9. Example buildings with green label through façade contribution

Mfree-S application and EPBD for UCLH project

Yearly energy use; London, South, 80% glass, Decision Output

One of First BREEAM Excellent hospitals in the world
9. Example buildings with green label through façade contribution

Mfree-S façade + BCS integration + wood application

200 George street, Sydney, Australia
Architect: Francis-Jones Morehen Thorp (fjmt)
7. Better LCA by use of alternative materials

*Use of wood in facades*

Tower at PNC Plaza, Pittsburgh, Pennsylvania

200 George Street
Sydney, Australia

Development of 200,000km wooden slats for 2900 blinds suitable for mfree-S cavity
6. Whole building energy consumption

**Mfree-S, BCS integration and EPBD software application**

Integrated blind control system allows the optimization of the dynamic properties of the facade in terms of energy and light performances by means of the prediction by EPBD software.

---

**London Climate**

<table>
<thead>
<tr>
<th>INPUT</th>
<th>GLAZING TYPE</th>
<th>TGU</th>
<th>MW</th>
<th>CCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>U [W/m²K]</td>
<td>no blinds</td>
<td>0.78</td>
<td>1.16</td>
<td>1.07</td>
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<tr>
<td>blinds</td>
<td>0.69</td>
<td>0.93</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Temp. [°C]</td>
<td>no blinds</td>
<td>18.1</td>
<td>17.2</td>
<td>17.4</td>
</tr>
<tr>
<td>blinds</td>
<td>18.1</td>
<td>17.2</td>
<td>17.4</td>
<td></td>
</tr>
<tr>
<td>g [-]</td>
<td>no blinds</td>
<td>0.52</td>
<td>0.53</td>
<td>0.54</td>
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<tr>
<td>blinds</td>
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<td>0.13</td>
<td>0.15</td>
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<tr>
<td>Temp. [°C]</td>
<td>no blinds</td>
<td>53.3</td>
<td>33.7</td>
<td>25.6</td>
</tr>
<tr>
<td>blinds</td>
<td>53.3</td>
<td>33.7</td>
<td>25.6</td>
<td></td>
</tr>
<tr>
<td>LT [-]</td>
<td>no blinds</td>
<td>0.67</td>
<td>0.69</td>
<td>0.69</td>
</tr>
<tr>
<td>blinds</td>
<td>0.67</td>
<td>0.69</td>
<td>0.69</td>
<td></td>
</tr>
</tbody>
</table>

**OUTPUT (g, solar and daylight only)**

More than 25% saving
9. Example buildings with green label through façade contribution

Mfree-S integration

Roche Diagnostics

Administration Building No. 5, Roche Diagnostics, Rotkreuz

Received Minergie certificate

(Ref. Burckhardt+Partner AG)
Backup
Example 1: UCLH: mfree-S

BREEAM & Sustainable design approach
(Ref. Edward Williams Architects)

BREEAM 2008 (Healthcare):
- Achieved a score of 71 (70+ = Excellent / 85+ = Outstanding)
- Hospital design presents particular difficulties
e.g. 80% occupied floor area to achieve 2% daylight factor

9 CATEGORIES: Façade impact:
- Management 12%
- Health & Wellbeing 15%
- Energy 19%
- Transport 8%
- Water 6%
- Materials 12.5%
- Waste 7.5%
- Land Use & Ecology 10%
- Pollution 10%

Total 100%
Innovation (awarded separately) 10%
Example 1: UCLH: *mfree*-S

**BREEAM & Sustainable design approach** *(Ref. Edward Williams Architects)*

**HEALTH & WELLBEING**

**Daylight:**
- Large area of glazing: *mfree*-S/ clear glass
- Privacy blinds & Solar control blinds: BCS
- User control & central re-set: BCS

**Occupant thermal comfort:**
- Some very fragile patients
- Façade system minimises cold zone (low $U_{cw} 1.2$W/m²K): *mfree*-S

**Acoustics:**
- High acoustic performance essential for central urban location

**Indoor air & water quality:**
- Natural ventilation not possible

**Lighting:**
- Good quality lighting much of it driven by clinical need (500lux)

**ENERGY**

- CO2 emissions / Low or zero carbon technologies
- Energy sub metering & Energy efficient building systems

**Lean, Green approach:**
- Lean .....minimise energy consumption
- Energy efficient lighting & ventilation aided by the high performance façade
- Green..... Use low or zero greenhouse gas emitting energy supplies
- PV array on roof. High efficiency chillers. Link to district heating system

**Significant Achievement:**
- An 18% reduction in CO2 emissions relative to PartL2006
- + reduction of 20% by us of PV arrays & link to district heating system
- Gives an overall reduction of 42%

**MATERIALS**

**Embodied life cycle impact of materials:**
- Embodied carbon very difficult to measure
- BRE provides a calculating tool and has rated multiple products & materials

**Materials re-use:**
- Maximize reuse where possible aluminium etc.

**Responsible sourcing:**
- Avoidance (e.g. timber chain of custody certification)

**Robustness:**
- Bronze chosen for durability and robustness
- Thicker & more robust than aluminium
- Robust detailing at ground floor, specially backed panels to prevent denting etc.
- Patination process slows natural weathering of the bronze

**EXAMPLES OF FAÇADE CONTRIBUTION AS PART OF A GREEN BUILDING**
EXAMPLES OF FAÇADE CONTRIBUTION AS PART OF A GREEN BUILDING

Example 1: UCLH: *mfree-S*

Yearly energy use; London, South, 80% glass, Decision Output

UCLH, London
Architect: Hopkins
Client: University College London Hospital NHS Trust

<table>
<thead>
<tr>
<th>Façades</th>
<th>Energy demand [kWh]</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>428</td>
</tr>
<tr>
<td>E</td>
<td>379</td>
</tr>
<tr>
<td>J</td>
<td>385</td>
</tr>
<tr>
<td>H</td>
<td>340</td>
</tr>
<tr>
<td>K</td>
<td>314</td>
</tr>
</tbody>
</table>

- **Red** indicates yearly total room heating demand [kWh]
- **Blue** indicates yearly total room cooling demand [kWh]
Example 1: UCLH: mf\textit{free-S}

Sustainable design approach **GOING FORWARD** (Ref. Edward Williams Architects)

Focus must be on zero emissions (0GG) of greenhouse gases in:
- Construction
- Maintenance
- Refurbishment / replacement

**Current UK approach on lowering energy consumption**
- Too prescriptive
- Not allowing for approaches to solve the key focus of zero carbon emissions
- Phase 4 building next door we are now talking about U value in the range of 0.65-0.7W/m2K, this is almost a reduction of 50% on the level required for Phase 3 over a design period of 5 years!
- Our view is that we should be defining in energy terms a successful sustainable solution as one that has total 0GG emissions. Thinking is moving in this direction with the new approved documents but has further to go
- This would allow for ideas that traded off sustainable energy use with possibly reduced thermal performance but better lifecycle and design performance to achieve overall superior result.

**One example might be the use of single glazing in multiple skin façade systems to achieve:**
- A better long term performance (e.g. no degradation in glazed seal unit performance)
- A more economical, elegant set of design solutions (reduced size frames, reduced mass, simplification of replacement etc.)
- Coupled with a complete 0GG energy supply solution

This approach would be more flexible, performance driven & actually address the key driver of global warming rather than confuse it with other policy drivers
EXAMPLES OF FAÇADE CONTRIBUTION AS PART OF A GREEN BUILDING

Example 2: Roche Diagnostics: *mfree*-S
Administration Building No. 5, Roche Diagnostics, Rotkreuz
(Ref. Burckhardt+Partner AG)

Key Figures
- Start of Planning: April 2008
- Hand over: June 2011
- 17 floors above grade, height: 67.60m
- total 625 employees
- 8.200 m² facade

Received Minergie certificate
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Combining Energy and Building Concept
- activating thermal mass
- integrating room acoustics
- intelligent building envelope: mfree-S
  (Ucw = 0.84 W/m²*K / g – value = 39%)
- natural ventilation
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  \[(U_{cw} = 0.84\text{ W/m}^2\text{K} / g – value = 39\%)
- natural ventilation
  - strips of absorbing material
  - foamglass in fibre-cement shell
  - imbedded in concrete ceiling
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- natural ventilation

550 local ventilation units
EXAMPLES OF FAÇADE CONTRIBUTION AS PART OF A GREEN BUILDING

Example 2: Roche Diagnostics: *mfree-S*

**Sustainable Energy Concept**

- heatpump / chiller
- energy supply by thermal storage
- waste heat recovery from exhaust air
- natural ventilation

**Resulting in:**

primary energy consumption of
82 kWh / m² / year