SMT. S.R.PATEL ENGINEERING COLLEGE, DHABHI, UNJHA.

PRESENTATION ON “ARTIFICIAL SAND USE IN PLASTER MORTAR”

Guide: Prof. Amar Salariya

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INTRODUCTION

1) To provide alternative material for natural sand

2) Use of crushed sand

3) Use of admixtures, fibers

4) Advantages over natural sand
NECESSITY

❖ Technical Aspect

• Natural Sand - weathered particles of rock
• Less fine particles
• Available sand is course and contains silt and clay
• Fine particles below 600 micron must be present up to 30 - 50%
• Quality of natural sand varies from place to place
• Crushed sand is available according to size and grade
Environmental Impact

- In traditional construction techniques, river sand is used
- Due to dragging from river bed, water head is reduced
- Lower ground water level
- Extinction of river sand
1. Recent Tradition (Market Survey)
   Collection and study of recent market trends in cement plaster mortar

2. Mixing Proportion
   Preparation of various mix proportion

3. Testing of mixing proportion
   Behavior of mix proportions under various parameters viz. bonding, strength etc.
4. Testing of mixing proportion along with admixtures and fibers
   Effect of admixtures and fibers on various mix proportion

5. Result comparison
   Comparative analysis of different mix proportion

6. Comparison of river sand and crushed sand plaster mortar
   Comparison considering factors such as environmental effect, cost analysis etc
PARAMETERS

• Strength
• Durability & Economy
• Fineness
• Bonding
• Workability
• Waterproofing
• Shrinkage and cracking prevention
INGREDIENTS

• Crushed Sand
  - Graded sand
    (1) 2.36 mm passing & 150 micron retaining
    (2) 2.36 mm passing & 300 micron retaining
  - Non graded crushed sand

• Fly Ash
  - Reduces cement consumption
  - Increases finish-ability & workability
  - Eco friendly

• Cement
  - OPC (43 Grade)
• **Micro Silica**
  - Increases bonding
  - Reduction in cracks
  - Prevents water seepage
  - Better surface finishing

• **Poly fibers (Grade-2)**
  - Prevents cracks
  - Increases tensile strength & bonding

• **Admixture - Naphthalene**
  - Produces concrete with high levels of workability without segregation
  - Provides improved finish-ability and surface finishes
  - Provides water reduction
Mixtures

(1) Sample 1

• Proportion - 1:6
• Fly Ash was not used
• W/C Ratio - 0.70
• River Sand - 2.36mm Passing & 150 micron Retained

✔ Observation
- No cracks were developed.
- Smooth finishing easily achieved.
- Less economical.
(2) Sample 2

- Proportion - 1:6
- 15% Fly Ash
- W/C Ratio - 0.70
- Crushed Sand - 2.36mm Passing & 150 micron Retained

✓ Observation
- Initially good finish was observed.
- Cracks were developed after drying.
(3) Sample 3

- Proportion - 1:6
- Fly Ash was not used
- W/C Ratio - 0.70
- Crushed sand - 2.36mm Passing & 150 micron Retained

✓ Observation
- No cracks were developed.
- Smooth finishing was not achieved.
- Less economical.
(4) Sample 4

- Proportion - 1:6
- 15% Fly Ash
- Micro silica - 2% of cementitious material
- W/C Ratio - 0.90
- Crushed Sand - 2.36mm Passing & 300 micron Retained
- Fibers - 0.35% of cementitious material

✓ Observations:
- Poor bonding with surface
- Poor finishing
- Less economy
- More water was required
- More wastage of mortar
(5) Sample 5

- Proportion - 1:6
- 15% Fly Ash
- Micro silica - 2% of cementitious material
- Naphthalene - 0.5% of cementitious material
- Fibers - 0.4% of cementitious material
- W/C Ratio - 0.70
- Crushed Sand - 2.36mm Passing & 300micron Retained

✓ Observations:
  - Good bonding
  - Less surface finishing
  - No cracks were developed
  - Not economical
(6) Sample 6

- Crushed sand - Non Graded sand
- Proportion - 1:6
- 10% Fly Ash
- Naphthalene - 0.5%
- W/C Ratio - 0.70

✓ Observations:
- Good bonding with surface
- Perfect finishing
- Better economy
- Less wastage of mortar
CUBE TESTING

DIMENSION: 10 cm x 10 cm x 10 cm
## COMPARISON OF QUANTITY OF MATERIAL

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SAMPLE 1</th>
<th>SAMPLE 2</th>
<th>SAMPLE 3</th>
<th>SAMPLE 4</th>
<th>SAMPLE 5</th>
<th>SAMPLE 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLY ASH</td>
<td>15%</td>
<td>---</td>
<td>25%</td>
<td>15%</td>
<td>15%</td>
<td>10%</td>
</tr>
<tr>
<td>CRUSHED SAND</td>
<td>GRADED</td>
<td>GRADED</td>
<td>GRADED</td>
<td>GRADED</td>
<td>GRADED</td>
<td>NON GRADED</td>
</tr>
<tr>
<td>FIBERS</td>
<td>---</td>
<td>---</td>
<td>0.6%</td>
<td>0.4%</td>
<td>0.35%</td>
<td>---</td>
</tr>
<tr>
<td>ADMIXTURE (NAPHTHALENE)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>0.5%</td>
</tr>
<tr>
<td>MICRO SILICA</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>2%</td>
<td>2%</td>
<td>---</td>
</tr>
</tbody>
</table>
## COMPARISON OF RESULT OF COMPRESSIVE STRENGTH OF SAMPLE

<table>
<thead>
<tr>
<th>SAMPLES</th>
<th>COMPRESSIVE STRENGTH (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 Days</td>
</tr>
<tr>
<td>SAMPLE - 1</td>
<td>7</td>
</tr>
<tr>
<td>SAMPLE – 2</td>
<td>6</td>
</tr>
<tr>
<td>SAMPLE - 3</td>
<td>8.5</td>
</tr>
<tr>
<td>SAMPLE – 4</td>
<td>8</td>
</tr>
<tr>
<td>SAMPLE – 5</td>
<td>7.5</td>
</tr>
<tr>
<td>SAMPLE – 6</td>
<td>12</td>
</tr>
<tr>
<td>Factors</td>
<td>Plastering using River Sand</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Time</td>
<td>Less time consuming</td>
</tr>
<tr>
<td>Finishing</td>
<td>Easily achieved</td>
</tr>
<tr>
<td>Availability of sand</td>
<td>Not easily available</td>
</tr>
<tr>
<td>Texture of sand</td>
<td>Non-uniform particles</td>
</tr>
<tr>
<td>Watering</td>
<td>Less watering is needed</td>
</tr>
<tr>
<td></td>
<td>before plastering</td>
</tr>
<tr>
<td>CRITERIA</td>
<td>SAMPLES</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>BONDING</strong></td>
<td>Good</td>
</tr>
<tr>
<td><strong>FINISHING</strong></td>
<td>Average</td>
</tr>
<tr>
<td><strong>COST</strong></td>
<td>Less</td>
</tr>
<tr>
<td><strong>WATER REQUIREMENT</strong></td>
<td>Average</td>
</tr>
<tr>
<td><strong>WASTAGE OF MORTAR</strong></td>
<td>Less</td>
</tr>
<tr>
<td><strong>DEVELOPMENT OF CRACKS</strong></td>
<td>Average</td>
</tr>
</tbody>
</table>
RATE ANALYSIS

Rate of the material for their perspective unit and for the quantity required for 100 sq. m of plaster.

<table>
<thead>
<tr>
<th>Sr.no.</th>
<th>Material</th>
<th>Rate in Rs.</th>
<th>Plaster using Crushed sand</th>
<th>Plaster using Natural sand</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cement</td>
<td>260/bag</td>
<td>1900.314/-</td>
<td>2111.46/-</td>
</tr>
<tr>
<td>2</td>
<td>Crushed sand</td>
<td>2500/ brass</td>
<td>1435/-</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>Natural sand</td>
<td>4500/ brass</td>
<td>--</td>
<td>2583/-</td>
</tr>
<tr>
<td>4</td>
<td>Fly ash</td>
<td>90 paisa/kg</td>
<td>36.54/-</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>Naphthalene</td>
<td>30/kg</td>
<td>73.69/-</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL Rs.</strong></td>
<td></td>
<td><strong>3445.54 /-</strong></td>
<td><strong>4694.46 /-</strong></td>
</tr>
</tbody>
</table>
OUT COME OF THE PROJECT

1. ECOFRIENDLY
   (a) USE OF WASTE MATERIAL
   (b) LESS POLLUTION

2. EASY AVAILABILITY

3. ECONOMICAL
Among all mixtures Sample - 6 containing non graded crushed sand, fly ash, cement and admixture naphthalene gave required results, viz. better surface finish, perfect bonding with the wall, less or no wastage, and most important economic compared to conventional plaster. Compressive strength test of a cube has been conducted to check the compatibility of mix. Standard mix having natural sand carries compressive strength of 10 to 12 N/mm². Whereas this mixture yields 12 N/mm² of compressive strength for 7 days and 24 N/mm² for 21 day strength. It concludes that the mixture is far more versatile than conventional mixture.
ACI Committee 544. 1982. State-of-the-Report on Fibre Reinforced Concrete, (ACI 544.1R-82), Concrete International: Design and Construction. 4(5): 9-30, American Concrete Institute, Detroit, Michigan, USA.

ACI Committee 544. 1989. Measurement of Properties of Fibre Reinforced Concrete, (ACI 544.2R-889). American Concrete Institute, Detroit, Michigan, USA.


STROMBERG CONSTRUCTION, USA. —Guide Book to GFRC.


Is 456-2000
Thank you