IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 6, June 2023

DOI: 10.17148/IARJSET.2023.10680

Study of Mechanical Properties of Concrete using E-Waste as Fiber

A.D. AGHARDE[1], A.B. WAKANKAR[2], V. R. HANDE[3], N.B. CHANNDODKAR[4], K.R. DACCHAWAR[5]

Assistant professor, Department of Basic Science & Humanities, Deogiri Institute of Engineering and Management Studies, Aurangabad-2114, Maharashtra[1-5]

Abstract: The world is emerging towards the online resources due to Covid-19. It is resulting into large use of electronic and computer devices worldwide. As new upgradation in E-devices is taking place, the old once again creating big problem for ecology and environment on earth surface.And to balance the E-waste produce and avoid the e-waste landfill all over the world. Hence vigorous and determinant attempts are made to use non-biodegradable E-Waste in concrete.

The main intention is to add non-biodegradable E-Waste as fibers in concrete to upsurge the mechanical properties of concrete. In this research paper E-waste material strips (Strips of external body of E- devices cut in length of Fibers) are used as Fibers. Fiber strips are added in proportion starting from 0, 0.25, 0.5 and 1% of total volume of concrete. In this article mechanical properties of concrete like compressive strength, flexural strength, bending strength and bond strength using E-waste strip as fiber.

Keywords: Electronic Waste, Strips, Fiber, Concrete, strength.

I. INTRODUCTION

Concrete is the material most employed by humankind in the construction of civil engineering works. Much testing and research has been done in order to better understand the behavior and to improve the performance of the material. This chapter will summarize briefly the main characteristics of the material and the contribution of fiber reinforcement. The aim of this chapter is to give the reader a picture of the technological aspects for the formulation of reinforced concrete with steel fiber in general and in case of plain concrete.

Concrete made with Portland cement has certain characteristics. It is relatively strong in compression but possesses a very tensile strength, limited ductility and little resistance to cracking and tends to be brittle. Internal micro cracks are inherently present in concrete and its poor tensile strength is due to the propagation of such micro cracks, eventually lading to brittle fracture of the concrete. In the past, attempts have been made to impart improvement in tensile properties of tensile members by way of using conventional method provide tensile strength to the concrete member, they however do not increase inherent tensile strength of concrete itself.

The weakness in tension can be overcome by the use of conventional rod reinforcement and to some extent by the inclusion of a sufficient volume of certain fibers. The use of fibers also alters the behavior of the fiber-matrix composite after it has cracked, thereby improving its toughness [5]. Strength of concrete is considered as a governing factor in the various types of concrete applications, because all other properties were assumed to be related to the strength. However, now, more stress is being laid on the performance criteria of concrete.

By adding non-biodegradable E-Waste as fibers in concrete to upsurge the mechanical properties of concrete this research paper E-waste material strips (Strips of external body of E- devices cut in length of Fibers) are used as Fibers. Fiber strips are added in proportion starting from 0, 0.25, 0.5 and 1% of total volume of concrete. In this article mechanical properties of concrete like compressive strength, flexural strength, bending strength and bond strength using E-waste strip as fiber.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 6, June 2023

DOI: 10.17148/IARJSET.2023.10680

II. MATERIAL USED FOR PROJECT

1. CEMENT:

Ultra-tech 53 grade Ordinary Portland Cement". All properties of cement are tested by referring IS 12269-1987 Specification for 53 Grade Ordinary Portland cement.

Sr. No.	Description of test	Result
1.	Fineness of cement	3.12%
2.	Specific gravity	3.15
3.	Standard consistency of cement	30%
4.	Setting time	
	a) Initial setting time	160 minutes
	b) Final setting time	250 minutes
5.	7 days compressive strength	42.4 N/mm^2
	28 days compressive strength	66 N/mm^2

2. SAND

Artificial sand obtained from stone quarry is used as fine sand. Various tests such as specific gravity, water absorption and sieve analysis etc. have been conducted on this sand to know their quality & grading. The above said test results are shown in Tables (3.2).Artificial sand is used as angular in shape.

Sr. No.	Description of test	Result
1.	Particle size	150-400 micron.
2.	Specific gravity	2.96
3.	Silt /dust content	Negligible amount
4.	Surface moisture	0.42%
5.	Water absorption	2.30%

3. FIBER

E-waste material strips (Strips of external body of E- devices cut in length of Fibers) having length 30mm to 50mm and width- 2mm to 4mm.

4. Coarse aggregate

Coarse aggregate having size 20mm.
Which improves the compressive strength?

5. Water

Potable water available in laboratory is used for mixing & curing of concrete.

MIX DESIGN

Performance of concrete is depending upon careful selection of raw materials in combination with adequate proportioning and quality control throughout production. The grade of concrete is M20 and Proportion of concrete- 1: 1.65: 2.393.Water Cement Ratio is 0.45.

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 6, June 2023

DOI: 10.17148/IARJSET.2023.10680

Batch	Number of Cubes Casted	% of Fibre	Cement (kg)	Fine Aggregate (kg)	Coarse Aggregate (kg)	Water (Lit)
PC	**9**	0	13.357	24.483	39.947	6.5
PC 0.5	**9**	0.5	13.357	24.483	39.947	6.5
PC 1	**9**	1	13.357	24.483	39.947	6.5
PC 1.5	**9**	1.5	13.357	24.483	39.947	6.5
PC 2	**9**	2	13.357	24.483	39.947	6.5

IV. PREPARATION OF SPECIMEN

1. Batching:

A proper and accurate measurement of all the materials used in the production of concrete is essential to ensure uniformity of proportion and aggregate grading in successive batches. The measurement of materials for making concrete is known as batching. In this experimental work, all the ingredients of concrete were weighing batched. Weigh batch is correct method of measuring the material. Use of weigh system in batching, facilitates accuracy, flexibility and simplicity.

2. Mixing Procedure:

The mixing procedure was adopted through a trial and error process. However, their mix procedures were developed for large scale applications in high speed planetary mixers which differ substantially to the mixers used in the current study.

1. Oiling of cubes
2. Dry Mixing
3. Demoulding of cubes after 24 hrs
4. Filling of cubes
5. Slump Cone test
6. Curing (3days, 7days and 28 days)
7. Testing

Compressive strength test

A cube compression test performed on standard cubes of reactive powder concrete with varying percentage of fly ash which replace silica fume and by using steel fiber having size 100mmX100mmX100mm after 7 days and 28 days of immersed in water .The compressive strength of specimens was calculated by the following formula:

$$f_{cu} = P_c / A$$

Where

f_{cu} = Compressive strength of cube, MPa

P_c = Failure load in compression, KN

A = Loaded area of cube, mm^2

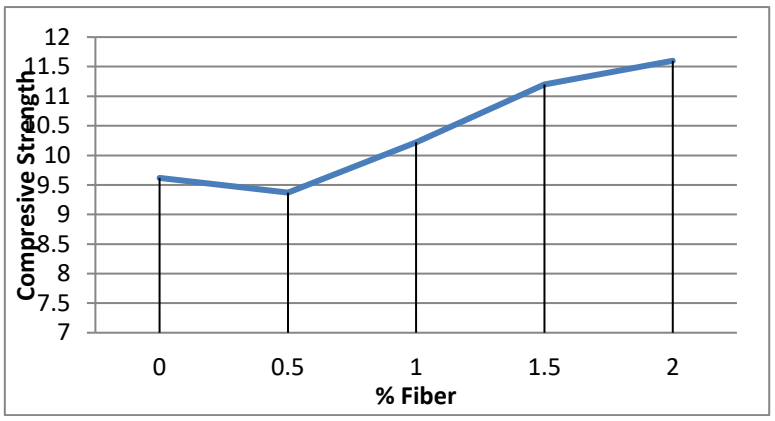
Sr.No	Batch	3 Days	%Increase	7 Days	%increase	28 Day	%increase
1	PC	9.62	0	13.4	0	22.93	0
2	PC 0.5	9.37	-2.66	12.51	-7.4	21.95	-4.27
3	PC 1	10.22	6.23	13.73	2.1	24.04	4.3
4	PC 1.5	11.2	16.42	14.4.	6.667	25.68	11.99
5	PC 2	11.6	20.58	13.93	3.6	25.06	9.28

IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 6, June 2023

DOI: 10.17148/IARJSET.2023.10680



V. CONCLUSION

1. For M20 Grade plain Concrete we got standard result i.e. 45%. Of Specified Strength.

2. For 3 Days results, Compressive Strength increased with increase in percentage of E-waste as Fiber.

REFERENCES

[1]. IS Code 456-2000
[2]. IS Code 10262-2009
[3]. Concrete Technology by M S Shetty
[4]. Sai Venu Madhav.H "An Experimental Study on Mechanical Properties of E-Plastic Waste Concrete" International Research Journal of Engineering and Technology (IRJET) Volume: 02 Issue: 04 | July-2015.
[5]. M. L Gambhir,Concrete Technology(Theory and Practice),Fourth edition(2011) Tata McGraw Hill Education Private Limited,New Delhi.
[6]. 6. A.M Neville,Proporties of Concrete,Fifth edition(2013), Dorling Kindersley India Pvt.Ltd, New Delhi