Intelligent building with low impact materials
Why use low impact materials?

• Many low impact materials have more than one characteristic that makes them suitable and beneficial for construction.

• Properties can passively regulate building’s internal environment, reducing heating/cooling.

• Function is the most important aspect. Sustainability is important but other aspects usually override it.
Scenarios

- Mansard roof/loft conversions, particularly in urban areas.
- Extensions to the rear of terraced and inaccessible buildings.
- Internal wall insulation.
- Insulation of timber framed structures
- Acoustic insulation
Scenarios

• Rendered facades in urban areas.
Mansard roofs/Loft conversions

- Often able to hear street noise or aircraft noise.
- In winter can be cold but very often over heat in summer.
- Flat roof sections awkward to ventilate.
• Solution - wood fibre insulation sarking boards on top of rafters, flexible wood fibre insulation between and specially designed board for interior. Variable VCL’s for flat roof.

• Very high levels of acoustic insulation

• Thermal shielding (low diffusivity) prevents summer overheating.

Mansard roofs/Loft conversions
Mansard roofs/Loft conversions

- Moisture management of wood fibre ensures permanently dry timbers.
- Additional heat buffering from clay boards and PCM boards.
Extensions to terraced dwellings

Existing window opening to be opened down to floor level. French doors and operable windows double glazed with leaded frames.

Use compressible seals and expanding foam between frame and wall and seal internally with exterior quality sealant.

Use level of solvent internally in junction of plaster with timber frames.

Door to have draft proof and threshold strip. FR drop board to base of door.

Install suitable threshold sill to throw water away from wall.

Paint; Use Dulux exterior quality water based microporous moisture permeable paints. Prime, undercoat and finish coats as recommended by the manufacturer.

NEW CEILING LEVEL: New ceiling level to match existing.
Extensions to terraced dwellings

- Access is normally through the house itself.
- Concrete floors are messy and normally site mixed concrete is used - variable quality.
- Screeds for UFH add lots of moisture to otherwise dry buildings, then have to dry.
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• Using Cemwood and Lithotherm combination avoids need for concrete slab and issues relating to levelling and screed drying times.

• Cemwood - mineralised wood chip, load bearing, moisture resistant but insulative.

• Lithotherm tiles- made with basalt or brick for added heat storage.
Internal Wall Insulation

• Uneven walls are very difficult to insulate. For direct insulation walls must be rendered flat.

• Insulated stud walls, cheap but sound cheap and take up space. Insulated block walls take up even more space.

• Synthetic materials problematic with timber internally.
Internal Wall Insulation

• UdiRECO wood fibre insulation fixes directly to the wall surface, avoiding flattening render.

• Modified wood fibre wool moulds itself to the shape of the wall.

• Modified lime plaster acts a VCL to ensure minimal condensation within.
Internal Wall Insulation

• Wood fibre able to manage moisture around joists/ lintels/rafters to prevent decay from condensation.

• Suitable for any pre-1940’s building
New build Timber frame

• Panels get wet on site, insulation holds moisture and doesn’t dry. Construction moisture can cause issues later.

• Use of many membranes exacerbates issue of trapped moisture but also adds complexity to construction.

• Lightweight insulation is poor for sound insulation.

• Synthetic render boards must be very dry to render, can go green on Northerly faces.
Recycled slate interlocking roof tile on treated timber counter battens as recommended by tile Udi wood fibre insulation (60mm UdiTOP + 60mm deep timber joists infilled with 175mm UdiFLEX with 18mm Norboard OSB3, joints taped with Udi 100mm service void, finished with 12.5mm plaster.

\[ U = 0.121 \text{ W/m}^2\text{K} \]

External finish of 8mm wood fibre boards (450mm timber studs at 600mm centres, 38mm service void 12.5mm Fermacell OSB3 board with joints taped with 18mm Norboard OSB3, joints taped with Udi 100mm service void, finished with 12.5mm plaster.

\[ U = 0.143 \text{ W/m}^2\text{K} \]
New build Timber frame

• Taped OSB3 internally, flexible wood fibre batts between studs with wood fibre boards screwed to studs and rendered.

• Very simple and fast to install. Materials dry quickly allowing finishing fast.

• Results in buildings which perform as expected or better, avoiding the performance gap.
New build Timber frame

- Acoustic insulation is very good.
- Mass and heat storage of boards reduces stress on render and likelihood of algal growth.
- Avoiding cavity construction improves airtightness.
- Moisture management properties cope with interstitial condensation from air leakages.
Sound insulated rooms

• Lightweight insulation materials don’t absorb sound.
• Plasterboard and other hard surfaces reflects sound.
• Reverb can be cut in the room but transmission through the walls less easy to stop.
• Clay boards very sound absorbent, especially at higher frequencies, can absorb over 98% of airborne sound.

• Wood fibre boards, such as UdiClimate, absorb air borne sound and prevent reverb.

• Combination of materials absorbs and prevents transmission.
Rendered facades in cities

• Using cement based renders with cheap acrylic finishes, facades deteriorate quickly, especially north facing.

• Cheap components and poor detailing accelerate deterioration.

• Mould growth and staining caused by pollution and birds.
Rendered facades in cities

- Baumit produce lime based, breathable renders are more flexible, less expansive and more able to deal with moisture.

- Range of self coloured finishes includes silicones and silicates and nanoporous renders. All very vapour permeable.

- NanoporTop cleans itself in sunlight and rain.
Summary

• Address multiple issues not covered by other single building/insulation materials, such as sound absorption, moisture transport, diffusivity and thermal mass.

• Well tried and tested for European climate, including UK.

• Material costs are higher but installed costs are comparable but with lower construction risks.
Questions?

Thanks for listening

Chris Brookman

backtoearth
innovative natural building solutions