

Sustainability with adaptive building concepts

Tobias Dressen

Research Engineer
RWTH Aachen University
Aachen, Germany
tdressen@imb.rwth-aachen.de

Tobias Dressen, born 1977, received his civil engineering degree from the RWTH Aachen University in 2004. He works as a research engineer at the institute of structural concrete.

**Josef Hegger**

Professor
RWTH Aachen University
Aachen, Germany
heg@imb.rwth-aachen.de

Josef Hegger, born 1954, received his doctoral degree from the Technical Univ. of Brunswick in 1984. He is head of the institute of structural concrete since 1993.



Summary

At present, buildings in urban areas are often broken down or elaborately rebuilt before they reach their economical lifetime. The most common reasons are the inflexibility of the construction to allow a change in utilization (e.g. from residential to office building or v.v.) and the realisation of current architectural requirements or new technical innovations. In order to use a building for a longer period more efficiently, one has to aim at designing more flexible structural systems, which also enable economical and ecological recycling. The paper deals with the comparison of adaptive building concepts with nowadays commonly used structures. Due to the higher service life of flexible structures less environmental impacts can be achieved. Thus, structures allowing flexible utilization can contribute a sustainable progress.

Keywords: adaptive buildings; flexibility in utilization; environmental impact; recycling of structures

1. Introduction

Civil engineering has a high influence on a sustainable progress due to its ecological importance, the large environmental impact (e.g. use of resources and energy) as well as its huge social relevance. Building activity refers briefly to the three spheres of sustainability. Decisions during building activity have an effect on several generations, who spend a bigger part of their life in time in these buildings, because of the high service life of a real estate. Furthermore land- and townscape are formed by construction activities.

The structural concept of an adaptive building has to allow for different floor plans and a variable arrangement of building services systems. In particular, floor constructions are of high importance for sustainability in multi-storey buildings due to their intense material usage and their huge potential in terms of savings of material in construction and deconstruction as well as of planning a flexible utilization of a building.

In general the service lifetime of extension systems, building service systems and parts of the façade is considerable lower than the lifetime of the structure [1]. At present, buildings in urban areas are demolished or elaborately rebuilt before they reach their economical lifetime. The most common reasons are the inflexibility of the construction to allow a change in utilization (e.g. from residential to office building or v.v.) and the realisation of current architectural requirements or new technical innovations. The main issue is to utilize the possible lifetime of the structural system in a more efficient and intense way.