WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

The Effect on the Behavior of Concrete by Using Recycled Aggregate Concrete

Deepak Sangwan[1], Abhishek Sharma[2], Mohit Kumar Yadav[3]

[1]M. Tech Scholar, 2nd year, Department of Civil Engineering, CBS group of Institutions, Jhajjar Haryana (India)
[2]Assistant Professor, Department of Civil Engineering, CBS group of Institutions, Jhajjar Haryana (India)
[3]M. Tech Scholar, 2nd year, Department of Civil Engineering, CBS group of Institutions, Jhajjar Haryana (India)

ABSTRACT:

This analysis of prior studies on the behavior and characteristics of recycled aggregate concrete is a compilation of the data from such investigations. Construction and demolition trash are produced in significant quantities by the construction industry. This garbage may take the shape of trash and construction waste, such as shattered bricks, mortar, concrete, and steel. The foundry business also produces a lot of waste sand at the same time. The sand used in foundries is utilized to create the molds needed for casting. It is discarded in open spaces or low-lying places after serving its purpose. Additionally, open space and low lying places are used to dump building and demolition waste. This process pollutes groundwater and damages the ecosystem. Concrete with recycled aggregates uses components from masonry and concrete projects. Reusing demolition debris aids in closing the gap between aggregate supply and demand and solves the issue of waste disposal.

According to many experts, recycled aggregates made from concrete specimens provide high-quality concrete. Numerous surface treatment techniques, such as washing the recycled aggregates with water and dilute acid, were examined to improve the quality of recycled coarse aggregate. The treated and untreated coarse aggregates' strength characteristics were contrasted. According to the findings, recycled aggregate has a lower compressive strength than natural aggregate. Numerous tests employing demolition trash have been conducted to examine the strength behavior of recycled aggregate concrete. With regard to workability and strength variation, recycled aggregate-made concrete behaves more or less similarly to conventional concrete. The report presents a comparative examination of the experimental findings regarding the properties of freshly-poured and fully-cured concrete with various replacement ratios of natural and recycled coarse aggregate. Waste concrete from precast concrete columns and laboratory test cubes was crushed to create recycled aggregate. Three different concrete compositions were tested: one with only natural aggregate (NAC), which served as the control, and two with natural fine and recycled coarse aggregate (with 50% and 100% replacement of the latter).

Keywords: Construction material, demolition waste, recycled coarse aggregate, compressive strength, Acids.

1. INTRODUCTION

After water, the second most used material worldwide is concrete, and urban growth is based on its extensive use. An estimated 25 billion metric tons of concrete are produced annually. The most popular building material utilized in all forms of civil engineering projects, including infrastructure, low- and high-rise structures, military installations, environmental protection, and local/domestic constructions, is concrete. A manufactured good called concrete primarily consists of cement, aggregates, water, and additives. Aggregates, or inert granular materials like sand and crushed stone, make up a significant portion of these. Historically, aggregates have been easily accessible and affordable.

On the other hand, there are more than 1 billion tonnes of construction and demolition trash produced annually. Crushed concrete is now widely available and is a byproduct of both new construction waste and the demolition of older buildings. An estimated 2% to 10% (on average 5%) of the projected ready-mixed concrete produced each year is thought to be returned to the concrete plant, raising serious disposal concerns. Over the past two decades, the importance of using recycled aggregates made from construction and demolition debris in new building has increased. A global problem is minimizing waste and lessening the load on landfills. The use of recycled aggregate in concrete has been the subject of extensive research on a global scale. Hardened concrete can be crushed and utilized as a partial replacement for natural aggregate in fresh concrete construction. This is a tried-and-true technology. Recycling construction waste is crucial for reducing the requirement for landfill space and for preventing the depletion of basic materials. The usage of natural aggregate and the accompanying environmental costs of mining and transportation are conserved when concrete materials are recycled or recovered, while landfill space is maintained for items that cannot be recycled. In the past few decades, there have been numerous attempts to create high-quality uses for building waste, such as using it as aggregate when creating new concrete. All concretes in which recycled material generated by crushing old concrete was used in place of the natural coarse aggregate generally showed a reduction in compressive strength. In the present work, we will investigate the viability of recycled aggregate in the production of concrete when it is mixed with various ratios of fly ash and admixtures. We will examine the strength characteristics of concrete that is created using the best possible ingredient ratios.

II. LITERATURE REVIEW

LIMBACHIYA AND LEELAWAT (2000)[1], discovered that recycled concrete aggregate had a relative density 7 to 9% lower and a water absorption rate 2 times higher than natural aggregate. The ceiling strength of concrete was not affected by the replacement of the 30% coarse recycled concrete aggregate, according to the test results. Additionally, it was claimed that high strength concrete mixes could incorporate recycled concrete aggregate as part of the concrete's aggregate mix.

Sagoe, Brown and Taylor (2002)[2],stated that the difference between the characteristic of fresh and hardenedrecycled aggregate concrete and natural aggregate concrete is relatively narrower than reported for laboratory crush recycled aggregate concrete mixes. There was no difference at the 5% significance level in concrete compressive and tensile strength of recycled concrete and control normal concrete made from natural aggregate.

Akansha Tiwari (2015)[3], studied about water absorption of RCA and founded that water absorption is higher than the natural aggregate also the compressive strength of concrete containing 50% of RCA has strength approximately to that of normal concrete. Also her study tells that Concrete has good tensile strength when replaced up to 25-30%.

Vinod Sunhere and Rajesh Joshi (2015) [4],studied and their test results suggest that as the percentage of Natural Aggregate decreases by replacing the Recycled Concrete Aggregate, the corresponding strength goes on decreasing, yet up to 60% replacement it achieves target mean strength.

N.Sivakumar (2014)[5], et al studied the percentage of RCA replacement, and it was discovered that as RCA replacement rises, so does its compressive strength. The compressive strength, however, rises as the water/cement ratio of the mixture is reduced. The findings of their investigation demonstrate that by reducing the water cement ratio and altering the mix's admixture concentration, compressive strength (40 MPa) may be attained with 30 to 40% of RCA substitution.

Prof. Dharmesh K. Bhagat et al(2014)[6], from their study concludes that the, recycled coarse aggregate has comparatively less specific gravity than Natural coarse aggregate. Water absorption of Recycled coarse aggregate was found greater then Natural coarse aggregate, because of adhesive property in cement mortar and cement paste. Result shows that the compressive strength for the use of Recycled coarse aggregate up to 40% can affect the stability requirements of concrete structures.

Yong.P.C and Teo,D.C (2009)[7], performed experiment in which the 28 day strength concrete cubes were crushed to suitable size and reused as recycled coarse aggregate. The w/c used in all mixes is 0.41. The proportion of cement: sand: gravel is 1: 1.11:

2.07. And they concluded that RAC can achieve high compressive strength, split tensile strength as well as flexural strength.

Parekh.D.N.,et al., (2009)[8], outlined the fundamental characteristics of recycled coarse aggregate and recycled fine aggregate. Here, the fundamental characteristics of concrete—compressive strength, flexural strength, workability, etc.—were described for various mixes of recycled aggregate and natural aggregate. They came to the conclusion that RA can be utilized in concrete and that its use has very few (if any) application-related problems.

III. MATERIAL USED

Ordinary Portland Cement (OPC) is the most common cement used in general concrete construction when there is no exposure to sulphates in the soil or groundwater.OPC is a gray coloured cement powder. It is capable of bonding mineral fragments into a compact whole when mixed with water. This hydration process results in a progressive stiffening, hardening and strength development.

Recycled aggregate is produced by crushing concrete, and sometimes asphalt, to reclaim the aggregate. Recycled aggregate can be used for many purposes. The primary market is road base. For information on recycling asphalt pavement into new asphalt pavement.

IV. CHARACTERISTICS OF MATERIALS

In general, a lower w/c ratio results in a more durable concrete mix. The durability of recycled aggregate (RA) can be influenced by coarse aggregate replacement ratio, concrete age, w/c ratio, and moisture content. RABecause recycled aggregate is highly porous, concrete is less durable. However, the combination of recycled aggregate with CO2 and chlorides, which lowers their penetration rates, may compensate for decreased resistance to ingress of some agents. SCM is utilized to increase the RA's strength and durability. concrete The compressive strength is reduced by 5 to 25% when recycled aggregates replace virgin aggregates by 50 to 100%. However, it was discovered that RCA may replace up to 30% virgin aggregate without affecting the strength of the concrete.

Recycled aggregate has marginal influence on flexural strength, some studies showed that flexural strength reduction is limited to 10 % in RA concrete. Others indicated that RA concrete has very similar flexural behavior with virgin aggregate concrete.

When compared to regular concrete, RA concrete exhibits 25 and 35% more shrinkage and creep deformation, respectively. The percentage of substitution, the size and origin of the parent aggregate, the mixing method, curing, SCM, and chemical admixture all have an impact on the shrinkage and creep of RA concrete. Curing, low w/c ratios, and mix proportioning may all be employed to enhance behavior, according to recent studies.

V. NECESSITY FOR THE RE-USE OF RECYCLED AGGREGATE CONCRETE(RAC)

It has been discovered that recycling and reusing building wastes is an excellent solution to the issues of dumping hundreds of thousands of tons of rubbish together with a shortage of natural aggregates. We must apply the 3R approach due to the necessity for sustainable development and the scarcity of natural resources. We must adhere to the principle of Reduce, Reuse, and Recycling. Thus, sustainable growth will be encouraged. Sustainability is widely acknowledged as the cornerstone for resource and energy-saving technological advancements in numerous industries, including the building industry. The concrete industry has increasingly adopted the phrase "sustainable construction materials," but most often mistakenly as a synonym for "recycled materials".

In terms of technology, the environment, and the economy, recycled aggregates in concrete may prove to be valuable building materials. When compared to natural aggregate, recycled aggregate is significantly less expensive but has poorer bulk density, workability, crushing, and impact properties, as well as higher water absorption. However, further investigation and action should be taken to apply RCA and change our design guidelines, requirements, and practices to employ recycled aggregate concrete.

VI. CONCLUSION

The characteristics and strength of concrete were investigated experimentally by substituting recycled aggregate for coarse aggregate. Concrete specimens were cast, and their compressive, split-tensile, and flexural strengths were examined. The percentage that produced superior results than conventional concrete for 7, 14, and 28 days in terms of compressive strength, split tensile strength, and flexural strength when substituted with recycled aggregates was deduced from the test data.

It is evident from numerous studies that recycled aggregate can be used alongside natural aggregates. Recycled aggregate and natural aggregate can be combined in ratios of 80:20, 75:25, and 70:30.A higher percentage of recycled aggregate can degrade the mix's qualities and strength. The building sector can reduce the environmental impact of trash by using recycled aggregate. It will encourage long-term growth. It will lighten the load on natural aggregate, allowing it to be utilised for other crucial purposes.

REFERENCES

[1]. Limbachiya M. C., Leelawat T. and Dhir R. K.,2000, Use of recycled concrete aggregate in highstrength concrete, Materials and Structures, Volume 33, November 2000.

[2]. Sagoe, Brown and Taylor "High-Strength Structural Concrete with Recycled Aggregates" in 2002.

[3]. Akansha Tiwari, "Recycled Concrete Aggregates" (IRJET) Volume: 02 Issue: 06 | Sep-2015.

[4]. Vinod Sunhere and Rajesh Joshi, "Evolution of Concret using Recycled Concrete Aggregate made up by Crushed Concrete Structures" 2015

[5]. N.Sivakumar, S.Muthukumar, V.Sivakumar, D.Gowtham and V.Muthuraj,"Experimental studies on High Strength Concrete by using Recycled Coarse Aggregate, International Journal of Engineering and Science",Vol.4, Issue 1, Jan 2014.

[6]. Prof. Dharmesh K. Bhagat, Jigar P. ParmarYati, R. Tank, Darpan H. Gadhiya and Jigar S. Goyani, "Experimental Study of Compressive Strength of Recycled Aggregate Concrete" International Journal ofEngineering Research & Technology (IJERT) Vol. 3 Issue 4, April – 2014.

[7]. Yong, P.C. and Teo, D.C.L. "Utilisation of Recycled Aggregate as Coarse Aggregate in concrete" UNIMASE-Journal of Civil Engineering, Vol. 1: issue 1 August 2009.

[8]. Parekh D. N. and Dr.Modhera.C.D "Assessment of Recycled Aggregate Concrete" Journal of EngineeringResearch and Studies, E-ISSN 0976-7916.

[9]. Kornack and P. Rakic, "Cell Proliferation without Neurogenesis in Adult Primate Neocortex," Science, vol. 294, Dec. 2001,pp. 2127-2130, doi:10.1126/science.1065467.

[10]. M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.

[11]. R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

[12]. K. Elissa, "Title of paper if known," unpublished.