Forgotten Best Practices for Unsealed Roads

In-situ blending for low cost pavements

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Problems with Bad Practices

Ravelling

Corrugations
Pavement Performance

Key Properties
- Stability
- Strength
- Durability

Environmental Influences
- Moisture
- Traffic
- Temperature
Stability

Resist failure by volumetric change

- Minimum air voids, maximum dry density
- Low permeability
- Maximises strength

Specify:

- Compactive effort
- Particle distribution limits
Strength

Support future loadings

• Good stability
• High quality aggregates
• Low moisture content

Specify:
• Minimum CBR values
Durability

Performance over time

- Good stability
- Good strength
- Durable aggregates & soil matrix
- Low weathering

Specify:
- Wet/dry strength limits
- Flakiness index limit
- Texas triaxial repeat load test
GUIDE TO PAVEMENT TECHNOLOGY

Part 6: Unsealed Pavements

SUPERVISORS HANDBOOK FOR
the Construction & Maintenance of Infrastructure

Manual for the training of practitioners & a guide to work practices
### Table 3.5: Typical properties for unsealed road wearing course

<table>
<thead>
<tr>
<th>Sieve size (mm)</th>
<th>Per cent passing for all maximum sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>100</td>
</tr>
<tr>
<td>37.5</td>
<td>95-100</td>
</tr>
<tr>
<td>26.5</td>
<td>90-100</td>
</tr>
<tr>
<td>19</td>
<td>80-100</td>
</tr>
<tr>
<td>2.36</td>
<td>35-65</td>
</tr>
<tr>
<td>0.425</td>
<td>15-50</td>
</tr>
<tr>
<td>0.075</td>
<td>10-40</td>
</tr>
</tbody>
</table>

**Plasticity**

- Less than 500 mm annual rainfall – max. 20
- More than 500 mm annual rainfall – max. 12

OR

- Weighted Plasticity Index (PI x % passing 0.425)
  - Max. 500 for low rainfall
  - Max. 250 for high rainfall

**4 day Soaked CBR**

- Minimum 40%

Source: based on NAASRA (1980).
Fines Performance Check

Fines Component Check

- D: Slippery
- A: Erodable
- E: Good
- C: Ravels
- B: Corrugates and Ravels

Grading Coefficient

Shrinkage Product

0 50 100 150 200 250 300 350 400 450 500 550
TMR Type 2 Gravel Grading

**Grading Curve**

- Grading B
- Grading C
- Grading D

% Passing vs. Sieve Size (mm)
TMR Type 2 Gravel Fines Check

Fines Component Check

- **A** Erodable
- **B** Corrugates and Ravels
- **C** Ravels
- **D** Slippery
- **E** Good

Grading Coefficient

Shrinkage Product
About Cassowary Coast Regional Council

- Area of 4,702 square km
- Population of 30,843
- Mix of town, rural and coastal communities
- WET! – average rainfall over 3 metres per year
- 513km unsealed roads
- Approximately 50% of the road network is unsealed
Silvio Road (before)

- 50 vehicles per day
- Type 2 gravel over sand subgrade
- Corrugations and ravelling
- Relatively high maintenance frequency
Silvio Road (construction)

- in-situ (sand): 30%
- crusher run (28mm): 45%
- overburden: 25%
Silvio Road (after)
Stamp Road

Before

After

in-situ (sand+type 2.1) 30% to 75%

type 2.1 25% to 55%

overburden 0% to 20%
Jubilee Road

- 200 vehicles per day
- Steep and winding in parts
- One of Council’s worst performing roads

Before

After
Completed Projects

Hamilton Road  
Sullivan Road

Lily Creek Road  
Meacham Road
Demonstration of Spreadsheet

MP4 Video demonstration of spreadsheet
WMV Video demonstration of spreadsheet
Financial Benefits

Reduction in unsealed road reconstruction costs by 15% to 40% depending on quantity of in-situ material used.

Reduction in maintenance costs by an average of 50% to date.
Other Benefits

- Sustainability – re-use up to 70% existing
- Road user benefits – better ride, improved safety
- Reduced demand on road authorities to upgrade to sealed standard
Issues Encountered

- Material supply (overburden)
- Wet weather
- CBR of blended material
- Community perception
“Please fix the road properly. Now we have a muddy dangerous road which made my Mercedes slip this morning. It was graded yesterday but no gravel replaced. Photo attached”

“Council recently graded my road but did not put any gravel on it. The road is in need of gravel before it rains again and makes the road muddy”

“Road conditions are still bad after grading works have been completed and new gravel laid - there are long stretches of road with no blue metal on it at all”
The Future
Acknowledgements

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