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RESEARCH ARTICLE OPEN ACCESS

The Utilization Of Crushed Stone Dust As A Replacement Of Sand In Cement Concrete

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ABSTRACT
In concrete as a composite material, the workability for placement and strength development with age depend upon the properties of the constituent materials and their combined action. The role of fine aggregate on strength and workability has to be deciphered before examining the possibility of total replacement of fine aggregate. The author's content that stone dust can completely replace sand provided the mixes are repro-portioned to comply with practical requirements. A strong case is made out for greater and efficient utilization of stone dust.The purpose of mix proportioning is to produce the required properties in both plastic and hardened concrete by the most economical and practical combination of materials available. There has been very little use reported of the vast quantities of waste generated by mixing and quarrying industries. Only small amounts of these wastes have been used in road making and in the manufacture of building materials such as lightweight aggregate bricks and autoclaved blocks. An attempt is made to study the effects of stone dust ass fine aggregate on the strength and workability aspects of concrete mixes.It is evident that the concrete strength development depends upon the strength of the cement mortar and its synergetic with coarse aggregate. The applicability of the comprehensive approach, for proportion-quietly used or discarded presently such as stone dust has been highlighted.

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I. INTRODUCTION

The crushed stone dust waste as a fine aggregate for concrete has been assessed by comparing its basic properties with that of conventional concrete. The basic mixes were chosen for natural sand to achieve M20 grades concrete. The equivalent mixes were obtained by replacing natural sand by stone dust partially or fully. Test results indicate that crushed stone dust waste can be used effectively to replace natural sand in concrete. Concrete made this replacement attain the same compressive strength, comparable tensile strength.

Concrete required for extensive construction activity can always be made available, since all the ingredients of concrete are of geological origin. In the production of concrete, granite/basalt stone and river sand are used as coarse and fine aggregate, respectively. Although these materials are usually available, at some places it is economical to substitute these materials by locally available ones. River sand which is most commonly used as fine aggregate in the production of concrete and mortar poses the problem of acute shortage I many areas. At the same time increasing quantity of crushed stone dust as available from crushers as waste. The disposal of this dust is a serious environmental problem. If it is possible to use this crushed stone dust in with partially/ fully replacement of natural river sand, then this will not only save the cost of construction but at the same time it will solve the problem f disposal of dust.
For satisfactory utilization of stone dust the various phages of examination have to be

- Durability of processed concrete.
- Economic feasibility.

There has been inadequate utilization of large quantities of crushed stone as a alternative material left out after crushing of stone to obtain coarse aggregate/ ballast for concrete. Crushed stone dust does not satisfy the standard specification of fine aggregate in cement mortar and concrete. Efforts have been made to replace river sand by stone dust. The manufacture of coarse aggregate by rushing stone ballast produce large amount of crushed stone dust as waste material. This poses a serious disposal problem. In many reason of India acres of land have become barren due to disposal of crushed stone dust on it. This study mainly directed towards exploring the possibility of making effective use of the discarded crushed stone dust in concrete. The test result generated through a well planned and carefully executed programme indicate good prospects of utilizing this crushed stone dust as a partial

replacement of river sand in making quality concrete.

II. MATERIALS

Cement: -

Ordinary Portland cement (OPC) is by far the most important type of cement. All the discussions that we have done in the previous chapter and most of the discussions that are going to be done in the coming chapters relate to OPC. It has been possible to upgrade the qualities of cement by using high quality limestone, modern equipments, closer on line control of constituents, maintaining better particle size distribution, finer grinding and better packing. Generally use of high-grade cements offer many advantages for making stronger concrete. Although they are little costlier than low-grade cement, they offer 10-20% saving in cement consumption and also they offer many other hidden benefits. One of the most important benefits is the faster rate of development of strength. In the modern construction activities, higher-grade cements have become so popular that 43-grade cement is almost out of the market.

Aggregate : -

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy, earlier, aggregates were considered as chemically inert materials but now it has been recognized that some of the aggregates are chemically active and also that certain aggregates exhibit chemical bond at the interface of aggregate and paste. The more fact that the aggregates occupy 70-80 per cent of the volume of concrete, their impact on various characteristics and properties of concrete is undoubtedly considerable. To know more about the concrete it is very essential that one should know more about the aggregates, which constitute major volume in concrete. Generally 20mm size aggregate used for concreting work.

Crushed Stone Dust

Crushed stone dust is a material obtained from stone crusher. In the crusher machine after crushing of stone the product retained known as crushed stone dust. If can be used as a fine aggregate in cement concrete as a replacement of sand it may be replace fully or partially as a percentage of 20%, 40%, 50%, 60%, 80% of gives the higher strength as that of sand gives with the help of suitable admixtures. Crushed stone dust is a waste product generated in crusher machine and it is very cheap as compare to the sand. The fineness modulus crushed stone dust is 2.2 to 2.6 as same as that of sand and specific gravity is 2.4. Due to utilization of crushed stone dust we can reduces the cost of construction at the same time we try to solve the problem on disposal of crushed stone dust because of the waste material generated in crusher the manufacturer collected it and dispose any were so that the land on which the crushed stone dust dispose becomes unusable.

The crushed stone dust is advantages over sand due to following points.

1) The cost of sand is very high as compare to the crushed stone dust.
2) It gives the better result with the help of suitable admixtures.
3) Due to non-availability of well specified sand near by the construction site.
4) It reduces the cost of construction at the same time it solve the problem of disposal of crushed stone dust.
5) The crushed stone dust is cheaply available and application is very easy.

III. ADMIXTURES

Superplasticizers: -

Use of superplasticizers permit the reduction of water to the extent up to percent in case of plasticizers. The use of superplasticizer is practiced for production of flowing, self-leveling, self-compacting and for the production of high strength and high performance concrete. Only thing is that the superplasticizers are more powerful as dispersing agents and they are high range water reducers. They are called high range Water Reducers In American Literature. It is the use of superplasticizer which has made it possible to use w/c as low as 0.25 or even lower and yet to make flowing concrete to obtain strength of the order 120 Mpa or more.

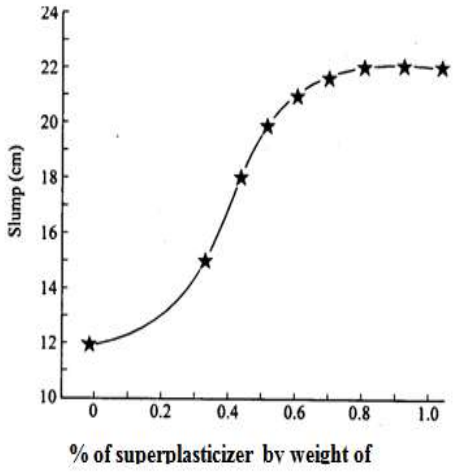
Superplasticizers can produce:-

- at the same w/c ratio much more workable concrete than the plan ones,
- for the same workability, it permits the use of lower w/c ratio,
- as a consequence of increased strength with lower w/c ratio, it also permits a reduction of cement content.

Compatibility of Superplasticizers and Cement: -

It has been noticed that all superplasticizers are not showing the same extent of improvement in fluidity with all types of cements. Some superplasticizers may show higher fluidizing effect on some type of cement than other cement. There is noting wrong with either the superplasticizer or that of cement. The fact is that they are just not compatible to show maximum fluidizing effect. Optimum fluidizing effect at

lowest dosage is an economical consideration. Giving maximum fluidizing effect for a particular superplasticizer and a cement is very complex involving many factors like composition of cement, fineness of cement etc. the graph show the comparison between the slum and % of superplasticizer by weight of cement.



Experimental Investigation & Characteristics

Stone dust obtained from granite stone quarry was used as the fine aggregate. Compared to sand, stone dust was finer with relatively lower fineness modulus. The developed comprehensive approach of proportioning normal weight concrete mixes[1] was examined to enhance its applicability potential. Conventional control mixes, that is, consisting of sand were also demonstrated for the sake of comparison.

Accordingly the trial mix was proportioned for a water cement ratio of 0.5 and low workability. For an identical quantity and quality of the paste, the control mix with a relatively higher sand content reflected 7 higher workability as compared to the workability of stone dust concrete inspite of having a relatively lower stone dust content. This reinforces the concept of the higher surface area effect of fine aggregate, that is, stone dust on workability. The strength remained identical in both the cases.

Further both the mixes were reproportioned for a compressive strength of 65 N/mm^2 and low workability using the comprehensive approach. As can be seen from stone dust consumes comparatively more cement to achieve the same workability that of the control mixes. The close agreement between the required and identical strengths obtained reinforces the efficient replacement of stone dust for sand in adverse situations.

Characteristics Of The Materials : -

Crushed coarse aggregate

Cubes strength:112 N/mm^2
Aggregate size:25mm and down 20mm
Specific gravity:2.4

Fine Aggregate	Fineness Modulus	Specific Gravity
Natural sand	2.65	2.6
Stone dust	2.5	2.48

Cement

Specific gravity:3.15
Normal Consistency:28 percent.

Preparation Of Specimen & Test

The exact amounts of cement, sand, stone dust and coarse aggregate were weighed and then placed in a laboratory concrete mixer. The water was then added in required amount and workability fresh concrete was measured by compacting factor method immediately after mixing. The test specimens were case in steel moulds and compacted on a vibrating table. They were demoulded a day after day costing. The specimens were cured in water until the test date.

Test

Size of cubes 150 x 150 x 150mm were tested to determine the compressive strength, three at the age of 7 days and 28days. And three 150mm x 300mm cylinders were tested for splitting tensile strength both at 28 days.

IV. FUTURE SCOPE

1) Such type research work give opportunity to create challenge work in the future such type of project have great importance.
2) Day by Day the problem on construction goes increase tremendously, so there is basic need to find out such type of substitute material's
3) In feature it may help to solve the sand problem, which occure now a day's & must occure in future.
4) Due to this project, it we success we try to solve directly or indirectly the problem occure in construction work.
5) And due to such type of project we try to utilized waste product in right way i.e. the main object of every engineer's.
6) If our project got success then every one goes through this, because it reduce the cost of construction.

V. CONCLUSION

1. The workability of the concrete mixes decreased with an increase in percent of stone dust as partial replacement of sand.

2. The workability of concrete mixes increased with an increase percent of superplasticizer.
3. There is a significant increase in compressive strength, modulus of rupture and split tensile strength for both the concrete mixes when sand is partially replaced by stone dust.

It can be concluded that if 45 percent sand is replaced by stone dust in concrete it will not only reduce the cost of concrete but at the same time will save large quantity of natural sand and will also reduce the pollution created due to the disposal of this stone dust on valuable fertile land.

REFERENCES

[1]. Crushed stone waste as fine aggregate for concrete. – a technical paper.(**K. Sahu, Sunil Kumar & A. K. Sachen)**
[2]. Efficient utilization of stone dust as aggregate in Portland cement concrete - a technical paper **(T. S. Nagaraj & Zahida Banu)**
[3]. The text book of Concrete Technology by M. S. Shetty
[4]. www.icjonline.com

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