

# Lessons to be learned from 15-year-old second-coat seals and reseals

Full report: [www.nzta.govt.nz/resources/research/reports/612](http://www.nzta.govt.nz/resources/research/reports/612)

## Factors effecting seal longevity

**Research has sought to identify the reasons why some seals and reseals have very long lives. The aim was to pinpoint factors that could economically be applied in future resealing contracts, in order to reduce the whole-of-life costs of chipsealing and pavement maintenance.**

The study by Opus Research found seal lifespan was most influenced by the seal design, the quality of the workmanship at time of construction, and the properties of the materials used, such as the bitumen and aggregate, and the underlying pavement.

In particular, long-life seals are more likely to:

- be a single-coat seal
- have a large chip size
- use a 180/200 penetration grade bitumen
- be located on roads with average daily traffic (ADT) of less than 2,000 vehicles
- be based on a good quality, strong, durable, well-drained pavement
- be located in areas where the demand for skid resistance is lower.

Another variable found to have a significant influence on the lifespan of a reseal was the quality of the reseal at the time it was laid: longer life reseals generally showed an aggregate mosaic that was flat and tightly packed, suggesting good workmanship during construction.

Kym Neaylon of Opus Research says, 'Our research found that long seal lives relate to a specific treatment selection (single coat) on a sound well-drained pavement with traffic less than 2,000 ADT. To obtain longer lives in future work, it will be vitally important to repeat this good quality workmanship in seal construction.'

'However, to extend long-life seals to roads with traffic volumes greater than 2,000 ADT will require more than repeating the best practices from the past, and possibly a quantum change in practices. This is of particular importance if traffic volumes continue to grow, resulting in more and more roads carrying volumes greater than 2,000 ADT. It is also important if the percentage of heavy commercial vehicles grows, as these are known to be hard on seal lives.'

### Providing value for money

The *Government policy statement on land transport 2015/16 – 2024/25* establishes that transport infrastructure and services must provide value for money.

The current research came about as a result of the identification of a number of second-coat seals

and reseals in various parts of New Zealand that were 15 years old or more. There was an obvious opportunity to improve value for money in the procurement of road maintenance services if more seals, reseals and renewals could be engineered to have these extended lives.

The research looked at findings from the international and national literature on seal life, and compared the factors that emerged from this review with the data in the New Zealand road asset management database (RAMM), backed up by site inspections.

The RAMM database was interrogated to extract details of all chipseals 15 years old or more. In total, 930 lengths of chipseal were identified, totalling 780km. The database did not indicate what type of condition these older seals were in, though, which was the function of the site visits.

This process confirmed the factors that contributed to long seal life identified in the literature (namely chip size, low traffic volumes and attention to detail at the time of construction) were valid in the New Zealand context.

### A closer look at the factors

The research report examines in detail the factors that emerged as the most significant, and makes recommendations for how they should be incorporated in resealing projects in the future. These included the following findings (among others).

- Chip size and treatment selection – chipseals that used larger sized chips tended to last longer. One possible explanation for this may be that the larger sealing chips require a larger bitumen application rate, which in turn leads to a greater bitumen film thickness. As the bitumen ages (through exposure to air and sunlight), a greater proportion of the bitumen remains un-aged, and thus the bitumen can last longer.
- Treatment selection – the research agreed with the findings of other recent New Zealand research that had found single seals were significantly over-represented, and two-coat seals significantly under-represented, among long-life seals, compared with the national average.

- Binder type – although seals with penetration grade 180/200 bitumen were over-represented among older seals, it was not possible to conclude softer binders give longer lives. In practice, long-life seals were found to contain a range of binders.
- Traffic volumes – findings in the literature that seals subject to lower traffic loadings tended to last longer were borne out in the research.
- Timing – most of the long-life seals had been constructed between November and March. The research found it is important to lay chipseals in summer, as the air and pavement temperatures are higher, so the bituminous binder stays warmer, enabling the chip particles to re-orient sooner. Sealing in summer also means less cutter is required, which is desirable as seals that include large amounts of cutter tend to flush and bleed.

Another interesting finding of the report is, contrary to what might be expected, climatic factors had negligible impact on the longevity of seals. The research team had expected areas with low air and pavement temperature, low rainfall and

low sunshine hours would be more favourable for seal life, as these conditions would minimise bitumen aging. The data showed otherwise, however, with long-life seals found equally in high or low pavement temperatures, in wider as much as in narrower temperature extremes, in high and low rainfall areas, and in high or low sunshine hours.

#### **Focus on quality**

A main finding of the report was: 'A pre-requisite for a long-life seal is a good quality pavement'. This relates to both the quality of the workmanship and quality or appropriateness of the treatment selection and seal design. Data about these factors is not held in the RAMM database, and could not be examined within the scope of the research project.

However, the report acknowledges the Transport Agency's recently implemented Quality Right, No Defects Project will be important for embedding a quality culture within the roading industry. The report recommends the momentum gained from the project should be maintained by extending expectations for on-site quality management to sealing operations, as well as pavement construction.