State of MN
Energy Code Review
for
2015
Energy Design conference

By

Mike D. Wilson

Dakota Supply Group

- In accordance with the Department of Labor and Industry's statute 326.0981, Subd. 11,

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Agenda

Key points

1. Ducted returns
2. Duct testing post construction or after rough-in
3. Mechanical ventilation
4. Blower door for all homes
5. Load calculation
    1. 40 % over size for the heating
    2. 15 % over size for the cooling
6. Documentation certification
7. Demo the duct blaster test
8. Demo bath fan flow use
9. Other code info

This will be an overview of the proposed MN energy code

This session will go over some of the changes

- Air sealer … blower door test
- Duct leakage test… duct blaster
- Complete ducted return systems
- Sizing of systems
- Ventilation systems
- Documentation

Two documents

- 2012 International Energy Conservation Code
- State of MN Energy Code

- Builder Association of MN 20 point guide line on changes for Energy Code

Documentation

“ The appropriate construction documents and preventative maintenance information must be provided , along with a permanent certificate listing certain insulation, windows and HVAC performance information”

- This guideline is in section R401.3 in the IECC 2012
- Needs to be complete to get building permit

4. R403.2.3 Building Cavities (mandatory)

- Building framing cavities shall not be used as ducts or plenums

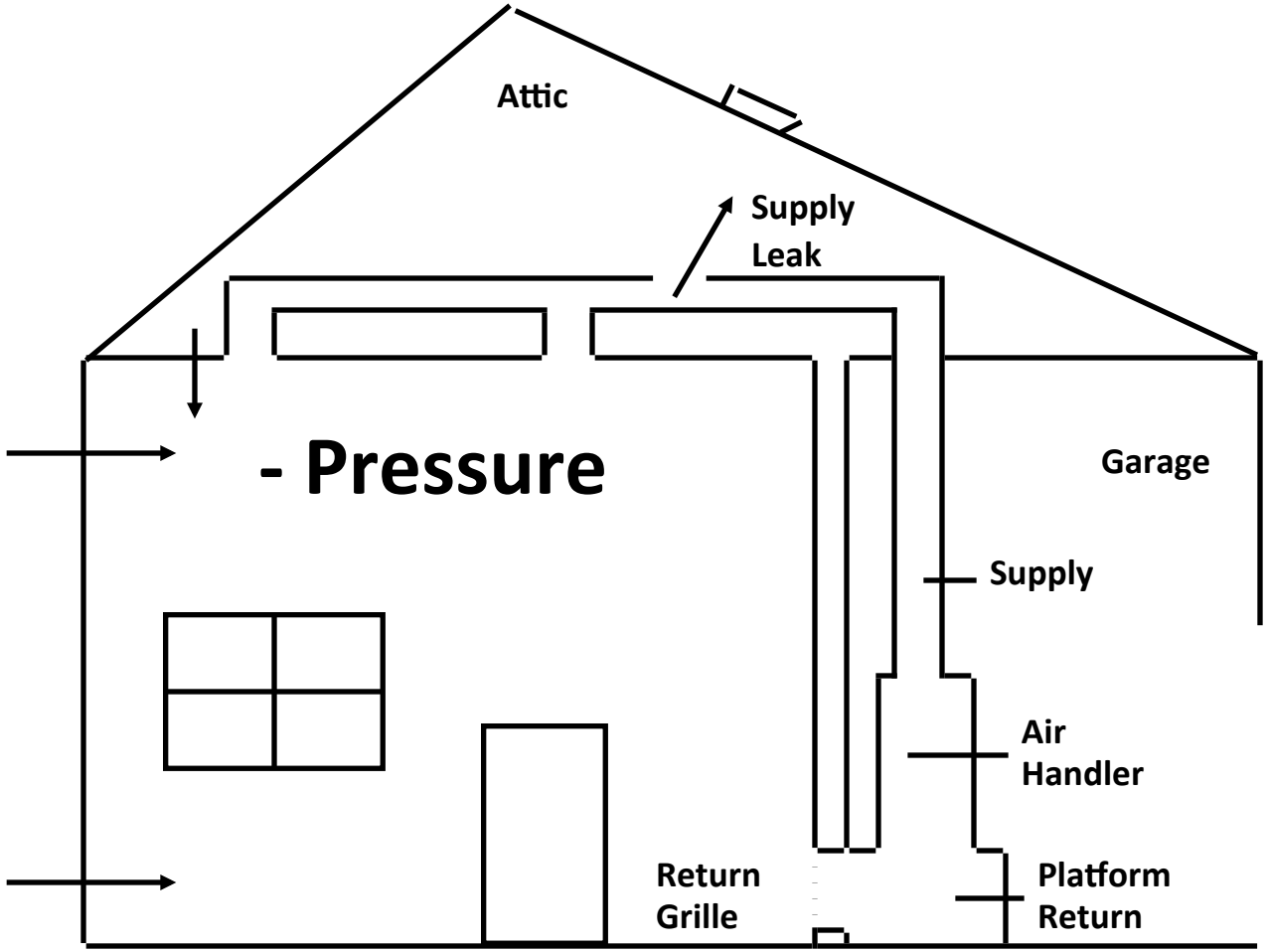
Return air

- Heating and cooling system have commonly used building cavities (walls and joist cavities) as return air space for heating and cooling system, that practice will end

Why we need to duct seal in unconditioned spaces

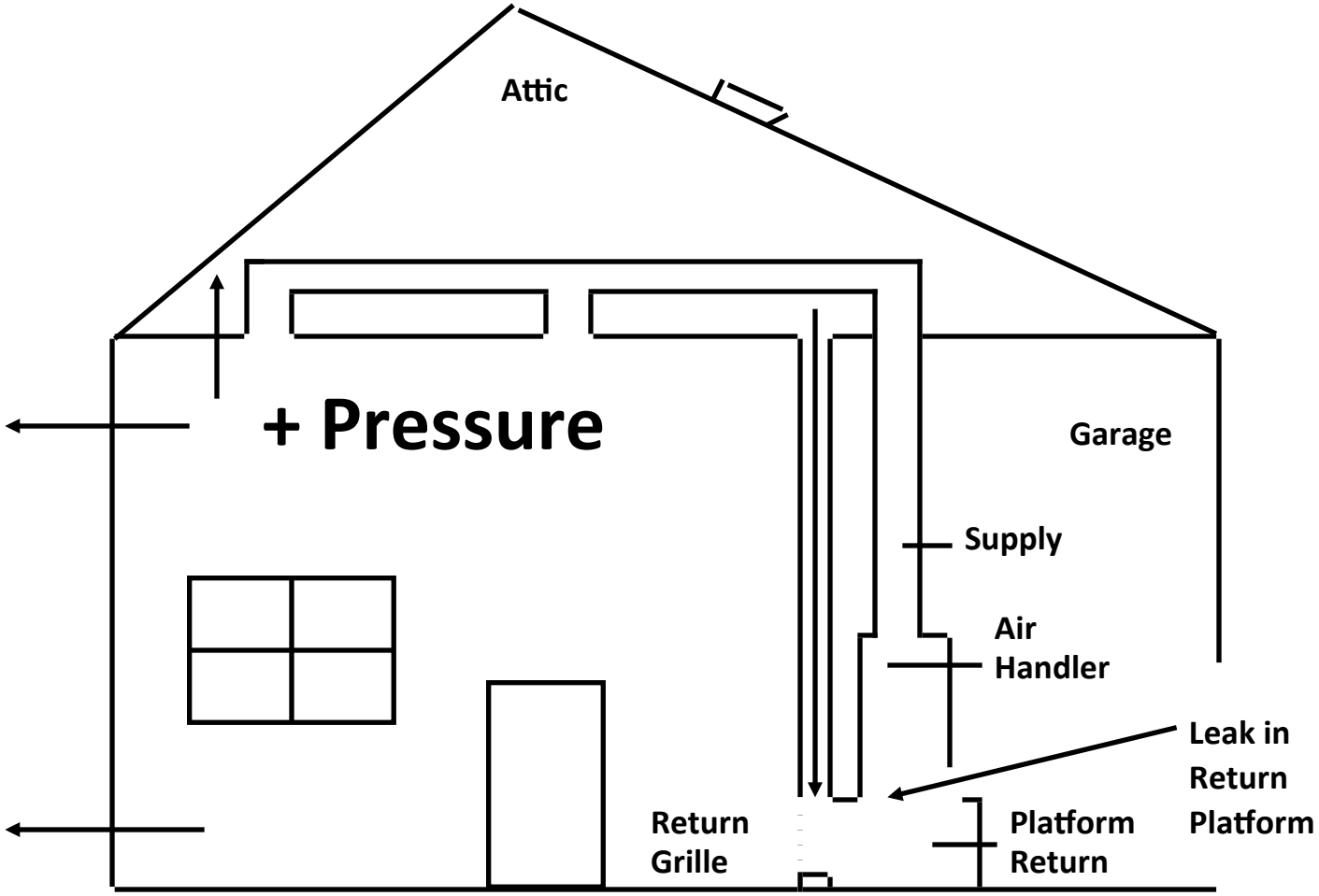
- Energy … saving it
- Building pressure… back drafting and comfort
- Durability … moisture and mold related problems

Supply Leaks to Outside Depressurize Houses



Small tight Mech room… pressure… back drafting

Return Leaks From Outside Pressurize Houses



Conclusions

- **Keep duct systems inside the conditioned space. Watch out for connections with building cavities.**
- **If ducts are outside, make them airtight.**
- **Beware of pressures in combustion appliance zones and other parts of the house due to door closure. Watch out for imbalances caused by zoned distribution systems.**
- **Always measure to be sure.**

Ducts

This is how it is going to affect the builder and HVAC

- Design … floor plan and duct layout
- Installation
- Testing
- Static pressure
- Cost

Mastic vs tape

- It has been proven in many programs thought out the country and performance testing over many years that mastic is better sealing the duct work when doing the air tightness testing on the duct system
- Spread the mastic on nickel thick.. With brush is generally the best
- To my understanding no tape meets the UL 181 (A or B ?) listing
- Most mastic is water based it needs to be applied above 32 degrees

Duct sealing (mandatory)

Exception

1. Air – impermeable spray foam shall be permitted to applied without additional joint seals
2. Where a duct connection is made that is partially inaccessible, three screws or rivets shall be equally spaced on the exposed portion of the joint so as to prevent a hinge effect.

Spray foam attic

Duct mastic UL 181

Duct mastic

Take off with flex

Attic insulation with duct work

Duct work over garage, bonus room

When do we need to do duct blaster test

- When duct work is out of thermal building envelope

Definitions

This is out of 2012 IECC Chapter 2

BUILDING THERMAL ENVELOPE

The basement walls, exterior walls, floor, roof, and any other building elements that enclose conditioned space or provide a boundary between condition space and exempt or unconditioned space

Duct testing post construction or after rough in

- “ Ducts must be tested and verified to have to have total leakage of no more than 4 cfm/100 sq. ft. (or 3 cfm if air handler is not installed), except where air handler and all ducts are inside conditioned space”

Testing of Duct System… Air Tightness of Complete Duct System… Duct Blaster Test

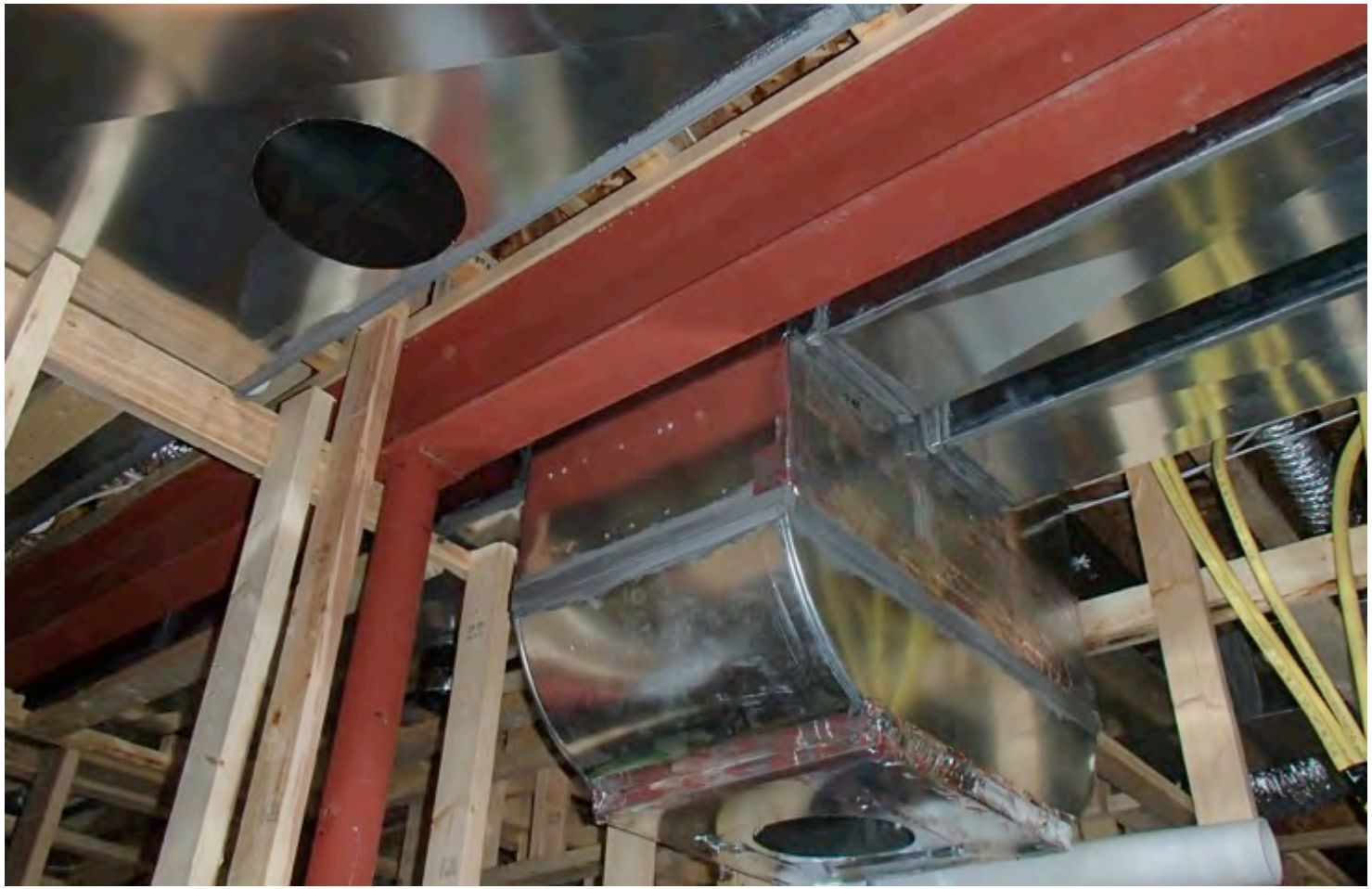
- Both return and supply shall be tested if duct work is out side thermal building envelope
- Two options for testing
  1. Rough in test , when duct work is complete but furnace cabinet has not been installed
  2. Post construction , this is when furnace cabinet has be installed

Option one at rough in

- Find air leaks early
- Who is going to do the test?
- Test one side at a time
- 0.03 x sq. ft. of condition area
- Example 3000 ft. = 90 cfm leakage

Meeting with all parties, explain duct leakage test

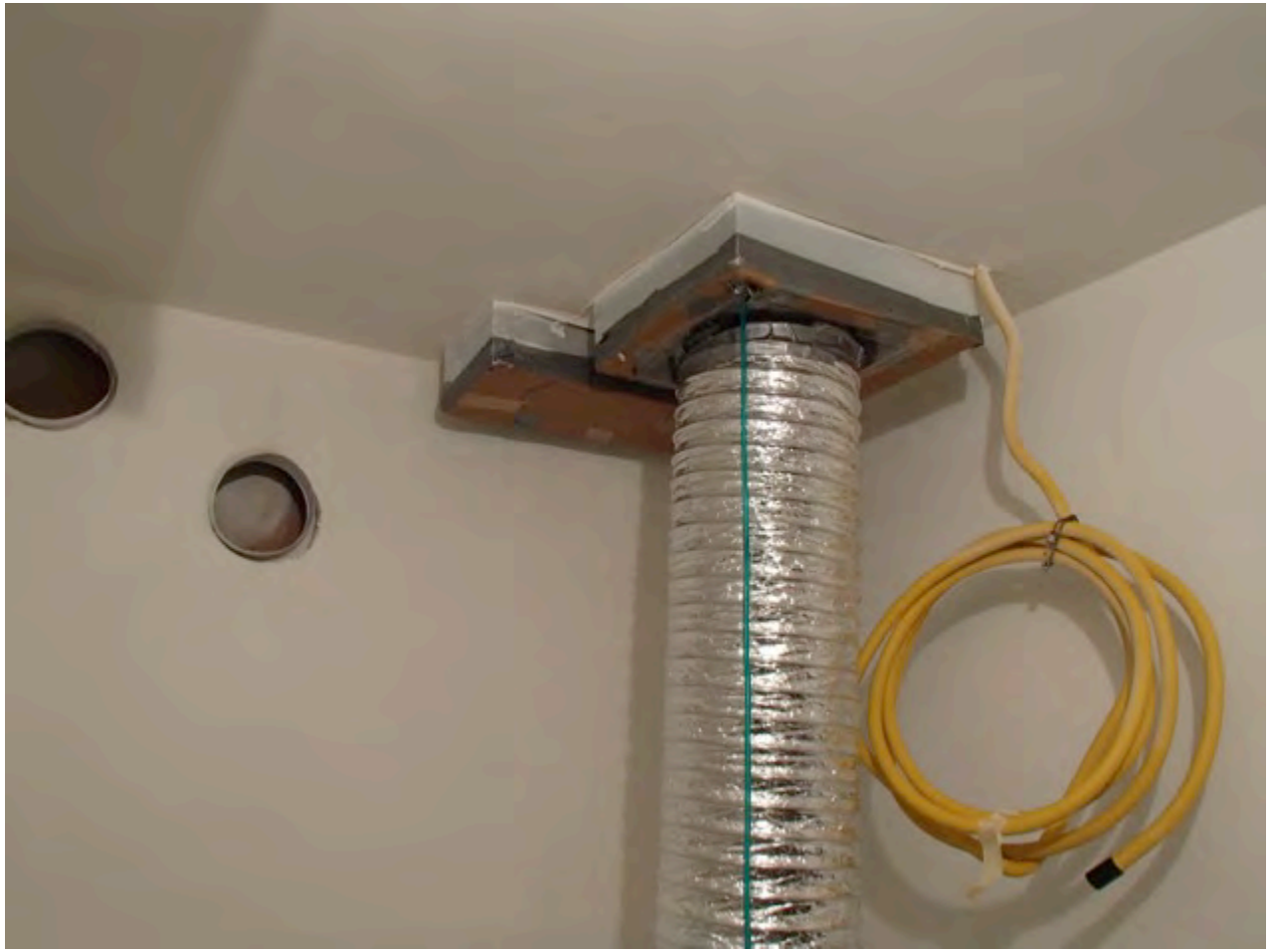
Do duct tightness at rough in



Cover supply and return covered with card board

Installing flex duct from duct blaster, at rough in

Duct blaster



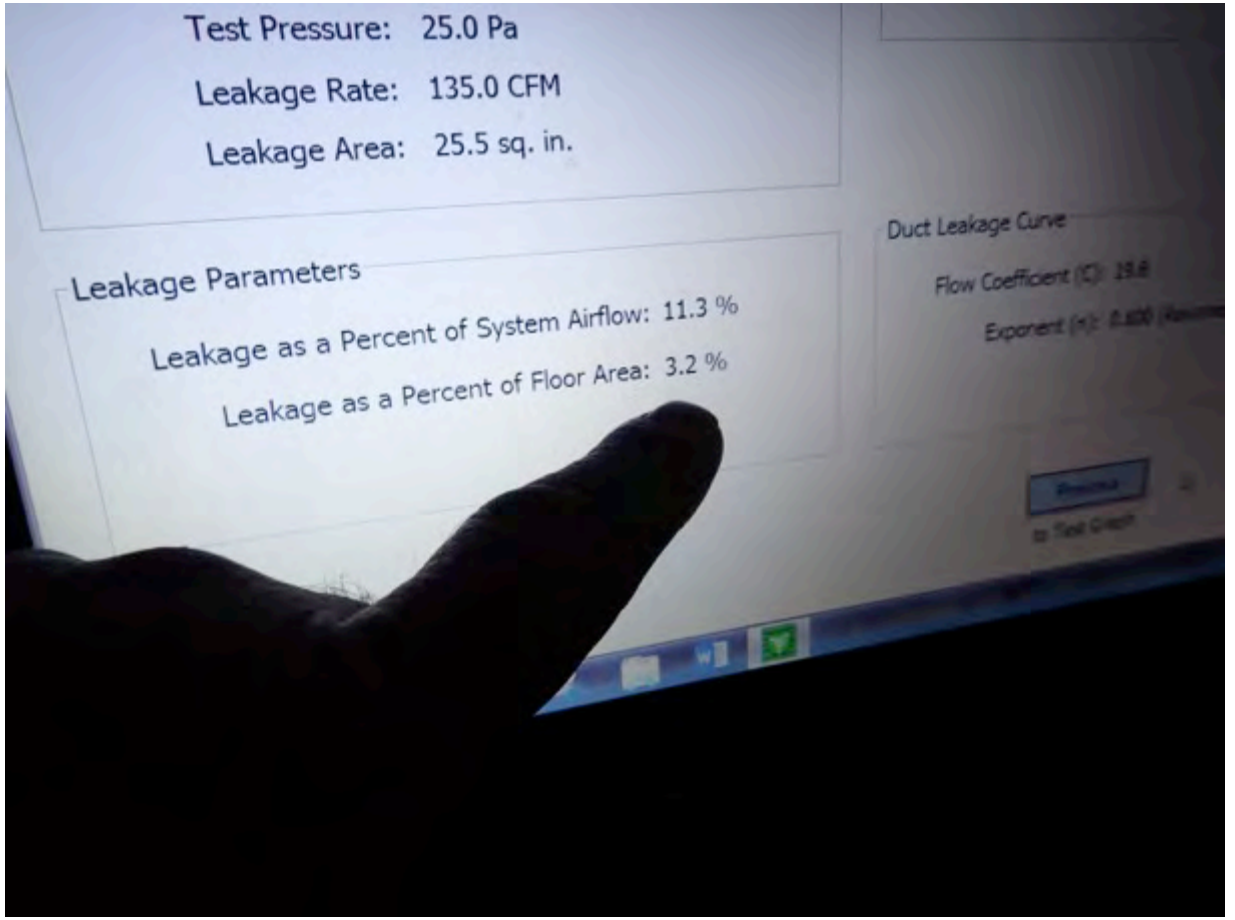
Technician checking for air tightness

Toe kick in kitchen

Make sure plug is tight and sealed

Small leakages make a big difference

Duct blaster print report , leakage %



DUCT LEAKAGE TEST

Date of Test: 11/25/2014
Test File:

Technician: Chris

Customer:

Building Address:

C
Phone:
Fax:

Test Results

1. Measured Duct Leakage:		**135.0 CFM / 25.5 sq. in. (+/- 0.0 %)**
2. Duct Leakage as a Percent of System Airflow:		**11.3 %**
3. Duct Leakage as a Percent of Building Floor Area:		**3.2 %**
4. Leakage Split:	Supply Side:	
	Return Side:	
5. Duct Leakage Curve:	Flow Coefficient (C):	**19.6**
	Exponent (n):	**0.600 (Assumed)**
6 Test Settings:	Test Mode:	**Pressurization**
	Test Pressure:	**25.0 Pa**
	Equipment:	**Series B Minneapolis Duct Blaster**
	Test Type:	**Total Leakage (Duct Blaster Only)**

Building and System Parameters:

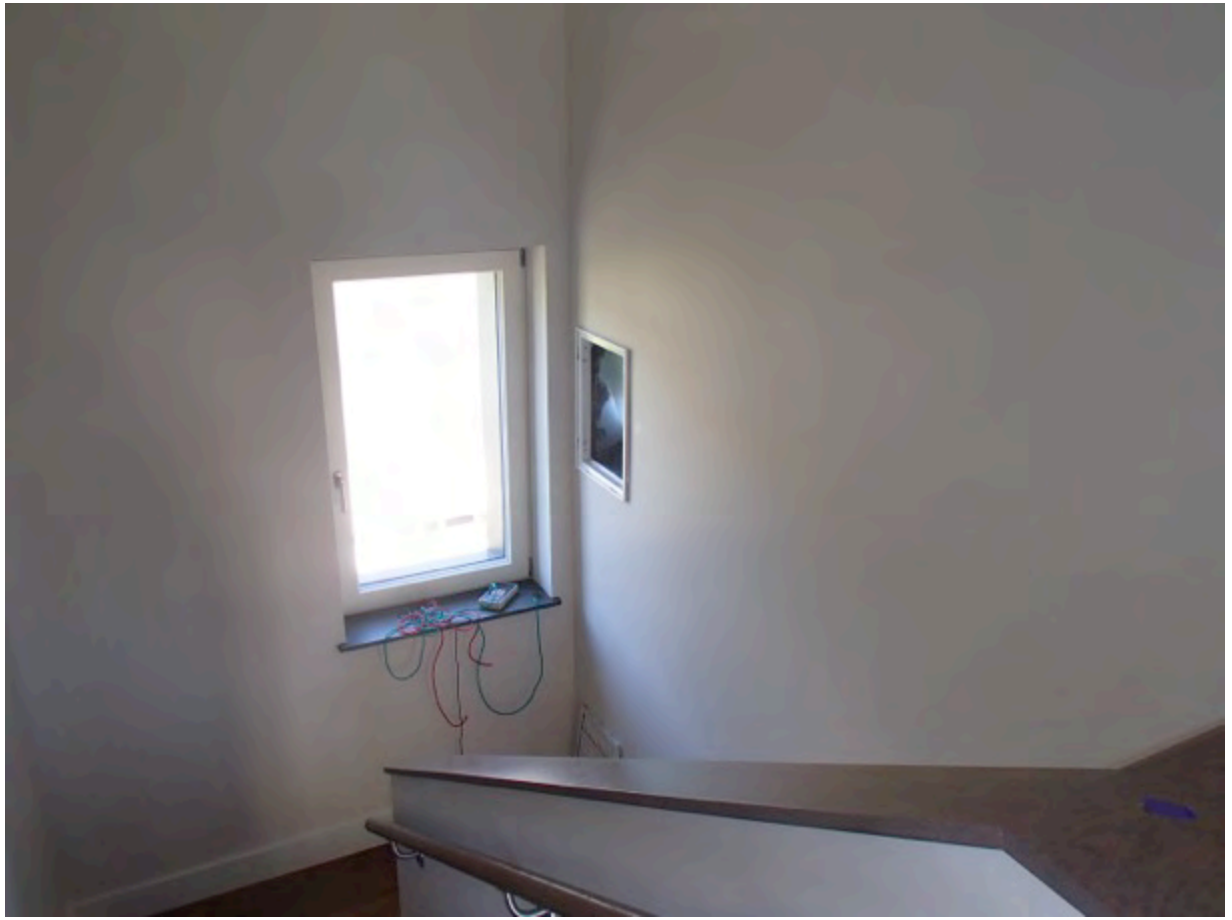
Floor Area:	**4164 sq. ft.**	Average Supply Operating Pressure:	**Pa**
System Airflow:	**1200 CFM**	Average Return Operating Pressure:	**Pa**
Supply Leakage Split:	**%**	Supply Leakage Penalty:	
Return Leakage Split:	**%**	Return Leakage Penalty:	

Percentage of Measured Leakage Connected to Outside: **100% (135.0 CFM)**

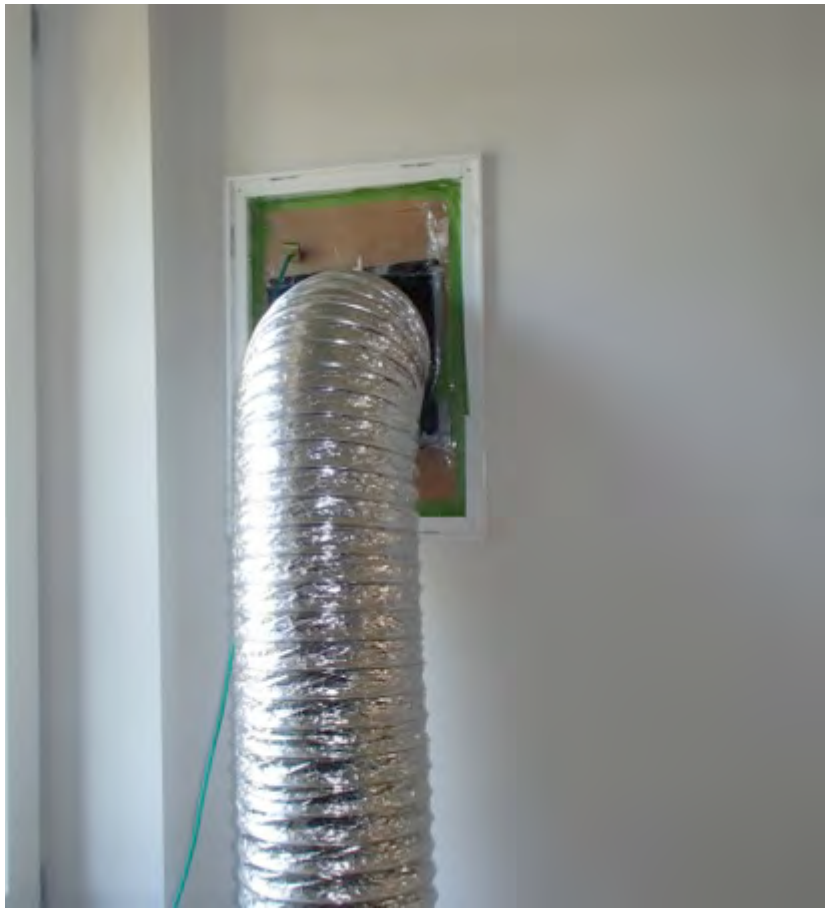
Option two when ducting and furnace installation is complete

- Hard to find and seal air leaks
- Who is going to do the test ?
- 0.04 x sq. ft of condition area
- Example 3000 ft. would = 120 cfm of leakage

Single filter grill in stair well



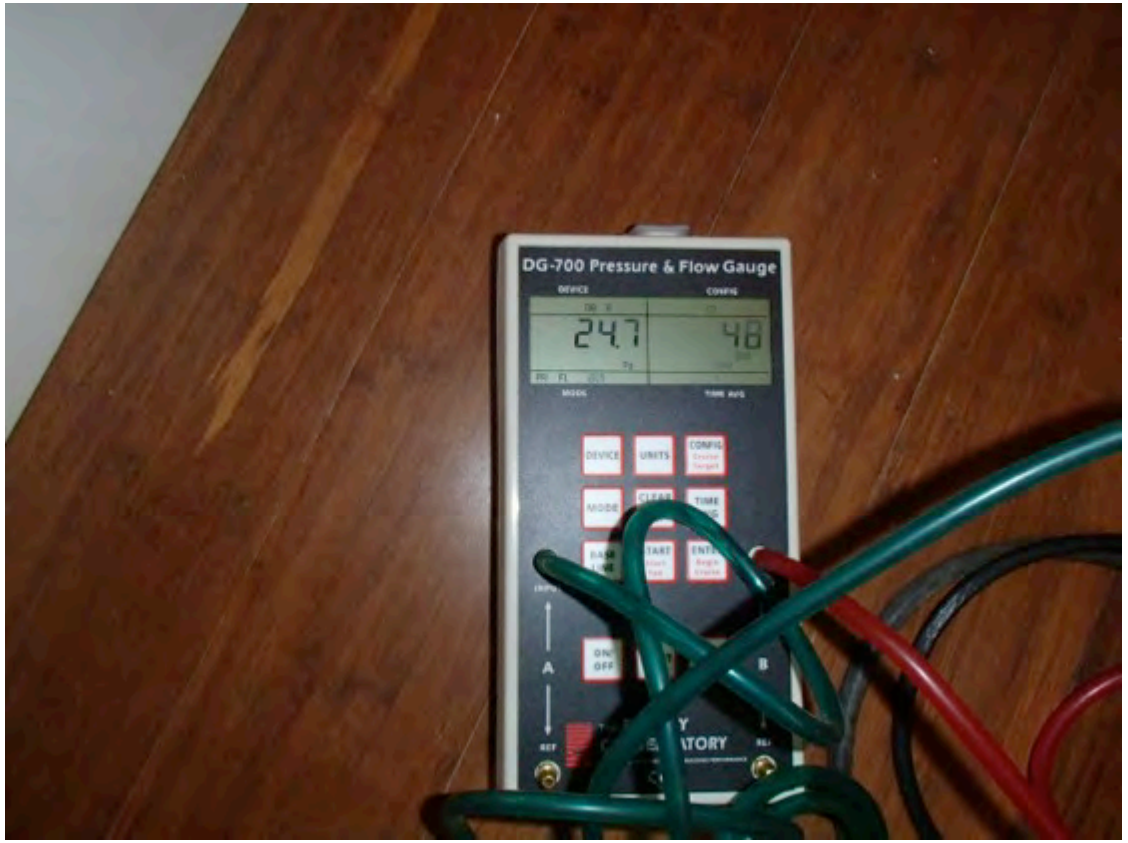
Duct Blaster connection to single return opening



Duct mask tape on grills

On round opening… take grill off and mask over

Small cfm number on Channel B



Demo the duct blaster test

- CFM at 25 PA
- Tec blast

All houses will need to do a blower door

- Talk about houses and the testing that have been done
- Show them a report
- What does three ach mean

Testing of Building… Air Tightness Blower door

The building envelope is required to be properly sealed and tested, and verified as having an air leakage no higher than 3 Air Changes per Hour (ACH) at 50 PA of pressure with a blower door. A written report of the results shall be provided to the code official. When required by code official , testing shall be conducted by an approved third party

- What does this mean?
- Blower Door testing on all new houses
- Most homes will easily pass this test

BUILDING LEAKAGE TEST

Date of Test: 5/20/2014
Customer:

Test File:
Technician: mike d wilson
Project Number:

Building Address:

Test Results

1. Airflow at 50 Pascals: (50 Pa = 0.2 w.c.)	1498 CFM50 (+/- 0.4 %) 0.97 ACH50 0.3240 CFM50/ft2 floor area 1.4366 CFM50/ft2 surface area
2. Leakage Areas:	161.2 in2 (+/- 1.5 %) Canadian EqLA @ 10 Pa 87.9 in2 (+/- 2.5 %) LBL ELA @ 4 Pa
3. Building Leakage Curve:	Flow Coefficient (C) = 130.4 (+/- 4.0 %) Exponent (n) = 0.624 (+/- 0.011) Correlation Coefficient = 0.99970
4. Test Settings:	Test Standard: CGSB Test Mode: Depressurization

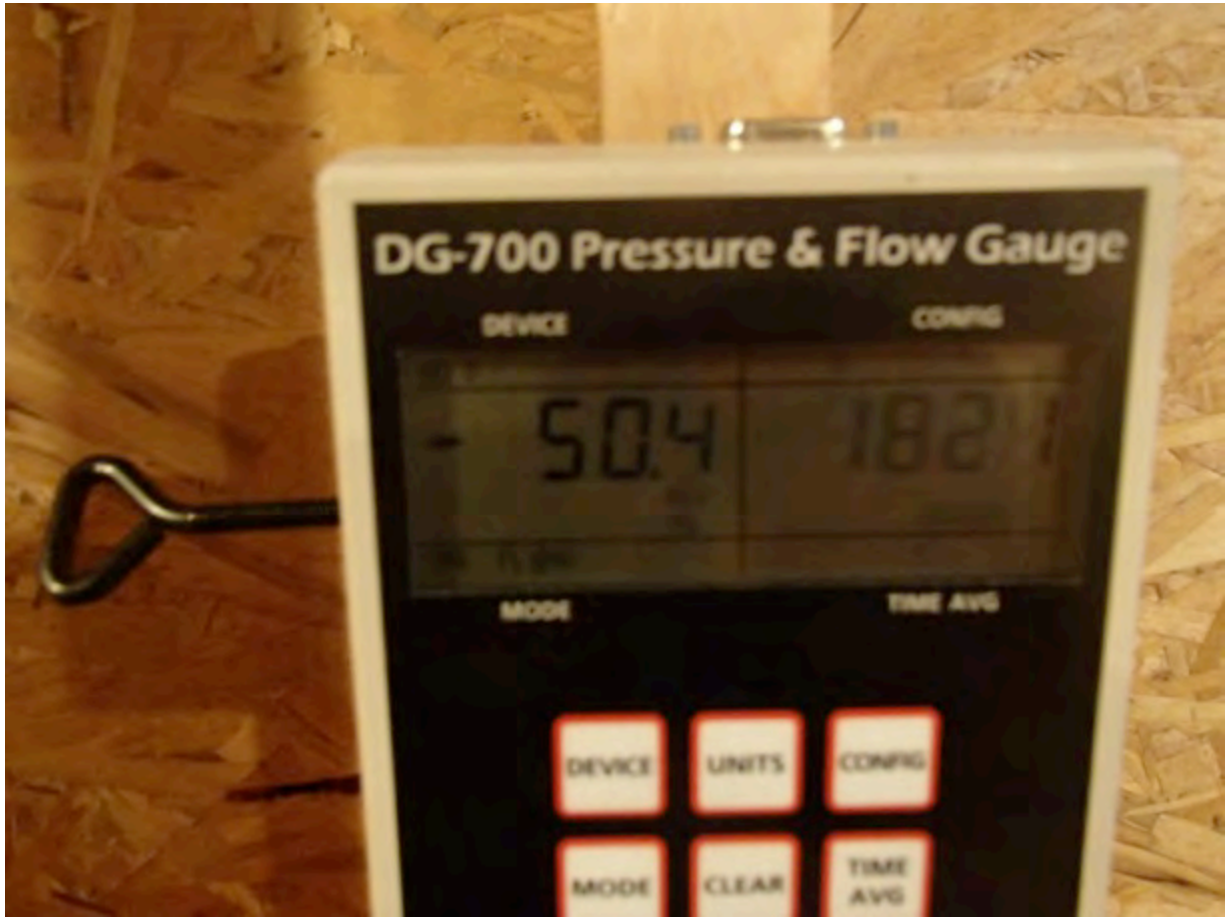
Infiltration Estimates

1. Estimated Average Annual Infiltration Rate:		109.7 CFM 0.07 ACH		
2. Estimated Design Infiltration Rate:	Winter:	186.8 CFM 0.12 ACH	Summer:	136.0 CFM 0.09 ACH

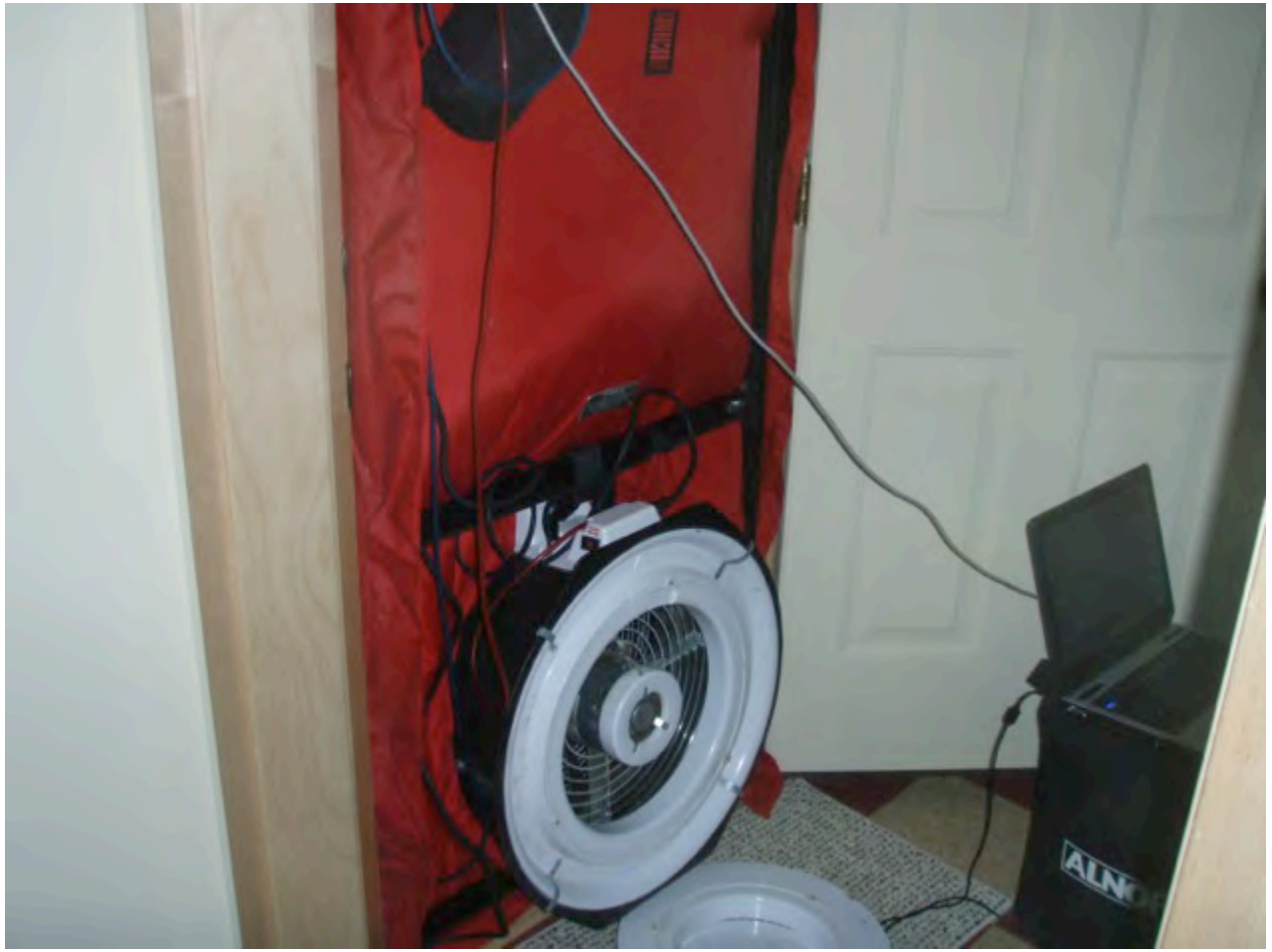
Cost Estimates

1. Estimated Cost of Air Leakage for Heating:
2. Estimated Cost of Air Leakage for Cooling:

DG-700 50 Pascal's at 1821 CFM of leakage



Blower door test



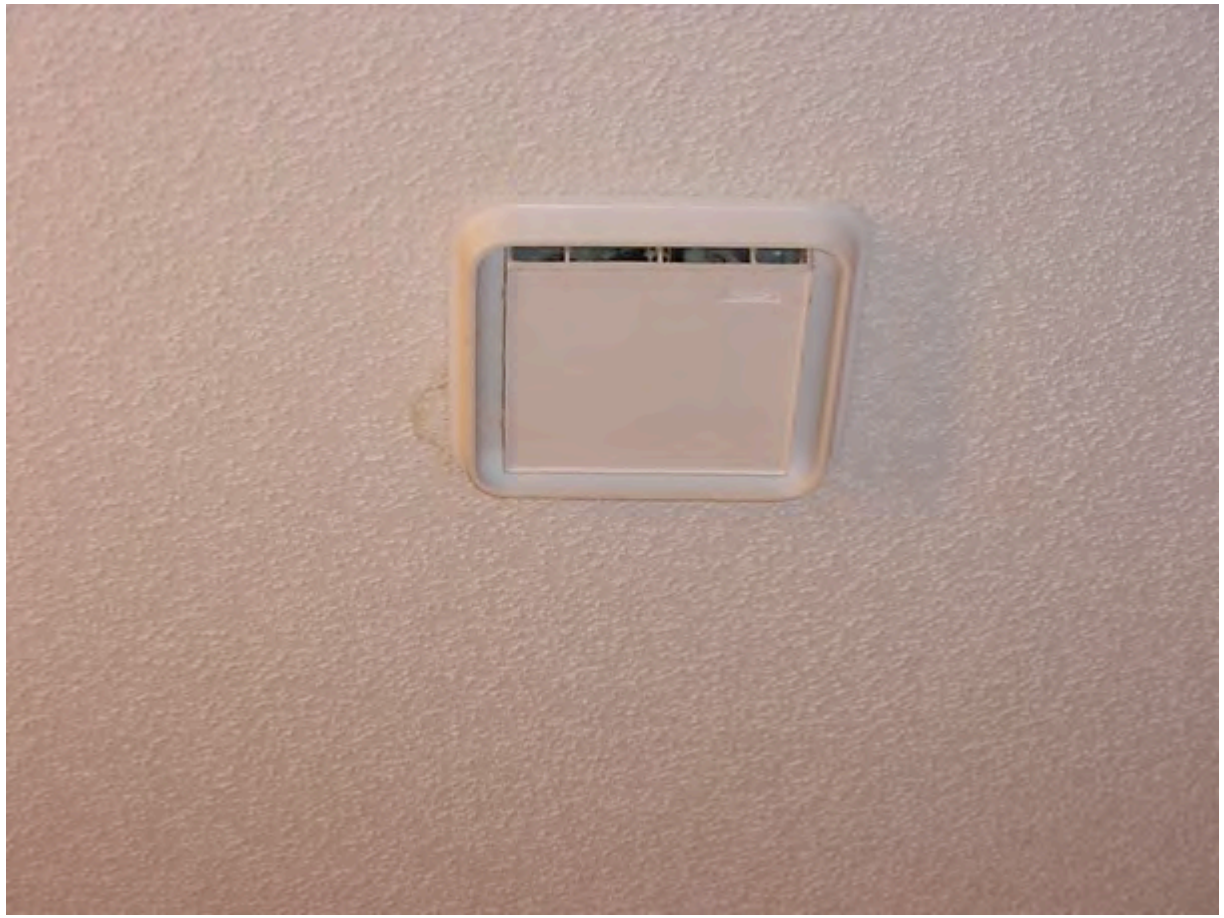
Ventilation

Mechanical ventilation is still Required

- Exhaust only for whole house is not allowed
- Balanced with or with out heat recovery is allowed

Let us look at a few ventilation details we have learned over 30 years

Whole house bath fan ventilation



Major air flow reduction… maintenance

High Quality bath fan and duct installation?!#

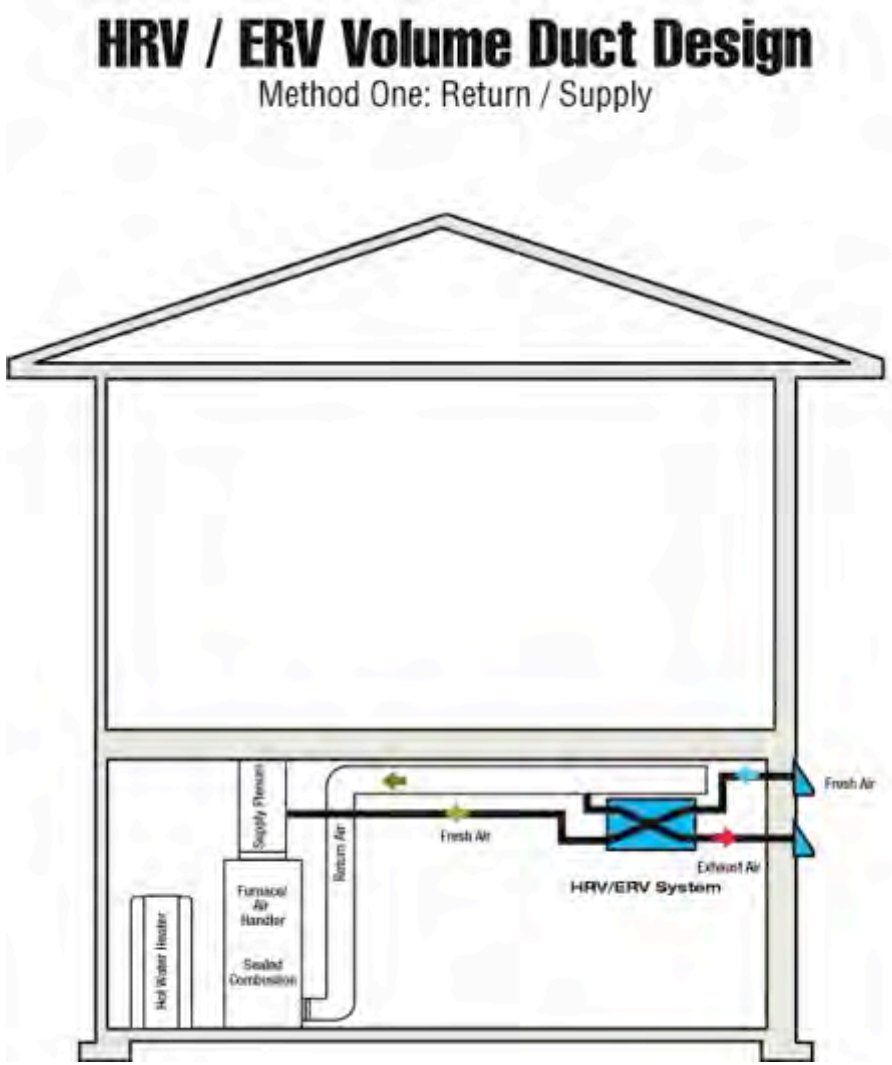
Inlet damper in the return air

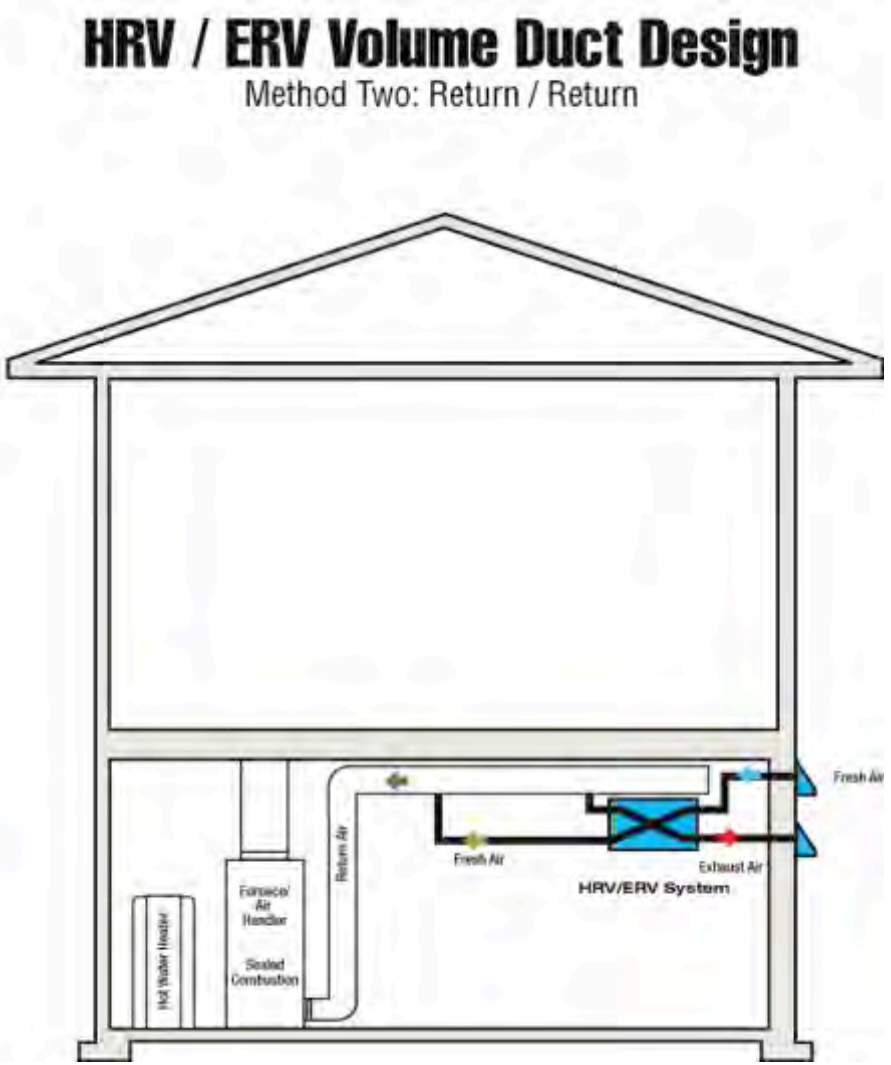
Control Interface with non HRV/ERV balanced systems can be very challenging

Mechanical ventilation

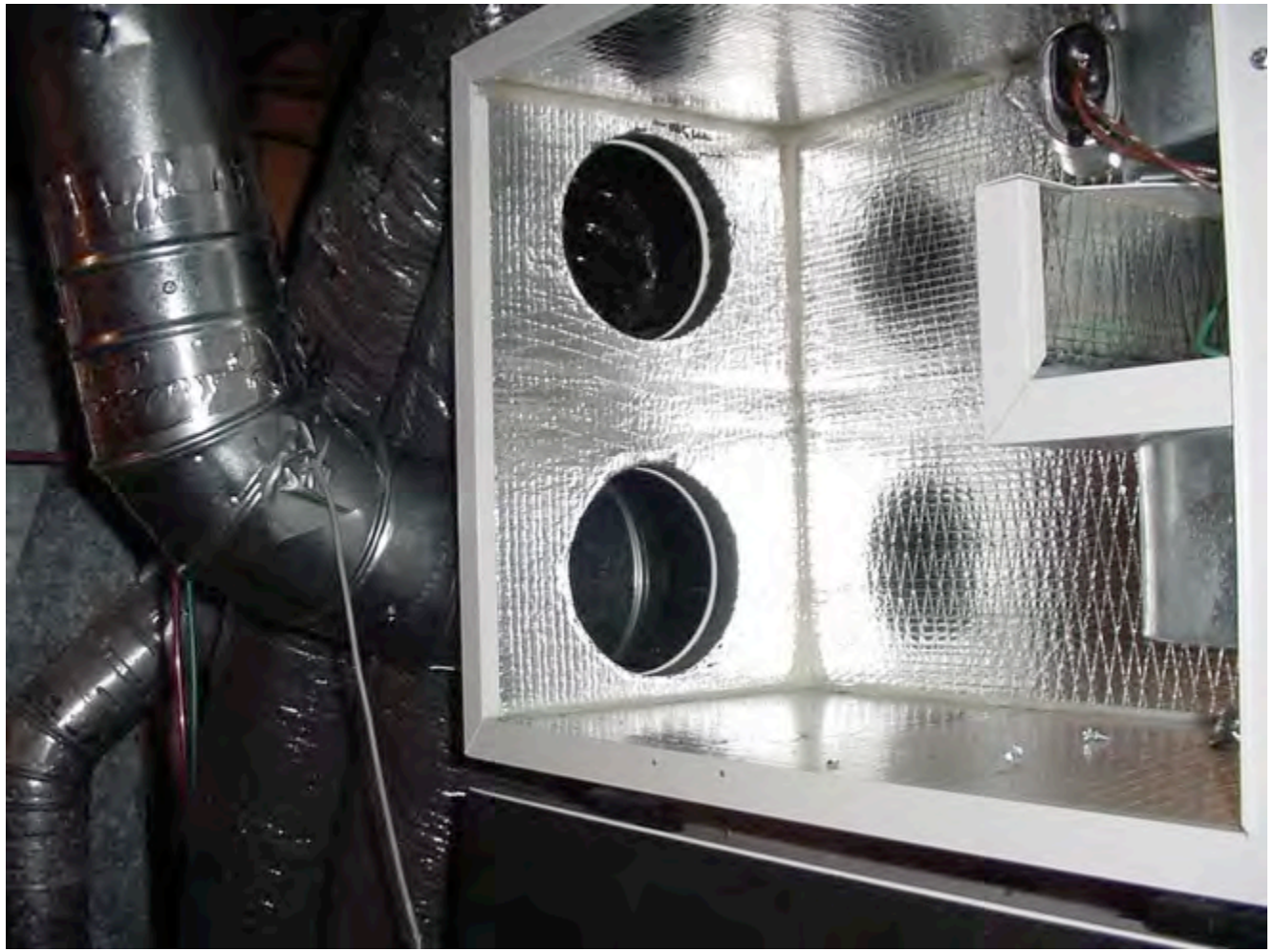
- Shall be provide with balanced ventilation that is +/- 10 percent f design capacity
- All conditioned areas… no change from previous code
- Outdoor air intakes and exhaust shall have automatic or gravity dampers that close when the ventilation system is not operating
- Kit and bath fans exempt
- 1 hour period

Balanced HRV / ERV





HRV/ERV AIR EXCHANGER dampers



Mechanical Ventilation

- Total Ventilation Rate (cfm) = (0.02 x sq. ft. of condition space) + (15 x (number of bedrooms + 1))
- Continuous Ventilation Rate (cfm) = Total ventilation rate /2
- TVR
- CVR

Table R403.5.2 Mechanical Ventilation

- Sizing
- Do example

Mechanical Ventilation Design

- Size you HRV/ERV or Balanced to meet TVR
- Size you HRV/ERV or Balanced to meet just CVR
- Both Continuous and Intermittent must be balanced

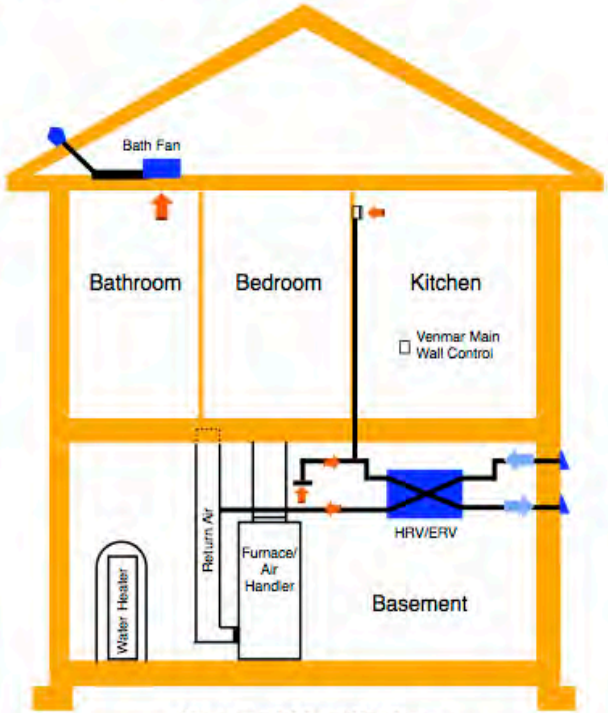
- Exception under R403.5.5 Balanced and HRV/ERV systems

“ The balanced system and HRV/ERV system may include exhaust fans to meet the intermittent ventilation rate. Surface mounted fans shall have a maximum 1.0 sone per HVI Standard 915”

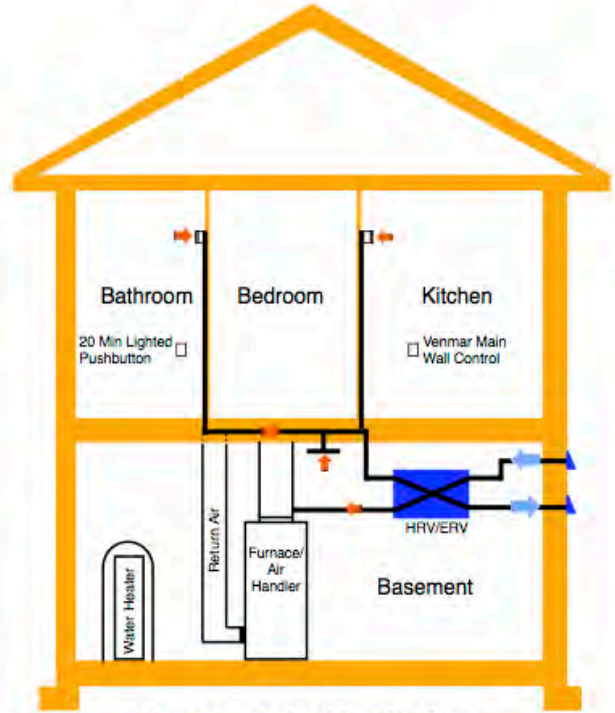
Duct design Hrv/Erv

- General ventilation
- Source point
- Fully ducted
- Return- return
- Return- supply

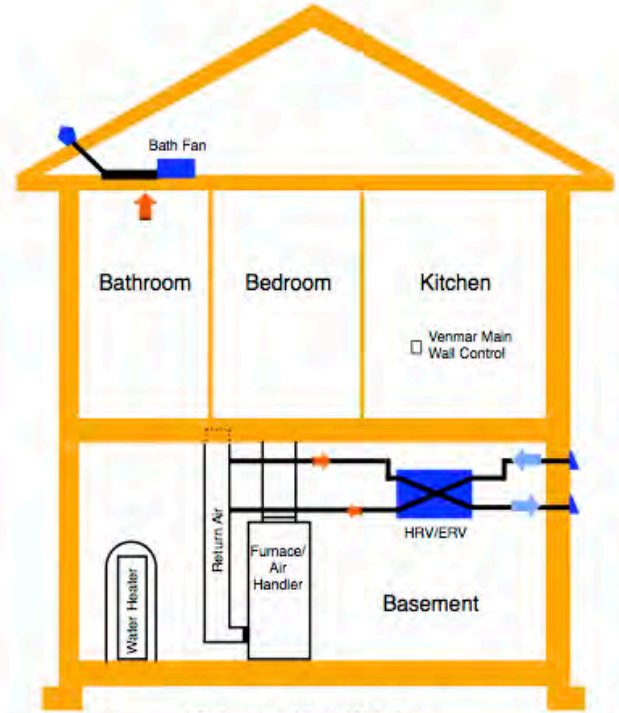
Installation Options



General Ventilation
(one exhaust per level)



Source Point Ventilation



Volume Ventilation
(return/return or return supply)

General Ventilation

- Air is exhausted from the basement (musty smells, moisture) and the kitchen area (moisture, cooking odors, gas stove by-products)
- Tempered fresh Air is ducted to furnace return or supply

Source Point Ventilation

- Air is exhausted from the kitchen area and can replace bathroom fans-- in applications where duct lengths are not excessive.
- Tempered air is ducted to furnace return or supply.

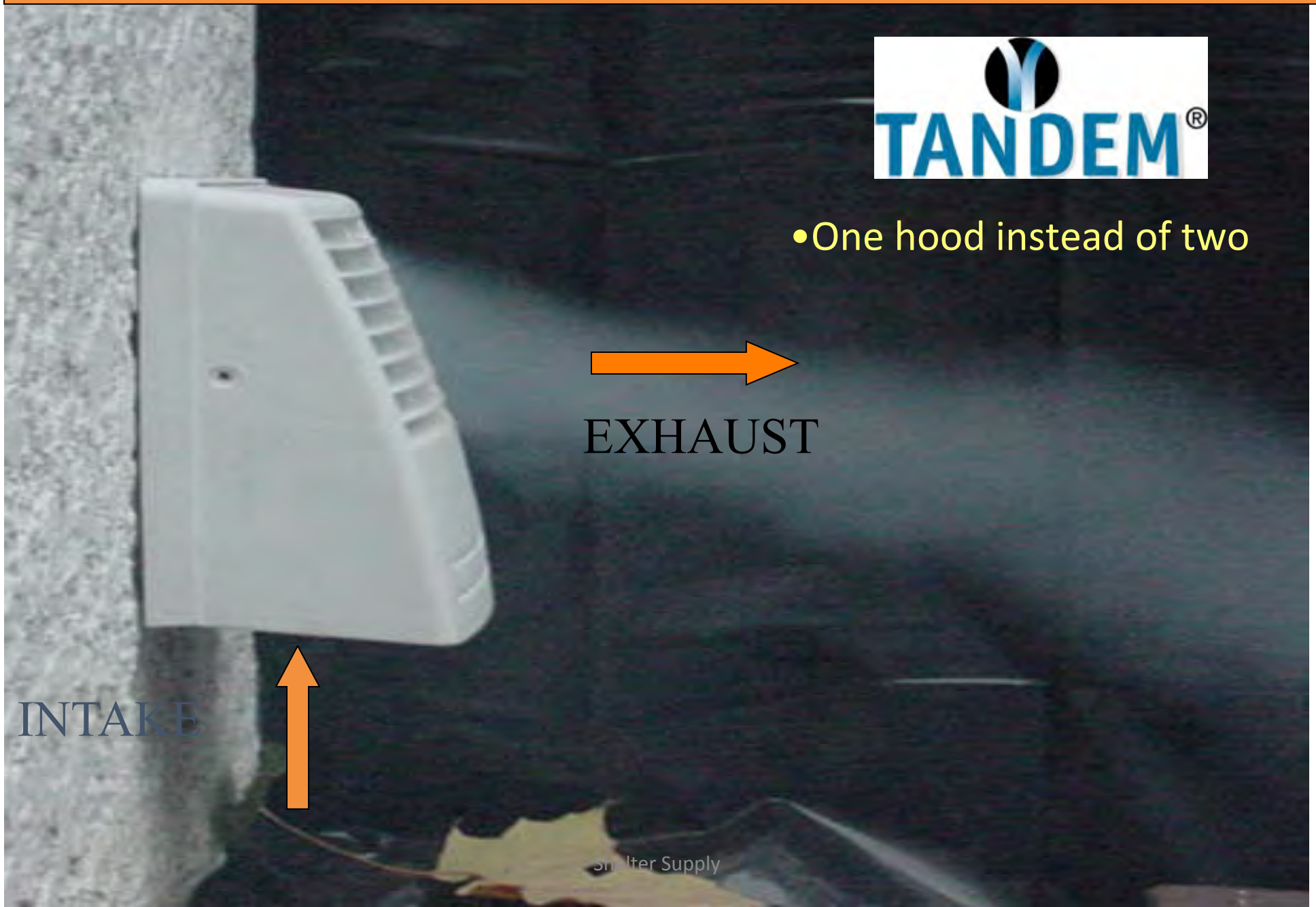
Volume Ventilation

- The existing furnace ductwork is used to exhaust and supply fresh air to the building.
- Tempered air is ducted to furnace return or supply.

Furnace fan needs to run on a return/return strategy


ERV
CONSTRUCTO
1.0

BALANCED - HRV/ERV



Mechanical Ventilation distribution

- 0.075 cfm per conditioned floor area
- No less then 40 degrees at grill

Labeling and documentation

- No changes
- Hoods need to be marked

Noise and vibration

- Isolation duct connection shall be used to mitigate noise transmission

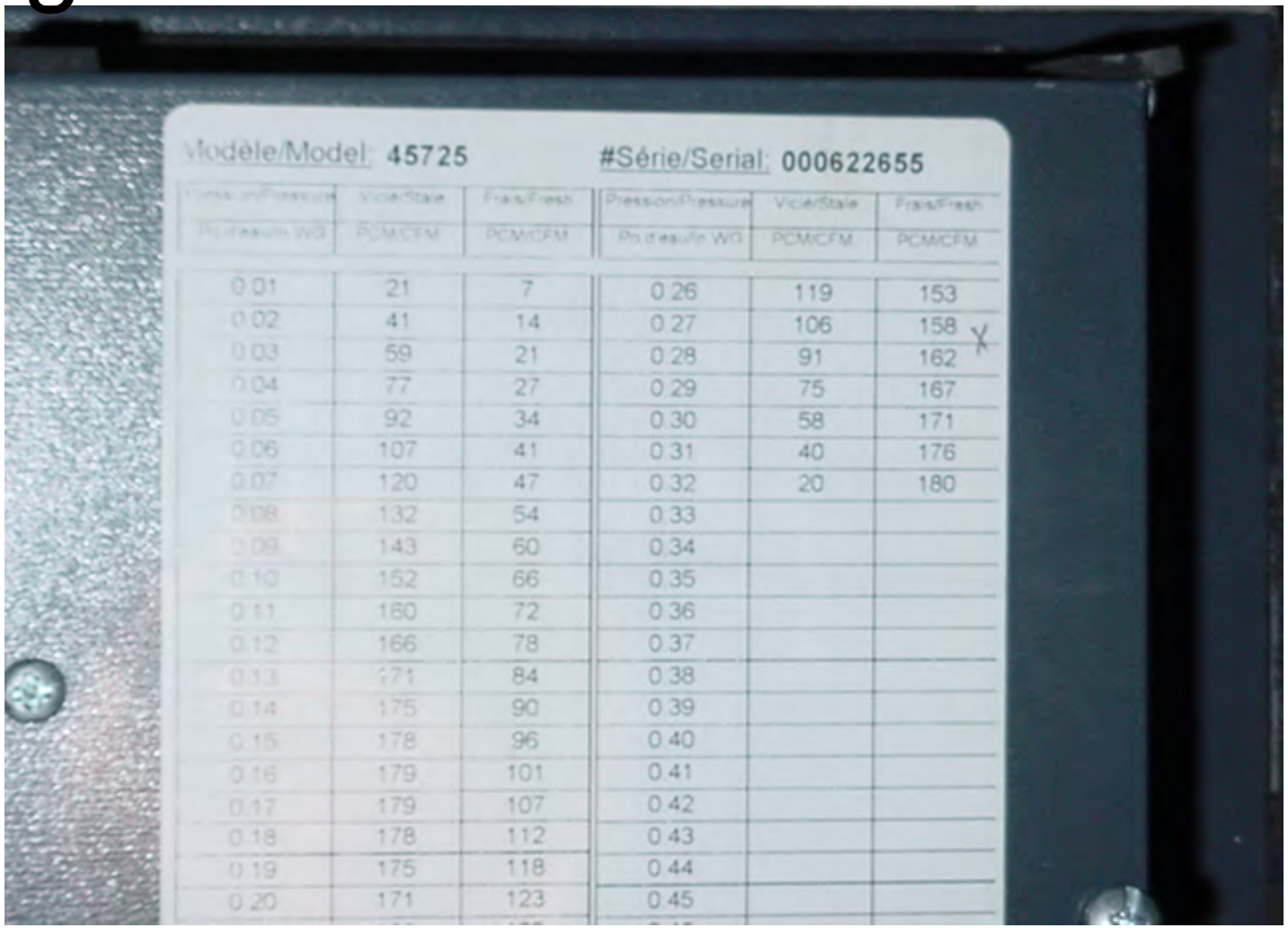

Vibration flex

R403.5.6.1.3 Airflow Verification

- Greater then 30 cfm
- Method of testing air flow
- Equipment to measure

BALANCED - HRV/ERV

Balancing chart



Modèle/Model: **45725** #Série/Serial: **000622655**

Pression/Pressure Po d'eau/in WG	Vicié/Stale PCM/CFM	Frais/Fresh PCM/CFM	Pression/Pressure Po d'eau/in WG	Vicié/Stale PCM/CFM	Frais/Fresh PCM/CFM
0.01	21	7	0.26	119	153
0.02	41	14	0.27	106	158
0.03	59	21	0.28	91	162
0.04	77	27	0.29	75	167
0.05	92	34	0.30	58	171
0.06	107	41	0.31	40	176
0.07	120	47	0.32	20	180
0.08	132	54	0.33		
0.09	143	60	0.34		
0.10	152	66	0.35		
0.11	160	72	0.36		
0.12	166	78	0.37		
0.13	171	84	0.38		
0.14	175	90	0.39		
0.15	178	96	0.40		
0.16	179	101	0.41		
0.17	179	107	0.42		
0.18	178	112	0.43		
0.19	175	118	0.44		
0.20	171	123	0.45		

Other code information

- R-6 on duct work
- Load calculation and sizing
- Snow melt
- Pipe insulation
- Sheet rock any room larger then 80 square feet

R-6 insulation duct insulation in condition areas

- No more 1 inch insulated flex duct

Sizing HVAC system

- Manual J
- Manual S
- 40 % over size for the heating
- 15% over size for the cooling

R403.3 Mechanical systems piping insulation (mandatory)

- Mechanical system piping capable of carrying fluids above 105 degrees F or below 55 degrees F shall be insulated to a minimum of R- 3

Snow melt

- If you install these type of systems… you should look into this section

Thank you for your time

- Mike D. Wilson, presenter
- Dakota Supply Group
- 612-597-3395
- mwilson@dsginc.biz