Compressed Stabilised Earth Blocks
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Abstract:
Earth block is a construction material made primarily from soil. Compressed Stabilised earth blocks have been widely used to construct many older structures which were found more economical. The present study involves the use of cement and palm jaggery water as admixtures which can improve the compressive strength of the blocks. As soil is abundant in nature, the compressed stabilised earth blocks can be manufactured in a large quantity. Objective is to demonstrate and popularize the technology of stabilized earth blocks using locally available soils.

Keywords: Cement, Earth Blocks, Palm Jaggery Water.

I. INTRODUCTION:
The compressed stabilised earth block is the modern descendent of the moulded stabilised earth block. The idea of compressing in the earth soil to improve the quality and performance of moulded earth blocks Compressed Stabilised Earth Blocks (CSEB) represents a considerable improvement over normal techniques of producing the blocks. When guaranteed by quality control, CSEB products can very easily bear comparison with other materials such as the fired bricks. CSEB can be compressed in many different shapes and sizes. The input of soil stabilization allowed people to build higher with thinner walls, which have a much better compressive strength and water resistance. With cement stabilization, the blocks must be cured for four weeks after manufacturing. CSEB are most the time cheaper than fired bricks. Equipment for CSEB is available from manual to motorized tools ranging from village to semi industry scale. Since the soil is available in large quantities in most regions, this type of soil is easily accessible to low income groups as it a suitable construction material for most parts of the building. The compressive strength of compressed stabilised earth building blocks depends upon the soil type and amount of stabiliser, and the compaction pressure used to form the blocks. Blocks of the same size, when made of a sufficiently good quality and shape with a high quality finish, can be used for fair-faced walling.

II. EXPERIMENTAL PROGRAM
Materials Used:
Cement:
Ordinary Portland Cement (OPC) - 53 grade conforming to IS: 8112 – 1989, having a specific gravity of 3.15 was made use of, in the casting of the specimens. Palm

Jaggery Water:
Jaggery is fermented for one day and 25gms of jaggery is mixed with 1000ml of water.

Red Earth Soil:
The soil used in this work was collected from a village in Madurai. The soil has the following physical properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic Limit</td>
<td>12.5%</td>
</tr>
<tr>
<td>Liquid Limit</td>
<td>24.6%</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>12.1%</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>2.71</td>
</tr>
<tr>
<td>Fineness Modulus</td>
<td>0.55</td>
</tr>
<tr>
<td>Optimum Moisture Content</td>
<td>14%</td>
</tr>
<tr>
<td>Flow Index</td>
<td>8.51</td>
</tr>
<tr>
<td>Maximum Dry density</td>
<td>2.01 g/cc</td>
</tr>
</tbody>
</table>

Preparation of blocks:
The size of the block selected for this investigation is 23.5 x 11.5 x 9 cm and wooden moulds were used for the casting of blocks. Five mixes were prepared namely Mix 1, Mix 2, Mix 3, Mix 4 & Mix 5.

- Mix 1 - Soil with 5% of Cement & 0 % Jaggery water
- Mix 2 - Soil with 5% of Cement & 25 % Jaggery water
- Mix 3 - Soil with 5% of Cement & 50 % Jaggery water
- Mix 4 - Soil with 5% of Cement & 75 % Jaggery water
- Mix 5 - Soil with 5% of Cement & 100 % Jaggery water

For each mixes 12 blocks were cast out of which 9 blocks were tested for their compressive strength and 3 blocks were subjected to water absorption test. Soil and Cement were thoroughly mixed in dry condition and palm jaggery water was added according to the mix proportion as shown in Figure1 and Figure 2 respectively. After complete mixing, soil- cement mixture was filled into the moulds which are placed in the compressing machine as shown in Figure 3. After 24 hours of moulding of blocks, curing was done daily by sprinkling water thoroughly over them. All the cast blocks were tested for the parameters like compressive strength and water absorption tests were carried out as per the specifications given in IS 3495 -1992, Part1 and Part2 respectively.
III. TESTING OF BLOCKS

Compressive Strength: For each of the mixes, three blocks were subjected to Compressive strength test as shown in Figure 5. As per the recommendations of Indian Standard specification IS 1725 – 1982, soil cement blocks shall have a minimum average compressive strength of 1.96 N/mm² (20 kgf/cm) for Class 20 and 2.96 N/mm² (30 kgf/cm) for Class 30.

Water absorption:
For each of the mixes, remaining blocks were subjected to Water absorption test. As per the recommendations of Indian Standard specification IS 1725 – 1982, soil cement blocks after immersion in cold water for 24 hours shall not have an average water absorption of more than 15 percent by weight.

Table 1. Table for water Absorption Test Results

<table>
<thead>
<tr>
<th>Mix Proportions</th>
<th>% of Water Absorbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix 1</td>
<td>7%</td>
</tr>
<tr>
<td>Mix 2</td>
<td>8.9%</td>
</tr>
<tr>
<td>Mix 3</td>
<td>7.3%</td>
</tr>
<tr>
<td>Mix 4</td>
<td>10.2%</td>
</tr>
<tr>
<td>Mix 5</td>
<td>12.5%</td>
</tr>
</tbody>
</table>
IV. DISCUSSIONS

- The Compressed Stabilised Earth Blocks (CSEB) was taken for strength determination after 28 days.
- The maximum compressive strength was attained in mix 3 (Soil with 5% of Cement & 50 % Jaggery water) is 3.2 N/mm².
- Without utilization of stabilizer the strength of the CSEB obtained is very less, so mixing of stabiliser must be taken in to consideration.
- Addition of more amount of palm jaggery water, which leads to decrease in compressive strength.
- As per IS 1725-1982, average water absorption of blocks, after immersion in cold water for 24 hours shall not be more than 15 per cent by weight and our obtained results is also less than 15 percentage.

V. REFERENCES

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