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Applicationof DemolishedConstructionWastefor Manufacturingof PaverBlocktoAnalyzetheResultofPartialReplacementofDemolished ConstructionWasteinPaverBlock

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Abstract: ***Conceptual With rapid population growth and fast urbanization, the construction activity also increased. In India, with fast growing constructions, the natural resources are becoming inadequate to fulfill the needs of construction. Materials like natural sand, coarse aggregate natural available clay for bricks have become scarce, resulting in increase in masonry work, concrete work, and overall construction cost. Also, prices of cement, the binding material, is going in increasing day by day. interlocking concrete paver blocks by using demolished concrete waste are the new approach for paver construction work with advantageous like good appearance, less motor , no need of finishing and more effective bond they can be more advantageous than conventional paver blocks .In this report, an attempt is made to study the various aspects of interlocking concrete paver blocks by using demolished concrete waste or material. Also, emphasis Is given on the eco-accommodating of greenery approach for interlocking concrete paver block.***

Keyword: demolished construction waste, paver block, C & D waste, partial replacement, debris, utilization, Solid Waste Management.

I. INTRODUCTION

A. Overview on Indian Construction Industry

In India, there is large amount of use of concrete which is made from natural material like river sand, course aggregate from demolition of mounts by stone crusher and artificial material like cement, Indian buildings in 2013 have generated more than 626 million tones of solid waste which is 52 times more than official estimate. A great part of this waste is being used illegally for dumping and filing up urban water bodies. From the large amount of solid waste generated from various industries, construction and demolition waste contributes in large amount. Construction and demolition waste is the waste which is generated from various activities like residential construction work, road work, renovation work, demolition, etc. Indian construction industry forms an integral part of the economy and a conduit for a substantial part of its development investment, is poised for growth on account of industrialization, urbanization, economic development and people's rising expectations for improved quality of living. There are mnly three segments in the construction industry like real estate construction which includes residential and commercial construction; infrastructure building which includes roads, rlways, power etc. and industrial construction that consists of oil and gas refineries, pipelines, textiles etc. Development constitutes 40% to 50% of India's capital expenditure on projects in various sectors such as highways, roads, rlways, energy, ports, irrigation, etc. and is the second largest industry in India after horticulture. It accounts for about 11% of India's GDP and employs over 35 million people. The highly fragmented Indian construction industry is valued at over USD 126 Billion.

1) *Development and Demolition Waste:* Nearness C & D waste and other inert material like C and D silt, dust and grit is significant. Non-idle construction waste is directly use for land filling. Recycled aggregates are obtned by crushing of concretes from demolition of structural components in many structures such as old buildings, concrete pavements, bridges, and structures at the end of their service life. C & D waste needs to be focused upon in view of (1) the potential to save natural resources (stone, river sand, soil, etc.) and energy (2) its bulk which is carried over long distances for just dumping, (3) its occupying significant space at landfill sites. Utilization of C & D waste is quite common in industrialized countries but in India so for, no organized effort has been made. The utilization of the C & D is necessary in upcoming years in growing industries.
2) *Little steps to make Reuse from C & D Waste*

a) C & D waste can be recycled and reused in construction and minimize environmental degradation and pressure on land.
b) Small steps in Delhi have been taken to reuse the recycled aggregates in RMC, pavement blocks, kerb stones and concrete bricks.
c) Processed C & D waste can be used for road and embankment construction. Finer grade can be molded into blocks and

slabs with appropriate binder.

3) *Paver Block:* Solid paver block was first introduced in Holland in the fifties as replacement of paver bricks. This block was rectangular and had the same size as the bricks. During past five decades, the block shape has steadily evolved from non-interlocking to partially interlocking to fully interlocking to multiply interlocking shapes. Interlocking concrete block pavement (ICBP) consists of a surface layer of small element, solid unreinforced precast concrete paver blocks ld on a thin, compacted bedding material which is constructed over properly profile base coarse. Concrete paving block is versatile, aesthetically attractive, functional and cost effective and requires little or no mntenance if correctly manufactured and ld. Interlocking concrete paving block technology has been introduced in India in construction, a decade ago, for specific requirement like footpaths, parking areas, gardens, etc. A properly design ICBP gives excellent performance when applied at location where conventional systems have lower service life due to number of geological, traffic, environmental and operational constant. Many number of such applications for light, medium, heavy ,and very heavy traffic conditions are currently in practice around the world.

B. *Introduction to Project Work*

1) In this project, we have presented the concept of suitable use of concrete waste in concrete which can be reused in manufacturing of interlocking paver blocks. Manufacture of paver blocks is made in two layers, one is top layer having specified thickness and another is bottom layer.
2) In our project, we have decided the thickness of paver block as 80mm having 10mm top layer thickness and 70mm bottom layer thickness, Shape of paver blocks plays an important role in interlocking, so paver block of zigzag shape is manufactured in our project. Concrete waste was collected from the nearby demolished site and was squashed through machinery and manually. After crushing of the concrete waste which was collected aggregates obtned were used as a replacement of coarse and fine aggregate as partial (50%) replacement in top and bottom layer of paver blocks by considering IS specification. Selected grade of concrete for paver block casting was M35.

C. *Problem Statement*

1) Construction wastes have become a pressing issue in many developing countries and have adverse effects on environment, economy, and social aspects.
2) In developing cities, there is generation of quality C & D waste from reprs and rehabilitation of structures and from material used for giving aesthetic view for structures. There is need to reuse this huge amount of waste generated.
3) Illegal dumping is common issue created from physical construction waste which needs serious attention.
4) So, we have adopted one of the effective ways to reuse construction concrete waste.

D. *Objectives of Project*

1) To study the conventional paver blocks-This implies about the materials, manufacturing process, used of paver blocks and growing recent trends in that. It was done by having an actual visit to a paver block manufacturing industry.
2) To use the concrete waste from debris in manufacturing paver block- This involves collection of concrete waste from nearby site, its crushing and separating the materials and using it in paver block manufacturing.
3) To perform various physio-mechanical test in laboratory and compare the results with those of conventional concrete paver blocks if avlable or with the flexure strength, their result analysis and comparison.
4) To achieve economy- This contributes to achieve the economy in comparison with the conventional blocks by considering various factors.
5) To provide safeguard to the environment by utilizing waste properly-Any type of waste affects the environment in some or the other way directly or indirectly and to minimize its impact should be the priority. Similarly, to reuse the concrete waste in this manner can be effective.

E. *Advantages*

1) Sustned use of construction concrete waste.
2) Avoiding dumping problems of concrete waste.
3) Results obtned are comparatively like standard blocks as studied in various research papers.
4) Use of paver blocks gives good aesthetic view.

5) Economy can be achieved for large scale use.

F. Limitations

1) Transportation cost of concrete waste will be more if site is at far distance.
2) Heavy machinery is require for proper crushing of concrete waste.
3) There is no standard mix design, hence require proper proportion of ingredients.

G. Future Scope

1) Construction and demolition waste issue remning unaddressed in the light of growing construction activities.
2) Proper collection and disposal methods are not applied in the practical world because of which such waste finds its way to illegal road side and empty dumping site.
3) In a view of above, we appeal to all municipal authorities of big cities in India to establish such plants where C &D waste of city can be gathered, sorted.
4) By ensuring the technical and economic feasibility of the material, various products like pavers blocks, tiles, kerb stones divider blocks, etc can be manufactured and used for public work.

II. LITERATURE REVIEW

A. V.A. Dakwale & R.V. Ralegaonkar " Development of sustnable construction Material using C&D waste"

1) Construction and demolition waste eco bricks of size 230mm*90mm*90mm are developed for six different compositions.
2) Amongst the various trials carried out the brick with ratio of binder, fine aggregate and coarse aggregate as 1:2.75:2.25 exhibit compressive strength and water absorption within the limits of IS with minimum self- weight.
3) Compressive strength of bricks reduced with increased percentage of fine aggregate Increase in both fine and coarse waste aggregates resulted in reduction in compressive strength by 30%.

B. 2.1.2. M.C. Nataraja & Lelin Das " Study on strength properties of paver blocks made from unconventional material

1) In this investigation, various properties such as compressive split tensile, bending strength and water absorption of paver blocks consisting of crushed granite, unconventional materials such as Kadapa and broken paver for various percentage replacement of coarse aggregate are studied as per IS 15658:2006.
2) Kadapa aggregates are better than granite aggregates in terms of water absorption limits.
3) Broken paver aggregate is not suitable in making paver blocks as water absorption is more than 7%. However, 50% replacement of paver aggregate with natural aggregate can be used.

C. Joel Santhosh & Ravikant Talluri "Manufacture of concrete paving blocks With fly ash and glass powder"

1) Different mix proportion is prepared using cement replacediby equal quality of fly ash and waste glass powder.
2) The study indicated that fly ash and waste glass powder can effectively be used as cement replacement without substantial change in strength.
3) Mix design is carried out to form M40 grade of concrete by using IS specifications
4) Tensile splitting strength and abrasion resistance seems to be satisfactory.
5) There is saving in cost of cement an it also reduces burden of dumping fly ash and west glass on earth which is eco-accommodating.

D. Osman gencel,"Properties of concrete paving block made with waste marble"

1) Marble industry produces large amounts of waste marble. In paving blocks, they have partly replaced aggregate with waste marble.
2) Abrasive resistance of the blocks is strongly influence by their marble aggregate content.
3) Although compressive strength decreases with increasing marble content in concrete, 28 days' strength obtned was satisfactory.

E. Sasitharan Nagapan, Isml Rahman "Issue on Construction waste : The need for Sustnable waste Management"

1) Construction wastes are a prominent issue in many developing countries and have adverse effects on environment, economy, and social aspects

2) Impacts due to construction waste also contributes to reduction in construction productivity and thus reduced the performance of overall construction projects.

3) Studies shows that material waste has significant impact to cost of project as well as on environment.

4) This paper discusses the issues created from physical and nonphysical construction waste and the factors that generated construction waste.

5) The paper also has highlighted cause factors which can be mitigated for managing construction waste.

6) Various steps of sustnable waste management like prevention, minimization, reused, recovery , disposal,etc.

III. MATERIALS AND METHODOLOGY

Material used :Material used in making paver block are as below

1) *Concrete:* Ordinary Portland Cement 53grade cement which is available in local market by confirming to IS12269:2013.

2) *Totals*: Material obtained after crushing manually and by machine inspected and aggregates passing from 12mm and remaining on 4.75mm were used as coarse aggregates.

3) *Coarseness:* When crushing by machine, mixed material of various sizes was obtained. Out of that, material passing from 4.75mm and remaining on 2m IS sieve was used as fine aggregate.

4) *Pulverize Sand:* When crushed through machine, lot of powder form was obtained which include all mix ingredients from concrete waste. Material passing from 2mm IS sieve was taken as crush sand.

5) *Hardner:* Liquidise material named lacquer was used as suggested by the plant in-charges which is used to avoid curing and to improve binding.

6) *Water:* Free from deleterious matter and shall fulfill the requirement as per IS456-2000.

7) *Concrete Mix Design:* The mix design can be defined as the process of selecting suitable ingredients of concrete and determining their relative proportions with the object of producing concrete certain minimum strength and durability as economically as possible. For proportioning about a concrete mix, four factors are important, namely (a) water/concrete ratio, (b) Cement Content, (c) Gradation of aggregates and (d) Consistency. Our effort is to minimize the water cement ratio to get the good strength by controlling the proportion of grade or mix design. Any change in proportion amount or human error will create unbalance in mix design and it will affect on water content and the cost of paver block.

IV. RESULT AND DISCUSSION

A. Test 1- Compression Test

Table No. 1. Testing of Block After 28 Days on replacement of 10%

Name of Material Replaced	Strength (N/mm2)
Crushed Sand	22
Coarse aggregate	32.8
Aggregate & Sand	25.9

B. Test 2- Flexural Test

Table no.- 2. Testing of Block After 28 Days on replacement of 10%

Name of Material Replaced	Strength (N/mm2)
Crushed sand	2
Coarse aggregate	3.18
Aggregate & Sand	2.59

C. Test 3- Abrasion Resistance Test

Table no.- 3. Testing of Block After 28 Days (10%)

Name of Material Replaced	Loss in thickness(mm)
Crushed Sand	2.00
Coarse aggregate	1.21
Aggregate & Sand	1.86

Table No 4 Testing of Block After 28 Days on replacement of 30%

Name of Material Replaced	Strength (N/mm2)
Crushed sand	25.12
Coarse aggregate	29.7
Aggregate & Sand	26.29

D. Test 2- Flexural Test

Table no.- 5. Testing of Block After 28 Days on replacement of 30%

Name of Material Replaced	Strength (N/mm2)
Crushed sand	1.08
Coarse aggregate	2.25
Aggregate & Sand	1.26

E. Test 3- Abrasion Resistance Test

Table no.- 6. Testing of Block After 28 Days (30%)

Name of Material Replaced	Loss in thickness(mm)
Crushed Sand	1.96
Coarse aggregate	1.80
Aggregate & Sand	2.31

V. CONCLUSION

A. Characteristic compression strength of interlocking paver block obtned, which is more than design standard for M35 was 32.8 KN/m2 after replacement of 10% coarse Aggregate.

B. Minimum breaking load for a was 936.8 KN, which is still more than that required for Regularly Trafficked Roads.

C. Split tensile strength was obtned as 3.18KN/m2.Maximum loss in thickness for a paver Block is 2.33mm which is safe by Abrasion Test.

D. Finally we can conclude that the paver blocks prepared using M35 grade of concrete and 10% replacement of coarse Aggregates can be used for pedestrian plazas, car parks, office complexes, rural roads with low volume traffic.

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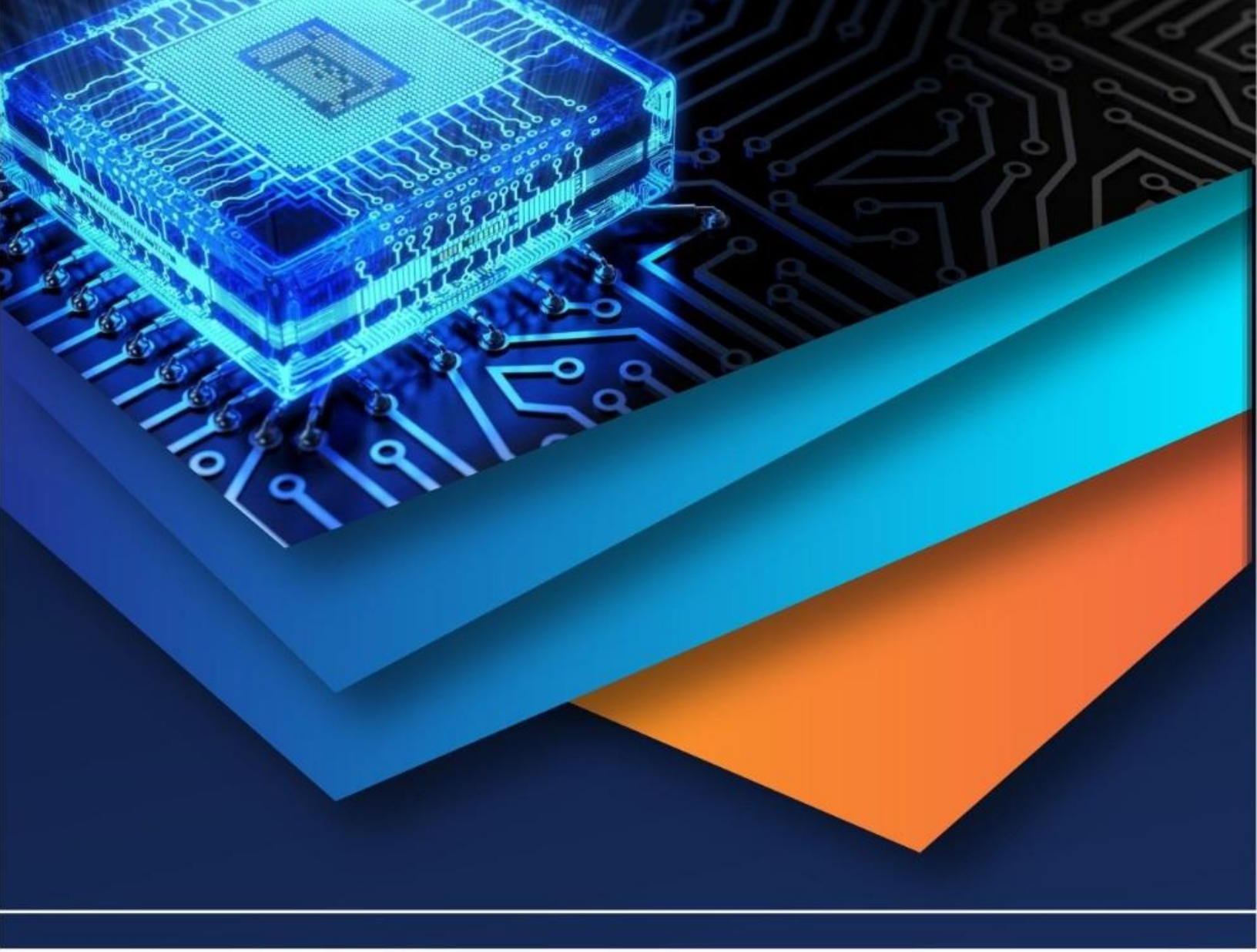

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