PROJECT Boulder Fire Station 3

YEAR
2024

LOCATION
Boulder, CO, United States

USE
Public Order and Safety

CONSTRUCTION
New Construction

ARCHITECT
Davis Partnership Architects

ENGINEER
KL&A Engineers and Builders

DEVELOPER
City of Boulder

BUILDER
Mark Young Construction

SUPPLIER
Boulder Community Hospital Steel Stockpile; Full Metal Iron (Steel Fabricator)

SPECIALISTS
KL&A Team Carbon, Embodied Carbon Specialists

GROSS AREA
28,370 sq-ft

MEAN ROOF HEIGHT
34 ft

STORIES ABOVE GRADE
2

STORIES BELOW GRADE
0

RISK CATEGORY
IV (buildings and other structures designated as essential facilities or the failure of which could pose a substantial hazard to the community)

COST INFORMATION
Partially available

LCA INFORMATION
Partially available

Credit: Feitel, KL&A

MATERIALS		Steel	
SYSTEMS		Columns, Roof, Beams	
SCALE		Elemental	
	DfD *Design for Disassembly*	**SCR** **Structural Component Reuse**	DECON *Deconstruction*

SUMMARY

Boulder Fire Station 3 is a 2-story building, utilizing a concrete slab on metal deck, on composite steel framing. 89 pieces of wide-flange steel were procured from the Boulder Community Hospital Steel Stockpile and reused as structural members.

SUSTAINABILITY GOALS

The project goals were to directly reuse salvaged steel as structural framing and to be net-zero operational energy. The project did not pursue formal sustainability certifications.

CIRCULAR ECONOMY STRATEGIES

The construction made use of reused 1980's structural steel from neighboring Boulder Community Hospital deconstruction and steel stockpile project. The steel was procured from the stockpile, transported to the local fabricator's facility, cleaned, and the ends re-fabricated. By reusing the salvaged steel directly from the hospital as structural steel in the new construction of Fire Station 3, the material and its value was kept within the City of Boulder, illustrating the potential of circular economy and its opportunities to the community.

KEY FINDINGS, RECOMMENDATIONS, AND LESSONS LEARNT

89 pieces of wide-flange steel were procured from the Boulder Community Hospital Steel Stockpile and reused as structural members in the roof framing over the apparatus bay and mechanical screen framing atop the roof. The estimated embodied carbon savings of reusing the steel compared to standard new steel is 36,300 kgCO2eq. After a final cleaning of the salvaged steel, the fabrication process was reported to be seamless and like that of new steel. It was successfully installed in 2023. There were no reported differences in fabrication or installation costs and schedules and the steel was procured at zero cost to FS3. This resulted in a net cost savings of 0.5% of the total steel contract because the material savings outweighed the fabricator's cost to transport and clean the steel. FS3 illustrates that structural component reuse is possible and financially feasible. The enthusiasm and commitment of the owner, design, and construction team were instrumental to the implementation and execution of the direct use of salvaged steel in the construction of the new building. The financial feasibility of deconstruction is directly tied to connecting an end-use of the recovered material. Understanding the ability of FS3 to use pieces from the Boulder Community Hospital stockpile was critical to moving forward with its deconstruction. The donation of the reused steel to the fabricator was a condition of the City of Boulder's strategy for this project and can be seen as a City investment in facilitating improved material transfer of reused steel. This condition will not always be present.

FURTHER INFORMATION AND RESOURCES

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https://lsc-pagepro.mydigitalpublication.com/publication/?m=7946&i=825571&p=32&ver=html5

https://issuu.com/structuremag/docs/august2024/10;

https://www.youtube.com/watch?v=kvwn5U9KsyU

AVAILABLE QUANTITATIVE DATA

89 pieces of salvaged steel; 37.1 tons; 36,300 kgCO2eq savings; cost-neutral

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!