TECHNICIAN TRAINING FOR THE CONSERVATION OF MOSAICS

PART 1
THE CONSERVATION OF IN SITU MOSAICS

Reburial

Livia Alberti, Ermanno Carbonara, Thomas Roby
Reburial

is a temporary or permanent

protection measure
A proper reburial protects a mosaic from:

- direct action of atmospheric precipitation
- variations in temperature and humidity
- growth of vegetation
- foot traffic
Reburial is necessary when:

• resources for maintenance are lacking;

• other forms of protection (shelter, guard, fence, etc.) are lacking;

• the original materials of the mosaic are too damaged or are in an aggressive environment.
Protection from deterioration factors

Deterioration of an exposed mosaic
due to water and variations in temperature and humidity
Change in level of variations in temperature and humidity
Deterioration of an exposed mosaic
due to capillary rise of water
Change in level of water capillary rise
Deterioration of an exposed mosaic
due to vegetation growth
Change in level of vegetation growth
Deterioration of an exposed in situ mosaic without maintenance and without protection
Reburial generally consists of 
fill materials 
and 
separation membranes
## Materials for reburial

<table>
<thead>
<tr>
<th>Fill materials</th>
<th>Separation membranes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Plastic sheeting</td>
</tr>
<tr>
<td>Sand</td>
<td>Plastic netting</td>
</tr>
<tr>
<td>Gravel</td>
<td>Woven plastic sheeting</td>
</tr>
<tr>
<td>Other natural and synthetic materials</td>
<td>Non-woven geotextiles</td>
</tr>
<tr>
<td></td>
<td>Other synthetic fabrics</td>
</tr>
</tbody>
</table>
Fill materials

Soil

Sand
Fill materials

Gravel

Pozzolana
Fill materials

Expanded clay

Expanded polystyrene
## Fill Materials

<table>
<thead>
<tr>
<th>Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>• Allows continuous water transport&lt;br&gt;• Maintains good moisture and temperature stability&lt;br&gt;• Readily available and inexpensive</td>
<td>• Contains seeds and small plants&lt;br&gt;• Prone to vegetation growth and animal activity&lt;br&gt;• Difficult to remove from the mosaic surface</td>
</tr>
<tr>
<td>Sand</td>
<td>• Less prone to vegetation growth and animal activity&lt;br&gt;• Maintains fairly stable moisture and temperature levels&lt;br&gt;• Clean&lt;br&gt;• Readily available and inexpensive</td>
<td>• Limits the continuous movement of water&lt;br&gt;• Can contain salts</td>
</tr>
<tr>
<td>Gravel</td>
<td>• Less prone to vegetation growth and animal activity&lt;br&gt;• Clean&lt;br&gt;• Easy to remove&lt;br&gt;• Readily available and inexpensive</td>
<td>• Inhibits the continuous movement of water&lt;br&gt;• Poor moisture and temperature stability&lt;br&gt;• Hard with sharp edges&lt;br&gt;• Heavy</td>
</tr>
<tr>
<td>Other natural materials (&lt;i&gt;pozzolana&lt;/i&gt;, “tiff”, etc.)</td>
<td>• Allows continuous water transport&lt;br&gt;• Maintains fairly stable moisture and temperature levels&lt;br&gt;• Inexpensive near their place of extraction&lt;br&gt;• For “tiff”, less prone to vegetation growth</td>
<td>• Dirties the mosaic surface&lt;br&gt;• Hard to remove from the mosaic surface&lt;br&gt;• Not available everywhere&lt;br&gt;• For “tiff”, can create concretions on the mosaic surface</td>
</tr>
<tr>
<td>Specialized synthetic materials (&lt;i&gt;Expanded clay – Leca™, expanded polystyrene, etc.&lt;/i&gt;)</td>
<td>• Less prone to vegetation growth and animal activity&lt;br&gt;• Clean&lt;br&gt;• Very easy to remove&lt;br&gt;• Lightweight</td>
<td>• Inhibits the continuous movement of water&lt;br&gt;• Poor moisture and temperature stability&lt;br&gt;• Hard to obtain and expensive</td>
</tr>
</tbody>
</table>
Separation membranes

Plastic sheeting

Plastic netting
Separation membranes

Woven plastic sheeting

Non-woven geotextiles
## Separation Membranes

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<th>Type</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tr>
<td>Plastic sheets</td>
<td>• Partially effective against vegetation penetration and animal activity</td>
<td>• Inhibits liquid-water/water-vapor transport</td>
</tr>
<tr>
<td></td>
<td>• Effective separation between all fill materials</td>
<td>• Promotes root growth underneath</td>
</tr>
<tr>
<td></td>
<td>• Easily available and inexpensive</td>
<td></td>
</tr>
<tr>
<td>Plastic netting</td>
<td>• Permits liquid-water/water-vapor transport</td>
<td>• Ineffective barrier to vegetation penetration and animal activity</td>
</tr>
<tr>
<td></td>
<td>• Does not promote root growth underneath</td>
<td>• Ineffective separation of smaller fill particles</td>
</tr>
<tr>
<td></td>
<td>• Easily available and inexpensive</td>
<td></td>
</tr>
<tr>
<td>Woven plastic sheeting</td>
<td>• Effective separation between all types of fill materials</td>
<td>• Reduces liquid-water/water-vapor transport</td>
</tr>
<tr>
<td></td>
<td>• Easily available and inexpensive</td>
<td>• Fairly ineffective barrier to vegetation penetration and animal activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Promotes growth of roots underneath</td>
</tr>
<tr>
<td>Non-woven geotextiles and other synthetic fabrics</td>
<td>• Permits water-vapor transport</td>
<td>• Reduces liquid-water transport</td>
</tr>
<tr>
<td></td>
<td>• Partially effective against vegetation penetration and animal activity</td>
<td>• Promotes growth of roots underneath</td>
</tr>
<tr>
<td></td>
<td>• Effective separation between all types of fill materials</td>
<td>• Hard to obtain and very expensive</td>
</tr>
</tbody>
</table>
Examples of reburial
Thickness
Thickness

Diagram showing the thickness of layers in a construction process:
- **Gravel**: 5-10 cm
- **Earth**: 50-80 cm
- **Bags of Sand**: 2-5 cm
- **Sand**: 10-20 cm
Containment of fill materials

Dry stone wall
Containment of fill materials
Dry stone barrier
Containment of fill materials
Barrier of stones set in mortar with open joints for drainage
Containment of fill materials
Row of stones set in mortar
Containment of fill materials

Stones and geotextile
Containment of fill materials
Wooden plank barrier
Containment of fill materials
Wooden plank frame
Containment of fill materials
Wooden plank frame supported by metal pipes
Poor practice to be avoided
Lack of reburial maintenance ➔ presence of vegetation
Insufficient depth of reburial fill  \rightarrow  root growth in the mosaic
Lack of containment barriers → loss of fill materials
Lack of containment barriers  → exposure and deterioration of separation membranes
Separation membrane in direct contact with mosaic → growth of roots under the membrane
Reburial with fill material in contact with unstabilized mosaic → loss of original location of tesserae
Reburial with membrane in contact with unstabilized mosaic → growth of roots between tesserae
Reburial: an effective management tool for the conservation of in situ mosaics.
MOSAIKON is a partnership of four institutions: the Getty Conservation Institute, the Getty Foundation, ICCROM, and ICCM. The aims of the project are to strengthen the network of professionals concerned with the conservation, restoration, maintenance, and management of mosaic heritage in the southern and eastern Mediterranean region; provide training to a variety of individuals involved in mosaics conservation and, more generally, with the management of archaeological sites and museums with mosaics; work with national and international bodies to provide a more favorable legislative, regulatory, and economic environment for the conservation of mosaics in the Mediterranean; and promote the dissemination and exchange of information.