



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 1, January 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.569

 9940 572 462

 6381 907 438

 ijrset@gmail.com

 www.ijrset.com



A Review on Maintaining Economy of RAC and its Design Strategy

Anuradha P.Modak¹, Sakshi S. Lonsane², Rizwan Ahmad GY. Shaikh³,

Rushikesh D.Bhatkar⁴, Rupali A. Dakhore⁵

Assistant Professor, Department of Civil Engineering, MGICOET, Shegaon, Maharashtra, India¹

U.G Student, Department of Civil Engineering, MGICOET, Shegaon, Maharashtra, India^{2,3,4,5}

ABSTRACT: As the construction industry is expanding day by day so the need of construction materials is also increasing. Increasing population is one of the factors which is affecting India's construction sector. But on the other hand construction waste is increasing day-by-day because people want to live in modern buildings and they want to use various technologies in their day to day life and it started with the place where they live, work and spend more time of their day. And this Construction and Demolition waste (C&D waste) is causing an adverse effect on environment. Also, the overall construction project cost is increasing because of high rates of construction material. Hence we studied, to develop the best economic solution by use of recycled aggregate in structural concrete by maintaining quality of material. By using Recycled Aggregate in concrete for construction will definitely reduce pollution and will help to create sustainable environment.

KEYWORDS: recycled aggregate, structural concrete, construction and demolition waste, sustainable environment.

I. INTRODUCTION

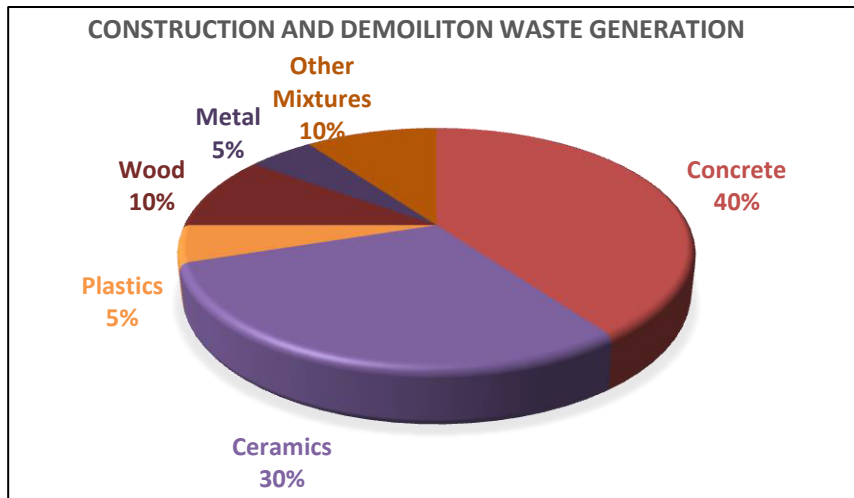
As industrialization is increasing day by day in India urbanization is also increasing. Due to this, rapid growth of India is reaching to 9% of GDP. Rapid development in infrastructure requires a large quantity of construction materials, land and the construction sites. But as an Engineer it's our responsibility to keep an eye to maintain environment while developing our nation by contributing to construction industry. Out of the total construction and demolition waste generated, 40% is of concrete, 30% ceramics, 5% plastics, 10% wood, 5% metal, & 10% other mixtures. Modern construction industry demands new technologies and new construction materials.

1.1 Economic Aspect:

1. Obtaining aggregates free of charge.
2. Abundant source of demolished materials in urban areas.
3. As demolished materials are closer to the factories of concrete than natural sources of material hence transportation cost is also get reduced.
4. Company engaged in the demolition projects use construction waste as a raw material for another projects.

1.2 Design Strategy:

1. Collection of Demolished Materials or Construction waste.
2. Mechanical Screening with the help of revolving screen.
3. Crushing Treatment by using concrete waste crushing machine.
4. Magnatic Separation with the help of magnetic head pullies.
5. Low Graded RA are not taken in use.
6. High graded Recycled Aggregates are obtained after washing.



Graph no. 1 C and D Waste Generation



Fig. no. 1 Recycled Aggregate Concrete Formation



Fig. no. 2 Recycled Aggregates



Fig. no. 3 Natural Aggregates

II. LITERATUREREVIEW

In this review design strategy of Recycled Aggregate is studied by using the literature reviews mentioned below. The replacement of Natural Aggregate with Recycled Aggregate is possible partially and fully. In urban areas of India construction waste is increasing day by day and this is causing problems to the environment. And with the help of literature reviews given below it is studied that how to reduce construction and demolition waste with maintain economy of construction project. Literature given below helped to study that recycling is one of the major aspect to reduce an adverse effect which is occurring in the environment due to construction and demolition waste.

2.1 Katrina McNeil et al. (2013) – Authors worked out on the effects of RCA use on concrete material properties. Replacement of natural aggregates in concrete with recycled concrete aggregate decreases the compressive strength of concrete, but yields comparable splitting tensile strength of concrete. Also, the modulus of rupture was found slightly to be less than conventional concrete. As far as structural performance is concerned, structural members like beams, columns do not experience midspan deflections under service loading.

2.2 Md. Safiuddin et al. (2013) - Authors have observed in this paper that the use of recycled concrete aggregate in concrete as a partial and full replacement is possible without change of durability of structure. Also, it will reduce demand for natural aggregates which will definitely help to reduce cost of construction projects. Along with this physical, chemical and mechanical properties of RCA are discussed in this paper. Recommendations for future research are also provided in this paper.

2.3 Nada Curovic et al. (2016)–Author introduced an economic model which shows overall cost of project also affects with the price of demolition, transport costs of material and machineries, the price of recycling, labor costs and the price of natural materials. The study has shown that production of recycled aggregate concrete, is most cost effective.

2.4 Nitin Goyal et al. (2016)–Authors in this paper discussed need of recycled concrete aggregate. As aggregates are main component of concrete which plays a main role in development but the real challenge is to protect environment and according to authors protection of environment is possible by reducing consumption of energy. Various tests were carried out on RAC and the tests were Compressive test, Tensile splitting test, Slump test.

2.5 Aquib Javid et al. (2017)–Author worked out a study on the properties of recycled aggregate concrete. According to the study of author, construction industry produces 40% of total waste each year. This waste causes the various environmental hazards and causes land fill issue. In this paper the author introduced that demolished structures, site



tested concrete, pile cap demolished concrete are good sources of recycled aggregate.

2.6 Dung Tien Nguyen (2018)– In this paper, author presented the findings of long term properties of high performance recycled aggregate concrete. According to data of this paper water absorption capacity of recycled aggregate is directly proportional to recycled aggregate content. The concrete samples were examined in this study and satisfactory results were found durability and anti-erosion capacity.

2.7 Manik Goyal et al. (2018)–Author carried out a study on past researches by different scholars and the results obtained from various research have been studied. According to author's research, aggregates represents 70-80% of total concrete mass. And finally, the author made an important conclusion that recycled aggregate can be replaced with natural aggregate in concrete.

2.8 Jung-Ho Kim et al. (2019) – Author described Korean scenario of construction waste generation. In this study, author carried out research on mechanical and durability properties of recycled aggregate concrete and the quality of RA was improved. Further, this improved RA can be used for environmental improvements.

2.9 Bhagyashree Panda et al. (2020) – In this paper the authors carried out a study on replacement of coarse aggregate with NA for rigid pavement. According to authors process of formation of NA creates serious hazards to ecosystem. It also causes deforestation, air and noise pollution. Tests were carried out separately on aggregates as well as concrete cubes.

2.10 Natt Makul et al. (2021) – A review was proposed by authors which proves that concrete which is made up of complete replacement of NA by RA (Recycled Aggregate) does not reduce the quality of concrete. Cement production and aggregate formation requires non-renewable fossil energy and carbon dioxide which is responsible for global warming.

III. ADVANTAGES AND LIMITATIONS

3.1 Advantages:

1. Moisture does not affect the expansion property of RCA hence can be used in frosted region also.
2. Generally, RA are light in weight also the plant can be established near to construction site, hence it reduces transportation cost as well.
3. Recycled Aggregate's compaction factor is also high as compared to NA.
4. Formation and use of RA is environmental friendly and also it saves energy of mining, extraction activities.
5. During the formation of NA dust emission is also less when compared to NA formation process.
6. It saves time also as it is easily available.
7. Due to less crushing less carbon emission is also less.

3.2 Limitations:

1. Sometimes permission required for machinery for formation of RA is not easily granted. It totally depends on rules and regulations of respective state or province.
2. RA possess less strength value when compared to NA. Hence it cannot use for high-rise structures.
3. The wash water escape from recycling plant is highly alkaline and hence it creates an adverse effect on aquatic life. pH of this highly alkaline water is 12.
4. RA have high water absorption phenomenon.
5. Sometime RA obtained are of low quality which cannot use in concrete. It causes wastage of RA.

IV. APPLICATIONS

1. Most of the time recycled aggregates can be used as paving material and building blocks in some regions.
2. Due to flexibility of formation of RA cost of RA is get reduced and hence overall cost of construction project also get reduce.
3. RA can be used in road construction also.
4. RA can also be used for construction of drainage structure to maintain economy.
5. RA can also be used for dispensaries or other low budget housing.



6. It can be use as granular base course layer when used for pavement construction.

REFERENCES

1. Katrina McNeil, Thomas H.-K. Kang, "Recycled Concrete Aggregates: A Review", International Journal of Concrete Structures and Materials Vol.7, ISSN 1976-0485, 2013.
2. Md. Safiuddina, Ubagaram Johnson Alengaramb, Md. Moshir Rahmanb, Md. Abdus Salamb, Mohd. Zamin Jumaatb, "Use of Recycled Concrete Aggregate in Concrete: A Review", Journal of Civil Engineering and Management, 2013.
3. Nada Curovic, JP Elektromreza Srbije, "Recycled Concrete - Ecology And Economic Criterias", Journal of Applied Engineering Science 14(2016)2, 2016.
4. Nitin Goyal, Shagun Chaddha, Hitanshu Saini, "Need of Recycled Concrete Aggregates", International Journal of Trend in Research and Development, Volume 3(2), ISSN: 2394-9333, 2016.
5. Aquib Javid, Er. Aman Bathla, "A Review Study on the Properties of Recycled Aggregate Concrete", International Journal of Latest Research in Engineering and Computing (IJLREC), ISSN: 2347-6540, Volume 5, Issue 3, 2017.
6. Dung Tien Nguyen, "Long-Term Mechanical and Durability Properties of High-Performance Recycled Aggregate Concrete", 2018.
7. Manik Goyal, Hinoni Goyal, "A Review Paper on use of Recycled Aggregates in Concrete", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, 2018.
8. Jung-Ho Kim, Jong-Hyun Sung, Chan-Soo Jeon, Sae-Hyun Lee, Han-Soo Kim, "A Study on the Properties of Recycled Aggregate Concrete and Its Production Facilities", Multidisciplinary Digital Publishing Institute, 2019.
9. Bhagyashree Panda, Nazia T. Imran, Kundan Samal, "A Study on Replacement of Coarse Aggregate with Recycled Concrete Aggregate (RCA) in Road Construction", Springer Nature Singapore Pte Ltd., 2020.
10. Natt Makul, Roman Fediuk, Mugahed Amran, Abdullah M. Zeyad, Sergey Klyuev, Irina Chulkova, Togay Ozbakkaloglu, Nikolai Vatin, Maria Karelina, Afonso Azevedo, "Design Strategy for Recycled Aggregate Concrete: A Review of Status and Future Perspectives", Multidisciplinary Digital Publishing Institute, 2021.
11. Arulrajah, J. Piratheepan, M. M. Y. Ali, M. W. Bo, "Geotechnical Properties of Recycled Concrete Aggregate in Pavement Sub-Base Applications", Geotechnical Testing Journal, Vol. 35, 2012.
12. Tushar R Sonawane, Sunil S. Pimplikar, "Use of Recycled Aggregate in Concrete", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 2 Issue 1, 2013.
13. Ahmed Shaban Abdel-Hay, "Properties of recycled concrete aggregate under different curing conditions", Housing and Building National Research Center Journal, 2015.
14. Pavan P S, Babitha Rani H, Deepika Girish, Raghavendra K M, Vinod P N, Dushyanth.V. Babu.R, Shaik Numan, "A Study on Recycled Concrete Aggregates", International Journal of Pure and Applied Mathematics Volume 118, ISSN: 1311-8080, 2015.
15. Marija Nedeljkovic, Jeanette Visser, Branko Savija, Siska Valcke, Erik Schlangen, "Use of fine recycled concrete aggregates in concrete: A critical review", Journal of Building Engineering, 2021.



**Impact Factor:
7.569**



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details