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Use of Ruby Mica dust as a Replacing Material in Design Mix Concrete - A Review

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Abstract – *At present day, different type of material is widely used in construction which is responsible for increasing the rate of construction structure. Ruby mica is an industrial waste material which is obtains by the fleshing and quarrying of mica for the manufacturing electrical product. This industrial waste ruby mica is group of phyllosilicate minerals which is naturally metamorphic rocks. The Pozzolanic properties of industrial waste ruby mica which help to fully replaced of sand in concrete mix design M20 (W/C=0.50) and M25 (W/C=0.43) for the manufacturing of the hollow concrete brick. The desired proportion of the percentage of the industrial waste ruby mica as 0%,25%,50%,75% and 100% along with the ordinary Portland cement of grade 43,Which has to investigate the strength parameter of the hollow concrete brick used Workability, Compressive Strength, Flexural strength and Tensile strength. The experimental result has been obtained after 14 days and 28 days. The main objective of this study is too utilized of industrial waste ruby mica as a replacing material with fine aggregate. Which have to manufacturing of concrete hollow brick because it reduced to construction cost and also highly reduce effect on the environmental.*

Key Words: Industrial Waste Ruby Mica, Phyllosilicate Minerals, Pozzolanic Properties, Compressive strength, Flexural Strength, Tensile Strength, Hollow concrete block.

1. INTRODUCTION

Ruby mica is widely distributed and occurs in igneous, metamorphic and sedimentary regime. Large crystals mica used for various applications are typically mined from granitic pegmatite. This type of ruby mica found at Koderma district in Jharkhand had the largest deposits of mica in the world. Mica is most stable when exposed to electricity, light, moisture and extreme temperature. Fine powder of mica has been used for various purposes. Mica is a naturally occurring group of silicate minerals Concrete is widely used construction material in the civil construction work because of its structure strength, stability and durability. The ingredients of Concrete are a mixture of cement, fine aggregate(sand), coarse aggregate and water. Cement is used as a binding material with water for binding aggregates while coarse aggregate is responsible for the performance and durability of concrete and fine aggregates fills the voids of concrete mix. Gases were evolved during and after setting of cement are harmful for the environment and hence there are requirement of reducing effect of gases and it can be done by introducing other material in concrete. The main objective of this study to investigate the experimental results of replacing fine aggregate with industrial waste ruby mica in concrete mix design of M20 and M25 grade of concrete. All the investigation is based on comparative test results of normal concrete and desired proportional concrete. *The* desired proportion of the percentage of the industrial waste ruby mica as 0%, 25%, 50%,75% and 100% along with the ordinary Portland cement of grade 43 (Shree cement manufactured in Bihar unit)

2. LITERATURE REVIEW

2.1. Sumit A.Balwaik, S.P Raut et al (2011).The utilization of paper mill pulp in concrete has great advantage for the land fill disposal. The cement has been replaced by waste paper sludge with 5% to 20% by weight for M20 and M30 mix grade of concrete. The test was carried out to evaluate the mechanical properties for up to 28days.as a result, the compressive strength, splitting tensile and flexural strength increase up to 10% addition of waste paper pulp and further increase in waste paper pulp reduces the strength gradually.

2.2 Dhanaraj Mohan Patil, Dr.Keshav K. Sangle et al(2013).In this experimental results, the waste glass powder used as replacement to some percentage of cement in the concrete ingredient. The compressive strength is satisfied. The cement is replaced at 10%, 20% and 30%.It is found that initial strength is very less due to addition of waste glass powder on 7 days an increase on 28days. It is found that20% addition of waste glass powder gives higher compressive strength.

2.3 Mr.R.Balamurugan, Mr.R.Karthick raja et al (2014). Concrete is strength and tough material but it became porous martial which interact with the surrounding environment. To produce low cost concrete with the help of hypo sludge. These tests gives results for evaluate the mechanical properties like compressive strength till 28 days. As a result, the compressive strength up to 10% addition of used hypo sludge and further increase in desired proportion of hypo sludge reduce the strength gradually. In This research work is concerned with experimental investigation on strength of concrete and optimum percentage of the partial replacement by

replacing cement 5%, 10%, 15% and 20% of hypo sludge. Keeping all this view of research, the aim of investigation is the behavior of concrete while adding of waste with different proportion of hypo sludge in concrete by using test like compressive strength and split strength.

2.4 T.Omoniyi, S.Duna, A.Mohammed et al (2014)," This work reports on an investigation in to use of Cow Dung Ash as supplementary cementations materials in concrete. Cement was replaced with Cow dung as up to 30% and gets the experiment results such as setting time, slump test and compressive strength. In this experiment the workability decrease as the cow dung ash will increase. Cement is replacing up to 15% can be consider for the production of strong and quality concrete.

2.5 P. Padma Rao, A. Pradhan Kumar, B.Bhaskar Singh et al (2014),In this research paper it is based on this study carried out on the strength behavior of rice husk ash. The replacement levels of Rice husk ash, there is 5%,7.5%,10%,12.5% and 15%.There is gradually increase in compressive strength from 7 days to 28 days followed by gradually increase. The flexural strength of rice husk concrete is decrease gradually till 7.5% replacement of cement.

2.6 Jitender Kumar Dhaka, Surendra Roy et al (2015).In this experiment show that the study of utilization of waste material in concrete production will not only save cement used in concrete industry but will also protects the environment. In this experimental study, the replacement material is fly ash and cow dung ash, the cube of M20 grade of concrete has different proportion of cement, fly ash and cow dung ash. Then specimens were cured for the period of 3 days, 14 days and 28 days. The compressive strength of all the specimen was determines using universal compressive strength.

2.7 Inderveer singh Gurjar et al (2015).In this paper present the experimental study of cow dung ash and rice husk ash act as partial replacement of ordinary Portland cement in M15 Mix concrete. Cement was replaced with cow dung and rice husk ash by weight of 5%, 10%, 15%, 20% and 25% respectively in concrete. Compressive strength test were carried out on concrete cube after 7 days, 14 days and 28 days curing. These experimental results has maximum compressive strength is achieved when cement is replaced with 5% cow dung ash and rice husk ash.

2.8 D.Gowrisankar, S. Aslam, R Satish Kumar et al (2016).This

Experimental study present the variation in the strength of concrete when replacing sand by quarry dust and cement by lime powder also replacement by the percentage of 0% to 30% in M20 grade of concrete mix design. The slump results are 60mm and the compressive strength of specimen at 7 days and 28 days also increase. It also helps increase in the tensile strength of concrete. These results also gives that quarry dust can be partially utilized in concrete mix design as a good substitute of natural river sand.

2.9 Sandeep Dalal, Parveen Berwal et al (2016),"In this research paper the compressive strength of M20 design Mix concrete specimen increase as the time of curing period increase .It has observed that the percentage of rice husk and cow dung ash increase the strength decrease even after increase in curing period. The compressive strength of cube prepared only by the cement was the highest at 28 days. There is significant different in the strength of concrete which is prepared by 10% of rice husk and 10% of cow dung ash. Then the cube were cured for the period of 3 days, 7 days, 21 days and 28 days.

2.10 Sruthy B, Anisha G Krishnan ,Gibi Miriyam Mathew and Sruthi G Raj et al (2017),This paper presents the results on the study for the use of Cow dung ash act as partial replacement of cement in the production of concrete. This replacement were design for study of effect of adding cow dung ash in various percentage by weight (6%, 8%, 10%,12% and 14%) of cement. The Strength the cow dung ash concrete and making it more durable 0.5% glass fibre is being added.it is an economic strong material which have excellent flexural strength, crack resistant and can also use as alternative material of concrete construction.

3. EXPERIMENTAL MATERIALS

3.1 CEMENT

Cement used in used of 43 grade for this work and IS 4031 - 1968 was adopted in this study; the test conducted on cement is given below.

Table-1.Properties of Cement:

S.N	Properties	Test Method	Standard Results
1.	Normal Consistency	Vicat's Apparatus	<8 mm
2.	Soundness	Chatlier's Apparatus	<10 mm
3.	Initial & Final Setting Time	Vicat's Apparatus	>300Min & <600 Min
4.	Specific Gravity	Pycnometer	3.15- 3.25
5.	Fineness Modulus	Sieve 9 Micron	<10%
6.	Compressive Strength	Universal Testing Machine	
	3 Days		>16N
	7 Days		>22 N
	28 Days		>33 N

3.2 FINE AGGREGATE

Natural sand which is used for testing of the fine aggregate and satisfied results of the all properties of fine aggregate ,natural sand which is easily available nearest river and charge is applicable so it was costly used for this work, fine aggregate conform to zone (I) as per the IS 383:1970.

Table-2.Properties of Fine Aggregate:

S.N	Experimental Method	Results Value
1	Fines modulus %	2.450
2.	Specific gravity	2.650
3.	Bulk density(Loose)(gm/cm^3)	1.464
4.	Bulk Density (Compact)(gm/cm^3)	1.627
5.	Water Absorption (%)	1.00

3.3 COURSE AGGREGATE

The course aggregate used in the work was crushed granite of pass through 20 mm seive and retain on 10 mm, aggregate are locally available and easily test conducted on aggregate is shown.

Table-3.Properties of Coarse Aggregate:

S.N	Experimental Method	Result Value
1.	Fines modulus %	6.580
2.	Specific gravity	2.68
3.	Bulk Density(Loose)(Gm/cm^3)	1.753
4.	Bulk Density (Compact)(Gm/cm^3)	1.862
5.	Water Absorption (%)	0.60
6.	Elongation Index (%)	10.23
7.	Flakiness Index (%)	11.28

3.4 INDUSTRIAL WASTE RUBY MICA

Industrial waste ruby mica is widely present in koderma district of Jharkhand .In refining mill large amount of ruby mica dust collected. These ruby mica dusts were not used in industries but powder form of ruby mica are utilized as fine aggregates. Due to this basic nature it used in concrete for the manufacture of hollow concrete brick.

Table-4.Experimental Results Value:

S. N	Experimental Method	Result Value
I	Fines Modulus %	3.58
II	Specific Gravity	2.640
III	Bulk Density(Loose)(Gm/cm^3)	1.621
6.	Bulk Density (Compact)(Gm/cm^3)	1.785
7.	Water Absorption (%)	0.80

Table-5.Physical Properties of Ruby Mica:

S.N	Physical Properties	Result Value
1.	Physical State	Non toxic
2.	Appearance	Fine
3.	Particle Size	<45 micron
4.	Colour	Grey
5.	Odour	Odourless
6.	Hardness	2.5

3.5 WATER

Water is an important ingredient of concrete which is actually participate in the chemical reaction with cement. Hence it improve the strength to cement concrete, the quantity and quality of water are required to very carefully. Portable water is free from injurious amount of oils, acids, alkalis, salts and other organic materials. The pH value of water should be equal to 7.0.It confirming the requirement of IS: 456:2000 was used for the mixing of concrete and curing the specimen.

4. EXPERIMENTAL PROCEDURE

In this experiment arbitrary method of proportioning concrete is used. Concrete include cement, sand, fine aggregate, coarse aggregate and water. Fine aggregate is replaced with ruby mica powder by 0%, 25%, 50%,75% and 100% by desired proportion of M20 (1:1.5:3 ,W/C=0.50) and M25 (1:1:2,W/C=0.43) grade of concrete mix design. For analysis of the experimental results of normal concrete and other variation concrete mix design with totally 270 specimen were casted and cured for compressive strength, Flexural strength and Tensile strength. The specimens are taken and tested were required at 7 days, 14days and 28 days for their comparative results with normal concrete and desired proportion mix design.

5. CONCLUSIONS

The conclusion based on experiment conducted and observation from the present study below.

1. In this experiment arbitrary method is easy method for the mix design of M20 and M25 grade of concrete. This type of concrete is used where large mass of industrial waste ruby mica are easily available for construction of structure and it is used as a replacement material for river sand in concrete.

2. Industrial waste material ruby mica is fully utilized in concrete structure which prevents various hazardous effects in nature.

3. The utilization of industrial waste ruby mica in concrete will prevent natural resource of river sand.

4. The used of industrial waste ruby mica help to prevent environment from dust and hazardous effect.

5. Estimate cost of construction can be reducing by local available material.

6. It is cheaper than utilization of river sand because it is available from quarry and fleshing of industries ruby mica.

7. The replacement of the sand with the industrial waste material ruby mica also increases the workability of the concrete and also decreasing the absorption of water.

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