

AUSTRALIAN PERSPECTIVE

Bridge & Vehicle Monitoring

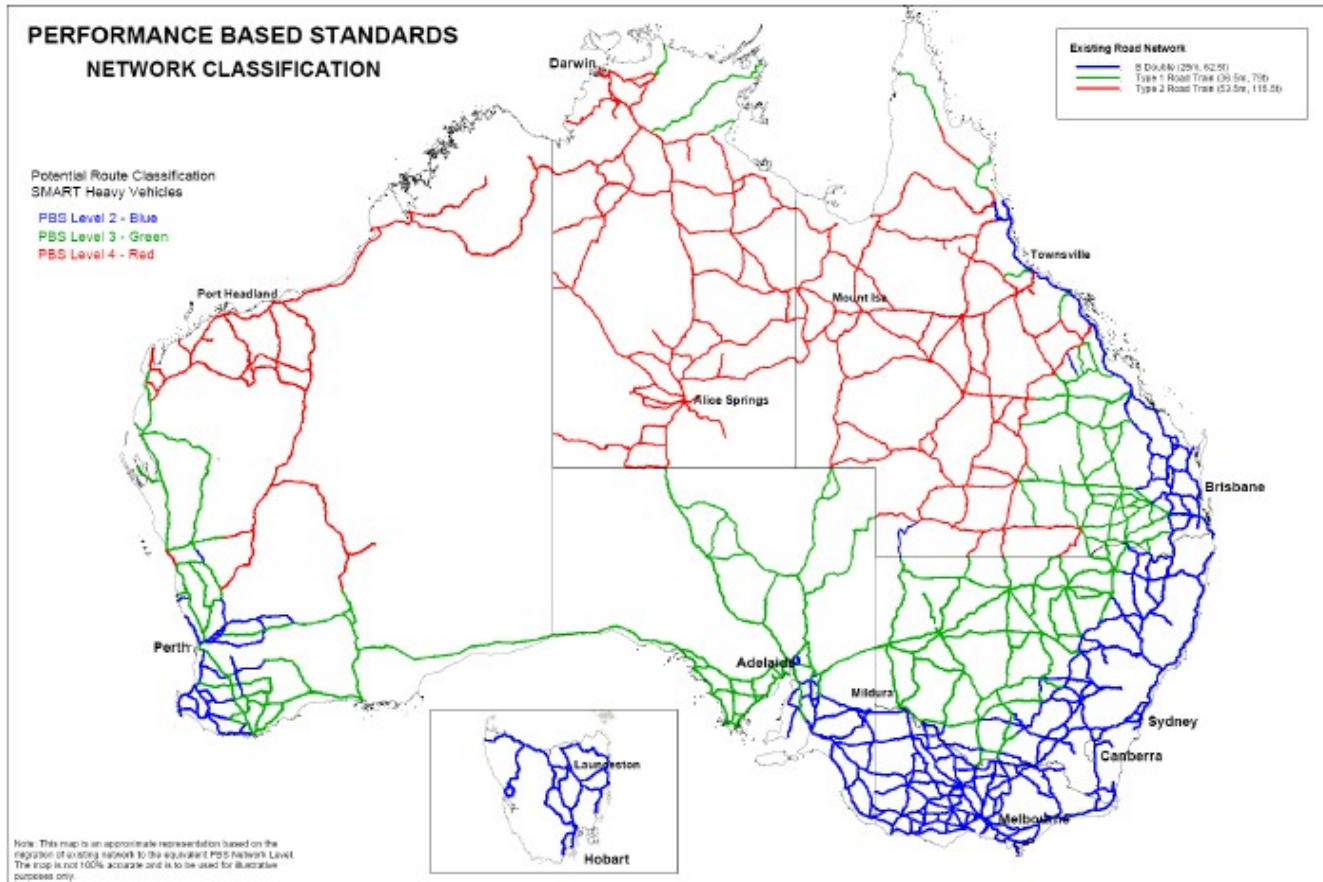
Geoff Bouilly VicRoad / Austroads



UK BRIDGE OWNERS FORUM
September 2009

AUSTRALIAN BRIDGES

PBS Road Mapping Classification



37000 bridges in Australia
17000 bridges in NZ

- 1 per 22 km
- 1 per 5 km

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Significant bridges



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Bridge Inspection Systems

General

- Manuals based on USA Pontis system
- Common approach by all states
- State specific bridge types, components and environments
- Applicable to bridges and other road related structures – signs, mast, retaining walls and similar

Level 1

- Undertaken as part of routine road and bridge maintenance
- Undertaken after specific incidents – flood, fire, earthquake, accident

Level 2

- Visual inspection and with standardised reporting
- Undertaken by prequalified bridge inspectors

Level 3

- Undertaken by experienced bridge engineer
- Field inspection and testing
- Theoretical analysis
- Complex bridges – bridge specific inspection, monitoring and maintenance systems
- Heritage bridges – bridge specific requirements
- **Results** held in **Bridge Information Systems** and used for **Bridge Asset Management**
- **Bridge Condition Rating** influences maintenance priorities and funding

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Theoretical Assessment

General

- Ultimate limit state live load factors
- Serviceability limit states
- Fatigue assessment
- Material properties and allowing for condition deterioration

Freight Vehicles

- Increasing mass and number
- Overloading - potential failure of components
- Repeated loading - potential fatigue damage in steel and concrete bridges

Special Purpose Vehicles

- Increasing number
- Overloading still an issue – counterweights on cranes

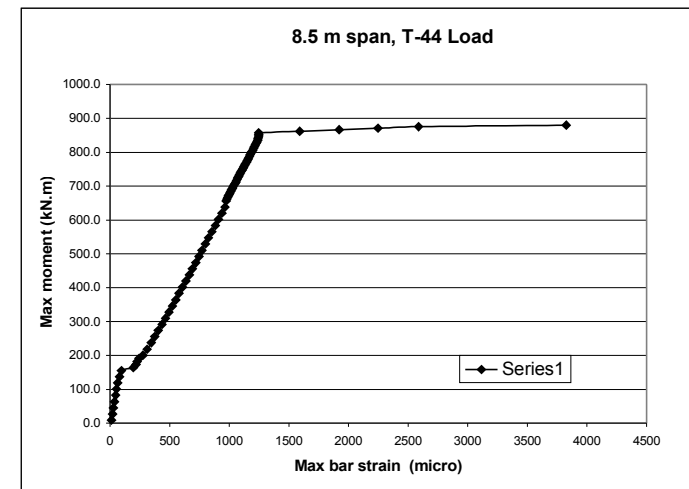
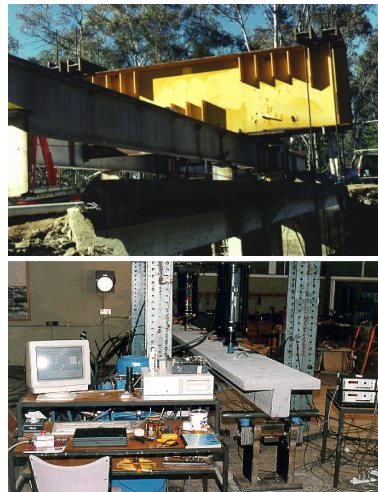
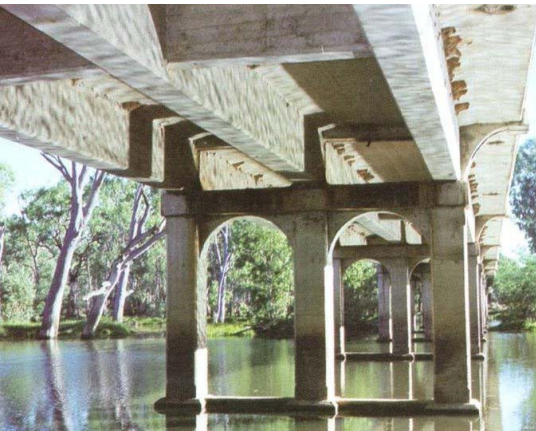
Indivisible Heavy Loads

- Mass measurement
- Allowable stresses

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Load Testing & Monitoring

- Ultimate load capacity
 - Linear elastic behaviour
 - Measured strains
- Calibration of computer models
- Load distribution
- Dynamic response
- Monitor bridge inspections



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Monitoring Inspections



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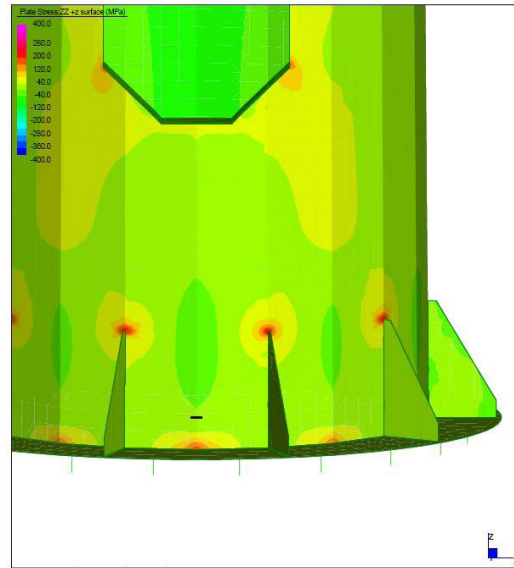
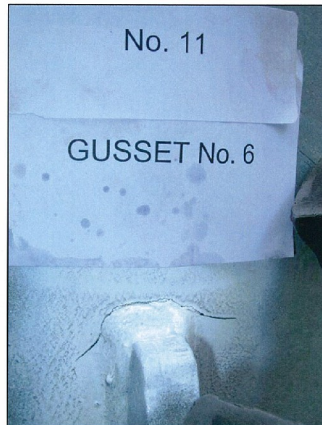
Cantilever, Gantry & High Mast Structures

Retaining Walls & Noise Walls



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High Mast Lighting Structures



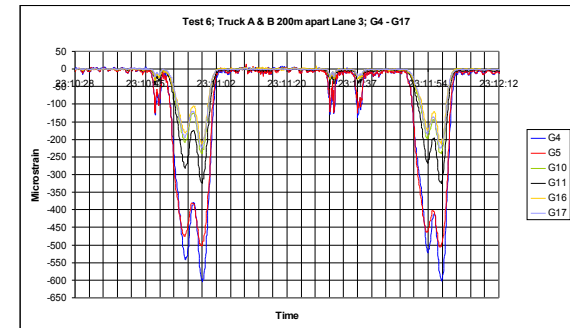
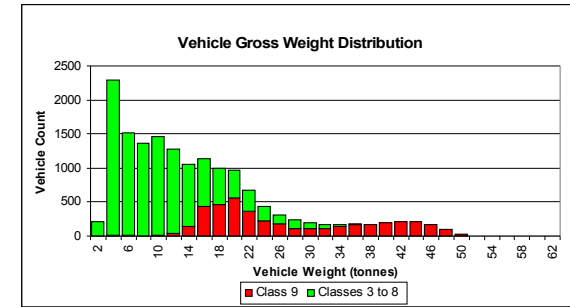
Defects

Analysis

Retrofit Strengthening

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Inspection & Monitoring - Structure & Traffic



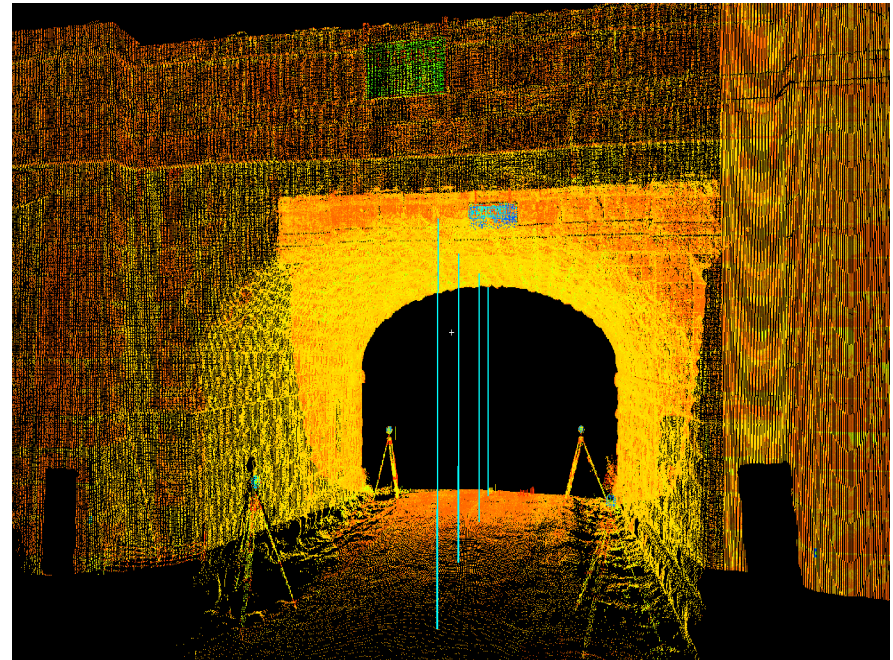
- On bridge weigh-in-motion system
- Traffic loop detection
- Health monitoring and testing

- Visual inspection
- NDT inspection

BRIDGE SURVEY & MONITORING

Laser scanning – Cloud map generation

- 3D models
- Monitor movements periodically
- Monitor movements during load testing



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Vehicle and Freight Monitoring & Management

Weigh-in-motion systems

- Vehicle type and mass data
- Freight data
- Current and future trends
- Enforcement – linked to cameras

Mass Management

- Self regulation – QA systems, weigh-bridges
- On-board weighing systems
- Audits by surveillance officers

Intelligent Access Programs

- GPS tracking over permit specified routes
- On-board weighing
- Weigh-in-motion audits

AXLE DYNAMIC LOADING MEASUREMENT



Measuring Heavy Vehicle Wheel Loads Dynamically

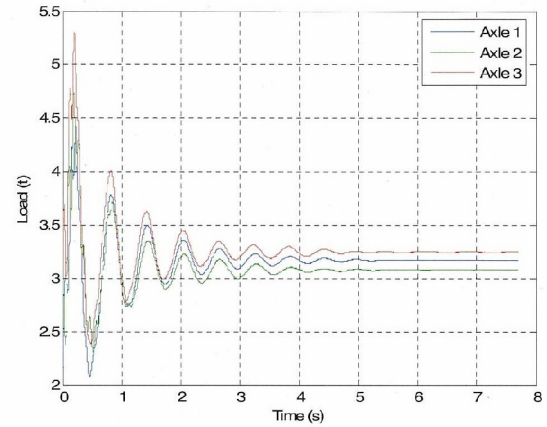


Figure 5.8: Drop test result for air suspension with axle 2 shock absorbers removed

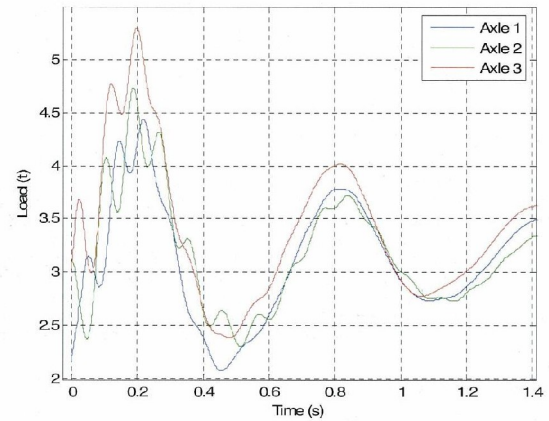


Figure 5.9: Drop test result for air suspension with axle 2 shock absorbers removed (expanded)