Maintenance for unpaved roads carrying very low levels of traffic

Developing a spot improvement manual for basic accessibility
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Background

- The International group at TRL has been carrying out research for the benefit of developing regions of the world for many years
- Some of the key outputs of this research are guidelines and best practice guides
- These include the following...

Overseas Road Notes

And ORN 20 ‘Management of rural networks’
Aimed at the very low traffic end of the spectrum

Scope of the Road Notes

Cumulative Traffic (mesa)

<table>
<thead>
<tr>
<th>0</th>
<th>0.25</th>
<th>0.5</th>
<th>0.75</th>
<th>1.0</th>
<th>1.25</th>
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</thead>
</table>

ORN 1 - Maintenance management for District engineers
ORN 2 - Maintenance techniques for District engineers
ORN 18 - A guide to pavement evaluation and maintenance of bitumen surfaced roads
ORN 20 - Management of rural networks

New project aimed at very low traffic where environmental effects dominate road behaviour

Contribution of environment and traffic to road behaviour (schematic)

- Environment
- Traffic

1
Scope of the new project

- The majority of roads in most developing countries fall into the category of ‘low traffic’
- Although the level of motorised traffic is low, the roads perform a vital function for the rural population
- Maintaining them has always been a problem
- Insufficient funds is one reason but...
- Traditionally priority has been determined by traffic
- Social benefits need to be included (ORN 22)
- Methods of maintenance suitable for higher traffic levels are not suitable because of cost

National roads...

But there is not enough money available to construct and maintain all regional roads to the same high standard

As a result, there are many problems on regional roads

... and Regional roads

Rural accessibility

Erosion
Because of these problems, vehicles often do not travel. People suffer because they have to walk to fetch water, go to the market, visit the hospital or work on their farms.

How can we improve regional roads at low cost so that vehicles can travel and so that funds remain to improve other roads to rural communities?
This level of service is called Basic Access. It does not permit high speed travel. But it provides reliable and safe access. What does Basic Access involve? What are typical critical sites? What are the likely solutions? Problem: absence of water crossing. Solution: culvert...
Problem: erosion in side drain

Solution: mitre drains...

...and drain lining
Side accesses... can cause side drains to overtop and erode the surface.

Solution: access structures

Problem: flooding

Solution: embankment

Problem: erosion on an unformed track
Solution: diversion banks

Problem: surfaces can be dusty...

...slippery...

...badly eroded...

...with potholes...

Solution: gravel...
...seals...
...

...spot sealing...
...

...geo cells
...

And if the road or track is passable...
...

...do nothing...
...

...do nothing
Reasons for adopting spot improvements:

- Very large rural network
- Low available funding
- Low maintenance capacity
- Low levels of traffic
- Priorities of local road users
- Deterioration of rehabilitated road

Decision made to commission a spot improvement manual

Spot improvement manual: problems 1

Must be Acceptable to:
- Road authority staff
- Local residents
- Local politicians
- Contractors

Spot improvement manual: problems 2

Change of approach/policy:
- Definitions of access
- Definitions of spot improvements
- Contract forms
- Publicity/dissemination

Spot improvement manual: problems 3

Engineers require:
- Focus on access
- Flexibility
- Understanding of deterioration
- Confidence
- Guidance/training
- Authority to carry out spot improvements

Spot improvement manual: solutions

- Include in national road policy
- Allow inclusion in maintenance contracts
- Commission a Manual
- Include training
- Series of dissemination workshops
- National launch of Manual
A manual has been written to help with the design of spot improvements and the provision of Basic Access.

Chapter 1 – Introduction
Description of Basic Access
Description of spot improvements
Target group of the Manual
Involvement of local communities
Additional useful manuals

Definition of Basic Access:

For a standard vehicle:
* Pass all year
* Travel above a speed of 20 km/h
* No one in danger
* No damage to the road
* No damage to the vehicle
* Road condition unlikely to worsen

Chapter 2 – Identify critical sites

- List of different types of defect
- Water courses
- Soils, surfaces and alignment
- Drains and slopes

Some defects

Form – for recording critical sites
Guidance on carrying out a survey

Other survey techniques

Measuring Surface Deflection
- Creep speed
- Running speed
- Traffic speed
- Walking speed

For Unpaved Primary Routes
Equipment for measuring vehicle response - bump integrator mounted on vehicle rear axle

For Unpaved Primary Routes
Equipment for measuring longitudinal profile - MERLIN

For Unpaved Feeder Roads
Instead use video records
- more consistent
- can provide reference
Chapter 3 – Select appropriate solutions

- Water courses – water crossing structures
- Erosion on a track – diversion banks
- Loose sand – formation and improved surface
- Swamp – embankment
- Erosion in side drain – mitre drains and scour checks

Chapter 4 – Estimate the costs

- Bill of quantities

Chapter 5 – Reduce costs

1. Construct more cheaply - Can the communities contribute materials?
2. Prioritise the roads - Which road is the more important?
3. Prioritise the critical site - Can we adjust the definitions of Basic Access?
4. Reduce the length - Can we improve only the first part of the road?

Chapter 6 – Implement spot improvements

- Self-help (by local communities and organisations)
- Commercial (by contractors)

Advice on how to arrange for the work to be carried out – large teams
Advice on how to arrange for the work to be carried out – individual workers

Or even small work carried out by a community

Chapter 7 – Training

Completed form

Completed plan
Chapter 8
Catalogue of solutions

Alternatives
Descriptions
Sketches
Drawings
Quantities

Estimating the size of a structure...

To prevent overtopping of a structure

Culvert – direct inputs

Drift
**Splash**

**Vented drift**

**Embankment**

**Submersible bridge**

**High bridge**

**Prevention of erosion**

Resolve problems while still small
Identify and treat the source of erosion
Divert water to surrounding land
Place top soil and plant grass
Construct improved surfaces
Clean the drains
Shape the road surface well
Maintain all roads and tracks
Diversion banks to prevent erosion on a track

Removal of anthill

Removal of roots

Separate track

Sustainability in the UK!

Road formation
Road on rock

Drains, mitre drains and scour checks

Side access

Bio-engineering

Vegetation on slopes
Stone paving
Live scour checks
Vegetation fascines

Grass cutting, bush clearing & tree removal

Improved surfaces

Slippery
Erosion
Loose sand
Dusty
Weak
Swampy
Rock outcrops
### Selection table for improved surfaces

<table>
<thead>
<tr>
<th>Traffic (vehicles per day)</th>
<th>Conditions</th>
<th>Surface Type 1</th>
<th>Surface Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 100</td>
<td>Bons materiais naturais disponíveis</td>
<td>Saibro Otta seal duplo</td>
<td>Chip seal duplo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Otta seal duplo</td>
<td>Chip seal duplo</td>
</tr>
<tr>
<td>More than 100</td>
<td>Bons materiais naturais não disponíveis</td>
<td>Solo quimicamente estabilizado</td>
<td>Saibro Otta seal duplo</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Otta seal duplo</td>
<td>Chip seal duplo</td>
</tr>
<tr>
<td>50-100</td>
<td>Bons materiais naturais disponíveis</td>
<td>Saibro</td>
<td>Otta seal simples</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grit seal</td>
<td>Chip seal simples</td>
</tr>
<tr>
<td>30-100</td>
<td>Bons materiais naturais não disponíveis</td>
<td>Base de Emulsão Betuminosa (ETB)</td>
<td>Saibro</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Otta seal simples</td>
<td>Chip seal simples</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grit seal</td>
<td>Chip seal simples</td>
</tr>
<tr>
<td>Menos de 50</td>
<td>Bons materiais naturais disponíveis</td>
<td>Saibro</td>
<td>Otta seal simples</td>
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</table>

### Gravelling

- Gravel tests
- Grading coefficient
- Shrinkage product
- Settlement test
- Drying test

### Bituminous seals

- Sand seal – area
- Grit seal – 0-6 mm
- Otta seal – 0-16 mm
- Chip seal – 10 ou 13 mm

### Geo cells

- Geo cells

### Gravel selection chart

- Specification of material for saibro layer
- Coefficient of granulometry
- Gradation coefficient
- Shrinkage product
- Settlement test
- Drying test
- Bituminous seals
- Grit seal – 0-6 mm
- Otta seal – 0-16 mm
- Chip seal – 10 ou 13 mm
Summary of Manual

- Define Basic Access
- Identify critical sites
- Select solutions
- Estimate costs
- Reduce costs
- Design the improvements
- Construct the improvements
- Train

We can provide access to the rural communities, so they can reach the farms...

...trade their crops...

...visit hospitals...

...and go to markets

The End
Merci
Pour votre attention!

Thank you for listening
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