GROUND PENETRATING RADAR (GPR) IN ROAD PAVEMENT ASSESSMENT

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Summary

- GPR: a road-user friendly technique
  - Ground Penetrating Radar
    - method
    - equipment
  - GPR during road life time
  - Data aquisition
  - examples of GPR survey
    - 32km highway inspection
    - moisture in pavement analisys

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GPR: a road-user friendly technique

TRABALHOS FIXOS

Rakenteen parantamisuuinnittelua edellävät maastututkimukset ja tulosten esittystapa - menetelmäkuvauks

Data for Pavement Assessment

Summary: This Standard describes the data required for pavement assessment and the data collection methods that are currently approved by the Oversea Organisations. These methods cover measurement of the construction and condition of different types of pavements, except skidding resistance which is covered in HD 38 (DMR) 7.3.1. This revision has been updated to reflect current practice and include requirements previously issued in JAN-05/05.
Ground Penetrating Radar

The method
Ground Penetrating Radar

The method

\[ v = \frac{c}{\sqrt{\varepsilon_r}} \]
\[ d = \frac{v \times t}{2} \]
\[ K = \frac{\sqrt{\varepsilon_r^2} - \sqrt{\varepsilon_{r_1}}}{\sqrt{\varepsilon_r^2} + \sqrt{\varepsilon_{r_1}}} \]
\[ R = 1 - K \]

Velocity  
Depth  
Reflection coefficient  
Penetration coefficient
Ground Penetrating Radar
The equipment
Ground Penetrating Radar
The equipment

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GPR and road life cycle

HMA:
- thickness
- segregation;
- Air voids;
- compaction;
Granular layers
- thickness.

HMA
- Damages detection ("stripping");
- Relative permittivity as distress indicator;
Granular layers
- moisture;
- fine contamination;

- Quality Control/Quality assurance
- Pavement Monitoring
- Network management
- Design
- Damages and forensics

(from Saarenketo, 2005)
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32 km highway inspection

10 scans/m at highway velocity

Variability of layer thickness

Contribute to probabilistic approach to pavements
Moisture in pavement analysis

Irregularity of pavement surface

September 2009 – 1st GPR survey

Conclusive pit inspection

Mars 2010 – 2nd GPR survey

After deep drainage installation

3rd GPR survey

Monitoring opposite hydraulic state

Deep drainage efficiency evaluation

Regularization of pavement surface
Conclusions

- GPR it is useful along the entire road life cycle;
- Most relevant aspects accessible with GPR are layer thickness, moisture in granular bases, HMA air voids and defects detection;
- One of the most promising aspects related with GPR deals with the perspective to have relative dielectric permittivity as an quality indicator of HMA;
- However GPR does not substitute any other road inspection techniques, also shouldn’t be considered, simply, as another one, because allows new perspectives to road analysis;
- It is very important to normalize GPR survey proceedings and equipments, and gives formation to technicians in data acquisition and interpretation, as well to final users; EuroGPR rules are a good start to those purposes.
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