NZ Guide to Pavement Evaluation and Treatment Design

Rehabilitation guide

NZ TRANSPORT AGENCY WAKA KOTAHI

New Zealand Government

Speakers

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NZ Guide to Pavement Evaluation and Treatment Design

- The Guide replaces the Rehabilitation Design chapter of the New Zealand Supplement to *Austroads*.
- Provides information on evaluating a pavement and designing a suitable pavement rehabilitation treatment.
- This Guide should be read in conjunction with the Guide to Pavement Technology Part 5: Pavement Evaluation and Treatment Design (Austroads 2011).

Learning outcomes

- Awareness of the two new guides
- Knowledge of the significant changes to the design approach for pavements in terms of:
  - Risk
  - Site investigations
  - Characterisation of material performance
  - Foamed bitumen design

Background

- In 2007 the NZ supplement to Austroads Pavement Structural Design was released
- Intent was to create a separate rehabilitation supplement
- The New Zealand Guide to Pavement Evaluation and Treatment Design has been written after extensive consultation with industry
- Incorporates the technical developments, relating to pavement design and construction, of the last 16 years.

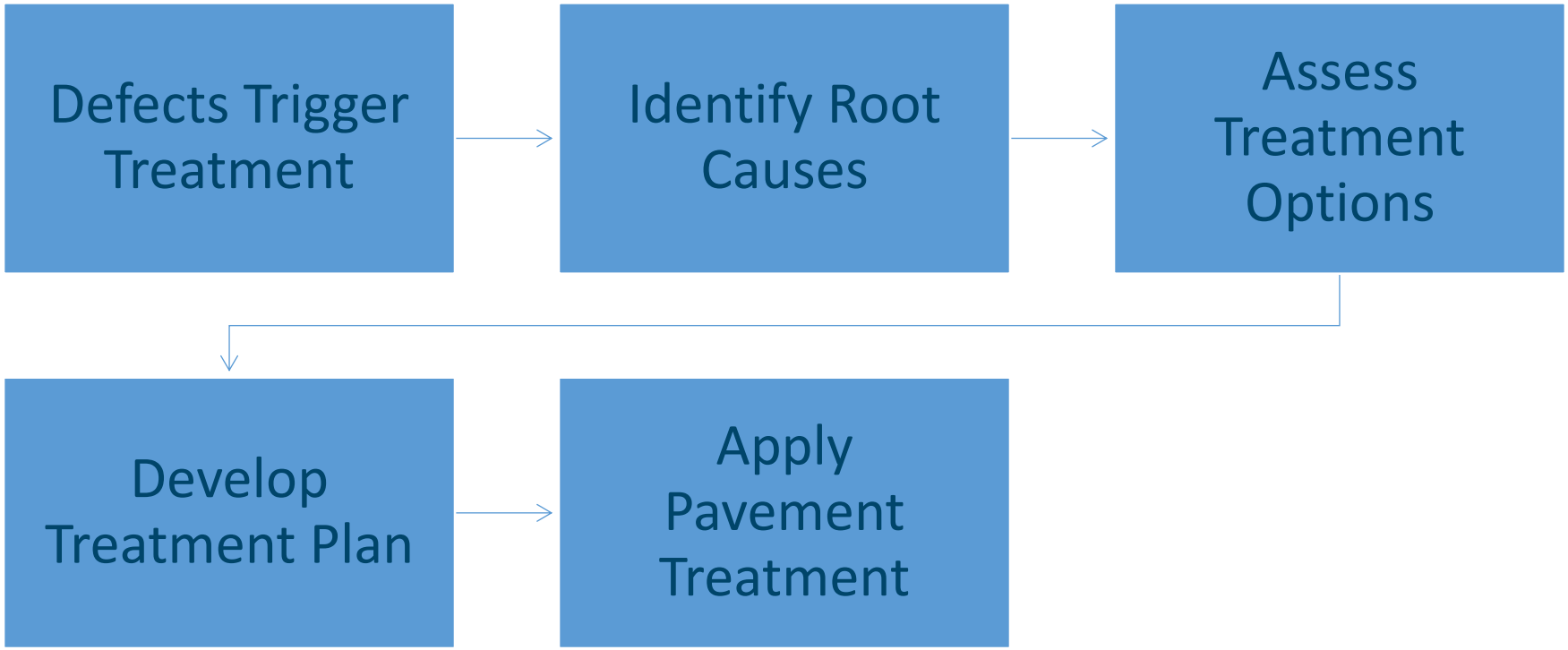
Background

- The guide is prescriptive in regards to levels of investigations and documents the levels of risk that are considered acceptable for the various One Network Road Classifications.
- The anticipated improvement in pavement performance will result in decreased costs for the Transport Agency or Local Authorities who adopt the guide as well as reduced interruptions for Customers during their journeys.

Cost implications

- Feedback indicated that the cost implications are primarily in testing
- More expensive construction options are appropriate considering risks
  - This approach was supported by Agency senior leadership

The Renewal Process



Construction based risk design

Risk = Probability of failure × Consequence of failure

Probability of failure should equal the defined project reliability*

Consequence of failure is higher on high volume roads due to disruptions and increased pavement costs.

$$Probability\ of\ failure = \frac{(100 - Project\ Reliability)}{100}$$

Project reliability as a function of road classification

Road Classification	Project Reliability (%)
National (high volume)	97.5
National	95
Regional or Arterial	90
Primary Collector or Secondary Collector	90
Access and Access (low volume)	80

Risk of pavement rehabilitation against traffic volume

25 year design traffic volume (ESAs)	Less than 5×10^6	Between 5×10^6 and 1×10^7	Between 1×10^7 to 5×10^7	Greater than 5×10^7
Continuously Reinforced Concrete Pavement	**Unlikely to be economic**	**Unlikely to be economic**	**Unlikely to be economic**	**Low risk**
Structural Asphalt	**Unlikely to be economic**	**Unlikely to be economic**	**Low risk**	**Low risk**
Modified aggregate overlay basecourse and bound subbase	**Unlikely to be economic**	**Low risk**	**Low risk**	**Medium risk**
Foamed bitumen basecourse	**Low risk**	**Low risk**	**Low risk**	**Medium risk**
Modified aggregate base only	**Low risk**	**Low risk**	**Medium risk**	**High risk**
Unbound aggregate overlay	**Low risk**	**Medium risk**	**High risk**	**High risk**

NPTG

National Pavements Technical Group

- Industry group of selected technical specialists
- Produced specifications B/5, B/6, B/7, B/8, and draft B/9
- Comment to NZTA on draft *NZ Guide to Pavement Evaluation and Treatment Design*
- Advisor to NZTA on request, e.g. Claycrete, Concrete Roads

Pavements: Managing Risk

Risk = Probability of failure x consequences of failure

Failure

- Consequences major on heavily trafficked roads – more materials, more traffic disruption
- Consequences may be minor on lightly trafficked roads
- Reliability factor

Manage risk by lower risk pavement types on busier roads

Managing Risk

Unbound Aggregate Basecourse

- NZ Guide; traffic up to 5 x 10^6 ESA
- M/4 allows a range of aggregate properties
- Aggregate held together only by interlock and suction
- Degree of saturation < 80%
- If get damp → Rut

  → Shear
- But Austroads indicates thin asphalt life only 10^5 ESA

Austroads Fig 8.4 up to 10^8 ESA, requires strong subgrade, quality aggregate, excellent drainage, wide lanes, shakedown.

Managing Risk

Modified Basecourse

- Modified with low % of lime / cement
- Reduced plasticity of clay in basecourse
- Some bonding of aggregate particles so strength increase
- Probably reduced permeability
- Some tolerance to moisture
- Reduced rutting or shoving
- Improved support for asphalt

Managing Risk

Modified Basecourse, Bound Subbase

- Low % lime / cement in basecourse, higher % cement (e.g. ≥ 4%) in subbase
- Likely will achieve high compaction in basecourse, so,
- Improved support for asphalt
- Maybe attractive option over weak subgrades, but,
  - Must achieve compaction subbase – construction platform under?
  - ≤ 2 hours mix until compact
- Some tolerance of moisture, but,
  - Likely permeability reversal so MUST have waterproof surfacing

Managing Risk

Foamed Bitumen Basecourse

- Cement for early stability, bitumen for strength later
- Usually about 1% cement, 3% bitumen - but test
- Requires basecourse aggregate with PI ≤ 10% and 5%-20% passing 75 µm
- Must have layer(s) of compacted aggregate beneath
- ≤ 2 hours mix until compact
- Low permeability
- Reduced moisture sensitivity
- Can traffic prior to surfacing
- Bitumen in basecourse encourages bond to surfacings
- Good support for asphalt

Managing Risk

Structural Asphalt

- Low risk of early failures
- To achieve long life, requires expert specification and excellent construction
- NZ Transport Agency Note #17-01 – *Asphalt at High Stress Locations* requires minimum 125 mm, but must design
- Design to Austroads usually require > 200 mm

Managing Risk

Portland Cement Concrete Pavements

- Offers strong and durable pavements, but,
- Detailing of the design requires expertise
- Offers strength even at end of life

Managing Risk

Construction Quality

- To achieve their design life, all options require knowledge and understanding of the materials

- To achieve their design life, all options require good quality construction