BLACKBURN LEVEL CROSSING REMOVAL PROJECT

8TH AUSTRALIAN SMALL BRIDGES CONFERENCE
BACKGROUND

In 2015 Victoria Labour Government announced to remove 50 dangerous road crossings in Melbourne's metropolitan areas by 2022 years.
BLACKBURN GRADE SEPARATION

End Chainage CH 18750 (From Blackburn Train Station)

Extent of work = 1.45km

End Chainage CH 18750 (To Metropolitan Ave)

1st Level Crossing: Blackburn Road Bridge

2nd Level Crossing: Cottage St Pedestrian Bridge

3rd Level Crossing: Oliver Ave Pedestrian Bridge
Blackburn Road Bridge
Critical Edge to the rail below
## Table 5: Desirable and Absolute Limits for Design Gradients

<table>
<thead>
<tr>
<th>Track Location</th>
<th>Desirable Maximum</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Line (Metropolitan rolling stock only)</td>
<td>1 in 100</td>
<td>1 in 40</td>
</tr>
<tr>
<td>Main Line (Shared use)</td>
<td>1 in 100</td>
<td>1 in 50</td>
</tr>
<tr>
<td>At platforms</td>
<td>1 in 300</td>
<td>1 in 150</td>
</tr>
<tr>
<td>At terminal platforms at end of electrified network</td>
<td>1 in 400</td>
<td>1 in 250</td>
</tr>
<tr>
<td>Sidings</td>
<td>1 in 400</td>
<td>1 in 250</td>
</tr>
</tbody>
</table>
BLACKBURN
GRADE SEPARATION

Cottage Street Pedestrian Bridge Above Rail

2.5%
BLACKBURN
GRADE SEPARATION

Oliver Avenue Pedestrian Bridge
Above Rail

2.5%

1.5 m UN.
Particular attention shall be paid to the trackside faces of these structures in the zones extending to a minimum height of 2400mm above the top of the nearest rail. These faces shall be continuous, free of abrupt changes in direction greater than 10 degrees and free of catch features greater than 25mm. Catch features exceeding this limit shall be protected by 10 degree maximum robust approach surfaces which shall be structurally integrated with the parent wall, as illustrated by the following example.

SOLDIER PILE

SOIL SIDE

SHOTCRETE WALL

10° MAX.
DEFLECTION SURFACES

TRACK

SOLDIER PILE & SHOTCRETE RETAINING WALL
CRASH PROTECTION TREATMENT UP TO 2.4 m ABOVE RAIL
Tender Design – Pile wall with arch shotcrete

- 1050dia bored piles spaced at 2.7m crs
- Fibrecrete as infill panels for quick installation
- No dowelling required between shotcrete and piles
BLACKBURN
PILED RETAINING WALL

Adopted Detailed Design – Pile wall shotcrete infill panels
Construction of the piled wall

**Stage 1**
- Install 1050dia bored piles at 2.7m CRS
- Excavate behind piles to install storm water drain
- Install a 2m deep continuous cut-off wall behind to span across piles

**Stage 2**
- Wait until main rail occo, start excavation in front of the pile for the rail cutting
- Install shotcrete infill panel
- Repeat the above two points until reaching the bottom of excavation
BLACKBURN
PILE RETAINING WALL

KEY STATISTICS
These are just some of the amazing statistics the tell part of the story of the summer works program.

Over 800,000 passenger trips on train-replacement buses
Over 250,000 work hours across the Blackburn site
270,000 tonnes of material removed from the rail corridor at Blackburn
15,000m² of concrete sprayed on the walls of the cutting
5.5km of drainage installed
7.3km of overhead wiring installed
9 community Q&A sessions held in Blackburn
The equivalent of 6 months of works delivered in just 6 weeks
The individual site characteristics such as road geometry, road use, traffic volumes, commercial vehicle, offset distance from hazard have been considered as well as the following design guidelines:

- AS5100.1, VicRoads supplement to Austroads Guide to Road Design (ARGD) Part 6
- QueenslandRail Design Guideline - Design and Selection Criteria for Road/Rail Interface Barriers (MCE-SR-007)

Actual site conditions with operational speed of 60km/h and average commercial vehicle of 800 per day. Medium performance level barrier is considered appropriate.

**Chart-based Level Selection AS5100.1 Appendix B**

- Road Type Factor (RT) = 1.5 (Two-way undivided road type with up to 4 lanes)
- Grade Factor (GD) = 1.0 (Longitudinal gradient less than 2%)
- Curvature Factor (CU) = 1.3 (Radius of curve 670m)
- Under-structure land use factor (US) = 1.5 (High occupancy land use)

**Adjusted AADT** = \( 18150 \times 1.5 \times 1.0 \times 1.3 \times 1.5 \)

\[ = 51,047 \]
• Adjusted AADT = 51,047
• % of Commercial vehicle = 6%
• The chart-based method determined **Regular** performance level barrier is required at this site.
AS 5100.1—2004

AS5100.1 Appendix B

FIGURE B1  BARRIER PERFORMANCE LEVEL SELECTION

Determine initial traffic data and road environment details including AADT, commercial vehicle types and number, road alignment, bridge width and height, under bridge conditions including land use, depth of water, road or rail usage.

Does bridge comply with requirements for No Barrier? (See Clause 10.5.2)

- Yes → No Barrier required
- No

Is the bridge location a potentially medium- to high-risk situation?

- Yes → Perform site-specific risk assessment and benefit-cost analysis
- No

Determine additional information for chart-based level selection including barrier offset, operational speed, road type, gradient and curvature.

- Medium

Calculate "Adjusted AADT = (RT x GD x CU x USI) / AADT"

Determine barrier performance level from Figures B5 to B8.

Is performance level determined from site-specific risk assessment greater than from the charts?

- Yes → Use performance level determined from site-specific risk assessment
- No

Use performance level determined from charts.

FIGURE B1  BARRIER PERFORMANCE LEVEL SELECTION

Medium was adopted
BLACKBURN ROAD BRIDGE

- Early division on all existing utilities 6 months before main rail occupation.
- Minimize the duration of impact to public due to disconnection of services.

300dia Gas Main
12 No 100dia Telstra Conduits
2 No. 100dia Optus Conduits
300dia Water Main
2 No. 150dia United Energy Conduits
BLACKBURN ROAD BRIDGE

- Early division on all existing utilities 6 months before main rail occupation.
- Minimize the duration of impact to public due to disconnection of services.

450 NOM BALLAST
DENSITY = 1600 Kg/m³
Pour a layer of Cement stabilised sand to provide a uniform bearing surface on the underside of the planks.

- Early division on all existing utilities 6 months before main rail occupation.
- Minimize the duration of impact to public due to disconnection of services.

Planks to be supported on jacks temporarily Until the hardening of stabilized sand.
• Early division on all existing utilities 6 months before main rail occupation.
• Minimize the duration of impact to public due to disconnection of services.

Planks to be supported on jacks temporarily
Support the planks

Maintain a 50mm min physical gap to eliminate any load transfer to the abutments
BLACKBURN ROAD BRIDGE

- Early division on all existing utilities 6 months before main rail occupation.
- Minimize the duration of impact to public due to disconnection of services.
BLACKBURN ROAD BRIDGE

Planks to be supported on jacks temporarily

HDPE wrapping all around plank
Level Crossing at Blackburn Road – Existing Condition
BLACKBURN ROAD BRIDGE

- Level Crossing removed
- Rail lowered under Blackburn Road
Thank you for listening.