Increasing Urban Density with Steel and Timber: XRAD and SPIDER Systems

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Increasing Urban Density with Steel and Timber: XRAD and SPIDER Systems

Hannes Blaas – US CEO
Jason Cattelino – US/CA Technical Consultant
Case Studies

**SPIDER**
Aggie Park - Texas

**X-RAD**
Hotel Schwartz – Austria
SPIDER – Structural System

The first post and plate connector for horizontal CLT slabs

Provides a solution for large concentrated loads at columns

Resolves characteristic rolling shear failure of CLT – punching shear

Exploits the mechanical behavior of CLT for plate bending – increases utilization of wood throughout a building
SPIDER - Mechanics

LOAD FROM TOP STORIES

LOAD FROM THE CLT SLAB

TOTAL LOAD
SPIDER - Mechanics

REINFORCEMENT TO ROLLING SHEAR

REINFORCEMENT COMPRESSION
PERPENDICULAR TO THE GRAIN
**SPIDER – Traditional Framing**

Traditional Framing System

Optimized Framing System
**SPIDER – Panel Connection Options**

- **XEPOX Epoxy + Steel Plate**

- **VGS Fully Threaded Screws + Concrete**
SPIDER – Benefits

Eliminates beam framing members = material cost savings & potential labor savings

Reduced number of connections at columns

Simplified MEP layout and runs

Decreases floor-to-floor height – allows for additional levels within height limitations

Maximizes column grid spacing for greater flexibility in floor layouts

Simplifies detailing and maximizes accessibility for curtain wall design and installation
SPIDER – Case Study: Aggie Park – Project Details

Project
20 acre development of outdoor green space at Texas A&M.

Location
College Station, TX

Building Architect
Lake|Flato

Structural Engineer
Fast + Epp

Installers
R.M. Rodgers, Inc and Binkley Construction
SPIDER – Case Study: Aggie Park – Project Details

4" HOLE IN CLT PANE.

V21M1 SMARTLAM 7-ALT
9 5/8" CLT

4x 7/16"Ø A325 COUNTERSUNK BOLTS
BLEVE BOLT WITH HEADS AT 45 DEGREES, OR APPROVED EQUIVALENT

SPI60S240 CONNECTOR
CUSTOM DIMENSIONED FOR 9 5/8" CLT

14x VGS 3/8"Øx 4 3/4"
REINFORCING SCREWS.

7.5" x 5/8" PLATE TAPPED TO ALLOW COUNTERSUNK BOLTS TO THREAD INTO IT.

HSS AS PER PLAN
HSS5x5x1/4
HSS6x6x5/16

Hannes Blaas and Jason Cattelino
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SPIDER – Case Study: Aggie Park – Installation Training
SPIDER – Case Study: Aggie Park – Installation
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SPIDER – Case Study: Aggie Park – Conclusions

Accelerated construction schedule was dependent on design schedule

Off the shelf solutions and design assist/support from Rothoblaas ensured project schedule was met

Low risk solution confirmed by product testing

Installation and tolerance considerations for panel-to-panel connections
X-RAD – Structural System

Innovative connection system ideal for CLT wall applications

Provides a solution for in-plane loads in all directions

Reduces the number of connection points

Compliments the prefabrication and modularity of CLT construction
X-RAD - Mechanics

Traditional Connection System

X-RAD System
X-RAD – Components and Options

X-ONE
Installed on a CLT panel to create a building module

X-PLATE
Provides options for connecting building modules and assembling them in various configurations

X-SEAL
Pre-shaped airtightness and noise abatement
**X-RAD** – Design Versatility for ALL Locations Within a Structure

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Diagram showing the locations for TOP, MID, and BASE within a structure.
X-RAD – Case Study: Hotel Schwartz – Project Details

Project
3 story mass timber addition over 2 stories of existing masonry

Location
Obermieming, Austria

Height: 30’-6”

Length: 50’-0”
Additional bearing walls or framing not permitted on existing lower floors

CLT walls were designed as 3-story deep beams spanning between masonry wall supports
X-RAD – Case Study: Hotel Schwartz – Solution

New floors and roof supported by the deep beams

CLT and X-RAD resolve in-plane shear forces, compression and tension

Steel beams used as tension and compression chords
X-RAD – Case Study: Hotel Schwartz – Installation
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X-RAD – Case Study: Hotel Schwartz – Project Details
X-RAD – Case Study: Hotel Schwartz – Conclusions

Preinstalled and reduced number of connections = decreased installation time

Similar connection detailing between CLT elements and steel elements

Connector stiffness provided verification of deep beam behavior

Ductile performance for seismic areas

Concentrated connection areas within the plane of CLT

- reduced interference with floor structural connections

- Simplified fire protection
THANK YOU FOR YOUR ATTENTION