



**BEST PRACTICE GUIDE – (WALL AND CEILING INSULATION AND ROOF VENTILATION)**

**June 19th 2019**

Each part of an *external wall* in *climate zone 5* with a *Wall Surface Density less than 220 kg/m<sup>2</sup>* must—

- OPTION A: achieve a minimum **Total R-Value** of **2.8**; or
- OPTION B: achieve a minimum **Total R-Value** of **2.4**; and
  - Shade the *external wall* of the storey with a verandah, balcony, eaves, carport or the like, which projects at a minimum angle of 15 degrees. **All roof pitches governed by AS1684 comply.**

**OPTION B:** Each part of an *external wall* in *climate zone 5* with a *Wall Surface Density greater than or equal 220 kg/m<sup>2</sup>* (*Double Brick Cavity/Masonry construction*) must—

- shade the wall with a verandah, balcony, eaves, carport or the like that projects at a minimum angle of 15 degrees. **Only a Metal roof with pitch 23.75° or less/Tiled roof with pitch 25.63° or less with 3 Brick course Drop off eaves Comply.**
- incorporate insulation with an *R-Value* of greater than or equal to 0.5;
- have external *glazing* that complies with 3.12.2.1 with the applicable value for CSHGC in Table 3.12.2.1e reduced by 15%; and have a concrete slab floor.

*Information obtained from: NCC 2019 Volume 2 – Part 3.12.1.4 Energy Efficiency*

- **BRICK VENEER (BEST PRACTICE)**
  - o Kingspan Kooltherm K12 Framing Board Insulation) – 40mm Thick Board - (**Summer Heat Flow in** R-Value: **3.6** – **Winter Heat flow out** R-Value: **3.9**)
- **DOUBLE BRICK CAVITY (BEST PRACTICE)**
  - o Kingspan Kooltherm K8 Cavity Board – 40mm Thick Board - (**Summer Heat Flow in** R-Value: **3.1** – **Winter Heat flow out** R-Value: **3.2**)
- **CLADDED WALL WITH COUNTER CAVITY BATTEN (BEST PRACTICE)**
  - o Kingspan Kooltherm K12 Framing Board Insulation) – 40mm Thick Board - (**Summer Heat Flow in** R-Value: **3.5** – **Winter Heat flow out** R-Value: **3.7**)
- **INSULATION USED AS CLADDING SUBSTRATE (BuildItEco Thermawall Including double sided reflective Sarking (Direct Fix)**
  - o 100mm Thick Orange Board - (**Summer Heat Flow in** R-Value: **3.25** – **Winter Heat flow out** R-Value: **3.41**)
- **INSULATION USED AS CLADDING SUBSTRATE (BuildItEco Thermawall Including double sided reflective Sarking (Batten Cavity Fix – BEST PRACTICE)**
  - o 100mm Thick Orange Board - (**Summer Heat Flow in** R-Value: **3.41** – **Winter Heat flow out** R-Value: **3.57**)

**Best Practice Note:** Paying special attention to air sealing the building envelope is crucial in ensuring your home maintains a healthy indoor air quality, and greatly improves the overall total R-Value of your insulation system. When deciding which insulation option to choose (Budget or Best Practice), the U factors of glazing and its framing needs to be considered, as up to 40% of a home's heating energy can be lost and up to 87% of its heat gained through windows.

## INSULATION – ROOF & CEILINGS

Direction of heat flow	Upper surface solar absorptance value	Minimum Total R-Value
Up	≤ 0.4	4.1
Up	> 0.4 but ≤ 0.6	4.6
Up	> 0.6	5.1

**Refer to Link Below for Common colorbond color Solar Absorptance value:**  
<http://www.steel.com.au/products/coated-steel/colorbond-steel/basix-and-bca-classification>

Percentage of ceiling area uninsulated	Minimum R-Value of ceiling insulation required to satisfy table above										
	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
	Adjusted minimum R-Value of ceiling insulation required to compensate for loss of ceiling insulation area										
0.5% to less than 1.0%	1	1.6	2.2	2.8	3.4	4	4.7	5.4	6.2	6.9	X
1.0% to less than 1.5%	1.1	1.7	2.3	2.9	3.6	4.4	5.2	6.1	7	X	X
1.5% to less than 2.0%	1.1	1.7	2.4	3.1	3.9	4.8	5.8	6.8	X	X	X
2.0% to less than 2.5%	1.1	1.8	2.5	3.3	4.2	5.3	6.5	X	X	X	X
2.5% to less than 3.0%	1.2	1.9	2.6	3.6	4.6	5.9	X	X	X	X	X
3.0% to less than 4.0%	1.2	2	3	4.2	5.7	X	X	X	X	X	X
4.0% to less than 5.0%	1.3	2.2	3.4	5	X	X	X	X	X	X	X
5.0% or more	X	X	X	X	X	X	X	X	X	X	X

*Note: When considering the reduction of insulation because of exhaust fans, flues or recessed downlights, 0.5% of the ceiling area for a 200 m<sup>2</sup> house would permit 2 bathroom heater-light assemblies, a laundry exhaust fan, a kitchen exhaust fan and either approximately 20 recessed downlights with 50 mm clearance to insulation, 10 recessed downlights with 100 mm clearance to insulation or only 3 recessed downlights with 200 mm clearance to insulation.*

### 300m2 Area Ceiling Insulation R Value and Cost comparison - Supply

Bradford Ceiling Insulation	R-Value	Thickness	Price
Bradford Black Ceiling Insulation Batts – (Asthma or Allergy Sufferers)	4.1	205	\$ 2,700.00
Bradford™ Polymax Polyester Thermal Ceiling Insulation Batts	4	220	\$ 5,100.00
Bradford Gold™ Ceiling Insulation Batts	4	210	\$ 2,263.20
Bradford Gold™ Hi-Performance Acoustic Ceiling Insulation	5	240	\$ 3,245.25
Bradford Gold™ Hi-Performance Acoustic Ceiling Insulation	6	260	\$ 4,026.00

#### - TILED ROOF

- Sarking – Bradford thermoseal roof tile plus – Single sided Reflective
- Ceiling - Bradford Gold™ Hi-Performance Acoustic Ceiling Glasswool Batt Insulation – R6.0

**Bradford Ceiling insulation Manufacturers instruction Notes:** Insulation must not be installed in contact with downlights recessed into ceilings. To meet AS3999 in Australian homes a clearance of 50mm must be provided around the perimeter of the fitting to help heat dissipation, however the clearance should be as close to 50mm as possible to ensure maximum insulation performance.

Note: Ventilated Roof space with Single sided foil and R6.0 Batts achieves R-7.1 **Winter Heat Flow Out** and R-7.6 **Summer Heat Flow In**. As the above tables 3.12.1.1e and 3.12.1.2 show, the minimum required R Value in Perth climate zone based on Solar Absorptance of most common roof tiles being >0.6 is 5.1. To allow for a percentage of ceiling area uninsulated due to exhaust fans, flues and recessed downlights, the required roof system R-Value is increased to a minimum of R-6.34.

- In a truss roofed system where there are no ceiling support members compressing insulation, and where insulation installers have maintained minimum clearances around ceiling penetrations, this R-Value is achievable in theory. This doesn't take into account the reduction in batt size at external wall plates to allow manufacturers requirement of a 20mm minimum air gap between insulation and sarking membrane or roof material.

- In a stick roof frame system (Most common in Perth), the insulation is compressed underneath ceiling support beams and roof support beams, therefore reducing the total R-Value by greater than a further 0.5-1.0%.

- **METAL ROOF**

- Sarking - Bradford Anticon™ Roofing Insulation Blanket – Medium Duty Foil – Anticon 60 – R1.3 (60mm Batt. Used In conjunction with 40/45mm Roof batten)
- Ceiling - Bradford Gold™ Hi-Performance Acoustic Ceiling Glasswool Batt Insulation – R6.0

Note: Ventilated Roof space with Bradford Anticon™ Roofing Insulation Blanket R1.3 and R6.0 Batts achieves R-8.2 **Winter Heat Flow Out** and R-8.6 **Summer Heat Flow In**. As the above tables 3.12.1.1e and 3.12.1.2 show, the minimum required R Value in Perth climate zone based on Solar Absorptance of various colorbond colours varies between **R4.1 for a SA of  $\leq 0.4$**  (eg. Classic Cream, Surfemist), **R4.6 for a SA of  $> 0.4$  but  $\leq 0.6$**  (eg. Paperbark, Evening Haze, Shale Grey) and **R5.1 for a SA  $> 0.6$**  (eg. Jasper, Woodland Grey, Monument). To allow for a percentage of ceiling area uninsulated due to exhaust fans, flues and recessed downlights, the required roof system R-Value is increased to a minimum of R-4.84, R-5.5 and R-6.34 respectively.

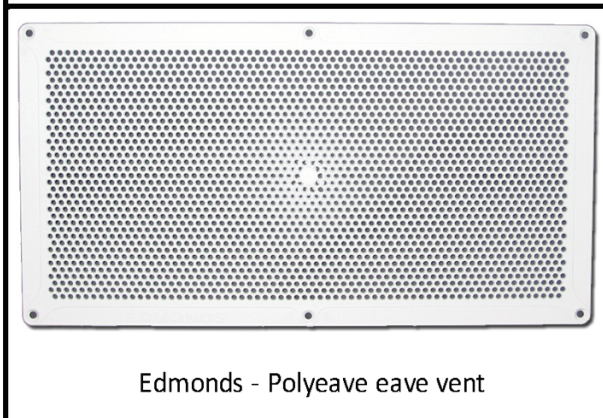
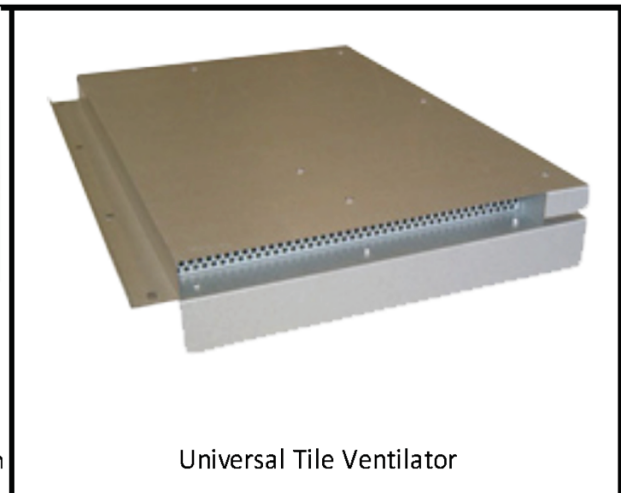
- In a truss roofed system where there are no ceiling support members compressing insulation, and where insulation installers have maintained minimum clearances around ceiling penetrations, this R-Value is achievable in theory. This doesn't take into account the reduction in batt size at external wall plates to allow manufacturers requirement of a 20mm minimum air gap between insulation and sarking membrane or roof material.

- In a stick roof frame system (Most common in Perth), the insulation is compressed underneath ceiling support beams and roof support beams, therefore reducing the total R-Value by greater than a further 0.5-1.0%.

*Best Practice Note: It is clear based on comparing the R-Values of Metal Roof sheeting vs Tiled roofs, that is much more likely to achieve required R-Value of NCC 2019 utilising a metal roof system as per below example:*

- *Surfmist colorbond roof sheeting (Upper surface solar absorptance value 0.32)*
- *Bradford Anticon™ Roofing Insulation Blanket – Medium Duty Foil – Anticon 60 – R1.3*
- *Bradford Gold™ Hi-Performance Acoustic Ceiling Glasswool Batt Insulation – R6.0*
- *Roof ventilation - totalling a min 0.14m<sup>2</sup> throat areas whilst having not less than 0.2% of ceiling plan area as open inlet air passage.*
- *In a trussed roof as per above with no ceiling framing members compressing insulation batts, glasswool batts can be substituted with batts with an R-Value of 4.0.*

- Metal Roof - Ridge Vent – Stratco 1200mm Exhale Ventrledge (1x1200mm Exhale Ventrledge per 100m<sup>2</sup> min. ceiling area)
- Tiled Roof – Universal Tile Ventilator (4 vents for a small house up to 112 sqm, 6 vents from 112 sqm up to 170 sqm, 8 vents for above 170-260 sqm plus for larger houses.)
- Eave vent – Edmonds Polyeave vent or Metal Eave Vent (for use in bushfire zones up to BAL 40) - aggregate fixed open area of not less than 0.2% of the ceiling area required (0.6m<sup>2</sup> for 300m<sup>2</sup> ceiling area)
  - o Polyeave opening area approx: 0.034m<sup>2</sup>
  - o Metal Eave Vent opening area approx: 0.054m<sup>2</sup>



**BATT INSULATION AND WALL WRAPS**

**WALL WRAP - 150m2**

WALL BATT INSULATION - 135m2	WALL ASSEMBLY TYPE	BATT R-VALUE	PRICE	Kingspan AIR-CELL Permivac XV			Kingspan AIR-CELL Permishield 65			Bradford THERMOSEAL WALL WRAP XP			BRADFORD ENVIROSEAL PROCTORWRAP		
				HEAT FLOW OUT	HEAT FLOW IN	TOTAL PRICE	HEAT FLOW OUT	HEAT FLOW IN	TOTAL PRICE	HEAT FLOW OUT	HEAT FLOW IN	TOTAL PRICE	HEAT FLOW OUT	HEAT FLOW IN	TOTAL PRICE
Bradford™ Polymax Wall Insulation Batts	Brick Veneer Wall	1.5	\$ 804.00	2.72	2.52	\$ 2,398.50	2.72	2.12	\$ 2,556.45	2.52	2.32	\$ 1,123.22	2.02	1.82	\$ 1,248.40
	Cladded Wall With Counter Batten			x	x		2.52	2.32		2.42	2.12		1.82	1.62	
	Brick Veneer Wall	2	\$ 1,200.00	3.32	3.02	\$ 2,794.50	3.32	3.02	\$ 2,952.45	3.12	2.82	\$ 1,200.00	2.52	2.32	\$ 1,644.40
	Cladded Wall With Counter Batten			x	x		3.02	2.82		2.92	2.62		2.32	2.12	
Bradford Gold Batts Wall Insulation	Brick Veneer Wall	2.5	\$ 2,376.00	3.82	3.42	\$ 3,970.50	3.82	3.42	\$ 4,128.45	3.62	3.32	\$ 2,695.22	3.02	2.82	\$ 2,820.40
	Cladded Wall With Counter Batten			x	x		3.42	3.22		3.42	3.12		2.82	2.62	
	Brick Veneer Wall	1.5	\$ 503.40	2.72	2.52	\$ 2,097.90	2.72	2.12	\$ 2,255.85	2.52	2.32	\$ 822.62	2.02	1.82	\$ 947.80
	Cladded Wall With Counter Batten			x	x		2.52	2.32		2.42	2.12		1.82	1.62	
Bradford Gold Batts Hi-Performance Wall Insulation	Brick Veneer Wall	2	\$ 936.36	3.32	3.02	\$ 2,530.86	3.32	3.02	\$ 2,688.81	3.12	2.82	\$ 1,255.58	2.52	2.32	\$ 1,380.76
	Cladded Wall With Counter Batten			x	x		3.02	2.82		2.92	2.62		2.32	2.12	
	Brick Veneer Wall	2.5	\$ 1,105.38	3.82	3.42	\$ 2,699.88	3.82	3.42	\$ 2,857.83	3.62	3.32	\$ 1,424.60	3.02	2.82	\$ 1,549.78
	Cladded Wall With Counter Batten			x	x		3.42	3.22		3.42	3.12		2.82	2.62	
Bradford Gold Batts Hi-Performance Wall Insulation	Brick Veneer Wall	2.7	\$ 2,139.77	4.02	3.62	\$ 3,734.27	4.02	3.62	\$ 3,892.22	3.92	3.52	\$ 2,458.99	3.22	2.92	\$ 2,584.17
	Cladded Wall With Counter Batten			x	x		3.62	3.42		3.62	3.42		3.12	2.82	
<b>Price:</b>				\$		1,594.50	\$		1,752.45	\$		319.22	\$		444.40

**Sources:** - ICANZ: Insulation Handbook - Part 1: Thermal Performance - Version 3  
 (Total R-value calculations for typical building applications)  
 - Kingspan AIR-CELL  
 - CSR Bradford

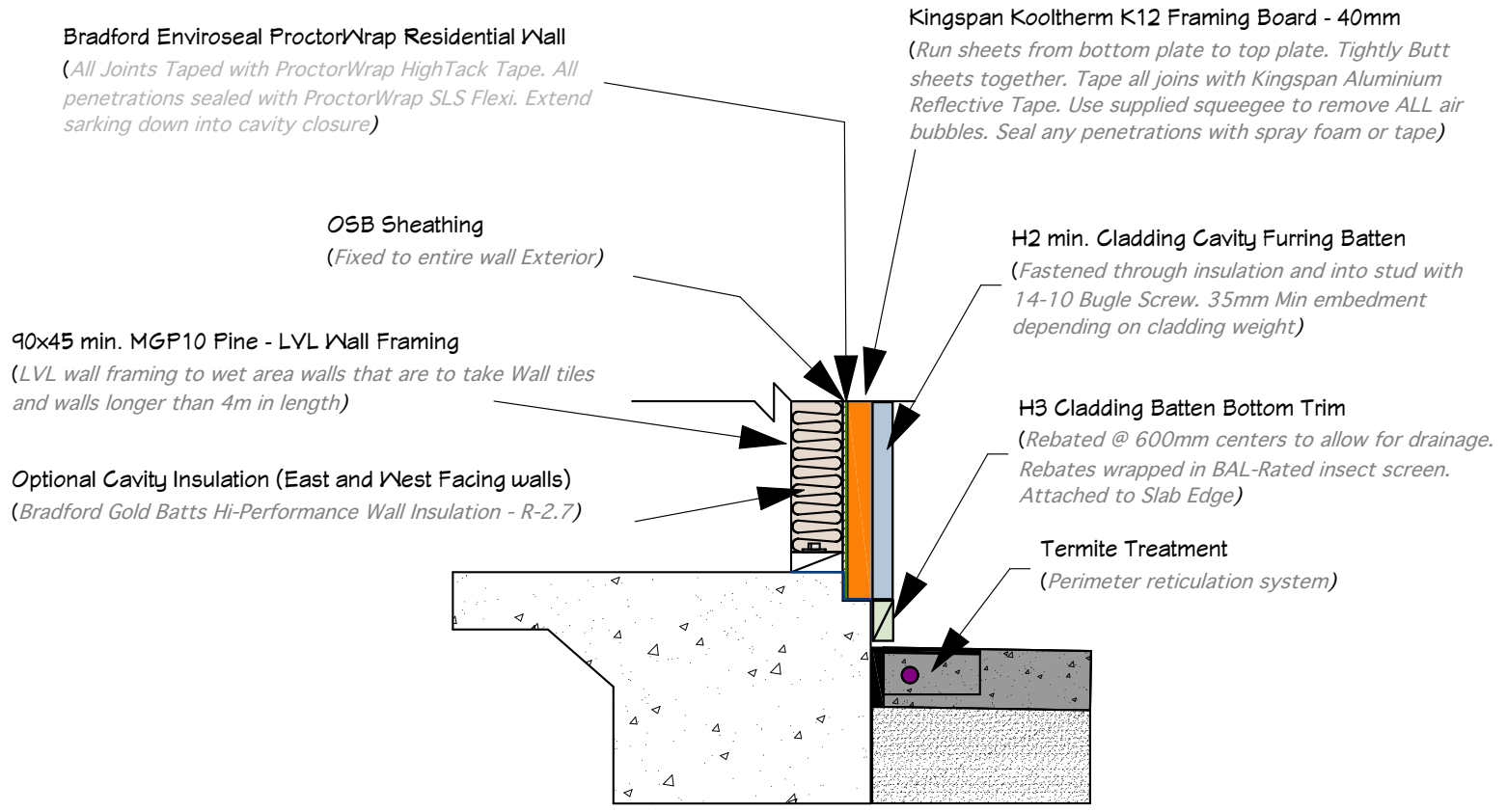
**Note:** R Values for wall assemblies don't take into account 10-12% of wall area not insulated due to framing members.

EXTERIOR/CAVITY INSULATION - 150m2								
WALL ASSEMBLY TYPE	Thickness	R Value		Price	Brick Veneer	Cladding	Double Brick	
		HEAT FLOW OUT	HEAT FLOW IN					
Kingspan Kooltherm K8 Cavity Board	Double Brick Cavity	25	2.5	2.3	\$ 5,837.78	N	N	Y
	Double Brick Cavity	40	3.2	3.1	\$ 7,470.75	N	N	Y
Kingspan Kooltherm K12 Framing Board Insulation	Brick Veneer Wall	25	3.1	2.9	\$ 4,525.00	Y	Y	N
	Cladded Wall With Counter Batten		3	2.8				
	Brick Veneer Wall	30	3.3	3.1	\$ 5,610.00	Y	Y	N
	Cladded Wall With Counter Batten		3.2	3				
	Brick Veneer Wall	40	3.9	3.6	\$ 5,824.00	Y	Y	N
	Cladded Wall With Counter Batten		3.7	3.5				
Foilboard® Green Rigid Insulation Panels	Brick Veneer Wall	10	2.3	2	\$ 1,614.08	Y	Y	Y
	Cladded Wall With Counter Batten		2.1	1.8				
	Double Brick Cavity	15	1.8	1.6	\$ 1,992.12	Y	Y	Y
	Brick Veneer Wall		2.4	2.1				
	Cladded Wall With Counter Batten	20	2.2	2	\$ 2,440.36	Y	Y	Y
	Double Brick Cavity		1.9	1.8				
	Brick Veneer Wall	25	2.5	2.3	\$ 2,918.76	Y	Y	Y
	Cladded Wall With Counter Batten		2.3	2.1				
	Double Brick Cavity	30	2	1.9	\$ 3,389.88	Y	Y	Y
	Brick Veneer Wall		2.7	2.4				
	Cladded Wall With Counter Batten	25	2.5	2.2	\$ 2,918.76	Y	Y	Y
	Double Brick Cavity		2.1	2				
	Brick Veneer Wall	30	2.9	2.6	\$ 3,389.88	Y	Y	Y
	Cladded Wall With Counter Batten		2.7	2.4				
	Double Brick Cavity	6.5	2.2	2.2	\$ 1,594.50	Y	N	Y
	Brick Veneer Wall		1.9	1.7				
Kingspan AIR-CELL Permicav XV	Double Brick Cavity	75	2	1.8	\$ 2,974.22	N	Y	N
	Direct Fix		2.74	2.61				
	Batten Cavity Fix EIFS - 25mm	100	2.91	2.77	\$ 3,728.72	N	Y	N
	Direct Fix		3.41	3.25				
BuilditEco RMAX ThermaWall Including Double sided Reflectice Sarking	Batten Cavity Fix EIFS - 25mm	100	3.57	3.41	\$ 4,483.22	N	Y	N

**Sources:** · ICANZ: Insulation Handbook - Part 1: Thermal Performance - Version 3 (Total R-value calculations for typical building applications)  
· Kingspan AIR-CELL  
· CSR Bradford

**Note:** True R Values - assuming installed correctly as per Manufacturers Specifications.





## Apollo Improvements - Exterior Wall Insulation Best Practice

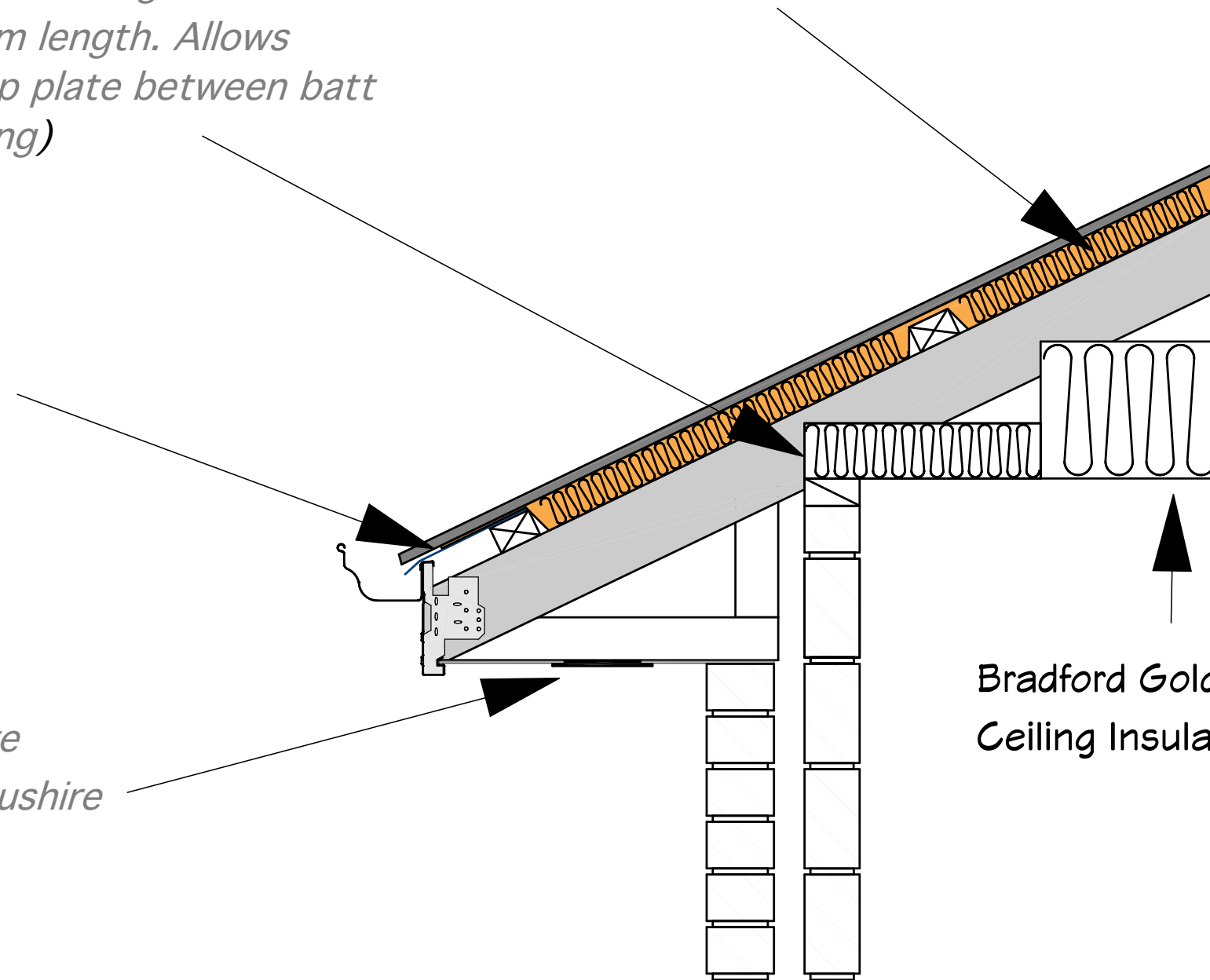
(Timber framed wall. Exterior cladding omitted for clarity.)

Bradford Gold Batts Hi-Performance Wall  
Insulation - 90mm R 2.7 (Full length 1160mm  
Batt cut into 3x386mm length. Allows  
20mm clearance at top plate between batt  
and underside of sarking)

Bradford Anticon (Installed as per Anticon  
Roofing Blanket Installation guide for  
residential class 1)

Bradford Thermoseal  
(300mm strip run from edge  
of fascia to first batten.  
Anticon lapped on sarking  
minimum 50mm from fascia  
edge. )

Eave Vent (Edmonds Polyeave  
vent or Metal Eave Vent for bushire  
zones up to BAL 40)



Bradford Gold™ Hi-Performance Acoustic  
Ceiling Insulation - 260mm - R6.0

## Apollo Improvements Best Practice Roof sheeting sarking and insulation

(Best Practice and Manufacturers recommendations)

Bradford Thermoseal (*Rolled horizontally on rafters. 150mm min. overlap of sheets required. Overlap fascia edge by 25mm into gutter*)

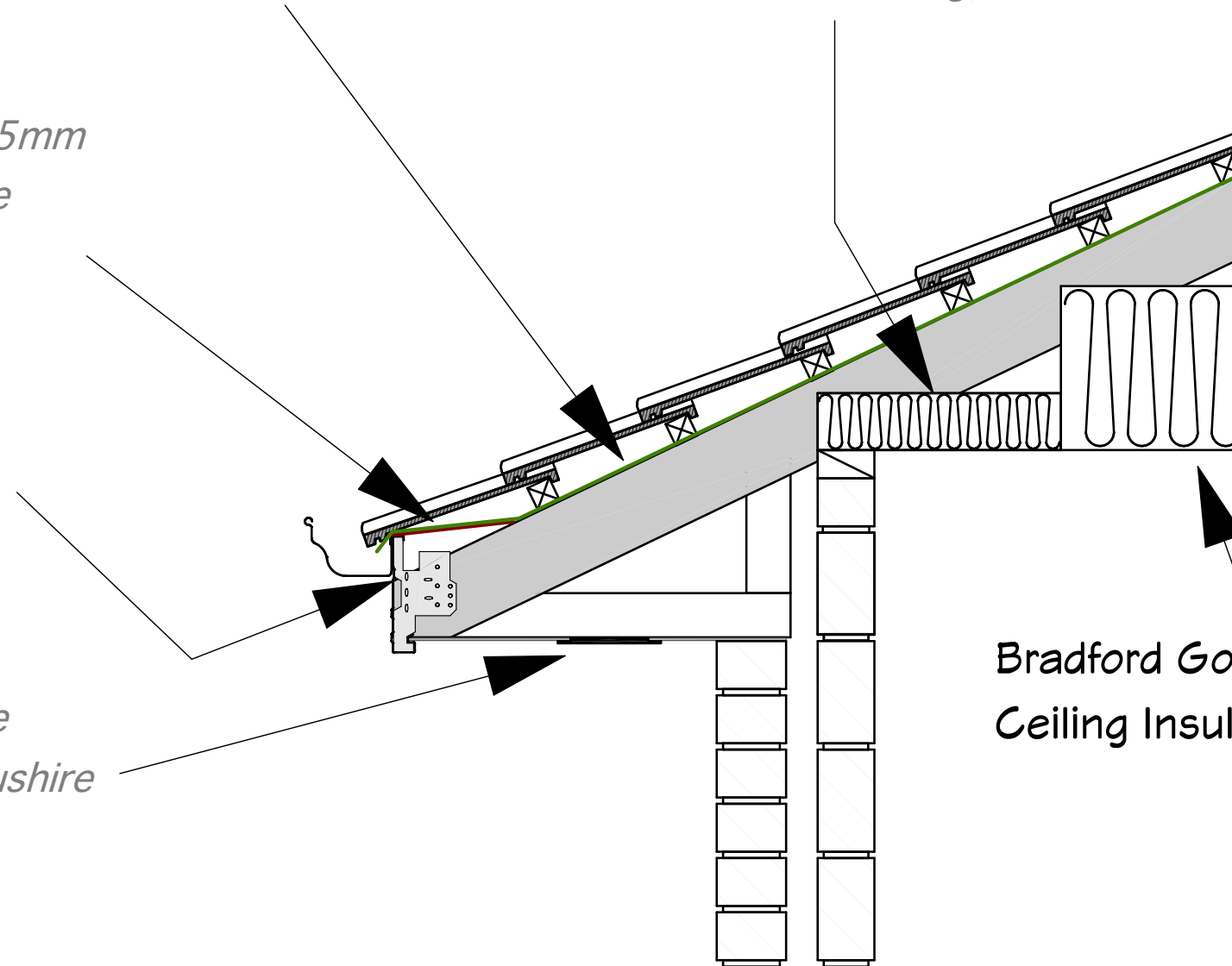
Bradford Gold Batts Hi-Performance Wall Insulation - 90mm R 2.7 (*Full length 1160mm Batt cut into 3x386mm length. Allows 20mm clearance at top plate between batt and underside of sarking*)

Anti-Ponding board (*275mm x 4.5mm fibrecement. 50mm min. clearance between first tile batten.*)

Roof Batten Tilt (*Top of fascia 25mm above first batten height*)

Eave Vent (*Edmonds Polyeave vent or Metal Eave Vent for bushire zones up to BAL 40*)

Bradford Gold™ Hi-Performance Acoustic Ceiling Insulation - 260mm - R6.0



## Apollo Improvements Best Practice Tile Roof sarking and insulation

*(Best Practice and Manufacturers recommendations)*

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