

Sustainability in construction: circularity as a tool for a sustainable future

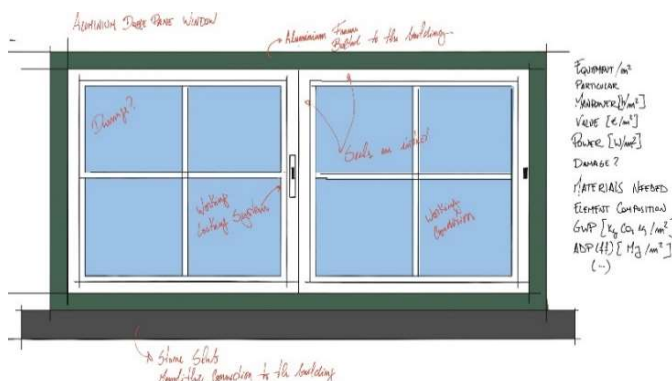
Summary

The construction sector is one of the main economic sectors worldwide, while also being one of the main contributors to the production of harmful environmental impacts. Thus, through European legislation, this sector faces several challenges in the next few years to address issues such as the waste generation and the use of virgin raw materials. The concept of Circular Economy (CE) aims to undertake these challenges, intending to close the life cycle loop of products and turning the waste produced in the end-of-life (EoL) into raw materials in a new cycle. To fully adopt a CE approach, the EoL of buildings will need to be properly studied and, instead of the demolition, a deconstruction approach will have to be embraced. However, the deconstruction of a building needs a higher amount of work by tools and manpower to recover elements (such as windows, doors, stone slabs, etc.), thus, with higher environmental impacts that must be accounted for. Adding to that, elements recovered from a building might not be immediately reusable for a new building, needing some repair and strengthening that, again, have environmental impacts. Therefore, this work aims to tackle this issue by the development of a tool for environmental assessment methodologies: the Archetypes of Deconstruction. The archetypes aim to help and facilitate the quantification of the environmental impacts of the recovery of an element before the deconstruction, so as to justify, or not, in an environmental (and possibly, economic) point of view, the recovery of that element. These archetypes aim to construct type-models of various elements (such as windows, doors, etc.) facilitating, in a pre-demolition audit through the quantification of the environmental impacts of the recovery of each element, depending on various factors such as the type of connection to the building, the elements' materials, their condition, among others.

The objective is, by the end of this work, to generate a methodology to create the archetypes and to build several of them that, using a meaningful functional unit, such as square meter for windows, can predict, with a good level of precision, the amount of work and total environmental impacts that recovering the element in study will generate. Besides the development of this methodology, this work also intends to develop a material circularity index, that aims to describe, in a single score, the value and ability of a material of being recovered from a building, refurbished, and reapplied. This index circles around the archetypes and will aim to condense all the information into one score to help the stakeholders to take decisions. This will support the development of Circularity Passports, that are documents where all circularity information of a material is stored, in a standardized way, so materials can be easily compared, and the information contained is useful and easy to read. To bring these concepts to the market and to the numerous stakeholders that exist in the construction sector, this work will also help develop an online platform that aims to connect the different stakeholders, from the owner of an old building to the deconstructing company, to the company that receives and treats the Construction and Demolition Wastes and or recovered materials. The platform is under development within a project (C+D); however this work will also support that development.

Keywords

Sustainability, LCA, end-of-Life, circular, circularity, deconstruction, environment.



Archetype of Deconstruction: example of approach for aluminium double pane windows.



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