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COMPARISON OF COMPRESSIVE STRENGTH OF GEOPOLYMER CONCETE OVER M25 CONVENTIONAL CONCRETE

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Abstract - *Concrete is presently one of the maximum normally used creation materials within the business. Concrete's major component is Portland cement. because it does now not require Portland cement and does now not release greenhouse gases, geopolymer is probably seemed an essential factor. Davidovits (1978) described a geopolymer generation that has plenty of potential for usage within the concrete enterprise. Fly-ash and floor Granulated Blast Furnace Slag are two of the most commonplace strong wastes produced through industries. they're considered a partial alternative for stable wastes due to their low value and availability.*

The aim of this look at is to compare the compressive energy of M25 grade concrete with Geopolymer concrete (GPC) after 3, 7 and 28 days at varied alternative stages. As alkaline activators, sodium silicate solution and sodium hydroxide solution will be hired on this investigation.

Key Words: **Geopolymer concrete, Compressive strength, Fly Ash, Ground Granulated Blast Furnace Slag.**

1. INTRODUCTION

GGGBS is an iron production in blast furnaces. it may be utilized in prepared-mix concrete considering that it is low-cost to make in massive portions and does no longer necessitate large garage centers. At a temperature of 2000°C, iron ore, coke, and limestone are properly combined in blast furnaces. Iron ore is transformed to iron and sinks to the furnace's bottom. Slag floats to the floor. GGBS is applied as a uncooked component in cement manufacture, concrete, and pavements. Researchers determined that replacing up to forty% of the cement with slag ended in higher compressive and flexural energy than traditional concrete. The conduct of GGBS-added concrete at high temperatures changed into studied by way of the authors.

2. LITERATURE REVIEW

B. Rajini, A.V. Narasimha Rao and C. Sashidhar (2020), Pradip and Prabir (2014), Aslam Hutagi & Khadiranaikar (2014), Nath & Sanjay Kumar (2013), Kong et al. (2010) etc

have experience with geopolymer concrete. The majority of researchers have used by-product materials such as Fly Ash and Ground Granulated Blast to substitute cement. GGBS have focused on the Geopolymer Concrete Compressive Strength at Different Temperatures levels of replacement.

3. MATERIALS

The material used in present experimental project

Cement: In this present work cement of 25 grade ordinary Portland cement (OPC) is used for casting cubes for all concrete mixes.

Fly Ash & Ground Granulated Blast Furnace Slag: In this current project the fly ash and GGBS are collected from the Nature and Green private limited is located in Jamnagar (District), Gujarat.

Fly Ash

Ground Granulated Blast Furnace Slag

Fine Aggregate: Natural River sand was used as fine aggregate.

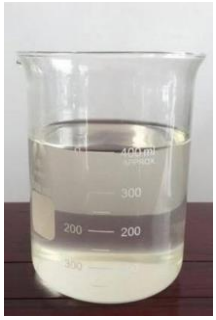
Fine Aggregate

Coarse Aggregate: Crushed granite stones of size 20mm and 10mm were used as coarse aggregate.

Coarse Aggregate

Alkaline Liquid: We used an aggregate of sodium silicate solution and sodium hydroxide solution for the alkaline liquid. The sodium silicate solution and sodium hydroxide have been bought regionally.

Sodium Hydroxide



Sodium Silicate

4. METHODOLOGY

The water-cement ratio, cement strength, concrete material quality, and quality control during the manufacturing process are all elements that affect the compressive strength of concrete.

According to IS 516, compressive strength tests will be performed on cubical specimens after 3 and 7 days of curing for all combinations (1956). Three 150 mm x 150 mm x 150 mm cubical specimens will be casted and examined. The specimen's compressive strength will be determined by dividing the greatest load applied to the specimen by its cross-sectional area.

Making of Geopolymer concrete.

To make geopolymer concrete, the traditional procedure used to make regular concrete is used. The fine aggregate, coarse aggregate, GGBS, and fly ash are mixed dry for 3–4 minutes before adding the alkaline solution, which is a combination of sodium hydroxide and sodium silicate solution, to the dry mix. For effective bonding of all ingredients, the mixing takes around 6-8 minutes. After mixing, the specimens are cast in three layers with adequate compaction.

For comparative investigation, M25 grade conventional concrete (CC) has been developed (see Appendix (B) as per IS 10262 (2009) and IS 456 (2000).

5. RESULT AND DISCUSSION

After 3, 7 and 28 days of curing, the compressive strength of GPC mixtures will be measured. These compressive strength values will be compared to those of M25 concrete grade (CC).

At different curing times, the compressive strength of CC (M25) and GPC mixes (FA100-GGBS0; FA25-GGBS75; FA50-GGBS50; FA75-GGBS25; FA0-GGBS100).

COMPRESSIVE STRENGTH TEST SETUP

Table 1 Compressive strength of CC and GPC

Mechanical Property		**Compressive strength Pc (MPA)**		
Age (Days)		**3 days**	**7 days**	**28 days**
Mix-Design	M25	09.00	19.45	33.45
	FA0-GGBS100	18.60	40.25	45.20
	FA25-GGBS75	17.25	37.30	37.80
	FA50-GGBS50	12.20	26.50	30.15
	FA75-GGBS25	7.20	9.90	10.20
	FA100-GGBS0	4.58	7.85	7.90

6. CONCLUSION

According to the results of this investigation, the following conclusions can be drawn:

1. The compressive strength of geopolymer concrete decreases as the FA content increases, regardless of the curing period.

2. For a given proportion of mix, compressive strength increases with age.

3. When mixed in a proportion of FA: GGBS: 0:100, geopolymer concrete has the highest compressive strength, regardless of curing time.

7. REFERENCES

I. Aslam Hutagi & Khadiranaikar, RB 2014, 'Review on mechanical properties of geopolymer concrete and its durability', Journal of Civil Engineering Technology and Research, vol. 2, no. 1, pp. 7-14.

II. B. Rajini, A.V. Narasimha Rao and C. Sashidhar 2020, 'Cost analysis of Geopolymer Concrete over Conventional Concrete,' vol. 11, pp. 23-30.

III. Dumpati Mamatha, T Ajay, Kiran H 2018, 'An experimental investigation on partial replacement of cement with ggbs and fly-ash in rigid pavements,' vol. 05.

IV. Kong LY Daniel & Sanjayan, Jay G 2010, 'Effect of elevated temperatures on geopolymer paste, mortar and concrete', Cement and Concrete Research, vol. 40, pp. 334-339.

V. Nath, SK & Sanjay Kumar 2013, 'Influence of iron making on strength and microstructure of fly ash geopolymer', Construction and Building Materials, vol. 38, pp. 924-930.

VI. Pradip N., and Prabir K. S. (2014) "Effect of GGBFS on setting, workability and early strength properties of fly ash geopolymer concrete cured in ambient condition", Elsevier, Construction and Building Materials 66 (2014). pp. 163- 171.