STABILISED SOILS FOR STRUCTURAL APPLICATIONS AND SOME ISSUES ON SUSTAINABLE CONSTRUCTIONS

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ABSTRACT

Construction industry is the largest producer of materials when compared with any other industrial sector. Currently the annual production of cement is about 3 billion tonnes and burnt clay bricks are about 3.5 billion tonnes. Consumption of every tonne of cement requires 5 – 6 tonnes of aggregates and therefore 15 – 20 billion tonnes of aggregates are consumed annually. Therefore, Manufacturing and use of construction materials necessitates consumption of raw material resources and energy. Raw materials are mined from the earth and energy is expended to convert these raw materials into construction products. The consequences are depletion of the raw material resources due to mining. Any activity related with mining is unsustainable. Expenditure of energy causes green house gas (GHG) emissions. Thus construction sector has two problems to address: (1) unsustainable mining of limited raw material resources and (2) GHG emissions. It has been assessed that the built environment alone consumes 30% of raw materials extracted and 40% energy resources. The built environment is responsible for 40% of GHG emissions and 30% of solid waste generation. Majority of the arguments proposed regarding sustainability of construction sector in general and the built environment in particular address the issue of pollution and GHG emission reductions. Without addressing the issue of depleting material resources due to mining there is no meaning in talking about sustainability of construction sector. This presentation will discuss some real issues of sustainability with reference to construction sector and the technology of stabilised soil products (low energy and sustainable products) for structural applications like walls and other building components.

Concepts of sustainability of construction sector particularly with reference to the mining of material resources and energy represent the main focus of the presentation. Energy, emissions and life cycle of some conventional materials are discussed. Case studies of zero carbon foot print vernacular structures and the problems associated with rating systems are illustrated. Broad guidelines on achieving sustainability construction sector are proposed.

Potential of earth based low embodied carbon building products for structural applications in buildings has been illustrated with some examples. Loss of strength on saturation and rain erosion are the two major disadvantages of pure soil based constructions. Hence, there is a need for stabilised soil products for structural components of buildings. Examples of centuries old earthen structures especially multi-storey residential structures are pictorially illustrated. Surge of recent interests in reviving earthen architecture for dwellings with case studies are shown.

Principles soil stabilisation as adopted for the production of stabilised soil blocks and stabilised rammed earth elements would be dealt in greater detail. Density, strength and moisture relationships and their importance in devising good quality stabilised soil blocks and stabilised rammed earth walls forms the main theme of discussions on stabilised soil products for structural applications. Discussions on embodied carbon in stabilised soil products, retrieving clay minerals from such products, recycling and end of life considerations of such products forms the main scientific analysis. The presentation leads to the emergence of some useful guidelines on stabilised earth construction as applicable to sustainable constructions.

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