International Journal of
AI ELECTRICAL CIVIL AND MECHANICAL ENGINEERING
Peer Reviewed, Referred & Indexed Journal
ISSN: 3070-0434 www.zesterapublications.com Original Research Paper

EXPERIMENTALINVESTIGATIONONRECYCLEDAGGREGATE CONCRETE CONTAINING CRUMB RUBBER

[1] P. Subash Babu,[2] E. Pranith, [3] E. Kalyan, [4] M. Laxman, [5] M. Madhu, [6] P. Karthik, [7]D. Venkatesh
[1]Assistant Professor,[23456]Students, [7]Associate Professor
Department of Civil Engineering
Narsimhareddy Engineering College, Maisammaguda, Kompally, Secunderabad.

ABSTRACT
This study deals with the experimental investigation on recycled aggregate concrete (RAC) containing crumb rubber as a partial replacement of natural aggregates. Due to rapid urbanization and increasing construction activities, the demand for natural aggregates is increasing, leading to depletion of natural resources. At the same time, disposal of waste materials such as demolished concrete and waste tires has become a major environmental concern. Recycled aggregate and crumb rubber provide an effective solution to these issues by promoting sustainable construction practices. In this study, recycled coarse aggregates obtained from demolished concrete and crumb rubber obtained from waste tires are used in concrete mixtures. Different percentages of crumb rubber are used as partial replacement to fine aggregates, and the mechanical properties of concrete such as compressive strength, split tensile strength, and workability are evaluated. The experimental results are compared with conventional concrete to assess performance. The study aims to evaluate the feasibility of using recycled materials in structural concrete and to promote eco-friendly construction techniques.

Key Words: Recycled Aggregate Concrete, Crumb Rubber, Sustainable Construction, Waste Management, Mechanical Properties

I. INTRODUCTION

1.1 Background

Concrete is one of the most widely used construction materials in the world due to its strength, durability, and versatility. However, the production of concrete requires large quantities of natural aggregates, which leads to depletion of natural resources and environmental degradation. At the same time, the construction industry generates a significant amount of demolition waste, and disposal of waste tires poses serious environmental challenges.

Recycled aggregate concrete (RAC) and crumb rubber concrete have emerged as sustainable alternatives to conventional concrete. Recycled aggregates are obtained from demolished concrete structures, while crumb rubber is produced from waste tires. The incorporation of these materials in concrete helps in reducing environmental pollution and conserving natural resources.

1.2 Problem Statement

The disposal of construction waste and used tires has become a major environmental issue. Conventional concrete production contributes to resource depletion and carbon emissions. The use of recycled aggregates and crumb rubber may affect the strength and durability of concrete, which needs to be studied in detail.

1.3 Objectives

- To study the properties of recycled aggregate concrete
- To investigate the effect of crumb rubber on concrete
- To evaluate compressive and tensile strength
- To compare RAC with conventional concrete
- To promote sustainable construction practices

Received: 06-03-2026 | Accepted: 14-04-2026 | Published: 20-04-2026

International Journal of
AI ELECTRICAL CIVIL AND MECHANICAL ENGINEERING
Peer Reviewed, Referred & Indexed Journal
ISSN: 3070-0434 www.zesterapublications.com Original Research Paper

1.4 Scope of Study

The study focuses on experimental investigation of concrete using recycled aggregates and crumb rubber under controlled laboratory conditions.

II. LITERATURE REVIEW

Concrete technology has undergone significant development in recent years with the introduction of sustainable materials such as recycled aggregates and crumb rubber. Several researchers have investigated the feasibility and performance of recycled aggregate concrete (RAC) and rubberized concrete to address environmental concerns associated with construction and waste disposal.

Ravindrarajah and Tam (1985) conducted one of the earliest studies on recycled aggregate concrete and observed that the compressive strength of RAC is generally lower than conventional concrete due to the presence of adhered mortar on recycled aggregates. However, they concluded that RAC can still be used for structural applications with proper mix design.

Hansen (1992) carried out extensive research on recycled aggregates and reported that recycled aggregate concrete exhibits higher water absorption and lower density compared to natural aggregate concrete. The study emphasized the importance of proper processing and grading of recycled aggregates to improve performance.

Topçu (1995) investigated the mechanical properties of concrete made with recycled aggregates and found that the strength reduction depends on the replacement percentage of recycled aggregates. The study suggested limiting the percentage of recycled aggregates to achieve acceptable strength levels.

Eldin and Senouci (1993) studied the use of crumb rubber in concrete and reported that the inclusion of rubber particles leads to a reduction in compressive strength but significantly improves toughness and impact resistance. The study highlighted the potential of rubberized concrete in applications where energy absorption is important.

Khatib and Bayomy (1999) investigated the effect of rubberized concrete and observed that increasing rubber content decreases compressive strength and modulus of elasticity. However, the ductility and resistance to cracking were found to improve, making rubberized concrete suitable for flexible structures.

Li, Stubblefield, Garrick, Eggers, Abadie, and Huang (2004) conducted research on crumb rubber concrete and found that the addition of rubber particles improves durability and resistance to dynamic loading. They also suggested surface treatment of rubber particles to enhance bonding with cement paste.

Siddique and Naik (2004) reviewed the use of waste materials in concrete and concluded that both recycled aggregates and crumb rubber can be effectively used in concrete production to promote sustainability. The study emphasized the need for optimizing mix proportions to balance strength and durability.

Poon, Shui, and Lam (2004) studied recycled aggregate concrete and found that proper treatment of recycled aggregates can significantly improve strength and durability. The authors recommended pre-soaking of recycled aggregates to reduce water absorption effects.

Ismail and Hassan (2008) investigated crumb rubber concrete and observed that rubber particles improve sound insulation and vibration damping properties. The study highlighted the suitability of rubberized concrete for pavement and acoustic applications.

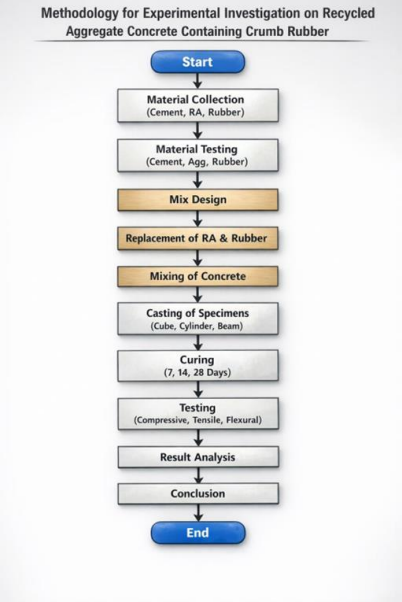
Thomas and Gupta (2016) conducted experimental investigations on rubberized concrete and reported that although strength decreases with increasing rubber content, the material shows improved deformation capacity and crack resistance. The study concluded that

International Journal of
AI ELECTRICAL CIVIL AND MECHANICAL ENGINEERING
Peer Reviewed, Referred & Indexed Journal
ISSN: 3070-0434 www.zesterapublications.com Original Research Paper

rubberized concrete is suitable for non-structural applications.

Gupta and Chaudhary (2017) studied recycled aggregate concrete and concluded that partial replacement of natural aggregates with recycled aggregates can produce sustainable concrete with acceptable mechanical properties. The study emphasized the environmental benefits of using recycled materials.

III. MATERIALS REQUIRED



3.1 Cement

Ordinary Portland Cement (OPC) of grade 53 is used in this study. It acts as the binding material in concrete and provides strength through hydration.

3.2 Fine Aggregate

Natural river sand is used as fine aggregate. It is clean, well-graded, and free from impurities.

3.3 Recycled Coarse Aggregate

Recycled aggregates are obtained from demolished concrete structures. These aggregates contain residual mortar, which affects strength and water absorption.

3.4 Crumb Rubber

Crumb rubber is obtained from waste tires and is used as a partial replacement for fine aggregates. It improves ductility and impact resistance of concrete.

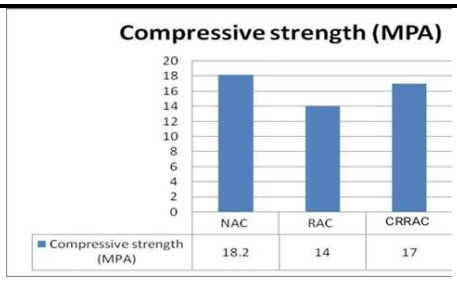
3.5 Water

Clean potable water is used for mixing and curing of concrete.

IV. RESULTS AND DISCUSSION

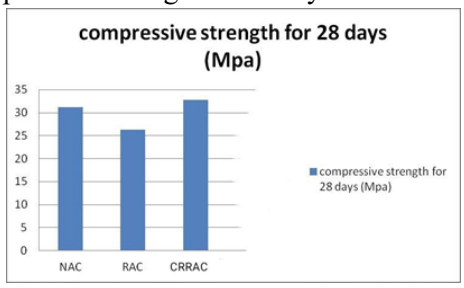
Compressivestrengthfor7days:

International Journal of
AI ELECTRICAL CIVIL AND MECHANICAL ENGINEERING
Peer Reviewed, Referred & Indexed Journal
ISSN: 3070-0434 www.zesterapublications.com Original Research Paper

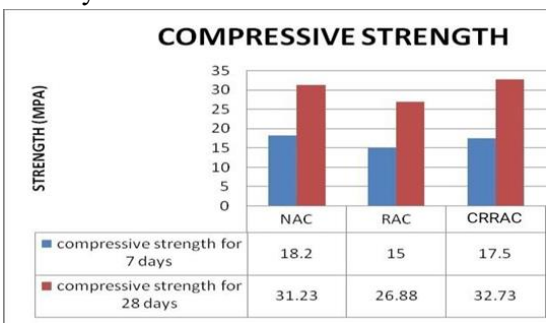


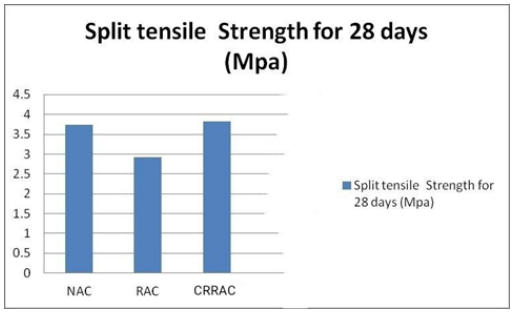
Material	Compressive strength (MPA)
NAC	18.2
RAC	14
CRRAC	17

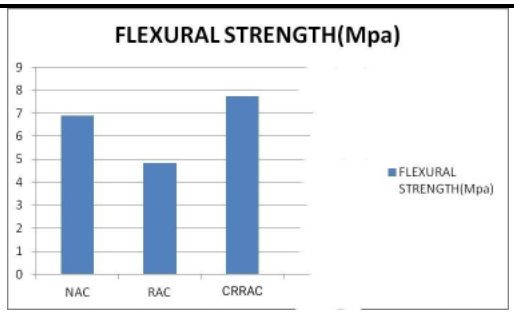
Compressive strength for 28days



Comparison of Compressive strength for 7 days & 28 days







V. CONCLUSION

It has been observed that the specific gravity of Natural Coarse Aggregate is more than the Recycled Coarse Aggregate

Compressive test was carried out for 7 days on cube of dimensions 150x150x150mm and found that Natural Aggregate Concrete is having more compressive strength when compared with Recycle Aggregate Concrete and there is an increase of 21%with addition of Crumb Rubber in Recycle Aggregate .

Compressive strength was carried out for 28 days for Natural aggregate concrete (NAC) Recycled aggregate concrete(RAC), Crumb Rubber Recycled Aggregate Concrete(CRRAC)andthestrengthofCRRACismorewhencomparedbyNACby4.80% andthereisadecreaseinRACby16.18%sotoimprovethestrengthofRAC30%ofCrumb Rubberadded and the strength was increased by 21.66% .

Splittensiletestwasalsocarriedoutfor28daysandthestrengthofRecycledaggregatewas less when compared to Natural aggregate concrete by 28% so to improve the strength we haveaddedCrumbRubberandtherewasanimprovementinconcreteby31.16%forCrumb Rubber and it was observed that CRRAC was having more strength then NAC .

Flexural test was carried out for 28 days under CTM with 3 point loading and it was observed that strength of recycled aggregate is very less when compared with NAC by 42.85%sotoimprovethestrengthRAC30%ofCrum

International Journal of
AI ELECTRICAL CIVIL AND MECHANICAL ENGINEERING
Peer Reviewed, Referred & Indexed Journal
ISSN: 3070-0434 www.zesterapublications.com Original Research Paper

bRubberwasaddedandthestrength was improved by 59.84% when compared with RAC

REFERENCES

- Text book by MS SHETTY for concrete Mix Design.
- IS-456-2000Mixdesign.
- IS:383-1970
- Dr . G. D. Awchat & Dr. N. M. Kanhe IJRET.
- A. M. Shende, A. M. Pande &M. Gulfan Pathan IRJES.
- Er. Kapil Soni, Dr. Y. P. Joshi IERA.
- Visakh Suthan Pallath, G. Gangha & N. Ganapathy Ramasamy IJRET.
- Sudhir P. Patil, Ganesh S. Single & Prashant D. Sathe IJATC.
- Chetna M. Vyas & Darshana RBhatt IJSR
- VikranthSVairagade,KavitaS.Kene&Tejas R.PatilIJSRP