

STUDY ON THE EFFECT OF FOUNDRY SAND ON MECHANICAL STRENGTHS OF CONCRETE

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ABSTRACT

India is a developing country. Now a day, maximum construction projects are ongoing to construct in India. Natural sand is a most useful material in construction worksbut this is not easily available for construction and it costly material. So there is a need to find alternative material for natural river sand. There are many materials available replaced for natural sand as like foundry sand, fly ash, crushed sand etc. In this research, a attempt has been made to partially or fully replacement of natural sand to foundry sand which is waste product from machine industries. The study of various engineering properties like split tensile strength, compressive strength and as well as flexural strength of concrete is done. Tests carried out on cubes, cylinders and beams to study the mechanical strengths of M25 grade concrete using foundry sand and compare with natural sand in the concrete. Fine aggregates were replaced with 0%, 25%, 50%, 75% and 100% percentages of foundry sand by weight. This research shows that such mechanical properties of concrete increases up to certain percentage. But if further increase in percentage increase in foundry sand decreases mechanical properties of concrete.

Keywords: foundry sand, split tensile strength, compressive strength, flexural strength

1.INTRODUCTION

The use of natural resources such as natural sand in concrete in getting costlier day by day. Which increases per unit cost of construction units. Now days construction industry is in search of reliable alternative source for natural sand. Various successful attempts made in this regard such as use of fly ash, crushed sand etc. but there are some construction constraints on usages of crushed sand and fly ash. Hence in present study an attempt have been made to check effect of partial replacement of foundry sand on compressive, split tensile and flexure strength of concrete.

As India is developing country industrialization and urbanization is increasing rapidly. With increasing in industrialization a problem of waste byproduct always alarming. Foundry industry is also facing such problem i.e. safe disposal waste foundry sand. Foundry sand is waste disposal from metal industry used after casting process. it mainly consist of silica. Foundry sand can be used in concrete to improve its strength and other durability factors.

In present study Fine aggregates were replaced with 0%, 25%, 50%, 75% and 100% percentages of foundry sand by weight. Tests were performed for compressive strength, for all replacement levels of foundry sand at different curing periods (28-days).

Test results shown that there is certain increase in compressive strength after replacing the fine aggregates with certain percentage of foundry sand. So It can be concluded that foundry sand can be used in concrete for strength purposes.

II.OBJECTIVES AND SCOPE OF PRESENT STUDY

- To know the properties of foundry sand.
- To understand mix design procedure for M25 grade concrete.
- To conduct flexure, compressive and split tensile strength of concrete replaced natural sand by varying percentage of foundry sand.
- To analyse the effect of partial replacement foundry sand on flexure, compressive and split tensile strength of M20 concrete.
- Suggesting An optimum percentage of replacement of foundry sand to natural sand.

III.THE TEST PROGRAMME

It is proposed to conduct compression ,flexure and split tensile test on M25 concrete. The mix proportion for M20 concrete was 1:1.52:2.67. With water cement ratio of 0.45.To fulfil this aim mix design for M20 concrete was done by IS456:2000 method. For each % replacement of foundry sand 3 Cubes, 3 Cylinders, 3 Beams were cast and tested at age of 28days. The details are mentioned as below.

- A) Size of cube specimen - (150mmX150mm)
- B) Size of cylinder specimen - (L-300mm D-150mm)
- C) Size of beam specimen - (100mmX150mm)

IV.MIX DESIGN FOR M25 GRADE

A) Design requirement

- 1) Characteristic strength at 28 days- 25mpa
- 2) Aggregates size- 20mm
- 3) Type of aggregates- Angular (Natural)

B) Characteristic

- 1) Grade of cement taken - 53OPC
- 2) Specific gravity fine and course aggregate 2.61
- 3) Specific gravity of cement 3.15
- 4) Bulk density of river sand-1730kg/m³
- 5) Bulk density course aggregate - 1850kg/m³
- 6) Bulk density of cement - 1450kg/m³

C) Mix design considerations

- 1) Moderate exposure condition
- 2) Min. cement content- 300kg/m^3
- 3) W/C ratio- 0.45

Final Mix design proportion-1:1.52:2.67

V.EXPERIMENTAL PROGRAM

The following test carry on the concrete by using of foundry sand replaced to natural sand

A) Compressive strength

Compressive strength tests were carried on 150 mm size cube specimen for 28 days curing by using compression testing machine (CTM).

- 1) FOR 100% FOUNDRY SAND AND 0% RIVER SAND USED
= 10.85mpa and Strength is decrease by 14.95mpa
- 2) FOR 25% FOUNDRY SAND AND 75% RIVER SAND USED
=12.5mpa and Strength is decrease by 13.3mpa
- 3) FOR 50% FOUNDRY SAND AND 50% RIVER SAND USE
=15.2mpa and Strength is decrease by 10.6mpa
- 4) FOR 25% FOUNDRY SAND AND 75% RIVER SAND USE
=19.4mpa and Strength is decrease by 6.4mpa
- 5) FOR 0% FOUNDRY SAND AND 100% RIVER SAND USED
=25.80mpa which is satisfactory result

B) Split Tensile Strength

Split Tensile Strength tests were carried on 150 mm diameter and 300mm depth cylinder specimens for 28 days curing by using compression testing machine (CTM).

- 1) FOR 100% FOUNDRY SAND AND 0% RIVER SAND USED= 6.76mpa
- 2) FOR 25% FOUNDRY SAND AND 75% RIVER SAND USED=7.3mpa
- 3) FOR 50% FOUNDRY SAND AND 50% RIVER SAND USED=7.6mpa
- 4) FOR 25% FOUNDRY SAND AND 75% RIVER SAND USED=7.9mpa
- 5) FOR 0% FOUNDRY SAND AND 100% RIVER SAND USED=8.58mpa

VI.CONCLUSION

The following conclusions may be drawn from present experimental work

1. The failure is same for both river sand as well as foundry sand.
2. The water absorption decreased upto 55% replacement of fine sand by foundry sand.
3. Environmental effect from waste and disposal problems of waste can be reduced through this project.
4. This research shows that such mentioned mechanical strength of concrete increases up to certain percentage of foundry sand and get reduces the increasing percentage of foundry sand in the concrete.

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