TBMS

RENOVATION UNDER RESOURCE CONSTRAINTS

1 PROBLEM

Modern construction requires a large amount of materials, equipment, logistics and capital.

MATERIALS · LABOR · EQUIPMENT · LOGISTICS · CAPITAL



2 QUESTION

How to build and renovate when resources are limited?

MATERIAL SHORTAGE · LABOR SHORTAGE · LIMITED EQUIPMENT · TIME CONSTRAINTS · BUDGET CONSTRAINTS



3 APPROACH

New structural systems that reduce dependence on scarce resources.

LIGHTWEIGHT MATERIALS · MODULAR SYSTEMS · CNC MANUFACTURING



4 OUR GOAL

Development and improvement of construction technologies for:

- renovation
- new construction
- remote areas
- agricultural sector
- other conditions where resources are a limiting factor





Transforming the Rooftops of the Past into the Neighborhoods of the Future

- Renovation without demolition.
- Creating highly livable, architecturally beautiful density.
- A scalable, sustainable blueprint for the rapid recovery of Ukraine's urban infrastructure.

TBMS

RENOVATION PROTOCOL

An Integrated Timber Platform for Deep Renovation, Vertical Extension and Adaptive Reuse

THREE COMPLEMENTARY TECHNOLOGIES

- VK TSS – Timber Structural System
- VK HTSS – Hexagonal Timber Sandwich System
- VK TBLS – Timber Beam-Lath System

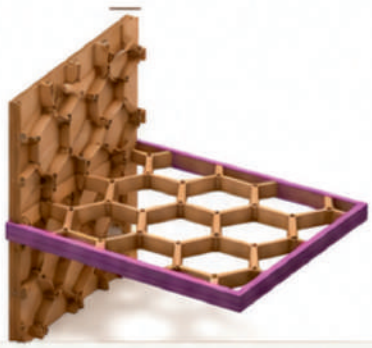
A UNIFIED DIGITAL WORKFLOW

From point cloud to fabrication and on-site assembly.

FOR THE TRANSFORMATION OF EXISTING CITIES

Lightweight, precise, fast and environmentally responsible.

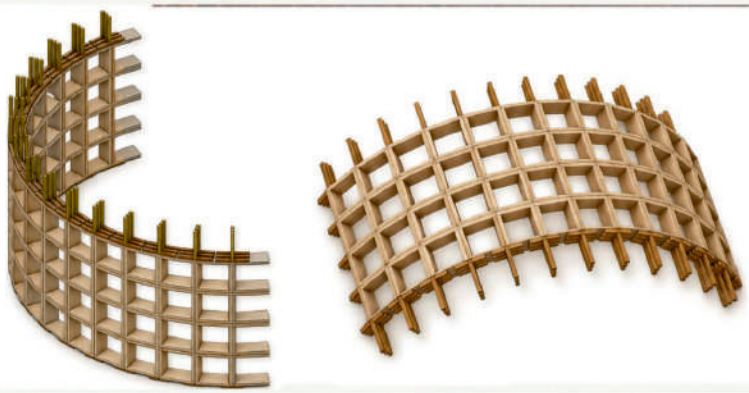
VK HTSS – HEXAGONAL TIMBER SANDWICH SYSTEM



VK TSS – TIMBER STRUCTURAL SYSTEM



VK TBLS – TIMBER BEAM–LATH SYSTEM



LIGHTWEIGHT
Minimal additional load on existing structures.

PRECISE
Engineered with digital accuracy and fabrication.

ADAPTIVE
Modular systems for multiple architectural scenarios.

FAST
Reduced on-site time and disruption.

SUSTAINARDY
Timber-based, low embodied carbon and recyclable.

FUTURE-READY
Enabling vertical extension and adaptive reuse.

VIKTOR KOVTUN
Independent Research

TBMS

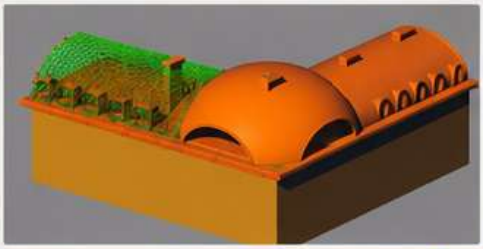
RENOVATION PROTOCOL

THE CHALLENGE

Existing buildings in historic cities require solutions that are lightweight, fast to implement and respectful of the original fabric. Conventional methods often add excessive weight, disrupt occupancy and lack adaptability for future needs.

THE TBMS APPROACH

An integrated timber platform that combines structural efficiency, digital precision and modularity. TBMS enables deep renovation, vertical extension and adaptive reuse with minimal impact on existing structures.











Legacy Materials Cannot Survive the Constraints of Urban Renovation

	Foundation Weight	Crane Independence	Thermal Efficiency	Corrosion Resistance	Seismic Safety	Adaptability
Heavy Concrete/Brick	X	X				
Light Gauge Steel (LGSF)			X	X		X
Mass Timber (CLT)		X			X	
VK TSS						

Fails on Foundation Weight and Crane Independence.

Fails on Thermal Efficiency (cold bridges), Corrosion Resistance, and Adaptability to uneven old walls.

Fails on Seismic Safety (dangerous stress points on brittle masonry) and Crane independence.

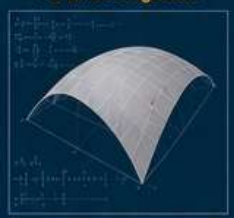
Digital-to-Physical Workflows Eliminate On-Site Error

Digital Twin / BIM



Replaces manual, on-site carpentry adjustments with a fully integrated digital pipeline.

Parametric Algorithm



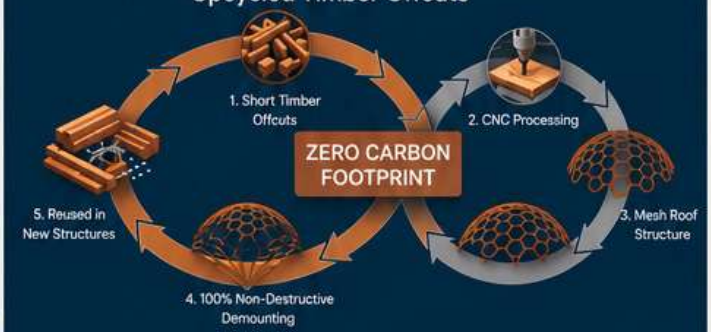
Algorithms automatically calculate the length and angle of every single rib based on the BIM model.

CNC Precision



CNC machines mill timber and connector slots to exact millimeter accuracy.

High-Tech Structures Forged from Upcycled Timber Offcuts



Zero Waste. Transforms short timber offcuts—traditionally burned or discarded—into high-performance structural ribs, drastically lowering material input costs.

Carbon Sink. Sequesters carbon over the building's lifespan, contrasting sharply with the massive CO_2 emissions of steel and concrete production.

Total Demountability. The patented connector allows the entire frame to be disassembled without damage and repurposed, embodying ultimate circular economy standards.



Parametric Precision Enables Crane-Free 'Constructor' Assembly

The Lego Principle. Every timber module and steel connector arrives pre-cut and meticulously labelled.

Manual Assembly. Because the system mathematically aligns itself, the structure is assembled rapidly by hand.

Zero Heavy Machinery. Solves the critical bottleneck of renovating within hyper-dense, historic city blocks.

TBMS
RENOVATION PROTOCOL

THE TECHNOLOGY

Timber Bionic Mesh Shells on Reinforced Ring Beam Platform

A new generation of lightweight timber structures based on axial force transfer, digital precision and modular components.



REINFORCED CONCRETE RING BEAM

- Rigid connection and structural stabilization above existing walls
- Engineering hub for ventilation, services and cabling
- Digital precision to compensate for irregularities
- Reduced additional mass through partial removal of unstable masonry

TIMBER BIONIC MESH SHELL



Lightweight shell structure made of timber laths and nodes arranged in a bionic hexagonal mesh. Loads are transferred by axial forces through the mesh to the ring beam.

MESH TO RING BEAM CONNECTION



Timber nodes are fixed to the ring beam using steel connectors and anchors. The connection is designed to transfer axial forces and ensure stability.

VENTILATION & SERVICES INTEGRATION



Services and ventilation systems are integrated within the ring beam system without compromising the structural integrity of the building.

TWO-STAGE ASSEMBLY

1 **GEOMETRIC FORMATION**

Hinged connectors allow easy assembly and precise positioning of the timber mesh into the required spatial geometry.



2 **STRUCTURAL REINFORCEMENT**

After the geometry is formed, connectors are locked and additional structural elements are installed to achieve final stiffness and load capacity.



INSTALLATION SEQUENCE

1. Prepare Ring Beam



Install reinforced concrete ring beam with integrated engineering systems.

2. Install Timber Anchors



Fix timber base anchors to the ring beam.

3. Assemble Timber Mesh



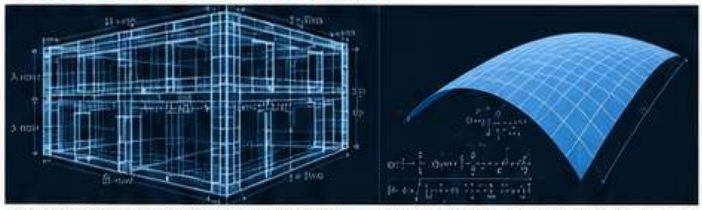
Assemble timber laths and nodes according to the digital model.

4. Complete Shell



Complete the shell surface. Ready for cladding and finishing works.

DIGITAL TWIN OF THE BUILDING



3D laser scanning captures the existing geometry with millimetre accuracy. A parametric BIM model is created as a single source of truth.

Timber bionic mesh shell is designed parametrically to ensure perfect fit and optimal structural performance.

NO CRANES & HEAVY EQUIPMENT
All elements are lightweight and manually assembled following the LEGO principle.

DRY & SAFE PROCESS
Fully "dry" installation. No water on lower floors, minimal risk during rain or snow.

LIGHTWEIGHT SOLUTION
Minimal additional load on existing structures.

HIGH PRECISION
Digital fabrication and prefabrication ensure accuracy and speed.

ADAPTIVE & FLEXIBLE
Modular system fits various architectural forms and renovation scenarios.

SUSTAINABLE APPROACH
Timber-based, low embodied carbon, recyclable and future-ready.

VIKTOR KOVTUN
Independent Research

STRUCTURAL PERFORMANCE COMPARISON

Performance Metric	Conventional RC & Masonry	TBMS Structural System
Structural Load on Existing Building	Higher permanent structural load	Significantly reduced permanent structural load
Site Logistics	Heavy lifting equipment, cranes and extensive site operations	Lightweight manual assembly with minimal equipment
Construction Process	Conventional wet construction sequence	Rapid dry prefabricated installation
Structural Behaviour	Higher bending effects transferred to the existing structure	Efficient axial-force load transfer
Seismic Performance	Additional strengthening is often required	Resilient diaphragm behaviour with improved global stiffness
VK TSS		

Fails on Foundation Weight and Crane Independence.

Fails on Thermal Efficiency (cold bridges), Corrosion Resistance, and Adaptability to uneven old walls.

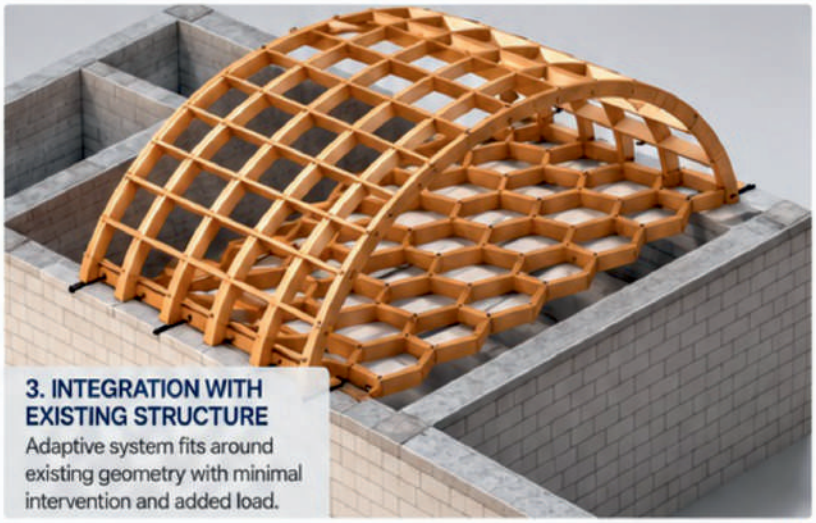
Fails on Seismic Safety (dangerous stress points on brittle masonry) and Crane Independence.



1. OVERALL VIEW
Lightweight spatial shell system spanning across existing structures.



2. NODE DETAIL
Axial-force oriented connection system ensuring efficient load transfer with minimal components.



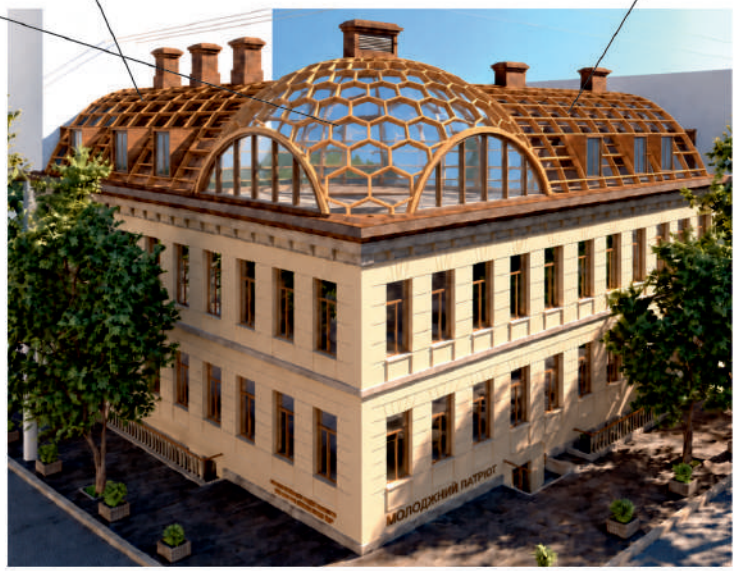
3. INTEGRATION WITH EXISTING STRUCTURE
Adaptive system fits around existing geometry with minimal intervention and added load.

TBMS TECHNOLOGY APPLICATION

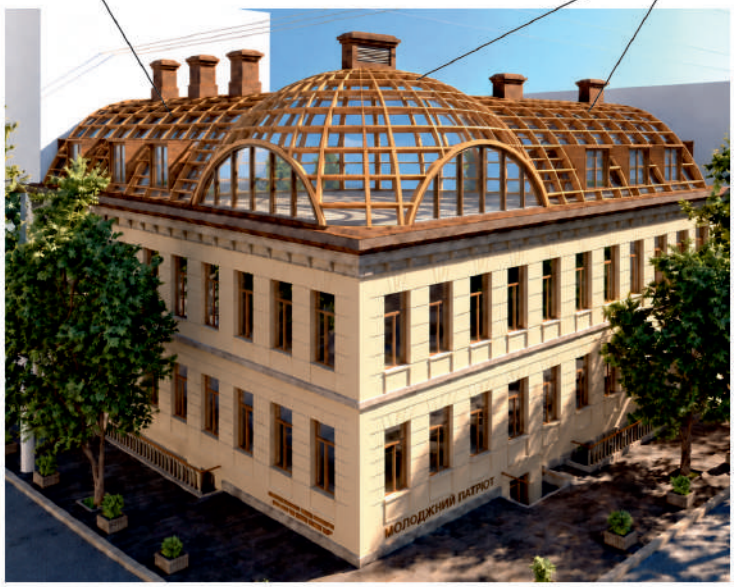
K Connector – hexagonal mesh.



S Connector, Spt Connector – orthogonal mesh.



S Connector, Spt Connector – orthogonal mesh.



K Connector, S Connector, Spt Connector – combined variant.

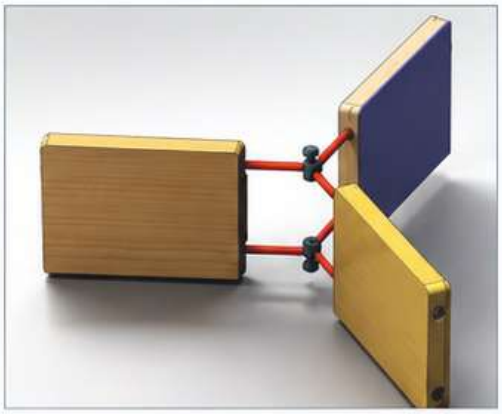


K Connector, S Connector, Spt Connector – combined variant.

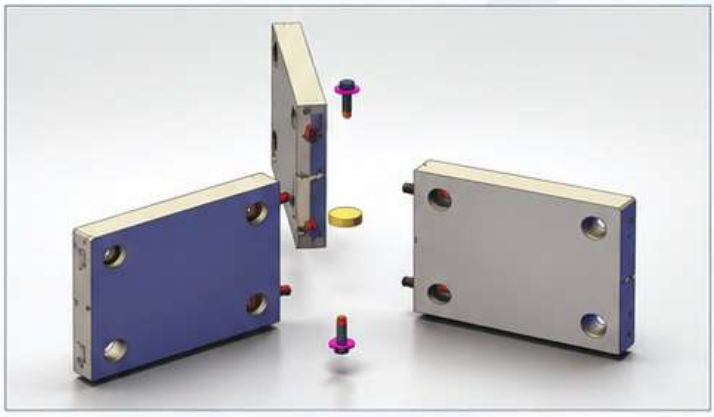
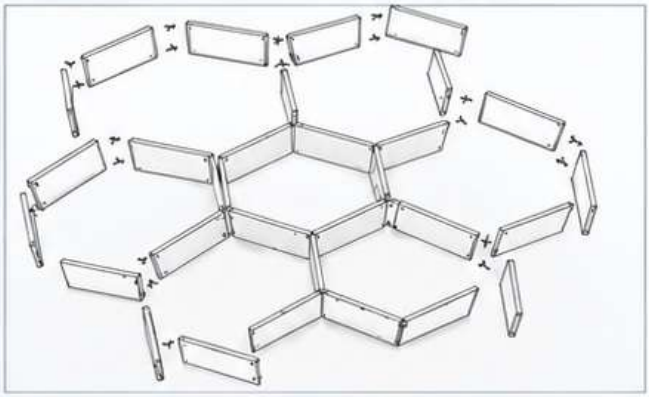


TBMS: The evolution of technology from a furniture connector to a line of construction technologies.

The system originates from modular furniture and simple connection logic.

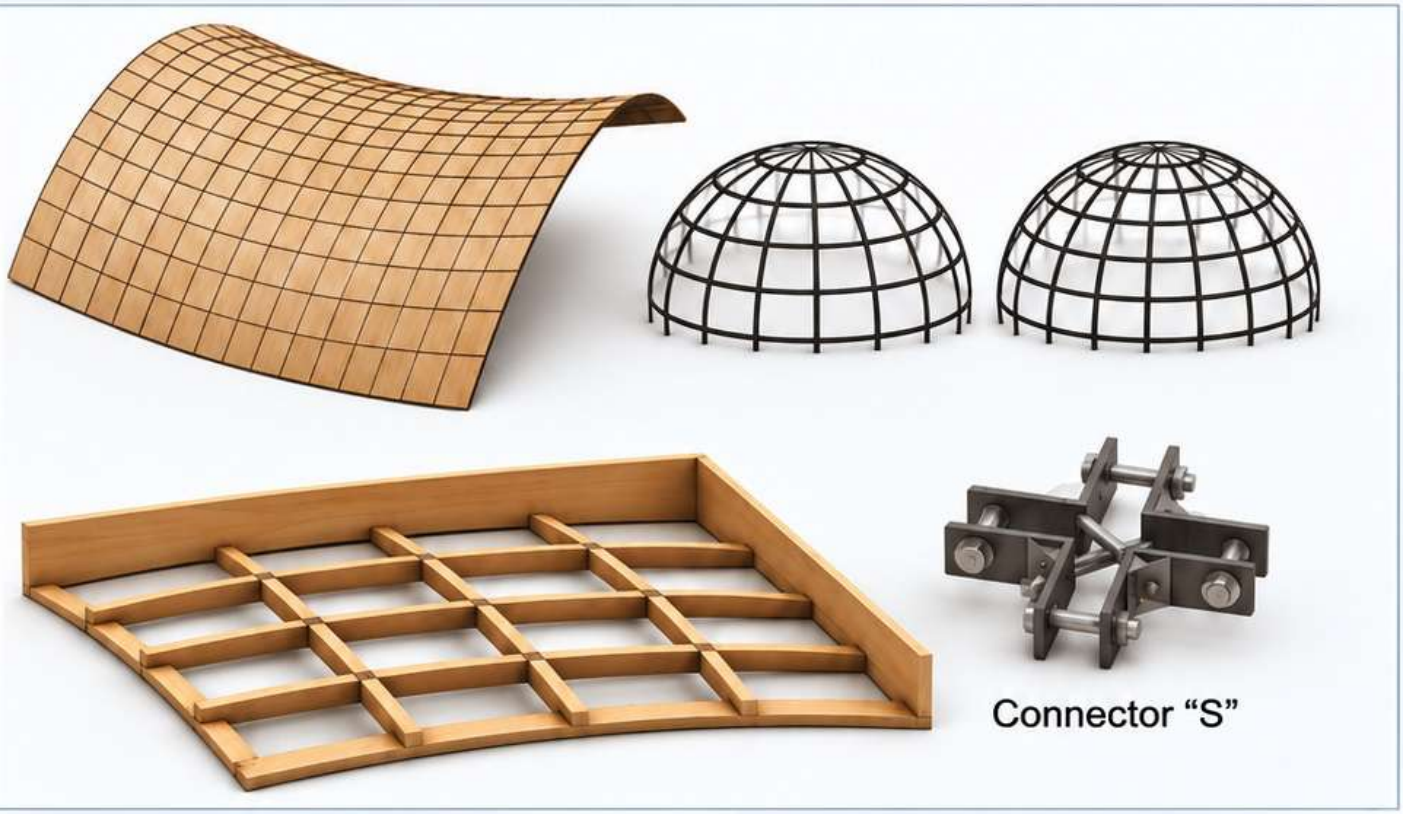



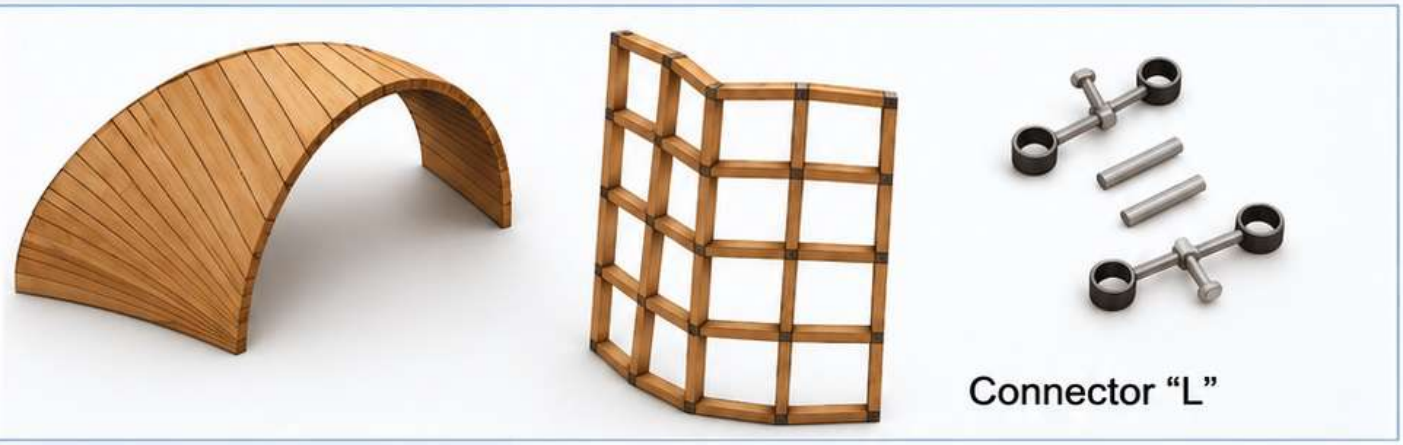

Universal Connector K: scaling from hexagonal furniture to structural shells.



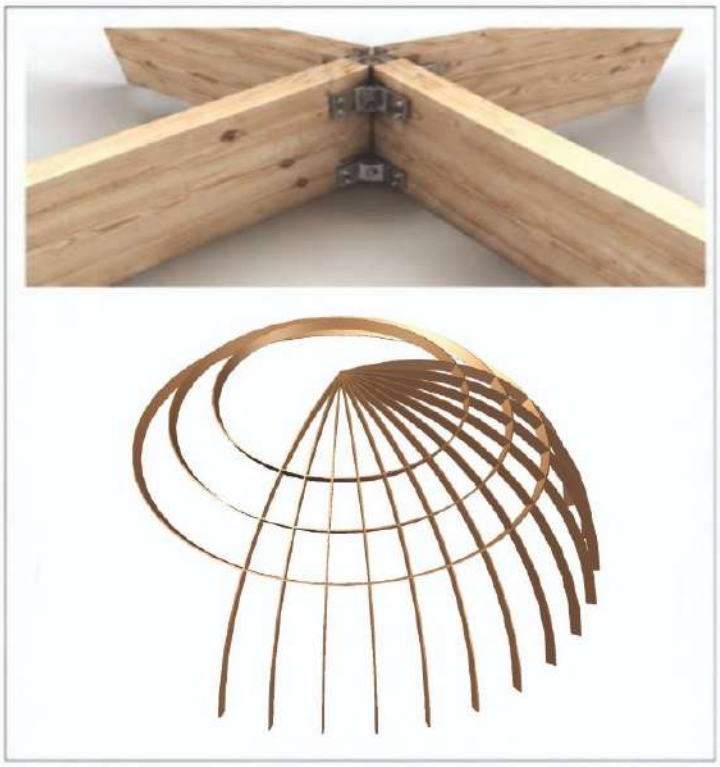

TBMS: The evolution of technology from a furniture connector to a line of construction technologies.







More complex geometries can be achieved using specialized connectors.
Connector V enables the construction of Voronoi-based spatial frameworks inspired by natural structural patterns.



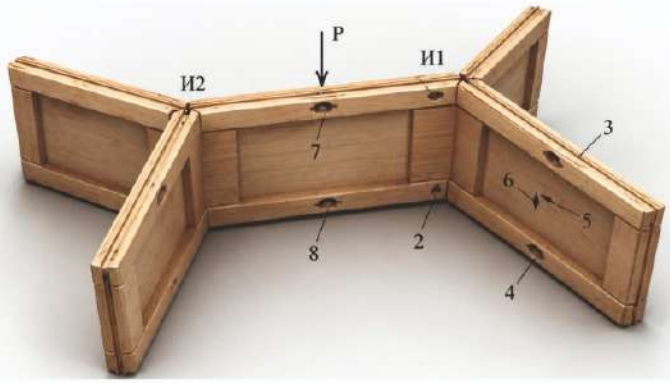


Stratodesic shell assembly using connector Spt.

TBMS: from prototype development to modeling and laboratory testing.

Odesa State Academy of Civil Engineering and Architecture, Laboratory of the Department of Timber and Metal Structures.

Dome Fragment Test with Universal Connector "K" (2021)



The fragment was loaded up to 9,9 kN. Up to 7,2 kN, the specimen exhibited elastoplastic behaviour with clearly pronounced elastic deformations.
The maximum recorded deformation was 3.3 mm.



Full-Scale Dome Model Test Using Connector 'K' Technology (2024)



A full-scale 4.0 m dome model built with the 'K' connector technology was preliminarily loaded to 10 kN (≈1 ton).
The resulting load per node was approximately 50 kg.
The measured deformation under this load was 4.5 mm.
Testing is ongoing



TBMS: from prototype development to modeling and laboratory testing.

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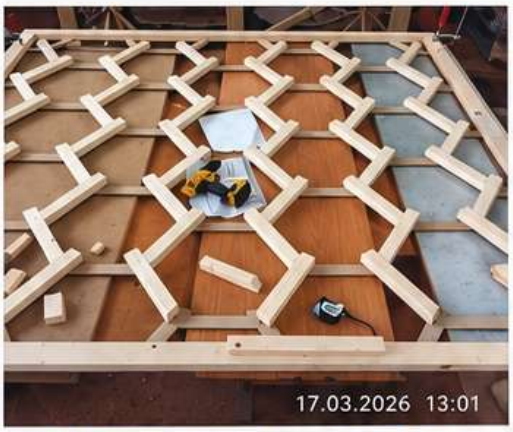








Connector S: prototyping, model fabrication, laboratory testing.







VK HTSS: prototyping, model fabrication, and preparation for laboratory testing.