

# Introduction to Quarry-Dust as Partial Replacement Material to Scarce Building Material

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**Abstract:-** To construct a concrete structure the three main constituent material are cement, Fine aggregate(sand) and coarse aggregate. Cement plays an important role in binding fine and coarse aggregate in concrete structure. The demand of cement in construction market is increased significantly due to the construction of infrastructures globally and construction of houses by huge population results in shortage of cement supply and available, at high cost. Similarly, river sand is expensive due to excessive cost of transportation from natural sources and providing it through Black-marketing has increases the cost of sand. The stated situations are responsible to make cement and sand as scarce material. To solve the problem Quarry-dust has emerged as Substitute material for both i.e. cement and sand. This review study is a trial of giving some highlights on using Quarry dust as partial replacement material to scarce building material.

**Keywords:-** Quarry dust, Compressive strength, Durability, Workability, Soil stabilization.

## INTRODUCTION

Developing country like India has taken a major responsibility of constructing the infrastructures such as express highways, power projects and industrial structures etc., to meet the requirements of globalization. In the construction of buildings and other structures concrete plays an important role and a large quantity of it is being used. River sand, which is highly expensive and also scarce is one of the main component used in the preparing of conventional concrete. The accessibility of sand as a fine aggregate at low cost option is not possible. Therefore there is a need of an hour to search for an alternative material. Researchers and Investigators thought of using Quarry rock dust as a fine aggregate(sand) in concrete d. Quarry dust is a waste material that is generated from the stone crushing industry which is a concentrated material in the form of dust and is abundantly available to the extent of 200 million tons per annum. It is dumped as useless material causing air pollution. Recycling such wastes by incorporating them into building materials is a practical solution for pollution problem and can become an alternative building material as partial replacement for cement to make the concrete more economical and also to have higher workability along with long term strength. To study the durability and strength of concrete tests were conducted on cubes and beams made of quarry dust and the results were compared with the natural sand concrete. The compressive strength, flexural strength and durability

studies of concrete made of quarry dust shown results that are nearly 10% more than the conventional concrete. In large scale, Quarry dust is used in the highways in the form of surface finishing material and also, in producing of hollow blocks and lightweight concrete prefabricated elements.

## QUARRY DUST AS PARTIAL REPLACEMENT OF CEMENT:

Using of waste to make concrete is a new technique to handle waste material from industries. Quarry dust is a waste from the crushing unit which accounts 25%-30% of the final product from stone crushing unit and a reason to cause environmental pollution. Quarry dust can be used as an admixture in concrete efficiently to lessen its impact on environment and human. It can also be used as partial replacement of cement in concrete. Cement can be replaced partially by quarry dust in percentage by weight like 10%,15%,20%,25%,30%,35%,40% and 50%. Experimental Study has shown the effect on Compressive strength of concrete by replacing cement with 10%,20% and 30% of quarry dust by S. Nazma and S. Madhavi [1]. They have concluded the linear increase in compressive strength by replacing quarry dust upto 10 to 20% and observed decrease if replaced more than 20 to 30% and Also optimization of cement content can be achieved by using quarry dust as a replacement. Another study done by Venkata Sairam Kumar N., Dr. B. Panduranga Rao, Krishna Sai M.L.N [2] states the workability of concrete. In their experiment they have taken different percentage of quarry dust with different grade of concrete viz M20, M30 and M40 with varying water-dust ratio like 0.5, 0.4 and 0.35 to check Physical and Mechanical properties of concrete. The result concludes that there is no change in workability even if water-dust ratio is varied. Again, decrease in compressive strength has been observed if cement is replaced by more than 25% with quarry dust. In one more experimental study it has seen that rice husk which is also a waste material from rice mill, is added in form of ash with quarry dust as partial replacement to cement content. In this, rice husk ash is added in 5%, 10%,15% and 20% to quarry and cement mix by taking quarry dust in variation of 5%,10%, 15% and 25%.Kankipati Dinesh kumar, P.Rani , N.Venkatesh, M.Vamsi krishna, Sk.Salman basha Sk. Gouse basha [3].The result of this experiment concludes that by adding rice husk ash with quarry dust and replacing it partially with cement in

concrete upto 35% give better results as compared with concrete made with normal cement, have good workability and also have cement content optimization.

#### QUARRY DUST AS FINE AGGREGATE: EFFECT ON COMPRESSIVE STRENGTH , DURABILITY AND WORKABILITY OF CONCRETE.

The experimental study done by R Chandana Sukesh, Katakam Bala Krishna, P.Sri Lakshmi Sai Teja, S.Kanakambara Rao.[6] in which replacement of the sand with quarry dust shows an improvement in the compressive strength of the concrete. The investigation concludes that, as the replacement of the sand with quarry dust increases the workability of the concrete decreases due to the absorption of the water by the quarry dust. The specific gravity is almost same for both the natural river sand and quarry dust. The physical properties parameter like particle size distribution and bulking has shown high variation which can affect the mix design of the concrete. The necessity of water for making the concrete to form a zero slump with a partial replacement requires more water which results in very less workability at standard water-cement ratio. The test conducted at 50% replacement showed that the water cement ratio increased to 1.6 at which slump failed. In one more investigation where natural sand is replaced 100% with quarry dust to study the physical properties, mechanical properties and durability of concrete made by quarry dust with done by R. Ilangovala , N. Mahendrana and K. Nagamanib [7].Mix design has been developed for M20, M30 and M40 grade of concrete for both conventional concrete and quarry dust concrete using design approach IS, ACI,USBR,RN.No.4 and BRITISH to compare the results. This experiment concludes that if quarry dust replaced by 100% gives equal or better results as compared with conventional concrete. The results has shown that the compressive strength of quarry dust concrete is 10-12% more along with durability under sulphate and acid action. It also shown that the water absorption property of this concrete is slightly higher and lastly they have conclude that the replacement of natural sand with quarry dust, as full replacement in concrete is possible. To decide the water content and mix proportion to cope with the required workability levels and strength requirement it is advisable to carry out trial casting of proposed quarry dust to be used.

#### QUARRY DUST IN SOIL STABILIZATION AND IN BRICKS.

Fine and Coarse aggregate are basic need of construction industry and can be replaced by quarry dust which is a byproduct of rubble crusher units. It contains some Geotechnical and mineralogical characterization which can easily interact with soil. This characterization can lead to viable solution for its proper utilization. An experimental study is carried out to study the effect of addition of quarry dust with red earth and two different cohesive soils viz, Kaolinite and Cochin marine clay T. Soosan, A. Sridharan, B. Jose, and B. Abraham [8]. The intention of this experiment is to improve Geotechnical properties of soil in highway using quarry dust. The experimental result has

shown that the compaction characteristics and CBR value of soil has improved by addition of quarry dust. This paper concludes a solution for a problem accomplice with the construction of highway over clayey sub grade which can be decreased considerably by mixing it with quarry dust. In one of the review study done by C Onyelowe Ken, Fo Okafor, Dc Nwachukwu [9] has mention the difficulties of soil stabilization. It is a costly affair done by cement or sand or any other soil having good properties. In this study they have concluded that soil improvement can be done using quarry dust which helps in enhancing engineering behavior or properties of soil with cost effectiveness. In another experimental study quarry dust is incorporated into fired clay bricks A A Kadir, M I H Hassan, N A Sarani, A S Abdul Rahim and N Ismail [10]. The intension of this investigation is to make quarry dust as an alternative low cost material for brick and at the same time suggest a new method of waste disposal. Bricks were prepared by mixing different percentages of quarry dust i.e. 10%, 20% and 30%. All bricks sample was tested for their physical and mechanical properties. This experiment concludes that incorporating quarry dust in 10% gives good physical and mechanical properties and recommends the use of quarry dust in bricks.

#### CONCLUSIONS:

A review study on The introduction of quarry dust as partial replacement to scarce material is still promising. Sustainable and long-lasting Concrete structures can be made using quarry dust. Different structures are being made all over the world using it. Lots of research work has been done and still it is being continued for more better results. This review study has tried to focus on the incorporation of quarry dust in different ways which has given good and satisfactory results, proved economical to use and also become a low cost alternative material which can be partially replaced with the scarce material i.e cement and sand. According to researchers cement and sand can be replaced with quarry dust maximum upto 25 to 30%. To achieve cost effectiveness in construction, cement and sand should be replaced by more than 50% with quarry dust without affecting the concrete properties and experiments should be continued to achieve the same.

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