CIBSE School Design Conference

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29th July 09
Agenda

- The Carbon Trust
- User comfort performance metrics
- Interpretation of Modelling Results
- Competencies
Low Carbon Buildings

1. Reduce
2. Efficiency
3. Recover
4. Renewable
Think of a low carbon building
Did it look like this?
People in Buildings

- Light – enough, but not glaring
- Temperature – warm, but not too hot
- Fresh air – some fresh air, but not a gale
- Humidity – dry, but not too dry
User comfort – enhance productivity through

- Daylight
- Even brightness gives visual comfort
- Thermal comfort winter
- Thermal comfort summer
- Low CO₂ rates
- Even humidity
- Good acoustics
- Low VOC
Daylight factor

windows

7.5%   7.5%   8%
4%     4%     4.2%
0.4%   0.5%   0.6%
What is holding low carbon buildings back?

- Skills to design
- Skills to specify performance in use
- Skills for a holistic approach
Sections to competencies

- OM 1 - Organisational Management
- CV 1 - Client Values at project inception
- D1 - Process & Finance
- D2 - Site Selection & Planning
- D3 - Sustainability
- D4 - Operating energy minimisation
- D5 - Passive Design
- D6 - Productive Workplace
- D7 - Investment & Whole Life Costs
- D8 - Operational Costs
- CST 1 - Construction
- OPR 1 - Operation
- Cont 1 - Contracts
<table>
<thead>
<tr>
<th>LEVEL</th>
<th>Performance based metrics</th>
<th>Design fees adequacy</th>
</tr>
</thead>
</table>
| 4     | • internal environment & carbon impact energy operating requirements defined  
      • Based on performance requirements in operation, not based on conformance with design criteria. | • Design / project management fees split into standard (historical) duties, and specifics.  
      • Adequate time for ‘fitness for purpose’, sustainability, productive workplace, and low-carbon issues. |
| 1     | • Client is unaware of operational / ‘fitness for purpose’ implications of design criteria. | • Design / project fees slightly extended (circa. 0.5% of capital cost) for increased design duties. |
| 0     | • Little or no interest. | • Standard fee scale. |
## D2 Site Selection

<table>
<thead>
<tr>
<th>Column Titles</th>
<th>Site suitability for passive design</th>
<th>Planning application passive features</th>
<th>Massing optimises daylight &amp; solar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEVEL ↓</strong></td>
<td></td>
<td></td>
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</tbody>
</table>
| **4**         | • Site assessed for passive operation.  
                • Urban horizon <15°  
                • Background noise <48 dBA. | • Daylight access  
                • Window head heights for daylight,  
                • Floor arrangements narrow-plan  
                • Walls thick enough to be well insulated,  
                • Access and space for biomass. | • Building massing - good daylighting and >50% displacement.  
                • Useful winter solar gains.  
                • Avoid visual discomfort |
| **1**         | • Site has substantial limitations. | • Option to use passive features very limited. | • <40% areas have >20% displacement |
| **0**         | • Passive impossible. | • Passive impossible. | • Not thought about. |
# D4 Operating energy minimisation

<table>
<thead>
<tr>
<th>Column Titles</th>
<th>Lighting and lamp efficiency &amp; control</th>
<th>Heating &amp; HWS energy minimisation</th>
<th>Small power energy minimisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEVEL ↓</strong></td>
<td>• Lamp LOR &gt; 0.85</td>
<td>• Overnight temperature loss &lt; 0.7°C</td>
<td>• All small power consumption and standby minimum.</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>• Output over life</td>
<td>• Heating balance temperature &lt; 30 days/yr</td>
<td>• Computer servers etc suitable for supply air up to 27°C.</td>
</tr>
<tr>
<td></td>
<td>• Best practice lumens/watt</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>1</strong></td>
<td>• LOR’s &gt; 0.7 in over 60% luminaires</td>
<td>• Heating energy power / consumption 20% better than regulations.</td>
<td>• Equipment selection puts energy low-down on priorities.</td>
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</tbody>
</table>
## D5 Passive Design

<table>
<thead>
<tr>
<th>Column Title</th>
<th>Heating energy minimisation</th>
<th>Summer overheat minimisation</th>
<th>Daylight optimisation</th>
<th>Airtightness detailing / testing</th>
</tr>
</thead>
</table>
| **LEVE↓ 4**  | • Space heating ≤10W/m² thermal.  
• Space heating carbon impact ≤29 kg CO₂ per year supply basis. | • Maximum day internal T < max external T +2.5 C | • Daylight displaces > 60 % artificial lighting | • Air-tightness <1m³/hour m² façade at 50Pa. |
| 1            | • Demand ≤15W/m². Carbon impact ≤55kgCO₂/y | • As ‘2’ above but 40% of spaces. | • >30% of lighting | • Air-tightness <5m³/ hour /m². |
| 0            | • Regulatory compliance | • No compliance as above | • No compliance as above | • Regulatory compliance |
## Cont1 - Contracts

<table>
<thead>
<tr>
<th>Column Titles</th>
<th>Payment mechanism</th>
<th>Contract equity</th>
<th>Financial close – low-carbon items</th>
<th>Feedback to procurement team</th>
</tr>
</thead>
</table>
| **LEVEL ↓ 4** | • penalties for inadequate Contractor performance for issues under total control of Contractor.  
• Degree days only used if uncertainty < 3% | • Client and Contractor work co-operatively to achieve lowest possible carbon impact  
• Contractor pays for energy wasted. | • Named low-carbon features shall remain sacrosanct and not be available for negotiation at financial close. Part of the bid evaluation. | • The Client funds one report on the energy and carbon impact performance in mature operation.  
• Report 2-4 years after handover. |
Summary

- Productivity gains drives building spec

- Needs skills to specify and design low carbon buildings and take a holistic approach