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Bending Study of High Capacity Reinforced Concrete Beams

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Abstract:- The use of factory-made derivatives improves the boundary with aggregates while decreasing the penetration of the mortar medium. The addition of chemicals results in higher strength and a noteworthy reduction in the amount of water added. To improve the overall quality of the concrete, we use factory-made derivatives such as residual ash, smoked silica, and steel slag aggregates. In case of high-performance concrete, such factory-made derivatives are used to improve properties such as durability and strength. To examine working execution of high-performance concrete, factory-made derivatives such as silica dust, residual ash, and furnace steel waste aggregates are used, which serve as substitutes for cement, fine aggregate, and coarse aggregate, respectively, which is the main focus of the work.

Keyword:- *High performance concrete, Residual ash, Furnace steel waste, Silica dust, bending strength.*

I. INTRODUCTION

Concrete is without a doubt the most frequently used material for structure building in the world for all sorts of frameworks and, due to its qualities, is a long-lasting substance. Concrete draws raw materials because of its benefits in terms of strength and durability, low fabrication costs and maintenance capacity, flexibility in producing the most various shapes, and structural relevance without the need for metallic components. However, due to the connection of the basic ingredients of concrete, the fabrication of concrete encounters fundamentally important challenges. Cement production necessitates a large amount of energy, which results in the production of a large amount of carbonic anhydride [1]. As cement manufacturing increases, the earth's temperature rises rapidly (Climate Warming), and cement causes stress on concrete under these adverse climatic circumstances. As a result, it is vital that we limit our reliance on cement and broaden our efforts to adopt alternatives that use chemical additions to improve hardness and resilience using mineral compounds [2]. The majority of developing nations are investigating the usage of resourceful resources in building materials. Aggregate, which has a maximum contribution of approximately 70% in the creation of concrete mix, is one of the main components in the formation of concrete mix. River sand, which is acquired by collecting sand from the river's bank, is most typically utilized as a fine aggregate in concrete. Sand mining has an impact not just on the subterranean layer of water-bearing porous rock, but also on the environment [3].

II. OBJECTIVES

- Workability assessment utilizing a slump test and implementation of an incorporation project for M30 conventional concrete using IS 10262: 2009.
- With the accurate choice of factory manufactured derivative through test mixture in order to determine the absolute assimilation proportions for standard concrete by checking combinations and high-quality concrete.
- The effect on factory-made derivatives in HPC blends is investigated using non-destructive test methods.

III. DURABILITY OF HPC (HIGH PERFORMANCE CONCRETE)

The presence of the concrete is unsafe since it must tolerate the environment under which the formation is done in order for the structure to exist. According to observations, high-quality concrete may not function well in a violent setting. The word "durability" is used to characterize the ability of concrete to withstand the variety of physical as well as the chemical assaults induced by their external and internal sources on the properties of the concrete [4]. The accurate collection and application of material units is required for the creation of high-quality concrete. It tends to produce a combination that is defined mostly by its poor porous nature.

IV. NON-DESTRUCTIVE TEST PERFORMED

A. Resistance Against Acid Test

An acid investigation is done to evaluate the blockage of the acid-attacked concrete cubes. Acid proof tests are carried out on a 150 mm cube prototype that had been cured for a period of 28 days with water, before exposing the cubes to the acid it is being weighted [5].

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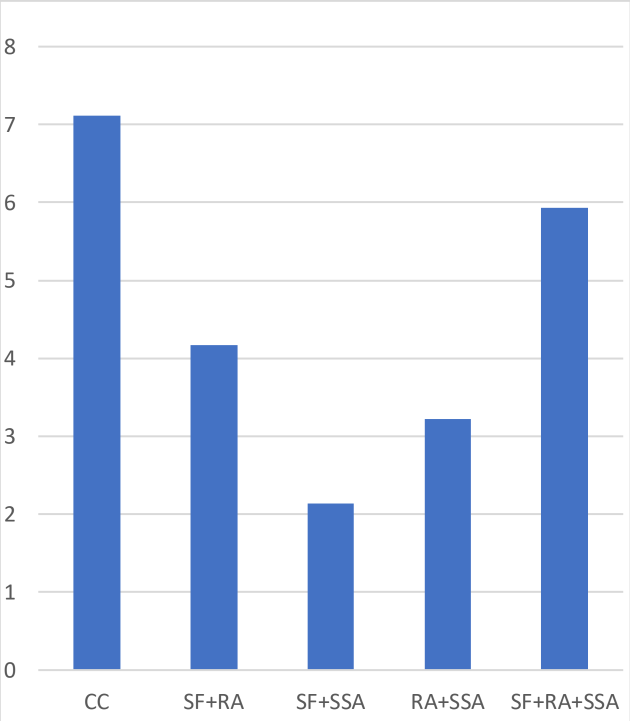

Fig. 1 : Change of mass on acid test in %

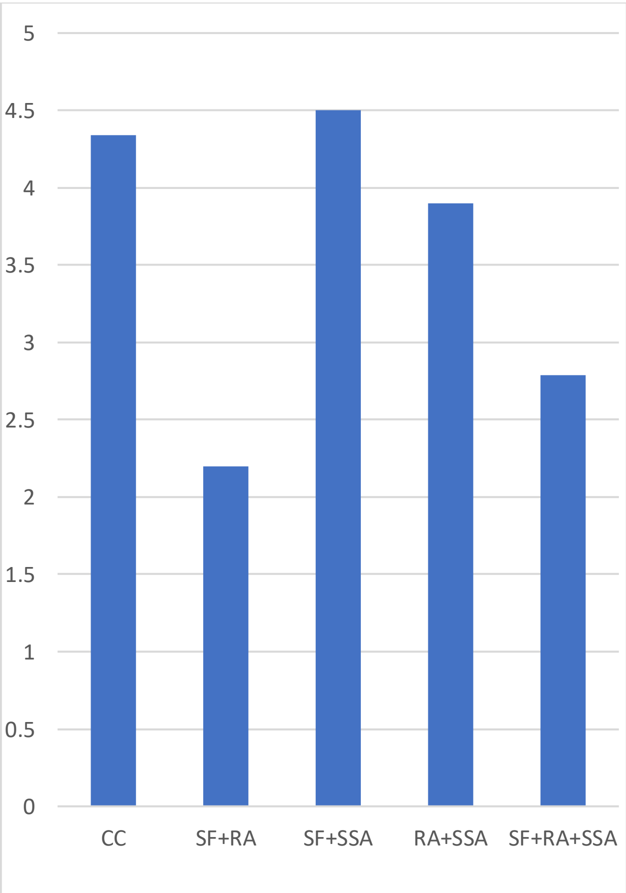

Fig. 2 : Change in Strength on Acid test

B. Resistance To Salt Test

A test was carried out to examine the concrete cubes durability when the cubes were exposed to the sea water having high concentration of salt. The dispersion of the salt concentration creates internal pressures that cause internal rupture and, finally, collapse. Concrete cubes with dimensions of 150 mm x 150 mm x 150mm formed for testing the weight dropped and the also the rate of firmness that is being lost due to salt assault. After cubes were cured for 28 days, the mass of the cube units was determined.

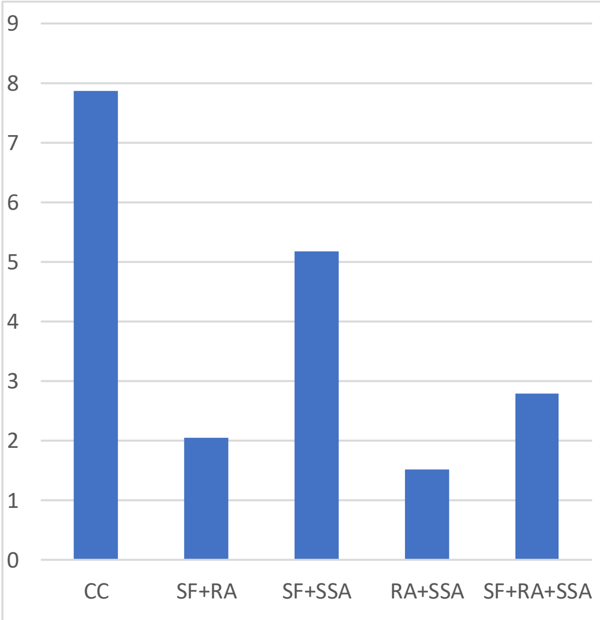

Fig . 3 : Change in mass on salt test in %

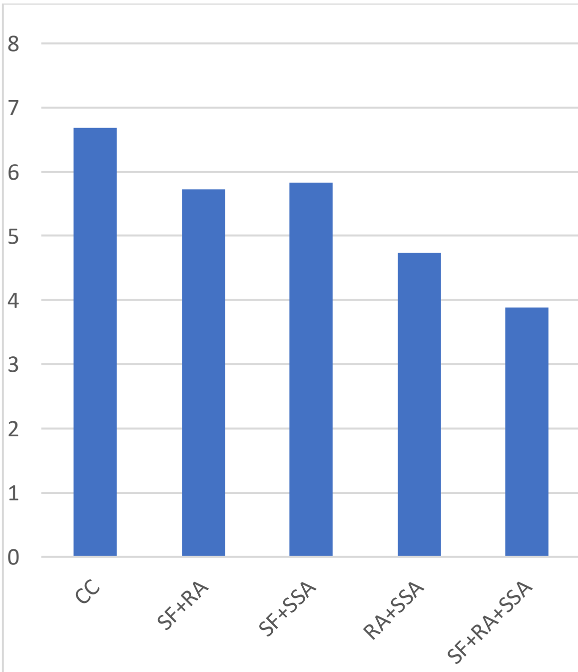

Fig 4 : Change in Strength on salt test

C. Resistance To Sulphate

To examine the adversities of the sulphate over concrete cubes a sulphate proof test is being carried out in which block used were previously being exposed to the sulphate contact. Concrete cubes 150mm x 150mm x 150mm are moulded to imitate the weight and strength reduction caused by sulphur

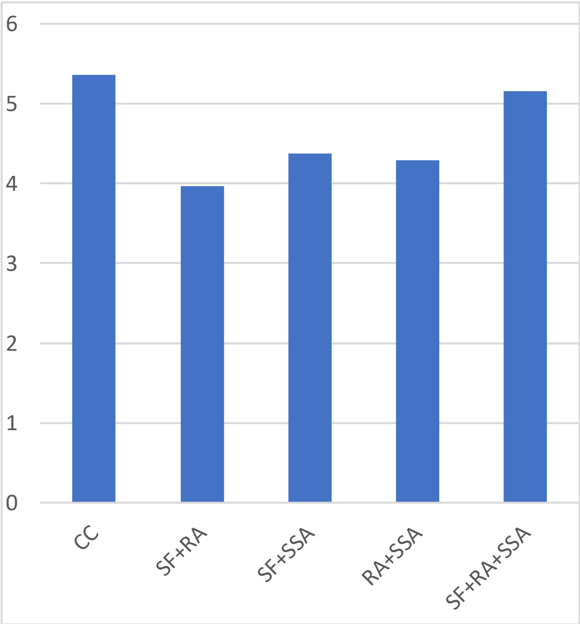

Fig. 5 : Change in Strength in percentage on Sulphate test

ions. After determining the mass of the blocks, they were submerged in a 5% diluted sodium sulphate solution.

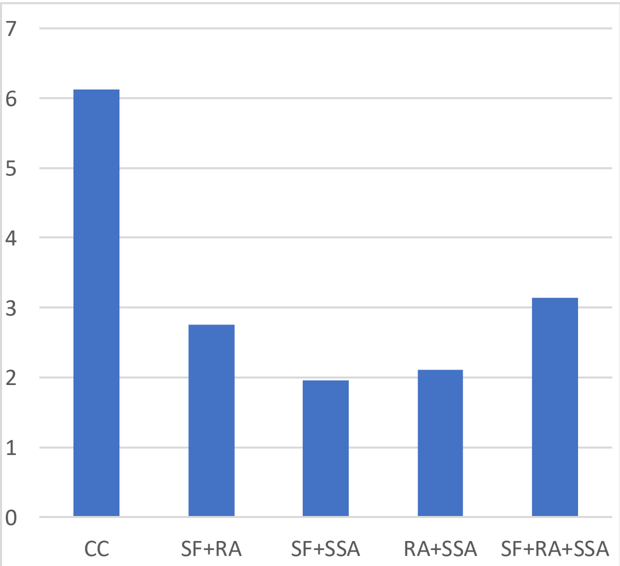

Fig 6 : Change in Strength in percentage on Sulphate test

V. CONCLUSION

Concrete RASSAC demonstrated significant sulphate resistance in a 5% sodium sulphate solution, outperforming other concretes with a weight loss of 3.38 percent and a strength loss of 1.39 percent in the SFRAC mix compared to CC. Water intake was 6.44 percent, 5.56 percent, 5.87 percent, and 6.21 percent lower in SFRAC, SFSSAC, RASSAC, and SFRASSAC, respectively, then in CC. The rapid chloride penetration results for RCPT was equated to the percentage of CC for SFRAC, SFSSAC, RASSAC, and SFRASSAC, which were 19.14 percent, 39.03 percent, 16.84 percent, and 4.56 percent, respectively. When compared to all specimens, the penetration of chloride ions in the SFRAC mix was 1020 few coulombs.

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