

A Review on Feasibility of Cement Concrete by Partially Replacing Cement by Marble dust in Cement Concrete

ANKIT SHARMA¹, DR. A.S TRIVEDI², MANOJ SHARMA³

¹Research scholar M.Tech Final year Institute of professional studies affiliated to RGPV Bhopal, Madhya Pradesh India

²Professor, Department of civil engineering Institute of professional studies affiliated to RGPV Bhopal, Madhya Pradesh India

³Assistant professor, Department of civil engineering Institute of professional studies affiliated to RGPV Bhopal, Madhya Pradesh India

Abstract: As now a day, different types of marble is widely used in structures which is responsible for increasing the amount of waste in the environment. Marble powder is the waste product which is obtained as a result of sawing and shaping of marble by metamorphic rock, which contains heavy metals which make the water unfit for use. Although environmental problems is created by marble powder but as it content high oxide calcium, which is an important cementing material, hence partial replacement of cement by marble dust in concrete can be done. In previous study, sample of marble dust was collected from the marble industry and it was used in different grades of concrete as a partial replacement of cement in percentage of 5, 10, 15, 20, 25 and 30 and investigates its effects on the concrete in different proportion and also compares the compressive, split tensile and flexure strength of concrete. Compare its workability and durability was also compared. The main objective of this study is to partially replace cement by marble powder in concrete so as to reduce the waste in environment and its effect on the environment.

Key Words: Marble dusts, compressive strength, cement consistency, cement concrete, cement tensile strength etc.

1. INTRODUCTION:

Lot of waste is generated during sawing, grinding and polishing process of marble rock at marble industry site. About 20% marble waste is generated from total marble quarried which now has become millions of tons. These day marbles are widely used in construction work. This marble dust should be dumped in notified areas marked for dumping but it is being dumped at nearby pit of marble industry or vacant space available nearby marble industry. This marble dust flies in the air and spreads near dumped area which is leading to increase environmental risks. In summer season i.e. from April to September this marble dust remain in dried condition and hence particles flies in the air in huge quantity thus get deposited on crops and vegetation. Also necrotic conditions for flora and fauna which changes landscapes and habitats are created by deposition of fine dust in huge amount. Underground water reserves as well as surface water resources being contaminated by this accumulated waste due to which water is becoming unhygienic for human beings and animals. In past two

decades marble waste has become the main cause of environmental problems all over the world and it has now become difficult to provide dump area for dumping this waste. so today there is a need for utilization of this marble waste in real estate, agriculture, glass and paper industries which will protect environment and will solve the problem of area required for dumping recently generated marble waste. Concrete is the most widely used construction material in the civil construction work because of its high structural strength and stability. Concrete is basically a mixture of cement, fine aggregate, coarse aggregate and water. Cement is used as binding material in concrete for binding aggregates while coarse aggregate is responsible for performance and durability of concrete and fine aggregate fill the voids of concrete matrix. Gases evolved during and after setting of cement are harmful for the environment and hence there is requirement of reducing effects of gases and it can be done by introducing other material in cement. The main objective of this study is to investigate the feasibility of marble dust as partial replacement of cement in concrete. All the investigation is based by comparing test results of ordinary concrete i.e. without partially replacing cement by marble dust and the concrete in which cement is partially replaced by marble dust. Marble dust is replaced in percentage of 5,10,15,20 and 25.

2. LITERATURE REVIEW

A. Manju Pawar et.al (2014): he founded that with the partial replacement of cement by marble powder up to 12.5% the compressive strength of concrete increases and further addition results decrease in compressive strength. also tensile strength of concrete were founded to increase when marble dust is used up to 12.5% and further replacement results decrease in tensile strength.

B. V.M. Sounthararajan et.al (2013): he founded increase in the compressive strength of 46.80 MPa at 7 days for 10% replacement of cement by marble dust in concrete. Also some mechanical properties were founded improved as compared to controlled concrete.

C. Er. Tanpreet Singh and Er. Anil Kumar Nanda: founded reduction in mechanical properties of concrete with increase marble dust content in concrete.

D. Er. Amritpal Kaur, Er. Rajwinder Singh Bansal: founded that compressive strength of cubes and split tensile strength to decrease after 10% replacement of cement by marble dust in cement concrete but durability properties has makeable changes by replacement of cement by marble dust in cement concrete.

E. Er. Raj P. Singh Kushwah, Prof. (Dr.), Ishwar Chand Sharma, Prof (Dr.) PBL Chaurasia(2015): founded that mechanical properties of concrete like specific gravity, fineness modulus of concrete in which sand was replaced by marble dust upto 30% were same as the conventional concrete in which marble percentage is taken as zero. Thus marble dust can be used as a partial replacement of sand in cement concrete.

F. Bahar Demirel (2010): founded the use of marble dust as a fine aggregate in cement concrete. Concrete was prepared by partially replacing sand by marble dust taken in order 0%,25%,50%,75%,100% . Properties like porosity values, ultrasonic pulse velocity and the unit weight were tested in series. He founded that use of marble dust in concrete as a partial replacement of sand in cement concrete enhances the compressive strength of cubes. Thus marble dust can be used as a partial replacement of sand in cement concrete.

F. Hassan A. Mohamadien(2012) : used marble dust and silica fume as a partial replacement of cement in cement concrete and cement mortar. Sample was prepared by partially replacing cement by marble dust and silica flume separately 0%, 5%, 10%, 15%, 20%, 30% and 50 % by weight in concrete and mortar. The compressive strength of concrete and cement mortar was found to be increasing on addition of both material separately maximum upto 15% replacement. The compressive strength was increased by 31.4% for seven days and 48.3% for 28 days when cement was partially replaced by silica flume while on partial replacement by marble dust the compressive strength increases 22.7% for 7 days and 27.8% for 28 days.

G. Noha M. Soliman (2013): the compressive strength, workability and tensile strength increases by using definite amount of marble dust as a replacement of marble dust in cement concrete. It also increases the stiffness and the ultimate strength of RC slabs as compared to normal concrete slab having 0% marble dust.

H. Prof. Veena G. Pathan, Prof. Md. Gulfam Pathan: Properties of cement such as consistency, setting time, insoluble residue and soundness improves up to studied feasibility of 10% replacement of cement by marble powder in OPC. There is also an impressive increase in the tensile strength of concrete on partial replacement of cement by marble powder in cement concrete.

I. Animesh Mishra, Abhishek Pandey, Prateek Maheshwari, Abhishek Chouhan, S. Suresh,

Shaktinath Das (2013) : cement hydration products were examined by means of scanning electron microscopy. The

increase in the compressive strength was more in 28 days concrete specimen as compared 7 days specimen of concrete prepared by partial replacement of sand by marble dust. He concluded that marble dust can be used as a 100% substitute of sand in cement concrete.

J. Baboo Rai, Khan Naushad (2011): use of marble dust as a partial replacement of cement in cement concrete results increase in compressive strength of concrete specimen. Workability was also found to be increased. Cement compressive strength can also be increased by partial replacement of cement by marble dust in cement sand mortar.

K. Vaidevi C (2013): partial replacement of cement by marble dust saves 1 bag of cement as 10% replacement of cement by marble dust in concrete gives the same compressive strength of concrete specimen as that of 0% marble dust concrete. Result was obtained for every 10 bags of cement.

L. Prof. P.A. Shirule, Ataur Rehman, Rakesh D. Gupta: the compressive strength of concrete specimen was found to be increased up to 27.4% on partial replacement of cement by marble dust 10% in concrete while split tensile strength of cylinders was increase by 11.5% as compared to ordinary concrete.

M. Jashandeep singh, Er. R S Bansal: partial replacement of 12% cement by marble dust in cement concrete results in increase in compressive as well as tensile strength of cement concrete specimen. The study was carried out on M25 grade of cement concrete. Thus 12% is the optimum percentage of replacement of cement by marble dust in cement concrete.

3. MATERIALS

3.1 Cement

A cement is a binding material used for binding the other ingredients of concrete in various construction activities. There are following tests conducted on cement:

- Consistency of cement
- Initial and final setting time of cement
- Soundness test of cement by Le- chatlier's apparatus
- Compressive strength of cement
- Tensile strength of cement etc.

3.2. Aggregate

Generally sand which is locally available is used as a fine aggregate in concrete for filling the voids in the concrete and gravel of different sizes is used as coarse aggregate in concrete which provides the strength to concrete and increase frictional coefficient of concrete. There are following tests conducted on aggregate:

- a) Specific gravity
- b) Flakiness and elongation index
- c) Impact value
- d) Fine sieve and coarse sieve analysis
- e) Los angels etc.

(f) www.iosrjournals.org

(g) A research article on "Partial replacement of cement with marble powder by Mr. Ranjan Kumar, Shyam kishori kumar, Department of civil engineering, B.I.T Dhanbad, Jharkhand.

3.3 Marble dust

Marble powder: Marble dust was collected from the nearby marble processing units initially was in wet form. It was dried by exposing to the sun.

TABLE 3.3 CHEMICAL PROPERTIES OF MARBLE DUST

S.NO.	CHEMICAL PROPERTIES	PERCENTAGE
1	CaO	28-35
2	MgO	10-14
3	Al ₂ O ₃	1.09
4	SiO ₂	11.38
5	Fe ₂ O ₃	1.10
6	SO ₃	0.008
7	R ₂ O ₃	1-2.5

4. CONCLUSION

From the previous papers it can be concluded that when cement can be partially replaced by marble dust in cement concrete (which is a wastage material) up to 10% enhances the compressive strength of the cement concrete cubes thus have a impact on other properties of cement concrete also it lowers the cost of cement bags.

5. REFERENCES

(a) A research paper on "Partial replacement of cement with marble powder by prof. P.A shirule,Ataur Rehman, Rakesh D. Gupta, department of civil engineering, SSBT's COET,Bambhori,Jalgaon,Maharashtra-425001.

(b) A book of concrete technology for civil engineering by M.S Shetty.

(c) A book of concrete technology for civil engineering by M.L Gambhir.

(d) A research paper on "use of marble dust as a partial replacement of cement by Mrs. Shalaka S. Utkar, department of civil engineering, D.Y Patil college og engineering, Savitribai Phule Pune universit .

(e) SSRG International Journal of Civil Engineering (SSRG-IJCE)-EFES April 2015