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AN EXPERIMENTAL INVESTIGATION OF PARTIAL REPLACEMENT OF CEMENT BY FLY-ASH AND SAND BY QUARRY DUST

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Abstract - Concrete is the most important civil engineering material in construction buildings and industries because its increase the strength properties. The addition of some other material may change the properties of concrete. Prestressed concrete and high rise building there is a growing demand of concrete with higher compressive strength. The present work when cement is replaced by fly ash at 15%, 20% and 25%.by weight of cement, and sand by quarry dust 40% by weight of sand for M20 mix. The experimental studies are made to obtain the properties of concrete like the compressive strength at the curing age of 7, 14, 21 and 28 day.

Key Words: **Ordinary Portland Cement, Fly-ash, Quarry Dust , Compressive strength**.

1. INTRODUCTION

Concrete is the most commonly used construction material in civil engineering because high structural strength stability. The natural resources are decreases and also the cost of natural sand and cement are increases. The concrete plays very important role in developing the infrastructure like highway, buildings, towns and bridges etc. The concrete is a mixture of cement sand, coarse aggregate and water.

In concrete the most commonly used fine aggregate is sand which is obtained from rever banks and the demand of natural sand is very high also its transportation cost is very high and its also create environmental problems due its large consumptions. We can minimize this problem by partially replacement of sand with quarry dust.

Quarry dust is a by product which is obtained from the crushing process of rock. Quarry dust is used for various purposed in construction industry, such as road construction, light weight aggregate, bricks, autoclave blocks and tiles etc. the quarry dust is economical material as compared to sand. Due to the increasing in cost of cement and also demand of cement is very high in various construction industries, we need to minimized this problem by partially replacement of cement with fly ash. Fly is economical material as compared to cement.

Fly ash is the by product which is obtained during the combustion of coal and it's also having some similar specification of cement so it is better option by partially replacement of cement with fly ash.

The most widely used supplementary cementations material in concrete, to use fly ash as partial replacement for cement to have high workability and quarry dust when compred to that of the natural river sand.Fly-ash is used as an ingredient in block, briksetc.The non-combustible mineral portion of coal is comprised the fly-ash, quarry dust have been used different in the construction industry, such as building material, road construction material. In construction field concrete is used as most important structural material ,in the industry the development is specially subjected to the concrete. This problem by partially replacement of quarry dust with sand and also for better improvement purpose cement partially replaced with fly-ash. As a result reasonable studies have been conducted to find the suitability of quarry dust in conventional concrete.

2. LITERATURE REVIEW

- **Jagdish Virupakshi Patil -** To study the compressive strength of concrete by partial replacement of cement with maximum or minimum fly-ash, i.e. 5% 10% 20% and 30% the cement OPC

for M20 and M25 10% of fly-ash is the replaced by cementations material. It may be noticed that for the fly ash concrete the total cementations' material is grater but the OPC content is smaller, the fine aggregate content is reduced but the coarse aggregate content is deliberately the same, the water is reduced and the density is reduced because of the lower density of fly ash compared with cement.

- **Vinod Goud(1)-** To study the compressive strength of concrete by partial replacement of cement with fly ash and its effect. This research conclude the study of the effect of fly ash on the properties of concrete for nominal mix of M25 grade of concrete. The 10% and 20% of replacement of cement with fly ash shows good compressive strength for 28 days. The 30% replacement of cement with fly ash shows ultimate compressive strength of concrete decrease.

- **Chandana Swrkesh(3)-** To study the compressive strength of concrete by partial replacement of sand with quarry dust. The replacement of sand with quarry dust shows an improved in the compressive strength of concrete. The result show the decrease in the workability of concrete when the percentage of the replacement is increasing. The ideal percentage of replacement of sand with quarry dust is 55% to 75% in case of compressive strength.

- **K.Lakshmidevi and A.V. Narasimha Rao -** The study is conducted to analyse the properties of concrete the cement material by fly-ash and sand by quarry dust in this study the concrete mix design for M25 of concrete find out to according IS-Code. Compressive strength test is the most common test conducted on hardened concrete as it is easy to perform and most of the desirable characteristic properties of concrete are qualitively related to its compressive strength. The tests are performed in compression testing machine using cube and cylindrical samples. The compressive strength of concrete cubes are tested at 7,14,21,28,56,and 90days of curing period and compressive strength of concrete cylinders are tested at 28 days of curing period. And gain the maximum compressive strength.

- **Lohani T. K.(3)-** The replacement of quarry dust by sand is 40 % then it gives the maximum results in strength compared to fresh concrete and to find out the results of compressive strength of cube during (7,14,21,28) days.

- **T. Subramani(1)-** The fly-ash % increases compressive strength and split strength decreases and also save the cost of disposal of fly-ash use of quarry dust as fine aggregate it gives good strength and used in building material cement, bricks etc.

- **Vinit Kumar Singh(3)-** It is observed that on addition of fly ash up to 20% partial replacement of PPC increasing compressive strength is achieved at all ages as compared to the referrals concrete. At 10% replacement level the compressive strength is 4.8%, 9.62% and 16.83% , more the referral concrete at 7,28,56 days respectively. And 20% replacement level the compressive strength is 1.35%, 1.08% and 7.49% in same days.

- **S.N Raman(3)-** The 91 day compressive strength of concrete with water binder ratio of 0.35 ranged between 61.2Mpa and 70.98Mpa. For the case of concrete with water binder ratio of 0.50, the 91 days compressive strength ranged between 37.6Mpa and 51.8Mpa.

3. CONCLUSIONS

The experimental study conducted on the partially replacement of cement with fly ash as percentage of 15%, 20%, 25% and sand with quarry dust by 40%. In this study the maximum compressive strength of concrete is obtained by partially replacement of cement with fly ash at 20%. The 25% replacement of cement with fly ash, the compression strength of concrete is decreases. Hence it is concluded that the partially replacement of cement with fly ash above 20% is decreases the compression strength of concrete.

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