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EXPERIMENTAL INVESTIGATION ON CONCRETE USING E-WASTE

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Abstract

Disposal of E-waste is a typical task faced in many regions across the globe. Computer wastes that are land filled produces contaminated leachates, which eventually pollute the groundwater. Acids and sludge obtained from melting computer chips, if disposed on the ground causes acidification of soil. Utilization of E- waste is a partial solution to environmental and ecological problems. In this work printed circuit board is used asa E-waste material.This paper aims to minimize the dangers to human health and the environment that disposed and dismantled electronics can create.It has been decided to make three different types of conventional specimens with partial replacement of E-waste on a percentage of 10%, 20%, and 30% to coarse aggregate with water cement ratio of 0.45. For conventional specimens are also prepared for M20 Concrete without using E- waste aggregates. The effect of physical, and mechanical properties of the concrete were studied.

Introduction

Concrete is used in farther than any other man- made material in the world. Concrete is a truly eclectic composition paraphernalia. It's a list and emulsion material, where coarse and fine materialsare padding material and cement history are binding paraphernalia. The maximum parcels of concrete and malleability of concrete is depending on total. The mechanical parcels of concrete depends on the parcels of aggregate like shape of total, size of total, source of total, crushing type of total, normal or light or heavy weight aggregate, angularity index, modulus of elasticity, face texture, specific staidness, bulk density, adsorption and moisture content, cleanliness, soundness of total, bulking of total, thermal parcels and grading of aggregate etc. Waste paraphernalia from other industriousness are being employed in concrete products analogous as cover ash, silica pall etc. The waste paraphernalia from electronics and electrical industriousness are divided in two orders dangerous and inert waste paraphernalia. The inert waste is also known asE- waste describes obsolete, discarded and conked electrical or electronics bias. It's truly delicate to dispose- off theE- waste paraphernalia. Waste paraphernalia from other industriousness are being employed in concrete products analogous as cover ash, silica pall etc. The waste paraphernalia from electronics and electrical industriousness are divided in two orders dangerous and inert waste paraphernalia.TheE-waste that generated is generally disposed in the form of land filler, incineration, exercise, recovering. still, the cost of these disposal measures is high and has dangerous effect on our terrain. It's necessary to arrive at a cost effective and environmental friendly recycling process, which may be considered as

the real need hour.Total External solid waste in developing countries ranges from0.01 to 1. Such like, the adding of E-waste is an arising issue as well as it carriages serious pollution problems to the mortal life. So, considering the terrain options it needs to be measured especially on recovering generalities. E- Waste describes approximately rejected fat, outdated, broken, electrical or electronic bias. The major cause of fast growing fat of electronic waste around the globe is that Rapid technology change and low original cost. For those reasons, several tones of E-waste need to be disposed per time. E-waste can produce serious mortal health problem due to presence of multitudinous types of substances and terrain problems if not handled duly. Owing to the deficit of coarse total for the root of concrete, partial relief of E-waste with coarse was plodded in numerous exploration.

3. Objective:

1. Guarding humans& environmental health by keeping those devices out of landfill.
2. The aim is to dispose of unwanted electronic gadgets.
3. One of the major objective ofe-waste operation is to reduce, reuse& reclaim.
4. To observe the compressive strength of concrete is advanced when coarse aggregate is replaced by 15% withE-waste material.

4. MixedDesign:

Characteristic compressive strength (that is, below which only a specified proportion of test results are allowed to fall) of concrete at 28 days (f_{ck}), Degree of workability desired,Limitations on the water-cement ratio and the minimum cement content to ensure adequate durability,Type and maximum size of aggregate to be used, andStandard deviation (s) of compressive strength of concrete**.**

Determination of cement content

w/c ratio = 0.4

water =186 l

cement = 186/0.4 = 465 kg/m^2

Determination of course and fine aggregate contents

$$V = [W + C/S + F/S] / 100$$

Where,

V= Absolute volume of fresh concrete= Gross volume of concrete - volume of entrapped air

V = 100 - 2 = 98% =0.98

W=mass of water (kg) per m^2 of concrete

W =186 l/m^2

C= Mass of cement

C = 465 kg/m^3

S= specific gravity of cement

S= 3.10 (assumed)

P= Ratio of FA to total aggregate by absolute volume

P = 31% = 0.31

S_{fa}= Specific gravity of saturated dry fine aggregate = 2.52

S_{ca}= Specific gravity of saturated dry course aggregate=2.71

Aggregate content can be determined from the following equation –

For fine aggregate

$$V = (W + \frac{C}{Sc} + \frac{fa}{P \times Sfa}) \frac{1}{1000}$$

$$.98 = (186 + \frac{465}{4.10} + \frac{fa}{.31 \times 2.52}) \frac{1}{1000}$$

$f_a = 603.09 \text{ kg/m}^3$

For course aggregate

$$V = (W + \frac{C}{Sc} + \frac{Ca}{(1-P) \times SCa}) \frac{1}{1000}$$

$$.98 = (180 + \frac{\mathbf{465}}{\mathbf{3.1}} + \frac{Ca}{(1-0.31) \times 0.69}) \frac{1}{1000}$$

$C_a = 1202.35 \text{ kg/m}^3$

5. Results:

FOR COURSE AGGREGATE

Sample of course aggregate was collected from the field and conduct the following experiment on this.

Weight in gm of saturated surface dry sample (A)

= 991 gm

Weight in gm of pycnometer containing sample and filled with distilled water (B)

= 1863.8 gm

Weight in gm of pycnometer containing sample water only (C) = 1235.3 gm

Weight of oven dried sample (D) = 984.1 gm

Specific gravity

$$\text{Specific gravity} = \frac{D}{A-(B-C)}$$

$$= \frac{984.1}{991-(1863.8-1235.3)}$$

$$= 2.71$$

Water absorption

$$\text{Waterabsorption} = \frac{100(A - D)}{D}$$

$$= \frac{100(991 - 984.1)}{984.1}$$

$$= 0.7\ \%$$

Free moisture content

Weight of the sample at field = 1000 gm

Weight of oven dry sample = 999.8gm

$$\text{Freemosture} = \frac{1000 - 999.8}{1000} \times 100$$

$\approx 0\%$

FOR FINE AGGREGATE :

Sample of fine aggregate was collected from the field and conduct the following experiment on this.

Weight in gm of saturated surface dry sample (A) = 470.5 gm

Weight in gm of pycnometer containing sample and filled with distilled water (B)= 1521.5 gm

Weight in gm of pycnometer containing sample water only (C) = 1235.3 gm

Weight of oven dried sample (D)= 464.5 gm

Specific gravity

$$\text{Specific gravity} = \frac{D}{A - (B - C)}$$

$$= \frac{464.5}{470.5 - (1521.5 - 1235.3)}$$

$= 2.52$

Water absorption

$$\text{Water absorption} = \frac{100(A - D)}{D}$$

$$= \frac{100(470.5 - 464.5)}{464.5}$$

$$= 1.29\ \%$$

Free moisture

Weight of the sample at field = 1000 gms

Weight of oven dry sample = 999.1 gms

$$\text{Free mosture} = \frac{1000 - 999.1}{1000} \times 100$$

$\approx 1\%$

• MPa at 28 days. Compressive Strength : It was found that the compressive strength for control mix is 40.3

MIXING MATERIAL WITH % OF (E-WASTE)	COMPRESSIVE STRENGTH (N/MM²)	
	7Days	28Days
CC	37.193	58.26
MIX_1 (2%)	60.04	66.54
MIX_2 (3%)	60.54	66.44
MIX_3 (4%)	62.52	69.45
MIX_4 (5%)	61.52	67.25

Table 1 Result of Compressive Strength of E-Waste Concrete.

6. Conclusion

1. The good results will be founded by the substitution of Mix i.e. 3%, 4% .
2. To find the force of concrete, the concrete evaluated for the test of compression force of high strength concrete in which the replacement of material E-Waste and Concrete testing 7days, 28days.

3. In every trail mix of our concrete mix will be tested by compressive, flexural Test.
4. The Compressive Strength increases with the use of E-Waste material. The maximum strength achieved in concrete having 4% E-Waste , i.e., Mix 3.the strength increased 2.3% as compare to CC.
5. The Flexural-Strength(force) also shows the enhancing in concrete strength with the presence of E-Waste, The maximum strength achieved in concrete having 4% Mix, i.e., Mix4.the strength increased 1.6% as compare with the normal concrete.
6. Hence for an above experimental research has concluded that concrete with GGBS 4% partial replacement gives an optimum good result of forces and also helps in the strength & durability improvement properties of high strength concrete.

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