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"EFFICIENT UTILIZATION OF DEMOLITION WASTE IN CONCRETE CONSTRUCTION "

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Abstract– Demolished waste contributes a major portion of total solid waste production in the world and most of it is used in landfills. Demolished waste generation issues have been in main focus to achieve sustainable goals. In India we can link growth of country with growth of demolished waste. If measures to minimize and handle the demolished waste are not developed and efficiently adopted, it may threat the environment as well as sustainable moment of Indian construction industry.

This thesis gives a brief description of the researched carried out for demolished waste management all over the world. Along with this, discussions on different aspects of the problem beginning with a brief review of the international scenario in terms of demolished waste generated, recycled aggregate produced from demolished waste and their utilization in concrete and governmental initiatives towards recycling demolished waste. Followed by a brief overview of the engineering properties of recycled aggregates, the thesis also gives a summary of the effect of use of recycled aggregate on the properties of concrete. The paper concludes by identifying future scope of development of construction industry in India and benefits to the society by adopting the practice production of recycled aggregate concrete (RAC).

Key words- Demolished Waste, Recycled Aggregates Concrete, Engineering Properties of RAC, Development of Construction industry

I. INTRODUCTION

Concrete is that the most generally used material of construction everywhere the planet. A huge quantity of concrete is consumed by global industry. In India, the normal concrete is usually prepared by using natural sand obtained from the riverbeds as fine aggregate. India may be a developing country where the expansion rate is increasing and side by side waste is additionally increased so there's a requirement of the management of waste material in India. Because of increase in industries, IT sectors, New Infrastructure the industry of construction has shown magnificent growth. Builders face the matter of monetary difficulty because of the excessively material wastage in construction projects. In major cities of world there is major flow in demolished and construction waste quantities. Which cause unfavourable effect on environment. The use of such waste as Recycled fine-aggregate in concrete are often useful for both environmental and economic aspects within the industry. This study discusses the possibility to replace natural/crushed fine aggregate with demolished concrete waste (crushed fine aggregate) in structural concrete. An investigation into the properties of recycled concrete as a fine aggregate is made using crushing and grading of concrete collected from different demolition sites and locations around the locality. Tests will be carried out for different grade of concrete. The concrete might be transformed into useful recycled fine aggregate and utilized in concrete production with properties suitable for many structural concrete applications in India.

Globally, cities generate about 1.3 billion tonne of solid waste per annum . This volume is expected to increase about to 2.2 billion tonne by 2025 report by the World Bank. Building materials account for about half all materials used and about half the solid waste generated worldwide. Building materials have environmental effect at every work of construction of building like-transportation, manufacturing, disposal of building after end of useful life.

II. LITRATURE REVIEW

A ton of research work has been carried out in utilizing the demolished waste right since 1974 and a brief description of these researches are being highlighted here in this chapter followed by various case studies which were investigated. Based on the intensity of generation of demolished waste in different countries, the legal authorities of different countries have framed standards for handling demolished waste are also elaborated in this chapter.

A. Castledine (1990)

He studied the impact of incineration and found ways to reduce the amount of generated waste. The reduction of waste at its source is genuinely is the most logical and even most economical way to “treat” construction waste.

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B. **(Rafael M. Gavilan and Leonhard E. Bernold, 1994)**They have highlighted the source evaluation of solid waste in building construction. The construction industry gives major part of waste in United States of America. Both increased cost for settle waste have created many construction companies to re-examine their practices and increase in environmental consciousness. As yet no scientific data are obtainable for create strategies to adjust changing parameters and needs.

This paper addresses one critical step in developing a comprehensive waste-management system; the categorization and quantification of construction wastes. Several residential building projects were used to test a conceptual framework for studying the sources of solid wastes in one important segment of the construction industry. Three important categories of building materials brick and block, dimensional lumber, and Sheet rock were analysed using a "sources-of-waste" framework. The presented research data indicate that solid wastes in residential construction are primarily scraps resulting from cutting dimensional stock material to size. They have shown, many factors that are related to the amount of such process waste. Strong relationships between poor productivity and high waste generation are suggested by them.

C. Akash Rao et al. (2006) ELSEVIER

He states that the engineering property of recycled aggregates facilitates the use of recycled aggregate on the properties of fresh and Hardened concrete. This paper also identified that there are major barriers in more widespread use of recycled aggregates in recycled aggregate concrete because of lack of awareness, lack of government support, and non-existence of codes for reprocessing these aggregate in new concrete.

Further study can be extended to identify the use of RA for making normal structural concrete with the addition of fly ash, condensed silica fume etc.

D. Ashraf M. Wagih *et al. (2013)*

An investigation on the properties of Recycled concrete aggregates is made by using crushing and grading of concrete rubble collected from different demolition sites and landfill locations. A total of 50 concrete cubes have been casted and all this concrete cubes were divided into eight groups. Groups were appointed to study the effect of recycled coarse aggregates' quality content, cement dosage, use of super plasticizer and silica fumes.

A significant reduction in the properties of recycled aggregate concrete made of 100% Recycled concrete aggregate has seen when compared to natural aggregate concrete, while the properties of recycled aggregate concrete made of a blend of 75% natural aggregate concrete and 25% Recycled concrete aggregate revealed no significant change in concrete properties.

E. Yadhu Panicker et al. (2015)

In this project they have replaced sand by crushed (demolished) concrete. The concrete produced using this aggregate gives almost the same strength to concrete as given by natural sand. This is not only cheaper than river sand but also helps to decrease the disposal of construction waste. So finally, use of demolished waste is beneficial not only for the contractor but also for the environment. Test results indicate that the concrete made using crushed construction and demolition waste gives almost as much as strength as normal concrete which is 30.66N/mm^2 for 28 day.

III. SMART, INNOVATIVE , TECHNIQUES OF USING DEMOLITION WASTE

1)Use of recycled aggregate as replacement of natural aggregate-

In this experimental research, they have studied the properties of normal aggregates and properties of recycled aggregates as a replacement of normal aggregates for the NA: RA Ratio of

i) NA: RA=60:40
ii) NA: RA= 70:30
iii) NA: RA= 80:20

For the designed characteristic compressive strength of M20 & M25 design mix. A detailed comparison of difference in the characteristic strength of concrete at 14 & 28 days produced by using recycled aggregates with respect to concrete produced by using normal aggregates without provision for use of any type of admixtures.

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I. Observations-

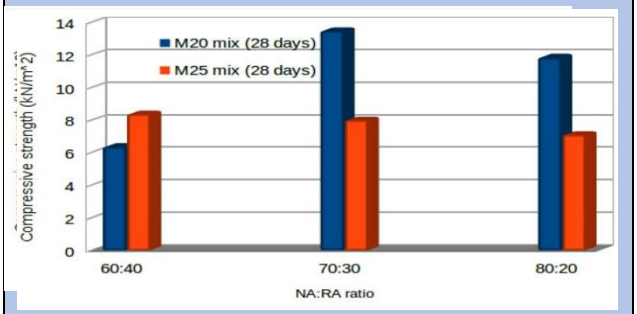

Fig no.2
Comparison result of M20 & M25 mix at 28 days

CONCLUSION-

The NA:RA mix of 70:30 and 80:20 have consistently given better results as compared to mix proportion of 60:40 and thus, maybe recommended for sustainable and economic development of concrete. The concrete is suitable for low level construction works like that of pavements, etc. But however, compressive strength characteristics can be fulfilled with use of stable admixture in proper proportion.

2) Experimental investigation on recycled course aggregate-

The main intent of the present research work is to get the characteristics of the recycled coarse aggregate concrete for structural applications. Then properties of recycled aggregate concrete have to compared with the conventional or natural coarse aggregate concrete. The present investigation is concentrated on the compressive strength and strength characteristics of RCA (Recycled Coarse Aggregate) concrete. The full replacement of natural coarse aggregate with recycled course aggregate is investigated. Three grades of concrete M20, M25 and M30 are adopted in the present investigation.

RESULT

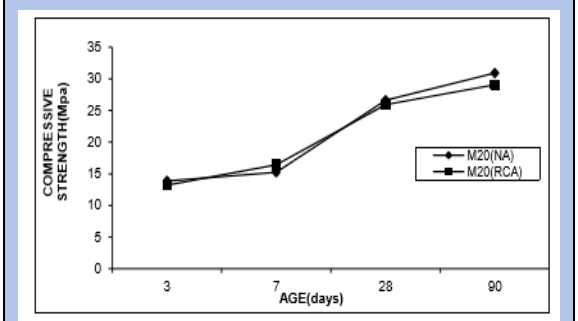

Fig no.4
Variation of Compressive Strength of M 20 Grade Concrete with Curing Period

Aggregate	Grade of Concrete	Days of Curing			
		3 days	7 days	28 days	90 days
Natural Coarse Aggregate Concrete	M 20	13.36	16.23	36.6	42.37
	M25	17.03	20.3	38.3	44.44
	M30	18.84	22.97	44.60	47.85
Recycled Coarse Aggregate Concrete	M 20	14.18	20.78	37.33	44.15
	M25	15.41	22.07	40.73	46.37
	M30	18.52	27.70	45.63	49.47

Fig No. 3
Average Compressive Strength (N/Mm^2) of Tested Cubes for Different Grades at Different Periods of Curing

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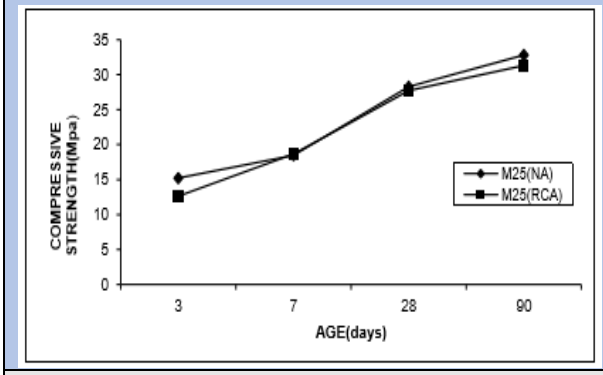

Fig no.5
Variation of Compressive Strength of M 25 Grade Concrete with Curing Period

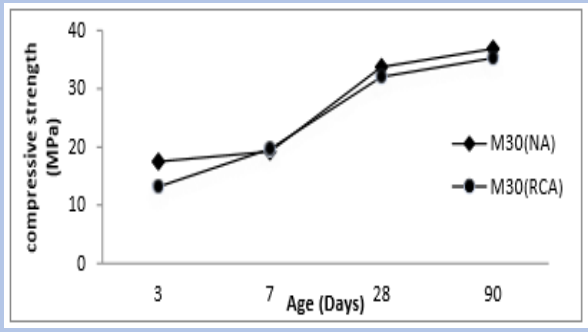

Fig no.6
Variation of Compressive Strength of M 30 Grade Concrete with Curing Period

CONCLUSIONS

Based on the test results of the present investigation, the following conclusions are drawn. Recycled aggregate concrete (RCA) has compressive strength comparable to the natural coarse aggregate concrete compressive strength for all grades of concrete at 3, 7, 28 and 90 days. This can be attributed to the cement mortar coat of RCA participates in hydration process and contribute additional strength. Along with strength, concrete should also be durable. The durability property of concrete is determined using RCPT on the concrete specimens prepared with natural coarse aggregate and recycled course aggregate. It is observed that as per ASTM C1202, the chloride penetrating rate is "high" for RCA concrete and "moderate" for NCA.

Concrete for all grades of concrete. Based on the test results, it can be recommended for the full replacement of NCA concrete with RCA concrete in structural concrete. RCA concrete can be effectively used to meet the objective of disposal of waste and also to meet the replacement for the depleting natural course aggregate.

IV. BENIFITS OF USING RECYCLED AGGREGATES IN CONCRETE CONSTRUCTION

1. Economical concrete structure-

As standard aggregates are replaced by demolished concrete aggregate in the new concrete then the structure will be more economical. Because it will reduce the quantity of standard aggregates hence cost of construction will reduce.

2. Eco-friendly structure-

Use of recycled aggregates helps to reduce the amount of conventional aggregates. Hence it will reduce stress on nature. It will reduce pollution generated at making of conventional aggregates.

3. Less use of landfill-

If we use recycled aggregates in construction than automatically proper use of land can be achieved because there will be less waste. Hence it will reduce need of new landfill.

4. Flexibility-

Recycled aggregates can be used for various construction activities. With recycled aggregate we can do landscaping projects, earth work, home refurbishment, etc.

5. Durability-

From various studies it is concluded that recycled aggregates are as durable as conventional aggregates. They are also structurally sound like conventional aggregate.

V. CONCLUSION

This study was conducted to study the efficient use of demolished aggregates in concrete construction. Conventionally practised methods of dumping of demolished waste in landfill are very hazardous to the environment as well as to the society. But by reusing the demolished waste in the production of concrete, we can contribute in reducing the mass disposal of demolished waste and overcome the scarcity of natural available resources (i.e. river sand) and enhance the characteristics of the concrete.

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From above study we can conclude that demolished waste can be utilized as it is abundantly available throughout the country, and due to its suitable physical properties so as to prevent the hazardous conditions caused to the environment due to dumping of such waste in various ways. This research may be helpful for increasing the performance level of conventionally used concrete.

Based on the researches a highlighted in this paper we can conclude that demolished waste can be utilized as it is abundantly available throughout the country. This research may be helpful for increasing the performance level of conventionally used concrete.

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