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Green Concrete – A Literature Review

A.Tarun¹, Ch.Ramya Pramodha², E.Jitendra³, G.Anuradha⁴, K.Sai Tirumala⁵

Under Graduate Students, Department of Civil Engineering, Nadimpalli Satyanarayana Raju Institute of Technology,
Sontyam, Visakhapatnam, A.P., India^{1,2,3,4,5}

ABSTRACT: Green concrete bears a huge impact on sustainability. Concrete is most widely used material on Earth. Nowadays recycling of waste and industrial by products gaining popularity to make concrete environment friendly material and the concrete can be called as “ GREEN CONCRETE” . Development and growth of construction is addicted to concrete and fossil fuels and these two are the biggest issues making carbon dioxide growing in the environment. The following investigations give us an idea on green concrete and makes us aware of it’s importance.

KEY WORDS: Concrete , Cement , Fly ash , Carbon emission , Sustainability , Recycling , Environment.

I. INTRODUCTION

The concrete is made with concrete wastes which are eco-friendly so called as Green concrete. Green concrete is a revolutionary topic in the history of concrete. This was first invented in Denmark in the year 1998 by Dr. WG. In the construction of any infrastructure , concrete plays an important role. But as such concrete is major source of carbon emission. So these following case studies tells us that the usage of green concrete instead of normal concrete is far better.

II. LITERATURE REVIEW

Most of the researches have worked in publishing their work in investigating about the green concrete’s supremacy over the normal concrete. The observation, methodology, conclusions and further scope of work are used to finalise the objectives of present work. The available literature of review is as follows:

A. K. Minocha (2015) This paper investigated deal with the development of green concrete (M30 grade) using recycled coarse aggregates for sustainable development characterization of recycled coarse aggregate shown that physical and mechanical properties are of interior quality and improvement in properties was observed after washing due to removal of old weak mortar adhered on its surface. The influence of natural coarse aggregates replacement (50 and 100%) with recycled coarse aggregate on various mechanical and durability properties of hardened concrete were observed using washed recycled coarse aggregates The compressive strength of 28-day hardened concrete.

Prof.Ashok Adamuthu(2017) This paper was investigated on high conventional cement contains amount of carbon-dioxide which harms the environment drastically so by replacing the cement by various materials which causes harm to the environment. The 70000 materials manufacture over construction mixture design to structural design, and durability. Green Concrete is considered to be often cheap to produce due to of recycled material. at each stage of the life cycle of the construction it increases ease and quality of life, while minimizing the negative environmental impacts and increasing of the environmental economic sustainability any infrastructure a sustainable of resources the and constricted in way minimizes the through the whole life cycle of construction process in which the green concrete play a vital role in achieving certain limit improves workability of concrete. at certain specified limit improves workability of cement. at certain specified limit replacement of cement by silica increase compressive strength of concrete. The ultrasonic pulse velocity increases load initially with increase in compressive and the decreases with increase in compressive load due to development of micro cracks in concrete silica fume as a pozzolana material is rapidly used. The condition of the concrete gets improved by the involvement of silica fume.

P. PURUSHOTAM (2017) It is a study Green concrete. Concrete plays crucial role in the construction. OPC is used to produce concrete and a lot of energy and natural resources are consumed in production of OPC. Geopolymer Concrete (GPC) is one of the processes usage that reduces cement usage and increase usage of industrial by-products. OPC is

fully replaced by pozzolanic materials. The main pozzolanic chemical considered silica. Such reaction and constituents of material composition for and of geo polymer. alumina. The geopolymers alkaline activator. material Should be rich in by fly ash, Silica, slag that takes geopolymers materials used in place in product etc. the polymerization. geopolymers ash, fine aggregate, Sodium Hydroxide, coarse concrete aggregate, The materials chemical manufacturing The are fly water, Sodium Silicate (Na₂SiO₃). The specimens of performed for the similar the concrete After with that test desired age of slump test specimen. to the and the test normal concrete. as on experimental investigations of geopolymers concrete, we conclude the performance & geopolymers concrete. Compressive strength concrete may be attained by GGBS based than the fly ash in the geopolymers concentration designed and implemented in construction.

Tahira Zahoor (2020) This paper was investigated on the most important constituent of concrete is portland cement. The cost high of portland cement very and is versatile it is. a versatile and relatively high cost material - Large bulk production of cement is causing environmental problems and depletion of natural resources This paper represents the details experimental study of compressive strength, flexural strength and split tensile strength In future green concrete will reduce the emission of CO₂ in environmental problems. conventional concrete is responsible for amount of carbon-dioxide emission to some extent So to reduce the emission, various types of concrete are developed using waste products from industries and agricultural use like blast furnace slag, silica fume, fly ash which requires low amount of energy. Green Concrete is a new technology developed now day's to reduce the effect on of environment by production cement addition of silica fume up to sustainable construction. Green Concrete is miracle of present and tool for future when the natural resources are on the average of extinction. Silica fume is material which may this is the addition of causing pollution by product of some industries. micro silica in cement reduces the air pollution and make concrete more sustainable, the overall cost of concrete reduces up to 20% so economically the Concrete is made economically than conventional concrete.

Gomasa Ramesh (2021) This is study of environment friendly solution about Green Concrete sustainable is material a paper represent concrete. Type of used in Green now a construction. Consumption the Green Concrete. Construction concrete days subject is It is of reinforced concrete structures. is different plays a normal concrete. Crucial Role in the low energy and very good development. Substituent cement such as and concrete low material for sustainable made from replacement of substituent ingredients such as cement and aggregates. agricultural during manufacture This paper mainly to In this industrial produce d disadvantages and application main advantage of providing long term environment friendly building material. with Care different high And Green with a wastes New Such as materials are placed to concrete advantages and of Green Concrete is a environmentally friendly elements. is replacement of cement and disadvantages are high cost of Reinforcement and low tensile strength and corrosion of the bars and some of substitutes are fly ash , GGBS , Metakaplin etc. Green concrete is a good material used in construction of buildings , for this we conduct compressive strength test for concrete , it varies similarly for 20-30 maps for compressive strength . Green concrete is a good material for concrete structures which gives strength and durability.

Supriya Sai Adabala (2022)- This paper investigated green concrete and environmentally friendly building materials. It discusses the viability of using resources such as fly ash , quarry dust , marblesludge powder and quarry rock dust , aggregates made from recycled concrete and masonry concrete . "Green concrete" is a type of concrete created from plants , concrete wastes that are environmentally friendly and requires less energy . It uses less energy and produces less carbon . Ordinary concrete is referred to green concrete . Fly ash powder left behind after burning is a finely split residue arising from the combustion of powdered coal in an explosion , which is moved by flue gases and collected. In India, only approximately 5% of the total fly powder left over after burning is utilized. Green Concrete is defined as the use of industrial waste such as Marble powder, quarry dust, wood powder left over the after burning, paper pulp and other materials. To limit the consumption of important natural resources and energy. Quarry Rock dust is described as the residue, tailing, or other non - valuable waste material left over after the extraction and processing of rocks into tiny particles with a diameter of less than 4.75m. Quarry dust contains rough , sharps, and slender particles with angles, which increase Strength. The methodologies adopted is 60%. of the cement with supplementary Cementitious materials, Such as flyash. Three Cube Samples of each 1.1.03:2.5 concrete mix with partial replacement of Coarse aggregate and 100% substitution of natural fine aggregates with water cement ratio of 0.50 were also cast in the test was Carried mould of size 150 x 150x150mm. The Out at 7, 14, 28 days. The cube is loaded at a rate of 35 N/mm² each minute. Green Concrete specimens were made with all natural fine aggregate replace with artificial fine aggregate , recycled Coarse aggregates partially replaced with natural coarse aggregates , and regular portland cement partially replaced with fly ash. The Green concrete seduces pollution in the environment, overall, cement consumption is

reduced. Green concrete can be made from a variety of waste material. As a result, green made successfully using locally accessible ingredients and concrete waste.

Abiraami. R and Anuradha. R. (2024)- Since concrete is a fundamental component of all types of construction, many researches are concentrating on developing High Performance Concrete (HPC) using efficient manufacturing processes. Nano silica is a quartz and silica dust this can be replaced instead of cement to achieve great strength and produce sustainable concrete. High performance Concrete is one that is strong, durable, and easy to work in, with correct material selection, mix design and concrete handling from the fresh stage through the hardening stage, HPC can be achieved.. The Study aims to produce a high performance Concrete (HPC) using sisal fibres, nano silica and delonixregial pods. It is now common practise to add these SCMs as just a substitute for cement, in HPC, which can help to reduce global clinker consumption. Fly ash is the most popular cement substitute SCMs for making among these concrete for further than 50 years world wide Since 1952, silica fume has been used as of substitute for SCM in the manufacturing of Concrete. Sudarsana Rao (2012) examined the characteristics of high performance concrete when made with regular materials like super plasticizers and mineral admixtures. In addition to improving the Concrete's strength, the use of mineral admixtures also Significantly improved its durability. Strength and durability Can be improved by dose of delonixregia ash, nano silica, sisal fibres and super plasticizers. OPC 53 grade cement, fine aggregate formed. oflocally accessible river sand, coarse aggregate 20mm, pods of delonixregial ash, nano silica, sisal fibres and super plasticizer are the features of the materials used in this research. Mix design was completed in accordance with the Standards and guidelines outlined with in Indian standards (is) and guidelines outlined with in regulations IS 10262: 2009; to satisfy the M70 requirements. The ratio of 1.1.39.2.18 with 0.36 water cement ratio was obtained from the components of cement 53 grade, Pine aggregate, coarse aggregate, nano silica, pods of delonixregial ash, Sisal fibre, and super plasticizers Characteristics. The mix design proportions are calculated and tested then in both a fresh and hardened State. M70 mix design was followed to produce a HPC and it is Compared with Conventional concrete. with 0.36 w/e ratio. The pods of delonixregial ash is replaced we from 1% to 7% to Produce HPC, as a corrosion Inhibitor. The nano silica is used from 0.5%-3.5% and the sisal fibre was replaced from 0.5-14. and super plasticizer of 2% instead of cement content by Volume replacement. The mechanical characteristics are analyzed in this investigation. The test results shows satisfactory results in the performance of HPC with the pods of delonixregia with 5%, nano silica with 2.5% and sisal fibres with 1% of replacement of super plasticizers (M13 mix). The SEM analysis shows the micro structure properties of concrete.

III. CONCLUSION

From all the above investigations and from the opinions of all the authors, we can finally conclude that green concrete plays a vital and a major role in building up the environment with atleast some improvised sustainability brought in the construction sector as it replaces hazardous concrete components which affects both the environment and humans. And we can also know the importance of the pozzolanic materials , silica particles and recycled concrete material which combinely make up the green concrete.

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