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EXPERIMENTAL STUDY OF USE OF WASTE MARBLE SAND IN CONCRETE WITH VARIOUS PROPORTIONS.

[1]Rushikesh Ramchandra Pawar,[2]Ajay Pravin Sawant,[3]Aniket Sanjay Yelave
[4]Sangram Shamrao Girulkar, [5]Tushar Sambhaji Patil,[6]Proff. S P Pawar,[7]Proff. A. N. Kumbhar

[1]B.Tech Civil Engineering Scholar, [2]B.Tech Civil Engineering Scholar,[3]B.Tech Civil Engineering Scholar
[4]B.Tech Civil Engineering Scholar,[5]B.Tech Civil Engineering Scholar, [1]Assistant Proffessor in Civil Engg. Department,
, [7]HOD of Civil Engg. Department
[1]Civil Engineering,
[1]shree Santkupa Institute of Enginering And technology,Ghogaon Tal – Karad ,Dist - Satara

Abstract : - Concrete is the most vital constituent used in the construction business right through the world, where the fine aggregate is generally natural sand. The demand for natural sand in the construction industry has repeatedly increased which has resulted in the reduction of sources and an increase in price. In such a situation the waste marble sand can be an economical option to the river sand in & as fine aggregate. Disposal of the waste marble sand or powder material from the marble industry is one of the environmental problems worldwide today. So we have decided to utilize this waste marble in construction industry as partial replacement to sand or fine aggregates in concrete, this paper presents the consequences of study undertaken to explore the feasibility of using industrial and quarrying waste marble sand (dust) in concrete as replacement to fine aggregates. We have replaced fine aggregates in concrete by waste marble sand of size 1-2mm (marble fine aggregates) in m20 mix design as per IS CODE 10262:2019. As waste marble is low costly product and it resembles cementitious properties concrete, so the strength of concrete is also increased than normal conventional concrete. It is cheap economical and eco-friendly material for replacement of natural sand and fine aggregate.

***IndexTerms*–Cement ,Waste Marble Sand,Coarse Aggrigate, Fine Aggrigate, Compressive Strength.**

I. INTRODUCTION

Conventional concrete is just normal concrete that we regularly use in India. It is a mix obtained by mixing coarse aggregates, fine aggregate, water, cement and sometimes admixture in required proportions. Conventional concrete is a conglomerate of hydraulic (Portland) cement, sand, stone, and water. It was developed approximately 150 years ago to imitate natural stone while providing less labour- intensive methods of shaping the material (i.e., casting rather than hewing and carving).

Marble has been commonly used as a building material since the ancient times. Consequently, Marble waste as a by-product is a very important material which requires adequate environmental disposal effort. In addition, recycling waste without proper management can result in environmental problems greater than the waste itself.

Marble sand or dust is a waste product formed during the production of marble. A large quantity of marble waste is generated during the cutting process. The result is that about 25% of the original marble mass is lost in the form of sand dust. Leaving these waste materials to the environment directly cancause environmental problems such as increases the soil alkalinity, affects the plants, affects the human body etc.

Marble sand can be used as a partial replacement to sand (fine aggregates) in concrete, so that strength of the concrete can be increased. It is a solid waste material generated from the marble processing and cutting and can be used either as a filler material in cement or fine aggregates or as partial replacement while preparing concrete.

II. OBJECTIVE OF STUDY

To resolve the environmental problems caused by large scale depletion of natural resources.

To reduce the dumping of waste material waste marble sand (dust) and to utilize them in concrete.

To increases the strength of concrete.

To study the effect of use of waste marble on the mechanical properties of concrete.

To compare the compressive,flexural,and tensile strength using WMsand with the given design mix.

To establish alternative for sand with partial use of WMD in concrete

III. MATERIAL

1.Marble Sand

Marble sand, sometimes referred to as marble dust or marble powder, is a finely crushed form of marble. It's a byproduct of marble processing and is often used in various applications. Marble sand offers similar properties to natural sand but with the added benefit of aesthetic appeal and potential performance enhancements in certain applications. However, it's essential to consider the environmental impact of quarrying marble and the sustainability of its use as a resource.

2.Cement

Cement is primarily composed of calcium, silicon, aluminum, iron, and other ingredients. The most common type of cement is Portland cement, which is made by heating limestone (calcium carbonate) with other materials such as clay to form a clinker, which is then ground into a fine powder.

3.Coarse Aggrigate

Coarse aggregate refers to the portion of aggregate materials larger than 4.75 millimeters (mm) in diameter in concrete mixes. These larger particles provide strength and support to the concrete mixture.

4.Fine Aggrigate

Fine aggregate, also known as sand, refers to the portion of aggregate materials smaller than 4.75 millimeters (mm) in diameter in concrete mixes. It plays a crucial role in the workability, cohesion, and finish of concrete.

5.Water

Water is an essential and versatile substance with numerous properties and roles in various aspects of life and the environment.

6.Admixtures

Admixtures are substances added to concrete, mortar, or grout during mixing to modify its properties or enhance its performance. They can affect the workability, setting time, strength, durability, and other characteristics of the mixture.

IV. RESEARCH METHODOLOGY

Research on project topic
Getting material properties
Preparation of M20 Mix concrete
Selection of best suitable proportion
Casting of concrete
Curing of concrete
Testing on concrete

V. TEST ON MATERIAL

Physical properties of Cement

Initial setting time	30 min
Final setting time	600 min
Compressive strength	53MPa
Standard consistency	33%
Specific gravity	3.15

Physical properties of Aggregate

Aggregate Type	Specific gravity	Water absorption % by weight
Natural coarse aggregate	3.42	0.54
Natural fine aggregate	2.66	2.0
Waste marble fine aggregate	2.23	0.05

VI. CASTING AND CURING OF CONCRETE

Concrete cube of size 150mm were casted in standard 150mm square mould to determine the compressive strength and water permeability test for determining the resistance against aggressive environment. The weight batching of material was according mixing design as per IS code. 150 mm size cubes specimen was casted the moulds were filled in three layers and each layer was compacted with help of vibrating table as per procedure defined in BIS 516:2021 after casting all specimen were de moulded after 24 hours and cured in water the compressive strength test was performed on 7 days curing 14 days curing and 28 days curing, and water absorption was done.

MIX PROPORTION

Material	Quantity/m³
Cement	413 kg/m3
Marble sand	722 kg/m3
Coarse aggregate	1135 kg/m3
Water	185 kg/m3
W/ C ratio	0.45

VII. TEST ON CONCRETE

SLUMP CONE TEST

Aim: The main aim of the slump cone test is to assess the workability of freshly mixed concrete. Workability refers to the ease with which concrete can be mixed, transported, placed, and compacted without segregation or bleeding.

Theory: The test involves filling a metallic mold in the shape of a cone with the freshly mixed concrete, compacting it in layers, and then lifting the mold vertically to allow the concrete to spread and slump. The amount of slump, or the difference in height between the top of the mold and the displaced concrete, is measured in millimeters.

COMPRESSIVE SRENGTH TEST

The compressive strength test is a fundamental procedure in civil engineering and construction materials testing. It assesses the ability of a material, typically concrete, to withstand axial loads that tend to reduce its size. This test is critical because concrete is often subjected to compressive forces in real-world applications, such as in buildings, bridges, and infrastructure.

VIII. RESULTS

4.1 Results of Descriptive Statics of Study Variables

Average compressive strength	In days after curing	Average load applied on specimens
26.38 N/mm2	7 Days	595 kN
34.44 N/mm2	14 Days	774 kN
43.95 N/mm2	28 Days	1000 kN

IX. CONCLUSION

- The workability of all the concrete mix increases with increased percentage of replacement of natural coarse aggregate by marble aggregates.
- Compressive strength of the concrete shows an upward trend till 100 % marble is used as fine aggregate in concrete.
- Weight of concrete also increases so this high weight concrete can be utilized to manufacture high strength concrete components like paver, blocks, railway sleepers, rigid pavement etc. Compared to conventional concrete its weight is increased by 5%.

The marble waste is available in vast amounts in Rajasthan and other areas of India. From the economic and environmental point of view this waste can be used as aggregates in production of concrete mixes. However, from the durability point of view more studies would be required to use this waste as an aggregate in concrete mixes.

X. REFERENCES

1. Sudarshan D. Kore, A.K. Vyas “Impact of marble waste as coarse aggregate on properties of lean cement concrete”, Elsevier journal Case Studies in Construction Materials 4 (2016) 85-92.
2. H.Hebhoub , H.Aoun , M.Belachia , H.Houari , E.Ghorbel “Use of waste marble aggregates in concrete”, Journal of Construction and Building Materials 25 (2011) (1167–11713)
3. Hebhoub Houria, Kherraf Leila, Abdelouahed Assia and Belachia Mouloud “Introduction of Marble Waste Sand in the Composition of Mortar“, Sandy Materials in Civil Engineering - Usage and Management (2020). DOI: http://dx.doi.org/10.5772/intechopen.91254
4. S. C. Boobalan M., Vishnu Nishanth,M. Amarnath “ Impact of Marble Waste with Partial Replacement of Fine Aggregate in Concrete ”, Journal of Xi'an University of Architecture & Technology ,Volume XII, Issue IV, (2020).
5. Ahed Habib and Maan Habib,” Sustainable Recycling of Marble Dust as Cement Replacement in Concrete Advances and Recent Trends”, Cement Industry - Optimization, Characterization and Sustainable Application (2007) DOI: http://dx.doi.org/10.5772/intechopen.93915

6. Ankita Khatri, Abhishek Kanoungo and Dr. Umesh Sharma et.al (2015) "Use of waste marble dust in Concrete" Deptt. of Civil Engineering. PEC University of Technology, Sector-12 Chandigarh.
7. Mamta B Rajgor, Nutan C. Patel, Prof. Jayeshkumar Pitroda, et.al "A Study On Marble Waste Management: Opportunities And Challenges In Current Age For Making Valueadded Bricks" Proceedings of National Conference CRDCE13, 20-21 (2013), SVIT, Vasad.
8. Begashaw Worku Yifru, Bahiru Bewket Mitikie "Partial replacement of sand with marble waste and scoria for normal strength concrete production" Research Article (2020) © Springer Nature Switzerland AG (2020)
9. Sudarshan D. Kore, A. K. Vyas and Syed Ahmed Kabeer K.I. "A brief review on sustainable utilisation of marble waste in concrete" International Journal of Sustainable Engineering, 13:4, 264 279, DOI: 10.1080/19397038.2019.1703151(27 Dec 2019.).