Designing for Increased Traffic Loading

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AUSTRALIAN BRIDGES
Road Mapping Classification
AUSTRALIAN BRIDGES

Freight Movement

*Modal shares by net tonne kilometres

Source: BTRE Information sheet 22: Freight between Australian capital cities 1972-2001; BTRE staff paper, Predicting traffic growth in Australian cities, 2004
AUSTRALIAN BRIDGES
Freight Movement

• Freight task increasing at about 4% compound p.a. on major routes for past decade
• Important networks linking interstate cities, ports, rail terminals and industry hubs
• Continual trend towards heavier and longer vehicles
• SM1600 capacity for new bridges provides for volume limit on almost 60% vehicles
AUSTRALIAN BRIDGES
Traffic Live Load Design Standards

Pre – 1950
Individual states varied
Generally 15t tractor +/- or 1.5t/m udl

1950 – 1976
AASHTO HS20-44 / MS18 - 33t semi-trailer or 1.25t/m udl

1976 -2000
T44 - 44t semi-trailer or 1.25t/m udl

2000 onwards
SM1600 M1600 moving 160t load
S1600 stationary 160t load
HML Vehicles - Defined networks
(Road friendly suspensions)

Australian B-Doubles
• B-Doubles increased to 11,000 since introduction 18 years ago
• Saving of nearly 7000 semi-trailers
• 70,000 articulated vehicles currently on Australia’s road network
• Estimate increase to about 100,000 by 2020 without introduction of new vehicles and technologies

Road Trains - Remote Area Networks

45.5t Semi-Trailer

68t B-Double
OTHER COMMERCIAL VEHICLES

Future High Productivity Freight Vehicles

Special Purpose / Permit Vehicles

European Cranes
- Specific networks being developed

110t Super B-Double - currently
Ports of Melbourne & Sydney

Quarry road train – Darwin Port

Heavy Load Platform Indivisible Loads
e.g. 600t transformer Individual trip assessment
BRIDGE CONSTRUCTION
Design Standards

Design for Durability
• Design standards
• Materials supply
• Construction methods
• Bridge hardware durability and replacement – integral bridges

Design for Work Place Safety
• Construction
• Inspection
• Maintenance
BRIDGE CONSTRUCTION
Construction Standards

Quality Assurance
• Systems
• Surveillance & audits

Different Types of Contract Delivery
• Informed purchaser
• Appropriate planning
• Appropriate tender period
• Effective delivery

Construction Issues

Traffic Management & Emergency Bridging
• Staging operations
• Rapid forms of construction
  • Rapid deck construction
  • Rail over road bridges jacked in sideways
• Temporary bridging
• Temporary barriers
BRIDGE CONSTRUCTION
Typical Bridges
Bridge Strengthening & Widening

Improved Traffic Capacity and Road Safety
• Widening
• Improved alignments
• Upgrading bridge and bridge approach barriers

Increased Load Capacity for Heavier Vehicles
• Strengthening of existing bridges
• Widening and strengthening existing bridges

Reduced Maintenance
• Eliminate expansion joints and bearings
  • Concrete overlays – continuous decks on precast beams
  • Integral bridges
CONCRETE SEGMENTAL BOX GIRDER

- Connections
  - strength
  - durability
- Compatibility
- Strengthening existing structure
REINFORCED CONCRETE BEAM BRIDGE

- Multiple widening
- Different design capacities
- Capacity Rating
  - Freight vehicles
  - Heavy load platforms
SUPER-TEE BEAM BRIDGE

- New infill section
- Existing structure
HAUNCHED STEEL GIRDERS – DROP IN SPAN
1960s bridge

- Increase strength & width
- Load test, theoretical assessment & design
- MS18 to 75% SM1600 - use by 110t super BDbls
- Reduce maintenance & risk
- Eliminate expansion joints
- Eliminate pins / monitor fatigue
- Adjust articulation
- Widen to retain architecture