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PARTIAL REPLACEMENT OF CONCRETE CONSTITUENTS BY FLY ASH, CRUMB RUBBER POWDER, AND E- WASTE

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Abstract - The project work consists of, “PARTIAL REPLACEMENT OF CONCRETE CONSTITUENTS BY FLY ASH, CRUMB RUBBER POWDER AND E-WASTE” due to the rapid growth, the demand of infrastructure is increased. The basic need of infrastructure is concrete but raw material availability is questioned. Thus to fulfill the demand of concrete materials, it is necessary to find alternatives. On the other hand, E-waste from various electronics items and rubber wastes were increasing rapidly, their waste disposal is tedious process and causes serious impact on environment. For solving the both problems, large amount of fly ash, E-waste and rubber powder can be utilized as an ingredient of a concrete as a substitute for cement, coarse and fine aggregate. Thus the use of this waste material tends to reduce the demand of natural resources used in concrete and also the waste management problems. The main parameter investigated in this experimental is M30 Grade concrete as per IS10262-2009 With partial replacement of concrete constituents by fly ash, crumb rubber powder and E-Waste by 0%, 5%,10%, 15%.

Keywords – Fly ash, crumb rubber powder, and E- waste

I.INTRODUCTION

One of the crucial environment issues all around the world is the disposal of the waste materials. Accumulations of discarded waste crumb rubber powder, E-waste, Fly ash have been a major concern because the waste crumb rubber powder, E-waste, is not easily biodegradable even after a long period landfill treatment. However, the materials and energy are alternatives to dispose of the waste materials of rubber goods. A variety of waste materials has been suggested as add to cement based materials. Other construction products are also based on crumb rubber powder obtained from cryogenic milling of tires mixed with concrete materials.

Unfortunately, not much attention has been paid to use the waste materials in Portland cement concrete mixtures particularly for highway use. Limited work was done by researches to investigate the potential use of rubber wires, E-waste, fly ash in conventional concrete. The literature about the use of Ewaste, crumb rubber powder, fly ash powder particles in cement- based materials focuses on the uses on fine and coarse aggregate concrete. The use only coarse as an E-waste particle, fly ash, and fine aggregate as a crumb rubber powder. As a result, we save energy, reduce pollution, reduce greenhouse gas emissions & save natural resources by extracting fewer raw

materials from the earth. The use of waste materials saves a natural resources and dumping spaces to help maintain a clean environment.

II.METHODOLOGY

All materials are used in this study were locally available. Ordinary Portland cement, 20mm aggregate, and river sand used in the investigation. Partial replacement of cement by fly ash, fine aggregate by crumb rubber powder, and coarse aggregate by E-waste. Collection, separation, grading and grading the fly ash, crumb rubber powder, E- waste materials testing the physical properties. Mix design were designed by M₃₀ grade of concrete. Casting the cube of size 150mmX150mmX150mm with replacement and test them for 7 days, and 28 days for compressive strength test. The result is then compared with the control mix.

III.MATERIAL USED

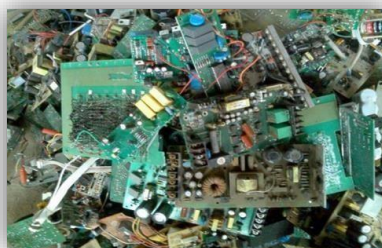
1. Fly ash:

Fly ash is a fine powder. It is produced as a product from industrial plants using pulverized coal. It is the most widely used pozzolan siliceous or alumina siliceous in nature in a finely divided form. They are spherical shaped “balls” fineness than cement particles.



2. Electronic waste (E- waste):

Rapid growth of technology, up gradation of technical innovations, and electronics, industry has led to one of the fastest growing waste streams in the world. Electronic waste such as, refrigerator, washing machines, computers, and printers, televisions, mobiles, I-pods etc. E-waste was collected locally from a PCB Board. Copper strips at the bottom of PCB were removed manually and broken in to 20mm size.



2.1. Types of E-waste:

Print Circuit board (PCB), Computers, Printers, Televisions, Mobiles, Refrigerators, washing machines, I-pods, Glass powder, Brick pieces, Saw dust. (We used a project material as print circuit board)

1. Crumb Rubber Powder (CRP):

Crumb rubber powder or ground powder produced in the process is used in the manufacture of numerous rubber products. These include mats for domestic, commercial, recreational, industrial uses.

Rubber wheels for cars and lawnmowers, insulation products, lumber and other construction products. The scrap tire is shredded into small pieces by the help of mechanical blades up to sizes of 1mm -75µm.



IV.MIX PROPORTIONS

MIX	BINDING MATERIAL		FINE AGGREGATE		COARSE AGGREGATE	
	Cement	Fly ash	Sand	Rubber powder	Aggregate	E-waste
Control Mix	100%	0%	100%	0%	100%	0%
C1	90%	10%	90%	10%	95%	5%
C2	90%	10%	90%	10%	90%	10%
C3	90%	10%	90%	10%	85%	15%

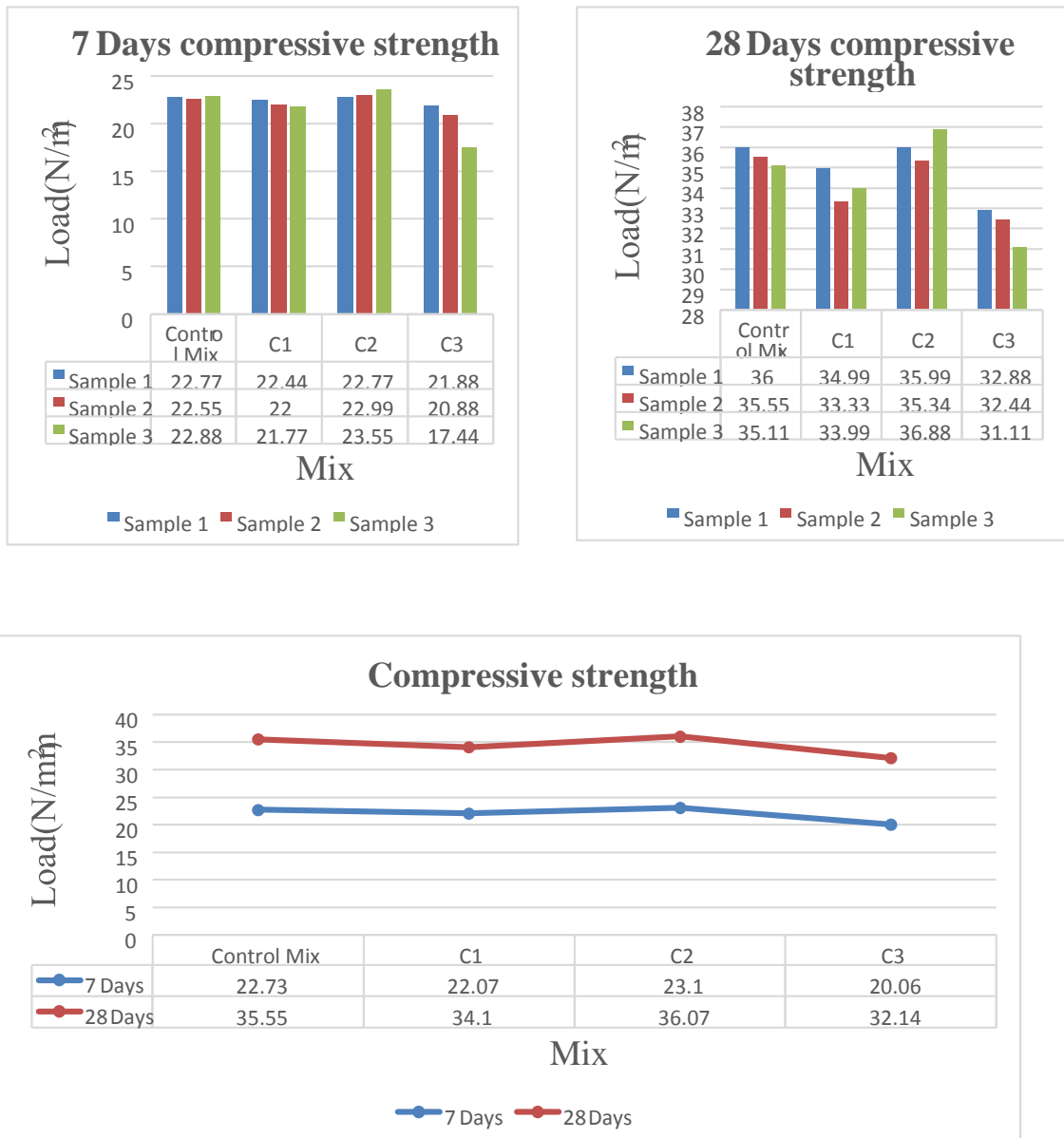
V.EXPERIMENTAL RESULTS

Compressive strength test:

Compressive strength test is a mechanical test. It is measuring the maximum amount of compressive load the material can before fracturing. The test concrete sample is usually in the form of a cube is compressed between the platens of a compression-testing machine by a gradually applied load.



GRAPH:



Result:

The compressive strength has been increased up to 10% replacement by both 7 and 28 days.

Days	Control Mix	C1	C2	C3
7 Days	22.73	22.07	23.10	20.06
28 Days	35.55	34.10	36.07	32.14

VI.CONCLUSION

1. Fly ash is considered 5% constantly for all mixes. If we increase the percentage of fly ash will may change the results. So that further investigational research is needed to use in concrete.
2. The compressive strength of concrete will decrease with the increase of fly ash.

3. The 10% and 20% replacement of cement with fly ash shows good compressive strength for 28 days.
4. Considerable consumption of E-waste in concrete reduces environmental problems. Hence, production of environment friendly or sustainable concrete.
5. E-waste can be disposed in concrete as a coarse aggregate.
6. Up to 10% of partial replacement of E-waste with coarse aggregate is found to be satisfactory.
7. Crumb Rubber Powder has improved workability and freeze/ thaw resistance.
8. Crumb Rubber Powder improves mechanical property and reduces the greenhouse emission gases.
9. Fire resistance for rubberized concrete.
10. Crumb Rubber Powder exhibits energy absorption, and ductility.

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