Installation of Geogrid to Improve Forest Roads Construction

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NZ Forest Roads

- Many new roads being constructed, esp. in steep terrain
- Design and construction relies mainly on ‘experience’
- Extensive use of ‘local’ aggregate to keep cost down
- Road failure common problem
- Typical solution is…
NZ Forest Roads

Typical solution is...

- Add more rock / aggregate

2009: Poor grading of aggregates

2010: Poor preparation of subgrade
Design of Forest Road Pavements

- Public ‘engineering’ road standards → most conservative and expensive
- Forest industry typically uses lowest cost ‘fit-for-purpose’ option → acceptance of failure
- Use of improvement products, but performance not well understood → i.e. lime, ash, cement, geocloth, Geogrid

Typical design of a public low-volume road (Sessions, 2007)

Typical design of a forest road (Sessions, 2007)
Research Project

- Can Geogrid improve the strength of forest roads?

- Can Geogrid improve the shape integrity of forest roads?

- Is Geogrid cost-effective for reinforcing forest roads?
Limitations?

- Geogrid is an engineer designed product:
  - Specific aggregate size (40mm) and strength (80 CBR)
  - Reduce depth of material (i.e. from 400 → 200mm)
  - Careful installation…
Experimental Design

Seven sites

Two repetitions per site

Three 25 metre treatments within each trial

Control
Geogrid + Control
Geogrid + reduced aggregate
### Experiment Measurement

- **A**
  - Subgrade and Aggregate Samples
  - Clegg Hammer – subgrade, pre and post-use
  - Cross-section pre and post-use
What is a failed forest road?

- Rutting
- Pot-holes
- Scouring
- Corrugations
- Heaving
Unsealed Road Classification Index (URCI)

- Quantitative measure of road quality developed by US Army Corps of Engineers
- Measurements of observable road defects are recorded
- A series of graphical charts combine to give the road a final score
The Good News…

- Easy to install… 75 kgs 75m rolls, 3.8m wide.

- Also road curves are no great problem…
The Bad News…

- Need to modify ‘common’ forest road construction practice?
  - More consistent subgrade preparation
  - Even spread of aggregate
Results: Clegg Hammer

- Stat. sig. (but small) strength improvement ‘Geogrid’ vs ‘Control’
  - split-plot design & site variation very high

- No difference between ‘Geogrid’ vs ‘Geogrid + reduced Aggregate’
  - no cost-benefit can be established
Results: URCI

- Before
- After

- No significant difference – to be retested after longer use
Geogrid Conclusion

- Easy to lay down, but difficult to ‘install’ correctly
- Has shown potential to improve forest road strength
- Cost-benefit not established
- Further work required to understand subgrade, aggregate and installation factors → where it will work