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# SUSTANABLE CONSTRUCTION MATERIALS AND TECHNOLOGY: GREEN CONCRETE

**Kakamare M.S.[1], Nair V. V.[2]**

[1]*Associate Professor, Department of Civil Engineering, P.V.P.I.T. Budhgaon (India)*

[2]*Assistant Professor Department of Civil Engineering, P.VP.I.T. Budhgaon (India)*

## ABSTRACT

*GREEN CONCRETE is a type of concrete which resembles the conventional concrete but the production or usage of such concrete requires minimum amount of energy and causes least harm to the environment. Green concrete is very low energy & resource consumption, no environmental pollution & sustainable development. It can be developed and applied rapidly. It reduces the dead weight of a facade from 5 tons to about 3.5 tons & reduce crane age load, allow handling, lifting flexibility with lighter weight. It has good thermal and fire resistance, sound insulation than the traditional granite rock. It enhances speed of construction, shorten overall construction period. It enhances green building construction; It improves damping resistance of building. The focus of this technology is mainly based on co2 reduction.*

***Keywords*: *Green Concrete, Damping resistance, sustainable construction***

## I. INTRODUCTION

Concrete is one of the most widely used man-made building materials in the world. Compared to other building material concrete has numerous advantages such as abundant resources, easy operation, steady mechanical properties, durability, of production. These characteristics enable concrete to be widely employed in the field of civil bridges, roads, hydraulic structures, Underground Ocean and military engineering. Despite such advantages concrete has some disadvantages such as high energy and raw material consumption &environmental pollution etc. which tends to serious effects on the image of the concrete as a sustainable material. In this respect the concept of "GREEN CONCRETE" was introduced.

The aim of GREEN CONCRETE is to meet three requirements i.e. very low energy & resource consumption, no environmental pollution & sustainable development. After that 'GREEN CONCRETE' was developed and applied rapidly. In ceramic industries about 30% of the production goes as waste due to manufacturing flaws. This waste is not utilized in any form, adding up day by day and occupies more area of the industry. So industries are in pressure to find a disposal system for this waste. These ceramic wastes are durable, hard & almost inert to normal chemicals. The mechanical properties of the coarse aggregates from these wastes are well within the range of the properties of concrete-making aggregates. The concrete made with these industries waste is eco-friendly and so it is called as "Green Concrete".

## II. WHAT IS GREEN CONCRETE

Green concrete is a type of concrete which resembles the conventional concrete but the production or usage of such concrete requires minimum amount of energy and causes least harm to the environment. There is considerable knowledge about how to produce concrete with lower environmental impact, the so-called green concrete.

## III. CONCRETE AND CO2

Every 1 ton of cement produced leads to about 0.9 tons of co2 emissions and 0.7643 m3 of concrete contains about 10% by weight of cement. There have been a number of ways for reducing the co2 emissions from concrete primarily, through the use of lower amounts of cement and higher amounts of supplementary cementations material (SCM) such as fly ash and slag. Since, a co2 emission from 1 ton of concrete varies between 0.05 to 0.13 tons. Approximately 95% of all co2 emissions from a cubic yard of concrete is from cement manufacturing and so it is no wonder that much attention is paid to using greater amounts of SCM. Thus, environmental aspects are not only interesting from an ideological point of view, but also from an economic aspect.

## IV. MAIN OBJECTIVES

- CO2 emissions shall be reduced by at least 30%.
- At least 20% of the concrete shall be residual products used as aggregate.
- Use of concrete industries own residual products.
- Use of new types of residual products, previously land-filled or disposed of in other ways.
- CO2 neutral waste-derived fuels shall replace at least 10% of the fossil fuels in cement production.

The technical goals are to obtain the same technical properties for the green concrete compared to conventional concrete. The comp. strength goals for the green concrete are:

- Aggressive environmental class (outdoor, horizontal): 28-days strength > 35 N/mm2and 56-days strength > 85% of the strength of a reference concrete.
- Passive environmental class (indoor): 28-days strength >12 N/mm2 and 56-days strength > 85% of the strength of a reference concrete.

## V. PRODUCTION OF CONCRETE

To increase the use of conventional residual products, i.e. fly ash.High-volume fly ash concrete which requires far less fossil fuel to produce than conventional concrete. Fly ash is a byproduct of coal-burning power plants. The ash is created at high temperatures and becomes tiny, beady glass particles. Out of 60 million tons produced every year in this country, about 75 percent of fly ash is trucked off to landfills rather than converted into building material. But enthusiastic design and construction teams working on UC Berkeley seismic projects say that the high-volume fly ash concrete mixture reduces environmental impacts and can save money while producing more durable concrete structures

To use residual products from the concrete industry, i.e. stone dust Green concrete capable for sustainable development is characterized by application of industrial wastes to reduce consumption of natural resources and energy and pollution of the environment. Marble sludge powder can be used as filler and helps to reduce the total voids content in concrete. Natural sand in many parts of the country is not graded properly and has excessive silt on other hand quarry rock dust does not contain silt or organic impurities and can be produced to meet desired gradation and fineness as per requirement.

## VI. PRODUCTION OF GREEN CEMENT

The manufacture of cement reactive ingredients in concrete is responsible for over 5% of world co2 emission .Cement already third largest manmade source of co2 more than 2 billion tone of it a year,60% of carbon emission from cement manufacture comes from chemical reaction required to make it. Calcium carbonate is heated until breaks into calcium oxide and by product is co2.

## VII. MANUFACTURING PROCESS

First step is same as an ordinary cement, sand and gravels are loaded in a storage hopper then cliff, slag and fly ash are fed the activation is added the geo polymer concrete is then used exactly as an ordinary concrete.

1. To minimize the clinker content (i.e. by replacing cement with fly ash, micro silica in larger amounts are allowed today, or by using extended cement, i.e. lime stone filler cement)

2. To develop new green cements and binding materials (i.e. by increasing the use of alternative raw materials and alternative fuels, and by developing/improving cement with low energy consumption).

3. Concrete with inorganic residual products (stone dust, crushed concrete as aggregate in quantities and for areas that are not allowed today) and cement stabilized foundation with waste incinerator, slag and low quality fly ash.

## VIII. IMPACTS OF GREEN CONCRETE

Concrete serves as a better alternative for the utilization or recycle of the solid hazardous waste materials. Properties of mixed concrete can be listed as follows:

- Strength: different solid hazardous waste materials used in mixed concrete. It shows 70-85% strength of pure concrete.
- Durability: concrete shows long-term durability by the use of mineral admixtures; many important structures are manufactured using the concrete with silica fume, which positively affects on durability aspects.
- Leaching: About 85-90% of heavy metals and other contaminants are solidified and stabilized in the concrete matrix. Mixed concrete named “Green concrete”. It is used as filling materials, pavements and roadbeds, etc. This concrete also affects the cost of construction comparable to pure concrete.
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## IX. SUITABILITY OF GREEN CONCRETE IN BUILDINGS:

The following advantages are concluded for using lightweight green concrete in Prefabrication in building;

- Reduce the dead weight of a facade from 5 tons to about 3.5 tons.
- Reduce crane age load, allow handling, lifting flexibility with lighter weight.
- Good thermal and fire resistance, sound insulation than the traditional granite rock.
- Allow design and construction flexibility for larger prefabrication modules.
- Allow maintenance flexibility with replaceable modules.
- Factory production of module enhances quality of product.
- Enhance speed of construction, shorten overall construction period.
- Enhance green building construction, minimize wet trade on site.
- Improve damping resistance of building.
- Utilization of PFA in aggregate production resolves the waste disposal problems of ash and reduce the production cost of concrete.

## X. ADVANTAGES OF GREEN CONCRETE

- Reduction of the concrete industry's CO2 emission by 30 %.
- Increased concrete industry's use of waste products by 20%.
- No environmental pollution and sustainable development.
- Green concrete requires less maintenance and repairs.
- It is more durable & corrosion resistant.
- By using the light weight aggregates self weight of structures can be reduced.
- Energy saving material.
- Green concrete having better workability than conventional concrete.
- Flexural strength of green concrete is almost equal to that of conventional concrete.
- Use of concrete industries own residual products.
- Less expensive to produce it.
- At least 20% of the concrete shall be residual products used as aggregates.
- Good thermal resistant and fire resistant.
- Good sound insulation than traditional concrete.
- Improve damping resistant of buildings.

## XI. LIMITATIONS OF GREEN CONCRETE

The focus of this technology is mainly based on co2 reduction, while whole environmental impact should be covered and accordingly investigations should not only make in the field of concrete but also structures build with it.

- The research & development works are solely based on environmental goals. While, some consideration need to be given to the market condition which limits the cost of the products in terms of technology.
- Green concrete does not fulfill the requirement of existing standards also according to structures of least importance.

## XII. CONCLUSION

Green concrete having reduced environmental impact with reduction of the concrete industries co2 –emissions by 30%. By using 40% fly ash of powder and cement with reduced environmental impact. Therefore reduced environmental pollution. Green concrete is having good thermal and fire resistant. Also having good sound insulation in comparison with traditional concrete. In this concrete recycling use of waste material such as ceramic wastes, aggregates, so increased concrete industry's use of waste products by 20%.hence green concrete consumes less energy and becomes economical. Developing country like India second rank is given to construction development, which uses concrete in large amount & at the same time produces waste in the form of concrete material. So use of product like green concrete in future will not only reduce the emission of co2 in environment but also economical to produce.

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