Spaceloft Aerogel Blanket Insulation

23rd March 2012
Copenhagen

www.aerogel.com
Building & Construction Europe
Company Introduction
Aerogels born in the 1930s. Aspsen Aerogels were invented in the 1990s and opened their first plant in 1995. In 1997, Aerogel PUF 6350 was created for the petrochemical industry. In 2001, Plant 2 opened. Aspen = AeroSPace Engineering.
Silica Aerogel

- Silica Aerogel contains 95 - 97% air
- Not vacuum based, do not require blowing agents
- Air is trapped within the nano-scale cells
- Very convoluted silica matrix
- Extremely Hydrophobic by design

~10 nm
Our Technology
The Manufacturing Process

- **Silica Sol**
- **Catalyst**
- **Dopants**

Dry batting

Casting

Gelation

Aerogel-filled blanket

Chemical Aging

- **Functional:***
  - TC
  - Thickness
  - density
  - Hydrophobicity
  - combustibility

- **Form/Fit:***
  - Length validation
  - Edge defects
  - Visual aspects

Finished Rolls

Final Test

Drying

Verification
- Roll weight
- calculated length

Supercritical extraction
Aerogel Blanket Range - Application

Cryogel
-200° C to +200° C
- Cryogenic
- LNG
- Petrochemical
- Industrial

Spaceloft
-50° C to +200° C
- Building & Construction
- Clothing
- Appliances
- Services

Pyrogel
+650° C
- Industrial
- Hot Process
- Fire Protection
- District heating
- Appliances
- Transport
Aerogels Have the Lowest $k$-Value of Any Conventional Insulation

![Graph showing thermal conductivity of different insulations across temperature range.](image-url)
Spaceloft Aerogel Blanket’s Unique Physical Characteristics

- Lambda 14mW/mK to 18mW/mK
- 5mm & 10mm blanket thicknesses
- Excellent Vapour permeability ($\mu = 5$), Extremely Hydrophobic – withstand hydrostatic Head test to 80cm
- Euro Fire class C or A2
- Will not promote mould growth, first class indoor air quality test result
- Good impact sound absorption, up to 20% light transmission
- Full technical data set for simulation of vapour transfer – example WUFI (Historic Buildings & Breathable Construction)
- European Technical Approval – 11_0471
## Spaceloft Aerogel Blankets for Construction

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Spaceloft Classic</th>
<th>Spaceloft A2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5mm Blanket</td>
<td>Yes</td>
<td>No *</td>
</tr>
<tr>
<td>10mm Blanket</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Euro Fire Class</td>
<td>C-s1,d0</td>
<td>A2-s1, d0</td>
</tr>
<tr>
<td>Thermal Conductivity</td>
<td>0.014 W/mK</td>
<td>0.018 W/mK</td>
</tr>
<tr>
<td>Density</td>
<td>150 kgs / m3</td>
<td>150 kgs / m3</td>
</tr>
<tr>
<td>Vapour Permeability Factor mu</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Colour</td>
<td>White, Grey</td>
<td>White</td>
</tr>
</tbody>
</table>

* - enquire for availability
Aerogel Blanket Applications
Aerogel Blanket Applications

- Fabricated Insulation
- IR Repression
- Building & Construction
- LNG and Cryogenics
- Clothing
- Industrial Plants
- Footwear
- Aerospace & Military
- Subsea Pipelines
Aerogel Blanket Applications in Building & Construction include:

- Roof
- External Insulation
- Heat Bridge
- Services
- Balcony
- Internal Heritage
- Internal Insulation
Spaceloft – Valuing Space

- Preserve living space in small area properties
- Improve energy performance - sustain investment income
- Unrivalled U value improvement potential
- Whole envelope solutions - treat problem areas
Walls

Internal
External
Internal Insulation

- Spaceloft is the thinnest insulation material available for internal insulation
- Thin sections = more space for occupants & preserves property value
- It can be laminated offsite or applied onsite in layers
- It can be used in breathable form or with an integrated AVCL
- No foils required to maintain performance = no puncture risk
- Indoor air quality is maintained
- Data package available for software simulations
**Wall construction**

10mm Space Loft
SL 10mm + 9.5mm plasterboard)

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**Solid wall (9” brickwork)**

<table>
<thead>
<tr>
<th>Thickness</th>
<th>TC (W/m-K)</th>
<th>U value (W/m²K)</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 215mm brick</td>
<td>215</td>
<td>0.450</td>
<td>2.10</td>
</tr>
<tr>
<td>Plasterboard</td>
<td>12.5</td>
<td>0.140</td>
<td></td>
</tr>
<tr>
<td>Spaceloft 1 layer</td>
<td>10</td>
<td>0.014</td>
<td>0.77</td>
</tr>
<tr>
<td>Spaceloft 2 layer</td>
<td>20</td>
<td>0.014</td>
<td>0.49</td>
</tr>
<tr>
<td>Spaceloft 3 layer</td>
<td>30</td>
<td>0.014</td>
<td>0.36</td>
</tr>
<tr>
<td>Spaceloft 4 layer</td>
<td>40</td>
<td>0.014</td>
<td>0.29</td>
</tr>
<tr>
<td>Spaceloft 8 layer</td>
<td>80</td>
<td>0.014</td>
<td>0.16</td>
</tr>
</tbody>
</table>
Interior Walls

Project: Victorian period renovation
Location: UK
Bldg. Type: Solid Masonry
Application: Interior Walls
Benefit: Saves Space
Case Study – Nottingham

- The homeowner remained in the property during the work.
- The house is much warmer than before.
- The job took 3 days from start to finish.
- This job included a bay window.
### Interior Walls

<table>
<thead>
<tr>
<th>Project</th>
<th>Stone Cottage Renovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>England</td>
</tr>
<tr>
<td>Bldg. Type</td>
<td>Stone</td>
</tr>
<tr>
<td>Application</td>
<td>Internal insulation</td>
</tr>
<tr>
<td>Benefit</td>
<td>U value from 2.1 to 0.3 in 40mm</td>
</tr>
</tbody>
</table>
**Interior Walls**

<table>
<thead>
<tr>
<th>Project</th>
<th>My Space Pod</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>London</td>
</tr>
<tr>
<td>Bldg. Type</td>
<td>Reconstituted Sea Container</td>
</tr>
<tr>
<td>Application</td>
<td>Internal Walls, Partition Walls, Floor</td>
</tr>
<tr>
<td>Benefit</td>
<td>Saves Internal Space</td>
</tr>
<tr>
<td><strong>Project</strong></td>
<td>Renovation</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Italy</td>
</tr>
<tr>
<td><strong>Bldg. Type</strong></td>
<td>House</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>Internal Wall</td>
</tr>
<tr>
<td><strong>Benefit</strong></td>
<td>Energy Saving, Space Saving</td>
</tr>
</tbody>
</table>
Historic Stable Block Terrace - UK

- Project: Renovation
- Location: Luton
- Bldg. Type: Stable Block
- Application: Internal Wall
- Benefit: Energy Saving, Space Saving
True to traditional Amsterdam architecture
Row houses have 6cm spacing between units.
Thin wall insulation maximises internal space.
50mm & 100mm thicknesses applied
Problem Zone? – Curved Stairwell

20mm Spaceloft applied to the curved concrete wall
Impact protection with 3mm Magnesium Silicate board
Spaceloft – External Insulation

- Whole wall solution, single or multiple layer
- Compatible with all render systems
- Mechanical and/or adhesive fix
- With or without construction board
- Targeted application with other insulations eg. gable walls, stairwells, archways
- Solve Thermal Bridging at reveals, returns & cills
External Insulation - Traditional Swiss Mill House

a. Before
b. Spaceloft mechanically fixed to walls
c. Rendered
External Insulation - Traditional Swiss Mill House

External Rendering

- Robust site storage
- Mushroom & SS Mesh
- Lime Render ~ 25mm
- Compact Site Storage
- Mushroom & SS Mesh
Improved wall U value (50-60%)
Meets local authority approval
Unique solution
Standard B&C practices
Heritage External Render

Press Spaceloft into wet basecoat

Wet lime render over Spaceloft
New Build ETICS

Spacoloft 10 cut to length

Spacoloft 10 easily handled
External Insulation - Fixing

Step 1
- Punch through layer(s) of Spaceloft

Step 2
- Drill hole for fixing as normal

Step 3
- Apply mesh & hammer low TC mushroom fixing
External Insulation - Switzerland
## External Insulation - Switzerland

<table>
<thead>
<tr>
<th>Project</th>
<th>Fascia Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Switzerland</td>
</tr>
<tr>
<td>Bldg. Type</td>
<td>Concrete</td>
</tr>
<tr>
<td>Application</td>
<td>External Insulation</td>
</tr>
<tr>
<td>Benefit</td>
<td>Continuous fascia dimension</td>
</tr>
</tbody>
</table>
Floor Insulation

Applications

Case Studies
Floor Insulation

- Thin section facilitates non-disruptive upgrades
- Suitable for domestic compressive loadings
- Compatible with all floor finishes and under-floor heating
- Fast Installation in roll or board format
<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>Renovation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>Switzerland</td>
</tr>
<tr>
<td><strong>Bldg. Type</strong></td>
<td>concrete floor</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>Underfloor Insulation</td>
</tr>
<tr>
<td><strong>Benefit</strong></td>
<td>Significant height gain / minimum disruption to fittings &amp; fixtures</td>
</tr>
</tbody>
</table>
**Terrace Insulation**

- **Project**: New Build concrete
- **Location**: Switzerland
- **Bldg. Type**: Concrete
- **Application**: External Insulation
- **Benefit**: Height / Space management
Under Floor – Laminated Boards

Under parquet.
Panels to facilitate fast install
Roof Insulation

Pitched
Flat
Flat Roof upgrade

2 or 3 layers of SL 10mm

To compliment roof U value

In restricted height conditions
Heritage Projects

Figure 1 – inside view of existing roof

Request for analysis
Client wishes to assess performance of Aspen Aerogel as roof insulation in warm-roof buildup between a timber ceiling deck and battens of a vaulted Victorian courthouse building in the south suburbs of Dublin. Roof buildup to be absolutely minimised. Building to be intensely used by small number of people with a lot of electronics.
Heritage Projects

MAIN CHURCH

- Existing sandstone coping stones rebedded
- New Code 5 lead abutment secret gutter flashing
- Existing slates salvaged and reused with replacement salvaged to match sourced
- 60 x 25mm new treated SW battens
- 50 x 25mm new treated SW counter slating battens
- Existing panel timber ceiling and rafter bead between rafters (hidden)
- Intello sarking membrane
- 2 x 10mm Aspen Aerogel space loft insulation
- Existing diagonal sarking

- 100mm void
- 2 x 125mm Extg. rafters (approx) 5° deg. pitch
- Existing rafters retained. Ends spliced where rotting at eaves and valley gutters etc
- Existing T&G timber ceiling on lath and plaster retained. Repairs at eaves prepare and re-stain to match existing
- Existing lime plaster removed and replaced with new lime plaster to match
- Existing sandstone walls outer face repointed with lime mortar

Confidential & Proprietary
Heritage Projects

Renovation of Kronborg Castle (Hamlet’s Castle) in Denmark
SL 10 used at dormer windows
Project led by renowned Danish architect – Erik Moller

Confidential & Proprietary
Heat Bridge Treatments
Thermal Bridging Applications

- Internal or External
- Pre-cut or cut to length onsite
- Adhesive or mechanical fix
- Window & Door reveals
- Dormer & Roof Windows
- Partition Wall Returns
- Door & window Components
Internal Insulation - Reveals

Client: Aerobord
Ref: 5013_B_03.1
Date: 17.02.2011

Thermal Bridge Assessment of Junction
‘SUPERSLIM’ DETAIL – WINDOW REVEAL

Description
9mm thick magnesium silicate board on 40mm aerogel insulation on existing wall (retain lime or cement internal plaster but strip off any gyprock). 10mm thick board on reveal (10mm aerogel insulation between 3mm magnesium silicate boards).

Linear thermal transmittance
\( U = 0.081 \text{ W/mK} \) (DEAP)
\( U = 0.086 \text{ W/mK} \) (frame)

Temperature factor
\( \tau_{\text{FM}} = 0.875 \)

This detail has been assessed in accordance with the procedure in BRE IP 1466 “Assessing the effects of thermal bridging at junctions and around openings” and the guidance in BRE report BR 497 “Conventions for calculating linear thermal transmittance and temperature factors” in accordance with Appendix D of Technical Guidance Document L (2007) of the Irish Building Regulations. The calculations have been carried out analysing a 3D numerical model through conduction heat-transfer analysis based on the finite-element method performing to the standard indicated by IG EN ISO 18231.
10mm Spaceloft used to treat the heat bridge at the window reveal
Heat Bridges – Large Scale Projects

External Window Reveals
Internal Insulation – Partition Walls
<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>Perimeter Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>Switzerland</td>
</tr>
<tr>
<td><strong>Bldg. Type</strong></td>
<td>Concrete</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>External insulation</td>
</tr>
<tr>
<td><strong>Benefit</strong></td>
<td>minimum space disruption to pavement space</td>
</tr>
</tbody>
</table>

![Perimeter Insulation Image](image-url)
Balcony

4-5x faster install rates from roll.

Insulated balconies, limited height
Thermal Bridging in Zero Carbon Construction

Spaceloft used as a thermal gasket at concrete block gable

above & left: Spaceloft used to limit thermal bridging through structural steel roof support
<table>
<thead>
<tr>
<th><strong>Project</strong></th>
<th>Internal thermal bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>Switzerland</td>
</tr>
<tr>
<td><strong>Bldg. Type</strong></td>
<td>Concrete</td>
</tr>
<tr>
<td><strong>Application</strong></td>
<td>Thermal bridge</td>
</tr>
<tr>
<td><strong>Benefit</strong></td>
<td>significant thermal leak reduction</td>
</tr>
</tbody>
</table>
Thermal Bridging: Timber Frame, Spaceloft Insulcap

With Spaceloft Thermal Bridging Strips

No Spaceloft Thermal Bridging Strips
Passive House: lower vertical wall

- Timber frame
  - classic Thermal bridging

- Aerogel Cassettes
  - No Thermal bridging
Aluprof (Poland) Industry leading
0.5 W/m²K Uₜ Value
Using Spaceloft

market in Poland
Superior Pipe Insulation

**Condensulate**

The Fit & Forget Solution To Frozen Condense Pipes

*Condensulate-Xtreme* offers an innovative passive solution to the issue of freezing condensate from condensing boilers.

**Key Benefits of Condensulate-Xtreme**
- Easy to Install - includes adaptors
- Fully integrated, insulated and flexible pipe
- Not vulnerable to UV degradation, vandalism or vermin when sleeved in waste pipe
- An innovative cost effective solution
- Aesthetically pleasing
- No electrical or mechanical parts
- Sleeve in 40mm waste pipe

**NEW PRODUCT**

*For further information please contact Martin Clayton on 01369 702070*

**Bi-Tubo Solare Nanotecnologico**

Nanosun² utilizza isolante nanotecnologico in AERGELS

Conduttività termica $\lambda = 0.014 \text{ W/(m-K)}$

Temperatura da -200 °C a +200 °C costanti

Unico spessore 5 mm per tutte le applicazioni 4 volte più sottile rispetto agli isolanti tradizionali

20 mm

5 mm
Thank you for your attention.

Brian Cahill
bcahill@aerogel.com
+353 86 411 4677

Thank You!

www.aerogel.com