

STUDY ON STRENGTH PAREMETER OF CEMENT MORTAR USING FLY ASH AND GRANITE FINES

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Abstract:

The present study was carried out for 1:3 ratio of cement mortar replacing cement by fly ash at constant percentage of 25% and granite fines replaced by fine aggregate varying percentages of 0%, 10%, 20%, 30%, 40%, and 50%. The results concludes that the maximum compressive strength was obtained 10 % of granite fine and after 10% of granite fines goes on reduced.

1.INTRODUCTION

Cement mortar is a building compound created by mixing sand and a selection of aggregates with a specified amount of water. The mortar can be used for a number of applications, such as plastering over bricks or other forms of masonry. The huge demand for mortar and concrete has made this natural resource to get impoverished hence massive quantities of cement needs to be annually produced This production leads to pollute the environment by releasing significant quantities of CO₂ emission and on the other hand extraction of river sand in excess has conspicuous environmental impacts. Large quantity of like fly ash, and many other types of ashes and powder form materials is being produced every day leading to many environmental problems. Lot of research has been carried out to use alternative material in cement mortar and concrete so as to satisfy various properties. Granite fine powder is one such alternative material which can be effectively used to replacement for cement and manufacture sand.

Fine aggregate is the most popular building material in the world. Construction Industry contributes huge amounts to Indian economy and Fine aggregate is one of the best materials used in construction. The ingredients used in it include Cement, Sand, Gravel and Water. Now-a-days sand is not easily available. The worldwide consumption of sand as fine aggregate in concrete production is very high, and several developing countries have encountered some strain in the supply of natural sand in order to meet the increasing needs of infrastructural development in recent years. A situation that is responsible for increase in the price of sand, and the cost of concrete. Expensive and scarcity of river sand which is one of the constituent materials used in the production. The use of Crushed Granite Fine (CGF) as an

alternative to natural sand. The Granite fines use up to 10%, 20%, 30%, 40% and 50% as a partial replacement.

1.1 OBJECTIVES OF THE STUDY

In this present study the granite fine is using as an alternative material for sand and fly ash is using as alternatives for Cement in cement mortar ratio of 1:3.

The following objectives of the proposed work are

1. The main object is to find a suitable and economical alternative for sand in cement mortar with require strength.
2. To study the physical properties of materials such as specific gravity, fineness, initial setting and final setting time of cement etc.
3. To study the Compressive strength behaviour of cement mortar with and without alternative material.

2. MATERAILS PROPERTIES

2.1 MATERIALS USED

- Cement
- Fine aggregate
- Replacement of Granite fines (partial replacement of 10%, 20%, 30%, 40% and 50%)
- Water
- Fly ash (replacement Of 25% constant)

1. Cement

The material of cement were used in Ordinary Portland Cement (OPC) 43 grade is used.

Table 1: Physical properties of Cement

S. No.	Properties of Cement	Result
1	Specific gravity	3.1
2	Standard consistency	32%
3	Initial setting time	30 mins
4	Final setting time	600 ns

2. Fine aggregate

Sand collected from nearby river is used for this project.

Table 2: Properties of fine aggregate

S. No.	Description	Value
1	Specific gravity	2.640
2	Sieve Analysis	Zone-III

3. Granite Fine

For this study Granite cutting dust obtain from locally available.

Table 3: Properties of granite fine

S. No.	Description	Value
1	Specific gravity	2.112
2	Sieve Analysis	Zone-IV

4. Water

Water is an important ingredient of the Cement mortar it actually participates in the chemical reaction with cement. In general water fit for drinking purpose is suitable for mixing.

5. Fly ash

For this study Karnataka Power Transmission Corporation Limited (KPTCL) Fly Ash obtain from Raichur, Karnataka.

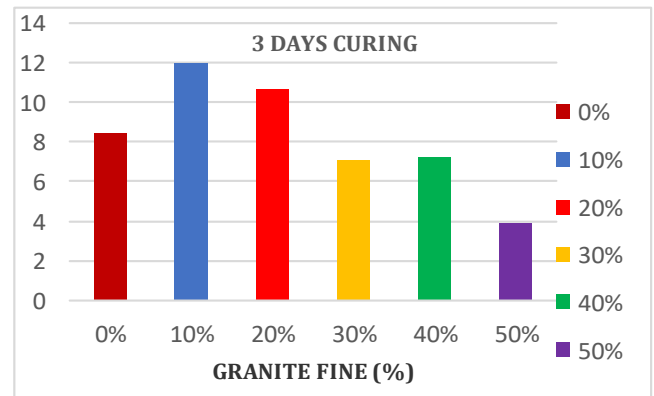
Table 4: Replacement for Cement and Sand

S. No.	Percentage of Fly Ash replacement for Cement (in %)	Percentage of Granite fine replacement for Sand (in %)
1	25	0
2	25	10
3	25	20
4	25	30
5	25	40
6	25	50

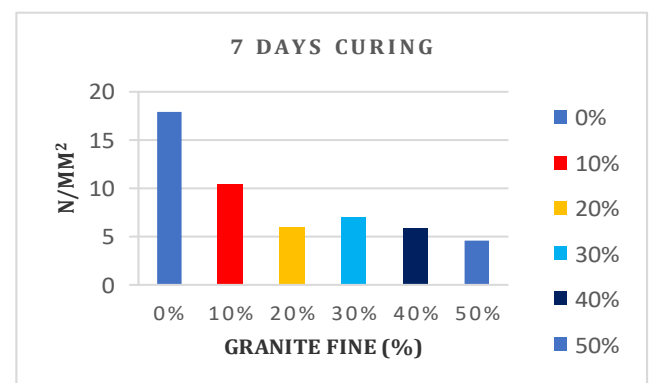
3.RESULTS AND DISCUSSION

Table 5: Test of curing after 3 days

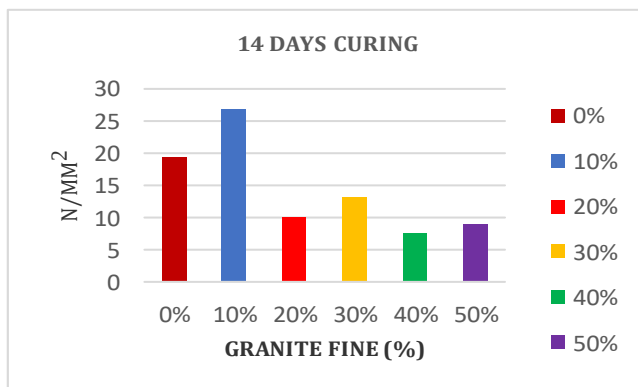
Sample No	Granite fine (%)	Average Compressive strength (n/mm ²)
Mix 1	0	8.435
Mix 2	10	11.972
Mix 3	20	10.621
Mix 4	30	7.082
Mix 5	40	7.210
MIX 6	50	3.877

Chart 1: compressive strength

Table 6: Test of curing after 7 days

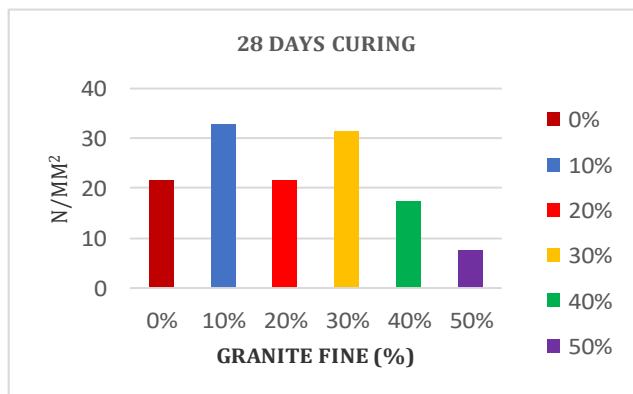
Sample No	Granite fine (%)	Average Compressive strength (n/mm ²)
Mix 1	0	17.890
Mix 2	10	10.399
Mix 3	20	5.985
Mix 4	30	6.938
Mix 5	40	5.714
Mix 6	50	4.577

Chart 2: Compressive strength

Table 7: Test of curing after 14 days

Sample No	Granite fine (%)	Average Compressive strength (n/mm ²)
Mix 1	0	12.250
Mix 2	10	26.739
Mix 3	20	9.8620
Mix 4	30	12.992
Mix 5	40	7.5500
Mix 6	50	8.9100

Chart 3: Compressive strength

Table 8: Test of curing after 24 days

Sample No	Granite fine (%)	Average Compressive strength (n/mm ²)
Mix 1	0	21.359
Mix 2	10	32.809
Mix 3	20	21.291
Mix 4	30	31.223
Mix 5	40	17.346
Mix 6	50	7.549

Chart 4: Compressive strength


From the above chart1,2,3, and 4 it is observed that for 10% of granite fines gives maximum strength after that the percentage of granite fine increase strength goes on decrease in cement mortar.

FUTURE SCOPE OF THE STUDY

The present study carried out for cement mortar 1:3 ratio and for further study the ratios can be changes with same percentage of replacement of fly ash and granite fine for cement and fine aggregate respectively. For further study instead of using granites fine other mineral additives can be

used for replacement for fine aggregate with varying in percentages and the fly ash can be replace varying in percentage as further in replacement for cement in cement mortar also other types additives can be used such as marble powder.

4. CONCLUSIONS

The experimental results concludes that the study focuses the relative performance of mortar by using the Granite powder as partial replacement of the natural sand and fly ash as partial replacement of cement. From the laboratory study, it can be concluded that the Granite powder is well appropriate for normal sand up to certain limits. And it has better performance as compared to the sand. It is also concluded that the fly ash can be used as cement replacement to certain limits.

- As observed by this study the maximum compressive strength obtained at 10% of granite fines as a replacement for fine aggregate
- As the percentage of granite fines increase the strength goes on decrease after 10% of granite fines for replacement for fine aggregate.
- Due the presence of fly ash and granite fines percentage increase reduce the workability of mix was observed.
- By this study the fly ash can be reduce the usage of cement it can reduce the carbon footprint.
- It can also use in future for various wall construction works using mortar, which includes determining compressive strength parameters.

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