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Sustainable Development Principles into Building Design

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Description

The main aim of this research is to utilize the focus of sustainable design to compare the material and subsequent environmental impacts of multi-story structures situated in Australia. The structure types under investigation were characterized by post-tensioned and conventionally reinforced floor and roof flat plate slab systems [1]. The foundation designs are undertaken for isolated spread footings on 32 structural model types with constant external dimensions which were composed of floor and roof slabs of varying concrete strength, span length and construction method, with all footing designs providing equivalent structural performance. The results from this study have reinforced the evidence that post-tensioned construction can have significant effects in reducing material requirements and provide increased structural and environmental efficiency[2]. Through reducing the frame mass, the footing systems were able to be designed using significantly less embodied energy when compared to the reinforced concrete structures. It is also noted that further investigation in the foundational requirements of these models is warranted, with the need to investigate the use of mat foundations for cases where isolated spread footings have required more than 50% of the structural plan area and for the footings that have required excessively thick sections to resist large shearing actions for larger spanned cases at 10 and 13.33 m.

In recent times sustainable development and design has become an increasingly important issue to consider in our built environment [3]. The factors driving the adoption of sustainable development and design are numerous but perhaps the most significant is a growing concern about anthropogenic global warming caused through carbon emissions. The building and construction industry is a significant contributor to carbon emissions through the consumption of large quantities of energy. The main aim of this research is to utilize the focus of sustainable design to compare the material and subsequent environmental impacts of multi-story structures in Australia. Globally, greenhouse gas emissions are rising exponentially with most of this rise occurring in the last 60 years. Australia is ranked in the top 10 greenhouse gas emitting countries in the world with 25 t CO2-e per capita in 2012. Australia's greenhouse gas emissions peaked in 2009. It has since declined, however now not the time for complacency is the introduction of energy efficiency provisions in the National Construction Code (NCC) has attempted to address global warming issues by prescribing the requirements for operational energy efficiency [4]. Soon after these changes the Green Building Council of Australia introduced the Green Star rating system which defines optional requirements above the NCC for energy efficiency and sustainability. Green Star's rise in popularity is a clear indication that building owners, developers and occupiers are demanding sustainable and energy-efficient buildings. Aside from addressing sustainability and global warming issues, stakeholders recognize the benefits that green buildings offer with lower operational costs being a prominent motivator. The incorporation of the requirements of the NCC and Green Star into buildings inevitably lowers operational energy consumption during a structures' life cycle. This has resulted in a more significant portion of the life cycle energy being represented by the structure itself which is referred to as embodied energy [5]. This is clearly a target area for further reducing the energy consumed by a building. Currently, the NCC does not identify embodied energy as an area to improve the energy performance of buildings. Furthermore, the prominent building rating systems place insufficient emphasis on embodied energy considerations.

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