Holistic House Commissioning

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Today’s Speakers

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Industry Standards and Building Codes

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Mechanical Requirements

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Builders Prospective

Holistic House Commissioning

- Is a house with a 97% AFUE heating system actually operating at 97% AFUE ?
- If the ventilation system meets the ventilation standard does it guarantee a healthy indoor environment?

Commissioning

- Commissioning is a process of checking that the systems are working and or performing as designed.

Holistic House Commissioning

- Holistic, Whole Building, or Total Building Commissioning
- The process of checking that **All** the systems are working and or performing as designed , working with and complementing other systems

Holistic House Commissioning

- To assure we are getting what we want
  - Go beyond the labels
    - Is that 97%AFUE system performing at 97%
      - Must be properly sized
      - Distribution balanced
    - Is the ventilation system going to meet all of the requirements for good indoor air quality?
      - Proper distribution of the air is just as important as the amount of ventilation air

Beyond the Common Criteria

- Location
- Square footage
- Number of bedrooms
- Cosmetic Appeal
  - Counter tops
- Energy rating

Safety, Health & Energy Efficiency

- What makes a “good value” house?
- Energy Efficiency
  - Not just high efficiency but operating at high efficiency
- Healthy Indoor Environment
  - Not only meets the amount of ventilation air but distributes it to the proper areas.
- Building Longevity
  - Will all of the systems complement each other rather than conflicting

Safety, Health & Energy Efficiency

- Energy Efficiency:
- Reduces long-term operating/utility costs
  - Reduced operating cost for the life of the home
  - Home is more affordable
    - Possible reduced interest rates
    - Possible rebates and incentives

Safety, Health & Energy Efficiency

- Healthy Indoor Environment:
- Healthy occupants
  - Reduced medical costs
  - Better quality of life

Safety, Health & Energy Efficiency

- Building Longevity:
- Houses outlive their initial occupancy – ideally last generations

The House is a System

- Each independent systems affects performance of other systems
  - Insulation can affect
    - Heating system
    - Ventilation system
    - Air Leakage

Codes and Standards

- Codes set a baseline standard for design and construction of new and renovated buildings
- Intended to help improve health, safety ,durability, and reduce energy consumption of buildings
- Meeting the minimum standards and codes does not guarantee a perfect home
- All components and systems have to work together

Current Regulations

- International Residential Code
- International Energy Conservation Code
- International Mechanical Code
- Uniform Plumbing Code
- National Electrical Code
- Alaska Building Energy Efficiency Standard
  - Provide Alaska specific amendments to codes for energy and ventilation.

Air Infiltration

- Why control air leakage?
- Cost
  - Heating system sizing
  - Utility cost
- Comfort

Air Infiltration Cost

- Example House, Natural Gas with a 95% AFUE System
  - Air Leakage
    - 4 ACH 50 = 194 CFM of natural Air Leakage
    - 2 ACH 50 = 97 CFM of Natural Air Leakage
    - 1 ACH 50 = 48 CFM of Natural Air Leakage
  - Cost of Air Leakage
    - 4 ACH50 = $ 685.00 ($1796.00 oil)
    - 2 ACH 50 =$ 342.00 ($ 913.50 oil)
    - 1 ACH50 = $ 170.00 ($ 455.00 oil)

Ventilation

- Why control ventilation?
- Reduce indoor pollutants
  - People spend about 90% of their time indoors
  - The EPA has ranked indoor air pollution among the top five environmental dangers
- Increase productivity and well-being

Ventilation

Ventilation Example:

- 3305 square foot house CFM
- 83 CFM of continuous Ventilation

Ventilation

- Ventilation Example: Costs of leaky house with no ventilation vs. tight house with HRV
  - Ventilation Standards do not allow credit for leaky house
    - 4 ACH50 House 194 CFM + 83 CFM = 276 CFM ($978.00 with exhaust only/ $773.00 with HRV)
    - 1 ach 50 House 48 CFM + 83 CFM = 131 CFM ($463.00 with exhaust only / $257.00 with HRV)
    - Over $500 to $700 per year Savings

- How we deliver the ventilation air to the home just as important as the amount of air itself
- Difference can be between meeting minimum standard (code) and the whole house as a system method where all systems work together

Heating System Efficiency/Sizing

- Why regulate size/efficiency?
- Proper size reduces up-front cost & long term operating cost
- Reduces utility cost
- Better efficiency typically closed combustion – safer for air tight housing

Heating System Efficiency/Sizing

- Life cycle cost comparison
  - 5-7 year pay back for upgrade from mid efficiency to high efficiency
- Gas vs. other fuels
  - Off the Natural Gas system paybacks can be as little as 2 years

Heating System Efficiency/Sizing

- Manual J
- AkWarm
- Whole building system sizing
  - Getting the proper size for lower cost and better efficiency
- Room by room distribution sizing
  - Getting a smaller furnace to deliver proper comfort

Insulation

- Why regulate insulation levels?
  - Reduces size of heating system
  - Can increase air tightness
  - Reduces long term utility costs
  - Long life-cycle/low maintenance

Energy Standards

- Minimum 5 Star Rating to meet the standard
  - 5 Plus and 6 Star rating
    - Go beyond the minimum standards
    - Promote higher insulation levels
    - More efficient Heating systems
    - Higher quality windows
    - Possible rebates on new construction
  - 5 Star plus or 6 Star does not guarantee optimal performance or quality of the home.

Performance vs Prescriptive Standards

- Prescriptive standards easier to meet and easier to hold down cost
  - As simple as a check list for minimum standards
  - Simple list of materials look for the lowest cost per component
- Performance methods encourage integrated systems
  - Encourages use of innovative systems and materials that work as a system
  - Requires more thought and planning

Summary

- Investment in the basics up front is the gate way to good home performance over the long term
- Counter tops can be changed more easily than insulation, ventilation or heating systems!
- Whole House Commissioning will optimize performance and integration of systems, which will maximize long term savings

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Mechanical Contractors Prospective

- New Construction
- Retrofit of Exiting System

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Hydronic Vs Forced Air Systems

- Comfort
- Zoning
- Controls

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Hydronic Vs Forced Air Systems

- Cost For a typical 200 square foot Home
- Forced Air as a base line
- Hydronic Base Board Heating
- 26% more
- Hydronic Radiant Floor System
- 85-115% more

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Hydronic Vs Forced Air Systems

- Cost increases for differ types of systems only address the cost for the mechanical contractor
- General Contractor will also have added cost such as
- Additional insulation for Radiant system
- Gyp Crete for Radiant system
- Wall height changes

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Hydronic vs Forced Air Systems

- Ventilation / Indoor Air Quality
- Forced Air is more forgiving
- more air circulation
- Hydronic Heating
- Increases the importance of air circulation

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Hydronic Vs Forced Air Systems

- Air Filtration and Humidity Control
- Forced Air Some advantages

Design Requirements for Heating Systems

- Sizing of the heating system
- Applies to both Forced air and Hydronic
- Over sizing the system
- Cost of equipment
- Operating cost of equipment
- Modulating Systems
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Design Requirements for Ventilation Systems

- Alaska Building Efficiency Standard
- ASHARE 62.2-2010
- Minimum Requirements for fresh air
- Help Control Humidity and particulates in the air
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Ventilation Systems

- Cost
- Comfort and air quality
- Exhaust only system
- HRV System

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Quality of the Installation

- Meeting the minimum Standard
- Balance of Comfort and Efficiency
- Long Term Satisfaction with the System
- Exhaust only system
- HRV System

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Mechanical Contractor Summary

Summary

General Contractor Perspective

Complexity of Pulling the Whole Project Together

Customers Vision vs Reality

Cost vs want

Coordinating the trades

House is a system

All components must work together

All trades must have a common goal