Steel & Mass Timber Hybrid Structures – The Opportunities in Tall Buildings

Nick Milestone
Steel / Mass Timber Expert
Nick Milestone BSc, Bsc (Hons), MSc.

Senior Advisor – Softwood Lumber Board
Chairman – TRADA (UK) – Vice Chair of the Timber Research and Development Association
Project Consultant, NTU, Singapore

Nick has overseen the design and construction of over 550 steel and mass timber structures during his 36+ years in construction.

- Trained as Quantity Surveyor & Project Manager for a General and Structural Steel Contractor (1986 – 2002)
- Created demand for Mass Timber in Singapore (2017 – 2020)
- Developed a Light Gauge Steel, off-site construction business for Wm Hare Ltd (2018 – 2020) UK, UAE, Singapore
- Part of the COP26 team to deliver the world Timber Manifesto

Previous Directorships
- Structural Timber Association (UK)
- Katerra (USA)
- B&K Structures (UK), Managing
- Wm Hare (UK, UAE),
- TiongSeng (Singapore),
- Katerra (USA)
- Sigmat (UK)

Current Directorships
- TRADA (Chairman)
- Vice Chair, Timber Development UK
- Mercer Mass Timber (USA) – June 1 2022
HYBRID STRUCTURES A DEFINITION

‘Hybrid construction systems integrate different materials to carry specific design loads. Connection and joint details are crucial for hybrid structures’

http://newbuildscanada.ca/research/theme-2/
Integrated Digital Delivery – The Digital Twin (VDC)

Design for Off-Site Manufacture and Assembly (Off-Site)

Green and Sustainably Technologies in the Building Physics (Mass Timber & Steel)

Construction Disruption – Vertical Integration
### B&K Structures: Project Carbon Estimator

<table>
<thead>
<tr>
<th>B&amp;K Structures</th>
<th>Total Tons CO₂e per m² of Project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.47</td>
</tr>
</tbody>
</table>

**Project Details**

- **Project Name:** Believe In Better
- **Project Client:** BSkyle - Marco

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
<th>Value 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons of Steel in Project?</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coke plant m³ in Project?</td>
<td>530</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coke plant kg in Project?</td>
<td>1190</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Square metres of Concrete in Project?</td>
<td>2410</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance (kg): Transitted on Project?</td>
<td>46000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total_Tons_CO2</td>
<td>2403.50</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Notes**

- The calculator is provided by B&K Structures as an optimized hybrid solution.
- The Council on Tall Buildings and Urban Habitat is credited in the upper right corner.
The BIM Integrated solution includes:

- Cross Laminated Timber (X-LAM)
- Glulam Structures
- Steel/Timber Hybrid Frames
- Structural Cassettes (Load / Non-Load Bearing)
- Modular Build Solutions (Flat pack)
RETAIL
FRAME AND ROOF SOLUTION
SAINSBURY’S SHEFFIELD
Scunthorpe Leisure, UK
Banyan Wharf, London – ‘The Cube’
VIRTUAL DESIGN AND CONSTRUCTION

- Cadworks – CLT
- Trimble - Steelwork
Pinewood Studios – 600,000sqft Structural Timber Panels on a Steel Frame
TRADA Founded in 1934
The Future of Mass Timber

Modular / Volumetric
POD & PANEL

VASTINT - MOXY HOTEL
A load bearing pod and panel solution.

BINDERHOLZ - BWOOD SOLUTION
A load bearing pod and panel solution.
GOOGLE HQ
LONDON

Concrete Cores / Steel Frame / Cross Laminated Timber Floor Decks / Glulam facade
Grenfell Tower and the impact on Mass Timber
RESIDENTIAL
NEW SOLUTIONS

PANELISED LGSF/CONCRETE METAL DECK MODULAR

Typ. Embodied Carbon: 376kgCO2e/m2
Typ. Sequestered carbon: -0kgCO2e/m2

Values above podium level only
Perimeter LGSF walls and internal LGSF walls included
Cladding build up, finishes, M&E not included

CAN GO ~15 STOREYS INC. PODIUM

PANELISED LGSF/CLT MODULAR

Typ. Embodied Carbon: 269kgCO2e/m2
Typ. Sequestered carbon: -87kgCO2e/m2

Values above podium level only
Perimeter LGSF walls and internal LGSF walls included
Cladding build up, finishes, M&E not included

CAN GO ~15 STOREYS INC. PODIUM
HYBRID CLT / CFS SYSTEM

PROS
- Structurally efficient
- 18 stories possible
- Least expensive
- Least weight
- Smallest wall dimension

CONS
- Trade coordination
- Lower embodied carbon
What Are the Opportunities for Steel & Mass Timber?

• Composite Design?

• Keep it simple, use Cross Laminated Timber as a floor plate, on either a steel frame (Long Span) or on a CFS frame (Short Span)

• One model for all components........Trimble are working on it, have faith in the IFC’s

• Look at the holistic value of CLT as a dry floor plate, speed of build, 20% quicker 11% cheaper.

• National Specifications, standardize the billets, like steel and glulam

• Digitalization & Post processing, the bottle necks of any prefabricated component

• Keep in service class 1 & 2 only, avoid service class 3

• The devil is in the detail, steel and mass timber are symbiotic to each other