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Utilization of hair fibre and M-sand in Concrete as a Replacement of Natural Sand : A Review

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ABSTRACT

In the current world, concrete has become a very important part of the construction industry and the materials which are used in making concrete have evolved due to better quality of cement and better grade of coarse aggregates. The sand is an important part of concrete. It is mainly procured from natural sources. Thus the grade of sand is not under our control. The concrete cubes of M-25 grade were threw in this trial explore work and tried to analyze different properties of concrete like compressive quality, workability. In this study we are reviewing literatures related to advances in concrete technologies, and utilization of fibers and materials in construction industry.

Keywords : Concrete, Fibers, Compressive Strength, Flexure Strength, Improvement, Grade, Waste

I. INTRODUCTION

In the current world, concrete has become a very important part of the construction industry and the materials which are used in making concrete have evolved due to better quality of cement and better grade of coarse aggregates. The sand is an important part of concrete. It is mainly procured from natural sources. Thus the grade of sand is not under our control.

II. LITERATURE REVIEW

In this study we are preparing review of literatures, journals related to advancesin construction industry mainly in concrete technology. Following research has been reviewd as follows:

Roy et. al. (2015) (Effect of Steel Fibres on Concrete with M-Sand as a Replacement of Natural Sand) Here author described the experimental study of fiber reinforced concrete with m-sand. Investigated the compressive strength and tensile strength of the concrete grades M25 & M30 having different percentage of steel fibre (0%, 1%, 1.5% & 2%).The chemical admixtures is used to increase the workability of concrete. The investigation is carried out on a total no of 96 specimen by conducting compressive strength test and split tensile test.

Concluded that the strength obtained by natural sand and replacement of natural sand with M sand in concrete with addition of steel fibers. The investigation derives the following conclusion. By adding steel fibers to fresh concrete compressive strength increases by resisting cracks and their by increasing the durability. Replacement of river sand with m sand gives a satisfactory strength and can be used as alternate material for river sand. Using steel fiber reinforcement admixture enhances the both compressive strength and flexural strength.

Uttamraj and Rafeeq (2017) (A Experimental study on m- sand and recron 3s fiber for m30 concrete) Here Author find the effect of fresh properties of concrete like workability and hardened properties like compressive strength , split tensile & flexure strength of the concrete by replacing natural sand by robo sand in proportions of 0% and 50% & 100%with cubes 18cubes of 150mmx150mmx150mm, 18 cylinders of 150mmx300mm , 18prisms of 150mmx150mmx700mm were casted and tested at the age of 7 days and 28 days.is studied for M30 design mix. In second phase recron 3s was mixed in Concrete containing 100% m- sand at different percentages of 0%, 0.5%, 1%, 1.5% & 2% and cubes 27cubes of 150mmx150mmx150mm, 27 cylinders of 150mmx300mm , 27 prisms of 150mmx150mmx700mm were casted and tested at the age of 7 days and 28 day. Concluded that The compressive strength of concrete specimens made with 0% replacement of robo sand gives higher strength when compared with 50% and 100%.

Magudeaswaran and Eswaramoorthi (2016) (High Performance Concrete Using M Sand) Presented efforts on the enhancement of vacuum condition in concrete by focusing on the surface area to volume ratio phenomenon to improve the impermeability of concrete and thereby improving its living standard in terms of workability, Compressive strength and durability. The mechanical parameter of concrete was tested by inoculation of silica fume at the progressive interval of 2.5% with fully replacement of river sand by M sand. From the observation it was inferred that rise in percentage of fractional replacement of silica fume, improve the compressive, tensile strength, flexure strength and revealed a better picturesque in terms of allied standard durability indicators of High Performance Concrete.

Marcalíková et. al. 2019 Illustrated work is focused on the area of mechanical properties of two types of Steel Fibers for reinforced concrete. In both cases, the same concrete mixture is used. The Steel Fibers used differ in shape. The first one is short and straight fiber and the second one is 3D steel fiber. Steel Fiber Reinforced Concrete was prepared at a dosage of 40 and 75 kg steel fibers/m3 . The experiment includes determination of strengths, concretely compressive strength, a three-point flexural test and Splitting Tensile Strength test. The results are summarized; fracture mechanics parameters necessary for structural modeling are also included.

Roy et. al. (2018) (Effect of Steel Fibres on Concrete with M-Sand as a Replacement of Natural Sand) Here author described the experimental study of fiber reinforced concrete with m-sand. Investigated the compressive strength and tensile strength of the concrete grades M25 & M30 having different percentage of steel fibre (0%, 1%, 1.5% & 2%).The chemical admixtures is used to increase the workability of concrete. The investigation is carried out on a total no of 96 specimen by conducting compressive strength test and split tensile test.

Concluded that the strength obtained by natural sand and replacement of natural sand with M sand in concrete with addition of steel fibers. The investigation derives the following conclusion. By adding steel fibers to fresh concrete compressive strength increases by resisting cracks and their by increasing the durability. Replacement of river sand with m sand gives a satisfactory strength and can be used as alternate material for river sand. Using steel fiber reinforcement admixture enhances the both compressive strength and flexural strength.

Neeraja et. al. (2017) (Study on strength characteristics of concrete using M-Sand and coconut fibers) Here author attempt was made to use M-sand and coconut fiber in concrete. In this study, a total of around 90 specimens were made and concrete was both hand mixed and machine mixed. The grade concrete used was M-35. In this study initially 100% river sand was used to make the samples. The different types of concrete mixes involved in specimen making were 100% river sand, 20% river

sand replacement with M-sand and similarly 40%, 60%, 80%, 100% replacement by the M-sand. After curing of the above samples for 7 or 28 days, tests were done on them to determine the maximum compressive tensile and flexural strength of the different mixes. Here they Concluded that The addition of M-sand significantly increased the compressive, tensile and flexural strengths of concrete with maximum strengths in each case being achieved at 80% M-sand. The compressive strength of concrete with above mix increased by about 25 %. The addition of coconut fibers significantly improved engineering properties of the concrete like tensile strength and flexural strength. It is also noted that Compressive strength decreased as the percentage of coconut fiber was varied from 0.2% to 1.0 %.This is due to the fact that addition of coconut fibers increases the void ratio of concrete, which in turn decreases the compressive strength.

Uttamraj and Rafeeq (2017) (A Experimental study on m- sand and recron 3s fiber for m30 concrete) Here Author find the effect of fresh properties of concrete like workability and hardened properties like compressive strength , split tensile & flexure strength of the concrete by replacing natural sand by robo sand in proportions of 0% and 50% & 100%with cubes 18cubes of 150mmx150mmx150mm, 18 cylinders of 150mmx300mm , 18prisms of 150mmx150mmx700mm were casted and tested at the age of 7 days and 28 days.is studied for M30 design mix. In second phase recron 3s was mixed in Concrete containing 100% m- sand at different percentages of 0%, 0.5%, 1%, 1.5% & 2% and cubes 27cubes of 150mmx150mmx150mm, 27 cylinders of 150mmx300mm , 27 prisms of 150mmx150mmx700mm were casted and tested at the age of 7 days and 28 day. Concluded that The compressive strength of concrete specimens made with 0% replacement of robo sand gives higher strength when compared with 50% and 100%.

Deepa and Kumar (2018) (Experimental Study On Hybrid Fibre Concrete With Using GGBS And M Sand) Here Author illustrated that advancement of concrete technology can reduce the utilization of natural resources and energy sources and lessen the burden of pollutants on environment. Presently large amounts of GGBS (**Ground granulated blast furnace slag)** generated in industries with an impact on environment and humans. Conventional concrete has two major defects: low tensile strength and a destructive and brittle failure. In an attempt to increase concrete ductility and energy absorption, fibre reinforced concrete has been introduced. The present investigation revealed the effect of using GGBS and M Sand as a partial replacement of cement and fine aggregate along with optimum percentage of polypropylene and steel fiber. For this study (M30) grade concrete is designed. Partial replacement of cement with GGBS will be made for varying percentages such as by weight 0%, 10 %, 20% and 30% .Along with M Sand as fine aggregate and with optimum fibre percentage as polypropylene (0.4%) and steel fiber (0.6%) respectively. From this study the strength properties of the concrete have been investigated

Manogna and Guruprasad (2017) (Experimental study on the properties of PFRC using M-Sand) Author stated that River sand is becoming a scarce commodity and hence an exploration alternative to it has become imminent. Manufactured sand is the good alternative to river sand and it is purposely made, fine crushed aggregate produced under controlled conditions from a suitable sand source rock. Plastics are non-biodegradable common environmental polluting materials. These are going to affect the fertility of soil. Consider a design mix of M25 grade concrete with replacement of 0%, 20%, 40%, 60%. 80% and 100% of M-sand have been considered for laboratory analysis that is slump test, compressive strength for cube and split tensile strength for cylinder, sieve analysis and specific gravity tests for both fine and coarse aggregates and M-Sand and

results were compared with standards to achieve the desired parameter.

Concluded that manufactured sand is the good alternative to river sand and it is purposely made, fine crushed aggregate produced under controlled conditions from a suitable sand source rock. Plastics are non-bio-degradable common environmental polluting materials. These are going to affect the fertility of soil. In our study the detailed experimental investigation was carried out on plastic fiber reinforced concrete by partial replacement of natural sand by manufactured sand with different percentages (0%, 20%, 40%, 60%,80%,100%) and adding fixed percentage (0.5% of weight cement) of plastic fibers (PP fibers).

Magudeaswaran and Eswaramoorthi (2016) (High Performance Concrete Using M Sand) Presented efforts on the enhancement of vacuum condition in concrete by focusing on the surface area to volume ratio phenomenon to improve the impermeability of concrete and thereby improving its living standard in terms of workability, Compressive strength and durability. The mechanical parameter of concrete was tested by inoculation of silica fume at the progressive interval of 2.5% with fully replacement of river sand by M sand. From the observation it was inferred that rise in percentage of fractional replacement of silica fume, improve the compressive, tensile strength, flexure strength and revealed a better picturesque in terms of allied standard durability indicators of High Performance Concrete.

Suresh and Revathi (2017) (High Performance Concrete with M-Sand and Its Further Aspects) Examined that building constructors have been using river sand as fine aggregate in the manufacture of concrete. But in due course, an enormous increase has happened in the construction activities. It causes a heavy shortage in the availability of good quality sand and it also affects concrete manufacture. Because, excessive sand mining from river causes the degradation of river beds and environmental pollution. Besides, river sand mining deepens the river courses and disturbs the aquatic life style. In short, the agricultural activities are totally affected. Therefore, river mining is restricted. As a result, a necessity has arisen to find out an alternative solution. That is, we are left in a position to select manufactured sand that contains the equal properties of river sand. Because, the higher practical density of manufactured sand would intensity the durability of concrete. In this dissertation, on investigation.

Vishal Gadgihalli et. al. (2017) (analysis of properties of concrete using manufacture sand as fine aggregates) Analyzed that Aggregate in concrete acts as structural filler, these place a crucial than simple statement implies it is the material that the cement paste coats and blind together. Now a day's using river sand is prohibited by government, as these cause soil erosion. In this paper analysis of properties of concrete using manufacture sand as course aggregate is studied and verified the strength of concrete and temperature emitted due to chemical reaction to the normal Portland cement. Using manufacture sand as course aggregate the temperature emitted due to exothermal reaction of concrete has reduced. Although the compressive strength of the concrete has reduced compared to normal concrete where no admixtures were used to enhance the properties of concrete.

Bhishma k Vaidya et. al. (2016) (Comparative Study on Cost Analysis of Natural & Manufacture Sand in Residential Building) The huge quantity of concrete is consumed by construction industry all over the world. In India, the conventional concrete is produced by using natural sand obtained from riverbeds as fine aggregate. The cheapest and the easiest way of getting substitute for natural sand is by crushing natural stone to get manufactured sand which would be free from all impurities. Manufactured sand is a term used for aggregate materials less than 4.75mm and which are processed from crushed rock or gravel. The concrete mixes having different mix proportions for both natural and

manufactured sand (i.e. 100%NS+0%MS, 70%NS+30%MS, 40%NS+60%MS, and 0%Ns+100%MS) were prepared for M30 grade of concrete for cubes. Then there were 2 case studies is taken in which slab concrete cost of building by done construction and concrete cost of same quantity by my trial mix variation is compared. And this cost comparison of trial mix is done with cost of Natural sand & Manufactured Sand obtained from 3 different cities.

Vinayak R.Supekar & Popat D.Kumbhar (2012) (Properties of Concrete by Replacement of Natural Sand with Artificial Sand) In the present an attempt has been made to discuss the properties such as workability and compressive strength of concrete prepared by replacing natural sand with artificial sand at different replacement levels (0%, 20%, 40%, 60% and 100%). The development of cracks and their measurement is also studied. The results have shown that the natural sand can be replaced with artificial sand up to a maximum replacement level of 60% in order to produce concrete of satisfactory workability and compressive strength and also with cracks of lesser areas.

Chirag D Magnani & Vatsal N Patel (2014) (Review on Need of Manufactured Sand in Concrete constructions as a Replacement to River Sand) The reduced availability of natural sands, particularly along the east coast of India, and the need to better utilise sand-size material generated in the aggregate crushing process, has combined to encourage the development of „Manufactured Sand". . With manufactured sand marketed as a material complying with certain recognized specifications, it is then up to the design engineers or concrete producers to specify ordinary crushed rock fine, which is cheaper and should be good enough for normal concrete, or manufactured sand, which is more expensive but should be a better choice for high strength concrete. This paper describes different issues related with manufactured sand.

Nimitha Vijayaraghavan and Wayal (2013) (effects of manufactured sand on compressive strength and workability of concrete) A huge amount of concrete is consumed by the construction industry. About 35% volume of concrete is comprised of sand. A good quality concrete is produced by careful mixing of cement, fine and coarse aggregates, water and admixtures as needed to obtain an optimum quality and economy. Generally cement and coarse aggregates is factory made products and their quality and standards can be easily controlled and maintained. Water used for mixing of concrete is usually tap water. The fine aggregates or sand used is usually obtained from natural sources specially river beds or river banks. Now-a-days due to constant sand mining the natural sand is depleting at an alarming rate. Sand dragging from river beds have led to several environmental issues. Due to various environmental issues Government has banned the dragging of sand from rivers. This has led to a scarcity and significant increase in the cost of natural sand. There is an urgent need to find an alternative to river sand. The only long term replacement for sand is manufactured sand.

Adams Joe et. al. (2013) (Experimental Investigation on The Effect Of M-Sand In High Performance Concrete) The natural river sand was the cheapest resource of sand. However the excessive mining of river bed to meet the increasing demand for sand in construction industry has led to the ecological imbalance in the country. Now the sand available in the river bed is very coarse and contains very high percentage of silt and clay. The silt and clay present in the sand reduce the strength of the concrete and holds dampness. A few alternatives have come up for the industry to bank on of which manufactured sand or M-sand, as it is called, is found to be the most suitable one to replace river sand. M-sand has caught the attention of the construction industry and environmentalists alike for its quality and the minimum damages it causes to nature. Usage of M-Sand can drastically reduce the cost since like river sand, it does not contain impurities and wastages is nil

since it is made with modern technology and machinery. Once the M-sand becomes more popular in the construction industry, the demand for river sand and illegal sand-mining would come down. Compared to the river sand, the M-sand has a better quality consistency high Strength concrete with signifance saving instrument. M-sand that is available is graded, sieved and washed. The particles are more rounded and granular and do not have sharp edges. Usage of M-Sand can overcome the defects occurring in concrete such as honey combing, segregation, voids, capillary, etc. The purpose of this research is to experimentally investigate the effect of M-Sand in structural concrete by replacing river sand and develop a high performance concrete. It is proposed to determine and compare the differences in properties of concrete containing river sand and M-sand. It is also proposed to use steel fibres and chemical admixtures to increase the strength and workability of concrete respectively. The investigations are to be carried out using several test which include workability test, compressive test, tensile test, and flexural test.

Magnani et. al. (2014) (A Reviewe on Need of Manufactured Sand in Concrete Constructions As A Replacement To River Sand) The reduced availability of natural sands, particularly along the east coast of India, and the need to better utilise sand-size material generated in the aggregate crushing process, has combined to encourage the development of 'Manufactured Sand'. The crushed rock fine should be processed to have fines content close to the optimum fines content or within a certain recommended range encompassing the optimum fines content. Such knowledge of the optimum fines content would help the quarry operators process the crushed rock fine to produce manufactured sand. With manufactured sand marketed as a material complying with certain recognized specifications, it is then up to the design engineers or concrete producers to specify ordinary crushed rock fine, which is cheaper and should be good enough for normal concrete, or manufactured sand, which is more expensive but should be a better choice for high strength concrete. This paper describes different issues related with manufactured sand.

Yajurved Reddy et. al. (2015) (study on properties of concrete with manufactured sand as replacement to natural sand) In the present investigation workability, strength and durability of concrete with manufactured sand as replacement to natural sand in proportions of 0%, 20%, 40%, 60% and 100% is studied. The experiments were conducted on M20 and M30 concrete grade with 450 specimens. Slump cone, compaction factor and vee-bee time tests were conducted to determine workability. Results showed that as replacement of natural sand by manufactured sand is increased, there is a decrease in the workability. Compressive strength, split tensile strength and flexural strength tests were conducted to determine strength of concrete. The 60% replacement showed an increase in strength of about 20% and other replacements to an order of minimum 0.93% in both the grades. The durability study is conducted by treating specimens for 30 days with 5% concentrated Hydro Chloric Acid and the concrete mix with 60% replacement has given good durable properties.

Suseela et. al. (2017) (strength analysis on concrete with m-sand as a partial replacement of fine aggregate) In general concrete is a combination of cement, fine and course aggregate. These days, natural river sand is difficult to acquire and extraction of sand from river has represented an awesome threat to environment. In addition, government has connected limitation on extraction of sand from riverbed. Subsequently, insufficiency of natural river sand and increase in demand contemplate research seek towards alternate fine aggregate. This seek turns the research intention towards effective utilization of Manufactured sand (M-sand) for commercial purpose. This research incorporates effectiveness of M-sand by investigation compressive stress, split tensile stress and durability of concrete with various mix.

Vaishali et. Al. (2018) (Effect of Manufactured Sand on Mechanical Properties of Concrete) Natural river sand was the cheapest sand readily available. But excessive mining increased the demand for sand and had lead to the ecological imbalance. Now the sand available contains very high amount of silt and clay which holds dampness and reduces the strength of concrete. Though the researchers suggest M-sand for construction purposes, it has not fully come to practice. Also the property of M-sand available in different places varies. Hence after going through several works, full replacement of river sand with M-sand in concrete has been carried out. For this study M-sand from three different localities were collected and tested. M20 mix is adopted as grade of concrete and water cement ratio 0.45 is followed. Three variants of samples containing different M-sand are casted. Workability and Mechanical properties have been examined. Slump tests showed that river sand is highly workable than the M-sand. On comparing their Mechanical Properties, concrete containing M-sand obtained from Karur showed 10.71%, 12.15% and 8.22% increase in Compressive Strength, Split Tensile Strength and Flexural Strength when compared to the conventional concrete at the end of 28 days curing.

Sachin and Roshan (2018) (M-SAND, An Alternative To The River Sand In Construction Technology) A few alternatives have come up for the industry to bank on of which manufactured sand or M-sand, as it is called, is found to be the most suitable one to replace river sand. M-sand has caught the attention of the construction industry and environmentalists alike for its quality and the minimum damages it causes to nature. Usage of M-Sand can drastically reduce the cost since like river sand, it does not contain impurities and wastages is nil since it is made with modern technology and machinery. Once the M-sand becomes more popular in the construction industry, the demand for river sand and illegal sand mining would come down, A well processed manufactured sand as partial or full replacement to river sand is the need of the hour as a long term solution in Indian concrete industry until other suitable alternative fine aggregate are developed. In the present study, a comparison of the Compressive strengths of River Sand and M-sand is done with the hundred percent replacement of river sand by M sand.

III. CONCLUSION

From the above studies it is found that the different materials are used by the various author's some have used single and some have more than two materials. In literature survey it is observed that none of them provide a proper mix design using admixture and manufacturing sand In above survey effect of Hair fiber and its beneficial advantages are not mentioned. workability and setting time of concrete. we would some be able to nations, higher summer temperatures, low relative moistness and sweltering breeze blowing cause fast dissipation of water from the crisp concrete surface. Thus concrete sets prior and no appropriate time is left accessible for cementing operations. For instance, it has been accounted for that, when the temperature of concrete mortar met a water/bond (w/c) proportion of 0.6 is expanded from 27°C to 45°C both the underlying and last setting circumstances are about divided.

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