A Paper on Sustainability of Concrete Building

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ABSTRACT: Sustainability is vital for our planet's well-being, society's continued growth, and human progress. Concrete is one of the world's most commonly used materials for building. Nevertheless, the manufacturing of Portland cement, an integral part of concrete, results in the release of large quantities of CO2, a greenhouse gas! GHG'; processing of one ton of Portland cement contains nearly one ton of CO2 and other GHGs. In addition to natural resource concerns, the environmental issues associated with GHGs will play a leading role in the sustainable growth of the cement and concrete sector during this century. For instance, as the availability of good-quality limestone to manufacture cement declines, it would become more difficult to produce sufficient quantities of Portland cement for building. There is a risk that all the workers associated with the concrete industry, as well as new building projects, will be terminated when there is no more good-quality limestone in, say, a regional area, and therefore no Portland cement.

KEYWORDS: Sustainability, Concrete Industry, Urban context, Maintenance, Building material, Quality factor.

INTRODUCTION

Sustainability requires "meeting the needs of the present without compromising the ability of future generations to meet their own needs," according to the United Nations World Commission on Climate and Prosperity. For the well-being of our world and human growth, the survival of the cement and concrete industry is indispensable. However, the processing of Portland cement, which is an integral part of concrete, results in a large amount of CO2 and other greenhouse gases being released [1]. Over this century, the environmental challenges associated with CO2 will play a leading role in the sustainable growth of the cement and concrete sector. The diminishing quantity of limestone in certain geographical regions is one of the main challenges to the survival of the cement industry.

For the production of Portland cement, limestone is important. Jobs and development associated with the concrete industry will decrease as limestone becomes a scarce resource [2]. Those associated with these industries must then create modern methods for the manufacture of concrete with limited limestone use. Concrete manufacturing is not only a vital source of societal growth, but also an important source of employment. Concrete is the most eaten man-made substance in the world. It is no surprise that concrete production in the United States alone accounted for 2 million workers in 2002. Around 2.7 billion cubic meters of concrete were manufactured worldwide in 2002. This equals more than 0.4 m3 of concrete produced per person annually [3]. Therefore, not only for the creation of sustainable social development, but also for the maintenance of employment, such as batch plant operators, truck drivers, ironworkers, laborers, carpenters, finishers, equipment operators and testing technicians, as well as professional engineers, architects, surveyors and inspectors, the concrete industry must continue to evolve as societal needs and expectations change.

Sustainability for Concrete Industry

A sustainable concrete system is one that is built such that over the entire life span, the overall societal effect is negligible. Designing with feasibility means accounting for the structure's short-term and long-term implications. The construction of robust structures is paramount in order to reduce the long-term effects of structures. In the "new construction ideology" of this new century, building in a sustainable manner and scheduling adequate building maintenance are critical. In particular, designing in a sustainable way requires concentrating emphasis on the influence of new and current buildings on human health, energy conservation, and physical, environmental

and technical capital. In the design of sustainable structures, it is also important to take into account the influence of construction technology and methods [4].

An integrated environmental design process may minimize the costs of the project and the running costs of the development or construction of facilities. Portland cement manufacture is associated with multiple problems [5][6]. Of these, the most important are energy and resource management, the cost of making Portland cement, and GHG emissions. Therefore, supplemental cementing ingredients such as fly ash and ground granulated blast-furnace slag can substitute greater quantities of Portland cement in concrete. However, all aspects of the building materials to be used should be determined before the work begins. The effect of construction materials on local and global air quality must be studied in order to create buildings and infrastructures that are cost-efficient, environmentally sustainable and robust.

At the current rate of growth in the production of cement, global cement production is estimated to increase from around 2.5 billion tons in 2006 to around 5 billion tons by 2020. CO_2 emissions from the manufacture of Portland cement are also projected to increase by 100 percent from the current amount by 2020. 1.5 to 10 kg of NOx is released into the environment with each metric ton of Portland Cement Clinker. The worldwide production of cement clinkers was around 1.5 billion tons in 2000. About 2.3 and 15 million tons of NOx were developed for the manufacture of Portland cement clinkers in 2000 [7]. In the United States, clinker demand in 2005 was approximately 85 million tons; and thus, in the United States, approximately 125 to 850 thousand tons of NOx were produced for the production of Portland cement. If the problems associated with reducing CO_2, NOx and other GHGs are to be faced; other materials to replace Portland cement must be produced by the concrete industry. For the survival of the cement and concrete industry, the use of mixed cements and renewable chemical admixtures must be expanded considerably.

Design for Sustainability

When the World Fair was planned in 1991, the city of Hannover, Germany, invited William McDonough and Michael Braungart to create the concepts of sustainability to guide the large-scale development of EXPO 2000 in Hannover. The Hannover Principles, 'Plan for Sustainability' also contain the Water Usage Directives [8]. Although these standards have been developed for the World's Fair, they are also a good tool to direct worldwide current and future progress. The Hannover Concepts can be used by builders, architects, elected leaders, and all others interested in the development of new buildings and facilities [9]. In the future, ecological structures and architecture should be included in the current design philosophy that has arisen from these concepts. Sustainable and environmentally sustainable cultures have been developed by a variety of societies [10][11]. It is hoped that the Hannover Ideals will encourage progress and changes to create a prosperous and supportive future for communities and the environment, dedicated to sustainable growth with reasonable constraints.

William McDonough's Hannover Values are as follows: focus on the rights of humans and nature to coexist; consider interdependence; honor relationships between spirit and matter; take liability for design implications; build healthy objects of long-term value; eradicate the idea of waste; rely on natural energy flows; acknowledge design constraints; and pursue continuous imposition. The Ideals of Hannover are not "cast in concrete." As our perception of our interdependence with nature grows more relevant over time, they were intended to offer a concrete record that could develop and be adapted. For sustainability, consider the following actions:

- Materials- using native materials.
- Land use: preserving and producing fertile soil.
- Urban context- maintaining green spaces.
- Wastes- recycle.

- Energy- use solar and wind power.
- Nature's responsibility- create quiet.
- Maintenance - For future generations, reduce or eradicate.

CONCLUSION

As U.N. Secretary General Kofi Annan said in 2002, "We have the human and material capital needed not as an abstract idea but as a tangible fact to achieve sustainable growth". It is the duty of practitioners working in the cement and concrete industry to produce enduring developments to safeguard the potential competitiveness of the industries, as well as the health of our community. Generally, substantial quantities of by-product products are disposed of in landfills. The disposal costs for by-products are increasingly escalating due to tighter environmental regulations. Not only does recycling and the development of sustainable building designs contribute to lower disposal rates, but they also help to protect natural resources. Technical and economic advantages are provided by this conservation. For those working in the cement and concrete industry, it is important to reduce waste and take responsibility for the life cycle of their goods. It is important to care about the environment, equity, and economy of our architecture in order to be responsible engineers. Throughout our construction activities, engineers must bring forethought to prompt and practical action. Sustainable technologies have to be seen as alternatives to conventional designs and as better methods. In the latest design methods produced and used by the cement and concrete industry, the consequences of a design decision on the natural and cultural capital of the local, regional and global ecosystems must be understood.

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