



Independent Testing

Performance Air Balancing Diagnostics is **NBC, NBI & NCI** certified **Air Balance, Hydronic Balancing, Combustion Efficiency Diagnostic Testing company**. We have served engineers, architects, contractors, industry and business throughout America since 1998.

We have attached a submittal package that introduces our staff, projects we've completed, the services we offer, and the certifications we hold.

We have also included some sample forms that give you a glimpse of the way we present our reports and arrive at solutions. Please keep this file for a future submittal package or just for reference.

All of our **reports are color coded**, this makes our reports easy to understanding and see how your systems are performing.

HSER & CSER reports give you a detailed total BTU performance of your systems delivered capacity. Compare too the manufactures rated BTU capacity and know what your systems our doing.

We submit the following information to help you evaluate how **Performance Air Balancing Diagnostics** can satisfy your Air & Hydronic testing and balancing needs.

We offer a **solution-based** approach to Air & Hydronic balancing, as we maximize the efficiency and comfort of your HVAC systems. This is the primary strength we bring to your projects...**Solutions, not just "match the numbers" balancing.**

PABD does not furnish or install any part of the system; therefore, **our reports are factual and unbiased.**

Sincerely,

Al D' Ambola

Al D'Ambola
V.P./Balancing Supervisor
PABD, Inc.
P.O. Box 328
Avon Lake, OH 44012
PH 440-930-2004
FX 440-930-0985
Email office@pabdinc.com
www.pabdinc.com

Certifications Offered

NBC Certified

National Balancing Council,
Air & Hydronic Balancing

NBI Certified

National Balancing Institute,
Air Diagnostics

NCI Certified

National Comfort Institute,
Carbon Monoxide Safety &
Combustion Efficiency

Services Offered

Air Balancing-Hydronic Balancing,
HVAC System Diagnostics
Indoor Air Quality Testing,
Comfort Balancing,
Duct Leakage Testing,
Building Pressure Testing,
Kitchen Exhaust &
Makeup Air Systems,
Commissioning,
Pressure testing,
Combustion Efficiency testing,
Carbon Monoxide safety testing,
CSER reports, HSER reports,
Maximize Burner performance,
Temperature Diagnostics,
Thermal Imaging,
Humidity testing,
Delivered BTU Measurements,
Verification of control operation,
Verification of pressure drops,
Power measurements on
motors,
Belt size calculations,
Air system resistance
measurements,
Water system resistance
measurements,
Inspection of HVAC systems,
Verification of air changes in
an area,
OSA Readings,
Verification of physical condition of
HVAC equipment,
Special projects quoted on request



Al D'Ambola
V.P./Balancing Supervisor

Certifications: **NBC, NBI & NCI**

Al brings to your projects over 15 years of balancing experience. He is the firm's **NBC, NBI** certified air balancing supervisor. Al has conducted over 250 Air Balancing seminars across the United States for the National Comfort Institute. He has trained over 5,000 technicians. **Al has been a featured speaker at Comfortech, ACCA local chapter meetings and has written numerous articles for National Comfort Institute**, and authored the ***Air Diagnostic/Troubleshooting Pocket Guide for HVAC technicians and installers***. Al is also an expert in duct renovations, reaching beyond the typical air balancing limits, delivering complete system solutions and creating measured system performance. Al holds a **NCI CO/Combustion Efficiency certification**, it is the only type in the country, maximizing heating efficiency. Not performing a combustion analysis test typically leaves the heating performance at 50-60% efficient. This service separates **PABD** from all other balancing companies. Al has also trained contractors across America in Building Science envelope testing. Al is available for consultation for commercial and residential projects.

Retro-Commissioning: Is our company strong point. We are trained and focused on trouble shooting the delivered performance. Where other companies match numbers **PABD** will give you measured results and help with the solutions to make system perform according to engineers and manufacturer specs.

Diagnostics Results: When we are called in to identify performance issues we typically see **equipment functioning at 50-60% delivered capacity**. Our diagnostics reports uncover problems that are typically not seen by HVAC contractors. Helping HVAC contractors reduce un-billable hour call backs. Great customer satisfaction.

To bring integrity, honesty, and repeatable test results to our customers ensuring maximized system performance.

Why Performance Air
Balancing Diagnostics ?

Experienced Staff

Quick Quotes

NBC, NBI & NCI Certified

Easy to read Reports

Serving America

Responsive Service

Advanced Instruments

Large or Small Projects

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Jim Fano
Project Manager/Balancing Technician

Certifications: **OSHA, Fire Life Safety, MEP Master**

Having 25 yrs in the mechanical trades, Jim is our newest addition to the team. Jim began his career in the mid 80's working as residential/light commercial HVAC installer for one of North Ohio's largest Trane dealers. After spending 10 yrs designing, fabricating and installing MEP systems in large custom homes, it was a natural transition for Jim to move into the commercial/industrial portion of the market. Jim handled the in house air balancing responsibilities for several local contractors. Working with recognized contractors such as TH Martin, Smith and Oby, Brewer Garret and Relmec, Jim soon developed the necessary skills to become a Project Manager for an international mechanical engineering firm. Staying true to his roots and not afraid to get his hands dirty, Jim has always maintained a hands on approach with his involvement in all the varied projects he has managed throughout his 25 yr career. Jim is currently authoring HVAC, electrical and plumbing instructor manuals. Taking into consideration all that Jim brings to the table, Performance Air Balancing Diagnostics is proud to have Jim aboard.

Field Related Skills

Mechanical Design, Fabrication, Installation, Estimator, Detailer
Sales

Past Projects Jim has worked on:

Charter Steel – Clev, Oh
YMCA – Sioux Falls, SD
Owens Corning – Morehead, NC
RTA – Clev, Oh
Copley Fire Dept – Copley, Oh
GE – Conneaut, Oh
University Hospitals – Clev, Oh
M&G Polymers – Copley, Oh
Case Western Reserve – Clev, Oh
Medina High School – Medina, Oh
Progressive Insurance – Beechwood, Oh
AES – Akron, Oh
Federal Court House – Clev, Oh
Cleveland Zoo – Clev, Oh

**Why Performance Air
Balancing Diagnostics?**

Experienced Staff

Over 15 years of Service

Quick Quotes

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Easy to read Reports

Serving America

Responsive Service

Advanced Instruments

Large or Small Projects

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Some of our Recent Projects:

Schools:

Delta Technical College, South Haven, MS
Riverside High School, Belle WV

Medical Facilities:

All Medical Clinic, Bronx, NY
Fox Valley Healthy Paws Hospital, Woodstock, IL

Restaurants:

Gus' Steak House, Sheffield, OH
Chandelier Restaurant, Belleville, NJ
Lola's Restaurant, Cleveland, OH. Iron Chef, Michael Symon.
Burger King's, Cleveland, OH
Wendy's Cleveland, OH
Tomo's Japanese Restaurant, Cedar Point Amusement Park, Sandusky, OH
Lastrada's, Cleveland, OH
Jakes on the Lake, Avon Lake, OH
Saga Steak House, Pittsburg, PA

Retail Stores:

Talbot Clothing, Kettering, OH
Lite Salon & Spa, Avon, OH
Avenbury Lodge, Avon, OH
Scottrade, Erie, PA

Office/Apartment Buildings:

Offices of Miss America, Atlantic City, NJ
Magnum Building, Solon, OH
Park Ten Building, Houston, TX
Youth Detention Center, Las Vegas, NV
200 West Apartments, Fairview Park, OH
Willis Insurance, Nashville, TN

Government facilities:

United States Coast Guard, Lorain, OH
AMETEK, Garden City, NY

DATE

PROJECT

TO

Performance Air Balancing Diagnostics, Inc.

P.O. BOX 328
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AIR TEST AND BALANCE PROCEDURES

1. GATHER DESIGN INFORMATION

- Plans
- Specifications
- Equipment and control data
- Mark plans, number outlets, prepare system diagram sketch

2. AIR TESTING AND BALANCING:

- Locate actual registers, grills, equipment, controls & dampers
- Identify each register/grill to area served
- Set all system dampers to the "open" position
- Check filters and coils to make sure they are clear of debris
- Switch the thermostat fan switch to the "on" position with system in full cooling at 55 F to start high speed blower
- Check for proper fan rotation
- Drill test holes for static pressure and temperature
- Testing Outlets:
 - Measure each supply outlet, total readings
 - Measure each return outlet, total readings
 - Compare actual airflow to design airflow conditions
 - Adjust blower to obtain design total airflow
 - Re-measure total supply and return airflows
 - Adjust dampers to obtain design airflow
 - Measure total airflow to verify within $\pm 10\%$
- Record any system deficiencies that exist
- Mark damper settings

3. FINAL EQUIPMENT TESTING:

- Record equipment and motor nameplate data
- Record sheave, pulley & belt sizes data
- Test and record full load motor amperes
- Test and record voltage
- Test and record motor & fan RPM
- Test and record supply and return static pressures
- Test and record entering air temperatures (heating and cooling)
- Test and record exiting air temperatures (heating and cooling)
- Return thermostat to normal operating conditions

4. REPORT COMPLETION:

- Cover letter including:
 - Project description & location
 - Installing contractor
 - Certification statement that project is correctly balanced
- HVAC System Report
- System Diagrams
- Symbols Legend
- Duct Traverse or Pulley Data forms, if needed
- Instrument list, including calibration dates
- Certificates of calibration, if needed

DATE

PROJECT

TO

JOB NUMBER

Performance Air Balancing Diagnostics, Inc.

P.O. BOX 328
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RECTANGULAR AIRFLOW TRAVERSE REPORT

DATE

PROJECT

TO

JOB NUMBER

Performance Air Balancing Diagnostics, Inc.

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TEST HOLES (")

TEST LOCATIONS (")

DUCT/GRILLE	DESIGN	ACTUAL
FREE SIZE		
FREE AREA		
AVERAGE VELOCITY		
IF GRILL X AK FACTOR		
AIR FLOW (CFM)		
CALCULATIONS	TEST 1	FINAL
TOTAL READINGS (FPM)		
DIVIDED BY NO. OR READINGS		
AVERAGE VELOCITY		

DUCT TEST PATTERN

DISTANCE BETWEEN TEST HOLES AND READING LOCATIONS

NO. OF TEST SITES AND FACTORS				X DUCT HEIGHT =	TEST HOLE LOCATION	X DUCT WIDTH =	READING LOCATION
4	5	6	7				
.15	.10	.10	.05				
.35	.25	.25	.20				
.65	.50	.40	.35				
.85	.75	.60	.50				
	.90	.75	.65				
		.90	.75				
			.95				

VELOCITY READINGS

READING NUMBER	TEST 1	TEST 2	FINAL TEST	READING NUMBER	TEST 1	TEST 2	FINAL TEST
1				27			
2				28			
3				29			
4				30			
5				31			
6				32			
7				33			
8				34			
9				35			
10				36			
11				37			
12				38			
13				39			
14				40			
15				41			
16				42			
17				43			
18				44			
19				45			
20				46			
21				47			
22				48			
23				49			
24				50			
25				51			
26				52			

SAMPLE

PULLEY CALCULATIONS

MOTOR NAMEPLATE DATA:

MANUFACTURER **GE**
 VOLTS/PHASE **460/3**
 HORSEPOWER **3**
 FULL LOAD AMPS **6.8**
 RPM **1750**
 SERVICE FACTOR **1.15**

BELT DATA:

MANUFACTURER **Browning**
 MODEL **5L**
 BELT SIZE **MVL 44**
 NUMBER OF BELTS **1**

FAN	DESIGN	ACTUAL
SUPPLY AIR CFM	3000	2600
STATIC PRESSURE +	.75	.05
STATIC PRESSURE -	.75	1.1
TOTAL STATIC PRESSURE	1.5	1.6
RPM	900	714
MOTOR		
AMPS	6.8	5.7
VOLTS	460	458
HORSEPOWER	3	3
RPM	1750	1744

DATE

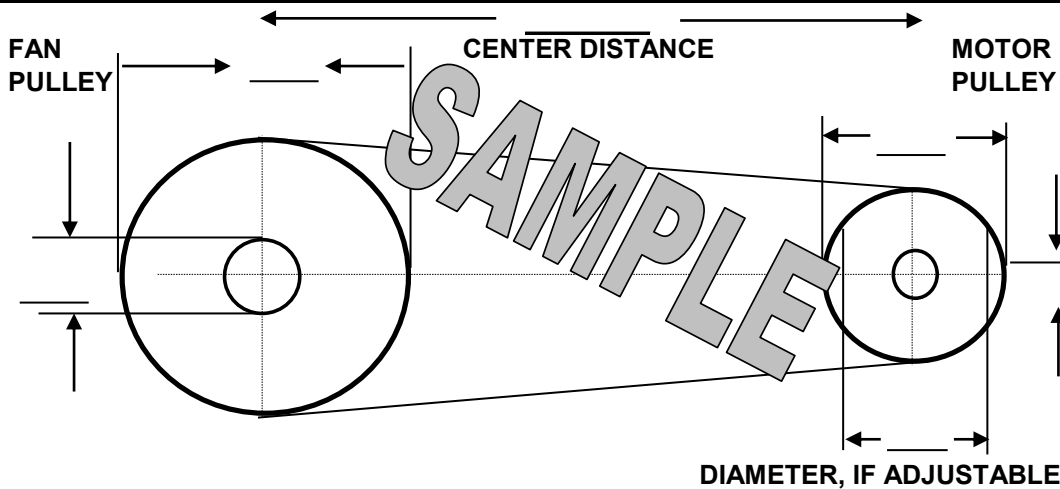
PROJECT

SYSTEM

READINGS BY

JOB NUMBER

Performance Air Balancing Diagnostics, Inc.
 P.O. BOX 328
 Avon Lake, OH 44012
 PH 440-930-2004 FX 440-930-0985



MANUFACTURER	
MODEL	
ADJUSTABLE	
BUSHING DATA	

IS THERE ROOM TO ADJUST MOTOR MOUNT? FORWARD BACKWARD

TEST	SUPPLY CFM	FAN RPM	TOTAL STATIC PRESSURE	AMP DRAW	MOTOR PULLEY DIAMETER	OTHER
TEST 1	2600	714	1.6"wc	4.7	3"	1.15
TEST 2						
TEST 3						

FORMULAS

FAN LAW ONE - PULLEY SIZE

$$PD2 = PD1 \times \left(\frac{CFM2}{CFM1} \right)^2$$

$$3.45 = 3 \times 1.15$$

FAN LAW TWO - STATIC PRESSURE

$$SP2 = SP1 \times \left(\frac{CFM2}{CFM1} \right)^2$$

FAN LAW THREE - AMP DRAW

$$AMP2 = AMP1 \times \left(\frac{CFM2}{CFM1} \right)$$

FAN LAW ONE - RPM

$$RPM2 = RPM1 \times \left(\frac{CFM2}{CFM1} \right)$$

CSER REPORT

CSER is Cooling *System Efficiency Ratio* is a rating performed by NBC air balancing certified technicians exclusively. CSER is the ratio of field measured system BTU's compared equipment rated BTU's. Cooling BTU's are measured as Total BTU's.

RECORD TEST CONDITIONS

- Time of Day 1:30 PM Weather Conditions: 87 degrees-sunny-humid
- Condenser Entering Dry Bulb Temperature: 89 degrees
- Evaporator Entering Wet Bulb Temperature: 68 degrees
- Plot the Factory-Rated Total Equipment BTUs under current conditions from the Manufacturers performance data chart 290,000 TBTU

TEST PROCEDURE

- Measure the total supply airflow delivered by the system into the envelope. This is the CFM to be used in the BTU formula. Supply CFM 9275

TEMPERATURES

- Read and record the average Wet Bulb Air Temperature of the return grilles.
Return Wet Bulb 66.2
- Read and record the average wet bulb air temperature of the supply grilles.
Supply Wet Bulb 57.4

DETERMINE THE ACTUAL SYSTEM TOTAL BTU DELIVERY

- Plot the enthalpy of the average entering and exiting wet bulb temperatures on the Enthalpy Chart and record Enthalpy below.
- Subtract the difference to find the Enthalpy Change.

$$\begin{array}{r}
 \text{Return Air Enthalpy } 31.00 \\
 \text{Minus Supply Air Enthalpy } 24.72 \\
 \hline
 \text{Equals Enthalpy Change } 6.28 \\
 \text{Calculate Total BTU Delivery}
 \end{array}$$

$$\frac{9275}{\text{SUPPLY CFM}} \times \frac{6.28}{\Delta ht} \times 4.5 = \frac{262,111}{\text{SYSTEM BTU DELIVERY CONSTANT}}$$

ESTABLISH COOLING SYSTEM EFFICIENCY RATIO

$$\frac{262,111}{\text{SYSTEM BTU DELIVERY}} / \frac{290,000}{\text{SYSTEM RATED BTU OUTPUT}} = \frac{90\%}{\text{SYSTEM CSER RATING}}$$

QUALIFICATIONS:

CSER Ratings should exceed 90% for most systems under standard operating conditions. The result of this system efficiency rating will vary depending on actual conditions. Duct renovation work, air balancing, testing, adjusting and equipment repair or replacement will increase your system's CSER Rating.

Estimator Name:
Al D'Ambola

Bid Number:
00-0007

Date:
July 25, 2008

Project:
Majestic Enterprise

Systems:
RTU # 1
25 Tons

Notes:

NBC Certification Stamp



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Sample CSER Test

HSER REPORT

HSER is *Heating System Efficiency Ratio* is a rating performed by NCI air balancing certified technicians exclusively. HSER is the ratio of field measured system BTU's compared equipment rated BTU's. Heating BTU's are measured as sensible BTU's.

RECORD TEST CONDITIONS

- Time of Day 10:15 AM Weather Conditions 27 degrees-cloudy
- Equipment rated BTU output 320,000

TEST PROCEDURE

- Determine the supply airflow that the system is delivering into the conditioned space. Measure all of the supply registers and add them together. 4716

TEMPERATURES

- Measure the average supply air temperature at the supply registers. 123
- Measure the average return air temperature of the air at the return grilles. 67
- Subtract supply temperature from return temperature. 57
This is the Δt through the system.

DETERMINE ACTUAL SYSTEM BTU DELIVERY

$$\frac{4716}{\text{SUPPLY CFM}} \times \frac{57}{\Delta t} \times 1.08 = \frac{290,316}{\text{SYSTEM BTU DELIVERY CONSTANT}}$$

ESTABLISH HEATING SYSTEM EFFICIENCY RATIO

$$\frac{290,316}{\text{SYSTEM BTU DELIVERY}} \div \frac{320,000}{\text{SYSTEM RATED BTU OUTPUT}} = \frac{90\%}{\text{SYSTEM HSER RATING}}$$

QUALIFICATIONS:

HSER Ratings should exceed 90% for most systems under standard operating conditions. The result of this system efficiency rating will vary depending on actual conditions. Duct renovation work, air balancing, combustion testing and adjusting and equipment repair or replacement will increase your system's HSER Rating.

Estimator Name:
Al D'Ambola

Bid Number:
00-0001

Date:
January 8, 2005

Project:
The Mall at Avon

Systems:
RTU #7

Notes:



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Sample HSER Test

BALANCING QUOTE REQUEST

To provide fast and reliable air balancing quotes, please complete this information and fax it to **Performance Air Balancing Diagnostics** we will return a proposal for the project as soon as possible, often in less than 30 minutes. Thank you for requesting a quote.

Name of project _____ City _____

Estimated date when balancing will be needed _____

YES NO

- NBC Balancing certification. Other Certification _____
- Number of supply and return grilles _____
- Number of units or air handlers list tons or total CFM _____

- Number of exhaust fans with CFM _____
- Number of chillers, pumps, boilers with sizes _____

- Number of VAV boxes, or sub zones _____
- Number of hydronic balancing stations _____
- Number of exhaust hoods and CFM _____
- Number of Makeup air units and CFM _____
- Is duct leakage testing required ? Number _____
- Is phased work or multiple visits required?
- Are a man lift or special ladders required?
- Is prevailing wage required?
- Is night work required?
- If new pulleys or belts, are they to be provided by us?
- Will one of your technicians be present to make repairs that may be needed during the balancing work?
- Any other unusual conditions? _____

QUOTE REQUESTED BY _____

COMPANY NAME _____

PHONE(_____) _____ - _____ FAX(_____) _____ - _____

What time & date do you need this quote returned? _____

DATE

Fax to

PABD
440-930-0985
www.pabdinc.com

FROM

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