



Compressive Strength of Conventional Concrete using E waste

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ABSTRACT

The Waste materials Utilization of construction industry by-products is a sustainable solution to ecological and environmental problems. Use of such waste materials makes their re utilization in cement-concrete, other construction materials, and also the cost of cement and concrete manufacturing is reduces. Other indirect benefits of e-waste include reduction in landfill cost, saving energy and reduction in solid waste. E-waste consists of discarded refrigerators, TVs radios, Mobile phones, Air conditioners, computers and several other electronic gadgets that have reached end of life their or become a obsolete. . The major aim of the study is to examine the alter in mechanical properties of concrete with the addition of Electronic waste in concrete. It is found that the use of Electronic waste aggregates results in the formation of concrete. In this addition Coarse aggregate is replaced by E- waste from 0% to 15% then in these mix 5%, 10% and 15%. It is that utilization of this Electronic waste in concrete will reduce the requirement for conventional coarse aggregates there by resulting in used by natural resources.

Keywords: EW, NA, Concrete, Slump, Compressive Strength

1. INTRODUCTION

One of the new waste materials used in the concrete industry is recycled e-waste. For solving the disposal of large amount of recycled e-waste material, reuse of e-waste in concrete industry is considered as the most feasible application. In this present experiment work

the coarse aggregates are partially replaced by e-waste in the proportion of 5%, 10%, & 15%, respectively. Electronics waste, commonly known as e-scrap and e-waste, is the trash we generate from surplus, broken and obsolete electronic devices and was collected from the local market.

1.1 EXPERIMENTAL INVESTIGATION

- To compare the compressive strength of Recycled E-waste used as Coarse Aggregate for Constructional Concrete with the Conventional concrete.
- To know its applications in construction industry
- To reduce the pressure on naturally available materials by replacing it with recycled e- waste aggregate.
- To compare the physical characteristics of natural aggregate with E-waste recycled aggregate.
- To study the behavior of fresh and hardened concrete reinforced with e- waste coarse aggregate.

2. MATERIALS AND METHODS

2.1. MATERIALS

The ordinary Portland cement of 43 grade was taken for the present investigation work. All possible contact with moisture was avoided while storing cement. Concrete mixes were prepared using locally available sand. Ordinary crushed stone with size 20mm was used as coarse aggregate in concrete mixes. They generally possess all the essential

qualities of a good stone showing very high crushing strength, low absorption value and least porosity. In general, water fit for drinking is taken for mixing the concrete.

E-waste was collected locally area in the form of long chips. Copper strips present at the bottom of waste were removed manually and broke into 4.75 to 20mm size. Specific gravity and water absorption was tested for E-waste.

Properties	Fine Aggregate	Coarse Aggregate	E-Waste
Specific Gravity	2.65	2.71	2.0
Water Absorption(%)	1.3	0.06	0.3
Colour	Dark	Dark	Dark,light Green
Shape	-	Angluar	Angluar

Table 1: Physical Properties of Aggregate and E-Waste

2.2. CONCRETE MIXES

The mix was designed of 20 Mpa was designed according to the Indian Standard code. Mix proportions were presented and Electronic waste was added to the concrete mix with a w/c ratio 0.50.

The percentage of E-waste added by weight was 0, 5, 10 & 15%. Mix concrete and modified concrete with varying percentage of Electronic waste.

Mix Specification	Control Mix	Modified Mix 1	Modified Mix 2	Modified Mix 3
Percentage Of E-Waste Added	0%	5%	10%	15%

Table 2: Details of Concrete Mix

2.3. CURING

Water curing is the most effective and useful method of curing. It gives the highest level of compressive strength. With these in mind, proper curing was done for specified days.

3. EXPERIMENTAL PROCEDURE

The purpose of testing, the concrete specimens were prepared for different mixes of concrete. Preparation of concrete aggregates, cement and Electronic waste was added. After the mixing, water was added and the mixing was continued until a mix was obtained. The concrete was then placed in to the moulds which were properly oiled and prepared. After placing of concrete in moulds,

For compressive strength test, cubes of size 15x15x15 -cm-3 were cast. . Specimens thus prepared were demoulded after 24 hours of casting and doing curing in curing water tank. The dimensions of specimens used for the present study are listed in

Test Detail	Dimension Of The Specimen
Compressive Strength	Cube :150*150*150mm

Table3. Details of Test Specimens

4. TESING OF MIX

4.1. SLUMP TEST

Workability is a term associated with freshly prepared concrete. This can be defined as the ease with which concrete can mixed, placed, compacted and finished. Slump test is the most commonly used method of measuring ‘workability’ of concrete in a laboratory or at site of work. It is used to Vertical settlement of a standard cone of freshly prepared concrete is called ‘slump test.

Apparatus:

Slump cone (bottom diameter = 20 cm, top diameter = 10 cm, height=30 cm), Weighing balance, tray, standard tamping rod, concrete mixer

Materials used:

Cement, stone chips (Coarse aggregate) and water

Concrete Mix: 1:1.5:3 (W/C=0.5). The ingredients are by weight.

W/C ratio	Percentage of plastic replaced (%)	Height of mould (mm)	Height of concrete subsided (mm)	Slump (mm)
0.5	0	300	220	80
0.5	10	300	225	75
0.5	10	300	205	95
0.5	15	300	214	86

Table.4 Observation for Slump Test

4.2 COMPRESSIVE STRENGTH TEST

Presents the Compressive strength of concrete mixes with and without E waste aggregates, where 0% is M0 is Conventional Mix, M1 with E-waste of 5% of, M2 with 10% of E -waste and M3 with 15% of E-waste

Mix	Mix Name	3 Days Strength (Mpa)
M 20	M0	15.36
M 20 & replace 5%	M1	16.87
M 20 & replace 10%	M2	18.93
M 20 & replace 15%	M3	15.32

Table 5: 3 days compressive strength of conventional concrete and partially replaced with e-waste

Mix	Mix Name	7 Days Strength (Mpa)
M 20	M0	19.55
M 20 & Replace 5%	M1	20.33
M 20 & Replace 10%	M2	22.21
M 20 & Replace 15%	M3	21.05

Table 6: 7 days compressive strength of conventional concrete and partially replaces with e waste

Mix	Mix Name	28 Days Strength (Mpa)
M 20	M0	21.00
M 20 & replace 5%	M1	22.26
M 20 & replace 10%	M2	28.42
M 20 & replace 15%	M3	23.10

Table 7: 28 days compressive strength of conventional concrete and partially replaces with e waste

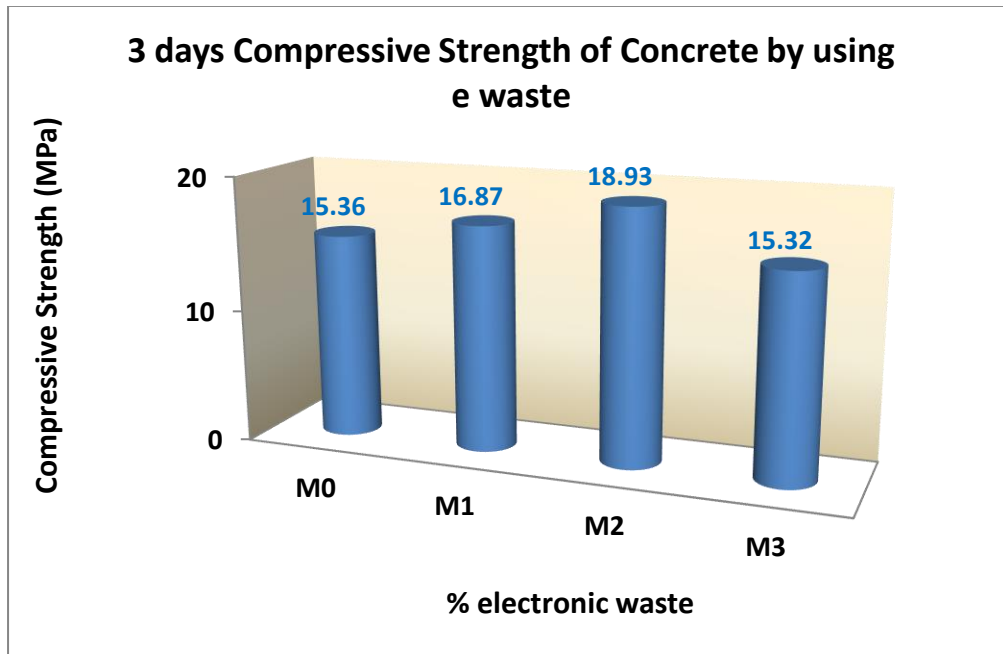


Figure 1:- 3 days compressive strength

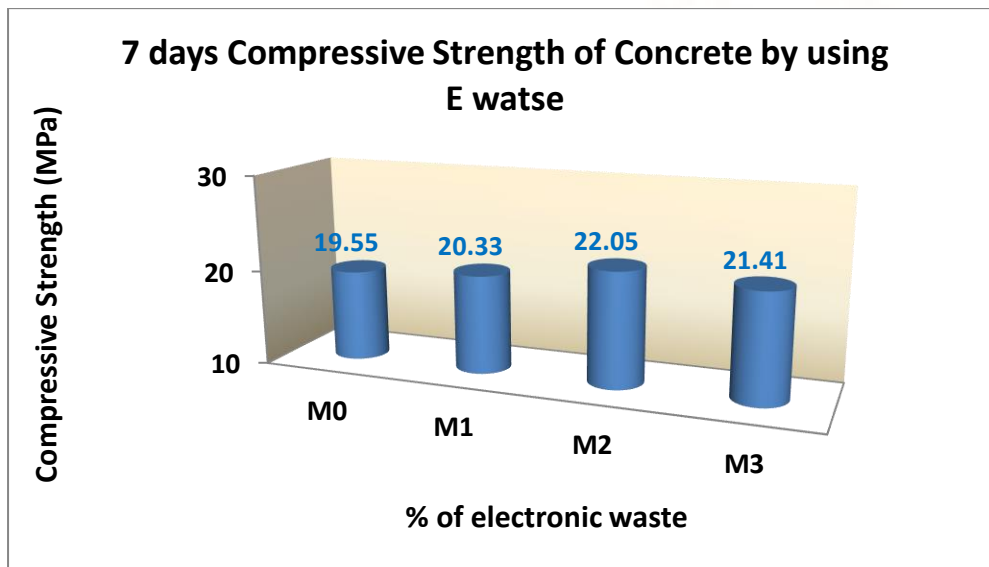


Figure 2:- 7 days compressive strength

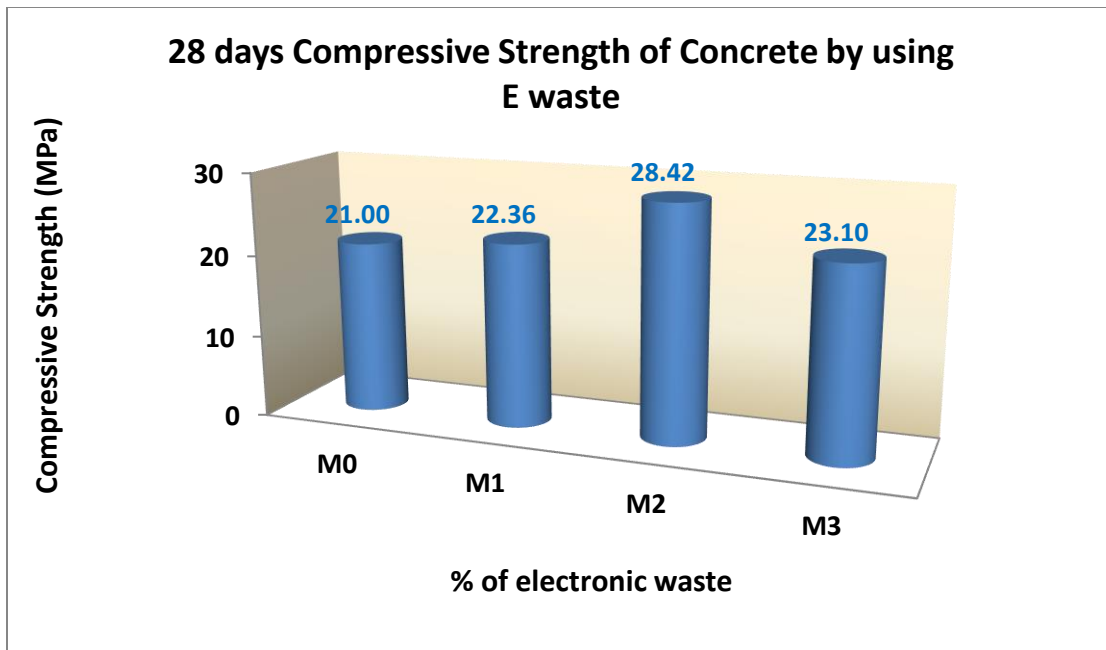


Figure 3:- 28 days compressive strength

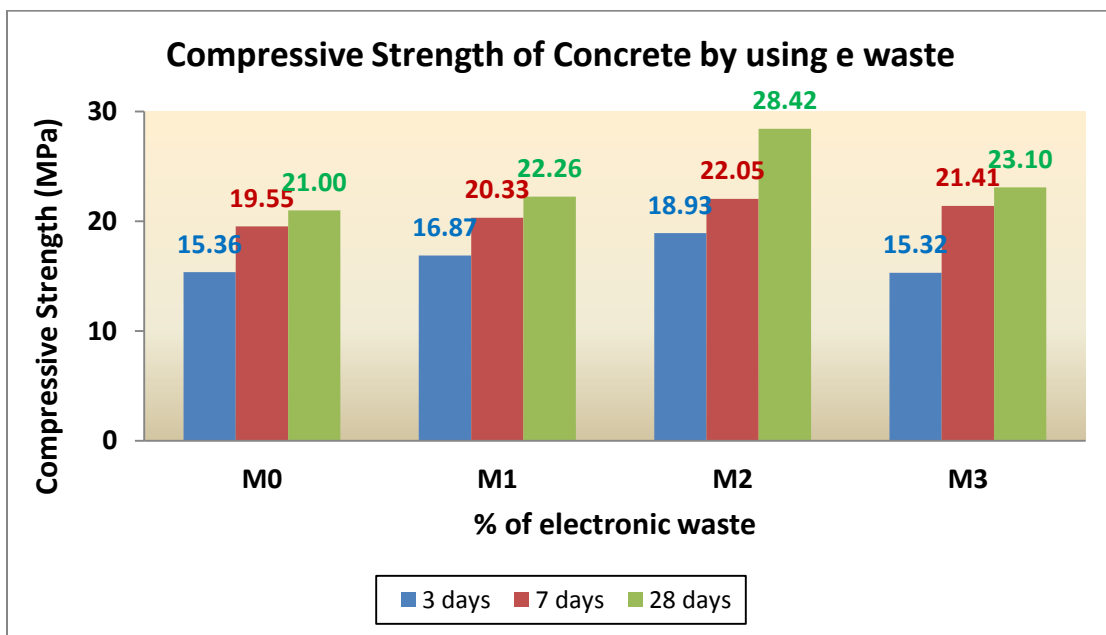


Figure 4:- Comparative compressive strength

5. CONCLUSION

The following conclusions are drawn with the current research work:

- Using E- waste as coarse aggregate partially replacement in concrete, 28 days strength is found to marginally increase up to 10% replacement level.
- It was observed that the optimum strength is 28.42 MPa at 10% replacement level of coarse aggregate with the E waste.
- Due to e- waste, it proved to be very effective in assuring very good cohesiveness of mortar and concrete.
- As compare to conventional concrete, on addition of electronic waste more than 10% its characteristic strength is decreased. So the electronic waste has been replaced by up to 10% by weight of aggregate without affecting the characteristic strength of M20 grade concrete.

- 5) The best possible way of disposal of waste material like E waste can be done by using it in concrete, which will reduce environmental burden.
- 6) We have put forth a simple step to minimize the costs for construction with usage of electronic waste because it is freely and cheaply available.
- 7) We have also stepped into a realm of saving the environment from pollution by aggregate production; being our main objective as Civil Engineers.

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