Living Walls and their impact on Internal Building Temperatures and Air Quality
“Introducing sustainable Landscape to the built environment to promote biodiversity, health & wellbeing”
Living Walls, Old Style
2nd Generation Living Wall
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Plan A

Helping companies such as M&S improve their sustainability in addition to the aesthetic and footfall benefits which companies gain through the installation and maintenance of Living Walls.
The Green Roof and Living Wall market will grow from a $5.3 billion dollar market in 2011 to a $7.7 billion market in 2017.

Installations will increase 70% but costs and lack of validation will limit their rise.

Market share of Living Walls forecasted at 680 Million - 9% of the overall market.

Adoption is driven by a handful of cities. With rising environmental awareness, growth of the green roof market is driven by cities in the developed world such as London, New York, Singapore, and Tokyo.
Research Project
Living Walls impact on Internal Building Temperatures
TEST WALL
• Living walls were installed on the south-west facing wall of the building. They cover a section of the walls of a 1st floor classroom.

• Monitoring has also been carried out on the identical classroom directly above.

  1F: A room with living wall cover

  2F: Reference room (no vegetation cover)
Test Beds

- Trough
- Compost
- Hydroponic
- Ivy screen

- System + extra insulation layer
- Existing system
- System without plants
Measurements

- Sensors have been recording temperatures of both surfaces of the classroom wall, inside the substrate & foliage mass.

- Water meters have been recording the consumption for irrigation and the tanks have been collecting the excess water released from each system.
Thermal Analysis

External wall surface temperature
Determines how much heat coming in / out of the room through the wall

Energy loads for heating & cooling
Heat transferred through the wall structure
External Surface Temperature - Summer

July

Temperature

0:00 15:30 7:00 22:30 14:00 5:30 21:00 12:30 4:00 19:30 11:00 2:30 18:00 9:30 1:00 16:30 8:00 0:30 16:00 7:30 23:30 14:30 6:00 21:30 13:00 4:30 20:00 11:30 3:00 18:30 10:00 1:30 17:30 8:30

Temperature

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

Comp-EX-INS
Comp-PL
Comp-SB
Comp-EX
Comp-EX-NP
NV-EX-1F
Out Temp
External Surface Temperature - Summer

Summary

- Summer in the UK in 2013 was the hottest summer on record since 1910 – on average it was 0.8°C hotter. July was the hottest month.

- The external wall temperature on a non-vegetated wall surface reached a peak of 45°C.

- Temperatures behind all systems tested showed positive cooling effects, lowering the external wall temperature by 20°C.
External Surface Temperature - Winter

January

Temperature

Comp-EX

INS

Comp-PL

Comp-SB

Comp-EX

NP

NV-EX-1F
External Surface Temperature - Winter

Summary

- Winter 2013 was slightly wetter than average and the temperature was an average of 0.4°C cooler. February was the coldest month of the year and a spell of severe weather brought very low temperatures during March and April.

- Temperatures behind the systems with no vegetation remained between 2-5°C higher than the wall temperature with no systems in place.

- Temperatures behind the systems with plants was 4-7°C higher than the wall temperature with no systems in place – meaning that plants provided additional insulation in winter.
<table>
<thead>
<tr>
<th>JULY</th>
<th>Cooling load (Wh/m²)</th>
<th>Reduction</th>
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<tbody>
<tr>
<td><strong>When air-conditioning is on for 24hrs</strong></td>
<td></td>
<td></td>
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<tr>
<td>No Living Wall</td>
<td>1685</td>
<td></td>
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<tr>
<td>Living Wall</td>
<td>0</td>
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</tr>
<tr>
<td>Living Wall + Insulation</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Between 8:00 - 19:00</strong></td>
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<td>1667</td>
<td></td>
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<tr>
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<td>0</td>
<td>100%</td>
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<tr>
<td>Living Wall + Insulation</td>
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<table>
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<tr>
<th>JANUARY</th>
<th>Heating load (Wh/m²)</th>
<th>Reduction</th>
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<tbody>
<tr>
<td><strong>When heating is on for 24hrs</strong></td>
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<tr>
<td>Living Wall</td>
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- Living walls are very effective tools to reduce the heat absorbed by buildings during the Summer. Cooling buildings by up to 20°C thus reducing the need to cool buildings by using excessive air conditioning.

- Living walls are effective insulators of buildings during the Winter, insulating buildings by up to 7°C.

- Scotscape development of Insulated Living Wall Panel in order to provide a thermal measurement.
2nd Generation Living Wall

Development as a result of research

We have an ongoing programme of R&D
Air Quality
Air - our most important food

approximately 15,000 litres of air

1 kg of solid food

3 litres of liquid food
Humans perform best when air temperature is 21 deg C and humidity is 45%-55%
Sick Building Syndrome
Dry Air from Air Conditioning and Heating
Biophilia

- Remove CO2
- Remove VOC’s
- Increase wellbeing
- Increase productivity
- Noise suppression
Biophilia

- Produce Oxygen
- Increase humidity
- Trap Particulate matter
- Reduce temperature
- Less sick days
Greening the workplace increases productivity by 39.6%.

Targeted use of plants can increase satisfaction by 40.7%.

Reduces sick days by 25%.
Summary

Living Wall market is in its infancy and has huge growth potential.

Scotscape are committed to ongoing R&D and thought leadership.

Living Walls improve Air quality in both exterior and interior settings.

Living Walls insulate buildings thus reducing cost of heating and cooling.

For more information visit www.scotscapelivingwalls.net
Any questions?

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