Brisbane Tramway System single-line section Colour Light Signalling.

Tramways in common with the railways, require some effective means of control when operating under single line conditions. Whatever system is adopted, be it mechanical or manual operation, it must be efficient in its operation to avoid any undue delays, yet ensure maximum safety at all times.

With the later arrival of street tramways on the transport scene, it was only natural for well proven railway practices to be adapted on a somewhat modified scale, this being applicable in the use of safety controls for single line operation.

One such system, staff and ticket operation has been used by a number of tramway authorities in this country. The last example of this method of operation was to be found on the outer section of the Carnegie route in Melbourne. Following the disappearance of the staff sometime during 1975 single line working reverted to timetable and visual operation until May 1989 when the duplication was completed to the terminus. This system of control allows no vehicle to occupy a single line section without the possession of some tangible object, such as a staff or tablet which is kept in a secured instrument receptacle, situated at the opposite ends of each section.

A strong feature of this system- is that it requires the running staff to participate in its operation and it also gives the motorman tangible evidence of his right to that particular section of single track line. Its disadvantage is that it requires the car to be halted in order to deposit or receive the staff and this delay is further accentuated in tramway operation as most sections of single line are not of any great length. Consequently this calls for a repetition of this time consuming operation after, literally speaking, a matter of minutes.

However with the installation of trolley operated signals, this time factor is eliminated as a motorman is able to determine without having to leave his car whether or not a single track section is all clear.

The signals are operated by the current collector of the tram, in this case the trolley coming in contact with an overhead switch. These switches, referred to as contactors, are attached to each trolley wire and are located at the entry and the exit of each block. The passage of the wheel forms an electrical circuit which causes the switch to open or close.

The mechanism of the signal can be divided into three distinct parts:

(1) The actuating section consisting of the overhead contact switches which determine the indicators regulated by the trolley wheel. The switch itself consists of a light angle iron frame on which are mounted two contact strips on either side of, but insulated from the trolley wire. These are so arranged as to allow the uninterrupted passage of the trolley wheel. The two strips are electrically connected to each other and to the relays. In addition to the trolley wire, a signal wire, supported on the adjacent span-poles, connects in series the indicators at the other end of the block. Photo at left is a typical detector unit.

(2) The intermediate section representing the relay through which the impulses of current caused by the passage of the trolley wheel can be converted to signals on the indicator.

(3) The indicators or coloured lights. These comprise a large metal box with two shielded indicator lights, one green the other red, positioned near the top of the box. As with all signals, these boxes are so positioned to be easily discernible by motormen.

Photograph below is of an Indicator box. The relays in (2)are within the box.

The motorman of a tram approaching a single track section will know that his car will have sole occupancy of this section if no lights are shown on the indicator. On proceeding, the trolley wheel passes under the switch and a green light is registered on the indicator at the point of entry. Simultaneously a red warning light is cut in at the opposite end of the block.

In the event of a motorman proceeding past a terminal signal at danger, a second danger signal is positioned in a prominent location midway in the block. This single aspect signal is actuated by trams proceeding in the opposite direction.

Photo below is a typical Single Aspect Danger Signal.

At the exit to each block is a single aspect green signal which is also linked in series with the previously mentioned signals. The purpose of this signal is to indicate that once the tram leaves the block the signals are also cleared from the indicators. If however the green light remains on after the passage of the wheel under the switch, it conveys that a following car has also entered the block.

A following car may occupy the block before the first car has cleared the signals at the other end. A green light indicates that there is at least one other car ahead, travelling in the same direction. With the entry of each car into the block, its passage is registered on the signal relay and so

the signals remain until such time as the number of cars entering a block have also cleared that particular section.

This system is well suited for sections of single line with crewing loops at each end. However where no such facilities are provided at the terminus a problem arises in that a tram on arriving there cuts out all lights in that block thus indicating the terminus has been reached. The system of signalling as described above is also applicable to this section with the exception of the overhead switches which at the terminus end of the block are located a short distance from the standing road.

However with the signals cleared from this block there is no indication to a motorman of a following car on arriving at the loop, if another tram is standing at the terminus. To overcome this a second indicator is positioned immediately above the twin aspect signal at the terminus end of the loop. This second indicator is in the form of an illuminated sign displaying "Tram at Term". A tram on proceeding to the terminus switches on this sign which remains illuminated until such time as the same number of cars travelling to the terminus have arrived back at the loop. Therefore if no red light is visible, following cars may proceed to the terminus to complete the journey providing the timetable does not require the same order of departure as of arrival.

Having thus briefly described the workings of the trolley operated colour light signalling, a brief account will be made of its application to tramway operation in Brisbane.

Single line working has always been a feature of the Brisbane tramways. Prior to 1st January, 1923, the tramways were owned and operated by the Brisbane Tramways Company Limited who were responsible for the construction of many of the lines which were to form the nucleus of the once extensive system. Without exception these pioneer lines were constructed with at least one single track section and wherever possible, the crossing loops were so positioned as to allow for single line working either by timetable or by visual operation.

With the refusal of the then State Government to extend the Company's franchise, very little in the way of capital expenditure was carried out. Therefore when the Brisbane Tramway Trust took possession of the undertaking, it inherited a run down and poorly maintained system. In relation to track work many sections of single line were duplicated but when it came to constructing new lines the Trust was forced through limited funds to revert to single line construction with the provision of crossing loops where necessary. Allowance was made for eventual duplication by laying the single line, usually the inbound track offcentre. This method of construction was continued by the Brisbane City Council into whose control the system passed on 1st December, 1925. By 1940, of the 22 suburban routes, only 2 were

completely duplicated.

In the immediate post war years with the increase in motor traffic it became desirable to duplicate sections of single line which were located in busy arterial roads. Accordingly duplications were carried out in six routes and where a line was extended duplication was undertaken simultaneously.

he first known installation of colour light signalling in Brisbane was introduced by the Brisbane Tramway Company in June 1916 on the single line between Bernhard St and the then Paddington terminus at Macgregor Tce.

The signal consisted of a red and a green light contained in a box placed on a pole at each end of the single line. Boxes containing two switches (one for use inbound and one for use outbound) was placed one pole back from the signal at each end of the single track. The signals at each end of the single line were activated by the conductor with a key giving the appropriate switch a quarter turn to the right. On arrival at the switch box at the other end the conductor repeated the procedure to turn off the lights. Trams were not permitted to proceed past the signal unless the lights were turned off.

Automatic colour light signalling of the "Forrest City" and "Nachod" types were introduced by the Brisbane City Council in 1928 and eventually all sections of regularly used single line were protected with these appliances. By 1943 no less than 26 sections of single line were operated with this method of safe working.

During the twilight years of the Brisbane Tramways the last installation was made on the 0'Keefe Street depot working line in 1961, and in 1964 a "Tram at Terminus" sign was erected at the Ashgrove terminus.

FM 492 inbound from Bardon approaching Chiswick Road loop. Note the signals on the left span pole. The top unit is a "Tram at Term" signal and the lower one is

the two light signal and relay box. Portion of the signalling contactor is just visible in the top right of the photo.

FM454 entering the single track in Richmond St Gordon Park on the Stafford line. Contactors for the signalling are clearly visible in top right of photo.

Listed hereunder are the sections of single track which at one tine were protected by colour light signalling.

Ascot
Kitchener Rd - Oriel Park

Ashgrove
Boon St- Stewarts Rd
Stewarts Rd - Oleander Drive
Oleander Drive - Girraween Grove
Girraween Grove - Ashgrove (Glory St)

Balmoral
Exeter St - Pashen St
Pashen St - Barton Rd
Barton Rd - Fifth Ave
Fifth Ave - Balmoral (Oxford St)

Bardon
Bernhard St. - Macgregor Tce
Macgregor Tce - Coopers Camp Rd
Coopers Camp Rd - The Drive
Simpsons Rd - Bardon (Morgan Tce)

Bulimba Ferry
Stratton St - Wyandra St

Camp Hill
Coorparoo Jct. - Bennetts Rd
Bennetts Rd - Glanosmond Ave
Glanosmond Ave - Camp Hill (Bruce St)

Cavendish Road
Coorparoo Jct. - Harty St
Harty St - Chatsworth Rd
Chatsworth Rd. - Park St

Clayfield
Adelaide St - Clayfield (Beyond Wagner Rd)

Dutton Park
Annerley Rd - Dutton Park (Carville St)

Holland Park
Raff Ave - Victor St
Victor St - Holland Park (Arnold St)

Kalinga
Lodge Rd - Kalinga (Emma St)

Lutwyche
Somerset Rd - Oliver St
Oliver St - Cemetery (Kitchener Rd)

Moorooka
Cracknell Rd - Yeronga Park Y
Beaudesert Rd - Vendale Ave
Vendale Ave - Moorooka (Mayfield Rd)

New Farm Park
Moray St - Hazel St

New Farm. Wharf
New Farm Ferry - Terminus (Tram at Term signal only)

Newmarket
Edmondstone St- Newmarket (Banks St)

Rainworth
Elizabeth St - Osman St
Osman St - Rainworth (School)

Stafford
Lennox St - Haig St
Turner Rd - Stafford (Clifford St)

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