WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Review-Experimental Investigation on Quarry Dust as a Partial Replacement of Sand for M-40 Grade Concrete

[1]Pankaj Prajapati, [2]Ankita Agnihotri, [3]Anant Bharadwaj, [4]Siddharth Pastariya

[1]M. Tech Scholar, Department of Civil Engineering, Sri Aurobindo Institute of Technology, Indore
[2]Assistant Professor, Department of Civil Engineering, Sri Aurobindo Institute of Technology, Indore
[3]Assistant Professor, Department of Civil Engineering, Sri Aurobindo Institute of Technology, Indore
[4]Assistant Professor, Department of Civil Engineering, Sri Aurobindo Institute of Technology, Indore

ABSTRACT—

To increase the strength of the concrete, the stone dust will be presented as a partial replacement of the fine aggregate in M40 concrete mix with water reducer admixture. The strength parameters such as compressive strength, flexural strength and split tensile strength of the casted cubes, beams and cylinders will be tested respectively. Cubes cylinders and beams will be casted by a partial replacement of natural fine aggregate in concrete mix and quarry dust will be used as a fine aggregate.

Keywords: Quarry, water cement ratio, Cubes, Cylinders, beams, fine aggregate

1. INTRODUCTION

Rapid industrialization in developing countries is increasing in urbanized areas. To support the urbanization, new building, such as buildings for housing and industries, transit large scale for people to move, and all construction activities are required for facilities to deal with water and sewage. In developing countries, the lack of traditional building materials and abundant industrial waste products has encouraged the recent construction material.

Natural river sand is the product of sedimentation. Asbestos, coal, fossils and other organic inaccuracies are present in the sand of the river above a few percent, which makes the sand unsuitable for concrete work. The natural river sand was the cheapest resource in sand. However, to meet the growing demand of sand in the construction industry, excessive mining of the river bed has given rise to ecological imbalance in the state. Now the sand available in the river is very thick and it has a lot of silt and soil. The presence of silt and soil in the sand reduces the power of concrete and keeps moisture.

In such a scenario the quarry dust will be a cheap different to stream sand. Stone dust or quarry dust is a waste material obtained from crusher plants. It has potential to be used as partial replacement of natural stream sand in concrete. Use of stone dust in concrete not only improves the quality of concrete but also conserve the natural river sand for future generations.

2. LITERATURE REVIEW

N N Priya Darshini et.al [1] (2019): This experimental work describes the study on the feasibility of the quarry dust for usage in concrete. To study the effect of quarry dust on the use of super plasticizer, sulphonated naphthalene based super plasticizer was added with fresh concrete of grades M20 and M25 using OPC and PPC separately. Super plasticizer was added at 1.2 lit/100 kg of cement as per the recommendation of the manufacturer. Water cement ratio was found out by conducting slump test for a constant slump of 60 mm. Tests were conducted in limited ratios of sand: quarry dust choosing one ratio each above and below the one giving maximum strength say 60:40, 50:50 and 40:60. At the age of 28 days the compressive strength, tensile strength and flexural strength were determined. From the test results it is found that the compressive strength, tensile strength and flexural strength are maximum at 50:50 ratios. These results on strength studies give a clear conclusion that quarry dust can be used as a good substitute for natural river sand with higher strength at 50% replacement compared with control concrete

K. Shyam Prakash et.al [2] (2016): The concept of replacement of natural fine aggregate by quarry dust which is highlighted in the study could boost the consumption of quarry dust generated fromquarries. By replacement of quarry dust, the requirement of land fill area can be reduced and can also solve the problem of natural sand scarcity. The availability of sand at low cost as a fine aggregate in concrete is not suitable and that is the reason to search for an alternative material. Quarry dust satisfies the reason behind the alternative material as a substitute for sand at very low cost. It even causes burden to dump the crusher dust at one place which causes environmental pollution. From the results of experimental investigations conducted, it is concluded that the quarry dust can be used as a replacement for fine aggregate. It is found that 40% replacement of fine aggregate by quarry dust gives maximum result

in strength than normal concrete and then decreases from 50%. The compressive strength is quantified for varying percentage and grades of concrete by replacement of sand with quarry dust

Bruce Roy Thulane Vilane1 et al. [3] (2016) The mixing magnitude relation 1:1:4 employed by CM concrete, D and N resulted in CQDB with different mean compressive strengths. Amongst these companies CM concrete's CQDB attained the highest (5.55 N/mm2) mean compressive strength and D's CQDB had the lowest (1.68 N/mm2) mean compressive strength. This could be attributed to the set amount of three days employed by D. Out of the six CQDB manufacturing companies in Matsapha the CQDB manufactured by R attained the lowest (1.24 N/mm2) mean compressive strength which was a product of a mix of 1:3:2 and a set amount of four days. The mix employed by R was identical as that employed by T and S to provide CQDB that had the third highest mean compressive strength of three.02 N/mm2. It can be over that the set amount of four days employed by R was answerable for this distinction in mean compressive strength.

K. Shyam Prakash et al. [4] (2016) The objective of the study is to separate the complete percentage replacement and to monitor the compressed power properties of the quarry dust. The results show an increase in power up to 40 percent and then there is a decrease in the compressed strength with the change in age for concrete M20 grade. With the results of experimental investment on organized ions, it has been concluded that the use of mine dust can be used as a replacement for the fine aggregate. It has been found that 40% fine concentration from mine dust gives maximum results in strength compared to normal concrete and then decreases by 50%. For the replacement of sand with mine dust, the quantity of compressed power is determined for different percentage and grade of concrete.

Vinay M, Dr. et al. [5] (APRIL 2015) In this experimental study, author used quarry dust as a replacement of natural sand and manufactured fly ash aggregates as partial replacement of granite aggregate in standard M20 grade concrete to find out strength of concrete. The manufactured fly ash aggregate were created by cement and fly ash mixer, in which quantity of cement was less than fly ash quantity. A suitable mixture of cement and fly ash selected for manufacturing of fly ash aggregates. The standard M20 grade concrete was designed for this experimental study because there was both fly ash aggregate and Quarry dust were used and the author calculated the specific gravity and water absorption for fly ash aggregate and Quarry dust. Here, the strength parameters of concrete were compressive strength, flexural strength and split tensile strength. For strength test cubes, beams and cylinders were casted using manufactured fly ash aggregate at replacement level of 25%, 30%, 35%, 40%, 45% and 50% of natural granite aggregate and in which Quarry dust used as fine aggregate**.**

Dr. A. Vijayakumar et al. [6] (OCT 2015) In this work, the cement ratio of water was tested with standard mix M20 (1: 1.5: 3) with 0.55. This is done by using cement concrete to know the possibilities of incorporating the mining dust in the optimum ratio in normal construction activities. There is a need to deal with this problem. Therefore, replacement of standard watercourse sand is important. This requires abundant quantities of material available in a modest degree season at a less expensive rate. Use of quarry dirt - Penalties are found, because the residue of equipment business is being tried as a replacement of sand at different places, but no authentic result area is not attainable for the strength of the unit characteristics and therefore by Optimal ratio Are often attached as a secluded syllable. Properties such as: In addition to compressed, split tensile and flexural strength, quarry dust has been examined with the stability of the concrete.

AmitKumarSinghet.al [7] (2015): Stone dust is a waste material obtained from crusher plants. It has potential to be used as partial replacement of natural river sand in concrete. Use of stone dust in concrete not only improve the quality of concrete but also conserve the natural river sand for future generations. In the present investigation, an experimental program was carried out to study the workability and compressive strength of concrete made using stone dust as partial replacement of fine aggregate in the range of 10% - 100%. M25 grade of concrete was designed using Portland pozzolana cement (PPC) for referral concrete. Workability and Compressive strength were determined at different replacement level of fine aggregate viz a viz referral concrete and optimum replacement level was determined based on compressive strength. Results showed that by replacing 60% of fine aggregate with stone dust concrete of maximum compressive strength can be made as compared to all other replacement levels**.**

T. Subramaniet.al [8] (2015): Due to rapid growth in construction activity, the available sources of natural sand are getting exhausted & also, good quality sand may have to be transported from long distance, which adds to the cost of construction. In some cases, natural sand may not be of good quality. Therefore, it is necessary to replace natural sand in concrete by an alternate material partially, without compromising the quality of concrete. Quarry sand is one such material which can be used to replace sand as fine aggregate. The present study is aimed at utilizing Quarry sand as fine aggregate replacing natural sand and also the compressive strength of the water cured specimens is measured on the 7,14,28 Days. Split Tensile strength, Flexural Strength, Here we have conducting a test on concrete by using fly ash and m sand. By using these materials we have find out strength on a concrete by adding partial replacement on cement with fly ash and complete replacement of sand with m sand

Sandeep Kumar Singh et al. [9] (OCT 2014) The objective of this study was to investigate the possibility of using stone dust as a partial replacement of fine aggregation. In the current investigation, a referral M25 concrete mixture was used. The results of the test show that the stone dust can be effectively used in partial replacement of the total concrete in the concrete. It has been found that the use of stone dust increases the compressed and flexible strength of the concrete. The replacement level of the fine stone dust (30%, 40%, 50%, 60% and 70%) was checked by stone dust. It has been observed that the compressed power is not greatly affected by replacement of up to 40%; however, the flexural strength at all ages made significant improvements at all the replacement levels. In partial replacement of fine aggregate, an experimental screening was done to obtain the strength of the sample (cube and beam) made using the stone dust. The strength of conventional concrete and other blends was determined at the end of 7 and 28 days of moist treatment. Cubes and beams of the design mixture of M25 grade concrete were inserted to study the effect of the inclusion of stone dust. 100 mm cubes were tested for compressed strength and the ray of the shape (500 mm × 100 mm × 100 mm) was tested for flexural strength. The w/c ratio at M25 1: 1.65: 3 was 0.48.

Dr. A.D. Pofale et al. [10] (AUG 2013) In this research paper the author used Crusher dust in concrete mix at different replacement level. He made 5 different concrete mix batch with Crusher dust at replacement level of 30%, 40%, 50% and 60% and also used Portland pozzolana cement. The author made two control concrete mixes of M25 and M30 grades with slump of 100 mm to 120 mm with natural river sand. There were 120 specimens casted and tested for compressive strength test and workability tests of fresh concrete. The two different concrete mixes M25 and M30 grades made by author and then tested for different workability tests like slump test, compacting factor test, flow table test and the all casted cubes tested for compressive strength test

Venkata Sairam Kumar N [11] (2013): Quarry dust a waste from the stone crushing unit accounts 25% of the final product from stone crushing unit. This quarry dust which is released directly into environment can cause environmental pollution. To reduce the impact of the quarry dust on environment and human, this waste can be used to produce new products or can be used as admixture in concrete so that the natural resources are used efficiently and hence environmental waste can be reduced. Here quarry dust is used for partial replacement of cement in concrete for studying the strength property of concrete. The aim of the experiment is to find the maximum content of quarry dust partial replacement of cement in concrete. The percentages of quarry dust partial replacement of cement in concrete are 0, 10%, 15%, 20%, 25%, 30%, 35%, and 40%. M20, M30, M40 grade concrete cubes of 150x150x150mm size were cast for conducting compressive strength test. From the experimental studies 25% of partial replacement of cement with quarry dust improved hardened concrete properties.

Joseph O. Ukpata et al. [12] (JAN 2012) In this paper, the authors studied about compressive strength of concrete using lateritic sand and Quarry dust is fine aggregate. In this paper author used various combination of lateritic sand and Quarry dust is complete replacement for natural sand to study structural characteristics of concrete. Three concrete mixes were prepared M15, M20 and M25 grade concrete. The workability test work carried out to find out desired water cement ratio for concrete mixes. samples were created using different proportion of laterite and quarry dust in which laterite quantity was varied from 0-100% while quarry dust was used at intervals of 25%, i.e., laterite and quarry dust was used in experimental concrete as 0%-100%, 25%- 75%, 50%- 50%, 75%- 25% and 100%- 0%. The cured samples were tested for compressive strength and results compared with conventional normal concrete.

6. CONCLUSIONS:

1. From following previous studies results we found that the quarry dust as a fine aggregates relatively weaker as compared to river sand which is used in the study.

2. The concrete mix of dust as partial replaced to sand, results a reduction in the compressive strength.

3. But the reduction in the compressive strength of the quarry dust concrete was compensated by the inclusion of mineral admixtures into the concrete mix.

4. In the presence of silica fume or fly ash, quarry dust can be a suitable partial replacement material to sand to produce concretes with fair ranges of compressive strength.

REFERENCES

[1] N N Priya Darshini*, D Rambabu (2019): An Experimental Study On The Use Of Quarry Dust As A Replacement Material In Concrete International Journal Of Advance Civil Engineering And Technology Volume 4 Issue 1 PP 27-53

[2] K. Shyam Prakash1 And Ch. Hanumantha Rao2(2019) Study On Compressive Strength Of Quarry Dust As Fine Aggregate In Concrete Hindawi Publishing Corporation Advances In Civil Engineering Volume 2016, PP 1-5

[3] Bruce Roy Thulane Vilane, Thandeka Lucia Dlamini. (2016). "The Structural Integrity Of Concrete Quarry Dust Blocks (Cqdb) Manufactured In Matsapha, Swaziland." American Journal Of Environment And Sustainable Development. Vol. 1, No. 1, 2016, Pp. 6- 10.

[4] K. Shyam Prakash And Ch Hanumantha Rao. (2016) "Study On Compressive Strength Of Quarry Dust As Fine Aggregate In Concrete." Hindawi Publishing Corporation Advances In Civil Engineering Volume 2016, Article ID 1742769, 5 Pages

[5] Vinay M., Dr. V Ramesh, Geena George. (2015). "Experimental Study On Strength Characteristics Of Concrete Using Flyash Aggregate And Quarry Dust". International Journal Of Civil And Structural Engineering Research ISSN 2348-7607 (Online) Vol. 3, Issue 1, Pp: (355-359), Month: April 2015 – September 201.

[6] Dr. A. Vijaya Kumar, Revathi K., Bharathi C. (2015). "Strength And Durability Studies On Concrete Using Quarry Dust As Fine Aggregate." International Research Journal Of Engineering And Technology (IRJET) E-ISSN: 2395 -0056 Volume: 02 Issue: 07 Oct-2015 Www.Irjet.Net P- ISSN: 2395-0072.

[7] Amit Kumar Singh, Vikas Srivastava, V.C. Agarwal (2015): Stone Dust In Concrete: Effect On Compressive Strength International Journal Of Engineering And Technical Research (IJETR) ISSN: 2321-0869 (O) 2454-4698 (P), Volume-3, Issue-8, August 2015 PP: 115-118

[8] 1T.Subramani , K.S.Ramesh2; Experimental Study On Partial Replacement Of Cement With Fly Ash And Complete Replacement Of Sand With M Sand International Journal Of Application Or Innovation In Engineering & Management (IJAIEM) PP:313-322

[9] Sandeep Kumar Singh, Vikas Srivastava, V.C. Agarwal, Rakesh Kumar And P.K. Mehta (2014). "An Experimental Investigation On Stone Dust As Partial Replacement Of Fine Aggregate In Concrete." Journal Of Academia And Industrial Research (JAIR) Volume 3, Issue 5 October 2014.

[10] Dr. Pofale A.D., Quadri Syed Raziuddin (2013). "Effective Utilization Of Crusher Dust In Concrete Using Portland Pozzolana Cement". International Journal Of Scientific And Research Publications, Volume 3, Issue 8, August 2013, ISSN 2250-3153

[11] Venkata Sairam Kumar N.1, Dr. B. Panduranga Rao2, Krishna Sai M.L.N.3 (2013): Experimental Study On Partial Replacement Of Cement With Quarry Dust Sairam Kumar Et Al, International Journal Of Advanced Engineering Research And Studies PP 1-3

[12] Joseph O Ukpata, Maurice E. Ephraim And Godwin A. Akeke. (2012). "Compressive Strength Of Concrete Using Lateritic Sand And Quarry Dust As Fine Aggregate". ARPN Journal Of Engineering And Applied Sciences. VOL.7, NO.1, JANUARY 2012 ISSN 1819-6608.

[13] Radhikesh P. Nanda, Amiya K. Das, Moharana N. C. (2010). "Stone Crusher Dust As A Fine Aggregate In Concrete For Paving BlockS." INTERNATIONAL JOURNAL OF CIVIL AND STRUCTURAL ENGINEERING Volume 1, No3, 2010, ISSN 0976–4399.

[14] Rajapaksha R. W. C. N. And Sooriyaarachchi H.P. (2009). "Feasibility Of Quarry Dust To Replace River Sand As Fine Aggregate Of Concrete". The Institution Of Engineers, Sri Lanka. Vol. XXXX1I, No. 04, Pp. [30-37].

[15] K. Subramanian, Kannan A. (2009). "An Experimental Study On Usage Of Quarry Dust As Partial Replacement For Sand In Concrete And Mortar." Australian Journal Of Basic And Applied Sciences. Vol. 7(8): 955-967, 2013 ISSN 1991-8178.

[16] S. N. Ramana, M. F. M. Zainb, H. B. Mahmuda, K. S. Tanb (2005):Influence Of Quarry Dust And Fly Ash On The Concrete Compressive Strength Development PP1-5.

[17] Siddharth Pastariya, Soniya Keswani (2016)**"**Experimental Investigation on Strength Characteristics of Fly Ash as Partial Replacement of Cement for M-20 grade of Concrete" IJournals: International Journal of Software & Hardware Research in Engineering ISSN-2347-4890 Volume 4 Issue 10 October, 2016.

[18] Siddharth Pastariya, Shanu Sharma (2017) **"**Experimental Investigation On Partial Replacement Of Cement With Marble Dust Powder on Properties Of Concrete" IJournals: International Journal of Software & Hardware Research in Engineering ISSN-2347-4890 Volume 5 Issue 9 September, 2017.

[19] Siddharth Pastariya, Siddharth Nahar (2018) **"**Experimental Investigation on PEG Fume as Partial Replacement of Cement for M-25 &M-20 Concrete" iJournals: International Journal of Software & Hardware Research in Engineering ISSN-2347-4890 Volume 6 Issue 7 July, 2018.