OPTIMIZATION OF ARTIFICIAL SAND IN CONCRETE

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Abstract — Artificial sand is most commonly used in construction because of the problem of shortage of river sand. The replacement of artificial sand proves economical in the construction and it is the best substitute for natural sand. But it is found that maximum replacement of artificial sand causes some structural problems (i.e. crack, workability, permeability) because of its properties. Artificial sand does not fulfill the few properties of natural sand so that we decided to replace optimum percent of artificial sand with natural sand. As per the experimental study the replacement of 65-70% of artificial sand gives excellent results as compressive strength, flexural strength and split tensile strength. Mix design has been done for M25 grade concrete using design approach IS for the conventional concrete. Test were conducted and compared with natural sand. It is found that compressive and flexural strength of artificial sand is more than natural sand. So, replacement of natural sand gives a proper solution over scarcity of natural sand and also helps in making eco-balance.

Keywords — Artificial Sand, Natural Sand, Compressive Strength, Concrete, Properties, Environmental Protection.

I. INTRODUCTION

We cannot imagine civil engineering structures without concrete. Concrete is backbone of infrastructural development. Maximum content of concrete is made of aggregate. The workability, bleeding, segregation and durability are the characteristics of aggregate which influence the concrete. There are two types of fine aggregate natural and artificial sand. Availability of good quality of natural sand is decreasing and also it is costly and hence there is need to find the substitute for natural sand. Natural sand is mainly excavated from river beds and always contain high % of chloride, silt and clay. Which affects the strength, durability of concrete and reinforcing steel thereby reducing the life of structure? Also because of excessive sand lifting erosion of nearby land occurred. The easiest and cheapest substitute for natural sand is artificial or natural sand which is obtain by crushing stone. Concrete made with crushed stone dust as replacement of natural sand in concrete can attain the same compressive strength, comparable tensile strength, modulus of rupture and lower degree of shrinkage as the control concrete.

In this project the comparable test results of compression, flexural and split tensile strength of concrete by replacing natural sand with artificial sand 100%, 80%, 76%, 72%, 68%, 64%, 60%, 56%, 52%, 48%, 44% for M25 grade of concrete.

II. MATERIALS AND METHODS

2.1 Cement

Cement (Bharati cement) 53 grade has been used for mix proportion for M25 grade concrete.

2.2 Aggregates

Sand
Natural black coloured locally available sand at Pune region is used for the study.

Artificial sand
Available artificial sand at Pune region is used for the study.

Coarse aggregate
20mm and 10mm mix coarse aggregate available at Pune region is used for study.

2.3 Water
Tap water offered pH value 7.5 is used.
III. RESULTS AND DISCUSSION

![Graph showing compressive strength of concrete (M25 grade)]

- **Fig. 1** Compressive strength of concrete (M25 grade)
- **Fig. 2** Flexural strength of concrete (M25)
- **Fig. 3** Tensile strength of concrete (M25)
CONCLUSION

1. After experimental study we are concluding that the optimum proportion of artificial sand with natural sand is come in between 65%-70%.
2. After studying graphs the optimum replacement gives more strength than the strength obtained using 100% natural or artificial sand.
3. Artificial sand proves itself as suitable and competitive substitute for natural sand at reasonable cost.

REFERENCES

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