PROJECT K118 Kopfbau Halle

YEAR
2021

LOCATION
Winterthur, Switzerland

USE
Office

CONSTRUCTION
Major Renovation of Existing Structure: Vertical Expansion

ARCHITECT
baubüro in situ

ENGINEER
Oberli Ingenieurbau AG (civil), Josef Kolb AG (timber)

DEVELOPER
Stiftung Abendrot (client, not a developer)

BUILDER
Wetter AG (steel), Zehnder Holz und Bau (timber)

SUPPLIER
Not explicitly listed.

SPECIALISTS
Architects were chosen as specialists in adaptive reuse projects

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GROSS AREA
13,600 sq-ft

MEAN ROOF HEIGHT
70 ft

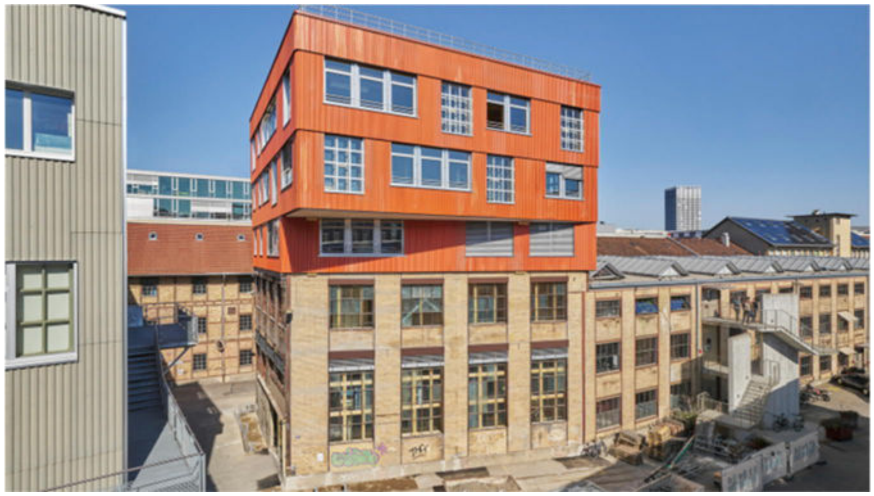
STORIES ABOVE GRADE
6

STORIES BELOW GRADE
0

RISK CATEGORY
II

COST INFORMATION
Unavailable

LCA INFORMATION
Unavailable


Credit: Martin Zeller

PRINCIPLE	SCALE	SYSTEMS	MATERIALS
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
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

Three floors of office space were added to an old warehouse as workspaces using locally sourced reused elements, including salvaged steel beams, and additional material categories such as salvaged steel staircases, granite facade, windows, metal sheets, radiators, and photovoltaic panels.

SUSTAINABILITY GOALS

There was an owner-driven goal of minimal environmental impact and preserving all of the existing buildings on the site with an original aim of 100% salvaged materials used. The owner was interested in using natural materials as much as possible. No specific GHG emissions targets are available.

CIRCULAR ECONOMY STRATEGIES

Over 50 product categories of salvaged materials were used, including steel beams from an old distribution center in Basel and a steel staircase used as-is (which dictated the floor heights) from a demolished office building in Zurich (Orion used only for 28 years). From that same office building, granite facade was repurposed as kitchen and bathroom floor finishes and balcony pavers, and aluminum insulated windows (some used as they were and fulfilling today's energy standards and some that were doubled to form box windows resulting in either double- or quadruple-paned windows). Additional salvaged materials include red facade metal sheets from the nearby Ziegler printing company (overlapped instead of trimmed), radiators, photovoltaic systems, sinks, mailboxes, roof elements from Aarau, solid wood doors from Uster, and parquet flooring from a wine warehouse. The extension was designed to be dismantled and reused, featuring strategies such as filling the floors with loose fill insulation.

KEY FINDINGS, RECOMMENDATIONS, AND LESSONS LEARNT

The design process for this project focused on identifying locally available materials and their constraints, and then evaluating how those materials dictate the design rather than the usual process of designing first and identfying appropriate materials. Design decisions (space, structure, and architectural expression) were considerably influenced by the choice of specific reused components in this project, which were sought out months before the project actually started. This enabled an extensive used of locally salvaged materials including structural steel beams, stair cases, facades, finishes, and fixtures. Many elements were used as-is as much as possible, for example overlapping the red metal facade sheets instead of trimming them, and doubling up the single-paned windows rather than opting for new more efficient windows. The original goal was for the extension to use 100% salvaged materials, however that proved to be challenging to meet the project budget which was set to be the approximate cost of an equivalent new building. The major factors driving cost were the labor (dismantling, processing, reassembly) and expertise needed to salvage and reuse existing building components. The team found that heavier components were typically less worthwhile for reuse economically compared to building new, and that lightweight components and those with complex manufacturing processes (like doors and windows) could achieve cost savings compared to new components.

The project balanced the cost goals with maximizing the use of salvaged materials, saving 60% of GHG emissions (494 t CO_2eq) compared to using only new materials, and saving 500 tons of materials that would be destinated for their typical end-of-life scenarios. Emissions savings from reused components were primarily achieved through savings in production phase emissions, whereas transport emissions savings were seen to be insignificant. The final reuse rate ended up being about 14% by weight (due to the more heavy components like concrete needing to be built new), or 41% by volume. Overall, the project illuminates the need for a new business model for circular construction that includes a wider range of stakeholders, including skilled crafts and logistics experts. Additionally, cost and timelines have a different nature compared to conventional construction, where procurement may start months before the project actually starts and often require advance payments earlier in the project timeline.

FURTHER INFORMATION AND RESOURCES

General Info: https://www.archdaily.com/968958/k118-kopfbau-halle-118-hauburo-in-situ

General Info: https://www.baunetzwissen.de/fenster-und-tueren/objekte/sonderbauten/aufstockung-k118-in-winterthur-7848543

General Info: https://www.swiss-architects.com/de/architecture-news/bau-der-woche/k118-eine-pionierleistung-fur-das-zirkulare-bauen

General Info with links to more documents: https://www.insitu.ch/projekte/196-k-118

Case study paper: https://iopscience.iop.org/article/10.1088/1742-6596/2600/19/192008

Interview: https://www.insitu.ch/doc/420

Drawings: https://www.insitu.ch/doc/57

AVAILABLE QUANTITATIVE DATA

60% GHG emissions savings compared to building with only new materials

500 tons of materials salvaged/reused

14% reuse rate by weight

41% reuse rate by volume

50 different material types reused

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!