e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

REVIEW PAPER ON HIGH PERFORMANCE CONCRETE USING RECYCLED AGGREGATES

A.S Moon[*1], Nayan Gode[*2], Nandkishor Parteki[*3], Akash Shahu[*4]

[*1]Professor, (HOD), Department Of Civil Engineering, Smt. Radhikatai Pandav College Of Engineering, Nagpur, Maharashtra, India.

[*2,3,4]Student B.E. Department Of Civil Engineering, Smt. Radhikatai Pandav College Of Engineering, Nagpur, Maharashtra, India.

ABSTRACT

Crushed, graded inorganic particles that have been processed from construction materials and demolition debris make up recycled aggregates. The purpose of this study is to look into the strength characteristics of recycled aggregates for use in high-performance concrete, in order to learn more about the characteristics of concrete that uses recycled aggregates as a coarse aggregate substitute in structural concrete. The purpose of this research is to examine and contrast the characteristics of high-performance concrete constructed entirely of recycled particles.

The use of waste materials to produce new products is a worldwide trend that is quickly gaining support. Recycling materials allows for a more efficient life cycle and contributes to environmental protection. This practise has gained traction in the building sector due to the paucity of natural resources and the environmental difficulties connected with storing demolition waste. As a result of this situation, researchers are exploring for new ways to utilise these wastes, and employing them as aggregates in concrete is an exciting possibility. The problem with recycled aggregates in concrete, according to research conducted around the world, is that they have a lesser strength and durability.The purpose of this study is to see how recycled aggregate from high-strength parent concrete influences high-performance concrete properties.

Keywords: Compressive Strength, Natural Aggregate Concrete (NAC), Recycled Aggregate Concrete (RAC).

I. INTRODUCTION

Because of its high structural strength, stability, and longevity, concrete is a widely used construction material in the civil engineering industry. The Indian building industry uses about 400 million tonnes of concrete per year and is likely to surpass a billion tonnes in less than a decade. Deterioration, long-term poor performance, and insufficient resilience to hostile environments, combined with increased demands for more advanced architectural form, prompted faster study into cement and concrete microstructure. As a result, new auxiliary materials, enhanced concretes, and composites have been created. The development of a durable concrete that is less reliant on the quality of building work was prompted by the frequent occurrence of durability-related problems in concrete structures.

II. MATERIAL

2.1 CEMENT

In this study, ordinary Portland cement of grade 53 from the local market was employed. The cement used was tested for various amounts according to IS 4031-1988 and determined to meet the requirements of IS 12269-1987. The fineness was 2280cm2/gm and the specific gravity was 3.1.

2.2 Fine Aggregate

The fine aggregate utilised in the study was river sand from a local river that met Indian standard specifications for zone II (IS 383-1970). The sand was sieved through a 4.75mm IS sieve to eliminate any particles larger than 4.75mm, then washed to remove dust.

2.3 Coarse Aggregate

Coarse aggregate is the material that passes through IS sieve no. 4.75. For the experiment, two types of coarse aggregate were used. There are two types of coarse aggregate: natural coarse aggregate and recycled coarse aggregate. The investigation's recycled coarse aggregate came from demolished cubes examined in the civil engineering department's concrete technology lab. They are taken from the final mix made with natural

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

aggregate in this study. As a result, the parent concrete from which recycled aggregate was obtained at the age of 28 days was of grade 80 MPa, whereas natural aggregates were collected from a nearby stone quarry.

2.4 Silica fume

Silica fume is produced as a byproduct of the production of silicon metal or ferrosilicon alloys. One of the most prominent mineral admixtures with pozzolanic characteristics.

2.5 Super plasticizer

Aura mix 400, manufactured by Fosroc Chemicals, is a high-performance superplasticiser designed for applications requiring high water reduction and long workability retention. It was designed for use in self-compacted concrete, pumped concrete, concrete with long workability retention, and high-performance concrete.

III. MIX PROPORTIONING

Designing an acceptable mix proportion and analysing the qualities of the concrete thus obtained are the most important tasks in producing high-performance concrete. There are a variety of standard mix design and proportioning procedures. The preliminary mix design for this study was done using the ACI method for M80 grade high performance concrete with 100 percent natural coarse particles.

Following the initial mix design, trial mixes are created and tested for fresh concrete qualities. If the design mix fails to meet all of the standards for concrete's fresh properties. The quantities of the trial mixtures are fine-tuned until all requirements are met. We arrived at the final blends after repeating the trials.

IV. EXPERIMENTAL METHODS

Procurement of Materials

⬇

Testing of Materials

⬇

Arriving mix Proportion

⬇

Testing of fresh concrete

⬇

Casting & curing of concrete

⬇

Strength Investigation

⬇

Permeability Test

⬇

Durability Test

⬇

Result & Discussion

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:04/April-2022 Impact Factor- 6.752 www.irjmets.com

V. ADVANTEGES AND DISADVANTEGES

ADVANTEGES

- Cost-cutting There are no negative impacts on concrete, and the higher cost of cement is predicted to be offset by the lower cost of Recycled Concrete Aggregate (RCA).
- Save the environment> There will be no natural resource mining and less transportation. Less acreage is required, resulting in lower carbon emissions.
- Time is money. There is no need to wait for materials to become available.
- Job opportunity In the recycling industries, it creates job possibilities and economic activity.
- Reduces the amount of waste that is dumped in landfills and burned in incinerators.
- Natural resources such as timber, water, and minerals are conserved.
- Increases economic security by utilising a home material source.
- Reduces the need to obtain additional raw materials, which reduces pollution.
- It conserves energy.

DISADVANTES

- A lower level of quality (e.g. compressive strength reduces by 10-30 percent). The length of time it takes to purchase materials may have an impact on the project's life cycle.
- Land, specific equipment, and machinery are all needed (more cost). Water absorption is really high (up to 6 percent).
- It has a larger drying shrinkage and creep than other fabrics.
- 1Recycling Disadvantages
- High initial capital expenditures.
- Recycling centres are always unsanitary, dangerous, and unattractive.
- It is possible that products made from recycled garbage would not last.
- It's possible that recycling isn't cheap.
- On a big scale, recycling is not practised.
- More pollution as a result of increased energy usage and pollution.

VI. APPLICATIONS OF RECYCLED AGGREGATE

- Can be used to build gutters, pavements, and other structures.
- Large chunks of crushed aggregate can be used to construct revetments, which are effective at preventing soil erosion.
- Concrete rubbles that have been recycled can be utilised as coarse aggregate.
- Many by-products of RAC production are produced, including a ground improvement material, a concrete addition, and an asphalt filler, among others.

VII. FUTURE SCOPES OF RECYCLE OF AGGREGATE

- India currently generates roughly 23.75 million tonnes of construction and demolition (C & D) trash per year, with these estimates expected to treble in the next seven years.
- In affluent countries, C&D waste, particularly concrete, has been viewed as a resource.
- Recycling efforts have stressed the importance of adhering to the required compressive strength when using old concrete in second generation concrete.
- Using recycled aggregate from demolished concrete, the project was completed.
- Our goal is to look into the properties of recycled aggregate concrete in terms of numerous criteria.
- After comparing the results of numerous tests performed on recycled aggregate and natural aggregate, it was discovered that the recycled aggregate has different result values, implying that RA and NA have highly different qualities.
- However, using recycled aggregate, the Control mix performed better.

- The compressive strength of recycled aggregate concrete is determined by the grade of concrete demolished to obtain recycled aggregate and the age of the demolished concrete, according to the findings.

VIII. CONCLUSION

The findings of the experiments are highly encouraging in terms of encouraging the usage of recycled aggregate in high-performance concrete. The following are some of the significant results reached from this research: When compared to natural aggregate HPC, recycled aggregate HPC showed better compressive strength and split tensile strength after 28 days. The qualities of RCA concrete are more affected by the strength of the parent concrete from which recycled aggregate was produced. When compared to natural aggregate HPC, recovered aggregate HPC has a two-fold higher water absorption rate.Natural aggregate HPC has a 3 times greater sorptivity coefficient than recycled aggregate HPC. When compared to natural aggregate HPC, recycled aggregate HPC showed better acid resistance. The results of this experiment show that recycled aggregate obtained from high-quality parent concrete has the ability to totally replace natural aggregates in high-performance concrete.

IX. REFERENCES

[1] Bureau of Indian Standards, New Delhi, IS516:1959(Reaffirmed 1999), Indian Standard Method of a Test for Concrete Strength.

[2] M Chakradhara Rao, S. K. Bhattacharyya, and S. V. Barai, "Recycled Concrete Aggregate and Its Use in Concrete," ICI Journal, January-March 2011, pp. 27-40.

[3] A. K. Padmini, K. Ramamurthy, and M. S. Mathews, "Influence of Concrete on the Properties of Recycled Aggregates Concrete," Construction and Building Material, 23(2009), pp. 829-836.

[4] Dhir R K and Paine K. A., Value Added Sustainable Use of Recycled and Secondary Aggregate in Concrete, The Indian Concrete Journal, Vol. 84, No. 3, pp. 7-26. (2010)

[5] Recycled Concrete Aggregate: A Sustainable Built Environment, International Conference on Sustainable Built Environment (ICSBE-2010), Kandy, 13-14 December 2010.

[6] M. Chakradhara Rao, S. K. Bhattacharyya, S. V. Barai, Recycled Concrete Aggregate: A Sustainable Built Environment, International Conference on Sustainable Built Environment (ICSBE-2010), Kandy, 13-14 December 2010.Rozuddin Nassar, Parviz Soroushian, Strength and Durability of Recycled Aggregate Concrete Containing Milled Glass as Partial Replacement for Cement, Construction and Building Material (2012)p.p. 368-377.

[7] Parekh, D. N., and Modhera, C. D., Assessments of Recycled Aggregate Concrete, Journal of Engineering Research and Studies, vol. 2, pp. 1-9. (2011)

[8] Okamura

[9] Self Compacting Concrete, Amd M. Ouchi, Journal of Advance Concrete Technology, 1(1), pp. 5-15, 2003.

[10] EFNARC Self-Compacting Concrete Specification and Guidelines. 32, February 2002.

[11] IS 12269:1987, Indian Standard Code of Practice for Specification of 53 Grade Ordinary Portland Cement (Reaffirmed 2004) New Delhi's Bureau of Indian Standard. IS 383:1970 (Reaffirmed2002), Bureau of Indian Standard, New Delhi, Indian Standard Code of Practice for Specification for Coarse and Fine Aggregates from Natural Sources for Concrete. A Simple Mix Design Method for Self Compacting Concrete, Nan Su, Kung-Chung Hsu, His-Wen Chai, Cement And Concrete Reserch, 31 (2001), pp. 1799-1807.