Implementing ASHRAE 62.2 Ventilation Standards

Wisconsin’s Experience
WI’s Experience w/ 62.2

- WI moved to 62.2-December 2005
  - After 2004 Pilot of 62.2-2004 and 62.1(BTLa) ventilation requirements
- The link between ventilation & combustion
  - Standard testing requirements
- Ventilation implementation issues
  - Can you make it work in the field?
- Fine tuned procedures
  - 2008
  - 2011
Changing Housing Stock

• Houses smaller, tighter
  – Many more 1960-1970’s ranch style units coming into the program
    • Don’t need much insulation
    • Mechanical have usually been changed out or we will
  • Issues are often health & safety:
    – Air quality
    – Moisture management
    – CO/attached garages
Different Housing Stock

- Will this house need ventilation?
Aging Ranch Houses

- Will this house need ventilation?

Note: Beaver is eligible for Social Security

But we can smell his socks in the TV room.
Diagnostic Testing & Ventilation are Linked

- Blower door testing allows the advantage of the infiltration credit.
- Worse case depressurization provides an indication of the existing building pressures.
- Initial test results provide information for “End State Planning.”
Diagnostic Procedures

• **Performance testing:**
  – Worst Case Draft (WCD)
  – Building Depressurization (DTL)
  – Building Air Leakage (blower door testing)

• **Mechanical ventilation**
  – Based on ASHRAE Standards, WI UDC, and practical applications
  – Assessment of existing ventilation
WI's Standard Diagnostic Testing

• Blower Door Tests:
  – As is, Pre-test, Post-Test, Zone Diagnostics, as needed
• Worst Case Draft and Spillage Tests
• Depressurization Limit Tests
  – Exhaust Appliance measurements/estimates
• Ventilation
  – 62.2 Vent Calculations
  – Existing actual/estimate
• Gas Range CO Testing
Piloted ASHRAE 62.2-2004

- Strong interest in the potential benefits in the new standard
- Piloted the project with several grantees
  - Compare the results from BTLa and 62.2
  - Allowed pilot agencies to use the results that (BTLa and 62.2) most workable for program
2004-2005 WI Study
On Ventilation Rates

- Information Collected On Exhaust Flow Rates
  - Existing Equipment
  - Added or Replacement Equipment
  - Type of Combustion Systems
- Blower Door Results
- Calculated Pressure Differences
Continuous Ventilation Rates

- Quadrature
- Ecotope
- Full 62.2
- 62.2 with Credit

Average: 70, 64, 50
Median: 69, 59, 50
Highest: 201, 228, 114, 76, 76
Percent of Units Requiring Ventilation

- Quadrature: Current Method: 46.90%
- Ecotype: 46.90%
- 62.2 with credit: 78.10%
- 62.2 no credit: 100%
Expectations Based on 2004 Pilot

- Install ventilation in 75-80% of units
  - Versus 50% rate for 62.1
- Invest $525 in equipment
  - Fan & Controls
  - Same with no intermittent options
- Install an average of 30 cfm of continuous ventilation
  - Versus 60 CFM continuous for 62.1
    - No intermittent options
Key Interest Groups

- Trainers
- Building occupants & owners
- Auditor/Inspectors
- Crews/Contractors
- Local program management
- Quality Assurance staff
- Program Administrators
Implementing Ventilation

- **Hurdles**
  - Field testing the form & protocols
  - Training & Implementation
  - Quality assurance issues
    - Error tolerance
    - How do you measure success?
  - Management understanding protocols & goals
Don’t Underestimate Work Flow Issues

• Who does what tests when?
• The numbers change when you’re working on the building.
  – Depressurization of CAZ
  – Blower door CFM50 numbers
  – CFM of exhaust ventilation required
Work Flow Issues Continued

• When do you install exhaust ventilation?
  – What if the numbers change?
    • Start out needing 20 cfm, end up needing 70
    • New controllers are very helpful

• Do you need to add make-up air?
  – How and where?
  – Current models are not very helpful.
    • Best case scenario is good end-state planning.
Implementing Ventilation

Considering Ventilation

• Issues
  – How big is the house? Basement in or out
  – Use blower door guidance
  – How to calculate the size of fan

• When in the workflow?:
  – Some solutions
    • Do end stat planning
    • Mock up the fan
    • Use a good controller and adjust at final
How Big Is the House?

- If you’d open the basement door to get a CFM50,
- If the basement is finished or living space,
  - the basement is in.
New Expectations

• Auditors Inspectors:
  – Performance & diagnostic testing
    • Measuring Flow Rates of existing ventilation

• Installers
  – Ducting Methods
    • Size and Type of Material
    • Connections and Sealing

• Customers
  – Maintenance of Systems
    • Cleaning Grilles
    • Changing Filters (HRV)
Staggered Implementation

• Assessed our training capacity
  – Built curriculum pieces
  – Determined how many sessions were required for statewide implementation

• Allowed grantees to sign-up for their training and implementation timetable
  – Implementation required the day after training

• Trained August through December
Implementation Lessons

• Grantees loved staggered process
  – QA monitors did not love it—what? When?

• Training covered basic calculations and field planning
  – Primarily inspection staff

• Needed additional training in ventilation systems
  – Installation options
  – Target: Inspectors, installers, subcontractors

• Needed “Why” training for staff and customers
  – Staff need to believe in ‘why’ to sell customers on ‘why’
Combustion Safety, Depressurization & Ventilation

• Buildings with significant negative pressure have many solutions
  – Must identify and solve the driving forces
    • Prior to ventilation

• Make-up air for ventilation is usually not needed with proper building assessment

• Depressurization testing
  – Critical component of ventilation process
Depressurization Solutions

• Assess distribution system
  – Seal returns
  – Add returns

• Sealed combustion furnaces

• Power vented water heaters

• De-rating existing ventilation

• Upgrading existing ventilation
  – Better fan, good controller
Is This A Problem?

- Impacts on heat loss
- Draft
- Moisture
- Building $\Delta P$
Draft Concerns
CAZ goes Negative

What should we do?
- Solvable draft problem?
- Add make-up air?
- Extend chimney?
Solutions to Depressurization

- High Efficiency Heating Systems
  - Sealed Combustion

- Power Vented Water Heaters
Another Solution to Depressurization

Fixing Disconnected Returns
Ventilation Not Always the Solution?

Moisture Problems—Fixable
Cracked heat exchanger in oil furnace
- Wet & Crawl basement
- Broken chimney liner
- Knee walls attics tied together through the floor
- Gutters not extended

62.2 will not solve serious moisture problems.
Small Houses Can Be Trouble

- Moisture problems at audit
  - <1200 cfm50
- No signs of moisture problems on follow-up

- Measures Installed
  - Attic insulation R50
  - Baseload measures
  - Sealed combustion furnace installed
  - Power vented water heaters
  - ENERGY STAR exhaust fans
Know What’s There

• These Tools Assist In Accurately Measuring Exhaust Ventilation Flow Rates
End State Planning

• Design your job work plan
  – Know the Depressurization, CFM50 numbers when planning work
  – Assess the impact of planned work
    • Key juncture sealing
    • Sidewall insulation
    • Bypass sealing
    • Mechanical systems work-water heater, heating system
  – Project what the Final Product should be
  – Installers mock up the fan
  – Use a good controller and adjust at final test
Make-up Air

• WI UDC language:
  – Add make-up air if the house is excessively depressurized or pressurized
  – Use DTL Guidelines to determine that
    • Add make-up that is 40% of the exhaust ventilation (code doesn’t require dryer)
      – Allow dryer in the calculation
2008 Administrative Concerns

• Too expensive
  Hard sell to some customers
  – Defer unit if they don’t allow the installation?

• Strays from Mandate to “Save Energy”
  – Electrical costs to vent; heated CFMs lost
    • Modeling does show costs offset by overall annual savings from air sealing
    • Therm savings evaluation shows a 25 therm penalty
Fine Tuning:
Refine Ventilation Criteria

- Bedrooms vs. occupant sizing
  - Move to occupant based sizing
- No added ventilation when 62.2 called for <15 CFM of additional ventilation
  - Spot ventilation allowed for bath & kitchen, moisture control
- Develop customer control package
  - Guidance what ventilation is
  - What has been installed; how to use the equipment
  - Measure refusal tied required signature on liability waiver
Current Ventilation Statistics

• Occurrence Rate:
  – 57.1% (1 to 4 Unit buildings)
    • Exhaust ventilation- 56.4%
    • Exhaust w/ make-up air-0.7%
    • HRA/ERA-0.6%
  – 43.1% (mobile homes)
    • Exhaust ventilation 42.9%

• Average Cost
  – $513.61 (1 to 4 Unit buildings)
  – $541.53 (mobile homes)