

BIM-based Catalogue & Circular Type Building

Preliminary results 16.6.2026

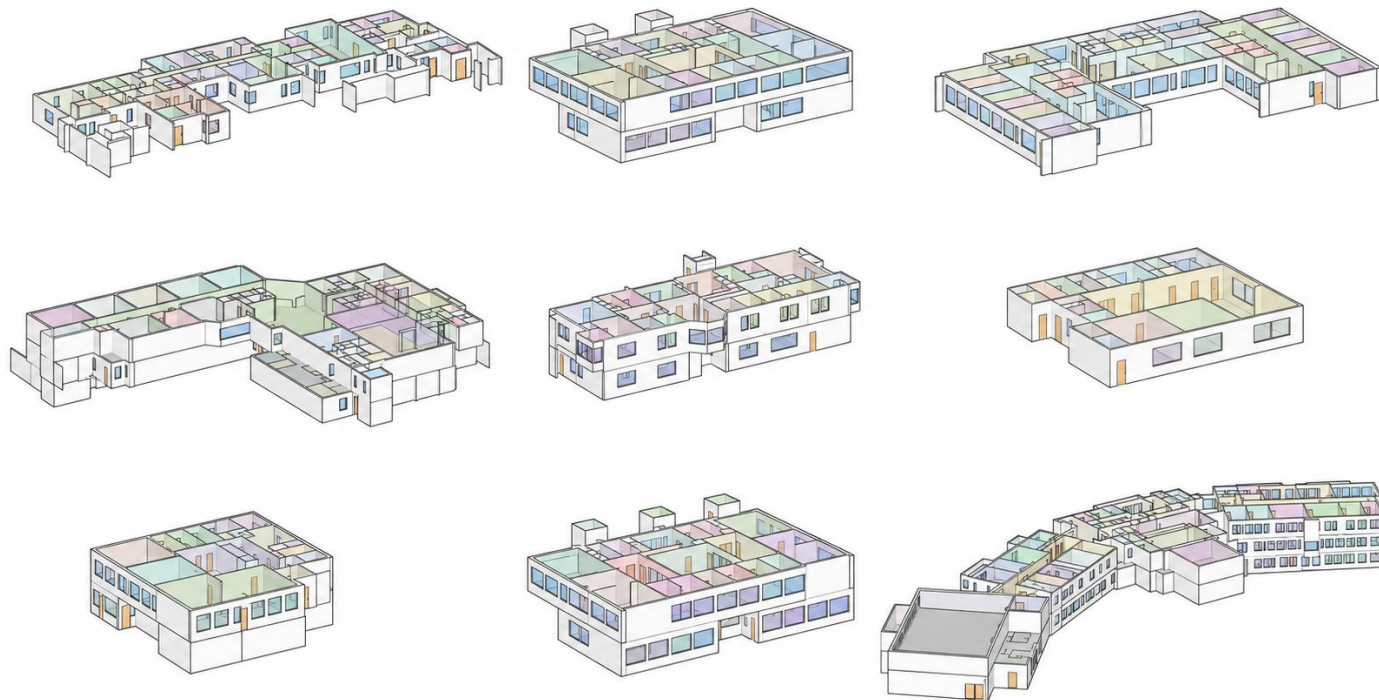
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Make a BIM

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- 1. Automated BIM based catalogue of building parts**
-
- 2. Co-created type building**



Automated BIM modelling

AI-generated models enriched with additional information.

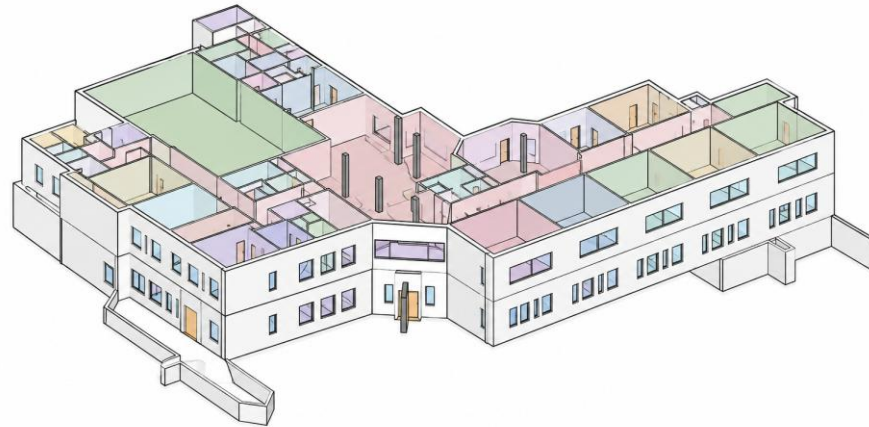


Circular type buildings

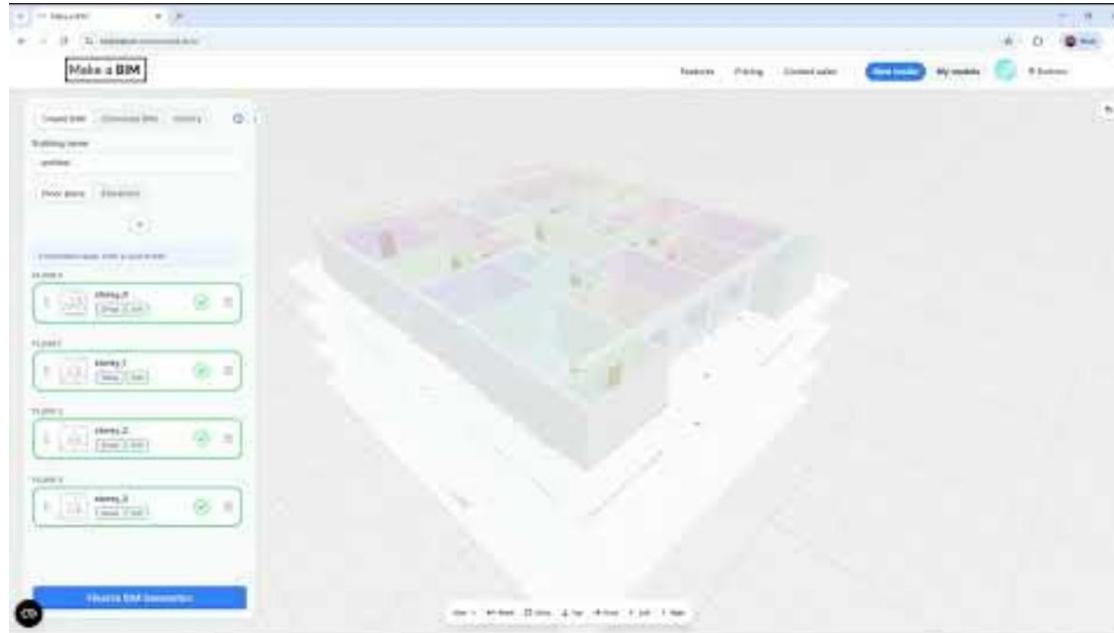
Auxiliary buildings for daycares composed of reused building parts

Automated BIM modelling

- Develop and test an AI-based workflow for generating inventory models with practical accuracy and improved efficiency
- Modeling 10 buildings owned and managed by the City of Espoo to create an inventory



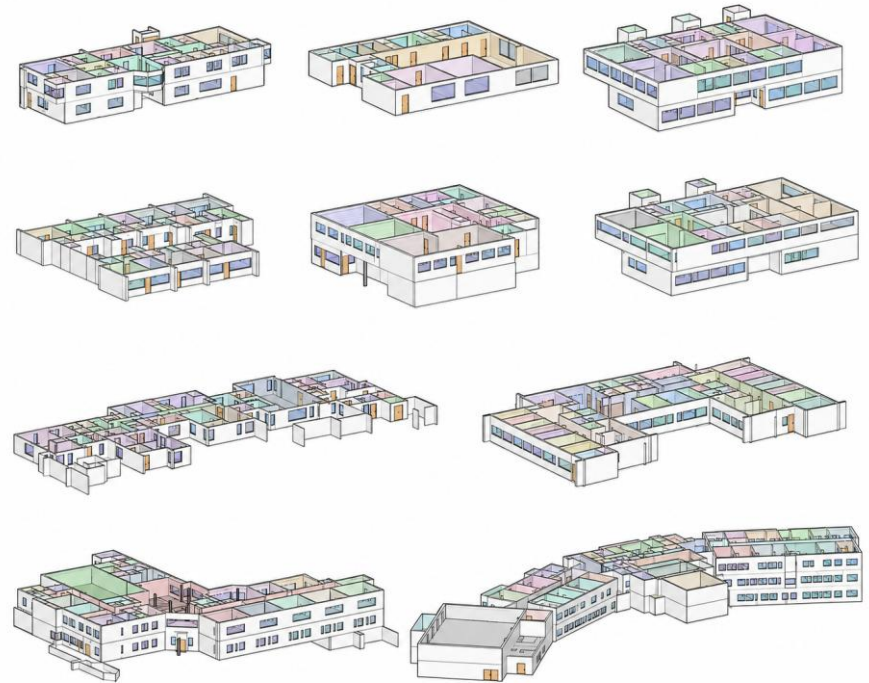
Objectives



Automated BIM modelling

AI-Generated BIM Models from 2D Drawings

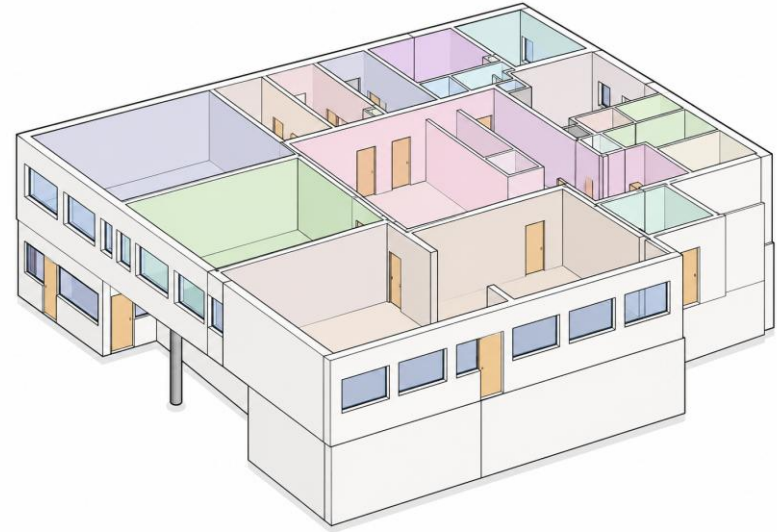
- The first iteration of the 10 BIMs was created in 30 minutes after receiving the drawings.
- For the final iteration the AI output was reviewed and cleaned up by Make a BIM using the manual tools in makeabim.com
- The makeabim.com AI is available for use online.



Process

Generating models of the pilot buildings using AI

- The models are in the IFC format
- They include separate objects for walls, windows, doors, slabs and spaces.
- The models also include semantic IFC data such as hierarchy, object types and relations.
- Unlike most IFC models, these models are editable in Revit, Archicad and AutoCAD architecture.



BIM data

What do the AI generated models include?

- Automatically generated models provide rapid quantity data and a foundation for further refinement.
- Façade details, complex roof geometries, and individual structures may not be fully represented in the models.
- The greatest cost benefits are expected in larger projects where manual modeling is more time-consuming.
- High-quality IFC data structures are essential for seamless model interoperability.

Key findings

Balancing automation, expert oversight, model accuracy, and interoperability

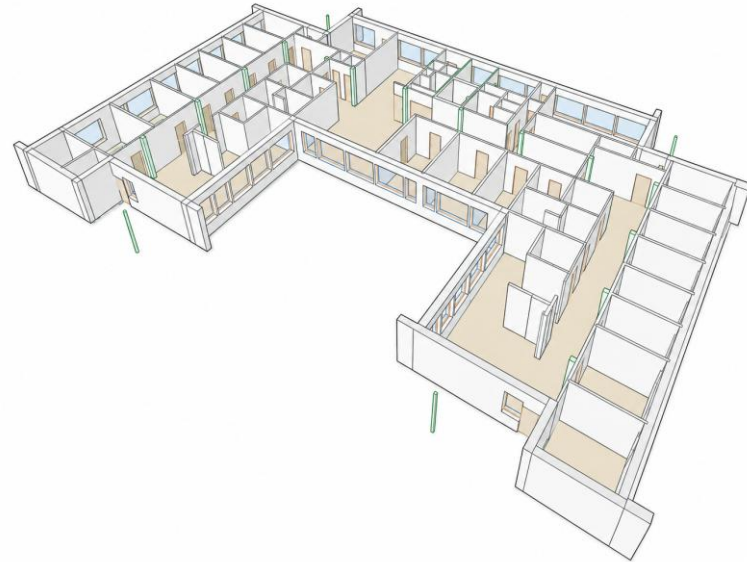
Catalogue of building parts

- To reuse components from demolished buildings as a basis for new projects, more information is needed about the components contained within the existing building stock in a cost-effective way
- A building component catalogue generated from buildings scheduled for demolition through automated BIM-modeling offers a solution to this challenge.
- Develop a method to manage the data and the 10 BIM-models of the Espoo City owned buildings, which consist of 9 daycare, school and other social facilities primarily from the 1980s to 1990s

Objectives

Improving access to reusable building components through automated cataloguing of existing building stock

US 1 / D1			
rakennetyypin tilavuus (netto), m3			28,45
	paksuus, mm	osuus, %	materiaalin tilavuus (brutto,) m3
Teräsbetoni	150	39,47 %	11,23
Kosteuseristys	0	0,00 %	0,00
Mineraalivilla	100	26,32 %	7,49
1/2 kiven kalkkihiekkatiili	130	34,21 %	9,73
pintakäsittely	0	0,00 %	0,00
	380	100,00 %	28,45
US 2			
rakennetyypin tilavuus (netto), m3			5,14
Teräsbetoni	150	54,55 %	2,80
Kosteuseristys	0	0,00 %	0,00
Mineraalivilla	100	36,36 %	1,87
Muovikelmu	0	0,00 %	0,00
Mäntyilupaneeli	25	9,09 %	0,47
	275	100,00 %	5,14
US 3			
rakennetyypin tilavuus (netto), m3			11,25
Teräsbetoni	130	33,77 %	3,80
Mineraalivilla	125	32,47 %	3,65
Kalkkihiekkatiili	130	33,77 %	3,80
Pintakäsittely	0	0,00 %	0,00
	385	100,00 %	11,25



Automated BIM Data Extraction

AI-generated BIM models serve as the basis for automated metadata extraction and digital building information workflows

- AI-generated models require expert review of inputs and outputs
 - vast quantity of several types of building documentation needs to be assessed before modeling
 - the quality and accuracy of the model is evaluated based on the building documentation
- The accuracy of the catalogue is determined by the quality of the underlying source data (drawings)
 - Models can be enriched and developed manually using the expert assessment of the building after some indication of reuse is established
- The catalogue can provide valuable data for the building owner (City of Espoo/Tilapalvelut) in procuring design and demolition services, as well as target setting for circularity in their projects
- Optimal solution to handle the data would be a digital platform where the data and models are gathered, primarily for internal use
 - Future development should ensure compatibility with national data systems and classification standards, such as RAPU.

Key findings

Key considerations for ensuring reliable data, practical usability, and future interoperability

Circular type building

- The original objective was to create a repeatable type building from the components in the building element catalogue.
- During the process, it was concluded that **a design guide or a method for circular building project** would provide greater value than a single building design
 - Guide gives examples on how to use the existing materials for new buildings

Objectives

Developing a reusable design framework for daycare auxiliary buildings

For the **client** project managers:

- Set the targets for circularity in the project and include them in procurements
- Use the catalogue to define which materials are going to be available

For the architectural **designers**:

- Define the intended use and space requirements
- Select the structural system and verify dimensional requirements
- Adapt and position the building on the site
- Select the façade materials and openings based on the site and intended use, leave flexibility for changes in material availability

Etc.

Type Building Design Process in Brief

A modular design approach based on use, structure, site, and envelope

S

20 – 30 m²

- Small storage rooms for smaller daycares
- Enclosed canopy/shelter for strollers (prams)

M

40 – 55 m²

- Play equipment storage room

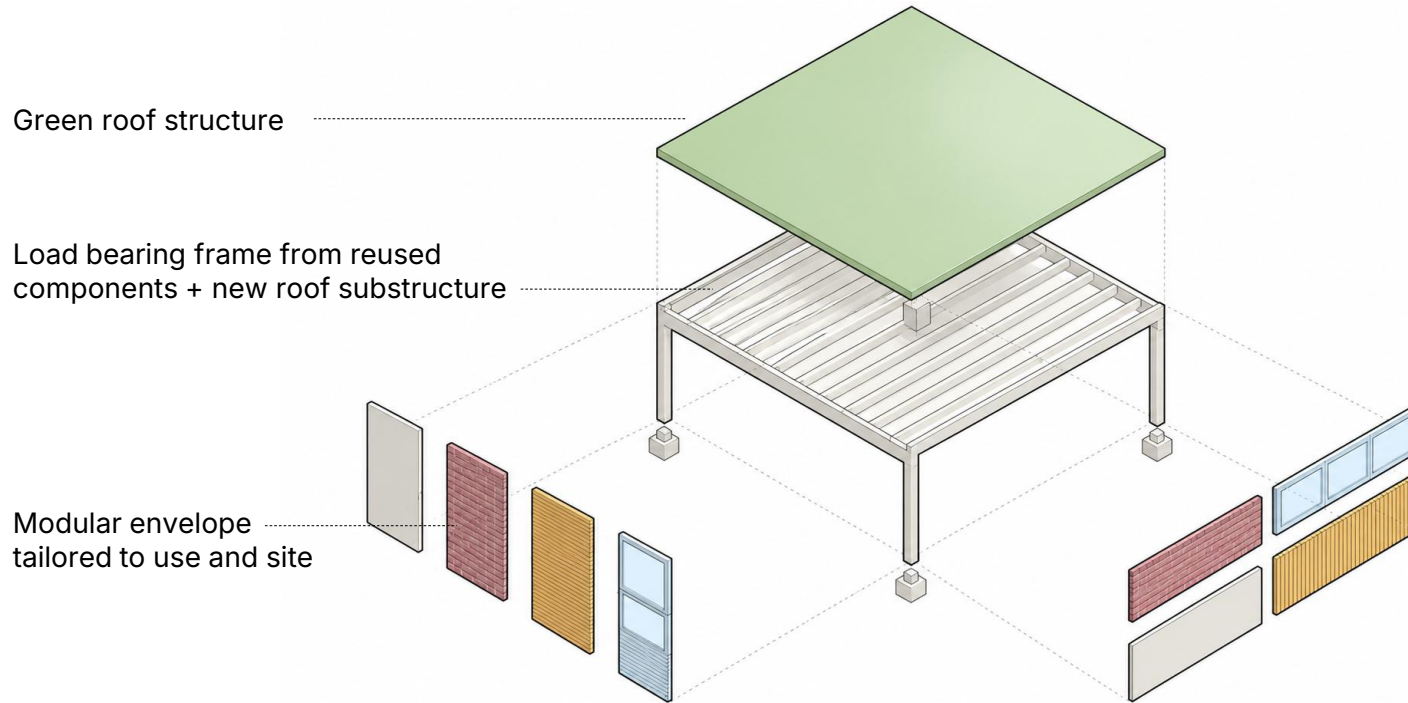
L

60 – 70 m²

- Play equipment storage room for larger units

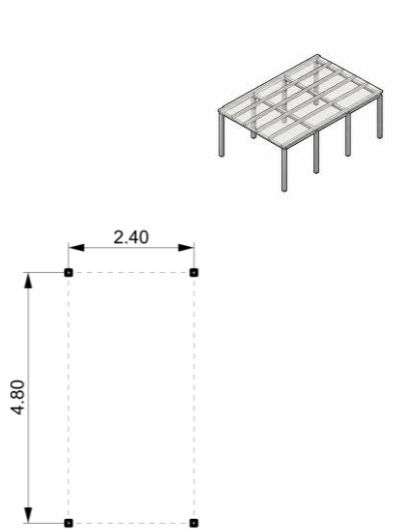
Space requirements as a starting point

Auxiliary buildings for daycare facilities, according to the guideline by Espoo City Facilities Services.

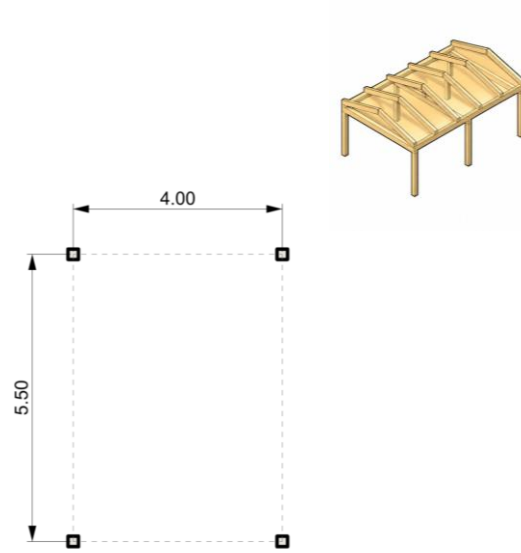


Type building layers

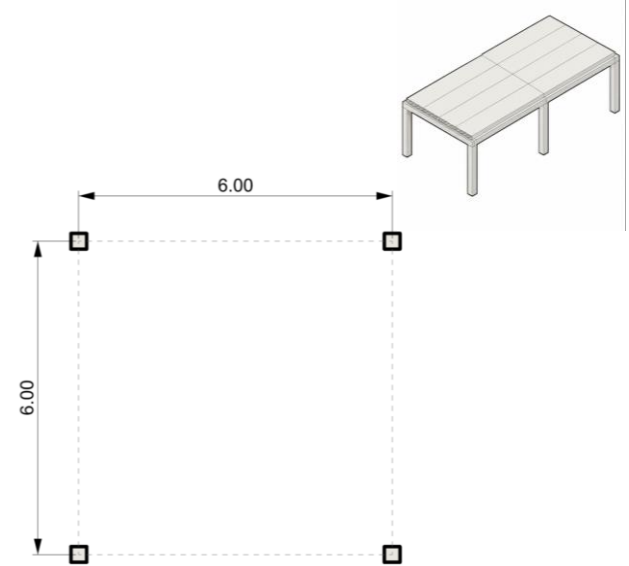
Definition of the structural frame in relation to space requirements + Design of the building envelope according to the intended use



Steel frame from a social services building



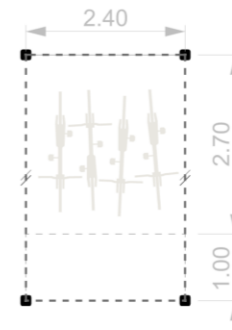
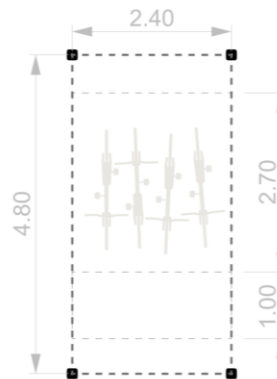
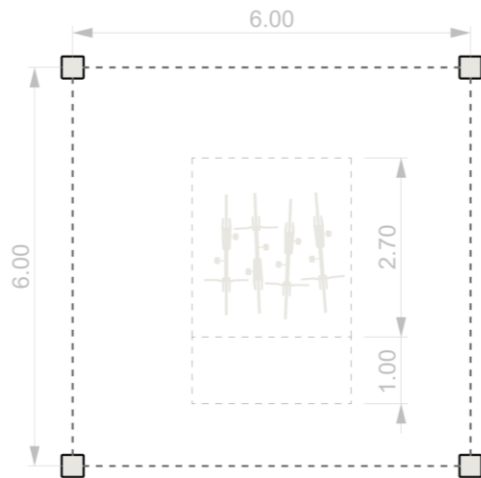
Reused timber frame



Concrete frame from a daycare

Existing building frames as the basis for design

Structural systems and module sizes identified from the catalogued buildings



Dimensioning of the module

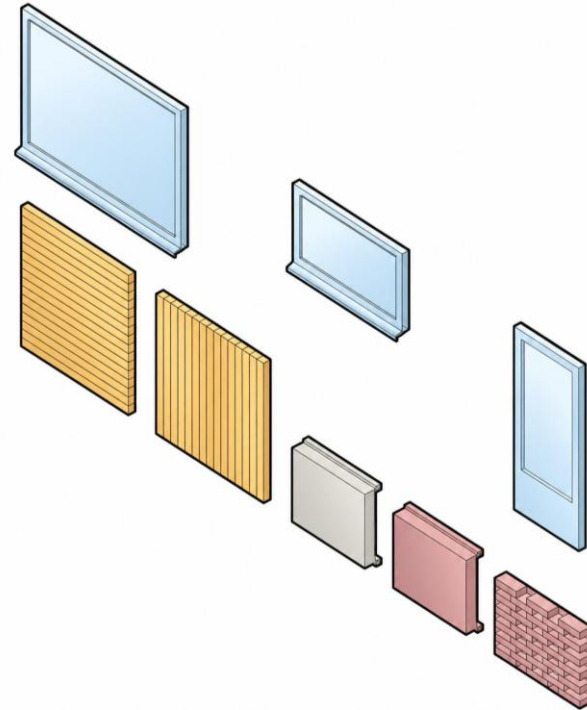
1. Select the intended use 2. Select the structural system 3. Adapt the structure

From the catalogue for reused facades:

- façade bricks and calcium-silicate bricks in vast quantities
- Windows and doors (both wood and metallic framed)

From other sources:

- Circular wood panels
- Materials and window/door configurations selected from the catalogue
- Brick facades are planned to be detached in small elements, and re-assembled to new configurations
- Individual bricks can also be used



Building envelope

A modular façade approach balancing architectural variety and manufacturing efficiency



Steel frame (IPE 200
beams + columns)

Steel door

Modular brick façade and
individual bricks

S-building

Parts from a social services building



Circular wood paneling
and lamellas for fitting

Reused glulam frame

M-building

Windows and doors from daycare 1



Window from social services building

Modular façade
Calcium-silicate brick

Concrete post-beam frame
with hollow core slabs
from Daycare 1

L-building

Parts from two buildings

- Develop a design guide instead of a fixed type-building solution – flexibility is needed during the design and procurement processes according to material availability
 - Assess site specific needs to modifying the spatial requirements (= slightly larger buildings, but less modification to components)
 - Allowing selective modification of reused components can improve dimensional accuracy (= modification of structural components for compact sites)
- Suitability for reuse needs to be evaluated separately
 - Fx. changes in exposure conditions require assessment of concrete and steel structures durability and protection
- In the Espoo catalogue created during the pilot, brick structures are reoccurring in most of the buildings. Thus, modular brick façade elements could facilitate disassembly and reuse, and serve as the next development target

Key findings

Insights into balancing reuse, adaptability, and project-specific requirements.

Thank you!

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