Inspirational timber projects and systems

Part II – structural systems & products

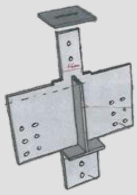
Sticks

- Small timber sections
- Simple connections
- In-situ construction
- AS1684

Typical 1-2 floors in Aus

Up to around five common internationally

Post and beam



- Glulam columns
- Glulam beams
- Fabricated steel nodes
- Solid timber slabs & joists

W.I.S.E, C.A.T.
Pat Borer and David Lea Arch's
UK

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Post and beam

- Steel columns
- Glulam beams
- Solid timber slabs

John Hope Gateway
Edward Cullinan Arch.
UK

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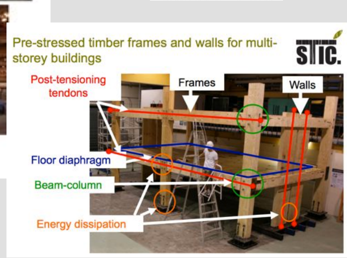
Post and beam

- Prestressed timber box beams
- LVL and plywood
- Solid timber slabs

STIC
NZ



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Post and beam

- Portals
- Plywood/LVL box beams
- 42m span

Auckland MOTAT
Studio Pacific Architecture
NZ

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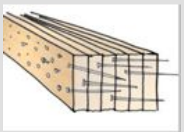
Solid panels/planes - products

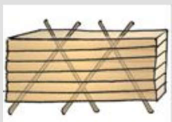
- Developed in central Europe in the 90s
- Size generally limited by transport restrictions
- Up to 500mm thick
- One producer in NZ

CROSS-LAMINATED-TIMBER

KLH Massivholz, StoraEnso, X-Lam

Solid panels/planes - products





- Low-grade timber
- Joined by timber dowel or nails

Brettstapel
Continental Europe and UK

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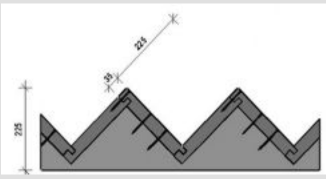
Solid panels/planes - products

- Low-grade timber
- Wenus panel system
- Exposed sofit
- Efficient span:material
- Requires jig to manufacture

Sandoz, iBois, EPFL



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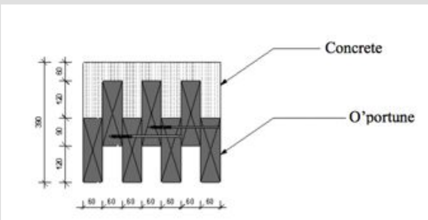
Solid panels/planes - products



- Low-grade timber
- Staggered system
- Exposed sofit
- Good structural depth
- Concrete topping can be used

Sandoz, iBois, EPFL

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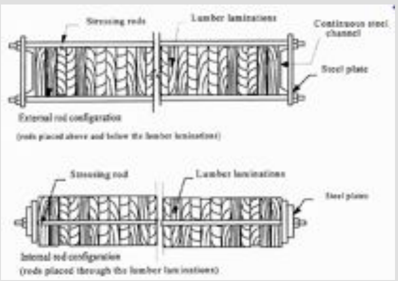
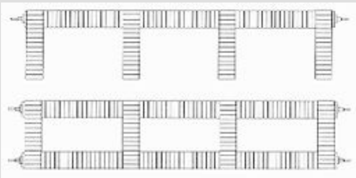
Solid panels/planes - products



- Low-grade timber
- Short elements in 'stressed skin'
- Compressed with threaded rod
- Common in Canadian bridge decks 1970 and 1980

Freedman, Kermani Napier uni

Duwadi, Ritter FWHA



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Solid panels/planes - products

- Low-grade timber
- Lamloc

Douglas Consultants Canada

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Solid panels/planes - products

- CLT2.0
- Lower capital base CLT manufacture
- Boards glued and stapled into placed rather than pressed

Douglas Consultants Canada

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Solid panels/planes - systems

- Floors/ceilings
- Low or high-tech solutions: CLT, Brettstapel etc
- On timber or other frame/walls
- Can provide floor diaphragm
- Architecturally expressed or concealed

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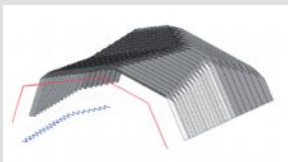
Solid panels/planes - systems

- Walls
- Can provide lateral stability system
- Architecturally expressed or concealed

Solid panels/planes - systems

- Folded plates, origami
- Folding structure introduces structural depth
- Simple connections are key

i Bois, EPFL



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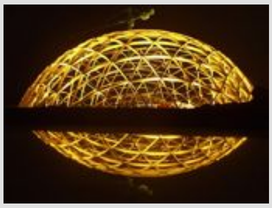
Dome

- Proprietary connection systems available for conventional geometry
- Connection design is key
- Typically glulam elements joined at metal nodes
- Efficient
- Often chosen due to cost
- Superior Dome Michigan 165m span

Haring.ch
Cowley Timberwork





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Dome

- More complex arrangements possible
- Can lead to very onerous forces and complex nodes

Scunthorpe Sports Academy
Andrew Wright Architects
UK


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Gridded surfaces – small elements

- Small elements bent in-situ
- Grid around 500mm to 1m
- Double curvature is key
- Base connection critical
- Construction process
- In plane bracing important

Manheim Gridshell, Frei Otto, Ger
Japan Pavillion, Shigeru Ban, Hanover Expo

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Gridded surfaces – small elements

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GRIDSHELL
Weald and Downland, Edward Cullinan Arch.
Windsor Great Park Gridshell Glenn Howells Arch
UK

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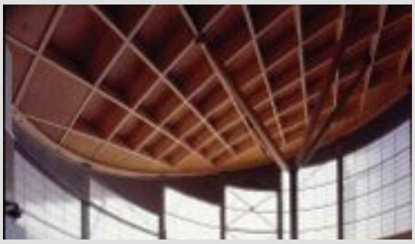
Gridded surfaces – large elements



- Large rigid elements
- Typically LVL or glulam
- Grid around 500mm to 1.5m
- Arrangement gives bending stiffness
- Connection within grid is critical
- Point supports can be awkward

LAMELLA STRUCTURES

Gridded surfaces – large elements

- Large elements
- Typically LVL or 'glulam'
- Multi-layer triangulated grid
- Rationalising members is key
- Double curvature helps
- Fabrication is critical
- Cost

Metz Pompidou, Shigeru Ban, France
Yeoju Golf club, Korea

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Questions?

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