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# ANALYSIS OF PERFORMANCE OF KOTA STONE BY REPLACING CERTAIN AMOUNT OF CEMENT IN CONCRETE BLOCKS OF M 20 & M 25 GRADES

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**Abstract -** *Producing useful shape of stone, the various stone wastes comes out from the various processes in stone industries. From the preliminary waste, known as stone dust it is taken out to replace the certain amount of cement utilization in concrete due to its minimum cost. In the present scenario, cement materials are being utilized more and as stone waste is available in abundance it can help to substitute cement percentages for practical improvement in bigger project like RCC Roads Structures, etc. Reductions in some amount of cement can cut the cost that can be a cost optimization tool for civil engineers. Stone waste is available in variety and in huge quantity. This research paper presents the properties of regular Kota stone dust in M20 and M25 concrete blocks. It is reasonable to utilize Stone Chips as completely coarse or fractional in concrete with normal Kota stone dust.*

***Keywords:*** *Kota Stone, Concrete, Cement reduction, M 20, M 25.*

## 1. INTRODUCTION

The waste material generated directly in the open areas can cause environmental problems. Hence, the utilization of this waste material in the construction Industry is necessary. As a large amount of Stone dust are generated from the process of cutting and polishing of natural stones. Stone wastes generated from Marble/Granite/Kota stone lays a great impact on both the environment and humans. Thus, Stone industries producing large amounts of Stone waste are responsible for generating many environmental issues. Today, there are basic deficiencies of common assets in initial stages of material used in construction. Production of cement and its use has quickly expanded, which brings about its increased utilization on regular basis in the form of solid segment.

A common arrangement of these issues is to utilize that misuse of stone. Stone industry creates an option total for auxiliary cement along these lines stone dust delivered by two phases:

- Crushing of stone chips into dust
- Decreasing vitality utilization

Both can give cost investment funds. Stone waste is easily available from stone industries and this which can be crushed and get predominant size by suitable IS sieve analysis after hammering or in available crushing machine and this graded cutting waste called stone chips.

1. Kota Stone Dust
2. Black Concrete Stone
3. Sand
4. Cement

Stone dust is used in concrete. Blend of Kota stone dust had been taken and is tested by replacing 5%, 10%, 15% of cement in the concrete.

Concrete is the most utilized development material over the world and in solid. Subsequently, examination of these properties with characteristics in M 20 and M 25 blocks. Fundamental changes in both kind of block are being made with certain amount of Kota stone dust. Stone dust is required from the perspective of purpose of test protection and compelling use of assets.

## 2. RESEARCH METHODOLOGY

In this research we will be making cubes 4 cubes of concrete each with different percentages of cement is replaced with Kota stone dust.

1. 0%
2. 5%
3. 10%
4. 15%

Then the calculations will be done accordingly that what percentage of cement could be replaced with the help of Kota stone dust.

### A. Compressive strength

The compressive strength of concrete and cement mortar is a fundamental property that is thoroughly studied in almost all research works

In this research article we are partially replacing cement with Kota stone dust & calculating the compressive strength of the concrete blocks.
Where we are going to test & observe the variations of the Compressive Strength with varying percentage of cement replaced.

### B. Splitting tensile strength

Ability to resist elongation is called tensile strength of concrete. In order to test the tensile strength of concrete, Split cylinder method is performed. As we know that, concrete is weak in tension. As shown in case of compressive strength, the incorporation of any type of stone waste decreases the tensile strength of the resulting concrete/mortar with the replacement of cement and increases with sand replacement.

Picture 1: Mixing of Kota Stone Dust in the concrete

Picture 2: Testing of Concrete Cube Samples

Picture 3: Cracks in Concrete Cube

## 3. RESULTS

Test conducted on the mixes are given below:

**TABLE NO. 1 COMPRESSIVE STRENGTH TEST RESULT OF M-20 CONCRETE MIX**

| S. No. | Amount of Kota stone dust used | Compressive Strength at 28 days (N/mm²) |
|---|---|---|
| 1 | 0% | 22.89 |
| 2 | 5% | 25.64 |
| 3 | 10% | 24.26 |
| 4 | 15% | 17.28 |

**TABLE NO. 2 COMPRESSIVE STRENGTH TEST RESULT OF M-25 CONCRETE MIX**

| S. No. | Amount of Kota stone dust used | Compressive Strength at 28 days (N/mm²) |
|---|---|---|
| 1 | 0% | 27.93 |
| 2 | 5% | 30.72 |
| 3 | 10% | 29.35 |
| 4 | 15% | 22.27 |

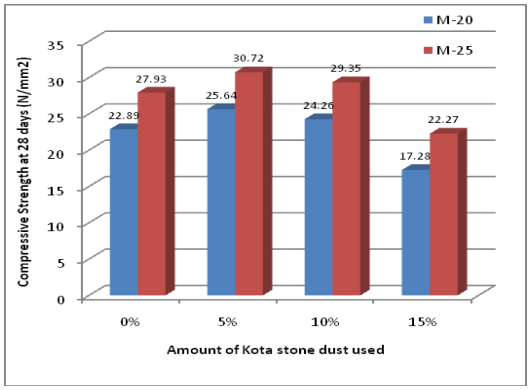


**Figure 1: Graphical comparison of Compressive Strength test result of M-20 & M-25 Mix Concrete at various percentage of Kota Stone Dust used**

**TABLE NO. 3 SPLIT STRENGTH TEST RESULT OF M-20 CONCRETE MIX**

| S. No. | Amount of Kota stone dust used | Split Tensile Strength at 28 days (N/mm²) |
|---|---|---|
| 1 | 0% | 3.13 |
| 2 | 5% | 3.36 |
| 3 | 10% | 3.24 |
| 4 | 15% | 2.19 |

**TABLE NO. 4 SPLIT STRENGTH TEST RESULT OF M-25 CONCRETE MIX**

| S. No. | Amount of Kota stone dust used | Split Tensile Strength at 28 days (N/mm²) |
|---|---|---|
| 1 | 0% | 3.5 |
| 2 | 5% | 3.83 |
| 3 | 10% | 3.69 |
| 4 | 15% | 3.04 |

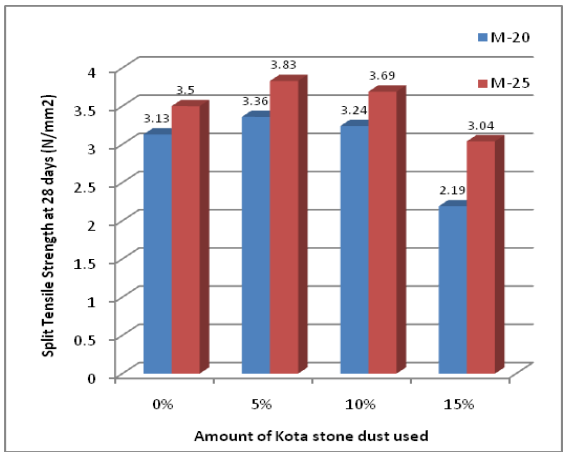


**Figure 2: Graphical comparison of Split Tensile Strength test result of M-20 & M-25 Mix Concrete at various percentage of Kota Stone Dust used**

## 4. CONCLUSIONS

Based on limited experimental investigations concerning the compressive strength and Split Tensile strength of concrete, the following observations are made by regarding the resistance of partially replaced stone waste:

**The Compressive Strength** increases when replacement of stone waste percentage increases when compared to traditional concrete.

• From this test, replacement of cement with this stone waste material provides maximum compressive strength at 5% replacement.

• From this test, replacement of cement with this stone waste material provides minimum compressive strength at 15% replacement.

• Waste utilization making it more environmental friendly & competent.

The split tensile strength increases when replacement of stone waste percentage increases when compared to traditional concrete.

• From this test, replacement of cement with this stone waste material provides maximum Split Tensile strength at 5% replacement.

• From this test, replacement of cement with this stone waste material provides minimum Split Tensile strength strength at 15% replacement.

• Utilization of Stone waste and its application are used for the development of the construction industry, Material sciences.

• Lower manufacturing cost of concrete using stone waste in concrete.

• It is the possible alternative solution of safe disposal of Stone waste.

• Due to Longer setting time making it more workable than OPC.

The laboratory test results in compressive strength and Split Tensile strength, seems to indicate that it increases & enhances the mix strength over the conventional mix. This is due to the fact that Kota stone is denser and more durable and less after absorbing. Also higher workability is obtained for more basalt aggregate content mix which reduces the cost of labor.

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