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A Review on Replacement of Natural Sand with Artificial Sand and Their Properties in Concrete

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Abstract *– As there is an economic boom, increasing demand for in the structure in order to accommodate the requirement as this will lead to high demand for material cost. Material and this will deplete them quickly. This paper has been presented in order to give the developers and insight about the usage of alternate material. The important ingredient of concrete is fine aggregate, the natural sand is widely used as a fine aggregate, hence to meet demand of fine aggregate it has been replaced by artificial sand. To keep the quality of concrete intact with artificial sand there is need to emphasize on the properties of concrete by replacing natural sand with artificial sand.*

Keywords- *Natural Sand, Artificial Sand, Compressive Strength, Crack Pattern, Concrete.*

I- INTRODUCTION

In India the conventional concrete is produced by using natural sand obtained from the river beds as fine aggregate. Concrete are coarse aggregate, fine aggregate, binding material and water. Artificial sand is a process controlled crushed fine aggregate produced from quarried stone by crushing or grinding and classification to obtain a controlled gradation product that completely passes the 4.75mm sieve.

II- LITERATURE REVIEW

1. **Hudson (1997)** has conducted experiments to study the performance of concrete by adding manufacturing sand instead of sand .He prepared trial mixes by using by using 3 to 20 percentage partial replacement of sand by manufacture sand . The water cement ratio was fixed as 0.7. Form the experimental result it was found that there was remarkable increase in
2. compressive strength in the concrete manufacture with 20 percentage replacement of sand with manufactured sand. This was due to the inclusion of high percentage of minus 75 micron dust in a suitably graded form with a good particle shape that allows aggregate packing and results in a denser concrete.
3. **Patagundi and Patil (2002)** have conducted experiment to investigate the properties of concrete when cement was partially replaced by fly ash and natural sand .The compressive strength and flexural strength were studied. The water cement ratio was fixed 0.30. Using OPC the design mix 1 1:2 2:4 was prepared. To facilitate the flow of concrete a super plasticizer was used. In temperature resistance test, the concrete cube specimen were subjected to heat cycle say 8 hours of heating at 60^0C followed by 16 hours of cooling at 25^0C. Two heat cycles say 15 day cycle and 30 day cycle were adopted. Form test results it was observed that 28 day compressive strength was maximum at 30% sand replacement and this was due to the fact that crusher powder fills up the maximum voids to get dense concrete and fly ash liberates strength during later periods.
4. **Chandrasekhara Reddy (2003)** has conducted experiment to study the performance of concrete using stone dust as a replacement to sand. Sand was replaced by quarry dust from 0 to 100% at increment of 25%. Compressive strength and tensile strength tests were conducted using 43grade OPC in M20 concrete. Compressive strength was computed at the age of 7 days, 28 days and 60 days. Form the test results he observed that all the mixes expect 50%

replacement achieved the target strength. The stone dust decreases workability of concrete due to the larger portions of fine particles. At 75% of sand replacement, the percentage of increase in compressive and tensile strength were 40 and 28 compared with references mix respectively.

5. **Chaturanga Lakshmi Kapugamage (2008)** have reported about the use of fly ash and quarry dust as partially replacement materials for cement and sand in concrete. Sand was replaced by quarry dust from 0 to 45% at increment of 15%. Cement was replaced by fly ash at 0%, 15%, and 30%. Using M30 mix with OPC the strength was determined at the age of 3, 7 and 28 days. Form the test result it was observed that the use of 15% fly ash leads to a reduction in early strength of concrete. Therefore, the concurrent use of crushed rock material and fly ash in concrete will leads to the benefits. Mix design has developed for M20, M30 and M40 grades for both conventional concrete and quarry dust concrete. Tests were conducted on cubes and beams to study the strength and durability of concrete made of quarry rock dust and the result were compared with natural sand concrete.
6. **Radhikesh Nanda (2010)** have conducted experiments on cement concrete paving block replacing sand by crusher dust as fine aggregate. Paving block of size 0.25x0.20x0.05m was cast with mix M20 by weight with water cement ratio 0.6. Compressive, flexural and split tensile tests were conducted by replacing sand by crusher dust from 0 -100% at increments of 25%. Form the test results it was observed that the compressive strength is decreases if the addition of crusher dust increases. Similarly flexural and tensile strength also decreases due to increase in crusher dust percentage. Slump value decreases if the crusher dust percentage increases. I t was concluded that crusher dust may be used instead of sand up to 50% in the place where sand availability was less and crusher dust is in plenty.
7. **Rajendra Prasad (2011)** have conducted experimental works to study the effect of crushed rock powder (CRP) as fine aggregate and partial replacement of cement with admixture. Sand was replaced by CRP in 0%, 10%, 20%, 40%, 60%, 80% and 100% and cement replaced by 10% rice hush ash (RHA). 53 grade OPC was used to prepare M30 concrete with water cement ratio 0.45. Form the test result it was observed that 10% RHA with 20% quarry dust replacement combination gave better compressive strength. Other than 20% replacement obtained lesser compressive strength compared with higher concrete. This was due to the voids present in the concrete mixes with higher amount of CRP. It was concluded that quarry dust can be utilize in concrete replacing sand.
8. **Nagabhushana and Sharda bai (2011)** have conducted experiment on concrete using crushed rock powder as a partial replacement material for natural sand. The percentage of replacement was 20, 30, and 40 .Three grades of concrete of M20, M30, and M40 were taken for study using 53grade OPC. Tests were conducted on compressive, flexural and split tensile strength at the age of 7 and 28 days. The water cement ratio was fixed as 0.5, 0.39 and 0.31 for M20, M30 and M40 mixes respectively. For M40 mix in addition to the water quantity as per water cement ratio a super plasticizer was added to keep slump of 70mm. From the test results it was observed that the compressive, flexural and split tensile strength was increased and maximum at 40% sand replacement. The percentage of increase will be inversely proportional to the mix ratio. It was conclude that the compressive , flexural and split tensile strength of concrete were not affected with the replacement of sand by crushed rock powder as fine aggregate up to 40%.

III- CONCLUSION OF LITERATURE REVIEW

1. Most of the researchers listed above considered alternative material such that stone dust and construction waste for fine aggregate and coarse aggregate replacement in the production of concrete for other purpose.

2. The maximum tensile strength of concrete is obtain at 60% and 70% replacement of natural sand with crushed sand.

3. Better for strength and durability performance to replace river sand and conventional stone in the production of concrete for use in rigid pavement for rural areas.

4. The maximum tensile strength of concrete is obtain at 60% and 70% replacement of natural sand with crushed sand.

5. The concrete with crushed sand performed better than concrete with natural sand as the property of crush sand is better than that of natural sand.

6. From our study it is concluded that different crushed sand gives different results for compressive strength depending in different quarries and from study of different research paper at 40% to 50% replacement of crushed sand the maximum compressive strength is obtained.

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