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# Investigation Study on Fine Aggregate Fragmentary Replacement by using Glass Powder

**Arulsurya.M[1], SuryaPrakash.S[2], Mohanasudan.V[3], Tamilvanan[4], Elamurugu.A.M[5]**

*[1,2,3,4,5]PG Students, Department of Civil Engineering, Bannari Amman Institute of Technology, Sathyamangalam, Erode638 401, India.*

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**Abstract -** By increasing commercial buildings, the industrial wastes are being accumulated to larger being extent to disposal on environmental surroundings. From this by product of glass is also one of the by products in their industries, due to this recycling of glass by the replacement of fine aggregate in the construction field. The use of glass powder in the concrete mixer we can reduce the land filling (disposal)on environment regions .By eliminating the fine aggregate can be preserve our soil resources, energy and pollution should be controlled .The use of glass powder due to this replacement method cam be attain greater strength ,resistance to chemicals and electrical insulator. These tests (Compressive strength, split tensile strength) are achieved to be evaluated.

***Key Words***: Glass powder, fine aggregate, soil resources, strength parameters

## 1. INTRODUCTION

Construction industry is one of the fastest emerging industries. Concrete is one of the most commonly used materials in building construction. Concrete is made from a mixture of four main raw materials namely cement, fine aggregate, coarse aggregate and water. It is evident by examining the general design of concrete mixtures, that portions of raw material used in concrete can be replaced with recycled material. During recent years awareness is increased regarding environmental pollution due to domestic and industrial waste. Pollution control board is formed to regulate environmental degradation due to industrial waste. An enormous quantity of waste glass is generated all around the world. In India, 0.7%of total urban waste generated comprises of glass. Concrete industry is one of the largest consumer's of natural resources due to which sustain ability of concrete industry is under threat. In order to make concrete industry sustainable, the use of waste materials in place of natural resources is one of the best approaches. The use of river sand as fine aggregate leads to exploitation of natural resources. If fine aggregate is replaced by waste glass by specific percentage and in specific size range, it will decrease fine aggregate content and thereby reducing the ill effects of river dredging. The amount of waste glass produced has gradually increased over the recent years and most of the glass is being dumped into landfill sites. The land filling of waste glass is undesirable because it is non-biodegradable making environment less friendly. In this project, fine aggregate is partially replaced by wasteglasspowderas10%,20%and 30%by weight of concrete.

## 2. SCOPE AND OBJECTIVE

Inside the recent years, there has been growing demand for renewable strength assets. Among those assets, by products wastes are the gradable source of renewable power. Glass is a fully recyclable material that can be recycled in close loop over and over again. This is particularly true for glass bottles which on average have a recycling rate varying from 50% to 80% to glass recycling, significant amounts of raw materials are saved and natural resources are preserved.

The objective of this project is to find the compressive strength, split tensile strength to evaluate the utility of glass powder as partial replacement of fine aggregate in concrete. The increase in strength of glass powder concrete than the conventional concrete.

## 3. METHODOLOGY

### 3.1 COMPONENT MATERIALS

These substances for concrete components have been:

- Portland Pozzolona cement(PPC)
- Fine aggregate
- Coarse aggregate
- Water

#### 3.1.1 CEMENT

The Portland pozzolana cement is to be used in this mixture. It changed into procured from a single source and saved as in keeping with IS: 4032– 1977. Care has been taken to make sure that the cement of equal organization and identical grade is used all through the investigation. The cement consequently procured turned into tested for physical properties according with the IS: 1489-1991(part 1).

#### 3.1.2 COARSE AND FINE AGGREGATE

The first-class mixture used was regionally available m-sand with none organic impurities and conforming to IS: 383 – 1970 [methods of physical tests for hydraulic cement]. The coarse mixture selected turned into typically round in form,

well graded and smaller in most size than that used for traditional concrete. the size of coarse mixture used in self-compacting concrete turned into between 10mm to 16mm.The aggregates were examined for their requirements consisting of gradation, fineness modulus, unique gravity and bulk density in accordance with IS: 2386 – 1963.

### 3.1.3 WATER

Water used for blending and curing was potable water, which turned into free from any quantities of oils, acids, alkalis, sugar, salts and organic substances or other materials that may be deleterious to concrete or metal confirming to IS:3025 – 1964 part22, element 23 and IS : 456 –2000 [Code of exercise for plain and bolstered concrete]. The pH cost is to no longer be less than 6. The solids present have been inside the permissible limits as in keeping with clause 5.4 of IS: 456 – 2000.

### 3.1.4 GLASS

The proportions of concrete mix (GP replacement of 10 – 30% decreasing by weight of sand) including the control mixture were prepared with water to binder ratio of 0.5.The unique gravity of GP changed into found to be less than that of sand. unique gravity of glass powder is 2.71 conforming to BS 6262.

**Table -1:** Test on concrete

| Test on concrete | Compressive strength of cylinder (N/mm2) | Split tensile strength of cylinder (N/mm2) |
|---|---|---|
| 7-daystrength(N/mm2) | 22.5 | 3.39 |
| 28-daystrength(N/mm2) | 32.85 | 3.91 |

### 3.1.5 CUBE TEST

Samples with 0%, 10% and 15% replacement of sand with glass powder had been casted. The cubes had been casted as according to the technique specified in IS 516:1959 and IS 456:2000. The power of three samples were examined at 7 and 28 days using compression trying out gadget. The compressive energy values have been in comparison with that of conventional concrete mix of M25. Following the mix design precise in IS: 10262(1982), samples have been casted.

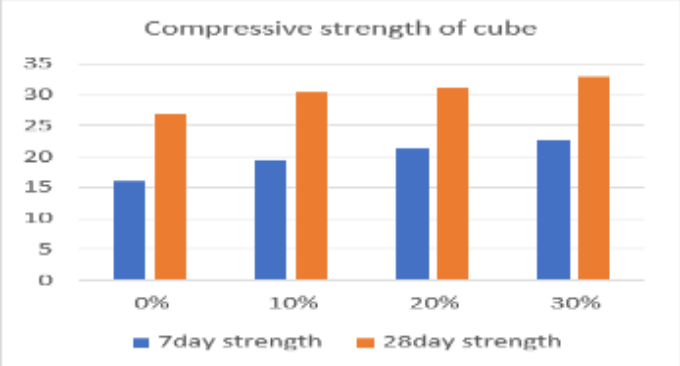


**Figure 1.**Compressive strength of cube

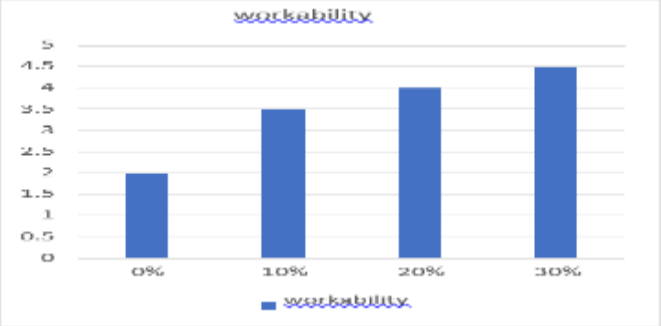


**Figure 2.** Workability

The 7 day compressive electricity of a well known M25 concrete turned into received as 16.7N/mm2 and the 28 day compressive electricity was acquired as 25.8N/mm2. From the above effects, it's miles observed that the 7-day electricity of 0%, 10%, 20% and 30% is greater than the predicted energy of 15.9N/mm2.The 28 day compressive energy with 0% of sand replacement is simplest 26.89N/mm2 that's lesser than 32.85N/mm2.therefore, it's miles discovered that the sand can be competently replaced with glass powder as much as 30%. It may be assessed that the workability of concrete decreases with in percent of glass powder this is because, the water absorption of the glass powder is more than that of sand.

### 3.1.6 CYLINDER TEST RESULTS

#### 3.1.6.1 SPLIT TENSILE STRENGTH OF CYLINDER TEST RESULTS

The cylinders were casted as in step with the design blend specified in IS: 10262 (1982). The acquired results are proven in fig.3.The 28-day split tensile strength of cylinder of the manage sample turned into received as 2.65 N/mm2. despite the fact that the energy has reduced with growth in % of glass powder, all of the four replacements of sand with glass powder are extra than the 28-day compressive strength of manipulate pattern. The maximum strength turned into obtained for 30% substitute that is 3.91N/mm2.

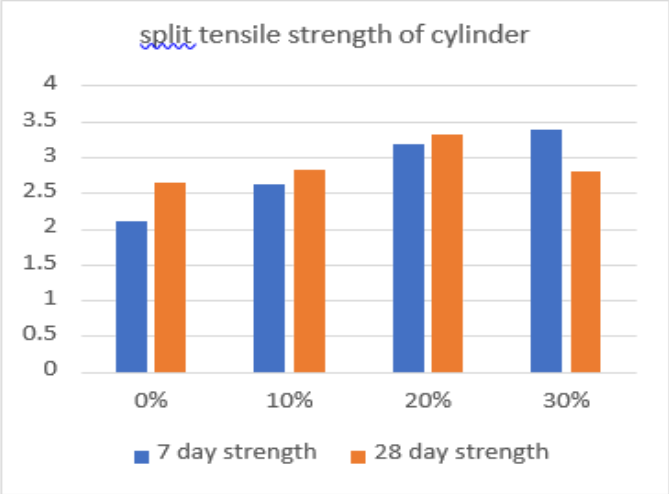


**Figure 3.** Split tensile strength

## CONCLUSION

The 7-day compressive strength of dice with all of the 4 percentages of alternative to the energy requirement. The 28day compressive strength of 30% alternative of sand with glass powder was located less than the same old strength of a manipulate specimen. The 28-day compressive power of cylinder turned into obtained first-rate for all of the four possibilities of replacement of sand with glass powder. The compressive strength of concrete containing 30% glass powder at 28 days is 32.85 N/mm2 whereas the split – tensile strength is 3.91N/mm2 .The compressive strength and split – tensile strength of concrete specimens increase with increase in glass powder content. From the observations, it is known that the strength of concrete by glass powder gradually increases and attains an optimum value by30%replacement. It can be concluded that fine aggregate replacement by 30% is appreciable. The workability of the concrete also increases when the glass powder content increases. Making concrete using waste materials saves energy and conserve primary resources and it is concluded that the more material was reused, the fewer resources were consumed which leads to a safe sustainable environment.

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