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Environmental - Friendly Brick Blocks using E- Waste

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ABSTRACT

Waste electrical and equipment (WEEE) is changing into major thread to the total world. Its toxic emissions mixed with virgin soil and air and inflicting harmful effects to the complete biology either directly or indirectly. Direct impacts embody unharnessed of acids, hepatotoxic compounds as well as serious metals, malignant neoplastic disease chemicals and indirect effects like bio magnification of serious metals. Several non-public corporations are concerned in collecting, activity, and separation and mercantilism e-wastes for recyclers. Growth in technology enhances want and utilization of electronic and electrical equipment's (EEE) everywhere within the world. As a result, e-waste acquires an outsized share within the typical solid waste stream. Limited recycling solutions out there push the requirement for e-waste disposal solutions. A comparison of assorted disposal solutions done on the premise of parameters like disposal capability, damage to the surroundings and its resources cost and time constraints analysis is mentioned within the paper. Landfill marketing answer is most accepted, proving resolute is best among all solutions by acting as a reserve to be recovered in future with the event of additional utilisation facilities. At an equivalent time, tremendous growth in use of ICT devices and services, quicker modification of technology and frequent innovations in ICT sector, had left the planet with a threat of degradation in environmental conditions and human health as the-waste of electronic and electrical instrumentation, that contains risky parts, remains handled in Associate in Nursing environmentally unfriendly manner primarily in developing nations.

Keywords: *Waste electrical and electronic equipment, Bricks, Environment, recycling, waste management.*

1.0 INTRODUCTION

It is a tough undeniable fact that with the voluminous increase in use of ICT devices to bridge the digital divide there's additionally associated in nursing fearful growth of e-waste worldwide. E-waste is outlined as "waste electrical and equipment, whole or partly or rejects from their producing and repair method, that area unit meant to be discarded" whereas electrical and equipment has been outlined as 'equipment that depends on electrical currents or electro-magnetic fields to be totally functional'. There's a necessity for e-waste management as e-waste elements could cause severe health risks and environmental injury, when crude, unscientific strategies area unit applied for recovery of helpful elements. There's a necessity to encourage utilisation of all helpful and valuable material from e-wastes to preserve the natural resources. Most of the developing countries area unit suffering with the speedily growing issues of e-waste and have to be compelled to have sound e-waste Management systems for finish of life ICT product to avoid the threat on surroundings and grouping. The rise of ICT, Frequent innovations

and technological changes area unit leading to shorter era of ICT instrumentality. Further more in developing countries the amount of foreign noncurrent Electrical and equipment (EEE) is uncontrolled .So the volume of e-waste has additionally inflated drastically in developing and developed nations. At constant time, it's encouraging that each nation, together with going for the event within the ICT sector, is additionally operating for 'going green' by taking care of problems like economical use of natural resources, minimisation of e-waste, property utilisation of e-waste and development of product with minimum use of unsafe substances. Electrical and equipment (EEE) contain valuable moreover as unsafe materials and if at finish of lifetime of EEE, the unsafe materials aren't disposed of scientifically it should cause serious injury to the surroundings and public health. The presence of serious metals (like Arsenic, Cadmium, Barium, Lead, Lithium, Mercury, Nickel, metal Sulphide) and different virulent substances like PCB (Polychlorinated biphenyls) etc. could cause extreme damage, if not disposed of in surroundings friendly manner. Around the world, e- waste generation rates are rising. In 201, the worlds' cities generated 1.5 billion tonnes of 2016 e-waste per year, amounting to a footprint of 1.2 kilograms per person per day.

2.0 MATRIALS AND METHODS

2.1 Cement

Portland cement is that the most common kind of cement usually use around the world as a basic ingredient of concrete, mortar, stucco, and non-specialty grout. It had been developed from different kinds of hydraulic lime in England at intervals the centre nineteenth century, and usually originates from rock. It is a fine powder, created by heating rock associate degreed clay minerals in an extremely kitchen appliance to form clinker, grinding the clinker, and adding very little amounts of different materials. Ordinary Portland Cement (OPC) confirming to IS: 8112-1989 cement used. Table 1 gives the properties of cement used.

Table 1: Properties of cement

Description of test	*Results obtained*	*Requirement of IS: 8112-1989*
1. Specific gravity	3.15	3.15
2. Initial setting time	70 minutes	Min. 30 minutes
3. Final setting time	280 minutes	Max. 600 minutes
4. Fineness	413.15m^2/kg	Min. 225 m^2/kg

2.2 Sand

Sand particles encompass little grains of oxide (SiO2). It's fashioned by the decay of sand stones owing to varied effects of weather. In step with natural resources from that the sand is obtained, it's termed as pit sand, watercourse sand and ocean sand. In step with the dimensions of grains, the sand is assessed as fine, coarse and gravel. The properties were analyzed as per BIS commonplace.

Table 2: Properties of Sand

Sr. No.	Properties	Results obtained
1	Fineness	4.30%
2	Specific gravity	2.65

Fig 1: E-waste cut into pieces.

2.5 Water

Water is a very important ingredient of environmental-friendly brick blocks using e- waste because it is concerned within the chemical process with cement. Potable water ought to be used for mixing the cement, sand and e-waste. It ought to be

free from organic matter and also the pH price ought to be between 6.5 and 7.5.

2.6 Experimental Procedure

According to analysis, up to now, there's no laborious and quick rule for formal combine style of e-waste, and in this respect no laborious procedure for casting the bricks. Thus, during this analysis, some laboratory tests were performed to get some mechanical properties of e-waste.

2.6.1 Mould Preparation

After assembling all the materials, a mould was ready. A wood standard brick mould was ready of size 230mm X 110mm X 80mm. Joints were created with none whole or gap to avoid any run. Before putting mixture in to mould, mould was lubricated so as to allow easy removal of bricks.

2.6.2 E-waste

The e-waste, that was collected, cannot be utilized directly. E-waste was cut with help of cutter into small pieces. These pieces were used in mixture.

2.6.3 Mixing

Mixing was done in any case the ingredients were prepared. During this project, commixture was done manually. A tried combination of cement: sand: e-waste (1:1:3) was employed in research. There's no such special care required for set of bricks as a result of the e-waste employed in bricks itself hold up for a protracted time.

Figure 2: E-bricks after casting.

3. Results and Discussion

After casting the bricks they were analyzed for victimisation as a brick. For this, numerous checks were conceded bent on ensure the properties of bricks and therefore the results of the test were analyzed by the prevailing and normal results. The subsequent tests were meted out to visualize the strength of the brick.

3.1 Compression Test

This check was command out by Compression Testing Machine when the ordinal day from the date of casting e-brick. E-bricks ne'er fail catastrophically, it simply compressed like compression rubber. So guardianship should be thought of whereas testing the e-brick as a result of in load ought to be applied up to 0.5 compressions solely. The e- bricks are having elastic behaviour and fewer crispness, because of this the structure wasn't totally folded, once the e-brick fails at higher load. Solely the outer faces cracked and e-waste out.

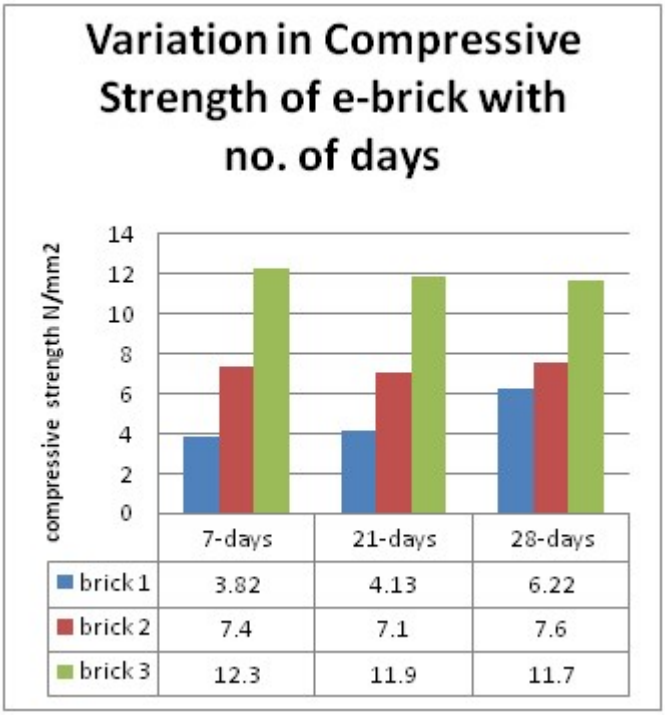


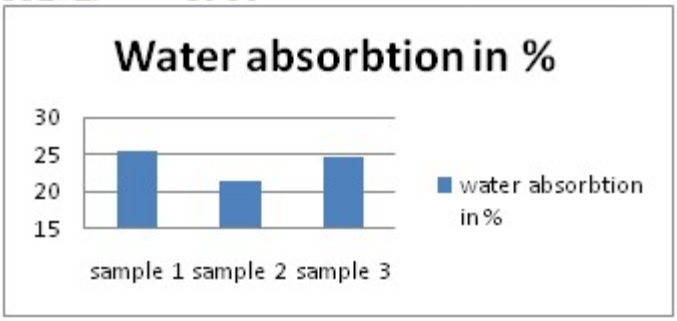
Figure 3: Variation in Compressive Strength of e-brick with no. of day

Table 3: Compressive Strength of e-Brick in N/mm2

No of days.	No. of Samples	Compressive Strength
7 Days	Sample 1	3.82 N/mm^2
	Sample 2	4.13 N/mm^2
	Sample 3	6.22 N/mm^2
21 Days	Sample 1	7.40 N/mm^2
	Sample 2	7.10 N/mm^2
	Sample 3	7.60 N/mm^2
28 Days	Sample 1	12.30 N/mm^2
	Sample 2	11.90 N/mm^2
	Sample 3	11.70/mm^2

3.2 Weight

The ordinary conventional clay bricks weight varies from 3 – 3.5 kg but the e-bricks weight varies from 2 –2.5 kg. The maximum weight is less than 2 kg only. All the bricks were weighed in a well conditioned electronic weighing machine. Sand based e-bricks are having weight 2/3rd of the conventional clay brick only.



3.3 Water Absorption

take a look at Water absorption take a look at is needed to envision whether or not the bricks area unit appropriate for water logged areas or not. As per standards the bricks shouldn't absorb water quite two hundredth of its original weight.

3.4 Hardness

In this take a look at, a scratch was created on brick surfaces. Whereas the scratch was created with the assistance of finger nail on the bricks, flare impression was left on the fibrous concrete brick surface. Hence, this takes a look at results that fibrous concrete bricks square measure sufficiently arduous.

3.5 Soundness

In this take looks at 2 bricks were taken and that they were cursed one another. The bricks weren't broken and a transparent ringing sound was made. Thus the bricks square measure safe to use

Fig4: E-bricks used in construction

4. CONCLUSION

From the results obtained, the subsequent conclusions were made: Considering the fascinating compressive strength shown by the tested specimen, it's clear that e-brick have the power to supply an eco-friendly, light-weight weight concrete block with the employment of less variety of natural resources. Although the results obtained throughout compression take a look at showed that e-bricks are acceptable for non load bearing walls solely. As per analysis the bricks mustn't absorb water quite two hundredth. The water absorption capability of e-brick was found to be quite two hundredth that makes it not appropriate for water work and external walls. However, by providing a water-proof coating. it also can be used as external wall. The weight of the e-brick was 1/3rd to 2/5th lesser than the standard clay brick. Owing to less weight of e- bricks, the total burdens of the building are going to be reduced. Due to lesser weight and a lot of flexibility, these bricks are probably ideal material for earthquake prone regions So these bricks are lightweight and thus helpful to reduce the total cost of construction due to are duction in total dead load of the structure . E-bricks contains a high fireplace resistance, good sound absorbent, smart thermal resistance with an worth between two to three per in. In walls twelve to sixteen inches thick, the long energy saving of e-brick are going to be an excellent advantage for the house owner and environmental. This e- brick doesn't expand nor shrinks therefore, sheets of glass or glass block are often mounted in and cut with-brick. Since, e-brick primarily consists of waste product; it'll cut back the landfills and pollution. Hence, the overall price is extremely low as compared to traditional brick. It's been seen that by victimization e-bricks during a building construction, the full price was reduced from two hundredth to five hundredth.

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