Road Rehabilitation Projects in Mongolia

International Seminar on the appropriate use of Natural Materials in Roads

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Road Rehabilitation Projects in Mongolia

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Denmark
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Our work in Mongolia is the Technical Assistance to the Supervision Teams on 4 projects:

1. 215 km of Rehabilitation the road between Erdenesant and Arvaiheer.

2. The upgrading 86 km to an all weather road between Kharkhorin and Tosontsengel.

3. The upgrading of 93 km to an all weather road between Arvaiheer and Khovd.

4. Technical Assistance for the preparation of 3 year rolling maintenance plan.
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Map of our Project Roads
The detail of the specified types of reconstruction used on the project are as follows:

Type 1:
- Crack sealing
- Patching
- Surface dressing
- Shoulder treatment
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The detail of the specified types of reconstruction used on the project are as follows:

Type 2:
• Crack sealing
• Patching
• Shoulder treatment
• Tack coat and asphalt regulating
• 50 mm of asphalt wearing course
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The detail of the specified types of reconstruction used on the project are as follows:

Type 3:

• Excavation of existing surface

• 150 mm of crushed stone basecourse

• Prime coat

• 50 mm of asphalt wearing course
The detail of the specified types of reconstruction used on the project are as follows:

Type 4:

- Excavation of existing surface
- 200 mm Nonfrost layer
- 200 mm Subbase
- 200 mm Basecourse
- Prime coat
- 50 mm of asphalt wearing course
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Potholes and shoulders
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Wheel tracks – asphalt shoving
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Excavation of existing road showing the depth of the old pavement
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Base course laying
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Compaction of base course
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Close up of finished base course surface
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Base course segregation
Segregation probably causes:

- less bearing capacity of the E-modulus in the layer which will cause faster deterioration of the above layers and relatively thicker overlay thickness when needed

- also risk particles break down and will penetrate into the voids between the other particles settlement and lower bearing capacity in the above unbound layer.
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## Unbound layer requirements

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>&lt; 25%</td>
</tr>
<tr>
<td>Compaction degree, modified Proctor</td>
<td>&gt; //</td>
</tr>
</tbody>
</table>
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### Asphalt aggregate requirements

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Abrasion</td>
<td>Max 25</td>
</tr>
<tr>
<td>Aggregate Crushing Value</td>
<td>Max 25</td>
</tr>
<tr>
<td>Sodium Sulphate Soundness</td>
<td>Max 12</td>
</tr>
<tr>
<td>Water Absorption</td>
<td>Max 2%</td>
</tr>
<tr>
<td>Flakiness Index</td>
<td>Max 20</td>
</tr>
</tbody>
</table>
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Result of segregation

- Less bearing capacity probable of lower E-modulus in the layer which cause relatively faster deterioration of the above layers and result in a thicker overlay being required in the future.

- Risk that particles break down and penetrate into the voids between the other particles causing settlement within the layer.

- Risk that the fines from the above unbound layer penetrate into the segregated layer, causing settlement and lower bearing capacity in the above unbound layer.
## Graded crushed stone base material

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasticity Index</td>
<td>Max 6</td>
</tr>
<tr>
<td>Plasticity Product</td>
<td>Max 45</td>
</tr>
<tr>
<td>Sodium Sulphate Soundness</td>
<td>Max 12</td>
</tr>
<tr>
<td>Los Angeles Abrasion Value</td>
<td>Max 30</td>
</tr>
<tr>
<td>Flakiness Index</td>
<td>Max 35</td>
</tr>
<tr>
<td>Ten percent Fines Value</td>
<td>Min 110 kN</td>
</tr>
<tr>
<td>CBR after 4 day soak at 100% MDD</td>
<td>Min 90%</td>
</tr>
</tbody>
</table>
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Necessary quality of natural aggregates means the appropriate quality level for aggregates for roads are the level which is based on technology financial and environmental matters are taken into consideration:

- Technological consideration
- Environmental consideration
- Economical consideration

Under the right construction conditions aggregates of lesser quality can be used for highways as well as heavy duty pavements.
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Typical defects seen in older and new roads:

• Shoving
• Rutting
• Cracks
• Deformation
• Potholes
• Deterioration
• Shoulder erosion
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Road defects are primarily caused by:

• Frost heave
• Freeze / thaw
• Water penetration
• Low compaction degrees
• Improper material composition
• Weak materials
• Hard binders / soft binders
How to avoid the problems?

• Appropriate use of the materials and what does it mean:
  • Appropriate design
  • Appropriate material requirements
• Appropriate quality control by the Contractor
• Appropriate quality control by the Client
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