Commissioning of Homes
for
2018
Energy Design Conference

By

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agenda

- What is commissioning
- Is it needed
- Who would do this
- Call back
- Wants, needs, expectation
- Design house layout
- Performance testing and verification
- Codes being followed
- Benefits
- Systems
- Shell
- Mechanical hvac

Commissioning- what is it

- It is done on commercial building all the time
- It is more then performing a blower door test
- It is more then finishing the punch list
- It follows the house as a system thought
- There is levels of commissioning… depends

Commissioning process should look like

- Test and verify individual components functionality
- Do those components work in there designed systems
- Does all components and systems interact properly and perform to expectation

Wants and expectation

- What does the home owner want
- Low energy
- IAQ
- Certain look or shell design…passive solar
- Components of the house
- Expectations
- Temp- RH%
- Cost of energy
- Maintenance
- Other

Benefits

- Piece of mind
- Warranties
- Comfort
- Less hassles after closing
- Less call backs

Commissioning- who does it

- Could be single person
- A small team
- Services from a Architect group
- Services from a Engineer group
- Services from a Energy professional
- Services from a HVAC professional

DESIGN

- Builder
- Architect
- Engineer
- Sub contractors
- Internet
- Home owner

Come up with a plan, map it out

- The process should start during design and blue print stage
- What is the guidelines of the process
- Get the home owner involved
- Sub contractors should be involved
- All party will know before rough in what is to be tested and verified

Meeting with all parties, explain what testing is to be done

FLASHING AND WINDOW LOCATION

HOT TUB MPLS

WATER AND WINDOWS?

FOUR SEASON AREA … WHAT DO YOU SEE

Commissioning- why is it needed

- An over all process that looks at how the shell and it components work together …. A lot of homes are built with the thought that when MY part is done, I am done
- Codes do not cover performance and maintenance
- In general builders do a great job on going over the house and operation, but do they have all the tools and skills to verify operation

Give examples

- Call back issues… costly
- This is just a few examples

AIR FLOW LEAKAGE(speakers and lights) and DUCT PENETRATION FROM ATTIC

EXHAUST HOOD SUCKING AIR IN

Failure Summary WOOD FLOORING

1. **Uncontrolled jobsite moisture**
2. **Wrong Parameters by HVAC**
3. **Uncontrolled Rh by homeowner**
4. **Radiant Heat Controls**
5. **Wrong Product Choice**

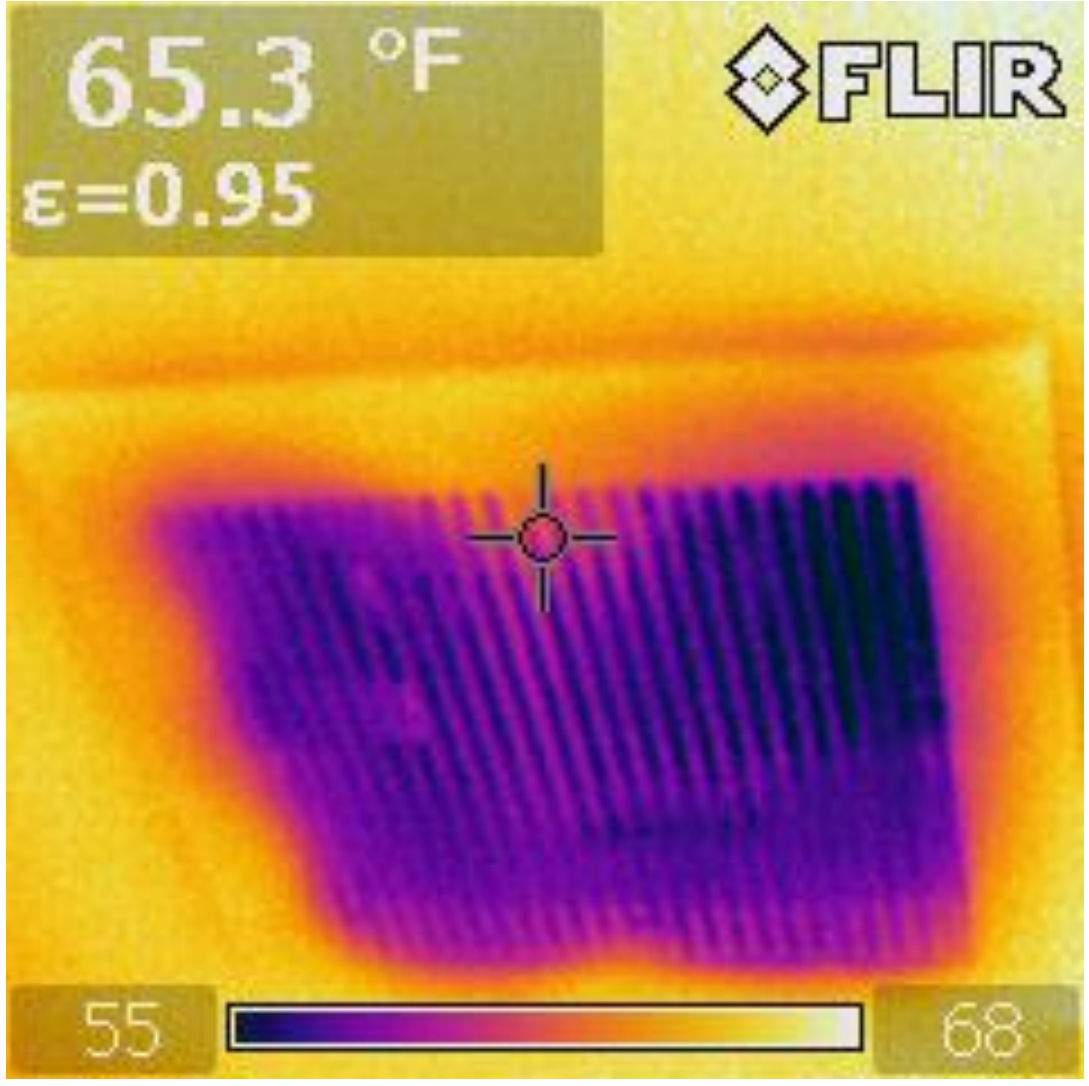
Large floor to ceiling drapes act as insulation, cooling glass surfaces

You can’t make this stuff up ?!

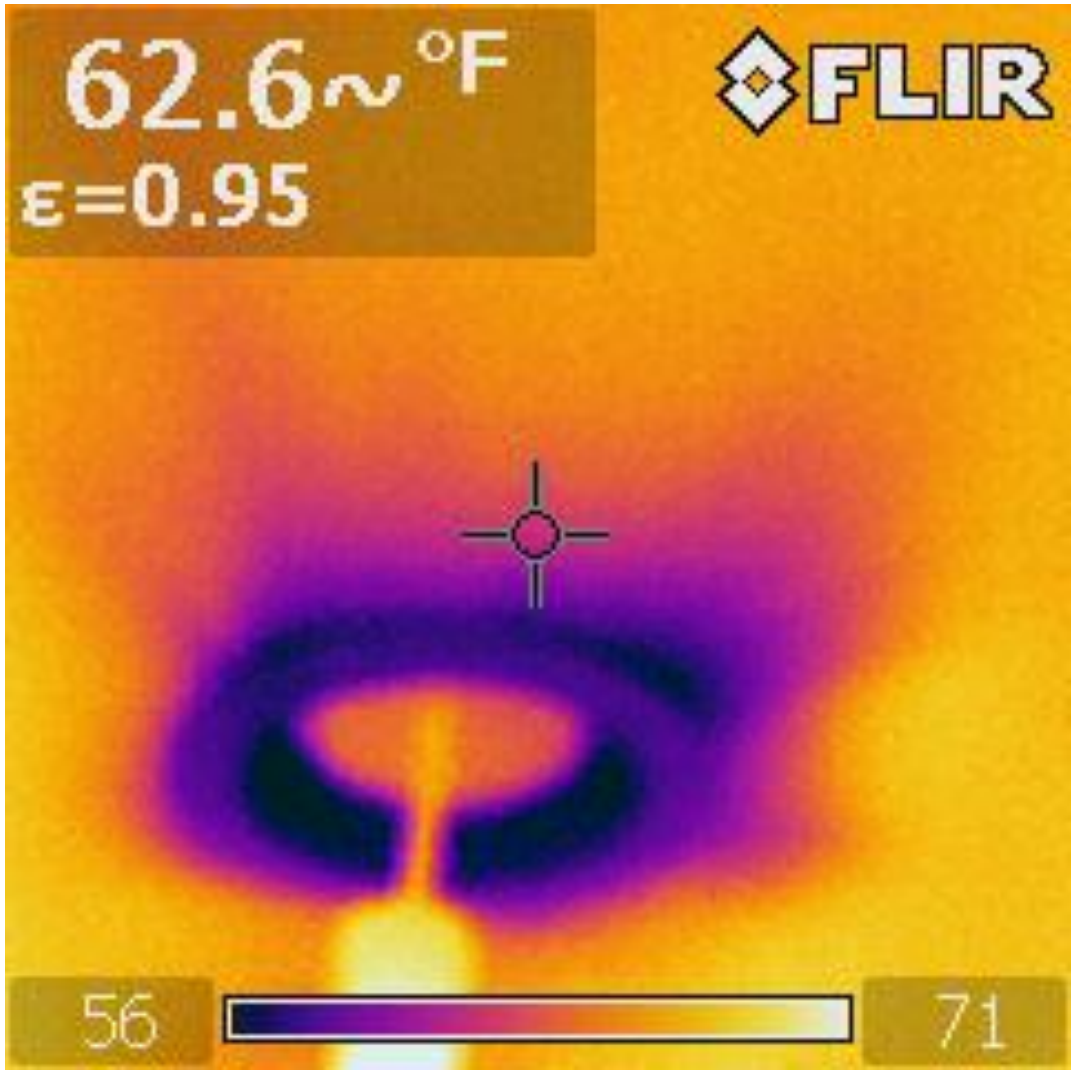
Duct work needs to be covered with insulation

Moisture Failure at duct/hood

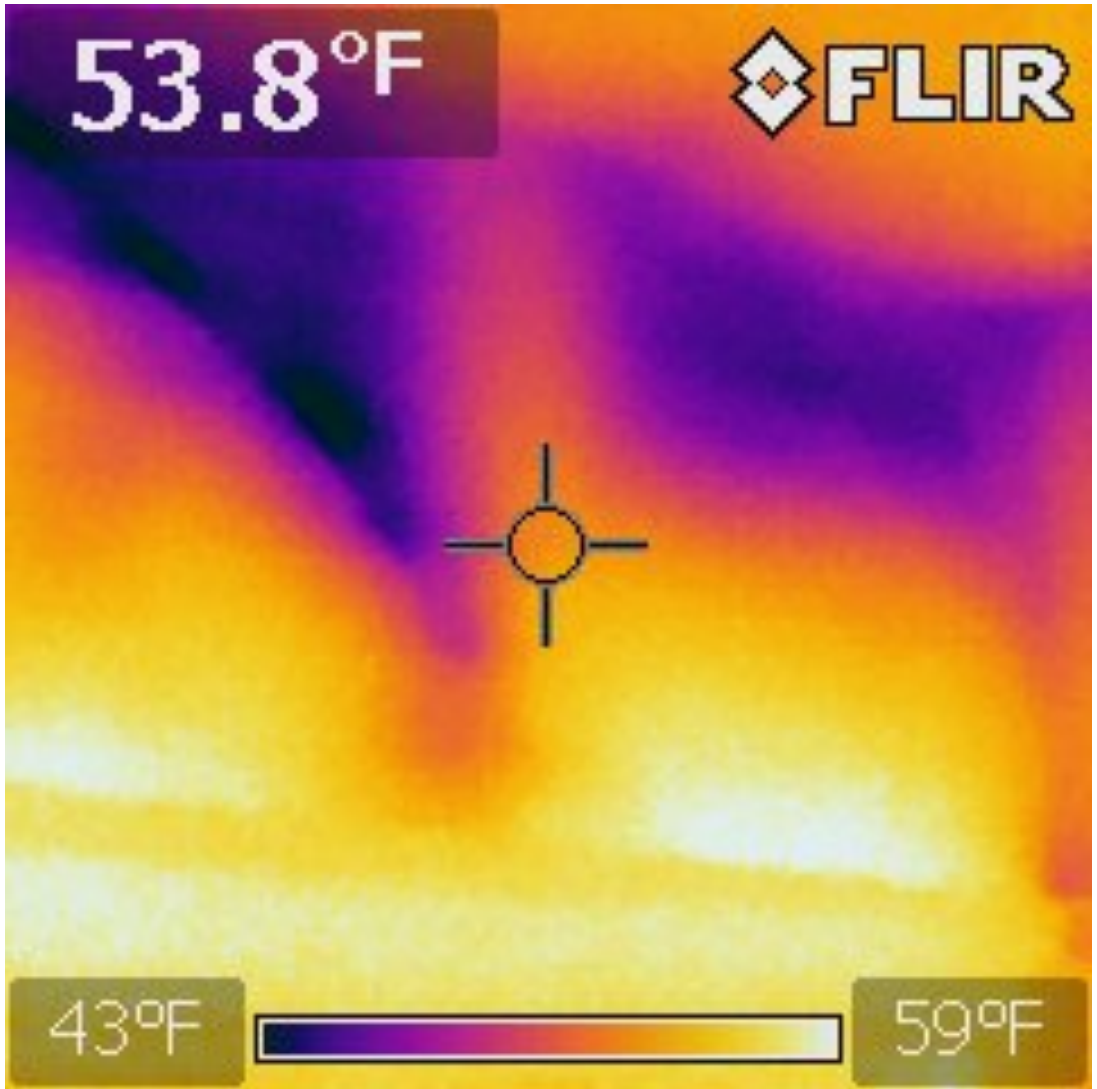
Cold air thru bath fan , damper open



Can light

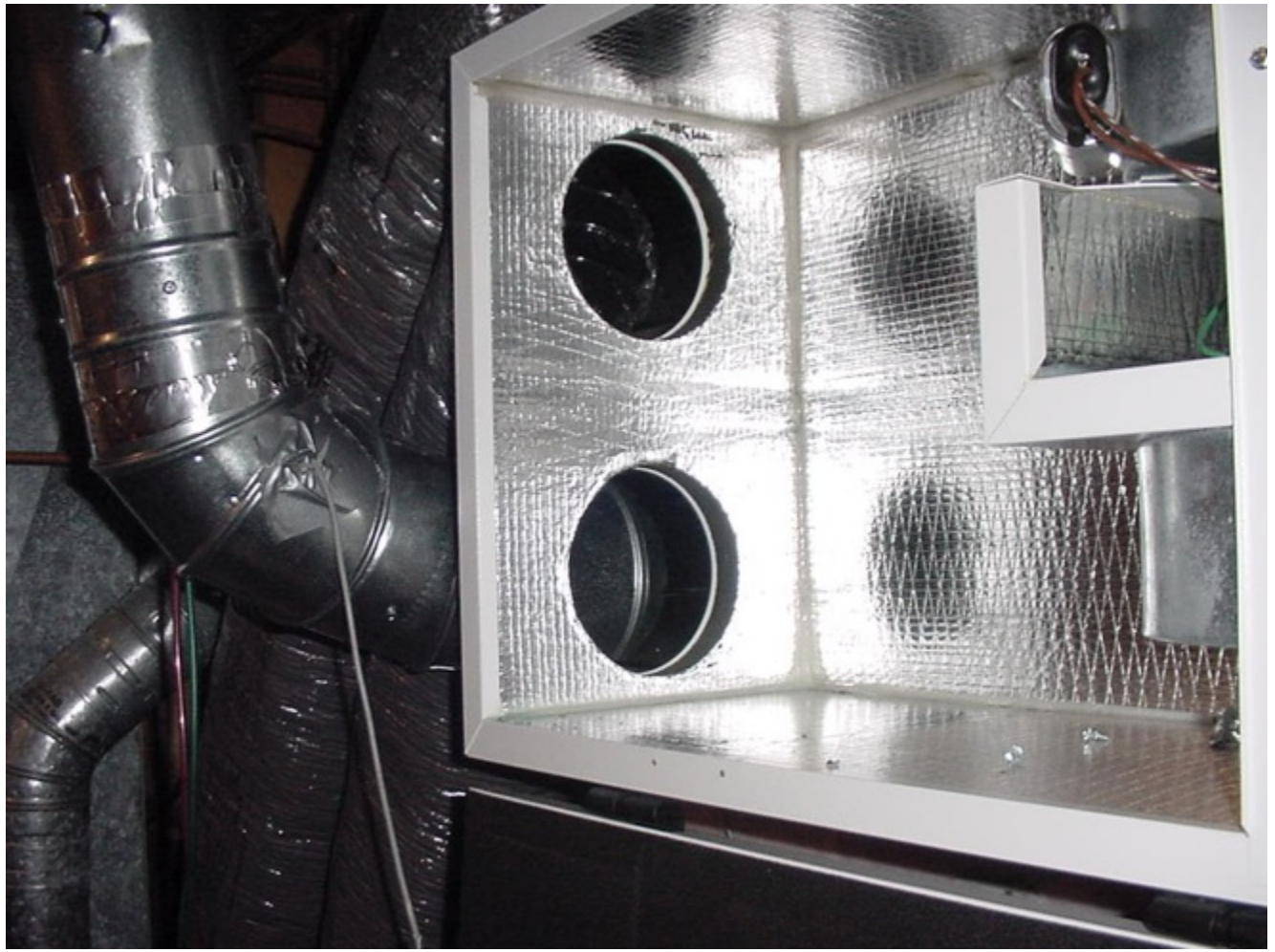


Wall cavity poor insulation detail

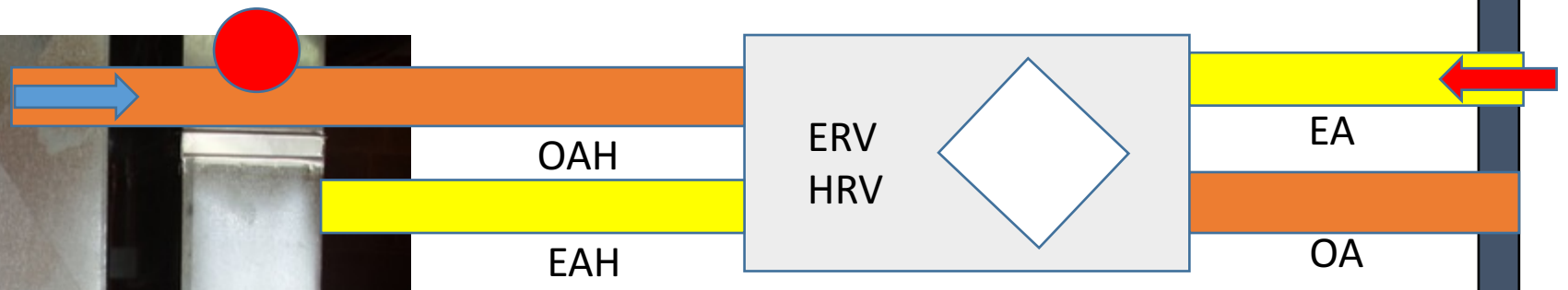


This type of shade also cools window surface, cooler surface more window condensation

HRV/ERV AIR EXCHANGER with no dampers in system



SUPPLY- RETURN DUCT DESIGN, NO DAMPERS



- SEASON SUMMER
- CALL FOR COOLING OR FAN ON
- ERV OR HRV IS OFF
- ACTUAL MEASURED FLOWS 6 INCH DUCT
  1. OUTSIDE AIR TO HOUSE DUCT, IS NOW REVERSE IN FLOW AND IS BLOWING 110 CFM OF 50 DEGREE TO THE OUTSIDE
  2. EXHAUST AIR TO OUTSIDE DUCT IS ALSO IN REVERSE FLOW IT IS SUCKING IN 65 CFM OF 85 DEGREE 58 DEGREE DEWPOINT FROM OUTSIDE

APPLY THIS TO WINTER OPERATION #?!

Back flow demonstration

Two six inch flex ducts for make up air, constant flow of cold air

Condensation in the Building Assemblies

- Can lead to mold and rot
- Can cause building failures in, siding, rim joists, walls, frost and moisture in attic
- Can lead to litigation and some very $ expenses repairs
- The higher the RH% is in the winter the more the structure has a potential for problems
- Proper RH% and air sealing/insulating can solve these problems
- **Follow Systems Approach**

Codes

- Are codes being followed ?
- In areas that there is no enforcement, do what ever ?
- In areas that have inspection , this does not ensure operation and performance
- Codes and standards are not perfect… but a lot of time and thought goes into the code making process
- Building to code is a base line, talk to homeowner on how to achieve performance above the code line

House design and HVAC

- Does the layout of the house make sense with the HVAC design?
- Is the HVAC bid price or performance driven?
- Expectations of the home owner?
- Input from the Sub Contractors
- Track record (proven history) with equipment, installations, suppliers, service tech ,tech support, manufactures and warranties

A LOT OF GLASS FACING WEST

HVAC

- Follow manufacturing install specification…. Read the manual
- Industry standards
- Start up forms
- Registration
- Certification and Training
- Meet code standards

Does ever body under stand how the control work

System approached on interface and operation

- Does system work together under different conditions
- Does home owner understand how controls work
- Operation and performance
- Maintenance plan

Walk thru with home owner

Testing and verification

Blower door test

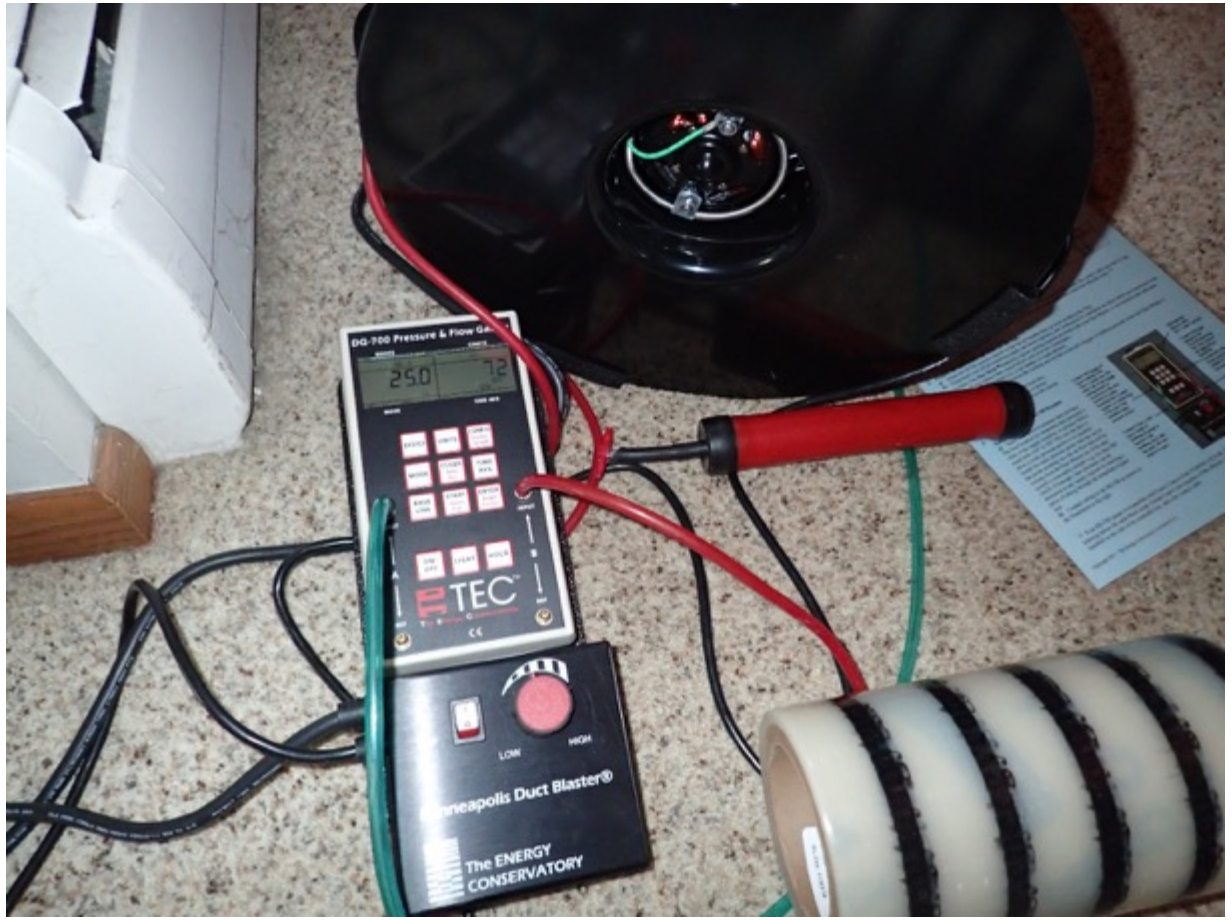
BALANCED - HRV/ERV

Lab test at MCTC Duct blaster

Tools you need

- Equipment that is calibrated to do duct leakage testing
- Formula or software to do the calculations
- Equipment that I use
- Duct Blaster, The Energy Conservatory
  - DG -700 digital manometer
  - Duct Blaster fan with rings
  - Instructions and software

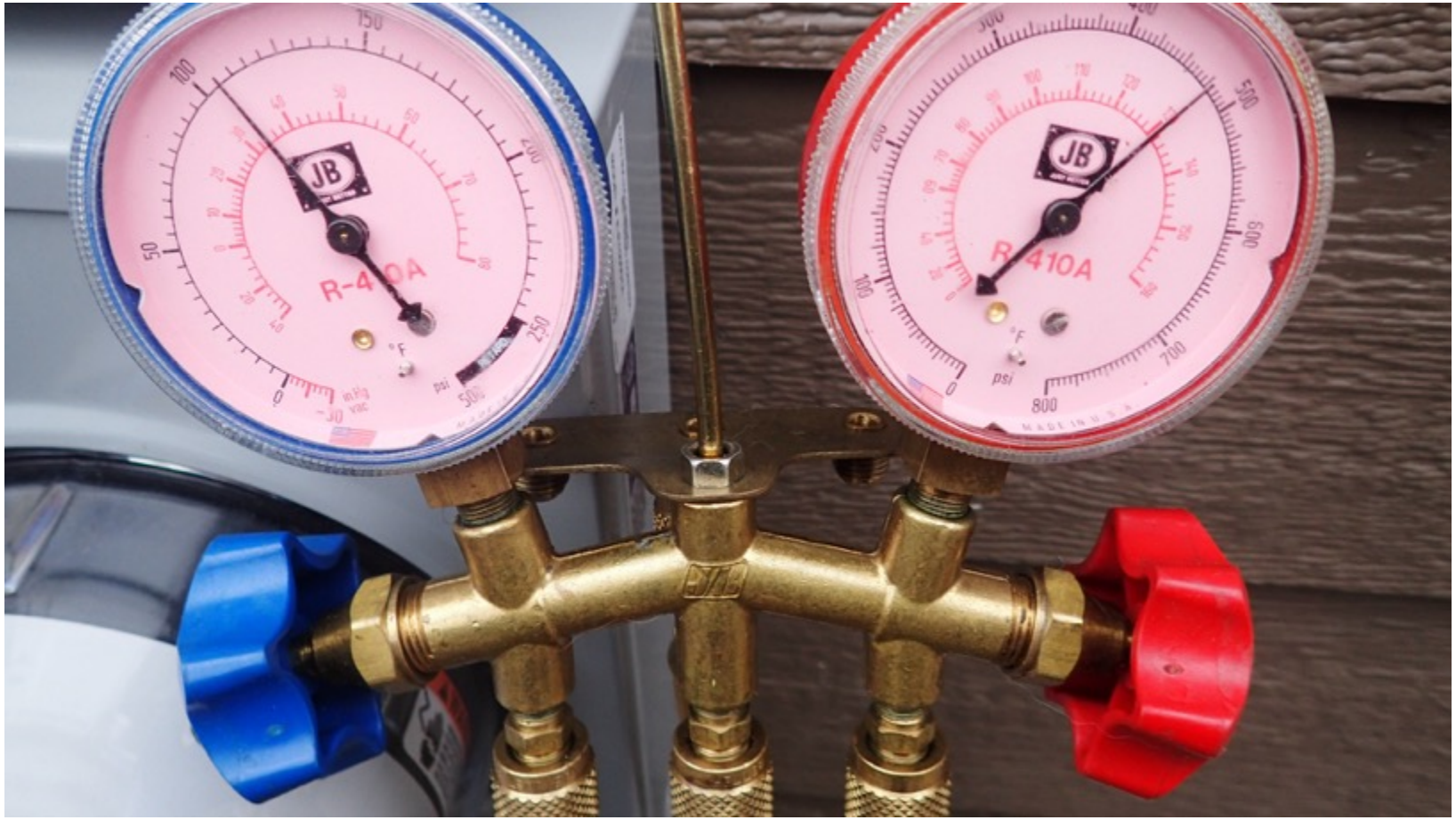
  - Duct mastic
  - Duct mask or plugs
  - Lights (trouble and flash)
  - Smoke (fogger or hand held)



Verify exhaust and supply flow

Delivery temp runs about 10 degrees colder then a conventional AC system it will dehumidify the house air more

TEST AC UNIT



DEEP VACUM ON AC/HEAT PUMP

SURFACE TEMPS


FLUKE 116 TRUE RMS MULTIMETER
128.5
°F
°C / °F
HOLD
MIN MAX
RANGE
AUTO-V
LoZ
OFF
Hz
mV
Ω
μA
COM
+

Supply air temperature on a 0 degrees F day

BUILDING PRESSURE


ACE

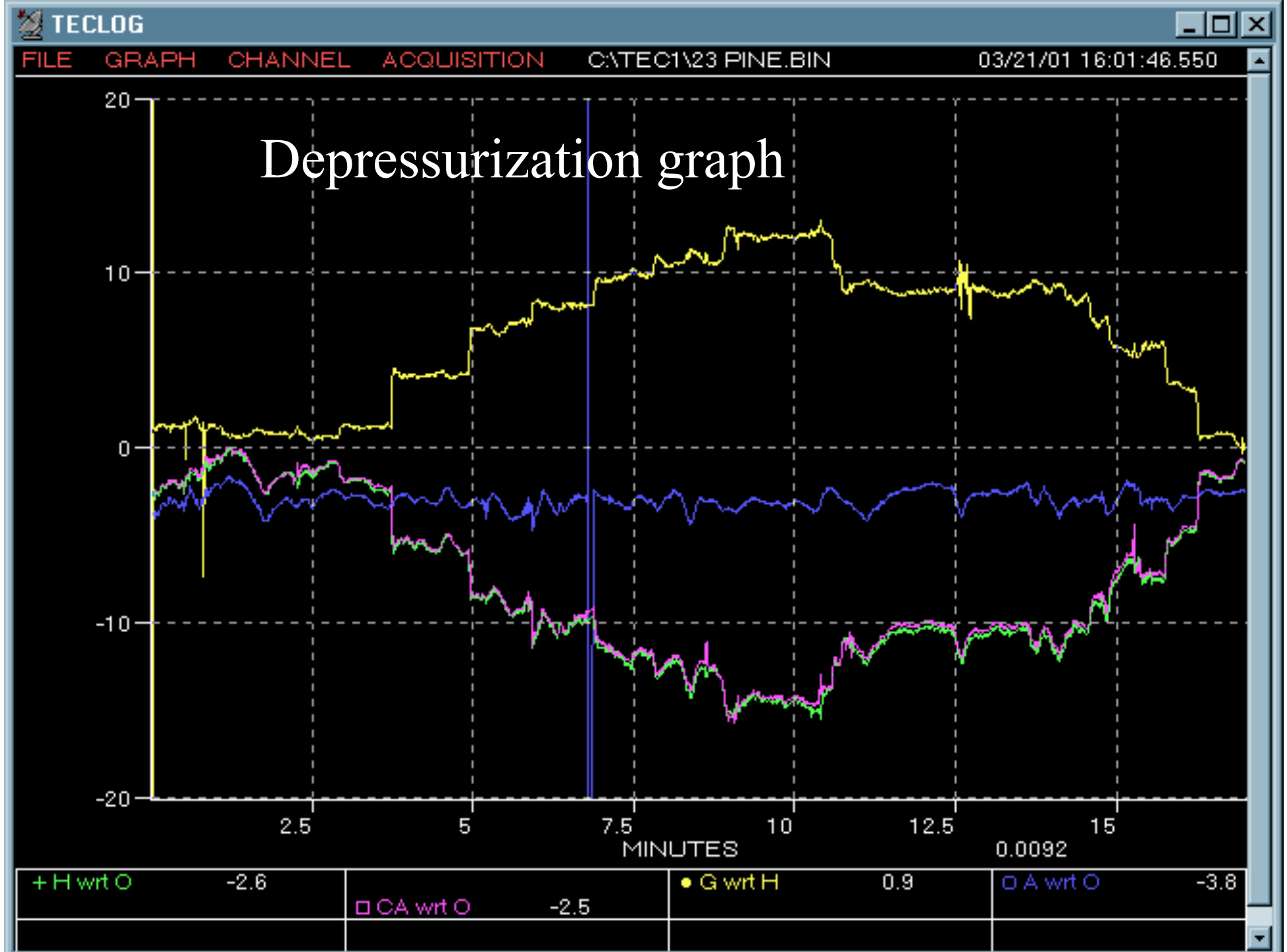
DEPRESSURIZATION TESTING

- WALK THROUGH

1. DETERMINE WATER HEATER, SPACE HEATING EQUIPMENT AND ANY WOOD BURNING EQUIPMENT

- THREE LARGEST FANS, THIS IS PART OF THE TEST
- READ THE PROTOCOL TABLES
- PREP HOUSE AND DO TEST
- RECORD
- RETURN HOUSE TO ORIGINAL SETTINGS

Pool to house pressure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Depressurization graph
20
10
0
-10
-20
2.5
5
7.5
10
12.5
15
MINUTES
0.0092
+ H wrt O -2.6
CA wrt O -2.5
G wrt H 0.9
A wrt O -3.8

HOBO U12 Tells You When Someone is Tweaking with the Thermostat

Residential air balancing

- This is a few ideas on how to make some quick adjustments
- This service could be a quick walk thru observation to a several hours and duct work being changed

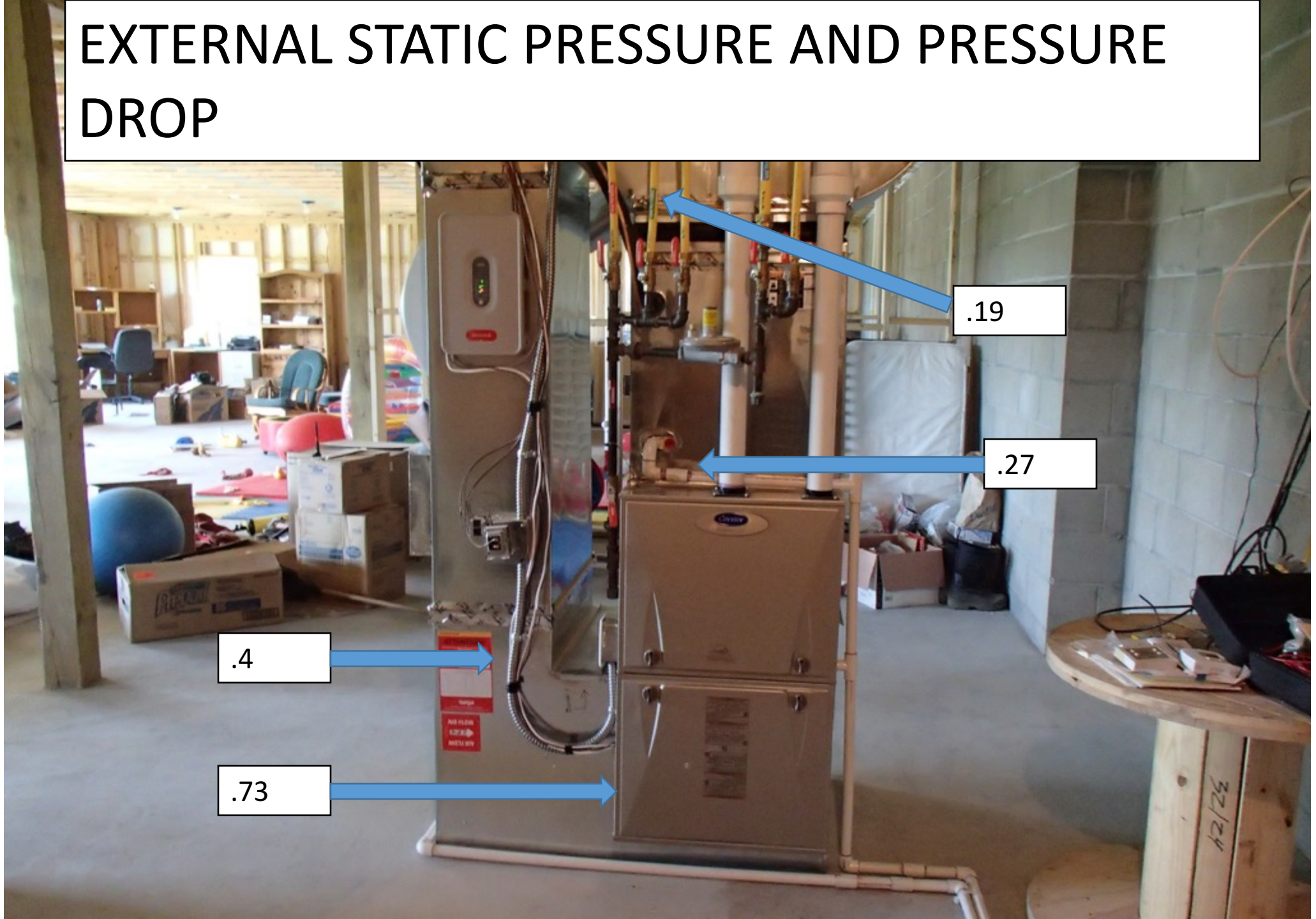
Residential Air Balancing

A. Interview the homeowner
    1. What is the issue, comfort, Condensation, IAQ, seasonal ,temp
B. What kind of duct system(where is the duct work)
C. What type of blower motor
D. How do they run the blower (AUTO or ON)
E. Can you get at trunk and branch dampers
F. Measure flow or pressure before and after adjustment
G. Document what you did and tell someone

FLOW MEASUREMENT

Trunk and run out dampers

EXTERNAL STATIC PRESSURE AND PRESSURE DROP



Thank you for your time

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