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Hanford Waste Treatment Plant Low Activity Waste Facility Stack Effluent Monitoring

Sampling Probe Location Qualification Evaluation

February 2024

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U.S. DEPARTMENT OF ENERGY

Prepared for the U.S. Department of Energy
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Richland, Washington 99354

Revision History

Revision Number	Effective Date	Description of Change
1	2/20/2024	Applied revisions to stack DV ranges so that the LV-S1, LV-S2, and LV-C2 stacks conservatively use the average DV to maximum 6 DV, while LV-S3 conservatively uses the average 1/3 DV to 3 DV. Corrected distance to disturbance values. Correction applied to Table 9, which previously listed the 1/6 DV value instead of the DV value. Correction applied to Table 15, which previously listed incorrect LV-C2 summary data. Modifications to text and tables per discussions with WA DOH
0	4/8/2022	Initial Issue

Summary

The Hanford Tank Waste Treatment and Immobilization Plant Low Activity Waste (LAW) facility stack monitor locations were qualified using scale model stacks to mitigate the risk of discovering that sampling locations do not meet the qualification criteria on the full-scale stacks. 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 LAW stacks were performed at normal operating conditions. The minimum 1/6 DV value, along with the maximum 6 DV value from the scale model testing, determines the range of stack flow rates for which the full-scale stack may be operated and remain in compliance with the stack verification criterion. For this analysis, the range of qualified flow rates listed is conservatively based on the average DV through 6 DV for LV-S1, LV-S2, and LV-C2, and 1/3 DV to 3 DV for LV-S3. Table S1 lists the operating flow rates along with the conservative lower and upper qualified stack flow rates for each of the LAW facility stacks. For each stack, the operating flow is below the upper qualified stack flow, which means that the scale model test results are acceptable for stack qualification.

Table S1. LAW Facility Stack Operating and Qualified Flow Rates.

Stack Parameter	LV-S1	LV-S2	LV-S3	LV-C2
Normal Operating Flow (scfm)	37,905	46,740	3,056/4,526[a]	50,680
Lower Qualified Stack Flow (scfm)[b]	7,489	10,919	872	10,212
Upper Qualified Stack Flow (scfm)[c]	56,279	112,580	7,849	80,512

a. The LV-S3 operating flow for one melter is 3,056 standard cubic feet per minute (scfm), while for two melters, it is 4,526 scfm.
b. The lower DV for the LV-S1, LV-S2, and LV-C2 stacks are the average DV from the scale model tests. The lower DV for the LV-S3 stack is 1/3 of the average DV from the scale model tests.
c. The upper DV for the LV-S1, LV-S2, and LV-C2 stacks are the maximum 6DV from the scale model tests. The upper DV for the LV-S3 stack is three times the average DV from the sale model tests.

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 LAW facility. Flow angle results were primarily <10°, and all flow angle results were within the ≤20° criterion. The velocity uniformity results for each test condition ranged between 1.5% COV and 9.2% COV, which were all within the range of the target % COV values from the scale model tests.

Based on these stack verification test results, the four LAW filtered exhaust stack sampling locations meet the qualification criteria provided in the ANSI/HPS N13.1-1999 standard for all planned fan operating configurations. This includes single-fan operating conditions for LV-S1 and LV-S2, dual-fan operations for LV-S3 at both the continuous air monitor and record sampler locations, and both single-fan and dual-fan operations for LV-C2. 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

Mike Wentink of Bechtel National, Inc. (BNI) was the project manager for this effort. We acknowledge support from Ryan Cioli, Bill Jackson, and Clarke Respess from BNI who facilitated Pacific Northwest National Laboratory (PNNL) staff in observing the stack tests at the Hanford Tank Waste Treatment and Immobilization Plant Low Activity Waste facility. We also acknowledge Zach Harding, Connor Everly, Jeremy Clark, and Kelly Dorsi from Bison Engineering, Inc., who performed their work with PNNL staff observing in the field during testing and asking questions.

The quality assurance measures employed to produce this document include oversight and guidance from our quality engineer, David MacPherson, as well as independent reviews from Xiao-Ying Yu and Matthew Barnett. Chrissy Charron provided administrative support for this effort. Finally, Cary Counts served as the technical editor for this document.

Acronyms and Abbreviations

% COV	percent coefficient of variation
acfm	actual cubic feet per minute, an air volume flow unit at actual conditions
ANSI	American National Standards Institute
BNI	Bechtel National, Inc.
CAM	continuous air monitor
CFR	Code of Federal Regulations
DV	product of the hydraulic diameter and the mean velocity
EPA	Environmental Protection Agency
HPS	Health Physics Society
LAW	Low Activity Waste (facility)
LV-C2	WTP Low Activity Waste Facility C2V ventilation system exhaust stack
LV-S1	WTP Low Activity Waste Facility C3V ventilation system exhaust stack
LV-S2	WTP Low Activity Waste Facility C5V ventilation system exhaust stack
LV-S3	Stack for the combined melter offgas /vessel vent exhaust system of the WTP Low Activity Waste Facility
NESHAP	National Emissions Standards for Hazardous Air Pollutants
PNNL	Pacific Northwest National Laboratory
QA	quality assurance
RS	record sampler
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

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1.0 Introduction

Stack verification tests were performed by a Bechtel National, Inc. (BNI)/Waste Treatment Completion Company contractor at the exhaust stack monitoring location of the Hanford Tank Waste Treatment and Immobilization Plant (WTP) Low Activity Waste (LAW) facility stacks to evaluate whether it meets the applicable regulatory criteria (i.e., Washington Administrative Code, Chapter 246–247) that govern effluent monitoring systems.

Emissions from three out of the four LAW facility air exhaust stacks are estimated 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 (NESHAP), Subpart H, National Emissions Standard for Emissions of Radionuclides Other than Radon from Department of Energy Facilities. However, continuous sampling of emissions is planned for the first year of stack operations for all four LAW facility stacks. The NESHAP 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 standard, 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. Under certain conditions, ANSI/HPS N13.1-1999 allows results from previously tested stacks to be used instead of a full series of tests at the facility stack. For the LAW facility stacks, previous scale model test results were used, and verification tests were performed on the full-scale stack.

While a contractor to BNI performed the verification tests, Pacific Northwest National Laboratory (PNNL) provided guidance for these tests, performed data reduction following the tests, and produced this report to provide an assessment of the compliance of the stack sampling location. PNNL previously 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. Section 4.0 compares the results from the verification tests against the scale model test results, while conclusions are summarized in Section 5.0.

The four LAW facility stacks exhaust air from general building ventilation, process areas, non-process areas, and melter offgas/vessel vent process systems. The four stacks considered are described below:

- Stack LV-S1 – Ventilates hoods and maintenance (C3) areas
- LV-S2 – Ventilates hot cells and glovebox (C5) areas
- LV-S3 – Ventilates melter offgas and vessel vent processes
- LV-C2 – Ventilates non-process (C2) areas.

Table 1 provides information about the LAW stack operations. Each ventilation system has an extra standby fan available for back-up or maintenance needs. Velocity and flow values presented in this document use standard units, and standard conditions used is 68°F and 14.7 psia.

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

Stack Parameter	LV-S1[a]	LV-S2[b]	LV-S3[c]	LV-C2[d]
Discharge diameter (in.)	48	60	18	60
Duct diameter at sampling probes (in.)	48	60	18	60
Number of duct diameters from full-scale test port to upstream disturbance[e]	10.5	18.4	37.2 / 44.2[f]	10.5
Total available fans	2	2	3	2
Number of operating fans	1	1	2	1
Normal operating flow rates (standard cubic feet per minute [scfm])	37,905	46,740	3,056/4,526[g]	50,680

a. DS No: 24590-LAW-JFD-SDJ-21040, Rev 4 (available from PNNL)
b. DS No: 24590-LAW-JFD-SDJ-21080, Rev 3, CD No. 24590-LAW-M8N-C5V-00117 (available from PNNL)
c. DS No: 24590-LAW-JFD-SDJ-21130, Rev 2, CD No. 24590-LAW-M6E-LVP-00019 (available from PNNL)
d. DS No: 24590-LAW-JFD-SDJ-21010, Rev 4 (available from PNNL)
e. Based on Bechtel-provided heating, ventilation, and air conditioning diagrams and isometric drawings
f. LV-S3 distances for the record sampler (RS) and continuous air monitor (CAM) locations, respectively.
g. The LV-S3 operating flow for one melter is 3,056 scfm, while for two melters, it is 4,526 scfm.

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 a 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*. The standard uses the term *coefficient of variation*, so it also is used here.

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 model stacks of the exhaust ductwork and stacks from the fans to the planned position of the probes used for sampling. Scale model test results are documented in Glissmeyer, Antonio, Flaherty, and Amidan (2014); Glissmeyer, Antonio, and Flaherty (2015); and Glissmeyer, Flaherty, and Piepel (2011). 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 must be within a factor of six of that of the tested stack, and the hydraulic diameters of the stack must be at least 250 mm at the sampling location. For clarity, the DV requirement can be expressed as 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-inch-diameter ducting to represent each of the LAW facility stacks. Glissmeyer, Antonio, Flaherty, and Amidan (2014); Glissmeyer, Antonio and Flaherty (2015); and Glissmeyer, Flaherty, and Piepel (2011) report on the complete set of tests that were performed with 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 BNI at the time of the scale model tests. 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 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 LAW facility scale model stacks. For consistency with both the design documents for these stacks and verification test results, the velocity values are presented in standard units (i.e., standard feet per minute [sfpm]; the standard conditions used here are 68°F and 14.7 psia). The full range of acceptable DV values for the full-scale stack qualification is 1/6 DV through 6 DV; a subset of this range was used in this analysis. For LV-S1, LV-S2, and LV-C2, the average DV through the maximum 6 DV was used, and for LV-S3, the average 1/3 DV though the average 3 DV was used. For convenience, the subset of ranges is identified as 'lower' and 'upper' to avoid conflict with the ANSI/HPS N13.1-1999 allowed full 1/6 DV to 6 DV range. Because the scale model stack diameter is nominally 1 ft, the velocity value is essentially equal to the DV value, and the lower DV values for LV-S1, LV-S2, and LV-C2 in Table 2 is therefore the average of the scale model velocity values.

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

Stack	Diameter (in.)	Velocity Range (sfpm)	Lower DV[a] (ft^2/min)	Upper DV[b] (ft^2/min)
LV-S1	11.8	1,575–2,986	2,384	17,914
LV-S2	12.0	1,504–4,778	2,780	28,668
LV-S3	11.9	1,357–3,267	784	7,054
LV-C2	11.9	1,517–3,417	2,600	20,502

a. The lower DV for the LV-S1, LV-S2, and LV-C2 stacks are the average DV from the scale model tests. The lower DV for the LV-S3 stack is 1/3 of the average DV from the scale model tests.
b. The upper DV for the LV-S1, LV-S2, and LV-C2 stacks are the maximum 6DV from the scale model tests. The upper DV for the LV-S3 stack is 3 times the average DV from the sale model tests.

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 the U.S. Department of Energy 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 tests of the four LAW facility stacks during two separate week-long periods of May 24–28, 2021, and June 21–25, 2021. The test plan (Bison Engineering Inc. 2021[1]), which was informed by a PNNL test input document (Peterson 2020), 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, also were performed during this test period. Those tests dictated that 14 stack flow tests be performed as an independent measurement for comparison with the stack flow monitor for each of the four stacks. As shown in Table 3, multiple tests were performed for most fan configurations because variations in results are common among field measurements.

Table 3. LAW Facility Stack Test Matrix. All tests performed at flow conditions as indicated. The same number of tests were performed for flow angle and velocity uniformity.

Stack	Fan Configuration	Nominal Flow Rate (scfm)[a]	Number of Flow Angle, Velocity Uniformity Tests
LV-S1	Fan A Only	37,000	7
	Fan B Only		7
LV-S2	Fan A Only	38,000	7
	Fan B Only		7
LV-S3	Exhausters A and B	3,700	5
	Exhausters B and C		4
	Exhausters A and C		5
LV-C2	Fans A and B	48,000	12
	Fan A Only		1
	Fan B Only		1

a. Nominal flow rates were obtained by rounding the average Bison verification test flow rate to two significant figures. The LV-S3 rate is aligned with the RS tests, while the CAM tests were slightly higher (~3,900 scfm).

Bison followed test measurement practices as described 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 electronic manometer. Velocity uniformity tests were performed with either a standard pitot tube or an S-type 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 the four stacks as seen from the rooftop of the LAW facility. The LV-S1, LV-S2, and LV-S3 stacks are the tallest stacks and are enclosed within a common support structure. The LV-C2 stack is slightly northeast of the cluster of other stacks and is in a separate support structure because it is significantly shorter. The LV-C2 stack is also the only stack with sampling and testing locations located along the outdoor, vertical section of the stack.

[1] Bison Engineering, Inc. 2021. Low-Activity Waste Facility Flow Verification Test Plan. 24590-CM-HC4-HX00-00007. Helena, Montana.



Figure 1. Photograph of the Four LAW Stacks Taken from the Facility Rooftop. Each stack is labeled near the lowest visible portion of the stack.

Figure 2 through Figure 5 shows the testing location of each of the three LAW stacks in the L-0320 Stack Monitoring Room (for LV-S1, LV-S2, and LV-S3) and on the rooftop (for LV-C2). The LV-S1 (Figure 2) and LV-S2 (Figure 3) locations required a scissor-lift to access the testing ports. The LV-S3 (Figure 4) testing locations were both more centrally located within the room and are elevated higher above the floor, in addition to having two locations (for the CAM and RS), so a scaffold was constructed to provide access. The LV-C2 testing location (Figure 5) was on the roof but was accessible by a staff member standing on the rooftop.

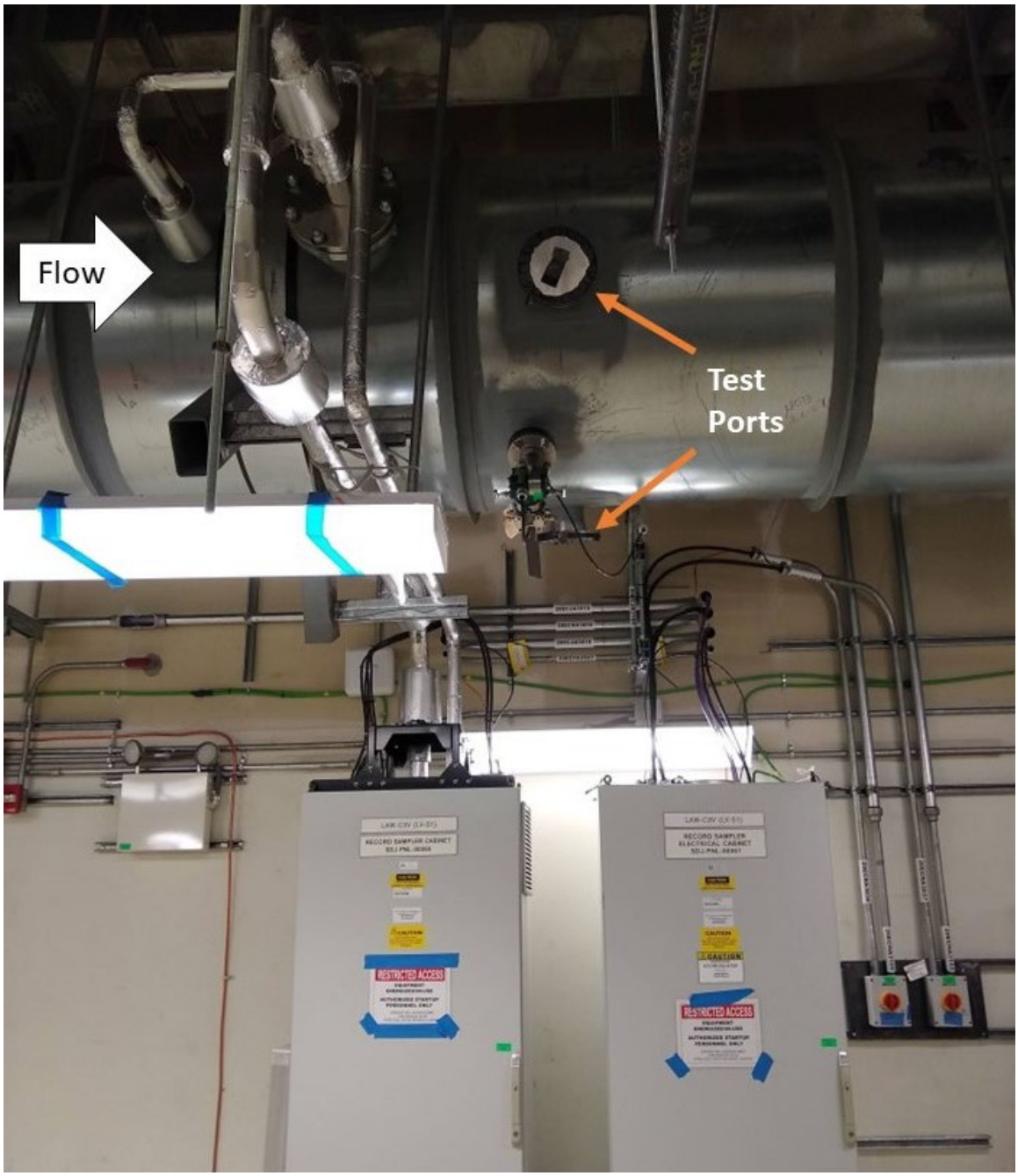


Figure 2. LAW LV-S1 Stack. The stack is positioned along the west wall of the L-0320 Stack Monitoring Room, with one test port slightly below the horizontal centerline, and the second test port slightly west of plumb (behind the probe in the photo). Stack flow is from left (south) to right (north).

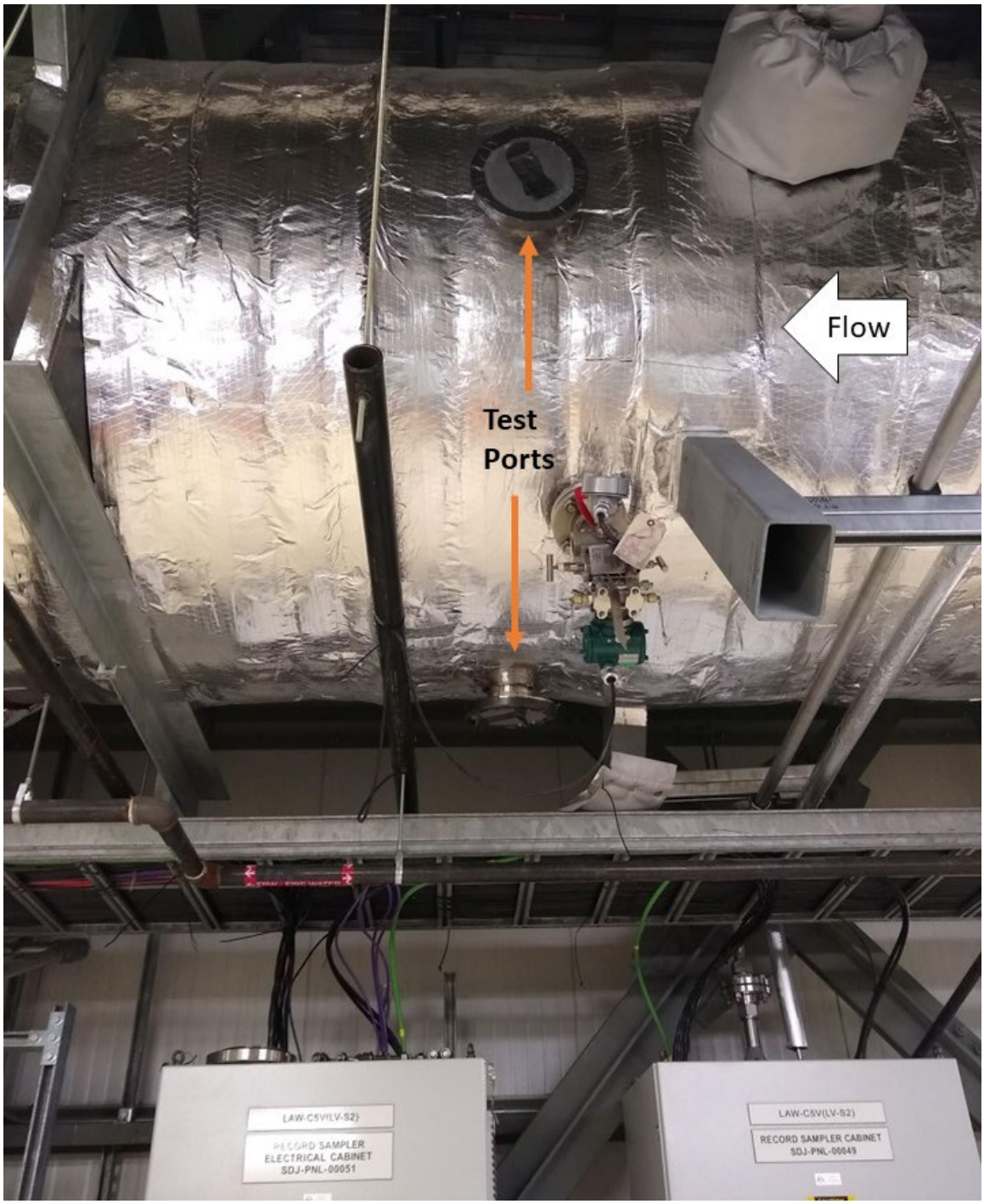


Figure 3. LAW LV-S2 Stack. The stack is positioned along the east wall of the L-0320 Stack Monitoring Room, with one test port near the horizontal centerline, and the second test port nearly plumb (behind and to the left of the probe in the photo). Stack flow is from right (south) to left (north).



Figure 4. LAW LV-S3 Stack. The pair of ports to characterize the RS port location is visible in the foreground (near the center of the image) while the ports to characterize the CAM is in the background, at the location of the Bison staff member. The stack is positioned near the center of the L-0320 Stack Monitoring Room, and the photograph is nominally pointed to the north. Stack flow is from the foreground (south) to background (north).



Figure 5. LAW LV-C2 Stack on the Facility Rooftop. The Bison staff member is measuring flow angle at the east port, and the west port is visible behind him.

For each traverse, the probe (i.e., S-type or standard pitot tube) was inserted completely into the stack such that the tip contacted the far wall, and then backed away from that wall the necessary distance to measure point 1. 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. During tests, the port cover plate was replaced with a relatively thin plate with a hole in the center that was just large enough for the pitot tube, and duct tape was used to seal the opening when the port was not in use (see Figure 2, Figure 3, and Figure 4).

While Bison performed the tests under a subcontract from BNI, PNNL staff observed most tests to understand how they were executed. Because of obstructions in the test area (e.g., beams, platforms, sample cabinets, etc.), the pitot tube was not positioned exactly along the stack diameter during all portions of the test. As a result, measurements in the stack may have been co-planar, but not exactly at the specific, planned positions. This positioning of the pitot tube for sampling does not have a practical impact on the measurement results. Test staff did not appear to record any negative flow angle values in the case of LV-C2, which was along a vertical section of duct, or flow angle values greater than 90° in the case of LV-S1, LV-S2, and LV-S3, which were measurements made at horizontal duct sections. This does not impact the results because the absolute value is used but is listed here to note that all flow angle test results presented in the appendices are small positive values.

Finally, we note that equipment used for these tests generally were marked with calibration information. The barometer, digital manometer, and thermocouple, as well as the pitot tubes also were checked in-house before and after each testing trip.

3.0 Verification Test Results

PNNL was directed by BNI to use data collected by Bison to perform the LAW 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 QA 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. Bison (2021[1], 2022[2]) reports documenting the verification tests were used as the basis for PNNL data processing and analysis.

Velocity-uniformity measurements collected by Bison were delta-pressure values, which then were 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.

There are some minor differences between the values calculated in the Bison report and the values calculated by PNNL. The primary source of these differences is that Bison 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 inches of water). The PNNL data sheets used the single decimal point values in the subsequent calculations. Appendix A, Appendix B, Appendix C, and Appendix D contain the flow angle and velocity data sheets produced by PNNL to support this analysis. Average velocities calculated by PNNL and Bison are identical for all tests.

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

3.1 LV-S1 Verification Tests

Table 4 summarizes the flow angle and velocity uniformity test results from the LV-S1 stack verification tests. The DV values, calculated from the stack nominal diameter and the velocity computed from the EPA Method 1 measurement points, are included in Table 4 for reference. 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.

[1] Bison Engineering, Inc. 2021. Low-Activity Waste Facility Flow Verification. 24590-CM-HC4-HX00-00007-01-00008 Rev 00. Helena, Montana.
[2] Bison Engineering, Inc. 2022. Low-Activity Waste Facility Flow Verification. 24590-CM-HC4-HX00-00007-01-00008 Rev 00B. Helena, Montana.

Table 4. LV-S1 Verification Test Results

Fan Configuration	Test Number	Flow Angle (°)	Velocity Uniformity Test Flow (scfm)	Velocity Uniformity (% COV)	DV (ft^2/min)
Fan A Only	1	4.8	37,180	1.6	11,837
	2	7.5	37,162	1.9	11,830
	3	5.0	34,319	2.2	10,924
	4	7.3	32,526	1.7	10,354
	5	4.9	37,728	3.2	12,008
	6	3.3	37,466	1.5	11,925
	7	6.3	37,052	1.5	11,795
Fan B Only	8	5.7	38,299	2.5	12,191
	9	5.1	37,303	2.8	11,875
	10	5.1	37,287	2.1	11,870
	11	4.6	38,089	1.8	12,125
	12	2.7	37,855	2.5	12,049
	13	5.7	40,438	1.9	12,874
	14	1.9	37,349	3.1	11,889

3.2 LV-S2 Verification Tests

Table 5 summarizes the flow angle and velocity uniformity test results from the LV-S2 stack verification tests. The DV values calculated from the stack nominal diameter and the velocity computed from the EPA Method 1 measurement points are included in Table 5 for reference. 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.

Table 5. LV-S2 Verification Test Results

Fan Configuration	Test Number	Flow Angle (°)	Velocity Uniformity Test Flow (scfm)	Velocity Uniformity (% COV)	DV (ft^2/min)
Fan A Only	1	3.3	36,800	6.9	9,372
	2	3.4	39,495	6.1	10,057
	3	4.4	37,435	4.6	9,531
	4	13.2	37,793	9.2	9,622
	5	3.4	37,836	7.0	9,637
	6	5.0	38,746	5.6	9,867
	7	3.3	37,752	2.8	9,614
Fan B Only	8	3.0	37,869	5.3	9,643
	9	2.4	38,936	1.9	9,916
	10	4.9	37,530	4.0	9,556
	11	2.4	36,828	4.6	9,380
	12	3.2	37,899	5.3	9,652
	13	2.7	38,035	4.3	9,688
	14	4.1	38,070	4.8	9,693

3.3 LV-S3 Verification Tests

Table 6 and Table 7 summarize the flow angle and velocity uniformity test results from the LV-S3 stack verification tests at the CAM and RS locations. The DV values calculated from the stack nominal diameter and the velocity computed from the EPA Method 1 measurement points are included in these tables for reference. While the stack data sheet (24590-LAW-JFD-SDJ-21130, Rev 2) listed 18 inches as the outside diameter for LV-S3, Bison recorded an inside diameter of 17 inches, which was used for the calculations presented here. 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 are 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.

The CAM location is downstream of the RS location, and tests were performed at the RS location first, then at the CAM location, so that each numbered test for the flow angle and velocity at each location was performed within about 1 hour. In general, the stack flow rate at the RS location, which used a standard pitot tube, was slightly lower than the stack flow measurements made at the CAM location using an S-type pitot tube. Based on comparisons with the installed stack flow measurement system, the RS location measurements are approximately 3% lower than the installed continuous emissions monitoring system. Because the installed systems agree within 1% between the CAM and RS locations, it appears there is a random low bias at the Bison-measured RS location. Given that the bias is small and cannot be attributed to any obvious source, no adjustments are made to the data. Additionally, the ANSI/HPS N13.1-1999 standard states that for continuously monitored stacks and ducts, the flow measurement and recording system shall be capable of determining the mass flowrate of the effluent stream with an accuracy that is within 10% of that measured with the reference method (i.e., 40 CFR 60, Appendix A, Methods 1 and 2). Based on the requirements of the standard, a 3% difference is acceptable.

Table 6. LV-S3 CAM 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	1	4.6	3,882	6.6	3,489
	2	3.7	3,825	6.9	3,437
	3	5.5	3,887	6.6	3,493
	4	7.2	3,862	6.3	3,471
	5	4.2	3,854	6.1	3,464
Fans B and C	6	5.8	3,865	5.7	3,473
	7	3.1	3,847	5.7	3,458
	8	3.9	3,825	6.1	3,438
	9	5.7	3,849	5.4	3,459
Fans A and C	10	4.1	3,886	6.1	3,493
	11	2.6	3,847	6.5	3,457
	12	3.8	3,842	6.0	3,452
	13	4.0	3,854	5.5	3,464
	14	3.5	3,849	6.0	3,460

Table 7. LV-S3 RS 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	1	3.3	3,556	6.4	3,196
	2	6.2	3,634	5.2	3,266
	3	5.1	3,690	5.1	3,316
	4	5.0	3,713	5.0	3,338
	5	2.9	3,684	4.8	3,311
Fans B and C	6	3.8	3,686	4.4	3,313
	7	3.5	3,689	4.8	3,315
	8	3.5	3,717	5.5	3,341
	9	3.6	3,661	6.1	3,290
Fans A and C	10	4.0	3,735	5.6	3,356
	11	2.8	3,745	4.0	3,366
	12	3.5	3,715	5.3	3,338
	13	3.9	3,705	5.4	3,330
	14	3.3	3,718	5.2	3,341

3.4 LV-C2 Verification Tests

Table 8 summarizes the flow angle and velocity uniformity test results from the LV-C2 stack verification tests. The DV values calculated from the stack nominal diameter and the velocity computed from the EPA Method 1 measurement points are included in Table 8 for reference. 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.

Table 8. LV-C2 Verification Test Results

Fan Configuration	Test Number	Flow Angle (°)	Velocity Uniformity Test Flow (scfm)	Velocity Uniformity (% COV)	DV (ft^2/min)
Fan A	1	2.3	44,156	4.1	11,243
Fans A and B	2	3.6	48,640	1.8	12,388
	3	4.2	48,237	2.7	12,284
	4	2.9	48,776	1.5	12,421
	5	3.1	48,091	3.0	12,245
	6	3.6	48,327	1.7	12,306
	7	3.9	48,677	1.6	12,394
	8	3.8	48,247	1.7	12,287
	9	3.8	49,025	2.4	12,482
	10	4.2	48,213	1.8	12,279
	11	4.7	48,071	2.0	12,243
	12	4.5	47,434	2.3	12,081
	13	3.1	47,239	2.3	12,030
Fan B	14	6.3	48,253	5.0	12,287

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 9 presents a summary of the normal operating velocity for the stack, along with the corresponding DV values. Additionally, Table 9 includes the scale model lower and upper DV values for each stack. For the LV-S1, LV-S2, and LV-C2 stacks, the lower DV lists the DV values themselves, while for the LV-S3 stack, the lower DV lists 1/3 DV values. For the LV-S1, LV-S2, and LV-C2 stacks, the upper DV lists the 6 DV values, while for the LV-S3 stack, the upper DV lists the 3 DV values. The scale model ranges provide the limits of the full-scale stack DV values for which the surrogate stack may be used to represent the full-scale stack. Note that while the LV-S3 stack data sheet listed 18 inches for the outside diameter, DV calculations used 17 inches because this was the inside diameter measured in the field by Bison.

Table 9. Calculation of Acceptable DV Ranges

Stack	Diameter (in.)	Stack Design		Bison Test Condition		Scale Model	
		Operating Velocity[a] (sfpm)	DV (ft^2/min)	Test Velocity[b] (sfpm)	DV (ft^2/min)	Lower DV[c] (ft^2/min)	Upper DV[d] (ft^2/min)
LV-S1	48	3,016	12,064	2,956	11,825	1,575–2,986	9,450–17,914
LV-S2	60	2,380	11,900	1,932	9,659	1,504–4,778	9,025–28,668
LV-S3	17	1,939	2,747	2,393	3,390	452–1,089	4,071–9,801
LV-C2	60	2,582	12,910	2,442	12,212	1,517–3,417	9,099–20,502

a. Velocity based on normal operating flow velocity from stack design documents (available from PNNL).
   - LV-S1: 24590-LAW-JFD-SDJ-21040, Rev. 4
   - LV-S2: 24590-LAW-M8N-C5V-00117
   - LV-S3: 24590-LAW-M6E-LVP-00019
   - LV-C2: 24590-LAW-JFD-SDJ-21010, Rev. 4

b. Velocity based on average velocity measured during velocity uniformity tests performed by Bison.

c. The lower DV for the LV-S1, LV-S2, and LV-C2 stacks are the average DV from the scale model tests. The lower DV for the LV-S3 stack is 1/3 of the average DV from the scale model tests.

d. The upper DV for the LV-S1, LV-S2, and LV-C2 stacks are the maximum 6DV from the scale model tests. The upper DV for the LV-S3 stack is 3 times the average DV from the sale model tests.

There were minor differences between the Bison test conditions and the stack design conditions. There were slightly more substantive differences between the latest design flow rates and the conditions that were in place at the time of the scale model stack tests (e.g., LV-S1 design DV was approximately 12,000 ft^2/min, compared with the scale model DV, which was approximately 2,500 ft^2/min). Therefore, to be complete, comparisons with the scale model stack conditions are made against both sets of conditions (design document and Bison test conditions) for each stack in the sub-sections below. 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. Table 9 summarizes that both the DV from the design document and the DV from the Bison test conditions are within the required 1/6 DV (not shown in Table 9) and 6 DV.

4.1 LV-S1 Qualification

The LV-S1 stack qualification tests were performed on a scale model of the stack constructed at a PNNL outdoor facility. The results were reported in Glissmeyer, Flaherty, and Piepel (2011). At the time of these scale model tests, the design flow rate for the stack was 40,000 scfm, with a maximum flow of 46,000 scfm (which was assumed, based on 115% of the normal flow rate). However, the latest version of the data sheet for this stack (24590-LAW-JFD-SDJ-21040, Rev. 4) reflects that the normal stack flow is 37,905 scfm and maximum flow is 48,000 scfm. While these differences are relatively minor and scale model maximum conditions remain within the range of DV values that represent the normal flow conditions, most of the scale model minimum conditions are below the range needed to represent normal full-scale flows.

Scale model tests with this stack were performed with each fan individually and at flows intended to represent the minimum and maximum stack flow rates. Table 10 presents the results of tests performed on the scale model stack.

Three test port locations were used during the scale model tests and Test Port 2, located 12.4 duct diameters from the nearest upstream disturbance, is the closest scale model port to the sampling port on the full-scale stack (located 10.5 duct diameters from the nearest upstream disturbance). Differences between the velocity uniformity results for minimum and maximum conditions or between Fan A or Fan B operations were relatively minor. Fan A, Port 2 was tested at maximum flow conditions with result of 4.5% COV and 3.6% COV for minimum flow conditions. Overall, the full-scale verification test result with a velocity uniformity value less than 8.6% COV is acceptable, based on the criterion that the two tests (full-scale and surrogate) agree within 5%. Fan B, Port 2 test results from the scale model tests were 5.7% COV on average for maximum flow conditions and 4.8% COV for the single minimum flow condition test that was performed. Velocity uniformity tests with results less than or equal to 9.8% COV meet the ANSI/HPS N13.1-1999 criterion. LV-S1 verification tests performed by Bison were between 1.5 and 3.2% COV with Fan A operations and were between 1.8 and 3.1% COV for Fan B operations, which meets the criterion.

Scale model tests of gaseous and particulate tracer uniformity were performed at the same conditions used for the velocity uniformity tests.

4.2 LV-S2 Qualification

The LV-S2 stack qualification tests were performed on a scale model of the stack constructed at a PNNL outdoor facility. The results were reported in Glissmeyer, Antonio, Flaherty, and Amidan (2014). At the time of these tests, the design flow rate for the stack was 60,117 actual cubic feet per minute (acfm), with a maximum flow of 91,019 acfm. However, the latest change document for this stack (24590-LAW-M8N-C5V-00117) reflects that the normal stack flow is 46,740 scfm. Scale model maximum conditions remain within the range of DV values that represent the normal flow conditions. The scale model minimum conditions are below the range needed to represent normal full-scale flows from the current data sheets; however, Fan A minimum test flows from the scale model tests were large enough to encompass some Bison test DV values.

Table 10. Summary of LV-S1 Scale Model Velocity Uniformity Tests. Adapted from Table 4.14 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	Max	VT-19	2,984	17,902$^{D/B}$	5.9	5.6	0.6≤x≤10.6
		Max	VT-20	2,950	17,699$^{D/B}$	5.5		
		Max	VT-21	2,929	17,573$^{D/B}$	5.4		
	2	Max	VT-22	2,986	17,914$^{D/B}$	4.5	4.5	≤9.5
		Min	VT-18	1,761	10,568^{B}	3.5	3.6	≤8.6
		Min	VT-24	1,686	10,114^{N}	3.7		
	3	Max	VT-23	2,882	17,292$^{D/B}$	6.0	6.0	1.0≤x≤11.0
B	1	Max	VT-12	2,773	16,641$^{D/B}$	6.5	6.5	1.5≤x≤11.5
		Min	VT-13	1,575	9,450^{N}	4.3	4.3	≤9.3
	2	Max	VT-5	2,546	15,278$^{D/B}$	6.2	5.7	0.7≤x≤10.7
		Max	VT-6	2,518	15,111$^{D/B}$	6.1		
		Max	VT-7	2,513	15,081$^{D/B}$	5.1		
		Max	VT-8	2,710	16,258$^{D/B}$	5.7		
		Max	VT-9	2,734	16,402$^{D/B}$	5.2		
		Max	VT-10	2,721	16,324$^{D/B}$	5.7		
		Min	VT-14	1,589	9,534^{N}	4.8	4.8	≤9.8
	3	Max	VT-11	2,829	16,976$^{D/B}$	6.3	6.3	1.3≤x≤11.3
		Min	VT-15	1,670	10,018^{N}	6.4	5.9	0.9≤x≤10.9
		Min	VT-16	1,668	10,006^{N}	4.7		
		Min	VT-17	1,652	9,910^{N}	6.7		

a. Labeling for maximum or minimum flow conditions (i.e., Max or Min) 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 (afpm) 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 latest design values (D), the Bison test conditions (B), or both (D/B). Cases where the listed DV falls below both the data sheet and Bison flow rates are marked by (N). Design DV values are presented in Table 9, and Bison test DV values are presented in Table 4.

Scale model tests with this stack were performed with each fan individually and at flows meant to represent the minimum and maximum stack flow rates. Table 11 presents the results of tests performed on the scale model stack. Test Port 1 corresponds most closely to the location of the sampling port on the full-scale stack monitoring location. Differences between the velocity uniformity results for minimum and maximum conditions or between Fan A or Fan B operations were relatively minor. Fan A, maximum flow conditions had a result of 4.7% COV, while the minimum flow conditions had a result of 4.6% COV. This means that full-scale verification test results with a velocity uniformity value of less than or equal to 9.6% COV is clearly acceptable for Fan A cases. Fan B, maximum flow conditions had a result of 4.0% COV, while the minimum flow result was 5.1% COV. This means that full-scale verification tests with a velocity uniformity value of less than or equal to 9.0% COV is clearly acceptable for Fan B cases. Overall, velocity uniformity verification tests with results less than or equal to 9.0% COV meet the ANSI/HPS N13.1-1999 criterion. LV-S2 verification tests performed by Bison were between 2.8 and 9.2%

COV with Fan A operations and were between 1.9 and 5.3% COV for Fan B operations, which meets the criterion.

Table 11. Summary of LV-S2 Scale Model Velocity Uniformity Tests. Adapted from Table 4.1 of Glissmeyer, Antonio, Flaherty, and Amidan (2014).

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	Max	VT-7	4,778	28,668$^{D/B}$	4.1		
		Max	VT-8	4,458	26,750$^{D/B}$	4.6	4.7	≤9.7
		Max	VT-9	4,513	27,077$^{D/B}$	5.5		
	1	Min	VT-4	1,639	9,836^{B}	4.6		
		Min	VT-5	1,637	9,822^{B}	4.7	4.6	≤9.6
		Min	VT-6	1,660	9,962^{B}	4.5		
B	1	Max	VT-10	4,589	27,536$^{D/B}$	4.0	4.0	≤9.0
		Min	VT-1	1,520	9,122^{N}	5.1		
	1	Min	VT-2	1,505	9,031^{N}	5.2	5.1	0.1≤x≤10.1
		Min	VT-3	1,504	9,025^{N}	5.0		

a. Labeling for maximum or minimum flow conditions (i.e., Max or Min) 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 afpm 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 latest design values (D), the Bison test conditions (B), or both (D/B). Cases where the listed DV falls below both the data sheet and Bison flow rates are marked by (N). Design DV values are presented in Table 9, and Bison test DV values are presented in Table 5.

Scale model tests of gaseous and particulate tracer uniformity were performed at the same conditions used for the velocity uniformity tests and at two different injection port locations.

4.3 LV-S3 Qualification

The LV-S3 stack qualification tests were performed on a scale model of the stack constructed at a PNNL outdoor facility. The results were reported in Glissmeyer, Antonio, Flaherty, and Amidan (2014). At the time of these tests, the design flow rate for the stack was 5,631 acfm, with a maximum flow of 6,258 acfm. However, the latest change document for this stack (24590-LAW-M6E-LVP-00019) reflects that the normal stack flow is 3,056 scfm for one melter and 4,526 scfm for two melter operations. The scale model maximum, normal, and minimum conditions remain within the range of DV values that represent the normal flow conditions.

Scale model tests with this stack were performed with each fan combination and with each fan individually and at flows meant to represent the minimum, normal, and maximum stack flow rates. Table 12 presents the results of tests performed on the scale model stack for the dual-fan conditions. Two test port locations were used during the scale model tests. Test Port 1 corresponds most closely to the RS location, while Test Port 2, located five duct diameters downstream of Test Port 2, corresponds to the CAM location.

Table 12. Summary of LV-S3 Scale Model Velocity Uniformity Tests. Adapted from Table 4.5 of Glissmeyer, Antonio, Flaherty, and Amidan (2014).

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 and B	1	Max	VT-1	2,870	17,219$^{D/B}$	5.9	5.9	0.9≤x≤10.9
		Norm	VT-26	2,591	15,548$^{D/B}$	6.5	6.5	1.5≤x≤11.5
		Min	VT-20	1,385	8,310$^{D/B}$	7.5		
		Min	VT-21	1,377	8,261$^{D/B}$	7.2	7.2	2.2≤x≤12.2
		Min	VT-22	1,373	8,235$^{D/B}$	6.9		
	2	Min	VT-23	1,385	8,312$^{D/B}$	8.4		
		Min	VT-24	1,403	8,420$^{D/B}$	9.3	8.6	3.6≤x≤13.6
		Min	VT-25	1,357	8,142$^{D/B}$	8.0		
B and C	1	Max	VT-5	3,235	19,412$^{D/B}$	5.6		
		Max	VT-6	3,211	19,265$^{D/B}$	5.7	5.5	0.5≤x≤10.5
		Max	VT-7	3,179	19,071$^{D/B}$	5.3		
		Norm	VT-8	2,918	17,507$^{D/B}$	6.0	6.0	1.0≤x≤11.0
		Min	VT-9	1,493	8,959$^{D/B}$	7.0	7.0	2.0≤x≤12.0
	2	Max	VT-2	3,267	19,602$^{D/B}$	6.1		
		Max	VT-3	3,237	19,421$^{D/B}$	5.8	6.0	1.0≤x≤11.0
		Max	VT-4	3,248	19,486$^{D/B}$	6.0		
A and C	1	Max	VT-18	3,251	19,508$^{D/B}$	5.1	5.1	0.1≤x≤10.1
	1	Min	VT-19	1,546	9,274$^{D/B}$	7.1	7.1	2.1≤x≤12.1

a. Labeling for maximum or minimum or flow conditions (i.e., Max or Min) 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 afpm 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 latest design values (D), the Bison test conditions (B), or both (D/B) Design DV values are presented in Table 9, and Bison test DV values are presented in Table 6 and Table 7.

The combination of Fan A and B at minimum flow conditions had an average result of 8.6% COV at the Test Port 2 location, while those same minimum flow conditions had an average result of 7.2% COV at the Test Port 1 location. Single tests were performed at the normal and maximum flow conditions, and these tests resulted in 6.5% COV and 5.9% COV, respectively. Similar results were obtained when the combination of Fan B and C were operated. In this case, multiple maximum flow tests were performed at Test Port 2 with an average result of 6.0% COV, while the Test Port 1 result at maximum flow was slightly lower, with an average of 5.5% COV. Normal and minimum flow tests at Test Port 1 were 6.0% COV and 7.0% COV, respectively. The Fan A and C combination corroborates the similar results of the other fan combinations, with a Test Port 1 maximum flow result of 5.1% COV, and a minimum flow result of 7.1% COV.

Based on these scale model results, full-scale verification test results with a velocity uniformity value between 3.6% COV and 10.1% COV meets the criteria for all cases. LV-S3 verification tests performed by Bison were between 4.0 and 6.4% COV at the RS location, which meets the criterion. CAM location results were between 5.4% COV and 6.9% COV, which also meets the criterion.

Scale model tests of gaseous and particulate tracer uniformity were performed at conditions like the velocity uniformity tests.

4.4 LV-C2 Qualification

The LV-C2 stack qualification tests were performed on a scale model of the stack constructed at a PNNL outdoor facility. The results were reported in Glissmeyer, Antonio, and Flaherty (2015). At the time of these tests, the design flow rate for the stack was 50,500 scfm, with a maximum flow of 55,550 scfm. However, the latest version of the data sheet for this stack (24590-LAW-JFD-SDJ-21010, Rev. 4) reflects that the normal stack flow is 50,680 scfm and maximum flow is 62,800 scfm. The scale model maximum and scale model normal conditions remain within the range of DV values that represent the current stack normal flow conditions. The scale model minimum conditions are below the range needed to represent normal full-scale flows.

Scale model tests with this stack were performed with each fan operated alone, as well as dual-fan operations at flows that were meant to represent the minimum, normal, and maximum stack flow rates. Table 13 presents the results of tests performed on the scale model stack.

Table 13. Summary of LV-C2 Scale Model Velocity Uniformity Tests. Adapted from Table 4.1 of Glissmeyer, Antonio, and Flaherty (2015).

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	Max	VT-12	3,313	19,880$^{D/B}$	2.1	2.1	≤7.1
		Norm	VT-16	2,698	16,186$^{D/B}$	2.5	2.5	≤7.5
		Min	VT-13	1,666	9,996^{N}	2.7		
		Min	VT-14	1,658	9,946^{N}	2.6	2.7	≤7.7
		Min	VT-15	1,661	9,965^{N}	2.7		
B	1	Max	VT-1	3,417	20,502$^{D/B}$	3.4		
		Max	VT-2	3,363	20,181$^{D/B}$	4.4	4.0	≤9.0
		Max	VT-3	3,347	20,081$^{D/B}$	4.2		
		Norm	VT-5	2,700	16,198$^{D/B}$	2.8		
		Norm	VT-6	2,938	17,627$^{D/B}$	4.9	4.3	≤9.3
		Norm	VT-7	2,468	14,810$^{D/B}$	5.2		
		Min	VT-4	1,517	9,099^{N}	5.1	5.1	0.1≤x≤10.1
A and B	1	Max	VT-8	3,074	18,444$^{D/B}$	3.7		
		Max	VT-9	3,073	18,441$^{D/B}$	3.2	3.4	≤8.4
		Max	VT-10	3,059	18,352$^{D/B}$	3.3		
		Min	VT-11	1,655	9,930^{N}	3.7	3.7	≤8.7

a. Labeling for maximum or minimum flow conditions (i.e., Max or Min) 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 afpm were converted to sfpm using 68°F as the standard temperature.
c. DV values result in the latest design values (D), the Bison test conditions (B), or neither (N) fell within the range for the use of scale model stack qualification data. Design DV values are presented in Table 9, and Bison test DV values are presented in Table 8.

While there were limited numbers of tests performed at each flow condition, higher flows tended to have slightly higher levels of mixing compared with lower flows within a specific fan configuration. Fan A maximum flow conditions had a result of 2.1% COV, while the minimum flow conditions had an average result of 2.7% COV. This means that full-scale verification test results with a velocity uniformity value of less than or equal to 7.1% COV is clearly acceptable for Fan A cases. Fan B maximum flow conditions had a result of 4.0% COV, while the minimum flow result was 5.1% COV. This means that full-scale verification tests with a velocity uniformity value of less than or equal to 9.0% COV is clearly acceptable for Fan B cases. For dual-fan operations, scale model tests averaged 3.4% COV at maximum flow conditions, which results in an acceptable verification result of 8.4% COV. Overall, velocity uniformity verification tests with results less than or equal to 7.1% COV meet the ANSI/HPS N13.1-1999 criterion. The LV-S2 verification test performed by Bison was 4.1% COV with Fan A operations, 5.0% COV for Fan B operations, and were between 1.5 and 3.0% COV for dual-fan operations, which meets the criterion.

Scale model tests of gaseous and particulate tracer uniformity were performed at conditions like the velocity uniformity tests.

5.0 Summary/Discussion

The WTP LAW 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 14 summarizes the stack design conditions, including the duct diameter, the distance to the nearest upstream disturbance from the scale model and full-scale stack tests, and the operating fans.

Table 14. LAW Stack Design Summary

Stack Parameter	LV-S1[a]	LV-S2[b]	LV-S3[c]	LV-C2[d]
Duct diameter at sampling probes (in.)	48	60	18	60
Number of duct diameters from scale model test port to upstream disturbance	12.4	18.4	35.5 / 42.5[e]	10.0
Number of duct diameters from full-scale test port to upstream disturbance	10.5	18.4	37.2 / 44.2[e]	10.5
Total available fans	2	2	3	2
Number of operating fans	1	1	2	1
Design Normal operating flow rate (scfm)	37,905	46,740	3,056/4,526[f]	50,680

a. DS No: 24590-LAW-JFD-SDJ-21040, Rev 4 (available from PNNL)
b. DS No: 24590-LAW-JFD-SDJ-21080, Rev 3, CD No. 24590-LAW-M8N-C5V-00117 (available from PNNL)
c. DS No: 24590-LAW-JFD-SDJ-21130, Rev 2, CD No. 24590-LAW-M6E-LVP-00019 (available from PNNL)
d. DS No: 24590-LAW-JFD-SDJ-21010, Rev 4 (available from PNNL)
e. LV-S3 distances for the RS and CAM locations, respectively
f. The LV-S3 operating flow for one melter is 3,056 scfm, while for two melters, it is 4,526 scfm.

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 tests. In this analysis, the range from the average DV through 6 DV from the scale model stack tests was used for the LV-S1, LV-S2, and LV-C2 stacks and 1/3 DV through 3 DV for the LV-S3 stack. Table 15 summarizes the stack flow conditions from the verification tests 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 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 those tests. The lower and upper qualified stack flow rates are based on the DV values from the scale model tests and does 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 14) are also within the acceptable range.

Table 15. LAW Stack Sampling/Monitoring Location Qualification Summary

Stack Parameter	LV-S1	LV-S2	LV-S3	LV-C2
Verification Test Average Flow Rate (scfm)	37,147	37,930	3,772	47,956
Verification Test Average DV (ft^2/min)	11,825	9,659	3,390	12,212
Lower Scale Model DV (ft^2/min)[a]	2384	2780	784	2600
Upper Scale Model DV (ft^2/min)[b]	17,914	28,668	7,054	20,502
Lower Qualified Stack Velocity (sfpm)	596	556	553	520
Upper Qualified Stack Velocity (sfpm)	4,479	5,734	4,979	4,100
Lower Qualified Stack Flow (scfm)	7,489	10,919	872	10,212
Upper Qualified Stack Flow (scfm)	56,279	112,580	7,849	80,512

a. Lower DV values at the LAW stacks based on DV from the LV-S1, LV-S2, and LV-C2 scale model tests, or based on 1/3 DV from the LV-S3 scale model tests; also found in Table 2.
b. Upper DV values at the LAW stacks based on 6 DV from the LV-S1, LV-S2, and LV-C2 scale model tests, or based on 3 DV from the LV-S3 scale model tests; also found in Table 2 and Table 9.

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. These criteria were met through the full-scale stack tests at the LAW facility, as shown in Table 16.

Based on these stack verification test results, the four LAW filtered exhaust stack sampling locations meet the qualification criteria provided in the ANSI/HPS N13.1-1999 standard for all fan operating conditions. This includes single-fan operating conditions for LV-S1 and LV-S2, dual-fan operations for LV-S3 at both the CAM and RS locations, and both the single-fan as well as the dual-fan operations for LV-C2. Further changes to the system configuration or operating conditions that are outside the qualified flow rates described in this report may require additional tests or analyses to determine compliance with the standard.

Table 16. LAW Stack Sampling/Monitoring Location Qualification Test Result Summary

Stack	Operating Fan(s)	Average Flow Angle (°)	Average Velocity Uniformity (% COV)	Target % COV[a]
LV-S1	Fan A Only	5.6	1.9	≤8.9
	Fan B Only	4.4	2.4	0.5≤x≤10.5
LV-S2	Fan A Only	5.1	6.0	≤9.7
	Fan B Only	3.2	4.3	≤9.8
LV-S3 CAM	Exhauster A and B	5.0	6.5	3.6≤x≤13.6
	Exhauster B and C	4.6	5.7	1.0≤x≤11.0
	Exhauster A and C	3.6	6.0	1.1≤x≤11.1[b]
LV-S3 RS	Exhauster A and B	4.5	5.3	1.8≤x≤11.8
	Exhauster B and C	3.6	5.2	0.9≤x≤10.9
	Exhauster A and C	3.5	5.1	1.1≤x≤11.1
LV-C2	Fan A Only	2.3	4.1	≤7.5
	Fan A and B	3.8	2.1	≤8.5
	Fan B Only	6.3	5.0	≤9.3

a. The % COV values are based on the most comparable scale model test conditions when available or the most conservative bounds when multiple, similarly comparable conditions exist.
b. LV-S3 scale model stack tests were not performed at Test Port 2 (the CAM location) with Fans A and C in operation. The Target % COV listed here is for the Test Port 1 result.

6.0 References

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

40 CFR 52, Appendix E. “Performance Specifications and Specification Test Procedures for Monitoring Systems for Effluent Stream Gas Volumetric Flow Rate.” *Code of Federal Regulations,* U.S. Environmental Protection Agency.

40 CFR 60, Appendix A. “Test Methods 1 through 2F.” *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 and reissued in 2021 as ANSI/HPS N13.1-2021).

ASME NQA-1-2000. 2000. *Quality Assurance Requirement for Nuclear Facility Applications*. The American Society of Mechanical Engineers, New York, New York.

DOE Order 414.1D. “Quality Assurance.” U.S. Department of Energy, Washington, D.C.

Glissmeyer JA, EJ Antonio, JE Flaherty, and BG Amidan. 2014. *Assessment of the LV-S2 & LV-S3 Stack Sampling Probe Locations for Compliance with ANSI/HPS N13.1-1999*. PNNL-23386, WTP-RPT-231 Rev 0, Pacific Northwest National Laboratory, Richland, Washington.

Glissmeyer JA, EJ Antonio, and JE Flaherty. 2015. *Assessment of the LV-C2 Stack Sampling Probe Locations for Compliance with ANSI/HPS N13.1-1999*. PNNL-24467, WTP-RPT-236 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.

Peterson R to C Luchi. April 10, 2020. *Subcontract No. 24590-QL-HC9-WA49-00001, Project No. 53024 (WA#09) Transmittal of Revised LAW Verification Test Input Document*. [Memorandum] WTP/RPP-MOA-PNNL-01019, Rev 0.0, Pacific Northwest National Laboratory, Richland, Washington.

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

Appendix A – LV-S1 Stack Verification Data Sheets

A.1 Flow Angle Data Forms

FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-1
Date	5/24/2021	Fan Setting	NA Hz
Start/End Time	14:17 14:26	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	79.7 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	3.0	1.5	1.4	2.0	6.1	5.9	6.3	6.1
2	5.04	3.0	2.8	2.8	2.9	6.5	6.6	4.9	6.0
3	9.31	5.2	4.7	4.4	4.8	6.4	5.9	5.6	6.0
4	15.50	7.5	7.4	6.6	7.2	1.2	1.0	1.5	1.2
Center	24.00	12.4	12.2	11.3	12.0	3.2	4.0	3.3	3.5
5	32.50	3.1	4.9	4.5	4.2	2.6	2.2	2.1	2.3
6	38.69	8.3	6.7	7.6	7.5	3.8	3.3	3.3	3.5
7	42.96	3.9	3.9	3.8	3.9	2.3	2.1	2.2	2.2
8	46.96	6.6	6.8	7.0	6.8	0.3	0.3	1.4	0.7
Mean of absolute values:					5.7				3.5
" " w/o points by wall:					6.0				3.5
								Grand mean ABS	4.6
								Grand mean ABS w/o wall pts	4.8

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

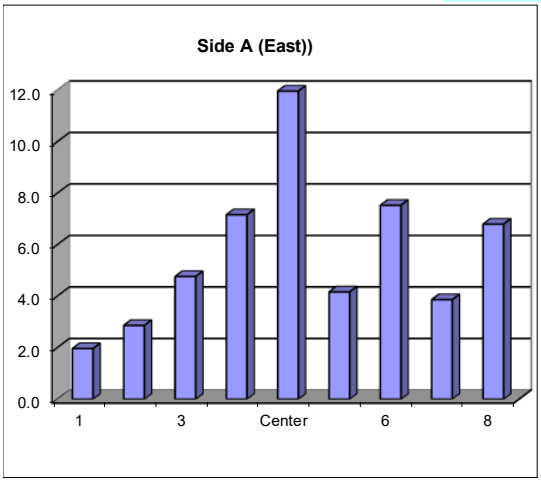
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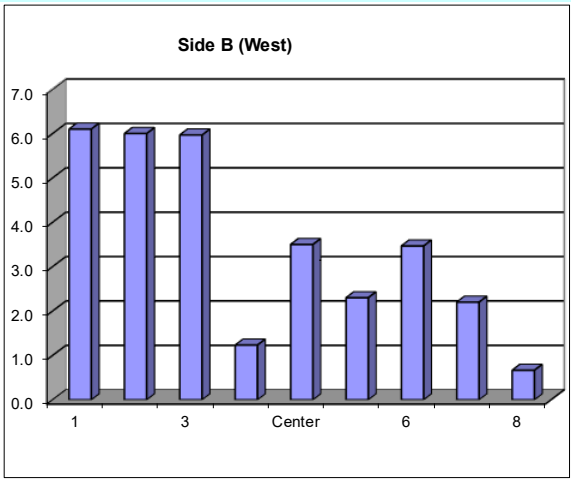
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-2
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	10:03 10:12	Fan Configuration	A
Testers	ZDH/LCE	Stack Temp	79.2 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	10.6	12.1	11.1	11.3	4.5	2.6	4.8	4.0
2	5.04	10.1	11.5	10.7	10.8	7.9	6.3	6.3	6.8
3	9.31	11.3	10.8	11.1	11.1	7.5	7.7	6.9	7.4
4	15.50	10.3	9.9	9.2	9.8	5.6	4.7	5.5	5.3
Center	24.00	13.4	13.9	13.8	13.7	2.7	2.7	2.6	2.7
5	32.50	13.2	13.1	13	13.1	0.1	1.2	1.9	1.1
6	38.69	10.1	9.6	8.9	9.5	5.5	4.3	4.5	4.8
7	42.96	5.6	3.2	5.6	4.8	3.4	3.9	4.2	3.8
8	46.96	3.8	4.8	5.3	4.6	4.3	4.7	3.9	4.3
Mean of absolute values:					9.9				4.5
" " w/o points by wall:					10.4				4.5
								Grand mean ABS	7.2
								Grand mean ABS w/o wall pts	7.5

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

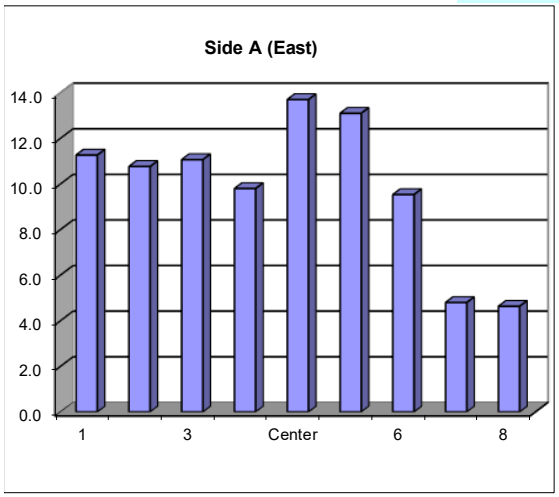
Note:

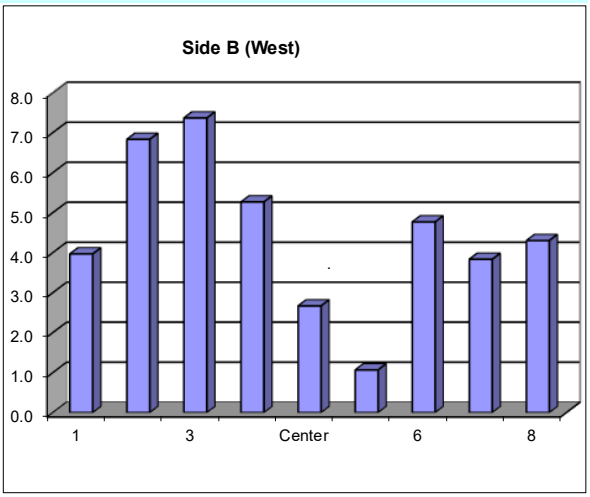
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-3
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	11:18 11:25	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	80.2 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.54	13.0	13.1	12.5	12.9	10.6	10.7	10.7	10.7
2 / 5.04	12.5	11.9	11.7	12.0	11.5	11.3	9.0	10.6
3 / 9.31	9.6	6.3	9.0	8.3	5.5	5.9	4.5	5.3
4 / 15.50	7.4	6.6	6.3	6.8	4.4	3.3	4.2	4.0
Center / 24.00	2.6	3.0	2.5	2.7	1.4	1.9	2.2	1.8
5 / 32.50	3.6	4.3	5.3	4.4	1.8	1.5	0.4	1.2
6 / 38.69	5.9	4.7	4.7	5.1	1.0	1.3	1.9	1.4
7 / 42.96	4.4	4.3	4.6	4.4	2.5	2.4	1.7	2.2
8 / 46.96	4.1	3.7	4.0	3.9	0.8	0.6	1.0	0.8
Mean of absolute values:				6.7				4.2
" " w/o points by wall:				6.2				3.8
							Grand mean ABS	5.5
							Grand mean ABS w/o wall pts	5.0

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

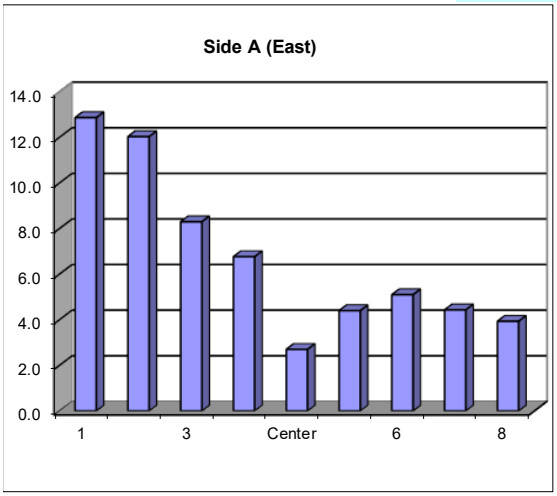
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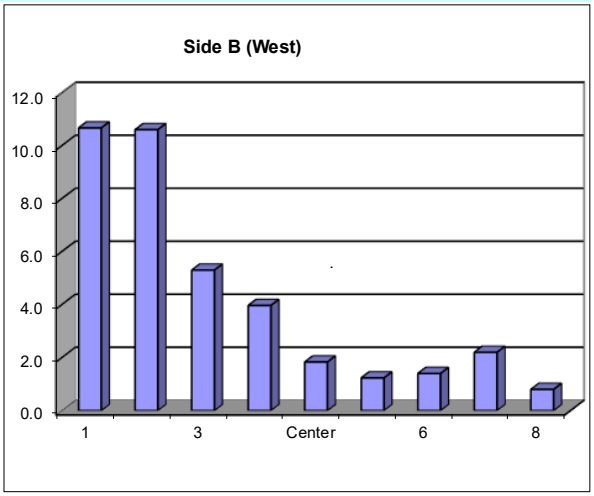
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-4
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	13:30 13:37	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	79.8 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	11.0	10.8	11.0	10.9	6.4	5.0	5.2	5.5
2	5.04	12.6	12.2	12.2	12.3	5.1	6.8	4.7	5.5
3	9.31	12.3	11.8	11.7	11.9	11.3	11.6	10.7	11.2
4	15.50	7.0	6.2	6.0	6.4	14.4	14.1	14.6	14.4
Center	24.00	10.8	11.6	10.9	11.1	1.0	0.8	2.1	1.3
5	32.50	5.0	4.9	5.1	5.0	6.9	6.7	5.9	6.5
6	38.69	6.3	3.4	3.0	4.2	7.5	6.6	5.9	6.7
7	42.96	0.2	0.3	0.0	0.2	5.0	5.1	4.8	5.0
8	46.96	9.0	8.7	9.0	8.9	5.5	2.5	0.4	2.8
Mean of absolute values:					7.9				6.5
" " w/o points by wall:					7.3				7.2
								Grand mean ABS	7.2
								Grand mean ABS w/o wall pts	7.3

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

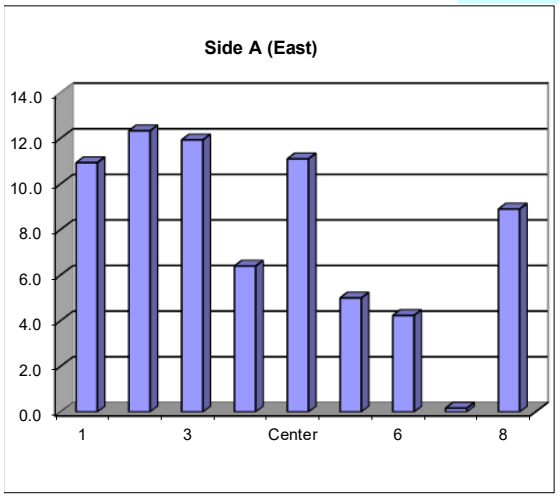
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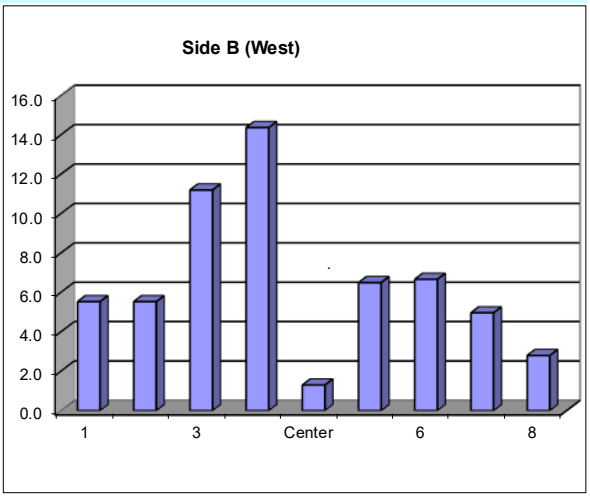
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-5
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	14:32 14:38	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	81.3 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	10.0	9.7	9.5	9.7	7.6	5.3	7.7	6.9
2	5.04	9.7	9.4	8.8	9.3	4.5	4.4	1.8	3.6
3	9.31	8.5	8.9	8.4	8.6	5.5	4.7	5.3	5.2
4	15.50	9.0	8.9	8.5	8.8	4.8	4.5	4.3	4.5
Center	24.00	6.4	5.0	4.9	5.4	2.1	0.8	1.5	1.5
5	32.50	4.9	4.8	5.4	5.0	1.2	2.4	2.7	2.1
6	38.69	5.5	4.4	5.1	5.0	0.4	2.4	1.8	1.5
7	42.96	5.7	6.1	5.9	5.9	2.7	1.6	1.4	1.9
8	46.96	7.9	8.0	8.5	8.1	0.1	1.3	1.3	0.9
Mean of absolute values:					7.3				3.1
" " w/o points by wall:					6.9				2.9
								Grand mean ABS	5.2
								Grand mean ABS w/o wall pts	4.9

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

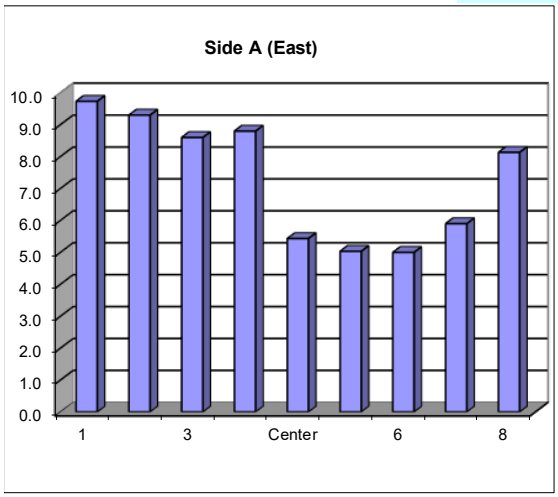
Note:

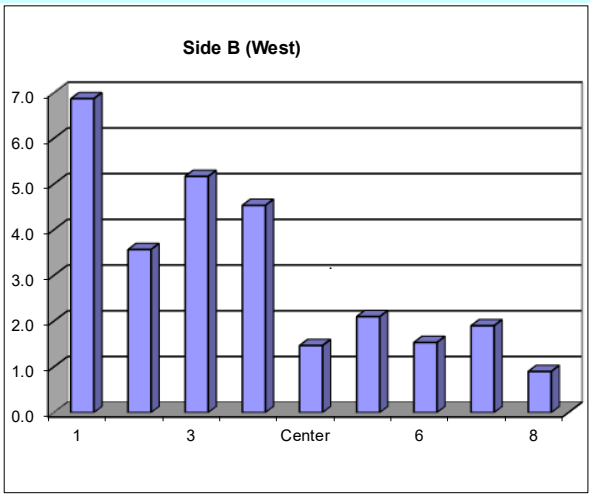
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-6
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	9:57 10:03	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	79.7 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ---->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	3.7	2.9	2.5	3.0	4.5	5.4	5.9	5.3
2	5.04	0.9	1.1	1.1	1.0	6.1	5.6	5.4	5.7
3	9.31	1.7	1.8	1.3	1.6	6.2	5.9	6.1	6.1
4	15.50	5.7	6.5	5.9	6.0	1.1	1.3	0.7	1.0
Center	24.00	3.1	2.9	3.1	3.0	6.3	3.3	2.9	4.2
5	32.50	4.2	3.5	4.0	3.9	1.8	1.3	1.0	1.4
6	38.69	3.9	3.5	4.1	3.8	2.7	2.5	1.9	2.4
7	42.96	5.3	5.0	5.1	5.1	2.2	0.6	0.5	1.1
8	46.96	4.2	4.2	4.5	4.3	1.2	0.9	0.0	0.7
Mean of absolute values:					3.5				3.1
" " w/o points by wall:					3.5				3.1
								Grand mean ABS	3.3
								Grand mean ABS w/o wall pts	3.3

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

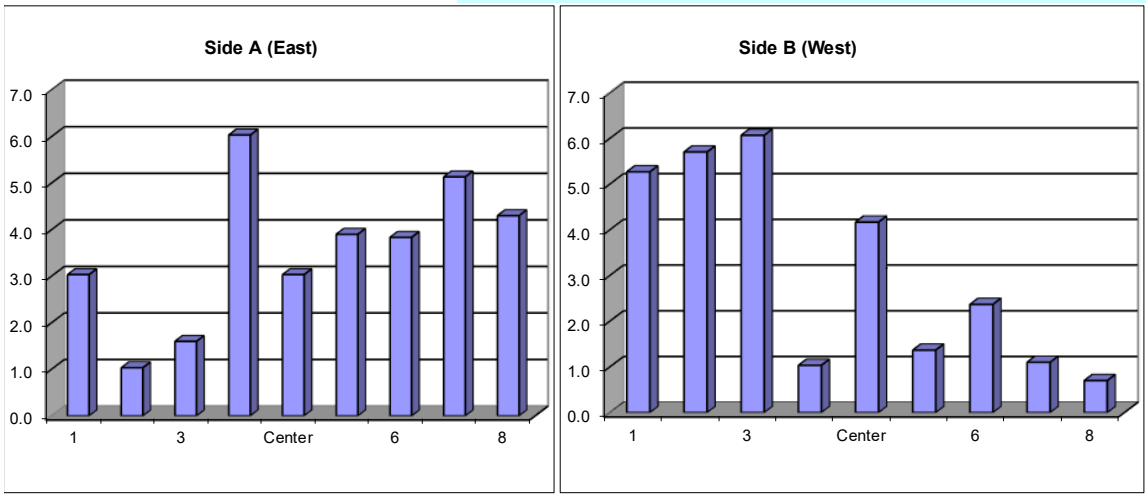
Note:

Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form



FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-7
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	11:04 11:12	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	80.3 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.54	3.6	3.0	3.7	3.4	5.2	4.7	5.2	5.0
2 / 5.04	7.9	7.6	7.5	7.7	6.5	7.2	6.0	6.6
3 / 9.31	7.9	7.2	7.3	7.5	2.1	1.8	2.5	2.1
4 / 15.50	7.9	8.1	7.9	8.0	4.6	6.0	4.9	5.2
Center / 24.00	8.8	8.8	9.4	9.0	4.5	5.9	5.0	5.1
5 / 32.50	9.3	9.0	8.9	9.1	6.0	6.3	5.7	6.0
6 / 38.69	8.1	8.3	8.3	8.2	3.6	2.9	2.7	3.1
7 / 42.96	8.2	7.0	6.8	7.3	3.5	2.2	2.5	2.7
8 / 46.96	7.9	9.1	8.2	8.4	1.8	1.1	1.0	1.3
Mean of absolute values:				7.6				4.1
" " w/o points by wall:				8.1				4.4
							Grand mean ABS	5.9
							Grand mean ABS w/o wall pts	6.3

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

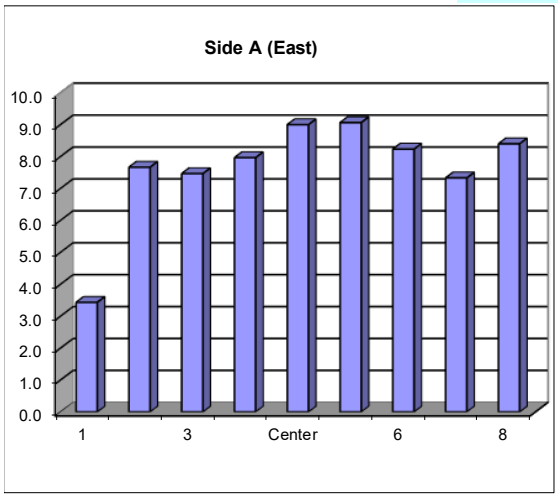
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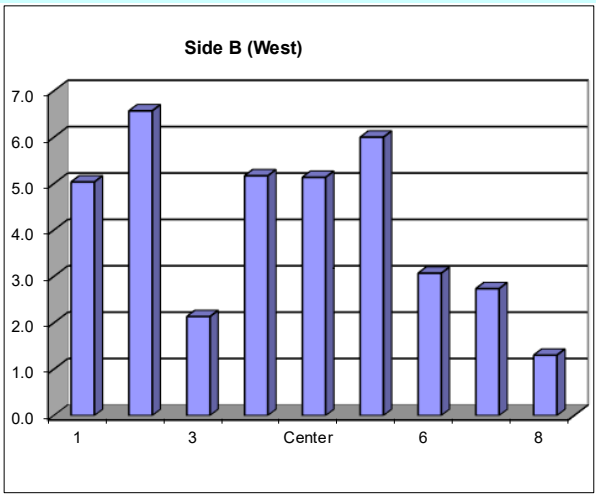
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-8
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	13:15 13:21	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	80.2 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	5.8	6.1	6.4	6.1	1.1	1.2	0.5	0.9
2	5.04	7.7	7.0	6.8	7.2	4.2	4.1	3.7	4.0
3	9.31	8.6	8.1	8.0	8.2	1.5	1.7	1.9	1.7
4	15.50	8.1	8.3	8.3	8.2	0.3	0.5	1.5	0.8
Center	24.00	11.5	11.2	11.3	11.3	5.8	4.4	4.5	4.9
5	32.50	11.4	11.0	11.6	11.3	4.2	3.2	3.0	3.5
6	38.69	10.3	10.4	10.2	10.3	0.5	0.0	0.2	0.2
7	42.96	7.7	7.4	8.5	7.9	0.1	0.6	0.7	0.5
8	46.96	8.0	7.9	8.0	8.0	1.1	0.4	0.2	0.6
Mean of absolute values:					8.7				1.9
" " w/o points by wall:					9.2				2.2
								Grand mean ABS	5.3
								Grand mean ABS w/o wall pts	5.7

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

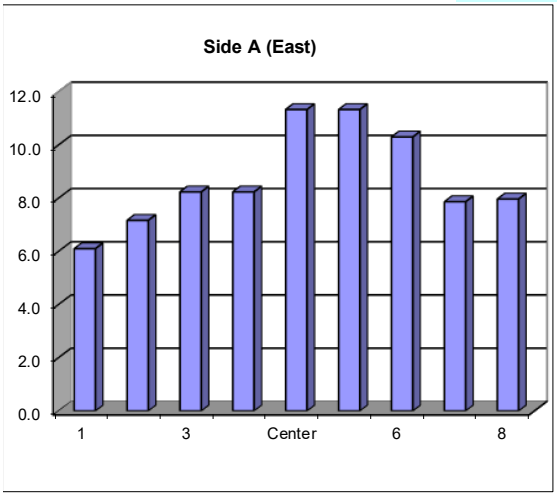
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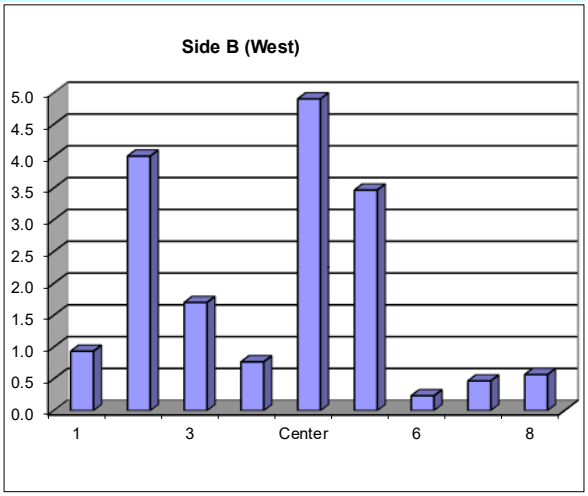
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-9
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	14:19 14:26	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	80.9 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.54	4.5	4.4	4.1	4.3	0.5	0.2	1.0	0.6
2 / 5.04	7.1	7.1	7.0	7.1	0.5	1.8	1.2	1.2
3 / 9.31	9.0	8.7	8.9	8.9	1.8	2.1	2.3	2.1
4 / 15.50	8.8	8.7	8.5	8.7	0.6	3.2	1.5	1.8
Center / 24.00	12.1	12.0	12.0	12.0	2.5	2.6	2.8	2.6
5 / 32.50	5.3	6.0	5.6	5.6	2.3	1.5	2.1	2.0
6 / 38.69	6.9	6.8	7.0	6.9	3.4	4.0	4.3	3.9
7 / 42.96	7.3	6.7	7.0	7.0	3.4	2.6	1.1	2.4
8 / 46.96	3.9	4.0	4.3	4.1	2.8	2.1	2.6	2.5
Mean of absolute values:				7.2				2.1
" " w/o points by wall:				8.0				2.3
							Grand mean ABS	4.6
							Grand mean ABS w/o wall pts	5.1

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

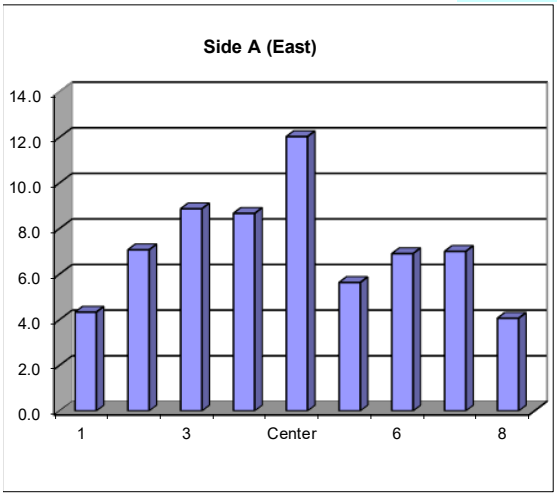
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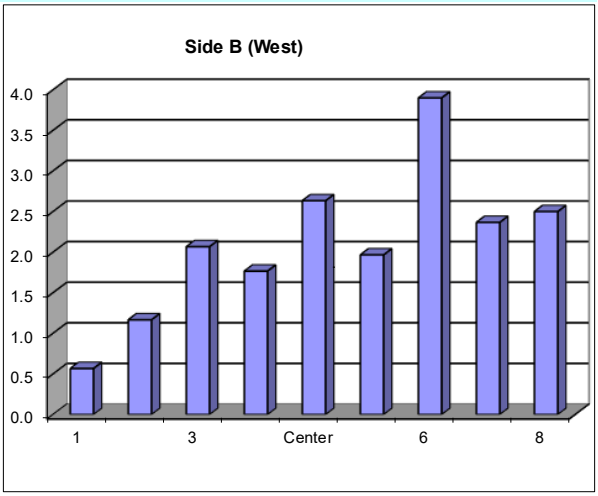
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-10
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	9:32 9:38	Fan Configuration	B
Testers	ZDH/LCE	Stack Temp	81.7 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ----->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.54	1.4	1.6	1.8	1.6	6.5	5.4	4.3	5.4
2 / 5.04	4.1	3.3	3.7	3.7	1.2	1.6	1.6	1.5
3 / 9.31	4.0	4.7	5.3	4.7	3.3	2.9	2.5	2.9
4 / 15.50	8.7	8.2	8.6	8.5	4.8	4.0	4.2	4.3
Center / 24.00	12.0	11.0	12.3	11.8	11.2	10.1	11.0	10.8
5 / 32.50	9.0	8.5	8.6	8.7	4.4	5.1	3.8	4.4
6 / 38.69	5.5	4.5	4.4	4.8	1.1	0.1	0.4	0.5
7 / 42.96	3.9	4.6	5.0	4.5	1.3	0.8	0.6	0.9
8 / 46.96	4.8	4.4	4.1	4.4	1.9	1.2	1.8	1.6
Mean of absolute values:				5.9				3.6
" " w/o points by wall:				6.7				3.6
							Grand mean ABS	4.7
							Grand mean ABS w/o wall pts	5.1

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

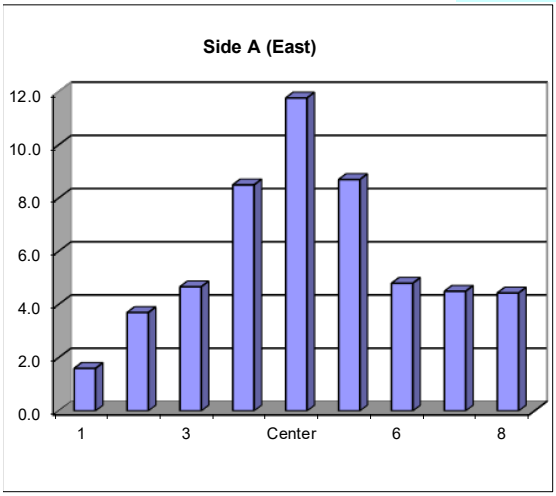
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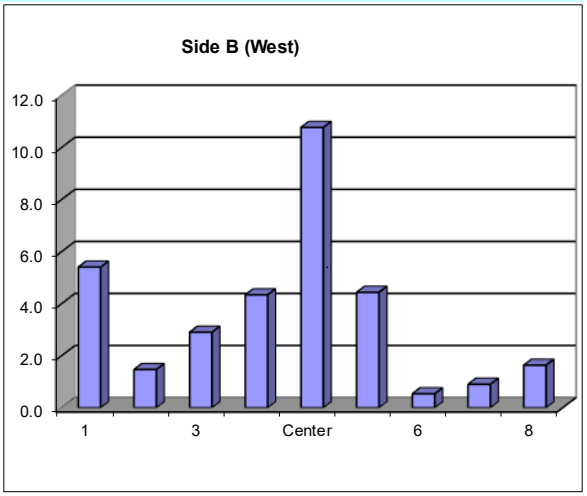
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-11
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	10:37 10:44	Fan Configuration	B
Testers	ZDH/LCE	Stack Temp	82.8 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ----->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	2.0	2.4	2.5	2.3	0.7	0.5	0.6	0.6
2	5.04	6.7	6.0	5.5	6.1	0.8	0.9	0.5	0.7
3	9.31	6.0	5.9	6.0	6.0	0.5	1.8	2.2	1.5
4	15.50	7.9	7.7	8.0	7.9	1.0	0.6	0.4	0.7
Center	24.00	8.7	8.3	8.2	8.4	0.8	1.3	1.5	1.2
5	32.50	7.1	7.9	7.0	7.3	2.3	3.1	2.3	2.6
6	38.69	8.9	9.0	8.5	8.8	1.8	2.5	1.9	2.1
7	42.96	7.7	8.7	8.5	8.3	3.2	2.1	3.7	3.0
8	46.96	8.8	9.2	9.3	9.1	1.4	2.5	2.1	2.0
Mean of absolute values:					7.1				1.6
" " w/o points by wall:					7.5				1.7
								Grand mean ABS	4.4
								Grand mean ABS w/o wall pts	4.6

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

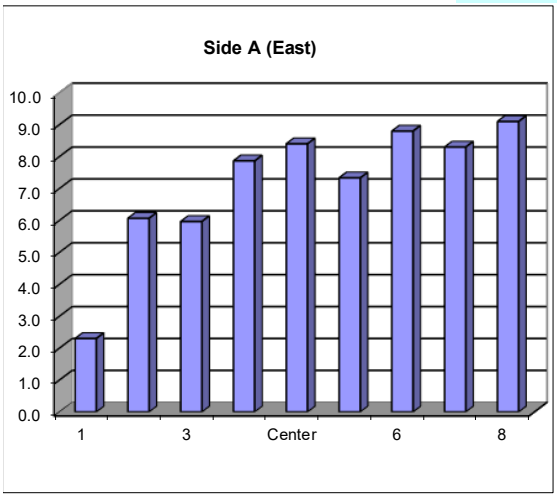
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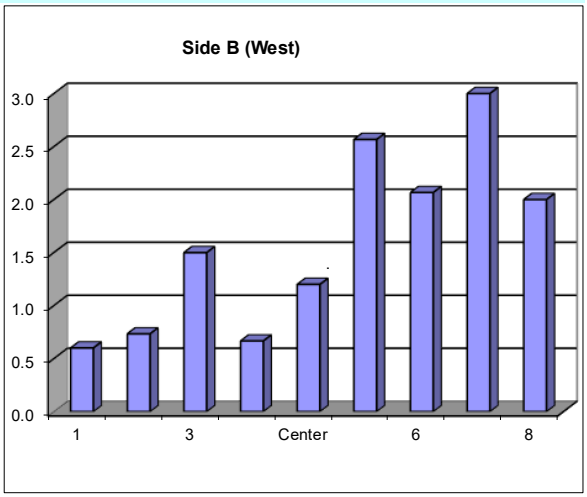
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-12
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	11:38 11:43	Fan Configuration	B
Testers	ZDH/LCE	Stack Temp	83.0 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.54	3.2	2.9	3.2	3.1	0.7	0.9	1.0	0.9
2 / 5.04	6.7	6.0	5.5	6.1	2.6	2.6	3.0	2.7
3 / 9.31	4.3	5.0	4.6	4.6	1.6	1.3	0.0	1.0
4 / 15.50	7.3	7.1	6.1	6.8	0.5	1.3	1.9	1.2
Center / 24.00	1.9	1.8	1.9	1.9	3.5	3.0	2.9	3.1
5 / 32.50	0.8	0.9	0.3	0.7	0.4	1.2	0.5	0.7
6 / 38.69	2.6	2.5	2.1	2.4	1.4	1.6	1.0	1.3
7 / 42.96	3.2	3.4	3.2	3.3	2.3	1.5	1.9	1.9
8 / 46.96	1.8	1.9	1.9	1.9	1.7	2.5	1.4	1.9
Mean of absolute values:				3.4				1.6
" " w/o points by wall:				3.7				1.7
							Grand mean ABS	2.5
							Grand mean ABS w/o wall pts	2.7

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

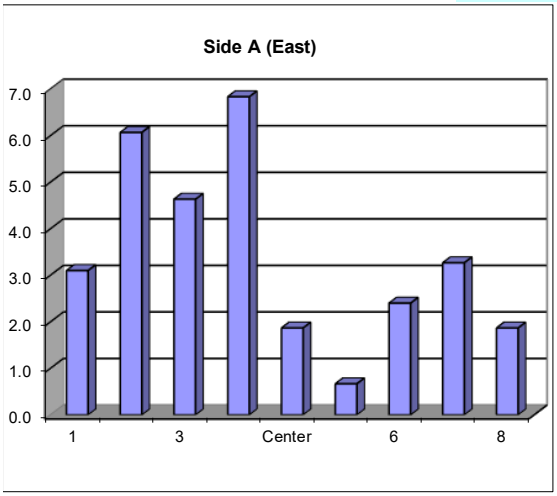
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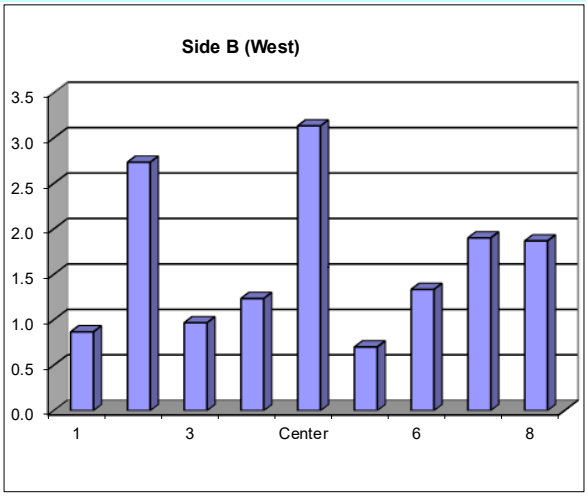
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-13
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	12:43 12:49	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	83.6 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.54	4.1	4.0	3.9	4.0	6.9	5.9	6.2	6.3
2 / 5.04	7.5	7.1	7.2	7.3	7.0	5.9	4.8	5.9
3 / 9.31	2.3	2.5	2.3	2.4	5.3	4.9	4.9	5.0
4 / 15.50	5.9	6.1	6.8	6.3	5.0	5.3	5.2	5.2
Center / 24.00	7.2	7.5	7.3	7.3	6.9	6.5	5.1	6.2
5 / 32.50	7.0	6.6	6.5	6.7	8.8	7.7	6.7	7.7
6 / 38.69	6.3	6.0	5.6	6.0	2.4	3.3	2.8	2.8
7 / 42.96	7.4	6.9	7.0	7.1	4.5	4.3	3.1	4.0
8 / 46.96	8.9	8.4	8.0	8.4	4.1	2.4	1.7	2.7
Mean of absolute values:				6.2				5.1
" " w/o points by wall:				6.1				5.3
							Grand mean ABS	5.6
							Grand mean ABS w/o wall pts	5.7

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

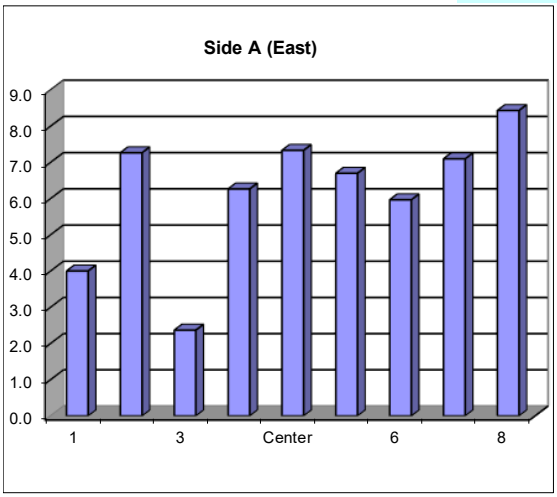
Note:

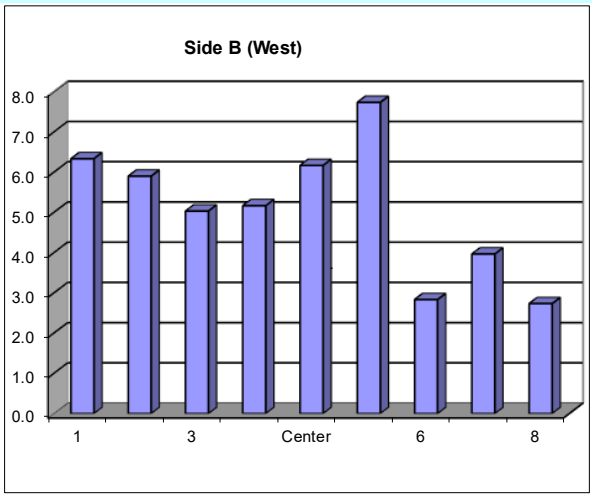
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





FLOW ANGLE DATA FORM

Stack	LV-S1 (C3V)	Run No.	FA-14
Date	5/28/2021	Fan Setting	NA Hz
Start/End Time	9:20 9:28	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	80.1 deg F
Stack Dia.	48 in		
Stack X-Area	1809.6 in2	Units	Degrees
Elevation	691 ft	Ports	A & B
Distance to disturbance	65.67 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.54	3.1	2.8	2.6	2.8	3.6	4.0	3.2	3.6
2	5.04	0.1	0.5	0.8	0.5	3.6	2.5	2.9	3.0
3	9.31	3.3	2.7	2.6	2.9	1.3	0.8	0.7	0.9
4	15.50	1.0	1.6	1.5	1.4	1.7	1.9	1.6	1.7
Center	24.00	1.4	1.1	1.7	1.4	3.3	2.7	2.7	2.9
5	32.50	1.6	1.9	2.3	1.9	3.5	3.3	3.0	3.3
6	38.69	3.3	3.6	3.3	3.4	0.1	0.8	0.1	0.3
7	42.96	1.1	1.3	0.8	1.1	2.5	1.7	0.9	1.7
8	46.96	1.9	1.8	1.5	1.7	0.9	1.3	2.0	1.4
Mean of absolute values:					1.9				2.1
" " w/o points by wall:					1.8				2.0
								Grand mean ABS	2.0
								Grand mean ABS w/o wall pts	1.9

Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	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
Digisense 20250-13 Manometer (SN: 191212877)		Pre-test inspection; post test calibration check.

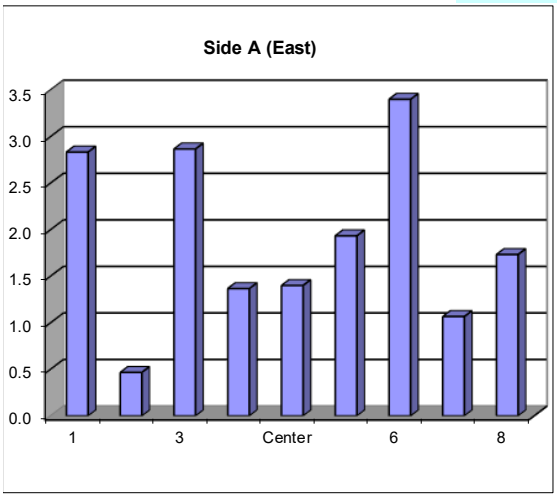
Note:

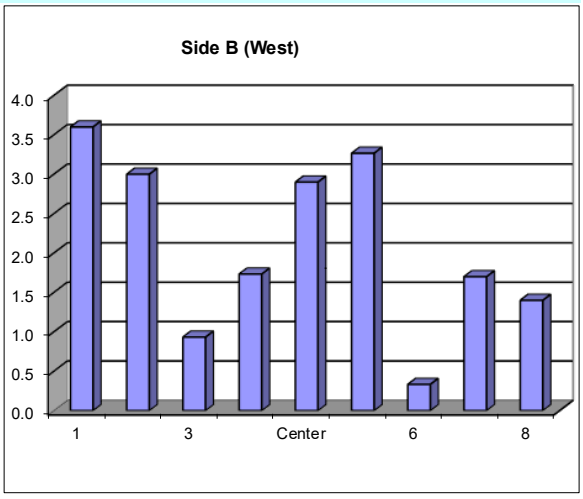
Notes:

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

First traverse point is all the way into the stack

Approx. air velocity was derived from all points on the Verlocity Traverse Form





A.2 Velocity Uniformity Data Forms

VELOCITY TRAVERSE DATA FORM

Stack	LV-S1 (C3V)	Run No.	VT-1
Date	5/24/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	79.7 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:04 14:12
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2,952.9	2,780.8	2,780.8	2,838.2	2,720.9	2,780.8	2,751.0	2,750.9
2	5.04	3,141.8	3,244.9	3,062.4	3,149.7	3,244.9	3,062.4	3,089.1	3,132.1
3	9.31	3,193.8	3,219.4	3,219.4	3,210.9	3,141.8	3,193.8	3,115.6	3,150.4
4	15.50	3,168.0	3,244.9	3,295.2	3,236.0	3,062.4	3,193.8	3,141.8	3,132.7
Center	24.00	3,168.0	3,219.4	3,141.8	3,176.4	3,219.4	3,168.0	3,115.6	3,167.7
5	32.50	3,320.1	3,193.8	3,193.8	3,235.9	3,168.0	3,193.8	3,115.6	3,159.1
6	38.69	3,270.2	3,295.2	3,270.2	3,278.5	3,115.6	3,141.8	3,168.0	3,141.8
7	42.96	3,219.4	3,244.9	3,141.8	3,202.0	3,062.4	3,089.1	3,089.1	3,080.2
8	46.46	3,062.4	3,035.3	2,924.9	3,007.5	2,952.9	2,952.9	2,896.7	2,934.2
Averages ---------->		3,166.3	3,164.3	3,114.5	3,148.4	3,076.5	3,086.3	3,053.6	3,072.1

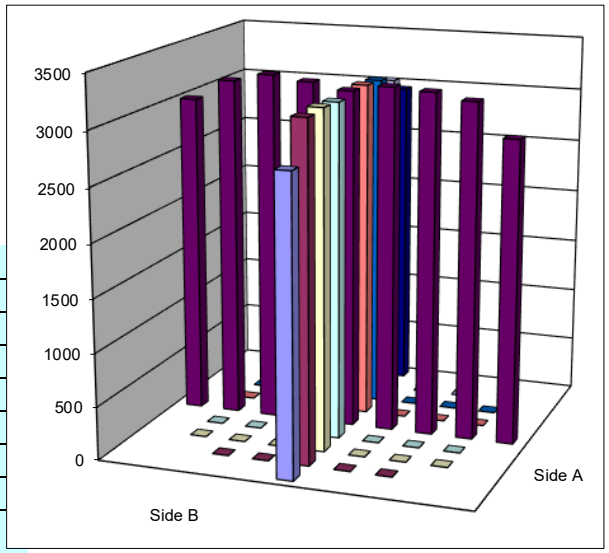
All	ft/min	Dev. from mean	*Center 2/3*	Side	Bottom	All
Mean	3110.2		Mean	3212.8	3137.7	3175.2
Min Point	2750.9	-11.6%	Std. Dev.	42.5	28.6	52.2
Max Point	3278.5	5.4%	COV as %	1.3	0.9	**1.6**

Flow w/o C-Pt 38987 cfm

Vel Avg w/o C-Pt 3103 fpm

	Start	Finish	
Stack temp	80.2	79.2	F
Equipment temp	75.7	75.9	F
Ambient temp	75.7	75.9	F
Stack static	0.67	0.82	mbars
Ambient pressure	987.13	986.79	mbars
Total Stack pressure	987.80	987.61	mbars
Ambient humidity	32	31	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-2
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	79.2 deg F
Stack X-Area	1809.6 in.2	Start/End Time	9:52 10:00
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,526.4	2,743.8	2,652.8	2,641.0	2,215.8	2,427.2	2,324.0	2,322.3
2 / 5.04	3,054.3	3,133.6	3,211.0	3,133.0	3,054.3	3,054.3	3,133.6	3,080.7
3 / 9.31	3,236.4	3,236.4	3,261.6	3,244.8	3,311.3	3,185.4	3,185.4	3,227.4
4 / 15.50	3,311.3	3,261.6	3,286.6	3,286.5	3,360.4	3,261.6	3,261.6	3,294.5
Center / 24.00	3,185.4	3,185.4	3,159.6	3,176.8	3,211.0	3,185.4	3,261.6	3,219.3
5 / 32.50	3,286.6	3,236.4	3,286.6	3,269.9	3,159.6	3,211.0	3,185.4	3,185.3
6 / 38.69	3,211.0	3,211.0	3,311.3	3,244.5	3,311.3	3,236.4	3,261.6	3,269.8
7 / 42.96	3,236.4	3,211.0	3,159.6	3,202.3	3,185.4	3,185.4	3,159.6	3,176.8
8 / 46.46	2,860.6	2,945.2	3,000.2	2,935.3	2,860.6	2,831.8	2,831.8	2,841.4
Averages ---------->	3,100.9	3,129.4	3,147.7	3,126.0	3,074.4	3,064.3	3,067.2	3,068.6

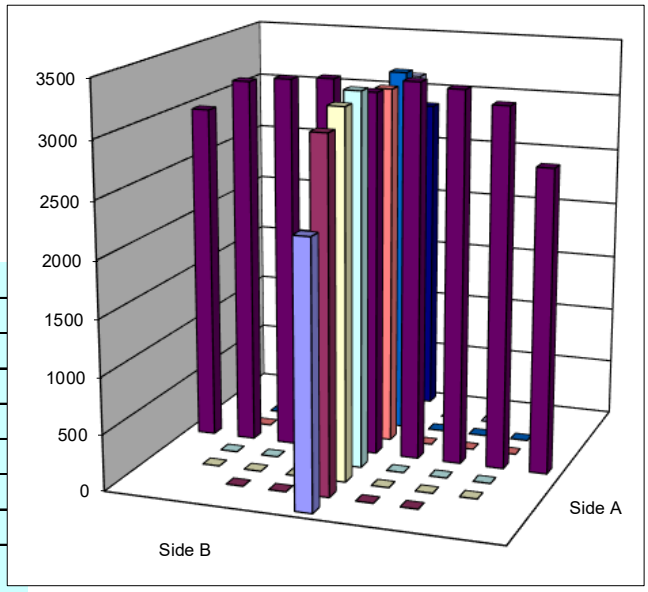
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3097.3		Mean	3222.5	3207.7	3215.1
Min Point	2322.3	-25.0%	Std. Dev.	54.5	70.1	60.8
Max Point	3294.5	6.4%	COV as %	1.7	2.2	**1.9**

Flow w/o C-Pt 38764 cfm

Vel Avg w/o C-Pt 3085 fpm

	Start	Finish	
Stack temp	79.5	78.8	F
Equipment temp	73.0	73.4	F
Ambient temp	73.0	73.4	F
Stack static	1.67	1.79	mbars
Ambient pressure	990.18	990.18	mbars
Total Stack pressure	991.85	991.97	mbars
Ambient humidity	35	35	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-3
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	80.2 deg F
Stack X-Area	1809.6 in.2	Start/End Time	11:09 11:15
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,104.4	2,326.5	2,218.2	2,216.4	2,529.2	2,624.7	2,593.2	2,582.4
2 / 5.04	2,776.5	2,805.9	2,863.7	2,815.4	2,805.9	2,892.2	2,892.2	2,863.4
3 / 9.31	2,805.9	2,835.0	2,976.1	2,872.3	2,976.1	3,030.7	3,030.7	3,012.5
4 / 15.50	2,948.4	2,920.4	2,892.2	2,920.4	3,030.7	2,920.4	3,003.5	2,984.9
Center / 24.00	2,776.5	2,835.0	2,892.2	2,834.6	2,920.4	2,920.4	2,863.7	2,901.5
5 / 32.50	3,003.5	2,948.4	3,003.5	2,985.1	2,976.1	3,003.5	2,976.1	2,985.2
6 / 38.69	2,976.1	3,003.5	3,030.7	3,003.4	2,948.4	2,976.1	2,976.1	2,966.9
7 / 42.96	2,948.4	2,920.4	2,920.4	2,929.8	2,920.4	2,892.2	2,948.4	2,920.4
8 / 46.46	2,776.5	2,863.7	2,835.0	2,825.1	2,805.9	2,746.8	2,835.0	2,795.9
Averages ---------->	2,790.7	2,828.8	2,848.0	2,822.5	2,879.2	2,889.7	2,902.1	2,890.3

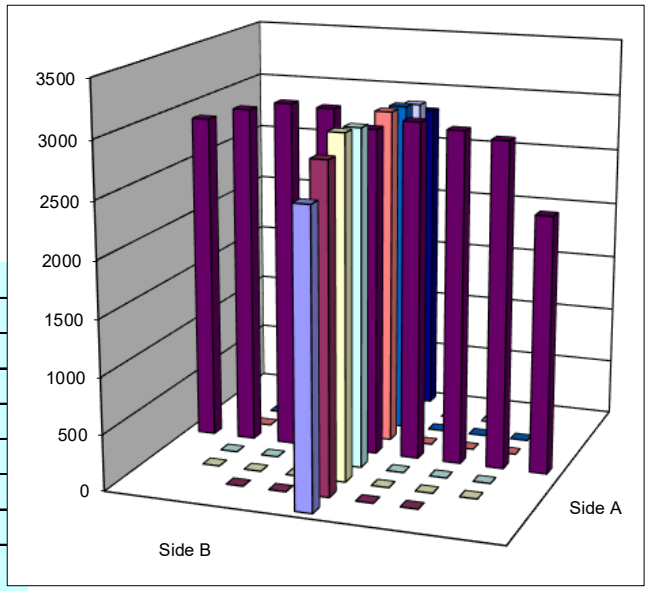
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2856.4		Mean	2908.7	2947.8	2928.3
Min Point	2216.4	-22.4%	Std. Dev.	71.8	53.8	64.2
Max Point	3012.5	5.5%	COV as %	2.5	1.8	**2.2**

Flow w/o C-Pt 35877 cfm

Vel Avg w/o C-Pt 2855 fpm

	Start	Finish	
Stack temp	80.6	79.7	F
Equipment temp	75.0	74.5	F
Ambient temp	75.0	74.5	F
Stack static	1.79	1.67	mbars
Ambient pressure	989.84	989.84	mbars
Total Stack pressure	991.63	991.51	mbars
Ambient humidity	33	33	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-4
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	79.8 deg F
Stack X-Area	1809.6 in.2	Start/End Time	13:21 13:26
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2,464.4	2,396.8	2,327.3	2,396.2	2,594.1	2,530.0	2,530.0	2,551.4
2	5.04	2,594.1	2,687.3	2,687.3	2,656.3	2,717.7	2,777.5	2,806.8	2,767.3
3	9.31	2,656.7	2,747.8	2,835.9	2,746.8	2,717.7	2,835.9	2,806.8	2,786.8
4	15.50	2,777.5	2,835.9	2,806.8	2,806.8	2,777.5	2,777.5	2,777.5	2,777.5
Center	24.00	2,864.7	2,747.8	2,747.8	2,786.8	2,717.7	2,777.5	2,806.8	2,767.3
5	32.50	2,864.7	2,835.9	2,835.9	2,845.5	2,777.5	2,717.7	2,717.7	2,737.6
6	38.69	2,835.9	2,864.7	2,777.5	2,826.0	2,777.5	2,777.5	2,747.8	2,767.6
7	42.96	2,747.8	2,717.7	2,806.8	2,757.5	2,747.8	2,656.7	2,747.8	2,717.4
8	46.46	2,717.7	2,656.7	2,717.7	2,697.4	2,497.4	2,497.4	2,464.4	2,486.4
Averages ---------->		2,724.8	2,721.2	2,727.0	2,724.3	2,702.8	2,705.3	2,711.7	2,706.6

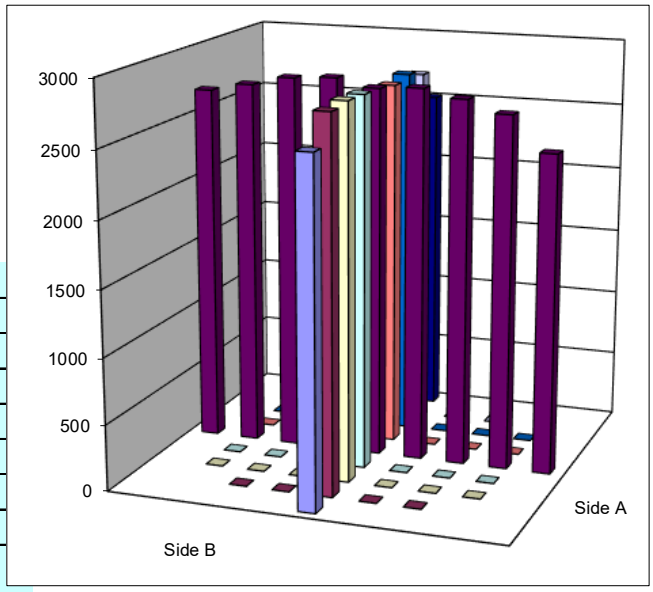
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2715.5		Mean	2775.1	2760.2	2767.7
Min Point	2396.2	-11.8%	Std. Dev.	63.1	24.2	46.6
Max Point	2845.5	4.8%	COV as %	2.3	0.9	**1.7**

Flow w/o C-Pt 34027 cfm

Vel Avg w/o C-Pt 2708 fpm

	Start	Finish	
Stack temp	79.8	79.8	F
Equipment temp	74.2	74.6	F
Ambient temp	74.2	74.6	F
Stack static	1.67	1.12	mbars
Ambient pressure	988.83	988.83	mbars
Total Stack pressure	990.50	989.95	mbars
Ambient humidity	33	33	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-5
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	81.3 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:22 14:29
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2,691.0	2,660.2	2,597.6	2,649.6	2,660.2	2,691.0	2,721.4	2,690.9
2	5.04	3,245.5	3,245.5	3,220.0	3,237.0	3,168.4	3,089.5	3,142.4	3,133.5
3	9.31	3,220.0	3,245.5	3,320.6	3,262.0	3,270.7	3,220.0	3,369.8	3,286.8
4	15.50	3,345.4	3,418.3	3,418.3	3,394.0	3,194.3	3,089.5	3,194.3	3,159.4
Center	24.00	3,220.0	3,295.7	3,245.5	3,253.7	3,220.0	3,168.4	3,270.7	3,219.7
5	32.50	3,295.7	3,442.3	3,320.6	3,352.9	3,220.0	3,142.4	3,194.3	3,185.6
6	38.69	3,345.4	3,394.1	3,394.1	3,377.9	3,270.7	3,270.7	3,245.5	3,262.3
7	42.96	3,320.6	3,345.4	3,369.8	3,345.3	2,953.4	3,008.6	3,089.5	3,017.2
8	46.46	2,953.4	3,089.5	3,168.4	3,070.5	3,008.6	2,953.4	2,925.3	2,962.5
Averages ---------->		3,181.9	3,237.4	3,228.3	3,215.9	3,107.4	3,070.4	3,128.1	3,102.0

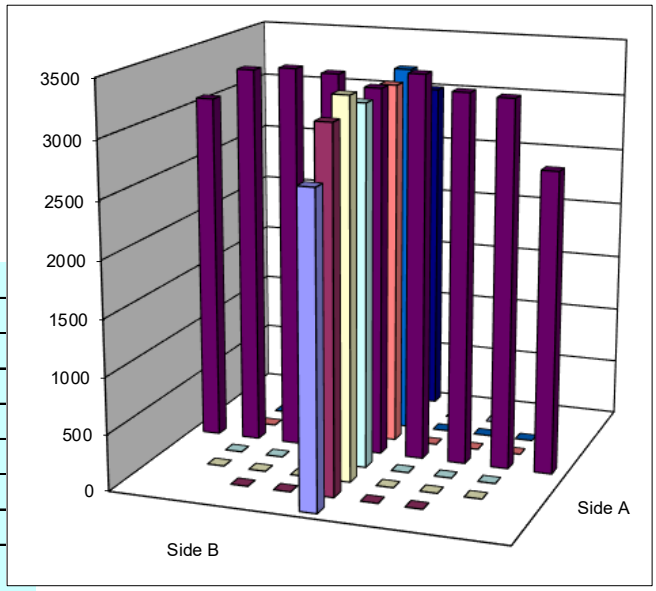
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3158.9		Mean	3317.5	3180.6	3249.1
Min Point	2649.6	-16.1%	Std. Dev.	64.7	90.3	103.6
Max Point	3394.0	7.4%	COV as %	2.0	2.8	**3.2**

Flow w/o C-Pt 39574 cfm

Vel Avg w/o C-Pt 3149 fpm

	Start	Finish	
Stack temp	81.3	81.2	F
Equipment temp	76.3	76.2	F
Ambient temp	76.3	76.2	F
Stack static	2.17	1.99	mbars
Ambient pressure	988.15	988.15	mbars
Total Stack pressure	990.32	990.14	mbars
Ambient humidity	31	31	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-6
Date	5/26/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	79.7 deg F
Stack X-Area	1809.6 in.2	Start/End Time	9:48 9:54
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,320.7	2,389.9	2,355.5	2,355.4	2,798.8	2,827.9	2,827.9	2,818.2
2 / 5.04	3,103.0	3,180.9	3,076.6	3,120.2	3,076.6	3,155.1	3,180.9	3,137.5
3 / 9.31	3,281.9	3,206.4	3,231.9	3,240.1	3,231.9	3,180.9	3,231.9	3,214.9
4 / 15.50	3,206.4	3,281.9	3,180.9	3,223.1	3,206.4	3,331.2	3,331.2	3,289.6
Center / 24.00	3,129.2	3,129.2	3,180.9	3,146.4	3,257.0	3,231.9	3,206.4	3,231.8
5 / 32.50	3,180.9	3,231.9	3,206.4	3,206.4	3,281.9	3,206.4	3,180.9	3,223.1
6 / 38.69	3,257.0	3,231.9	3,206.4	3,231.8	3,206.4	3,257.0	3,206.4	3,223.3
7 / 42.96	3,180.9	3,155.1	3,180.9	3,172.3	3,206.4	3,155.1	3,076.6	3,146.0
8 / 46.46	3,129.2	3,023.1	3,076.6	3,076.3	2,856.5	3,023.1	2,941.0	2,940.2
Averages ---------->	3,087.7	3,092.3	3,077.4	3,085.8	3,124.7	3,152.1	3,131.5	3,136.1

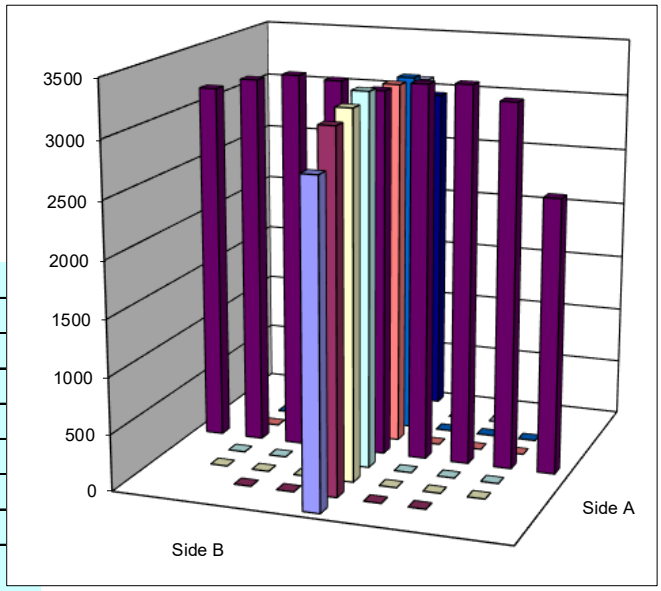
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3110.9		Mean	3191.5	3209.5	3200.5
Min Point	2355.4	-24.3%	Std. Dev.	46.0	52.5	48.3
Max Point	3289.6	5.7%	COV as %	1.4	1.6	**1.5**

Flow w/o C-Pt 38970 cfm

Vel Avg w/o C-Pt 3101 fpm

	Start	Finish	
Stack temp	79.7	79.6	F
Equipment temp	73.2	73.0	F
Ambient temp	73.2	73.0	F
Stack static	2.61	1.87	mbars
Ambient pressure	993.57	993.23	mbars
Total Stack pressure	996.18	995.10	mbars
Ambient humidity	32	31	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-7
Date	5/26/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	80.3 deg F
Stack X-Area	1809.6 in.2	Start/End Time	10:56 11:01
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,393.0	2,460.5	2,358.6	2,404.0	2,526.1	2,493.4	2,590.1	2,536.5
2 / 5.04	3,027.0	3,184.9	3,159.2	3,123.7	3,133.2	3,286.1	3,235.9	3,218.4
3 / 9.31	3,210.6	3,159.2	3,159.2	3,176.3	3,286.1	3,310.9	3,286.1	3,294.4
4 / 15.50	3,335.5	3,286.1	3,184.9	3,268.9	3,210.6	3,235.9	3,286.1	3,244.2
Center / 24.00	3,184.9	3,210.6	3,235.9	3,210.5	3,286.1	3,261.1	3,184.9	3,244.1
5 / 32.50	3,210.6	3,235.9	3,261.1	3,235.9	3,184.9	3,184.9	3,133.2	3,167.7
6 / 38.69	3,310.9	3,286.1	3,184.9	3,260.7	3,210.6	3,261.1	3,133.2	3,201.6
7 / 42.96	3,133.2	3,159.2	3,159.2	3,150.6	3,184.9	3,286.1	3,235.9	3,235.7
8 / 46.46	3,133.2	2,972.4	2,944.8	3,016.8	2,802.4	2,558.2	2,621.4	2,660.7
Averages ---------->	3,104.3	3,106.1	3,072.0	3,094.1	3,091.7	3,097.5	3,078.5	3,089.2

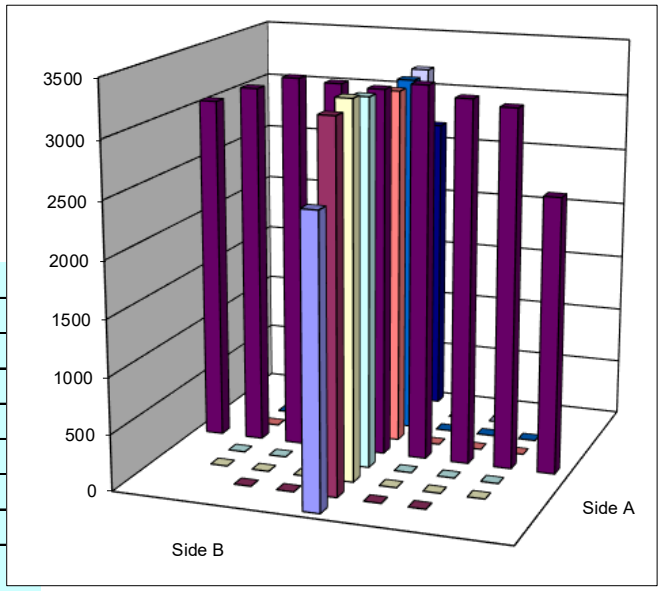
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3091.7		Mean	3203.8	3229.4	3216.6
Min Point	2404.0	-22.2%	Std. Dev.	55.6	39.6	48.2
Max Point	3294.4	6.6%	COV as %	1.7	1.2	**1.5**

Flow w/o C-Pt 38638 cfm

Vel Avg w/o C-Pt 3075 fpm

	Start	Finish	
Stack temp	80.3	80.2	F
Equipment temp	73.7	73.5	F
Ambient temp	73.7	73.5	F
Stack static	1.29	2.02	mbars
Ambient pressure	992.55	992.55	mbars
Total Stack pressure	993.84	994.57	mbars
Ambient humidity	31	31	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-8
Date	5/26/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	80.2 deg F
Stack X-Area	1809.6 in.2	Start/End Time	13:06 13:11
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,743.7	2,683.3	2,713.7	2,713.6	2,743.7	2,743.7	2,652.7	2,713.3
2 / 5.04	3,159.5	3,236.3	3,159.5	3,185.1	3,286.4	3,236.3	3,311.2	3,278.0
3 / 9.31	3,261.4	3,210.9	3,210.9	3,227.7	3,286.4	3,311.2	3,335.9	3,311.2
4 / 15.50	3,286.4	3,236.3	3,261.4	3,261.4	3,335.9	3,360.3	3,360.3	3,352.1
Center / 24.00	3,210.9	3,236.3	3,236.3	3,227.8	3,286.4	3,261.4	3,286.4	3,278.1
5 / 32.50	3,432.6	3,384.6	3,432.6	3,416.6	3,261.4	3,210.9	3,261.4	3,244.6
6 / 38.69	3,384.6	3,432.6	3,432.6	3,416.6	3,286.4	3,236.3	3,159.5	3,227.4
7 / 42.96	3,261.4	3,311.2	3,286.4	3,286.4	3,107.3	3,159.5	3,107.3	3,124.7
8 / 46.46	3,159.5	3,159.5	3,185.3	3,168.1	2,860.4	3,000.1	2,945.1	2,935.2
Averages ---------->	3,211.1	3,210.1	3,213.2	3,211.5	3,161.6	3,168.8	3,157.7	3,162.7

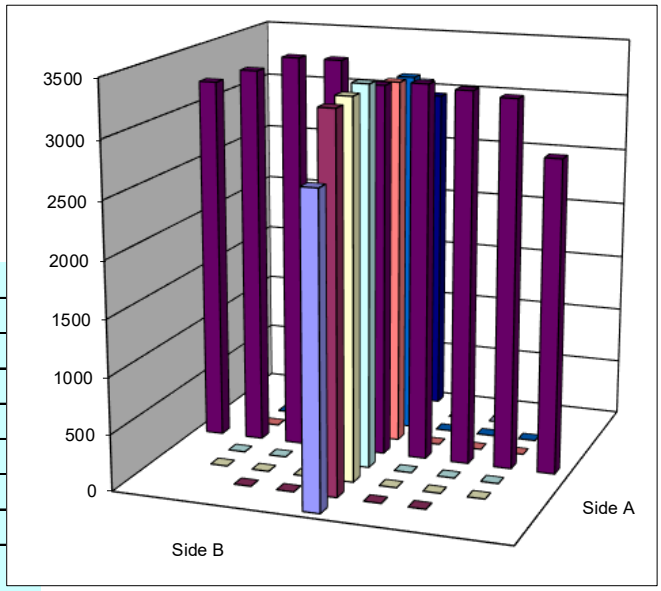
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3187.1		Mean	3288.8	3259.4	3274.1
Min Point	2713.3	-14.9%	Std. Dev.	92.8	72.3	81.3
Max Point	3416.6	7.2%	COV as %	2.8	2.2	**2.5**

Flow w/o C-Pt 39947 cfm

Vel Avg w/o C-Pt 3179 fpm

	Start	Finish	
Stack temp	80.2	80.2	F
Equipment temp	74.1	74.3	F
Ambient temp	74.1	74.3	F
Stack static	2.27	2.49	mbars
Ambient pressure	991.53	991.53	mbars
Total Stack pressure	993.80	994.02	mbars
Ambient humidity	30	30	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-9
Date	5/26/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	80.9 deg F
Stack X-Area	1809.6 in.2	Start/End Time	14:11 14:16
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2,104.9	2,143.5	2,181.5	2,143.3	2,430.6	2,464.1	2,430.6	2,441.8
2	5.04	2,949.2	3,058.4	3,189.8	3,065.8	3,215.4	3,266.0	3,215.4	3,232.3
3	9.31	3,137.8	3,266.0	3,291.1	3,231.7	3,389.3	3,365.0	3,389.3	3,381.2
4	15.50	3,266.0	3,340.5	3,340.5	3,315.7	3,365.0	3,365.0	3,291.1	3,340.3
Center	24.00	3,315.9	3,389.3	3,365.0	3,356.7	3,365.0	3,315.9	3,340.5	3,340.5
5	32.50	3,413.4	3,389.3	3,389.3	3,397.4	3,315.9	3,291.1	3,291.1	3,299.3
6	38.69	3,365.0	3,413.4	3,389.3	3,389.2	3,291.1	3,365.0	3,315.9	3,324.0
7	42.96	3,291.1	3,291.1	3,315.9	3,299.3	3,291.1	3,164.0	3,111.6	3,188.9
8	46.46	2,976.9	2,806.6	2,921.2	2,901.6	2,864.5	2,687.1	2,625.3	2,725.6
Averages ---------->		3,091.1	3,122.0	3,153.7	3,122.3	3,169.8	3,142.6	3,112.3	3,141.5

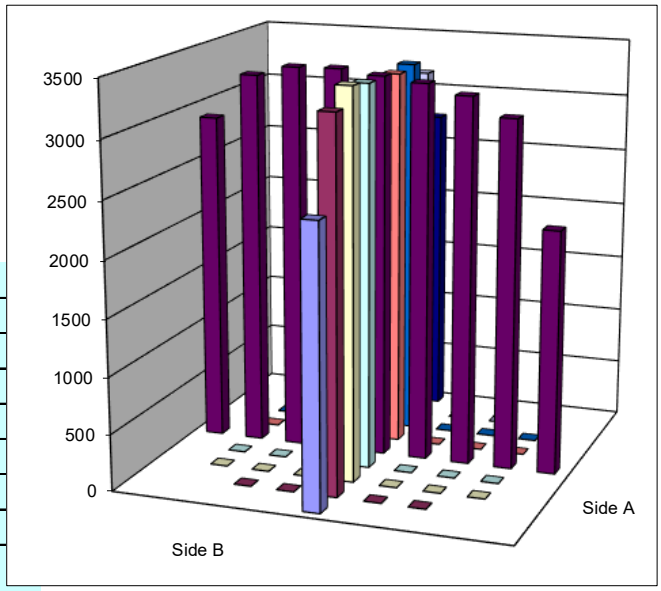
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3131.9		Mean	3293.7	3300.9	3297.3
Min Point	2143.3	-31.6%	Std. Dev.	115.6	67.5	91.0
Max Point	3397.4	8.5%	COV as %	3.5	2.0	**2.8**

Flow w/o C-Pt 39017 cfm

Vel Avg w/o C-Pt 3105 fpm

	Start	Finish	
Stack temp	81.1	80.6	F
Equipment temp	75.8	75.7	F
Ambient temp	75.8	75.7	F
Stack static	1.42	1.54	mbars
Ambient pressure	990.86	990.86	mbars
Total Stack pressure	992.28	992.40	mbars
Ambient humidity	28	28	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-10
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	81.7 deg F
Stack X-Area	1809.6 in.2	Start/End Time	9:25 9:30
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2,299.7	2,506.1	2,299.7	2,368.5	2,405.1	2,506.1	2,603.1	2,504.8
2	5.04	3,096.1	3,122.6	3,175.1	3,131.3	3,201.0	3,302.7	3,149.0	3,217.6
3	9.31	3,327.7	3,277.6	3,302.7	3,302.7	3,352.4	3,352.4	3,376.9	3,360.6
4	15.50	3,201.0	3,226.8	3,252.3	3,226.7	3,401.3	3,352.4	3,376.9	3,376.9
Center	24.00	3,175.1	3,122.6	3,201.0	3,166.3	3,302.7	3,277.6	3,252.3	3,277.5
5	32.50	3,327.7	3,327.7	3,252.3	3,302.5	3,252.3	3,277.6	3,302.7	3,277.5
6	38.69	3,352.4	3,201.0	3,302.7	3,285.4	3,302.7	3,252.3	3,252.3	3,269.1
7	42.96	3,302.7	3,252.3	3,252.3	3,269.1	3,226.8	3,201.0	3,175.1	3,201.0
8	46.46	3,042.2	3,096.1	2,987.4	3,041.9	2,959.6	2,874.6	2,787.1	2,873.8
Averages ---------->		3,125.0	3,125.9	3,113.9	3,121.6	3,156.0	3,155.2	3,141.7	3,151.0

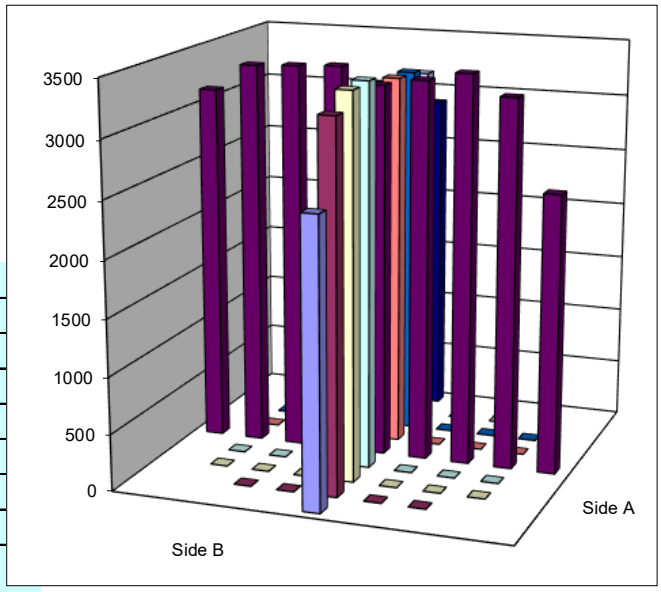
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3136.3		Mean	3240.6	3282.9	3261.7
Min Point	2368.5	-24.5%	Std. Dev.	68.5	65.9	68.2
Max Point	3376.9	7.7%	COV as %	2.1	2.0	**2.1**

Flow w/o C-Pt 39277 cfm

Vel Avg w/o C-Pt 3126 fpm

	Start	Finish	
Stack temp	81.7	81.7	F
Equipment temp	74.4	74.7	F
Ambient temp	74.4	74.7	F
Stack static	1.69	1.87	mbars
Ambient pressure	985.10	985.10	mbars
Total Stack pressure	986.79	986.97	mbars
Ambient humidity	26	26	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-11
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	82.8 deg F
Stack X-Area	1809.6 in.2	Start/End Time	10:29 10:35
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,475.2	2,573.6	2,668.3	2,572.3	2,819.2	2,759.8	2,729.6	2,769.5
2 / 5.04	3,151.9	3,204.1	3,280.6	3,212.2	3,229.8	3,204.1	3,255.3	3,229.7
3 / 9.31	3,380.1	3,229.8	3,280.6	3,296.8	3,355.4	3,330.7	3,330.7	3,339.0
4 / 15.50	3,255.3	3,255.3	3,229.8	3,246.8	3,255.3	3,204.1	3,330.7	3,263.4
Center / 24.00	3,305.7	3,330.7	3,330.7	3,322.4	3,330.7	3,355.4	3,330.7	3,339.0
5 / 32.50	3,428.7	3,355.4	3,355.4	3,379.9	3,380.1	3,404.5	3,476.7	3,420.4
6 / 38.69	3,380.1	3,380.1	3,305.7	3,355.3	3,355.4	3,330.7	3,330.7	3,339.0
7 / 42.96	3,255.3	3,305.7	3,204.1	3,255.0	3,305.7	3,355.4	3,355.4	3,338.9
8 / 46.46	3,098.9	3,072.1	3,098.9	3,090.0	3,098.9	3,125.5	2,990.2	3,071.5
Averages ---------->	3,192.4	3,189.6	3,194.9	3,192.3	3,236.7	3,230.0	3,236.7	3,234.5

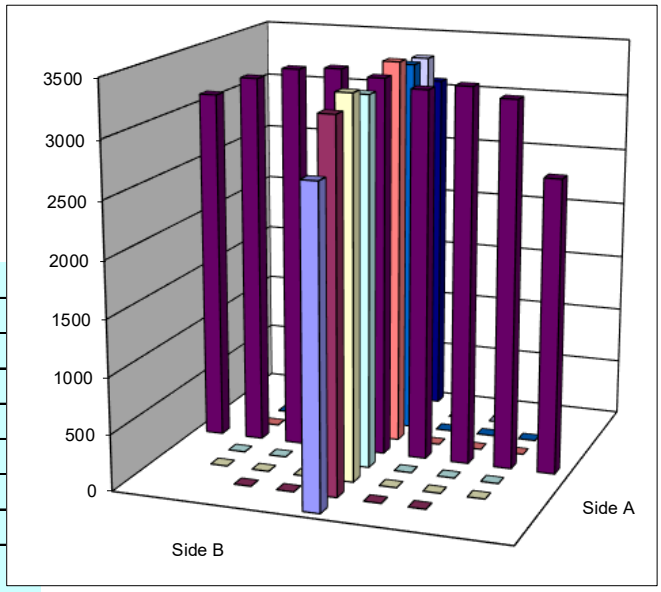
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3213.4		Mean	3295.5	3324.2	3309.8
Min Point	2572.3	-19.9%	Std. Dev.	61.1	61.6	60.8
Max Point	3420.4	6.4%	COV as %	1.9	1.9	**1.8**

Flow w/o C-Pt 40196 cfm

Vel Avg w/o C-Pt 3199 fpm

	Start	Finish	
Stack temp	83.0	82.6	F
Equipment temp	76.0	76.3	F
Ambient temp	76.0	76.3	F
Stack static	2.24	2.37	mbars
Ambient pressure	984.76	984.76	mbars
Total Stack pressure	987.00	987.13	mbars
Ambient humidity	28	28	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-12
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	83.0 deg F
Stack X-Area	1809.6 in.2	Start/End Time	11:31 11:35
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,338.3	2,442.3	2,476.0	2,418.9	2,302.6	2,408.1	2,509.2	2,406.6
2 / 5.04	3,230.9	3,205.1	3,205.1	3,213.7	3,205.1	3,100.0	3,179.1	3,161.4
3 / 9.31	3,356.6	3,331.8	3,331.8	3,340.1	3,381.2	3,306.9	3,429.8	3,372.6
4 / 15.50	3,230.9	3,205.1	3,205.1	3,213.7	3,429.8	3,453.9	3,356.6	3,413.5
Center / 24.00	3,281.8	3,331.8	3,306.9	3,306.8	3,331.8	3,356.6	3,331.8	3,340.1
5 / 32.50	3,331.8	3,405.6	3,453.9	3,397.1	3,356.6	3,405.6	3,356.6	3,373.0
6 / 38.69	3,405.6	3,429.8	3,477.9	3,437.8	3,306.9	3,356.6	3,331.8	3,331.8
7 / 42.96	3,381.2	3,381.2	3,306.9	3,356.4	3,331.8	3,179.1	3,256.4	3,255.8
8 / 46.46	3,100.0	3,205.1	3,046.0	3,117.1	3,100.0	3,153.0	3,018.7	3,090.6
Averages ---------->	3,184.1	3,215.3	3,201.1	3,200.2	3,194.0	3,191.1	3,196.7	3,193.9

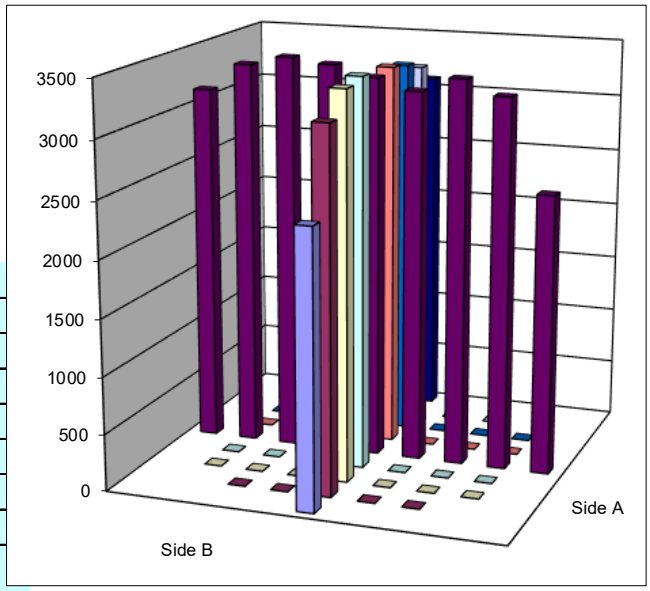
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3197.1		Mean	3323.7	3321.2	3322.4
Min Point	2406.6	-24.7%	Std. Dev.	85.8	85.7	82.4
Max Point	3437.8	7.5%	COV as %	2.6	2.6	**2.5**

Flow w/o C-Pt 39977 cfm

Vel Avg w/o C-Pt 3181 fpm

	Start	Finish	
Stack temp	83.1	82.8	F
Equipment temp	76.0	76.3	F
Ambient temp	76.0	76.3	F
Stack static	1.69	2.44	mbars
Ambient pressure	984.42	984.76	mbars
Total Stack pressure	986.11	987.20	mbars
Ambient humidity	30	30	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-13
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	83.6 deg F
Stack X-Area	1809.6 in.2	Start/End Time	12:35 12:40
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.54	2,792.0	3,020.2	2,821.4	2,877.9	2,443.4	2,477.2	2,374.6	2,431.7
2	5.04	3,479.5	3,550.3	3,455.6	3,495.1	3,526.9	3,503.2	3,407.2	3,479.1
3	9.31	3,619.6	3,455.6	3,526.9	3,534.0	3,732.5	3,619.6	3,665.2	3,672.4
4	15.50	3,573.5	3,642.5	3,573.5	3,596.5	3,596.7	3,665.2	3,479.5	3,580.5
Center	24.00	3,573.5	3,526.9	3,526.9	3,542.4	3,573.5	3,596.7	3,550.3	3,573.5
5	32.50	3,573.5	3,573.5	3,550.3	3,565.8	3,665.2	3,687.8	3,573.5	3,642.2
6	38.69	3,503.2	3,479.5	3,479.5	3,487.4	3,526.9	3,665.2	3,619.6	3,603.9
7	42.96	3,455.6	3,431.5	3,455.6	3,447.5	3,479.5	3,503.2	3,431.5	3,471.4
8	46.46	3,232.3	3,358.2	3,180.6	3,257.1	3,358.2	3,308.5	3,180.6	3,282.5
Averages ---------->		3,422.5	3,448.7	3,396.7	3,422.6	3,433.6	3,447.4	3,364.7	3,415.2

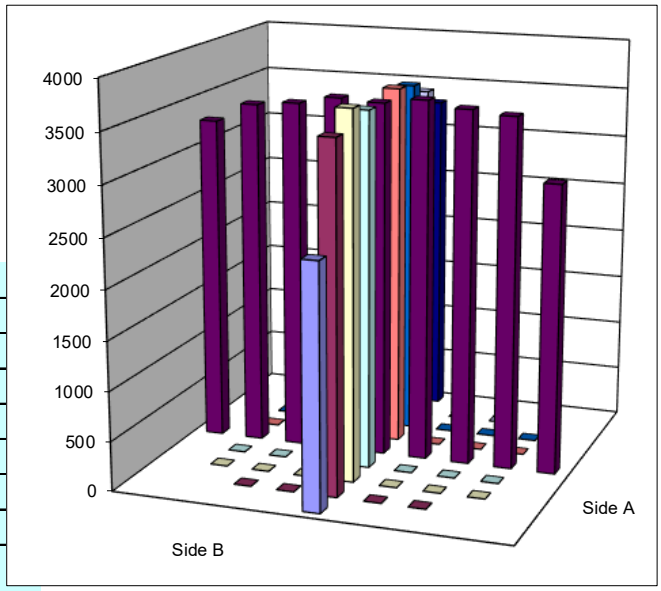
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3418.9		Mean	3524.1	3574.7	3549.4
Min Point	2431.7	-28.9%	Std. Dev.	50.8	76.2	67.5
Max Point	3672.4	7.4%	COV as %	1.4	2.1	**1.9**

Flow w/o C-Pt 42745 cfm

Vel Avg w/o C-Pt 3402 fpm

	Start	Finish	
Stack temp	83.3	83.8	F
Equipment temp	77.3	77.5	F
Ambient temp	77.3	77.5	F
Stack static	2.04	2.07	mbars
Ambient pressure	984.76	984.76	mbars
Total Stack pressure	986.80	986.83	mbars
Ambient humidity	30	30	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S1 (C3V)	Run No.	VT-14
Date	5/28/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	48 in.	Stack Temp	80.1 deg F
Stack X-Area	1809.6 in.2	Start/End Time	9:12 9:18
Test Port	A & B	Center 2/3 from	4.40 to: 43.60
Distance to disturbance	65.67 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.54	2,708.8	2,617.0	2,521.8	2,615.9	2,553.9	2,797.7	2,738.8	2,696.8
2 / 5.04	3,021.9	2,994.8	3,048.7	3,021.8	3,075.3	3,101.7	3,075.3	3,084.1
3 / 9.31	3,075.3	3,153.9	3,205.2	3,144.8	3,230.5	3,378.5	3,329.9	3,313.0
4 / 15.50	3,205.2	3,230.5	3,179.6	3,205.1	3,354.4	3,280.6	3,378.5	3,337.8
Center / 24.00	3,128.0	3,205.2	3,179.6	3,170.9	3,329.9	3,305.4	3,305.4	3,313.6
5 / 32.50	3,255.7	3,230.5	3,255.7	3,247.3	3,280.6	3,255.7	3,230.5	3,255.6
6 / 38.69	3,305.4	3,255.7	3,255.7	3,272.2	3,230.5	3,255.7	3,205.2	3,230.5
7 / 42.96	3,205.2	3,205.2	3,230.5	3,213.6	3,021.9	3,101.7	2,994.8	3,039.5
8 / 46.46	2,883.8	2,994.8	2,967.4	2,948.7	2,826.7	2,768.4	2,797.7	2,797.6
Averages ---------->	3,087.7	3,098.6	3,093.8	3,093.4	3,100.4	3,138.4	3,117.4	3,118.7

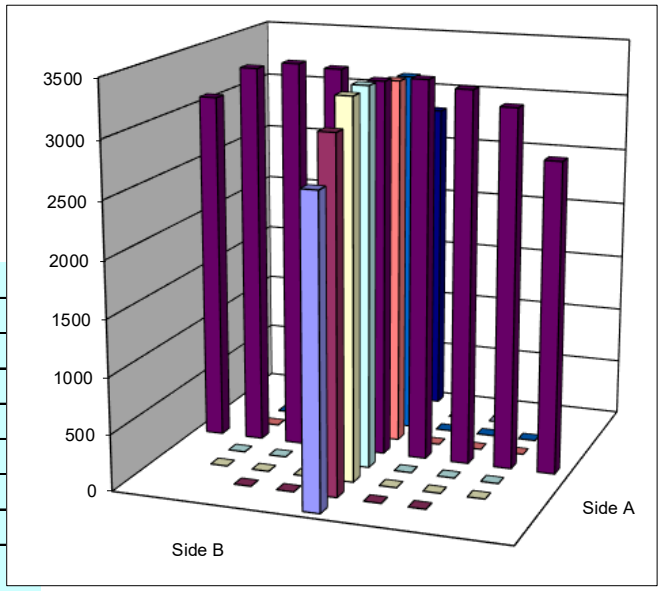
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	3106.0		Mean	3182.3	3224.9	3203.6
Min Point	2615.9	-15.8%	Std. Dev.	82.8	118.0	100.4
Max Point	3337.8	7.5%	COV as %	2.6	3.7	**3.1**

Flow w/o C-Pt 38818 cfm

Vel Avg w/o C-Pt 3089 fpm

	Start	Finish	
Stack temp	80.1	80.1	F
Equipment temp	72.2	72.6	F
Ambient temp	72.2	72.6	F
Stack static	2.04	1.64	mbars
Ambient pressure	995.60	995.26	mbars
Total Stack pressure	997.64	996.90	mbars
Ambient humidity	27	27	RH (%)

Instuments Used:	Cal Due
Standard pitot (ID A06AG 160-60, 60")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 1912128770	12/3/2021
Control Co. Thermometer (SN:220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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.

Appendix B – LV-S2 Stack Verification Data Sheets

B.1 Flow Angle Data Forms

FLOW ANGLE DATA FORM

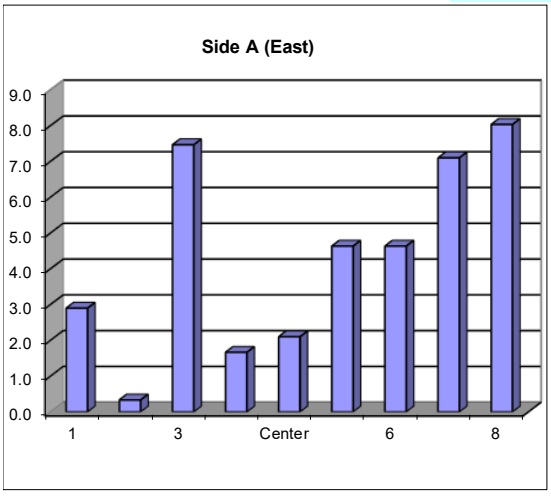
Stack	LV-S2 (C5V)	Run No.	FA-1
Date	5/24/2021	Fan Setting	NA Hz
Start/End Time	13:45 13:54	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	74.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

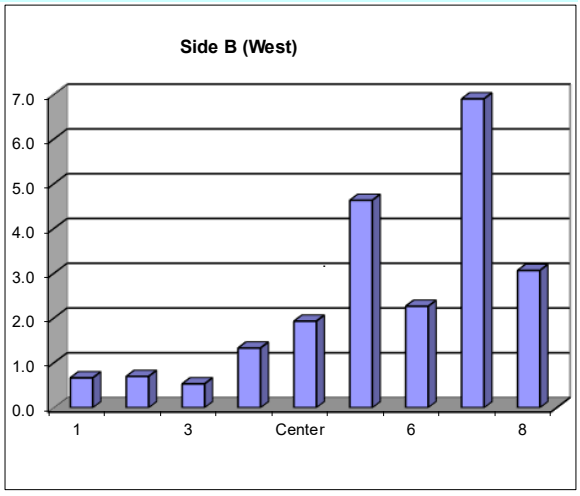
Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	2.8	3.4	2.5	2.9	1.4	0.2	0.4	0.7
2	6.30	0.2	0.5	0.3	0.3	0.0	0.9	1.2	0.7
3	11.64	7.9	6.7	7.8	7.5	0.5	0.8	0.3	0.5
4	19.38	1.1	1.7	2.2	1.7	1.4	0.3	2.3	1.3
Center	30.00	2.0	2.1	2.2	2.1	1.5	2.4	1.9	1.9
5	40.62	4.1	5.4	4.4	4.6	4.6	5.3	4.0	4.6
6	48.36	5.2	4.9	3.8	4.6	1.6	2.9	2.3	2.3
7	53.70	7.1	6.9	7.3	7.1	6.9	6.7	7.1	6.9
8	58.08	7.2	8.6	8.3	8.0	6.0	0.9	2.3	3.1
Mean of absolute values:					4.3				2.4
" " w/o points by wall:					4.0				2.6
								Grand mean ABS	3.4
								Grand mean ABS w/o wall pts	3.3

Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	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
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

Notes:

Traverse point depth = the distance from inside stack wall to each point.
First traverse point is all the way into the stack.
Approx. air velocity was derived from all points on the Velocity Traverse Form.





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-2
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	9:42 9:48	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	72.2 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	0.1	1.0	0.3	0.5	2.1	0.8	1.6	1.5
2	6.30	1.8	2.2	2.0	2.0	2.2	1.9	1.0	1.7
3	11.64	0.7	0.1	0.7	0.5	5.5	6.7	5.6	5.9
4	19.38	1.0	0.9	0.8	0.9	4.4	4.8	4.6	4.6
Center	30.00	4.4	5.8	4.0	4.7	12.2	12.6	7.8	10.9
5	40.62	0.3	1.0	2.0	1.1	5.0	6.4	5.2	5.5
6	48.36	2.4	2.5	2.0	2.3	2.8	3.2	3.7	3.2
7	53.70	2.3	1.8	1.9	2.0	2.7	2.4	1.5	2.2
8	58.08	3.0	1.5	1.7	2.1	5.5	5.8	5.7	5.7
Mean of absolute values:					1.8				4.6
" " w/o points by wall:					1.9				4.9
								Grand mean ABS	3.2
								Grand mean ABS w/o wall pts	3.4

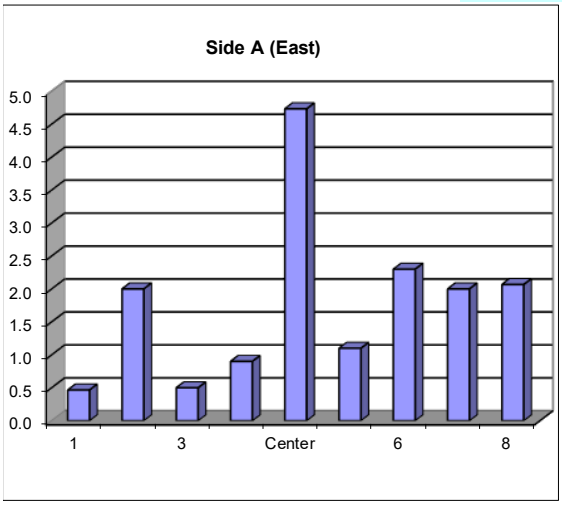
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

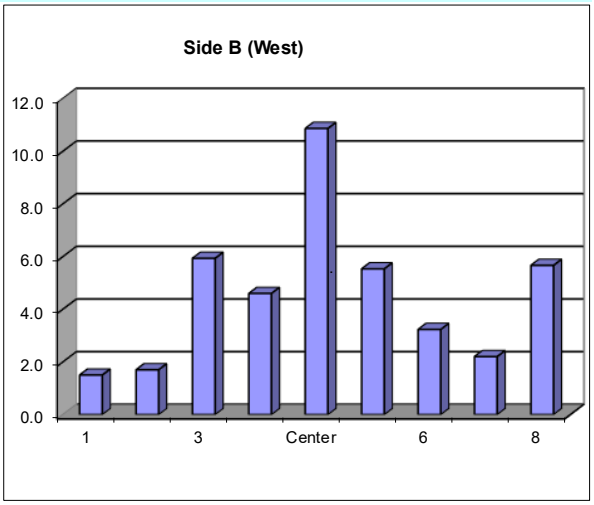
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-3
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	10:56 11:04	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	75.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	2.2	2.0	2.1	2.1	3.3	4.6	7.1	5.0
2	6.30	2.6	2.2	2.0	2.3	1.7	1.3	4.5	2.5
3	11.64	0.2	0.8	0.6	0.5	12.2	10.1	9.5	10.6
4	19.38	1.5	0.8	1.8	1.4	11.5	10.5	11.8	11.3
Center	30.00	2.4	2.6	2.9	2.6	8.2	6.6	6.2	7.0
5	40.62	1.5	1.0	0.9	1.1	9.5	9.6	8.6	9.2
6	48.36	0.9	0.8	1.1	0.9	8.5	8.6	8.6	8.6
7	53.70	1.5	0.7	0.7	1.0	1.8	1.4	2.7	2.0
8	58.08	3.4	5.0	4.4	4.3	4.5	4.5	5.4	4.8
Mean of absolute values:					1.8				6.8
" " w/o points by wall:					1.4				7.3
								Grand mean ABS	4.3
								Grand mean ABS w/o wall pts	4.4

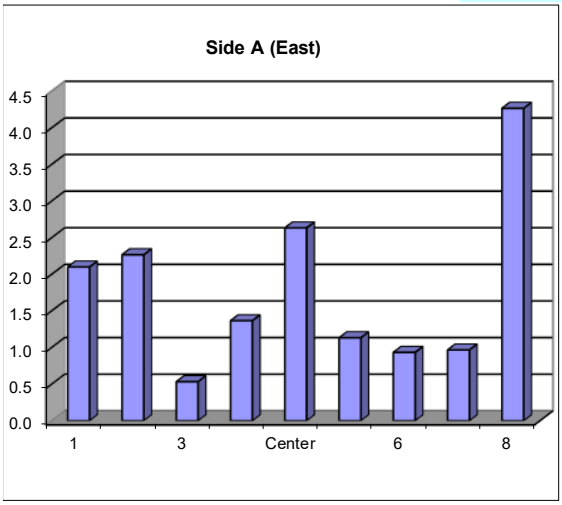
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

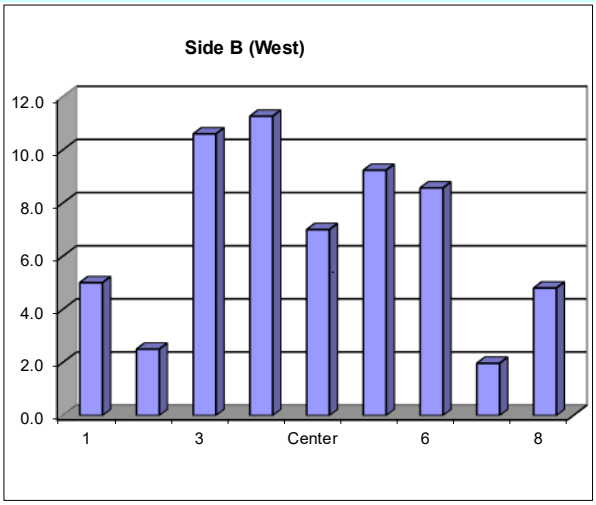
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-4
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	12:05 12:13	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	75.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	6.7	6.3	5.4	6.1	0.5	0.6	0.8	0.6
2	6.30	5.6	5.9	5.5	5.7	13.9	13.0	13.2	13.4
3	11.64	15.2	15.4	15.7	15.4	21.5	21.6	21.4	21.5
4	19.38	15.6	15.4	16.1	15.7	16.3	17.0	15.0	16.1
Center	30.00	14.9	14.2	14.0	14.4	11.7	12.4	10.1	11.4
5	40.62	13.9	13.2	13.0	13.4	16.2	15.2	17.8	16.4
6	48.36	6.8	5.9	5.5	6.1	13.3	12.2	15.2	13.6
7	53.70	9.5	9.7	8.7	9.3	11.8	12.1	12.8	12.2
8	58.08	3.0	1.9	3.3	2.7	10.3	12.4	10.0	10.9
Mean of absolute values:					9.9				12.9
" " w/o points by wall:					11.4				14.9
								Grand mean ABS	11.4
								Grand mean ABS w/o wall pts	13.2

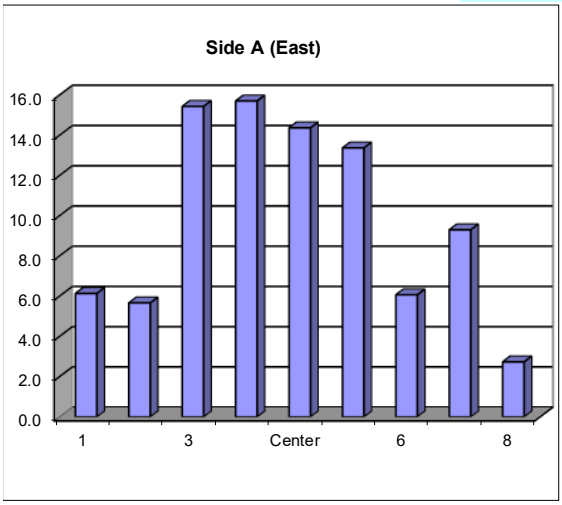
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

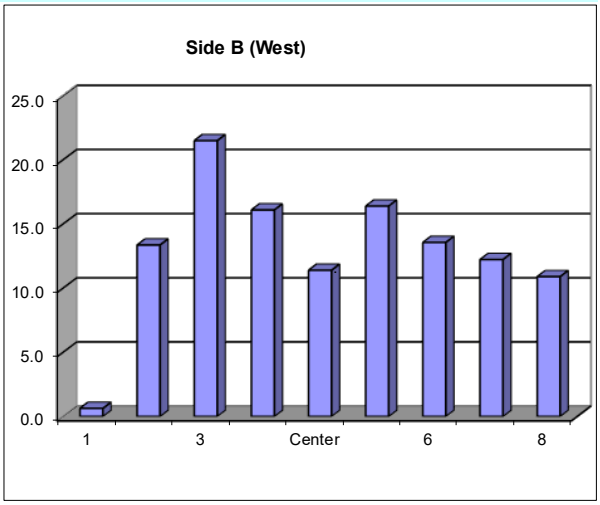
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-5
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	14:11 14:18	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	75.6 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	2.6	2.4	2.3	2.4	-0.8	0.3	1.0	0.2
2	6.30	6.8	6.6	6.7	6.7	1.0	1.4	1.8	1.4
3	11.64	5.5	7.3	8.0	6.9	3.6	3.1	3.2	3.3
4	19.38	2.1	2.5	3.7	2.8	0.9	1.9	0.1	1.0
Center	30.00	3.8	2.9	2.8	3.2	0.2	1.2	0.9	0.8
5	40.62	2.5	1.6	2.1	2.1	8.1	6.1	5.5	6.6
6	48.36	2.5	4.0	4.2	3.6	6.4	5.5	5.2	5.7
7	53.70	4.2	4.2	0.9	3.1	0.3	0.1	1.4	0.6
8	58.08	3.2	0.7	1.7	1.9	2.5	0.4	0.5	1.1
Mean of absolute values:					3.6				2.3
" " w/o points by wall:					4.0				2.8
								Grand mean ABS	3.0
								Grand mean ABS w/o wall pts	3.4

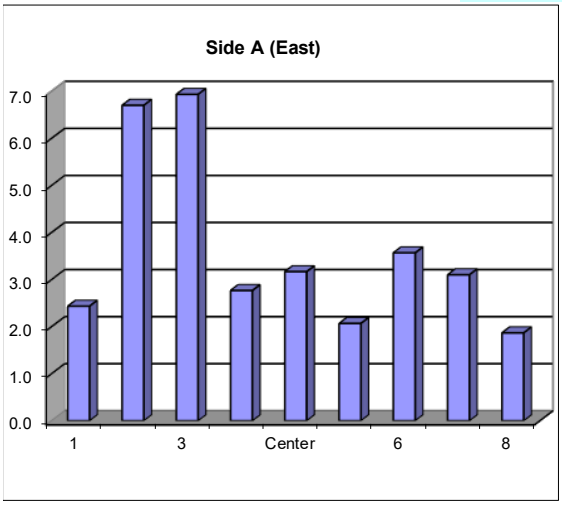
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

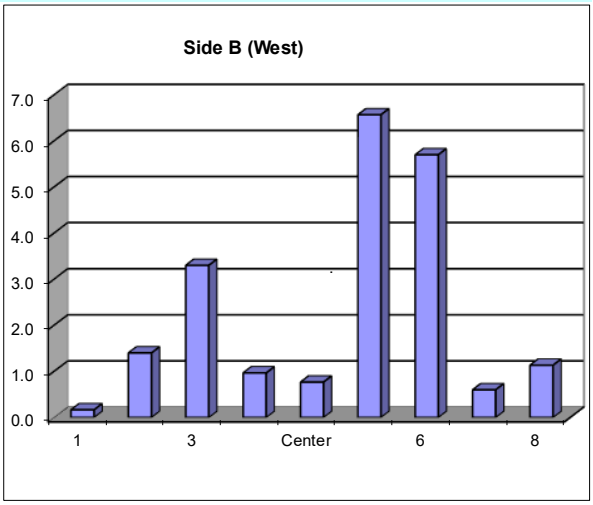
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-6
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	9:37 9:44	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	74.9 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	3.0	2.7	2.5	2.7	2.4	2.1	2.7	2.4
2	6.30	4.7	4.6	4.1	4.5	1.8	1.3	3.7	2.3
3	11.64	10.7	10.9	10.5	10.7	1.0	0.4	0.8	0.7
4	19.38	4.7	4.4	4.4	4.5	1.0	0.9	1.6	1.2
Center	30.00	4.1	4.7	5.0	4.6	2.7	2.6	2.2	2.5
5	40.62	7.0	6.9	6.7	6.9	3.5	3.6	3.8	3.6
6	48.36	7.1	6.9	7.3	7.1	4.1	4.0	5.0	4.4
7	53.70	8.4	8.3	9.2	8.6	8.7	9.8	8.5	9.0
8	58.08	6.2	7.4	7.8	7.1	6.9	7.7	6.6	7.1
Mean of absolute values:					6.3				3.7
" " w/o points by wall:					6.7				3.4
								Grand mean ABS	5.0
								Grand mean ABS w/o wall pts	5.0

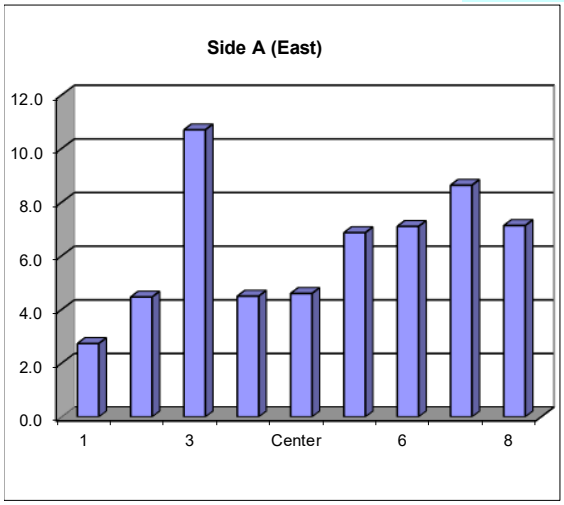
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

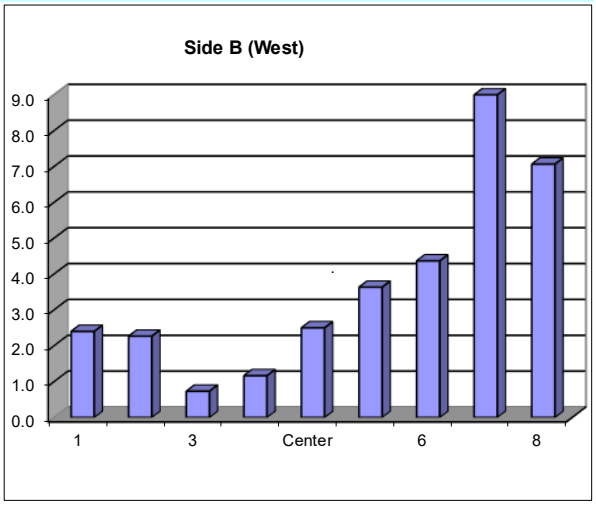
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-7
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	10:44 10:51	Fan Configuration	Fan A
Testers	ZDH/LCE	Stack Temp	75.2 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	2.1	2.2	2.4	2.2	5.5	3.9	4.0	4.5
2	6.30	3.7	4.5	3.4	3.9	3.3	3.6	2.9	3.3
3	11.64	2.2	2.9	2.0	2.4	1.9	1.5	2.1	1.8
4	19.38	4.5	3.9	4.0	4.1	2.0	3.3	2.3	2.5
Center	30.00	2.7	2.5	3.0	2.7	1.6	0.8	1.6	1.3
5	40.62	4.3	4.1	3.1	3.8	10.3	7.5	6.3	8.0
6	48.36	5.7	5.2	5.1	5.3	3.3	4.7	3.2	3.7
7	53.70	1.4	2.2	1.5	1.7	2.1	2.7	1.2	2.0
8	58.08	1.2	1.0	0.9	1.0	1.2	0.8	1.0	1.0
Mean of absolute values:					3.0				3.1
" " w/o points by wall:					3.4				3.2
								Grand mean ABS	3.1
								Grand mean ABS w/o wall pts	3.3

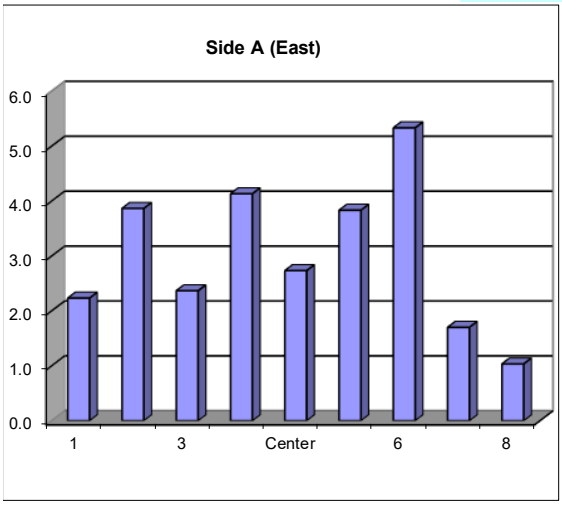
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

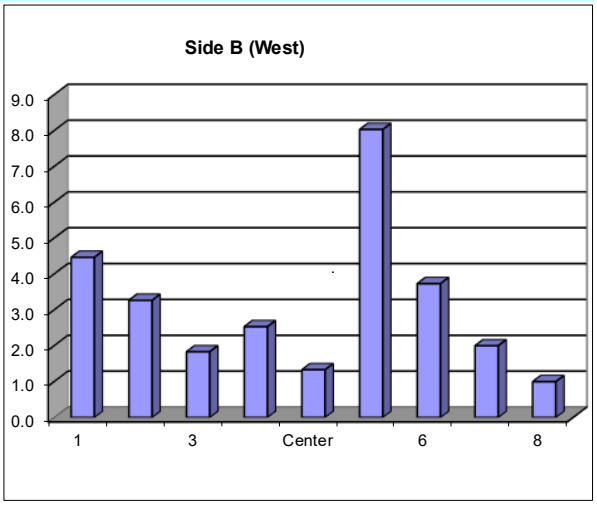
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-8
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	12:56 13:02	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	75.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	1.4	1.5	1.6	1.5	0.7	1.2	0.9	0.9
2	6.30	2.4	3.7	2.7	2.9	0.2	0.7	0.1	0.3
3	11.64	2.6	2.7	2.9	2.7	2.4	3.2	3.0	2.9
4	19.38	3.2	2.5	2.4	2.7	3.2	0.9	1.6	1.9
Center	30.00	2.5	2.3	2.7	2.5	4.0	3.6	3.5	3.7
5	40.62	1.4	1.9	1.6	1.6	4.9	4.4	3.7	4.3
6	48.36	9.5	9.7	8.7	9.3	3.7	4.4	4.5	4.2
7	53.70	0.8	1.3	0.7	0.9	2.7	2.6	1.0	2.1
8	58.08	5.3	4.5	5.4	5.1	2.9	1.9	1.6	2.1
Mean of absolute values:					3.3				2.5
" " w/o points by wall:					3.2				2.8
								Grand mean ABS	2.9
								Grand mean ABS w/o wall pts	3.0

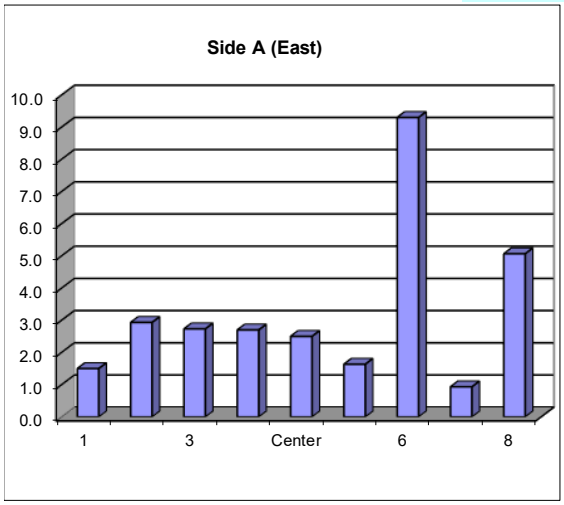
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

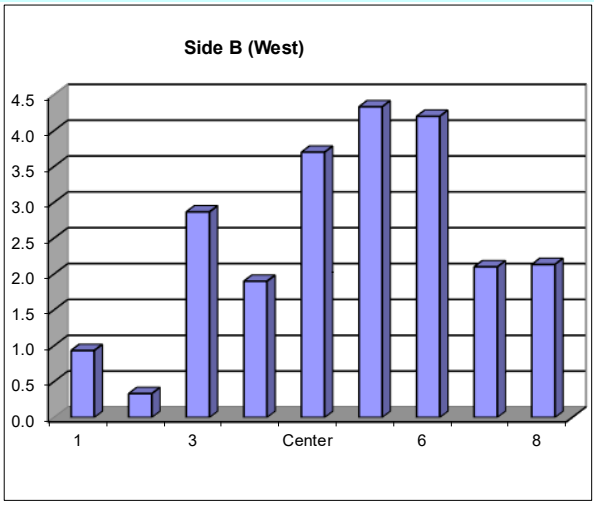
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-9
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	14:01 14:08	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	75.8 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	7.5	7.0	7.0	7.2	1.6	1.1	0.4	1.0
2	6.30	10.6	10.2	9.9	10.2	1.3	1.6	2.1	1.7
3	11.64	0.0	0.3	0.2	0.2	0.3	0.0	0.1	0.1
4	19.38	3.3	3.1	2.7	3.0	1.3	0.5	0.5	0.8
Center	30.00	4.7	4.8	4.1	4.5	1.4	1.3	0.5	1.1
5	40.62	1.6	1.7	1.9	1.7	1.6	3.4	2.1	2.4
6	48.36	0.5	1.1	1.2	0.9	2.5	3.5	1.7	2.6
7	53.70	1.4	1.5	1.4	1.4	2.3	3.2	2.5	2.7
8	58.08	2.4	2.1	2.4	2.3	2.8	0.6	0.2	1.2
Mean of absolute values:					3.5				1.5
" " w/o points by wall:					3.2				1.6
								Grand mean ABS	2.5
								Grand mean ABS w/o wall pts	2.4

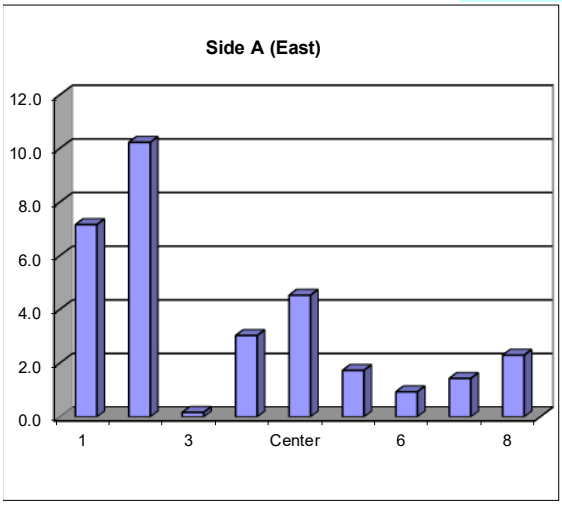
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

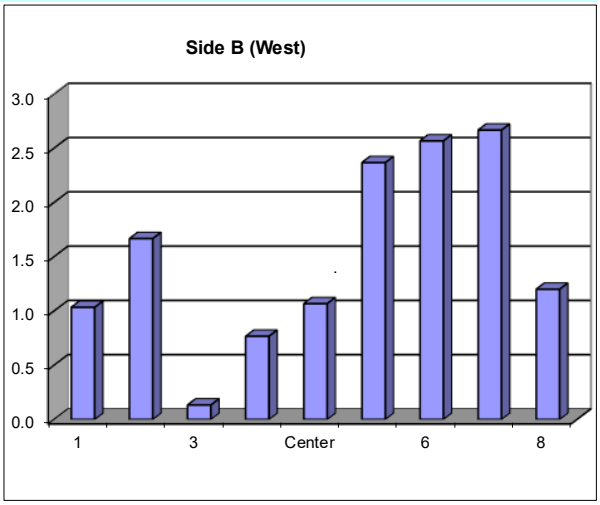
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-10
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	9:15 9:21	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	75.9 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	2.8	2.5	2.7	2.7	0.4	0.2	0.6	0.4
2	6.30	2.1	2.5	2.3	2.3	3.5	4.8	4.9	4.4
3	11.64	2.4	2.9	2.3	2.5	5.2	4.2	3.8	4.4
4	19.38	3.7	3.3	3.6	3.5	0.1	1.7	2.7	1.5
Center	30.00	6.2	6.0	5.9	6.0	0.1	0.8	2.0	1.0
5	40.62	7.0	7.5	7.6	7.4	4.3	5.6	4.7	4.9
6	48.36	10.1	10.1	10.0	10.1	3.1	3.7	3.9	3.6
7	53.70	12.0	12.1	11.9	12.0	4.3	5.1	4.0	4.5
8	58.08	9.7	9.9	11.2	10.3	2.8	0.6	0.9	1.4
Mean of absolute values:					6.3				2.9
" " w/o points by wall:					6.3				3.5
								Grand mean ABS	4.6
								Grand mean ABS w/o wall pts	4.9

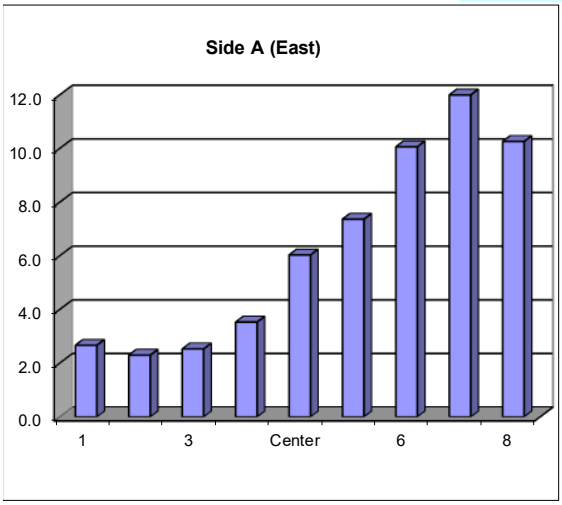
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

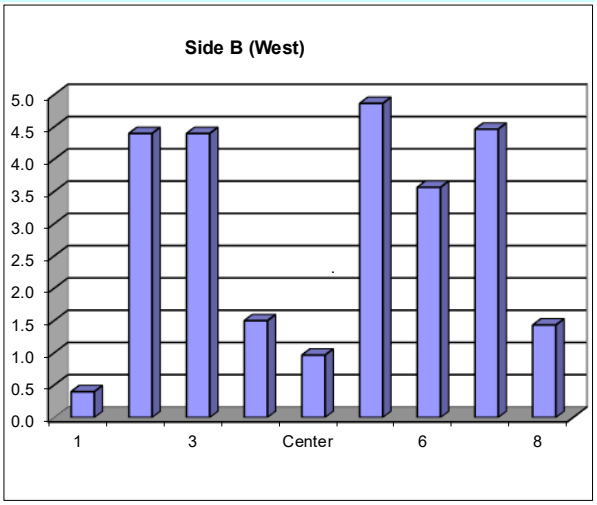
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-11
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	10:19 10:25	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	77.0 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	4.0	3.7	3.7	3.8	2.2	3.1	3.0	2.8
2	6.30	3.6	4.2	4.8	4.2	3.1	0.6	1.6	1.8
3	11.64	0.9	0.8	1.2	1.0	3.0	1.4	1.1	1.8
4	19.38	4.1	3.9	4.1	4.0	0.1	2.2	2.3	1.5
Center	30.00	2.8	1.9	1.8	2.2	0.2	0.7	1.1	0.7
5	40.62	5.4	5.0	5.0	5.1	0.8	0.6	0.2	0.5
6	48.36	5.2	4.6	5.1	5.0	2.0	1.8	2.0	1.9
7	53.70	2.8	3.3	3.3	3.1	0.7	0.7	1.0	0.8
8	58.08	1.7	2.2	2.1	2.0	1.1	1.6	1.5	1.4
Mean of absolute values:					3.4				1.5
" " w/o points by wall:					3.5				1.3
								Grand mean ABS	2.4
								Grand mean ABS w/o wall pts	2.4

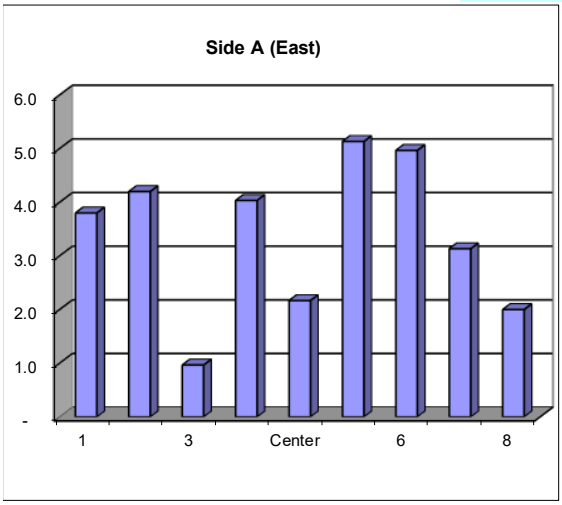
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

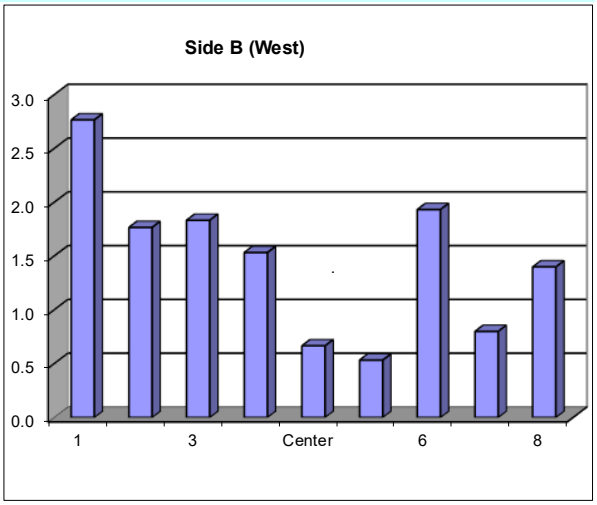
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-12
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	11:19 11:25	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	76.4 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	2.2	1.9	1.6	1.9	0.6	0.8	0.4	0.6
2	6.30	2.6	2.4	2.7	2.6	3.1	3.2	3.6	3.3
3	11.64	7.5	6.9	8.0	7.5	1.0	1.2	1.6	1.3
4	19.38	0.5	0.5	0.2	0.4	4.0	3.7	3.3	3.7
Center	30.00	5.5	4.7	5.3	5.2	5.1	5.4	5.6	5.4
5	40.62	1.1	1.0	0.9	1.0	5.4	2.9	4.5	4.3
6	48.36	2.3	1.2	0.9	1.5	5.3	4.9	3.8	4.7
7	53.70	2.6	2.2	3.0	2.6	0.9	0.8	1.1	0.9
8	58.08	2.7	1.9	1.4	2.0	2.3	2.8	2.8	2.6
Mean of absolute values:					2.7				3.0
" " w/o points by wall:					3.0				3.4
								Grand mean ABS	2.8
								Grand mean ABS w/o wall pts	3.2

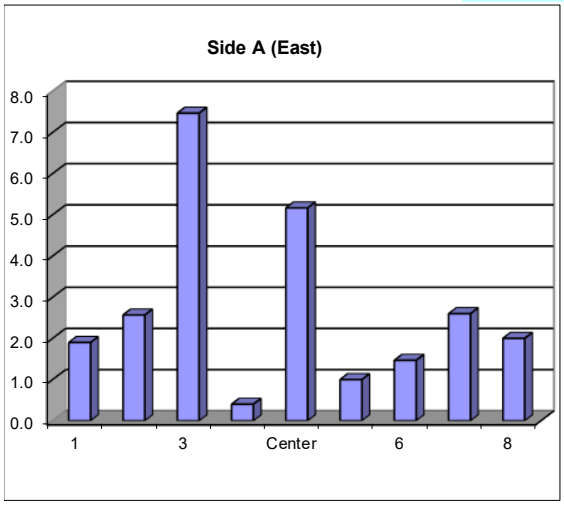
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

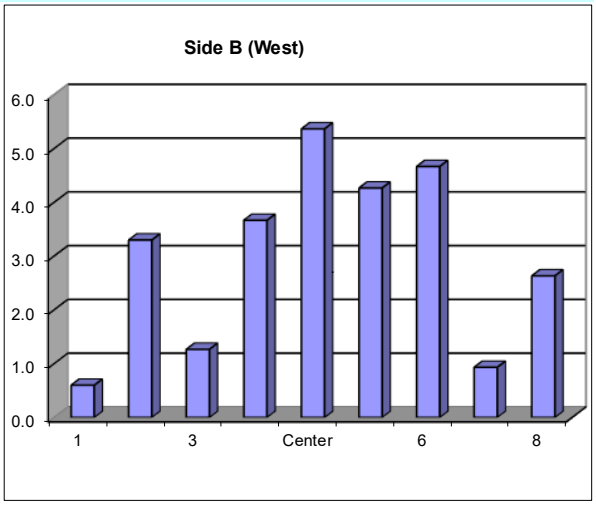
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-13
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	12:26 12:31	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	77.1 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	3.4	3.1	3.7	3.4	2.3	1.9	1.9	2.0
2	6.30	2.3	1.6	1.9	1.9	1.2	1.4	1.2	1.3
3	11.64	1.3	1.1	1.7	1.4	2.8	3.2	3.2	3.1
4	19.38	4.1	4.0	3.9	4.0	2.4	3.1	2.7	2.7
Center	30.00	4.9	5.2	5.4	5.2	3.3	3.5	3.6	3.5
5	40.62	3.6	3.7	3.6	3.6	2.0	1.7	1.5	1.7
6	48.36	3.2	3.5	2.7	3.1	1.7	2.5	2.3	2.2
7	53.70	3.6	3.3	3.3	3.4	0.2	0.2	0.5	0.3
8	58.08	2.3	2.0	1.9	2.1	0.6	0.7	0.3	0.5
Mean of absolute values:					3.1				1.9
" " w/o points by wall:					3.2				2.1
								Grand mean ABS	2.5
								Grand mean ABS w/o wall pts	2.7

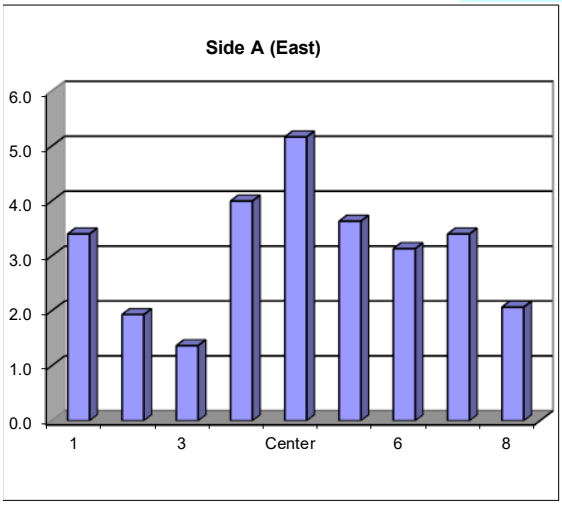
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

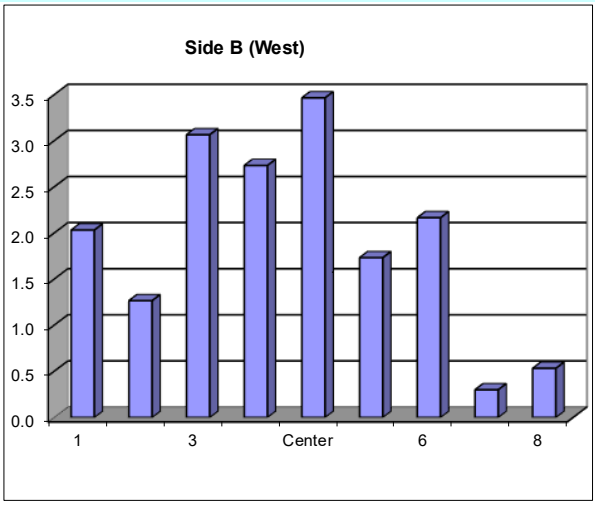
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S2 (C5V)	Run No.	FA-14
Date	5/28/2021	Fan Setting	NA Hz
Start/End Time	8:59 9:07	Fan Configuration	Fan B
Testers	ZDH/LCE	Stack Temp	75.6 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	91.17 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	4.1	3.8	4.3	4.1	0.5	0.4	0.6	0.5
2	6.30	4.4	4.1	4.5	4.3	1.3	0.4	0.5	0.7
3	11.64	7.2	6.9	6.7	6.9	0.8	1.8	1.5	1.4
4	19.38	6.5	7.3	6.9	6.9	0.9	1.0	1.2	1.0
Center	30.00	6.3	5.7	6.3	6.1	1.0	0.9	1.2	1.0
5	40.62	9.1	8.9	9.3	9.1	2.3	1.4	2.5	2.1
6	48.36	7.3	7.9	8.1	7.8	1.9	1.3	1.9	1.7
7	53.70	6.4	7.0	6.4	6.6	0.6	2.4	3.4	2.1
8	58.08	3.3	4.1	3.5	3.6	0.7	0.9	1.0	0.9
Mean of absolute values:					6.2				1.3
" " w/o points by wall:					6.8				1.4
								Grand mean ABS	3.7
								Grand mean ABS w/o wall pts	4.1

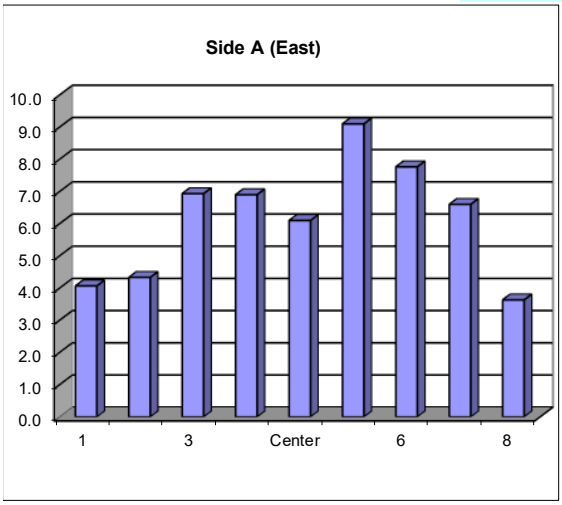
Instuments Used:	Cal. Due
S-type pitot (ID:A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Digi-sense 20250-13 Manometer (SN: 191212877)	Pre-test inspection; post test calibration check.

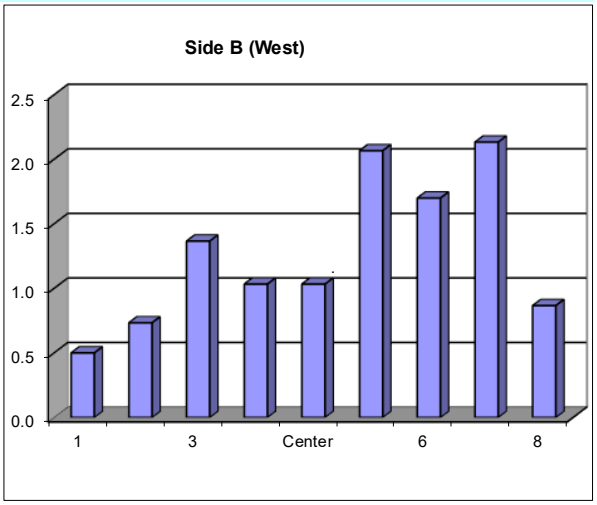
Notes:

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

First traverse point is all the way into the stack.

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





B.2 Velocity Uniformity Data Forms

VELOCITY TRAVERSE DATA FORM

Stack	LV-S2 (C5V)	Run No.	VT-1
Date	5/24/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	74.7 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:35 13:42
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First Port				Second Port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	1,493.1	1,453.3	1,370.1	1,438.8	1,678.1	1,712.7	1,678.1	1,689.6
2	6.30	1,606.6	1,678.1	1,712.7	1,665.8	2,083.6	2,055.2	2,055.2	2,064.7
3	11.64	2,026.5	1,997.3	2,055.2	2,026.3	2,111.6	2,139.2	2,139.2	2,130.0
4	19.38	2,026.5	2,055.2	2,026.5	2,036.1	2,166.4	2,139.2	2,083.6	2,129.7
Center	30.00	2,139.2	2,111.6	2,166.4	2,139.1	2,139.2	2,083.6	2,083.6	2,102.1
5	40.62	2,348.3	2,297.8	2,297.8	2,314.7	2,139.2	2,166.4	2,193.4	2,166.3
6	48.36	2,083.6	2,083.6	2,055.2	2,074.1	2,139.2	2,111.6	2,111.6	2,120.8
7	53.70	2,026.5	1,967.8	2,026.5	2,006.9	1,997.3	1,967.8	1,937.7	1,967.6
8	58.08	1,642.8	1,746.6	1,746.6	1,712.0	1,642.8	1,569.7	1,606.6	1,606.4
Averages ---------->		1,932.6	1,932.4	1,939.7	1,934.9	2,010.8	1,993.9	1,987.7	1,997.5

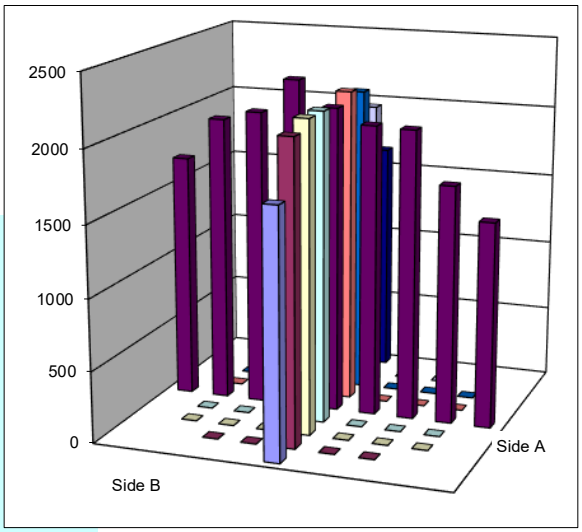
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	1966.2		Mean	2037.6	2097.3	2067.4
Min Point	1438.8	-26.8%	Std. Dev.	194.8	65.0	142.9
Max Point	2314.7	17.7%	COV as %	9.6	3.1	**6.9**

Flow w/o C-Pt 38227 cfm

Vel Avg w/o C-Pt 1947 fpm

	Start	Finish	
Stack temp	75.1	74.3	F
Equipment temp	74.6	75.2	F
Ambient temp	74.6	75.3	F
Stack static	0.65	0.37	mbars
Ambient pressure	987.47	987.13	mbars
Total Stack pressure	988.12	987.50	mbars
Ambient humidity	33%	32%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-2
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	72.2 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:25 9:33
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First Port				Second Port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	1,636.3	1,739.7	1,671.5	1,682.5	1,739.7	1,837.3	1,805.4	1,794.2
2	6.30	2,363.8	2,211.1	2,339.1	2,304.7	1,930.0	1,960.0	1,989.5	1,959.8
3	11.64	2,363.8	2,412.6	2,460.3	2,412.2	2,075.4	2,184.7	2,237.3	2,165.8
4	19.38	2,483.8	2,339.1	2,363.8	2,395.6	2,075.4	2,047.1	2,075.4	2,065.9
Center	30.00	2,263.2	2,237.3	2,211.1	2,237.2	2,103.2	2,047.1	2,103.2	2,084.5
5	40.62	2,211.1	2,263.2	2,237.3	2,237.2	2,103.2	2,157.8	2,103.2	2,121.4
6	48.36	2,237.3	2,211.1	2,211.1	2,219.9	2,211.1	2,130.7	2,075.4	2,139.1
7	53.70	2,211.1	2,130.7	2,157.8	2,166.5	2,075.4	1,960.0	1,989.5	2,008.3
8	58.08	1,772.8	1,868.7	1,899.6	1,847.1	1,671.5	1,600.3	1,671.5	1,647.8
Averages ---------->		2,171.5	2,157.1	2,172.4	2,167.0	1,998.3	1,991.7	2,005.6	1,998.5

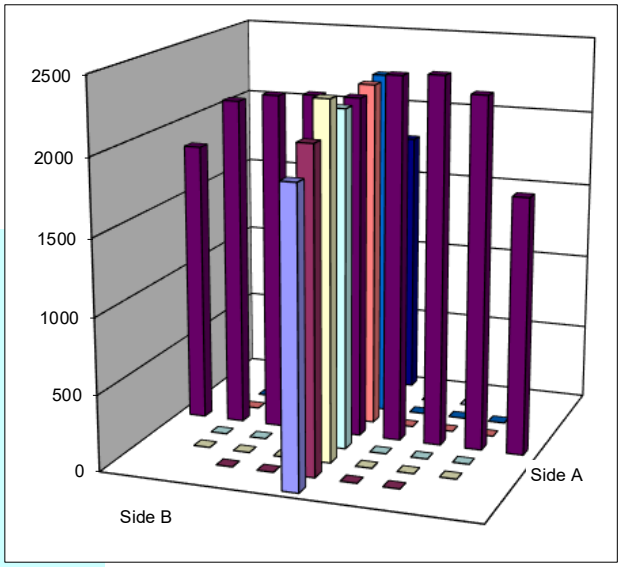
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2082.8		Mean	2281.9	2077.8	2179.9
Min Point	1647.8	-20.9%	Std. Dev.	92.7	73.4	132.9
Max Point	2412.2	15.8%	COV as %	4.1	3.5	**6.1**

Flow w/o C-Pt 40703 cfm

Vel Avg w/o C-Pt 2073 fpm

	Start	Finish	
Stack temp	73.1	71.3	F
Equipment temp	72.2	72.8	F
Ambient temp	72.2	72.8	F
Stack static	1.10	0.57	mbars
Ambient pressure	990.18	990.18	mbars
Total Stack pressure	991.28	990.75	mbars
Ambient humidity	36%	35%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-3
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.3 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:46 10:53
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,492.3	1,531.1	1,605.8	1,543.1	1,811.6	1,811.6	1,843.6	1,822.3
2 / 6.30	1,745.7	1,779.0	1,875.2	1,800.0	1,966.8	2,082.5	2,054.2	2,034.5
3 / 11.64	2,082.5	2,082.5	2,110.5	2,091.8	2,165.3	2,110.5	2,192.2	2,156.0
4 / 19.38	2,054.2	2,110.5	2,110.5	2,091.7	2,165.3	2,110.5	2,110.5	2,128.7
Center / 30.00	2,138.1	2,165.3	2,110.5	2,138.0	2,082.5	2,054.2	2,025.5	2,054.1
5 / 40.62	2,138.1	2,192.2	2,192.2	2,174.2	2,082.5	2,165.3	2,082.5	2,110.1
6 / 48.36	2,138.1	2,218.8	2,165.3	2,174.1	2,025.5	2,054.2	2,165.3	2,081.7
7 / 53.70	2,054.2	2,082.5	2,082.5	2,073.1	1,966.8	1,996.3	1,996.3	1,986.5
8 / 58.08	1,745.7	1,711.8	1,711.8	1,723.1	1,605.8	1,677.3	1,711.8	1,665.0
Averages ---------->	1,954.3	1,986.0	1,996.0	1,978.8	1,985.8	2,006.9	2,020.2	2,004.3

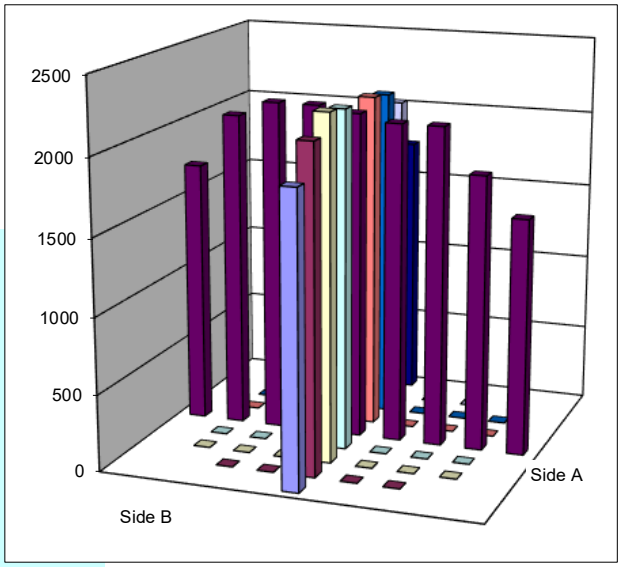
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	1991.5		Mean	2077.5	2078.8	2078.2
Min Point	1543.1	-22.5%	Std. Dev.	129.0	58.5	96.2
Max Point	2174.2	9.2%	COV as %	6.2	2.8	**4.6**

Flow w/o C-Pt 38847 cfm

Vel Avg w/o C-Pt 1978 fpm

	Start	Finish	
Stack temp	75.0	75.5	F
Equipment temp	77.9	76.1	F
Ambient temp	77.9	76.1	F
Stack static	0.22	0.12	mbars
Ambient pressure	989.50	989.84	mbars
Total Stack pressure	989.72	989.96	mbars
Ambient humidity	31%	32%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-4
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.7 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:56 12:01
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First Port				Second Port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	1,678.1	1,569.7	1,606.7	1,618.2	1,712.7	1,844.6	1,780.0	1,779.1
2	6.30	1,569.7	1,569.7	1,493.2	1,544.2	1,997.4	2,083.6	2,055.3	2,045.4
3	11.64	1,967.7	2,083.6	1,997.4	2,016.3	2,193.3	2,220.0	2,220.0	2,211.1
4	19.38	2,193.3	2,166.5	2,166.5	2,175.4	2,139.2	2,166.5	2,193.3	2,166.3
Center	30.00	2,220.0	2,246.2	2,272.2	2,246.1	2,166.5	2,246.2	2,220.0	2,210.9
5	40.62	2,297.9	2,220.0	2,220.0	2,245.9	2,083.6	2,083.6	2,139.2	2,102.2
6	48.36	2,297.9	2,446.3	2,470.1	2,404.8	2,055.3	2,083.6	2,111.6	2,083.5
7	53.70	2,083.6	2,083.6	1,997.4	2,054.9	2,026.5	2,111.6	2,026.5	2,054.9
8	58.08	1,780.0	1,606.7	1,678.1	1,688.2	1,844.6	1,812.5	1,746.6	1,801.3
Averages ---------->		2,009.8	1,999.2	1,989.1	1,999.3	2,024.3	2,072.5	2,054.7	2,050.5

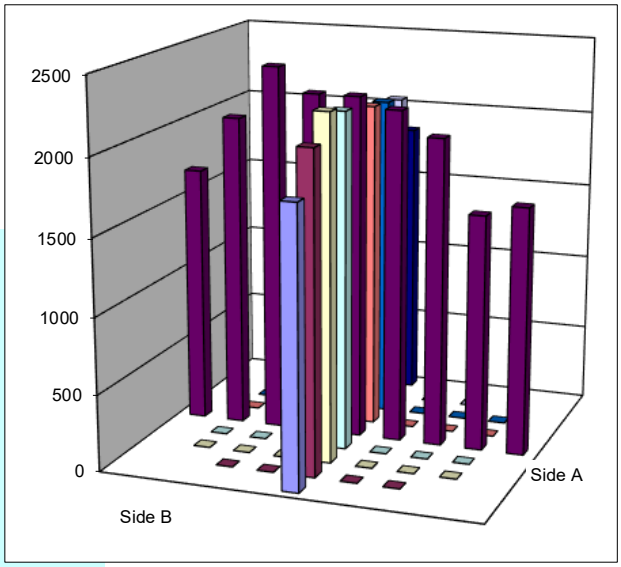
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2024.9		Mean	2098.2	2124.9	2111.6
Min Point	1544.2	-23.7%	Std. Dev.	276.6	70.7	194.5
Max Point	2404.8	18.8%	COV as %	13.2	3.3	**9.2**

Flow w/o C-Pt 39260 cfm

Vel Avg w/o C-Pt 1999 fpm

	Start	Finish	
Stack temp	75.7	75.6	F
Equipment temp	75.8	75.6	F
Ambient temp	75.8	75.6	F
Stack static	0.30	0.45	mbars
Ambient pressure	989.16	989.16	mbars
Total Stack pressure	989.46	989.61	mbars
Ambient humidity	33%	32%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-5
Date	5/25/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.6 deg F
Stack X-Area	2827.4 in.2	Start/End Time	14:04 14:09
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,532.6	1,607.5	1,643.6	1,594.6	1,938.6	1,908.1	1,998.3	1,948.3
2 / 6.30	1,607.5	1,643.6	1,643.6	1,631.5	2,027.5	2,112.5	2,056.3	2,065.4
3 / 11.64	2,112.5	2,167.5	2,194.4	2,158.1	2,221.0	2,167.5	2,140.2	2,176.2
4 / 19.38	2,298.9	2,194.4	2,167.5	2,220.3	2,027.5	2,167.5	2,140.2	2,111.7
Center / 30.00	2,221.0	2,140.2	2,167.5	2,176.2	2,167.5	2,056.3	2,112.5	2,112.1
5 / 40.62	2,221.0	2,084.6	2,194.4	2,166.7	2,112.5	2,084.6	2,167.5	2,121.5
6 / 48.36	2,194.4	2,140.2	2,140.2	2,158.3	1,968.7	2,027.5	2,027.5	2,007.9
7 / 53.70	2,167.5	2,027.5	2,027.5	2,074.1	1,968.7	1,938.6	2,056.3	1,987.8
8 / 58.08	1,713.5	1,813.4	1,780.7	1,769.2	1,908.1	1,813.4	1,877.0	1,866.2
Averages ---------->	2,007.6	1,979.9	1,995.5	1,994.3	2,037.8	2,030.7	2,064.0	2,044.1

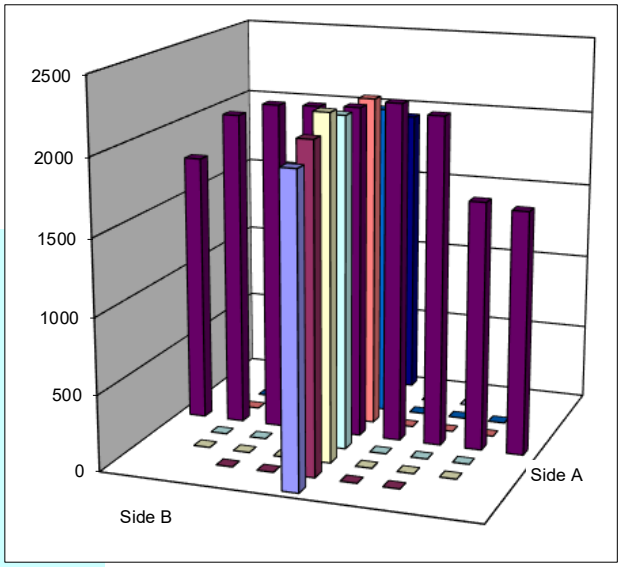
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2019.2		Mean	2083.6	2083.2	2083.4
Min Point	1594.6	-21.0%	Std. Dev.	204.0	66.9	145.9
Max Point	2220.3	10.0%	COV as %	9.8	3.2	**7.0**

Flow w/o C-Pt 39341 cfm

Vel Avg w/o C-Pt 2004 fpm

	Start	Finish	
Stack temp	75.6	75.6	F
Equipment temp	75.0	75.8	F
Ambient temp	75.0	75.8	F
Stack static	0.52	0.22	mbars
Ambient pressure	988.15	988.15	mbars
Total Stack pressure	988.67	988.37	mbars
Ambient humidity	32%	31%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-6
Date	5/26/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	74.9 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:29 9:34
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,638.5	1,638.5	1,673.7	1,650.2	1,902.2	1,902.2	1,932.6	1,912.3
2 / 6.30	1,932.6	1,962.6	1,932.6	1,942.6	1,932.6	1,962.6	1,992.1	1,962.4
3 / 11.64	2,187.5	2,160.8	2,106.0	2,151.4	2,187.5	2,187.5	2,187.5	2,187.5
4 / 19.38	2,214.1	2,214.1	2,187.5	2,205.2	2,078.1	2,160.8	2,133.6	2,124.2
Center / 30.00	2,291.8	2,367.0	2,367.0	2,341.9	2,133.6	2,106.0	2,133.6	2,124.4
5 / 40.62	2,291.8	2,240.3	2,187.5	2,239.9	2,049.8	2,078.1	2,133.6	2,087.2
6 / 48.36	2,266.2	2,291.8	2,214.1	2,257.4	2,106.0	2,021.2	2,106.0	2,077.7
7 / 53.70	2,240.3	2,214.1	2,240.3	2,231.5	1,992.1	1,962.6	1,962.6	1,972.4
8 / 58.08	1,807.8	1,839.8	1,742.1	1,796.6	1,807.8	1,742.1	1,871.2	1,807.0
Averages ---------->	2,096.7	2,103.2	2,072.3	2,090.8	2,021.1	2,013.7	2,050.3	2,028.4

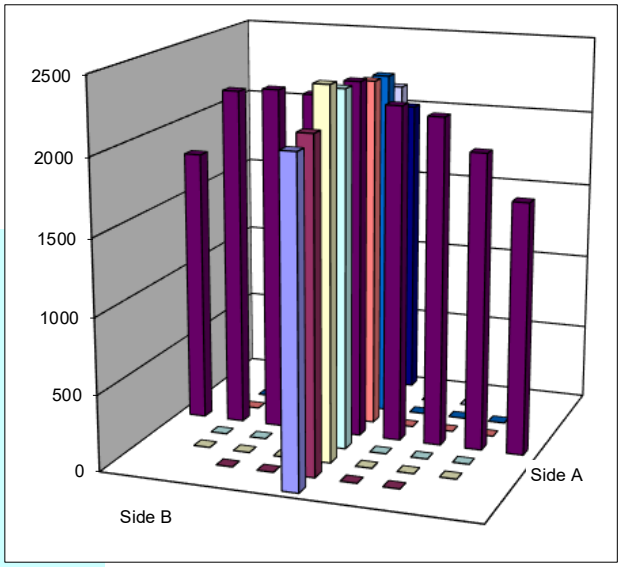
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2059.6		Mean	2195.7	2076.6	2136.1
Min Point	1650.2	-19.9%	Std. Dev.	125.5	82.5	119.3
Max Point	2341.9	13.7%	COV as %	5.7	4.0	**5.6**

Flow w/o C-Pt 40013 cfm

Vel Avg w/o C-Pt 2038 fpm

	Start	Finish	
Stack temp	74.5	75.2	F
Equipment temp	72.3	72.7	F
Ambient temp	72.3	72.7	F
Stack static	0.12	0.87	mbars
Ambient pressure	993.23	993.57	mbars
Total Stack pressure	993.35	994.44	mbars
Ambient humidity	33%	33%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-7
Date	5/26/21	Fan Configuration	Fan A
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.2 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:35 10:40
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,603.3	1,566.4	1,674.6	1,614.8	1,840.8	1,840.8	1,840.8	1,840.8
2 / 6.30	1,963.6	2,051.0	1,963.6	1,992.7	2,107.2	2,107.2	2,079.3	2,097.9
3 / 11.64	2,107.2	2,051.0	2,134.7	2,097.6	2,107.2	2,051.0	2,079.3	2,079.1
4 / 19.38	2,107.2	2,079.3	2,161.9	2,116.1	2,051.0	2,079.3	2,134.7	2,088.3
Center / 30.00	2,215.3	2,215.3	2,134.7	2,188.5	2,107.2	2,107.2	2,079.3	2,097.9
5 / 40.62	2,215.3	2,188.8	2,134.7	2,179.6	2,051.0	2,022.3	1,993.2	2,022.2
6 / 48.36	2,134.7	2,107.2	2,107.2	2,116.3	2,079.3	2,051.0	1,993.2	2,041.1
7 / 53.70	2,051.0	2,051.0	2,079.3	2,060.4	2,022.3	1,933.6	2,022.3	1,992.8
8 / 58.08	1,776.2	1,743.0	1,674.6	1,731.3	1,808.8	1,674.6	1,776.2	1,753.2
Averages ---------->	2,019.3	2,005.9	2,007.3	2,010.8	2,019.4	1,985.2	1,999.8	2,001.5

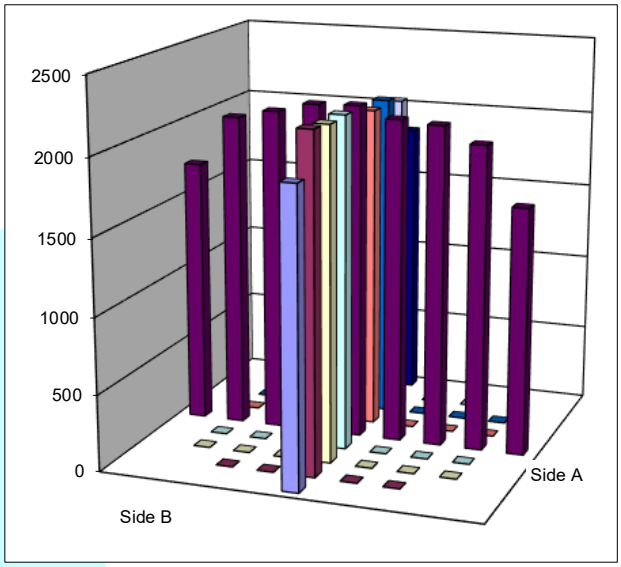
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2006.1		Mean	2107.3	2059.9	2083.6
Min Point	1614.8	-19.5%	Std. Dev.	67.6	41.5	59.2
Max Point	2188.5	9.1%	COV as %	3.2	2.0	**2.8**

Flow w/o C-Pt 39054 cfm

Vel Avg w/o C-Pt 1989 fpm

	Start	Finish	
Stack temp	74.9	75.5	F
Equipment temp	74.4	73.9	F
Ambient temp	74.4	73.9	F
Stack static	0.32	0.27	mbars
Ambient pressure	992.55	992.55	mbars
Total Stack pressure	992.87	992.82	mbars
Ambient humidity	32%	31%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-8
Date	5/26/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.3 deg F
Stack X-Area	2827.4 in.2	Start/End Time	12:48 12:55
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,450.9	1,567.2	1,675.4	1,564.5	1,743.8	1,777.0	1,841.7	1,787.5
2 / 6.30	1,841.7	1,777.0	1,841.7	1,820.1	1,964.6	2,051.9	1,964.6	1,993.7
3 / 11.64	1,964.6	1,904.1	1,934.5	1,934.4	2,135.7	2,135.7	2,162.9	2,144.7
4 / 19.38	2,135.7	2,135.7	2,162.9	2,144.7	2,189.7	2,189.7	2,189.7	2,189.7
Center / 30.00	2,162.9	2,135.7	2,135.7	2,144.7	2,162.9	2,189.7	2,189.7	2,180.8
5 / 40.62	2,189.7	2,162.9	2,162.9	2,171.8	2,108.1	2,135.7	2,135.7	2,126.5
6 / 48.36	2,216.3	2,108.1	2,162.9	2,162.4	2,162.9	2,189.7	2,189.7	2,180.8
7 / 53.70	1,994.1	2,023.2	2,080.2	2,032.5	2,135.7	2,023.2	2,080.2	2,079.7
8 / 58.08	1,809.7	1,709.9	1,777.0	1,765.5	1,841.7	1,841.7	1,873.1	1,852.2
Averages ---------->	1,973.9	1,947.1	1,992.6	1,971.2	2,049.4	2,059.4	2,069.7	2,059.5

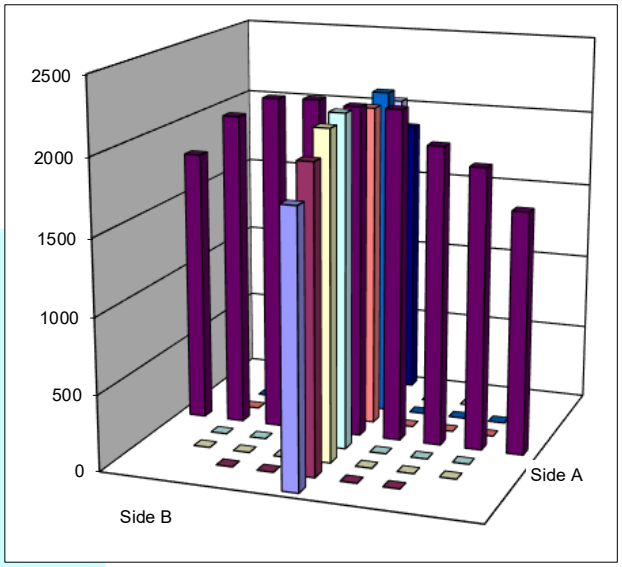
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2015.4		Mean	2058.7	2128.0	2093.3
Min Point	1564.5	-22.4%	Std. Dev.	136.3	70.8	110.3
Max Point	2189.7	8.7%	COV as %	6.6	3.3	**5.3**

Flow w/o C-Pt 39210 cfm

Vel Avg w/o C-Pt 1997 fpm

	Start	Finish	
Stack temp	74.9	75.6	F
Equipment temp	73.2	73.7	F
Ambient temp	73.2	73.7	F
Stack static	0.20	0.80	mbars
Ambient pressure	991.53	991.53	mbars
Total Stack pressure	991.73	992.33	mbars
Ambient humidity	31%	30%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-9
Date	5/26/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.8 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:53 13:58
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,711.4	1,778.5	1,530.8	1,673.5	1,874.7	1,905.7	1,874.7	1,885.1
2 / 6.30	2,164.7	2,191.6	2,137.5	2,164.6	2,082.0	2,082.0	2,137.5	2,100.5
3 / 11.64	2,137.5	2,024.9	2,218.2	2,126.9	2,164.7	2,137.5	2,137.5	2,146.6
4 / 19.38	2,191.6	2,137.5	2,191.6	2,173.6	2,110.0	2,137.5	2,110.0	2,119.2
Center / 30.00	2,218.2	2,191.6	2,218.2	2,209.4	2,110.0	2,164.7	2,110.0	2,128.2
5 / 40.62	2,191.6	2,164.7	2,191.6	2,182.7	2,218.2	2,218.2	2,191.6	2,209.4
6 / 48.36	2,164.7	2,191.6	2,191.6	2,182.7	2,137.5	2,110.0	2,164.7	2,137.4
7 / 53.70	2,191.6	2,164.7	2,110.0	2,155.4	2,024.9	2,110.0	2,053.7	2,062.9
8 / 58.08	1,711.4	1,778.5	1,778.5	1,756.1	1,778.5	1,936.2	1,778.5	1,831.1
Averages ---------->	2,075.9	2,069.3	2,063.1	2,069.4	2,055.6	2,089.1	2,062.0	2,068.9

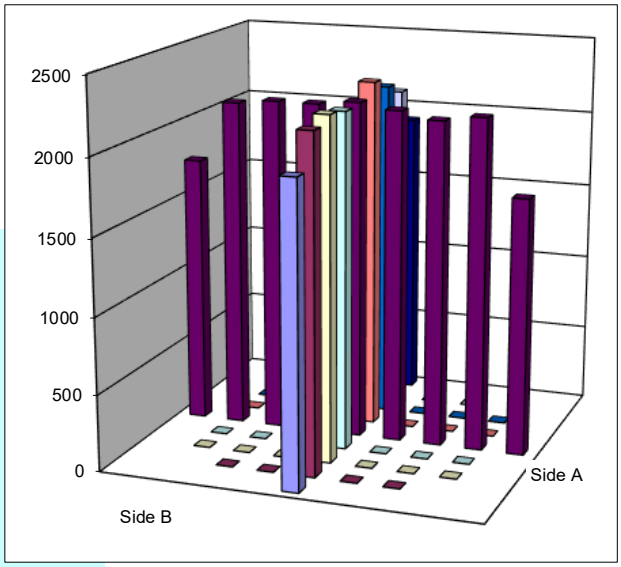
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2069.2		Mean	2170.7	2129.2	2150.0
Min Point	1673.5	-19.1%	Std. Dev.	25.7	44.9	41.3
Max Point	2209.4	6.8%	COV as %	1.2	2.1	**1.9**

Flow w/o C-Pt 40384 cfm

Vel Avg w/o C-Pt 2057 fpm

	Start	Finish	
Stack temp	75.5	76.0	F
Equipment temp	75.6	75.7	F
Ambient temp	75.6	75.7	F
Stack static	0.05	0.77	mbars
Ambient pressure	990.86	990.86	mbars
Total Stack pressure	990.91	991.63	mbars
Ambient humidity	28%	28%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-10
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.9 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:08 9:12
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,751.3	1,682.6	1,536.0	1,656.6	1,881.2	1,912.3	1,817.4	1,870.3
2 / 6.30	1,912.3	1,784.6	1,849.6	1,848.8	2,002.7	2,002.7	2,060.8	2,022.0
3 / 11.64	2,172.2	2,117.2	2,089.2	2,126.2	2,089.2	2,144.9	2,117.2	2,117.1
4 / 19.38	2,144.9	2,117.2	2,117.2	2,126.5	2,117.2	2,089.2	2,117.2	2,107.9
Center / 30.00	2,199.2	2,225.9	2,225.9	2,217.0	2,117.2	2,144.9	2,144.9	2,135.7
5 / 40.62	2,117.2	2,089.2	2,089.2	2,098.5	2,060.8	2,089.2	2,117.2	2,089.1
6 / 48.36	2,117.2	2,117.2	2,144.9	2,126.5	2,089.2	2,032.0	2,002.7	2,041.3
7 / 53.70	2,060.8	2,089.2	2,032.0	2,060.6	2,032.0	2,089.2	2,089.2	2,070.1
8 / 58.08	1,881.2	1,849.6	1,784.6	1,838.5	1,817.4	1,682.6	1,717.3	1,739.1
Averages ---------->	2,039.6	2,008.1	1,985.4	2,011.0	2,023.0	2,020.8	2,020.4	2,021.4

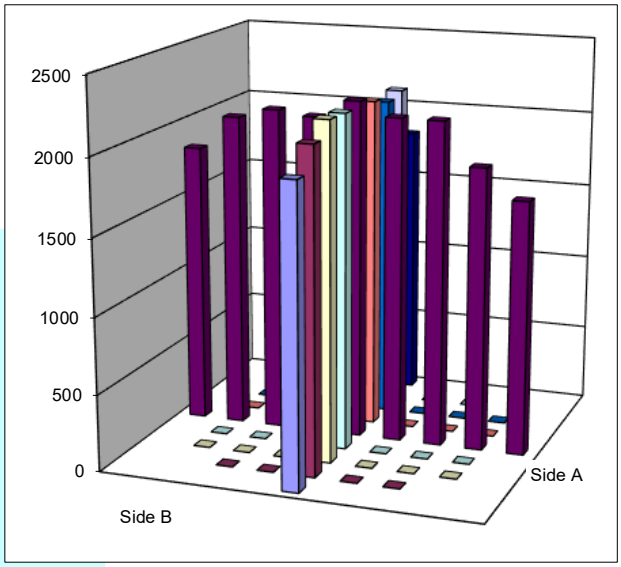
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2016.2		Mean	2086.3	2083.3	2084.8
Min Point	1656.6	-17.8%	Std. Dev.	114.8	41.3	82.9
Max Point	2217.0	10.0%	COV as %	5.5	2.0	**4.0**

Flow w/o C-Pt 39195 cfm

Vel Avg w/o C-Pt 1996 fpm

	Start	Finish	
Stack temp	75.7	76.1	F
Equipment temp	70.3	72.5	F
Ambient temp	70.3	72.5	F
Stack static	0.25	0.37	mbars
Ambient pressure	984.42	984.42	mbars
Total Stack pressure	984.67	984.79	mbars
Ambient humidity	29%	27%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-11
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	77.0 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:11 10:17
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,575.4	1,648.7	1,684.3	1,636.1	1,718.9	1,786.4	1,753.0	1,752.8
2 / 6.30	1,914.1	1,786.4	1,786.4	1,829.0	2,091.2	2,033.9	2,033.9	2,053.0
3 / 11.64	1,914.1	1,944.8	1,974.9	1,944.6	2,119.3	2,119.3	2,147.0	2,128.5
4 / 19.38	2,119.3	2,091.2	2,091.2	2,100.6	2,119.3	2,091.2	2,119.3	2,109.9
Center / 30.00	2,201.3	2,174.4	2,119.3	2,165.0	2,119.3	2,174.4	2,147.0	2,146.9
5 / 40.62	2,119.3	2,119.3	2,119.3	2,119.3	2,147.0	2,091.2	2,147.0	2,128.4
6 / 48.36	2,119.3	2,147.0	2,091.2	2,119.2	2,062.8	2,062.8	2,004.6	2,043.4
7 / 53.70	2,062.8	1,883.0	1,944.8	1,963.5	2,062.8	2,062.8	1,883.0	2,002.8
8 / 58.08	1,753.0	1,718.9	1,684.3	1,718.7	1,786.4	1,786.4	1,684.3	1,752.3
Averages ---------->	1,975.4	1,946.0	1,944.0	1,955.1	2,025.2	2,023.1	1,991.0	2,013.1

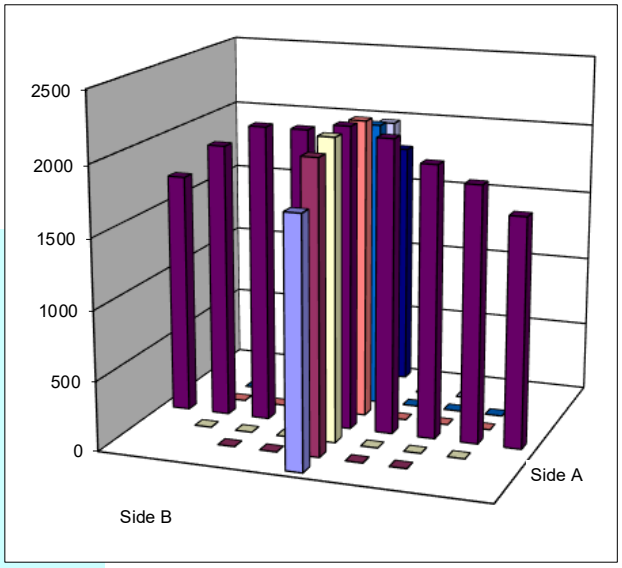
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	1984.1		Mean	2034.4	2087.6	2061.0
Min Point	1636.1	-17.5%	Std. Dev.	123.2	54.3	95.5
Max Point	2165.0	9.1%	COV as %	6.1	2.6	**4.6**

Flow w/o C-Pt 38536 cfm

Vel Avg w/o C-Pt 1963 fpm

	Start	Finish	
Stack temp	77.0	77.0	F
Equipment temp	74.6	75.4	F
Ambient temp	74.6	75.4	F
Stack static	0.40	0.12	mbars
Ambient pressure	984.42	984.76	mbars
Total Stack pressure	984.82	984.88	mbars
Ambient humidity	30%	28%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-12
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	76.4 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:12 11:17
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,752.2	1,611.8	1,752.2	1,705.4	1,818.3	1,818.3	1,850.5	1,829.0
2 / 6.30	1,718.1	1,818.3	1,785.6	1,774.0	2,090.2	2,032.9	2,003.7	2,042.3
3 / 11.64	2,146.0	2,118.3	2,090.2	2,118.1	2,118.3	2,146.0	2,173.3	2,145.9
4 / 19.38	2,146.0	2,146.0	2,118.3	2,136.7	2,227.0	2,146.0	2,146.0	2,173.0
Center / 30.00	2,227.0	2,305.1	2,227.0	2,253.0	2,146.0	2,090.2	2,173.3	2,136.5
5 / 40.62	2,173.3	2,200.3	2,173.3	2,182.3	2,200.3	2,146.0	2,200.3	2,182.2
6 / 48.36	2,227.0	2,118.3	2,118.3	2,154.5	2,200.3	2,118.3	2,146.0	2,154.8
7 / 53.70	2,090.2	2,118.3	2,090.2	2,099.6	2,090.2	2,032.9	2,061.7	2,061.6
8 / 58.08	1,818.3	1,752.2	1,752.2	1,774.2	1,752.2	1,683.4	1,818.3	1,751.3
Averages ---------->	2,033.1	2,020.9	2,011.9	2,022.0	2,071.4	2,023.8	2,063.7	2,053.0

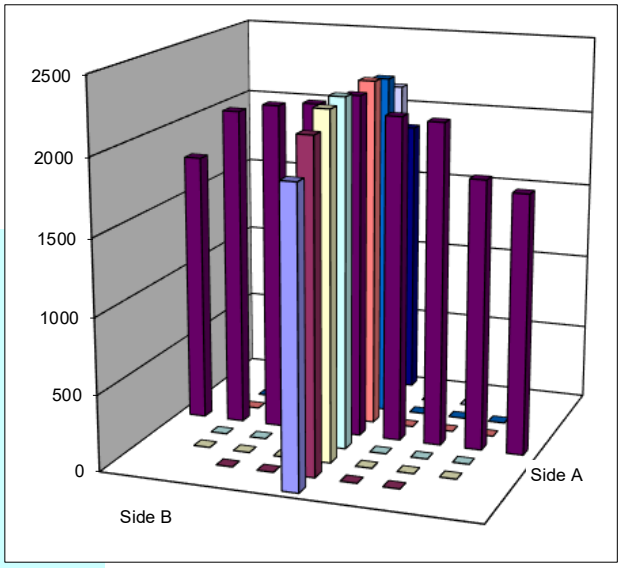
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2037.5		Mean	2102.6	2128.0	2115.3
Min Point	1705.4	-16.3%	Std. Dev.	153.3	54.5	111.3
Max Point	2253.0	10.6%	COV as %	7.3	2.6	**5.3**

Flow w/o C-Pt 39620 cfm

Vel Avg w/o C-Pt 2018 fpm

	Start	Finish	
Stack temp	76.4	76.4	F
Equipment temp	73.9	75.0	F
Ambient temp	73.9	75.0	F
Stack static	0.40	0.45	mbars
Ambient pressure	984.08	984.42	mbars
Total Stack pressure	984.48	984.87	mbars
Ambient humidity	32%	31%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-13
Date	5/27/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	77.1 deg F
Stack X-Area	2827.4 in.2	Start/End Time	12:18 12:24
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,753.3	1,786.6	1,914.5	1,818.1	1,786.6	1,819.5	1,753.3	1,786.5
2 / 6.30	1,883.3	1,819.5	1,786.6	1,829.8	2,091.5	2,034.2	2,091.5	2,072.4
3 / 11.64	2,091.5	2,091.5	2,119.6	2,100.9	2,174.7	2,119.6	2,147.3	2,147.2
4 / 19.38	2,119.6	2,147.3	2,147.3	2,138.0	2,174.7	2,228.3	2,228.3	2,210.4
Center / 30.00	2,147.3	2,174.7	2,201.6	2,174.5	2,147.3	2,091.5	2,174.7	2,137.8
5 / 40.62	2,201.6	2,174.7	2,174.7	2,183.7	2,174.7	2,091.5	2,119.6	2,128.6
6 / 48.36	2,174.7	2,174.7	2,119.6	2,156.3	2,147.3	2,034.2	2,063.0	2,081.5
7 / 53.70	2,147.3	2,147.3	2,174.7	2,156.4	2,147.3	2,004.9	2,091.5	2,081.2
8 / 58.08	1,851.6	1,786.6	1,753.3	1,797.2	1,786.6	1,719.2	1,753.3	1,753.0
Averages ---------->	2,041.1	2,033.6	2,043.5	2,039.4	2,070.1	2,015.9	2,046.9	2,044.3

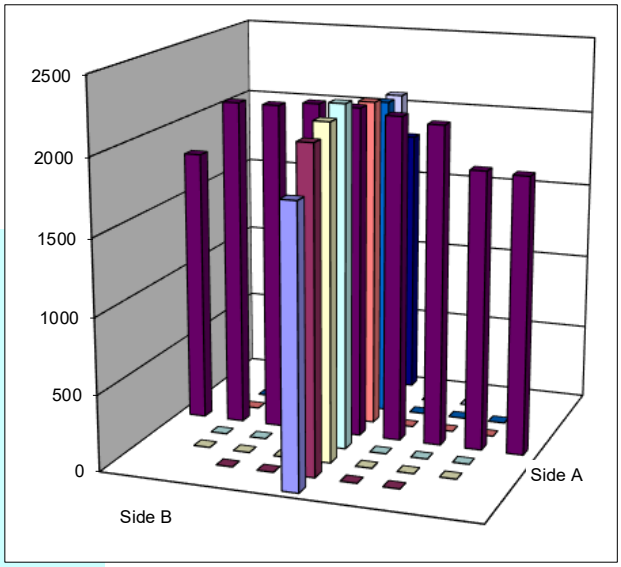
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2041.9		Mean	2105.7	2122.7	2114.2
Min Point	1753.0	-14.1%	Std. Dev.	124.6	49.2	91.4
Max Point	2210.4	8.3%	COV as %	5.9	2.3	**4.3**

Flow w/o C-Pt 39811 cfm

Vel Avg w/o C-Pt 2028 fpm

	Start	Finish	
Stack temp	77.2	76.9	F
Equipment temp	76.0	76.8	F
Ambient temp	76.0	76.8	F
Stack static	0.27	0.20	mbars
Ambient pressure	984.42	984.42	mbars
Total Stack pressure	984.69	984.62	mbars
Ambient humidity	32%	30%	RH

Instuments Used:	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S2 (C5V)	Run No.	VT-14
Date	5/28/21	Fan Configuration	Fan B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	75.6 deg F
Stack X-Area	2827.4 in.2	Start/End Time	8:52 8:57
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	91.17 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First Port				Second Port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	1,806.8	1,838.7	1,774.2	1,806.6	1,806.8	1,806.8	1,741.1	1,784.9
2 / 6.30	1,870.2	1,961.4	1,741.1	1,857.6	1,931.5	1,901.1	1,901.1	1,911.3
3 / 11.64	2,104.8	2,076.9	1,991.0	2,057.6	2,104.8	2,048.7	2,048.7	2,067.4
4 / 19.38	2,159.5	2,186.4	2,159.5	2,168.5	2,076.9	2,104.8	2,104.8	2,095.5
Center / 30.00	2,186.4	2,239.0	2,186.4	2,203.9	2,159.5	2,186.4	2,186.4	2,177.4
5 / 40.62	2,186.4	2,159.5	2,159.5	2,168.5	2,132.4	2,132.4	2,104.8	2,123.2
6 / 48.36	2,212.8	2,186.4	2,132.4	2,177.2	2,132.4	2,159.5	2,132.4	2,141.4
7 / 53.70	2,076.9	2,048.7	2,132.4	2,086.0	2,048.7	2,076.9	2,020.1	2,048.6
8 / 58.08	1,741.1	1,741.1	1,774.2	1,752.1	1,774.2	1,806.8	1,741.1	1,774.0
Averages ---------->	2,038.3	2,048.7	2,005.6	2,030.9	2,018.6	2,024.8	1,997.8	2,013.7

All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2022.3		Mean	2102.7	2080.7	2091.7
Min Point	1752.1	-13.4%	Std. Dev.	120.3	86.6	101.3
Max Point	2203.9	9.0%	COV as %	5.7	4.2	**4.8**

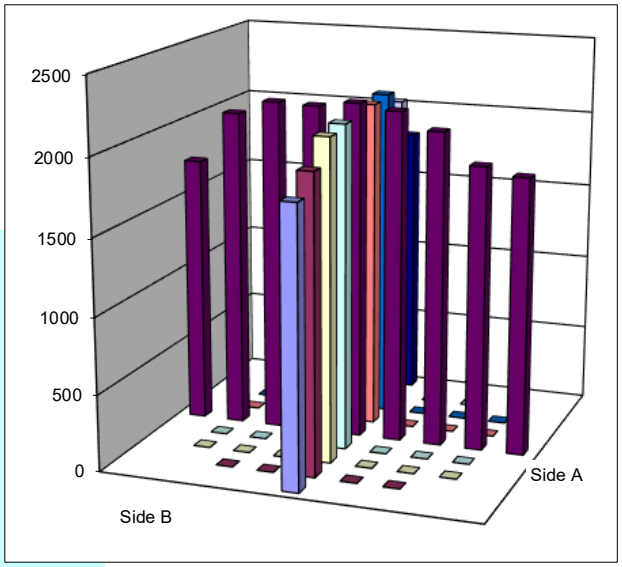
Flow w/o C-Pt 39295 cfm

Vel Avg w/o C-Pt 2001 fpm

Instuments Used:

	Cal Due
S-type pitot (ID: A100-19, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification

	Start	Finish	
Stack temp	75.6	75.6	F
Equipment temp	71.6	71.8	F
Ambient temp	71.6	71.8	F
Stack static	0.12	0.30	mbars
Ambient pressure	995.60	995.60	mbars
Total Stack pressure	995.72	995.90	mbars
Ambient humidity	28%	28%	RH



Notes:

Traverse point depth = the distance from the 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.

Appendix C – LV-S3 Stack Verification Data Sheets

C.1 Continuous Air Monitor (CAM) Flow Angle Data Forms

FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-1
Date	6/21/2021	Fan Setting	NA Hz
Start/End Time	11:29 11:40	Fan Configuration	A & B
Testers	JPC/LCE	Stack Temp	109.7 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	4.6	4.3	3.7	4.2	6.3	6.4	6.4	6.4
2	1.79	2.5	2.5	2.9	2.6	10.5	10.4	10.1	10.3
3	3.30	3.9	2.6	2.0	2.8	6.0	5.8	6.5	6.1
4	5.49	5.8	5.6	6.1	5.8	5.9	6.2	7.3	6.5
Center	8.50	7.2	6.8	7.0	7.0	3.3	4.2	3.7	3.7
5	11.51	4.9	3.8	4.4	4.4	0.1	1.2	1.5	0.9
6	13.70	2.0	1.7	1.6	1.8	9.7	2.8	1.7	4.7
7	15.22	2.6	2.1	2.7	2.5	4.6	4.5	5.3	4.8
8	16.46	3.6	1.8	3.6	3.0	2.5	3.2	2.9	2.9
Mean of absolute values:					3.8				5.1
" " w/o points by wall:					3.8				5.3
								Grand mean ABS	4.5
								Grand mean ABS w/o wall pts	4.6

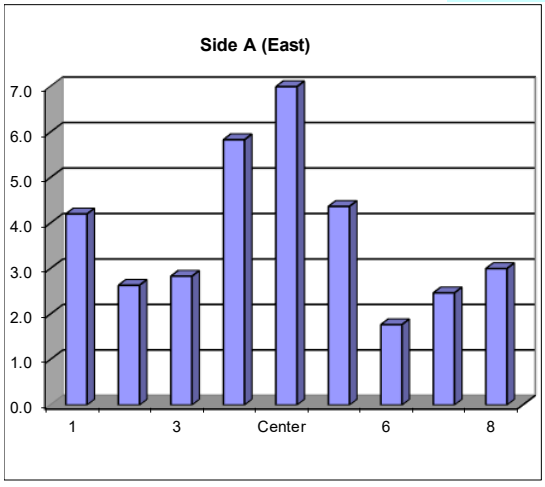
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

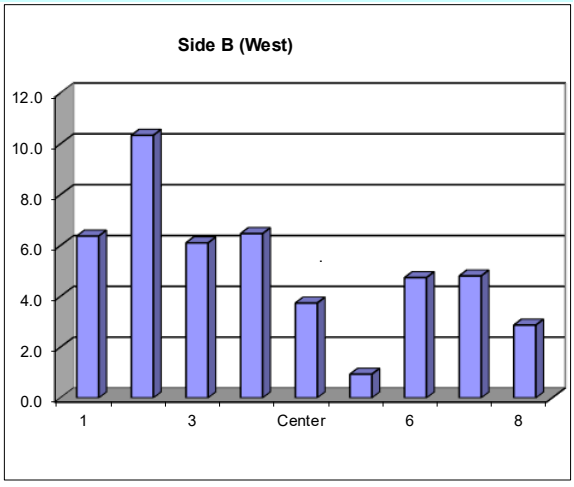
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-2
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	10:12 10:22	Fan Configuration	A & B
Testers	JPC/LCE	Stack Temp	110.0 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 0.54	3.8	3.6	5.2	4.2	5.3	4.7	4.9	5.0
2 / 1.79	1.5	3.2	1.8	2.2	6.3	5.4	5.6	5.8
3 / 3.30	4.8	4.1	3.4	4.1	5.1	6.2	1.6	4.3
4 / 5.49	0.7	0.9	0.9	0.8	6.2	6.3	5.6	6.0
Center / 8.50	3.2	4.6	4.8	4.2	2.3	2.8	3.0	2.7
5 / 11.51	4.0	4.7	3.9	4.2	2.4	1.9	2.2	2.2
6 / 13.70	2.8	2.7	3.3	2.9	2.8	2.4	2.0	2.4
7 / 15.22	2.5	2.9	2.6	2.7	7.4	6.7	7.1	7.1
8 / 16.46	4.8	1.6	1.4	2.6	2.7	10.1	6.2	6.3
Mean of absolute values:				3.1				4.6
" " w/o points by wall:				3.0				4.3
							Grand mean ABS	3.9
							Grand mean ABS w/o wall pts	3.7

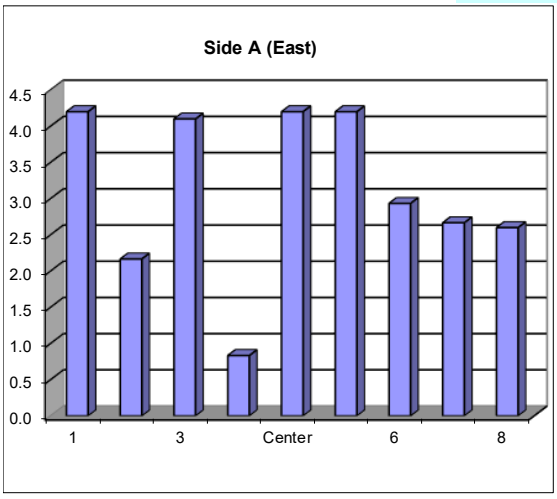
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

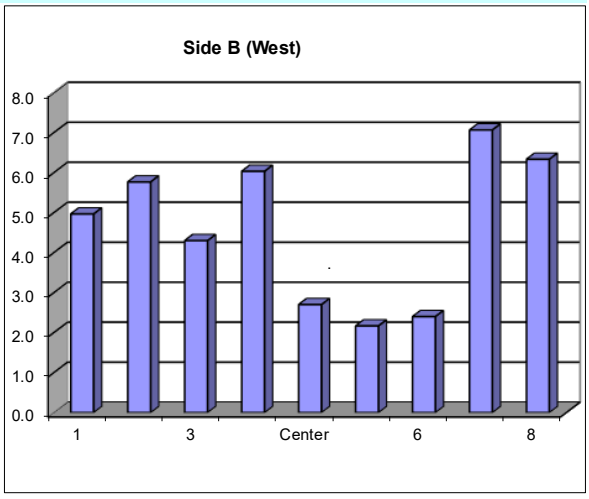
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-3
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	11:15 11:25	Fan Configuration	A & B
Testers	JPC/LCE	Stack Temp	110.4 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	6.3	5.9	5.0	5.7	2.1	4.1	3.4	3.2
2	1.79	4.2	3.1	7.5	4.9	1.4	1.0	0.8	1.1
3	3.30	3.7	2.5	2.3	2.8	12.5	10.7	11.8	11.7
4	5.49	6.1	4.0	4.5	4.9	11.7	11.5	11.1	11.4
Center	8.50	8.6	7.7	6.5	7.6	10.3	9.3	9.4	9.7
5	11.51	6.4	3.6	1.7	3.9	4.6	6.4	5.6	5.5
6	13.70	6.3	5.9	3.9	5.4	1.5	1.6	1.7	1.6
7	15.22	3.3	4.4	4.8	4.2	2.0	1.8	2.1	2.0
8	16.46	0.4	0.9	2.5	1.3	4.8	3.4	4.3	4.2
Mean of absolute values:					4.5				5.6
" " w/o points by wall:					4.8				6.1
								Grand mean ABS	5.1
								Grand mean ABS w/o wall pts	5.5

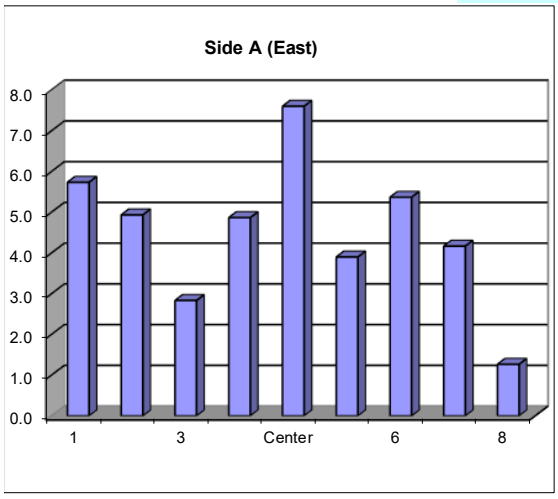
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

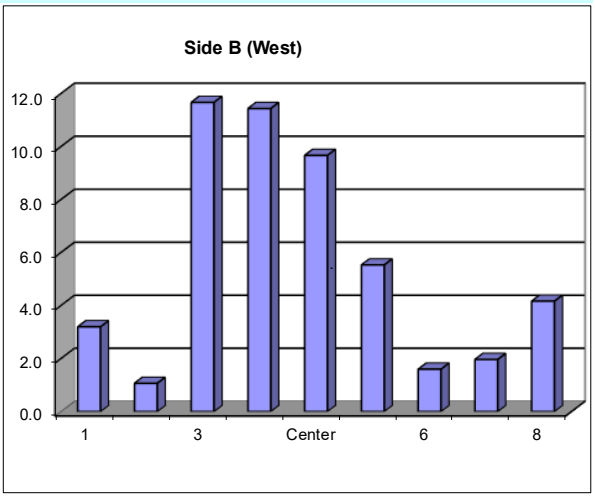
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-4
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	13:24 13:33	Fan Configuration	A & B
Testers	JPC/LCE	Stack Temp	111.0 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	0.54	1.6	1.4	1.7	1.6	12.5	11.7	12.3	12.2
2	1.79	2.5	1.0	1.3	1.6	9.5	10.4	10.1	10.0
3	3.30	1.6	1.7	0.9	1.4	12.7	13.3	12.7	12.9
4	5.49	0.6	0.5	1.2	0.8	12.1	10.8	10.9	11.3
Center	8.50	6.0	5.4	6.1	5.8	9.1	7.9	8.3	8.4
5	11.51	7.2	7.0	6.3	6.8	12.5	12.1	13.4	12.7
6	13.70	2.7	2.6	2.0	2.4	4.9	5.8	5.5	5.4
7	15.22	9.6	9.3	8.9	9.3	11.5	11.4	11.6	11.5
8	16.46	2.6	3.3	3.6	3.2	12.6	11.8	11.0	11.8
Mean of absolute values:					3.7				10.7
" " w/o points by wall:					4.0				10.3
								Grand mean ABS	7.2
								Grand mean ABS w/o wall pts	7.2

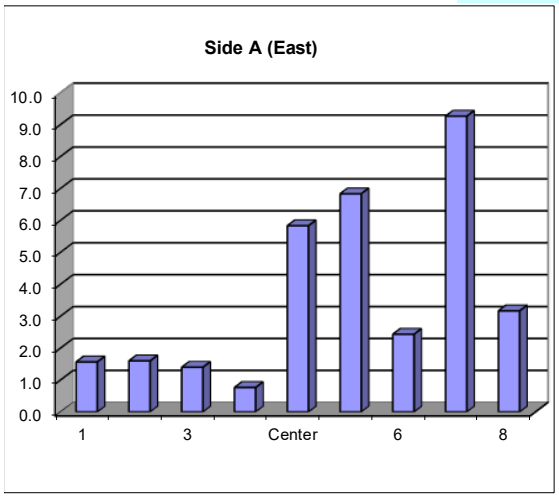
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

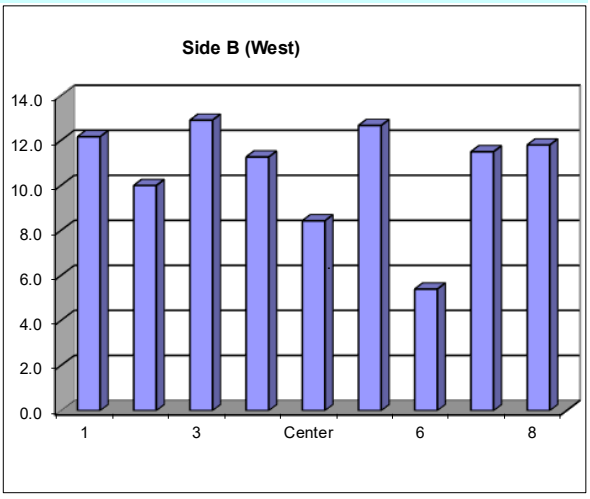
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-5
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	14:26 14:33	Fan Configuration	A & B
Testers	JPC/LCE	Stack Temp	110.2 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 0.54	2.7	1.3	3.1	2.4	5.7	5.6	4.0	5.1
2 / 1.79	1.0	2.2	1.5	1.6	2.2	2.5	3.4	2.7
3 / 3.30	2.0	1.1	0.9	1.3	8.8	7.6	6.9	7.8
4 / 5.49	0.5	2.2	1.3	1.3	11.5	11.2	11.7	11.5
Center / 8.50	4.3	2.9	3.1	3.4	5.4	5.2	4.8	5.1
5 / 11.51	4.6	5.0	4.0	4.5	0.6	1.1	2.3	1.3
6 / 13.70	1.1	2.4	2.1	1.9	1.5	2.7	2.5	2.2
7 / 15.22	7.7	7.3	6.8	7.3	8.1	7.5	6.9	7.5
8 / 16.46	2.7	2.4	2.6	2.6	5.4	9.6	7.3	7.4
Mean of absolute values:				2.9				5.6
" " w/o points by wall:				3.0				5.4
							Grand mean ABS	4.3
							Grand mean ABS w/o wall pts	4.2

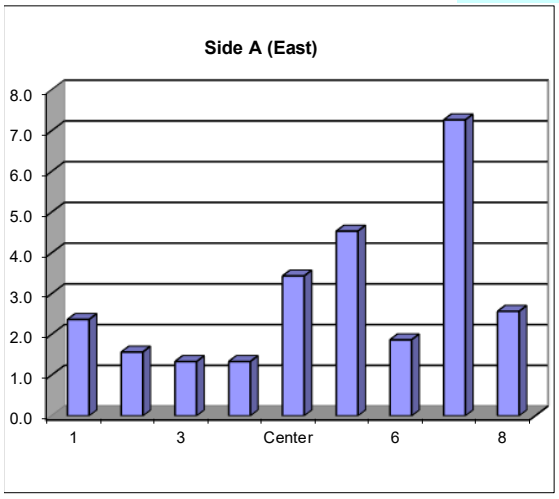
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

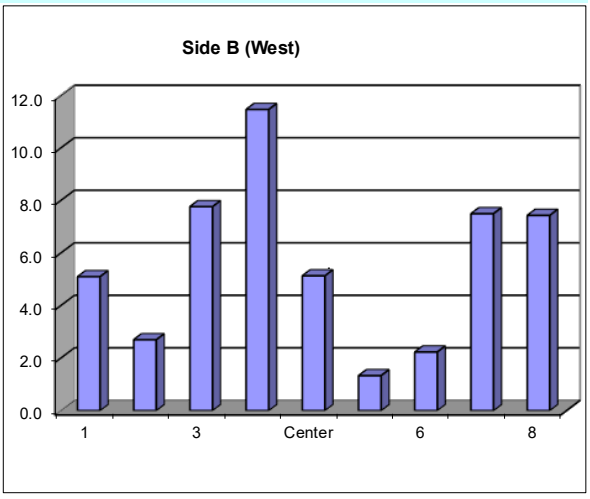
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-6
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	10:11 10:22	Fan Configuration	B & C
Testers	JPC/LCE	Stack Temp	111.1 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	0.54	2.3	2.0	2.4	2.2	2.3	3.2	3.1	2.9
2	1.79	3.1	2.9	4.3	3.4	7.0	6.3	5.0	6.1
3	3.30	4.4	3.9	5.3	4.5	6.2	5.2	4.9	5.4
4	5.49	8.8	6.3	6.8	7.3	6.2	5.3	5.0	5.5
Center	8.50	4.1	2.9	2.8	3.3	3.4	2.4	2.1	2.6
5	11.51	8.5	7.7	8.1	8.1	4.2	1.6	0.3	2.0
6	13.70	10.3	11.4	10.4	10.7	3.9	3.4	3.1	3.5
7	15.22	12.6	12.3	13.1	12.7	5.9	5.4	4.9	5.4
8	16.46	14.5	11.0	11.3	12.3	12.2	12.3	14.3	12.9
Mean of absolute values:					7.2				5.2
" " w/o points by wall:					7.1				4.4
								Grand mean ABS	6.2
							Grand mean ABS w/o wall pts		5.8

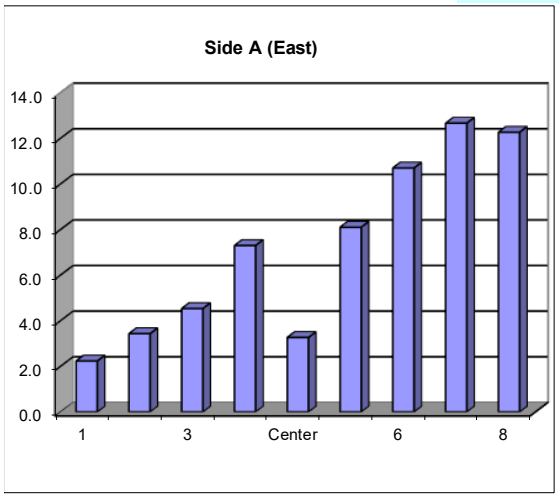
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

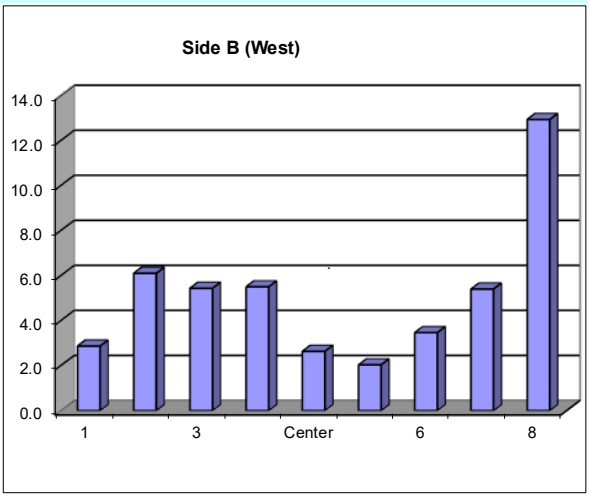
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-7
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	11:15 11:25	Fan Configuration	B & C
Testers	JPC/LCE	Stack Temp	111.6 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	2.8	2.3	1.8	2.3	2.9	2.3	3.7	3.0
2	1.79	1.8	0.5	0.9	1.1	3.8	3.0	2.7	3.2
3	3.30	3.1	2.8	3.5	3.1	4.0	4.4	2.9	3.8
4	5.49	2.5	1.9	2.4	2.3	5.5	6.6	6.7	6.3
Center	8.50	0.4	4.1	3.3	2.6	2.2	2.2	3.3	2.6
5	11.51	1.1	0.7	2.3	1.4	5.7	6.3	4.9	5.6
6	13.70	3.0	2.1	3.4	2.8	4.6	5.3	4.0	4.6
7	15.22	5.1	3.7	2.8	3.9	0.3	0.2	0.1	0.2
8	16.46	2.0	1.3	1.0	1.4	13.5	13.0	12.6	13.0
Mean of absolute values:					2.3				4.7
" " w/o points by wall:					2.4				3.7
								Grand mean ABS	3.5
								Grand mean ABS w/o wall pts	3.1

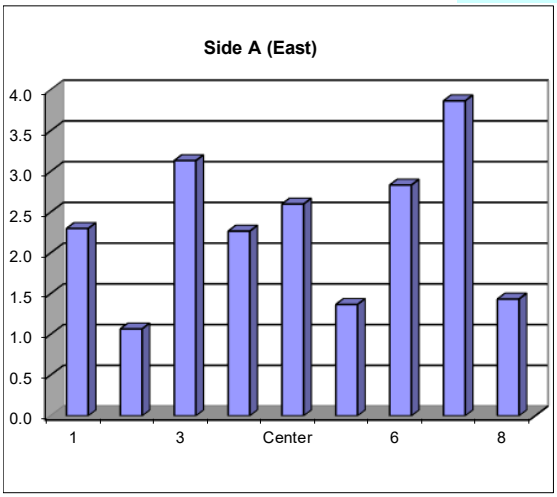
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

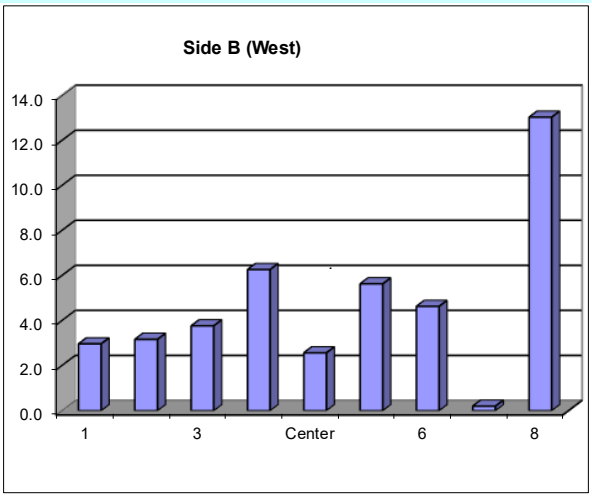
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-8
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	13:16 13:24	Fan Configuration	B & C
Testers	JPC/LCE	Stack Temp	110.6 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ---->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	3.5	2.0	1.3	2.3	1.4	1.4	1.3	1.4
2	1.79	1.9	1.7	0.9	1.5	5.4	5.9	4.2	5.2
3	3.30	3.4	3.5	3.0	3.3	6.9	3.6	3.9	4.8
4	5.49	1.9	2.0	1.5	1.8	5.7	5.1	5.4	5.4
Center	8.50	1.0	0.9	0.8	0.9	8.4	9.2	8.7	8.8
5	11.51	5.0	3.0	3.6	3.9	4.0	3.7	3.9	3.9
6	13.70	4.5	2.1	1.9	2.8	4.0	4.6	5.0	4.5
7	15.22	4.2	5.2	4.1	4.5	3.6	4.4	3.7	3.9
8	16.46	1.9	2.1	2.0	2.0	13.4	13.0	12.3	12.9
Mean of absolute values:					2.6				5.6
" " w/o points by wall:					2.7				5.2
								Grand mean ABS	4.1
								Grand mean ABS w/o wall pts	3.9

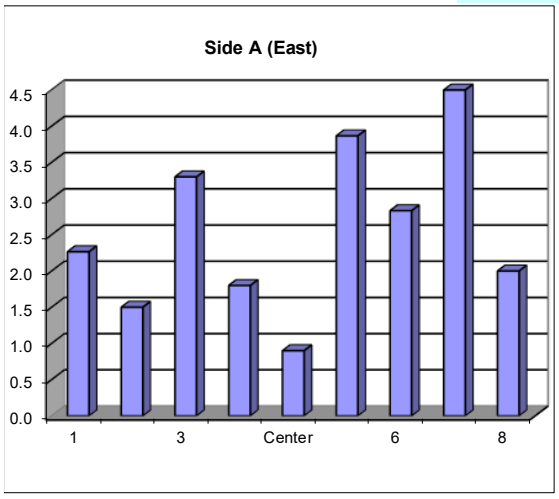
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

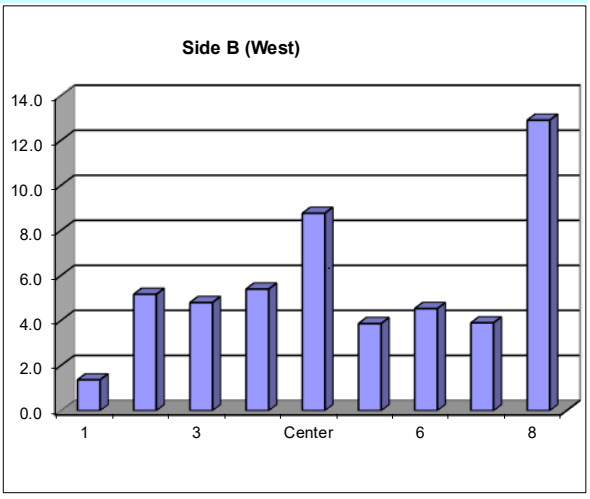
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-9
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	14:24 14:34	Fan Configuration	B & C
Testers	JPC/LCE	Stack Temp	110.0 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ----->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	0.5	0.9	1.6	1.0	4.5	3.0	3.3	3.6
2	1.79	1.2	1.2	1.0	1.1	3.6	4.3	2.5	3.5
3	3.30	2.5	1.9	0.7	1.7	5.7	6.4	5.3	5.8
4	5.49	5.6	5.5	5.0	5.4	6.3	6.5	6.4	6.4
Center	8.50	3.2	3.7	3.7	3.5	7.6	8.1	7.9	7.9
5	11.51	5.1	4.9	5.6	5.2	7.3	8.4	7.9	7.9
6	13.70	2.8	2.9	3.1	2.9	8.1	8.6	8.9	8.5
7	15.22	4.0	5.9	5.2	5.0	14.7	15.2	15.0	15.0
8	16.46	2.5	1.4	1.2	1.7	6.4	6.2	5.3	6.0
Mean of absolute values:					3.1				7.2
" " w/o points by wall:					3.6				7.8
								Grand mean ABS	5.1
								Grand mean ABS w/o wall pts	5.7

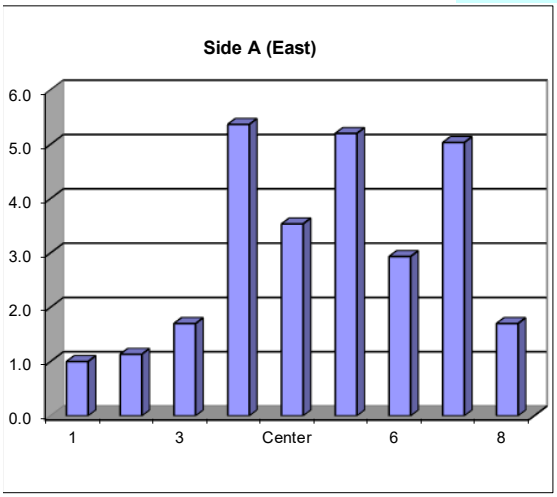
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

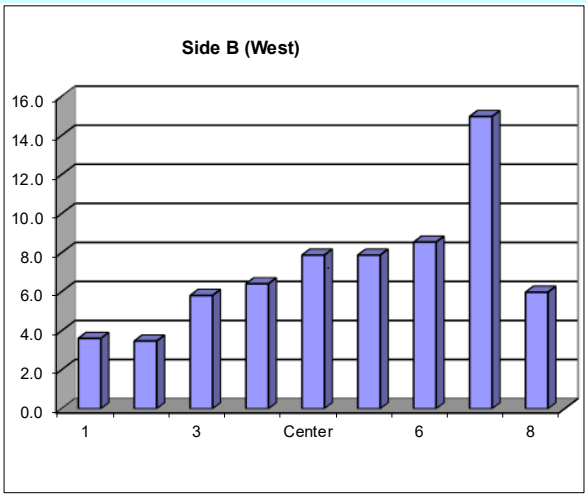
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-10
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	9:55 10:04	Fan Configuration	A & C
Testers	JPC/LCE	Stack Temp	110.8 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	1.7	0.8	1.3	1.3	2.9	5.0	3.7	3.9
2	1.79	0.6	1.3	2.4	1.4	7.9	6.9	5.2	6.7
3	3.30	4.1	2.8	5.3	4.1	2.9	4.6	5.0	4.2
4	5.49	4.9	5.7	4.7	5.1	5.2	4.0	4.2	4.5
Center	8.50	3.6	2.3	3.0	3.0	7.4	7.9	8.2	7.8
5	11.51	1.9	1.5	0.7	1.4	4.2	3.5	1.8	3.2
6	13.70	3.8	3.6	3.4	3.6	3.9	4.1	3.3	3.8
7	15.22	0.9	2.4	2.3	1.9	7.1	7.2	6.9	7.1
8	16.46	0.7	0.9	2.2	1.3	5.9	6.2	5.8	6.0
Mean of absolute values:					2.5				5.2
" " w/o points by wall:					2.9				5.3
								Grand mean ABS	3.9
								Grand mean ABS w/o wall pts	4.1

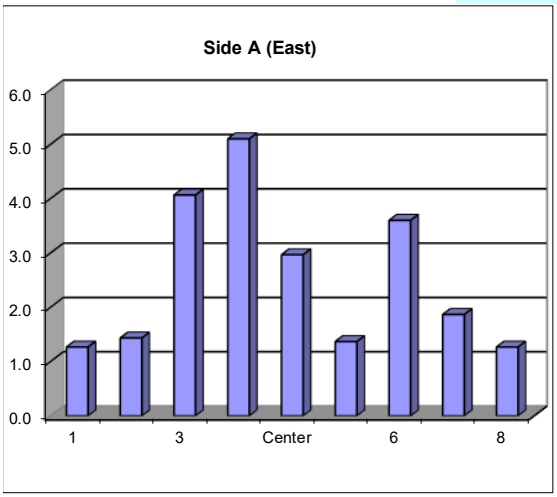
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

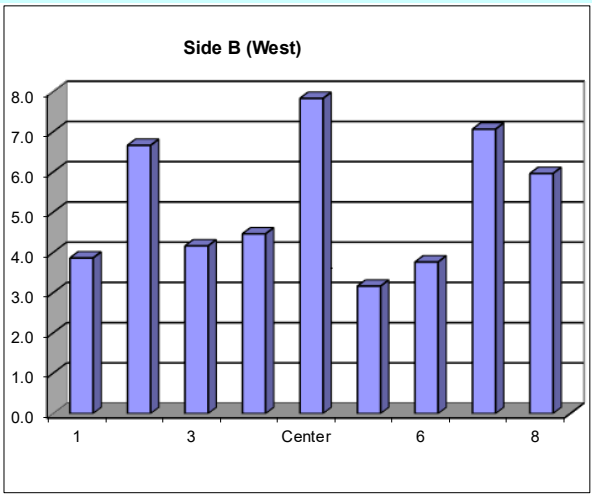
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-11
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	10:58 11:07	Fan Configuration	A & C
Testers	JPC/LCE	Stack Temp	110.8 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	1.7	2.2	3.1	2.3	7.5	6.3	6.7	6.8
2	1.79	3.7	4.2	2.9	3.6	1.6	0.8	0.3	0.9
3	3.30	3.3	4.3	4.6	4.1	3.6	3.7	2.8	3.4
4	5.49	2.8	3.1	2.6	2.8	4.6	3.9	5.2	4.6
Center	8.50	0.6	0.3	1.0	0.6	3.7	2.9	3.4	3.3
5	11.51	0.9	1.0	1.2	1.0	1.4	0.8	0.7	1.0
6	13.70	1.9	0.6	0.7	1.1	1.9	2.2	2.1	2.1
7	15.22	1.5	5.5	3.8	3.6	4.4	4.7	3.8	4.3
8	16.46	1.0	2.5	1.4	1.6	3.4	4.6	4.0	4.0
Mean of absolute values:					2.3				3.4
" " w/o points by wall:					2.4				2.8
								Grand mean ABS	2.8
								Grand mean ABS w/o wall pts	2.6

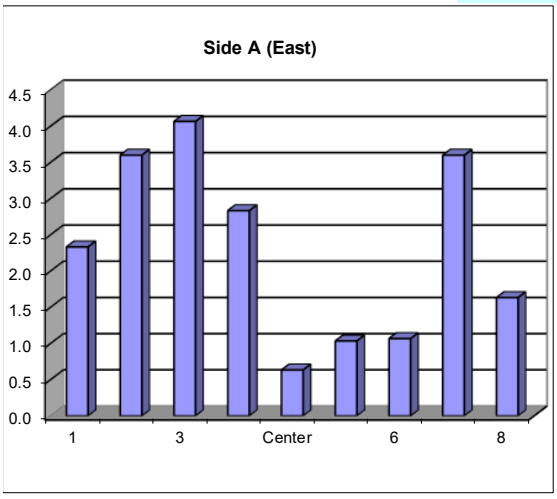
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

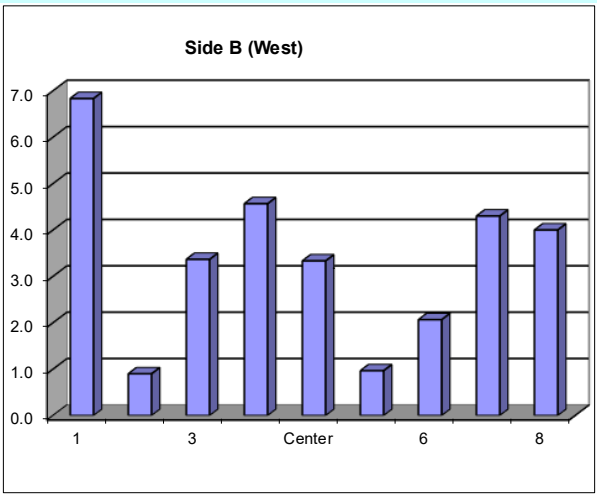
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-12
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	13:23 13:30	Fan Configuration	A & C
Testers	JPC/LCE	Stack Temp	110.7 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 0.54	4.8	3.6	3.8	4.1	0.4	1.3	0.9	0.9
2 / 1.79	3.4	4.1	3.6	3.7	2.0	1.3	1.8	1.7
3 / 3.30	1.3	1.6	1.4	1.4	1.9	3.2	2.7	2.6
4 / 5.49	1.0	0.7	0.5	0.7	3.1	4.2	4.8	4.0
Center / 8.50	3.1	3.6	3.4	3.4	9.1	6.8	6.6	7.5
5 / 11.51	5.4	5.3	5.8	5.5	2.9	2.4	2.0	2.4
6 / 13.70	6.9	7.2	6.4	6.8	3.7	3.2	2.7	3.2
7 / 15.22	5.2	5.7	6.3	5.7	4.8	4.9	5.1	4.9
8 / 16.46	3.0	3.6	3.1	3.2	4.0	1.7	3.3	3.0
Mean of absolute values:				3.8				3.4
" " w/o points by wall:				3.9				3.8
							Grand mean ABS	3.6
							Grand mean ABS w/o wall pts	3.8

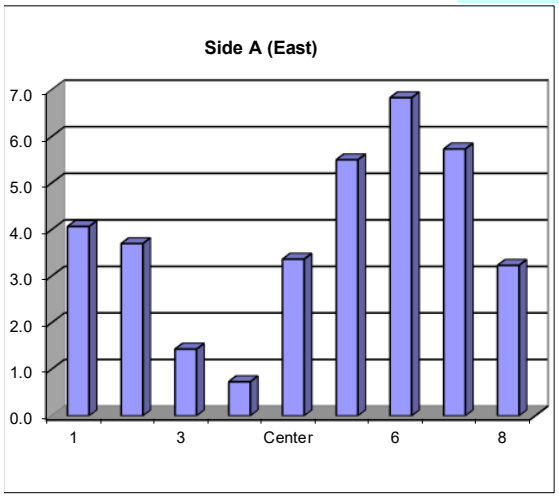
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

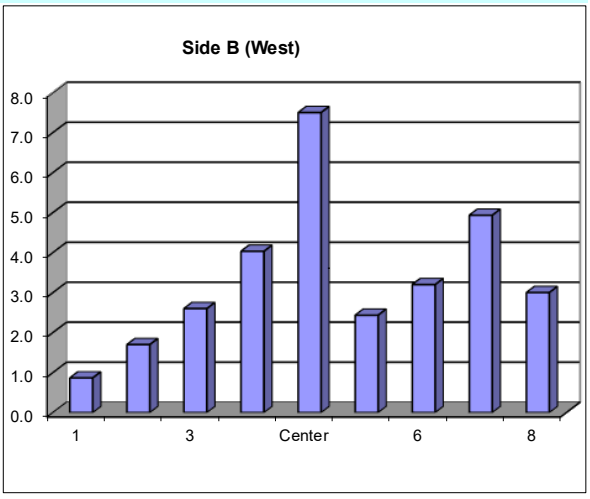
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-13
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	14:25 14:34	Fan Configuration	A & C
Testers	JPC/LCE	Stack Temp	110.8 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 0.54	3.1	2.8	2.9	2.9	4.5	4.9	4.7	4.7
2 / 1.79	4.3	6.1	5.2	5.2	5.1	3.6	4.3	4.3
3 / 3.30	0.4	0.3	0.2	0.3	6.3	4.0	3.7	4.7
4 / 5.49	2.1	1.6	1.2	1.6	6.1	6.3	5.7	6.0
Center / 8.50	5.7	6.1	5.9	5.9	0.8	2.0	2.9	1.9
5 / 11.51	5.5	5.0	4.8	5.1	3.6	2.1	1.9	2.5
6 / 13.70	5.9	5.3	6.0	5.7	0.3	2.5	1.1	1.3
7 / 15.22	9.1	7.9	8.6	8.5	3.9	3.0	3.4	3.4
8 / 16.46	0.3	0.6	0.1	0.3	6.1	9.2	7.4	7.6
Mean of absolute values:				4.0				4.1
" " w/o points by wall:				4.6				3.5
							Grand mean ABS	4.0
							Grand mean ABS w/o wall pts	4.0

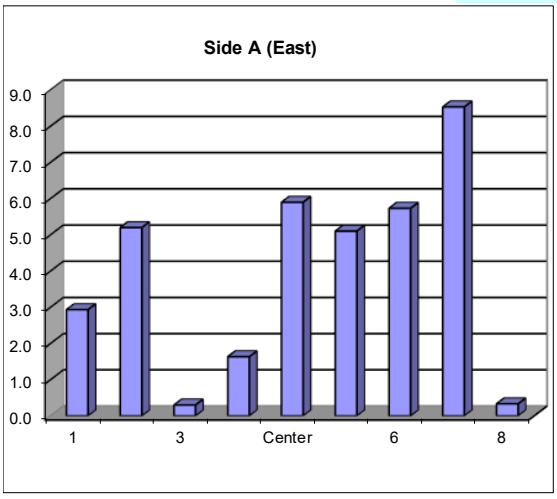
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

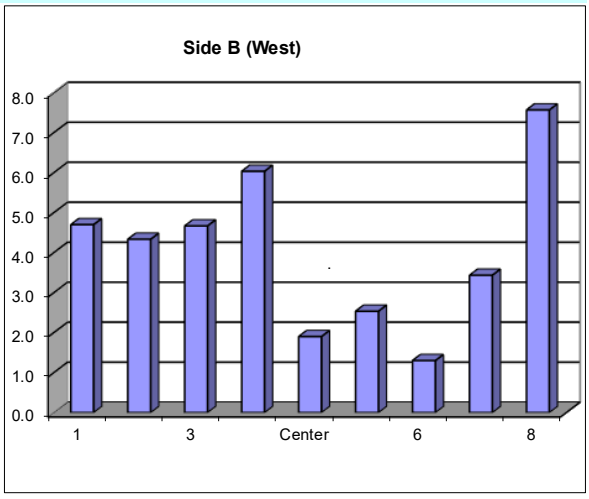
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) CAM	Run No.	FA-14
Date	6/25/2021	Fan Setting	NA Hz
Start/End Time	9:16 9:24	Fan Configuration	A & C
Testers	JPC/LCE	Stack Temp	110.9 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	11.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 0.54	5.3	5.1	4.5	5.0	6.7	5.4	6.0	6.0
2 / 1.79	6.9	5.4	5.9	6.1	8.0	3.9	4.9	5.6
3 / 3.30	0.4	1.3	1.6	1.1	3.6	4.3	4.2	4.0
4 / 5.49	0.2	2.6	1.4	1.4	6.4	2.6	3.6	4.2
Center / 8.50	4.2	3.2	2.9	3.4	2.8	3.5	0.6	2.3
5 / 11.51	1.8	1.3	0.9	1.3	4.7	6.3	5.6	5.5
6 / 13.70	0.8	0.9	1.9	1.2	5.0	6.6	5.9	5.8
7 / 15.22	0.6	0.5	0.8	0.6	3.2	8.3	6.6	6.0
8 / 16.46	3.1	1.5	2.7	2.4	11.8	9.9	12.2	11.3
Mean of absolute values:				2.5				5.7
" " w/o points by wall:				2.2				4.8
							Grand mean ABS	4.1
							Grand mean ABS w/o wall pts	3.5

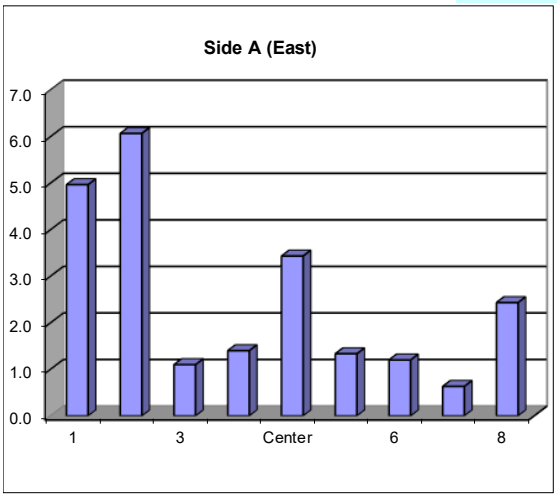
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

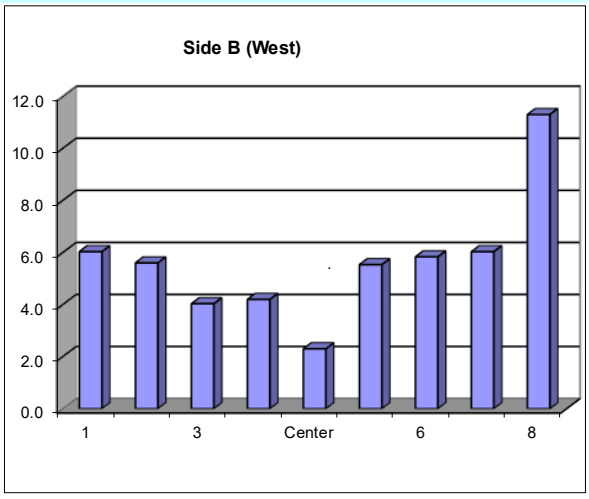
Notes:

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

First traverse point is all the way into the stack.

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





C.2 Record Sampler (RS) Flow Angle Data Forms

FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-1
Date	6/21/2021	Fan Setting	NA Hz
Start/End Time	11:01 11:11	Fan Configuration	A & B
Testers	JPC/LCE	Stack Temp	109.1 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	3.8	3.6	1.4	2.9	6.2	0.1	0.6	2.3
2	1.79	12.2	12.3	11.7	12.1	1.4	1.7	0.8	1.3
3	3.30	9.1	8.3	7.5	8.3	0.4	0.9	1.2	0.8
4	5.49	6.1	5.3	5.2	5.5	2.1	2.0	2.2	2.1
Center	8.50	0.1	0.7	0.5	0.4	0.7	0.8	0.2	0.6
5	11.51	3.7	4.6	3.4	3.9	4.7	5.1	5.6	5.1
6	13.70	0.7	0.6	1.4	0.9	3.6	3.2	2.9	3.2
7	15.22	0.8	0.2	0.7	0.6	0.8	1.4	2.5	1.6
8	16.46	3.5	4.3	2.8	3.5	1.7	2.1	1.6	1.8
Mean of absolute values:					4.2				2.1
" " w/o points by wall:					4.5				2.1
								Grand mean ABS	3.2
								Grand mean ABS w/o wall pts	3.3

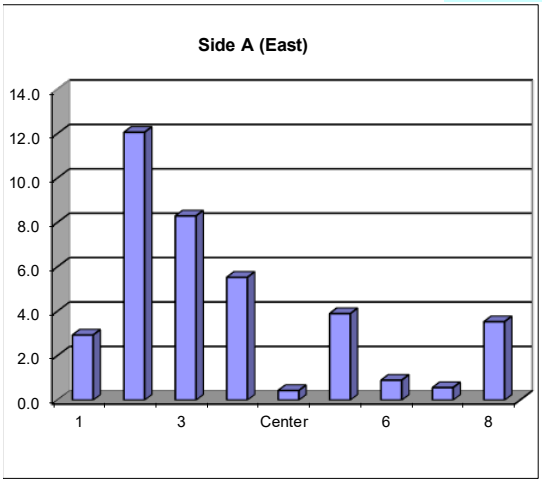
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

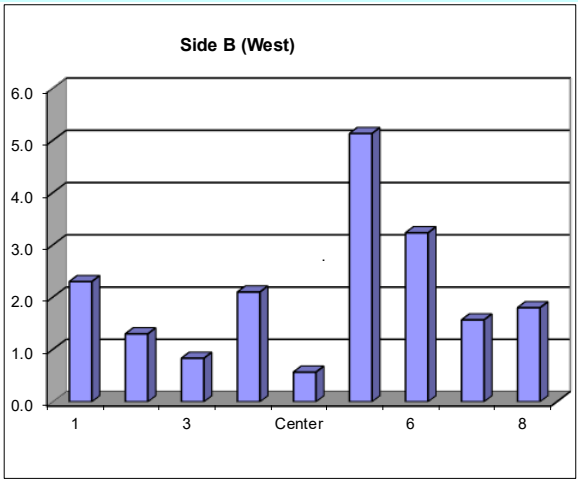
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-2
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	9:44 9:55	Fan Configuration	A&B
Testers	JPC/LCE	Stack Temp	111 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	7.7	7.0	6.8	7.2	3.6	2.9	3.3	3.3
2	1.79	0.3	1.7	0.6	0.9	7.5	6.8	6.4	6.9
3	3.30	8.8	9.6	7.2	8.5	9.4	8.8	8.3	8.8
4	5.49	6.3	5.4	6.3	6.0	8.5	8.0	8.3	8.3
Center	8.50	3.4	7.3	2.8	4.5	3.2	4.8	3.9	4.0
5	11.51	14.6	16.9	15.5	15.7	0.7	1.0	0.3	0.7
6	13.70	10.1	8.7	9.5	9.4	0.9	2.2	1.7	1.6
7	15.22	6.9	7.1	7.3	7.1	5.9	4.7	4.6	5.1
8	16.46	13.4	13.1	14.0	13.5	3.9	3.4	3.8	3.7
Mean of absolute values:					8.1				4.7
" " w/o points by wall:					7.4				5.0
								Grand mean ABS	6.4
								Grand mean ABS w/o wall pts	6.2

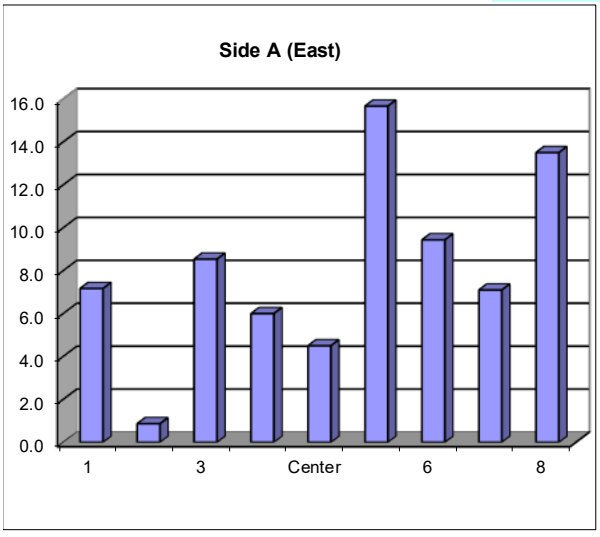
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

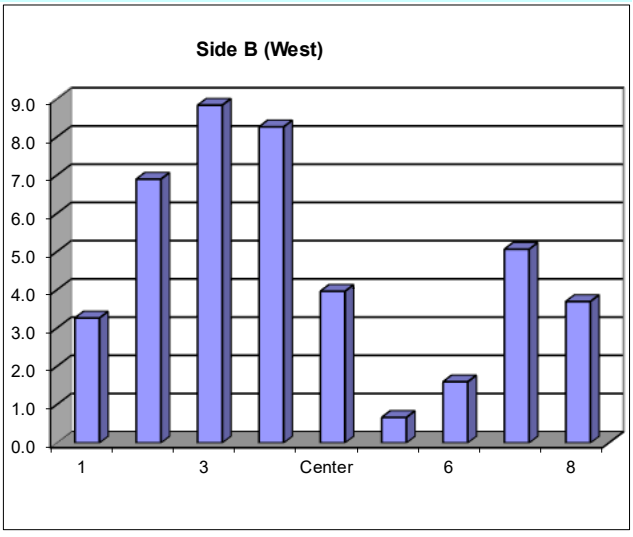
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-3
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	10:47 10:57	Fan Configuration	A&B
Testers	JPC/LCE	Stack Temp	110.4 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	0.54	9.1	6.8	9.6	8.5	1.9	2.8	2.9	2.5
2	1.79	11.6	9.4	8.0	9.7	1.7	3.3	1.7	2.2
3	3.30	9.6	12.0	10.1	10.6	3.8	3.4	4.0	3.7
4	5.49	7.4	8.6	5.1	7.0	4.3	4.4	4.6	4.4
Center	8.50	3.0	3.5	4.7	3.7	2.0	2.1	2.0	2.0
5	11.51	3.9	4.7	3.0	3.9	0.4	0.3	0.1	0.3
6	13.70	13.3	11.7	11.4	12.1	4.0	3.2	3.0	3.4
7	15.22	6.9	7.7	6.9	7.2	1.7	1.2	0.8	1.2
8	16.46	2.5	3.4	2.4	2.8	4.4	4.3	4.5	4.4
Mean of absolute values:					7.3				2.7
" " w/o points by wall:					7.7				2.5
								Grand mean ABS	5.0
							Grand mean ABS w/o wall pts		5.1

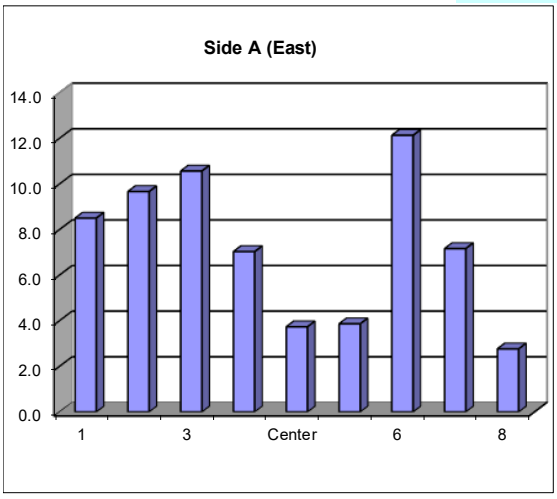
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

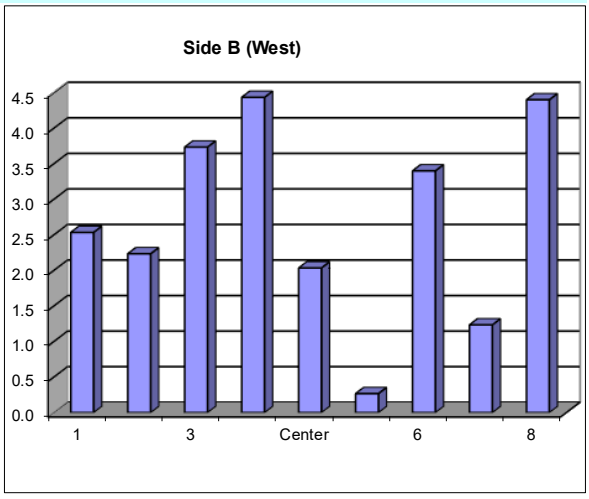
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-4
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	13:00 13:10	Fan Configuration	A&B
Testers	JPC/LCE	Stack Temp	110.1 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	0.3	0.8	0.5	0.5	11.2	10.3	10.4	10.6
2	1.79	2.3	0.5	0.9	1.2	11.2	10.5	12.3	11.3
3	3.30	0.2	0.6	2.4	1.1	10.3	10.9	10.8	10.7
4	5.49	2.9	2.5	1.8	2.4	11.3	9.9	10.6	10.6
Center	8.50	5.2	7.1	7.6	6.6	9.4	9.1	8.7	9.1
5	11.51	2.1	1.3	1.0	1.5	2.9	2.2	2.1	2.4
6	13.70	8.5	5.6	5.9	6.7	0.5	0.7	0.5	0.6
7	15.22	2.7	2.7	3.4	2.9	2.6	2.2	2.3	2.4
8	16.46	1.3	0.9	1.3	1.2	0.3	0.7	0.1	0.4
Mean of absolute values:					2.7				6.4
" " w/o points by wall:					3.2				6.7
								Grand mean ABS	4.6
								Grand mean ABS w/o wall pts	5.0

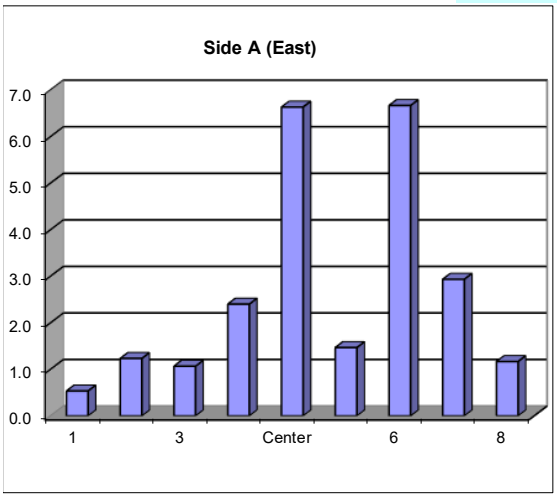
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

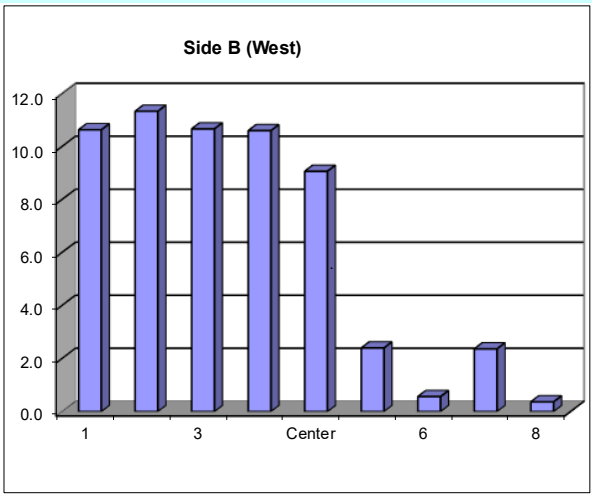
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-5
Date	6/22/2021	Fan Setting	NA Hz
Start/End Time	14:05 14:15	Fan Configuration	A&B
Testers	JPC/LCE	Stack Temp	110.3 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	0.1	0.2	0.5	0.3	4.4	2.6	4.1	3.7
2	1.79	2.6	1.8	1.1	1.8	4.1	3.6	5.3	4.3
3	3.30	0.9	0.2	0.3	0.5	5.1	4.4	4.5	4.7
4	5.49	2.2	1.5	2.8	2.2	3.5	5.5	4.6	4.5
Center	8.50	1.7	0.9	1.9	1.5	1.9	1.7	2.1	1.9
5	11.51	2.4	3.0	4.5	3.3	0.1	0.3	0.5	0.3
6	13.70	1.8	2.1	1.8	1.9	2.9	0.8	0.7	1.5
7	15.22	9.0	8.7	8.4	8.7	2.6	2.6	4.6	3.3
8	16.46	2.7	2.4	2.9	2.7	6.2	3.8	4.0	4.7
Mean of absolute values:					2.5				3.2
" " w/o points by wall:					2.8				2.9
								Grand mean ABS	2.9
								Grand mean ABS w/o wall pts	2.9

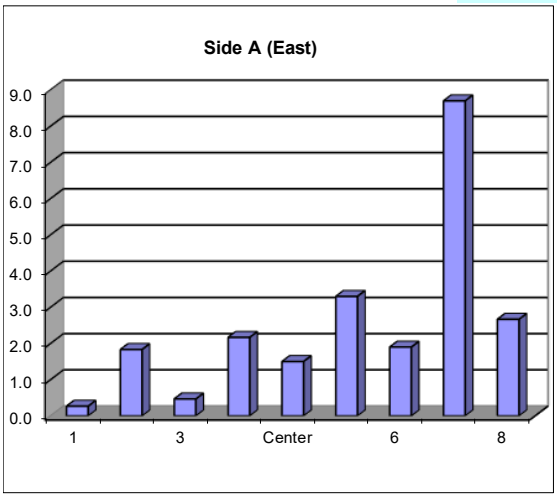
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

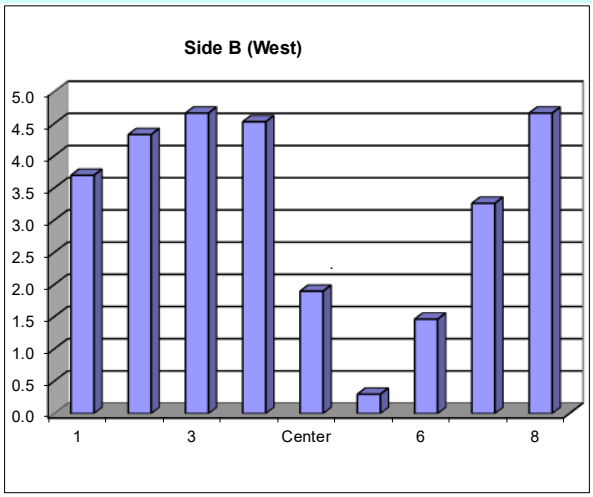
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-6
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	9:44 9:55	Fan Configuration	B&C
Testers	JPC/LCE	Stack Temp	111.3 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ---->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	3.8	3.4	3.0	3.4	5.2	5.1	6.0	5.4
2	1.79	2.5	1.3	1.8	1.9	7.6	7.7	6.8	7.4
3	3.30	2.5	1.9	2.5	2.3	4.0	3.6	3.4	3.7
4	5.49	2.9	0.6	2.6	2.0	6.7	5.9	6.8	6.5
Center	8.50	1.4	1.8	1.2	1.5	5.3	4.8	3.7	4.6
5	11.51	5.5	2.2	3.3	3.7	7.1	8.0	8.3	7.8
6	13.70	0.8	0.7	0.3	0.6	5.5	5.9	5.9	5.8
7	15.22	2.4	1.8	1.6	1.9	2.9	2.4	5.3	3.5
8	16.46	3.5	3.4	2.5	3.1	12.2	11.8	11.7	11.9
Mean of absolute values:					2.3				6.3
" " w/o points by wall:					2.0				5.6
								Grand mean ABS	4.3
								Grand mean ABS w/o wall pts	3.8

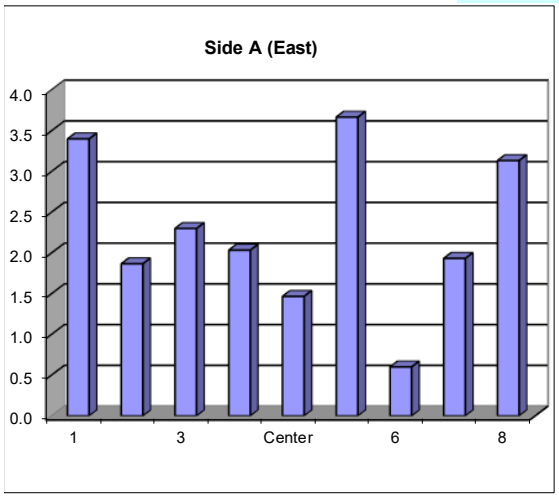
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

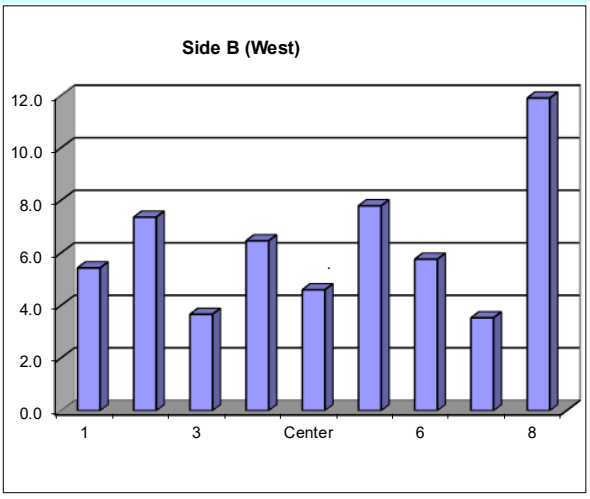
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-7
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	10:47 10:58	Fan Configuration	B&C
Testers	JPC/LCE	Stack Temp	111.9 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ---->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	0.5	1.4	2.4	1.4	11.6	11.0	12.4	11.7
2	1.79	1.0	0.1	0.3	0.5	2.9	1.9	1.7	2.2
3	3.30	0.6	1.5	0.9	1.0	5.0	4.8	5.0	4.9
4	5.49	3.8	3.5	3.6	3.6	7.5	6.6	6.3	6.8
Center	8.50	2.8	4.4	3.3	3.5	3.0	3.5	2.8	3.1
5	11.51	6.0	4.7	5.3	5.3	4.6	4.5	4.4	4.5
6	13.70	3.0	2.1	2.3	2.5	3.2	2.9	3.4	3.2
7	15.22	1.4	6.1	6.5	4.7	3.6	4.1	3.4	3.7
8	16.46	12.2	12.6	12.9	12.6	3.9	4.0	5.7	4.5
Mean of absolute values:					3.9				5.0
" " w/o points by wall:					3.0				4.1
								Grand mean ABS	4.4
								Grand mean ABS w/o wall pts	3.5

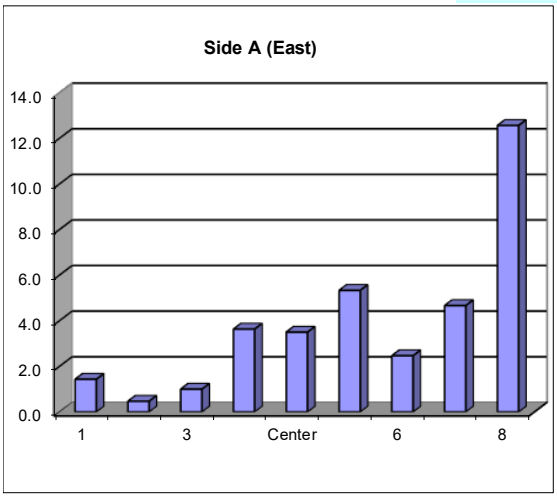
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

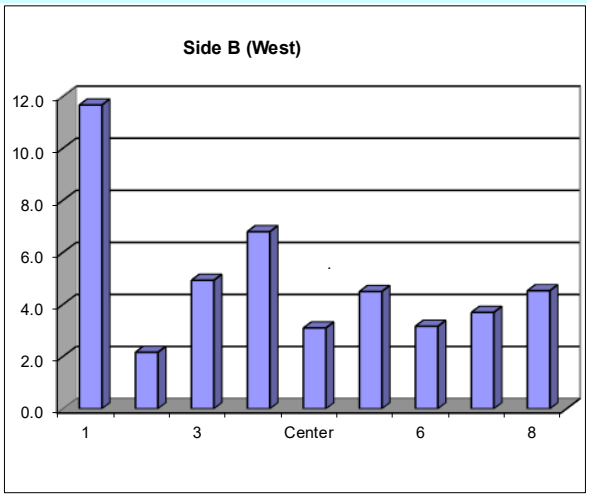
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-8
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	12:54 13:03	Fan Configuration	B&C
Testers	JPC/LCE	Stack Temp	111.3 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	2.4	2.2	1.0	1.9	0.6	0.1	1.0	0.6
2	1.79	2.2	1.7	1.3	1.7	3.4	2.1	2.4	2.6
3	3.30	1.9	1.3	1.2	1.5	2.0	0.7	0.3	1.0
4	5.49	5.7	3.7	3.9	4.4	3.3	2.3	2.9	2.8
Center	8.50	0.3	0.3	0.5	0.4	6.5	5.5	5.8	5.9
5	11.51	2.8	1.9	1.8	2.2	3.4	3.7	3.7	3.6
6	13.70	3.2	2.6	2.7	2.8	2.9	3.0	2.8	2.9
7	15.22	13.4	12.3	13.2	13.0	5.0	4.9	4.4	4.8
8	16.46	6.5	4.7	6.0	5.7	14.5	15.1	14.7	14.8
Mean of absolute values:					3.7				4.3
" " w/o points by wall:					3.7				3.4
								Grand mean ABS	4.0
								Grand mean ABS w/o wall pts	3.5

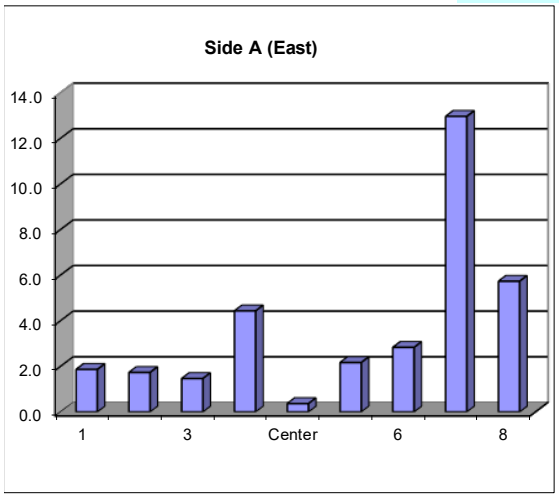
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

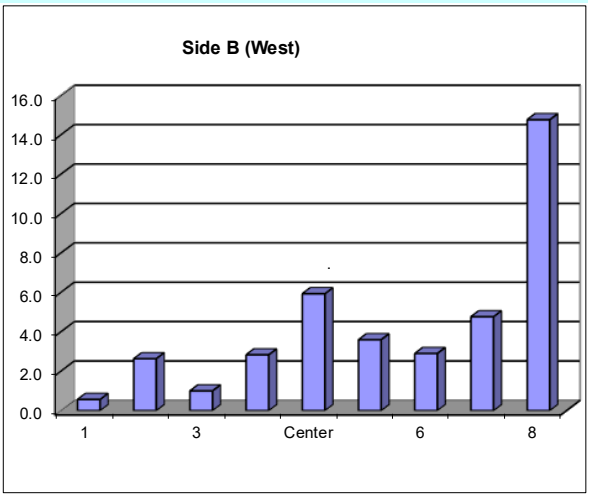
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-9
Date	6/23/2021	Fan Setting	NA Hz
Start/End Time	13:58 14:08	Fan Configuration	B&C
Testers	JPC/LCE	Stack Temp	111.5 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw			deg. cw			
1	0.54	3.4	4.4	4.2	4.0	2.3	3.7	3.5	3.2
2	1.79	3.8	3.7	4.0	3.8	2.0	2.6	3.2	2.6
3	3.30	2.9	1.7	1.6	2.1	4.4	3.9	4.6	4.3
4	5.49	2.5	2.3	1.9	2.2	5.4	5.3	5.4	5.4
Center	8.50	2.5	2.2	2.3	2.3	1.2	1.7	2.1	1.7
5	11.51	5.5	5.0	4.6	5.0	4.2	3.3	2.9	3.5
6	13.70	4.7	5.0	3.9	4.5	1.4	0.5	0.4	0.8
7	15.22	8.1	9.8	8.9	8.9	4.5	3.7	3.2	3.8
8	16.46	10.6	10.2	9.9	10.2	1.7	2.0	2.4	2.0
Mean of absolute values:					4.8				3.0
" " w/o points by wall:					4.1				3.1
								Grand mean ABS	3.9
							Grand mean ABS w/o wall pts		3.6

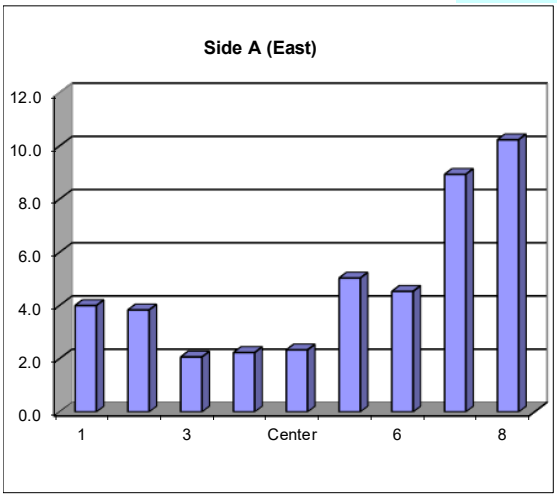
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

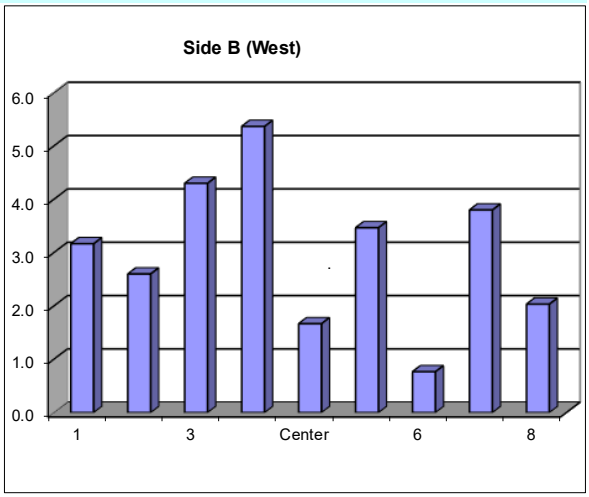
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-10
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	9:33 9:41	Fan Configuration	A&C
Testers	JPC/LCE	Stack Temp	111.1 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ---->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	0.5	0.3	0.8	0.5	8.7	8.3	9.0	8.7
2	1.79	0.3	1.3	3.7	1.8	5.0	4.7	6.6	5.4
3	3.30	3.5	1.3	1.2	2.0	5.2	4.4	5.1	4.9
4	5.49	2.0	1.0	1.5	1.5	3.6	4.1	4.4	4.0
Center	8.50	6.8	5.6	5.5	6.0	10.3	8.8	10.2	9.8
5	11.51	4.7	3.0	3.6	3.8	5.2	3.4	3.6	4.1
6	13.70	1.3	2.0	0.8	1.4	4.3	5.1	5.5	5.0
7	15.22	1.4	3.0	3.6	2.7	2.6	3.0	4.5	3.4
8	16.46	3.0	1.0	0.6	1.5	7.4	5.9	6.6	6.6
Mean of absolute values:					2.3				5.8
" " w/o points by wall:					2.7				5.2
								Grand mean ABS	4.1
								Grand mean ABS w/o wall pts	4.0

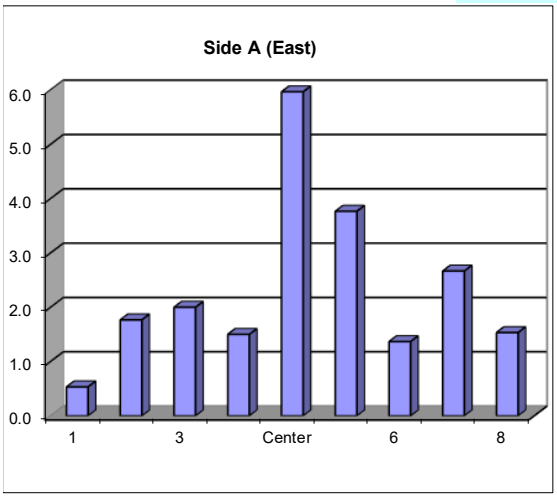
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

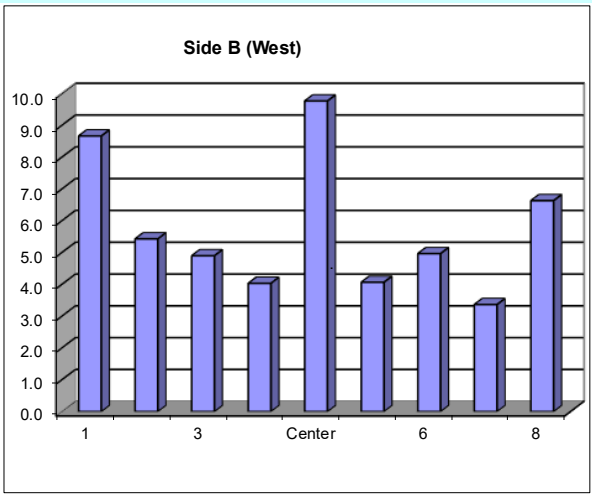
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-11
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	10:35 10:43	Fan Configuration	A&C
Testers	JPC/LCE	Stack Temp	111.1 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ---->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	0.5	0.6	0.8	0.6	2.8	2.0	3.2	2.7
2	1.79	1.3	0.9	1.3	1.2	2.4	4.0	2.1	2.8
3	3.30	1.2	1.8	0.9	1.3	5.0	4.9	5.3	5.1
4	5.49	2.2	1.8	2.1	2.0	3.2	2.1	4.3	3.2
Center	8.50	3.7	3.3	2.8	3.3	3.1	2.4	2.3	2.6
5	11.51	7.8	8.3	7.2	7.8	0.5	1.6	1.3	1.1
6	13.70	2.8	1.9	0.9	1.9	1.9	2.3	2.0	2.1
7	15.22	2.6	2.5	2.0	2.4	3.1	2.4	2.0	2.5
8	16.46	1.7	0.9	1.5	1.4	2.0	4.7	2.7	3.1
Mean of absolute values:					2.4				2.8
" " w/o points by wall:					2.8				2.8
								Grand mean ABS	2.6
								Grand mean ABS w/o wall pts	2.8

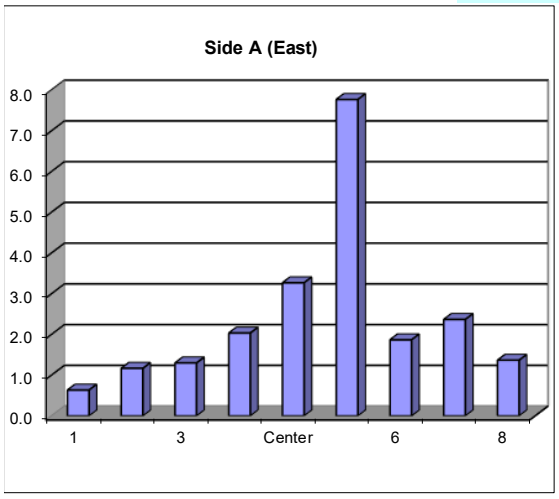
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

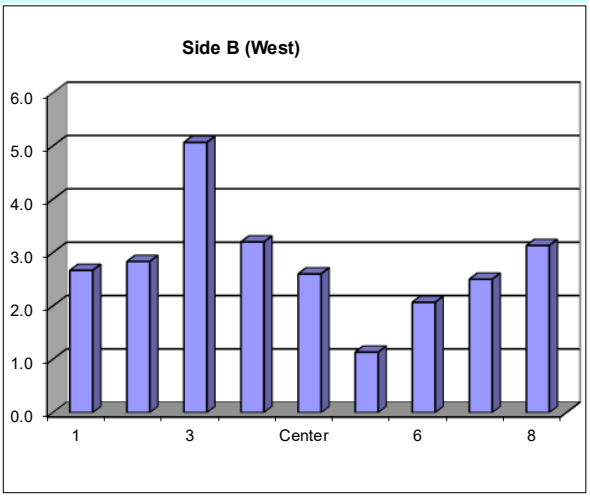
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-12
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	13:01 13:09	Fan Configuration	A&C
Testers	JPC/LCE	Stack Temp	110.6 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second				
Traverse-->	Side A (East)				Side B (West)				
Trial ---->	1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	3.6	3.5	3.0	3.4	3.4	3.5	3.0	3.3
2	1.79	3.3	3.0	2.6	3.0	6.8	6.4	5.5	6.2
3	3.30	2.0	1.7	1.8	1.8	6.0	5.0	5.9	5.6
4	5.49	0.1	1.1	0.6	0.6	5.1	4.9	4.9	5.0
Center	8.50	1.6	2.5	2.7	2.3	2.9	2.6	2.5	2.7
5	11.51	3.7	2.8	3.0	3.2	0.8	0.3	0.0	0.4
6	13.70	6.3	6.2	6.1	6.2	2.7	1.9	2.0	2.2
7	15.22	6.9	6.7	6.7	6.8	2.2	3.5	3.8	3.2
8	16.46	3.0	2.6	3.3	3.0	2.8	1.4	2.4	2.2
Mean of absolute values:					3.3				3.4
" " w/o points by wall:					3.4				3.6
								Grand mean ABS	3.4
								Grand mean ABS w/o wall pts	3.5

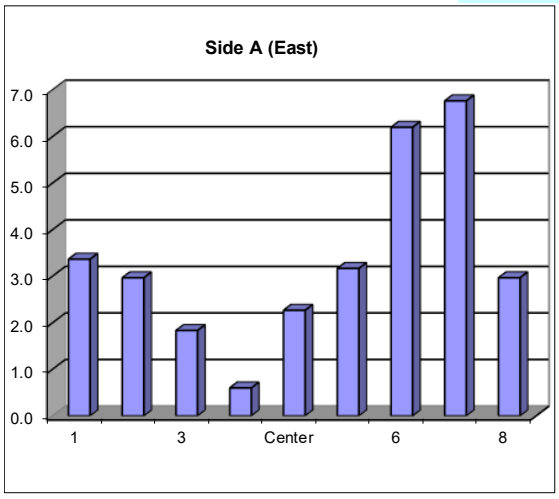
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

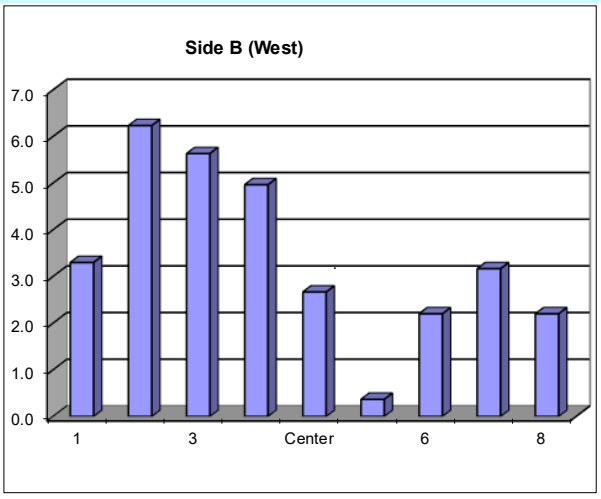
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-13
Date	6/24/2021	Fan Setting	NA Hz
Start/End Time	14:00 14:07	Fan Configuration	A&C
Testers	JPC/LCE	Stack Temp	111 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	0.54	2.1	3.6	1.6	2.4	6.9	7.3	7.4	7.2
2	1.79	1.6	2.5	3.1	2.4	7.9	8.1	8.0	8.0
3	3.30	2.2	2.3	1.7	2.1	9.2	9.9	9.2	9.4
4	5.49	5.6	3.6	2.9	4.0	4.4	3.3	4.0	3.9
Center	8.50	4.1	2.3	3.3	3.2	3.6	1.7	0.9	2.1
5	11.51	5.2	3.4	4.0	4.2	0.9	1.0	1.0	1.0
6	13.70	1.9	2.7	0.8	1.8	1.4	1.6	2.3	1.8
7	15.22	2.7	4.4	3.2	3.4	6.6	7.4	7.2	7.1
8	16.46	2.0	0.9	1.0	1.3	4.2	3.9	5.0	4.4
Mean of absolute values:					2.8				5.0
" " w/o points by wall:					3.0				4.7
								Grand mean ABS	3.9
								Grand mean ABS w/o wall pts	3.9

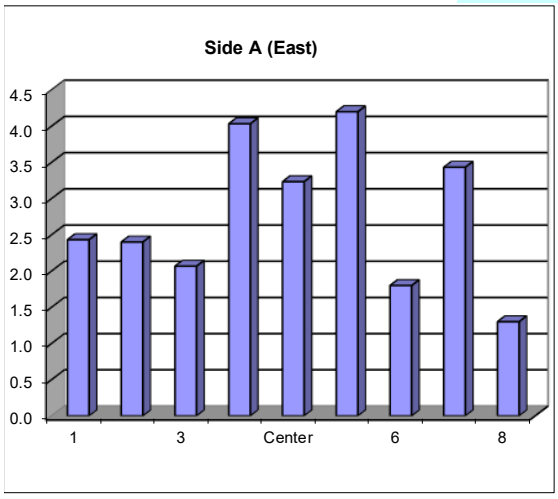
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

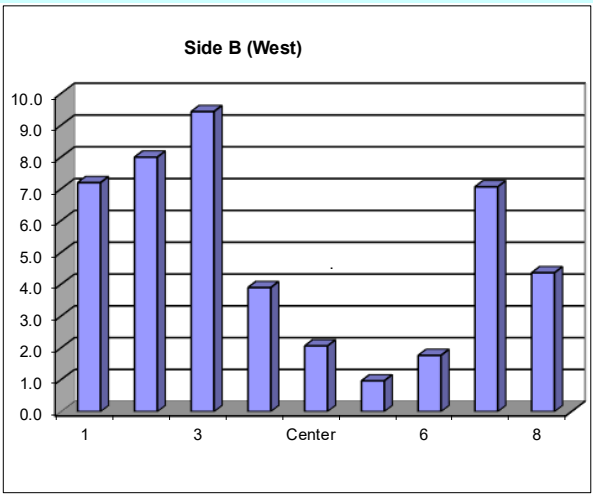
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	FA-14
Date	6/25/2021	Fan Setting	NA Hz
Start/End Time	9:00 9:07	Fan Configuration	A&C
Testers	JPC/LCE	Stack Temp	110.6 deg F
Stack Dia.	17 in		
Stack X-Area	227.0 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	50.08 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 0.54	2.4	0.8	1.7	1.6	1.7	2.3	3.3	2.4
2 / 1.79	1.8	1.9	1.5	1.7	3.2	3.6	4.7	3.8
3 / 3.30	2.1	2.8	2.6	2.5	5.1	3.9	4.0	4.3
4 / 5.49	2.3	2.1	1.9	2.1	4.8	3.8	5.2	4.6
Center / 8.50	2.9	1.5	1.7	2.0	5.4	5.4	5.7	5.5
5 / 11.51	4.5	2.4	3.4	3.4	1.2	1.5	0.9	1.2
6 / 13.70	6.6	6.2	4.9	5.9	4.8	3.1	2.7	3.5
7 / 15.22	0.5	0.9	0.1	0.5	4.6	2.7	5.6	4.3
8 / 16.46	4.9	4.5	3.9	4.4	0.2	0.3	1.1	0.5
Mean of absolute values:				2.7				3.4
" " w/o points by wall:				2.6				3.9
							Grand mean ABS	3.0
							Grand mean ABS w/o wall pts	3.3

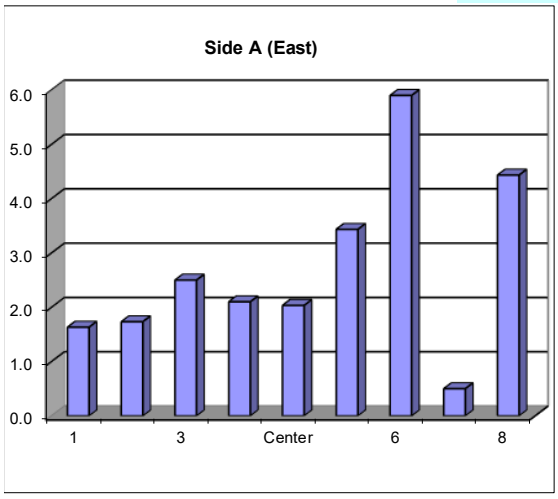
Instuments Used:		Cal. Due
S-type pitot	(ID: 2A, 24")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

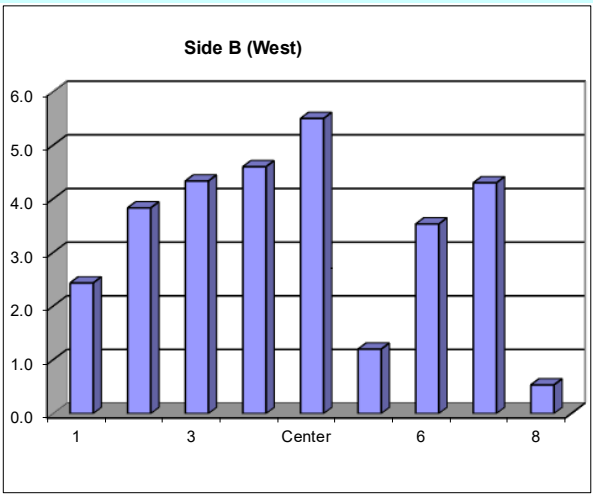
Notes:

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

First traverse point is all the way into the stack.

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





C.3 CAM Velocity Uniformity Data Forms

VELOCITY TRAVERSE DATA FORM

Stack	**LV-S3 (LVP) CAM**	Run No.	**VT-1**
Date	**6/21/21**	Fan Configuration	**A & B**
Testers	JPC/LCE	Fan Setting	**NA** **Hz**
Stack Dia.	17 in.	Stack Temp	109.7 deg F
Stack X-Area	227.0 in.2	Start/End Time	11:16 11:26
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		**Port A (East)**				**Port B (West)**			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,822.5	2,686.9	2,709.9	2,739.8	2,392.9	2,418.7	2,366.7	2,392.8
2	1.79	2,755.5	2,686.9	2,755.5	2,732.7	2,755.5	2,755.5	2,800.3	2,770.5
3	3.30	2,800.3	2,887.9	2,866.2	2,851.5	2,909.3	2,951.8	2,930.6	2,930.6
4	5.49	3,055.4	2,972.9	3,075.7	3,034.6	2,909.3	2,972.9	2,909.3	2,930.5
Center	8.50	3,014.4	3,055.4	3,035.0	3,034.9	2,993.7	2,993.7	2,972.9	2,986.7
5	11.51	2,844.4	2,887.9	2,887.9	2,873.4	2,972.9	2,951.8	2,972.9	2,965.8
6	13.70	2,519.5	2,686.9	2,709.9	2,638.8	2,800.3	2,709.9	2,822.5	2,777.6
7	15.22	2,392.9	2,340.2	2,340.2	2,357.8	2,663.7	2,663.7	2,640.2	2,655.8
8	16.46	2,057.2	2,116.9	2,026.7	2,066.9	2,709.9	2,732.9	2,663.7	2,702.2
Averages ---------->		2,695.8	2,702.4	2,711.9	2,703.4	2,789.7	2,794.5	2,786.6	2,790.3

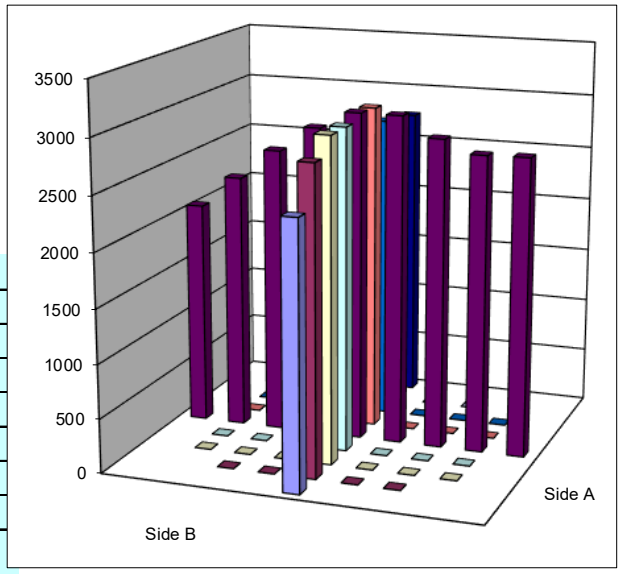
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2746.8		Mean	2789.1	2859.6	2824.4
Min Point	2066.9	-24.8%	Std. Dev.	239.3	125.0	187.0
Max Point	3034.9	10.5%	COV as %	8.6	4.4	**6.6**

Flow w/o C-Pt 4278 cfm

Vel Avg w/o C-Pt 2714 fpm

	Start	Finish	
Stack temp	109.9	109.5	F
Equipment temp	74.0	74.0	F
Ambient temp	84.0	86.0	F
Stack static	2.19	0.37	mbars
Ambient pressure	990.86	990.86	mbars
Total Stack pressure	993.05	991.23	mbars
Ambient humidity	33%	33%	RH

Instuments Used:		Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection	
Digi-sense 20250-13 Manometer (SN: 191212877)		12/3/2021
Control Co. Thermometer (SN: 220435230)		Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-2
Date	6/22/21	Fan Configuration	A & B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.0 deg F
Stack X-Area	227.0 in.2	Start/End Time	10:00 10:10
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,374.1	2,452.0	2,452.0	2,426.0	2,624.7	2,600.7	2,552.1	2,592.5
2	1.79	2,831.3	2,741.4	2,831.3	2,801.3	2,695.3	2,741.4	2,671.9	2,702.9
3	3.30	2,809.1	2,853.3	2,875.2	2,845.9	2,695.3	2,809.1	2,853.3	2,785.9
4	5.49	3,003.0	3,023.8	3,003.0	3,010.0	2,961.0	3,003.0	3,003.0	2,989.0
Center	8.50	3,023.8	3,023.8	3,003.0	3,016.9	3,044.4	3,023.8	3,003.0	3,023.8
5	11.51	2,896.9	2,961.0	2,896.9	2,918.2	3,064.9	2,961.0	3,003.0	3,009.6
6	13.70	2,624.7	2,576.5	2,552.1	2,584.4	2,918.4	2,918.4	2,875.2	2,904.0
7	15.22	2,374.1	2,320.7	2,426.3	2,373.7	2,718.4	2,671.9	2,576.5	2,655.6
8	16.46	2,123.4	2,063.7	2,063.7	2,083.6	2,347.6	2,374.1	2,374.1	2,365.2
Averages ---------->		2,673.4	2,668.5	2,678.2	2,673.3	2,785.6	2,789.3	2,768.0	2,781.0

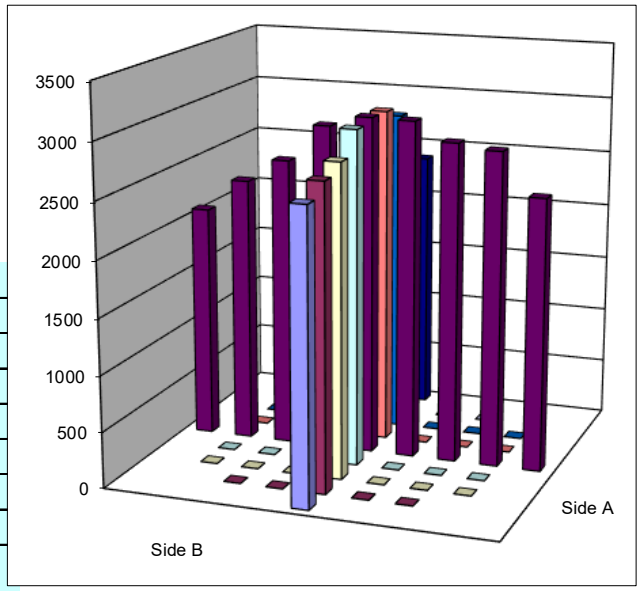
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2727.1		Mean	2792.9	2867.3	2830.1
Min Point	2083.6	-23.6%	Std. Dev.	236.3	152.4	194.9
Max Point	3023.8	10.9%	COV as %	8.5	5.3	**6.9**

Flow w/o C-Pt 4241 cfm

Vel Avg w/o C-Pt 2690 fpm

	Start	Finish	
Stack temp	110.3	109.7	F
Equipment temp	76.1	76.2	F
Ambient temp	91.0	91.0	F
Stack static	0.57	0.52	mbars
Ambient pressure	986.12	985.78	mbars
Total Stack pressure	986.69	986.30	mbars
Ambient humidity	26%	26%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-3
Date	6/22/21	Fan Configuration	A & B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.4 deg F
Stack X-Area	227.0 in.2	Start/End Time	11:01 11:13
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,578.0	2,696.8	2,578.0	2,617.6	2,553.6	2,626.2	2,578.0	2,585.9
2	1.79	2,788.3	2,765.7	2,832.9	2,795.6	2,742.9	2,765.7	2,626.2	2,711.6
3	3.30	3,004.8	2,962.7	2,962.7	2,976.7	2,983.8	2,920.1	2,876.9	2,926.9
4	5.49	3,066.7	3,025.6	3,066.7	3,053.0	3,004.8	2,962.7	2,983.8	2,983.8
Center	8.50	3,025.6	3,025.6	2,983.8	3,011.7	3,066.7	3,025.6	3,066.7	3,053.0
5	11.51	2,920.1	2,898.5	2,941.5	2,920.1	2,983.8	3,025.6	3,025.6	3,011.7
6	13.70	2,602.2	2,602.2	2,650.0	2,618.1	2,876.9	2,898.5	2,920.1	2,898.5
7	15.22	2,375.5	2,401.7	2,427.7	2,401.6	2,765.7	2,720.0	2,742.9	2,742.9
8	16.46	2,095.0	2,267.5	2,064.8	2,142.4	2,375.5	2,401.7	2,453.4	2,410.2
Averages ---------->		2,717.3	2,738.5	2,723.1	2,726.3	2,817.1	2,816.2	2,808.2	2,813.8

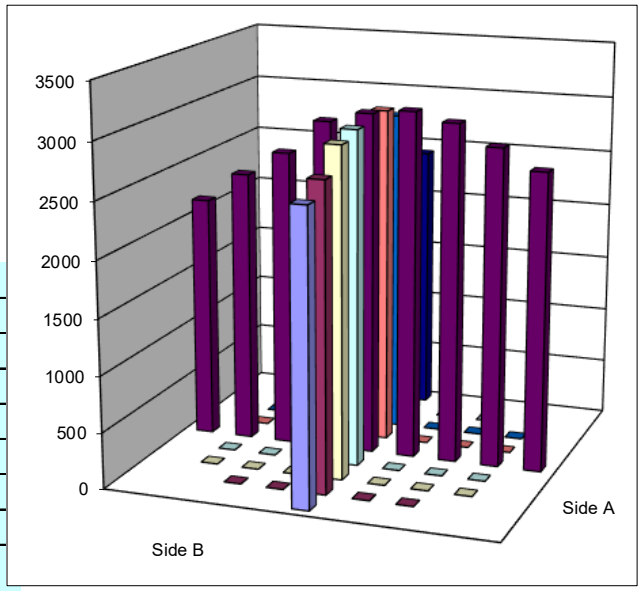
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2770.1		Mean	2825.3	2904.1	2864.7
Min Point	2142.4	-22.7%	Std. Dev.	238.7	131.5	189.6
Max Point	3053.0	10.2%	COV as %	8.4	4.5	**6.6**

Flow w/o C-Pt 4315 cfm

Vel Avg w/o C-Pt 2737 fpm

	Start	Finish	
Stack temp	110.2	110.6	F
Equipment temp	76.1	76.5	F
Ambient temp	93.6	94.2	F
Stack static	1.00	0.22	mbars
Ambient pressure	985.44	985.44	mbars
Total Stack pressure	986.44	985.66	mbars
Ambient humidity	24%	23%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-4
Date	6/22/21	Fan Configuration	A & B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.0 deg F
Stack X-Area	227.0 in.2	Start/End Time	13:13 13:23
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,506.3	2,430.0	2,580.4	2,505.6	2,556.0	2,628.7	2,676.1	2,620.2
2	1.79	2,676.1	2,745.5	2,745.5	2,722.4	2,768.4	2,791.0	2,768.4	2,775.9
3	3.30	2,901.3	2,965.6	2,986.6	2,951.2	2,813.4	2,879.6	2,901.3	2,864.8
4	5.49	3,069.6	3,110.3	3,007.6	3,062.5	2,965.6	3,007.6	2,986.6	2,986.6
Center	8.50	2,986.6	2,965.6	3,007.6	2,986.6	3,049.0	3,069.6	3,069.6	3,062.8
5	11.51	2,879.6	2,965.6	2,944.2	2,929.8	2,944.2	2,944.2	2,965.6	2,951.3
6	13.70	2,676.1	2,699.4	2,722.6	2,699.4	2,879.6	2,857.6	2,879.6	2,872.3
7	15.22	2,404.0	2,455.7	2,404.0	2,421.2	2,699.4	2,604.7	2,676.1	2,660.1
8	16.46	2,156.0	2,156.0	2,126.7	2,146.3	2,377.7	2,430.0	2,481.1	2,429.6
Averages ---------->		2,695.1	2,721.5	2,725.0	2,713.9	2,783.7	2,801.4	2,822.7	2,802.6

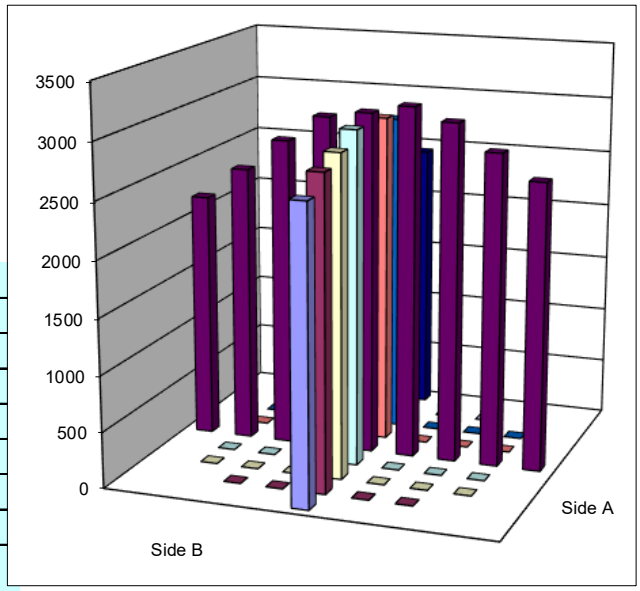
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2758.2		Mean	2824.7	2881.9	2853.3
Min Point	2146.3	-22.2%	Std. Dev.	223.1	135.0	179.7
Max Point	3062.8	11.0%	COV as %	7.9	4.7	**6.3**

Flow w/o C-Pt 4295 cfm

Vel Avg w/o C-Pt 2725 fpm

	Start	Finish	
Stack temp	110.6	111.3	F
Equipment temp	76.6	76.7	F
Ambient temp	97.5	97.5	F
Stack static	0.45	0.30	mbars
Ambient pressure	984.76	984.76	mbars
Total Stack pressure	985.21	985.06	mbars
Ambient humidity	19%	19%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-5
Date	6/22/21	Fan Configuration	A & B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.2 deg F
Stack X-Area	227.0 in.2	Start/End Time	14:18 14:25
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,454.5	2,530.0	2,530.0	2,504.8	2,554.7	2,579.1	2,402.7	2,512.2
2	1.79	2,856.3	2,721.2	2,834.2	2,803.9	2,698.0	2,744.1	2,789.6	2,743.9
3	3.30	2,921.4	2,985.2	2,899.8	2,935.5	2,834.2	2,767.0	2,744.1	2,781.8
4	5.49	3,068.1	3,026.9	3,006.1	3,033.7	2,921.4	2,985.2	2,942.8	2,949.8
Center	8.50	3,047.6	3,068.1	3,006.1	3,040.6	3,006.1	2,985.2	3,026.9	3,006.1
5	11.51	2,985.2	2,834.2	2,921.4	2,913.6	2,985.2	3,026.9	2,985.2	2,999.1
6	13.70	2,603.4	2,674.7	2,627.3	2,635.1	2,899.8	2,878.1	2,878.1	2,885.3
7	15.22	2,428.8	2,479.9	2,376.5	2,428.4	2,721.2	2,744.1	2,698.0	2,721.1
8	16.46	2,154.9	2,240.6	2,154.9	2,183.5	2,505.0	2,428.8	2,376.5	2,436.8
Averages ---------->		2,724.4	2,729.0	2,706.3	2,719.9	2,791.7	2,793.2	2,760.4	2,781.8

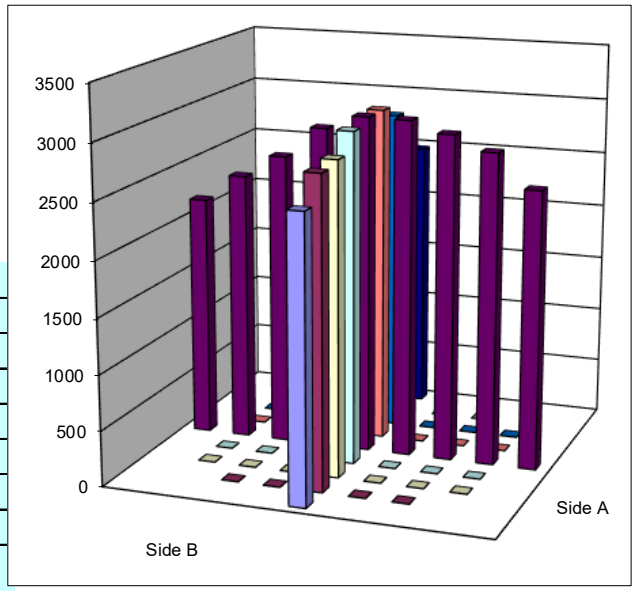
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2750.8		Mean	2827.3	2869.6	2848.4
Min Point	2183.5	-20.6%	Std. Dev.	225.0	120.8	174.9
Max Point	3040.6	10.5%	COV as %	8.0	4.2	**6.1**

Flow w/o C-Pt 4282 cfm

Vel Avg w/o C-Pt 2717 fpm

	Start	Finish	
Stack temp	109.4	111.0	F
Equipment temp	77.1	76.3	F
Ambient temp	98.6	98.7	F
Stack static	0.65	0.50	mbars
Ambient pressure	984.42	984.08	mbars
Total Stack pressure	985.07	984.58	mbars
Ambient humidity	19%	19%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-6
Date	6/23/21	Fan Configuration	B & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.1 deg F
Stack X-Area	227.0 in.2	Start/End Time	9:58 10:08
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,426.5	2,477.6	2,502.7	2,468.9	2,502.7	2,576.7	2,477.6	2,519.0
2	1.79	2,741.6	2,672.1	2,741.6	2,718.4	2,718.7	2,741.6	2,718.7	2,726.3
3	3.30	2,940.0	2,918.6	2,982.4	2,947.0	2,786.9	2,741.6	2,809.3	2,779.3
4	5.49	3,065.2	3,065.2	3,044.7	3,058.3	2,940.0	2,918.6	2,961.3	2,940.0
Center	8.50	2,961.3	3,003.3	3,044.7	3,003.1	3,003.3	2,982.4	3,003.3	2,996.3
5	11.51	2,961.3	3,044.7	2,897.1	2,967.7	2,982.4	3,003.3	2,940.0	2,975.2
6	13.70	2,695.5	2,672.1	2,695.5	2,687.7	2,875.4	2,875.4	2,918.6	2,889.8
7	15.22	2,400.5	2,477.6	2,552.3	2,476.8	2,764.4	2,786.9	2,718.7	2,756.7
8	16.46	2,181.9	2,153.0	2,153.0	2,162.6	2,452.2	2,452.2	2,400.5	2,435.0
Averages ---------->		2,708.2	2,720.5	2,734.9	2,721.2	2,780.7	2,786.5	2,772.0	2,779.7

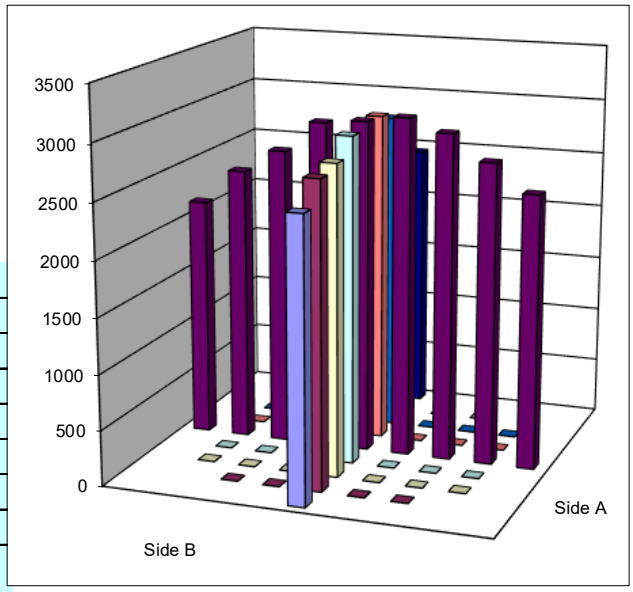
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2750.5		Mean	2837.0	2866.2	2851.6
Min Point	2162.6	-21.4%	Std. Dev.	212.9	111.0	163.8
Max Point	3058.3	11.2%	COV as %	7.5	3.9	**5.7**

Flow w/o C-Pt 4286 cfm

Vel Avg w/o C-Pt 2719 fpm

	Start	Finish	
Stack temp	110.9	111.3	F
Equipment temp	78.2	77.9	F
Ambient temp	84.8	84.9	F
Stack static	0.47	0.37	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	988.28	988.18	mbars
Ambient humidity	29%	27%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-7
Date	6/23/21	Fan Configuration	B & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.6 deg F
Stack X-Area	227.0 in.2	Start/End Time	11:01 11:13
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,478.5	2,553.2	2,503.6	2,511.7	2,478.5	2,503.6	2,577.6	2,519.9
2	1.79	2,810.2	2,765.3	2,810.2	2,795.3	2,787.9	2,742.6	2,719.6	2,750.0
3	3.30	2,919.7	2,962.3	2,898.1	2,926.7	2,876.4	2,810.2	2,810.2	2,832.3
4	5.49	3,045.7	3,025.2	3,025.2	3,032.0	2,898.1	2,941.1	2,941.1	2,926.8
Center	8.50	3,045.7	3,045.7	3,066.3	3,052.6	2,962.3	3,025.2	2,983.4	2,990.3
5	11.51	2,832.5	2,941.1	2,919.7	2,897.8	2,941.1	2,941.1	2,983.4	2,955.2
6	13.70	2,649.6	2,673.1	2,649.6	2,657.4	2,765.3	2,810.2	2,832.5	2,802.7
7	15.22	2,427.3	2,503.6	2,478.5	2,469.8	2,719.6	2,696.5	2,696.5	2,704.2
8	16.46	2,124.4	2,124.4	2,239.3	2,162.7	2,401.4	2,427.3	2,375.2	2,401.3
Averages ---------->		2,703.7	2,732.7	2,732.3	2,722.9	2,759.0	2,766.4	2,768.8	2,764.7

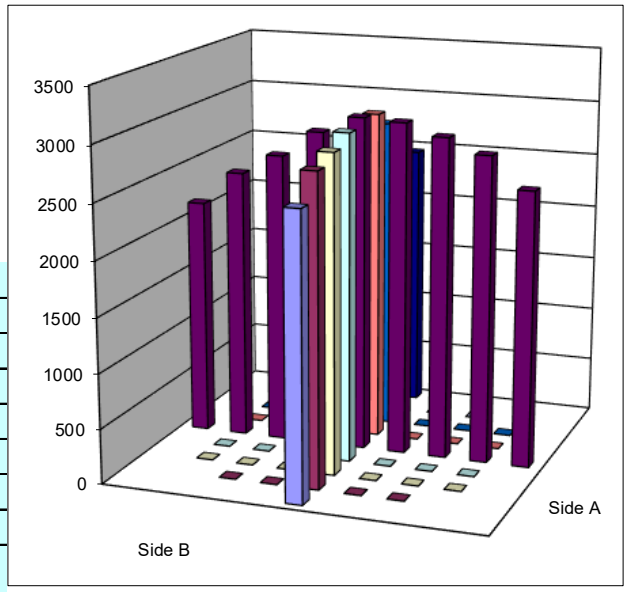
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2743.8		Mean	2833.1	2851.6	2842.4
Min Point	2162.7	-21.2%	Std. Dev.	210.1	108.3	160.9
Max Point	3052.6	11.3%	COV as %	7.4	3.8	**5.7**

Flow w/o C-Pt 4270 cfm

Vel Avg w/o C-Pt 2709 fpm

	Start	Finish	
Stack temp	112.8	110.3	F
Equipment temp	78.8	77.4	F
Ambient temp	87.8	88.1	F
Stack static	0.60	0.42	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	988.41	988.23	mbars
Ambient humidity	25%	25%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-8
Date	6/23/21	Fan Configuration	B & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.6 deg F
Stack X-Area	227.0 in.2	Start/End Time	13:06 13:14
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,502.6	2,477.4	2,502.6	2,494.2	2,624.8	2,576.6	2,600.8	2,600.7
2	1.79	2,695.4	2,718.6	2,695.4	2,703.1	2,672.0	2,741.5	2,764.3	2,725.9
3	3.30	2,831.4	2,831.4	2,853.5	2,838.7	2,764.3	2,831.4	2,831.4	2,809.0
4	5.49	3,044.6	3,003.1	3,003.1	3,016.9	2,940.0	2,940.0	2,982.2	2,954.0
Center	8.50	2,982.2	3,044.6	3,023.9	3,016.9	2,982.2	2,982.2	3,023.9	2,996.1
5	11.51	2,853.5	2,853.5	2,875.3	2,860.7	3,023.9	2,918.5	2,982.2	2,974.9
6	13.70	2,502.6	2,576.6	2,576.6	2,552.0	2,786.8	2,875.3	2,853.5	2,838.5
7	15.22	2,400.4	2,477.4	2,502.6	2,460.2	2,695.4	2,718.6	2,718.6	2,710.8
8	16.46	2,123.5	2,123.5	2,093.9	2,113.6	2,426.4	2,400.4	2,400.4	2,409.1
Averages ---------->		2,659.6	2,678.5	2,680.8	2,672.9	2,768.4	2,776.1	2,795.2	2,779.9

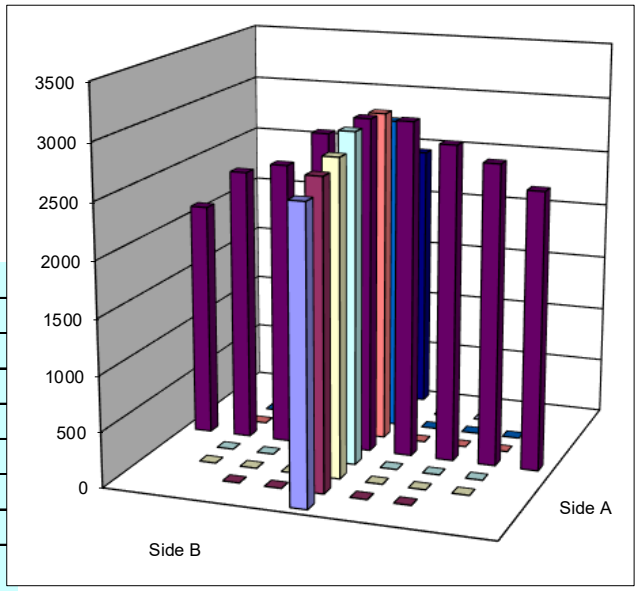
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2726.4		Mean	2778.4	2858.5	2818.4
Min Point	2113.6	-22.5%	Std. Dev.	217.0	118.2	172.9
Max Point	3016.9	10.7%	COV as %	7.8	4.1	**6.1**

Flow w/o C-Pt 4242 cfm

Vel Avg w/o C-Pt 2691 fpm

	Start	Finish	
Stack temp	110.7	110.5	F
Equipment temp	76.9	77.7	F
Ambient temp	94.2	94.5	F
Stack static	0.32	0.30	mbars
Ambient pressure	987.13	987.13	mbars
Total Stack pressure	987.45	987.43	mbars
Ambient humidity	19%	19%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-9
Date	6/23/21	Fan Configuration	B & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.0 deg F
Stack X-Area	227.0 in.2	Start/End Time	14:10 14:22
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,425.5	2,425.5	2,476.6	2,442.6	2,647.6	2,551.3	2,476.6	2,558.5
2	1.79	2,763.3	2,763.3	2,763.3	2,763.3	2,694.5	2,763.3	2,763.3	2,740.3
3	3.30	2,917.5	2,830.4	2,874.3	2,874.0	2,785.8	2,830.4	2,830.4	2,815.5
4	5.49	3,002.0	2,960.0	3,002.0	2,988.0	2,917.5	2,938.9	2,938.9	2,931.7
Center	8.50	3,022.9	3,022.9	3,002.0	3,015.9	2,981.1	2,938.9	3,002.0	2,974.0
5	11.51	2,938.9	2,917.5	2,852.4	2,902.9	2,917.5	2,960.0	2,960.0	2,945.8
6	13.70	2,575.7	2,671.1	2,647.6	2,631.5	2,852.4	2,830.4	2,960.0	2,880.9
7	15.22	2,451.2	2,501.7	2,451.2	2,468.0	2,717.6	2,694.5	2,740.5	2,717.5
8	16.46	2,122.8	2,181.0	2,152.1	2,151.9	2,399.6	2,551.3	2,476.6	2,475.8
Averages ---------->		2,691.1	2,697.0	2,691.3	2,693.1	2,768.2	2,784.3	2,794.3	2,782.2

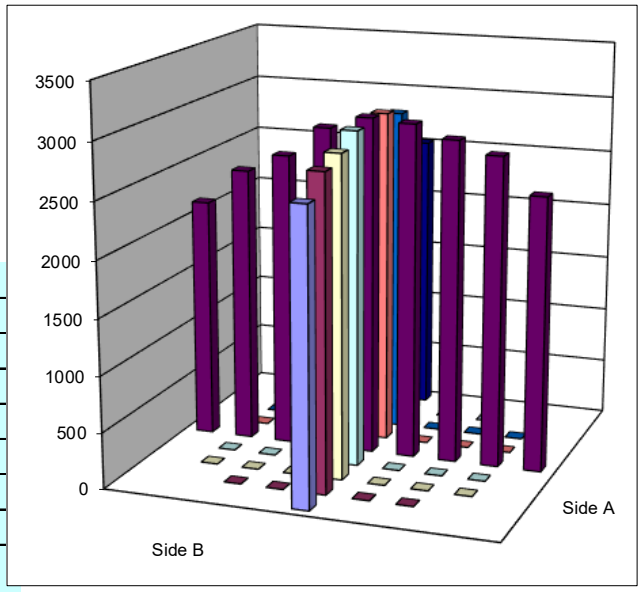
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2737.7		Mean	2806.2	2858.0	2832.1
Min Point	2151.9	-21.4%	Std. Dev.	199.1	102.1	154.3
Max Point	3015.9	10.2%	COV as %	7.1	3.6	**5.4**

Flow w/o C-Pt 4265 cfm

Vel Avg w/o C-Pt 2706 fpm

	Start	Finish	
Stack temp	110.2	109.7	F
Equipment temp	75.9	77.3	F
Ambient temp	96.1	96.2	F
Stack static	0.40	0.42	mbars
Ambient pressure	986.79	986.46	mbars
Total Stack pressure	987.19	986.88	mbars
Ambient humidity	18%	18%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-10
Date	6/24/21	Fan Configuration	A & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.8 deg F
Stack X-Area	227.0 in.2	Start/End Time	9:45 9:53
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,471.8	2,420.9	2,395.0	2,429.2	2,618.8	2,642.5	2,618.8	2,626.7
2	1.79	2,712.4	2,757.9	2,689.3	2,719.8	2,757.9	2,712.4	2,735.2	2,735.2
3	3.30	2,954.4	2,911.8	2,933.2	2,933.1	2,846.9	2,868.7	2,824.9	2,846.9
4	5.49	3,017.1	3,017.1	3,037.6	3,023.9	2,933.2	2,975.4	2,975.4	2,961.3
Center	8.50	3,058.1	3,078.4	3,078.4	3,071.6	3,058.1	3,078.4	3,098.6	3,078.3
5	11.51	2,890.4	2,933.2	2,890.4	2,904.7	2,975.4	2,954.4	3,017.1	2,982.3
6	13.70	2,618.8	2,618.8	2,735.2	2,657.6	2,824.9	2,911.8	2,846.9	2,861.2
7	15.22	2,446.5	2,496.9	2,446.5	2,463.3	2,735.2	2,824.9	2,735.2	2,765.1
8	16.46	2,147.9	2,205.2	2,118.7	2,157.3	2,521.7	2,496.9	2,420.9	2,479.8
Averages ---------->		2,701.9	2,715.6	2,702.7	2,706.7	2,808.0	2,829.5	2,808.1	2,815.2

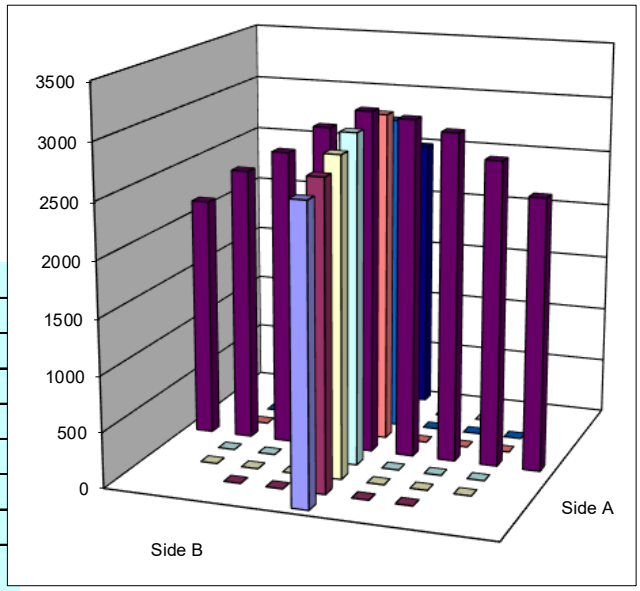
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2761.0		Mean	2824.9	2890.0	2857.5
Min Point	2157.3	-21.9%	Std. Dev.	219.2	123.4	174.2
Max Point	3078.3	11.5%	COV as %	7.8	4.3	**6.1**

Flow w/o C-Pt 4290 cfm

Vel Avg w/o C-Pt 2722 fpm

	Start	Finish	
Stack temp	111.5	110.0	F
Equipment temp	77.3	77.4	F
Ambient temp	86.5	86.9	F
Stack static	0.37	0.35	mbars
Ambient pressure	991.87	991.87	mbars
Total Stack pressure	992.24	992.22	mbars
Ambient humidity	26%	26%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-11
Date	6/24/21	Fan Configuration	A & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.8 deg F
Stack X-Area	227.0 in.2	Start/End Time	10:46 10:56
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,394.9	2,368.7	2,420.8	2,394.8	2,496.9	2,521.6	2,546.2	2,521.6
2	1.79	2,570.6	2,618.7	2,594.8	2,594.7	2,735.1	2,757.8	2,802.6	2,765.2
3	3.30	2,824.8	2,824.8	2,846.8	2,832.1	2,824.8	2,890.3	2,846.8	2,854.0
4	5.49	3,078.3	3,057.9	3,098.5	3,078.2	2,975.3	2,975.3	2,954.3	2,968.3
Center	8.50	3,078.3	3,098.5	3,078.3	3,085.0	3,017.0	2,996.2	2,996.2	3,003.1
5	11.51	2,933.1	2,975.3	2,933.1	2,947.1	2,890.3	2,996.2	3,017.0	2,967.8
6	13.70	2,757.8	2,665.9	2,618.7	2,680.8	2,846.8	2,824.8	2,846.8	2,839.5
7	15.22	2,496.9	2,394.9	2,446.4	2,446.0	2,735.1	2,712.3	2,712.3	2,719.9
8	16.46	2,028.4	2,147.8	2,118.6	2,098.3	2,315.5	2,496.9	2,394.9	2,402.4
Averages ---------->		2,684.8	2,683.6	2,684.0	2,684.1	2,759.6	2,796.8	2,790.8	2,782.4

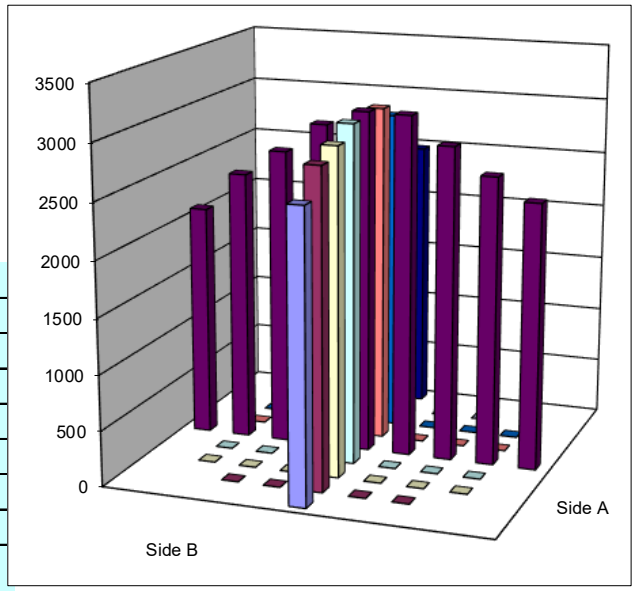
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2733.3		Mean	2809.2	2874.0	2841.6
Min Point	2098.3	-23.2%	Std. Dev.	245.8	109.2	185.8
Max Point	3085.0	12.9%	COV as %	8.7	3.8	**6.5**

Flow w/o C-Pt 4247 cfm

Vel Avg w/o C-Pt 2694 fpm

	Start	Finish	
Stack temp	110.9	110.6	F
Equipment temp	76.3	76.9	F
Ambient temp	88.7	88.9	F
Stack static	0.45	0.42	mbars
Ambient pressure	991.87	991.87	mbars
Total Stack pressure	992.32	992.29	mbars
Ambient humidity	24%	24%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-12
Date	6/24/21	Fan Configuration	A & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.7 deg F
Stack X-Area	227.0 in.2	Start/End Time	13:13 13:20
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,395.7	2,395.7	2,369.5	2,387.0	2,643.3	2,595.7	2,619.7	2,619.6
2	1.79	2,595.7	2,713.2	2,713.2	2,674.1	2,713.2	2,736.1	2,690.1	2,713.1
3	3.30	2,891.3	2,891.3	2,847.9	2,876.8	2,781.3	2,803.7	2,781.3	2,788.8
4	5.49	3,038.6	2,997.3	3,038.6	3,024.8	2,891.3	2,912.8	2,912.8	2,905.6
Center	8.50	3,059.1	3,018.0	3,018.0	3,031.7	2,976.4	2,976.4	2,955.4	2,969.4
5	11.51	2,955.4	2,934.1	2,955.4	2,948.3	2,912.8	2,912.8	2,934.1	2,919.9
6	13.70	2,758.8	2,619.7	2,736.1	2,704.9	2,847.9	2,891.3	2,847.9	2,862.3
7	15.22	2,369.5	2,472.6	2,421.6	2,421.2	2,666.9	2,690.1	2,643.3	2,666.8
8	16.46	2,059.7	2,119.4	2,148.6	2,109.2	2,421.6	2,472.6	2,472.6	2,455.6
Averages ---------->		2,680.4	2,684.6	2,694.3	2,686.4	2,761.6	2,776.8	2,761.9	2,766.8

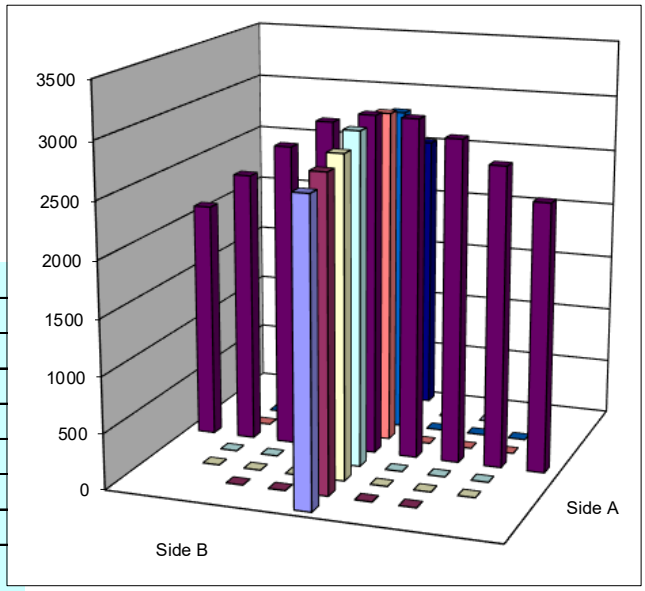
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2726.6		Mean	2811.7	2832.3	2822.0
Min Point	2109.2	-22.6%	Std. Dev.	223.4	112.7	170.4
Max Point	3031.7	11.2%	COV as %	7.9	4.0	**6.0**

Flow w/o C-Pt 4244 cfm

Vel Avg w/o C-Pt 2692 fpm

	Start	Finish	
Stack temp	111.3	110	F
Equipment temp	76.4	76.7	F
Ambient temp	93.3	93.4	F
Stack static	0.37	0.42	mbars
Ambient pressure	991.20	990.86	mbars
Total Stack pressure	991.57	991.28	mbars
Ambient humidity	21%	21%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-13
Date	6/24/21	Fan Configuration	A & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.8 deg F
Stack X-Area	227.0 in.2	Start/End Time	14:15 14:23
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,473.4	2,523.4	2,498.5	2,498.4	2,343.8	2,370.3	2,396.5	2,370.2
2	1.79	2,644.1	2,644.1	2,620.4	2,636.2	2,736.9	2,759.7	2,782.2	2,759.6
3	3.30	2,913.7	2,935.0	2,935.0	2,927.9	2,892.2	2,826.7	2,826.7	2,848.5
4	5.49	3,018.9	2,956.3	2,956.3	2,977.2	2,935.0	2,977.3	2,977.3	2,963.2
Center	8.50	3,018.9	2,998.2	3,018.9	3,012.0	2,998.2	2,956.3	2,998.2	2,984.2
5	11.51	2,935.0	2,913.7	2,892.2	2,913.6	2,935.0	2,956.3	3,018.9	2,970.1
6	13.70	2,667.6	2,667.6	2,691.0	2,675.4	2,848.7	2,935.0	2,826.7	2,870.1
7	15.22	2,498.5	2,548.0	2,473.4	2,506.6	2,691.0	2,759.7	2,759.7	2,736.8
8	16.46	2,120.0	2,120.0	2,149.3	2,129.8	2,448.0	2,498.5	2,422.4	2,456.3
Averages ---------->		2,698.9	2,700.7	2,692.8	2,697.5	2,758.8	2,782.2	2,778.7	2,773.2

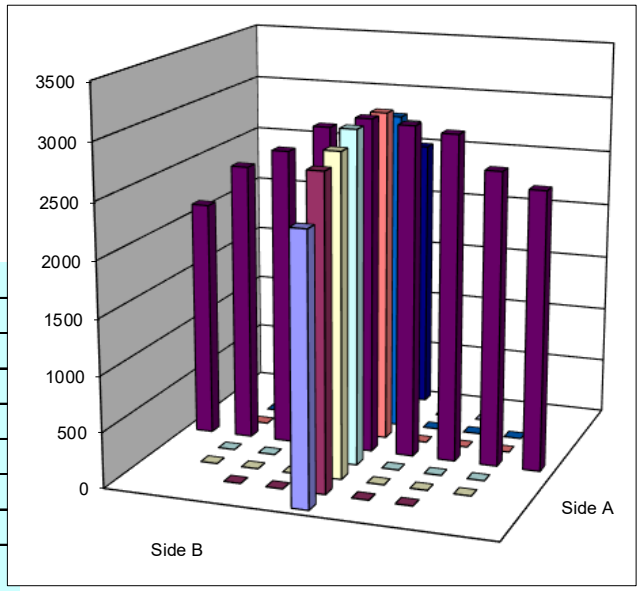
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2735.3		Mean	2807.0	2876.1	2841.5
Min Point	2129.8	-22.1%	Std. Dev.	197.4	101.6	155.0
Max Point	3012.0	10.1%	COV as %	7.0	3.5	**5.5**

Flow w/o C-Pt 4260 cfm

Vel Avg w/o C-Pt 2703 fpm

	Start	Finish	
Stack temp	110.7	110.8	F
Equipment temp	76.9	77.2	F
Ambient temp	94.4	94.7	F
Stack static	0.52	0.40	mbars
Ambient pressure	990.52	990.52	mbars
Total Stack pressure	991.04	990.92	mbars
Ambient humidity	20%	20%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) CAM	Run No.	VT-14
Date	6/25/21	Fan Configuration	A & C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.9 deg F
Stack X-Area	227.0 in.2	Start/End Time	9:08 9:14
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	11.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,469.4	2,494.5	2,494.5	2,486.2	2,519.3	2,568.3	2,494.5	2,527.4
2	1.79	2,616.2	2,663.4	2,686.7	2,655.4	2,777.8	2,709.7	2,709.7	2,732.4
3	3.30	2,822.2	2,930.4	2,887.6	2,880.1	2,822.2	2,800.0	2,844.1	2,822.1
4	5.49	2,972.5	3,014.1	3,034.7	3,007.1	2,930.4	2,930.4	2,930.4	2,930.4
Center	8.50	2,993.4	3,055.1	3,014.1	3,020.9	2,993.4	2,972.5	3,014.1	2,993.3
5	11.51	2,844.1	2,887.6	2,866.0	2,865.9	2,909.1	2,993.4	2,951.6	2,951.3
6	13.70	2,592.4	2,592.4	2,686.7	2,623.8	2,822.2	2,909.1	2,844.1	2,858.5
7	15.22	2,519.3	2,469.4	2,469.4	2,486.0	2,519.3	2,686.7	2,639.9	2,615.3
8	16.46	2,174.6	2,203.1	2,231.2	2,203.0	2,313.3	2,469.4	2,444.1	2,408.9
Averages ---------->		2,667.1	2,701.1	2,707.9	2,692.0	2,734.1	2,782.2	2,763.6	2,760.0

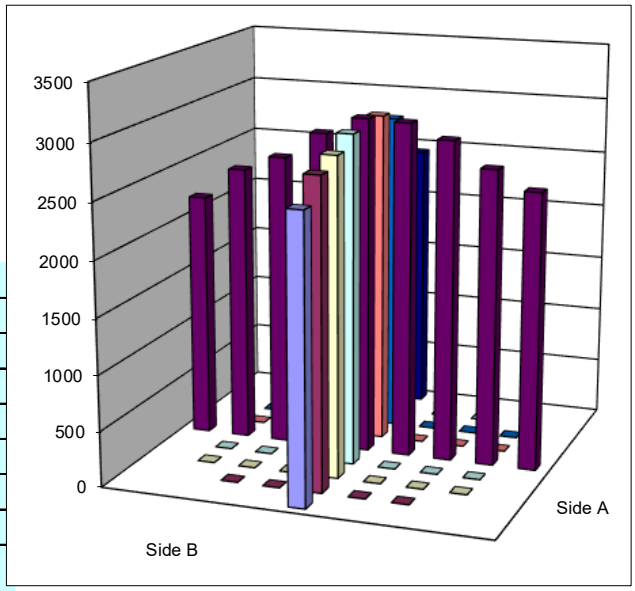
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2726.0		Mean	2791.3	2843.3	2817.3
Min Point	2203.0	-19.2%	Std. Dev.	205.1	133.4	168.4
Max Point	3020.9	10.8%	COV as %	7.3	4.7	**6.0**

Flow w/o C-Pt 4241 cfm

Vel Avg w/o C-Pt 2691 fpm

	Start	Finish	
Stack temp	111.0	110.7	F
Equipment temp	76.0	76.3	F
Ambient temp	88.7	88.9	F
Stack static	0.45	0.40	mbars
Ambient pressure	993.91	993.91	mbars
Total Stack pressure	994.36	994.31	mbars
Ambient humidity	33%	33%	RH

Instuments Used:	Cal Due
S-type pitot (ID: 2A, 24")	Pre-test calibration, Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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.

C.4 RS Velocity Uniformity Data Forms

VELOCITY TRAVERSE DATA FORM

Stack	LV-S3 (LVP) RS	Run No.	VT-1
Date	6/21/21	Fan Configuration	A&B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	109.1 deg F
Stack X-Area	227.0 in.2	Start/End Time	10:26 10:46
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	1,992.1	1,810.6	1,857.7	1,886.8	2,526.7	2,560.6	2,691.9	2,593.1
2	1.79	2,492.3	2,422.0	2,457.4	2,457.2	2,627.1	2,659.7	2,659.7	2,648.8
3	3.30	2,723.8	2,594.0	2,627.1	2,648.3	2,526.7	2,526.7	2,691.9	2,581.8
4	5.49	2,755.3	2,723.8	2,691.9	2,723.7	2,691.9	2,755.3	2,691.9	2,713.1
Center	8.50	2,847.7	2,877.8	2,877.8	2,867.8	2,659.7	2,691.9	2,817.3	2,723.0
5	11.51	2,786.4	2,755.3	2,755.3	2,765.7	2,691.9	2,786.4	2,786.4	2,754.9
6	13.70	2,691.9	2,594.0	2,627.1	2,637.7	2,492.3	2,560.6	2,526.7	2,526.5
7	15.22	2,457.4	2,457.4	2,492.3	2,469.0	2,198.0	2,236.9	2,158.3	2,197.7
8	16.46	2,312.7	2,236.9	2,158.3	2,236.0	1,810.6	1,857.7	1,903.5	1,857.2
Averages ---------->		2,562.2	2,496.9	2,505.0	2,521.4	2,469.4	2,515.1	2,547.5	2,510.7

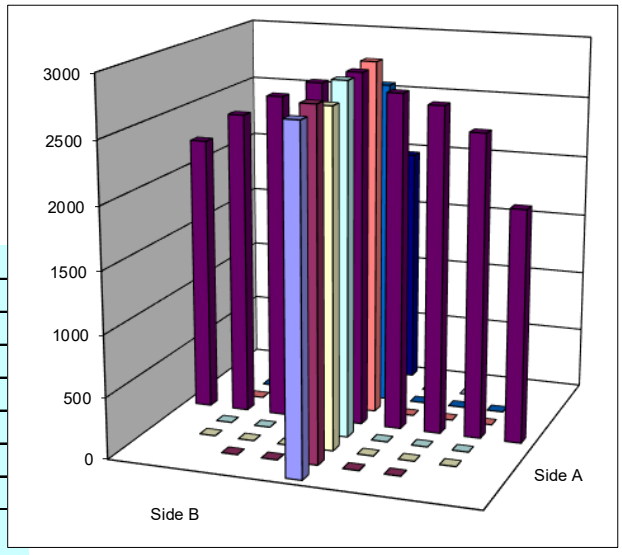
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2516.0		Mean	2652.8	2592.3	2622.5
Min Point	1857.2	-26.2%	Std. Dev.	150.7	192.1	168.8
Max Point	2867.8	14.0%	COV as %	5.7	7.4	**6.4**

Flow w/o C-Pt 3911 cfm

Vel Avg w/o C-Pt 2481 fpm

	Start	Finish	
Stack temp	109.4	108.7	F
Equipment temp	74.0	74.0	F
Ambient temp	83.0	83.0	F
Stack static	1.67	2.07	mbars
Ambient pressure	991.20	991.20	mbars
Total Stack pressure	992.87	993.27	mbars
Ambient humidity	33%	33%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-2
Date	6/22/21	Fan Configuration	A&B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.0 deg F
Stack X-Area	227.0 in.2	Start/End Time	9:30 9:42
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,206.6	2,042.9	1,999.9	2,083.1	2,245.7	2,166.9	2,245.7	2,219.4
2	1.79	2,502.0	2,467.0	2,604.3	2,524.4	2,570.6	2,536.5	2,467.0	2,524.7
3	3.30	2,766.1	2,637.4	2,702.5	2,702.0	2,702.5	2,734.5	2,702.5	2,713.2
4	5.49	2,828.3	2,797.4	2,828.3	2,818.0	2,828.3	2,889.1	2,797.4	2,838.3
Center	8.50	2,858.9	2,889.1	2,889.1	2,879.0	2,858.9	2,889.1	2,889.1	2,879.0
5	11.51	2,828.3	2,797.4	2,734.5	2,786.7	2,797.4	2,797.4	2,828.3	2,807.7
6	13.70	2,734.5	2,670.2	2,604.3	2,669.6	2,702.5	2,637.4	2,637.4	2,659.1
7	15.22	2,467.0	2,536.5	2,502.0	2,501.9	2,467.0	2,467.0	2,570.6	2,501.6
8	16.46	2,206.6	2,206.6	2,166.9	2,193.4	2,284.0	2,536.5	2,206.6	2,342.4
Averages ---------->		2,599.8	2,560.5	2,559.1	2,573.1	2,606.3	2,628.3	2,593.8	2,609.5

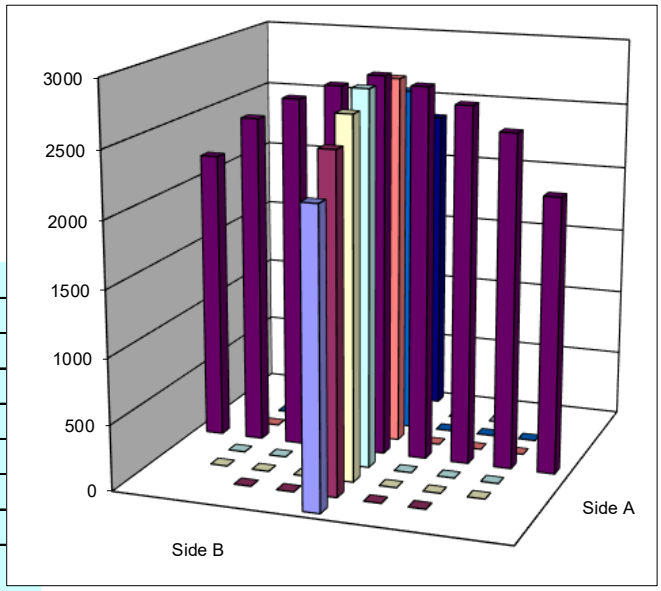
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2591.3		Mean	2697.4	2703.4	2700.4
Min Point	2083.1	-19.6%	Std. Dev.	144.0	149.8	141.2
Max Point	2879.0	11.1%	COV as %	5.3	5.5	**5.2**

Flow w/o C-Pt 4028 cfm

Vel Avg w/o C-Pt 2555 fpm

	Start	Finish	
Stack temp	111.8	110.2	F
Equipment temp	79.3	76.9	F
Ambient temp	90.0	90.0	F
Stack static	2.54	2.61	mbars
Ambient pressure	986.12	986.12	mbars
Total Stack pressure	988.66	988.73	mbars
Ambient humidity	28%	28%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-3
Date	6/22/21	Fan Configuration	A&B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.4 deg F
Stack X-Area	227.0 in.2	Start/End Time	10:32 10:45
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,285.3	2,360.2	2,246.9	2,297.4	2,285.3	2,360.2	2,360.2	2,335.2
2	1.79	2,605.6	2,468.3	2,468.3	2,514.1	2,537.9	2,638.9	2,605.6	2,594.1
3	3.30	2,767.6	2,767.6	2,605.6	2,713.6	2,735.9	2,798.9	2,735.9	2,756.9
4	5.49	2,860.4	2,829.9	2,798.9	2,829.7	2,860.4	2,860.4	2,860.4	2,860.4
Center	8.50	2,829.9	2,860.4	2,920.6	2,870.3	2,890.7	2,920.6	2,920.6	2,910.6
5	11.51	2,798.9	2,890.7	2,860.4	2,850.0	2,860.4	2,890.7	2,798.9	2,850.0
6	13.70	2,704.0	2,671.6	2,735.9	2,703.8	2,671.6	2,704.0	2,671.6	2,682.4
7	15.22	2,537.9	2,432.8	2,537.9	2,502.9	2,605.6	2,572.0	2,537.9	2,571.8
8	16.46	2,285.3	2,168.0	2,207.8	2,220.3	2,246.9	2,246.9	2,323.1	2,272.3
Averages ---------->		2,630.5	2,605.5	2,598.0	2,611.4	2,632.7	2,665.8	2,646.0	2,648.2

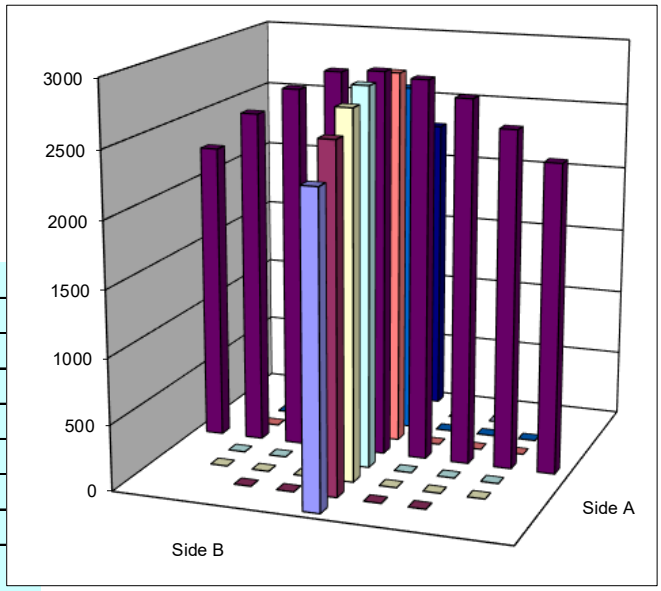
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2629.8		Mean	2712.1	2746.6	2729.3
Min Point	2220.3	-15.6%	Std. Dev.	153.3	134.5	139.7
Max Point	2910.6	10.7%	COV as %	5.7	4.9	**5.1**

Flow w/o C-Pt 4094 cfm

Vel Avg w/o C-Pt 2597 fpm

	Start	Finish	
Stack temp	111.3	109.4	F
Equipment temp	76.6	76.3	F
Ambient temp	91.4	91.2	F
Stack static	0.60	0.87	mbars
Ambient pressure	985.78	985.78	mbars
Total Stack pressure	986.38	986.65	mbars
Ambient humidity	26%	26%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-4
Date	6/22/21	Fan Configuration	A&B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.1 deg F
Stack X-Area	227.0 in.2	Start/End Time	12:48 12:58
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

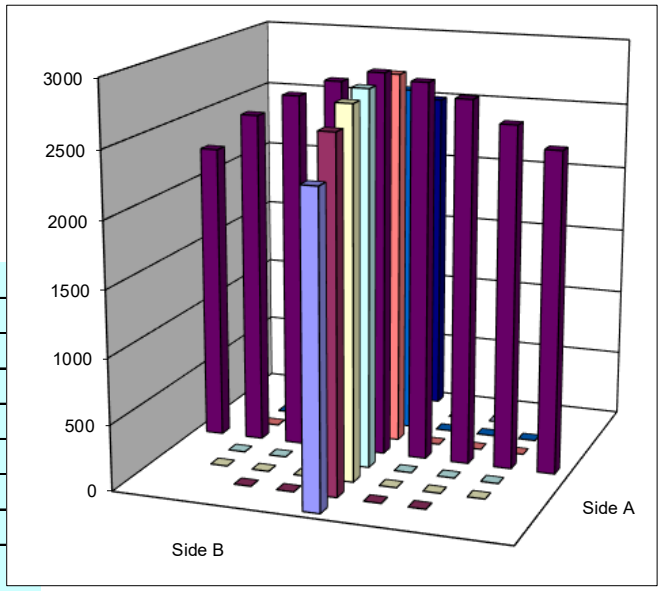
Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,397.2	2,397.2	2,468.8	2,421.1	2,360.6	2,360.6	2,247.3	2,322.8
2	1.79	2,572.4	2,639.3	2,538.4	2,583.4	2,639.3	2,606.1	2,639.3	2,628.2
3	3.30	2,736.5	2,799.4	2,704.4	2,746.8	2,736.5	2,768.1	2,799.4	2,768.0
4	5.49	2,891.2	2,799.4	2,860.9	2,850.5	2,768.1	2,830.3	2,860.9	2,819.8
Center	8.50	2,921.2	2,891.2	2,891.2	2,901.2	2,860.9	2,921.2	2,860.9	2,881.0
5	11.51	2,768.1	2,799.4	2,891.2	2,819.5	2,860.9	2,799.4	2,799.4	2,819.9
6	13.70	2,704.4	2,639.3	2,736.5	2,693.4	2,606.1	2,704.4	2,639.3	2,649.9
7	15.22	2,538.4	2,503.8	2,538.4	2,526.8	2,397.2	2,468.8	2,538.4	2,468.1
8	16.46	2,285.7	2,168.4	2,285.7	2,246.6	2,538.4	2,360.6	2,503.8	2,467.6
Averages ---------->		2,646.1	2,626.4	2,657.3	2,643.3	2,640.9	2,646.6	2,654.3	2,647.3

All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2645.3		Mean	2731.7	2719.3	2725.5
Min Point	2246.6	-15.1%	Std. Dev.	139.2	144.3	136.3
Max Point	2901.2	9.7%	COV as %	5.1	5.3	**5.0**

Flow w/o C-Pt	4121 cfm
Vel Avg w/o C-Pt	2615 fpm

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification

	Start	Finish	
Stack temp	110.2	109.9	F
Equipment temp	76.0	76.8	F
Ambient temp	97.3	97.4	F
Stack static	0.55	0.52	mbars
Ambient pressure	985.10	985.10	mbars
Total Stack pressure	985.65	985.62	mbars
Ambient humidity	19%	19%	RH



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-5
Date	6/22/21	Fan Configuration	A&B
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.3 deg F
Stack X-Area	227.0 in.2	Start/End Time	13:52 14:02
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,469.7	2,434.1	2,361.5	2,421.8	2,209.0	2,209.0	2,209.0	2,209.0
2	1.79	2,607.0	2,504.7	2,573.4	2,561.7	2,539.3	2,469.7	2,504.7	2,504.5
3	3.30	2,705.4	2,769.1	2,607.0	2,693.8	2,737.4	2,539.3	2,705.4	2,660.7
4	5.49	2,831.3	2,831.3	2,861.9	2,841.5	2,800.3	2,800.3	2,861.9	2,820.9
Center	8.50	2,831.3	2,892.2	2,831.3	2,851.6	2,922.2	2,861.9	2,861.9	2,882.0
5	11.51	2,922.2	2,861.9	2,831.3	2,871.8	2,800.3	2,769.1	2,737.4	2,768.9
6	13.70	2,705.4	2,673.1	2,673.1	2,683.8	2,705.4	2,673.1	2,705.4	2,694.6
7	15.22	2,607.0	2,573.4	2,539.3	2,573.2	2,573.4	2,539.3	2,573.4	2,562.0
8	16.46	2,324.3	2,286.5	2,286.5	2,299.1	2,469.7	2,286.5	2,361.5	2,372.6
Averages ---------->		2,667.1	2,647.4	2,618.4	2,644.3	2,639.7	2,572.0	2,613.4	2,608.4

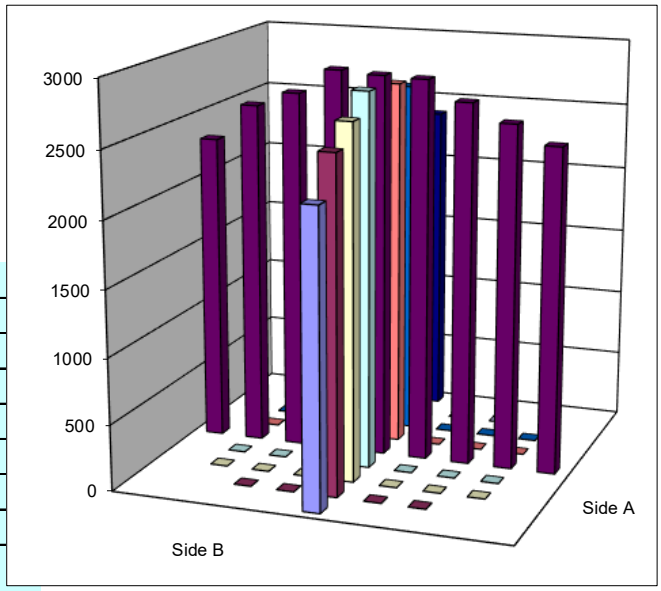
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2626.3		Mean	2725.4	2699.1	2712.2
Min Point	2209.0	-15.9%	Std. Dev.	131.3	136.2	129.3
Max Point	2882.0	9.7%	COV as %	4.8	5.0	**4.8**

Flow w/o C-Pt 4092 cfm

Vel Avg w/o C-Pt 2596 fpm

	Start	Finish	
Stack temp	110.7	109.9	F
Equipment temp	76.0	77.1	F
Ambient temp	98.3	98.3	F
Stack static	0.82	0.75	mbars
Ambient pressure	984.76	984.42	mbars
Total Stack pressure	985.58	985.17	mbars
Ambient humidity	19%	19%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-6
Date	6/23/21	Fan Configuration	B&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.3 deg F
Stack X-Area	227.0 in.2	Start/End Time	9:30 9:40
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,323.1	2,207.9	2,207.9	2,246.3	2,360.3	2,396.9	2,323.1	2,360.1
2	1.79	2,538.0	2,572.1	2,503.5	2,537.9	2,572.1	2,538.0	2,538.0	2,549.4
3	3.30	2,767.7	2,799.0	2,671.7	2,746.1	2,704.1	2,829.9	2,704.1	2,746.1
4	5.49	2,671.7	2,799.0	2,767.7	2,746.1	2,860.5	2,829.9	2,860.5	2,850.3
Center	8.50	2,736.1	2,860.5	2,829.9	2,808.9	2,860.5	2,920.7	2,860.5	2,880.6
5	11.51	2,736.1	2,920.7	2,860.5	2,839.1	2,890.8	2,799.0	2,799.0	2,829.6
6	13.70	2,799.0	2,572.1	2,671.7	2,680.9	2,767.7	2,704.1	2,704.1	2,725.3
7	15.22	2,503.5	2,638.9	2,538.0	2,560.1	2,572.1	2,605.7	2,538.0	2,571.9
8	16.46	2,323.1	2,360.3	2,285.4	2,323.0	2,247.0	2,168.1	2,207.9	2,207.7
Averages ---------->		2,599.8	2,636.7	2,592.9	2,609.8	2,648.4	2,643.6	2,615.0	2,635.7

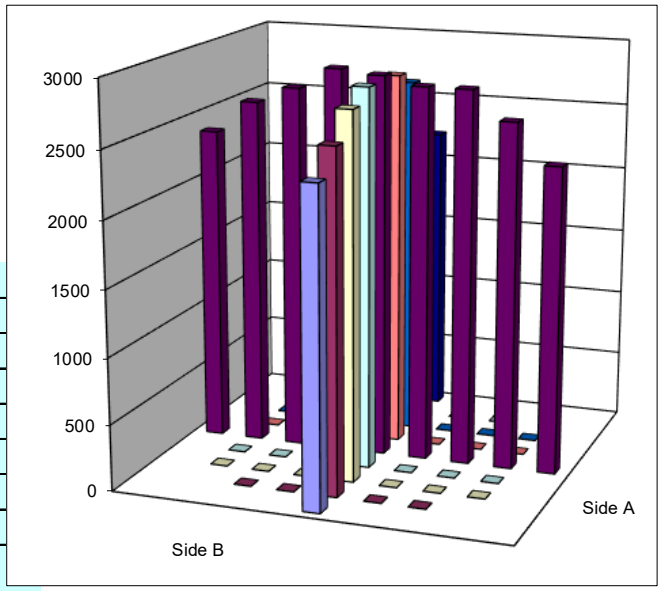
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2622.7		Mean	2702.7	2736.2	2719.4
Min Point	2207.7	-15.8%	Std. Dev.	116.6	132.1	121.0
Max Point	2880.6	9.8%	COV as %	4.3	4.8	**4.4**

Flow w/o C-Pt 4090 cfm

Vel Avg w/o C-Pt 2595 fpm

	Start	Finish	
Stack temp	111.5	111.1	F
Equipment temp	76.5	77.3	F
Ambient temp	84.2	84.7	F
Stack static	0.17	0.35	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	987.98	988.16	mbars
Ambient humidity	30%	29%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-7
Date	6/23/21	Fan Configuration	B&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.9 deg F
Stack X-Area	227.0 in.2	Start/End Time	10:32 10:43
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,208.8	2,247.9	2,286.4	2,247.7	2,324.2	2,361.3	2,286.4	2,324.0
2	1.79	2,539.1	2,504.6	2,539.1	2,527.6	2,672.8	2,539.1	2,573.3	2,595.1
3	3.30	2,672.8	2,640.1	2,705.3	2,672.7	2,831.2	2,737.3	2,737.3	2,768.6
4	5.49	2,769.0	2,800.2	2,800.2	2,789.8	2,831.2	2,861.8	2,861.8	2,851.6
Center	8.50	2,892.1	2,892.1	2,892.1	2,892.1	2,892.1	2,861.8	2,831.2	2,861.7
5	11.51	2,861.8	2,831.2	2,892.1	2,861.7	2,800.2	2,831.2	2,831.2	2,820.9
6	13.70	2,705.3	2,737.3	2,705.3	2,716.0	2,705.3	2,769.0	2,737.3	2,737.2
7	15.22	2,539.1	2,504.6	2,469.5	2,504.4	2,640.1	2,606.9	2,539.1	2,595.4
8	16.46	2,208.8	2,286.4	2,286.4	2,260.5	2,361.3	2,247.9	2,324.2	2,311.2
Averages ---------->		2,599.6	2,604.9	2,619.6	2,608.1	2,673.2	2,646.3	2,635.8	2,651.7

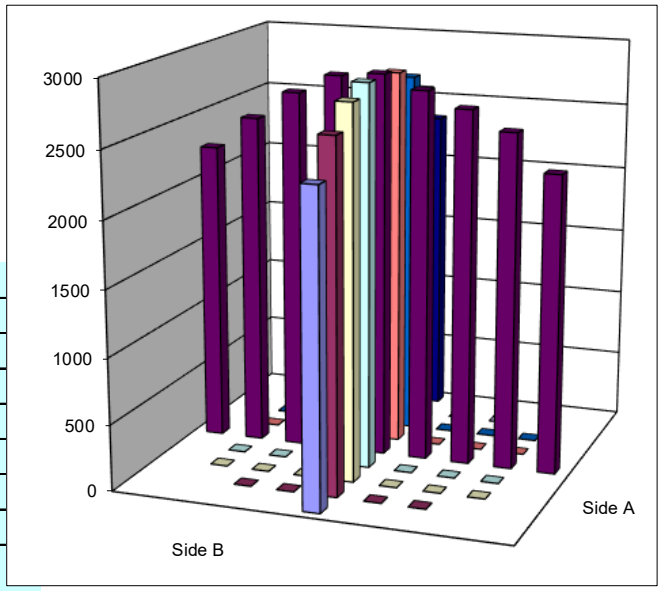
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2629.9		Mean	2709.2	2747.2	2728.2
Min Point	2247.7	-14.5%	Std. Dev.	152.5	112.7	130.3
Max Point	2892.1	10.0%	COV as %	5.6	4.1	**4.8**

Flow w/o C-Pt 4097 cfm

Vel Avg w/o C-Pt 2599 fpm

	Start	Finish	
Stack temp	111.7	112.0	F
Equipment temp	76.7	77.3	F
Ambient temp	86.7	87.2	F
Stack static	0.30	0.37	mbars
Ambient pressure	987.81	987.81	mbars
Total Stack pressure	988.11	988.18	mbars
Ambient humidity	26%	26%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-8
Date	6/23/21	Fan Configuration	B&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.3 deg F
Stack X-Area	227.0 in.2	Start/End Time	12:42 12:52
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,605.7	2,572.2	2,468.6	2,548.8	2,397.0	2,397.0	2,433.0	2,409.0
2	1.79	2,767.8	2,639.0	2,704.1	2,703.6	2,639.0	2,538.0	2,639.0	2,605.3
3	3.30	2,736.1	2,736.1	2,767.8	2,746.6	2,767.8	2,799.0	2,799.0	2,788.6
4	5.49	2,830.0	2,830.0	2,860.6	2,840.2	2,830.0	2,890.9	2,890.9	2,870.6
Center	8.50	2,890.9	2,890.9	2,920.8	2,900.8	2,890.9	2,920.8	2,860.6	2,890.7
5	11.51	2,890.9	2,799.0	2,860.6	2,850.2	2,799.0	2,767.8	2,704.1	2,757.0
6	13.70	2,671.7	2,605.7	2,704.1	2,660.5	2,704.1	2,704.1	2,639.0	2,682.4
7	15.22	2,323.2	2,397.0	2,397.0	2,372.4	2,572.2	2,468.6	2,605.7	2,548.8
8	16.46	2,246.9	2,323.2	2,207.9	2,259.4	2,086.3	2,323.2	2,285.4	2,231.6
Averages ---------->		2,662.6	2,643.7	2,654.6	2,653.6	2,631.8	2,645.5	2,650.8	2,642.7

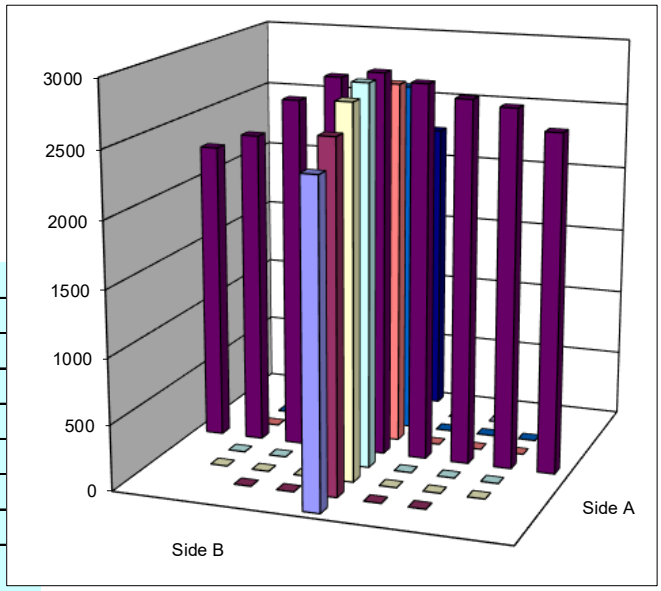
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2648.1		Mean	2724.9	2734.8	2729.8
Min Point	2231.6	-15.7%	Std. Dev.	177.6	129.3	149.3
Max Point	2900.8	9.5%	COV as %	6.5	4.7	**5.5**

Flow w/o C-Pt 4125 cfm

Vel Avg w/o C-Pt 2617 fpm

	Start	Finish	
Stack temp	111.1	111.4	F
Equipment temp	77.1	77.2	F
Ambient temp	93.4	93.8	F
Stack static	0.52	0.45	mbars
Ambient pressure	987.47	987.47	mbars
Total Stack pressure	987.99	987.92	mbars
Ambient humidity	19%	19%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-9
Date	6/23/21	Fan Configuration	B&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.5 deg F
Stack X-Area	227.0 in.2	Start/End Time	13:45 13:55
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,087.1	2,286.3	2,247.8	2,207.0	2,397.8	2,433.9	2,433.9	2,421.9
2	1.79	2,469.4	2,573.1	2,539.0	2,527.2	2,539.0	2,573.1	2,606.7	2,572.9
3	3.30	2,737.1	2,831.0	2,768.8	2,779.0	2,705.2	2,768.8	2,768.8	2,747.6
4	5.49	2,800.1	2,800.1	2,768.8	2,789.7	2,891.9	2,891.9	2,861.7	2,881.8
Center	8.50	2,921.8	2,891.9	2,891.9	2,901.9	2,861.7	2,861.7	2,921.8	2,881.7
5	11.51	2,800.1	2,831.0	2,831.0	2,820.7	2,831.0	2,831.0	2,831.0	2,831.0
6	13.70	2,672.7	2,705.2	2,639.9	2,672.6	2,672.7	2,768.8	2,639.9	2,693.8
7	15.22	2,504.4	2,539.0	2,469.4	2,504.3	2,324.0	2,361.2	2,397.8	2,361.0
8	16.46	2,286.3	2,286.3	2,247.8	2,273.5	2,168.9	2,208.7	2,168.9	2,182.2
Averages ---------->		2,586.6	2,638.2	2,600.5	2,608.4	2,599.1	2,633.2	2,625.6	2,619.3

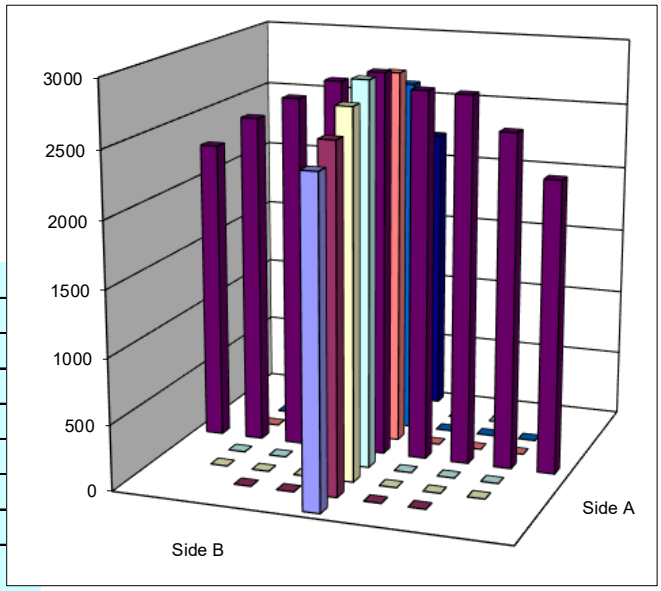
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2613.9		Mean	2713.6	2710.0	2711.8
Min Point	2182.2	-16.5%	Std. Dev.	151.2	189.7	164.8
Max Point	2901.9	11.0%	COV as %	5.6	7.0	**6.1**

Flow w/o C-Pt 4065 cfm

Vel Avg w/o C-Pt 2579 fpm

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification

	Start	Finish	
Stack temp	111.3	111.6	F
Equipment temp	77.4	77.4	F
Ambient temp	95.4	95.4	F
Stack static	0.35	0.52	mbars
Ambient pressure	987.13	987.13	mbars
Total Stack pressure	987.48	987.65	mbars
Ambient humidity	18%	18%	RH



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-10
Date	6/24/21	Fan Configuration	A&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.1 deg F
Stack X-Area	227.0 in.2	Start/End Time	9:21 9:31
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,462.9	2,462.9	2,497.9	2,474.6	2,497.9	2,497.9	2,462.9	2,486.2
2	1.79	2,599.8	2,599.8	2,633.0	2,610.9	2,599.8	2,665.7	2,665.7	2,643.7
3	3.30	2,761.5	2,729.9	2,792.7	2,761.4	2,761.5	2,792.7	2,823.5	2,792.6
4	5.49	2,854.1	2,854.1	2,884.3	2,864.2	2,884.3	2,884.3	2,914.2	2,894.3
Center	8.50	2,854.1	2,943.8	2,914.2	2,904.0	2,854.1	2,914.2	2,884.3	2,884.2
5	11.51	2,854.1	2,792.7	2,761.5	2,802.8	2,943.8	2,792.7	2,823.5	2,853.4
6	13.70	2,729.9	2,729.9	2,665.7	2,708.5	2,665.7	2,633.0	2,698.0	2,665.6
7	15.22	2,532.3	2,391.6	2,497.9	2,473.9	2,391.6	2,427.5	2,462.9	2,427.3
8	16.46	2,122.8	2,163.2	2,202.9	2,163.0	2,280.2	2,241.9	2,241.9	2,254.7
Averages ---------->		2,641.3	2,629.8	2,650.0	2,640.4	2,653.2	2,650.0	2,664.1	2,655.8

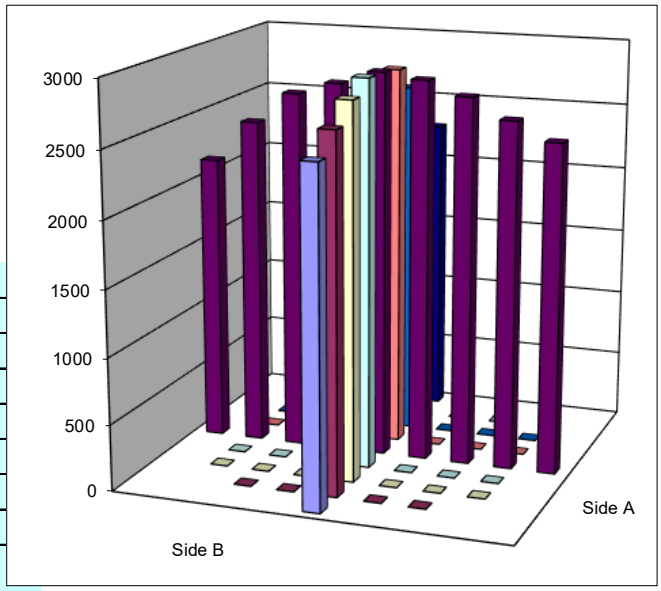
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2648.1		Mean	2732.2	2737.3	2734.8
Min Point	2163.0	-18.3%	Std. Dev.	149.9	169.7	153.8
Max Point	2904.0	9.7%	COV as %	5.5	6.2	**5.6**

Flow w/o C-Pt 4126 cfm

Vel Avg w/o C-Pt 2617 fpm

	Start	Finish	
Stack temp	111.4	110.8	F
Equipment temp	75.2	75.4	F
Ambient temp	84.3	84.4	F
Stack static	0.37	0.25	mbars
Ambient pressure	991.87	991.87	mbars
Total Stack pressure	992.24	992.12	mbars
Ambient humidity	29%	29%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-11
Date	6/24/21	Fan Configuration	A&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.1 deg F
Stack X-Area	227.0 in.2	Start/End Time	10:24 10:33
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,391.2	2,462.6	2,391.2	2,415.0	2,354.7	2,391.2	2,354.7	2,366.9
2	1.79	2,632.6	2,665.3	2,565.9	2,621.3	2,697.7	2,565.9	2,632.6	2,632.1
3	3.30	2,729.5	2,792.3	2,761.1	2,761.0	2,792.3	2,823.2	2,823.2	2,812.9
4	5.49	2,823.2	2,883.9	2,853.7	2,853.6	2,853.7	2,823.2	2,853.7	2,843.5
Center	8.50	2,883.9	2,883.9	2,853.7	2,873.8	2,853.7	2,792.3	2,913.7	2,853.2
5	11.51	2,853.7	2,792.3	2,823.2	2,823.0	2,665.3	2,853.7	2,761.1	2,760.0
6	13.70	2,697.7	2,761.1	2,697.7	2,718.8	2,729.5	2,665.3	2,632.6	2,675.8
7	15.22	2,565.9	2,497.5	2,565.9	2,543.1	2,599.5	2,565.9	2,599.5	2,588.3
8	16.46	2,279.9	2,279.9	2,241.6	2,267.1	2,317.6	2,354.7	2,241.6	2,304.6
Averages ---------->		2,650.9	2,668.8	2,639.3	2,653.0	2,651.5	2,648.4	2,645.9	2,648.6

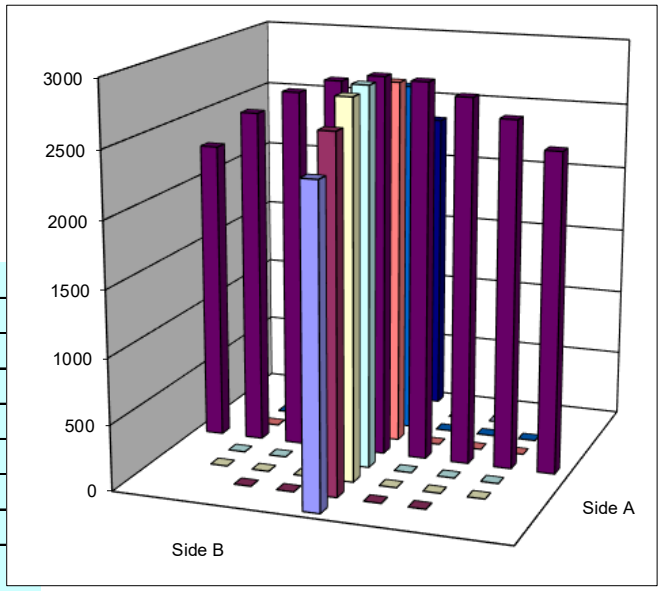
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2650.8		Mean	2742.1	2738.0	2740.0
Min Point	2267.1	-14.5%	Std. Dev.	123.4	106.5	110.8
Max Point	2873.8	8.4%	COV as %	4.5	3.9	**4.0**

Flow w/o C-Pt 4136 cfm

Vel Avg w/o C-Pt 2624 fpm

	Start	Finish	
Stack temp	110.7	111.4	F
Equipment temp	75.2	77.2	F
Ambient temp	88.9	89.3	F
Stack static	0.45	0.55	mbars
Ambient pressure	991.87	991.87	mbars
Total Stack pressure	992.32	992.42	mbars
Ambient humidity	25%	25%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-12
Date	6/24/21	Fan Configuration	A&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.6 deg F
Stack X-Area	227.0 in.2	Start/End Time	12:48 12:59
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,391.0	2,426.9	2,391.0	2,403.0	2,391.0	2,531.7	2,462.3	2,461.7
2	1.79	2,565.8	2,665.2	2,599.3	2,610.1	2,632.4	2,599.3	2,697.4	2,643.0
3	3.30	2,822.9	2,760.9	2,760.9	2,781.6	2,792.1	2,792.1	2,792.1	2,792.1
4	5.49	2,853.5	2,792.1	2,853.5	2,833.1	2,853.5	2,883.7	2,883.7	2,873.6
Center	8.50	2,883.7	2,853.5	2,913.6	2,883.6	2,883.7	2,883.7	2,853.5	2,873.6
5	11.51	2,883.7	2,822.9	2,883.7	2,863.4	2,822.9	2,822.9	2,853.5	2,833.1
6	13.70	2,665.2	2,729.4	2,632.4	2,675.6	2,632.4	2,697.4	2,729.4	2,686.4
7	15.22	2,497.3	2,462.3	2,531.7	2,497.1	2,462.3	2,462.3	2,391.0	2,438.6
8	16.46	2,081.1	2,122.4	2,162.7	2,122.1	2,081.1	2,122.4	2,162.7	2,122.1
Averages ---------->		2,627.1	2,626.2	2,636.5	2,629.9	2,616.8	2,644.0	2,647.3	2,636.0

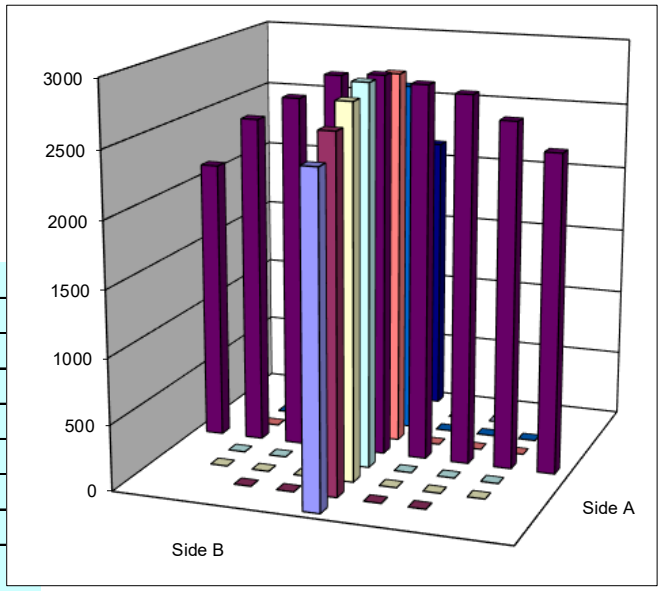
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2633.0		Mean	2734.9	2734.4	2734.6
Min Point	2122.1	-19.4%	Std. Dev.	145.0	158.1	145.7
Max Point	2883.6	9.5%	COV as %	5.3	5.8	**5.3**

Flow w/o C-Pt 4102 cfm

Vel Avg w/o C-Pt 2602 fpm

	Start	Finish	
Stack temp	110.7	110.4	F
Equipment temp	76.4	76.5	F
Ambient temp	93.2	93.3	F
Stack static	0.37	0.55	mbars
Ambient pressure	991.20	991.20	mbars
Total Stack pressure	991.57	991.75	mbars
Ambient humidity	21%	21%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-13
Date	6/24/21	Fan Configuration	A&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	111.0 deg F
Stack X-Area	227.0 in.2	Start/End Time	13:50 13:58
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,163.8	2,355.7	2,392.2	2,303.9	2,498.6	2,428.1	2,392.2	2,439.7
2	1.79	2,567.0	2,600.6	2,567.0	2,578.2	2,600.6	2,567.0	2,600.6	2,589.4
3	3.30	2,762.3	2,730.7	2,730.7	2,741.2	2,762.3	2,793.5	2,793.5	2,783.1
4	5.49	2,854.9	2,854.9	2,885.1	2,865.0	2,854.9	2,915.0	2,885.1	2,885.0
Center	8.50	2,944.6	2,915.0	2,915.0	2,924.9	2,885.1	2,885.1	2,885.1	2,885.1
5	11.51	2,824.3	2,854.9	2,793.5	2,824.2	2,698.7	2,824.3	2,793.5	2,772.2
6	13.70	2,567.0	2,600.6	2,567.0	2,578.2	2,698.7	2,666.5	2,600.6	2,655.3
7	15.22	2,498.6	2,498.6	2,463.6	2,486.9	2,567.0	2,533.1	2,567.0	2,555.7
8	16.46	2,163.8	2,203.6	2,242.6	2,203.3	2,280.9	2,318.6	2,318.6	2,306.0
Averages ---------->		2,594.0	2,623.8	2,617.4	2,611.8	2,649.6	2,659.0	2,648.4	2,652.4

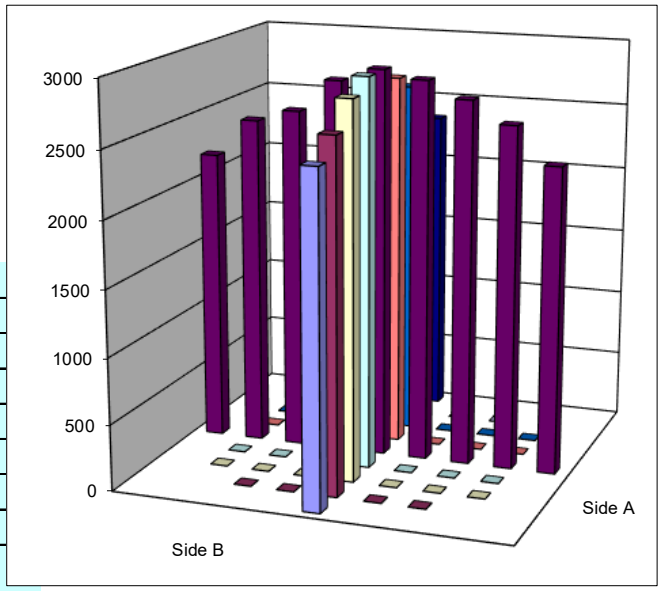
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2632.1		Mean	2714.1	2732.2	2723.2
Min Point	2203.3	-16.3%	Std. Dev.	167.6	134.4	146.3
Max Point	2924.9	11.1%	COV as %	6.2	4.9	**5.4**

Flow w/o C-Pt 4095 cfm

Vel Avg w/o C-Pt 2598 fpm

	Start	Finish	
Stack temp	111.2	110.7	F
Equipment temp	76.7	76.8	F
Ambient temp	94.0	94.1	F
Stack static	0.45	0.57	mbars
Ambient pressure	990.86	990.86	mbars
Total Stack pressure	991.31	991.43	mbars
Ambient humidity	20%	20%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-S3 (LVP) RS	Run No.	VT-14
Date	6/25/21	Fan Configuration	A&C
Testers	JPC/LCE	Fan Setting	NA Hz
Stack Dia.	17 in.	Stack Temp	110.6 deg F
Stack X-Area	227.0 in.2	Start/End Time	8:52 8:58
Test Port	A & B	Center 2/3 from	1.56 to: 15.44
Distance to disturbance	50.08 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	0.54	2,494.0	2,494.0	2,595.8	2,527.9	2,276.7	2,387.8	2,387.8	2,350.8
2	1.79	2,459.1	2,628.9	2,661.5	2,583.2	2,595.8	2,595.8	2,628.9	2,606.8
3	3.30	2,757.3	2,788.3	2,725.7	2,757.1	2,757.3	2,788.3	2,788.3	2,778.0
4	5.49	2,788.3	2,849.7	2,849.7	2,829.2	2,849.7	2,909.7	2,849.7	2,869.7
Center	8.50	2,849.7	2,879.8	2,939.2	2,889.5	2,879.8	2,939.2	2,909.7	2,909.5
5	11.51	2,849.7	2,788.3	2,849.7	2,829.2	2,788.3	2,693.8	2,757.3	2,746.5
6	13.70	2,693.8	2,562.4	2,661.5	2,639.2	2,661.5	2,693.8	2,693.8	2,683.1
7	15.22	2,494.0	2,494.0	2,459.1	2,482.4	2,459.1	2,528.4	2,459.1	2,482.2
8	16.46	2,036.3	2,119.5	2,159.8	2,105.2	2,314.3	2,314.3	2,238.4	2,289.0
Averages ---------->		2,602.5	2,622.8	2,655.8	2,627.0	2,620.3	2,650.1	2,634.8	2,635.1

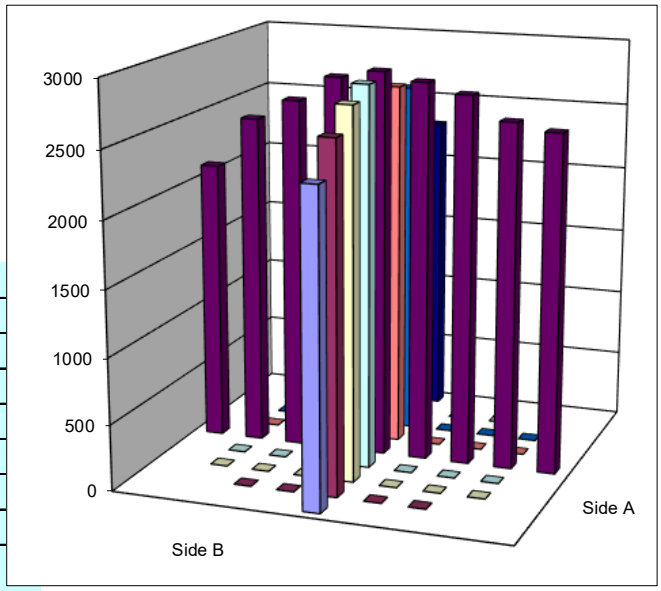
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2631.0		Mean	2715.7	2725.1	2720.4
Min Point	2105.2	-20.0%	Std. Dev.	150.3	148.8	143.8
Max Point	2909.5	10.6%	COV as %	5.5	5.5	**5.3**

Flow w/o C-Pt 4094 cfm

Vel Avg w/o C-Pt 2597 fpm

	Start	Finish	
Stack temp	110.4	110.8	F
Equipment temp	77.5	75.4	F
Ambient temp	88.4	88.6	F
Stack static	0.42	0.57	mbars
Ambient pressure	993.91	993.91	mbars
Total Stack pressure	994.33	994.48	mbars
Ambient humidity	33%	33%	RH

Instuments Used:	Cal Due
Standard pitot (ID: HStd1, 36")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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.

Appendix D – LV-C2 Stack Verification Data Sheets

D.1 Flow Angle Data Forms

FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-1
Date	5/24/2021	Fan Setting	NA Hz
Start/End Time	14:49 14:56	Fan Configuration	A
Testers	ZDH/LCE	Stack Temp	81.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	2.8	2.9	3.1	2.9	1.3	1.3	1.4	1.3
2	6.30	2.3	2.0	1.6	2.0	1.2	1.8	0.8	1.3
3	11.64	1.2	0.2	1.3	0.9	1.7	2.4	1.9	2.0
4	19.38	1.4	0.9	1.4	1.2	2.3	2.6	2.5	2.5
Center	30.00	3.7	4.2	4.1	4.0	2.2	2.3	3.2	2.6
5	40.62	3.1	4.1	3.3	3.5	2.2	2.4	1.7	2.1
6	48.36	2.2	3.8	5.7	3.9	5.3	1.0	0.8	2.4
7	53.70	3.2	3.0	0.7	2.3	1.1	1.5	2.0	1.5
8	58.08	4.1	4.2	3.8	4.0	0.6	0.8	0.3	0.6
Mean of absolute values:					2.8				1.8
" " w/o points by wall:					2.5				2.0
								Grand mean ABS	2.3
								Grand mean ABS w/o wall pts	2.3

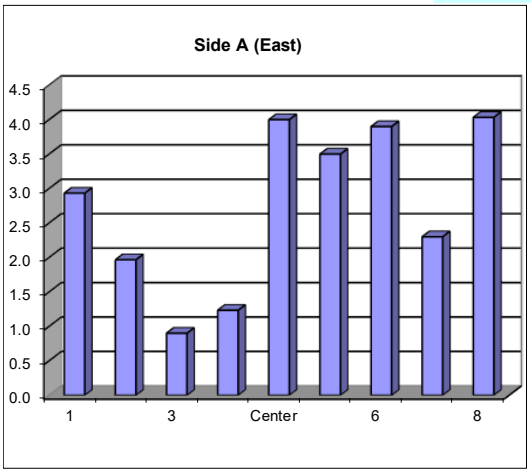
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

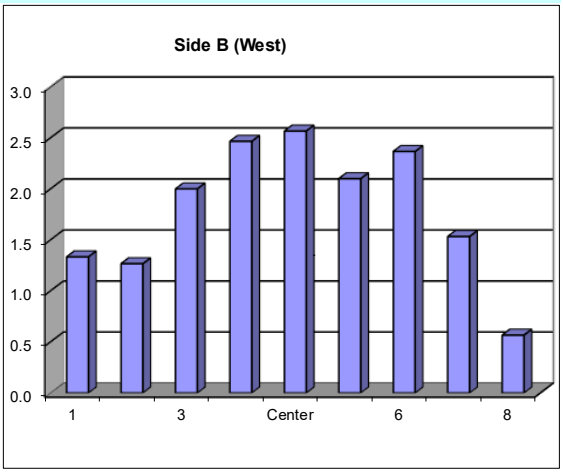
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-2
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	10:27 10:35	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	77.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	9.0	8.0	8.9	8.6	7.3	9.8	9.1	8.7
2	6.30	9.9	8.2	7.1	8.4	6.5	6.2	6.3	6.3
3	11.64	3.7	3.1	2.9	3.2	2.4	2.6	1.6	2.2
4	19.38	1.3	1.3	1.1	1.2	3.3	2.3	2.0	2.5
Center	30.00	0.7	1.0	0.9	0.9	1.9	3.2	4.9	3.3
5	40.62	3.8	3.0	2.6	3.1	6.2	6.2	6.2	6.2
6	48.36	6.7	5.3	4.7	5.6	3.1	3.1	3.2	3.1
7	53.70	1.8	0.3	3.0	1.7	3.2	2.8	3.3	3.1
8	58.08	1.1	1.5	2.0	1.5	4.6	3.8	2.9	3.8
Mean of absolute values:					3.8				4.4
" " w/o points by wall:					3.4				3.8
								Grand mean ABS	4.1
								Grand mean ABS w/o wall pts	3.6

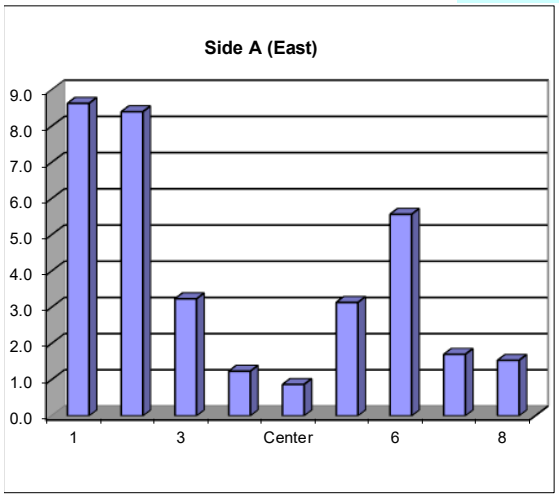
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

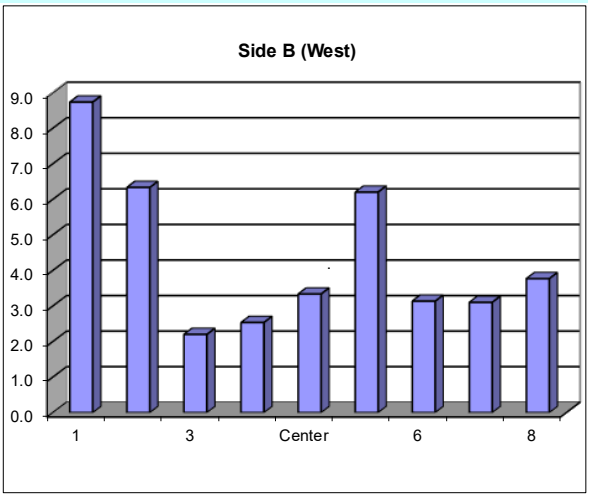
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-3
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	11:39 11:46	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	77.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.92	4.3	3.8	4.2	4.1	6.5	6.4	5.8	6.2
2 / 6.30	6.2	5.5	5.8	5.8	3.7	3.3	3.5	3.5
3 / 11.64	0.6	1.2	0.9	0.9	1.1	1.3	1.4	1.3
4 / 19.38	5.6	5.1	4.9	5.2	1.6	1.1	1.4	1.4
Center / 30.00	3.4	3.1	3.0	3.2	7.0	6.8	6.9	6.9
5 / 40.62	3.6	3.4	3.2	3.4	7.5	7.7	7.0	7.4
6 / 48.36	7.7	6.2	6.2	6.7	6.2	5.7	6.7	6.2
7 / 53.70	3.2	4.3	2.5	3.3	3.7	3.8	3.6	3.7
8 / 58.08	0.6	0.7	0.9	0.7	0.9	0.9	1.0	0.9
Mean of absolute values:				3.7				4.2
" " w/o points by wall:				4.1				4.3
							Grand mean ABS	3.9
							Grand mean ABS w/o wall pts	4.2

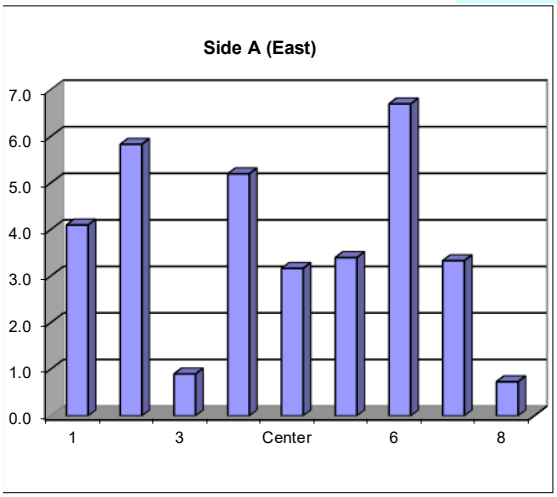
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

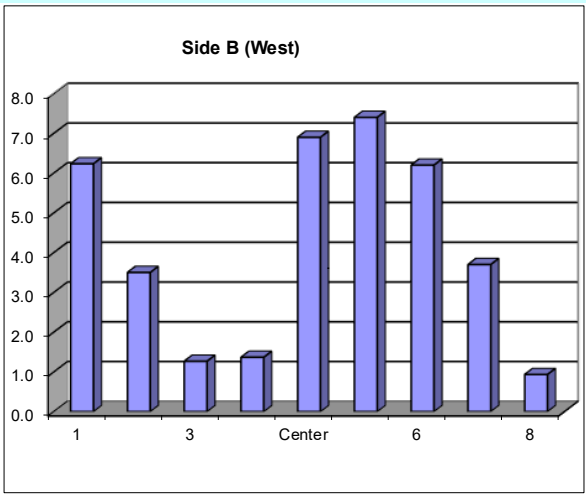
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-4
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	13:49 13:56	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	78.4 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	5.5	5.2	5.1	5.3	6.0	5.2	4.8	5.3
2	6.30	2.3	2.0	1.7	2.0	5.0	5.0	4.8	4.9
3	11.64	0.0	0.3	1.0	0.4	3.0	3.2	3.2	3.1
4	19.38	3.7	3.8	2.7	3.4	1.1	0.4	0.1	0.5
Center	30.00	3.8	3.4	3.2	3.5	6.1	4.7	3.7	4.8
5	40.62	3.4	2.0	1.3	2.2	5.2	3.7	2.7	3.9
6	48.36	2.6	2.4	1.9	2.3	6.3	6.1	6.4	6.3
7	53.70	1.7	1.6	1.5	1.6	1.8	1.5	1.3	1.5
8	58.08	2.0	2.1	2.3	2.1	1.9	1.2	1.3	1.5
Mean of absolute values:					2.5				3.5
" " w/o points by wall:					2.2				3.6
								Grand mean ABS	3.0
								Grand mean ABS w/o wall pts	2.9

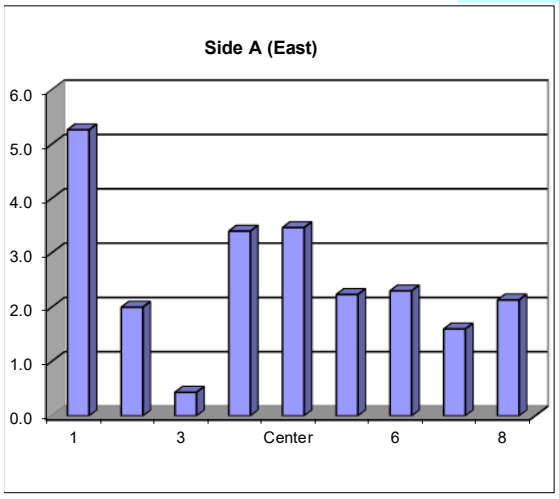
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

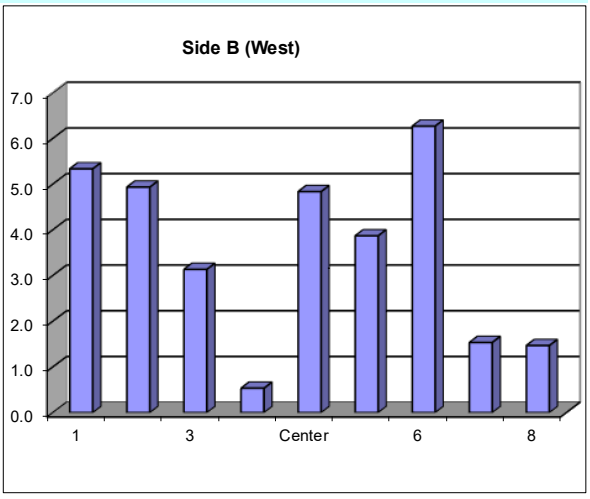
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-5
Date	5/25/2021	Fan Setting	NA Hz
Start/End Time	14:53 15:00	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	79.2 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	5.3	4.8	4.5	4.9	7.0	7.3	7.4	7.2
2	6.30	3.8	3.6	3.4	3.6	7.4	6.1	6.0	6.5
3	11.64	2.2	1.2	1.5	1.6	0.3	0.2	0.1	0.2
4	19.38	0.4	0.7	0.2	0.4	4.0	3.4	3.5	3.6
Center	30.00	0.2	1.4	0.5	0.7	3.4	3.8	3.5	3.6
5	40.62	5.5	4.6	4.4	4.8	2.0	1.7	1.2	1.6
6	48.36	5.4	5.3	5.1	5.3	6.3	6.2	5.7	6.1
7	53.70	4.7	3.8	3.8	4.1	1.8	1.0	1.8	1.5
8	58.08	4.1	3.1	3.1	3.4	2.3	1.5	0.0	1.3
Mean of absolute values:					3.2				3.5
" " w/o points by wall:					2.9				3.3
								Grand mean ABS	3.4
								Grand mean ABS w/o wall pts	3.1

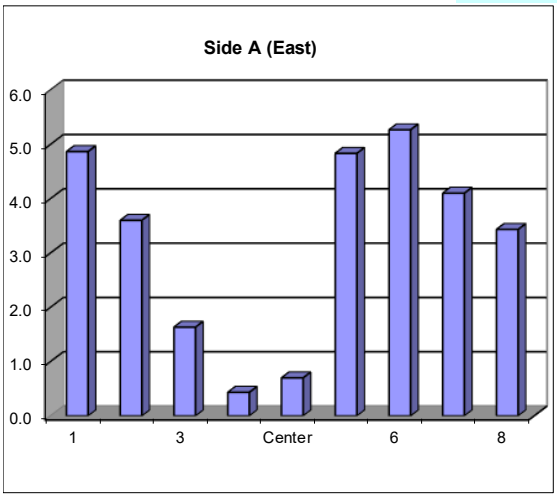
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

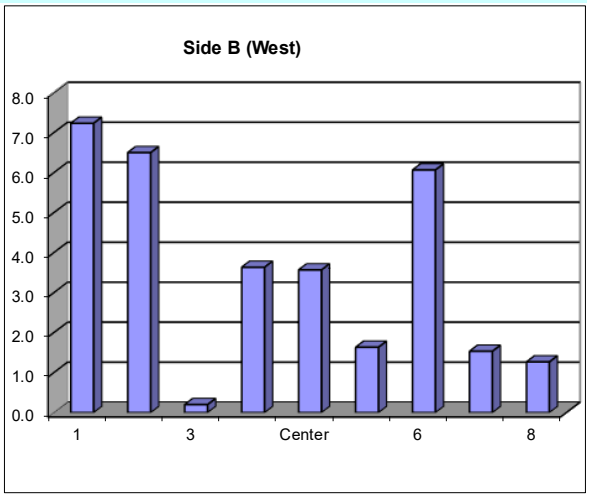
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	(LV-C2) C2V	Run No.	FA-6
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	10:18 10:25	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	77.8 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	9.0	8.6	8.5	8.7	6.2	5.4	6.1	5.9
2	6.30	5.5	5.5	5.9	5.6	8.2	6.6	6.5	7.1
3	11.64	3.6	3.4	3.5	3.5	0.4	1.1	1.1	0.9
4	19.38	1.1	0.4	1.0	0.8	4.9	4.2	3.5	4.2
Center	30.00	0.3	0.1	0.8	0.4	5.5	3.2	3.6	4.1
5	40.62	0.4	0.5	0.8	0.6	3.6	3.7	3.1	3.5
6	48.36	3.7	4.1	3.0	3.6	6.6	6.9	5.9	6.5
7	53.70	7.3	6.8	6.1	6.7	2.9	4.6	2.7	3.4
8	58.08	3.2	0.2	1.1	1.5	1.5	1.6	2.4	1.8
Mean of absolute values:					3.5				4.1
" " w/o points by wall:					3.0				4.2
								Grand mean ABS	3.8
								Grand mean ABS w/o wall pts	3.6

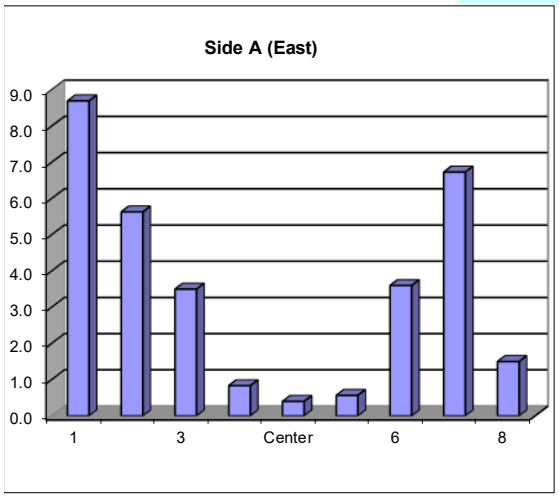
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

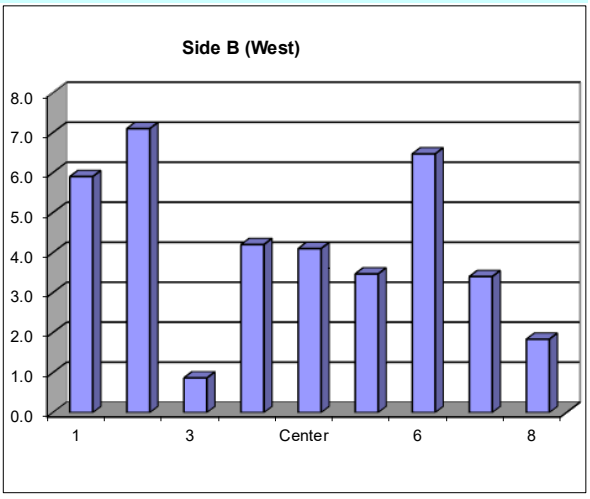
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-7
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	11:27 11:34	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	76.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.9	7.7	7.0	6.7	7.1	7.7	7.8	6.7	7.4
2	6.3	6.6	6.3	6.3	6.4	4.3	4.2	3.8	4.1
3	11.6	1.2	0.7	0.8	0.9	0.9	1.1	1.9	1.3
4	19.4	3.8	3.7	3.5	3.7	4.4	2.9	3.2	3.5
Center	30.0	1.2	1.1	1.3	1.2	5.4	5.1	4.4	5.0
5	40.6	5.0	4.7	3.1	4.3	4.9	5.0	5.1	5.0
6	48.4	9.1	8.8	8.0	8.6	4.6	4.1	4.2	4.3
7	53.7	4.3	3.5	1.9	3.2	2.7	2.4	2.3	2.5
8	58.1	2.4	2.9	2.3	2.5	0.1	0.8	0.0	0.3
Mean of absolute values:					4.2				3.7
" " w/o points by wall:					4.0				3.7
								Grand mean ABS	4.0
								Grand mean ABS w/o wall pts	3.9

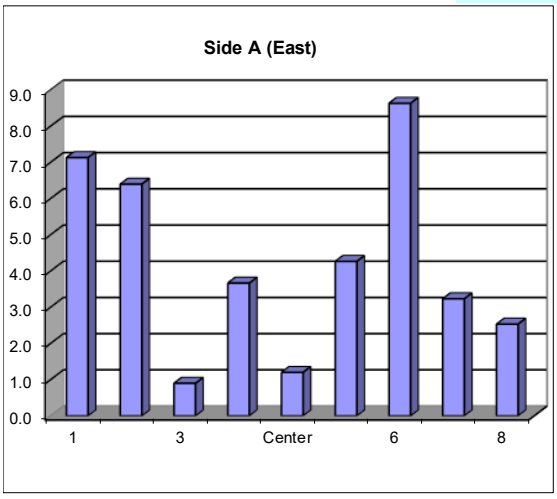
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

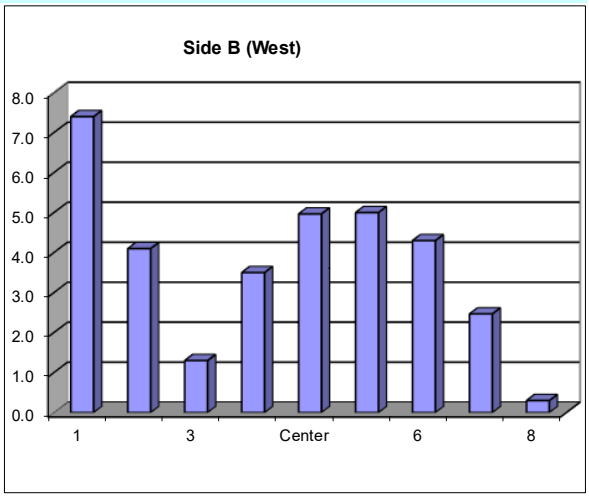
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	(LV-C2) C2V	Run No.	FA-8
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	13:35 13:41	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	78.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.92	4.7	4.5	4.8	4.7	5.5	6.0	5.9	5.8
2 / 6.30	4.9	4.0	4.0	4.3	3.9	3.7	4.1	3.9
3 / 11.64	1.5	1.5	1.5	1.5	0.6	0.6	0.6	0.6
4 / 19.38	3.8	3.3	3.1	3.4	3.9	3.8	3.9	3.9
Center / 30.00	2.6	2.0	1.6	2.1	8.0	8.4	8.0	8.1
5 / 40.62	2.9	2.6	1.9	2.5	5.3	4.6	4.8	4.9
6 / 48.36	8.8	8.5	9.1	8.8	1.6	0.5	0.4	0.8
7 / 53.70	4.2	2.9	2.6	3.2	5.6	6.3	4.1	5.3
8 / 58.08	0.5	0.8	0.4	0.6	0.6	0.2	0.3	0.4
Mean of absolute values:				3.4				3.7
" " w/o points by wall:				3.7				3.9
							Grand mean ABS	3.6
							Grand mean ABS w/o wall pts	3.8

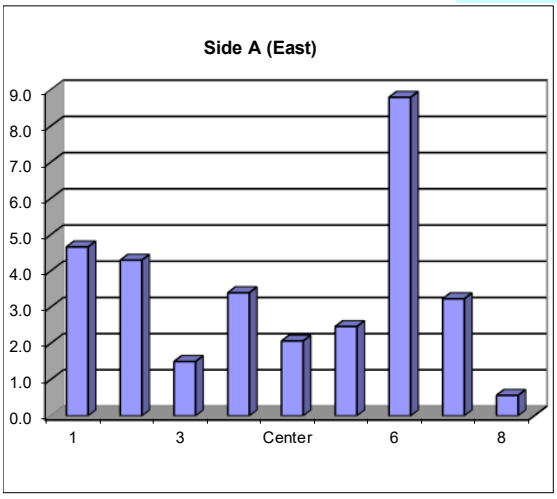
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

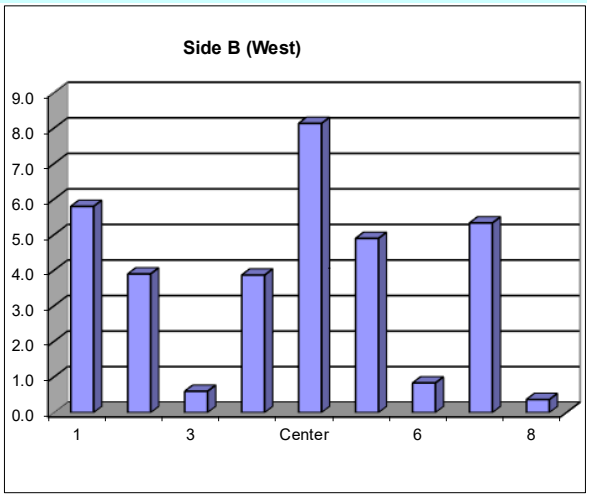
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-9
Date	5/26/2021	Fan Setting	NA Hz
Start/End Time	14:39 14:45	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	79.4 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51 ft		

Order -->	First				Second			
Traverse-->	Side A (East)				Side B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	deg. cw				deg. cw			
1 / 1.92	5.9	5.7	4.7	5.4	9.2	9.1	9.0	9.1
2 / 6.30	4.5	3.5	2.7	3.6	7.2	6.7	6.3	6.7
3 / 11.64	3.0	2.9	3.1	3.0	0.7	0.9	1.9	1.2
4 / 19.38	1.7	1.5	1.9	1.7	4.1	3.8	3.5	3.8
Center / 30.00	0.5	0.0	0.3	0.3	5.8	4.8	4.4	5.0
5 / 40.62	1.5	0.9	1.1	1.2	5.6	5.5	4.9	5.3
6 / 48.36	6.5	6.3	5.6	6.1	7.3	7.0	7.0	7.1
7 / 53.70	1.7	2.6	2.2	2.2	5.3	6.1	6.2	5.9
8 / 58.08	0.8	0.7	0.5	0.7	3.1	3.8	2.5	3.1
Mean of absolute values:				2.7				5.2
" " w/o points by wall:				2.6				5.0
							Grand mean ABS	4.0
							Grand mean ABS w/o wall pts	3.8

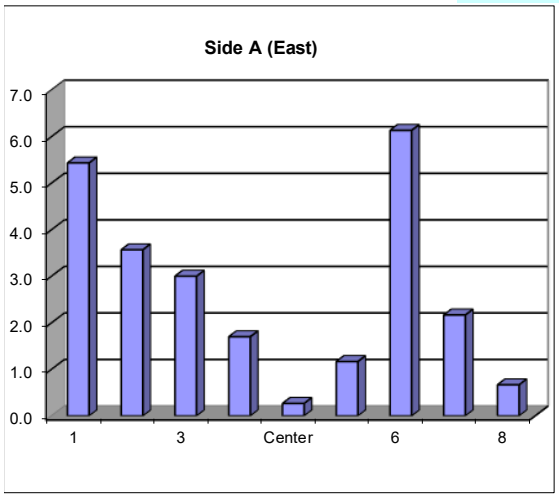
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

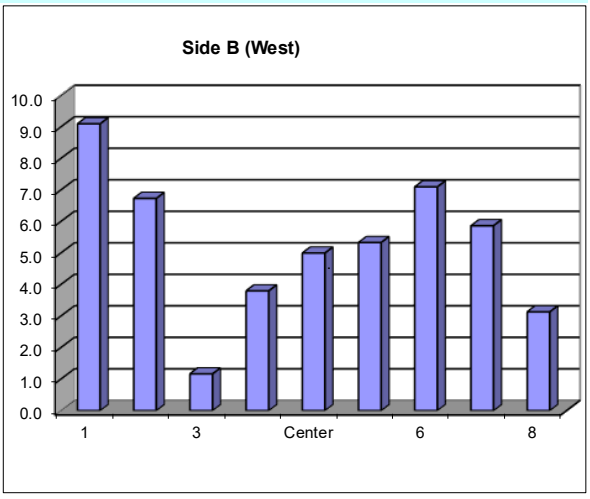
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-10
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	8:56 9:02	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	78.4 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.9	6.2	6.4	7.0	6.5	4.7	5.2	4.8	4.9
2	6.3	4.7	4.8	4.7	4.7	3.8	3.9	4.3	4.0
3	11.6	1.0	0.8	2.3	1.4	1.1	1.0	0.7	0.9
4	19.4	1.3	1.9	1.8	1.7	2.4	2.2	2.4	2.3
Center	30.0	1.4	1.0	1.4	1.3	6.3	5.8	5.7	5.9
5	40.6	5.1	4.5	2.7	4.1	8.8	8.3	8.0	8.4
6	48.4	9.2	8.0	7.4	8.2	9.9	9.7	9.8	9.8
7	53.7	3.4	4.1	3.9	3.8	2.5	1.8	2.7	2.3
8	58.1	4.9	6.1	5.8	5.6	4.8	4.3	3.4	4.2
Mean of absolute values:					4.1				4.8
" " w/o points by wall:					3.6				4.8
								Grand mean ABS	4.4
								Grand mean ABS w/o wall pts	4.2

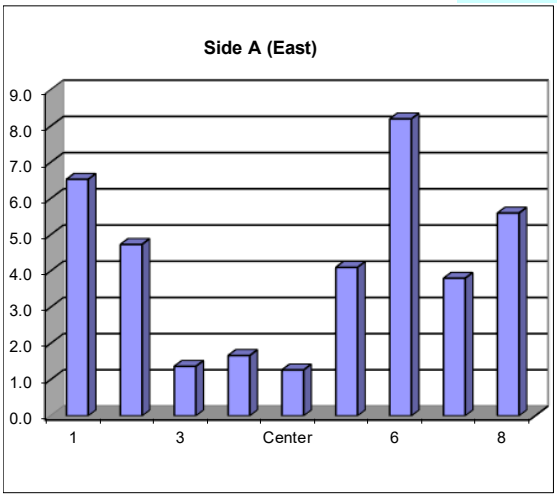
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

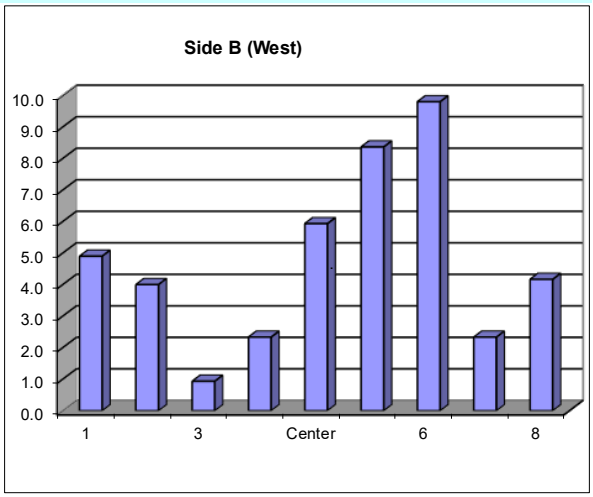
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-11
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	9:58 10:05	Fan Configuration	A & B
Testers	ZDH/LCE	Stack Temp	79.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	8.8	8.7	9.2	8.9	7.9	8.1	8.1	8.0
2	6.30	8.6	7.7	7.2	7.8	7.5	7.7	7.6	7.6
3	11.64	2.2	0.4	1.0	1.2	0.5	1.3	1.1	1.0
4	19.38	1.5	1.4	1.1	1.3	1.3	1.0	1.3	1.2
Center	30.00	5.6	4.9	5.2	5.2	6.1	6.8	6.8	6.6
5	40.62	7.5	5.6	5.5	6.2	7.2	7.1	6.9	7.1
6	48.36	9.2	8.7	7.9	8.6	4.7	5.3	6.1	5.4
7	53.70	1.5	1.0	2.8	1.8	5.2	4.1	3.8	4.4
8	58.08	5.6	1.7	2.2	3.2	2.0	2.6	1.1	1.9
Mean of absolute values:					4.9				4.8
" " w/o points by wall:					4.6				4.7
								Grand mean ABS	4.9
								Grand mean ABS w/o wall pts	4.7

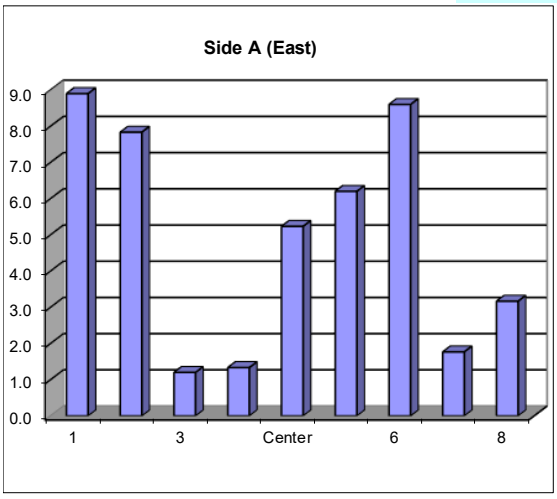
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

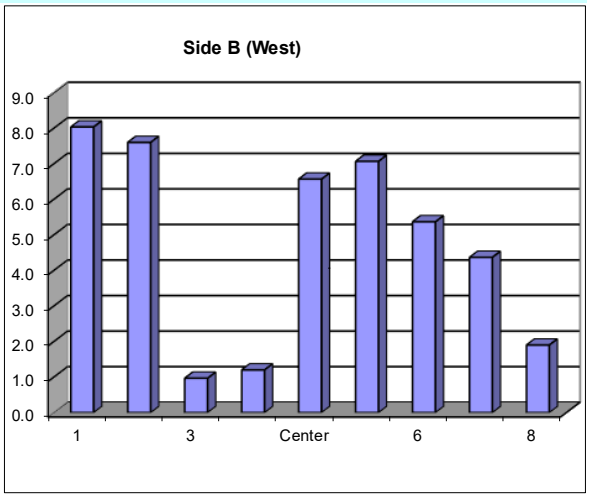
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-12
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	10:57 11:03	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	80.1 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.9	5.3	4.8	5.7	5.3	8.4	7.8	8.4	8.2
2	6.3	7.3	7.8	8.0	7.7	3.3	3.3	3.2	3.3
3	11.6	0.1	0.2	0.3	0.2	5.0	4.6	4.5	4.7
4	19.4	2.6	3.2	2.1	2.6	2.7	2.8	2.6	2.7
Center	30.0	3.4	3.3	2.7	3.1	8.1	7.7	7.6	7.8
5	40.6	3.8	3.1	3.0	3.3	6.9	6.6	6.9	6.8
6	48.4	9.8	8.6	7.4	8.6	4.4	3.2	3.8	3.8
7	53.7	6.5	7.4	6.9	6.9	0.7	0.6	1.0	0.8
8	58.1	4.3	3.2	1.2	2.9	2.1	1.9	0.8	1.6
Mean of absolute values:					4.5				4.4
" " w/o points by wall:					4.6				4.3
								Grand mean ABS	4.5
								Grand mean ABS w/o wall pts	4.5

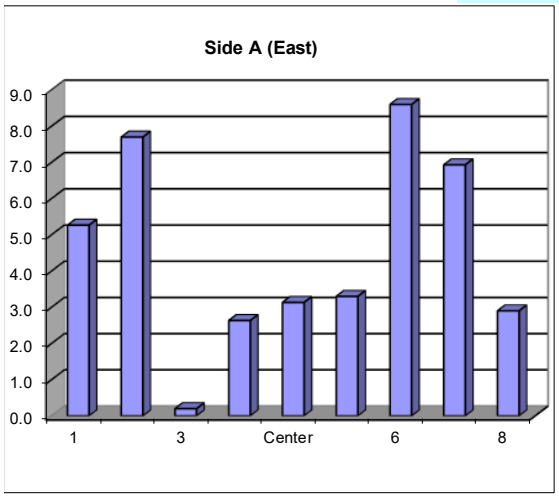
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

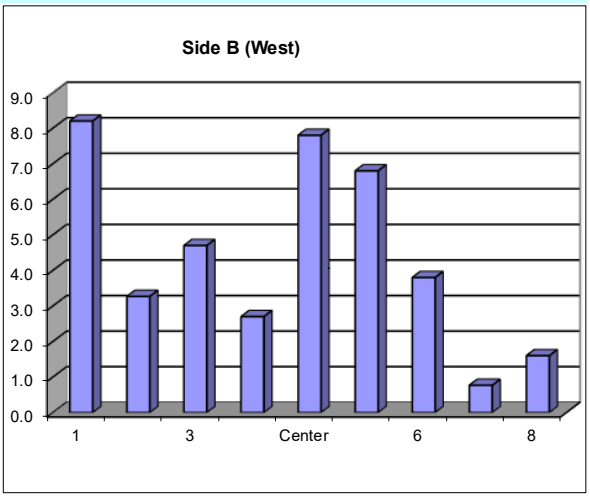
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-13
Date	5/27/2021	Fan Setting	NA Hz
Start/End Time	12:04 12:10	Fan Configuration	A+B
Testers	ZDH/LCE	Stack Temp	79.7 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	11.4	10.1	10.3	10.6	5.4	5.5	5.5	5.5
2	6.30	6.9	7.0	6.6	6.8	6.2	5.9	5.5	5.9
3	11.64	1.9	1.4	0.9	1.4	1.8	1.1	1.7	1.5
4	19.38	2.6	2.3	0.3	1.7	0.1	1.7	1.6	1.1
Center	30.00	0.9	0.8	0.6	0.8	6.6	6.2	5.8	6.2
5	40.62	2.7	2.4	2.0	2.4	7.1	6.7	6.3	6.7
6	48.36	0.2	0.5	0.3	0.3	3.3	3.2	2.9	3.1
7	53.70	3.8	4.2	4.1	4.0	2.5	0.3	0.5	1.1
8	58.08	2.6	1.0	1.4	1.7	1.4	1.1	1.4	1.3
Mean of absolute values:					3.3				3.6
" " w/o points by wall:					2.5				3.7
								Grand mean ABS	3.5
								Grand mean ABS w/o wall pts	3.1

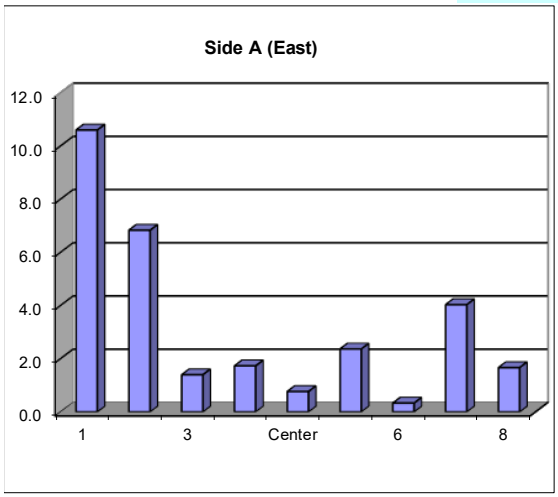
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

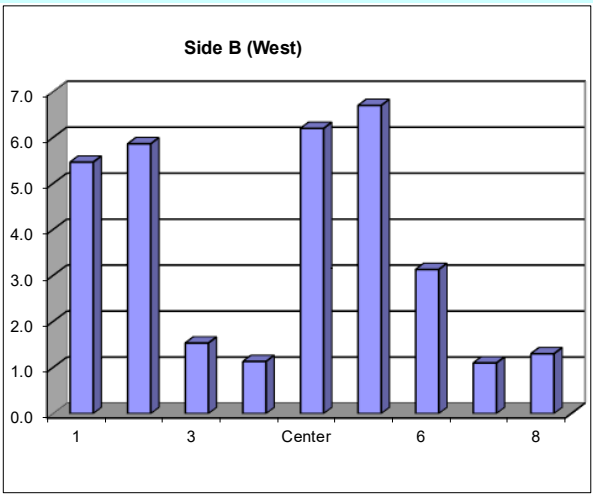
Notes:

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

First traverse point is all the way into the stack.

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





FLOW ANGLE DATA FORM

Stack	LV-C2 (C2V)	Run No.	FA-14
Date	5/28/2021	Fan Setting	NA Hz
Start/End Time	9:40 9:48	Fan Configuration	B
Testers	ZDH/LCE	Stack Temp	78.3 deg F
Stack Dia.	60 in		
Stack X-Area	2827.4 in2	Units	Degrees
Elevation	691 ft	Port	A & B
Distance to disturbance	51.00 ft		

Order -->		First				Second			
Traverse-->		Side A (East)				Side B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	deg. cw				deg. cw			
1	1.92	8.0	8.1	8.3	8.1	9.2	9.1	9.3	9.2
2	6.30	8.0	8.3	8.5	8.3	8.0	7.7	6.8	7.5
3	11.64	3.1	3.0	2.9	3.0	1.2	2.0	1.8	1.7
4	19.38	1.4	1.5	1.4	1.4	1.9	1.7	2.5	2.0
Center	30.00	1.8	1.6	1.0	1.5	5.6	6.1	6.4	6.0
5	40.62	5.8	3.6	5.8	5.1	6.7	6.9	7.3	7.0
6	48.36	8.0	8.0	8.0	8.0	12.8	14.2	12.4	13.1
7	53.70	8.6	8.4	10.4	9.1	15.5	14.2	14.0	14.6
8	58.08	12.2	11.1	9.4	10.9	7.1	8.4	7.3	7.6
Mean of absolute values:					6.2				7.6
" " w/o points by wall:					5.2				7.4
								Grand mean ABS	6.9
								Grand mean ABS w/o wall pts	6.3

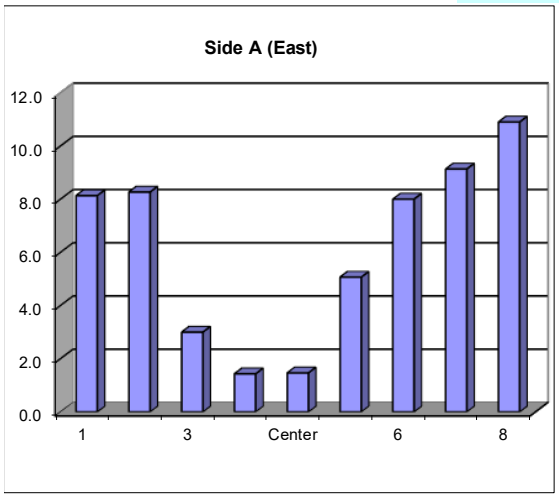
Instuments Used:		Cal. Due
S-type pitot	(ID: A100-19, 72")	Pre-test calibration; Post-test inspection.
Angle indicator	SPI Tronic PRO 360 (SN 31-038-3)	Accuracy check prior to each use; field recalibration as necessary
Manometer	Digisense 20250-13 (SN: 191212877)	Pre-test inspection; post test calibration check.

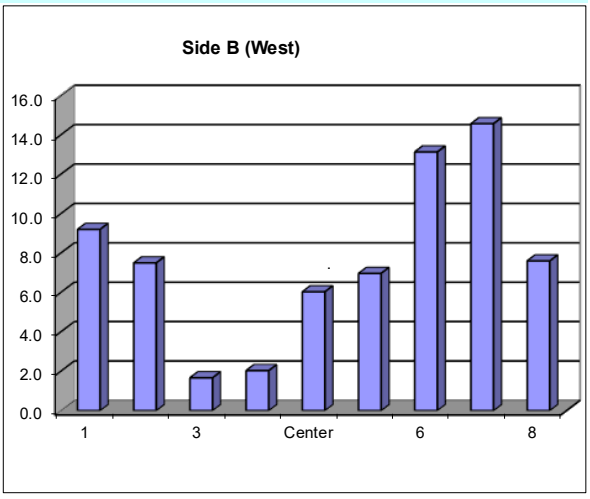
Notes:

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

First traverse point is all the way into the stack.

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





D.2 Velocity Uniformity Data Forms

VELOCITY TRAVERSE DATA FORM

Stack	**LV-C2 (C2V)**	Run No.	**VT-1**		
Date	**5/24/21**	Fan Configuration	**A**		
Testers	ZDH/LCE	Fan Setting	**NA**	**Hz**	
Stack Dia.	60 in.	Stack Temp	81.3	deg F	
Stack X-Area	2827.4 in.2	Start/End Time	14:38	14:45	
Test Port	A & B	Center 2/3 from	5.51	to:	54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2	to:	7
Velocity units	ft/min				

Order -->		First port				Second port			
Traverse-->		**Port A (East)**				**Port B (West)**			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,389.4	2,414.2	2,389.4	2,397.7	2,389.4	2,313.6	2,414.2	2,372.4
2	6.30	2,414.2	2,487.0	2,463.0	2,454.7	2,287.7	2,339.2	2,389.4	2,338.8
3	11.64	2,510.8	2,510.8	2,487.0	2,502.9	2,126.1	2,126.1	2,287.7	2,179.9
4	19.38	2,438.7	2,438.7	2,414.2	2,430.6	2,487.0	2,487.0	2,364.5	2,446.2
Center	30.00	2,603.9	2,534.4	2,438.7	2,525.7	2,510.8	2,510.8	2,463.0	2,494.9
5	40.62	2,580.9	2,510.8	2,557.8	2,549.8	2,463.0	2,534.4	2,487.0	2,494.8
6	48.36	2,438.7	2,414.2	2,389.4	2,414.1	2,510.8	2,557.8	2,603.9	2,557.5
7	53.70	2,339.2	2,364.5	2,339.2	2,347.6	2,463.0	2,463.0	2,364.5	2,430.2
8	58.08	2,153.8	2,069.4	2,126.1	2,116.4	1,857.2	1,825.0	1,889.0	1,857.1
Averages ---------->		2,430.0	2,416.0	2,400.5	2,415.5	2,343.9	2,350.8	2,362.6	2,352.4

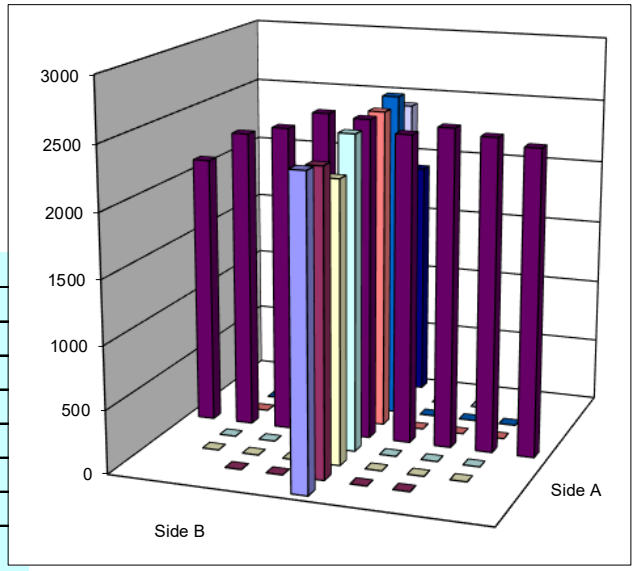
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2384.0		Mean	2460.8	2420.3	2440.5
Min Point	1857.1	-22.1%	Std. Dev.	70.5	125.9	100.3
Max Point	2557.5	7.3%	COV as %	2.9	5.2	**4.1**

Flow w/o C-Pt 46499 cfm

Vel Avg w/o C-Pt 2368 fpm

	Start	Finish	
Stack temp	80.8	81.7	F
Equipment temp	76.8	75.4	F
Ambient temp	76.8	75.3	F
Stack static	-0.77	0.57	mbars
Ambient pressure	986.46	986.46	mbars
Total Stack pressure	985.69	987.03	mbars
Ambient humidity	31%	30%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-2
Date	5/25/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	77.3 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:18 10:25
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,543.0	2,566.0	2,519.8	2,542.9	2,566.0	2,611.4	2,678.1	2,618.5
2	6.30	2,764.5	2,678.1	2,721.7	2,721.4	2,700.0	2,588.8	2,633.9	2,640.9
3	11.64	2,678.1	2,656.1	2,633.9	2,656.0	2,543.0	2,656.1	2,678.1	2,625.7
4	19.38	2,611.4	2,496.3	2,566.0	2,557.9	2,588.8	2,519.8	2,633.9	2,580.8
Center	30.00	2,566.0	2,633.9	2,588.8	2,596.2	2,566.0	2,588.8	2,611.4	2,588.8
5	40.62	2,721.7	2,678.1	2,611.4	2,670.4	2,678.1	2,656.1	2,633.9	2,656.0
6	48.36	2,611.4	2,656.1	2,678.1	2,648.6	2,721.7	2,678.1	2,743.2	2,714.3
7	53.70	2,656.1	2,611.4	2,678.1	2,648.6	2,678.1	2,611.4	2,656.1	2,648.6
8	58.08	2,168.7	2,195.6	2,168.7	2,177.7	2,168.7	2,141.4	2,141.4	2,150.5
Averages ---------->		2,591.2	2,574.6	2,574.1	2,580.0	2,578.9	2,561.4	2,601.1	2,580.5

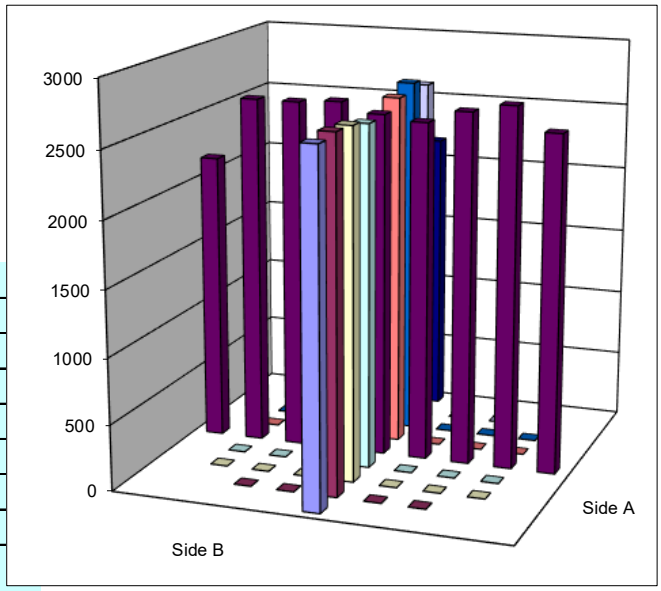
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2580.2		Mean	2642.7	2636.5	2639.6
Min Point	2150.5	-16.7%	Std. Dev.	52.5	44.9	47.1
Max Point	2721.4	5.5%	COV as %	2.0	1.7	**1.8**

Flow w/o C-Pt 50632 cfm

Vel Avg w/o C-Pt 2579 fpm

	Start	Finish	
Stack temp	77.6	76.9	F
Equipment temp	73.7	72.3	F
Ambient temp	73.7	72.3	F
Stack static	0.25	1.29	mbars
Ambient pressure	989.84	989.50	mbars
Total Stack pressure	990.09	990.79	mbars
Ambient humidity	34%	35%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-3
Date	5/25/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	77.7 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:30 11:36
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,679.6	2,701.4	2,567.4	2,649.4	2,450.1	2,497.7	2,544.4	2,497.4
2	6.30	2,612.8	2,635.2	2,657.5	2,635.2	2,590.2	2,544.4	2,657.5	2,597.3
3	11.64	2,612.8	2,635.2	2,612.8	2,620.3	2,497.7	2,567.4	2,590.2	2,551.8
4	19.38	2,450.1	2,474.0	2,474.0	2,466.0	2,567.4	2,544.4	2,612.8	2,574.8
Center	30.00	2,701.4	2,723.1	2,723.1	2,715.8	2,590.2	2,612.8	2,657.5	2,620.2
5	40.62	2,679.6	2,766.0	2,701.4	2,715.6	2,657.5	2,590.2	2,679.6	2,642.4
6	48.36	2,766.0	2,723.1	2,723.1	2,737.4	2,590.2	2,657.5	2,635.2	2,627.6
7	53.70	2,590.2	2,567.4	2,612.8	2,590.1	2,657.5	2,723.1	2,657.5	2,679.3
8	58.08	2,196.8	2,196.8	2,114.8	2,169.5	2,169.8	2,249.7	2,196.8	2,205.4
Averages ---------->		2,587.7	2,602.5	2,576.3	2,588.8	2,530.1	2,554.1	2,581.3	2,555.1

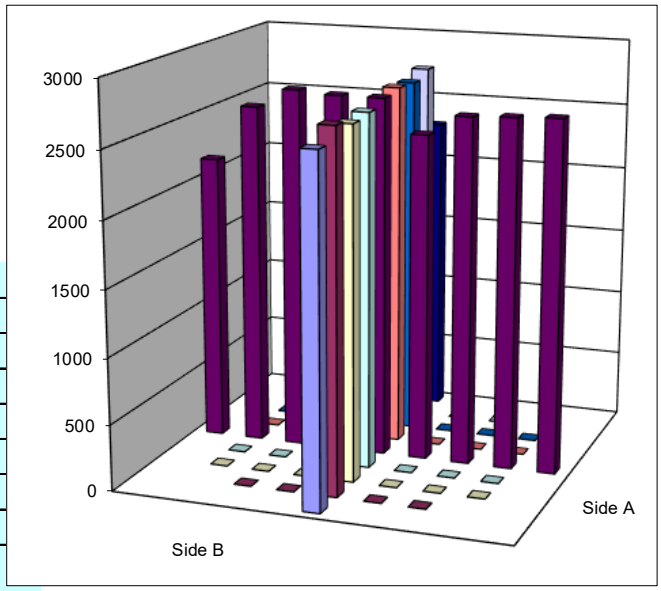
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2572.0		Mean	2640.1	2613.4	2626.7
Min Point	2169.5	-15.6%	Std. Dev.	95.0	42.8	72.1
Max Point	2737.4	6.4%	COV as %	3.6	1.6	**2.7**

Flow w/o C-Pt 50265 cfm

Vel Avg w/o C-Pt 2560 fpm

	Start	Finish	
Stack temp	77.4	77.9	F
Equipment temp	74.9	76.6	F
Ambient temp	74.9	76.6	F
Stack static	0.95	0.70	mbars
Ambient pressure	989.50	989.16	mbars
Total Stack pressure	990.45	989.86	mbars
Ambient humidity	32%	30%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-4
Date	5/25/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	78.4 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:43 13:47
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2,571.0	2,616.5	2,616.5	2,601.3	2,429.4	2,524.6	2,683.3	2,545.8
2 / 6.30	2,524.6	2,571.0	2,661.2	2,585.6	2,748.5	2,661.2	2,616.5	2,675.4
3 / 11.64	2,705.2	2,616.5	2,683.3	2,668.3	2,661.2	2,616.5	2,616.5	2,631.4
4 / 19.38	2,661.2	2,638.9	2,638.9	2,646.3	2,571.0	2,661.2	2,638.9	2,623.7
Center / 30.00	2,593.8	2,501.2	2,593.8	2,562.9	2,661.2	2,661.2	2,638.9	2,653.8
5 / 40.62	2,683.3	2,638.9	2,705.2	2,675.8	2,705.2	2,616.5	2,748.5	2,690.1
6 / 48.36	2,616.5	2,748.5	2,547.9	2,637.6	2,661.2	2,705.2	2,705.2	2,690.5
7 / 53.70	2,547.9	2,616.5	2,616.5	2,593.6	2,616.5	2,616.5	2,593.8	2,608.9
8 / 58.08	2,380.2	2,330.1	2,380.2	2,363.5	2,330.1	2,252.9	2,304.7	2,295.9
Averages ---------->	2,587.1	2,586.5	2,604.8	2,592.8	2,598.2	2,590.6	2,616.3	2,601.7

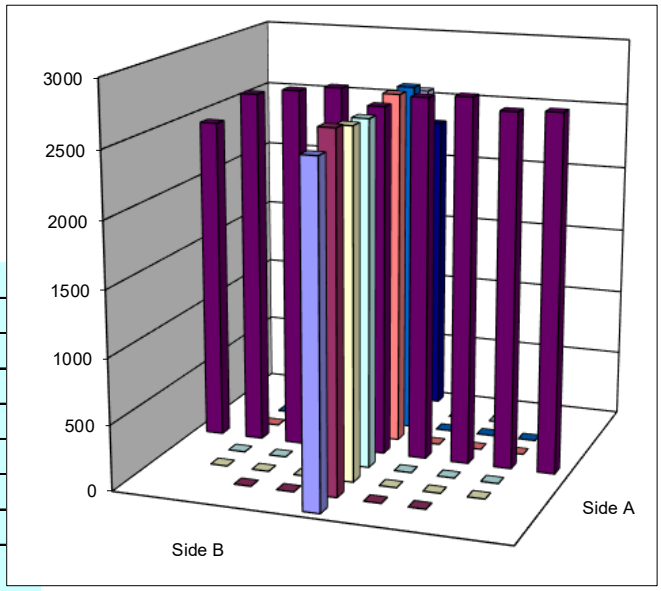
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2597.3		Mean	2624.3	2653.4	2638.9
Min Point	2295.9	-11.6%	Std. Dev.	43.7	33.0	40.2
Max Point	2690.5	3.6%	COV as %	1.7	1.2	**1.5**

Flow w/o C-Pt 50970 cfm

Vel Avg w/o C-Pt 2596 fpm

	Start	Finish	
Stack temp	78.6	78.2	F
Equipment temp	75.6	75.2	F
Ambient temp	75.6	75.2	F
Stack static	0.25	0.27	mbars
Ambient pressure	988.49	988.49	mbars
Total Stack pressure	988.74	988.76	mbars
Ambient humidity	31%	30%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-5
Date	5/25/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	79.2 deg F
Stack X-Area	2827.4 in.2	Start/End Time	14:45 14:51
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,431.6	2,455.8	2,550.3	2,479.3	2,596.3	2,618.9	2,641.4	2,618.8
2	6.30	2,596.3	2,641.4	2,663.7	2,633.8	2,663.7	2,641.4	2,663.7	2,656.3
3	11.64	2,618.9	2,663.7	2,641.4	2,641.3	2,641.4	2,618.9	2,550.3	2,603.5
4	19.38	2,663.7	2,596.3	2,573.3	2,611.1	2,596.3	2,618.9	2,618.9	2,611.4
Center	30.00	2,663.7	2,641.4	2,618.9	2,641.3	2,685.8	2,772.5	2,685.8	2,714.7
5	40.62	2,618.9	2,596.3	2,618.9	2,611.4	2,596.3	2,663.7	2,641.4	2,633.8
6	48.36	2,685.8	2,618.9	2,663.7	2,656.1	2,527.0	2,618.9	2,618.9	2,588.3
7	53.70	2,618.9	2,685.8	2,663.7	2,656.1	2,550.3	2,255.0	2,281.0	2,362.1
8	58.08	2,382.5	2,332.3	2,332.3	2,349.1	2,228.6	2,332.3	2,382.5	2,314.5
Averages ---------->		2,586.7	2,581.3	2,591.8	2,586.6	2,565.1	2,571.2	2,564.9	2,567.0

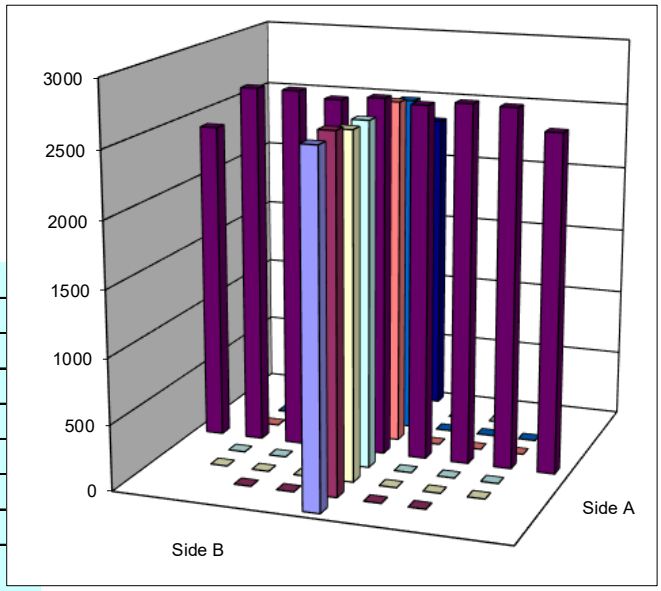
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2576.8		Mean	2635.9	2595.7	2615.8
Min Point	2314.5	-10.2%	Std. Dev.	18.7	111.2	79.4
Max Point	2714.7	5.4%	COV as %	0.7	4.3	**3.0**

Flow w/o C-Pt 50347 cfm

Vel Avg w/o C-Pt 2564 fpm

	Start	Finish	
Stack temp	79.0	79.3	F
Equipment temp	76.6	75.3	F
Ambient temp	76.5	75.3	F
Stack static	0.10	0.52	mbars
Ambient pressure	988.15	987.81	mbars
Total Stack pressure	988.25	988.33	mbars
Ambient humidity	28%	29%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	(LV-C2) C2V	Run No.	VT-6
Date	5/26/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	77.8 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:11 10:16
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port					Second port				
Traverse-->		Port A (East)				Port B (West)				
Trial ---->		1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	Velocity				Velocity				
1	1.92	2,493.9	2,422.2	2,517.3	2,477.8	2,563.5	2,563.5	2,608.8	2,578.6	
2	6.30	2,517.3	2,675.5	2,697.4	2,630.1	2,517.3	2,540.5	2,653.4	2,570.4	
3	11.64	2,631.3	2,675.5	2,631.3	2,646.0	2,631.3	2,653.4	2,608.8	2,631.2	
4	19.38	2,653.4	2,697.4	2,675.5	2,675.4	2,586.3	2,563.5	2,608.8	2,586.2	
Center	30.00	2,608.8	2,563.5	2,653.4	2,608.6	2,631.3	2,653.4	2,675.5	2,653.4	
5	40.62	2,586.3	2,631.3	2,675.5	2,631.0	2,761.8	2,675.5	2,719.0	2,718.8	
6	48.36	2,675.5	2,586.3	2,653.4	2,638.4	2,563.5	2,586.3	2,631.3	2,593.7	
7	53.70	2,740.5	2,608.8	2,675.5	2,675.0	2,586.3	2,517.3	2,540.5	2,548.0	
8	58.08	2,298.0	2,083.7	2,055.3	2,145.7	2,193.5	2,111.7	2,193.5	2,166.2	
Averages ---------->		2,578.3	2,549.4	2,581.6	2,569.8	2,559.4	2,540.6	2,582.2	2,560.7	

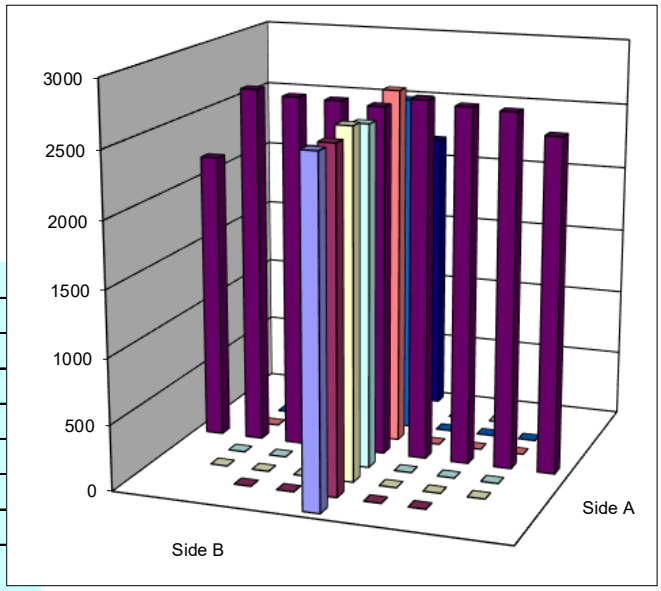
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2565.2		Mean	2643.5	2614.5	2629.0
Min Point	2145.7	-16.4%	Std. Dev.	24.5	58.1	45.4
Max Point	2718.8	6.0%	COV as %	0.9	2.2	**1.7**

Flow w/o C-Pt 50207 cfm

Vel Avg w/o C-Pt 2557 fpm

	Start	Finish	
Stack temp	78.1	77.5	F
Equipment temp	73.5	73.3	F
Ambient temp	73.5	73.3	F
Stack static	0.95	0.12	mbars
Ambient pressure	992.89	992.89	mbars
Total Stack pressure	993.84	993.01	mbars
Ambient humidity	31%	31%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-7
Date	5/26/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	76.3 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:19 11:24
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port					Second port				
Traverse-->		Port A (East)				Port B (West)				
Trial ---->		1	2	3	Mean	1	2	3	Mean	
Point	Depth, in.	Velocity				Velocity				
1	1.92	2,537.9	2,716.2	2,628.6	2,627.6	2,467.7	2,419.8	2,443.9	2,443.8	
2	6.30	2,694.6	2,694.6	2,628.6	2,672.6	2,560.9	2,672.8	2,650.8	2,628.2	
3	11.64	2,628.6	2,583.7	2,628.6	2,613.7	2,560.9	2,606.2	2,606.2	2,591.1	
4	19.38	2,583.7	2,650.8	2,628.6	2,621.0	2,514.8	2,560.9	2,537.9	2,537.9	
Center	30.00	2,694.6	2,650.8	2,606.2	2,650.5	2,560.9	2,628.6	2,672.8	2,620.8	
5	40.62	2,606.2	2,694.6	2,583.7	2,628.2	2,801.2	2,694.6	2,650.8	2,715.5	
6	48.36	2,672.8	2,716.2	2,606.2	2,665.1	2,716.2	2,694.6	2,628.6	2,679.8	
7	53.70	2,737.7	2,537.9	2,628.6	2,634.8	2,606.2	2,628.6	2,606.2	2,613.7	
8	58.08	2,217.8	2,270.0	2,217.8	2,235.2	2,164.4	2,270.0	2,217.8	2,217.4	
Averages ---------->		2,597.1	2,612.8	2,573.0	2,594.3	2,550.3	2,575.1	2,557.2	2,560.9	

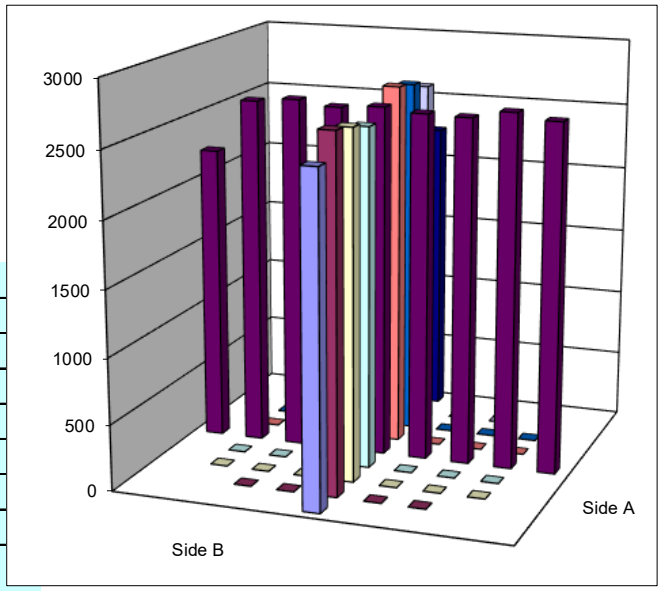
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2577.6		Mean	2640.8	2626.7	2633.8
Min Point	2217.4	-14.0%	Std. Dev.	22.4	57.9	42.8
Max Point	2715.5	5.4%	COV as %	0.8	2.2	**1.6**

Flow w/o C-Pt 50469 cfm

Vel Avg w/o C-Pt 2570 fpm

	Start	Finish	
Stack temp	76.0	76.5	F
Equipment temp	73.8	72.5	F
Ambient temp	73.8	72.5	F
Stack static	0.70	0.67	mbars
Ambient pressure	991.87	991.87	mbars
Total Stack pressure	992.57	992.54	mbars
Ambient humidity	30%	30%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	(LV-C2) C2V	Run No.	VT-8
Date	5/26/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	78.7 deg F
Stack X-Area	2827.4 in.2	Start/End Time	13:28 13:32
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	6.88	2,401.7	2,426.0	2,450.2	2,426.0	2,474.0	2,567.5	2,544.5	2,528.7
2	11.25	2,544.5	2,590.3	2,567.5	2,567.4	2,635.3	2,567.5	2,567.5	2,590.1
3	16.63	2,635.3	2,657.6	2,679.6	2,657.5	2,590.3	2,544.5	2,612.9	2,582.6
4	24.38	2,635.3	2,612.9	2,635.3	2,627.8	2,567.5	2,544.5	2,635.3	2,582.4
Center	35.00	2,657.6	2,590.3	2,612.9	2,620.2	2,635.3	2,744.7	2,723.2	2,701.1
5	45.63	2,635.3	2,612.9	2,657.6	2,635.2	2,657.6	2,635.3	2,590.3	2,627.7
6	53.38	2,679.6	2,723.2	2,635.3	2,679.4	2,723.2	2,701.5	2,679.6	2,701.4
7	58.75	2,657.6	2,679.6	2,723.2	2,686.8	2,657.6	2,590.3	2,635.3	2,627.7
8	63.13	2,196.8	2,377.0	2,377.0	2,316.9	2,142.6	2,142.6	2,115.0	2,133.4
Averages ---------->		2,560.4	2,585.5	2,593.2	2,579.7	2,564.8	2,559.8	2,567.1	2,563.9

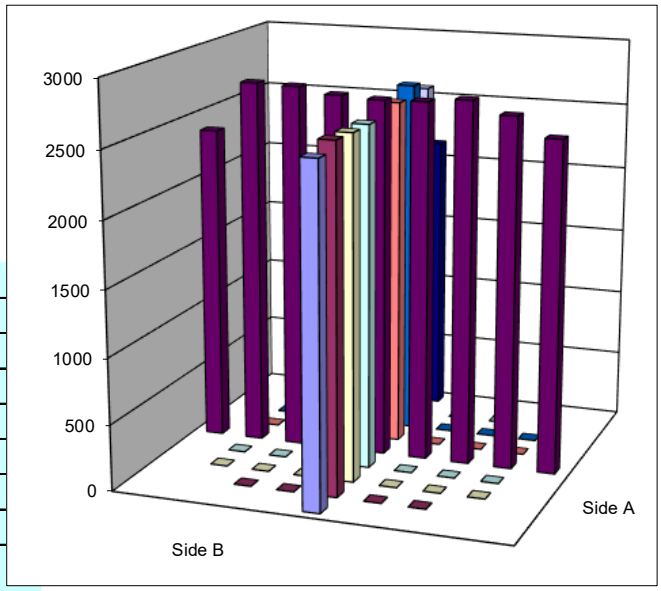
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2571.8		Mean	2639.2	2630.4	2634.8
Min Point	2133.4	-17.0%	Std. Dev.	40.6	52.1	45.1
Max Point	2701.4	5.0%	COV as %	1.5	2.0	**1.7**

Flow w/o C-Pt 50279 cfm

Vel Avg w/o C-Pt 2561 fpm

	Start	Finish	
Stack temp	78.5	78.9	F
Equipment temp	74.7	74.0	F
Ambient temp	74.7	74.0	F
Stack static	0.27	2.04	mbars
Ambient pressure	990.86	990.86	mbars
Total Stack pressure	991.13	992.90	mbars
Ambient humidity	29%	28%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-9
Date	5/26/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	79.4 deg F
Stack X-Area	2827.4 in.2	Start/End Time	14:32 14:36
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2,524.8	2,548.1	2,453.6	2,508.8	2,571.1	2,705.3	2,548.1	2,608.2
2 / 6.30	2,727.1	2,661.4	2,748.7	2,712.4	2,639.1	2,639.1	2,705.3	2,661.2
3 / 11.64	2,639.1	2,616.6	2,616.6	2,624.1	2,571.1	2,770.0	2,639.1	2,660.1
4 / 19.38	2,548.1	2,571.1	2,571.1	2,563.4	2,571.1	2,594.0	2,477.6	2,547.6
Center / 30.00	2,705.3	2,594.0	2,661.4	2,653.6	2,639.1	2,571.1	2,727.1	2,645.8
5 / 40.62	2,791.3	2,748.7	2,616.6	2,718.8	2,683.5	2,661.4	2,616.6	2,653.8
6 / 48.36	2,683.5	2,727.1	2,661.4	2,690.6	2,812.3	2,833.3	2,770.0	2,805.2
7 / 53.70	2,683.5	2,748.7	2,639.1	2,690.4	2,501.3	2,683.5	2,705.3	2,630.0
8 / 58.08	2,253.0	2,330.2	2,405.1	2,329.4	2,226.7	2,405.1	2,405.1	2,345.6
Averages ---------->	2,617.3	2,616.2	2,597.1	2,610.2	2,579.5	2,651.4	2,621.6	2,617.5

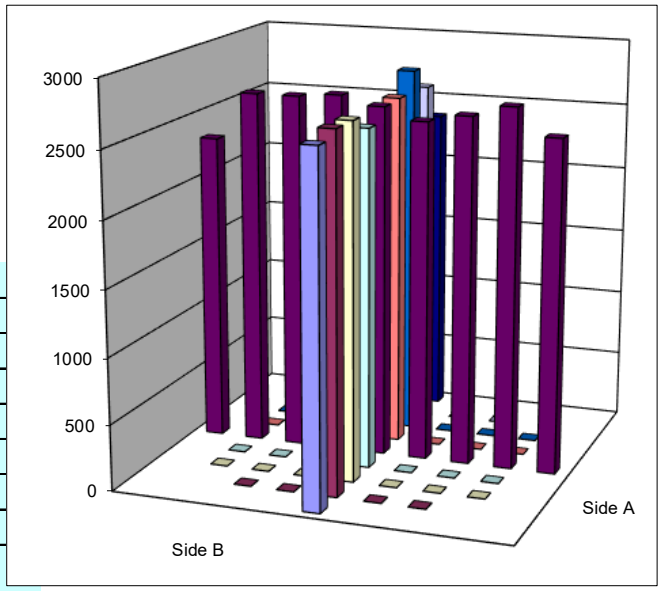
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2613.8		Mean	2664.8	2657.7	2661.2
Min Point	2329.4	-10.9%	Std. Dev.	55.6	76.2	64.2
Max Point	2805.2	7.3%	COV as %	2.1	2.9	**2.4**

Flow w/o C-Pt 51235 cfm

Vel Avg w/o C-Pt 2609 fpm

	Start	Finish	
Stack temp	78.8	79.9	F
Equipment temp	76.0	76.1	F
Ambient temp	76.0	76.1	F
Stack static	0.03	0.05	mbars
Ambient pressure	990.52	990.18	mbars
Total Stack pressure	990.55	990.23	mbars
Ambient humidity	26%	25%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-10
Date	5/27/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	78.4 deg F
Stack X-Area	2827.4 in.2	Start/End Time	8:50 8:54
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->	First port				Second port			
Traverse-->	Port A (East)				Port B (West)			
Trial ---->	1	2	3	Mean	1	2	3	Mean
Point / Depth, in.	Velocity				Velocity			
1 / 1.92	2,505.9	2,482.1	2,433.9	2,474.0	2,552.7	2,359.8	2,409.5	2,440.6
2 / 6.30	2,666.2	2,621.4	2,598.7	2,628.8	2,688.3	2,621.4	2,621.4	2,643.7
3 / 11.64	2,621.4	2,775.1	2,666.2	2,687.6	2,575.8	2,710.3	2,666.2	2,650.8
4 / 19.38	2,552.7	2,621.4	2,529.4	2,567.8	2,598.7	2,621.4	2,575.8	2,598.6
Center / 30.00	2,643.9	2,598.7	2,598.7	2,613.8	2,688.3	2,775.1	2,710.3	2,724.6
5 / 40.62	2,666.2	2,621.4	2,732.1	2,673.2	2,688.3	2,666.2	2,688.3	2,681.0
6 / 48.36	2,710.3	2,775.1	2,753.7	2,746.3	2,666.2	2,598.7	2,621.4	2,628.8
7 / 53.70	2,621.4	2,688.3	2,710.3	2,673.3	2,688.3	2,688.3	2,666.2	2,681.0
8 / 58.08	2,121.8	2,230.7	2,230.7	2,194.4	2,177.0	2,309.0	2,230.7	2,238.9
Averages ---------->	2,567.8	2,601.6	2,583.8	2,584.4	2,591.5	2,594.5	2,576.7	2,587.5

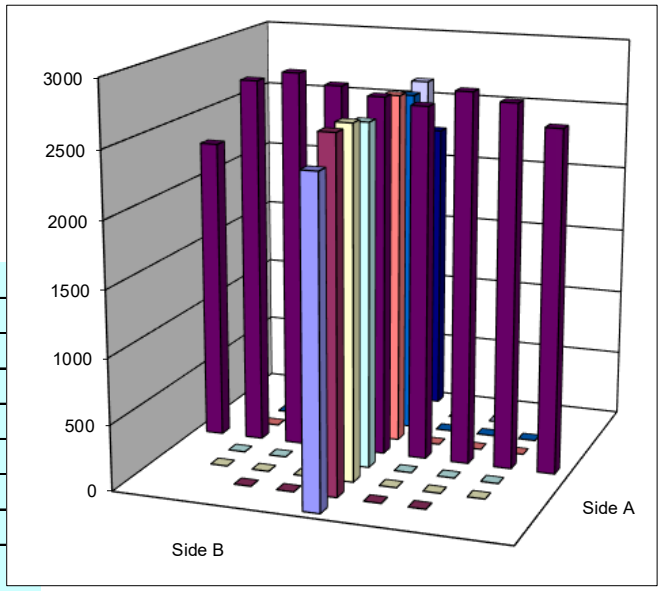
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2586.0		Mean	2655.8	2658.3	2657.1
Min Point	2194.4	-15.1%	Std. Dev.	57.8	41.1	48.2
Max Point	2746.3	6.2%	COV as %	2.2	1.5	**1.8**

Flow w/o C-Pt 50571 cfm

Vel Avg w/o C-Pt 2576 fpm

	Start	Finish	
Stack temp	77.9	78.8	F
Equipment temp	72.6	71.3	F
Ambient temp	72.6	71.3	F
Stack static	0.12	0.25	mbars
Ambient pressure	984.76	984.76	mbars
Total Stack pressure	984.88	985.01	mbars
Ambient humidity	25%	26%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-11
Date	5/27/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	79.3 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:51 9:55
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,644.7	2,553.5	2,599.5	2,599.2	2,482.9	2,576.6	2,553.5	2,537.7
2	6.30	2,689.2	2,711.1	2,689.2	2,696.5	2,599.5	2,689.2	2,622.2	2,637.0
3	11.64	2,732.9	2,732.9	2,667.0	2,711.0	2,599.5	2,622.2	2,644.7	2,622.1
4	19.38	2,530.2	2,553.5	2,622.2	2,568.6	2,458.9	2,576.6	2,553.5	2,529.7
Center	30.00	2,599.5	2,622.2	2,576.6	2,599.4	2,622.2	2,599.5	2,622.2	2,614.6
5	40.62	2,622.2	2,622.2	2,599.5	2,614.6	2,667.0	2,711.1	2,689.2	2,689.1
6	48.36	2,711.1	2,689.2	2,667.0	2,689.1	2,553.5	2,599.5	2,622.2	2,591.7
7	53.70	2,644.7	2,644.7	2,599.5	2,629.6	2,599.5	2,576.6	2,599.5	2,591.9
8	58.08	2,283.9	2,309.7	2,204.7	2,266.1	2,122.5	2,065.9	2,231.5	2,139.9
Averages ---------->		2,606.5	2,604.3	2,580.6	2,597.1	2,522.8	2,557.5	2,570.9	2,550.4

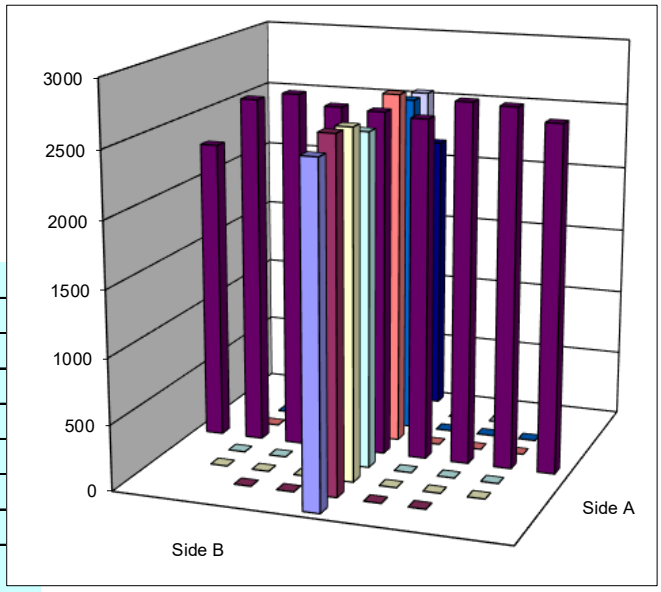
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2573.8		Mean	2644.1	2610.9	2627.5
Min Point	2139.9	-16.9%	Std. Dev.	54.8	48.8	52.7
Max Point	2711.0	5.3%	COV as %	2.1	1.9	**2.0**

Flow w/o C-Pt 50454 cfm

Vel Avg w/o C-Pt 2570 fpm

	Start	Finish	
Stack temp	79.1	79.5	F
Equipment temp	75.0	73.7	F
Ambient temp	75.0	73.7	F
Stack static	1.37	0.57	mbars
Ambient pressure	985.10	985.10	mbars
Total Stack pressure	986.47	985.67	mbars
Ambient humidity	28%	29%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-12
Date	5/27/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	80.1 deg F
Stack X-Area	2827.4 in.2	Start/End Time	10:52 10:56
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,533.2	2,509.7	2,579.7	2,540.9	2,647.9	2,556.5	2,461.8	2,555.4
2	6.30	2,485.8	2,556.5	2,533.2	2,525.2	2,533.2	2,579.7	2,625.3	2,579.4
3	11.64	2,579.7	2,647.9	2,602.6	2,610.1	2,556.5	2,625.3	2,625.3	2,602.4
4	19.38	2,556.5	2,647.9	2,625.3	2,609.9	2,413.1	2,509.7	2,579.7	2,500.8
Center	30.00	2,647.9	2,625.3	2,579.7	2,617.7	2,670.3	2,533.2	2,602.6	2,602.0
5	40.62	2,670.3	2,602.6	2,602.6	2,625.2	2,670.3	2,736.2	2,714.3	2,706.9
6	48.36	2,647.9	2,625.3	2,579.7	2,617.7	2,692.4	2,757.9	2,692.4	2,714.2
7	53.70	2,556.5	2,533.2	2,533.2	2,541.0	2,692.4	2,602.6	2,579.7	2,624.9
8	58.08	2,260.5	2,180.3	2,207.3	2,216.0	2,125.0	2,125.0	2,039.4	2,096.5
Averages ---------->		2,548.7	2,547.6	2,538.2	2,544.8	2,555.7	2,558.5	2,546.8	2,553.6

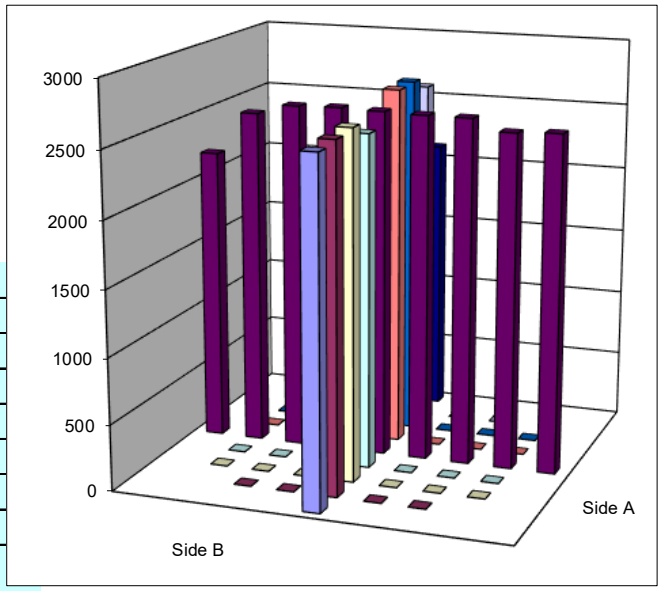
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2549.2		Mean	2592.4	2618.7	2605.5
Min Point	2096.5	-17.8%	Std. Dev.	41.1	74.1	59.2
Max Point	2714.2	6.5%	COV as %	1.6	2.8	**2.3**

Flow w/o C-Pt 49905 cfm

Vel Avg w/o C-Pt 2542 fpm

	Start	Finish	
Stack temp	79.9	80.2	F
Equipment temp	75.2	72.8	F
Ambient temp	75.2	72.8	F
Stack static	0.37	0.27	mbars
Ambient pressure	984.76	984.76	mbars
Total Stack pressure	985.13	985.03	mbars
Ambient humidity	30%	33%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-13
Date	5/27/21	Fan Configuration	A+B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	79.7 deg F
Stack X-Area	2827.4 in.2	Start/End Time	11:58 12:02
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,437.0	2,461.2	2,509.0	2,469.1	2,624.7	2,624.7	2,713.7	2,654.3
2	6.30	2,509.0	2,555.9	2,691.7	2,585.5	2,509.0	2,532.5	2,579.1	2,540.2
3	11.64	2,713.7	2,602.0	2,647.2	2,654.3	2,602.0	2,691.7	2,669.5	2,654.4
4	19.38	2,509.0	2,412.5	2,412.5	2,444.6	2,555.9	2,579.1	2,509.0	2,548.0
Center	30.00	2,647.2	2,624.7	2,624.7	2,632.2	2,691.7	2,602.0	2,624.7	2,639.5
5	40.62	2,602.0	2,579.1	2,602.0	2,594.4	2,647.2	2,555.9	2,647.2	2,616.8
6	48.36	2,555.9	2,691.7	2,647.2	2,631.6	2,579.1	2,691.7	2,579.1	2,616.6
7	53.70	2,602.0	2,602.0	2,532.5	2,578.9	2,532.5	2,461.2	2,602.0	2,531.9
8	58.08	2,067.8	2,286.1	2,179.7	2,177.8	2,124.5	2,206.8	2,206.8	2,179.4
Averages ---------->		2,516.0	2,535.0	2,538.5	2,529.8	2,540.7	2,549.5	2,570.1	2,553.5

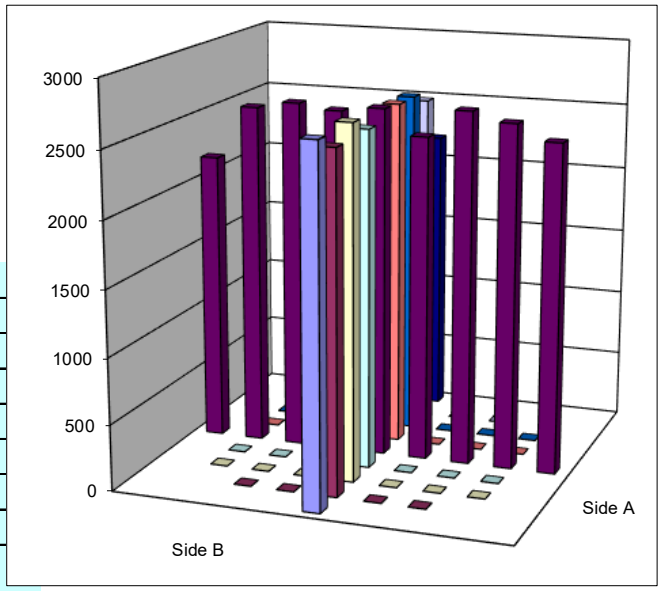
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2541.6		Mean	2588.8	2592.5	2590.6
Min Point	2177.8	-14.3%	Std. Dev.	69.4	51.0	58.5
Max Point	2654.4	4.4%	COV as %	2.7	2.0	**2.3**

Flow w/o C-Pt 49674 cfm

Vel Avg w/o C-Pt 2530 fpm

	Start	Finish	
Stack temp	79.1	80.2	F
Equipment temp	76.1	75.1	F
Ambient temp	76.1	75.1	F
Stack static	0.25	0.27	mbars
Ambient pressure	984.42	984.76	mbars
Total Stack pressure	984.67	985.03	mbars
Ambient humidity	31%	32%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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	LV-C2 (C2V)	Run No.	VT-14
Date	5/28/21	Fan Configuration	B
Testers	ZDH/LCE	Fan Setting	NA Hz
Stack Dia.	60 in.	Stack Temp	78.3 deg F
Stack X-Area	2827.4 in.2	Start/End Time	9:34 9:38
Test Port	A & B	Center 2/3 from	5.51 to: 54.49
Distance to disturbance	51.00 ft	Points in Center 2/3	2 to: 7
Velocity units	ft/min		

Order -->		First port				Second port			
Traverse-->		Port A (East)				Port B (West)			
Trial ---->		1	2	3	Mean	1	2	3	Mean
Point	Depth, in.	Velocity				Velocity			
1	1.92	2,716.9	2,651.4	2,584.2	2,650.8	2,738.4	2,759.7	2,673.4	2,723.8
2	6.30	2,738.4	2,695.2	2,716.9	2,716.8	2,738.4	2,738.4	2,716.9	2,731.2
3	11.64	2,420.4	2,371.5	2,515.4	2,435.7	2,538.5	2,606.8	2,651.4	2,598.9
4	19.38	2,515.4	2,296.1	2,296.1	2,369.2	2,515.4	2,396.0	2,396.0	2,435.8
Center	30.00	2,491.9	2,296.1	2,584.2	2,457.4	2,584.2	2,538.5	2,561.5	2,561.4
5	40.62	2,396.0	2,346.6	2,396.0	2,379.6	2,538.5	2,538.5	2,584.2	2,553.8
6	48.36	2,584.2	2,584.2	2,651.4	2,606.6	2,651.4	2,843.3	2,759.7	2,751.5
7	53.70	2,561.5	2,468.3	2,491.9	2,507.2	2,606.8	2,606.8	2,695.2	2,636.3
8	58.08	2,296.1	2,491.9	2,468.3	2,418.8	2,296.1	2,218.3	2,296.1	2,270.2
Averages ---------->		2,524.5	2,466.8	2,522.7	2,504.7	2,578.6	2,582.9	2,592.7	2,584.8

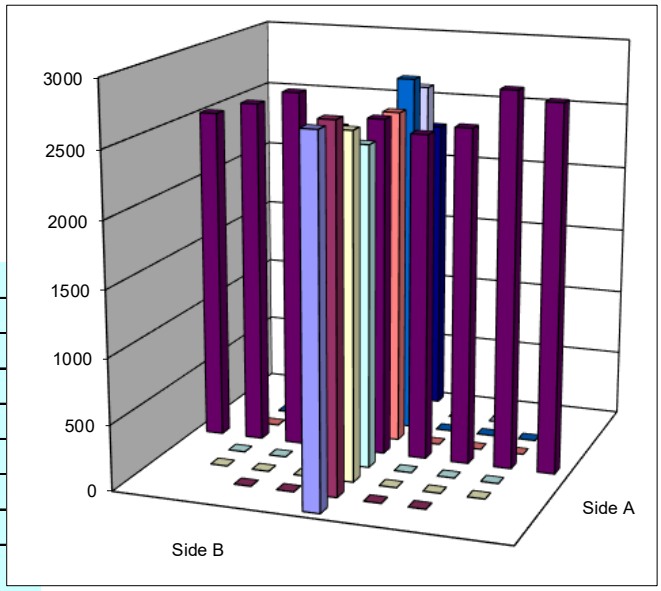
All	ft/min	Dev. from mean	***Center 2/3***	Side	Bottom	All
Mean	2544.7		Mean	2496.1	2609.8	2553.0
Min Point	2270.2	-10.8%	Std. Dev.	126.4	109.1	127.9
Max Point	2751.5	8.1%	COV as %	5.1	4.2	**5.0**

Flow w/o C-Pt 50052 cfm

Vel Avg w/o C-Pt 2549 fpm

	Start	Finish	
Stack temp	77.0	79.5	F
Equipment temp	72.9	70.7	F
Ambient temp	72.9	70.7	F
Stack static	0.27	0.15	mbars
Ambient pressure	995.60	995.60	mbars
Total Stack pressure	995.87	995.75	mbars
Ambient humidity	26%	25%	RH

Instuments Used:	Cal Due
S-type (ID: A10019, 72")	Post-test inspection
Digi-sense 20250-13 Manometer (SN: 191212877)	12/3/2021
Control Co. Thermometer (SN: 220435230)	Post-test verification



Notes:

Traverse point depth = the distance from the 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.

Appendix E – Low Activity Waste Stack Verification Document Summary

The following table provides a summary of the documents produced by Pacific Northwest National Laboratory (PNNL) during low activity waste (LAW) Verification Test activities.

Document Title	Document Number	Notes
LAW Verification Test Input Document	Attachment to WTP/RPP-MOA-PNNL-01019, Rev. 0	Test input document to provide information to Bison Engineering Inc. (Bison) and Waste Treatment Completion Company (WTCC) concerning the verification tests. Transmitted as an attachment to a memo.
WTP LAW Stack Verification Tests of Velocity Uniformity and Flow Angle Provided by Bechtel National, Inc.	TDP-WTPSP-946	Test Data Package to contain the data sheets collected by Bison
Qualification of LAW Stack Verification Testing Data Collected by Bison Engineering	DQP-WTPSP-0005 Rev. 0	Data Qualification Plan to describe the qualification of the data from WTCC
Qualification of LAW Stack Verification Testing Data Collected by Bison Engineering	N/A	Data Qualification Evaluation to assess whether the data from WTCC are acceptable using data corroboration method
Qualification of LAW Stack Verification Testing Data Collected by Bison Engineering	DQR-WTPSP-0005 Rev. 0	Data Qualification Report to document the results of the data evaluation(s)
LAW Stack Verification Testing Observation Forms	TDP-WTPSP-945	Test Data Package to contain the observation forms PNNL staff used when observing Bison tests
Determine Air Velocity Uniformity of LV-C2, LV-S2, LV-S2, and LV-S3	CCP-WTPSP-1380, Rev. 0	Calculation package to document and review equations and calculations performed to determine velocity uniformity
Determination of Flow Angles in LV-C2, LV-S1, LV-S2, and LV-S3 (CAM and RS) Stacks	CCP-WTPSP-1381, 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 LAW Stacks	CCP-WTPSP-1384, Rev. 1	Calculation package to document and review equations and calculations performed to determine DV values for the Bison tests and the scale model tests.
Documentation to support stack sampling location distance to disturbance	WTPSP-DP-966, Rev 0	Data package to contain the WTP LAW stack drawings showing the sample probe location(s) and nearest upstream disturbance.
Determine Distance to Disturbance for LAW Stacks	WTPSP-CCP-1391, Rev. 0	Calculation package to document and review calculations of the distances to the nearest upstream disturbance for each of the LAW sampling ports.

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