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A REVIEW ON THE USE OF MANUFACTURED SAND AS FULL REPLACEMENT OF RIVER SAND

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Abstract

Common river sand is expensive because it costs so much to transport it from natural sources. The widespread depletion of these sources also causes environmental problems. Finding an alternative or replacement product for the concrete industry is necessary because river sand is less readily available and less desirable to use due to environmental, transportation, and other factors. The viability of using manufactured sand in place of natural sand in concrete is presented by Manufactured Sand's study. Using design codes like the IS codes for both conventional concrete and precast concrete, several mix designs have been created for various grades. The strength of concrete created of Manufactured Sand was investigated in this research by a number of experiments on cubes strength. The results were compared to those of concrete made with natural sand. It was discovered that concrete constructed with manufactured sand has virtually identical more Compared to regular concrete, it has higher compressive and tensile strength.

Keywords: *Manufactured Sand, River Sand, Environment, Researchers, Compressive Strength, Flexural Strength, Tensile Strength.*

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1. INTRODUCTION

Due to the global infrastructure's rapid growth, concrete is presently the most common and frequently utilized construction material. In order to meet the increased need for infrastructure development, this has put tremendous pressure on the concrete sector to manufacture enormous amounts of concrete. The cost of cement, aggregates (both coarse and fine), and water, the raw materials used to build concrete, determines the cost of making concrete in the main. The Natural River sand, one of the constituent raw materials, accounts for around 35% of the volume of concrete and is crucial in determining the price of concrete. The concrete industry has increasingly turned its focus toward a suitable fine aggregate replacement for the currently employed natural river sand due to the diminishing sources of natural river sand and stringent mining regulations. Genuine River Sand. As a practical substitute for natural river sand, crushed rock sand has emerged as a popular fine aggregate in concrete that is currently utilized all over the world.

1.1 Overuse of Sand Mining and Its Effects on the Environment:

Around the world, Sand and gravel mining produces between 47 and 59 billion tonnes of material each year, making up the lion's share, ranging from 68 to 85 percent. For the year 2012 alone25.9 billion to 29.6 billion tonnes are expected of aggregates were used for concrete worldwide. This estimate may reach 40 billion tonnes annually if aggregate used in concrete pavements, asphalt, and other industrial applications is included. It is impossible to harvest and use this much material without having a major negative influence on the ecosystem.

In-stream sand mining activities reduce the quality of river water. At the mining site, the re-suspension of sediments and organic particle matter causes an increase in short-term turbidity. Oil leaks and spills from mining equipment and cars make the problem worse. An increase in suspended particles has a direct impact on water consumers by driving up the cost of water treatment and harming aquatic habitats. Sand removal transforms riverbeds into vast, deep holes that reduce the groundwater level in neighbouring communities' wells, negatively limiting the accessibility of local groundwater.

Loss of biodiversity results from bed deterioration and sedimentation, which have a negative effect on aquatic life by upsetting the species that are linked to streambed deposits. Fishery productivity is also lost as a result of degraded stream habitats.

1.2. Alternatives for Natural Sand:

Due to a shortage of sufficient natural sand close to the site of consumption, the cost of this sand is increasing, which ultimately affects construction costs. Finding a replacement substance that not only satisfies the technical requirements of fine aggregate but is also widely accessible is necessary for the sustained growth of infrastructure in the modern world. In the past, extensive study has been conducted to identify alternative sources of fine aggregate.

(A) Quarry Stone Dust:

When rocks are extracted and processed at a quarry's crushing plant, the residues, tailings, or waste products are referred to as "quarry dust." It is sometimes referred to as rock dust, stone dust, and quarry debris. The primary goal of rock crushing and sizing in quarries has often been used to produce coarse graded aggregates and materials for road construction that adhere to particular norms and specifications. A certain fraction of the rock is ground down throughout the course of a quarry's routine production procedures to a size that prevents it from being used as a component of coarse aggregates.

Production of crushed stone coarse aggregate starts with blasting and breaking up of the parent rock .The broken rock is subsequently processed via several rounds of crushing and screening. Primary crushing, secondary crushing, and tertiary crushing are typically used for crushing quarried rock. The schematic representation of the various procedures carried out at a quarry that result in the production of quarry dust is provided by the by-product, which takes the form of the end of each stage, quarry dust is produced, and screening is used to separate it from the coarse aggregate component.. Various crusher types are employed in the primary, secondary, and tertiary crushing stages, it should be emphasized. Because of this, the by-products created at the end of each stage could have various qualities.

Table 1 compares the specifications for natural sand and crushed sand according to BS 882-1992

Fine Aggregate Type	Passing the 150-micron sieve %	Passing a 75-micron sieve, % (Max)
Natural Sand	0-10 (Zone I, II & III) 0-15 (Zone-IV)	3
Crushed Sand	0-20	15

The micro-fine concentration in crushed sand was raised from its initial 3 percent threshold to 15% by BIS 383:1970. For crushed sand, the limit for material percent passing a 150 micron screen has also been raised to 20%, however for natural sand, the restriction is only 10% for sand in Zones I, II, and III and 15% for sand in Zone IV. Table 1 compares the requirements for crushed rock fine aggregate and natural river sand as stated in BIS 383:1970.

Its application in concrete is not very common, nevertheless. Quarry dust's poorly graded grains and high concentration of micro-fines are the main deterrents to using it as fine aggregate. To reduce the amount of river sand needed, it can completely substitute river sand in concrete a carefully formulated mixture that uses quarry dust and natural sand as fine aggregate uses as full replacement of natural.

Crushed Stone Sand

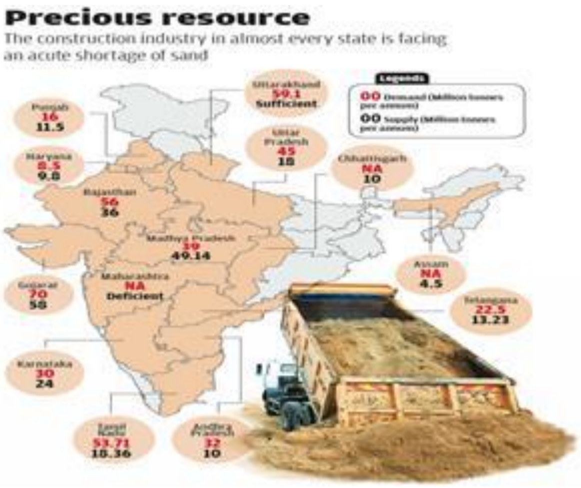

Figure 1. is a schematic illustration of how quarry dust is produced.

2. OBJECTIVE OF STUDY

The project's main objective is to look into the possibility of using sandstone quarry dust in place of natural sand in concrete. This study used concrete mixtures as containing 100 percent manufactured sand compared to a control concrete mix made with 100 percent natural sand are prepared with a full substitution of natural sand with sandstone quarry.

- To compare the workability of concrete and gradation of aggregates mixes incorporating sandstone quarry dust as replacement of natural sand with control concrete mix.
- To evaluate the compressive strength and density of concrete mixes using sandstone quarry dust in place of natural sand in comparison to a control concrete mix.
- Determining the best percentage to replace natural sand with in order to provide adequate workability, toughened, and durability attributes.

In this chapter, the results of several experimental investigations are presented and discussed. In the first section, the outcomes of physical tests on cement, coarse aggregate, natural sand, and quarry dust are reported. The cubes' specific gravity, compressive strength, beginning and final setting times, standard uniformity, soundness, and fineness were all measured as part of the physical testing for cement. We estimated sieve analysis, bulk density, specific gravity, and water absorption for coarse aggregates with nominal diameters of 20 mm and 10 mm. Some of the tests performed on fine aggregate were sieve analysis, silt content, bulk density, specific gravity, and water absorption. Physical testing was carried out on sandstone quarry dust.

Figure 2. Water Absorption Test on Curing Tank of Standard Size Cube and Curing Process

The next section includes mix proportioning for various concrete mixes as well as the mix design for M20 grade concrete. Additionally, blended aggregate is graded as an all-in aggregate. To assess the impact of replacing. On the workability, density, compressive strength, and water absorption of natural sand with sandstone quarry dust of M20, M25, M30 and M35 grade concrete, the natural sand was completely replaced with the latter. Various experiments were then carried out.

3. CONCLUSION

1. Manufactured sand has significant economic advantages in areas where natural sand is hard to come by or in urban areas where transportation is expensive. The building sector benefits from the best possible resource exploitation and the reduction of avoidable environmental damage thanks to the use of produced sand. If the issues with the workability of the concrete mix can be handled by utilising super plasticizer, manufactured sand presents a feasible alternative to natural sand.
2. Further Investigation and work for this project basis has to be done on the continuation of next research publish by the Author of this Paper.

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