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Increasing the usage of green concrete in conflict areas

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Abstract

Green concrete is the most recent advancement in construction technology, offering a sustainable and environmentally friendly alternative to traditional concrete as a building material. The cement used in traditional concrete contributes significantly to the release of dangerous carbon dioxide into the atmosphere. Green concrete is a concept that involves the partial or complete substitution of cement with a variety of elements that are either by-products of the manufacture of other materials or recovered garbage. The following article discusses. Green concrete is created by partly substituting fly ash for cement, which is derived from the combustion of pulverized coal in electric power plants, and totally substituting fine aggregate for a 60 percent – 40 percent replacement rate. A mixture of crushed glass and destroyed building trash that has been transformed until it reaches a fine powdered state. Building debris obtained from the remnants of buildings destroyed due to the conflict. Additionally, a comparison of the characteristics of normal concrete and green concrete materials.

Introduction

Concrete is the most prevalent building material used in the construction industry. Its great strength, long-term durability, and mechanical qualities make it a highly useable material with a diverse range of uses. Despite its tremendous benefits, it does have some drawbacks. Conventional concrete is not considered a reusable product since the raw materials required to make it are not generated in an environmentally friendly way and do damage to the environment. Cement, one of the components of concrete, is responsible for more than 6% of all CO_2 emissions, which contributes to global warming (Greenhouse gas). CO_2 emissions range between 0.05 and 0.13 tons every ton of concrete produced. Cement manufacture accounts for 95% of all CO_2 emissions from a cubic meter of concrete. The Middle East is one of the world's biggest consumers of cement and an important producer of it. Green Concrete created to mitigate this detrimental effect [1]. It produced for the first time in 1998 in Denmark BY Dr. W.G. Green buildings and reusable construction practices have proved very effective in reducing Green House Gas emissions by using green concrete. It is an eco-friendly concrete that emits a tiny quantity of CO_2 during the manufacturing process, posing no environmental hazard. It incorporates waste materials into its design. Numerous benefits of Green Concrete make it the most appropriate material for the building sector include the following:

- It contributes to the reduction of structure's dead weight.

- It contributes to complete the building construction more quickly by shortening the total build duration.

- It contributes to a 30% decrease in CO2 emissions [2].

- It contributes to the re-use of waste material.

- It is thermally and fire resistant.

-It has a stronger compressive strength than traditional concrete at the same water-cement ratio. Fly ash, granulated blast furnace slag, recycled concrete, demolition debris, micro silica, glass powder, marble powder, and quarry dust are all examples of materials that may be utilize in place of standard components. To save on energy and transportation costs, recycled material or industrial waste might be chosen depending on its availability near the building site. The following items fall within this category and are addressed in detail below.

- Aggregate made from demolished construction debris- These construction material fractions are the remnants that can be reuse from the destroyed structure. A mixture of natural and recycled aggregates. Concrete's characteristics are unaffected by demolition aggregate [3].

- Fly Ash – Fly ash is the product of coal combustion Coal- fired power and steam plants. fly ash provide environmental benefits by improves concrete durability, reducing energy and greenhouse gas emissions and conserving other natural resources. Cement can be replaced by fly ash up to 80% without changing the property of the final product. A cheap, economical and abundant material can be it is easily used as a substitute for cement.

- Slag from a kiln - has a property equivalent to cement. That obtained as a by-product of iron and steel in the steam industry or water from the blast furnace.

- Husk of rice - obtained as a by-product of rice milling. It contains 83-87% of amorphous silica. Considered as the most important alternative of cement material producing green concrete this reduces carbon dioxide emissions.

- A mixture of marble powder - waste marble powder is industrial waste contains heavy metals in the ingredient. Marble powder has a very high blain purity of about 1.5m2/g with 90% of particles passing through a sieve are 50 µm and 50% are under 7 µm [4].

Material and Method

- Cement - Ordinary Portland cement grade 43. Was used Emphasis on IS 8112-1989 with normal consistency of 28% with the characteristics listed in Table 1.

- Aggregate with a coarse texture - coarse aggregate usually available, which passes through a sieve with a size of 12.5-20 mm corresponding to IS 383:
1970 is used.

- Soft Aggregate - Medium sized sand passing through 4.75 mm Sieve conforming to IS 2386: 1963 in use. Water - tap water is used to prepare green and normal water concrete.

-Fly ash - fly ash obtained when pulverized coal is burned produce heat. Fly ash produces cement compound calcium silicate
Hydrate (C-S-H) when reacting with lime and alkali. Reaction. It represented by the following equation [3]:

Cement Reaction: $C_3S + H \rightarrow C - S - H + CaOH$
Pozolanic Reaction: $CaOH + S \rightarrow C - S - H$
The characteristics of the fly ash used are shown in Table1.

Glass powder - Glass is mainly composed of silica. Garbage glass created after its service life is converted into small- sized particles or in powder form, and also undergoes pozolanic reactions with cement hydrate, secondary calcium silicate hydrate is formed (C -S - H).

Concrete and brick rubble - concrete and brick debris after the demolishing of buildings, it can be converted into powder form and can be used as a substitute for fine as well Coarse aggregate in the preparation of green concrete.

Design mix

The concrete mix design of M20 grade both normal and green concrete has been done confirming to the specification of code IS 10262-2009. The design mix proportion is shown in Table 1. The proportion by Bulk Density for the materials are given in 9 cubes of 150 mm 150 mm 150 mm are prepared for normal concrete and 9 cubes of 150 mm 150 mm 150 mm are prepared by replacing 50% cement by fly ash and 100% fine It is prepared

by replacing 50% of the cement with fly ash and 100% fine tell us. The characteristics of the fly ash used are shown in Table 1.

Table 1. Material Prosperities

Material	Color	Specific Gravity	Bulk Density
Cement	Grey	3.15	-
Fine Aggregate	Grey	2.57	1427 kg/m
Coarse Aggregate	Grey	2.62	1211 kg/m
Fly Ash	Grey	2.09	623 kg/ m
Glass powder	white	2.39	1110kg/m
Concrete and brick debris	Grey	1.98	-

Results

The test on concrete has been conducted during two stages: (1) the workability and consistency of fresh concrete is measured by slump test before the hardening of concrete, according to IS 1199-1959. 2) Compressive strength and water absorption test have been performed on hardened concrete.

Conclusion

The data from the experiments prove that green concrete is a feasible alternative to traditional concrete. Though it is showing that there is not much difference between the properties of both the concrete, but economic cost of green concrete is coming out to be less and if produced in large quantities may further create a huge difference. Further, green concrete utilizes waste products of other industries thus acting as a sink for these materials which otherwise creates a disturbance to the environment.

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