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.

AS/NZS 4859.2:2018 is a referenced document in NCC2019 & NCC2022.

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), Registered Professional Engineer (Victoria PE0005355)

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ESTIMATION OF THE THERMAL RESISTANCE OF THE LOKPOD SYSTEM - LOKPOD 300 RAFT SLAB POD WITH VOID ABOVE NON-REFLECTIVE GROUND BARRIER

The following determines Total Thermal Resistances (R-values) per AS/NZS 4859.1&2:2018, and "Added R". **JMF Calc 556LP01b**

The following uses the isothermal planes method to estimate the resulting combined R from the main thermal paths through the concrete/void LOKPOD system. The thermal elements considered to be within the isothermal planes are hilit with yellow in the table

The only insulating elements in the bare LOKPOD system are the voids between the inverted pods and the ground barrier.

				WINTER R				SUMMER R
Centre Post	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	300mm concrete	300	1.44	0.208	300mm concrete	300	1.44	0.208
	LOKPOD 300 polypropylene	2	0.25	0.008	LOKPOD 300 polypropylene	2	0.25	0.008
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
0.30% area.	R sum between isothermal planes			0.841	R sum between isothermal planes			0.841
4 Sides	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	300mm concrete	300	1.44	0.208	300mm concrete	300	1.44	0.208
	2mm polypropylene	2	0.25	0.008	2mm polypropylene	2	0.25	0.008
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
14.70% area.	R sum between isothermal planes			0.841	R sum between isothermal planes			0.841
Central Void	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	2mm polypropylene	2	0.25	0.008	2mm polypropylene	2	0.25	0.008
	Non-reflective air void	**300**	1.32	**0.226**	**Non-reflective air void**	**300**	2.02	**0.149**
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
85.0% area.	R sum between isothermal planes			0.859	R sum between isothermal planes			0.782
100% area.								

	winter	summer
Combined R between isothermal planes (= 1/(A%/Ra + B%/Rb + C%/Rc)	**R0.86**	**R0.79**

	System R-values	
	winter	summer
LOKPOD 300 Thermal Resistance*, base R =	**R0.30**	**R0.23**

***combined R with top 100mm concrete, without earth beneath**

	Total R-values	
LOKPOD 300 (with top 100mm concrete)	winter	summer
with bare floor	**R0.46**	**R0.34**
with 6mm carpet and 15mm underlay	**R0.87**	**R0.75**
with 25mm mountain ash floating timber overlay	**R0.62**	**R0.50**

ADDED R VALUES -	winter	summer
LOKPOD 300 (with non-reflective void beneath)	**R0.23**	**R0.17**

NOTES

Determinations based upon AS/NZS 4859.1&2:2018, Thermal insulation materials for buildings.

The thermal components in the system are hilit in yellow and the bounding surfaces are taken as the isothermal planes for thermal bridging calculations.

The 1000 mm earth is included in the calcs to achieve the requisite isothermal plane, and then its value subtracted for the System & Total R results.

If 25mm of extruded polystyrene is used as slab perimeter insulation, edge heat loss will be negligible.

"Added R" is the thermal resistance addition due to the inclusion of the LOKPOD system to a base system only having a 100mm concrete slab.

Calculated by James Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)
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Calculation date 18/03/2024
556_LOKPOD.xls

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ESTIMATION OF THE THERMAL RESISTANCE OF THE LOKPOD SYSTEM - LOKPOD 225 RAFT SLAB POD WITH VOID ABOVE NON-REFLECTIVE GROUND BARRIER

The following determines Total Thermal Resistances (R-values) per AS/NZS 4859.1&2:2018, and "Added R". **JMF Calc 556LP02b**

The following uses the isothermal planes method to estimate the resulting combined R from the main thermal paths through the concrete/void LOKPOD system. The thermal elements considered to be within the isothermal planes are hilit with yellow in the table

The only insulating elements in the bare LOKPOD system are the voids between the inverted pods and the ground barrier.

				WINTER R				SUMMER R
Centre Post	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	225mm concrete	225	1.44	0.156	225mm concrete	225	1.44	0.156
	LOKPOD 225 polypropylene	2	0.25	0.008	LOKPOD 225 polypropylene	2	0.25	0.008
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
0.30% area.	R sum between isothermal planes			0.789	R sum between isothermal planes			0.789
4 Sides	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	225mm concrete	225	1.44	0.156	225mm concrete	225	1.44	0.156
	2mm polypropylene	2	0.25	0.008	2mm polypropylene	2	0.25	0.008
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
14.70% area.	R sum between isothermal planes			0.789	R sum between isothermal planes			0.789
Central Void	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	2mm polypropylene	2	0.25	0.008	2mm polypropylene	2	0.25	0.008
	Non-reflective air void	**225**	1.00	**0.225**	**Non-reflective air void**	**225**	1.51	**0.149**
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
85.0% area.	R sum between isothermal planes			0.858	R sum between isothermal planes			0.782
100% area.								
	Combined R between isothermal planes (= 1/(A%/Ra + B%/Rb + C%/Rc)			winter R0.85				summer R0.78

	System R-values	
	winter	summer
LOKPOD 225 Thermal Resistance*, base R =	**R0.29**	**R0.23**

***combined R with top 100mm concrete, without earth beneath**

	Total R-values	
LOKPOD 225 (with top 100mm concrete)	**winter**	**summer**
with bare floor	**R0.45**	**R0.34**
with 6mm carpet and 15mm underlay	**R0.86**	**R0.75**
with 25mm mountain ash floating timber overlay	**R0.61**	**R0.50**

ADDED R VALUES -	**winter**	**summer**
LOKPOD 225 (with non-reflective void beneath)	**R0.22**	**R0.16**

NOTES

Determinations based upon AS/NZS 4859.1&2:2018, Thermal insulation materials for buildings.

The thermal components in the system are hilit in yellow and the bounding surfaces are taken as the isothermal planes for thermal bridging calculations.

The 1000 mm earth is included in the calcs to achieve the requisite isothermal plane, and then its value subtracted for the System & Total R results.

If 25mm of extruded polystyrene is used as slab perimeter insulation, edge heat loss will be negligible.

"Added R" is the thermal resistance addition due to the inclusion of the LOKPOD system to a base system only having a 100mm concrete slab.

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Calculation date 18/03/2024
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ESTIMATION OF THE THERMAL RESISTANCE OF THE LOKPOD SYSTEM - LOKPOD 150 RAFT SLAB POD WITH VOID ABOVE NON-REFLECTIVE GROUND BARRIER

The following determines Total Thermal Resistances (R-values) per AS/NZS 4859.1&2:2018, and "Added R". **JMF Calc 556LP03b**

The following uses the isothermal planes method to estimate the resulting combined R from the main thermal paths through the concrete/void LOKPOD system. The thermal elements considered to be within the isothermal planes are hilit with yellow in the table

The only insulating elements in the bare LOKPOD system are the voids between the inverted pods and the ground barrier.

				WINTER R				SUMMER R
Centre Post	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	150mm concrete	150	1.44	0.104	150mm concrete	150	1.44	0.104
	LOKPOD 150 polypropylene	2	0.25	0.008	LOKPOD 150 polypropylene	2	0.25	0.008
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
0.30% area.	R sum between isothermal planes			0.737	R sum between isothermal planes			0.737
4 Sides	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	150mm concrete	150	1.44	0.104	150mm concrete	150	1.44	0.104
	2mm polypropylene	2	0.25	0.008	2mm polypropylene	2	0.25	0.008
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
14.70% area.	R sum between isothermal planes			0.737	R sum between isothermal planes			0.737
Central Void	Floor system element	t, mm	k	m².K/W	Floor system element	t, mm	k	m².K/W
	100mm concrete	100	1.44	0.069	100mm concrete	100	1.44	0.069
	2mm polypropylene	2	0.25	0.008	2mm polypropylene	2	0.25	0.008
	Non-reflective air void	**150**	0.67	**0.223**	**Non-reflective air void**	**150**	1.01	**0.149**
	Non-reflective barrier	0	-	0.000	Non-reflective barrier	0	-	0.000
	1000mm earth	1000	1.6	0.625	1000mm earth	1000	1.6	0.625
85.0% area.	R sum between isothermal planes			0.856	R sum between isothermal planes			0.782
100% area.								
	Combined R between isothermal planes (= 1/(A%/Ra + B%/Rb + C%/Rc)			**winter R0.84**				**summer R0.77**

System R-values	winter	summer
LOKPOD 150 Thermal Resistance*, base R =	**R0.28**	**R0.22**

***combined R with top 100mm concrete, without earth beneath**

Total R-values	winter	summer
LOKPOD 150 (with top 100mm concrete)		
with bare floor	**R0.44**	**R0.33**
with 6mm carpet and 15mm underlay	**R0.85**	**R0.74**
with 25mm mountain ash floating timber overlay	**R0.60**	**R0.49**

ADDED R VALUES -	winter	summer
LOKPOD 150 (with non-reflective void beneath)	**R0.21**	**R0.15**

NOTES

Determinations based upon AS/NZS 4859.1&2:2018, Thermal insulation materials for buildings.

The thermal components in the system are hilit in yellow and the bounding surfaces are taken as the isothermal planes for thermal bridging calculations.

The 1000 mm earth is included in the calcs to achieve the requisite isothermal plane, and then its value subtracted for the System & Total R results.

If 25mm of extruded polystyrene is used as slab perimeter insulation, edge heat loss will be negligible.

"Added R" is the thermal resistance addition due to the inclusion of the LOKPOD system to a base system only having a 100mm concrete slab.

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