

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

Using Waste Construction Material in Paving Blocks with Coir Fibre

Anil Vasant Shirgire¹, Swati D Ambadkar²

PhD Scholar, Department of Civil Engineering Shri JJT University, Rajasthan, India¹

PhD Supervisor, Department of Civil Engineering Shri JJT University, Rajasthan, India²

ABSTRACT-India being a developing nation and in several other developing countries similar to Indian country economical building material along with economical construction plays a dynamic role in construction of countries in overall expansion. Building waste material in building construction sector can show remarkable role to make it economical and durable due to some of its specific properties relevant to construction materials. This concrete waste after crushing by laboratory jaw crusher can be used as coarse aggregates replacement in two stages as complete 100 % replacement and 40 % partial replacement by concern of Indian Standard requirements in paver blocks. Near about 12 to 14 million tons per year waste is generated from construction industry from this total waste brick and concrete waste is about 7 to 8 million tonnes. The activity like demolition, construction and renovation are producing concrete waste in huge amount. In this study, the representation of the concept of sustainable use of concrete waste in concrete which was used in manufacturing of interlocking paver blocks with coir fibre. In this study, analysis were carried out on property such as compressive strength , splitting tensile strength and water absorption test to develop paver block along with coir fibre in different percentage.

KEYWORDS: Concrete, Paver block, Grade, waste material, coir fibre.

I. INTRODUCTION

Construction materials use by BIS code on Fast track arrangement: For recycled waste material new code is necessary. Initiation of exclusion clauses set the example which has previously for flyash exercise into the building materials manufacturing. Around many researchers taking place in this part; this researcher must be leverage fast to put together principles and accelerate the progression.

Promotion of substitute substance in construction: Devise inventive method that permits old goods, systems/procedure related to shelter or BIS is not face by building; it should be certified after detailed assessment. Check learning based on BIS criteria may contain a material in their programme. Building charity or authorities. Promote substitute matter for non-structural utilize as a short-term compute till the occasion principles are in position.

Modify CPWD SOR to contain products ended away of waste recycled Construction and Demolition: Using publicly existing systematic studies completed by institutes like the Building and Cement National Council Material, the CPWD should modify to permit utilize of products like flooring tiles and paver blocks of waste recycled Construction And Demolition ended out. Certain market development will build for the products used cheaply making them practicable for recyclers and decrease funding weight on public body.

The objectives of study were as given below.

1. To study the conventional paver blocks.
2. To use the concrete waste from debris in manufacturing paver blocks.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

II. EXPERIMENTAL PROCEDURES

2.1. Materials:

Cement, sand, fine aggregate and coarse aggregate is collected locally. The waste construction material was selected from the site after visiting various sites. A suitable sites were selected which fulfilled material. The recycled waste is obtained by crushing the waste aggregate obtained at demolished site.

2.2 Preparation of Concrete and Test Specimens

Cement: Fine Aggregate: Coarse Aggregate

437.77:1168.7: 1123.2 i.e. (1:2.6:2.5) Final Mix Proportion for 40 % Recycled Aggregate

2.3 Casting of Paver Blocks:-

From the received waste materials from the site the paver blocks was casted by compression moulds machine on the site itself.

2.4 Finishing and Curing:-

After filling and compacting the finishing of top layer was completed by machine itself. The surface was smoothly levelled and all the voids were removed. Concrete cubes for blocks paving of size 0.15 m X 0.15m X 0.15 m air curing method was used. The paving blocks and concrete cubes below shadow for curing were kept. The curing is done for 14 days and 28 days. For air-dry curing, the specimens weighing was done and explosion of dry air was done.

2.5. TESTING OF SPECIMENS

2.5.1 Preliminary Tests on Normal and coarse Aggregate-

The specific gravity test, water absorption test, crushing value test, impact value and bulk density tests were carried out on material.

Table 1. Results of Recycled Aggregates in Comparison to Normal Aggregates

Sr.No	Test Performed	Test results Obtained of Normal Aggregate	Permissible limits as per BIS : 2386-1963	Result Of Waste Construction Aggregate
1	Specific gravity	2.6	Minimum 2.6	2.33
2	Water absorption, %	1.28 %	Maximum 3	7 %
3	Crushing value, %	33	Maximum 30	13.25 %
4	Impact value , %	18.79%	Maximum 30	14.3 %
5	Bulk Density	20 mm Size- 1510 Kg/m ³ 10 mm size- 1500 kg/m ³		20 mm Size-1320 kg/m ³ 10 mm size- 1260 kg/m ³
6	Flakiness Index	21 %		13.3 %
7	Elongation Index	24 %		17 %

2.5.2 Compressive strength test-

In preparing the paver block concrete mix design was done. There was addition of coarse aggregate, fine aggregate, recycled waste aggregate and water in layers of bottom with coir fiber. While cement and fine aggregate mix was added in top layer .The coir fibre used in paver block was in less percentage. Percentage of coir fibre used was 0.5% , 0.3 % and 0.1 % .Blocks were casted for three measure tests. Compression strength test, water absorption test, tension strength test were measure tests which were done successfully on paver block. Then water curing was done of all blocks .Curing was done for taking strength tests after 14 days and 28 days.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

The blocks sizes were determined for calculating area. The blocks were placed in water for one day. The maintained temperature of water was 27⁰ C. The testing block was placed on bearing plate for experiments. The load was given to block continuously with constant increment. There was application of load at a 15 N/mm² for one minute at constant rate. Readings were taken for different blocks.

2.5.2 Water absorption test

Paver blocks, IS 15658-2006 Annexure, description was used to determine the water absorption. The paver blocks three absorption tests were done. The average values were taken to find water absorption. As per IS code the water content should be below 7 %.

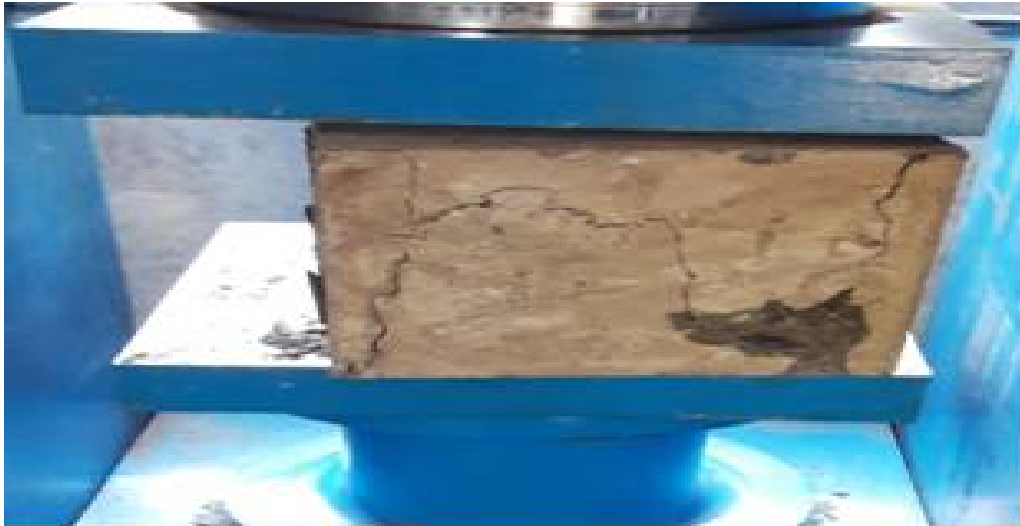


Fig1: Failure of block in compression testing

III. RESULTS AND GRAPHS

3.1. RESULTS

3.1.1. Compressive strength test results

Table No 2 : Results of compression test after 14 days (100 % fully replacement)

Sr. No	% Of Coir Fibre	Sample No	Wt Of Sample (Kg)	Breaking Load (KN)	Compressive Strength(N/mm ²)	Average (N/mm ²)
1	0.1	1	3.730	349.50	15.00	15.81
		2	3.605	360.15	15.44	
		3	3.610	380.30	16.31	
		4	3.730	385.35	16.52	
2	0.3	1	3.540	497.50	21.34	20.16
		2	3.550	471.15	20.47	
		3	3.620	451.15	19.35	
		4	3.450	454.25	19.48	
3	0.5	1	3.475	430.65	19.19	18.68
		2	3.425	436.35	18.66	
		3	3.325	440.05	18.87	
		4	3.480	420.15	18.02	

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

Table No 3: Results of compression test after 14 days (40 % partially replacement)

Sr. No	% Of Coir Fibre	Sample No	Wt Of Sample (Kg)	Breaking Load (KN)	Compressive Strength (N/mm ²)	Average (N/mm ²)
1	0.1	1	3.675	551.25	23.84	23.60
		2	3.256	545.25	23.39	
		3	3.800	556.20	23.86	
		4	3.715	543.75	23.33	
2	0.3	1	3.450	607.00	26.36	26.03
		2	3.425	600.00	25.76	
		3	3.570	605.59	25.97	
		4	3.215	615.00	26.38	
3	0.5	1	3.440	566.05	24.29	24.85
		2	3.526	576.00	24.71	
		3	3.540	586.00	25.14	
		4	3.435	589.00	25.26	

Table No 4- Results of compression test 28 days (100 % fully replacement)

Sr. No	% of coir fibre	Sample No	Wt Of Sample (Kg)	Breaking Load (KN)	Compressive Strength (N/mm ²)	Average (N/mm ²)
1	0.1	1	3.655	649.40	24.23	24.81
		2	3.526	660.15	24.63	
		3	3.645	680.30	25.38	
		4	3.620	670.35	25.01	
2	0.3	1	3.535	702.65	26.21	26.45
		2	3.526	697.35	26.02	
		3	3.420	705.6	26.32	
		4	3.480	730.06	27.26	
3	0.5	1	3.230	635.15	23.69	23.51
		2	3.452	610.98	22.76	
		3	3.325	640.30	23.89	
		4	3.270	635.45	23.71	

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

Table No 5. - Results of compression test 28 days (40 % partially replacement)

Sr. No	% Of Coir Fibre	Sample No	Wt Of Sample (Kg)	Breaking Load (KN)	Compressive Strength(N/mm ²)	Average (N/mm ²)
1	0.1	1	3.655	857.55	31.99	30.89
		2	3.526	826.05	30.86	
		3	3.645	805.03	30.04	
		4	3.620	823.00	30.72	
2	0.3	1	3.535	845.35	31.76	31.93
		2	3.526	853.56	31.54	
		3	3.420	873.07	31.84	
		4	3.480	851.00	32.60	
3	0.5	1	3.230	746.00	27.85	28.48
		2	3.452	746.98	27.85	
		3	3.325	785.77	29.31	
		4	3.270	775.23	28.92	

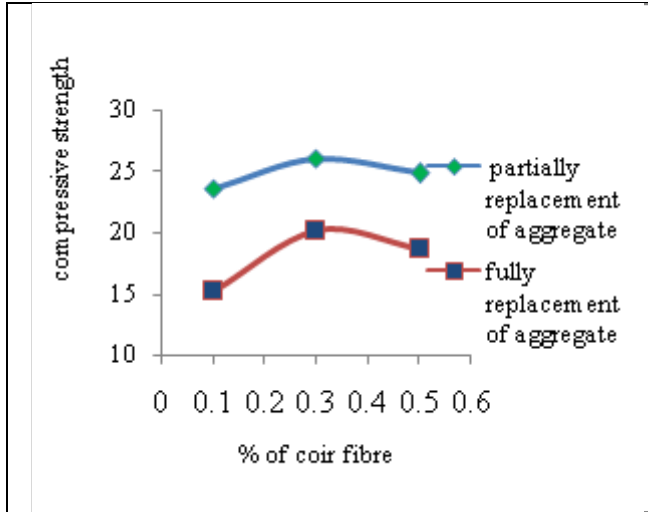


Fig-3 Avg Compressive strength of paving blocks at 14 days

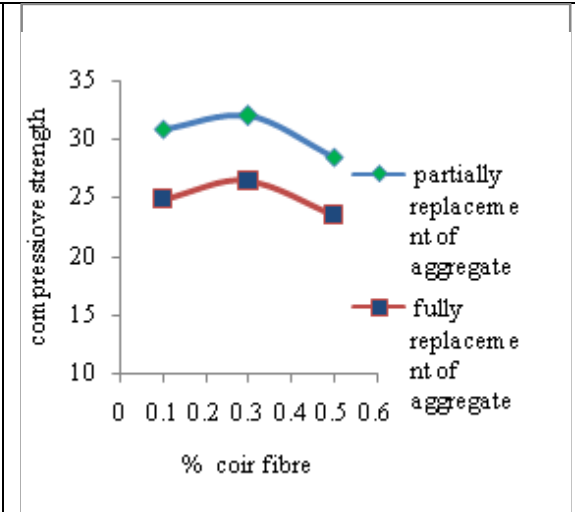


Fig. 4 Average Compressive strength of paving blocks at 28 days

From Fig No. 3 & 4 the average compressive strength of paving block with the 0.3% coir fibre gives optimum result as comparing to 0.1% & 0.5% coir fibre respectively.

The average compressive strength of paving block of 0.3% coir fibre of partially replaced demolished aggregate at 14 & 28 days are 29% & 21% higher than fully replaced demolished aggregate respectively.

The average compressive strength of paving block at 28 days is 22.67% & 31.20% higher than avg. compressive strength of paving block at 14 days of partially and fully replaced aggregate respectively.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

3.1.2. Water absorption test results

Table No 6. Result of Water Absorption Test (partially 40 % Replacement)

Sr. No	% of coir fibre	Sample No	Initial Wt Of Sample (Kg)	Final weight Of sample kg	Water absorption (%)	Average (N/mm ²)
1	0.1	1	3.830	3.960	3.39	3.65
		2	3.795	3.930	3.55	
		3	3.815	3.965	3.93	
2	0.3	1	3.825	3.985	4.18	4.40
		2	3.805	3.970	4.36	
		3	3.790	3.975	4.68	
3	0.5	1	3.880	4.060	4.83	4.99
		2	3.785	3.980	5.15	
		3	3.795	3.985	5.00	

Table No 7: Result of Water Absorption Test (100 % fully replacement)

Sr. No	% Of coir fibre	Sample No	Initial Wt Of Sample (Kg)	Final weight Of sample Kg	Water absorption (%)	Average (N/mm ²)
1	0.1	1	4.037	4.267	5.70	5.49
		2	4.137	4.357	5.32	
		3	4.130	4.355	5.45	
2	0.3	1	4.150	4.395	5.90	5.97
		2	4.175	4.440	6.34	
		3	4.145	4.380	5.67	
3	0.5	1	4.135	4.390	6.167	6.40
		2	4.155	4.375	5.294	
		3	4.125	4.445	7.75	

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

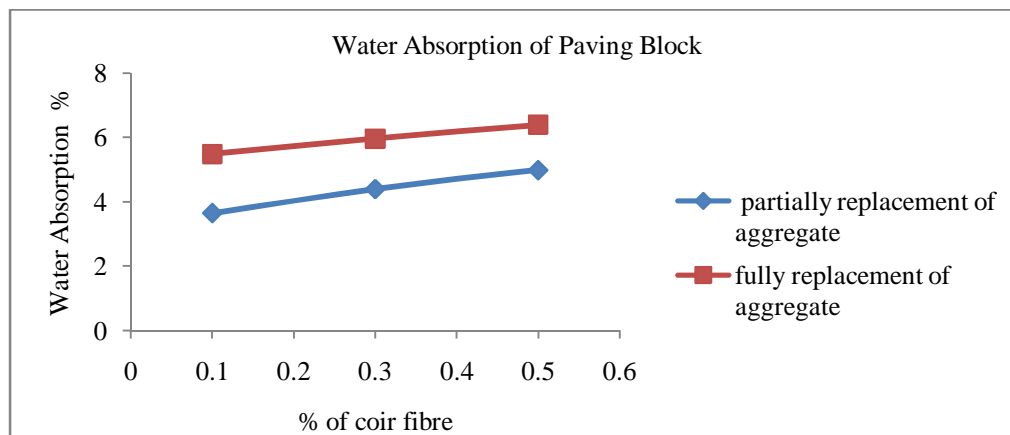


Fig No 5: Result of Water absorption (%) of paving blocks.

From Fig No 5 its shows that water absorption percentage of paving block increases with percentage of coir fibre in both partially and fully replaced demolished aggregate.

The water absorption of paving block of fully replaced demolished aggregate of 0.5% coir fibre is 28.25% higher than partially replaced demolished aggregate.

IV. CONCLUSION

1. Partially replaced (40%) demolished aggregate paving block has higher compressive strength as comparing to fully replace demolished paving block at both 14 & 28 days.
2. The water absorption, tensile strength of paving block increases with percentage of coir fibre.
3. In fully replaced aggregate paving blocks absorb the water about 28.25% more than partially replaced aggregate.
4. A demolished replaced aggregate paving block absorbs more water. Because of coir fibre consumes more water.
5. In compression strength test of paving block of 0.3% coir fibre give optimum result.
6. Water absorption after using demolished aggregates, is below 7% as per IS recommendations.

REFERENCES

1. G. Navya "experimental investigation on properties of concrete paver block with inclusion of natural fibre" International Journal of Engineering Research and Applications www.ijera.com ISSN: 2248-9622, Vol. 4, Issue 8(Version 6), August 2014, pp.34-38.
2. Maninder Kaur & Manpreet Kaur, Review On Utilization Of Coconut Shell As Coarse Aggregates in Mass Concrete, International Journal of Applied Engineering Research, vol.7, Issue 11, 2012.
3. McCaffrey, R. "Climate Change and the Cement Industry", Global Cement and Lime Magazine (Environmental Special Issue), pp.15-19, 2002.
4. Mehta, P.K. "Greening of the Concrete Industry for Sustainable Development", Journal of ACI Concrete International, Vol.24, No.7,pp.23-28, 2002.
5. Mithun "Hypo Sludge Paver Blocks" International Journal of Advance Technology in Engineering, Volume 4 Issue 7, July 2016 IC Value: 13.98 ISSN: 2348-7550
6. Nataraja, M. C and Nalanda, Y "Performance of industrial by-products in controlled low-strength materials (CLSM)", Waste Management, pp. 787-791, 2007.
7. Padmini A. K., Ramamurthy K., Mathews M. S.(2009). —Influence of Parent Concrete on the Properties of Recycled Aggregate Concrete, Construction and Building Materials, Vol. 23, pp. 829–836.

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 7, Issue 8, August 2018

8. Parag S. Kambli and Sandhya R. Mathapati, Compressive Strength of Concrete by Using Coconut Shell, IOSR Journal of Engineering (IOSRJEN) www.iosrjen.org ISSN (e): 2250-3021, ISSN (p): 2278-8719 Vol. 04, Issue 04 (April. 2014).
9. Patel Vivek V and DR. Jayeshkumar Pitroda “Experimental investigation on replacement of Aggregates by kota stone chips in rubber mould paver Block” International Journal of Current Trends in Engineering & Research (IJCTER) e-ISSN 2455–1392 Volume 2 Issue 5, May 2016 pp. 33 – 42.
10. R. C. Yeole and Dr. M. B.Varma ‘Comparison of Mix Designs of Paver Blocks using Waste Rounded Steel Aggregates and Rubber Pad’ International Journal of Emerging Technology and Advanced Engineering (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 10, October 2014).
11. Ravindrarajah R. S. and Tam C. T.(1985). —Properties of Concrete Made with Crushed Concrete as Coarse Aggregatel, Magazine of Concrete Research, Vol. 37(130), pp. 29-38.
12. Ryu J. S.(2002). —An Experimental Study on the Effect of Recycled Aggregate on Concrete Properties , Magazine of Concrete Research, Vol. 54(1), pp. 7-12.
13. Shafigh, P, Jumaat, MZ, Mahmud, HB & Alengaram, UJ 2011 b, ‘new method of producing high strength oil palm shell lightweight concrete’, materials and Design’, vol. 2, pp. 8 9–4843.
14. Vinayak Awasare, Prof. M. V. Nagendra (2014) —Analysis of strength characteristics of GGBS concrete IJAET: Volume 07.
15. Vishwas P. Kulkarni and Sanjay kumar B. Gaikwad, Comparative Study on Coconut Shell Aggregate with Conventional Concrete, Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 12, June 2013.