

ECOFRIENDLY NO-FINES GEOPOLYMER CONCRETE FOR SUSTAINABLE PAVEMENT A REVIEW

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Abstract: Water infiltration and capacity make No-fine cement concrete one of a kind as pervious concrete while utilizing it in asphalts to diminish flood hazards by tempest water the executives. Yet cement is the principle part as a binder material, which contributes to an unnatural weather change by having carbon dioxide discharges during cement generation in plants. New investigates have indicated Geopolymer innovation a decent elective material for concrete to preclude cement and battle against the unnatural weather change which the world is concerned these days. No-fine Geopolymer concrete is the answer for both a dangerous atmospheric deviation and flood dangers. This paper plans to discover M20 grade eco-accommodating no-fine geopolymer concrete having elements of fly cinder squander material, coarse totals, sodium hydroxide, sodium silicate and GGBS in various rates to improve its compressive quality.

IndexTerms - Pervious Concrete, Global Warming, Flood Risks, Infiltration, Sodium hydroxide, Sodium Silicate.

1. INTRODUCTION

Urbanization and development of the world is increasing day by day along with increase in population and human needs hence concrete is still worldwide used material in construction industry since long time. Concrete having properties of high compressive strength, ease of shape, durability, availability and low cost make it correlative of urbanization. Many advancements have been brought in concrete to use it in different environments and serviceability purposes. But still researches are needed to make it more beneficial technically, environmentally and economically. From these three aspects enough changes have been brought in concrete in technical and economic aspects such as innovations of high strength concrete, acid resistant concrete, mass concrete, light weight concrete, self-cured concrete and many more with low costs that can be available and used globally. Looking at environmental aspect concrete needs to be green and eco-friendly. But concrete having cement as a main binding material intensively contributes in global warming and air pollution by emitting carbon dioxide greenhouse gas while producing cement in cement industries. To make it environment friendly two ways are there either partially replace the cement with pozzolanic materials like fly ash, silica fume, metakaolin etc. or go for an alternative material like geopolymer concrete.

1.1 Geopolymer Concrete

Geopolymer concrete zero cement concrete can be used as a potential substitute of ordinary Portland cement concrete in some fields to make the concrete ecological, green and sustainable to overcome global warming caused by cement production. Geopolymer was introduced for the first time by a French scientist Davidovits in 1972 or 1979. And attracts researchers interests nowadays for its low carbon foot print, fire resistance, acid resistance, thermal resistance and even low cost because of using waste material like fly ash as main binding material. Geopolymer is an inorganic construction material produced by alkaline activating aluminum-silicate material like fly ash, rice husk ash, metakaolin etc. Geopolymerization process is accelerated at higher temperatures compared to normal heat curing and this is the only hurdle for replacing conventional concrete with geopolymer concrete and researches are needed to overcome heat curing issue of geopolymer concrete. But still the geopolymer concrete needs less curing time compared to conventional concrete to gain strength.

1.2 No-fines Concrete

No-fines Concrete is termed as pervious concrete because of voids present in its structure. Presence of voids is due to omitting the fine aggregates thus it become light weight also. On other hand using no-fines concrete for pavements will reduce run off water during storms by absorbing and transferring water to the ground, this will help to recharge ground No-fines concrete is also called thirsty concrete. So using no-fines concrete will make pavements pervious and sustainable. Heat Island effect and pavements noise due to vehicles will also be decreased because of low thermal and sound conductivity due to porosity factor of the concrete.

Another important issue in pavements is safety; Accidents take place while pavements are wet it can be avoided by no-fines pervious pavements to avoid ponds and drain water to sub base and will keep the environment green for having water saturated soil.

1.3 No-fines Geopolymer Concrete

No-fines Geopolymer Concrete is a combination of two ideas explained above, geopolymer concrete usage as a pervious concrete. To make the concrete eco-friendly, sustainable and pervious for low traffic pavements for both problems of environmental concerns of global warming and flood risks management. Eco-friendly No-fines geopolymer concrete has no effect on the environment and will also reduce the waste material of the environment and has the ability of absorbing and delivering storm water to ground to recharge ground water for being sustainable material and manage rain water for proper water management and avoiding pollution of surface water. This will help to decrease heat island effect of urban cities due to low thermal conductivity and will reduce the vehicles noise pollution in urban areas having the property of low sound conductivity and this is because of pores present in concrete.

2. RELATIED WORK

2.1 Geopolymer Concrete

Ajay Kumar Singh in (2000) Contemplated quality and toughness of Fly fiery debris and GGBS based Geopolymer concrete. The examples were taken to be tried following 28 days of relieving in sun. At that point the examples were inundated in 3% HCL, 3% H₂SO₄ and 3% HNO₃. Results indicated more prominent protection from corrosive condition and high compressive quality contrasted with ordinary Portland cement concrete.

K.Prasanna, Arun Kumar, M.Dinesh Kumaran J R and Lakshminarayanan.B investigated Flyash based Geopolymer concrete with GGBS. In view of results picked up from test examination. The Geopolymer concrete picked up quality inside 24 hours at surrounding temperature without water relieving and furthermore the quality of Geopolymer concrete was expanded with increment in level of GGBS in a blend. Low calcium Flyash (ASTM Class F) was utilized. Low calcium Flyash based Geopolymer concrete has astounding compressive quality and is appropriate for auxiliary applications.

Satpute Manesh B., Wakchaure Madhukar R., Patankar Subhash Where test assessment of Impacts of Length and Temperature of restoring on compressive quality of Geopolymer Concrete. They have tried the examples in various relieving hours and shifting temperature and got that by expanding the temperature in a similar restoring time the compressive quality of Geopolymer concrete expanded in impressive sum.

Chennur Jithendra Reddy and Dr. S. Elavenil It is established that, expanding the measurements of NaOH molarity prompts decline in new properties, anyway it expanded the compressive quality. The commitment of GGBS causes the SCGC to achieve high compressive quality at surrounding room temperature. GGBS at encompassing restoring condition had more compressive quality instead of Fly fiery debris based SCGC.

Mr. Pratik B. Shinde.1, Mr. Swapnil A. Suryawanshi.2, Mr. Amit D.Chougule.3 Investigated The light weight Geopolymer concrete addition the quality inside 24 hours without water relieving. The quality of light weight Geopolymer concrete was expanded with diminished in molarity of soluble arrangement. It was seen that, with a 1M arrangement the example gives great compressive quality with attainable thickness to make it light weight.

Mr. Pradip Nath, Prabir Kumar and Vijaya B Rangan concentrated low calcium fly fiery remains based geopolymer concrete with added substances of ground granulated impact heater slag, calcium hydroxide and with customary Portland cement to set at room temperature or low warmth is required for picking up its quality. Test consequences of concrete shows decrease in its setting time at encompassing temperature contrasted with conventional Portland cement. The compressive quality was found to increment from 26 MPa to 58 MPa at 28 days by expanding of binder substance of fly fiery remains with 10% OPC from 450 kg/m³ to 730 kg/m³. Accordingly, a low measure of ground granulated impact heater banner, Customary Portland cement, and Calcium hydroxide results in an increment of solidarity at encompassing temperatures.

Benny Joseph and George Mathew studied impact of total substance on the conduct of fly fiery debris based geopolymer concrete, stream sand and squashed rock were utilized in geopolymer concrete under 30 degree Celsius to 120 degree Celsius and

acquired that compressive quality of concrete increments with increment in restoring temperature up to 100 degree Celsius and past that quality will diminish. Concrete with total substance of 70%, proportion fine total to add up to total 0.35, sodium hydroxide arrangement of 10 moles at 100 degree Celsius will give 52 MPa compressive quality following 28 days of relieving.

Hamidi.R.M and Man.Zakaria Grouping of sodium hydroxide and the Impact on the properties of fly fiery remains Based geopolymer for one day restoring under 60 degree Celsius temperature, results have indicated noteworthy impact of sodium hydroxide focus on mechanical properties of geopolymer concrete and the molarity of 12 is gotten as ideal molarity of fixation for sodium hydroxide for best mechanical properties.

2.2 No-fines Concrete

Md.Abid Alam and Shagufta Naz studied the slump of No-Fine Concrete is found to be zero irrespective of aggregate size and addition of fine aggregates. The porosity of No-fine concrete is largely affected by size of coarse aggregates. The compressive strength of No-fine concrete largely depends upon size of coarse aggregates, lower value compressive strength obtained for 20mm size of coarse aggregates.

Sirile Eathakoti et al had Innovative No-Fines Concrete Pavement Modal on various proportions of cement vs coarse aggregates with different sizes, and obtained that 20mm nominal size aggregates are appropriate for 1:4 cement: coarse aggregates with 0.45 w/c to obtain M20 grade of concrete. It will have the ability of water absorption of 125 liters per on cubic meter of concrete which shows a large amount to decrease the rain water flowing and enhances the ground water.

Dr.M.Mageswari and M.P.Karthikeyan had investigation on High quality penetrable asphalt utilizing no fines concrete for various proportion from 1:4 to 1:8 for 20mm size totals and following 7 days and 28 days relieving test outcomes were discovered that water to cement proportion of 0.36 for cement to coarse totals proportion of 1:4 with 30% percent of ground granulated impact heater slag having void substance running from 13-25 percent of all out volume with standard compaction will give a compressive quality of M20 evaluation concrete. In any case, suggest that utilizing little size totals will result in increment of compressive quality of the concrete with legitimate compaction and void will extend between 13-16 percent of the absolute volume of the concrete.

3. CONCLUSION

In this study we discourse about the green building material for low traffic pavements which is not harmful to the environment and contributes in reduction of risks caused by storm water. We Finding No-fine Geopolymer concrete which is an ecofriendly, light weight, zero cement concrete. Widening the technology of Geopolymer concrete to replace the conventional concrete which can help to combat against the Global warming and air pollution due to CO₂ emissions in cement production. By omitting the fine aggregates, the concrete becomes pervious and light weight which actually helps us to decrease the overall dead load of the structures. As No-fine Geopolymer is a pervious concrete which has ability to absorb large amount of water so it can be used in low traffic pavements to combat against the floods by decreasing the total runoff water produced in raining. No-fine Geopolymer concrete is a thirsty concrete, the water absorbed by it in pavements will be transferred to ground and can help to recharge ground water. It's also suitable material for buildings because of its low thermal conductivity and can save the electrical energy. To decrease heat island effect in urban areas by having the property of low thermal conductivity and to decrease noise pollution caused by vehicles movement on pavements in urban areas because of having the ability to absorb the noise or low noise conductivity because of pores available in the structure of no fines geopolymer concrete.

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