Effect of Partial Replacement of Fine Aggregate with Artificial Sand

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***Abstract*— Sand is the one of main material for concrete structures making nearly 40 % of volume of concrete used in construction industry. Natural sand is mainly obtained from river beds and always contains high range of inorganic materials, various chemical components. Obtaining sand, from river bed, in access quantity is makes a hazardous to environment. So, it is time to find an alternative material for natural sand. In order to fulfill the requirement of fine aggregates work, an alternative material like manufactured sand and quarry dust can be used in concrete. Manufactured sand is defined as a purpose-made crushed fine aggregate produced from a suitable source material. Production generally involves crushing, separation and washing. In this paper deals with Natural River sand is replaced by manufactured sand by various proportions such as 0%, 25%, 50% and 75%. Aim of project is to study the strength and durability performance of concrete made with natural sand and artificial sand.**

Keywords: M-sand, quarry rock dust, strength properties of concrete.

I. INTRODUCTION

At present India has confronting an awesome request to regular river sand because of its over the top cost and exhaustion of these characteristic sources causes major natural issues. These days in the development business, significant tasks, for example, development of power plants, silos, dams, bridges, highway projects etc., take care of more demand in the building materials. The use of manufactured sand has been acknowledged as one of the building material. The above investigation exhibits the utilization of produced sand in concrete at different replacement proportions.

To reduce use of natural sand we are replacing natural sand to 0%, 25%, 50%, 75% of artificial sand for M_{20}, M_{25} grade of concrete. Nominal mix (ratio) is used for preparation of concrete, so that the result should also available on lower scale construction work where mix design is not usually taken in consideration., replacement of natural sand by quarry dust was Encouraged from those results. Test was conducted on cubes of square size.

II OBJECTIVE

A) To Study the properties.

B) To study the compressive and split tensile strength of the specimens which is replaced upto 75%

III. SCOPE

1. The mechanical strength of the concrete is enhanced in the partial replacement

2. Analyzing the replacement is suitable or not.

IV Material Properties

Physical properties of sand

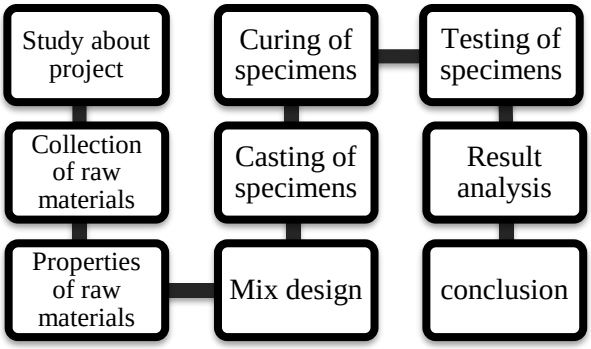
The physical properties tested as per Indian standards

TABLE I: physical properties of quarry dust and natural sand

property	Quarry dust natural sand	River sand	cement
Specific gravity	2.54-2.60	2.60	3.15
Bulk density (Kg/m3)	1720-1810	1420	-
Water absorption(%)	1.2	nil	-
Finess	2.58	2.52	6.30

V.METHODOLOGY

To investigate the effect of waste marble dust on concrete, three different specimens were casted and tested at an interval of 7 days and 28 days. After the evaluation of their strength the results were compared to control mix concrete.



VI. MIX DESIGN

The nominal mixes of fixed cement aggregate ratio (by volume) vary widely in strength and may result in under or over-rich mix. These mixes are termed standard mixes. IS 456-2000 has designated the concrete mixes into a number of grades as M10, M15, M20, M25, M30, M35 and M40. In this designation the letter M refers to the mix and the number to the specified 28 day cube strength of mix in N/mm2. The mixes of grades M10, M15, M20 and M25 correspond approximately to the mix proportion (1:3:6), (1:2:4), (1:1:5:3) and (1:1:2) respectively.

Proportion of M $_{20}$ 1:1.5:3

Cement:	Sand	: Aggregate	:	Water
1372 kg:	2686 kg	: 4700kg	:	576lt.
1	: 1.5	: 3	:	0.45

Proportion of M $_{25}$ 1:1:2

Cement:	Sand	: Aggregate	: Water
1886 kg:	2462kg	: 430kg	: 792lt.
1	: 1	: 2	: 0.48

VII.RESULTS AND DISCUSSION

1.COMPRESSIVE STRENGTH

Results for M_{20} at 7 and 28 days respectively.

TABLE : Relation of compressive strength and percentage of replacement for M $_{20}$ grade at 7 days and 28 days in N/mm^2

REPLACEMENT PERCENTAGE	7 DAYS(N/mm2)	28 DAYS (N/mm2)
0%	14	22
25%	15.62	22.08
50%	16.37	23.07
75%	16.75	22.95

Results for M_{25} at 7 and 28 days respectively.

TABLE : Relation of compressive strength and percentage of replacement for M $_{25}$ grade at 7 days and 28 days in N/mm^2

REPLACEMENT PERCENTAGE	7 DAYS(N/mm2)	28 DAYS (N/mm2)
0%	17.5	24.23
25%	17.92	24.32
50%	18.32	25.67
75%	18.59	24.87

2.TENSILE STRENGTH

Results for M_{20} at 7 and 28 days respectively.

TABLE : Relation of tensile strength and percentage of replacement for M $_{20}$ grade at 7 days and 28 days in N/mm^2

REPLACEMENT PERCENTAGE	7 DAYS(N/mm2)	28 DAYS (N/mm2)
0%	1.70	2.2
25%	1.60	2.29
50%	1.81	2.59
75%	1.57	2.25

Results for M_{20} at 7 and 28 days respectively.

TABLE : Relation of tensile strength and percentage of replacement for M $_{20}$ grade at 7 days and 28 days in N/mm^2

REPLACEMENT PERCENTAGE	7 DAYS(N/mm2)	28 DAYS (N/mm2)
0%	1.5	2.15
25%	1.37	2.21
50%	1.52	2.3
75%	1.27	2.15

VIII.CONCLUSION

- This experiment shows that the concreting can be done economically eco-friendly.
- The results prove that the compressive strength of 75% replacement natural sand is higher than 0% replacement.
- The compressive strength is maximum at 50% replacement.
- The compressive strength increases upto 50% variation and then it decreases upto 75%, but still at 75% strength is more than 0% replacement of natural sand.

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