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EXPERIMENTAL INVESTIGATION ON PERFORMANCE OF COATINGS IN RC SLAB WITH THE PARTIAL REPLACEMENT OF QUARY DYST AS AFINE AGGREGATE

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Abstract - *The main objective of this project is to describe some of the important topics related to the use of protective coatings in R.C. slab and quarry dust as fine aggregate, Zinc-Phosphate, Rust remover(WD40) and red oxide polymer. Phosphate coatings have a wide field of applications in industry. The aim of the present work is to control the ion concentration in the phosphate bath in order to improve the quality and adhesive properties of zinc phosphate coatings in steel. Rust remover(WD40) soak quickly dissolves rust from metal and restores surfaces to bare metal without scraping, chipping or scrubbing. It removes light rust, leave the parts in 1-3 hours. Red oxide systems are polymers containing groups that can be reversibly reduced or oxidized. In other words, these electrochemical properties via losing electrons or gaining electrons. River sand is too cost due to excessive cost in transportation from natural sources and also large scale depletion of these sources creates environmental problems. Quarry dust is used as the alternate product produced during the production of coarse aggregates. About 20 to 25 percentage of the total production in each crusher unit is left out as the waste material called quarry dust. The quarry dust can be effectively used in the construction industries as a partial replacement of sand in concrete. In this work the behavior of RC Slab using different percentages of quarry dust as a partial replacement for fine aggregates were studied succesfully. Different ratios like 10% and 20% for M30 grade of concrete were cast and the strength parameters were studied. It is then cured in water and is tested for its compressive strength on 7 days and 28 days.*

***Key Words*: Quarry dust, impact test, corrosion test, red oxide, zinc phosphate**

1. INTRODUCTION

Steel Reinforcement is widely used in the construction. The corrosion of the steel reinforcing bars in the concrete limits the life span of the concrete structures. It is one of the main deterioration of the civil infrastructures. Corrosion occurs in the steel regardless of the inherent capacity of the concrete to protect the steel from the corrosion results from the loss of alkalinity in the concrete or penetration of the aggressive ions**.** Zinc Phosphates are used for the corrosion resistance, a lubricant base layer and as a painting/coatings base and can also be applied by immersion or spraying. Copper sulphate is an inorganic compound that combines sulfur with copper. It can kill bacteria, algae, roots, plants, snails, and fungi. The toxicity of copper sulphate depends on the copper content. Quarry dust is the by product from the crushing process of stones which is available abundantly from rock quarries at low cost in many areas can be an economical alternative to the river sand. Quarry dust can be used for the different activities in the construction industry such as road construction and manufacture of building materials such as light weight aggregate , bricks , tiles and autoclave blocks.

2. METHODOLOGY

The research work was done before starting the work by reviewing the previous research topics papers published. The materials used are ordinary Portland cement of grade 43, quarry dust is used as fine aggregate, natural crushed aggregate is used as a coarse aggregate which is passed from 20 mm sieve and retained on 4.75 mm sieve is employed in this research project. The materials nature was tested by conducting tests namely specific gravity test, water absorption test, Impact value test, corrosion test. As per IS 10262:2009 mix design is done. Mix prepared which contain 10% to 20% quarry dust as partial replacement to fine aggregate along with natural fine aggregate with water cement ratio of 0.45 which is determined by conducting slump cone test for fresh concretes of every proportion of quarry dust replaced specimens. Once design mix has been prepared, then 50x50x5cm slab mould was prepared and casted for these mixes which is going to tested after 7,21and 28 days of curing.

3. Materials used

3.1Cement

Cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Some tests were conducted such as consistency test, setting time test, specific gravity test.

Table - 1: properties of cement

S.NO	PROPERTY	VALUE
1.	Specific gravity	3.14
2.	Consistency	33%
3.	Initial setting time	30min
4.	Final setting time	300min

3.2 AGGREGATE

Aggregates are materials added to cementation mixtures to improve the strength of that mixture. The size of aggregates used is 20mm and the grain size of sand is used. The aggregate tests are performed and results are as follows.

(1)Fine aggregate

Aggregate is the granular materials used to produce concrete or mortar and when the particles of the granular material are so fine that they pass a 4.75mm sieve, it is called fine aggregate. It is widely used in the construction industry to increase the volume of concrete, thus it is a cost saving materials.

(2)Coarse aggregate

Coarse-grained aggregate will not pass through a sieve with 4.75mm. Those particles that are predominantly retained on the 4.75mm sieve and will pass through 3-inch screen are called coarse aggregate. It gives strength, hardness, durability in concrete.

Table -2 : properties of aggregate

S.NO	PROPERTY	FINE AGGREGATE	COARSE AGGREGATE
1.	Fineness modulus	2.64	4.16
2.	Specific gravity	2.65	2.85
3.	Bulk density(kg/m^3)	1810	1800
4.	Water	0.55%	0.65%

3.3 WATER

Water as a material to make any kind of cementious paste. It is what helps initiate the hydration reaction of the cement to turn that slurry of the mix to act as a binder between all its constituents. Water influences the strength development and durability of concrete. Ordinary drinking water can be used for preparing concrete. Guidance of examine the suitability of the available water for construction can be obtained from the following specified data in IS 456-2000.The pH value of water should be generally not be less than 6.

3.4 QUARRY TEST

Quarry dust is the byproduct from the crushing process of stones which is available abundantly from rock quarries at low cost in many areas can be an economical alternative to the river sand. Quarry dust can be used for the different activities in the construction industry such as road construction and manufacture of building materials such as light weight aggregate ,bricks ,tiles and autoclave blocks. . About 20 to 25 percentage of the total production in each crusher unit is left out as the waste material called quarry dust. The quarry dust can be effectively used in the construction industries as a partial replacement of sand in concrete. Different ratios like 10% and 20% for M30 grade of concrete were cast and the strength parameters were studied.

4. CONCRETE MIX

The mixes were designated with the grade of concrete and the type of fine aggregate used. Mix proportions were arrived and quarry dust was added to the concrete mix with a w/c ratio 0.45. The percentage of quarry dust added by weight was 10% and 20%. Control mix concrete and modified concrete with varying percentage of quarry dust and the percentage for various replacement levels are presented.

Table- 3: Mix specification

MIX SPECIFICATION	CONTROL MIX	MODIFIED MIX
PROPORTION OF QUARRY DUST ADDED	10%	20%

5 .EXPERIMENTAL PROCEDURE

5.1 Preparation of Test Specimens:

For the purpose of testing specimens, various concrete specimens were prepared for different mixes using rotating drum mixer. Preparation of concrete specimens aggregates, cement and Quarry dust was added. After thorough mixing, water was added and the mixing was continued until a uniform mix was obtained. The concrete was then placed in to the moulds which were properly oiled. After placing of concrete in moulds, proper compaction was given using the table vibrator. Specimens thus prepared were de-molded -after 24 hours of casting and were kept in a curing tank for curing. For durability test, cubes of 50x50x5cm were cast for acid and sulphate attack. The durability test was done after 28 days of water curing.

Table- 4: size of slab

TEST DETAILS	SHAPE AND DIMENSION OF THE SPECIMENS
Compressive strength	Slab:50x50x5cm
Split tensile strength	Slab:50x50x5cm
Flexural strength	Slab:50x50x5cm

6. TESTING OF SPECIMENS:

6.1 Compressive strength

Slab specimens are used of size 50x50x5cm to determine compressive strength of mix design concrete no. of slab casted for compressive strengthis 10slabs with the addition of quarry waste(10% and 20%)for 7 days and 28 days under normal water curing

Table-5 : Tested value

S NO	% of quarry dust added	7days compressive strength (N/mm²)	28 days compressive strength (N/mm²)
1	10%	19 .21	29.02
2	20%	18.5	28.5

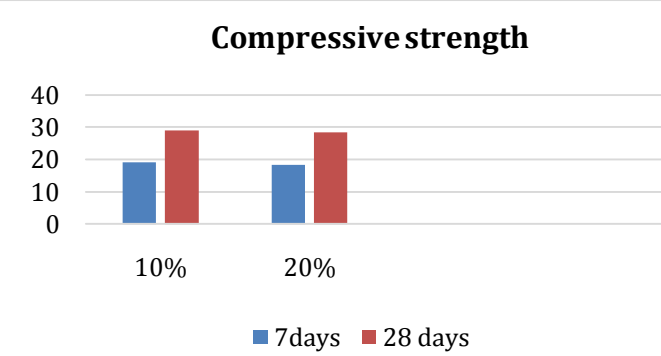

Chart -1: compressive strength

6.2. Tensile Strength:

Slab specimens are used of size 50x50x5cm to determine compressive strength of mix design concrete no of slab casted for tensile strength is 10slab with the addition of quarry waste(10% and 20%)for 7 days and 28 days under normal water curing.

Table – 6 : Tested value

S NO	% of quarry dust added	7days split tensile strength (N/mm²)	28 days split tensile strength (N/mm²)
1	10%	3.4	2 .9
2	20%	3.2	2.75

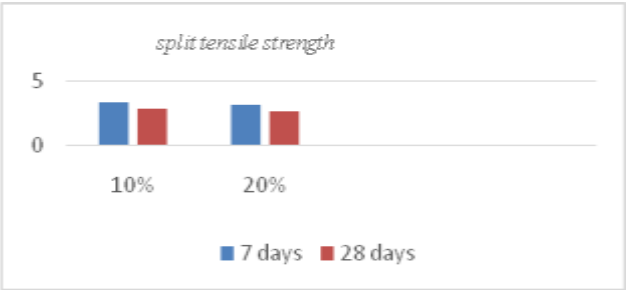

Chart – 2 : Split tensile strength

6.3 *Flexural strength test:*

Normal mix concrete slab and addition of quarry dust concrete mix slab size 50x50x5cm are used for flexural testing machine . No. of Specimens casted for Flexural Strength is 10 slabs with the addition of quarry dust (10% and 20%) for 28 days.

Table no- 7:Tested value

S. NO	% of Quarry dust added	28 days Flexural strength (N/mm^2)
1	10%	2.1
2	20%	1.6

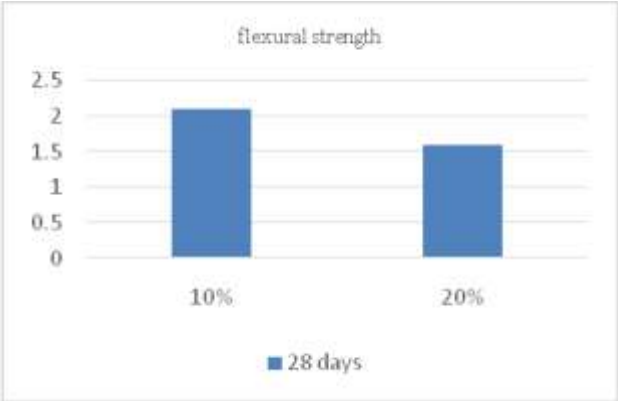

Chart-3: Flexural strength

7. CONCLUSION

In this experimental investigation, an attempt has been made to use quarry dust to replace the fine aggregate in concrete. Quarry dust can be widely used as a finer materials which can be reduce the voids in concrete. Up to 20% replacement of fine aggregate by quarry dust, the results obtained are satisfactory. From the above results give high compressive strength and flexural strength. By using this quarry dust wastes instead of conventional materials, which would not only be preserving the natural materials, but also solving the serious problem. Construction of buildings from quarry dust waste is eco-friendly as it utilizes waste and reduces air, land and water pollution. Zinc phosphate and Red oxide polymer reduces the corrosion in the reinforcement and gives strength to the buildings etc.

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