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A Study on Partial Replacement of Fine Aggregates by Quarry Dust and Cement with Fly Ash

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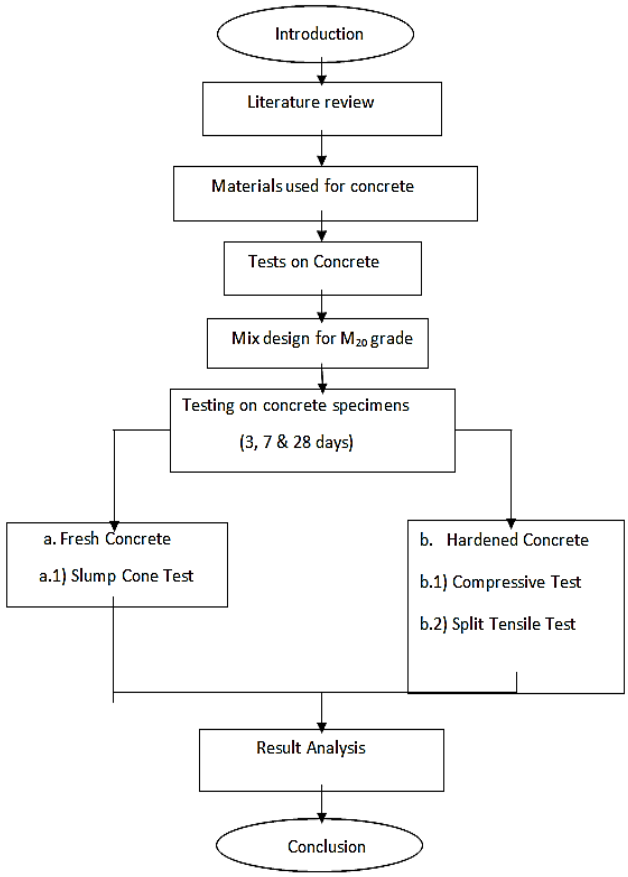
***Abstract:*-- Quarry dust is a waste product obtained from quarrying , by and large it is characterized as the buildup. Quarry dust being overall, product will also likewise reduce environmental effect is devoured by development industry in vast amounts .Hence the utilization of quarry dust as in fine total in solid will reduce not only regular sand as well as decrease the natural issues. In addition, Generally in 10 to 25% by weight of Portland concrete. The utilization of mineral admixtures like fly ash remains in quarry clean cement by as incomplete substitution of cement, improves the pumping of the concrete, strength, durability and reduction of cement consumption. It also reduces the CO2 emission during the manufacturing of Portland cement. Therefore an attempt has been made to study the performance of organic, inorganic inhibitors dosage of 1%,2%,3% and 4% by weight of cement in quarry dust concrete to control the rebar corrosion. M20 grade of Concrete cube of size 150X150X150 mm, cylinder of size 150mm diameter and 300 mm long cast for compressive, split tensile tests after 3,7 and 28 days , curing the specimen cubes shapes have been tried .**

Key Words- Quarry Dust, Fly ash, slump cone , Compressive strength, split tensile, alkalinity

INTRODUCTION

Concrete is an one of the most comprehensively used development material now a days. The constituents of cement are coarse aggregates, fine total are the binding material and water. It is standard than that of sand is being utilized as fine aggregate in concrete. For the last a few years, the cost of sand because of regulatory limitations in Indian nation requests relatively more prominent cost at around a few times the cost of quarry clean even in places where stream sand is accessible nearby places . To accomplish the economy, it is proposed to study the utilization of a quarry dust as an elective material to replace concrete by fly ash. Generally it is increase in compressive strength of concrete with 30% replacement of sand with manufactured sand[1], 30% replacement is possible[2] and 40% replacement gave higher strength[3]. Quarry dust as a fine total diminished the compressive strength because of grading and over the top flakiness [4]. The w/c proportion and slump value expanded with the substitution of sand [5]. Voids exhibit in quarry dust mortar were not as much as that of sand, consequently higher compressive strength. fly ash powder partially replacement for the normal Portland cement, and also in view of an across the board false that fly ash remains concrete is less impervious to the activity of fire than concrete made from other aggregates.



LITERATURE REVIEW:

Steps involved in present work,

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USAGE OF MATERIALS

Cement

In this experiment by using OPC (ordinary Portland cement)53 grade of cement, The Alternative of fly fiery remains 0%,5%,10%,20% and 25%. Numerous tests were directed on concrete are as per the following For this test the OPC-53 grade cement will be utilized.

Specific gravity: 2.89
Initial setting time: 30 min.
Final setting time: 260 min
Fineness: 6 % residue on IS 90 micron sieve

Fine aggregates: sand (River sand) fine aggregates implies it is a blend of little particles of grains and minerals which is passing through the 9mm sieve and it is used for construction purposes like mixing in concrete and form work.

TABLE 1. RESULT OF SIEVE ANALYSIS FOR SAND

Is Sieve	Retained weight(gm)	Cumulative weight retained(gm)	Cumulative %weight retained(gm)	Cumulative %passing
10mm	0	0	0	100
4.75mm	10	10	2	98
2.36mm	50	60	12	88
1.18mm	50	110	20	78
600µ	95	205	46	59
300µ	175	380	82	24
150µ	85	465	91	7
<150µ	35	500		
total	150		253	
F.M=253/100=2.53				

TABLE 2: RESULT FOR SPECIFIC GRAVITY OF SAND

S.NO	PARTICULARS	PROPOTIONS
1	Specific gravity	2.89
2	Fineness	2.53
3	Density	1.76
4	Void ratio	0.55

Coarse Aggregates:

in these experiment were using 20mm size of aggregates are used . Most for the total coarse aggregates can be characterized as either smooth or rounded , (for example, river gravel) or precise angular, (for example, smashed stone). Many tests were conducted on Coarse Aggregates are as follows For this experiment the 20 mm size of aggregates are preferable

TABLE 3: RESULT FOR SPECIFIC GRAVITY OF COARSE AGGREGATES

S.NO	PARTICULARS	PROPOTIONS
1	Specific gravity	2.93
2	Fineness	3.34
3	Density	1.34
4	Void ratio	0.75

Water: water is an one of the most important ingredients of the concrete. Generally in these experiments by using of tap water. it is chemically reacting with cement

Fly Ash:

Fly ash, also called "pounded fuel ". fly ash was by and large discharged into the climate, fly ash is by and large put away at coal control plants or placed in landfills. About 43% is recycled. it is producing the and a replacement or partial replacement for cement in concrete production. Use of Fly Ash is Ash is environmentally friendly as the waste materials from businesses are adequately being utilized to make quality building materials. Fly Ash has little particles which makes the solid exceedingly thick and lessens the porous of cement. It can add more greater strength to the building The utilization of fly powder as a Pozzolanic fixing was recognized as in front of timetable as 1914. Utilization of fly ash as an incomplete trade for Portland cement is especially reasonable however not constrained to Class C fly ash. Class "F" fly ash .

Advantages of fly ash

- Initial cost is high
- Mine recovery
- Stabilization of delicate soils
- Road sub base advancement
- As Aggregate substitute material (e.g. for block generation
- Mineral filler in asphaltic cement
- Fly Ash concrete is impervious to acid and sulphate attacks.

Disadvantages of fly ash

- The nature of fly ash remains can influence the quality and quantity of Cement concrete

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- Poor quality fly ash remains can expand the permeability of the solid and cause damage to the building

Consequently the benefits of utilizing fly ash in concrete are more than the advantages

Fig: Fly ash

Fig: Quarry dust

Quarry dust: The quarry dust which for the most referred as waste thing, it is reducing the cost of building advancement and besides decreasing the impact on environment. Quarry dust was required from adjacent quarries at the home spots like Kurabalakota area, Angallu (mandal), Madanapalli (rural). The quarry clean examples gathered from kurabalakota area were examined and analyzed regarding Geotechnical properties. by and large Compression testing machine of 2000 KN limit was utilized to test the cubes' specimens.

advantages of quarry dust

- Quarry dust is better than sand.
- It could be utilized as fractional substitutions, however not completely.
- In the event that utilized, there is a major particle size difference.
- It s better not to use in concrete.
- River sand can be favored than Quarry dust.

Table:4 PHYSICAL PROPERTIES OF QUARRY DUST

S.NO	PARTICULARS	PROPERTIES
1	Colour	Gray
2	Shape	Irregular
3	Particle Size	> 50 microns
4	Odour	Odorless
5	Mineralogy	Non- crystalline
6	Specific gravity	2.8

Table:5 CHEMICAL PROPERTIES OF QUARRY DUST

S.NO	PARTICULARS	PROPORTION
1	Calcium oxide	0.3-2.2%
2	Iron Oxide	0.1%
3	Potassium Oxide	2.1-2.3%
4	Aluminum Oxide	0.2%
5	Magnesium Oxide	0.2-0.6%
6	Sodium Oxide	0.1-0.8%

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METHODOLOGY

INTRODUCTION

In this mix design we prepare M20grade Concrete by using IS 10262-2009 according to these, the mix proportion of cement, fine aggregates, coarse aggregates and appropriate water content ratio is taken mix proportion table

S.NO	Grade of concrete	Cement content	Fine aggregate(1 cubic meter)	Coarse aggregate(1 cubic meter)	Water content	Water in liter
1	M20	290	435	870	0.5	145
		1	1.5	3	0.5	

SLUMP CONE TEST

by using of quarry dust has found to have the less workability, The various w/c for different proportions of sand with quarry dust is tabulated in below. The slump value of Mix 1 is 47mm whereas for Mix 2 is32, Mix 3 is 26,and Mix 4 and Mix 5 it is 18mm. The slump value is decreased by expansion of mineral admixtures to the solid. It indicates the concrete has low workability

TABLE:6 RESULTS FOR SLUMP CONE TEST FOR QUARRY DUST MIX CONCRETE

S.NO	Concrete Mixes	Slump in mm
1	MIX-1	47
2	MIX-2	32
3	MIX-3	26
4	MIX-4	18
5	MIX-5	18

COMPRESSIVE STREGNTH

In this mix design we prepare M20grade Concrete by using of cement, fine aggregate, coarse aggregate, water and some percentage of quarry dust which replaces the fly ash. In this analysis solid concrete cube of sizes are 150×150×150 mm were casted and cured for 7,28 and 60 days respectively. In this analysis casted are threw with fine aggregate of concrete by quarry dust with rates 0%, 10%, 20%, 30%, 40%and wind up with 50%.

TABLE:7 RESULTS FOR COMPRESSIVE STRENGTH TEST OF "QUARRY DUST" MIX CONCRETE (DAYS)

S.NO	Grade With % of quarry dust and 5% of fly ash in all grades	C.S for 3 days	C.S for 7 days	C.S for 28 days
1	M20(0%)	7.43	14.77	21.12
2	M20(5%)	8.56	16.10	23.23
3	M20(10%)	9.67	18.34	24.87
4	M20(15%)	7.12	14.56	20.14
5	M20(20%)	6.56	12.87	18.36
6	M20(25%)	5.58	11.13	17.13

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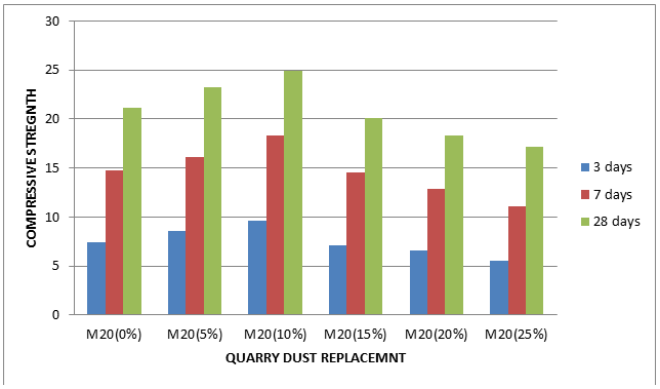

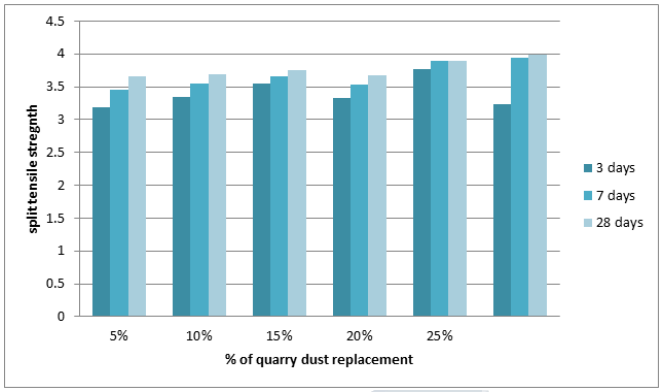

SPLIT TENSILE STRENGTH:

The split-tensile strength of the concrete was controlled by placing of cylinder of size 150 mm x 300 mm evenly in the pressure testing machine. The load is applied gradually till the failure of the specimens and it is recorded.

TABLE.8: SPLIT-TENSILE STRENGTH RESULTS

Replacement of fly ash Powder %	3 DAYS	7 DAYS	28 DAYS
0%	3.18	3.45	3.65
5%	3.34	3.54	3.69
10%	3.54	3.65	3.75
15%	3.32	3.53	3.68
20%	3.76	3.89	3.90
25%	3.23	3.94	3.98

CONCLUSION

- Natural River sand, if replaced by fifteen to twenty percent Quarry Rock Dust from quarries, preferred outcome over the solid made with Natural Sand, regarding compressive and split pliable test considers
- It is experimental studies it is known that at 5% of fly ash and 15% of quarry dust replacement in cement and aggregates respectively is better for optimal usage.
- By increasing the quarry dust split tensile strength of concrete also increase up to certain limit of 25%.
- It is economical than that of normal concrete.

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