SUSTAINABLE SOCIAL HOUSING
BEST PRACTICE CONFERENCE

New Materials Review

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These slides are reproduced with thanks to *Inside Housing* magazine

The Expert Panel

John Cave - Sustainable Products Manager, EH Smith

John has worked on the specification and supply of building materials for some of the largest construction projects in the UK

Warren Sparkes - Sustainability Manager, Hill Partnerships

Warren has worked on the technical side of house building for 12 years and now specialises in Sustainability at Hill Partnerships

Jon Broome - MD, Jon Broome Architects

Jon has many years' experience in designing cost effective green homes and Neighbourhoods. His practice won Sustainable Social Housing Design Consultancy of the Year 2010.

The Expert Panel

Mark Elton - Head of Sustainability, ECD Architects

Mark has a particular expertise in sustainable housing design incorporating innovative materials and technologies.

Andrew Mitchell - Company Director, Natural Building Technologies

Andrew is a pioneer of high performance building envelope design, an approach that has become widely recognised as the foundational route to a low energy, low carbon built environment.

The Material Groups

1. **Insulation**
2. **Glazing**
3. **Phase Change Materials**
4. **Wall materials**

Selection and Analysis

- Non standard, innovative materials
- Being trialled by some but not yet mainstream use
- Consideration for new build primarily
- What are the benefits and issues with using these materials?
- Material selection will undoubtedly become more important
  - capital costs and maintenance costs
  - higher thermal efficiency standards
  - embodied carbon

The Review Process

Materials Panel Score sheet	**Insulation**							**Glazing**	**Phase Change materials**		**Wall materials**	
Assumes new build situation Typical three bed semi	Aerogel	Vacuum insulated panels	Multifoils	Sheeps wool	Hemp	Wood fibre	Paper based	Vacuum glazing	Plasterboard	Thermal mass panels	Thin joint blockwork	Perforated clay block
Is the material readily available/short lead times?												
Is it easy to install?												
Is it easy to maintain?												
Typical cost to install over a traditional material												
Appropriateness for social housing												
Additional benefits eg. health, recycled content												
Applicability to retrofit applications?												
Overall rating												

- Panel all have experience of using the materials on social housing projects
- Scoring was made with reference to case studies
- Scoring each category out of 5, giving a total out of 35.

Insulation

Aerogel

- Made from silica and air - Lightweight, low density
- Typically used as laminate panels – board finish

Benefits

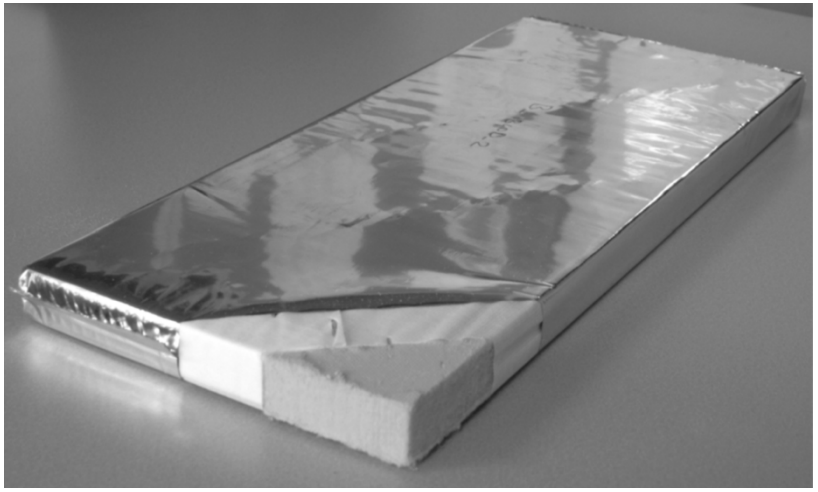
- Achieves same performance as traditional insulation with half the thickness
- Resistant to fire and rot
- Can be used in new build and retrofit

Drawbacks

- Expensive
- Supply problems
- Dust problem when cutting and fixing issues

Vacuum Insulated Panels

- Core insulated panel vacuum wrapped in foil
- Insulation is polystyrene, polyurethane or other



Benefits

- High performance
- Use in limited space applications

Drawbacks

- Standard sizes, cannot be cut to fit
- Can be damaged during installation or in occupation
- Expensive

Multifoils

- Foils separated by thin layers of fleece
- Sheet product

Benefits

- Very thin product
- Can replace roof underlay
- Suitable for new build and retrofit

Drawbacks

- Performance is questionable
- Requires additional insulation to meet standards

Sheepswool

- Natural sheep wool with binder - treated for fire/insects
- Used in roofs and breathable wall construction
- Supplied as roll and batts – same performance as mineral fibre

Benefits

- Hygroscopic – humidity control
- Low embodied carbon
- Suitable for new build and retrofit
- No protective equipment required for installation

Drawbacks

- Can not be used in traditional cavity wall or solid ground floors

Hemp

•Hemp with binder – treated for fire resistance

•Used in roofs and breathable wall construction

•Supplied as batts

Benefits

•Hygroscopic – humidity control

•Low embodied carbon

•Suitable for new build and retrofit

•No protective equipment required for installation

Drawbacks

•Can not be used in traditional cavity wall or solid ground floors

•Supply volumes not available for large projects

Wood Fibre

- Pre-consumer wood waste
- Soaked and then pressed to form batts
- Used in framed construction and external wall insulation

Benefits

- Uses waste material and renewable material
- Easy to install and low embodied carbon

Drawbacks

- Requires stud supports for services etc.
- More expensive than petro-chemical insulations

Paper Based

•Recycled newspaper - Treated for fire and insect resistance

•Supplied loose and in batts

•Used in roofs and walls of lw framed structures

Benefits

•Hygroscopic – humidity control

•Low embodied carbon

•90% recycled content and recyclable

Drawbacks

•Dust produced through loose product installation

•Potential off gassing from printing inks

•Later removal from loft space difficult if poured

Insulation – thermal performance comparison

Insulation Type	Thermal Conductivity (W/m^2K)	U-value from 100mm* (W/m^2K)	Thickness to achieve a U-value of 0.3
Aerogels	0.013	0.127	41mm
Vacuum Insulated Panels (VIP)	0.005	0.050	16mm
Multifoil insulation	0.040	0.375	127mm
Sheepswool	0.042	0.392	133mm
Hemp	0.048	0.444	152mm
Wood fibre	0.038	0.357	120mm
Paper based	0.038	0.357	120mm
Mineral Fibre	0.042	0.392	133mm

* this is a basic U value not taking into account wall construction

Insulation – Panel scoring

Materials Panel Score sheet	**Insulation**						
Assumes new build situation *Typical three bed semi*	Aerogel	Vacuum insulated panels	Multifoils	Sheeps wool	Hemp	Wood fibre	Paper based
Is the material readily available/short lead times?	2.3	1.3	4	3.8	3.5	3.7	4.3
Is it easy to install?	2.3	2	3.8	4.5	4.3	4.7	3
Is it easy to maintain?	3	2	4.3	4.5	4.3	4.3	4.3
Typical cost to install over a traditional material	1.8	1	2.8	2.8	2.5	2.7	3.3
Appropriateness for social housing	2.8	2.3	2.3	4	4	4.3	4.3
Additional benefits eg. health, recycled content	1.5	1	1.8	4.8	4.5	4.7	4.3
Applicability to retrofit applications?	3.5	3	3	4	3.5	4.7	4.3
Overall rating	**17.2**	**12.6**	**22**	**28.4**	**26.6**	**29.1**	**27.8**

Glazing

Vacuum Glazing

•Two layers of glass

•0.2mm gap – vacuum

•Micro spacers 20mm apart

Benefits

•Very thin glazing – 6mm total

•Performance equal to DG 4 times as thick

•Use in new box sashes or retrofit

Drawbacks

•Manufactured outside of UK

•Long supply times

•Not economically viable for new build casements

Glazing– Panel scoring

Materials Panel Score sheet	Glazing
Assumes new build situation *Typical three bed semi*	Vacuum glazing
Is the material readily available/short lead times?	1.8
Is it easy to install?	3.3
Is it easy to maintain?	3.3
Typical cost to install over a traditional material	1.8
Appropriateness for social housing	2.3
Additional benefits eg. health, recycled content	1.5
Applicability to retrofit applications?	3.5
Overall rating	**17.3**

Phase Change

Plasterboard

- Plasterboard or plaster finish
- Paraffin wax molecules incorporated

Benefits

- Regulates internal temperatures
- Suitable for new-build and retrofit
- Finish and thickness same as conventional plasterboard

Drawbacks

- Expensive – better to design out overheating risk

Thermal Mass Panel

- Aluminium laminated core panel
- Copolymer and Paraffin Wax

Benefits

- Regulates internal temperatures
- Suitable for new-build and retrofit

Drawbacks

- Cannot be cut to size
- Requires finishing board as well
- Expensive – better to design out overheating risk

Phase Change Materials – Panel scoring

Materials Panel Score sheet	**Phase Change materials**	
Assumes new build situation *Typical three bed semi*	Plaster board	Thermal mass panels
Is the material readily available/short lead times?	2	2.5
Is it easy to install?	3.7	3
Is it easy to maintain?	4	4
Typical cost to install over a traditional material	2	2
Appropriateness for social housing	2	2
Additional benefits eg. health, recycled content	2	2.5
Applicability to retrofit applications?	2.7	2.5
Overall rating	**18.3**	**18.5**

Wall Blocks

Thin Joint

- 2-3mm mortar joint
- Aircrete blockwork
- Applied using applicator

Benefits

- Mortar cures within 1-2 hours
- Greater wall lifts per day
- Less mortar volumes – delivery, storage

Drawbacks

- Price needs to become more competitive

Perforated Clay Block

•Clay block with cellular structure

•Reduced weight /improved thermal performance

Benefits

•Established material in Europe

•Good insulating properties and thermal mass

•Less mortar and thermal bridging

•Low waste levels

Drawbacks

•Unfamiliar to some UK bricklayers

•Dimensions not UK module

•More expensive than traditional blocks

Wall Blocks – Panel scoring

Materials Panel Score sheet	**Wall materials**	
Assumes new build situation *Typical three bed semi*	Thin joint blockwork	Perforated clay block
Is the material readily available/short lead times?	4.3	4
Is it easy to install?	4	4.5
Is it easy to maintain?	4.5	4.5
Typical cost to install over a traditional material	3.5	3.5
Appropriateness for social housing	3.8	4.25
Additional benefits eg. health, recycled content	2.8	3.5
Applicability to retrofit applications?	1.5	1.5
Overall rating	**24.3**	**25.75**

Summary of Materials Panel Scoring

Materials Panel Score sheet	**Insulation**							**Glazing**	**Phase Change materials**		**Wall materials**	
Assumes new build situation *Typical three bed semi*	Aerogel	Vacuum insulated panels	Multifoils	Sheeps wool	Hemp	Wood fibre	Paper based	Vacuum glazing	Plaster board	Thermal mass panels	Thin joint blockwork	Perforated clay block
Is the material readily available/short lead times?	2.3	1.3	4	3.8	3.5	3.7	4.3	1.8	2	2.5	4.3	4
Is it easy to install?	2.3	2	3.8	4.5	4.3	4.7	3	3.3	3.7	3	4	4.5
Is it easy to maintain?	3	2	4.3	4.5	4.3	4.3	4.3	3.3	4	4	4.5	4.5
Typical cost to install over a traditional material	1.8	1	2.8	2.8	2.5	2.7	3.3	1.75	2	2	3.5	3.5
Appropriateness for social housing	2.8	2.3	2.3	4	4	4.3	4.3	2.3	2	2	3.8	4.25
Additional benefits eg. health, recycled content	1.5	1	1.8	4.8	4.5	4.7	4.3	1.5	2	2.5	2.8	3.5
Applicability to retrofit applications?	3.5	3	3	4	3.5	4.7	4.3	3.5	2.7	2.5	1.5	1.5
Overall rating	**17.0**	**13.0**	**21.8**	**28.3**	**26.5**	**29.0**	**28.0**	**17.3**	**18.3**	**18.5**	**24.3**	**25.75**