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UTILIZATION OF RECYCLED DEMOLITION WASTE AGGREGATES IN PERVIOUS CONCRETE

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ABSTRACT

Around the world, everyday construction and demolition wastes are produced in large amounts. This work is investigated using recycled demolition waste aggregates (RDA) in making pervious concrete and the effects on properties like density and compressive strengths. Many countries outside India have replaced the natural aggregates with the recycled aggregates as it has the potential of replacing it thus addressing the issues of sustainability and environmental degradation. Thus, this paper helps us to better understand the characteristics of natural as well as recycled aggregates for knowing their properties thereby also the performances and behavior of the designed pervious concrete. It shows us the effects on strength and density of concrete on the utilization of construction and demolition waste as a partial replacement to coarse aggregates in making pervious concrete.

Keywords - construction and demolition waste, RDA- recycled demolition waste aggregates, sustainability, environmental degradation, pervious concrete.

I. INTRODUCTION

In the last several years, the use of pervious concrete has increased significantly. It is used largely because it is considered an environmentally friendly and a sustainable product. It addresses important environmental issues and support green, sustainable growth hence considering pervious concrete a unique and effective means. In making pervious concrete, carefully controlled amounts of water and cementitious materials are to be used to create a paste that forms a thick coating around aggregate particles [2]. It is hence noted that pervious concrete consumes less raw material than normal concrete. It helps to recharge the ground water in its pavement applications through the direct drainage of water and also provides superior insulation values when used in walls. Pervious concrete a very cost effective and environmentally friendly solution supporting sustainable construction. Looking at the present status of our countries nonrenewable resources, there is a need to increase the awareness for conservation of nonrenewable mineral resources. Increased consideration is required to the use of pervious concrete in our country.Wide variety of wastes which are produced through various activities are presently reused and are also usable in construction. Various such wastes include waste rock, mill tailings and coal refuse from the mining industry; dredge spoil; slimes and sludges from ore processing; fly ash, bottom ash and flue gas scrubber sludges from combustion processes; slags from the metallurgical industry; sewage sludge, municipal refuse, and demolition wastes. These wastes are used for embankments, highway base course, and landfills; aggregates in concrete and bituminous mixtures; pozzolanic concrete; brick and ceramic; plasterboard, floor and roof filler, and mineral wool. Thus various wastes

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generated nowadays can be incorporated in many ways. Using the substantial proportion of this waste in construction would result in a greater savings of natural materials thus addressing the issues of sustainability and environmental degradation and hence would also lead to greater amounts of energy savings as well.The fig. 1 below shows a typical life cycle of wastes useable in construction [1

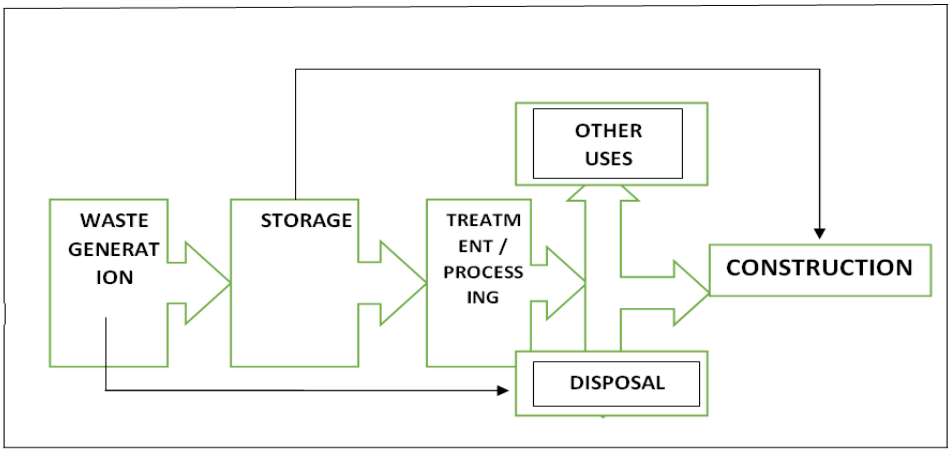

Fig 1 Life cycle of wastes useable in construction

of all the raw materials used in construction, aggregates are important components for all the construction activities. Construction and demolition waste disposal is a major problem in India. Presently India is generating construction and demolition waste to the tune of 23.75 million tons annually as per the Hindu online of March 2007[4], which is comparable to some of the developed nations and these figures are likely to double fold in the next 7 years. Due to increased quantity of demolition rubble, continuing shortage of dumping sites, increase in cost of disposal and transportation and above all the concern about environment degradation managing of these construction and demolition waste is a major concern.Many countries outside India have replaced the natural aggregates with the recycled aggregates as it has the potential of replacing it thus addressing the issues of sustainability and environmental degradation. But by such replacement care must be taken as the aggregate's properties greatly affect the properties of a concrete. It is necessary to assess the effect of recycled material on final concrete. Thus we need to know the optimum composition of recycled aggregate to produce concrete of desirable quality.

Taking advantage of the high flow rate through pervious concrete the various applications of pervious concrete include drainage media for hydraulic structures, tennis courts, greenhouses,parking lots and pervious base layers under heavy-duty pavements. It is also known as high porosity concrete or no fines concrete.The high porosity offersit other useful characteristics such as it is thermally insulating (for example, in walls of buildings) and has good acoustical properties (for sound barrier walls).Its other applications include walls of two-story houses, load-bearing walls for high-rise buildings (up to ten stories), infill panels for high-rise buildings, roads,sea groins and parking lots. All of the applications take advantage of the benefits of various characteristics of pervious concrete.

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II. LITERATURE REVIEW

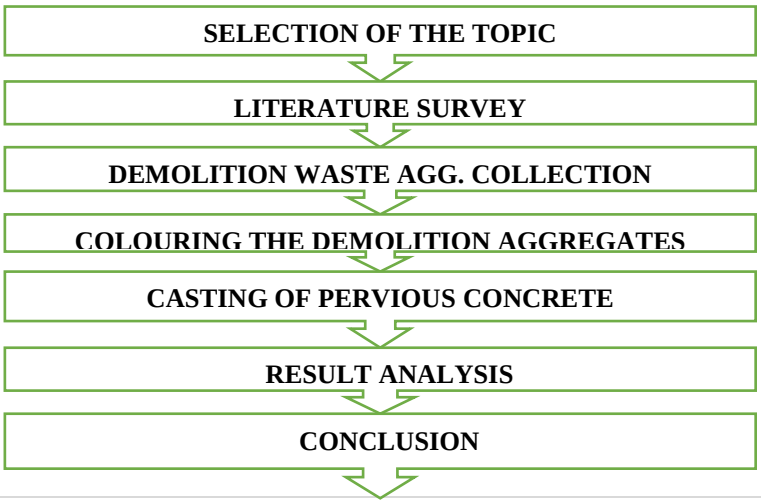
1. Thushara Priyadarshana (Manager Research and Development, Holcim (Lanka) Limited, 413 R A De Mel Mawatha, Colombo 3, Sri Lanka,ThilakJayathunga Head of Innovation and Applications, Holcim (Lanka) Limited, 413 R A De Mel Mawatha, Colombo 3, Sri Lanka) has discussed the art of pervious concrete; materials and possible mix proportions, properties such as compressive strength, flexural strength, shrinkage, permeability with initial tests done at Innovation & Application Center of Holcim (Lanka) Limited, and the principal advantages, major disadvantages and principal applications in Sri Lankan construction industry in (Pervious concrete – a sustainable choice in civil engineering and construction)

2. James S. Gidley,1 A. M. ASCE and William A. Sack,2 M. ASCE, (J. Environ. Eng., 1984, 110(6): 1117-1133) in his work on (Environmental aspects of waste utilization in construction)did a general survey of waste utilization in construction from an environmental engineer's point of view. He has reviewed generic environmental impacts with a view to the alternative impacts of waste disposal. The environmental impacts of five major construction uses are discussed: ceramics and insulation, concretes, aggregates, construction metals, and embankments, road base and landfills. Techniques of mitigating these impacts are also discussed.

Study tells us that there are great environmental benefits associated with using waste materials in construction. These benefits include the reduction in use of virgin resources and the reduction of waste disposal impact. Waste utilization brings wastes into closer proximity to people, who are then subjected to the effects of dusting, erosion, leaching, and radiation.

3. S R Yadav from National Institute of Construction, Management and Research (NICMAR), India and S R Pathak, College of Engineering Pune (COEP), Pune, India in his work on (USE OF RECYCLED CONCRETE AGGREGATE IN MAKING CONCRETE- AN OVERVIEW) gives a simple procedure of using recycled by considering % adhered mortor and evaluating the mix proportions for attaining a comparable strenghth for high grade applications. It discusses the use of recycled concrete as aggregates in concrete in respect of compressive strength.

III. METHODOLOGY



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3.1 Selection of topic

- Topic was selected through communication with other staffs/ departments.
- Finalization of selected topic after discussion with project guide.
- Plan for collection of data.

3.2 Literature review

- Data collected through internet
- Data collected through publications related to the topic selected.

3.3 Demolition waste aggregate collection

- Demolished waste aggregates collection from D.Y. Patil college hostel demolished building, pimpri, pune.
- Demolished waste aggregates collection from Kharabwadi residential demolished building, chakan, pune.
- Demolished waste aggregates collection from Tathawade residential demolished building, chakan, pune.

3.4 Colouring the waste aggregates

- These waste aggregates will be coloured (green) with water insoluble paint to distinguish between natural and waste aggregates once casted.
- These aggregates will be kept for drying for 2days.

3.5 Casting of pervious concrete

- Tests on C & D aggregates- Abrasion test and Impact test.
- Seive Analysis of C & D aggregates.
- Mix design proportion.
- Casting of pervious concrete done by replacing waste aggregates by various percentages (0%, 10%, 20% and 30%) of natural aggregates. The casting will be done in cast iron moulds measuring 150mm × 150mm × 150mm internally. The specimens made in accordance with BS 1881(1996).
- Slump tests.
- Demoulding the moulds after 24 hours.
- Curing until the day of testing (7days, 14 days and 28days)

3.6 Result analysis

- Graphs to be plotted of percentage aggregates replacements against respective compressive strengths for 7days, 14 days and 28days.
- Various tests to be performed like density, compressive strengths.
- The densities of wastes utilized (demolished recycle aggregates) for various percentages of replacement to coarse aggregate are to be found out. Graphs plotted between various densities (at 7,14 and 28 days) and percentage of aggregate replaced.
- The compressive strengths are obtained from crushing tests for 7, 14 and 28 days respectively for various percentage of replaced aggregate. The graph is plotted of compressive strength versus percentage of replacement for 7, 14 and 28 days.

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IV. CONCLUSION

- The paper concludes that with rising construction cost there is a need to reduce environmental stresses to make construction industry sustainable.
- Hence it is necessary to find the alternative materials which would replace the natural materials thus helping in reducing environmental stresses.
- Thus, this paper helps us to better understand the characteristics of natural as well as recycled aggregates for knowing their properties thereby also the performances and influences.
- It shows us the effects on strength and porosity of concrete on the utilization of construction and demolition waste as a full or partial replacement to coarse aggregates in pervious concrete.
- Thus the overall work aims at finding out new material for pervious concrete and its new applications.

V. REFRENCES

[1.] ENVIRONMENTAL ASPECTS OF WASTE UTILIZATION IN CONSTRUCTION By James S. Gidley,1 A. M. ASCE and William A. Sack,2 M. ASCE

[2.] http://www.pervious pavement.org/construction.html

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[4.] USE OF RECYCLED CONCRETE AGGREGATE IN MAKING CONCRETE- AN OVERVIEW,S R Yadav*, National Institute of Construction, Management and Research (NICMAR), India, S R Pathak, College of Engineering Pune (COEP), Pune, India