Takitimu Drive (SH2) Hi-Lab Pavement Rehabilitation Trial

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REAAA Young Presenters Competition 2013
Introduction – What is Hi-Lab

• Hi-Lab is constructed from coarse graded, large stone aggregate incorporating low cement contents.
• Pavement strength is derived by larger stones interlocking and having direct stone on stone contact.
• Stones are held in place by a slurry of cement and fines that coat the larger stones.
• Being introduced by Gerhard van Blerk at NZTA.
Background of Trial Site

- The trial site was constructed on Taktitimu Drive SH2 RS151 in the northbound lanes only.

- It is the main route to the Port of Tauranga from the north with a traffic volume of 11,782 vpd in the northbound lanes with 7% heavies.

- Was constructed in 2002 and then reconstructed in 2005, with cement stabilised M/4 basecourse.

- Since 2010 there have been a series of structural asphalt pavements constructed on Takitimu Drive.

- Trial was undertaken to have a comparison between performance of Hi-Lab and structural asphalt pavements.
Construction Process

- Placement
- Stabilisation
- Levelling/Grading
- Compaction
- Spreading of PAP 7/fines
Pavement Design

Hi-Lab pavement design used on the trial site,

- 25mm Open Graded Porous Asphalt
- 50mm Mix 20 Asphalt
- 180mm Hi-Lab 40 with 3% cement

Existing Sub-base

Pavement design and construction was based on NZTA’s Hi-Lab Pilot Specification.
Hi-Lab 40 Grading Curves

Hi-Lab, due to its coarse grading, is particularly vulnerable to segregation, therefore critical to minimise the handling of the material.
Construction and Challenges

Initial Placement

- Issues with trucks getting struck if placed too deep, essentially driving on marbles.
- Bottom dumpers are preferable to tip dumpers to spread material.
- Care not to deliver extra material to site that will need to be graded off.
Construction and Challenges
Construction and Challenges

Stabilisation

– Cement is added at 3% of dry mass of aggregate and water content is adjusted during stabilisation.
– Aim is to achieve a slurry of fines and cement coating the larger stones.
Construction and Challenges

Levelling after stabilisation a single sweeping pass with a grader. Imperative to minimise handling to reduce risk of segregation.
Construction and Challenges

Compaction

- Initial compaction by three to five passes of pad foot roller to knead the stones so that they interlock.
- Primary compaction by five to seven passes of steel drum roller.
Construction and Challenges

- Spreading of PAP 7 to ‘choke’ surface
  - Found to have better results if applied directly after compaction of stabilised Hi-Lab.
  - Sooner the PAP 7 is spread the faster and more completely the fines will react with the cement in the Hi-Lab.
  - Traffic can run over the Hi-Lab once PAP 7 has been applied.
Completed Hi-Lab Surface
Performance vs Structural Asphalt

• FWD testing was carried out after construction on the Hi-Lab and adjacent SAC pavements, two months after construction.

• $d_0$ deflections are more variable on the Hi-Lab but are over a similar range to the SAC pavement.

  • Hi-Lab – $d_0$ range 0.219mm to 0.518mm
  • SAC – $d_0$ range 0.218mm to 0.440mm

• Expectation that the Hi-Lab pavement will gain strength over time as the cement continues to cure.

• The same depth of Hi-Lab was 55% cheaper than placing the same depth of structural asphalt in the adjacent rehabilitation.
Performance vs Structural Asphalt

**d0 Deflections Between SAC and Hi-Lab Pavements**
Conclusion

- Hi-Lab does have potential in being a cost effective treatment for pavements with high traffic loading.

- Care needs to be taken during construction particularly to reduce the risk of segregation.

- Construction crews new to Hi-Lab need to be supervised to handle the material correctly.
Questions?