

Impact of Insulation Installation Quality

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Do batts require “perfect” installation to perform as advertised?

- Will normal installation practices result in significant decrease in performance?
- Do voids significantly impact heat flow (in the absence of convection)?

Supporting Research

- Calculations from the ASHRAE Handbook for all wall configurations
 - Accounts for framing
 - R-value of insulation
 - Air spaces
 - Finishing materials
- Calibrated hot box ASTM C1363
 - Measures system performance
 - Compare to heatflow meter
 - Accredited laboratory test

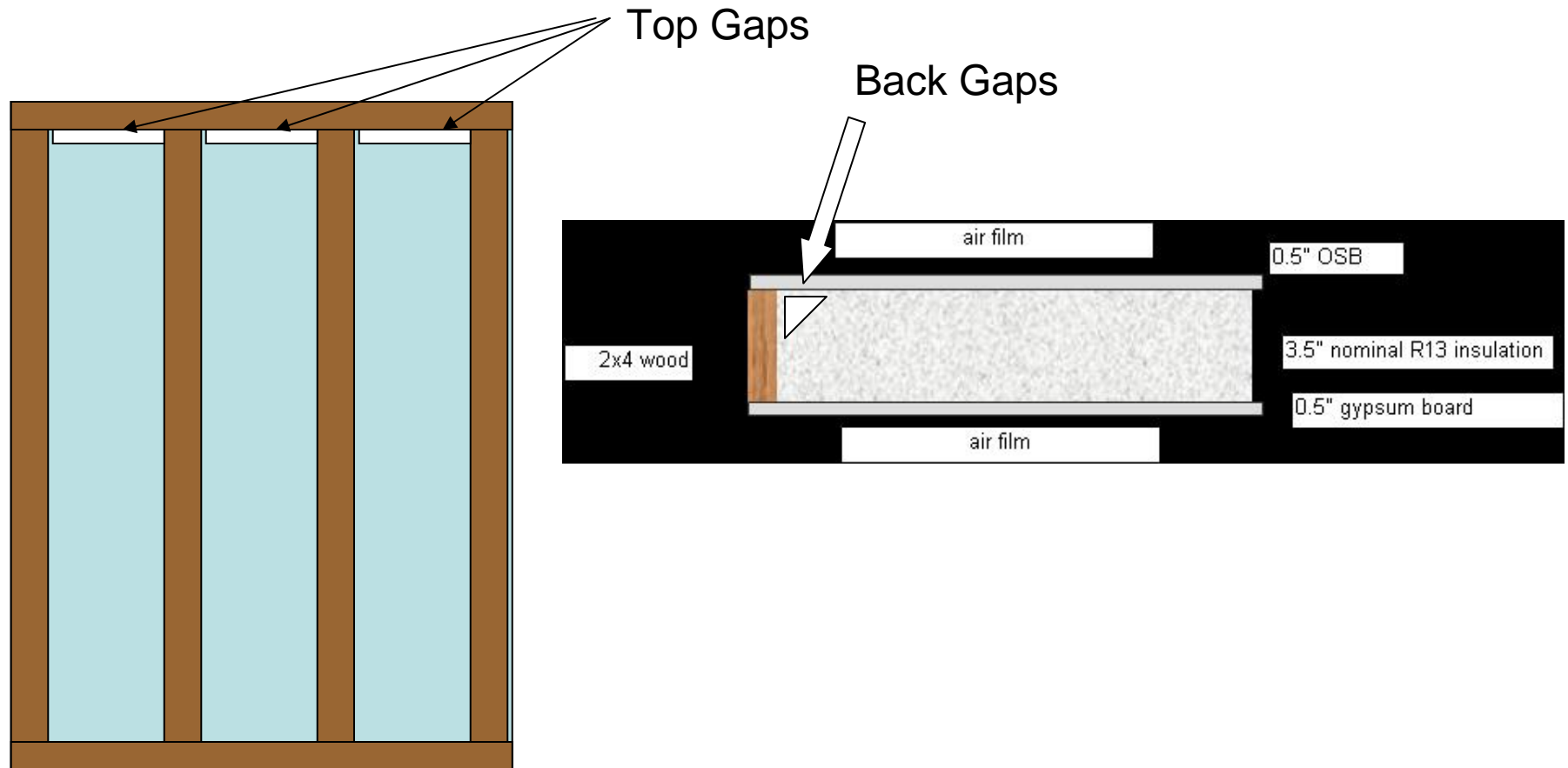
Wall Configuration

- Wood stud wall
- 2x4
- 16" oc
- Kraft-faced R13 batts
- House wrap

Installation Defect Configuration

- No defects
- Front gaps (inset stapling)
- Back gaps
- Top gaps
- Combination

Wall Configuration



Calibrated Hot Box



Warm Side

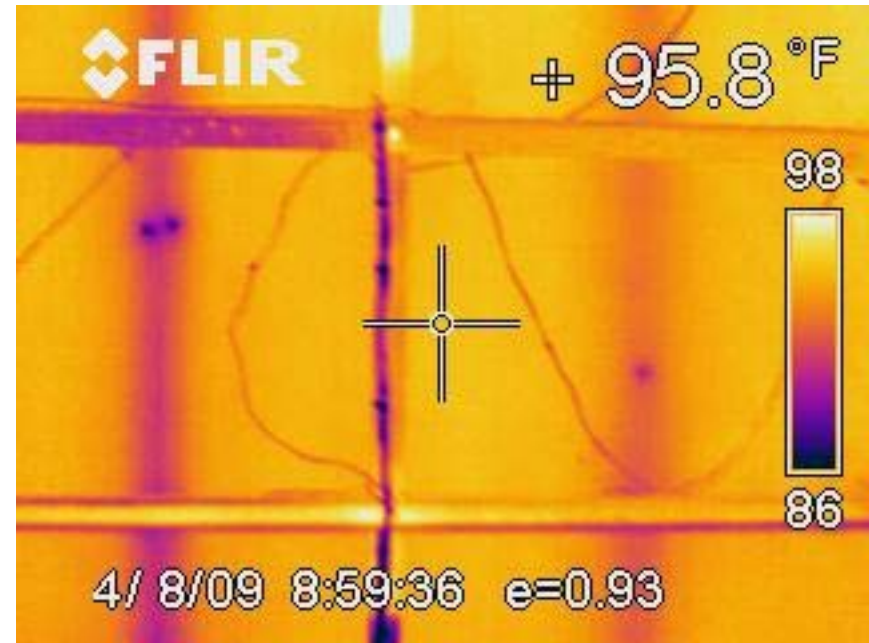


Cold Side

Wall Insulation



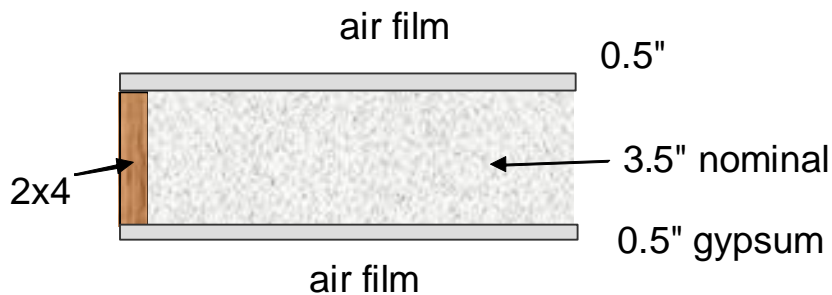
Test Sample, Face Stapled Batt



IR Photo of Test Wall

Perfect Installation

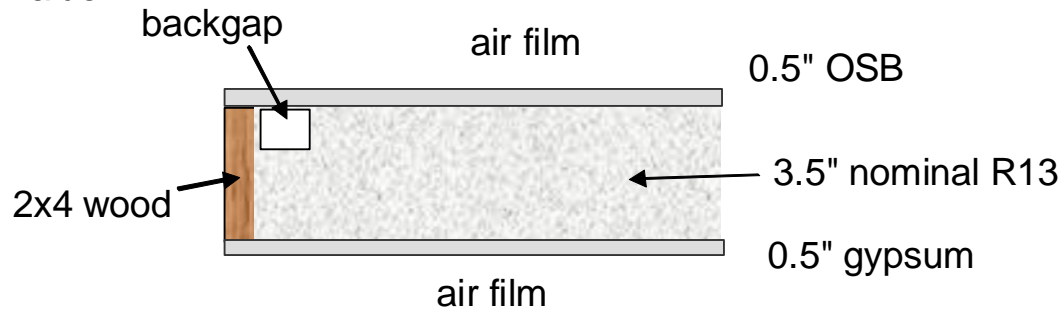
Framing Area	R-value	Insulation Area	R-value
air film, still air	0.17	air film, still air	0.17
7/16" OSB	0.55	7/16" OSB	0.55
no insulation		3.5" insulation	12.7
wooden 2x4	4.38	no stud	
0.5" drywall	0.45	0.5" drywall	0.45
air film, still air	0.68	air film, still air	0.68
TOTAL R-value	6.23	TOTAL R-value	14.55
U-factor	0.1605	U-factor	0.0687
Portion of Area	14%		86%
U*Area	0.02251	U*Area	0.05909
Sum of U*Area	0.08160		
Overall R-value	12.25		



Measured Result:
R = 12.28

Installation with Back Gaps

Framing Area	R-value	Insulation Area	R-value	Gap Area	R-value
air film, still air	0.17	air film, still air	0.17	air film, still air	0.17
7/16" OSB	0.55	7/16" OSB	0.55	7/16" OSB	0.55
wooden 2x4	4.38	3.5" insulation	12.7	3" insulation	10.9
0.5" drywall	0.45	0.5" drywall	0.45	Air gap	0.9
air film, still air	0.68	air film, still air	0.68	0.5" drywall	0.45
TOTAL R-value	6.23	TOTAL R-value	14.55	air film, still air	0.68
U-factor	0.1605	U-factor	0.0687	TOTAL R-value	13.6357
				U-factor	0.0733
Portion of Area	14%		80%		6%
U*Area	0.02251	U*Area	0.05465	U*Area	0.00474
Sum of U*Area	0.08190				
Overall R-value	12.21				



Measured Result
R = 12.39

Wall Insulation



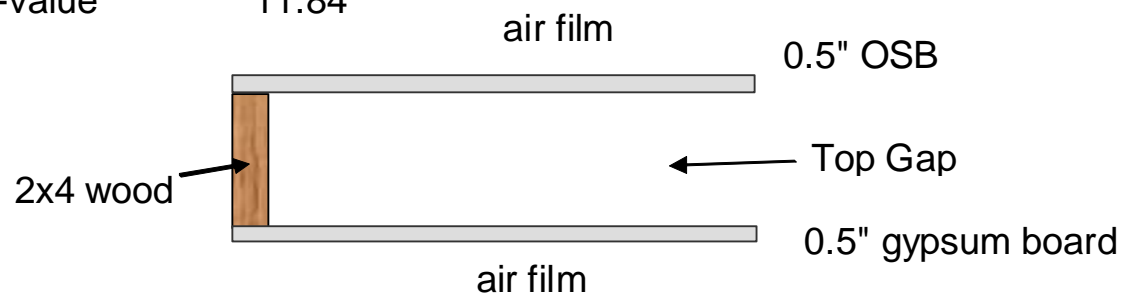
Test Sample, Inset Stapled Batt



IR Photo of Test Wall

Installation with Top Gap

Framing Area	R-value	Insulation Area	R-value	Gap Area	R-value
air film, still air	0.17	air film, still air	0.17	air film, still air	0.17
7/16" OSB	0.55	7/16" OSB	0.55	7/16" OSB	0.55
		3.5" insulation	12.7		
wooden 2x4	4.38			air gap, still air	1
0.5" drywall	0.45	0.5" drywall	0.45	0.5" drywall	0.45
air film, still air	0.68	air film, still air	0.68	air film, still air	0.68
TOTAL R-value	6.23	TOTAL R-value	14.55	TOTAL R-value	2.85
U-factor	0.1605	U-factor	0.0687	U-factor	0.3509
Portion of Area	14%		85%		1%
U*Area	0.02251	U*Area	0.05840	U*Area	0.00353
Sum of U*Area	0.08444				
Overall R-value	11.84				



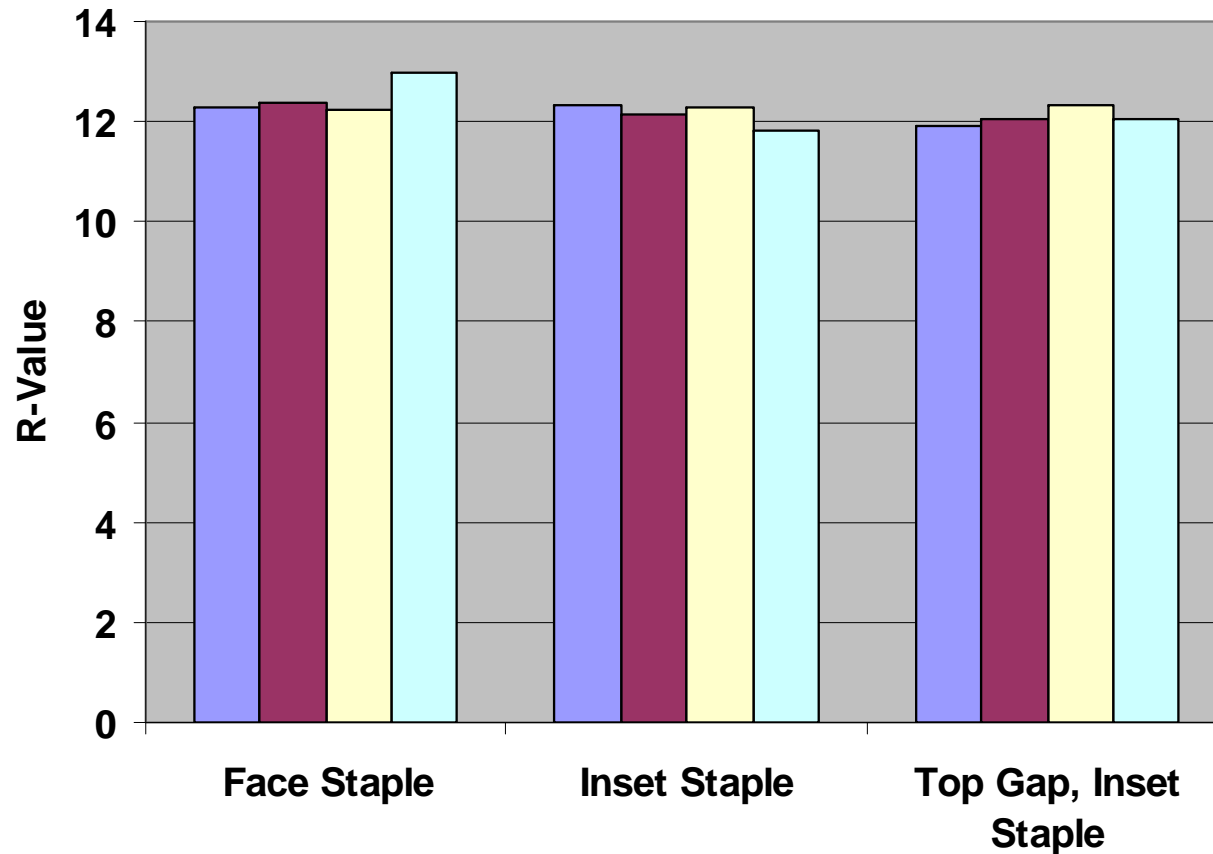
Measured Result
R = 11.94

Overall R-Value of Wall with Different Installation Methods for Batts

Wall: 2x4 wood stud 16" oc, housewrap, OSB sheathing, kraft faced R13 Batt, gypsum wallboard

October 16, 2009 Johns Manville

All measured differences are insignificant as they are smaller than the error of the test method.



■ No Back Gaps, 75F Mean Temp. ■ Back Gaps, 75F Mean Temp. □ No Back Gaps, 50F Mean Temp. □ Back Gaps, 50F Mean Temp.

All differences are insignificant

Conclusions

- Inset stapling, back gaps, and top gaps have an insignificant impact on the overall R-value of an air sealed wall
- Measured wall system performance compares well with predictions from ASHRAE handbook
- No convection is indicated from these defects.