

SINTEF Byggforsk confirms that

**Kingspan Therma™ PIR insulation boards for compact roofs**

are considered suitable for use and meet the requirements for product documentation in accordance with the Regulations for Sales and Documentation of Products for Construction (DOK) and the Regulations for Technical Requirements for Construction (TEK10) for the properties, areas of application and conditions of use specified in this document

**1. Approval holder**

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

**2. Product description**

Kingspan Insulation AS insulation boards are made of rigid polyisocyanurate (PIR) with 90% closed cells. The boards are manufactured according to NS-EN 13165, see Fig. 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. Kingspan Therma™ insulation boards are manufactured in four variants, see Table 1.

Table 1

Kingspan Therma™ insulation boards for compact (flat) roofs

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

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

The insulation boards are normally supplied in the thicknesses shown in Table 3 and the dimensions shown in Table 2. Completely installed, the insulation has a weight of approx. 30 kg/m<sup>3</sup>. The aluminium laminate has a thickness of approx. 140 µm.

Table 2

Dimensions and tolerances of Kingspan Therma™ insulation boards

Property	Standard	Dimensions and tolerances
Length	NS-EN 822	1200 or 2400 ± 10 mm
Width	NS-EN 822	600 or 1200 ± 7.5 mm
Squareness	NS-EN 824	Sb ≤ 5 mm/m
Flatness	NS-EN 825	Smax ≤ 10 mm

The boards come with straight edges (see Fig. 1), tongue and groove or half groove joints. Fall insulation (TT46 FM and TT47 FM) is normally supplied with a fall of 1:40, 1:48, 1:60, 1:80 or 1:120.

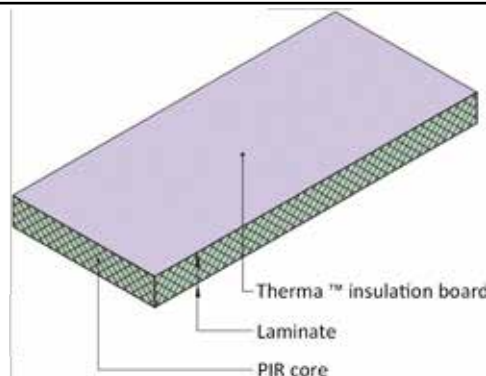


Fig. 1 Polyisocyanurate (PIR) insulation board with laminate on both sides and straight edges

**3. Areas of application**

Kingspan Therma™ insulation boards can be used as insulation in compact roofs and terraces according to the conditions and principles stated in Section 6 Conditions of use in this approval, and which are shown in Fig. 2–12. Therma™ TR26 FM and TT46 FM (aluminium laminate) is ideally used with mechanical fastening. Therma™ TR27 FM and TT47 FM (fibreglass laminate) is ideally used where the boards are glued together and to the base.

Kingspan Therma™ insulation boards can be used as insulation in/over load-bearing structures made of wood-based materials in compact roofs and terraces if the load-bearing structure itself satisfies current requirements for fire safety properties (current REI requirements).

The solutions using Kingspan Therma™ insulation boards on load-bearing steel sheets shown in Fig. 2–5 in this document can be used in fire classes 1–2 if the load-bearing structure itself satisfies current requirements for fire safety properties (current REI requirements). The solutions can also be used in fire class 3 if a fire safety assessment has been made in each case.

The solutions shown in Fig. 2–5 can be used in roof structures with unspecified fire resistance if the load-bearing structure satisfies class A2-s1,d0 [non-flammable materials].

## 4. Properties

### Material properties

The material properties of Kingspan Therma™ insulation boards manufactured in Winterswijk are shown in Table 3, and insulation boards manufactured in Herefordshire are shown in Table 4.

### Properties when impacted by fire

The insulation boards meet fire safety class E according to EN 13501-1, see Table 3. The properties do not change over time according to EN 13165.

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

Table 3

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

Property	Standard	Performance statement and control limits Class/level NS-EN 13165	
		TR26 FM/TT46 FM	TR27 FM/TT47 FM
Thickness tolerance	EN 823	dN 25–49 mm: T3 dN 50-120 mm: T2	dN 25–49 mm: T3 dN 50-120 mm: T2
Compressive strength	EN 826	dN ≤ 80 mm: CS(10/Y)150 dN > 80 mm: CS(10/Y)120	dN ≤ 80 mm: CS(10/Y)150 dN > 80 mm: 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: λD	EN 13165	0.022 W/(m.K)	dN < 80 mm: 0.027 W/(m.K) dN 80-119 mm: 0.026 W/(m.K) dN ≥ 120 mm: 0.025 W/(m.K)
Properties when impacted by fire	EN 13501-1	E	E

Table 4

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

Properties	Standard	Performance statement and control limits Class/level NS-EN 13165	
		TR26 FM/TT46 FM	TR27 FM/TT47 FM
Thickness tolerance	EN 823	dN 25-200 mm: T2	dN 25-200 mm: T2
Compressive strength	EN 826	dN 25-200 mm: CS(10/Y)150	dN 25-200 mm: 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: λD	EN 13165	0.022 W/(m.K)	dN < 80 mm: 0.026 W/(m.K) dN 80-119 mm: 0.025 W/(m.K) dN ≥ 120 mm: 0.024 W/(m.K)
Properties when impacted by fire	EN 13501-1	E	E

## 5. Environmental conditions

### *Chemicals hazardous to health and environment*

The insulation boards do not contain any prioritised environmental contaminants or other relevant substances in a quantity that is considered to be hazardous to health and the environment. Prioritised environmental contaminants include CMR, PBT and vPvB substances.

### *Impact on indoor climate*

The insulation boards are judged to not emit particles, gases or radiation which will have a negative impact on the indoor climate, or which will have a serious effect on health.

### *Disposal/recycling*

The insulation boards are sorted as residual waste on site/at disposal. The product must be delivered to an approved disposal site for energy recovery.

### *Environmental declaration*

No environmental product declarations (EPD) have been prepared for the insulation boards.

## 6. Conditions of use

### *Fire safety conditions:*

Use of the name Kingspan Therma™ in the approval text includes the use of all four product variants specified in Table 1. For Fig. 2–12, the load-bearing capacity in case of fire must be taken into account as part of planning, including the necessary protection on the inside of the load-bearing steel sheets (Fig. 2–5).

- The roof covering on Kingspan Therma™ TR26/TT46 FM must meet fire safety class B<sub>ROOF</sub> (t2) based on a fire test (CEN/TS 1187, test 2) with Kingspan Therma™ TR26 FM as the base. The roof covering on Kingspan Therma™ TR27/TT47 FM must meet fire safety class B<sub>ROOF</sub> (t2) based on a fire test with Kingspan Therma™ TR27 FM as the base.
- To prevent fire spread, Kingspan Therma™ must be laid in at least two layers with staggered joints. In cases where Kingspan Therma™ is laid 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 of profiled steel sheets, concrete elements (cavity ceilings or DT elements) or poured concrete, Kingspan Therma™ can be used without having to cover the underside with non-flammable insulation (A2-s1,d0). On these roofs, Kingspan Therma™ can be used without having to cover the top side with non-flammable insulation (A2-s1,d0) or with partitioning of the roof surface into smaller areas of max. 400 m<sup>2</sup> with non-flammable insulation (A2-s1,d0). See the examples shown in Fig. 2, 6 and 8.
- Kingspan Therma™ can be used against and around openings (as well as smoke outlets and skylight turrets) without the need to replace with non-flammable

insulation (A2-s1,d0). See Fig. 7.

- In cases where a roof structure of load-bearing steel sheets has parapets or adjacent walls/facades of or with flammable materials, a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate must be laid against the wall under the Kingspan Therma™. Parapets of or with flammable materials must be protected on the side against the roof with two type A plaster boards or one type F fireproof plaster board, alternatively a 30 mm layer of rock wool with a minimum density of 170 kg/m<sup>3</sup> can be used. See Fig. 4.
- In cases where a roof structure of concrete or concrete elements has parapets or adjacent walls/facades of or with flammable materials, the side against the roof must be protected with two type A plaster boards or one type F fireproof plaster board. In this case, a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate against the wall under the Kingspan Therma™ is not necessary. See Fig. 9.
- On roofs with load-bearing profiled steel sheets, the profiles must be filled with non-flammable insulation (A2-s1,d0) both on the top side and underside of the board over fire cell-limiting walls. See Fig. 5.
- When fire walls or sectional walls project through and continue at least 0.5 m above roofs of load-bearing profiled steel sheets, concrete or concrete elements, and the wall is made of, or covered with, non-flammable materials, Kingspan Therma™ can be used without the need to replace with non-flammable insulation (A2-s1,d0). See Fig. 10.
- In roofs where other flammable insulation materials are used (e.g. partially renovated roofs), flammable insulation must be separated from Kingspan Therma™ with non-flammable insulation (A2-s1,d0) with a min. width of 0.6 m.

Fig. 2–12 show examples of the approved use of Kingspan Therma™ PIR insulation boards in compact roofs.

### *Installation*

The insulation boards should be cut and installed so that no unwanted cavities form in the insulation layer. The boards can be cut using a regular hand saw.

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

A vapour barrier must be installed as shown in Fig. 2–12. Some insulation can also 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 Byggforsk series 525.207 *Compact roofs* for further information on installing the vapour barrier etc.

### Structural details

Structural details must be installed according to the principles shown in Figures 2–5 for bases of profiled steel sheets, in Figures 6–10 for bases of poured concrete and concrete elements and in Figures 11–12 for terraces, and according to the Kingspan Insulation AS installation instructions. Use in apartment buildings with covered terraces assumes

that a fire safety plan is prepared that aims 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.

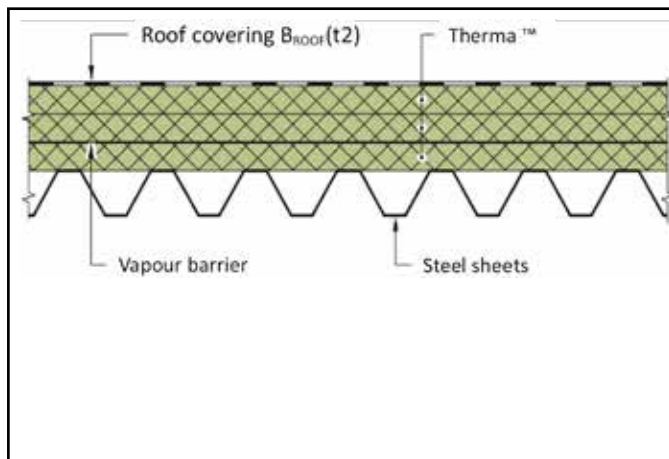


Fig. 2

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 1–2 if the load-bearing structure itself satisfies current requirements for fire safety properties (current REI requirements).
- The solutions can also be used in fire class 3 if a fire safety assessment has been made in each case.

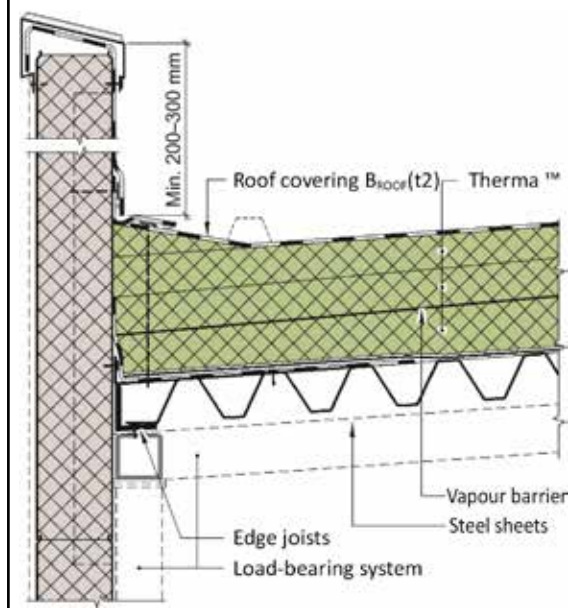


Fig. 3

Kingspan Therma™ insulation boards on steel sheet roofs against walls or parapets comprising sandwich elements with a core of rock wool (non-flammable materials) or PIR elements documented for the area 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 replacing with non-flammable insulation where it meets non-flammable walls and parapets.
- The structure can be used in fire class 1–2.

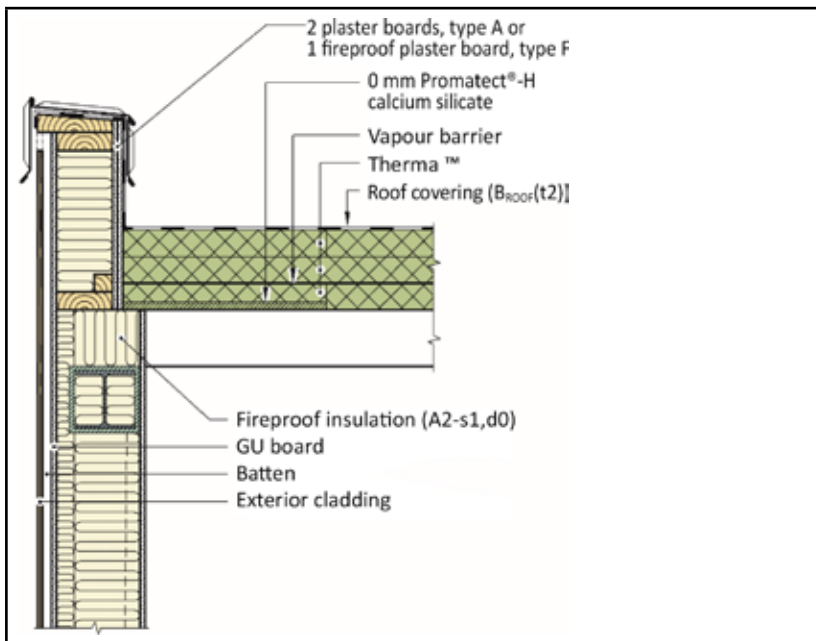


Fig. 4  
 Roof structure of load-bearing steel sheets insulated with Kingspan Therma™ against adjacent walls/facades of or with flammable materials, such as wood.

- Kingspan Therma™ insulation boards must be protected.
- on the top side against the wall with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate, possibly with a heavy 30 mm rock wool board.
- Parapets of or with flammable materials must be protected on the side against the roof with two type A plaster boards or one type F fireproof plaster board.
- The structure can be used in fire class 1–2.

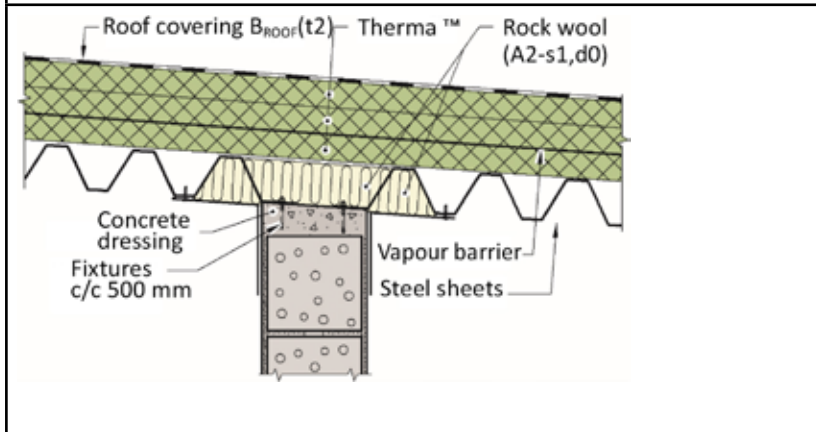


Fig. 5  
 Fire cell-limiting walls finished under load-bearing profiled steel sheets insulated with Kingspan Therma™ insulation boards.

- Walls finished under steel sheet roofs. The sheet roof must be broken over the wall, that is to say, the sheets must not run continuously over the riser.
- 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.

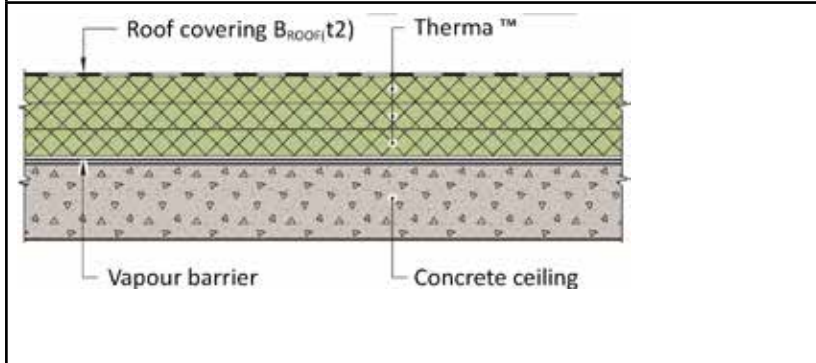


Fig. 6  
 Kingspan Therma™ insulation boards on concrete element ceilings or concrete ceilings.

- 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 1–3.

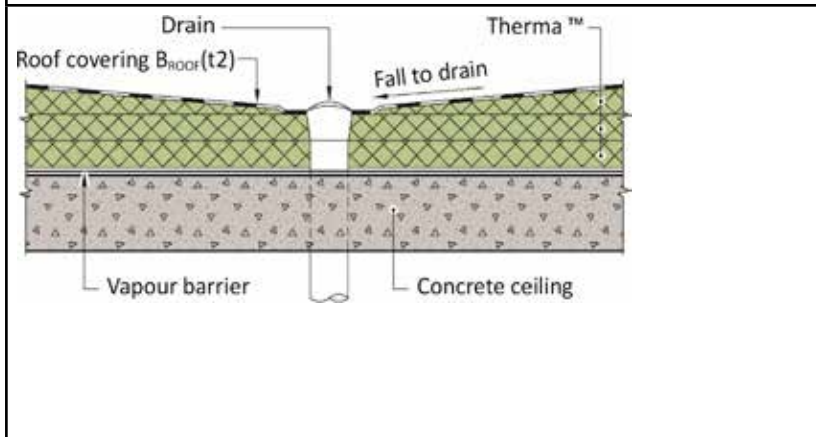


Fig. 7  
 Kingspan Therma™ insulation boards on concrete element ceilings or concrete ceilings.

- 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.
- No requirement for replacing with non-flammable insulation around drains or openings.
- The structure can be used in fire class 1–3.

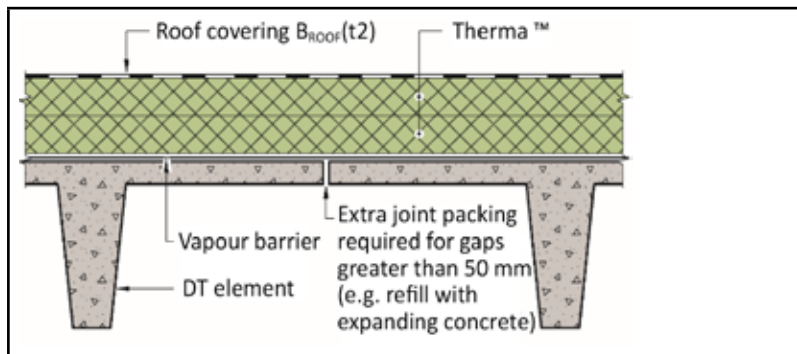


Fig. 8  
 Kingspan Therma™ insulation boards on concrete element ceilings with small open joints.

- 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 1–3.

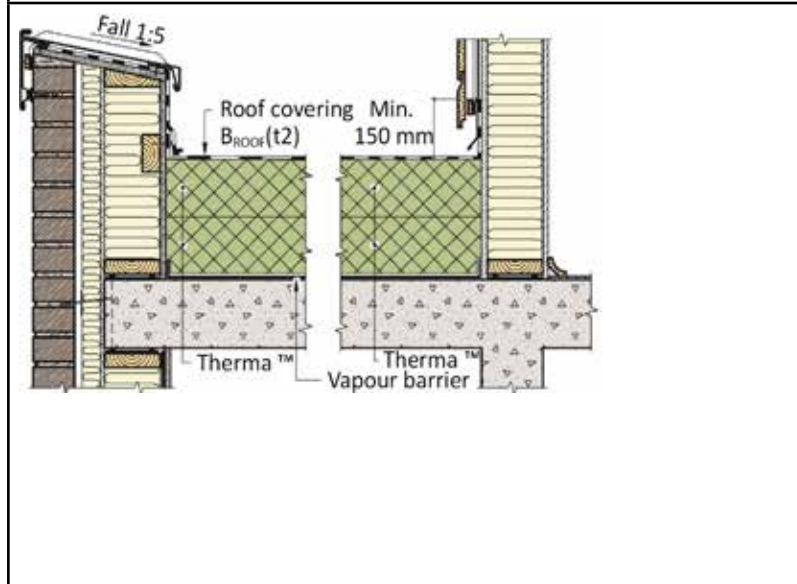


Fig. 9  
 Kingspan Therma™ insulation boards on concrete element ceilings or concrete ceilings against adjacent parapets or walls/facades of or with flammable materials.

- Not requirement to protect Kingspan Therma™ insulation boards on the underside against the wall with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate.
- Parapets or walls of or with flammable materials must be protected on the side against the roof with two type A plaster boards or one type F fireproof plaster board.
- The structure can be used in fire class 1–2.
- If the ceiling structure is made of concrete and runs continuously past the wall as shown in the diagram, the solution can also be used in fire class 3.

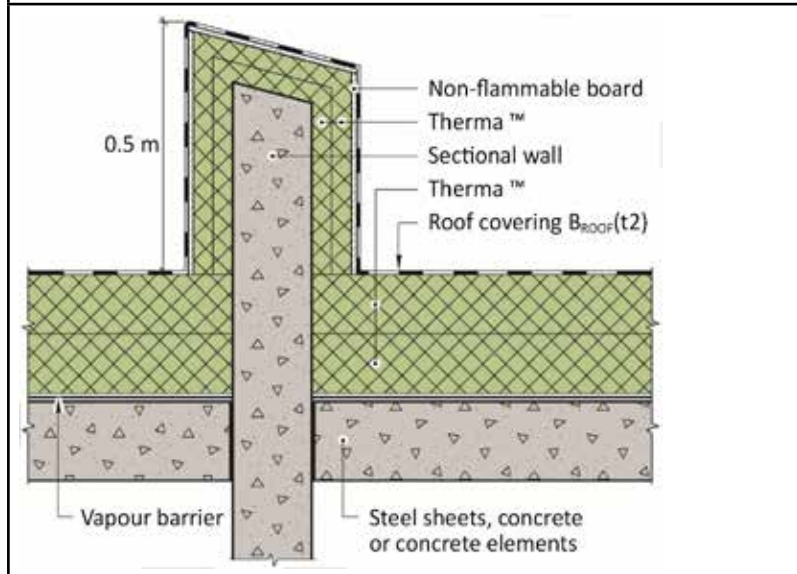
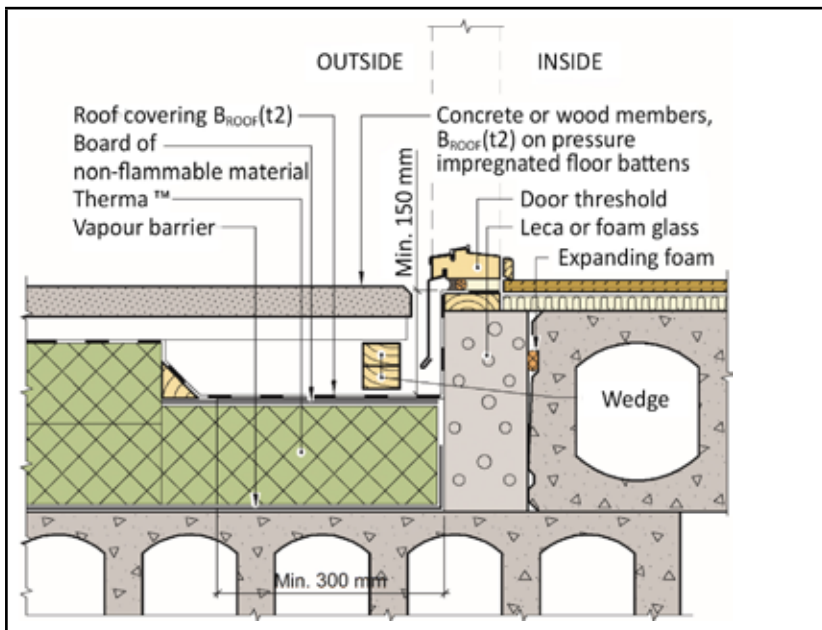


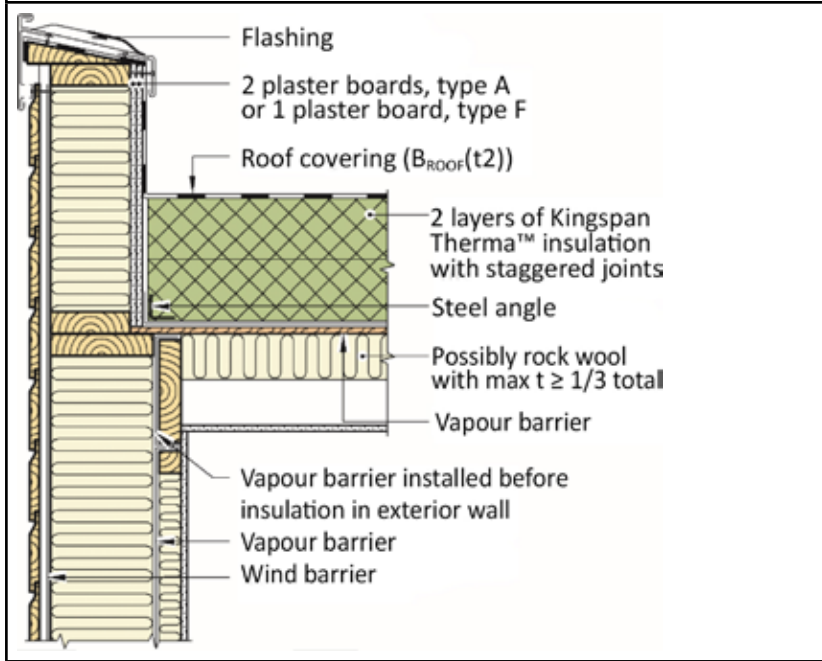
Fig. 10  
 Kingspan Therma™ insulation boards on ceilings made of concrete elements or poured concrete, and sectional walls or fire walls projecting 0.5 m above the roof and made from or covered with non-flammable materials

- 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 cavity ceilings elements are used, there is no requirement for additional packing of the joints between elements.
- No requirement for replacing with non-flammable 0.6 m wide insulation against wall openings.
- The structure can be used in fire class 1–3.



**Fig. 11**  
 Roof terraces of load-bearing cavity ceiling elements insulated with Kingspan Therma™ against adjacent walls (with terrace door) of or with flammable materials.

- No requirement for covering on the top side or underside.
- No requirement to protect Kingspan Therma™ insulation boards on the underside against the wall with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate.
- Against walls/facades of or with flammable materials, the side of the wall against the roof must be protected with two type A plaster boards or one type F fireproof plaster board.
- Regarding parapets, see Fig. 9.
- The structure can be used in fire class 1–3.



**Fig. 12**  
 Roof terrace of wooden beams with roof boards insulated with Kingspan Therma™ against adjacent parapets or walls/facades of or with flammable materials.

- No requirement for covering on the top side or underside.
- No requirement to protect Kingspan Therma™ insulation boards on the underside against the wall/parapet with a 0.6 m wide board of 20 mm PROMATECT®-H calcium silicate.
- Parapets/facades of or with flammable materials must be protected on the side against the roof with two type A plaster boards or one type F fireproof plaster board.
- The structure can be used in fire class 1–2 if the load-bearing structure itself satisfies current requirements for fire safety properties (current REI requirements).

**7. Product and production control**

The products are manufactured 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 production control to ensure that the product is manufactured according to the conditions that form the basis of the approval.

Factory production of Kingspan Therma™ insulation boards is subject to monitoring product and production controls according to the contract for SINTEF Technical Approval.

## 8. Basis for approval

Approval is based on properties that are 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 Note 20239 dated 27.03.2017
- Technical Research Institute of Sweden (SP). - SINTEF 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 m
- 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. Labelling

Kingspan Therma™ insulation boards are labelled with the manufacturer, product name/grade and date of manufacture. They can also be labelled with the SINTEF Technical Approval label, TG 20556.



Approval label

## 10. Liability

The holder/manufacturer has sole product liability in accordance with existing law. Claims resulting from the use of the product cannot be brought against SINTEF Byggforsk beyond the provisions of NS 8402.