"STUDY ON PROPERTIES OF CONCRETE BY THE PARTIAL REPLACEMENT OF CEMENT BY RICE HUSK ASH (RHA) AND COARSE AGGREGATE BY ASBESTOS SHEET WASTE (ASW) WITH THE ADDITION OF STEEL FIBER"

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ABSTRACT: *This paper aims of studying and analyzing the various properties of concrete by partially replacement of Cement and coarse aggregate by Rice Husk Ash (RHA) and Asbestos Sheet Waste (ASW) with the Addition of Steel Fiber. These are the some solid waste produced by Human Beings for their day to day utilities. The result revealed that the compacting factor decreased as the percentage replacement of OPC with RHA increased. Replacement of cement by rice husk ash and coarse aggregate by Asbestos Sheet Waste (ASW) with the addition of Steel Fiber showed in M25 grade concrete compressive strength improvement at the replacement of 10% in all Ages. From this entire experimental work & studies it is concluded that mix M2 (M0+10%RHA) is the best combination among all mixes of RHA and M3 (M0+15%ASW) with the 2% of Steel Fiber, which gives max compression strength, Spilt Tensile Strength and Flexural Strength over normal concrete.*

1. INTRODUCTION

Due to rapidly growing civilization, day by day the amount of solid waste is increasing so there are only two way to control or to decomposed the waste is either to utilized it in healthy manner or to recycled it and reused it. This Industrial waste RHA is a great environment threat causing damage to the land and the surrounding area in which it is dumped. Lots of ways are being thought of for disposing it by making commercial use of this RHA. In the present investigation, Portland cement was replaced by rice husk ash at various percentages to study Compressive, Tensile and Flexural strength. About 20 million tons of RHA is produced annually. Same as off Asbestos Sheet Waste comes in the category of solid waste which comes from Old construction sites. Asbestos is a silicon-based mineral that is found in various locations around the world. Besides personal health, asbestos has a negative impact on the environment. A study presented in 2006 at the international conference Health, The Environment and Justice found that asbestos dust can easily travel through the air into the water supply. It can also settle on the surface of the soil instead of getting absorbed into the ground, which means that it can still get picked up by the wind and inhaled into human lungs. India uses an estimated 350,000 tons of asbestos annually, trailing behind China as the world's most prodigious consumer of the naturally occurring carcinogen. Only a fraction of the asbestos used in India originates in the country. The majority is imported from Russia and Brazil, the world's two biggest exporters of the product. Although its toxicity has prompted 52 countries to ban its use, India continues to utilize the material in cement roofing sheets, cement piping, friction materials, textiles and insulation. Steel wool, also known as iron wool, wire wool, steel wire or wire sponge, is a bundle of very fine and flexible sharp-edged steel filaments. Where Steel Wool Fiber is domestically used in India in large scale for washing the pots.

After several washes, these steel fiber cannot used for further cleaning purpose, but it can be used in construction. Steel fiber reinforcement offers a solution to the problem of cracking by making concrete tougher and more ductile. Steel fiber improves compressive strength of concrete marginally about 10-30%.

2. EXPERIMENTALS AND METHODS

2.1. Materials used

2.1.1. Cement
The cement used was Ordinary Portland Cement. It was sourced Wardha and it conformed to the requirements of BS EN 197-1: 2000.

2.1.2. Fine Aggregate
The sand used for this research work was sourced from Wardha. The impurities were removed and it conformed to the requirements of BS 882 (1992).

2.1.3. Coarse Aggregate
The granite used for this research work was 20mm size. It was sourced from a Wardha.

2.1.4. Rice Husk Ash (RHA)
The Rice Husk used was obtained from Gondia. After collection, the Rice Husk was burnt under guided or enclosed place to limit the amount of ash that will be blown off.. The ash was ground to the required level of fineness and sieved through 90µm sieve in order to remove any impurity and larger size particles.

2.1.5. Asbestos Cement Sheet Waste Material (ASW)

3. RESULT ANALYSIS

3.1 COMPRESSIVE STRENGTH (N/mm^2) For Asbestos Sheet with Addition of Steel Fiber

Sr. No.	Cement	% Asbestos	Compressive strength (N/mm^2)		
			3 Days	7 Days	14 Days
1	100%	0%	8.86	17.89	26.75
2	95%	5%	10.15	14.88	26.98
3	90%	10%	11.19	15.86	28.19
4	**85%**	**15%**	**12.89**	**20.75**	**32.70**
5	80%	20%	10.68	17.19	27.11
6	75%	25%	9.55	15.88	25.24

TABLE 1: Effect of Asbestos sheet on 3 , 7 & 14 days compressive strength (N/mm^2)

Asbestos cement sheet waste are taken from old construction sites such as old school, Old Gov. Offices, Residential Bulding, etc. They were crushed into required sizes of 4.75 mm to 20 mm by manually operating a hammer. The specific gravity of AC Sheet waste material is 1.61 and fineness modulus of 7.347. Water absorption of AC Sheet waste material is 4.4 %, Aggregate Crushing value is 14.53% and Aggregate Impact Value is 9.84%.

2.1.5. Water
The water used for the study was obtained from a free flowing stream. The water was clean and free from any visible impurities.

2.2. Batching and Mixing
Batching of materials was done by weight. The percentage replacements of Ordinary Portland Cement (OPC) by Rice Husk Ash (RHA) were 0%, 5%, 10%, 15%, 20% and 25%. The 0% replacement was to serve as control for other samples.

2.3. Concrete Mix Design
The concrete used in this research work was made using cement, sand and aggregate. The concrete mix proportion was 1:2.02:2.70 by weight.

2.4. Casting of samples
Cubic cylinder & beam specimens of concrete with size 150 x 150 x 150 mm, dia150 x 300mm & 150 x 150 x 600 mm respectively were cast for determination of all measurements. Six mixes were prepared using different percentages of 0, 5, 10, 15, 20 and 25 RHA & AWS with addition of asbestos sheet . The concrete was mixed, placed and compacted in three layers. The samples were remolded after 24 hours and kept in a curing tank for 3, 7 and 14 days as required.

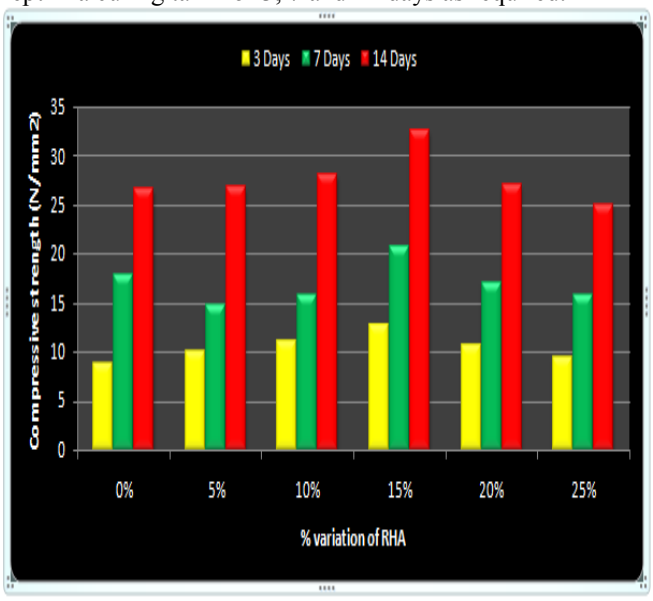

Figure 1: Graphical Representation of Compressive Strength Test on Concrete.

From the Above graph it is observe that,

Above graph shows the gradual changes in the value of compressive strength as the % of Asbestos Sheet Waste (ASW) is increases, There are certain ups and down in the values of compressive strength for 3, 7, and 14 days. So the maximum compressive strength is obtained at 15% addition of Asbestos Sheet Waste (ASW) which is greater than nominal concrete (0%) and that value is said to be modified concrete

3.2 SPLIT TENSILE STRENGTH (N/ mm^2)

Sr. No.	% Coarse Aggregate	% Asbestos Sheet Waste	Split Tensile Strength (N/ mm^2)		
			3 Days	7 Days	14 Days
1	100%	0%	2.69	3.54	5.10
2	95%	5%	2.49	3.33	4.12
3	90%	10%	2.73	3.61	4.79
4	**85%**	**15%**	**2.80**	**3.75**	**5.85**
5	80%	20%	2.63	3.50	5.04
6	75%	25%	2.42	3.10	4.48

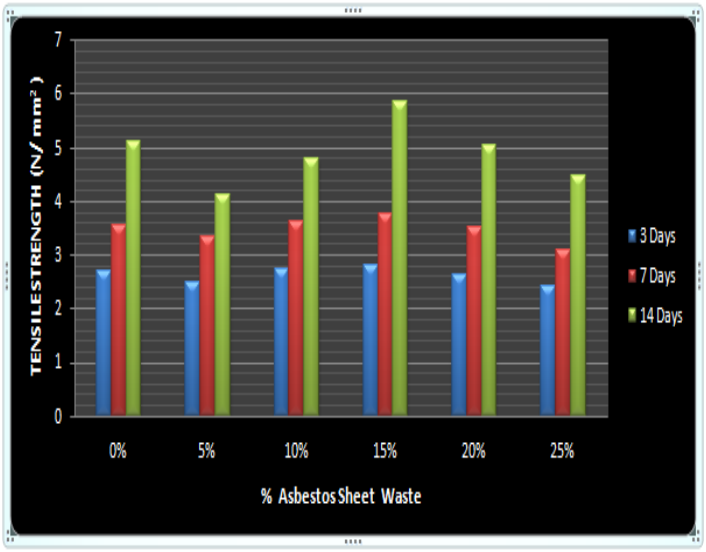

Figure 2: Graphical Representation of Tensile Strength Test on Concrete

From the Above graph it is observe that,

1. As the percentage of ASW increases the Split tensile strength of concrete tends to increase up to certain percentage and then start's decreasing with the increase of ASW content.

2. 15% ASW gives the higher strength Split tensile Strength test as compare to percentage of other combination.

5.2.4 FLEXURAL STRENGTH (N/mm^2)

Sr. No.	% Coarse Aggregate	% Asbestos Sheet Waste	Flexural Strength (N/mm^2)		
			3 Days	7 Days	14 Days
1	100%	0%	5.53	6.35	8.14
2	95%	5%	5.32	6.16	7.55
3	90%	10%	5.57	6.41	8.36
4	**85%**	**15%**	**5.64**	**6.53**	**9.48**
5	80%	20%	5.47	6.31	9.08
6	75%	25%	5.25	5.95	8.56

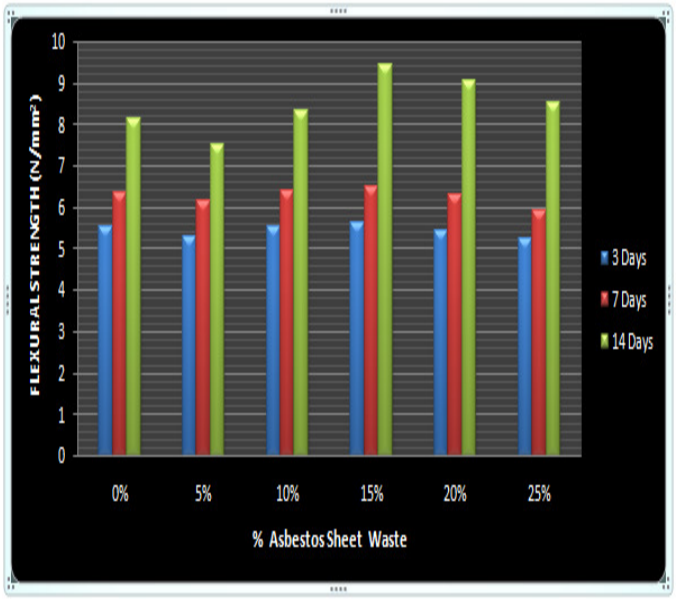

Figure 3: Graphical Representation of Flexural Strength Test on Concrete

From the Above graph it is observe that,

1. As the percentage of ASW the Flexural strength of concrete tends to increase up to certain percentage and then start's decreasing with the increase of ASW content.

2. 15% ASW gives the higher strength Flexural strength test as compare to percentage of other combination

4. CONCLUTIONS

1. Due to addition of rice Husk ash, concrete becomes cohesive and more plastic and thus permits easier placing and finishing of concrete. It also increases workability of concrete.

2. As the replacement of cement by RHA in concrete increases, the workability of concrete decreases.

3. Asbestos cement sheet waste aggregate concrete may be an alternative to the conventional concrete.

4. Waste material is utilized in effective manner so by using asbestos cement sheet waste, one can reduce the effective cost of the concrete and it is also helpful for the environmental point of view.

5. Addition of steel scrubbers as fiber in concrete leads to an increase in compressive strength and split tensile strength

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