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PERFORMANCE ON HOOKED STEEL FIBER REINFORCED CONCRETE BY PARTIAL REPLACEMENT OF CEMENT WITH GGBS

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Abstract- Concrete is the best construction material. And it will adapt extremely well to the circumstances on the spot. This concrete is thought to be homogeneous, yet it is a mixture of cement, fine aggregate, coarse aggregate, and water. Concrete can be obtained using a variety of processes. Strength, replacing the ingredients of concrete is also a method, but it is only considered partially replaced to GGBS by 10%,20%,30% and 40%. By addition of Hooked steel fibre of 1% with different percent of Ggbs. To determine compressive and split tensile strength of concrete for 7 and 28 days.

Keywords: Ground Granulated Blast Furnace Slag, Hooked Steel fiber, Compressive Strength and Split tenile Strength.

1. INTRODUCTION

Concrete is the most well-known construction material in the world, and it is utilized for all types of structural development. There are a range of approaches to accomplish various needed conditions that may be of a higher strength than the usual, and concrete will also support methods such as post and pre tensioning to obtain a higher strength at a time with the reduction of concrete. Concrete is a mixture of cement, coarse aggregate, fine aggregate, and water, with cement acting as a binding agent. When cement comes into touch with water, an exothermic reaction occurs, causing the contents of the concrete to hardened. The expansion of steel strands in the solid and fractional supplementation of cement with GGBS was investigated in this study.

Hooked steel fibers are the most widely used for structural reasons because their anchorage mechanisms, length, and tensile strength provide stronger pull-out resistance and may increase structural element performance further than smooth fiber. Concrete is created from coarse aggregates, which are granular and irregular materials such as sand, gravel, or crushed stone. Hooked steel fiber is made from high-quality base steel bar with exceptional mechanical properties such as high tensile strength.

2. OBJECTIVES

a. To investigate the strength qualities of ggbs as a partial substitute for cement in concrete.

b. To increase the compressive and split tensile strength of concrete by including hooked fibers.

3. MATERIALS

a. Cement: For this experimental experiment, regular Portland cement with a grade of 53 was used. To make high-performance concrete, high-strength cements must be used. Choosing the right cement brand and kind is crucial for producing high-quality concrete. The type of cement used determined the pace of hydration. It is also vital to ensure that the chemical and mineral admixtures are proportionate to the cement.

b. Fine Aggregate: Fine aggregate is a granular material whose particles are so small that they can pass through a 4.75mm screen. The granular material used to build concrete or mortar is known as aggregate. It is often used in the construction industry to increase concrete volume, making it a cost-effective ingredient. You should, however, be well aware of the fine aggregate size, density, and grading zone two river sand.

C.Coarse Aggregate: The current study used 20 mm coarse aggregate that meets IS: 383- 1970. The pycnometer test is used to determine aggregate specific gravity. After sieve analysis, the material used for the task was passed through a 20 mm sieve and held on a 4.75 mm screen to measure the aggregate fineness modulus. Coarse aggregate has a smaller surface area than fine aggregate.The current study used 20 mm coarse aggregate that meets IS: 383- 1970. The pycnometer test is used to determine aggregate specific gravity. After sieve analysis,

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d.Water: Water is one of the most significant elements in building, since it is required for mortar preparation, cement concrete mixing, and curing operations, among other things. The strength of the motor and cement concrete in the construction process is directly related to the quality of the water utilized.

e. GGBS: GGBS (ground granulated blast furnace slag) is a white slag produced by iron ore refining furnaces. Calcium, silica, aluminum, and magnesium oxides are the primary components of GGBS. GGBS typically contains 40% calcium oxide.

f. Hooked steel fibre: Hooked steel fiber is made from high-quality base steel bar with exceptional mechanical properties such as strong tensile strength. The hooked end fibre is a very adaptable steel fiber that may be utilized in precast, shotcrete, and pouring applications, as well as a variety of other steel fiber reinforced concrete systems.

4. RESULTS AND DISCUSSIONS

a. Compressive strength test: The compression strength test is carried out on a 150 mm by 150 mm by 150 mm cube-shaped cast specimen. The strength of the cast specimen was measured 7 and 28 days after it had finished curing in a water tank.

Table 1: Compressive Strength Results By Adding 1% Hooked Steel Fibre Reinforced Concrete by Partial Replacement of 1 % Of GGBS

S.No	1% Of HSF and % Of GGBS	Compressive Strength Results, N/mm²	
		7 days	28 days
1	0%	27.36	39.71
2	1% HSF+10%GGBS	29.62	43.06
3	1% HSF+20%GGBS	30.56	43.72
4	1% HSF+30%GGBS	31.28	44.56
5	1% HSF+40%GGBS	31.04	44.28

b, Split tensile Strength test: At 7 and 28 days of age, the cylindrical specimens (150mm diameter x 300mm height) were tested for split tensile strength.

Table 2: Split Tensile Strength Results By Adding 1% Hooked Steel Fibre Reinforced Concrete by Partial Replacement of 1 % Of GGBS

S.No	1% Of HSF and % Of GGBS	Split Tensile Strength Results, N/mm²	
		7 days	28 days
1	0%	2.57	3.83
2	1% HSF+10%GGBS	2.85	4.21
3	1% HSF+20%GGBS	2.96	4.35
4	1% HSF+30%GGBS	3.15	4.58
5	1% HSF+40%GGBS	3.07	4.42

5. CONCLUSIONS

1. The Normal Concrete of Compressive Strength result for 7 and 28 days is 27.36 N/mm² and 39.71 N/mm².
2. The Normal Concrete of Split tensile Strength results is for 7 and 28 days is 2.57 N/mm² and 4.21 N/mm².
3. By 1%HSF and 30%GGBS the Compressive Strength results for 7 and 28 days is 31.28 N/mm² and 44.56 N/mm².
4. By 1%HSF and 30%GGBS the Split tensile Strength results for 7 and 28 days is 3.15 N/mm² and 4.58N/mm².

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