# A
# Seminar Report
# On
## GREEN CONCRETE

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SAVITRIBAI PHULE UNIVERSITY OF PUNE

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# Seminar
# Report On
## GREEN CONCRETE

In partial fulfillment of requirements for the degree of

**BACHELOR OF ENGINEERING**

**(Civil Engineering)**

**SUBMITTED BY**

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**The Guidance of**

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**GENBA SOPANRAO MOZE COLLEGE OF ENGINEERING BALEWADI**

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**GENBA SOPANRAO MOZE COLLEGE OF ENGINEERING DEPARTMENT OF COMPUTER ENGINEERING BALEWADI, PUNE 411045**

# CERTIFICATE

This is to certify that Mr.Pruthviraj Kisan Waghamode has successfully completed his seminar work on ”GREEN CONCRETE” at G.S. Moze College of Engineering , Pune in the partial fulfillment of the degree course in T.E. at the department of Civil Engineering, in the academic Year 2018-2019 Semester II as prescribed by the Uni- versity of Pune.

| | | |
|---|---|---|
| Prof.Priyanka Garsole | Prof.Rahul Hodge | Prof. Auti Sir |
| Guide | H.O.D | Principal |
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Pruthviraj Kisan Waghamode
(T.E. Civil Engg.)



# ABSTRACT

Green concrete capable for sustainable development is characterized by application of industrial wastes to reduce consumption of natural resources and energy and pol- lution 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. Consequently, this contributes to improve the strength of concrete. Through reaction with the concrete admixture, Marble sludge powder and quarry rock dust improved pozzolanic reaction, micro-aggregate filling, and con- crete durability. This paper presents the feasibility of the usage of quarry rock dust and marble sludge powder as hundred percent substitutes for natural sand in con-

crete. An attempt has been made to durability studies on green concrete compared with the natural sand concrete. It is found that the compressive, split tensile strength and durability studies of concrete made of quarry rock dust are nearly 14 percent more than the conventional concrete. The concrete resistance to sulphate attack was enhanced greatly. Application of green concrete is an effective way to reduce envi- ronment pollution and improve durability of concrete under severe conditions.



# Contents

# List of Figures

# CHAPTER 1
# INTRODUCTION

- **INTRODUCTION**

The concrete is made with concrete wastes which are eco-friendly so called as Green concrete. The other name for green concrete is resource saving structures with reduced environmental impact for e.g. Energy saving, co2 emissions, waste wa- ter.Green concrete is a revolutionary topic in the history of concrete industry. This was first invented in Denmark in the year 1998 by Dr.WG.

- **Why Green Concrete?**

Huge impact on sustainability. 1]
Most widely used material on
Earth
2]30 percent of all materials flows on the planet

3]70 percent of all materials flows in the built
environment. 4] 2.1 billion tonnes per annum.
5] 15 billion tonnes poured each year. 6]
Over 2 tonnes per person per annum.

- **What is GREEN concrete?**

Most people associate GREEN concrete with concrete that is colored with pig-ment.However, it is also referred which has not yet hardened. But in the context of this topic, green concrete is taken to mean environmentally friendly concrete. This means concrete that uses less energy in its production amp; produces less carbon dioxide than normal concrete is green concrete.

Engineers and architects have choices of the material and products they use to design projects - when it comes to a building frame the choice is typically between concrete,steel and wood. Material choice depends on several factors including first cost, life cycle cost and performance for a specific application. Due to growing interest in sustainable development, engineers and architects are motivated more than ever before to choose materials that are more sustainable. However, such choice is not as straight forward as selecting an energy star rated appliance or a vehicle providing high fuel mileage.



Engineers and architects can compare materials and choose one that is more sustainable or specify a construction material in such a way as to minimize environ- mental impact? Recent focus on climate change and the impact of

greenhouse gas emissions on our environment has caused many to focus on CO2 emissions as the most critical environmental impact indicator.

Life Cycle Assessment (LCA) is the parameter; the construction industry should look into. LCA considers materials over the course of their entire life cycle including material extraction, manufacturing, construction, operations, and finally reuse/recycling.

Concrete is one of the world39;s most widely used structural construction ma- terial. High quality concrete that meets specification requires a new standard of pro- cess control and materials optimization. Increasingly, concrete is being recognized for its strong environmental benefits in support of creative and effective sustainable development. Concrete has substantial sustainability benefits.

The main ingredient in concrete is cement and it consists of Limestone (Cal- cium Carbonate CaCO3). During manufacture of cement, its ingredients are heated to about 800 - 10000C. During this process the Carbon Dioxide is driven off. Ap- proximately 1kg of cement releases about 900gms of Carbon Dioxide into the atmo- sphere.

# CHAPTER 2
# FEATURES OF GREEN CONCRETE

- **FEATURES OF GREEN CONCRETE:**

Where does the Carbon Dioxide come from in concrete? Cement production accounts for more than 6 percent of all CO2 emission which is a major factor in the world global warming (Greenhouse gas). India is the third largest cement producer in the World and one of the largest consumers of cement per capita in the world.Rough figures are that India consumes about 1.2 Ton/year/capita, while as World average is

0.6 Ton/year/capita.

There have been a number of efforts about reducing the CO2 emissions from concrete primarily through the use of lower amounts of cement and higher amounts of supplementary cementitious material (SCM) such as fly ash, blast furnace slag etc. CO2 emissions from 1 ton of concrete produced vary between 0.05 to 0.13 tons. 95 percent of all CO2 emissions from a cubic meter of concrete is from cement manufacturing. It is important to reduce CO2 emissions through the greater use of SCM.

- **Cement:**

Most of CO2 in concrete is from the cement manufacturing process. A typical cubic meter of concrete contains about 10 percent cement by weight. Out of all ingredi- ents, cement gives out most carbon dioxide. The reaction in the process of Cement manufacture is:

$$CaCO3 = CaO + CO2$$

- **Aggregate:**

Use of virgin aggregates contributes about 1 percent of all CO2 emissions from a typical cubic meter of concrete. Therefore, the use of alternate aggregate is desirable. The use of local and recycled aggregates is desirable as it can reduce transportation and fuel cost and support sustainable development.



- **Resources:**

The growing shortage of natural aggregate and sand is another aspect the construc- tion industry must consider. While this may not appear to be a priority

topic, pressure from environmentalist and conservationists worldwide will continue to encourage both legislators and construction engineers to look for viable alternatives to natural resources. Use of recycled materials like aggregate, water is some ingredient which should be encouraged since fresh resources are becoming increasingly scarce.

## 2.2 GREEN CONCRETE:

Obtaining the most suitable mix based on the specification or suggesting improve- ments in the mix is to assist with the most suitable concrete for the project. The concrete which can fall in the category of green must have the following character- istics.

1]Optimizes use of available materials. 2]
Better Performance.
3]Enhanced cohesion workability /
consistency. 4]Reduced shrinkage / creep.
5]Durability - Better service life of concrete.
6]No increase in cost.
7]LEED India Certification.

Green concrete mix is designed with the principle of quot;Particle-Packing Optimizationquot; to meet requirements of plastic and hardened properties.

# CHAPTER 3
# MATERIALS FOR GREEN CONCRETE

- **MATERIALS FOR GREEN CONCRETE:**

Green construction materials are composed of renewable, rather than non-renewable resources. Green materials are environmentally responsible because impacts are con- sidered over the life of the product. Depending upon project-specific goals, green materials may involve an evaluation of one or more of the following criteria.

- **Locally available:**

Construction materials, components, and systems found locally or regionally, saving energy and resources in transportation to the project site.

- **Salvaged, re-furnished, or re-manufactured:**

Includes saving a material from disposal and renovating, repairing, restoring, or gen- erally improving the appearance, performance, quality, functionality, or value of a product.

- **Reusable or recyclable:**

Select materials that can be easily dismantled and reused or recycled at the end of their useful life. Recycled materials that the Industry has found to perform favorably as substitutes for conventional materials include: fly ash, granulated blast furnace slag, recycled concrete, demolition waste, microsilica, etc. Generation and use of recycled materials varies from place to place and from time to time depending on the location and construction activity as well as type of construction projects at a given site.
Following materials can be considered in this category and are discussed
here. a]. Recycled Demolition Waste Aggregate
b]. Recycled Concrete
Aggregate c]. Blast furnace
Slag
d]. Manufactured
Sand e]. Glass
Aggregate
f]. Fly ash

# CHAPTER 4

# ENVIRONMENTAL BENEFITS TO USING GREEN CONCRETE

- **ENVIRONMENTAL BENEFITS TO USING GREEN CONCRETE:**

Geopolymer concrete, or green concrete, is part of a movement to create construc- tion materials that have a reduced impact on the environment. It is made from a combination of an inorganic polymer and 25 to 100 percent industrial waste. Here is a list of 4 benefits to using green concrete for your next project.

- **Lasts Longer:**

Green concrete gains strength faster and has a lower rate of shrinkage than concrete made only from Portland Cement. Structures built using green concrete have a better chance of surviving a fire (it can withstand temperatures of up to 2400 degrees on the Fahrenheit scale). It also has a greater resistance to corrosion which is important with the effect pollution has had on the environment (acid rain greatly reduces the longevity of traditional building materials). All of those factors add up to a building that will last much longer than one made with ordinary concrete. Similar concrete mixtures have been found in ancient Roman structures and this material was also used in the Ukraine in the 1950s and 1960s. Over 40 years later those Ukrainian buildings are still standing. If buildings aren39;t constantly having to be rebuilt, fewer construction materials are needed and the impact to the environment during the process of making those materials is reduced.

- **Uses Industrial Waste:**

Instead of a 100 percent Portland cement mixture, green concrete uses anywhere from 25 to 100 percent fly ash. Fly ash is a byproduct of coal combustion and is gathered from the chimneys of industrial plants (such as power plants) that use coal as a power source. There are copious amounts of this industrial waste product. Hundreds of thousands of acres of land are used to dispose of fly ash. A large increase in the use of green concrete in construction will provide a way to use up fly ash and hopefully free many acres of land.



- **Reduces Energy Consumption:**

If you use less Portland cement and more fly ash when mixing concrete, then you will use less energy. The materials that are used in Portland cement require huge amounts of coal or natural gas to heat it up to the appropriate temperature to turn

them into Portland cement. Fly ash already exists as a byproduct of another industrial process so you are not expending much more energy to use it to create green concrete.

Another way that green concrete reduces energy consumption is that a build- ing constructed from it is more resistant to temperature changes. An architect can use this and design a green concrete building to use energy for heating and cooling more efficiently.

- **Reduces CO2 Emissions:**

In order to make Portland cementone of the main ingredients in ordinary cement pulverized limestone, clay, and sand are heated to 1450 degrees C using natural gas or coal as a fuel. This process is responsible for 5 to 8 percent of all carbon dioxide (CO2) emissions worldwide. The manufacturing of green concrete releases has up to 80 percent fewer CO2 emissions. As a part of a global effort to reduce emissions, switching over completely to using green concrete for construction will help considerably.

# CHAPTER 5
# PRODUCTION OF GREEN CONCRETE

- **PRODUCTION OF GREEN CONCRETE:**

Concrete with inorganic residual products.Ceramic wastes used as green aggregates. By replacing cement with fly ash, micro silica in larger amounts.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 en- ergy consumption). To use residual products from the concrete industry, i.e. stone dust (from crushing of aggregate) and concrete slurry (from washing of mixers and other equipment). To use new types of

cement with reduced environmental impact. (mineralized cement, limestone addition, waste-derived fuels).

- **GREEN LIGHTWEIGHT AGGREGATES:**

Synthetic lightweight aggregate produced from environmental waste is a viable new source of structural aggregate material. The uses of structural grade lightweight con- crete reduce considerably the self-load of a structure and permit larger precast units to be handled. Water absorption of the green aggregate is large but the crushing strength of the resulting concrete can be high. The 28-day cube compressive strength of the resulting lightweight aggregate concrete with density of 1590 kg/m3 and re- spective strength of 34 MPa.Most of normal weight aggregate of normal weight con- crete is natural stone such as limestone and granite.

# CHAPTER 6
# ADVANTAGES

Advantage Of Green Concrete:

It will give enhanced cohesion so user friendly - easier to place, compact amp; finish concrete. It can be seen in concrete slump given in figure 13. Some other advantages of such mix are:

1]Optimized mix designs mean easier handling, better consistency and easier finish- ing

2]Reduction in shrinkage amp; creep

3]Green Concrete uses local and recycled materials in concrete.

4]The heat of hydration of green concrete is significantly lower than traditional con- crete

5]This result in a lower temperature rise in large concrete pours which is a distinct advantage for green concrete.

Improved engineering properties:

1]Mix can result in a reduced paste volume within the concrete structure resulting

in a higher level of protection against concrete deterioration.

2]Higher strength per kilogram of cement. 3]

Increased durability amp; lower permeability.
4]More aggregates typically mean higher Modulus of elasticity.

# CHAPTER 7
# CONCLUSION

Green concrete having reduced environmental impact with reduction of the concrete industries co2 commissions by 30 per. Green concrete is having good thermal and fire resistant. In this concrete recycling use of waste material such as ceramic wastes, aggregates, so increased concrete industry use of waste products by 20 per. Hence green concrete consumes less energy and becomes economical. So definitely use of concrete product like green concrete in future will not only reduce the emission of co2 in environment and environmental impact but also economical to produce.

# CHAPTER 8
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