

# BEYOND CODES

FROM THE BUILDING AMERICA EXPERIENCE

It is time to capture the fundamentals  
learned from Energy Star Homes and  
Building America



The US Department of Energy cooperative residential research program to deliver Zero Energy Homes by 2020

**IBACOS**

Brad Oberg AIA, CTO, IBACOS Inc.



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# Beyond Codes

Establishing a code requirement for a new  
“better”, “beyond” practice allows broad  
adoption within a quality standard

OR

Codes can be used to eliminate a past practice in  
order to force change. That is a tough path.



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# Execution

Code Council CEO Rick Weiland, July 17<sup>th</sup>

- ▣ “...the Council supports increasing energy efficiency in the built environment.”
- ▣ “Without strong compliance, even the most positive code provisions have limited value”



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# Balance

Jerry Howard, NAHB executive vice president, CEO

- ▣ “Also, it is important to maintain a balance between the goals of affordable housing development and maximizing energy efficiency”



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# Natural Tension

- ▣ Codes must address the unintentional results of change
- ▣ To capture the current opportunities, the code changes must be looked at as a system. Cost neutrality is a result of trade-offs, not a specific change at a cost neutral
- ▣ By the way, even without codes, there is a natural, market driven, evolution of practice that improves the energy performance of homes



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# The challenge

- New knowledge is emerging faster than the industry can absorb it
  - Residential design has changed significantly in the last ten years
    - The I codes
    - Energy Star
    - Big Builders got bigger
    - Building America creates technical validity
    - Courts assign liability risk to building inspectors
    - Housing markets hit a new high volume
    - Housing markets hit a new low volume
    - .....

# Falling Quality or Poor Understanding?





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# Three Opportunities

- Thermal Enclosure
  - OVE framing
  - Thermal insulation
- Moisture Management
  - Ground contact
  - Finishes integration
- Thermal Comfort
  - Mechanical system sizing
  - Distribution effectiveness



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# Thermal Enclosure

- ▣ OVE Framing
  - Higher performance at lower cost
  - Conservation of materials, labor, and money
  
- ▣ Cost Reduction
  - Less material and less labor
  
- ▣ Improved Performance
  - 15% framing; down from 25%
  - Increased R-value of wall
    - ▣ Thanks to Building Science Corp for OVE materials

# OVE Framing

SIMPLE AND LOGICAL

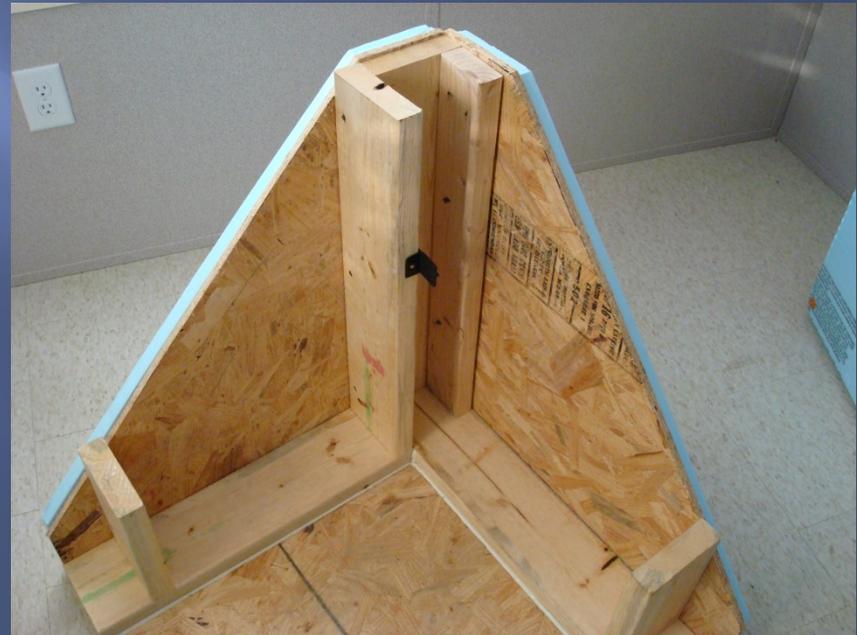
DESIRABLE AESTHETIC



# OVE Framing

CORNER ADAPTED FOR  
TRIM APPLICATION

CORNER ADAPTED FOR  
INSULATION CONTINUITY



# OVE Framing

REDUCED WOOD AT SILL



HEADER ALLOWANCE  
FOR INSULATION



# OVE Framing

## ALIGNMENT OF ROOF TRUSSES



## ALIGNMENT OF FLOOR JOISTS



# OVE Framing

DRYWALL CLIPS



TRIM ADAPTATION





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# Thermal Enclosure

- Thermal insulation
  - Getting what you paid for
  - Your customer expects it to be right
  
- Fewer call backs
  - Comfort complaints
  - No more bonus room nightmare
  
- Better Performance
  - Fully delivered R-Value
  - Smaller space conditioning systems

# Reduced Defect Insulation

SEEING THE TREES FOR THE FOREST

ALLOWING PRODUCTION AND SCHEDULE TO RULE





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# Reduced Defect Insulation

IMPROVE THE EAVE  
DETAILS

VERY MINOR COST, BIG  
RETURN IN PERFORMANCE



# Reduced Defect Insulation

INSPECTION ACCESS  
REQUIRED



HIDDEN CAVITY FILLED



# Reduced Defect Insulation

FULL DRAFT STOPPING  
AT KNEE WALLS

INSULATION CONTAINMENT  
AT LEVEL CHANGES



# Reduced Defect Insulation

DRAFT-STOPPING  
REQUIRED AT TUBS

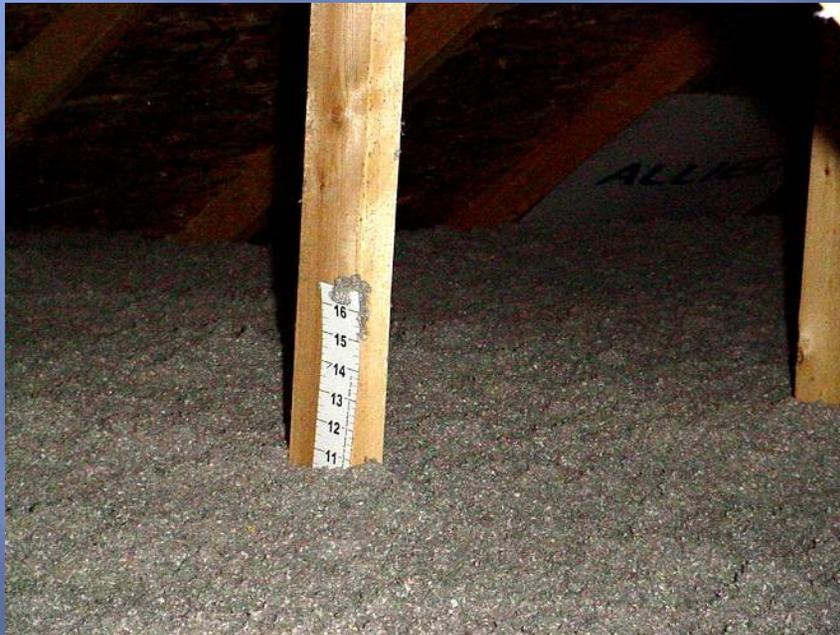
CHANGING POPULATION  
CHANGES PRACTICES



# Reduced Defect Insulation

REQUIRE QUALITY  
CONTROL TOOLS

REQUIRE FULL  
COVERAGE





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# Moisture Management

- Ground Contact
  - Its just dirt, right?
  - Changing energy use, changes drying patterns
  
- Out of sight: out of mind
- In lower energy homes, drying is reduced and issues that were unimportant will increase in concern
- Very low cost fix during construction

# Ground Contact Conditions

CAPILLARY MOISTURE:  
BASEMENT CONDITION



CAPILLARY MOISTURE:  
SLAB ON GRADE



# Ground Contact Conditions

FOOTER CAPILLARY BREAK  
SHOULD BE REQUIRED

THERE IS A DIRECT IMPACT  
ON OCCUPANT HEALTH



# Ground Contact Conditions

SUB GRADE DRAINAGE  
SHOULD BE A FOCUS



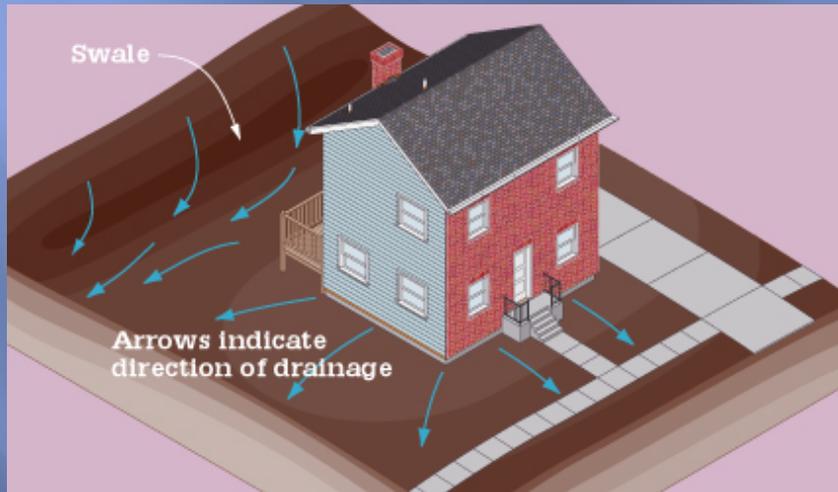
MATERIAL PROPERTIES AND  
SYSTEM DESIGN ARE  
IMPORTANT BELOW GRADE  
TOO



# Ground Contact Conditions

SITE GRADING IS  
TYPICALLY REQUIRED

SELDOM ACHIEVED





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# Ground Contact Conditions

DESIGN PRACTICES  
CREATE CONFLICTS

LANDSCAPING IS OUTSIDE  
THE CODE; BUT CRITICAL



# Ground Contact Conditions

CODE CONFLICTS AND  
DEVELOPMENT PRESSURES

THE CRITICAL ZONE  
MUST BE PROTECTED





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# Moisture Management

- Finishes integration
  - Drainage plane continuity
  - Weather barrier integration issues (solutions?)
  
- Little added Cost, mostly execution
  - Additional flashing materials needed
- Increases durability of structure
- Improves conditions for occupant health



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# Finish Integration

YOU CAN'T LEGISLATE  
AESTHETICS

BUILDING DURABILITY  
SHOULD BE REWARDED



# Finish Integration

WE KNOW WHAT WILL FAIL  
YET CONTINUE TO DO IT

SEPARATION OF WATER  
SENSITIVE MATERIALS  
COULD BE REQUIRED





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# Finish Integration

MAJOR, REPETITIVE FAILURE POINTS ARE KNOWN

SOLUTIONS ARE LOW COST

It's not enough to assume your trade partners will know how to do it right.  
We must provide effective training tools and control the process by which such tools are deployed.





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# Finish Integration

DETAILED FOR FIRE  
PERFORMANCE



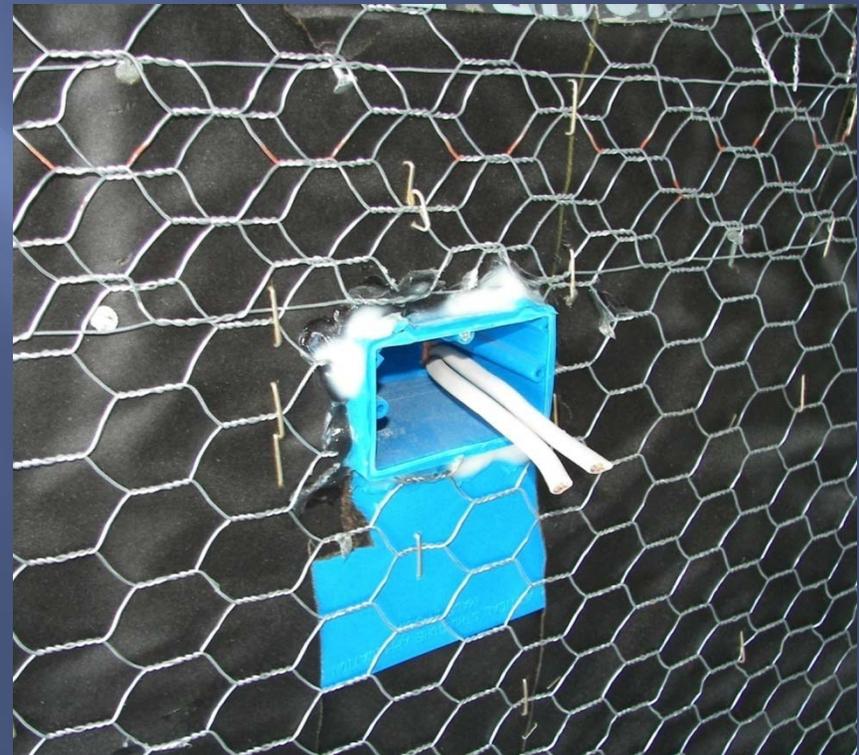
DETAILED FOR FIRE AND  
BULK WATER



# Finish Integration

FLASHING PRODUCTS  
ARE AVAILABLE

INTEGRATION KNOWLEDGE  
IS MAINSTREAM





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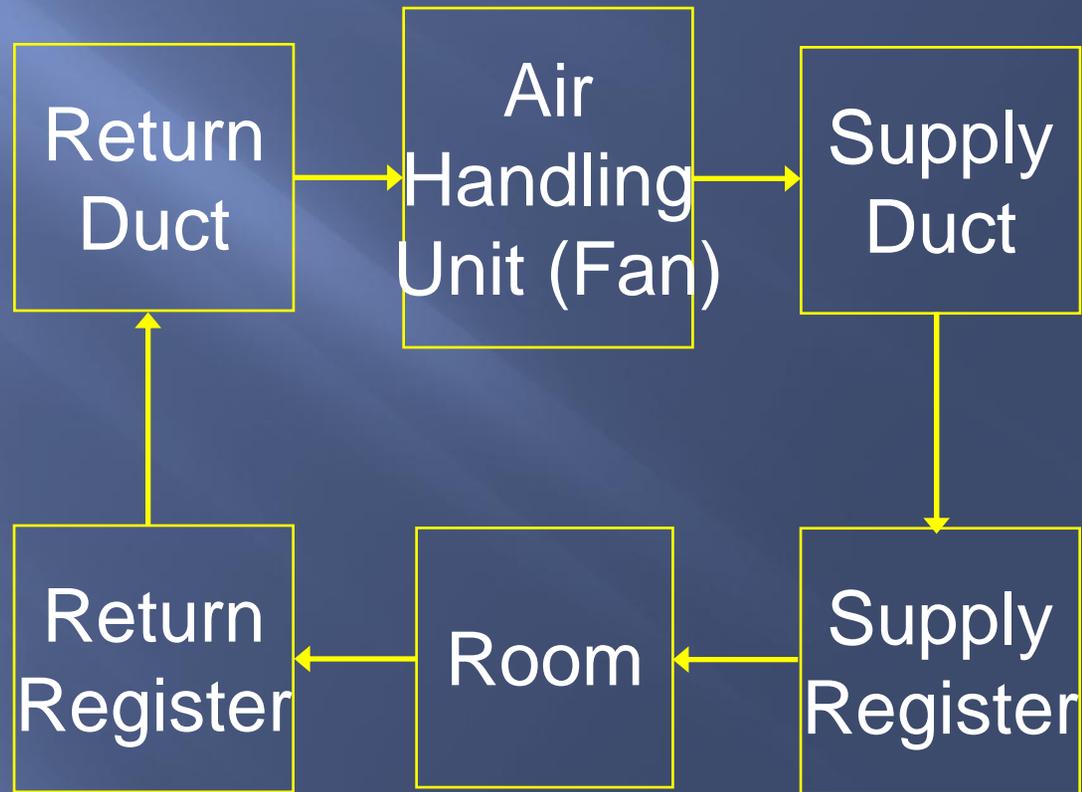
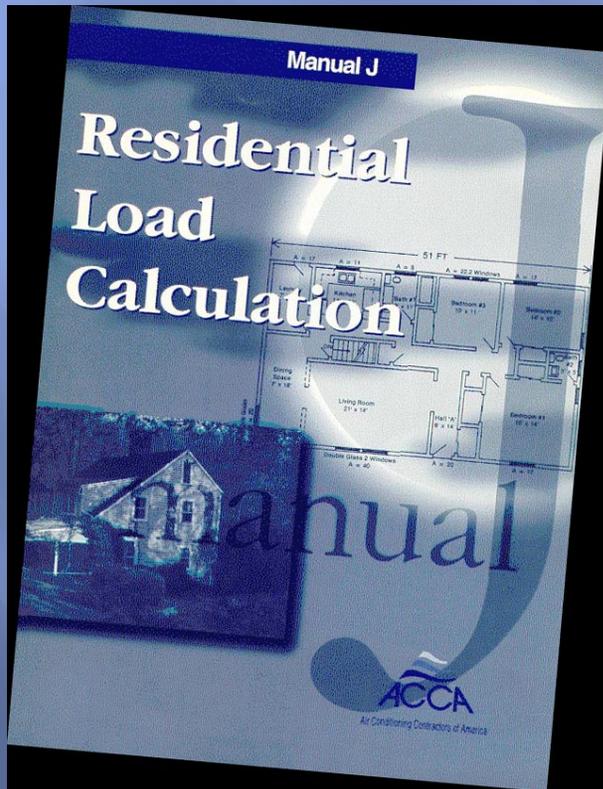
# Thermal Comfort

- Mechanical system sizing
  - Short hand vs. Detail analysis
  - Trade execution in a vacuum of direction
  - What if we simply don't understand
  
- Reduced Cost: First and Operating
- Reduced Call Backs
- Longer Service Life

# Mechanical Equipment sizing

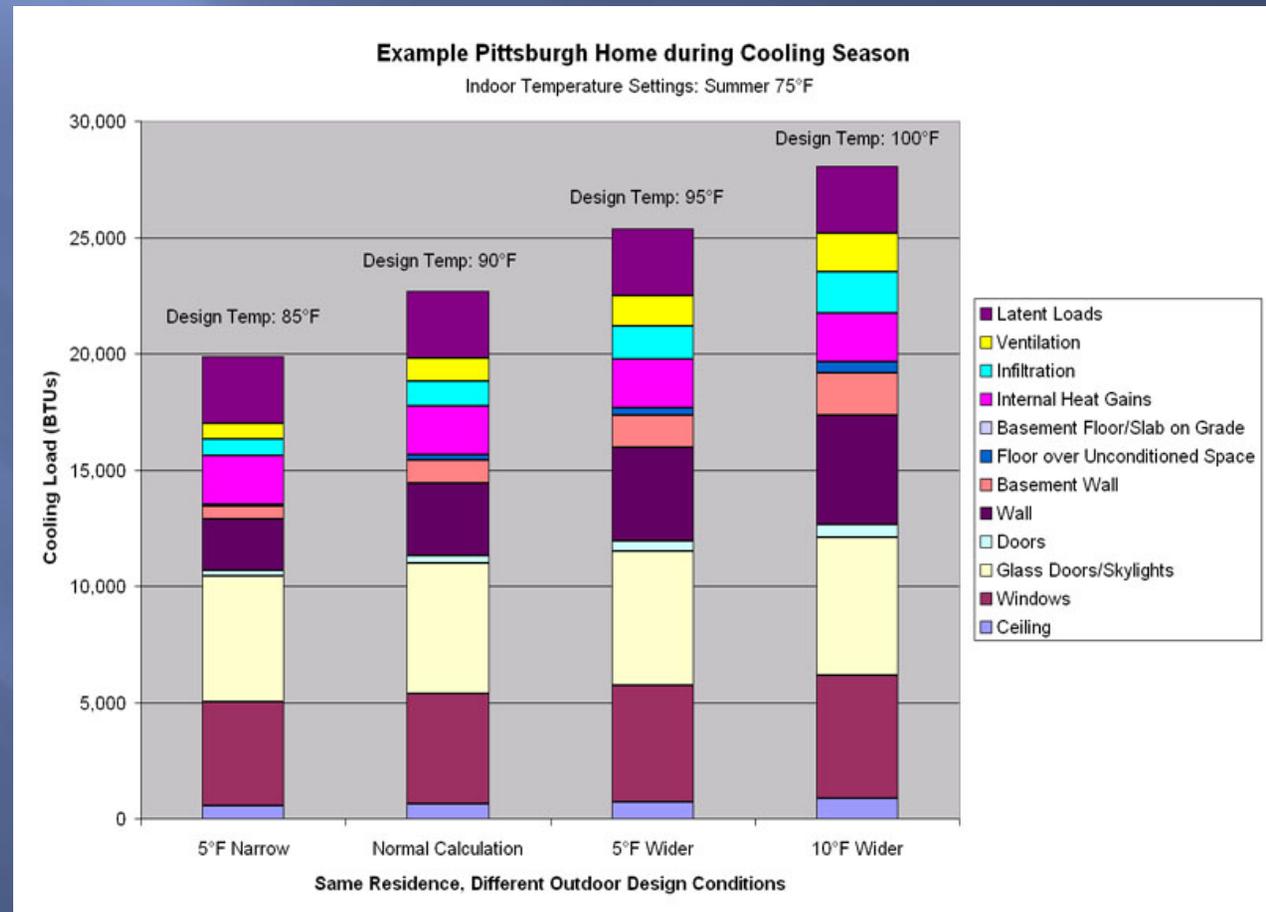
ACCURATELY USE  
SIZING METHODS

SPECIFICALLY DESIGN  
EACH SECTION



# Mechanical Equipment sizing

## USE APPROPRIATE CONDITIONS FOR SIZING OPERATIONS





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# Mechanical Equipment sizing

- ❑ Energy Star Homes utilize 1 ton for 700 to 900 SF
- ❑ Fan capacity of systems is becoming the critical limit
- ❑ Systems are not small enough
  - Need part ton and 1/2 ton increments to 4 tons
  - US manufacturers produce mini's in Europe and Asia
- ❑ Variable Latent capacities needed for Attached and stacked residential product
  - (40 to 50% of next decades homes)



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# Thermal Comfort

- Distribution Effectiveness
  - The customer only expects to be comfortable
  - Less can be more, smaller can be better
  
- Smaller Ducts
  - Less cost
  - Fewer structural coordination issues
  
- “Certified Delivery Rates”
  - Delivery flows specifically per room
  - Allows full equipment capacity to be used

# Distribution Effectiveness

ESTABLISH BETTER  
STANDARDS FOR DUCT  
MATERIALS

REQUIRE QUALITY  
INSTALLATION



# Distribution Effectiveness

SIZE DUCTS FOR  
FRICTION AND FLOW

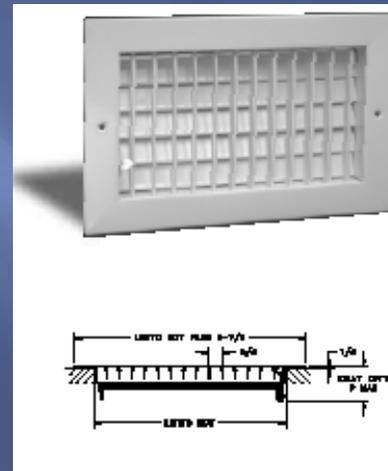
REQUIRE DUCT SEALING  
FOR DELIVERY EFFICACY



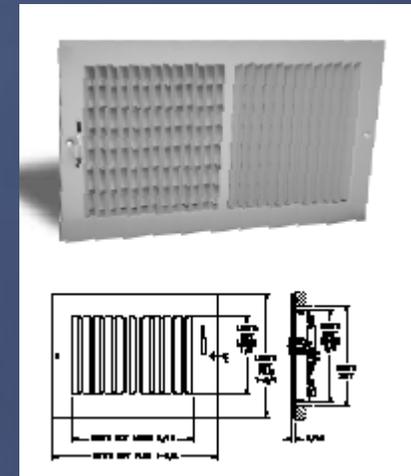
# Distribution Effectiveness

REQUIRE MANUAL T OR  
EQUIVALENT DESIGN

REQUIRE FULL RANGE  
FLOW TESTING



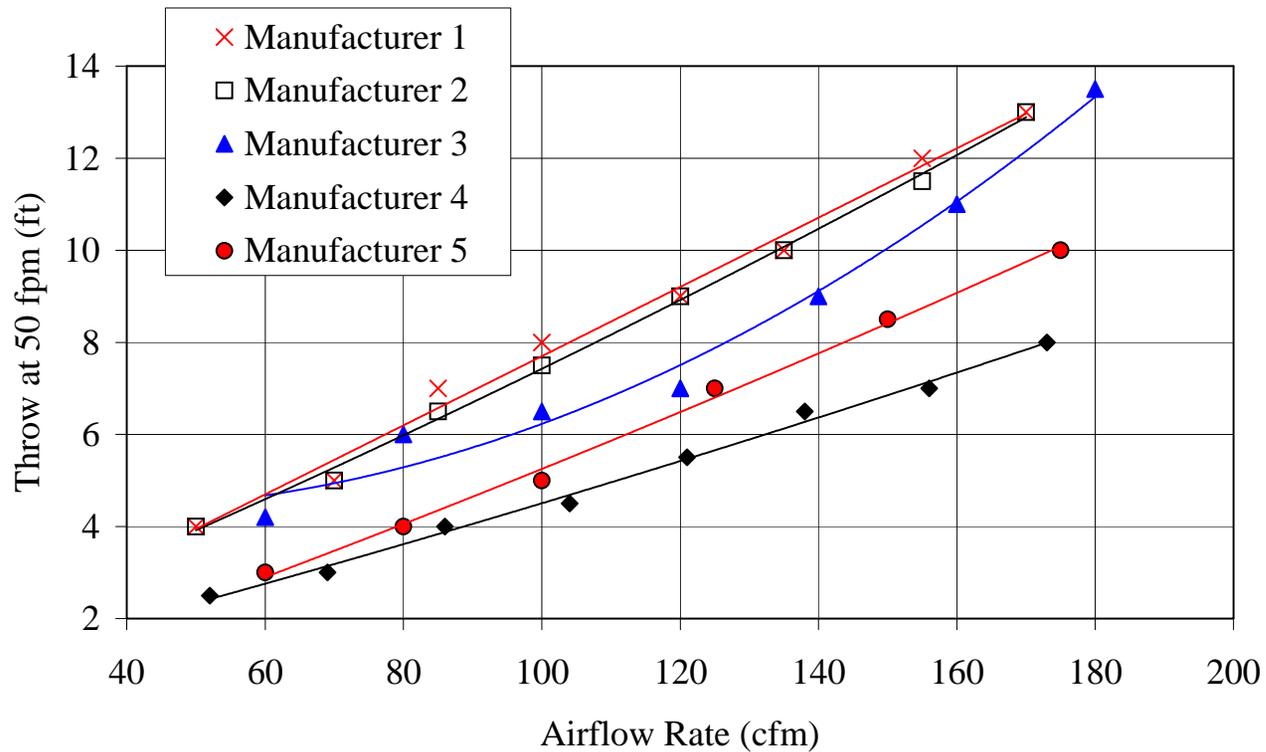
900 Commercial



600 Residential

# Distribution Effectiveness

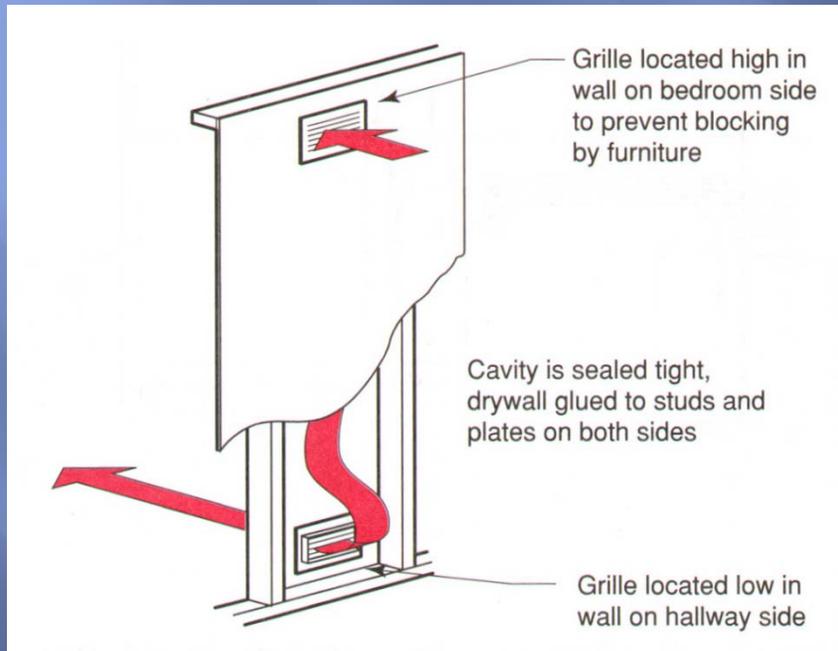
## INCORPORATE TESTING STANDARDS IN A RESIDENTIAL RANGE OF FLOWS



# Distribution Effectiveness

REQUIRE PRESSURE  
BALANCED RETURN  
SYSTEM

ESTABLISH SIZING  
STANDARDS FOR  
RETURN FLOWS





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# Three Opportunities

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# Three Opportunities

- ❑ Beyond codes doesn't need to be way beyond
- ❑ There is tremendous opportunity right now to improve energy performance and durability and health at little or no cost
- ❑ Market leaders don't need code change to make improvements, It is the 95% of builders who build 50% of the homes who need the support of codes



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# Give them the tools; Give them the code





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# Thank-You

## Questions?