



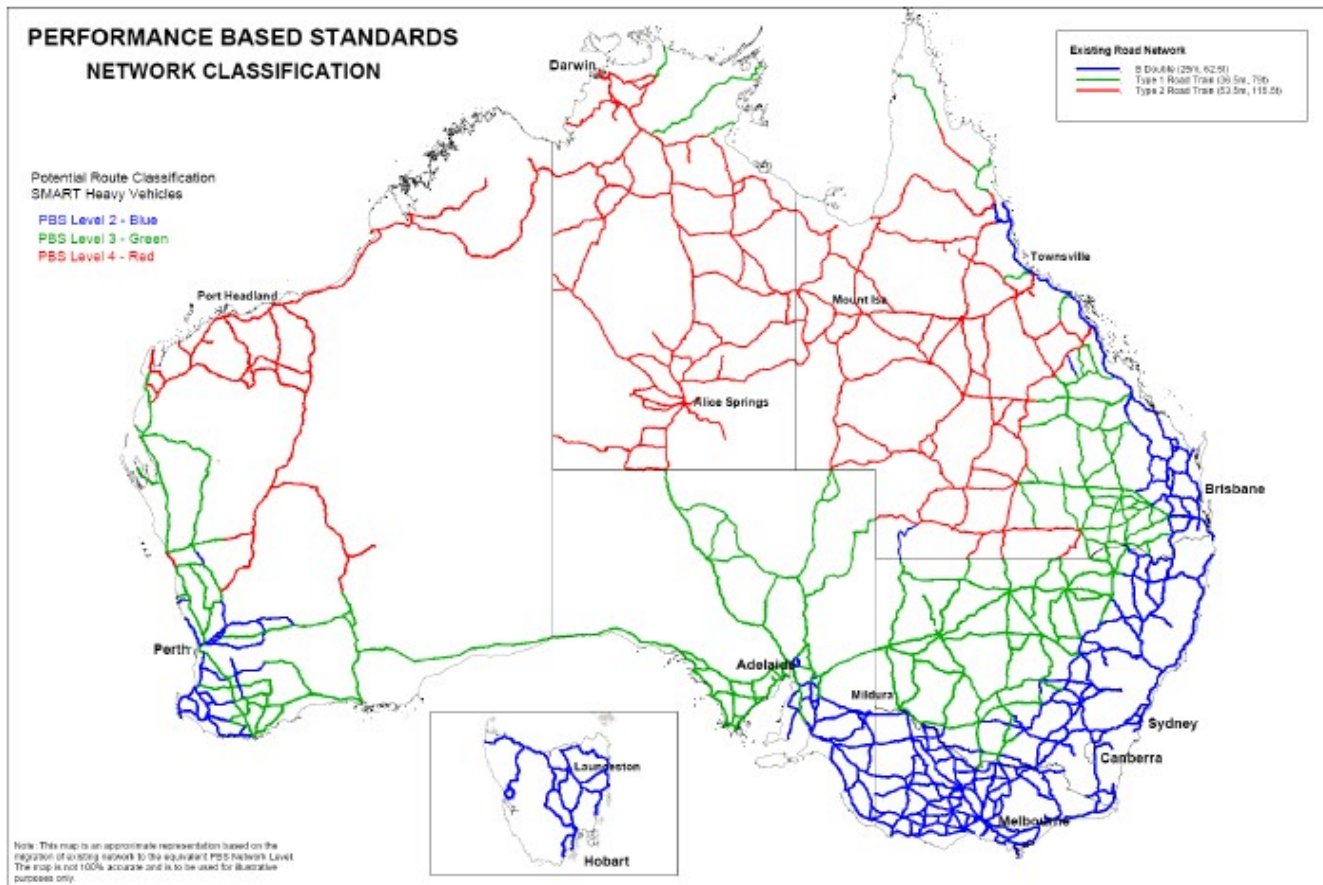
Designing for Increased Traffic Loading

Geoff Bouilly - Australia



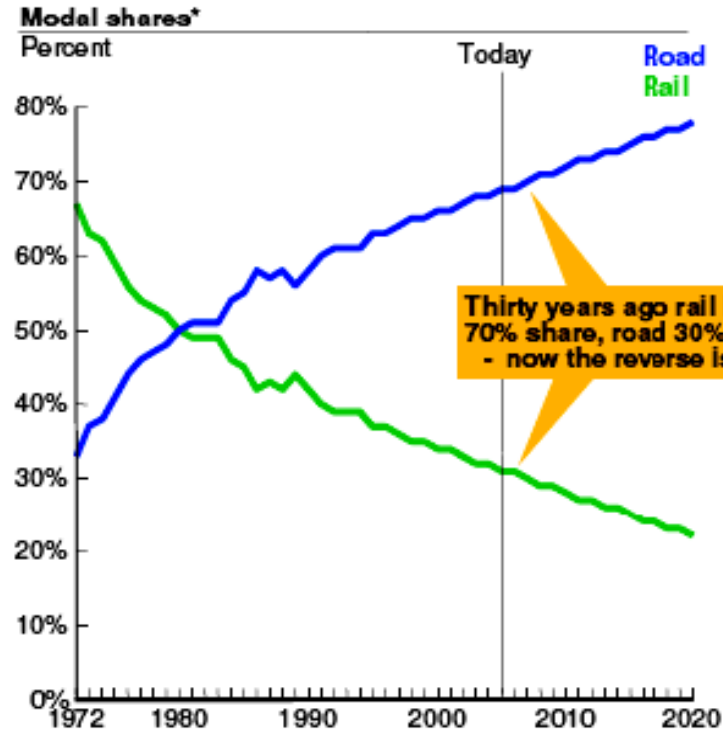
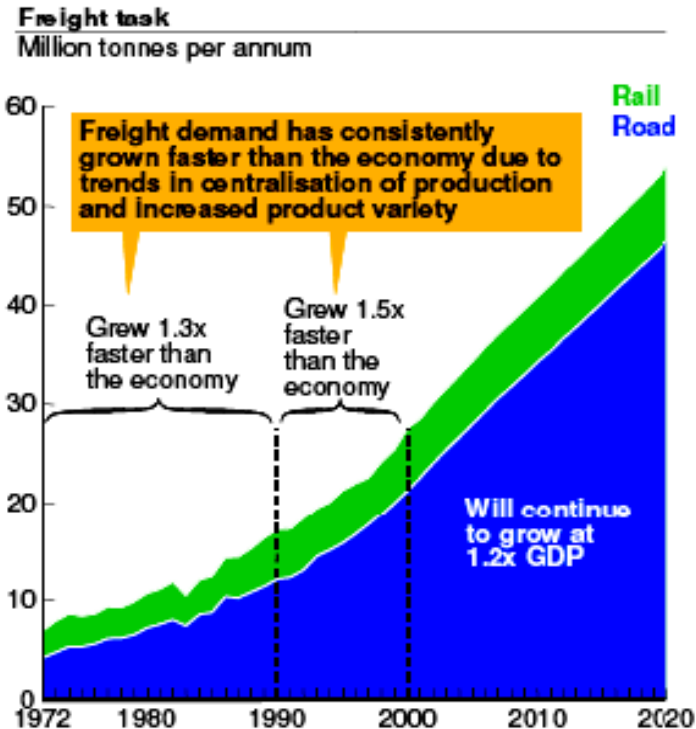
AUSTRALIAN BRIDGES

Road Mapping Classification



AUSTRALIAN BRIDGES

Freight Movement



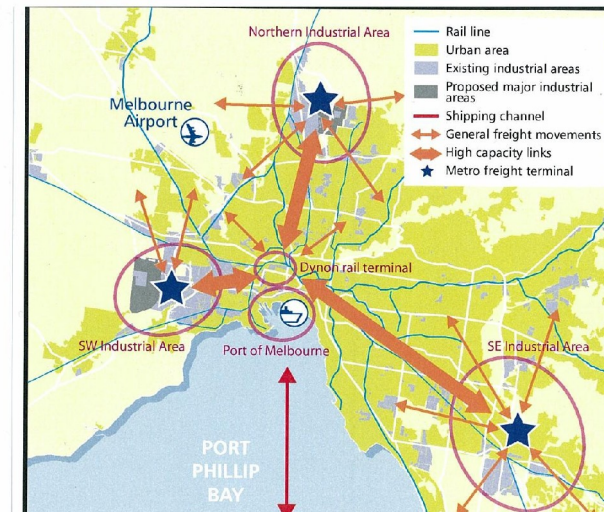
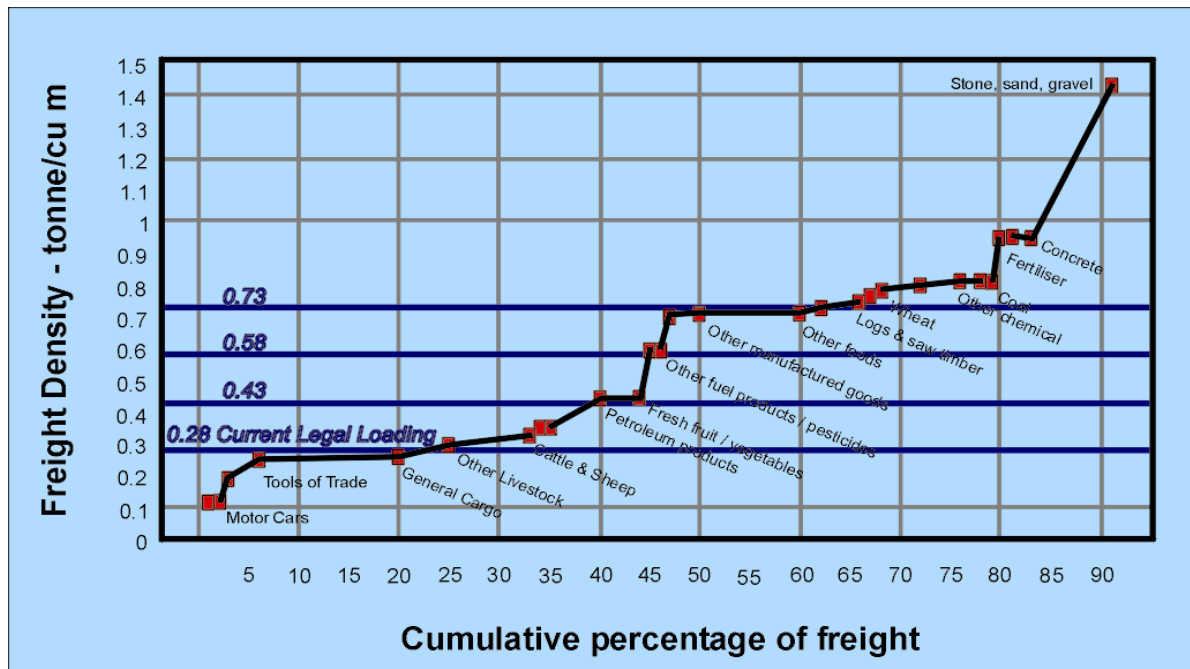
* Modal shares by net tonne kilometres

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



Melbourne Port Area

AUSTRALIAN BRIDGES

Traffic Live Load Design Standards

Pre – 1950

Individual states varied

Generally 15t tractor +/- 1.5t/m udl



1950 – 1976

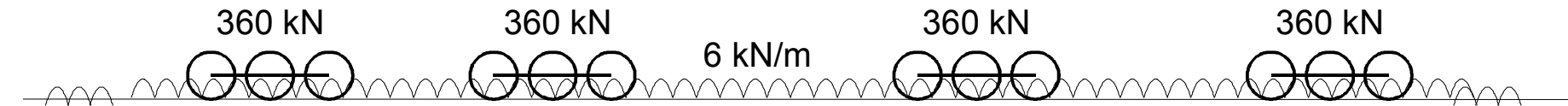
AASHTO HS20-44 / MS18 - 33t semi-trailer or 1.25t/m udl

1976 -2000

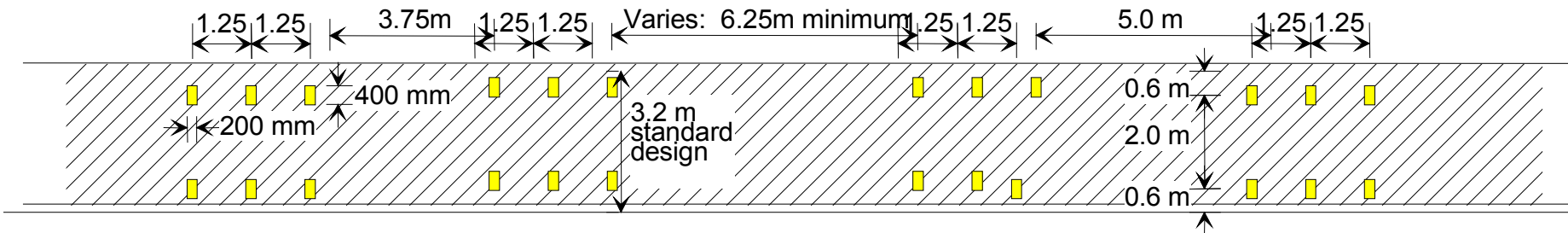
T44 - 44t semi-trailer or 1.25t/m udl

2000 onwards

SM1600	M1600	moving 160t load
	S1600	stationary 160t load

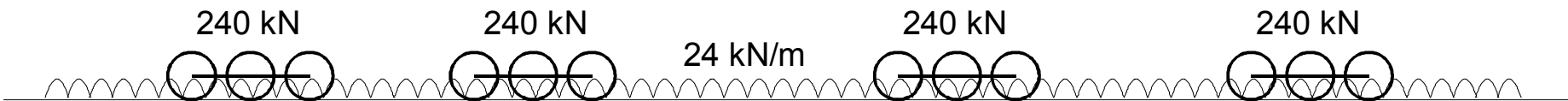


ELEVATION

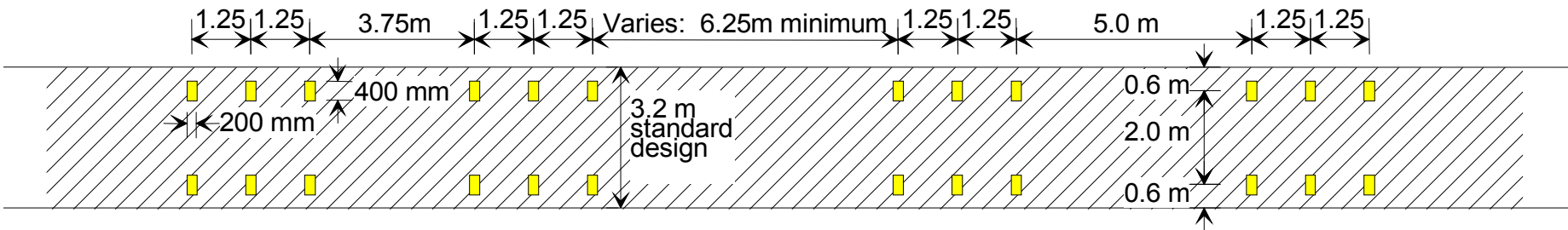


PLAN

M 1600



ELEVATION



PLAN

S 1600

HML Vehicles - Defined networks (Road friendly suspensions)



45.5t Semi-Trailer



68t B-Double

Road Trains - Remote Area Networks



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

HIGH PRODUCTIVITY FREIGHT VEHICLES

SMART
SOLUTIONS FOR AUSTRALIAN ROAD TRANSPORT

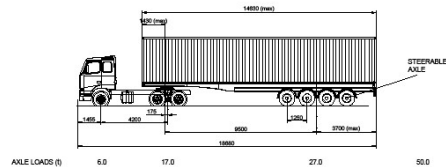


Blueprint quad axle semi-trailer specifications

This document provides specifications for a quad axle semi-trailer combination that is deemed to satisfy the Level 1 Performance Based Standards requirements set out in the ATC-approved national policy on quad axle groups (ATC 08/78(N)). Vehicles meeting this specification must also satisfy the conditions specified in the policy document.

Unless otherwise specified in the conditions below, the vehicle combination must have the dimensions shown in Figure 1 (± 10 mm), and is limited to the axle loads shown in Figure 1.

Figure 1: Baseline quad axle semi-trailer dimensions and loads



- Loading**
- Loading type is general freight or containerised freight.
 - Load may be mixed or constant density. If mixed density, heavy freight must be loaded on the bottom and light freight on top.
 - Under an agreed Australian Transport Council reform, a steer axle load of 6.5 t is allowed for heavy vehicles featuring the latest safety equipment and Euro 4 engine technology.

- Brakes**
- One of the following conditions must be satisfied:
- full brake compatibility and load proportioning on all axles and all vehicle units; or
 - an acceptable form of ABS/EB and automatic slack adjusters on all vehicle units; or
 - an acceptable form of ABS/EB and automatic slack adjusters on a prime mover and full brake compatibility and load proportioning on all trailer axles.

www.ntc.gov.au



50t Quad Axle Semi-Trailers

SMART
SOLUTIONS FOR AUSTRALIAN ROAD TRANSPORT

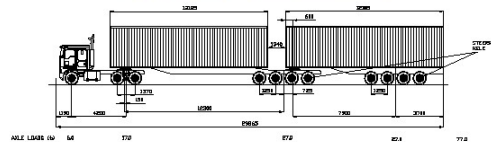


Blueprint quad-quad B-double specifications

This document provides specifications for a quad axle B-double combination that is deemed to satisfy the Level 3 Performance Based Standards requirements set out in the ATC-approved national policy on quad axle groups (ATC 08/78(N)). Vehicles meeting this specification must also satisfy the conditions specified in the policy document.

Unless otherwise specified in the conditions below, the vehicle combination must have the dimensions shown in Figure 1 (± 10 mm), and is limited to the axle loads shown in Figure 1.

Figure 1: Baseline quad-quad B-double dimensions and loads



- Loading**
- Loading type is containerised freight.
 - Load may be mixed or constant density. If mixed density, heavy freight must be loaded on the bottom and light freight on top.
 - Under an agreed Australian Transport Council reform, a steer axle load of 6.5 t is allowed for heavy vehicles featuring the latest safety equipment and Euro 4 engine technology.

- Brakes**
- One of the following conditions must be satisfied:
- full brake compatibility and load proportioning on all axles and all vehicle units; or
 - an acceptable form of ABS/EB and automatic slack adjusters on all vehicle units; or
 - an acceptable form of ABS/EB and automatic slack adjusters on a prime mover and full brake compatibility and load proportioning on all trailer axles.

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77.5t Quad Axle B-Doubles

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SOLUTIONS FOR AUSTRALIAN ROAD TRANSPORT

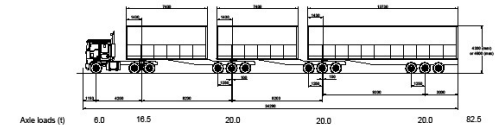


Blueprint B-triple specification sheet

This document provides specifications for a B-triple that is deemed to satisfy Level 3 Performance Based Standards requirements.

Unless otherwise specified in the conditions below, the vehicle combination must have the dimensions shown in Figure 1 (± 10 mm), and is limited to the axle loads shown in Figure 1.

Figure 1: Baseline B-triple dimensions and loads



- Loading**
- General Mass Limits (as per Figure 1).
 - Loading type is general freight.
 - Load may be mixed or constant density. If mixed density, heavy freight must be loaded on the bottom and light freight on top.
 - Under an agreed Australian Transport Council reform, a steer axle load of 6.5 t is allowed for heavy vehicles featuring the latest safety equipment and Euro 4 engine technology.

- Brakes**
- One of the following conditions must be satisfied:
- full brake compatibility and load proportioning on all axles and all component vehicles; or
 - an acceptable form of ABS/EB and automatic slack adjusters on all component vehicles; or
 - an acceptable form of ABS/EB and automatic slack adjusters on a prime mover and full brake compatibility and load proportioning on all trailer axles.

- Tyres**
- Must use either 11R22.5 or 205/60R22.5 tyres, at the manufacturer's recommended inflation pressures.

www.ntc.gov.au



82.5t & 90.5t B-Triples



OTHER COMMERCIAL VEHICLES

Future High Productivity Freight Vehicles



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

Special Purpose / Permit Vehicles



European Cranes
- Specific networks being developed



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 CONSTRUCTION

Bridge Strengthening & Widening

Improved Traffic Capacity and Road Safety

- Widening
- Improved alignments
- Upgrading bridge and bridge approach barriers

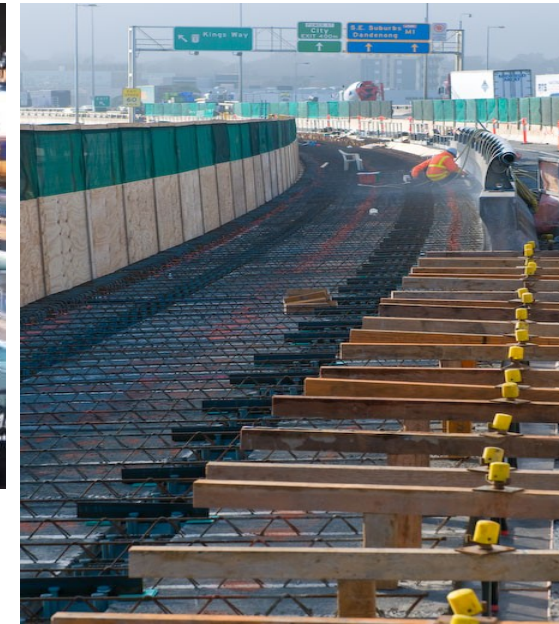
Increased Load Capacity for Heavier Vehicles

- Strengthening of existing bridges
- Widening and strengthening existing bridges

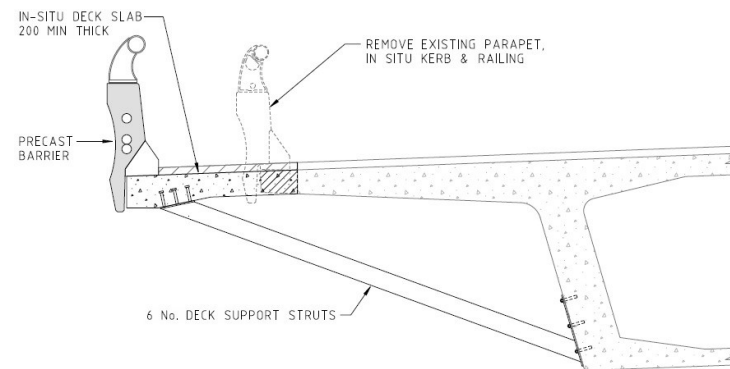
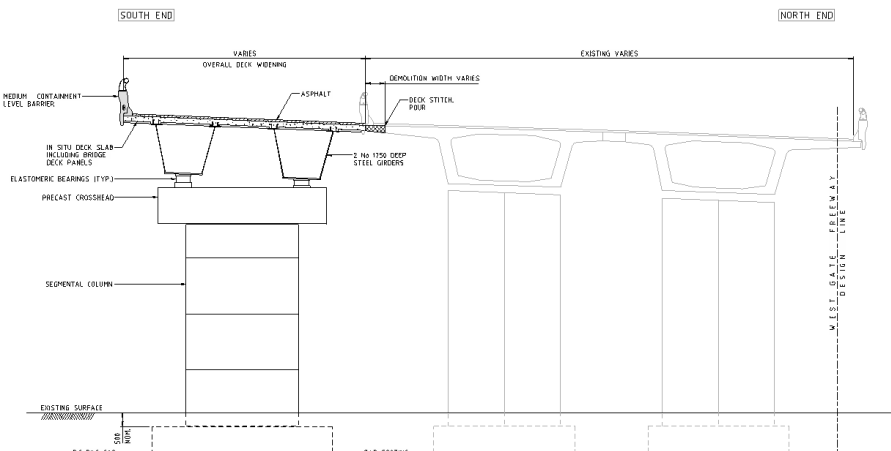
Reduced Maintenance

- Eliminate expansion joints and bearings
 - Concrete overlays – continuous decks on precast beams
 - Integral bridges

CONCRETE SEGMENTAL BOX GIRDER

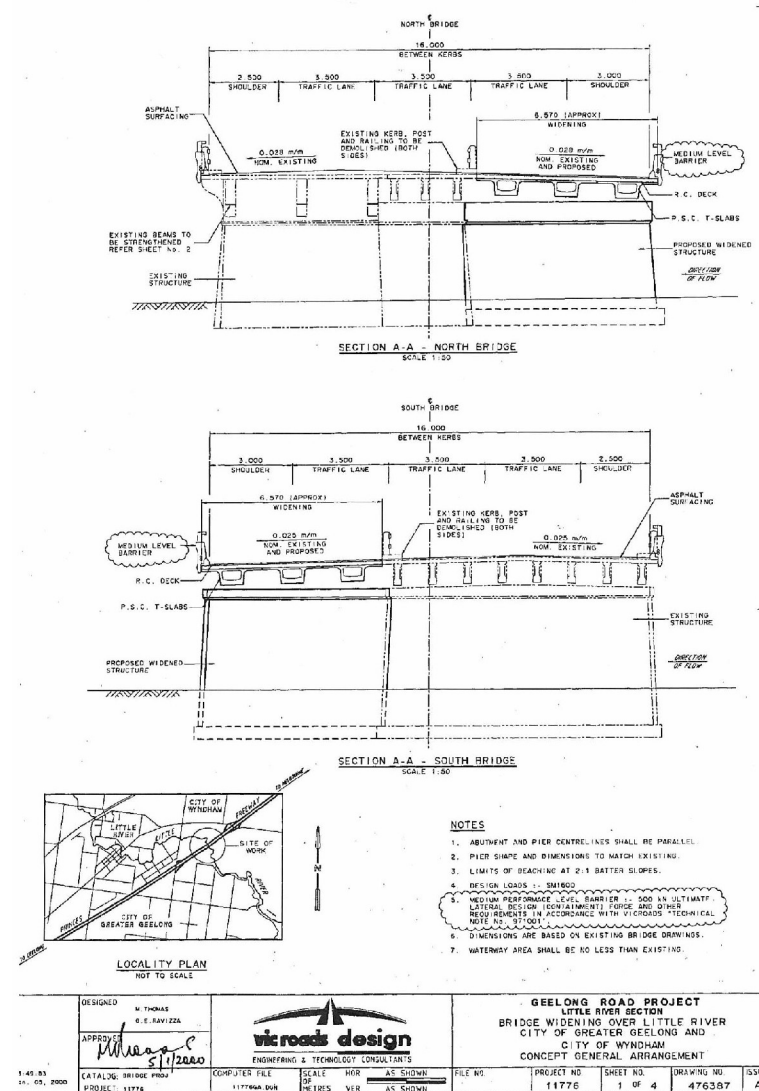


- Connections
 - strength
 - durability
- Compatibility
- Strengthening existing structure



REINFORCED CONCRETE BEAM BRIDGE

- Multiple widening
- Different design capacities
- Capacity Rating
 - Freight vehicles
 - Heavy load platforms

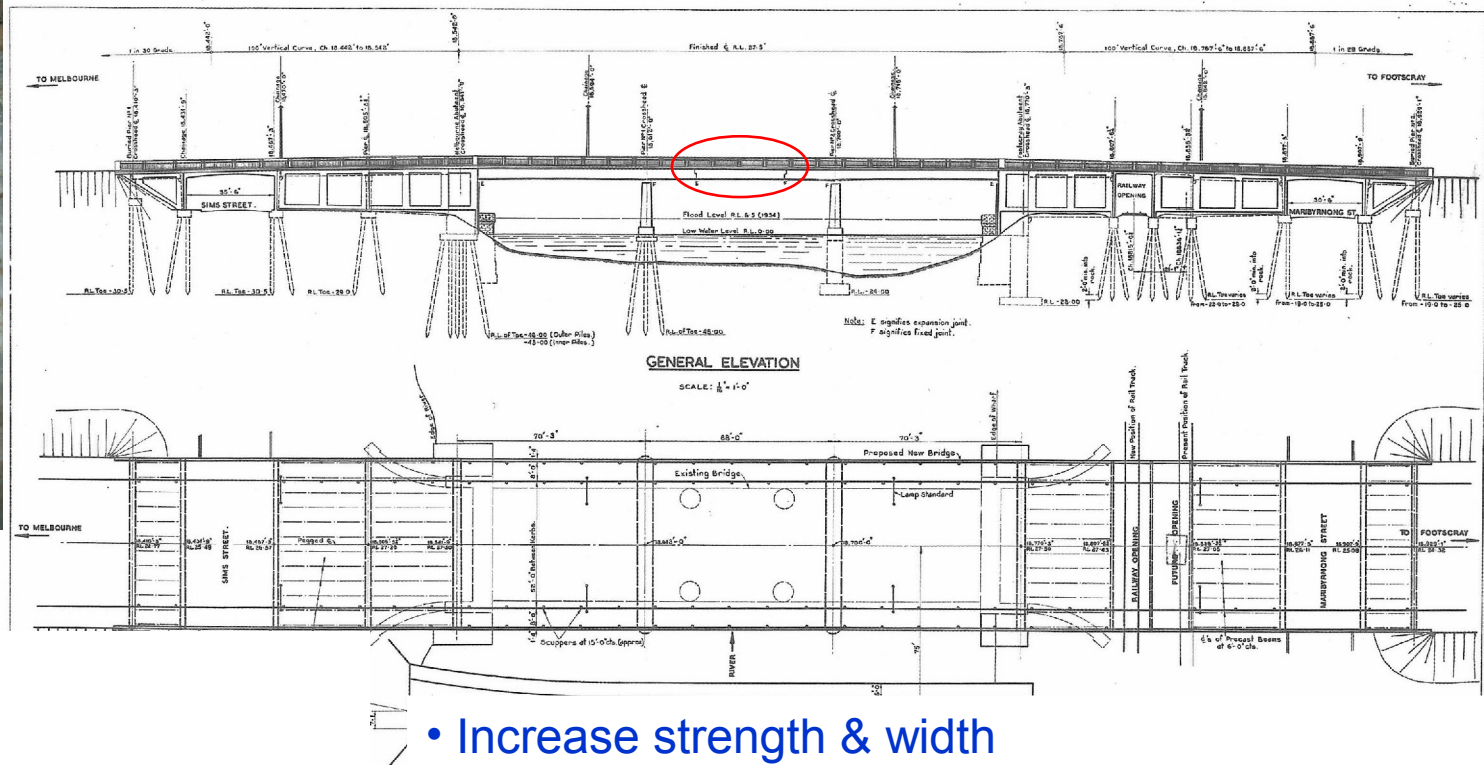


- New infill section
- Existing structure



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