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RESEARCH ARTICLE

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MANUFACTURED SAND CAN BE USED AS FINE AGGREGATE IN CONCRETE PAVERS BLOCK

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ABSTRACT

Natural hard granite stone is best alternative of Fine aggregate for the concrete pavers block. Its use in the crushed form and called manufactured sand (M-Sand). Which is cubically shaped with grounded edges, graded and washed.In this study Manufactured sand is used as fine aggregate and analysis of compressive strength and water absorption and physical requirement of concrete block at 28 days .To analysis of thickness of concrete block according to traffic load.

KEYWORDS

Various test, M-Sand as fine aggregate, Cement, vibration table, PVC-Mould.

INTRODUCTION

Precast pavers are a very popular solution for outdoor flooring with many architects and landscaping designers, due to their design flexibility and wide variety of colors, shapes and patterns. Precast pavers are a man-made concrete product that is intended to replicate the durability and beauty of natural stone pavers. Most importantly, precast concrete block provides the homeowner with a lower priced alternative to natural stone, thus avoid having to pay the high price associated with acquiring natural stone pavers.

Concrete paver blocks were first introduced in Holland in the fifties as replacement of paver bricks which had become scarce due to the post-war building construction boom. These blocks were rectangular in shape and had more or less the same size as the bricks. During the past five decades, the block shape has steadily evolved from non-interlocking to partially interlocking to fully interlocking to multiply interlocking shapes. Consequently, the pavements in which non-interlocking blocks are used are designated as Concrete Block Pavement (CBP) or non-interlocking CBP, and those in which partially, fully or multiply interlocking blocks are used are designated as 'Interlocking Concrete Block Pavement (ICBP).

Objective of the study :

- To study effect on the properties of concrete pavers block by using M –sand as fine aggregate.
- To study the effect on compressive strength of pavers block.

- To analysis of thickness of concrete block according to traffic load.

MATERIALS

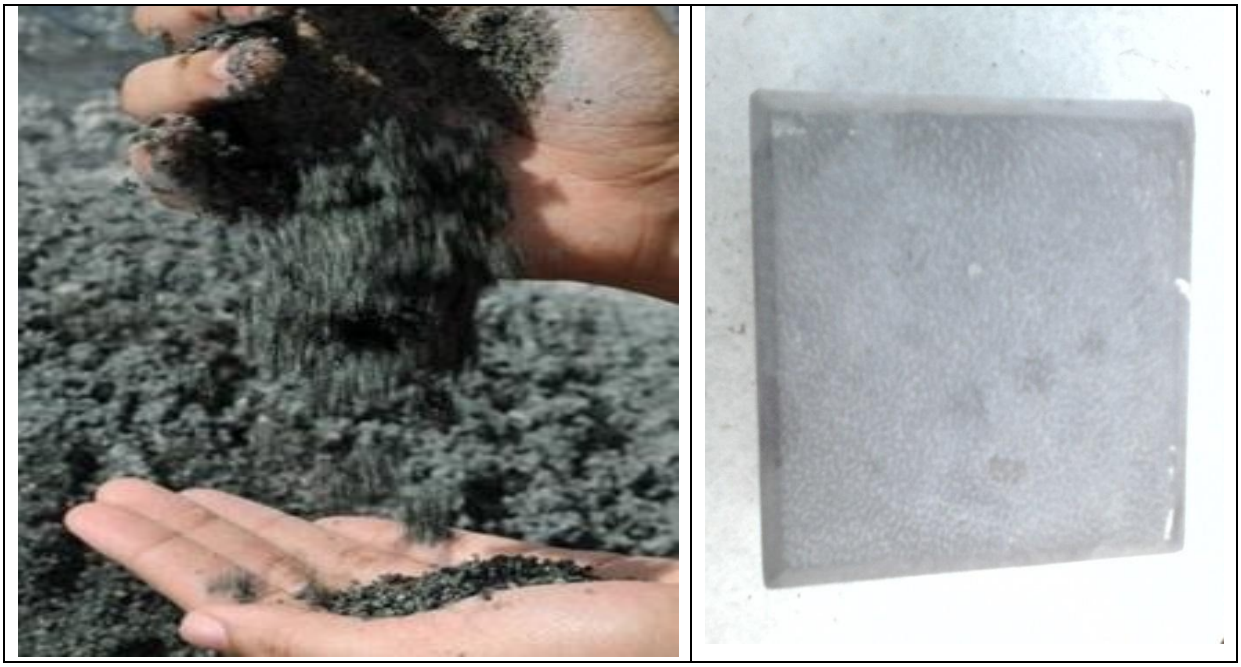
Aggregates:

Course Aggregate :

- It should be crushed / semi crushed and free from soft or honeycombed particle.
- Aggregate should not contain more than 0.5% of sulphates as SO_3.
- Its should not absorb more than 2% of their own mass of water.
- Nominal maximum size of course aggregate used in production of pavers block shall be 12 mm.

Fine Aggregate :

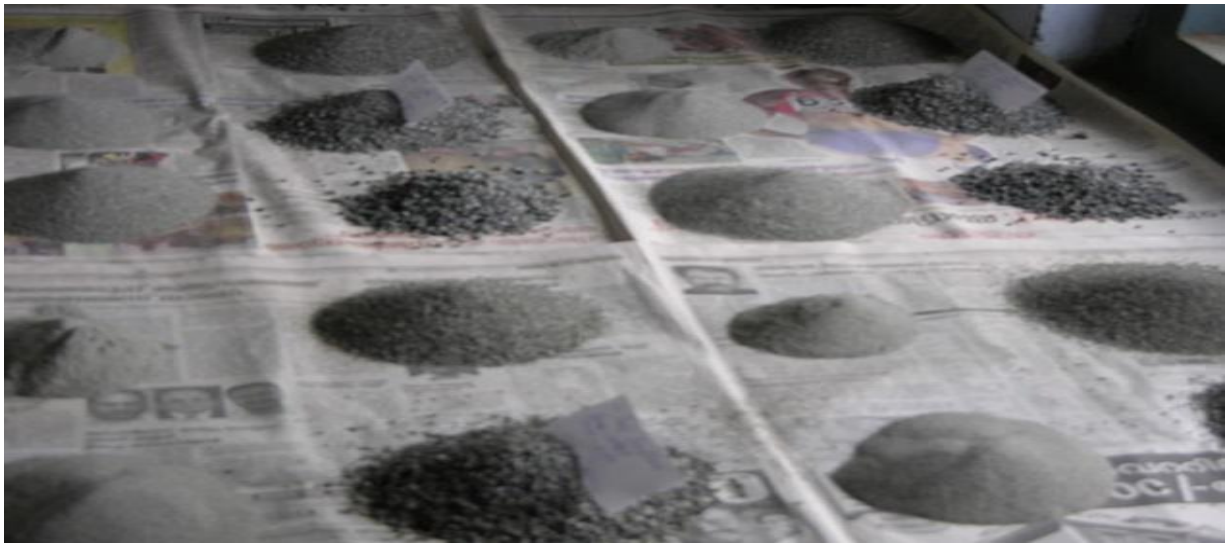
- River sand/ quarry sand and M-sand and double wash can be used in pavers production .



Nimco precast (P) L.t.d New Delhi

Size of M-Sand:

IS Sieve	% of Passing of M-Sand
4.75mm	99.60
2.36mm	86.31
1.18mm	69.01
600µ	57.29
300µ	54.92
150µ	09.82
Fineness Modulus	2.43



Physical properties of materials:

Properties	Fine Aggregate	Course Aggregate
Water Absorption	5.6%	2.5%
Fineness Modulus	2.84	-
Specific Gravity	2.84	2.75

Pigment :

- Synthetic or natural pigment may be used in concrete mix to obtain pavers block with desired shade of colour.
- The quantity of pigment restricted to a maximum of 9% by weight of cement .
- Pigment should be finer than cement .
- Fineness value : 2-15 m2/Kg.

Cement

A cement is a binder, a substance that sets and hardens and can bind other materials together hat was made from crushed rock with burnt lime as binder. Cement is manufactured through a closely controlled chemical combination of calcium, silicon, aluminium , iron and other ingredients. Common materials used to manufacture cement include limestone, shells, and chalk or marl combined with shale, clay, slate, blast furnace slag, silica sand, and iron.

SALIENT MIX DESIGN ASPECTS

The commonly used processes for the manufacturing of pre-cast cement concrete paving units required dry, low –slump mixes.

1. Water/cement ration : 0.34 to 0.38
2. Water content of the mix : 5 to 7% of total mix
3. Quantity of cement : Generally not less than 380 kg/m^3 depending on the equipment being used for block making .Upper limit of cement shall not be more than 425 Kg/m3.
4. Aggregate/cement ratio : 3:1 to 6:1

Note- *The above values are for the general guideline only the actual Mix –Design can be change according to requirement as area , thickness and load acting on it* .

Guideline of thickness of paver block according to traffic load:

Table 1: Recommended Grades of Paver Blocks for Different Traffic Categories

Grade Designation of Paver Blocks	Specified Characteristics Compressive Strength of Paver Blocks At 28 Days N/mm²)	Traffic Category	Recommended Minimum Paver Block Thickness (mm)
(1)	(2)	(3)	(4)
M-25-M-30	25-30	Non-traffic	50
M-30-M-35	30-35	light	60
M-35-M-45	35-45	Medium	60, 80
M-45-M- 55	45-55	Heavy to Very Heavy	80, 100, 120

Analysis of Compressive strength

Specimen should be uniform and equal pavers and the specimen shall be stored for 24 ± 4h in water maintained at temperature of20 ± 5°C.the bearing plates of testing machine shall be wiped clean . the specimen are aligned with those of the bearing plate.

The load shall be applied without shock and increased continuously at rate 15 ± 3**N/mm²**until no greater load can be sustained by the specimen or delamination occurs . the maximum load applied to specimen shall be noted in N,

Compressive strength = maximum load applied (N)/plan area (mm²)

Corrected compressive strength = (compressive strength x correction factore)

S No	Paves thickness	Correction Factors
1	50	0.96
2	60	1.00
3	80	1.12
4	100	1.18

	Compressive Strength (N/mm²)		
Specimen Size (200mmX200mmX50mm)	7 Day	14Day	28day
Specimen (1)	29.03	94.15	38.4
Specimen (2)	36.77	37.74	42.11
Specimen (3)	34.20	37.43	41.42
Specimen (4)	34.89	38.66	43.89

Analysis of Water Absorption :

Test Specimen completely immersed in water at room temperature for 24 ± 4h.the specimen remove from water and allowed to dry for 1 minute by placing them on 10mm courser wir mesh . after that specimen immediately weight in N.

% Water Absorption = $[(W_w - W_d) / W_d] \times 100$

Where, W_w = Wet Weight of paver block, W_d = Dry Weight of paver block

Water absorption Test	
Specimen	28 Day
Specimen	3.92
Specimen	3.11
Specimen	2.64
Specimen	2.01

CONCLUSION

- By using the M sand we can achieved the appropriate compressive strength is 43.80N/mm^2 in M30 grade pavers size 200mmX200mmX50mm.
- M-sand is good alternative of river sand and cost is also economical.
- Water absorptions is also decreased with decreasing of compressive strength.
- M-sand is good to increase the compressive strength and durability.
- Pigment easily mix with M-sand and increase lightness of colour and get good appearance.
- M-sand easily distribute throughout the block and get more strength especially edge of bock
- In India Vasthu Shastra Says Building material must be free from traces of human body or animal. M-sand is free of such material and is produced by crushinghard granite stone when compared to river sand thatis produced naturally from weathered rock.

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