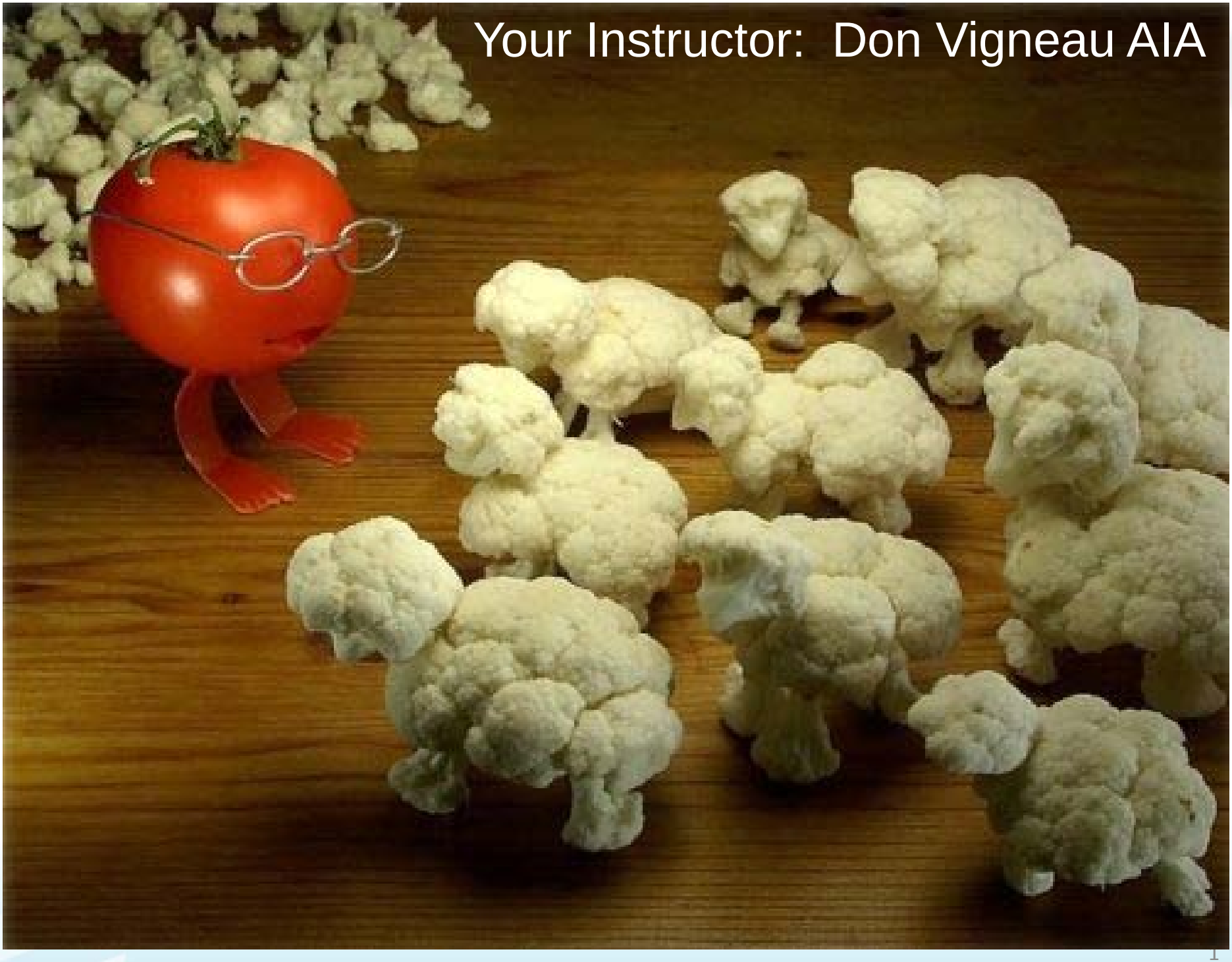
NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS

ENERGY CODE BASICS

PLAN REVIEWS AND FIELD INSPECTIONS

Donald J. Vigneau AIA

Northeast Energy Efficiency Partnerships


Your Instructor: Don Vigneau AIA

NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS

"Facilitating Partnerships to advance the efficient use of energy"

MISSION

Promote the efficient use of energy in homes, buildings and industry in the Northeast U.S.

ORGANIZATION

Regional nonprofit since 1996

PRIMARY AUDIENCES

- State policy makers
- Efficiency program administrators

APPROACH

Overcome barriers to efficiency through ***strategic regional collaboration*** of public policies and programs

WHAT DOES NEEP DO?

FACILITATE PARTNERSHIPS...

REGIONAL INITIATIVES

- High Efficiency Retail Products
- High Efficiency Home Performance
- High Efficiency Commercial Buildings and Technologies
- Workforce Development

PUBLIC POLICY

- Policy Outreach
- Building Energy Codes
- High Performance School and Public Buildings
- Appliance Efficiency Standards

EM&V FORUM

- Protocol Development
- Research and Evaluation
- Education and Information Access

NEEP SUMMIT

- Conference
- Workshop
- Business Leadership
- Exhibition

TO ADVANCE THE EFFICIENT USE OF ENERGY EFFICIENCY

WHERE IS ENERGY HEADING?

- **Zero Net Energy Buildings (ZNEB)**
  - **Energy Input = Energy Output**

    (what's produced on site equals what's used)

THE TIMETABLE (DOE)

2010	**2015**	**2030**
30%	50%	3% per year ➔ ➔ ➔ 0%

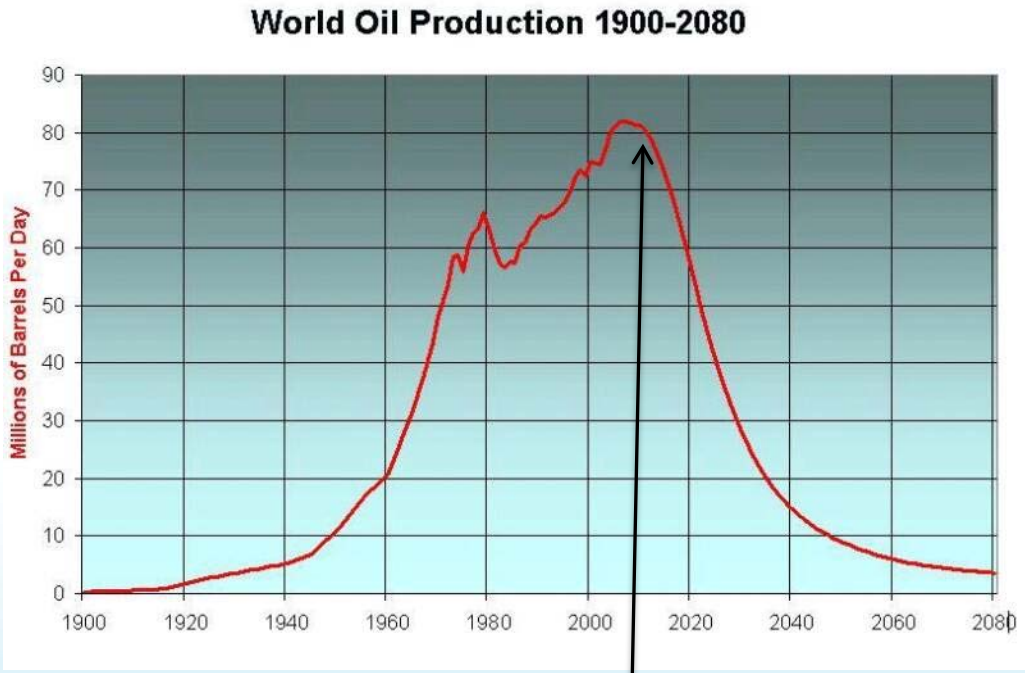
WHAT'S IN IT FOR US

SAVING OUR ECONOMY FROM UNSUSTAINABLE VOLATILITY

Energy Security

- 1970 – last year U.S. exports oil
- 1973 – 1st oil embargo
- 1978 – 2nd oil embargo

- www.peakoil.org



A FIRM SET OF PRIORITIES

- CONSERVATION (NEGA-WATTS) – Use less energy
  - Prioritize space utilization: THINK SMALL
  - Re-use energy; recycle waste
- EFFICIENCY – Use most efficient equipment that does the job
  - Research your choices
  - Use the right tools: ACCA S/J/D/T, ASHRAE 183-07
  - TEST; COMMISSION to verify results
- THEN ADD RENEWABLES – More cost-effective here
- SUSTAINABILITY: not a separate priority;
  permeates each and every one of the issues above
- VERIFICATION: not a separate priority;
  needs to be a normal procedure that measures actual performance of systems

ENERGY SAVINGS STRATEGIES

ELIMINATE

- Unintended air leaks
- Voids, chases, chimneys
- Thermal bridging
- Attic ovens
- HVAC/SHW systems outside the envelope

REDUCE

- Uncontrolled Solar Gains
- Non-required Glazing*

INNOVATE

Control Layer Functions:

- Water Barriers
- Moisture Retarders
- Air Barriers
- Thermal Barriers

PLAN REVIEWS
BASIC REQUIREMENTS

USING ADMINISTRATIVE PROVISIONS TO OBTAIN NECESSARY INFORMATION

…IT'S IN THE CODE

IECC 103.2 Information.

Details shall include:

- Insulation materials/R-values
- Fenestration U-factors/SHGC's
- System & equipment efficiencies,
- Types, sizes & controls
- Duct sealing, insulation & locations
- Air sealing details

BASIC CODE REQUIREMENTS

OTHER INFORMATION (meet mandatory requirements)

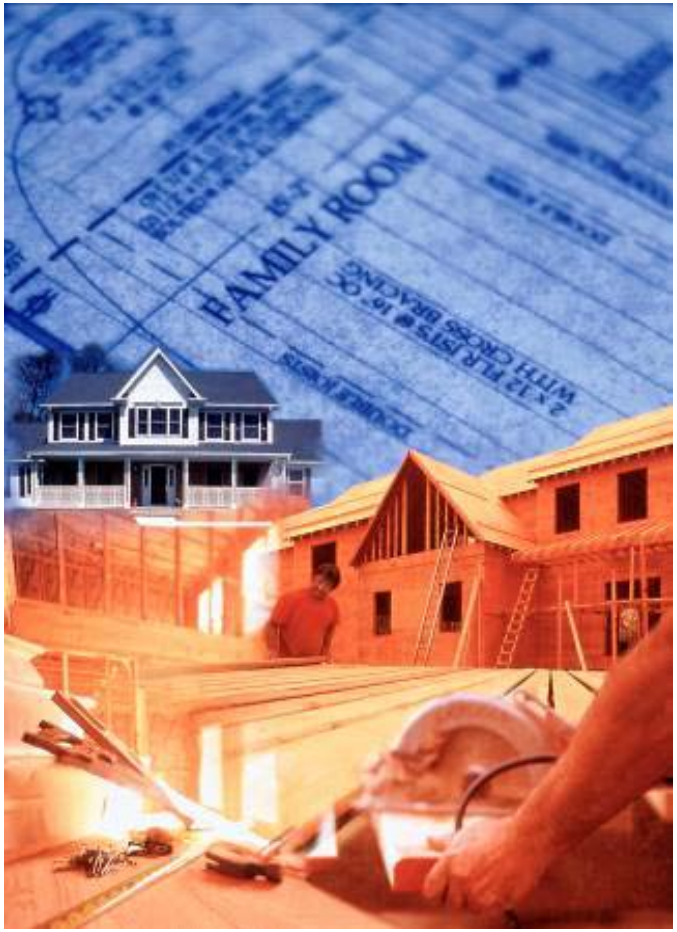
- REScheck Compliance Report
- Energy Star Application w/information

SPECIAL REPORTS

- 3rd Party Inspectors
- Testing

COMPLIANCE DOCUMENTATION & REPORTS – SECTION 104.2

- Code Official has final acceptance authority
  - Software, worksheets
  - Above Code Programs
- Electronic media can be used
- Construction work for which a permit is required is subject to inspection
- A certificate is required to be posted*



BASIC CODE REQUIREMENTS

GENERAL REQUIREMENTS – IECC 303

- Insulation Materials: Default R-Values/U-Factors
- Window & Door Default U-Factors (SHGC & VT)

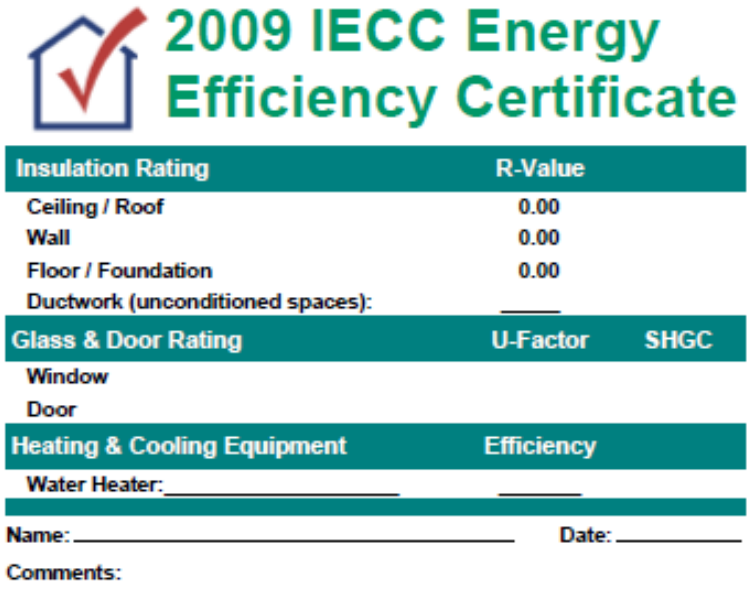
CHAPTER 4

- Average Area-weighted U-Factors (maybe)
- HVAC & SHW Design information: sizing; equipment types
- Duct sealing/insulation

...IT'S IN THE CODE

401.3 CERTIFICATE

- PREDOMINANT R-VALUES
- U-FACTORS
- DUCT INSULATION
- HVAC & SHW EFFICIENCIES
- UNVENTED APPLIANCES



2009 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Ceiling / Roof	0.00
Wall	0.00
Floor / Foundation	0.00
Ductwork (unconditioned spaces):	_____

Glass & Door Rating	U-Factor	SHGC
Window		
Door		

Heating & Cooling Equipment	Efficiency
Water Heater:_____	_____

Name:_____ Date:_____

Comments:

402.3.5 SUNROOM EXCEPTIONS

Less stringent insulation, R-value and glazing U-factor requirements – not changed in Chapter 5

Sunroom definition:

- Glazing area **>40%** glazing of combined gross exterior wall and roof area
- Separate heating or cooling system or zone (or none?)
- Must be thermally isolated (closeable doors or windows to the rest of the house)

Vigneau Residence
Mansfield Center CT

USING LESS:
CONTROLLING THE ENVELOPE

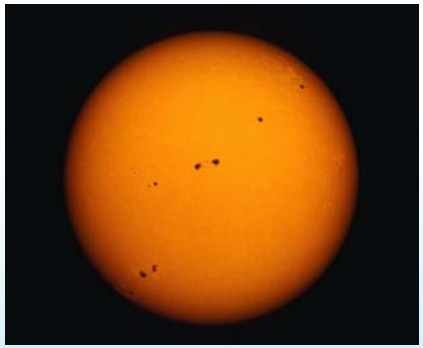
ENVELOPE: KEY CONTROL LAYERS

- WATER

- AIR

- WATER VAPOR

- THERMAL



www.buildingscience.com

CONTROLLING GAINS, LOSSES

HEAT GAIN

- Solar Heat Gain
- Shading / PF
- Attic ventilation

AIR MOVEMENT

- Make-Up Air Dampers
- Reduced Leakage

EXHAUSTS

- Baths
- Kitchens
- Laundry

MAKEUP AIR

- Combustion Eqp't.
- Fireplaces
- Central Vac

THE PERFECT WALL

HOW IT WORKS

- Uses thermal breaks
- Controls temperature
- Controls humidity
- Controls air - Relies on ventilation systems

THE SANDWICH

- Outside Cladding
  - Imperfect Weather Barrier
- Control Layers
  - Rain*
  - Air
  - Vapor*
  - Thermal
- Structure – Why here?
- Interior Finish

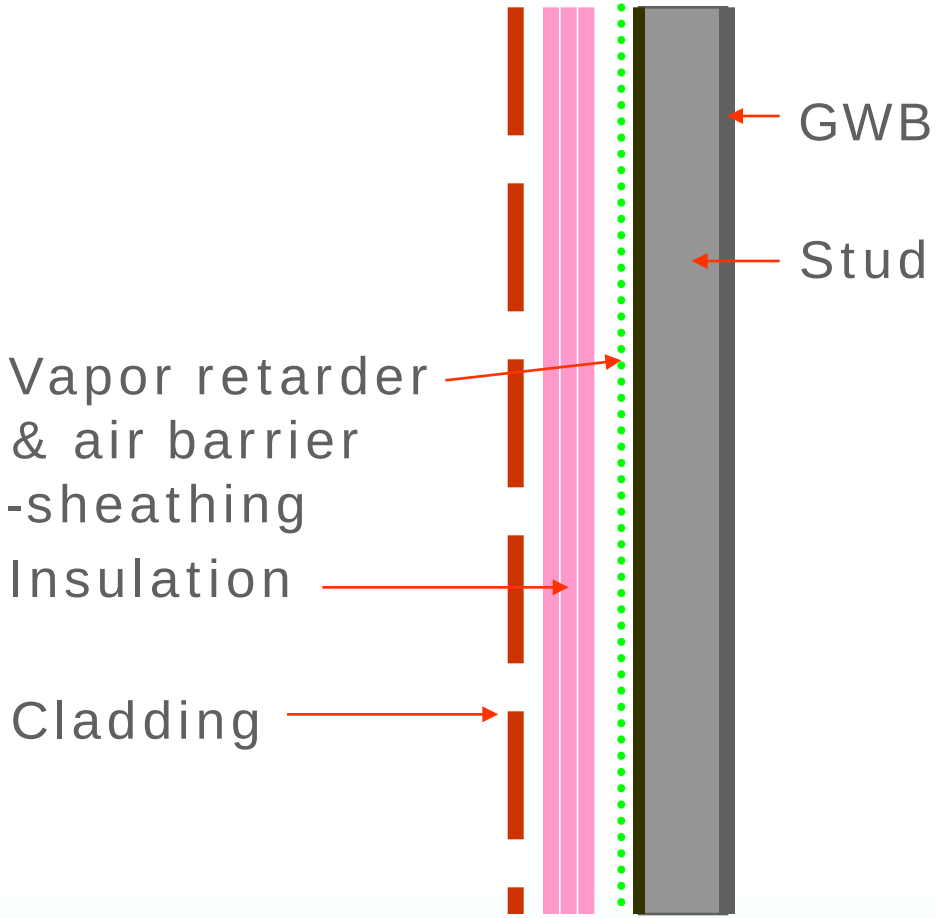
WHAT DOES IT LOOK LIKE?

"OUT-SULATION"

- Insulates the structure
- Provides/protects:
  - Drainage plane
  - Air barrier
  - Vapor retarder

The Perfect Wall functions

- **as the Perfect Roof (over the structure)**
- **as the Perfect Floor (under the slab)**



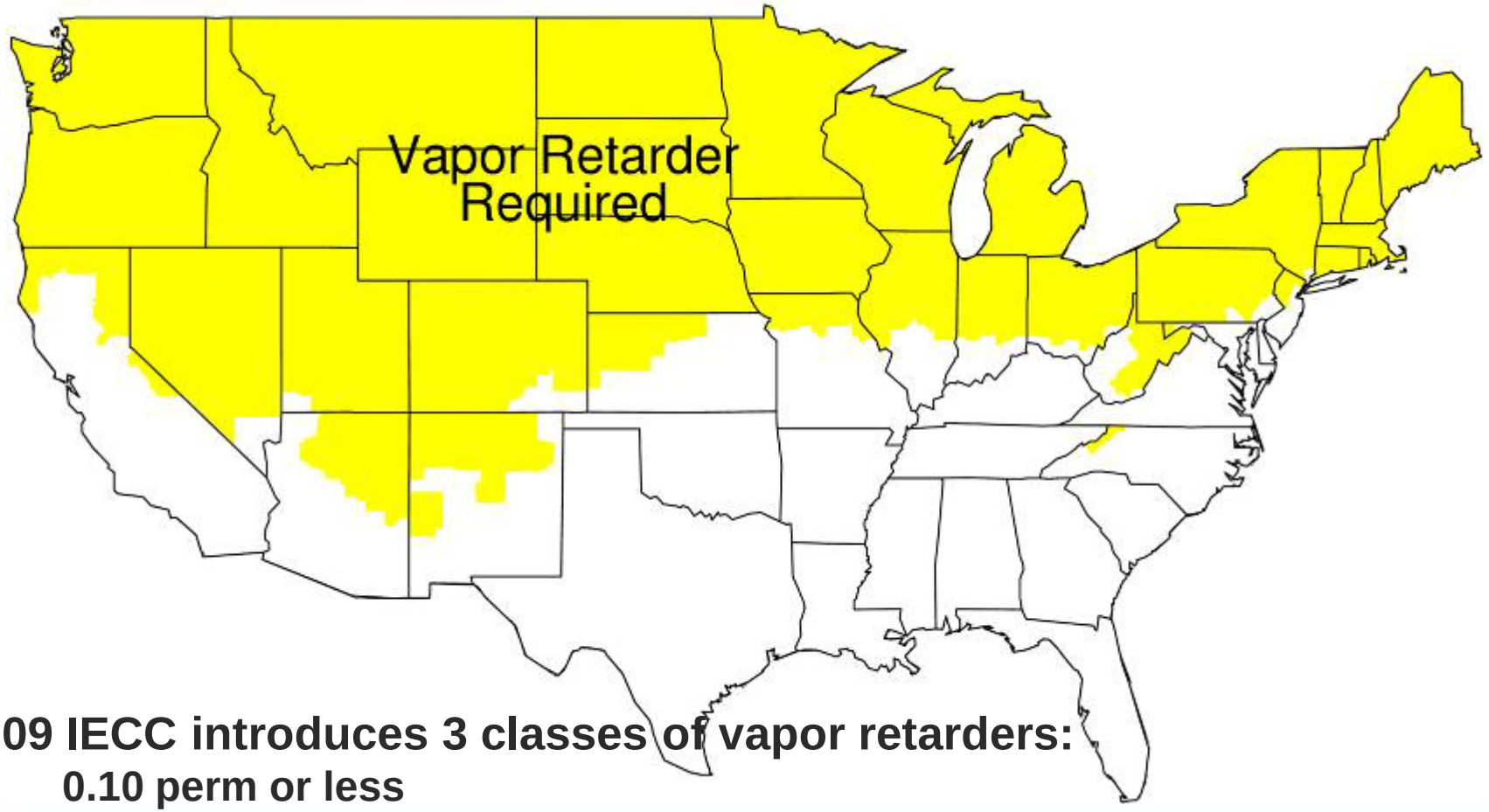
LEARNING HOW TO BUILD IT

IRC SECTION R601.3 - VAPOR RETARDER

New vapor retarder requirements allow the use of a coat of vinyl paint to satisfy the requirement when:

- An impermeable insulating sheathing with a value of **R-5** is located outside of a 2x4 stud wall with **cavities insulated to R-3.4 per inch** minimum in Zone 5;
- An impermeable insulating sheathing with a value of **R-7.5** is located outside of a 2x6 stud wall with **cavities insulated to R-3.4 per inch** minimum in Zone 5;

CONTROLLING VAPOR



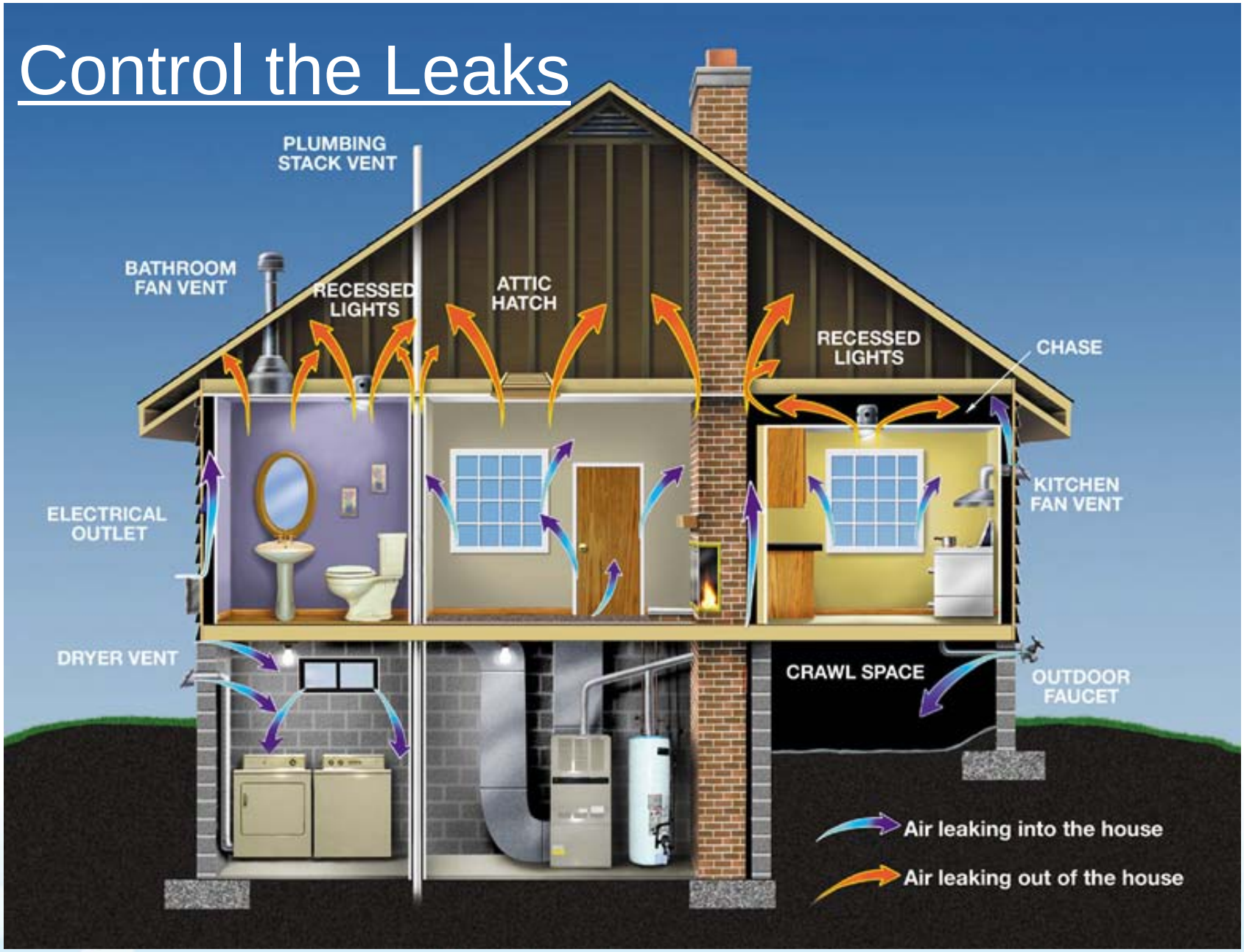
2009 IECC introduces 3 classes of vapor retarders:

I. 0.10 perm or less
II. 0.10 – 1.00 perm
III. 1.00 – 10.0 perm

MOISTURE DIFFUSION IN MATERIALS

MATERIAL	PERM RATING	VAPOR RETARDER(?)
½" GWB	38 -42	NO
TYVEK	52	NO
Latex Primer	7.0 – 10.0	NO
7/16" OSB (w/exterior glue)*	0.77* – 3.48	SOMETIMES
1" XPS	0.40 – 1.60	SOMETIMES
7/16" Plywood (exterior glue)	0.70	YES
Kraft Paper Facing	1.0	YES
2 mil polyethylene	0.06 – 0.22	YES
Alkyd-base or V/R paint	< 0.05	YES
1 mil aluminum foil laminate	< 0.05	YES
½" GWB + VWC	0.05 – 0.80	YES

HOW TO CONTROL VAPOR (MOISTURE)



POP QUIZ:

IS WATER VAPOR...

LIGHTER THAN AIR?

HEAVIER THAN AIR?

THE SAME?

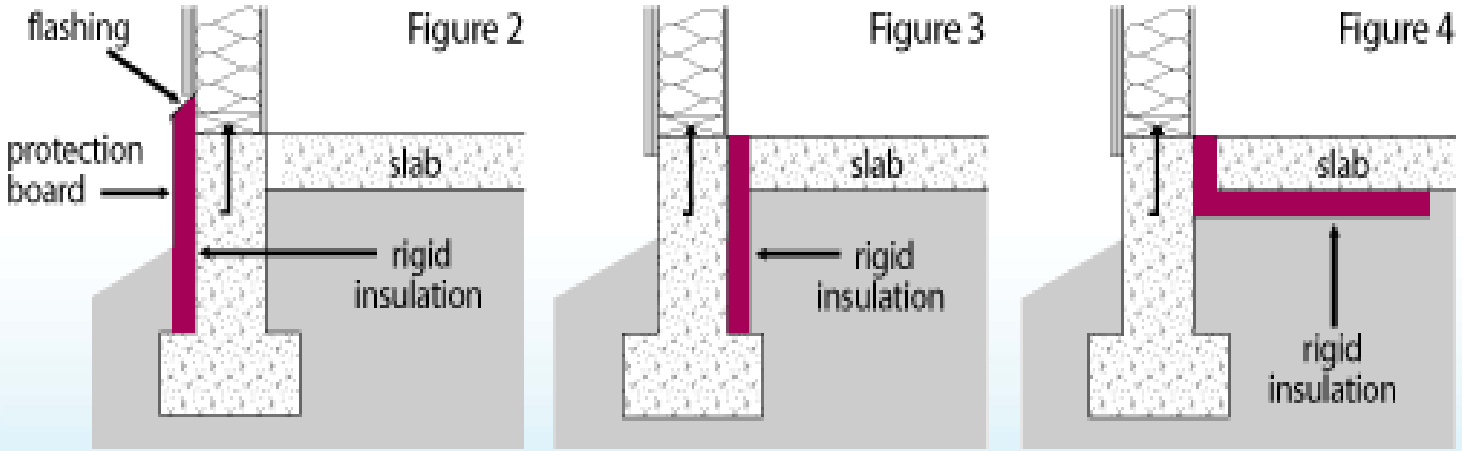
Does it matter?

(TONIC)

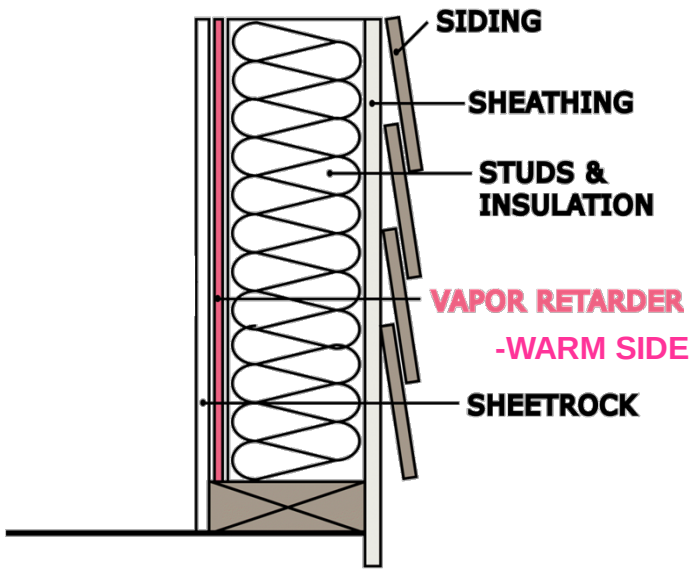
…ANY QUESTIONS?

402.2.7 SLAB EDGE INSULATION

- R-10 (typically 2 inches) insulation in Zones 4 and above; *Note 'd' requires 5" more for heated slabs*
- Downward from top of slab a minimum of 24" (Zones 4 and 5) or 48" (Zones 6, 7, and 8)
- Insulation can be vertical or extend horizontally under the slab or out from the building (must be under 10 inches of soil)



INSULATION – VAPOR RETARDER

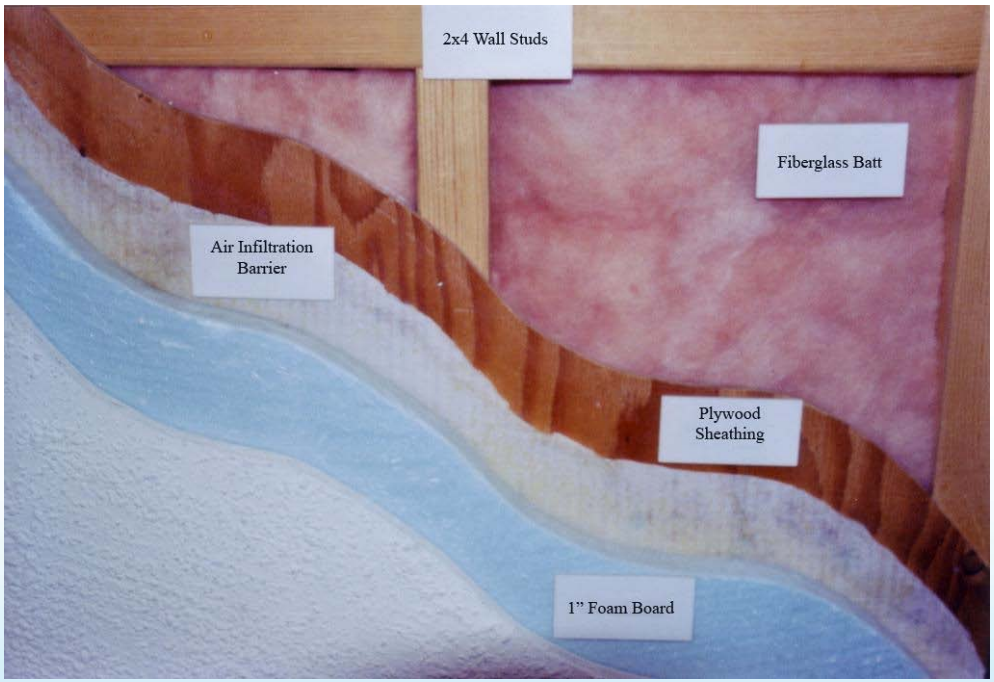


BEST PRACTICES

- Use R-601.3/Tbl.601.3.
  - R 5 on 2x4; R 7.5 on 2x6
- Midpoint air/VR barrier

CONVENTIONAL

- Full cavity R-20; face stapled
- Fitted at boxes
- Class 1 V/R warm side
- Air barrier at exterior



1998 AIRTIGHT STUDY

SINGLE FAMILY - ACH

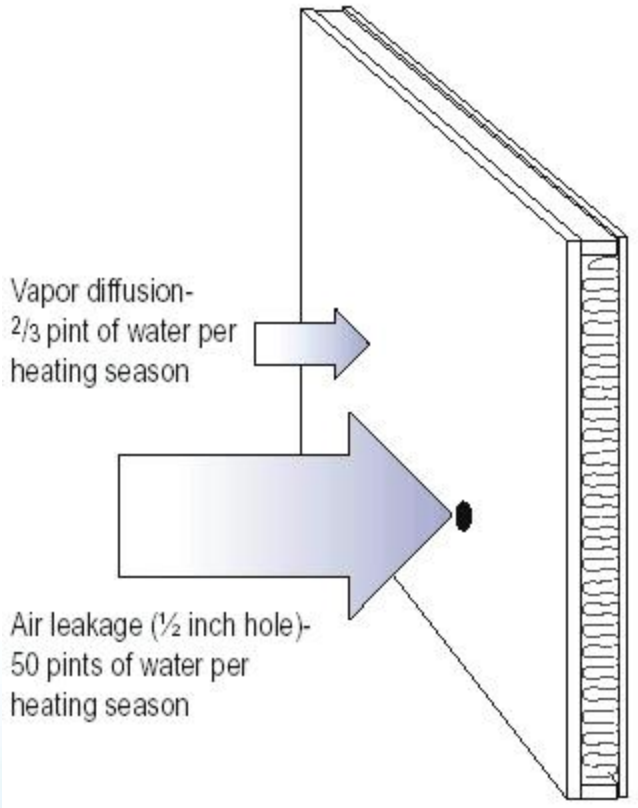
- Mean Age: 20-30yr

- Tight: 0.19-0.24
- Good: 0.48-0.59
- Typical: 0.96-1.18
- Leaky: 1.93-2.35

- Canada: 0.11+
- ASHRAE 62 min 0.35

MOISTURE MIGRATION PRIORITIES

Significantly more water vapor travels through a wall by air leakage than by diffusion



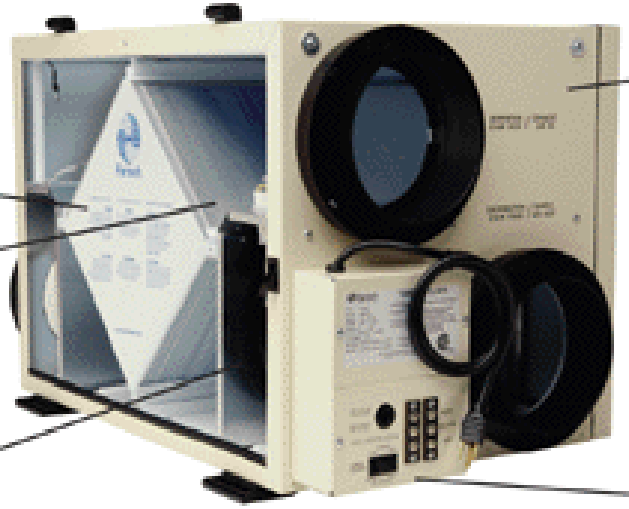
HOW TO DO IT?

CONTROLLING VENTILATION

Core: Heat Recovery Units feature a lifetime warranty on the aluminum core.

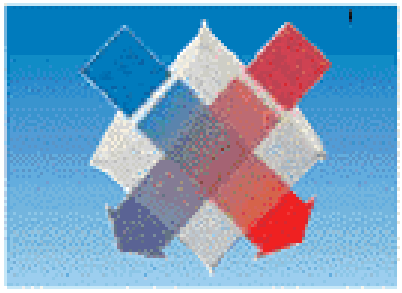
Washable Electrostatic Filters

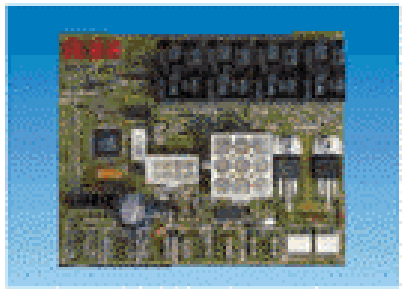
Superior EBM Motors: Units are designed with German manufactured EBM external rotor motorized impellers – the most durable motors in the industry. Precise balancing ensures vibration-free operation. No maintenance needed. 7 Year Limited Warranty.

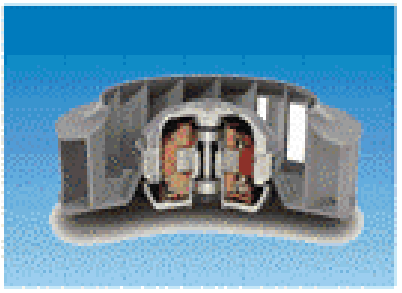


Fully Insulated Cabinet: Baked powder-coat finish. Insulated with 1" (25mm) foil-faced, high density polystyrene foam. For quiet, trouble-free operation.

Electronic Control Board: Units feature state-of-the-art control boards for easy connection to existing HVAC equipment. All units are designed for easy operation from a series of optional remote controls.







Measuring Leaks - Blower Door Test

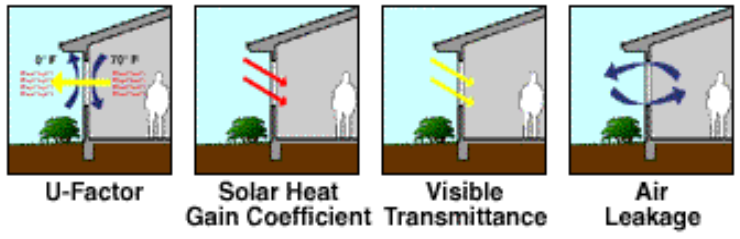
CFM x 60/CF of house. Air natural leakage (1/20 of test) should be expected between <0.70 (leaky) and >0.35 (tight).

CONTROLLING FENESTRATION

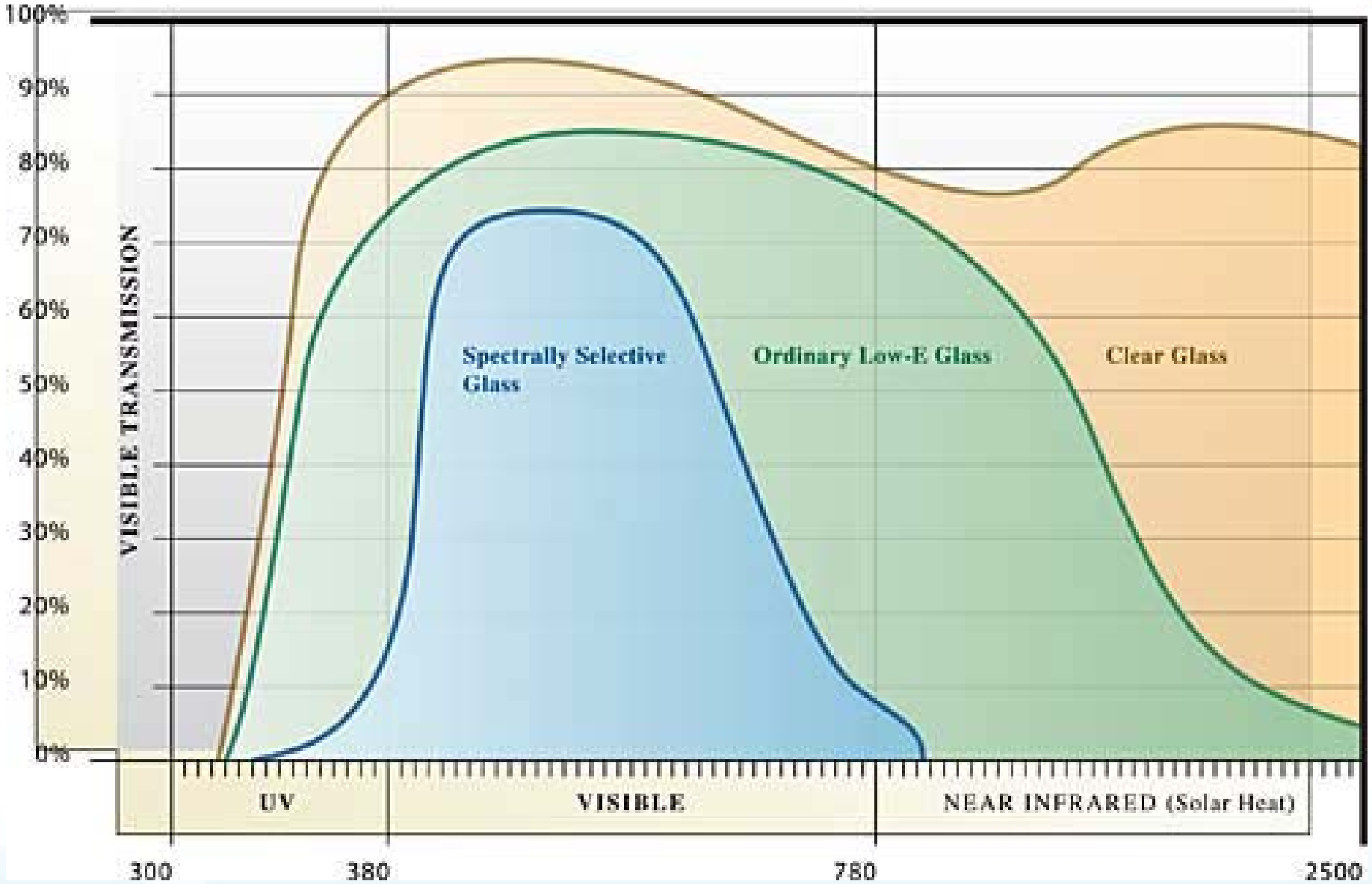
- **WINDOWS**
- **SKYLIGHTS**
- **DOORS**

FENESTRATION PERFORMANCE

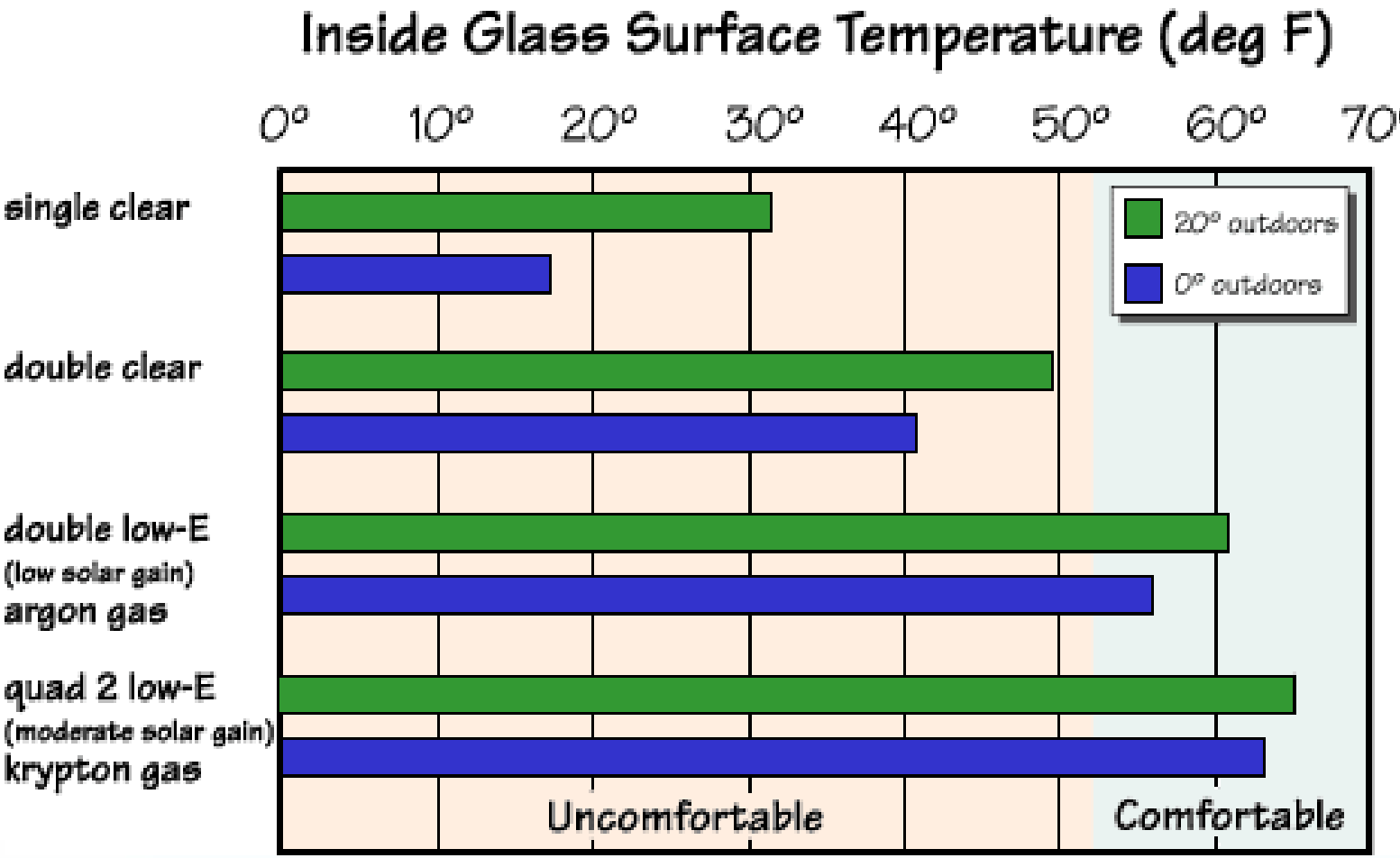
- NFRC Ratings
  - NFRC 100, *U*-factors
  - NFRC 200, SHGC
  - Windows, doors, skylights
- Default *U*-factors & SHGC's
- Manufactured fenestration
  - Standardized infiltration rates
  - AAMA/WDMA I.S.2, or
  - NFRC 400
- "Site-built" fenestration
  - Caulk, gasket or weather-strip for infiltration control



GLASS & TOTAL INCIDENT SOLAR ENERGY



RE-RADIATION: LOW – E



U=1.04

U=0.57

U=0.35

U=0.28

http://www.efficientwindows.org/selection.cfm

CORRELATION: Low E and SHGC

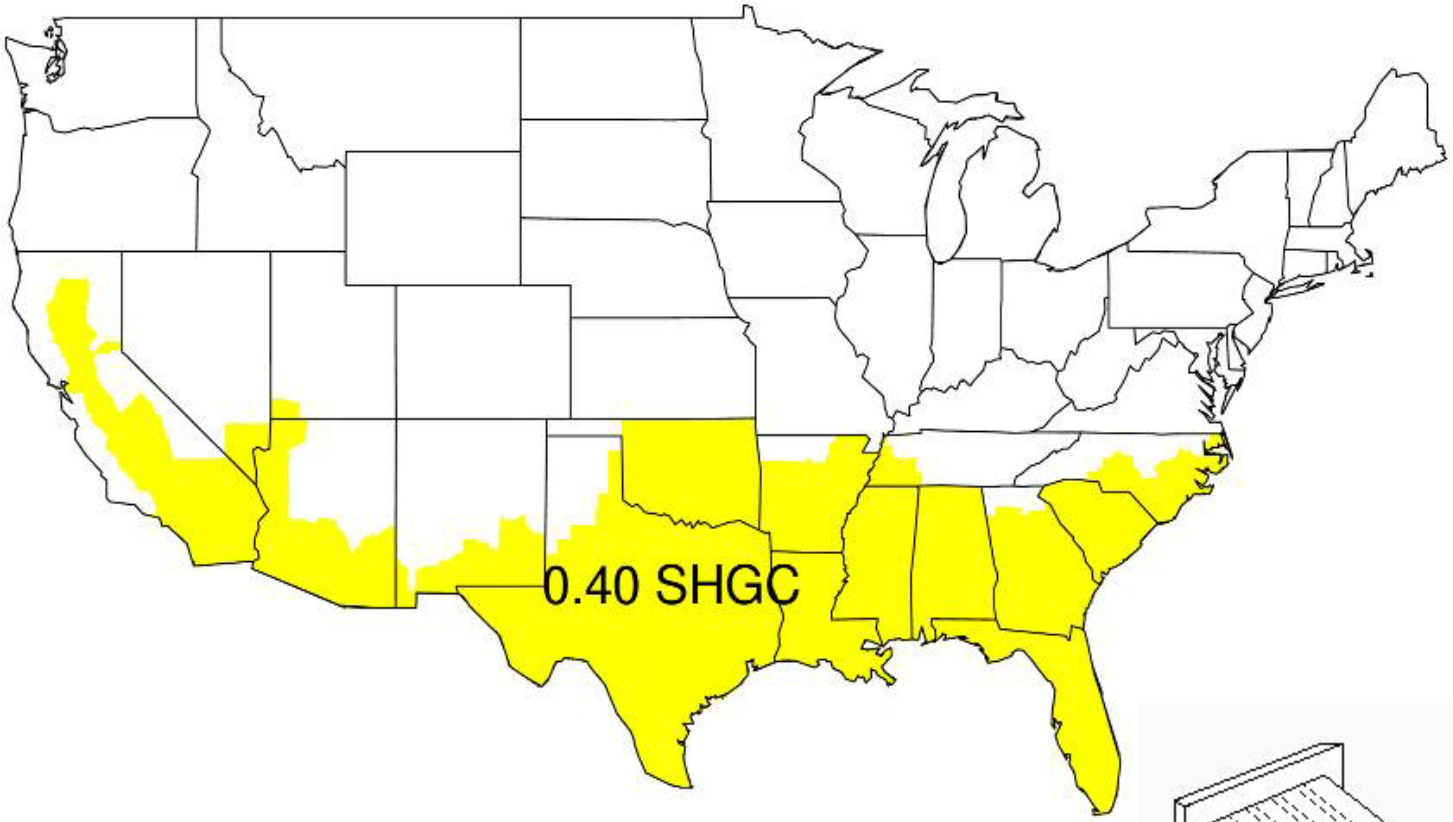
LOW 'E'

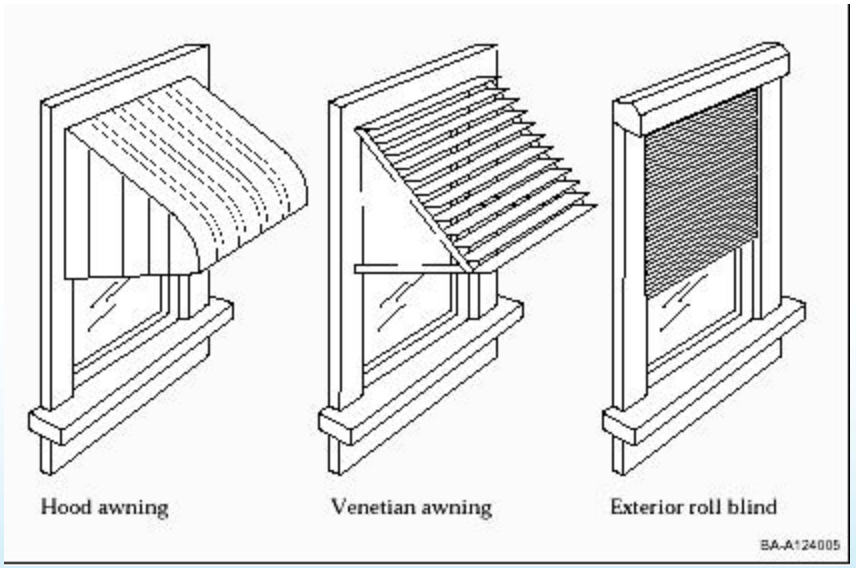
- VLT transparent
- Reflects primarily infrared
- Pyrolitic coating
- May be sputtered

SHGC

- Reduces VLT
- Reflects more energy
- Sputter coat 'silvered'
- May be film or tint

LOCATIONS WITH SHGC REQUIREMENTS





Thermal Bypass Checklists

VENTILATION

- Kitchens & bathrooms
- Limiting exhaust CFM*
- Clothes dryers vent outside
- Air inlet/exhaust locations
- Ventilation controls
- MERV filtration required*
- Limitations on fan noise*
- NO vent-less combustion*
- CO detector for fueled* appliances

Thermal Bypass Checklists

WATER MANAGEMENT

- Slope patios, walks, grades
- Slab capillary breaks
- Damp-proof foundation walls
- Gasket sump drain covers
- Cover foundation drains
- Flash base of exterior wall
- Drainage plane - outward
- Roof/window/door flashings
- Backer board tubs & showers

MECHANICAL & ELECTRICAL SYSTEMS

WHERE EFFICIENCY MATTERS

SELECT

HVAC EQUIPMENT

- Energy Star qualified
- Right – sized
  *(15-40%)
  (see 2012 EC-121)

Service Hot Water

MECHANICAL & CONTROL SYSTEMS

- "Right-sized"
  - Better than NAECA
  - ACCA: S/J/D/T
- Tested
  - Ductwork
  - Balancing
  - Proper charge
- Commissioned*
  - Post-occupancy (C.O.)

ACCA SYSTEM DESIGN PROCESS

AGGREGATED LOADS FOR INDIVIDUAL SPACES

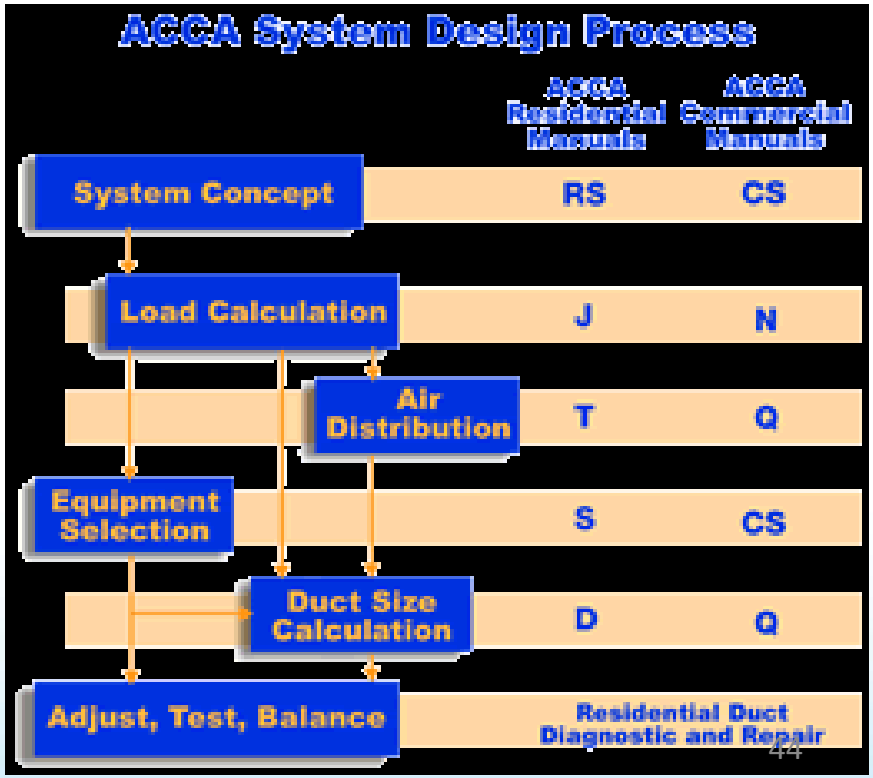
- Sensible: envelope, air leakage & exhaust, equipment, occupants & activities
- Latent: cooking, bathing, occupant, weather-related (A/C)

SYSTEM LOAD REQUIREMENTS

SELECTIONS OF EQUIPMENT

DELIVERY NETWORK SIZING

TESTING, LOAD BALANCING



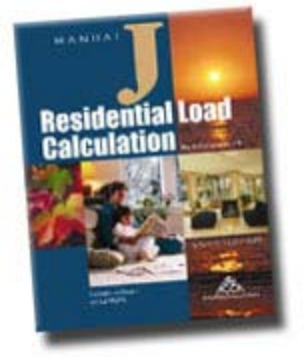
LOADS – ACCA MANUAL J8

DESIGN ISSUES

- Exposure, orientation
  - Latitude, altitude
- Large glazing areas
  - NFRC compatible
  - Glazing orientations
- Solariums
- Shading devices
- Internal loads

CONSTRUCTION ISSUES

- Gains/losses for many materials systems
- Roofing color, loads
- Duct loads
- Infiltration loads
- Internal loads



VENTILATION AND EQUIPMENT SIZING

- Ventilation
  - Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating
- Equipment Sizing
  - IECC references Section M1401.3 of the IRC
  - Load calculations determine the proper capacity (size) of equipment
    - Goal is big enough to ensure comfort but no bigger
  - Calculations shall be performed in accordance with ACCA Manual J or other approved methods

CHAPTER 5 - EQUIPMENT SIZING

UNIT	MAXIMUM OVERSIZING PERCENTAGE	MINIMUM EFFICIENCY AND TESTING PROCEDURE
Air Conditioners	15%	Table 503.2.3(1)
Multi-speed Air Source Heat pumps & GSHP	15%	Table 503.2.3(2)
Single-speed GSHP	25%	Tables 503.2.3(2) or (3)
All fuel-fired heating appliances	40%	Tables 503.2.3(4) or (5)

Thermal Bypass Checklists

EQUIPMENT

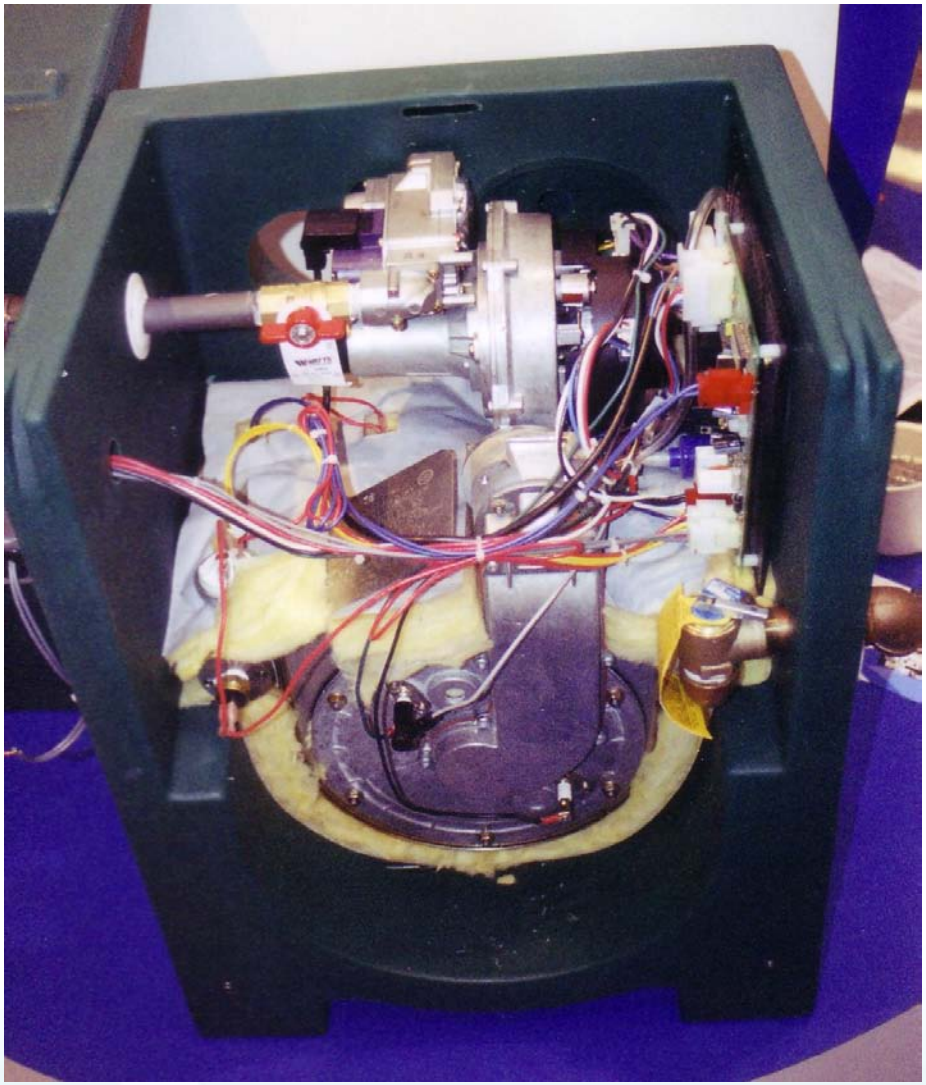
- Design, spec, document
- Ducts – ACCA "D"
- Duct Terminals – ACCA "T"
- Design Loads – ACCA "J"
- Equipment specs – ACCA "S"
- ARI condenser/evaporator
- Drain pan to plumbing trap
- **LIGHTING** (N1104)

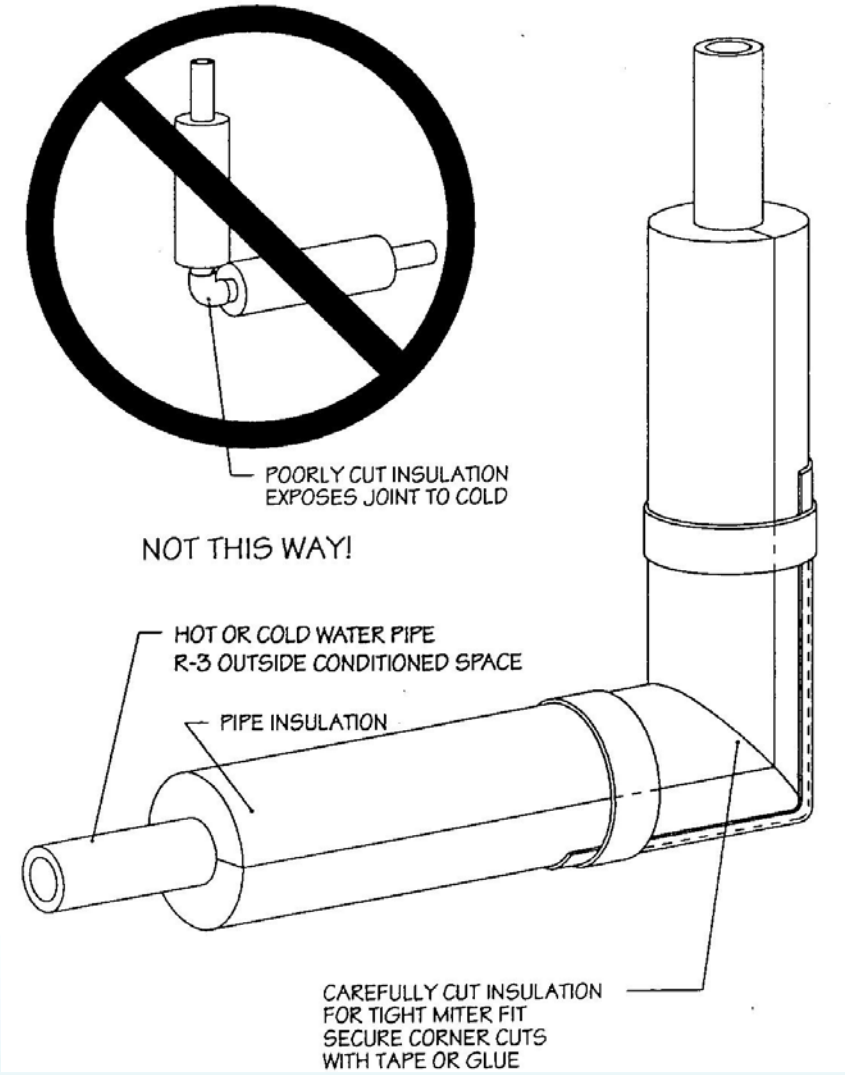
Thermal Bypass Checklists

FIELD VERIFY EQUIPMENT:

- Heat gains – latent/sensible
- Air flows/static pressures
- Fan motor – type, speed
- Refrigerant type/charge
- Refrigerant metering devices
- Return/supply air temps.
- Outdoor ambient temp.
- Line pressures/temps.

MECHANICAL & ELECTRICAL SYSTEMS





THINKING OUTSIDE THE BOX

SERVICE WATER EFFICIENCY

RE-THINKING WATER USAGE

DESIGN

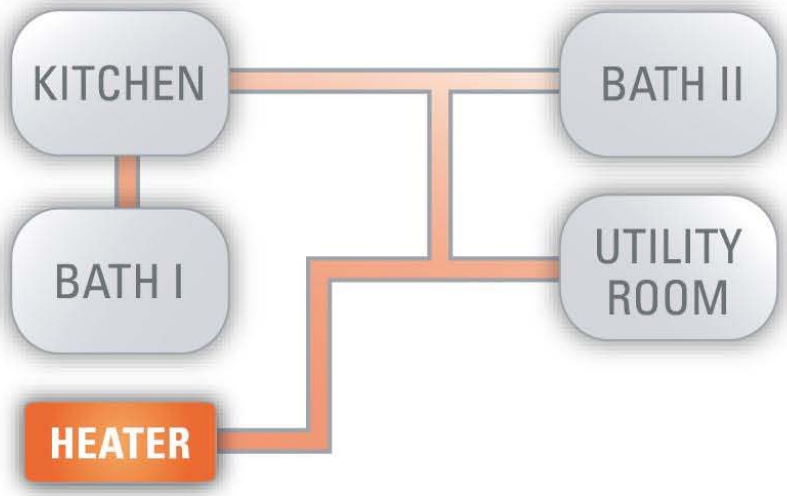
- Centralize Functions
- Compact Layout
- "Right Size" piping*
- Insulate HW lines

SYSTEM FEATURES

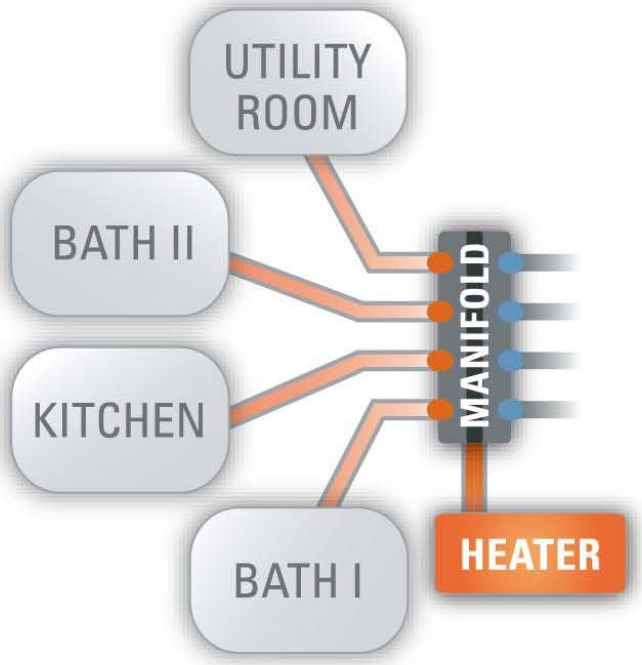
- Minimize MANIFOLDS
- Make more "TWIGS"
- Shut off CIRCULATORS
- Reduce SOURCE TEMPS*

SERVICE HOT WATER EFFICIENCY

Traditional Trunk System



More Efficient Manifold System ?



INSPECTIONS

What Are We Looking For?

When Should We
Be Looking For It?

….A RES*CHECK* REPORT

RES*check* Software Version 4.3.1

Inspection Checklist

Ceilings:

- ☐ Ceiling 1: Cathedral Ceiling (no attic), R-0 (uninsulated)
  Comments: Sloped ceilings in 2nd Floor bedrooms, bath & hall
- ☐ Ceiling 2: Flat Ceiling or Scissor Truss, R-0 (uninsulated)
  Comments: Flat ceiling portion, 2nd Floor
- ☐ Ceiling 3: Flat Ceiling or Scissor Truss, R-0 (uninsulated)
  Comments: Ceiling of 1st Floor
- ☐ Ceiling 4: Other, U-factor: 0.599
  Comments: Insulate under stairs to 2nd floor

Above-Grade Walls:

- ☐ Wall 1: Wood Frame, 24" o .c., R-0 (uninsulated)
  Comments: North Wall 1st Floor - FRONT
- ☐ Wall 2: Wood Frame, 24" o .c., R-0 (uninsulated)
  Comments: East Wall 1st Floor
- ☐ Wall 3: Wood Frame, 24" o .c., R-0 (uninsulated)
  Comments: East Wall 2nd Floor - lower
- ☐ Wall 4: Wood Frame, 24" o .c., R-0 (uninsulated)
  Comments: East Wall 2nd Floor - upper
- ☐ Wall 5: Wood Frame, 24" o .c., R-0 (uninsulated)
  Comments: South Wall 1st Floor - REAR
- ☐ Wall 6: Wood Frame, 24" o .c., R-0 (uninsulated)
  Comments: West Wall 1st Floor - lower
- ☐ Wall 7: Wood Frame, 24" o .c., R-0 (uninsulated)
  Comments: West Wall 2nd Floor -upper
- ☐ Wall 8: Wood Frame, 16" o.c., R-0 (uninsulated)
  Comments: 1/2 x 2 stair walls to unconditioned basement

Windows:

- ☐ Window: Kitchen: Vinyl Frame, Double Pane with Low-E, U-factor: 0.290
  For windows without labeled U-factors, describe features:

RES*check* Software Version 4.3.1

Compliance Certificate

Project Title: MBOIA TEST HOME

Energy Code:	**2009 IECC**
Location:	**Lewiston, Maine**
Construction Type:	**Single Family**
Conditioned Floor Area:	**1500 ft2**
Glazing Area Percentage:	**10%**
Heating Degree Days:	**7244**
Climate Zone:	**6**

Construction Site:
ANYWHERE STREET
LEWISTON, ME

Owner/Agent:

Designer/Contractor:
DONALD VIGNEAU
NEEP
91 HARTWELL AVE
LEXINGTON, MA 02421
781-860-9177 eXT.136
dvigneau@neep.org

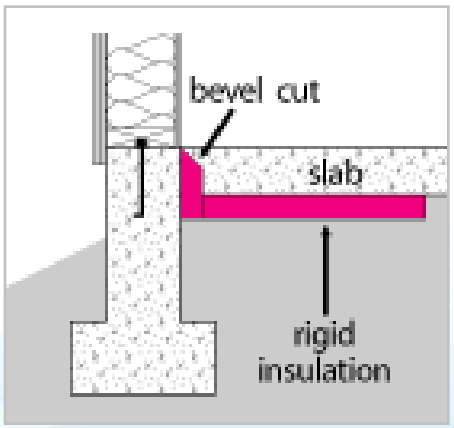
Compliance: Wall orientation not specified

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or Door U-Factor	UA
Ceiling 1: Cathedral Ceiling (no attic)	317	0.0	0.0		187
Skylight: 2 Bath: Wood Frame, Double Pane with Low-E SHGC: 0.47	6			0.350	2
Ceiling 2: Flat Ceiling or Scissor Truss	368	0.0	0.0		209
Ceiling 3: Flat Ceiling or Scissor Truss	442	0.0	0.0		251
Ceiling 4: Other	50			0.599	30
Wall 1: Wood Frame, 24" o .c. Orientation: Front	340	0.0	0.0		69
Window: Kitchen: Vinyl Frame, Double Pane with Low-E SHGC: 0.40 Orientation: Front	14			0.290	4
Window: Bath: Vinyl Frame, Double Pane with Low-E SHGC: 0.40 Orientation: Front	14			0.290	4
Window: Entry: Vinyl Frame, Double Pane with Low-E SHGC: 0.40	7			0.290	2

INSPECTING FOUNDATIONS

FOR NOW

- Sill sealer under sill plates
- Dampproofing
- Exterior foundation insulation



FOR LATER

- Slab edge insulation
- Under-slab EPS/XPS

ROUGH FRAMING / ROUGH-INS*

CONVENTIONAL

- Air Sealing Table 402.4.2 (but see EC-25 FAH)
- Openings/holes
- Caulking/foam

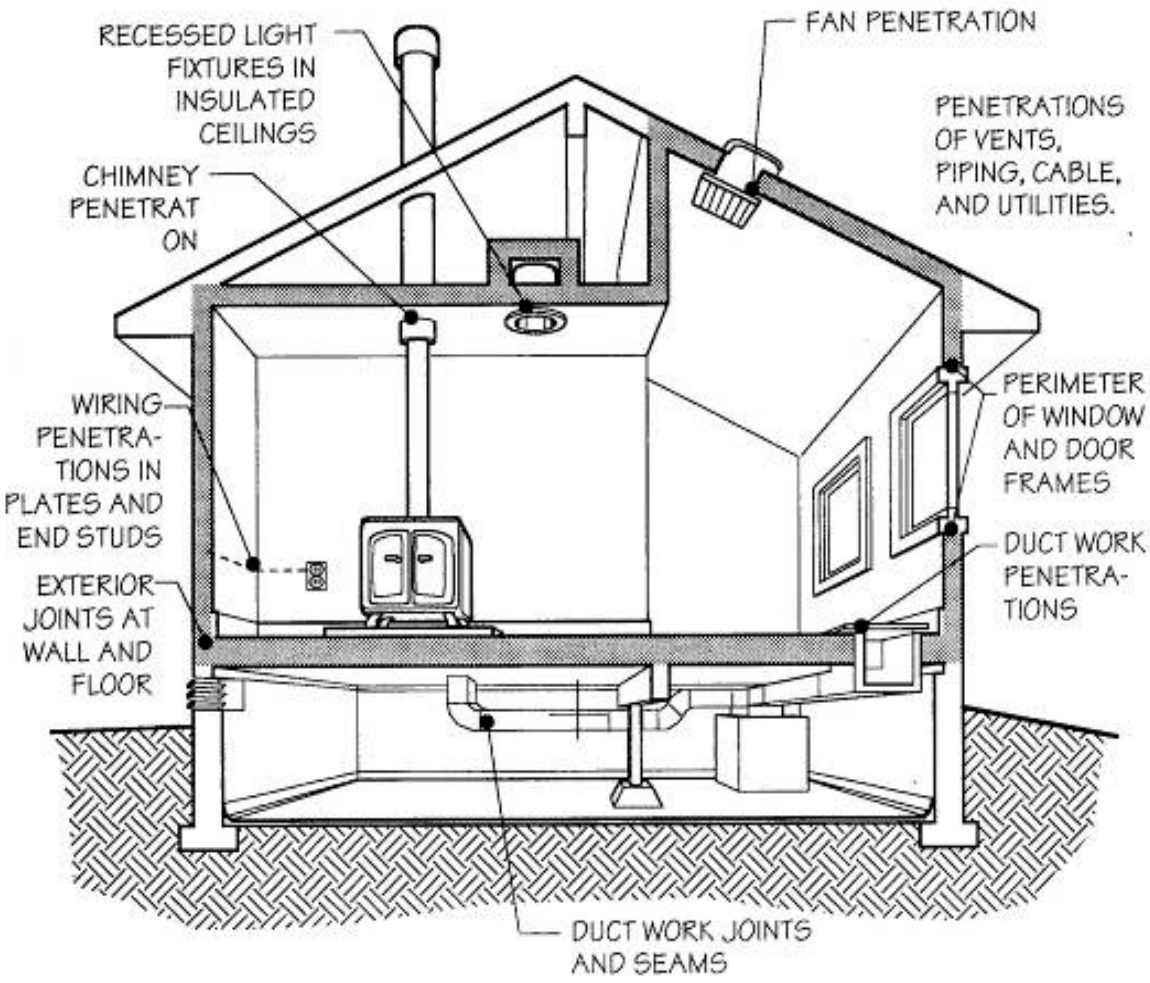
ENERGY STAR etc.

- Insulation location(s)
- Taped sheathing
- Drainage plane

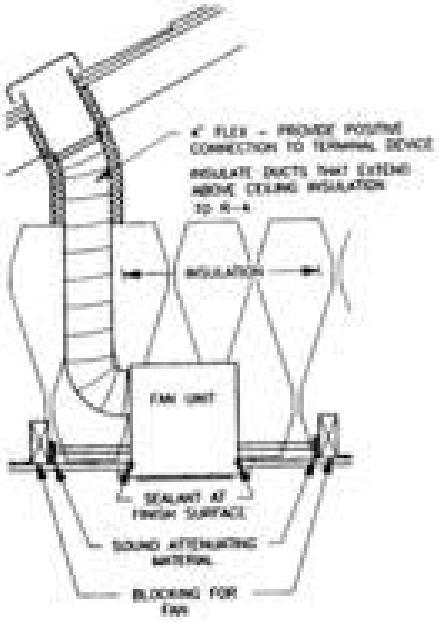
**How do you resolve split jurisdiction inspections?*

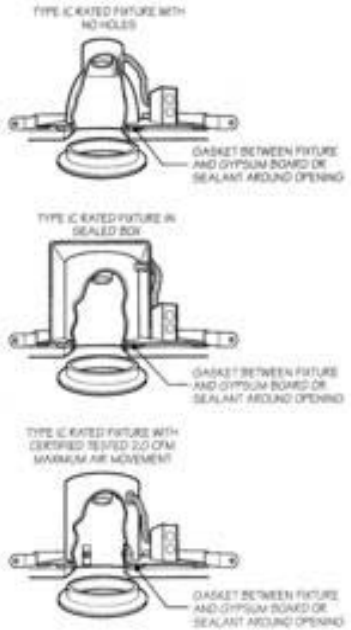
AIR LEAKAGE INSPECTIONS 402.4.1

- Joints, seams, other penetrations
- Dropped ceilings
- Between sole plates
- Behind tubs, showers
- Floors/exterior walls unconditioned space
- Plumbing/Electrical utility penetrations
- Service access doors or hatches

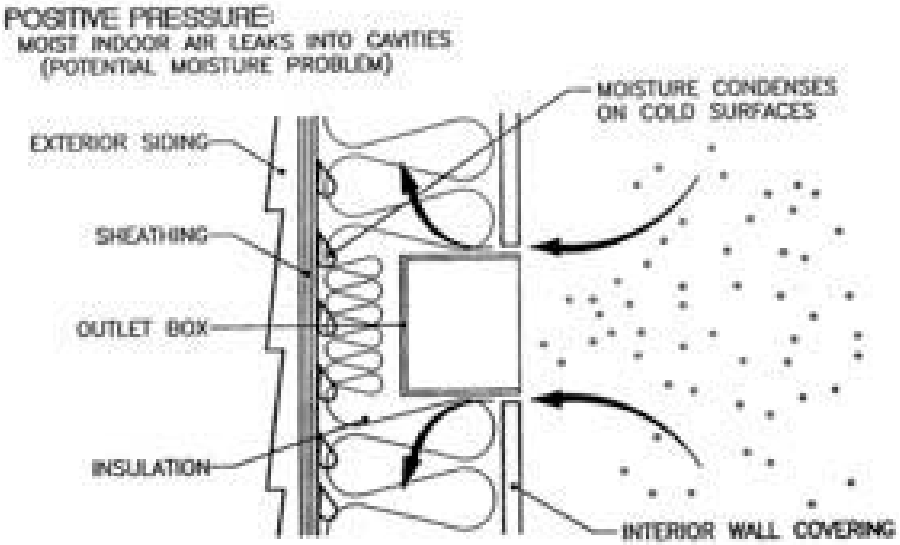


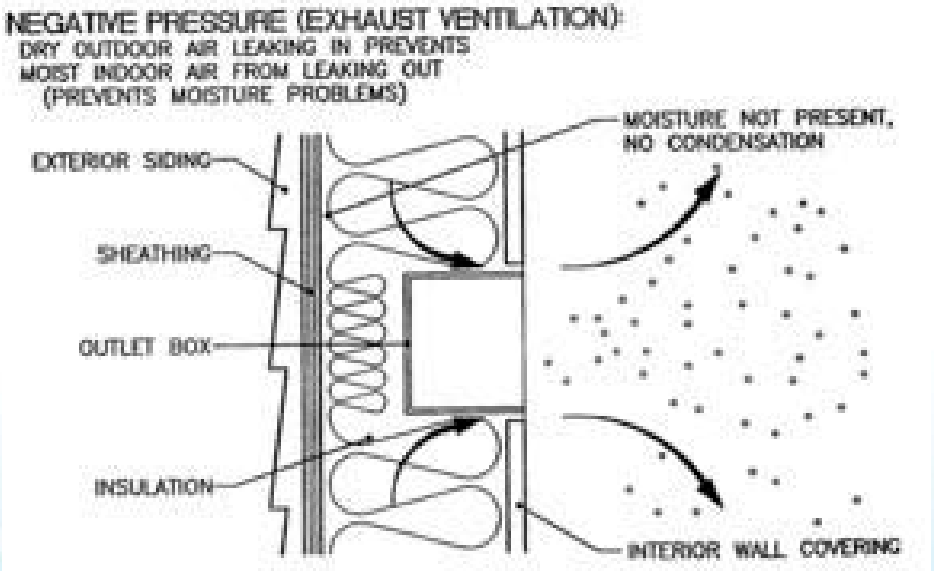
- AROUND PENETRATIONS



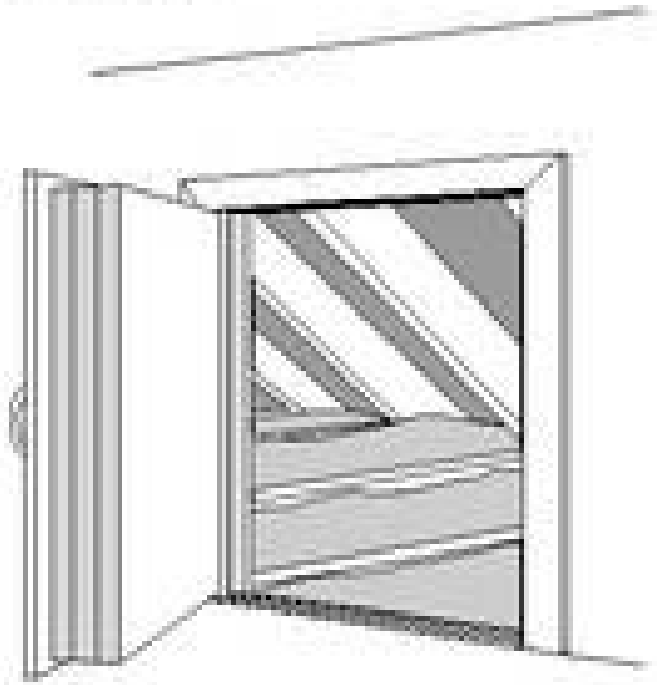


OTHER AREAS





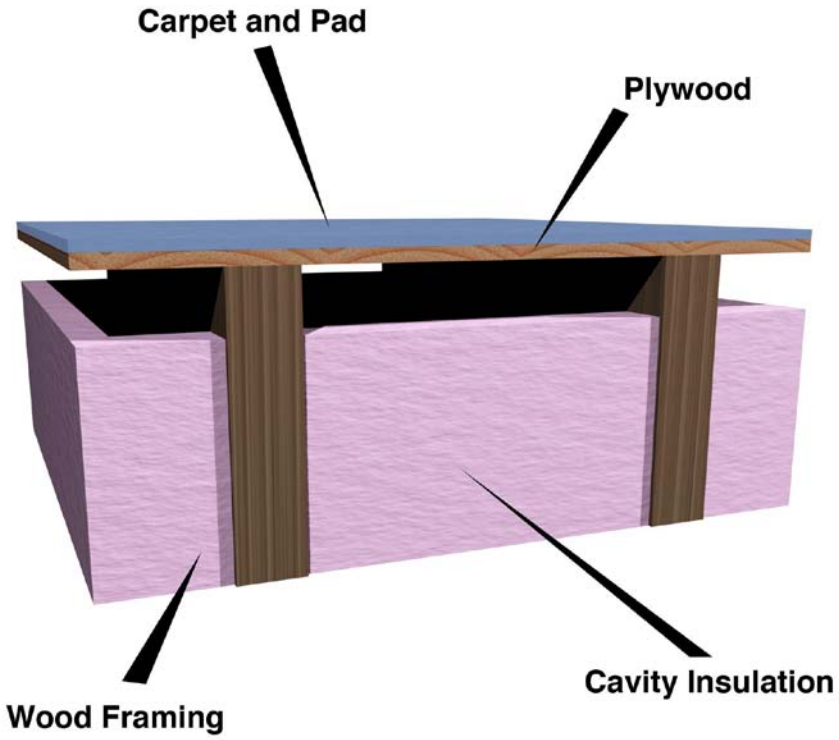
Knee wall door



Add R-value to the knee-wall door, by adhering rigid insulation board (sandwiched together with construction adhesive and screws) to the back of the door. The clearance between the insulation and the door frame as well as air sealing details will require special attention.

INSULATION INSPECTIONS ANYTHING WRONG HERE?

photo by Britt-Makela Group



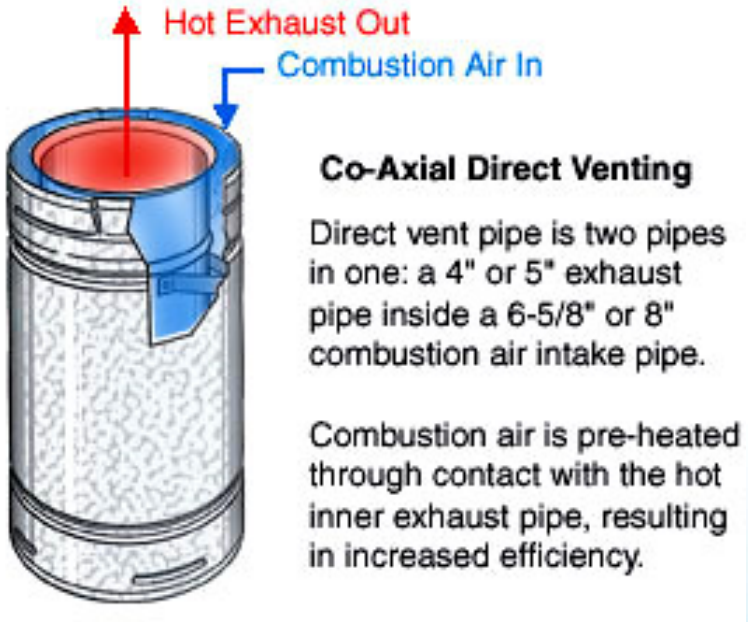
EQUIPMENT / APPLIANCES

CONVENTIONAL

- Gravity Venting
- Power Venting
- Combustion air (leaks)

ENERGY STAR etc.

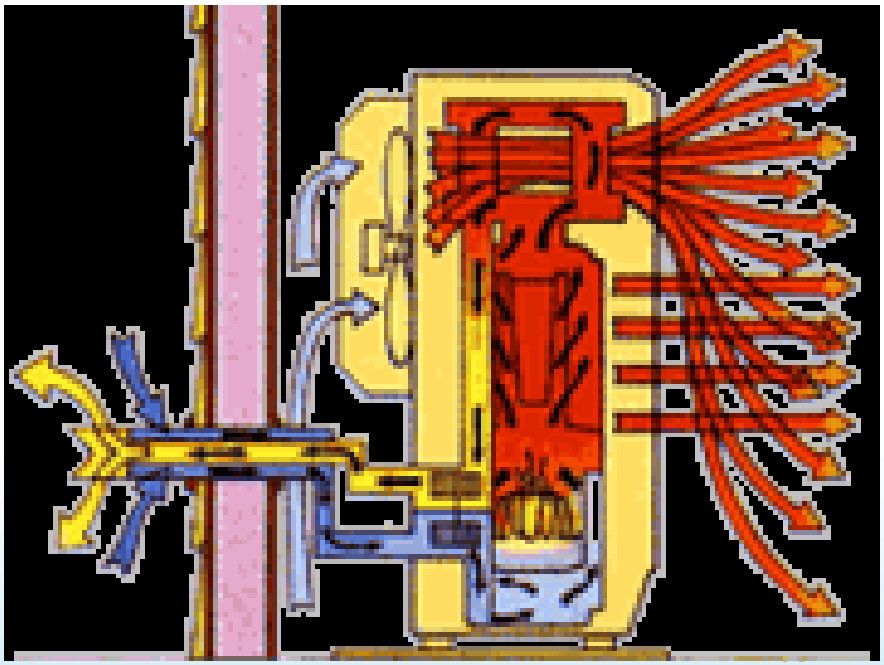
- Direct Venting
- Fuel-fired direct vent
- Insulating lines



Co-Axial Direct Venting

Direct vent pipe is two pipes in one: a 4" or 5" exhaust pipe inside a 6-5/8" or 8" combustion air intake pipe.

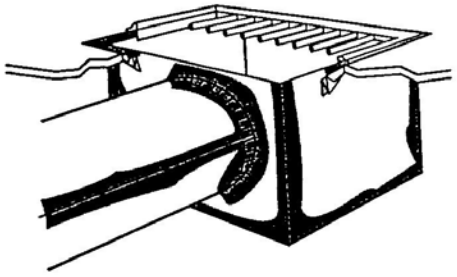
Combustion air is pre-heated through contact with the hot inner exhaust pipe, resulting in increased efficiency.



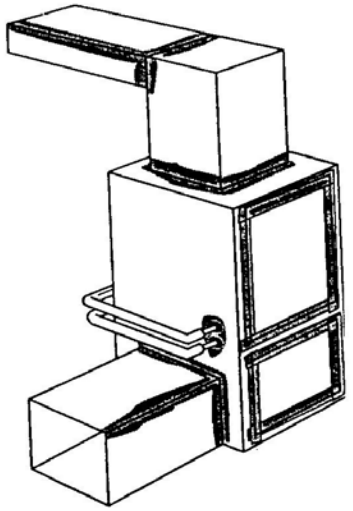
THERMOSTAT CONTROLS 403.1.1

- One per dwelling for forced air required
- Programmable
- Heat / AC or HVAC
- Deadband ≥ 5^0 F
- One per ZONE really needed, but not code

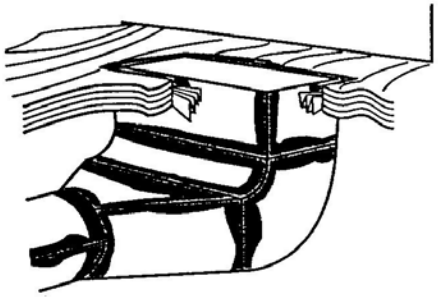
SECTION 403.2 DUCT EFFICIENCY - BY TESTING



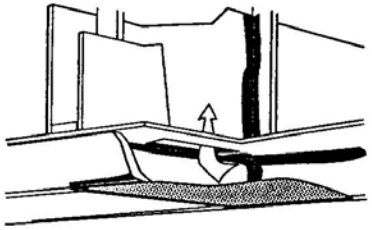
TRANSITIONS



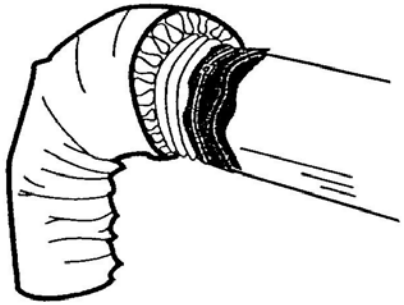
AIR HANDLER



REGISTER BOOT



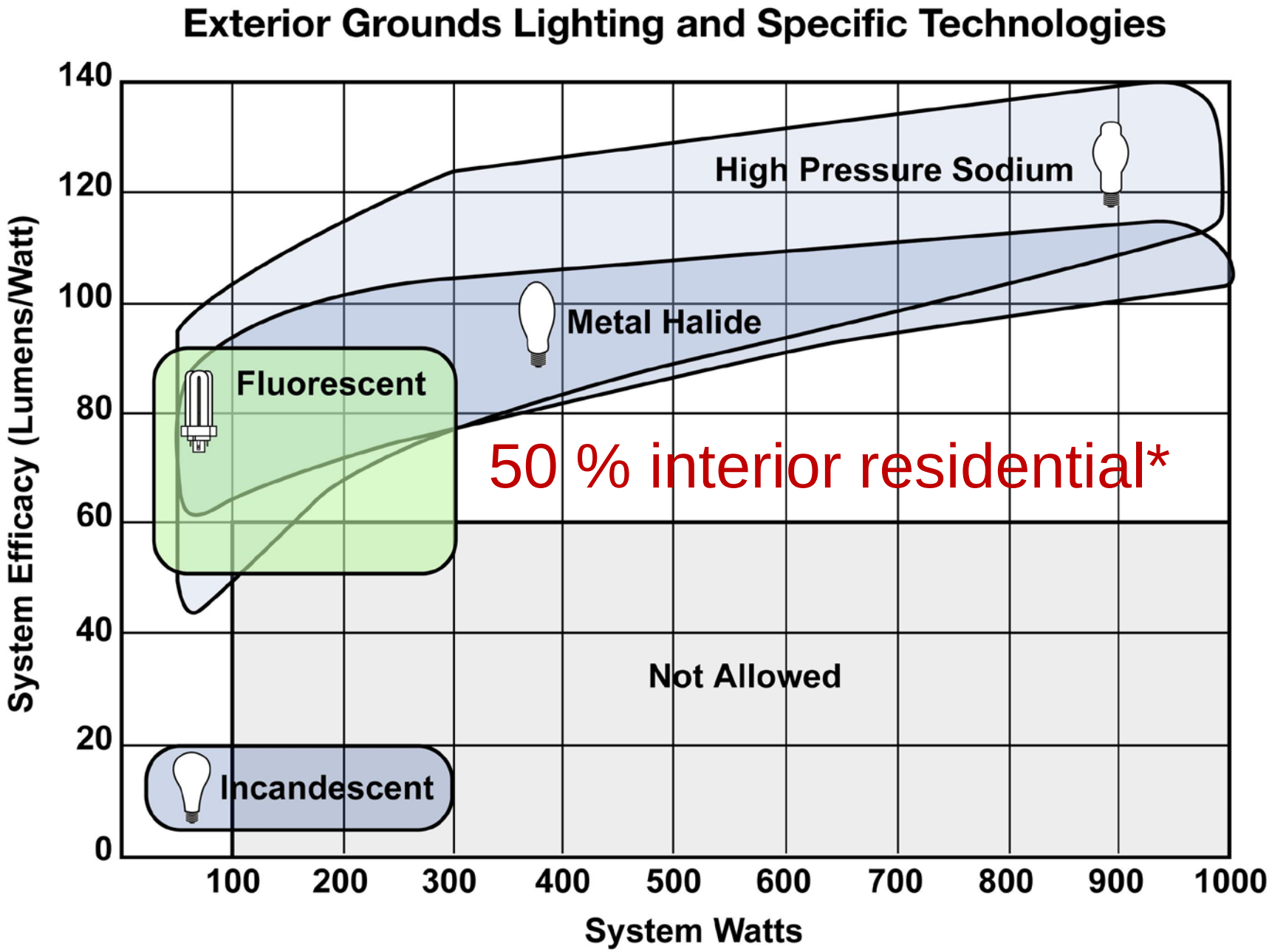
BUILDING CAVITIES



FLEX DUCT CONNECTIONS

6 cfm/100sf w/air handler
4 cfm WITHOUT (0.1” w.g.)

LIGHTING SOLUTIONS – N1104*



THANK YOU

PLAN REVIEWS AND FIELD INSPECTIONS

DONALD VIGNEAU AIA

dvigneau@neep.org

Massachusetts Building Commissioners
and Inspectors Association
OCTOBER 23, 2010

5 Militia Drive Lexington, MA 02421
P: 781.860.9177
www.neep.org

MASSACHUSETTS APPENDIX 120.AA

NEW RESIDENTIAL

- Energy Star 2.0 based*
- Prescriptive Option
- RESNET performance

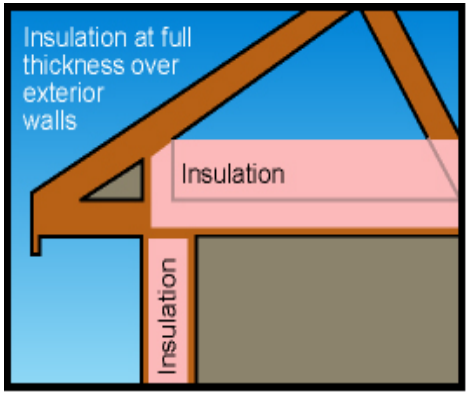
NEW COMMERCIAL

- NBI & ASHRAE based
- Prescriptive/Performance
- Commissioning measures

ENERGY STAR

A 120.AA REQUIREMENT

Thermal Bypass Checklists



WALLS – "O.V.E." FRAMING

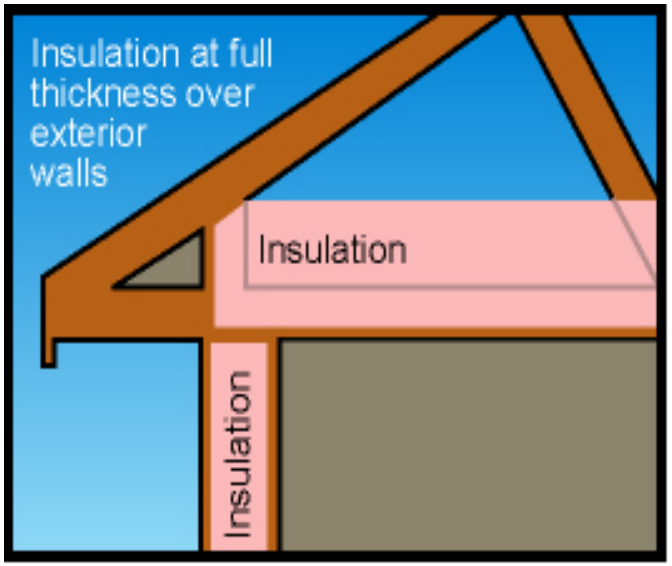
- **Minimize framing**

- Two-stud corners
- Insulated headers
- Single jacks or hangers
- 24" stud/floor/truss alignments
- Envelope/partition intersections sealed/insulated

High Performance DEFINITION:

- Insulated sheathing OR
- Structural insulated panels OR
- Insulated concrete walls OR
- Double wall framing

Thermal Bypass Checklists



THERMAL BYPASS

- Overall Barrier Alignment
- Wall envelope interfaces
- Floor envelope interfaces
- Attic/ceiling interfaces
- Shafts; utility penetrations
- Attic/ceiling interfaces

FRAMING FEATURES - ATTIC

- Trusses – raised heel
- Raised equipment platform

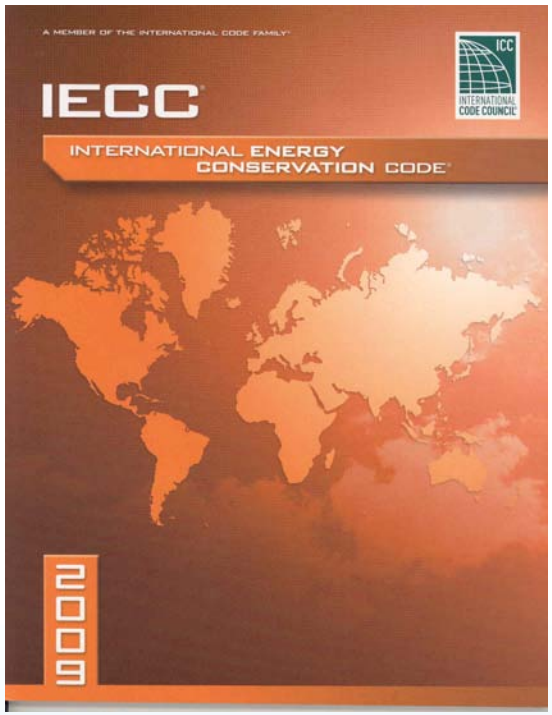
NO FREEBIES

- No free window/door/ceilings

NEW RESIDENTIAL COMPLIANCE

BASED ON:

- **120AA Chapter 1; IECC 2009 Chapter 4**
- **ENERGY STAR Thermal Bypass Checklists**
- **HERS Rating Index for the dwelling -**
- **65 for > 3,000 sf (greater than)**
- **70 for < 3,000 sf (less than)**



HERS® Home Energy Rating System

HOME PERFORMANCE WITH ENERGY STAR

H.E.R.S. is based on the 2004 IRC

- **NOT IRC**

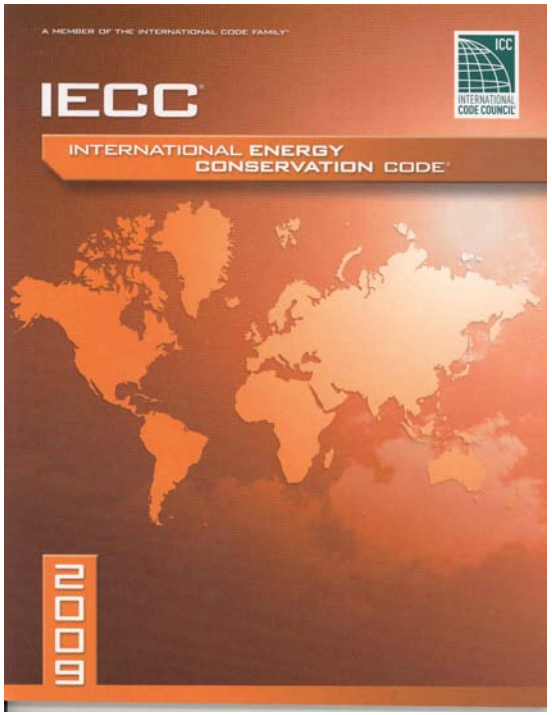
RESIDENTIAL RENOVATIONS COMPLIANCE

AFFECTED ENVELOPE PORTIONS:

- **Meet/exceed IECC 2009, OR**
- **Fully fill cavities (R-3.7 minimum)**

OR

- **Use ENERGY STAR Checklists w/**
- **HERS Performance Option**
  - **85 for < 2,000 sf (less than)**
  - **80 for > 2,000 sf (greater than)**
- **Exceptions:**
  - **Construction not disturbed**
  - **Sash repairs**



H.E.R.S. changing in 2011 **NOT IRC**

404.7 H.E.R.S. COMPLIANCE OPTION

- The Home Rating Energy System (HERS) is an optional path to compliance

HERS®
Home Energy Rating System

SOLVING PROBLEMS

Do we address:

- The SYMPTOM

or

- The CAUSE


QUESTIONS

GREENHOUSE GAS NEWS

YEAR	CO_2 (PPM)	NOTES
2009	387.35	COPENHAGEN ACCORD
2008	385.57	THE LATEST YEAR FOR WHICH A FULL YEAR OF DATA IS AVAILABLE
2007	383.71	
2006	381.85	
1997	363.47	Kyoto Protocol
1992	356.27	Earth Summit in Rio de Janeiro
1987	348.98	The last year in which the annual CO_2 data was less than 350 ppm
1959	315.98	The first year for which a full year of precise instrument data is available

HOW DO WE GET THERE - USE GLOBAL THINKING

- SOURCE ENERGY: Extract, process, store, modify, use; re-use; dispose of; all in a controlled/managed way; as opposed to water, lightning, wind, fire, geothermal that we can capture, and manage to exert some control over.

- CONTROL/MANAGE/FIND THE NEGAWATTS

- "The cheapest BTU is one you never have to use"

- What don't I understand about energy?

- What makes energy efficiency visible?