

#### 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





#### WI Ventilation Pilot (2004)

#### **Continuous Ventilation Rates**





### Percent of Units Requiring Ventilation







#### 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

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- 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





#### Hurdles

- Field testing the form & protocols
- Training & Implementation
- Quality assurance issues
  - Error tolerance
  - How do you measure success?
- Management understanding protocols & goals



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#### 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.





## **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 affinal carry



#### 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.

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## 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

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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 ΛP



#### Draft Concerns





CAZ goes Negative

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



#### Defuser in Return





### 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</p>
- 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)

