

SINTEF Building and Infrastructure confirms that

## Kingspan Therma™ PIR insulation boards for compact roofs

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document

### 1. Holder of the approval

Kingspan Insulation AS  
Slemdalsveien 70B  
0373 OSLO  
[www.kingspaninsulation.no](http://www.kingspaninsulation.no)

### 2. Product description

Kingspan Therma™ insulation boards are made of rigid polyisocyanurate (PIR) with 90% closed cells, see Fig. 1.

Kingspan Therma™ insulation board covered by this approval is listed in Table 1. Therma™ TR26 FM and TT46 FM have aluminium laminate on both sides. Therma™ TR27 FM and TT47 FM have fibreglass laminate on both sides. Tapered insulation (TT46 FM and TT47 FM) is normally supplied with a rate of fall 1:40, 1:48, 1:60, 1:80 or 1:120.

The boards come with straight edges (see Fig. 1), tongue and groove or rebate joints. The insulation boards are normally supplied with thicknesses  $s$  shown in Table 1 and dimensions as shown in Table 2. The insulation boards have a density of approx. 30 kg/m<sup>3</sup>. The aluminium laminate thickness is approx. 140 µm.

Table 1  
Kingspan Therma™ insulation boards for compact (flat) roofs

Kingspan Therma™	Area of application	Thickness
TR26 FM *	Insulation for compact roofs	30-200mm
TR27 FM *	Insulation for compact roofs	30-200mm
TT46 FM *	Tapered boards for use together with TR26	Tapered boards 25<t<130
TT47 FM *	Tapered boards for use together with TR27	Tapered boards 25<t<130

\*) FM approved. See Section 8 and FM Approval Class: 4470

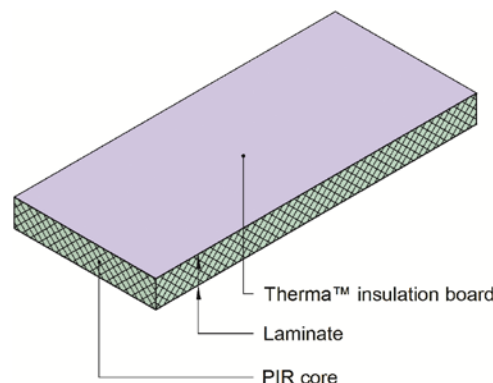


Fig. 1  
Polyisocyanurate (PIR) insulation board with laminate on both sides and straight edges

Table 2  
Dimensions and tolerances of Kingspan Therma™ insulation boards

Property	Standard	Dimensions and tolerances
Length	EN 822	1200 or 2400 ± 10 mm
Width	EN 822	600 or 1200 ± 7,5 mm
Squareness	EN 824	$S_b \leq 5 \text{ mm/m}$
Flatness	EN 825	$S_{\max} \leq 10 \text{ mm}$

### 3. Fields of application

Kingspan Therma™ insulation boards can be used as thermal insulation in compact roofs and terraces as shown in Fig. 2 – 12 and according to the conditions and principles stated in Section 6 Conditions of use.

Therma™ TR26 FM and TT46 FM (aluminium laminate) is preferably used with mechanical fastening.

Therma™ TR27 FM and TT47 FM (fibreglass laminate) is preferably used where the boards are glued together and to the underlay.

Kingspan Therma™ insulation boards can be used as insulation above load-bearing wood-based structures in compact roofs and terraces, see Fig. 12, provided the load-bearing structure itself has the required fire resistance (R). The load-bearing structure must also protect the insulation against heat from below.

The solutions with Kingspan Therma™ insulation boards on load-bearing steel sheets or concrete decks shown in Fig. 2 – 11 can be used if the load-bearing structure itself has the required fire resistance (R).

The solutions shown in Fig. 2 - 11 may also be used in roof constructions with unspecified fire resistance when the loadbearing construction is incombustible.

For other applications than stated above the safety in case of fire must be determined by specific analytical fire design.

#### 4. Properties

The product characteristics of Kingspan Therma™ insulation boards manufactured in Winterswijk are shown

in Table 3, and insulation boards manufactured in Herefordshire are shown in Table 4.

#### Reaction to fire

The insulation boards are class E according to EN 13501-1, see Table 3.

Several fire safety assessments have been carried out, Section 8 shows the most important fire safety reports that this approval is based on.

#### Fire resistance

The fire resistance for the constructions shown in figures 2-12 is not determined.

Table 3

Material properties of Kingspan Therma™ PIR insulation boards for compact roofs manufactured in Winterswijk (NL)

Property	Standard	Declaration of performance <sup>1)</sup> and control limits <sup>2)</sup> Class/level EN 13165	
		TR26 FM/TT46 FM	TR27 FM/TT47 FM
Thickness tolerance	EN 823	d <sub>N</sub> 25-49mm: T3 d <sub>N</sub> 50-120mm: T2	d <sub>N</sub> 25-49mm: T3 d <sub>N</sub> 50-120mm: T2
Compressive strength	EN 826	d <sub>N</sub> ≤ 80mm: CS(10/Y)150 d <sub>N</sub> > 80mm: CS(10/Y)120	d <sub>N</sub> ≤ 80mm: CS(10/Y)150 d <sub>N</sub> > 80mm: CS(10/Y)120
Tensile strength	EN 1607	TR 40	TR 80
Dimensional stability at specified temperature and humidity	EN 1604	DS (70,90) 3 DS (-20, -)1	DS (70,90) 3 DS (-20, -)1
Deformation under specified load and temperature conditions	EN 1605	DLT(2)5	DLT(2)5
Water vapour resistance: without laminate / with laminate	EN 12086	NPD	NPD
Water absorption: long term / short term	EN 12087 (2A)	NPD	NPD
Thermal conductivity PIR alone: λ <sub>D</sub>	EN 13165	0.022 W/(m.K)	d <sub>N</sub> < 80mm: 0.027 W/(m.K) d <sub>N</sub> 80-119 mm: 0.026 W/(m.K) d <sub>N</sub> ≥ 120mm: 0.025 W/(m.K)
Reaction to fire	EN 13501-1	E	E

<sup>1)</sup> The manufacturers Declaration of performance, DoP

<sup>2)</sup> Control limit shows values that the product has to satisfy during internal factory production control and audit testing

Table 4

Properties of Kingspan Therma™ PIR insulation boards for compact roofs manufactured in Herefordshire (GBR)

Properties	Målemetode	Declaration of performance <sup>1)</sup> and control limits <sup>2)</sup> Class/level EN 13165	
		TR26 FM/TT46 FM	TR27 FM/TT47 FM
Thickness tolerance	EN 823	d <sub>N</sub> 25-200mm: T2	d <sub>N</sub> 25-200mm: T2
Compressive strength	EN 826	d <sub>N</sub> 25-200mm: CS(10/Y)150	d <sub>N</sub> 25-200mm: CS(10/Y)150
Tensile strength	EN 1607	TR 40	TR 80
Dimensional stability at specified temperature and humidity	EN 1604	DS (70,90) 3 DS (-20, -)1	DS (70,90) 3 DS (-20, -)1
Deformation under specified load and temperature conditions	EN 1605	DLT(2)5	DLT(2)5
Water vapour resistance: without laminate / with laminate	EN 12086	NPD	NPD
Water absorption: long term / short term	EN 12087 (2A)	NPD	NPD
Thermal conductivity PIR alone: λ <sub>D</sub>	EN 13165	0.022 W/(m.K)	d <sub>N</sub> < 80mm: 0.026 W/(m.K) d <sub>N</sub> 80-119 mm: 0.025 W/(m.K) d <sub>N</sub> ≥ 120mm: 0.024 W/(m.K)
Reaction to fire	EN 13501-1	E	E

<sup>1)</sup> The manufacturers Declaration of performance, DoP

<sup>2)</sup> Control limit shows values that the product has to satisfy during internal factory production control and audit testing

## 5. Environmental aspects

### *Substances hazardous to health and environment*

The insulation boards contains no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

### *Effect on indoor environment*

The insulation boards is not regarded as emitting any particles, gases or radiation that have a perceptible impact on the indoor climate, or to have any significant impact on health.

### *Waste treatment/recycling*

The insulation boards shall be sorted as residual waste. The product shall be delivered to an authorized waste treatment plant for energy recovery.

### *Environmental declaration*

No environmental declaration (EPD) has been worked out for the insulation boards.

## 6. Special conditions for use and installation

### *Fire safety conditions*

The use of products named Kingspan Therma™ in this approval includes all four type of boards specified in Table 1.

Figures 2 - 12 show examples of approved use of Kingspan Therma™ PIR insulation boards in compact roofs. For all solutions shown in the figures, the fire resistance and the load-bearing capacity during fire must be part of the structural design, including necessary protection of the load-bearing steel sheets (Fig. 2 - 5). Connections and roof penetrations must be made in a way that do not reduce the fire resistance of the roof.

### *Preconditions:*

- The roof covering on top of Kingspan Therma™ TR26/TT46 FM must have fire classification B<sub>ROOF</sub>(t2) on standard EPS-insulation, or current Therma™ insulation.
- The roof covering on top of Kingspan Therma™ TR27/TT47 FM must have fire classification B<sub>ROOF</sub>(t2) on standard EPS-insulation, or current Therma™ insulation.
- To prevent fire spread, Kingspan Therma™ must be installed in at least two layers with staggered joints. In cases where Kingspan Therma™ is installed in a single layer, rebated boards must be used.
- Observations from fire tests have shown that the risk of horizontal fire spread in Kingspan Therma™ is small. A slow and limited horizontal fire spread should still be taken into account in cases that are not described above.
- On roof structures with profiled steel sheets, concrete elements (hollow block core or DT elements) or in-situ concrete, Kingspan Therma™ may be used without having to cover the underside with non-combustible insulation (A2-s1,d0). On such roofs, Kingspan Therma™ may be used without having to

cover the top side with non-combustible insulation (A2-s1,d0) or with sectioning of the roof surface into smaller areas of max. 400 m<sup>2</sup> with non-combustible insulation (A2-s1,d0). See the examples shown in Fig. 2, 6 and 8.

- Kingspan Therma™ can be used towards and around roof openings (as well as smoke outlets and skylight turrets) without the need to replace with non-combustible insulation (A2-s1,d0). See Fig. 7.
- In cases where a roof structure of load-bearing steel sheets has parapets or adjacent walls/facades with combustible materials, a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate must be placed under the Kingspan Therma™ towards the wall. Parapets with combustible materials must be protected on the roof side with two layers of type A gypsumboards 13 mm or one layer of type F gypsumboard 15 mm. Alternatively a 30 mm layer of rock wool with a minimum density of 170 kg/m<sup>3</sup> may be used. See Fig. 4.
- In cases where a concrete roof structure has parapets or adjacent walls/facades made with combustible materials, the roof side must be protected with two layers of type A gypsumboards 13 mm or one layer type F fireproof plaster board 15 mm. In this case a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate under the Kingspan Therma™ towards the wall is not necessary. See Fig. 9.
- On roofs with load-bearing profiled steel sheets, the profiles must be filled with non-combustible insulation (A2-s1,d0) from both sides above fire compartment walls. See Fig. 5.
- When fire walls or fire compartment walls project at least 0.5 m above roofs with load-bearing profiled steel sheets or concrete slabs, and the wall is made or covered with non-combustible materials, Kingspan Therma™ can be used without the need for replacement with non-combustible insulation (A2-s1,d0). See Fig. 10.
- In roofs where other combustible insulation materials are used (e.g. partially renovated roofs), combustible insulation must be separated from Kingspan Therma™ with minimum 0.6 m wide non-combustible insulation (A2-s1,d0).

### *Installation*

The insulation boards should be cut and installed in a way to avoid cavities in the insulation layer. The boards may be cut with a regular hand saw.

When the insulation is installed in several layers, boards with straight edges may be used when the boards are laid with staggered joints. When the insulation is installed in a single layer, boards with tongue and groove or rebate joints should be used.

A vapour barrier must be installed as shown in Fig. 2 – 12. Part of the thermal insulation may be installed on the inside of the vapour barrier. The insulation thickness on the underside of the vapour barrier should not exceed 1/4 of the total insulation thickness. See SINTEF Building Research Design Guide 525.207 *Compact roofs* for further information on installing the vapour barrier etc.

### Construction details

Construction details must follow the principles shown in Fig. 2 – 5 for profiled steel sheets underlay, in Fig. 6 – 10 for concrete underlays, and in Fig. 11 – 12 for terraces. For use in apartment buildings with covered terraces a specific fire safety design is required in order to prevent fire spread to neighbouring apartments.

### Storage

The insulation boards should be stored dry in the original, unopened packaging, and should not be exposed to sunlight during storage.

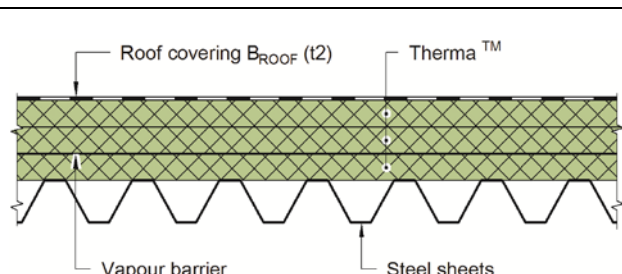


Fig. 2

Kingspan Therma™ insulation boards on steel sheet roofs.

- No requirement for covering on the top side or underside.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- The structure can be used in fire class 1 and 2 when the load-bearing has the required fire resistance (R)

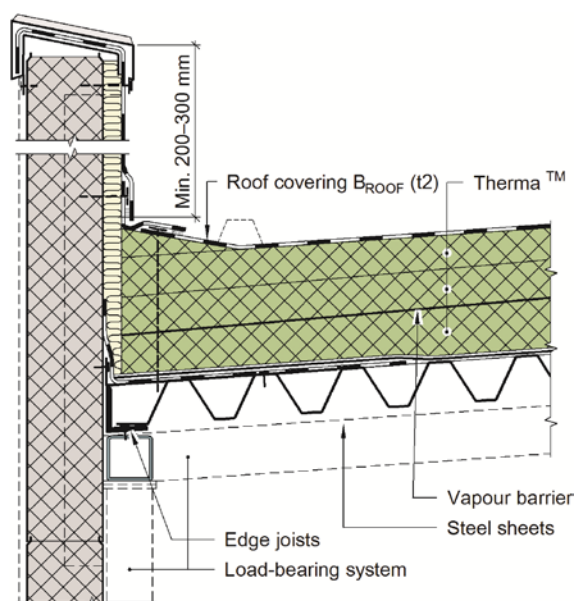


Fig. 3

Kingspan Therma™ insulation boards on steel sheet roofs towards walls or parapets of sandwich elements with rock wool (non-combustible materials) core or PIR elements approved for this field of application (e.g. FM-Global 4880).

- No requirement for covering on the top side or underside.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- No requirement for replacement with non-combustible insulation towards non-combustible walls and parapets.
- The structure can be used in fire class 1 and 2.

#### NB

The vertically installed mineral wool sheet shall be able to absorb temperature movement in the sandwich element and to avoid thermal bridges. See more details on connections between steel sheet roofs and sandwich wall panels in TPF Informer nr. 12 at [www.tpf-info.org](http://www.tpf-info.org).

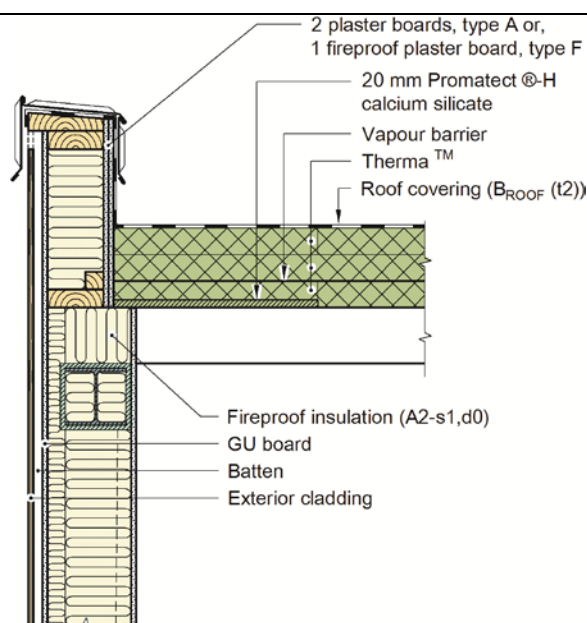


Fig. 4

Roof structure with load-bearing steel sheets, insulated with Kingspan Therma™ towards adjacent walls/ facades with combustible materials, such as wood.

- Kingspan Therma™ insulation boards must be protected on the underside towards the wall with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate, or a heavy 30 mm rock wool board.
- No requirement for covering on the top side
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- Parapets with combustible materials must be protected with two layers of type A gypsumboards or one layer of type F gypsumboard on the side towards the roof.
- The structure can be used in fire class 1 and 2.

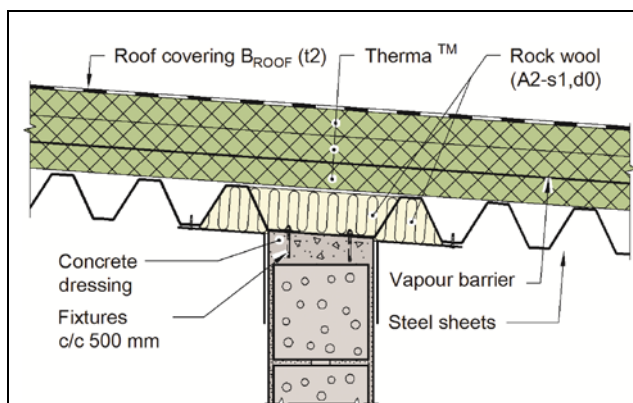


Fig. 5

Fire compartment wall under load-bearing profiled steel sheets insulated with Kingspan Therma™ insulation boards.

- Wall connected to underside of steel sheet roofs. The steel sheet layer must be divided and not installed continuously over the wall.
- No requirement for covering on the top side or underside.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- The structure can be used in fire class 1 and 2.

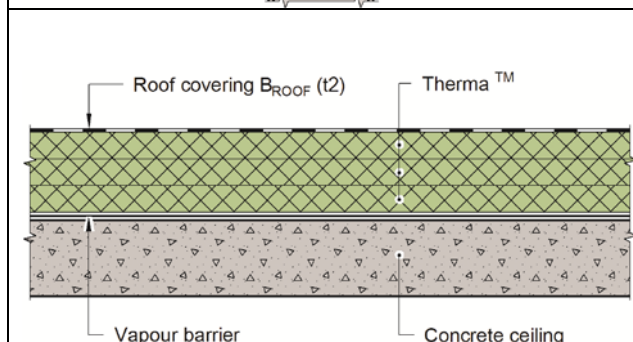


Fig. 6

Kingspan Therma™ insulation boards on concrete decks.

- No requirement for covering on the top side or underside.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- No requirement for special packing of possible joints.
- The structure can be used in fire class 1, 2 and 3.

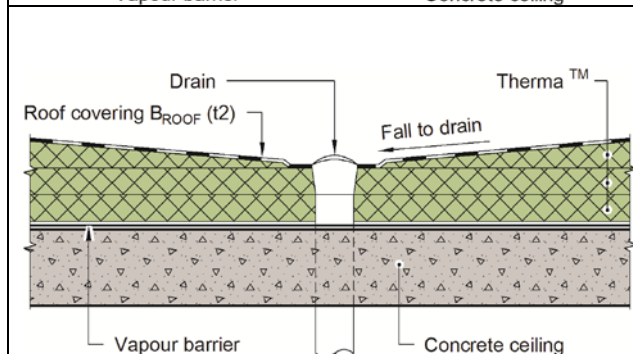


Fig. 7

Kingspan Therma™ insulation boards on concrete decks.

- No requirement for covering on the top side or underside.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- No requirement for special sealing of possible joints.
- No requirement for replacing with non-combustible insulation around drains or openings.
- The structure can be used in fire class 1, 2 and 3.

Openings in the concrete deck for roof drains and other pipes must be closed with expanding mortar and sealed with a fire approved sealing.

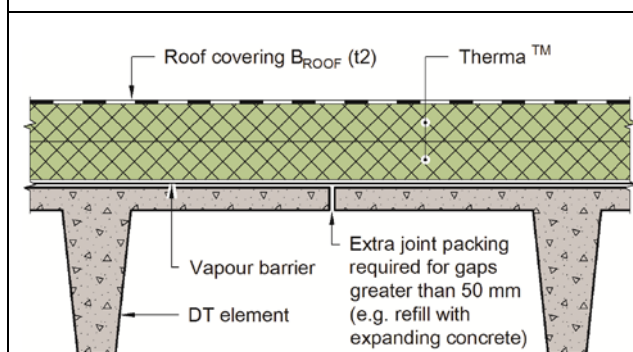


Fig. 8

Kingspan Therma™ insulation boards on concrete elements with small open joints.

- No requirement for separate packing of joints.
- No requirement for covering on the top side or underside.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- The structure can be used in fire class 1, 2 and 3.



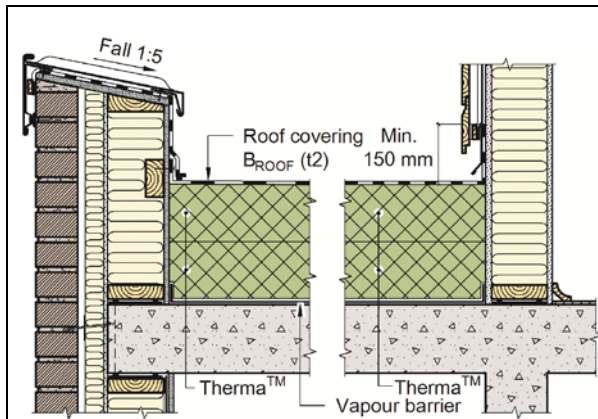


Fig. 9

Kingspan Therma™ insulation boards on concrete decks adjacent to parapets or walls/facades with combustible materials.

- Not requirement to protect Kingspan Therma™ insulation boards on the underside towards the wall with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate.
- No requirement for covering on the top side
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- Parapets or walls with combustible materials must be protected on the side facing the roof with two layers of type A gypsumboards 13 mm or one layer of type F gypsumboard 15 mm.
- The structure can be used in fire class 1 and 2.
- If the concrete deck runs continuously partitioning walls as shown in the figure, the solution may also be used in fire class 3. This requires an analytical fire design of the whole structure.

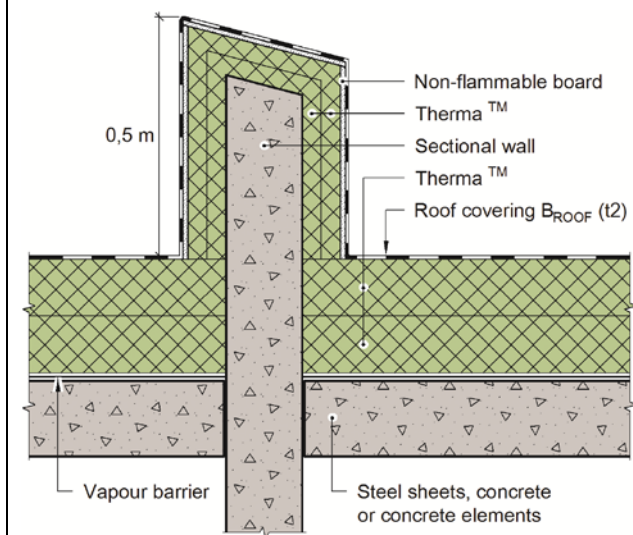


Fig. 10

Kingspan Therma™ insulation boards on concrete decks, with partitioning walls projecting 0.5 m above roofs made of or covered with non-combustible materials

- No requirement for covering on the top side or underside.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- When DT elements or hollow core concrete elements are used, no additional sealing of the joints between elements is required.
- No requirement for replacing with non-combustible 0.6 m wide insulation towards wall openings.
- The structure can be used in fire class 1, 2 and 3.

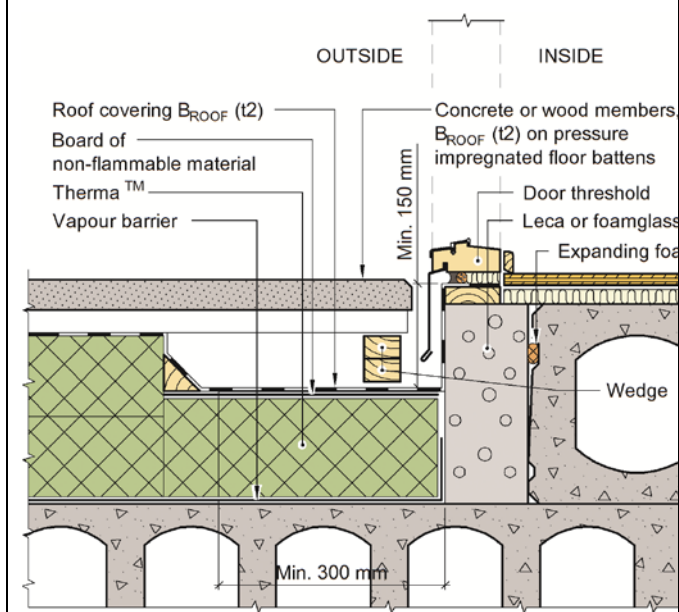


Fig. 11

Roof terraces with load-bearing hollow core concrete elements insulated with Kingspan Therma™, adjacent to walls with combustible materials and with terrace door.

- No requirement for covering on the top side or underside.
- No requirement to protect Kingspan Therma™ insulation boards on the underside towards the wall with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate.
- No requirement for partitioning into smaller areas of max. 400 m<sup>2</sup>.
- Walls or facades with combustible materials must be protected towards the roof with two layers of type A gypsumboards 13 mm or one layer of type F gypsumboards 15 mm.
- Regarding parapets, see Fig. 9.
- The structure can be used in fire class 1, 2 and 3.

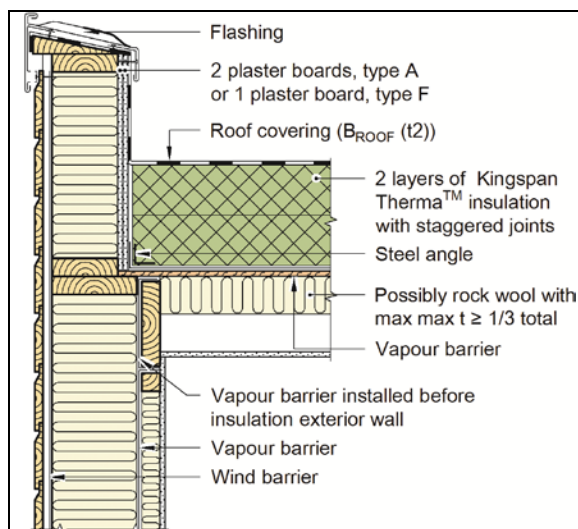


Fig. 12

Roof terrace with wooden beams and roof sheathing insulated with Kingspan Therma™ towards adjacent parapets or walls/facades with combustible materials.

- No requirement for covering on the top side or underside.
- No requirement to protect Kingspan Therma™ insulation boards on the underside towards the wall/parapet with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate.
- Parapets/facades with combustible materials must be protected on the side towards the roof with two layers of type A gypsumboards 13 mm or one layer of type F gypsumboards 15 mm.
- The structure can be used in fire class 1 and 2 if the load-bearing structure has the required fire resistance (R), and protect the insulation against heat from the underside.

## 7. Factory production control

The product is produced in the following places:

- Kingspan Insulation NV Lorentzstraat 1, 7102 JH Winterswijk, Netherlands: Therma™ TR26/27 FM and TT46/47 FM Kingspan Insulation Ltd,
- Herefordshire HR6 9LA, UK: Therma™ TR26/27 FM and TT46/47 FM

The holder of the approval is responsible for the factory production control in order to ensure that the product is produced in accordance with the preconditions applying to this approval.

The manufacturing of the product is subject to continuous surveillance of the factory production control in accordance with the contract regarding SINTEF Technical Approval.

## 8. Basis for the approval

The approval is based on properties documented in the following reports:

### Fire safety properties:

- SP Fire report no. R16 2020302:1 dated 14.12.2016. Assessment report on fire spread in flat compact roofs
- SP Fire report no. F16 20139:1 dated 05.10.2016. Horizontal fire spread in flat roofs
- SP Fire report no. F16 20139:2 dated 05.10.2016. Horizontal fire spread in flat roofs
- SP Fire report no. F16 20139:3 dated 05.10.2016. Horizontal fire spread in flat roofs
- SP Fire Research, Note 20239 dated 27.03.2017
- NBL AS. Report no. 103011.63C, dated 11.12.2013 (fire resistance underside of roofs)
- Technical Research Institute of Sweden (SP). Report no. PX21802, dated 18.04.2012 (SP 105 Fire)
- SP Fire Research AS report no. F16 20239:1 dated 07.10.2016 Study of horizontal fire spread in flat roofs Kingspan Therma TR 26 – 300 mm
- SP Fire Research AS report no. F16 20239:2 dated 05.10.2016 Study of horizontal fire spread in flat roofs Kingspan Therma TR 26 – 300 mm with openings

- SP Fire Research AS report no. F16 20239:3 dated - 05.10.2016 Study of horizontal fire spread in flat roofs Kingspan Therma TR 26 – 100 mm
- Exova Warringtonfire, report WF359497, dated 08.12.2015, Fire classification – E of TR26
- Exova Warringtonfire, report WF351262, dated 16.04.20, Fire classification – E of TR27
- FIW München, report H.K-39/13, dated 05.08.2013, Fire classification – E of TR26
- FIW München, report H.E-103e/16, dated 14.06.2016, Fire classification – E of TR27
- Technical Research Centre of Finland (VTT). Report no. VTT-S-02296-14, dated 14.05.2014 on fire resistance testing of load-bearing steel sheet roofs.
- Technical Research Centre of Finland (VTT). Classification report no. VTT-S-02296-14, dated 29.09.2014 on fire resistance according to NS-EN 13501-2:2007 + A1:2009
- FM Approval Id: 3024112, dated 17.05.2007 (Herefordshire, TR26, TR27, TT46, TT47)
- FM Approval Id: 3044621, dated 27.02.2007 (Winterswijk, TR26, TR27, TT46, TT47)
- FM Approval Id: 0003058313, dated 09.06.2016 (Tampere/Kankaanpää, TR26, TR27)

### Material properties Winterswijk

- Tampere University of Technology. Report no. 1967, dated 01.07.2011 (water vapour resistance).
- FIW München U1.204-1/15, dated 12.10.2015 (Material properties for Therma™ TR27 FM)
- FIW München U1.204-2/15, dated 12.10.2015 (Material properties for Therma™ TR27 FM)
- FIW München U1.204-3/15, dated 12.10.2015 (Material properties for Therma™ TR26 FM)
- FIW München U1.204-7/15, dated 12.10.2015 (Material properties for Therma™ TR27 FM)
- FIW München U1.204-10/14, dated 24.03.2015 (Material properties for Therma™ TR26 FM)

*Material properties Herefordshire*

- FIW München U1.248-E1a/16, dated 18.08.2016.  
(Material properties for Therma™ TR26 FM 75 mm)
- FIW München U1.248-E6a/16, dated 03.04.2017.  
(Material properties for Therma™ TR27 FM 50 mm)
- FIW München L1.3-13-019, dated 03.04.2013.  
Deformation ... (DLT(2)5) for TR26 70 mm.
- FIW München L1.3-13-020, dated 03.04.2013.  
Deformation ... (DLT(2)5) for TR26 120 mm.
- FIW München L1.3-13-021, dated 03.04.2013.  
Deformation ... (DLT(2)5) for TR27 90 mm
- FIW München L1.3-13-022, dated 03.04.2013.  
Deformation ... (DLT(2)5) for TR27 25 mm.

**9. Marking**

Kingspan Therma™ insulation boards are labelled with the name of the manufacturer, product name/grade and date of manufacture.

Kingspan Therma™ is CE-marked according to EN 13165.

The approval mark for SINTEF Technical Approval No. 20556 may also be used.



Approval mark

**10. Liability**

The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402

for SINTEF Byggforsk

Hans Boye Skogstad  
Approval Manager