SOMERSAULT

MAY 2019
VOL 42, NO 3
SIGNALLING RECORD SOCIETY OF VICTORIA

SOCIETY CONTACT INFORMATION

Published by the Signalling Record Society Victoria Inc (A0024029F)

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MINUTES OF MEETING HELD FRIDAY 15 MARCH 2019, AT THE SURREY HILLS NEIGHBOURHOOD CENTRE, 1 BEDFORD AVENUE, SURREY HILLS, VICTORIA

Present: – Glenn Cumming, Graeme Dunn, Michael Formaini, Ray Gomerski, Chris Gordon, Judy Gordon, Andrew Gostling, Bill Johnston, David Jones, Keith Lambert, David Langberg, Neil Lewis, Andrew McLean, Phillip Miller, Peter Silva, David Stosser and Stuart Turnbull.

Apologies: – Robert Bremner, Jon Churchward, Graeme Henderson, David Langley, Steve Malpass, Colin Rutledge, Laurie Savage, Rod Smith, Bob Taaffe, Andrew Waugh and Andrew Wheatland.

In the absence of the President, the Vice-President Mr. Bill Johnston, took the chair & opened the meeting at 20:27 hours, following the 2019 Annual General Meeting.

Minutes of the November 2018 Meeting: – Accepted as published. Michael Formaini / Keith Lambert. Carried.

Minutes of the February 2019 Meeting: – Accepted as published. Michael Formaini / Keith Lambert. Carried.

Business Arising: – Nil.

Correspondence: – Invoice from Surrey Hills Neighbourhood Centre for the hire of the meeting room for 2019.

Payment sent to Surrey Hills Neighbourhood Centre for the hire of the meeting room for 2019.

Letter to Diamond Valley Railway thanking them for hosting our visit on Saturday 16 February 2019.

Email from Bruce McCurry advising that the collection on the day of the visit to the Diamond Valley Railway had been donated to the Puffing Billy Belgrave Signalbox fund.

David Stosser / Michael Formaini. Carried.

Reports: – David Langberg reported that the SRSV had purchased a plan scanner. Much discussion followed.

General Business: – Membership renewal forms for 2019 have been sent and renewals are now due.

Bill Johnston asked for suggestions for future visits for meetings in February.

David Stosser suggested visiting other miniature railways.

Bill Johnston noted that a new signal box is being constructed at Lakeside on the Puffing Billy Railway.

Keith Lambert provided details about the various level crossing removal projects in the Metropolitan District. A summary of the discussion follows: –

- The control panel at Macleod has been abolished and Macleod is now controlled from Epping.
- The control panel at Upfield is still in use.
- It is planned to abolish the lever frame at Darling later in 2019 and transfer control to Metrol.

(Front cover). The electrification of Melbourne's suburban network saw the introduction of three position signalling to Victoria. B357, at Gardenvale, was erected in 1926 when three position signalling replaced double line block between Elsternwick and Brighton Beach. Ninety three years later there have been a small number of changes to the signal, but the combined overhead structure, doll with RSA finial, and marker light case are unchanged. The upper quadrant semaphore was removed on 29 October 1978 when the post was temporarily placed out of service during the replacement of the Nepean Hwy bridge. When the post was restored to service on 10 August 1982 a searchlight was placed on the doll. On 11 August 2002 the searchlight was replaced by a Westinghouse Tri-colour LED, however this in turn was replaced on 20 July 2008 by a United Group Tri-colour TC2 LED head as the Westinghouse product proved to have a design flaw. Photo Andrew Waugh

- It is proposed to provide facilities at Anstey to allow trains to terminate and turn back as part of the project to remove level crossings at Moreland and Coburg.

Phillip Miller reported that the name of Spencer Street is still used for signalling and safeworking purposes.

Phillip Miller described works at Kananook.

David Stosser provided an update on Chelsea. The building is now in use as an office for Protective Services Officers but the signal control panel is still inside.

David Stosser commented on the colour printing of "Somersault" and noted that this might encourage more people to contribute images for publication.

David Stosser provided an update on his efforts to preserve the Oakleigh signal control panel.

David Stosser reported that North Geelong "C" Box had been abolished.

Andrew McLean reported on progress on the construction of the new crossing loop at Millbrook (between Ballan and Warrenheip).

Chris Gordon advised that Carrum will be abolished and new stabling sidings provided at Kananook in July 2019.

David Stosser suggested that the new Cheltenham station will be based on the design used for Blackburn.

David Stosser asked if Banner Indicators were track cancelled? The answer given is that Banner Indicators are track cancelled except for the Banner Indicators on the Flinders Street viaduct.

David Stosser asked about levers in interlocking machines that worked equipment not related to signalling. Answers given were the green lever at Elsternwick that operated an overhead section switch and levers pained half black and half red that worked platform indicators at Clifton Hill and Ringwood.

Meeting closed at 21:30 hours.

The next meeting will be on Friday 17 May, 2019 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 9/19 to WN 15/19, 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 alterations.

(19.02.2019) Frankston (SWP 5/19, WN 8)

A hand operated flag derail was provided in X track extension on the Up side of Points 62.

The derail provides roll-out protection for stabled track machines in X track extension. The derail must be placed on the rail by the person in charge of the track machine movement. The key to the padlock securing the derail is held by the Signaller, Frankston.

A new clause (c) was added to Caulfield Group Operating Procedure 10A

(26.02.2019) South Kensington (SW 29/19 & 145/19, WN 9)

Diagram 49/18 (South Kensington) replaced 11/18 as in service. The alterations mainly involve VicTrack changes at North Dynon yard.

(26.02.2019) Ararat – Maryborough (SW 30/19, WN 9)

Diagrams 6/19 (Amphitheatre – Elmhurst) and 2/19 (Bung Bong – Avoca) replaced 88/18 and 90/18 respectively as in service. The alterations concern the provision of boom barriers at Porcupine Lane, Wardlaws Lane, Dawsons Road, LJ Dawson Road and Moonlight Road.

27.02.2019 Wunghnu (TON 32/19, WN 10)

On Wednesday, 27.2., the siding at Wunghnu (208.158 km) was booked out of use due to poor point lever foundations.

08.03.2019 Kerang (SW 31/19, WN 10)

On Friday, 8.3., the notice board at the Up end of the platform was altered to read "Maximum speed to crossing 30 kph". Amend Diagram 54/13 (Pyramid – Kerang).

09.03.2019 Epping (SW 142/19, WN 9)

On Saturday, 9.3., the point machines on Points 049 and 055 were renewed as Clamp Lock SPX Mk3 type.

11.03.2019 North Geelong C – Grain Loop (SW 33/19 & 38/19, WN 11)

On Monday, 11.3., the mechanical signalling at North Geelong C was formally abolished and the power signalling was notionally commissioned. However, the new signals will be secured at Stop and the points will be operated by hand by a Signaller based at the North Geelong C signal box. The signalling at the Down end at the junction of the Western line and the dual gauge Main Line to North Geelong C remains operational and continues to be worked by ARTC Mile End.

The Westcad and Phoenix signalling VDUs at North Geelong C were abolished. The mechanical interlocking frame and all associated signal box equipment was abolished. The staff proving box was abolished.

The Train Staff & Ticket section "Geelong Grain Loop" was abolished and the Train Staff removed.

Homes Post 14, 15, 16, 19, & CGL40 were abolished. Dwarf Post 18 was abolished. Repeating Signal CGL46 was abolished. Dwarfs 18, 58 & 60 were renumbered NGC66, NGC58 & NGC60 respectively. Homes CGL26, CGL30, & CGL32 and Dwarfs CGL48 & CGL54 were not altered.

Points 15 & 53 were renumbered NGC67 & NGC53 respectively. Crossover 12 was renumbered NGC51, Catch 19 was renumbered NGC65. Derails and Crowders 53 & 55 were renumbered NGC53 & NGC55 respectively.

Points NGC51, NGC67, & NGC53, Catch NGC65, and Derail NGC53 were provided with dual control point machines.

The Wagon Maintenance Access Crossing on the Up side of Separation St has been closed and barriers installed. The strobe lights for this crossing have been abolished. A replacement passive access crossing leading from Duoro St across the Through and Ballarat sidings will be provided at a later date.

The Corridor Master Keys for Waurn Ponds – Warrnambool and Batesford – Ballarat East were relocated to South Geelong.

A Signaller will be attendance at North Geelong C for all rail traffic. Only one rail movement is allowed to operate in the North Geelong C area at one time.

The dual gauge Main Line, the Geelong Grain Loop, and the portion of the Corio Independent Goods Line between the Grain Loop and the dual gauge Main Line were restored to service. The following signals were provided, but are secured at Stop:

- Home NGC62 (dual gauge Main Line to NGC64)
- Home NGC64 (dual gauge Main Line to Grain Loop)
- Home CGL46 (Grain Loop to CGL44)
- Banner Indicator CGL44BI was secured normal
- Home CGL44 (Grain Loop to Corio Independent Goods Line)
- Home NGC70 (Corio Independent Goods Line to dual gauge Main Line)

Points CGL41, which form the junction between the Grain Loop and the Corio Independent Goods Line on the Up side of Separation St, will be operated manually by the Signaller.

The existing boom barriers at Separation St and Corio Quay South Road (on the Grain Loop) remain in service and will be manually operated using the test switch by the Signaller.

Gates CGL45 are secured open. Local keyswitch operation for manual operation of Rail Gates CGL45 was retained.

Local controls are provided at the Grain Unloading Shed to operate the shed doors. These are operated by the Grain Shed personnel. Prior to a train being signalled towards the North Geelong C controlled area, the Train Operator must confirm with the Grain Shed Operator that the train can be accepted, and the Train Operator must inform the Signaller, North Geelong C.

The Arrival Track, Departure Track, Melbourne Loop, North Geelong Yard access, Corio Independent Goods line, and North Shore Yard are not available for rail traffic and will be placed under Absolute Occupations.

- Homes NGC68, CGL26, CGL30, & CGL32, & CGL42, and Dwarfs NGC58, NGC60, NGC66, CGL48 & CGL54 are not yet in use.
- Crossover NGC51, Points NGC67, & Points CGL43 were secured normal
- Points CGL37 & CGL39 remain out of use within an Absolute Occupation.

Up train movements towards the Grain Loop

Prior to signalling an arriving train to the dual gauge Main Line, the ARTC Network Controller must confirm with the Signaller that the train can be accepted onto the dual gauge Main Line. Operation of the Thompsons Road level crossing and authority to pass Home 72/40 will under instructions issued by the ARTC Network Controller. The Signaller will issue a Caution Order for Home NGC62. The Signaller must then confirm that the Separation St level crossing is operating and issue a Caution Order for Home NGC64. On arrival at Home CGL46 the train crew will contact the Signaller and request a verbal authority to pass that signal. The Signaller must then go to Points CGL41 and, after ensuring that the train is clear, set them for the departing train movement from the Grain Loop.

Down train movements from the Grain Loop

Prior to a departing train leaving the Grain Loop, the Signaller must confirm with the ARTC Network Controller that the train can enter the ARTC main line at Thompsons Road. After confirming that Corio Quay South Rd is operating, the Signaller will issue a Caution Order for Home CGL44. After confirming that Separation St is operating, the Signaller will issue a Caution Order for Home NGC70. There are no instructions to set Points CGL45 for the next arriving train.

(12.03.2019) Level Crossing Test Switches (SW 32/19, WN 11)

Commencing forthwith, the test switch may only be used to start level crossing warning equipment for the passage of rail traffic on the V/Line network in the following situations:

- Where it is known that the warning equipment will not work automatically. This includes where the vehicles are not designed to activate level crossings; for single line working of double lines; where a signal must be passed at stop and the island track circuit cannot be occupied by the train before it enters the roadway; and where it is necessary for rail traffic to return on the wrong line to the location in the rear.
- Where it cannot be guaranteed that the warning equipment will work correctly (see TON 400/08 and SW 129/07).
- Where approval is issued by the V/Line Compliance and Safeworking Department.

In all cases the employee operating the test switch must ensure that the level crossing protection equipment has operated for at least 25 seconds before giving an all-right hand signal to the driver.

(12.03.2019) Ararat (SW 36/19, WN 11)

Operating Procedure 82 (Ararat) was reissued. SW 27/19 was cancelled.

14.03.2019 South Kensington (SW 177/19, WN 12)

On Thursday, 14.3., Points 663 were booked out due to track condition. These points are secured normal.

17.03.2019 Rockbank & Melton (SW 37/19, WN 11)

On the nights between Saturday, 16.3., and Monday, 18.3., pedestrian footbridges were installed at Rockbank (29.800 km) and Cobblebank (34.400 km).

Amend Diagrams 10/19 (Ardeer – Rockbank) and 68/10 (Melton – Parwan Loop).

18.03.2019 South Kensington (SW 171/19, WN 11)

On Monday, 18.3., Up Home SKN756 was relocated 63 metres in the Up direction. Location cases 4A, 4B, 4C, 4D, 5A, 5B, 5C, & 5D were replaced by SKNZER 4/5.

Amend Diagram 49/18 (South Kensington).

01.04.2019 Bacchus Marsh (SW 43/19, 46/19, &50/19 WN 13 & 14)

Between Friday, 22.3., and Monday, 1.4., the following alterations took place:

- No 3 Road was abolished between Dwarf BMH740 and Siding A. Baulks were proved at Dwarf BMH740. An illuminated Buffer Stop Light BMH799 was provided for Up movements at these baulks.
- Siding A and Siding D were abolished.
- No 5 Road was temporarily retained (a train was stabled in it until 1 April), but baulked at the Up end. The hand points leading to No 6 Road were secured to lay for No 5 Road.
- Points BMH15 at the Up end of No 2 Road were secured normal.
- Dwarfs BHM716 and BMH720 were abolished.
- Down Home Departure BMH714 was altered to show Medium Speed Warning when the route is set towards the Maddingley Sidings
- Down Home BMH734 was altered to display Reduce to Medium Speed when BMH714 is displaying Medium Speed Warning.
- Points 7W was provided at 50.395 km facing Down trains. The points are equipped with a point motor, but will be secured normal.

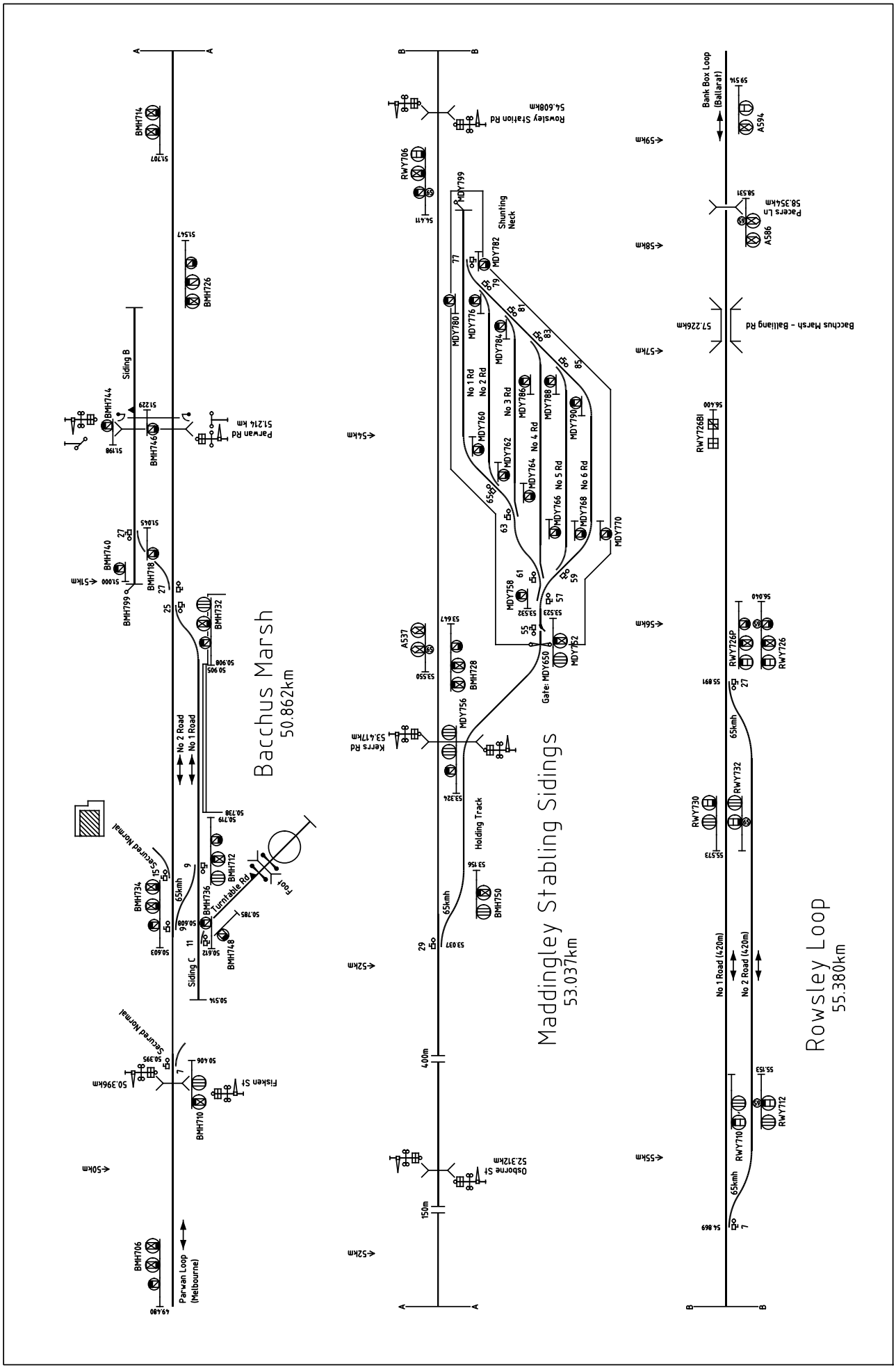
On Monday, 1.4., the following alterations took place:

- Nos 5 & 6 Roads were abolished after the train stabled in No 5 Road has been shunted clear
- The hand points leading to No 4 Road will be secured to lie for No 3 Road.

01.04.2019 Maddingley Sidings (SW 43/19, 46/19, & 50/19 WN 13 & 14)

Between Friday, 22.3., and Monday, 1.4., the Maddingley Stabling Sidings were brought into use. The Sidings are situated on the Up side of the line between Kerrs Rd and Rowsley Station Rd on the Down side of Bacchus Marsh. The following alterations took effect:

- Points BMH29, facing Down trains, were provided at 53.037 km between Osbourne St and Kerrs Rd. These points were equipped with a dual control point machine.


Bacchus Marsh
50.862km
Maddingley Stabling Sidings
53.037km
Rowsley Loop
55.380km
Parwan Loop (Melbourne)
Siding B
Siding C
No 1 Road
No 2 Road
Turntable Rd
Secured Normal
Fisken St
Kerrs Rd 53.417km
Holding Track
Osborne St 52.312km
Rowsley Station Rd 54.608km
Shunting Neck
No 1 Rd
No 2 Rd
No 3 Rd
No 4 Rd
No 5 Rd
No 6 Rd
Gate: MDY650
Bank Box Loop (Ballarat)
Pacers Ls 58.354km
Bacchus Marsh - Balliang Rd 57.226km
No 1 Road (420m)
No 2 Road (420m)
65kmh
400m
150m

A Holding Track extends from Points BMH29 to the stabling sidings. This Holding Track will be part of the Bacchus Marsh – Rowsley Loop single line section. The signalling of a train between Bacchus Marsh and the Maddingley Sidings (including the Holding Siding) will prevent the signalling of a train between Bacchus Marsh and Rowsley Loop. The Holding Track is a Running line and trains are not allowed to be stabled or left unattended in the Holding Track.

- Six loop sidings were provided: No 1 Road (187 metres clear); No 2 Road (187m); No 3 Road (189m); No 4 Road (200m); No 5 Road (200m) and No 6 (200m)
- A shunt neck with 86 metres standing room was provided at the Down end of the sidings
- A friction Buffer Stop was provided at the Down end of the Shunt Neck.
- Homes BMH750, MDY752, & MDY756 were provided. These Home signals are equipped with TPWS.
- Dwarfs MDY758, MDY760, MDH762, MDY764, MDY766, MDY768, MDY770, MDY776, MDY780, MDY782, MDY784, MDY786, MDY788, MDY790, & MDY799 were provided.
- Points BMH29, 57, 59, 61, 63, 65, 77, 79, 81, 83, & 85 and Catch 55 were provided. All points are operated by dual control point machines.
- Motorised security gates MDY650 were provided.
- Operation of the level crossing equipment at Kerrs Rd (53.417 km) was converted to axle counter equipment and the level crossing predictor signage was abolished.
- All track circuits at Maddingley Sidings and in the Holding Track are operated by axle counters. All track circuits between Points 29 and Rowsley Loop are axle counters.

Diagrams 14/19(Bacchus Marsh – Rowsley) & 18/18 (Bank Box – Ingliston) replaced 32/15 (Bacchus Marsh – Bank Box Loop).

Operating Procedure 67 (Deer Park West – Wendouree Defective Signals) was reissued to include Maddingley Stabling Sidings. SW 13/17 was cancelled. Operating Procedure 74 (Maddingley Stabling Sidings) was issued.

01.04.2019 Millbrook (SW 43/19, WN 13)

Between Friday, 22.3., and Monday, 1.4., a set of motorised points (Points 27W) were provided at 98.924 km facing Up trains. A dual control point machine was provided. The points are secured normal.

Diagram 8/19 (Bungaree) replaced 8/19.

(02.04.2019) Book of Rules, Section 36 (SW 52/19, WN 14)

Section 36 was reissued and is now Version 19.02. The main change is that Rule 6 has been updated to reflect the introduction of Maddingley Stabling Sidings. SW 1/19 is cancelled.

(02.04.2019) Metrol (SW 201/19, WN 14)

The train control boards at Metrol are:

- Burnley Operations Controller. Supervises Flinders Street Platforms 1, 2, 3 & 14; Southern Cross Platforms 9 & 10; the Clifton Hill & Burnley Viaducts and Underground Loops; and all tracks between Flinders Street and Burnley & Clifton Hill. Operates continuously.
- Northern Operations Controller. Supervises Flinders Street Platforms 4 & 5; Southern Cross Platform 11 and No 10A Track; the Northern Viaduct and Underground Loop; and the East Suburban and Main Suburban lines to North Melbourne. Operates Monday – Friday 0600 – 1830 hours; at other times control is transferred to the Caulfield Operations Controller.
- Caulfield Operations Controller. Supervises Flinders Street Platforms 6 to 13 and No 9A Track; Southern Cross Platforms 12, 13, & 14; the Caulfield and Through Suburban Viaducts and the Caulfield Underground Loop; the Caulfield Through and Local lines to Caulfield; the Sandringham Line and Special Lines between Flinders Street and Richmond Junction; and the Through Suburban Lines to North Melbourne. Operates continuously.
- Eastern Line Controller. Supervises Clifton Hill to Mernda and Hurstbridge and all lines beyond Burnley. Operates Sunday – Wednesday 0500 to 2130 hours and for 24 hours Thursday – Saturday (i.e. when the train service runs).
- Caulfield Line Controller. Supervises Richmond – Sandringham and all lines beyond Caulfield. Operates Monday – Friday 0600 to 2030 hours and Saturday 1200 to 2000 hours; at other times control is transferred to the Western Line Controller.
- Western Line Controller. Supervises all lines beyond North Melbourne. Operates continuously

The Signal Control Panels are:

- Clifton Hill. Works Flinders St Platforms 1, 1A, & 14; City Circle Viaduct and City Circle Underground Loop, Southern Cross Platforms 9?, 8 Centre, 8 South, and 8A Track (but only for trains departing for Flinders Street); and Flinders Street to Westgarth. Operates continuously, but from 2100 hours to 0600 hours the following morning one Operator works both the Burnley and Clifton Hill panels.

- Burnley. Works Flinders Street Platforms 2, 3, & 4 (but only Down trains towards Richmond); Burnley Viaduct and Burnley Underground Loop; Southern Cross Platform 10; Burnley Local and Through Lines between Flinders Street and Burnley, and the Burnley Stabling Sidings. Operates continuously, but from 2100 hours to 0600 hours the following morning one Operator works both the Burnley and Clifton Hill panels.
- Northern. Works Flinders Street Platforms 4 & 5, Northern Viaduct and Northern Underground Loop; Southern Cross Platforms 8 North, 8 Centre, 8 South, 11, and Track 10A; East Suburban and Main Suburban Lines between Southern Cross and North Melbourne, North Melbourne Platforms 1 & 3. Operates continuously.
- Caufield Panel. Works Flinders Street Platforms 6 to 13; Caufield Viaduct and Caulfield Underground Loop; Caulfield Local, Caulfield Through, Sandringham, and Special Lines between Finders Street & Richmond; Southern Cross Platforms 12, 13, & 14; Through Suburban Lines between Flinders Street & North Melbourne; North Melbourne Platform 5; and leads towards Metro Freight Bypass line. Operates Continuously.
- Western Panel. Works North Melbourne Platforms 2, 4, & 6; lines from North Melbourne to Macaulay, Kensington, Sunshine (Main Suburban and Sunbury lines) and South Kensington (Through Suburban and Newport lines). Operates continuously.

02.04.2019 **Tottenham Yard** **(SW 54/19, WN 14)**

On Tuesday, 2.4., No 8 Road East Yard was abolished and will be removed (it was previously booked out in TON 25/18). The points leading to No 8 Road will be secured for No 7 Road.

Amend Diagram 61/14 (West Footscray – Tottenham).

02.04.2019 **Cobblebank** **(SW 46/19, WN 14)**

By the resumption of services on Tuesday, 2.4., coping stones had been installed on the platforms at 34.400 km.

02.04.2019 **Melton** **(SW 46/19, WN 14)**

By the resumption of services on Tuesday, 2.4., a signal gantry had been provided at 38.600 km.

Amend Diagram 68/10 (Melton to Parwan Loop).

02.04.2019 **Bacchus Marsh** **(SW 46/19, WN 14)**

By the resumption of services on Tuesday, 2.4., precast platform units had been installed adjacent to No 2 Road.

02.04.2019 **Ballan** **(SW 46/19, WN 14)**

By the resumption of services on Tuesday, 2.4., a pedestrian overpass has been provided at 79.438 km.

Amend Diagram 4/19 (Ballan – Gordon).

05.04.2019 **North Geelong C – Grain Loop** **(SW 57/19 WN 15)**

On Friday, 5.4., the Melbourne Loop line was restored to use and broad gauge operations over the Grain Loop are permitted. Points NGC67 were restored to use and will be manually controlled.

Departure of broad gauge trains via the Melbourne Loop line

The Driver of the broad gauge train within the Grain Loop will advise the Signaller that they have finished discharging grain wagons and will ask to move the lead locomotive from the front of the train to the rear for push/pull operations. The Signaller will confirm that Corio Quay Rd is operating and issue a Caution Order for Home CGL44. The Driver will secure the train, uncouple the lead locomotive, and drive the locomotive to NGC70. After confirming that Separation St is operating, the Signaller will issue a Caution Order for Home NGC70. Once the light engine is clear of Separation St and Home NGC64, the Signaller will restore Points CGL41 to normal. The Signaller will again confirm that Separation St is operating and issue a Caution Order for Home NGC64. On arrival at Home CGL46, the train crew will contact the Signaller and request permission to pass the signal to couple up to the grain wagons.

The Signaller will reverse Points CGL41 and contact the V/Line Geelong Train Controller to confirm that the train can be accepted onto the V/Line Network via the Melbourne Loop line. The Signaller will confirm the operation of Corio Quay Rd and issue a Caution Order for Home CGL44. The Signaller will confirm the operation of Separation St and issue a Caution Order for Home NGC40. Once the train is clear of Separation St and Home NGC64 the Signaller will restore points CGL41 normal.

The Driver will advise the Signaller when the train is ready to depart via the Melbourne Loop line. The Signaller must obtain a Train Path from the Geelong Train Controller. Once a path has been agreed, the Signaller must reverse Points NGC67 for the Melbourne Loop Line. The Signaller will confirm the operation of Separation St and issue a Caution Order for Home NGC64. The Signaller must advise Geelong Train Controller that the train has departed. Once the train is clear of the Melbourne Loop Line the Signaller must restore Points NGC67 normal for moves to the Grain Loop.

End£

SIGNALLING THE ELECTRIFIED RAILWAY

This year marks the centenary of the inauguration of the electric train service in Melbourne. Electrification had a significant effect on Victorian signalling practice as it was the driver for the introduction of automatic and power signalling, and the consequent choice of the US speed signalling scheme. The path to the introduction of this signalling was surprisingly hesitant and tortuous. It appears that at least some in the VR hierarchy were hesitant about departing from UK practice, and the UK at the time had little knowledge or experience of automatic signalling.

What had gone before

The first widespread application of electric power to rail vehicles was to street railways (tramways) in the US which, of course, had no need for signalling. The City and South London was opened in 1890 and appears to have been the first significant electric transit railway – the choice of electric traction is scarcely surprising given that it was also the first deep level underground tube. This line used conventional mechanical signalling with Spagnoletti Lock and Block. The same approach was used on the later Waterloo & City (1898, but with Sykes Lock & Block), and the Central London Railway (1900). The choice of conventional mechanical signalling on these lines is not to be wondered at. There was little experience with automatic signalling in the UK at this time, of course, and, even had there been any interest, the technical problem of using DC track circuits over rails that were also used for traction return had not been solved.

The Liverpool Overhead Railway (1893) appears to not only have been the first electrified elevated railway, but the first to use automatic signalling. The automatic signals on the LOR were operated by means of contactors operated by strikers mounted on the rear car of each train. In the US the steam operated elevated lines in New York and Chicago largely operated without signals of any kind, just like the street railways beneath them.

It appears the first use of track circuits and automatic signals was on the new Boston Elevated (1900). This dedicated one rail for the traction return while the second was divided into blocks for single rail DC track circuits. It was quickly realised that this was not altogether safe, and the track circuits were altered in 1901 to use polarised DC relays which made it unlikely that the track relays would be picked up by the traction return. In the same year the Boston Elevated also introduced automatic train stops. In the UK, the American C.T. Yerkes, orchestrated a take-over of the District Railway and a number of projected tube lines in 1901 and the resulting company was the genesis of the London Underground. Untrammelled by a necessity to follow UK ideas, the company adopted the automatic signalling system used on the Boston Elevated, including the DC track circuits and polarised relays. This signalling was first used in the UK on the Ealing & South Harrow (part of the District Railway) in 1903. Features of this line, still present in London Transport signalling today, include two aspect signalling (with 'repeaters' used where sufficient sighting of the home cannot be obtained) and electro pneumatic train stops. This signalling was used on all the early Yerkes tubes, with the only change being the adoption of AC track circuits: the Baker Street and Waterloo (the Bakerloo) in 1906, the Great Northern, Piccadilly & Brompton (the Piccadilly) also in 1906, and the Charing Cross, Euston & Hampstead (the Hampstead tube) in 1907. The Underground subsequently took over the City and South London and the Central London and resignalled both with their standard automatic signalling between 1912 and 1914.

This is, however, jumping ahead of the development of automatic signalling for electric railways. The major step forward occurred in 1903, again in the US, when the AC track circuit was introduced (on the North Shore Railroad in California). The following year the Boston Elevated commenced to use double rail AC track circuits with impedance bonds. As mentioned above, this technology had spread to the London Underground by 1906.

The use of three aspect automatic signalling in the US dates from the 1880s – at this time using two position home/distant arms. The three position upper quadrant semaphore was patented in 1903 by Loree & Patenall, and in 1906 the Railway Signal Association recommended its general adoption. The first three-position upper right hand quadrant semaphore signals in the US were installed on the Pennsylvania Railroad in 1906. Formal adoption of the upper quadrant signal by the Railway Signal Association as preferred practice occurred in 1908.

Speed signalling dates from 1896 when the PRR Lines West introduced a new signalling standard where all home signals would have an upper arm for the main route and a lower arm for all other (diverging) routes, although this was a formalisation and extension of previous junction signalling practice on a number of railroads. At this date the signals were two position signals, and usually mechanically worked.

The Melbourne electrification

In 1907, Thomas Tait, Chairman of the Victorian Railways Commissioners, visited Europe and North America to investigate electrification schemes and to engage a consulting engineer to prepare a report on the proposed Melbourne suburban electrification. Tait chose the British electrical engineer Charles Merz[1] to prepare the report.

[1] Charles Hesterman Merz (1874-1940) was a significant British electrical engineer. He was apprenticed to the Newcastle-upon-Tyne Electric Supply Co in 1889 and became a pupil at the Robey & Co engineering works (manufactures of high speed reciprocating steam engines). In his early career he worked at a variety of electric supply companies around the UK. In 1899 he set up a consulting firm, and in 1902 partnered with William McLellan to form Merz & McLellan. In 1902 Merz was consulting engineer for the Neptune Bank Power Station in Wallsend – this was the first three phase AC power station in the UK and was a pioneer in the use of steam turbines instead of reciprocating engines. This was essentially the prototype of all current steam power stations. He subsequently was a major influence in the development of power system grids in the UK. In 1904, Merz was consulting engineer to

Merz visited Melbourne and prepared a report in the first half of 1908.

With regard to automatic signalling Merz seemed to consider that the existing double line block sections would suffice for the new electric service as electric trains would occupy the block sections for a shorter time (i.e. have a higher average speed) allowing a closer headway. If not "additional and automatically operated block sections should be introduced on this section to avoid short signal checks to one train affecting the trains following." Merz went on to say "There are many arrangements of automatic signalling on the market but my experience under operating conditions is confined to the Westinghouse and the Hall systems, both of which give good results, the cost of maintenance being low and the irregularities few. In the case of a London railway equipped with the former, a four months' special record was recently taken and gave only one failure for 570,000 signal movements.[1]"

Merz went on to consider the provision of power signalling:

> The introduction of electrical working renders possible some signal and safety devices which are not readily adaptable for steam locomotive operation. For example, the necessary supply of electrical energy for any power signalling system is placed at the disposal of the Railway Department at medium cost. This renders such a system possible commercially in cases where the cost of providing and running special plant for supplying the electrical energy required for power signalling alone would be prohibitive. In spite of this advantage, however, I do not consider that the installation of a power signalling system on your lines would at present show an actual economy if interest and capital expenditure were taken into consideration [Footnote in original report: The main gain is in the safety of the system, the working and checking being more precise and the relief of physical strain on the signalmen tending to reduce fatigue and increase the efficiency of the men. The abolition of noise from the cabin is also in favour of better concentration of the operators upon the work in their charge.] I also see considerable disadvantage in attempting alterations to the signalling system at a time when in any case the railway staff will already be very fully occupied.
>
> As regards automatic safety devices it may, for example, be arranged that the signals are interlocked with track levers which, in the event of signals being over-run for any reason, will engage with a lever on the train arranged to open a valve on the air brake pipe line and so apply the brakes throughout the train while simultaneously causing the overload device on the main power switch on the train to open and interrupt the supply of power to the motor. Again, in the case of a train over-running a signal power can be cut off that section of the line at the discretion of the signalman and the train brought to a standstill.
>
> I would, however, recommend that the whole question of signalling and of the provision of special automatic safety devices be left over at any rate until the first section of the lines is being operated electrically so as to profit by the experience of actual working conditions.
>
> The systems of train despatch do not, in my opinion, require any modification for the time being; they are sufficiently good not to have any retarding effect on the improvement in the train service proposed, and can be conveniently considered in detail and dealt with at some later stage when actual experience with the larger number of trains has directed your attention to any real improvement that might be made, and then one or more of the numerous fully developed systems on the market could be adapted for your purpose.

At this time the Commissioners agreed with these recommendations, but it was a moot point as the Commissioners recommended to the government that the electrification scheme not proceed.

The matter was revisited in 1912 as part of a wider inquiry into the electrification of the Melbourne railway and tramway systems. Merz was requested to prepare a second report which was considered by the Commissioners and Parliament towards the end of 1912.

The revised report still did not include any provision for a new signalling system. As Merz explained to the Select Committee[2] "the reason being that there is no necessity to alter the signalling system because electric traction is adopted. The adoption of electric traction may be an inducement to change the signalling system, but it does not necessitate any alteration." (q 1950). Merz further explained that "The Commissioners have been discussing with me, at some length, the procedure in connexion with any alterations to the signalling system, which, of course, might quite as well take place in so far as they are possible with steam working; and they propose to send one of their officers Home in order to confer with us there; and we propose to send one of our responsible engineers, who has a knowledge of the subject, with him to America before coming to any final conclusion." (q1648)

At the end of 1912 the Victorian Parliament approved electrification project. In mid March 1913 the Commissioners created an electrification committee consisting of Edwin Jones (VR Secretary, Chair), William Shannon (Chief Mechanical Engineer), Thomas Molomby (Superintendent of Passenger Train Service), William Stone (Electrical & Lighting Engineer, and to become Chief Electrical Engineer on 1 May 1913), and William Rennick (Engineer of Works). Much of the following information comes from the minutes of this committee[3].

The initial signalling scheme

Apparently as a result of the discussions with Merz, the Commissioners directed in February 1913 that arrangements be made for the visit of Francis Calcutt (Signal Engineer) and Ernest Blazey (Superintendent of Goods Train Service) to England, Paris, and America. William Fitzpatrick, the VR Chairman of Commissioners, would follow them overseas and would participate in the

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the NER on electrification of the Tyneside local suburban service. It would appear that was this experience that led to his selection for the Victorian work. Subsequently he worked on electrification schemes in India, South Africa, the United States and South America. Merz's consulting company was one of the forerunners of Sinclair, Knight, Merz. (https://www.gracesguide.co.uk/Charles_Merz)

[1] The 'Westinghouse system' would be as used on the London Underground. The 'Hall system' would be the electro-gas system used on the NER between York and Northallerton in 1903.

[2] Report of the Select Committee in connexion with the Further Report by Mr C.H. Merz upon the Application of Electric Traction to the Melbourne Suburban Railway System" December 1912.

[3] VPRS 12583

inspections and the discussions with Merz. A letter from Fitzpatrick to Merz explained the proposed program:

> We propose that the Officers shall proceed direct to London, where they will immediately place themselves in touch with you, and look into questions relating the Automatic Signalling and Safe Working Appliances generally in England and Paris, and then meet me on my arrival a month later; and that they then shall proceed to America at the end of May or early in June, to which place I propose to follow them a fortnight or three weeks later and make a similar investigation. After having seen the various Automatic Systems in operation in England, Paris, and America, we will meet you again in London and agree with you as to the system that should be provided for in the Scheme that you are required to submit under Clause 17 of your agreement.
>
> We will be glad if, as suggested in your letter, you will kindly send a representative of your Firm with Messrs Calcutt and Blazey on their visits of inspection, and our officers will be available to afford you any information as to the Melbourne conditions which you may require and to also collaborate with you as may be necessary in the preparation of the final Scheme.
>
> We further contemplate that, after a definite decision has been reached, the Officers shall study in close detail the actual operation in all respects of the system that will be adopted, so as to facilitate our operation of the System."
>
> It is recommended that the Officers include in their investigation the question of applying electricity in the lighting of all signals within the suburban area.

Calcutt and Blazey sailed from Melbourne on the 11 March 1913 and Fitzpatrick followed on 8 April 1913. It appears that they spent most of their time in or near London, but they visited the electrified systems in Paris and Berlin. The US portion of the tour may have have only covered New York - Fitzpatrick noted inspecting the Manhattan Elevated and the Interborough Rapid Transit. It was interesting that Fitzpatrick's published comments on the New York systems focussed on his observations of crowding on the systems ("that it was the standing passengers or 'strap-hangers,' as they are termed, who were looked to for the dividends") and not on the signalling. At each city, Calcutt and Blazey preceded Fitzpatrick by about a month, giving them time in each case to make an inspection of the electrified lines (and some steam railways) and prepare a report for Fitzpatrick. Using this report as a base, Fitzpatrick made his own inspection. Calcutt and Blazey were accompanied by Edwin Grove[1], of Merz and McLelland. Calcutt and Blazey returned to Melbourne on 27 October 1913 and Fitzpatrick returned on 22 December 1913. On his arrival, Fitzpatrick described the results of the fact finding mission to the press:

> Mr Fitzpatrick said that, with the advent of electric traction in other parts of the world a more elaborate system of signalling was evolved, and in London, New York, Paris, and other great cities the automatic system was now in general use. The Victorian Railways was aware of the advanced methods which had been introduced, but in order to obtain an intimate knowledge of their working the signalling engineer (Mr Calcutt) and the superintendent of goods train service (Mr Blazey), who was also the safe working expert, were directed early in the year to visit England, Paris, Berlin, and New York. After they had visited a city and submitted a report, he followed and made observations. The object of the investigation was to evolve an up-to-date system which would be best suited to Victoria's conditions. They had considered the automatic system worthy of imitation, and after having selected a scheme which seemed most appropriate to Victorian lines they had noted points in other system which might be applied beneficially. With an automatic system of signalling it was necessary to introduce what were known as automatic stops. The automatic stops gave an immediate signal to the driver that he had gone too far, and brought the train to a stand still. They had also agreed to adopt various other devices, such as illuminated diagrams, special train describers, and platform indicators. The diagrams enabled a signalman to see the movements of a train in the vicinity. The special train describers more clearly indicated to the signalman the character of the traffic which he was dealing with. They showed whence and whither trains were going. Some platform indicators gave information to a driver as to how much ahead another train was, and others gave general information to the public. Many other questions they had taken note of, and in consultation with Messrs Merz and McLellan, the electrical advisers, they had elaborated a system of safe working. Tenders in connection with the necessary detail were called shortly before he left England. The department would introduce the system of signalling as soon as possible. While the improved methods would be brought into use without interfering with the existing arrangements, the best use of the new system could not be made until the electrification scheme was in operation[2].

Reading between the lines, the signalling on the London tube lines had clearly had a big impact on Fitzpatrick, as the features he emphasised, particularly the train describers and illuminated diagrams, were special features of that system.

The report from Blazey & Calcutt was formally submitted by the General Superintendent of Transportation in late November 1913. Fitzpatrick's separate report was submitted to the Minister in January 1914. Unfortunately, I have not seen either, but the press highlights of Fitzpatrick's report make the general tenor clear.

The press comments on Fitzpatrick's report began by stating the benefits to be gained by the introduction of automatic signalling: "the closer headway and increased number of trains combined with other reasons, render it necessary, in the case of busy electric railways, to adopt an automatic system of signalling with the various safe-working appliances that it is practicable to introduce with greater facility than under steam conditions". After describing the features of an automatic signalling system, the report continued:

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[1] Edwin Grove served an apprenticeship with Willans & Robinson, steam engine builders, and afterwards worked for the firm as assistant engineer on erecting their steam engines. The Willans high speed reciprocating steam engine was popular for electricity generating plants. Subsequently he moved to a similar role with the British Thomson-Houston Company. In this role he was involved in many large power stations and the equipment of several tramway systems. After this he became the Chief Engineer of the Central London Railway for 10 years, and had been responsible for, and begun the installation of, a complete system of automatic track signalling. He arrived in Melbourne as Merz & McLellan's resident engineer in October 1913. He remained in Melbourne on the electrification work until 1924 when he was sent by Merz & McLellan to New Zealand to report on proposed railway electrification there.

[2] The Argus, 23.12.913 p8

> [T]hat after inspecting all the systems of automatic signalling in conjunction with Messrs Grove, Blazey, and Calcutt, and discussing the matter thoroughly with Mr Merz and his staff, it was unanimously concluded that a system controlled by alternating current track circuits, with automatic stops and other auxiliaries, similar to that in use on some of the London underground railways was the most suitable for the Melbourne suburban lines. That system had been so developed that the reliability of the apparatus was remarkable, and in due course Mr Merz would, having regard to the local conditions, submit a final scheme for consideration. It would not, however, be practicable to install the system as a whole at once, and it would be necessary to provide in the meantime for continuing the operation of the system of track circuits which was now in effect, care being taken that all the apparatus installed should fit in with the complete automatic signalling scheme when the latter was put into operation. Arrangements were therefore made with Mr Merz to issue specifications of the apparatus required in the transition stage, such specifications being prepared in conjunction with Messrs Calcutt and Blazey, and approved of by Mr Fitzpatrick; and, as the apparatus was not made in Australia, tenders were invited in London, and were returnable on the 22nd ultimo [December], and it would be necessary to expedite the work as much as possible, so that the track circuits on the first line to be electrified, viz, Sandringham to Broadmeadows, may be maintained in operation when the electric trains commenced running[1].

As foreshadowed by Fitzpatrick's December announcement, it appears that automatic signalling based on that used by the London tube lines was preferred for the Victorian electrification. As already mentioned, this signalling was, in turn, based on US technology with AC track circuits and impedance bonds. The main limitation of the London signalling was that it was designed for what would now be described as rapid transit – where all the trains were identical in handling characteristics and had a relative low top speed. At this time the lines themselves had a relatively simple layout. A two aspect signalling system was consequently adequate. In Melbourne, however, the trains would be larger and heavier than on the Underground, they would travel at higher speeds, and the signalling system would have to also accommodate steam hauled goods and passenger trains. Based on subsequent comments, it appears that 'similar' meant that Fitzpatrick, Blazey, and Calcutt had in mind a three position signalling system, probably using a yellow aspect. It is important to note that Fitzpatrick did not state that automatic signalling was to be installed, just that Merz would prepare an automatic signalling scheme for consideration.

Note also the implication at the end of the press report that it was not expected that automatic signalling would be in use on the Sandringham – Broadmeadows line when electrification was brought into service, but that work would have to be undertaken on the existing track circuits. Since the Richmond accident in 1910 the Department had pursued a policy of installing track locking on suburban double line block sections. By May 1916 the track locked sections extended from Flinders-street to Seddon, West Footscray, Essendon (including Flemington Racecourse), Port Melbourne (including the branch to Port Melbourne B), St Kilda, and from Westgarth – Alphington, Richmond – East Camberwell, and Hawksburn – Caulfield. Lock and Block instruments with superimposed track locking had been installed between Princes Bridge – Clifton Hill, Flinders-street – Richmond, and Prahan – Balaclava. At the beginning of March 1914, the Commissioners explained the position. Electrification had been approved for the Broadmeadows – Sandringham line and was expected to be in use around November 1915, followed by the other lines served by the Flinders St viaduct, then the Camberwell group, the Caulfield group, the Clifton Hill group, and finally the St Kilda and Port Melbourne lines with completion by June 1917. They continued:

> When the decision to provide track-locking and Sykes Lock and Block system was arrived at, the question of electrification seem to be much further off, and now that it is within a comparatively short time of being in actual use, some modification of that intention may be needed for the reason that under electrification an automatic system of signalling will have be established on the principle lines, and it may not be advisable to incur any further expense in the provision of Sykes Lock and Block Instruments in conjunction with tracklocking for the comparatively short time that will elapse before the introduction of the automatic system.

Essentially the inner area was already track locked. Some of these tracked locked sections would be ultimately converted to automatic signalling, but probably not always before electric operation was commenced. Other sections would remain track locked with mechanical signalling, and, in fact, the decision to adopt electric traction did not stop the track locking project. The St Kilda line, for example, was not track locked until 1915.

Starting work

Although the report recommending the introduction of automatic signalling was handed to the Minister in January 1914, a lot of signalling work was already underway.

As mentioned in passing, Fitzpatrick, Calcutt, Blazey, Merz and Grove had had a number of meetings while the Victorians were in Great Britain and a number of key decisions had already been made.

The most important decision, of course, was that the installation of automatic signalling should be investigated, and this decision appears to have been reached around the beginning of 1913. By early February 1914 it certainly seems that the Commissioners, at least, were of the opinion that automatic signalling would be installed, at least on the principle lines.

A second decision was that Merz would develop a complete automatic signalling scheme as part of his work for the electrification of the Melbourne suburban system, and would be responsible for carrying it out if it was decided to install it. During June, July, and August 1913 Merz requested (via cable) various details, including goods trains, about the Metropolitan system to enable him to prepare the signalling scheme.

A conference occurred at the beginning of September 1913 between Merz, Fitzpatrick, Blazey and Calcutt in the UK "during which the main principles were settled upon". Almost immediately Merz requested drawings of signal

[1] The Argus 22.1.1914 p11

arms, lamps, dwarf signals, rodding, etc. These were supplied by the Chief Engineer of Way & Works at the beginning of November.

AC track circuit material

Even if automatic signalling was not to be installed, there was still a lot of signalling work to do. A focus of the early work was the existing track locked sections, particularly the bonding. These lines would be electrified and all of the existing DC track circuits would have to be replaced, even if no automatic signalling was installed and the existing track locking was to be retained. New AC track circuits, immune to the DC traction return, would need to be installed together with impedance bonds at the block joints. The existing light bonding would have to be replaced with heavy bonding suitable to carry the traction return. An AC signalling power supply would have to be provided to power the track circuits. In February 1914 it was reported that it would be necessary to convert 269 DC track circuits when electrifying the Broadmeadows [sic] to Sandringham section alone.

Consequently, well before a decision had been made on the form of signalling to be adopted, Merz had been instructed to prepare specifications for material necessary to install AC track circuits. By mid October 1913 it was reported that Merz was preparing specifications for the purchase of automatic signalling equipment "necessary for continuing the existing track circuits, pending the development of the complete scheme of automatic signalling". These specifications covered track feed boxes, transformers, switch gear and accessories, track resistances, impedance bonds, track relays, and relay boxes.

Tenders for this equipment were called by mid December 1913 and copies of the submitted tenders were received in Victoria in February 1914. By the beginning of April 1914, the recommendations for the signalling apparatus required for the equipment of the Broadmeadows – Sandringham line was submitted to the Commissioners. The Commissioners referred it back to the electrification committee to reconsider the type of transformer as Calcutt considered that British Pneumatic Signal Company[1] apparatus was superior to that recommended by Merz. In mid April a cable was sent to Merz agreeing to the acceptance of the tenders for track feed boxes, switchgear and accessories, track resistances, and impedance bonds recommended by Merz. The transformers and relays offered by the British Pneumatic Signalling Company were preferred to those recommended by Merz, and that the relay boxes would be manufactured by the department. Merz apparently raised some issues; Calcutt was asked to report; and the Commissioners finally dealt with the matter at the beginning of May 1914. By this time the quantities ordered were intended to equip (convert the track circuits on) the Broadmeadows – Sandringham, Williamstown, Caulfield, and Clifton Hill lines. The Commissioners informed Merz that they wished to equip these lines with automatic and semi-automatic signals (i.e. track locking) without waiting for a general scheme to be prepared. Consideration was given to obtaining more material but it was recommended to the Commissioners that no further material should be obtained until Prescot (Merz's signal engineer – see the next section) had arrived and considered the matter. By the beginning of June 1914 the Orders in Council for the signalling material had been obtained. Curiously, the contracts were not gazetted until 31 March 1915 and 14 April 1915 and were as follows:

- Track feed boxes, including signal transformers, switch gear, and accessories £15,512, A Reyrolle & Co Ltd
- Impedance bonds, £8,000, British Pneumatic Railway Signalling Co (an extra £6150 was added to this contract in February 1917)
- Track and line relays, £3060, British Pneumatic Railway Signalling Co (an extra £11784 was added to this contract in February 1917)
- Track resistances, £1547, McKenzie & Holland

Note that none of these contracts involved the signals themselves, nor the train stops. The conversion work was drawn out; it was still underway in June 1915.

Signalling staff

The Department had no staff that were experienced in the design and installation of power signalling and a small number of experts were obtained from overseas[2].

At the beginning of June 1913, the Chairman was considering obtaining expert staff from England for the installation of automatic signalling. It was subsequently recommended to the Commissioners that two electrical fitters who had experience with automatic signalling should be obtained around April 1914. This was approved in February 1914 and Mr Jones was requested to engage them when in the UK. Messrs Edwin Fox and Francis Raynor Wilson were engaged in September 1914 as electrical fitters and joined the Department on 1 January 1915. Francis Raynar Wilson, incidentally, was the son of the well known signal engineer H Raynar Wilson and by 1917 was a draftsman.

As part of his agreement, Merz also hired a signal engineer to work in Victoria. Merz's choice fell on Charles Prescott. Beyond the information that he had "experience on the London Underground railways" not much more is known about him[3]. The Commissioners requested that Prescott, the Signalling Engineer, be despatched to Melbourne as early as possible "with a view of preliminary action being taken forthwith for the installation of

[1] The British Pneumatic Railway Signalling Coy was set up in 1900 to hold the British patents of the low pressure pneumatic interlocking system devised by the US Pneumatic Railway Signal Company, one of the predecessors of the GRS. Until 1923 the BPRS was the UK affiliate of the GRS. The material supplied under these contracts would have been GRS derived designs, and probably of GRS manufacture.

[2] The Age 4.10.15 p9

[3] Prescott was, however, an early member of the IRSE and his career can be traced through the list of members in the Proceedings. In 1913 he was recorded as 'Signal Engineer', Merz and McLellan, Newcastle-on-Tyne. In 1914 he was recorded as still with Merz & McLellan but located in Melbourne at 360 Collins St. Curiously this did not change until 1921 when he moved to Sydney, ultimately working for the Australian offshoot of GRS.

automatic and semi-automatic signals on the Broadmeadows - Sandringham, Caulfield, and Clifton Hill lines. In June 1914 Merz reported that he was arranging for Prescott to leave for Melbourne as soon as the samples of material submitted in connection with the signalling tender had been found to be in accordance with the specifications. Prescott left England on 28 August on RMS Osterley, and arrived at the beginning of October. By late October 1914 it was reported that he "was familiarising himself with local conditions prior to taking up the question of automatic signalling for the suburban lines."

A key appointment was George Wion[1] as Assistant Engineer of Signals in the Department in mid 1914. Wion was an American with experience on the Pennsylvania Railroad, holding positions such as Acting Chief Circuit Designer and Assistant Supervisor of Signals, Manhattan Division.

An Order in Council was signed in June 1914 to employ Wion to "install a system of power and automatic signalling in connection with the electrification of Melbourne suburban railways" at a salary of £500 pa. This was significant enough to be specifically mentioned in the 1914 Annual Report:

> The duties of the Engineer of Signals would not admit of his devoting personal attention to the installation, and as there is not at present any other officer in the Department in possession of the requisite knowledge to supervise the execution of the work, we have engaged the services of Mr G.H. Wion, of the Pennsylvania Railroad Company, who, in addition to an extensive theoretical knowledge of the system which it is intended to adopt, has had considerable practical experience in such work.

Wion was formally appointed to the position on 1 August 1914, and sailed for Melbourne, with his family, on 4 August 1914. They arrived in Melbourne on 27 August 1914. His appointment was for a term of five years.

It is not clear how Wion was selected, or who selected him, but the appointment is significant as it was a very decisive move away from the UK signalling focus that had previously been shown.

In December 1914, Mr W.J. Huggins was engaged by the Department for five years as a signal foreman in connection with the installation of power and automatic signalling. Huggins was also required by the Commissioners for the instruction of the local fitters who would be installing the signalling. Huggins was formerly assistant inspector of signals and telegraphs on the Metropolitan Railway, London.

The final expert obtained was Mr T. Kittredge, who was engaged in the US as a 'track circuit design draftsman' for term of three years. It was reported in October 1915 that he was on his way to Melbourne.

Extent of automatic signalling

By early February 1914 the Commissioners had approved the division of the proposed electrified lines into three groups for signalling purposes.

The first group contained the lines that should (but, note, not necessarily would) be equipped with automatic signals. This comprised the following sections: North Melbourne Junction – Williamstown Pier (including the line – Williamstown Racecourse), North Melbourne Junction – Essendon (including the line to Flemington Racecourse); Prince's Bridge – Clifton Hill; Jolimont Junction – Box Hill; Jolimont Junction – Caulfield – Mordialloc; Jolimont Junction – Sandringham; Flinders-street – St Kilda and Flinders-street – Port Melbourne.

The second group contained the lines that could be considered for conversion to automatic signalling. This comprised the following sections: Footscray Junction – Sunshine; Essendon – Broadmeadows; North Melbourne Junction – Coburg; Clifton Hill – North Fitzroy; Clifton Hill – Reservoir; Clifton Hill – Heidelberg; and Caulfield – Oakleigh.

The final group contained those lines on which automatic signalling should not be installed. This comprised the following lines: Sunshine – St Albans; Coburg – Fawkner; Royal Park – Northcote Loop Junction; Heidelberg – Eltham; Burnley – Darling; Hawthorn – Kew; Ashburton – Deepdene; Box Hill – Ringwood; Oakleigh – Dandenong; Spring Vale – Cemetery; and Mordialloc – Frankston.

It is interesting to note that the inner city area between Jolimont Junction and North Melbourne Junction was not included in any of the three groups.

In early March 1914 the electrification committee noted that it would be necessary to consider the signalling on the quadruplicated portion of the South Yarra – Caulfield line. Calcutt was asked to submit a special report. The new signalling on this line was eventually provided on 26 September 1915 as three position automatic signalling between Richmond and Hawksburn and track block between Hawksburn and Caulfield.

In mid April 1914, Mr Grove was asked about the quantity of material required to equip the Broadmeadows – Sandringham, Caulfield, and Clifton Hill lines, as the Commissioners wished to equip these lines with automatic signals without waiting for a general scheme to be prepared.

In late April 1914, the Commissioners approved of a recommendation of the electrification committee that lines be equipped with automatic signalling concurrently with their conversion to electric traction.

By June 1914 it had been agreed that the existing DC track circuits working the track locking would be replaced with AC track circuits suitable for electric traction, and any extension of track locking would be in AC track circuits. It had also been agreed that the Essendon – Sandringham line would be equipped with automatic signals, but the design of the signalling scheme had not been agreed.

Two position or three position signals?

By January 1914 it was settled that automatic signals "similar" to those installed on the London Underground would be provided in Melbourne. It is also believed that the decision to use three position signals had been taken. However, it appears that the form of these signals had not

[1] A biography of George Wion was published in Somersault, Vol 41 No 6, November 2018.

been settled – in particular whether to use a home/distant combination (as was adopted in NSW), or yellow for a third aspect. It seems that this decision took about 18 months to make; and it appears the main reason for this delay was the caution of Edwin Jones, Chairman of the Electrification Committee and VR Secretary.

On 23 February 1914 Fitzpatrick wrote to Alex Moncrieff (SAR Commissioner) requesting him to invite various railway heads to discuss the use of yellow a caution signal. After noting that the previous Inter-State Officers' Conference noted the tests that were occurring with a distinctive light for distant signals, and agreed to consider this at the next meeting, Fitzpatrick went on to say:

> On a recent visit by Messrs Calcutt and Blazey of this Department (and who happened to be the Victorian representatives on the Committee appointed to investigate the question of obtaining a distinctive light for distant signals) to Great Britain, Canada, and the United States, they gave considerable attention to the matter, and I personally made enquiries, and kept my eye open with a view to ascertaining what the practice is in those countries.
>
> Our enquiries and observations disclosed that in England the whole of the Tube lines, and the under and over connections therewith, use a yellow light, and as far as these particular lines are concerned, there remains no questions whatever that is the proper thing to do. We did not find the steam lines outside of London using the yellow light, but in Canada and the United States it is the light which is coming into general use, not only for steam lines but also for the electrified lines, whilst the same remark applies to Germany. There does not, therefore seem to be any doubt that the use of the yellow light for distant signals has proved to be eminently satisfactory.
>
> In Victoria, owing to the decision to introduce the automatic system of signalling, in connection with the electrification of the Melbourne Suburban lines, it is necessary that we should come to an early decision on the question, and we are firmly of opinion that it will be found necessary to resort to the yellow light, but before taking any action in that direction, and as the question constitutes a Conference Matter, we would like to see a Committee of Officers appointed to investigate the question, and meet, say, in Melbourne at the end of April next, so that Messrs Calcutt and Blazey may place before the Committee the result of their observations abroad, and in order to ascertain what has been the effect of the tests which have been carried out by the different States.

The proposed committee meet in Melbourne on 29 and 30 April 1914. It consisted of G.R. Steer (General Traffic Superintendent, QGR); F.G. Nevill (Signal and Light Engineer, QGR); C.A. Hodgson (Superintendent of the Lines, NSWGR); C.B. Byles (Signal Engineer, NSWGR); F.M Calcutt (Engineer of Signals, VR); E.C. Blazey (Superintendent of Goods Train Service, VR); A Moncrief (Chief Engineer, SAR); B.F. Rushton (Chief Mechanical Engineer, SAR); and S. Mann (Traffic Superintendent, TGR). The Victorian report of the results of this meeting was that the committee failed to come to an agreement on the best light for a distant signal. The Victorian, Queensland and Tasmanian representatives consider that the yellow light is the best of those tested, while the New South Wales and South Australian considered yellow "the least unsatisfactory" of the lights tested. All states agreed that the yellow light was the least expensive to install and involved no additional cost for maintenance.

In the meantime, Jones and Molomby were in the UK conferring with Merz and his staff (including Prescott). The minutes of a meeting held 23 April 1914 were:

> Yellow lights for Repeater signals. Mr Jones state that the question of yellow lights was under consideration but that so far the opinion was rather against them. Being a surface railway there was considerable risk of yellow lights being confused with other lights bordering on the Commissioner's property, and it was also found that under certain conditions of fog a yellow light was liable to be mistaken for a red. The matter was, however, not yet decided and was being further investigated. Mr Prescott point out incidentally that another method which obviated the use of identical light indications for 'stop' and 'caution' signals was the adoption of the Coligny Welsh lamp showing a white fish tail beside a red light; he, however, considered this inferior to the yellow light.

Jones reported on 26 April 1914 that:

> Prescott further wished to know if you had decided anything definitely about the use of yellow lights, which matter was discussed when you were in London. […] As you know they use yellow lights on the London Electric Lines for repeating signals and it seems to me that yellow would be alright for us only if our sections were made short. Even in the tunnels of the District the yellow and red are not easily distinguished at any distance or so it seemed to me in a number of trips we rode in the Drivers' cab.

At the end of July, it was recommended to the Commissioners that the use of yellow would be referred to Blazey & Calcutt.

At the beginning of August 1914, the VR wrote to Frank Potter, General Manager of the GWR, on the vexed issue of the yellow light. Unfortunately, the copy of the letter in the file is in poor condition and the text in square brackets has had to be reconstructed.

> As you may remember, we are electrifying our [extensive] Suburban system and introducing a system of [automatic] signalling in connexion therewith. In about six months [time] we will have to start introducing the system and [the Commissioners] here would very much like to get some little [assurance?] from you in connexion with the use of three position [signals]. The block sections will be short varying from 3 [?] and arranged with a full block overlap, which is [?] longer than the braking distance. At [signals?] an automatic stop will be fitted and the [signal and] stops will be operated by motors. Owing to the [serious? obstruction] to view caused by overhead bridges and the [structures? holding?] the catenary wire, the usual course of [placing?] the Distant signals at such short intervals, [a?] of such a multiplicity of arms and lights [?] sighting of signals as would be [obtain ?] signals. […]
>
> I am enclosing a print [of the] arrangement of Home and Distant signals on [a mast?] as we would have to arrange them according to the Board of Trade requirements, and below it an alternative arrangement of three position signals.
>
> Up to the present our system of signalling has been based on British practice, and the Commissioners are averse to introducing any radical change until it has had the sanction of the Board of Trade, or, at any rate, until the Board of Trade has expressed a favourable opinion, as they might probably do in connexion with your contemplated introduction of the three position [signal?].
>
> Can you let us know whether you have approached [the Board] of Trade in connexion with the introduction of three [position] signals, and, if so, with what result. If not, would we [?ng] you kindness too much to ask you to get an expression [?] from Major Pringle as to whether he does not consider [the conditions?] we have to meet here there three-position [signal? the?] one to adopt.

A sample yellow light was fixed for test purposes at the north end of the Inwards General Shed at Melbourne Yard in August 1914. A committee concluded unanimously that it was satisfactory and could not be reasonably mistaken for either a red light or for a light that would be shown if a red spectacle was broken. Calcutt considered that it was preferable to any alternative for the distant signals. The Chief Engineer, Way and Works, and the General Superintendent agreed with all of these conclusions, but the Acting Chairman of the Electrification Committee merely forwarded this information for the 'information' of the Commissioners. He suggested that the matter pend until Prescott arrived from the UK (Prescott arrived in October 1914).

Frank Potter, General Manager of the GWR responded on 13 November 1914 (received 8 January 1915):

> I duly received your letter upon the subject of the system of signalling to be adopted on your proposed electric railway and in reply have to say that in connection with the Ealing and Shepherds Bush Railway now in course of construction, it is proposed to install three-position signals and a plan of the suggested arrangements has been submitted unofficially to the Chief Inspecting Officer of the Board of Trad, who has expressed his personal approval of such signals, but he regards it as probable that the Board of Trade may, as a matter of form, required the installation to be regarded as experimental for a period of six months.
>
> On the section of line referred to which is really and extension to the suburb of Ealing of the Central London "Tube" electric railway it is intended to run electric passenger trains at high speeds at intervals of five minutes and in addition steam passenger and goods trains will be worked over the line.
>
> I have asked out Signal Engineer for an expression of opinion upon the signalling arrangements set out in the blue print which accompanied your communication and he informs me that the provision of three-position signals on an electrified line using an overhead conductor appears to him to be a most suitable arrangement but you will appreciate that the expression of opinion is not based upon actual experience of the three-position signal on the Great Western and is given simply as a result of an examination of the system in America.
>
> I have pleasure in sending you a plan shewing [sic] the signalling proposed to be provided on the Ealing and Shepherds Bush Railway. At the moment circumstances arising out of the War are holding up the equipment of this line and we have not so far placed any contract for the signalling.

In January 1915 Calcutt formally reported:

> I have perused the letter from Mr Potter, General Manager of the Great Western Railway, dated 13/11/14, on the subject of three position signalling with great satisfaction.
>
> The signalling plan which he forwarded showing the proposed signalling on the three position system between Ealing and Shepard's Bush is practically on the same lines as we are proposing to adopt for the Suburban lines – at it is an over-ground line and carries a five minute service of mixed steam and electric trains our running conditions are equal.
>
> The distant signal reading over two or three signals was found useless in England with a frequent service since it was seldom possible to clear it, therefore fishtailed repeater arms were installed under each stop signal which only repeated the next signal in advance – the three position signal gives the same indication as the "stop and repeater" arrangements given above but in a simpler form for sighting by the Driver and with less first cost and maintenance.
>
> The advantages of the latter system are so obvious that it is only the difficulty of settling on a satisfactory light for "Caution" indication that has caused any hesitation in adopting it. Now that yellow has been proved so satisfactory under all conditions this difficulty has disappeared.
>
> The indications for a three position system are as follows:

Arm horizontal (or red light)	Danger
Arm 45 degrees above horizontal (or yellow light)	Caution, proceed prepared to find next signal at danger
Arm 90 degrees above horizontal (or green light)	Clear, proceed, next signal at caution or clear.

> The advantages of a three position system of signals for our conditions on the Suburban lines are as follows:-
>
> 1) There are only half the signal mechanisms to install and maintain that are necessary in a "Home and Repeater" system – this means a large saving in capital cost and annually a less maintenance bill and less mechanism to get out of order
>
> 2) Overhead structures and over-bridges make it very difficult to get good sighting of two arm or lights at a sufficient distance – but the problem is simplified with only one arm and one light and Drivers are not confused by a multiplicity of arms and lights.
>
> 3) It may be taken as an axiom that the purpose of a signal system is to give a driver the fullest information necessary to enable him to properly control his train – the three position system possesses many advantages in this respect – one of the main ones being that every signal gives an indication of the state of the next signal in advance without extra mechanisms or power consumption.
>
> On account of the many advantages referred to above, I consider that the three position system more suitable for the work in hand than the two position and I therefore recommend its adoption within the electrified area.

On 8 May 1915, Calcutt noted that since the Officers' Conference in April 1914, South Australia had adopted yellow in connection with three position signals[1]. He continued "Mr Prescott is in favor of the yellow light and with everyone in agreement on the subject I see no reason why a decision should not be given to adopt it in order that we can order the necessary material."

In early July 1915 when the Commissioners announced "The system selected provides for the closer spacing of signals, in order to admit of a more frequent service."

Responsibility for the signalling scheme

As noted earlier, Wion arrived in Melbourne at the beginning of September 1914. It may have been a co-incidence, but October 1914 saw the start of a significant change in the delivery of the signalling scheme. Essentially, responsibility for developing the automatic signalling scheme was taken away from Merz & McLellan and passed to the Departmental signal engineers. This was associated with a redefinition of what would now be called the 'interface' between the Departmental engineers and Merz & McLellan – the two interfaces being the delivery of power to the signalling functions and the trip gear.

[1] The SAR all-electric installation at Adelaide, using three position signalling, was brought into use in May 1915.

In mid October 1914, Grove suggested that the contractors constructing the electrification cabling also joint the cable for the signal mains, and this was agreed to by Calcutt in late October 1914. (The lineside signalling was to be supplied with power via 2200V signalling mains running between substations in troughing alongside the lines.)

This was only the start of a more general discussion about the actual installation of automatic signalling. In late November 1914 there was a discussion in the electrification committee about the arrangements for carrying out the actual installation of automatic signalling. Jones, as chairman of the electrification committee, agreed to discuss the questions raised at this meeting with Grove. Calcutt was asked whether lines should be moved between the three groups given recent investigations.

As a result of these discussions a draft memo was prepared for the Commissioners at the beginning of December 1914 on the procedures for carrying out the installation of the automatic signalling. The need to co-ordinate the various branches, and Merz & McLellan, in order to achieve the best results was noted.

The memo containing the procedures for installing the automatic signals was submitted to the Commissioners in mid December 1914. It was recommended that the line of demarcation between the department and Merz be the point where the 2200V signalling cables are joined at the Track Feed boxes, instead of as originally contemplated the substation switchboard.

What was not made explicit in the minutes of the electrification committee was that these changes transferred responsibility for the design of the signalling scheme to the department from Merz. When the changes were publicly revealed in July 1915 it was stated:

> Arrangements made for carrying out of an automatic signalling scheme in connection with the electrification of the suburban railways have been modified. The Railway Commissioners announced yesterday that the original intention was that Mr Merz, the consulting engineer, should submit a complete automatic signalling scheme, and should be responsible for carrying it out. However, it had since been considered impracticable to follow that procedure exactly. The general principles of the scheme had been approved, but much detail work had to be performed by departmental officers in the application of the scheme; and if the original intention were adhered to, the necessary interchange of correspondence to secure an agreement would entail so much delay that it would be impossible to introduce the desired safeguards concurrently with the introduction of electric traction. In the circumstances, Mr Merz had agreed that the responsibility for the detail work here should rest with the commissioners; and, in order to assist the departmental engineers, arrangements had been made to transfer to the service of the commissioners the expert signalling engineer, Mr C.W. Prescott, who was sent from England by Mr Merz to work under the direction of his superintending engineer, Mr Grove. Mr Merz, however, would continue to inspect before shipment the automatic signalling apparatus which would be installed[1].

Four days later the Commissioners clarified that these alterations had been suggested by Mr Merz[2].

An early example of this change in responsibilities occurred in early December 1914 when it was minuted that the "Engineer of Signals submitted [a] report on factors determining the spacing for automatic signals, and stating that the emergency braking distance on various grades at maximum speed would be required from the Rolling Stock Branch. The Committee noted that this was no different to the case of ordinary signals, and there was no necessity for Mr Grove to be consulted. The Engineer of Signals had been supplied with the draft time-table and Mr Shannon will arrange to furnish information about braking distances of steam and electric trains can stop." Note that the spacing of the signals was being handled entirely in house; it was not considered necessary to consult with Merz's engineer at all.

The alteration in responsibilities required the agreement with Merz & McLellan to be changed and the necessary report to the Government had been submitted by early February 1915. The question of paying Merz & McLellan a retaining fee was noted for further consideration. It was noted that no responsibility would devolve on Mr Grove as a standard type of trip would be used, and the trigger on the coaches would be adjusted to suit. The Minister approved of the alteration in the agreement with Mr Merz in late April 1915, subject to the Crown Solicitor being satisfied it would not affect the main scheme. At the end of April, the Crown Solicitor had given his opinion that this change would not affect the main scheme. The alteration in the agreement was implemented in late May 1915, and included transferring Prescott to the Department. Prescott joined the department as from 1 June 1915 on a three year contract.

Speed signalling

At the beginning of 1915 matters still seemed to be very unsettled – both if track block or automatic signalling was to be provided, and, if automatic signalling whether a single light (yellow aspect) or double light (home/distant) system was to be adopted.

In early January 1915 Calcutt reported to the committee on the "additional apparatus for the complete automatic signalling of the Sandringham – Broadmeadows line, and the arrangements necessary to ensure that it be available in sufficient time to avoid delay to the installation. The approximate value is £48,000." The committee agreed with the recommendations, however, as noted earlier, a decision as to whether yellow was to be adopted as the third aspect still had not been made in May. The Commissioners approved the installation of complete automatic signalling on the Sandringham – Broadmeadows line in late January 1915. The committee was instructed that tenders were to be advertised for all items except the three position relays which were to be obtained under the existing contract with Reyrolle & Co[3].

In early June 1915 Jones submitted a special report to the Commissioners recommending that track block and automatic stops should be installed on all 2, 4, and 6 track lines in the electrified area, and automatic signals where

[1] The Argus 8.7.15 p12

[2] The Argus 12.7.15 p12

[3] This seems confused as Reyrolle & Co were supplying switch gear. Probably the British Pneumatic Railway Signal Co was meant.

possible, or an intermediate automatic stop system, and that a sub-committee should be appointed to report as to what should be done in connection with single lines. It appears that Jones still was not giving up on largely mechanical signalling.

Perhaps in opposition, reference was made in the report to the economies that could be made by the introduction of automatic signalling and the greater safety and increased carrying a capacity of the lines thereby afforded. The Chief Engineer, Way and Works branch, and the General Superintendent of Transportation were asked to submit a report quantifying the savings that would result from the introduction of automatic signalling. The Commissioners had approved this recommendation by mid June 1915 and the sub-committee had been set up. The sub-committee reported in early September 1915. Commissioner Miscamble further inquired as to the savings expected to result from automatic signalling in late September 1915.

Trial automatic signalling apparatus had been erected near the signal fitters' shop at Flinders street by mid June 1915, including an electrically operated three position signal.

Also by mid June 1915 it was reported that an electro-mechanical interlocking machine was on order for the new junction at South Yarra and preparations were in hand for its installation.

Finally, early July 1915 saw the breakthrough. A committee representing the Rolling Stock, Transportation, and Way & Works branches made the following recommendations:

- Three position signals should be installed
- The signal arms should be coloured yellow
- Yellow should be used for the distant signal lights
- Signals should be kept inside the line of the structure masts
- Speed signals should be installed at junctions
- Shunting signals should be dwarfs and located on the ground.

These recommendations had been approved by the Commissioners. The Engineer of Signals suggested the provision of a small working model in the lecture theatre for the instruction of the operating staff, and this was approved.

In late July 1915 Molomby reported that work on the new Rule Book and General Appendix had been temporarily checked by the preparation of supplementary instructions respecting the arrangements which it is proposed to introduce at South Yarra in connection with the Caulfield Cup traffic. These supplementary instructions would contain diagrams and other information necessary for regulating train working and signalling operations, and, in addition will be a manual in regard to automatic and semi-automatic signals, automatic block sections, upper quadrant signals, 3-position signals and speed signalling. By early August 1915, Mr Molomby reported that the supplementary instruction book had been practically completed. The book would be submitted to the Commissioners and was expected that it would be circulated about six weeks prior to the instructions coming into force. By early September 1915 the instructions had been approved by the Commissioners and were being issued to staff. These instructions became C 8/15 "Instructions for Guidance of Employes in the service of the Victorian Railways Commissioners in regard to the use of Three-Position Signals."

The new style of signalling was first brought into use on 3 October 1915. Three position automatic signalling was provided between Richmond and Hawksburn/Prahan, with the junction at South Yarra signalled using speed signalling.

The introduction of the new signalling coincided with the release of VR annual report for the year ending 30 June 1915. In this report the Commissioners stated:

> The electrification of the suburban lines will admit of the provision of an increased service during the busy periods of the day, by the adoption of a closer interval between trains, but in order to obviate difficulty in maintaining the more frequent service, it is proposed to introduce an automatic system of signalling, with various safe-working appliances, as has been done in the case of the majority of the electrically operated suburban railways of any magnitude in other parts of the world.
>
> The system will provide for a closer spacing of signals and for the electric control of the line in such a manner as will prevent the exhibition of a clear signal when the section in advance is occupied, whilst the automatic stops will, if a signal be passed at danger, cause a suspension of the power and the application of the brakes, and the installation generally will not only increase the carrying capacity of the lines, but will also afford the maximum safety to the travelling public.
>
> The introduction of the scheme will involve a considerable expenditure, but it is anticipated that, apart from the factors of greater safety and the more convenient method of signalling, the savings arising mainly from the abolition of signal boxes will enable the change to be effected at only a slight increase in the annual expenditure.

Unfortunately, it did not quite work out that way.