Report By:

National TAB
1329 E. KEMPER ROAD
SUITE 4210
CINCINNATI, OH 45246

Report: Anderson GME (Cincinnati, OH)

Function: Test, Adjust, & Balance

Date: 07/13/2023

PROJECT

Anderson GME (Cincinnati, OH)

8000 FIVE MILE RD

CINCINNATI, OH

Client

Mechanical Optimizers

2145 Patterson Street

Cincinnati, OH 45214

National TAB

Project: Anderson GME (Cincinnati, OH)

Table Of Contents

Section	Page #
Certification	3
Equipment Calibrations	4
Abbreviations	5
Summary	6

CERTIFICATION

PROJECT: Anderson GME (Cincinnati, OH)

The data presented in this report is a record of system measurements and final adjustments that have been obtained in accordance with the current edition of the NEBB *Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.* Any variances from design quantities, which exceed NEBB tolerances, are noted in the Test-Adjust-Balance Report Project Summary.

The air distribution system has been tested and balanced and final adjustments have been made in accordance with NEBB standards and the project specifications.

NEBB TAB FIRM:	National TAB
REGISTRATION NO:	3629
CERTIFIED BY:	Joe Hertenstein
DATE:	7/7/2023

The hydronic distribution system has been tested and balanced and final adjustments have been made in accordance with NEBB standards and the project specifications.

NEBB TAB FIRM:	National TAB
REGISTRATION NO:	3629
CERTIFIED BY:	Joe Hertenstein
DATE:	

Submitted and Certified by:

NEBB TAB FIRM:	National TAB
TAB PROFESSIONAL:	Joe Hertenstein
SIGNATURE:	Joe Hertenstein
REGISTRATION NO:	3629
CERTIFICATION EXP:	12/31/2023

National TAB

Testing, Adjusting, and Balancing Equipment

Function		Range	Minimum Accuracy	Instrument Information	Calibration Date	Date Due
AIR	AIR PRESSURE	0 in wg to 10 in wg	2% +/- 0.001 in wg	TSI Alnor EBT 731 S/N EBT732044025	11/17/2022	11/17/2023
	AIR VELOCITY INSTRUMENT	50 fpm to 3900 fpm	+/- 5 % +/- 7 fpm	TSI Alnor EBT 731 S/N EBT732044025	11/17/2022	11/17/2023
	DIRECT HOOD READING	100 cfm to 2000 cfm	+/- 5 % +/- 7 cfm	TSI Alnor EBT 731 S/N EBT732044025	11/17/2022	11/17/2023
TEMPERATURE	AIR METER	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - SRH77A S/N 071118034	6/6/2023	6/6/2024
	AIR PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - PD1388 7-6 S/N 5028	6/6/2023	6/6/2024
	IMMERSION METER	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - SRH77A S/N 071118034	6/6/2023	6/6/2024
	IMMERSION PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - PD1388 7-6 S/N 1075	6/6/2023	6/6/2024
	CONTACT METER	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - SRH77A S/N 071118034	6/6/2023	6/6/2024
	CONTACT PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - PD1388 7-6 S/N 4011	6/6/2023	6/6/2024
HUMIDITY	HUMIDITY PROBE	10 % RH to 90 % RH	3% of reading	Cooper ATKINS - SRH77A S/N 071118034	6/6/2023	6/6/2024
ELECTRICAL	VOLTAGE MEASUREMENT	0 VAC to 600 VAC	2 % reading +/- 5 digits	Fluke 373 True RMS, S/N: 33290686	6/1/2023	6/1/2024
	AMPERAGE MEASUREMENT	0 Amperers to 100 Amperes	2 % reading +/- 5 digits	Fluke 373 True RMS, S/N: 33290686	6/1/2023	6/1/2024
ROTATION	ROTATION MEASUREMENT	60 rpm to 5000 rpm	2 % reading 2 rpm	SHIMPO DT-207LR S/N: D1530081R	6/1/2023	6/1/2024
HYDRONIC	PRESSURE MEASUREMENT	-30 in Hg to 200 psi	±2% of reading +/- 1 psi	Alnor HM675 S/N: 72214041	5/2023	5/2024
	DIFFERENTIAL PRESSURE MEASUREMENT	0 psi - 80 psi	±2% of reading +/- 1 psi	Alnor HM675 S/N: 72214041	5/2023	5/2024

Abbreviation List

A = Area (ft^2)	S.F. = Service Factor
AHU = Air Handling Unit	SF = Supply Fan
A_k = Effective Area	SP = Static Pressure
BHP = Brake Horsepower (IP) HP	SR = Supply Register
Btu = British Thermal Unit	T = Temperature
Btu/h = Btuh = BTUH = BTU/Hour	T_{ma} = Mixed Air Temperature
CL = Center Distance (used in belt formula)	T_{oa} = Outside Air Temperature
CD = Ceiling Diffuser	T_{ra} = Return Air Temperature
CF = Correction Factor	H = Head (in wc, ft wc, psi)
CFM = Volumetric Flow: Cubic Feet Per Minute	h = Enthalpy
CO2 = Carbon Dioxide	HP = Horsepower
CO = Carbon Monoxide	hr = Hour
C_v = Flow Constant	K_v = Flow constant (SI)
d = Diameter (in.) IP	kW = Kilowatt = 1000 Watts
Δ = Difference or Change (Final - Initial)	LAT = Leaving Air Temperature
DB = Dry Bulb	lb = Pounds
EA = Exhaust Air	LWT = Leaving Water Temperature
EAT = Entering Air Temperature	ma = Mixed Air
EF = Exhaust Fan	MIN = Minimum
Eff = Efficiency	MAX = Maximum
EG = Exhaust Grille	N/A = Not Applicable
ESP = External Static Pressure	NA = No Access
EWT = Entering Water Temperature	NL = Not Listed
°F = Degrees Fahrenheit, °F	NPSHA = Net Positive Suction Head Available
FPB = Fan Powered Box	NS = Not Specified
FLA = Full Load Amps	OA = Outside Air
fpm = Feet per Minute (fpm)	OAT = Outside Air Temperature
ft = Foot	PD = Sheave Pitch Diameter
gal = Gallons	P.D. = Pressure Drop
GPM = Gallons Per Minute (GPM)	PF = Power Factor
h = Enthalpy (BTU/lb dry air)	SG = Supply Grille
P = Pressure	SR = Supply Register
ppm = parts per million	TP = Total Pressure
psi = Pounds Per Square Inch	T_{ra} = Return Air Temperature
psid = PSI Differential	TS = Tip Speed (fpm) IP, (m/s) SI
r = Radius (in)	TSP = Total Static Pressure
$\%_{ra}$ = % of Return Air	V = Velocity
RA = Return Air	VAV = Variable Air Volume
RAT = Return Air Temperature	VD = Volume Damper
RF = Return Fan	VFD = Variable Frequency Drive
RG = Return Grille	W = Watt
RH = Relative Humidity	WB = Wet Bulb
RPM = Revolutions Per Minute	wg = wc = water gauge = water column
RTU = Roof Top Unit	WHP = Water Horsepower (IP)
SA = Supply Air	ω = Humidity Ratio

National TAB

Project: Anderson GME

Address: 8000 Five Mile Rd. Cincinnati, OH

Summary

Work performed includes balancing VAV, associated air devices, and (4) Exhaust grilles. All work was able to be successfully balanced within 10% of design.

National TAB

Project: Anderson GME

Address: 8000 Five Mile Rd. Cincinnati, OH

Asset: VAV's (EXISTING)

Asset	Area Served	Type	Size	Design Max CFM	Actual Max CFM	Ak (max)
VAV-1	104	VAV	8	490	481	0.63
VAV-2	101	VAV	8	425	431	0.86
VAV-3	108	VAV	14	1550	1531	0.38
VAV-4	131	VAV	10	1325	1365	0.57
VAV-5	128	VAV	12	1730	1775	0.76
VAV-6	115	VAV	14	1805	1826	0.69
VAV-8	120	VAV	6	375	383	0.61
VAV-10	142	VAV	8	250	254	1.31

National TAB

Project: Anderson GME

Address: 8000 Five Mile Rd. Cincinnati, OH

Asset: SUPPLY

Asset	Area Served	Type	Size	DESIGN CFM	Prelim CFM	FINAL CFM	% to design
1-1	103	CD	8	225	115	217	0.96
1-2	104	CD	8	225	171	222	0.99
1-3	105	CD	6	40	148	42	1.05
VAV-1				**490**		**481**	**0.98**
2-1	101	CD	8	125	225	118	0.94
2-2	101	CD	8	125	0	126	1.01
2-3	104	CD	8	125	236	133	1.06
2-4	HALL	CD	6	50	209	54	1.08
VAV-2				**425**		**431**	**1.01**
3-1	108	CD	10	250	184	237	0.95
3-2	131	CD	10	200	226	202	1.01
3-3	108	CD	10	225	215	240	1.07
3-4	106	CD	10	325	201	317	0.98
3-5	106	CD	10	300	184	289	0.96
3-6	131	CD	10	250	192	246	0.98
VAV-3				**1550**		**1531**	**0.99**
4-1	131	CD	10	300	412	320	1.07
4-2	131	CD	10	300	218	317	1.06
4-3	131	CD	6	125	0	118	0.94
4-4	131	CD	6	125	311	124	0.99
4-5 [1]	[2]	CD	6	50	76	49	0.98
4-6	131	CD	6	125	140	126	1.01
4-7	HALL	CD	6	50	28	52	1.04
4-8	144	CD	6	100	0	101	1.01
4-9 [1]	HALL	CD	6	50	145	52	1.04
4-10	140	CD	6	50	88	55	1.10
4-11 [1]	[2]	CD	6	50	101	51	1.02
VAV-4				**1325**		**1365**	**1.03**

National TAB

Project: Anderson GME

Address: 8000 Five Mile Rd. Cincinnati, OH

Asset: SUPPLY

Asset	Area Served	Type	Size	DESIGN CFM	Prelim CFM	FINAL CFM	% to design
5-1	131	CD	10	250	287	262	1.05
5-2	131	CD	10	275	329	289	1.05
5-3	109	CD	8	100	127	104	1.04
5-4	109	CD	6	90	162	91	1.01
5-5	130	CD	6	75	55	77	1.03
5-6	109	CD	8	100	0	105	1.05
5-7	129	CD	8	125	148	117	0.94
5-8	128	CD	6	80	118	84	1.05
5-9	127	CD	6	80	88	77	0.96
5-10	136	CD	6	100	71	105	1.05
5-11	126	CD	6	75	96	76	1.01
5-12	109	CD	6	90	75	85	0.94
5-13	125	CD	6	40	23	42	1.05
5-14	137	CD	6	100	124	103	1.03
5-15	138	CD	6	75	97	80	1.07
5-16	124	CD	6	75	88	78	1.04
VAV-5				**1730**		**1775**	**1.03**
6-1	116	CD	8	275	315	262	0.95
6-2	116	CD	8	275	295	269	0.98
6-3	117	CD	8	225	280	233	1.04
6-4	119	CD	8	250	267	271	1.08
6-5	119	CD	8	250	215	254	1.02
6-6	115	CD	8	115	194	119	1.03
6-7	114	CD	4	25	30	23	0.92
6-8	113	CD	8	100	116	107	1.07
6-9	112	CD	6	80	128	82	1.03
6-10	111	CD	6	80	92	78	0.98
6-11	110	CD	6	80	99	75	0.94
6-12 [1]	[2]	CD	6	50	105	53	1.06
VAV-6				**1805**		**1826**	**1.01**

National TAB

Project: Anderson GME

Address: 8000 Five Mile Rd. Cincinnati, OH

Asset: SUPPLY

Asset	Area Served	Type	Size	DESIGN CFM	Prelim CFM	FINAL CFM	% to design
8-1	139	CD	6	75	118	77	1.03
8-2	120	CD	8	150	142	148	0.99
8-3	123	CD	6	150	196	158	1.05
VAV-8				**375**		**383**	**1.02**
10-1	HALL	CD	6	50	46	52	1.04
10-2	142	CD	6	75	92	77	1.03
10-3	HALL	CD	6	50	85	46	0.92
10-4	141	CD	6	75	99	79	1.05
VAV-10				**250**		**254**	**1.02**

National TAB

Project: Anderson GME

Address: 8000 Five Mile Rd. Cincinnati, OH

Asset: EXHAUST [1]

Asset	Area Served	Type	Size	DESIGN CFM	Prelim CFM	FINAL CFM	% to design
E1-1	118	EG	12X12	50	113	52	1.04
E1-2	114	EG	12X12	50	127	55	1.10
E1-3	107	EG	12X12	50	74	51	1.02
E1-4	105	EG	12X12	50	65	50	1.00