

Experimental Study on Behaviour of Concrete By Using Domestic Plastic Waste as a Fiber Content

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ABSTRACT: The study on behavior of concrete by using domestic plastic waste. India is leading developing country in world. Present days high strength and high-performance concrete required for construction work. So, utilization of artificial fibers in construction is carried out. The use of recycled materials in new concrete production is very appealing because of the low cost of the raw materials and the landfill space saving, as well as the enhancement of the resulting concrete's properties. The fiber like Polypropylene fiber, Steel fiber and Glass fiber are generally utilized in mortar and concrete. In such a way Portland cement can be partially replaced by plastic fiber. We investigate engineering applications of plastic fibers obtained from recycled domestic waste. This study presents reusing of locally available waste fibrous materials as concrete composites. Mechanical strength properties (compressive strength, split tensile strength, flexural strength) of plastic fibers with substitution of (0.5%, 1.0%, 1.5%) were evaluated. Concrete mixed with domestic waste fibers improved mechanical strength. We investigated the influence of a fiber content on the properties of fresh and hardened concrete with comparing it with conventional concrete.

KEYWORDS: Waste Pet Bottles, Polyethylene Terephthalate (PET), Compressive Strength, Aggregate Replacement.

I. INTRODUCTION

Among various waste parts, plastic waste merits extraordinary consideration on record decayable material which is drawing attention of everybody. Nearly 60 million tons of waste is disposed annually in developing nations like India which is growing 2.5 to 4% rapidly. Among the wastage, plastic occupy significant position (12.3%) which is from disposed of water jugs. The PET disposal is very complex issue whose degradation or incineration causes harmful effects on the environment and surrounding ecological conditions, which might also cause damage to vegetation. Extensive research and numerous scientists are working in this area of plastic waste disposal in eco-friendly manner. Especially, the First World Countries like United states, Britain are very much interested in this subject. The focus is shifting to utilization of plastic in the architectural field and construction industry which is very much feasible in construction driven and intensive countries like India. Poly-ethylene Terephthalate (PET) bottle granules are explored for usage in construction industry and the effect of morphological change on physiological behavior of the manufacturing materials is studied in this paper with the help of some tests. The issue of organizing and supervising solid waste materials in all countries has been able to be one of the real common, reasonable, and societal related issues. A comprehensive integrated waste management system comprising of reuse, incineration, proper disposal of non-decaying waste, usage of non-bio degradable items as auxiliary equipment in other fields like construction industry and other areas, other waste exchange issues.

In general, the material plastic cannot be reutilized and people are not really very interested to rapidly consider recycling of these materials. There is growing awareness in the recycling and reuse of plastics nowadays due to growing concern for ecological aspects among the mankind. But the recycling involves many technical and scientific

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procedures as recuperated one cannot be utilized again with regard to the structural changes and temperatures required for melting. The driving ideology of this paper is to examine the possibility and to what extent the plastic can be used again. Among the applications which suit for plastic recycling, construction industry generally promises to maximum extent of usage. Sand in case of hard composites in concrete technology is vividly replaced by plastic.

The polyethylene (PET) bottle which can without much of a stretch be gotten from the earth with no expense is destroyed and added into customary cement to analyze the quality conduct of different examples. Warm assurance update in concrete technology by including plastic waste and versatile smaller units can similarly be considered. The plastic technology doesn't require any maintenance (in light of composing) and in this manner disintegration control examination ought to be conceivable. The things which are pointed in this suspect genuinely have a business regard consequent to there is predefined specification for commercial items for advancement. The PET can be efficiently used with proper engineering works and sophisticated as well as superior technology which can disintegrate the plastic into smaller granules which may be sometimes shallow type or bursting debris. Essentially the divider sheets which are light in weight and balusters are to be used in ever changing conditions in both industrial as well as societal changes.

Concrete is generally brittle in nature. Its causes the structure to sudden failure during earthquakes and other seismic effects, and also cause cracks. This can be overcome by the addition of fiber in concrete especially plastic fiber. Fiber reinforcement of cement-based materials is not a new process. In India domestic plastic waste causing great damage to the environment. The objective of this project is to study experimentally the properties of fiber reinforced concrete containing plastic fiber. The properties of concrete namely compressive strength, split tensile strength, and flexural strength were studied.

II. OBJECTIVE

To study the effect and properties of concrete with different ratios of substitution (0.5%, 1.0%, 1.5%) of cement with plastic fiber. The grade of the concrete is M₂₀. The fresh properties of concrete are tested for satisfying the basic requirements of concrete by, slump cone test and compaction factor test. The hardened properties of the concrete is tested by, compressive strength test split tensile strength and flexural strength test.

III. EXPERIMENTAL INVESTIGATION

Detailed descriptions about the material used, specimens testing methods, are important for an experimental investigation. Therefore, they are described in detail in the following sections. As per the above mix proportion cube, beam and cylinder to be cast and test is carried on 7 days and 28 days. For each concrete mixture nine (150mm×150mm×150mm) cubes were cast for the determination of compressive strength. Nine (150mm×300mm) cylinder were cast for determination of split tensile strength

IV. SPECIMEN CASTING

Concrete materials like aggregate cement, sand is tested as per codes. Cube moulds of size 150mm x 150mm x 150mm were casted for finding compressive strength of plastic fiber reinforced concrete compare with conventional concrete. Cylinder moulds of size 150mm x 300mm were casted to find the split tensile strength of plastic fiber reinforced concrete compare with conventional concrete. After casting, the entire specimen was covered with plastic sheet in laboratory at 27^oC the time of testing.

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V. PROCEDURE



Fig 1. PET Bottle fibers

In this project, river sand found in percentages 5%, 10%, 15% & 20% is substituted for 20, 25 and 30 molar grade concretes. The amount of replacement percentage with respect to volume wise in comparison to the total volume is relative and it is blend proportioned. 150 mm x 150 mm x 150 mm cubical and axle specimens of admeasurements 100 mm x 100 mm x 500 mm and the butt specimen's admeasurements are 150mmx600mm dia of 36 numbers are chosen for the purpose of casting for altered accommodation with PET bottles (grounded) and ascendancy mixture. Slump analysis was performed initially accurate to actuate the feasibility. The extensive performance evaluation tests performed on accustomed accurate afterwards 7 and 28days canticle of abating were compression bend analysis and spilt compactness tests.

VI. CONCLUSION

The plastic fiber-reinforced concrete was slightly more ductile and tougher than the plain concrete because the fibers have an important role after failure. The tensile strength, maximum load-bearing capacity and modulus of elasticity decreased slightly with the addition of plastic fibers, but drying shrinkage was lower than for plain concrete. For this study on the effects of synthetic fiber reinforcement, we manufactured concrete specimens investigated their mechanical properties. The fiber-reinforced concrete suffered less drying shrinkage than the plain concrete, and this is always beneficial because it coincides with a more limited formation of microcracks in the cement paste and a more durable material. The results of our mechanical analyses showed that the added fibers did not significantly affect the concrete's compressive strength nor did they have any negative fallout on other properties.

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