High Performance Diagnostics
Blower Doors and Infrared Cameras

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PV Burns

- “Attic Rat”- House Doctor, Insulator, Radon Mitigation
- Indoor Air Quality Technician on the Metropolitan Airport Commission Sound Insulation Project
  - Performed over 1000 blower door and worst case depressurization tests
- Supervised Insulation, Lead & Mold Abatement Crews
- PV Burns Consulting
  - Performed forensic investigations for clients involved in moisture and performance related building failures.
  - Building Science Trainer for Midwest Environmental Consulting, Quantum Business Group

Currently working as a
- Technical Sales Rep for the Energy Conservatory
  - Manufacturer of the Minneapolis Blower Door System
Why does Building Performance Matter

The stakes are high
CAUTION
FALLING
ICE
Outline

- Blower Doors
- Infrared Cameras
- New Construction
- Retrofit
Purposes of a Blower Door Test

- Measure and record the relative air tightness of buildings
  - (are they leaky - tight - or somewhere in between).
- Help find air leaks by inducing air to move through all leaks at the same time (chemical smoke, IR camera, feeling with your hand, zonal pressures).
Purposes of a Blower Door Test

- Determine the effectiveness of the air barrier
- Determine the effectiveness of air sealing activities
  - compare before and after measurements.
- Find air leaks
- Investigate duct leakage problems.
- Help estimate the need for mechanical ventilation.
Anatomy of the Minneapolis Blower Door

Lightweight, Durable Door Frame and Panel
- This innovative design is the result of years of refinements based on the experience of thousands of users. There is no easier way to install a Blower Door fan into a door opening.
- Snap-together aluminum frame comes in a compact case and sets up in seconds.
- Precision cam lever mechanism securely clamps the nylon portal into the door opening.

DIG-700 Pressure and Flow Gauge
- Specifically designed for blower testing with specialized measurement functions. One of the best air pressure measuring gauges on the market.
- Channel A measures the change in building pressure.
- Channel B measures airflow from the Blower Door fan.
- DIG700 can be connected to a laptop computer for automated testing.

Fan Speed Controller
- Precision control of fan speed throughout the entire range.
- Compatible with Cruise Control feature and automated testing.

Powerful, Calibrated Fan
- The Minneapolis Blower Door comes with Rings A and B to measure a wide range of air tightness conditions. Optional Rings C, D and E extend the low range of the Blower Door fan.
- Flow sensor at the entrance to the fan ensures precision readings from 1 CFM to 1,000 CFM.
Blower Door Test

- Blower Door fan is used to blow air out of (or into) the house.
- Adjust fan until the house pressure is changed by 50 Pa. (Approx. pressure of 20 mph wind)
- Flow through the fan needed to create a 50 Pa change is the house air tightness – CFM50.
Blower Door Test

- ACH50 is used to adjust for house size-
  - <1.5 - very tight (requires mechanical ventilation)
  - 1.5 to 3 – tight (requires mechanical ventilation)
  - 3 to 6 - typical pretty good new construction or retrofit (may require mechanical ventilation)
  - 6 to 10 - leaky
  - 10 to 20 - very leaky

- ACH50 = CFM50 x 60 House volume
- 2009 IECC- 7ACH50
Thermal Imaging InfraRed Cameras

- 120x120 IR Resolution
- Thermal Sensitivity of < 0.1°C @ 25°C
Blower Door with IR

- Air Leakage Path investigation
  - Blower Door with an Infrared Camera
  - View wall before Blower Door Test
  - View wall with Blower Door running
- Non-contact
- Obtained without disturbing structure
- Very sensitive to problem characteristics
- Detect problem before significant damage
- Can scan large areas quickly
- Identifies specific location
- Apply to most all conditions
A camera is not...

- A “solve-all” tool
- Moisture meter
- Can not see through walls
- The only tool needed on the job
How does it work?

- Every object emits infrared energy / heat
- Sensors measure the energy emitted by the object and produce a digital thermal image
Opportunities

- “Contractor of Choice”
- Performance Contractor
- Local Expert
  - “House Doctor”
- Additional markets served - new connections made
- Great networking
What are common “problem” calls

- Ice Dams
  - Leaks
- Attic frost
- Condensation drips
- Cold rooms
- Freezing pipes
- High Bills
- Drafts
Solving problems can set you apart

- Uneven heat / comfort
- Ice dams
- Attic moisture problems
- Ductwork in attics
- High energy bills
- Being able to measure things helps you figure things out
Systems Approach

- Observations
  - Bottom to Top
    - Start in the basement and work up
      - H20 problems
        - Visual & olfactory
  - Safety
    - Combustion Appliances
Systems Approach

Existing Conditions

- Insulation
  - Visual
  - IR

- Air Tightness
  - Blower Door testing
    - We only know what we can measure

- Ventilation
Systems Approach

- #1 Do no harm

- Law of unintended consequences
  - Depressurizations
  - Condensation
  - Poor drafting
Retrofit Opportunities

- Problem solving
  - Residential
  - Townhouses
  - Commercial
- Attics
- Walls
- Additions
- Green Remodels
- Conversions
  - Warehouse to Condo
Symptoms
- Attic frost, melt patterns
- Ice Dams
  - H20 leaking in
Control Unit
Attic Temp
02-05-08 10:47pm
44 d F

Treated attic temp
15 d F
The process of modifying existing construction

The addition of new technology to existing homes and buildings that was not available when the system was originally built
New construction

- Check your own work
  - A lot easier to correct problems before drywall
House as a System

- Mechanical Ventilation
- Combustion Safety
  - CAZ Testing
- Test in / complete work / test out
Build Tight – Ventilate right
FV-08VKM1
WhisperGreen™ 80 CFM Premium Ceiling Mounted Continuous and Spot Ventilation Fan with SmartAction™ Motion Sensor
More Useful Information

- Visit our website (www.energyconservatory.com)
- Articles on air sealing and duct leakage diagnostics.
- All product manuals and guides are online.
- Links to other sites.

Thanks!

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