

Timber Frame Solutions



PAVACLAD & DIFFUTHERM THE SCIENCE OF NATURE - THE FUTURE OF CONSTRUCTION

TECHNICAL MANUAL

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Product Overview: Insulation

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Describtion of NBT Timber Frame Systems

The NBT timber frame system is flexible in its final finish: The PAVACLAD system which is an external insulation with cladding and the DIFFUTHERM system which is an external insulation with render.



Made from 99.5% waste softwood and 0.5% inert water-proofing additives, Pavatex Woodfibre Boards (Pavatherm, Diffutherm, Pavatherm Plus, Isolair) are a genuinely sustainable non-toxic building material.

To make Pavatex boards, waste wood fibres are pulped and mixed with water. The pulp is heated to activate the lignin they contain in order to glue the fibres together. The pulp is then pressed into boards, dried, and cut to size.

The advanced manufacturing process uses the inherent properties of wood fibres to produce boards with many excellent technical qualities for thermal and acoustic insulation, thermal storage capacity, vapour permeability and moisture control.



The NBT Timber Frame Systems are...

- very vapour permeable
- good air- & wind tightness
- no membranes required
- improved sound insulation for light weight structures
- improved heat storage for light weight structures
- substantial saving of build cost compared with conventional timber frame construction
- simple robust construction has few skill operation and is easily adapted for offsite manufacture
- reduces thermal bridging and therefore ideal to achieve new Building Regulation part L





Performance Guide

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

NBT Timber Frame System (PAVACLAD & DIFFUTHERM)...









...keeps the building warmer for longer in cold weather

Low thermal conductivity and high vapor permeability provide high thermal insulation with no risk of interstitial condensation. Vapor barriers are unnecessary. When used on studwork the boards reduce the effect of thermal bridging and the interlocking board design easily achieves good wind-tightness so increasing thermal performance. Energy use for heating is significantly reduced leading to lower CO2 emissions and running costs.

...keeps the building cooler in hot weather

The unique combination of high density, high specific heat capacity and low thermal conductivity gives lightweight framed constructions the effect of thermal mass that would normally be associated with masonry. Compared to conventional framed constructions NBT Timber Frame Systems can keep the internal temperature up to 4°C cooler over the course of a hot day. NBT Timber Frame System slows the transmission of outside temperature extremes to the inside of the building (expressed as decrement delay). The more the decrement delay the more this will help to provide cooler internal temperatures during day- and nighttime.

...keeps the building quieter

The high mass and the fibrous texture of Pavatex Woodfibre Boards gives excellent acoustic performance. This gives the required mass performance to light-weight timber frame buildings.

...keeps the building dry and is breathable

Pavatex Woodfibre Boards are very vapour permeable and hygroscopic. This allows it to disperse short term moisture accumulating and protect vulnerable elements of the building fabric, with no reduction in the performance of the boards themselves. The boards allows moisture from within the structure to pass easily to the outside. This provides a safeguard against high moisture which cause decay in timber structures. This is vital for the long-term health of the building fabric, and is completely overlooked by most conventional insulation systems.



Summer Overheating: Decrement Delay and Decrement Factor

As part of the design of buildings it is important to consider effects of summer overheating control, particulary when there are rooms in roofs or if you work with light weight constructions as timber frame. Summer overheating is in fact caused by any or a combination of three reasons:

- 1) too large internal gains from appliances, people machines etc.
- 2) two much sun directly through windows due to poor summer shading,
- 3) heat passing directly through the wall.

The solution to the first is to reduce the gains or ventilate, the second to provide better shading, and the third is to reduce peak heat gain to the room by changing the Decrement. Decrement can be thought of as the amount a peak external surface temperature is smoothed out by the structure, and the time that the peak is delayed before it reaches the inside.



These are in fact two factors and are called respectively Decrement factor and Decrement delay. To reduce the solar heat from passing through a wall, we need a low decrement factor, and more importantly, have it occur a minimum of 6-12 hours after the midday external solar radiation peak – ie a decrement delay of at least 6-12 hours.

In terms of achieving satisfactory values, an insulation material that also has thermal mass will produce better values. What is required is a function of density, thermal conductivity and specific heat capacity. Pavatex woodfibre boards have an excellent combination of low k-value (0.038-0.047 W/m²K), high specific heat capacity (2100J/kgK) and for insulation boards a high density (140-240 kg/m³) which far exceeds any conventional material. This means that with Pavatex woodfibre insulation a "lightweight" structure such as timber can perform as though it was a mass structure. The consequence is the reduction of internal temperatures by 4degC or more in summer compared to a room with may have the same u-value but conventional insulation.





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PAVACLAD System





System Build-Up PAVACLAD



Thermal Properties PAVACLAD

89mm Stud

Insulation		22mm	35mm	60mm	60mm	80mm	100mm
onto Stud	U	Isolair	Isolair	Isolair	Pavatherm Pl.	Pavatherm Pl.	Pavatherm PI.
Insulation	0	89mm	89mm	89mm	89mm	89mm	89mm
between Stud*	C	Hemp Batts	Hemp Batts	Hemp Batts	Hemp Batts	Hemp Batts	Hemp Batts
U-Value		0.36	0.33	0.28	0.27	0.24	0.22
[W/m²K]							
Decrement		0.82	0.75	0.56	0.63	0.50	0.39
Factor							
Decrement		4.0	5.0	7.1	6.4	7.8	9.1
Delay [h]							
Admittance		1.47	1.48	1.49	1.50	1.50	1.50
[W/m ² K]							

140mm Stud

Insulation	0	22mm	35mm	60mm	60mm	80mm	100mm
onto Stud	0	Isolair	Isolair	Isolair	Pavatherm Pl.	Pavatherm Pl.	Pavatherm Pl.
Insulation	୍	140mm	140mm	140mm	140mm	140mm	140mm
between Stud*	Ø	Hemp Batts	Hemp Batts	Hemp Batts	Hemp Batts	Hemp Batts	Hemp Batts
U-Value		0.27	0.25	0.22	0.21	0.19	0.18
[W/m²K]							
Decrement		0.75	0.68	0.48	0.55	0.42	0.32
Factor							
Decrement		5.3	6.4	8.5	7.8	9.2	10.6
Delay [h]							
Admittance		1.51	1.51	1.51	1.52	1.52	1.52
[W/m²K]							

* based on breathable insulation (k=0.039 W/mK) between studs @600mm ctr with 15% bridging





Specification PAVACLAD onto timber frame

1.0 General :

The system comprises Pavatex ISOLAIR or PAVATHERM PLUS boards supplied together with all accessories by NBT

1.01 Access :

Scaffolding and access to the work must be carried out in accordance with current CDM and Health and Safety Regulations

1.02 Adverse Weather / Storage :

Application of the system must only take place in suitable weather conditions in accordance with NBT recommendations, protecting the works if necessary. Boards should be clad within 2 months. Boards should be stored flat and dry. Edges should be protected to prevent damage to tongue & groove.

1.03 Board System :

Do not use the PAVACLAD system below DPC. Board edges should be adequately protected at DPC level to prevent water ingress.

1.04 Fixing Boards :

Locate the 1st course of boards with grooved side down and edge t & g joints fully engaged. Initially fix through the boards into the timber studs using 1 No. VHT-R 4.8 x L fixings / stud / board.

1.04 (A,B) Fixing if Timber Batten/ Cladding Final fixing of the system occurs through the batten according to guidance of NBT and the cladding manufacturer ("Installation Procedure PAVACLAD", page 12-14).

1.04 (C) Fixing if Brick Facade Use 3 No. EJOT SBH-T / VHT-R x L fixings /stud as the PAVACLAD system is finally fixed at this stage. Fix the brick facade with suitable brick ties into the timber studs ("Installation Procedure PAVACLAD", page 12-14).

Boards must span at least 2 studs. Board edges need not coincide with stud positions, which should be at < 850mm centres. The faces of the boards should be flush. Stagger fixings where board edges coincide with a stud position. Install 2nd course in ½ bond pattern with minimum overlap 200mm, over-lapping board ends at vertical corners, ensuring all board joints are fully engaged and tightly joined. Fix to studs as for 1st course. Fill any gaps and areas of damaged boards with loose Woodfibres and apply a "patch" of Pavatex PAVATAPE and PRIMER ("Installation Procedure PAVACLAD", page 12-14) least 50mm larger than area of damage/repair.

1.05 Openings and Abutments :

At all openings, service penetrations and cut/exposed edges, seal the board using Pavatex PAVATAPE and PRIMER (Installation procedure page11).

1.06 Cladding System :

Ensure that any cladding system / protection rain screens are securely fixed back to the PAVACLAD system and are non-load bearing.

Only use the fixings according to NBT's recommendations or manufacturers instructions.

The cladding system should offer weather protection to the PAVACLAD system.

The cladding system should be detailed to offer adequate weather protection to the PAVACLAD system at all openings and abutments.

The cladding system should be detailed so as to allow an unobstructed flow of ventilation to the void behind the cladding and to the face of the PAVACLAD system boards.





Key Considerations PAVACLAD for Designers

General :

The PAVACLAD System must 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 can only be guaranteed if only the boards, and accessories approved by NBT are used. Only use the fixings as per NBT's recommendations or manufacturers instructions ("Installation Procedure PAVACLAD", page 12-14). PAVACLAD system has LANTAC approval (Local Authority National Type Approval Confederation) and is currently BBA (British Board of Agrement) tested.

DPC-Level :

Do not use ISOLAIR or PAVATHERM PLUS boards below DPC level.

Building Height :

The PAVACLAD System is certified for use in buildings where the height to the top floor is < 8m. If intended for use in higher buildings, contact NBT for advice.

Non Load Bearing :

The PAVACLAD System must be designed so that no loads from the structure are carried by the boards or cladding system. Ensure that any cladding system / protection screens are securely fixed back to the PAVACLAD system and are non-load bearing.

Carefully plan the location of down-pipes, lights, security systems etc. and attach fixing discs screwed directly to the structure where the attachment is more than can be carried directly by the cladding (i.e. cast iron guttering). Contact NBT for further advice on fixings.

Movement Joints :

Movement joints in the substrate must be incorporated into the PAVACLAD System. Consider movement joints for wall elevations longer than 18m.

Wind- / Weather-tightness :

For wind-tightness seal the boards against the structure at all joints, intersections, openings and penetrations and along all edges using Compriband strip. Carefully detail the ISOLAIR or PAVATHERM PLUS layer for wind-tightness.

For weather-tightness, seal all exposed board edges, openings, corners etc. with Pavatex PRIMER and PAVATAPE ("Installation Procedure PAVACLAD", page 10-14).

Rain Penetration :

Design a positive strategy for avoiding rain penetration of the PAVACLAD system. This will include :

- generous overhangs for roofs, cills and copings (in no case < 30mm)
- drip details on all overhangs
- careful detailing of flashings at critical areas eg. balconies, decks, walkways, parapets, copings, service penetrations, roof abutments, intersecting and adjoining buildings, etc.
- window and door frames set back from the external face of the wall by at least the thickness of the insulation boards.

Air-tightness :

Carefully detail the OSB layer for air-tightness at all openings and at internal corners and junctions.





Key Considerations PAVACLAD for Installers

General :

The PAVACLAD System must only be installed by competent contractors.

The details and specifications in this guide and from the Designer should be followed as the basis of a successful installation.

The system can be guaranteed only if the boards and accessories approved by NBT are used in the proper specified manner.

Timber frames must not be excessively wet when the boards are applied to avoid trapping moisture within the construction.

Movement joints in the substrate must be incorporated into the PAVACLAD system.

Carefully plan the location of down-pipes, lights, security systems etc. and attach fixing discs screwed directly to the structure or fix battens where the attachment is more than can be carried directly by the cladding (i.e. cast iron guttering). Contact NBT for further advice on fixings.

Boards :

Plan board layout to reduce wastage prior to commencing installation.

Minimum bond overlap is 200mm between courses.

Boards must not be wet or damaged and board edges must be tightly butted together.

Tightly pack all gaps between boards with Woodfibre and seal area with Pavatex PRIMER and PAVATAPE ("Installation Procedure PAVACLAD", page 12-14).

Seal the boards against the structure around all openings and penetrations and along all edges and corners using Compriband strip. For all exposed board edges, openings, corners etc. use Pavatex PRIMER and PAVATAPE.

Do not use the PAVACLAD system below DPC level.

Do not allow the boards to stand exposed to weather for more than 60 days after fixing before applying the cladding System.

Cladding :

Ensure that any cladding system / rain screens are securely fixed back to the PAVACLAD system and are non-load bearing.

Only use the fixings recommended by NBT.

The cladding system should offer weather protection to the PAVACLAD system.

The cladding system should be detailed so as to allow an unobstructed flow of air ventilation to the void behind the cladding and to the face of the PAVACLAD system boards.



BT Timber Frame Solutions PAVACLAD

Installation Procedures PAVACLAD

Step 1 - Fitting Boards >> Step 2 - Using Pavatape >> Step 3 - Fixing Cladding

Cutting

The boards are easily cut with any of the following tools:

- Pavatex Knife edge jigsaw blade, bayonet fitting to suit most makes of jigsaw, part no: PAVZK.
- Standard wave edge insulation knife.
- Circular saw, hand-held or bench mounted with a fine, cross-cut, tungsten tipped blade.

Safety goggles and dust mask must be worn during cutting to protect the user from the small, non hazardous, dust particles.



Pavatex Jig Saw Blades

Fitting



Fix first row of boards with tongue uppermost using one to two fixings per board. (Final fixing occurs through batten except with brick clad facades see fixings guidelines)



Fix subsequent rows ensuring that the tongue is fully engaged. Fix as first row.



Boards should be installed with a minimum 200mm staggered bond.



Joint does not have to be over stud due to the T@G board edge.

Provided board is supported by at least 2 studs

Damaged boards and butt edged joints

Any damaged areas and "butt edged" joints should be filled tightly with woodfibre offcuts - primed and taped with Pavatex PAVATAPE to ensure the integrity of the layer and to prevent water ingress. (See using PAVATAPE Section).

Openings, corners and penetrations

All openings, corners and penetrations should be primed and taped with Pavatex PAVATAPE to ensure the integrity of the layer and to prevent water ingress. (See using PAVATAPE section).

Expansion joints

Expansion joints must be provided for wall elevations more than 18m long. After the whole wall section has been fitted cut a 5mm wide groove through the board on the center line of a stud. Seal over the groove with Pavatex PAVATAPE to form a sealed air gap.



Installation Procedures PAVACLAD

Step 1 - Fitting Boards >> Step 2 - Using Pavatape >> Step 3 - Fixing Cladding

Guidelines for use

- Only use PAVATAPE on dry, clean and dust-free Pavatex board
- Use after fitting boards and always <u>BEFORE</u> installing battens
- Two priming solutions are available dependent on weather conditions: For temperatures between 5 10 degC use **PAVZTP1** (solvent based) use **PAVZTP5** (water-based) othertime
- PAVATAPE should not be applied if the temperature is below 5 degC Contact NBT for Guidance.
- Apply Pavatex PRIMER with a brush or roller onto the board and abutments and allow to dry: Water-based primer is temperature sensitive - drying time is between 30 and 60 minutes (@20 degC ca 30min / @ 5 degC ca 60min). Drying time for solvent based is 20min.
- Store Pavatex PAVATAPE rolls on a flat surface in a dry dust-free environment.
- Shelf life when stored at around 20 degC is unlimited for PAVATAPE. PRIMER needs to be used within 12 month after manufacture.
- PAVATAPE (width 150mm) is supplied in 15m rolls.
- PAVZTP5 Water-based Primer is supplied in 5 litre tins (coverage 20m/l i.e. 6 Rolls PAVATAPE per tin).
- PAVZTP1 Solvent-based Primer is supplied in 1 litre tins (coverage 15m/l i.e. 1 Roll PAVATAPE per tin).

How to install



PAVATAPE self adhesive butyl tape 15m long x 150mm wide.

When to use



Angles, corners



Clean surface with a brush. Surface **MUST** be dry to ensure good adhesion (use of hot air gun to dry board).



Exposed Openings



Apply PRIMER with a brush or a roller and allow to dry.



Roll out PAVATAPE and press down with other hand. Avoid creases.



Press PAVATAPE on firmly using a hard faced decorators seam roller or similar.



Abutments



Penetrations

Ask for further instructions from NBT staff for circular penetrations.



Butt edges joints and damaged board areas.

Fill any gaps tightly with woodfibre off cuts prior to applying PAVATAPE.

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Installation Procedures PAVACLAD

Step 1 - Fitting Boards >> Step 2 - Using Pavatape >> Step 3 - Fixing Cladding

Guidelines for use

- Only use fixings in accordance with NBT's recommendations or manufactures instructions
- Batten / rail system should applied AFTER taping / sealing the board surface
- In general fixings should be at 200mm centres for exposed areas / buildings over 8m high please contact NBT or the fixing Manufacturer for specific project advice.

A) Timber Batten onto Timber Stud / Substrate



Initially fix the boards as described at 'Step 1'. Final fixing occurs through the battens. For fixing of timber battens over the PAVACLAD system onto a timber stud / substrate, NBT recommend the use of:

- HELIFIX InSkew 600 helical nail fixing (embedment >35mm)
- EJOT VHT-R screw fixing 4.8 x L (embedment >40mm)

B) Rain Screen onto Timber Stud / Substrate



Initially fix the boards as described at 'Step 1'. Final fixing of the system occurs on installation of the rail system - fixings as specified by the rain screen supplier.

C) Brick Facade onto Timber Stud / Substrate



For a Brick façade over the PAVACLAD system onto timber Studs NBT recommend the use of 3 No. EWI fixing / board/ stud, because final fixing of the system occurs at this stage:

• EJOT SBH-T/ VHT-R 4.8 x L (embedment >40mm)

Suitable Brick ties, fixed back to the studs, should be installed as façade is built.

Fixing Partners



Helifix Ltd 21 Warple Way London W3 0RX England Freephone 0800 731 7732 Tel: 020 8735 5200 Fax: 020 8735 5201



EJOT U.K. Limited Hurricane Close Sherburn Enterprise Park Sherburn-in-Elmet Leeds LS25 6PB Tel: 01977 6870740 Fax: 01977 687041 Web: www.ejot.co.uk



Components & Accessories PAVACLAD (1)

	pavatex	Isolair Woodfibre insulation board with t&g for external wall and roof insulation. Waterproof because of latex impregnation. Thermal conductivity 0.047 W/mK, length 2500mm, width 770mm			
		PAVI22 PAVI35 PAVI60	Isolair 35mm thickness Isolair 60mm thickness		
-	pavatex	Pavatherm Plus Woodfibre insulation board wit external wall and roof insulation because of latex impregnation Thermal conductivity 0.044 W/ 1580mm, width 780mm			
		PAVP060 PAVP080 PAVP100	Pavatherm Plus 60mm thickness Pavatherm Plus 80mm thickness Pavatherm Plus 100mm thickness		
	pavatex	Pavatape Butyl tape with edge joints (co through ISOLA boards. Surfac Length 15m, w PAVZT15	aluminum covering to seal butt rners, etc.) and openings IR and PAVATHERM PLUS e of the board requires priming. ridth 150mm. Pavatex Tape		
PVEIE PVEIE Presenterate Presenterate Presenterate Presenterate	pavatex	Primer for Pay Solvent based PAVATAPE ont Used for tempe time approx. 20 Comes in 1 litro PAVZTP1	vatape (Solvent Based) primer for better adhesion of to woodfibre insulation boards. eratures above 5degC. Drying 0 minutes. Coverage 15m/l. e tin. Pavatex solvant primer 1lt		
	pavatex	Primer for Pay Water based p PAVATAPE ont Recommended C. Drying time Coverage 20m PAVZTP5	vatape (Water Based) rimer for better adhesion of to woodfibre insulation boards. d for temperatures above15deg approx. 30 to 60 minutes. /I. Comes in 5 litre tub. Pavatex waterbased primer 5lt		



Components & Accessories PAVACLAD (2)







Stainless Steel fixings with 6mm outside helical diameter. For fixing battens through insulation back into timber studs. InSkew effectively withstands compression loads. Embedment into timber 35mm.

120mm

140mm

160mm 170mm

InSkew600
InSkew600
InSkew600
InSkew600

EJOT TKR

Climadur coated carbon steel fixings for fixing battens through insulation back into timber studs. Embedment into timber 40mm.

FXEVHTR4.8100 EJOT VHT-R 4.8 x 100mm FXEVHTR4.8110 EJOT VHT-R 4.8 x 110mm FXEVHTR4.8120 EJOT VHT-R 4.8 x 120mm EJOT VHT-R 4.8 x 140mm FXEVHTR4.8140 FXEVHTR4.8160 EJOT VHT-R 4.8 x 160mm FXEVHTR4.8180 EJOT VHT-R 4.8 x 180mm FXEVHTR4.8200 EJOT VHT-R 4.8 x 200mm FXEVHTR4.8220 EJOT VHT-R 4.8 x 220mm EJOT VHT-R 4.8 x 240mm FXEVHTR4.8240



Pavatex Jigsaw Blade

Baynet fitting jigsaw blade from Pavatex for cutting woodfibre insulation boards. Length approx. 130mm.

PAVZK

Pavatex Cutting Blades





Title								
Timber Frame Pavaclad Eaves								
Drawing Number	Drawn By	Date						
TEP001	Beat	02 07 2007						
111 001	Deal	02.01.2001						
CAD File Name								
TFP001 070702 Eaves								





Title							
Timber Frame Pavaclad Plinth							
Drawing Number	Drawn By	Date					
TFP002	Beat	21.11.2006					
CAD File Name	-						
TFP002_061121_Plinth							





Time Timber Frame Pavaclac	I Window Revea	al			
Drawing Number	Drawn By	Date			
TFP007	Beat	02.07.2007			
CAD File Name					
TFP007_070702_Window Reveal					





Timber Frame Pavaclad Roof Flashing								
Drawn By	Date							
Poot	17 05 2007							
Deal	17.05.2007							
CAD File Name								
TFP005 070517 RoofFlashing								
	Roof Flashing ^{Drawn By} Beat							





Title							
Timber Frame Payaclad Corner							
Drawing Number	Drawn By	Date					
	Reat	18 04 2007					
111 004	Deat	10.04.2007					
CAD File Name	-						
TFP004_070418_Corner							



DIFFUTHERM System







System Build-Up DIFFUTHERM



Thermal Properties DIFFUTHERM

		89mm Stud			140mm Stud		
Insulation	(1)	60mm	80mm	100mm	60mm	80mm	100mm
onto Stud	\mathbf{U}	Dimutnerm	Diffutherm	Diffutherm	Diffutherm	Dimutnerm	Diffutherm
Insulation	0	89mm	89mm	89mm	140mm	140mm	140mm
between Stud*	C	Hemp Batts					
U-Value		0.28	0.25	0.22	0.22	0.20	0.18
[W/m²K]							
Decrement		0.63	0.49	0.37	0.55	0.41	0.31
Factor							
Decrement		6.6	8.1	9.5	8.0	9.5	11.0
Delay [h]							
Admittance		1.50	1.50	1.50	1.52	1.52	1.52
[W/m²K]							

* based on breathable insulation (k=0.039 W/mK) between studs @600mm ctr with 15% bridging



Specification DIFFUTHERM onto timber frame.

1.0 General :

The system comprises Pavatex Diffutherm boards and Bayosan thin mesh coat renders supplied together with all accessories by NBT

1.01 Access :

Scaffolding and access to the work must be carried out in accordance with current CDM and Health and Safety Regulations

1.02 Adverse Weather / Storage :

Application of the system must only take place in suitable weather conditions in accordance with NBT recommendations and good rendering practice, protecting the works if necessary. Do not apply the Diffutherm System in ambient temperatures below 5° C. Boards should be rendered within 2 months. Boards should be stored flat and dry. Edges should be protected to prevent damage to tongue.

1.03 Board System :

Below dpc and in the plinth area (up to 300 mm above finished ground level) use XPS plinth boards; above the plinth area use Pavatex Diffutherm boards.

1.04 Fixing Boards :

Above Plinth Area :

Fix the base rail above DPC to each stud packed to true line and level, using 1 No. fixing per stud.

Locate the 1st course of Diffutherm boards tightly in the base rail channel with grooved side down and edge t & g joints fully engaged. Fix through the boards into the studs using 3 No. fixings / board / stud.

Boards must span at least 2 studs. Board edges need not coincide with stud positions, which should be at < 650mm centers. The faces of the boards should be flush. Stagger fixings where board edges coincide with a stud position.

Install 2rd course in ½ bond pattern with minimum overlap 200mm, over-lapping board ends at vertical corners, ensuring all board joints are fully engaged and tightly joined. Fix to studs as for 1st course. Fill any gaps and areas of damaged boards with loose Woodfibres and apply a "patch" of reinforcing mesh at least 200mm larger than area of damage/repair. (See 1.06 - Render System.)

1.05 Openings and Abutments :

At all openings, service penetrations and free edges, seal the board to the structure using Compriband to create an air and weather-tight joint.

1.06 Render System :

Above Plinth Area : Apply mm APU rails to all door and window frames to form a weather-tight joint.

Apply diagonal strips of mesh reinforcement across the corners of all openings and continuous strips of mesh reinforcement above the base rail and along all free board edges (as NBT recommendations) into 2mm of MC55W mortar.

Apply MC55W mortar to all corners and reveals and set fibreglass mesh beads plumbed and aligned to a render depth of 5 - 8mm.

Hand or machine apply MC55W over the board surface and straighten out. Comb with a tooth trowel to an overall depth of 4 - 6mm then place sheets of fibreglass mesh lightly onto the render (min 100mm laps).

Apply a further 2 - 3mm coat of MC55W and smooth out. On hardening, scrape back the surface with the edge of a trowel.

Apply	decorative	finish	coat after	
6 days.				

Apply equalizing paint after 6 days.



Key Considerations DIFFUTHERM for Designers

General :

Provide the Contractor with full and complete details for all critical areas of the system including those listed following. Leave nothing 'to be agreed on site'.

System Guarantee :

The system is guaranteed if only the boards, mortars, renders and accessories approved by NBT or an approved contractor are used. The Diffutherm System is certified for use in rain Exposure Zones 1, 2 and 3 (described in BS 8104 and the BRE report "Thermal Insulation, avoiding risks"). If intended for use in Exposure Zone 4, contact NBT for advice. The system can be guaranteed only if the boards, mortars, renders and accessories approved by NBT are used in the proper specified manner.

DPC-Level :

Do not use Diffutherm boards below DPC level. Use boards suitable for wet exposure (EPS, XPS) and Baumit Bayosan Hm50 in the plinth area (ie. within 300mm of Ground Level).

Building Height :

The Diffutherm System is for use in buildings where the height to the top floor is < 8m. If intended for use in higher buildings, contact NBT for advice.

Non Load Bearing :

The Diffutherm System must be designed so that no loads from the structure are carried by the boards or render.

Only lightweight fittings can be attached directly to the Diffutherm boards. Carefully plan the location of down-pipes, lights, security systems etc. and attach using fixing disks screwed directly to the structure. Contact NBT for further advice on fixings.

Movement Joints :

Movement joints in the substrate must be incorporated into the Diffutherm EWI System. Consider movement joints for walls longer than 18m.

Wind- / Weather Tightness :

For wind-tightness seal the boards against the

structure at all joints, intersections, openings and penetrations and along all edges using Compriband strip.

For weather-tightness, seal the render around all openings using the appropriate APU strips

Rain Penetration :

Design a positive strategy for avoiding rain penetration of the EWI system. This will include:

- generous overhangs for roofs, cills and copings (in no case < 30mm) drip details on all overhangs
- careful detailing of flashings at critical areas eg. balconies, decks, walkways, parapets, copings, service penetrations, roof abutments, intersecting and adjoining buildings, etc.
- window and door frames set back from the external face of the wall by at least the thickness of the insulation boards.

Air-tightness :

Carefully detail the OSB layer for air-tightness at all openings and at internal corners and junctions.

Render :

Light coloured finishes (light intensity > 40%) and coarse-grained finishes (2-5mm grain sizes) are preferred for long-term durability and appearance.

Cracking of the render system cannot be completely avoided. Minor cracking is not detrimental to the system and the board will not deteriorate if the cracks are small and repaired quickly.

Apply equalisation paint to the finish render coat to avoid discolouration from uneven drying.

To select paints for applying to the finished surface without significant reduction of the vapour permeability of the Diffutherm System, refer to NBT.



Key Considerations DIFFUTHERM for Installers

General :

The Diffutherm System must only be installed by approved contractors who have been trained by NBT.

The details and specifications in this guide and from the Designer should be followed as the basis of a successful installation.

The system can be guaranteed only if the boards, mortars, renders and accessories approved by NBT are used in the proper specified manner.

Timber frames must not be excessively wet when the boards are applied to avoid trapping moisture within the construction.

Movement joints in the substrate must be incorporated into the Diffutherm System.

Only lightweight fittings can be attached directly to the Diffutherm boards. Carefully plan the location of down-pipes, lights, security systems etc. and attach using fixing disks screwed directly to the structure. Contact NBT for further advice on fixings.

Boards :

Plan board layout to reduce wastage prior to commencing installation.

A base rail must be used to start the system.

Minimum bond overlap is 200mm between courses.

Boards must not be wet or damaged and board edges must be tightly butted together.

Tightly pack all gaps between boards with woodfibre.

Seal the boards against the structure around all openings and penetrations and along all edges using Compriband strip.

Do not use the Diffutherm EWI system below

the DPC level.

Use appropriate boards (XPS) and renders (Baumit Bayosan Hm50) in the plinth area (ie. within 300mm above Ground Level)

Do not allow the boards to stand exposed to weather for more than 60 days after fixing before applying the render system.

Renders :

Do not apply the render system onto rainsoaked boards or when the air temperature is below 5 degree C and avoid working in strong, direct sunlight.

The reinforcing mesh sheets should lie in the outer 1/3 of the basecoat layer and sheets should overlap by at least 100mm.

Additional mesh reinforcement is required around all openings, along all corners and edges, across zones where suspended floors intersect walls and where boards are applied over different substrates, along continuous straight board joints and over repaired areas.

Seal the render around all openings using the appropriate APU strips.

Allow 1 day/mm thickness drying time for the basecoat before applying the topcoat.

Apply equalisation paint to the finish render coat to avoid discolouration from uneven drying.

Cracking of the render system cannot be completely avoided. Minor cracking is not detrimental to the system and the board will not deteriorate if the cracks are small and repaired quickly.



Installation Procedures DIFFUTHERM (1)

System Components



- 1 Pavatex Diffutherm Insulation Board
- 2 Baumit Bayosan MC55W Render
- 3 Baumit Bayosan AG01 Mesh
- 4 Baumit Bayosan Decorative Finish
- 5 Timber Studwork
- 6 Wemico Mesh Corner Bead
- 7 Wemico Base Rail
- 8 EJOT SBH-T 65/25 Washer with TKR 4.8 x L fastener
- 9 Inner OSB Sheating (air tightness, vapour control & racking)
- 10 Insulation Material
- 11 Compriband

Cutting

The boards are easily cut with any of the following tools:

- Pavatex knife-edge jigsaw blade, bayonet fitting to suit most makes of jigsaw, part no: PAVZK.
- Standard wave edge insulation knife.
- Circular saw, hand-held or bench mounted with a fine, cross-cut, tungsten tipped blade.

Safety goggles and dust mask must be worn during cutting to avoid breathing/ inhaling the small, non hazardous, dust particles.

Fitting

Above Plinth Area : Fix the base rail and corner rail above DPC to each stud packed to true line and level, using 1 fixing per stud. Rail connector clips should be fitted at all rail joints. Attach clip-on drip profile to complete run of base and corner rail.

Locate the 1st course of Diffutherm boards tightly in the base rail channel with grooved side down and edge t & g joints fully engaged. Fix through the boards into the studs using 3 fixings (EJOT SBH-T with VHT-R 4.8 x L) per stud / board. Boards must span at least 2 studs. Board edges need not coincide with stud positions, which should be at < 600mm centers. The faces of the boards should be flush. Stagger fixings where board edges coincide with a stud position.

Install 2nd course in ½ bond pattern, over-lapping board ends at vertical corners, ensuring all board joints are fully engaged and tightly packed. Fix to studs as for 1st course.

Movement Beads

Where structural movement joints or changes in substrate occur a movement bead should be incorporated into the Diffutherm system to prevent cracking due to differential movement.

Compriband

Where boards butt up to other substrates a Compriband sealing strip should be inserted to allow for differential movement and provide a weather tight seal. Such areas include window and door frames, sills, eaves and soffit boards.



Installation Procedures DIFFUTHERM (2)

Fixings

Diffutherm woodfibre boards needs to be fixed with special thermally-broken fasteners. The washer is flush with the surface of the Diffutherm. Use 3 No. fixings per stud/ board (see picture). We can provide EJOT or FISCHER fixings for installation of Diffutherm boards.

Thickness	EJOT SYSTEM		FISCHER SYSTEM
Insulation	Screw	Washer	(Incl. Washer)
60 mm	VHT-R 4.8 x 90	SBH-T 65/25	Termofix 6H/100mm
80 mm	VHT-R 4.8 x 110	SBH-T 65/25	Termofix 6H/120mm
100 mm	VHT-R 4.8 x 130	SBH-T 65/25	Termofix 6H/140mm



Additional Meshing

To reduce the risk of cracking, additional mesh reinforcement is required along all exposed board edges and around all openings.

Bed the mesh in MC55W mortar and then apply the main meshed render layer, overlapping with the edge strips by at least 100mm.

In the diagram additional mesh is shown across the corners of window and door openings (1), along all reveals and corners (2), over the starter track and below window sills (3)

An additional band of mesh should be applied across the zone where suspended floor joists bear



- (1) Diagonal Strip
- (2) Mesh Corner Beads
- (3) Mesh Strips 150 mm wide
- (4) Mesh Strips 500 mm wide at Floor Level

Reveals

Fully paste the rear side of the reveal boards using MC55W and trowel through using a tooth trowel. Apply a compri-band along the edge of the board and place the board tightly up against the window or door frame.

Render System

Trowel or machine-apply MC55W over the boards and straighten out the render. Using a tooth trowel comb through the render to ensure an overall render depth of 4-6mm.

Place sheets of fibreglass mesh lightly onto the render, with overlaps not less than 100mm and lightly trovel over. On stiffening apply another coat of MC55W 2-3mm thick and smooth out.

On hardening rough up the surface using the edge of a trowel. After six days apply a decorative finish coat



Detail Solutions DIFFUTHERM



(1) Edges:

• wind tightness with use of Compriband

- (2) Plinth:
 - plinth area 300mm
 - use perimeter insulation in plinth area (XPS)
 - use Base Rail at bottom of Diffutherm
- (3) Window:
 - wind tightness with use of Compriband and APU-rails
 - use window sill with upstand
 - Diffutherm board pattern to window opening (see below)

Board Pattern





NOTE: PLEASE FIND DETAIL DRAWINGS AT THE END OF THIS MANUAL

Set out Diffutherm Boards so that board edges DO NOT coincide with the corners of wall openings.

Always ensure that the vertical joints are staggered by at least 200mm between courses and that each board is supported on at least 2 studs.

Board joints DO NOT have to terminate on a stud due to the tongue groove board edge.



Components & Accessories DIFFUTHERM (1)

Diffutherm Woodfibre insulation board with t&g manufactured in accordance to EN 13171.For External Wall Insulation (EWI) systems. Thermal conductivity 0.044 W/mK, length 1300mm, width 790mm		
PAVX060Diffutherm 60mmPAVX080Diffutherm 80mmPAVX100Diffutherm 100mm		
MC55W (Basecoat onto Diffutherm) Factory prepared white lime-cement dry powder mortar in accordance to DIN 18557 and DIN EN 998-1. Base coat onto Diffutherm. Not recommended for plinth area. Grain size 0- 1.2mm, yield 1.0kg /m ² per mm thickness. Comes in 25kg bag.		
BYMC55W Bayosan Multi Purpose White MC55W		
HM50 (Basecoat onto Plinthboard)Factory prepared lime-cement dry powder mortar in accordance to DIN 18557 and DIN EN 998-1. To use in plinth area onto XPS plinth insulation board. Grain size 0-1.2mm, yield 1.2kg/m² per mm. Comes in 25kg bag.BYHM50Bayosan Bonding Mortar HM50		
SEP (Topcoat onto Diffutherm)Factory prepared white lime-cement dry powder mortar in accordance to DIN 18557 and DIN EN 998-1. Available in 200 colours. Comes in 25kg bag.SEP01: Grain size 0-1mm, yield 2.2kg/m²SEP01: Grain size 0-1mm, yield 2.2kg/m²SEP01: Grain size 0-2mm, yield 3.3kg/m²SEP02: Grain size 0-2mm, yield 3.3kg/m²SEP03: Grain size 0-3mm, yield 4.0kg/m²BYSEP01Lime Dual Topcoat SEP01BYSEP02Lime Dual Topcoat SEP02BYSEP03Lime Dual Topcoat SEP02		
Silikonfarbe (Equalization Paint) Silikone based paint to equalize SEP topcoat. Additional driven rain protection but very vapour open. Yield 0.2 litre/m ² (only one coat required). Comes in 5L or 15L tub. BYSFCOLO Colour Silikone Paint 15L or 5L		



Components & Accessories DIFFUTHERM (2)



EWI Fixing EJOT

For fixing the Diffutherm wood fibre insulation board as EWI onto timber. Embedment of 40mm into timber. The air column which is created between countersunk screw and the plug ensures perfect insulation. Heat loss through conduction is therefore substantially reduced. Please find required length of fixings on page 19.

FXESBHT65	EJOT SBH-T Washer
FXEVHTR4.8090	EJOT VHT-R 4.8 x 90mm
FXEVHTR4.8110	EJOT VHT-R 4.8 x 110mm
FXEVHTR4.8140	EJOT VHT-R 4.8 x 140mm



EWI Fixing FISCHER

For fixing the Diffutherm wood fibre insulation board as EWI onto timber. Embedment of min. 25mm into timber. The air column which is created between countersunk screw and the plug ensures perfect insulation. Heat loss through conduction is therefore substantially reduced. Please find required length of fixings on page 19.

FXFT060	Timber Termofix 6H/100 for 60mm
FXFT080	Timber Termofix 6H/120 for 80mm
FXFT100	Timber Termofix 6H/140 for 100mm Diffutherm



Base Rail & Clip on Profile

The base rail is generally fixed at DPC (damp proof course) level, using screws, to act as a base for the first layer of Diffutherm. The clipon profile is then clipped to the front edge of the track to provide a clean edge for the render to finish to. Length always 2500mm.

Base Rail Aluminium 60mm
Base Rail Aluminium 80mm
Base Rail Aluminium 100mm
Base Rail Stainless Steel 60mm
Base Rail Stainless Steel 80mm
Base Rail Stainless Steel 100mm
Base Rail Clip Aluminium 6mm
Base Rail Clip Aluminium 10mm
Base Rail Clip Stainless Steel 6mm
Base Rail Clip Stainless Steel 10mm



Components & Accessories DIFFUTHERM (3)



Board Thickness WEMICO +3mm Render Stop

Rail Connector

Rail Connector to attach between two base rails.

BYY3756

Profile connector 30mm



Render Stop Profile

Similar in appearance to a starter track the stop end profile is used where the Diffutherm system finishes up against another wall of a different type. le; against timber or rainscreen cladding or a masonry wall. They are fixed vertically against the other wall with a compriband in between the profile and wall to ensure the joint is sealed against the weather. The lip on the edge of the profile is used to provide a solid edge for the render to finish up to. Length 2500mm.

Ste
Ste
St

op Profile Aluminium 60mm top Profile Aluminium 80mm top Profile Aluminium 100mm

Movement Beads

Applied where a movement joint occurs in the structure. The boards must be spaced apart over the joints and the bead set in MC55w mortar across the joint. Provides aneat joint to take up movement of the render. Length 3000mm.

BYYWE79/79 Stainless Steel Render 6mm **BYYWE80/80** Stainless Steel Render 10mm

Corner Mesh Angle

PVC or Stainless Steel meshed angles are used on the corners of windows, doors and building corners to provide a straight reinforced edge for the render to finish to. Fixed prior to rendering with MC55w to the Diffutherm boards and levelled up. Length 2500mm.

BYY3707	Corner Mesh Bead PVC
BYY2031	Corner Mesh Bead Stainless Steel

WEMICO

Corner Beads

WEMICO



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Components & Accessories DIFFUTHERM (4)

expanded



non - expanded



Fixed to door or window frames tight against the edge of the Diffutherm. The render is finished flush with the outside of the APU rail and the sacrificial strip removed. Provides a secondary waterproof seal with no additional mastic required. Self- adhesive band can be removed to enable a protective sheet to be applied to cover door and windows - this is then discarded by breaking away the removable protection strip. Length 2600mm. Packed in bundles of 50.

BYY3726 APU Sealing Bead PVC



An expanding foam sealant applied around the frames of windows and doors, under window sills and soffits. Also around projections through the wall such as pipes or balcony steels. Provides a waterproof seal at these junctions. Length 6000mm

FXTAPE15 Compriband 15mm

Reinforcing Mesh

Small, 300mm x 300mm patches are first applied diagonally to the corners of windows and doors. When the specified render thickness has been applied the reinforcing mesh is applied into the surface of the wet render. The mesh should overlap 100mm where it meets. Prevents cracking and increases flexibility. Roll: 50m length, 1m width

BYYR131 Wemico Glassfibremesh







Title Timber Frame Diffutherm Eaves			
Drawing Number	Drawn By	Date	
TFD001	Beat	15.12.2006	
CAD File Name			
TFD001 061215 Eaves			





Title				
Timber Frame Diffutherm Plinth1				
Drawing Number	Drawn By	Date		
TED002 1	Beat	15 12 2006		
11 8002_1	Deal	10.12.2000		
CAD File Name				
TFD002_061215_Plinth1				





Title Timber Frame Diffutherm Plinth2			
Drawing Number	Drawn By	Date	
TFD002_1	Beat	15.12.2006	
CAD File Name			
TED000 061015 Dlinth	つ		

TFD002_061215_Plinth2





Title			
Timber Frame Diffutherm Window Reveal			
Drawing Number	Drawn By	Date	
	Reat	15 12 2006	
11 8001	Boat	10.12.2000	
CAD File Name			
TFD004 061215 Window Reveal			
— —			





Title			
Timber Frame Diffutherm Window Sill & Head			
Drawing Number	Drawn By	Date	
	Reat	15 03 07	
11 2005	Deal	15.05.07	
CAD File Name			
TFD003 070315 Window Sill & Head			





Title		
Timber Frame Diffutherm Roof Flashing2		
Drawing Number	Drawn By	Date
TED010	Beat	17 05 2007
II Bere	Doat	11.00.200.
CAD File Name		
TFD010_070517_RoofFlashing2		

Product Overview: Insulation

Size Cover area:

Thicknesses:

k-value / λ_{D} :

Density:

ISOLAIR L sarking board



PAVATEX wood fibre board for breathable roof & wall constructions

> 770 x 2500 mm 750 x 2480 mm 22, 35 & 60 mm 0.047 W/(mK) 240 kg/m³

PAVATHERM-PLUS sarking board



Composite wood board for roof & wall insulation

780 x 1580 mm

0.044 W/(mK)

600 × 1020 &

20 - 100 mm

140 kg/m³

Wood fibre board for insulating floors or

internal walls with plaster

0.038 W/(mK)

600 × 1020 cm

40 & 60 mm

180 kg/m³

Compr. strenght: ≥70 kPa (at 10 % compr.ession)

0.044 W/(mK)

1200 × 2050 mm

180 kg/m³

60, 80 & 100 mm

Size Thicknesses: k-value / λ_{D} : Density: Compr. strenght: ≥70 kPa (at 10 % compression)

PAVATHERM general purpose insulation board

Sizes'



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

Thicknesses: k-value / $\lambda_{\rm D}$: Density:

PAVATHERM-FLOOR-NK wall & floor board

Size

Size I: Size II:

Density:

Thicknesses[,]

k-value / λ_{D} : Density:



NBT Hemp Batts

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

385 x 1200 mm 575 x 1200 mm 50, 75, 100 & 140* mm Thicknesses: 0.040 W/(mK) k-value / λ_{D} : 40 kg/m³ only size II



treated with fire retardant and biocidal

Cover area: k-value / λ_{D} : Density:

Bags of 8 kg (compressed) e.g. 1 m² at 228 mm 0.035 W/(mK) 35 kg/m³

ISOLAIR L, all PAVATHERM products, PAVATEX DIFFUTHERM & NBT Hemp Batts are certified by natureplus. This testifies to excellent natural & ecological compatability. PAVATEX wood fibre insulation boards are manufactured in Switzerland according to BS EN 13171, have the CE marking and are monitored by 3rd parties. NBT Hemp Batts are manufactured in Poland according to ETA-06/0040 Z-23.16-1598, have the CE marking & are monitored by 3rd parties. NBT Warmcel 100 is manufactured in the UK according to prEN 15101 & has the CE marking.

The following applies to all PAVATEX products: Specific heat capacity c = 2100 kJ/(kg•K), Euroclass E (according to BS EN 13501-1), vapour resistivity μ = 5 (25 MNs/gm) The following applies to NBT Hemp Batts: Specific heat capacity c = 1700 kJ/(kg•K), Euroclass D-s3,d0 (according to BS EN 13501-1), vapour resistivity μ = 2 (10 MNs/gm) The following applies to NBT Warmcell 100: Specific heat capacity c = 1700 kJ/kg+K), Euroclass E (according to BS EN 13501-1), vapour resistivity μ = 1.86 (9.3 MNs/gm)

Your business development manager is happy to give professional advice:

Natural Building Technologies Ltd.

Natural Building Technologies

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08/BC

PAVATEX DIFFUTHERM external wall insulation

Size



Wood fibre board for rendered external wall insulation

Thicknesses: k-value / λ_{D} : Density:

790 x 1300 mm Reveal board: 600 × 1200 mm 60,80 & 100 mm 0.044 W/(mK) 180 kg/m³

PAVADENTRO internal wall insulation



Cover area: Thicknesses: k-value / λ_{D} : Density:

refurbishment

Size

600 x 1020 mm 590 x 1010 mm 60, 80 & 100 mm 0.042 W/(mK) 180 kg/m³

Innovative wood fibre insulation board for

PAVABOARD load bearing insulation



PAVATEX accessories

Wood fibre board for highly insulated floors that have to carry loads 600 × 1020 mm

Size 40 & 60 mm Thicknesses: 0.046 W/(mK) k-value / λ_{D} : Density: 210 kg/m³ Compr. strenght: ≥150 kPa (at 10 % compression)

NBT provides the full range of PAVATEX accessories & complementary products:

- PAVATAPE incl. waterbased/solvent primers (for junctions on walls & roofs)
- PAVATEX cutting blades & knives
- PAVATEX system glue (for sarking boards) etc.

NBT Warmcel 100 cellulose fibres

Loose fill derived from waste UK newsprint additives

Packaging: