INVESTIGATION OF TONKIN, REID HIGHWAY& KWINANA FREEWAY TRIAL SECTIONS

Review of the design procedures for unbound granular pavements with thin asphalt surfacings

WARRIP investigated the better-than-expected performance exhibited by the trial sections, which were originally designed to fail within two years. However, these are still performing up to 35 years later without any major overlays or rehabilitation

Background

With the continuing performance not only of these trial pavements, but also of the majority of metropolitan granular pavements, Main Roads proposed further investigation of the better-than-expected performance.

The aim is to reduce conservatism within the current pavement design procedure for granular pavements with thin asphalt surfacings, and in-turn, improve value-for-money outcomes.

Approach

- Review of design pavement profile and assumptions
- Review of subsurface and climatic conditions
- Review of construction data
- Review post-construction monitoring
- Traffic history
- Review of performance data, including historic Benkelman beam (BB), falling weight deflectometer (FWD), and roughness and rutting data.

Further to the data review, field investigations of Tonkin and Reid Highway was undertaken to confirm the pavement profile, collect samples for laboratory testing and conduct FWD testing.

Following the data analysis, a review of the current design procedures outlined by Main Roads *Engineering Road Note 9* (Main Roads 2013) and Austroads *Guide to Pavement Technology Part 2: Pavement Structural Design* (Austroads 2012) was undertaken.

Data Review

For each trial section, the cumulative traffic loading was compared to the allowable traffic loading predicted by the current design method. It was determined that for all trial sections the cumulative traffic loadings were greater than the predicted fatigue lives.

This disparity between the measured and allowable traffic suggests that all sections should be showing signs of fatigue cracking. However, this has not been observed at either the Tonkin Highway, Reid Highway or Kwinana Freeway trial sites.

Field Investigations

In situ base, subbase and subgrade moduli were back-calculated from measured surface deflections. The moduli of the sand subgrade exceeded 150 MPa which is larger than the allowed maximum of 120 MPa, stipulated by ERN9. In addition, the moduli of the limestone subbase was greater than the currently assumed 250 MPa.

These findings indicate that presumptive moduli and the current method of elastic characterisation is needed to more appropriately reflect the structural contribution of the sand subgrade and limestone subbase to the fatigue performance of thin asphalt surfacings.

Such a change to the elastic characterisation may enable the use of these cost-effective granular pavements in place of more expensive full depth asphalt pavements

TONKIN HIGHWAY GRANULAR PROFILE AND SUBGRADE SURFACE

Source: ARRB 2016.

Observations were based on three separate trial locations with varying designs, traffic levels, conditions, age and specification conformance.

All have shown similar performance trends throughout their service life.

Conduct further investigation through analysis of other sections of road to verify observations.

FUTURE CONSIDERATIONS

The allowance of granular pavements with thin asphalt surfacing to be used in heavier traffic scenarios in place of full depth asphalt pavements.

Amendments to the ERN9 design methods need to be developed which better reflect the structural contribution of crushed limestone subbase.

Refinement of the presumptive sand subgrade moduli to reflect strength qualities available in Perth.

References

Austroads 2012, *Guide to pavement technology: part 2: pavement structural design*, 3rd, edn, AGPT02-12, prepared by G Jameson, Austroads, Sydney, NSW.

Main Roads 2013, *Engineering road note 9: procedure for the design of road pavements*, Main Roads, Perth, WA.