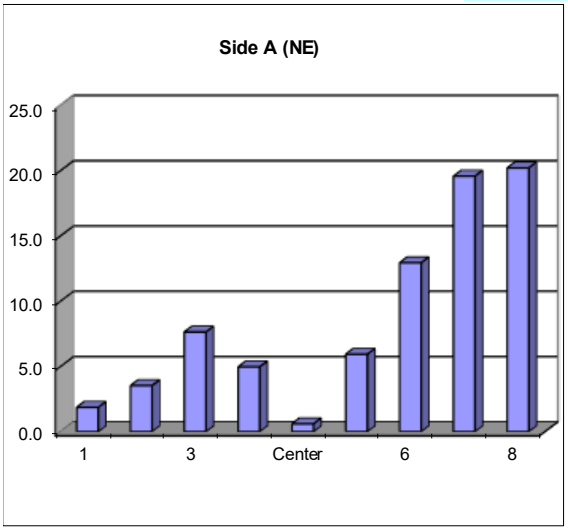
Order -->		First				Second			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	0.3	2.9	2.4	1.9	6.1	10.1	8.7	8.3
2	6.30	3.4	4.1	3.1	3.5	15.0	10.9	14.0	13.3
3	11.64	7.8	7.9	7.2	7.6	13.2	9.5	8.5	10.4
4	19.38	4.1	5.1	5.7	5.0	3.0	4.0	3.8	3.6
Center	30.00	0.6	0.2	1.0	0.6	2.2	2.2	4.1	2.8
5	40.62	5.2	3.9	8.7	5.9	9.9	9.3	11.2	10.1
6	48.36	11.3	12.2	15.3	12.9	13.4	13.6	13.1	13.4
7	53.70	19.8	18.4	20.5	19.6	17.6	17.3	15.1	16.7
8	58.08	16.8	21.4	22.4	20.2	18.8	17.0	18.9	18.2
Mean of absolute values:					8.6				10.8
" " w/o points by wall:					7.9				10.0
								Grand mean ABS	9.7
								Grand mean ABS w/o wall pts	9.0

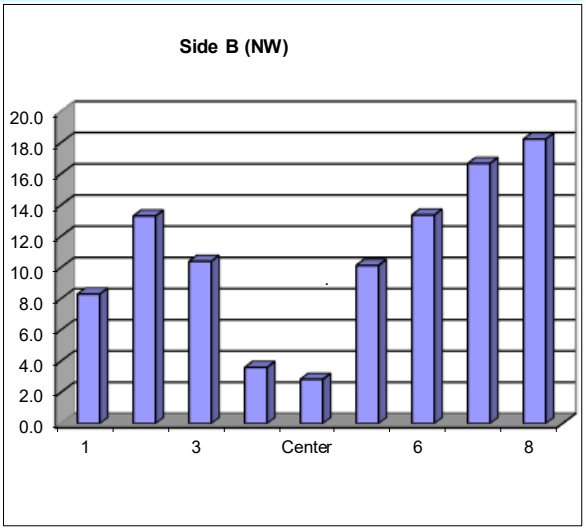
Instuments Used:		Cal. Due
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

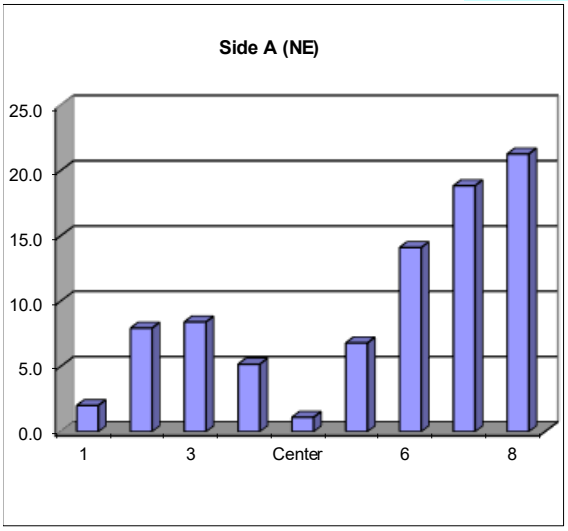
Stack	LB-S1 (C3V)	Run No.	FA-8
Date	6/21/2023	Fan Setting	79% 79%
Start/End Time	11:22 11:40	Fan Configuration	Fan A & B
Testers	JCR/AJV	Stack Temp	73.7 deg F
Stack Dia.	60 in	Approx. air vel.	3015 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

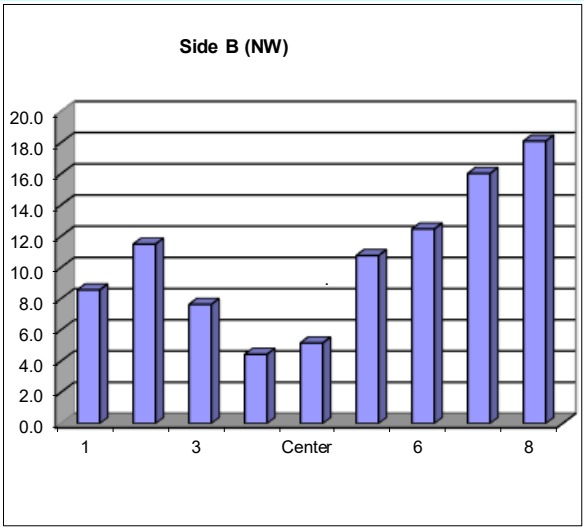
Order -->		First				Second			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	1.3	2.2	2.5	2.0	14.1	6.3	5.3	8.6
2	6.30	14.3	4.1	5.4	7.9	11.0	10.6	12.9	11.5
3	11.64	9.4	9.0	6.8	8.4	3.4	9.4	10.1	7.6
4	19.38	4.0	7.5	4.0	5.2	1.3	5.5	6.5	4.4
Center	30.00	1.5	1.3	0.5	1.1	8.0	5.7	1.8	5.2
5	40.62	6.4	7.0	7.0	6.8	15.1	10.4	6.8	10.8
6	48.36	14.1	15.1	13.1	14.1	12.4	13.7	11.3	12.5
7	53.70	19.3	16.9	20.3	18.8	16.9	15.8	15.4	16.0
8	58.08	20.0	20.4	23.4	21.3	18.0	18.2	18.1	18.1
Mean of absolute values:					9.5				10.5
" " w/o points by wall:					8.9				9.7
								Grand mean ABS	10.0
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	9.3
S-type pitot (ID: A100-19, 60")					Pre-test calibration; post-test inspection.				
Angle indicator		SPI Tronic PRO 360 (SN 31-038-3)			Accuracy check prior to each use; field recalibration as necessary				
Digital Manometer		Digisense Manometer (ID: DM1)			Post-test verification				

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-9
Date	6/21/2023	Fan Setting	68 %
Start/End Time	12:49 12:57	Fan Configuration	Fan B & C
Testers	JCR/AJV	Stack Temp	75.4 deg F
Stack Dia.	60 in	Approx. air vel.	2629 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

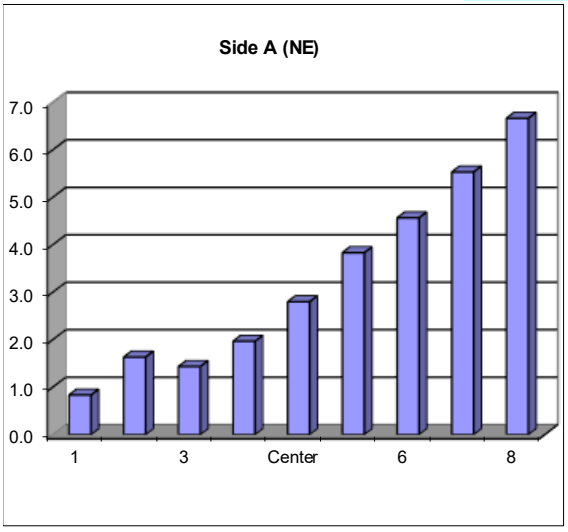
Order -->		First				Second			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	1.3	0.1	1.1	0.8	0.7	0.5	0.0	0.4
2	6.30	1.7	2.6	0.6	1.6	1.0	0.9	1.1	1.0
3	11.64	2.4	0.6	1.3	1.4	1.0	3.4	1.3	1.9
4	19.38	1.4	4.1	0.4	2.0	0.1	0.4	0.7	0.4
Center	30.00	4.0	3.1	1.3	2.8	3.9	2.9	1.3	2.7
5	40.62	2.5	3.5	5.5	3.8	3.7	4.8	5.2	4.6
6	48.36	4.9	5.0	3.8	4.6	7.0	3.6	6.2	5.6
7	53.70	6.7	5.6	4.3	5.5	3.5	6.2	6.4	5.4
8	58.08	7.5	6.5	6.0	6.7	8.9	7.6	9.6	8.7
Mean of absolute values:					3.3				3.4
" " w/o points by wall:					3.1				3.1
								Grand mean ABS	3.3
								Grand mean ABS w/o wall pts	3.1

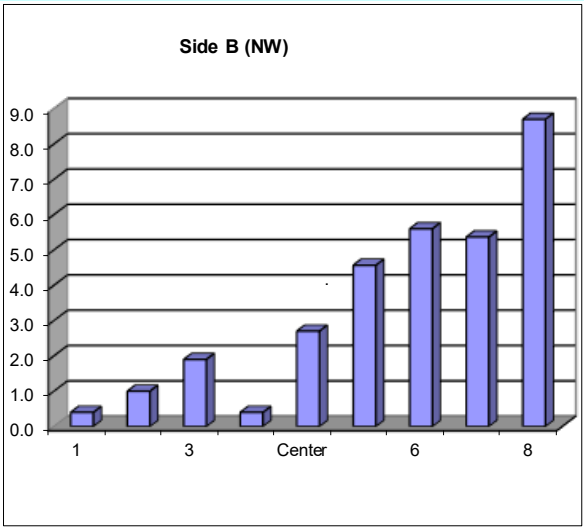
Instuments Used:		Cal. Due
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-10
Date	6/21/2023	Fan Setting	68 %
Start/End Time	13:17 13:21	Fan Configuration	Fan B & C
Testers	AJV/JCR	Stack Temp	75.5 deg F
Stack Dia.	60 in	Approx. air vel.	2612 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

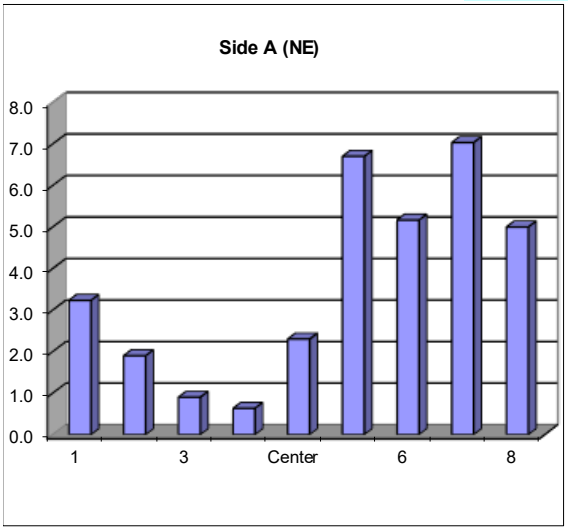
Order -->		First				Second			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	2.3	4.1	3.3	3.2	1.4	2.0	3.5	2.3
2	6.30	0.4	3.1	2.2	1.9	1.9	1.6	0.1	1.2
3	11.64	1.9	0.6	0.2	0.9	0.9	3.1	0.2	1.4
4	19.38	0.5	0.1	1.3	0.6	0.4	1.7	1.1	1.1
Center	30.00	2.8	1.5	2.6	2.3	1.5	2.9	3.5	2.6
5	40.62	7.0	4.6	8.5	6.7	3.8	5.5	4.9	4.7
6	48.36	6.2	4.6	4.7	5.2	5.2	5.0	6.9	5.7
7	53.70	5.7	7.9	7.5	7.0	2.6	4.1	4.7	3.8
8	58.08	6.8	5.2	3.0	5.0	7.0	10.5	8.7	8.7
Mean of absolute values:					3.7				3.5
" " w/o points by wall:					3.5				2.9
								Grand mean ABS	3.6
								Grand mean ABS w/o wall pts	3.2

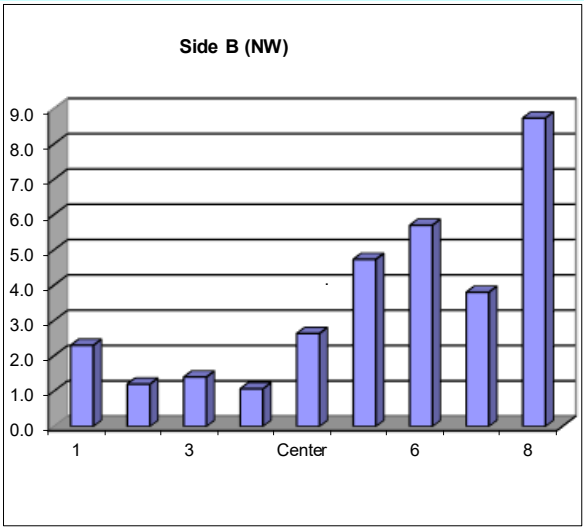
Instuments Used:		Cal. Due
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S1 (C3V)	Run No.	FA-11
Date	6/21/2023	Fan Setting	80 %
Start/End Time	13:57 14:04	Fan Configuration	Fan B & C
Testers	JCR/AJV	Stack Temp	76.8 deg F
Stack Dia.	60 in	Approx. air vel.	3147 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

Order -->		First				Second			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	0.4	3.3	2.5	2.1	0.2	1.8	4.2	2.1
2	6.30	1.6	4.8	2.2	2.9	0.3	0.0	1.4	0.6
3	11.64	0.4	0.1	0.9	0.5	2.2	0.4	1.4	1.3
4	19.38	3.4	3.3	0.5	2.4	1.3	0.1	1.1	0.8
Center	30.00	4.0	5.1	3.4	4.2	2.8	3.2	3.0	3.0
5	40.62	4.2	5.4	4.9	4.8	6.1	1.1	3.1	3.4
6	48.36	4.9	7.5	6.2	6.2	6.5	7.8	4.5	6.3
7	53.70	4.3	6.5	5.2	5.3	8.2	6.0	6.6	6.9
8	58.08	8.8	6.3	8.3	7.8	7.9	9.6	9.5	9.0
Mean of absolute values:					4.0				3.7
" " w/o points by wall:					3.8				3.2
								Grand mean ABS	3.9
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	3.5

S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

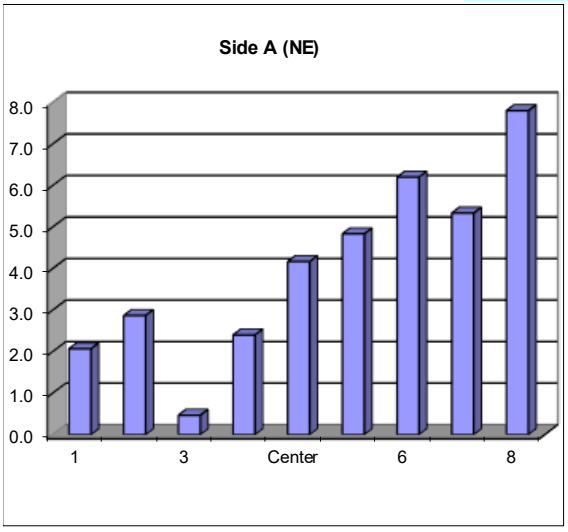
Notes:

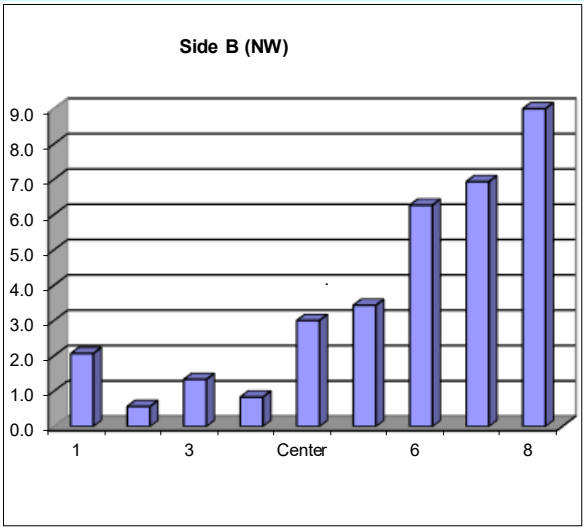
Traverse point depth = the distance from inside stack wall to each point.

First traverse point is closest to the sampling port.

Approx. air velocity was derived from all points on the Velocity Traverse Forms

Side A port was always measured first.





FLOW ANGLE DATA FORM

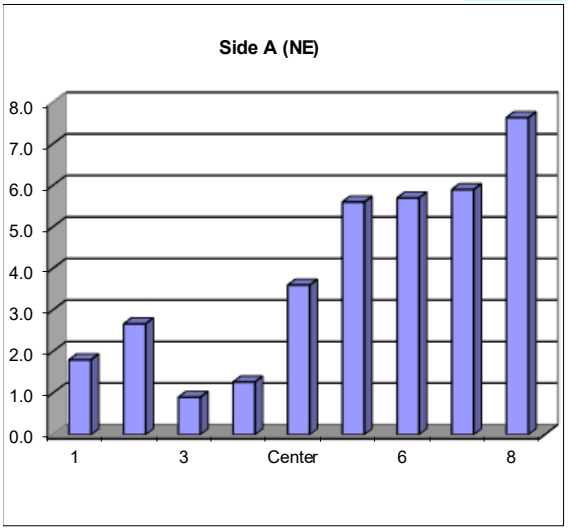
Stack	LB-S1 (C3V)	Run No.	FA-12
Date	6/21/2023	Fan Setting	80 %
Start/End Time	14:34 14:42	Fan Configuration	Fan B & C
Testers	AJV/JCB	Stack Temp	75.8 deg F
Stack Dia.	60 in	Approx. air vel.	3123 afpm at point Mean All
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	623.00 in		

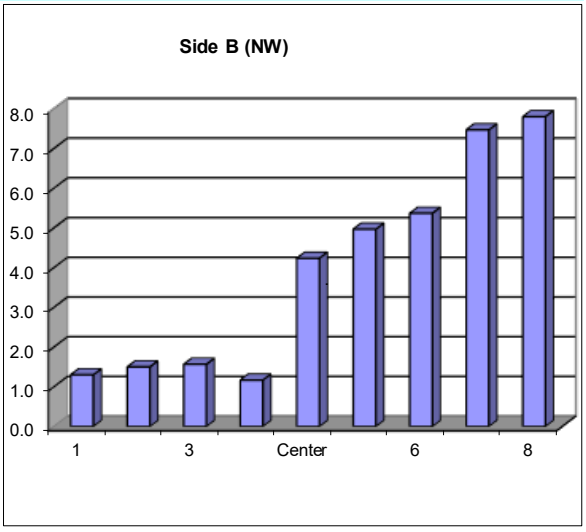
Order -->		First				Second			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	1.92	2.5	1.0	1.9	1.8	0.5	0.6	2.8	1.3
2	6.30	3.3	1.8	2.9	2.7	1.5	2.8	0.2	1.5
3	11.64	0.8	0.8	1.1	0.9	0.9	1.5	2.3	1.6
4	19.38	0.9	1.1	1.8	1.3	0.3	1.2	2.0	1.2
Center	30.00	3.3	4.7	2.8	3.6	3.8	5.1	3.8	4.2
5	40.62	6.4	6.4	4.0	5.6	5.3	5.3	4.3	5.0
6	48.36	6.7	6.2	4.2	5.7	4.5	6.4	5.2	5.4
7	53.70	7.1	5.0	5.6	5.9	7.9	6.5	8.0	7.5
8	58.08	7.1	7.9	7.9	7.6	8.2	6.9	8.3	7.8
Mean of absolute values:					3.9				3.9
" " w/o points by wall:					3.7				3.8
								Grand mean ABS	3.9
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	3.7
S-type pitot (ID: A100-19, 60")					Pre-test calibration; post-test inspection.				
Angle indicator		SPI Tronic PRO 360 (SN 31-038-3)			Accuracy check prior to each use; field recalibration as necessary				
Digital Manometer		Digisense Manometer (ID: DM1)			Post-test verification				

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





B.3 Velocity Transverse Data Forms - 2019

VELOCITY TRAVERSE DATA FORM

Stack	**LB-S1**	Run No.	**VT-1**
Date	**10/15/19**	Fan Configuration	**Fan A & B**
Testers	ZDH/LCE	Fan Setting	**NA** **Hz**
Stack Dia.	60 in.	Stack Temp	65.85 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:12 13:19
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		**Side1 (310 deg from N)**				**Side2 (40 deg from N)**			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,954.5	3,893.5	3,810.7	3,886.2	3,726.0	3,789.7	3,747.3	3,754.3
2	53.7	4,073.8	3,994.6	3,934.3	4,000.9	3,914.0	3,934.3	3,831.6	3,893.3
3	48.4	3,893.5	3,934.3	3,974.6	3,934.1	3,810.7	3,934.3	3,934.3	3,893.1
4	40.6	3,934.3	3,893.5	3,872.9	3,900.2	3,852.3	3,726.0	3,872.9	3,817.1
Center	30.0	3,810.7	3,934.3	3,831.6	3,858.8	3,831.6	3,768.5	3,872.9	3,824.3
5	19.4	3,994.6	3,974.6	3,872.9	3,947.4	4,014.6	3,934.3	3,974.6	3,974.5
6	11.6	3,872.9	3,994.6	3,934.3	3,933.9	4,073.8	4,189.7	4,034.4	4,099.3
7	6.3	3,831.6	3,934.3	3,852.3	3,872.7	4,093.3	4,054.1	4,014.6	4,054.0
8	1.9	3,617.3	3,459.5	3,528.0	3,534.9	3,810.7	3,893.5	3,810.7	3,838.3
Averages ---------->		3,887.0	3,890.4	3,845.7	3,874.4	3,903.0	3,913.8	3,899.3	3,905.3

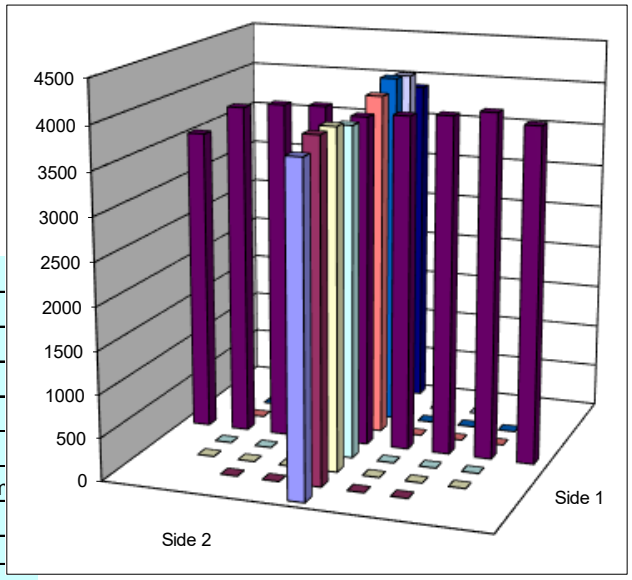
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3889.9		Mean	3921.2	3936.5	3928.8
Min Point	3534.9	-9.1%	Std. Dev.	48.4	109.8	81.9
Max Point	4099.3	5.4%	COV as %	1.2	2.8	**2.1**

Flow w/o C-Pt 76496 cfm

Vel Avg w/o C-Pt 3896 fpm

	Start	Finish	
Stack temp	65.80	65.90	F
Equipment temp	63.10	63.10	F
Ambient temp	63.10	63.10	F
Stack static	0.90	1.00	mbars
Ambient pressure	991.87	991.87	mbars
Total Stack pressure	992.8	992.9	mbars
Ambient humidity	32%	33%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-2
Date	10/15/19	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	66.75 deg F
Stack X-Area	2827.4 in.2	Start/End Time	15:15 15:28
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	4,096.4	3,997.7	3,957.5	4,017.2	3,707.3	3,750.1	3,813.6	3,757.0
2	53.7	4,096.4	4,115.8	4,096.4	4,102.9	3,957.5	3,875.9	3,917.0	3,916.8
3	48.4	3,957.5	3,917.0	4,037.5	3,970.7	3,896.5	3,896.5	3,855.2	3,882.7
4	40.6	3,997.7	3,977.6	3,957.5	3,977.6	3,750.1	3,896.5	3,792.5	3,813.0
Center	30.0	3,957.5	3,977.6	3,997.7	3,977.6	4,037.5	3,977.6	3,957.5	3,990.9
5	19.4	3,957.5	3,896.5	3,937.2	3,930.4	3,937.2	3,997.7	3,957.5	3,964.2
6	11.6	3,834.4	3,896.5	4,037.5	3,922.8	4,037.5	4,154.5	4,096.4	4,096.2
7	6.3	3,896.5	3,875.9	3,917.0	3,896.5	3,957.5	4,076.9	3,977.6	4,004.0
8	1.9	3,664.0	3,664.0	3,620.0	3,649.3	3,896.5	3,917.0	3,957.5	3,923.7
Averages ---------->		3,939.8	3,924.3	3,950.9	3,938.3	3,908.6	3,949.2	3,925.0	3,927.6

All	ft/min	Dev. from mean
Mean	3933.0	
Min Point	3649.3	-7.2%
Max Point	4102.9	4.3%

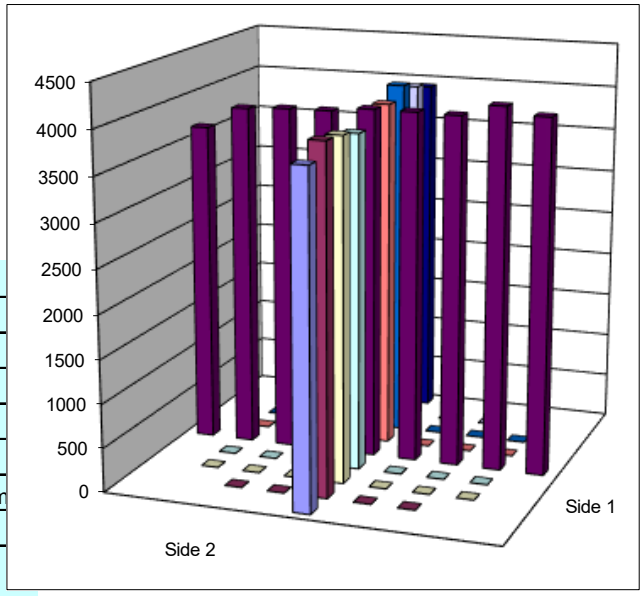
Center 2/3	Side	Bottom	All
Mean	3968.4	3952.5	3960.4
Std. Dev.	67.0	91.7	77.6
COV as %	1.7	2.3	**2.0**

Flow w/o C-Pt 77098 cfm

Vel Avg w/o C-Pt 3927 fpm

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	66.50	67.00	F
Equipment temp	62.30	67.00	F
Ambient temp	62.30	63.10	F
Stack static	2.86	0.42	mbars
Ambient pressure	991.87	990.86	mbars
Total Stack pressure	994.7	991.3	mbars
Ambient humidity	34%	33%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-3
Date	10/16/19	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	63.45 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:21 9:29
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,874.7	3,833.2	3,895.2	3,867.7	3,727.6	3,770.2	3,596.8	3,698.2
2	53.7	3,996.4	4,036.2	3,996.4	4,009.7	3,833.2	3,833.2	3,874.7	3,847.0
3	48.4	3,996.4	4,095.1	3,915.7	4,002.4	3,812.3	3,895.2	3,812.3	3,840.0
4	40.6	3,936.1	3,854.0	3,915.7	3,901.9	3,833.2	3,854.0	3,854.0	3,847.1
Center	30.0	3,936.1	3,854.0	3,956.3	3,915.4	3,936.1	3,915.7	3,854.0	3,901.9
5	19.4	3,996.4	3,874.7	3,976.4	3,949.2	3,976.4	3,956.3	3,936.1	3,956.3
6	11.6	3,976.4	4,036.2	3,976.4	3,996.3	4,055.9	4,036.2	4,075.6	4,055.9
7	6.3	3,812.3	3,874.7	3,749.0	3,812.0	4,075.6	4,153.3	4,036.2	4,088.4
8	1.9	3,574.5	3,529.6	3,641.0	3,581.7	3,684.6	3,854.0	3,749.0	3,762.5
Averages ---------->		3,899.9	3,887.5	3,891.3	3,892.9	3,881.7	3,918.7	3,865.4	3,888.6

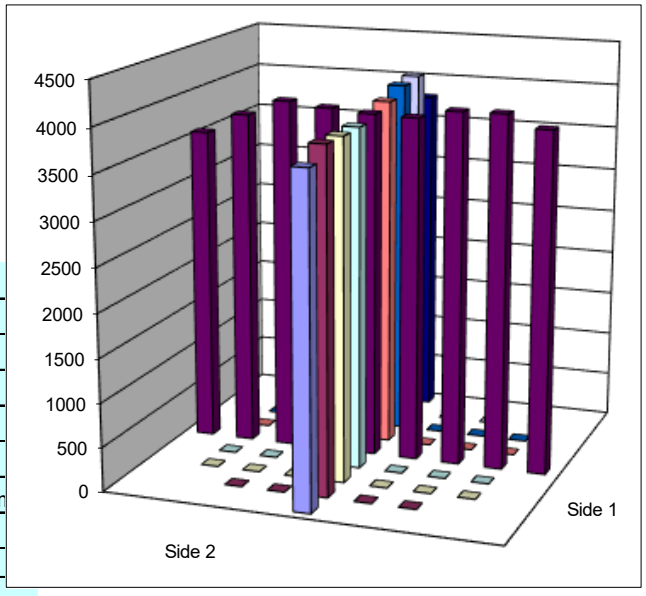
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3890.8		Mean	3941.0	3933.8	3937.4
Min Point	3581.7	-7.9%	Std. Dev.	71.2	103.4	85.4
Max Point	4088.4	5.1%	COV as %	1.8	2.6	**2.2**

Flow w/o C-Pt 76351 cfm

Vel Avg w/o C-Pt 3889 fpm

	Start	Finish	
Stack temp	63.30	63.60	F
Equipment temp	54.50	63.60	F
Ambient temp	54.50	55.10	F
Stack static	2.44	1.49	mbars
Ambient pressure	985.44	985.44	mbars
Total Stack pressure	987.9	986.9	mbars
Ambient humidity	52%	50%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-4
Date	10/16/19	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	65.90 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:47 10:56
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,777.6	3,861.5	3,861.5	3,833.5	3,669.9	3,559.0	3,625.9	3,618.3
2	53.7	4,063.8	4,004.2	4,103.1	4,057.0	3,691.7	3,798.7	3,669.9	3,720.1
3	48.4	3,819.8	4,004.2	3,902.8	3,908.9	3,798.7	3,861.5	3,669.9	3,776.7
4	40.6	3,902.8	3,819.8	3,840.7	3,854.4	3,734.9	3,777.6	3,840.7	3,784.4
Center	30.0	3,840.7	3,902.8	3,923.3	3,888.9	3,882.2	3,798.7	3,923.3	3,868.1
5	19.4	3,964.0	3,943.6	3,923.3	3,943.6	3,923.3	4,044.0	4,083.5	4,016.9
6	11.6	3,923.3	3,902.8	3,840.7	3,888.9	4,044.0	4,024.2	4,063.8	4,044.0
7	6.3	3,756.3	3,734.9	3,798.7	3,763.3	4,004.2	3,902.8	4,083.5	3,996.8
8	1.9	3,559.0	3,444.6	3,490.8	3,498.1	3,756.3	3,444.6	3,691.7	3,630.8
Averages ---------->		3,845.2	3,846.5	3,853.9	3,848.5	3,833.9	3,801.2	3,850.2	3,828.5

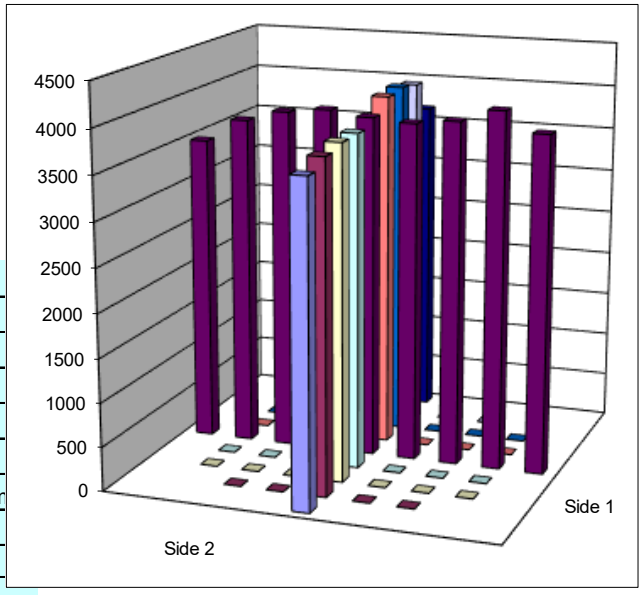
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3838.5		Mean	3900.7	3886.7	3893.7
Min Point	3498.1	-8.9%	Std. Dev.	89.1	132.0	108.4
Max Point	4057.0	5.7%	COV as %	2.3	3.4	**2.8**

Flow w/o C-Pt 75271 cfm

Vel Avg w/o C-Pt 3833 fpm

	Start	Finish	
Stack temp	65.60	66.20	F
Equipment temp	64.80	66.20	F
Ambient temp	64.80	63.70	F
Stack static	3.96	2.56	mbars
Ambient pressure	985.10	984.76	mbars
Total Stack pressure	989.1	987.3	mbars
Ambient humidity	36%	38%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-5
Date	10/16/19	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	67.8 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:03 13:09
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,357.0	3,451.6	3,404.6	3,404.4	3,655.4	3,677.4	3,931.3	3,754.7
2	53.7	3,806.5	3,785.2	3,848.6	3,813.4	4,091.8	3,972.1	3,806.5	3,956.8
3	48.4	3,951.7	3,827.5	3,848.6	3,875.9	3,992.2	4,111.5	4,072.1	4,058.6
4	40.6	4,052.3	3,910.8	3,992.2	3,985.1	4,032.3	3,972.1	3,992.2	3,998.9
Center	30.0	3,992.2	3,931.3	4,012.4	3,978.6	3,848.6	3,992.2	3,951.7	3,930.8
5	19.4	3,806.5	3,677.4	3,655.4	3,713.1	3,890.1	3,972.1	3,992.2	3,951.5
6	11.6	4,052.3	3,972.1	3,869.4	3,964.6	3,869.4	3,827.5	3,910.8	3,869.2
7	6.3	3,951.7	3,910.8	3,869.4	3,910.6	3,633.4	3,677.4	3,764.0	3,691.6
8	1.9	3,742.4	3,633.4	3,677.4	3,684.4	3,428.1	3,259.7	3,380.9	3,356.2
Averages ---------->		3,856.9	3,788.9	3,797.5	3,814.5	3,826.8	3,829.1	3,866.9	3,840.9

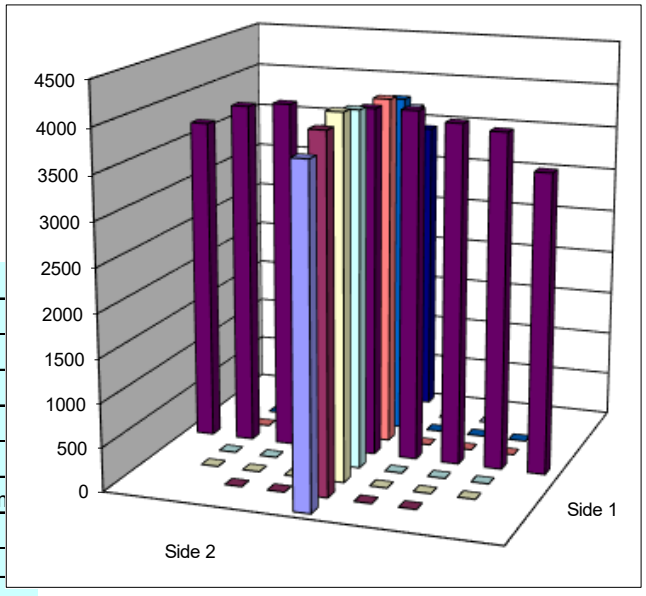
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3827.7		Mean	3891.6	3922.5	3907.1
Min Point	3356.2	-12.3%	Std. Dev.	100.2	117.3	106.0
Max Point	4058.6	6.0%	COV as %	2.6	3.0	**2.7**

Flow w/o C-Pt 74845 cfm

Vel Avg w/o C-Pt 3812 fpm

	Start	Finish	
Stack temp	67.70	67.80	F
Equipment temp	68.10	67.80	F
Ambient temp	68.10	67.20	F
Stack static	3.78	4.33	mbars
Ambient pressure	983.75	983.41	mbars
Total Stack pressure	987.5	987.7	mbars
Ambient humidity	34%	35%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

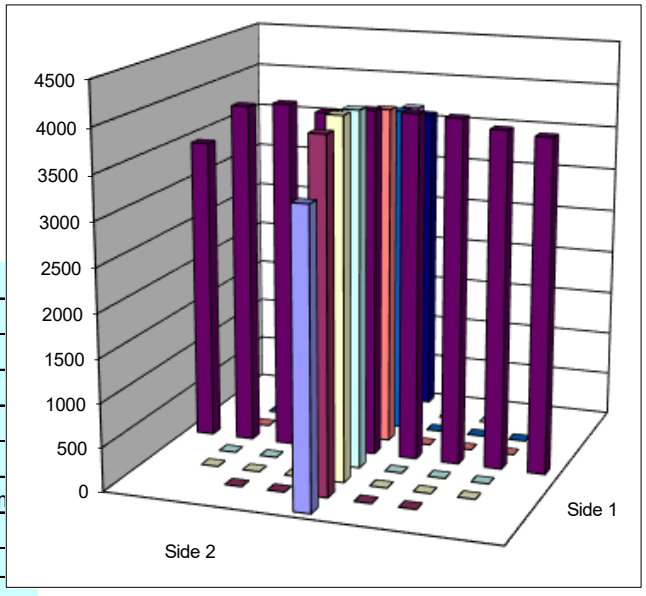
Stack	LB-S1	Run No.	VT-6
Date	10/16/19	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	68.95 deg F
Stack X-Area	2827.4 in.2	Start/End Time	14:09 14:14
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,660.2	3,811.4	3,895.2	3,788.9	3,263.9	3,337.2	3,361.3	3,320.8
2	53.7	3,768.8	3,811.4	3,915.8	3,832.0	3,895.2	3,997.4	3,936.4	3,943.0
3	48.4	3,915.8	3,874.4	3,997.4	3,929.2	4,057.6	4,057.6	4,037.7	4,051.0
4	40.6	3,977.2	3,895.2	3,977.2	3,949.9	4,057.6	3,956.8	4,057.6	4,024.0
Center	30.0	3,997.4	3,936.4	3,936.4	3,956.7	3,977.2	3,853.6	3,977.2	3,936.0
5	19.4	3,874.4	3,956.8	3,853.6	3,895.0	3,895.2	3,874.4	3,811.4	3,860.3
6	11.6	3,997.4	3,956.8	3,936.4	3,963.6	3,725.7	3,768.8	3,768.8	3,754.5
7	6.3	3,874.4	3,915.8	3,936.4	3,908.9	3,615.9	3,704.1	3,811.4	3,710.5
8	1.9	3,409.1	3,502.4	3,456.1	3,455.9	3,660.2	3,548.3	3,432.7	3,547.1
Averages ---------->		3,830.5	3,851.2	3,878.3	3,853.3	3,794.3	3,788.7	3,799.4	3,794.1

All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3823.7		Mean	3919.3	3897.0	3908.2
Min Point	3320.8	-13.2%	Std. Dev.	46.0	129.1	93.8
Max Point	4051.0	5.9%	COV as %	1.2	3.3	**2.4**

Flow w/o C-Pt	74778 cfm	**Instuments Used:**	Cal Due
Vel Avg w/o C-Pt	3808 fpm	Standard pitot (ID: BST8, 8ft)	Post-test inspection
		Digi-sense 20250-13 Manometer	9/15/2020
		Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	69.20	68.70	F
Equipment temp	70.70	68.70	F
Ambient temp	70.70	63.60	F
Stack static	4.13	3.98	mbars
Ambient pressure	983.41	983.07	mbars
Total Stack pressure	987.5	987.1	mbars
Ambient humidity	32%	36%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-7
Date	10/17/19	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	66.40 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:12 9:21
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,478.6	3,570.2	3,547.5	3,532.1	3,501.8	3,408.3	3,547.5	3,485.9
2	53.7	4,096.4	3,976.5	4,036.9	4,036.6	3,956.1	3,894.4	3,894.4	3,915.0
3	48.4	3,935.6	4,016.8	4,115.9	4,022.8	3,935.6	3,956.1	3,996.6	3,962.8
4	40.6	3,976.5	3,935.6	3,976.5	3,962.8	3,915.1	3,956.1	3,831.7	3,901.0
Center	30.0	3,996.6	4,016.8	3,852.8	3,955.4	3,852.8	3,873.6	3,852.8	3,859.7
5	19.4	3,810.7	3,935.6	3,935.6	3,894.0	3,894.4	3,935.6	3,976.5	3,935.5
6	11.6	3,873.6	3,894.4	3,915.1	3,894.4	3,894.4	3,976.5	3,915.1	3,928.6
7	6.3	3,810.7	3,789.4	3,915.1	3,838.4	4,036.9	3,956.1	4,076.6	4,023.2
8	1.9	3,615.1	3,637.4	3,384.6	3,545.7	3,637.4	3,592.7	3,478.6	3,569.6
Averages ---------->		3,843.8	3,863.6	3,853.3	3,853.6	3,847.2	3,838.8	3,841.1	3,842.4

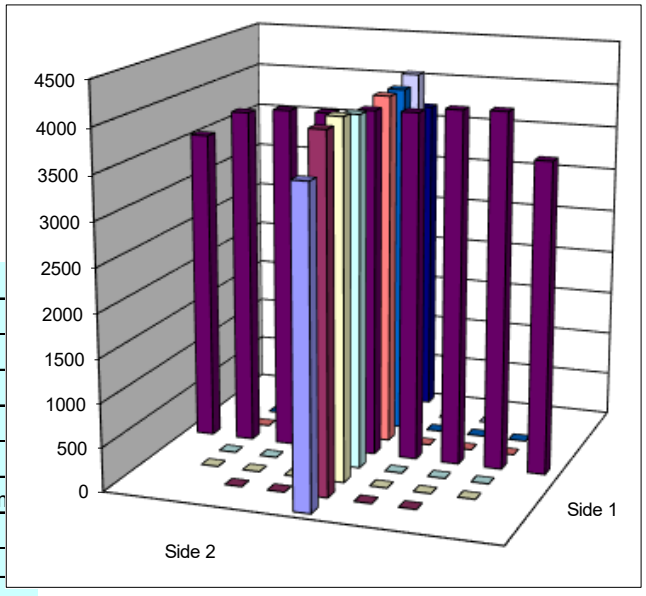
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3848.0		Mean	3943.5	3932.3	3937.9
Min Point	3485.9	-9.4%	Std. Dev.	72.3	51.2	60.5
Max Point	4036.6	4.9%	COV as %	1.8	1.3	**1.5**

Flow w/o C-Pt 75408 cfm

Vel Avg w/o C-Pt 3841 fpm

	Start	Finish	
Stack temp	67.10	65.70	F
Equipment temp	65.60	65.70	F
Ambient temp	65.60	59.30	F
Stack static	2.39	3.11	mbars
Ambient pressure	980.02	980.36	mbars
Total Stack pressure	982.4	983.5	mbars
Ambient humidity	38%	43%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-8
Date	10/17/19	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	68.40 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:21 10:30
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,815.1	3,793.7	3,707.5	3,772.1	3,574.3	3,388.5	3,528.7	3,497.1
2	53.7	4,001.2	3,981.0	3,981.0	3,987.7	3,878.1	3,836.1	3,919.5	3,877.9
3	48.4	4,140.2	4,001.2	3,940.2	4,027.2	3,836.1	3,898.9	3,729.3	3,821.4
4	40.6	4,041.4	4,101.0	4,001.2	4,047.9	4,001.2	3,836.1	3,878.1	3,905.1
Center	30.0	4,001.2	3,981.0	3,898.9	3,960.3	3,857.2	3,898.9	3,919.5	3,891.8
5	19.4	3,836.1	4,001.2	3,857.2	3,898.2	3,919.5	3,940.2	3,940.2	3,933.3
6	11.6	4,021.4	3,981.0	3,878.1	3,960.1	3,919.5	4,101.0	4,081.3	4,033.9
7	6.3	3,919.5	3,772.4	3,836.1	3,842.7	3,919.5	3,940.2	4,001.2	3,953.6
8	1.9	3,619.2	3,685.6	3,528.7	3,611.2	3,793.7	3,551.6	3,707.5	3,684.3
Averages ---------->		3,932.8	3,922.0	3,847.6	3,900.8	3,855.4	3,821.3	3,856.1	3,844.3

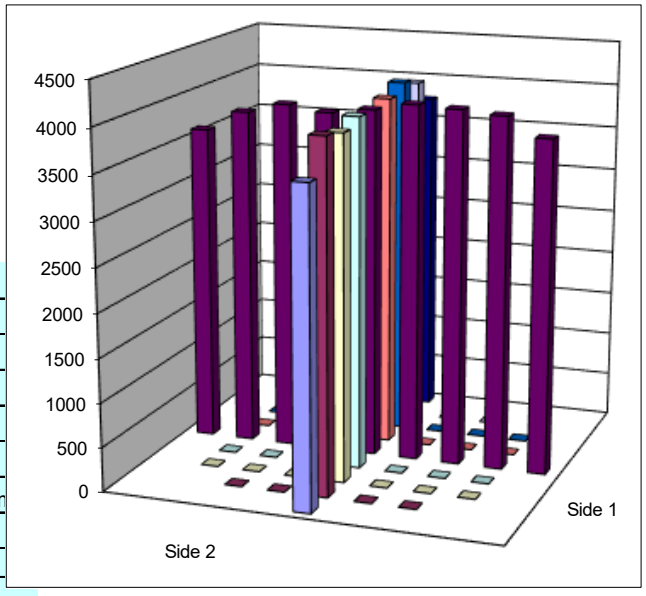
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3872.6		Mean	3960.6	3916.7	3938.7
Min Point	3497.1	-9.7%	Std. Dev.	71.4	66.7	70.2
Max Point	4047.9	4.5%	COV as %	1.8	1.7	**1.8**

Flow w/o C-Pt 75906 cfm

Vel Avg w/o C-Pt 3866 fpm

	Start	Finish	
Stack temp	68.1	68.7	F
Equipment temp	58.7	68.7	F
Ambient temp	58.7	62.6	F
Stack static	2.1	5.3	mbars
Ambient pressure	980.7	980.7	mbars
Total Stack pressure	982.8	986.0	mbars
Ambient humidity	44%	37%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-9
Date	10/17/19	Fan Configuration	Fan B&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	70.30 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:30 11:38
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,606.3	3,606.3	3,760.7	3,657.8	3,373.4	3,421.3	3,349.2	3,381.3
2	53.7	3,971.0	4,011.8	3,991.4	3,991.4	3,717.3	3,950.5	3,782.3	3,816.7
3	48.4	4,111.8	4,052.0	4,011.8	4,058.5	3,867.4	3,803.8	3,888.2	3,853.1
4	40.6	3,909.1	4,011.8	3,991.4	3,970.8	3,782.3	3,909.1	4,011.8	3,901.1
Center	30.0	3,825.0	4,011.8	3,909.1	3,915.3	4,072.1	3,929.9	3,909.1	3,970.4
5	19.4	3,739.1	3,950.5	3,846.2	3,845.3	3,929.9	3,888.2	4,111.8	3,976.6
6	11.6	3,909.1	3,825.0	3,888.2	3,874.1	4,052.0	3,991.4	4,011.8	4,018.4
7	6.3	3,803.8	3,950.5	3,971.0	3,908.4	3,929.9	4,011.8	4,052.0	3,997.9
8	1.9	3,695.4	3,397.4	3,491.8	3,528.2	3,673.3	3,739.1	3,782.3	3,731.6
Averages ---------->		3,841.2	3,868.6	3,873.5	3,861.1	3,822.0	3,849.4	3,877.6	3,849.7

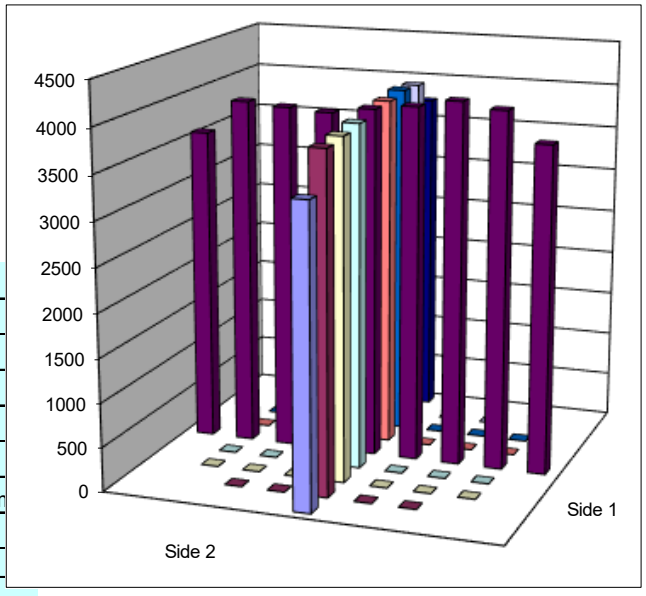
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3855.4		Mean	3937.7	3933.5	3935.6
Min Point	3381.3	-12.3%	Std. Dev.	73.6	77.2	72.5
Max Point	4058.5	5.3%	COV as %	1.9	2.0	**1.8**

Flow w/o C-Pt 75486 cfm

Vel Avg w/o C-Pt 3844 fpm

	Start	Finish	
Stack temp	70.40	70.20	F
Equipment temp	60.50	70.20	F
Ambient temp	60.50	60.90	F
Stack static	2.12	2.04	mbars
Ambient pressure	981.04	980.36	mbars
Total Stack pressure	983.2	982.4	mbars
Ambient humidity	42%	41%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-10
Date	10/17/19	Fan Configuration	Fans A&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	69.60 deg F
Stack X-Area	2827.4 in.2	Start/End Time	14:18 14:26
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,758.3	3,885.8	3,670.9	3,771.6	3,779.9	3,648.7	3,714.8	3,714.5
2	53.7	4,109.1	3,968.4	4,029.3	4,035.6	4,049.4	4,109.1	4,009.1	4,055.9
3	48.4	4,009.1	4,128.8	4,029.3	4,055.7	3,968.4	4,089.3	4,128.8	4,062.2
4	40.6	4,264.2	4,226.0	4,226.0	4,238.7	4,187.4	4,049.4	4,089.3	4,108.7
Center	30.0	4,245.1	4,128.8	4,168.0	4,180.6	4,069.4	4,029.3	4,148.4	4,082.4
5	19.4	4,049.4	4,069.4	4,148.4	4,089.1	4,128.8	4,245.1	4,206.7	4,193.6
6	11.6	4,029.3	4,148.4	4,109.1	4,095.6	4,245.1	4,089.3	4,009.1	4,114.5
7	6.3	3,947.9	3,885.8	3,947.9	3,927.2	3,947.9	3,988.8	3,968.4	3,968.4
8	1.9	3,347.0	3,298.1	3,535.7	3,393.6	3,273.5	3,489.5	3,347.0	3,370.0
Averages ---------->		3,973.3	3,971.1	3,985.0	3,976.4	3,961.1	3,971.0	3,958.0	3,963.3

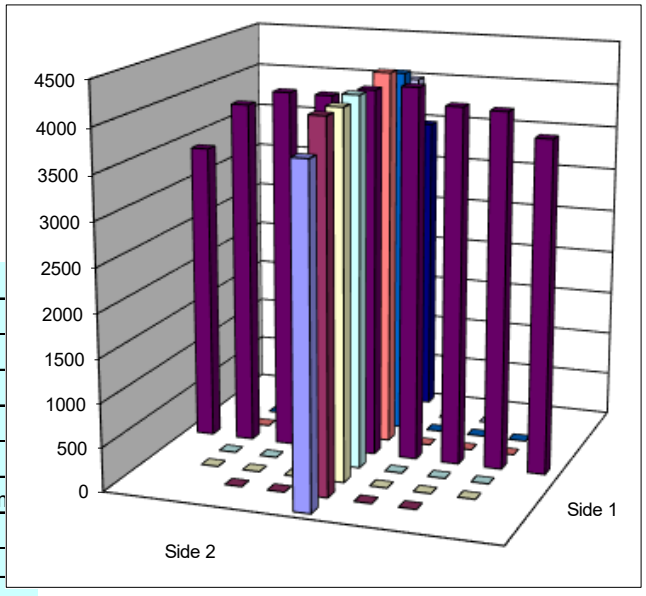
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3969.9		Mean	4088.9	4083.6	4086.3
Min Point	3370.0	-15.1%	Std. Dev.	100.8	68.5	82.9
Max Point	4238.7	6.8%	COV as %	2.5	1.7	**2.0**

Flow w/o C-Pt 77552 cfm

Vel Avg w/o C-Pt 3950 fpm

	Start	Finish	
Stack temp	69.50	69.70	F
Equipment temp	59.70	69.70	F
Ambient temp	59.70	60.60	F
Stack static	2.32	2.61	mbars
Ambient pressure	981.04	980.70	mbars
Total Stack pressure	983.4	983.3	mbars
Ambient humidity	45%	44%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-11
Date	10/17/19	Fan Configuration	Fans A&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	70.45 deg F
Stack X-Area	2827.4 in.2	Start/End Time	15:26 15:33
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,673.7	3,651.5	3,761.2	3,695.5	3,782.7	3,717.6	3,561.3	3,687.2
2	53.7	3,930.3	4,072.6	3,909.6	3,970.8	4,171.2	3,846.7	3,930.3	3,982.7
3	48.4	4,132.0	4,092.4	4,012.1	4,078.9	4,171.2	3,888.7	3,991.9	4,017.3
4	40.6	4,032.4	4,132.0	4,132.0	4,098.8	4,052.5	4,072.6	4,032.4	4,052.5
Center	30.0	4,092.4	4,052.5	4,052.5	4,065.8	4,072.6	4,072.6	4,092.4	4,079.2
5	19.4	4,072.6	4,229.2	4,072.6	4,124.8	4,132.0	4,112.2	4,132.0	4,125.4
6	11.6	3,971.5	4,012.1	4,032.4	4,005.4	4,171.2	4,092.4	3,909.6	4,057.7
7	6.3	3,950.9	4,052.5	4,112.2	4,038.5	4,052.5	4,012.1	3,888.7	3,984.5
8	1.9	3,397.7	3,492.2	3,538.5	3,476.1	3,782.7	3,739.5	3,606.7	3,709.6
Averages ---------->		3,917.1	3,976.3	3,958.1	3,950.5	4,043.2	3,950.5	3,905.0	3,966.2

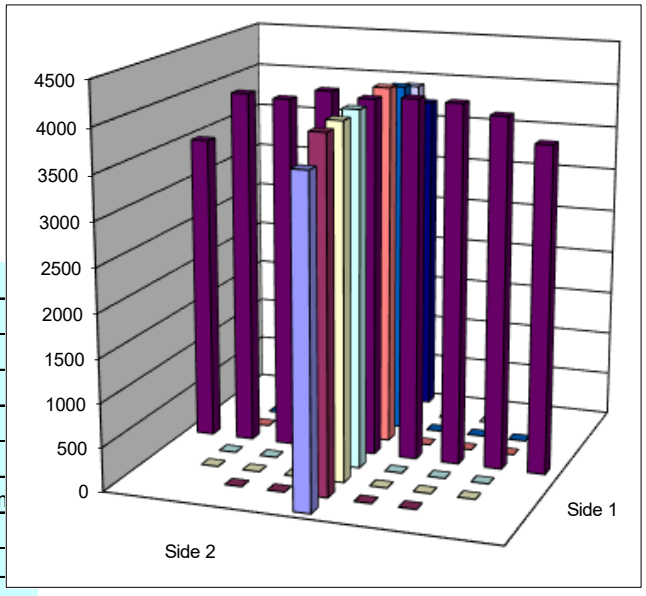
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3958.4		Mean	4054.7	4042.7	4048.7
Min Point	3476.1	-12.2%	Std. Dev.	53.7	51.9	51.1
Max Point	4125.4	4.2%	COV as %	1.3	1.3	**1.3**

Flow w/o C-Pt 77442 cfm

Vel Avg w/o C-Pt 3944 fpm

	Start	Finish	
Stack temp	70.40	70.50	F
Equipment temp	61.90	70.50	F
Ambient temp	61.90	60.60	F
Stack static	2.51	2.12	mbars
Ambient pressure	980.70	980.36	mbars
Total Stack pressure	983.2	982.5	mbars
Ambient humidity	42%	44%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-12
Date	10/18/19	Fan Configuration	Fan A&C
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	63.90 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:06 9:14
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,618.6	3,551.8	3,596.5	3,589.0	3,640.6	3,618.6	3,662.4	3,640.5
2	53.7	4,016.0	4,094.8	4,016.0	4,042.2	3,976.0	3,935.7	3,996.1	3,969.3
3	48.4	4,133.5	4,035.8	4,094.8	4,088.0	4,114.2	4,133.5	4,152.8	4,133.5
4	40.6	4,191.1	4,152.8	4,229.0	4,191.0	4,210.1	4,055.6	4,114.2	4,126.7
Center	30.0	4,035.8	4,075.2	4,152.8	4,087.9	4,075.2	4,094.8	4,094.8	4,088.2
5	19.4	4,191.1	4,094.8	4,229.0	4,171.6	4,016.0	4,152.8	4,075.2	4,081.3
6	11.6	4,114.2	4,229.0	4,114.2	4,152.5	4,114.2	4,094.8	4,094.8	4,101.2
7	6.3	3,976.0	4,094.8	3,935.7	4,002.1	4,075.2	4,055.6	3,935.7	4,022.2
8	1.9	3,596.5	3,640.6	3,618.6	3,618.5	3,483.7	3,596.5	3,791.0	3,623.7
Averages ---------->		3,985.9	3,996.6	3,998.5	3,993.7	3,967.2	3,970.9	3,990.8	3,976.3

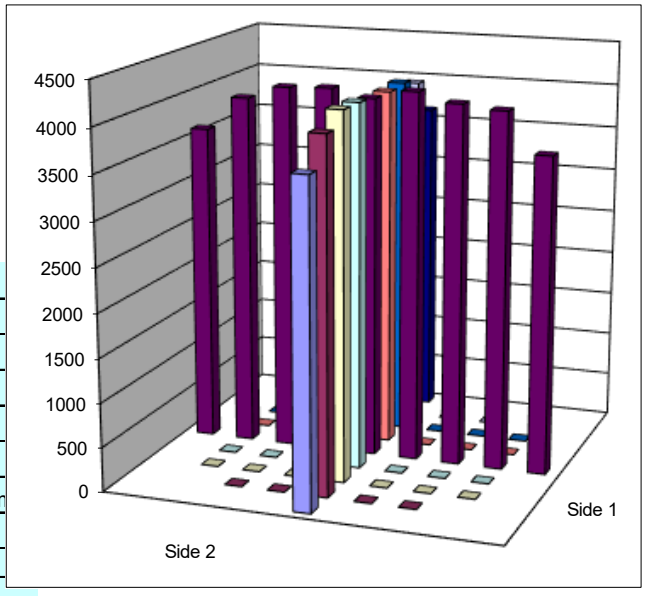
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3985.0		Mean	4105.1	4074.6	4089.8
Min Point	3589.0	-9.9%	Std. Dev.	69.7	59.1	64.1
Max Point	4191.0	5.2%	COV as %	1.7	1.5	**1.6**

Flow w/o C-Pt 77992 cfm

Vel Avg w/o C-Pt 3972 fpm

	Start	Finish	
Stack temp	64.1	63.7	F
Equipment temp	53.1	51.8	F
Ambient temp	53.1	51.8	F
Stack static	2.9	2.4	mbars
Ambient pressure	985.8	985.8	mbars
Total Stack pressure	988.7	988.2	mbars
Ambient humidity	44%	45%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	**LB-S1**	Run No.	**VT-13**
Date	**10/18/19**	Fan Configuration	**Fan A&C**
Testers	ZDH/LCE	Fan Setting	**NA** **Hz**
Stack Dia.	60 in.	Stack Temp	66.5 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:15 10:22
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		**Side1 (310 deg from N)**				**Side2 (40 deg from N)**			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,756.6	3,692.1	3,626.3	3,691.7	3,713.7	3,692.1	3,735.3	3,713.7
2	53.7	3,984.5	4,083.9	4,064.2	4,044.2	4,024.6	4,024.6	4,044.4	4,031.2
3	48.4	4,044.4	4,238.0	4,122.9	4,135.1	3,923.7	3,923.7	3,944.1	3,930.5
4	40.6	4,103.5	4,064.2	4,064.2	4,077.3	4,044.4	4,238.0	4,004.6	4,095.7
Center	30.0	4,083.9	4,122.9	4,083.9	4,096.9	4,044.4	4,083.9	4,064.2	4,064.2
5	19.4	4,122.9	4,044.4	4,004.6	4,057.3	4,161.7	4,103.5	4,103.5	4,122.9
6	11.6	4,004.6	4,161.7	4,142.4	4,102.9	4,142.4	4,161.7	4,044.4	4,116.2
7	6.3	4,024.6	4,044.4	3,964.3	4,011.1	3,923.7	4,004.6	3,964.3	3,964.2
8	1.9	3,514.0	3,559.4	3,581.8	3,551.7	3,491.1	3,491.1	3,536.8	3,506.3
Averages ---------->		3,959.9	4,001.2	3,961.6	3,974.2	3,941.1	3,969.2	3,938.0	3,949.4

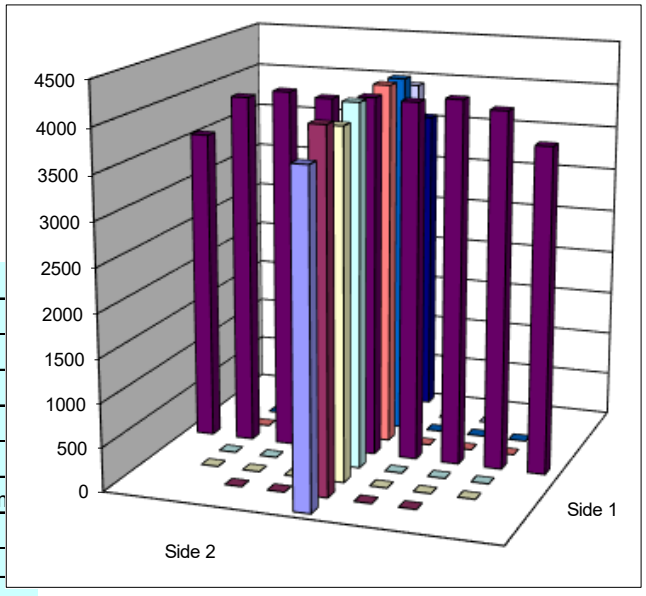
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3961.8		Mean	4075.0	4046.4	4060.7
Min Point	3506.3	-11.5%	Std. Dev.	41.3	75.1	60.1
Max Point	4135.1	4.4%	COV as %	1.0	1.9	**1.5**

Flow w/o C-Pt 77499 cfm

Vel Avg w/o C-Pt 3947 fpm

	Start	Finish	
Stack temp	67	66	F
Equipment temp	56.6	57.2	F
Ambient temp	56.6	57.2	F
Stack static	2.9	2.4	mbars
Ambient pressure	985.8	985.8	mbars
Total Stack pressure	988.7	988.2	mbars
Ambient humidity	37%	35%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1	Run No.	VT-14
Date	10/19/19	Fan Configuration	Fan A & B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	61.75 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:17 9:24
Test Port	1	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	56.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (310 deg from N)				Side2 (40 deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	58.1	3,949.1	4,029.8	4,009.7	3,996.2	4,029.8	4,108.8	3,989.6	4,042.7
2	53.7	4,089.1	4,167.0	4,069.4	4,108.5	4,089.1	4,167.0	4,205.5	4,153.9
3	48.4	4,049.6	4,029.8	3,989.6	4,023.0	4,167.0	4,128.2	4,167.0	4,154.1
4	40.6	3,969.5	3,949.1	4,029.8	3,982.8	4,029.8	3,949.1	4,009.7	3,996.2
Center	30.0	3,969.5	3,989.6	3,969.5	3,976.2	4,089.1	4,009.7	4,009.7	4,036.2
5	19.4	4,108.8	4,108.8	4,089.1	4,102.2	4,049.6	4,167.0	4,147.7	4,121.5
6	11.6	4,243.4	4,147.7	4,167.0	4,186.1	4,224.5	4,029.8	3,949.1	4,067.8
7	6.3	4,281.2	3,803.9	3,866.8	3,984.0	4,089.1	4,108.8	3,908.1	4,035.3
8	1.9	3,825.0	3,866.8	3,908.1	3,866.7	3,740.1	3,782.8	3,653.0	3,725.3
Averages ---------->		4,053.9	4,010.3	4,011.0	4,025.1	4,056.4	4,050.1	4,004.4	4,037.0

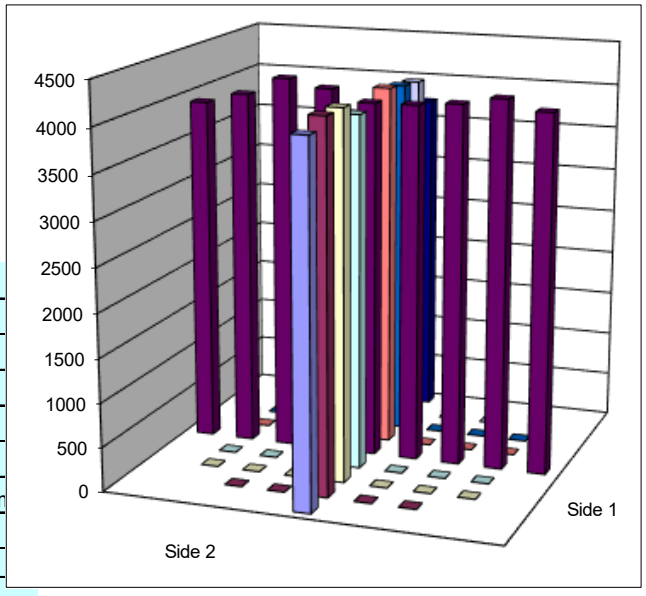
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	4031.0		Mean	4051.8	4080.7	4066.3
Min Point	3725.3	-7.6%	Std. Dev.	81.3	62.9	71.4
Max Point	4186.1	3.8%	COV as %	2.0	1.5	**1.8**

Flow w/o C-Pt 79210 cfm

Vel Avg w/o C-Pt 4034 fpm

	Start	Finish	
Stack temp	61.70	61.80	F
Equipment temp	40.90	48.70	F
Ambient temp	40.90	48.70	F
Stack static	2.39	2.09	mbars
Ambient pressure	975.28	975.62	mbars
Total Stack pressure	977.67	977.71	mbars
Ambient humidity	80%	79%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST8, 8ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

B.4 Velocity Transverse Data Forms - 2023

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-1
Date	04/17/2023	Fan Configuration	Fan A & C
Testers	JCR/ARB	Fan Setting	NA %
Stack Dia.	60 in.	Stack Temp	73.9 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:49 9:56
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2351.7	2572.7	2386.8	2437.1	2635.0	2633.8	2588.2	2619.0
2	6.30	2736.5	2783.2	2654.5	2724.7	2798.4	2720.6	2578.7	2699.2
3	11.64	2614.5	2749.0	2907.0	2756.8	2825.9	2929.7	2681.1	2812.2
4	19.38	2707.7	2804.5	2756.4	2756.2	2736.8	2863.8	2821.9	2807.5
Center	30.00	2596.7	2701.7	2645.5	2648.0	2850.4	2827.4	2739.2	2805.7
5	40.62	2817.3	2830.3	2875.7	2841.1	2821.6	2805.7	2775.3	2800.9
6	48.36	2837.7	2632.2	2669.8	2713.2	2747.8	2866.3	2674.1	2762.7
7	53.70	2902.3	2746.9	2907.0	2852.1	2888.7	2736.2	2931.6	2852.2
8	58.08	2619.5	2737.4	2746.9	2701.3	2698.4	2628.5	2702.9	2676.6
Averages ---------->		2687.1	2728.7	2727.7	2714.5	2778.1	2779.1	2721.4	2759.6

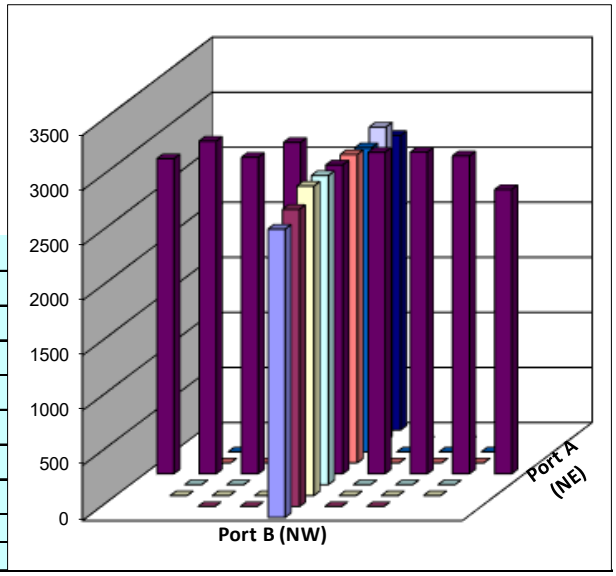
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2737.0		Mean	2756.0	2791.5	2773.8
Min Point	2437.1	-11.0%	Std. Dev.	71.8	48.3	61.6
Max Point	2852.2	4.2%	COV as %	2.6	1.7	**2.2**

Flow w/o C-Pt 53766 cfm

Vel Avg w/o C-Pt 2738 fpm

	Start	Finish	
Stack temp	73.7	74.1	F
Equipment temp	45.0	45.0	F
Ambient temp	46.0	46.0	F
Stack static	1.32	1.19	mbars
Ambient pressure	984.08	984.08	mbars
Total Stack pressure	985.40	985.28	mbars
Ambient humidity	45%	45%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-2
Date	04/17/2023	Fan Configuration	Fan A & C
Testers	JCR/ARB	Fan Setting	NA %
Stack Dia.	60 in.	Stack Temp	77.0 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:15 10:22
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2370.8	2559.6	2444.1	2458.2	2236.8	2384.6	2381.9	2334.4
2	6.30	2682.7	2728.6	2709.2	2706.8	2676.0	2794.3	2771.6	2747.3
3	11.64	2530.3	2817.4	2642.3	2663.3	2697.7	2613.9	2757.3	2689.6
4	19.38	2754.0	2650.1	2849.0	2751.0	2683.4	2800.4	2747.8	2743.9
Center	30.00	2899.5	2813.3	2884.2	2865.7	2905.5	2834.8	2811.0	2850.4
5	40.62	2873.9	2813.3	2656.9	2781.4	2871.7	2740.6	2637.7	2750.0
6	48.36	2939.5	2987.1	2892.7	2939.8	2848.7	2850.7	2631.4	2776.9
7	53.70	2735.8	2879.1	2856.7	2823.9	2701.3	2666.5	2870.2	2746.0
8	58.08	2734.0	2756.7	2607.3	2699.3	2643.6	2743.9	2724.0	2703.8
Averages ---------->		2724.5	2778.4	2726.9	2743.3	2696.1	2714.4	2703.7	2704.7

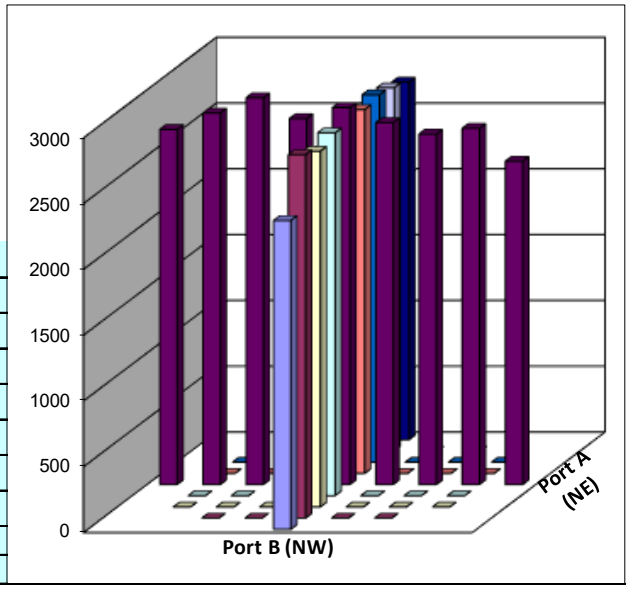
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2724.0		Mean	2790.3	2757.7	2774.0
Min Point	2334.4	-14.3%	Std. Dev.	94.7	48.5	74.2
Max Point	2939.8	7.9%	COV as %	3.4	1.8	**2.7**

Flow w/o C-Pt 53156 cfm

Vel Avg w/o C-Pt 2707 fpm

	Start	Finish	
Stack temp	76.8	77.2	F
Equipment temp	45.0	45.0	F
Ambient temp	49.0	49.0	F
Stack static	1.24	1.27	mbars
Ambient pressure	983.41	983.41	mbars
Total Stack pressure	984.65	984.68	mbars
Ambient humidity	40%	40%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-3
Date	04/17/2023	Fan Configuration	Fan A & C
Testers	JCR/ARB	Fan Setting	NA %
Stack Dia.	60 in.	Stack Temp	78.2 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:49 10:56
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NE)				Port B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2785.5	2814.3	2756.4	2785.4	2701.9	2658.3	2680.2	2680.1
2 / 6.30	2859.0	3308.1	2941.0	3036.0	3226.8	3086.3	2989.3	3100.8
3 / 11.64	3171.0	3217.6	3216.8	3201.8	3146.2	3309.1	3184.9	3213.4
4 / 19.38	3330.9	3301.4	3217.3	3283.2	3303.1	3269.6	3252.9	3275.2
Center / 30.00	3208.1	3205.5	3147.8	3187.1	3266.3	3292.2	3109.6	3222.7
5 / 40.62	3279.4	3430.2	3201.2	3303.6	3313.6	3256.2	3293.9	3287.9
6 / 48.36	3214.3	3204.8	3238.0	3219.0	3137.0	3215.5	3050.3	3134.3
7 / 53.70	3103.5	3243.1	3113.6	3153.4	3231.6	3048.7	3082.8	3121.0
8 / 58.08	3241.3	3168.6	2978.8	3129.6	3127.8	3033.3	3115.7	3092.3
Averages ---------->	3132.6	3210.4	3090.1	3144.4	3161.6	3129.9	3084.4	3125.3

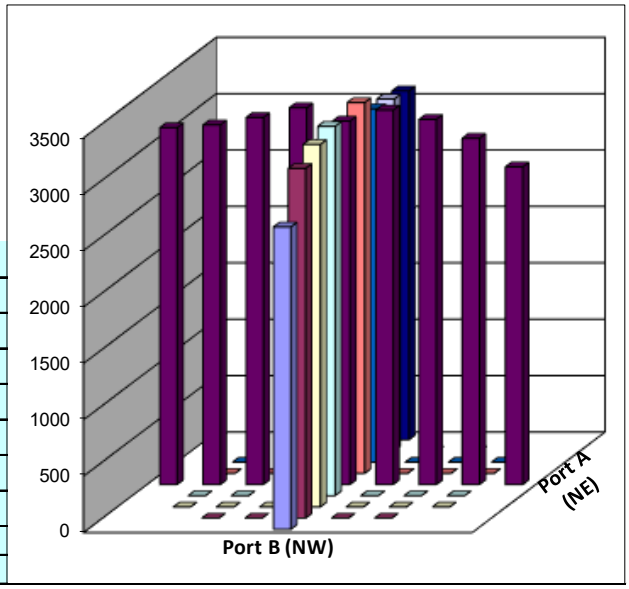
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3134.8		Mean	3197.7	3193.6	3195.7
Min Point	2680.1	-14.5%	Std. Dev.	88.7	75.5	79.2
Max Point	3303.6	5.4%	COV as %	2.8	2.4	**2.5**

Flow w/o C-Pt 61380 cfm

Vel Avg w/o C-Pt 3126 fpm

	Start	Finish	
Stack temp	78.4	78.0	F
Equipment temp	45.0	45.0	F
Ambient temp	49.0	49.0	F
Stack static	1.77	1.84	mbars
Ambient pressure	983.07	982.73	mbars
Total Stack pressure	984.84	984.57	mbars
Ambient humidity	40%	35%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-4
Date	04/17/2023	Fan Configuration	Fan A & C
Testers	JCR/ARB	Fan Setting	NA %
Stack Dia.	60 in.	Stack Temp	76.7 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:08 11:15
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NE)				Port B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2641.5	2756.2	2899.1	2765.6	2976.8	3037.4	2981.7	2998.6
2 / 6.30	3141.8	3115.6	3093.6	3117.0	3154.6	3324.7	3195.7	3225.0
3 / 11.64	3391.2	3193.2	3277.2	3287.2	3323.7	3179.5	3203.7	3235.6
4 / 19.38	3245.2	3269.9	3287.7	3267.6	3306.8	3287.2	3297.1	3297.0
Center / 30.00	3305.1	3352.7	3202.4	3286.7	3272.9	3264.6	3216.7	3251.4
5 / 40.62	3204.5	3332.1	3230.0	3255.5	3209.6	3266.1	3242.4	3239.4
6 / 48.36	3194.7	3133.2	3263.1	3197.0	3244.9	3115.1	3235.6	3198.5
7 / 53.70	3101.9	3136.1	3295.2	3177.7	3247.0	3131.4	3120.9	3166.4
8 / 58.08	3011.6	3151.2	3017.0	3059.9	3040.1	3100.8	3161.9	3100.9
Averages ---------->	3137.5	3160.0	3173.9	3157.1	3197.4	3189.6	3184.0	3190.3

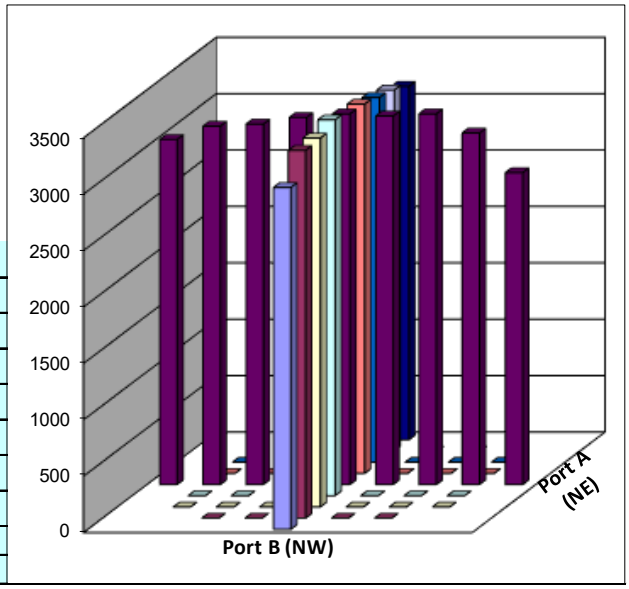
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3173.7		Mean	3227.0	3230.5	3228.7
Min Point	2765.6	-12.9%	Std. Dev.	64.7	41.1	52.1
Max Point	3297.0	3.9%	COV as %	2.0	1.3	**1.6**

Flow w/o C-Pt 62082 cfm

Vel Avg w/o C-Pt 3162 fpm

	Start	Finish	
Stack temp	75.2	78.2	F
Equipment temp	45.0	45.0	F
Ambient temp	49.0	49.0	F
Stack static	1.87	1.77	mbars
Ambient pressure	982.39	982.05	mbars
Total Stack pressure	984.26	983.82	mbars
Ambient humidity	35%	35%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-5
Date	06/21/2023	Fan Configuration	Fan A & B
Testers	JCR/AJV	Fan Setting	69% %
Stack Dia.	60 in.	Stack Temp	70.4 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:07 9:16
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NE)				Port B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2414.4	2690.3	2591.9	2565.5	2452.6	2229.6	2188.9	2290.4
2 / 6.30	2555.5	2764.7	2497.0	2605.7	2428.3	2474.4	2337.4	2413.4
3 / 11.64	2736.4	2670.9	2521.3	2642.9	2487.7	2503.1	2533.1	2508.0
4 / 19.38	2721.4	2589.1	2752.8	2687.8	2477.7	2482.9	2464.1	2474.9
Center / 30.00	2673.3	2653.4	2588.2	2638.3	2580.1	2561.7	2516.5	2552.8
5 / 40.62	2607.6	2612.9	2685.5	2635.3	2739.6	2593.1	2510.5	2614.4
6 / 48.36	2635.2	2581.7	2684.9	2633.9	2674.5	2800.2	2717.0	2730.6
7 / 53.70	2673.9	2691.8	2512.1	2625.9	2690.6	2756.9	2740.8	2729.4
8 / 58.08	2660.0	2697.7	2701.9	2686.5	2543.8	2746.9	2686.4	2659.0
Averages ---------->	2630.9	2661.4	2615.1	2635.8	2563.9	2572.1	2521.6	2552.5

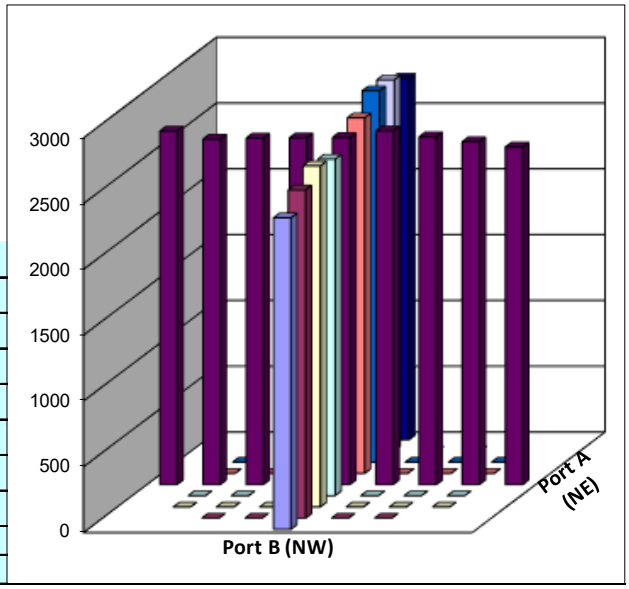
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2594.2		Mean	2638.6	2574.8	2606.7
Min Point	2290.4	-11.7%	Std. Dev.	24.9	123.0	91.4
Max Point	2730.6	5.3%	COV as %	0.9	4.8	**3.5**

Flow w/o C-Pt 50933 cfm

Vel Avg w/o C-Pt 2594 fpm

	Start	Finish	
Stack temp	69.6	71.2	F
Equipment temp	61.0	66.0	F
Ambient temp	61.0	63.0	F
Stack static	1.05	1.24	mbars
Ambient pressure	994.58	994.24	mbars
Total Stack pressure	995.63	995.49	mbars
Ambient humidity	52%	45%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-6
Date	06/21/2023	Fan Configuration	Fan A & B
Testers	JCR/AJV	Fan Setting	69% %
Stack Dia.	60 in.	Stack Temp	71.6 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:41 9:51
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NE)				Port B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2354.1	2658.6	2398.8	2470.5	2301.6	2247.9	2231.0	2260.2
2 / 6.30	2752.8	2596.8	2445.2	2598.3	2385.7	2434.4	2297.1	2372.4
3 / 11.64	2623.9	2777.2	2504.1	2635.1	2696.4	2581.8	2412.5	2563.6
4 / 19.38	2513.4	2663.4	2629.4	2602.1	2580.3	2525.8	2632.7	2579.6
Center / 30.00	2594.3	2507.6	2727.8	2609.9	2575.0	2568.4	2640.1	2594.5
5 / 40.62	2466.2	2500.5	2543.6	2503.4	2529.6	2688.9	2529.3	2582.6
6 / 48.36	2579.0	2528.3	2642.8	2583.4	2702.4	2700.9	2728.1	2710.5
7 / 53.70	2576.5	2571.2	2563.1	2570.3	2784.4	2724.9	2812.0	2773.8
8 / 58.08	2595.2	2667.6	2624.5	2629.1	2757.2	2781.8	2743.7	2760.9
Averages ---------->	2561.7	2607.9	2564.4	2578.0	2590.3	2583.9	2558.5	2577.6

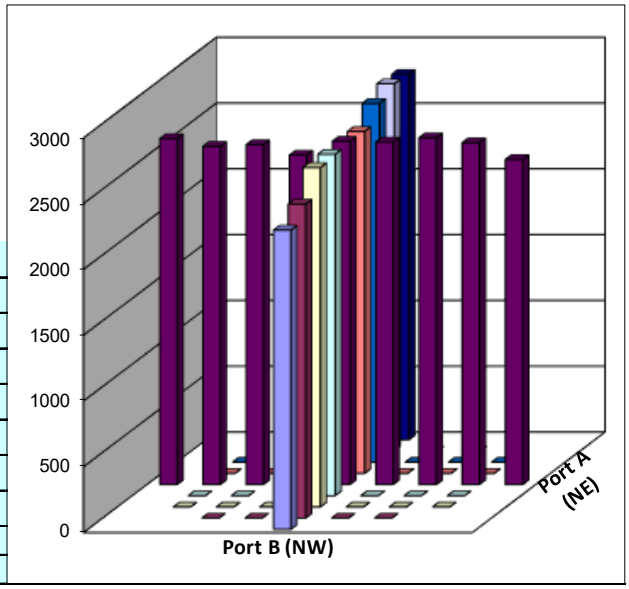
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2577.8		Mean	2586.1	2596.7	2591.4
Min Point	2260.2	-12.3%	Std. Dev.	41.8	126.6	90.7
Max Point	2773.8	7.6%	COV as %	1.6	4.9	**3.5**

Flow w/o C-Pt 50555 cfm

Vel Avg w/o C-Pt 2575 fpm

	Start	Finish	
Stack temp	71.7	71.4	F
Equipment temp	66.0	67.0	F
Ambient temp	63.0	63.0	F
Stack static	0.90	1.00	mbars
Ambient pressure	994.24	994.24	mbars
Total Stack pressure	995.14	995.24	mbars
Ambient humidity	45%	45%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-7
Date	06/21/2023	Fan Configuration	Fan A & B
Testers	JCR/AJV	Fan Setting	79% %
Stack Dia.	60 in.	Stack Temp	73.4 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:35 10:46
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NE)				Port B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2973.5	3024.9	2910.7	2969.7	2458.2	2449.0	2628.2	2511.8
2 / 6.30	3197.0	3003.7	3166.6	3122.4	2531.3	2966.4	2809.5	2769.1
3 / 11.64	3181.1	3257.8	3278.5	3239.1	2879.8	2953.9	2824.4	2886.0
4 / 19.38	3114.0	3117.8	3113.2	3115.0	2870.5	3027.0	2865.5	2921.0
Center / 30.00	2995.9	2916.8	2875.3	2929.3	2920.4	2927.9	3045.9	2964.7
5 / 40.62	2989.2	2865.2	3039.8	2964.7	3070.7	3097.6	3121.5	3096.6
6 / 48.36	3021.4	3060.9	2976.2	3019.5	3192.7	3261.7	3133.3	3195.9
7 / 53.70	2898.0	3059.3	3045.6	3001.0	3238.1	3153.3	3240.6	3210.7
8 / 58.08	3132.5	2991.1	3096.8	3073.5	3269.6	3086.9	3079.1	3145.2
Averages ---------->	3055.8	3033.1	3055.9	3048.3	2936.8	2991.5	2972.0	2966.8

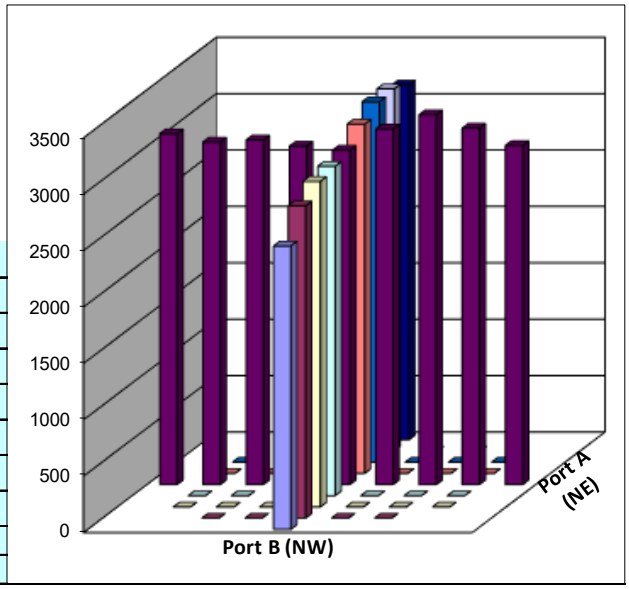
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	3007.5		Mean	3055.9	3006.3	3031.1
Min Point	2511.8	-16.5%	Std. Dev.	108.1	166.1	137.1
Max Point	3239.1	7.7%	COV as %	3.5	5.5	**4.5**

Flow w/o C-Pt 59201 cfm

Vel Avg w/o C-Pt 3015 fpm

	Start	Finish	
Stack temp	74.1	72.6	F
Equipment temp	70.0	70.0	F
Ambient temp	66.0	66.0	F
Stack static	1.37	1.44	mbars
Ambient pressure	994.24	993.91	mbars
Total Stack pressure	995.61	995.35	mbars
Ambient humidity	39%	39%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-8
Date	06/21/2023	Fan Configuration	Fan A & B
Testers	JCR/AJV	Fan Setting	79% %
Stack Dia.	60 in.	Stack Temp	73.7 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:11 11:21
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NE)				Port B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	3106.1	2876.7	3116.0	3032.9	2464.1	2513.1	2558.6	2511.9
2 / 6.30	3146.6	3164.5	3079.5	3130.2	2652.5	2900.8	2966.3	2839.9
3 / 11.64	3230.4	3259.8	3133.0	3207.7	2976.8	2844.6	2834.0	2885.1
4 / 19.38	3220.4	3240.2	3112.9	3191.2	2975.5	2963.8	2899.4	2946.2
Center / 30.00	3031.1	2960.8	3018.3	3003.4	2917.4	3094.4	3001.4	3004.4
5 / 40.62	2934.2	2992.3	2943.3	2956.6	3111.8	3071.6	3132.5	3105.3
6 / 48.36	3124.8	3062.1	2958.1	3048.3	2993.6	3106.6	3023.7	3041.3
7 / 53.70	3076.6	3030.6	2809.4	2972.2	3123.5	3139.7	3269.7	3177.6
8 / 58.08	2990.6	2995.5	3020.7	3002.3	3182.9	3181.8	3284.2	3216.3
Averages ---------->	3095.6	3064.7	3021.2	3060.5	2933.1	2979.6	2996.6	2969.8

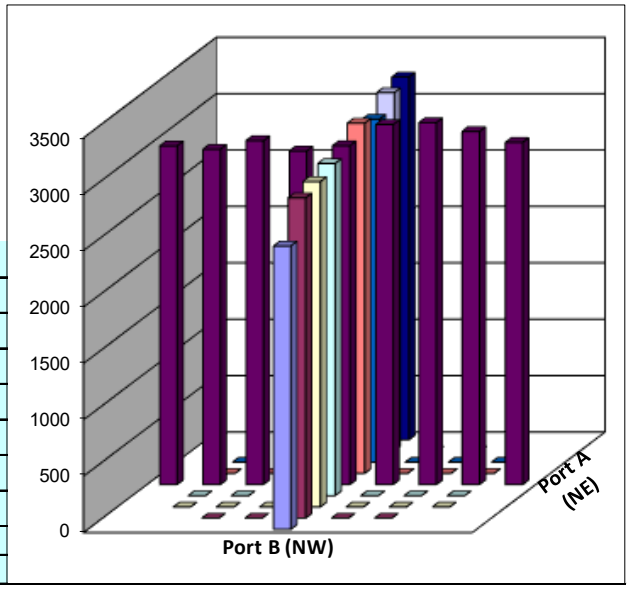
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	3015.2		Mean	3072.8	3000.0	3036.4
Min Point	2511.9	-16.7%	Std. Dev.	103.7	119.8	114.1
Max Point	3216.3	6.7%	COV as %	3.4	4.0	**3.8**

Flow w/o C-Pt 59230 cfm

Vel Avg w/o C-Pt 3017 fpm

	Start	Finish	
Stack temp	73.9	73.5	F
Equipment temp	70.0	70.0	F
Ambient temp	69.0	69.0	F
Stack static	1.37	1.52	mbars
Ambient pressure	993.91	993.91	mbars
Total Stack pressure	995.27	995.42	mbars
Ambient humidity	34%	34%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-9
Date	06/21/2023	Fan Configuration	Fan B & C
Testers	JCR/AJV	Fan Setting	68 %
Stack Dia.	60 in.	Stack Temp	75.4 deg F
Stack X-Area	2827.4 in.2	Start/End Time	12:35 12:48
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2273.1	2324.9	2383.4	2327.1	2287.7	2544.3	2456.1	2429.4
2	6.30	2407.4	2627.9	2571.5	2535.6	2650.3	2449.2	2586.9	2562.1
3	11.64	2703.9	2674.4	2655.2	2677.8	2752.9	2706.3	2693.7	2717.6
4	19.38	2737.0	2619.6	2723.3	2693.3	2647.0	2662.5	2623.6	2644.4
Center	30.00	2738.8	2819.5	2716.5	2758.3	2785.1	2715.6	2793.5	2764.7
5	40.62	2686.2	2737.6	2772.9	2732.2	2831.3	2734.6	2635.6	2733.8
6	48.36	2804.8	2667.7	2736.1	2736.2	2631.6	2729.0	2509.3	2623.3
7	53.70	2708.1	2821.0	2593.5	2707.5	2587.8	2564.3	2624.8	2592.3
8	58.08	2548.7	2522.8	2656.8	2576.1	2601.6	2407.8	2497.3	2502.2
Averages ---------->		2623.1	2646.2	2645.5	2638.2	2641.7	2612.6	2602.3	2618.9

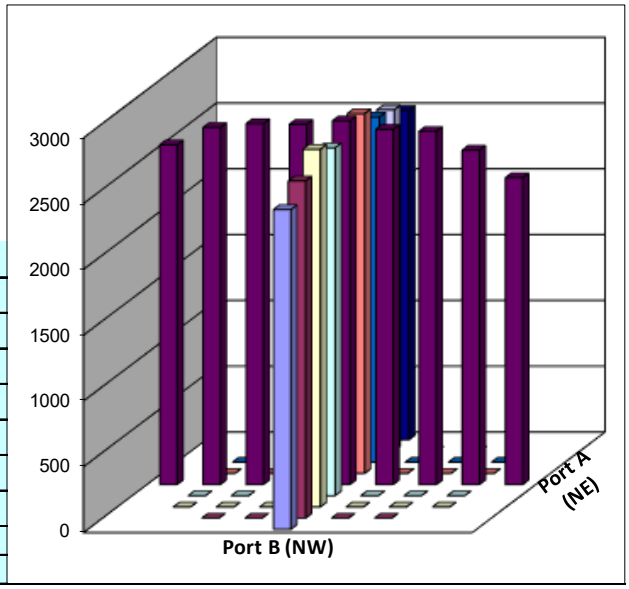
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2628.6		Mean	2691.6	2662.6	2677.1
Min Point	2327.1	-11.5%	Std. Dev.	74.0	76.9	74.0
Max Point	2764.7	5.2%	COV as %	2.7	2.9	**2.8**

Flow w/o C-Pt 51285 cfm

Vel Avg w/o C-Pt 2612 fpm

	Start	Finish	
Stack temp	74.7	76.1	F
Equipment temp	70.0	70.0	F
Ambient temp	72.0	72.0	F
Stack static	1.17	1.29	mbars
Ambient pressure	993.57	993.23	mbars
Total Stack pressure	994.74	994.52	mbars
Ambient humidity	28%	28%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-10
Date	06/21/2023	Fan Configuration	Fan B and C
Testers	JCR/ AJV	Fan Setting	68 %
Stack Dia.	60 in.	Stack Temp	75.5 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:01 13:11
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2268.6	2272.5	2428.4	2323.2	2298.1	2417.4	2299.5	2338.3
2	6.30	2782.2	2434.4	2578.4	2598.3	2513.7	2603.7	2668.3	2595.2
3	11.64	2721.0	2535.6	2535.2	2597.3	2584.3	2745.9	2699.1	2676.4
4	19.38	2619.5	2555.3	2632.8	2602.5	2703.0	2741.4	2776.4	2740.3
Center	30.00	2710.2	2629.1	2668.6	2669.3	2749.7	2743.5	2752.9	2748.7
5	40.62	2563.2	2606.2	2609.6	2593.0	2586.5	2552.8	2680.7	2606.7
6	48.36	2630.4	2614.0	2717.4	2653.9	2568.9	2645.7	2712.9	2642.5
7	53.70	2813.8	2762.4	2709.9	2762.0	2754.7	2513.7	2738.2	2668.9
8	58.08	2577.1	2560.7	2729.3	2622.4	2662.8	2574.9	2514.7	2584.1
Averages ---------->		2631.8	2552.2	2623.3	2602.4	2602.4	2615.4	2649.2	2622.3

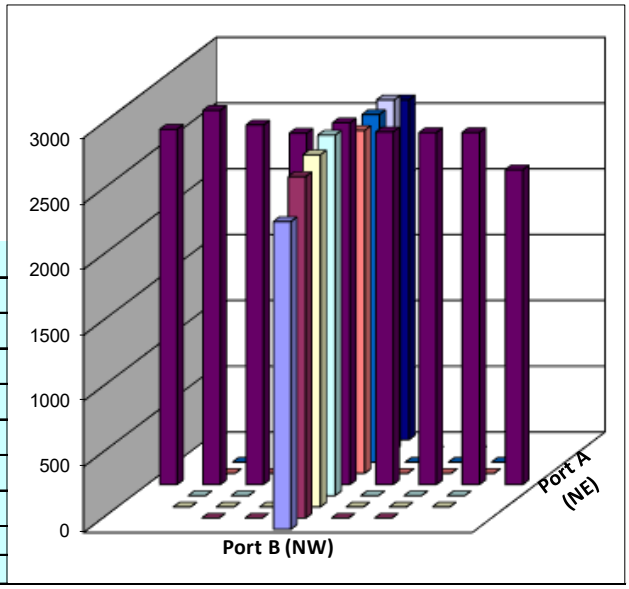
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2612.4		Mean	2639.5	2668.4	2653.9
Min Point	2323.2	-11.1%	Std. Dev.	62.1	59.9	60.5
Max Point	2762.0	5.7%	COV as %	2.4	2.2	**2.3**

Flow w/o C-Pt 51057 cfm

Vel Avg w/o C-Pt 2600 fpm

	Start	Finish	
Stack temp	76.2	74.8	F
Equipment temp	70.0	70.0	F
Ambient temp	75.0	75.0	F
Stack static	1.39	1.24	mbars
Ambient pressure	993.23	992.89	mbars
Total Stack pressure	994.62	994.13	mbars
Ambient humidity	25%	25%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-11
Date	06/21/2023	Fan Configuration	Fan B & C
Testers	JCR/AJV	Fan Setting	80 %
Stack Dia.	60 in.	Stack Temp	76.8 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:48 13:56
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NE)				Port B (NW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2837.1	2765.7	2891.5	2831.4	2961.2	3035.5	2787.6	2928.1
2 / 6.30	2849.1	2941.7	3222.0	3004.3	3164.0	3257.1	2939.2	3120.1
3 / 11.64	3275.3	3314.8	3207.1	3265.7	3214.2	3325.3	3281.0	3273.5
4 / 19.38	3255.4	3109.3	3155.5	3173.4	3245.4	3065.3	3106.4	3139.0
Center / 30.00	3305.4	3231.1	3189.3	3241.9	3153.9	3256.4	3239.1	3216.5
5 / 40.62	3261.4	3225.3	3255.9	3247.5	3252.6	3328.2	3252.9	3277.9
6 / 48.36	3225.0	3144.4	3177.6	3182.3	3246.4	3355.0	3248.1	3283.2
7 / 53.70	3115.1	3140.5	3086.7	3114.1	3101.5	3178.3	3171.2	3150.3
8 / 58.08	3219.2	3085.4	3043.0	3115.9	2968.6	3191.9	3099.1	3086.5
Averages ---------->	3149.2	3106.5	3136.5	3130.7	3145.3	3221.4	3125.0	3163.9

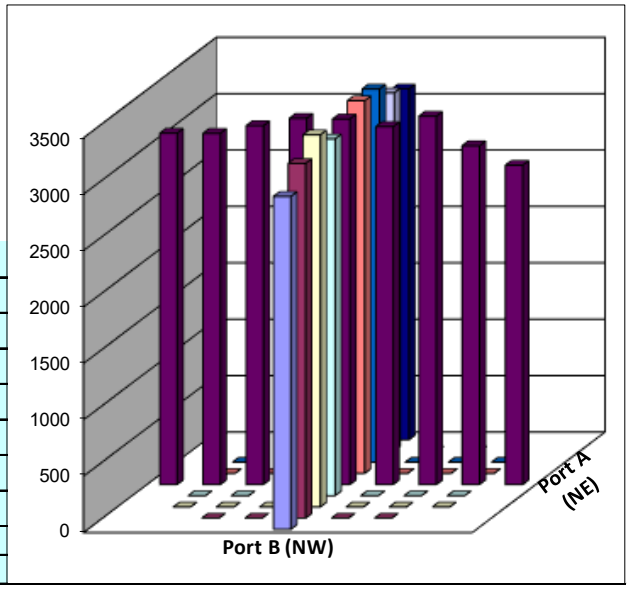
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3147.3		Mean	3175.6	3208.6	3192.1
Min Point	2831.4	-10.0%	Std. Dev.	92.1	71.5	81.1
Max Point	3283.2	4.3%	COV as %	2.9	2.2	**2.5**

Flow w/o C-Pt 61596 cfm

Vel Avg w/o C-Pt 3137 fpm

	Start	Finish	
Stack temp	76.6	77.0	F
Equipment temp	70.0	70.0	F
Ambient temp	74.0	74.0	F
Stack static	1.54	1.79	mbars
Ambient pressure	992.89	992.55	mbars
Total Stack pressure	994.43	994.34	mbars
Ambient humidity	29%	29%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S1 (C3V)	Run No.	VT-12
Date	06/21/2023	Fan Configuration	Fan B & C
Testers	AJV/JCR	Fan Setting	80 %
Stack Dia.	60 in.	Stack Temp	75.8 deg F
Stack X-Area	2827.4 in.2	Start/End Time	14:23 14:34
Test Port	A&B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	623 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NE)				Port B (NW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2702.6	2619.0	2809.2	2710.3	2750.2	3026.4	2829.6	2868.7
2	6.30	2848.7	3133.9	2966.0	2982.9	2965.7	3202.0	3033.1	3066.9
3	11.64	3201.8	3282.6	3001.3	3161.9	3128.2	3263.0	3106.1	3165.8
4	19.38	3282.9	3187.0	3183.2	3217.7	3222.0	3191.9	3187.8	3200.6
Center	30.00	3210.1	3193.4	3216.4	3206.6	3256.1	3203.5	3191.6	3217.1
5	40.62	3204.6	3197.7	3246.6	3216.3	3256.6	3163.8	3369.7	3263.4
6	48.36	3329.5	3338.5	3284.7	3317.6	3112.6	3331.0	3270.0	3237.9
7	53.70	3220.0	3240.1	3157.4	3205.8	3065.0	3154.5	3189.1	3136.2
8	58.08	3135.7	2961.1	2931.9	3009.6	3128.7	3001.3	2971.5	3033.8
Averages ---------->		3126.2	3128.1	3088.5	3114.3	3098.3	3170.8	3127.6	3132.3

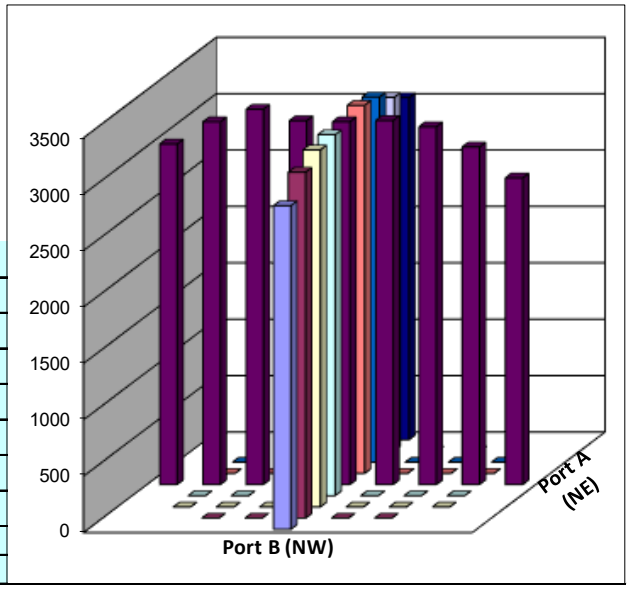
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	3123.3		Mean	3187.0	3184.0	3185.5
Min Point	2710.3	-13.2%	Std. Dev.	101.6	66.9	82.7
Max Point	3317.6	6.2%	COV as %	3.2	2.1	**2.6**

Flow w/o C-Pt 61108 cfm

Vel Avg w/o C-Pt 3112 fpm

	Start	Finish	
Stack temp	78.6	73.0	F
Equipment temp	70.0	70.0	F
Ambient temp	75.0	75.0	F
Stack static	1.64	1.49	mbars
Ambient pressure	992.55	992.21	mbars
Total Stack pressure	994.19	993.71	mbars
Ambient humidity	26%	26%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A06AG, 60")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

Appendix C – LB-S2 Stack Verification Data Sheets

C.1 Flow Angle Data Forms - 2019

FLOW ANGLE DATA FORM

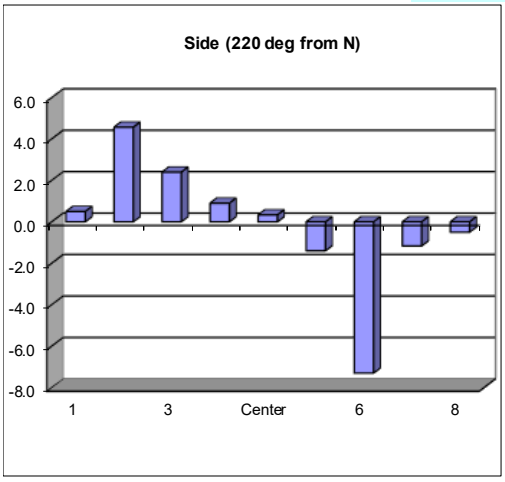
Stack	LB-S2		Run No.	FA-1	
Date	10/15/2019		Fan Setting	N/A	Hz
Start/End Time	14:15	14:30	Fan Configuration	Fan A	
Testers	ZDH/LCE		Stack Temp	68	deg F
Stack Dia.	28	in			
Stack X-Area	615.8	in2	Units	degrees (clockwise > pos. nos.)	
Elevation	753	ft	Port	2	
Distance to disturbance	57.5	ft			

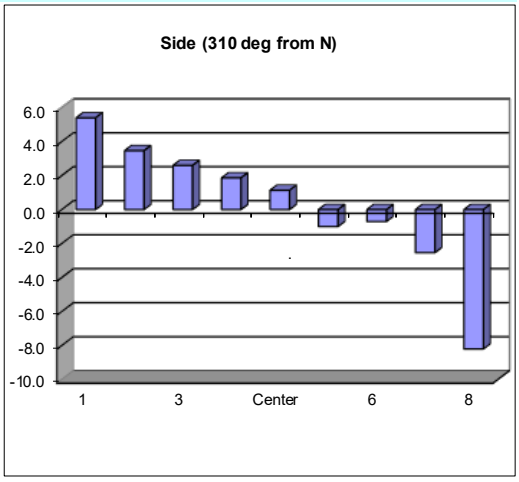
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	1.2	0.2	0.1	0.5	5.5	5.6	5.1	5.4
2	25.1	4.3	4.3	5.1	4.6	3.5	2.7	4.2	3.5
3	22.6	2.0	2.7	2.5	2.4	1.7	2.8	3.3	2.6
4	19.0	1.3	0.6	0.8	0.9	2.2	1.6	1.8	1.9
Center	14.0	0.6	0.2	0.2	0.3	1.1	0.5	1.8	1.1
5	9.0	-1.6	-1.4	-1.2	-1.4	-2.0	-0.8	-0.2	-1.0
6	5.4	-7.5	-7.3	-7.1	-7.3	-0.2	-1.4	-0.5	-0.7
7	2.9	-1.2	-1.1	-1.2	-1.2	-4.0	-1.7	-1.9	-2.5
8	0.9	-0.2	-0.5	-0.8	-0.5	-9.7	-6.7	-8.2	-8.2
Mean of absolute values:					2.1				3.0
" " w/o points by wall:					2.6				1.9
								Grand mean ABS	2.6
								Grand mean ABS w/o wall pts	2.2

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

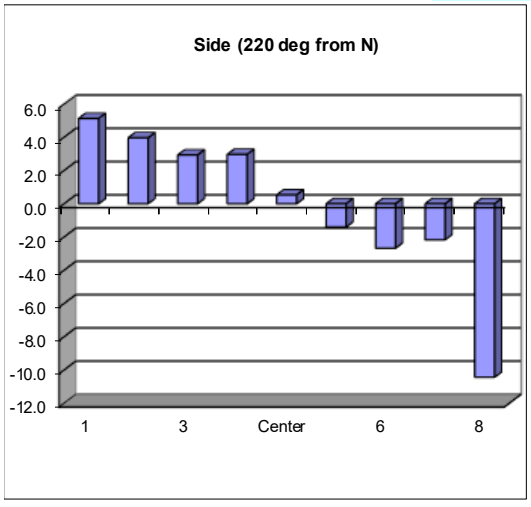
Stack	LB-S2	Run No.	FA-2
Date	10/15/2019	Fan Setting	N/A Hz
Start/End Time	15:55 16:04	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	68.9 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

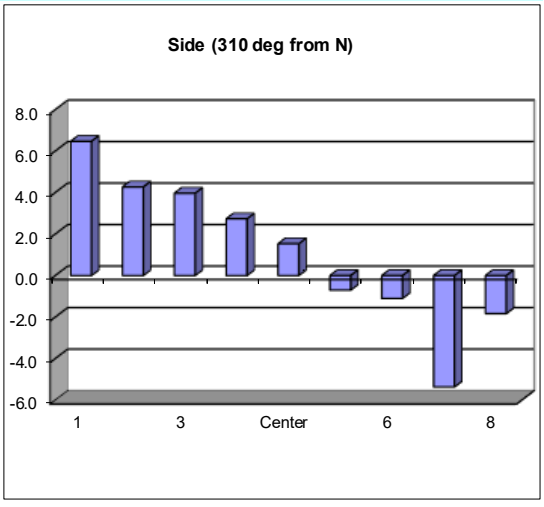
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 27.1	4.6	5.7	5.1	5.1	6.4	7.8	5.2	6.5
2 / 25.1	3.9	4.5	3.5	4.0	3.4	4.7	4.7	4.3
3 / 22.6	3.1	2.7	3.0	2.9	5.3	1.9	4.7	4.0
4 / 19.0	2.6	3.4	2.9	3.0	2.7	3.2	2.3	2.7
Center / 14.0	0.0	1.2	0.4	0.5	2.2	1.1	1.3	1.5
5 / 9.0	-2.0	-1.3	-0.9	-1.4	-0.3	-0.8	-1.0	-0.7
6 / 5.4	-2.5	-2.8	-2.7	-2.7	-1.4	-1.2	-0.7	-1.1
7 / 2.9	-2.6	-2.8	-1.1	-2.2	-5.8	-5.5	-4.8	-5.4
8 / 0.9	-10.8	-10.2	-10.3	-10.4	-3.4	-1.6	-0.5	-1.8
Mean of absolute values:				3.6				3.1
" " w/o points by wall:				2.4				2.8
							Grand mean ABS	3.3
							Grand mean ABS w/o wall pts	2.6

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

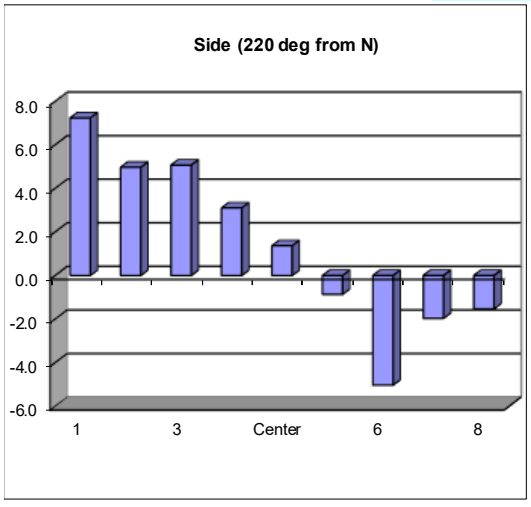
Stack	LB-S2	Run No.	FA-3
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	9:52 10:01	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	66.8 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

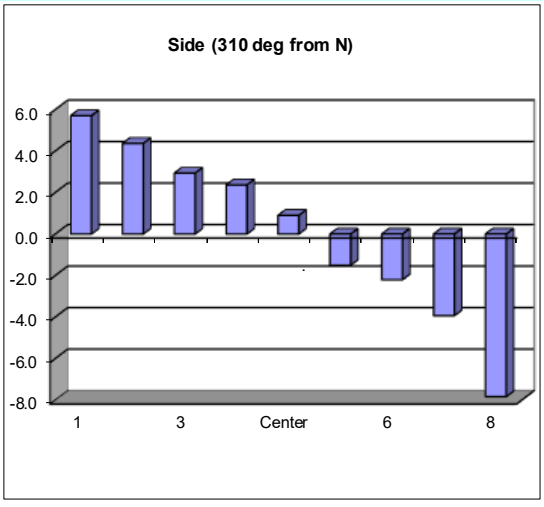
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 27.1	8.0	7.1	6.6	7.2	6.3	4.7	6.1	5.7
2 / 25.1	5.9	4.8	4.2	5.0	4.5	4.3	4.3	4.4
3 / 22.6	5.3	5.1	4.8	5.1	4.0	2.6	2.2	2.9
4 / 19.0	3.6	3.3	2.4	3.1	2.1	2.3	2.7	2.4
Center / 14.0	0.8	1.6	1.7	1.4	1.0	0.9	0.8	0.9
5 / 9.0	-1.6	-0.7	-0.3	-0.9	-1.6	-1.4	-1.5	-1.5
6 / 5.4	-5.2	-4.9	-5.0	-5.0	-2.6	-2.1	-1.9	-2.2
7 / 2.9	-1.8	-1.9	-2.2	-2.0	-4.0	-3.8	-4.0	-3.9
8 / 0.9	-2.3	-1.2	-1.1	-1.5	-7.9	-8.1	-7.5	-7.8
Mean of absolute values:				3.5				3.5
" " w/o points by wall:				3.2				2.6
							Grand mean ABS	3.5
							Grand mean ABS w/o wall pts	2.9

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

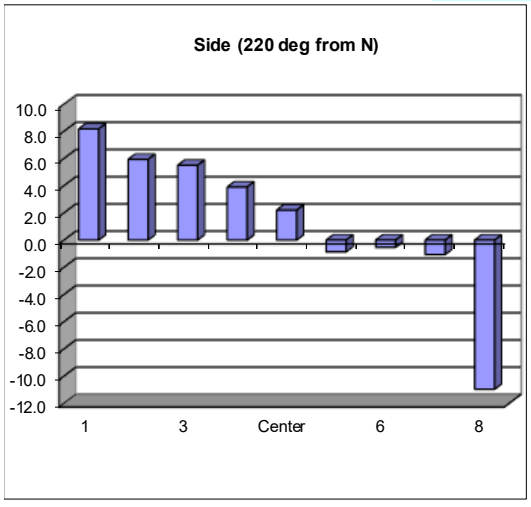
Stack	LB-S2	Run No.	FA-4
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	11:21 11:29	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	68.3 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

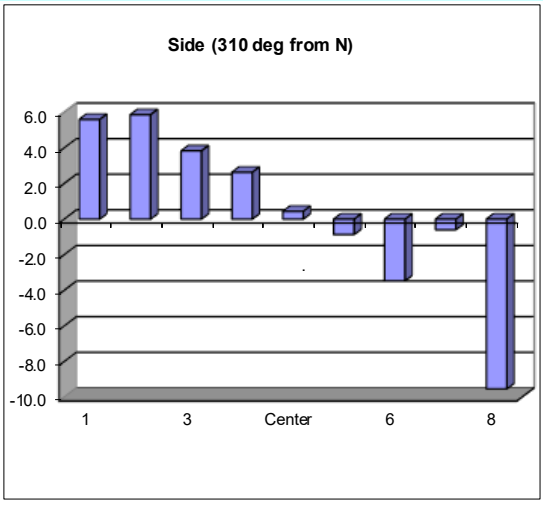
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 27.1	7.9	9.7	6.9	8.2	4.6	5.9	6.3	5.6
2 / 25.1	5.9	5.9	6.0	5.9	6.5	6.0	5.1	5.9
3 / 22.6	5.7	5.2	5.6	5.5	4.4	3.6	3.5	3.8
4 / 19.0	3.1	4.4	4.2	3.9	2.8	2.6	2.5	2.6
Center / 14.0	2.3	2.4	1.9	2.2	0.1	0.4	0.8	0.4
5 / 9.0	-1.2	-0.8	-0.6	-0.9	-0.9	-1.3	-0.4	-0.9
6 / 5.4	-1.0	-0.5	-0.1	-0.5	-4.2	-4.9	-1.3	-3.5
7 / 2.9	-1.1	-0.7	-1.4	-1.1	-0.6	-0.5	-0.7	-0.6
8 / 0.9	-11.2	-11.5	-10.2	-11.0	-9.5	-9.3	-9.8	-9.5
Mean of absolute values:				4.3				3.6
" " w/o points by wall:				2.9				2.5
							Grand mean ABS	4.0
							Grand mean ABS w/o wall pts	2.7

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

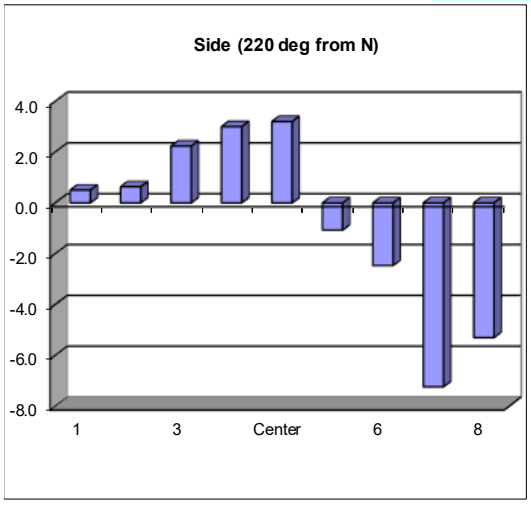
Stack	LB-S2	Run No.	FA-5
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	13:27 13:33	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	68.7 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

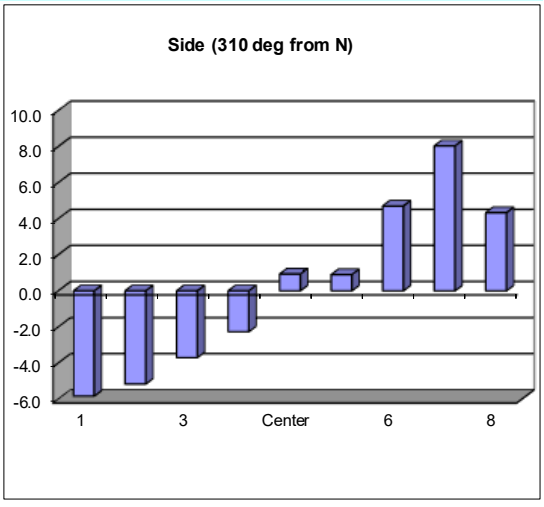
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	0.5	0.5	0.5	0.5	-7.1	-5.4	-5.0	-5.8
2	25.1	0.7	0.6	0.6	0.6	-3.4	-6.1	-6.0	-5.2
3	22.6	0.7	3.3	2.7	2.2	-3.2	-3.7	-4.2	-3.7
4	19.0	3.2	3.0	2.8	3.0	-2.4	-1.8	-2.6	-2.3
Center	14.0	3.2	2.8	3.6	3.2	1.5	0.8	0.5	0.9
5	9.0	-0.9	-1.0	-1.3	-1.1	0.2	1.5	1.0	0.9
6	5.4	-5.0	-0.9	-1.5	-2.5	4.8	4.7	4.6	4.7
7	2.9	-7.2	-7.7	-6.8	-7.2	8.1	8.8	7.2	8.0
8	0.9	-6.9	-5.8	-3.2	-5.3	4.8	3.4	4.8	4.3
Mean of absolute values:					2.8				4.0
" " w/o points by wall:					2.8				3.7
								Grand mean ABS	3.4
								Grand mean ABS w/o wall pts	3.3

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

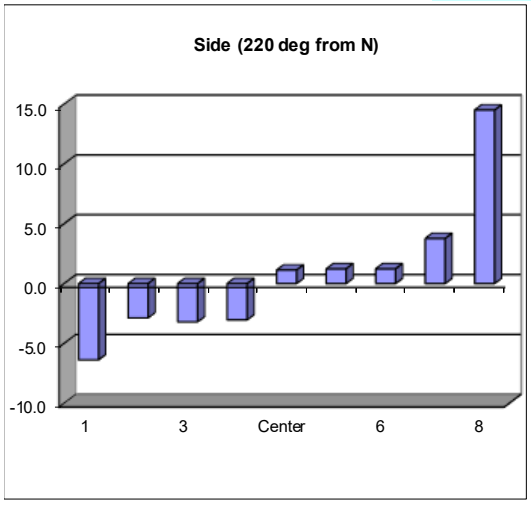
Stack	LB-S2	Run No.	FA-6
Date	10/16/2019	Fan Setting	N/A Hz
Start/End Time	14:34 14:40	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	69.1 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

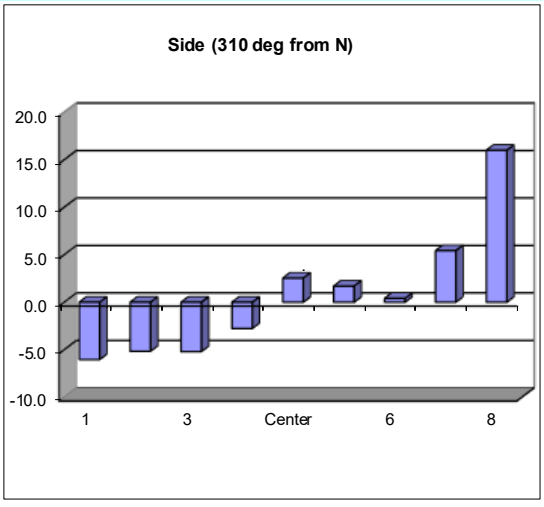
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	-4.0	-7.7	-7.4	-6.4	-6.3	-5.8	-6.0	-6.0
2	25.1	-3.0	-2.7	-2.9	-2.9	-5.4	-5.0	-5.1	-5.2
3	22.6	-2.8	-3.3	-3.5	-3.2	-5.6	-4.9	-5.1	-5.2
4	19.0	-3.4	-2.7	-3.0	-3.0	-3.0	-2.6	-2.7	-2.8
Center	14.0	0.8	1.2	1.4	1.1	2.7	2.4	2.5	2.5
5	9.0	1.4	1.2	1.1	1.2	1.1	1.4	2.6	1.7
6	5.4	1.1	1.0	1.6	1.2	0.1	0.4	0.7	0.4
7	2.9	3.6	3.7	4.0	3.8	6.2	5.7	4.4	5.4
8	0.9	14.5	14.9	14.1	14.5	15.2	16.5	16.3	16.0
Mean of absolute values:					4.1				5.0
" " w/o points by wall:					2.4				3.3
								Grand mean ABS	4.6
								Grand mean ABS w/o wall pts	2.8

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

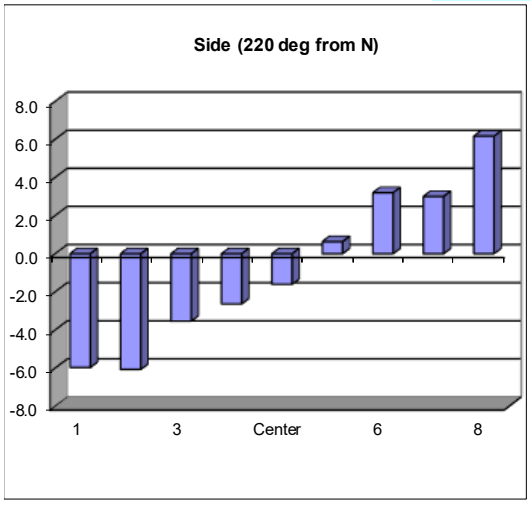
Stack	LB-S2	Run No.	FA-7
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	9:43 9:51	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	69.2 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

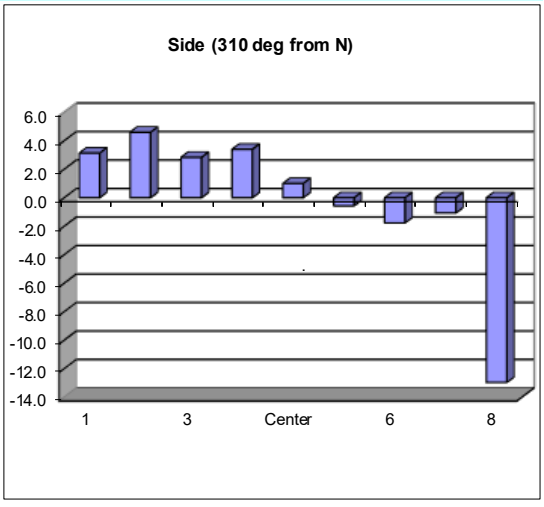
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	-5.9	-5.4	-6.6	-6.0	3.2	3.1	3.1	3.1
2	25.1	-6.1	-5.8	-6.3	-6.1	4.6	5.0	4.2	4.6
3	22.6	-4.2	-3.8	-2.6	-3.5	2.5	3.2	2.8	2.8
4	19.0	-3.3	-2.3	-2.3	-2.6	4.2	3.3	2.7	3.4
Center	14.0	-1.7	-1.1	-2.0	-1.6	0.9	0.9	1.2	1.0
5	9.0	0.8	0.3	0.8	0.6	-0.1	-1.1	-0.5	-0.6
6	5.4	1.6	2.5	5.5	3.2	-1.8	-1.6	-1.9	-1.8
7	2.9	4.0	2.3	2.7	3.0	-0.7	-1.1	-1.4	-1.1
8	0.9	6.2	6.5	5.8	6.2	-13.9	-12.7	-12.3	-13.0
Mean of absolute values:					3.6				3.5
" " w/o points by wall:					3.0				2.2
								Grand mean ABS	3.6
								Grand mean ABS w/o wall pts	2.6

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

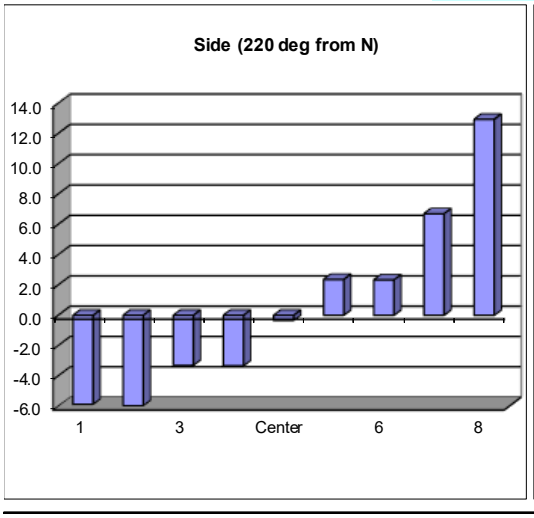
Stack	LB-S2	Run No.	FA-8
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	10:52 11:00	Fan Configuration	Fan B Only
Testers	ZDH/LCE	Stack Temp	69.2 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

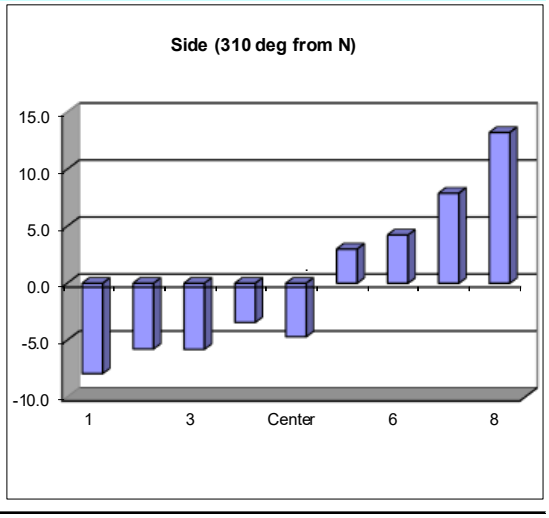
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	-7.6	-4.3	-5.7	-5.9	-8.2	-7.9	-7.7	-7.9
2	25.1	-5.7	-6.5	-5.7	-6.0	-6.7	-5.3	-5.3	-5.8
3	22.6	-5.4	-3.2	-1.3	-3.3	-6.3	-5.8	-5.3	-5.8
4	19.0	-2.9	-5.4	-1.7	-3.3	-4.8	-2.8	-2.7	-3.4
Center	14.0	-0.2	-0.7	-0.1	-0.3	-5.2	-4.7	-4.2	-4.7
5	9.0	3.1	2.8	1.2	2.4	4.8	2.0	2.2	3.0
6	5.4	2.8	2.0	2.2	2.3	4.4	4.3	4.0	4.2
7	2.9	6.9	6.5	6.7	6.7	7.4	8.1	8.2	7.9
8	0.9	13.4	13.0	12.4	12.9	13.8	12.5	13.4	13.2
Mean of absolute values:					4.8				6.2
" " w/o points by wall:					3.5				5.0
								Grand mean ABS	5.5
								Grand mean ABS w/o wall pts	4.2

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

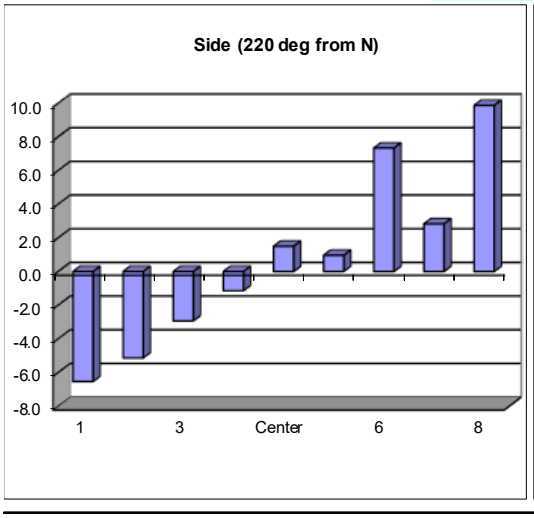
Stack	LB-S2	Run No.	FA-9
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	13:20 13:27	Fan Configuration	Fan B Only
Testers	ZDH/LCE	Stack Temp	70.6 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

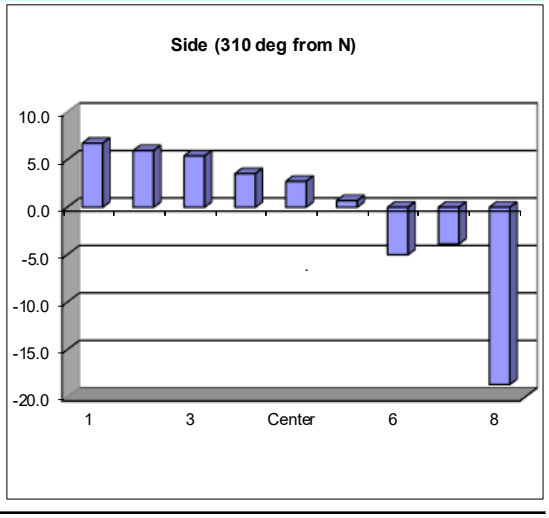
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 27.1	-6.6	-6.8	-6.2	-6.5	6.4	7.5	6.3	6.7
2 / 25.1	-5.1	-5.6	-4.7	-5.1	6.1	5.8	6.0	6.0
3 / 22.6	-2.7	-2.8	-3.3	-2.9	5.5	5.8	4.9	5.4
4 / 19.0	-0.9	-1.3	-1.2	-1.1	3.5	3.3	3.8	3.5
Center / 14.0	1.8	1.1	1.6	1.5	2.4	2.9	2.9	2.7
5 / 9.0	1.0	0.7	1.2	1.0	0.6	1.0	0.5	0.7
6 / 5.4	7.6	7.3	7.1	7.3	-4.9	-5.0	-5.1	-5.0
7 / 2.9	2.5	3.3	2.7	2.8	-3.9	-4.2	-3.5	-3.9
8 / 0.9	9.2	10.0	10.4	9.9	-18.2	-18.7	-19.1	-18.7
Mean of absolute values:				4.2				5.8
" " w/o points by wall:				3.1				3.9
							Grand mean ABS	5.0
							Grand mean ABS w/o wall pts	3.5

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

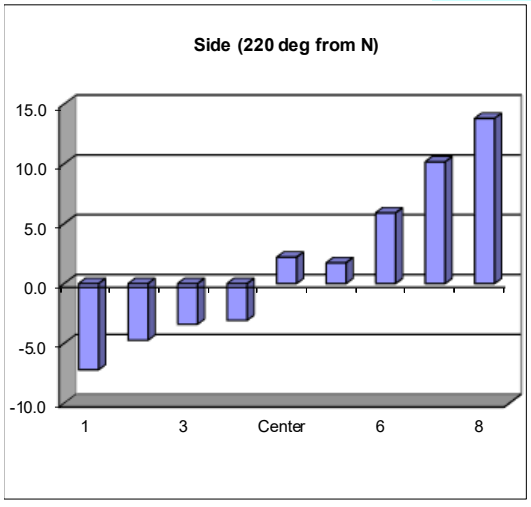
Stack	LB-S2	Run No.	FA-10
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	14:45 14:52	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	70.2 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

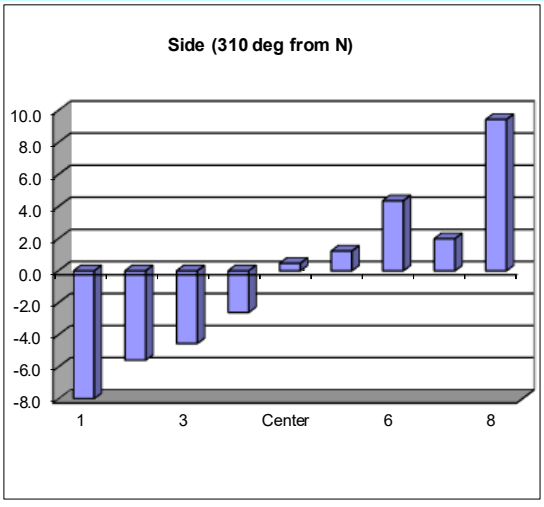
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	-8.4	-6.6	-6.6	-7.2	-8.4	-7.4	-8.1	-8.0
2	25.1	-5.7	-4.2	-4.3	-4.7	-6.1	-4.5	-6.1	-5.6
3	22.6	-3.4	-3.9	-2.9	-3.4	-4.6	-4.9	-4.1	-4.5
4	19.0	-2.9	-3.1	-3.2	-3.1	-2.5	-3.5	-1.8	-2.6
Center	14.0	2.6	2.5	1.5	2.2	0.8	0.5	0.1	0.5
5	9.0	1.2	2.2	1.8	1.7	2.0	1.2	0.5	1.2
6	5.4	5.3	6.1	6.3	5.9	4.1	4.8	4.2	4.4
7	2.9	11.7	9.3	9.5	10.2	2.1	1.9	2.0	2.0
8	0.9	14.2	13.5	13.7	13.8	10.0	9.8	8.5	9.4
Mean of absolute values:					5.8				4.2
" " w/o points by wall:					4.5				3.0
								Grand mean ABS	5.0
								Grand mean ABS w/o wall pts	3.7

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

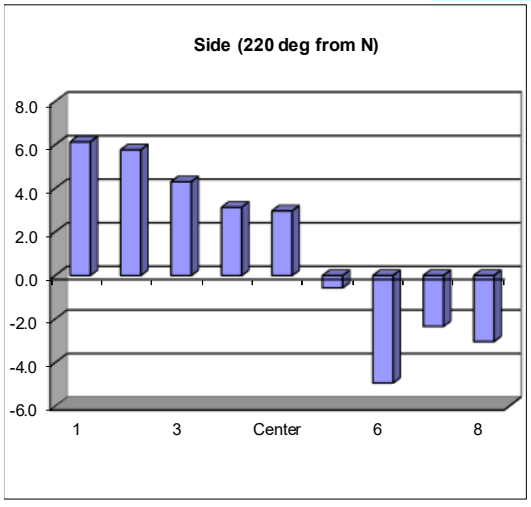
Stack	LB-S2	Run No.	FA-11
Date	10/17/2019	Fan Setting	N/A Hz
Start/End Time	15:52 15:57	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	70.4 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

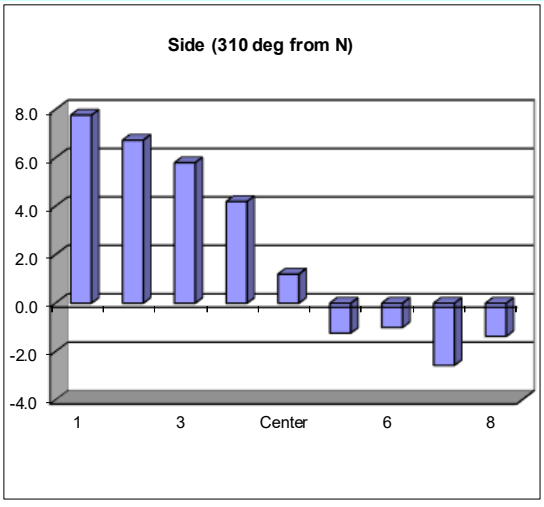
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	6.4	6.1	5.9	6.1	8.3	7.4	7.6	7.8
2	25.1	5.5	5.8	6.0	5.8	6.7	6.9	6.6	6.7
3	22.6	4.0	4.6	4.3	4.3	6.4	5.4	5.6	5.8
4	19.0	4.1	2.7	2.6	3.1	3.4	4.8	4.4	4.2
Center	14.0	2.6	3.1	3.2	3.0	1.3	1.2	1.1	1.2
5	9.0	-0.8	-0.6	-0.3	-0.6	-0.9	-1.3	-1.5	-1.2
6	5.4	-4.8	-5.1	-4.9	-4.9	-0.8	-1.2	-1.0	-1.0
7	2.9	-2.2	-2.3	-2.5	-2.3	-2.4	-2.6	-2.7	-2.6
8	0.9	-3.6	-2.8	-2.7	-3.0	-0.6	-1.8	-1.7	-1.4
Mean of absolute values:					3.7				3.5
" " w/o points by wall:					3.4				3.2
								Grand mean ABS	3.6
								Grand mean ABS w/o wall pts	3.3

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

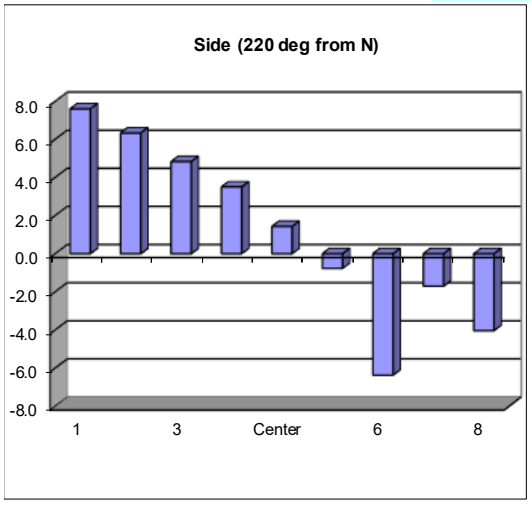
Stack	LB-S2	Run No.	FA-12
Date	10/18/2019	Fan Setting	N/A Hz
Start/End Time	9:31 9:37	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	67.8 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

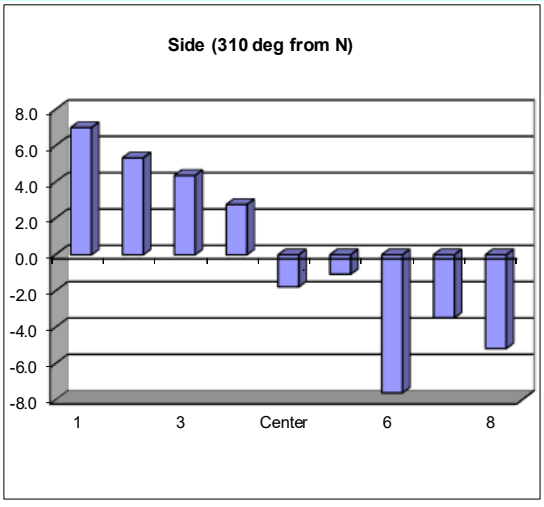
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	7.7	7.6	7.5	7.6	7.6	6.9	6.5	7.0
2	25.1	7.1	5.2	6.7	6.3	5.6	5.0	5.4	5.3
3	22.6	5.3	4.6	4.6	4.8	4.6	4.1	4.4	4.4
4	19.0	3.5	3.1	3.9	3.5	2.4	3.1	2.8	2.8
Center	14.0	1.8	1.0	1.5	1.4	-2.1	-2.2	-1.0	-1.8
5	9.0	-1.3	-0.7	-0.3	-0.8	-1.3	-0.8	-1.1	-1.1
6	5.4	-7.1	-6.2	-5.8	-6.4	-7.4	-7.9	-7.5	-7.6
7	2.9	-1.2	-1.1	-2.8	-1.7	-3.1	-3.4	-3.9	-3.5
8	0.9	-4.1	-4.5	-3.5	-4.0	-4.5	-6.2	-4.8	-5.2
Mean of absolute values:					4.1				4.3
" " w/o points by wall:					3.6				3.8
								Grand mean ABS	4.2
								Grand mean ABS w/o wall pts	3.7

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

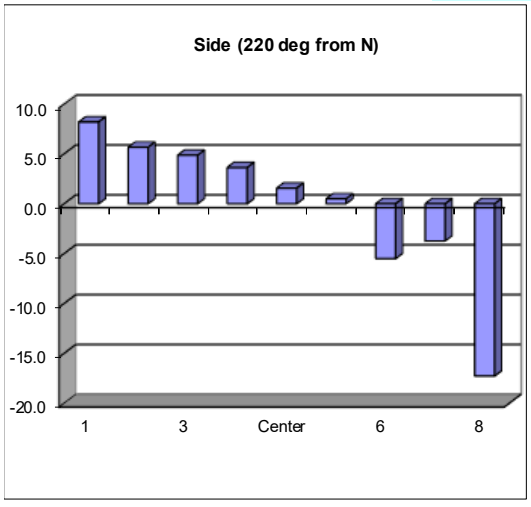
Stack	LB-S2	Run No.	FA-13
Date	10/18/2019	Fan Setting	N/A Hz
Start/End Time	10:39 19:46	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	67.7 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

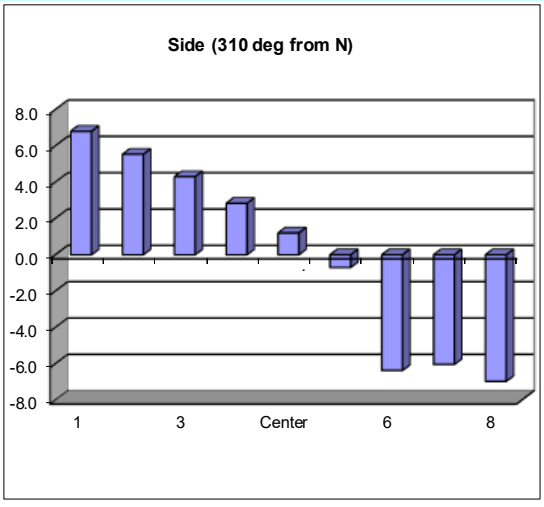
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	8.8	7.7	8.1	8.2	7.4	6.8	6.2	6.8
2	25.1	5.5	5.8	5.7	5.7	5.7	5.4	5.5	5.5
3	22.6	4.5	5.2	4.9	4.9	4.4	4.3	4.2	4.3
4	19.0	3.6	3.9	3.4	3.6	2.8	3.1	2.6	2.8
Center	14.0	1.6	1.3	1.8	1.6	0.5	1.4	1.7	1.2
5	9.0	0.7	0.5	0.3	0.5	-0.5	-0.7	-0.9	-0.7
6	5.4	-6.4	-5.5	-4.6	-5.5	-6.5	-6.2	-6.4	-6.4
7	2.9	-4.2	-3.8	-3.2	-3.7	-6.3	-6.0	-5.8	-6.0
8	0.9	-17.0	-18.1	-16.7	-17.3	-7.8	-6.5	-6.6	-7.0
Mean of absolute values:					5.7				4.5
" " w/o points by wall:					3.6				3.9
								Grand mean ABS	5.1
								Grand mean ABS w/o wall pts	3.7

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





FLOW ANGLE DATA FORM

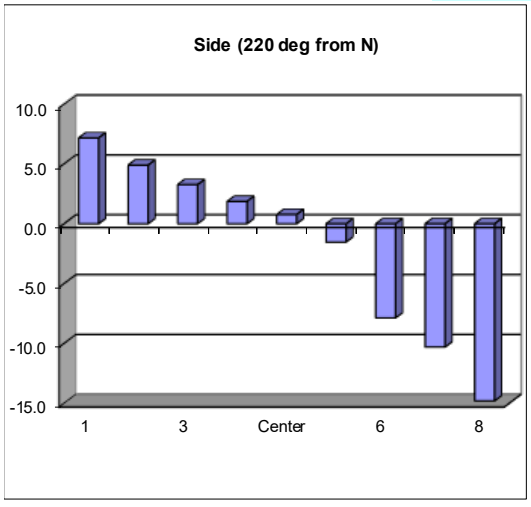
Stack	LB-S2	Run No.	FA-14
Date	10/19/2019	Fan Setting	N/A Hz
Start/End Time	9:45 9:51	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	66.6 deg F
Stack Dia.	28 in		
Stack X-Area	615.8 in2	Units	degrees (clockwise > pos. nos.)
Elevation	753 ft	Port	2
Distance to disturbance	57.5 ft		

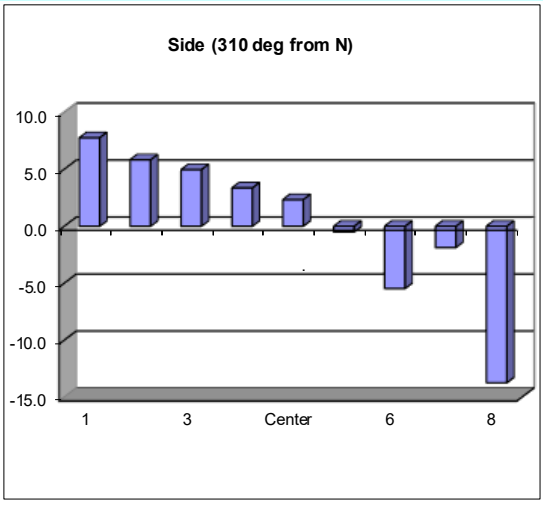
Order -->	First				Second			
Traverse-->	Side 1 (220 deg from N)				Side 2 (310 deg from N)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	27.1	6.7	7.0	7.8	7.2	8.2	7.8	7.3	7.8
2	25.1	4.4	5.7	4.6	4.9	6.2	5.6	5.7	5.8
3	22.6	3.2	3.7	2.9	3.3	4.8	5.0	5.1	5.0
4	19.0	2.3	2.1	1.2	1.9	3.4	3.4	3.3	3.4
Center	14.0	0.0	1.1	1.2	0.8	2.5	2.2	2.3	2.3
5	9.0	-1.7	-1.5	-1.4	-1.5	-0.5	-0.7	-0.3	-0.5
6	5.4	-7.6	-8.1	-7.9	-7.9	-5.8	-5.4	-5.2	-5.5
7	2.9	-10.3	-10.1	-10.5	-10.3	-2.2	-1.7	-1.7	-1.9
8	0.9	-14.5	-14.7	-15.2	-14.8	-13.5	-13.9	-13.8	-13.7
Mean of absolute values:					5.8				5.1
" " w/o points by wall:					4.4				3.5
								Grand mean ABS	5.5
								Grand mean ABS w/o wall pts	3.9

Instuments Used:		Cal. Due
S-type pitot (ID: 7A, 7ft)		Post-test
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; filed recalibration as necessar
Fluid Manometer	5D	Primary standard

Note:
To assure similar hose connections between the manometer and pitot tube, rotating the pitot tube assembly clockwise drives the meniscus to the right (to higher pos. numbers).

Notes:
Traverse point depth = the distance from inside stack wall to each point
Sign of flow angle indicates which direction the pitot was turned to achieve null angle.
Approx. air velocity was derived from all points on the Velocity Traverse Forms





C.2 Flow Angle Data Forms – 2023

FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-1
Date	4/13/2023	Fan Setting	51 %
Start/End Time	8:37 8:47	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	74.9 deg F
Stack Dia.	28 in	Approx. air vel.	2503 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

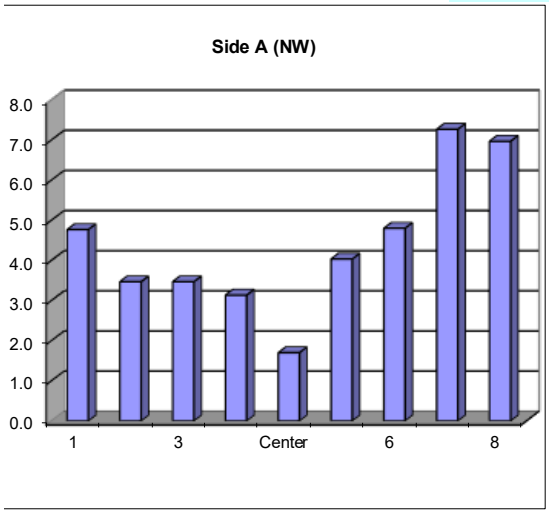
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	2.1	4.9	7.3	4.8	0.3	0.7	0.7	0.6
2	2.94	4.2	0.7	5.5	3.5	0.3	1.1	3.2	1.5
3	5.43	0.1	2.8	7.5	3.5	0.2	1.0	3.8	1.7
4	9.04	2.3	4.2	2.9	3.1	0.1	1.4	0.3	0.6
Center	14.00	1.4	0.9	2.8	1.7	4.0	2.2	2.3	2.8
5	18.96	2.6	4.4	5.1	4.0	5.0	2.7	6.1	4.6
6	22.57	4.1	6.7	3.6	4.8	5.9	5.2	4.4	5.2
7	25.06	9.4	6.1	6.3	7.3	5.2	4.5	7.2	5.6
8	27.10	8.0	8.7	4.2	7.0	4.2	4.2	7.1	5.2
Mean of absolute values:					4.4				3.1
" " w/o points by wall:					4.0				3.1
								Grand mean ABS	3.7
								Grand mean ABS w/o wall pts	3.6

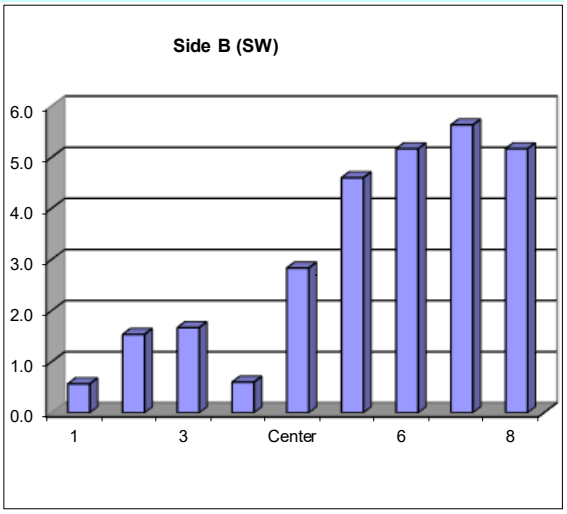
Instuments Used:		Cal. Due
S-type pitot	(ID: A10019, 60")	Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-2
Date	4/13/2023	Fan Setting	51 %
Start/End Time	9:10 9:19	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	74.9 deg F
Stack Dia.	28 in	Approx. air vel.	2544 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

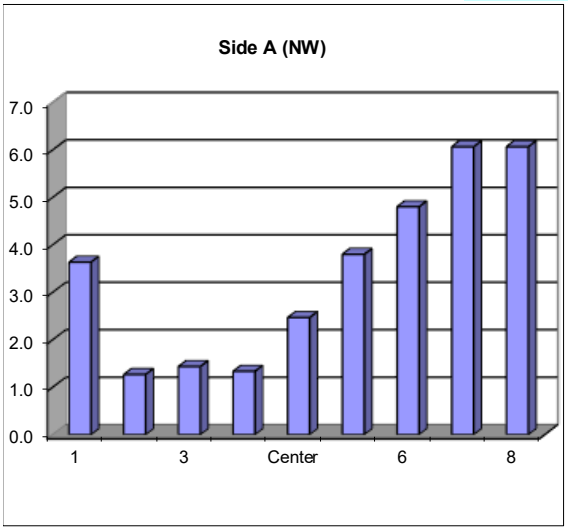
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	1.7	3.7	5.5	3.6	3.6	3.3	3.2	3.4
2	2.94	3.2	0.2	0.4	1.3	0.9	0.3	0.4	0.5
3	5.43	1.9	1.2	1.2	1.4	0.4	1.8	0.5	0.9
4	9.04	2.2	1.3	0.5	1.3	1.3	0.7	1.1	1.0
Center	14.00	2.0	2.4	3.0	2.5	2.5	2.7	3.9	3.0
5	18.96	3.0	4.9	3.5	3.8	6.4	5.6	5.0	5.7
6	22.57	4.9	5.3	4.2	4.8	5.1	6.2	5.5	5.6
7	25.06	5.9	5.5	6.8	6.1	6.7	7.9	6.4	7.0
8	27.10	6.5	6.7	5.0	6.1	7.9	8.0	6.7	7.5
Mean of absolute values:					3.4				3.9
" " w/o points by wall:					3.0				3.4
								Grand mean ABS	3.6
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	3.2

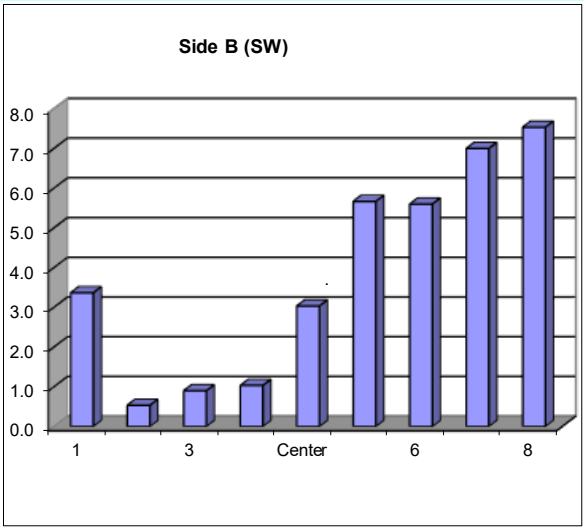
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-3
Date	4/13/2023	Fan Setting	51 %
Start/End Time	9:53 10:02	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	77.8 deg F
Stack Dia.	28 in	Approx. air vel.	2520 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

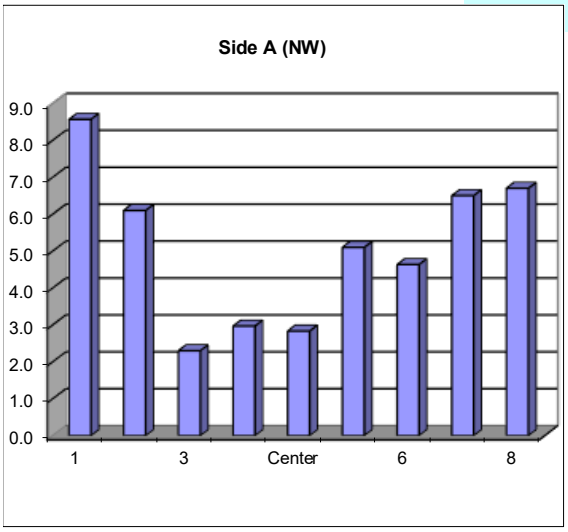
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	4.6	10.0	11.1	8.6	0.7	2.2	1.1	1.3
2	2.94	2.1	7.3	8.9	6.1	1.0	1.4	0.7	1.0
3	5.43	2.0	0.4	4.5	2.3	3.2	1.3	1.6	2.0
4	9.04	3.3	3.5	2.1	3.0	2.1	1.1	2.7	2.0
Center	14.00	2.2	3.7	2.6	2.8	3.8	3.0	3.4	3.4
5	18.96	5.9	4.5	4.9	5.1	5.2	4.6	5.5	5.1
6	22.57	3.3	5.4	5.2	4.6	6.7	7.1	6.1	6.6
7	25.06	6.2	7.3	6.0	6.5	6.5	7.8	5.9	6.7
8	27.10	6.6	7.0	6.5	6.7	5.9	6.7	7.0	6.5
Mean of absolute values:					5.1				3.9
" " w/o points by wall:					4.3				3.8
								Grand mean ABS	4.5
								Grand mean ABS w/o wall pts	4.1

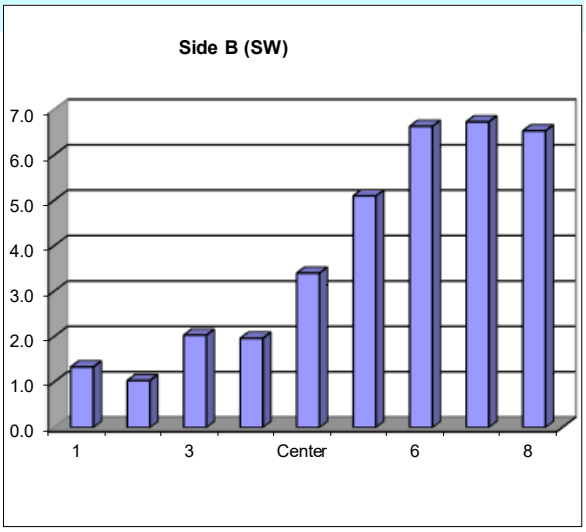
Instuments Used:		Cal. Due
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-4
Date	4/13/2023	Fan Setting	71 %
Start/End Time	11:21 11:31	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	82.9 deg F
Stack Dia.	28 in	Approx. air vel.	3694 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

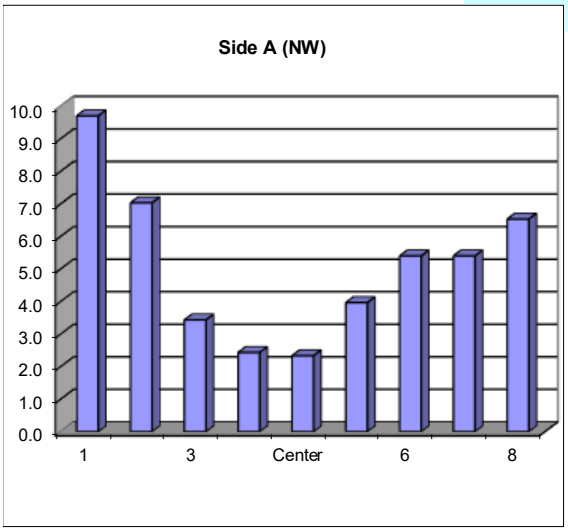
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	10.5	7.2	11.4	9.7	8.0	6.6	6.9	7.2
2	2.94	5.3	7.0	8.8	7.0	7.1	4.3	8.5	6.6
3	5.43	2.0	5.1	3.2	3.4	8.6	1.4	5.7	5.2
4	9.04	2.3	3.2	1.8	2.4	2.5	1.1	1.5	1.7
Center	14.00	2.2	2.8	2.0	2.3	2.7	3.0	3.4	3.0
5	18.96	3.1	4.2	4.6	4.0	4.6	5.9	4.4	5.0
6	22.57	5.2	5.3	5.7	5.4	6.4	5.7	6.1	6.1
7	25.06	4.4	6.7	5.1	5.4	7.0	4.4	6.9	6.1
8	27.10	6.2	6.1	7.3	6.5	6.7	6.9	8.0	7.2
Mean of absolute values:					5.1				5.3
" " w/o points by wall:					4.3				4.8
								Grand mean ABS	5.2
								Grand mean ABS w/o wall pts	4.6

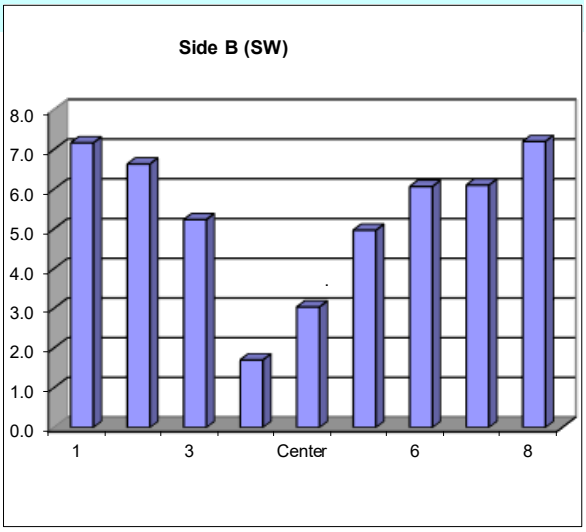
Instuments Used:		Cal. Due
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-5
Date	4/13/2023	Fan Setting	71 %
Start/End Time	11:51 12:02	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	78.5 deg F
Stack Dia.	28 in	Approx. air vel.	3674 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	15.3	9.7	8.7	11.2	1.4	2.0	0.7	1.4
2	2.94	5.0	7.3	9.8	7.4	1.3	5.5	0.4	2.4
3	5.43	2.0	4.0	5.7	3.9	1.7	2.2	0.6	1.5
4	9.04	0.8	1.3	3.4	1.8	2.5	1.6	2.6	2.2
Center	14.00	3.0	2.6	2.0	2.5	3.5	2.3	3.6	3.1
5	18.96	3.6	3.3	3.8	3.6	4.1	4.2	3.5	3.9
6	22.57	4.7	4.0	4.7	4.5	5.3	5.8	5.6	5.6
7	25.06	7.1	5.3	4.9	5.8	7.5	5.9	6.7	6.7
8	27.10	6.8	7.9	6.3	7.0	7.5	6.3	7.4	7.1
Mean of absolute values:					5.3				3.8
" " w/o points by wall:					4.2				3.6
								Grand mean ABS	4.5
								Grand mean ABS w/o wall pts	3.9

Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

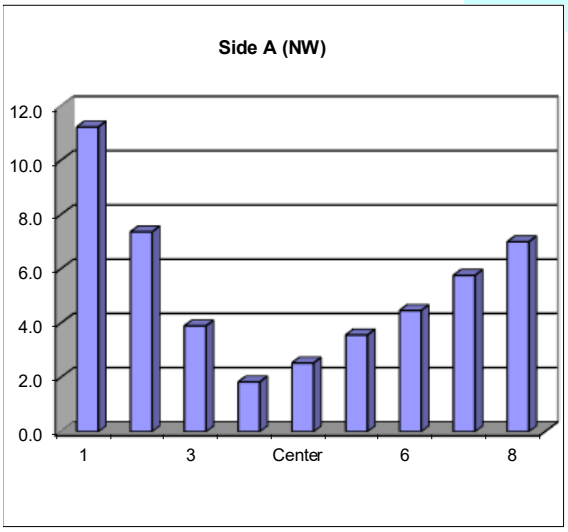
Notes:

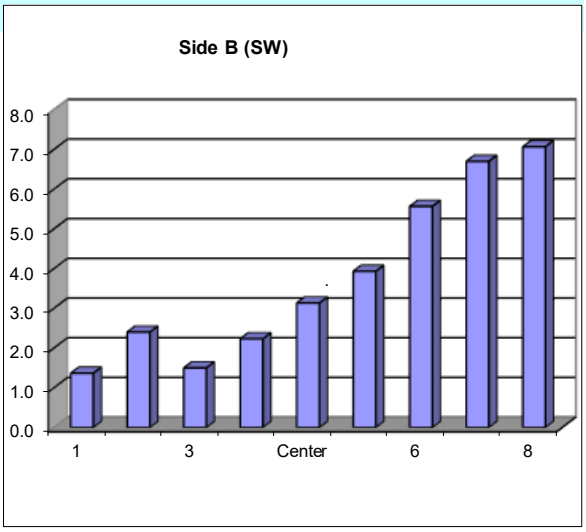
Traverse point depth = the distance from inside stack wall to each point.

First traverse point is closest to the sampling port.

Approx. air velocity was derived from all points on the Velocity Traverse Forms

Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-6
Date	4/13/2023	Fan Setting	71 %
Start/End Time	12:23 12:33	Fan Configuration	Fan A only
Testers	JCR/ARB	Stack Temp	80.7 deg F
Stack Dia.	28 in	Approx. air vel.	3705 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	5.1	4.7	7.4	5.7	3.4	4.4	4.2	4.0
2	2.94	8.2	8.1	6.3	7.5	2.0	6.5	7.0	5.2
3	5.43	5.7	5.4	1.2	4.1	0.6	3.5	0.2	1.4
4	9.04	2.4	3.0	0.5	2.0	4.7	0.8	2.9	2.8
Center	14.00	2.0	2.9	2.9	2.6	4.0	3.1	3.5	3.5
5	18.96	4.3	4.4	4.2	4.3	3.8	4.7	4.1	4.2
6	22.57	4.7	4.9	4.4	4.7	4.7	4.2	5.1	4.7
7	25.06	5.9	5.7	4.8	5.5	6.2	6.5	6.4	6.4
8	27.10	6.6	7.5	5.7	6.6	5.6	6.5	8.3	6.8
Mean of absolute values:					4.8				4.3
" " w/o points by wall:					4.4				4.0
								Grand mean ABS	4.6
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	4.2
S-type pitot (ID: A10019, 60")					Pre-test calibration; post-test inspection.				
Angle indicator		SPI Tronic PRO 360 (SN 31-038-3)			Accuracy check prior to each use; field recalibration as necessary				
Digital Manometer		Digisense Manometer (ID: DM1)			Post-test verification				

Note:

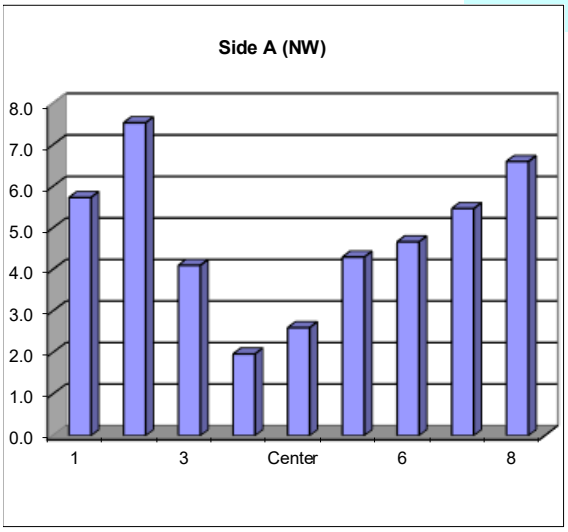
Notes:

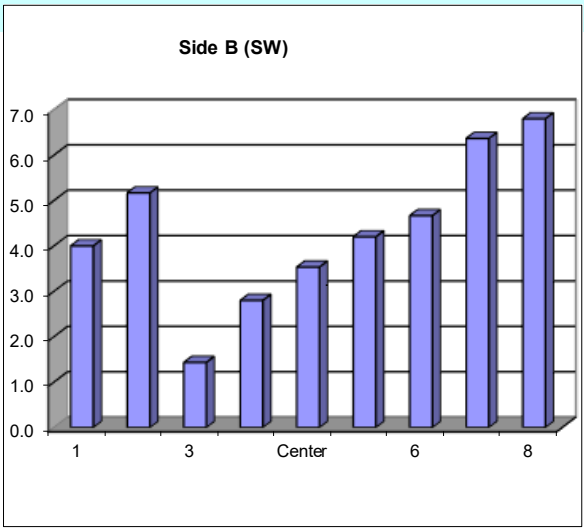
Traverse point depth = the distance from inside stack wall to each point.

First traverse point is closest to the sampling port.

Approx. air velocity was derived from all points on the Velocity Traverse Forms

Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-7
Date	4/13/2023	Fan Setting	52 %
Start/End Time	13:20 13:30	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	75.9 deg F
Stack Dia.	28 in	Approx. air vel.	2556 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

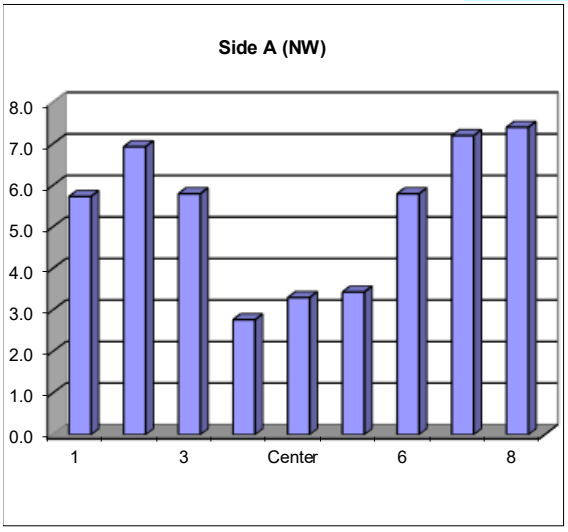
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	3.9	5.5	7.8	5.7	0.2	5.7	4.8	3.6
2	2.94	5.8	6.4	8.6	6.9	1.1	4.3	3.3	2.9
3	5.43	6.4	7.4	3.6	5.8	1.8	0.6	10.1	4.2
4	9.04	2.2	2.5	3.6	2.8	2.7	1.0	2.4	2.0
Center	14.00	1.5	3.3	5.1	3.3	4.8	3.6	2.2	3.5
5	18.96	3.0	4.0	3.3	3.4	4.5	3.7	5.2	4.5
6	22.57	5.0	5.1	7.3	5.8	6.4	6.1	4.3	5.6
7	25.06	8.3	8.9	4.4	7.2	5.8	7.2	6.1	6.4
8	27.10	8.3	9.7	4.2	7.4	6.8	7.2	3.8	5.9
Mean of absolute values:					5.4				4.3
" " w/o points by wall:					5.0				4.2
								Grand mean ABS	4.8
								Grand mean ABS w/o wall pts	4.6

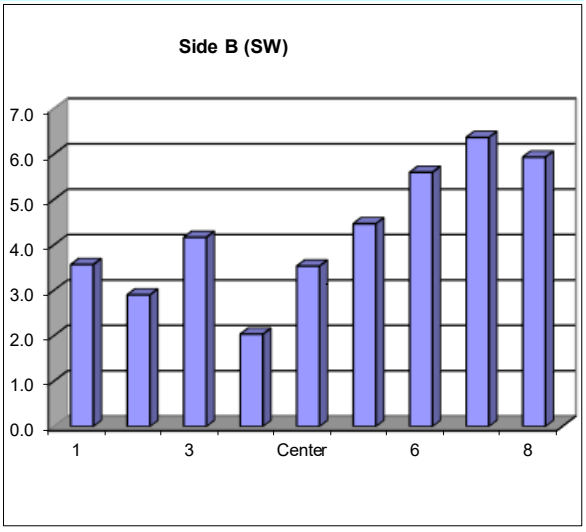
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-8
Date	4/13/2023	Fan Setting	52 %
Start/End Time	13:49 13:58	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	77.0 deg F
Stack Dia.	28 in	Approx. air vel.	2560 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

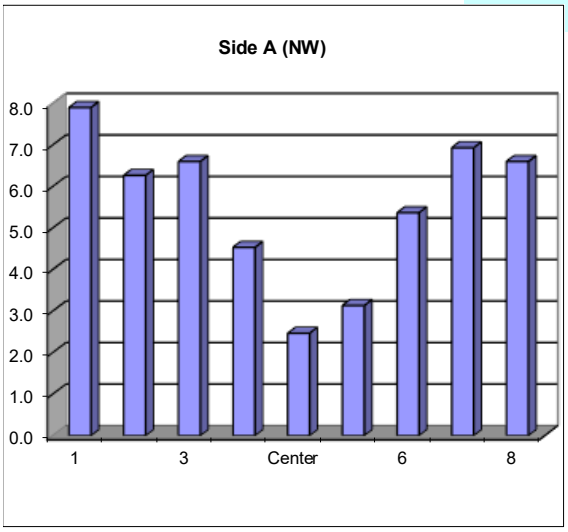
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	9.1	7.0	7.6	7.9	3.3	1.1	2.7	2.4
2	2.94	4.0	5.2	9.6	6.3	4.5	3.9	0.0	2.8
3	5.43	3.4	8.0	8.4	6.6	1.6	2.4	1.8	1.9
4	9.04	5.9	2.6	5.1	4.5	6.1	1.2	1.3	2.9
Center	14.00	1.4	3.6	2.4	2.5	4.2	3.6	2.5	3.4
5	18.96	3.6	2.6	3.2	3.1	3.4	5.5	3.8	4.2
6	22.57	4.9	6.2	5.0	5.4	6.0	7.0	5.4	6.1
7	25.06	6.8	7.1	6.9	6.9	7.2	8.1	7.1	7.5
8	27.10	6.5	7.3	6.0	6.6	7.1	7.4	7.4	7.3
Mean of absolute values:					5.5				4.3
" " w/o points by wall:					5.0				4.1
								Grand mean ABS	4.9
								Grand mean ABS w/o wall pts	4.6

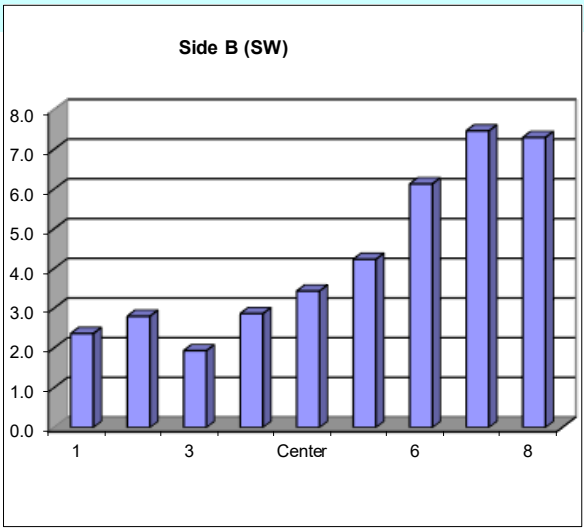
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-9
Date	4/13/2023	Fan Setting	52 %
Start/End Time	14:18 14:27	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	76.1 deg F
Stack Dia.	28 in	Approx. air vel.	2548 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

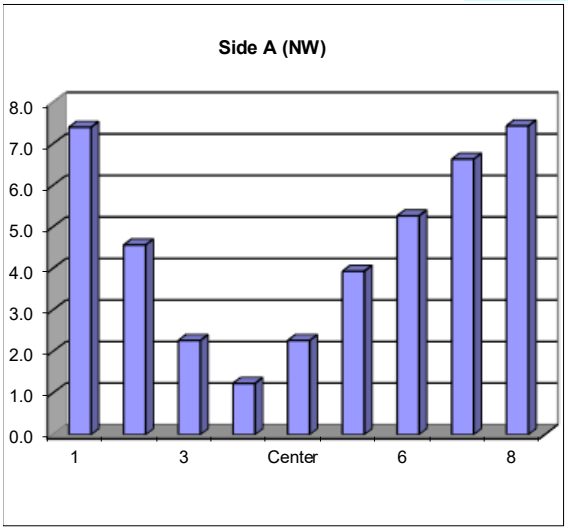
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	9.0	7.1	6.1	7.4	3.7	0.5	0.9	1.7
2	2.94	9.3	0.1	4.3	4.6	0.6	10.8	3.5	5.0
3	5.43	5.6	1.1	0.1	2.3	8.7	3.6	1.3	4.5
4	9.04	0.9	2.1	0.7	1.2	4.1	1.2	0.4	1.9
Center	14.00	1.9	2.9	2.0	2.3	3.5	3.5	1.5	2.8
5	18.96	4.3	5.2	2.3	3.9	4.5	5.1	4.9	4.8
6	22.57	5.1	5.4	5.3	5.3	4.9	5.8	6.3	5.7
7	25.06	6.9	6.4	6.6	6.6	6.0	6.7	6.2	6.3
8	27.10	6.2	6.4	9.7	7.4	6.9	7.1	7.5	7.2
Mean of absolute values:					4.6				4.4
" " w/o points by wall:					3.7				4.4
								Grand mean ABS	4.5
Instuments Used:					**Cal. Due**			Grand mean ABS w/o wall pts	4.1

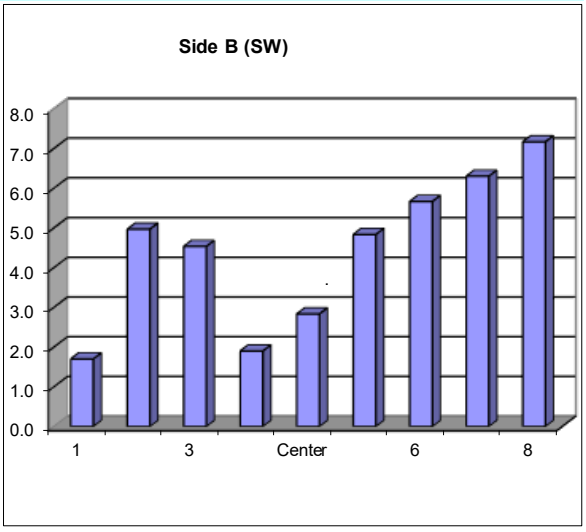
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-10
Date	4/13/2023	Fan Setting	70 %
Start/End Time	14:52 15:02	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	77.7 deg F
Stack Dia.	28 in	Approx. air vel.	3685 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

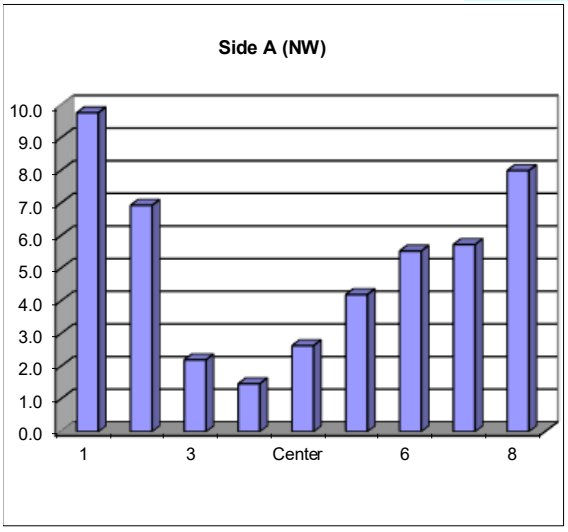
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	9.5	9.8	10.0	9.8	9.7	3.0	3.9	5.5
2	2.94	3.7	9.2	7.9	6.9	9.1	2.6	2.1	4.6
3	5.43	1.1	0.4	5.1	2.2	4.4	0.7	0.0	1.7
4	9.04	0.9	1.3	2.2	1.5	1.1	2.4	1.0	1.5
Center	14.00	2.6	3.2	2.1	2.6	3.0	4.0	3.3	3.4
5	18.96	4.4	3.7	4.5	4.2	4.0	3.8	4.0	3.9
6	22.57	5.7	6.1	4.8	5.5	6.1	5.2	5.1	5.5
7	25.06	5.7	6.4	5.1	5.7	5.7	7.1	5.2	6.0
8	27.10	9.2	8.0	6.8	8.0	7.9	8.5	6.7	7.7
Mean of absolute values:					5.2				4.4
" " w/o points by wall:					4.1				3.8
								Grand mean ABS	4.8
								Grand mean ABS w/o wall pts	4.0

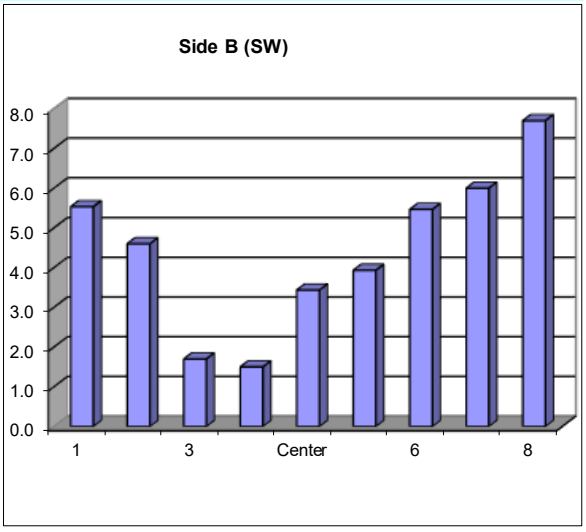
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-11
Date	4/13/2023	Fan Setting	70 %
Start/End Time	15:21 15:30	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	79.3 deg F
Stack Dia.	28 in	Approx. air vel.	3665 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

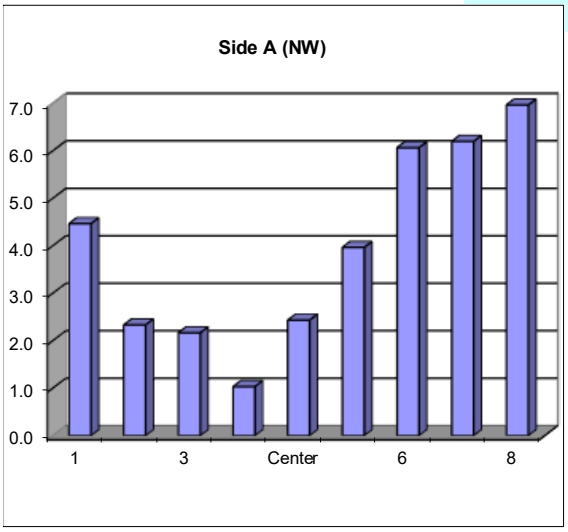
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	4.7	4.8	3.9	4.5	0.3	7.3	6.6	4.7
2	2.94	2.8	2.8	1.4	2.3	0.4	6.3	8.3	5.0
3	5.43	2.6	2.4	1.5	2.2	3.0	3.1	1.1	2.4
4	9.04	0.7	2.2	0.2	1.0	2.5	0.8	0.0	1.1
Center	14.00	2.1	4.6	0.6	2.4	4.2	3.7	3.0	3.6
5	18.96	3.2	5.0	3.7	4.0	4.2	5.9	6.0	5.4
6	22.57	7.6	5.6	5.0	6.1	6.6	6.1	6.4	6.4
7	25.06	5.5	5.5	7.6	6.2	7.3	8.7	6.6	7.5
8	27.10	6.9	6.4	7.6	7.0	8.5	8.0	8.6	8.4
Mean of absolute values:					4.0				4.9
" " w/o points by wall:					3.5				4.5
								Grand mean ABS	4.5
								Grand mean ABS w/o wall pts	4.0

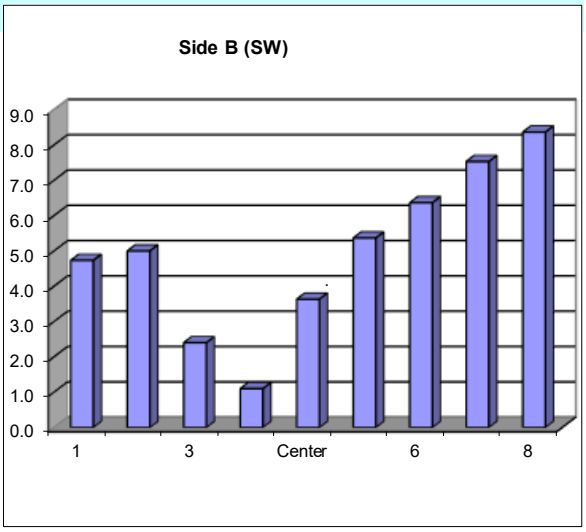
Instuments Used:		Cal. Due
S-type pitot (ID: A100-19, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is closest to the sampling port.
Approx. air velocity was derived from all points on the Velocity Traverse Forms
Side A port was always measured first.





FLOW ANGLE DATA FORM

Stack	LB-S2 (C5V)	Run No.	FA-12
Date	4/13/2023	Fan Setting	70 %
Start/End Time	15:51 16:01	Fan Configuration	Fan B only
Testers	JCR/ARB	Stack Temp	83.4 deg F
Stack Dia.	28 in	Approx. air vel.	3701 afpm at point Mean All
Stack X-Area	615.8 in2	Units	Degrees
Elevation	83 ft	Port	A & B
Distance to disturbance	683.00 in		

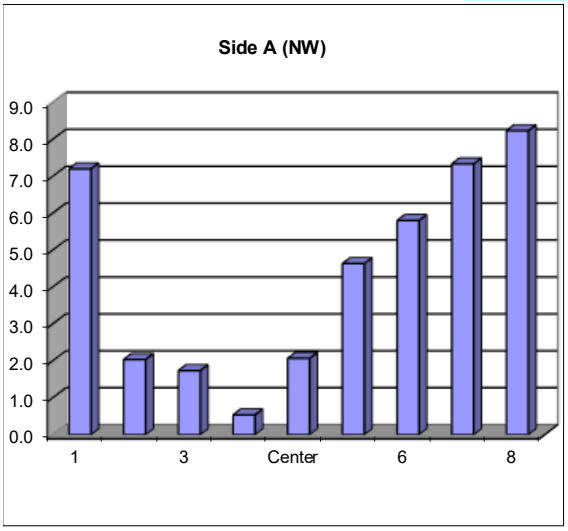
Order -->		First				Second			
Traverse-->		Side A (NW)				Side B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Degrees				Degrees			
1	0.90	5.1	4.1	12.4	7.2	3.3	4.4	4.2	4.0
2	2.94	0.7	2.4	3.0	2.0	2.0	11.4	3.1	5.5
3	5.43	1.4	2.8	1.0	1.7	0.1	2.8	3.1	2.0
4	9.04	0.1	0.9	0.6	0.5	0.3	1.3	1.1	0.9
Center	14.00	1.6	1.8	2.8	2.1	3.2	2.2	3.7	3.0
5	18.96	4.3	5.9	3.7	4.6	5.7	5.0	4.8	5.2
6	22.57	5.5	6.3	5.6	5.8	7.2	6.5	6.1	6.6
7	25.06	8.4	7.4	6.2	7.3	6.9	8.1	6.9	7.3
8	27.10	8.3	9.3	7.1	8.2	8.5	8.2	7.3	8.0
Mean of absolute values:					4.4				4.7
" " w/o points by wall:					3.4				4.4
								Grand mean ABS	4.6
								Grand mean ABS w/o wall pts	3.9

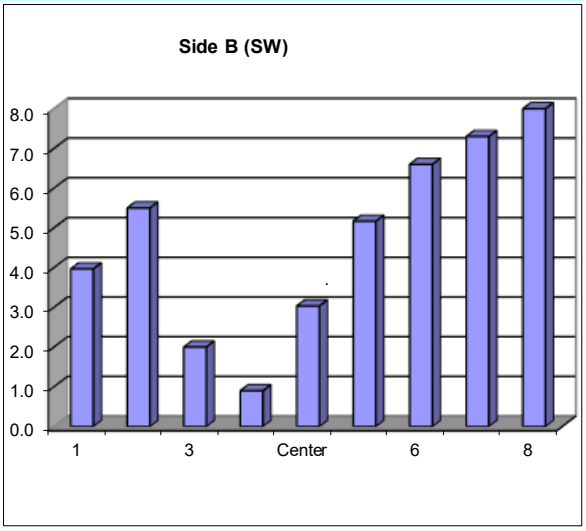
Instuments Used:		Cal. Due
S-type pitot (ID: A10019, 60")		Pre-test calibration; post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digital Manometer	Digisense Manometer (ID: DM1)	Post-test verification

Note:

Notes:

- Traverse point depth = the distance from inside stack wall to each point.
- First traverse point is closest to the sampling port.
- Approx. air velocity was derived from all points on the Velocity Traverse Forms
- Side A port was always measured first.





C.3 Velocity Transverse Data Forms - 2019

VELOCITY TRAVERSE DATA FORM

Stack	**LB-S2**	Run No.	**VT-1**
Date	**10/15/19**	Fan Configuration	**Fan A**
Testers	ZDH/LCE	Fan Setting	**N/A** **Hz**
Stack Dia.	28 in.	Stack Temp	67.90 deg F
Stack X-Area	615.8 in.2	Start/End Time	14:07 14:13
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		**Side1 (XX deg from N)**				**Side2 (YY deg from N)**			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,820.2	3,799.2	3,862.0	3,827.1	3,326.6	3,203.7	3,444.9	3,325.1
2	25.1	4,123.1	3,984.6	4,004.7	4,037.5	3,882.7	3,923.8	4,044.5	3,950.3
3	22.6	4,350.3	4,219.2	4,350.3	4,306.6	4,161.8	4,200.2	4,064.3	4,142.1
4	19.0	4,387.0	4,405.2	4,275.8	4,356.0	4,331.7	4,350.3	4,275.8	4,319.3
Center	14.0	4,387.0	4,368.7	4,350.3	4,368.6	4,387.0	4,313.2	4,350.3	4,350.2
5	9.0	4,294.5	4,275.8	4,294.5	4,288.3	4,350.3	4,200.2	4,350.3	4,300.2
6	5.4	4,181.0	4,238.2	4,219.2	4,212.8	4,064.3	3,882.7	4,142.5	4,029.8
7	2.9	3,984.6	4,064.3	3,903.3	3,984.1	3,964.4	4,024.7	4,004.7	3,998.0
8	0.9	3,713.8	3,735.3	3,626.4	3,691.9	3,491.2	3,514.1	3,559.4	3,521.6
Averages ---------->		4,138.0	4,121.2	4,098.5	4,119.2	3,995.6	3,957.0	4,026.3	3,993.0

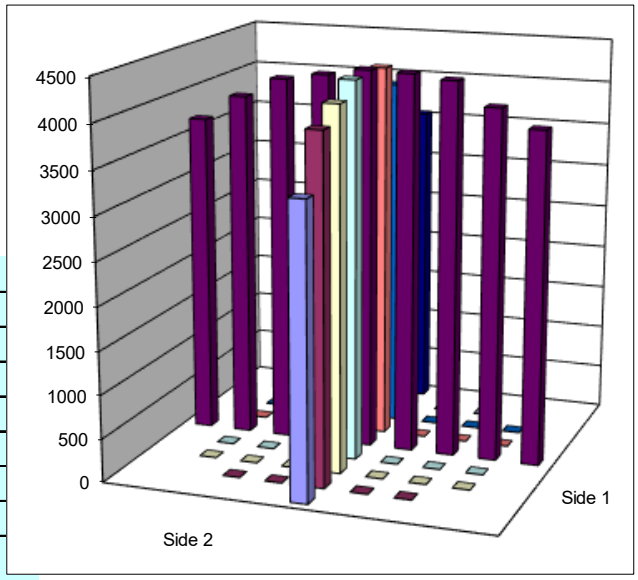
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4056.1		Mean	4222.0	4155.7	4188.8
Min Point	3325.1	-18.0%	Std. Dev.	153.7	167.6	158.3
Max Point	4368.6	7.7%	COV as %	3.6	4.0	**3.8**

Flow w/o C-Pt 17182 cfm

Vel Avg w/o C-Pt 4018 fpm

	Start	Finish	
Stack temp	67.70	68.10	F
Equipment temp	73.70	68.10	F
Ambient temp	73.70	69.60	F
Stack static	0.50	0.50	mbars
Ambient pressure	991.20	991.20	mbars
Total Stack pressure	991.7	991.7	mbars
Ambient humidity	25%	27%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

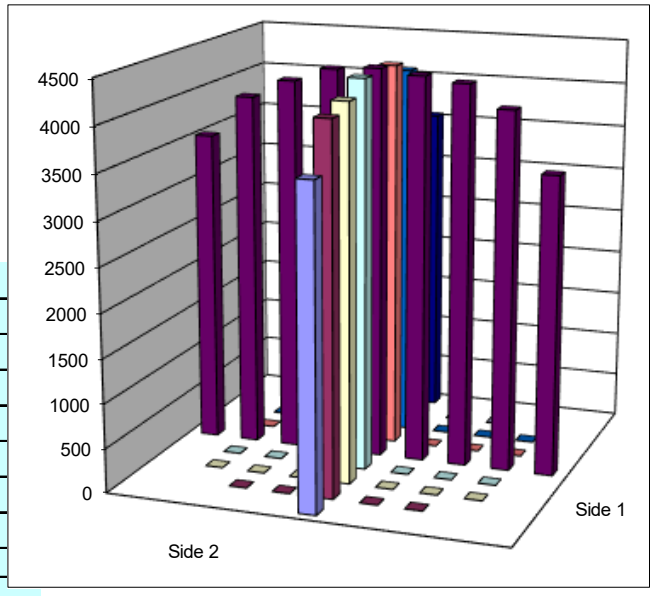
Stack	LB-S2	Run No.	VT-2
Date	10/15/19	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	68.65 deg F
Stack X-Area	615.8 in.2	Start/End Time	15:46 15:52
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,323.4	3,441.7	3,323.4	3,362.8	3,578.5	3,556.1	3,600.8	3,578.5
2	25.1	3,920.0	4,020.8	4,157.8	4,032.9	4,080.1	4,099.7	4,157.8	4,112.5
3	22.6	4,327.7	4,271.8	4,253.0	4,284.1	4,080.1	4,253.0	4,290.5	4,207.9
4	19.0	4,364.4	4,309.1	4,346.0	4,339.9	4,437.2	4,327.7	4,346.0	4,370.3
Center	14.0	4,419.2	4,364.4	4,401.0	4,394.8	4,346.0	4,437.2	4,419.2	4,400.8
5	9.0	4,382.8	4,364.4	4,327.7	4,358.3	4,327.7	4,382.8	4,364.4	4,358.3
6	5.4	4,099.7	4,234.1	4,271.8	4,201.8	4,234.1	4,177.0	4,271.8	4,227.6
7	2.9	4,080.1	4,000.9	3,899.6	3,993.5	4,020.8	3,980.8	4,099.7	4,033.8
8	0.9	3,600.8	3,441.7	3,533.5	3,525.3	3,533.5	3,510.7	3,578.5	3,540.9
Averages ---------->		4,057.6	4,049.9	4,057.1	4,054.8	4,070.9	4,080.6	4,125.4	4,092.3

All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4073.6		Mean	4229.3	4244.5	4236.9
Min Point	3362.8	-17.4%	Std. Dev.	160.3	139.4	144.6
Max Point	4400.8	8.0%	COV as %	3.8	3.3	**3.4**

Flow w/o C-Pt	17245 cfm	**Instuments Used:**	Cal Due
Vel Avg w/o C-Pt	4033 fpm	Standard pitot (ID: BST3, 3ft)	Post-test inspection
		Digi-sense 20250-13 Manometer	9/15/2020
		Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	68.40	68.90	F
Equipment temp	64.10	68.90	F
Ambient temp	64.10	63.10	F
Stack static	4.58	4.03	mbars
Ambient pressure	990.86	990.52	mbars
Total Stack pressure	995.4	994.6	mbars
Ambient humidity	32%	33%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-3
Date	10/16/19	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	66.85 deg F
Stack X-Area	615.8 in.2	Start/End Time	9:45 9:51
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,303.2	3,375.3	3,351.4	3,343.3	3,560.3	3,515.0	3,605.1	3,560.1
2	25.1	3,945.2	4,104.6	3,904.3	3,984.7	3,965.5	3,863.0	3,985.6	3,938.0
3	22.6	4,295.7	4,351.3	4,351.3	4,332.8	4,220.3	4,162.9	4,065.3	4,149.5
4	19.0	4,332.8	4,351.3	4,369.7	4,351.3	4,295.7	4,314.3	4,295.7	4,301.9
Center	14.0	4,388.1	4,406.2	4,332.8	4,375.7	4,406.2	4,351.3	4,351.3	4,369.6
5	9.0	4,351.3	4,239.3	4,276.9	4,289.2	4,276.9	4,369.7	4,276.9	4,307.8
6	5.4	4,201.2	4,201.2	4,162.9	4,188.4	4,258.1	4,295.7	4,182.0	4,245.3
7	2.9	4,025.7	3,985.6	3,904.3	3,971.9	4,065.3	3,924.7	3,985.6	3,991.9
8	0.9	3,649.4	3,492.1	3,515.0	3,552.1	3,515.0	3,515.0	3,582.9	3,537.6
Averages ---------->		4,054.7	4,056.3	4,018.7	4,043.3	4,062.6	4,034.6	4,036.7	4,044.6

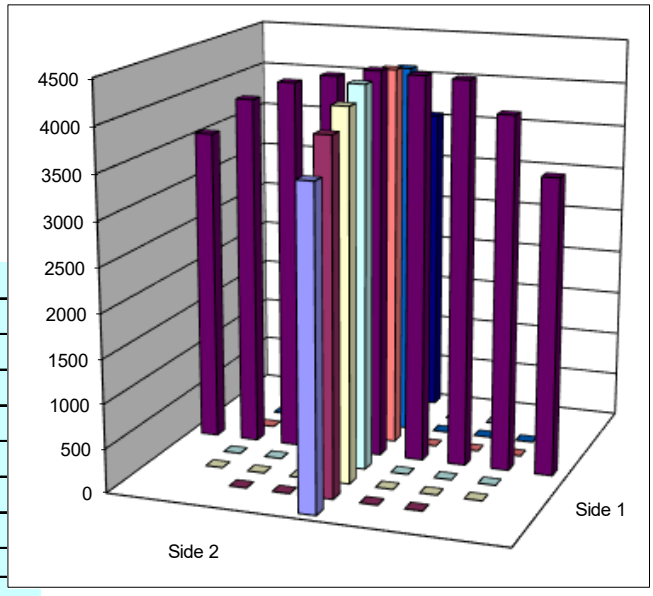
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4043.9		Mean	4213.4	4186.3	4199.9
Min Point	3343.3	-17.3%	Std. Dev.	171.6	166.3	162.9
Max Point	4375.7	8.2%	COV as %	4.1	4.0	**3.9**

Flow w/o C-Pt 17116 cfm

Vel Avg w/o C-Pt 4003 fpm

	Start	Finish	
Stack temp	66.90	66.80	F
Equipment temp	56.40	66.80	F
Ambient temp	56.40	57.80	F
Stack static	4.58	3.34	mbars
Ambient pressure	985.44	985.10	mbars
Total Stack pressure	990.0	988.4	mbars
Ambient humidity	48%	46%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-4
Date	10/16/19	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	67.95 deg F
Stack X-Area	615.8 in.2	Start/End Time	11:14 11:20
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,607.4	3,540.0	3,517.3	3,554.9	3,353.6	3,280.9	3,353.6	3,329.4
2	25.1	4,048.2	3,927.2	4,087.7	4,021.0	3,906.8	3,947.7	3,823.7	3,892.7
3	22.6	4,223.0	4,298.4	4,184.7	4,235.4	4,203.9	4,223.0	4,241.9	4,222.9
4	19.0	4,354.1	4,298.4	4,298.4	4,317.0	4,279.6	4,409.1	4,260.9	4,316.5
Center	14.0	4,390.8	4,354.1	4,223.0	4,322.6	4,317.0	4,390.8	4,335.6	4,347.8
5	9.0	4,241.9	4,317.0	4,279.6	4,279.5	4,317.0	4,372.5	4,354.1	4,347.9
6	5.4	4,165.5	4,260.9	4,241.9	4,222.8	4,223.0	4,317.0	4,372.5	4,304.2
7	2.9	4,008.3	4,048.2	4,087.7	4,048.1	4,107.2	4,028.2	3,906.8	4,014.1
8	0.9	3,448.1	3,585.1	3,494.3	3,509.2	3,717.1	3,585.1	3,607.4	3,636.6
Averages ---------->		4,054.1	4,069.9	4,046.1	4,056.7	4,047.3	4,061.6	4,028.5	4,045.8

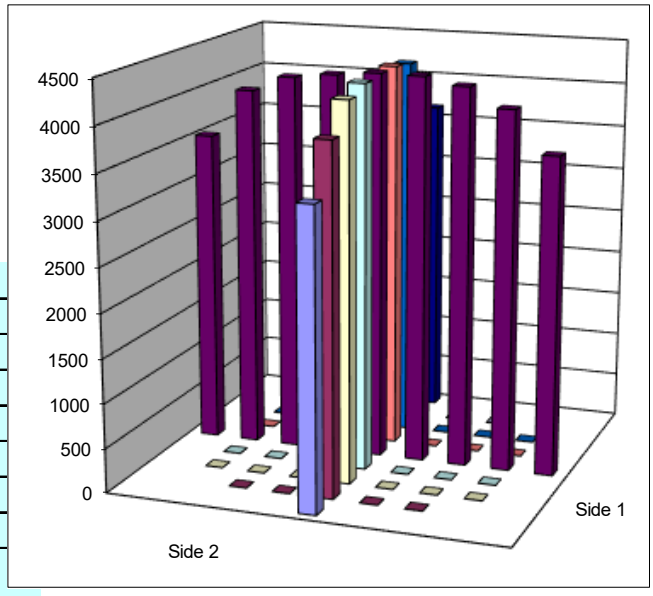
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4051.2		Mean	4206.6	4206.6	4206.6
Min Point	3329.4	-17.8%	Std. Dev.	123.6	181.4	149.1
Max Point	4347.9	7.3%	COV as %	2.9	4.3	**3.5**

Flow w/o C-Pt 17172 cfm

Vel Avg w/o C-Pt 4016 fpm

	Start	Finish	
Stack temp	67.60	68.30	F
Equipment temp	66.40	68.30	F
Ambient temp	66.40	66.90	F
Stack static	6.40	4.13	mbars
Ambient pressure	984.76	984.76	mbars
Total Stack pressure	991.2	988.9	mbars
Ambient humidity	38%	37%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-5
Date	10/16/19	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	69.00 deg F
Stack X-Area	615.8 in.2	Start/End Time	13:21 13:27
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	4,016.8	3,478.7	3,592.8	3,696.1	3,312.3	3,312.3	3,287.9	3,304.2
2	25.1	4,016.8	3,996.7	4,056.8	4,023.4	3,915.1	4,016.8	3,996.7	3,976.2
3	22.6	4,251.0	4,269.9	4,174.4	4,231.8	4,251.0	4,135.6	4,193.6	4,193.4
4	19.0	4,307.5	4,326.2	4,269.9	4,301.2	4,251.0	4,307.5	4,326.2	4,294.9
Center	14.0	4,288.8	4,381.8	4,344.9	4,338.5	4,307.5	4,326.2	4,363.3	4,332.4
5	9.0	4,174.4	4,135.6	4,212.9	4,174.3	4,251.0	4,193.6	4,096.3	4,180.3
6	5.4	4,076.6	3,976.4	4,155.0	4,069.3	4,251.0	4,212.9	4,232.0	4,232.0
7	2.9	3,956.1	4,096.3	3,956.1	4,002.8	3,873.7	3,935.6	3,956.1	3,921.8
8	0.9	3,431.9	3,524.7	3,570.2	3,509.0	3,810.7	3,659.5	3,703.3	3,724.5
Averages ---------->		4,057.8	4,020.7	4,037.0	4,038.5	4,024.8	4,011.1	4,017.3	4,017.7

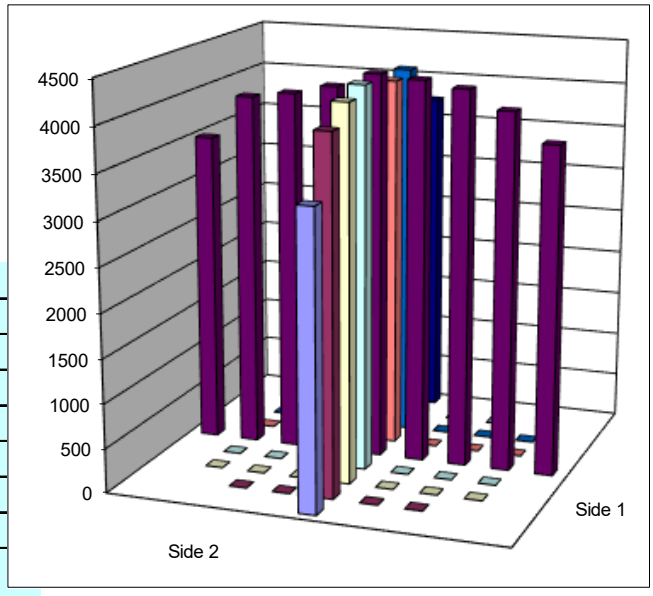
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4028.1		Mean	4163.0	4161.6	4162.3
Min Point	3304.2	-18.0%	Std. Dev.	134.6	155.5	139.7
Max Point	4338.5	7.7%	COV as %	3.2	3.7	**3.4**

Flow w/o C-Pt 17060 cfm

Vel Avg w/o C-Pt 3990 fpm

	Start	Finish	
Stack temp	69.30	68.70	F
Equipment temp	67.70	68.70	F
Ambient temp	67.70	67.50	F
Stack static	4.08	4.66	mbars
Ambient pressure	983.41	983.41	mbars
Total Stack pressure	987.5	988.1	mbars
Ambient humidity	34%	34%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-6
Date	10/16/19	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	69.60 deg F
Stack X-Area	615.8 in.2	Start/End Time	14:27 14:33
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,113.9	3,241.0	3,481.4	3,278.8	3,216.0	3,363.3	3,387.3	3,322.2
2	25.1	3,999.8	3,999.8	3,959.2	3,986.3	4,756.5	3,897.5	3,979.6	4,211.2
3	22.6	4,158.4	4,292.2	4,254.4	4,235.0	4,235.4	4,216.2	4,254.4	4,235.3
4	19.0	4,273.3	4,366.9	4,273.3	4,304.5	4,348.3	4,311.0	4,348.3	4,335.9
Center	14.0	4,348.3	4,292.2	4,292.2	4,310.9	4,385.3	4,403.7	4,329.7	4,372.9
5	9.0	4,329.7	4,311.0	4,348.3	4,329.7	4,216.2	4,235.4	4,254.4	4,235.3
6	5.4	4,216.2	4,177.7	4,329.7	4,241.2	4,216.2	4,079.9	4,040.1	4,112.1
7	2.9	3,918.3	3,979.6	3,938.8	3,945.6	4,158.4	3,999.8	3,897.5	4,018.6
8	0.9	3,434.7	3,387.3	3,363.3	3,395.1	3,527.5	3,550.4	3,411.1	3,496.4
Averages ---------->		3,977.0	4,005.3	4,026.8	4,003.0	4,117.8	4,006.4	3,989.2	4,037.8

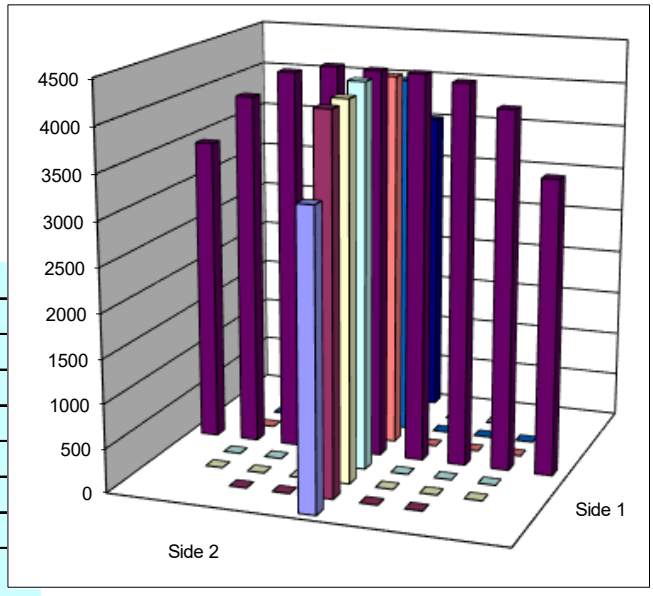
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4020.4		Mean	4193.3	4217.3	4205.3
Min Point	3278.8	-18.4%	Std. Dev.	159.7	122.2	137.2
Max Point	4372.9	8.8%	COV as %	3.8	2.9	**3.3**

Flow w/o C-Pt 17020 cfm

Vel Avg w/o C-Pt 3980 fpm

	Start	Finish	
Stack temp	70.10	69.10	F
Equipment temp	63.80	69.10	F
Ambient temp	63.80	64.60	F
Stack static	5.68	5.30	mbars
Ambient pressure	982.39	982.39	mbars
Total Stack pressure	988.1	987.7	mbars
Ambient humidity	37%	35%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-7
Date	10/17/19	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	68.95 deg F
Stack X-Area	615.8 in.2	Start/End Time	9:36 9:43
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,508.5	3,577.1	3,508.5	3,531.4	3,414.9	3,391.1	3,391.1	3,399.0
2	25.1	4,201.7	4,064.6	4,004.3	4,090.2	3,943.2	4,084.4	4,004.3	4,010.6
3	22.6	4,278.1	4,371.8	4,240.1	4,296.6	4,240.1	4,240.1	4,371.8	4,284.0
4	19.0	4,371.8	4,426.9	4,353.2	4,384.0	4,297.0	4,390.2	4,297.0	4,328.1
Center	14.0	4,390.2	4,390.2	4,426.9	4,402.5	4,408.6	4,371.8	4,371.8	4,384.1
5	9.0	4,201.7	4,220.9	4,334.5	4,252.4	4,390.2	4,315.7	4,334.5	4,346.8
6	5.4	4,143.4	4,220.9	4,084.4	4,149.6	4,143.4	4,297.0	4,163.0	4,201.1
7	2.9	3,943.2	3,984.1	3,881.1	3,936.1	4,064.6	4,278.1	4,104.2	4,149.0
8	0.9	3,367.1	3,531.4	3,367.1	3,421.9	3,485.3	3,508.5	3,462.0	3,485.3
Averages ---------->		4,045.1	4,087.5	4,022.2	4,051.6	4,043.0	4,097.4	4,055.5	4,065.3

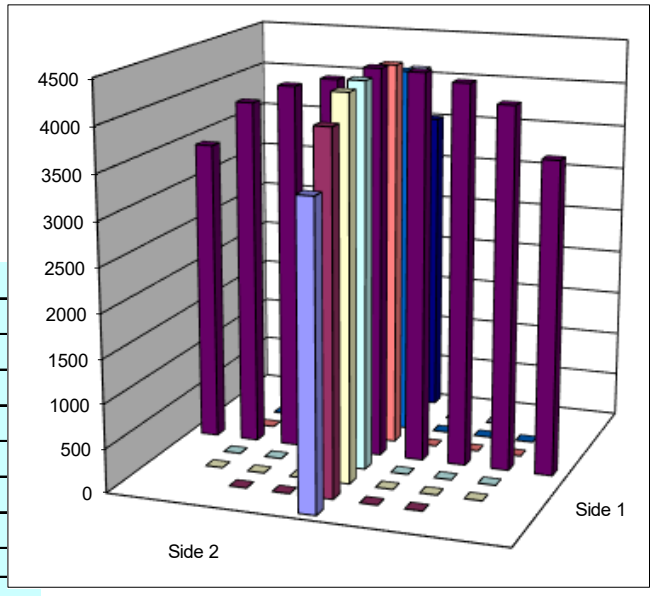
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4058.5		Mean	4215.9	4243.4	4229.6
Min Point	3399.0	-16.2%	Std. Dev.	168.0	131.8	145.8
Max Point	4402.5	8.5%	COV as %	4.0	3.1	**3.4**

Flow w/o C-Pt 17175 cfm

Vel Avg w/o C-Pt 4017 fpm

	Start	Finish	
Stack temp	68.70	69.20	F
Equipment temp	57.10	69.20	F
Ambient temp	57.10	57.10	F
Stack static	3.64	4.16	mbars
Ambient pressure	980.02	980.02	mbars
Total Stack pressure	983.7	984.2	mbars
Ambient humidity	47%	47%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-8
Date	10/17/19	Fan Configuration	Fan B only
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	69.45 deg F
Stack X-Area	615.8 in.2	Start/End Time	10:45 10:50
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,369.0	3,487.3	3,533.5	3,463.3	3,690.6	3,668.6	3,579.0	3,646.1
2	25.1	4,261.5	4,204.0	4,026.7	4,164.1	4,355.6	4,336.9	4,299.4	4,330.7
3	22.6	4,355.6	4,223.3	4,318.3	4,299.1	4,447.7	4,502.1	4,538.0	4,495.9
4	19.0	4,608.8	4,465.9	4,447.7	4,507.5	4,591.2	4,643.9	4,555.8	4,597.0
Center	14.0	4,520.0	4,447.7	4,538.0	4,501.9	4,573.5	4,502.1	4,538.0	4,537.9
5	9.0	4,411.1	4,392.7	4,429.4	4,411.1	4,465.9	4,392.7	4,429.4	4,429.3
6	5.4	4,411.1	4,374.2	4,411.1	4,398.8	4,336.9	4,242.5	4,318.3	4,299.2
7	2.9	4,280.5	4,280.5	4,242.5	4,267.8	4,145.8	4,261.5	3,924.8	4,110.7
8	0.9	3,862.4	3,904.1	3,986.3	3,917.6	3,777.5	3,579.0	3,601.7	3,652.7
Averages ---------->		4,231.1	4,197.7	4,214.8	4,214.6	4,265.0	4,236.6	4,198.3	4,233.3

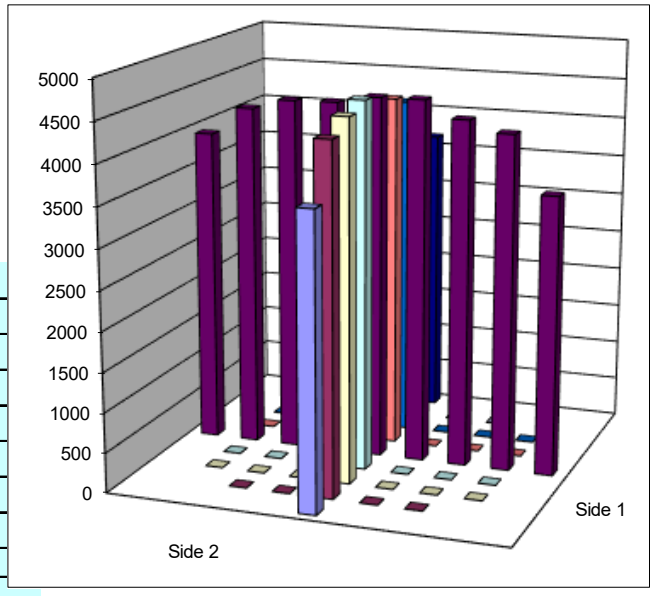
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4223.9		Mean	4364.3	4400.1	4382.2
Min Point	3463.3	-18.0%	Std. Dev.	126.8	166.6	143.4
Max Point	4597.0	8.8%	COV as %	2.9	3.8	**3.3**

Flow w/o C-Pt 17904 cfm

Vel Avg w/o C-Pt 4187 fpm

	Start	Finish	
Stack temp	69.70	69.20	F
Equipment temp	59.10	69.20	F
Ambient temp	59.10	58.60	F
Stack static	3.04	3.39	mbars
Ambient pressure	980.36	980.70	mbars
Total Stack pressure	983.4	984.1	mbars
Ambient humidity	42%	43%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-9
Date	10/17/19	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	70.95 deg F
Stack X-Area	615.8 in.2	Start/End Time	13:13 13:19
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,468.0	3,491.4	3,583.2	3,514.2	3,845.8	4,011.3	3,950.0	3,935.7
2	25.1	3,991.0	4,170.2	4,209.0	4,123.4	4,228.2	4,051.6	4,189.6	4,156.5
3	22.6	4,397.8	4,434.7	4,507.3	4,446.6	4,304.4	4,525.3	4,247.4	4,359.0
4	19.0	4,489.2	4,507.3	4,507.3	4,501.3	4,397.8	4,452.9	4,525.3	4,458.7
Center	14.0	4,452.9	4,543.3	4,561.1	4,519.1	4,416.3	4,471.1	4,471.1	4,452.8
5	9.0	4,489.2	4,434.7	4,379.3	4,434.4	4,507.3	4,416.3	4,379.3	4,434.3
6	5.4	4,170.2	4,247.4	4,342.1	4,253.2	4,304.4	4,507.3	4,379.3	4,397.0
7	2.9	4,051.6	4,150.6	5,644.1	4,615.4	4,304.4	4,342.1	4,111.3	4,252.6
8	0.9	3,672.8	3,694.9	3,628.4	3,665.4	3,950.0	3,824.6	3,824.6	3,866.4
Averages ---------->		4,131.4	4,186.0	4,373.5	4,230.3	4,251.0	4,289.2	4,230.9	4,257.0

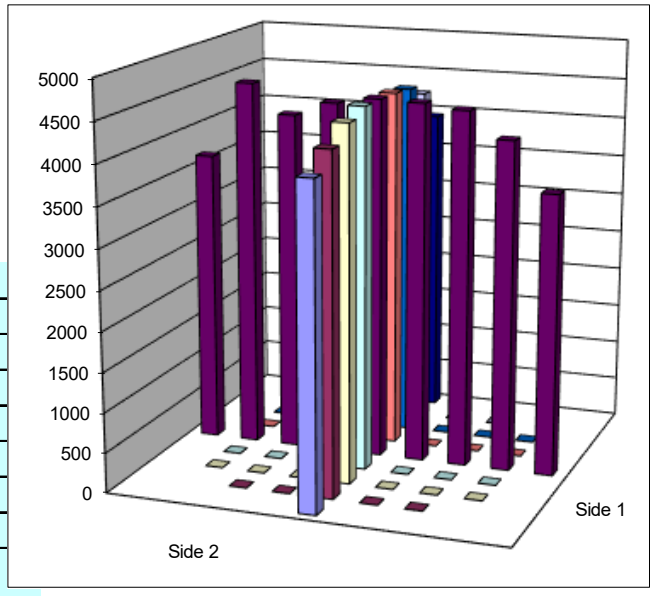
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4243.7		Mean	4413.3	4358.7	4386.0
Min Point	3514.2	-17.2%	Std. Dev.	168.8	114.2	141.3
Max Point	4615.4	8.8%	COV as %	3.8	2.6	**3.2**

Flow w/o C-Pt 18017 cfm

Vel Avg w/o C-Pt 4213 fpm

	Start	Finish	
Stack temp	71.3	70.6	F
Equipment temp	61.8	62.1	F
Ambient temp	61.8	62.1	F
Stack static	3.4	3.7	mbars
Ambient pressure	980.7	980.7	mbars
Total Stack pressure	984.1	984.4	mbars
Ambient humidity	42%	41%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-10
Date	10/17/19	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	70.30 deg F
Stack X-Area	615.8 in.2	Start/End Time	14:38 14:44
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,120.5	3,041.6	3,068.2	3,076.8	3,692.3	3,603.3	3,580.7	3,625.4
2	25.1	4,282.5	4,167.3	4,320.2	4,256.7	4,128.1	4,167.3	4,225.3	4,173.6
3	22.6	4,301.4	4,339.0	4,467.9	4,369.5	4,486.1	4,263.5	4,431.5	4,393.7
4	19.0	4,504.1	4,449.8	4,522.1	4,492.0	4,449.8	4,394.7	4,557.9	4,467.5
Center	14.0	4,467.9	4,486.1	4,486.1	4,480.1	4,540.1	4,467.9	4,504.1	4,504.0
5	9.0	4,449.8	4,320.2	4,431.5	4,400.5	4,449.8	4,413.1	4,413.1	4,425.3
6	5.4	4,244.4	4,376.3	4,263.5	4,294.7	4,413.1	4,376.3	4,449.8	4,413.0
7	2.9	4,206.0	4,225.3	4,048.7	4,160.0	4,244.4	4,263.5	4,147.7	4,218.5
8	0.9	3,648.1	3,625.8	3,714.2	3,662.7	3,714.2	3,736.0	3,757.7	3,736.0
Averages ---------->		4,136.1	4,114.6	4,146.9	4,132.5	4,235.3	4,187.3	4,229.7	4,217.5

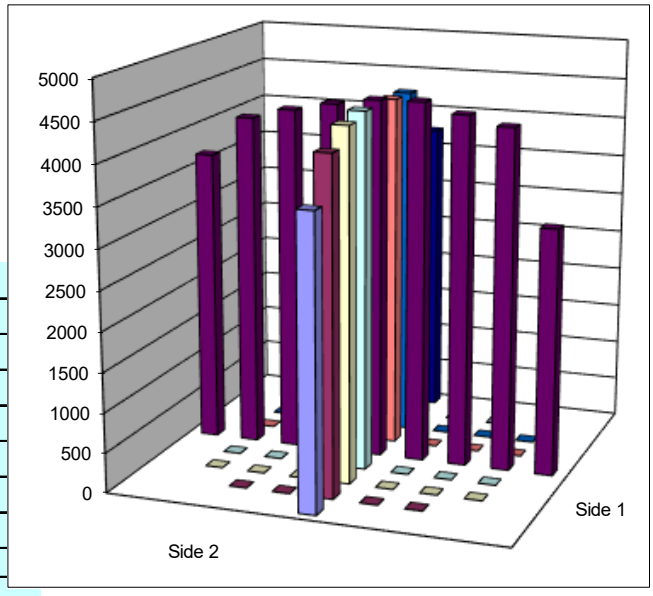
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4175.0		Mean	4350.5	4370.8	4360.6
Min Point	3076.8	-26.3%	Std. Dev.	121.0	125.5	118.9
Max Point	4504.0	7.9%	COV as %	2.8	2.9	**2.7**

Flow w/o C-Pt 17683 cfm

Vel Avg w/o C-Pt 4135 fpm

	Start	Finish	
Stack temp	70.4	70.2	F
Equipment temp	61.6	70.2	F
Ambient temp	61.1	61.7	F
Stack static	3.7	3.4	mbars
Ambient pressure	980.7	981.0	mbars
Total Stack pressure	984.4	984.4	mbars
Ambient humidity	42%	42%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-11
Date	10/17/19	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	70.75 deg F
Stack X-Area	615.8 in.2	Start/End Time	15:45 15:51
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,627.5	3,759.4	3,649.8	3,678.9	3,694.0	3,627.5	3,627.5	3,649.6
2	25.1	4,359.6	4,246.3	4,169.2	4,258.4	4,010.3	4,010.3	3,989.9	4,003.5
3	22.6	4,451.8	4,470.0	4,506.2	4,476.0	4,524.2	4,396.7	4,359.6	4,426.8
4	19.0	4,524.2	4,577.8	4,488.1	4,530.0	4,613.0	4,577.8	4,560.0	4,583.6
Center	14.0	4,470.0	4,506.2	4,506.2	4,494.1	4,470.0	4,524.2	4,451.8	4,482.0
5	9.0	4,265.4	4,415.1	4,284.5	4,321.7	4,303.4	4,359.6	4,415.1	4,359.4
6	5.4	4,070.5	4,284.5	4,265.4	4,206.8	4,378.2	4,322.2	4,378.2	4,359.5
7	2.9	4,169.2	4,090.5	4,010.3	4,090.0	4,130.0	4,265.4	4,188.5	4,194.7
8	0.9	3,780.9	3,759.4	3,604.9	3,715.1	3,737.7	3,802.4	3,802.4	3,780.8
Averages ---------->		4,191.0	4,234.3	4,165.0	4,196.8	4,206.7	4,209.6	4,197.0	4,204.4

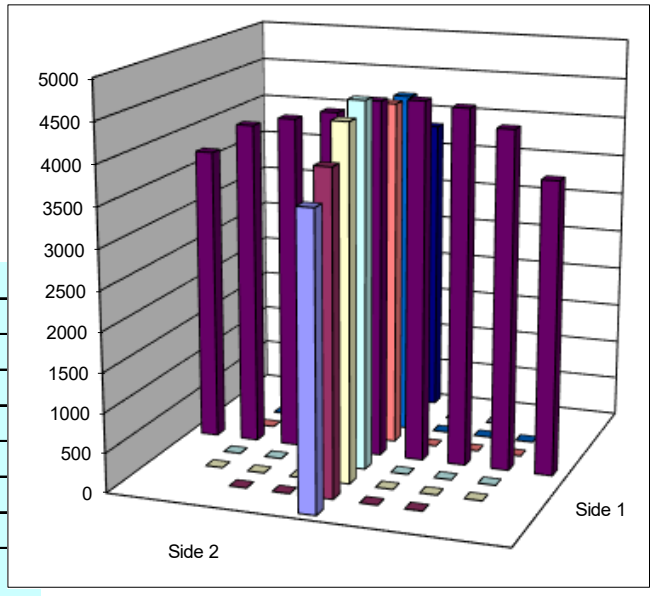
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4200.6		Mean	4339.6	4344.2	4341.9
Min Point	3649.6	-13.1%	Std. Dev.	166.1	192.4	172.7
Max Point	4583.6	9.1%	COV as %	3.8	4.4	**4.0**

Flow w/o C-Pt 17808 cfm

Vel Avg w/o C-Pt 4165 fpm

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	71.1	70.4	F
Equipment temp	60.7	70.4	F
Ambient temp	60.7	60.9	F
Stack static	3.8	3.5	mbars
Ambient pressure	980.7	980.7	mbars
Total Stack pressure	984.5	984.2	mbars
Ambient humidity	43%	43%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-12
Date	10/18/19	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	67.75 deg F
Stack X-Area	615.8 in.2	Start/End Time	9:24 9:31
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,673.5	3,673.5	3,607.3	3,651.4	3,517.0	3,494.1	3,280.8	3,430.6
2	25.1	4,146.0	4,165.3	4,067.7	4,126.3	4,316.8	4,390.6	4,298.2	4,335.2
3	22.6	4,427.0	4,241.8	4,184.5	4,284.5	4,516.9	4,427.0	4,445.1	4,463.0
4	19.0	4,499.1	4,516.9	4,390.6	4,468.8	4,569.9	4,587.4	4,552.2	4,569.9
Center	14.0	4,516.9	4,427.0	4,499.1	4,481.0	4,499.1	4,587.4	4,463.2	4,516.6
5	9.0	4,481.1	4,390.6	4,463.2	4,445.0	4,279.4	4,408.9	4,372.3	4,353.5
6	5.4	4,372.3	4,390.6	4,372.3	4,378.4	4,335.3	4,260.6	4,260.6	4,285.5
7	2.9	4,372.3	4,107.1	4,184.5	4,221.3	4,222.8	4,165.3	4,203.7	4,197.3
8	0.9	3,844.4	3,947.5	3,865.3	3,885.7	3,695.3	3,695.3	3,651.5	3,680.7
Averages ---------->		4,259.2	4,206.7	4,181.6	4,215.8	4,216.9	4,224.1	4,169.7	4,203.6

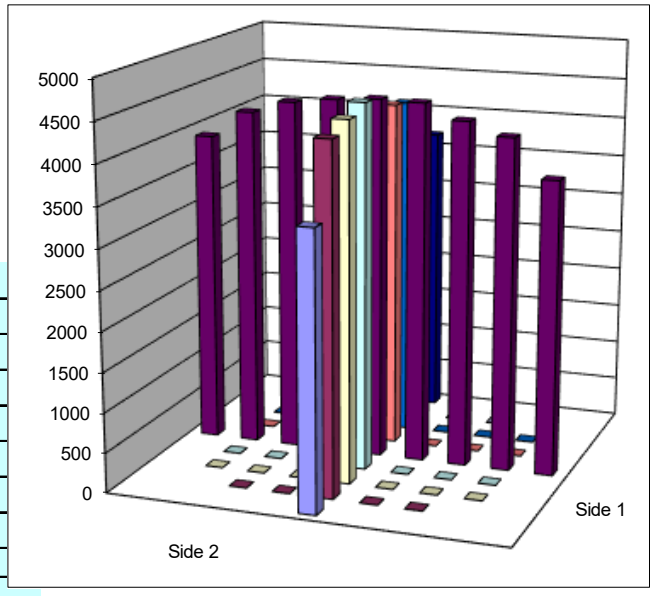
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4209.7		Mean	4343.6	4388.7	4366.2
Min Point	3430.6	-18.5%	Std. Dev.	136.4	133.0	131.5
Max Point	4569.9	8.6%	COV as %	3.1	3.0	**3.0**

Flow w/o C-Pt 17846 cfm

Vel Avg w/o C-Pt 4174 fpm

	Start	Finish	
Stack temp	67.70	67.80	F
Equipment temp	51.90	52.30	F
Ambient temp	51.90	52.30	F
Stack static	3.61	3.66	mbars
Ambient pressure	986.12	986.12	mbars
Total Stack pressure	989.7	989.8	mbars
Ambient humidity	45%	44%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

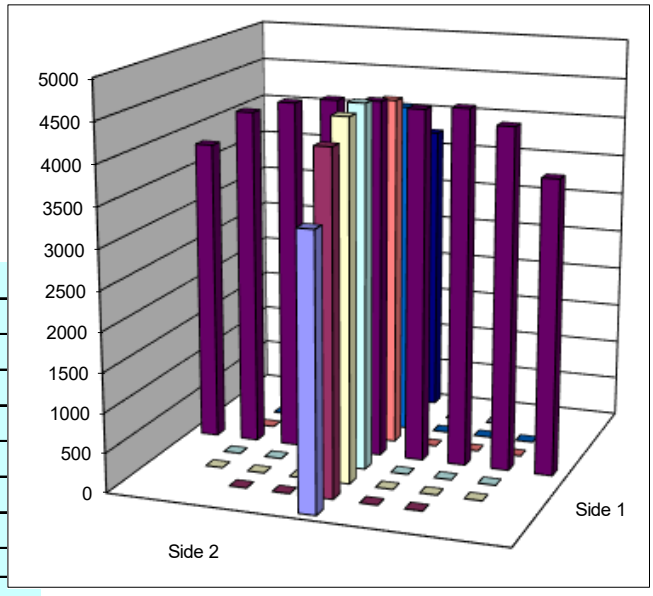
Stack	LB-S2	Run No.	VT-13
Date	10/18/19	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	67.8 deg F
Stack X-Area	615.8 in.2	Start/End Time	10:33 10:38
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	3,715.1	3,627.7	3,671.6	3,671.5	3,204.9	3,538.1	3,492.4	3,411.8
2	25.1	4,277.3	4,406.7	4,085.4	4,256.5	4,163.3	4,333.2	4,239.7	4,245.4
3	22.6	4,479.0	4,424.9	4,406.7	4,436.9	4,550.1	4,461.0	4,479.0	4,496.7
4	19.0	4,479.0	4,406.7	4,296.1	4,393.9	4,567.7	4,550.1	4,567.7	4,561.8
Center	14.0	4,532.4	4,370.2	4,461.0	4,454.5	4,479.0	4,479.0	4,514.6	4,490.8
5	9.0	4,388.5	4,424.9	4,496.8	4,436.7	4,333.2	4,461.0	4,443.0	4,412.4
6	5.4	4,443.0	4,351.7	4,314.7	4,369.8	4,239.7	4,201.6	4,258.5	4,233.3
7	2.9	4,314.7	4,163.3	4,182.4	4,220.2	4,085.4	4,220.7	4,065.8	4,124.0
8	0.9	3,842.5	3,821.6	3,671.6	3,778.6	3,671.6	3,736.6	3,715.1	3,707.8
Averages ---------->		4,274.6	4,222.0	4,176.3	4,224.3	4,143.9	4,220.1	4,197.3	4,187.1

All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	4205.7		Mean	4366.9	4366.3	4366.6
Min Point	3411.8	-18.9%	Std. Dev.	93.0	165.3	128.8
Max Point	4561.8	8.5%	COV as %	2.1	3.8	**3.0**

Flow w/o C-Pt	17841 cfm	**Instuments Used:**	Cal Due
Vel Avg w/o C-Pt	4172 fpm	Standard pitot (ID: BST3, 3ft)	Post-test inspection
		Digi-sense 20250-13 Manometer	9/15/2020
		Workhorse Thermometer	Verified prior to each field use

	Start	Finish	
Stack temp	67.7	67.8	F
Equipment temp	51.9	52.30 F	F
Ambient temp	51.9	52.3	F
Stack static	3.7	3.8	mbars
Ambient pressure	986.8	987.1	mbars
Total Stack pressure	990.5	991.0	mbars
Ambient humidity	45%	44%	RH



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm) (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2	Run No.	VT-14
Date	10/19/19	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	N/A Hz
Stack Dia.	28 in.	Stack Temp	67.95 deg F
Stack X-Area	615.8 in.2	Start/End Time	9:39 9:44
Test Port	2	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	57.5 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Side1 (XX deg from N)				Side2 (YY deg from N)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	27.1	2,988.9	3,249.3	3,147.7	3,128.7	3,844.7	3,780.8	3,715.7	3,780.4
2	25.1	4,303.2	4,207.7	4,265.3	4,258.7	4,322.0	4,149.4	4,265.3	4,245.6
3	22.6	4,396.6	4,524.0	4,541.9	4,487.5	4,451.6	4,340.7	4,284.2	4,358.9
4	19.0	4,524.0	4,612.9	4,506.0	4,547.6	4,524.0	4,488.0	4,559.7	4,523.9
Center	14.0	4,524.0	4,541.9	4,541.9	4,535.9	4,541.9	4,524.0	4,559.7	4,541.9
5	9.0	4,524.0	4,340.7	4,359.4	4,408.0	4,451.6	4,415.0	4,469.8	4,445.5
6	5.4	4,169.0	4,303.2	4,246.2	4,239.5	4,415.0	4,359.4	4,396.6	4,390.3
7	2.9	4,129.9	4,050.4	3,989.7	4,056.7	4,227.0	4,303.2	4,188.4	4,239.5
8	0.9	3,802.2	3,693.8	3,490.3	3,662.1	3,627.3	3,671.8	3,693.8	3,664.3
Averages ---------->		4,151.3	4,169.3	4,120.9	4,147.2	4,267.2	4,225.8	4,237.0	4,243.4

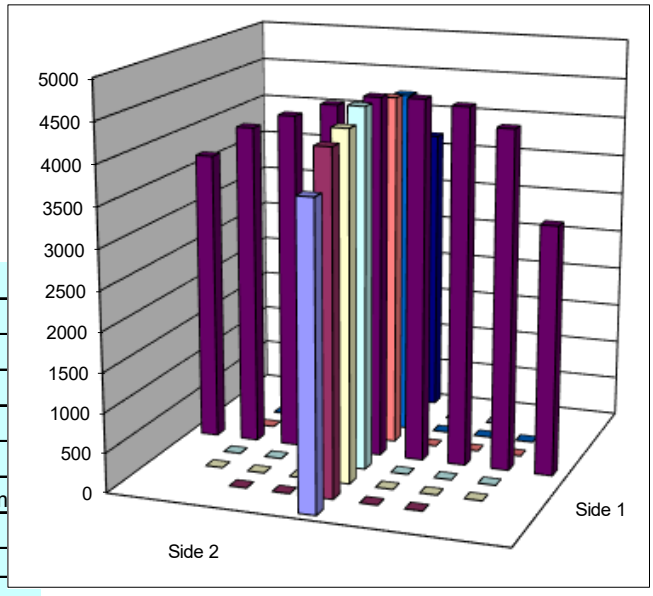
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	4195.3		Mean	4362.0	4392.2	4377.1
Min Point	3128.7	-25.4%	Std. Dev.	183.2	121.5	150.2
Max Point	4547.6	8.4%	COV as %	4.2	2.8	**3.4**

Flow w/o C-Pt 17756 cfm

Vel Avg w/o C-Pt 4152 fpm

	Start	Finish	
Stack temp	69.30	66.60	F
Equipment temp	47.30	46.80	F
Ambient temp	47.30	46.80	F
Stack static	3.66	3.56	mbars
Ambient pressure	975.62	975.62	mbars
Total Stack pressure	979.28	979.18	mbars
Ambient humidity	84%	86%	RH

Instuments Used:	Cal Due
Standard pitot (ID: BST3, 3ft)	Post-test inspection
Digi-sense 20250-13 Manometer	9/15/2020
Workhorse Thermometer	Verified prior to each field use



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side 1 port was always measured first.

Direct measurements of differential pressure (in. H20) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (afpm (shown here) in a separate datasheet based on recorded total stack pressure, stack temperature and density of air for each run.

C.4 Velocity Transverse Data Forms - 2023

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-1
Date	04/13/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	51 %
Stack Dia.	28 in.	Stack Temp	74.9 deg F
Stack X-Area	615.8 in.2	Start/End Time	8:20 8:34
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	2073.8	2073.8	2129.2	2092.3	2151.3	2315.4	2159.6	2208.8
2	2.94	2504.7	2414.3	2413.3	2444.1	2447.4	2422.4	2470.0	2446.6
3	5.43	2617.3	2591.6	2606.0	2605.0	2696.4	2535.7	2622.6	2618.2
4	9.04	2600.1	2666.9	2610.4	2625.8	2617.3	2709.0	2664.5	2663.6
Center	14.00	2645.1	2689.4	2669.7	2668.1	2691.8	2633.1	2694.6	2673.2
5	18.96	2621.0	2676.7	2635.9	2644.5	2647.3	2632.8	2611.4	2630.5
6	22.57	2629.1	2535.4	2603.2	2589.2	2633.7	2642.7	2714.1	2663.5
7	25.06	2444.8	2559.1	2512.5	2505.5	2557.5	2589.1	2549.2	2565.3
8	27.10	2202.9	2303.8	2146.8	2217.8	2194.4	2285.7	2105.4	2195.2
Averages ---------->		2482.1	2501.2	2480.8	2488.0	2515.2	2529.5	2510.2	2518.3

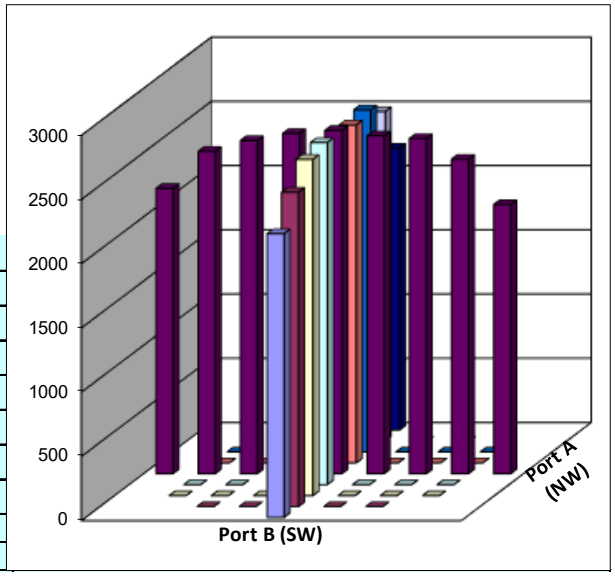
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	2503.2		Mean	2583.2	2608.7	2595.9
Min Point	2092.3	-16.4%	Std. Dev.	80.3	80.5	78.4
Max Point	2673.2	6.8%	COV as %	3.1	3.1	**3.0**

Flow w/o C-Pt 10614 cfm

Vel Avg w/o C-Pt 2482 fpm

	Start	Finish	
Stack temp	75.0	74.8	F
Equipment temp	40.0	40.0	F
Ambient temp	42.0	42.0	F
Stack static	0.82	0.85	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	988.63	988.66	mbars
Ambient humidity	57%	57%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-2
Date	04/13/2023	Fan Configuration	Fan A only
Testers	JCR/ARB	Fan Setting	51 %
Stack Dia.	28 in.	Stack Temp	74.9 deg F
Stack X-Area	615.8 in.2	Start/End Time	8:56 9:06
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	1986.5	2213.4	2290.1	2163.3	2130.9	2222.6	2170.7	2174.7
2	2.94	2452.6	2384.9	2493.7	2443.7	2599.9	2528.1	2400.9	2509.6
3	5.43	2628.9	2522.7	2600.3	2584.0	2582.0	2602.4	2651.7	2612.0
4	9.04	2611.2	2673.8	2683.8	2656.3	2714.6	2769.8	2626.1	2703.5
Center	14.00	2729.9	2739.7	2731.9	2733.8	2711.9	2769.3	2682.0	2721.1
5	18.96	2633.2	2663.4	2700.8	2665.8	2659.4	2741.2	2632.0	2677.5
6	22.57	2611.5	2764.8	2608.7	2661.7	2722.1	2591.1	2676.2	2663.1
7	25.06	2621.8	2600.9	2570.3	2597.7	2554.1	2587.7	2577.9	2573.2
8	27.10	2438.9	2450.6	2214.9	2368.1	2224.0	2254.2	2386.9	2288.4
Averages ---------->		2523.8	2557.1	2543.8	2541.6	2544.3	2562.9	2533.8	2547.0

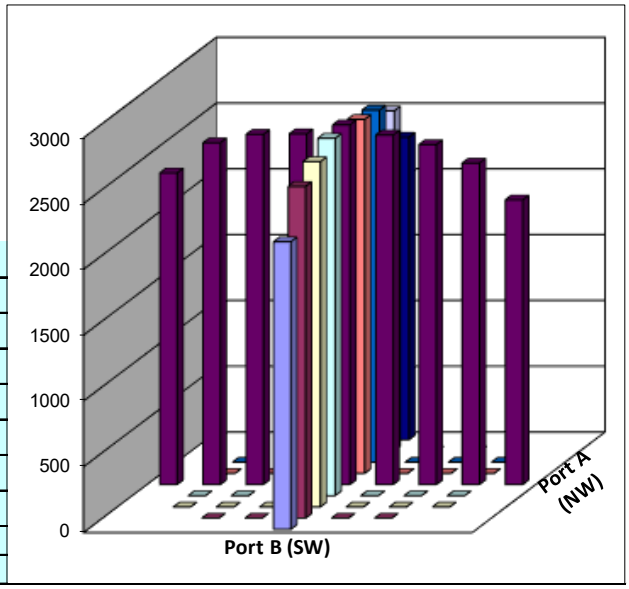
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2544.3		Mean	2620.4	2637.2	2628.8
Min Point	2163.3	-15.0%	Std. Dev.	92.2	76.1	81.7
Max Point	2733.8	7.4%	COV as %	3.5	2.9	**3.1**

Flow w/o C-Pt 10782 cfm

Vel Avg w/o C-Pt 2521 fpm

	Start	Finish	
Stack temp	75.2	74.6	F
Equipment temp	40.0	40.0	F
Ambient temp	42.0	45.0	F
Stack static	1.07	1.05	mbars
Ambient pressure	987.47	987.47	mbars
Total Stack pressure	988.54	988.52	mbars
Ambient humidity	57%	51%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-3
Date	04/13/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	51 %
Stack Dia.	28 in.	Stack Temp	77.8 deg F
Stack X-Area	615.8 in.2	Start/End Time	9:41 9:50
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	1952.6	2292.6	2196.2	2147.1	2208.1	2052.4	2084.8	2115.1
2	2.94	2367.1	2414.1	2472.1	2417.8	2339.3	2361.6	2514.8	2405.2
3	5.43	2537.8	2631.6	2743.5	2637.6	2468.1	2691.6	2616.3	2592.0
4	9.04	2742.9	2611.0	2755.7	2703.2	2739.0	2709.5	2671.8	2706.8
Center	14.00	2692.8	2665.3	2745.6	2701.2	2668.1	2751.2	2665.9	2695.1
5	18.96	2748.3	2675.8	2686.1	2703.4	2736.9	2535.5	2726.4	2666.3
6	22.57	2510.2	2627.3	2670.5	2602.7	2659.2	2616.0	2602.2	2625.8
7	25.06	2459.4	2625.1	2611.6	2565.4	2551.3	2520.0	2466.8	2512.7
8	27.10	2131.5	2317.1	2396.3	2281.6	2407.9	2190.2	2271.0	2289.7
Averages ---------->		2460.3	2540.0	2586.4	2528.9	2530.9	2492.0	2513.3	2512.1

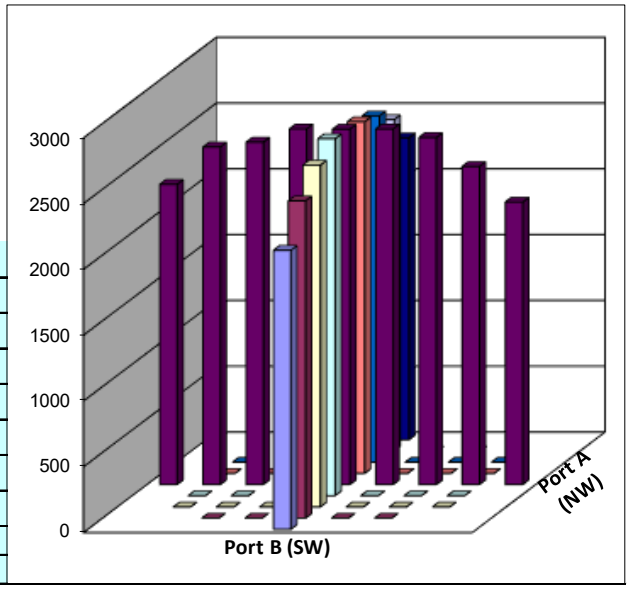
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2520.5		Mean	2618.8	2600.5	2609.7
Min Point	2115.1	-16.1%	Std. Dev.	104.1	108.9	102.7
Max Point	2706.8	7.4%	COV as %	4.0	4.2	**3.9**

Flow w/o C-Pt 10683 cfm

Vel Avg w/o C-Pt 2498 fpm

	Start	Finish	
Stack temp	77.7	77.9	F
Equipment temp	40.0	40.0	F
Ambient temp	45.0	45.0	F
Stack static	1.07	1.02	mbars
Ambient pressure	987.13	987.47	mbars
Total Stack pressure	988.20	988.49	mbars
Ambient humidity	51%	51%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-4
Date	04/13/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	71 %
Stack Dia.	28 in.	Stack Temp	82.9 deg F
Stack X-Area	615.8 in.2	Start/End Time	11:09 11:18
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	3344.1	3439.4	3282.5	3355.3	3043.8	3196.3	3184.1	3141.4
2	2.94	3510.5	3641.5	3658.3	3603.4	3732.1	3719.0	3538.9	3663.3
3	5.43	3845.5	3756.8	3745.8	3782.7	3730.9	3775.2	3625.6	3710.6
4	9.04	3842.7	3928.8	3819.8	3863.8	3881.6	3882.0	3935.5	3899.7
Center	14.00	3900.3	3998.4	3966.9	3955.2	3963.3	3967.1	3961.9	3964.1
5	18.96	3881.6	3873.3	3974.0	3909.6	3948.5	3851.5	3936.6	3912.2
6	22.57	3914.9	3812.0	3827.4	3851.4	3753.2	3887.1	3778.0	3806.1
7	25.06	3711.6	3857.7	3842.5	3803.9	3556.3	3588.2	3657.6	3600.7
8	27.10	3348.6	3398.1	3393.4	3380.0	3280.8	3363.6	3212.6	3285.7
Averages ---------->		3700.0	3745.1	3723.4	3722.8	3654.5	3692.2	3647.9	3664.9

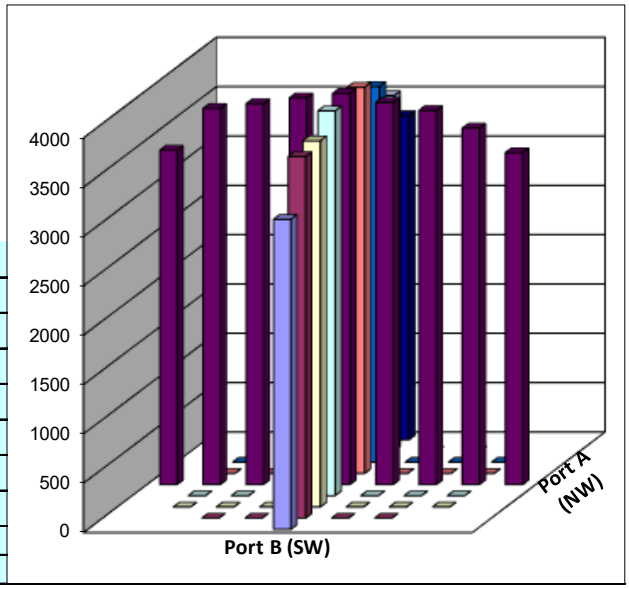
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3693.8		Mean	3824.3	3793.8	3809.1
Min Point	3141.4	-15.0%	Std. Dev.	113.8	138.8	122.9
Max Point	3964.1	7.3%	COV as %	3.0	3.7	**3.2**

Flow w/o C-Pt 15653 cfm

Vel Avg w/o C-Pt 3661 fpm

	Start	Finish	
Stack temp	84.2	81.5	F
Equipment temp	45.0	45.0	F
Ambient temp	49.0	49.0	F
Stack static	1.82	1.99	mbars
Ambient pressure	987.13	987.13	mbars
Total Stack pressure	988.95	989.12	mbars
Ambient humidity	47%	47%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-5
Date	04/13/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	71 %
Stack Dia.	28 in.	Stack Temp	78.5 deg F
Stack X-Area	615.8 in.2	Start/End Time	11:40 11:48
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NW)				Port B (SW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 0.90	3141.1	3181.5	3246.8	3189.8	3256.9	3353.7	3241.5	3284.0
2 / 2.94	3638.0	3513.7	3590.8	3580.8	3513.2	3644.0	3496.4	3551.2
3 / 5.43	3735.8	3737.1	3796.4	3756.4	3751.2	3876.1	3756.4	3794.6
4 / 9.04	3904.3	3894.9	3799.2	3866.1	3901.6	3821.3	3773.2	3832.0
Center / 14.00	3868.2	3969.1	3969.1	3935.5	3923.6	3928.0	3881.2	3910.9
5 / 18.96	3857.4	3830.1	4007.6	3898.4	3911.3	3935.7	3950.3	3932.4
6 / 22.57	3889.6	3839.7	3922.3	3883.9	3894.0	3847.2	3624.0	3788.4
7 / 25.06	3741.1	3587.8	3597.4	3642.1	3685.2	3606.7	3723.3	3671.7
8 / 27.10	3222.0	3232.4	3352.4	3268.9	3413.5	3362.7	3250.4	3342.2
Averages ---------->	3666.4	3642.9	3698.0	3669.1	3694.5	3708.4	3633.0	3678.6

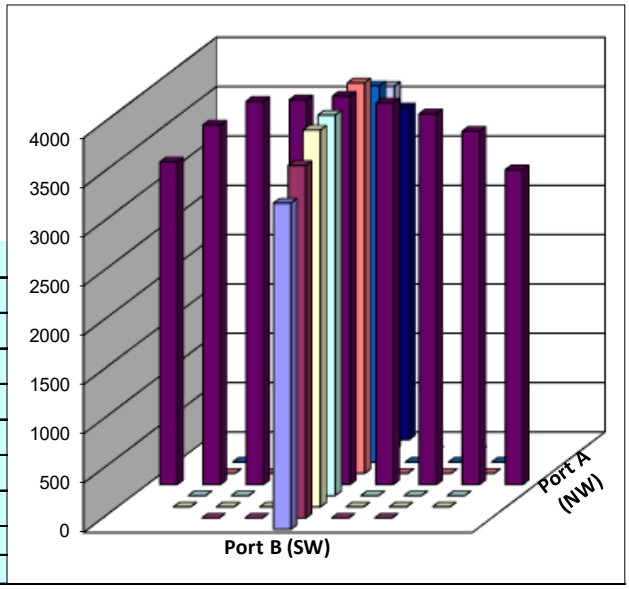
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3673.9		Mean	3794.7	3783.0	3788.9
Min Point	3189.8	-13.2%	Std. Dev.	137.9	133.8	130.7
Max Point	3935.5	7.1%	COV as %	3.6	3.5	**3.4**

Flow w/o C-Pt 15576 cfm

Vel Avg w/o C-Pt 3643 fpm

	Start	Finish	
Stack temp	78.4	78.6	F
Equipment temp	45.0	45.0	F
Ambient temp	49.0	49.0	F
Stack static	2.04	2.02	mbars
Ambient pressure	986.79	986.46	mbars
Total Stack pressure	988.83	988.47	mbars
Ambient humidity	47%	47%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-6
Date	04/13/2023	Fan Configuration	Fan A Only
Testers	JCR/ARB	Fan Setting	71 %
Stack Dia.	28 in.	Stack Temp	80.7 deg F
Stack X-Area	615.8 in.2	Start/End Time	12:10 12:20
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NW)				Port B (SW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 0.90	3208.2	3295.6	3322.0	3275.3	3371.4	3236.1	3031.6	3213.0
2 / 2.94	3464.2	3633.6	3746.5	3614.8	3828.3	3474.9	3481.3	3594.8
3 / 5.43	3873.2	3734.4	3857.6	3821.7	3757.5	3770.6	3792.8	3773.6
4 / 9.04	3953.2	3838.4	3982.8	3924.8	3871.3	3908.1	3946.9	3908.8
Center / 14.00	3954.2	3932.7	3902.0	3929.6	3963.6	3970.4	3883.2	3939.1
5 / 18.96	3963.4	3967.3	3881.0	3937.2	3884.9	3904.1	3956.9	3915.3
6 / 22.57	3977.9	4016.6	3914.6	3969.7	3768.2	3769.3	3834.7	3790.7
7 / 25.06	3703.9	3706.5	3740.1	3716.8	3694.1	3648.3	3599.7	3647.4
8 / 27.10	3353.1	3427.1	3399.2	3393.1	3295.6	3417.5	3252.8	3322.0
Averages ---------->	3716.8	3728.0	3749.5	3731.5	3715.0	3677.7	3642.2	3678.3

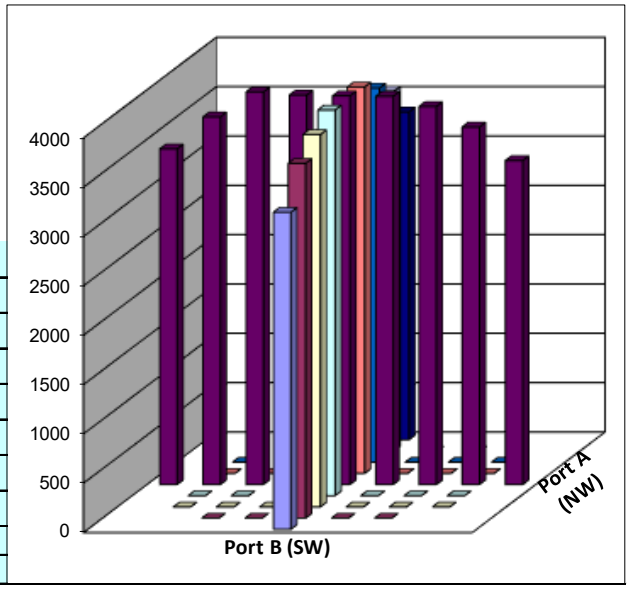
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	3704.9		Mean	3845.0	3795.7	3820.3
Min Point	3213.0	-13.3%	Std. Dev.	133.9	135.7	132.0
Max Point	3969.7	7.1%	COV as %	3.5	3.6	**3.5**

Flow w/o C-Pt 15720 cfm

Vel Avg w/o C-Pt 3676 fpm

	Start	Finish	
Stack temp	80.6	80.7	F
Equipment temp	45.0	45.0	F
Ambient temp	49.0	49.0	F
Stack static	1.94	1.82	mbars
Ambient pressure	986.46	986.46	mbars
Total Stack pressure	988.40	988.27	mbars
Ambient humidity	47%	47%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-7
Date	04/13/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	52 %
Stack Dia.	28 in.	Stack Temp	75.9 deg F
Stack X-Area	615.8 in.2	Start/End Time	13:10 13:18
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	2231.3	2223.3	2345.0	2266.5	2220.3	2122.0	2251.0	2197.8
2	2.94	2389.9	2562.6	2678.4	2543.6	2510.1	2397.4	2491.1	2466.2
3	5.43	2608.5	2695.8	2611.9	2638.7	2676.0	2527.6	2661.6	2621.7
4	9.04	2646.8	2657.0	2699.7	2667.8	2600.0	2619.8	2797.9	2672.6
Center	14.00	2698.5	2709.1	2740.9	2716.2	2643.1	2735.2	2695.2	2691.2
5	18.96	2708.5	2721.1	2774.1	2734.6	2730.4	2719.9	2713.0	2721.1
6	22.57	2551.4	2735.8	2689.1	2658.8	2679.3	2683.6	2712.1	2691.7
7	25.06	2390.2	2587.4	2516.9	2498.2	2500.0	2535.7	2621.6	2552.4
8	27.10	2319.4	2331.4	2248.5	2299.8	2516.3	2296.7	2310.6	2374.5
Averages ---------->		2504.9	2580.4	2589.4	2558.2	2563.9	2515.3	2583.8	2554.4

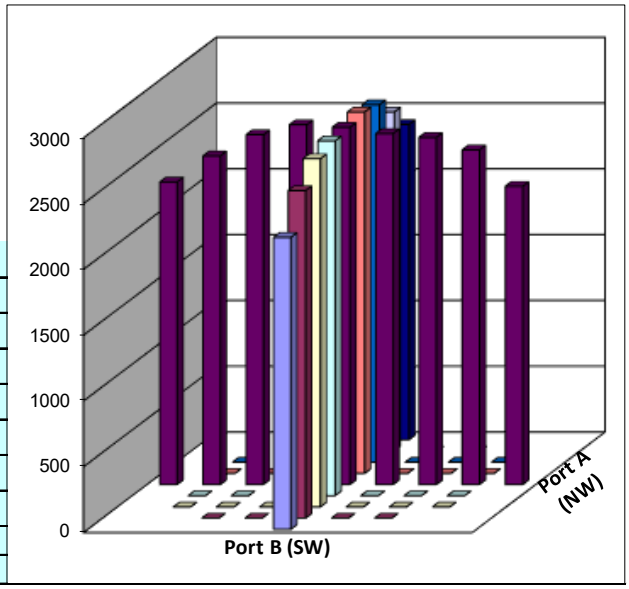
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2556.3		Mean	2636.8	2631.0	2633.9
Min Point	2197.8	-14.0%	Std. Dev.	86.8	91.8	85.9
Max Point	2734.6	7.0%	COV as %	3.3	3.5	**3.3**

Flow w/o C-Pt 10852 cfm

Vel Avg w/o C-Pt 2538 fpm

	Start	Finish	
Stack temp	77.5	74.3	F
Equipment temp	50.0	50.0	F
Ambient temp	53.0	53.0	F
Stack static	1.02	1.09	mbars
Ambient pressure	985.44	985.44	mbars
Total Stack pressure	986.46	986.53	mbars
Ambient humidity	35%	35%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-8
Date	04/13/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	52 %
Stack Dia.	28 in.	Stack Temp	77.0 deg F
Stack X-Area	615.8 in.2	Start/End Time	13:38 13:47
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NW)				Port B (SW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 0.90	2201.3	2296.1	2260.8	2252.7	2210.3	2168.3	2109.3	2162.6
2 2.94	2657.7	2640.3	2464.7	2587.6	2368.8	2379.5	2636.0	2461.4
3 5.43	2641.6	2546.8	2679.5	2622.6	2389.1	2614.5	2628.2	2543.9
4 9.04	2648.1	2648.7	2687.4	2661.4	2723.7	2728.9	2660.7	2704.4
Center 14.00	2701.7	2743.5	2763.5	2736.2	2721.3	2651.8	2651.2	2674.8
5 18.96	2687.4	2772.0	2790.0	2749.8	2713.2	2753.4	2692.9	2719.8
6 22.57	2654.6	2715.6	2694.1	2688.1	2715.9	2621.3	2637.2	2658.1
7 25.06	2528.1	2479.3	2549.7	2519.0	2561.9	2674.0	2621.3	2619.1
8 27.10	2253.9	2277.8	2453.4	2328.4	2406.2	2308.5	2450.7	2388.5
Averages ---------->	2552.7	2568.9	2593.7	2571.8	2534.5	2544.5	2565.3	2548.1

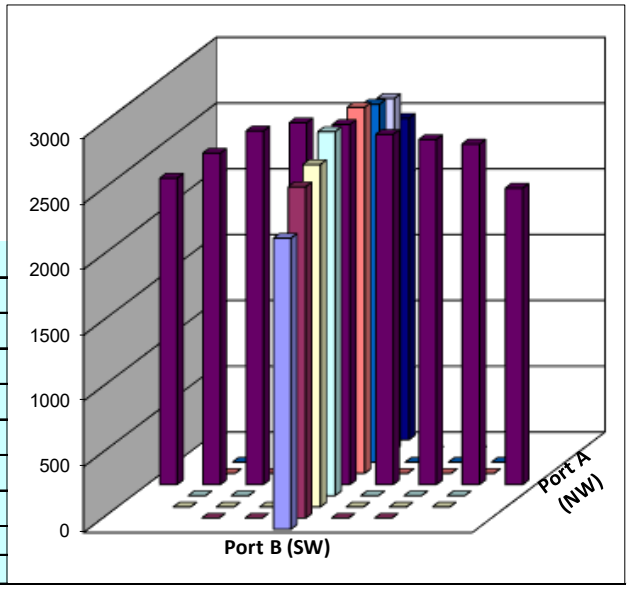
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	2559.9		Mean	2652.1	2625.9	2639.0
Min Point	2162.6	-15.5%	Std. Dev.	82.4	93.3	85.7
Max Point	2749.8	7.4%	COV as %	3.1	3.6	**3.2**

Flow w/o C-Pt 10869 cfm

Vel Avg w/o C-Pt 2542 fpm

	Start	Finish	
Stack temp	77.5	76.4	F
Equipment temp	50.0	50.0	F
Ambient temp	53.0	53.0	F
Stack static	1.27	0.92	mbars
Ambient pressure	985.44	985.44	mbars
Total Stack pressure	986.71	986.36	mbars
Ambient humidity	35%	35%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-9
Date	04/13/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	52 %
Stack Dia.	28 in.	Stack Temp	76.1 deg F
Stack X-Area	615.8 in.2	Start/End Time	14:08 14:16
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	2152.3	2156.9	2136.7	2148.6	2178.4	2153.4	2096.8	2142.9
2	2.94	2631.4	2441.6	2480.5	2517.8	2410.9	2457.7	2572.2	2480.3
3	5.43	2677.3	2571.9	2490.4	2579.9	2571.6	2650.6	2459.3	2560.5
4	9.04	2685.5	2651.2	2729.1	2688.6	2618.6	2637.3	2683.7	2646.5
Center	14.00	2722.5	2657.4	2721.6	2700.5	2726.4	2708.3	2686.8	2707.2
5	18.96	2809.5	2641.6	2763.0	2738.0	2788.7	2735.4	2724.0	2749.4
6	22.57	2654.0	2759.8	2543.7	2652.5	2772.5	2679.4	2658.6	2703.5
7	25.06	2537.3	2483.8	2470.3	2497.1	2638.5	2645.3	2524.7	2602.8
8	27.10	2441.3	2590.6	2346.9	2459.6	2212.7	2424.8	2242.1	2293.2
Averages ---------->		2590.1	2550.5	2520.2	2553.6	2546.5	2565.8	2516.5	2542.9

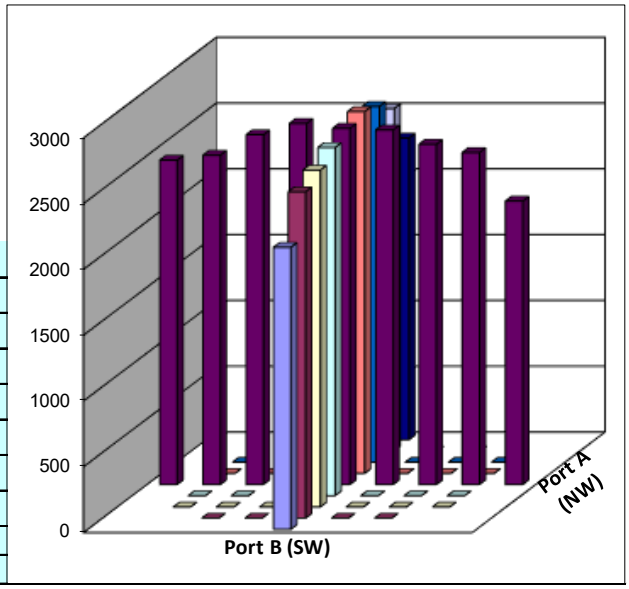
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	2548.3		Mean	2624.9	2635.7	2630.3
Min Point	2142.9	-15.9%	Std. Dev.	94.1	94.5	90.8
Max Point	2749.4	7.9%	COV as %	3.6	3.6	**3.5**

Flow w/o C-Pt 10813 cfm

Vel Avg w/o C-Pt 2529 fpm

	Start	Finish	
Stack temp	75.5	76.6	F
Equipment temp	50.0	50.0	F
Ambient temp	54.0	54.0	F
Stack static	0.92	0.92	mbars
Ambient pressure	985.10	985.10	mbars
Total Stack pressure	986.02	986.02	mbars
Ambient humidity	33%	33%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-10
Date	04/13/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	70 %
Stack Dia.	28 in.	Stack Temp	77.7 deg F
Stack X-Area	615.8 in.2	Start/End Time	14:41 14:50
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (NW)				Port B (SW)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 0.90	3498.2	3298.6	3145.6	3314.1	3327.1	3225.7	3249.5	3267.4
2 / 2.94	3513.2	3791.2	3617.8	3640.7	3554.3	3595.8	3672.5	3607.5
3 / 5.43	3578.9	3826.5	3681.0	3695.5	3608.1	3737.6	3634.4	3660.0
4 / 9.04	3848.3	3812.4	3892.2	3851.0	3941.2	3806.1	3926.0	3891.1
Center / 14.00	3906.7	3934.3	3966.1	3935.7	3887.6	3899.4	3867.2	3884.7
5 / 18.96	3959.5	3874.2	3923.0	3918.9	3916.8	3947.0	3889.7	3917.8
6 / 22.57	3775.4	3819.0	3890.5	3828.3	3727.3	3940.4	3775.6	3814.4
7 / 25.06	3761.0	3486.9	3619.0	3622.3	3681.4	3738.5	3793.2	3737.7
8 / 27.10	3324.1	3353.8	3218.8	3298.9	3409.9	3454.1	3440.5	3434.8
Averages ---------->	3685.0	3688.5	3661.6	3678.4	3672.6	3705.0	3694.3	3690.6

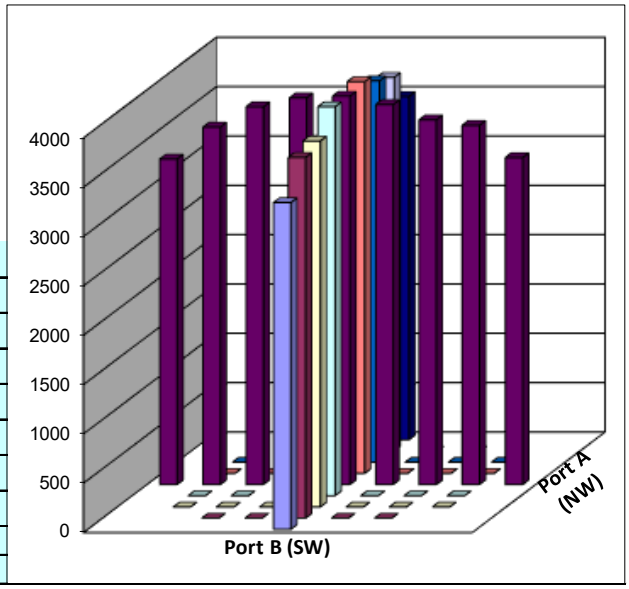
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3684.5		Mean	3784.6	3787.6	3786.1
Min Point	3267.4	-11.3%	Std. Dev.	130.5	121.8	121.3
Max Point	3935.7	6.8%	COV as %	3.4	3.2	**3.2**

Flow w/o C-Pt 15634 cfm

Vel Avg w/o C-Pt 3656 fpm

	Start	Finish	
Stack temp	77.3	78.0	F
Equipment temp	50.0	50.0	F
Ambient temp	54.0	54.0	F
Stack static	1.69	1.79	mbars
Ambient pressure	985.10	985.10	mbars
Total Stack pressure	986.79	986.89	mbars
Ambient humidity	33%	33%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-11
Date	04/13/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	70 %
Stack Dia.	28 in.	Stack Temp	79.3 deg F
Stack X-Area	615.8 in.2	Start/End Time	15:10 15:20
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	2981.5	3386.3	3258.2	3208.7	3161.3	3354.1	3168.1	3227.8
2	2.94	3592.9	3521.9	3219.1	3444.6	3585.6	3696.6	3333.6	3538.6
3	5.43	3840.5	3817.7	3890.3	3849.5	3749.9	3608.2	3806.5	3721.5
4	9.04	3749.6	3848.4	3770.7	3789.6	3781.1	3857.4	3767.8	3802.1
Center	14.00	3893.1	3894.8	3875.7	3887.9	3867.2	3935.6	3855.3	3886.0
5	18.96	3850.8	4005.6	3899.2	3918.5	3904.7	3870.8	3823.5	3866.3
6	22.57	3806.5	3733.1	3550.8	3696.8	3913.5	3876.1	3769.3	3853.0
7	25.06	3758.6	3636.4	3585.4	3660.1	3783.9	3693.9	3682.1	3720.0
8	27.10	3408.1	3404.3	3344.5	3385.6	3543.6	3561.2	3419.2	3508.0
Averages ---------->		3653.5	3694.3	3599.3	3649.0	3699.0	3717.1	3625.0	3680.4

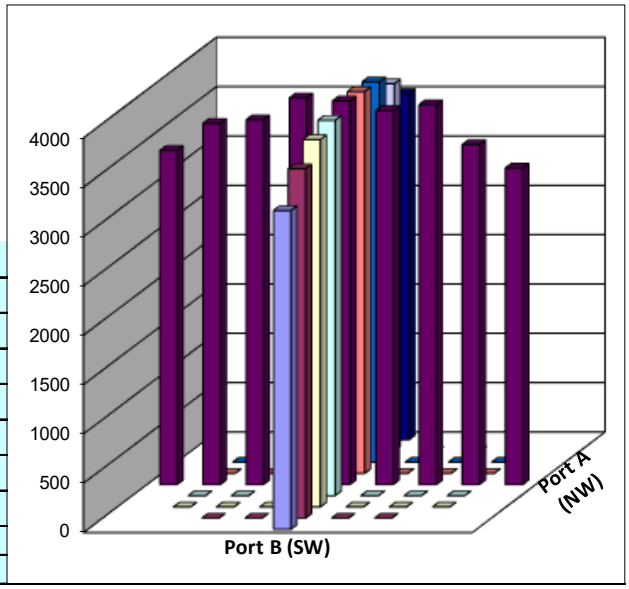
All	ft/min	Dev. from mean	*Center 2/3*	Port A	Port B	All
Mean	3664.7		Mean	3749.6	3769.6	3759.6
Min Point	3208.7	-12.4%	Std. Dev.	164.8	121.8	139.6
Max Point	3918.5	6.9%	COV as %	4.4	3.2	**3.7**

Flow w/o C-Pt 15552 cfm

Vel Avg w/o C-Pt 3637 fpm

	Start	Finish	
Stack temp	80.7	77.9	F
Equipment temp	50.0	50.0	F
Ambient temp	55.0	55.0	F
Stack static	1.62	1.69	mbars
Ambient pressure	984.76	984.76	mbars
Total Stack pressure	986.38	986.45	mbars
Ambient humidity	32%	32%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

VELOCITY TRAVERSE DATA FORM

Stack	LB-S2 (C5V)	Run No.	VT-12
Date	04/13/2023	Fan Configuration	Fan B Only
Testers	JCR/ARB	Fan Setting	70 %
Stack Dia.	28 in.	Stack Temp	83.4 deg F
Stack X-Area	615.8 in.2	Start/End Time	15:40 15:50
Test Port	A&B	Center 2/3 from	2.57 to: 25.43
Distance to disturbance	683 in.	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (NW)				Port B (SW)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.90	3438.7	3422.2	3175.0	3345.3	3210.6	3150.4	3270.8	3210.6
2	2.94	3750.7	3673.6	3827.1	3750.5	3579.1	3490.1	3726.7	3598.6
3	5.43	3887.3	3891.8	3780.2	3853.1	3765.5	3694.7	3661.4	3707.2
4	9.04	3895.6	3946.4	3774.0	3872.0	3958.8	3647.5	3838.1	3814.8
Center	14.00	3892.2	3878.7	3899.9	3890.3	3845.7	3943.0	3890.7	3893.1
5	18.96	3948.7	3924.7	3925.9	3933.1	3943.6	3924.5	3912.2	3926.8
6	22.57	3932.7	3829.0	3865.5	3875.7	3865.0	3964.8	3951.4	3927.1
7	25.06	3536.4	3588.8	3885.4	3670.2	3656.8	3753.8	3608.4	3673.0
8	27.10	3201.8	3185.7	3288.0	3225.2	3573.8	3380.5	3424.2	3459.5
Averages ---------->		3720.5	3704.5	3713.4	3712.8	3711.0	3661.0	3698.2	3690.1

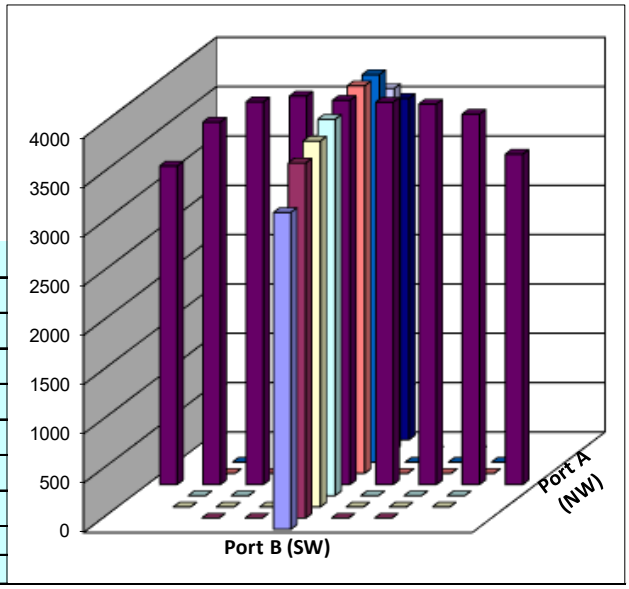
All	ft/min	Dev. from mean	***Center 2/3***	Port A	Port B	All
Mean	3701.4		Mean	3835.0	3791.5	3813.2
Min Point	3210.6	-13.3%	Std. Dev.	91.6	132.8	111.9
Max Point	3933.1	6.3%	COV as %	2.4	3.5	**2.9**

Flow w/o C-Pt 15726 cfm

Vel Avg w/o C-Pt 3678 fpm

	Start	Finish	
Stack temp	83.3	83.4	F
Equipment temp	50.0	50.0	F
Ambient temp	55.0	55.0	F
Stack static	1.57	1.74	mbars
Ambient pressure	984.42	984.42	mbars
Total Stack pressure	985.99	986.17	mbars
Ambient humidity	32%	32%	RH

Instruments Used:	Cal Due
Standard pitot (ID: A49AF, 48")	Post-test inspection
Shortridge Instruments Micromanometer (SN: M22572	2/24/2025
Digisense Thermometer (ID: HT4)	Post-test verification



Notes:

Traverse point depth = the distance from inside stack wall to each point.

Side A port was always measured first.

Direct measurements of differential pressure (in. H2O) were recorded using a digital manometer. Differential pressures were converted to the stack gas velocities (fpm) based on recorded total stack pressure stack temperature and density of air for each run.

Appendix D – LAB Stack Verification Document Summary

The following table provides a summary of the documents produced by Pacific Northwest National Laboratory (PNNL) during LAB Verification Test activities.

Document Title	Document Number	Notes
LAB Verification Test Input Document	Attachment to WTP/RPP-MOA-PNNL-00970, Rev 0	Test input document to provide information to Bison Engineering (Bison) and Waste Treatment Completion Company (WTCC) concerning the verification tests. Transmitted as an attachment to a memo.
LAB Verification Test Input Document	Attachment to WTP/RPP-MOA-PNNL-01038, Rev 0	Test input document to provide information to Bison and WTCC concerning the additional LAB verification tests. Transmitted as an attachment to a memo.
WTP LAB Stack Verification Tests of Velocity Uniformity and Flow Angle provided by WTCC	TDP-WTPSP-958	Test Data Package to contain the data sheets collected by Bison.
Qualification of LAB Stack Verification Testing Data collected by Bison	DQP-WTPSP-0003, Rev 1	Data Qualification Plan to describe the qualification of the data from WTCC.
Qualification of LAB Stack Verification Testing Data Collected by Bison	N/A	Data Qualification Evaluation to assess whether the data from WTCC are acceptable.
Qualification of LAB Stack Verification Testing Data collected by Bison	DQR-WTPSP-0003, Rev 1	Data Qualification Report to document the results of the data evaluation(s).
WTP LAB Stack Verification Tests of Velocity Uniformity and Flow Angle transcribed by PNNL	TDP-WTPSP-959	Test Data Package to contain the data that were input into PNNL spreadsheets from the Bison sheets.
Determine Air Velocity Uniformity of LB-C2, LB-S1, and LB-S2 Stacks	CCP-WTPSP-1374, Rev 1	Calculation package to document and review equations and calculations performed to determine velocity uniformity.
Determine Flow Angle in LB-C2, LB-S1, and LB-S2 Stacks	CCP-WTPSP-1375, Rev 0	Calculation package to document and review equations and calculations performed to determine flow angle.
Determine the product of the hydraulic diameter and the mean velocity of LAB Stacks	CCP-WTPSP-1385, Rev 1	Calculation package to document and review the equations and calculations performed to determine the DV values from the scale model stack tests and the verification tests.
LAB Stack LB-C2, LB-S1, and LB-S2 Additional Velocity Traverse Data Sheets	CCP-WTPSP-1388	Calculation package to document and review equations and calculations performed to determine velocity uniformity from additional LAB tests.
Additional Flow Angle Data Sheets of LAB Stacks LB-C2, LB-S1, and LB-S2	CCP-WTPSP-1389	Calculation package to document and review equations and calculations performed to determine flow angle from additional LAB tests.
Determine the product of the hydraulic diameter and the mean velocity of LAB Stacks	CCP-WTPSP-1390	Calculation package to document and review the equations and calculations performed to determine the DV values from the scale model stack tests and the additional verification tests.

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