An Inherently Healthier Home?

Investigating A Package of Ventilation, Dehumidification, and Filtration in High Performance Housing

Healthy Homes, Healthy Lives Phase II Study

2006 – 2009

BEST 1 Conference

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Study Partners

- U.S. Department of Housing and Urban Development - Office of Healthy Homes and Lead Hazard Control
- National Institutes of Environmental Health Sciences
- UNC School of Medicine - Center for Environmental Medicine, Asthma, and Lung Biology
- Habitat for Humanity Affiliates in North Carolina
- Advanced Energy
- Whole house mechanical dehumidification (<50% RH)
- Changed to a lower cost crawl space
- Eliminated air cycling device on ventilation system
Research Questions

- Can off the shelf whole house mechanical dehumidification maintain indoor RH at < 50%?
- Will house dust mite levels be lower in intervention houses than in non-intervention?
Presentation Overview

- Study design
- Parameters to be measured
  - Relative humidity
  - Allergens
- Next steps
Selection Process

- Population Pool
  - Houses built to EPA Energy Star standards
  - One story ~ 1200 Ft² per house, 2-3 beds, 1-2 baths
  - And less than 10 years old
  - No irreparable moisture conditions
  - No unvented combustion sources (all electric)

- Testing Performed (Summer/Fall 2007)
  - House and duct tightness testing
  - Dust mite sampling on living room and bedroom floors
Grouping and Pre-Data Collection

- Houses statistically matched in pairs based on size, location, house leakage, duct leakage, and presence of pets.
- Then randomly assigned to intervention or control group. Creating:
  - > 11 control Energy Star based houses
  - > 11 intervention Energy Star “plus” houses
- Prior to data collection
  - > Professional deep clean of all the floors.
Features of the Intervention

- Lower cost closed crawl space
- Exhaust ventilation
  - Kitchen flow of 212 l/s (100 CFM)
  - Bathroom flow of 106 l/s (50 CFM)
- Whole house dehumidifier
- Filtered and dampered outside air supply ventilation to 85 l/s (40 CFM)
- MERV 11 whole house filtration
- Combustion safety measures (all electric)
Lower cost closed crawl space

Air sealed foundation vents, sill plate, and other penetrations. Poly liner overlap and piers connection.

Supply air provides drying.
Ventilation

**Outdoor Air Supply**

> Outside air supply ventilation to 85 l/s (40 CFM)

**Spot Exhaust**

> Kitchen flow of 212 l/s (100 CFM)
> Bathroom flow of 106 l/s (50 CFM)
Whole House Dehumidifier and Filter

Dehumidifier

Filter
Remote Temperature and Relative Humidity Sensors
Sampling Frequency

- Temperature and relative humidity in house and crawl space
  - Hourly
- Dust mite allergen
  - Spring, summer, and fall
- Cat and dog allergen
  - Spring, summer, and fall
Main results we are interested in:

- Can off the shelf whole house mechanical dehumidification equipment maintain indoor RH at < 50%?
- Were house dust mite levels lower in intervention houses than in non-intervention?
Research Questions

- Can lower cost crawl space maintain relative humidity of <70%?
- What is installation cost of this intervention package?
- Is the dehumidifier power usage affordable?
- What are the effects of filtration and ventilation?
- What are the levels of formaldehyde, PM 2.5 and PM 10 between control and intervention houses?
Where are we now?

- All houses are online
- Created weekly Temp/RH QA reports telling us how the homes are performing and if there are any problems
  - Reduce installation or user errors
  - Retain statistical validity for small sample size of 22 houses
- First two rounds of dust sampling visits have been collected
- Just recently making our way out of a statewide drought and moisture levels are high enough outside to have an effect on the house
Outcomes

- Medical Tools

Medical Prescription

- House modifications
- Medications

Thank You

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