

USE OF MARBLE CHIPS AND MARBLE POWDER IN CONCRETE: A SHORT REVIEW

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ABSTRACT. The key area of interest of present era is about the preservation of environment and sustainable development in each and every sector of engineering. Since the advent of civilization various types of cementitious materials have been used for construction practices. The arrival of Portland Pozzolona cement (PPC) changed the construction activities completely. However, because of several drawbacks associated with properties of cement and manufactured building materials using PPC as well as the cost factor attempts one mode to utilize other materials for economical constructions and improved mortar and concrete characteristics. Also, several waste materials are generated in huge quantities by different industrial activities. Now attempts were made to utilize these waste materials or industrial byproducts in construction activities to solve the environmental pollution problems, and safer and economical construction. Marble powder is one such industrial by product which is being used and experimented upon to obtain a stronger and durable concrete. Also, because of its very fine size it act as filler material between the cement gel grains. This paper presents a short review of Marble powder and marble chips utilization in concrete production and its effect on the concrete.

Keywords: Marble powder, Marble chips, Portland Pozzolona cement, Marble waste.

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INTRODUCTION

Concrete is a development material comprising of cementitious material, fine aggregate, coarse aggregate also, water. Presently days the cost of these materials are expanded in this way, we have to take a look at an approach to diminish the cost of building materials particularly concrete. One of the ongoing headway in development industry is substitution of materials in concrete. The substitution of materials offers cost decrease, vitality funds and security of condition [1]. Concrete is one of the real upsets ever of. Many surprising landmarks were manufactured utilizing concrete. Be that as it may, now daily in the present situation the regular assets are being depleted to manufacture the concrete wilderness. Prior to common assets are totally exhausted, it is smarter to pick other elective assets for binder, fine aggregate and coarse aggregate [4].

Green concrete is an idea of utilizing eco-accommodating materials in concrete, to make the framework more supportable. Green concrete is all the time and furthermore shabby to create, on the grounds that for instance, waster items are utilized as a fractional substitute for aggregates and cement, charges for the transfer of waste are maintained a strategic distance from, vitality utilization underway is lower, and toughness is more noteworthy. This solid ought not to be mistaken for its shading. Waste can be utilized to deliver new items or can be utilized as admixtures with the goal that regular assets are constrained and utilized all the more proficiently and nature is shielded from squander stores. Inorganic remaining items like stone residue, smashed marble squander are utilized as green totals in concrete. This task outlines the different endeavors in progress to enhance the ecological invitingness of cement to make it appropriate as a "Green Building" material [5].

GENERATION OF MARBLE WASTE

Generally there are two sorts of waste named as quarry/ cutting/ sawing from in-situ stone site and cleaning squander from building locales. Amid the handling of stone, the crude stone square is cut as requested either into tiles or sections of different thickness (normally 2 or 4 cm), utilizing jewel sharp edges. Water is showered on cutting edges while stone squares are cut into sheets of shifting thickness, to cool the sharp edges and assimilate the residue delivered amid the cutting task. The amount of waste water from this task is large. It isn't reused as the water is so exceptionally soluble that, if re-utilized, it can diminish the chunks to be cleaned. In vast manufacturing plants, where the squares are cut into chunks, the cooling water is put away in pits until the suspended particles settle (sedimentation tanks), at that point the slurry is gathered in trucks and arranged off on the ground and left to dry. This water conveys a lot of Marble powder. The cleaning activity is completely robotized with the utilization of powdered abrasives that continue scouring the surface of the stone until the point that it winds up smooth and gleaming. Water showers are fundamental to forestall overheating of the sharp edges. The flow diagram of marble waste generation has been shown in Figure 1.

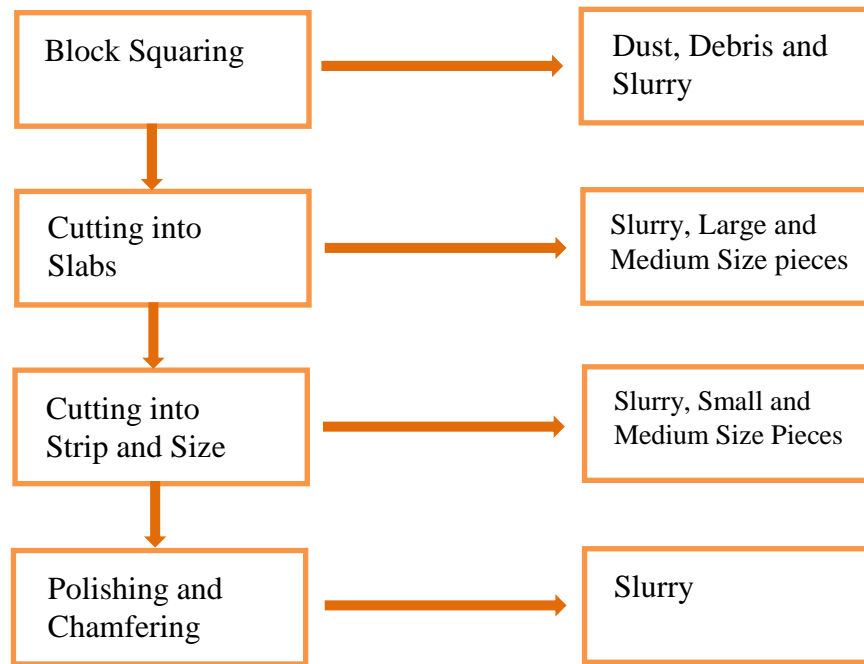


Figure 1 Generation of marble waste

LITERATURE SURVEY ON MARBLE CHIPS AND MARBLE DUST

G.Latha et al [1] did Experimental Investigation on strength characteristics of concrete using Waste marble powder as cementitious material. One of the recent advancement in construction industry is replacement of materials in concrete. The replacement of materials offers cost reduction, energy savings and protection of environment. To accomplish the above target the author is partially supplanting the concrete with squander marble powder (WMP) delivered from marble businesses. The present examination is planned to think about the crisp and solidified properties of concrete when cement is mostly supplanted by squander marble powder. The work is centered on M20, M30, M40 evaluations of concrete. The level of Waste marble powder that supplanted bond in this examination are 0%,5%,10%, 15% and 20% .Workability was carried out to check fresh properties of concrete whereas compressive strength, flexural strength and split tensile strength at a curing age of 28 days were carried out to check hardened properties of concrete. Results demonstrates that the workability and compressive strength, flexural, and split tensile strengths of concrete are expanded with incomplete substitution of bond by squander marble powder between 10% to 15%.

Rochak Pandey et al [2] studied the optimum partial replacement of cement in concrete with waste marble dust in conjunction with super plasticizers. In the present investigation, marble dust acquired in the wake of preparing of marble waste has been utilized as a filler material as substitution of fine aggregate. This examination researches the ideal incomplete supplanting of cement in concrete with marble dust in conjunction with super-plasticizers. This examination demonstrated the plausibility of marble dust as a financial and eco-accommodating substitution of concrete. The compressive strength performance of the concrete was enhanced when 5%, 10% and 15% marble powder by weight of cement was

supplanted with cement to get M20 concrete. This paper gives the extension to more research that if the marble dust is utilized as a substitution of cement in conjunction with super-plasticizers, the issue of feasible, prudent and condition well disposed cement can be settled.

Aalok D. Sakalkale et al [3] did the experimental study on use of waste marble dust in concrete. The utilization of sand in development exercises results in the over the top mining. Because of inordinate mining, normal assets are getting depleted, results in increment in scour profundity and here and there surge plausibility. Consequently, it is getting to be inescapable to utilize elective material in concrete. Marble is one of the imperative materials utilized in the development business. Marble powder is delivered from handling plants amid the sawing and cleaning of marble squares and around 20 - 25% of the prepared marble is transform into powder frame. Transfer of the marble powder material from the marble business is one of the ecological issues overall today. The substitution is done somewhat and completely in the extent 0%, 25%, 50% and 100% and their impacts on properties of concrete were examined.

B. P. R. V. S. Priyatham et al [4] did experimental study on partial replacement of cement with marble powder and fine aggregate with quarry dust. Marble stone industry generates both solid waste and stone slurry. Whereas solid waste results from the rejects at the mine sites or at the processing units, stone slurry is a semi liquid substance consisting of particles originating from the sawing and the polishing processes. The series of tests are conducted to study the effect of 5%, 10% and 15% replacement of cement with marble powder on compressive strength and split tensile strength and compare it with the conventional concrete. Quarry dust is replaced with fine aggregate at 10%, 20%,30%,40% and tested for compressive strength and split tensile strength. With these optimum results glass fiber is added for further improvement in strength.

Athul Krishna K R [5] studied on the optimum replacement of marble chips and marble dust as aggregates in M 20 concrete. The fundamental objective of this investigation was to show the likelihood of utilizing marble waste as a substitute as opposed to natural aggregates in concrete production. The paper introduced the investigation strategy, the portrayal of waste marble aggregates and different functional details of cement. This test examination was done on three arrangements of concrete mixtures: Fine aggregate substitution mixture and coarse aggregate substitution mixture. The solid plans were delivered with a steady water/cement proportion.

Mr. Ranjan Kumar et al [6] studied the partial replacement of cement with marble dust powder, in this experimental study; the impact of MDP in concrete on quality was introduced. Five concrete mixtures containing 0%, 5%, 10%, and 20% MDP as concrete substitution by weight premise has been prepared. Water/cement proportion (0.43) was kept constant in all the concrete mixes. Compressive strength, split tensile strength & flexural strength of the concrete mixtures has been obtained at 7 and 28 days of curing. The aftereffects of the research facility work demonstrated that supplanting of cement with MDP increment, up to 10% for compressive strength, and up to 15% for split tensile strength & flexural strength of concrete.

Veena Pathan and Gulfam Pathan [7] have conducted a periodic research on the significance of partial replacement of cement with waste marble powder. They found that the effect of using marble powder as constituents of fines in mortar or concrete by partially replacing quantities of cement gave significant impact on the relative compressive, tensile as

well as flexural strengths. Partial replacement of cement by varying percentage of marble powder reveals that increased waste marble powder (WMP) ratio resulted in increased strengths of the mortar and concrete. Leaving the waste materials to the environment directly can cause environmental problem. By utilizing the WMP in concrete in the range of 0% to 12.5% the compressive strength and split tensile strength of concrete was increased significantly. However, further addition in WMP, a decrease in strength performance was observed. Thus they found out the optimum percentage as 12.5% for replacement of WMP with cement.

B. V.M. Sounthararajan et.al [8] A Study has been conducted on Effect of the Lime content in MDP for producing high strength concrete. They found that the MDP up to 10% by weight of cement was investigated for hardened concrete properties. Furthermore, the effect of different percentage replacement of MDP on the compressive strength, splitting tensile strength and flexural strength was evaluated. It can be noted that the influence of fine to coarse aggregate ratio and cement-to total aggregate ratio had a higher influence on the improvement in strength properties. A phenomenal increase in the compressive strength has been observed with the replacement of MDP with cement in the range of 0 to 10%. The maximum strength at 7 days of curing age was observed to 46.80 MPa with 10% replacement of cement with MDP.

C. Corinaldesi V et.al [9] Marble as a building material especially in palaces and monuments has been in use for ages. However the use is limited as stone bricks in wall or arches or as lining slabs in walls, roofs or floors, leaving its wastage at quarry or at the sizing industry generally unattended for use in the building industry itself as filler or plasticizer in mortar or concrete. The result observed was the mass which is 40% of total marble quarried has been reached as high as millions of tons. This huge unattended mass of marble waste consisting of very fine particles is today one of the environmental problems around the world.

Ramya Raju et al [10] studied the partial replacement of cement by marble powder. This paper introduced the investigation of concrete mix design utilizing marble powder. The transfer of marble powder from the marble business is one of the ecological issues today. The spots where marble is utilized for different purposes, the utilization of marble powder can be incorporated for development reason. Marble powder is delivered from preparing plant amid the sawing and cleaning of marble squares and around 20 – 25% of the handled marble is transformed into powder shape. Transfer of the marble powder material from the marble business is one of the natural issues overall today. The substitution is done mostly in different extents and its impact on properties of cement is examined. The ideal rate for substitution of marble powder to accomplish the most extreme quality is half substitution where as in elasticity the ideal quality is accomplished by 10% substitution by concrete. As the rate substitution of marble powder expands the functionality diminishes. The utilization of marble powder decreases the cost of development as it utilized in blending with concrete for working of floors and different structures and it additionally lessens the extent of water cement ratio.

CONCLUSIONS

After studying the various literatures done by the authors, Following conclusions are drawn:

- According to past studies, it may be concluded that marble powder can be used as partial replacement of cement in a concrete mix.

- The marble powder enhances overall properties of concrete mix when used in a optimum quantity (i.e. 5%-10%).
- Marble powder may prove eco-friendly by controlling the production of cement which makes a cause of an unhealthy environment.
- As marble chips is used in concrete, it reduces use of natural aggregate which reduces mining to extract natural aggregate, which in turn results in reduced environmental contamination.
- Marble chips are a cost effective potential alternative to conventional natural aggregates.
- Marble chips reduce the depletion of conventional coarse aggregates from environment and also enables to produce Green Concrete.

Therefore it can be concluded that the Marble chips and marble powder are innovative supplementary Construction Materials which can be effectively replaced to some extent by natural aggregates and cement respectively.

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