Soil-Cement for Stream Bank Stabilization

Wayne Adaska
Portland Cement Association
Tri-Service Infrastructure Systems Conference
August 2 – 4, 2005
Mix Design

- Granular material
- Plasticity index of fines less than 8
- Cement contents between 5 - 13%
- 7-day compressive strengths between 500 – 1000 psi
- PCA short-cut method (plus 2% cement)
## Typical Cement Contents

<table>
<thead>
<tr>
<th>Component</th>
<th>Code</th>
<th>Recommended Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravels</td>
<td>A-1a</td>
<td>5-7% by weight</td>
</tr>
<tr>
<td></td>
<td>A-1b</td>
<td>7-10%</td>
</tr>
<tr>
<td>Sands</td>
<td>A-2</td>
<td>7-11%</td>
</tr>
<tr>
<td></td>
<td>A-3</td>
<td>9-13%</td>
</tr>
<tr>
<td>Silts</td>
<td>A-4</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>A-5</td>
<td>Not recommended</td>
</tr>
<tr>
<td>Clays</td>
<td>A-6</td>
<td>Not recommended</td>
</tr>
<tr>
<td></td>
<td>A-7</td>
<td>Not recommended</td>
</tr>
</tbody>
</table>
Effect of Soil Type on Erosion Resistance

![Graph showing the effect of soil type on erosion resistance. The graph plots time in days against erosion depth with respect to cement content by weight. Two curves are shown, each corresponding to different soil types and flow conditions.](image-url)
RELATIONSHIP BETWEEN DENSITY AND COMPRESSIVE STRENGTH

9% cementitious content
1 1/2 in. MSA
Modified Proctor (ASTM D1557)

Density

Strength

7-day Compressive strength, psi

Dry density, pcf

Moisture content, % by dry wt.
Effect of Density on Strength

% Max. Density

7-day UCS (psi)

- 99.2%: 830
- 98.3%: 795
- 97.0%: 695
- 94.2%: 550
- 92.7%: 450
- 91.3%: 400
STRENGTH VERSUS TIME OF COMPACTION
AT VARIOUS COMPACTIVE EFFORTS

7-day compressive strength, psi

Plant mixed CTB with 5% cement

Time of compaction, h

Standard Proctor Test (ASTM D 558)

25 blows / lift

20

15
Typical Section

SOIL CEMENT IN 6" TO 9" (MAX) LIFTS

STREAMBED

VARIES

TYPICAL SECTION FOR BANK PROTECTION
Construction
More Information

- PCA website – www.cement.org/water

- Water Resources EC

- PCA Technical Support
  - Fares Abdo, P.E. fabdo@cement.org
  - Wayne Adaska, P.E. wadaska@cement.org