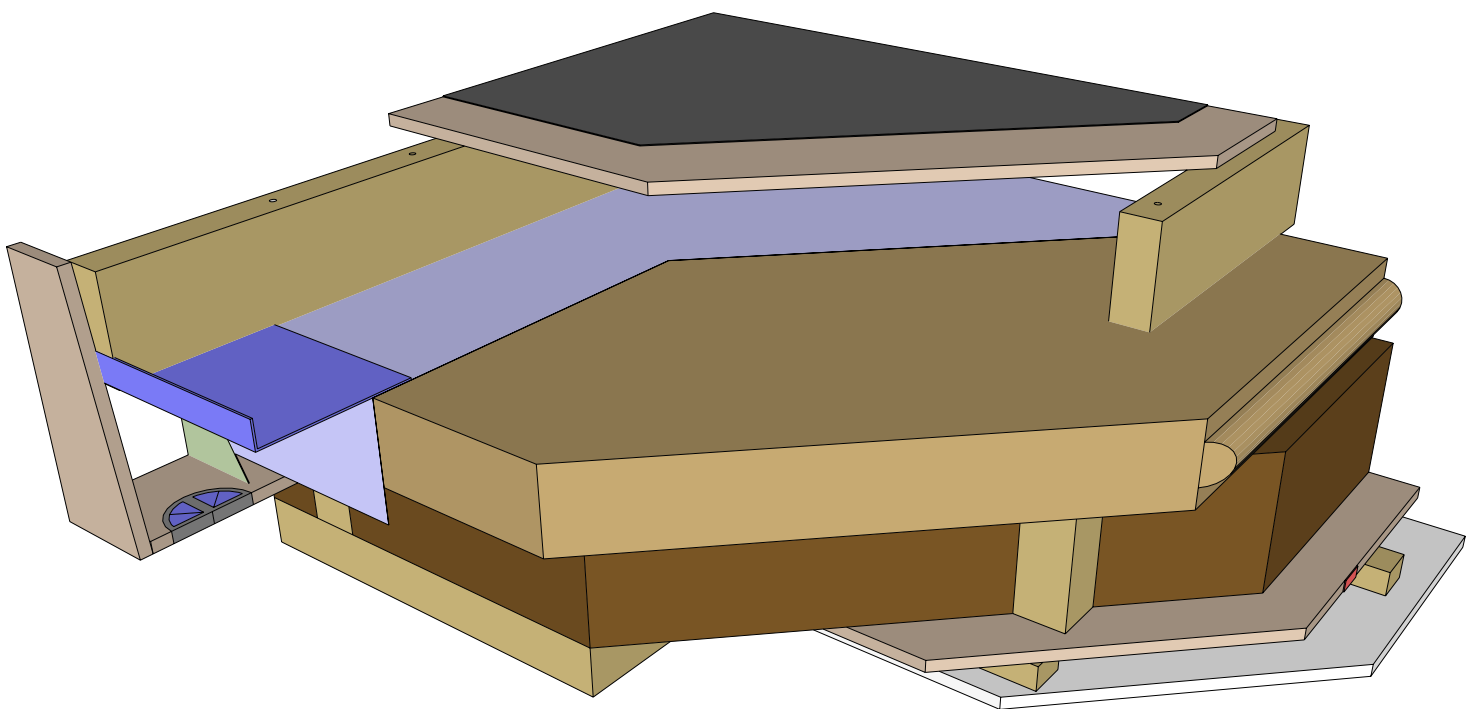




Natural  
Building  
Technologies

# Technical Manual NBT Flat roof system



# NBT FLAT ROOF

## Introduction

### Performance Guide

A modern roof insulation system must do more than just protect building occupants from cold. It must create a comfortable and healthy environment in all possible combinations of external and internal conditions and control the effects of external heat, cold, noise and internal moisture generation.

### NBT Flat roof system...

#### Keep the building warmer for longer in cold weather:

Low thermal conductivity and high vapour permeability provide high thermal insulation with a lower risk of interstitial condensation than conventional constructions. Vapour barriers are unnecessary. Wood fibre boards over the rafters reduce the effect of thermal bridging and increase the thermal performance. Energy use for heating is significantly reduced leading to lower CO<sub>2</sub> emissions and running costs.

#### Keep the building quieter:

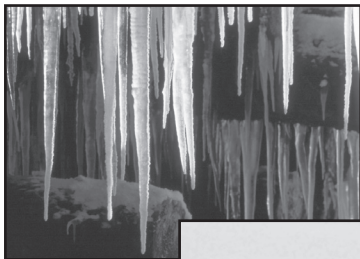
The high mass and the fibrous texture of NBT PAVATEX woodfibre boards give excellent acoustic performance to buildings.

#### Keep the building cooler in hot weather:

In flat roof constructions, protection against summer overheating is important as (especially with dark coverings) solar gains can be enormous. The unique combination of high density, high specific heat capacity and low thermal conductivity gives NBT solutions the effect of thermal mass that would normally be associated with green roofs.

#### Keep the building dry and breathable:

NBT PAVATEX woodfibre boards are very vapour permeable and hygroscopic. This allows them to disperse accumulating short term moisture and protect vulnerable elements of the building fabric, with no reduction in the performance of the boards themselves. The boards allow moisture from within the structure to dry out to both the inside and the outside. This provides a safeguard against high moisture content. This is vital for the long-term health of the building fabric, and is completely overlooked by most conventional insulation systems.



# NBT FLAT ROOF

## Checklist

The checklist below shows important factors that need to be considered when building a flat roof. Please note, that this is not a complete list, and the suitability of NBT products should be assessed by NBT in every case.



### Location

Page 5

Factors such as the amount of sunshine, temperature, surrounding buildings or wind affect a flat roof and need to be considered.



### Finish

Page 6

Material, colour, vapour resistance or shadow (e.g. through solar panels) are important factors that affect a flat roof construction.



### Airtightness

Page 7

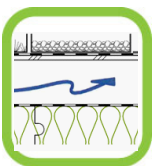
Very good levels of airtightness are required for all flat roof constructions. A blower door test is strongly recommended.



### Pitch

Page 7

Minimum Pitch for all NBT flat roof constructions is 3°.



### Ventilation

Page 8

For vented flat roof constructions (Type B), sufficient ventilation is key to avoid failures. Not only the ventilation area, but also its continuity via openings at both ends is vital.



### Other factors

Page 8

There are other factors that need to be considered, such as using dry timber, covering the site during construction, good workmanship and much more.



### Flat roof type

Page 9-11

Check out different construction types from page 9-11. Each type has its own important factors that need to be considered. Depending on certain factors, not every construction is possible for every location.

# NBT FLAT ROOF

## Principle

Despite modern building materials, calculation tools and many years experience, flat roof constructions remain a critical construction and require special attention during both planning and construction phase. The graphic and text below show complex moisture and temperature movements that will affect a flat roof construction.

They can be defined as moisture and heat factors, then further divided into internal and external factors.

### Internal:

Internal **temperature** should remain steady during the whole year. NBT systems help to prevent the building from overheating in the summer and keep it warm in the winter.

It is important to know that warm air can hold more moisture (absolute content) than cold air, which plays an important role in moisture movements within a flat roof.

The **moisture** impact from the inside is due to diffusion (amount of moisture that gets into the construction through the materials) and convection (moisture that gets into the construction through convection of air that penetrates the airtightness layer e.g. through leakages).

Generally, diffusion happens from the inside to the outside during winter, and the other way around in summer (provided a low vapour resistance of the airtightness membrane allows drying out to the inside).

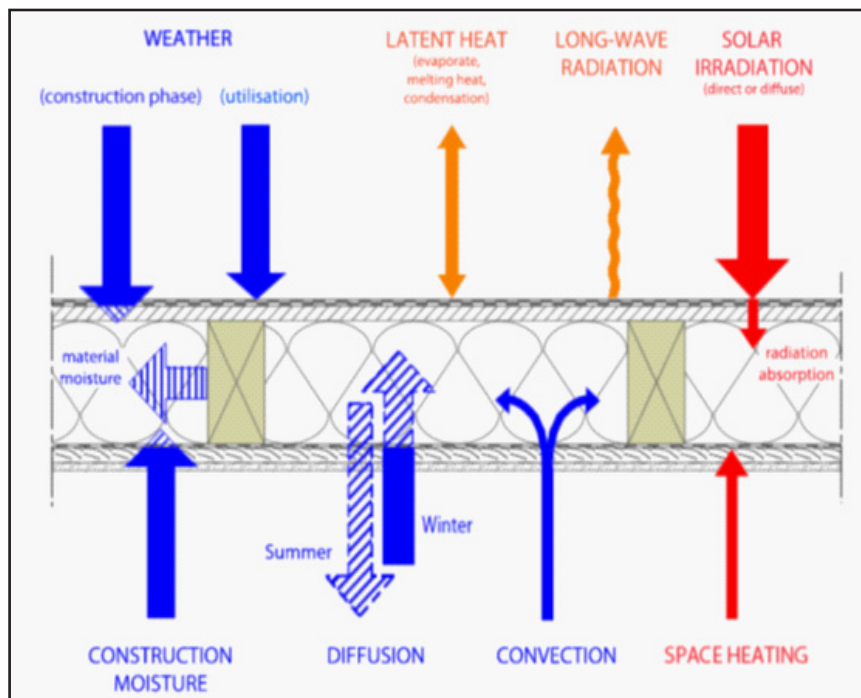
High material moisture content is another (often forgotten) way for moisture to get into a construction. Wet initial conditions can lead to problems as the dry out potential in a flat roof is limited. Kiln dried timber and dry insulation (protected against rain during construction) are vital to avoid high moisture content.

### External:

The driving factor in terms of outside **temperature** is the sun. The incidence of direct or diffused sunlight (**short wave irradiation**) on a flat roof surface is very important in helping to dry out the construction to the inside (provided no internal vapour barrier limits the drying out). Dark coloured coverings can absorb more of the sun's energy than bright coverings, which reflect most of the short waves. Also, the type and thickness of the coverings (e.g. a green roof) has a big impact on the dry out of the construction.

Another factor that affects a flat roof is latent heat. This is the energy that is released or used when water changes its condition of aggregation (e.g. when water evaporates it cools down the surrounding area). Compared with the energy of the sun, this has a minor effect on the flat roof.

The **moisture** impact from outside should be zero as soon as the construction has its finished covering. Due to the limited dry out capability, measures to eliminate moisture ingress during the construction phase should be employed.



Interactions on a flat roof construction  
(blue colour = moisture; red colour temperature)

# NBT FLAT ROOF - Key Factors

## Location



Location is a very important factor which can be decisive in making a flat roof construction work or fail.

### The sun (radiation)

The sun is the driving factor to dry out a flat roof construction. If the absorption of the sun's heat is restricted due to the proximity of buildings or trees, solar panels, green roofs, parapets or similar, the dry out potential of the construction can be reduced considerably.

### Precipitation

Rain should not cause any problems to a flat roof if it is built properly (3° pitch, drain, waterproof EPDM,...). However, the amount of rainfall is closely related to the amount of sunshine, whose importance is demonstrated in the graph below. For northerly locations, precipitation as snow can be a limiting factor in terms of snow loads and must be considered by the structural engineer.

### Temperature

Temperature on the outside as well as on the inside plays a vital role in terms of condensation and the dry out potential of the construction. Obviously higher outside temperatures are favourable for drying out and avoiding interstitial condensation. Internally, a steady temperature is desirable, without overheating in the summer and keeping the building warm in winter. The internal temperature is closely linked to relative humidity levels.

### Humidity

Internal: High moisture loads internally can be harmful to the construction. NBT woodfibre insulation can act as a buffer for moisture. This means that moisture can be temporarily stored in the woodfibre boards and later released when the relative humidity drops. However, a constant high humidity is not good for the construction and will lead to increased moisture content in the material, including the structural timber.

External: higher humidities will limit the dry out potential.

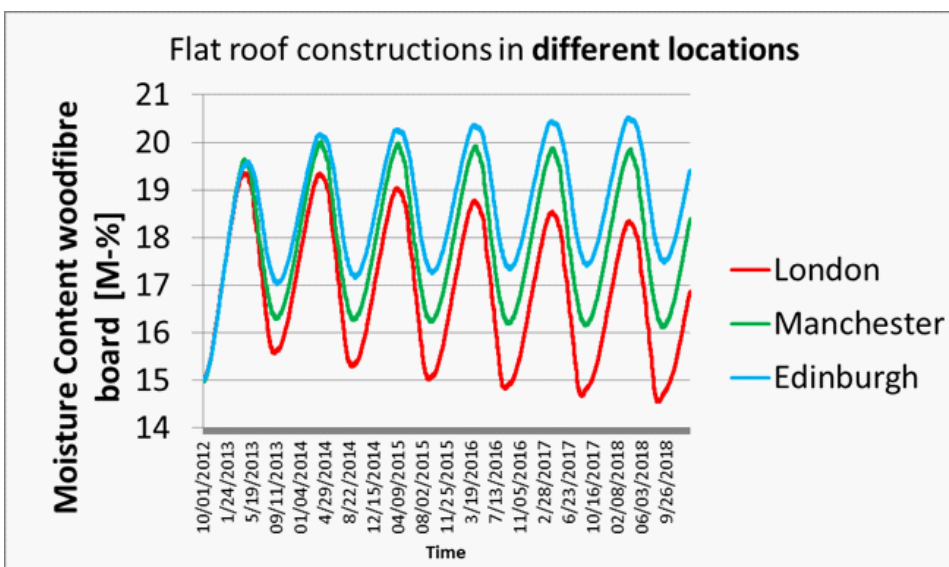
### Wind

Wind does not greatly affect non-vented flat roofs. For vented flat roof construction, wind is normally beneficial to the ventilation and helps to dry out the construction as it dissipates wet air from between the covering and the breathable membrane.

### Summary location:

All these different external conditions can affect a flat roof construction greatly. The graph below shows the identical construction located in different cities.

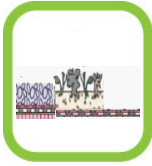
It can be seen that the material moisture content is up to 4% higher for Edinburgh compared to London. This difference is significant, especially as flat roofs are often critical construction elements.



Moisture content of the outermost layer of woodfibre boards of an identical flat roof construction in different locations

# NBT FLAT ROOF - Key Factors

## Finish



The finish of a flat roof is crucial to its functionality. There are many different factors, some of which are described below:

### Colour

Dark colours result in more absorption of sunlight. This is beneficial to the dry out of the construction and therefore beneficial to a flat roof construction. However, drying out to the inside has to be possible (i.e. no vapour barrier present).

### Density

Dense insulation materials provide better protection against airborne sound and will also affect heat storage and the amount of moisture that can be held within the insulation (if hygroscopic). The load must be taken into account by a structural engineer.

### Vapour permeability

Although the finish of a flat roof must be waterproof, vapour should still be able to diffuse through the layers. Extremely vapour-closed materials such as bituminous felts reduce the dry out potential of a construction considerably. Moisture can be trapped within such constructions and lead to moisture accumulation and ultimately structural damage.

### Surface/material

Different surfaces react differently to the external conditions. A green roof, for example, will never get as hot as a lead covering.

### EPDM (single ply)

EPDM (ethylene propylene diene monomer) membranes come in various colours, thicknesses, properties and application systems.

For non-vented NBT flat roof systems the EPDM needs to have the following properties:

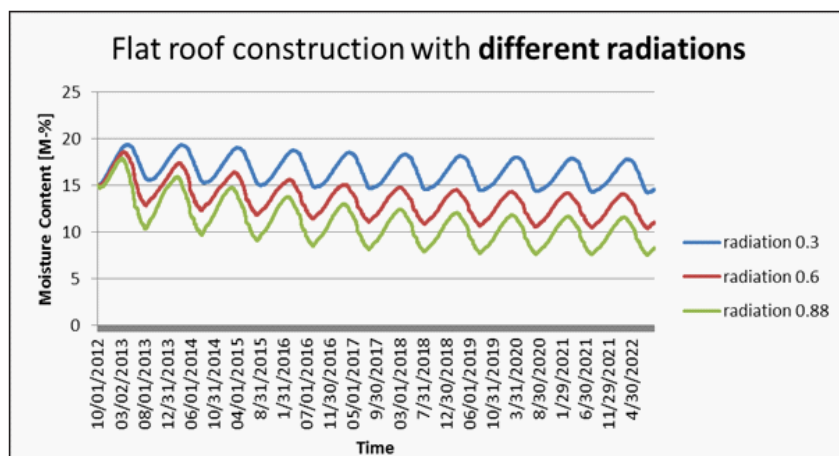
- Vapour resistance 100-200MNs/g (equals Sd-Values 20-40m)
- Dark colour to absorb maximum sunlight (short-wave radiation absorption  $\geq 80\%$ )
- Waterproof
- Minimum lifespan of 30 years

There are many products which fulfil these requirements. Please contact NBT for further advice.

These EPDM's can be applied on a plywood, which is located directly onto the woodfibre insulation and fixed through to the structure.

### Green roofs. Gravel, Solar panels, Metal cover, ...

All other finishing surfaces require a vented construction (check page 8 for advice on ventilation) as they reduce the dry out potential excessively.



Effect of different radiations on flat roof construction (radiation 0.88 = dark covering; radiation 0.6 = partly shadowed dark colour or grey cover; radiation 0.3 = bright colour of covering or more shadow)

# NBT FLAT ROOF - Key Factors

## Airtightness



**Airtightness is a crucial part of NBT flat roof systems. Good levels of airtightness help to prevent large amounts of moisture entering the construction**

Compared to the amount of moisture that can get into the construction through diffusion, large amounts of convection moisture can enter the construction through leakages in the airtightness layer.

The damaging effect of penetrations (e.g. services, roof lights or similar) in the airtightness layer, if not sealed properly, is often underestimated.

In the UK, Building Regulations require an airtightness of  $10\text{m}^3/(\text{h}\cdot\text{m}^2)$  at a pressure difference of 50Pa ( $q_{50}$ -Value) for new build. For flat roof construction the target should be lower at a maximum of  $3\text{m}^3/(\text{h}\cdot\text{m}^2)$ . (Passivhaus requires  $0.6\text{m}^3/(\text{h}\cdot\text{m}^2)$ )

Frequently, the design airtightness value differs considerably from the actual as-built value. A blower door test would help to detect leakages and ensure the performance of the construction is as designed and required.

### Type of airtightness membrane

For NBT flat roof constructions, an airtightness membrane with a low vapour resistance must be used to allow dry out to the inside.

A moderate vapour permeability (Sd-Value of 5m or less) membrane should be used on the warm side of the construction. Membranes with a variable vapour resistance such as Vario KM are recommended, as they allow less moisture to enter the construction during winter and more to dry out to the inside in the summer.

Using a vapour closed airtightness layer such as a vapour check or a thick plywood reduces the dry out potential considerably and is therefore not recommended.

## Pitch



**Even though it is described as flat roof, a minimum pitch of 3° is required for every flat roof construction to avoid standing water.**

With less than 3° it is very likely standing water will gather on top of the construction, which sooner or later, will lead to a failing flat roof construction.

3° is just enough to allow water flow into a gutter. Ensure the gutters are not blocked (e.g. though falling leaves) and water is always able to run off.

Introducing a pitch is relatively easy for some constructions, but more challenging for others. It is not possible to introduce uninsulated firrings within a flat roof construction which create air pockets within the construction (contact NBT for advice).

For vented constructions, introducing firrings at the level of the ventilation is not sufficient as the woodfibre boards need to have the same minimum pitch of 3°.



Flat roof construction with standing water. This construction will eventually fail

Source: Schmidt, D.; Winter, S.: Flachdächer in Holzbauweise; INFORMATIONSDIENST HOLZ Spezial, Oktober 2008, Holzabsatzfonds, Bonn

# NBT FLAT ROOF - Key Factors

## Ventilation



If a flat roof is vented properly, it is a good option for flat roof constructions. However, there are a couple of things that need to be considered.

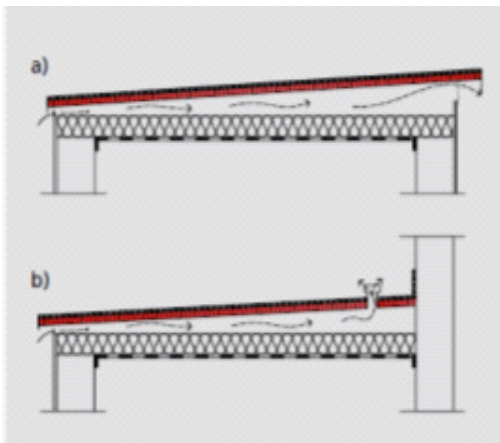
The advantage of a vented flat roof construction is that a variety of different coverings can be applied. The downside is that the construction is thicker due to the additional ventilation space. Ventilation is vital to make this type of flat roof construction work. If there is not sufficient air exchange, the construction is likely to fail.

Unlike vented facades or pitched roofs, flat roofs do not have sufficient height differential, which is a driving factor for air movement within a cavity. This means that the geometry of the ventilation and the openings are crucial for providing sufficient ventilation.

The minimum **height** for ventilation battens is 100mm. If the length of the ventilation is greater than 10m, contact NBT for advice as achieving sufficient ventilation in this case is particularly challenging.

If a flat roof is adjoining a wall, or is built with parapets, it is very likely that there will not be sufficient airflow.

The ventilation **openings** must be continuous, with an effective opening of at least 100cm<sup>2</sup> per linear metre on both sides.



examples with appropriate ventilation space and openings

## Other Factors



A couple of additional factors that need considering are listed below:

### Protection against moisture during construction

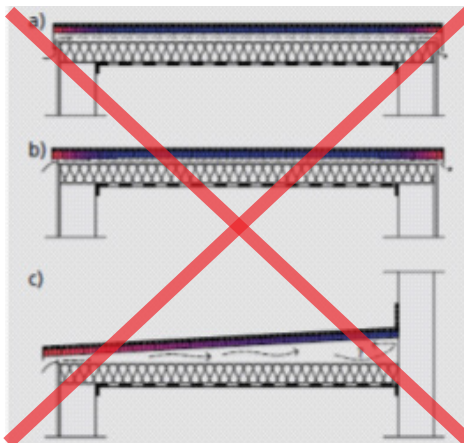
A flat roof construction has a much lower dry out potential than other building elements. Therefore it is important that the materials are protected against moisture ingress during construction to avoid high initial moisture content.

### Air pockets within the construction

When air pockets caused by firrings or missing insulation are present within a flat roof construction convection is likely within this space. Moisture will then be accumulated at the coldest spot within the construction and lead to problems.

### Maintenance

A regular check of the condition of a flat roof is important to prevent problems. Drainage needs to be clear of leaves, and ventilation space and openings must remain unobstructed.



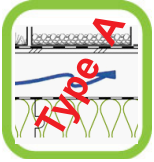
ventilation is insufficient due to small or missing openings (a,c) or not enough ventilation space (b)

# NBT FLAT ROOF - Construction Types

## Construction Type A

UNVENTILATED FLAT ROOFS ARE NOT RECOMMENDED BY SOPREMA

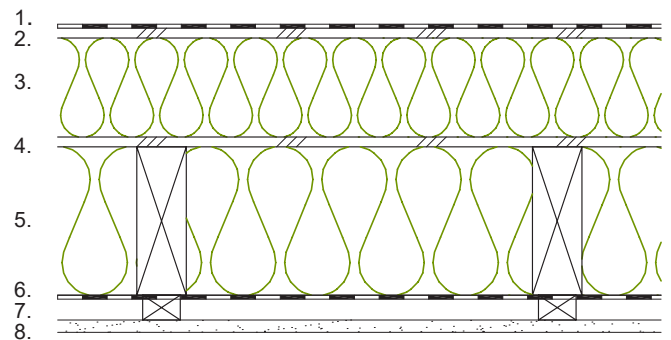
\*Contact NBT for bespoke U-value and WUFI calculations.



This build-up is the most delicate of the three different NBT options because the structural element is within the insulated area, creating a potential risk of interstitial condensation. As a result, the only possible covering is a dark coloured EPDM with a moderate vapour permeability (no green roof, gravel, solar panels or similar). Check page 6 for more information about the finish covering.

### Build-up

1. EPDM (Sd-Value 20-40m)
2. Plywood (max. 24mm)
3. NBT ISOROOOF or PAVATHERM-PLUS  
(board preference subject to WUFI calculation)
4. Plywood 10mm (optional)
5. Rafters / NBT PAVAFLEX
6. Airtightness membrane (taped)
7. Service void 25mm
8. Plasterboard 12.5mm



### Insulation:

- NBT Pavaflex insulation is a flexible woodfibre batt used to insulate between rafters.
- NBT ISOROOOF is a rigid T&G woodfibre insulation board with a high density (230kg/m<sup>3</sup>) and compressive strength (150kPa @ 10% compression).
- NBT PAVATHERM-PLUS is a rigid T&G woodfibre insulation board with a high density (190kg/m<sup>3</sup>) and compressive strength (100kPa @ 10% compression).

### Flat roof type A - Physical properties

	Unit	Rafter depth * Pavaflex insulation between rafters	over-rafter insulation ISOROOOF / Pavatherm-Plus				
			35	60	80	100	120
	mm	150	35	60	80	100	120
U-Value **	W/m <sup>2</sup> K	100+50	0.21	0.19	0.17	0.16	0.15***
Sound insulation (approximately)	dB		44	45	46	47	48
Decrement delay	hrs		6.5	7.9	9.3	10.7	12.1
	mm	219	35	60	80	100	120
U-Value	W/m <sup>2</sup> K	80+140	0.16	0.15	0.14	0.13	0.12
Sound insulation (approximately)	dB		47	48	49	50	51
Decrement delay	hrs		10.0	11.1	12.6	13.9	15.3
* ref. structural engineer							
** Calculations done according to BS EN ISO 6946:1997 and BR 443.(allowances for wall plates etc, give a 9% bridging area for the timber).							
*** Passivhaus solutions are marked in orange.							

# NBT FLAT ROOF - Construction Types

## Construction Type B

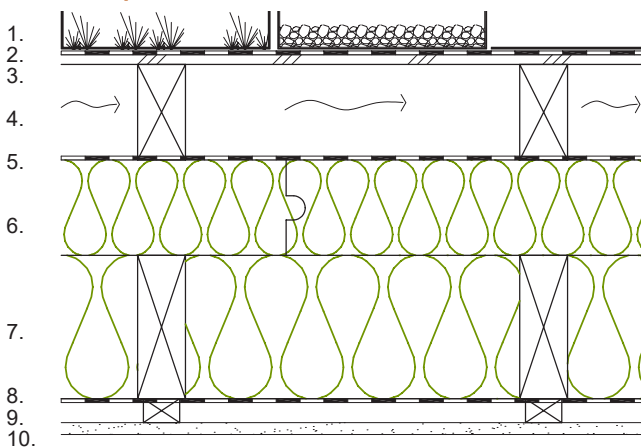
ONLY SPECIFICATION THAT SOPREMA RECOMMENDS

\*Contact NBT for bespoke U-value and WUFI calculations.



This build-up is the only one where a variety of finishing surfaces can be chosen. However, its performance is dependent on the ventilation and it will fail if this is not working properly (Check page 8 for information on ventilation). Use double threaded screws to fix the ventilation battens through the over-rafter insulation into the rafters to cope with the loads from the covering. Please consult a structural engineer for type and quantity of the fixings.

### Build-up



1. Finish covering (such as green roof or gravel)
2. EPDM
3. WBP Plywood
4. Battens for ventilation (minimum 100mm)
5. Breathable roofing membrane
6. NBT **ISOLAIR**
7. Rafters / NBT PAVAFLEX
8. Airtightness membrane (taped)
9. Service void 25mm
10. Plasterboard 12.5mm

Battens must sit on Pavafix SN Band to prevent moisture penetration going through the membrane below, where the fixings are located.

80mm deep battens could be used if space is at a premium, but the pitch must be 5 deg min, roof must be well ventilated with good ventilation grill on either side, roof must be well drained and Pavafix SN Tape must be used under battens.

### Insulation:

- NBT Pavaflex insulation is a flexible woodfibre batt used to insulate between rafters.
- NBT ISOROOOF is a rigid woodfibre insulation board with a high density (230kg/m<sup>3</sup>) and compressive strength (150kPa @ 10% compression). Use Isolair instead: Density 30mm (200kg/m<sup>3</sup>), 40-80mm thickness (165 kg/m<sup>3</sup>) or 100mm+ (145 kg/m<sup>3</sup>)
- NBT Pavatherm-Plus is a rigid woodfibre insulation board with a density of 180kg/m<sup>3</sup> and a compressive strength of 100kPa @ 10% compression. Use Isolair instead: Density 30mm (200kg/m<sup>3</sup>), 40-80mm thickness (165 kg/m<sup>3</sup>) or 100mm+ (145 kg/m<sup>3</sup>)

### Physical Properties Flat roof type B

	Unit	Rafter depth * Pavaflex insulation between rafters	over rafter insulation ISOROOOF / Pavatherm-Plus				
	mm	150	35	60	80	100	120
U-Value **	W/m <sup>2</sup> K	100+50	0.21	0.19	0.17	0.16	0.15
Sound insulation (approximately)	dB		depending on finishing surface; check construction A for indication of insulation only				
Decrement delay	hrs		6.5	7.9	9.3	10.7	12.1
	mm	219	35	60	80	100	120
U-Value	W/m <sup>2</sup> K	140+80	0.16	0.15	0.14	0.13	0.12
Sound insulation (approximately)	dB		depending on finishing surface; check construction A for indication of insulation only				
Decrement delay	hrs		10.0	11.1	12.6	13.9	15.3

\* ref. structural engineer

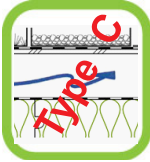
\*\* Calculations done according to BS EN ISO 6946:1997 and BR 443.(allowances for wall plates etc, give a 9% bridging area for the timber).

# NBT FLAT ROOF - Construction Types

## Construction Type C

UNVENTILATED FLAT ROOFS ARE NOT RECOMMENDED BY SOPREMA

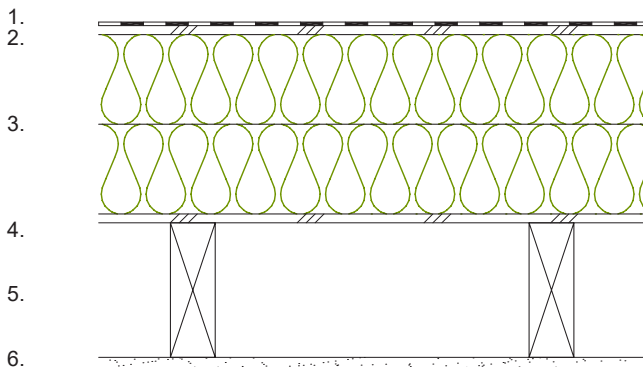
\*Contact NBT for bespoke U-value and WUFI calculations.



This flat roof construction is the best of the three as the structural element is on the warm side. It is normally easy to introduce the required pitch and there is no issue with ventilation. It requires, however, more space as all the insulation is above the rafters.

Ideally, use a tongue and grooved plywood over the top to limit movement between the boards. This helps to avoid stress on the membrane (e.g. when walking on the roof).

### Build-up



1. EPDM (Sd-Value 20-40m)
2. Plywood (max. 24mm)
3. NBT PAVATHERM COMBI or NBT PAVATHERM (board preference subject to WUFI calculation)
4. OSB (18mm, taped for airtightness)
5. Rafters (create service void)
6. Plasterboard 12.5mm

or  
ISOLAIR

DB 3.5 Airtightness Membrane or Intelligent Membrane should also be used with OSB - be careful not to puncture it.

### Flat roof type C

**Insulation:** or Isolair

- Pavatherm-Combi woodfibre insulation boards are T&G boards which come in thicknesses of 40, 60, 80, 100, 120, 140mm and more. They have a high compressive strength (100kPa @ 10% compression) and a format which is easy to handle (58 x 178cm).

### Physical Properties Flat roof type C

	Unit	Thickness of insulation Pavatherm-Combi						
		140	160	180	200	220	240	260
U-Value *	W/m <sup>2</sup> K	0.25	0.23	0.21	0.19	0.17	0.16	0.15
Sound insulation (approximately)	dB	37	38	38	39	39	39	40
Decrement delay	hrs	7.9	9.2	10.6	11.9	13.3	14.6	16.0

\* Calculations done according to BS EN ISO 6946:1997 and BR 443

# NBT FLAT ROOF

## General Considerations

### General:

The NBT System should only be installed by competent contractors. Provide the contractor with full and complete details for all critical areas of the system including those listed below - leave nothing to be agreed "on site".

### System Guarantee:

The system is guaranteed only if boards and accessories approved by NBT are used. Each flat roof must be modelled by NBT to check its suitability.

### Weathertightness/Pitches:

Seal the boards for weathertightness against other elements at all joints, intersections, openings and penetrations and along all edges using NBT tapes and primer.

All boards have to be covered with a breathable membrane (taped at joints) and protected against moisture ingress during construction.

### Airtightness:

Carefully detail the airtightness layer especially around openings, corners and junctions. Penetrations in the airtightness layer must be taped carefully to avoid moisture ingress through convection.

A blower door test is highly recommended to check the level of airtightness.

### Boards:


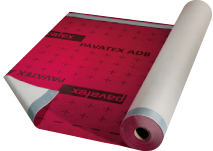


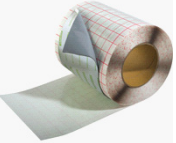



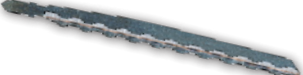
Plan board layout to reduce wastage prior to commencing installation.

Boards must span at least 2 rafters. Board edges should not coincide with rafter positions, which should be at  $\leq 650$  mm centres. Minimum bond overlap is 200 mm between courses.

Boards must not be wet or damaged and board edges

# NBT FLAT ROOF

## Components & Accessories

Product	Use	Picture
NBT PAVATEX DB3.5	<ul style="list-style-type: none"> <li>Airtightness membrane</li> <li>For internal use</li> <li>Sd-Value = 3.5m</li> <li>Roll size 1.5* 50m</li> <li>All joints to be taped</li> </ul>	
NBT ADB BREATHABLE MEMBRANE	<ul style="list-style-type: none"> <li>Breathable membrane</li> <li>Use on top of flat roof type B</li> <li>Sd-Value = 0.03m</li> <li>Roll size 1.5* 50m</li> <li>All joints to be taped</li> </ul>	
NBT PAVATEX PAVAPRIM	<ul style="list-style-type: none"> <li>Primer for NBT PAVATAPE</li> <li>Solvent based, for better adhesion of NBT PAVATAPE onto woodfibre boards.</li> <li>Coverage 15m/l; 1 litre tub</li> </ul>	
NBT PAVATEX PAVABASE	<ul style="list-style-type: none"> <li>Primer for NBT PAVATAPE</li> <li>Water based, for better adhesion of NBT PAVATAPE onto woodfibre boards.</li> <li>Coverage 20m/l; 5 litre tub</li> </ul>	
NBT PAVATEX PAVATAPE	<ul style="list-style-type: none"> <li>Butyl based tape with aluminium covering to seal edge joints (corners, etc.) and openings through NBT woodfibre boards.</li> <li>Surface on board requires priming;</li> <li>Length 15m; width 150mm</li> </ul>	
NBT PAVATEX PAVAFIX	<ul style="list-style-type: none"> <li>Synthetic based tape</li> <li>To be used internally or externally</li> <li>Length 25m; width 60mm, 150mm and special 20/40 for sealing internal corners</li> </ul>	
EJOT TKR	<ul style="list-style-type: none"> <li>Philips head countersunk screw with self-tapping tip;</li> <li>4.8mm x 60-200mm (10mm increments);</li> <li>4.8 x 200-300mm (20mm increments);</li> <li>Minimum embedment in rafter = 40mm</li> </ul>	
HECO TOPIX-T THERM	<ul style="list-style-type: none"> <li>Double Threaded, T40 drill head countersunk screw with self-tapping tip;</li> <li>8mm x 160-460mm (20mm increments);</li> <li>Minimum embedment in rafter = 40mm</li> </ul>	
NBT PAVATEX JIGSAW BLADE	<ul style="list-style-type: none"> <li>Jigsaw blades for accurate cutting of the woodfibre boards (up to 120mm thickness)</li> <li>Length 150mm;</li> <li>3 blades per pack</li> </ul>	

**For your Notes & Sketches**

# NBT Product Overview: Insulation

## ISOROOF sarking board



PAVATEX wood fibre board for breathable roof & wall constructions

Size: 770 x 2500 mm  
 Cover area: 750 x 2480 mm  
 Thicknesses: 20\* & 35 mm  
 k-value / I<sub>D</sub>: 0.046 W/(mK)  
 Density: 230 kg/m<sup>3</sup>  
 Compr. strength: 150 kPa (at 10 % compression)

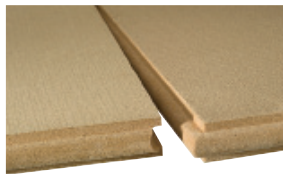
## PAVATEX DIFFUTHERM external wall insulation



Wood fibre board for rendered external walls

Size: 580 x 1450 mm  
 Cover: 560 x 1430 mm  
 Thicknesses: 60, 80, 100 & 120 mm  
 k-value / I<sub>D</sub>: 0.043 W/(mK)  
 Density: 190 kg/m<sup>3</sup>  
 Compr. strength: 80 kPa (at 10 % compression)

## PAVATHERM-PLUS sarking board



Composite wood board for roof & wall insulation

Size: 580 x 1800 mm  
 Cover area: 560 x 1780 mm  
 Thicknesses: 60, 80, 100, 120 mm  
 k-value / I<sub>D</sub>: 0.043 W/(mK)  
 Density: 180 kg/m<sup>3</sup>  
 Compr. strength: 100 kPa (at 10 % compression)

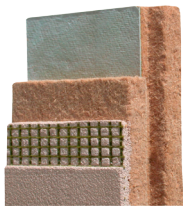
## PAVATHERM-COMBI multipurpose



Composite wood board for roof & wall insulation

Size: 580 x 1800 mm  
 Cover area: 560 x 1780 mm  
 Thicknesses: 60, 80, 100, 120 mm  
 k-value / I<sub>D</sub>: 0.041 W/(mK)  
 Density: 145 kg/m<sup>3</sup>  
 Compr. strength: 100 kPa (at 10 % compression)

## PAVADENTRO internal wall insulation



Innovative wood fibre insulation board for refurbishment

Size: 600 x 1020 mm  
 Cover area: 590 x 1010 mm  
 Thicknesses: 40, 60, 80 & 100 mm  
 k-value / I<sub>D</sub>: 0.043 W/(mK)  
 Density: 175 kg/m<sup>3</sup>  
 Compr. strength: 70 kPa (at 10 % compression)

## PAVADRY internal wall insulation



Innovative wood fibre insulation board for refurbishment

Size: 600 x 1020 mm  
 Cover area: 590 x 1010 mm  
 Thicknesses: 52, 72 & 92 mm  
 (Pavadentro/Hardboard) k-value / I<sub>D</sub>: 0.043 / 0.14 W/(mK)  
 (Pavadentro/Hardboard) Density: 175/740 kg/m<sup>3</sup>  
 (Pavadentro) Compr. strength: 70 kPa (at 10 % compression)

## PAVATHERM-PROFIL wall & floor board



Wood fibre board for insulating floors or internal walls with plaster

Size: 600 x 1020 cm  
 Cover: 590 x 1010 mm  
 Thicknesses: 40 & 60 mm  
 k-value / I<sub>D</sub>: 0.043 W/(mK)  
 Density: 175 kg/m<sup>3</sup>  
 Compr. strength: 70 kPa (at 10 % compression)

## PAVATHERM general purpose insulation board



Universal wood fibre board for use in external & internal walls, floors & roofs

Sizes/Cover: 600 x 1020 mm  
 Thicknesses: 20 -140 mm  
 k-value / I<sub>D</sub>: 0.038 W/(mK)  
 Density: 110 kg/m<sup>3</sup>  
 Compr. strength: 50 kPa (at 10 % compression)

## NBT Pavaflex



Flexible woodfibre insulation batts for loft, walls, floors & ceilings

Size I: 375 x 1350 mm  
 Size II: 575 x 1350 mm  
 Thicknesses: 50, 80, 100 & 140 mm  
 k-value / I<sub>D</sub>: 0.038 W/(mK)  
 Density: 55 kg/m<sup>3</sup>  
 Compr. strength: -

## PAVABOARD load bearing insulation



Wood fibre board for highly insulated floors that have to carry loads

Size/Cover: 600 x 1020 mm  
 Thicknesses: 40 & 60 mm  
 k-value / I<sub>D</sub>: 0.046 W/(mK)  
 Density: 220 kg/m<sup>3</sup>  
 Compr. strength: 150 kPa (at 10 % compression)

## PAVAFLOC - cellulose fibres



Packaging: Bags of 12.5 kg (compressed)  
 Cover area: e.g. 30-60 kg/m<sup>3</sup>  
 k-value / I<sub>D</sub>: 0.038 W/(mK)

\* contact NBT for details or download data sheet online



Natural  
Building  
Technologies



# Natural Building Materials and Systems



**high performance systems** NBT PAVATEX woodfibre systems provide exceptional thermal & acoustic insulation, summer overheating protection and moisture control for the whole building in wall roof and floor



**low carbon, renewable products** NBT PAVATEX boards are made of waste wood and lock up the equivalent of ca. 11 tonnes of CO<sub>2</sub> per building. Raw material resources are entirely renewable, unlimited and FSC certified



**healthy housing** NBT PAVATEX insulation boards are certified by natureplus as non-polluting and the NBT systems lead to breathable constructions; NBT PAVATEX insulation is specified exclusively by the Sentinel Haus Institute for healthy housing



**tried & tested systems** NBT PAVATEX woodfibre insulation are widely used across Europe in all climates and conditions; physical values are 3rd party tested and guaranteed and production is according to BS EN



**local service & support** Pavatex's partner in the UK is Natural Building Technologies (NBT) who are a Technical Sales Company with nationwide coverage based in Oakley, Bucks. NBT lead the UK sustainable materials & systems for high performance building shells



Swiss Made

**swiss quality & know-how for the UK** produced and developed in Switzerland for more than 70 years by the world's most innovative woodfibre insulation manufacturer

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