Code of practice for sustainable structures

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Abstract

The construction sector being responsible for about 42% of the final energy consumption and about 35% of global greenhouse gas emissions, plays a central role in the global effort for decarbonization and mitigation of climate change. However, despite worldwide policies and investments to make the building sector more efficient, no clear structural changes have yet occurred to reduce energy demand or cut carbon emissions.

Sustainability is a mindset that should be embraced by all professionals in the construction sector, to drive positive changes towards a more sustainable and decarbonized future. In this regard, a code for the sustainability of buildings is crucial to set target values for carbon emissions and other environmental problems, and to provide clear guidelines on how to comply with such values, across the life cycle of buildings. In this paper, a performance-based approach for sustainability assessment of structures is presented, based on the limit state approach that is familiar to most structural engineers. The harmonization of structural and sustainable design fosters a mindset that considers environmental impacts alongside safety and functionality, allowing structural engineers to become key players in the larger quest for a sustainable built environment.

Keywords: sustainable structures, decarbonization, limit state of sustainability, code for sustainability.

1 Introduction

The world is currently living in a state of climate emergency and urgent measures are required to control the temperature rise and mitigate climate change effects.

The impacts of the construction sector on energy consumption and greenhouse gas emissions are significant. In fact, this sector is responsible, at the EU level, for about 42% of the final energy consumption and about 35% of global greenhouse gas emissions (EEA, 2022). This highlights the sector's central role in the global effort for decarbonization and mitigation of climate change, and efforts toward enhanced construction practices could have far-reaching effects on these numbers.

As part of the European Green Deal (EC, 2019), the recently published European climate law aims for a net-zero balance of greenhouse gas emissions by 2050, and the intermediate target of reducing emissions by at least 55% by 2030 compared to 1990 levels (Regulation (EU) 2021/1119). Hence, climate neutrality became legally binding in the EU.

However, despite this and other worldwide policies and investments to make the building sector more efficient, no clear changes have yet occurred within the buildings sector to reduce energy demand or cut carbon emissions.

In fact, the operational energy consumption in buildings and associated carbon emissions had an increase of about 3% and 2%, respectively, in relation to pre-pandemic values, in 2019, as illustrated in Figure 1 (UNEP, 2022).

Hence, a stronger effort is required by the construction sector to implement sustainable and energy-efficient approaches. By doing so, the

https://doi.org/10.2749/newdelhi.2023.0060