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Study on Structural Behavior of Iron Ore in Concrete

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Abstract: Concrete is one of the important construction material used in the world of all engineering works including the infrastructure development proved that it is a cheap material and its constituents are widely available in nature. Due to widespread usage and electric infrastructure development in all over the world, there is the shortage of natural aggregates such as fine aggregate and course aggregate. So, we can replace this beautiful aggregate and course aggregate with waste materials. In this project work, fine aggregates were replaced by iron ore with various percentage of 0, 10, 15 and 20.

Key words: Iron ore, concrete, structural behaviour, construction, waste materials, world

INTRODUCTION

Examine the effects of increasing the fine aggregate replacement rate with iron ore on real fresh properties, compressive strength, split-tension, flexural strength and determine an optimum replacement percentage of fine aggregate with iron ore in concrete. An experimental study on partial replacement of coarse aggregate by iron slag with polypropylene fiber and experimental study of partial replacement of coarse aggregate by Steel Slag are discussed by Kumar and Ranjith (2013). Provide recommendations for the use of iron ore as a fine aggregate replacement in a concrete mixture designed for field implementation. Experimental investigation of coarse aggregate with steel slag in concrete is presented by Subramani and Ravi (2015). The main benefit of the research is to find an alternative to recycling waste tires in concrete. Study on behavior of concrete mix replacing fine aggregate with steel slag at different properties and strength analysis of concrete by using iron slag as a partial replacement of normal aggregate (Coarse) in concrete are discussed by Sethuramalingam and Nagaraj (2015) and Raza *et al*. (2014). If iron ore can successfully replace the fine aggregate in concrete mixes, the benefit from the value gained in extending natural resources, reducing land space needed for waste products and potentially decreasing costs associated with the product development and construction.

The main objective of this work is to increase the strength of concrete by using iron ore. Iron ore is a heat resistance material. Thus, it prevents the formation of cracks. With the growth in construction activities, there is the heavy demand on concrete and consequently on its ingredient like aggregate also. Fabrication of Htc plant for carbonisation of industrial waste is discussed by Kaviya and Geetha (2016). However, the objective of the project is to study and compare the strength behavior of concrete using iron ore as a partial replacement of fine aggregate (Table 1 and 2).

Table 1: Physical properties of iron ore

Property	Values
Specific gravity	3.2-3.6
Unit weight (kg/m^3 (lb/ft^3))	1600-1920 (100-120)
Absorption	up to 3%

Table 2: Chemical properties of iron ore

Constituent	Composition (%)
CaO	40-52
SiO_2	10-19
FeO	10-40(70-80% FeO, 20-30% Fe_2O_3)
MnO	5-8
MgO	5-10
Al_2O_3	1-3
P_2O_5	0.5-1
S	<0.1
Metallic Fe	0.5-10

MATERIALS AND METHODS

The different diaries were gathered and considered on the iron ore in concrete by various materials. As per these diaries the procedure of the investigation and the strategy for the experimentation and the diverse tests led in those diaries were examined and learned. On the premise of the investigations of the diaries gathered for the trial the trial procedure for the venture was pick.

As indicated by the procedure taken after for the venture, the materials were gathered for the examination, the preparatory tests were led to the materials to know the properties, for example, particular gravity, fineness modulus and the water assimilation. In view of these properties the plan blend was done to know the amount of the materials required for the M20 grade concrete.

The examples with the three distinct rates of including iron ore, for example, 0.5, 0.8 and 1.0% alongside the control examples. The compressive, split and flexural qualities of the examples were tested.

RESULTS AND DISCUSSION

The mix design was prepared for the M25 grade concrete with partial replacement of fine aggregate by iron ore with various percentages of 0, 10, 15 and 20% (Fig. 1 and 2). The 7% achieves the maximum flexural strength for partial replacement of fine aggregate with iron ore is found to be greater than the conventional concrete (Table 3 and 4). It reached maximum compressive strength

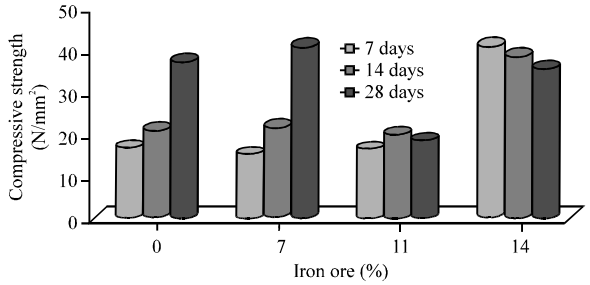

Fig. 1: Compressive strength of cubes

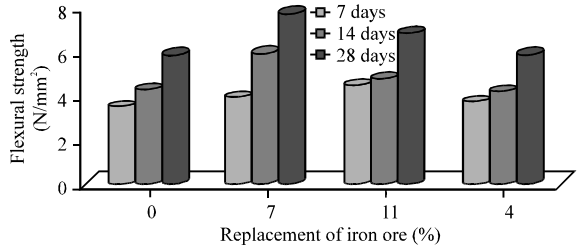

Fig. 2: Flexural strength of beams

Table 3: Test results cubes for compressive strength

	Average compressive strength (N/mm²)			
		Iron ore concrete (%)		
Number of curing days	Conventional concrete	10	15	20
7	16.88	15.23	16.71	14.66
14	21.24	22.01	20.45	18.98
28	37.72	41.36	39.24	36.19

Table 4: test results beam for flexural strength

	Average compressive strength (N/mm²)			
		Iron ore concrete (%)		
Number of curing days	Control concrete	10	15	20
7	3.46	3.90	4.46	3.70
14	4.28	5.96	4.77	4.12
28	5.86	7.67	6.83	5.97

when there is the partial replacement of fine aggregate with iron ore (7%). So, the maximum percentage of replacement of iron ore is 7%.

CONCLUSION

The SFRHPC joints experience expansive removals without creating more extensive splits when contrasted with the HPC joints. This shows steel filaments confer high flexibility to the SFRHPC joints which is one of the fundamental properties for the pillar segment joints. Expansion of filaments to the bar section joints diminished the rate of solidness corruption apparently when contrasted with the joints without strands. Henceforth, the system of consideration of steel strands in shaft segment joints gives off an impression of being a valuable arrangement on account of joints subjected to rehashed or cyclic stacking. Amid testing it has been noticed that expansion of filaments could enhance the dimensional security and trustworthiness of the joints. Likewise, it is conceivable to decrease the clog of steel fortification in the bar section joints by supplanting some portion of ties in the segments by steel filaments. Load conveying limit of the joints likewise expanded with the expanding fiber content.

REFERENCES

Kaviya, B. and K. Geetha, 2016. Experimental study of partial replacement of coarse aggregate by steel slag. Intl. J. Innovative Res. Sci. Eng. Technol., 3: 17402-17408.

Kumar, P.V. and R.K. Ranjith, 2013. An experimental study on partial replacement of coarse aggregate by Iron slag with polypropylene fiber. Intl. J. Sci. Res., 5: 212-216.

Raza, K., A. Singh and R.D. Patel, 2014. Strength analysis of concrete by using iron slag as a partial replacement of normal aggregate (Coarse) in concrete. Intl. J. Sci. Res., 3: 190-193.

Sethuramalingam, T.K. and B. Nagaraj, 2015. Design model on ship trajectory control using particle swarm optimisation. Proceedings of the 2015 Online International Conference on Green Engineering and Technologies, November 27-27, 2015, IEEE, Coimbatore, India, ISBN:978-1-4673-9781-0, pp: 1-6.

Subramani, T. and G. Ravi, 2015. Experimental investigation of coarse aggregate with steel slag in concrete. IOSR. J. Eng., 5: 64-73.