

CONCRETE STRUCTURES FOR SUSTAINABILITY IN A CHANGING WORLD

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ABSTRACT

Concrete is after water the most used material in the World. Basically every con-temporary construction contains concrete. Cement production is associated with large energy consumption and high amount of CO₂ emissions. World cement production has been 12 times increased in the second half of the last century and thus the cement industry produces at present about 5 - 7% of global man-made CO₂ emissions. More over high amount of concrete use is associated with high transport needs and demands on production and demolition processes within the entire life cycle. This all has significant impact on the environment.

Current development of concrete, production technology and development of concrete constructions during last twenty years have lead to quality shift of technical parameters and also of related environmental impacts. New types of concrete have due to mix optimization significantly better characteristics from the perspective of strength, mechanical resistance, durability and resistance to extreme loads. Concrete gradually becomes building material with high potential for expectant environmental impact reduction. This needs better knowledge about technological processes and their impacts from wide variety of sustainability aspects within entire life cycle – from acquisition of materials, through production of concrete and concrete components, construction, use, up to demolition of concrete structure and recycling.

World is changing. We are faced to increasing frequency of natural disasters due to continuously increasing global environmental changes. Earthquakes, floods, storms, hurricanes, tornados, fires, tsunami, volcanic events, extreme dry weather etc. are more and more frequent. We are faced to increasing economical social problems - increasing migration of people, terrorism etc. The structures for sustainable future should be better prepared for the new conditions, to be more resilient.

New conceptual approach to design and evaluation of structures is an integrated life-cycle assessment, representing multi-parametric assessment of the structure within the whole life cycle. This approach integrates material, component, and structure design and considers selected relevant criterions from a wide range of criterions sorted in three basic groups of sustainability: environmental, economical and social. The paper presents conceptual approach for integrated life-cycle assessment of concrete structures based on general methods and tools for life-cycle assessment of structures and considering aspects of sustainability.

Already implemented realizations give clear signal that in the forthcoming era when designing and implementing concrete structures it will be necessary to take into account new requirements and criteria following from global aspects on sustainable development.

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