



Recycled Plastic and Coconut Fibre used in Concrete Paver Block

M. Achitra¹, R. Ambika Rajasree², R. Vijayalakshmi Pandit³, V.Saranya⁴
UG Scholar^{1, 2, 3}, Assistant Professor⁴

Department of Civil Engineering
Sethu Institute of Technology, Madurai, Tamilnadu, India

Abstract:

Coconut fibres were added in proportions of 0.5%, 1.0%, 1.5% and 2.0% in volume of concrete. The compressive strength, flexural strength and water absorption were determined at the end of 7 and 28 days. Test results indicate that addition of coconut fibre gradually increases flexural strengths and water absorption at 7 and 28 days. Disposal of plastic waste in an environment is considered to be a big problem due to its very low biodegradability and presence in large quantities. In recent time use of such, Industrial wastes from plastic bottles, pallets, carry bags; polypropylene (PP) and polyethylene Terephthalate (PET) were studied as alternative replacements of a part of the conventional aggregates of concrete. By using up of plastic and coconut fibre which shows the eco-friendly nature.

I. INTRODUCTION

- Coconut coir has about 48% of lignin which adds strength and elasticity to the cellulose based fibre walls.
- Since lignin resists bio-degradation, high lignin content also imparts longevity to outdoor applications.
- Coir fibre nearly takes more than 20 years to decompose.
- Disposal of plastic waste in an environment is considered to be a big problem due to its very low biodegradability and presence in large quantities.
- If plastic wastes can be mixed with the concrete mass in some quantity or in some form, without affecting the fundamental and other properties or slight negotiation in strength of concrete.

II. LITERATURE REVIEW

“COIR FIBRE USED IN PAVING BLOCK”

Author Name : Shivkumar Hallale¹, Shinde Swapnil ², Mote Sumit³, Vikas Londhe⁴.

Journal Name : Assistant professor Dept of Civil engg, Dr. DY Patil Institute of Engineering Management and Research Akurdi, Maharashtra, India.

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The individual cellular structure is narrow and hollow, with thick walls of cellulose. It is pale in colour at immature stage but with age becomes hardened and yellow with deposition of lignin layer. Each cell is about 1mm long with diameter 10-20 µm. Lignin content also imparts longevity to outdoor applications. Coir fibre nearly Generally length of fibre is found between 10 to 30 cm. Coconut coir has about 48% of lignin which adds strength and elasticity to the cellulose based fibre walls. Since lignin resists bio-degradation, high takes more than 20 years to decompose.

RECYCLED PLASTIC USED IN CONCRETE PAVER BLOCK

Author Name: Ganesh Tapkire¹, Satish parihar², Pramod Patil³, Hemraj R Kumavat⁴.

Journal Name: International Journal of Research in Engineering and Technology

Published on: Volume: 03 Special Issues: 09 June-2014,

In this paper Recycled plastic aggregate used in various proportion in concrete mix and check there suitability. Amount of waste plastic being accumulated in 21st centuries has created big challenges for their disposal, thus obliging the authorities to invest in facilitating the use of waste plastic coarse aggregate in a concrete is fundamental to the booming construction industry. Disposal of plastic waste in an environment is considered to be a big problem due to its very low biodegradability and presence in large quantities. In recent time use of such, Industrial wastes from plastic bottles, pallets, carry bags; polypropylene (PP) and polyethylene Terephthalate (PET) were studied as alternative replacements of a part of the conventional aggregates of concrete. If plastic wastes can be mixed with the concrete mass in some quantity or in some form, without affecting the fundamental and other properties or slight negotiation in strength the strength of concrete. Industrial wastes from polypropylene (PP) and polyethylene Terephthalate (PET) were studied as alternative replacements of a part of the conventional aggregates of concrete. Three replacement levels. 10 %, 20 %, 30 by Weight of aggregates were used for the preparation of the concrete.

• EXPERIMENTAL STUDY ON PAVER BLOCKS UTILIZE IN PET FIBRES

Author Name: G.Lavanya¹, P.Vasanthakumar²

Journal Name: International Journal of Advanced Engineering Research and Technology

Published on: Volume 4 Issue 4, April 2016

Utilization of waste material in concrete paving block would be beneficial in order to find an alternative solution to reduce environmental pollution. One of the waste material is polyethylene terephthalate (PET) which is a polyester material and is produced in large quantities. In this work fibres are simply cut from waste plastic bottles reducing, in this way, the manufacturing costs of recycled PET fibre concrete. Plastics constitute 12.3% of total waste produced most of which is from discarded water bottles. One possible solution is using RPET as short fibres in concrete paving blocks. It can provide greater crack control and ductility enhancement capacities for quasi-brittle concrete as well as mass consumption alternative, which is a very important issue in the merit of recycling waste materials. The aim of this work is to explore the possibility of a waste material to be used in concrete paving blocks as fibre. The dimensions of PET fibres used are 30mm long, 5mm

width and 0.6mm thickness It was added to concrete in the various percentages 0.0%, 0.25%, 0.5%, and 0.75% of fibre in total weight of concrete. And sand was replaced with 50% of quarry dust in paving blocks. Using 280*140*80 mm zigzag paver block moulds and M30 grade of concrete mix are used. Paver blocks test carried by compressive, flexural, split tensile and water absorption.

REUSE OF PLASTIC WASTE IN PAVER BLOCKS

Author Name: B. Shanmugavalli

Journal Name: International Research Journal of Engineering and Technology (IRJET)

Published On: Vol. 6 Issue 02,February-2017

The aim of this project is to replace cement with plastic waste in paver block and to reduce the cost of paver block when compared to that of convention concrete paver blocks. At present nearly 56 lakhs tonne of plastic waste is produced in India per year. The degradation rate of plastic waste is also very slow process. Hence the project is helpful in reducing plastic waste in useful way. In this project we have used plastic waste in different proportions with quarry dust, coarse aggregate and ceramic waste. The paver blocks were prepared tested and the results were discussed.

III. PROPERTIES OF MATERIALS

Coarse Aggregate

Aggregates are the important constituents of the concrete which give body to the concrete and also reduce shrinkage. Aggregates occupy 70 to 80 % of total volume of concrete. So, we can say that one should know definitely about the aggregates in depth to study more about concrete. According to size In general, 40mm size aggregate used for normal strengths a and 20mm size is used for high strength concrete. The size range of various coarse aggregates given below



Figure.1. Aggregate

Table.1. Size of Coarse Aggregate

Coarse Aggregate	Size
Fine gravel	4mm - 8mm
Medium gravel	8mm - 16mm
Coarse gravel	16mm - 64mm
Cobbles	64mm - 256mm
Boulders	>256mm

Table.2. Property Tests on Coarse Aggregate

SI.NO	Properties	Result
1	Specific gravity	2.70
2	Water absorption	0.53
3	Bulk density	1406 kg/m ³

Fine aggregate

When the aggregate is sieved through 4.75mm sieve, the aggregate passed through it called as fine aggregate. Natural sand is generally used as fine aggregate silt and clay are also come under this category.

Table.3. Property Tests on Fine Aggregate

SI.NO	Properties	Result
1	Specific gravity of sand	2.80
2	Grading	Zone II
3	Bulk density	1688 kg/m ³
4	Fineness modulus	3.50

Cement

A cement is a binder, a substance used for construction that sets, hardens and adheres to other materials, binding them together. Cement is seldom used on its own, but rather to bind sand and gravel (aggregate) together.

Table.4. Property Tests on Cement

SI.NO	Properties	Result	IS-Required
1	Specific gravity	2.5	-
2	Initial Setting Time	30 mins	As per IS4031-1986 max 30 min
3	Final Setting Time	600 mins	As per IS4031-1986 max 600 min

Coconut fibre

Coir or coconut fibre, is a natural fibre extracted from the husk of coconut and used in products such as floor mats, doormats, brushes and mattresses.

Table.5. Property Tests on Coconut fibre

SI.NO	Properties	Result
1.	Specific gravity	1.23

Plastic

A synthetic material made from a wide range of organic polymers such as polyethylene, PVC, nylon, etc., and then can be moulded into shape while soft, and then set into a rigid or slightly elastic form.

Table.6. Property Tests on Plastic

SI.NO	Properties	Result
1.	Specific gravity	1.5
2.	Water absorption	0.18

MIX RATIO

1 : 1 : 2

IV. RESULT

Compressive test on paver block:

Compressive strength = P/lb



Figure.2. Compressive strength test

Table.7. Comparison of 7 days and 28 days – Compressive strength

SI .N O	Specimen	Compressive Strength	
		7days	28days
1.	Control Mix	14.04	25.458
2.	0.5% coconut fibre + 0.5% Plastic chips	19.170	30.021
3.	1% coconut fibre + 1% Plastic chips	17.746	28.096
4.	1.5% coconut fibre + 1.5% Plastic chips	16.991	26.508
5.	2% coconut fibre + 2% Plastic chips	14.869	23.742

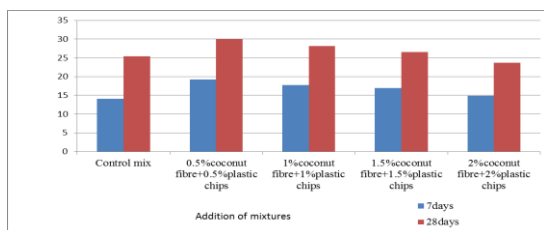


Figure.3. Comparison of 7 days and 28 days – Compressive Strength

Split tensile strength on paver block:

Split tensile = P/bd

Table.7. Comparison of 7 days and 28 days – Split Tensile Strength

SI.N O	Specimen	Split Tensile Strength	
		7 days	28 days
1.	Control Mix	1.291	2.103
2.	0.5% coconut fibre + 0.5% Plastic chips	2.082	2.597
3.	1% coconut fibre + 1% Plastic chips	1.694	1.976
4.	1.5% coconut fibre + 1.5% Plastic chips	1.543	1.791
5.	2% coconut fibre + 2% Plastic chips	1.227	1.761

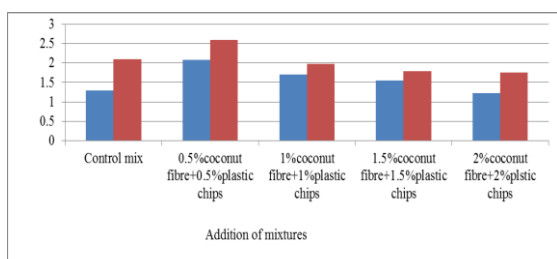


Figure.4. Comparison of 7 days and 28 days – Split Tensile Strength

Flexural strength on paver block:

Flexural strength = Pl/bd^2

Table. 8. Comparison of 7 days and 28 days – Flexural Strength

SI. NO	Specimen	Flexural Strength	
		7 days	28 days
1.	Control Mix	2.507	3.91
2.	0.5% coconut fibre + 0.5% Plastic chips	4.036	5.22
3.	1% coconut fibre + 1% Plastic chips	3.361	4.70
4.	1.5% coconut fibre + 1.5% Plastic chips	3.292	4.370
5.	2% coconut fibre + 2% Plastic chips	3.016	4.01

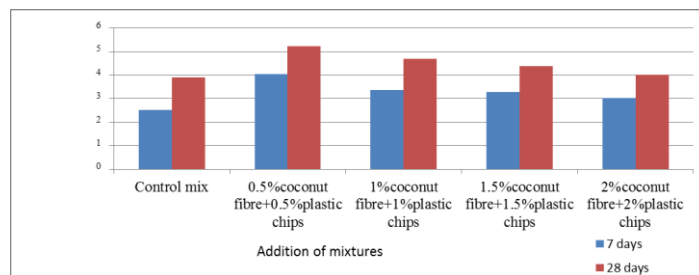


Figure.5. Comparison of 7 days and 28 days – Flexural Strength Test

6. CONCLUSION

- The Paver blocks developed can be used for light and medium traffic applications which is based on compressive strength.
- The paver blocks test result was taken by compressive, flexural, split tensile and water absorption.
- In compared all the test results shows 0.5% percentage of coconut fibre and plastic chips adding to concrete blocks good achieve in compressive, flexural, split tensile.
- Looking in to above aspect we come to the conclusion that plastic and coconut fibre can be in cement concrete mix increase the % in plastic and coconut fibre to decrease the strength of concrete.
- Looking in to above aspect we come to the conclusion that plastic and coconut fibre can be in cement concrete mix increase the % in plastic and coconut fibre to decrease the strength of concrete.
- On comparing the 7days and 28 days test, better results was obtained in the 28 days strength.
- Lastly, we strongly conclude the use of Recycled plastic chips and coconut fibre in concrete which is the best option for the disposal of plastic and coconut fibre and

ultimately reduces the plastic and coconut fibre pollution in the Environment.

7. REFERENCE

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