

Installation

Flat roof insulation

General information and examples of the installation of LINITHERM flat roof systems



Preliminary remark	FL-V
Types of attachment	FL-B
1. Mechanical attachment	FL-MB
2. Bonded roof structure	FL-VD
3. Loose installation	FL-L
4. Tapered insulation	FL-Gd
5. Lightweight industrial roof	FL-IL
6. Compact roof	FL-K

■ FL-V

Preliminary remark

Delivery

LINITHERM insulating elements are delivered on pallets/in packets. Great care must be taken when unloading and transporting on the building site. The elements must be stored flat on level and dry ground. During all work (installation, cutting to size, etc.), attention must be paid that no damage is done to the elements. During storage, transport and installation, the elements must be protected against moisture and direct sunlight.

Safety provision

The safety regulations on the building sites must be observed.

Rules of construction technology

LINITHERM insulation systems are high-quality products for the most various insulation solutions. The elements are manufactured on modern production facilities in top-quality, flawless condition. In order to achieve the benefit of an optimal insulation solution, proper installation of the elements is essential. **Our installation recommendations serve as schematic information for the buyer, and do not claim to be fundamentally valid, nor do they substantiate an entitlement to a guarantee. Each building offers different prerequisites; therefore the general procedure is to follow the rules of construction technology for each specific building.**

Tools

Only a few tools, which are usually available on any building site, are required for the installation of LINITHERM insulation systems. Suitable tools are, e.g.: Hans-held circular saw with guide rail, hand saw, drill.

Principles

The following points must generally be observed during the installation of the LINITHERM elements.

- The elements must be closely jointed and installed on a dry substrate!
- Any damage must be properly repaired (e.g. by masking, foaming, etc).
- All preparatory work (e.g. installation of vapour barrier/airtight layer, connections o light domes, vapour pipes, penetrations etc) should be finished.
- Waterproofing of the roof should take place immediately after installation of the elements.

Installation options

The LINITHERM rigid foam panels can be installed on concrete ceilings, wooden boarding, plywood panels and steel profile sheets. In the case of greater construction heights, multi-layer installation of the insulation panels is recommended. In this case the panels must be installed with staggered joints, such that the butt joints are covered.

Attachment of the LINITHERM rigid foam panels to the substrate (vapour barrier) can take place by the following means:

- mechanically attached
- loosely installed with superimposed load
- Bonding
 - Cold bonding with approved roof adhesives
 - Hot bonding with bitumen

Note: The products LINITHERM PAL FD and LINITHERM PGV FD are not suitable for the execution of bonded constructions without additional superimposed load or mechanical attachment.

The elements LINITHERM PAL and LINITHERM PAL Gefälle are approved for bonding under the boundary conditions of the separate data sheet "Information fr the bonding of LINITHERM PAL and PAL Gefälledämmung". Deviating superstructures must be secured against wind suction by superimposed load or mechanical attachment.

Roof pitch:

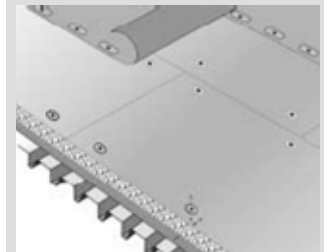
Roof pitch:

Areas intended for the application of roof waterproofing should be planned with a gradient of at least 2% for the dissipation of rainwater in accordance with rules and requirements of the ZVDH (Central Organisation of the German Roofing Trade).

Irregularities in the substrate must be compensated in advance by levelling layers. "Concrete projections" must be removed beforehand.

■ FL attachment

■ 1. FL-MB



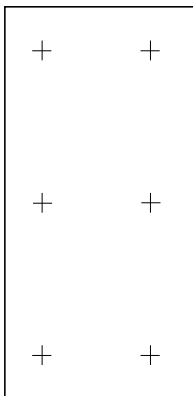
■ 2. FL-VD

Types of attachment

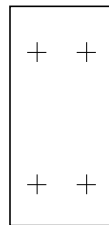
Mechanical attachment

All LINITHERM insulating elements are suitable for mechanical attachment. To be able to absorb the occurring wind loads, the elements must be secured with the corresponding approved means of attachment, depending on the subsurface.

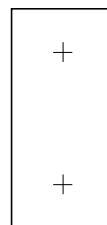
The quantity, type and position of the fasteners must be verified in compliance with e.g. DIN 1055. The wind suction certificates must be provided by the manufacturers of the roof waterproofing sheeting applied. The elements must be evenly attached over the full surface, irrespective of calculation. In the case of large-sized panels (e.g. LINITHERM PAL FD/PGV FD), 6 fasteners per panel are required. For small-sized panels, at least 2 fasteners in the main roof surface, and 4 fasteners in the edge area are sufficient. Attention must be paid to a frictional connection, even in the event of multi-layer installation of the insulating elements.



LINITHERM PAL FD/
LINITHERM PGV FD



LINITHERM Gefälle
and
LINITHERM
universal insulating
panels
in the edge and
corner area



LINITHERM
universal insulating
panels
in the interior area

Bonded roof structures

A bonded roof structure without additional mechanical fixation or superimposed load is only permissible for products coated with mineral fleece. Roof structures with aluminium-coated insulating materials can be approved for bonding subject to the adherence to the separate data sheet "Instructions for the bonding of LINITHERM PAL and PAL Gefälledämmung".

Bonding with cold adhesives

The bonding of LINITHERM insulating elements with PUR insulating material adhesives or with PUR adhesive foams and cold bitumen adhesives is possible. For cold bonding, the adhesive must be applied evenly and in strips to the subsurface. Attention must be paid here to the application of a sufficient quantity of the adhesive. The quantity of the insulation material adhesive depends on the wind suction calculation and on the position of the insulating panels on the roof. An additional mechanical attachment in the edge and corner area may possibly be necessary. The spacing of the adhesive strips must not exceed 200 mm if applied in strips. The distance from the panel edge should not exceed 100 mm.

Spot-by-spot bonding to the subsurface is not permissible. Sufficient evenness of the subsurface must be observed. The processing guidelines and information of the adhesive manufacturer must be separately observed. Multi-layer installation/bonding is possible.

In the case of bonding on profile roof structures (e.g. trapezoidal sheet), the strips of adhesive tape may only be applied to the high beadings of the sheet. This is the only way to ensure a tight bond.

2. FL-VD**Bonding with hot bitumen (only LINITHERM PGV)**

For hot bonding, the bitumen is heated and liquefied in corresponding boilers to a temperature of approx. 180 °C. The LINITHERM insulating elements are resistant to hot bitumen up to +250 °C for a short time and can therefore be bonded to the subsurface with liquid bitumen.

Application of the bitumen takes place over the full surface or strip by strip to the subsurface.

For the strip by strip bonding with hot liquid bitumen, at least 50% of each insulation panel must be frictionally bonded to the subsurface. When doing so, please ensure that the bitumen compound is evenly applied.

Application of the hot bitumen in serpentine lines has proven helpful in practice. Spot-by-spot bonding with hot bitumen is not permissible.

Due to the high heat load, the insulation elements should be at least 80 mm thick for bonding with hot bitumen. Thinner panels tend to be subject to deformation.

Multi-layer installation/bonding is not possible due to the expected heat accumulation.

Bonding with hot bitumen is not suitable for products with aluminium coating.

The subsurface should always be tested for suitability prior to bonding.

The processing guidelines and information of the bitumen manufacturer must also be observed.

3. FL-L**Loose installation with superimposed load**

Loose installation of the LINITHERM insulation elements is only permissible if the necessary waterproofing and superimposed load are applied over the full surface immediately after installation. Attention must be paid to sufficient securing of the roof edges.

Securing of the position of the loosely installed insulation panels during the construction phase is generally recommendable. This may take place with appropriate PUR adhesives or by mechanical attachment to the subsurface.

Securing the position by means of a superimposed load can be achieved by the following measures:

- Loose gravel

Grain size 16/32 mm, layer thickness \geq 50 mm.

If higher superimposed loads may become necessary, e.g. in the edge and corner areas, this may be achieved by means of loose gravel, additional panel coverings or similar measures.

- Panel coverings

In patio areas the superimposed load is mainly provided by coverings.

These are installed as loose gravel or chippings on top of the sarking membrane.

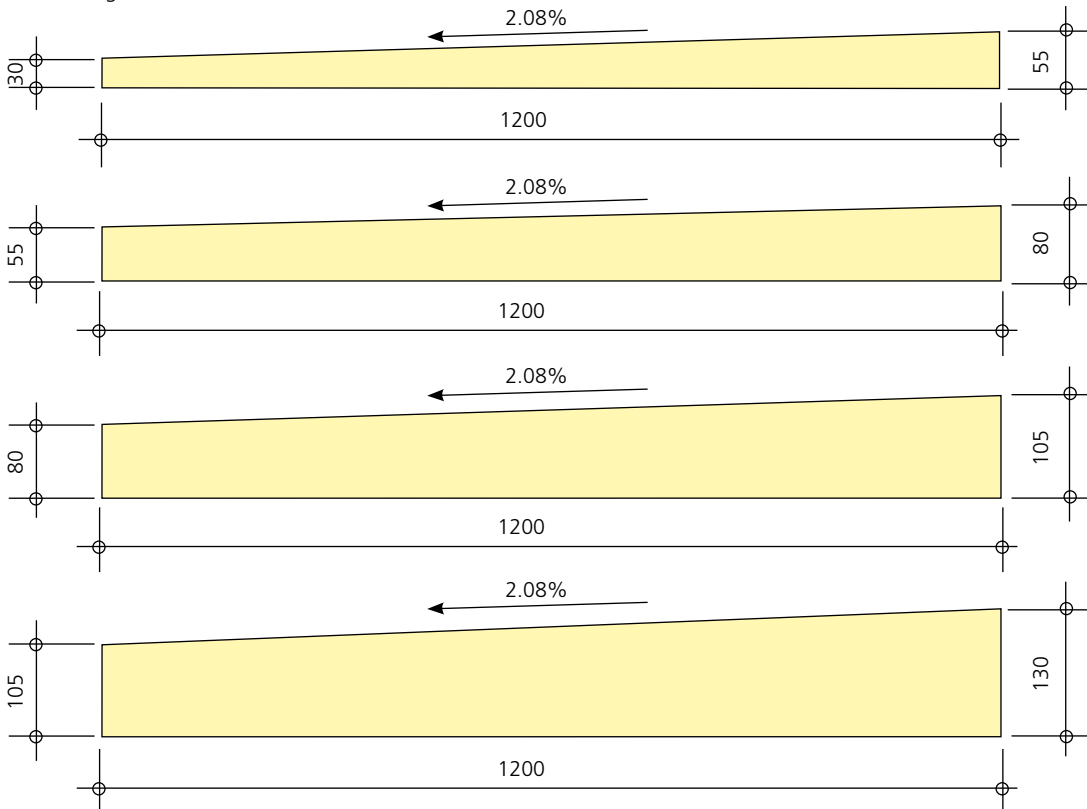
Separating layers may be required.

- Roof planting (extensive, intensive)

The dead weight of the dry vegetation substrate is decisive for the calculation of the superimposed load.

Tapered insulation

The LINITHERM tapered insulation panels are manufactured with a fixed gradient of approx. 2% and are usually installed in accordance with a prepared gradient plan. This is not absolutely essential for small areas due to the easy installation system. The LINITHERM tapered insulation panels are available in 4 different thickness grades.



Installation of the insulating panels usually begins at the lowest point. If a gradient plan is available, installation begins at the marked starting point.

The thickness at the starting point of the installation depends on the requirements placed on the thermal insulation of the flat roof or how much space there is at the connection points (gutters, drains, doors etc.). The minimum heat transfer resistance required in compliance with DIN 4108-2 can be fulfilled with the product LINITHERM PAL Gefälle already at a starting thickness of 30 mm; with LINITHERM PGV Gefälle this applies from a starting thickness of 55 mm.

If a greater starting thickness than the four existing thickness grades is required, then the tapered insulation panels with base panels or a first full-surface sub-layer are inserted (see schematic diagram).

Note: In case of a full-surface underlay, the further structure must be installed with an offset, such that no continuous cross joints result.

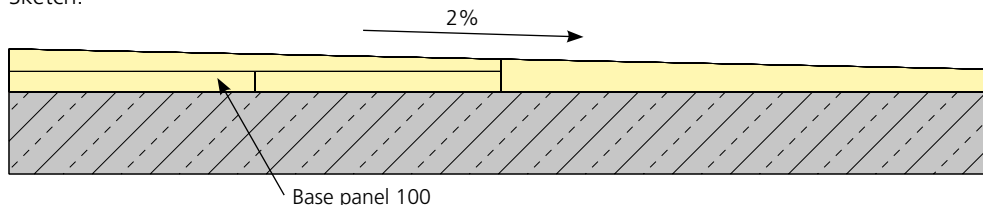
Installation principle

Procedure

In the first step the tapered panels [1200 x 1200 mm] (if necessary with an underlaid base panel [1200 x 600 mm]) are installed on the subsurface. The elements must be installed with the corresponding side facing upwards according to the marking. Installation takes place according to the gradient plan. In the case of simple floor plans without a gradient plan, installation usually begins at the lowest point. As four different thickness grades of tapered insulation panels are available for system-related reasons, the height changes must take acc. after the thickest gradient panel via the even panel lying underneath. Here, the height changes always take place in a grid of 100 mm. Height changes always take place after 4 installed gradient panels, meaning every 4800 mm.

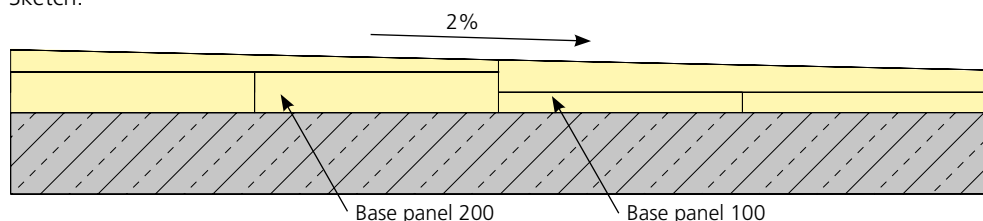
■ 4. FL-Gd

Sketch:



After 4800 mm, the thickness of the insulation material of the base plate rises again by 100 mm etc.

Sketch:



Ridge and valley panels

Upon request, the required ridge and valley panels are delivered in compliance with the gradient plan. The elements must be installed with the corresponding side facing upwards in accordance with the marking. As an alternative, the respective ridge and valley panels can also be cut out of the respective tapered panels. Both a ridge and valley panel are made as a result of the diagonal cut of a tapered insulation panel. Depending on local conditions, the corresponding pieces may be installed again. This method involves a certain amount of waste cuts.

Securing the position of a sloping roof

The initially described details of position securing must be observed.

Bonding with hot bitumen compound

Due to the high heat load and the expected heat accumulation, bonding with hot bitumen on a LINITHERM sloping roof (in multi-layer installation) is not possible.

■ 5. FL-IL

Lightweight industrial roof

According to the industrial construction guideline, roof surfaces exceeding 2500 m² must be designed such that the spreading of fire via the roof is not possible. This is deemed to be fulfilled for roofs acc. to DIN 18234. Building products used on lightweight industrial roofs are therefore subject to particular requirements. These requirements can be fulfilled using LINITHERM PAL FD or LINITHERM PGV FD.

Construction proposal

Trapezoidal steel roof, vapour barrier, LINITHERM PAL FD or LINITHERM PGV FD, waterproofing with plastic roof sheeting.

LINITHERM PAL FD/PGV FD is installed in formation. The vapour barrier and the overall structure must be designed considering the structural conditions and in accordance with the requirements of the use of the property. Changes in the conditions of use must be communicated.

The insulation panels (cover width 2420 x 1180 mm) should be attached with at least 6 attachment elements per panel. The elements must be installed with the corresponding side facing upwards in accordance with the marking panel.

The mechanical attachment of the plastic roof sheeting takes place according to the manufacturer's specifications for the respective waterproofing system.

The current standards, guidelines and manufacturer's regulations must be observed (e.g. Directive regarding the structural fire protection in industrial buildings DIN 18234, DIN 1055 and the flat roof guidelines of the ZVDH (Central Organisation of the German Roofing Trade).

Compact roof

When installing a LINITHERM compact roof, all layers of the roof structure, i.e. the vapour barrier, thermal insulation and waterproofing sheets are compactly and homogeneously bonded together and to the sub-surface with hot bitumen.

The following requirements need to be fulfilled for the manufacture of a compact roof.

Subsurface

The subsurface must be correspondingly level. Irregularities up to 5 mm can be levelled using hot bitumen. In the case of too uneven subsurfaces, cavities may be formed. Furthermore, the subsurfaces must be free of cracks. Infiltration-proof bonding of the vapour barrier to the subsurface is not possible if cracks are present.

The installation of a compact roof is only permissible on a dry subsurface. During transport, storage and installation, the panels must be protected against moisture.

The inclusion of moisture during installation leads to the formation of bubbles in the roof waterproofing and to bulging of the insulation panels.

Any soiling on the subsurface must be removed in advance. In order to improve adhesion to the concrete ceiling, a suitable primer must be applied. The manufacturer's instructions must be separately observed. Furthermore, attention must be paid that the air temperature and the temperatures of the components to be installed and of the substrate do not exceed 5 °C.

Vapour barrier

The vapour barrier must be bonded to the full subsurface with hot bitumen. The manufacturer's specifications must be observed accordingly!

Insulation

Only LINITHERM PGV panels are permissible for the manufacture of a LINITHERM compact roof. Two side surfaces of the panels are immersed in the hot bitumen compound. After this the panels are installed in formation with tight joints.

Cross joints during installation must be avoided. The panels are guided diagonally over the hot bitumen, such that the panel joints are completely filled with hot bitumen. In the case of greater insulation material thickness grades, the panel joints must be filled afterwards with hot bitumen from above. The bonded elements must be secured against slipping until the bitumen compound has cooled down sufficiently. They may for example take place by means of nail boards. Excess bitumen compound must be taken off and evenly distributed with the next panel.

For this type of installation, the panel thickness should be at least 80 mm, as the panels may deform due to the great heat. Only one layer of panels may be installed here due to the expected heat accumulation.

If irregularities have occurred during installation of the insulation panels, they must then be eliminated by rubbing off the peak points on the insulation panels or by filling in the low points using hot bitumen.

It must not rain during the installation of the insulation panels. The panels may only be installed in dry condition. Moist panels may not be installed, as the enclosed moisture leads to the formation of bubbles in the waterproofing layer and to bulging of the insulation panels.

Waterproofing layers

The 1st waterproofing layer must be bonded full-surface to the insulation panels using hot bitumen.

The 2nd waterproofing layer must be welded full-surface onto the first waterproofing layer.

The manufacturer's specifications must be observed accordingly.