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STUDY ON FLAT PANEL USING GEOPOLYMER MORTAR UNDER SUNLIGHT CURING

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ABSTRACT

Geo polymer is an innovative revolutionary green material. Fly ash based Geo polymer mortar is a new material that does not need the presence of Portland cement as a binder and the role of Portland cement is replaced by low calcium fly ash. The production of OPC releases large amount of carbon dioxide (CO2) to the atmosphere that significantly contributes to greenhouse gas emissions. One ton of CO2 is released into the atmosphere for every ton of OPC produced. Therefore, there is a need to find an alternative type of binder to produce more environmentally friendly mortar. The geo polymer mortar gives better performance than OPC concrete, in both ambient and elevated temperatures and sunlight curing. The loss in compressive strength and weight due to thermal changes is less in geo polymer concrete as compared to OPC concrete. To reduce greenhouse gas emissions efforts are needed to develop environmentally friendly construction materials.

Keywords : Geo Polymer Mortar, Fly Ash, Compressive Strength ,Sun Light Curing.

1.INTRODUCTION

In Geo polymer mortar , it utilizes a large amount of industrial waste material and also reduces the greenhouse gas emissions compared to the Ordinary Portland cement. Geo polymer is an eco friendly binding material alternative to Ordinary Portland Cement (OPC). Geo polymer can be manufactured by using the low - calcium fly ash obtained from coal - burning power stations. Geo polymer mortar is produced by mixing of fly ash, alkaline solution and fine aggregate. Alkaline solution is composed of Sodium hydroxide (NaOH) and Sodium silicate solution. It is recommended that the alkaline liquid is prepared by mixing both the solutions together at least 24 hours prior to use.

2.PROBLEM IDENTIFICATION

The contribution of Ordinary Portland Cement (OPC) production worldwide to greenhouse gas emissions is estimated to be approximately 1.35 billion tons annually or approximately 7% of the total greenhouse gas emissions to the earth's atmosphere. To produce environmentally friendly concrete this paper suggested the use of fewer natural resources and to minimize carbon dioxide emission.

3.POLYMERISATION

A binder could be produced by a polymerization process involving a reaction between alkaline liquids and compounds containing aluminium and silicon. The binders created were termed "geopolymers". The alkaline solution produce an aluminosilicate gel that bind the materials together. The type of alkaline liquid used plays an important role in the polymerization process.

4.MATERIALS

4.1 FLY ASH

Fly ash is one of the residues generated in the combustion of coal. Quantity and fineness of fly ash plays an important role in the activation process of geopolymer. It was already pointed out that the strength of geopolymer concrete increases with increase in quantity and fineness of fly ash. So, in the proposed mix design procedure, quantity of fly ash is selected on the basis of fineness of fly ash and target strength.

4.2 SAND

Workability of geopolymer is also affected by grading of fine aggregate similar to cement concrete. So, on the basis of grading of fine aggregate is selected in the proposed mix proportionating method.

4.3 ALKALINE ACTIVATORS

In the present investigation, sodium based alkaline activators are used. The combination of sodium hydroxide and sodium silicate solutions are used for the activation of fly ash based geopolymer concrete. It is observed that the compressive strength of geopolymer concrete increases with increase in concentration of sodium hydroxide solution and or sodium silicate solution with increased viscosity of fresh mix. Due to increase in concentration of sodium hydroxide solution in terms of molarity (M) makes the concrete more brittle with increased compressive strength.

4.4 WATER

From the chemical reaction, it was observe that the water comes out from the mix during the polymerization process. The role of water in the geopolymer mix is to make workable concrete in plastic state and do not contribute towards the strength in hardened state.

4.5 WIRE MESH

Galvanized chicken wire mesh with a size 12mm and a wire thickness of 1.29mm was used. The size of the test slab panel is 600x600x25 mm.

5.METHODOLOGY

The methodology carried out for this project is shown in the below flow chart.

Literature Review

⬇

Problem Formulation

⬇

Material Selection

⬇

Study On Material

⬇

Mortar Specimen Preparation

⬇

Testing Of Mortar Specimens

⬇

Fabrication Of Mould

⬇

Casting And Curing Of Slab Panel

⬇

Result And Discussion

⬇

Conclusion

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6.EXPERIMENTAL INVESTIGATION

6.1 TESTS OF FLY ASH

The followings tests were conducted on flyash.

- ✓ Specific Gravity test(as per IS 3815 (part 3)-2003)
- ✓ Fineness test(as per IS 4031(part 1)-1996)

Specific gravity - 1.93

Fineness test - 0.2

6.2 FLEXURAL STRENGTH TEST

FIG.NO 1 TESING THE SPECIMEN

6.3 TESTS ON SAND

S.No	Properties of Sand	Result
1	Specific Gravity	2.8
2	Fineness modulus	4.21
3	Bulk density a) Loose sand b) Rooded Sand	1348 kg/m^3 1800 kg/m^3

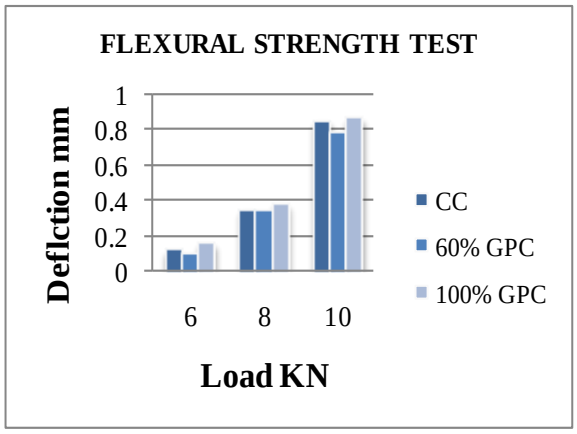
PLATE ID	N1	N2	IMPACT ENERGY AT FIRST CRACK (N.m)	IMPACT ENERGY AT FAILURE (N.m)
0%(cc)	12	20	247.212	412.02
60%	16	24	329.62	494.42
100%	10	16	206.01	329.62

7. RESULTS AND DISCUSSION

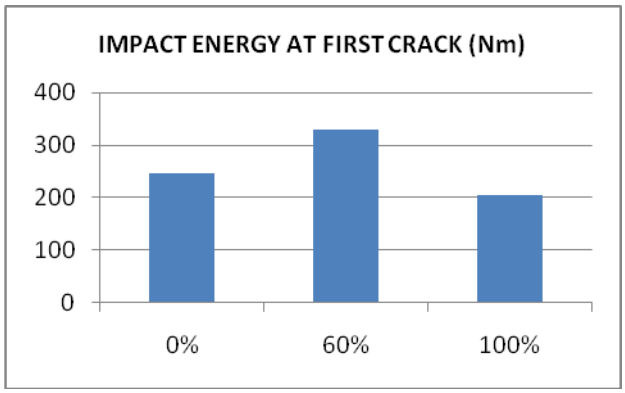
- The Geo polymer mortar is renewable and sustainable repair material.
- The sunlight curing showed the higher mechanical strength than other type of curing.
- The geopolymer mortar slabs exhibit the better load carrying capacity at shorter interval of curing under daylight.
- 18% to 30% economy is achieved in geopolymer mortar with compared to cement mortar.

FLEXURAL STRENGTH TEST

Load (kN)	M30 Conventional Concrete (Deflection Mm)	Geo Polymer Concrete (60% Replacement) (Deflection Mm)	Geo Polymer Concrete (100%Replacement) (Deflection Mm)
4	0.12	0.10	0.16
6	0.35	0.34	0.38
8	0.85	0.79	0.87



IMPACT TEST RESULT



8. CONCLUSION

When the molarity increased, the compressive strength is increased. The compressive strength of the flyash based geopolymer mortar is decreased with the increase in water to geopolymer solids ratio.

9. REFERENCE

1. Flexural behaviour of reinforced geopolymer concrete beams Rajamane et al (2011) International Journal of civil and structural engineering vol 2 ,No 1,2011
2. Gourley, J. T. Development inGeopolymerPrecastConcrete. Geopolymer, GreenChemistry and SustainableDevelopment Solutions. J.Davidovits. Saint Quentin, France, GeopolymerInstitute: 139-143.2005.
3. HamidrezaAllahdadi. A Study onGeopolymerConcrete Restrained One WaySlabs. International Journal ofEngineering ScienceInvention: 51-68.2011.
4. Hardjito, Djwantoro. 2005. Studies of fly ashbasedgeopolymerconcrete. Curtain University oftechnology,Dept. of civil engineering.
5. Hardjito, D. Development and Properties of LowCalciumFly Ash-Based Geopolymer Concrete.Research Report GC-1,Perth, Australia, Faculty ofEngineering, Curtin University ofTechnology: 94.2005.
6. Janani R, Revathi A (2015)," Experimental StudyofGeopolymer Concrete with ManufacturedSand,"International Journal of Science, EngineeringandTechnology Research (IJSETR).
7. J.M. Srishaila, ParvezAhamed. P, K.N. Vishwanath, P.Prakash (2014), "Experimental Study on Workability and Strength Characteristics of Fly ash and GGBS based Self-Compacting Geo polymer Concrete," International Journal of Engineering Research and Development.
8. L.Krishnan, S.Karthikeyan, S.Nathiya, K. Suganya(2014), "Geopolymer concrete an ecofriendly construction material," IJRET: International Journal of Research in Engineering and Technology.
9. Parthasarathi Deb, PradipNath andPrabirkumarsarker(2013),"Properties of fly ash slagblended geopolymerconcrete cured at ambienttemperature.