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Utilization of Marble Slurry as Cemento Binding Composition in Masonary Structures

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Abstract
The Cemento binding composition comprising of marble slurry waste in dry form ,fly ash from thermal power plant ,hydrated lime and mineral gypsum is for improving early strength, setting time in comparison to prior art and to overcome the shrinkage and temperature movement in the cement for masonry structures. The marble slurry waste is in dry powder form or mines waste in powder form or carbonated lime sludge. This research also includes the process for preparing the composition.

INTRODUCTION

Around 4000 marble mines and 1100 marble processing units are spread over the 16 districts of Rajasthan. Huge quantities of marble dust in form of slurry are generated during processing and slabing of marble stones. This large quantity, 5-6 million tons per annum, of the mineral waste from marble processing industry is an environmental problem. Indiscriminate disposal of marble slurry dust mostly on the road sides is causing problems of drainage, flow regime, air pollution and damage to agriculture land. The heaps of this waste material acquire large land areas and remain scattered all around, spoiling aesthetic of the entire region and have affected the tourism and industrial potential of the state. The hazardous dumping practices of MSD pose a severe threat on the environment, eco-system, and health of the people and have achieved mammoth proportion.

METHODS AND METHODOLOGY

The dolomite marble of Tripura- Sundry- Telwara area is white and fine grained, which is used both for block making and chips preperations. The chemical composition of dolomite powder producing from various processing plants are given below:-

Sample	1	2	3	4
SiO_2 + Acid Insoluble	1.54	0.66	0.80	2.58
AL_2O_3	0.23	0.72	0.73	0.54
Fe_2O_3	0.71	0.71	1.13	0.42
CaO	31.08	31.64	40.68	33.02
MgO	20.15	19.94	11.68	17.72
L.O.I	46.20	46.62	44.78	45.46
S	0.135	0.111	-	-

TEST CONDUCTED

Cemento binding material formed by mixing /grinding and blending the following components:

1. Marble slurry waste comprising Dolomite grade in the powder form: 50.5%.
2. Fly ash taken from thermal power plant 28%.
3. Hydrated lime – 15%.
4. Mineral gypsum – 6.5%.

The test conducted while preparing the Cemento binding composition as per Indian standard.

i. Fineness test :-
% retained on IS having sieve size of 45 micron: 12.87% retained.

ii. Setting time test :-
Initial setting time: 370 minutes.
Final setting time: 455 minutes.

iii. Compressive strength test :
7 days: 2.72N/mm2.
28days: 6.08N/mm2.

iv. Soundness test :
Auto clave expansion: + 0.145%
Flow required for 25 drops per 15 secs: 28%.

EXAMPLE- 2:

Cemento binding composition formed by mixing /grinding and blending the Following components:

i. Marble slurry waste comprising Dolomite grade in the powder Form: 70%.
ii. Fly ash taken from thermal power plant: 10%.
iii. Hydrated lime- 15%.
iv. Mineral gypsum = 5%.

Tests conducted: with this Cemento binding composition as per Indian
Standard:

1. Fineness test -% residue on IS sieve size of 45 micron: 9% retained.
2. Initial setting time: 260 minute and final setting time: 780 min.
3. Compressive strength:
After 7 days= 2.62 N/mm2 and
After 28 days: 6.40N/mm2.
4. Soundness test: Expansion in Le chatellier mould: 2.4mm.

EXAMPLE-3:

Cemento binding composition formed by mixing/grinding, grinding and Blending the following components;

1) Marble slurry waste comprising Dolomite grade in the powder form: 50%
2) Fly ash waste taken from thermal power plants 22%
3) Hydrated lime – 20% and
4) Mineral Gypsum – 8%.

Test Conducted while preparing the Cemento binding composition:

1. Fineness test-
% residue on IS having sieve size of 45 micron: 5% retained
2. Setting time test Cemento binding composition –
Initial setting time: 180 minutes
Final setting time: 660 minutes
3. Compressive strength test-
7days: 3.08 N/mm2
28Days: 7.1 N/mm2
4. Soundness test –
Expansion in le chatellier mould: 2.8 mm

EXAMPLE 4:

Cemento binding composition formed by mixing/grinding, grinding and Blending the following components;

1. Marble slurry waste comprising Dolomite grade in the powder form: 60%
2. Fly ash waste taken from thermal power plants: 12%
3. Hydrated lime – 20% and
4. Mineral Gypsum – 8%.

Test Conducted while preparing the Cemento binding composition:

1. Fineness test- % residue on IS having sieve size of 45 micron: 2% retained
2. Setting time test Cemento binding composition –
Initial setting time: 120 minutes
Final setting time: 720 minutes
3. Compressive strength test-

7 days: 3.35 N/mm2
28 days: 7.21 N/mm2

4. Soundness test –Expansion in le chatellier mould: 3.1 mm

CONCUSION

Looking to the test results, we conclude as follows:-

1. A best Cemento binding composition is:

i. A marble waste in dry powder form ----------30-70% (Calcite and dolomite)
ii. Fly ash of thermal power plant waste (as per IS 3812) - 10-50%
iii. Hydrated lime class c and waste of lime kiln (by weight) – 8-25%
iv. The mineral gypsum type or industrial waste gypsum-----5-8 % (by weight)

The composition is used for masonry structure in the cement binder for improving early more strength, setting time in comparison to cement and overcomes the shrinkage and temperature movement.

REFRENCES

1. Misra A K, Mathur R, goel P & Sheera S S, Marble slurry waste –A potential building material, in proc 7th NCB Seminar on cement and building Mat vol.4 xi, (New Delhi) Nov. 2000, 67-76.
2. V. Vijayalakshmi, S. Singh, and D. Bhatnagar. “Developmental Efforts in R & D for Gainful Utilization of Marble Slurry in India”. Centre for Development of Stones, 2003.
3. Rania Hamza, Salah El-Haggar, Safwan Khedr, “Utilization of Marble and Granite Waste in Concrete Bricks” International Conference on Environment and BioScience IPCBEE
4. B. Demirel, The effect of the using waste marble dust as fine sand on the mechanical properties of the concrete turkey, International Journal of the Physical Sciences 5 (9) (2010) 1372 – 1380.
5. T. Celik, K. Marar, Effects of crushed stone dust on some properties of concrete Turkey, Cement and Concrete Research. 26 (7) (1996) 1121 – 1130.
6. V.Corinaldesi, G. Moriconi, T.R. Naik, Characterization of marble powder for its use in mortar and concrete United States, Construction and building Materials 24 (2009) 113 – 117.
7. Ergu n, Effects of the usage of dialomite and waste marble powder as partial replacement of cement on the mechanical properties of concrete. Turkey, Construction and Building Materials 25 (2010) 806 – 812.
8. “Investigations on partial replacement of cement with marble powder” by Rahul Jagadeesh in International Journal of Civil And Structural Engineering, Vol 1, No 3, 2010.