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Graham, NC 27253
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Air Balance Report

**Biscuitville- Cameron
1608 NC 24-87
Cameron, NC**

June 2019

Prepared for:

Duggins Mechanical
3125 Tucker Street
Burlington, NC

Engineer:

National Restaurant Designers

Architect:

National Restaurant Designers

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Phone: 336-229-1470

Fax: 336-578-5378



June 2019

Duggins Mechanical
3125 Tucker Street
Burlington, NC

Referenced Project:

Biscuitville- Cameron
1608 NC 24-87
Cameron, NC

Attention: Jeff Duggins

Please find enclosed the balancing report which details the results of the testing and balancing that was completed at the above referenced site. The scope of work included testing and adjusting the airflow produced by the HVAC equipment to within design specifications provided to us. All systems were inspected for proper equipment, installation and operation. All systems were also balanced to within +/- 10 % unless noted otherwise.

Any questions and/or concerns regarding any data found within this report, please do not hesitate to contact the undersigned.

Danny Ange
Airflow Experts, Inc.



P.O. Box 1079
Graham, NC 27253
Phone: 336.229.1470
Fax: 336.578.5378
Email: sales@airflowexperts.com

CERTIFICATION

PROJECT: Biscuitville- Cameron

ADDRESS: 1608 NC 24-87
Cameron, NC

This is to certify that Airflow Experts Inc. has balanced the systems described herein to their optimum performance capabilities. The testing and balancing has been performed in accordance with the standard requirements and procedures of the Associated Air Balance Council and the results of these tests are herein recorded.

Associated Air Balance Council Certification Number: 17-05-106

June 13, 2019

Date

Donald James Clarke

Test and Balance Engineer





Air Apparatus Report



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Report Date: 04 Jun 2019

Unit Data

System/Unit:	RTU-1	Manufacturer:	AAON
Area Served:	KITCHEN	Model Number:	RN-011-8-0-B60C-112
		Serial Number:	201904-ANEZ18935

Motor Data

Service Factor:	1.15			<u>Nameplate</u>		
Motor Manufacturer:	WEG	Rated Amps:		5.9/2.9		
		Rated Volts:		230/460		
HP/Frame:	<u>Design</u> 2.00	<u>Actual</u> 2.0 / 182T		<u>L1</u>	<u>L2</u>	<u>L3</u>
RPM:	NA	1150	Operating Amps:	4.0	VFD	DISPLAY
Phase/Hz:	3/60	3/60	Operating Volts:	209	VFD	DISPLAY

Fan Data

	<u>Design</u>	<u>Actual</u>		<u>Design</u>	<u>Actual</u>
Supply Air CFM:	3000	3045	Fan Total S.P.(in.):	1.05	1.07
Outside Air CFM:	250	261	External S.P.(in.):	0.79	0.76
Return Air CFM:	1550	2784	Fan RPM:	1142	DD
Total Outlet Air CFM:	3000	3045			
Provisioning for Maintaining Minimum Ventilation Rate:				ECONOMIZER	
Normal Setpoint to Maintain Minimum Ventilation Rate:				AS SET	

Other Data

	<u>Actual</u>		<u>Actual</u>
Motor Sheave OD/Bore:	DD / DD	Fan Sheave OD/Bore:	DD / DD
Motor Sheave Bushing:	DD	Fan Sheave Bushing:	DD
Number of Belts:	DD	Sheave Center Dist.:	DD
Belt Size (in.):	DD	Fan Type:	BACKWARD INCLINE

Test Apparatus

Electric Test Apparatus:	Fluke 902	Serial Number:	23980194
Rotational Test Apparatus:	Shimpo DT-205L	Serial Number:	C29B0070
Outside Air Test Apparatus:	Alnor EBT721	Serial Number:	90702008

Remarks

VFD speed set to 52Hz. Return air total = Return air diffusers + MUA-1 DT-1.



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

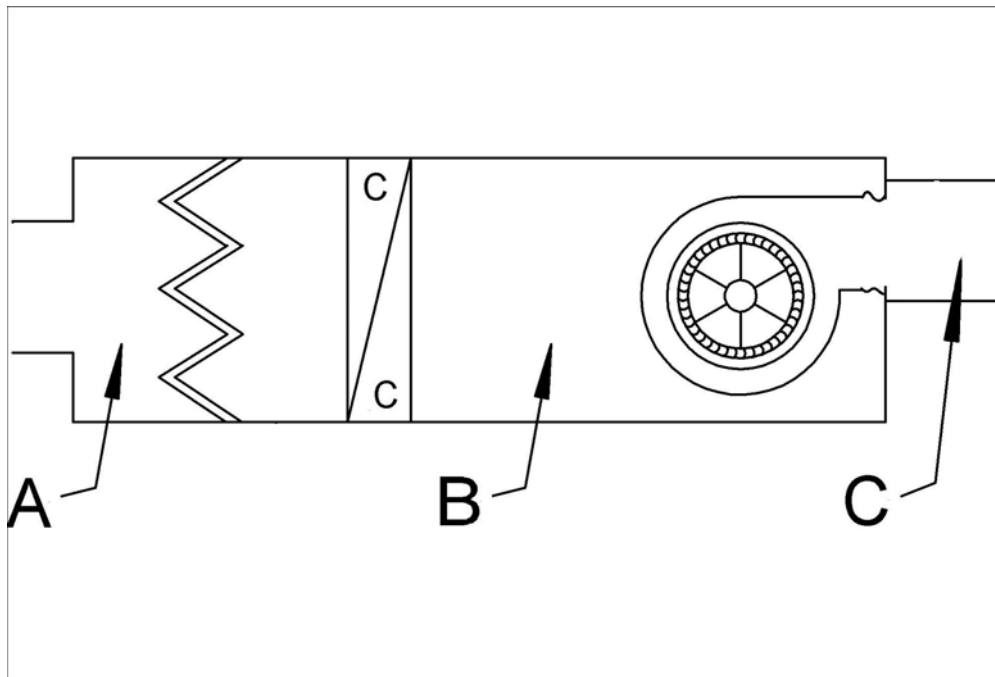
Date: 04 Jun 2019

V. Static Pressure Measurements (SOP CVSP-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

TEST DATA	Specified	Initial	Final
Unit E.S.P.:	<u>0.79</u>	<u>NA</u>	<u>0.76</u>
Supply Fan T.S.P.:	<u>1.05</u>	<u>NA</u>	<u>1.07</u>

System Diagram



LOCATION	A	B	C	D	E	F	G	H	I	J	K	L	M
FINAL	-0.40	-0.71	+0.36										

Notes & Observations:



UNIT #
RTU-1 OA

Phone: 336-229-1470
Fax: 336-578-5378



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Date: 04 Jun 2019

Duct Traverse Test Report

System/Unit: RTU-1 OA Service: OUTSIDE AIR
 Location/Zone: ROOF Altitude: 0 FT
 Density: 0.075 Corr. Factor: 1.00
 Test Apparatus: Digital Balometer Manufacturer: Alnor
 Model: EBT721 Serial: 90702008 Cal. Date/Due: 21 Aug 2018 / 20 Aug 2019

Duct			Design		As Found		Final	
Width	46	in.	SCFM	250	SCFM	261	SCFM	261
Depth	24	in.	CFM	250	CFM	261	CFM	261
Area	7.67	ft ²	FPM	33	FPM	34	FPM	34
Air Temp	70	°F	S.P.	NA "W.C.	S.P.	NA "W.C.	S.P.	NA "W.C.

Reading	1	2	3	4	5	6	7	8	9	10	11
Distance from Duct Edge											
1	28	34	30	37							
2	41	47	32	23							
3											
4											
5											
6											
7											
8											
9											
10											
11											

Velocity Subtotals	69	81	62	60							
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Average Velocity = $\frac{272}{8}$ (Velocity Total) = 34 FPM (# of Readings)

Air Volume = 7.67 X 34 = 261 CFM

Notes & Observations:



Project: Biscuitville- Cameron

Report No: None

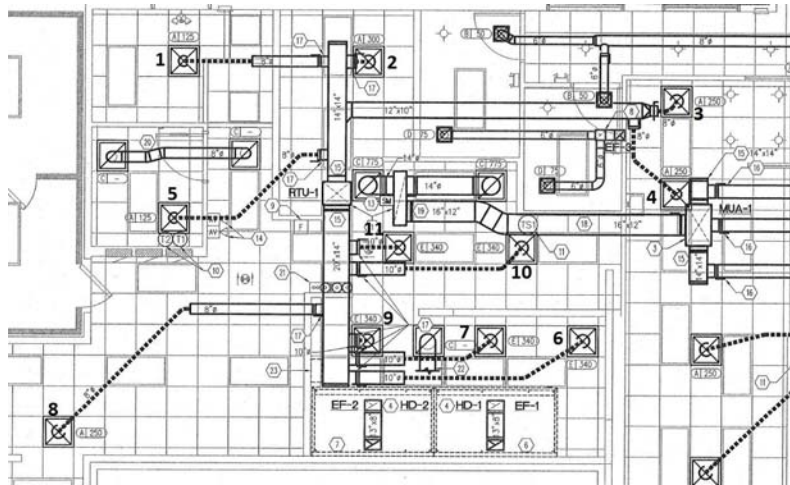
Test Performed By: Danny Ange

Date: 04 Jun 2019

Balancing of Terminal Air Devices (SOP: TAD-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

System Diagram



Air Outlet Terminal				OUTLET			
				Design	Preliminary	Final	
NO.	Area Served	Type	Size	CFM	Test 1	CFM	%
SUPPLY							
01	KITCHEN	A	8	125	215	127	102%
02	KITCHEN	A	10	300	417	306	102%
03	KITCHEN	A	8	250	225	244	98%
04	KITCHEN	A	8	250	212	250	100%
05	KITCHEN	A	8	125	158	120	96%
06	KITCHEN	E	10	340	380	338	99%
07	KITCHEN	E	10	340	442	349	103%
08	KITCHEN	A	8	250	369	255	102%
09	KITCHEN	E	10	340	365	352	104%
10	KITCHEN	E	10	340	309	356	105%
11	KITCHEN	E	10	340	315	348	102%
TOTAL				3000	3407	3045	101%



Project: Biscuitville- Cameron

Report No: None

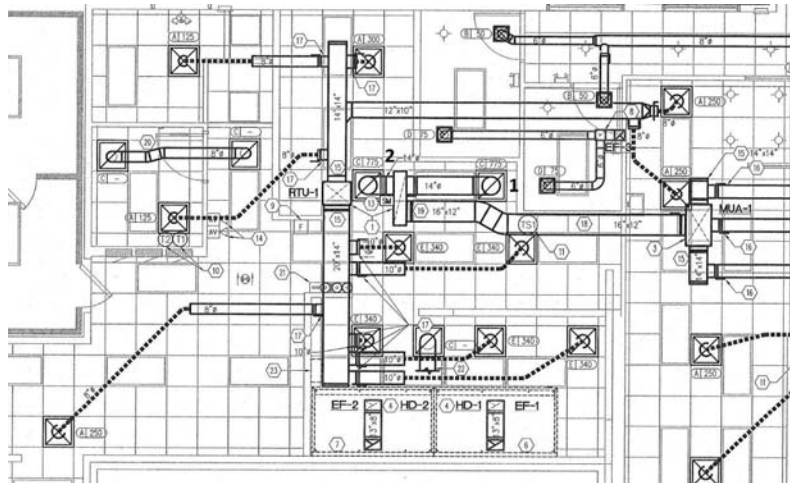
Test Performed By: Danny Ange

Date: 04 Jun 2019

Balancing of Terminal Air Devices (SOP: TAD-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

System Diagram



Air Outlet Terminal				OUTLET		
				Design	Final	
NO.	Area Served	Type	Size	CFM	CFM	%
RETURN						
01	KITCHEN	C	14	775	748	97%
02	KITCHEN	C	14	775	741	96%
	TOTAL			1550	1489	96%



Air Apparatus Report



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Report Date: 04 Jun 2019

Unit Data			
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System/Unit:	RTU-2	Manufacturer:	AAON
Area Served:	DINING	Model Number:	RN-009-8-0-B60C-122
		Serial Number:	201904-ANEQ18936

Motor Data						
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Service Factor:	1.15				<u>Nameplate</u>	
Motor Manufacturer:	WEG	Rated Amps:		5.9/2.9		
		Rated Volts:		230/460		
HP/Frame:	<u>Design</u>	<u>Actual</u>		<u>L1</u>	<u>L2</u>	<u>L3</u>
RPM:	2.00	2.0 / 182T		3.8	VFD	DISPLAY
Phase/Hz:	NA	1150	Operating Amps:	210	VFD	DISPLAY
	3/60	3/60	Operating Volts:			

Fan Data					
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	<u>Design</u>	<u>Actual</u>		<u>Design</u>	<u>Actual</u>
Supply Air CFM:	3000	2826	Fan Total S.P.(in.):	1.00	1.03
Outside Air CFM:	250	261	External S.P.(in.):	0.72	0.73
Return Air CFM:	1550	2565	Fan RPM:	1139	DD
Total Outlet Air CFM:	2850	2826			
Provisioning for Maintaining Minimum Ventilation Rate:	ECONOMIZER				
Normal Setpoint to Maintain Minimum Ventilation Rate:	AS SET				

Other Data			
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	<u>Actual</u>		<u>Actual</u>
Motor Sheave OD/Bore:	DD / DD	Fan Sheave OD/Bore:	DD / DD
Motor Sheave Bushing:	DD	Fan Sheave Bushing:	DD
Number of Belts:	DD	Sheave Center Dist.:	DD
Belt Size (in.):	DD	Fan Type:	BACKWARD INCLINE

Test Apparatus			
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Electric Test Apparatus:	Fluke 902	Serial Number:	23980194
Rotational Test Apparatus:	Shimpo DT-205L	Serial Number:	C29B0070
Outside Air Test Apparatus:	Alnor EBT721	Serial Number:	90702008

Remarks

VFD speed set to 53Hz. Return air total = Return air diffusers + MUA-1 DT-2, 3 & 4.



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

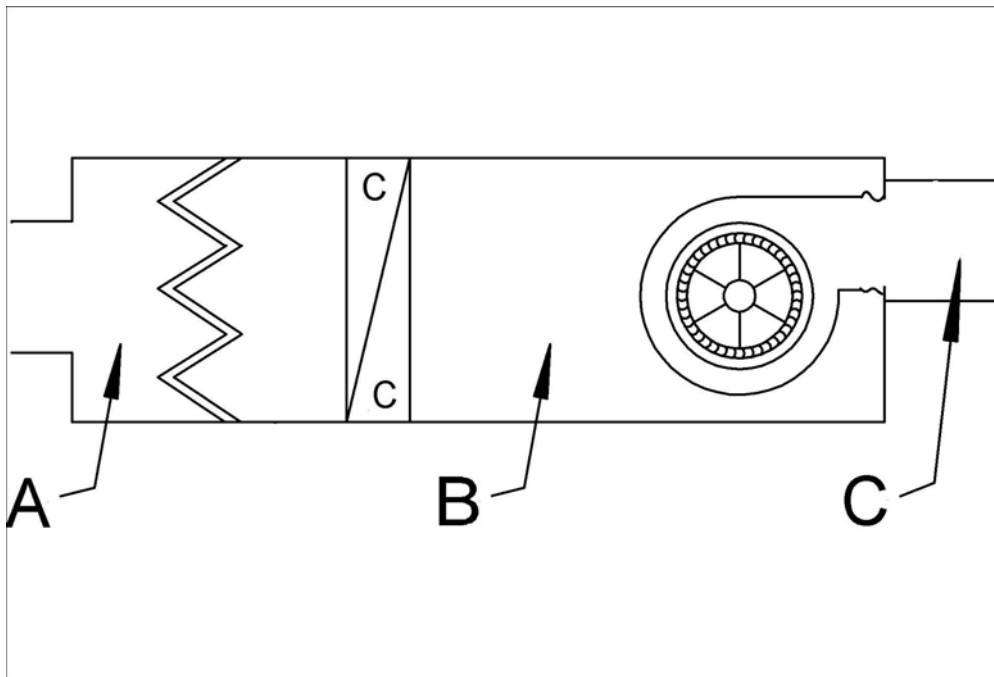
Date: 04 Jun 2019

V. Static Pressure Measurements (SOP CVSP-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

TEST DATA	Specified	Initial	Final
Unit E.S.P.:	<u>0.72</u>	<u>NA</u>	<u>0.73</u>
Supply Fan T.S.P.:	<u>1.00</u>	<u>NA</u>	<u>1.03</u>

System Diagram



LOCATION	A	B	C	D	E	F	G	H	I	J	K	L	M
FINAL	-0.43	-0.73	+0.30										

Notes & Observations:



UNIT #
RTU-2 OA

Phone: 336-229-1470
Fax: 336-578-5378



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Date: 04 Jun 2019

Duct Traverse Test Report

System/Unit: RTU-2 OA Service: OUTSIDE AIR
 Location/Zone: ROOF Altitude: 0 FT
 Density: 0.075 Corr. Factor: 1.00
 Test Apparatus: Digital Balometer Manufacturer: Alnor
 Model: EBT721 Serial: 90702008 Cal. Date/Due: 21 Aug 2018 / 20 Aug 2019

Duct			Design		As Found		Final	
Width	46	in.	SCFM	250	SCFM	261	SCFM	261
Depth	24	in.	CFM	250	CFM	261	CFM	261
Area	7.67	ft ²	FPM	33	FPM	34	FPM	34
Air Temp	70	°F	S.P.	NA "W.C.	S.P.	NA "W.C.	S.P.	NA "W.C.

Reading	1	2	3	4	5	6	7	8	9	10	11
Distance from Duct Edge											
1	43	41	29	27							
2	40	38	30	24							
3											
4											
5											
6											
7											
8											
9											
10											
11											

Velocity Subtotals	83	79	59	51							
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Average Velocity = $\frac{272}{8}$ (Velocity Total) = 34 FPM (# of Readings)

Air Volume = 7.67 X 34 = 261 CFM

Notes & Observations:

Project: Biscuitville- Cameron

Report No: None

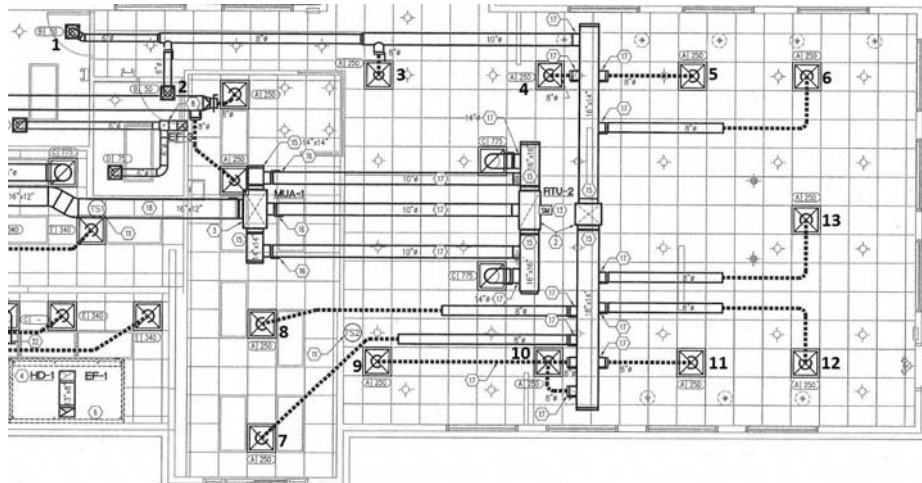
Test Performed By: Danny Ange

Date: 04 Jun 2019

Balancing of Terminal Air Devices (SOP: TAD-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

System Diagram



Air Outlet Terminal				OUTLET			
				Design	Preliminary	Final	
NO.	Area Served	Type	Size	CFM	Test 1	CFM	%
SUPPLY							
01	RESTROOM	B	6	50	63	50	100%
02	RESTROOM	B	6	50	71	51	102%
03	DINING	A	8	250	368	260	104%
04	DINING	A	8	250	340	253	101%
05	DINING	A	8	250	392	247	99%
06	DINING	A	8	250	328	239	96%
07	DRIVE THRU	A	8	250	329	247	99%
08	DRIVE THRU	A	8	250	347	255	102%
09	DINING	A	8	250	328	239	96%
10	DINING	A	8	250	331	240	96%
11	DINING	A	8	250	310	246	98%
12	DINING	A	8	250	286	251	100%



Project: Biscuitville- Cameron

Report No: None

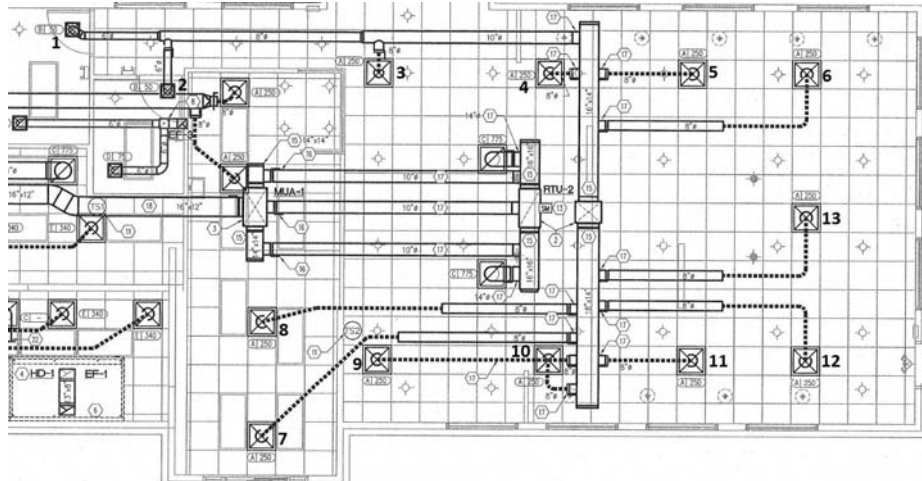
Test Performed By: Danny Ange

Date: 04 Jun 2019

Balancing of Terminal Air Devices (SOP: TAD-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

System Diagram



Air Outlet Terminal				OUTLET			
				Design	Preliminary	Final	
NO.	Area Served	Type	Size	CFM	Test 1	CFM	%
SUPPLY							
13	DINING	A	8	250	230	248	99%
	TOTAL			2850	3723	2826	99%



Project: Biscuitville- Cameron

Report No: None

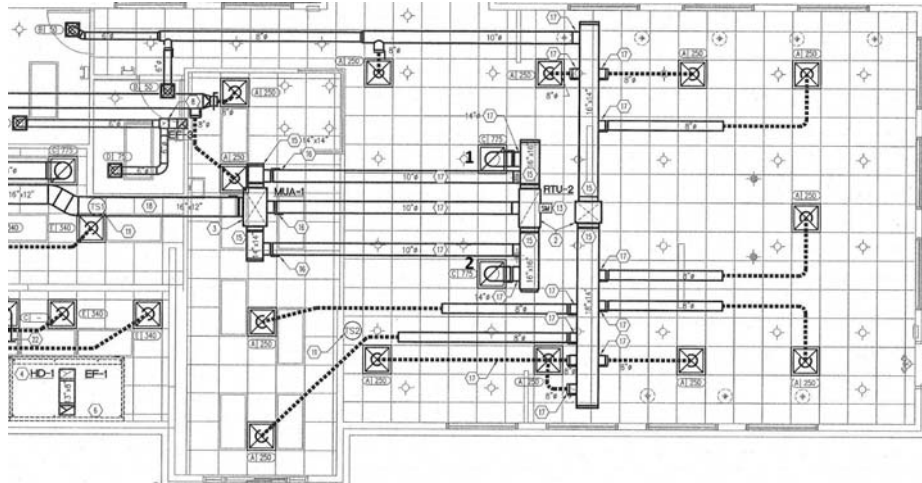
Test Performed By: Danny Ange

Date: 04 Jun 2019

Balancing of Terminal Air Devices (SOP: TAD-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

System Diagram



Air Outlet Terminal				OUTLET		
				Design	Final	
NO.	Area Served	Type	Size	CFM	CFM	%
RETURN						
01	DINING	C	14	700	691	99%
02	DINING	C	14	700	682	97%
	TOTAL			1400	1373	98%



Fan Report



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Report Date: 04 Jun 2019

Unit Data

System/Unit:	MUA-1	Manufacturer:	AAON
Area Served:	RTU-1 / RTU-2	Model Number:	RN - 009-8-0-CA02-159
		Serial Number:	201904-ANEQ18937

Motor Data

Service Factor:	1.15	Nameplate			
Motor Manufacturer:	WEG	Rated Amps:	2.6/1.0		
	<u>Design</u>	<u>Actual</u>	Rated Volts:	230/460	
HP/Frame:	1.00	1.0 / 182T	<u>L1</u>	<u>L2</u>	<u>L3</u>
RPM:	NA	1075	Operating Amps:	2.0	VFD DISPLAY
Phase/Hz:	3/60	3/60	Operating Volts:	209	VFD DISPLAY

Fan Data

	<u>Design</u>	<u>Actual</u>		<u>Design</u>	<u>Actual</u>
Fan Air CFM:	2400	2487	Fan Total S.P.(in.):	0.71	0.87
Total Outlet CFM:	2400	2487	External S.P.(in.):	0.51	0.58
Fan Rpm:	925	DD			

Other Data

	<u>Actual</u>		<u>Actual</u>
Motor Sheave OD/Bore:	DD / DD	Fan Sheave OD/Bore:	DD / DD
Motor Sheave Bushing:	DD	Fan Sheave Bushing:	DD
Number of Belts:	DD	Sheave Center Dist.:	DD
Belt Size (in.):	DD	Type of Service:	MAKE UP AIR
Unit Type/Size/Arrangement/Class: CABINET FAN / 14" / INLINE / i			

Test Apparatus

Electric Test Apparatus:	Fluke 902	Serial Number:	23980194
Rotational Test Apparatus:	Shimpo DT-205L	Serial Number:	C29B0070
Airflow Test Apparatus:	Alnor EBT721	Serial Number:	90702008

Remarks



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

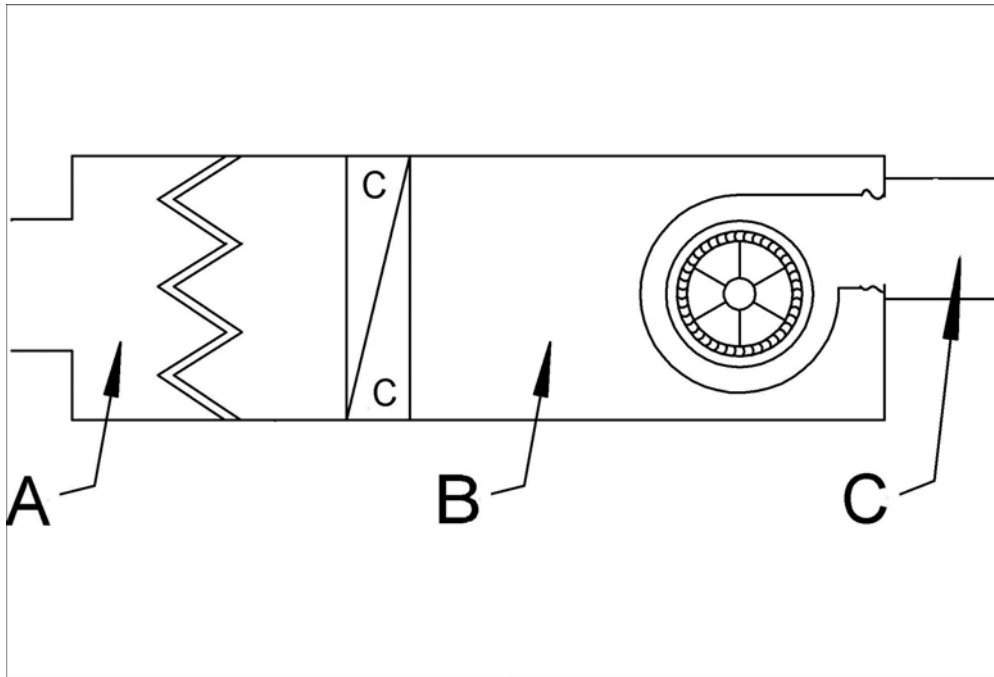
Date: 04 Jun 2019

V. Static Pressure Measurements (SOP CVSP-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

TEST DATA	Specified	Initial	Final
Unit E.S.P.:	<u>NA</u>	<u>NA</u>	<u>0.87</u>
Supply Fan T.S.P.:	<u>NA</u>	<u>NA</u>	<u>0.58</u>

System Diagram



LOCATION	A	B	C	D	E	F	G	H	I	J	K	L	M
Final	-0.30	-0.59	+0.28										

Notes & Observations:



UNIT #
MUA-1 DT-1

Phone: 336-229-1470
Fax: 336-578-5378



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Date: 04 Jun 2019

Duct Traverse Test Report

System/Unit: MUA-1 DT-1 Service: MAKE UP AIR
 Location/Zone: KITCHEN Altitude: 0FT
 Density: 0.075 Corr. Factor: 1.00
 Test Apparatus: Digital Balometer Manufacturer: Alnor
 Model: EBT721 Serial: 90702008 Cal. Date/Due: 21 Aug 2018 / 20 Aug 2019

Duct			Design		As Found		Final	
Width	16	in.	SCFM	1200	SCFM	1295	SCFM	1295
Depth	12	in.	CFM	1200	CFM	1295	CFM	1295
Area	1.33	ft ²	FPM	902	FPM	974	FPM	974
Air Temp	70	°F	S.P.	NA "W.C.	S.P.	0.17 "W.C.	S.P.	0.17 "W.C.

Reading	1	2	3	4	5	6	7	8	9	10	11
Distance from Duct Edge											
1	1053	1038	1011	1024							
2	1035	998	967	1002							
3	959	964	933	954							
4	927	902	920	895							
5											
6											
7											
8											
9											
10											
11											

Velocity Subtotals	3974	3902	3831	3875							
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Average Velocity = $\frac{15582}{16}$ (Velocity Total) = 974 FPM (# of Readings)

Air Volume = 1.33 X 974 = 1295 CFM

Notes & Observations:



Project: Biscuitville- Cameron

Report No: None

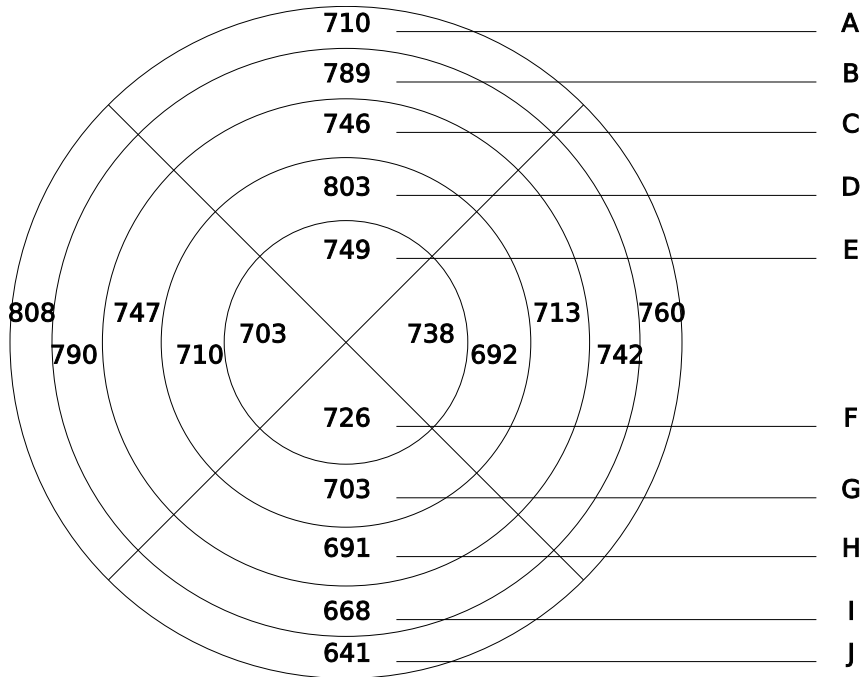
Test Performed By: Danny Ange

Date: 04 Jun 2019

Duct Traverse Test Report

System/Unit: MUA-1 DT-2 Service: MAKE UP AIR
 Location/Zone: DINING Altitude: 0FT
 Density: 0.075 Corr. Factor: 1.00
 Test Apparatus: Digital Balometer Manufacturer: Alnor
 Model: EBT721 Serial: 90702008 Cal. Date/Due: 21 Aug 2018 / 20 Aug 2019

Duct		Design		As Found		Final	
Diameter	10 in.	SCFM	400	SCFM	402	SCFM	402
		CFM	400	CFM	402	CFM	402
Area	.55 ft ²	FPM	727	FPM	731	FPM	731
Air Temp	70 °F	S.P.	NA "W.C.	S.P.	0.13 "W.C.	S.P.	0.13 "W.C.



Sample Locations	A	B	C	D	E	F	G	H	I	J

Velocity Subtotal 14629 Average Velocity 731 Measured Airflow 402

Notes & Observations:



Project: Biscuitville- Cameron

Report No: None

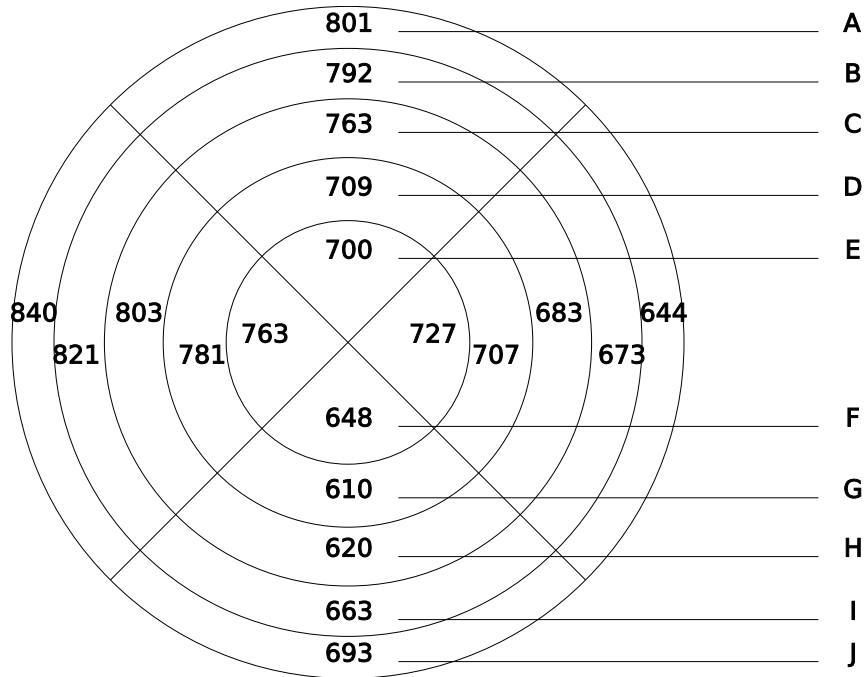
Test Performed By: Danny Ange

Date: 04 Jun 2019

Duct Traverse Test Report

System/Unit: <u>MUA-1 DT-3</u>	Service: <u>MAKE UP AIR</u>
Location/Zone: <u>DINING</u>	Altitude: <u>0FT</u>
Density: <u>0.075</u>	Corr. Factor: <u>1.00</u>
Test Apparatus: <u>Digital Balometer</u>	Manufacturer: <u>Alnor</u>
Model: <u>EBT721</u>	Serial: <u>90702008</u>
	Cal. Date/Due: <u>21 Aug 2018 / 20 Aug 2019</u>

Duct		Design		As Found		Final	
Diameter	10 in.	SCFM	400	SCFM	397	SCFM	397
		CFM	400	CFM	397	CFM	397
Area	.55 ft ²	FPM	727	FPM	722	FPM	722
Air Temp	70 °F	S.P.	NA "W.C.	S.P.	0.14 "W.C.	S.P.	0.14 "W.C.



Sample Locations	A	B	C	D	E	F	G	H	I	J

Velocity Subtotal 14441 **Average Velocity** 722 **Measured Airflow** 397

Notes & Observations:



Project: Biscuitville- Cameron

Report No: None

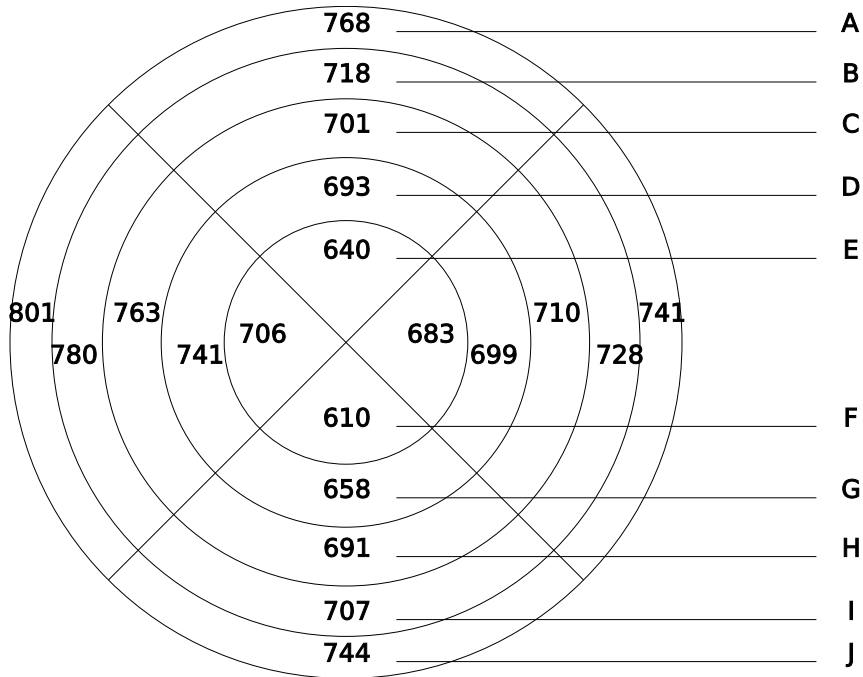
Test Performed By: Danny Ange

Date: 04 Jun 2019

Duct Traverse Test Report

System/Unit: MUA-1 DT-4 Service: MAKE UP AIR
 Location/Zone: DINING Altitude: 0FT
 Density: 0.075 Corr. Factor: 1.00
 Test Apparatus: Digital Balometer Manufacturer: Alnor
 Model: EBT721 Serial: 90702008 Cal. Date/Due: 21 Aug 2018 / 20 Aug 2019

Duct		Design		As Found		Final	
Diameter	10 in.	SCFM	400	SCFM	393	SCFM	393
		CFM	400	CFM	393	CFM	393
Area	.55 ft ²	FPM	727	FPM	714	FPM	714
Air Temp	70 °F	S.P.	NA "W.C.	S.P.	0.11 "W.C.	S.P.	0.11 "W.C.



Sample Locations	A	B	C	D	E	F	G	H	I	J

Velocity Subtotal 14282

Average Velocity 714

Measured Airflow 393

Notes & Observations:

Fan Report



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Report Date: 04 Jun 2019

Unit Data

System/Unit:	EF-1	Manufacturer:	FLOW AIRE
Area Served:	HOOD- 1	Model Number:	DV85H
		Serial Number:	3502859

Motor Data

Service Factor:	NA	<u>Nameplate</u>		
Motor Manufacturer:	US MOTORS	Rated Amps:	8.8	
		Rated Volts:	120	
HP/Frame:	0.75		<u>L1</u>	<u>L2</u>
			<u>L3</u>	
RPM:	NA	Operating Amps:	6.1	
Phase/Hz:	1/60	Operating Volts:	121	

Fan Data

	<u>Design</u>	<u>Actual</u>		<u>Design</u>	<u>Actual</u>
Fan Air CFM:	1224	1241	Fan Total S.P.(in.):	NA	1.01
Total Outlet CFM:	1224	1241	External S.P.(in.):	1.18	1.01
Fan Rpm:	1246	DD			

Other Data

	<u>Actual</u>		<u>Actual</u>
Motor Sheave OD/Bore:	DD / DD	Fan Sheave OD/Bore:	DD / DD
Motor Sheave Bushing:	DD	Fan Sheave Bushing:	DD
Number of Belts:	DD	Sheave Center Dist.:	DD
Belt Size (in.):	DD	Type of Service:	EXHAUST
Unit Type/Size/Arrangement/Class: CENTRIFUGAL / 16" / Upblast / I			

Test Apparatus

Electric Test Apparatus:	Fluke 902	Serial Number:	23980194
Rotational Test Apparatus:	Shimpo DT-205L	Serial Number:	C29B0070
Airflow Test Apparatus:	Alnor EBT721	Serial Number:	90702008

Remarks

Design static pressure = 0.15"; Actual = 0.151"



Fan Report



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Report Date: 04 Jun 2019

Unit Data

System/Unit:	EF-2	Manufacturer:	FLOW AIRE
Area Served:	HOOD - 2	Model Number:	DV85H
		Serial Number:	3502859

Motor Data

Service Factor:	NA			Nameplate		
Motor Manufacturer:	US MOTORS	Rated Amps:	8.8			
	<u>Design</u>	<u>Actual</u>	Rated Volts:	120		
HP/Frame:	0.75	3/4 / NA		<u>L1</u>	<u>L2</u>	<u>L3</u>
RPM:	NA	1800	Operating Amps:	6.2		
Phase/Hz:	1/60	1/60	Operating Volts:	120		

Fan Data

	<u>Design</u>	<u>Actual</u>		<u>Design</u>	<u>Actual</u>
Fan Air CFM:	1213	1182	Fan Total S.P.(in.):	NA	1.00
Total Outlet CFM:	1213	1182	External S.P.(in.):	1.06	1.00
Fan Rpm:	1194	DD			

Other Data

	<u>Actual</u>		<u>Actual</u>
Motor Sheave OD/Bore:	DD / DD	Fan Sheave OD/Bore:	DD / DD
Motor Sheave Bushing:	DD	Fan Sheave Bushing:	DD
Number of Belts:	DD	Sheave Center Dist.:	DD
Belt Size (in.):	DD	Type of Service:	EXHAUST
Unit Type/Size/Arrangement/Class: CENTRIFUGAL / 16" / Upblast / I			

Test Apparatus

Electric Test Apparatus:	Fluke 902	Serial Number:	23980194
Rotational Test Apparatus:	Shimpo DT-205L	Serial Number:	C29B0070
Airflow Test Apparatus:	Alnor EBT721	Serial Number:	90702008

Remarks

Design static pressure = 0.15"; Actual = 0.148"



Fan Report



Project: Biscuitville- Cameron

Report No: None

Test Performed By: Danny Ange

Report Date: 04 Jun 2019

Unit Data

System/Unit:	EF-3	Manufacturer:	FLOW AIRE
Area Served:	RESTROOMS	Model Number:	DR10H
		Serial Number:	3502859

Motor Data

Service Factor:	NA			Nameplate		
Motor Manufacturer:	HSSA	Rated Amps:		1.1		
	<u>Design</u>	<u>Actual</u>	Rated Volts:	115		
HP/Frame:	0.13	1/15 / NA		<u>L1</u>	<u>L2</u>	<u>L3</u>
RPM:	NA	1300	Operating Amps:	NA		
Phase/Hz:	1/60	1/60	Operating Volts:	121		

Fan Data

	<u>Design</u>	<u>Actual</u>		<u>Design</u>	<u>Actual</u>
Fan Air CFM:	150	150	Fan Total S.P.(in.):	NA	0.18
Total Outlet CFM:	150	150	External S.P.(in.):	0.25	0.18
Fan Rpm:	1095	DD			

Other Data

	<u>Actual</u>		<u>Actual</u>
Motor Sheave OD/Bore:	DD / DD	Fan Sheave OD/Bore:	DD / DD
Motor Sheave Bushing:	DD	Fan Sheave Bushing:	DD
Number of Belts:	DD	Sheave Center Dist.:	DD
Belt Size (in.):	DD	Type of Service:	EXHAUST
Unit Type/Size/Arrangement/Class: CENTRIFUGAL / 10" / DOWNBLAST / I			

Test Apparatus

Electric Test Apparatus:	Fluke 902	Serial Number:	23980194
Rotational Test Apparatus:	Shimpo DT-205L	Serial Number:	C29B0070
Airflow Test Apparatus:	Alnor EBT721	Serial Number:	90702008

Remarks



Project: Biscuitville- Cameron

Report No: None

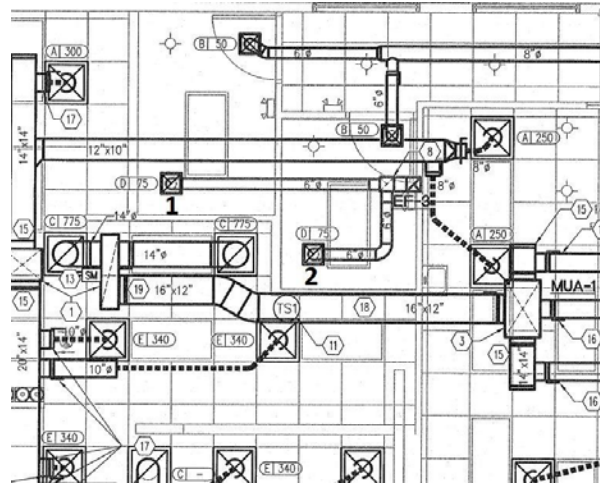
Test Performed By: Danny Ange

Date: 04 Jun 2019

Balancing of Terminal Air Devices (SOP: TAD-0100 TAB)

Test Apparatus: Digital Balometer
 Manufacturer: Alnor Model: EBT721
 Serial Number: 90702008 Cal. Date: 21 Aug 2018
 Cal. Due: 20 Aug 2019

System Diagram



Air Outlet Terminal				OUTLET		
				Design	Final	
NO.	Area Served	Type	Size	CFM	CFM	%
EXHAUST						
01	RESTROOM	D	6	75	74	99%
02	RESTROOM	D	6	75	76	101%
TOTAL				150	150	100%

REPORT ABBREVIATIONS

---	NOT APPLICABLE OR NOT AVAILABLE	GHR	GLYCOL-WATER HEATING RETURN	SAG	SUPPLY AIR DEVICE
"	INCHES	GHS	GLYCOL-WATER HEATING SUPPLY	SCR	SPEED CONTROLLER
°F	DEGREES FAHRENHEIT	GPH	GALLONS PER HOUR	SF	SERVICE FACTOR
'	FEET	GPM	GALLONS PER MINUTE	SP	STATIC PRESSURE
Δ	DELTA OR DIFFERENTIAL	GR	GRILLE	SQ FT	SQURE FEET
ΔP	PRESSURE DIFFERENTIAL	H	HEIGHT	SWR	SIDE WALL REGISTER
ΔS.P.	STATIC PRESSURE DIFFERENTIAL	"H2O	INCHES WATER COLUMN	SWSI	SINGLE WHEEL SINGLE INLET
ΔT.	TEMPERATURE DIFFERENTIAL	HD	HEAD	TA	TRANSFER AIR
AF	AIR FOIL	HOA	HAND OFF AUTOMATIC	TB	TERMINAL BOX
AHU	AIR HANDLING UNIT	HORIZ	HORIZONTAL	TC	TEMPERATURE CONTROL
AMP	AMPERES	HP	HEAT PUMP/HORSEPOWER	TD	TEMPERATURE DIFFERENTIAL
BAS	BUILDING AUTOMATION SYSTEM	HR	HOOR	TEMP	TEMPERATURE
BHP	BREAK HORSE POWER	HT	HEIGHT	TF	TRANSFER FAN
BI	BACKWARD INCLINE	HTG	HEATING	TFSP	TOTAL FAN STATIC PRESSURE
CD	CEILING DIFUSER	HTR	HEATER	TONS	TONS OF AIR CONDITIONING
CFLA	CORRECTED FULL LOAD AMPERES	HV	HEATING VENTILATING UNIT	TP	TOTAL PRESSURE
CFM	CUBIC FEET PER MINUTE	HVAC	HEATING VENTILATING AIR CONDITIONING	TS	TEMPERATURE SENSOR
CHW	CHILLED WATER	HW	HEATING WATER	TSP	TOTAL STATIC PRESSURE
CL	CENTER LINE	HZ	HERTZ(CYCLES PER SECOND)	T/T-STAT	THERMOSTAT
DB/WB	DRY BULB/WET BULB	JC	JANITOR CLOSET	TTT	TERMINAL (LEG)
DD	DIRECT DRIVE	MA	MIXED AIR	TU	TERMINAL UNIT
DIAM	DIAMETER	MAT	MIXED AIR TEMPERATURE	UH	UNIT HEATER
DWDI	DOUBLE WHEEL DOUBLE INLET	MECH	MECHANICAL	UV	UNIT VENTILATOR
EFF	EFFICIENCY	NA	NOT APPLICABLE OR NOT USED	V	VOLT
ELECT	ELECTRICAL	NL	NOT LISTED	VAV	VARIABLE AIR VOLUME
EMCS	ENERGY MANAGEMENT CONTROL SYS	NPSH	NET POSITIVE SUCTION HEAD	VAV	VARIABLE AIR VOLUME
ERU	ENERGY RECOVERY UNIT	NPSHR	NET POSITIVE SUCTION HEAD REQUIRED	VEL	VELOCITY
ESP	EXTERNAL STATIC PRESSURE	NS	NOT SPECIFIED	VENT	VENTILATION
EXT	EXTERNAL	OA	OUTSIDE AIR	VERT	VERTICAL
FC	FORWARD CURVE	OAT	OUTSIDE AIR TEMPERATURE	VFD	VARIABLE FREQUENCY DRIVE
FCU	FAN COIL UNIT	PF	POWER FACTOR	VM	VOLTMETER
FLA	FULL LOAD AMPERES	PRESS	PRESSURE	VOL	VOLUME
FME	FLOW MEASURING EQUIPMENT	PSI	POUNDS PER SQUARE INCH	VOLT	VOLTAGE (EMF)
FMS	FLOW MEASURING STATION	PSIA	POUNDS PER SQUARE INCH ABSOLUTE	VP	VELOCITY PRESSURE
FPM	FEET PER MINUTE	RA	RETURN AIR	VSMC	VARIABLE SPEED MOTOR CONTROLLER
FPS	FEET PER SECOND	RAG	RETURN AIR GRILL	W	WEST
FPTU	FAN POWERED TERMINAL UNIT	RAT	RETURN AIR TEMPERATURE	WB	WET BULB
FSD	FIRE/SMOKE DAMPER	REG	REGISTER	WC	WATER COLUMN
FT	FEET	RH	RELATIVE HUMIDITY	WFMD	WATER FLOW MEASURING DEVICE
FTR	FINNED TUBE RADIATION	RM	ROOM	WSHP	WATER SOURCE HEAT PUMP
GA	GUAGE	RPM	REVOLUTIONS PER MINUTE	WT	WEIGHT
GAL	GALLON	RR	RESTROOM	YD	YARD
GEN	GENERAL	RTU	ROOF TOP UNIT		
GF	GAS FURNACE	SA	SUPPLY AIR		



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CALIBRATION CERTIFICATE

MANUFACTURER: Fluke

MODEL NUMBER: 902

SERIAL NUMBER: 23980194

DESCRIPTION: HVAC Clamp Meter

PROPERTY OF: Airflow Experts Inc.

TEST PERFORMED BY: B.Cullen

TEST DATE: 12/28/18

TEMPERATURE: 23°C HUMIDITY: 45%

NEXT CALIBRATION DUE: 12/28/2019

CERTIFICATE NUMBER: 181228-1 Page 1 of 3

The above instrument was checked and calibrated against working standards which are traceable to the NIST and through NIST to the International System of Units (SI). The metrology procedures utilized conform to and satisfy the requirements of ISO/IEC 17025: 2005, ISO 10012-1, and ANSI/NCSL Z540.3-2006. The above instrument performance was determined using the specifications available from the manufacturer or some equivalent acceptable reference or PMC procedures specified in the QA manual. Expanded uncertainties represent uncertainties expressed at the 95% confidence level using a coverage factor of K=2. Although the item calibrated meets the specifications and performance at the time of calibration, due to any number of factors, the recommended due date of the item calibrated does not imply continuing conformance to specifications during the recommended interval. This certificate shall not be reproduced, except in full, without prior written approval of the laboratory.

Instrument Received: Within Tolerance

Instrument Returned: Within Tolerance

A handwritten signature in black ink, appearing to read "J. R. H. H. H.", is written over a horizontal line.

Authorized Signature



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STANDARDS PAGE

Property Of:	Airflow Experts Inc.
Certificate Number:	181228-1 Page 2 of 3
Manufacturer:	Fluke
Model Number:	902
Serial Number:	23980194
Test Date:	12/28/18
Temperature:	23 °C
Relative Humidity:	45%
Description:	HVAC Clamp Meter
Accuracy:	DCV+/-1% ACV+/-1% DCA+/-1% ACA+/-2% OHMS+/-1.5% TEMP+/-1% +.8 Deg C CAP+/-1.9%
Repair Status:	N/A
Calibration Specs:	Manufacturer

Standards Used

Manufacturer	Model Number	Serial Number	Cal Date	Cal Due	Description	Best Uncertainty
Fluke	5500A-SC600 OPT	6390007	10/12/18	10/2019	Multifunction Calibrator	DCV+/- .005% ACV+/- .04% DCA+/- .025% ACA+/- .05% OHMS+/- .0015% CAP+/- .25% FREQ+/- .0025% TEMP+/- .03 Deg C
HP	3458A	2823A12394	08/31/18	8/2019	Precision Multimeter	DCV+/- .0001% ACV+/- .004% DCA+/- .0025% ACA+/- .002% OHMS+/- .0001%

Applicable NIST Tests

AC Current- 350424, 401367, 811/249920-92, 2300010062, AC Voltage- 350424, 401367, 811/249920-92, 2300010062; 2300008356; 2300008946, Capacitance- 1700202840; 811/261196-99, DC Current- 350424, 401367, 811/249920-92, DC Voltage- 350424, 401367, 811/249920-92, 2300010062, 2300010061, Resistance- 811/249920-92; 2300010062; 1700210871, 1700210357; 811/261431-99, Temperature- 401367; 238455; 130734; 37488-40832



Airflow Experts Inc.

TEST REPORT

Certificate No: 181228-1
 Page 3 of 3

Calibration Data

	Standard	Before	After		Standard	Before	After
1	DCV 1.9	1.8	Same As Received	26			
2	600	599.7	SAR	27			
3	ACV 1.9	1.9	SAR	28			
4	600	599.6	SAR	29			
5	ACA 100	100.1	SAR	30			
6	200	201.1	SAR	31			
7	400	403.9	SAR	32			
8	500	504.9	SAR	33			
9	DCuA 50	49.9	SAR	34			
10	100	100.0	SAR	35			
11	150	149.9	SAR	36			
12	200	199.9	SAR	37			
13	Deg C -10.00	-16.2	SAR	38			
14	100.00	99.7	SAR	39			
15	200.00	199.7	SAR	40			
16	300.00	299.6	SAR	41			
17	400.00	399.5	SAR	42			
18	OHMS 100	100.4	SAR	43			
19	1K	1003	SAR	44			
20	9.9K	9906	SAR	45			
21	CAP 100 uF	99.7	SAR	46			
22	1000 uF	996	SAR	47			
23				48			
24				49			
25				50			



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CALIBRATION CERTIFICATE

MANUFACTURER: Alnor

MODEL NUMBER: EBT-721

SERIAL NUMBER: 90702008

DESCRIPTION: Balometer

PROPERTY OF: Airflow Experts Inc.

TEST PERFORMED BY: B.Cullen

TEST DATE: 08/21/18

TEMPERATURE: 23°C **HUMIDITY:** 45%

NEXT CALIBRATION DUE: 08/21/2019

CERTIFICATE NUMBER: 180821-2 Page 1 of 2

The above instrument was checked and calibrated against working standards which are traceable to the NIST and through NIST to the International System of Units (SI). The metrology procedures utilized conform to and satisfy the requirements of ISO/IEC 17025: 2005, ISO 10012-1, and ANSI/NCSL Z540.3-2006. The above instrument performance was determined using the specifications available from the manufacturer or some equivalent acceptable reference or PMC procedures specified in the QA manual. Expanded uncertainties represent uncertainties expressed at the 95% confidence level using a coverage factor of K=2. Although the item calibrated meets the specifications and performance at the time of calibration, due to any number of factors, the recommended due date of the item calibrated does not imply continuing conformance to specifications during the recommended interval. This certificate shall not be reproduced, except in full, without prior written approval of the laboratory.

Instrument Received: Within Tolerance

Instrument Returned: Within Tolerance

A handwritten signature in black ink, appearing to read "J. R. Cullen", written in a cursive style.

Authorized Signature



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STANDARDS PAGE

Property Of:	Airflow Experts Inc.
Certificate Number:	180821-2 Page 2 of 2
Manufacturer:	Alnor
Model Number:	EBT-721
Serial Number:	90702008
Test Date:	08/21/18
Temperature:	23 °C
Relative Humidity:	45%
Description:	Balometer
Accuracy:	Air Flow+/-3% FS Temp+/- .5 Deg F RH+/-3%
Repair Status:	N/A
Calibration Specs:	Manufacturer

Standards Used

Manufacturer	Model Number	Serial Number	Cal Date	Cal Due	Description	Best Uncertainty
Timeter Instrument Corporation	RT-200	P13J	02/10/18	2/2019	Calibration Analyzer	0 to 3 LPM +/-1 Digit 0 to 5 LPM +/-2 Digits 5 to 180 LPM +/-1 Digit -15 to 100 PSI +/-1 Digit -20 to 185mm Hg +/-2 Digits
Beta	321A	2071175	08/08/18	8/2020	Precision Pressure Calibrator	0-300 PSI+/- .11 PSI 0-3000 PSI+/-1.1 PSI
Fisher Scientific	14-649-6	20234990	06/02/17	6/2020	Precision Stop Watch	+/- .0003%

Applicable NIST Tests

DC Voltage- 350424; 401367; 811/249820-92; 2300010062; 2300010061, Frequency- WWVB; 2300009707, Humidity- Saturated Salt Solutions, Pressure- 42455; 821/229629; 821/316451; 737/236653; 52/236653; QSP-A012; MMAP822/LA, Temperature- 401367; 238455; 130734; 37488-40832



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CALIBRATION CERTIFICATE

MANUFACTURER: Shimpo

MODEL NUMBER: DT-205L

SERIAL NUMBER: C29B0070

DESCRIPTION: Contact / Noncontact Tachometer

PROPERTY OF: Airflow Experts Inc.

TEST PERFORMED BY: B.Cullen

TEST DATE: 12/28/18

TEMPERATURE: 23°C HUMIDITY: 45%

NEXT CALIBRATION DUE: 12/28/2019

CERTIFICATE NUMBER: 181228-4 Page 1 of 2

The above instrument was checked and calibrated against working standards which are traceable to the NIST and through NIST to the International System of Units (SI). The metrology procedures utilized conform to and satisfy the requirements of ISO/IEC 17025: 2005, ISO 10012-1, and ANSI/NCSL Z540.3-2006. The above instrument performance was determined using the specifications available from the manufacturer or some equivalent acceptable reference or PMC procedures specified in the QA manual. Expanded uncertainties represent uncertainties expressed at the 95% confidence level using a coverage factor of K=2. Although the item calibrated meets the specifications and performance at the time of calibration, due to any number of factors, the recommended due date of the item calibrated does not imply continuing conformance to specifications during the recommended interval. This certificate shall not be reproduced, except in full, without prior written approval of the laboratory.

Instrument Received: Within Tolerance

Instrument Returned: Within Tolerance

A handwritten signature in black ink, appearing to read "J. R. H. H. H.", written in a cursive style.

Authorized Signature



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TEST REPORT

Property Of:	Airflow Experts Inc.
Certificate Number:	181228-4 Page 2 of 2
Manufacturer:	Shimpo
Model Number:	DT-205L
Serial Number:	C29B0070
Test Date:	12/28/18
Temperature:	23 °C
Relative Humidity:	45%
Description:	Contact / Noncontact Tachometer
Accuracy:	+/- .006% +/-1 Digit
Repair Status:	N/A
Calibration Specs:	Manufacturer

Calibration Data

	Standard	Before	After		Standard	Before	After
1	FPM 10,000	10	Same As Received	7	60,000	60,003	SAR
2	100.00	100	SAR	8	80,000	80,003	SAR
3	1000.0	1000	SAR	9			
4	10,000	10,000	SAR	10			
5	20,000	20,001	SAR	11			
6	40,000	40,002	SAR	12			

Standards Used

Manufacturer	Model Number	Serial Number	Cal Date	Cal Due	Description	Best Uncertainty
Anritsu	MF2414B	6200357597	11/04/18	11/2020	Microwave Frequency Counter	10 Hz to 600 MHz +/-4.5X10 ⁻⁹ MHz 600 MHz to 40 GHz +/-3X10 ⁻⁸ GHz
Monarch	Tach-4A	1132684	09/18/18	9/2021	Precision Tachometer	+/- .0015% of rdg
Fisher Scientific	14-649-6	20234990	06/02/17	6/2020	Precision Stop Watch	+/- .0003%

Applicable NIST Tests

Frequency- WWVB, 2300009707