Lessons learned from using a donor skeleton in a 3 storey office building

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Abstract

During the last decade a lot of attention has been paid to sustainability of structures. Reuse of existing buildings, limiting environmental impact and reuse of elements were applied in practice. In general, reuse of elements, with for instance the use of a donor skeleton, was applied on a very limited scale, as this reuse often comes at a price. In 2018 there was an opportunity to apply a donor skeleton on a larger scale in an office building of 6200 m^2. This paper will describe the process of design and construction of this special project, and will derive lessons learned in order to increase application of upscaling of building elements in future projects.

Keywords: circularity, re-use and sustainability of structures

1 Introduction

The Brundtland report [1] defines sustainable development as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Within science a lot of attention has been paid to various frameworks for sustainable construction (e.g. shearing layers model Brand [2]), typologies and ways to measure sustainability. As the load bearing structure entails approximately 60% of the weight of a building, it is clear that the choices of structural engineers have a large influence on the environmental impact. Within practice, a huge number of initiatives of sustainable and less sustainable solutions have been launched. IMd Consulting engineers has been a frontrunner in the Netherlands in methodically thinking about sustainable structural engineering, in combination with practical application of the developed strategies.

In 2009 IMd published five principles of sustainable structural engineering, which were updated in 2020 [3].

These principles are:

1. Increase the lifetime of a building/structure
2. Reduce the use of materials
3. Use sustainable materials
4. Include the environmental impact of construction logistics and transport
5. Design for circular use in the future

The first principle entails that when a structure has a high level of adaptability, various types of future use are possible within the designed geometry, and the need for demolition and rebuilding will be reduced.

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