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Experimental Investigation on the Properties of Concrete With Partial Replacement of Sand by Scale

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ABSTRACT

This research study was motivated by the ecological concerns over the disposal of scale waste and scarcity of natural sources of raw sand in many countries. Study involved to find substitute to natural sand and to study the effect of scale on the properties of concrete. This paper reports the findings of an investigation undertaken on concretes made using scale waste from the iron and steel industries as a substitute for sand. The percentage of natural sand replaced with scale waste varied from (10% , 20% , 30% , 40%) By Weight in terms of weight of sand. The aim of this study is to investigate the compressive strength and absorption properties for gamma radiation of concrete with scale waste as a partial replacement for sand Also The Objective of This Investigation is to decrease the cost of concrete.

Keywords – Concrete, Sand, Scale, Compressive Strength, Split tensile test, Flexural test, Curing, Cost.

I. INTRODUCTION

For thousands of years, sand and gravel have been used in the construction of roads and buildings. Today, demand for sand and gravel continues to increase. Mining operators, in conjunction with cognizant resource agencies, must work to ensure that sand mining is conducted in a responsible manner.

Due to industrial development & population growth waste product disposal problem arises , In Steel Industry Steel Scale Waste Produces largely which is having a large disposal problem.

Steel Scale Waste (SSW) , a by-product of steel production , is formed on the surface of steel monoliths during their high temperature thermal treatments after casting ; SSW mainly contains iron oxide & a minor fraction of other oxides as function of steel composition. This type of waste, generally known as “calamine”, is presently mainly disposed of to landfill or use to prepare counterweights concrete , due to the higher specific gravity of calamine with respect to that of all the other components that are generally used to prepared ordinary mortars or concretes.SSW is added in different proportion to replace part or at least all of the fine fraction of the natural aggregate .

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II. EXPERIMENTAL MATERIAL

2.1 Cement

Cement is the primary requirement of concrete & cement is used as binding material of concrete . Now a day cement consumption should be increase every year. For Experimental Work O.P.C. 53 grade cement is being used .

2.2 Aggregates

Crushed or uncrushed material derived from natural sources such as rocks, gravels, boulders & sand for production of concrete are called as aggregates. The aggregates provide about 75% of the body of the concrete and hence its influence is extremely important.

2.3 Coarse Aggregate

The aggregates most of which are retained on 4.75 mm IS sieve and contain only so much of fine material as is permitted by the specifications are termed as coarse aggregates. The broken stone is generally used as a coarse aggregate. The nature of work decides the maximum size of the coarse aggregate. Locally available coarse aggregate having the maximum size of 20 mm was used in our work. The aggregates were washed to remove dust and dirt and were dried to surface dry condition. The aggregates were tested as per Indian Standard Specifications IS: 383-1970.

2.4 Fine Aggregate

Locally available river sand passing through 4.75 mm I.S .Sieve is used. The sand used for the experimental programme was locally procured and conformed to Indian Standard Specifications IS: 383-1970. The sand was first sieved through 4.75 mm sieve to remove any particles greater than 4.75 mm and then was washed to remove the dust. The aggregates were sieved through a set of sieves to obtain sieve analysis. The fine aggregated belonged to grading zone II.

2.5 Scale

Scale are a form of industrial waste produced in the iron and steel industry, which were previously considered as waste and disposed as landfill accordingly. This waste, however, has the potential to be used as coarse aggregate in concrete. Although studies that have reported on the effect of waste materials and by-product as aggregates on the properties of concrete do exist, there has been little research concerning the incorporation of as fine aggregates in concrete technology. This research was thus undertaken to evaluate the potential use of scale as sand replacement in concrete production.

2.6 Water

Water is the most important & least expensive ingredient of concrete. It is important to have the compatibility between given cement and chemical and mineral admixtures along with the water used for mixing. It is generally stated that in the concrete codes and also in the literature that the water chemical reaction with cement. The strength of cement concrete comes mainly from the binding action of hydrated cement gel. we take water-cement ratio is 0.45.

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III. MIX PROPORTION OF SOLID CONCRETE BLOCK

Various Solid concrete block mix proportions for 9 blocks, 2 cylinders, 2 Beam per batch it shown in table by Wt. in K.G.

Solid Concrete Block Mixes	Cement	Course Aggregate	Fine Aggregate	Scale
A	24.54	73.62	36.81	-
S1	24.54	73.62	33.13	3.68
S2	24.54	73.62	29.45	7.36
S3	24.54	73.62	25.767	11.043
S4	24.54	73.62	22.086	14.724

IV. SLUMP CONE TEST

conventional Concrete Block Mix	Slump Value
A (0%)	18.5
S1 (10%)	18
S2 (20%)	17
S3 (30%)	16.75
S4 (40%)	16

V. COMPRESSIVE STRENGTH TEST

150mm x 150mm x 150mm Concrete block Specimens with Ordinary Portland cement (OPC) coarse aggregate, and fine aggregate with partially replace by and scale accordingly at 10% , 20% 30%, 40%, level is cast Individually . After making the specimens are removed from the moulds and subjected to water curing for 7 day, 14 day, 28 day respectively . after that specimens are tested for compressive strength using compression testing machine of 2,000KN capacity. The compression test is carried out on the specimens at end for 7 day, 14 day, and 28 day respectively.

VI. COMPRESSIVE STRENGTH TEST RESULT OF BLOCK AT 7 , 14 , 28 DAYS

Solid Concrete Block Mix	7 Day Compressive Strength	14 Day Compressive Strength	28 Day Compressive Strength	% Change in Compressive Strength
A (0%)	15.18	23.00	26.23	0
S1 (10%)	15.48	21.26	27.28	3.84
S2 (20%)	12.45	16.60	24.47	-7.19
S3 (30%)	15.54	15.70	24.11	-8.79
S4 (40%)	12.71	13.74	16.50	-58.96

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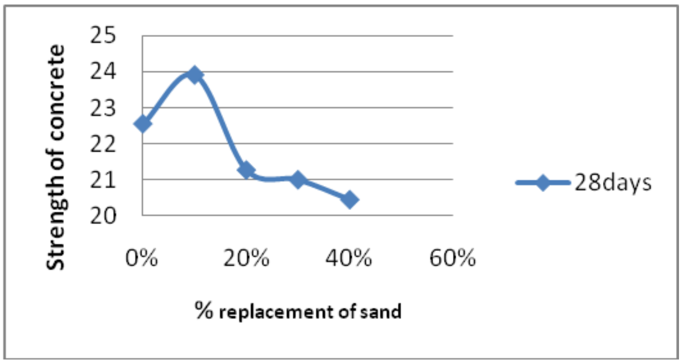
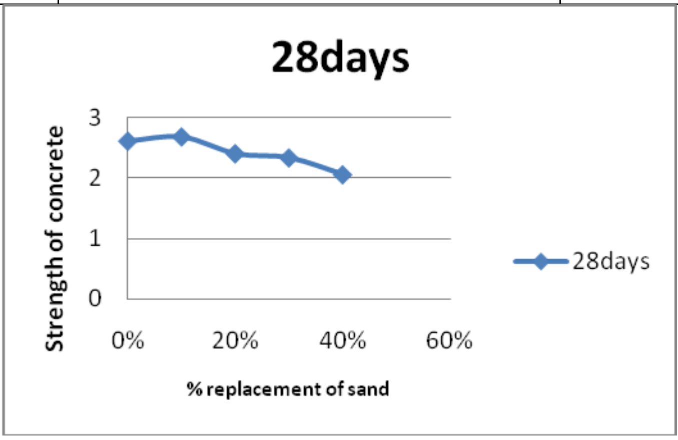


Graph No. 1 Compressive Strength Test

VII. SPLIT TENSILE TEST 28 DAYS OF CURING

Solid Concrete Block Mix	28 Day Split Tensile Test In N/mm2	% Change in Split Tensile Test
A (0%)	2.61	0
S1 (10%)	2.68	2.68%
S2 (20%)	2.40	-8.04%
S3 (30%)	2.33	-10.72%
S4 (40%)	2.05	-21.45%



Graph No. 2 Split Tensile Test

VIII. FLEXURAL TEST 28 DAYS OF CURING

Solid Concrete Block Mix	28 Day Flexural Test In N/mm2	% Change in Flexural Test
A (0%)	22.55	0%
S1 (10%)	23.90	1.05%
S2 (20%)	21.27	-5.67%
S3 (30%)	21.00	-6.87%
S4 (40%)	20.45	-9.31%

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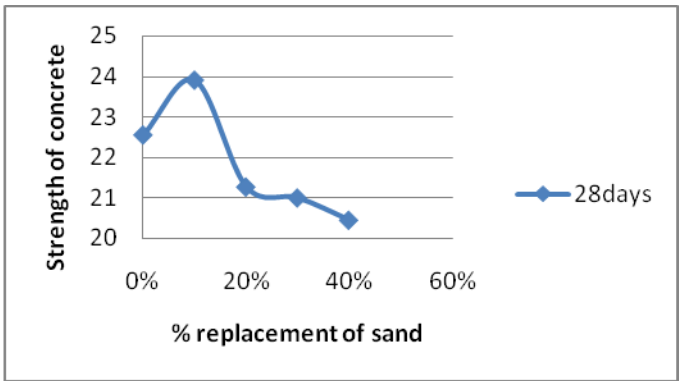

Graph No. 3 Flexural Test

IX. RATE ANALYSIS OF SOLID CONCRETE BLOCKS

Rate of Experimental Materials

Material	Rate/Kg(Rs.)
Cement	5.60
Aggregate (6-10mm)	0.40
Sand	0.65
Scale	0.10

Total Cost Per Solid Concrete Block

Solid Concrete Block Mix	Total Cost/Block(Rs.)
A (0%)	10.22
S1 (10%)	10.11
S2 (20%)	10.00
S3 (30%)	9.89
S4 (40%)	9.75

X. COST COMPARISON FOR MIX CONCRETE BLOCK & CONVENTIONAL BLOCK

Solid Concrete Block Mixes	Total Cost Per Block (Rs.)	% Changes in cost of Standard concrete block Vs Mix
A (0%)	10.22	0%
S1 (10%)	10.11	1.07%
S2 (20%)	10.00	-2.15%
S3 (30%)	9.89	-3.22%
S4 (40%)	9.75	-4.59%

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XI. CONCLUSION

The conclusion drawn from the experiment carried out summarized as follow

1. It is observed that compressive strength decreases for 20% or more replacement of natural sand by scale at 28 days of curing.
2. Compressive strength for 10% replacement of sand by scale is more than plain concrete for 28 days curing.
3. Split tensile for 10% replacement of sand by scale is more than plain concrete for 28 days of curing.
4. Flexural strength test for 10% replacement of sand by scale is more than plain concrete for 28 days of curing.
5. For concrete w/c ratio slump decreases for replacement of natural sand by scale.
6. For 10% replacement of natural sand by scale cost will decreases by1.01%.

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REFERENCES

[1] M.L.Gambhir , " Concrete Technology" ,TataMcgraw-Hill Publication New Delhi, In 2003, Pg 243-247.

[2] A.M.Pande AndR.S.DeotaleOmar M. Omar ,Ghada D. ,"Influence of limestone waste as partial replacement material for sand and marble powder in concrete properties the behavior of concrete," Housing and Building National Research Center,10 June 2012.

[3] ArunaKanthi E And Kavitha M Gulden CaginUlubeyli , TurhanBilir , RecepArtir, "Durability Properties of Concrete Produced by Marble Waste as Aggregate or Mineral Additives, "European1877-7058 © 2016 The Authors. Published by Elsevier Ltd.

[4] Erika Furlani, Stefano Maschio, "Steel scale waste as component inmortarsproduction: An experimental study,"2214-5095/ ã 2016 The Authors. Published by Elsevier Ltd.Dec2015.

[5] ArunaKanthi E and Kavitha M, "Study on Partial Replacement of Sand with Fly ash in concrete",European Journal of Advances in Engineering and Technology, 2014, 1(2): 89-92.

[6] John Zachar1 and Tarun R. Naik "More Sustainable and Economical ConcreteUsing Fly Ash,Used Foundry Sand, and OtherResiduals" .Second International Conference on Sustainable Construction Materials and Technologies

[7] June 28 - June 30, 2010

[8] ShehdehGhannam , HusamNajm , Rosa Vasconez "Experimental study of concrete made with granite and iron powders as partial replacement of sand" i2214-9937/@2016 elsevier B.V..

[9] IS: 2386 (PART IV) – 1963, Test on fresh concrete.

[10] IS: 4031 (PART 1) – 1996, Test on cement.

[11] IS: 2386 (PART 1) –1963, Test on aggregate