Interdisciplinary Collaboration: Product Development of Façade Systems

Dr. Ing. Jan Wurm, Berlin
Arup: local knowledge, global network

38 countries

90 offices

11,000 staff
our disciplines

- Structural Design
- MEP
- Architectural Engineering
- Facade Engineering
- Project Management
- Facility Management
- Sustainability Consulting

- Information & Communication Technology
- Fire Engineering
- Acoustics
- Materials Consulting
- Lighting Design
- Building Physics
- Waste Management
Corner moulds
Top closing piece
Spandrel panel
Mullion
Window frame
Glazing unit
Bottom closing piece
Building Physics - Thermal Performance

Uw-Wert: 1,2 W/m²K with 20mm Nanogel
0,9 W/m²K with 80mm Nanogel
## Building Physics – Acoustics

<table>
<thead>
<tr>
<th>Type</th>
<th>Mass (kg/m²)</th>
<th>D₂m + C(tr) With 8-18-44.2 Glass</th>
<th>D₂m + C(tr) With 8-12-44.2A Glass</th>
</tr>
</thead>
<tbody>
<tr>
<td>B basic: 4.5mm skins</td>
<td>20</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>B1: B + 2 x 12mm glass (inserts)</td>
<td>80</td>
<td>36</td>
<td>38</td>
</tr>
<tr>
<td>B2: B + 2 x 3mm steel (inserts)</td>
<td>66</td>
<td>35</td>
<td>36</td>
</tr>
<tr>
<td>B3: B + 55.2 glass on outside (decoupled)</td>
<td>45</td>
<td>34</td>
<td>35</td>
</tr>
<tr>
<td>B4: B + 2 x 12mm glass inserts + 55.2 glass (decoupled) outside</td>
<td>105</td>
<td>37</td>
<td>40</td>
</tr>
</tbody>
</table>
Fire Performance

SBI-Test EN 13501-1: B-s3-d0
Reinforced Concrete Deck 140mm

Perimeter Columns
Glulam GL24h
240x480mm

Ribs
Glulam
80mm/160mm deep

Span 8.10 m
BIPV

Ventilation units

Green Facade
Dimensions:
- height: ~ 2.6m
- width: ~ 0.7m
- volume: ~ 24 l
- weight: ~ 160 kg

Features:
- PBR
- Solar thermal collector
- Solar shading
- Self supporting
- 4 m high panel
- High thermal and acoustic performance
- High formal freedom
1. Geometry

1.4 Daylight study

Shading properties

Comparison of shading properties of a south facing facade in Berlin, Germany on the 8th of September.

<table>
<thead>
<tr>
<th>TIME</th>
<th>Altitude</th>
<th>Sun Path</th>
<th>Original Panel</th>
<th>Option 10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shaded Window Area</td>
<td>Shaded Window Area</td>
</tr>
<tr>
<td>10:00</td>
<td>30°</td>
<td>124°</td>
<td>1.04 m², 51.0%</td>
<td>1.46 m², 72.8%</td>
</tr>
<tr>
<td>11:00</td>
<td>33°</td>
<td>141°</td>
<td>0.40 m², 20.1%</td>
<td>0.71 m², 35.3%</td>
</tr>
<tr>
<td>12:00</td>
<td>41°</td>
<td>158°</td>
<td>0.27 m², 13.5%</td>
<td>0.29 m², 14.6%</td>
</tr>
<tr>
<td>13:00</td>
<td>43°</td>
<td>178°</td>
<td>0.14 m², 7.0%</td>
<td>0.15 m², 7.4%</td>
</tr>
<tr>
<td>14:00</td>
<td>42°</td>
<td>199°</td>
<td>0.23 m², 11.2%</td>
<td>0.22 m², 11.0%</td>
</tr>
<tr>
<td>15:00</td>
<td>33°</td>
<td>218°</td>
<td>0.30 m², 15.0%</td>
<td>0.30 m², 15.0%</td>
</tr>
<tr>
<td>16:00</td>
<td>31°</td>
<td>234°</td>
<td>0.40 m², 20.0%</td>
<td>0.40 m², 20.0%</td>
</tr>
<tr>
<td>17:00</td>
<td>23°</td>
<td>248°</td>
<td>0.69 m², 34.7%</td>
<td>0.73 m², 36.4%</td>
</tr>
</tbody>
</table>

Option 10:
10:00; 72.8% shaded window area
MODEL 10a: with internal ribs

MODEL 10b: no internal ribs

The diagrams illustrate the displacement in a model with and without internal ribs. The color scale represents the magnitude of displacement, with hotter colors indicating higher values.
Thank you

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