IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

"Review On – Plastic Aggregate Replaced With Coarse Aggregate Below The Neutral Axis Of The Beam"

Prof. Rakesh Kumar[1], Shivprasad Shingare[2], Rushikesh Murkute[3], Anant Navale[4],

Assistant Professor APCOER[1], Student of APCOER[2], Student of APCOER[3], Student of APCOER[4],

Department Of Civil Engineering, Pune University, Anantrao Pawar College of Engineering and Research

ABSTRACT

Under the neutral axis of simply supported reinforced concrete beams, this proposal seeks to replace coarse material with recycled plastic aggregate. The proposal involves crushing sections of reinforced concrete beams above the neutral axis and tensioning them below it. There is no compression or tension along the neutral axis. Below the neutral axis, concrete is superfluous since steel is better at bearing tension and concrete is better at bearing compressive stress. Using recycled plastic aggregate instead of natural coarse aggregate is one way to benefit the environment while also making better use of resources. This adjustment significantly improves M20 concrete, commonly used in various construction projects. Flexural testing on reinforced concrete beams is an important component of the project for assessing the composite material's performance. The results of these trials teach us a lot about the feasibility and efficiency of employing recycled plastic aggregate in construction projects. To sum up, the initiative is an aggressive effort to reduce negative environmental consequences, save resources, and promote sustainable construction techniques.

Keywords: Neutral axis, Plastic concrete, compressive stress, tensile stress.

I. INTRODUCTION

One of the most urgent environmental challenges confronting the world today is the rise of single-use plastics. The amount of trash it creates varies per nation, but it is most visible in business and residential areas. India uses more plastic than many other nations. Investigating effective alternatives for recycling plastic waste is crucial to fighting this rising issue. The primary goal of this project is to make beams from recovered plastic waste. A broad range of buildings depend on reinforced cement concrete as a key component. The four basic elements required to manufacture concrete—cement, sand, aggregate, and water—are very scarce. Researchers investigated the use of copper slag, rice husk, and fly ash as aggregate, cement, and sand substitutes. The depletion of natural common resources is a growing concern. To rectify this, the suggestion recommends completely swapping recycled plastic aggregate for natural coarse aggregate below the beam's neutral axis. Aggregate is crucial for the structural integrity of concrete, the primary construction material. There is a significant paucity of raw materials in the construction industry. Sections below and above the neutral axis of a simply supported reinforced concrete beam are tensioned and compressed accordingly. Steel reinforcements are required in this location because concrete is susceptible to strain. Under the neutral axis, concrete transmits stress from the compression zone to the tension zone. A unique technique involves totally replacing the coarse aggregate below the neutral axis. This will lead to a weight reduction, material savings, and beam strength comparable to current procedures. A parametric study of flexural members is part of the research. Below the neutral axis, coarse aggregate is replaced with plastic aggregate. In addition to addressing the pressing issues created by plastic litter accumulation, this initiative seeks to encourage sustainable construction approaches.

II. OBJECTIVES :

1. To reduce self-weight of beam.

2. To study a breaking stress of beam by replacing coarse aggregate by recycled plastic aggregate below the neutral axis.

3. To analyze the ultimate load carrying capacity of the beams after replacing the natural coarse aggregate below neutral axis.

III. LITERATURE REVIEW

1. Aswathy S Kumar, Anup Joy "Experimental Investigation on Partial Replacement of Concrete Below Neutral Axis of Beam"

Buildings, such as bridges, primarily use concrete for their structural components. The building sector is now experiencing a substantial lack of raw materials. In a simply supported reinforced concrete beam, the compressed portion is above the neutral axis, and the tensioned zone is below it. Steel reiWe use steel reinforcements instead of concrete due to the poor stress-holding capacity of concrete. ete below the neutral axis transfers the stress from the compression to the tension zones. One possible solution to the issue of excess weight and material waste is to significantly rebuild the concrete under the neutral axis. This article discusses the results of an experiment in which polythene balls were used to replace a part of concrete below the neutral axis and form air pockets.

2. Basil tom jose and Divya Sasi "Comparative Study on Partial Replacement of Concrete below Neutral Axis of Beam Using Seeding Trays and Polythene Balls"

Practically every building project today uses reinforced concrete. The building industry is now suffering from significant raw material shortages. In a simply supported reinforced concrete beam, tensile stresses are evident under the neutral axis and compressive pressures above it. Concrete's limited capacity to absorb strain leads to the use of reinforcing steel in the stress zone. Under the neutral axis, the stress travels from the compression zone to the tension zone via concrete. To solve the problem of excessive weight and material waste, we may consider replacing the concrete below the neutral axis. The research looked at three distinct ways for replacing concrete below the neutral axis: seeding trays, polythene balls, and conventional M25-grade concrete RCC beams.

3. Er. Ima Mathew, Er. Sneha M. Varghese "Experimental Study on Partial Replacement of Concrete in and Below Neutral Axis of Beam"

In a simply supported reinforced concrete beam, the segments below the neutral axis are tensioned, while the sections above the neutral axis are compressed. There is no tension or compression on the neutral axis. RC beams lose the strength of the concrete along and around the neutral axis. Along the neutral axis, concrete carries stress from the compressive zone to the tensional region. The experimental work in this thesis focuses on employing air holes manufactured from recycled plastic bottles to partly replace concrete in the areas immediately around and under the neutral axis. Consequently, the use of less concrete results in various advantages like cost savings and a lower load. Repurposing used plastic bottles to create air gaps enhances sustainability.

4. Soji Soman, Anima P "Experimental and Analytical Investigation on Partial Replacement of Concrete in the Tension Zone"

Beams, typically one-dimensional, horizontal flexural components, support the slab and neighbouring vertically oriented walls. A regularly supported beam normally has two zones: tension at the bottom and compression at the top. When concrete cracks as a result of excessive force, steel reinforcement supports the concrete in the stressed region, removing the requirement for concrete on the tensioned side. However, one must use "sacrificial concrete" or concrete on the stressed side to transfer the pressure to the steel. One possible solution to the issue of excess weight and material waste is to significantly rebuild the concrete under the neutral axis. This study investigates the use of air gaps as a partial replacement for concrete in the stress zone under the neutral axis. We present this work with the insights gained from the study and tests conducted. We created air circulation holes using polyethylene spheres and PVC tubing. We utilised various amounts of PVC pipes and polyethylene balls to form beams. We examined the performance of control samples, polyethylene spheres, and beams reinforced with PVC pipes. We use ANSYS to conduct an analytical investigation of the problem.

5. Rajat Saxena, Abhishek Jain, and Yash Agrawal "Utilization of Waste Plastic in Concrete Towards Sustainable Development: A Review"

Massive amounts of polyethylene terephthalate (PET) bottles and other plastic debris discarded in landfills and household waste are now posing a serious ecological challenge to our globe. Numerous relevant authorities express worry about the harmful effects of plastic waste on the environment. Despite significant attempts to reduce our use of plastic-based items, both the quantity of plastic waste we produce and its utility are increasing. The studies conducted to determine the viability of adding plastic trash to concrete covered a variety of characteristics, such as material strength, workability, durability, and ductility. The goal of this study is to conduct a complete review of the available literature on the possibility of employing recovered plastics in concrete applications.

6. R. S. Kognole, Kiran Shipkule, and Manish Patil "Utilization of Plastic waste for Making Plastic Bricks"

Plastic waste is the most dangerous threat facing our world right now. This is the greatest danger that humanity confronts today. The most harmful forms of garbage are polythene (PTE) and high-density polyethylene (HDPE), but any plastic smaller than 50 microns is also a big concern. When plastics are mixed with soil, they have a deleterious impact on its fertility. The seas are now inundated with plastic waste. Plastic waste pollutes the seas and harms marine life. In light of this, we are actively looking for a solution to the plastic waste problem. To make bricks, we mixed plastic waste with bricks. This is the most cost-effective and environmentally responsible solution for dealing with plastic debris in the construction industry.

7. Md. Hasibul Hasan Rahat, MSCM Studen, and Carol Massarra "Using Plastic Wastes in Construction: Opportunities and Challenges"

Urbanization and altering people's lives have a significant impact on the quantity of waste produced and thrown each year. Furthermore, since the COVID-19 outbreak began, mask use has increased dramatically, and worldwide plastic waste output has tripled. The negative impact of these wastes on the environment has drawn the attention of numerous government authorities. To satisfy future infrastructure demands while mitigating the negative effects of plastic waste, the construction sector must incorporate recovered plastic waste into construction applications. This is necessary because the amount of plastic waste created is increasing, as is interest in sustainability. This study provides a detailed review of the advantages and disadvantages of employing plastic waste in construction. The study's overall aims are as follows: 1) to catalog the most common types of construction-related plastic trash; 2) to catalog possible uses for this trash; 3) to catalog potential uses for COVID-19 plastic trash; 4) to describe the opportunities and threats associated with these uses; and 5) to suggest areas for future research into this topic. We conclude that constructing using plastic waste will help the environment, save money, improve project efficiency, and offer a consistent supply of construction materials. Finally, several paths for further research are offered.

8. Rafiq Ahmad Pirzada, Tapeshwar Kalra, and Fayaz Ahmad Laherwal "Experimental Study on Use of Waste Plastic as Coarse Aggregate in Concrete with Admixture Superplasticizer Polycarboxylate Ether"

"The lightweight, coarse total created from recycled plastic is an essential and adaptable material that will most likely be the dominant material in the next thousand years because of the many benefits it brings in terms of technology, economics, and the environment." When it comes to employing lightweight concrete for structural purposes, density is sometimes more important than strength. As a result, lowering density reduces self-weight, foundation size, and construction expenditures at the same level. Structural lightweight concrete often reduces the dead weight of structures, thereby reducing the risk of earthquakes. The current study added superplasticizer polycarboxylate ether to the design mix of M25-grade concrete to enhance its strength. The current research investigated the impacts of utilizing plastic aggregate instead of natural coarse aggregate at 0%, 5%, 10%, 15%, and 20% replacement rates. Compared to previous studies on employing waste plastic as coarse aggregate in combination with plastic coarse aggregate, the current study found that concrete properties improved. Slump cones improved the concrete's workability. Tensile and flexural strengths rise by 10%, while compressive strength increases by 15%. Using waste plastic concrete notably reduces heat conductivity. As a result, mixing plastic rubbish into concrete helps to alleviate environmental problems and keep our land from becoming a desert.

IV. METHODOLOGY

We are studying the use of plastic aggregate instead of coarse aggregate underneath the beam's neutral axis. Conducting a poll is the first step in collecting plastic aggregate. Then we proceed to test the plastic. Collect all of the project's materials, including cement, plastic aggregate, coarse aggregate, and fine aggregate. We must assess each unit of study using a separate test. After that, determine the steel and stirrup designs. Use the acquired data to calculate the mix design. Next, cast and test the beam and cube specimens. Finally, draw conclusions based on the analysis findings.

V. WORK PLAN

1. Collection of material
2. Testing of material
3. Design calculation
4. Casing of specimen
5. Testing
6. Analysis
7. Result
8. Conclusion

VI. CONCLUDING REMARK

Upon reviewing the entire body of literature, we found significant research on flexural beams, involving the replacement of coarse aggregate with plastic aggregate. Below the neutral axis, but just on paper and not applied in practice, we must educate people about these ways. The beam uses a large quantity of plastic and solves the issue of natural resources by providing an appropriate technique for using plastic waste.

VII. REFRENCES

1. Comparative study on partial replacement of concrete below neutral axis of beam using

seeding trays and polythene balls_Basil tom jose and DivyaSasi

2. Experimental Study on Partial Replacement of Concrete in and Below Neutral Axis of Beam_

Er.Ima Mathew1,Er.Sneha M.Varghese2

3. Experimental and analytical investigation on partial replacement of concrete in the tension

zone_Soji Soman11, Anima P 2

4. Experimental investigation on partial replacement of concrete below neutral axis of beam_

Aswathy S Kumar1, Anup Joy2

5. Rajat Saxena, Abhishek Jain, and Yash Agrawal "Utilization of Waste Plastic in Concrete Towards Sustainable Development: A Review"

6. R. S. Kognole, Kiran Shipkule, and Manish Patil "Utilization of Plastic waste for Making Plastic Bricks"

7. Md. Hasibul Hasan Rahat, MSCM Studen, and Carol Massarra "Using Plastic Wastes in Construction: Opportunities and Challenges"

8. Rafiq Ahmad Pirzada, Tapeshwar Kalra, and Fayaz Ahmad Laherwal "Experimental Study on Use of Waste Plastic as Coarse Aggregate in Concrete with Admixture Superplasticizer Polycarboxylate Ether"

IS Codes:-

1. IS 456 (2000): Plain and Reinforced Concrete

2. IS 2346: 1963, (Part I to Part VIII) Indian standard methods of test for aggregate for concrete

3. IS 10262 – 2009 Recommended guidelines for Concrete Mix Design

Books

1. M. S. Shetty, (2004), Concrete Technology, Chand S. And Co Ltd, India

2. Niashant A. Upadhye, (2009)