APPLICATION OF WASTE IN CONSTRUCTION- A REVIEW ARTICLE

Manmeet Kaur[1], Preetpal Singh[2]
[1]Department of Civil Engineering, Chandigarh University,Gharuan
[2] Department of Civil Engineering, Maharaja Agersen University, Baddi

ABSTRACT

The Solid Waste, one of the major threat to the environment, is now being utilized for the various different types of the construction projects. Based on the traditional method whatsoever is the solid waste generated that generally is dumped into the land filling sites. Such a process results into the harmful impacts on the environment. to cope up with this threat many advocates of environment came up with the different ways of recycling the solid waste apropos of the infrastructural developments. This, not only is lucrative for the decomposition of the waste, but also is responsible to enhance the efficiency of the work. The ensuing paper will glance through the available literature on the variety of materials that are available for the construction.

KEYWORDS: Solid Waste, Construction, Recycling the solid waste

INTRODUCTION

The rudimentary construction materials are presently being produced by the conventional methods. These methods pose a great threat to the environment as during the manufacturing process the various toxic gases; Carbon Monoxide, Sulphur Oxides, Nitrogen Oxides, Particulate Matter, and many more; are introduced into the environment. All Such contaminants exploit the biodiversity with special concerns to the Air, Water, Soil, Flora & Fauna ,and Humans. This acts as a prime reason to conserve the environment. the advocates of environment are now much more concerned about the conservation of environment so they focus on the reuse and recycling of the waste. Many authorities and investigators are keenly working reuse the waste in an effective environmentally and economic sustainable way (Aubert et al., 2006). One such innovative method is the usage of solid waste in construction, which is now a global concern. In response to such an issue the extensive research and development work is the precedence in view of exploring the new ingredients that can be a part of producing sustainable and environment-friendly construction materials. This study investigates the potential use of different solid wastes as a supplement to construction materials.

APPLICATION OF SOLID WASTES IN CONSTRUCTION

The numerous reasons are there which have resulted into the proliferated amount of solid waste. Some of the factors responsible are: soaring population, industrialization, urbanization and raised standard of living.

The solid is generally classified as:

1. Agricultural Waste: Rice, Wheat Straw, Vegetable residues
2. Industrial Waste: Coal Combustion residues, steel slag, construction debris
3. Non Hazardous Waste: Waste gypsum, lime sludge, lime stone waste, broken glass and ceramics, marble processing residues, kiln dust
4. Hazardous Waste: sludge from waste water and waste treatment plants, tannery waste

Globally, the estimated quantity of solid wastes generation was 12 billion tons in the year 2002 (Pappu et al., 2007). Among this amount, 11 billion tons were industrial solid wastes and 1.6 billion tons were municipal solid wastes. About 19 billion tons of solid wastes are expected to be generated annually by the year 2025 (Yoshizawa et al., 2004). Annually, Asia alone generates 4.4 billion tons of solid wastes. About 6% of this amount is generated in India (Yoshizawa et al., 2004; CPCB, 2000).

Some of the solid wastes that have gained the popularity in construction are listed below

I. FLY ASH (FA) AND BOTTOM ASH (BA)

The large scale operation of the inclinators and coal fuelled power stations produce a huge volume of Fly ash and Bottom ash. The basic composition of FA is the mixture of aluminosilicate and ferriferrous glassy spherical particles (about 60 - 80%) and irregular shaped grains of amorphous clay, mullite quartz and unburned metamorphic fuel (Malhotra and Ramezaniarpour, 1994; Diamond, 1986), while the bottom ash comprises of irregular particles with size range of 10-15 mm. It has been stated that the chemical compositions of FA and BA ashes from the same power plant is typically the same (Yun et al., 2004). FA, the recent innovation, emerged as a cost efficient alternative for Portland cement, hence being used in the cement. It improves the strength of the cement and makes the concrete mixture more workable (Pei-wei et al., 2007). , Lingling et al. (2005) found that fly ash improves the compressive strength of bricks and makes them more resistant to frost attack. With special concern to the environment the FA is that the firing energy can be saved because of the carbon content in fly ash. Due to this differentiating factor the FA is primarily used as a raw material for bricks.

II. RICE HUSK ASH (RHA)

RHA is obtained after burning the husks of rice paddy in rice milling industry. Non crystalline amorphous RHA is basically whitish or grayish in colour. These partices have a cellular structure with a very high surface area. RHA has 90–95% amorphous silica (Mehta, 1992). The RHA is being applied in the mortar and concrete, where good workability is required. Ismail and Waliuddin (1996) made high-strength concrete with RHA. Moreover, Zhang and Malhotra (1996) produced high-performance concrete using RHA as a supplementary cementing material. As suggested by Nasly and Yassin, 2009; Rahman, 1987, 1988, it can be proved efficient in the manufacturing of bricks without affecting the quality of the product.

III. WASTE STEEL SLAG

During the process of conversion of iron ore to steel, the steel slag is generated. The steel slag is a waste which when dumped into the environment has the negative or the depressing effects. But, this has been overcome to some extend by its utilization in the construction. Shi and Qian (2000) stated that the free CaO content enhances the reactivity of steel slag. However, the high free CaO content in steel slag has shown to produce volume expansion problems (Tang, 1973; Sun, 1983; Shi and Day, 1999).

Thus, the waste steel slag can be useful in the production of cement pastes and bricks. Li and Sun (2000) used steel slag to produce combined-alkali-slag paste materials. The bricks developed by the utilization of such a waste are basically the third class bricks.

IV. ORGANIC FIBERS

The key role for the generation of organic fibers is played by the solid wastes such as bamboo, coconut, date palm, oil palm, sugar palm, sugarcane, and vegetable wastes. The most prodigious advantage of these is their eco friendly nature and being economical. The first and the foremost example of the organic fibers is Bamboo Fibers. These are extracted from the bamboo waste. They are utilized in the production of bamboo fiber reinforced plastic composites

Subsequently, Coconut fibers can be used in combination with portland cement for the production of fiber-cement board. In a recent research, coconut fibers were used in reinforced concrete beam along with rice husk and sugarcane waste fibers (Sivaraja and Kandasamy, 2009).

Such advancement is related to the utilization of Date palm, a fibrous structure. The date palm is very rich in fibrous content. Although the flexural strength and toughness improves, the compressive strength

decreases with the increased length and percentage of date palm fibers (Kriker et al., 2005).

V. CONSTRUCTION AND DEMOLITION DEBRIS

With the growing urbanization and industrialization, the infrastructural development has resulted in the generation of increased volume of Construction and demolition debris. This waste, C&D debris, comprises the majority of solid waste. Since, the waste is majorly been dumped into the land fill sites it poses a great threat to the environment. the recycling of this waste ultimately results in the eco-friendly decay.

The major portion of the waste is comprised of concrete rubble, along with the aggregates, bricks, sand, tiles, paper, plastic and many more to name but a few. The C&D debris is considered as an alternative for the aggregates, which can be used for the production of concrete (Collins, 1994).

CONCLUSION

To conclude, it may be suggested that the solid waste has numerous applications in the field of construction. The vast area of application includes the construction of highways, concrete blocks, bricks, recycling of construction and demolition waste, and so on. Since, the significant research has been conducted in this arena but still the real application is still constrained. The focus of the research should also be on the attempt to investigate the durability performance of several construction materials including solid wastes.

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