

**Report On Mini Project**  
**Comparison of Different Ingredients of Normal Strength Concrete Mix design**  
**as per IS 456:2000 and IS 10262:2019**

Submitted by

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**CERTIFICATE**

Certified that the Mini project report entitled "Comparison of Different Ingredients of Normal Strength Concrete Mix Design as per IS 456:2000 and IS 10262:2019" submitted by Samyak Tamgadge, Satyajeet Aadil, Robin Kumar and Sourav Singh of B. Tech 4th Semester, in partial fulfilment of the requirements of the award of degree of Bachelor of Technology in Civil Engineering, School of Studies in Engineering and Technology Guru Ghasidas Vishwavidyalaya, Bilaspur is accorded to the student's own work, carried out by them in the Department of Civil Engineering during session 2023-24 under my supervision and guidance.

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# ABSTRACT

Concrete mix design may be defined as the art of selecting suitable ingredients of concrete and determining their relative proportions with the object of producing concrete of certain minimum strength & durability as economically as possible. This mini project presents a comprehensive analysis of the impact of different ingredients on the properties of normal strength concrete, focusing on M20 and M25 grades, in accordance with the guidelines specified in IS 456:2000 and IS 10262:2019. The objective is to compare how various types of cement, fine aggregates, coarse aggregates, and chemical admixtures influence concrete performance, specifically in terms of workability, compressive strength, and durability.

The study involves a systematic approach to mix design, where different types of cement (Ordinary Portland Cement (OPC) 43 grade, OPC 53 grade, and Portland Pozzolana Cement (PPC)) are evaluated. The fine aggregates used include natural river sand and crushed sand, while the coarse aggregates consist of 20 mm and 10 mm crushed stone. Additionally, the impact of chemical admixtures, specifically superplasticizers, is assessed to understand their role in enhancing workability and achieving desired concrete strength.

Concrete samples are prepared and subjected to a range of tests:

- **Slump Test:** To measure the workability and consistency of the concrete mixes.
- **Compressive Strength Test:** Conducted on standard cubes at 7, 14, and 28 days to determine the concrete's strength development over time.
- **Durability Tests:** Assessing the concrete's resistance to sulphate attack and freeze-thaw cycles to evaluate its long-term performance in aggressive environments.

The results indicate that OPC 53 grade cement provides higher early compressive strength compared to OPC 43 grade and PPC, making it suitable for applications requiring rapid strength development. On the other hand, PPC, although slower in achieving early strength, shows superior long-term durability, which is beneficial for structures exposed to harsh environmental conditions. The use of natural river sand enhances workability, whereas crushed sand, despite requiring more water or admixtures, improves compressive strength. The combination of 20 mm and 10 mm coarse aggregates offers a balanced approach, optimizing both strength and workability. Superplasticizers are effective in reducing the water-cement ratio while maintaining adequate workability, thus enhancing the concrete's overall performance.

**Keywords:** Grade of Concrete, Cost, Specification, Workability, Compressive Strength, W/C Ratio, Target average compressive strength, IS Method of Mix Design.