Bridge access and risk management

Current challenges

Julie Mitchell, A/Chief Operations Officer | Department of Transport and Main Roads
Queensland’s major road network and its economy are linked

• Freight routes on the state controlled road network are an enabler of the Queensland economy.

• Strength and condition of structures on the network cause bottlenecks
  – Impact efficient access
  – Impact the cost of goods.
What does a Road Authority do?

• Access regime that supports economy has been in place for many years
• Industry consistently desires more productivity
  – thus increased access to the network
• Concerns that bridges are over stressed
  – Beyond what is acceptable under current standards
  – But past performance has not raised any alarm bells?
Overview

• Management of safe access
• Structures on Queensland major freight network
• Vehicles on the network
• Current access framework
  – History MCV access
  – Priority Bridge project
• Focus on permit vehicles
  – History indivisible loads
• Is there a problem?
• Challenges
• Overview of the presentations for the rest of today in this stream
Management for safe access

- Solutions are complex, multipronged and must meet several objectives:
  - Efficient freight network
  - Allow safe and equitable access
  - Cost effective management of network
  - Sustainable network management
  - Modern and defensible approach to risk management.
Engineers

• Engineers are aware that being too conservative with access decisions results in a definite impact on the economy
  – constantly pushed to allow more access
• Operating
  – within a risk regime (not within absolutes)
  – under a professional regime that requires them to be reasonable, prudent and protect the public
• Must make decisions that, in hindsight, would be seen as justified
• Obviously they would only actually be viewed in hindsight if there was a failure.
  – So they are always thinking about possible outcomes.
Structures on the network

Culverts

- Major culverts = 4000
- Minor culverts >36000

Bridges

- Approximately 3135 bridges on whole network
Bridges on the major freight network

Total bridges on network 3135

B-Double and Road Train Bridges 2170

Remaining bridges 950

Carry majority of state’s long-distance freight

Still some last kilometre issues
## Bridge stock

<table>
<thead>
<tr>
<th>Era</th>
<th>Bridge Designed for:</th>
<th>% in the Network</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004 +</td>
<td>160 tonne road train</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>1976 - 2004</td>
<td>44 tonne semi</td>
<td>44%</td>
<td></td>
</tr>
<tr>
<td>1953 - 1976</td>
<td>9m, 3-axle truck</td>
<td>30%</td>
<td>H20S16, MS18</td>
</tr>
<tr>
<td>1922 – 1953* (Qld used until 60s)</td>
<td>Tractor with 3 trailers</td>
<td>12%</td>
<td></td>
</tr>
</tbody>
</table>
Queensland’s vehicles

Type I and Type II road trains

Quad

B-double
MCVs Current Access Framework

Bridge Access Formulae

- Codified as Axle Spacing Mass Schedules
- Developed in 1980s
- Assumed no access to calculators and computers
  - Bridges designed to H20S16 (1953) or later (not timber)
  - Simply supported spans < 20 m
  - Continuous spans < 10 m
  - Bridges in good condition
- Poor assumption for bending

Travel freely throughout the network without a permit.
Priority Bridge project – B-double and Road Train routes

Total bridges on Road Train and B Double routes
2170 bridges

The challenge: 1400 bridges have access exceeding design

Bridge assessment project 2014 identified 350 bridges as of right access exceeds capacity
• Currently we have approximately 270 bridges
  - that are carrying as-of-right Multi-combination Vehicle (MCV) loads, which
  - exceed their assessed capacities
  - based on current, accepted assessment methods.
## Priority Bridges – Where and why?

<table>
<thead>
<tr>
<th>Era</th>
<th>B-Double Routes</th>
<th>Type 1 Road Train</th>
<th>Type 2 Road Train</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004 +</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1976 - 2004 (above freight access standard)</td>
<td>13</td>
<td>3</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>1953 - 1976 (benchmark freight access standard)</td>
<td>57</td>
<td>26</td>
<td>16</td>
<td>99</td>
</tr>
<tr>
<td>1922 - 1953 (below freight access standard)</td>
<td>48 (34 timber)</td>
<td>74 (71 timber)</td>
<td>24 (8 timber)</td>
<td>146</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>118</td>
<td>103</td>
<td>46</td>
<td>267</td>
</tr>
</tbody>
</table>
Focus on access for permit vehicles

National Heavy Vehicle Regulator – Notices

• Knowledge of strength
• Move slowly

Industry

• Permit administration
• System not consistent and transparent

Automation of permits for regulation vehicles

• Protect assets
• Similar access
• Current design factors = a lot of rejects
Access Framework for indivisible vehicles under regulation/permit

History of Indivisible Loads

- Developed in 1980s
- Assumed to be infrequent
- Assumed to be well controlled
- No other vehicle on bridge at time
- Overstress allowed based on assumptions
- Increase loads for increase contact widths.
Vehicle Length vs Permitted Mass

Is there a problem?

1. Justification for accepting regime in 1980s no longer valid
2. Regardless of flaws access regime accepted and still in place
3. Cannot afford to upgrade all bridges to meet current design standards over short period of time

Continual overstress may reduce life of bridge significant
Challenges

1. Are we managing risk in a sustainable and justifiable way?
2. Are we getting the best and appropriate use out of our assets?
3. Do we understand our network sufficiently?
4. Does the current access framework meet today’s needs?
5. Are we making the best use of technology?
Today’s presentations

*Rapid, reliable, repeatable assessment of Transport and Main Roads’ bridges*  
(Peter Shaw)

- How do the department’s assessment ratios facilitate the assessment of heavy vehicles?
- An assessment tool that enables individual and network level bridge assessments
- The identification of Priority Bridges for further assessment.
Today’s presentations

Risk management and bridges
(Narelle Dobson)

- Governance
- Bridge condition
- Bridge capacity
- Condition/capacity interface.
Today’s presentations

NZ approach to asset management
(Barry Wright, NZTA)

• Simple bottom up management of the asset
• Condition rating process and the need to ensure we are clear that it is providing value.
• The key indicators of assets and what are they saying about future asset performance and real financial needs.
• Bridges are typically very resilient and forgiving.
Today’s presentations

*Bridge Assessment: An International Perspective*

(Rob Heywood)

- Is the department’s bridge assessment best practice?
- What can be learnt from international practice?
- Is the proposed Operational Parameter philosophy reasonable?
Today’s presentations

Value for money bridging in NZ
(Barry Wright, NZTA)

• Value for money and balancing risk against cost.
• Documentation of the do nothing and improvement options as a good basis for decision making
• Departures from normal standards can be appropriate.
• It is critical to understand the real risks, their causes and consequences.
Today’s presentations

Closing the plausibility gap: A case study
(Peter Shaw and Rob Heywood)

• How sensitive are assessment outcomes to the proposed Operational Parameters?
  - Prestressed concrete girder bridge
  - Sample of Priority Bridges

• Are the proposed Operational Parameters reasonable?
Panel session

- Rob Heywood
- Peter Shaw
- Narelle Dobson
- Barry Wright