# Advanced Duct Leakage Testing







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- » Choosing a Location to Measure Duct Pressure
- » Choosing a Location to Attach to the Ductwork
- » Basic Pressure Concepts
- » Duct Leakage to Outside Concepts
- » Testing Options





#### Choosing a Location to Measure Duct Pressure



Fig. 1 Generic Pitot Static tube configuration.













#### Static Probe not necessary at Supply Register







#### Duct Pressure Location Review

- Supply trunkline, Supply register, or Supply plenum if connecting to a central return
- If ducts are fairly tight (<200 cfm) any of 3 locations will give you consistent results</p>
- If ducts are leaky (> 500 cfm) there may be large pressure differences
- » Do two tests (near and far register) and average the results



#### Choosing a Location to Attach to the Ductwork

#### » At central return

• In 1 or 2 return systems the largest and closest one to the AH is best









#### Choosing a Location to Attach to the Ductwork

#### Connecting to a small return







#### Choosing a Location to Attach to the Ductwork

 All other systems, connect directly to the AH cabinet





# How to Measure Backpressure

- Measure backpressure if you suspect it might be an issue
- Measure pressure with Duct Blaster fan running
  - Backpressure should be less than 100 Pa





#### Location to Attach to the Ductwork -Review

- » 1 or 2 Return Systems
  - connect at largest grille closest to AH fan
- » All other systems
  - connect at AH
- If system is tighter than 50 CFM25, you can connect at either location.
- If you suspect backpressure >100 Pa, measure it
- If backpressure is high, move to a largest return or to the AH cabinet
- » Build out from AH cabinet with cardboard if backpressure at AH is high







#### » Supply leaks to outside can do the same





#### » Supply leaks to outside can do the same





# Total Leakage Pressurization does the sameImportant to open a window or door





Total Leakage Pressurization Test does the same

Important to open a window or door





# Total Leakage Pressurization does the sameImportant to open a window or door





Important that crawlspace and attic are well connected to outside



Important that crawlspace and attic are open to outside





Important that crawlspace and attic are open to outside



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#### Basic Pressure Concepts Review

- » Duct leaks change pressures in the house need to open a window during total leakage test
- Duct leaks change pressures in unconditioned spaces – need to open those spaces to the outside
- The most accurate measurement will be with 25 Pa across all duct leaks.
- Standards say unconditioned spaces containing ducts shall be opened to the outside
- » This is not always possible or practical.
- » To get repeatable numbers you need to document how the house was set up.
- » Understanding pressures in adjoining spaces may help you understand and explain the numbers you are getting

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- » Airflow requires both a driving force and a hole
- $\rightarrow$   $\Delta$  Pa + hole = airflow through the hole
- If the house and the ducts are at the same pressure, air will not flow through the leaks



- » To tape or not to tape
- » If entire duct is not at exactly 25 Pa, you can have large flow across open registers
- » Standards and manuals say to tape



- » Two methods are taught for measuring duct pressure
  - Duct / House
  - Duct / Outside



#### Measuring duct pressure

- Duct / House
- PR/ FL Mode
- Bring H to 25 Pa
- Bring D to 0 Pa



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Measuring duct pressure

- Duct / Outside
- PR/ FL@25 MODE
- Bring H to 25 Pa
- Bring D to 25 Pa



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#### » Advantages to bringing duct to 0:

- Method in Duct Blaster manual and quick guides
- Method in RESNET Chapter 8 Standard
- D / H is a more stable reading
- The goal is to bring H and D to the same pressure



- » Can't Reach Zero
- » Try to pressurize without flex duct
  - Depressurize requires a ring and flex duct so max flow is so maximum flow is 600 CFM
  - Maximum pressurization flow without flex is about 1350 CFM
- » Lower house pressure
- » Apply Can't Reach Pressure Factor





#### **Can't Reach Pressure Factor**

Chapter 6 Conducting a Total Leakage Pressurization Test

Duct Pressure (Pa)	CRP Factor	Duct Pressure (Pa)	CRP Factor
24	1.02	14	1.42
23	1.05	13	1.48
22	1.08	12	1.55
21	1.11	11	1.64
20	1.14	10	1.73
19	1.18	9	1.85
18	1.22	8	1.98
17	1.26	7	2.15
16	1.31	6	2.35
15	1.36	5	2.63

Table 2: Can't Reach Pressure Factors (25 Pa Target)

<u>Example:</u> With no Flow Ring installed and the fan running full speed, you are able to achieve a duct system test pressure of 14 Pascals with a measured fan flow of 1,200 cfm. The corresponding CRP Factor for a duct pressure of 14 Pascals is 1.42. The estimated total duct leakage at a test pressure of 25 Pascals is 1,200 x 1.42 = 1,704 cfm.



Note: The TECBLAST program automatically applies the CRP Factors to One-Point Test data.



If you have:

- » One unconditioned space containing most of ductwork
- » Minimal attic venting
- » Most ducts not seeing 25 Pa





- » One unconditioned space containing most of ductwork
- » Minimal attic venting
- » Most ducts not seeing 25 Pa
- » Move BD tube to attic
- » Now duct leaks see 25 Pa



+25 H/A

0 D/H

- » Two unconditioned space containing most of ductwork
- » Minimal attic and CS venting
- » Most ducts not seeing 25 Pa
- » Attic & Crawl not same Pa
- » It gets complicated



- » Conditioned crawl without an access to house
- » CS does not see 25 Pa
- » Some leaks to CS included



- » Conditioned crawl without direct access
- » CS does not see 25 Pa
- » Some leaks to CS included
- » Use 3<sup>rd</sup> fan



Duct Leakage to Outside Concepts - Review

- » To tape or not to tape
- » Duct / House or Duct / Outside
- » Can't reach zero or Can't reach 25
- » One unconditioned space containing most of the ducts
- » Conditioned crawl without access to house
- » Pressures in unconditioned spaces can be changed during the duct test and this will effect your readings
- If unconditioned crawlspaces or attic spaces are not well connected to the outside, it will effect readings



#### Testing options – One DG-700

• Bring house to 25



- Bring house to 25
- Disconnect BD tubing
- Connect DB tubing



- Bring house to 25
- Disconnect BD tubing
- Connect DB tubing
- Bring ducts to zero



- Bring house to 25
- Disconnect BD tubing
- Connect DB tubing
- Bring ducts to zero
- Disconnect DB tubing
- Reconnect BD tube



BLOWER

G-700 Pressure & Flow Gau

CONSERVATORY

CRAWLSPACE

0.0

25.0

OUTSIDE SUPPLY

INSIDE SUPPLY D

OUTSIDE RETURN DUCT LEAK

- Bring house to 25
- Disconnect BD tubing
- Connect DB tubing
- Bring ducts to zero
- Disconnect DB tubing
- Reconnect BD tube
- Adjust back to 25

- Bring house to 25
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- Disconnect DB tubing
- Reconnect BD tube
- Adjust back to 25
- Disconnect BD tubing



- Bring house to 25
- Disconnect BD tubing
- Connect DB tubing
- Bring ducts to zero
- Disconnect DB tubing
- Reconnect BD tube
- Adjust back to 25
- Disconnect BD tubing
- Reconnect DB and adj.



#### Testing options – Two DG-700's

- Cruise house at 25
- Bring duct to zero



#### » Testing options – Two DG-700's + WiFi Link

Cruise house at 25 using iTEC-700



# **Zone Dampers**



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#### **Troubleshooting High Static Problems**



#### **Other Uses for Duct Blaster**

 Measuring Total System Air Flow (Pressure Matching Method)







# Pressure Matching Method

- Measure the Normal System Operating Pressure (NSOP)
- Connect the Duct Blaster® Fan to the Duct System
- Turn on AH
- All return air must be flowing through the Duct Blaster fan
- Match the Normal System Operating Pressure (NSOP)



# Other uses

#### Duct Blaster as Powered Capture Hood.

- Accurately measure flow at supply or return registers.
- Bulky, but accurate



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#### Other uses

# » Flow Blasterattachment for aDuct Blaster fan





#### Other uses

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#### Use the Duct Blaster fan for a blower door test.





# Questions?

Thank you

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