

Product R-Value/U-Factor Documentation and ASHRAE 90.1-2019 Compliance Calculation Summary

TechnoNICOL

390047, Ryazan, Vostochny Promuzel, 21

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prepared for

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EXECUTIVE SUMMARY

This report summarizes Intertek's documentation of R-value and U-factor calculations for TechnoNicol PIR Thermal Insulation aluminum facing (PIR F/F) board in support of the energy code compliance as per 2019 ASHRAE 90.1. All calculations are based on ASHRAE 90.1-2019 Appendix-A and material properties information provided in [TechnoNICOL PIR Materials \(technonicol.eu\)](http://technonicol.eu). The table below summarizes the code requirements and PIR Product thicknesses recommended to meet the code requirements. It is shown that the recommended PIR product thicknesses meet the assembly R-value requirements and U-factor requirements for prescriptive compliance.

PIR Thickness & R-Value

Component	Zone 7		Zone 8	
	PIR F/F Thickness, R-value	Code Requirement	PIR F/F Thickness, R-value	Code Requirement
Roof – Insulation Entirely Above Deck	140mm R-6.35	R-6.2 ci	140mm R-6.35	R-6.2 ci
	<i>U – 0.157</i>	<i>U – 0.158</i>	<i>U – 0.157</i>	<i>U – 0.158</i>
Ext. Wall – Mass	60mm R-2.70	R- 2.7 ci	80mm R-3.60	R- 3.3 ci
	<i>U – 0.341</i>	<i>U – 0.404</i>	<i>U – 0.261</i>	<i>U – 0.273</i>
Ext. Wall – Steel-Frame (Nonresidential)	50mm R-2.25	R- 2.2 ci	80mm R- 3.60	R- 3.3 ci
	<i>U-0.270</i>	<i>U-0.277</i>	<i>U-0.198</i>	<i>U-0.212</i>
Ext. Wall – Steel-Frame (Residential)	70mm R-3.15	R- 2.7 ci	80mm R- 3.60	R- 3.3 ci
	<i>U-0.217</i>	<i>U-0.240</i>	<i>U-0.198</i>	<i>U-0.212</i>
Ext. Wall – Wood-Frame	30mm R-1.35	R-1.3 ci	80mm R-3.60	R- 3.3 ci
	<i>U – 0.249</i>	<i>U – 0.291</i>	<i>U – 0.160</i>	<i>U – 0.182</i>

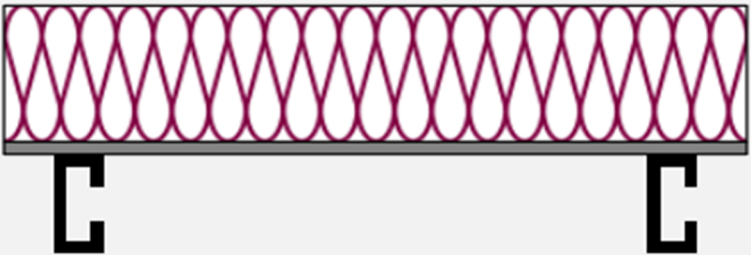
Note: ci – continuous insulation

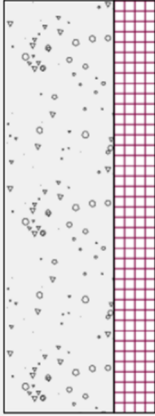
Conclusions

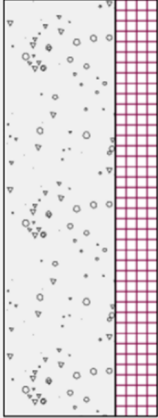
Based on the U-factor requirements and calculations as per ASHRAE 90.1-2019, Intertek concludes the following:

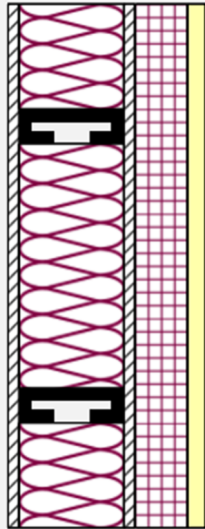
1. PIR F/F insulation Boards can be used in Climate Zones 7 and 8, to meet the prescriptive requirements for continuous insulation in roof and exterior wall assemblies as per ASHRAE 90.1-2019.
2. PIR F/F insulation board of 140 mm thickness can be used in roof systems where the insulation is placed entirely above deck to provide a total system R-value of 6.35, about 2% better than the code requirement for prescriptive compliance.
3. Exterior mass wall assemblies can be insulated with PIR F/F boards of 60mm and 80mm thickness for climate zones 7 and 8 respectively to meet the prescriptive requirements.
4. All steel and wood frame assemblies can be insulated with PIR F/F boards of thickness varying from 30mm to 80mm depending on the occupancy type and climate zone.

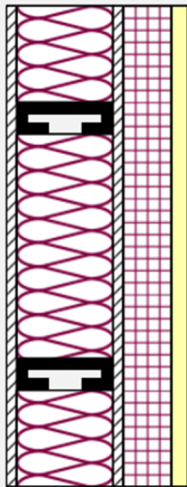
ATTACHMENT-1: Details of U-factor Calculation

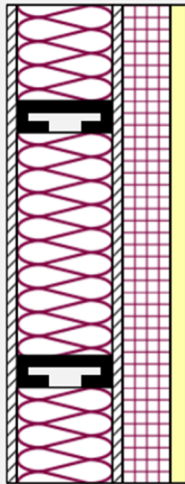
Name	PIR F/F: Roof – Insulation Entirely Above Deck (Climate Zone 7 & 8)																								
Date	09-02-2021																								
Detail Section																									
Layers/R-values	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #f2f2f2;"> <th style="padding: 5px;"><i>Layer Name</i></th><th style="padding: 5px;"><i>R-value</i></th><th style="padding: 5px;"><i>U-value</i></th><th style="padding: 5px;"><i>Notes</i></th></tr> </thead> <tbody> <tr> <td style="padding: 5px;">Exterior Air Film</td><td style="padding: 5px;">0.03</td><td style="padding: 5px;"></td><td style="padding: 5px;">A2.2.1</td></tr> <tr> <td style="padding: 5px;">PIR Insulation Boards F/F 140 mm thick</td><td style="padding: 5px;">6.2</td><td style="padding: 5px;"></td><td style="padding: 5px;">Table 5.5-7 & 5.5-8* / 140mm thickness</td></tr> <tr> <td style="padding: 5px;">Metal Deck</td><td style="padding: 5px;">0</td><td style="padding: 5px;"></td><td style="padding: 5px;">A2.2.1</td></tr> <tr> <td style="padding: 5px;">Interior Air Film</td><td style="padding: 5px;">0.11</td><td style="padding: 5px;"></td><td style="padding: 5px;">A2.2.1</td></tr> <tr style="background-color: #f2f2f2;"> <td style="padding: 5px;">Total</td><td style="padding: 5px;">6.34</td><td style="padding: 5px;">0.157</td><td style="padding: 5px;"></td></tr> </tbody> </table>	<i>Layer Name</i>	<i>R-value</i>	<i>U-value</i>	<i>Notes</i>	Exterior Air Film	0.03		A2.2.1	PIR Insulation Boards F/F 140 mm thick	6.2		Table 5.5-7 & 5.5-8* / 140mm thickness	Metal Deck	0		A2.2.1	Interior Air Film	0.11		A2.2.1	Total	6.34	0.157	
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Proposed Assembly U-factor	0.157 [W/m².K]																								
Code Requirement	0.158 [W/m².K]																								
Notes/ Reference	*Minimum c.i. R-value per ASHRAE 90.1 = R-6.2																								

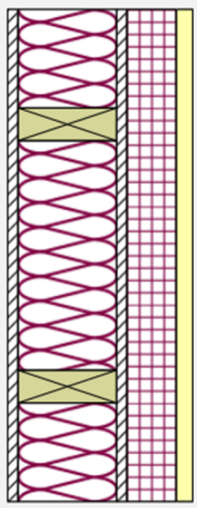
Name	PIR F/F: Exterior Wall – Mass (Climate Zone 7)																										
Date	09-02-2021																										
Detail Section																											
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Notes/ Reference	* Minimum c.i. R-value per ASHRAE 90.1 = R-2.7 **Based on density of 2304 kg/m³ R_c = 0.01																										

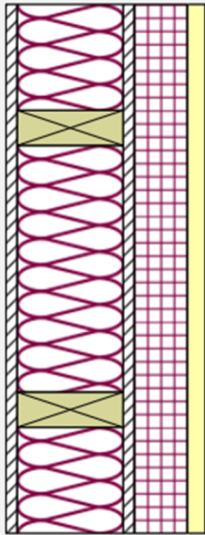
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Proposed Assembly U- factor	0.217 [W/m².K]																																							
Code Requirement	0.240 [W/m².K]																																							
Notes/ Reference	* Assuming this will be provided in all steel frame wall construction **Minimum residential continuous insulation R-value per ASHRAE 90.1 = R-2.7																																							

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Proposed Assembly U- factor	0.198 [W/m².K]																																							
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Date	09-02-2021																																							
Detail Section																																								
Layers/R-values	<table><tr><th>Layer Name</th><th>R-value</th><th>U-value</th><th>Notes</th></tr><tr><td>Exterior Air Film</td><td>0.03</td><td></td><td>A3.4.1</td></tr><tr><td>Stucco</td><td>0.01</td><td></td><td>A3.4.1</td></tr><tr><td>PIR Board Insulation F/F 80mm Thickness</td><td>3.60</td><td></td><td>Table 5.5-8** / 80mm thickness</td></tr><tr><td>16mm Gypsum Board</td><td>0.10</td><td></td><td>A3.4.1</td></tr><tr><td>Steel Framing at 400 mm On Centre to Centre Spacing, w/R-2.3*</td><td>2.3</td><td></td><td>Table A3.4.3.1</td></tr><tr><td>16mm Gypsum Board</td><td>0.10</td><td></td><td>A3.4.1</td></tr><tr><td>Interior Air Film</td><td>0.12</td><td></td><td>A3.4.1</td></tr><tr><td>Total</td><td>6.26</td><td>0.160</td><td></td></tr></table>	Layer Name	R-value	U-value	Notes	Exterior Air Film	0.03		A3.4.1	Stucco	0.01		A3.4.1	PIR Board Insulation F/F 80mm Thickness	3.60		Table 5.5-8** / 80mm thickness	16mm Gypsum Board	0.10		A3.4.1	Steel Framing at 400 mm On Centre to Centre Spacing, w/R-2.3*	2.3		Table A3.4.3.1	16mm Gypsum Board	0.10		A3.4.1	Interior Air Film	0.12		A3.4.1	Total	6.26	0.160				
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Proposed Assembly U- factor	0.160 [W/m².K]																																							
Code Requirement	0.182 [W/m².K]																																							
Notes/ Reference	* Assuming this will be provided in all wood frame wall construction **Minimum continuous insulation R-value per ASHRAE 90.1 = R-3.3																																							

ATTACHMENT-2: PIR F/F Insulation Board Product Data Sheet



TECHNICAL DATA SHEET 01 / 04.2021

PIR board F/F TECHNINICOL



DESCRIPTION:

PIR F/F TECHNINICOL is a thermal insulation board with a rigid polyisocyanurate foam core, faced on both sides with unmarked gastight aluminum foil.

This high performance PIR insulation board is designed for use on flat roofs with mechanically fixed single ply waterproofing systems. Being very rigid and perfectly flat, PIR is an ideal substrate for waterproofing materials.

PIR F/F TECHNINICOL is 100 % CFC, HCFC or HFC-free.

APPLICATION:

Flat roof: flat roof insulation for timber, concrete and steel deck.

Sarking: pitched roof insulation.

Floor: floor insulation (with underfloor heating).

Wall: cavity wall insulation, outside wall insulation.

Comfort: sauna internal insulation

EDGE FINISH:



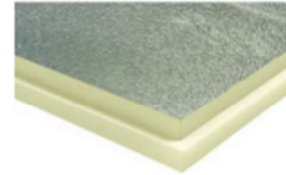
Straight



Rebate (L)



Tongue and groove (T)



PRODUCT STANDARD:
EN 13165+A2:2016

PRODUCTION:
ISO 9001:2015

**ENVIRONMENTAL
MANAGEMENT:**
ISO 14001:2015

CERTIFICATES:
M1 CERTIFICATE # 3272
FROM 28.04.2020

PERFORMANCE AND KEY PROPERTIES:

Properties	Test Method	PIR boards F/F TECHNINICOL
Thermal conductivity λ_D , W/(m ² K)	EN 12667	0.022
Thickness tolerance	EN 823	T2
Reaction to fire	EN 13501-1	Class E
Dimensional stability under specified temperature and humidity condition, 48 h, 70 °C, 90 % R.H	EN 1604:2013	DS(70,90)4
Deformation under specified compressive load and temperature conditions, 40 kPa, 70°C, 168h	EN 1605:2013	DLT(2)5
Fire class 'end use' application	EN 13501-1	B-s1,d0
Compressive stress or compressive strength, CS(10\Y)150, kPa	EN 826	≥ 150
Tensile strength perpendicular to faces	EN 1607:2013	TR100
Water permeability - short term water absorption, WS(P)	EN ISO 29767	0.1
Water permeability - flatness after one sided wetting, FW2	EN 825	≤5
Density, kg/m ³	EN 1602	30 ± 2
Facing type		aluminum foil

Thickness (mm)	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
Rd (m ² .K/W)	1,35	1,80	2,25	2,70	3,15	3,60	4,05	4,50	5,00	5,45	5,90	6,35	6,80	7,25	7,70	8,15	8,60	9,05

DIMENSIONS:

Standard dimensions, mm	1200x2400
Dimensions on request, mm	1200x1200, 600x1200
Thickness, mm	30-200 in steps of ten

* The boards produced with rebates on four sides have actual size 2385x1185, 1185x1185, 1185x585.



DECLARATION OF PERFORMANCE

No. 5.01

- | | |
|---|---|
| 1. Unique identification code of the product type: | PIR boards F/F TECHNONICOL |
| 2. Intended use/es: | Thermal insulation for buildings |
| 3. Manufacturer: | Zavod Logicroof PIR LLC
Vostochny Promuzel 21, Ryazan, 390047, Russian Federation |
| 4. System/s of AVCP: | System 3 |
| 5. Harmonised standard:
Notified body/ies: | EN 13165+A2:2016
1688 (Vilnius Gediminas Technical University, Faculty of Civil Engineering, Institute of Building Materials, Laboratory of Thermal Insulating Materials and Acoustics. Linkmenu 28, 08217 Vilnius). Test report # 1688-CPR-1864
1023 (INSTITUTE FOR TESTING AND CERTIFICATION, a.s. trida Tomase Bati 299, Louky, 763 02 Zlin, Czech Republic) |

6. Declared performance

Essential characteristics		Performance	
Thermal resistance	Thermal conductivity λ_D (W/(m.K))	0.022	
	Thermal resistance R_D ((m ² .K)/W)	d_N 30mm	1.35
		d_N 40mm	1.80
		d_N 50mm	2.25
		d_N 60mm	2.70
		d_N 70mm	3.15
		d_N 80mm	3.60
		d_N 90mm	4.05
		d_N 100mm	4.50
		d_N 110mm	5.0
		d_N 120mm	5.45
		d_N 130mm	5.9
		d_N 140mm	6.35
		d_N 150mm	6.81
		d_N 160mm	7.27
		d_N 170mm	7.72
		d_N 180mm	8.18
		d_N 190mm	8.63
		d_N 200mm	9.05
	Thickness tolerance	T2	
Reaction to fire		Class E	