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"Use of Quarry Dust as fine aggregates by Partial Replacement of Sand in Concrete Mix-Review Paper"

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Abstract: -*As we Know River Sand is one of the most common fine aggregates in the concrete mix. But today, in many areas we are facing an acute shortage of Sand because of the it's continue use and this uses resulting various serious problems such as shortage in availability, cost and impact on environment. To sort out this problem an alternative to the river sand is important. One such material is Quarry stone dust which is by product obtained during the quarrying process. Basically, we used the dust in the highway construction as a surface finishing material, also useful in making concrete hollow bricks. Therefore, Quarry dust has been proposed as an alternative to the river sand in concrete mix, and it gives an additional strength to the concrete. This utilization of Quarry Dust by replacing sand would also reduce the pollution in environment and also reduce the cost of concrete.*

Keywords: - Quarry dust, Sand, Concrete, Compressive strength.

INTRODUCTION:-

Quarry dust is a byproduct of the crushing process which is a concentrated material to use as aggregates for concreting purpose, especially as fine aggregates. In quarrying activities, the rock has been crushed into various sizes; during the process the dust generated is called quarry dust and it is formed as waste. Quarry dust should be used in construction works, which will reduce the cost of construction and the construction material would be saved and the natural resources can be used properly. Quarry dust has been used for different activities in the construction industry, such as building materials, road development materials, aggregates, bricks, and tiles.

The concept of replacement of natural fine aggregate by quarry dust improve the utilization of generated quarry dust, thus reducing the requirement of land fill area and conserving the scarcely available natural sand sustainable development. Strength of the concrete is mainly dependent on bonding of the fine aggregates which fills the voids between the coarse aggregates.

It is found that 50% replacement of fine aggregate by quarry dust gives maximum result in strength. As the quantity of water increases, the compressive strength decreases when replaced with quarry dust. This is due to the water absorption property of quarry dust. It is well known that the w/c ratio increases as the strength decreases. But the observation regarding compressive strength of quarry dust when compared to sand is nonlinear.

LITERATURE REVIEW:-

1. Radhikesh et al (2010) Quarry dust has been used for different activities in the construction industry such as for road construction and manufacture of building materials such as lightweight aggregates, bricks, tiles and autoclave blocks.
2. Shahul Hameed et al (2012) have done the experiment to study the feasibility of the usage of quarry rock dust and marble sludge powder as hundred percent substitutes for natural sand in concrete. Two sample of M20 mixes were prepared using Grade-43 OPC, one with quarry dust and another by marble sludge powder combination. It was concluded that quarry dust and marble sludge powder combination as fine aggregate in concrete was recommended.

3. Chandana Sukesh (2013) in his study published in the International Journal of Innovative Technology and Exploring Engineering, says that the ideal percentage of the replacement of sand with the quarry dust is 55 per cent to 75 per cent in case of compressive strength.

MATERIAL AND METHODS:-

I. Cement:-

Cement is a fine, soft, powdery-type substance. It is made from a mixture of elements that are found in natural materials such as limestone, clay, sand and/or shale. When cement is mixed with water, it can bind sand and gravel into a hard, solid mass called concrete.

Portland cement is manufactured by crushing, milling and proportioning the following materials:

- Lime or calcium oxide, CaO: from limestone, chalk, shells, shale or calcareous rock
- Silica, SiO_2: from sand, old bottles, clay or argillaceous rock
- Alumina, Al_2O_3: from bauxite, recycled aluminum, clay
- Iron, Fe_2O_3: from clay, iron ore, scrap iron and fly ash
- Gypsum, $CaSO_4.2H_20$: found together with limestone.

II. Aggregates:-

Aggregate**,** in building and construction, material used for mixing with cement, bitumen, lime, gypsum, or other adhesive to form concrete or mortar. The aggregate gives volume, stability, resistance to wear or erosion, and other desired physical properties to the finished product.

III. Quarry Dust:-

The crushed rock aggregates quarrying generates considerable volumes of quarry fines, termed quarry dust. The quarry dust is used as the first fine aggregates.

IV. Sand:-

Sand is used as the second fine aggregates. The locally available river sand at the site is used for the experiment.

METHODOLGY:-

This experiment briefly explains the methodology adopted for this experimental work. In the first phase, the physical properties of ingredients of concrete and compressive strength of mortar cubes have been found. In second phase, the compressive strength of concrete has been found.

The batching of concrete was done by weighing the materials of mix ratios of 1:2:4. The materials were then mixed thoroughly and prescribed quantity of water was added and then mixed to produce fresh concrete.

The fresh concrete was filled in the mould. Tamping rod has to be used for hand compaction of concrete. When compacting by hand, the standard tamping bar is used and the strokes of the bar are distributed in a uniform manner over the cross section of the mould. Compaction eliminates air bubbles and brings enough fine material both to the surface and against the forms to produce the desired finish. While tamping is carried out, care should be taken that the rod should penetrate the full layer of the last layer placed and to some extent into lying to ensure proper bond.

After 24 hrs of drying, curing is done for 7 days testing. After testing for compressive strength curing is done again for 28 days then the result is obtained for each concrete cube.

CONCLUSION:-

1. Replacement of fine aggregate by quarry dust at partial replace results the increase in strength of concrete.

2. The concept of replacement of natural fine aggregate (sand) by quarry dust may help in many ways such as it is helpful to control environment pollution, erosion of river bank might stop and also the waste quarry material can be utilize.

3. Since sand is much costlier due to reduction of sources as natural fine aggregate, we need to find a replacement product with less cost. Quarry dust is one of the Suitable and available product in the market, which also provides the benefit of less cost.

4. Due to high quantity of dust particles, the workability of concrete is affected but it can be resolved by Super plasticizer.

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