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A REVIEW ON STABILITY INVESTIGATION OF CONCRETE MEMBER WITH PARTIAL REPLACEMENT OF CRUSHED CONCRETE AS COARSE AGGREGATE

Amruth.A.K [1], Sudheer.K.V[2]

[1] *PG Student, Department of Civil Engineering, Sreepathy Institute of Management and Technology, Vavanoor, India*

[2] *Assistant Professor, Department of Civil Engineering, Sreepathy Institute of Management And Technology,Vavanoor, India*

Abstract - *Nowadays the trends in the construction industry are changing very quickly. A building becomes obsolete during a short time span. It becomes outdated in both function and form. Thus demolitions of such structures are unavoidable. Due to this the concrete wastes increasing day by day. If we can utilize this waste in some form in the industry it will be a big boost from both economical and environmental point of view. There are several papers are suggested and explained different properties of recycled aggregate. This paper gives an outline of review on this recycled aggregate and its properties and gives how it is suitable for the concrete and its advantages and future scope.*

Key Words: *Recycled aggregate, Mechanical properties, Physical properties.*

1. INTRODUCTION

The vision of a society towards an engineering structure is changing day by day. The new generation trends are clearly different from old generation concepts. The concept about a structure is totally changed, so that the need of changing the face of an existing building is increased. Now the demolition of old building and substitution with new one is a common phenomenon. The main reason behind this are, changes of purpose, expansion of traffic system, structural deterioration, natural disasters (earthquake, flood, tsunami etc.) etc. Because of above reasons we are forced to change the total concept of building. But we have limited resources here. Our aim is to do these changes using minimum amount of resources. Here comes an idea about the recycled aggregate. Using these recycled aggregate large number of construction projects are started in many European, American, Russian and Asian countries.

Figure 1.1 shows the comparison between ordinary coarse aggregate and waste concrete aggregate.In India no deep studies are done so far. Here I am presenting a literature review about this types of concrete.

(a)

(b)

Figure 1 Ccomparison between ordinary coarse aggregate and waste concrete aggregate.

2. LITERATURE REVIWE

Hemalatha.B.R.et.al (2008)[3] introduced an idea for developing a sustainable society by reusing and recycling the construction and demolition waste. This paper highlights the composition of construction and demolition waste, the need for its recycling and where it can effectively use in the field of concrete technology.

Sami W. Tabsh.et.al(2008)[9] investigated the strength of concrete made with recycled concrete coarse aggregate. They did Abrasion test, soundness test, compressive strength test and tensile strength test. For this study four different

types of coarse aggregate used, aggregates from natural origin, recycled from unknown source, aggregate obtained by crushing 30MPa concrete, aggregate obtained from crushing 50Mpa concrete. They concluded that recycled concrete from stronger concrete give good result and recycled concrete require more water to maintain the same slump.

Jian Yin.et.al.(2010)[5] Did investigation on mechanical properties like Flexural strength, Splitting tensile strength, Compression strength and, Young's modulus of recycled aggregate concrete (RAC) which incorporating with mineral admixture including fly ash and slag through laboratory tests. They found that the flexural/compression ratio and tension/compression ratio of RAC were a little higher than those of the natural aggregate concrete.

Mirjana Malešev.et.al.(2010)[7] investigate different properties like compressive strength, slump value, shrinkage and flexural strength of recycled aggregate with natural coarse aggregate in different replacement ratios, 0%, 50% and 100%. The beams with a length of 3.0 m and rectangular cross section of 15cmx25cm with minimum reinforcement were used for flexural test. They concluded that, if we using the water saturated surface dry condition for recycled concrete, it shows the same workability as that of zero percent replacement concrete. Shrinkage of concrete depends on the amount of recycled concrete aggregate. Concrete with more than 50% of recycled coarse aggregate has significantly more shrinkage compared to concrete with natural aggregate. In the case of beam the deflection increase when increase in the replacement ratio. The main reason for such behaviour of is the lower modulus of elasticity of concrete.

Ishtiyaq Gull (2011)[4] studied the stability of construction and demolition waste as coarse aggregate in new construction. He take 3 types of concrete mix FCM(Fresh Concrete Mix), WCM (Waste Concrete Mix), SWCM (Waste concrete strengthened with admixtures). He use M20 grade of concrete. The strength difference between FCM and strengthened concrete is less than 10% for cubes and cylinders and for flexural beam it is less than 5% at 28 days of curing.

Claudio Javier Zega and Angel Antonio Di Maio(2011)[2] done an experimental study for obtaining the properties of waste ready mix concrete. They studied the physical, mechanical and durability properties of structural concrete made with these waste ready mix concrete. They use two strength level low grade concrete and high grade concrete with 25%, 50% and 75% replacement level. In higher grade concrete the amount of water gets constant but the slump value decreases. Unit weight also decreased when percentage replacement increased. For lower strength level the compressive strength of RCA is similar to that of source concrete up to 50% replacement. In higher strength level it was 13% lower than that of reference concrete for all replacement percentage. From the studies they concluded that the strength of concrete made with RCA depends the source of RCA. Also the static modulus of elasticity decreased with increasing percentage of recycled coarse aggregate for both strength levels.

P. Saravana kumar and G. Dinakaran (2012)[8] considered the recycled aggregate with three different ages of 5, 10 and 15 years. Here the fly ash is used in three different combinations: 0% fly ash, 20% fly ash and 20% fly ash with super plasticizer. They compare the various physical properties of concrete made with recycled aggregate concrete with fresh aggregate concrete.

V.Bhashya.et.al (2015)[10] investigated the use of recycled aggregate concrete made using field demolition waste concrete as coarse aggregate. They cast the concrete specimens in three series of percentage. In the first series concrete specimens were casted with the replacement of natural aggregate by 0%, 50% and 100% of recycled aggregates. Second series incorporated 10% of fly ash with 50% and 100% of recycled aggregates. The last series consisted of concrete specimens with 50% and 100% of recycled aggregates along with silica fume. From this paper it was observed that there is a reduction in compressive strength of 12% and 15% of control concrete when natural aggregates are replaced by 50% and 100% respectively. The improvement in strength with the addition of fly ash and silica fume, when 100% of coarse aggregate was replaced by recycled aggregate was 16%. The water absorption of the concrete increases with the percentage of recycled aggregates increases.

Mahdi Arezoumandi.et.al (2015)[6] investigate the flexural strength of reinforced concrete beam which constructed with 100 percent recycled aggregate as well as conventional concrete. This study mainly focused on the cracking, yielding and ultimate moment of the beam. He concluded that, if we are analysing the cracking pattern of recycled concrete beam, their cracks spaced closer than conventional concrete beam. Cracking moment of RCA beam smaller than the conventional concrete beam. But in the case of yielding moment there is only significant difference between conventional concrete beam and RCA beam. RCA have lower stiffness than conventional concrete. The RCA beam showed comparable flexural capacity with the conventional concrete beam.

Adam.M.Knaak and Yahya C. Kurama (2015)[1] investigated the flexural and shear behaviour of reinforced concrete beam that use recycled concrete aggregate as replacement for coarse natural aggregate as replacement for coarse natural aggregate. This is a experimental also a analytical programme. They concluded that the recycled concrete beam cracks spaced closer compare to the conventional concrete beams. Also the cracking moment was less in recycled concrete beam without any significant change in the yielding moment of these.

3. CONCLUSIONS

The recycled concrete contains different types of constituents. Separation of these constituents is very difficult process. If we can reuse these waste is a better way of reducing the construction and demolition waste. Coming to the mechanical properties of recycled concrete aggregate, the compressive strength of recycled concrete aggregate lies between 20%-50% of replacement with natural coarse aggregate. If admixtures added to the mix we can replace it up-to 75%. Workability of concretes decreased with the increase in recycled concrete aggregate content. For getting higher workability extra amount of water is required due to the high water absorption of recycled concrete.

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