INNOVATIVE USE OF BRICK POWDER AND MARBLE DUST AS A MINERAL ADMIXTURE IN CONCRETE

Md. Mohsin Khan
Civil Engineering Department, NIT Hamirpur, Hamirpur, Himachal Pradesh, India

Sandeep Panchal
Civil Engineering Department, NIT Hamirpur, Hamirpur, Himachal Pradesh, India

Anurag Sharma
Civil Engineering Department, NIT Hamirpur, Hamirpur, Himachal Pradesh, India

Anupam Anand Bharti
Civil Engineering Department, NIT Hamirpur, Hamirpur, Himachal Pradesh, India

ABSTRACT

The objective of this study is to analyze the effect of brick powder and marble dust used as admixtures on the properties of concrete. The various properties like consistency, specific gravity, setting time of cement and compressive strength are analyzed by varying the amount of brick powder and marble dust in concrete. The results showed that brick powder and marble dust helps in increasing the workability and strength of concrete if mixed in certain proportion. The mix prepared in this study is M-25. It is found that marble dust replaced between 5-7.5% increases the compressive strength but compressive strength is reduced if the amount of marble dust is extended beyond 10%. The results for the brick powder are more encouraging as compared to the marble dust. The addition of brick powder as admixture shows significant increase in 28 days compressive strength of concrete.

Key words: marble dust, brick powder, admixtures, concrete


1. INTRODUCTION

In the rapidly changing modern society construction has been considered as an important element. Innovation in construction is linked with the development of progressive construction material. The major class of construction material is cementations material which has been used for several of years. Lime or lime in combination with natural pozzolana as well as gypsum was used in construction during ancient time whereas cement is used in modern era (Shirule; 2012). There is shortage of cement...
Innovative Use of Brick Powder and Marble Dust as a Mineral Admixture in Concrete

in many countries despite of higher demand, therefore the search of alternate binder or cement replacement material has become a technology of interest. The waste material and which are produced in industry and are no use for human such as marble dust; brick powder, etc. were replaced by some weight of cement. The result showed that the strength was increased and if it is used then our structure will also be economical. It will also contribute to our environment by reducing the waste from our surroundings.

Mineral admixture is defined as the material other than cement, aggregates and water which is added during or after batching (mixing) to attain the desired properties specially to increase the strength. They are the fine ground solid materials i.e. marble dust, brick powder (Surkhi), fly ash, etc (Uddin et al; 2004). They are also called ‘Supplementary Cementing Materials’. They have an ability to enhance workability as well as finish-ability of freshly laid concrete. The mineral admixtures like stone powder can enhance the strength of mortar and concrete if mixed in specified portion (Mahzuz et al; 2011). Different admixtures affect different properties of concrete like durability, workability, strength etc. The use of waste material like marble dust and brick powder not only increases the strength but also contributes to waste management.

In this study, brick powder and marble dust is added in various proportions in the concrete and the effect on the properties of the concrete is analyzed.

2. MATERIALS AND METHOD

The materials used in this study are cement, coarse aggregate, fine aggregate, brick powder and marble dust. Brick powder and marble dust are sieved through 600 micron sieve.

For the comparative study of the compressive strength, specific gravity, setting time, workability and consistency of the concrete before adding admixtures and after adding admixtures the various tests are performed. Slump test is done for measuring the consistency of the mix by varying the amount of brick powder and marble dust in 5%, and 10%. Also the compression tests are done and compression strength of sample cubes is measured.

3. RESULTS AND DISCUSSION

The results of the compression test and consistency test are shown in graphical form. The test results of Ordinary concrete, 5% brick powder (B.P) and 10% brick powder are compared. Workability tests show that the workability increases as the amount of brick powder and marble dust (M.D.) is increased.


Table 1 Effect of Brick Powder and Marble Dust on Slump

<table>
<thead>
<tr>
<th>Serial No.</th>
<th>Concrete</th>
<th>w/c ratio</th>
<th>Slump(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ordinary</td>
<td>0.45</td>
<td>20</td>
</tr>
<tr>
<td>2.</td>
<td>5% B.P.</td>
<td>0.45</td>
<td>25</td>
</tr>
<tr>
<td>3.</td>
<td>10% B.P.</td>
<td>0.45</td>
<td>25</td>
</tr>
<tr>
<td>4.</td>
<td>5% M.D.</td>
<td>0.45</td>
<td>30</td>
</tr>
<tr>
<td>5.</td>
<td>10% M.D.</td>
<td>0.45</td>
<td>32</td>
</tr>
</tbody>
</table>

The compression strength of the samples is calculated for 7, 14 and 28 days. The compression test is done for ordinary concrete and then for the composite cubes which contains specified amount of brick powder and marble dust. The results are shown in the bar graphs.

Figure 3 Effect of Marble Dust on Compression Strength

These results show that the It can be concluded that using 5% brick powder tends to increase in strength of concrete. 10% of brick powder also increases the strength but less than that of 5% brick powder in 7 days, 14 days and 28 days. But 5% of marble dust when used in concrete gives better
result than that of ordinary concrete and concrete using brick powder in 7 days. In 14 days and 28 days the compressive strength of brick powder is high among the all. While using 10% marble dust in concrete the strength of concrete is less than that of ordinary and 5% brick powder, 10% brick powder and 5% marble dust in 7 days and 14 days but in 28 days the compressive strength of 10% marble dust is more than that of ordinary concrete.

4. CONCLUSION

In the present study, an attempt is made to replace the cement with industrial waste like marble dust and brick powder. The various characteristics of concrete are tested and the effect of addition of marble dust and brick powder is analyzed. It is concluded that the waste material i.e. marble dust and brick powder can be used as construction material. The use of waste materials like marble dust and brick powder in construction industry reduces the cost, pollution and the problems related to the disposal of waste material. On the other hand it increases the strength of concrete and its consistency.

REFERENCES


