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A Study On Compressive Strength Of Paving Blocks Prepared With Stone Crusher Dust And Flyash

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ABSTARCT

An experimental study for manufacturing paving blocks with crusher dust is studied. Paving blocks replaced with crusher dust by various percentages and its properties have also been studied. The results show that replacing sand with crusher dust has a minimal reduction in weight and also it leads to economy. Since the availability of sand is reducing now-a-days using of crusher dust will reduce polluting the environment since it is being dumped in many places.

KEY WORDS: Compressive, Stone Crusher, Flyash.

1. INTRODUCTION

Concrete paving blocks provides an aesthetic appearance on bus-stops since it is pre-moulded and also it can be laid easily. It is available in many sizes and shapes such as hexagonal, square etc. It is used in many applications such as pavements, footpaths, and gardens, passengers waiting sheds, bus stops, industry and other public places. The product is commonly used in urban areas for those applications. A concrete mix of ratio 1:3:6 is used for making blocks. The water to cement ratio used is 0.5.The volume should not be richer than cement volume before mixing. The raw materials should be kept in a clan environment and transported to the rotary mix where it is mixed for 15 minutes.

Fly ash: Fly ash is a by-product obtained from burning of coal. It is collected from electrostatic precipitators. Depending upon the type of coal the fly ash contains little amount of silicon dioxide (SiO_2) and calcium oxide , both are important ingredients in many coal-bearing rock strata.

Fly ash is used as:

- Concrete production, as a substitute material for Portland cement and sand
- Embankments and other structural fills
- Grout and Flow-able fill production
- Waste stabilization and solidification
- Cement clinkers production
- Mine reclamation
- Stabilization of soft soils
- Road sub-base construction
- As Aggregate substitute material
- Mineral filler in asphaltic concrete

Manufacture sand: M-sand is obtained from hard stone which was cubical shape.it must be cleaned and washed so that it is used as an alternate for river sand. The materials used for construction should be free from pollutants.

Advantages of M-sand

- Durability is high
- Higher strength
- Workability is high
- Economical
- Environment-friendly

Materials used and their properties: The below table gives the properties of the materials used in this study.

Table.1. Physical properties of the materials

S.No	Physical properties of the materials	
	Material	**Values obtained**
1	Cement	
	Standard consistency in %	37
	Initial setting time in minutes	40
	Fineness modulus in %	7.67
	Specific gravity	3.15
2	Fine aggregate	
	Specific gravity	2.705
	Fineness modulus in %	3.464
	Bulk density in kg/m^3	1541.80
3	Coarse aggregate	
	Specific gravity	2.79
	Fineness modulus in %	9.96
	Bulk density in kg/m^3	1513.22
4	Water	Potable water

2. METHODOLOGY

Mix design: The mix design was calculated for M30 grade of concrete is designed as per IS 10262:2000.
Preparation of mould. Size of mould is 250 x 200 x 50 mm is made. As shown in FIG I. Three moulds are made in such a way that it can be detached with the help of studs at both the ends to remove the specimen after one day.

Figure.1. Moulds used for casting of paving blocks

Collections of materials: Materials such as cement, stone crusher dust, fly ash and coarse aggregate are used to prepare paving blocks. Stone crusher dust and coarse aggregate are seived in the following seive size.
Stone crusher dust - passed in 4.75mm and retained in 150 micron
Coarse aggregate- passed in 20mm and retained in 12.5mm

Pouring and compaction: The prepared concrete is placed into the moulds with the help of trowel and compacted with the help of electric concrete vibrator

Curing: Curing is a procedure that is adopted to promote the hardening of concrete under conditions of humidity and temperature which are conducive to the progressive and proper setting of the constituent cement.
Water curing can be done in following ways:

- Immersion
- Ponding
- Spraying or Fogging
- Wet covering

The precast concrete items are normally immersed in curing tanks for certain duration.

Period of curing:

- For 3 days curing, 3 blocks are prepared for each 0,10,20,30 percentage of fly ash.
- Similarly for 7 and 28 days curing, 3 blocks were prepared for each 0,10,20,30 percentage of fly ash.[17-19]

Compressive strength test:

Figure.2. Paving block under compressive testing

Compression test is the most common test conducted on hardened concrete, partly because it is an early test to perform, and partly because most of the desirable characteristic properties of concrete are qualitatively related to compressive strength. Paving blocks of size 250 mm x 200mm x 50mm were casted with stone crusher dust and partial replacement of cement with fly ash of various percentages.

After placing the paving block in compression testing machine as shown in FIG II, the testing is done till it fails.

$$\text{Compressive strength} = \frac{\text{Ultimate load in N}}{\text{Area of c/s in mm}^2}$$

The concrete cubes cured at 80ºC for 3 days, 7 days and 28 days are tested using Universal Testing Machine (UTM).

3. RESULTS AND DISCUSSION

The tested results of compression strength of paving blocks which are cured for 3 days, 7 days and 28 days are tabulated in Tables 2, 3 and 4.

Table.2. Compressive strength of paving blocks at 3 days curing

% cement	% flyash	Compressive load (kN)	Compressive strength(N/mm^2)	Average strength (N/mm^2)
100	0	1575	31.5	31.6
100	0	1580	31.6	
100	0	1585	31.7	
90	10	1360	27.2	27.3
90	10	1370	27.4	
90	10	1365	27.3	
80	20	1175	23.5	23.67
80	20	1190	23.8	
80	20	1185	23.7	
70	30	950	19	18.00
70	30	900	18	
70	30	925	17	

Table.3. Compressive strength of paving blocks at 7 days curing

% cement	% flyash	Compressive load (kN)	Compressive strength(N/mm^2)	Average strength (N/mm^2)
100	0	1650	33.0	33.03
100	0	1645	32.9	
100	0	1660	33.2	
90	10	1550	31.0	30.76
90	10	1540	30.8	
90	10	1525	30.5	
80	20	1345	26.9	27.10
80	20	1350	27.0	
80	20	1375	27.5	
70	30	1075	21.5	21.66
70	30	1090	21.8	
70	30	1085	21.7	

Table.4. Compressive strength of paving blocks at 28 days curing

% cement	% flyash	Compressive load (kN)	Compressive strength(N/mm^2)	Average strength (N/mm^2)
100	0	1750	35.0	34.9
100	0	1740	34.8	

100	0	1745	34.9	
90	10	1645	32.9	32.8
90	10	1650	33.0	
90	10	1625	32.5	
80	20	1425	28.5	29.0
80	20	1450	29.0	
80	20	1475	29.5	
70	30	1145	22.9	23.0
70	30	1150	23.0	
70	30	1155	23.1	

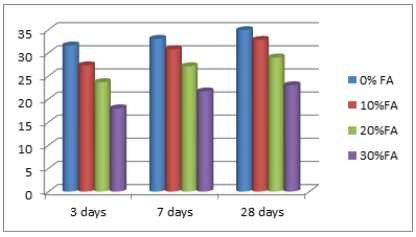

Figure.3. Compressive strength of paving blocks prepared at different proportions of fly ash replacing cement

DISCUSSION

- From the results obtained the compressive strength of concrete are studied and evaluated.
- Concretes containing stone crusher dust as fine aggregate, coarse aggregate and adding fly ash with cement in percentages of 0,10,20,30 displayed a decrease in compressive strength while used in higher percentage of fly ash.

4. CONCLUSION

The results shows that the fully replacement of stone crusher dust as fine aggregate, coarse aggregate and partial replacement of cement with fly ash increases the compressive strength when the percentage of cement is higher. The concrete with 0%, 10%, 20%, and 30% of fly ash showed the result decreased in compressive strength when the percentage of cement decreases.

REFERENCES

Ahmed AEK, Properties of concrete incorporating natural and crushed sand very fine sand, ACE Material Journal, 86 (4), 1989, 417-424.

Anbazhagan R, Prabhakar S, Vanangamudi S, Thamotharan C, Electromagnetic engine, Middle - East Journal of Scientific Research, 20 (3), 2014, 385-387.

Anbazhagan R, Satheesh B, Gopalakrishnan K, Mathematical modeling and simulation of modern cars in the role of stability analysis, Indian Journal of Science and Technology, 6 (5), 2013, 4633-4641.

Brindha G, Krishnakumar T, Vijayalatha S, Emerging trends in tele-medicine in rural healthcare, International Journal of Pharmacy and Technology, 7 (2), 2015, 8986-8991.

Brintha Rajakumari S, Nalini C, An efficient cost model for data storage with horizontal layout in the cloud, Indian Journal of Science and Technology, 7, 2014, 45-46.

Gopalakrishnan K, Prem Jeya Kumar M, Sundeep Aanand J, Udayakumar R, Analysis of static and dynamic load on hydrostatic bearing with variable viscosity and pressure, Indian Journal of Science and Technology, 6 (6), 2013, 4783-4788.

Hameed MS and Sekar ASS, Properties of green concrete containing quarry rock dust and Marble sludge powder as fine aggregates, ARPN journal of Engineering and applied Science, 4 (4), 2009, 83-89.

Ilangovana R Mahendrana N and Nagamanib K, Strength and durability properties of concrete containing quarry rock dust as fine aggregates, ARPN Journal of Engineering and Applied Science, 3 (5), 2008, 20-26.

IS 2185 (part1), Concrete masonry units specification, Part 1 hollow and solid concrete blocks, “Bureau of Indian Standard”, New Delhi, 2005.

Jayawardhane U, De s, Dissanayake DMS, Use of quarry dust instead of river sand for future construction in Sri Lanka, The Geological Society of London, AEG 200E, paper no38, pp 14.M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

Jeyanthi Rebecca L, Susithra G, Sharmila S, Das MP, Isolation and screening of chitinase producing Serratia marcescens from soil, Journal of Chemical and Pharmaceutical Research, 5 (2), 2013, 192-195.

Kerana Hanirex D, Kaliyamurthie KP, An adaptive transaction reduction approach for mining frequent itemsets, A comparative study on dengue virus type1, International Journal of Pharma and Bio Sciences, 6 (2), 2015, 336-340.

Prabhakar J, Senthilkumar M, Priya MS, Mahalakshmi K, Sehgal PK, Sukumaran VG, Evaluation of Antimicrobial Efficacy of Herbal Alternatives (Triphala and Green Tea Polyphenols), MTAD, and 5% Sodium Hypochlorite against Enterococcus faecalis Biofilm Formed on Tooth Substrate: An In Vitro Study, Journal of Endodontics, 36 (1), 2010, 83-86.

Ramkumar Prabhu M, Reji V, Sivabalan A, Improved radiation and bandwidth of triangular and star patch antenna, Research Journal of Applied Sciences, Engineering and Technology, 4 (12), 2012, 1740-1748.

Sachithanantham P, Sa Nkaran S, Elavenil S, Experimental study on the effect of rise on shallow funicular concrete shells over square ground plan, International Journal of Applied Engineering Research, 10 (20), 2015, 41340-41345.

Saravanan T, Srinivasan V, Sandiya VP, A two stage DC-DC converter with isolation for renewable energy applications, Indian Journal of Science and Technology, 6 (6), 2013, 4824-4830.

Sharmila S, Jeyanthi Rebecca L, Das MP, Production of Biodiesel from Chaetomorpha antennina and Gracilaria corticata, Journal of Chemical and Pharmaceutical Research, 4 (11), 2012, 4870-4874.

Sharmila S, Jeyanthi Rebecca L, Naveen Chandran P, Kowsalya E, Dutta H, Ray S, Kripanand NR, Extraction of biofuel from seaweed and analyse its engine performance, International Journal of Pharmacy and Technology, 7 (2), 2015, 8870-8875.

Srinivasan V, Saravanan T, Reformation and market design of power sector, Middle - East Journal of Scientific Research, 16(12), 2013, 1763-1767.

Thamotharan C, Prabhakar S, Vanangamudi S, Anbazhagan R, Coomarasamy C, Hydraulic rear drum brake system in two wheeler, Middle - East Journal of Scientific Research, 20 (12), 2014, 1826-1833.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Collision control system in cars, Middle - East Journal of Scientific Research, 20 (12), 2014, 1799-1809.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Drive shaft mechanism in motor cycle, Middle - East Journal of Scientific Research, 20 (12), 2014, 1810-1815.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Dual fuel hybrid bike, Middle - East Journal of Scientific Research, 20 (12), 2014, 1819-1822.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Turbo charger in two wheeler engine, Middle - East Journal of Scientific Research, 20 (12), 2014, 1841-1847.