

An In-depth look at Insulation, Air Sealing and Testing for the New Minnesota Energy Code

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Requirements Under Minnesota's New Energy Code.

A modified version of the
IECC 2012

IECC 2012 More Challenging than ever

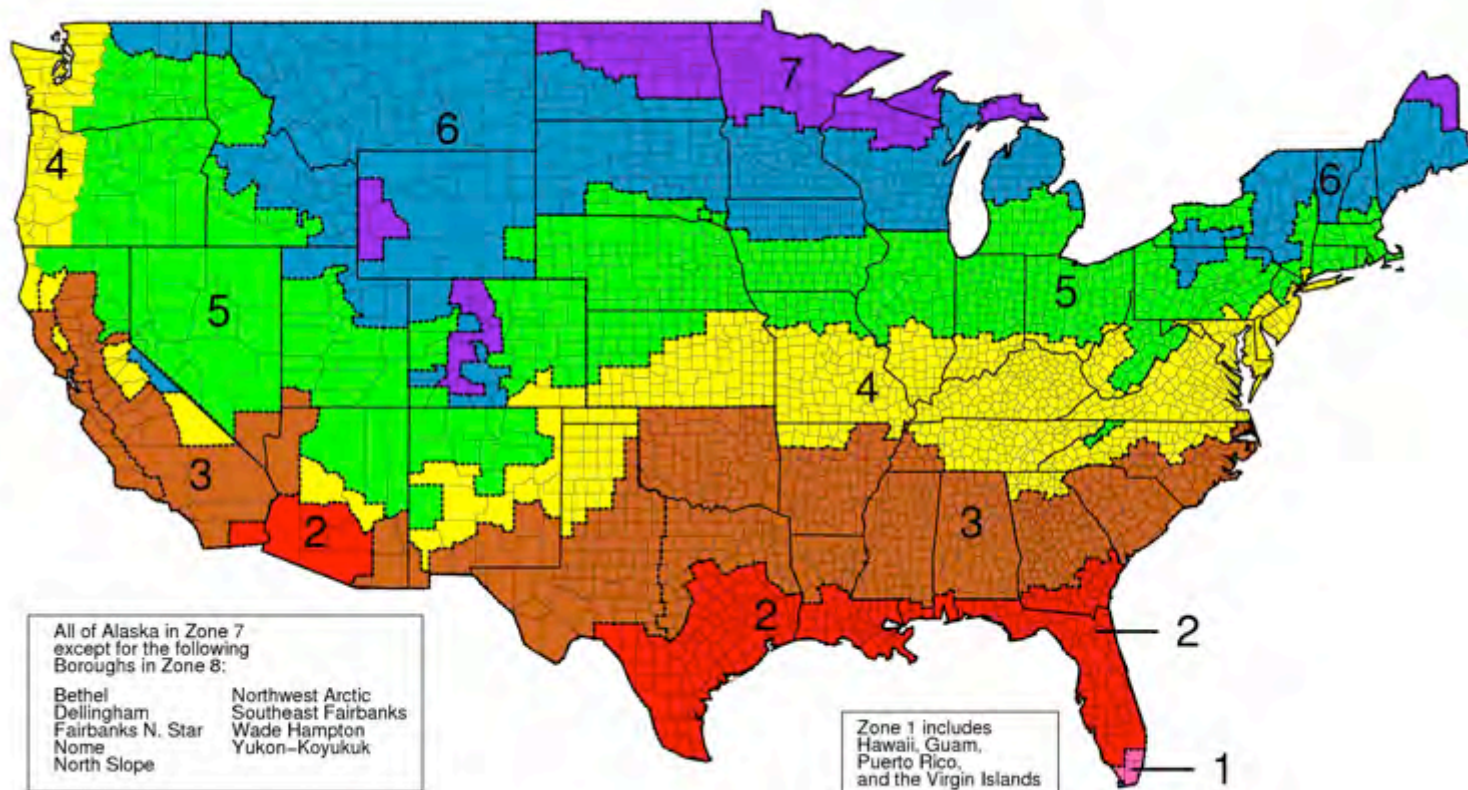
The Energy Code keeps raising the bar :

2009 Code is 15% more stringent than the 2006 version

2012 Code is 30% more stringent than the 2006 version

2015 target Code is 50% or greater than the 2006 Version

Climate Zones



UPGRADED INSULATION VALUES

Final changes to insulation & fenestration component requirements are listed below (*improvements over 2009 IECC are shaded in green*):

Insulation*	Ceiling R-value		Wood Frame R-value		Basement R-value		Crawl Space R-value	
	2009 IECC	2012 IECC	2009 IECC	2012 IECC	2009 IECC	2012 IECC	2009 IECC	2012 IECC
1	30	30	13	13	0	0	0	0
2	30	38	13	13	0	0	0	0
3	30	38	13	20 or 13+5**	5/13***	5/13	5/13	5/13
4 exc. Marine	38	49	13	20 or 13+5	10/13	10/13	10/13	10/13
4 Marine & 5	38	49	20 or 13+5	20 or 13+5	10/13	15/19	10/13	15/19
6	49	49	20 or 13+5	20+5 or 13+10	15/19	15/19	10/13	15/19
7 & 8	49	49	21	20+5 or 13+10	15/19	15/19	10/13	15/19

* Floor and Slab insulations levels remain unchanged.

** Commonly available insulation in 2x6 cavity (R20) or in 2x4 cavity with sheathing (R13+x)

*** R5 continuous insulation or R13 for framed cavity insulation

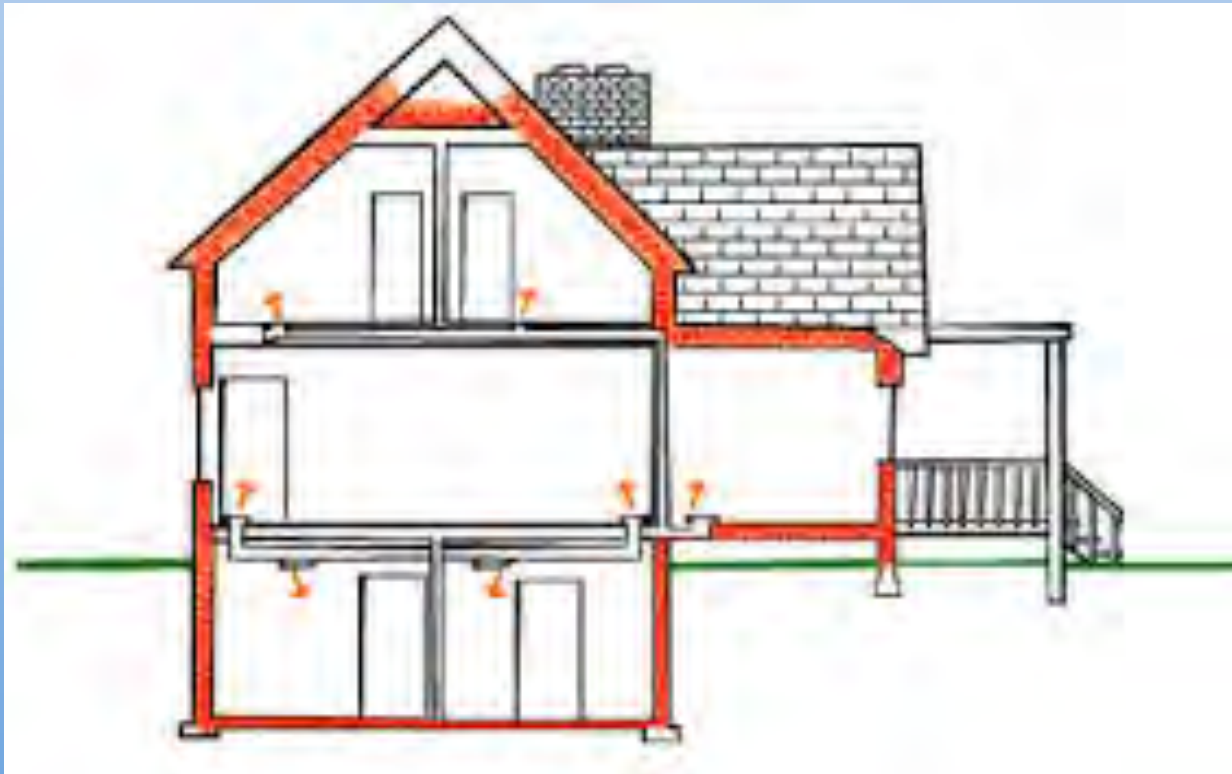
Increased Wall Insulation for climate Zone 6

Frame Wall R-20 or R13+5



Building Thermal Envelope

The Building Thermal Envelope is the Barrier that Separates conditioned space or inside from unconditioned space or outside



**Wall assemblies to ensure
meeting Energy Code..**

Wall Insulation for climate zone 6

Minnesota Minimum is R-20 Cavity
Insulation



Wall Insulation for climate zone 6 & 7

Builders will be looking to
differentiate themselves from other
builders



Wall Insulation

Insulation Opportunities

Open cell Foam

- 100-150% Expansion Rate
- Single Pass Application
- R-value=3.4-4.2/ inch(Aged)
- ½-lb Density
- Not Structural



Wall Insulation

Open Cell Foam



Wall Insulation

Insulation Opportunities

Closed Cell foam

- 30-50% Expansion Rate
- Multiple Passes (1.5-3" Max Per)
- R-Value 5.2-7.4/inch (aged)
- 2-lb density
- Can offer increased racking strength



Wall Insulation

SIPS Panel System



Wall Insulation

Insulation Opportunities

Department of Energy
Challenge Home Wall
System

University of Minnesota



Attic Insulation Level for climate zone 6 & 7

R-49 or R-38 continuous with raised heel framing



Attic Insulation Level for climate zone 6 & 7

R-49 or R-38 continuous with raised heel framing



Attic Insulation Level for climate zone 6 &7

Attic Insulation Strategies for Special Areas



Attic Insulation Level for climate zone 6 & 7

Attic Insulation Strategies for Special Areas



Foundation Insulation Level for climate zone 6 & 7

Basement foundation insulation R-15



Building Air Barrier

Building Envelope tightness



Building Air Barrier

Building Envelope tightness



Air Tightness Requirements

House must test out at
3 ACH 50 or better To
Receive a Certificate of
Occupancy

(Lower is better)



Air Tightness Requirements

Blower Door Testing

- Highly calibrated fan
- Air flow at 50 Pa WRT outside
 - Depressurize
 - Pressurize

Air Tightness Requirements

Blower Door Testing



Air Tightness Requirements

Blower Door Testing

Blower Door set up

- Open all interior doors
- Close all outside doors
- Turn off all equipment
- Leave all intentional openings open
 - Combustion air
- Dampened openings leave as is

(CHAPTER 8 OF THE RESNET STANDARDS ARE A GREAT REFERENCE)

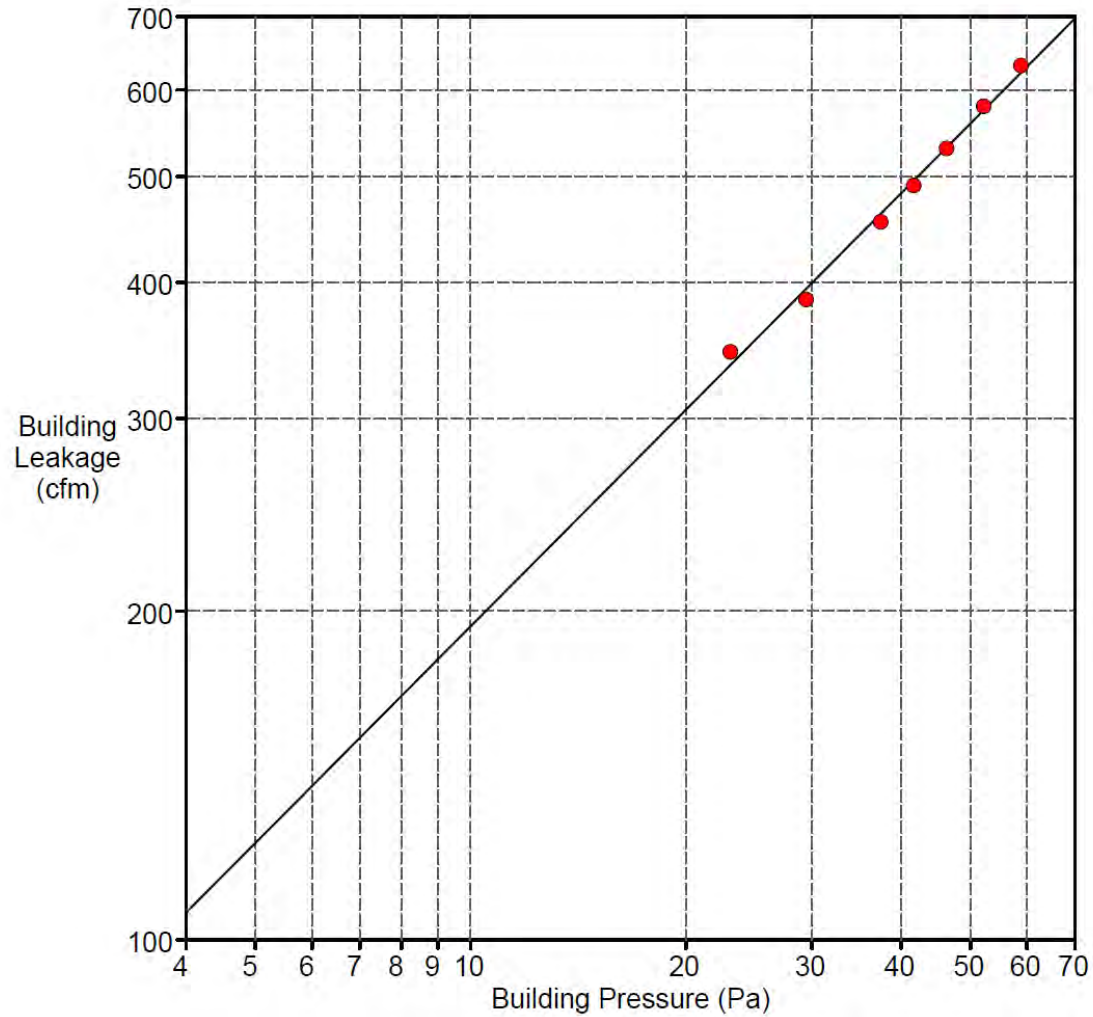
Air Tightness Requirements

Blower Door Testing

- There are 2 types of Tests
 - Single point test
 - Multipoint test (Requires a computer and testing Software)

Building Leakage Curve

Date of Test: 6/18/2013 Test File: presentation file



BUILDING LEAKAGE TEST Page 2 of 4

Date of Test: 6/18/2013 Test File: presentation file

Building Information

Volume	41729
Surface Area	8162
Floor Area	4374
Height	
# of Bedrooms	
# of Occupants	
Year of Construction	
Wind Shield	M

Location Climate Information

Ventilation Weather Factor	
Energy Climate Factor	
Heating Degree Days	
Cooling Degree Days	
Design Winter Wind Speed	
Design Summer Wind Speed	
Design Winter Temp Diff	
Design Summer Temp Diff	

Heating and Cooling Cost and Efficiency Information

Heating Fuel	Gas
Heating Fuel Cost	
Heating Efficiency %	
Cooling Fuel Cost	
Cooling SEER	

Equipment Information

Type	Manufacturer	Model	Serial Number	Custom Calibration Date
Fan	Energy Conservatory	Model 3 (110V)		Default
Micromanometer	Energy Conservatory	DG700	26973-7	5/4/2012

BUILDING LEAKAGE TEST Page 3 of 4

Date of Test: 6/18/2013 Test File: presentation file

Depressurization Test:

Environmental Data

Indoor Temperature (°F)	Outdoor Temperature (°F)	Altitude (ft)
73.0	73.0	841.0

Data Points

Nominal Building Pressure (Pa)	Baseline Adjusted Building Pressure (Pa)	Fan Pressure (Pa)	Nominal Flow (cfm)	Adjusted Flow (cfm)	% Error	Fan Configuration
0.8	n/a	n/a				
-58.7	-58.8	111.2	626	632	1.5	Ring B
-52.0	-52.2	93.5	575	580	0.8	Ring B
-46.1	-46.3	78.1	526	530	-0.2	Ring B
-41.5	-41.6	66.8	486	491	-1.0	Ring B
-37.3	-37.4	57.2	450	454	-1.7	Ring B
-29.3	-29.5	41.1	382	386	-2.2	Ring B
-22.9	-23.1	32.9	342	345	2.8	Ring B
-0.5	n/a	n/a				

Time Averaging Period: 0

Deviations from Standard RESNET Multi-Point Test - Test Parameters

- Fewer than 8 data points were taken.

Air Tightness Requirements

Blower Door Testing

- ACH 50
 - Air Exchange in building at 50 Pa of pressure WRT outside

$$\text{ACH50} = [\text{CFM50} \times (60)] / V$$

- Variables
 - Volume
 - CFM 50

Air Tightness Requirements

Blower Door Testing

Variables that Can Effect the Blower Door Results

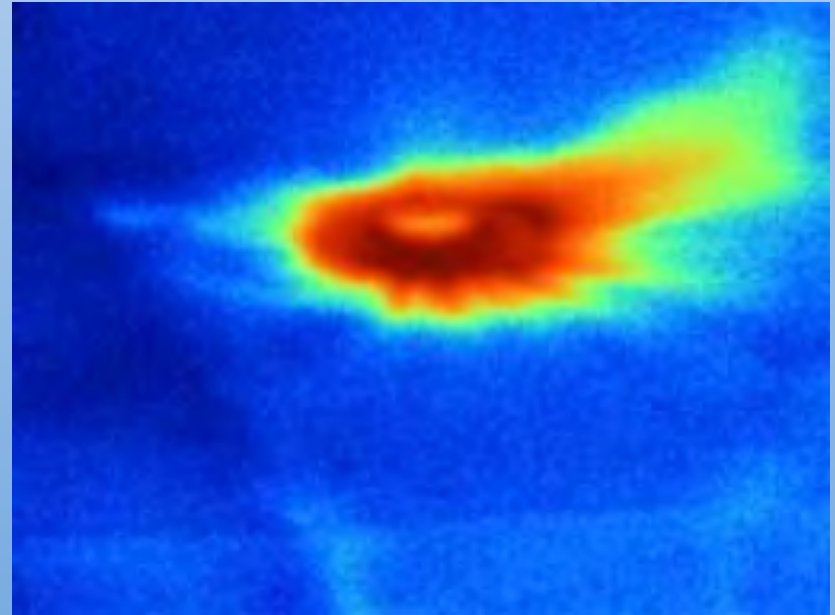
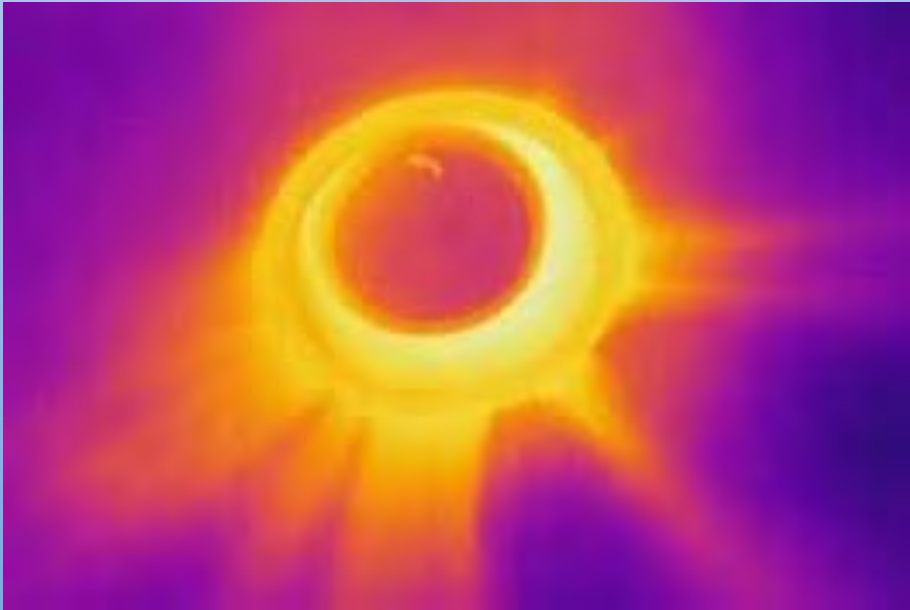
- Improper Volume calculations
- Faulty Equipment
- Extreme Weather conditions

Air Tightness Requirements

Air Barrier opportunities

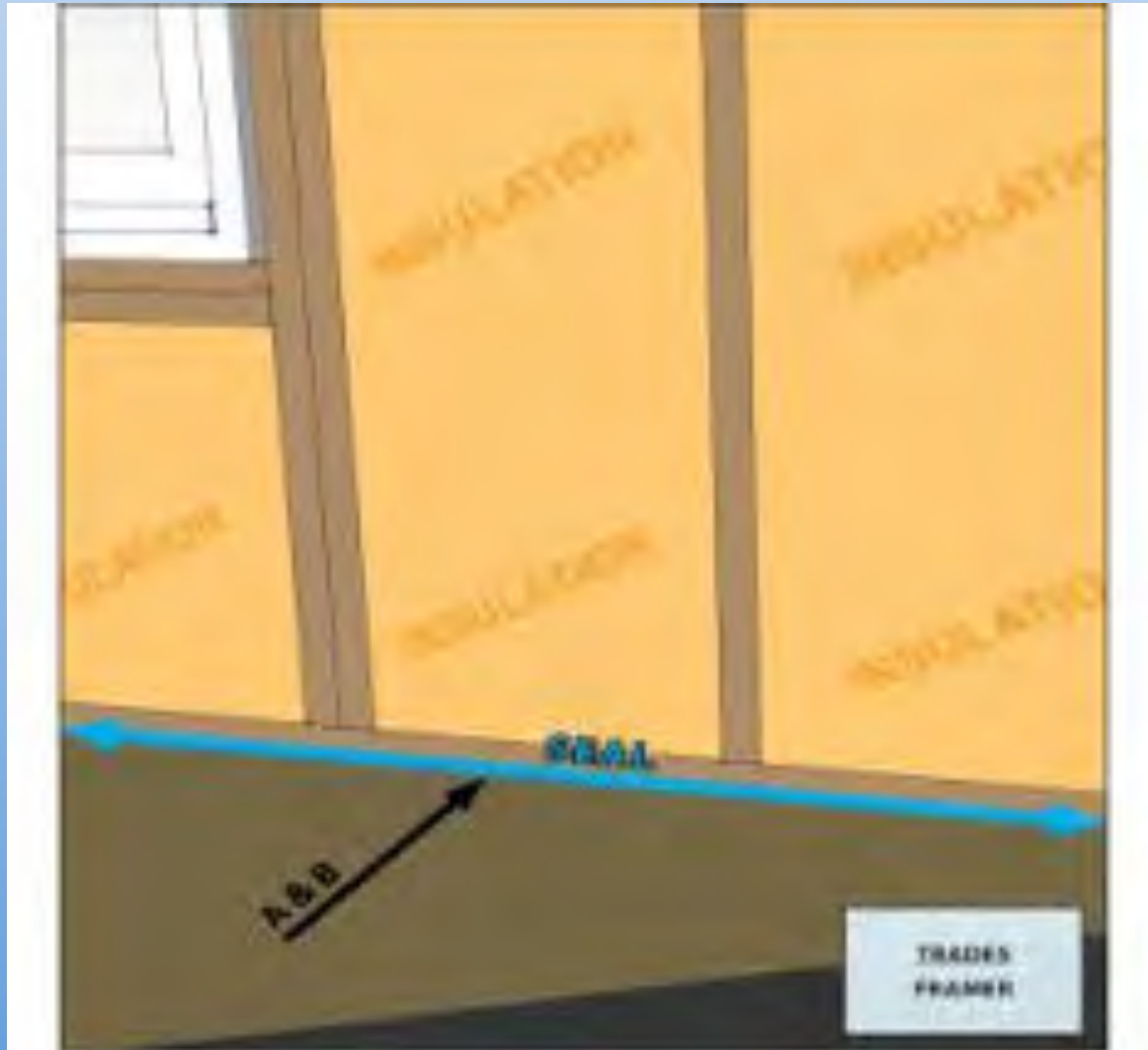
Building Air Barrier

Recessed can lights



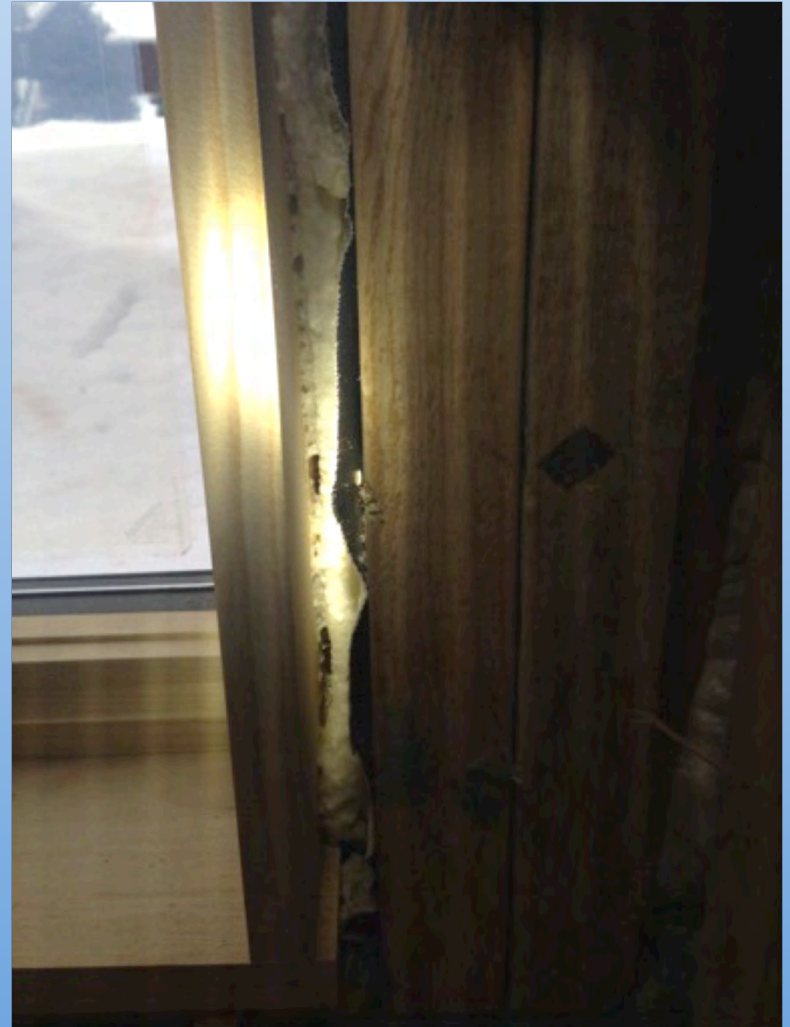
Building Air Barrier

Bottom plate leakage



Building Air Barrier

Insulating and Air
sealing around windows



WRB ISSUES



WRB ISSUES



WRB Issues



WRB THE FUTURE IS NOW

Foam Wall Systems



WRB THE FUTURE IS NOW

Fluid Applied Air Barriers



WRB THE FUTURE IS NOW



FAILURE TO EXECUTE



FAILURE TO EXECUTE

Insulators are responsible for the Envelope and Should test all Homes before drywall is installed?????

Failures to Execute

Attic Insulation Strategies for special areas



Failures to Execute

Attic Insulation Strategies for special areas



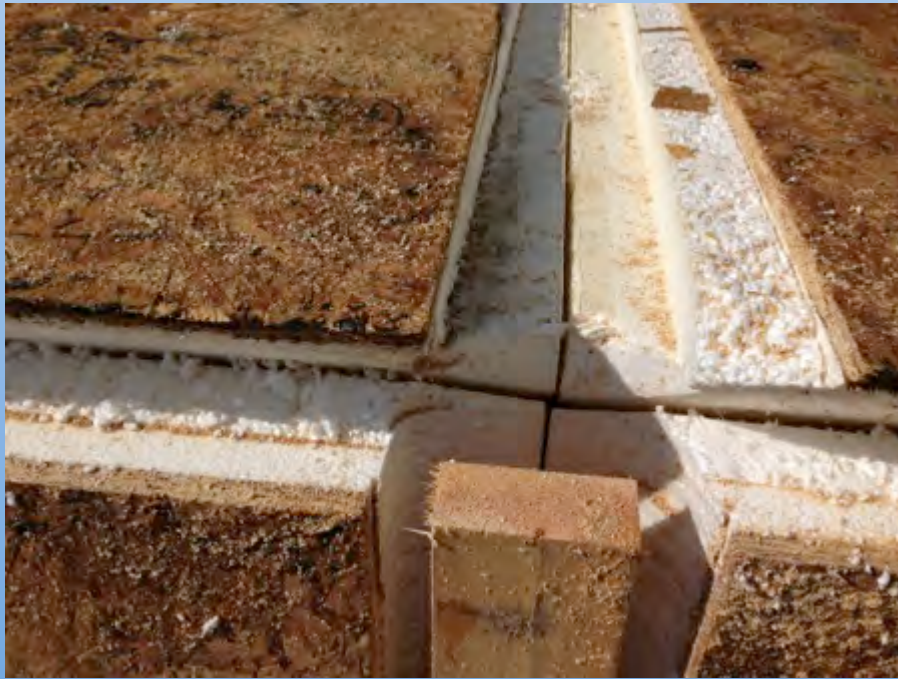
Failures to Execute

Attic Insulation Strategies for special areas



Failures to Execute

Attic Insulation Strategies for special areas



Building Air Barrier

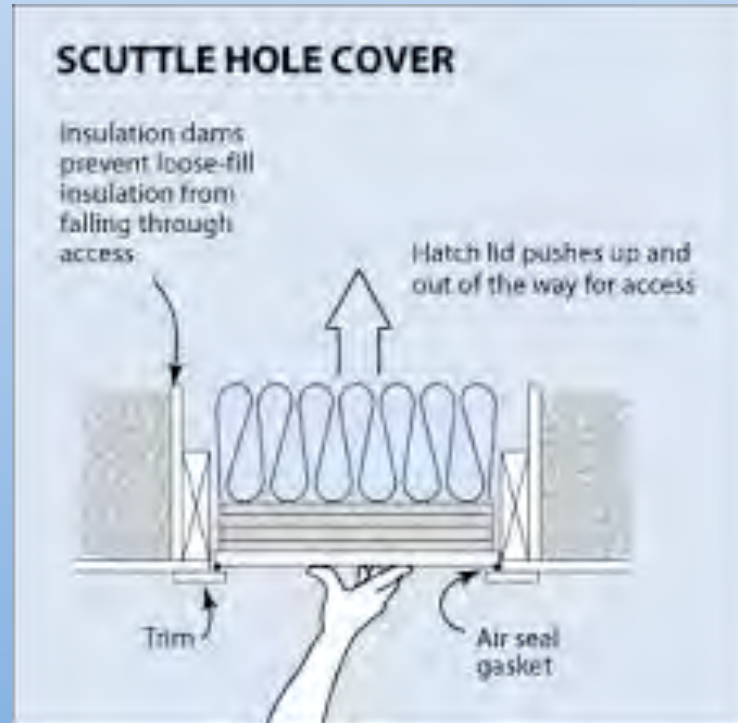


Ventilation Design Challenges



6. Attic Access

Weather strip
and insulate
access doors to
match
surrounding
R-Value



6. Attic Access

Weather strip
and insulate
access doors to
match
surrounding
R-Value



Window U-Factor Insulation For Climate Zone 6

Window U-Factor .32

Window .32
Skylights .55

Climate Zone	2009 U-factor	2012 U-factor	2009 SHGC	2012 SHGC
1	1.2	0.5	0.3	0.25
2	0.65	0.4	0.3	0.25
3	0.5	0.35	0.3	0.25
4 except Marine	0.35	0.32	NR	0.4
5 and 4 Marine	0.35	0.32	NR	NR
6	0.35	0.32	NR	NR
7 and 8	0.35	0.32	NR	NR

 National Fenestration Rating Council® CERTIFIED	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider	
	ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P)	Solar Heat Gain Coefficient	
0.30	0.30	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance	Air Leakage (U.S./I-P)	
0.51	0.2	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org</small>		

Additional Mandatory Requirements to Keep in Mind

New Mandatory requirements

A certificate must be on the panel box that lists the following:

- Major component R-values

- U-Factor, SHGC of windows

- Equipment efficiencies

- Load calculations for the building

- Blower door test results

- Ductwork Test results if applicable

Pipe insulation

Insulation of R-3 shall be applied to the following:

- Piping larger than $\frac{3}{4}$ inch diameter
- Piping serving more than 1 dwelling unit
- Piping from WH to Kitchen outlets
- Piping located outside conditioned space
- Piping to any distribution manifold
- Piping under any floor slab
- Buried Piping
- Piping with runs longer than specified on the table**



Lighting

- **75% of Lamps in Permanent fixtures shall be high efficacy lamps**

60 lumens per watt if over 40w

50 lumens per watt if between 40w and 15w

40 lumens per watt if 15w or less



Performance Design and Modeling

DESIGN OPPERTUNITIES

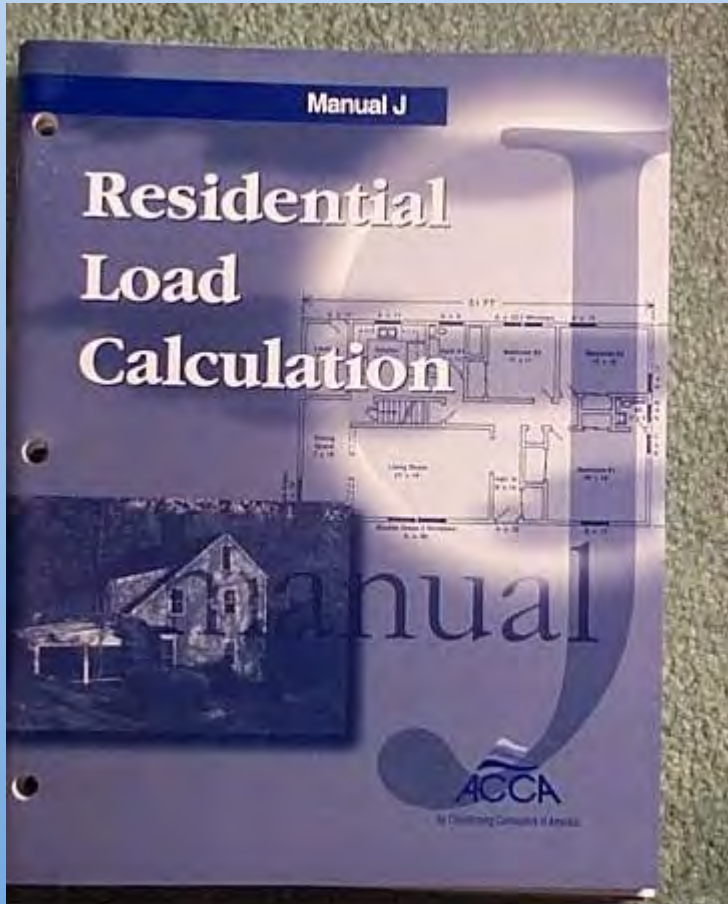


Performance Design and Modeling

REScheck has built a state specific version so you will be able to use to achieve code compliance



Energy Modeling Software



REM/Rate™
the Home Energy Rating Tool

Residential Energy Efficiency Program Support

- Utility and Public Access — Billing, Requirements, Fuel Costs
- ENERGY STAR Compliance

Most Widely Used HERS Software in the Industry

- Home Energy Rating (HERS) Certification
- ENERGY STAR Compliance
- Federal Tax Credit Certification
- Code Compliance Tools
- Virtual Tour Data

LEED- for Homes Provider

- LEED System
- Energy Modeling
- Field Training and Verification
- LEED Documentation and Certification

ARCHITECTURAL ENERGY
CORPORATION

www.remrate.com

A RESNET Certified Home Energy Rater:

A Certified Home Energy Rater or Rater is a person trained and certified by an accredited Home Energy Rating Provider to inspect and evaluate a home's energy features, prepare a home energy rating and make recommendations for improvements that will save the homeowner energy and money.



Seal Duct Work

All ductwork
must be hard
piped and sealed.
No more use of
sheet rock
cavities as
returns!!!!!!!!!!!!



Programmable Thermostat Requirements

Programmable thermostat now required on primary heating unit.



Seal Duct Work

All Duct boots must be sealed to the floor, wall and ceiling.



Tightness Testing for Duct Work

Total Duct leakage testing will be required to be 4 CFM per 100 sq.' of conditioned floor area.



Exception: If all ductwork and air handler is within conditioned space

Tightness Testing for Duct Work



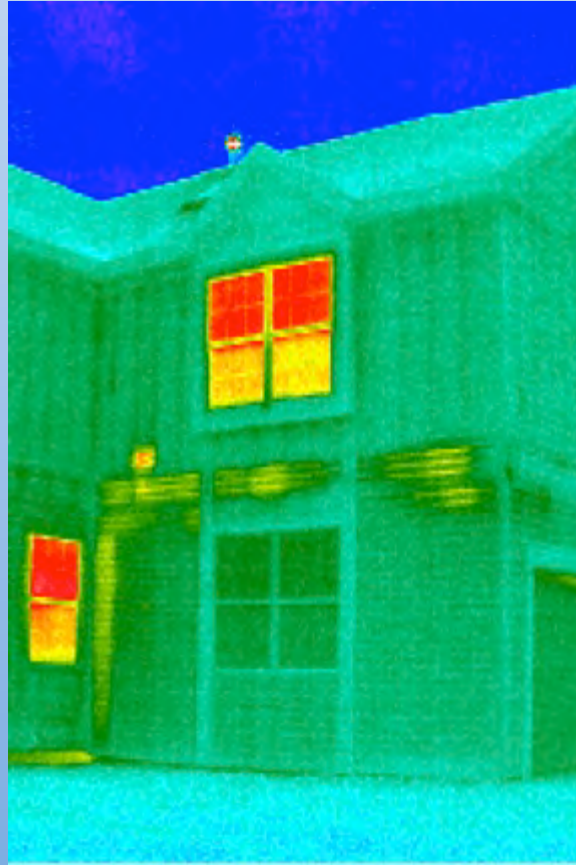
Tightness Testing for Duct Work

What will be considered conditioned space?



Exception: If all ductwork and air handler is within conditioned space

Avoid Ducts in Outside Walls



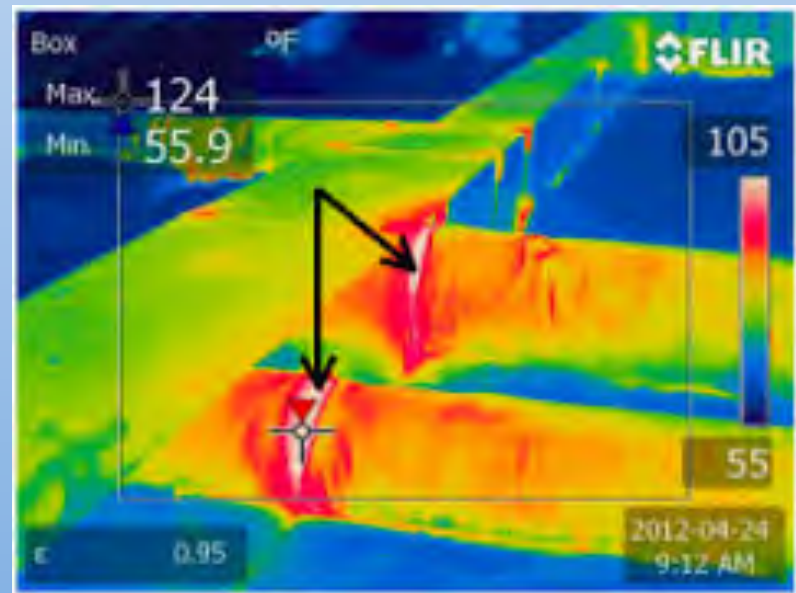
Tightness Testing for Duct Work

Avoid Ductwork
outside conditioned
space



Tightness Testing for Duct Work

All leaks will have to be repaired before Certificate of Occupancy will be Issued.



DUCT SEALING AFTER CONSTRUCTION



Tightness Testing for Duct Work

Rough in Ductwork testing is recommended for ALL ductwork if the homes system runs outside of conditioned space.

A duct blaster test should be performed to find all leaks before the installation of the Drywall

Balanced ventilation only!!



Thank You!

Ross Anderson
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