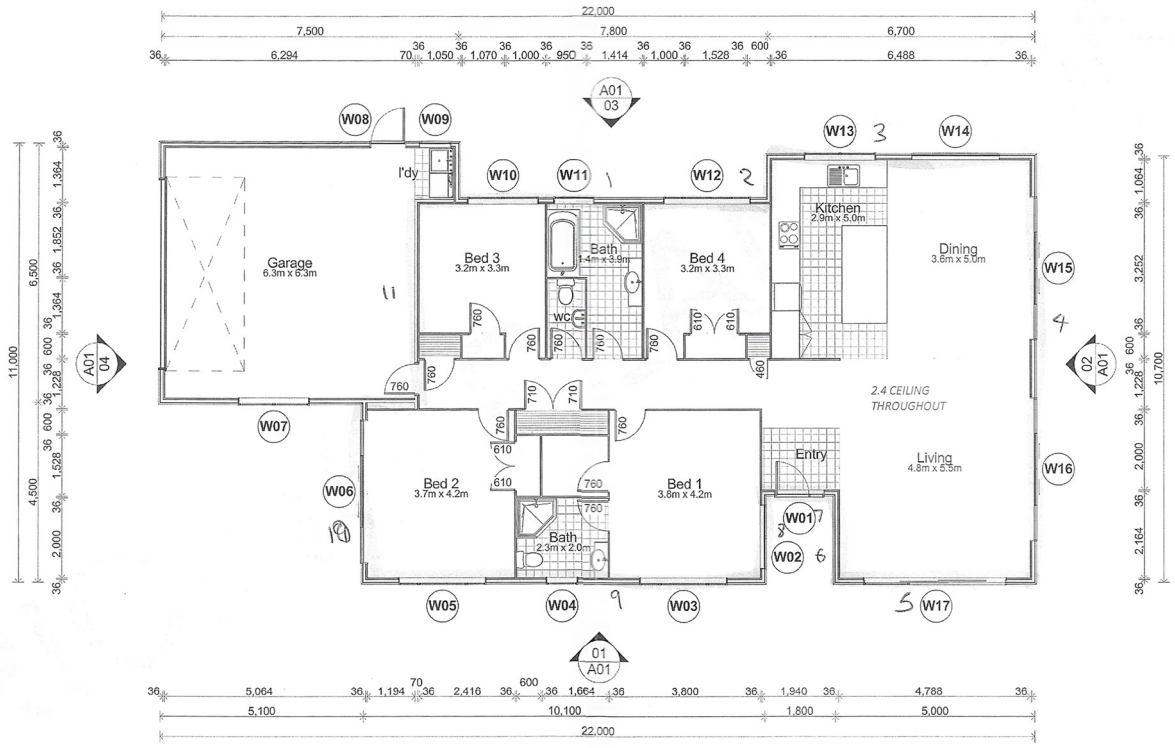
The Research.

NZ Foam set out to get the facts on the costs to insulate a home with different product options available on the New Zealand market. First, we got plans drawn up for a typical new build home with four bedrooms, two bathrooms, and an attached garage by our friends at Fusion Homes.



Then, went to several of our competitors to obtain quotes for the supply and install of their insulation products in to this home.

1
Fibreglass

2
Wool Blend

3
Polyester

4
Glass Wool

Want more details and data? **Contact us** *at any time*

The Results.

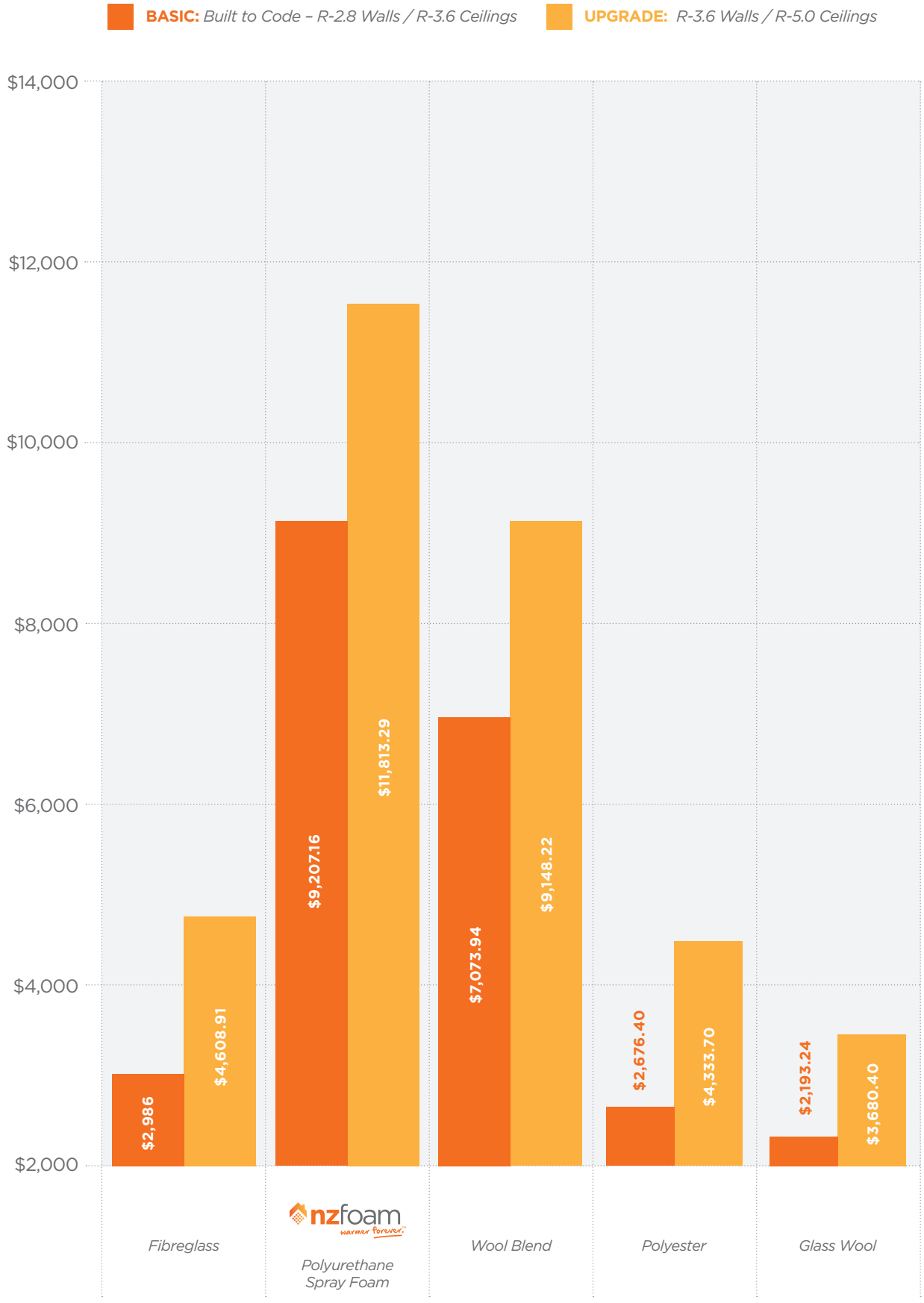
The results were exactly as we expected; our premium offering of Spray Foam insulation was more expensive than our competitors. However, our competitors products will need to be replaced several times throughout the lifetime of the building, and can't offer the same R-Value as our product can.

	BASIC: Built to Code *R-2.8 Walls / R-3.6 Ceilings*	**UPGRADE:** Exceeds Code *R-3.6 Walls / R-5.0 Ceilings*
nzfoam warmer forever™ *Polyurethane Spray Foam*	$9,207.16	$11,813.29
Fibreglass most popular choice in New Zealand & our main competitor	$2,986.00	$4,608.91
Wool Blend	$7,073.94	$9,148.22
Glass Wool	$2,193.24	$3,680.40
Polyester	$2,676.40	$4,333.70

View this data in more detail >

Want more details and data? **Contact us** *at any time*

Price Comparison Graph



Want more details and data? **Contact us** *at any time*

Zooming in on Fibreglass vs. Spray Foam.

There is no denying that Fibreglass insulation has had the majority of the market share for as long as New Zealand has been insulating it's homes. Even though the cost to insulate our model home is significantly less with Fibreglass compared to our Spray Foam; homeowners will find that they're not getting what they're really paying for with Fibreglass; and they may end up spending more money over the lifetime of the building to keep the Fibreglass performing how it should.

Oak Ridge National Laboratory recently underwent a consumer research project to analyse the effectiveness of fibreglass insulation. They wanted to test the performance of the product as it's labelled R-Value vs. it's installed R-Value performance.

Their research concluded that "perfectly installed" Fibreglass lost 11% of their labeled R-Value, and that "commonly installed" Fibreglass lost 28% of their labeled R-value!

So as you can see, the study revealed the surprisingly large disparity between the labeled R-value and the installed R-value of fibreglass. With Spray Foam insulation, the R-Value you choose to install will be the R-Value your house receives upon installation by a certified installer and for the rest of the buildings' life.

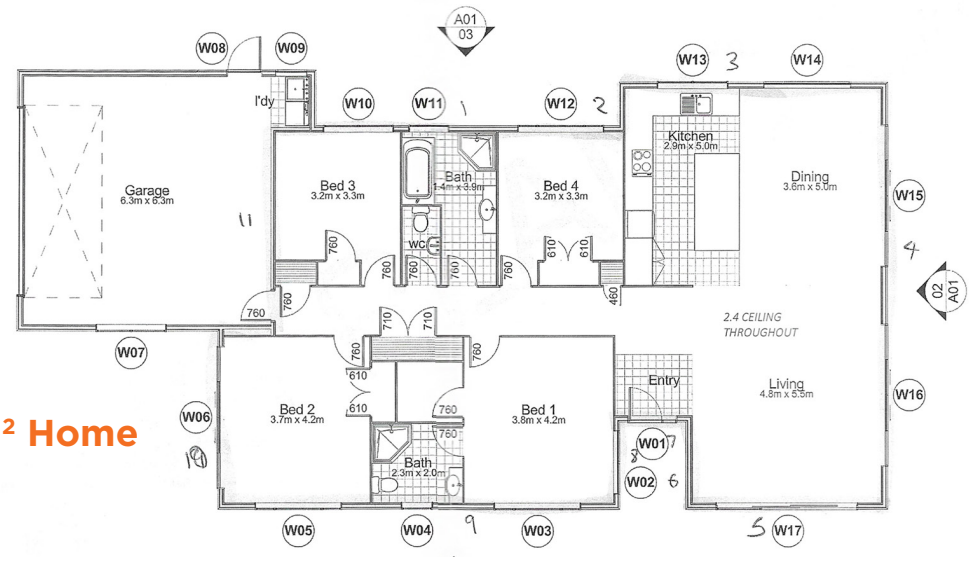
"You can check out the full study at the end of this book - or click here if you're viewing this PDF on your computer!"

- Filmore Foam
NZFoam Mascot

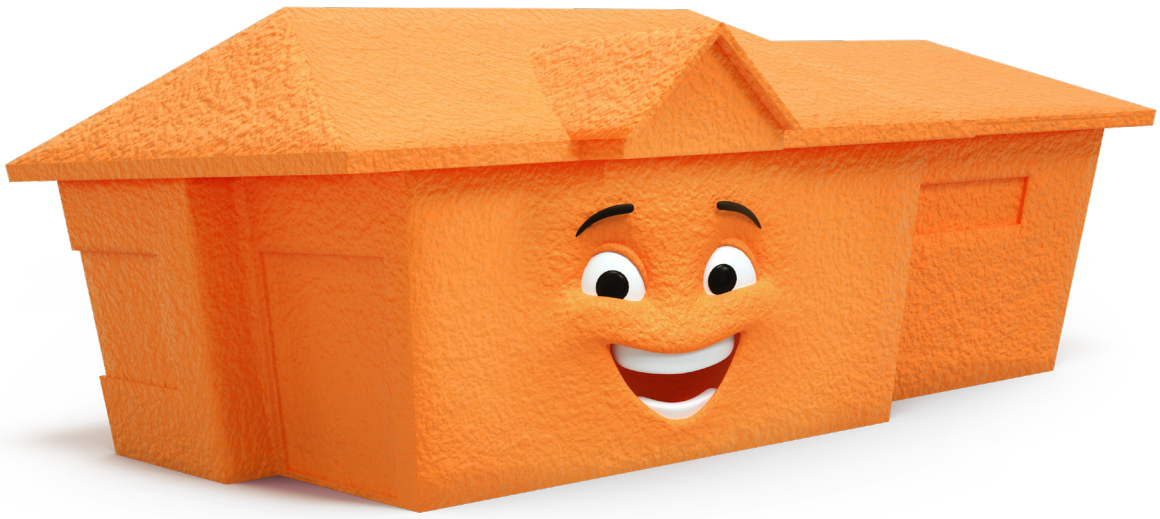
Want more details and data? **Contact us** *at any time*

Zooming in on Wool Blend vs. Spray Foam.

Here are some quick comparisons on Wool Blend vs. Spray Foam based on our costings research for our model home.



202m² Home



COST TO BUILD OUR MODEL HOME:

$434,300

Want more details and data? **Contact us** *at any time*

Zooming in on Wool Blend vs. Spray Foam.

Here are some quick comparisons on Wool Blend vs. Spray Foam based on our costings research for our model home.

SPRAY FOAM
@ 2.8 R-Value
2.1% of total build cost

vs.

WOOL BLEND
@ 2.8 R-Value
1.6% of total build cost

= 0.5% difference

SPRAY FOAM
@ 3.6 R-Value
2.7% of total build cost

vs.

WOOL BLEND
@ 3.6 R-Value
2.1% of total build cost

= 0.6% difference

SPRAY FOAM
@ 3.6 R-Value
2.7% of total build cost

vs.

WOOL BLEND
@ 2.8 R-Value
1.6% of total build cost

= 1.1% difference

Want more details and data? **Contact us** *at any time*

Spray Foam: Case Studies

Here are a couple of case studies of a home and a pre-school where premium Spray Foam insulation was opted for, for the health of the building and the people and children inhabiting them.

An award-winning family home is creating a buzz, simply because of NZ Foam insulation, a product improving the comfort levels and affordability standards for new builds.

NZ Foam is the main reason this consistently warm Christchurch abode, built by Fusion Homes, achieved the Lifestyle Award in the Sustainability category in the Canterbury Master Build Awards 2017. This spray-on insulation has insulation enabled the home to exceed the minimum government R-value requirements.

What is an R value? This is the official measurement of how well insulated walls can resist heat flow. The government minimum recommendation for R Values is 3.6 for ceilings and 2.4 for 90mm walls. The NZ Foam system, in this instance, measured R Values as 5.1 in the ceiling and 3.6 in the walls. There is no need to increase the thickness of the walls to achieve high results. A minimal 70mm layer of foam creates an R Value of 3.13.

Solar panels on the roof were connected to a pay-back system. The benefits are enviable low power bills: $145 in the depths of winter and as low as $25 in summer. The house is in 24/7 use, with an office and a toddler to keep cosy. The family puts away the energy savings each month for their child's future, and solar installation costs will have paid for itself in under six years.

Additionally, even airflow is the key to perfection, which was achieved by using a heat recovery veneration system supplied by Snow Temp. Heating is provided by a Tropicair dual burner.

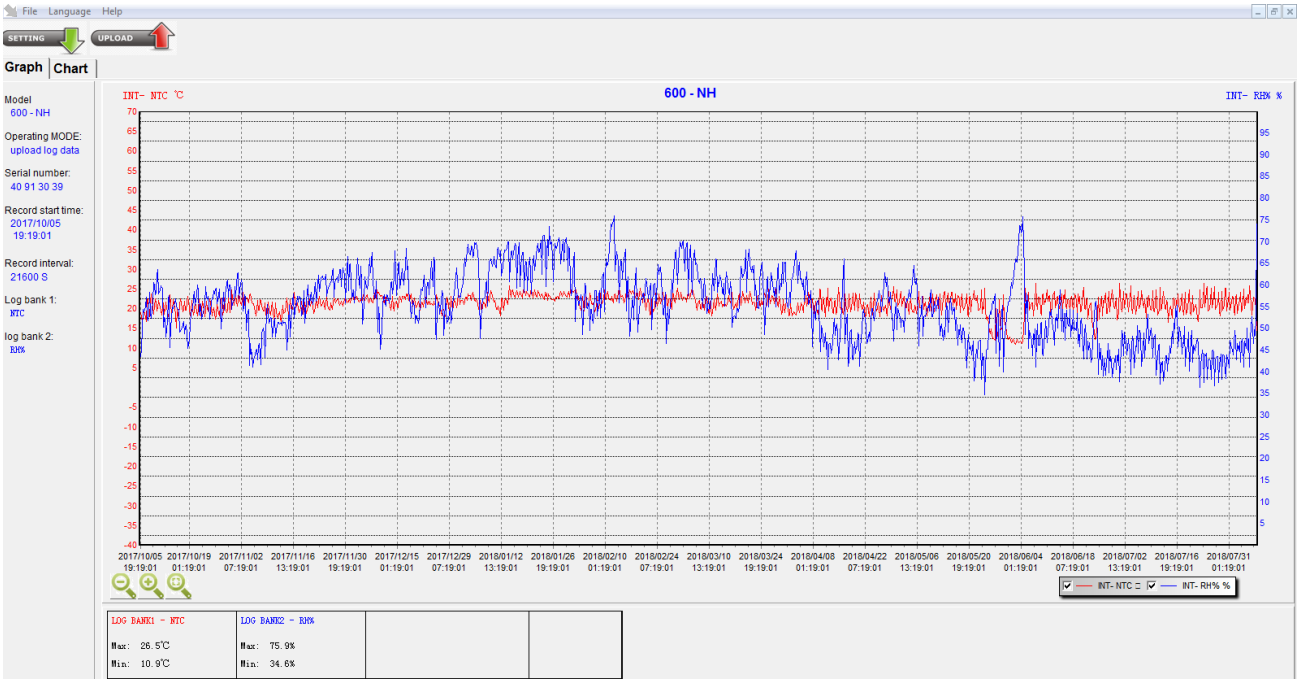
Due to the airtight NZ Foam system in the walls, ceiling and under floor, most days heat loss has been an average of 3.6 degrees overnight. It keeps the warmth in, but during summer months it keeps uncomfortable extremes of heat out.

NZFoam essentially creates the glue to achieve an affordable drier, warmer home.

Temperature taken morning and night - 10/05/2017 to 31/08/2018

Blue in Humidity. Red is temperature.

+



Blower door testing was complete in conjunction with the rest of the testing

Temperature Data taken from Jun 2016 – Nov 2017

Temperatures were taken of the outside and of the inside of the building in the morning and at night. Average loss was 3.6 degrees and average temperature was 22 degrees.

Temperature Data

Evening Temp Data

Year/Month	Ave. Night Temp Inside	Ave. Night Temp Outside	Ave. Night Temp Diff.
2016	22.3	10.4	11.6
Jun	21.7	9.2	12.4
Jul	21.6	7.0	14.5
Aug	23.1	6.6	16.5
Sep	22.8	9.9	11.2
Oct	21.5	11.4	10.1
Nov	22.4	12.8	9.6
Dec	22.7	15.6	7.2
2017	22.1	11.5	10.2
Jan	22.9	15.8	7.1
Feb	23.0	16.6	6.4
Mar	22.6	14.4	8.2
Apr	22.3	12.1	10.2
May	22.6	9.1	13.5
Jun	22.1	7.4	14.7
Jul	21.8	8.5	13.3
Aug	21.0	8.1	12.9
Sep	20.9	10.2	9.6
Oct	21.2	11.7	8.3
Nov	21.9	13.4	7.5
Grand Total	22.1	11.1	10.8

Morning Temp Data

Year/Month	Ave. Morning Temp Inside	Ave. Morning Temp Outside	Ave. Morning Temp Diff.
2016	18.3	8.8	9.4
Jun	16.8	7.8	9.0
Jul	16.3	5.4	10.9
Aug	18.5	4.6	13.4
Sep	18.8	8.8	9.1
Oct	18.3	9.7	8.6
Nov	19.3	11.3	8.0
Dec	20.2	13.7	6.5
2017	18.6	9.6	8.8
Jan	20.6	14.3	6.4
Feb	21.0	14.6	6.4
Mar	19.8	12.7	7.1
Apr	18.9	10.2	8.7
May	17.7	7.2	10.5
Jun	18.1	6.1	12.0
Jul	17.6	4.8	12.8
Aug	17.2	6.4	10.8
Sep	17.7	8.7	8.1
Oct	17.4	9.8	6.6
Nov	18.8	11.4	6.5
Grand Total	18.5	9.3	9.0

Heat Loss

Year/Month	Ave Overnight Heat Loss
2016	3.8
Jun	5.0
Jul	5.1
Aug	5.2
Sep	2.9
Oct	3.2
Nov	3.1
Dec	2.5
2017	3.4
Jan	2.1
Feb	2.2
Mar	2.8
Apr	3.5
May	4.9
Jun	4.0
Jul	4.2
Aug	3.9
Sep	2.9
Oct	3.2
Nov	3.6
Grand Total	3.6

Comments and result from a blower door test

I guess the number you really need to be think about are the Leakage areas. The Canadian EqLA is between 201.4 and 267.6 square centimetres. What that means is that over the whole house you have effective hole of 15cm x 15cm. Assuming that the log burner flue is 150mm and it has a gap of 5-10mm around it you could drop the effective hole size to 13.5cm x 13.5cm. Contrast this to the first test that had and effective hole size of 24cm x 24cm and I think you have done remarkably well (about a 40% decrease)! Remember that the outside surface area of the house is 405 sqm and you have an effective gap of only 0.15sqm.

On average the ACH@50 is 1.75- again this is a great number.

Gary Robertson

EECA energy Assessor

Results of Multi Point Depressurisation Test

BUILDING LEAKAGE TEST

Date of Test: 16/11/2017 Technician: GR
Test File: Depressurisation adj

Customer:

Building Address:
South New Brighton
Christchurch, 8062

Phone:
Fax:

Test Results at 50 Pascals:

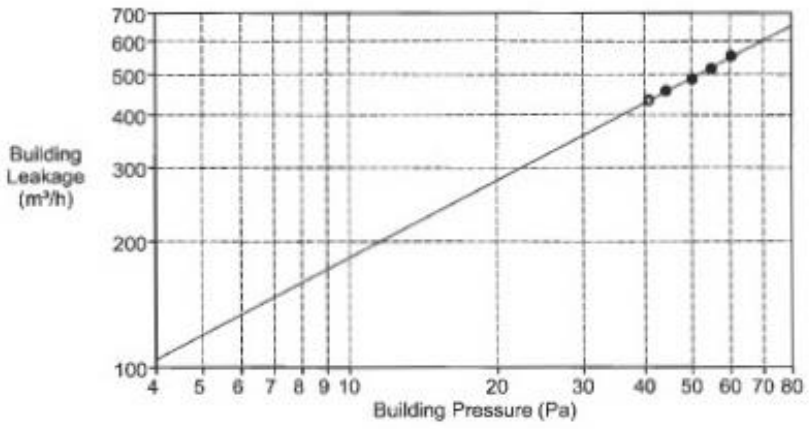
V50: Airflow (m³/h)	490 (+/- 0.4 %)
n50: Air Changes per Hour (1/h)	1.57
w50: m³/(h*m² Floor Area)	3.53
q50: m³/(h*m² Surface Area)	1.21

Leakage Areas: 204.4 cm² (+/- 4.3 %) Canadian EqLA @ 10 Pa or 0.50 cm²/m² Surface Area
112.5 cm² (+/- 6.8 %) LBL ELA @ 4 Pa or 0.28 cm²/m² Surface Area

Building Leakage Curve: Air Flow Coefficient (Cenv) = 44.8 (+/- 10.5 %)
Air Leakage Coefficient (CL) = 44.8 (+/- 10.5 %)
Exponent (n) = 0.612 (+/- 0.027)
Correlation Coefficient = 0.99717

Test Standard: EN 13829 Test Mode: Depressurization
Type of Test Method: A Regulation complied with:
Equipment: Model 3 (230V) Minneapolis Blower Door

Inside Temperature:	20 °C	Volume:	312 m³
Outside Temperature:	20 °C	Surface Area:	405 m²
Barometric Pressure:	101325 Pa	Floor Area:	139 m²
Wind Class:	0 Calm	Uncertainty of Building Dimensions:	3 %
Building Wind Exposure:	Partly Exposed Building	Year of Construction:	2016
Type of Heating:	ULEB/ HP		
Type of Air Conditioning:			
Type of Ventilation:	None		



BUILDING LEAKAGE TEST Page 2

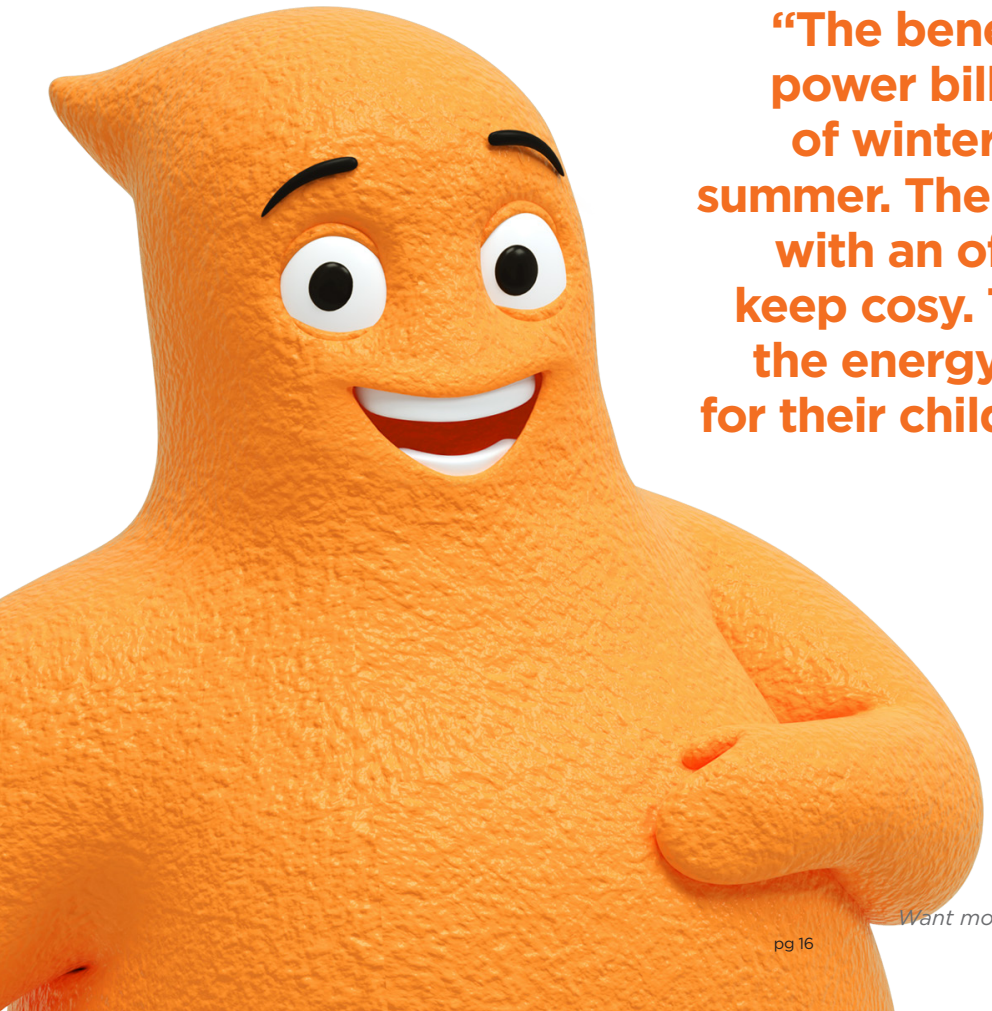
Date of Test: 16/11/2017 Test File: Depressurisation adj

Comments

Data Points: Depressurization - Data Entered Manually

Nominal Building Pressure (Pa)	Fan Pressure (Pa)	Nominal Flow (m³/h)	Temperature Adjusted Flow (m³/h)	% Error	Fan Configuration
0.0	n/a				
-60.2	29.9	553	553	0.7	Ring B
-54.9	25.9	515	515	-0.7	Ring B
-50.1	163.6	487	487	-0.7	Ring C
-44.3	144.7	457	457	0.4	Ring C
-40.8	131.0	434	434	0.3	Ring C
0.0	n/a				

Test 0 Baseline (Pa): p01- = 0.0 p01+ = 0.0 p02- = 0.0 p02+ = 0.0



"The benefits are enviably low power bills: $145 in the depths of winter and as low as $25 in summer. The house is in 24/7 use, with an office and a toddler to keep cosy. The family puts away the energy savings each month for their child's future! What's the health of your family worth to you?"

- Filmore Foam
NZFoam Mascot

Want more details and data? **Contact us** *at any time*

Foam on ceilings

Foam on walls

Fiberglass Batts- Labeled vs. Installed Performance

Consumer Update: Insulation Effectiveness Bulletin

Summary: *Oak Ridge National Laboratory research shows that "perfectly installed" batts lose 11% of their labeled R-Value, and that "commonly installed" fiberglass batts lose 28% of their labeled R-value.*[1]

This study confirms tests conducted 20 years ago by fiberglass manufacturers, and reveals the surprisingly large disparity between the labeled R-value and the installed R-value of fiberglass batts.[2]

"R-19" batts have an R-value of 13.7 when installed as commonly found in actual walls. [9]

Who: Oak Ridge National Laboratory [3]

What Was Measured: The R-value results presented here are the *clear wall R-values*, which Andre Desjarlais of Oak Ridge explains, "includes the studs, top and bottom plates, sheathings and exterior façade… It does not include additional structural components around details such as corners, windows, etc." [4]

"The *clear wall R-value*… represents the area of the wall containing insulation and only the necessary structural member away from all interface details." [5]

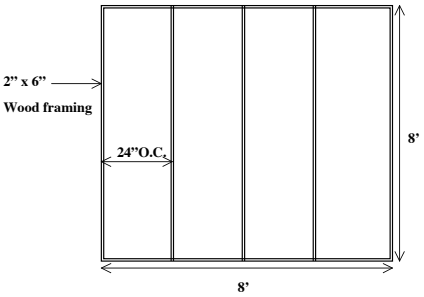


Figure 1 – Full size 8' x 8' wall sections were built using 2 x 6 wood framing 24" o.c. (Note that 89% of the surface area of the wall is insulated with "R-19" labeled batts and just 11% is wood framing.)

Why: "To address the number one wall research need…whole wall performance was ranked by 270 private building industry contributors as the most important public sector R&D need to accelerate the development and application of energy-efficient building walls." [6]

How: Full-size walls were constructed and tested to determine their thermal conductivity. [7]

What Did They Find: The highest tested R-value for "R-19" labeled batts was R-17.4 for batts before they were installed. From there, the test results dropped to R-17 and then R-13.7 [8]

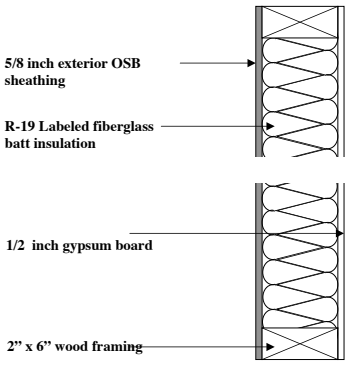


Figure 2 – The 2" x 6" wood framed wall was insulated with "R-19" labeled fiberglass batts and enclosed with 5/8 inch exterior OSB sheathing and 1/2 inch gypsum board.

Labeled vs. Installed Performance - *Explained*

Q: Did an independent laboratory conduct the tests? Who funded the tests?

A: Oak Ridge National Laboratory conducted the research. Oak Ridge is completely independent and funded by the US Department of Energy. [10]

Q: Why were the tests conducted?

A: According to Oak Ridge, builders, architects, designers, and homeowners want energy-efficient walls. The best way to determine how insulation systems perform is to build and test full-size walls. [11]

Q: Can't R-values be used to compare insulation systems?

A: R-values are a good starting point – but they are the results of small, meticulously prepared laboratory samples and do not necessarily reveal how an insulation system performs once installed in actual buildings. Different insulation systems with the same laboratory "R-value" can deliver much different levels of comfort and energy efficiency. [12]

Q: What did the researchers find?

A: The researchers found that fiberglass batts deliver far less than their labeled R-value in real walls, as shown in Figures 3 and 4. [13]

Q: Where does the R-value go?

A: Technically, the "R-value" doesn't change because it is based on specific laboratory test claims by the fiberglass manufacturers. However, the Oak Ridge research reveals the following:

- "R-19" labeled fiberglass batts have an R-value of 17.4 *before they are installed.* [14]
- "R-19" fiberglass batts have an R-value of 17.0 when installed *perfectly* (the scientists installed the batts before installing the exterior sheathing to precisely fit the batts in place from both sides). [15]
- "R-19" fiberglass batts have an R-value of 13.7 when installed as commonly found in actual walls. [16]

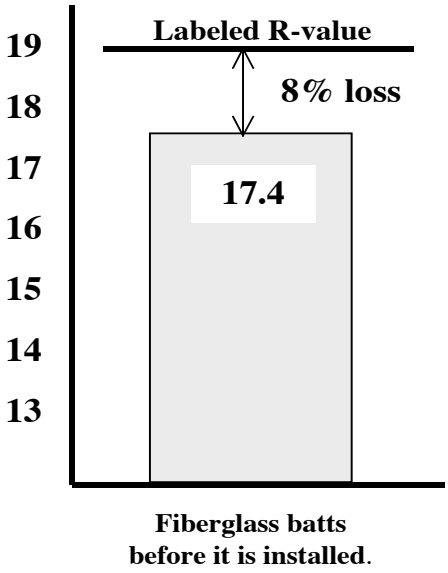


Figure 3 – Before any of the installation tests were begun, the fiberglass batts were tested and found to provide R-17.4

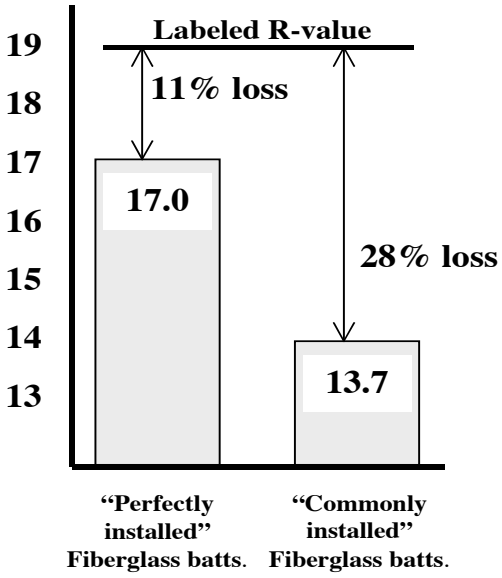


Figure 4 – Taking the framing, OSB, and gypsum board into account, the R-19 fiberglass batt insulation provided much less than its labeled R-value

Sources:
[1] J.E. Christian, J. Kosny, A.O. Desjarlasi, and P.w. Childs, "The Whole Wall Thermal Performance Calculator –On the Net", Thermal Performance of the Exterior Envelopes of Buildings VII, 1998.
[2] R.M. Neisel, "A Study of the Effects of Insulation Gaps on Building Heat Losses, Final Report," Johns-Manville Sales Corp, 1979
[3] Christian, et al.
[4] "Wall R-Values", Personal Correspondence, 2000
[5-9] Christian, et al.
[10] D.W. Yarbrough, Telephone Conversation, 2000.
[11] Christian, et al.
[12] Yarbrough
[13-16] Christian, et al.
Source for Figures 1-4: Christian, et al.