PROJECT Villa Welpeloo

Credit: Superuse studios

YEAR
2009

LOCATION
Enschede, Netherlands

USE
Single-Family Residential

CONSTRUCTION
New Construction

ARCHITECT
2012 Architecten

ENGINEER
Nico Plukkel Bouwkundig

DEVELOPER
Private Client (couple)

BUILDER
Den Boer Bouwen en Installeren (contractor), T.J. Knol, I. E. C. Blans

SUPPLIER
TBC

SPECIALISTS
N/A

GROSS AREA
4,300 sq-ft

MEAN ROOF HEIGHT
33 ft

STORIES ABOVE GRADE
2

STORIES BELOW GRADE
0

RISK CATEGORY
II

COST INFORMATION
Unavailable

LCA INFORMATION
Unavailable

DESIGN FOR DISASSEMBLY	Elemental Subsystems Whole-structure	Non-structural Envelope Balconies Stairs/ramps Foundations Beams Bracing Walls Roof Floors Columns	Other Earthen Wood Steel Masonry Precast concrete Insitu concrete
PRINCIPLE	SCALE	SYSTEMS	MATERIALS
STRUCTURAL COMPONENT REUSE	Whole-structure Subsystems **Elemental** **+Deconstruction**	Columns Floors Roof Walls Bracing **Beams** Foundations Stairs/ramps Balconies Envelope Non-structural	Insitu concrete Precast concrete Masonry **Steel** Wood Earthen Other

SUMMARY

A two-story single-family home was constructed using salvaged beams from an old lift of a textile factory and additional reused materials such as slats from cable reels repurposed as facade shingles.

SUSTAINABILITY GOALS

The architects aimed for the greatest possible use of recycled materials. No other metrics or goals were explicitly stated.

CIRCULAR ECONOMY STRATEGIES

The primary structural reused elements were steel girders as load-bearing structure salvaged from a pasternoster (or type of lift/elevator) used in the textile industry. This steel made up 90% of the steel used in the building. Since the exact steel specifications and specific sizes were unavailable, engineers assumed the lowest possible steel quality as the basis of design for the cross sections, and specified only the minimum sizes and not exact sizes. Additional reused elements included used umbrellas repurposed into light fittings, cable reels slats from the Twente cable factory repurposed into wooden facade cladding (heat treated to increase their durability), insulation of outer walls coming from a nearby industrial building, old construction site signs repurposed into shelves in the kitchen, and a scissor lift used in the construction of the steel frame used as an interior lift for artwork and gallery pieces. The estimated CO2 savings of the structure and facade by using reused elements was 90% compared to new materials. Materials were mainly sourced locally, resulting in about 60% of the building material coming from the immediate surroundings. Additionally, the building was designed to be dismantled with strategies such as using mechanical fasteners for the steel structure instead of welding. The only new elements included concrete foundations, building systems, plasterboard cladding, membranes, interior plaster and paint, synthetic resin flooring, and the windows.

KEY FINDINGS, RECOMMENDATIONS, AND LESSONS LEARNT

The structural engineer's strategy was to conservatively assume the lowest possible grade and calculate minimum sizes to allowed flexibility in what salvaged elements can be used where.

This project also featured a bit more creativity in repurposing old elements to not be used as-is, but modifying and reforming them to suit a new application, for example taking slats of old cable reels and using them as facade cladding. A primary emphasis on procurement was local sourcing, which resulted in 60% of building materials sourced from immediate surroundings which provided uniqueness to the elements incorporated in the building and also may have led to reduced transport impacts.

FURTHER INFORMATION AND RESOURCES

General info: https://www.superuse-studios.com/projectplus/villa-welpeloo/

General info: https://www.nextroom.at/building.php?id=34653

More details: https://issuu.com/2012architecten/docs/047.00_2010_detail

Drawings: https://www.nextroom.at/building.php?id=34653&sid=34481&inc=pdf

AVAILABLE QUANTITATIVE DATA

The facade was only 5% CO2 of equivalent facade made from new materials.

Steel structure was 12% CO2 of equivalent structure made from new materials.

Overall, the construction is estimated to be 10% CO2 of equivalent building made of new materials.

ABOUT THE DATABASE

This case study has been prepared by the Structural Engineering Institute Sustainability Committee Circular Economy Work Group with the goal of sharing and promoting the excellent circular economy work that project teams are working on throughout North America and the world. Often it is hard to find information on how circular economy principles are implemented in practice; these circular economy case studies aim to better share information amongst the industry.

Some case studies have been prepared directly by a project team member, while others have been prepared based on available texts and publications. In the second case, the text descriptions are a summary of information available from other sources. These sources are referenced in the *Further information and* resources section.

While reasonable efforts have been made to ensure the information is representative and accurate, we cannot guarantee there are no errors. Please contact the case study team to provide additional information, suggest updates and amendments, or with any other questions. To submit a new case study to the database, please use this submission form. Thank you!