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Affect of Mechanical Properties of Brick Prepared with Marble Powder

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Abstract

Stone manufacturing industries of Rajasthan is spread across the entire region of the state forming the grit of its economy. It produces more than 75 types of rocks and minerals making the state majestic mineral state in the nation. The natural rocks known as aggregates or stones are found in local areas out of which Marble being the one. The desert state itself contributes to 90% of the total marble production all over the country. The rock industries have provided employment opportunities and have used stones in building mesmerizing heritage and monuments of the State. More and more demand for finished and unfinished products are pouring in, exploring of various marble types have increased the growing rate of Marble Industry in the region. As a result, marble processing units and marble quarries had grown in the past ten years. This has lead to generation of waste to a very large amount; hence an alarming situation for the ailing environment and nature. Sustainability and environment friendliness for the industry has become an immediate social need.

The motive shown in this report points in finding out a reasonable, viable and viable way to extract out the waste in the form of marble produced from these industries. Many ways are put forward in order to use the waste which is in the form of marble slurry by producing clay bricks. In this report, investigation has been carried out to use such concrete and test the compression strength, water absorption capacity and density of the produced concrete.

This study has concluded that the economics of clay would be improved by adding cheap marble and granite waste from stone industry, thus enhancing the quality of clay bricks in all senses. Also, the issue of stone slurry as a waste material would be resolved by integrated marble usage and waste of granite in the clay bricks thus making it a win situation for everyone.

Keywords: *Brick, clay, marble powder, compressive strength, density.*

1. Introduction

Clay brick masonry is one of the oldest and most durable construction techniques used by mankind. Masonry consists of manually built stable stacks of small elements, with or without mortar. It was a fundamental building material in the Mesopotamian, Egyptian and Roman periods. During the Roman period, the use of clay brick increased and became specialized in order to maximize its benefits. Clay brick masonry continued to be used during medieval and modern times. Despite several modifications of the clay brick uses, shape and manufacture along thousands of years of constant evolution, the simplicity that made its success remained. Numerous buildings built with clay bricks prevailed until the 21st century, which testifies to the strength of this material along centuries of rain storms, snow, thaw freezing cycles, high temperatures and human induced deterioration. Moreover, brick could be easily, inexpensively and rapidly handled and produced with a simple manufacturing process. It is based on fired clay, a raw material available in large quantities all over the Earth. Its wide use proved that clay brick was an effective construction material that could provide both resistance to prevalent climatic conditions and insulation from cold and heat. It is known that the properties of ancient clay brick masonry rely essentially on the properties of the brick units, which depend on the quality of the raw materials used, together with the manufacturing process technology. The analysis of clay brick production and final properties are therefore fundamental. Generally, it is crucial to obtain the raw material required for production of clay brick.

This study has concluded that the economics of clay would be improved by adding cheap marble and granite waste from stone industry, thus enhancing the quality of clay bricks in all senses. Also, the issue of stone slurry as a waste material would be resolved by integrated marble usage and waste of granite in the clay bricks thus making it a win situation for everyone.

2. Material-ingredients:

The material used in this study was clay, marble powder . The chemical composition for material used was shown in Table 1. The specific gravity for clay, marble powder was 2.63, 2.72 and 2.61 respectively.

Table 1. Chemical composition of raw material

	Clay	Marble Powder
SiO_2	53.77	10.39
CaO	0.23	31.42
MgO	1.4	19.02
Al_2O_3	24.3	-
Fe_2O_3	5.04	-
LOI	7.7	35.5

In this present study, two series of brick were prepared with replacing the clay by marble powder separately. The clay was replaced from 0 to 25% in step of 5%. Total 11 mixes were prepared. The parameters which were evaluated are compressive strength, density and water absorption. The procedure for experiment was adopted as per specification of IS-3495:1992.

3. Results and Discussion:

The compressive strength for brick prepared with marble powder is sown in Figure 1. The maximum compressive strength for brick prepared with marble powder was 13.95 MPa and 13.71 MPa respectively. The above compressive strength was achieved at 15% and 10% replacement of clay respectively.

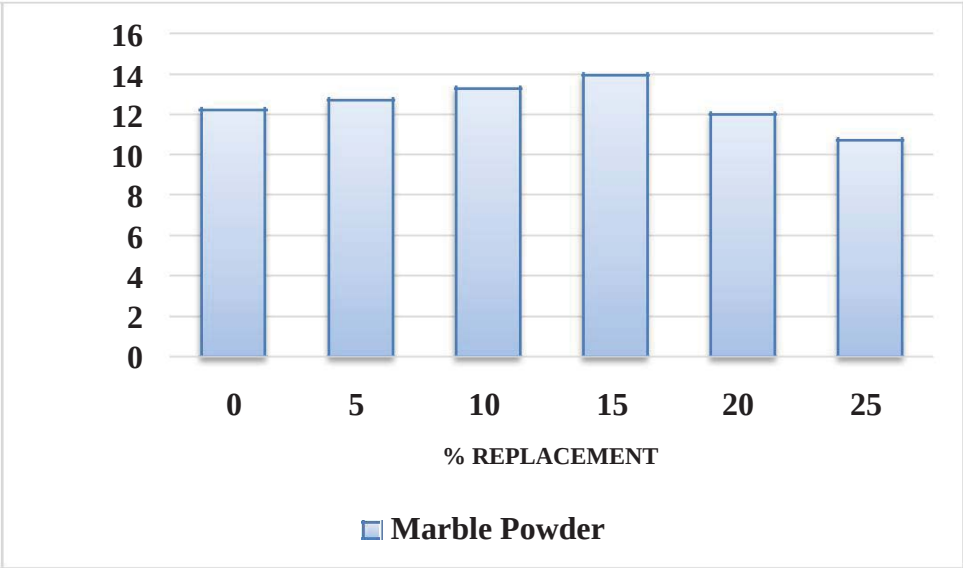

Figure 1: Compressive strength v/s % Marble Powder

Figure 2 represent the variation in density of brick prepared with marble powder . The maximum density was attained at 15% and 10% for marble powder brick. These results was confirmation of results obtained in compressive strength.

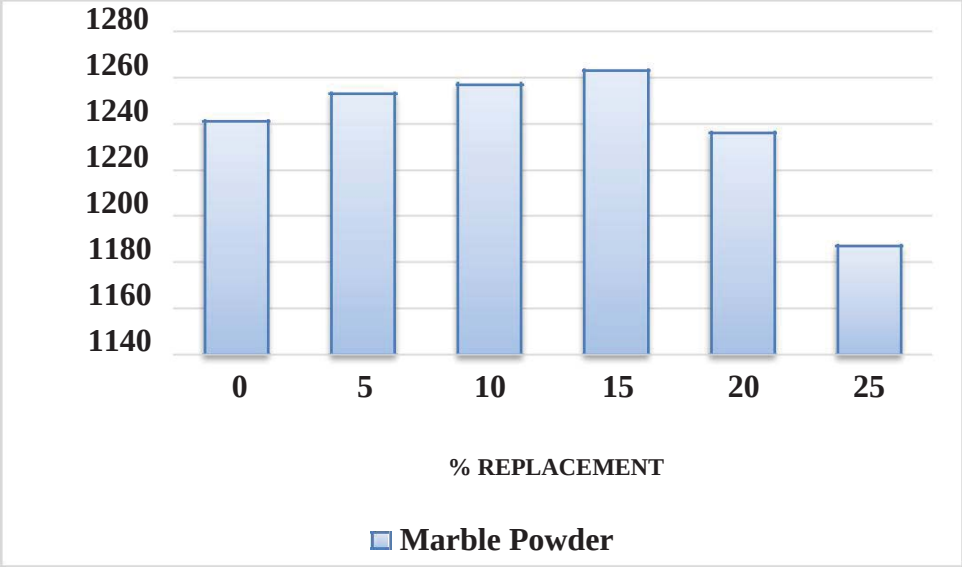

Figure 2: Density v/s % Marble Powder

The water absorption is represented in Figure 3 for brick prepared with marble powder. The minimum water absorption was obtained at 15% and 10% replacement of clay by marble powder respectively. This effect was clearly seen in the results of compressive strength and density.

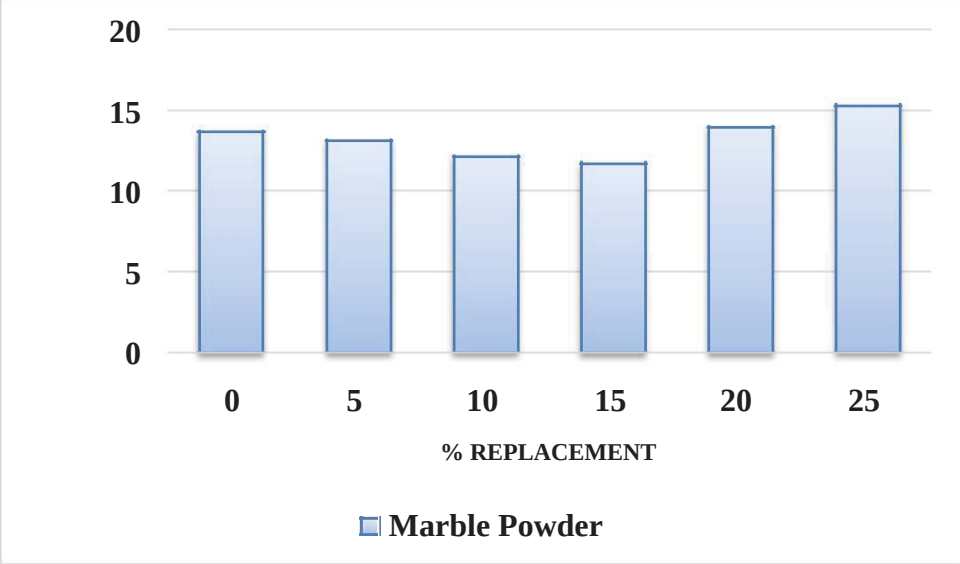

Figure 3: Water absorption v/s % Marble Powder

5. Conclusions:

After collecting and analyzing all the results, we can conclude that,

At 15% with marble slurry gives maximum compressive strength and density. After 15% with granite slurry and 20% with marble slurry, the compressive strength and density starts decreasing.

Water absorption decreases 15% replacement by marble powder and after that water absorption increases.
So we can analyze that 10 % replacement of marble is optimum.

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