REPORT No R-0140

Attention: Robert Rech
Client: Clear Form Wall Systems Pty Ltd
Re: Wall Thermal performance calculations "Total R"
Report Date: 30/11/2022
Compliance to: AS/NZS 4859.2:2018 Thermal insulation materials for buildings - Design

The following calculations PF01-CALC01-01 to 04 were carried out by Andres Romero based on the following literature.

1) AS/NZS 4859.2:2018 Thermal insulation materials for buildings – Design
2) The Australian Institute of Refrigeration Air-Conditioning & Heating (AIRAH) handbook 2013, 5th edition.

Also, the following assumptions and/or procedures were used for the calculations

- Results are for the insulation path only and no thermal short circuiting by frames were considered.
- R-values for the air cavities were calculated based on AS/NZS 4859.2:2018 section 6 and only the converged result from the iterations are shown.
- Emittance value adjustments were done as per AS/NZS 4859.2:2018 section 5.3.2. which depending on the conditions of installation factors for deteriorations such as dust were added.

If any of the materials, thicknesses or conditions change from the ones in this report new calculations might be required in order to capture those modifications.

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If you require any additional information or clarification, please don't hesitate to contact me.

THERMAL PERFORMANCE CALCULATIONS

Client: Clear Form Wall Systems Pty Ltd
Report Date: 30/11/2022
Calculation No: PF01-CALC01-01
Calculations By: Andres Romero - BE (Mech), MIEAust, CPEng, NER, RPEQ
Product Name: Clear Form

Clear Form wall (Bare)													
WALL ELEMENT	THK (mm)	k (W/m·K)	WINTER (6K)					SUMMER (12K)					NOTES
			R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	
Outside air film			0.040	**12.00**	12.92	12.46	0.92	0.040	**36.00**	34.15	35.08	1.85	1
PVC	2.0	0.159	0.013	12.92	13.21	13.07	0.29	0.013	34.15	33.57	33.86	0.58	4
32-40MPa concrete	106.7	1.43	0.075	13.21	14.94	14.08	1.72	0.075	33.57	30.12	31.85	3.45	3
PVC	2.0	0.159	0.013	14.94	15.23	15.08	0.29	0.013	30.12	29.54	29.83	0.58	4
Indoor air film			0.120	15.23	**18.00**	16.61	2.77	0.120	29.54	**24.00**	26.77	5.54	2
Total Thermal Resistance R_{Ti} (m^2·K/W):			**0.26**					**0.26**					
Total Conductance U (W/m^2·K):			**3.85**					**3.85**					
C_t (W/m^2):			**23.1**					**46.2**					
ΣΔt							6.0					12.0	

Summary table for Clear Form Wall standard thicknesses (Bare)				
Clear Form Wall Panel Type	TOTAL THK (mm)	Concrete THK (mm)	Winter TOTAL R	Summer TOTAL R
G4AP110	110.7	106.7	**0.26**	**0.26**
G4AP155	156.7	152.7	**0.29**	**0.29**
G4AP200	200.0	196.0	**0.32**	**0.32**
G4AP250	250.0	246.0	**0.36**	**0.36**

NOTES:

1. As per AS/NZS 4859.2:2018 section 8.a.
2. As per AS/NZS 4859.2:2018 section 8 Table 15
3. As per AIRAH Technical Handbook 2013 (pages 62-73)
4. ASHRAE Handbook p.22.18 and Rochling technical data sheet tested to DIN 52612-1.
5. Indoor and outdoor temperatures per AS/NZS 4859.2:2018 section 5.
6. Thermal short circuiting by frames was not considered here as evaluation is for the insulation path only.
7. These results are not compliant for labeling of insulation products to AS/NZS 4859.1:2018 section 3 without an independent endorsement from a recognised laboratory.

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THERMAL PERFORMANCE CALCULATIONS

Client: Clear Form Wall Systems Pty Ltd
Report Date: 30/11/2022
Calculation No: PF01-CALC01-02
Calculations By: Andres Romero - BE (Mech), MIEAust, CPEng, NER, RPEQ
Product Name: Clear Form

Clear Form wall + 50mm H grade EPS + 8mm render + 2mm texture coat													
WALL ELEMENT	THK (mm)	k (W/m·K)	WINTER (6K)					SUMMER (12K)					NOTES
			R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	
Outside air film			0.040	**12.00**	12.14	12.07	0.14	0.040	**36.00**	35.70	35.85	0.3	1
Texture coat	2.0	0.4	0.005	12.14	12.16	12.15	0.02	0.005	35.70	35.66	35.68	0.0	3
Render	8.0	0.4	0.020	12.16	12.23	12.20	0.07	0.020	35.66	35.51	35.59	0.1	3
EPS grade H	50.0	0.037	***1.390***	12.23	17.21	14.72	4.98	***1.317***	35.51	25.65	30.58	9.9	3, 8
PVC	2.0	0.159	0.013	17.21	17.26	17.24	0.05	0.013	25.65	25.55	25.60	0.1	4
32-40MPa concrete	106.7	1.43	0.075	17.26	17.53	17.39	0.27	0.075	25.55	24.99	25.27	0.6	3
PVC	2.0	0.159	0.013	17.53	17.57	17.55	0.05	0.013	24.99	24.90	24.95	0.1	4
Indoor air film			0.120	17.57	**18.00**	17.79	0.43	0.120	24.90	**24.00**	24.45	0.9	2
Total Thermal Resistance R_{Ti} (m^2·K/W):			**1.67**					**1.60**					
Total Conductance U (W/m^2·K):			**0.60**					**0.62**					
C_t (W/m^2):			**3.6**					**7.5**					
ΣΔt							6.0					12.0	

Summary table for Clear Form Wall standard thicknesses plus 50mm H grade EPS + 8mm render + 2mm texture coat				
Clear Form Wall Panel Type	TOTAL THK (mm)	Concrete THK (mm)	Winter TOTAL R	Summer TOTAL R
G4AP110	110.7	106.7	**1.67**	**1.60**
G4AP155	156.7	152.7	**1.71**	**1.63**
G4AP200	200.0	196.0	**1.74**	**1.66**
G4AP250	250.0	246.0	**1.77**	**1.70**

NOTES:

1. As per AS/NZS 4859.2:2018 section 8.a.
2. As per AS/NZS 4859.2:2018 section 8 Table 15
3. As per AIRAH Technical Handbook 2013 (pages 62-73)
4. ASHRAE Handbook p.22.18 and Rochling technical data sheet tested to DIN 52612-1.
5. Indoor and outdoor temperatures per AS/NZS 4859.2:2018 section 5.
6. Thermal short circuiting by frames was not considered here as evaluation is for the insulation path only.
7. These results are not compliant for labeling of insulation products to AS/NZS 4859.1:2018 section 3 without an independent endorsement from a recognised laboratory.
8. H grade EPS k= 0.037W/m·K @ 23°C. R adjusted as per AS/NZS 4859.2:2018 section 5.2.

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THERMAL PERFORMANCE CALCULATIONS

Client: Clear Form Wall Systems Pty Ltd
Report Date: 30/11/2022
Calculation No: PF01-CALC01-03
Calculations By: Andres Romero - BE (Mech), MIEAust, CPEng, NER, RPEQ
Product Name: Clear Form

Clear Form wall + 50mm 32kg/m^3 XPS + 8mm render + 2mm texture coat													
WALL ELEMENT	THK (mm)	k (W/m·K)	WINTER (6K)					SUMMER (12K)					NOTES
			R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	
Outside air film			0.040	**12.00**	12.11	12.06	0.11	0.040	**36.00**	35.76	35.88	0.2	1
Texture coat	2.0	0.40	0.005	12.11	12.13	12.12	0.01	0.005	35.76	35.73	35.75	0.0	3
Render	8.0	0.40	0.020	12.13	12.18	12.15	0.06	0.020	35.73	35.61	35.67	0.1	3
Extruded Polystyrene (32kg/m^2)	50.0	0.028	***1.854***	12.18	17.38	14.78	5.20	***1.726***	35.61	25.31	30.46	10.3	3, 8
PVC	2.0	0.159	0.013	17.38	17.42	17.40	0.04	0.013	25.31	25.24	25.27	0.1	4
32-40MPa concrete	106.7	1.43	0.075	17.42	17.63	17.52	0.21	0.075	25.24	24.79	25.01	0.4	3
PVC	2.0	0.159	0.013	17.63	17.66	17.65	0.04	0.013	24.79	24.72	24.75	0.1	4
Indoor air film			0.120	17.66	**18.00**	17.83	0.34	0.120	24.72	**24.00**	24.36	0.7	2
Total Thermal Resistance R_{Ti} (m^2·K/W):			**2.14**					**2.01**					
Total Conductance U (W/m^2·K):			0.47					0.50					
C_t (W/m^2):			2.8					6.0					
ΣΔt							6.0					12.0	

Summary table for Clear Form Wall standard thicknesses plus 50mm 32kg/m^3 XPS + 8mm render + 2mm texture coat				
Clear Form Wall Panel Type	TOTAL THK (mm)	Concrete THK (mm)	Winter TOTAL R	Summer TOTAL R
G4AP110	110.7	106.7	**2.14**	**2.01**
G4AP155	156.7	152.7	**2.17**	**2.04**
G4AP200	200.0	196.0	**2.20**	**2.07**
G4AP250	250.0	246.0	**2.24**	**2.11**

NOTES:

1. As per AS/NZS 4859.2:2018 section 8.a.
2. As per AS/NZS 4859.2:2018 section 8 Table 15
3. As per AIRAH Technical Handbook 2013 (pages 62-73)
4. ASHRAE Handbook p.22.18 and Rochling technical data sheet tested to DIN 52612-1.
5. Indoor and outdoor temperatures per AS/NZS 4859.2:2018 section 5.
6. Thermal short circuiting by frames was not considered here as evaluation is for the insulation path only.
7. These results are not compliant for labeling of insulation products to AS/NZS 4859.1:2018 section 3 without an independent endorsement from a recognised laboratory.
8. 32kg/m2 extruded polystyrene k= 0.028W/m·K @ 23°C. R adjusted as per AS/NZS 4859.2:2018 section 5.2.

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THERMAL PERFORMANCE CALCULATIONS

Client: Clear Form Wall Systems Pty Ltd
Report Date: 30/11/2022
Calculation No: PF01-CALC01-04
Calculations By: Andres Romero - BE (Mech), MIEAust, CPEng, NER, RPEQ
Product Name: Clear Form

Clear Form wall + 28mm air space + 10mm plasterboard													
WALL ELEMENT	THK (mm)	k (W/m·K)	WINTER (6K)					SUMMER (12K)					NOTES
			R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	R (m^2·K/W)	°C OUT	°C IN	°C AVG	Δt	
Outside air film			0.040	**12.00**	12.15	12.08	0.15	0.040	**36.00**	35.68	35.84	0.3	1
PVC	2.0	0.159	0.013	12.15	12.20	12.18	0.05	0.013	35.68	35.58	35.63	0.1	4
32-40MPa concrete	106.7	1.430	0.075	12.20	12.48	12.34	0.28	0.075	35.58	34.98	35.28	0.6	3
PVC	2.0	0.159	0.013	12.48	12.53	12.51	0.05	0.013	34.98	34.88	34.93	0.1	4
Foilboard SL grade polystyrene	15.0	0.034	***0.456***	12.53	14.27	13.40	1.74	***0.428***	34.88	31.46	33.17	3.4	8
Unventilated reflective air space	28.0	0.035	***0.800***	14.27	17.32	15.79	3.05	***0.753***	31.46	25.43	28.45	6.0	
Plasterboard	10.0	0.169	0.059	17.32	17.54	17.43	0.23	0.059	25.43	24.96	25.20	0.5	3
Indoor air film			0.120	17.54	**18.00**	17.77	0.46	0.120	24.96	**24.00**	24.48	1.0	2
Total Thermal Resistance R_{Ti} (m^2·K/W):			**1.57**					**1.50**					
Total Conductance U (W/m^2·K):			0.63					0.67					
C_t (W/m^2):			3.8					8.0					
ΣΔt							6.0					12.0	

Summary table for Clear Form Wall standard thicknesses plus 28mm air space + 10mm plasterboard				
Clear Form Wall Panel Type	TOTAL THK (mm)	Concrete THK (mm)	Winter TOTAL R	Summer TOTAL R
G4AP110	110.7	106.7	**1.57**	**1.50**
G4AP155	156.7	152.7	**1.61**	**1.54**
G4AP200	200.0	196.0	**1.64**	**1.57**
G4AP250	250.0	246.0	**1.67**	**1.61**

NOTES:

1. As per AS/NZS 4859.2:2018 section 8.a.
2. As per AS/NZS 4859.2:2018 section 8 Table 15
3. As per AIRAH Technical Handbook 2013 (pages 62-73)
4. ASHRAE Handbook p.22.18 and Rochling technical data sheet tested to DIN 52612-1.
5. Indoor and outdoor temperatures per AS/NZS 4859.2:2018 section 5.
6. Thermal short circuiting by frames was not considered here as evaluation is for the insulation path only.
7. These results are not compliant for labeling of insulation products to AS/NZS 4859.1:2018 section 3 without an independent endorsement from a recognised laboratory.
8. Foilboard 15mm foil based SL grade polystyrene k= 0.034W/m·K @ 23°C. R adjusted as per AS/NZS 4859.2:2018 section 5.2.
9. Unventilated air space with uniform parallel surfaces was calculated based on AS/NZS 4859.2:2018 section 6 and incorporating emittance value adjustments as per AS/NZS 4859.2:2018 section 5.3.2.

   Cavity properties were assumed as, e1=0.03 and e2= 0.87.

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