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

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Steel-Timber Conference

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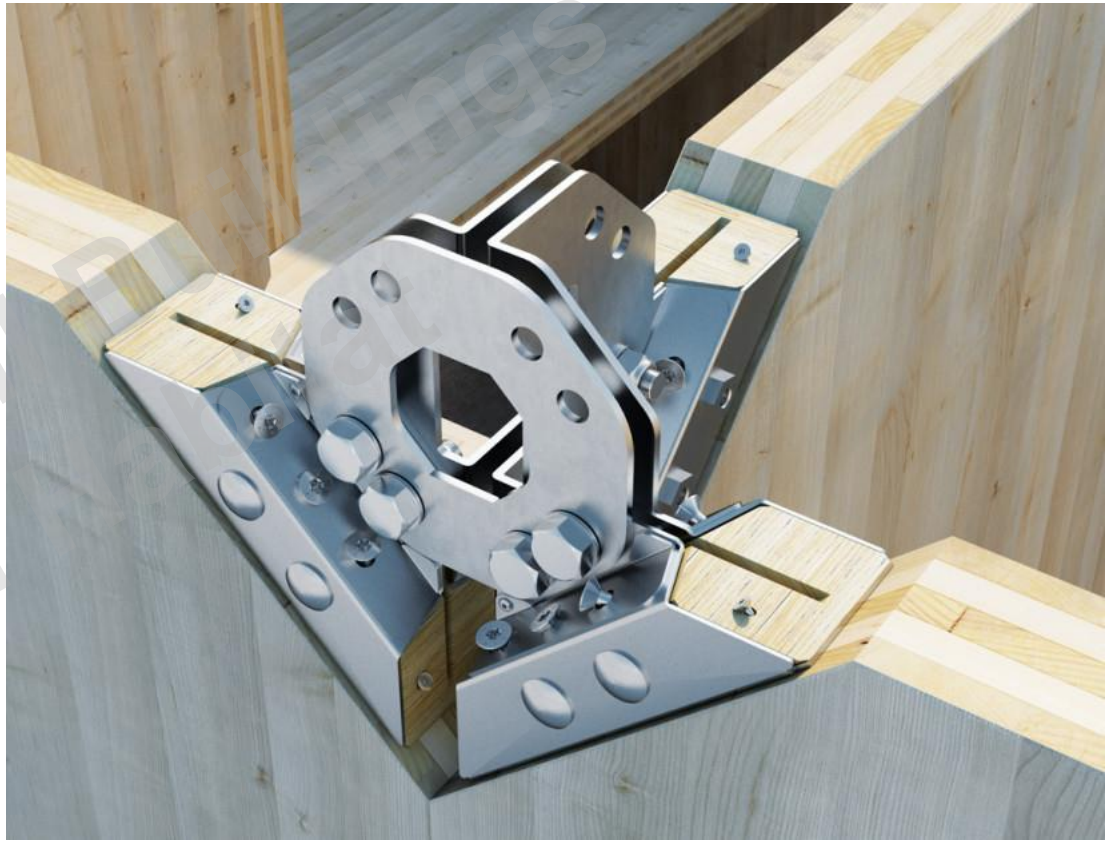
Jason Cattelino – US/CA Technical Consultant

Case Studies

SPIDER

Aggie Park - Texas



X-RAD

Hotel Schwartz – Austria

SPIDER – Structural System

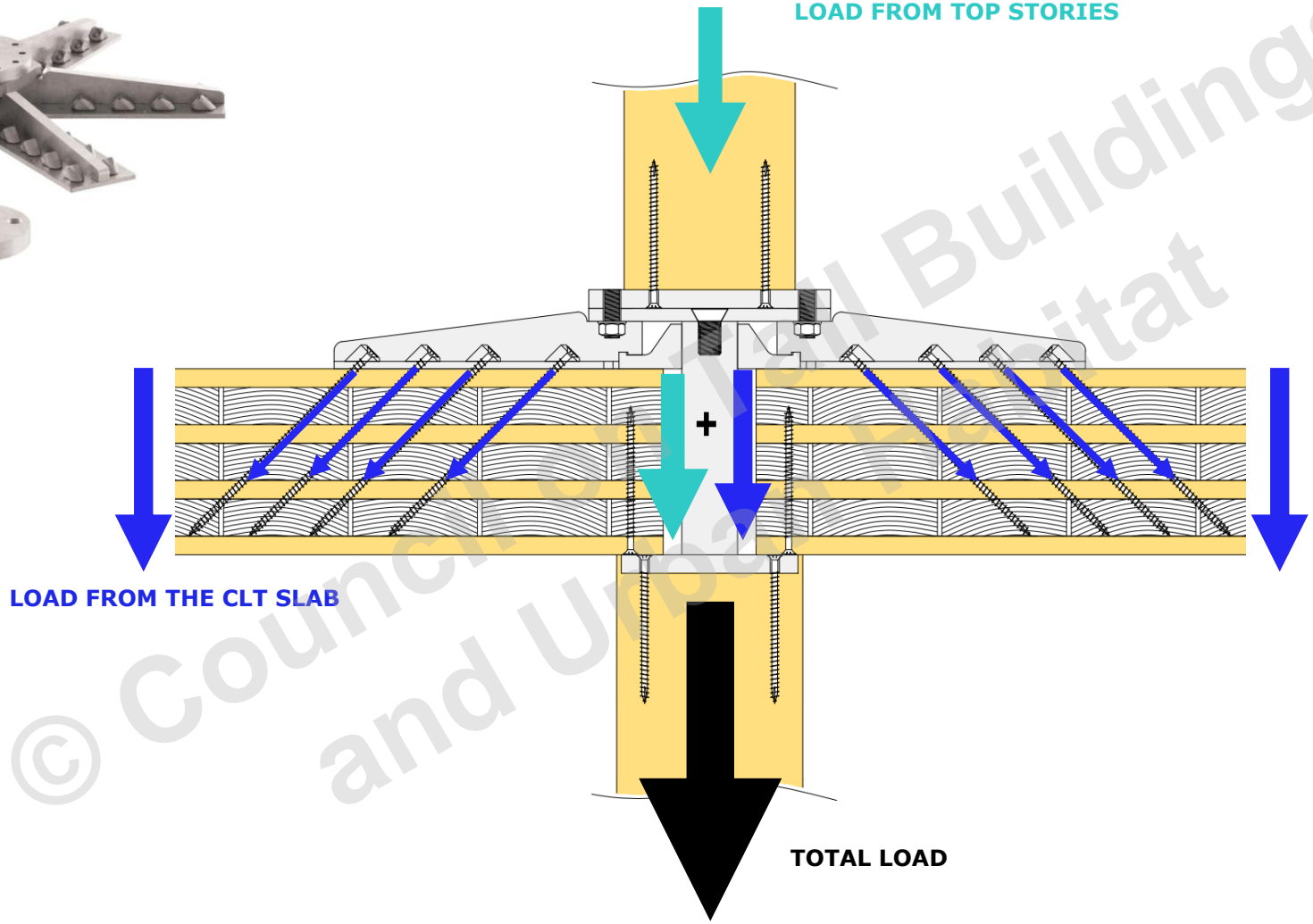
The first post and plate connector for horizontal CLT slabs

Provides a solution for large concentrated loads at columns

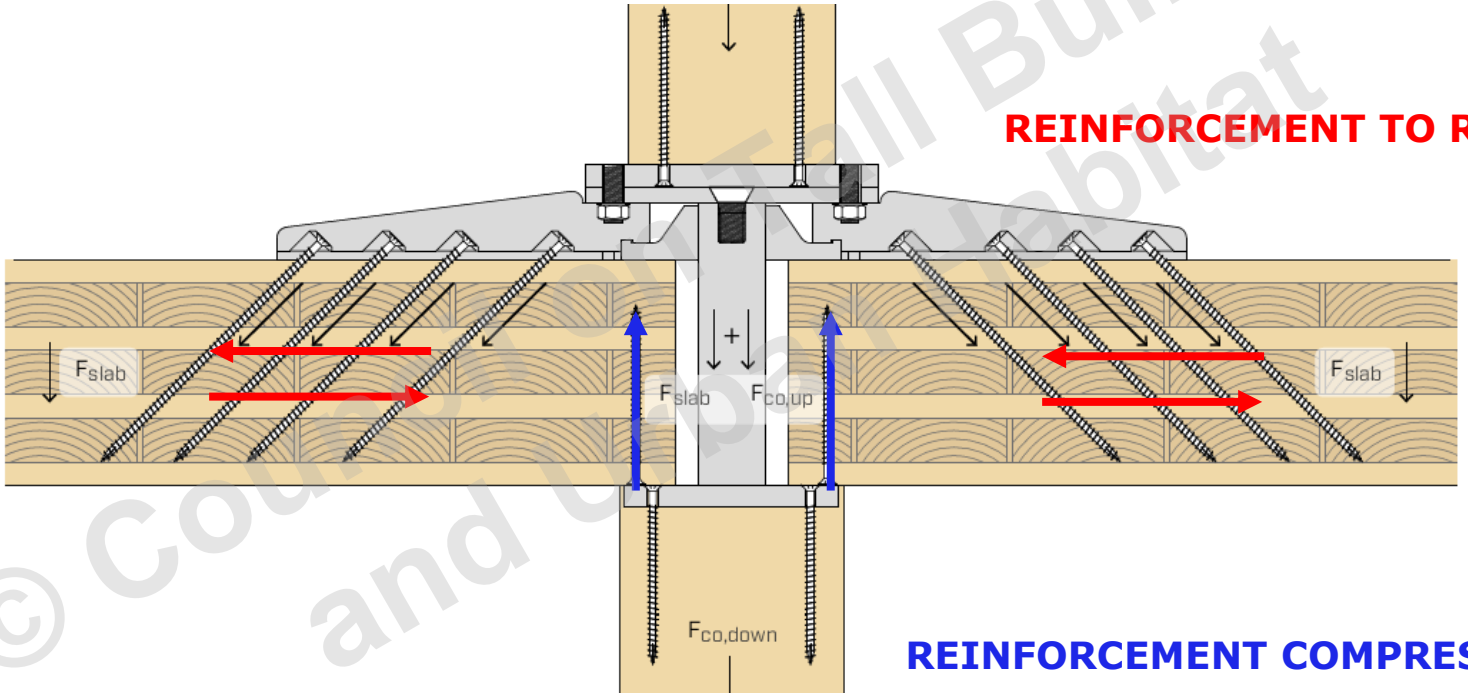
Resolves characteristic rolling shear failure of CLT – punching shear

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

SPIDER - Mechanics



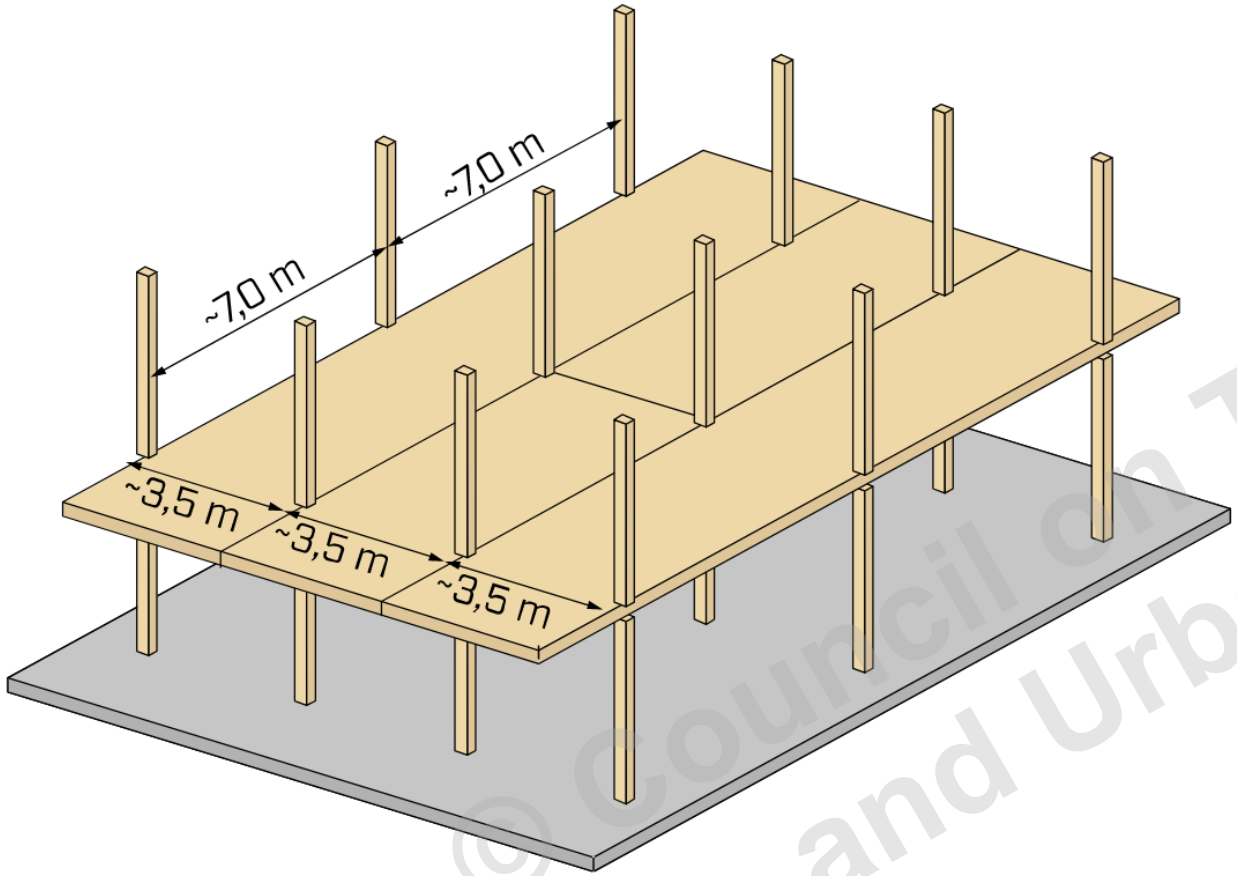
SPIDER - Mechanics



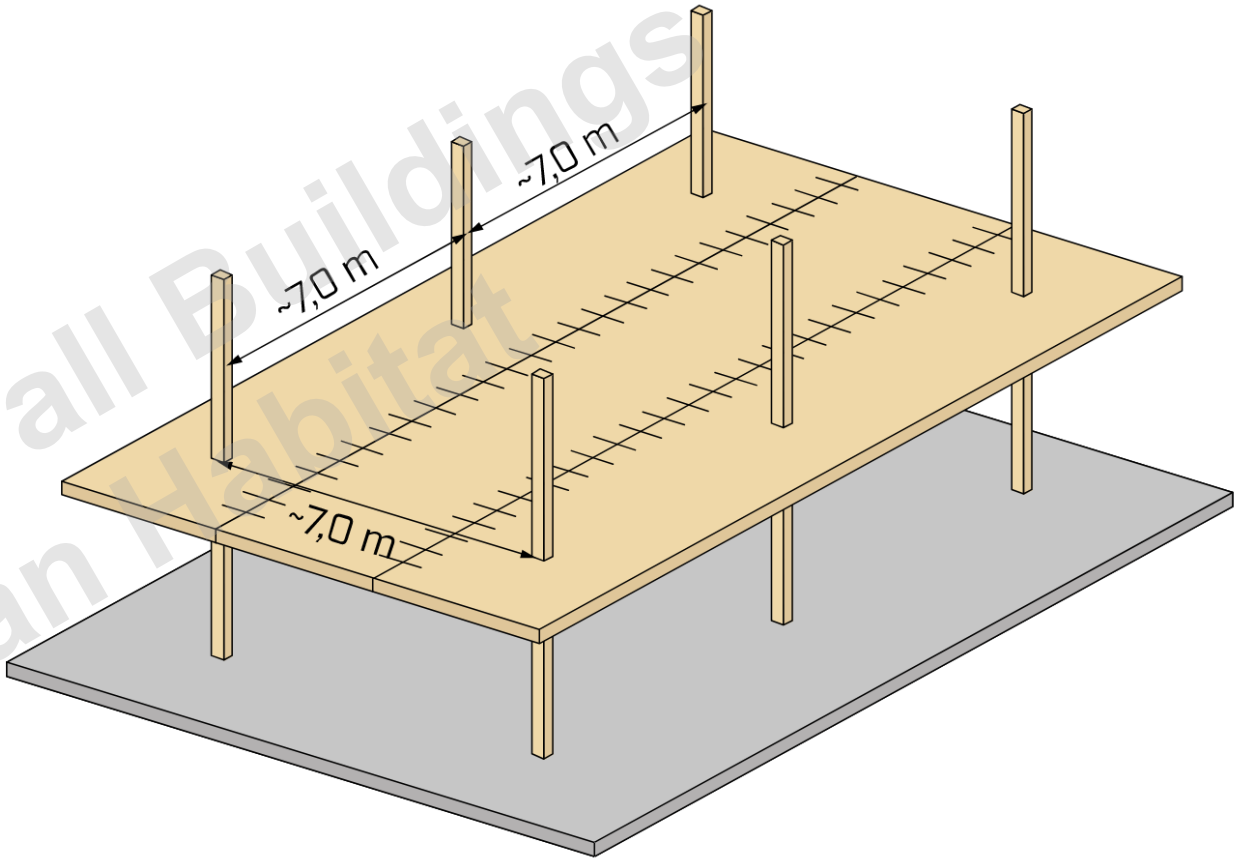
REINFORCEMENT TO ROLLING SHEAR

REINFORCEMENT COMPRESSION PERPENDICULAR TO THE GRAIN

SPIDER – Traditional Framing

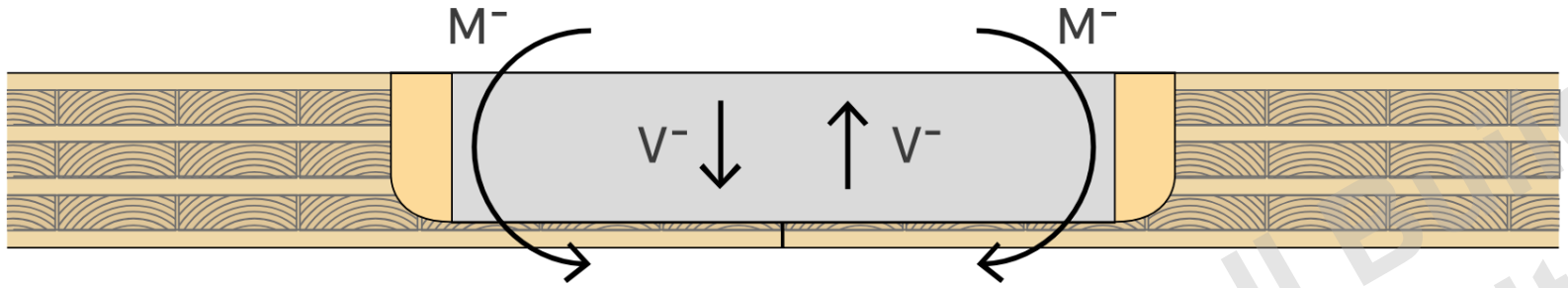


Traditional Framing System

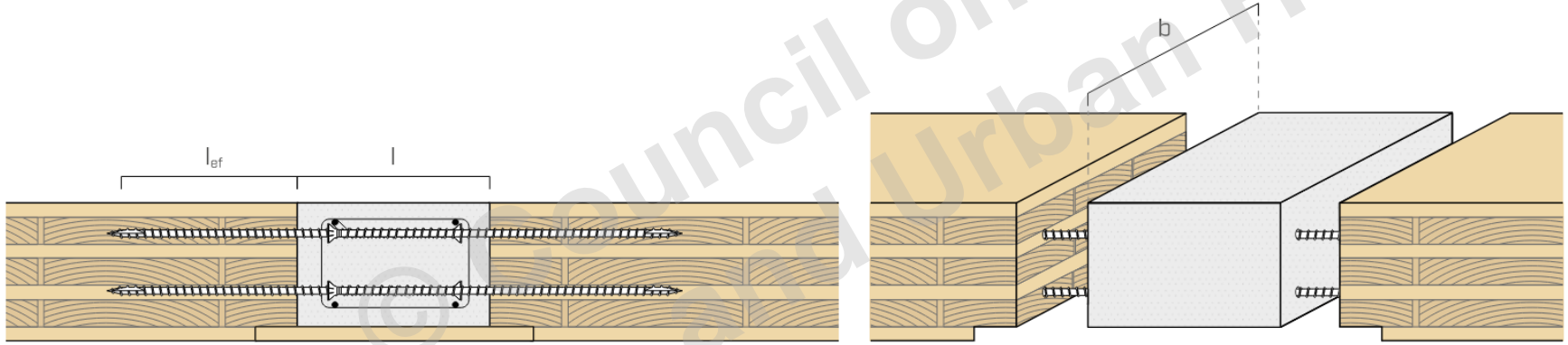


Optimized Framing System

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

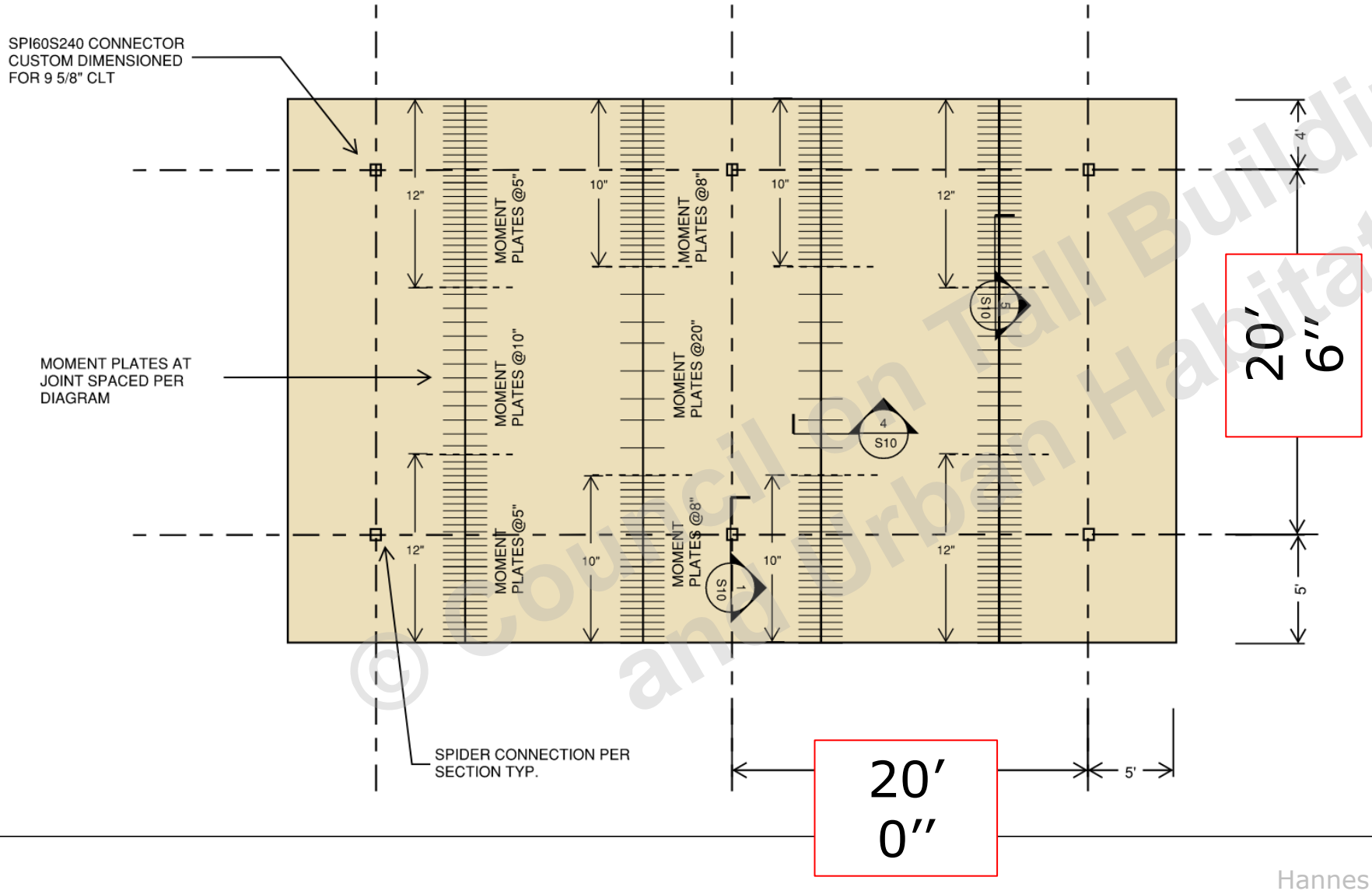
Simplified MEP layout and runs

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 accessiblity 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.

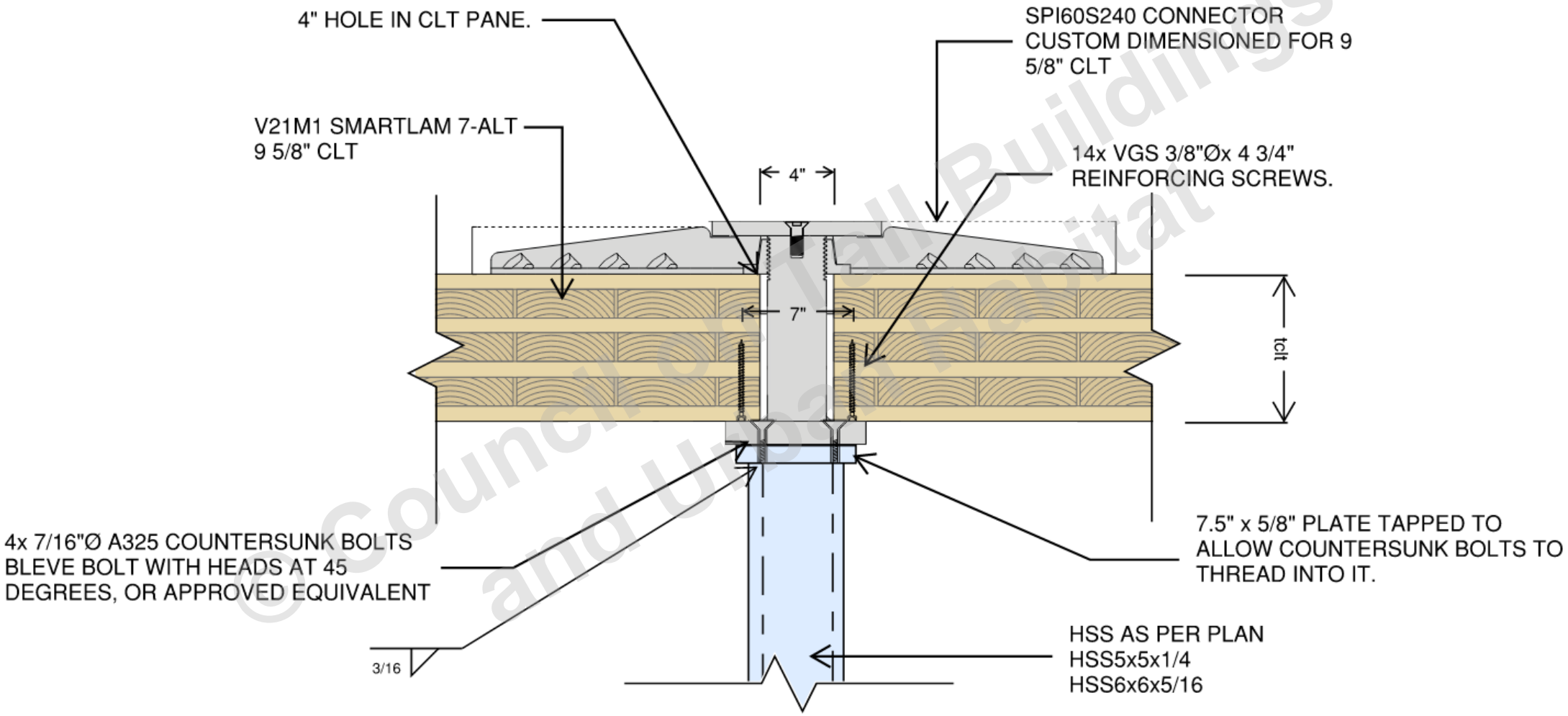
Location
College Station, TX

Building Architect
Lake|Flato

Structural Engineer
Fast + Epp

Installers
R.M. Rodgers, Inc and Binkley Construction

SPIDER – Case Study: Aggie Park – Project Details



SPIDER – Case Study: Aggie Park – Installation Training

SPIDER – Case Study: Aggie Park – Installation

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SPIDER – Case Study: Aggie Park – Installation

SPIDER – Case Study: Aggie Park – Installation

SPIDER – Case Study: Aggie Park – Conclusions

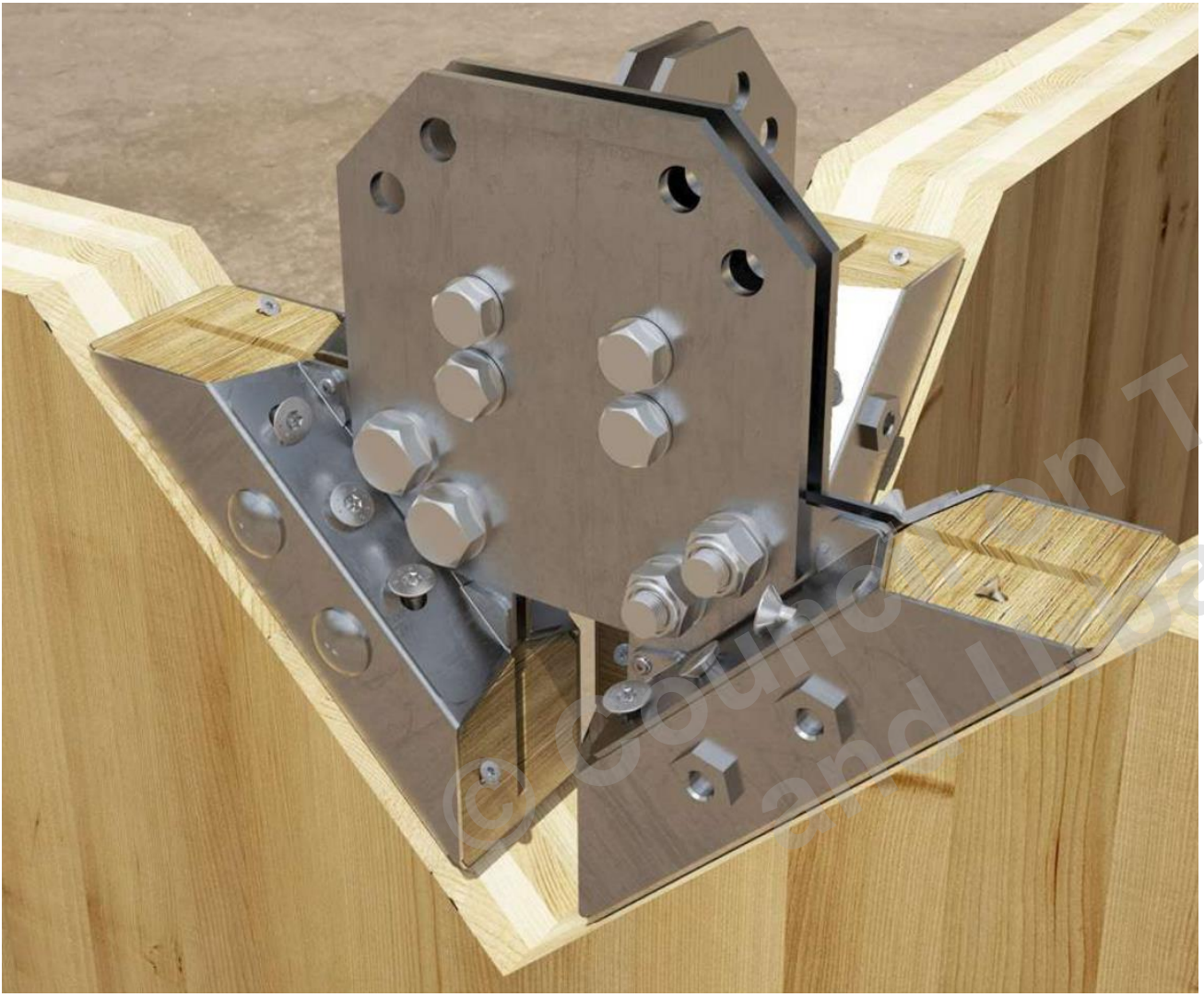
Accelerated construction schedule was dependent on design schedule

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



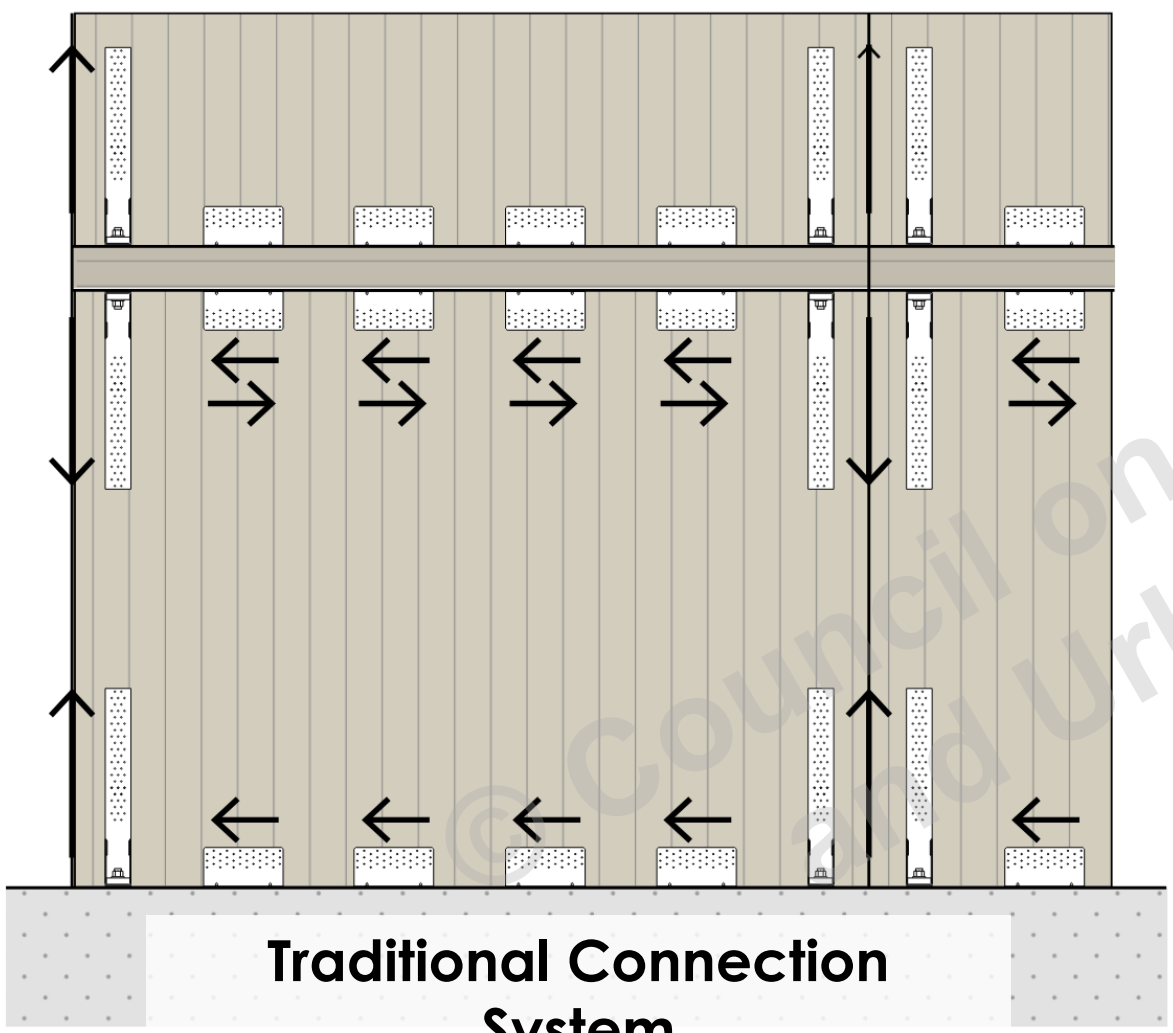
Innovative connection system ideal for CLT wall applications

Provides a solution for in-plane loads in all directions

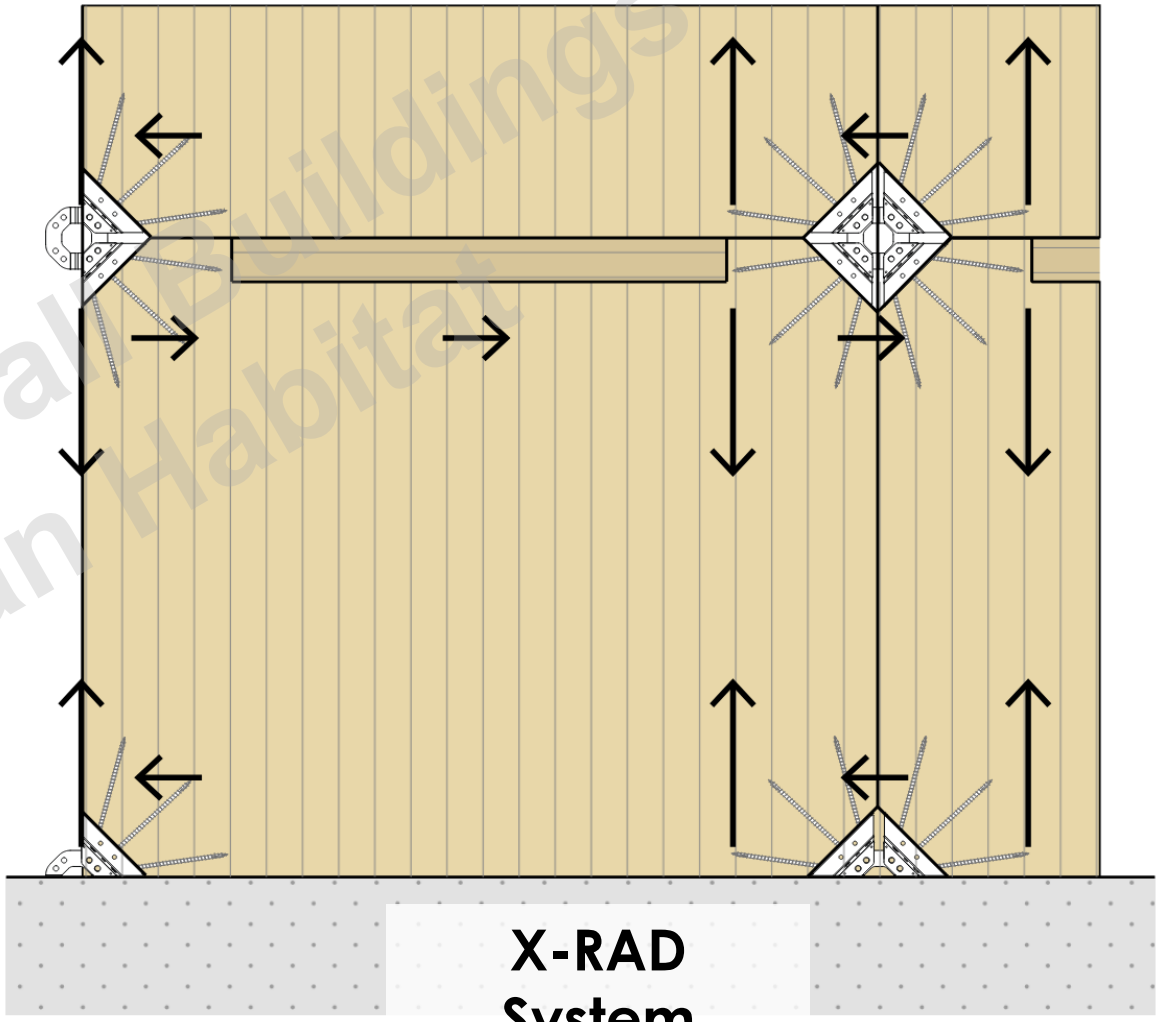
Reduces the number of connection points

Compliments the prefabrication and modularity of CLT construction

X-RAD - Mechanics



Traditional Connection System

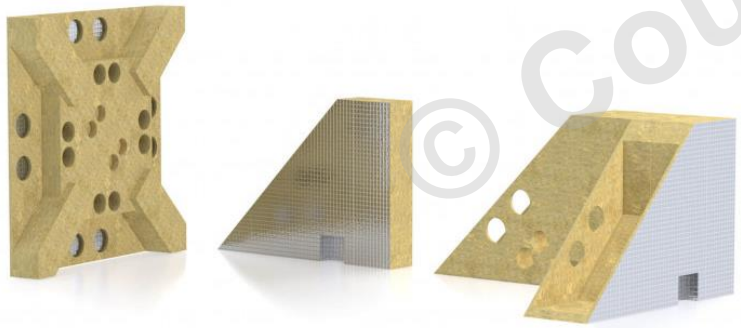


X-RAD System

X-RAD – Components and Options

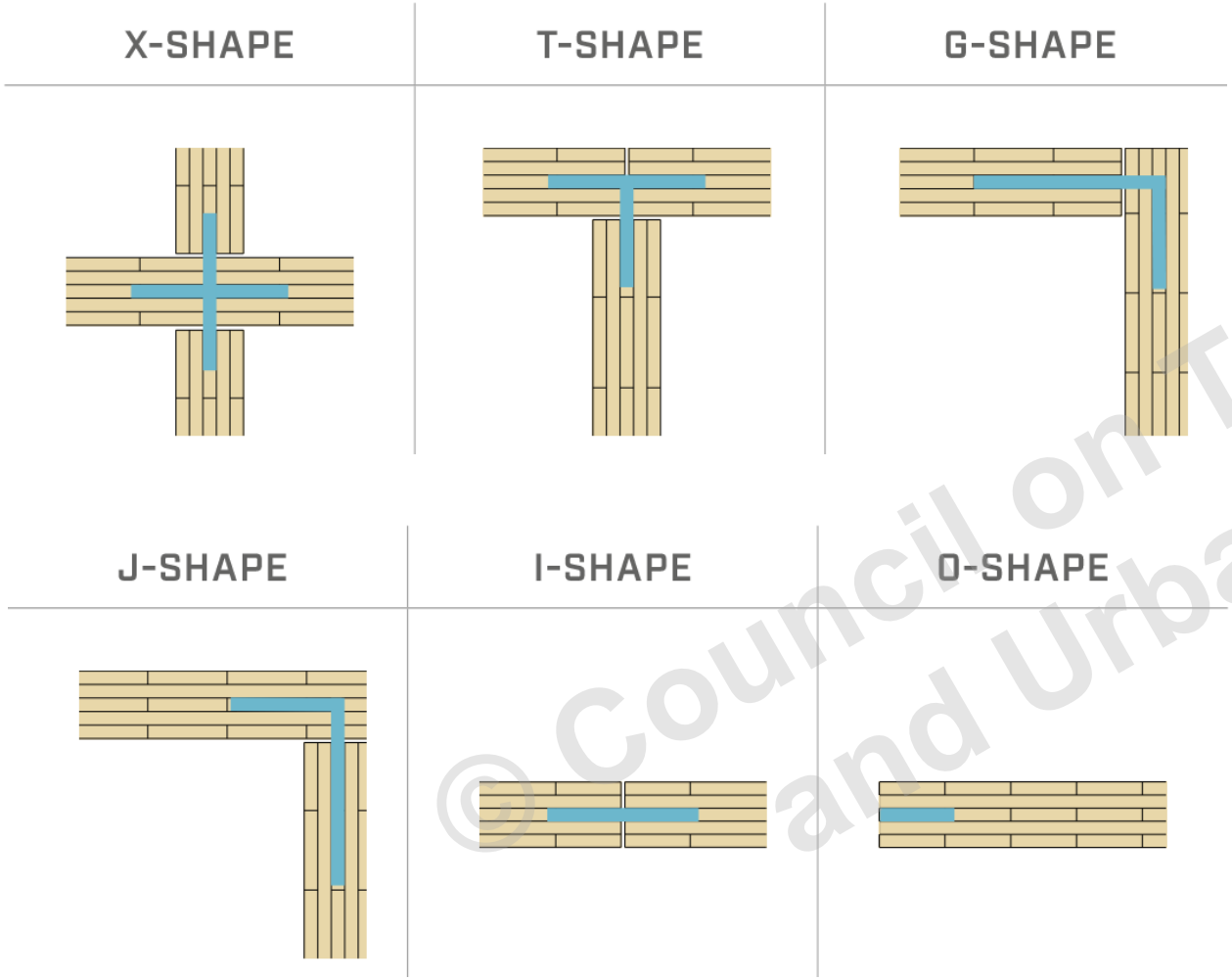
X-ONE
Installed on a CLT panel to create a building module

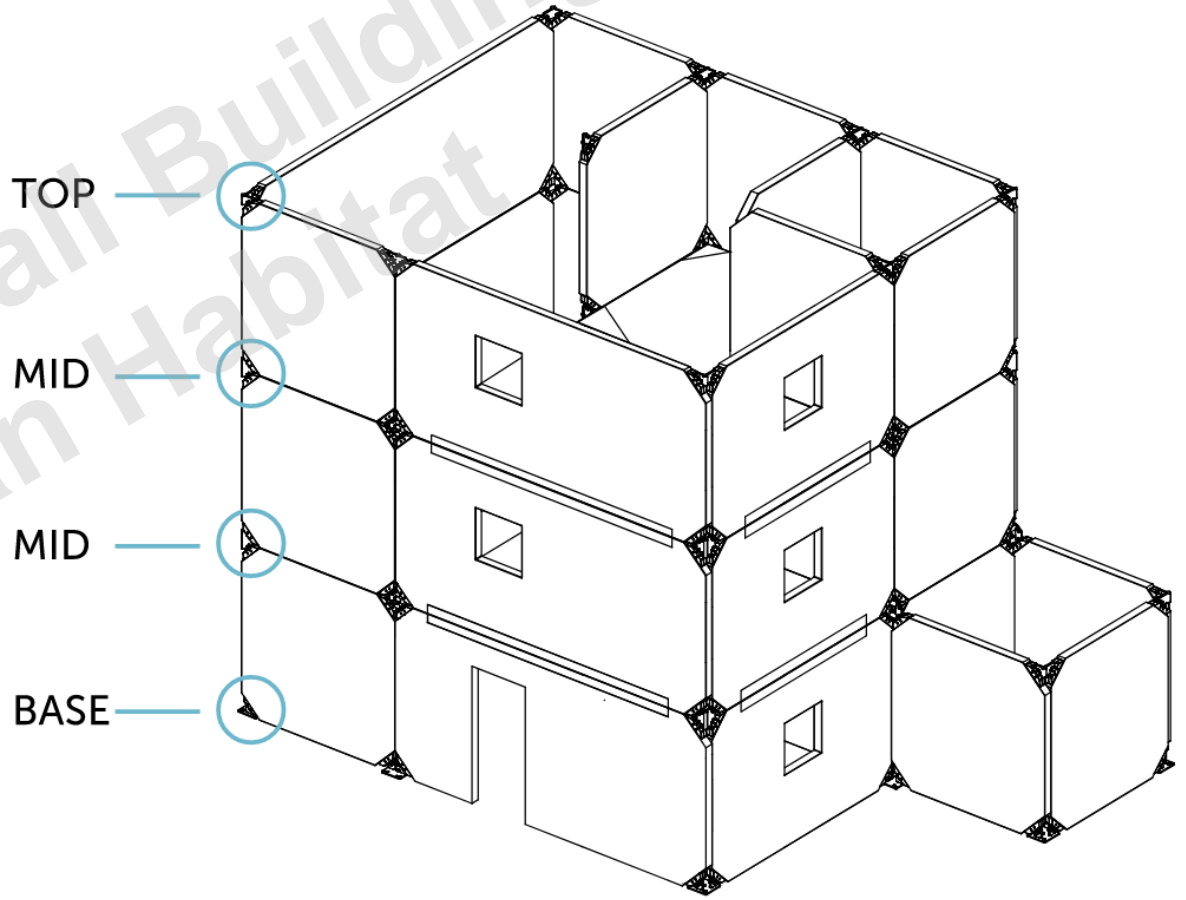
X-PLATE
Provides options for connecting building modules and assembling them in various configurations



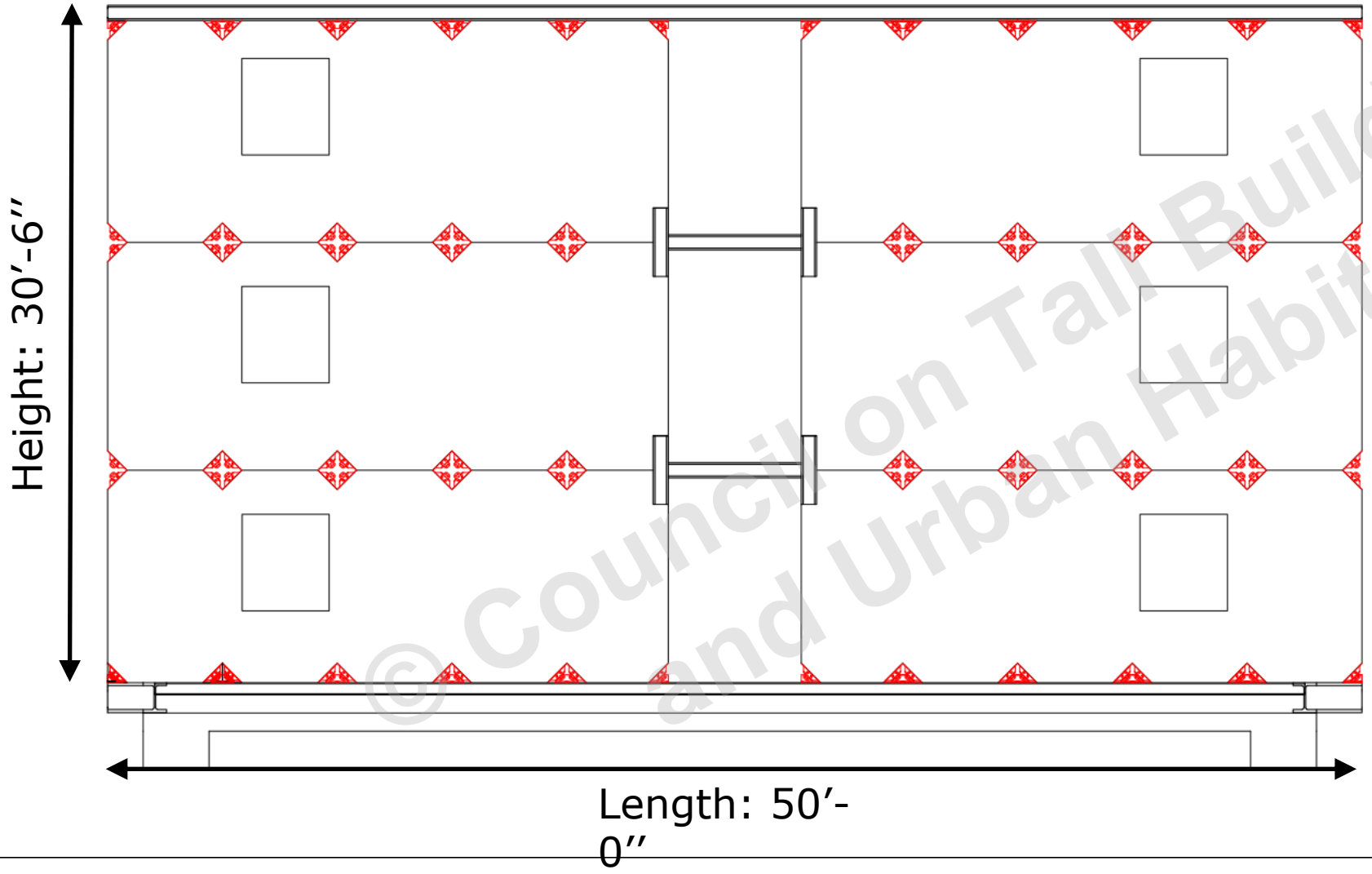
X-SEAL
Pre-shaped airtightness and noise abatement

X-RAD – Design Versatility for ALL Locations Within a Structure





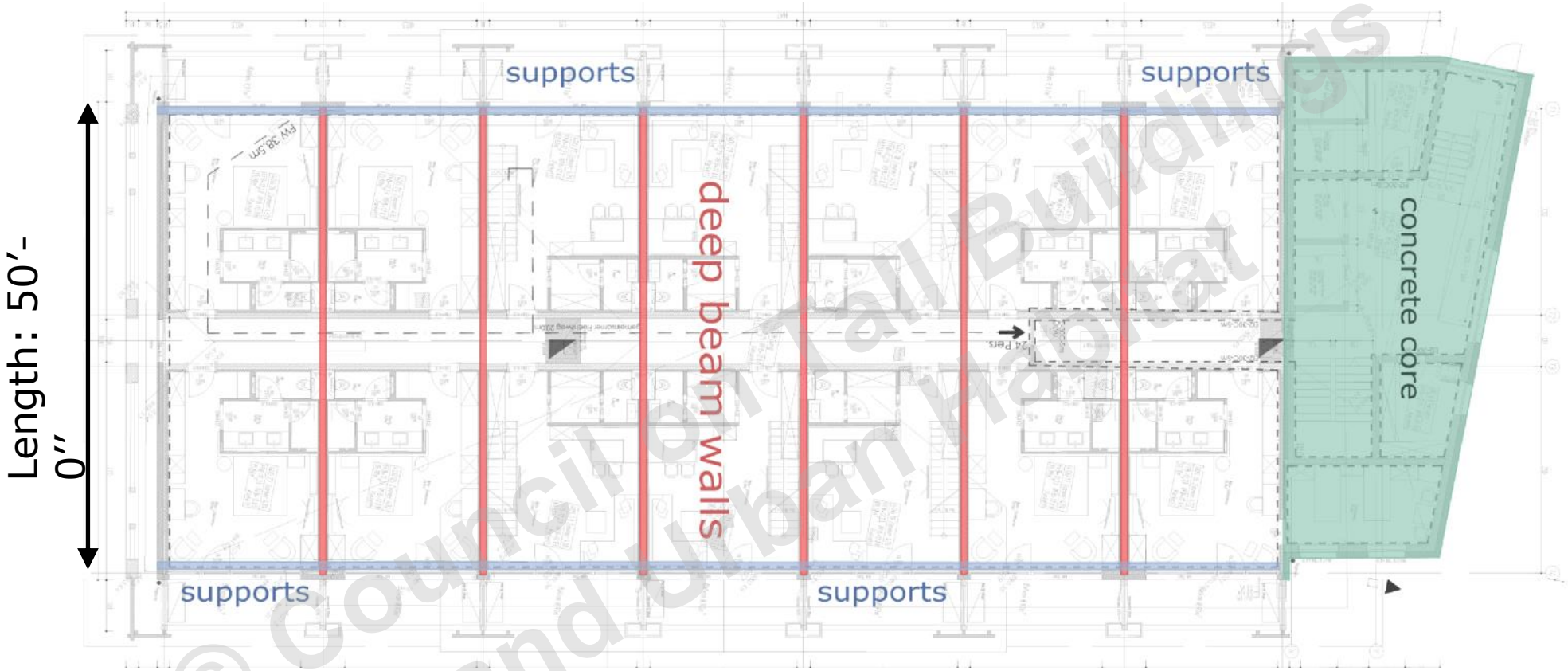
X-RAD – Case Study: Hotel Schwartz – Project Details



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

Location
Obermieming, Austria

X-RAD – Case Study: Hotel Schwartz – Solution



Additional bearing walls or framing not permitted on existing lower floors

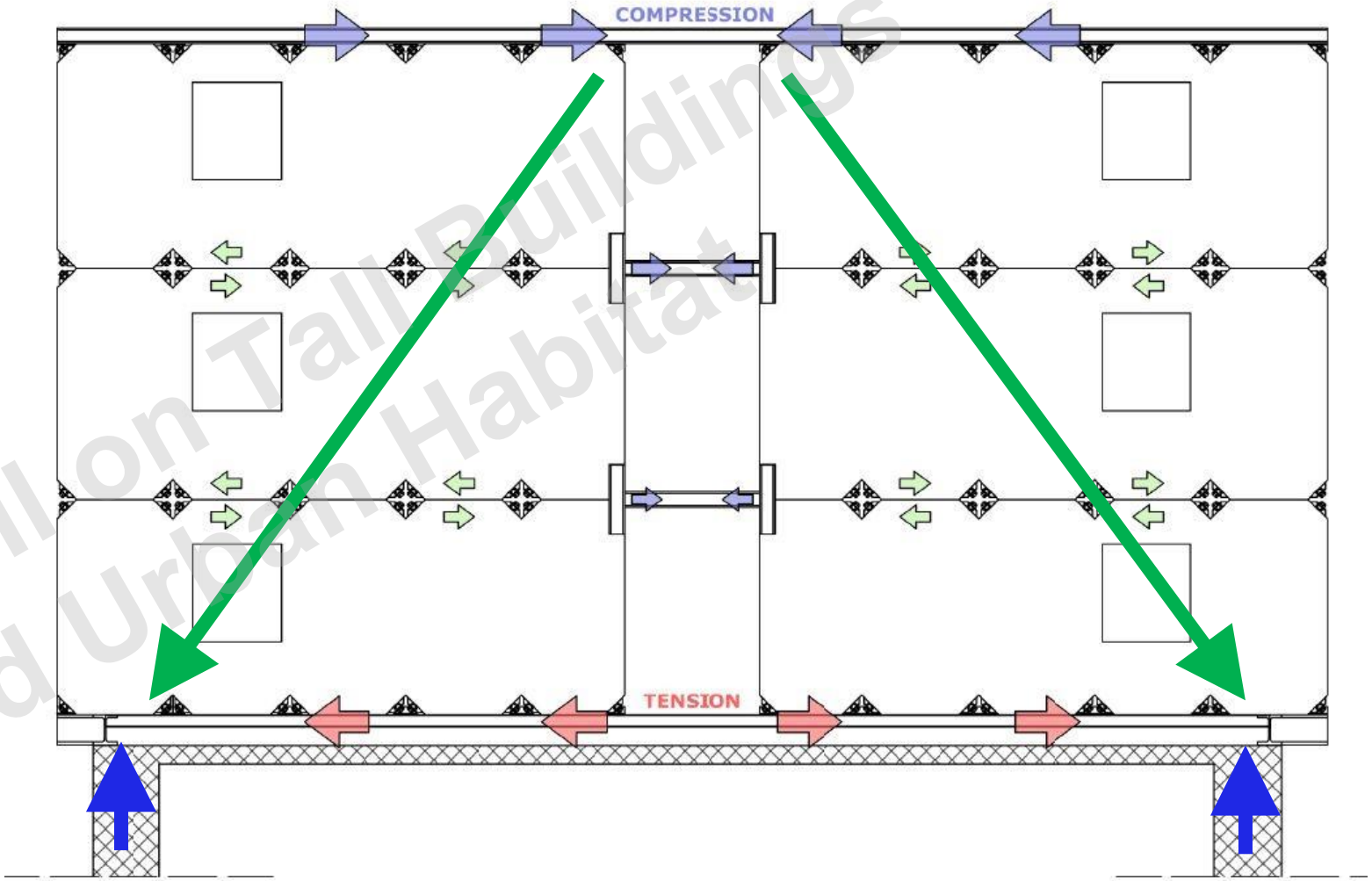
CLT walls were designed as 3-story deep beams spanning between masonry wall supports

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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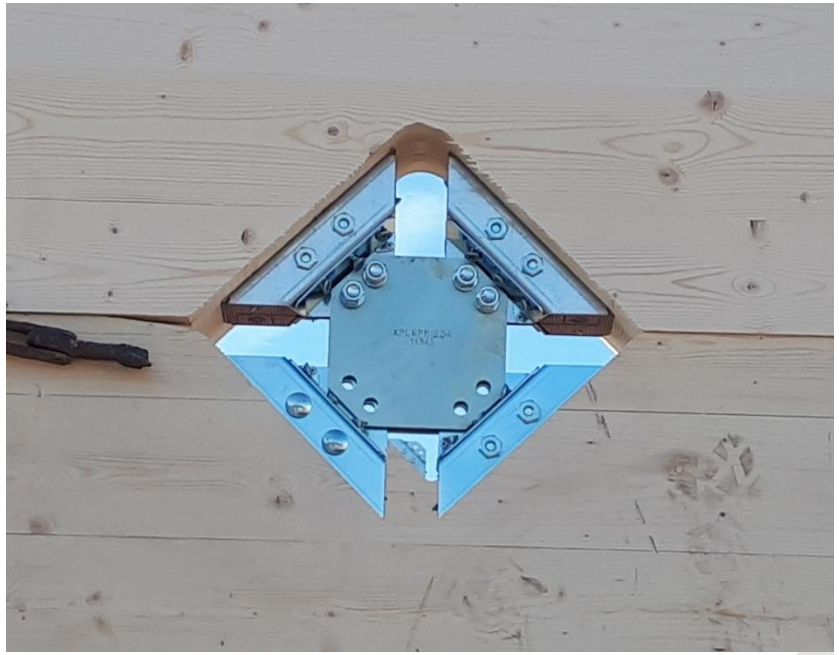

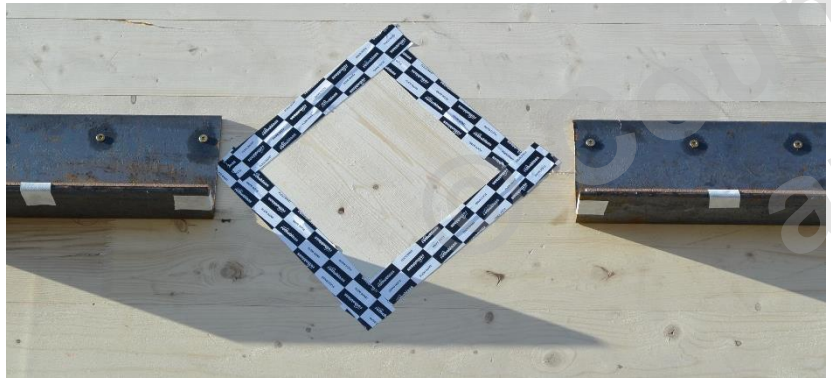

X-RAD – Case Study: Hotel Schwartz – Installation

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X-RAD – Case Study: Hotel Schwartz – Installation

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 YOU ATTENTION

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