

# OVERALL “TOTAL R” (THERMALLY BRIDGED) THERMAL PERFORMANCE CALCULATIONS TO AS/NZS 4859 Parts 1 & 2:2018

The following calculations by James M Fricker Pty Ltd are based upon:

- a) AS/NZS 4859.1:2018 “Thermal insulation materials for buildings. Part 1: General criteria and technical provisions”,
- b) AS/NZS 4859.2:2018 “Thermal insulation materials for buildings. Part 2: Design”,
- c) the Australian Institute of Refrigeration Air-conditioning & Heating (AIRAH) Handbook (Edition 5, 2013), and (if necessary) the ASHRAE Fundamentals Handbook.

Initial results report Total R for each thermal path. These results are combined by area weighting and isothermal planes method to deduce **Overall Surface Total R**. This is per AS/NZS 4859.2:2018 Clause 4.3 – “A total resistance associated with a construction of materials, computed or measured over an area sufficient to be fully representative of the element of construction, and specified as a Total R-value, including surface film resistances and thermal bridging.”

Total R-values are based on product in-service conditions in accordance with AS/NZS 4859.2:2018 including the alteration of insulation Material R for temperature, and Air Space R for temperature and infrared emittance.

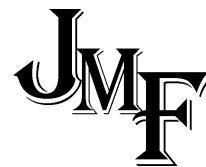
Each calculation result is subject to any specific notes and assumptions listed on the calculation.

If a construction differs from the described system, the thermal resistance may be different.

All calculations were done by James M Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



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**PROPOSED TABLE FOR THERMAL INSULATION DESIGN**

**Table 3.8a Ritek XL Wall® System - Panel Selection & Surface Treatment**

JMF R-Calc	Ritek Wall Type	Concrete Core thickness, mm	Wall Surface Treatment Option	Panel total thickness, mm	Total R-Value	
					Winter	Summer
215w40A1	115XL	103	A	115	0.28	0.28
215w40B1	115XL	103	B	168	1.43	1.37
215w40C1	115XL	103	C	175	1.71	1.64
215w40D1	115XL	103	D	175	2.16	2.03
215w40A2	135XL	123	A	135	0.29	0.29
215w40B2	135XL	123	B	188	1.45	1.38
215w40C2	135XL	123	C	195	1.73	1.66
215w40D2	135XL	123	D	195	2.17	2.05
215w40A3	150XL	138	A	150	0.30	0.30
215w40B3	150XL	138	B	203	1.46	1.39
215w40C3	150XL	138	C	210	1.74	1.67
215w40D3	150XL	138	D	210	2.19	2.06
215w40A4	165XL	153	A	165	0.31	0.31
215w40B4	165XL	153	B	218	1.47	1.40
215w40C4	165XL	153	C	225	1.75	1.68
215w40D4	165XL	153	D	225	2.20	2.07
215w40A5	200XL	188	A	200	0.34	0.34
215w40B5	200XL	188	B	253	1.49	1.43
215w40C5	200XL	188	C	260	1.78	1.70
215w40D5	200XL	188	D	260	2.22	2.09
215w40A6	265XL	253	A	265	0.38	0.38
215w40B6	265XL	253	B	318	1.53	1.48
215w40C6	265XL	253	C	325	1.82	1.75
215w40D6	265XL	253	D	325	2.27	2.14

NOTES: The above shows Total R determinations based upon AS/NZS 4859.1&2:2018, Thermal insulation materials for buildings. Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1

Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus), 14/2/20 20:41

Wall surface treatment options:

- A RITEK XL™ WALL (BARE) COMPRISING 6MM FIBRE CEMENT, CONCRETE, 6MM FIBRE CEMENT
- B RITEK XL™ WALL WITH 15MM FOILBOARD™, 28MM REFLECTIVE CAVITY, 10MM PLASTERBOARD
- C RITEK XL™ WALL WITH 50MM H GRADE EPS, 8MM RENDER, 2MM TEXTURE COAT
- D RITEK XL™ WALL WITH 50MM 32KG/M³ XPS, 8MM RENDER, 2MM TEXTURE COAT

**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40A1 115XL WALL SYSTEM - BARE (ABS spacers), 103mm concrete core**

**(i) Insulation path:- 6mm fibre cement sheet, 0mm PIR insulation, 103mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.86	12.43	0.86	0.040	36.00	34.28	35.14	1.72	
6mm fibre cement sheet		0.024	12.86	13.37	13.12	0.52	0.024	34.28	33.25	33.77	1.03	6
103mm concrete core		0.072	13.37	14.91	14.14	1.54	0.072	33.25	30.18	31.72	3.07	103
6mm fibre cement sheet		0.024	14.91	15.42	15.17	0.52	0.024	30.18	29.15	29.67	1.03	6
Indoor still air film		0.120	15.42	18.00	16.71	2.58	0.120	29.15	24.00	26.58	5.15	115

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.280 winter 0.280 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 103mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.33	12.17	0.33	0.040	36.00	35.34	35.67	0.66	
6mm fibre cement sheet		0.024	12.33	12.53	12.43	0.20	0.024	35.34	34.94	35.14	0.40	6
103mm ABS spacer		0.515	12.53	16.80	14.67	4.27	0.515	34.94	26.39	30.66	8.55	103
6mm fibre cement sheet		0.024	16.80	17.00	16.90	0.20	0.024	26.39	25.99	26.19	0.40	6
Indoor still air film		0.120	17.00	18.00	17.50	1.00	0.120	25.99	24.00	25.00	1.99	115

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 0.723 winter 0.723 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

**Overall Total Thermal Resistance, R<sub>T</sub> = 0.280 winter 0.280 summer 0.280 AVG**

**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 FC sheets assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 115XL WALL SYSTEM - BARE (ABS spacers), 103mm concrete core (total thickness 115mm),**  
 the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R0.28 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R0.28 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40A2 135XL WALL SYSTEM - BARE (ABS spacers), 123mm concrete core**

**(i) Insulation path:- 6mm fibre cement sheet, 0mm PIR insulation, 123mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.82	12.41	0.82	0.040	36.00	34.36	35.18	1.64	
6mm fibre cement sheet		0.024	12.82	13.31	13.06	0.49	0.024	34.36	33.38	33.87	0.98	6
123mm concrete core		0.085	13.31	15.06	14.18	1.75	0.085	33.38	29.89	31.64	3.49	123
6mm fibre cement sheet		0.024	15.06	15.55	15.30	0.49	0.024	29.89	28.91	29.40	0.98	6
Indoor still air film		0.120	15.55	18.00	16.77	2.45	0.120	28.91	24.00	26.45	4.91	135

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.293 winter 0.293 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 123mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.29	12.15	0.29	0.040	36.00	35.42	35.71	0.58	
6mm fibre cement sheet		0.024	12.29	12.47	12.38	0.17	0.024	35.42	35.07	35.24	0.35	6
123mm ABS spacer		0.615	12.47	16.95	14.71	4.48	0.615	35.07	26.10	30.58	8.97	123
6mm fibre cement sheet		0.024	16.95	17.13	17.04	0.17	0.024	26.10	25.75	25.92	0.35	6
Indoor still air film		0.120	17.13	18.00	17.56	0.87	0.120	25.75	24.00	24.87	1.75	135

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 0.823 winter 0.823 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

**Overall Total Thermal Resistance, R<sub>T</sub> = 0.294 winter 0.294 summer 0.294 AVG**

**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 FC sheets assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 135XL WALL SYSTEM - BARE (ABS spacers), 123mm concrete core (total thickness 135mm),**  
 the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:  
**R0.29 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,  
 the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:  
**R0.29 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40A3 150XL WALL SYSTEM - BARE (ABS spacers), 138mm concrete core**

**(i) Insulation path:- 6mm fibre cement sheet, 0mm PIR insulation, 138mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.79	12.39	0.79	0.040	36.00	34.42	35.21	1.58	
6mm fibre cement sheet		0.024	12.79	13.26	13.03	0.47	0.024	34.42	33.47	33.95	0.95	6
138mm concrete core		0.096	13.26	15.16	14.21	1.89	0.096	33.47	29.69	31.58	3.78	138
6mm fibre cement sheet		0.024	15.16	15.63	15.39	0.47	0.024	29.69	28.74	29.21	0.95	6
Indoor still air film		0.120	15.63	18.00	16.82	2.37	0.120	28.74	24.00	26.37	4.74	150
<b>Insulation path, Total Thermal Resistance</b>		<b>R<sub>Ti</sub> = 0.304</b>	<b>winter</b>				<b>0.304</b>	<b>summer</b>				

**(ii) Spacer path:- 6mm fibre cement sheet, 138mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.27	12.13	0.27	0.040	36.00	35.47	35.73	0.53	
6mm fibre cement sheet		0.024	12.27	12.43	12.35	0.16	0.024	35.47	35.14	35.31	0.32	6
138mm ABS spacer		0.690	12.43	17.04	14.73	4.61	0.690	35.14	25.92	30.53	9.22	138
6mm fibre cement sheet		0.024	17.04	17.20	17.12	0.16	0.024	25.92	25.60	25.76	0.32	6
Indoor still air film		0.120	17.20	18.00	17.60	0.80	0.120	25.60	24.00	24.80	1.60	150
<b>Spacer path, Total Thermal Resistance</b>		<b>R<sub>Ts</sub> = 0.898</b>	<b>winter</b>				<b>0.898</b>	<b>summer</b>				

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 0.304 winter</b>	<b>0.304 summer</b>	<b>0.304 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 FC sheets assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

For the 150XL WALL SYSTEM - BARE (ABS spacers), 138mm concrete core (total thickness 150mm),  
 the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R0.30 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R0.30 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40A4 165XL WALL SYSTEM - BARE (ABS spacers), 153mm concrete core**

**(i) Insulation path:- 6mm fibre cement sheet, 0mm PIR insulation, 153mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.76	12.38	0.76	0.040	36.00	34.47	35.24	1.53	
6mm fibre cement sheet		0.024	12.76	13.22	12.99	0.46	0.024	34.47	33.56	34.01	0.92	6
153mm concrete core		0.106	13.22	15.25	14.24	2.03	0.106	33.56	29.50	31.53	4.06	153
6mm fibre cement sheet		0.024	15.25	15.71	15.48	0.46	0.024	29.50	28.58	29.04	0.92	6
Indoor still air film		0.120	15.71	18.00	16.85	2.29	0.120	28.58	24.00	26.29	4.58	165

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.314 winter 0.314 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 153mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.25	12.12	0.25	0.040	36.00	35.51	35.75	0.49	
6mm fibre cement sheet		0.024	12.25	12.39	12.32	0.15	0.024	35.51	35.21	35.36	0.30	6
153mm ABS spacer		0.765	12.39	17.11	14.75	4.72	0.765	35.21	25.78	30.49	9.43	153
6mm fibre cement sheet		0.024	17.11	17.26	17.19	0.15	0.024	25.78	25.48	25.63	0.30	6
Indoor still air film		0.120	17.26	18.00	17.63	0.74	0.120	25.48	24.00	24.74	1.48	165

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 0.973 winter 0.973 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

**Overall Total Thermal Resistance, R<sub>T</sub> = 0.315 winter 0.315 summer 0.315 AVG**

**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 FC sheets assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 165XL WALL SYSTEM - BARE (ABS spacers), 153mm concrete core (total thickness 165mm),**  
 the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:  
**R0.31 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,  
 the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:  
**R0.31 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40A5 200XL WALL SYSTEM - BARE (ABS spacers), 188mm concrete core**

**(i) Insulation path:- 6mm fibre cement sheet, 0mm PIR insulation, 188mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.413%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.71	12.35	0.71	0.040	36.00	34.58	35.29	1.42	
6mm fibre cement sheet		0.024	12.71	13.13	12.92	0.43	0.024	34.58	33.73	34.16	0.85	6
188mm concrete core		0.131	13.13	15.45	14.29	2.31	0.131	33.73	29.10	31.42	4.63	188
6mm fibre cement sheet		0.024	15.45	15.87	15.66	0.43	0.024	29.10	28.25	28.68	0.85	6
Indoor still air film		0.120	15.87	18.00	16.94	2.13	0.120	28.25	24.00	26.13	4.25	200

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.339 winter 0.339 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 188mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.587%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.21	12.10	0.21	0.040	36.00	35.58	35.79	0.42	
6mm fibre cement sheet		0.024	12.21	12.33	12.27	0.13	0.024	35.58	35.33	35.46	0.25	6
188mm ABS spacer		0.940	12.33	17.25	14.79	4.91	0.940	35.33	25.51	30.42	9.83	188
6mm fibre cement sheet		0.024	17.25	17.37	17.31	0.13	0.024	25.51	25.25	25.38	0.25	6
Indoor still air film		0.120	17.37	18.00	17.69	0.63	0.120	25.25	24.00	24.63	1.25	200

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 1.148 winter 1.148 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 0.339 winter 0.339 summer 0.339 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 FC sheets assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 200XL WALL SYSTEM - BARE (ABS spacers), 188mm concrete core (total thickness 200mm),**  
 the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:  
**R0.34 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,  
 the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:  
**R0.34 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40A6 265XL WALL SYSTEM - BARE (ABS spacers), 253mm concrete core**

**(i) Insulation path:- 6mm fibre cement sheet, 0mm PIR insulation, 253mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.413%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.63	12.31	0.63	0.040	36.00	34.75	35.37	1.25	
6mm fibre cement sheet		0.024	12.63	13.00	12.81	0.38	0.024	34.75	34.00	34.37	0.75	6
253mm concrete core		0.176	13.00	15.75	14.37	2.75	0.176	34.00	28.50	31.25	5.49	253
6mm fibre cement sheet		0.024	15.75	16.12	15.94	0.38	0.024	28.50	27.75	28.13	0.75	6
Indoor still air film		0.120	16.12	18.00	17.06	1.88	0.120	27.75	24.00	25.88	3.75	265
<b>Insulation path, Total Thermal Resistance</b>		<b>R<sub>Ti</sub> = 0.384</b>	<b>winter</b>				<b>0.384</b>	<b>summer</b>				

**(ii) Spacer path:- 6mm fibre cement sheet, 253mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.587%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	12.00	12.16	12.08	0.16	0.040	36.00	35.67	35.84	0.33	
6mm fibre cement sheet		0.024	12.16	12.26	12.21	0.10	0.024	35.67	35.48	35.58	0.20	6
253mm ABS spacer		1.265	12.26	17.41	14.84	5.15	1.265	35.48	25.17	30.33	10.31	253
6mm fibre cement sheet		0.024	17.41	17.51	17.46	0.10	0.024	25.17	24.98	25.08	0.20	6
Indoor still air film		0.120	17.51	18.00	17.76	0.49	0.120	24.98	24.00	24.49	0.98	265
<b>Spacer path, Total Thermal Resistance</b>		<b>R<sub>Ts</sub> = 1.473</b>	<b>winter</b>				<b>1.473</b>	<b>summer</b>				

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 0.385 winter</b>	<b>0.385 summer</b>	<b>0.385 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 FC sheets assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

For the 265XL WALL SYSTEM - BARE (ABS spacers), 253mm concrete core (total thickness 265mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R0.38 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R0.38 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40B1 115XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (103mm concrete core)**

**(i) Concrete path:- 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Concrete path wall area: 95.36%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.16	12.08	0.16	0.040	36.00	35.66	35.83	0.34	cavity		
6mm fibre cement sheet		0.024	12.16	12.26	12.21	0.10	0.024	35.66	35.45	35.56	0.20			6
103mm concrete core		0.072	12.26	12.55	12.41	0.29	0.072	35.45	34.84	35.15	0.61			103
6mm fibre cement sheet		0.024	12.55	12.65	12.60	0.10	0.024	34.84	34.64	34.74	0.20			6
(i) 15mm Foilboard™		0.457	12.65	14.51	13.58	1.86	0.420	34.64	31.06	32.85	3.58			15
(ii) 28mm reflective unventilated airspace		0.679	14.51	17.27	15.89	2.76	0.648	31.06	25.53	28.29	5.53	0.04	0.87	28
10mm plasterboard		0.059	17.27	17.51	17.39	0.24	0.059	25.53	25.02	25.28	0.50			10
Indoor still air film		0.120	17.51	18.00	17.76	0.49	0.120	25.02	24.00	24.51	1.02			168

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.475 winter 1.406 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 103mm ABS spacer, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Spacer path wall area: 0.47%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.13	12.06	0.13	0.040	36.00	35.74	35.87	0.26	cavity		
6mm fibre cement sheet		0.024	12.13	12.20	12.16	0.08	0.024	35.74	35.59	35.67	0.15			6
103mm ABS spacer		0.515	12.20	13.81	13.01	1.61	0.515	35.59	32.29	33.94	3.30			103
6mm fibre cement sheet		0.024	13.81	13.89	13.85	0.08	0.024	32.29	32.14	32.21	0.15			6
(i) 15mm Foilboard™		0.456	13.89	15.31	14.60	1.43	0.424	32.14	29.42	30.78	2.72			15
(ii) 28mm reflective unventilated airspace		0.679	15.31	17.44	16.38	2.12	0.667	29.42	25.15	27.28	4.27	0.04	0.87	28
10mm plasterboard		0.059	17.44	17.62	17.53	0.18	0.059	25.15	24.77	24.96	0.38			10
Indoor still air film		0.120	17.62	18.00	17.81	0.38	0.120	24.77	24.00	24.38	0.77			168

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 1.917 winter 1.873 summer**

**(iii) Batten path:- 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm furring channel, 10mm plasterboard**

Batten path wall area: 4.17%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.27	12.13	0.27	0.040	36.00	35.44	35.72	0.56	cavity		
6mm fibre cement sheet		0.024	12.27	12.43	12.35	0.16	0.024	35.44	35.11	35.28	0.33			6
103mm concrete core		0.072	12.43	12.91	12.67	0.48	0.072	35.11	34.12	34.61	0.99			103
6mm fibre cement sheet		0.024	12.91	13.07	12.99	0.16	0.024	34.12	33.78	33.95	0.33			6
15mm Foilboard™		0.456	13.07	16.13	14.60	3.06	0.424	33.78	27.89	30.83	5.90			15
28mm furring channel		0.101	16.13	16.80	16.46	0.67	0.101	27.89	26.49	27.19	1.40			28
10mm plasterboard		0.059	16.80	17.20	17.00	0.40	0.059	26.49	25.67	26.08	0.82			10
Indoor still air film		0.120	17.20	18.00	17.60	0.80	0.120	25.67	24.00	24.83	1.67			168

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.895 winter 0.863 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.43 winter 1.37 summer 1.40 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the three listed parallel heat paths.  
 Section outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

**CONCLUSION:**

For the 115XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (103mm concrete core, total thickness 168mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R1.43 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.37 m².K/W after considering thermal bridging for this specific case.**



before concrete fill

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40B2 135XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (123mm concrete core)**

**(i) Concrete path:- 6mm fibre cement sheet, 123mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Concrete path wall area: 95.36%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.16	12.08	0.16	0.040	36.00	35.66	35.83	0.34	cavity		
6mm fibre cement sheet		0.024	12.16	12.26	12.21	0.10	0.024	35.66	35.46	35.56	0.20			6
123mm concrete core		0.085	12.26	12.60	12.43	0.34	0.085	35.46	34.74	35.10	0.72			123
6mm fibre cement sheet		0.024	12.60	12.70	12.65	0.10	0.024	34.74	34.54	34.64	0.20			6
(i) 15mm Foilboard™		0.457	12.70	14.54	13.62	1.84	0.420	34.54	30.99	32.77	3.54			15
(ii) 28mm reflective unventilated airspace		0.679	14.54	17.28	15.91	2.74	0.650	30.99	25.51	28.25	5.48	0.04	0.87	28
10mm plasterboard		0.059	17.28	17.52	17.40	0.24	0.059	25.51	25.01	25.26	0.50			10
Indoor still air film		0.120	17.52	18.00	17.76	0.48	0.120	25.01	24.00	24.51	1.01			188

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.489 winter | 1.422 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 123mm ABS spacer, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Spacer path wall area: 0.47%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.12	12.06	0.12	0.040	36.00	35.76	35.88	0.24	cavity		
6mm fibre cement sheet		0.024	12.12	12.19	12.15	0.07	0.024	35.76	35.61	35.68	0.15			6
123mm ABS spacer		0.615	12.19	14.02	13.11	1.83	0.615	35.61	31.87	33.74	3.74			123
6mm fibre cement sheet		0.024	14.02	14.09	14.06	0.07	0.024	31.87	31.73	31.80	0.15			6
(i) 15mm Foilboard™		0.456	14.09	15.45	14.77	1.36	0.425	31.73	29.14	30.43	2.58			15
(ii) 28mm reflective unventilated airspace		0.679	15.45	17.47	16.46	2.02	0.667	29.14	25.09	27.12	4.05	0.04	0.87	28
10mm plasterboard		0.059	17.47	17.64	17.56	0.18	0.059	25.09	24.73	24.91	0.36			10
Indoor still air film		0.120	17.64	18.00	17.82	0.36	0.120	24.73	24.00	24.36	0.73			188

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.016 winter | 1.974 summer**

**(iii) Batten path:- 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm furring channel, 10mm plasterboard**

Batten path wall area: 4.17%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.27	12.13	0.27	0.040	36.00	35.44	35.72	0.56	cavity		
6mm fibre cement sheet		0.024	12.27	12.43	12.35	0.16	0.024	35.44	35.11	35.28	0.33			6
103mm concrete core		0.072	12.43	12.91	12.67	0.48	0.072	35.11	34.12	34.61	0.99			103
6mm fibre cement sheet		0.024	12.91	13.07	12.99	0.16	0.024	34.12	33.78	33.95	0.33			6
15mm Foilboard™		0.456	13.07	16.13	14.60	3.06	0.424	33.78	27.89	30.83	5.90			15
28mm furring channel		0.101	16.13	16.80	16.46	0.67	0.101	27.89	26.49	27.19	1.40			28
10mm plasterboard		0.059	16.80	17.20	17.00	0.40	0.059	26.49	25.67	26.08	0.82			10
Indoor still air film		0.120	17.20	18.00	17.60	0.80	0.120	25.67	24.00	24.83	1.67			168

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.895 winter | 0.863 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.45 winter   1.38 summer   1.42 AVG</b>
---

**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the three listed parallel heat paths.  
 Section outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

**CONCLUSION:**

For the 135XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (123mm concrete core, total thickness 188mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R1.45 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.38 m².K/W after considering thermal bridging for this specific case.**



before concrete fill

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40B3 150XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (138mm concrete core)**

**(i) Concrete path:- 6mm fibre cement sheet, 138mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Concrete path wall area: 95.36%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.16	12.08	0.16	0.040	36.00	35.67	35.83	0.33	cavity		
6mm fibre cement sheet		0.024	12.16	12.26	12.21	0.10	0.024	35.67	35.46	35.56	0.20			6
138mm concrete core		0.096	12.26	12.64	12.45	0.38	0.096	35.46	34.66	35.06	0.80			138
6mm fibre cement sheet		0.024	12.64	12.74	12.69	0.10	0.024	34.66	34.46	34.56	0.20			6
(i) 15mm Foilboard™		0.457	12.74	14.57	13.65	1.83	0.420	34.46	30.95	32.70	3.52			15
(ii) 28mm reflective unventilated airspace		0.679	14.57	17.28	15.92	2.72	0.651	30.95	25.50	28.22	5.45	0.04	0.87	28
10mm plasterboard		0.059	17.28	17.52	17.40	0.24	0.059	25.50	25.00	25.25	0.49			10
Indoor still air film		0.120	17.52	18.00	17.76	0.48	0.120	25.00	24.00	24.50	1.00			203

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.499 winter 1.434 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 138mm ABS spacer, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Spacer path wall area: 0.47%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.11	12.06	0.11	0.040	36.00	35.77	35.88	0.23	cavity		
6mm fibre cement sheet		0.024	12.11	12.18	12.15	0.07	0.024	35.77	35.63	35.70	0.14			6
138mm ABS spacer		0.690	12.18	14.16	13.17	1.98	0.690	35.63	31.59	33.61	4.04			138
6mm fibre cement sheet		0.024	14.16	14.23	14.20	0.07	0.024	31.59	31.45	31.52	0.14			6
(i) 15mm Foilboard™		0.455	14.23	15.54	14.89	1.31	0.426	31.45	28.95	30.20	2.49			15
(ii) 28mm reflective unventilated airspace		0.679	15.54	17.49	16.51	1.95	0.667	28.95	25.05	27.00	3.91	0.04	0.87	28
10mm plasterboard		0.059	17.49	17.66	17.57	0.17	0.059	25.05	24.70	24.88	0.35			10
Indoor still air film		0.120	17.66	18.00	17.83	0.34	0.120	24.70	24.00	24.35	0.70			203

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.091 winter 2.050 summer**

**(iii) Batten path:- 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm furring channel, 10mm plasterboard**

Batten path wall area: 4.17%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.27	12.13	0.27	0.040	36.00	35.44	35.72	0.56	cavity		
6mm fibre cement sheet		0.024	12.27	12.43	12.35	0.16	0.024	35.44	35.11	35.28	0.33			6
103mm concrete core		0.072	12.43	12.91	12.67	0.48	0.072	35.11	34.12	34.61	0.99			103
6mm fibre cement sheet		0.024	12.91	13.07	12.99	0.16	0.024	34.12	33.78	33.95	0.33			6
15mm Foilboard™		0.456	13.07	16.13	14.60	3.06	0.424	33.78	27.89	30.83	5.90			15
28mm furring channel		0.101	16.13	16.80	16.46	0.67	0.101	27.89	26.49	27.19	1.40			28
10mm plasterboard		0.059	16.80	17.20	17.00	0.40	0.059	26.49	25.67	26.08	0.82			10
Indoor still air film		0.120	17.20	18.00	17.60	0.80	0.120	25.67	24.00	24.83	1.67			168

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.895 winter 0.863 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.46 winter 1.39 summer 1.43 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the three listed parallel heat paths.  
 Section outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

**CONCLUSION:**

For the 150XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (138mm concrete core, total thickness 203mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R1.46 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.39 m².K/W after considering thermal bridging for this specific case.**



before concrete fill

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40B4 165XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (153mm concrete core)**

**(i) Concrete path:- 6mm fibre cement sheet, 153mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Concrete path wall area: 95.36%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.16	12.08	0.16	0.040	36.00	35.67	35.83	0.33	cavity		
6mm fibre cement sheet		0.024	12.16	12.25	12.21	0.10	0.024	35.67	35.47	35.57	0.20			6
153mm concrete core		0.106	12.25	12.68	12.47	0.42	0.106	35.47	34.59	35.03	0.88			153
6mm fibre cement sheet		0.024	12.68	12.77	12.72	0.10	0.024	34.59	34.39	34.49	0.20			6
(i) 15mm Foilboard™		0.457	12.77	14.59	13.68	1.82	0.420	34.39	30.90	32.64	3.49			15
(ii) 28mm reflective unventilated airspace		0.679	14.59	17.29	15.94	2.70	0.652	30.90	25.49	28.19	5.41	0.04	0.87	28
10mm plasterboard		0.059	17.29	17.52	17.41	0.23	0.059	25.49	25.00	25.24	0.49			10
Indoor still air film		0.120	17.52	18.00	17.76	0.48	0.120	25.00	24.00	24.50	1.00			218

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.510 winter 1.445 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 153mm ABS spacer, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Spacer path wall area: 0.47%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.11	12.06	0.11	0.040	36.00	35.77	35.89	0.23	cavity		
6mm fibre cement sheet		0.024	12.11	12.18	12.14	0.07	0.024	35.77	35.64	35.71	0.14			6
153mm ABS spacer		0.765	12.18	14.30	13.24	2.12	0.765	35.64	31.32	33.48	4.32			153
6mm fibre cement sheet		0.024	14.30	14.36	14.33	0.07	0.024	31.32	31.18	31.25	0.14			6
(i) 15mm Foilboard™		0.455	14.36	15.62	14.99	1.26	0.426	31.18	28.78	29.98	2.41			15
(ii) 28mm reflective unventilated airspace		0.679	15.62	17.50	16.56	1.88	0.667	28.78	25.01	26.89	3.77	0.04	0.87	28
10mm plasterboard		0.059	17.50	17.67	17.59	0.16	0.059	25.01	24.68	24.84	0.33			10
Indoor still air film		0.120	17.67	18.00	17.83	0.33	0.120	24.68	24.00	24.34	0.68			218

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.166 winter 2.126 summer**

**(iii) Batten path:- 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm furring channel, 10mm plasterboard**

Batten path wall area: 4.17%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.27	12.13	0.27	0.040	36.00	35.44	35.72	0.56	cavity		
6mm fibre cement sheet		0.024	12.27	12.43	12.35	0.16	0.024	35.44	35.11	35.28	0.33			6
103mm concrete core		0.072	12.43	12.91	12.67	0.48	0.072	35.11	34.12	34.61	0.99			103
6mm fibre cement sheet		0.024	12.91	13.07	12.99	0.16	0.024	34.12	33.78	33.95	0.33			6
15mm Foilboard™		0.456	13.07	16.13	14.60	3.06	0.424	33.78	27.89	30.83	5.90			15
28mm furring channel		0.101	16.13	16.80	16.46	0.67	0.101	27.89	26.49	27.19	1.40			28
10mm plasterboard		0.059	16.80	17.20	17.00	0.40	0.059	26.49	25.67	26.08	0.82			10
Indoor still air film		0.120	17.20	18.00	17.60	0.80	0.120	25.67	24.00	24.83	1.67			168

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.895 winter 0.863 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.47 winter 1.40 summer 1.44 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the three listed parallel heat paths.  
 Section outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

**CONCLUSION:**

For the 165XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (153mm concrete core, total thickness 218mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R1.47 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.40 m².K/W after considering thermal bridging for this specific case.**



before concrete fill

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40B5 200XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (188mm concrete core)**

**(i) Concrete path:- 6mm fibre cement sheet, 188mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Concrete path wall area: 95.25%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.16	12.08	0.16	0.040	36.00	35.67	35.84	0.33	cavity		
6mm fibre cement sheet		0.024	12.16	12.25	12.20	0.09	0.024	35.67	35.48	35.58	0.20			6
188mm concrete core		0.131	12.25	12.76	12.51	0.51	0.131	35.48	34.41	34.95	1.06			188
6mm fibre cement sheet		0.024	12.76	12.85	12.81	0.09	0.024	34.41	34.22	34.32	0.20			6
(i) 15mm Foilboard™		0.457	12.85	14.64	13.75	1.79	0.420	34.22	30.79	32.51	3.43			15
(ii) 28mm reflective unventilated airspace		0.679	14.64	17.30	15.97	2.66	0.655	30.79	25.46	28.13	5.34	0.04	0.87	28
10mm plasterboard		0.059	17.30	17.53	17.42	0.23	0.059	25.46	24.98	25.22	0.48			10
Indoor still air film		0.120	17.53	18.00	17.77	0.47	0.120	24.98	24.00	24.49	0.98			253

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.534 winter 1.473 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 188mm ABS spacer, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Spacer path wall area: 0.59%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.10	12.05	0.10	0.040	36.00	35.79	35.90	0.21	cavity		
6mm fibre cement sheet		0.024	12.10	12.16	12.13	0.06	0.024	35.79	35.67	35.73	0.13			6
188mm ABS spacer		0.940	12.16	14.57	13.37	2.41	0.940	35.67	30.77	33.22	4.90			188
6mm fibre cement sheet		0.024	14.57	14.64	14.60	0.06	0.024	30.77	30.64	30.70	0.13			6
(i) 15mm Foilboard™		0.455	14.64	15.80	15.22	1.17	0.427	30.64	28.41	29.53	2.23			15
(ii) 28mm reflective unventilated airspace		0.678	15.80	17.54	16.67	1.74	0.668	28.41	24.93	26.67	3.48	0.04	0.87	28
10mm plasterboard		0.059	17.54	17.69	17.62	0.15	0.059	24.93	24.63	24.78	0.31			10
Indoor still air film		0.120	17.69	18.00	17.85	0.31	0.120	24.63	24.00	24.31	0.63			253

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.340 winter 2.302 summer**

**(iii) Batten path:- 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm furring channel, 10mm plasterboard**

Batten path wall area: 4.17%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.27	12.13	0.27	0.040	36.00	35.44	35.72	0.56	cavity		
6mm fibre cement sheet		0.024	12.27	12.43	12.35	0.16	0.024	35.44	35.11	35.28	0.33			6
103mm concrete core		0.072	12.43	12.91	12.67	0.48	0.072	35.11	34.12	34.61	0.99			103
6mm fibre cement sheet		0.024	12.91	13.07	12.99	0.16	0.024	34.12	33.78	33.95	0.33			6
15mm Foilboard™		0.456	13.07	16.13	14.60	3.06	0.424	33.78	27.89	30.83	5.90			15
28mm furring channel		0.101	16.13	16.80	16.46	0.67	0.101	27.89	26.49	27.19	1.40			28
10mm plasterboard		0.059	16.80	17.20	17.00	0.40	0.059	26.49	25.67	26.08	0.82			10
Indoor still air film		0.120	17.20	18.00	17.60	0.80	0.120	25.67	24.00	24.83	1.67			168

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.895 winter 0.863 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.49 winter 1.43 summer 1.46 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the three listed parallel heat paths.  
 Section outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

**CONCLUSION:**

For the 200XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (188mm concrete core, total thickness 253mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R1.49 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.43 m².K/W after considering thermal bridging for this specific case.**



before concrete fill

Signed:

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40B6 265XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (253mm concrete core)**

**(i) Concrete path:- 6mm fibre cement sheet, 253mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Concrete path wall area: 95.25%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.15	12.08	0.15	0.040	36.00	35.68	35.84	0.32	cavity		
6mm fibre cement sheet		0.024	12.15	12.24	12.20	0.09	0.024	35.68	35.50	35.59	0.19			6
253mm concrete core		0.176	12.24	12.91	12.58	0.67	0.176	35.50	34.11	34.80	1.38			253
6mm fibre cement sheet		0.024	12.91	13.00	12.96	0.09	0.024	34.11	33.92	34.02	0.19			6
(i) 15mm Foilboard™		<b>0.457</b>	13.00	14.74	13.87	1.74	<b>0.421</b>	33.92	30.61	32.26	3.32			15
(ii) 28mm reflective unventilated airspace		<b>0.679</b>	14.74	17.32	16.03	2.58	<b>0.660</b>	30.61	25.41	28.01	5.20	0.04	0.87	28
10mm plasterboard		0.059	17.32	17.54	17.43	0.22	0.059	25.41	24.95	25.18	0.46			10
Indoor still air film		0.120	17.54	18.00	17.77	0.46	0.120	24.95	24.00	24.47	0.95			318

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.579 winter | 1.523 summer**

**(ii) Spacer path:- 6mm fibre cement sheet, 253mm ABS spacer, 6mm fibre cement sheet, 15mm Foilboard™, 28mm reflective unventilated airspace, 10mm plasterboard**

Spacer path wall area: 0.59%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.09	12.05	0.09	0.040	36.00	35.82	35.91	0.18	cavity		
6mm fibre cement sheet		0.024	12.09	12.14	12.12	0.05	0.024	35.82	35.71	35.76	0.11			6
253mm ABS spacer		<b>1.265</b>	12.14	14.99	13.57	2.85	<b>1.265</b>	35.71	29.93	32.82	5.77			253
6mm fibre cement sheet		0.024	14.99	15.05	15.02	0.05	0.024	29.93	29.82	29.88	0.11			6
(i) 15mm Foilboard™		<b>0.454</b>	15.05	16.07	15.56	1.02	<b>0.429</b>	29.82	27.87	28.85	1.96			15
(ii) 28mm reflective unventilated airspace		<b>0.679</b>	16.07	17.60	16.83	1.53	<b>0.668</b>	27.87	24.82	26.34	3.05	0.04	0.87	28
10mm plasterboard		0.059	17.60	17.73	17.66	0.13	0.059	24.82	24.55	24.68	0.27			10
Indoor still air film		0.120	17.73	18.00	17.86	0.27	0.120	24.55	24.00	24.27	0.55			318

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.665 winter | 2.629 summer**

**(iii) Batten path:- 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet, 15mm Foilboard™, 28mm furring channel, 10mm plasterboard**

Batten path wall area: 4.17%		m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
Outside air film		0.040	12.00	12.27	12.13	0.27	0.040	36.00	35.44	35.72	0.56	cavity		
6mm fibre cement sheet		0.024	12.27	12.43	12.35	0.16	0.024	35.44	35.11	35.28	0.33			6
103mm concrete core		0.072	12.43	12.91	12.67	0.48	0.072	35.11	34.12	34.61	0.99			103
6mm fibre cement sheet		0.024	12.91	13.07	12.99	0.16	0.024	34.12	33.78	33.95	0.33			6
15mm Foilboard™		<b>0.456</b>	13.07	16.13	14.60	3.06	<b>0.424</b>	33.78	27.89	30.83	5.90			15
28mm furring channel		0.101	16.13	16.80	16.46	0.67	0.101	27.89	26.49	27.19	1.40			28
10mm plasterboard		0.059	16.80	17.20	17.00	0.40	0.059	26.49	25.67	26.08	0.82			10
Indoor still air film		0.120	17.20	18.00	17.60	0.80	0.120	25.67	24.00	24.83	1.67			168

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 0.895 winter | 0.863 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.53 winter   1.48 summer   1.50 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the three listed parallel heat paths.  
 Section outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

**CONCLUSION:**

For the 265XL wall with 15mm Foilboard™, 28mm reflective cavity, 10mm plasterboard (253mm concrete core, total thickness 318mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:

**R1.53 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.48 m².K/W after considering thermal bridging for this specific case.**



before concrete fill

Signed:

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40C1 115XL wall (ABS spacers), with external 50mm H Class EPS and 103mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:		99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.14	12.07	0.14	0.040	36.00	35.71	35.85	0.29	
2mm texture coat			0.005	12.14	12.16	12.15	0.02	0.005	35.71	35.67	35.69	0.04	2
8mm render			0.020	12.16	12.23	12.19	0.07	0.020	35.67	35.52	35.60	0.15	8
(i) 50mm H Class EPS			1.409	12.23	17.16	14.69	4.93	1.335	35.52	25.75	30.64	9.77	50
6mm fibre cement sheet			0.024	17.16	17.25	17.20	0.08	0.024	25.75	25.58	25.67	0.18	6
103mm concrete core			0.072	17.25	17.50	17.37	0.25	0.072	25.58	25.05	25.32	0.52	103
6mm fibre cement sheet			0.024	17.50	17.58	17.54	0.08	0.024	25.05	24.88	24.97	0.18	6
Indoor still air film			0.120	17.58	18.00	17.79	0.42	0.120	24.88	24.00	24.44	0.88	175

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.713 winter 1.640 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 103mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:		0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.11	12.06	0.11	0.040	36.00	35.77	35.88	0.23	
2mm texture coat			0.005	12.11	12.13	12.12	0.01	0.005	35.77	35.74	35.75	0.03	2
8mm render			0.020	12.13	12.18	12.15	0.06	0.020	35.74	35.62	35.68	0.12	8
(ii) 50mm H Class EPS			1.411	12.18	16.10	14.14	3.92	1.330	35.62	27.94	31.78	7.68	50
6mm fibre cement sheet			0.024	16.10	16.17	16.14	0.07	0.024	27.94	27.81	27.87	0.14	6
103mm ABS spacer			0.515	16.17	17.60	16.88	1.43	0.515	27.81	24.83	26.32	2.97	103
6mm fibre cement sheet			0.024	17.60	17.67	17.63	0.07	0.024	24.83	24.69	24.76	0.14	6
Indoor still air film			0.120	17.67	18.00	17.83	0.33	0.120	24.69	24.00	24.35	0.69	175

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.159 winter 2.078 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.715 winter 1.641 summer 1.678 AVG</b>
--

**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 115XL wall (ABS spacers), with external 50mm H Class EPS and 103mm concrete core (total thickness 175mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R1.71 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.64 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40C2 135XL wall (ABS spacers), with external 50mm H Class EPS and 123mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 123mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:		99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.14	12.07	0.14	0.040	36.00	35.71	35.85	0.29	
2mm texture coat			0.005	12.14	12.16	12.15	0.02	0.005	35.71	35.67	35.69	0.04	2
8mm render			0.020	12.16	12.23	12.19	0.07	0.020	35.67	35.53	35.60	0.15	8
(i) 50mm H Class EPS			1.409	12.23	17.12	14.67	4.89	1.335	35.53	25.84	30.68	9.69	50
6mm fibre cement sheet			0.024	17.12	17.20	17.16	0.08	0.024	25.84	25.67	25.75	0.17	6
123mm concrete core			0.085	17.20	17.50	17.35	0.30	0.085	25.67	25.05	25.36	0.62	123
6mm fibre cement sheet			0.024	17.50	17.58	17.54	0.08	0.024	25.05	24.87	24.96	0.17	6
Indoor still air film			0.120	17.58	18.00	17.79	0.42	0.120	24.87	24.00	24.44	0.87	195

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.727 winter 1.653 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 123mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:		0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.11	12.05	0.11	0.040	36.00	35.78	35.89	0.22	
2mm texture coat			0.005	12.11	12.12	12.11	0.01	0.005	35.78	35.75	35.77	0.03	2
8mm render			0.020	12.12	12.17	12.15	0.05	0.020	35.75	35.64	35.70	0.11	8
(ii) 50mm H Class EPS			1.412	12.17	15.92	14.05	3.75	1.329	35.64	28.32	31.98	7.33	50
6mm fibre cement sheet			0.024	15.92	15.98	15.95	0.06	0.024	28.32	28.18	28.25	0.13	6
123mm ABS spacer			0.615	15.98	17.62	16.80	1.63	0.615	28.18	24.79	26.49	3.39	123
6mm fibre cement sheet			0.024	17.62	17.68	17.65	0.06	0.024	24.79	24.66	24.73	0.13	6
Indoor still air film			0.120	17.68	18.00	17.84	0.32	0.120	24.66	24.00	24.33	0.66	195

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.260 winter 2.177 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.729 winter 1.655 summer 1.692 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 135XL wall (ABS spacers), with external 50mm H Class EPS and 123mm concrete core (total thickness 195mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R1.73 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.66 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40C3 150XL wall (ABS spacers), with external 50mm H Class EPS and 138mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 138mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.14	12.07	0.14	0.040	<b>36.00</b>	35.71	35.86	0.29	
2mm texture coat		0.005	12.14	12.16	12.15	0.02	0.005	35.71	35.68	35.69	0.04	2
8mm render		0.020	12.16	12.22	12.19	0.07	0.020	35.68	35.53	35.60	0.14	8
(i) <b>50mm H Class EPS</b>		<b>1.409</b>	12.22	17.09	14.66	4.86	<b>1.335</b>	35.53	25.90	30.72	9.63	<b>50</b>
6mm fibre cement sheet		0.024	17.09	17.17	17.13	0.08	0.024	25.90	25.73	25.82	0.17	6
138mm concrete core		0.096	17.17	17.50	17.34	0.33	0.096	25.73	25.04	25.38	0.69	138
6mm fibre cement sheet		0.024	17.50	17.59	17.54	0.08	0.024	25.04	24.87	24.95	0.17	6
Indoor still air film		<u>0.120</u>	17.59	<b>18.00</b>	17.79	0.41	<u>0.120</u>	24.87	<b>24.00</b>	24.43	0.87	210

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.738 winter 1.664 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 138mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.10	12.05	0.10	0.040	<b>36.00</b>	35.79	35.89	0.21	
2mm texture coat		0.005	12.10	12.12	12.11	0.01	0.005	35.79	35.76	35.77	0.03	2
8mm render		0.020	12.12	12.17	12.14	0.05	0.020	35.76	35.65	35.71	0.11	8
(ii) <b>50mm H Class EPS</b>		<b>1.412</b>	12.17	15.80	13.98	3.63	<b>1.329</b>	35.65	28.57	32.11	7.08	<b>50</b>
6mm fibre cement sheet		0.024	15.80	15.86	15.83	0.06	0.024	28.57	28.44	28.51	0.13	6
138mm ABS spacer		0.690	15.86	17.63	16.74	1.77	0.690	28.44	24.77	26.61	3.68	138
6mm fibre cement sheet		0.024	17.63	17.69	17.66	0.06	0.024	24.77	24.64	24.70	0.13	6
Indoor still air film		<u>0.120</u>	17.69	<b>18.00</b>	17.85	0.31	<u>0.120</u>	24.64	<b>24.00</b>	24.32	0.64	210

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.335 winter 2.252 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.740 winter 1.666 summer 1.703 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 150XL wall (ABS spacers), with external 50mm H Class EPS and 138mm concrete core (total thickness 210mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R1.74 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.67 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40C4 165XL wall (ABS spacers), with external 50mm H Class EPS and 153mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 153mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:		99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.14	12.07	0.14	0.040	36.00	35.71	35.86	0.29	
2mm texture coat			0.005	12.14	12.15	12.15	0.02	0.005	35.71	35.68	35.70	0.04	2
8mm render			0.020	12.15	12.22	12.19	0.07	0.020	35.68	35.53	35.61	0.14	8
(i) <b>50mm H Class EPS</b>			<b>1.409</b>	12.22	17.06	14.64	4.84	<b>1.335</b>	35.53	25.97	30.75	9.57	<b>50</b>
6mm fibre cement sheet			0.024	17.06	17.14	17.10	0.08	0.024	25.97	25.79	25.88	0.17	6
153mm concrete core			0.106	17.14	17.51	17.32	0.36	0.106	25.79	25.03	25.41	0.76	153
6mm fibre cement sheet			0.024	17.51	17.59	17.55	0.08	0.024	25.03	24.86	24.95	0.17	6
Indoor still air film			<u>0.120</u>	17.59	18.00	17.79	0.41	<u>0.120</u>	24.86	24.00	24.43	0.86	225

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.748 winter**

**1.674 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 153mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:		0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.10	12.05	0.10	0.040	36.00	35.79	35.90	0.21	
2mm texture coat			0.005	12.10	12.11	12.11	0.01	0.005	35.79	35.77	35.78	0.03	2
8mm render			0.020	12.11	12.16	12.14	0.05	0.020	35.77	35.66	35.72	0.10	8
(ii) <b>50mm H Class EPS</b>			<b>1.412</b>	12.16	15.68	13.92	3.52	<b>1.328</b>	35.66	28.81	32.24	6.85	<b>50</b>
6mm fibre cement sheet			0.024	15.68	15.74	15.71	0.06	0.024	28.81	28.69	28.75	0.12	6
153mm ABS spacer			0.765	15.74	17.64	16.69	1.90	0.765	28.69	24.74	26.72	3.95	153
6mm fibre cement sheet			0.024	17.64	17.70	17.67	0.06	0.024	24.74	24.62	24.68	0.12	6
Indoor still air film			<u>0.120</u>	17.70	18.00	17.85	0.30	<u>0.120</u>	24.62	24.00	24.31	0.62	225

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.410 winter**

**2.326 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.750 winter</b>	<b>1.676 summer</b>	<b>1.713 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41

Ref: 215\_Fxl.xls

The above estimates the resulting (overall) Total R from the two parallel heat paths -

(i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)

Outer surfaces assumed to be relevant isothermal planes.

Refer AS/NZS 4859:2018 for assumptions.

Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1

Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



before concrete fill

**CONCLUSION:**

**For the 165XL wall (ABS spacers), with external 50mm H Class EPS and 153mm concrete core (total thickness 225mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R1.75 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.68 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40C5      200XL wall (ABS spacers), with external 50mm H Class EPS and 188mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 188mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:		99.413%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	<b>12.00</b>	12.14	12.07	0.14	0.040	<b>36.00</b>	35.72	35.86	0.28	
2mm texture coat			0.005	12.14	12.15	12.14	0.02	0.005	35.72	35.68	35.70	0.04	2
8mm render			0.020	12.15	12.22	12.19	0.07	0.020	35.68	35.54	35.61	0.14	8
(i) <b>50mm H Class EPS</b>			<b>1.409</b>	12.22	16.99	14.60	4.77	<b>1.334</b>	35.54	26.11	30.83	9.43	<b>50</b>
6mm fibre cement sheet			0.024	16.99	17.07	17.03	0.08	0.024	26.11	25.94	26.03	0.17	6
188mm concrete core			0.131	17.07	17.51	17.29	0.44	0.131	25.94	25.02	25.48	0.92	188
6mm fibre cement sheet			0.024	17.51	17.59	17.55	0.08	0.024	25.02	24.85	24.93	0.17	6
Indoor still air film			<u>0.120</u>	17.59	<b>18.00</b>	17.80	0.41	<u>0.120</u>	24.85	<b>24.00</b>	24.42	0.85	260

**Insulation path, Total Thermal Resistance    R<sub>Ti</sub> = 1.773    winter      1.698    summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 188mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:		0.587%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	<b>12.00</b>	12.09	12.05	0.09	0.040	<b>36.00</b>	35.81	35.90	0.19	
2mm texture coat			0.005	12.09	12.10	12.10	0.01	0.005	35.81	35.78	35.80	0.02	2
8mm render			0.020	12.10	12.15	12.13	0.05	0.020	35.78	35.69	35.74	0.10	8
(ii) <b>50mm H Class EPS</b>			<b>1.413</b>	12.15	15.43	13.79	3.28	<b>1.327</b>	35.69	29.32	32.50	6.37	<b>50</b>
6mm fibre cement sheet			0.024	15.43	15.48	15.46	0.06	0.024	29.32	29.20	29.26	0.12	6
188mm ABS spacer			0.940	15.48	17.67	16.58	2.18	0.940	29.20	24.69	26.95	4.51	188
6mm fibre cement sheet			0.024	17.67	17.72	17.69	0.06	0.024	24.69	24.58	24.63	0.12	6
Indoor still air film			<u>0.120</u>	17.72	<b>18.00</b>	17.86	0.28	<u>0.120</u>	24.58	<b>24.00</b>	24.29	0.58	260

**Spacer path, Total Thermal Resistance    R<sub>Ts</sub> = 2.586    winter      2.500    summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = <u>1.776</u>    winter      <u>1.701</u>    summer      <u>1.738</u>    AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41      Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 200XL wall (ABS spacers), with external 50mm H Class EPS and 188mm concrete core (total thickness 260mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R1.78 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.70 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40C6 265XL wall (ABS spacers), with external 50mm H Class EPS and 253mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 253mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:		99.413%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.13	12.07	0.13	0.040	36.00	35.72	35.86	0.28	
2mm texture coat			0.005	12.13	12.15	12.14	0.02	0.005	35.72	35.69	35.71	0.03	2
8mm render			0.020	12.15	12.21	12.18	0.07	0.020	35.69	35.55	35.62	0.14	8
(i) 50mm H Class EPS			1.409	12.21	16.87	14.54	4.65	1.334	35.55	26.37	30.96	9.19	50
6mm fibre cement sheet			0.024	16.87	16.94	16.91	0.08	0.024	26.37	26.20	26.28	0.17	6
253mm concrete core			0.176	16.94	17.52	17.23	0.58	0.176	26.20	24.99	25.60	1.21	253
6mm fibre cement sheet			0.024	17.52	17.60	17.56	0.08	0.024	24.99	24.83	24.91	0.17	6
Indoor still air film			0.120	17.60	18.00	17.80	0.40	0.120	24.83	24.00	24.41	0.83	325

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 1.818 winter 1.742 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm H Class EPS, 6mm fibre cement sheet, 253mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:		0.587%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.08	12.04	0.08	0.040	36.00	35.83	35.91	0.17	
2mm texture coat			0.005	12.08	12.09	12.09	0.01	0.005	35.83	35.81	35.82	0.02	2
8mm render			0.020	12.09	12.13	12.11	0.04	0.020	35.81	35.72	35.77	0.09	8
(ii) 50mm H Class EPS			1.414	12.13	15.05	13.59	2.91	1.325	35.72	30.09	32.91	5.63	50
6mm fibre cement sheet			0.024	15.05	15.10	15.07	0.05	0.024	30.09	29.99	30.04	0.10	6
253mm ABS spacer			1.265	15.10	17.70	16.40	2.61	1.265	29.99	24.61	27.30	5.38	253
6mm fibre cement sheet			0.024	17.70	17.75	17.73	0.05	0.024	24.61	24.51	24.56	0.10	6
Indoor still air film			0.120	17.75	18.00	17.88	0.25	0.120	24.51	24.00	24.26	0.51	325

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.912 winter 2.823 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 1.822 winter 1.746 summer 1.784 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 265XL wall (ABS spacers), with external 50mm H Class EPS and 253mm concrete core (total thickness 325mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R1.82 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R1.75 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40D1 115XL wall (ABS spacers), with external 50mm XPS insulation and 103mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 103mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.11	12.06	0.11	0.040	<b>36.00</b>	35.76	35.88	0.24	
2mm texture coat		0.005	12.11	12.13	12.12	0.01	0.005	35.76	35.73	35.75	0.03	2
8mm render		0.020	12.13	12.18	12.15	0.06	0.020	35.73	35.62	35.67	0.12	8
(i) <b>50mm XPS insulation</b>		<b>1.854</b>	12.18	17.33	14.76	5.15	<b>1.726</b>	35.62	25.42	30.52	10.20	<b>50</b>
6mm fibre cement sheet		0.024	17.33	17.40	17.37	0.07	0.024	25.42	25.27	25.34	0.14	6
103mm concrete core		0.072	17.40	17.60	17.50	0.20	0.072	25.27	24.85	25.06	0.42	103
6mm fibre cement sheet		0.024	17.60	17.67	17.63	0.07	0.024	24.85	24.71	24.78	0.14	6
Indoor still air film		<u>0.120</u>	17.67	<b>18.00</b>	17.83	0.33	<u>0.120</u>	24.71	<b>24.00</b>	24.35	0.71	175

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 2.159 winter 2.030 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 103mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.09	12.05	0.09	0.040	<b>36.00</b>	35.81	35.90	0.19	
2mm texture coat		0.005	12.09	12.10	12.10	0.01	0.005	35.81	35.78	35.79	0.02	2
8mm render		0.020	12.10	12.15	12.13	0.05	0.020	35.78	35.68	35.73	0.10	8
(ii) <b>50mm XPS insulation</b>		<b>1.858</b>	12.15	16.43	14.29	4.28	<b>1.718</b>	35.68	27.32	31.50	8.36	<b>50</b>
6mm fibre cement sheet		0.024	16.43	16.48	16.46	0.06	0.024	27.32	27.21	27.27	0.12	6
103mm ABS spacer		0.515	16.48	17.67	17.08	1.19	0.515	27.21	24.70	25.95	2.51	103
6mm fibre cement sheet		0.024	17.67	17.72	17.70	0.06	0.024	24.70	24.58	24.64	0.12	6
Indoor still air film		<u>0.120</u>	17.72	<b>18.00</b>	17.86	0.28	<u>0.120</u>	24.58	<b>24.00</b>	24.29	0.58	175

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.606 winter 2.466 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

**Overall Total Thermal Resistance, R<sub>T</sub> = 2.160 winter 2.032 summer 2.096 AVG**

**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 115XL wall (ABS spacers), with external 50mm XPS insulation and 103mm concrete core (total thickness 175mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R2.16 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R2.03 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



**ENGINEERS AUSTRALIA**  
 Chartered Professional Engineer  
 MEMBER 1179647

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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40D2 135XL wall (ABS spacers), with external 50mm XPS insulation and 123mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 123mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.11	12.06	0.11	0.040	<b>36.00</b>	35.77	35.88	0.23	
2mm texture coat		0.005	12.11	12.12	12.12	0.01	0.005	35.77	35.74	35.75	0.03	2
8mm render		0.020	12.12	12.18	12.15	0.06	0.020	35.74	35.62	35.68	0.12	8
(i) <b>50mm XPS insulation</b>		<b>1.854</b>	12.18	17.30	14.74	5.12	<b>1.725</b>	35.62	25.49	30.55	10.13	<b>50</b>
6mm fibre cement sheet		0.024	17.30	17.37	17.33	0.07	0.024	25.49	25.35	25.42	0.14	6
123mm concrete core		0.085	17.37	17.60	17.48	0.24	0.085	25.35	24.85	25.10	0.50	123
6mm fibre cement sheet		0.024	17.60	17.67	17.64	0.07	0.024	24.85	24.70	24.78	0.14	6
Indoor still air film		<u>0.120</u>	17.67	<b>18.00</b>	17.83	0.33	<u>0.120</u>	24.70	<b>24.00</b>	24.35	0.70	195

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 2.173 winter 2.044 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 123mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.09	12.04	0.09	0.040	<b>36.00</b>	35.81	35.91	0.19	
2mm texture coat		0.005	12.09	12.10	12.09	0.01	0.005	35.81	35.79	35.80	0.02	2
8mm render		0.020	12.10	12.14	12.12	0.04	0.020	35.79	35.70	35.74	0.09	8
(ii) <b>50mm XPS insulation</b>		<b>1.859</b>	12.14	16.26	14.20	4.12	<b>1.716</b>	35.70	27.66	31.68	8.03	<b>50</b>
6mm fibre cement sheet		0.024	16.26	16.32	16.29	0.05	0.024	27.66	27.55	27.61	0.11	6
123mm ABS spacer		0.615	16.32	17.68	17.00	1.36	0.615	27.55	24.67	26.11	2.88	123
6mm fibre cement sheet		0.024	17.68	17.73	17.71	0.05	0.024	24.67	24.56	24.62	0.11	6
Indoor still air film		<u>0.120</u>	17.73	<b>18.00</b>	17.87	0.27	<u>0.120</u>	24.56	<b>24.00</b>	24.28	0.56	195

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.707 winter 2.564 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = <u>2.175</u> winter <u>2.046</u> summer <u>2.110</u> AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 135XL wall (ABS spacers), with external 50mm XPS insulation and 123mm concrete core (total thickness 195mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R2.17 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R2.05 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40D3 150XL wall (ABS spacers), with external 50mm XPS insulation and 138mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 138mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.528%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.11	12.05	0.11	0.040	<b>36.00</b>	35.77	35.88	0.23	
2mm texture coat		0.005	12.11	12.12	12.12	0.01	0.005	35.77	35.74	35.75	0.03	2
8mm render		0.020	12.12	12.18	12.15	0.05	0.020	35.74	35.62	35.68	0.12	8
(i) <b>50mm XPS insulation</b>		<b>1.854</b>	12.18	17.27	14.73	5.10	<b>1.725</b>	35.62	25.54	30.58	10.08	<b>50</b>
6mm fibre cement sheet		0.024	17.27	17.34	17.31	0.07	0.024	25.54	25.40	25.47	0.14	6
138mm concrete core		0.096	17.34	17.60	17.47	0.26	0.096	25.40	24.84	25.12	0.56	138
6mm fibre cement sheet		0.024	17.60	17.67	17.64	0.07	0.024	24.84	24.70	24.77	0.14	6
Indoor still air film		<u>0.120</u>	17.67	<b>18.00</b>	17.84	0.33	<u>0.120</u>	24.70	<b>24.00</b>	24.35	0.70	210

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 2.183 winter 2.054 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 138mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.472%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.09	12.04	0.09	0.040	<b>36.00</b>	35.82	35.91	0.18	
2mm texture coat		0.005	12.09	12.10	12.09	0.01	0.005	35.82	35.80	35.81	0.02	2
8mm render		0.020	12.10	12.14	12.12	0.04	0.020	35.80	35.70	35.75	0.09	8
(ii) <b>50mm XPS insulation</b>		<b>1.859</b>	12.14	16.15	14.14	4.01	<b>1.715</b>	35.70	27.90	31.80	7.80	<b>50</b>
6mm fibre cement sheet		0.024	16.15	16.20	16.18	0.05	0.024	27.90	27.79	27.85	0.11	6
138mm ABS spacer		0.690	16.20	17.69	16.95	1.49	0.690	27.79	24.65	26.22	3.14	138
6mm fibre cement sheet		0.024	17.69	17.74	17.72	0.05	0.024	24.65	24.55	24.60	0.11	6
Indoor still air film		<u>0.120</u>	17.74	<b>18.00</b>	17.87	0.26	<u>0.120</u>	24.55	<b>24.00</b>	24.27	0.55	210

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.782 winter 2.638 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = <u>2.185</u> winter <u>2.056</u> summer <u>2.121</u> AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 150XL wall (ABS spacers), with external 50mm XPS insulation and 138mm concrete core (total thickness 210mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R2.19 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R2.06 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40D4 165XL wall (ABS spacers), with external 50mm XPS insulation and 153mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 153mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:		99.528%	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.11	12.05	0.11	0.040	36.00	35.77	35.88	0.23	
2mm texture coat			0.005	12.11	12.12	12.12	0.01	0.005	35.77	35.74	35.75	0.03	2
8mm render			0.020	12.12	12.18	12.15	0.05	0.020	35.74	35.62	35.68	0.12	8
(i) 50mm XPS insulation			1.855	12.18	17.25	14.71	5.07	1.725	35.62	25.59	30.61	10.03	50
6mm fibre cement sheet			0.024	17.25	17.32	17.28	0.07	0.024	25.59	25.45	25.52	0.14	6
153mm concrete core			0.106	17.32	17.61	17.46	0.29	0.106	25.45	24.84	25.15	0.62	153
6mm fibre cement sheet			0.024	17.61	17.67	17.64	0.07	0.024	24.84	24.70	24.77	0.14	6
Indoor still air film			0.120	17.67	18.00	17.84	0.33	0.120	24.70	24.00	24.35	0.70	225

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 2.194 winter**

**2.064 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 153mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:		0.472%	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.08	12.04	0.08	0.040	36.00	35.82	35.91	0.18	
2mm texture coat			0.005	12.08	12.09	12.09	0.01	0.005	35.82	35.80	35.81	0.02	2
8mm render			0.020	12.09	12.14	12.12	0.04	0.020	35.80	35.71	35.76	0.09	8
(ii) 50mm XPS insulation			1.860	12.14	16.04	14.09	3.90	1.715	35.71	28.13	31.92	7.58	50
6mm fibre cement sheet			0.024	16.04	16.09	16.07	0.05	0.024	28.13	28.02	28.07	0.11	6
153mm ABS spacer			0.765	16.09	17.70	16.89	1.61	0.765	28.02	24.64	26.33	3.38	153
6mm fibre cement sheet			0.024	17.70	17.75	17.72	0.05	0.024	24.64	24.53	24.58	0.11	6
Indoor still air film			0.120	17.75	18.00	17.87	0.25	0.120	24.53	24.00	24.27	0.53	225

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 2.858 winter**

**2.713 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 2.196 winter</b>	<b>2.066 summer</b>	<b>2.131 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41

Ref: 215\_Fxl.xls

The above estimates the resulting (overall) Total R from the two parallel heat paths -

(i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)

Outer surfaces assumed to be relevant isothermal planes.

Refer AS/NZS 4859:2018 for assumptions.

Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1

Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



*before concrete fill*

**CONCLUSION:**

**For the 165XL wall (ABS spacers), with external 50mm XPS insulation and 153mm concrete core (total thickness 225mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R2.20 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R2.07 m².K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



**ENGINEERS AUSTRALIA**  
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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40D5 200XL wall (ABS spacers), with external 50mm XPS insulation and 188mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 188mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:		99.413%	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.11	12.05	0.11	0.040	36.00	35.77	35.89	0.23	
2mm texture coat			0.005	12.11	12.12	12.11	0.01	0.005	35.77	35.74	35.76	0.03	2
8mm render			0.020	12.12	12.18	12.15	0.05	0.020	35.74	35.63	35.68	0.11	8
(i) 50mm XPS insulation			1.855	12.18	17.19	14.68	5.02	1.724	35.63	25.72	30.67	9.91	50
6mm fibre cement sheet			0.024	17.19	17.26	17.22	0.06	0.024	25.72	25.58	25.65	0.14	6
188mm concrete core			0.131	17.26	17.61	17.43	0.35	0.131	25.58	24.83	25.20	0.75	188
6mm fibre cement sheet			0.024	17.61	17.68	17.64	0.06	0.024	24.83	24.69	24.76	0.14	6
Indoor still air film			0.120	17.68	18.00	17.84	0.32	0.120	24.69	24.00	24.34	0.69	260

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 2.218 winter**

**2.088 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 188mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:		0.587%	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	mm
Outside air film			0.040	12.00	12.08	12.04	0.08	0.040	36.00	35.83	35.92	0.17	
2mm texture coat			0.005	12.08	12.09	12.08	0.01	0.005	35.83	35.81	35.82	0.02	2
8mm render			0.020	12.09	12.13	12.11	0.04	0.020	35.81	35.73	35.77	0.08	8
(ii) 50mm XPS insulation			1.861	12.13	15.81	13.97	3.68	1.713	35.73	28.61	32.17	7.12	50
6mm fibre cement sheet			0.024	15.81	15.86	15.83	0.05	0.024	28.61	28.51	28.56	0.10	6
188mm ABS spacer			0.940	15.86	17.72	16.79	1.86	0.940	28.51	24.60	26.55	3.91	188
6mm fibre cement sheet			0.024	17.72	17.76	17.74	0.05	0.024	24.60	24.50	24.55	0.10	6
Indoor still air film			0.120	17.76	18.00	17.88	0.24	0.120	24.50	24.00	24.25	0.50	260

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 3.034 winter**

**2.886 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = 2.222 winter</b>	<b>2.091 summer</b>	<b>2.156 AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



**CONCLUSION:**

**For the 200XL wall (ABS spacers), with external 50mm XPS insulation and 188mm concrete core (total thickness 260mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R2.22 m².K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R2.09 m².K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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**THERMAL INSULATION EVALUATION BY CALCULATION**

JMF Calc Ref

**215w40D6 265XL wall (ABS spacers), with external 50mm XPS insulation and 253mm concrete core**

**(i) Insulation path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 253mm concrete core, 6mm fibre cement sheet**

Insulation path wall area:	99.413%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.11	12.05	0.11	0.040	<b>36.00</b>	35.77	35.89	0.23	
2mm texture coat		0.005	12.11	12.12	12.11	0.01	0.005	35.77	35.75	35.76	0.03	2
8mm render		0.020	12.12	12.17	12.15	0.05	0.020	35.75	35.63	35.69	0.11	8
(i) <b>50mm XPS insulation</b>		<b>1.855</b>	12.17	17.09	14.63	4.92	<b>1.723</b>	35.63	25.93	30.78	9.70	<b>50</b>
6mm fibre cement sheet		0.024	17.09	17.15	17.12	0.06	0.024	25.93	25.80	25.87	0.14	6
253mm concrete core		0.176	17.15	17.62	17.39	0.47	0.176	25.80	24.81	25.30	0.99	253
6mm fibre cement sheet		0.024	17.62	17.68	17.65	0.06	0.024	24.81	24.68	24.74	0.14	6
Indoor still air film		<u>0.120</u>	17.68	<b>18.00</b>	17.84	0.32	<u>0.120</u>	24.68	<b>24.00</b>	24.34	0.68	325

**Insulation path, Total Thermal Resistance R<sub>Ti</sub> = 2.264 winter 2.132 summer**

**(ii) Spacer path:- 2mm texture coat, 8mm render, 50mm XPS insulation, 6mm fibre cement sheet, 253mm ABS spacer, 6mm fibre cement sheet**

Spacer path wall area:	0.587%	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	m <sup>2</sup> .K/W	°C out	°C in	°C avg	Δt	mm
Outside air film		0.040	<b>12.00</b>	12.07	12.04	0.07	0.040	<b>36.00</b>	35.85	35.93	0.15	
2mm texture coat		0.005	12.07	12.08	12.08	0.01	0.005	35.85	35.83	35.84	0.02	2
8mm render		0.020	12.08	12.12	12.10	0.04	0.020	35.83	35.76	35.79	0.07	8
(ii) <b>50mm XPS insulation</b>		<b>1.862</b>	12.12	15.44	13.78	3.33	<b>1.710</b>	35.76	29.36	32.56	6.40	<b>50</b>
6mm fibre cement sheet		0.024	15.44	15.48	15.46	0.04	0.024	29.36	29.27	29.32	0.09	6
253mm ABS spacer		1.265	15.48	17.74	16.61	2.26	1.265	29.27	24.54	26.91	4.73	253
6mm fibre cement sheet		0.024	17.74	17.79	17.76	0.04	0.024	24.54	24.45	24.49	0.09	6
Indoor still air film		<u>0.120</u>	17.79	<b>18.00</b>	17.89	0.21	<u>0.120</u>	24.45	<b>24.00</b>	24.22	0.45	325

**Spacer path, Total Thermal Resistance R<sub>Ts</sub> = 3.360 winter 3.208 summer**

The thermal path area proportions are used to deduce the following overall Total R from the R values above.

<b>Overall Total Thermal Resistance, R<sub>T</sub> = <u>2.268</u> winter <u>2.136</u> summer <u>2.202</u> AVG</b>
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**NOTES:**

Calculated 14/2/20 20:41 Ref: 215\_Fxl.xls  
 The above estimates the resulting (overall) Total R from the two parallel heat paths -  
 (i) through the concrete, (ii) through plastic spacers (voids having negligible effect as air is an insulator)  
 Outer surfaces assumed to be relevant isothermal planes.  
 Refer AS/NZS 4859:2018 for assumptions.  
 Indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1  
 Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)



*before concrete fill*

**CONCLUSION:**

**For the 265XL wall (ABS spacers), with external 50mm XPS insulation and 253mm concrete core (total thickness 325mm), the WINTER overall Total R-value per AS4859.2:2018 (air Δt of 18°-12° = 6K) is:**

**R2.27 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Similarly,

the SUMMER overall Total R-value per AS4859.2:2018 (air Δt of 36°-24° = 12K) is:

**R2.14 m<sup>2</sup>.K/W after considering thermal bridging for this specific case.**

Signed:

*James Fricker*



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