

A REVIEW ON STRENGTH ASSESSMENT OF GREEN CONCRETE USING DIFFERENT ADMIXTURES

Yash Photographer¹, Yati Tank², Grishma Thaker³

¹M.Tech Student, Department of Civil Engineering, CGPIT, Uka Tarsadia University, Bardoli, Gujarat, India.

²Assistant Professor, Department of Civil Engineering, CGPIT, Uka Tarsadia University, Bardoli, Gujarat, India.

³Assistant Professor, Department of Civil Engineering, CGPIT, Uka Tarsadia University, Bardoli, Gujarat, India.

Abstract— Generation and handling of construction and demolition (C&D) waste has been focused to achieve sustainability goal at the developing stage of any country. If measures to minimize and handle the C&D waste are not developed and efficiently adopted, it may threat the environment as well as sustainable movement of Indian construction industry. C&D waste in India in 2010 may be estimated as 24 million tonnes. Owing to growth in construction in India, it is appropriate to link generation of C&D waste with the growth. Also the demolition of older structure may have concrete waste, which is deposited anywhere and put the adverse effects on the environment. By adopting waste concrete debris as recycled concrete aggregate (RCA), the conservation of natural resources and cost effectiveness in construction may be achieved. In the present study, an attempt has been made to study the various research papers related to RCA as a partial replacement of normal coarse aggregate (NCA). Also, the papers introducing the mineral admixtures such as, cow dung ash, fly ash, marble dust, etc. as a partial replacement of cement have been studied. And the fruitful concluding remarks have been made. Also, the paper provides an overview of the construction industry in India.

Keywords— recycled, C&D, cow dung ash, fly ash

I. INTRODUCTION

The concrete of its flexibility, durability, sustainability and economy have made its world's most widely used building material. Any construction activity requires several materials such as concrete, steel, brick, stone, glass, clay, mud, wood, and soon. However, concrete is the premier construction material across the world and the most widely used in all types of civil engineering works, including infrastructure, low and high-rise building, defence installations, environment protection and domestic development^[12]. Portland cement is a basic ingredient of concrete. The most common use for Portland cement is in the production of concrete. Concrete is a composite material consisting of aggregate (gravel and sand), cement and water. Portland cement may be grey and white. Many researchers have used different material as alternate to cement in concrete^[3]. Material such as Cow Dung Ash (CDA), Fly Ash (FA), Slag and Silica Fume can be used as partial replacement for cementing material. Cow Dung Ash is obtained from cow excreta which is dried by Sunlight and subjected to burning as a result, ash is obtained in black colour^[5]. Our country stands the first place among the other countries in cows framing and this cow dung as burning at 800°C and it produce the cow dung ash. The fly ash is majorly used in the manufacture of cement. Using cow dung ash and fly ash in the form as partial replacements of cement is very important than other using complementary cementations material. There are both technical advantages and communal benefits in using cow dung ash and fly ash in concrete. In order to make the concrete more ecological friendly and greener there is a dreadful need to use CDA and FA in concrete^[11]. Green concrete is nothing but using greener materials concrete to make a infrastructure more sustainable. Green concrete is cheap to produce because it is prepared by waste materials which lowers the energy consumption, increases its strength and durability. Green concrete was first developed by Dr.WG in 1998. He made green concrete by including various aspects such as mechanical properties, fire resistance, durability, strength environmental properties^[6]. Recycled concrete aggregate (RCA) is generally produced by two stages crushing of demolished concrete, and screening and removal of contaminants such as reinforcement, paper, wood, plastic. Concrete made with such as recycled concrete aggregate is called recycled aggregate concrete (RAC).The main purpose of this work is to determine the basic properties of RAC depending on coarse recycled aggregate content, and to compare them to properties of concrete made with natural aggregate (NAC)- control concrete^[4].

II. Properties of Green Concrete

- Workability- Which is basically the ease with which concrete can be compacted fully without segregating or bleeding^[9].
- Segregation- Which is basically separation of coarse particles from the green concrete.
- Bleeding – which is appearance of water along with cement particles on the surface or freshly laid concrete.
- Harshness- Which is the resistance offered by concrete its surface finish^[9].

III. LITERATURE REVIEW

A. Pandey Shivam , Dalvi Ankit , Patel Arshan , “ Studied on the Green Concrete.” International Journal of Engineering Research and Technology (IJERT) , U.G Student, Department of Civil Engineering, Thakur College of Engineering And Technology, Mumbai, India.

Pandey Shivam , Dalvi Ankit , Patel Arshan^[6] Studied that Green concrete is nothing but concrete made with eco friendly wastes. Green Concrete is a environmental friendly material. In shown in fig various types of concrete were developed by various researchers by using some waste products from industries and agriculture. It possess the convenience of the usage of various by products such as dust, marble, fly ash, plastic waste, marble granules, silica fumes, blast furnace, slag, etc. which requires less amount of energy and it is also less harmful to environment. Use of such materials saves approximately 20% of cements. Thus, green concrete is an excellent substitute of cement as it is cheaper, due to which it is made up of waste products, saving energy. Green Concrete has greater strength & durability compared to normal concrete. With the help of Green Concrete we can save the natural materials for future generations. Green Concrete Technology is one major steps in construction industry to achieve sustainable construction. It is cost effective. In future, green concrete will not reduce environmental problems but it also reduces the cost of concrete. Permeability of green concrete is less than conventional concrete.

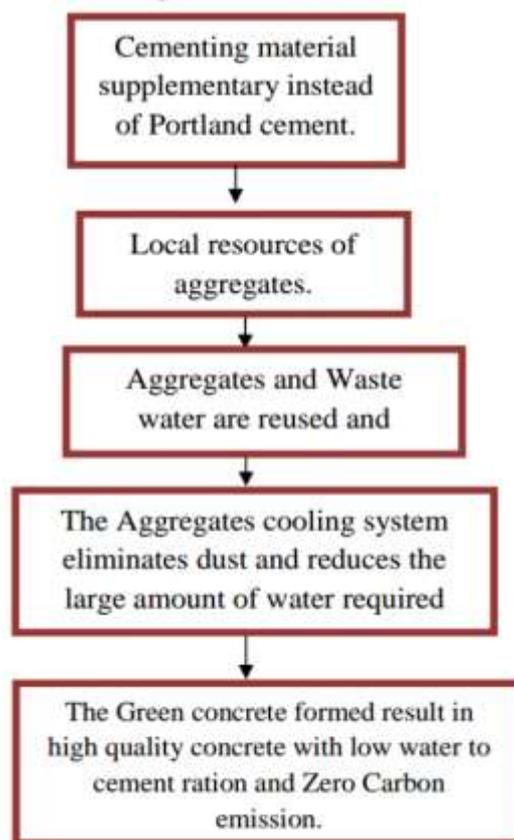


Figure 1 Concept of green concrete^[6]

B. Ojedokon O.Y¹, Adeniran A.A¹, Raheem S.B¹. , “Cow Dung Ash(CDA) as partial replacement in production of Concrete”, British Journal of Applied Science & Technology (BJACT) , Civil Engineering Department, The Polytechnic, Ibadan, Oyo state, Nigeria.

Ojedokon O.Y¹ , Adeniran A.A¹ , Raheem S.B¹.^[5] Studied that the Cow dung was habitually used in concrete and so one may suppose there were particular benefits in its inclusion. Recent publications suggest that dung may improve workability and durability. The cow dung ash has an advantage that offers lightness of weight that makes it useful construction material. Adding CDA in various percentages by weight (10% 20% 30%) of cement and cure period of (7, 14, 21, 28) days. In this paper compressive & workability test are performed. CDA concrete is recommended for use when (10%) of CDA is added. In this paper Author performed various tests for the hard properties of the workability test results give 40 mm, 48 mm, 80 mm, 100 mm respectively for 0% 10% 20% 30% replacement of cement CDA and fresh properties of the compressive test results are 21.33 N/mm², 21.11 N/mm², 11.11 N/mm², 6.00 N/mm² for 0% 10% 20% 30% replacement of cement with CDA respectively 28 days.



Figure 2 Cow Dung Ash(CDA)



Figure 4 Fly Ash (FA)



Figure 3 Recycled Aggregate Concrete(RAC)



Figure 5 Cement

C. Kumar P. Thej, Reddy Harshini R. , “Studied on possibility of utilizing Cow Dung Ash (CDA) as a supplementary cementing material in cement mortar and concrete.”, International Journal of Scientific Engineering and Applied Science (IJSEAS).

Kumar P. Thej. , Reddy Harshini R.^[3] Studied that Cement was partially replaced with percentages (5% 10% 15% 16%) of cow dung ash by weight. In shown in fig the compressive strength of mortar and concrete specimen were determined at (7, 14, 28) days. The compressive strength is increased when cement is replaced by 5% of CDA and decreased with the increase in cow dung ash. And in mortar 5% of cow dung ash may be used as partial replacement to cement in concrete. Hence, its possible the increase in strength can be observed at later curing ages (60 and 90 days) than at early curing periods of (7 and 28 days). In this paper Author had done tests for the hard properties of compressive test results are 22.94N/mm², 16.8N/mm², 8.56 N/mm², 6.93N/mm² for 5% 10% 15% 16% for variation of cement with variation of CDA respectively 28 days.



Figure 6 Compressive test

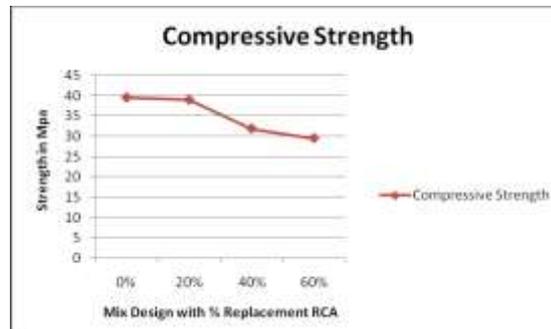


Figure 7 Workability test

D. Tank Yati R, Bhagat Dharmesh K. , Parmar Jigar P. , “Studied on the Experimental Study of Compressive Strength of Recycled Aggregate Concrete.”, International Journal of Engineering Research and Technology (IJERT) , Civil Engineering Department, Sarvajani Collage of Engineering and Technology, Surat India.

Tank Yati R. , Bhagat Dharmesh K. , Parmar Jigar P.^[10] Studied that using the demolished concrete debris as recycled concrete aggregate conserves natural aggregates, reduces the impact on landfills, decreases energy consumption and can provide cost savings. The use of recycled aggregates in concrete results in significant economical and environmental benefits. The basic engineering properties of recycled concrete aggregate (RCA) is evaluated and it is compared with

the Normal Aggregate (NA). Similarly, the basic concrete properties like, compressive strength, workability etc. are studied for the different combinations of RCA with NA. Compressive strength is the most common test conducted on hardened concrete. To evaluate the compressive strength cubes of size 150 mm x 150 mm x 150 mm were casted using C.I. mould. A test was conducted on the cubes of grade M25 at 28 days. Total four concrete mix batches were tested in which one mix was of normal aggregate concrete at 0% replaced by RCA and other are of Recycled aggregate concrete at 20%, 40% and 60% replaced by RCA. The compressive strength of M25 grade normal concrete at 28 days is 39.53 N/mm². At the same time, the compressive strength at 20 % replacement is found to be 38.96 N/mm². Also, there is sudden fall in strength at 40% and 60% replacement, as the quantity of RCA increases. At 60% replacement, the compressive strength is about 29.52 N/mm² which is less than 31.6 N/mm².



Graph 1 Comparison of compressive strength^[10]

IV. CONCLUSIONS

From the study of above research papers it can be concluded that,

- Green concrete has nothing to do with colour. And using eco friendly material in concrete to make system more sustainable.
- The Compressive strength of Fly Ash gives High Strength compared to compressive strength of Cow Dung Ash of Concrete.
- Recycling and reusing of concrete waste proves that its economical material.
- The Cow Dung Ash has an advantage that offers lightness of weight that makes it useful construction material.
- The significant potential in waste materials to produce green concrete.
- Partial replacement of ingredients by using waste materials and admixture shows better compressive and tensile Strength.
- Cow Dung Ash Concrete can be made to perform well in certain floor and wall applications when 10% only it added.
- The use of Recycled Aggregate in Concrete proves to be valuable building materials in technical, environmental and economical aspect.
- Use of RCA in concrete saves the disposal and land filling cost and produce a sustainable concrete for construction.

REFERENCES

- [1] A.Kranthi Swarup¹, T.Naresh Kumar², “ Compressive Study On Mechanical and Durability Properties of Concrete Using Fly Ash and Cow Dung Ash.”, International Journal of Research and Scientific Innovation (IJIRSI). ISSN: 2321 - 2705 , Vol. 4, Issue 7 , July 2017.
- [2] DVS Bhagavanulu , “Studied on possibility of utilizing Cow Dung Ash (CDA) as a supplementary cementing material in cement mortar and concrete.”, International Journal of Scientific Engineering and Applied Science (IJSEAS). ISSN: 2395-3470 , Vol. 1, Issue 9 , Dec 2015.
- [3] Kumar P. Thej, Reddy Harshini R. , “ Studied on possibility of utilizing Cow Dung Ash (CDA) as a supplementary cementing material in cement mortar and concrete.”, International Journal of Scientific Engineering and Applied Science (IJSEAS). ISSN: 2395- 3470 , Vol. 1, Issue 9 , Dec 2015.
- [4] Mirjana Malesev¹ , Valstimir Radonjanin¹ , “ Recycled Concrete as Aggregate for Structural Concrete Production.” ISSN: 2071-1050 .
- [5] Ojedokon O.Y¹, Adeniran A.A, Raheem S.B¹. “ Cow Dung Ash(CDA) as partial replacement in production of Concrete”, British Journal of Applied Science & Technology (BJACT) ISSN : 3445-3454 Vol. 4(24) Issue 2014.
- [6] Pandey Shivam , Dalvi Ankit , Patel Arshan “Studied on the Green Concrete.” International Journal of Engineering Research and Technology (IJERT) ISSN: 2350- 0328 , Vol. 4, Issue 7 , July 2017.
- [7] Roushan Kumar , Deepak Kumar , Sahil Hussain , “ Green Concrete.” International Conference on Emerging Trends in Engineering , Technology. ISBN: 978-93-86171-38-2 , Issue 12, April 2017.

- [8] V.S.R Pavan Kumar.Rayaprolu¹ , P. Polu Raju² , “ Incorporation of Cow dung Ash to Mortar and Concrete.” International Journal of Engineering Research and Application (IJERA). ISSN : 2248-9622 , Vol. 2, Issue 3, May-jun 2012.
- [9] Yati R. Tank , Maulik R. Joshi, “ Strength Assessment of Recycled Aggregate Concrete by Ultrasonic Pulse Velocity Test.” For International Journal of Science, Engineering and Technology Research (IJSETR), Volume 4, Issue 12, December 2015.
- [10] Yati R. Tank , Prof. Dharmesh K. Bhagat, Parmar Jigar P. “ Experimental Study of Compressive Strength of Recycled Aggregate Concrete.” For International Journal of Engineering Research & Technology (IJERT).