

Strengthening of Concrete with Partial Cement Replacement of Granite Dust and Timber Ash

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Abstract—As we know that the Granite powder is the waste material releases from the rock cutting and rock molding industry because of crushing of rock. And we also know very well that the timber after burn in industry and up to domestic level the ash produces are useless there is no use except dumping on the land and to fill the land mostly .if both material is possible to be used instead of some percentage of cement from local crusher and ash from local society for making the concrete then it is of benefit both environmentally and economically .And the effect on strength and characteristics strength is analyzed after mixing of both granite powder and timber ash proportionally .The investigation had happened on strength properties of concrete made with (5% to 15%) replacement instead of cement with constant proportion of the granite powder and timber ash. And the dust that is granite powder is sieved with 90 micron sieve and timber ash is also sieved with 90 micron particle size The test was carried for the finding of compressive strength and compaction factor and slump test and for preparing the particular sample for making the cube we had taken mixture of granite dust 70% and 30% timber ash of particular 100% of partial cement replacement.

Keyword: *Environmentally, Economically.*

1. INTRODUCTION

Now a day we know very well that cement and concrete is very important material for every Construction even the construction related from the building block more than 90. [1]

Percent of construction are carried by the cement mortar and concrete in all over the world. And the production of cement around 3 billion ton all over the world in 1 year and the 7 percentage of the total global co2 gas emitted is contributed by cement industries. And the most of places they use mountain rock as main material to form the cement and that why every year many mountains are cut and this is the very big issue for the world environmental impact due to cutting of mountain.so as we belong from civil department we should take the responsibility for the overcoming of the cutting mountain. So using the material such as fly ash and granulated slag these all are the supplement materials which offers reduction in Consumption of cement. And if it will be use more and more than emission of gases will be in low percentage and effect will be also low. And it will also

environmentally friendly for the disposing of huge amount of materials who pollute the land .[2]suppose if we dispose the granite powder for the land filling then it will be causes very serious environmental problem when wind blow in particular direction it will affect all living organism. So if it will be used in concrete making then it will be valuable resource. The granite powder waste in mainly composed of silica and alumina and so it act as cementing properties as pozzolanic materials. And the granite powder is also high fineness. The granite rock dust was analyzed for the replacement of cement in mortar I terms of strength of concrete and durability of concrete and T.Ramos observed that on mixing only granite dust up to 10 % there is marginal workability and strength loss [3]. Protection and Abukersh et al contemplated on reused total cement discharged with red stone tidy as a halfway fine total substitution and he indicated result that the utilization of rock clean mechanical properties and consumption protection of cement adjusted with stone tidy and glue of concrete altered with stone tidy were checked[4]. Granite stone of 20% to 50 % level decrease reliably the solid compressive quality .According to Abd Elmoaty et al research after mixing in cement during replacement the results showed an improvement on concrete compressive strength at 5.0%, 7.5%, 10% and 15.5% were used and MS jaafar et al inquire about made on quality and toughness attributes of high quality stone clean concrete [4]. Concrete sample were lower than control concrete test at all the ages blend containing 30% to 40% base ash. At 90 days advance the compressive quality of quality of ordinary cement at 28 days.

2. SIGNIFICANCE OF THE PROJECT

A considerable lot of the exploration paper and work had gone up against fines going through 150 micron sifters and after that utilized for supplanting fines totals. The allowable furthest riches of fine total going through 150 micron sifter are 20% on account of made sand is 389-1970. Also, more research ought to be done on clean of stone of fines less than 150 mm micron to supplant a segment of concrete. [4]

Main objective of this project be summarized as to Compare the properties of concrete mix with M20 with the properties of

concrete with granite dust and timber ash i.e. replacing partial cement and for finding the proper proportion that in which it could be implemented and give comparatively equal and more strength properties. And also two test carried slum test and compaction factor.

3. SCOPE OF THE PROJECT

It can be used when locally available i.e. granite dust and timber with proportion and overcome the air pollution and other effect on environment.

4. EXPERIMENTAL WORK AND RESULT

4.1 Materials

The cement used is Portland cement of grade 43 and brand name is ACC and this material is tested such as initial setting, final setting, specific gravity and we have collected granite dust from the local crusher or stone cutting factory and timber ash from the local home for the study and research. And both granite cutting dust and timber ash is sieved from the 90 micron sieve and the specific gravity of the granite dust is 3.02 and the type of aggregate is use is fine aggregate i.e. sand and coarse aggregate .And sieve analysis of sand is taken according to Is: 2386 (part1) and it is grade of zone (hot dry zone) and the water absorption is1.20% .we had taken 20 mm nominal size aggregate for used as coarse aggregate in the experiment. And the specific gravity was 2.75 and the water absorption was 0.08% and the aggregate is dry so moisture content is nil. A d we have already perform the different types of test on the aggregate such flakiness index, crushing value, aggregate impact value.

Table No (1) Chemical Compound of Granite Dust

Compound	Percentage
SiO ₂	53.15%
CaO	11.66%
K ₂ O	4.85%
P ₂ O	1.37%
So ₂	1.99%
TiO ₂	0.57%
Na ₂ O	6.24%

Table No (2) Chemical Compound of Timber Ash

Compound	Percent
SiO ₂	72.03%
Al ₂ O ₃	14.43%
K ₂ O	4.15%
Na ₂ O	3.66%
CaO	1.80%
FeO	1.70%
MgO	0.72%
TiO ₂	0.31%
P ₂ O ₂	0.9%
Fe ₂ O ₂	0.06%

4.2 Test parameters

During test of this experiment i.e. we have perform the compaction factor and slump test because for the observation

of fail and pass on the particular site and the made 8 cube block for observation of the compressive strength of particular block i.e. in which 1 block are made on standard proportion in which 100 % cement had taken and rest 6 block are made with 5%,10%,15% cement replacement respectively in which and in all these proportion we had also take the 30% ash and 70% granite dust of partial percentage of cement respectively. The cube is tested on after 3 days and 7 days curing. Mostly on concrete block we mainly find the compressive strength and characteristics compressive strength and compaction factor, slum test for workability of concrete and the test i.e. compressive strength perform on compression testing machine. The result are shown in given below table no-2. In this table we had shown the compressive strength of partial mix cement by the granite powder and timber ash with proportion of 5%, 10%, 15% after curing of 3 days and 7 days. As we see that from the particular data the enhancement of the compressive strength during 5%to15% if we compare from the standard result this happing because of in the granite powder good amount of silica and alumina are present both shows the binding property and timber ash which is fine particle who fill the porous of concrete and due to this the permeability of water decrease and becomes harder and tougher so due to this reason it is high load and providing more compressive strength but if we more and more increase the partial replacement material i.e. granite powder and timber ash then the bearing capacity will decrease than the standard result because of the lack of super plasticizer in whole concrete made and intensity to bind the cement of aggregate and sand will be loose so up to certain limit we can't exceed the granite powder and timber ash. So we observed that up to 10% of granite powder and timber ash with proportion of 70% and 30% respectively it can be used in concrete replacement instead of cement if it is possible to bring from the local crusher and local unit. And by this experiment we can also utilize the waste sludge and ash and to overcome the air pollution.

Table No (3) Material with Proportion Table

Mix grade & cement replacement %	w/c ratio	Cement wt. & Wt. %	Granite dust wt. & wt. %	Timber ash wt. & wt. %	Course age wt. gm.	Fine gag wt. gm.
M20 & 0%	0.5	4000g m & 100%	0 gm. & 0%	0 gm. & 0%	12000	6000
M20 & 5%	0.5	3800g m & 95%	140 gm. & 70%	60gm & 30%	12000	6000
M20 & 10%	0.5	3600g m & 90%	280 gm. & 70%	120gm & 30%	12000	6000
M20 & 15%	0.5	3400g m & 85%	420 gm. & 70%	180gm & 30%	12000	6000

5. RESULT

From this investigation we found that following results regarding compressive strength.

Table No (4) Strength of M20 Sample after Curing

Cement content	3 rd day	7 th day	28 th
100%	13.33	14.22	20
95%	16.90	20.44	21.5
90%	14.67	18.0	20.45
85%	13.02	14.20	19.55

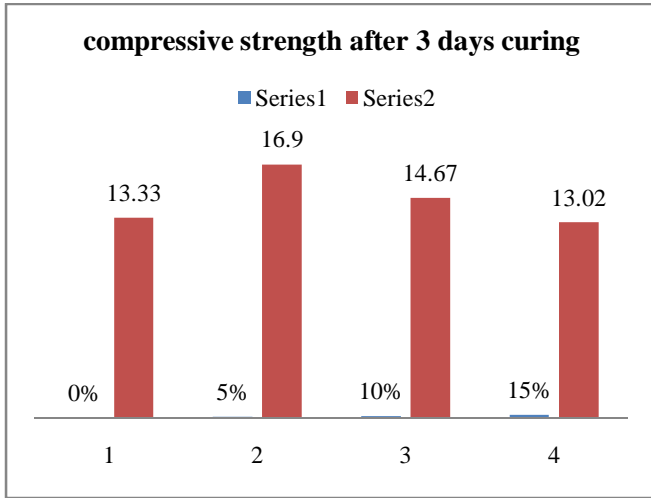


Fig. No1: Compressive Strength after 3 Days

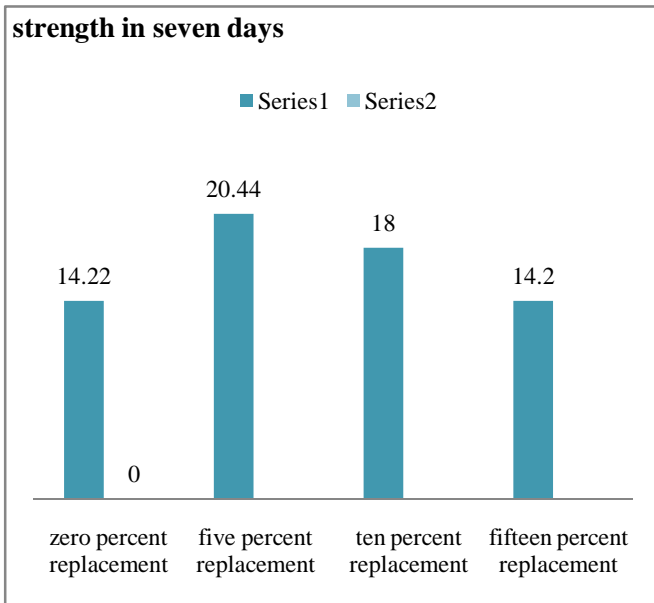


Fig. No. 2: Compressive Strength after 7 Days

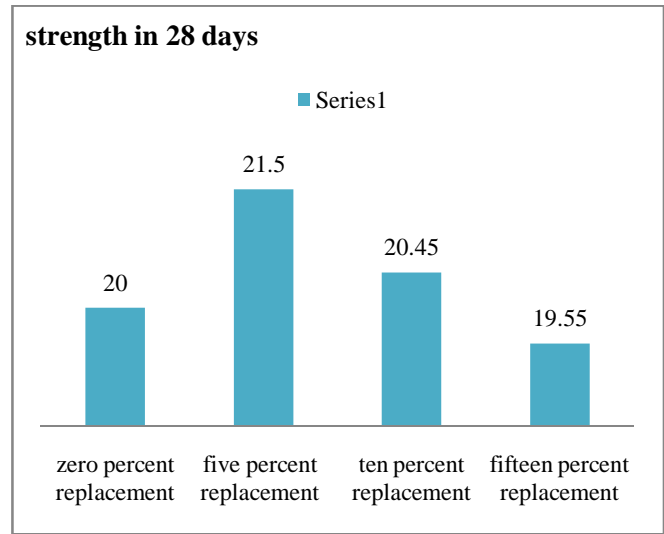


Fig. No. 3: Compressive Strength After 7 Days

6. CONCLUSION

From this investigation this is found that a supplementary or waste material i.e. granite dust and timber ash with given proportion it can be used for formation of concrete ,and it will provide approximately equal and more compressive strength as like as standard result of opc cement .Both the material are environmentally and economical because both are similar to waste material .And by the using these two material the air pollution also overcome and the particulate matter that are present in the atmosphere of a particular place by using this it can be control. And from using these two material granite dust and timber ash, at some extent decrement in carbon emission at particular place and environment, And cement consumption will be decrease. And according to this experimental activity 5% and 10% cement can be replace by the granite dust and timber ash if it will mix with the proportion of 70% and 30% respectively. And the result is more than the standard and it is reliable and there is no any bad effect on the concrete. The result of the 5% and 10% replacement is on 3 days curing is 16.9 and 14.67 respectively and on 7th days curing of 5% and 10% are 20.44 and 18 compressive strength respectively.

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