Kalzip

Kalzip low U-value deck roof system

Technical information

TIS-SYS-LOWU-286
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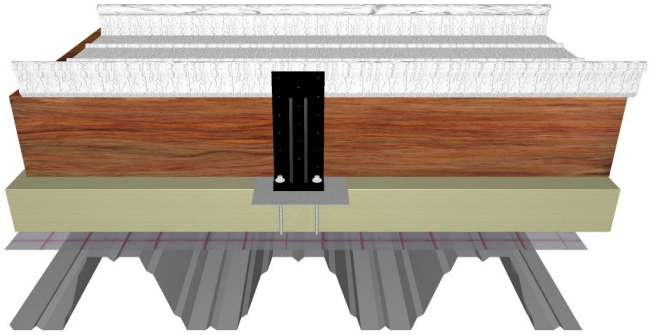
Kalzip low U-value roof system on structural metal decking



Introduction

Kalzip low U-value roof systems have been developed in anticipation of changes to Part L of the Building Regulations in 2010 and beyond. These new regulations will lead to ever-tightening design limits on thermal transmittance. The adoption of a hybrid or 'duo' liner system combining high-performance rigid insulation boards and mineral fibre layers provides a cost effective and technically feasible solution for roof U-values as low as 0.10 W/m²/K.

This series of information sheets deal with the low U-value roof system fixed to four types of roof lining: standard liner tray over purlins, liner-deck spanning between purlins, structural metal deck spanning between rafters and timber decking (eg glue-laminated decking).

Energy legislation

There are several key drivers for improving the thermal performance of the building envelope.

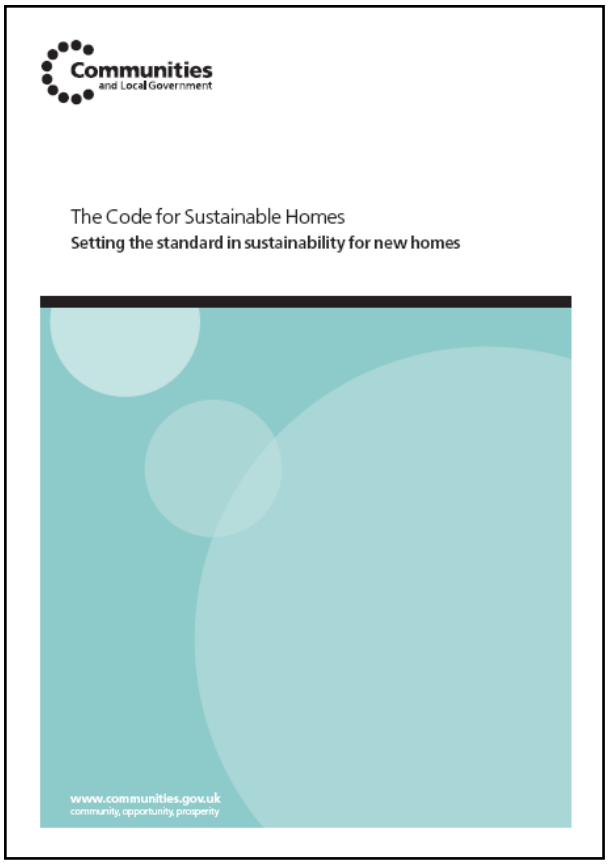
As climate change becomes an increasing reality, aggressive targets for reducing the carbon footprint of buildings continue to be committed to by the UK government. It is estimated that buildings in the UK account for approximately 50% of total CO_2 emissions. Reducing heat loss by improving U-values therefore plays a valuable role in meeting the country's obligations under the Kyoto Protocol.

The Code for Sustainable Homes represents current best practice for the construction of residential dwellings. The Code is closely linked to Building Regulations, which are the minimum building standards required by law. The higher standards of the Code will be reflected in future revisions of the Building Regulations, giving developers a clear framework within which to anticipate changes. It is generally accepted that this will ultimately spread to non-dwellings, driving the way forward to all new buildings becoming net zero carbon rated by the year 2019.

The Code measures the sustainability of a home against nine design categories, rating the whole home as a complete package. The design category covering building fabric is energy and CO_2 emissions. Studies on typical residential apartments have shown that U-values down to 0.10 W/m^2/K can be required to achieve a Code Level 3 rating without the need for additional low and zero carbon technologies.

Level 3 is the current standard required for all new public dwellings.

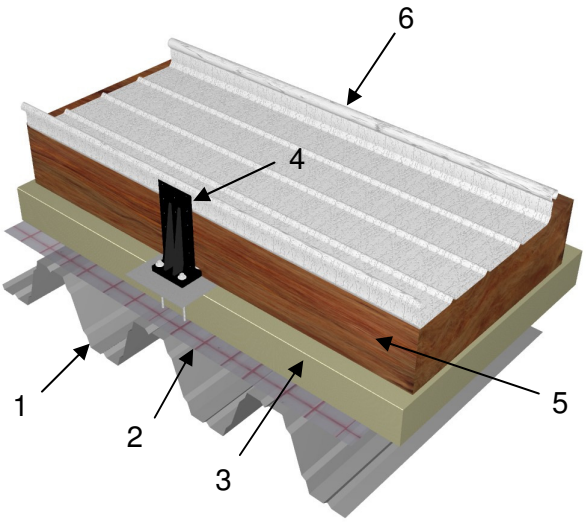
In whole-life cost terms, a Kalzip liner roof system is good place to invest in fabric improvements as it will likely survive the life of the building without requiring upgrade.



It is widely anticipated that The Code for Homes will extend to non-dwellings in coming years leading to a regime of improvements which will ultimately result in all new buildings being net zero carbon by 2019.

Structural metal deck roof system

The liner-deck system is a variation of the standard liner system. A higher structural grade of steel is used to allow the clip rails to be positioned away from purlins.



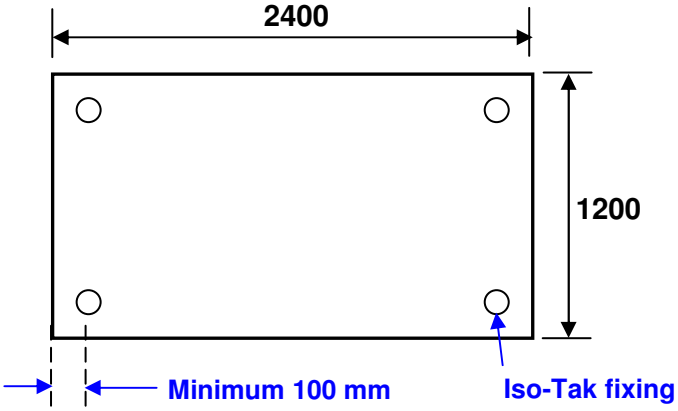
1. Structural metal deck spanning between rafters
2. Clear vapour control layer
3. Kalzip insulation 23
   (2400 mm x 1200 mm)
4. E clips fixed through steel bearer plates to crowns of metal deck
5. Mineral fibre quilt insulation
6. Kalzip top sheet

Using this combination of rigid board and mineral fibre insulation materials allows a significantly greater overall thermal resistance to be achieved compared to that of a single layer of mineral fibre of the same thickness.

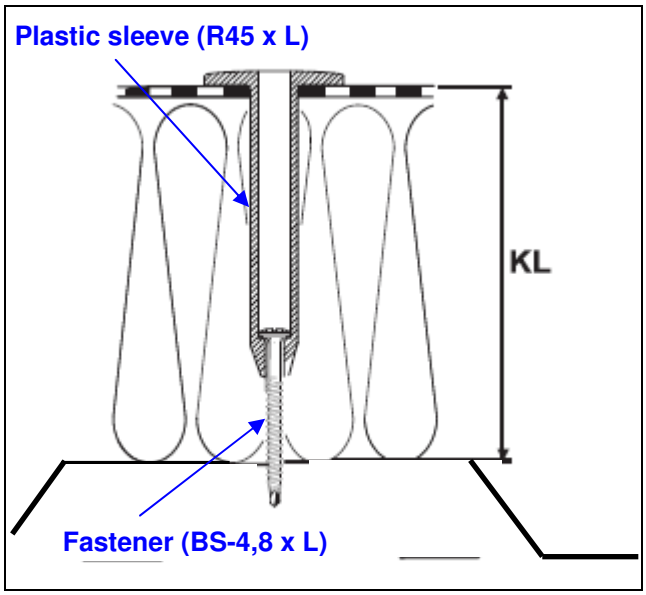
Fixing PIR board to structural deck

Each board requires four fixings one in each corner a located a minimum of 100 mm from the edge.

All insulation joints should be staggered by a minimum of 200 mm. Boards should be fixed as they are laid, ensuring they do not get wet.

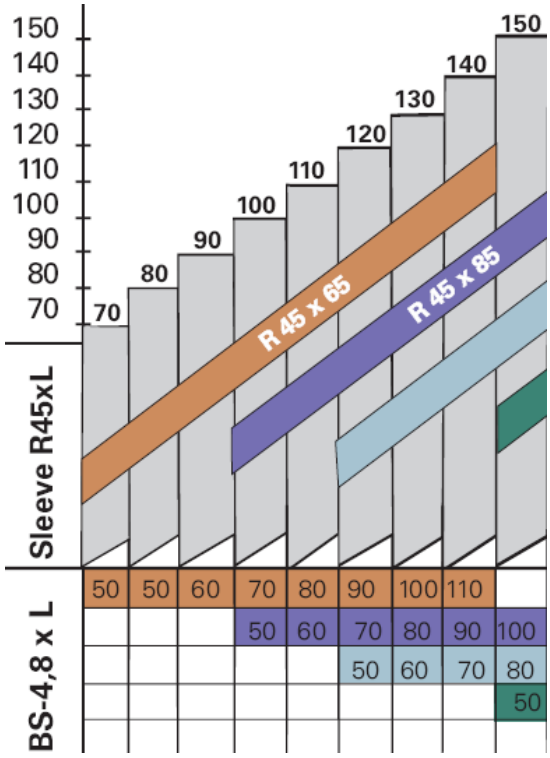


The board fixing is a two component Iso-Tak system manufactured by SFS Intec. The blue plastic sleeve (R45 x L) is first pushed into the board over the wide flange of the liner. Fastener BS-4,8 x L, is then placed into the sleeve and screw-fixed to the inverted liner thickness, t.



The overall thickness of the rigid insulation board, KL should be fixed using the following sleeve / fastener combinations.

KL (mm)



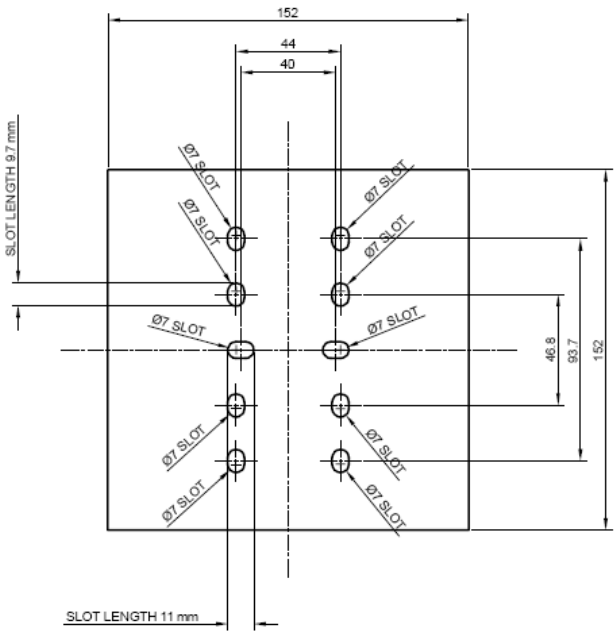
Example:

To fix a 100 mm thick board use either a R45 x 65 sleeve with a BS-4,8 x 70 screw or a R45 x 85 sleeve with a BS-4,8 x 50 screw.

Fixing bearer plate and clips to deck

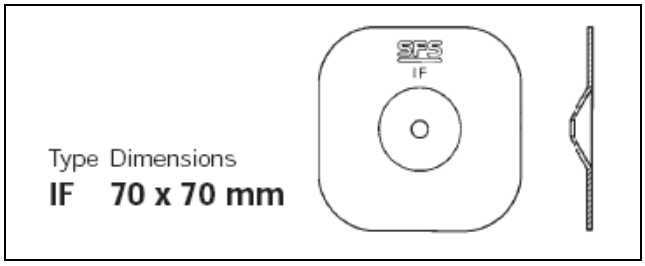
To attach clips to the deck, they must be fixed through a 0.7 mm glavanised steel bearer plate which sits on the Kalzip insulation 23. The clip/bearer plate assembly is fixed to the crowns of the structural deck using SFS IR2-4.8 fixings. The fastener pull-out values and hence the number and position of fixings will vary depending on the structural grade of steel used for the deck.

The length of IR2 screw required will be dependent on the thickness of PIR board through-fixed. The galvanised steel bearer plate is supplied with slotted pilot holes.



Fixing PIR board less than 50 mm thickness

In situations where the thickness of Kalzip insulation 23 is less than 50 mm the Iso-Tak fastener system should be replaced with an IR2 screw in combination with an SFS IF 70 mm x 70 mm stress plate.



Fixing two-layer systems

In case of fixing two layers of Kalzip insulation 23, the first board must be laid and fixed with one central fixing. The second layer of boards should then be laid with staggered joints and fixed as normal with four fixings per board.

Fastener aesthetics

Where concerns over aesthetics may be an issue, a range of coloured screw-tip caps are available from SFS to cover any exposed fixings.

Curving parameters

Where Kalzip insulation 23 board is fixed to a curved liner, there are a number of possibilities to accommodate a range of radii of curvature. At radii greater than 10.0 metre, the board will naturally curve to the liner. At smaller radii, slots can be introduced into the board to facilitate curving.

Radius of curvature	Solution
r < 1.5 m	Not possible
1.5 m ≤ r ≤ 4.0 m	25 mm slotted – two layers of board
4.0 m ≤ r ≤ 6.5 m	15 mm slotted
6.5 m ≤ r ≤ 10.0 m	10 mm slotted
> 10.0 m	No slots required

National Building Specification clauses

For a complete specification of the Kalzip low U-value liner-deck roof system, please refer to **TIS-NBS-LOWU-285**

U-value tables > 10.0 m radius

U-value (W/m²/K)	Roof radius (m)	Slotting depth required (mm)	Kalzip insulation 23 thickness (mm)	Kalzip insulation 23 thermal conductivity (W/m/K)	Kalzip insulation Plus* thickness (mm)	Kalzip insulation Plus* thermal conductivity (W/m/K)
0.09	> 10.0	None	110	0.023	180	0.032
0.10	> 10.0	None	90	0.023	180	0.032
0.11	> 10.0	None	80	0.023	180	0.032
0.13	> 10.0	None	40	0.023	180	0.032
0.14	> 10.0	None	35	0.023	180	0.032
0.15	> 10.0	None	25	0.023	180	0.032
0.10	> 10.0	None	100	0.023	180	0.035
0.11	> 10.0	None	80	0.023	180	0.035
0.12	> 10.0	None	70	0.023	180	0.035
0.13	> 10.0	None	50	0.023	180	0.035
0.14	> 10.0	None	40	0.023	180	0.035
0.15	> 10.0	None	35	0.023	180	0.035
0.10	> 10.0	None	110	0.023	180	0.037
0.11	> 10.0	None	90	0.023	180	0.037
0.12	> 10.0	None	70	0.023	180	0.037
0.13	> 10.0	None	60	0.023	180	0.037
0.14	> 10.0	None	50	0.023	180	0.037
0.15	> 10.0	None	35	0.023	180	0.037
0.10	> 10.0	None	120	0.023	180	0.040
0.11	> 10.0	None	95	0.023	180	0.040
0.12	> 10.0	None	80	0.023	180	0.040
0.13	> 10.0	None	70	0.023	180	0.040
0.14	> 10.0	None	60	0.023	180	0.040
0.15	> 10.0	None	50	0.023	180	0.040

U-value tables 1.5 m ≤ r ≤ 10.0 m

U-value (W/m²/K)	Roof radius (m)	Slotting depth required (mm)	Kalzip insulation 23 thickness (mm)	Kalzip insulation 23 thermal conductivity (W/m/K)	Kalzip insulation Plus* thickness (mm)	Kalzip insulation Plus* thermal conductivity (W/m/K)
0.10	1.5 ≤ r ≤ 4.0	25 per layer	2 x 70	0.027	180	0.032
0.11	1.5 ≤ r ≤ 4.0	20 per layer	2 x 60	0.027	180	0.032
0.10	4.0 ≤ r ≤ 6.5	15	120	0.027	180	0.032
0.11	4.0 ≤ r ≤ 6.5	15	100	0.027	180	0.032
0.12	4.0 ≤ r ≤ 6.5	15	80	0.027	180	0.032
0.13	4.0 ≤ r ≤ 6.5	15	60	0.027	180	0.032
0.10	6.5 ≤ r ≤ 10.0	10	120	0.027	180	0.032
0.11	6.5 ≤ r ≤ 10.0	10	100	0.027	180	0.032
0.12	6.5 ≤ r ≤ 10.0	10	80	0.027	180	0.032
0.13	6.5 ≤ r ≤ 10.0	10	60	0.027	180	0.032
0.10	1.5 ≤ r ≤ 4.0	25 per layer	2 x 70	0.027	180	0.035
0.11	1.5 ≤ r ≤ 4.0	20 per layer	2 x 60	0.027	180	0.035
0.10	4.0 ≤ r ≤ 6.5	15	120	0.027	180	0.035
0.11	4.0 ≤ r ≤ 6.5	15	100	0.027	180	0.035
0.12	4.0 ≤ r ≤ 6.5	15	80	0.027	180	0.035
0.14	4.0 ≤ r ≤ 6.5	15	60	0.027	180	0.035
0.10	6.5 ≤ r ≤ 10.0	10	120	0.027	180	0.035
0.11	6.5 ≤ r ≤ 10.0	10	100	0.027	180	0.035
0.12	6.5 ≤ r ≤ 10.0	10	80	0.027	180	0.035
0.13	6.5 ≤ r ≤ 10.0	10	60	0.027	180	0.035

U-value tables 1.5 m ≤ r ≤ 10.0 m (Cont'd)

U-value (W/m²/K)	Roof radius (m)	Slotting depth required (mm)	Kalzip insulation 23 thickness (mm)	Kalzip insulation 23 thermal conductivity (W/m/K)	Kalzip insulation Plus* thickness (mm)	Kalzip insulation Plus* thermal conductivity (W/m/K)
0.11	1.5 ≤ r ≤ 4.0	25 per layer	2 x 70	0.027	180	0.037
0.12	1.5 ≤ r ≤ 4.0	20 per layer	2 x 60	0.027	180	0.037
0.11	4.0 ≤ r ≤ 6.5	15	120	0.027	180	0.037
0.12	4.0 ≤ r ≤ 6.5	15	100	0.027	180	0.037
0.13	4.0 ≤ r ≤ 6.5	15	80	0.027	180	0.037
0.15	4.0 ≤ r ≤ 6.5	15	60	0.027	180	0.037
0.11	6.5 ≤ r ≤ 10.0	10	120	0.027	180	0.037
0.12	6.5 ≤ r ≤ 10.0	10	100	0.027	180	0.037
0.13	6.5 ≤ r ≤ 10.0	10	80	0.027	180	0.037
0.15	6.5 ≤ r ≤ 10.0	10	60	0.027	180	0.037
0.11	1.5 ≤ r ≤ 4.0	25 per layer	2 x 70	0.027	180	0.040
0.12	1.5 ≤ r ≤ 4.0	20 per layer	2 x 60	0.027	180	0.040
0.11	4.0 ≤ r ≤ 6.5	15	120	0.027	180	0.040
0.12	4.0 ≤ r ≤ 6.5	15	100	0.027	180	0.040
0.13	4.0 ≤ r ≤ 6.5	15	80	0.027	180	0.040
0.15	4.0 ≤ r ≤ 6.5	15	60	0.027	180	0.040
0.11	6.5 ≤ r ≤ 10.0	10	120	0.027	180	0.040
0.12	6.5 ≤ r ≤ 10.0	10	100	0.027	180	0.040
0.13	6.5 ≤ r ≤ 10.0	10	80	0.027	180	0.040
0.15	6.5 ≤ r ≤ 10.0	10	60	0.027	180	0.040