

SOMERSAULT

SEPTEMBER 2012

Vol 35, No 5

SIGNALLING RECORD SOCIETY OF VICTORIA INC



West Tower was closed as a signalbox at the end of July, albeit the name lives on describing a room in Centrol which houses the replacement VDU. This photo dates from August 1968 and shows the then uncommissioned West Tower looming over its predecessor, Dudley St. West Tower was commissioned on 1 December 1968 with a route setting panel on the top floor, and for a while shared operation of Melbourne Yard until Dudley St was closed on 29 December 1968. It is a sobering thought that almost nothing in this picture survives today. Dudley St signalbox and the mechanical signals were removed quick smart, of course, to make way for the hump. The W class and F class diesels and the four wheeled wagons are gone. The, then brand new, concrete bridge was removed when Melbourne Goods Yard was removed for the Docklands redevelopment. Even the goods lines in the foreground have now been removed, to be replaced by the new RRL track. Photo: David Langley

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Published by the Signalling Record Society Victoria Inc (A0024029F)

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MINUTES OF MEETING HELD FRIDAY 20 JULY, 2012,
AT THE SURREY HILLS NEIGHBOURHOOD CENTRE, 1 BEDFORD AVENUE, SURREY HILLS

Present: - Brett Cleak, Glenn Cumming, Graeme Dunn, Steven Dunne, Vance Findlay, Michael Formaini, Ray Gomerski, Judy Gordon, Bill Johnston, David Jones, Chris King, David Langley, Steve Malpass, Colin Rutledge, Andrew Wheatland, Bob Whitehead and Ray Williams.

Apologies: - Wilfrid Brook, Chris Gordon, Keith Lambert, Tom Murray, Greg O'Flynn, Peter Silva, David Stosser, Stuart Turnbull and Andrew Waugh.

The President, Mr. David Langley, took the chair & opened the meeting at 20:11 hours.

Minutes of the May 2012 Meeting: - Accepted as published. Bill Johnston / Graeme Dunn. Carried.

Business Arising: - The item re Metrol should be credited to Andrew Gostling, not Andrew Wheatland.

Correspondence: - The Annual Return was sent to Consumer Affairs Victoria

The invoice for the public liability insurance was received and payment has been sent.

The invoice for the "Signalling Record" for 2011 was received from the SRSUK and payment was sent.

Letter from Ray Layton suggesting payment of membership renewal by bank deposit. This will be arranged for 2013. Bob Whitehead / Vance Findlay. Carried.

Reports: - Glenn Cumming reported on plans for a signal box tour in the Western suburbs.

General Business: - Glenn Cumming advised that member Ian Cameron of Goulburn NSW had passed away.

Bob Whitehead tabled some notes from Keith Lambert about various works in the Metropolitan District. A summary of the discussion follows: -

- * The transfer of control of Sydenham to Craigieburn was commissioned last weekend.
- * Control of West Tower will be transferred to Centrol in a few weeks.
- * The transfer of control of Sunbury to Craigieburn will be commissioned on Friday 27 July 2012 as part of the nine day shutdown on the Sunbury Line.
- * A new crossover will be provided at the Down end of Albion to allow Up trains to terminate.
- * Both level crossings at Anderson Road Sunshine will be grade separated.

Michael Formaini reported that John Hearsch spoke at the ARE meeting last night and it was reported that remote control of the junction at Toolamba is being proposed if traffic on the Toolamba - Echuca Line increases.

Bob Whitehead advised that re-signalling and remote control of Echuca has been proposed.

Colin Rutledge provided details about various works in the Country Districts. A summary of the discussion follows: -

- * Further details of works proposals for the Toolamba - Echuca Line were provided.
- * The Arrival Yard at West Tower will be abolished tonight.
- * West Tower will be abolished next Friday night.
- * New connections at South Kensington and new passenger lines to Nos.15 & 16 Platforms at Spencer Street Station are expected to be provided in February 2013.
- * The period around Christmas 2013 will see a major rearrangement at Franklin Street including the tracks over the flyover and the Gauntlet Track being converted to Up & Down Dual Gauge tracks.
- * The ARTC boundary will move from the Up end of the flyover to Moonee Ponds Creek Junction.
- * A new signalling equipment room is being built near Dudley Street.
- * More semaphores will be converted to light signals.

Signalling materials and works contracts for the Regional Rail Link project were discussed.

Chris King asked about the working of the Toolamba - Echuca Line in the future. This line will be worked by Train Orders as it is now.

Brett Cleak provided details about various projects that he is working on. A summary of the discussion follows: -

- * Commissioning of CTC between Gheringhap - Wingeel is planned for October 2012. This work will include the commissioning of the new crossing loop at Barwon Park Loop.
- * Commissioning of CTC between Wingeel - Berrybank is planned for December 2012. The new crossing loop at Werneth will not be commissioned.
- * The Up end of Berrybank will be extended in the middle of August 2012.
- * The remainder of the CTC work between Gheringhap - Maroona will be commissioned in 2013.
- * The commissioning of the new crossover at Albion is planned for October 2012.
- * The commissioning of the new McIntyre Yard is planned for November 2012.
- * ARTC are bringing Victorian signal maintenance work "in - house" at the end of the current contract.

Syllabus Item: - The Secretary introduced President David Langley to present the Syllabus Item.

David presented a selection of approximately 100 digital images from his collection.

The presentation concentrated on images of signalling from the 1970s and 1980s based mainly on New South Wales and Victoria. Many different scenes were viewed, some in colour and some in black and white.

The presentation was thoroughly enjoyed by those present.

At the completion of the Syllabus Item, The President was thanked for the entertainment & this was followed by acclamation from those present.

Meeting closed at 23:15 hours.

The next meeting will be on Friday 21 September, 2012 at the Surrey Hills Neighbourhood Centre, Bedford Avenue, Surrey Hill, commencing at 20:00 hours (8.00pm).

SIGNALLING ALTERATIONS

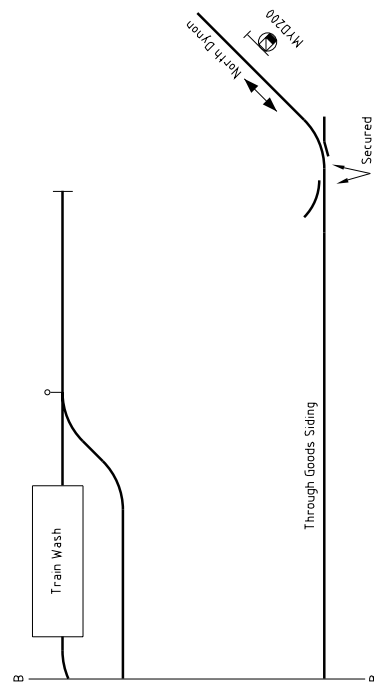
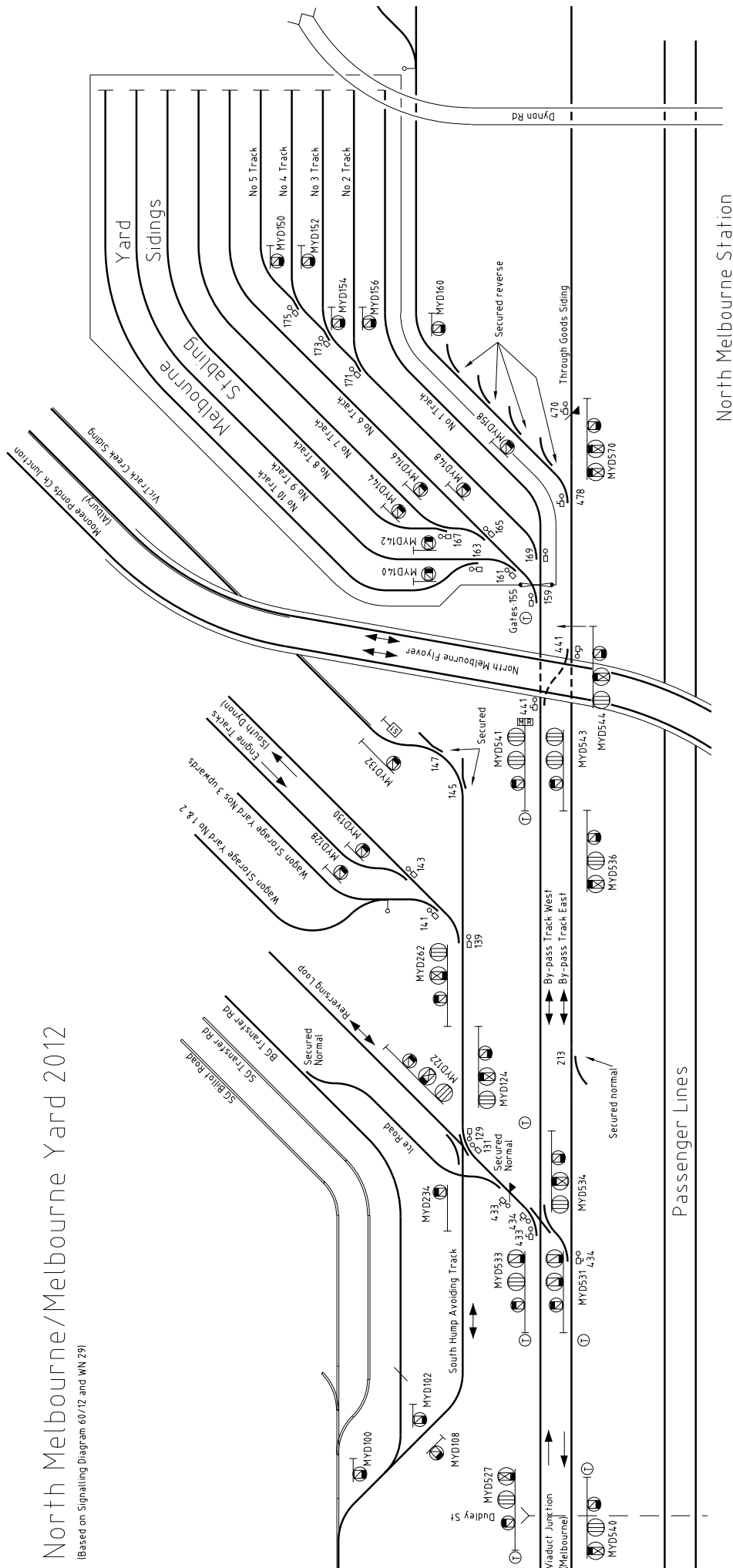
The following alterations were published in WN 26/12 to WN 35/12 and ETRB A circulars. The alterations have been edited to conserve space. Dates in parenthesis are the dates of publication, which may not be the date of the alteration.

- 01.07.2012 **Highett** (SW 233/12 & 243/12, WN 27 & 28)
On Sunday, 1.7., the automatic pedestrian booms at Highett Rd (20.140 km) were replaced by automatic pedestrian gates. Automatic F609 was upgraded to have LED heads. Diagram 69/09 (Glenhuntly - Highett) was temporarily amended and then replaced by 65/12.
- 01.07.2012 **Long Island Junction** (SW 217/12, WN 26)
On Sunday, 1.7., Points 91U were renewed in a tangential layout on concrete bearers. The rodded connection to Catch 91 was removed and the Catch point fitted with a M23A point machine. Diagram 77/12 (Leawarra - Stony Point) replaced 55/12. Note that this diagram also shows the removal of the Up end points at Somerville, which had occurred prior to the 1.7.
- (03.07.2012) **Warragul - Lardner's Track** (SW 113/12, WN 26)
The commissioning of boom barriers at Lardner's Track (SW 106/12) has been postponed. Diagram 108/11 will remain in service.
- 09.07.2012 **Lalbert** (TON 139/12, WN 27)
On Monday, 9.7., the siding was booked into service. TON 554/10 was cancelled.
- 12.07.2012 **Meredith** (TON 142/12, WN 28)
On Thursday, 12.7., No 2 Road was booked out due to track condition. The main line points were secured normal.
- 15.07.2012 **Drouin - Warragul** (SW 115/12, WN 27)
On Sunday, 15.7., boom barriers were provided at the flashing lights on the North Line at Lardners Track (95.625 km). Remote monitoring equipment had already been provided. Diagram 24/12 (Warragul - Yarragon) replaced 108/11.
- 16.07.2012 **Sydenham** (SW 228/12, SWP 17/12, WN 27)
Between 0200 hours Saturday, 14.7., and 0400 hours Monday, 16.7., the signalbox at Sydenham was abolished and control was transferred to Craigieburn signalbox. The SSI/Sigview system was replaced by a Westlock/Westcad CBI.
Crossover 625 was provided for moves from No 2 Track to the Down line (this crossover is not yet available for electric traction). Dwarf SDM734 (Down line to Nos 2 or 3 Tracks), and Home SDM735 (No 3 Track to Down line) were provided. Co-acting signal SDM702P was provided. TPWS (TSS) equipment was provided at SDM717, SDM719, and SDM735. The approach timings were altered at Melton Hwy, McNichol Way, and Ruth St pedestrian crossing.
Diagram 61/12 (Keilor Plains - Sydenham) replaced 33/11.
Metro Northern Group Operating Procedure 12 (Sydenham - Failure of signals) was reissued, and Procedure 13 was cancelled.

- 16.07.2012 **Glen Waverley** (SW 231/12, WN 27)
Between Saturday, 7.7., and Monday, 16.7., the point machines on Crossovers 11 & 17, and Points 13 & 15 were replaced by M23A point machines. The rodded connections to Catches 13 & 15 were removed and the Catch points fitted with M23A point machines. The WSA worked crossover between Sidings 3 & 4 was removed. The signal panel indications were improved, and the point levers provided with point correspondence lights.
Diagram 63/12 (East Malvern - Glen Waverley) replaced 25/06.
- 17.07.2012 **Ballarat** (TON 147/12 & 148/12, WN 29)
On Tuesday, 17.7., the Goods Track (Fish & Chips Siding) leading off the Loco Track was booked out of use and will be removed. The extension of No 5 Track (Independent Track) has been restored to use for track maintenance access. The baulk on No 5 Track opposite Post 36 has been removed. All the points in the Independent Track providing access to Ballarat Yard north of the Independent Track have been secured for the Independent Track. TON 113/12 is cancelled.
- 18.07.2012 **Shepparton** (SW 121/12, WN 28)
On Wednesday, 18.7., boom barriers were commissioned at the existing flashing lights at Ford Road (186.706 km) on the Down side of Shepparton. The boom barriers are operated by the existing predictor. Trains travelling at more than 50 km/h at the predictor boards may accelerate before reaching the level crossing. Amend Diagram 12/12 (Mooroopna - Shepparton).
- 20.07.2012 **West Tower - South Kensington** (SW 118/12 & 119/12, WN 28)
On Friday, 20.7., the remaining roads in the Arrival Yard and the connections between West Tower and South Kensington and North Dynon were taken out of use.
Nos 3, 4, 5, & 6 Arrival Roads were abolished and will be removed. Dwarfs 162, 164, 166, 168, 314, 316, 318, and 320 were abolished. Points 185, 187, 189, and 191 were secured reverse. Points 239, 243, 245, 255, 257, and 269 were abolished and the point machines removed. Access to the Train Wash will be temporarily unavailable and Points 137 are secured reverse.
The Up and Down Outside Goods Lines on the Down side of Home 134 were abolished.
The access line to the North Dynon yard will be out of use. Dwarf 200 was fixed at Stop and a baulk provided at the signal.
The Up and Down Goods Lines were taken out of use between the Up end of the Arrival Roads and South Kensington. Home 212 and Dwarf 208 are fixed at Stop and baulks are provided in the Up and Down Goods Lines at the signals.
At South Kensington, Points 678 leading to the Up Main Goods Line are secured normal. A 'Limit of Shunt' board is provided on L track, South Kensington, 135 metres on the Up side of SKN774. Home SKN774 is prevented from displaying a Normal Speed aspect for moves towards Home 212 and will only display Low Speed aspects for moves towards the Limit of Shunt board.
Amend Diagram 37/12 (West Tower).
- 20.07.2012 **Wycheproof Block Point - Sea Lake Block Point - Mittyack** (SW 122/12, WN 28)
On Friday, 20.7., the Train Order sections Wycheproof Block Point - Sea Lake Block Point - Mittyack were replaced by the section Wycheproof Block Point - Sea Lake.
Sea Lake Block Point was abolished and the Block Point Boards and Up Location Board was abolished. Sea Lake will become a Train Order Terminal Location. End and Commence Train Order Working Boards were provided at 419 km (the location of the former Sea Lake Block Point). The existing Down Location Board at 416.500 km for Sea Lake Block Point will become the Down Location Board for Sea Lake. The hand locking bars on the main line points at Sea Lake and the hand operated derails in Nos 2 & 3 Roads will remain. The baulks at 423.000 km will remain. Any train terminating at Sea Lake must be stabled in Nos 2 or 3 Roads.
Mittyack was abolished as a Train Order Terminal Location. The End and Commence Train Order Working Boards, and the Down Location Board were abolished.
- 23.07.2012 **Tottenham Yard** (TON 152/12 & 153/12, WN 29)
On Monday, 23.7., No 6 Track West Yard was booked out due to track condition. Consequently No 3 Track will be used as the default arrival track.
- (24.07.2012) **Mooroopna - Shepparton** (SW 131/12, WN 29)
Diagram 64/12 (Mooroopna - Shepparton) replaced 12/12 as in service.
- 25.07.2012 **Boort** (TON 157/12, WN 30)
On Wednesday, 25.7., Nos 3 & 4 Rds were taken out of use due to track condition.
- 27.07.2012 **Viaduct Junction - West Tower - South Kensington** (SW 125/12, 129/12 & 254/12, WN 29)
Between Friday, 27.7., and Monday, 6.8., the new East and West Bypass Tracks and Through Goods Siding were commissioned. The Up and Down Goods Lines were abolished between the Up side of the Latrobe St bridge and West Tower. The Up and Down Goods Lines between West Tower and South Kensington remain out of use as described in SW118/12.
West Tower was abolished as a signalbox. The functions were moved to Centrol and worked from a VDU based system.
Homes 110, 134, 252, 254, 256, 258, and 326, Dwarfs 120 & 248, and Points 113, 117, & 137 were abolished.

North Melbourne/Melbourne Yard 2012

(Based on Signalling Diagram 60/12 and WN 29)



Homes 124 & 262 and Dwarf 122 were converted to LED and renumbered with a 'MYD' prefix. The prefix 'MYD' was added to Dwarfs 100, 102, 104, 106, 108, 128, 130, 132, 140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 184, 186, 190, 194, 234, 280, 284, & 286. Dwarfs WST230 & WST232 were renumbered with the MYD prefix. Note that Dwarf 200 was not renumbered.

New East and West Bypass tracks were provided between Viaduct Junction and West Tower. These are located immediately on the western side of the former Goods Lines. The North Hump Avoiding Track was restored to use to form a connection between the Bypass tracks and the South Hump Avoiding Track and the Reversing Loop.

The Through Goods Siding was provided as the connection between the Bypass Tracks and North Dynon. It is a running road and vehicles are not to be stabled on it. Dwarf 200 was restored to use to control movements from North Dynon. Points 249 and 251 were secured normal. Points 433 and Derail 470 self normalise.

Diagrams 45/12 (Southern Cross - MTM Passenger Lines), 60/12 (West Tower), 72/12 (South Kensington), and 67/12 (Moonee Ponds Creek) replaced 21/12, 57/12, 55/12, and 3/11 respectively.

Operating Procedure 132 (West Tower) was re-issued. SW 131/11 was cancelled.

27.07.2012 **Sydenham - Sunbury** (SW 251/12 & 130/12, WN 29)

At 2130 hours on Friday, 27.7., the section of line between Sydenham and Sunbury was transferred from Control to Metrol. The boundary between Metrol and Control will be Signals SBY26 and SBY28.

In conjunction with transfer to Metrol, the control of signalling at Sunbury will be transferred from the Bendigo Corridor Signaller to the Craigieburn signalbox.

29.07.2012 **Burnley** (SW 258/12, WN 29)

On Sunday, 29.7., circuit alterations were made to the control of Automatic BLY379 to allow approach operation and time delayed clearing to Medium Speed Warning.

06.08.2012 **Sydenham - Sunbury** (SW 133/12, 134/12, & 255/12, WN 29)

Between Friday, 27.7., and Monday, 6.8., the electrification between Sydenham and Sunbury was commissioned. In conjunction with this, track circuits were provided between Sydenham and Sunbury to replace the axle counter detection and level crossing predictors at Holden Rd, Old Calder Hwy, and Watsons Rd. Additional stabling sidings were provided at Sunbury.

The maximum speed of electric trains between Sydenham and Sunbury is 115 km/h, but RFR trains may operate at 160 km/h and 130 km/h where authorised. Start and end RFR boards are provided at Sydenham.

At Sunbury, stabling sidings A, B, C, D, and E were commissioned. Points 41, 45, & 49, and Crossovers 43 & 47 self normalise 10 seconds after the train clears the points.

New Down Home Departure signals SBY42 and SBY44 were provided at 38.900 km controlling the entry into the West Line and East Line (respectively). These signals are worked by the Signaller, Bendigo. A release/slot from the Bendigo Corridor Signaller is provided for Homes SBY30, SBY32, & SBY34 for moves towards SBY42 & SBY44. Two three-position 'switches' are provided on the Bendigo VDU at Gisborne, one each for the East and West Lines. When in the 'Up' direction, trains can be signalled from Gisborne to Sunbury. When in the 'Down' position, the Signaller at Craigieburn can signal trains towards the Down Departure Home signal at Sunbury. When in the 'Centre' position, trains cannot be signalled in either direction.

Diagram 59/12 (Watergardens - Sunbury) replaced 71/11.

Operating Procedure 115 (Sunbury, Stabling of Passenger Trains in No 2 Rd) was cancelled. SW 107/06 is cancelled. Operating Procedure 115C (Sunbury - Bendigo, Failure of Signals) was reissued as Operating Procedure 115. SW 90/08 is cancelled.

08.08.2012 **Sunbury** (SWP 19/12, WN 30)

Commencing Wednesday, 8.8., Northern Group Operating Procedure 13 (Sunbury - Failure of Signals) was issued.

13.08.2012 **Albion Junction** (SW 272/12, WN 32)

On Friday, 13.8., track panels were installed for the future Crossover 85 between the Up and Down Sydenham lines at the Down end of Albion Junction. The points are secured normal and are detected in the signalling.

17.08.2012 **Ballarat** (TON 187/12, WN 33)

On Friday, 17.8., the extension of the Independent Track (No 5 Road) was booked back into service for all traffic. Ballarat yard, north of the Independent Track, is not available for traffic and all points leading from the Independent Track to the yard have been secured normal. TON 147/12 is cancelled.

21.08.2012 **Sunshine** (SW 151/12 & 282/12, WN 34)

On Tuesday, 21.8., Siding B was abolished. Points 634 were secured normal. SW 95/12 & 194/12 were cancelled. Amend Diagram 47/10 (Sunshine).

22.08.2012 **Shepparton** (SW 147/12, WN 33)

On Wednesday, 22.8., various circuit alterations will be commissioned. The Down annunciator will be altered to operate when a train passes Down Repeating U1779. The Up annunciator will be altered to operate when a train passes Up Repeating U1868.

23.08.2012

Maryborough

(SW 146/12, WN 33)

On Thursday, 23.8., the following alterations took place. Home 2 was replaced by a new mast situated on the right hand side of the track opposite the original mast. Homes 4 and 6 were replaced by new masts at the same location. Home 8 was replaced by a new mast 40 metres in the Down direction.

Homes 2, 4, 6, 8, 12, 14, 16, 18, 20, 24, & 26 now have LED heads. Dwarfs 14, 16, and 18 now display a purple light for stop. The 'V' and 'S' indicators on Homes 6, 8, 12, & 20 were removed. Standard gauge operations at Maryborough are not permitted.

The DICE equipment was formally abolished. The Down DICE approach board opposite the Down Location Board, the Up DICE approach board on the Up side of Griffiths St, and the DICE boards at Home 4 were removed.

Amend Diagram 118/11 (Maryborough).

24.08.2012

Moe - Hernes Oak - Morwell

(SW 155/12, WN 34)

Commencing Friday, 24.8., the following instructions will be in force for terminating Down trains at Moe during the Absolute Occupation between Hernes Oak and Morwell (due to the subsidence of the embankment at the Morwell River). Baulks have been provided at 139.200 km on the Down side of Hernes Oak. Homes HOK30 and HOK32 were fixed at Stop. Track circuit D1401T was dropped.

Locomotive hauled passenger trains will terminate at Moe and run around at Hernes Oak. The Down movement is to arrive into No 1 Road at Hernes Oak. An authority is to be granted for the locomotive to pass HOK30 at Stop and proceed to a point clear of HOK26. From here it is to be signalled through No 2 Road to run around its train.

The protection equipment at the pedestrian crossing at the Down end of Moe platform (130.234 km) will operate normally as the Down train approaches the platform. A track force protection co-ordinator will be stationed at the crossing and must prevent people from crossing the line on the approach of the train. The protection equipment will continue to operate while the train is in the platform, and so once the train has come to a stand in the platform, the co-ordinator will direct pedestrians through the emergency gates to cross the line. When the train is ready to depart for Hernes Oak to run around, the driver and the track force co-ordinator must agree on the movements. The co-ordinator must prevent pedestrians from crossing the track until the train has passed.

26.08.2012

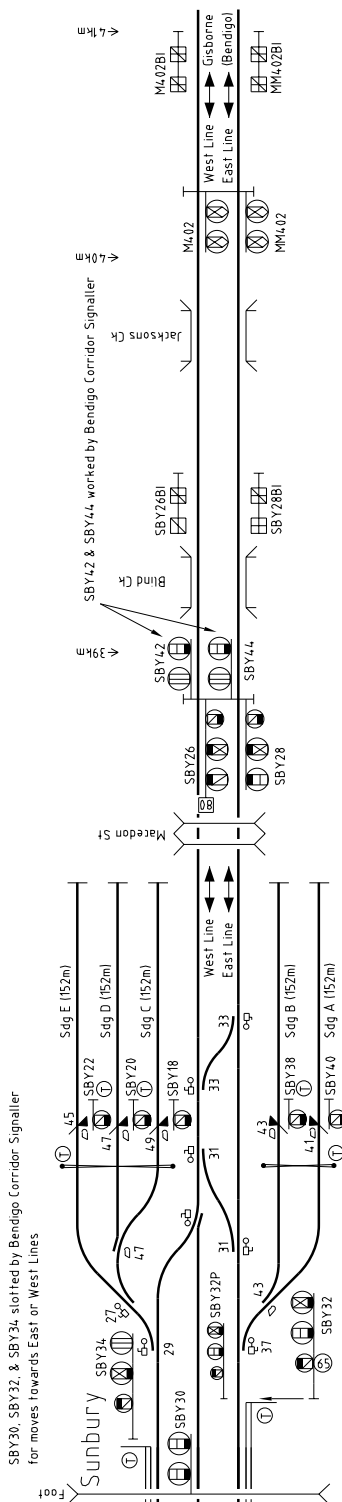
Metro Trains Safeworking

(WN 35)

From Sunday, 26.8., the position of Manager Rail Safety was replaced two new positions, the Operations Safety Manager and the Manager Rail Standards.

The Operations Safety Manager will be responsible for all operational safety/occupational health and safety incidents on the MTM network. The position will report to the Manager Network Safety. The Senior Rail Safety Officers and Network Interface Manager will report to the Operations Safety Manager.

The Manager Rail Standards will be responsible for the 1994 Book of Rules, site specific operating procedures, and safeworking policies. The MRS will sign Safeworking Circulars (SW, SWP, TS, & O) and Signalling Diagrams. The MRS will be involved in projects relating to improvements on the MTM network and the development of the new Victorian rulebook. The MRS will report to the Manager, Current Operations.



THE LAVERTON DERAILMENT - PART II

Since the publication of the article on the Laverton derailment in the previous issue of Somersault, a copy of the Secretary's Branch file dealing with the derailment has come to hand. This contains a copy of the report of the internal VR investigation, and details of the subsequent actions of the department.

The Board's Report

Interestingly, the file quite specifically states that the Board of Inquiry (the internal VR investigation) did not make its findings known until the Coroner had handed down his findings. This means that the Coroner would not have access to the results of the internal investigation in framing his inquiry - potentially a serious problem when considering an accident with detailed technical causes.

The report of the Board of Inquiry largely repeats the factual information in the previous article.

One key point which was not highlighted at the Coroner's Inquisition was that when approaching Up Arrival Home 20 the lights appeared against a backdrop of yellow lights illuminating the petrochemical complex on Kororoit Creek Rd. Consequently, when Home 20 was showing Yellow over Green, as it was on this occasion, the yellow light was very difficult to distinguish until the train was about 400 yards from the signal. It was consequently possible that the Driver, after having seen the previous signal GG824 step up from Y/G to G/R, missed the yellow light on Home 20 and read the single green as G/R. However, the report noted that once the Driver was within 400 yards of Home 20, the background interference disappeared and there should have been no problem in correctly reading the signal, and that Up Home 16 was clearly distinguishable at all times.

The Board concluded that the signalling was operating as designed, and consequently concluded that

16. The cause of the derailment was the apparent failure of the Driver to correctly read the aspects of Signals No 20 and No 16 after observing Automatic signal GG824 change from Y/G to G/R and to control the train in accordance with the aspects exhibited on No 20 and No 16 signals.

17. It follows that the Fireman and the Guard were also at fault in that they failed either to observe or, if they did observe the signals, to take appropriate action to ensure that the train was controlled in accordance with the aspects of Signals No 20 and No 16.

18. The Board, in consideration of recommendations to prevent a recurrence, believes that the following factors are important and must be properly evaluated when taken into account.

- a) The Driver was clearly alert in the sense that he was controlling his train.
- b) The Driver has had extensive experience; he has been a Driver for 22 years. He has been an Instructor Driver since about 1958. He is of high repute.
- c) There is no evidence that the Driver or other members of the crew were in any way unfit to carry out their duties.
- d) The effect of the background lighting on Signal No 20.
- e) The consequences of travelling through a standard crossover suitable for a maximum

speed of 25 mph at the normal speed for a high speed line (70 mph in this case).

- f) The effects of a Stop (R/R) signal, Clear Medium Speed (R/G); and Clear Normal Speed (G/R) signal upon drivers and the level of probability of a signal being misread.
- g) The relationship between Driver and Fireman in this instance, having regard to the experience of each and the speed of the train.
- h) The capacity of Guards to view signals, the order of responsibility and the practice of Guards with respect to signals.
- j) The effect of the location of the crossover with respect to the Highway overpass on the derailment of the train, the extent of damage to the train and the casualties among passengers and crew.
- k) Previous history of non-observance of medium speed signals through trackwork layouts and consequences.
- l) The possibility of pre-conditioning and expectation of Drivers brought about by common practice in train running.
- m) The probability of a recurrence.
- n) The possible disastrous consequences of non-observance in the future.
- o) The trends in operating speeds of passenger trains.

The Board went on to suggest the following methods of preventing a recurrence:

1. Discipline the crew to make them and other crews more observant in the future. The Board stated that "it is known that disciplinary action has been taken against crews following previous incidents of this type: such disciplinary action, whilst it probably served to reduce the incidence, has not prevented recurrence. Whilst disciplinary action must, in the view of the Board, be taken, such action alone is insufficient to prevent recurrence."
2. In conjunction with (1), improve Signal No 20. Signal No 20 was considered unsatisfactory because the yellow background lights made it more likely that drivers would misread the signal when it was showing yellow over green. Whilst the Board considered that Signal No 20 should be improved, it also considered that the improvement of the signal and the implementation of disciplinary action would not be sufficient to prevent a recurrence.
3. In conjunction with (2), approach release Home 16 from stop when the road is set for the crossover so that the Driver is required to bring the speed of the train down to about 25 mph before the signal shows clear medium speed (R/G). The board noted that the consequence of passage of a train through a 25 mph crossover at a speed of 60 to 70 mph was potentially disastrous; the consequences being similar to those of head to tail collision.
4. Provide a high speed crossover (40 mph) so that a train could negotiate the crossover at high speed without the risk of disastrous results. The Board noted that a crossover designed for passengers' comfort at a speed of 40 mph could reasonably be expected to be capa-

ble of safe passage of a train through the crossover at a speed of 70 mph. However, the Board noted that these crossovers were "most costly" and took up more space than 25 mph crossovers. While their use could prevent a recurrence, the board did not recommended their provision except where express passenger trains were regularly required to make the crossover move and the improved train running justified the added costs. Where a high speed crossover was provided, approach releasing the Home signal was not required.

- 5 Provide a high speed crossover that trains could negotiate at line speed without risk to the comfort of passengers. The expense of these crossovers meant that this option was not recommended, particularly as the Victorian Railways had no experience of their use.
- 6 Provide a system of train control that ensured control of the train in accordance with signal indications in the event of the Driver failing to do so. This option would also prevent other possible incidents related to crew error. Again, this was not recommended due to the cost.

The Board made three recommendations to prevent a recurrence. The first was compliance with the Rules and Regulations - the action was, presumably, by disciplining the train crew. The second was to improve Signal No 20 so that the yellow background lights did not make it difficult to read an aspect with a yellow light. The third was that home signals should be approach released for turnout moves on lines equipped with three position signalling and where the line speed exceeded 50 mph.

In addition to Patricia Cini, who lost her life, twelve passengers were listed with more than minor injuries. These ranged from bruising to fractured bones and lacerations. The cost of the derailment was put at \$375,000, made up of Rollingstock \$293,000; Trackwork \$34,000; and Signalling \$48,000.

The VR response

A copy of the Board's report was forwarded to the Minister of Transport, J.A. Rafferty, on 15 December 1977. The Minister was informed that the Board particularly considered two proposals to avoid a recurrence: (a) provision of a high speed crossover, and (b) the modification of the signal system so that the existing lower speed crossovers must be negotiated at an appropriate speed. The second proposal was preferred, but it was recognised that this would increase train running times. It was consequently considered necessary to consider the frequency of the diverging moves to determine whether a 40 mph crossover should be provided despite the substantially higher cost. The Minister returned the report on 16 January 1978 with the comment "I believe your Board will do what is necessary, in this and indeed in all areas, to maintain passenger safety."

On the same day as the report was sent to the Minister, the Chief Civil Engineer was asked to estimate the costs of providing a high speed (i.e. 40 mph) crossovers and approach releasing the home signals. On 26 May 1978 the S&C Engineer listed 17 locations signalled with three position signalling at which the line speed was in excess of 50 mph. These were located at Newport South, Altona Junction, Laverton, Werribee, Little River, Lara, Corio, North Geelong A, Sunshine, Deer Park, Bank Box Loop, Horsham, Dandenong, Pakenham, Wodonga, Albion Junction, and Essendon. It was estimated the signalling

cost of altering Crossover 3 at Laverton to 40 mph running was \$12,000. Based on a cost of \$6,000 per turnout, the 44 turnouts identified would cost \$264,000. This would not include the provision of '40' indicators on the relevant signals. These could be provided for an additional cost of \$5,500 per turnout, but provision depended on the number of trains to be routed over the high speed points. This estimate only included the signalling costs; the full cost, including the actual 'high speed' crossover, was estimated at in excess of \$1.25 million. The CCE considered that it would be hard to justify this expenditure over the completion of power signalling and train stop protection in the suburban area. The alternative of approach releasing the Home signal was estimated to cost \$15,000 per signal, giving a total cost of \$430,500. This substantially reduced the risk, but at a cost of delaying the train by 1 to 2 minutes. Both these estimates were forwarded to the General Manager on 31 May 1978.

The CCE was instructed on 26 June 1978 to implement the approach releasing of Home signals, with Laverton being the first priority. This instruction was relayed to the S&C Engineer on 4 July. On 13 July, the S&C Engineer noted that the cost for Laverton was estimated at \$60,000 (four signals). Signalling design was to commence in August 1978, with the other 17 locations being designed at approximately quarterly intervals as staff became available and other priorities permitted. The CCE responded by noting that the total estimated cost of providing approach releasing appeared to be in error (41 signals at \$15,000 each is \$615,000, not \$430,500). On 31 August 1978 the Estimating Engineer informed the S&C Engineer that the estimated cost per signal was now \$13,210 'at working expense rates', which was made up of labour of \$7,860; material at \$5,180; and other charges of \$170. The estimate also now included at 10% provision which had not previously been allowed for. The new estimate was for \$541,200 for the 41 signals. The new estimates were duly forwarded to the Secretary on 7 December 1978 with the comment that Laverton would be commissioned in the latter half of 1979, but that no firm commitment could be given to the other 17 locations until the relative priority with the other signalling projects was established. On this basis, the CCE issued instructions on 11 January 1979 that the work at Laverton was to be carried out, with the work at the other locations being undertaken "having regard to other commitments". While it is believed that the work at Laverton was carried out, it is not believed that this program was completed.

A question in parliament

On 11 December 1979, Dr Ken Coghill, MLA Werribee, asked the Minister of Transport whether the enquiry into the Laverton accident had been completed, and, if so, what were the causes, what findings and recommendations were made, and what action was taken. A handwritten note, probably a day or so later, states that design work for the modifications at Laverton had just been completed, and that the project should be completed by the end of April or early May 1980.

The official response to the parliamentary question on 11 March 1980 was that the

Board of Inquiry found that the cause of the derailment was due to the aspects of the relevant signal being obscured by background lights in the distance. As a result neither the driver nor the crew were able to correctly interpret the aspects of the signal and the train passed through the crossover at higher than the permitted speed.

The board found no evidence that the driver or other members of the crew were in any way unfit to carry out their duties.

The Board of Inquiry also recommended that signalling arrangements at medium speed crossovers generally be modified to provide a "stop" signal for the crossover move for sufficient time to ensure that the driver in observance of that signal reduces the speed of the train to a safe level.

The appropriate modifications to improve the visibility of the signal at Laverton have been completed.. Other modification should be completed by May 1980.

It could be argued that this did not precisely reflect the Board's report. One hopes that the train crew were not 'disciplined', if so, the Minister would have been guilty of misleading parliament!

ALTONA JUNCTION (PAISLEY), 1981

Only a little over a year after the parliamentary question on the Laverton derailment was answered, an almost identical incident occurred at Altona Junction. Fortunately, in this case the train held the rails and only one passenger was injured.

At this time Newport A signal box controlled the Geelong line as far as Maidstone Rd on the Down side of Galvin. The first section of the line, between Newport and Newport South Junction was signalled as conventional double track with a dedicated Up and a Down line. Beyond Newport South Junction, the two tracks were signalled bi-directionally and were known as the East and West Lines. Although the tracks were bi-directionally signalled, most Down trains used the East Line and most Up trains used the West Line. Shortly after Newport South Junction was Altona Junction where the single track Altona branch (also controlled from Newport) junctioned from the Geelong line. A 40 km/h crossover was provided at Altona Junction (adjacent to Paisley platform) to allow Up trains on the West Line to cross to the East Line. This appears to have been primarily provided for trains shunting the adjacent sidings. It was very rarely used for main line movements, as any Up train that was crossed over to the East Line would have to be recrossed back to the Up Line at Newport South Junction.

The morning of the 16 June 1981 was not a good day at Newport signalbox. At 10.04 am a track circuit failed on the West Line between Automatic GG548 and Home 232 and shortly afterwards the East Line block between Altona Junction and Laverton failed. This meant that all trains had to be worked on both lines by means of orders under the instructions of the Train Controller. The electrical fitter attended and both faults were cleared at 10.45. The failure on the West Line was found to be a broken track circuit connection to the rail at the Carbon Black Siding. When informing Control from the siding that the West Line fault had been cleared, the fitter was told that the East Line fault had also cleared. The fitter then went to Maidstone St (adjacent to Galvin platform) where he discovered that a jib wire of a contract crane was in contact with the signal pole line. The fitter instructed the operator to keep his machine clear of the aerial wires, and repeated this to the Ganger. After this he returned to Newport signalbox where he performed maintenance work on the North Williamstown (sic)/Newport block instrument.

Around midday Crossover 173 at Newport South Junction failed reverse following the passage of the Austral pilot from Sleights Siding to the Goods Siding. As the next two trains were an Up Altona, and the 11.20 am Up Geelong pass, and as reverse detection was available on the failed crossover, the signalmen at Newport A decided to work the two Up trains via the East Line to Newport South Junction and then across Crossover 173 reverse to the Up Line. (Newport A Box was manned by two signalmen.) When the Geelong pass struck in on the West Line annunciator (this occurred when the train occupied

Kororoit Ck road on the Down side of GG548), it was decided to give it preference (as per the WTT) as the Altona had not struck in. The signalman reversed Crossover 221 near Paisley and cleared Up Home 232. He then cleared Up Homes 192 and 194.

The 11.20 am Up Geelong passenger train consisted of B73, C20, AW15, BU2, BW37, and C40. Three people were in the cab of the B class: a trainee driver who was driving the train, a supervising Locomotive Running Inspector, and the rostered fireman. The rostered driver was riding in the rear cab of the B class. The rostered driver should have been acting as the fireman, according to the instructions, but the driver had taken himself to the rear cab at Geelong.

When the train was approaching Galvin, Up Automatic GG672 was displaying Reduce to Medium Speed as the signalmen at Newport A had not yet cleared Home 232 at Altona Junction. The inspector and the trainee driver stated that GG672 did not change aspect as they passed it, but the fireman stated that it cleared to Clear Normal Speed as they approached it. The recollection of the fireman matches the evidence of the signalman, who would have just reversed the crossover and cleared Home 232.

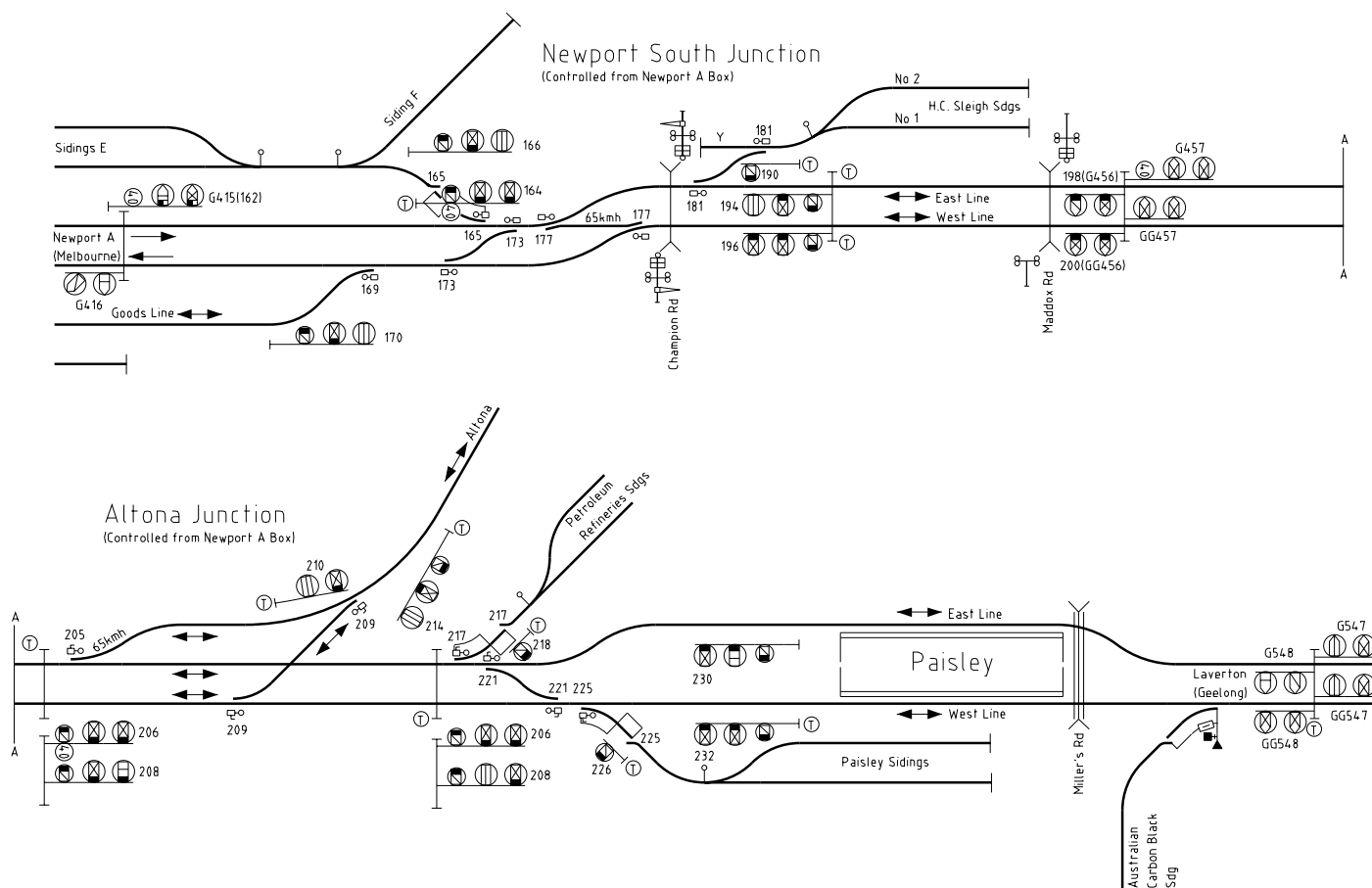
Around Maidstone Street (immediately on the Up side of Galvin), the trainee driver made a brake application for a 30 km/h perway slack, and then a second application 400 yards further on. The perway slack is not further explained in the report, but it extended from 16.6 km to 16.2 km over Cherry Creek (16.435 km). As the train traversed the slack, the trainee driver and the fireman took the opportunity to look back and observe the respective sides of the train.

Coming out of the slack, the inspector encouraged the trainee driver to accelerate the train. Automatic GG548 could be seen for some 2330 metres, but the aspect could not be determined until 950 metres from the signal. Looking ahead, the inspector saw a green light in Automatic GG548 which he took to be clear normal speed. The trainee driver stated that this signal was displaying a 'top green aspect' (clear normal speed). The fireman could not recall the aspect, which the Board treated with some scepticism as he could recall what both the previous and next signals were displaying. In fact, the signal was displaying Reduce to Medium speed (as shown by subsequent tests), as the next signal, Home 232, was displaying Clear Medium Speed for the movement across a 40 km/h crossover to the East Line. The train passed GG548 at around 85 km/h and still accelerating.

The view of Home 232 from the approaching train was obscured by a shallow right hand curve, the Millers Road overbridge, and the buildings on Paisley platform. However, tests showed that it first came into view through the overbridge, 480 metres after passing GG548 and 800 metres from the Home 232. Interestingly, this corresponded almost exactly with the fireman's estimate of the distance from which he first viewed the signal. The fireman recog-

Newport South Junction - Paisley 1981

Based on Diagram 3/80 and box diagram



nised that Home 232 was displaying Clear Medium Speed and understood that this meant that the train would diverge to the East Line at Crossover 232. Despite the fact that the trainee driver still had the throttle open, the fireman did not call out the aspect as he considered the inspector to be in control. Although he had been trained to call out the signals, as per Regulation 168, he had been told by two drivers (one of whom was the rostered driver) that calling the signals was not necessary on locomotives with a good view from the cab. This included the B class, the S class, and the L class.

The response of the inspector and the trainee driver was not so prompt. Although the inspector stated that Home 232 could be seen from a good long way, it was not until the locomotive was in Paisley platform (around 400 metres from the signal) that he realised it was displaying Clear Medium Speed. Even then he froze and didn't do anything until the train was entering the crossover. The trainee driver stated that he first saw Home 232 very close to, or passing under, the Millers Rd bridge at the entrance to Paisley platform, and he realised that it was displaying a 'bottom green aspect' and applied the brake in full emergency. He considered that it was not necessary to look for an earlier view of Home 232 as the previous signal had been displaying a top green aspect. As neither the inspector or the trainee driver were reacting to the medium speed aspect, the fireman decided that his interpretation was incorrect and that the Clear Medium Speed applied along the straight road - he knew of other locations where this occurred.

The trainee driver's recollection of his actions was contradicted by the evidence of the speed recording tape, the fireman, the rostered driver, and the conductor. The

speed recording tape did not show any slowing of the train prior to entering the crossover, but did show two movements of the throttle before entering the crossover. The fireman stated that he saw the crossover points lying reverse just before passing Home 232, and at that time both the trainee driver and inspector swore and the trainee driver made an emergency brake application. The rostered driver, travelling in the rear cab, did not notice any brake application before entering the crossover, nor did the conductor or guard in the train.

The train passed through the crossover at around 100 km/h, two and a half times the authorised speed. In the leading cab, the inspector was thrown about. The rostered driver, who was standing in the rear cab in preparation to come forward to the leading cab and who had no warning of the diverging movement, had a more vivid impression. He heard a loud bang and was thrown against the driver's seat. He then lost his footing and fell to the floor and then grasped the side of the driver's seat to prevent himself being thrown about. He stated that the locomotive appeared to tilt to 45 degrees in the direction of travel and he gained the impression that the wheels were off the rail on the left hand side. A subsequent site inspection revealed that at least some of the wheels on the right hand side of the train unloaded when the train was traversing the first turnout, allowing the wheels to run along the top of the guard rail and permitting the left hand wheels to strike the nose of the V crossing. This caused the crossing to move by about 3/8". The locomotive then rolled to the right when passing through the second turnout and the bottom of the cow catcher struck the V crossing of the turnout leading to the Petroleum Refiners Siding.

The train came to a stand on the East Line with the brakevan about 200 metres beyond the crossover and about 10 metres beyond Home 206. After checking on the rostered driver, the inspector checked the train for damage and contacted the signalmen at Newport A by the signalpost phone. The trainee driver and the fireman also inspected a side of the locomotive each. The conductor checked the passengers and found only one injury. The passenger had been seated in the vestibule at the rear of the middle carriage, and had been thrown across the vestibule against the external door and breaking its window. She sustained injuries to the back of her wrist and to her left knee.

Back at Newport signalbox, the signalmen were watching the passage of the train on the diagram. Immediately it cleared the junction, the second signalman at Newport made the road for the Up Altona. However, at around 1222 they noticed that the Geelong train was still occupying the East Line track section in advance of Home 206. Shortly afterwards the inspector rang in on the Altona Junction post telephone. Upon being told the identity of the train, the Signaller's first response was "Get out of there, you're blocking the Altona". The inspector then informed the Signaller that they had gone through the crossover at 60 mph (100 km/h) and that the signals needed to be immediately checked as the Automatic leading up to the Home had shown a top green. The signalmen notified Control of the incident and the electrical fitter. However, no-one directly notified the track force, and trains were allowed to pass over the crossover before it was inspected for damage.

Tests by the circuit design engineer subsequently showed that the signalling was operating as designed. With Home 232 showing a Clear Medium Speed indication, Automatic GG548 showed Reduce to Medium Speed. The control wires between the signals had a high resistance both to earth and to the other wires. This showed that a short circuit was unlikely. The approach locking on Home 232 was effective and had a time out period of 241 seconds. The signalman at Newport consequently could not have cleared Home 232 for the straight, restored it while the train approached GG548, and then reset the points for the crossover.

The fireman stated that, although he was taught during his training to call the signals, subsequently he was instructed by two drivers that they did not require the signals being called in a B or S class locomotive, or other locomotives short end leading. This was confirmed by the driver of the train who stated that "Firemen these days tend not to call signals, and when [the fireman] first started with me I informed him that I required him to call signals on a loco running long end first, but I did not require on Bs, Ss, or Ls, on which the driver's vision is satisfactory". Interestingly, on the trainee driver's Down journey to Geelong, also on a B class, the rostered driver (not the same driver as on the Up journey) occupied the fireman's seat and called the signal aspects at locations where his view preceeded the trainee driver's.

Findings

The Board's "Findings as to cause and blame" stated that "the incident was caused by perceptual errors in interpretation of signal aspects due to the unexpected diverging move when all concerned were strongly conditioned to expect a straight through run on the west track. This misinterpretation was assisted by the colour aspects of the signalling system which display a green light in a reduce to medium signal." It went on to state that following

people were at fault: the guard for failing to observe signals, the rostered fireman for failing to assure himself that the driver was aware of signal aspects and failing to take any action when it was clear to him that the driver was not responding to the signal; the trainee driver for failing to correctly respond to signal aspects; and the inspector for permitting the rostered driver to leave the leading cab, failing to properly observe signal aspects, and to correctly instruct the driver when he did not respond to signals.

The following recommendations were made to prevent a recurrence:

1. Adherence to the current Rules, Regulations and Instructions.
2. Issue instructions immediately for (a) the fireman at all times to call signal aspects to drivers immediately on sighting, and (b) where a trainee driver is being instructed the rostered driver to perform the function of the fireman for safeworking purposes. It was also recommended that instructions should be issued clarifying the responsibility and authority of Inspector Locomotive Running when instructing trainee drivers. A reminder of Regulation 168 was subsequently published in WN 27/81. The Board also suggested that this Regulation be amended so that the Assistant Engineman was required to call all signals, and in particular the aspect displayed on the next signal. The driver would be required to call the signal if they sighted it first. Irrespective of who called the signal, the other engineman was to repeat the indication or aspect. The Regulation was amended, although not in the exact form proposed by the 1987 Rulebook.
3. Implement an immediate program for revising the signalling system on bi-directional dual tracks to provide for approach operation of signals to ensure a medium speed warning aspect in the rear of a diverging move (i.e. holding the home at stop until the approach train had passed the previous signal). As an interim measure, it was recommended that instructions should be issued to signalmen that when trains are required to make an untimetabled diverging move on bi-directional dual tracks, they must not clear the home signal until the train has passed the automatic signal in the rear of the home. The board considered that this instruction could be reinforced by suitable sleeves on the signal levers.
4. Consider a further program of speed proving of approach operated signals.
5. All new track layouts for high speed operation should have turnouts suitable for diverging moves at 65 km/h.
6. Turnouts limited to 40 km/h diverging moves on high speed main lines should be replaced by 65 km/h turnouts when major alterations or renewals are carried out.

Response

The report was forwarded to the heads of the branches for information, advice as to any action taken or proposed as a result of the report, comments and advice in relation to the relevant recommendations, advice as to any disciplinary action taken as a result of the report, and, specifically, for a report by the CME into the purchase or lease

of a locomotive simulator. (81/1942).

Someone penned the following response to the recommendations. After agreeing that the current rules should be adhered to, and that the issue of supplementary instructions was appropriate, the memo continued (the comments in square brackets are handwritten comments on the recommendations on the original letter):

The recommendation to revise a long standing signalling philosophy needs to be considered very carefully before deciding to implement some fundamental change in the system. [No fundamental change.]

It is considered that the recommended instructions to signalmen as an interim arrangement, which adds another opportunity for human error and possible false sense of security, is not appropriate. [Reduce the odds.]

The recommendation for speed proving of approach operated signals is an extension of the program which was commenced after the Laverton accident in 1976 and will be continued. [As recommended.]

The matter of converting 25 mph crossovers to 40 mph should be decided on the basis of operating efficiency and economics and it not relevant to the cause of this particular incident. [Reduce risk of damage.]

It is clear, however, that more appropriate training and re-training procedures and facilities are necessary to ensure -

- (a) that instructors are competent as instructors
- (b) that crews are competent to recognise and react strictly in accordance with signal aspects displayed,
- (c) that experience can be gained with simulated emergency situations so that crews can be thoroughly trained to cope with all likely circumstances

To this end it is recommended that the Board authorise management to investigate the prospect of purchasing or leasing a locomotive simulator such as is used by some overseas railways. [Time share with Mt Newman.]

The Chairman of the Board of Enquiry responded on 14 August 1981:

The Board of Enquiry is concerned at the apparent misinterpretation of its recommendations.

The Board was mindful of the significance of recommending any fundamental changes in signalling philosophy and no such recommendations were made. Consideration was given to introduction of a double yellow aspect in lieu of yellow over green as the "reduce to medium speed" aspect, but this was rejected. The recommendations made apply existing signal aspects in a manner commonly used in cases where special complications exist.

The attached illustrations show that the signal aspects given to the driver are similar in each recommendation, and the options have been presented to enable Management to make appropriate selections.

Recommendation 3b was emphatically described as an interim measure, applicable only until such time as the selected final solution is applied.

In an increasing order of cost & complexity, the recommendations are as follows:-

3b. Interim measure, Special instruction & lever sleeves.

3a. Approach operation.

4. Speed proving.

In making recommendation 3b, it was recognized that whilst this relies upon additional human factors, operator failure would not lead to any reduction in safety and the recommendation was made to provide Management with an opportunity to obtain immediate benefit with zero cost.

Recommendations 3a & 3b are valid in view of the time required for total implementation of the speed proving signalling programme arising from the 1976 Laverton incident and this information was available to the Board.

The Board was aware that the conversion of 25 mph crossovers to 40 mph was not relevant to the cause, but flowed from the conclusion that it was probable that neither damage nor injuries would have occurred had the crossover been designed for higher speed.

It is agreed that a locomotive simulator would be a valuable acquisition for crew training, and this was considered by the Board as well as 'cab to control' radio. These were not recommended as it was believed that purchase of such equipment would require to be justified by other than a single incident which could have avoided by less costly methods. It would be expected that a decision to obtain a simulator would arise from an in-depth benefit-cost study.

The diagrams attached to the original memo show that the three recommendations (3b, 3a, and 4) were identical in what the driver of a train saw, they only differed in how this was achieved. In all three cases the home signal governing movement over the medium speed turnout was held at stop until the engine of the approaching train had passed the signal immediately in the rear of the home. This meant that the driver of the approaching train saw, successively, Reduce to Medium Speed (Y/G), Medium Speed Warning (R/Y) and then Stop (R/R). The safety improvement was that an additional warning aspect would be introduced before the turnout, and that this aspect did not contain a green light. The three recommendations achieved this in different ways. Recommendation 3b achieved this manually. The signaller simply did not clear the home signal until he or she saw from the diagram that the track circuit leading up to the home signal had become occupied. Recommendation 3a replicated the signaller's actions automatically. When a route was set up over the turnout reverse, the control circuit to clear the 'B' (medium speed) light required the track circuit leading up to the home to be occupied. The risk with both of these approaches was that neither checked that the approaching train was actually obeying the signal aspects and slowing down. Recommendation 4 added a timing track circuit to the controls of the home signal. The approaching train had to occupy the timing track circuit for a specified period of time before the next track circuit became occupied. This proved that the approaching train was not exceeding a specified speed.

The Assistant Chief Electrical Engineer penned a memo to the General Manager discussing what would be involved for the various recommendations (The signalling and telecommunications section had, by this date, been transferred to the Electrical Engineer's Branch). It is worth quoting in full as it gives a good idea of the relative

implementation costs of the various signalling options:

Recommendation 3(a) (Approach operation)

Approach operation of the medium speed aspect on the home signal controlling the movement across the crossover (i.e. Arrival Home Signal at Paisley).

Approach operation of the medium speed aspect is achieved by the addition of an 'Approach track circuit occupied' control to the Medium Speed Signal control circuit. A signal de-energised contact is required and as the appropriate relay is already provided at every relay interlocking, no additional hardware is necessary to achieve this alteration.

Very minor amendment to design plans is necessary and could be carried out at Technical Officer level in a minimal time i.e. 17 locations could be amended by one officer over 10 days (including checking and plan issue). Installation work is minor and may be carried out by signal maintenance technicians and supervised by District Maintenance Supervisors to ensure that the amendments are commissioned as soon as possible. This method will ensure that planned alterations are not delayed by priority of Capital Works. Estimated cost \$1000 per location.

Approach operation of the Medium Speed Aspect on a signal is a commonly used technique applied in signal engineering design wherever a complexity exists within the overlap (e.g. safety overrun beyond the intended stopping point). The method has been in use in VicRail over many years in such cases as complex boom barrier protection, terminating movements etc.

Recommendation 3(b) (Interim measure only)

Special operating instructions that in the event of an unscheduled crossover movement, the signalman must not reverse the arrival home signal for the movement until he has observed that the train has passed inside the automatic signal in the rear of the arrival home signal.

Crossover point levers to be sleeved in the Normal position to indicate that special instructions apply. This measure would remain in force only until Recommendation 3(s) (Approach Operation) or Recommendation 4 (Speed Proving) was introduced.

Recommendation 4

Speed proving approach train prior to clearing medium speed signal for crossover movement.

Speed proving is achieved by timing the approaching train over a specific track section. In order to enable a train travelling at the required speed (25 mph) to proceed without unnecessary braking, a timing track circuit must be added extending from the outer automatic signal toward the arrival Home signal. The new track relay must be repeated back to the relay room, where its contacts must be wired into the following circuits.

Speed providing timing relay

Approach relay

Signal control, up direction

Signal control, down direction

Approach locking relay

Track Block indication

The speed proving timing control must be added to the medium speed signal control and a proving contact must be added in the outer automatic signal control. The alterations are significant in mag-

nitude and require an experienced Technical Officer or Engineer to perform the design and checking functions and a Drafting Officer to attend the alteration to the drawings involved [sic]. The installation work requires an Electrical Mechanic to prepare the work and supervision and commissioning testing by circuit engineering staff. Priority capital works compete for the available Electrical Mechanic workforce and delayed installation can result. Estimated cost per location \$18,500.

General Note

Each recommendation has the effect of ensuring that a train crew approaching an unscheduled crossover movement will receive a reduce to medium aspect (Yellow over Green), then a medium speed warning aspect (Red over Yellow) and will then observe the aspect on the arrival home signal for the crossover movement Medium speed clear (Red over Green) or Medium Speed Warning (Red over Yellow) depending on the occupancy of the track ahead.

In Recommendation 4 (Speed Proving) the arrival home signal aspect is displayed only after the appropriate time delay has expired.

Comments

There were a large number of similarities between the Laverton accident and the Paisley incident, and, indeed it is clear that a serious derailment at Paisley was only just avoided.

1. In both cases the diverge to the East Line was not timetabled, was rarely used, and was not expected by the train crew. This resulted in a strong perceptual bias for train crews to read the signals as Clear Normal Speed. That the diverging movement was unexpected seems to have been taken to heart by the VR. The scope of all the engineering solutions was always restricted to high speed lines that were bi-directionally signalled. No apparent consideration was given to the possibility of misreading signals reading over 40 km/h turnouts on other high speed lines. Presumably this was because the diverging moves on non bi-directionally signalled lines were 'expected'.
2. In both cases, the critical missed signal was the signal showing Reduce to Medium Speed that gave warning of the diverging movement. In the case of Laverton, the top yellow light was disguised by other yellow lights in the background. At Paisley, the attention of the trainee driver was probably focussed on accelerating from the per way slack, and the inspector was probably focused on the driver. In both cases a key problem was the presence of a green light in the Reduce to Medium Speed aspect - when the diverge was unexpected, missing the upper yellow meant that crew was likely to misread the lower green as Clear Normal Speed. A safer aspect would be yellow over yellow - as used in the UK - however this was already in use in Victoria for Repeating signals. Repeating signals are relatively uncommon in Victoria, and it probably would not have been too expensive to convert them to show another aspect. What would have been expensive, however, would have been to rewire the control circuitry for all

the other three position signals that could show yellow over green to show double yellow.

3. In both cases, there is a strong indication that the fireman recognised the Reduce to Medium Speed and the Clear Medium Speed aspects. As already indicated, the airline industry recognises the existence of an 'authority gradient' between a senior pilot and a junior co-pilot that can cause the co-pilot not to question the actions of the pilot. At Laverton the very junior fireman did not question the actions of a driver, who was not only vastly more experienced, but who had trained the fireman in signal recognition. At Paisley, it is not known how experienced the fireman was, but the presence of the inspector in the cab made a very dramatic authority gradient.
4. In any case, the fireman did not call out the aspects to the driver. The evidence from Paisley is very clear that this was not a universal practice. The fireman stated that he had been instructed to not call aspects on locomotives with a clear view from the cab. Although he did not call any aspects the inspector made no comment on this. On the journey to Geelong, the rostered driver only called the aspects that he saw before the trainee driver.
5. The speed through the crossover in both cases was just at the limit for derailing. At Laverton the train did derail, but this was probably because the fishplates broken under the stress of the locomotive traversing the second turnout. The train did not derail at Paisley, but the marks on the rails indicated that the locomotive wheels unloaded and some flanges ran along the top of the rail until hitting the crossing. The conclusion drawn from these accidents that that a train could pass through a turnout at twice the permitted speed without derailing - 80 km/h in the case of a 40 km/h turnout, and 130 km/h in the case of a 65 km/h turnout. This was because the speed limit through a turnout was primarily set for passenger comfort, not for safety. However, travelling at higher speeds does not mean that there will not be damage to the track (possibly leading to a derailment), rolling stock, passengers or freight.

In Victoria this would mean that a derailment could occur on a 40 km/h turnout in the following sections: (115km/h): Altona Junction - Geelong; South Geelong - Warrnambool, Gheringhap - Warrenheip, (95 km/h): Geelong - South Geelong, North Geelong - Gheringhap - Maroona,

It is interesting that the engineering response to both Laverton and Paisley was always on protecting the 40 km/h crossovers on bi-directionally signalled tracks with a line speed of 110 km/h. No consideration was given to other locations where 40 km/h turnouts were approached at high speeds. No explanation for this decision has been seen. The decision clearly limited the costs of implementing the solutions. However, one other possible reason is that the crossovers on bi-directionally signalled lines were rarely used, and hence divergences were unexpected. At other locations the divergence might be more regularly used and hence no so unexpected by the train crew.

Home 20 is now Home LAV730 and in this photo displays a Reduce to Medium Speed aspect for an Up Sparc to proceed to the Altona Loop at Laverton. The back board was provided after the accident to reduce the chance of misreading the signal. Since the accident, the crossover at Laverton has been replaced by a high speed (65 km/h) crossover, hence the provision of a '65' indicator on this signal.



PEDESTRIAN CROSSINGS IN MELBOURNE

When Melbourne is described as the 'city of level crossings' it is the road crossings that are generally referred to. But Melbourne also has many, many, pedestrian crossings, both adjacent to road crossings, and independent.

The current standard protection for pedestrian crossings is the automatic wicket gate. However, on these pages we have some photos of older, and more unusual, pedestrian crossings. All photos were taken in September 2012.



Linacre Rd (18.293 km) on the Sandringham line is a now rare example of a crib crossing in the electrified area. The boom barriers here replaced hand gates on 19 December 1956, and little has changed since (it is interesting to try and spot the changes). Only one pedestrian crossing is provided, on the Down side of the road. Pedestrians on the northern side of the road, presumably, were expected to cross over to the southern side of the line. In practice they simply walk along the road. The crib crossing itself is constructed of lengths of condemned rail forming the uprights and painted tubular steel. Notice how the crib crossings are laid out so that the pedestrian approaches the actual crossing facing trains approaching on the nearest track - a subtle design feature to encourage the pedestrian to notice the trains.





This pedestrian only crossing at Kinane St (15.391 km), also on the Sandringham line and just south of Dendy St, is a puzzle. Although the Addenda states that this is an open crossing, in fact it is provided with hand operated wickets on both sides of the line. Neither wicket is controlled in any way and can be opened at any time by pedestrians. The gates open away from the track, and a spring is provided to close the wickets behind pedestrians. This is, in fact, a 'modern' implementation of a very old approach to pedestrian wickets in Victoria. However, this is the only known example of this type of crossing. On both sides, the pedestrians approach the actual crossing facing the trains approaching on the nearest track. However, the above picture shows that visibility of trains on the Down side is dubious at best. The pedestrian crossing is also completely unusable by anyone in a wheel chair or motorised scooter.

