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UTILIZE STEEL SLAG & R.H.A. AND STUDIES THE DURABILITY PROPERTIES FOR ECO FRIENDLY CONCRETE MIXES

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Abstract:
The recent study deals with the effect of utilization of steel slag and Rice husk ash (RHA) on the durability properties of concrete .The Steel slag is utilize as a natural coarse aggregate(NCA) and RHA is Utilize As A Cementatious Material. Steel slag is easily obtainable from the steel and iron industry as a waste product. Another materials Rice husk ash (RHA), Due to the irregular abrasive surface and high siliceous composition so natural degradation is restricted. RHA is a waste material that can be used as a partial replacement to improve the inferior property of concrete. Rice husk is an agricultural waste, when it will burnt at a specific Temperature it is converted in to RHA. In this work, the property of Steel slag, cement , RHA and conventional materials material are studied and Examine the similarity between two materials. Prepare the mix design for M40 by referring to code IRC- 44:2017 and IS 456-2000 . In order to fulfill the above objective, six concrete mixes are prepared .Out of which one mix is regarded as the control mix and another five mixes are prepared with replacement of NCA with steel slag in the range of 20%, 40%,50%, 60% and 80 % by weight of NCA .After that compressive strength Test is done and determine the Optimum % of replacement of steel slag . In optimum % of replacement of steel slag , Rice Husk Ash is Replace with cement. Again prepare five mixes in range of 5%,10%,15%,20% by total weigh of cement . Durability is the property by which concrete possess same strength through out its life time. The durability properties of these mixes will be evaluated by water absorption test, and Sulphate attack test. After that studied the Performance Of SteelSlag And RHA in Concrete Mixes .

Key Words: Concrete, Steel Slag, Coarse aggregate, Rice husk ash, Compressive strength, Durability properties ,Acid resistance Cement concrete , Eco-friendly concrete Durability.

1. INTRODUCTION

The most extensively used construction material is Concrete . The application of concrete are the Several kinds of structures such as highway infrastructure , Rigid pavement roads, water supply plants, buildings, industrial residential and agricultural drainage units etc. The Concrete is used for its high compressive strength, easy to produce, water tightness and for certain durability properties. In structural point of view concrete week in tension and strong in compression. However, concrete are mostly contact with aggressive environments. Aggressive environments means seawaters soils rich in sulphate percentage, artificially as chemical product obtained from industries, waste water obtained from drainage infrastructure. This aggressive environments affect the long term performance of concrete. When the concrete comes contact with aggressive environments, concreteand chemical substance are involving interchange of ions. So that it leads to reduction in Mechanical Strength .The property by which concrete possesses same strength throughout its life with much shrinkage and cracking is known as Durability property. Normally durability of concrete is subjected to sustain acid attack to the concrete pavement.

Concrete is a composite material collected of mainly water, aggregate, and cement and for better workability admixture are used. The building material can be replace by waste material, where the properties of both are similar . Aggregate is the main materials of concrete, holds more than 60% of total concrete matrix. And cementitious material are occupying about 16% of total concrete mixes .'

2. OBJECTIVE

The main objective of this project is that to improve

- Durability
- Environmental Friendly
- Economically Viable

To protect the environment and to improve its quality. To serve the protection of the human health. To guarantee a cautious and ecient use of the natural resources The last statement of the declared targets holds us responsible to save natural resources by using industrial co- products and to increase their utilization rate where- ever their technical and environmental.

3. SCOPE OF PRESENT WORK

To fulfill the above objective, taking concern of limitations and drawbacks of various literatures, the scope of work can be described as below:

- Characterization of aggregates and cementitious materials.
- Mix proportioning and casting of the concrete by using steel slag and RHA.
- Study of effect of substitution of natural aggregate with recycled concreteaggregate on physical, mechanical and durability behavior of concrete.

4. EXPERIMENTAL INVESTIGATION

On this studies work, a comprehensive experimental program has been completed with a purpose to fulfill the goal and scopes of the existing experimental research. The overall studies work is labeled into numerous levels. The primary section of this research includes the collection of materials. In addition the second section consists of characterization of materials along with, mechanical and chemical characteristics of cement, natural aggregates, Steel Slag and RHA. The third phase is the production of concrete specimens with cement, natural aggregates, Steel Slag and RHA. In fourth section the assessment of fresh and hardened concrete properties like mechanical and durable properties to be done.

The overview of various phases of the experimental program is shown in the figure 4.1.

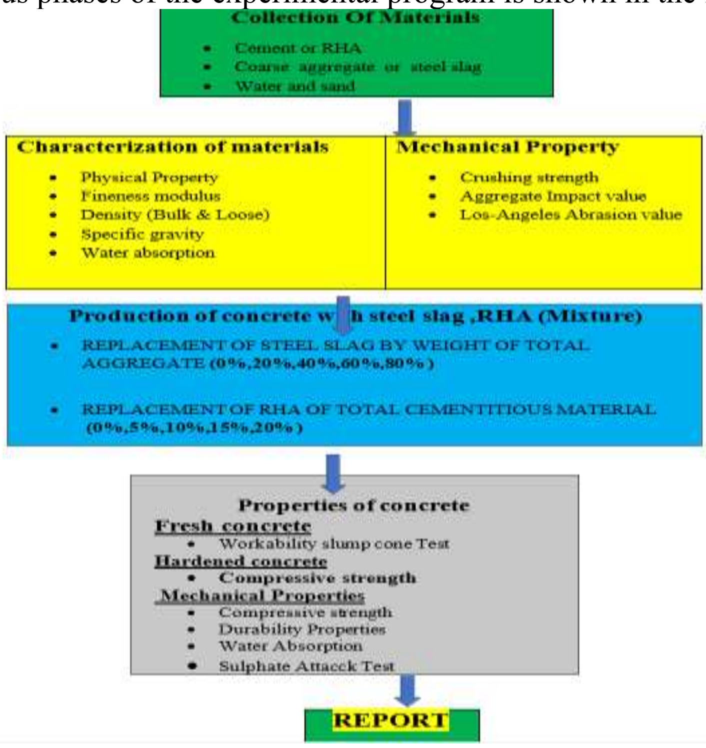

Figure 4.1 Schematic diagram of overview of experimental investigation

Characterization of materials
- Physical Property
- Fineness modulus
- Density (Bulk & Loose)
- Specific gravity
- Water absorption Mechanical Property
- Crushing strength
- Aggregate Impact value
- Los-Angeles Abrasion value

4.1 MATERIALS AND METHOD
The control concrete mixes were prepared using 43 grade OPC conforming toIS 8112- 2013.The concrete mix proportioning is based on Compressive Strength of concrete. In this project works there are various type of material or concrete mix in gradient and some of the replacement with virgin material.
Types of Material Use in Concrete mixes
I. Coarse Aggregate (Normal coarse aggregate Or Steel Slag)
II. Cementatious material (Cement And RHA)
III. Fine Aggregate (Sand)
IV. Water
V. Admixture
The description of important material as follows.
I. Coarse Aggregate
- Natural coarse aggregate (NCA)
Coarse aggregate is the part of the concrete mixes which is made up of thelarger stones embedded in the mix. There are 3 kinds of rocks namely igneous, sedimentary metamorphic. property of aggregate depend upon the parent rock itself. So the coarse aggregate is basically 2 types single size aggregate and graded aggregate coarse aggregate are the particle that retain on 4.75mm IS sieve. Locally available coarse aggregate having the maximum size of 20 mm were used in the present work. These are the naturally occurring rocks which are crushed in to different sizes in the crusher. The rocks are the natural resources which are comes from the mountains, tungiri etc.

Figure 4.2 (Normal coarse aggregate)

Table 4.1 (Physical Properties of natural aggregate)

Properties	NCA	Test methods
Loose bulk density (kg/m^3)	1508	**IS2386-Part-3(2002)**
Compacted bulk density (kg/m^3)	1648	**IS2386-Part-3(2002)**
Specific gravity	2.59	**IS2386-Part-3(2002)**

Water absorption (%)	1.29	**IS2386-Part-3(2002)**
Impact value (%)	15.03	**IS2386-Part-4(2002)**
Crushing value (%)	27.96	**IS2386-Part-4(2002)**
Abrasion Value	16.8%	**IS2386-Part-4(2002)**

 Steel slag aggregate

The Steel slag is a Waste Material generated from steel plant. It is formed during the taking apart of the molten steel from impurity in steel-making furnaces. The slag is proped as molten liquid melt and it is a complex solution of silicates andoxides that solidifies upon freezing. The slag produced at steel melting shop is known as steel slag. Slag output obtained during pig iron and steel production is variable and depends mainly on composition of raw materials and type of furnace.In this project RSP steel slag have been used .The steel is produce by or incorporate LD Technology . Basic oxygen steel making (BOS,BOP,BOF,OSM) .It is also known as Linz-Donawitz steelmaking or oxygen convorter process .It is the method of primary steel making in which carbon rich molten pig iron is made in to steel. Molten pig iron is lower the carbon content of alloy due to blowing oxygen through it. And therefore it change into low carbon steel. The process is known as basic because fluxes of burnt lime or dolomite ,which are chemical bases, are addedto promote the removal of impurity and protect the lining of the convorters.

Figure 4.3 (steel slag)

Property	**Value**
Specific Gravity	3.08
Unit Weight kg/m^3	1600 – 1920
Crushing value	20%
Impact value	7.63%
Abrasion Value	30%
absorption	2.26

Table 4.2 (Physical Properties of steel aggregate)

- Mechanical Properties
- The mechanical property of the steel slag are Impact value, Crushing value, Abrasion Value

.The test are conducted as per the IS2386-Part-4(2002). The values areobtained from this tests are grater as compared to the Natural coarse aggregate

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- Thermal Properties
- In hot mix asphalt repair work in cold weather. the advantageous is the heat retention characteristics of steel slag aggregates .
- Chemical composition

India having a maximum aggregate size of 20 mm was used. The aggregates obtained from the source (before weathering) displayed a porous texture with angular shape and was black in colour. Kandhal and Hoffman (1997) carried out extensive research on steel slag aggregates obtained from ten different sources and reported that steel slag aggregates weathered for six months . Hence, steel slag Aggregates before use in concrete production were subjected to a process of weathering by exposing the aggregates to outdoor conditions along with spraying water at regular intervals for a period of 9 months to reduce the free lime and magnesia contents in order to avoid volume deformation of aggregates. Chemical composition of steel slag was given in the table 4 .3 bellow

Constituents	Steel slag %
CaO	41
MgO	7
SiO2	36
Fe2O3	0.5
Al2O3	13

Table 4.3 (Chemical composition of Steel Slag)

The comparison of properties of natural coarse aggregate and steel slag are given on the **Table 4.4**

Sl No	Characteristics	Coarse Aggregate	Steel slag
1	Type	Angular	Crushed
2	Specific Gravity	2.59	3.09
3	Water absorption	1.29	2.24
4	Impact value	15.03%	7.61%
5	Crushing value	27.96%	20%
6	Abrasion Value	16.8%	30%

Table 4.4 (Physical Properties of steel aggregate and natural aggregate)

II. Cementatious Material

- Cement: The main binding or Cementatious material used in the present work was Ordinary Portland cement (OPC) of 43 grade affirming to IS: 8112 (1989) manufactured by Ultratech Cement Co, India. The cement was collected from local market of Sambalpur,

Odisha. The cement used was dry, powdery and having no lumps. With a purpose to increase required strength cement ought to represent its suitable rheological behavior. Similarly GGBFS is used as partial replacement of cement, which is collected from a supplier from Jindal Steel and Power Ltd., Jharsuguda, Odisha. Further, hydrated lime powder was purchasedfrom local market of Sambalpur, Odisha as an alternative of OPC, which acted as alkaline activator for GGBFS. Due to its easy availability, the hydrated lime powderwas obtained on the day of concrete preparation. Various tests are done in asystematic manner to know the physical and chemical properties of binders. Thetests are conducted as per IS codal provisions.

Physical properties of Cementatious Material

The above mentioned properties of the binders have been determined by conducting various tests as per the procedures described above and the results of thesame are presented in Table 4.1.

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Properties	Values obtained	Standard Values	Test methods
Specific gravity	*3.13*	3.15	**IS:4031-Part 11 (2005)**
Fineness (m^2/g)	*320*	26 to 32	**IS:4031-Part 2 (2004)**
Consistency (%)	*31*	Not less than 30 min	**IS:4031-Part 4 (2005)**
Initial setting time (min)	*70*	Not less than 600 min	**IS:4031-Part 5 (2005)**
Final setting time (min)	*288*	< 10%	**IS:4031-Part 5 (2005)**
Soundness (mm)	*1*	-	**IS:4031-Part 5 (2005)**

Table 4.5 (Physical properties of Cement)

Rice husk is an agricultural waste, whose natural degradation is restricted due to the irregular abrasive surface and high siliceous composition. RHA generated whenburning rice husk pellets in the boiler. Silica and Ca2+, OH and calcium hydroxide forms the calcium silicate hydrate gel during the hydration process that contributes to superior strength and durability.
RHA is highly pozzolanic because in this process of production about 25% ash containing amorphous silica (85% - 90%) and alumina(5%). Due to absorptive character of the cellular RHA particles so the RHA required more water. The test is conducted and studied by Mehta in the concrete with RHA for a given consistency.
In an investigation RHA obtained from Indian paddy when reburnt at 650 ºC for a period of 1 hour. There are 2 methods to burn rice hush that is controlled and uncontrolled methods.

S.No	Characteristics	Standard Values	Values obtained
1	Specific Gravity	3.15	2.18

Here, RHA locally obtained from kuntara rice mill. Then it was burned in heater at a temperature of 600 ºC for 5 h. The results of XRF test has been collected from Research Journal papers that can be seen in Table 4.6

Components	Ratio of the components
Sodium oxide(Na2O3)	9.76
Silicon dioxide(SiO2)	86.72
oxide(Al2O3)	0.05
Ferric oxide(Fe2O3)	0.63
Calcium oxide(CaO)	0.40
Magnesium oxide(MgO)	0.08
Sulphur trioxide(SO3)	1.32
Potassium oxide(K2O)	0.02
Loss of Ignition(LOI)	0.57

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Figure 4.4 Rice Husk Ash (RHA)

III. Fine Aggregate

The natural river sand used for the experimental program. The sand is first sieved through 4.75 mm and 75 micron IS sieve. The fine aggregate pass through 4.75mm and retained on 75 micron IS Sieve .This material is used for casting of all the specimens.

Sl. No	Charactristics	Values obtained
1	Type	The River Sands
2	Sp.Gr.	2.55
3	Water absorption (%)	1.5
4	Fineness Modulus	2.18
5	Bulk Density(comp)	1570
5	Grading Zone	II

Table 4.7 (Physical properties of Fine Aggregate)

IV. Water

Water is an important ingredient of concrete mix. The actively participates inthe chemical reaction is namely hydration with cement. Potable tap water available in the laboratory with pH value 7 and the water is free from organic matter and the solid contents should be within the permissible limits as per IS 456-2000 and conforming to IS 3025.1964.

V. Admixture

Admixture are Natural or manufactured chemical which can be added to gettingdesirable property of mix. These are added to concrete before or during mixing. Admixture are used in concrete to alert its properties in various way .Some common use of included improving workability, increasing or decreasing curing time and increasing concrete strength. Basically admixture are various types Retarder, Plasticizers, super plasticizers and air entraining admixture

Figure 4.5 Super plasticizer(Modified Sulphonated Napthalene Formaldehide)

Mix proportion and specimen details

The present experimental study is aimed at comparing of strength and durability properties OPC and RHA of similar strength grade and then studying the effect of incorporation of steel slag coarse aggregates and incorporation of steel slag as a coarse aggregates and RHA as a cementitious material in such mixes. The OPC concrete was designed as per IS:10262:2009 with an aim to achieve compressive strength in the range 55 ± 5 MPa after 28 days of curing and with a workability of 25 to 50 mm (slump cone value) and hence a binder content of 425 kg/m3 and water/binder ratio of 0.40 was selected for this purpose

CEMENT USED	**OPC 43 Grade**
SPECIFIC GRAVITY	
Cement	3.14
Coarse aggregate	2.6
Fine aggregate	2.5
WATER ABSORPTION	
Coarse aggregate	1.29
Fine aggregate	1.29
ADMIXTURE	Modified, Sulphonated, Naphthalene,Formaldehyde

Table 4.7 TEST DATA FOR MATERIALS

- TESTING

The material are mix as per mix design and prepare mould the do the test as follow below then the test result compare with test result.

- Specimens casting and curing
- Specimen casting details

TEST

- Workability of concrete
- Compressive strength test
- Resistance to sulphate attack test

From the mix design we get the Mix Proportions Ratio =1:1.57:3

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Similarly prepare the mix Design of concrete by Replacement Of Steel Slag By Weight Of Total Aggregate of 20% ,40% ,60% and then determine the optimum % and again Replacement Of RHA Of Total Weight Of Total Cementitious Material of 0%,5%,10%,15%,20% and the details are in tabulated form below

Grade Of Concrete	%of Replacement of steel slag	Water kg/m3	w/c Ratio	Cement kg/m3	Sand kg/cum	Coarse aggregate kg/m3	Steel Slag kg/m3
M40	0	144	0.36	400	630	1207	0
M40	20	144	0.36	400	630	966	302
M40	40	144	0.36	400	630	724	603
M40	60	144	0.36	400	630	623	788

Table 4.8 (Replacement of steel slag)

Grade Of Concrete	%of RHA	w/c ratio	Sand kg/cum	Water in kg/m3	Cement kg/m3	Coarse aggregate kg/m3	Steel slag kg/m3	RHA kg/m3
M40	0	0.36	630	144	400	724	603	0
M40	5	0.36	630	144	380	724	603	20
M40	10	0.36	630	144	360	724	603	40
M40	15	0.36	630	144	340	724	603	60
M40	20	0.36	630	144	320	724	603	80

Table 4.9 (Replacement of steel slag and RHA)

5. RESULTS AND DISCUSSION

Generally concrete is the heterogeneous mixture of aggregates, binding material and water in different proportions. Usually aggregate occupy significant percentage i.e., 70-80% volume of concrete. A suitable binding agent is also necessary to hold the different components of concrete together. Hence, it is important to understand the effect of various aggregates and cementatious material on concrete. The properties of concrete specimen made with different combination of cement, sand ,steel slag and RHA at different percentage of replacement. The concrete used in this research work is M240 grade confirming to IS: 10262 (1982).This chapter represents the experimental results and related discussions ofthe different properties of concrete mixes such as fresh properties, mechanical properties, physical properties, durability

. There are various types of test has been done in this project as follows.

- Compressive strength test
- Water absorption test
- Sulphate attack test

5.2 Compressive strength test

The compressive strength on concrete was performed as per codal provisions IS 512-1959.compressive strength is the capacity of the material or structure to withstand loads tending to reduce size ,as oppose to which withstands loads tending to elongate .It is also known as compression strength ,means resists being pushed together, where as tensile strength resists tension.

Figure.5.1 Compression Strength Testing Machine

In the compressive strength test, the compressive strength is measure in the compression testing machine (CTM).first of all prepare the concrete as per mix design than prepare the cube with the help of mould of specific size like 150*150*150 or 100*100*100 mm3 . Placed the concrete cube to curing for 7day and 28 day . The well prepared concert cube is placed in to the compression testing machine than apply load to the concrete cube and note that at which load the concrete cube will be break. The load per unit area (where the load is applied) is the compressive strength of the concrete cube. The Compressive strength test result are in the Table 5.1

S.No	**% replacement of steel slag**	**Compressive strength (N/mm²)**	
		7 days	**28 days**
1	control	32	49
2	20	32.2	49.6
3	40	32.8	50.03 (optimum)
4	60	31	47.24
5	80	28.4	43.92
6	50	32.13	48.11

Table 5.1 (Compressive strength of steel slag)

Percentage replacement of steel slag upto 40% the strength will be increasing but after that at 50% replacement the strength will be decrease. SO that the optimum replacement of steel slag is taken as 40% at compressive strength 50.03

S.No	**replacement ofRHA**	**Compressive strength (N/mm²)**	
		7 days	28 days
1	control	31.3	48.1

2	5	30.1	47.6
3	10	30.8	48.8 **(optimum)**
4	15	28	42.24
5	20	24.4	38.92

Table 5.2 (Compressive strength of RHA)

Again we have replaced the cementitious material (cement) is to RHA in different Proportion. In the optimum % Replacement of steel slag (40%) the RHA mixing is done. After 7days test and 28 days test result say that at 10 % replacement of RHAthe compressive strength is maximum. After that the compressive strength is decreasing.

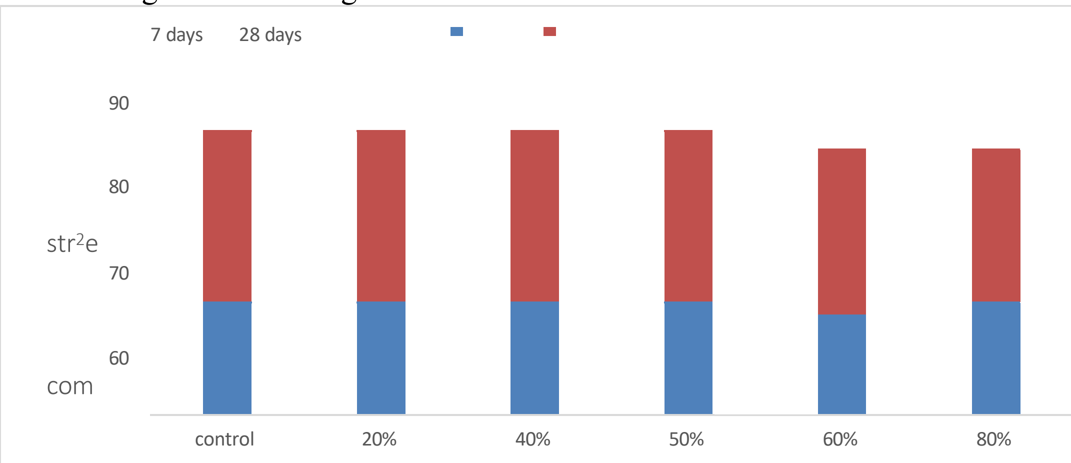

Figure.5.2 Compression strength VS % of replacement of steel slag

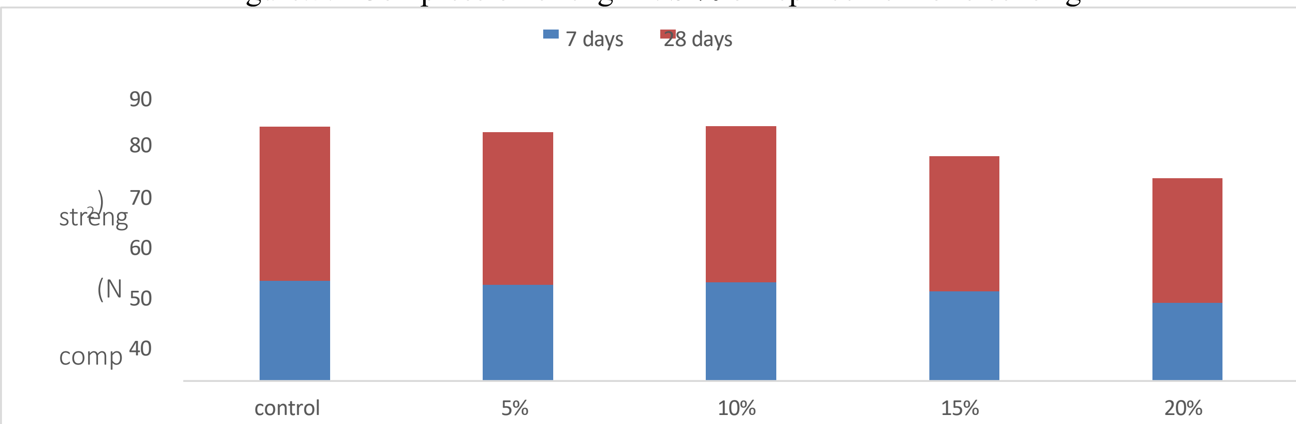

Figure.5.3 Compression strength VS % of replacement of RHA

Water Absorption Test

Water absorption is the measurement of the amount of water that penetrates into concrete samples when submersed. Absorption testing is a popular method of determining the water tightness of concrete. The test has been conducted s per the Bs1881-122 :2011.

Specimen	**itial weight in kg**	**l weight in kg**	**%of water absorption**	**verage% of Avg water absorption**
Control	8.871	8.990	1.34	**1.40**
	8.529	8.660	1.53	
	8.623	8.740	1.35	

40 % of steel slag	9.213	9.416	2.20	2.52
	9.120	9.311	2.09	
	8.928	9.220	3.27	
5% RHA	8.123	8.212	2.09	**2.09**
10% RHA	8.321	8.398	1.55	1.55
15% RHA	8.213	8.310	2.33	2.33
20% RHA	8.187	8.289	3.18	3.18

Table 5.3 (Water absorption on concrete)

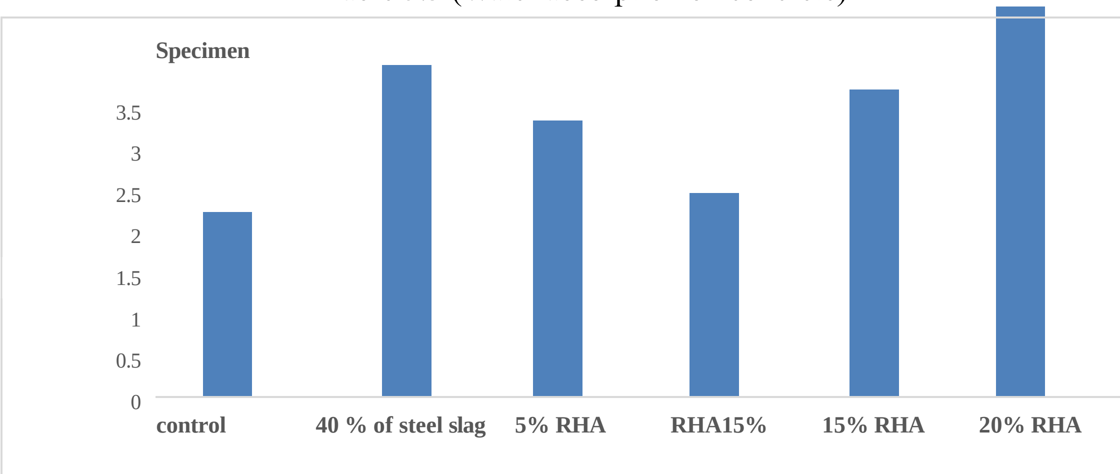

Figure 5.4 Average % of Avg water Absorptions %of Replacement

In this experiment Avg water absorption is get different result for different. Fromabove graph show that at 40% replacement of SS and 10% replacement of RHA thewater absorption value is minimum and it is good for the concrete .In this case SSis utilized and SS when comes in contact with water , the free lime and magnesia content will be than expand so the crack form in the concrete pavement. Less water absorption means that more durable.

5.3 Sulphate Attack Test

Magnesium sulphate attacks on concrete through a sequence of processessuch as attack on calcium hydroxide, attack on calcium aluminate phase and finally attack on calcium silicate phase of hydrated cement paste. When magnesium sulphate reacts Ca(OH)2, it leads to the formation of calcium sulphoaluminatewhich is also known as ettringite at the early stage. With the increase in the sulphate(SO4) concentration inside the concrete, the formation of ettringite also increases. It has some positive impact on strength as well as on compactness of concrete. But, its excess growth inside the concrete may lead to expansion, cracking, softening and even spalling of concrete due to which there is mass and strength loss. Again when magnesium sulphate attacks on the calcium silicate phase of hydrated paste it produces magnesium hydroxide (MgOH) and silica hydrate (SiO2.aq), which react with each other to form magnesium silicate hydrate (MSH), a non-cementitious product i.e formed by the destruction of CSH by magnesium sulphate weakens the bond between the cement paste and the aggregates. Hence, there is a reduction in compressive strength of concrete. The above phenomena conclude that, the externalmagnesium sulphate attack can cause mass loss due to deterioration of concrete as well as loss in compressive strength due to destruction of CSH. In context of the phenomenon of sulphate attack and the results presented in Table 5.2, the

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resistanceto sulphate attack of concrete mixes containing different fractions of steelslag and The RHA with respect to the mass loss and strength loss are discussed in the following sub- sections:

- Compressive strength loss due to magnesium sulphate (MgSO4) attack

Specimen	Compressive strength of concrete before Attack(N/ mm2)	Compressive strength of concrete after Attack(N/ mm2)	% loss in compressive strength
Control	49.00	46.32	**5.78**
40% steel slag	50.03	46.21	8.26
5% RHA	47.81	45.69	4.43
10% RHA	46.92	45.76	**2.48**
15% RHA	46.92	43.77	6.71
20% RHA	45.31	40.61	10.41

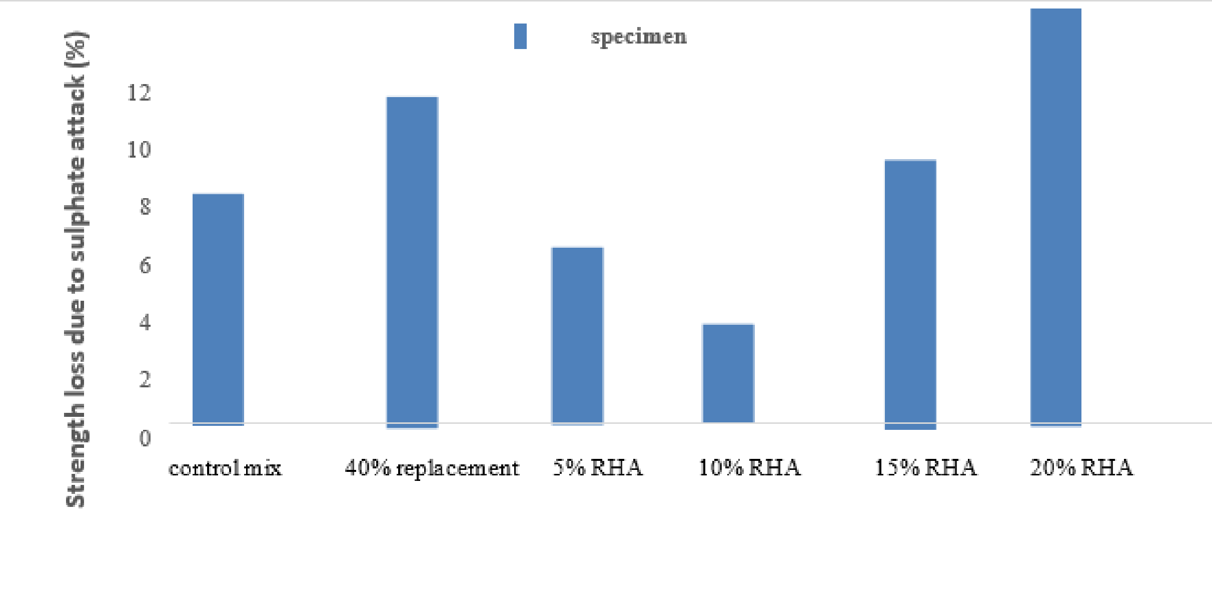

Table 5.4 (sulphate attack test on concrete)

Figure 5.5 Strength loss due to sulphate attack (%) VS % of Replacement

The variation in resistance to magnesium sulphate attack of concrete mixes comprising of Steel slag ,RHA From Table 5.20 the strength loss of control mix is found as 5.78% at 28 days. It is observed that inclusion of 40% natural aggregate tosteel slag has increases the strength loss to 8.26% at 28 days. Likewise, the strength loss due to inclusion of 40% SS mixes with 5%,10%,15% and 20% RHA are 4.43% and 2.48%,6.71% and 10.41% respectively at 28 days.

5.3 Mass loss due to suphate attack

Specimen	Weight of specimen before attack in kg	Weight of specimen after attack in kg	% Mass loss
Control	8.628	8.732	**1.2**
40% steel slag	9.214	9.312	1.04
5% RHA	8.729	8.812	0.95

10% RHA	8.432	8.498	**0.78**
15% RHA	9.111	9.201	0.98
20% RHA	9.301	9.9699	7.1

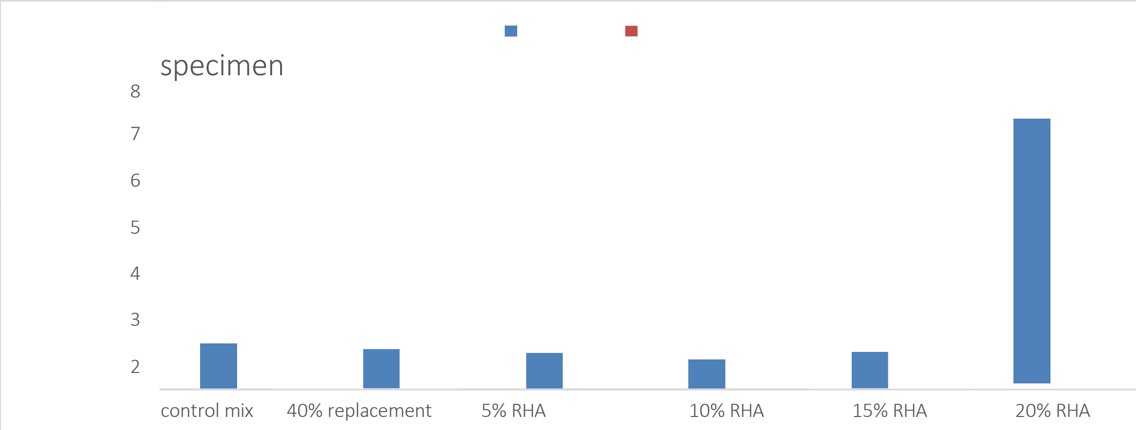

Table 5.5 (Mass loss due to suphate attack)

Figure 5.6 Mass loss due to suphate attack (%) VS % of Replacement

The resistance against magnesium sulphate attack of concrete mixes comprising SS and RHA are graphically presented in Figure 5.3. The control mix exhibits 28 days mass losses of 1.2% (Table 5.2). It is observed that inclusion of 40% NCA to SS has increases the mass loss to 1.04% at 28 days. In a similar way, the mass loss due to inclusion of 5%,10%,15%,20% RHA mixes with 40% SS are 0.95% and 0.785%, 0.98%,7.1%respectively at 28 days.

6. Conclusion

- From the above literature review, the was conclude that utilize of steel slag and RHA may be use advantageous construction material.
- The Steel Slag property is similar to the Normal coarse aggregate like Basalt. The physical properties of RHA is also similar to the cementitious material.
- RHA is mainly composed of silica, which constitutes 91% of the total mass. The reaction between the amorphous silica and Ca2+ OH and calcium hydroxide forms the calcium silicate hydrate gel during the hydration process that contributes to superior strength and durability.
- The Mix Design Of Concrete is As Per IRC 44-2017 And For M40 Grade The Mix proportions Ratio is 1:1.57:3 the Control Concrete Mix .
- In this test result the optimum % of replacement to coarse aggregate with steel slag is found to be 40 % .
- The optimum percentage of replacement to cement with RHA is found to be10% .
- Durability properties of concrete slight decreases with in compressive strength for sulphate attack test results due to pores present in steel slag and Rate of absorption of water gives better results.
- Overall, the Performance of steel slag and RHA is found to be satisfactory for structural and constructional purpose . So steel slag can be recognized as new construction material.
- The Use Of steel slags and RHA saves existing resources of natural aggregates and make the Environment ECO friendly.

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