NBT Retrofit
Two Drives

1. Rising energy costs

2. Legislation
Every home is different

....there is no ‘one size fits all’
Delivering a High Performance Retrofit Building Envelope.

- Principle Fabric Heat Loss - [U-values]
- Detailed Fabric Heat Loss - [Y-values]
- Heat Loss through air leakage - Air-tightness
- Moisture Control – Health, Fabric durability
Delivering a High Performance Retrofit Building Envelope.

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Repeating linear thermal bridges

Changing U-values

Always check ‘quoted’ u-values include common/repeating thermal bridges.
Measured 0.28 W/m²K
Calculated 0.42 W/m²K
Measured 0.58 W/m²K
Calculated 0.88 W/m²K
Delivering a High Performance Retrofit Building Envelope.

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Non-repeating linear thermal bridges

- GF - ground floor to wall
- GFP - ground floor to party wall
- IF - intermediate wall to floor
- RRE - roof rafter at eaves
- RRG - roof rafter at gable
- RRGP - Roof to party wall
- RRGF - roof to party wall at gable end

- WL - window to wall at lintel
- WJ - window to wall at jamb
- WC - window to wall at cill
- WEC - wall external corner
- WIC - wall internal corner
- WP - external wall to party wall

y-values

NB: insulation at RAFTER level

NBT Natural Building Technologies
Comparison of heat loss for different insulation thicknesses

- Rate of heat loss without Thermal Bridging
- Rate of heat loss with Thermal Bridging

U-values Vs Y-values
Delivering a High Performance Retrofit Building Envelope.

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Air tightness

eaves
window frame to wall
around opening window
through porous building materials
via ventilated cavity
door frame to wall
around door opening
via suspended floor
Air tightness

<table>
<thead>
<tr>
<th>Component</th>
<th>Optimum Zone</th>
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<tbody>
<tr>
<td>Bacteria</td>
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<tr>
<td>Viruses</td>
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<td>Fungi</td>
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<td>Mites</td>
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<td>Respiratory infections</td>
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<td>Allergic rhinitis and asthma</td>
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<td>Chemical interactions</td>
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<td>Ozone production</td>
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Decrease in bar width indicates decrease in effect
Air tightness

Breathable building fabric does not ventilate a building.
Air tightness

Controlling Airtightness is not just about controlling heat loss
Air tightness and IWI
Delivering a High Performance Retrofit Building Envelope.

- Principle Fabric Heat Loss - [U-values]
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- Moisture Control – Health, Fabric durability
Moisture movement within a solid wall

- Vapour diffusion
- Liquid transport
- Moisture convection (through leaks)

Existing Wall
Moisture movement within a solid wall

Existing Wall

- Wind driven rain
- High internal vapour pressure (vapour production, low ventilation..)
- High external vapour pressure (solar radiation..)
- Construction moisture
Moisture movement within a solid wall
Due to EWI contribution to airtightness and increased vapour resistance of walls (Polystyrene insulation)

Moisture movement within a solid wall
External Wall Insulation System

Clad
External Wall Insulation System
Rendered
Comparison between standard refurbishment and NBT PAVADENTRO & Pavadry

Standard Refurbishment:

- Exterior
- Interior
- Water vapour
- Temperature gradient
- Existing wall structure, with thermal insulation on the internal side

Water content
If the correct specification is not made:-

Water vapor diffusing inward during summer conditions in a cold climate (Waterloo, Canada) condensing on a low-permeance vapor barrier. The resulting damage is shown at right.
Comparison between standard refurbishment and NBT Pavadentro & Pavadry

NBT Pavadentro System:

Water vapour, decelerated by functional layer

Diffusing open structure, hygroscopic and capillary active NBT PAVADENTRO thermal insulation

The outstanding capillary active NBT PAVADENTRO rapidly absorbs any interstitial condensation and releases it back into the room as water vapour
Glaser

M. transport: vapour diffusion
M. source: internal vapour pressure

WUFI

Most transport mechanisms
most moisture sources
Internal Wall Insulation System
Dry Lined
Risk of surface condensation
Reduced space around the reveals for IWI application
Cross-section of system
System for Roof
Pitched Externally Fitted

Cross-section of system

1 2 3 4 5
6 7

In partnership with pavatex
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<td>Define an appropriate refurb performance target based on expert assessment of your buildings.</td>
<td>Ensure all aspects of design affecting long-term whole-building performance are considered.</td>
<td>Provide all necessary contractor support during construction.</td>
<td>Ensure your targeted refurb performance is met.</td>
<td></td>
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**Talk to us about:**
- Performance options
- Reducing risks
- NBT system options

**Talk to us about:**
- U-values and thermal bridging
- Bespoke details
- Fabric moisture control
- Air-tightness and indoor air quality
- Costings

**Commission NBT**
- WUFI advanced hygrothermal modelling
- RdSAP
- PHPP for EnerPHit
- Non-standard thermal bridge calculations

**Talk to us about:**
- NBT's Tender Pack, including NBS, BBA certifications and warranties
- NBT's Approved Installer network

**Commission NBT**
- NBT Approved Installer Training

**Site Support includes:**
- Call-off ordering
- Phone and email support
- On-site assistance

**Commission NBT**
- 1st Fix pressure testing (if required)

**Talk to us about:**
- Post occupancy evaluation
- Certified air-pressure testing
- Bespoke monitoring systems
- Cost review
Pavatex outperforms any synthetic insulation. No other insulation will breathe, wick moisture and regulate building temperature, both in the summer as well as the winter. Add to this the fact that it is 100% natural and locks up more Carbon than is used to produce is or transport, combined. Pavatex woodfibre is probably the most advanced insulation material developed to date.
Final Advice;

• Get a lot of it!
• Get Design advice
• Get installation advice
• Ensure that both understand the challenges of Retrofit
Simple Solutions for a Complex Problem

www.natural-building.co.uk