STUDIES ON COMPRESSIVE STRENGTH OF CEMENT CONCRETE BY USE OF ASBESTOS CEMENT SHEET WASTE

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Abstract :

In this constructed environment, the rising prizes of building construction materials are the factor of great worry. The coarse aggregates are the main ingredients used in concrete. We all want that our buildings must be strong, stable and should build with the construction material of reasonable prizes. Every construction industry totally relies on cement, aggregates whether it is coarse or fine for the production of concrete.In this research, I have replaced the coarse aggregate partially by using asbestos cement sheet waste. It is a waste material so by using asbestos cement sheet waste as a replacement we can solve the problems of price rising.Therefore, I have planned to prepared some number of cubes using asbestos cement sheet waste at various proportions like 0%, 5%, 10% ,15%, 20% and 25% by weight of coarse aggregate.The properties for fresh concrete are tested for compressive strength at the age of 7, 14 and 28 days. It is found that with the increase in the percentage replacement of coarse aggregate with AC sheet waste there is increase in Compressive Strength upto 10 % replacement after that there is decrease in Compressive Strength with further replacement of coarse aggregate with AC sheet waste. It can also observed that 28 days compressive strength is increased by 3.33%, 6.41% upto 10 % replacement of coarse aggregate with AC sheet waste as compared to conventional concrete.

Keywords: OPC 43 Grade, Coarse Aggregate, Fine Aggregate, superplasticizer (CICO), Water, W/C ratio, Concrete , Asbestos Cement Sheet Waste.

Introduction:

Almost in all countries in the world various experiments are done aimed at reducing theuse of primary aggregates and escalating reuse and recycling have been introduced, which is economically,technically or environmentally acceptable.As a result, in developing countries like India, the informal sector and secondary industries recycle 15–20% of solid wastes in various building materials and components.[1]Asbestos products manufacturing industriesare located in fifteen industrial states of Indiastrategically important from raw materials and energy availability view point and also fromconsumption pattern view point.

The pattern of asbestos industries can be predicted from the state wise asbestos consumption in India. From Figure 1, It is understood that Tamil Nadu, Andhra Pradesh, Haryana,

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Maharashtra, Madhya Pradesh and Gujarat consume more than 75 % of the asbestos in India.[2]

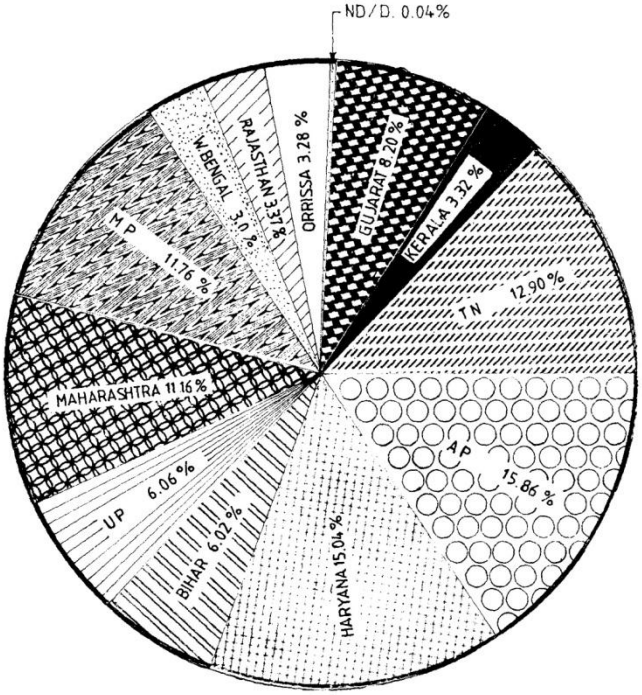

Fig. 1.State Wise Asbestos Consumption In India

Materials Used:

1. **Cement:** The cement used is Portland cement of 43 grade confirming to IS 8112:1989 is used in this study. The specific gravity, initial and final setting time of cement is respectively found as 3.157,80 minutes and 320 minutes. Fineness Modulus obtained is 8%.[3-7]

2. **Fine Aggregates:** Sand is used as the fine aggregate conforming to grading zone II as per IS 383:1970.The specific gravity, fineness modulus, Water absorption and silt content is respectively found as 2.62, 2.81, 0.32% and 2.604%. [8-9]

3. **Coarse Aggregates:** Coarse aggregate has a maximum size of about 20 mm. The coarse aggregate having a specific gravity 2.71 and fineness modulus of 7.401. Water absorption of coarse aggregate is 0.204 %, Aggregate Crushing value is 15.46% and Aggregate Impact Value is 11.23%. [8-10]

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4. **Asbestos Cement Sheet Waste Material**: Asbestos cement sheet waste are taken from upal ltd. near Gorakhnath, Gorakhpur, U.P. They were crushed into required sizes of 4.75 mm to 20 mm by manually operating a hammer.

Fig. 2 Breaking of Asbestos Cement Sheet Waste into pieces by hammer

Table1 : Physical properties of Asbestos Cement Sheet Waste Material

Sl.No.	Physical property	Test result
1.	Maximum Size (mm)	20
2.	Fineness modulus	7.34
3.	Specific Gravity	1.61
4.	Water Absorption (%)	4.401%
5.	Aggregate Crushing Value (%)	14.531%
6.	Aggregate Impact Value (%)	9.841%

5. **Water:** Water used for curing and producing of concrete should be practically clean and free from toxic substances such as oil, acid, sugar, silt, alkali, salt, organic matter and other elements which are harmful to the concrete. potable tap water is used in this study for mixing of ingredients and curing of concrete.

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6. **Admixture:** Super plasticizers (CICO Plast super HS) are used as water reducing admixture.

Mix design for M-30 Grade Concrete:

Concrete Mix Design is taken as per IS 10262 – 2009. The target mean strength obtained is 38.25 MPa for Control Mix.

The actual quantity of material required is

Sl. No.	Replacement of C.A. by AC waste	Cement (kg/m^3)	F.A (kg/m^3)	C.A (kg/m^3)	AC Sheet Waste (kg/m^3)	w/c ratio	Admixture (kg/m^3)	Water (kg/m^3)
1.	0%	398.7	669.87	1175.24	-	0.45	3.98	179.41
2.	5%	398.7	669.87	1116.65	35.045	0.45	3.98	179.41
3.	10%	398.7	669.87	1059.22	70.09	0.45	3.98	179.41
4.	15%	398.7	669.87	999.111	105.35	0.45	3.98	179.41
5.	20%	398.7	669.87	940.34	140.18	0.45	3.98	179.41
6.	25%	398.7	669.87	881.56	175.225	0.45	3.98	179.41

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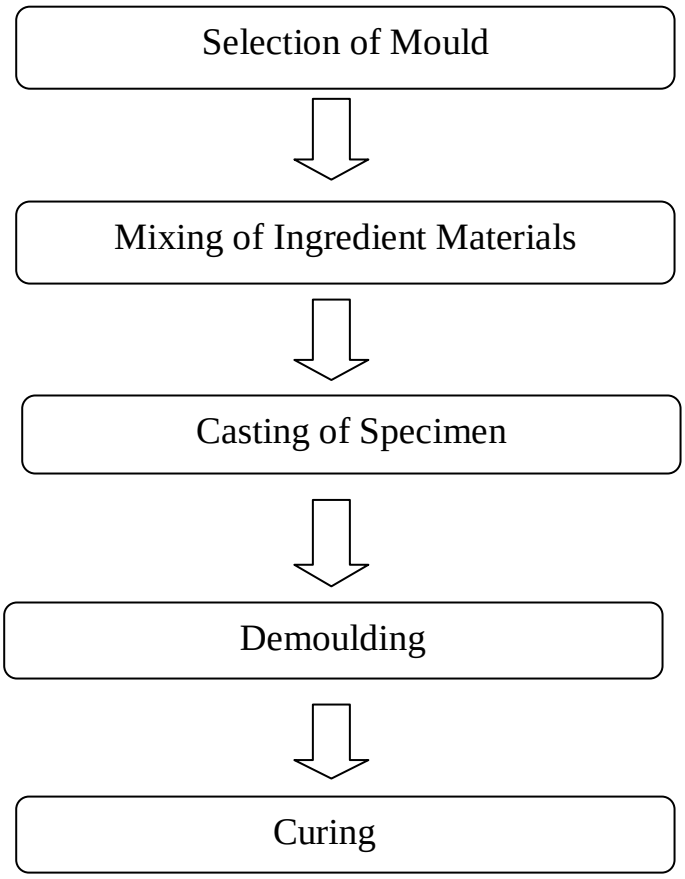
Flow Chart for Experimental Procedure



Experimental Setup:

A series of cube (150x150x150mm) specimens were tested in the laboratory to investigate the compressive strength. The preparatory work and the procedure of the experiments had described. The variables of the experimental specimens were the partial replacement of coarse aggregate by asbestos cement sheet waste. Experimental procedure shows the variation in strength parameter with the variation in asbestos cement sheet waste in the design mix.

Main object of mixing is to make concrete ingredients uniform thoroughly, uniform in colour and also in consistency. All the ingredients particles should have a layer of cement paste and blend into a uniform mass. Mixing is done by shovel here. The mixing of materials was done in the college laboratory. The cement, aggregate, fine aggregate and water were mix to the proportion of sieve analysis and conforming zone second. The proportion of cement: fine aggregate: aggregate was at **1:1.68:2.94** and water cement ratio was **0.45**. Appropriate quantity of fine and coarse aggregate spread in the tray in alternate layers then add asbestos cement sheet waste at required percentage and then cement is poured. Mixing is done at the dry state until the proper mixing is done. Then water is mixed and mixing continues till a uniform colour is not achieved.

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Fig. 3 Selection of mould

Fig. 4 Mixing of Ingredients

Fig. 5 Casting of Specimen

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Fig. 6 Demoulded Specimen after 24 Hours

Fig. 7 Curing of Cubes

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Results And Discussions:

Compressive strength test is conducted on cubes of size 150 x 150 x 150 mm. The compressive strength gives a good and clear indication that how the strength is affected with the increase of the replacement of coarse aggregate by using AC Sheet Waste in the test specimen.

Table 2 Compressive Strength of A.C. Sheet Waste Concrete

Sl. No.	% Replacement of Coarse Aggregate	Compressive Strength (N/mm^2)		
		7 days	14 days	28 days
1.	0% (C.M)	28.00	31.00	39.00
2.	5%	28.27	32.20	40.30
3.	**10%**	**30.00**	**33.35**	**41.50**
4.	15%	27.87	30.31	38.25
5.	20%	26.54	27.71	35.30
6.	25%	25.21	26.24	32.40

Fig. 8 Compressive Strength Testing Of Cube

Fig. 9 Crushing of Cube

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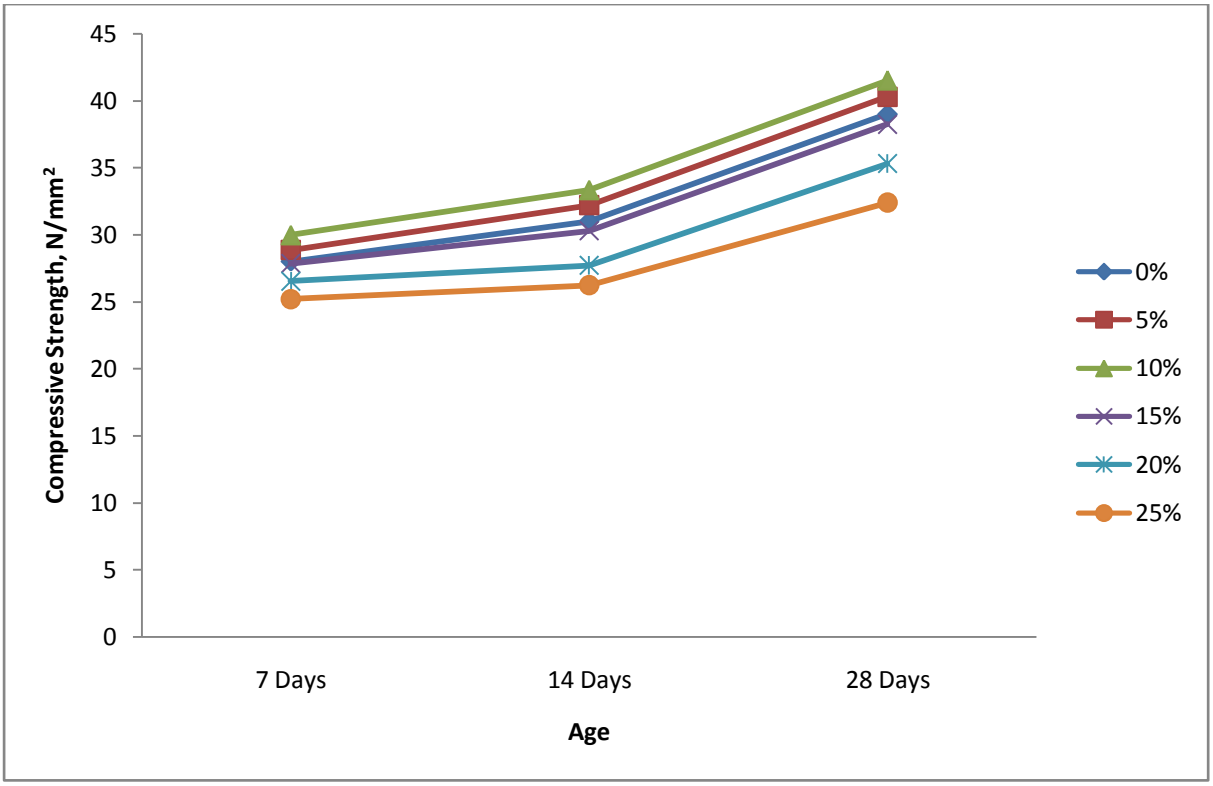

Fig. 4 Graph between Compressive Strength of Concrete and Age

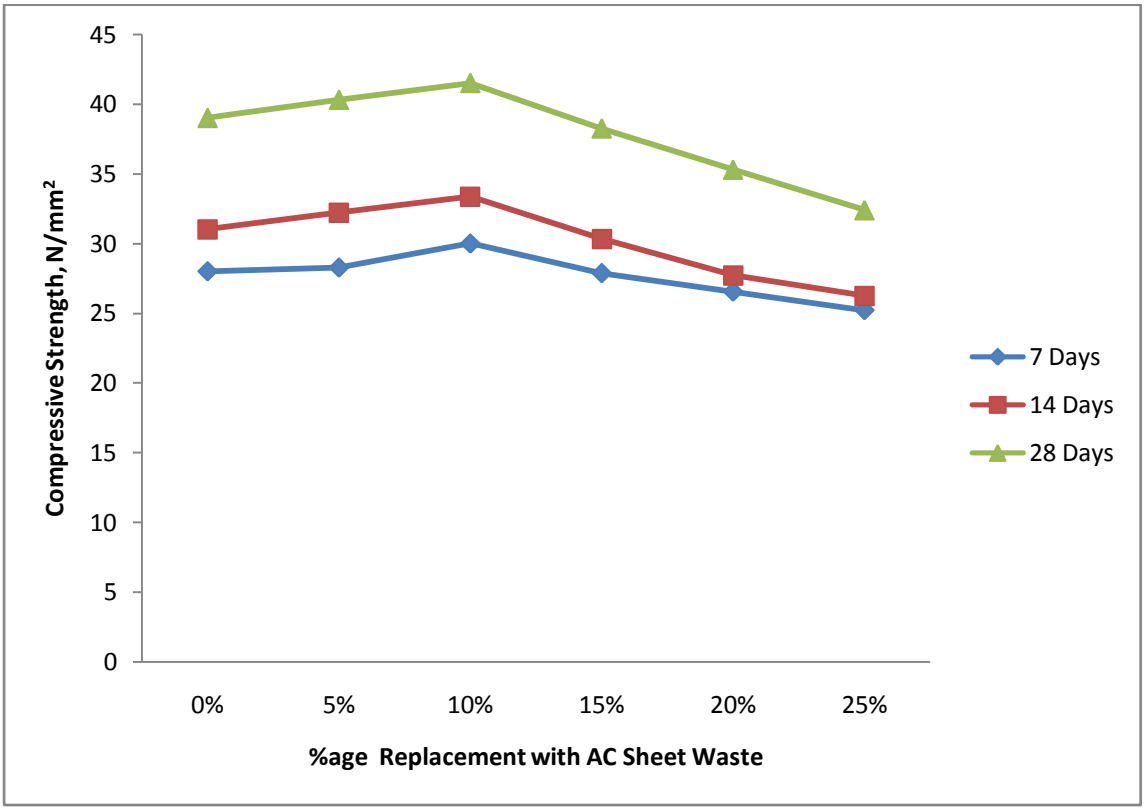

Fig.5 Graph between Compressive Strength of Concrete and % age of A.C. Sheet Waste

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With the increase in the percentage replacement of coarse aggregate with AC sheet waste there is increase in Compressive Strength upto 10 % replacement after that there is decrease in Compressive Strength with further replacement of coarse aggregate with AC sheet waste.The maximum Compressive Strength of 41.50 N/mm^2 was attained at 10% replacement, while the minimum strength of 32.40 N/mm^2 was attained at 25% replacement. Till 10% replacement, concrete Compressive Strength increases gradually but after 10% it reduces. The strength increased as the percentage of replacement increased to a certain limit and beyond that strength decreases. So it is beneficial to use AC sheet waste in place of coarse aggregate upto 10%. Beyond that it is not beneficial as strength decreases.

Conclusion:

It is observed from the experimental results and its analysis, that the compressive strength of concrete initially increases with replacement of coarse aggregate with AC sheet waste and after that there is decrease in compressive strength of concrete with further replacement of coarse aggregate with AC sheet waste.

From the Experimental test result we can concluded that –

1. In case of replacement of coarse aggregate, 10% asbestos cement sheet waste content can be taken as the optimum dosage for compressive strength, which can be used for giving maximum possible compressive strength at any age for Asbestos cement sheet waste aggregate concrete.
2. In case of replacement of coarse aggregate, the percentage increase of compressive strength of Asbestos cement sheet waste aggregate concrete compared with compressive strength of control mix is observed from 0.96 % to 7.14% at 7 days. The percentage increase of compressive strength of Asbestos cement sheet waste aggregate concrete compared with compressive strength of control mix is observed from 3.87% to 7.58% at 14 days. The percentage increase of compressive strength of Asbestos cement sheet waste aggregate concrete compared with compressive strength of control mix is observed from 3.33% to 6.41% at 28 days.
3. It is a waste material and abundantly available in the area of its production and near the industry used asbestos cement sheet waste, one can reduce the effective cost of the concrete and it is also helpful for the environmental point of view.

Suggestion For Future Work:

1. Effect of different type of admixtures on Asbestos Cement Sheet Waste Aggregate concrete can be studied.
2. Durability Test such as Acid Test and Chloride Test on Asbestos Cement Sheet Waste Aggregate Concrete can be studied.

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