Concrete Roads – better value across the life of a project

An Australian Life Cycle Cost Analysis has found that Concrete Pavements can deliver savings in the order of 25% across the life of a major road project.[1]

PARTIES

Arcadis	Author	• Global infrastructure advisory services • Approved on RMS Professional Services Contract Panel
Aurecon	Independent Verification	
MI Engineering	Cost Inputs	• Approved cost estimator for RMS projects

STUDY FEATURES

TIMING	2017 ANALYSIS
Five Pavement Types	• Plain Concrete Pavement (PCP) • Plain Concrete Pavement, Low Noise Diamond Grooving (LNDG) • Full Depth Asphalt (FDA) • Full Depth Asphalt incorporating EME2 Asphalt (FDE) • Asphalt over Heavily Bound Material (ACH)
Pavement Design Method	• Austroads Guide to Pavement Technology Part 2 - Pavement Structural Design (2012) • RMS Austroads Supplement for Guide to Pavement Technology Part 2: Pavement Structural Design (Version 2.2, 2015)
Maintenance Diaries	• NorthConnex, Sydney, NSW • WestConnex, Sydney, NSW • Pacific Highway, Frederickton to Eungai, NSW • Pacific Highway, Oxley Highway to Kempsey, NSW • Pacific Highway, Tintenbar to Ewingsdale, NSW • Pacific Highway, Woolgoolga to Ballina, NSW
Standardised Road Design	• Heavy Duty Australian interstate highway, 10km dual carriageway, two lanes each way plus shoulders (10m in width)
Design Life	• 40 years (and alternative modelling for 50 years)
Input Costs	• Sourced from MI Engineering, Q3 2017
Present Worth Cost Method	• Austroads Guide to Pavement Technology
Scenarios	• 72 cases each for PCP and PCP LNDG

FINDINGS

The 2017 analysis concluded that Concrete pavements are a lower cost solution with respect to both construction and ongoing maintenance costs when compared with Asphalt alternatives across scenarios modelled.

In fact, Concrete, (including Low Noise Diamond Grooved options) when compared to Full Depth Asphalt, was found to deliver **11-18% saving on construction cost and 43-55% saving on maintenance costs over a 40 year life for common pavement design scenarios.** Over the life cycle of such a project this would result in an overall saving in the order of 25%.[1]

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1. A total of 72 scenarios for PCP and 72 scenarios for PCP LNDG were studied. In one typical scenario, being a standardised greenfield ten kilometre dual carriageway highway, not under live traffic and less than 100 kilometres from its material supply sources the construction cost saving was found to be 18% and the maintenance saving was found to be 54%.

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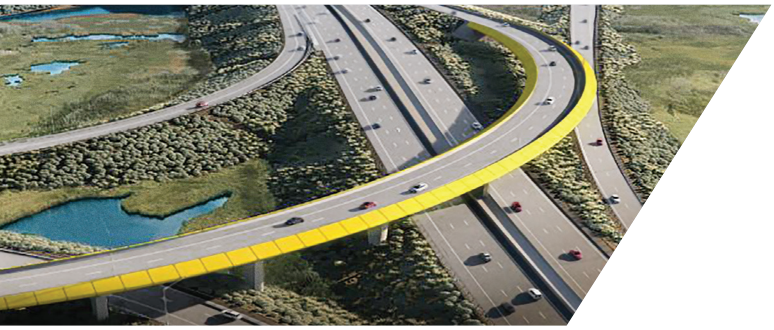
ANALYSIS DATA:

Life Cycle Cost Analysis, Concrete v Asphalt Pavements
Arcadis, 15 November 2017

ROAD DESIGN CONDITIONS:

- Ten kilometre length of Australian Interstate Highway:
- Dual carriageway, two lanes each way plus shoulders
- Designed for a forty year life (plus alternative modelling at fifty years)
- Maintained for forty years (plus alternative at fifty years)
- Salvaged at the end of its life
- Austroads Present Worth of Cost method for comparison.
- Design Subgrade Strength: 3% CBR
- Design Traffic: 8.64 x 107 HVAG (at year 40)



PAVEMENT DESIGN ASSUMPTIONS:

Concrete Options

- Plain Concrete Pavement, 250mm base, over 150mm Lean Mix Concrete subbase (PCP)
- PCP with Low Noise Diamond Grooved surface (LNDG) was incorporated in Appendix D for cost comparative purposes

Asphalt Options

- Full Depth Asphalt (FDA): 50mm SMA14, over 280mm AC20 (C450 binder)
- EME2 Asphalt (FDE): 50mm SMA14, over 220mm AC20 (EME2)
- Asphalt over Heavily Bound Material (ACH): 50mm SMA14, over 125mm AC20 (C450 binder), over 250mm HBM

All pavements have been designed over both a 300mm Selected Material Zone and a 300mm Upper Zone of Formation.

COST DATA:

- All obtained from MI Engineering, an approved cost estimator for RMS projects. Cost inputs were sourced Q3 2017