

**Report By:**

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

**NATIONAL**

**TAB**

Comfort. Under control.

**Report: CERTIFIED TAB REPORT  
Function: Test, Adjust, & Balance  
Date: 05/30/2023**

**PROJECT  
Boot Barn (Kansas City, MO)**

9900 NW Global Ave

Kansas City, MO 64153

**Client**

Metro Air Conditioning

8151 McCoy

Shawnee, KS 66227

# Issue List

- CEF2 low on flow, speed at max



# CERTIFICATION



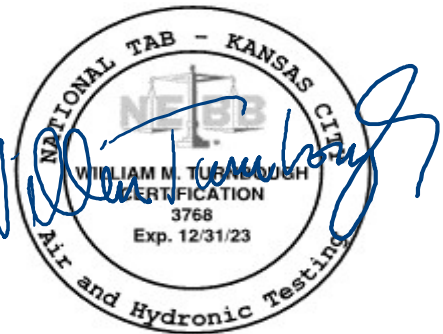
**PROJECT:** BOOT BARN - KANSAS CITY, MO

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 Standard for Testing, Adjusting and Balancing of Environmental Systems. The measurements shown, and the information given, in this report are certified to be accurate and complete, at the time and date information was gathered. Any variances from design quantities, which exceed NEBB tolerances, are noted in the TAB report project summary.

**NEBB TAB FIRM:** National TAB - Kansas City  
**REGISTRATION NO:** 3768  
**CERTIFIED BY:** Will Turnbough  
**DATE:** 6/7/2023

## Submitted and Certified by:

**NEBB TAB FIRM:** National TAB - Kansas City  
**TAB PROFESSIONAL:** Will Turnbough  
**REGISTRATION NO:** CP-24289  
**CERTIFICATION EXP:** 12/31/2023





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### Boot Barn (Kansas City, MO)

#### Project Issue Information

**Issue Name :** CEF2 low on flow, speed at max  
**Description :** CEF2 for the women’s restroom in the main office area is low on flow and above hard ceiling so tech cannot get above it. It is likely that the backdraft damper is closed. Opening the damper should give the flow needed.  
**Created By :** National TAB                      **Assigned To :** National TAB - Jacob Davidson  
**Status :** Open  
**Originated Date :** 04/26/2023 - Jacob Davidson - National TAB

#### Project Issue File Details



**Fannumber**  
04/26/2023



**Fanoutside**  
04/26/2023

#### Project Issue Response Details

- **05/22/2023 National TAB - Jacob Davidson**
  - Came back to retest after issues were resolved. CEF2 still only performs at 50CFM at max speed. Unable to increase speed to put fan in design.

# National TAB

Project: Boot Barn (Kansas City, MO)  
System/Unit: AHU/RTU



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Asset: RTU-1

AREA:MAIN OFFICE

Unit Data		
	Design	Actual
MFG	NA	CARRIER
Serial Num	-	0123C05467
Model Num	NA	48FCEA05A2A6A0A0A0
Configuration	VERTICAL	VERTICAL
Num OA Filters 1	-	1 METAL MESH
OA Filter Size 1	-	14X28
Num PreFilter 1	-	2
PreFilter Size 1	-	16X25X2

Test Data		
	Design	Actual
SF CFM	1600	1578
RA CFM	1380	1347
OA CFM	220	231
RL Voltage	-	487/489/488
RL Amperage	-	0.96/0.94/0.98
OA Damper Position	-	2.90V 11% HIGH/ 3.55V 19% LOW
Brake Horse Power	-	0.647

Motor Data		
	Design	Actual
Motor MFG	-	UTO
Frame	-	UTO
Horsepower	-	1.1
Motor Rpm	-	UTO
Phase	-	3
Rated Voltage	-	460
Rated Amperage	-	1.7
Service Factor	-	UTO

Performance Data		
	Design	Actual
MA Plenum SP	-	-0.24"
Fan Suction SP	-	-0.42"
Fan Discharge SP	-	0.47"
Total ESP	-	0.71"
Fan Total SP	-	0.89"

Completed By: Jacob Davidson on 06/05/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## AHU/RTU



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### Diffuser Supply (GRD)

#### RTU-1/MAIN OFFICE

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	RESTROOM	SD-2	8	100	162	96	96.0
SGRD2	MAIN OFFICE	SD-1	10	350	432	324	92.6
SGRD3	MAIN OFFICE	SD-1	10	350	447	332	94.9
SGRD4	MAIN OFFICE	SD-1	10	400	306	414	103.5
SGRD5	MAIN OFFICE	SD-1	10	400	391	412	103.0

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## System/Unit: AHU/RTU



Comfort. Under control.

Asset: RTU-2

AREA:MAIN OFFICE

Unit Data		
	Design	Actual
MFG	NA	CARRIER
Serial Num	-	0123C05465
Model Num	NA	48FCEA05A2A6A0A0A0
Configuration	VERTICAL	VERTICAL
Num OA Filters 1	-	1 METAL MESH
OA Filter Size 1	-	14X28
Num PreFilter 1	-	2
PreFilter Size 1	-	16X25X2

Test Data		
	Design	Actual
SF CFM	1600	1609
RA CFM	1340	1342
OA CFM	260	267
RL Voltage	-	490/488/488
RL Amperage	-	0.91/0.92/0.94
OA Damper Position	-	HIGH 3.95V LOW 4.60V
Brake Horse Power	-	0.602

Motor Data		
	Design	Actual
Motor MFG	-	UTO
Frame	-	UTO
Horsepower	-	1.1
Motor Rpm	-	UTO
Phase	-	3
Rated Voltage	-	460
Rated Amperage	-	1.7
Service Factor	-	UTO

Performance Data		
	Design	Actual
MA Plenum SP	-	-0.20"
Fan Suction SP	-	-0.39"
Fan Discharge SP	-	0.48"
Total ESP	-	0.68"
Fan Total SP	-	0.87"

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## AHU/RTU



Comfort. Under control.

### Diffuser Supply (GRD)

#### RTU-2/MAIN OFFICE

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	RESTROOM	SD-2	8	150	206	159	106.0
SGRD2	MAIN OFFICE	SD-1	10	325	416	295	90.8
SGRD3	MAIN OFFICE	SD-1	10	325	428	311	95.7
SGRD4	MAIN OFFICE	SD-1	10	400	340	408	102.0
SGRD5	MAIN OFFICE	SD-1	10	400	375	436	109.0

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)  
System/Unit: AHU/RTU



Comfort. Under control.

Asset: RTU-3

AREA:MAIN OFFICE

Unit Data		
	Design	Actual
MFG	NA	CARRIER
Serial Num	-	0123C05466
Model Num	NA	48FCEA05A2A6A0A0A0
Configuration	VERTICAL	VERTICAL
Num OA Filters 1	-	1 METAL MESH
OA Filter Size 1	-	14X28
Num PreFilter 1	-	2
PreFilter Size 1	-	16X25X2

Test Data		
	Design	Actual
SF CFM	1600	1601
RA CFM	1480	1479
OA CFM	120	122
RL Voltage	-	488/489/491
RL Amperage	-	0.34/0.32/0.41
OA Damper Position	-	HIGH 2.70V LOW 3.30V
Brake Horse Power	-	0.239

Motor Data		
	Design	Actual
Motor MFG	-	UTO
Frame	-	UTO
Horsepower	-	1.1
Motor Rpm	-	UTO
Phase	-	3
Rated Voltage	-	460
Rated Amperage	-	1.7
Service Factor	-	UTO

Performance Data		
	Design	Actual
MA Plenum SP	-	-0.22"
Fan Suction SP	-	-0.36"
Fan Discharge SP	-	0.52"
Total ESP	-	0.74"
Fan Total SP	-	0.88"

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## AHU/RTU



Comfort. Under control.

### Diffuser Supply (GRD)

#### RTU-3/MAIN OFFICE

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	MAIN OFFICE	SD-1	8	175	224	165	94.3
SGRD2	MAIN OFFICE	SD-1	8	175	228	185	105.7
SGRD3	MAIN OFFICE	SD-1	8	175	216	179	102.3
SGRD4	MAIN OFFICE	SD-1	10	375	323	360	96.0
SGRD5	MAIN OFFICE	SD-1	10	300	331	313	104.3
SGRD6	MAIN OFFICE	SD-1	10	400	336	399	99.8

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)  
System/Unit: FAN - Exhaust



Comfort. Under control.

Asset: CEF-1

AREA:RESTROOM

Unit Data		
	Design	Actual
<b>MFG</b>	NA	GREENHECK
<b>Model Num</b>	NA	SP-A110
<b>Serial Num</b>	-	20620943
<b>Type</b>	-	CEILING

Test Data		
	Design	Actual
<b>CFM</b>	150	162
<b>RL Voltage</b>	-	121
<b>RL Amperage</b>	-	0.40
<b>Total ESP</b>	-	UTO

Motor Data		
	Design	Actual
<b>Motor MFG</b>	-	MCMILLAN
<b>Frame</b>	-	NL
<b>Horsepower</b>	-	1/50
<b>Motor Rpm</b>	-	1400
<b>Phase</b>	-	1
<b>Voltage (rated)</b>	-	115
<b>Amperage (rated)</b>	-	0.45
<b>Service Factor</b>	-	NL

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## System/Unit: FAN - Exhaust



Comfort. Under control.

Asset: CEF-2

AREA:RESTROOM

Unit Data		
	Design	Actual
MFG	NA	GREENHECK
Model Num	NA	SP-A190
Serial Num	-	20620940
Type	-	CEILING

Test Data		
	Design	Actual
CFM	150	50
RL Voltage	-	116
RL Amperage	-	0.37
Total ESP	-	UTO

Motor Data		
	Design	Actual
Motor MFG	-	MCMILLAN
Frame	-	NL
Horsepower	-	1/50
Motor Rpm	-	1400
Phase	-	1
Voltage (rated)	-	115
Amperage (rated)	-	0.45
Service Factor	-	NL

Completed By: Michael Gabbert on

Notes: Speed is at max and motor direction is correct. The ductwork above ceiling also looks adequate. The most likely cause is a closed backdraft damper.

Date: 06/05/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## System/Unit: FAN - Exhaust



Comfort. Under control.

Asset: CEF-3

AREA:RESTROOM

Unit Data		
	Design	Actual
MFG	NA	GREENHECK
Model Num	NA	SP-A190
Serial Num	-	20620938
Type	-	CEILING

Test Data		
	Design	Actual
CFM	75	77
RL Voltage	-	121
RL Amperage	-	0.40
Total ESP	-	UTO

Motor Data		
	Design	Actual
Motor MFG	-	MCMILLAN
Frame	-	NL
Horsepower	-	1/50
Motor Rpm	-	1400
Phase	-	1
Voltage (rated)	-	115
Amperage (rated)	-	0.45
Service Factor	-	NL

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## System/Unit: FAN - Exhaust



Comfort. Under control.

Asset: CEF-4

AREA:RESTROOM

Unit Data		
	Design	Actual
MFG	NA	GREENHECK
Model Num	NA	SP-A110
Serial Num	-	20620942
Type	-	CEILING

Test Data		
	Design	Actual
CFM	75	79
RL Voltage	-	121
RL Amperage	-	0.15
Total ESP	-	UTO

Motor Data		
	Design	Actual
Motor MFG	-	GREENHECK
Frame	-	NL
Horsepower	-	NL
Motor Rpm	-	950
Phase	-	1
Voltage (rated)	-	115
Amperage (rated)	-	0.19
Service Factor	-	NL

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## System/Unit: Split Sys Furnace



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Asset: AHU-2

AREA:NORTH OFFICE

Unit Data		
	Design	Actual
MFG	NA	PAYNE
Model Num	NA	PG95ESAA30040A
Serial Num	-	2921A50966
Configuration	-	HORIZONTAL
Filter Size Size 1	-	12.5X23 MESH

Motor Data		
	Design	Actual
Motor MFG	-	BROAD OCEAN
Frame	-	NL
Horsepower	-	1/2
Motor Rpm	-	NL
Phase	-	NL
Voltage	-	115
Amperage	-	2.2

Test Data		
	Design	Actual
SF CFM	800	828
Motor Speed SetPt	-	YELLOW ON COOL
RL Voltage	-	NOT SAFE
RL Amperage	-	NOT SAFE
RA CFM	720	707
OA CFM	80	121

Performance Data		
	Design	Actual
Suction ESP	-	-0.12"
Discharge ESP	-	0.14"
Total ESP	0.5	0.26"

Completed By: Jacob Davidson on 04/26/2023

# National TAB

Project: Boot Barn (Kansas City, MO)

## Split Sys Furnace



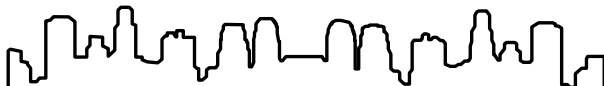
Comfort. Under control.

### Diffuser Supply (GRD)

#### AHU-2/NORTH OFFICE

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	NORTH OFFICE	SD-1	12	500	645	546	109.2
SGRD2	RESTROOM	SD-4	6	35	37	32	91.4
SGRD3	RESTROOM	SD-4	6	35	39	34	97.1
SGRD4	NORTH OFFICE	SD-1	8	200	278	216	108.0

Completed By: Michael Gabbert on



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BOOT BARN

ATICS CENTER VIII – 9900 NW GLOBAL AVE, KCMO

NOTED | DATE: 6/2/22 | DRAWN BY: M.D.K.

BY: G.M.M.	DWG #	M2	OF 3
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MECHANICAL DETAIL PLANS

TRAMMELL  
 CROW  
 COMPANY

Tobias Heddinghaus  
 Architect  
 No. A-2007011296



Job: | 22202.00

PERMIT

**M2.01**



# 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	Evergreen Telemetry S-PVF-1 2300177A	2/23/2023	2/23/2024
	AIR VELOCITY INSTRUMENT	50 fpm to 3900 fpm	+/- 5 % +/- 7 fpm	Evergreen Telemetry S-PVF-1 2300177A	2/23/2023	2/23/2024
	DIRECT HOOD READING	100 cfm to 2000 cfm	+/- 5 % +/- 7 cfm	Evergreen Telemetry CH-15D 2300114	2/20/2023	2/23/2024
TEMPERATURE	AIR METER	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	8/12/2022	8/12/2023
	AIR PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	8/12/2022	8/12/2023
	IMMERSION METER	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	8/12/2022	8/12/2023
	IMMERSION PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	8/12/2022	8/12/2023
	CONTACT METER	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	8/12/2022	8/12/2023
	CONTACT PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	8/12/2022	8/12/2023
HUMIDITY	HUMIDITY PROBE	10 % RH to 90 % RH	3% of reading	Cooper SRH77A S/N 100516003	8/12/2022	8/12/2023
ELECTRICAL	VOLTAGE MEASUREMENT	0 VAC to 600 VAC	2 % reading +/- 5 digits	Fluke 323 S/N 35491023WS	8/11/2022	8/11/2023
	AMPERAGE MEASUREMENT	0 Amperers to 100 Amperes	2 % reading +/- 5 digits	Fluke 323 S/N 35491023WS	8/11/2022	8/11/2023
ROTATION	ROTATION MEASUREMENT	60 rpm to 5000 rpm	2 % reading 2 rpm	Shimpo DT 207Lp S/N D1690029R	8/11/2022	8/11/2023
HYDRONIC	PRESSURE MEASUREMENT	-30 in Hg to 200 psi	±2% of reading +/- 1 psi	Hydronic Manometer - Dwyer 490W-6-HKIT S/N: 359515093207912	8/12/2022	8/12/2023
	DIFFERENTIAL PRESSURE MEASUREMENT	0 psi - 80 psi	±2% of reading +/- 1 psi	Hydronic Manometer - Dwyer 490W-6-HKIT S/N: 359515093207912	8/12/2022	8/12/2023

## Abbreviation List

A = Area (ft <sup>2</sup> )	S.F. = Service Factor
AHU = Air Handling Unit	SF = Supply Fan
A <sub>k</sub> = 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 <sub>ma</sub> = Mixed Air Temperature
CL = Center Distance (used in belt formula)	T <sub>oa</sub> = Outside Air Temperature
CD = Ceiling Diffuser	T <sub>ra</sub> = Return Air Temperature
CF = Correction Factor	H = Head (in wc, ft wc, psi)
CFM = Volumetric Flow: Cubic Feet Per Minute	h = Enthalpy
CO <sub>2</sub> = Carbon Dioxide	HP = Horsepower
CO = Carbon Monoxide	hr = Hour
C <sub>v</sub> = Flow Constant	K <sub>v</sub> = 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 <sub>ra</sub> = Return Air Temperature
psid = PSI Differential	TS = Tip Speed (fpm) IP, (m/s) SI
r = Radius (in)	TSP = Total Static Pressure
% <sub>ra</sub> = % 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