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An Experimental Investigation on Use of Slate Waste In Concrete

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Abstract: The slate waste is most of the one popular research areas that encompass a number of disciplines including in civil engineering and construction materials. In India slate waste is settled by the dumped away and sedimentation which affected to environment pollution and public health. therefore, utilization of the slate waste in various industrial sectors, agriculture, glass and paper industries would help to the protect environment. It is most essential to developed ecofriendly concrete from slate waste. In this research study the sand has been replaced by slate waste accordingly in the range of 15%, 20% & 25% by weight for M-25 grade concrete. Concrete mixtures were produced, tested and compared in terms of workability and strength to the conventional concrete 7, 14 and 28 days of curing. This research work is concerned with the experimental investigation on strength of concrete and optimum percentage of the partial replacement by replacing sand (40%) via 15%,20% and 25%of slate waste. These tests were carried out to evaluate the mechnical properties for 7, 14 and 28 days, it's been observed that the compressive strength of concrete increased up to 11.9%,28.51% and 8.73% by replacing 20% of slate waste. The experiment of investigation is the behaviour of concrete while replacing of sand with different proportion of slate waste in concrete by using test like compression test and temperature variation.

Keyword: Slate waste, Eco-friendly, Low cost, Free of cost, compression test, temperature variation test.

I. LITERATURE REVIEW

Baboo rai, et al (2011) influences of powder waste in concrete mix, international journal of civil and structural engineering volume I.

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II. INTRODUCTION

The slate waste used in construction building is known to go back around two thousand years. Slate is metamorphic rock and has known to be used since ancient roman era. Slate has a striking property, water resistance, fire resistance and durability make this natural slate a good choice for construction. during cutting process of slate 25% waste is form of dust. every year 200-400 tons of slate waste are generated on site. The slate cutting waste are dumping nearby vacant surrounding areas. This leads to serious environmental and dust pollution and occupation of a large area of land.

III. MATERIAL STUDY

Slate Waste: The slate waste coming from sites,shops, building, industry etc. the slate waste is generated form polishing and cutting process. The slate waste disposed in vacant space and remaining slate waste is scattered all around.it is very difficult to disposed all slate and fine particles. Slate waste used in concrete for increase compressive strength and reduce temperature. The slate waste can be used for partial replacement with sand to achieve compressive strength and reduce.

Fig (3.1) Slate Waste

Table No 3.1:

Slate Material Test	Result
Specific Gravity	2.67
Water Absorption	0.046%

Cement (PPC): The most common cement used is Portland pozzolana cement. The cement grade is 53 (Ambuja Cement PPC). It is used for many tests were conducted on cement, some of them consistency test, setting time test, compressive strength, specific gravity test, fineness test.

Fig (3.2) Cement

Table No 3.2

PROPERTY	RESULT
Fineness Test	3.08%
Specific Gravity Test	3.15
Consistency Test	34%
Setting Time Test Initial Setting Time Final Setting Time	 155min 270min
Compressive Strength	20N/mm^2 (3 Days)

Coarse Aggregate: The coarse aggregate we are used 10mm and 20mm. the coarse aggregate crushed from Basalt Rock.

Fig (3.3) Coarse Aggregate

Table No 3.3

Property	Coarse Aggregate	
Size	10mm	20mm
Specific Gravity	2.732	2.82
Water Absorption	0.033%	0.025%

Fine Aggregate: Those fractions from 4.75 mm to 150 microns are termed as fine aggregate. The river sand is used in combination as fine aggregate conforming to the requirements of IS: 383. The river sand is washed and screen, to eliminate deleterious materials and oversize particles.

Fig (3.4) Fine Aggregate

Table No 3.4

Property	Result
Specific Gravity	**2.659**
Water Absorption	**0.035%**

Water: -Water is an important ingredient of concrete as it actually participates in the chemical reaction with cement. Since it helps to from the strength giving cement gel, the quantity and quality of water are required to be looked into very carefully.

IV. EXPERIMENTAL METHODOLOGY

The evaluation of slate waste for use as a replacement of Sand material begins with the concrete testing. Concrete contains cement, water, fine aggregate, coarse aggregate and slate. With the control concrete, i.e., 15%,20% and 25% of the sand is replaced with slate waste, the data from the slate waste is compared with data from a standard concrete without slate waste. Three cube samples were cast on the mould of size 150*150*150 mm for each 1:1.78:2.95:0.5 concrete mix with partial replacement of Sand with a w/c ratio as 40% were also cast. After about 24 h the specimens were de-moulded and water curing was continued till the respective specimens were tested after 7,14 and 28 days for compressive strength test.

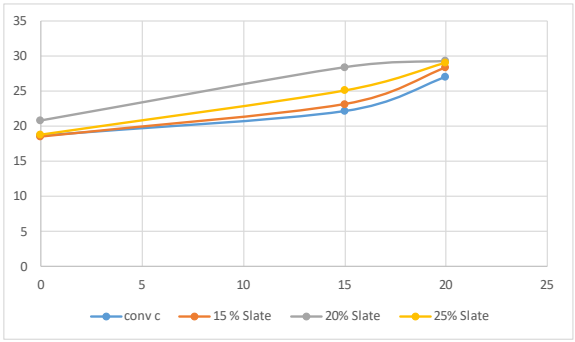
Compressive strength: -Compressive strength tests were performed on compression testing machine using cube samples. Three samples per batch were tested with the average strength values reported in this paper. The loading rate on the cube is 35 N/mm2 per min. The comparative studies were made on their characteristics for concrete mix ratio of 1:1.78:2.95:0.5 with partial replacement of Sand with slate waste as 15%, 20% and 25%.

Fig (4.1) Compressive Strength

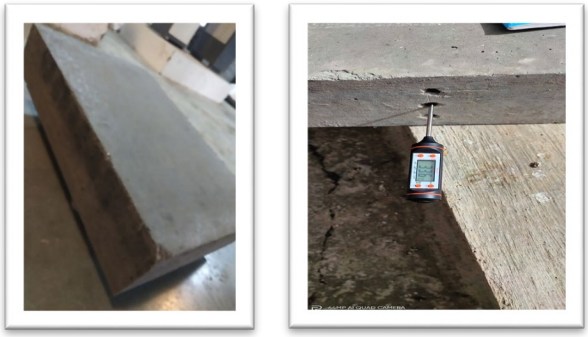
Table No 4.1

Concrete Type (Block)	Average Ultimate Compressive Strength at 7 days [N/mm^2]	Average Ultimate Compress-ive Strength at 14 days [N/mm^2]	Average Ultimate Compressive Strength at 28 days [N/mm^2]
Conventional Concrete	18.62	22.13	27.02
Slate 15%	18.53	23.17	28.40
Slate 20%	20.84	28.44	29.34
Slate 25%	18.75	25.11	29.12

Chart No:4.1 Compressive Strength



Temperature Variation Test: - Temperature variation tests were performed with digital thermometer using slabs. we cast two slabs conventional and admixture slab for temperature testing. The comparative studies were made on their characteristics for concrete mix ratio of 1:1.78:2.95:0.5 with partial replacement of Sand with slate waste as 15%, 20% and 25%.

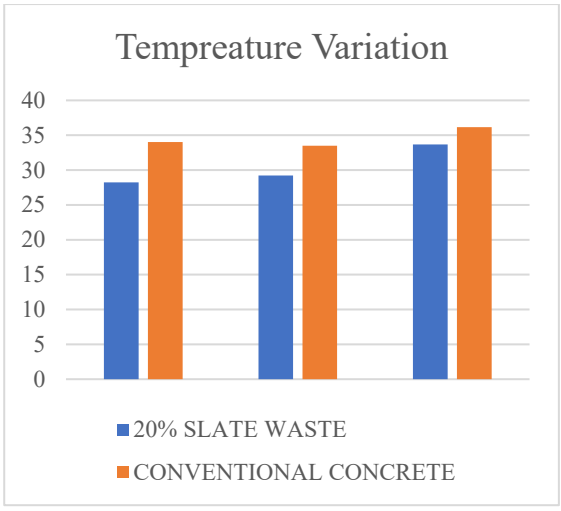


Temperature Variation Fig (4.2)

Table No.4.2

Days	7	14	28
Conventional Slab			
Hole At 3 cm	36.7	36.9	39
Hole At 6 cm	33.6	33	35.6
Hole At 9 cm	31.8	30.6	33.9
Admixture slab			
Hole At 3 cm	30.2	31	35.5
Hole At 6 cm	28.1	28.5	33.6
Hole At 9 cm	26.4	28.2	31.9

Chart No:4.2 Temperature Variation



V. RESULT/DISCUSSION

1) As per observation, we found percentage 28.51% of compressive strength of concrete increase for 20% slate powder as compared with other slate quantities.
2) As per our experiment conducted the temperature was decrease in admixture concrete compare to conventional concrete.

VI. FUTURE SCOPE

The current work was conducted on concrete (admixture as slate) to increase the compressive strength and decrease the temperature in comparison with conventional concrete. Slate has its unique properties such as hard and tough, it is also a good heat and electrical insulator and it offers good abrasive resistance. The same experimental work may also be carried out for following changes: -

1) In the present work we have replaced fine aggregate, in future we can also change the coarse aggregate and check the results accordingly.
2) likewise, we can also replace some percent of cement with fly ash.
3) We can also add coconut husky has an admixture to the concrete to increase strength.
4) Also, by using mineral admixtures like GGBS (ground granulated blast furnace slag) Triple hydration occurs, which would help in increasing the strength of concrete.
5) besides we can add superplasticizers to reduce water and increase strength.
6) Also testing can be done for flexural and torsion strength.

VII. CONCLUSION

Based on limited experimental investigations concerning the compressive strength and temperature variation test of concrete, the following observations are made regarding the resistance of partially replaced slate waste:

(a) Compressive strength increases when replacement of slate waste percentage increases when compare to traditional concrete.

(b) From this test, replacement of sand with this slate waste material provides maximum compressive strength at 20% replacement.
(c) According to experiments conducted by us the temperature was decrease in admixture concrete compare to conventional.
(d) Waste utilization making it more environmentally friends.
(e) Utilization of Slate waste and its application are used for the development of the construction industry, Material sciences.
(f) It is the possible alternative solution of safe disposal of Slate waste.

VIII. REFERENCE

Baboo rai,influences of powder waste in concrete mix, international journal of civil and structural engineering volume I,year 2011

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