The importance of drainage

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Drainage

• “Everyone knows” that good drainage is important
Drainage

- More moisture in the road decreases the bearing capacity
- Degradation in the road increases
- More and bigger need of reparations
- Bad drainage costs money
Why bad drainage?

**Problem type**

- **Maintenance related problems**
  - Problems that are related to poorly working drainage which can be handled through maintenance actions

- **Design related problems**
  - Problems that are related to the location of the road and its surroundings

- **Other problems**
  - Moisture trap
  - Stability problems in outer slopes

**Rain and melting snow**

- Melting snow

**High ground water level**

- Poorly working drainage structures
  - Culverts
  - Ditches
  - Grass verges
  - Poor crossfall
  - Cracks

- Low ground
  - Moraine
  - Clay/Silt
  - Peat

- Sidelong ground
  - Moraine
  - Clay/Silt
  - Bedrock

- Flat area
  - Moraine
  - Clay/Silt
  - Peat

- Bedrock cuttings
  - Moraine
  - Clay/Silt
  - Peat
  - Other soils
Different road cross-sections

- Cutting
- Side sloping ground
- 0-level
- Embankment

Terrain
Problem area
Ground water table
Drainage impact on permanent deformation

The diagram shows the rutting ratio between the two traffic lanes in sloping ground.
## The importance of drainage

<table>
<thead>
<tr>
<th>Drainage condition</th>
<th>Drainage class (VVK Sweden)</th>
<th>Change in length of life if the drainage is improved</th>
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</thead>
</table>
| **Class 1**  
Drainage system does not function. Water susceptible materials in road structure and subgrade. Very high ground water table. Groundwater flow blocked. | >3 | >2,5 |
| **Class 2**  
The drainage does not function. Some better materials in road structure and subgrade compared to Class 1.  
The drainage system is functioning poorly due to a lack of maintenance (ditches and culverts not cleared), and water susceptible materials | 3 | 2-2,5 |
| **Class 3**  
Drainage system is functioning poorly due to a lack of maintenance. (Ditches and culverts not cleared.) | 2 | 1,5-2 |
| **Class 4**  
Drainage system is working unsatisfactorily due to a lack of maintenance or the maintenance guidelines are insufficient. | 1-2 | 1-1,5 |
Does it pay off?

- The results from life cycle cost analyses show that drainage is almost always good value for money.
- On paved roads it is sometimes economic to check and fix drainage even every second year.
- When short of money always start with drainage.
ROADEX classification

• Divided into 3 classes
• 1 = good, functioning
• 2 = adequate, could be better
• 3 = poor, does not function
VISUAL ASSESSMENT OF DRAINAGE CONDITIONS ON GRAVEL ROADS

Class 1: good drainage

Description:
Faultless. The cross-section of the road has preserved its form well and water flows from the pavement to the ditch unrestricted. Water also has a clear passage in the ditches.
VISUAL ASSESSMENT OF DRAINAGE CONDITIONS ON GRAVEL ROADS

Class 3: Poor drainage

Description:
Deformation and damage on the road cross-section. The innerslope crest has a high edge and/or vegetation causing pools to be formed on the road. Vegetation in the ditch restricts water flow and causes damming in the ditch. Unstable soil flows from ditch slopes into ditches and blocks the water flow. A clogged culvert or outlet ditch prevents water from flowing in the ditch.
Sources

- WWW.ROADEX.ORG

Geir Berntsen, Timo Saarenketo

DRAINAGE ON LOW TRAFFIC VOLUME ROADS
  Problem description, improvement techniques and life cycle costs

Timo Saarenketo

DEVELOPING DRAINAGE GUIDELINES FOR MAINTENANCE CONTRACTS
  Results of a ROADEX III pilot project in the Rovaniemi Maintenance Area in Finland