

Sustainability in Construction and the Role of Structural Engineer

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ABSTRACT

This paper examines role of structural engineers in design of green buildings by analysing the structural aspects of buildings. Finally, the sustainability aspects related to structural design that are currently ignored in the rating systems were identified and discussed. Such aspects include: baseline material usage, structural design and resilience, structural adaptability and reuse, structural durability and longevity.

I. INTRODUCTION

Sustainability has been defined as economic growth that meets the current generation's needs without compromising the opportunity and the potential for future generation needs [1]. Construction industry is a growing and emerging sector in both developed and developing countries for which it is drawing attention towards improving social, economic and environmental indicators of sustainable development. This sector environmentally is responsible for high energy consumption, waste generation, global greenhouse gases emissions, pollution and resource depletion. It has been recognised that a major reduction in environmental issues is not achievable without a significant effort in contributions from the building and construction sector. Therefore, the construction industry is urged to move from traditional and conventional methods towards more environmental friendly, energy

efficient and reduced waste generation methods.

Socially and economically, the European Commission (2006) stated that 11.8 million operatives are directly employed in the sector and it is one of the Europe's largest industrial employer, accounting for 7% of total employment and 28% of industrial employment in the EU-15. Nearly 910 billion euros was invested in construction and infrastructure industry in 2003, signifying 10% of the gross domestic product (GDP) and 51.2% of the Gross Fixed Capital Formation of the EU-15[4].

Within the construction industry, structural engineers are one of the crucial players in building and civil infrastructure projects. They are part of a multidisciplinary team of architects, civil and services engineers, construction managers and owners which is required to function in an integrative manner to successfully deliver the project. Yet, it is a firm fact that the technical expertise provided by structural engineers has far reaching concerns for economy, constructability, operation and maintenance, and durability of the project.

II. STRUCTURAL STRATEGIES TO ENHANCE SUSTAINABILITY

There is no baseline values aimed at the material use/structural form model for structural efficiency as compared to the baseline for water and energy use against which the efficiency of these items is

measured. Research and studies in this area over time will provide broad database of energy considerations in structural design. Adoption of this technique will promote adequate use of resources and materials while conserving natural resources.

Designing for easy deconstruction and reuse should be studied and analysed for certain types of construction (steel, precast and wood). Existing technology should be adopted for building structures with modular components in standard dimensions for easy assembly and reuse. Emphasis should be laid on reusing the structural components rather than recycling. The area which contributes highly to sustainability is the issue of conservation, refurbishment and restoration of existing structures to extend their service life. Education and training of structural engineers in this regard is required for successful implementation of this task.

The popular method of achieving sustainability is to specify supplemental cementitious materials like fly ash and blast furnace slag to replace a percentage of cement content in concrete production. It is a well-established technique and should be encouraged.

Structural engineers should be aware of the availability of specified materials so as to limit the impact of transportation from faraway places. Similarly, structural engineers should specify substitute material that is locally available in the region so as to reduce the expenditure of transport of out of region material.

The design of rainwater storage tanks and wastewater tank by structural engineers will promote water efficiency. Likewise, design of structures for solar panels and wind turbines will encourage renewable energy efficiency. Although the added load of panels and turbines should be

carefully included so as to promote safety of structure and public lives.

Innovative designs and placements of windows, structural framework and light shelves so as to maximum natural light is utilised in building will encourage energy efficiency.

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