Designing for deconstruction and flexibility case study: Project XX, Netherlands

Office with a known lifecycle

Project XX is designed to last twenty years and then be deconstructed with 100% of the materials and components being re-used elsewhere or recycled locally.

Business benefits

- At the end of the building life, all materials will be disassembled into components that can be reused or recycled. Their financial value will be salvaged.
- Zero waste sent to landfill during the development, avoiding the associated costs.
- Building is sufficiently flexible to enable change of use from an office to an industrial building.

Project background

Occupancy of office buildings in Netherlands changes on average every 11.4 years. This results in frequent renovations of office buildings, or demolition much earlier than originally predicted. With these lifecycles in mind, architect Jouke Post aimed to design a building that is flexible during the in-use phase and can be fully deconstructed at the end of a lifecycle of twenty years.

Completed in 1999, Project XX is a two-storey office building. Deconstruction, to enable 100% of the materials and components to be reused or recycled locally, is intended for in 2019. The architect analysed material selections and considered durability, strength, costs, recyclability, and general experience of the project team in working with them. After considering all alternatives, a timber frame was selected as the main structural element.

The façade is independent from the main frame with the wooden façade frames placed on the steel consoles. These are attached to the main structure.

The building envelope is a triple glazed pre-assembled glass façade, which provides high levels of insulation and removes the need for supplementary mechanical heating systems.

Project details

Location: Delft, Netherlands
Architects: Jouke Post

Designing for deconstruction and flexibility

Potential materials and design solutions were evaluated early in the process based on four criteria:

- perishable naturally to raw materials;
- re-usable without any alteration;
- re-usable with minor alterations; or
- fully separable and recyclable.

The façade is independent from the main frame with the wooden façade frames placed on the steel consoles. These are attached to the main structure.

The roof is held down with a weight system that spreads across the perimeter of the building. This will aid removal and recovery of the roofing materials.

The office is in an open plan layout without partitions which allows for flexibility in the working space. Furthermore, the first floor is filled with sand and can be removed completely to provide an eight metre high space that can be used as an industrial building.

All connection fixings throughout the building can be dismantled and most of the materials can be reused in twenty years time. All connections can be loosened using simple tools. Adhesive fixings were banned.
Materials quantity

- The structural frame is laminated “Swedlam LVL” timber. The use of vacuum pressed wood meant that 25% less timber was required.

Materials wastage

- The volume of waste generated when the building is deconstructed will be significantly reduced, as a majority of the materials can be reused or recycled.
- Zero waste sent to landfill or incineration from the construction of the building.
- Electrical services channels and holes for pipework are pre-made in a limited number of locations in the floor panels. The locations were determined to maximise material recovery without damage.

Recycled content

- Concrete foundations and ground floor contain 20% recycled aggregate.
- Sand fill in the first floor.

Embodied carbon

- Ventilation ducts are made from cardboard, which were considered sufficiently durable for this temporary building.

Life span (e.g. durability)

- The corners of the façade have been constructed using steel to provide additional durability.

End of life potential

- The ground floor is separated from thermal insulation with thin foil so that the floor can be easily replaced or recycled in the future.
- The roof is held down with a weight system that spreads across the perimeter of the building. This will aid removal and recovery of the roofing materials.
- Columns and beams are connected with standard steel plates, pins and bolts.
- The façade is independent from the main frame with the wooden façade frames placed on the steel consoles. These are attached to the main structure.
- Unpainted softwood internal cladding panels.
- Unglued carpeting.

Cardboard ventilation ducts: reduced embodied carbon

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