Iron Ore Slag Dust and Cement Block

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Abstract -*This research paper represents the experimental study on use of iron ore slag dust material as an aggregate in concrete. To accomplish the objective of manageable turn of events and use of waste materials in substantial creation is particularly useful for what's to come. The iron ore slag dust aggregate used in this study was extracted from iron ores extraction fields or ore mines of India. The results show that it is possible to produce medium and high strength concrete with the addition of ore slag dust as aggregates instead of natural aggregate. It is also seen from the results that the compressive strength characteristics of iron ore slag dust aggregate concrete attain the required criteria set by various international standards and codes, which affirms the possibility of iron ore slag dust residue to be utilized as a substitute to normal aggregate in primary cement. We replaced the Fine aggregate in concrete by 100% to the iron ore slag material aggregate of size less than 4.65mm. The water to cement percentage was taken from 8% to 15 % of total weight for concrete production and compared with normal aggregate and using concrete of M20 grade. Although by changing the water/concrete proportion, high strength cement can be acquired. However, the usefulness will likewise contrast from ordinary total squares. As in this review the necessary functionality is accomplished by utilizing the greatest water concrete proportion. In this way, it is suggested that adding admixtures, for example, super plasticizer and silica seethe into the blending so the usefulness will be improved.*

Key Words*: *Iron ore slag dust, Sustainable development.

1.INTRODUCTION:

One of the most used construction materials worldwide is cement concrete, this is so because of its physical properties such as durability, resistance to fire, simple to use etc, and all these are under a very economical point of view , due to which its utilization is increasing day by day and because of this high demand of natural aggregates for concrete production is required. A drastic reduction in natural aggregates has been observed which is causing harm to the environment. To reduce the environmental impact of concrete production many substitute materials have been used as a substitute of natural aggregate for concrete production. Now a large group of Construction, metallurgical and innovative companies and industries are the major practitioners of alternative materials utilization in aggregate replacement for concrete. Nowadays, the use of iron ore slag dust as a land filling material is very popular. But, when that dust is utilized for land filling it becomes useless to the company, it loses its value and becomes a pile of waste. The Iron ore slag dust wastes are accumulating every day and it has become a burden on the extraction industries to adopt a viable solution for its disposal. This causes a negative impact on the environment as well as it utilizes the large amount of storage space of companies if these wastes are not removed efficiently otherwise construction industries have to deal a large amount of pressure to adopt an effective disposing solution of these wastes, which require an urgent measure for proper management of these wastes. Unfortunately, this waste removal process adds an extra maintenance cost to the total production and management expense. That's why reusing iron ore slag dust waste as aggregate in concrete is a new and effective way for ore slag dust to reuse and also the strength of the iron ore slag dust aggregate concrete is slightly more than that of conventional concrete. The main problem was to make this ceramic waste aggregates workable as they were flaky in nature so we decided to use them of 4.65mm size by which there can be workability increased

1.1 Literature Review

1. Atul Uniyal1 (Assistant Professor, HSST, SRHU Jollygrant), Karan Singh2 (Assistant Professor, HSST, SRHU Jollygrant)(2019):

They supplanted the totals with tile powder by 5%,10%,15% and 20%, they performed a test on this tile powder altered cement to discover the impact of tile powder on the trademark strength of cement. From their tests they closed the accompanying: The most ideal measurements for the halfway option of concrete by artistic tile powder is 15 %. The compressive strength of substantial abatements, when the expansion of dose is over 15%. The outcomes show assuming 20% substitution of concrete by ceramic tile powder will influence the strength of cement.

2. G. Navya*, J. Venkateswara Rao *(P.G student, Department of civil engineering, G.M.R.I.T, India) ** (Associate professor, Department of civil engineering, G.M.R.I.T, India)**

In this exploratory examination the compressive strength, water assimilation and flexural strength of paver blocks were controlled by adding Coconut strands in the top 20mm thickness. Coconut strands included extents of 0.1%, 0.2%, 0.3%, 0.4% and 0.5% in volume of cement. The compressive strength, flexural strength and water not really settled toward the finish of 7 and 28 days. Test results demonstrate that expansion of coconut fiber by 0.3% paver block achieves greatest compressive strength. Test results demonstrate that expansion of coconut fiber continuously increments flexural qualities and water ingestion at 7 and 28 days. In this examination at 0.3% of coconut fiber content the impact of top layer thickness on compressive strength and flexural strength was not really settled. Results show that incorporation of filaments even up to half of top layer thickness compressive and flexural qualities are expanding. The paper additionally shows the expense correlation per each square.

3. SP Ahirrao, KN Borse, S Bagrecha

They observed that increases in the compressive strength values at the 10%, 40%, and 60% aggregate replacement by waste glass with 0- 10 mm particle size were 3%, 8% and 5% as compared with control sample without waste glass but decrease in the compressive strength value was 2% at the 20% replacement. the replacement of Fine glass by Fine aggregate at level of 20% by weight has significant effect on the compressive strength, flexural strength, splitting tensile strength and abrasion resistance of the paving blocks with Fine glass compared with the control sample while the beneficial effect on these properties of CG replacement with Fine aggregate by weight is little.

4. P Turgut, ES Yahlizade

The experimental outcomes show that the substitution of Fine glass by Fine aggregate at level of 20% by weight significantly affects the compressive strength, flexural strength, parting elasticity and scraped spot obstruction of the clearing blocks as contrasted and the control test due to the pozzolanic idea of Fine glass. The compressive strength, flexural strength, parting rigidity and scraped spot obstruction of the clearing block tests in the Fine glass substitution level of 20% are 69%, 90%, 47% and 15 % higher as contrasted and the control test separately. results show that the Fine glass at level of 20% can possibly be utilized in the creation of clearing locks. The advantageous impact on these properties of Coarse glass supplanting with Fine aggregate is little as contrasted and Fine glass.

5. Veera Reddy (2010):

Veera Reddy investigated impact value and crushing value of artistic pieces as 18.2 and 24.7% separately. These qualities were inside as far as possible as indicated by IS 383-1970, henceforth it was protected to use as a coarse aggregate in concrete composition.

2. Methodology

Initially, 2 block of total constituent of 30 and 40 percent individually, typical substantial block of 150mmX150mmX150mm size are ready by blending sand, and normal Portland concrete which was accessible at our college lab, the water concrete proportion was kept from 8-15% by weight of proportion for M20 grade of cement. The mix was topped off pleasantly in three layers in form and packed 30-35 times on each layer.

Then the three blocks were left for curing 7days. After that iron ore slag dust were crushed manually using hammer and sieved uniformly from 4.65mm size sieve, the mix proportion of this concrete was kept same as that of M20, and proportion is given in the table below

	Cement	Dust	water % (By weight)	Total
30% (by weight)	2.1 kg	4.9kg	840 ml	7kg
40% (by weight)	2.8 kg	4.2kg	1050 ml	7kg

All the dry ingredients were mixed uniformly after that a water cement ratio of 8-15% by weight, has been used to make the concrete workable. If the water cement ratio had been kept low, the concrete must have possessed more strength, but it couldn't be workable at less water cement ratio. Once the concrete is ready it is again filled in three layers in 150mmX150mmX150mm mould size

3. Material specification

Iron ore slag dust: -

These are black coloured rock, which are the remains of iron ore . When iron is extracted from its ore then some residue left in the form of small dust or powder form, which are just waste materials for the manufactures and are used place where felling of land is required

4. Collection of materials

Iron ore slag dust was collected from the waste area of the iron ore extraction company or from any site where landfilling is happening.

5. Experimental result

Following were the outcomes acquired by various tests performed on the cube:

5.1 COMPRESSIVE STRENGTH TEST

Results of following test is:

S. No.	% of aggregate	Normal aggregate	Iron ore slag dust
1	30%	10 N/mm2	13.56 N/mm2
2	40%	14.6 N/mm2	20 N/mm2

5.2 Slump cone test

The slump obtained is a true slump

5.3. Initial/Final set times

The table below show the penetration of each block at different times

Time / Penetration	At T=0 min	At T= 5 min	At T=30 min
30%	35 mm	34mm	30 mm
40%	36 mm	34.5mm	27 mm

5.4 Properties difference of normal aggregate and Iron ore slag dust aggregate

S. No.	Properties	Normal aggregate	Iron ore slag dust
1	Shape	Angular	Flaky
2	Texture	Rough	All sides are rough

6. CONCLUSIONS

The aim of our project was to replace the normal aggregate to tile or Iron ore slag dust. As we know the normal aggregate we use comes from natural resources and from the current scenario we know that the natural resources are reducing day by day and its high time that we should start replacing them with other materials. India is a country where construction and excavation never stops, and huge amounts of deconstruction takes place for construction of new buildings etc. Iron ore slag dust is a material which is extracted from many ore industries and companies, may it be domestic ore or international ore. By excavating such huge amounts of ore waste is generated and we can replace them with natural aggregates. We can reuse this Iron ore slag dust as aggregate.

We supplanted natural aggregate by 100 percent of Iron more slag dust total in our task and as far as strength it was somewhat more than that of ordinary aggregate as affirmed by the compressive strength trial of 30% and 40% blend. Iron ore slag dust aggregate cement is somewhat more affordable when contrasted with customary cement. By expansion of Iron ore slag dust into concrete, elective compelling usage of Iron ore slag residue can be accomplished.

In this exploratory concentrate just compressive strength has been checked, impact on rigidity and flexural strength of cement with incorporation of iron ore slag dust aggregate can be examined. Despite the fact that by diminishing the water/concrete proportion, high strength cement is possible. Yet, the functionality will be exceptionally low. As in this review the necessary usefulness is accomplished by utilizing the most extreme water concrete proportion. Therefore, it is recommended that adding admixtures such as super plasticizer and silica fume into the mixing so that the workability will be improved. More preliminaries with various molecule sizes of iron ore slag dust aggregate and level of substitution of natural aggregate are recommended to get different outcomes and higher strength characteristics in concrete.

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