International Journal of Scientific & Engineering Research Volume 10, Issue 3, March-2019
ISSN 2229-5518

Experimental Investigation On Partial Replacement Of Sand With Limestone Waste In Concrete

1.Ashik M S,2. Mr:M.Sadhasivam,M.E.,
1.ME Student, JCT, Anna University,India
2.Professor, JCT, Anna University,India

Abstract:
Green concrete are generally composed of recycling materials as hundred or partial percent substitutes for aggregate, cement, and admixture in concrete. Limestone waste is obtained as a by-product during the production of aggregates through the crushing process of rocks in rubble crusher units. Using quarry waste as a substitute of sand in construction materials would resolve the environmental problems caused by the large-scale depletion of the natural sources of river and mining sands. This paper reports the experimental study undertaken to investigate the influence of partial replacement of sand with limestone waste (LSW), as an additive on the concrete properties. The replacement proportion of sand with limestone waste, 10%,20%,30%,40%,50%, and 60% were practiced in the concrete mixes except in the concrete mix. The effects of limestone waste as fine aggregate on several fresh and hardened properties of the concretes were investigated. The investigation included testing of compressive strength, indirect tensile strength, flexural strength, modulus of elasticity, and permeability. It was found that limestone waste as fine aggregate enhanced the slump test of the fresh concretes. But the unit weight concretes were not affected. However, the good performance was observed when limestone waste as fine aggregate was used in presence of marble powder.
.

1 INTRODUCTION

IN this paper Limestone waste is used as the partial replacement for sand in the manufacturing of concrete.
crete.

Geotechnical properties of sand and limestone waste replaced sand is Checked. The soil properties are checked for partial replacement of limestone waste with sand is done for 0% , 10% , 20% , 30% , 40% , & 50% The test results of limestone waste replaced sand can be comparable with sand. This Study is aimed to ensure the sustainability and economy. Throughout the world, concrete is being widely used for the construction of buildings, bridges etc. Our country is taking major initiatives to improve and develop its infrastructure by constructing express highways, power projects and industrial structures. It has been estimated that the infrastructure segment in our country is expected to invest around Rs.10000 billion in the year 2020. To meet out this rapid infrastructure development a huge quantity of cement concrete is required. Unfortunately, India is not sufficient in the availability of fine aggregate material namely Sand, one of the main ingredient of concrete and the demand exceeds for the supply and makes the construction activities very costlier. Hence, currently, the entire construction industry is in search of a suitable and effective of the waste product that would considerably minimize the use of sand and ultimately reduce the construction cost. Few of such products have already been identified like Green sand, Foundry sand, manufactured sand, etc., In our study, Lime stone waste sample is used as the fine aggregate in the production of concrete.

2 OBJECTIVES

1. To find out the suitable and effective replacement materi-

al for fine aggregate in the Production of concrete 2. To find out the possible utilization of waste materials in the construction industry that in turn minimizes the usage of scarcely

2.Available natural resources

3. To cut down the construction cost by using abundantly available free materials in the production of concrete

4. To investigate the potential use of Lime stone waste in the construction of structural and non-structural members in constructions

5. To find out the better way of utilizing waste materials and eliminate the problem of disposal and solid waste management.

3 MATERIALS USED

Several materials are used to manufacture good quality concrete. It is important to know the properties of cement, fine aggregate, coarse aggregate and water as they impart strength and durability to concrete. Of all the materials that influence the behavior of concrete, cement is the most important constituent, because it is used to bind Sand, Lime stone waste and coarse aggregate and it resists atmospheric action. In this chapter we will study the properties of all the major raw materials used to make concrete.

CEMENT

The major raw material for the production of cement is clinker. Clinker is an artificial stone made by heating other raw materials in specific quantities to a very high temperature in a high temperature kiln. Portland cement is hydraulic cement made by finely pulverizing the clinker produced by calcining to incipient fusion a mixture of argillaceous and calcareous materials. It is a fine grey powder that is the most important ingredient of concrete; hence it is named cement concrete. Cement undergoes a chemical. reaction with water and sets and hardens when it contacts with air or underwater. Ordinary Portland cement (OPC), 53 grade was used for the entire experimental investigation. The required quantity for this work was assessed and the entire quantity was purchased and stored properly in casting yard and used for the experimental investigation. The physical properties of the above tested according to standard procedure, conforms to the requirement of IS: 12269 -1989. The physical properties of the above cement are given in table.

FINE AGGREGATE

The fine aggregate are inert materials. They contribute to both stiffness and weight of concrete. In India river sand is preferred as fine aggregate. Of late, the lack of availability of river sand has led to the use of artificial sands, especially in southern states such as Tamilnadu. The physical, chemical and thermal properties of aggregates are substantially influence the performance of concrete. The fine aggregate used in this study are clean river sand,passing through 4.75mm sieve with properties presented in table.

COARSE AGGREGATE

Coarse aggregates are major ingredients of concrete. They provide rigid skeleton structure for concrete, and acts as economical and space fillers. They contribute to the both stiffness and durability to the concrete. Generally coarse aggregate are derived from rock. The properties derived from the mineralogical composition of the rock. The environmental exposure to which rocks has been subjected and the method of crushing employed to get the different sizes. In India crushed rock is used as coarse aggregates. Machine crushed stone with angular shape was used as coarse aggregate. The minimum and maximum size of aggregate is 12.5mm and 20mm respectively, properties of which are presented

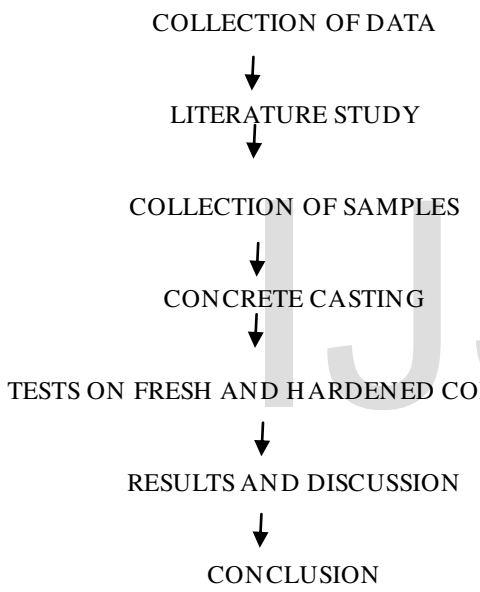
WATER

Water is the next most important ingredient after cement for making concrete. It is also least expensive. Careless use of water can lead to poor quality of concrete. Therefore, a detailed study of the quality and quantity of water required for making good quality concrete is essential. Water acts as a lubricant for the fine and coarse aggregate and acts as chemical cement to form the binding paste for the aggregate water is used for curing the concrete after it has cast into forms. Water used for both miming and curing should be free from injurious amount of deleterious materials. Portable water is generally considered satisfactory for mixing and curing of concrete. If water contains any sugar or excess of acid or salt, it should not be used. Ordinary tap water is used for preparation of concrete.

LIMESTONE WASTE POWDER

Lime stone waste consists primarily of clean, uniformly sized, high-quality silica sand or lake sand that is bonded to form molds. Although these sands are clean prior to use, after casting they may contain Ferrous (iron and steel) industries account for approximately 95 percent of eco sand used for castings.The Lime stone waste is a byproduct of Limestone. During the extraction of Limestone for the production of Portland cement, the large boulders of the limestone are cut down and transported. The remaining powders of the limestone are left free and stored as a waste material. The stored waste material is known as Lime stone waste.

4 METHODOLOGY



5 TESTS

COMPRESSIVE STRENGTH TEST

The compressive strength test is the most common test conducted `because most of the desirable characteristic properties of concrete and the structural design purpose are qualitatively related to compressive strength. The test was conducted in compression testing machine as per the specification given in IS under normal room temperature. The capacity of compressive testing machine was 20 tones. The cubes were properly held in position such that the load is applied uniformly over the surface. The load was applied gradually till the ultimate load is reached. The ultimate load was noted and from that the compressive strength was calculated using following formula

Compressive load strength =Ultimate Load /Cross Section Area N/mm2

SPLIT TENSILE TEST

According to split tensile strength, the cylinders were dealt with circumferential load and the results were noted by using formula. The split tensile strength is given by formula 2p/ ΠDL and the stress value is obtained in N/ mm². P is the ultimate load at which the cylinder fails D and L are the diameter and length of the cylinder Split tensile strength = 2P/ 3.14 LD N/ mm2

VEE BEE CONSISTOMETER

The test is suitable for stiff concrete mixes having low or very low workability. Compared to the slump and compacting factor tests, this testing has an advantage that the concrete in the test receives a treatment similar to what it would in actual.

6 CONCLUSION

Using the Limestone Waste as the partial replacement for sand gives the better results in all tests that are conducted. The availability of Limestone Waste is same as that of the availability of natural aggregates. Limestone Waste is also a cost effective material that can be used for the construction purpose. By using the Limestone Waste as a replacement of sand it will reduce the use of the natural aggregate (sand) so that the river mining and sand depletion get reduced.

From the results it was shown that mixes tested with Limestone Waste had properties, workability, strength & modulus of elasticity comparable to those of nominal concrete. Based on the tests done the following conclusions are made, the compressive strength of the 60% Limestone Waste concrete increases up to 65% than that of conventional concrete. The Split Tensile Strength of 60% Limestone Waste concrete decreases 30% than that of conventional concrete.

All the percentage of Limestone waste powder concrete proves better compressive strength and less split tensile strength compared than that of conventional concrete. Hence we can provide eco-friendly concrete with use of Limestone waste Powder.

7 REFERENCES

REFERENCES

1. M.S.Shetty, Concrete Technology Theory and Practice, Reprint2005.

2. IS 10262-2009: Specification for 53 grade Portland pozzolana cement.

3. IS 456-2000: Plain reinforced concrete –code of practice(Fourth revision).

4. "Recycling of PET bottles as fine aggregate in concrete" Mariaenrica Frigione., Department of Engineering for Innovation, University of Salento, Via per Monteroni, 73100 Lecce, Italy

5. "High-strength rice husk ash concrete incorporating quarry dust as a partial substitute for sand" S.N. Raman, T. Ngo, P. Mendis, H.B.Mahmud, Department of Civil & Environmental Engineering, The University of Melbourne, Victoria 3010, Australia

6. "Performance of high strength concrete made with copper slag as a fine aggregate"., Khalifa S. Al-Jabri , Makoto Hisada , Abdullah H. Al-Saidy , S.K. Al-Oraimi Department of Civil and Architectural Engineering, College of Engineering, Sultan Qaboos University, P.O. Box 33, Al Khodh, Post Code 123

7. "Effect of waste foundry sand (WFS) as partial replacement of sand on the strength, ultrasonic pulse velocity and permeability of concrete"., Gurpreet Singh, Rafat Siddique. Civil Engineering Department, RIMT (IET), Mandigobindgarh, Punjab, India.