EMISSIONS TEST REPORT

EAGLE FOUNDRY COMPANY

PERMANENT TOTAL ENCLOSURE VERIFICATION ON AIR ARC AND FINISH END AREAS

Oregon Department of Environmental Quality
Air Contaminant Discharge Permit No. 03-2631-ST-01

Prepared for:

Eagle Foundry Co.
23123 SE Eagle Creek Road
Eagle Creek, OR 97022

Prepared by:

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Project Number: EFC223174
Test Date: April 18, 2023
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STAC STACK TESTING ACCREDITATION COUNCIL
ACCREDITED TO ASTM D7036 ONLY CERT #4675.01
BISON ENGINEERING, INC.

EXECUTIVE SUMMARY

Eagle Foundry Company contracted Bison Engineering, Inc. to conduct permanent total enclosure (PTE) verifications at the Eagle Foundry Company facility in Eagle Creek, Oregon. PTE verification was performed on the air arc and finish end enclosures to demonstrate that all suspended particulate in each work area is captured by the associated baghouses. This report presents test data, describes the methods employed and details the quality assurance measures taken to ensure accurate data. Tables 1 through 4 summarize the test results.

Table 1 Air Arc Area PTE Verification Results Summary

Parameter	Units	Test Result	Criteria	Criteria Status
NEAR	N/A	0.001	≤ 0.05	Pass
Distance to any NDO from each emission point	Equivalent opening diameters	≥ 4 from each emission point to any NDO	≥ 4	Pass
Inward direction of air flow	N/A	Visually confirmed inward direction of flow at each NDO*	Continuous inward direction at each NDO	Pass

NEAR – natural draft opening to enclosure area ratio
NDO – natural draft opening
N/A – not applicable
inH_2O – inches of water
ED – equivalent opening diameter
* Documented photographically

Table 2 presents the average differential pressure readings taken for the air arc enclosure. While not all readings were <-0.007 inH_2O, these readings may still demonstrate that the enclosure does capture 100% of emissions. All readings demonstrate a negative pressure differential, the average of all readings is <-0.007 inH_2O, inward flow was documented visually at all NDOs, and no visible particulate emissions were observed leaving the test enclosures.

Table 2 Air Arc Area Differential Pressures

NDO #	NDO Description	Units	Round 1 Average	Round 2 Average	Round 3 Average
A-1	South Loading Door	inH_2O	-0.0111	-0.0119	-0.0116
A-2	North Loading Door	inH_2O	-0.0043	-0.0042	-0.0083

Table 3 Finish End Area PTE Verification Results Summary

Parameter	Units	Test Result	Criteria	Criteria Status
NEAR	N/A	0.002	≤ 0.05	Pass
Distance to any NDO from each emission point	Equivalent opening diameters	≥ 4 from each emission point to any NDO	≥ 4	Pass
Inward direction of air flow	N/A	Visually confirmed inward direction of flow at each NDO*	Continuous inward direction at each NDO	Pass

* Documented photographically

Table 4 presents the average differential pressure readings taken for the finish end enclosure. While not all readings were <-0.007 inH_2O, these readings may still demonstrate that the enclosure does capture 100% of emissions. All readings demonstrate a negative pressure differential, the average of all readings is <-0.007 inH_2O, inward flow was documented visually at all NDOs, and no visible particulate emissions were observed leaving the test enclosures.

Table 4 Finish End Area Differential Pressures

NDO #	NDO Description	Units	Round 1 Average	Round 2 Average	Round 3 Average
F-1	NE Loading Door	inH_2O	-0.0076	-0.0067	-0.0138
F-2	North Man Door	inH_2O	-0.0062	-0.0116	-0.0090
F-3	NW Loading Door	inH_2O	-0.0051	-0.0075	-0.0102
F-4	West Loading Door	inH_2O	-0.0188	-0.0286	-0.0399
F-5	South Man Door	inH_2O	-0.0062	-0.0046	-0.0114
F-6	Casting Loading Opening	inH_2O	-0.0115	-0.0074	-0.0085
F-7	SE Loading Door	inH_2O	-0.0106	-0.0078	-0.0091

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

CERTIFICATION FROM RESPONSIBLE OFFICIAL

I have reviewed the information being submitted in its entirety. Based on information and belief formed after reasonable inquiry, I certify that the statements and information contained in this submittal are true, accurate, and complete.

Greg Lasslett

Signature

05/15/2023

Date

Greg Lasslett

Name (printed)

Title

Eagle Foundry Co.

Company

REVIEW AND CERTIFICATION

All work, calculations, other activities, and tasks performed and documented in this report were carried out under my direction and supervision. This test project conforms to the requirements of Bison Engineering, Inc.'s quality manual and American Society for Testing and Materials (ASTM) D7036-04.

Project Manager: Jacob Rankin, QSTI

Title: Helena Source Team Lead

Signature: Jacob Rankin

Date: 5/15/2023

I have reviewed all testing details, calculations, results, conclusions and other appropriate written material contained herein, and hereby certify that the presented material is authentic and accurate.

Reviewer: Lynn Dunnington

Title: Environmental Scientist/Reporting Lead

Signature: Lynn Dunnington

Date: 5/10/2023

1.0 INTRODUCTION

1.1 Project Summary and Objectives

Eagle Foundry Company (Eagle Foundry) contracted Bison Engineering, Inc. (Bison) to perform permanent total enclosure (PTE) verification on the air arc (cutting) and finish end (grinding) enclosures at the Eagle Foundry facility in Eagle Creek, Oregon. Bison performed the PTE verification in accordance with the pre-test protocol dated February 16, 2023, that was submitted to the Oregon Department of Environmental Quality (ODEQ). Testing was conducted to demonstrate increased capture efficiency. Bison employed U.S. Environmental Protection Agency (EPA) test methods as described in Title 40 Code of Federal Regulations, Part 60 (40 CFR 60), Appendix A. Bison followed EPA Method 204 to determine whether the air arc and finish end work area enclosures inside their respective buildings meet the criteria to be considered PTEs, in which case particulate capture efficiency can be assumed to be 100 percent.

1.2 Project Contacts

Facility:	**Eagle Foundry Company**
Address:	23123 SE Eagle Creek Road Eagle Creek, OR 97022
Contact:	Greg Lasslett
Phone:	(503) 637-3048
Email:	gregl@eaglefoundryco.com
Consultant:	**Bison Engineering, Inc.**
Address:	3143 E Lyndale Avenue Helena, MT 59601
Contact:	Jacob Rankin
Phone:	(406) 442-5768
Email:	jrankin@bison-eng.com
State Authority:	**Oregon Department of Environmental Quality** **Northwest Region**
Address:	700 NE Multnomah Street, Suite 600 Portland, OR 97232
Contact:	Julia DeGagne
Phone:	(503) 866-9643
Email:	julia.degagne@deq.oregon.gov

1.3 Testing Personnel

The Bison on-site testing team was led by Jacob Rankin, Qualified Source Test Individual (QSTI), Helena Source Team Lead. Mr. Rankin was assisted during field testing by Adam Bender, Qualified Individual (QI), Environmental Scientist. Mr. Rankin served as project manager. Jennifer Kessler, QI, Environmental Scientist/Quality Manager, audited the test data and authored this report. Lynn Dunnington, Environmental Scientist/Reporting Lead, performed a final quality assurance review of the data and test report.

Greg Lasslett, Project Manager, was the primary contact for Eagle Foundry. Mr. Lasslett was on-site during testing.

ODEQ representative Thomas Rhodes was on-site during PTE verification.

2.0 SOURCE DESCRIPTION

2.1 Facility Description

Eagle Foundry owns and operates a white iron and steel alloy casting facility in Eagle Creek, Oregon. The facility specializes in custom castings for the aggregate industry and others.

2.2 Emission Source Description

After casting in the main foundry, steel alloy parts require air arc cutting to remove solidified metal risers from the cast part. Both steel and white iron parts are sent to the finishing building grinding enclosure. Within the enclosure parts are ground with grinding wheels to remove surface imperfections before they are considered finished and ready for sale. Cutting and grinding occur in two separate enclosures within buildings, each enclosure being equipped with a dedicated baghouse collection system.

The cutting, or air arc, enclosure is approximately 738 square feet (ft^2) with two NDOs (gaps around one solid door on the north side of the enclosure and gaps in a freezer strip door on the south side). The associated collection system is powered by a 10,000 cubic feet per minute (cfm) baghouse. The particulate emitting point in the air arc enclosure is considered to be the cutting table located on the west side of the room, from which particulate matter becomes airborne when excess material from castings is cut off using a welding torch. The cutting table has a hood system above it to collect the particulate matter and direct it to the baghouse.

The grinding, or finish end, enclosure is approximately 5,225 ft^2 with seven NDOs. The associated collection system is powered by a 30,000 cfm baghouse. Within each building, an enclosure has been constructed around the respective process (cutting or grinding), creating a smaller volume and more tightly sealed space in which the process occurs, thereby maximizing capture of emissions. The particulate emitting point in the finish end enclosure are the eight grinding booths (3- swing grinder workstations and 5 - portable grinding workstations) located centrally in the enclosure, from which particulate matter becomes airborne when excess material from castings is ground off using various grinding tools. The swing grinder tools (3) are connected directly to the baghouse and all 8 grinding workstations (booths) have a dust pickup hood that is easily positioned close to the grinding operation on the work bench at any given time to collect particulate matter as it is generated. All the suction hoses lead to the same baghouse.

3.0 PTE VERIFICATION RESULTS

Bison followed EPA Method 204 to assess whether the air arc and finish end enclosures meet the criteria for a PTE. Area measurements were taken for each NDO in an "as-found" condition. Supporting data and photographic evidence of inward flow are included in the appendices to this report.

A Shortridge Instruments electronic micromanometer (serial number M22572) was used to measure differential pressure in lieu of calculating facial velocity. Some of the differential pressure measurements were greater than -0.007 inches of water and therefore did not meet acceptance criteria. Field personnel believe that the layout of the buildings and weather conditions at the time of the verification influenced these measurements.

3.1 Air Arc Enclosure Results

3.1.1 Natural Draft Opening to Enclosure Area Ratio

Bison field personnel calculated the total interior area of the air arc enclosure to be 3,573 ft^2. Using Method 204, Eq. 204-2 the NEAR was calculated as follows:

Eq. 204-2 NEAR = total area of all NDOs/total enclosure area
NEAR= 3.5 ft^2/3,573 ft^2 = 0.001

The NEAR for the air arc enclosure was calculated to be 0.001, which is less than the limit of 0.05 for permanent total enclosures as stipulated by Method 204, Section 8.2. Table 5 presents the NDO dimensions. The south loading door (A-1) has a hinged frame with freezer strips and a 1-inch gap at the bottom to allow air to flow underneath. The south loading door is closed during normal operations; area measurements were taken with the door closed. The door frame is 10 feet wide with a 1-inch gap between the bottom of the freezer strips and the ground. The north loading door (A-2) is a hinged door and remains closed during normal operations; the area of A-2 was measured with the door fully closed and includes four gap measurements; 0.75 inches between the door and each supporting wall, 0.75 inches between the top of the door and the ceiling, and 1-inch between the door and the floor; the door frame is 10 feet by 10 feet.

Table 5 NDO Dimensions

NDO #	NDO Description	Length (in)	Width (in)	Area (in^2)
A-1	South Loading Door	120	1	120
A-2	North Loading Door (top/bottom)	120	0.75	210
		120	1	
A-2	North Loading Door (sides)	0.75	120	180
		0.75	120	
Total area of all NDOs				**510 (3.5 ft^2)**

in – inches
in^2 – square inches

3.1.2 Equivalent Opening Diameters

Method 204, Section 5.1 requires each NDO to be at least four equivalent opening diameters (ED) from each emitting point. Using the dimensions from Table 5, Bison calculated the number of EDs from each NDO to the emitting point in the air arc enclosure. Table 6 presents the calculated distances as ED. ED calculations are included in the appendices to this report. To determine ED for A-2, the sum of the side gap measurements (1.5") was used as the length measurement, and a width of 120" was used.

Table 6 Equivalent Opening Diameters

NDO #	NDO Description	ED (in)	Distance to Emitting Point (in)	# of Diameters
A-1	South Loading Door	1.98	277	140
A-2	North Loading Door	2.96	199	67

3.1.3 Differential Pressure Measurements and Inward Flow

Bison conducted three rounds of five differential pressure measurements at each NDO. The five measurements were taken approximately one minute apart. After recording the five pressure measurements, field personnel moved to the next location and performed five measurements on that NDO. This procedure was repeated until three rounds of five measurements were complete. Table 7 presents averages of the differential pressure measurements.

Table 7 Differential Pressures

NDO #	NDO Description	Units	Round 1 Average	Round 2 Average	Round 3 Average
A-1	South Loading Door	inH_2O	-0.0111	-0.0119	-0.0116
A-2	North Loading Door	inH_2O	-0.0043	-0.0042	-0.0083

Assuming the exhaust flow rate from the enclosure is >5,000 cfm (half the flowrate of the baghouse) and dividing that by the total area of all the NDOs, a facial velocity of ~1,400 feet per minute (fpm) would be expected. This facial velocity exceeds the 200 fpm criteria of Method 204. This suggests that quantifying the exhaust flow rate via Method 2 in addition to documenting a comprehensive total area of all NDOs could easily produce an average enclosure facial velocity in excess of 200 fpm.

Continuous inward direction of airflow at each NDO was confirmed by visual observation and documented photographically. Photographs are presented in an appendix to this report.

3.2 Finish End Enclosure Results

3.2.1 Natural Draft Opening to Enclosure Area Ratio

Bison field personnel calculated the total interior area of the finish end enclosure to be 19,594 ft^2. Using Method 204, Eq. 204-2 the NEAR was calculated as follows:

Eq. 204-2 NEAR = total area of all NDOs/total enclosure area
NEAR= 30.6 ft^2/19,594 ft^2 = 0.002

The NEAR for the finish end enclosure was calculated to be 0.002, which is less than the limit of 0.05 for permanent total enclosures as stipulated by Method 204, Section 8.2. Table 8 presents the NDO dimensions. All dimensions were measured with the NDOs in a normal operation orientation. The west loading door remains closed during normal operation, the NW and NE loading doors open episodically, and all other openings and doorways are covered with freezer strips. The openings and doorways with freezer strips are high traffic openings. The west loading door (F-4) is a roll-up door that is always closed and has a two-inch gap at the bottom. The NW (F-3) and NE (F-1) doors are sliding doors that have bristles around all edges of the door. A width of 0.25 inches was assumed for the draft opening of the bristles to be conservative and is applied on all four sides of both doors. The north man door (F-2), south man door (F-5), and SE loading door (F-7) all have a one-inch gap between the bottom of the freezer strips and the ground. Castings are fed into the grinding enclosure through the Casting Loading opening (F-6) on rollers underneath freezer strips; a maximum height of 14 inches was measured from the bottom of the freezer strips to the ground. Some sections of the freezer strips between the rollers were lower in height, but 14 inches was assumed across the length of the opening to be conservative.

Table 8 NDO Dimensions

NDO #	NDO Description	Length (in)	Width (in)	Area (in^2)
F-1	NE Loading Door	480	0.25	120
F-2	North Man Door	1	38	38
F-3	NW Loading Door	480	0.25	120
F-4	West Loading Door	2	144	288
F-5	South Man Door	1	43	43
F-6	Casting Loading Opening	14	264	3,696
F-7	SE Loading Door	1	108	108
Total area of all NDOs				**4,413 (30.6 ft^2)**

3.2.2 Equivalent Opening Diameters

Method 204, Section 5.1 requires each NDO to be at least four equivalent opening diameters from each emitting point. Using the dimensions from Table 8, Bison calculated the number of ED from each NDO to the nearest emitting point (grinding booth) in the finish end enclosure. Table 9 presents the calculated distances as ED.

Table 9 Equivalent Opening Diameters

NDO #	NDO Description	ED (in)	Distance to Emitting Point (in)	# of Diameters
F-1	NE Loading Door	0.50	353	706.4
F-2	North Man Door	1.95	282	144.7
F-3	NW Loading Door	0.50	295	590.3
F-4	West Loading Door	3.95	212	53.7
F-5	South Man Door	1.95	189	96.7
F-6	Casting Loading Opening	26.59	174	6.5
F-7	SE Loading Door	1.98	262	132.2

3.2.3 Differential Pressure Measurements and Inward Flow

Bison conducted three rounds of five differential pressure measurements at each NDO. The five measurements were taken approximately one minute apart. After recording the five pressure measurements, field personnel moved to the next location and performed five measurements on that NDO. This procedure was repeated until three rounds of five measurements were complete. Table 10 presents averages of the differential pressure measurements. While several readings were greater than -0.007, the overall average of the readings were within the method requirement of less than -0.007.

Table 10 Differential Pressures

NDO #	NDO Description	Units	Round 1 Average	Round 2 Average	Round 3 Average
F-1	NE Loading Door	inH_2O	-0.0076	-0.0067	-0.0138
F-2	North Man Door	inH_2O	-0.0062	-0.0116	-0.0090
F-3	NW Loading Door	inH_2O	-0.0051	-0.0075	-0.0102
F-4	West Loading Door	inH_2O	-0.0188	-0.0286	-0.0399
F-5	South Man Door	inH_2O	-0.0062	-0.0046	-0.0114
F-6	Casting Loading Opening	inH_2O	-0.0115	-0.0074	-0.0085
F-7	SE Loading Door	inH_2O	-0.0106	-0.0078	-0.0091

The grinding enclosure exhaust flow rate is rated at approximately 30,000 cfm. Dividing by the total area of all the NDOs, the resulting average facial velocity through the NDOs would be 980 fpm. Further measurements may prove that the grinding enclosure can pass the facial velocity criteria. Continuous inward direction of airflow at each NDO was confirmed by visual observation and documented photographically. Photographs are presented in an appendix to this report.

3.3 Operating Conditions

Eagle Foundry personnel ensured that the main foundry, air arc, and finish end areas were operating under normal conditions during the PTE verification.

3.4 Field Observations

Testing was performed as outlined in the test protocol. No adverse or unusual environmental conditions other than those noted in Section 3.0 are known to have influenced the outcome of these tests. No visible emissions were observed outside of the enclosures.

3.5 Conclusions

Three of the four Method 204 criteria were met to demonstrate that the air arc and finish end enclosures meet the definition of a PTE. Though differential pressure measurements were not all <-0.007 inH_2O, all measurements were negative, indicating inward flow. Additionally, inward flow was visually confirmed over a one-hour period. Fume generated in the enclosures was suspended and was not directed at any of the NDOs, meaning it did not appear to have any momentum that would allow it to overcome the inward flow. As a result, it is our professional opinion that these enclosures are capturing 100% of the emissions generated inside.

4.0 EMISSION TEST METHODS AND PROCEDURES

4.1 Testing Methods and Procedures

Bison testing personnel performed the following EPA methods as described in 40 CFR 60, Appendix A.

EPA Reference Method 204, "Criteria for and Verification of a Permanent or Temporary Total Enclosure." The objective of Method 204 is to determine whether a permanent or temporary enclosure meets the criteria for being considered a total enclosure. If all criteria are met, then the capture efficiency is assumed to be 100 percent.

4.2 Sample Handling and Analytical Procedures

Sampling procedures are cited in the appropriate methods and there was no deviation from those methods. No physical samples requiring off-site processing were generated during this test campaign.

4.3 Audit Samples

The stationary source audit program (SSAP) is effectively suspended as of March 2022 because there are currently no independent accredited audit sample providers (AASP).

APPENDIX A: AREA DRAWINGS AND TEST DATA

BISON ENGINEERING, INC.

COMPANY	**Eagle Foundry**
FACILITY	**Eagle Creek**
LOCATION	**Eagle Creek, Oregon**
SOURCE	**Air Arc (Cutting) Enclosure**
DATE	**04/18/23**
METHOD	**204**
PARAMETER	**PTE Verification**

Bison Engineering, Inc.
Method 204 Area Calculations

Enclosure Interior Dimensions

	Location Description	Length (ft)	Width (ft)	Area (ft^2)
N	Wall	25.0	21.5	537.5
S	Wall	25.0	17.0	425.0
W	Wall	29.5	19.3	567.9
E	Wall	29.5	19.3	567.9
	Floor	25.0	29.5	737.5
	Ceiling	25.0	29.5	737.5
		Total enclosure area:		3,573 ft^2

Note: The ceiling is assumed to have the same surface area as the floor.

NEAR Calculation

Total area of NDOs (A_N):	3.5 ft^2		
Total enclosure area (A_T):	3,573 ft^2		
	0.001	≤0.05	PASS

NEAR - NDO to enclosure area ratio

NDO Dimensions

NDO #	NDO Location Description	Length (in)	Width (in)	Area (in^2)
A-1	South Loading Door	120	1	120
A-2	North Loading Door (top/bottom)	0.75	120	90
		120	1	120
	North Loading Door (sides)	120	0.75	90
		120	0.75	90
		Total area of all NDOs:	3.5 ft^2	

Total area of Normal Operation Draft Openings

Equivalent Diameter (ED)

NDO #	NDO Location Description	ED (in)	Distance to emitting* point (in)	# of ED	
A-1	South Loading Door	1.98	277	140	PASS
A-2	North Loading Door	2.96	199	67	PASS

* The emitting point is a cutting table located on the southern side of the building. The cutting table has a hood system above it to collect particulate matter and route it to the baghouse.

Note ED for the North Loading Door was calculated using the sum of the side gaps (1.5") for use as the length and using 120" as the width.

Example Calculations:

NEAR = A_N/A_T = 0.0010

Where A_N 3.5 ft^2

Where A_T 3573.25 ft^2

ED= (2*Length*Width) / (Length + Width) = 1.98 in

Where Length= 120 in

Where Width= 1 in

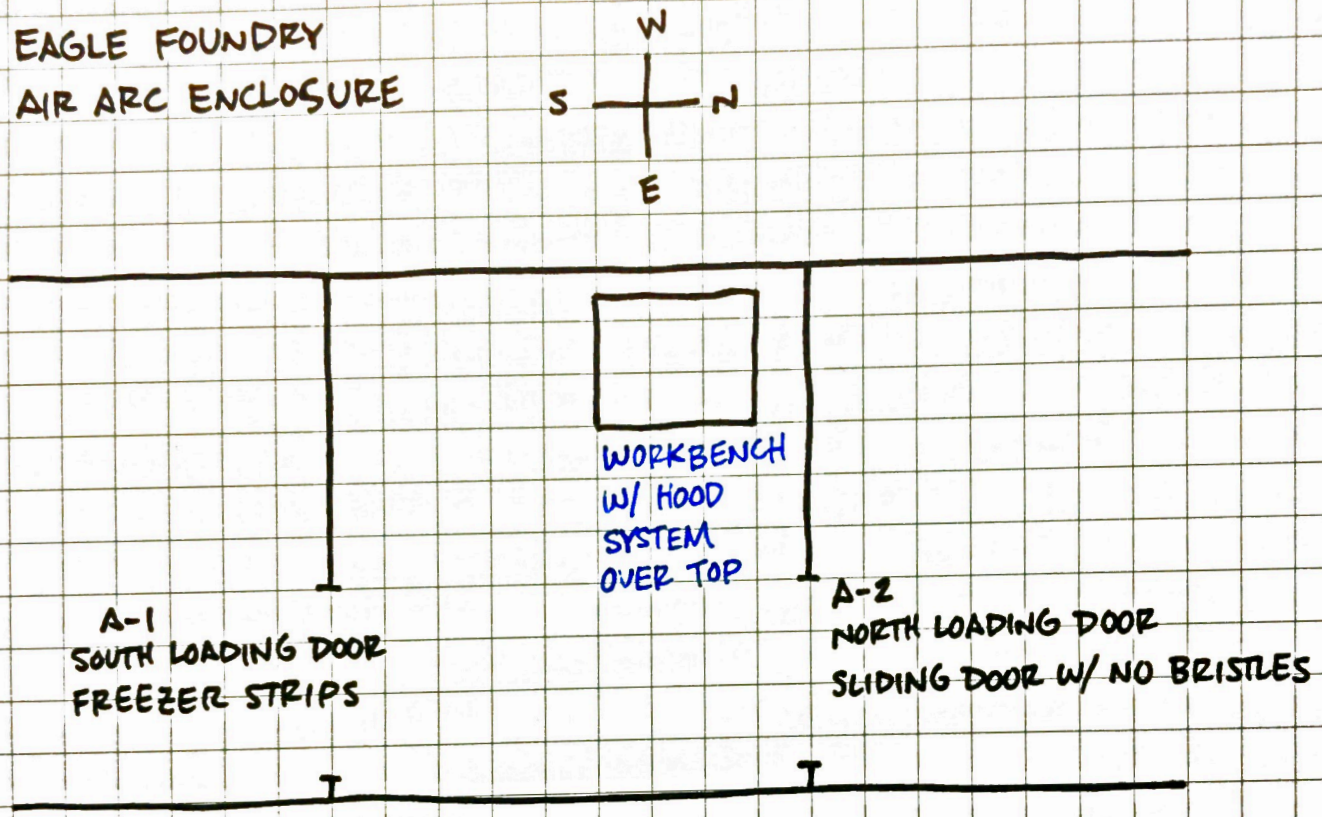
(East Loading Door)

Bison Engineering, Inc.
Method 204 Field Data

Client: Eagle Foundry
Source: Air Arc (Cutting) Enclosure
Location: Eagle Creek, Oregon
Date: 4/18/2023

NDO Description		South Loading Door (A-1)			North Loading Door (A-2)		
Time (mm:ss)		12:47	13:31	13:36	12:43	13:29	13:33
Units		Inches of H_2O			Inches of H_2O		
Readings	#1	-0.0124	-0.0118	-0.0081	-0.0012	-0.0054	-0.0059
	#2	-0.0151	-0.0160	-0.0158	-0.0043	-0.0020	-0.0135
	#3	-0.0113	-0.0070	-0.0076	-0.0045	-0.0031	-0.0024
	#4	-0.0074	-0.0149	-0.0091	-0.0035	-0.0036	-0.0130
	#5	-0.0092	-0.0100	-0.0172	-0.0079	-0.0069	-0.0067
Average		**-0.0111**	**-0.0119**	**-0.0116**	**-0.0043**	**-0.0042**	**-0.0083**
Overall			**-0.0115**			**-0.0056**	

Note: Yellow shading indicates values between -0.01 and -0.007 to alert testing personnel of values approaching (but not exceeding) the limit of -0.007. Red shading indicates readings greater than -0.007.



BISON
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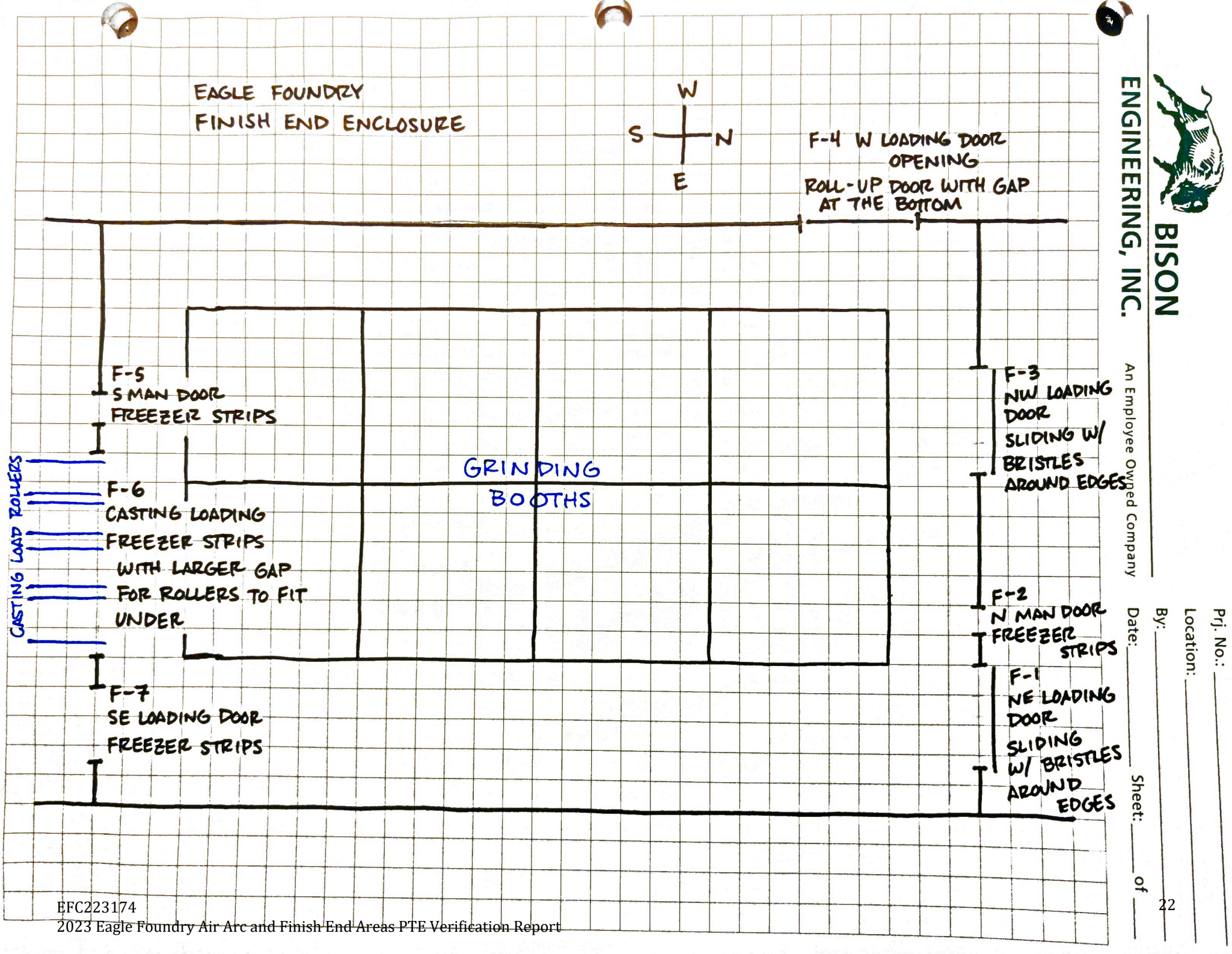

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BISON ENGINEERING, INC.

COMPANY	**Eagle Foundry**
FACILITY	**Eagle Creek**
LOCATION	**Eagle Creek, Oregon**
SOURCE	**Finish End (Grinding) Enclosure**
DATE	**04/18/23**
METHOD	**204**
PARAMETER	**PTE Verification**

Bison Engineering, Inc.
Method 204 Area Calculations

Enclosure Interior Dimensions

	Location Description	Length (ft)	Width (ft)	Area (ft^2)
N	Wall	59.8	32.3	1,929.6
S	Wall	59.8	32.3	1,929.6
E	Wall	87.3	30.3	2,641.8
W	Wall	87.3	30.3	2,641.8
	Floor	87.3	59.8	5,225.4
	Ceiling	87.3	59.8	5,225.4
			Total enclosure area:	19,594 ft^2

Note: The ceiling is assumed to have the same surface area as the floor.

NEAR Calculation

Total area of NDOs (A_N):	30.6 ft^2		
Total enclosure area (A_T):	19,594 ft^2		
	0.002	≤0.05	PASS

NEAR - NDO to enclosure area ratio

NDO Dimensions

NDO #	NDO Location Description	Height (in)	Width (in)	Area (in^2)	
F-1	NE Loading Door	480	0.25	120	Normal Operation Door Opening
F-2	North Man Door	1	38	38	Normal Operation Door Opening
F-3	NW Loading Door	480	0.25	120	Normal Operation Door Opening
F-4	West Loading Door	2	144	288	Normal Operation Door Opening
F-5	South Man Door	1	43	43	Normal Operation Door Opening
F-6	Casting Loading Opening	14	264	3,696	Normal Operation Door Opening
F-7	SE Loading Door	1	108	108	Normal Operation Door Opening
			Total area of all NDOs:	30.6 ft^2	

Equivalent Diameter (ED)

NDO #	NDO Location Description	ED (in)	Distance to emitting* point (in)	# of ED	
F-1	NE Loading Door	0.50	353	706.4	PASS
F-2	North Man Door	1.95	282	144.7	PASS
F-3	NW Loading Door	0.50	295	590.3	PASS
F-4	West Loading Door	3.95	212	53.7	PASS
F-5	South Man Door	1.95	189	96.7	PASS
F-6	Casting Loading Opening	26.59	174	6.5	PASS
F-7	SE Loading Door	1.98	262	132.2	PASS

*The emitting point is the grinding booths located in the center of the building. Each grinding booth has two suction hoses to collect particulate matter and route it to the baghouse.

Example Calculations:

NEAR = A_N/A_T = 0.002

Where A_N 30.6 ft^2

Where A_T 19593.81 ft^2

ED= (2*Length*Width) / (Length + Width) = 0.50 in

Where Length= 480 in

Where Width= 0.25 in

(NE Loading Door)

Bison Engineering, Inc.
Method 204 Field Data

Client: Eagle Foundry
Source: Finish End (Grinding) Enclosure
Location: Eagle Creek, Oregon
Date: 4/18/2023

NDO Description		NE Loading Door (F-1)			North Man Door (F-2)			NW Loading Door (F-3)			West Loading Door (F-4)		
Time (mm:ss)		12:14	13:48	14:07	12:17	13:49	14:08	12:21	13:51	14:09	12:24	13:54	14:10
Units		Inches of H_2O			Inches of H_2O			Inches of H_2O			Inches of H_2O		
Readings	#1	-0.0075	-0.0042	-0.0088	-0.0044	-0.0078	-0.0062	-0.0033	-0.0060	-0.0092	-0.0167	-0.0255	-0.0424
	#2	-0.0074	-0.0075	-0.0070	-0.0138	-0.0261	-0.0064	-0.0049	-0.0052	-0.0128	-0.0149	-0.0336	-0.0509
	#3	-0.0078	-0.0066	-0.0149	-0.0055	-0.0120	-0.0142	-0.0038	-0.0103	-0.0105	-0.0206	-0.0355	-0.0352
	#4	-0.0070	-0.0100	-0.0166	-0.0024	-0.0064	-0.0079	-0.0082	-0.0101	-0.0079	-0.0234	-0.0224	-0.0426
	#5	-0.0084	-0.0054	-0.0219	-0.0048	-0.0055	-0.0101	-0.0053	-0.0061	-0.0106	-0.0186	-0.0262	-0.0286
Average		**-0.0076**	**-0.0067**	**-0.0138**	**-0.0062**	**-0.0116**	**-0.0090**	**-0.0051**	**-0.0075**	**-0.0102**	**-0.0188**	**-0.0286**	**-0.0399**
Overall			**-0.0094**			**-0.0089**			**-0.0076**			**-0.0291**	

NDO Description		South Man Door (F-5)			Casting Loading Opening (F-6)			SE Loading Door (F-7)		
Time (mm:ss)		12:26	13:58	14:12	12:28	14:00	14:13	12:29	14:02	14:14
Units		Inches of H_2O			Inches of H_2O			Inches of H_2O		
Readings	#1	-0.0072	-0.0050	-0.0148	-0.0072	-0.0111	-0.0076	-0.0094	-0.0087	-0.0092
	#2	-0.0057	-0.0045	-0.0095	-0.0092	-0.0059	-0.0099	-0.0098	-0.0082	-0.0104
	#3	-0.0071	-0.0054	-0.0167	-0.0137	-0.0055	-0.0096	-0.0077	-0.0057	-0.0065
	#4	-0.0034	-0.0040	-0.0074	-0.0143	-0.0066	-0.0064	-0.0109	-0.0067	-0.0073
	#5	-0.0075	-0.0039	-0.0086	-0.0132	-0.0079	-0.0089	-0.0150	-0.0096	-0.0120
Average		**-0.0062**	**-0.0046**	**-0.0114**	**-0.0115**	**-0.0074**	**-0.0085**	**-0.0106**	**-0.0078**	**-0.0091**
Overall			**-0.0074**			**-0.0091**			**-0.0091**	

Note: Yellow shading indicates values between -0.01 and -0.007 to alert testing personnel of values approaching (but not exceeding) the limit of -0.007. Red shading indicates readings greater than -0.007.

APPENDIX B: INWARD FLOW DIRECTION PHOTOS

Bison Engineering, Inc.
EPA Method 204
Documentation of Inward Flow Direction

Client: Eagle Foundry Co.
Location: Eagle Creek, Oregon
Enclosure: Air Arc Building (Cutoff)
Date: April 18, 2023

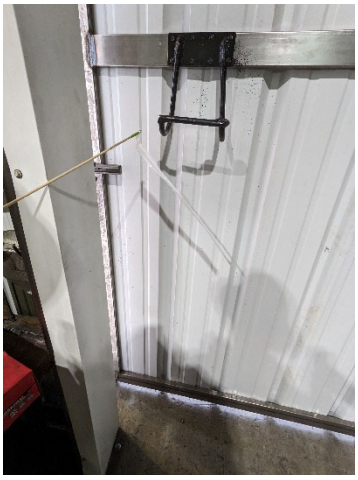
The following photographs document inward flow direction at NDOs A-1, South Loading door and A-2, North Loading door.

A-2 – North Loading Door

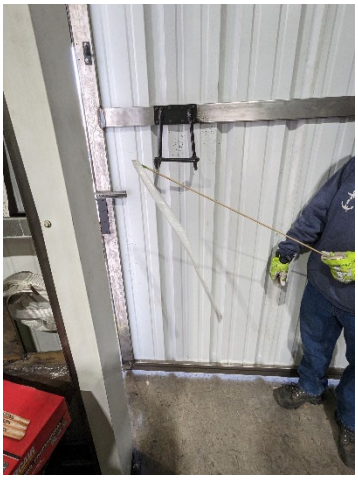
Outside Doorway

4-18-2023 15:51

4-18-2023 16:20



4-18-2023 15:30



4-18-2023 16:00

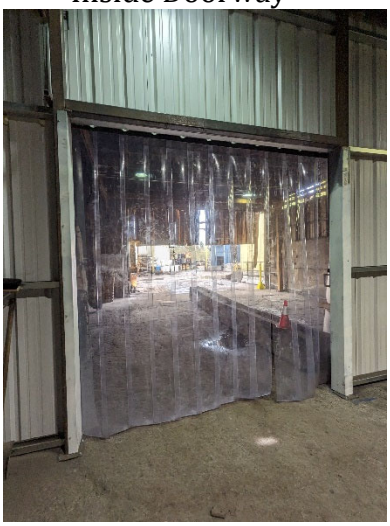
4-18-2023 16:31

4-18-2023 15:40

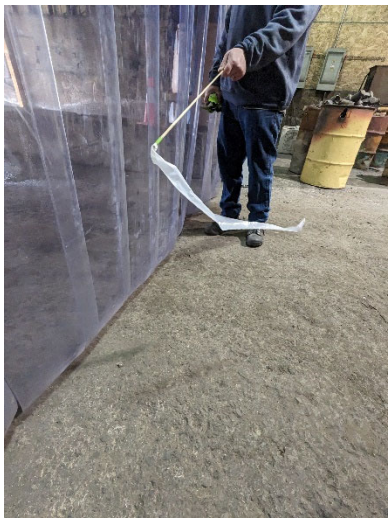
4-18-2023 16:10

A-1 – South Loading Door

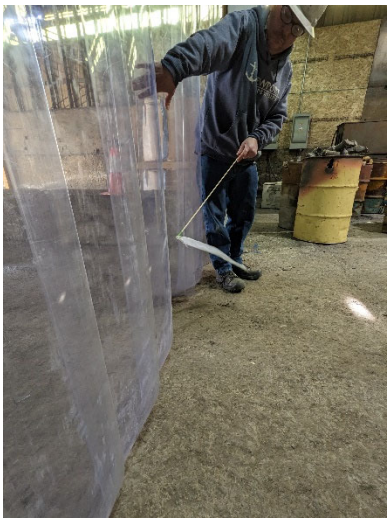
Inside Doorway



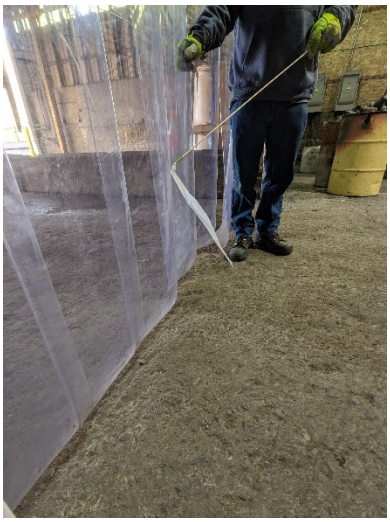
4-18-2023 15:52



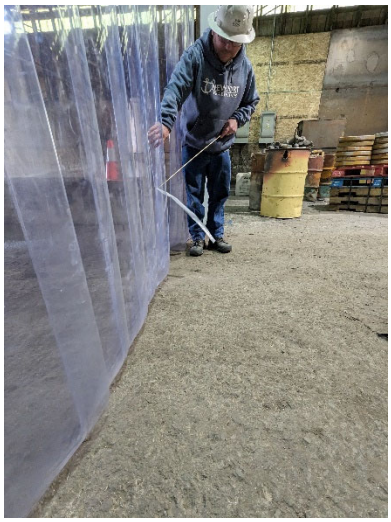
4-18-2023 16:20



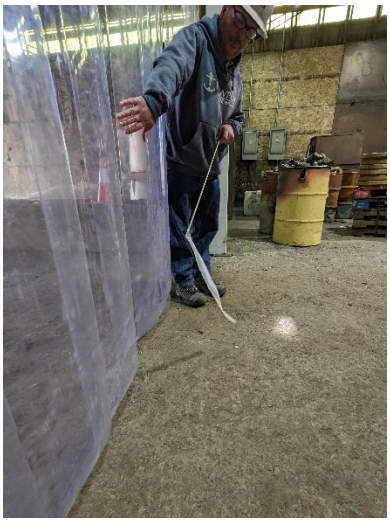
4-18-2023 15:31



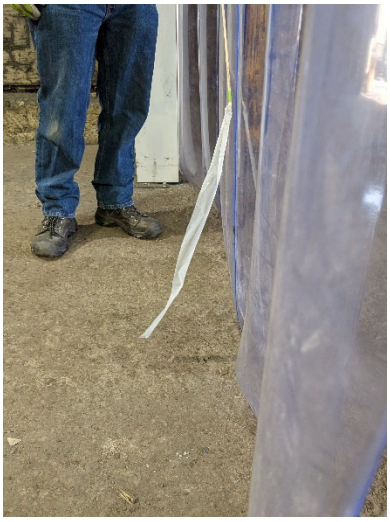
4-18-2023 16:00



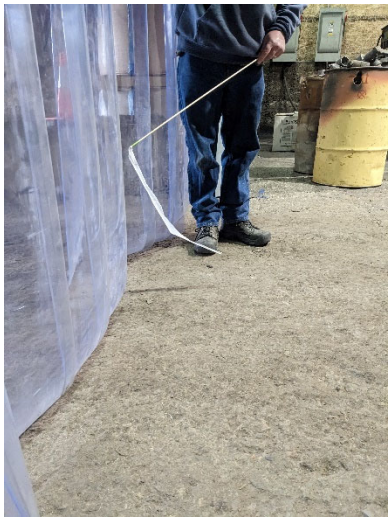
4-18-2023 16:31



4-18-2023 15:41



4-18-2023 16:10



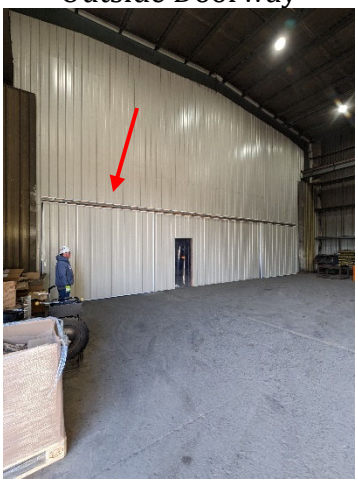
Bison Engineering, Inc.
EPA Method 204
Documentation of Inward Flow Direction

Client: Eagle Foundry Co.
Location: Eagle Creek, Oregon
Enclosure: Finish End Building (Grinding)
Date: April 18, 2023

The following photographs document inward flow direction at seven NDOs:
F-1, NE Loading Door
F-2, North Man Door
F-3, NW Loading Door
F-4, West Loading Door
F-5, South Man Door
F-6, Casting Loading Opening
F-7, SE Loading Door

F-1 – NE Loading Door

Outside Doorway

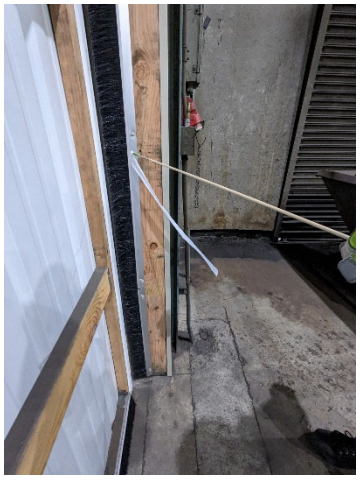


4-18-2023 14:35

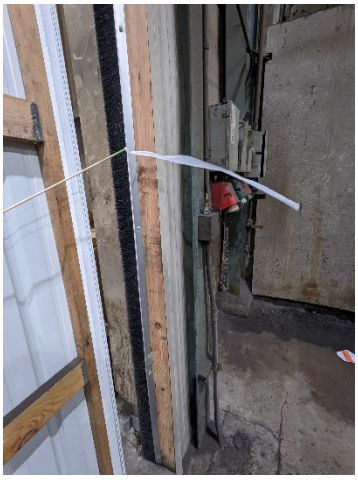
4-18-2023 15:05

Inside Doorway

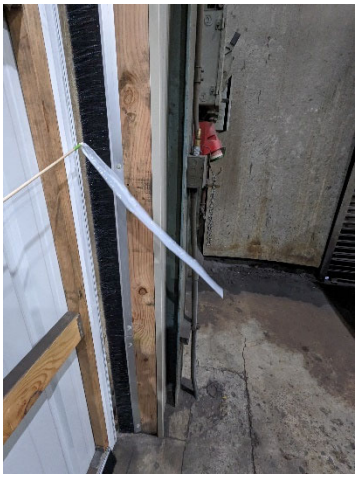
4-18-2023 14:45



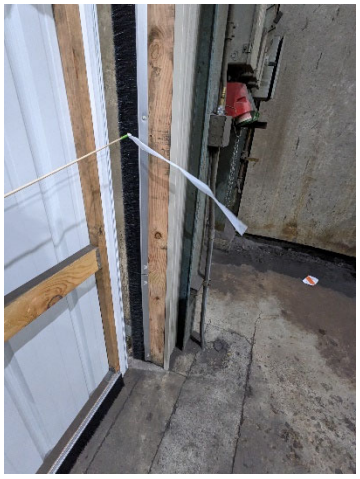
4-18-2023 15:15



4-18-2023 14:25



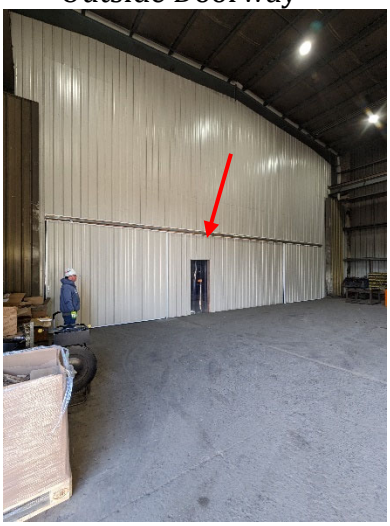
4-18-2023 14:55



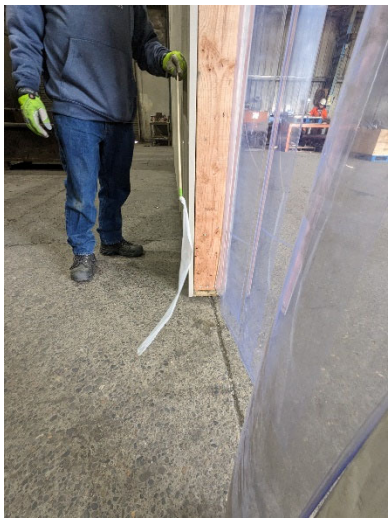
4-18-2023 15:25

F-2 – North Man Door

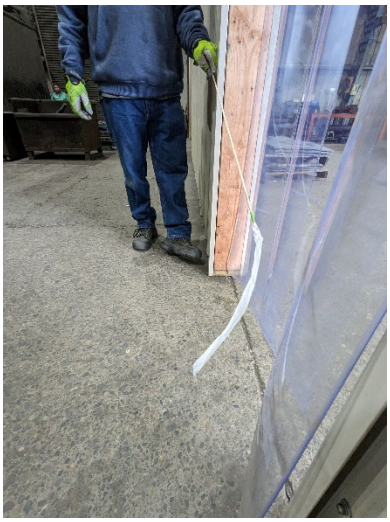
Outside Doorway



4-18-2023 14:36

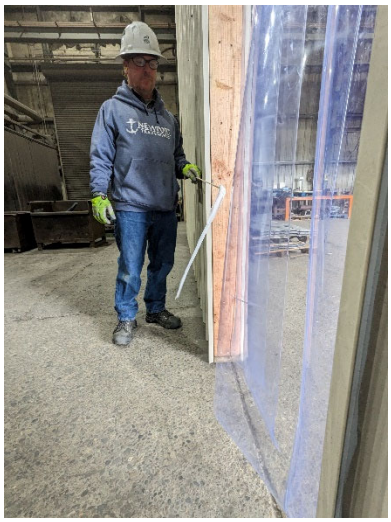


4-18-2023 15:06

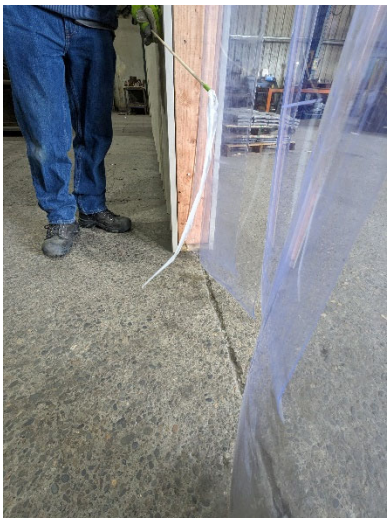


Inside Doorway

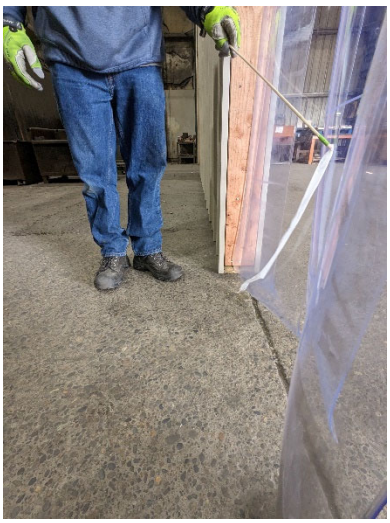
4-18-2023 14:46



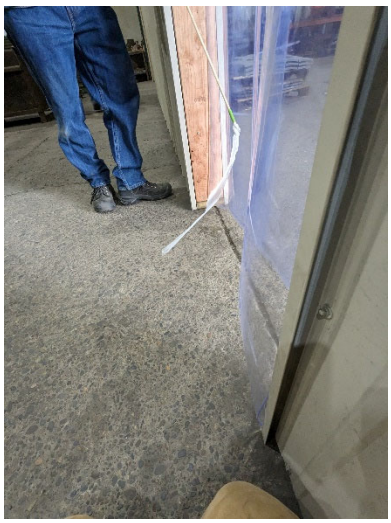
4-18-2023 15:15



4-18-2023 14:25



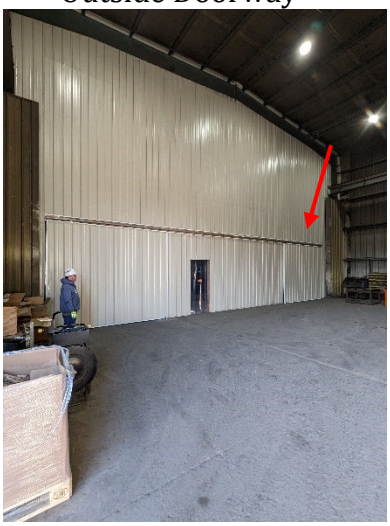
4-18-2023 14:57



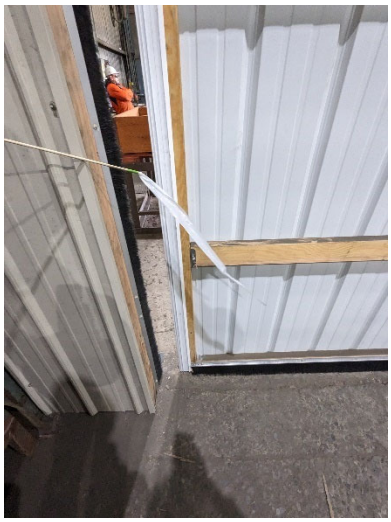
4-18-2023 15:25

F-3 – NW Loading Door

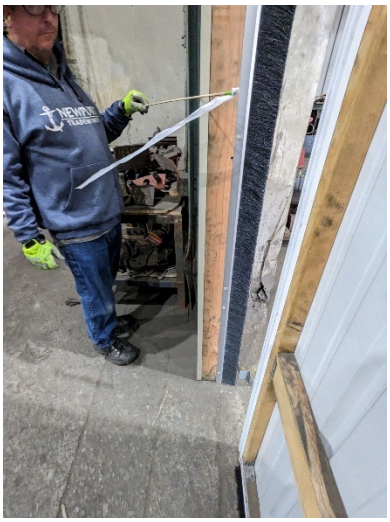
Outside Doorway



4-18-2023 14:37

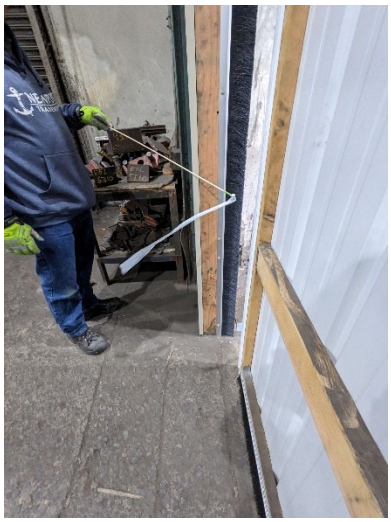


4-18-2023 15:06

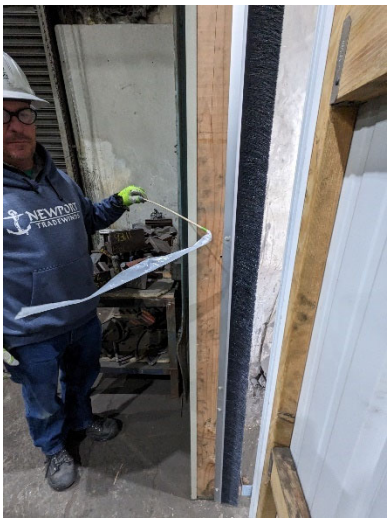


Inside Doorway

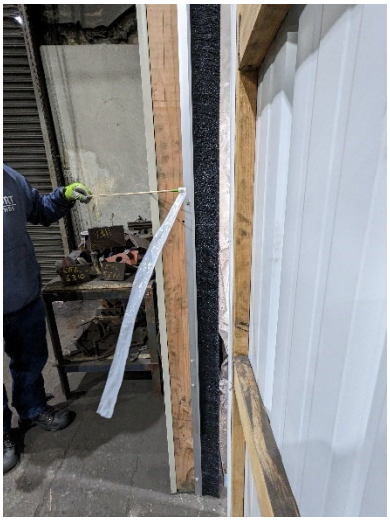
4-18-2023 14:46



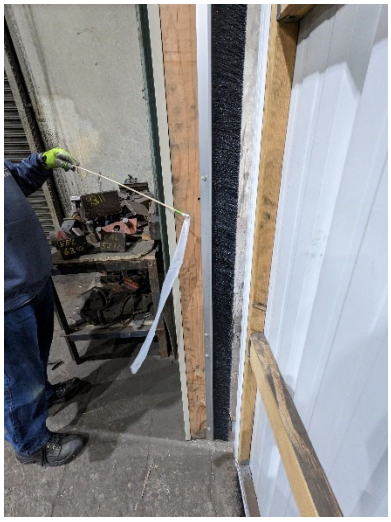
4-18-2023 15:16



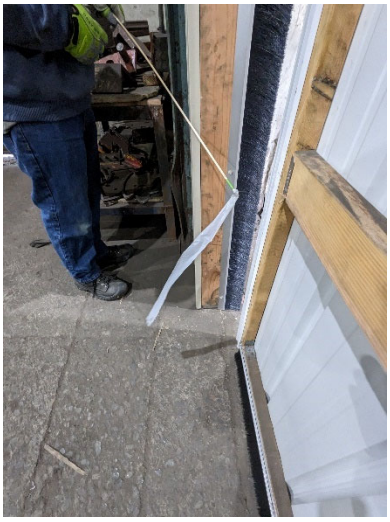
4-18-2023 14:26



4-18-2023 14:58

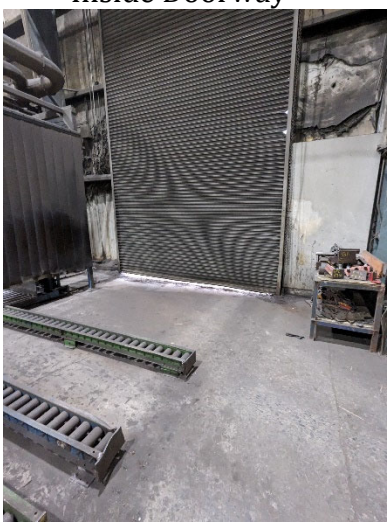


4-18-2023 15:25

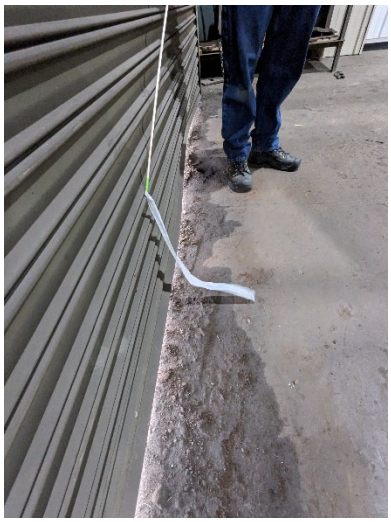


F-4 – West Loading Door Opening

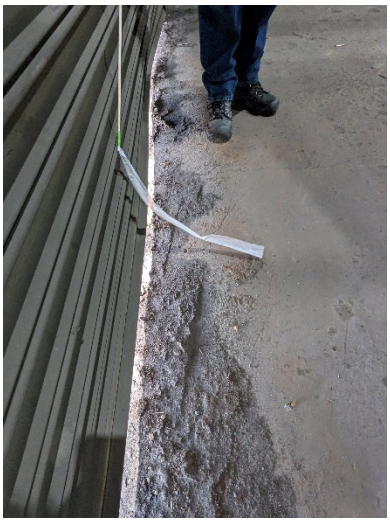
Inside Doorway



4-18-2023 14:46



4-18-2023 15:16

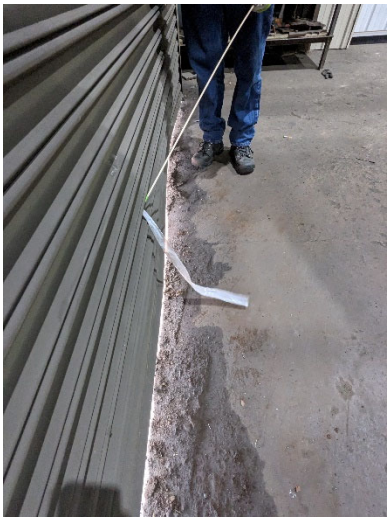


4-18-2023 14:26

4-18-2023 14:58

4-18-2023 15:26

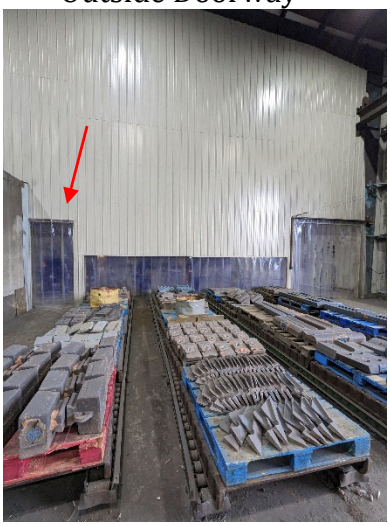
4-18-2023 14:38



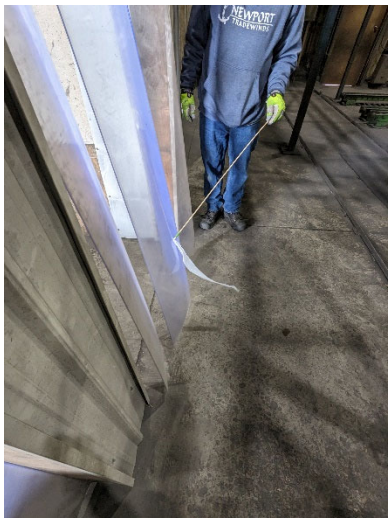
4-18-2023 15:07

F-5 – South Man Door

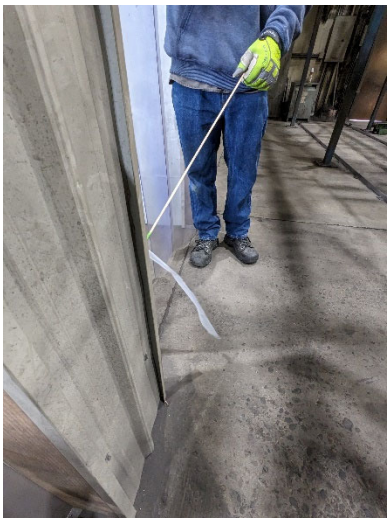
Outside Doorway



4-18-2023 14:38

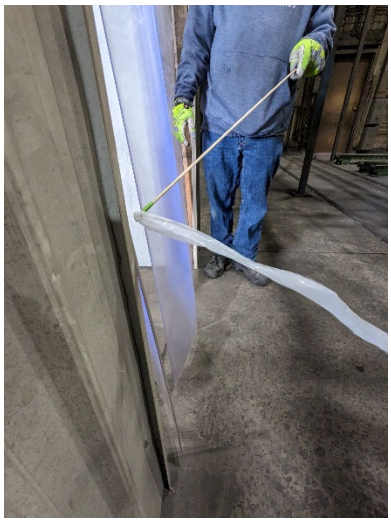


4-18-2023 15:08

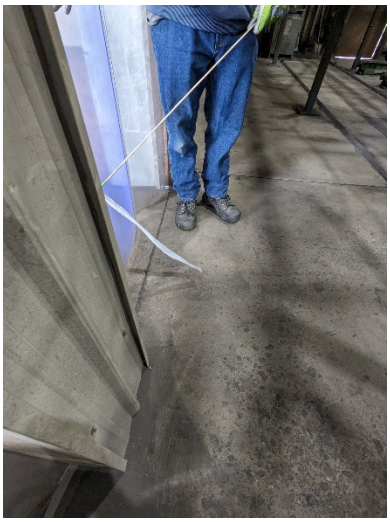


Inside Doorway

4-18-2023 14:47

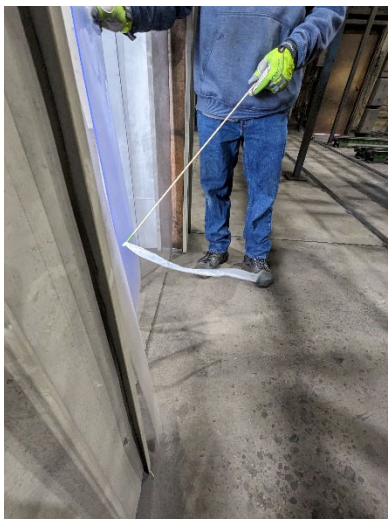


4-18-2023 15:17

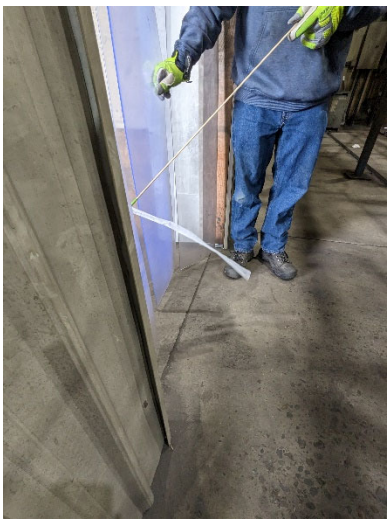


4-18-2023 14:27

4-18-2023 14:59

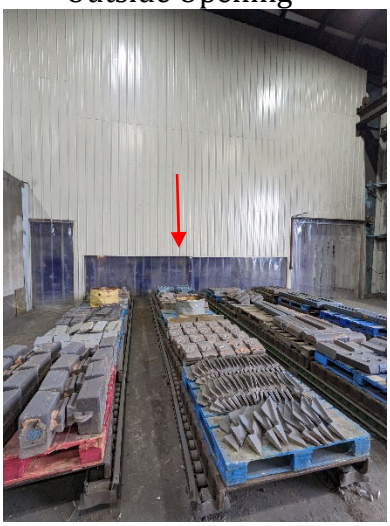


4-18-2023 15:26

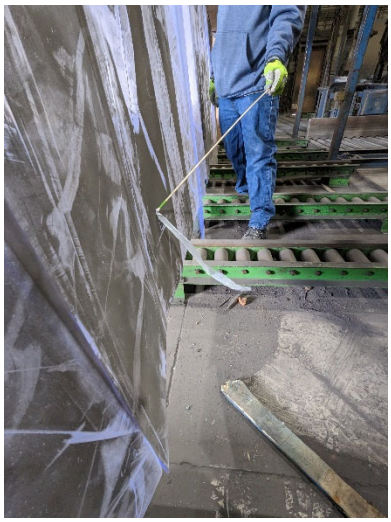


F-6 – Casting Loading

Outside Opening

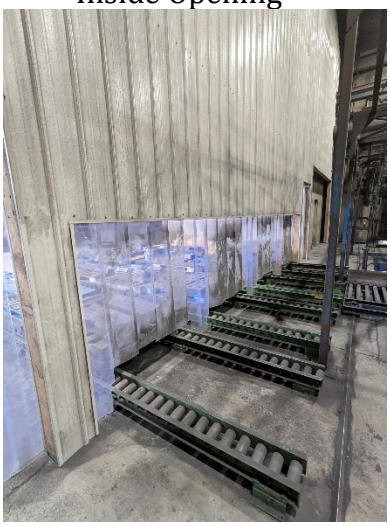


4-18-2023 14:39

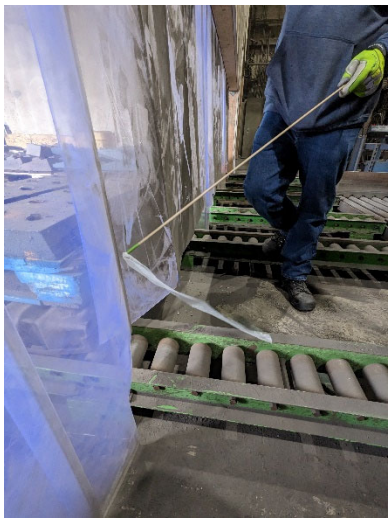


4-18-2023 15:08

Inside Opening

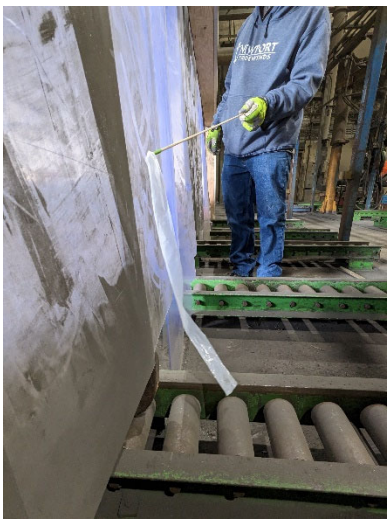


4-18-2023 14:48



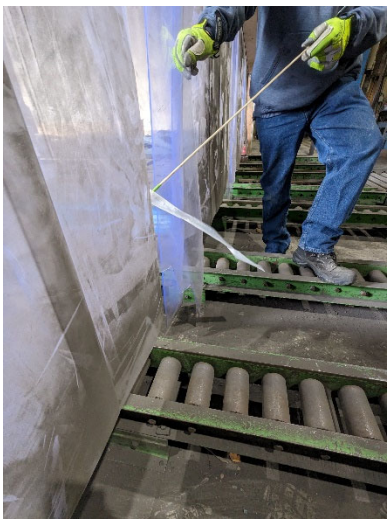
4-18-2023 15:17

4-18-2023 14:27



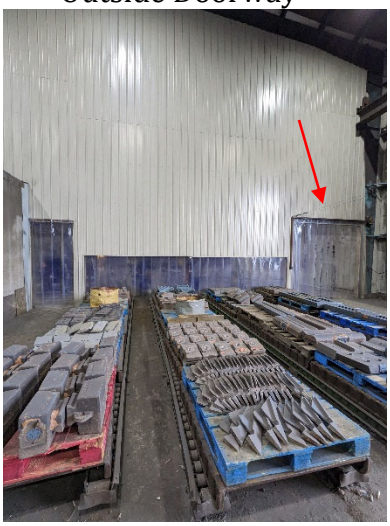
4-18-2023 14:59

4-18-2023 15:26



F-7 – SE Loading Door

Outside Doorway



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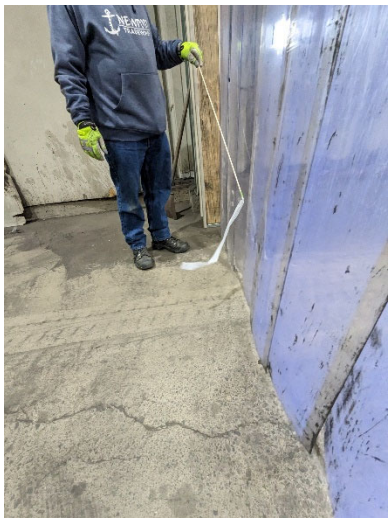

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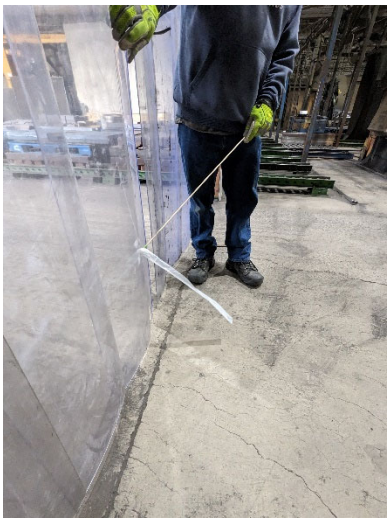
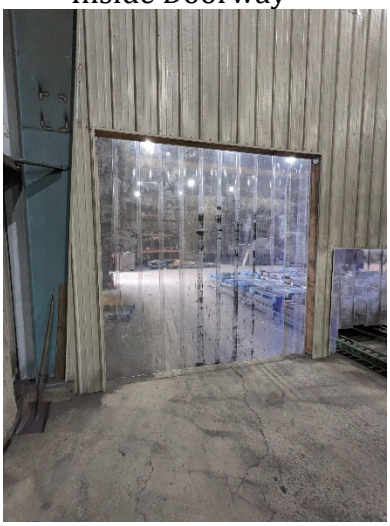


Inside Doorway



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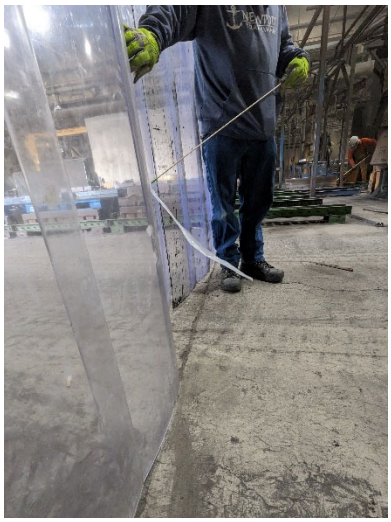

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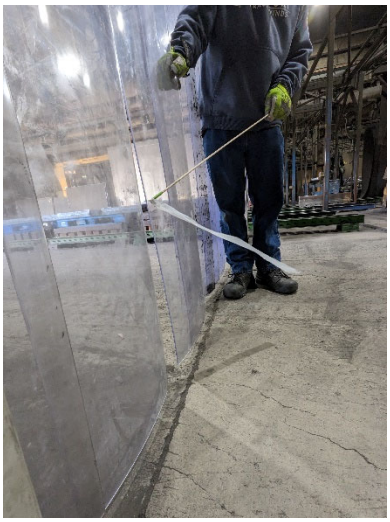
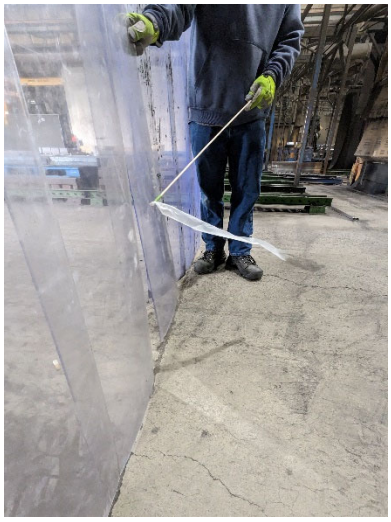
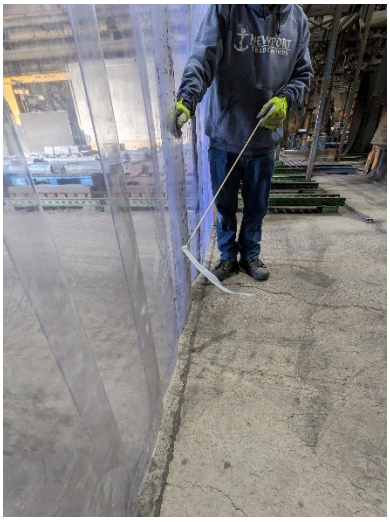


4-18-2023 14:28

4-18-2023 15:00



4-18-2023 15:27



APPENDIX C: CALIBRATIONS AND CERTIFICATIONS

STAC STACK TESTING ACCREDITATION COUNCIL

A2LA American Association for Laboratory Accreditation

Accredited Air Emission Testing Body

A2LA has accredited

BISON ENGINEERING, INC.

In recognition of the successful completion of the joint A2LA and Stack Testing Accreditation Council (STAC) evaluation process, this laboratory is accredited to perform testing activities in compliance with ASTM D7036:2004 - Standard Practice for Competence of Air Emission Testing Bodies.

Presented this 27th day of January 2022 .

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 4675.01
Valid to November 30, 2023

This accreditation program is not included under the A2LA ILAC Mutual Recognition Arrangement.

AIRDATA MULTIMETER CERTIFICATE OF CALIBRATION

Customer ID: 022037 S/N: M22572

Customer: BISON ENGINEERING, INC. City: HELENA State: MT

Model #: ADM-850L PO #: _____ Calibration Due Date: 02/2025 Order #: 230186

Rh 35 % Ambient Temperature 71 °F Barometric Pressure 28.56 in Hg

ABSOLUTE PRESSURE TEST (in Hg)
TEST METER TOLERANCE = ± 2.0 % ± .1 in Hg

Pressure Standard: Heise #02-R	S/N: 41741/42451		
Pressure Standard: Heise #04-R	S/N: 41743/42453		
Pressure Standard: Heise #06-R	S/N: 41742/42452-1	✓	
Pressure Standard: Heise #08-R	S/N: 42186/43328		
Pressure Standard: Heise #10-R	S/N: 42203/43352		
Pressure Standard: Heise #12A-R	S/N: 45605/48491		
Pressure Standard: Heise #14-R	S/N: 43412/45043-2		
Pressure Standard: Heise #16-R	S/N: 43413/45044		
Pressure Standard: Heise #18-R	S/N: 44581/46845		
Pressure Standard: Heise #20-R	S/N: 44582/46847		

Approx Set Point	Standard	Test Meter	% Diff
14.0	14.00	13.9	-.71
28.4	28.56	28.7	.49
40.0	40.00	40.2	.50

DIFFERENTIAL PRESSURE TEST (in wc)
TEST METER TOLERANCE = ± 2.0 % ± 0.001 in wc

Pressure Standard: Heise #01-L	S/N: 41739/42449		
Pressure Standard: Heise #01-R	S/N: 41739/42446		
Pressure Standard: Heise #02-L	S/N: 41741/42454		
Pressure Standard: Heise #03A-L	S/N: 45570/48461		
Pressure Standard: Heise #03A-R	S/N: 45570/48460		
Pressure Standard: Heise #04-L	S/N: 41743/42456		
Pressure Standard: Heise #05-L	S/N: 41740/42450	✓	
Pressure Standard: Heise #05-R	S/N: 41740/42447	✓	
Pressure Standard: Heise #06-L	S/N: 41742/42455	✓	
Pressure Standard: Heise #07-L	S/N: 42185/42186		
Pressure Standard: Heise #07-R	S/N: 42185/43326		
Pressure Standard: Heise #08-L	S/N: 42186/43329		
Pressure Standard: Heise #09-L	S/N: 42202/43351		
Pressure Standard: Heise #09-R	S/N: 42202/43350		
Pressure Standard: Heise #10-L	S/N: 42203/43353		
Pressure Standard: Heise #11-L	S/N: 43165/44551-1		
Pressure Standard: Heise #11-R	S/N: 43165/44730		
Pressure Standard: Heise #12A-L	S/N: 45605/48490-1		
Pressure Standard: Heise #13-L	S/N: 43415/45041		
Pressure Standard: Heise #13-R	S/N: 43415/45039		
Pressure Standard: Heise #14-L	S/N: 43412/45045		
Pressure Standard: Heise #15-L	S/N: 43416/45042		
Pressure Standard: Heise #15-R	S/N: 43416/45040-1		
Pressure Standard: Heise #16-L	S/N: 43413/45046		
Pressure Standard: Heise #17-L	S/N: 44579/46842		
Pressure Standard: Heise #17-R	S/N: 44579/46841		
Pressure Standard: Heise #18-L	S/N: 44581/46846		
Pressure Standard: Heise #19-L	S/N: 44580/46844		
Pressure Standard: Heise #19-R	S/N: 44580/46843		
Pressure Standard: Heise #20-L	S/N: 44582/46848		

Approx Set Point	Standard	Test Meter	% Diff
.0100	.0100	.0100	.00
.0500	.0515	.0514	-.19
.1250	.1254	.1254	.00
.2250	.2254	.2253	-.04
1.000	1.008	1.006	-.20
2.000	2.008	2.004	-.20
3.600	3.604	3.590	-.39
4.400	4.401	4.399	-.05
27.00	27.01	27.02	.04
50.00	50.05	49.85	-.40
Over Pressure	NA	✓	NA

Shortridge Instruments, Inc.
7855 East Redfield Road Scottsdale, Arizona 85260
(480) 991-6744 • Fax (480) 443-1267 • www.shortridge.com

AIRDATA MULTIMETER CERTIFICATE OF CALIBRATION

S/N: M22572

Order #: 230186

LOW VELOCITY CONFIRMATION (FPM)
TEST METER TOLERANCE = ± 3.0% ± 7 FPM

Vel Eqv Trans Std: S/N: M02009		Vel Eqv Trans Std: S/N: M10897	
Vel Eqv Trans Std: S/N: M02903		Vel Eqv Trans Std: S/N: M10901	
Vel Eqv Trans Std: S/N: M10839		Vel Eqv Trans Std: S/N: M13492	✓
Vel Eqv Trans Std: S/N: M10840		Vel Eqv Trans Std: S/N: M19325	

Approx Set Point	Standard	Test Meter	Diff
100	101	100	-1
500	514	514	0

ADM-880C, ADM-870C and ADM-860C AirData Multimeters are read in AirFoil Mode. ADM-850L AirData Multimeters are read in Pitot Tube Mode.

TEMPERATURE TEST - AIRDATA MULTIMETER (° F)
TEST METER TOLERANCE = ± 0.2° F

RTD Simulator: S/N 249	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 250	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 253	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 254	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 256	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 257	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 292	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 293	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 294	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 313	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 314	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 315	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 316	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 317	Set Point: 35.6° F	95° F	154.4° F
RTD Simulator: S/N 318	Set Point: 35.6° F	95° F	154.4° F

RTD Simulator Temperature

Equivalent Set Point	Test Meter	Diff
35.60	35.7	.1
95.00	95.0	.0
154.40	154.4	.0

NOTES: _____

Procedure used: Procedure for Differential Pressure, Absolute Pressure and Temperature Calibration of AirData Multimeters SIP-CP01 Revision: 17 Dated: 12/10/15. There were no additions to or deviations from the calibration procedure during this calibration process.

This instrument has been calibrated using Calibration Standards which are traceable to NIST (National Institute of Standards and Technology). Test accuracy ratio is 4:1 for pressures and temperature. Quality Assurance Program and calibration procedures meet the requirements for ANSI/NCSL Z540-1, ISO 17025, MIL-STD 45662A and manufacturer's specifications. Calibration accuracy is certified when meters are used with properly functioning accessories only. All Uncertainties are expressed in expanded terms (twice the calculated uncertainty). This report shall not be reproduced, except in full, without the written approval of Shortridge Instruments, Inc. Results relate only to the item calibrated.

Limitations on use: See Shortridge Instruments, Inc. Instruction Manual for the use of AirData Multimeters

Any calibration due date shown is specified by the customer. The enclosed ADM Calibration Standards for Pressure and Temperature form is an integral part of this calibration and must remain with this Certificate of Calibration.

Calibration Technician(s): B. Lw Calibration Date: 02/24/2023

Calibration Approved by: M. Ramirez Title: Cal Mgr Date: 02/24/2023

Shortridge Instruments, Inc.
7855 East Redfield Road Scottsdale, Arizona 85260
(480) 991-6744 • Fax (480) 443-1267 • www.shortridge.com

Shortridge Instruments, Inc. AirData Multimeter Calibration Equipment

Order Number: 230186 Serial Number: M22572 Test Type: (Initial) As-Received Final

ABSOLUTE PRESSURE STANDARDS

ADM #02-R	S/N: 41741/42451	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/28/22	Due Date: 06/2023
ADM #04-R	S/N: 41743/42453	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/19/21	Due Date: 02/2023
ADM #06-R	S/N: 41742/42452-1	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #08-R	S/N: 42186/43328	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/26/22	Due Date: 05/2023
ADM #10-R	S/N: 42203/43352	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #12A-R	S/N: 45605/48491	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/01/22	Due Date: 08/2023
ADM #14-R	S/N: 43412/45043-2	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/28/22	Due Date: 09/2023
ADM #16-R	S/N: 43413/45044	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 01/27/22	Due Date: 03/2023
ADM #18-R	S/N: 44581/46845	Heise Model: PPM-2	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/26/21	Due Date: 11/2022
ADM #20-R	S/N: 44582/46847	Heise Model: PPM-2	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/07/22	Due Date: 07/2023

#02-R, 04-R, 06-R, 08-R, 10-R, 12A-R, 14-R, 16-R	Rated Accuracy: 0.05% fs (0.0305 in Hg)	Range: 0-30 psia	Resolution: 0.01	Uncertainty: < 0.0358
#18-R, 20-R	Rated Accuracy: 0.05% fs (0.0305 in Hg)	Range: 0-60 in Hg	Resolution: 0.001	Uncertainty: < 0.0358

DIFFERENTIAL PRESSURE STANDARDS

ADM #01-L	S/N: 41739/42449	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/28/22	Due Date: 06/2023
ADM #01-R	S/N: 41739/42446	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/29/22	Due Date: 06/2023
ADM #02-L	S/N: 41741/42454	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/28/22	Due Date: 06/2023
ADM #03A-L	S/N: 45570/48461	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/24/21	Due Date: 02/2023
ADM #03A-R	S/N: 45570/48460	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/24/21	Due Date: 02/2023
ADM #04-L	S/N: 41743/42456	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/23/21	Due Date: 02/2023
ADM #05-L	S/N: 41740/42450	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #05-R	S/N: 41740/42447	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #06-L	S/N: 41742/42455	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #07-L	S/N: 42185/42186	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/29/22	Due Date: 05/2023
ADM #07-R	S/N: 42185/43326	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/29/22	Due Date: 05/2023
ADM #08-L	S/N: 42186/43329	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/28/22	Due Date: 05/2023
ADM #09-L	S/N: 42202/43351	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #09-R	S/N: 42202/43350	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #10-L	S/N: 42203/43353	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #11-L	S/N: 43165/44551-1	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/04/22	Due Date: 08/2023
ADM #11-R	S/N: 43165/44730	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/04/22	Due Date: 08/2023
ADM #12A-L	S/N: 45605/48490-1	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/03/22	Due Date: 08/2023
ADM #13-L	S/N: 43415/45041	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 10/11/22	Due Date: 09/2023
ADM #13-R	S/N: 43415/45039	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 10/11/22	Due Date: 09/2023
ADM #14-L	S/N: 43412/45045	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 10/11/22	Due Date: 09/2023
ADM #15-L	S/N: 43416/45042	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 02/07/22	Due Date: 03/2023
ADM #15-R	S/N: 43416/45040-1	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 02/07/22	Due Date: 03/2023
ADM #16-L	S/N: 43413/45046	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 02/07/22	Due Date: 03/2023
ADM #17-L	S/N: 44579/46842	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/29/21	Due Date: 11/2022
ADM #17-R	S/N: 44579/46841	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/29/21	Due Date: 11/2022
ADM #18-L	S/N: 44581/46846	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/29/21	Due Date: 11/2022
ADM #19-L	S/N: 44580/46844	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/14/22	Due Date: 07/2023
ADM #19-R	S/N: 44580/46843	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/14/22	Due Date: 07/2023
ADM #20-L	S/N: 44582/46848	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/14/22	Due Date: 07/2023

#01-L, 03A-L, 05-L, 07-L, 09-L, 11-L, 13-L, 15-L, 17-L, 19-L	Rated Accuracy: > 0.07% fs (0.000175 in wc)	Range: 0.0-0.25 in wc	Res.: 0.00001	Uncertainty: < 0.00035
#01-R, 03A-R, 05-R, 07-R, 09-R, 11-R, 13-R, 15-R, 17-R, 19-R	Rated Accuracy: > 0.06% fs (0.003 in wc)	Range: 0.0-5.0 in wc	Res.: 0.0001	Uncertainty: < 0.00348
#02-L, 04-L, 06-L, 08-L, 10-L, 12A-L, 14-L, 16-L, 18-L, 20-L	Rated Accuracy: > 0.06% fs (0.03 in wc)	Range: 0.0-50.0 in wc	Res.: 0.001	Uncertainty: < 0.0346

Shortridge Instruments, Inc.
7855 East Redfield Road Scottsdale, Arizona 85260
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Shortridge Instruments, Inc. AirData Multimeter Calibration Equipment

Customer Order Number, Meter Serial Number, and Test Type are referenced on page 1

LOW VELOCITY EQUIVALENT CONFIRMATION STANDARDS

Vel Eqv Transfer Standard S/N: M02009	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 08/16/22	Due Date: 08/2023
Vel Eqv Transfer Standard S/N: M02903	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 12/28/22	Due Date: 12/2023
Vel Eqv Transfer Standard S/N: M10839	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 10/26/22	Due Date: 10/2023
Vel Eqv Transfer Standard S/N: M10840	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 10/26/22	Due Date: 10/2023
Vel Eqv Transfer Standard S/N: M10897	Model ADM-870C	Mfg'd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 01/25/23	Due Date: 01/2024
Vel Eqv Transfer Standard S/N: M10901	Model ADM-870C	Mfg'd & Calibrated by Shortridge Instruments, inc.	Calibration Date: 12/29/22	Due Date: 12/2023
Vel Eqv Transfer Standard S/N: M13492	Model ADM-870C	Mfg'd & Calibrated by Shortridge Instruments, inc.	Calibration Date: 08/16/22	Due Date: 08/2023
Vel Eqv Transfer Standard S/N: M19325	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 06/30/22	Due Date: 06/2023
Rated Accuracy: Velocity ± 1.5 % ± 3.5 fpm		Range: 100-5000 fpm Resolution: 0.1	Uncertainty: <5.00 fpm at 100 fpm; <7.50 fpm at 500 fpm	

TEMPERATURE STANDARDS

RTD Simulator S/N: 249	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 04/02/20	Due Date: 03/2024
RTD Simulator S/N: 250	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 04/02/20	Due Date: 03/2024
RTD Simulator S/N: 253	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 04/02/20	Due Date: 03/2024
RTD Simulator S/N: 254	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/04/20	Due Date: 04/2024
RTD Simulator S/N: 256	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/04/20	Due Date: 04/2024
RTD Simulator S/N: 257	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/04/20	Due Date: 04/2024
RTD Simulator S/N: 292	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 01/03/20	Due Date: 01/2024
RTD Simulator S/N: 293	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 01/03/20	Due Date: 01/2024
RTD Simulator S/N: 294	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 01/03/20	Due Date: 01/2024
RTD Simulator S/N: 313	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 03/25/22	Due Date: 03/2026
RTD Simulator S/N: 314	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 03/25/22	Due Date: 03/2026
RTD Simulator S/N: 315	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 03/25/22	Due Date: 03/2026
RTD Simulator S/N: 316	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 06/06/22	Due Date: 05/2026
RTD Simulator S/N: 317	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/23/22	Due Date: 05/2026
RTD Simulator S/N: 318	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/23/22	Due Date: 05/2026
Rated Accuracy: 0.025% of setting		Range: 100.00 Ω to 11111.10 Ω		Resolution: 0.01 Ω	Uncertainty: ≤ 32 ppm

Thermometer #1 S/N 8A089/Thermistor S/N A410660	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 02/24/22	Due Date: 02/2024
Thermometer #2 S/N 8B104/Thermistor S/N 871507	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 12/07/22	Due Date: 11/2024
Thermometer #5 S/N B11780/Thermistor S/N B10505	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 05/16/22	Due Date: 05/2024
Thermometer #6 S/N B11782/Thermistor S/N B10509	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 06/09/22	Due Date: 06/2024
Thermometer #7 S/N B49938/Thermistor S/N B482202	Model 1504/5610	Mfgd and Calibrated by Fluke		Calibration Date: 10/13/21	Due Date: 10/2023
Rated Accuracy(combined): 0.0324° F		Range: 32° F to 176° F	Resolution: 0.001° F	Combined Uncertainty with Baths: ≤ 0.040° F	

Temp Transfer Standard S/N M00136	Model ADM-870	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 10/26/22	Due Date: 10/2023
Temp Transfer Standard S/N M96100	Model ADM-870	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 03/15/22	Due Date: 03/2023
Rated Accuracy: 0.03° F	Range: 33° F to 158° F	Resolution: 0.01° F	Uncertainty: < 0.023° F	

Total combined Uncertainty for MultiTemp and TemProbe testing : ≤ 0.046° F

This form must remain with the Certificate of Calibration corresponding to the Customer Order Number and Meter Serial Number referenced on page 1.

Shortridge Instruments, Inc.
7855 East Redfield Road Scottsdale, Arizona 85260
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TEMPROBES CALIBRATION TEST REPORT

Customer ID: 022037 Multimeter Serial Number: M22572

Customer: BISON ENGINEERING, INC. City: HELENA State: MT Order #: 230186

Test By: B. L Date: 02/15/2023 Calibration Due Date: 02/2025

Rh: 26 % Ambient Temperature: 71 ° F Barometric Pressure 28.44 in Hg

TEMPERATURE TEST (° F) TEMPROBE TOLERANCE = ± 0.3° F
TEMPROBE MODEL NUMBER: ADT442 TEMPROBE ID#: TP-M22572

Test(s) with Customer's Meter ☐ Test(s) with In-house Temperature Calibration Standard ☑ All Within Specification Yes ☑ No ☐

Temperature Standard Thermometer #1 S/N 8A089 / Thermistor S/N A410660	Set Point: (35° F) 95° F 155° F
Temperature Standard Thermometer #2 S/N 8B104 / Thermistor S/N 871507	Set Point: 35° F 95° F 155° F
Temperature Standard Thermometer #5 S/N B11780 / Thermistor S/N B10505	Set Point: 35° F 95° F (155° F)
Temperature Standard Thermometer #6 S/N B11782 / Thermistor S/N B10509	Set Point: 35° F 95° F 155° F
Temperature Standard Thermometer #7 S/N B49938 / Thermistor S/N B482202	Set Point: 35° F (95° F) 155° F
Temperature Standard AirData Multimeter S/N M00136	Set Point: 35° F 95° F 155° F
Temperature Standard AirData Multimeter S/N M96100	Set Point: (35° F) (95° F) (155° F)

Approx Set Point	Uncertainty ° F	Thermometer/Thermistor ° F	TemProbe ° F	Offset ° F
35 ° F	0.00324	35.0	35.0	.0
95 ° F	0.00324	95.0	94.9	-.1
155 ° F	0.00324	155.0	155.1	.1

TEMPERATURE TEST (° F) TEMPROBE TOLERANCE = ± 0.3° F
TEMPROBE MODEL NUMBER: ADT446 TEMPROBE ID#: TP-M22572

Test(s) with Customer's Meter ☐ Test(s) with In-house Temperature Calibration Standard ☑ All Within Specification Yes ☑ No ☐

Temperature Standard Thermometer #1 S/N 8A089 / Thermistor S/N A410660	Set Point: (35° F) 95° F 155° F
Temperature Standard Thermometer #2 S/N 8B104 / Thermistor S/N 871507	Set Point: 35° F 95° F 155° F
Temperature Standard Thermometer #5 S/N B11780 / Thermistor S/N B10505	Set Point: 35° F 95° F (155° F)
Temperature Standard Thermometer #6 S/N B11782 / Thermistor S/N B10509	Set Point: 35° F 95° F 155° F
Temperature Standard Thermometer #7 S/N B49938 / Thermistor S/N B482202	Set Point: 35° F (95° F) 155° F
Temperature Standard AirData Multimeter S/N M00136	Set Point: 35° F 95° F 155° F
Temperature Standard AirData Multimeter S/N M96100	Set Point: (35° F) (95° F) (155° F)

Approx Set Point	Uncertainty ° F	Thermometer/Thermistor ° F	TemProbe ° F	Offset ° F
35 ° F	0.00324	35.0	35.0	.0
95 ° F	0.00324	95.0	95.0	.0
155 ° F	0.00324	155.0	155.1	.1

Procedure used: Procedure for Calibration/Recalibration of MultiTemps and/or TemProbes SIP-CP14 Rev: 03 Dated: 07/31/14. There were no additions to or deviations from the calibration procedure during this calibration process.

Calibration standards used by Shortridge Instruments, Inc. are traceable to NIST (National Institute of Standards and Technology). Calibration is performed in accordance with ANSI/NCSL Z540-1, ISO 17025, MIL-STD 45662A and manufacturer's specifications. Calibration accuracy is certified when meters are used with properly functioning accessories only. This report shall not be reproduced, except in full, without the written approval of Shortridge Instruments, Inc. Results relate only to the item calibrated. Limitations on use: See Shortridge Instruments, Inc. Instruction Manual for the use of AirData Multimeters.

The enclosed ADM or HDM Calibration Standards form(s) is/are an integral part of this calibration and must remain with this Certificate of Calibration. Any calibration due date shown is specified by the customer.

Calibration Approved by: M. Ramirez Title: Cal Mgr. Date: 02/24/2023

Shortridge Instruments, Inc.
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Shortridge Instruments, Inc. AirData Multimeter Calibration Equipment

Order Number: 230186 Serial Number: TP-M22572 Test Type: (Initial) As-Received Final

ABSOLUTE PRESSURE STANDARDS

ADM #02-R	S/N: 41741/42451	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/28/22	Due Date: 06/2023
ADM #04-R	S/N: 41743/42453	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/19/21	Due Date: 02/2023
ADM #06-R	S/N: 41742/42452-1	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #08-R	S/N: 42186/43328	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/26/22	Due Date: 05/2023
ADM #10-R	S/N: 42203/43352	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #12A-R	S/N: 45605/48491	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/01/22	Due Date: 08/2023
ADM #14-R	S/N: 43412/45043-2	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/28/22	Due Date: 09/2023
ADM #16-R	S/N: 43413/45044	Heise Model: PPM-2	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 01/27/22	Due Date: 03/2023
ADM #18-R	S/N: 44581/46845	Heise Model: PPM-2	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/26/21	Due Date: 11/2022
ADM #20-R	S/N: 44582/46847	Heise Model: PPM-2	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/07/22	Due Date: 07/2023

#02-R, 04-R, 06-R, 08-R, 10-R, 12A-R, 14-R, 16-R	Rated Accuracy: 0.05% fs (0.0305 in Hg)	Range: 0-30 psia	Resolution: 0.01	Uncertainty: < 0.0358
#18-R, 20-R	Rated Accuracy: 0.05% fs (0.0305 in Hg)	Range: 0-60 in Hg	Resolution: 0.001	Uncertainty: < 0.0358

DIFFERENTIAL PRESSURE STANDARDS

ADM #01-L	S/N: 41739/42449	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/28/22	Due Date: 06/2023
ADM #01-R	S/N: 41739/42446	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/29/22	Due Date: 06/2023
ADM #02-L	S/N: 41741/42454	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 04/28/22	Due Date: 06/2023
ADM #03A-L	S/N: 45570/48461	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/24/21	Due Date: 02/2023
ADM #03A-R	S/N: 45570/48460	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/24/21	Due Date: 02/2023
ADM #04-L	S/N: 41743/42456	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 11/23/21	Due Date: 02/2023
ADM #05-L	S/N: 41740/42450	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #05-R	S/N: 41740/42447	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #06-L	S/N: 41742/42455	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 09/01/22	Due Date: 09/2023
ADM #07-L	S/N: 42185/42186	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/29/22	Due Date: 05/2023
ADM #07-R	S/N: 42185/43326	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/29/22	Due Date: 05/2023
ADM #08-L	S/N: 42186/43329	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/28/22	Due Date: 05/2023
ADM #09-L	S/N: 42202/43351	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #09-R	S/N: 42202/43350	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #10-L	S/N: 42203/43353	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 03/07/22	Due Date: 04/2023
ADM #11-L	S/N: 43165/44551-1	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/04/22	Due Date: 08/2023
ADM #11-R	S/N: 43165/44730	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/04/22	Due Date: 08/2023
ADM #12A-L	S/N: 45605/48490-1	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 08/03/22	Due Date: 08/2023
ADM #13-L	S/N: 43415/45041	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 10/11/22	Due Date: 09/2023
ADM #13-R	S/N: 43415/45039	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 10/11/22	Due Date: 09/2023
ADM #14-L	S/N: 43412/45045	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 10/11/22	Due Date: 09/2023
ADM #15-L	S/N: 43416/45042	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 02/07/22	Due Date: 03/2023
ADM #15-R	S/N: 43416/45040-1	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 02/07/22	Due Date: 03/2023
ADM #16-L	S/N: 43413/45046	Heise Model: PPM-1	Mfgd by Dresser Industries	Calibrated by Ashcroft	Calibration Date: 02/07/22	Due Date: 03/2023
ADM #17-L	S/N: 44579/46842	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/29/21	Due Date: 11/2022
ADM #17-R	S/N: 44579/46841	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/29/21	Due Date: 11/2022
ADM #18-L	S/N: 44581/46846	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 10/29/21	Due Date: 11/2022
ADM #19-L	S/N: 44580/46844	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/14/22	Due Date: 07/2023
ADM #19-R	S/N: 44580/46843	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/14/22	Due Date: 07/2023
ADM #20-L	S/N: 44582/46848	Heise Model: PPM-1	Mfgd & Calibrated by Ashcroft, Inc.		Calibration Date: 07/14/22	Due Date: 07/2023

#01-L, 03A-L, 05-L, 07-L, 09-L, 11-L, 13-L, 15-L, 17-L, 19-L	Rated Accuracy: > 0.07% fs (0.000175 in wc)	Range: 0.0-0.25 in wc	Res.: 0.00001	Uncertainty: < 0.00035
#01-R, 03A-R, 05-R, 07-R, 09-R, 11-R, 13-R, 15-R, 17-R, 19-R	Rated Accuracy: > 0.06% fs (0.003 in wc)	Range: 0.0-5.0 in wc	Res.: 0.0001	Uncertainty: < 0.00348
#02-L, 04-L, 06-L, 08-L, 10-L, 12A-L, 14-L, 16-L, 18-L, 20-L	Rated Accuracy: > 0.06% fs (0.03 in wc)	Range: 0.0-50.0 in wc	Res.: 0.001	Uncertainty: < 0.0346

Customer Order Number, Meter Serial Number, and Test Type are referenced on page 1

LOW VELOCITY EQUIVALENT CONFIRMATION STANDARDS

Vel Eqv Transfer Standard S/N: M02009	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 08/16/22	Due Date: 08/2023
Vel Eqv Transfer Standard S/N: M02903	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 12/28/22	Due Date: 12/2023
Vel Eqv Transfer Standard S/N: M10839	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 10/26/22	Due Date: 10/2023
Vel Eqv Transfer Standard S/N: M10840	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 10/26/22	Due Date: 10/2023
Vel Eqv Transfer Standard S/N: M10897	Model ADM-870C	Mfg'd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 01/25/23	Due Date: 01/2024
Vel Eqv Transfer Standard S/N: M10901	Model ADM-870C	Mfg'd & Calibrated by Shortridge Instruments, inc.	Calibration Date: 12/29/22	Due Date: 12/2023
Vel Eqv Transfer Standard S/N: M13492	Model ADM-870C	Mfg'd & Calibrated by Shortridge Instruments, inc.	Calibration Date: 08/16/22	Due Date: 08/2023
Vel Eqv Transfer Standard S/N: M19325	Model ADM-870C	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 06/30/22	Due Date: 06/2023

Rated Accuracy: Velocity ± 1.5 % ± 3.5 fpm Range: 100-5000 fpm Resolution: 0.1 Uncertainty: <5.00 fpm at 100 fpm; <7.50 fpm at 500 fpm

TEMPERATURE STANDARDS

RTD Simulator S/N: 249	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 04/02/20	Due Date: 03/2024
RTD Simulator S/N: 250	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 04/02/20	Due Date: 03/2024
RTD Simulator S/N: 253	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 04/02/20	Due Date: 03/2024
RTD Simulator S/N: 254	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/04/20	Due Date: 04/2024
RTD Simulator S/N: 256	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/04/20	Due Date: 04/2024
RTD Simulator S/N: 257	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/04/20	Due Date: 04/2024
RTD Simulator S/N: 292	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 01/03/20	Due Date: 01/2024
RTD Simulator S/N: 293	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 01/03/20	Due Date: 01/2024
RTD Simulator S/N: 294	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 01/03/20	Due Date: 01/2024
RTD Simulator S/N: 313	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 03/25/22	Due Date: 03/2026
RTD Simulator S/N: 314	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 03/25/22	Due Date: 03/2026
RTD Simulator S/N: 315	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 03/25/22	Due Date: 03/2026
RTD Simulator S/N: 316	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 06/06/22	Due Date: 05/2026
RTD Simulator S/N: 317	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/23/22	Due Date: 05/2026
RTD Simulator S/N: 318	Model RTD-1000/500	Mfgd by General Resistance	Calibrated by IET Labs	Calibration Date: 05/23/22	Due Date: 05/2026

Rated Accuracy: 0.025% of setting Range: 100.00 Ω to 11111.10 Ω Resolution: 0.01 Ω Uncertainty: ≤ 32 ppm

Thermometer #1 S/N 8A089/Thermistor S/N A410660	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 02/24/22	Due Date: 02/2024
Thermometer #2 S/N 8B104/Thermistor S/N 871507	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 12/07/22	Due Date: 11/2024
Thermometer #5 S/N B11780/Thermistor S/N B10505	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 05/16/22	Due Date: 05/2024
Thermometer #6 S/N B11782/Thermistor S/N B10509	Model 1504/5610	Mfgd by Hart Scientific	Calibrated by Fluke	Calibration Date: 06/09/22	Due Date: 06/2024
Thermometer #7 S/N B49938/Thermistor S/N B482202	Model 1504/5610	Mfgd and Calibrated by Fluke		Calibration Date: 10/13/21	Due Date: 10/2023

Rated Accuracy(combined): 0.0324° F Range: 32° F to 176° F Resolution: 0.001° F Combined Uncertainty with Baths: ≤ 0.040° F

Temp Transfer Standard S/N M00136	Model ADM-870	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 10/26/22	Due Date: 10/2023
Temp Transfer Standard S/N M96100	Model ADM-870	Mfgd & Calibrated by Shortridge Instruments, Inc.	Calibration Date: 03/15/22	Due Date: 03/2023

Rated Accuracy: 0.03° F Range: 33° F to 158° F Resolution: 0.01° F Uncertainty: < 0.023° F

Total combined Uncertainty for MultiTemp and TemProbe testing : ≤ 0.046° F

This form must remain with the Certificate of Calibration corresponding to the Customer Order Number and Meter Serial Number referenced on page 1.

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This is the last page of the report.