

Sky Pavilion

Structural Timber Conference

ARUP



Timothy Snelson

16 April 2024



Timber Buildings at Sky Campus



Believe in Better Building

Designed and constructed in one year.
First midrise UK mass timber office



Sky Fitness Centre

Innovative screw reinforced glulam
bandbeams



Sky Central

Hybrid timber steel
UK's largest timber roof

The Team

Client: **Sky UK**

Main Contractor: **ISG**

Architect: **Atkins**

Structural and Civil Engineer: **Arup**

Service Engineer: **Arup**

Timber Frame Contractor: **Hess**

Timber Facades: **Pacegrade**

Timber Joinery: **TMJ**



Project Brief

- Catering for 250 people
- Healthy street food offering
- Natural environment
- Connection to nature
- No single-use plastic
- GoZero strategy



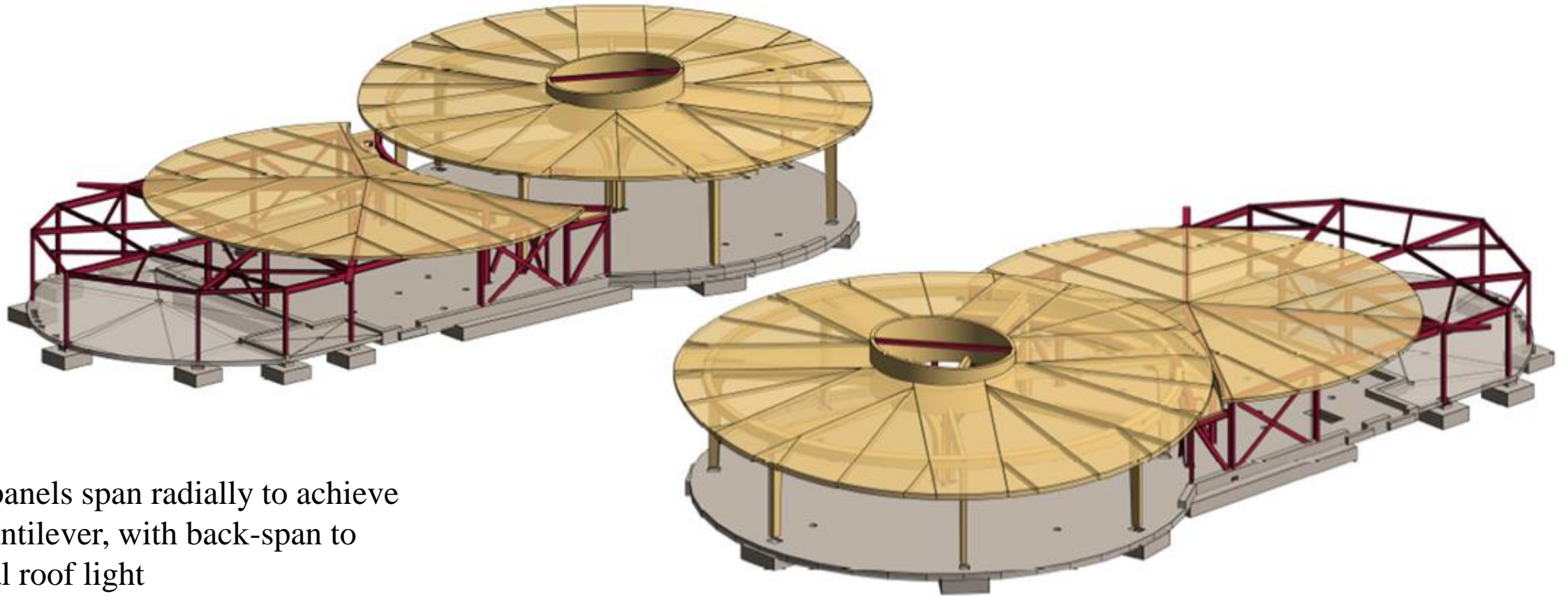




Inside a Sky

Sky Mob

Structural Frame

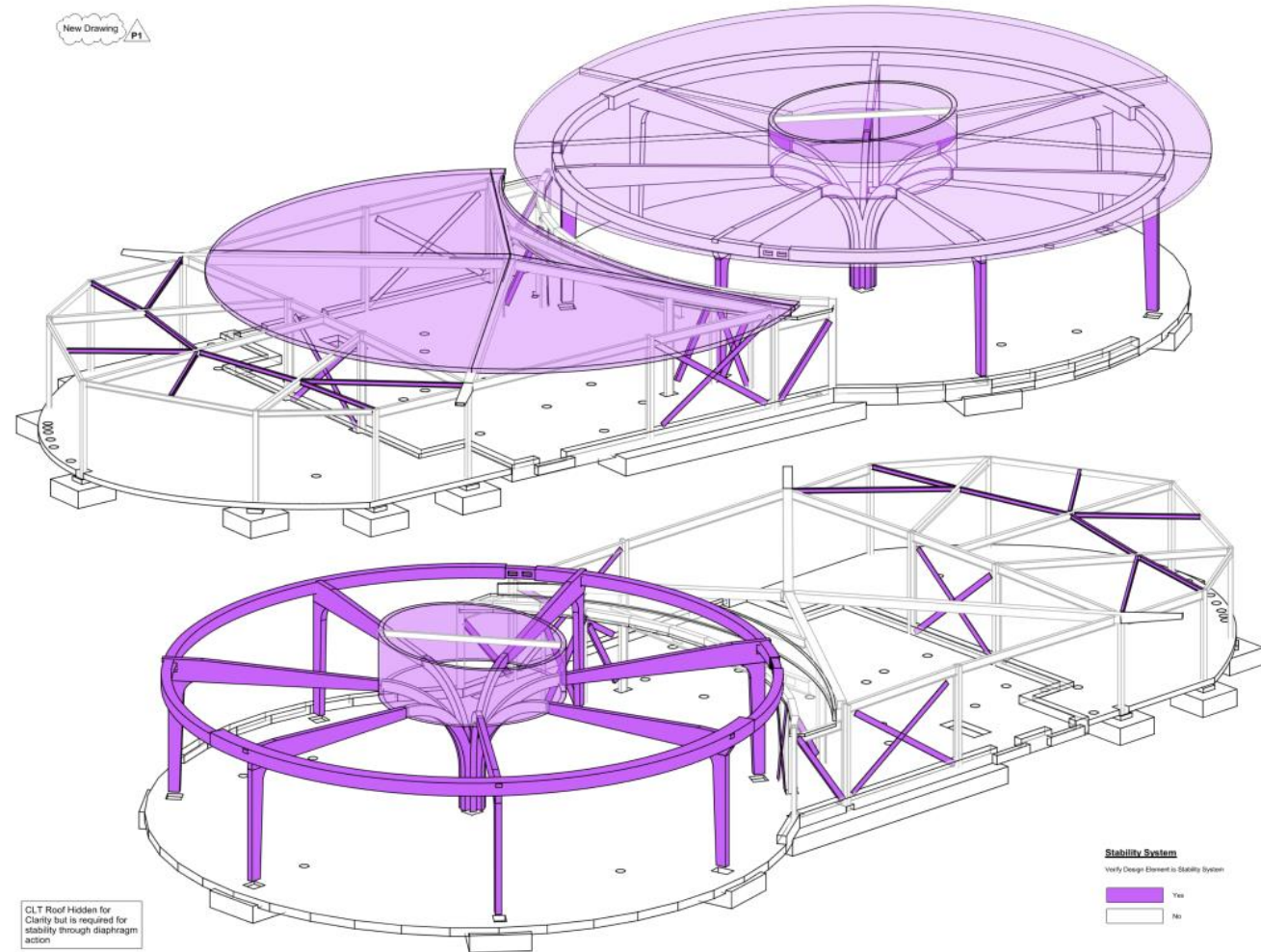


CLT panels span radially to achieve 5m cantilever, with back-span to central roof light

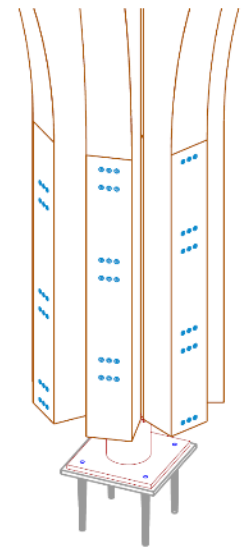
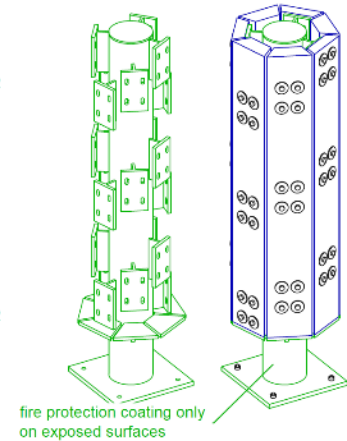
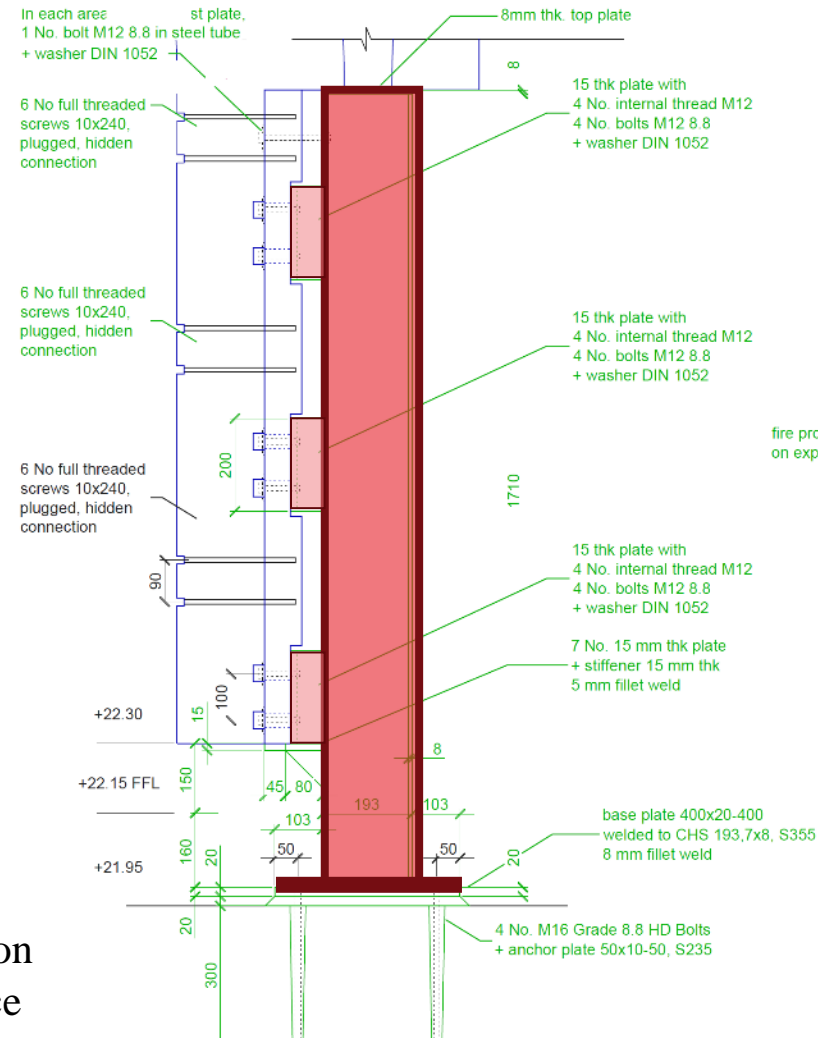
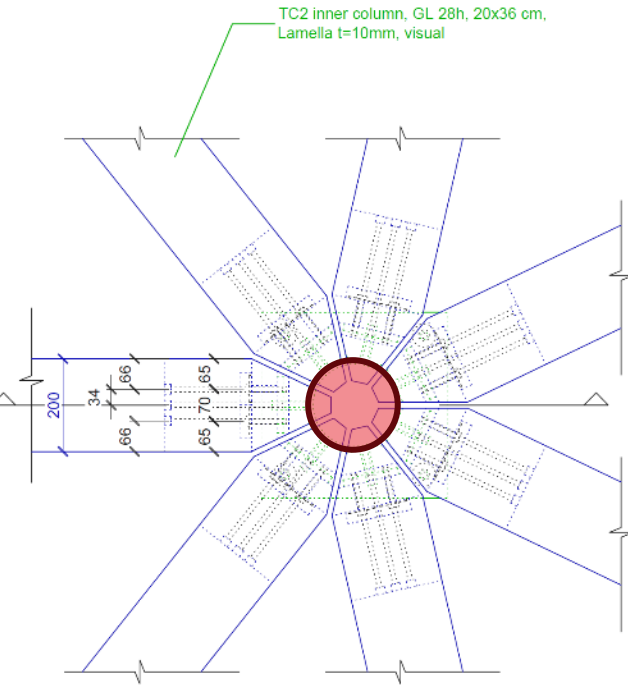
Back-of-house steel frame to reduce cost

Stability

- Front of house radial portal frames
- Back of house braced



Stability

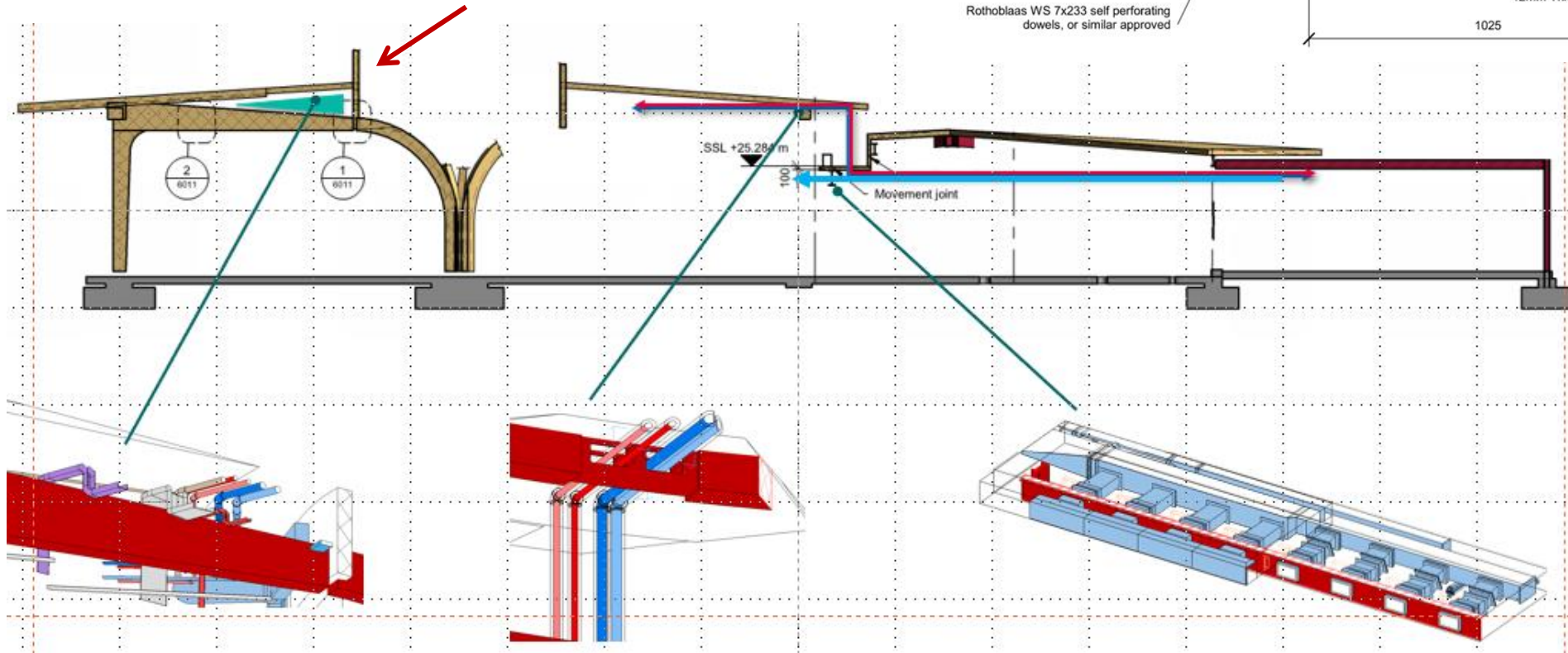
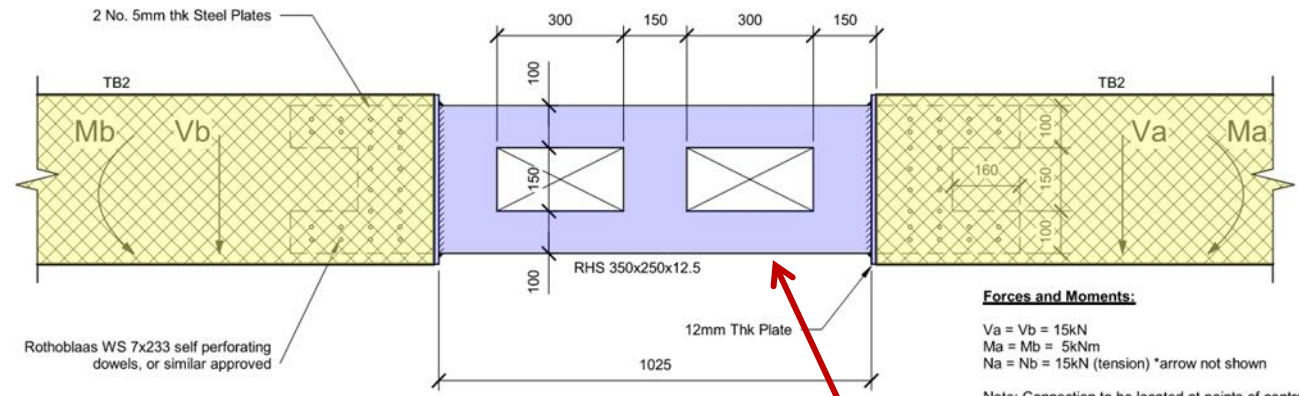


Central Tree Column Connection adds torsion and sway resistance for glulam portal frames



Invisible Coordination

MEP Zone above ceiling between glulam and CLT, keeps all services distribution invisible

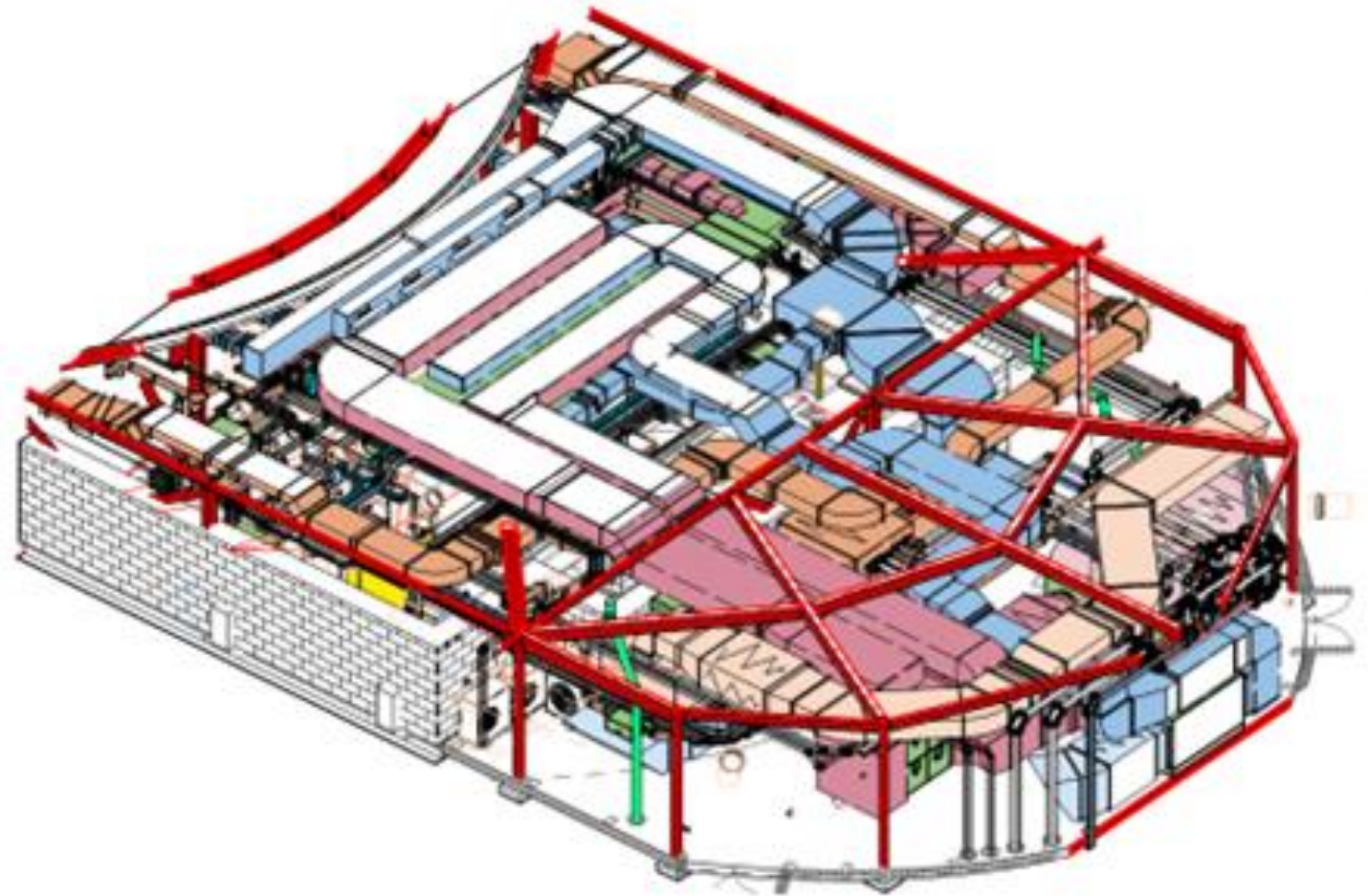


MEP holes incorporated into ring beam splices to allow invisible services connections from back of house to front of house and avoid holes in glulam

Digital SMEP Coordination

40% Gross area reduction

Catering and building services coordinated in BIM within minimised building envelope, enabling 40% reduction in back-of-house area



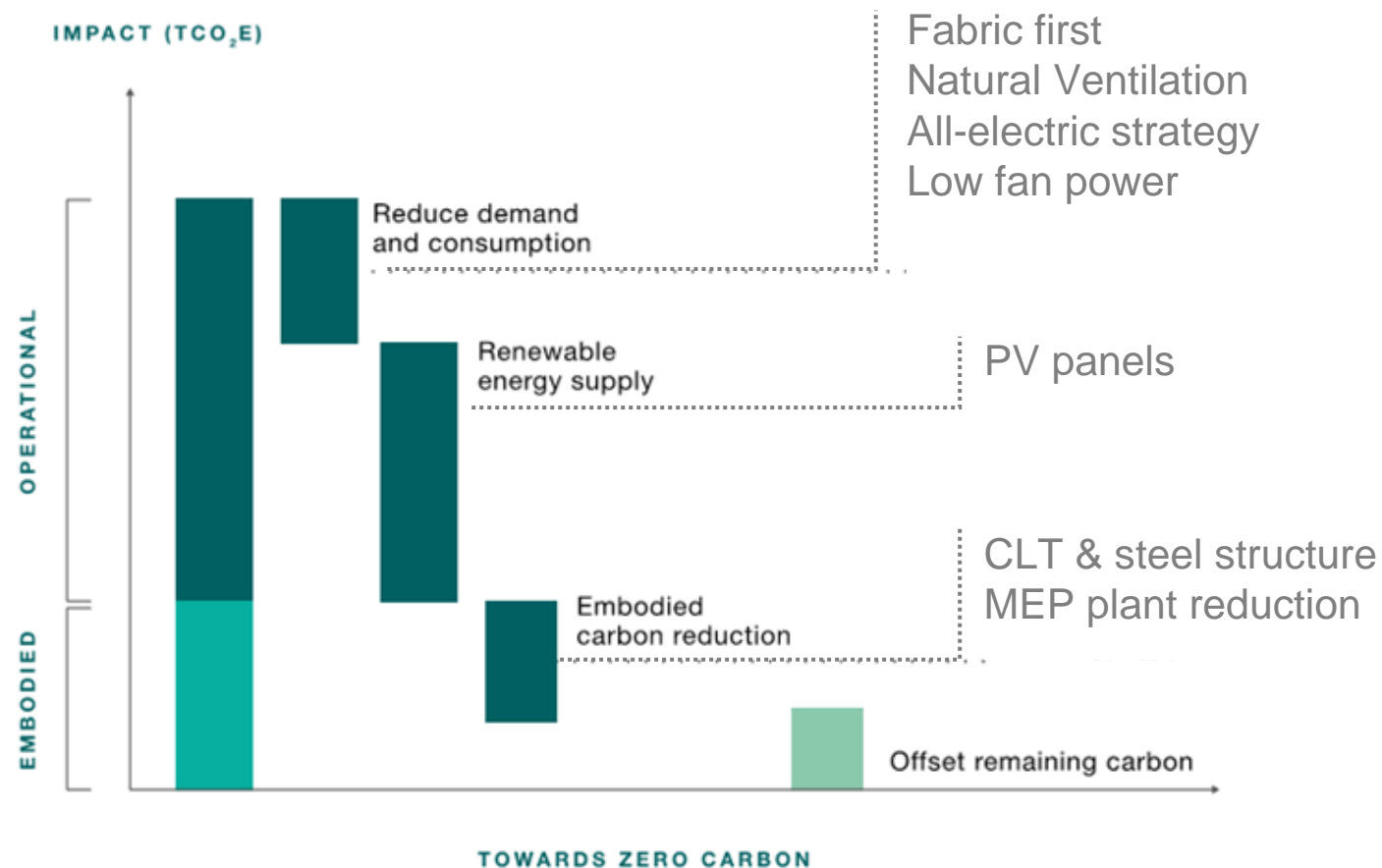


Net zero carbon by 2030
#GoZero

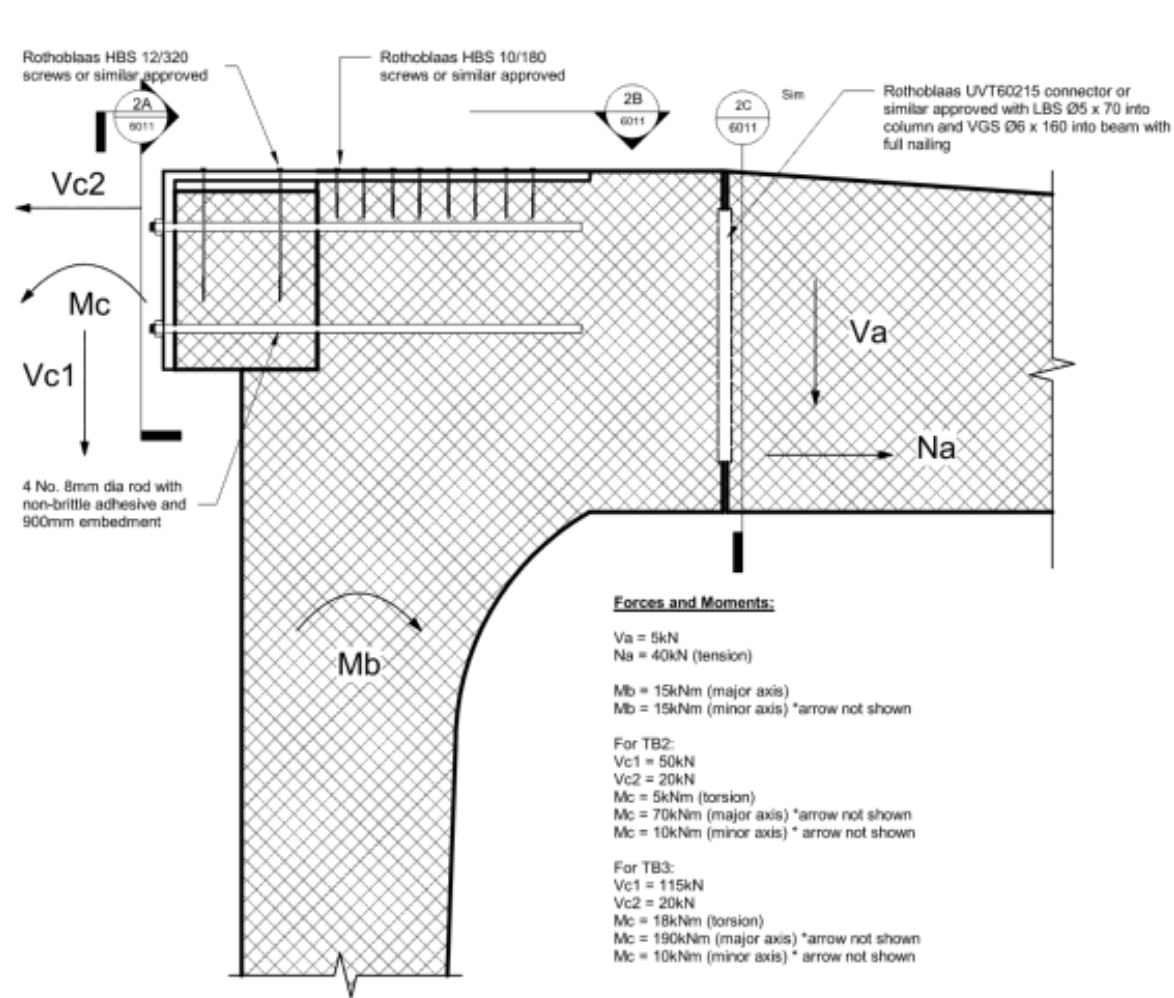
sky 13

Sustainability

- GoZero enabled
- 50% embodied carbon
- 46% energy improvement over Part L baseline
- 23% energy savings through efficiency/ low-carbon measures
- 31% renewable energy contribution
- No single-use plastics
- Take-back policy on packaging
- Modern Slavery case study

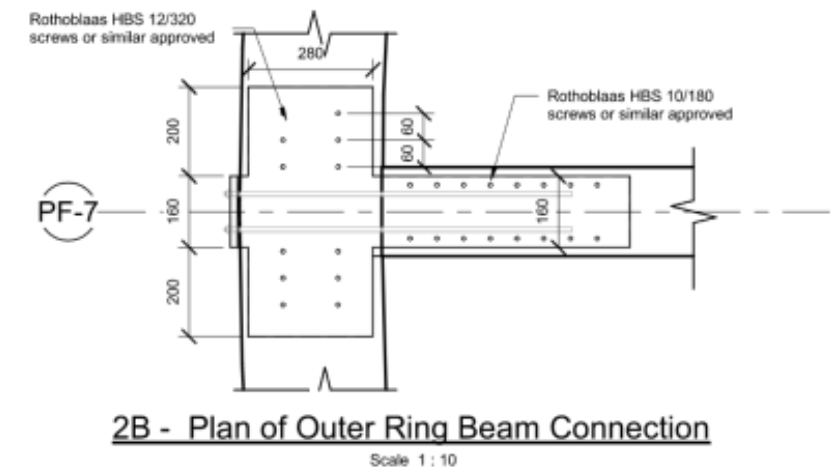
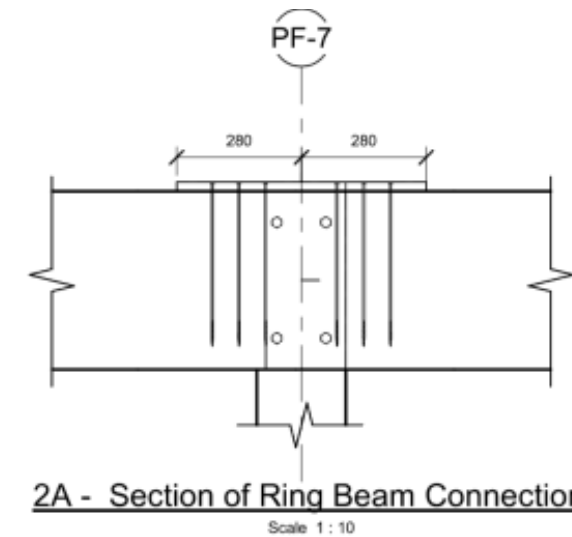


Outer ring beam portal connections

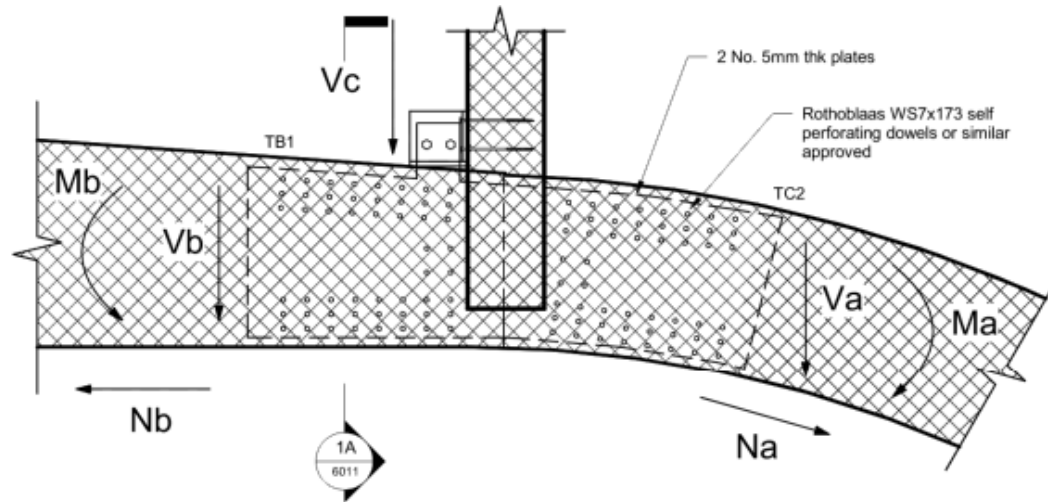


2 - FOH Outer Ring Beam Details

Scale 1 : 10



Inner ring beam connections

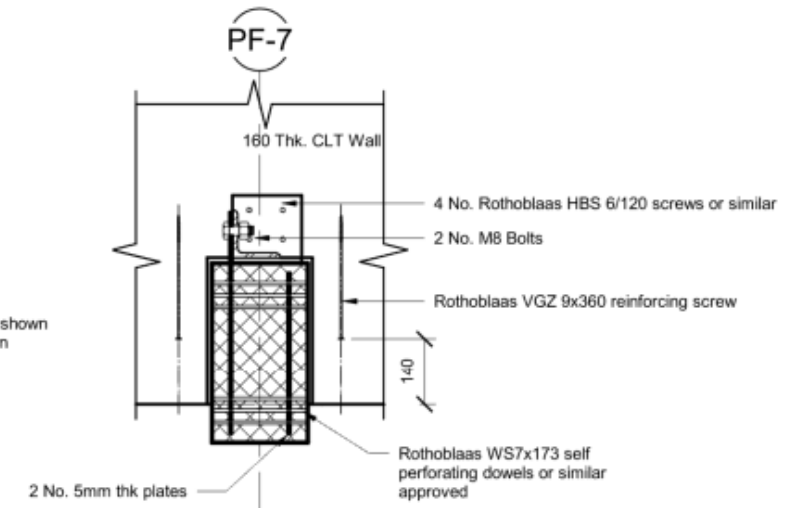


Forces and Moments:

$V_a = 30\text{kN}$
 $M_a = 35\text{kNm}$
 $N_a = 40\text{kN}$ (compression)

$V_b = 5\text{kN}$
 $M_b = 5\text{kNm}$
 $N_b = 40\text{kN}$ (tension)

$V_c = 20\text{kN}$
 $M_c = 35\text{kNm}$ (major axis) *arrow not shown
 $N_c = 60\text{kN}$ (tension) *arrow not shown



1 - FOH Inner Ring Beam Detail

Scale 1 : 10

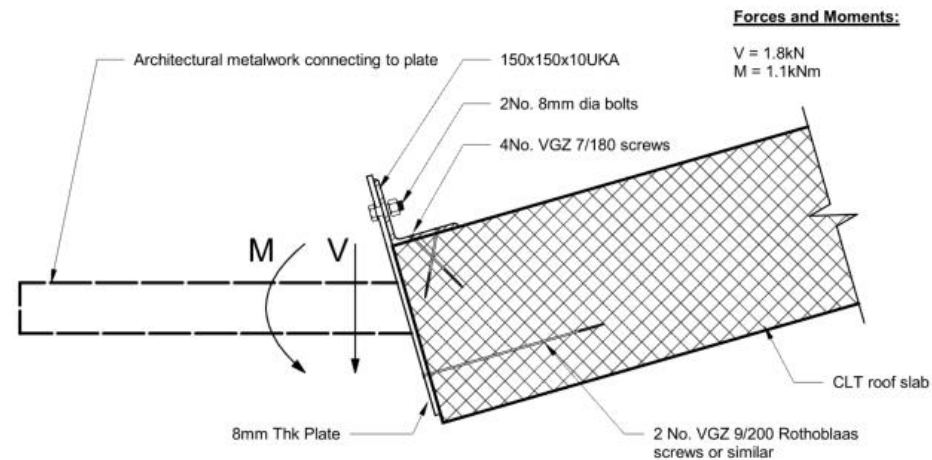
1A - FOH Inner Ring Beam Section

Scale 1 : 10

Rationalising geometry

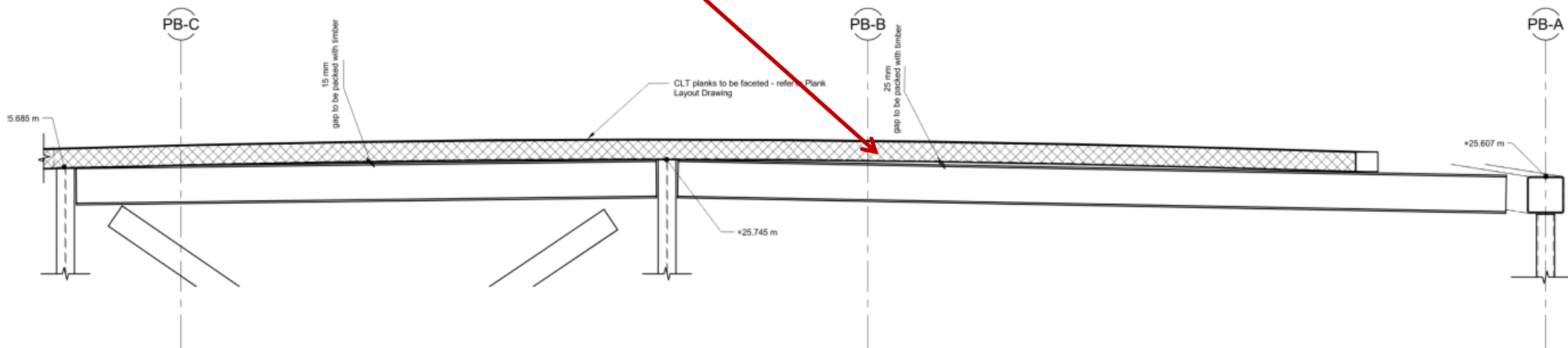
Gutter support beam resolves perimeter tolerances
 CLT planks facet

Packing zone CLT between CLT and steel to adjust tolerances



5 - Edge of Roof Slab Detail

Scale 1 : 10

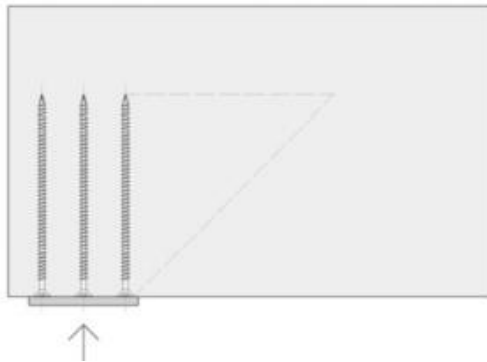


1 - BOH Steel to CLT interface

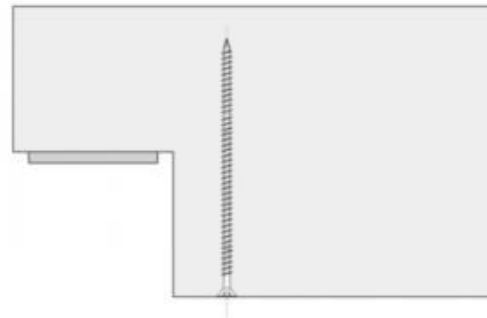
Scale 1 : 20

Typical Application of Screw Reinforcement

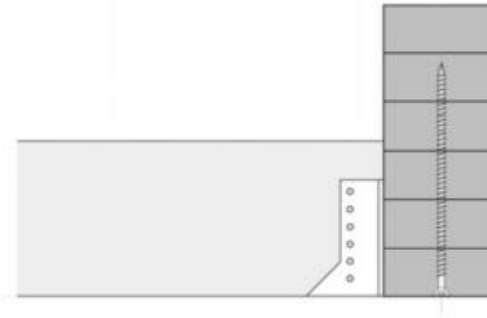
Lateral compression reinforcement of a bearing



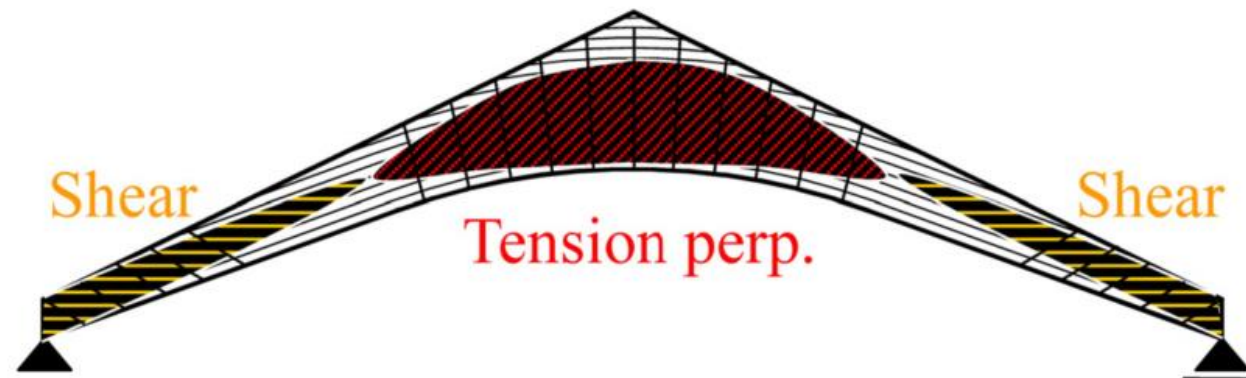
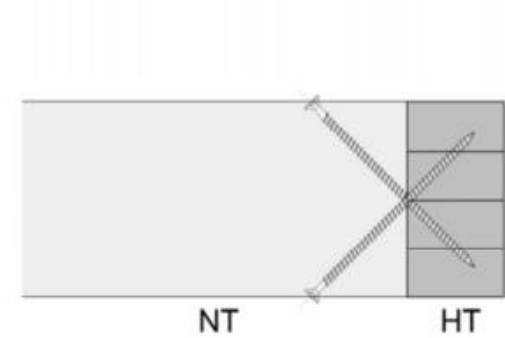
Lateral tension reinforcement of a notched bearing



Lateral tension reinforcement for a single load

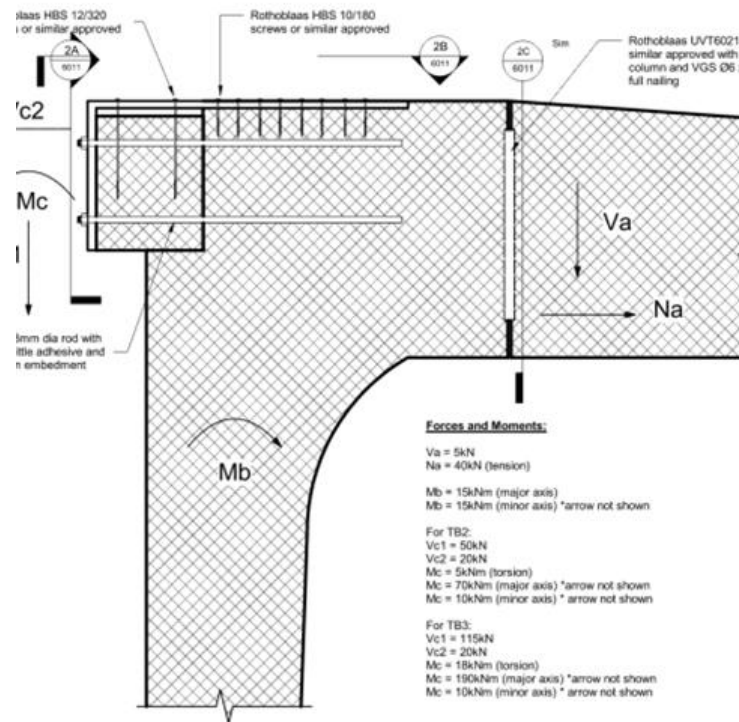


Connection of main and secondary girders



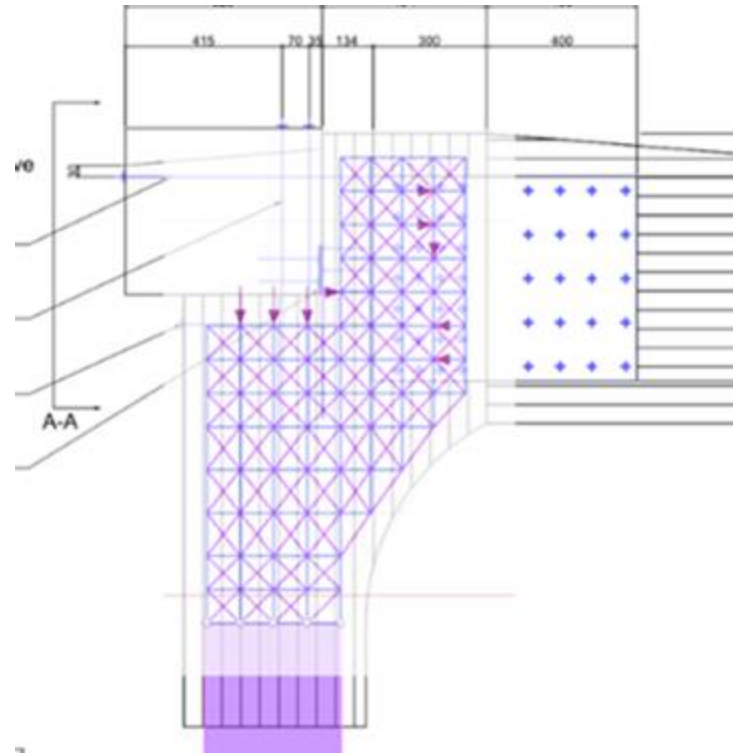
Screw Reinforcement

Strut and Tie Model



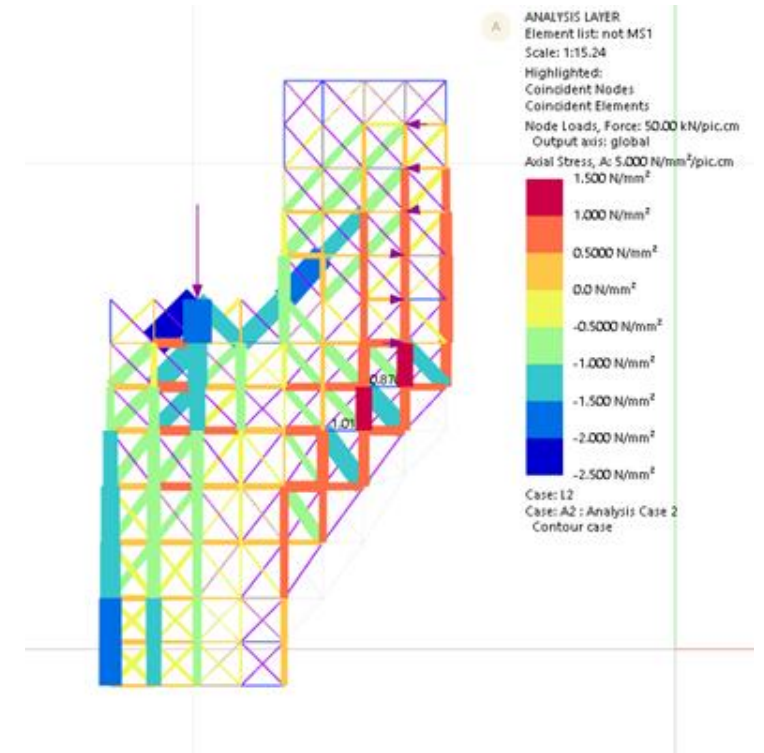
Tender geometry

Pin at knuckle



Modelling fabrication geometry

No pin at knuckle, pin moved to inner ring splice



Iterative strut-tie model to demonstrate stresses in timber / screw arrangement are safe



Sky Pavilion

Structural Timber Awards Winner



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