UNIVERSAL MODULAR BUILDING

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Tutors

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Two fundamental challenges in the built environment

1. There is a large and long lasting need for new homes.
   - In the Netherlands, we need 1,000,000 new homes by 2030.
   - Globally, we need 2,000,000,000 new homes by 2100.

2. There is a drastic and urgent need for reduced pollution from the building industry.
   - The building industry currently causes around 50% of man-made climate change.¹
   - Concrete and steel production together are responsible for 15% of global anthropogenic CO2 emissions.²

¹ https://www.worldgbc.org/sites/default/files/UNEP%20188_GABC_en%20%28web%29.pdf
INTRODUCTION

INPUT

Building Material Production
- Only custom shapes & sizes: hard to re-use
- Produced for every building
- Polluting materials chosen for economic reasons
- Non-adaptable

Densification

Changing Technical Demands

Socio-Demographic Changes in Society
Opportunity 1: Engineered Wood

CLT

- Strong & Lightweight

Glu-lam

- Climate-friendly production (low emissions & wood absorbs CO₂ during growth
  - High workability (CnC milling, high precision, automated production)

LVL
Opportunity 2: ‘Low-hanging fruit’

Most buildings we make have very simple structures that could easily be made out of a system of some kind.
**INTRODUCTION**

**INPUT**
- **Building Block Production**
  - Standard shapes and sizes with custom add-ons
  - Only produced when necessary
  - Climatically optimal materials
  - Fully adaptable

**OUTPUT**
- **Building Block End of Life**
  - Only happens when material technically cannot function any longer
  - Ready for systematic High-Value Recycling

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**Functioning Building Life**
- **Assembly**
- **(Re-) Design**
- **Disassembly**

**Densification**
**Changing Technical Demands**
**Socio-Demographic Changes in Society**
The Design Assignment

1. Design a Modular Reusable Building System prototype.
   - Disassemblable
   - Flexible in life (e.g. changeable inner walls)
   - Allows freedom of design
   - Useable in conjunction with ‘normal’, custom building elements
   - Engineered wood as main body

2. Use system to design two buildings in drastically different contexts
   - Show the system can adapt to different climates, architectural cultures and local problems.
   - Chosen locations are Amsterdam, the Netherlands and Jakarta, Indonesia
Cornerstones

1. System elements are directly reusable

- assembly
- damage
- transport
- storage
- etc..
1. Fill in product context profile & pairwise comparison to determine category weights

2. Fill in scoring tables for different categories and sub-categories (e.g. (dis)assembly, reusability in new designs)

3. Combine all scores and weigh according to pairwise comparison

4. Compare final- and sub-scores to gain insight about the product’s reusability
Cornerstones:

1. System elements are directly reusable

   - assembly
   - damage
   - transport
   - storage
   - etc..

2. System must give user FREEDOM OF DESIGN
- Loss of identity
- Loss of sense of belonging
- Uninspiring / Depressing

INTRODUCTION
Cornerstones

1. System elements are directly reusable
   - assembly
   - damage
   - transport
   - storage
   - etc..

2. System must have Freedom of Design

3. Climate-friendly production (WOOD!)

4. Prefabrication (efficiency, digital & smart production)
Essential for Mass Market Adaptation & Significant Impact!

Dream Scenario

Custom Building

Current Explorations

(ET) Modular Building Systems (X-rad)

Proposal

Hybrid Modularity

Modular System + Custom Elements

Reusability

Pre-Fabrication

Freedom of Design

Eco-friendly Production

Reusability

Pre-Fabrication

Reusability

Pre-Fabrication

Reusability

Pre-Fabrication

Reusability
Core of building made entirely out of system elements

Small amount of custom additions

Final result that is demountable and for the most part directly reusable
SYSTEM DESIGN
System design: Existing Solutions

X-rad system by ROTHOBLAAS
Various standard measurements

1.5m

3.2m

4m
The floor elements have three variables. The first variable is the span, which varies according to standard grid units of 1500 mm (V-G).

The second variable is the width, which also varies according to V-G.

The third variable is the thickness, which varies according to a number of standard measurements (V-S) based on both span and load. In this case the thickness is 220+50, with 220 mm of the thickness being load-bearing and the bottom 50 mm facilitating attachment points.

At the bottom side, each corner has milled-in space where the steel interfaces are placed to connect the floors to walls or beams. These interfaces can vary in height to either heighten or lower the floor elements as required for the design.

Similar to the beam elements, the floor elements have a bottom layer of 50 mm non-loadbearing CLT with milled-in slits and pre-drilled holes. These serve as attachment points for add-ons that can fulfill a variety and multiplicity of functions: sound insulation, fire proofing, electrics, ventilation and lowered ceiling (additional height).

On the top side, the floor elements have pre-drilled holes according to a simple grid of 150 x 150 mm. These holes serve as the attachment points for both floor add-ons (extra height, sound insulation, weight) and the ‘footprints’ of walls. These elements are connected via friction-fit steel pins to be completely remountable.

Notable is the bottom variant, which has double width and spacing in the middle for columns in the system grid. This variant makes use of the property of CLT where it can bear loads in both perpendicular directions, and only needs to be secured at the corners.
**Topside Add-on (PRE-FAB)**
Additional Height, Weight, Sound insulation. Variable according to building needs. Pre-drilled holes as attachment points for wall footprints.

**Floor Element (PRE-FAB)**
According to blueprint.

**Bottomside Add-on (PRE-FAB)**
Additional height, sound insulation, electrics and installations. Slid unto the bottom of the floor element and secured with horizontal friction fit pins.

**Ceiling Finish**
DESIGN SHOWCASES
**PRIMARY SHOWCASE**

THE NETHERLANDS,
AMSTERDAM,
NIEUW WEST,
OSDORPPEIN.

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**SECONDARY SHOWCASE**

INDONESIA,
JAKARTA,
CENKARENG,
RAWA BUAYA.
Locational differences:

1. Climate
2. Architectural culture
3. Local problems
4. Future developments
AMSTERDAM

Local challenge: Dutch housing crisis, lack of affordable and fitting home, especially for starters

Target Group: Starters & Starting families
Old Footprint: 1,500 m²

Old floor space: ~2,200 m²
- Heavyweight concrete construction
- Two double height floors

New Footprint: 2,000 m²

New floor space: max ~13,500 m²
- Lightweight wooden construction
- Six floors on old foundation, nine on new foundation
Amsterdam: Program of Requirements

- Discount store: 2200m²
- Retail: 400m²
- Restaurant: 400m²
- Greenhouse: 400m²

Dwellings & storage: 2200m²
Type A
Couple
30 - 40m²

Type B
3-person household
55 - 60 m²

Type C
4-person household
70 - 75 m²
Loss of individual (spatial) value on dwelling scale

- Smaller dwellings
- Fewer possibilities for social interactions, events, leisure, in private dwelling
Maximize efficiency available space

- Remove dedicated circulation space
- Integrate storage
- Maximize feeling of spaciousness
Opportunity: Introduce community (spatial) value on building scale

- Bring back lost values in shared environment.
- Sharing saves money & brings people together
- Encourages feeling of community & social interaction
BUILDING DESIGN
CHALLENGE 1: DEALING WITH THE EXISTING
CHALLENGE 2: FREELY PLANNABLE FLOOR PLANS
DETAIL G

GFRP 3x 12.5 mm
Outer layer used as functional finish layer

Studs / Rockwool, 80mm
Sound insulation

GFRP 3x 12.5 mm
Rockwool 20 mm
Decoupling layer
Sound insulation

GFRP 3x 12.5 mm
Studs / Rockwool, 80mm
Sound insulation

GFRP 3x 12.5 mm

Interior wall connecting foot
Thin steel plate integrated on the bottom of pre-fab interior wall elements. Connects to pre-fab floor via disposable wooden interface

Elastomer Joint
Decoupling element between wall and floor

Interior wall wooden footprint / interface
Custom-measured wooden footprint that forms the disposable / non-reusable connecting element between system wall and system floor elements. Attached to floor via steel friction-fit pins. Attached to wall via simple screws.

Steel pins
Friction-fit / demountable connection between wooden footprint and floor element. Goes through infill layer into CLT floor element.
CHALLENGE 3: LEVEL DIFFERENCE & CUSTOM ELEMENTS
**DETAIL E**

Extra long custom floor edge closer

- Constructed with a prefabricated wood frame construction
- Custom measurements for accommodative floor level difference
- Space for pipes and cables

Floor level difference

- Facilitates transition between skylights and roof terrace
- See Detail E

Custom ceiling elements

- Placed at floor level difference, bottom floor elements have special ceiling ceiling details
- Fire protection, sound insulation, etc.
- Provides full encapsulation of constructive elements

**DETAIL E’**

**Standard Glulam Beam**

- 450x450x1200 mm
- Interconnected glulam ceiling elements at top and bottom side of connected elements

**Custom Post-Beam Steel Interface**

- Eased connection is single element with two different height levels for beam(s) and floor in one pass of welding
- Interface before new construction layer is added

**Custom Post-Floor Steel Interface**

- Eased connection is single element with two different height levels for floor
- Attached to post interface

**Standard Glulam Beams**

- 900x300 mm, 200 mm height (450+50)
- Attached to sheet interface w/ 60 mm fillet equals cut-out
Terrace finish, wooden deck, 18mm
Wood frame, 100 + 40mm
- Constructive element opening at facade side to allow water to flow to drainage points
Waterproof membrane
Thermal Insulation (EPS), 250mm
- 10/1000 height gradient to facilitate water drainage
- Water drainage integrated in layer
- Separate closed-off water drainage for green roof segments
Vapor barrier

Downspout coupling point
Downspout is integrated in pre-fab facade elements, extended to roof/terrace on-site
SHOWCASE: AMSTERDAM
CHALLENGE 4: CUSTOM STRUCTURE
**Detail C**

**Wood frame construction**
- Balcony-bearing construction
- Custom element
- Finished with Derako demountable wood facade system
- Anchored to facade for stability

**Wooden Interface construction**
- Custom wooden construction
- Connects custom balcony construction to building system standard beam
- Constructed on-site

**Terrace finish, wooden deck, 18mm**

**Wood frame, 100 + 40mm**
- Constructive element
- Lower frame aligned with insulation height gradient to allow water drainage

**Waterproof membrane**

**Thermal Insulation (EPS), 250mm**
- 15/1200 height gradient to facilitate water drainage
- Water drainage integrated in layer

**Vapor barrier**

**Glu-lam 9m System beam**
- Standard system element
- Thicker variant compared to beams that do not bear balcony load
Greenhouse residual heat contributes to thermal energy storage system via heat pump.

Entire building makes use of floor heating.

Solar panels on south-western roof side to generate energy.
MODULARITY ANALYSIS
**EXCLUDING**

Foundation
Concrete elevator cores
Pergola construction
Greenhouse construction
Amsterdam: Building Envelope
Amsterdam: Building Envelope
JAKARTA

Local challenge: City flooding in 20 - 30 years, but big demand for housing

Target Group: Former rural migrants
- Attap roofing of low thermal capacity gives good insulation against heat.
- Ventilated roof space helps to cool the house.
- Ventilation through roof joint.
- Large roof eaves for effective sunshading.
- Open interior spaces with minimal partitions allow good ventilation in the house.
- Lightweight construction using low thermal capacity materials keeps house cool.
- Fully openable windows allow ventilation at body level.
- Stilted house catches winds of higher velocity.
MODULARITY ANALYSIS
EXCLUDING

Foundation
Elevator

Jakarta: Construction
Custom Modular Elements (Light Orange)

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1700 m²
facade elements

Non-Modular Elements (Orange)

~

2800 m²
custom roof

38%

62%

Jakarta: Building Envelope

SHOWCASE: JAKARTA
CONCLUSION
CONCLUSION

- Lower average pollution during production (wood > concrete/steel)
- Only have additional production when elements reach End of Life
- Vast and exponentially growing reduction of emissions over time

- Production more expensive (more complex elements)
- Linear costs to harvest materials
- Exponentially growing profit over time, breaking even at the second building cycle
CONCLUSION

1. System prototyping
   - Core concepts & ideas
   - First prototypes
   - Urgency & benefits

2. Re-work & Refine
   - Integrate Open Building
   - Refine connection types & techniques
   - Determine true grid

3. Subsystem Development
   - Modular subsystems across scales
   - Balconies
   - Roof edges
   - Staircases
   - Facade systems
   - Technical installations

4. Continuous Updates
   - Existing elements are improved over time
   - Old & New can be used in conjunction via custom interfaces

5. Larger Scales
   - System is expanded with large-scale construction possibilities
   - Combination of raw Engineered Timber techniques & reused reused of steel

6. Circular Foundations
   - Focused research on the possibilities of circular foundations & system integration

7. True Circular Building
   - On average, 80% of any new building is circular building
   - Externally are associated buildings, construction, and conceptual architecture in general
BOOKLET
SITUATION & FLOOR PLANS
DETAILS
**DETAIL A**

Custom floor edge closer
Only for floor elements that support facade via steel interface

**DETAIL A-Horiz**

Stucco, finishing layer, 2mm
Gypsum fibre board 2x, 30mm
Fire protection
Functional finishing layer
Vapor barrier
Rockwool, 300mm
Thermal insulation
Sound insulation for exterior sound
Waterproof membrane
Ventilated cavity, 35mm
Aberson A-brick system: metal sheet, 5mm protrusions to attach brick faces
Aberson A-brick system: brick faces, 25mm demountable ceramic/facade system

Floor-Facade Connection
Vertical space is provided to ease appliance of vapor barrier, see details A & A’

**DETAIL A-Horiz’**

Floor-Facade interface
At the bottom side of the facade elements, the interfaces don’t spread the entire width and provide space to seal the seams between separate elements on-site.

Floor-Facade interface
At the top side of the facade elements, the interface spreads the entire width to provide freedom of placement and strong construction. Attached with steel bolts, easily disassemblable.
DETAIL B

Lightweight steel frame
Greenhouse construction
Attached to construction with method comparable to detail X

Custom roof edge construction
Non-system roof edge, wood frame construction
Attached to facade elements via disposable wooden interfaces

Downspout coupling piece
Custom piece to couple the pre-fab water drainage from roof and facade elements

Greenhouse flooring, wooden deck, 18mm
Gravel, 150mm
Water drainage
Extra weight for construction
Sound insulation
Integrated water system for greenhouse units

Waterproof membrane
Timber, 18mm | PREFAB
Roof construction topping layer

Thermal Insulation (EPS), 250mm | PREFAB
Water drainage integrated

Vapor barrier | PREFAB
CLT, 360mm
Constructive element
Extra thickness to bear load of greenhouse

Rockwool, 40mm
Additional sound insulation

Gypsum fibre board double layer, 30mm
Fire protection
Functional finishing layer

Stucco, 2mm
Finish
DETAIL C

Wood frame construction
- Balcony-bearing construction
- Custom element
- Finished with Derako demountable wood facade system

Wooden Interface construction
- Custom wooden construction
- Connects custom balcony construction to building system standard beam
- Constructed on-site

Terrace finish, wooden deck, 18mm

Wood frame, 100 + 40mm
- Constructive element
- Lower frame aligned with insulation height gradient to allow water drainage

Waterproof membrane
- Thermal Insulation (EPS), 250mm
  - 10/1000 height gradient to facilitate water drainage
  - Water drainage integrated in layer

Vapor barrier

Glu-lam 9m System beam
- Standard system element
- Thicker variant compared to beams that do not bear balcony load
**DETAIL D**

- **Terrace finish, wooden deck, 18mm**
- **Wood frame, 100 + 40mm**
  - Constructive element
  - Opening at facade side to allow water to flow to drainage points
- **Waterproof membrane**
- **Thermal Insulation (EPS), 250mm**
  - 10/1000 height gradient to facilitate water drainage
  - Water drainage integrated in layer
  - Separate closed-off water drainage for green roof segments
- **Vapor barrier**

**Downspout coupling point**
- Downspout is integrated in pre-fab facade elements, extended to roof/terrace on-site
DETAIL E

- Extra long custom floor edge closer
- Construction detail in a simple axonometric view construction
- Custom measurements to accommodate floor to wall of corner
- Space for a plan and notes.

Floor level difference
- Fast track when transition between dwellings and roof terrace.
- See Detail C.

Custom swing attitude
- Posts at the level difference between floor elements have spaces to accommodate tie rods of isolation, sound insulation, fire barriers, etc.

DETAIL E'

- Standard Glu Lam Post:
  - 4500x125x2000 mm
  - Laminated sheet interfaces at top and bottom side to connect elements.

Custom Post-Beam Steal Interface
- Concrete at a single element with two different height levels for beams.
- Slab floor above post interface without need to construct new level is added.

Custom Post-Steel Stair Interface
- Concrete at a single element with two different height levels for floors.
- Attached to post interfaces.

Standard Glu Lam Beams:
- (1600x125x50) non-height adjustable.
- Attached to steel interfaces with non-removable bolts.
**DETAIL F**

**Elastomer bearing**
Decouples top layer from supporting timber elements to ensure sound insulative properties of honeycomb cardboard layer.

**Fire protective gap sealant**
Closes gaps of pre-fab beam and floor element's fire protective layers.

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**Floor Finish, 10mm**
Variable material

**Dry floor heating screed, 35mm**
Easy to disassemble

**Insulating Foam, 40mm**
To optimize underfloor heating

**Hardboard, 18mm**
Top layer of pre-fab floor elements
Pre-drilled holes with grid of 150 mm x 150 mm that allow easy disassemblable connections

**Honeycomb cardboard + Infill, 100mm**
Additional constructive weight
Sound insulation
Height padding

**CLT Sled, 35+220+35 mm**
Dwellings variant
35 mm extra material on top and bottom as utility layers
Top: Pre-drilled holes with grid of 150 mm x 150 mm that Bottom: Milled grooves to allow slide-on ceiling add-ons

**Ceiling Add-ons - Frame, 50 mm**
Wood frame attached to aluminium frames

**Ceiling Add-ons - Rockwool, 40 mm**
Additional sound insulation

**Ceiling Add-ons - Gypsum Fibre Board Double layer, 30 mm**
Fire protection
Functional finishing layer (drillingsmall holes in ceiling, walls without damaging core element)

**Stucco**
Finish
GFRP 3x 12.5 mm
Outer layer used as functional finish layer

Studs / Rockwool, 80m
Sound insulation

GFRP 3x 12.5 mm

Rockwool 20 mm
Decoupling layer
Sound insulation

GFRP 3x 12.5 mm

Studs / Rockwool, 80m
Sound insulation

GFRP 3x 12.5 mm

Interior wall connecting foot
Thin steel plate integrated on the bottom of pre-fab
interior wall elements. Connects to pre-fab floor via disposable
wooden interface

Elastomer Joint
Decoupling element between wall and floor

Interior wall wooden footprint / interface
Custom-measured wooden footprint that forms the disposable / non-reusable
connecting element between system wall and system floor elements. Attached
to floor via steel friction-fit pins. Attached to wall via simple screws.

Steel pins
Friction-fit / demountable connection between wooden footprint and floor
element. Goes through infill layer into CLT floor element.
FACADE FRAGMENT
SYSTEM GUIDE AND DETAILING
MAIN CONCEPT: ATTACHMENT POINTS & INTERFACES

The concept that forms the backbone of the whole system is the use of integrated attachment points in all elements, using steel interfaces to connect different elements together. Elements have both primary attachment points—meant for constructive connections—and secondary attachment points—meant to connect with functional elements such as finishing layers, inner walls or installations. Primary attachment points are made of steel elements secured to the wooden bodies, while the secondary attachment points are mostly integrated into the wood via milling or drilling (holes, slits).

This concept gives the system the enormous flexibility that it needs for achieving universal reusability, as well as forming an easy basis to combine system elements with custom architecture. Finally, it also ensures that the system can develop over time without making older elements lose value—they can always be used in conjunction with newer elements by simply using the right interfaces.

MAIN AND SECONDARY GRIDS

The main constructional elements all follow a set horizontal grid of 1.5 by 1.5 meters. Primary attachment points are integrated into the elements where the grid lines intersect.

Vertically, there is no grid but instead a set of standard measurements that make the most sense in practice. In the example projects, the standard measurements of 3.200 (standard dwelling height) and 4.000 (standard commercial height) are used.

Some elements use their own inherent grids for secondary attachment points—most notably the floor elements and facade components. These grids are separate from the main grid and used mainly to give a consistent ground to attach elements such as inner walls, installations or finishing layers.
DIVERSITY OF STRUCTURE AND SPACE

With the inherent flexibility of the interfaces and the combination of wall elements, columns and beams, a large variety of different structures and spaces can be made using the building system.

Depicted are a typical row house structure, an office building with double height plinth and a custom curved glass facade, a hexagon-shaped building with colosseum-like custom facade, and a simple structure for a large event hall.
The column elements have two different variables. The first variable is the dimensions of the section, in the shown case 400 x 400. Standard models are available in steps of 100 mm.

The second variable is the height, which also varies according to a number of standard measurements, in this case based on the standard floor height of 3.200. The total height is this number increased by 400, as the columns slid inside of each other.

Steel elements form the primary attachment points at both extremes of the columns.

Holes drilled at a regular interval serve to pin the attachment in place vertically with friction fit metal pins.

The column elements vary according to several factors, height, sectional dimensions, and shape.
The wall elements have three different variables. The first variable is the width, which is variable according to the standard Grid (V-G). The second variant is the thickness, which varies according to a set of standard options (V-S). The last variable is the height, which also varies according to a set of standard options (V-S). The standard used for dwelling type buildings is 3,200.

Primary Attachment Points
Steel attachment points are attached to the CLT body at a regular interval of 1,500 (Grid Unit). These steel elements are attached using multiple long screws. They serve as the backbone for the system, as they allow elements to be connected to theoretically any other element, using a variety of standard or custom interfaces.

At the bottom side they are only located at the corner, meant to secure the wall element itself. On the top side, they are placed at every grid unit to facilitate attachment to beams, floors or façade elements.

Variants
Depicted are several variants of wall elements, including a custom variant with a custom shape milled out. Elements like these can be easily re-manufactured into standard elements reducing its size.
The beam elements have three variables. The first variable is the span, which varies in increments of the standard 1.500 mm grid unit.

The second variable is the thickness, which varies according to a number of standard measurements, based on the load the beam needs to bear.

The third variable is the height, which varies according to a number of standard measurements, based on both the required load and the.

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Secondary Attachment Points
The bottom to the beam elements have a layer of 50 mm non-loadbearing Glulam, with slits milled to serve as attachment points for ceiling add-ons. These add-ons are slid on the bottom of the beams and secured in place horizontally with friction fit steel pins placed in pre-drilled holes in the side.

Primary Attachment Points
At both extremes the beams have eight pre-drilled holes as well as a vertical slit milled into the Glulam.

A variety of steel interfaces can be attached to this part of the beam, to attach it to different elements such as walls, columns or even other beams.

Variants
A depiction of several variants of beams, varying in span, height and thickness.

VARIABLES
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SECONDARY ATTACHMENT POINTS
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VARIANTS
A depiction of several variants of beams, varying in span, height and thickness.
VARIABLES

The floor elements have three variables. The first variable is the span, which varies according to standard grid units of 1500 mm (V-G).

The second variable is the width, which also varies according to V-G.

The third variable is the thickness, which varies according to a number of standard measurements (V-S) based on both span and load. In this case the thickness is 220+50, with 220 mm of the thickness being load-bearing and the bottom 50 mm facilitating attachment points.

PRIMARY ATTACHMENT POINTS

At the bottom side, each corner has milled-in space where the steel interfaces are placed to connect the floors to walls or beams. These interfaces can vary in height to either heighten or lower the floor elements as required for the design.

SECONDARY ATTACHMENT POINTS

On the top side, the floor elements have pre-drilled holes according to a simple grid of 150 x 150 mm. These serve as attachment points for add-ons that can fulfill a variety and multiplicity of functions: sound insulation, fire proofing, electrics, ventilation and lowered ceiling (additional height).

SECONDARY ATTACHMENT POINTS

Similar to the beam elements, the floor elements have a bottom layer of 50 mm non-load bearing CLT with milled-in slits and pre-drilled holes. These serve as attachment points for add-ons that can fulfill a variety and multiplicity of functions: sound insulation, fire proofing, electrics, ventilation and lowered ceiling (additional height).

VARIANTS

Depicted are several variants of the floor element, differing in width and span. Notable is the bottom variant, which has double width and spacing in the middle for columns in the system grid. This variant makes use of the property of CLT where it can bear loads in both perpendicular directions, and only needs to be secured at the corners.
Topside Add-on (PRE-FAB)
Additional Height, Weight, Sound insulation. Variable according to building needs. Pre-drilled holes as attachment points for wall foot-prints.

Floor Element (PRE-FAB)
According to blueprint.

Bottomside Add-on (PRE-FAB)
Additional height, sound insulation, electrics and installations. Slid unto the bottom of the floor element and secured with horizontal friction fit pins.

Ceiling Finish
Facade elements are composed of standardized wooden milled elements with a grid of 100 mm. The main horizontal and vertical elements are demountable and reusable without any damage. Disposable lats are used to secure elements such as interfaces or Finish lats in non-reusable manner (screws).

The main elements have pre-drilled holes in a simple grid to allow the attachment of window and door frames in a demountable way via pins.

The elements can be configured in an almost infinite number of ways to facilitate rectangular facade openings of almost any size. Window and door frames are attached in a remountable way but are themselves disposable – windows and doors are attached to these frames with regular attachment methods such as screws.
A standard frame with laths attached.

Insulation, windows and foils (dampopen and waterproofing respectively on the interior and exterior sides) are added. Insulation is naturally demountable and reusable.

Finish laths are added on both the exterior and interior sides. Finishing layers are attached to these in-situ with regular attachment methods such as screws. The laths are disposed after lifecycles.

Horizontal steel interfaces are added at the top and bottom sides of the interior to facilitate attachment of the facade elements to floors, beams and walls.
At this stage the elements are ready to be transported to the building site and attached to the main structure. In this case they are attached to interfaces on standard floor elements. Gaps and foils are sealed off with sealing tape on both the exterior and interior. The elements are designed to reserve space for this.

As the last step, finishing layers are added on the interior and exterior sides. Because the Finish laths are disposable, in principle anything can be attached to these elements as finishing layer, as long as the laths can bear its load. In the two example projects, existing remountable systems for wooden planks and a ceramic facade are used.

After the building life cycle has ended, the finishing layers (interior and exterior) can be removed, and the element can be demounted as a whole. It can then be either directly reused as is in a similar design or transported to the factory to be reconfigured in a new shape.