Study of Combine Effect of Silica Fume and E-Waste in Concrete

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Abstract - *Use of electronic waste and silica fume in concrete is a partial solution to environmental problems caused due to concrete. Use of e-waste and silica fume is going too studied in this report. In this study we are replacing cement by silica fume and coarse aggregate by e-waste. In this study we replacing cement by silica fume in 10% and replacing coarse aggregate by e-waste with a percentage of 5%, 10% and 15%. We decide to use M20 grade of concrete. We make concrete cubes of various proportions and check its compressive strength.*

***Key Words*: Silica Fume, E-waste, Compressive Strength.**

1. INTRODUCTION

Concrete plays a non-deniable role in construction industry as it is the major construction material. Every material has some advantages and disadvantages, in the same way concrete emits heat during setting and also emits co_2 in the environment. This leads to changes in the environmental conditions in the developing regions. Electronic waste is a discarded electrical or electronic devices. Electronic waste components contains potentially harmful components such as cadmium and lead. Its disposal is necessary as it can cause various health problems to human being. In composite concrete the cement and coarse aggregate is replaced by silica fume and electronic waste which causes increase in strength of concrete and also reduces consumption of cement in concrete. This will help to protect the environment up to certain extent and may be economical depends on the materials added in the concrete.

In this project work we have cast various combinations of concrete. In this work we replace cement by 5%, 10%, and 15% by electronic plastic waste with 10% silica fume. The details of results obtained along discussed in this report along with some suggestions.

2. EXPERIMENTAL INVESTIGATION

2.1 Materials

2.1.1 Cement

Table 1- Properties of Cement

Sr.No.	Property	Result
1	Standard Consistency	34%
2	Initial Settling Time	95 Minutes
3	Specific Gravity	3.15
4	Fineness Of Cement	1.22%

2.1.2 Fine Aggregate

Table 2- Properties of Fine Aggregate

Sr.No.	Property	Result
1	Fineness Modulus	2.9%
2	Specific Gravity	2.80

2.1.3 Coarse Aggregate

Table 3- Properties of Coarse Aggregate

Sr.No.	Property	Result
1	Fineness Modulus	5.06%
2	Specific Gravity	2.67
3	Aggregate Size	20mm
4	Water Absorption	0.55%

2.1.4 Silica Fume

Table 4- Properties of Silica Fume

Sr.No.	Property	Result
1	Size	0.1 Micron
2	Specific Gravity	2.2
3	Surface Area	30000 m^2/kg
4	SiO2	>90%

2.1.5 E-plastic Waste

Table 5- Properties of E- plastic Waste

Sr.No.	Property	Result
1	Specific Gravity	1.03
2	Shape	Angular and Triangular
3	Size	4.75-20mm

2.2 Mix Proportion

Table 6- Mix Proportions

Mix Specification	Conventional Mix X1	X2	X3	X4
Proportion of Silica Fume	0%	10%	10%	10%
Proportion Of E- Waste	0%	5%	10%	15%

3. EXPERIMENTAL PROCEDURE

The specimen of standard cube of (150mm×150mm×150mm) were casted to determine the compressive strength of concrete. 12 specimen were tested for 7, 14 and 28 days with each proportion of silica fume and e-waste. Totally 36 cubes were cast for the compressive strength. The materials were weighed and mixed by hand mixing. The concrete was filled in different layers and each layer was compacted. The cubes were demoulded after 24 hrs. Cured in water for 7, 14 and 28 days, and then tested for its compressive strength as per Indian Standers.

Fig 1- Cubes after Casting

3. TEST RESULT AND DISCUSSION

Table 7- Result of Compressive Strength

Mix	% of Silica fume added	% of E-waste added	Compressive Strength (N/mm²)		
			7 Days	14 Days	28 Days
X1	0%	0%	15.18	22.22	26.32
X2	10%	5%	15.45	21.75	23.36
X3	10%	10%	15.06	19.59	21.58
X4	10%	15%	13.57	18.25	20.6

The result of compressive strength were presented in Table 7. The test was carried out conforming to IS 516-1959 to obtain compressive strength at the age of 7, 14 and 28 days. The cubes were tested using compressive testing machine. The compressive strength is up to 15.45N/mm², 22.22N/mm² and 26.32N/mm² at 7, 14 and 28 days respectively. The maximum compressive strength is obtained at 5% replacement of e-waste at the age of 7 days.

By comparing the results with conventional concrete at 28 days it is observed that the strength of concrete is reduced by 11.24% for mix proportion X2 and 18.23%, 21.73% for mix proportion X3 and X4.

3. CONCLUSIONS

This study is perform to find the effective ways to reutilize the plastic waste particles as coarse aggregate. It is also observed that the compressive strength is found to be optimum when coarse aggregate is replaced by 5% with E-waste at the age of 7days. Beyond it the compressive strength is decreasing. The compressive strength will gradually decrease when silica fume is added by 10% in addition with different proportions replacement of E-waste with coarse aggregate.

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