Proposed 2011 Specification

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

OUTLINE

- *Introduction*
- *Compliance Options*
- *Mandatory Features*
- *Checklists*
- *The Road Ahead*

Introduction

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

WHAT IS ENERGY STAR FOR HOMES?

ENERGY STAR

A voluntary labeling program that:

- ***Defines Energy Efficient***

  Rigorous Specifications
  Third-Party Verified

- ***Recognizes Builders***

  Government-Backed Label
  Web Site, Marketing, Awards

METHOD TO ENERGY STAR MADNESS

Goal:

< Risk
> Customer Satisfaction
> Differentiation
> Environmental Protection
> National Security

=

Affordable
Comfortable
Healthy
Durable

=

Better Home
Lower Cost
Badge of Honor

How:

- Control Air Flow
  - Loads/ QA/QC
  - Driving Forces
  - Fans
- Control Thermal Flow
  - Conduction
  - Convection
  - Radiation
- Control Moisture Flow
  - Vapor
  - Bulk

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How:

- Control Air Flow
  - Loads/ QA/QC
    - Efficient HVAC
    - Verification
  - Driving Forces
    - Air Sealing
  - Fans
    - Air Sealing
    - Tight Ducts
- Control Thermal Flow
  - Conduction
    - Low-E Windows
  - Convection
    - Air Sealing
    - Tight Ducts
    - Low-E Windows
  - Radiation
    - Low-E Windows
- Control Moisture Flow
  - Vapor
    - Air Sealing
    - Tight Ducts
  - Bulk

1996

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1996

Loads/ QA/QC	Driving Forces	Fans	Conduction	Convection	Radiation	Vapor	Bulk
Efficient HVAC	Air Sealing	Air Sealing		Air Sealing		Air Sealing	
Verification		Tight Ducts		Tight Ducts		Tight Ducts	
			Low-E Windows	Low-E Windows	Low-E Windows		

2006

Loads/ QA/QC	Driving Forces	Fans	Conduction	Convection	Radiation	Vapor	Bulk
Efficient WH	Air Barriers	Air Barriers		Air Barriers		Air/Vapor Barriers	
Efficient Lgtg./Appl.			Insulation Alignment	Insulation Alignment		Right-Sizing	

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	Loads/ QA/QC	Driving Forces	Fans	Conduction	Convection	Radiation	Vapor	Bulk
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	Verification		Tight Ducts		Tight Ducts		Tight Ducts	
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2006	Efficient WH	Air Barriers	Air Barriers		Air Barriers		Air/Vapor Barriers	
	Efficient Lgtg./Appl.			Insulation Alignment	Insulation Alignment		Right-Sizing	
2011	HVAC Quality Inst.		Pressure Balancing	Insulation Installation	Insulation Installation	Radiant Barriers	Pressure Balancing	Water Man. Construction
	Hot Water Distribution			Min. Thermal Bridging			Ventilation	
	House Size						Dehumid. in Hot/Humid	

METHOD TO INDOOR AIR PLUS MADNESS

Why:

< Risk of IAQ Problems
Trivial Extra Cost

=

< Risk
> Customer Satisfaction
> Differentiation

=

Affordable
Comfort
Health
Durability

How:

- Source Control
  - Moisture Bulk
    - Water Man. Construc.
    - Moisture Resist. Mat.
    - Protect Materials
  - Moisture Vapor
    - Air Sealing
    - Air Barriers
    - Tight Ducts
    - HVAC Quality Inst.
    - Proper Vap. Barriers
    - Dehum. In Hot/Humid
  - Radon
    - Radon Resist. Con.
    - Test Kits Zones 1 & 2
  - Biological
    - Seal Foundation
    - Screen Openings
  - Combustion
    - Direct/Power Vent Equip.
    - FPL/Stove Vented/Stds.
    - CO Alarms
    - No Smoking Com. Areas
    - Garage Isolation
  - Chemical
    - Pressed Wood
    - Inter. Paints Finishes
    - Carpets
- Dilution
  - Ventilation
    - Whole-Hse Ventilation
    - Spot Ventilation
    - Garage Ventilation
- Filtration
  - Filters/ Air Cleaning
    - MERV 8 Filter
    - No Ozone Generators

What:

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

WHY NEW SPECIFICATIONS?

- *Codes Ramping Up*
- *Standard Business Practices Ramping Up*
- *Significant Value Opportunities*

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

KEY GOALS/SOLUTIONS

Goal	Solution
Ensure comprehensive building science approach	▪ Additional Mandatory Requirements

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

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Goal	Solution
Ensure comprehensive building science approach	▪ Additional mandatory requirements
Ensure high-efficency equipment and products more consistently included	▪ Additional Mandatory Requirements ▪ Reference Design vs. Fixed HERS Score

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

KEY GOALS/SOLUTIONS

Goal	Solution
Ensure comprehensive building science approach	▪ Additional mandatory requirements
Ensure high-efficency equipment and products more consistently included	▪ Additional mandatory requirements ▪ Reference design vs. fixed HERS Score
Enhance quality control of verification process	▪ Additional Mandatory Checklists

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

KEY GOALS/SOLUTIONS

Goal	Solution
Ensure comprehensive building science approach	▪ Additional mandatory requirements
Ensure high-efficency equipment and products more consistently included	▪ Additional mandatory requirements ▪ Reference design vs. fixed HERS Score
Enhance quality control of verification process	▪ Additional mandatory checklists
Reduce carbon emissions from bigger homes	▪ Size Adjustment Factor

ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

WHY CHANGE FIXED HERS SCORE?

- *Technical Challenge*
- *Built-in Flexibility*
- *Savings More Accurately Depicted*

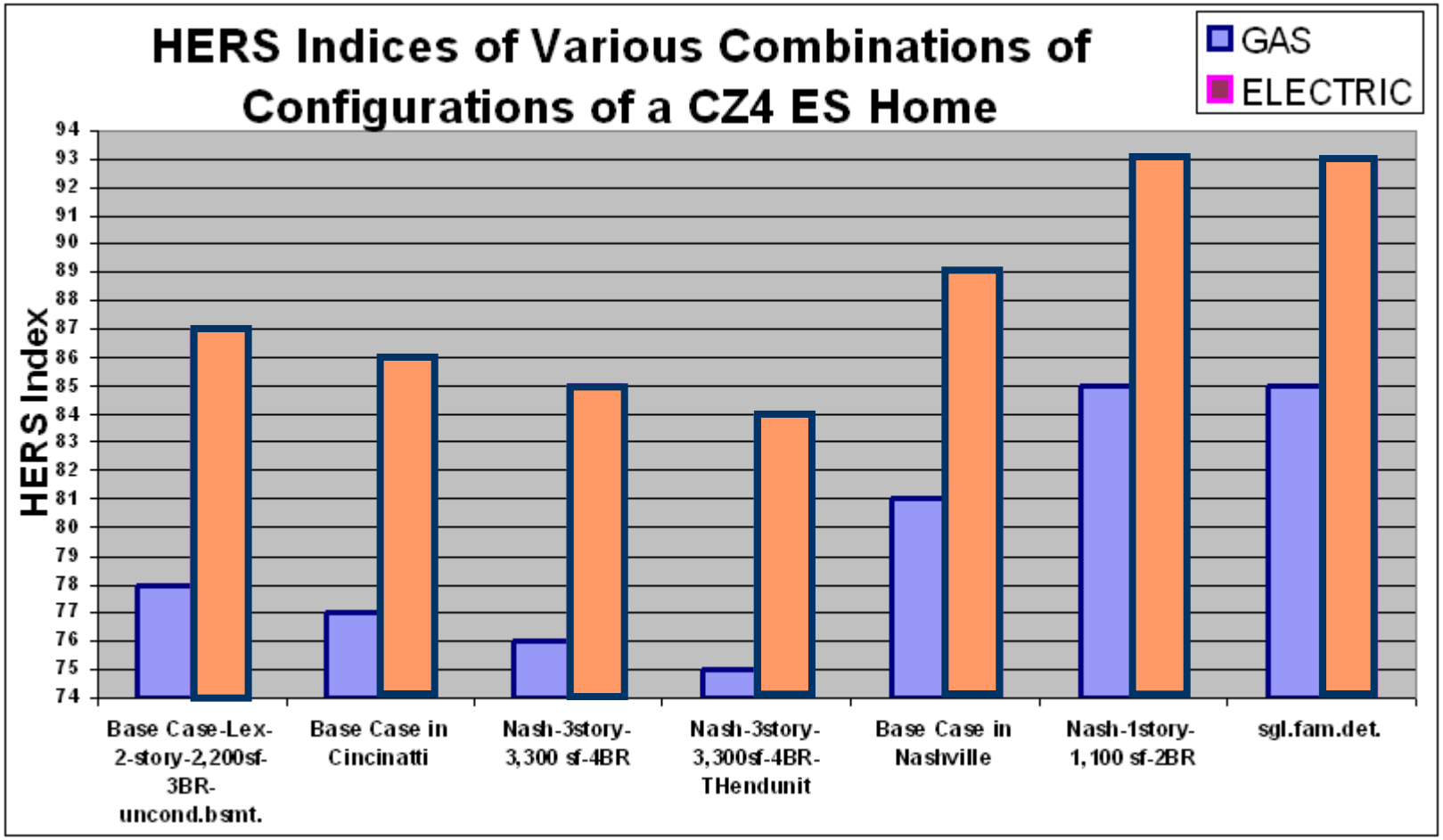
ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC

FACTORS AFFECTING HERS SCORE

- *Size*
- *# Bedrooms*
- *Location within Given Climate Zone*
- *Aspect Ratio*
- *Foundation Type*
- *Attached vs. Detached*
- *Fuel Type*

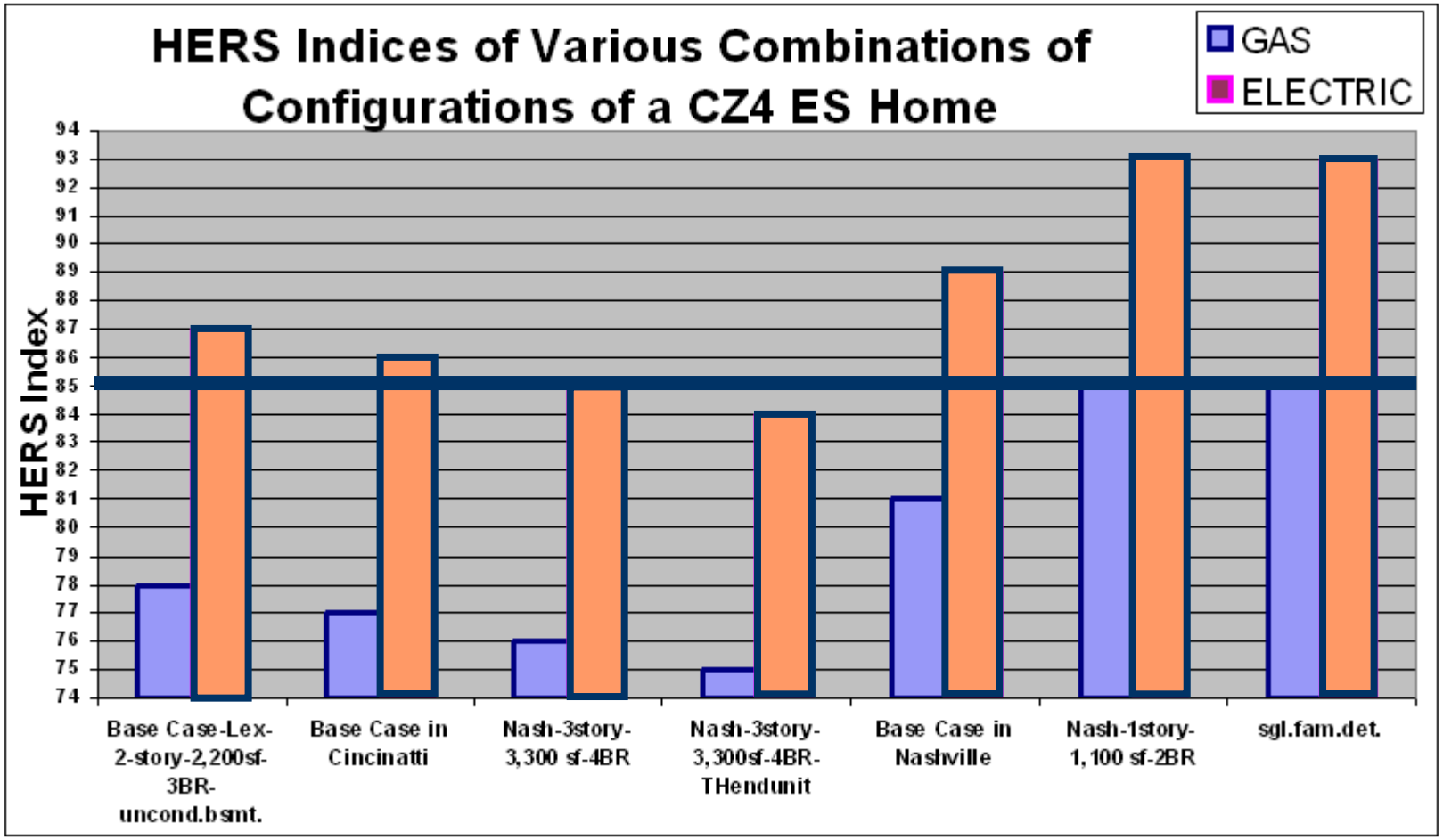
ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC:

TECHNICAL CHALLENGES



ENERGY STAR QUALIFIED HOMES PROPOSED 2011 SPEC:

TECHNICAL CHALLENGES



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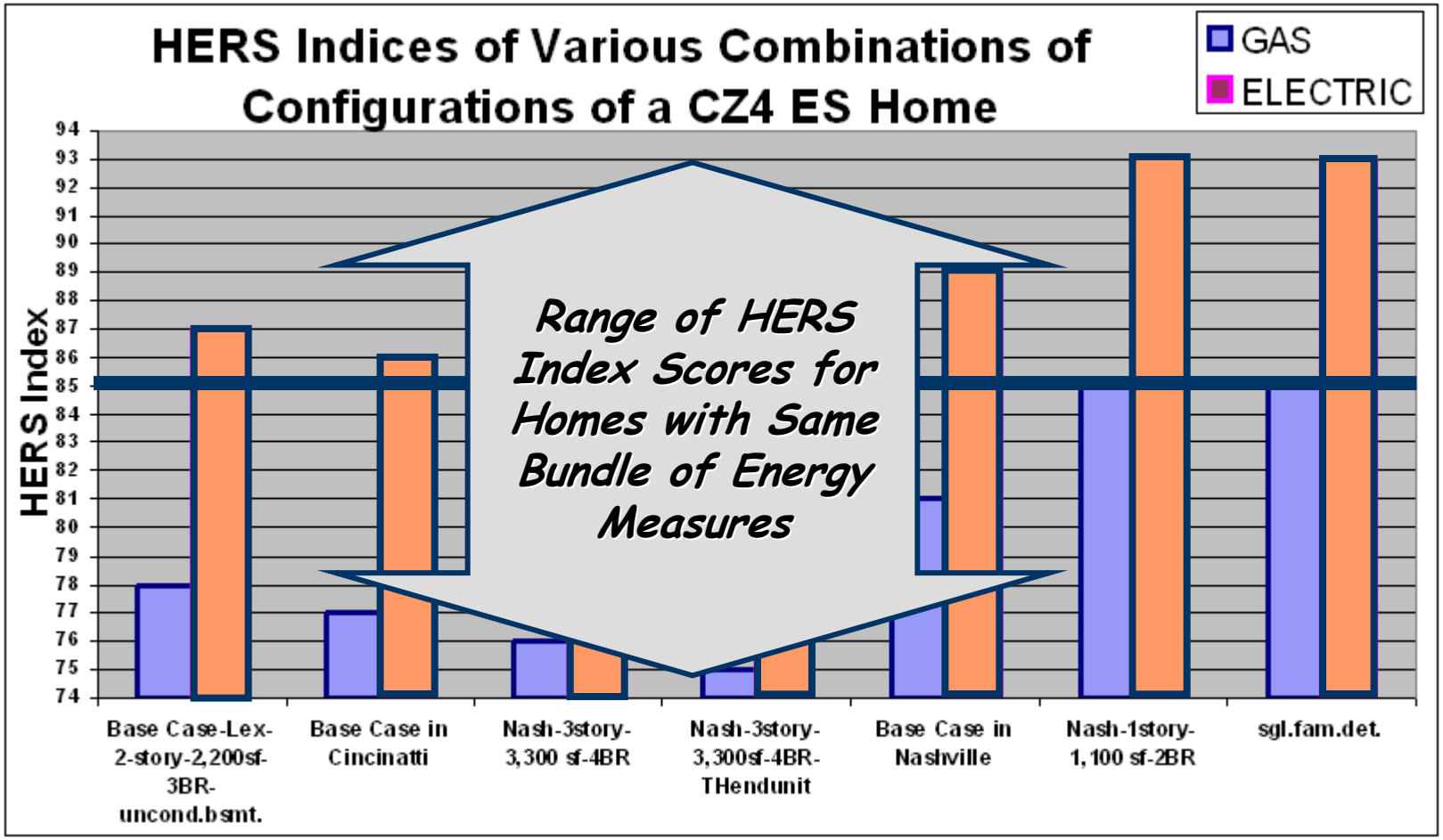
TECHNICAL CHALLENGES



Compliance Options

COMPLIANCE OPTIONS

PERFORMANCE VS. PRESCRIPTIVE

ENERGY STAR

Mandatory Measures

COMPLIANCE OPTIONS

PERFORMANCE VS. PRESCRIPTIVE

Mandatory Measures +

Prescriptive Path:
All ENERGY STAR Reference Design Specs [only for homes ≤ Benchmark CFA]

or

Performance Path:
Alternative Energy Efficiency Measures ≤ HERS Index Target Score Adjusted for Size

COMPLIANCE OPTIONS

PERFORMANCE VS. PRESCRIPTIVE

Mandatory Measures +

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ENERGY STAR Reference Design:
HVAC Equipment
Envelope & Windows
Water Heater
Thermostat
Lighting & Appl.

COMPLIANCE OPTIONS

PERFORMANCE VS. PRESCRIPTIVE

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All ENERGY STAR Reference Design Specs [only for homes ≤ Benchmark CFA]

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Alternative Energy Efficiency Measures ≤ HERS Index Target Score Adjusted for Size

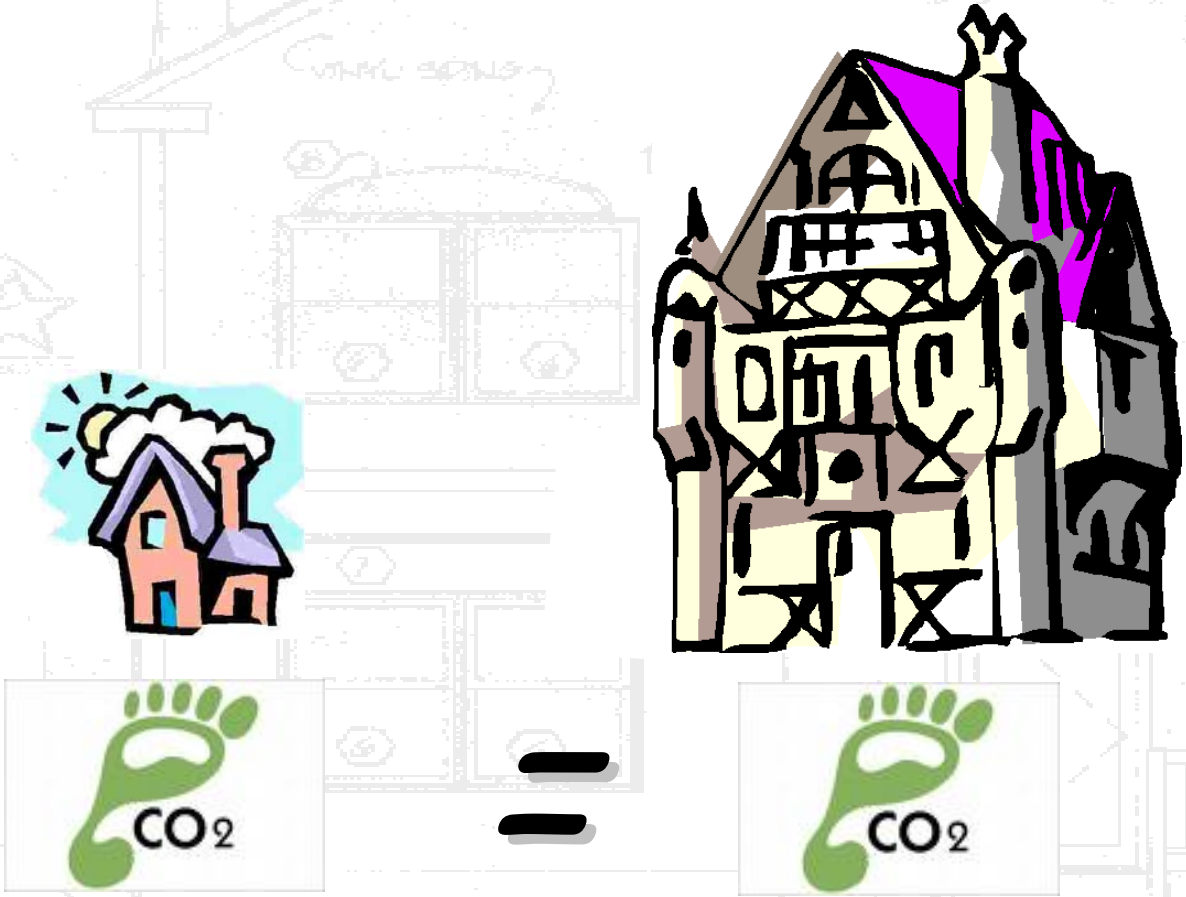
ENERGY STAR Reference Design:
HVAC Equipment
Envelope & Windows
Water Heater
Thermostat
Lighting & Appl.

HERS Software Evaluation for Rated Home

ENERGY STAR HERS Index Target Score
[Size Adjusted]

COMPLIANCE OPTIONS

SIZE ADJUSTMENT FACTOR STRATEGY



COMPLIANCE OPTIONS

SIZE ADJUSTED TARGET SCORE

Benchmark Home Size

BR's	1	2	3	4	5	6	7	8
CFA	1000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

$$\left(\frac{\text{CFA Benchmark Home}}{\text{CFA Rated Home}}\right)^{0.5} \times \text{HERS Index Target Score}$$

Size Modification Factor not to exceed 1.0

COMPLIANCE OPTIONS

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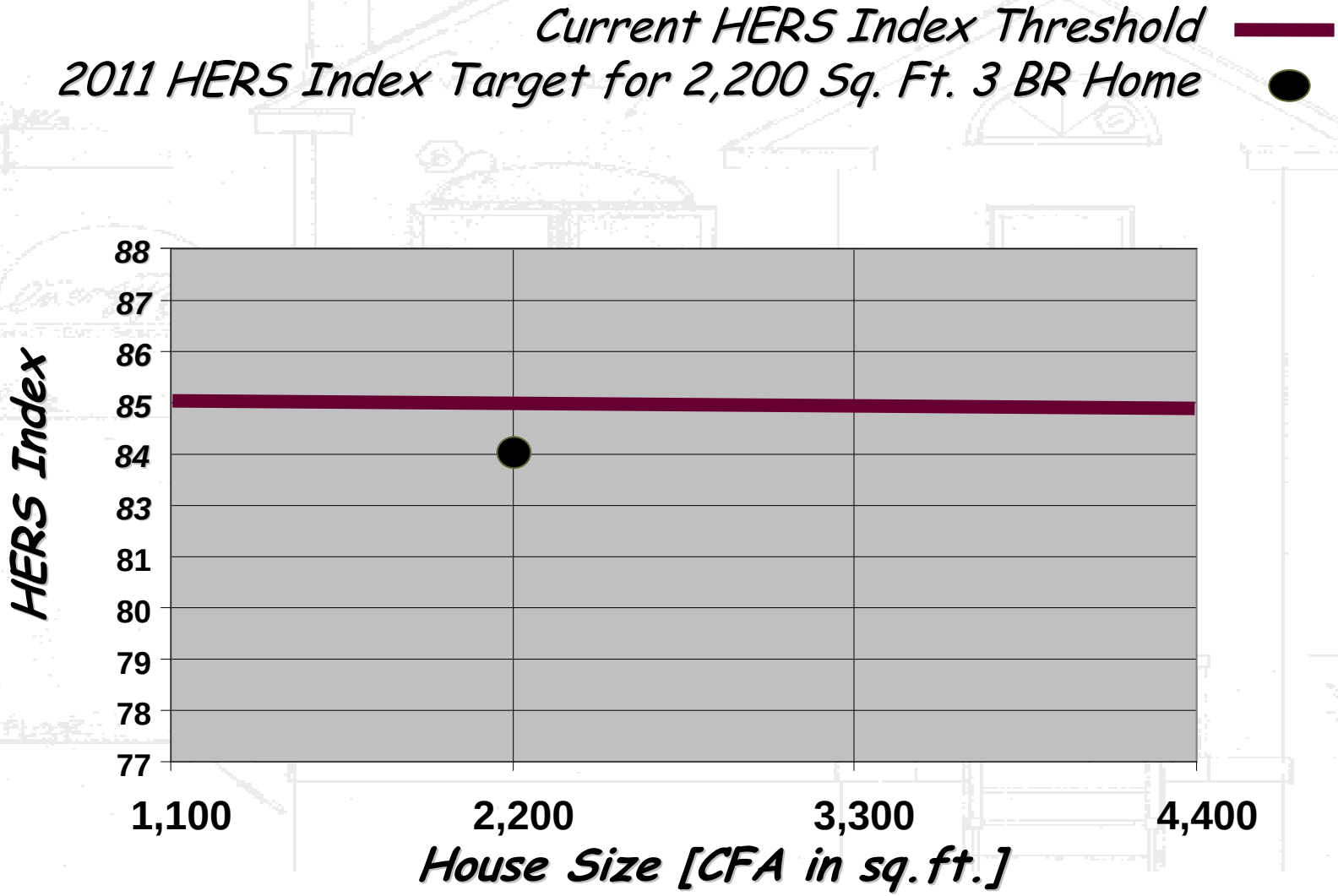
COMPLIANCE OPTIONS

2011 TARGET SCORE VS. FIXED SCORE



COMPLIANCE OPTIONS

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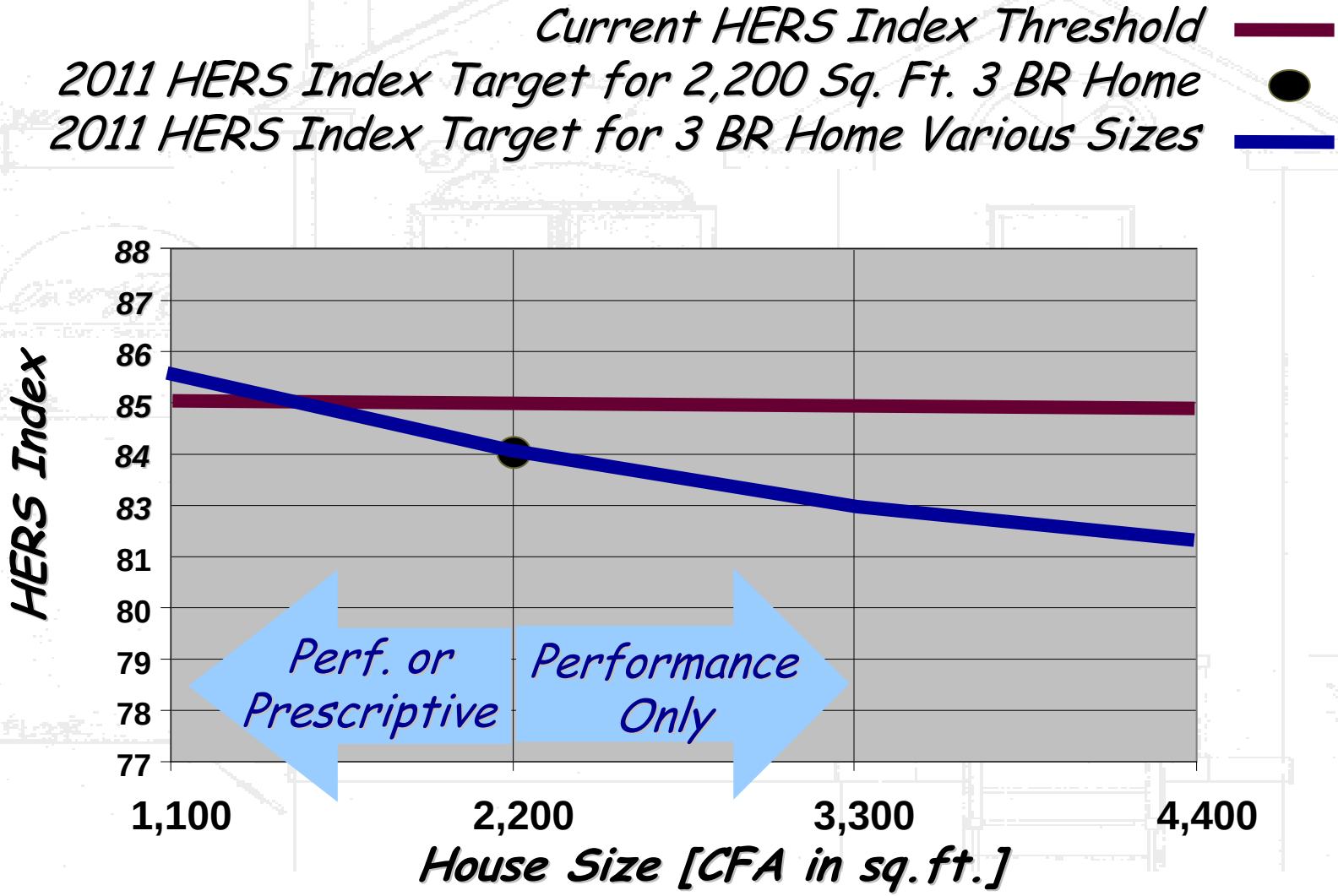

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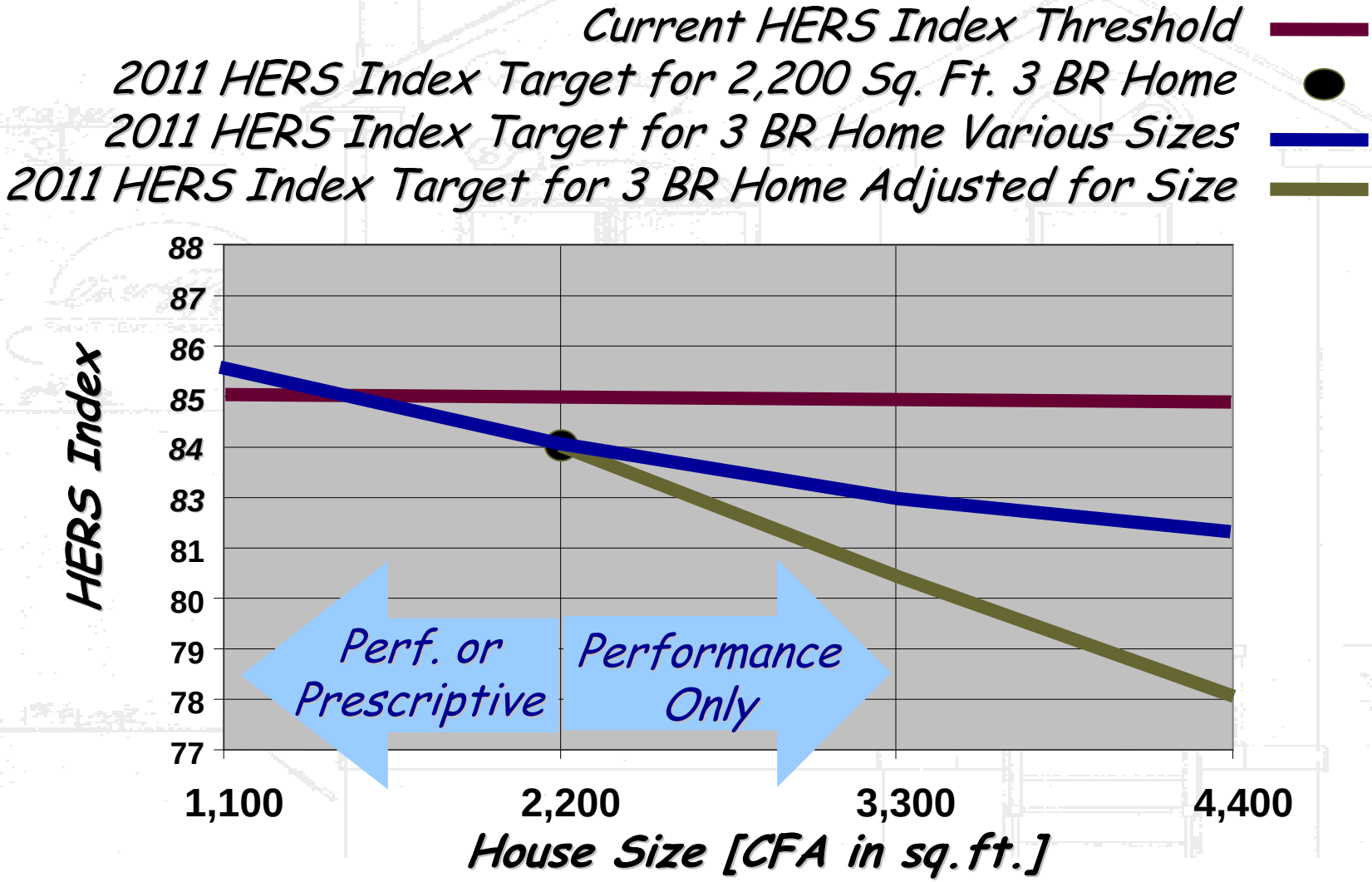

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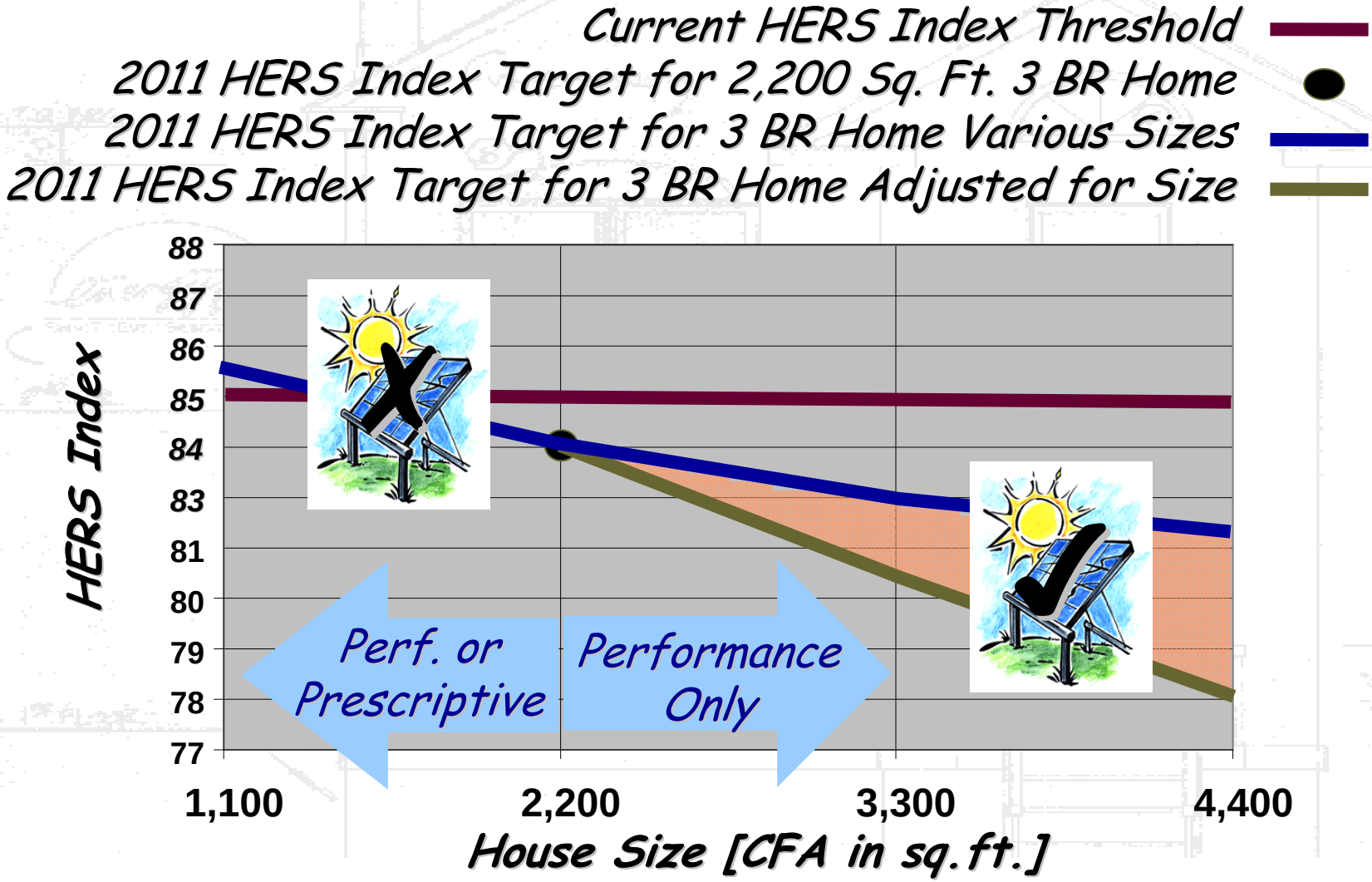


Mandatory Requirements

MANDATORY REQUIREMENTS:

ALL LABELED HOMES

- **Hot Water Efficiency**
  - Shower Heads < 2.0 gpm
  - Efficient Hot Water Distribution
- **ENERGY STAR Products**
  - Refrigerator, Dishwasher, Clothes Washer where provided
  - ALP or Bulbs in 80% Sockets
  - Ceiling Fans, where provided
- **Six Checklists**

MANDATORY REQUIREMENTS:

EFFICIENT WATER HEATING SYSTEM

- *Energy Factor*
- *Distribution*
- *Insulated Piping*
- *Heat Trap Above Tank/Heater*

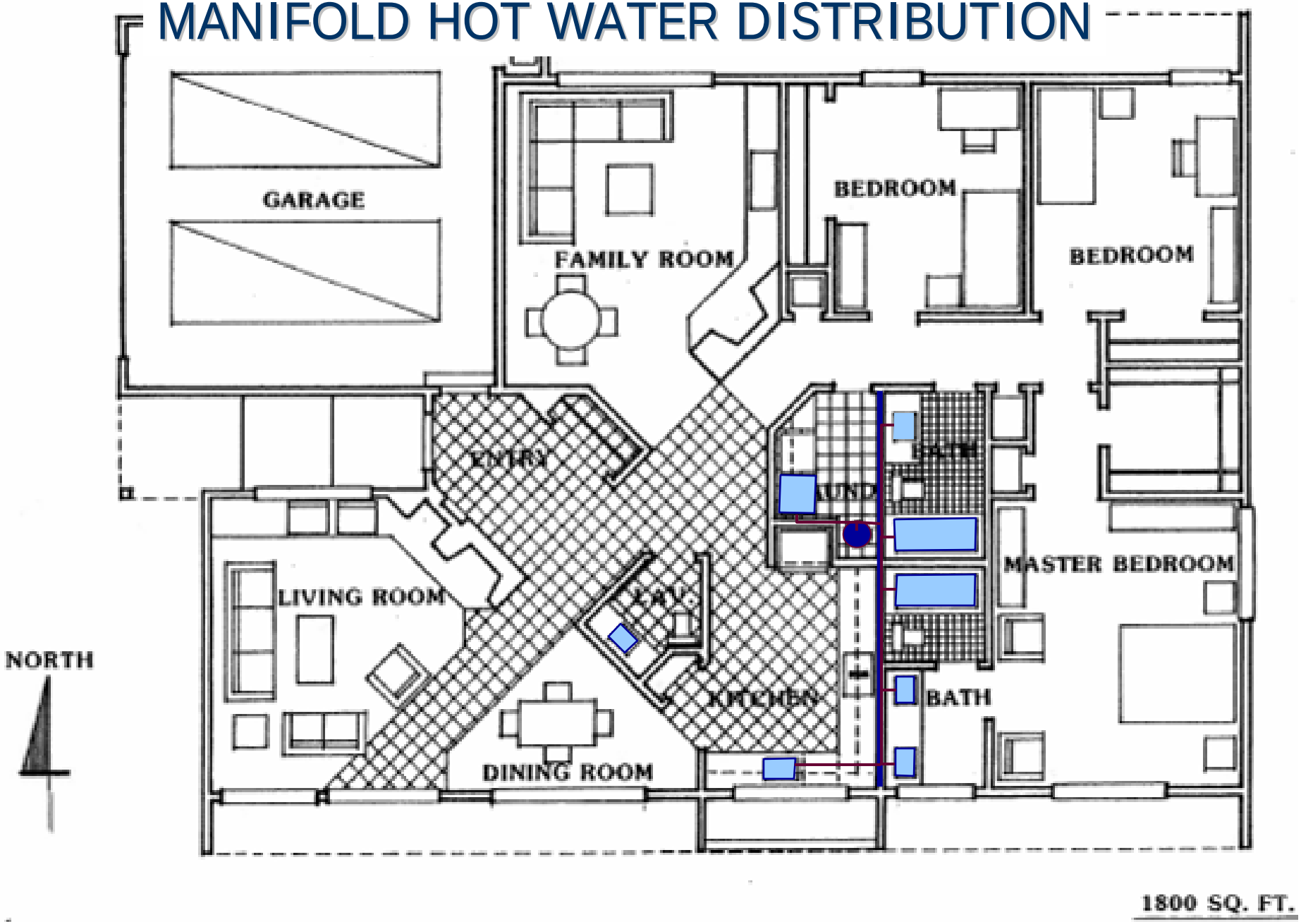
MANDATORY REQUIREMENTS:

WATER HEATING DISTRIBUTION

- *Core System (Wet Walls)*
- *Manifold System*
- *Demand Pumping System*

WATER HEATING DISTRIBUTION:

MANIFOLD HOT WATER DISTRIBUTION



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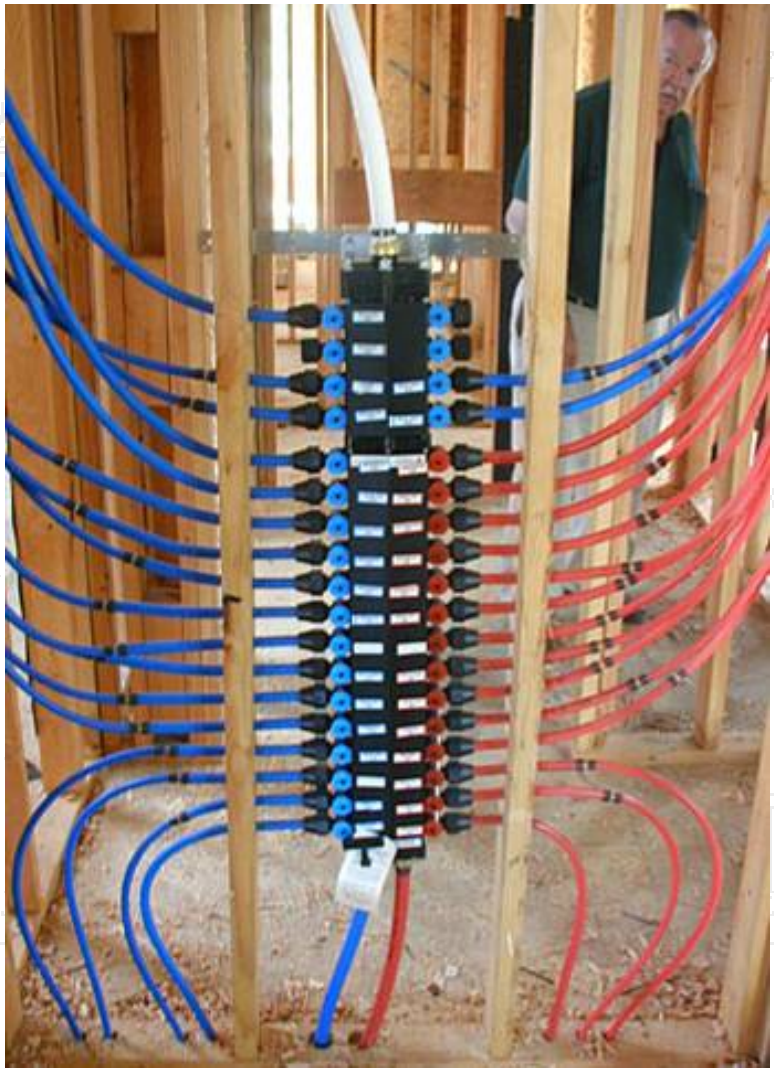
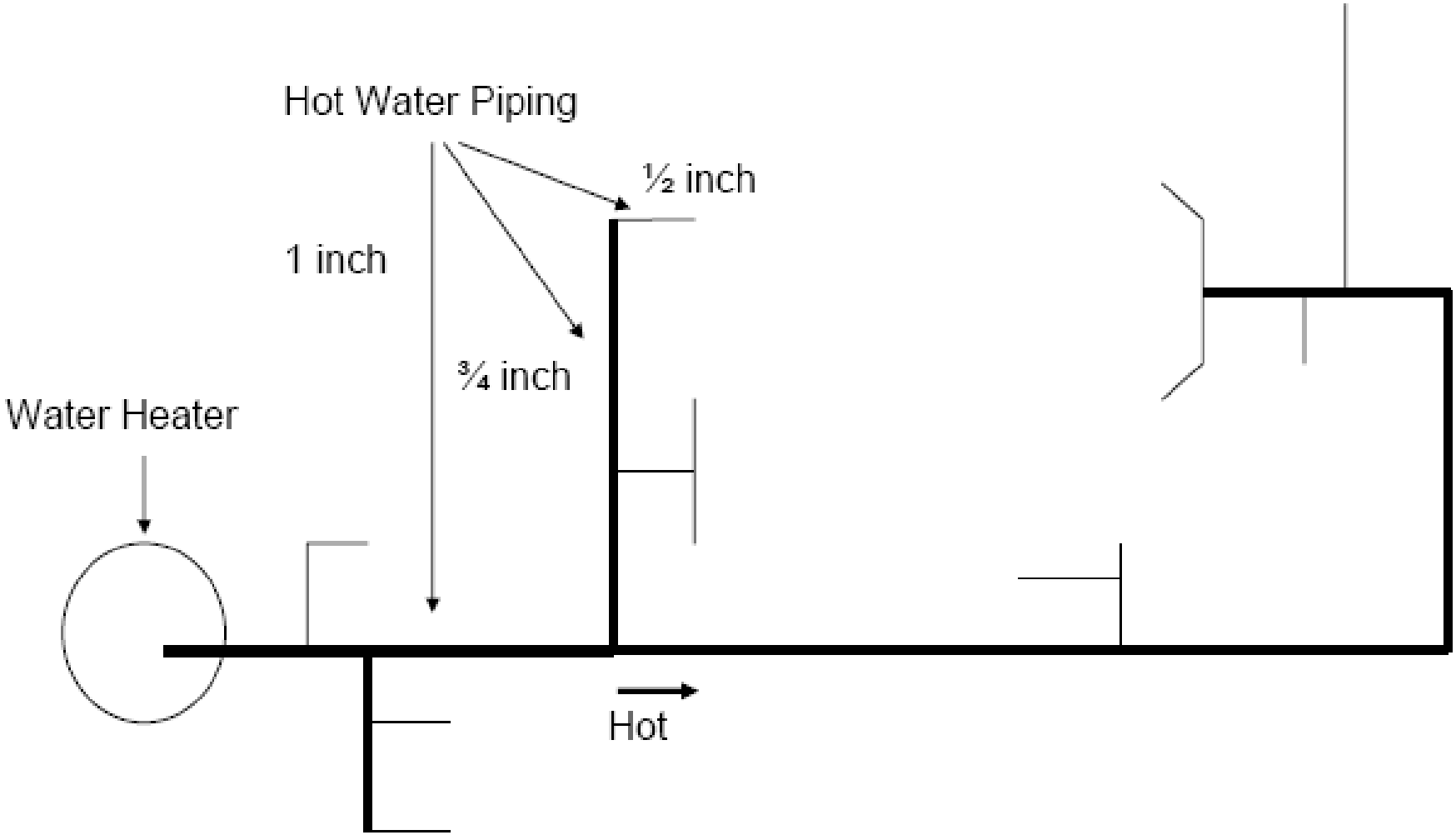
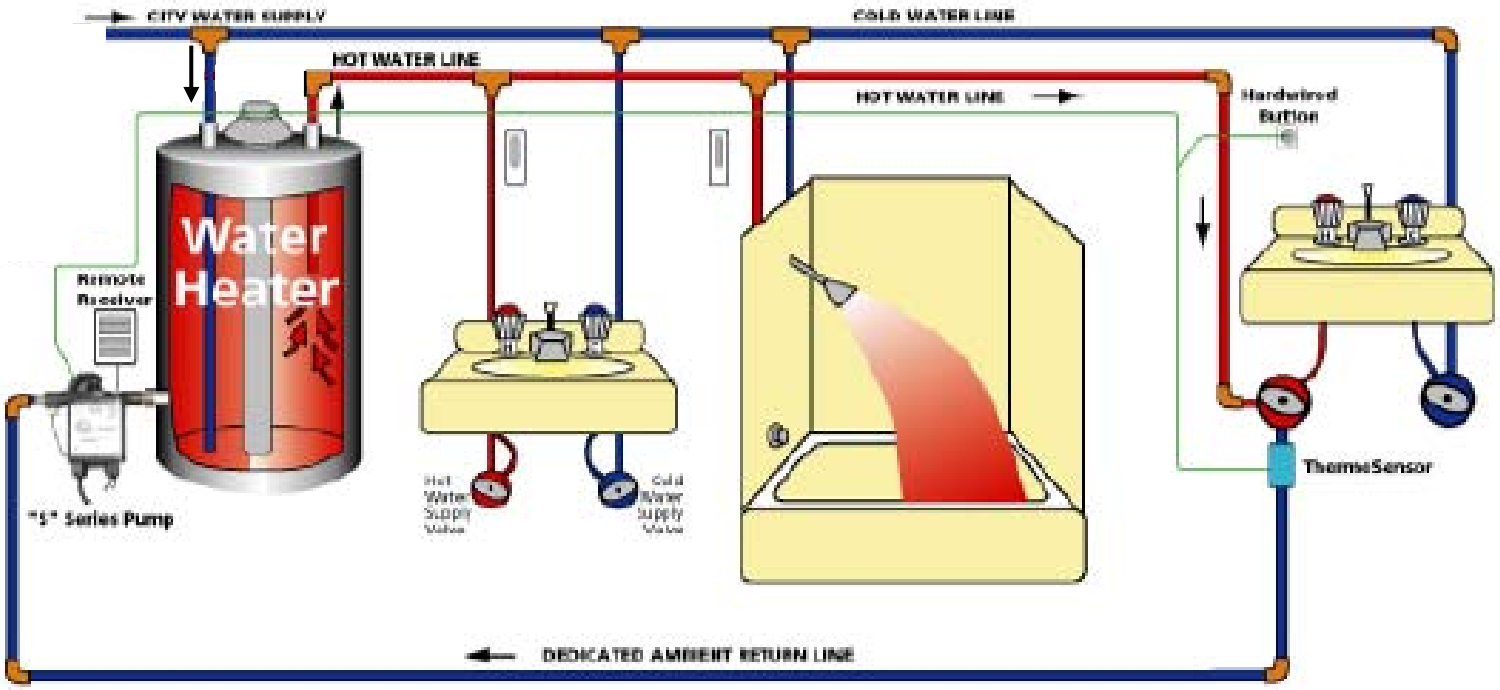


Single Trunk and Branch



WATER HEATING DISTRIBUTION:

DEMAND PUMPING SYSTEM



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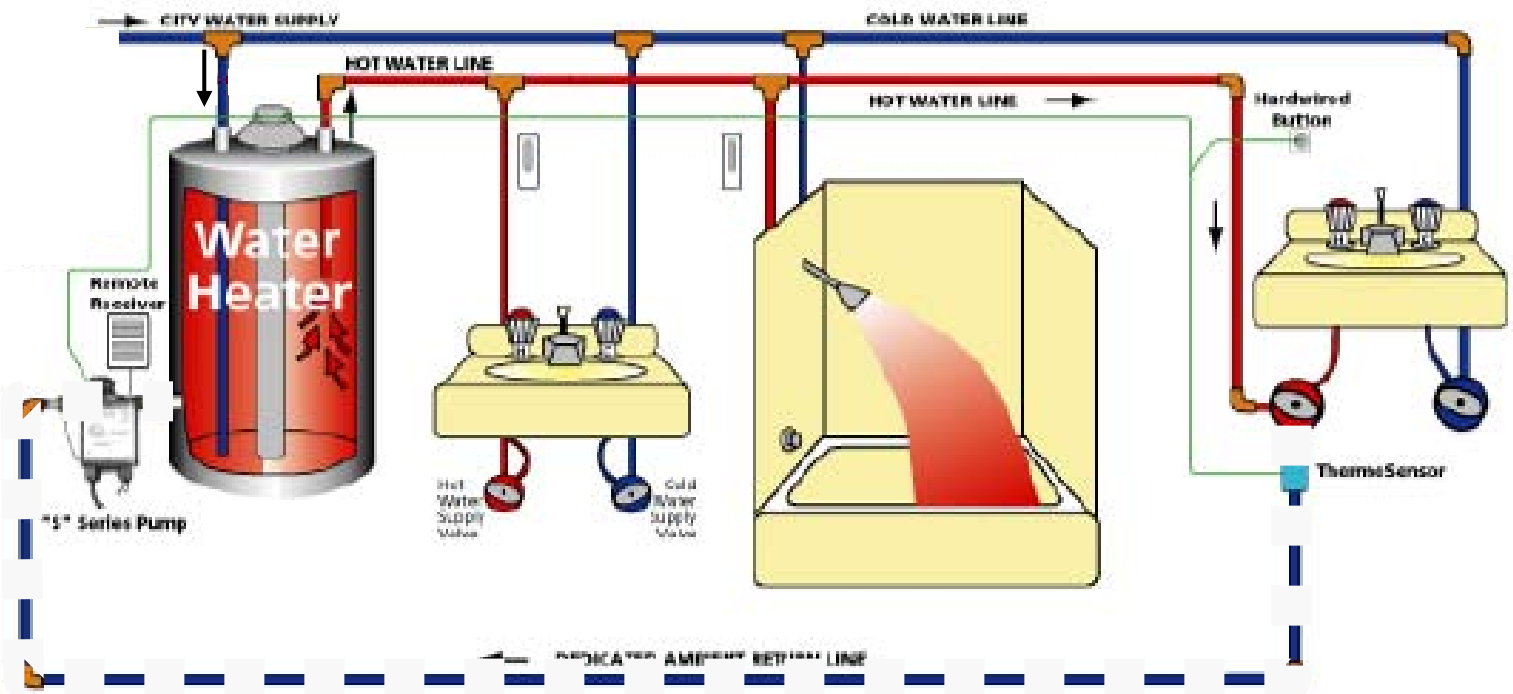

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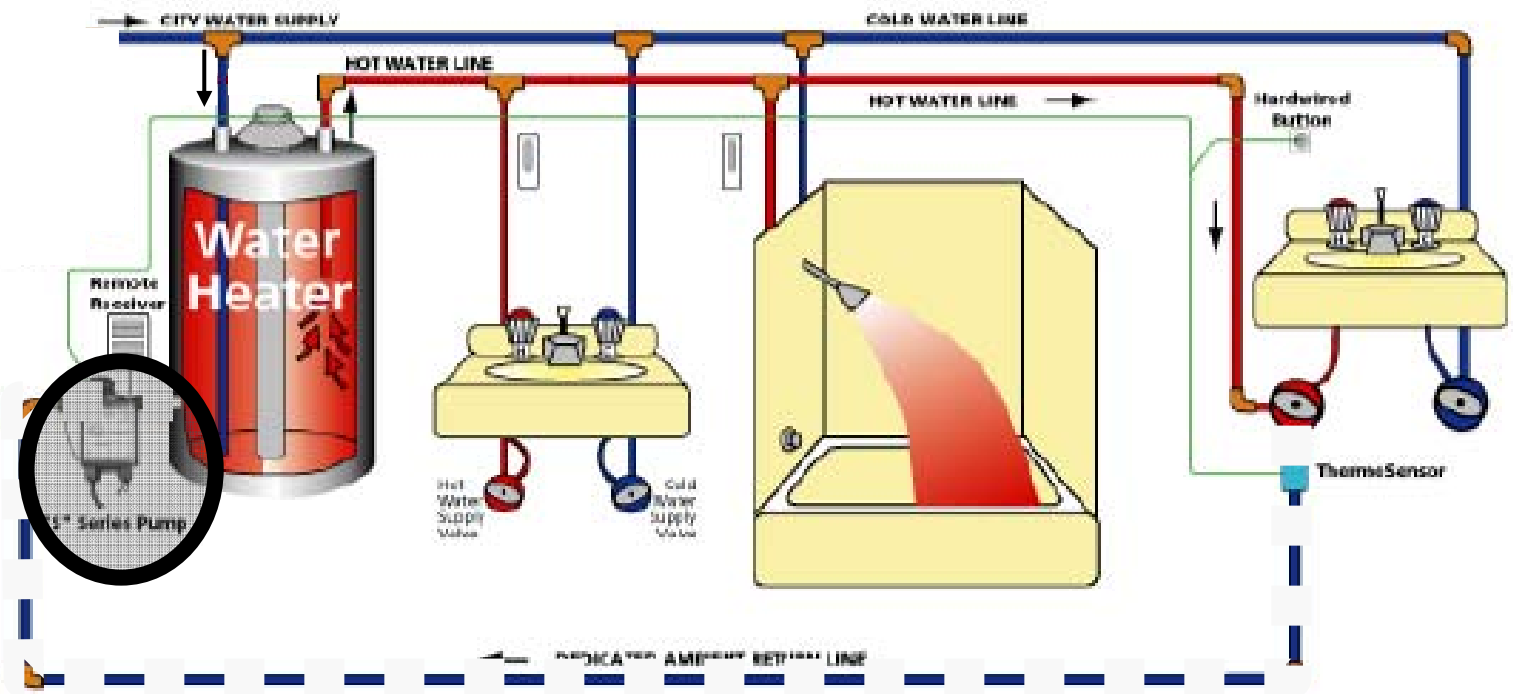

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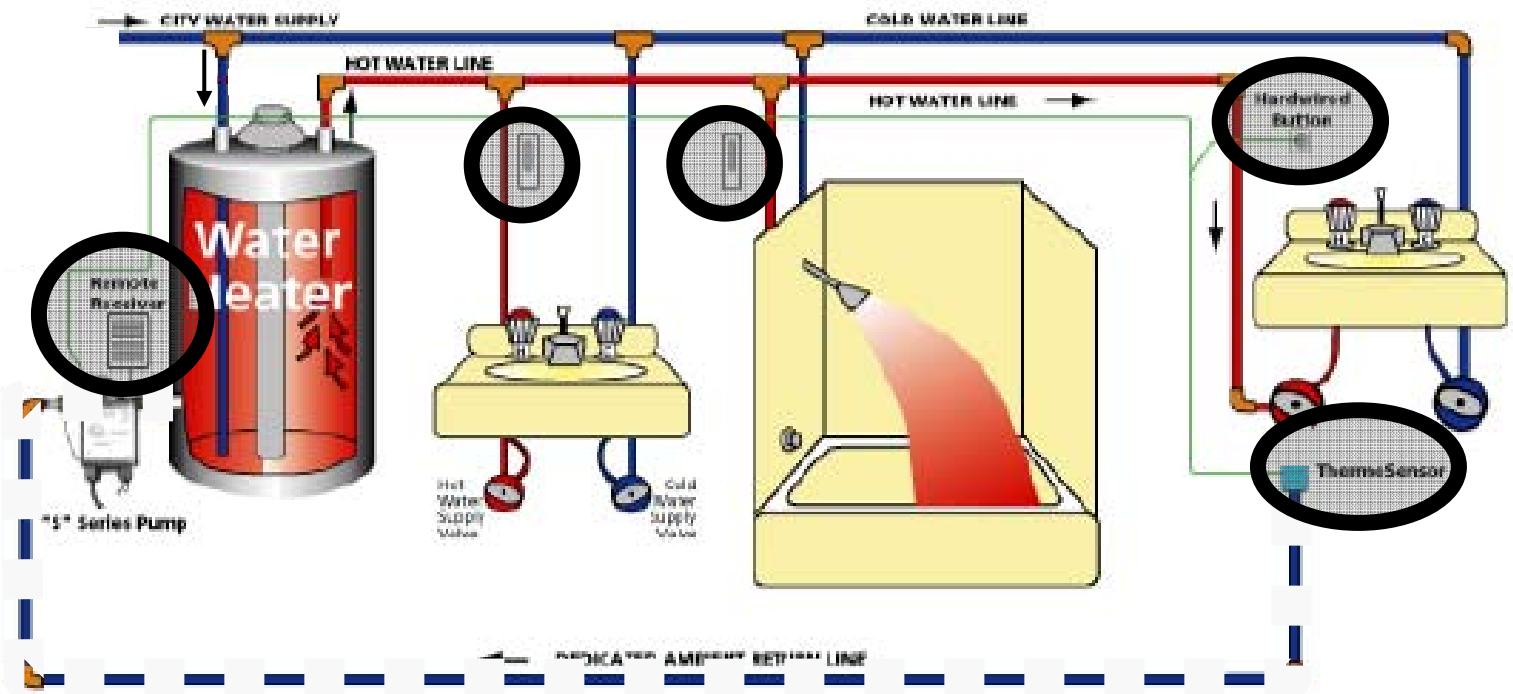


MANDATORY REQUIREMENTS:

ENERGY STAR APPLIANCES/FANS

Checklists

ENERGY STAR QUALIFIED HOMES 2011 SPEC

MANDATORY CHECKLISTS

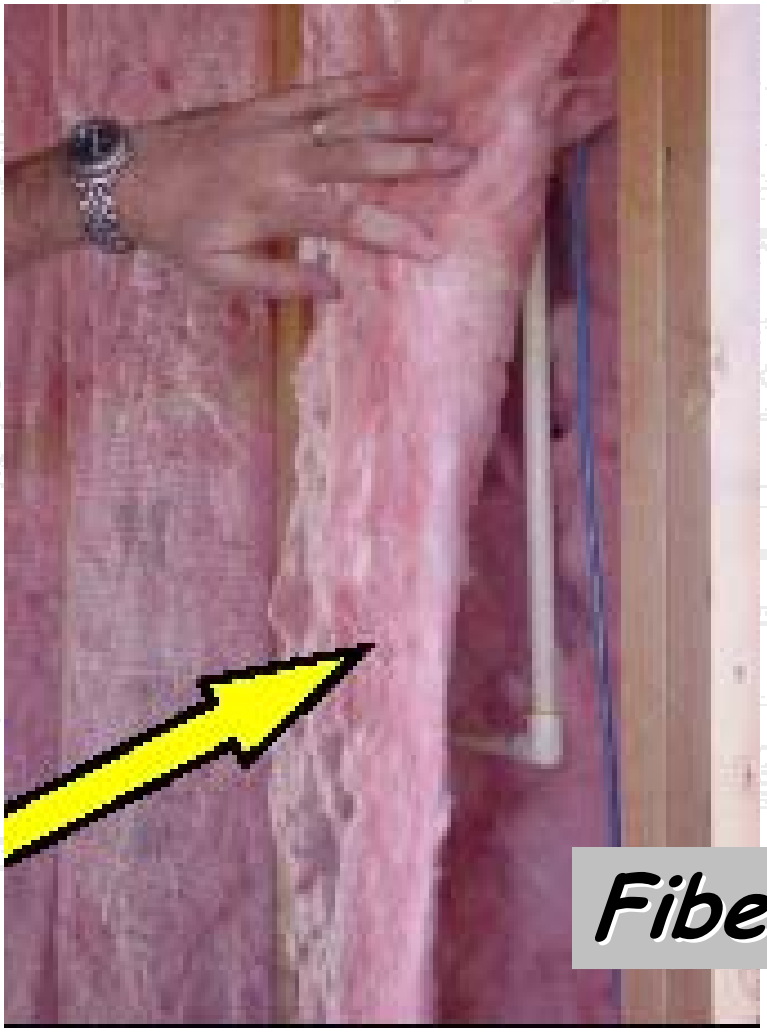
- *Thermal Bypass*
- *Quality Framing*
- *HVAC Quality Installation Contractor*
- *HVAC Quality Installation Verifier*
- *Indoor Air Quality*
- *Water Managed Construction*

THERMAL BYPASS CHECKLIST:

INSULATION INSTALLATION PROBLEM

THERMAL BYPASS CHECKLIST:

PROPER INSULATION



Fiberglass

THERMAL BYPASS CHECKLIST:

PROPER INSULATION

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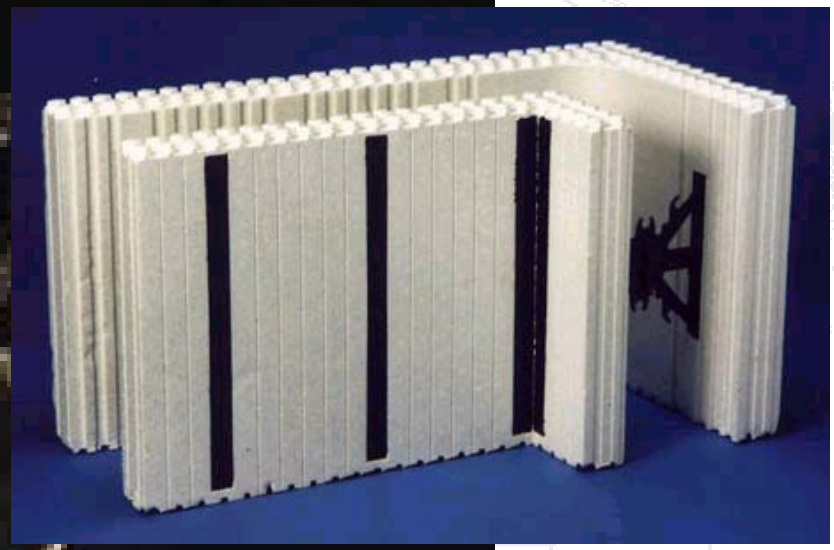
THERMAL BYPASS CHECKLIST:

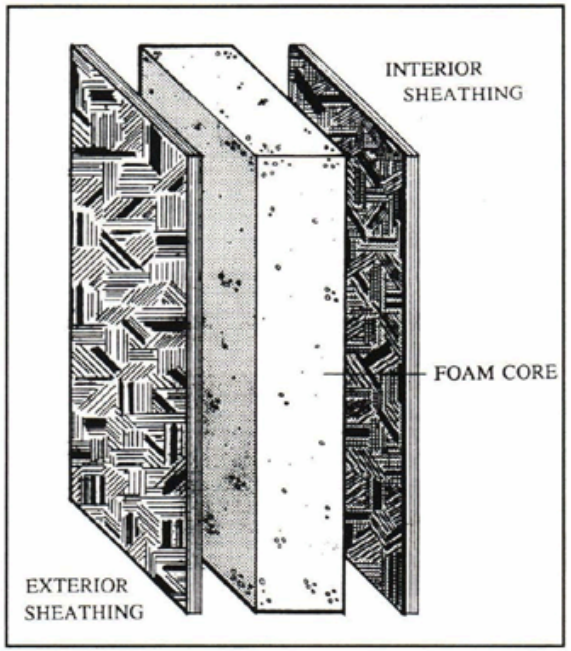
PROPER INSULATION



Insulated Concrete Forms (ICFs)

THERMAL BYPASS CHECKLIST:

PROPER INSULATION

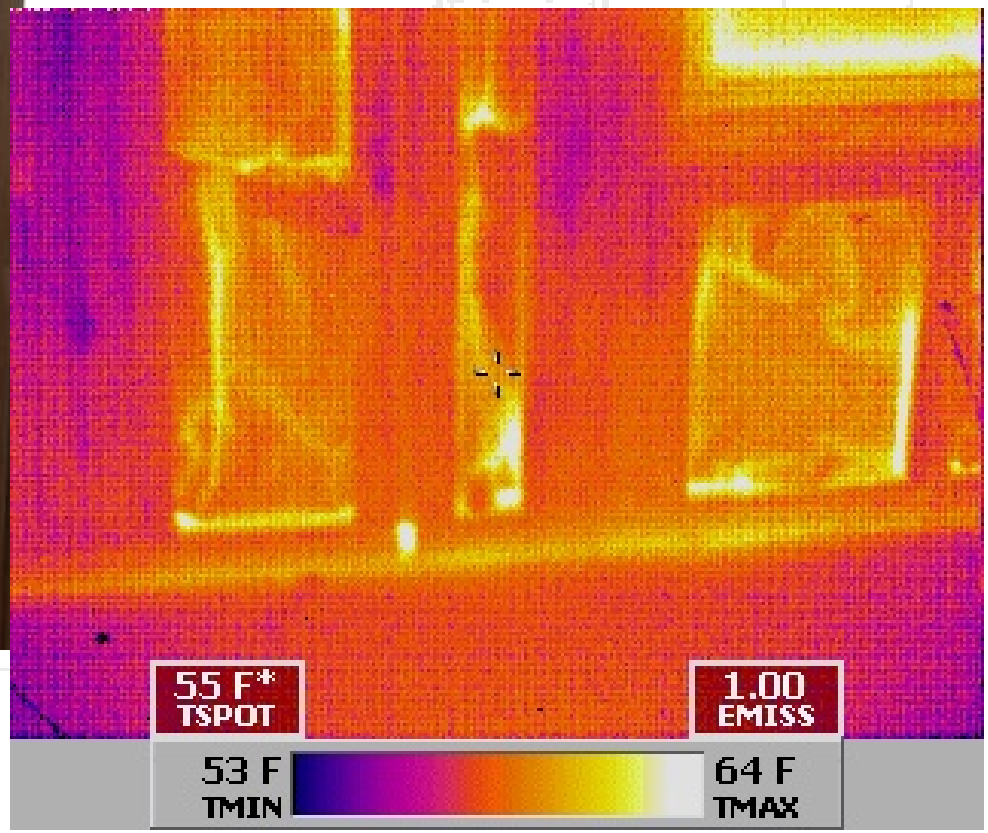


THERMAL BYPASS CHECKLIST:

BYPASS AT WALL/ATTIC INTERFACE

FRAMING QUALITY CHECKLIST:

THERMAL BRIDGING



FRAMING QUALITY CHECKLIST:

THERMAL BRIDGING SOLUTION

ENERGY STAR

Choose One System:

- Optimum Value Engineered Framing (OVE)
- Insulated Sheathing
- Structural Insulated Panels (SIPS)
- Insulated Concrete Forms (ICF)
- Double Wall Framing

Plus:

- Raised Heel Trusses
- Raised HVAC Attic Platform Framing

FRAMING QUALITY CHECKLIST:

OVE FRAMING

FRAMING QUALITY CHECKLIST:

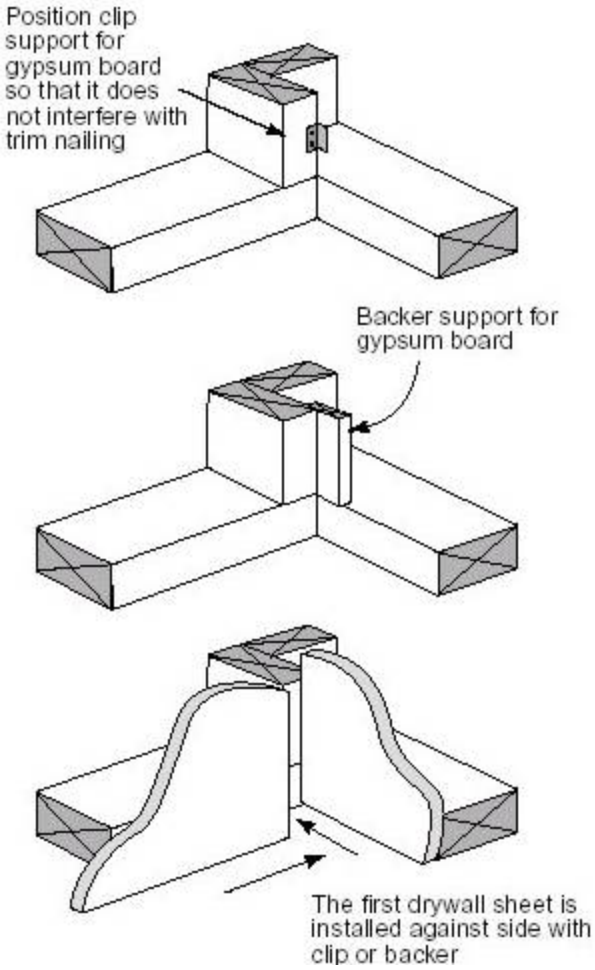
OVE FRAMING

FRAMING QUALITY CHECKLIST:

OVE FRAMING

Courtesy of Building Science Corp.

INSIDE "TWO-STUD" CORNERS



Courtesy of Southface Institute

FRAMING QUALITY CHECKLIST:

OVE FRAMING

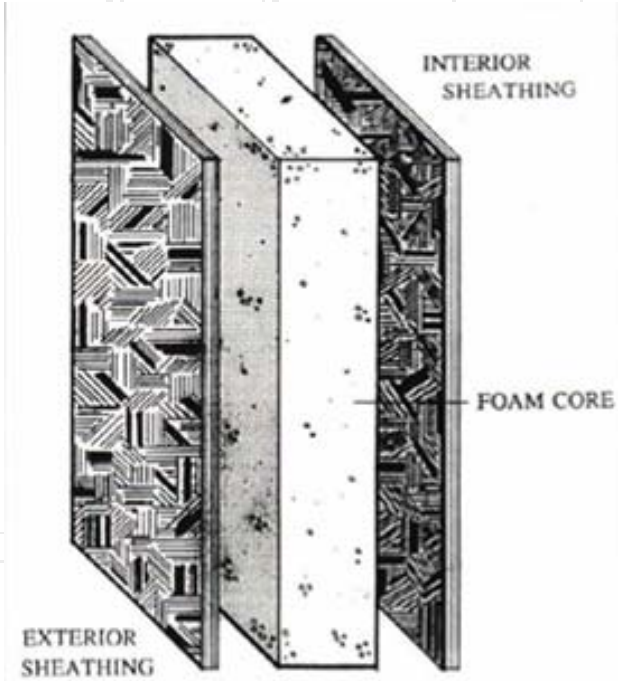
Ladder T – Allows insulation in exterior wall cavity at wall intersections

FRAMING QUALITY CHECKLIST:

INSULATED SHEATHING

FRAMING QUALITY CHECKLIST:

STRUCTURAL INSULATED PANELS



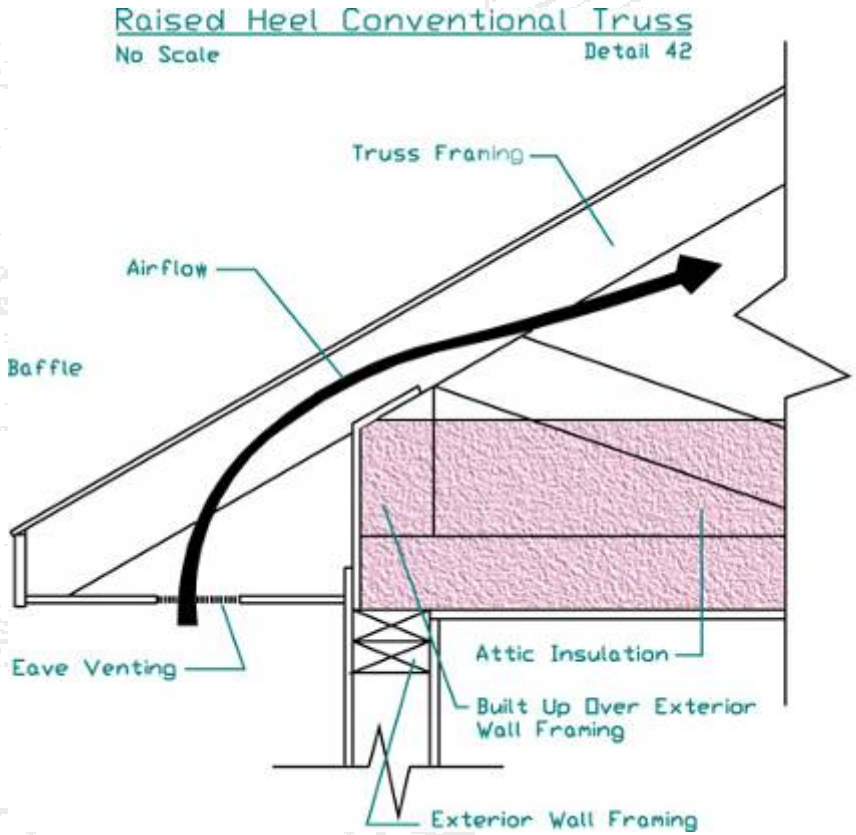
FRAMING QUALITY CHECKLIST:

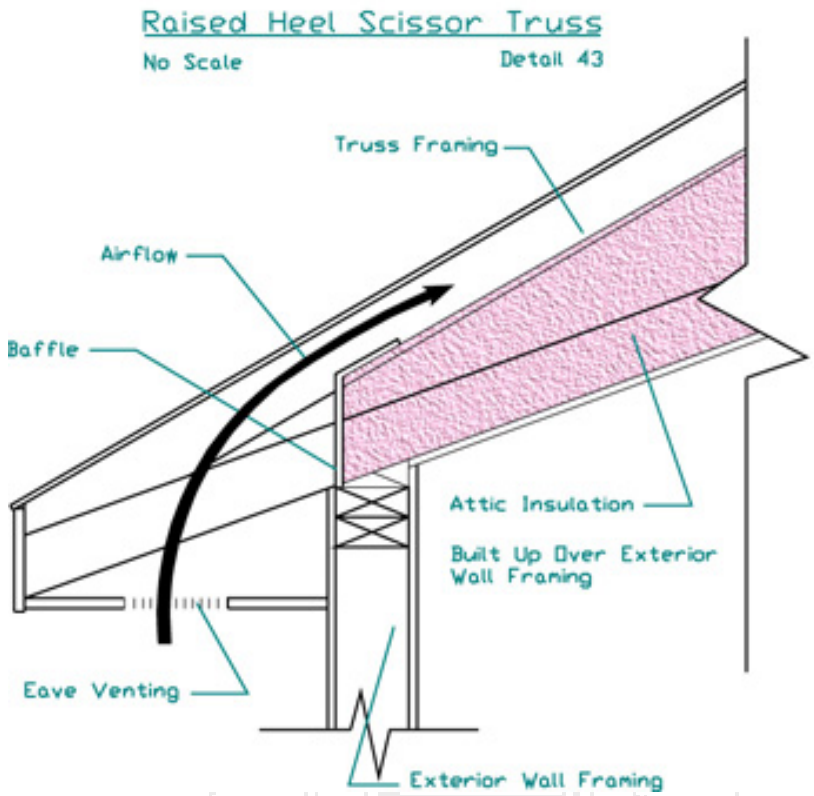
INSULATED CONCRETE FORMS

ENERGY STAR

FRAMING QUALITY CHECKLIST:

RAISED HEEL TRUSSES





FRAMING QUALITY CHECKLIST:

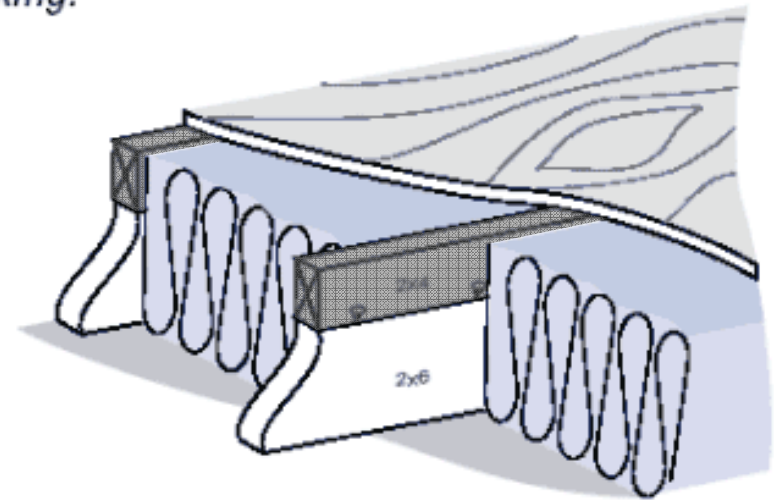
RAISED HEEL TRUSSES

FRAMING QUALITY CHECKLIST:

RAISED HVAC PLATFORM FRAMING

INCREASE ATTIC INSULATION LEVELS UNDER DECKING

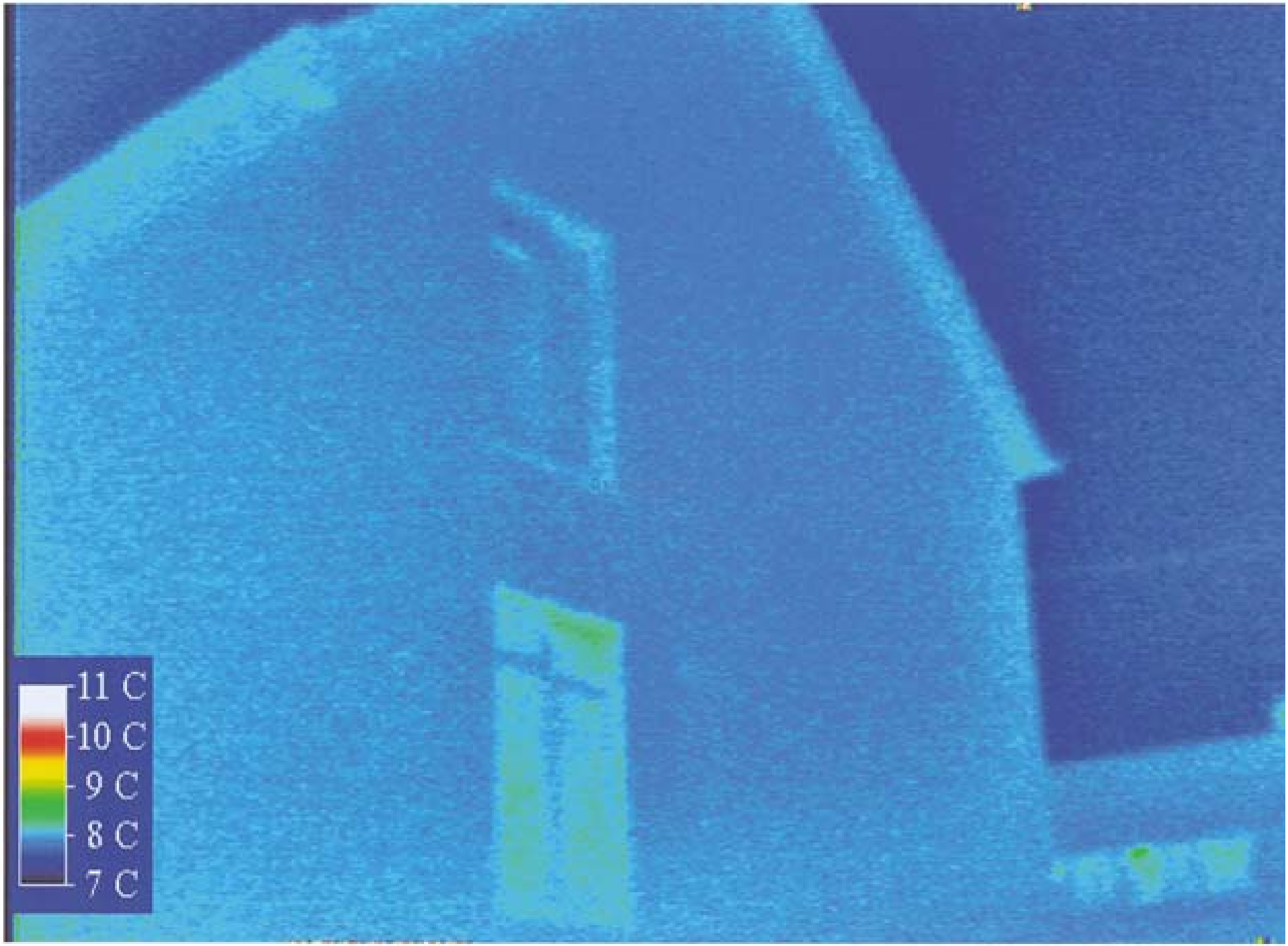
For many products, an insulation depth of 10 to 14 inches is needed to achieve an R-30 to R-38 insulation value. Thus, a 2x4 or 2x6 extension needs to be added to a 2x6 joist to provide sufficient depth before installing decking.



FRAMING QUALITY CHECKLIST:

COMPLETING THE INSULATION SYSTEM

- *Air-Tight Assemblies* *(Reference Design Air Leakage)*
- *Six-Sided Air Barrier* *(Thermal Bypass Checklist)*
- *Zero-Tolerance* *(Grade 1 Installation Mandatory)*
- *Minimal Thermal Bridging* *(Framing Checklist)*


11 C
10 C
9 C
8 C
7 C

HVAC QUALITY INSTALLATION CHECKLISTS:

HVAC QUALITY INSTALLATION

ENERGY STAR

Right-Sizing

Equipment (ACCA Manual J/S)
Ducts (ACCA Manual D)
Terminals (ACCA Manual T)

Air Distribution

Duct Leakage
Static Pressure
Flow Across Coil
Air Flow

Refrigerant Charge

Testing
TXV Valve

Duct Installation

Installation
R-8 Ducts in Attic
Leakage to Outdoors and Total Pressure Balancing

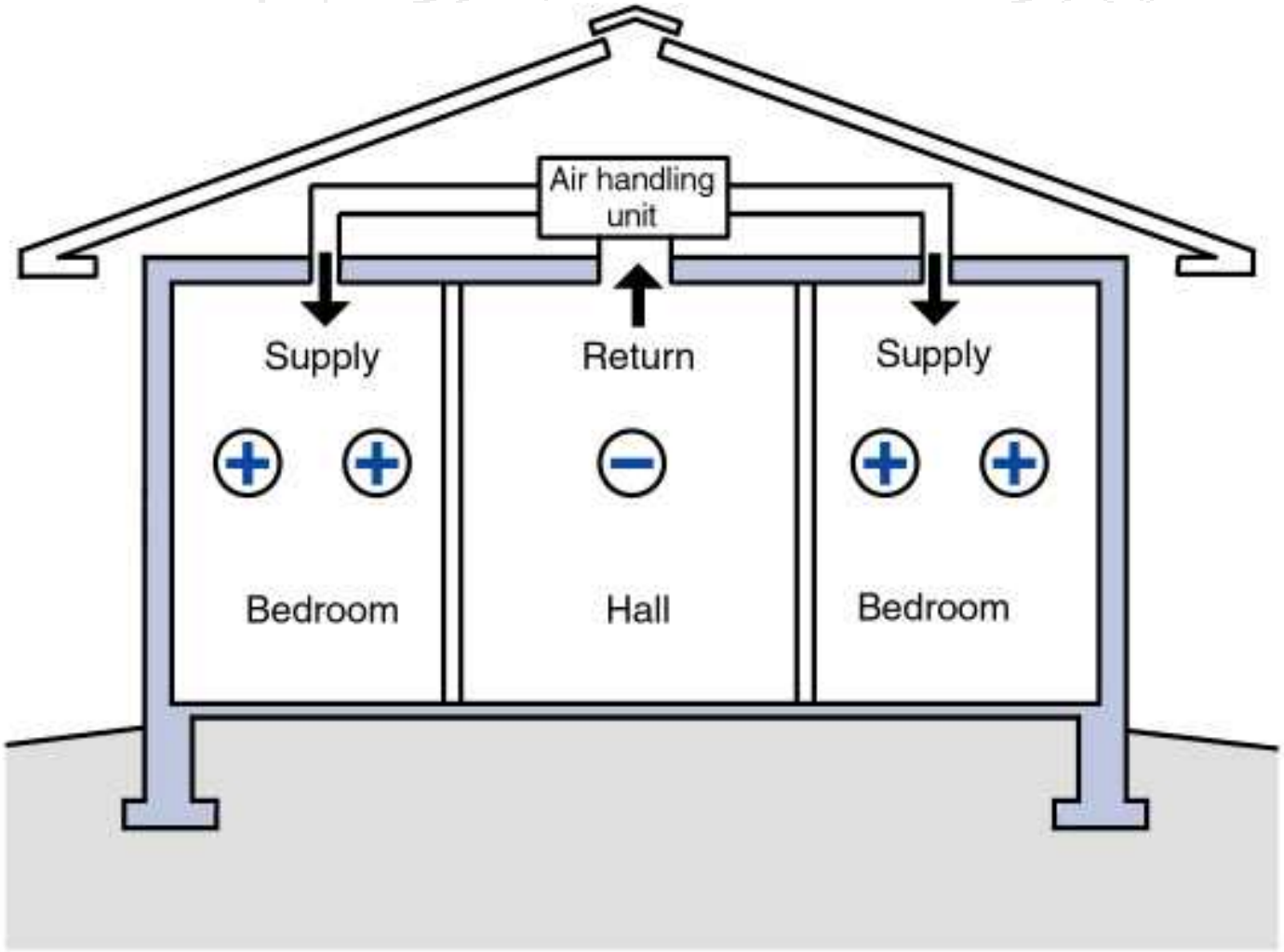
Exit grille is over here !

CLASS 1 AIR DUCT

05.08.2005

HVAC QUALITY INSTALLATION:

PRESSURE BALANCING: PROBLEM



HVAC QUALITY INSTALLATION:

PRESSURE BALANCING: SOLUTIONS

TRANSFER GRILLE

JUMP DUCT

INDOOR AIR QUALITY CHECKLIST:

WHOLE-HOUSE VENTILATION

CONTINUOUS EXHAUST

FRESH AIR DAMPER

DUCTED FRESH AIR SUPPLY

INDOOR AIR QUALITY CHECKLIST:

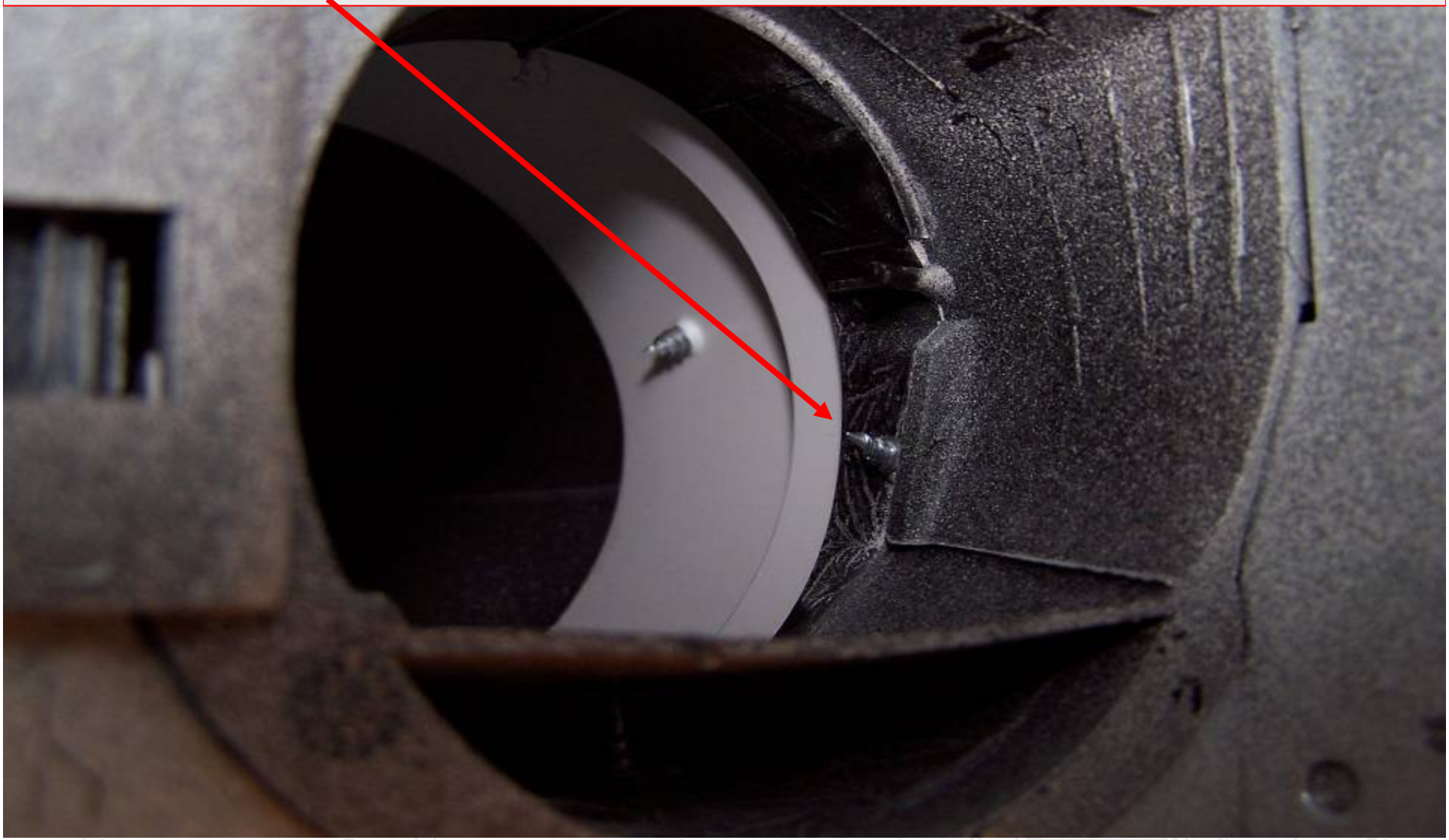
WHOLE-HOUSE VENTILATION

ERV

INDOOR AIR QUALITY CHECKLIST:

SPOT VENTILATION

Screw pinning damper closed- No airflow



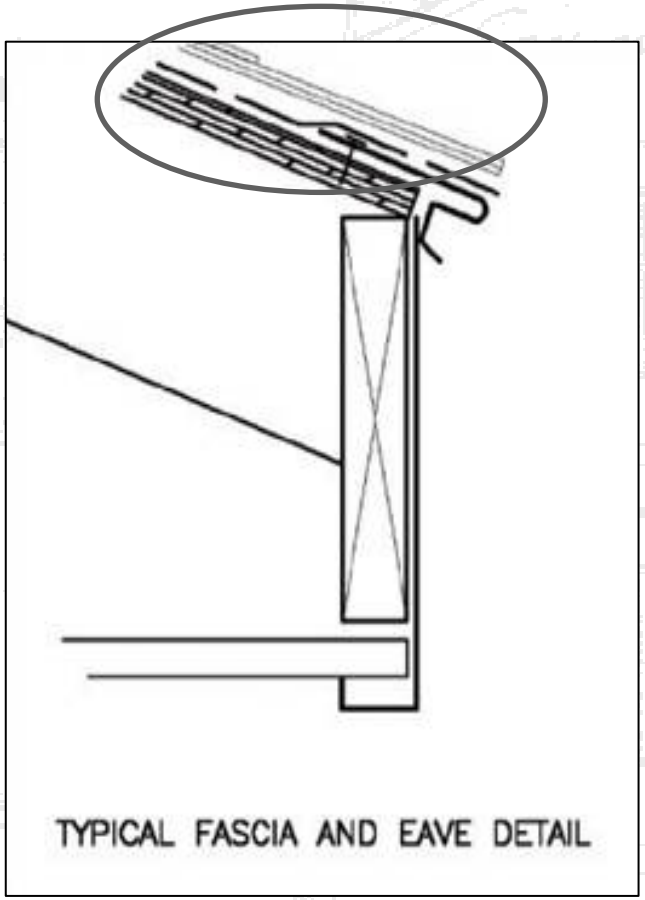
Only testing will find these things

This is the reading from a 110 cfm fan:

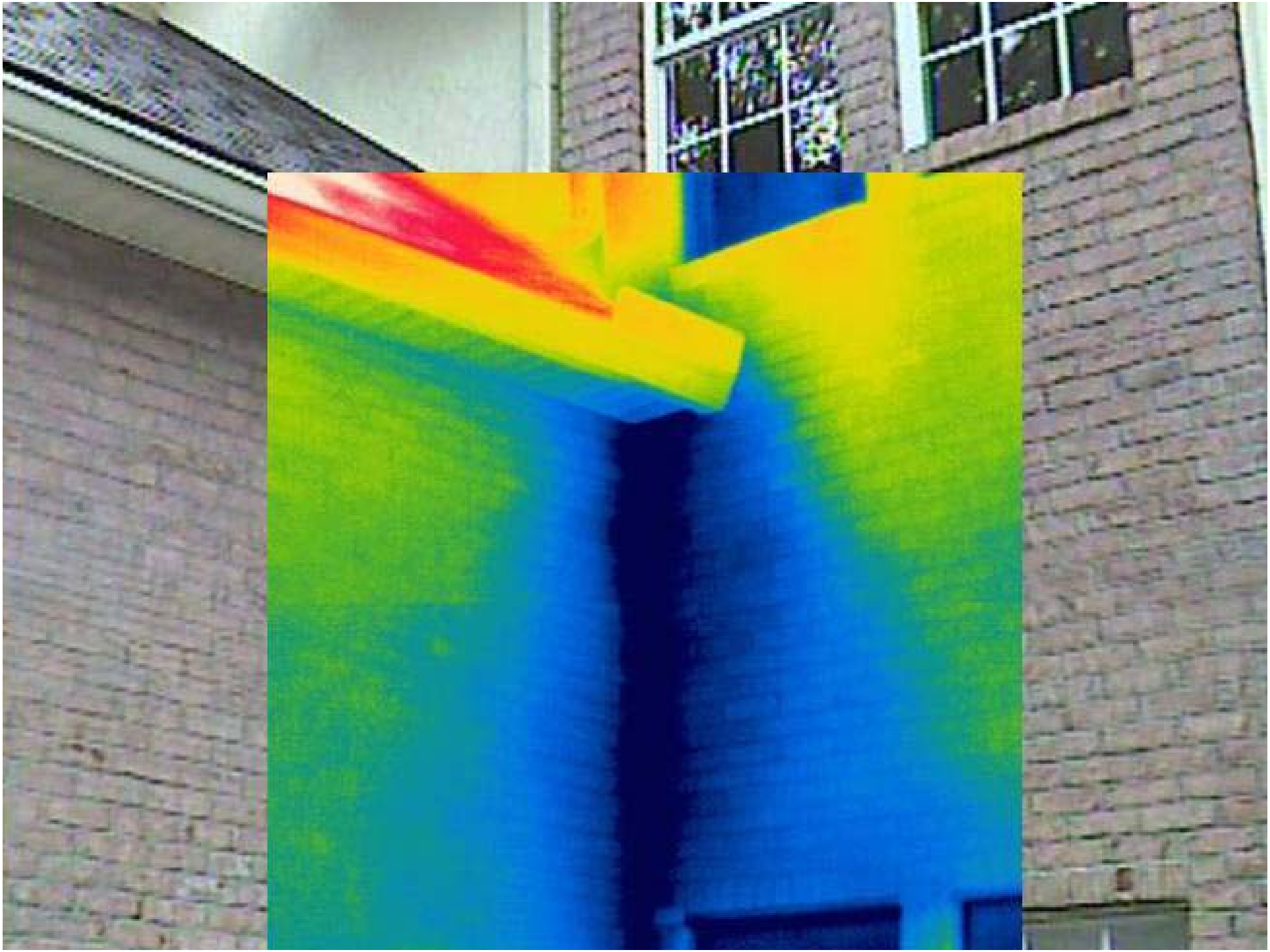
Testing tells the story

WATER MANAGED CONSTRUCTION CHECKLIST:

WATER MANAGED ROOFS



BITUMINOUS MEMBRANE AT VALLEYS

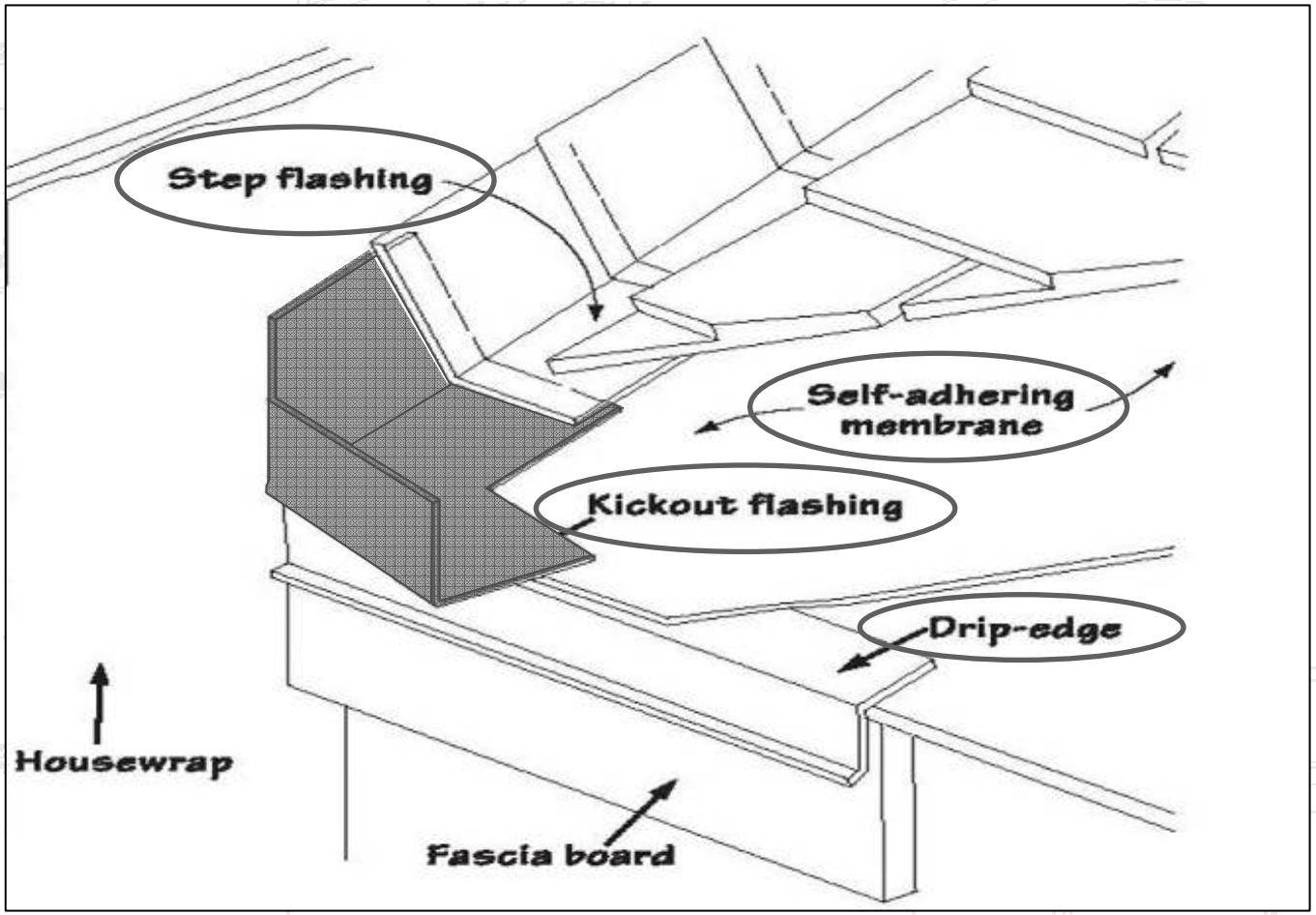


WATER MANAGED CONSTRUCTION CHECKLIST:

WATER MANAGED ROOFS

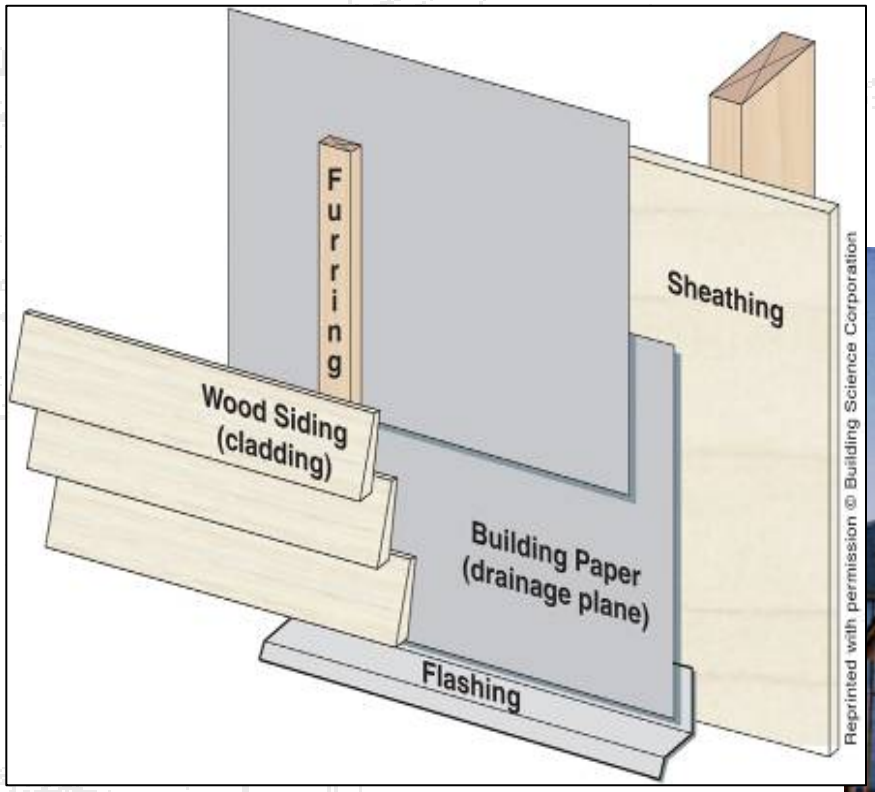
ENERGY STAR

MORE ROOF FLASHING DETAILS



WATER MANAGED CONSTRUCTION CHECKLIST:

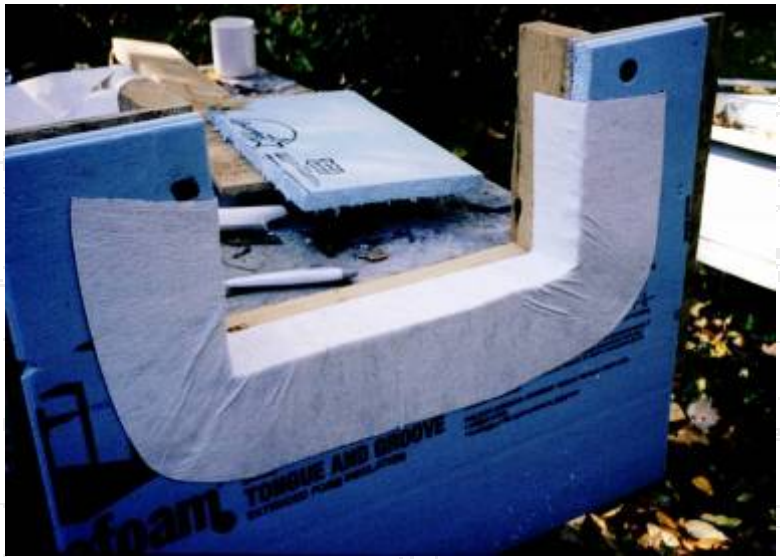
WATER MANAGED WALLS



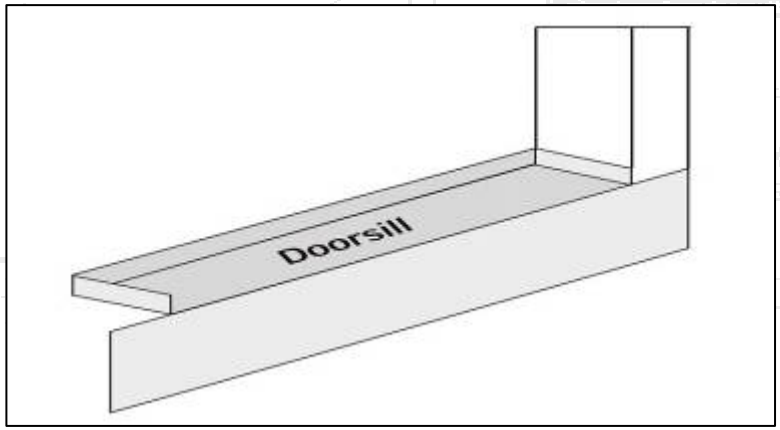
DRAINAGE PLANE DESIGN

WATER MANAGED CONSTRUCTION CHECKLIST:

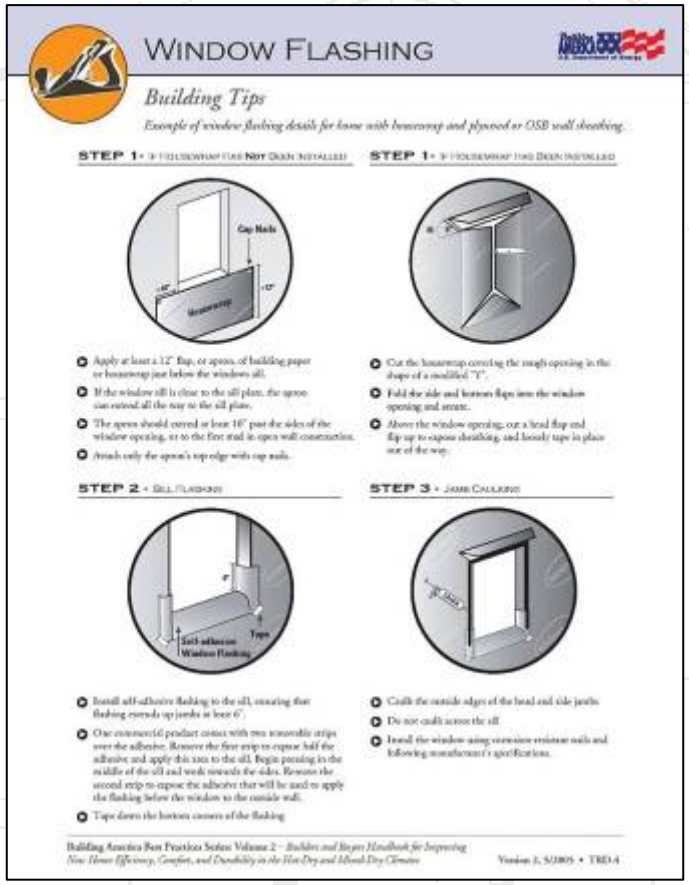
WATER MANAGED WALLS



WINDOW/DOOR PAN FLASHING



BEST PRACTICE INSTALLATION



WINDOW FLASHING

Building Tips

Example of window flashing details for home with housewrap and plywood or OSB wall sheathing.

STEP 1 • If Housewrap Has Not Been Installed

- Apply at least a 12" flap, or apron, of building paper or housewrap just below the windows sill.
- If the window sill is close to the sill plate, the apron can extend all the way to the sill plate.
- The apron should extend at least 10" past the sides of the window opening, so to the first stud in open wall construction.
- Attach only the apron's top edge with cap nails.

STEP 1 • If Housewrap Has Been Installed

- Cut the housewrap covering the rough opening in the shape of a modified "T".
- Fold the side and bottom flaps into the window opening and secure.
- Above the window opening, cut a head flap and flip up to expose sheathing, and loosely tape in place out of the way.

STEP 2 • Sill Flashing

- Install self-adhesive flashing to the sill, ensuring that flashing extends up jambs at least 6".
- One commercial product comes with two removable strips over the adhesive. Remove the first strip to expose half the adhesive and apply this side to the sill. Begin pressing in the middle of the sill and work towards the sides. Remove the second strip to expose the adhesive that will be used to apply the flashing below the window to the outside wall.
- Tape down the bottom corners of the flashing.

STEP 3 • Jamb Caulking

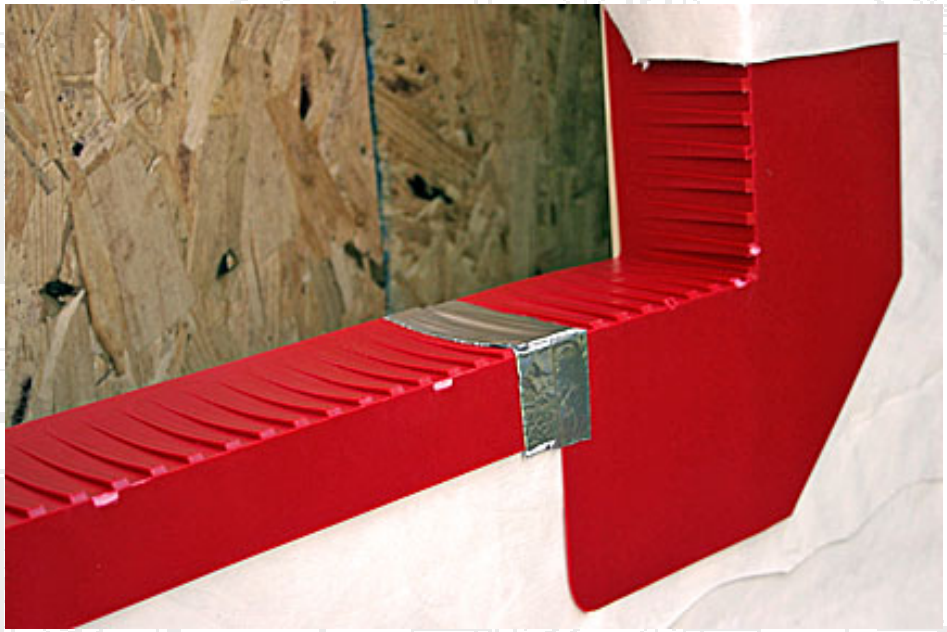
- Caulk the outside edges of the head and side jambs.
- Do not caulk across the sill.
- Install the window using corrosion resistant nails and following manufacturer's specifications.

Building America Best Practices Series Volume 2 – *Builders and Buyers Handbook for Improving New Home Efficiency, Comfort, and Durability in the Hot-Dry and Mixed-Dry Climates*

Version 2, 5/2005 • TRD-4

WATER MANAGED CONSTRUCTION CHECKLIST:

WATER MANAGED WALLS

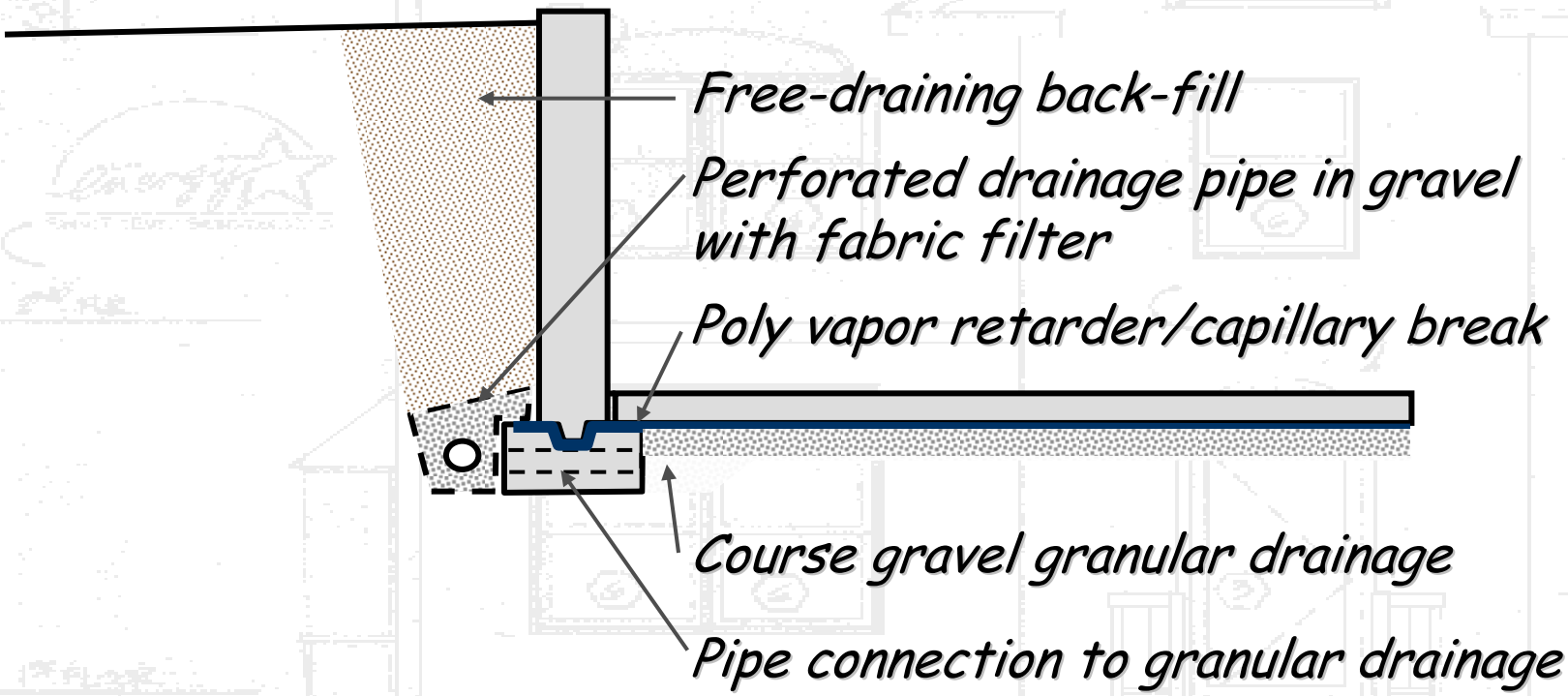


WINDOW/DOOR PAN FLASHING

WATER MANAGED CONSTRUCTION CHECKLIST:

WATER MANAGED FOUNDATIONS

FOUNDATION DRAINAGE SYSTEM
WITH CAPILLARY BREAKS



The Road Ahead

THE NUMBERS...

- 11+ million
- 1+ million
- 12+ million (1/5)

A UNIQUE TIME FOR 'BIG' CHANGE

"The automotive companies' being in a crisis [means]

now's the time for a disruptive technology…

The automotive industry has now

moved beyond trying to protect old technology…"

Alex Molinaroli, President of Power Solutions at Johnson Controls

RETOOLING HOW WE BUILD HOMES

ENERGY STAR

Net-Zero Ready Homes

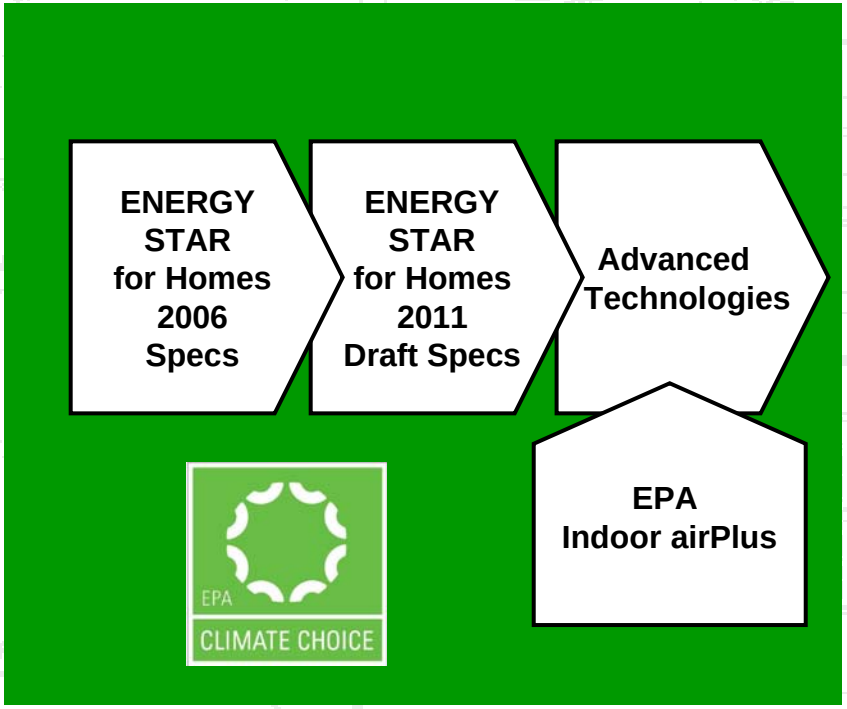
~30% - 50% Less

- Square Feet with 100% Function
- Cooling/Heating Loads
- Framing
- Ducts
- Plumbing
- HVAC Equipment Size
- Waste
- Construction Time

~70% Less Call-Backs

THE ROAD AHEAD:

PATH TO NO/LOW CARBON



THE ROAD AHEAD:

CLIMATE CHOICE ADVANCED TECHS.

ENERGY STAR

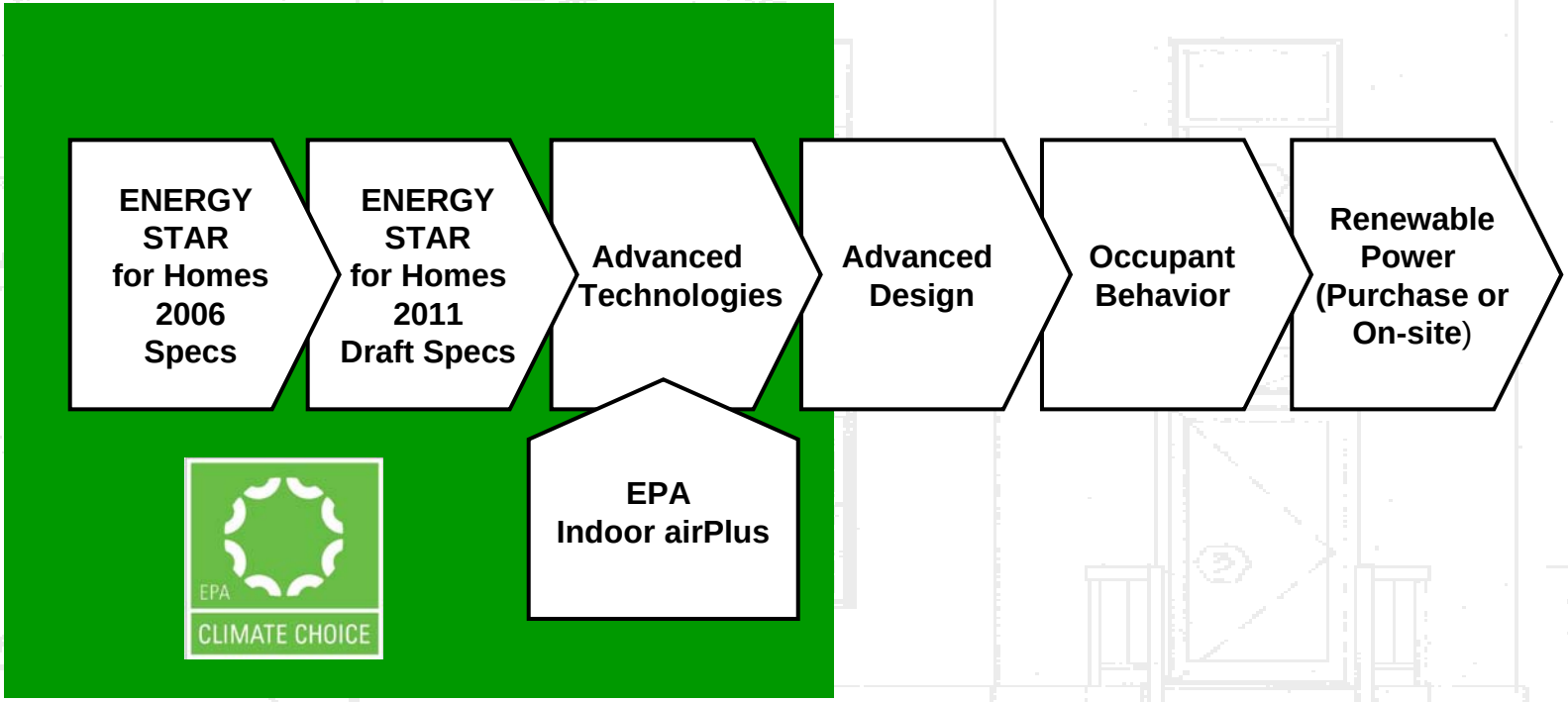
Base: ENERGY STAR 2011 + Indoor airPlus

Advanced Technologies:

- Super Air-Tight Construction
- Super Insulation
- Super Windows
- Super-Efficient Equipment
- Ducts Inside Conditioned Space
- ENERGY STAR Water Heating

THE ROAD AHEAD:

PATH TO NO/LOW CARBON



THE ROAD AHEAD:

WHY CLIMATE CHOICE?

- *Capture Moment in Time*
- *"Farm System"*

THE ROAD AHEAD:

NICHE OR MAINSTREAM?

RETOOLING HOW WE RETROFIT HOMES

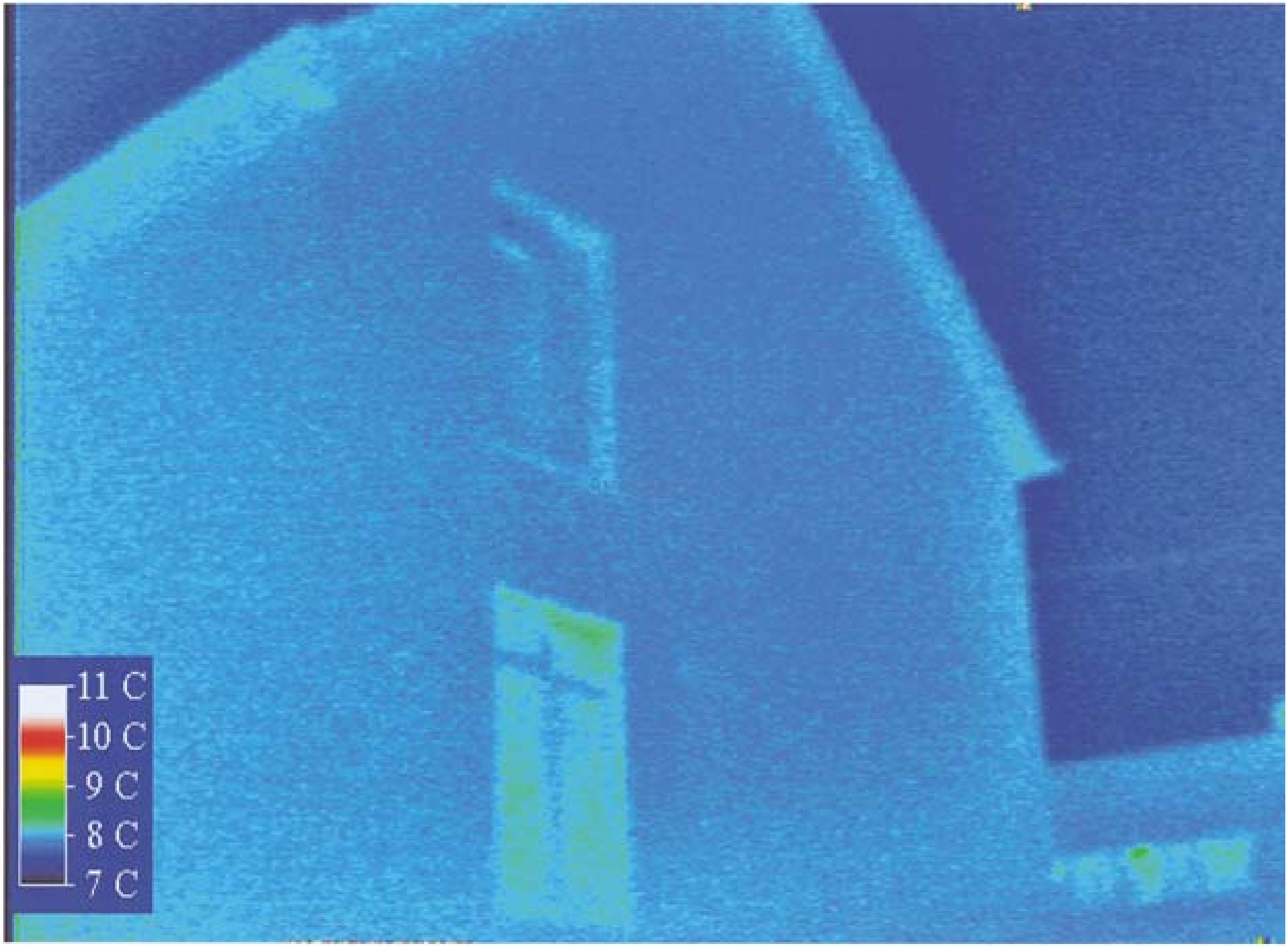
ENERGY STAR

Extreme Home Energy Makeovers Coming?

- *Rigid Insulation Cladding*
- *Advanced Air Sealing*
- *Advanced Duct Sealing*
- *Super Windows*
- *Super Attic Insulation*
- *Super Efficient, Right-Sized HVAC*

~30-50% > Code

02/15/93 INFRAMETRICS 760 BB 20:41:59
+ 2.5°C IMAGE MODE BAT=11.4VOLTS +12.5°C


11 C
10 C
9 C
8 C
7 C

CURING HOMES WITH ENERGY STAR

House as a 'System'

Existing Homes

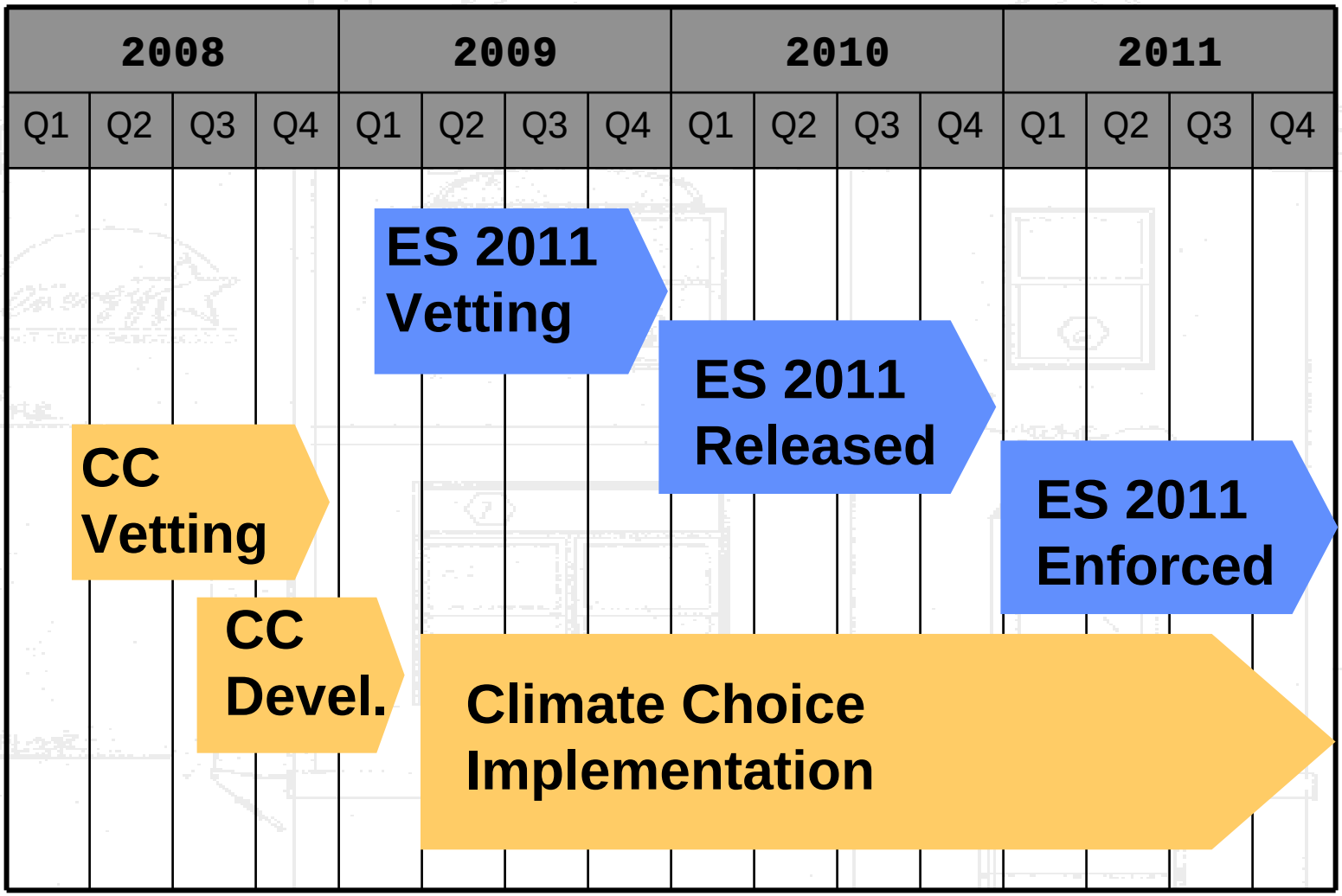
- *Home Performance with* ENERGY STAR
- *Seal and Insulate with* ENERGY STAR
- ENERGY STAR *HVAC Quality Installation*
- ENERGY STAR *Home Advisor*
- ENERGY STAR *Home Energy Yardstick*
- ENERGY STAR *Qualified Products*

New Homes

- EPA CLIMATE CHOICE *Qualified Home*
- ENERGY STAR *Qualified Home*
- ENERGY STAR *Qualified Products*

THE ROAD AHEAD:

TIMELINE



HOW TO GET MORE INFORMATION

On the Web at:

http://www.energystar.gov/homes