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EXPERIMENTAL INVESTIGATION OF DUNITE POWDER AS CEMENT REPLACEMENT AND ALKALI GLASS FIBER REINFORCEMENT IN CONCRETE

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ABSTRACT
The world is expanding quickly, as is well known, and building construction is essential to this growth. If we examine the usage of concrete in detail, we will find that it increases the demand for natural resources. We considered substituting the following measurements for part of the concrete's proportions in order to preserve our natural resources. This essay describes the usage of dunite in different proportions as a cement.Because we are aware that concrete is weak in tension and strong in compression, we are adding alkaline resistant glass fibres to the volume of concrete with a length of 12 mm in different percentages—0.03% and 0%, in order to improve the tensile qualities of the material. To determine compressive and split tensile strengths for 7 and 28 days.

Keywords:
Alkaline glass fiber, Dunite powder, compressive strength, split tensile.

1. INTRODUCTION

The search for long-lasting and ecological building materials has prompted creative developments in concrete technology. The integration of reinforcing fibers and the use of substitute materials in place of cement have drawn the most attention among these techniques. Alkali Resistant (AR) fibers and dunite powder stand out in this context as potentially useful additions to improve the longevity and functionality of concrete buildings.
Because of its pozzolanic qualities, dunite—a mineral rich in magnesium silicate—offers a chance to be used as an additional cementitious material. The environmental effect of producing concrete can be decreased, and the long-term strength and durability of the finished product can be enhanced, by substituting some of the cement with dunite powder.

2. OBJECTIVES

1. To assess the usage of dunite powder in cement.
2. To increases tensile properties by AR fibres in concrete.
3. To determine the compressive and spilt tensile strength of concrete.

3. MATERIALS

3.1 Cement: Cement is a material used in construction as a binding agent to hold the other building components together. Coarse aggregate makes up the majority of the material in concrete, while fine aggregate fills in the gaps left by the coarse aggregate. Whereas concrete is only cement mixed with coarse aggregate, mortar is just plain cement mixed with water and fine aggregate.
3.2 Fine Aggregate: Particles of natural sand that are taken out of the earth during the mining process are known as fine aggregates. They can be any size of crushed stone particle that is ¼" or smaller. Because this aggregate's size, or

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grading, is what makes it common to describe to this product as 1/4' minus. Fine aggregate is defined as the material that passes through an IS Sieve of 4.75 mm. Sand in Grading Zone II: River.(Medium grain).

3.3 Coarse Aggregate: Coarse aggregate is defined as the aggregate that is kept above IS Sieve 4.75 mm. The typical maximum size is progressively 10–20 mm; however, self-compacting concrete has been known to use particle sizes of up to 40 mm or more.

3.4 Dunite Powder: Magnesium Iron Silicate, or dunite, is a plutonic rock composed of a variety of fundamental minerals that are frequently transformed into secondary minerals by more or less complex geological processes. The main mineral found in dunite, a basic rock according to chemical classification, is olivine.

3.5 Alkalin-Resistance Glass Fibres: Glass fibre that has had zirconium oxide added to it to assist it withstand alkalinity attack is known as alkali resistant (AR) glass fibre. This is a crucial component of these fibres since the environment in concrete is alkaline. The alkaline aggregate environment in concrete causes normal fibreglass (e-glass) to deteriorate. Since the 1970s, AR fibre has been extensively utilised in the concrete industry. Concrete made with glass fibre can be lighter and thinner.

4. EXPERIMENTAL INVESTIGATIONS

4.1 **Compressive Strength Results:** The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 1 to 3.

Table 1: Compressive strength of concrete with dunite powder as partial replacement of cement.

S.No	% of Dunite powder	Compressive strength (N/mm^2)	
		7 Days	28 Days
1	0%	34.43	49.33
2	20%	35.55	50.86
3	40%	37.14	53.22
4	60%	35.48	50.84

Table 2: : Compressive strength of concrete with AR Glass Fiber replacement of concrete.

S.No	% of AR Glass fiber	Compressive strength (N/mm^2)	
		7 Days	28 Days
1	0%	34.43	49.33
2	0.03%	41.02	58.69

Table 3: Combined Compressive Strength of % of Dunite powder With Partial Replacement of cement +10 % of AR Glass fiber replacement of concrete.

S.No	% of DP+% of AR	Compressive strength (N/mm^2)	
		7 Days	28 Days
1	0%	34.43	49.33
2	40% DP+ 0.03% AR	44.79	64.09

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4.2 Split Tensile Strength Test

The results of the split tensile strength test that was performed on the cast and cured specimens of cylinders.

Table 4: Split tensile strength of concrete with dunite powder as partial replacement of cement.

S.No	% of Dunite powder	Split tensile strength (N/mm^2)	
		7 Days	28 Days
1	0%	3.41	4.87
2	20%	3.45	4.93
3	40%	3.64	5.15
4	60%	3.53	5.03

Table 5: Split tensile strength of concrete with AR Glass Fiber replacement of concrete.

S.No	% of AR Glass fiber	Split tensile strength (N/mm^2)	
		7 Days	28 Days
1	0%	3.41	4.87
2	0.03%	4.34	6.16

Table 6: Combined Split tensile strength of % of Dunite powder With Partial Replacement of cement +10 % of AR Glass fiber replacement of concrete.

S.No	% of DP+% of AR	Split tensile strength (N/mm^2)	
		7 Days	28 Days
1	0%	3.41	4.87
2	40% DP+ 0.03% AR	4.49	6.43

5. CONCLUSIONS

1. At 40% DP, the compressive strength of concrete is 37.14 and 53.22 N/mm^2 at 7 and 28 days.
2. For 0.03% AR glass fibers the compressive strength is 41.02 and 58.69 N/mm^2 at 7 and 28 days.
3. With 0.03% AR glass fiber + 40% DP the maximum compressive strength is 44.79 and 64.09 N/mm^2 at 7 and 28 days.
4. At 40% DP, the split tensile strength of concrete is 3.64 and 5.15 N/mm^2 at 7 and 28 days.
5. For 0.03% AR glass fibers the split tensile strength is 4.34 and 6.16 N/mm^2 at 7 and 28 days.
6. With 0.03% AR glass fiber + 40% DP the maximum split tensile strength is 4.49 and 6.43 N/mm^2 at 7 and 28 days.

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