

Timber and concrete hybrid superstructures – a potential step towards sustainability?

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Abstract

Timber is a renewable material having a lower carbon-footprint than conventional concrete and steel. Hence, timber would be a good choice of material to minimize the carbon-footprint of a building. Superstructures of pure timber are, however, cumbersome to use for multistory purposes – timber is simply too light to stabilize the building properly. Hence, the interest in timber and concrete/steel hybrid structures is increasing. The purpose of this paper is to investigate the potential savings of CO₂ emissions in the design of a multistory residential building - this by using timber and concrete in its superstructure instead of only concrete and concurrently ensuring global stability. The study is performed on an existing 17-story residential building with a pure concrete superstructure: The results indicate that the carbon-footprint of the building in question could have been reduced by 48% if a hybrid superstructure had been used instead.

Keywords: Case study; hybrid construction; timber; carbon dioxide; sustainable construction.

1 Introduction

According to Shaftel [1] the concentration of atmospheric CO₂ has increased by 30% since the beginning of the industrial revolution. It is generally acknowledged that CO₂ is the number one driving force of climate change.

World Green Building Council [2] claims that the building and construction industry is responsible for almost 39% of the annual CO₂ emissions globally.

According to Rodgers [3], 8% of the global CO₂ emissions originate from the use of cement in concrete construction, i.e. 21% of the emissions produced by the building industry. Thusly, one important part of reducing CO₂ emissions of the construction industry would be to replace conventional concrete with other materials.

The total amount of CO₂ emissions (and also other greenhouse gases) caused by the manufacturing of a product, such as a building, is sometimes referred to as the carbon-footprint of the product