

NEWSLETTER No 2/2008



Railway Technical Society of Australasia
SA Chapter
Engineering House, Bagot Street
NORTH ADELAIDE SA 5006

February 2008
NEXT MEETING

Next Meeting – 6th March 2008

The next meeting of the RTSA - SA Chapter will be held on **Thursday 6th March 2008** commencing at 5.30pm. The topic of the meeting is:

Level Crossing Accident Strategy

and will be presented by

Tony Simes
Senior Transport Safety Investigator
Australian Transport Safety Bureau



Level crossing accidents are one of the more serious safety issues faced by the rail industry in Australia. In many cases, level crossing accidents result in death or serious injury and generally account for a large proportion of fatalities associated with railway operations. However, the actions of third parties are often contributing factors to level crossing accidents and largely beyond the immediate control of railway organisations.

The presentation will discuss the ATSB's role of investigating level crossing accidents in Australia. A number of significant accidents from the past few years will be discussed, the circumstances leading up to each accident describes and a number of findings explained.

The presentation will also provide a brief discussion regarding the difficulties associated with level crossing safety and summarise some of the safety initiatives currently underway in Australia.

Prior to the meeting, light refreshments will be served.

Continuous Professional Development (CPD)

Engineers Australia members are reminded that attendance at RTSA technical meetings contribute towards CPD requirements. Each RTSA technical meeting generally has a value of 1 CPD point.

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LAST MEETING

The last meeting was a site inspection of the new Port River Rail Bridge.



Photo – View of Participants

A description of the bridge together with some photographs taken during the visit are shown below.

The meeting was attended by 35 members and visitors and George Erdos gave the Vote of Thanks.

Port River Expressway Rail Bridge

John Middleton - Abigroup

Railway Details

Horizontal Alignment

Commencing at the Outer Harbor end, the new work commences to the North of Stirling Street, Birkenhead. The level crossing has been converted to a single track level crossing and a new dual gauge turnout installed just north of Stirling Street to provide a connection to the temporary diversion which will, in the final stage, become the loop line that continues to the north. Just to the south of Stirling Street a new dual gauge turnout is to be installed to connect the existing Rosewater loop to Glanville. In the final configuration this will be form a shunt neck that will also provide derail protection for the bascule bridge.

From Stirling Street the new line continues south on the existing alignment for about 80 metres before entering a right hand curve of 2000m radius (no transition, no superelevation). This is followed by a left hand curve with a radius of 385m (30m transition length and 50mm superelevation) which connects to a 57m length of straight over the bridge lift span.



Photo – View of Outer Harbor Side of Bridge



Photo – View of Participants Inspecting Lift Up Span



Photo – View Port Adelaide Side of Bridge

The track then enters another left hand curve of 385m radius (30m transition length and 50mm superelevation) which ends at the 1 in 8 dual gauge turnout connecting to the west leg of the proposed Port Flat Triangle.

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Photo – View of Port Flat turnout and Expansion Rails

The alignment follows the straight leg of this turnout and then immediately enters a right hand curve of 840m radius (20m transition length and 30mm superelevation). The positioning of this curve has been selected to ensure maximum clearance from the property boundaries in the vicinity of the acid storage tanks. This curve is followed by a 200m long straight. The common rail changeover is located within this straight. The changeover has been designed such that the standard gauge rails remain straight. At the end of this straight the alignment enters a right hand curve of 320m radius (35m transition length and 70mm superelevation) that ends at a new 1 in 8 turnout to be inserted in the existing Port Flat line on the approach to Francis Street. The turnout is placed such that the connection to the East leg of the Port Flat Triangle turns out of the main line.

Vertical Alignment

The rail level required for the underside of the lifting span of the bridge to be 10 metres clear of the Mean Sea Level envelope defines the vertical alignment of the new railway. In addition the design for the vertical alignment of the new work for the Port River Expressway line was complicated by the presence of turnouts on each side of the Stirling Street level crossing and the need for the rail profile across the level crossing to be 100mm above the design profile. The design also ties in to a section of works for the Le Fever which was designed on an incompatible survey grid system.

Just to the north of the turnout on the north side of Stirling Street, the vertical alignment commences with a 0.087% grade that runs through the turnout and then connects vertical curve to a 1.168% grade across the level crossing and through the Rosewater line turnout to a vertical curve that connects into the maximum allowable rising grade of 1 in 70 (1.429%) up to the bascule bridge. At the bascule bridge it passes through a 1450m radius summit vertical curve and then runs down a maximum allowable grade of 1 in 90 through a vertical curve with a 20m length to 0.825% grade.



Photo – View of Vertical Curve on Lift Up Span

The 1 in 90 (1.111%) grade down off the bascule bridge is continued into the western leg of the Port Flat Triangle.

Direct Fixation Track

A direct fixation rail fastening system is used to fix the track over the bridge structures. Two types of fastening used are based on the Pandrol Fastclip 'VIPA' system. The VIPA system comprises dual rail base plates separated vertically by a rubber pad to reduce transfer of rail vibrations into the structure and surrounding ground. The lower base plate is fixed directly to the bridge deck. The rails are fixed to the upper base plate by the 'Fastclip' rail fastening system which fastens the rail to the base plate. In specific locations a "Fastclip ZLR" which is a modified fastclip which, while ensuring

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the rail is held in place ensures Zero Longitudinal Restraint. The two fastening types have been located on the bridge so that the rail and bridge can move independently of each other thus minimising the stresses in both the rail and the bridge deck.



Photo – View of Dual Rail Vipa Fastening System on Fixed Bridge Span

The eastern elevated structure (adjacent to the acid storage tanks) also has Pandrol Fastclip VIPA system base plates. The Pandrol Fastclip VIPA for dual gauge uses a Pandrol 'e' clip between the standard gauge and dual gauge rails. The fixings are placed at 667mm centres.



Photo – View of Dual Rail Vipa Fastening System on Lift Up Bridge Span with Std Gauge Rail To Be Installed

Away from the bridge the track is concrete sleeper track with Pandrol Fastclip fastenings.

Turnouts

The turnout geometry used in the alignment design is consistent with that of the existing (former) South Australian Railways 1 in 8 turnout designs for types 29, 30, 39 and 40 using 47 / 53 kg/m rail.

The new turnout design is based on the 1 in 8 design but is a pivot heel tangential turnout using 50 kg rail. It is noted that the overall turnout dimensions remain the same as for the existing design.

The turnouts incorporate a cast crossing which is explosively hardened before installation.

Common Rail Changeover

A Common Rail Changeover is required on the Port River Expressway line between the Eastern and Western legs of the Triangle. It has been located on a short length of straight adjacent to the Perkins Drive level crossing. The Standard gauge track remains straight through the changeover. However because the track alignment is identified using the broad gauge centre line the centre line has two short horizontal curves at the Changeover to meet this requirement.

The concept design was provided by ARTC, the key features of switch length and operating method were incorporated as givens. A feature of this design was that operation was from one switch machine at one end and operation of the remote end was intended to be by means of three runs of rodding, an actuating run, a locking run and a detection run. The final design adopted a circuit controller for detection device and the third run of rodding was eliminated.

Catch Point

The turnout off the main line connecting into the western leg of Port Flat Triangle has a derail operated by a point machine. The derail prevents movements entering the main line from the western leg of the triangle. To ensure positive derailment away from the acid storage tanks this derail was constructed as a catch point using a set of switch blades from a dual gauge turnout. This will ensure positive derailment if ever required.

The function of the catchpoint is to achieve controlled derailment of wheelsets when required to prevent a shunting movement from conflicting with a main line movement. The blades are orientated to derail a train away from the acid storage tanks.

The dual-gauge catch point uses standard switch and crossing geometry of the AN Type 30 fully mixed gauge turnout design for 47kg AS rail. The principal variation in adapting these assemblies for 50kg AS rail is in the switchblade machining. All heel and spacer blocks are modified to suit the 50kg AS profile.

The entire assembly uses un-canted rails. Three additional cant transition bearers are provided at each end with 1 in 80, 1 in 40 and 1 in 30 canted baseplates.

Continuous guardrails are carried through the catchpoint in alignment with those on adjoining plain dual-gauge track.

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Insulated Rail Joints

The insulated rail joints are located adjacent to the common rail changeover, Port Flat Triangle western leg turnout and the bascule bridge.

Rail Movement Joints

The bridge design requires the provision of four (4) rail movement joints to accommodate the movement of the rails which are different from those of the bridge.

Mitre Joints

Two of the movement joints are for the bascule bridge and incorporate the mitre joint. Mitre joints are a CMI-Promex design which uses a short length of manganese steel profiled to provide a ramp over the gap in the rails. The mitre is bolted to a machined rail web and is located during closure by guide plates that ensure alignment. Vertical closure of the mitre is monitored by proximity switches that are a critical control point in the bridge operating system.

Expansion Joints

Special designs have to be prepared for the other two rail movement joints – one adjacent to the Port Flat turnout on the bridge deck and the other on steel box sections in concrete sleeper track north of the western abutment. The location of the expansion joints was limited to short lengths of tangent track.



Photo – View of Special Rail Components

The expansion joint has been designed as a lapped mitred joint. This was made necessary by the specified movement of ± 200 mm in the joint and the length of track available to locate the joint. The lapped mitred joint provides continuous support for each wheel, irrespective of the state of the joint within its design operating range.

The joint rails are supported and guided by rail guides mounted on canted baseplates. The principal aim in sizing the support elements was to maintain adequate

track stiffness through the discontinuous rails of the joint. The noses of the mitred ends of the joint rails taper at an angle of 1 in 15.

Bascule Bridge Details

The railway bascule superstructure consists of a through steel box-girder superstructure. A through structure is required because of the limited envelope between the top of rail and clearance envelope of the channel. The leaf has two bascule girders. The bascule girders are welded steel box girders 60.5 metres in length with 47.25 metres from bearing to bearing. The girders vary in depth from 2.9 metres in the main span to 4 metres deep through the counterweight.



Photo – View of Bridge



Photo – View of Inside of Lift Up Span

To balance the rail bridge the counterweight is approximately 460 tonnes.

The single leaf bascule for the bridge, rotates about, and is supported by two trunnion shaft assemblies, one mounted in each bascule girder. Each trunnion shaft is simply supported between two plain bronze sleeve bearings. The railway bascule leaf is operated by span drive machinery located beneath the track level. A 75 KW (100 hp) span motor has been sized to operate the span under normal operation through a 384:1 reduction ratio gearbox. The machinery is also equipped with a 18 KW (25 hp) auxiliary motor to be operated by an

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independent electrical supply system for complete redundancy. In the event of an electrical utility a back-up generator is located on site for operating the bridges in accordance with the design.

The railway leaf machinery consists of a primary reducer which is coupled directly to the main pinion shaft. Each main pinion shaft is simply supported between two spherical roller bearings. The main pinions mesh with rack segments (which is the means of span rotation operation) mounted to the bottom flange of the railway bascule girder.

Braking for both bascule spans will be provided by two drum brakes, mounted on the motor shafts. To secure each bascule span in the seated position, lock bars will be driven by machinery mounted at each rest pier to a receiving socket located at the toe of each bascule span. The actuator for each leaf will be remotely operated during normal operation, but will also be equipped with a manual hand crank for emergency operation.

Fixed Bridges

There are three types of fixed bridges - steel box girder with reinforced concrete deck for 60 metre spans over water, prestressed concrete box girders with concrete deck for 40 metre spans for high level bridge over land and prestressed concrete planks with concrete deck for 10 metre spans for low level elevated structure. The bridge sits on reinforced concrete columns which have piled foundations.



Photo – View of Approach Bridge with Steel Box Girder near and Prestressed Concrete Girders in Distance

The bridges are conventional structures with the exceptions that in order to transmit emergency braking forces to the ground, lock up devices (LUD) are fitted to nine piers. The LUD's, typically used in earthquake prone areas, are silicone filled two way pistons that have a small hole to allow movement as a result of temperature changes. However under shock the viscous silicone filler is unable to pass from one side of

the piston to the other, effectively locking the girder to the substructure.



Photo – View of Lock-Up Device

Chairman's Chatter – Duncan McLeod

It is a timely coincidence that the Victorian investigator's report into the tragic level crossing accident at Kerang last June has been released just prior to our Chapter meeting on level crossing accident prevention.

The report observed that the investigation was unable to determine the reasons why the truck driver involved did not heed the level crossing warning devices, which were properly designed and installed, and operating as intended.

The report recommends some improvements to the design of passenger rolling stock, to lessen the consequences of a collision such as the one that occurred at this site. Also, importantly, the report recommends reconsideration of the speed limit for road vehicles at crossings, and the education and reassessment of heavy road vehicle drivers.

It is somewhat incongruous that drivers of trains are subject to much more rigorous health checks, shift duration limitations, training regimes, and performance reassessment, than are drivers of heavy trucks. Would a commonality of driver management standards across the two transport modes have lessened the likelihood of this accident occurring?

Various improvements were made to the crossing before it was re-opened after the accident – boom barriers to supplement the flashing lights, rumble strips on the highway approaching the crossing, automated advanced warning signs, updated warning signage, and a rail level crossing predictor to standardise warning times for approaching trains. All of this on a crossing which had previously been assessed as priority 140 on the Victorian list for safety improvements.

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Surprisingly, the report's recommendations mostly relate to physical aspects, with little involving "human factors", specifically road user behaviour at level crossings. For some reason a "stop" sign at a railway crossing seems to mean something different to the same sign elsewhere on the road network. Flashing red lights are often treated similarly. This appears to be an area deserving of more research and investigation.

It is unfortunate that notwithstanding improvements in crossing safety, and increasing numbers of installations with active protection, the incidence of serious collisions at level crossings does not seem to be diminishing.

Despite public calls for more boom barriers, one wonders that in a situation where the approaching train is visible, the locomotive horn is sounded, the headlight is illuminated, warning road signs are displayed, and flashing lights are flashing, would the addition of boom barriers really prevent a collision which would otherwise occur?

It will be interesting, at our March meeting, to learn of the Australian Transport Safety Bureau's initiatives to reduce the number of collisions at level crossings.

The report on the Kerang incident can be found at www.doi.vic.gov.au/chiefinvestigator

THE OBSERVATION POST – Max Michell

January is not the best time to be writing an editorial – all that cheer and goodwill, outdoor days and a happy social whirl tend to set passionate scribbling back a step or two. So I thought I would provide a description of two longer distance rail journeys I have undertaken this month and leave you to draw your own conclusions.

The first was a quick trip from Melbourne (or Southern Cross as its major station is now known) to Ballarat to observe the practical impact of the recent upgrading program (the RFR upgrade). The 10:05 Down this day was a single Vlocity (DMU) set, which curiously was identified by set number on the train departure board. These cars are set up for middle distance service (70 – 200 km sort of thing) and seem to have plenty of power to cope with the long grades encountered on some RFR routes of which Ballarat is one. Running was to time and the 119 km with several stops and two single line crosses was completed in the scheduled 1h 27m (82 km/h average). The only disruptive note was the overly zealous signalling and TPS that wanted this high performance train to behave like a poorly braked freight train when approaching any restrictive signal – which it did for the crosses and to take the platform loop at one intermediate station. The time penalty imposed by these less than charming features was around 10

minutes. At every stop there were both boarders and leavers indicating a reasonable level of regional travel on this line.

Return on the same train set was all stations (three more stops than on the down), but via the new 'short' track at Bungaree, which was run in 1h 19m (86 km/h average). Two significant deviations (at Parwan and Bungaree, and several curve realignments (Melton, Bacchus Marsh, Ballan, Gordon, Warrenhiep) have provided a route that is at least in keeping with the high performance DMU's that now provide the majority of services on this line. It should be noted that a peak hour express runs a 1 h 4m schedule in both directions, averaging 109 km/h despite the 500 m summit that is encountered on this line. A 40% jump in regional passenger travel immediately following completion of the RFR program is indicative of the value of this integrated project.

The second outing was by XPT to Harden and return. In this case the specific reason for travelling was to observe the effects of diversion via Wollongong – something that was a daily event for three weeks from the beginning of January (the dreaded track work between Glenfield and Campbelltown was the reason for this diversion).

There is a bit of essential background to this one. In summer, starting a year ago, a summer timetable is applied to the XPT on the Southern line to account for those days that have heat related speed restrictions (WOLO conditions). The down daytime XPT moves from a 07.45 departure to 06.58, but still arrives at Melbourne 10 minutes later than normal. The northbound daylight run continues to depart Melbourne at 08.30 but in summer arrives at Sydney at 21.00 instead of 19.55. Overlay a diversion via Wollongong on the summer times and the RailCorp / ARTC altered timetable had the southbound daytime XPT south of Moss Vale around 1h 50m minutes later than the normal summer timetable. Northbound the diversion added 1h 56m to the schedule into Sydney. In a somewhat defeatist move the XPT's were terminated at Albury for the duration and buses run over the 300km Victorian section. The sad part is that the buses were able to maintain the XPT timings. Apparently CountryLink, in some curious sort of denial, still advised the normal summer times south of Moss Vale, so some punters must have been mightily confused.

Back a year or two ago (in Jan 1964 to be precise) a rather younger writer travelled to Wollongong on the 12:10 all stations ('all stations' then meaning everywhere south of Sutherland). Venerable steam loco 3223 (dating from the 1890's) had a load of 242

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tonnes – much the same as the six passenger cars on the latter day XPT. This train did the journey in 2h 15m, while the rather faster steam South Coast Daylight which ran express south of Sutherland was timed at around 1h 30m. Now of course we have the XPT which for this diversion was tabled by RailCorp for a 1h 55m non stop run to Wollongong southbound and 1h 56m northbound. As any even vaguely aware person would gather, a train with 4 times the installed power of the 1964 train, and no intermediate stops, should be able to save a significant amount of time, but RailCorp in their wisdom went for the safe move and put the XPT in both directions behind stopping trains (even though the schedules for those stopping trains were heavily sedated in the last timetable change). So in nearly 45 years it would seem that all the vast sums spent on the South Coast line have actually produced little in the way of faster transit times, although they have given us electric trains at higher frequencies and with air conditioning. Unlike Victoria, there have been no improvements to the alignment, and in fact there have been a number of retrograde steps which have slowed trains down.

XPT motors XP 2003 and 2018 bracketed six refurbished cars on the down. Departure was one minute late at 07:05 (the changed depart time was something else the punters knew nothing of) and by Wollongong we had dropped a further 3 minutes (even the stopper ahead couldn't keep up with its Valium addled schedule) – a stunning average of 42 km/h non stop. Moss Vale was almost two hours late on the 'summer' timetable (and still at 42 km/h average from Sydney) where we collected a couple of busloads of passengers, who had been bussed from Campbelltown and Strathfield only to suffer an extended wait for their hitherto missing train. Beyond Moss Vale running was reasonable but hardly competitive, and I am pleased to advise by Harden the average speed from Sydney had risen to a breathtaking 59 km/h. 3809 on the Melbourne Express in October 1960 achieved exactly the same result, but with a considerably heavier load.

The return train arrived Harden early (it was after all on a WOLO schedule on a non WOLO day), and had a similar experience at Yass Jn, Goulburn and Moss Vale – waiting for the timetable to catch up from behind. The run from there to Wollongong was steady (this line has severe speed limits on the long descent to the coastal plain from Robertson to Unanderra) but due to some quite negligent ARTC timetabling we were 48 minutes early there despite taking a few minutes longer than on the down journey. From there the smell of home must have pervaded the train (and controllers) and we gained 12 more minutes to Waterfall – you guessed it, just in time to be held to follow the local all stations from there. Bi-di signalling and a plethora of by pass loops at Waterfall are totally wasted on this railway – hold the express (even if it is only a three week wonder) for a stopping train with bugger all passengers and a schedule that at that time of night could be reduced cutting the Valium supply to shorten the journey by 10 minutes on its way to Central. Someone must have had a brain explosion at Hurstville, since they diverted us to overtake the stopper such that we arrived 70 minutes early on the 'diverted' schedule, or 45 minutes late on the 'summer' schedule or 1h 50m late on the 'normal' schedule (it was after all a non WOLO day).

As I said at the beginning I will leave you to work this one out on your own, but I can't help feeling that the thing that we are told is one of the most complex systems in the world (an obvious bit of creativity to anyone who has been outside the country) is in reality a system with unduly simple management. It would not be beyond the scope of an old fashioned clerk with a quill and eyeshade to have scheduled this diversion with a modicum of sanity. Why then, with all the computerised widgets and remote controlled what-nots, can't even a half decent result be achieved these days? Draw your own conclusions.

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MEETINGS FOR 2008

Future Speakers/Dates/Topics				
<u>Date</u>	<u>Speaker</u>	<u>Organisation</u>	<u>Topic</u>	<u>Venue</u>
6/03/2008	Tony Simes	ASTB	Level Crossing Accident Strategy	Chapman Hall, ENG AUST, Bagot St North Adelaide
3/04/2008	Gareth Evans	DTEI	Seaford Rail Extension	Chapman Hall, ENG AUST, Bagot St North Adelaide
1/05/2008	TBA	Bombardier	Rail Maintenance Activities in Adelaide	Chapman Hall, ENG AUST, Bagot St North Adelaide
5/6/2008	R Barry	TransAdelaide	Upgrade of Noarlunga and Belair Lines	Adelaide Riviera
3/07/2008	TBA	DTEI	Relocation of Rail Car Depot	Chapman Hall, ENG AUST, Bagot St North Adelaide
12/08/2008	Graham Haywood	United Goninan	92 Class Locomotives	Chapman Hall, ENG AUST, Bagot St North Adelaide
7-10/09/2008		RTSA	CORE2008	Perth WA
2/10/2008	George Erdos	ASTB	Benalla Signalling Accident	TBA – Joint with IRSE and PWI
6/11/2008	TBA		South East Railway Upgrade Project	Chapman Hall, ENG AUST, Bagot St North Adelaide
2/12/2008		RTSA	AGM	

Note: Meeting topics are subject to change. Please refer to future Newsletters for confirmation.

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Articles or editorial comment for Newsletter are very welcome. We have over 100 members locally some of whom will have stories, events or developments of interest that could be reported in Newsletter.

Part of the function of RTSA is to keep members in touch with what is going on in the industry and with each other and to that end we are only too happy to publish items of interest.

Send copy to the Editor, Stephen Townsend at st771048@bigpond.net.au or fax to 08 8297 0992.

Electronic despatch of Newsletter is undertaken by Steve Torok – contact Steve on storok@tge.com.au if you have any problems receiving Newsletter electronically or in hard copy. Note that electronic subscribers will get their Newsletters and flyers as soon as the editorial work is done, while the hard copy mail will of course be some days slower.

For all other matters relating to RTSA SA Chapter contact Duncan McLeod (Chairman) at e-mail dmcleod@aapt.net.au, or by phone on 08 8338 7919.

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