PARTIAL REPLACEMENT OF FINE AGGREGATE WITH SHREDDED PLASTIC

Prof. Y. B. Survase
Assistant professor Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Dr. M. G. Dheshmukh
Associate professor Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Prof. Sonali S. Patil
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Asha K. Shinde
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Shaheen J. Shaikh
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Sony D. Kotwal
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Vrushali S. Shivharan
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

Pratiksha D. Surwase
UG Student Department of Civil engineering,
SVERI's College of Engineering Pandharpur Maharashtra

ABSTRACT

The concrete is the second largest material using on earth after water. In India, approximately 400 million metric cube concrete is being used every year and is increasing day by day. This increase in demand will create disturbance in proportion between

availability and need of material. Hence an alternative material is required to vanishing this disturbance. In this paper studies conducted on utility of waste shredded plastic material used in the concrete. Moreover, this paper will focus toward the change in various properties of concrete when partially replacing with shredded plastic. Concrete with 0.5%, 1.0%, 2%, 4% and 6 % shredded plastic is prepared. Specific gravity, fineness, setting time, sieve analysis, fineness modulus tests on cement, coarse and fine aggregates are performed in this study. As per IS 10262-2009 mix design code, Mix design is done. Cubes and beams are cast for M20 grade concrete with and without shredded plastics and tests on concrete are conducted. The standard mechanical properties of concrete like compressive strength, flexure and strength are tested and compared with the results of standard specimen.

Keywords: Shredded Plastic, Compressive strength.

INTRODUCTION:

The second most used substance in the world after water is concrete, which is the most frequently used man-made material for construction. The current challenge is finding aggregates for concrete and getting rid of trash from diverse products. Today, the building industry places a high focus on sustainability. A sustainable solution for handling plastic trash was provided in the current study by using the shredded plastics to make the coarse aggregates. These plastics will therefore become earth fill. Instead of recycling it constantly in this case, it would benefit the building sector if it were used to prepare concrete aggregates. There are many infrastructural developments happening as a result of the country's rising industrialisation and urbanisation. This quick development caused a severe lack of building supplies and increased trash disposal. Therefore, waste products should be used as a construction material to solve the aforementioned issues. After testing the qualities and replacing a portion of the fine aggregate in concrete with shreds of plastic, the ideal replacement % is determined.. Considerable researches were carried out in some countries like USA, UK on this topic however there have been very limited studies on plastics in India.

1. OBJECTIVES:

To investigate the Mechanical properties like Compressive Strength, Slump Cone Test of such Partial replacement of fine aggregate by shredded plastic waste concrete with conventional concrete.

To determine the optimum percentage of shredded waste plastic at which it gives more strength when compared to conventional concrete.

To study the Durability of conventional concrete and Partial replacement of fine aggregate by Shredded plastic waste concrete.

To study the cost comparison for production ofconventional concrete and Partially replaced Shredded plastic concrete.

1.1. SCOPE:

1) To determine the compressive strength of concrete partially replaced with shredded plastic.
2) To provide an economical and convenient material for construction use.

2. MATERIALS USED:

2.1. SHREDDED PLASTIC:

A Plastic Shredder is a machine used to cut plastic into smaller pieces for granulation or it's a waste plastic cut into number of small pieces is called as shredded plastic.

Types of plastic

- PET
- HDPE
- PVC
- LDPE
- PP

3.2 Fine Aggregate:

Fine aggregate was purchased which satisfied the required properties of fine aggregate required for experimental work and the sand conforms to zone III as per the specification of IS: 383:1970

Table 3: Physical characteristics of fine aggregate

Sr. No	characteristics	value
1.	Specific Gravity	2.68
2.	Fineness	2.77

3.3 Coarse Aggregate:

Crushed granite of 20mm maximum size has been used as coarse aggregate. The sieve analysis of combined aggregates confirms to the specifications of IS: 383:1970 for graded aggregates.

Table 4: Physical characteristics of coarse aggregates

Sr. No	Characteristics	value
1.	Specific Gravity	2.80
2.	Fineness	2.92

3.4 Water:

Water used was normal water from tap, which was free from salt and conforming the requirement of IS: 456-2000.

4 METHODOLOGY:

Ordinary Portland cement of grade 43 was used as a binding material which satisfies the requirements according to Indian standards, IS 8112: 2013. Coarse aggregate was obtained froma local quarry work. Sand was sourced from a local supplier. While shredded plastic is obtained from plastic waste factory. A concrete mix of ratio 1:1.5:3 by volume was used as control; to which the properties of the shredded plastic was used to replace sand at percentages of 1%, 2%, 3%, 4% of shredded plastic by weight. A water cement ratio of 0.45 was adopted. Concrete was produced by mixingtheconstituentrawmaterialsinaconcretemixer.Ninespecimensofeachmixwereproduced. Concrete was casted in cast iron moulds measuring 150mm× 150mm× 150mminternally. A total of Forty-five (45) specimens were casted in accordance with IS: 456-2000.After twenty-four (24) hours of casting, the specimens were demolded and placed in a curing tank until the day of testing. The compressive strengths of the samples were determined at 3,7 and 28

daysofcuringusinga1000kncompressiontestingmachine.Onthedayofcrushing,thespecimenswereremovedfromth ecuringtank,wipedcleanwithasofttowelandplacedonthesurfaceofthelaboratoryforapprox.Theresultspresentedare theintermediatevalueofthreesamplesofthesamemixture.AlltestswereconductedattheConcreteTechnology laboratory in the department of civil engineering of the SVERI's College of Engineering, Pandharpur.

5 SAMPLE CALCULATION:

- Cement = 1.360 x 45 = 61.2 kg
- Sand = 2.403 x 45 = 108.135 kg
- Aggregate = 5.634 x 45 = 253.53 kg

6 Results:

6.1 Compressive strength:

Table 5: Compressive strength test (N/mm^2)

Sr. No	Percentage of shredded plastic	Quantity of plastic (In gm)	Curing 3 days (In KN)	Curing 7 days (In KN)	Curing 28 days (In KN)
1	0 %	0	8.1	14.2	20.10
2	1 %	216	13.12	18.25	21.22
3	2 %	432	12.61	14.20	21.41
4	3%	648	12.56	14.31	22.25
5	4%	864	12.25	13.82	22.90

It is seen from table 5 that for the control mix, the compressive strength of concrete at 4 % replaced is increased 28 days is 22.90 KN\mm2.

6.2 Slump cone test:

Table no.7 shows the result of slump cone test of concrete to determine their workability, the workability increases when the water content is increases.

Sr. No	Material	Slump (mm)	Slump Type
1	Conventional concrete	27mm	True slump
2	Concrete Mix	29mm	True slump

It seen that the both conventional concrete and concrete mix has value of 27mm and 29mm and the type of slump is True Slump.

7 CONCLUSION:

1. The Waste Shredded Plastic can be effectively used in concrete without affecting or compromising with Strength.
2. Maximum Compressive strength is observed at addition of 4% of shredded plastic in concrete. Furthermore, addition will lead to decrease in compressive strength after 28 days of proper curing.
3. The 0 to 2% percentage replacement of Shredded plastic does not make any considerable change after 28 days of curing in compressive strength of concrete.
4. It is observed that the mixing of shredded plastic does not make considerable change in properties of fresh concrete which is tested by slump cone test.

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