



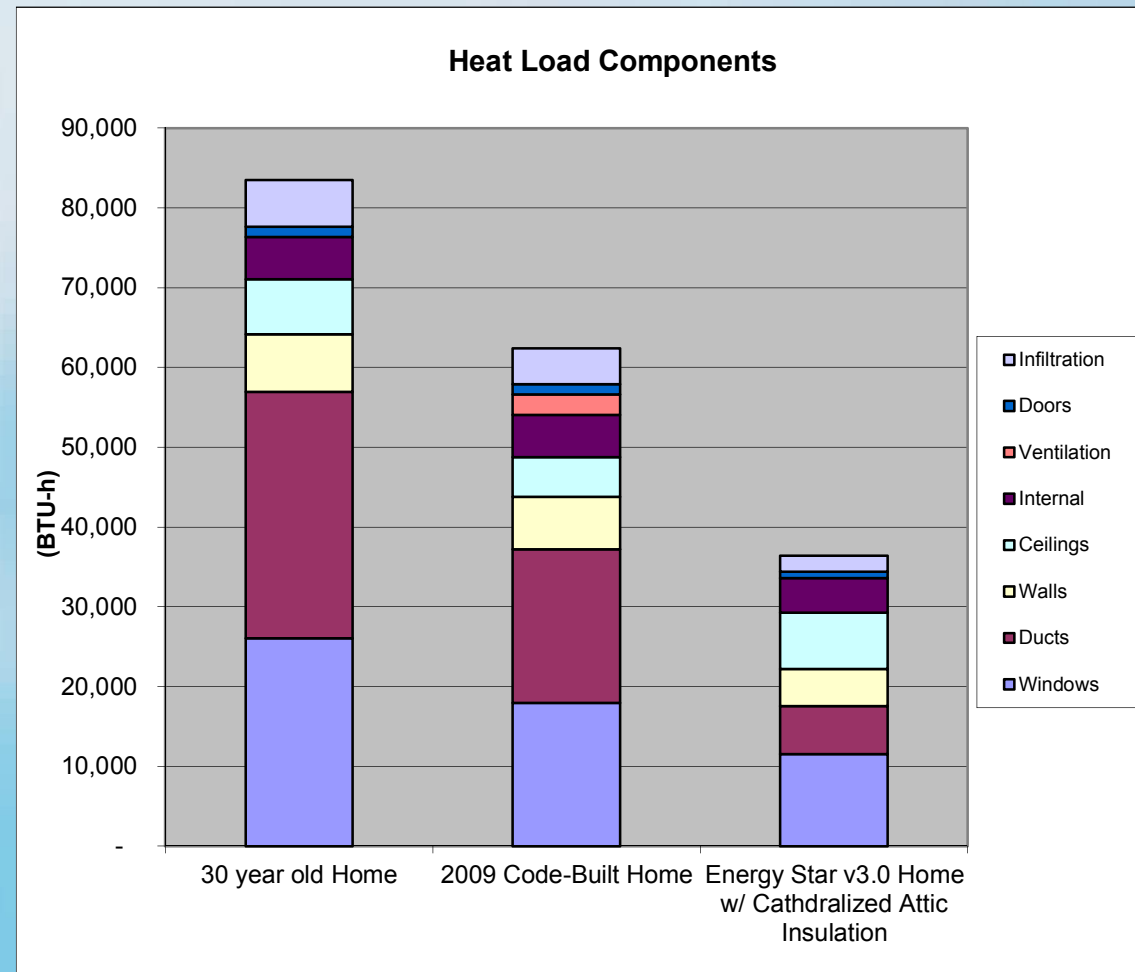
DOE Zero Energy Ready Homes Webinar
Ensuring Comfort in Low Load Homes
Greg Cobb, iEngineer, LLC

Overview & Objectives

- What Has Changed?
- HVAC Design & Execution
- Pitfalls to Avoid
- Challenges
- Future Planning

What Has Changed?

- Windows
- Insulation
- Envelope Leakage
- Duct Gain/Leakage
- Ventilation Load
- Sq.Ft. Covered By Single System
- Homeowner Appliances/Lifestyle/Density
- NOT Homeowner Expectations



HVAC Design & Execution

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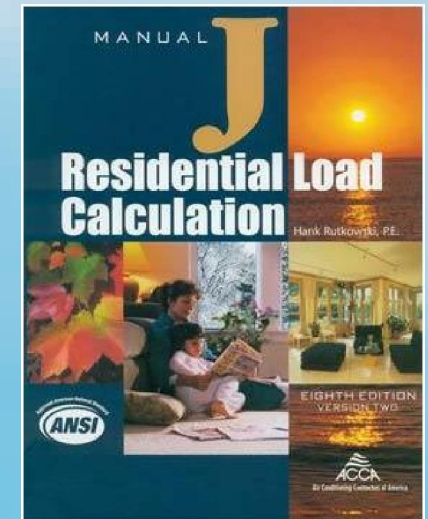
EQUIPMENT

DUCT

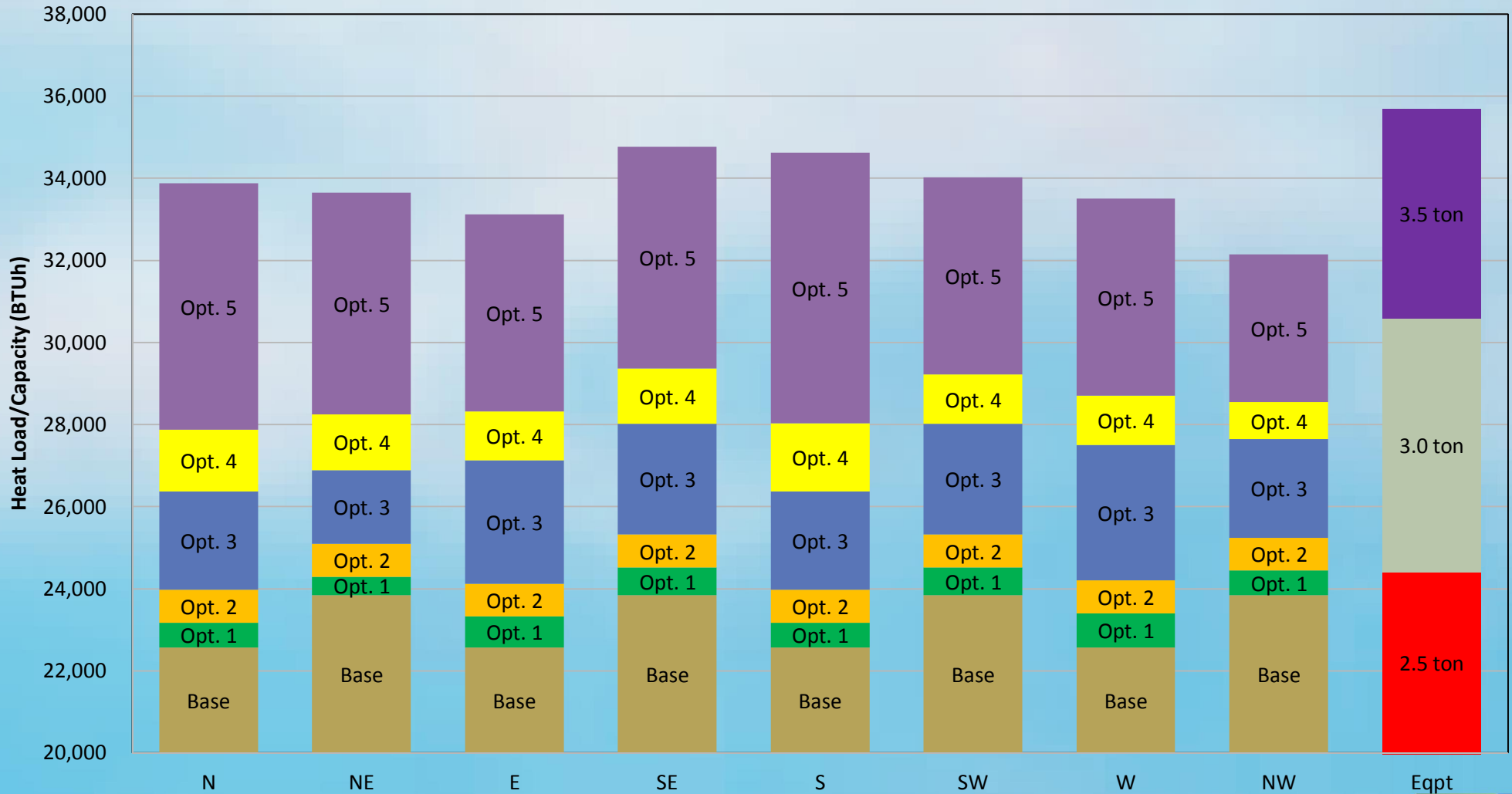
CONTROLS

VENTILATION

- **Room-level, Configuration-specific Manual J**
 - Floor-plan & Glazing Options
 - Orientation & Garage Hand
- **Best Practice**
 - Entry-level: Group Design
 - Move-Up: Lot-specific “Layer-cake” Design
 - Luxury/Custom: Lot-specific Custom Design



“Layer Cake” HVAC Design



HVAC Design & Execution

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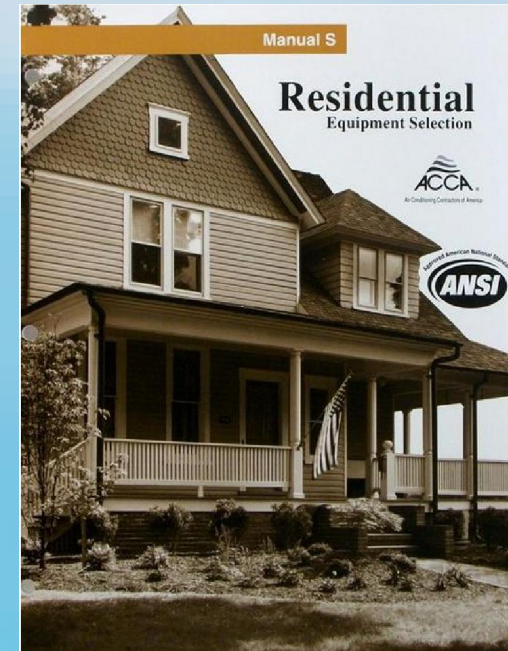
EQUIPMENT

DUCT

CONTROLS

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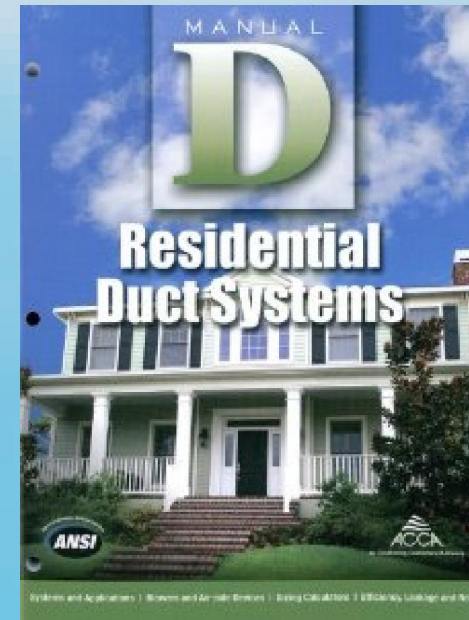
- **Configuration-specific Manual S**
 - Use Configuration-specific Manual J
 - Use Manufacturer Extended Ratings Capacity Data
- **Best Practice**
 - Entry-level: Single-capacity
 - Move-Up: Dual-capacity (especially in humid climates)
 - Luxury/Custom: Variable-capacity



HVAC Design & Execution

LOAD EQUIPMENT **DUCT** CONTROLS VENTILATION

- **Room-level, Configuration-specific Manual D**
 - Use Room-level Configuration-specific Manual J
 - Use Manufacturer Blower & Coil Data
 - Compact Duct Design; Attention to Register Throw
- **Best Practice**
 - Entry-level: “Loose” Duct Design w/ Balancing Dampers
 - Move-Up: Lot-specific, Balanced Duct Design
 - Luxury/Custom: Lot-specific, Balanced Duct Design



HVAC Design & Execution

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DUCT

CONTROLS

VENTILATION

- **Appropriate Controls**

- Pay Attention to T-stat/Sensor Locations
- “Set it & Forget it”; No Programming T-stat
- Mobile Connectivity Expected; Stay Away From NEST for RNC

- **Best Practice**

- Entry-level: Remote Temp Sensors
- Move-Up: Zoning
- Luxury/Custom: Communicating Controls & Zoning

HVAC Design & Execution

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DUCT

CONTROLS

VENTILATION

- **Smart Ventilation to Meet ASHRAE 62.2**
 - Time-shift Load with Smart Controls
 - Climate-specific Strategy: Supply, Exhaust or Balanced
 - De-humidifying Ventilator for Humid Climates
- **Best Practice**
 - Entry-level: Single Fan
 - Move-Up: Single Fan with Smart Controls
 - Luxury/Custom: ERV/HRV

Pitfalls to Avoid

- Worst-case Loads
- Rule-of-thumb Equipment Sizing
- Field Designed Duct Systems
- One Thermostat for Multi-story Homes
- Ignoring Humidity
- “Un-commissioned” HVAC Systems
- Less than 2 of 3 Strong:
 - HVAC Designer
 - HVAC Contractor
 - Energy Rater/Inspector



Challenges

- **Homeowner Expectations – Over-Communicate:**
 - Sales/Construction
 - Closing/Orientation
 - Service/Warranty
- **HVAC Contractors – Book-end with:**
 - HVAC Designer
 - Energy Rater/Inspector
- **Bid/Pricing Complexity – Link to:**
 - Equipment Tonnage
 - Option Materials Changes

Recent/Coming Changes

- Make-up Air for High-flow Kitchen Exhaust Hoods
- Energy Star REV 08
- ASHRAE 62.2-2013 & IECC 2015
- High-Velocity Duct Systems
- Load Time-Shifting
- Heat Pump Ventilators

Wrap-up

- What Has Changed?
- HVAC Design & Execution
- Pitfalls to Avoid
- Challenges
- Future Planning

Questions?

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