

Master's Thesis project description

Designing and assessing Circular Economy building structures and facades

Main supervisor: The student(s) is/are asked to find a relevant main supervisor at DTU

Co-supervisor: Leonora Eberhardt, AAU SBI
Morten Birkved, SDU

Project start: Summer 2019

Research question: Which circular design principles and variants are the most circular in terms of building structures and facades?

Relevance: Implementation of circular economy practices is of interest in the construction industry to reduce the sectors vast consumption of natural resources, large production of waste and great contribution to many environmental impacts such as greenhouse gas emissions. Although circular economy design principles and circular economy building precedence exist it remains unclear which circular design principles and variants are the most circular. Recent life cycle assessment studies have shown a potential for developing circular economy design variants for building structures and facades. Hence, a collaboration between Danish and Dutch partners have resulted in the development of new circular design variants for building structures and facades. Flexibility and adaptability through design for disassembly and modularity are some of the key elements of the design variants. Furthermore, principles such as recyclability and bio-based materials are also incorporated and tested within the design variants.

Objectives: The objective of the project is hence to derive systematic research-based knowledge and design guidelines for which circular economy design variant for building structures and facades is the most circular.

Data: The student(s) will build upon existing research in the field, work with building specific data from the industry and collaborate with the Danish contractor MT Højgaard as well as Danish and Dutch researchers from the Danish Building Research Institute, University of Southern Denmark and Delft University of Technology.

Content: On the basis of a newly developed life cycle assessment (LCA) method and material flow analysis (MFA) for assessing circular economy building designs the project will be carried out by (i) a comprehensive and systematic LCA and MFA of the developed design variants. Furthermore, (ii) on the basis of the synthesized learnings from (i) derive design guidelines for which circular economy design variant for building structures and facades is the most circular to help the industry develop similar circular economy building concepts in the future.

Journal article: Instead of a delivering a final thesis report the master student will instead be given the opportunity to co-write a journal article in close collaboration with the supervisors which will be submitted to an established scientific journal within the field.