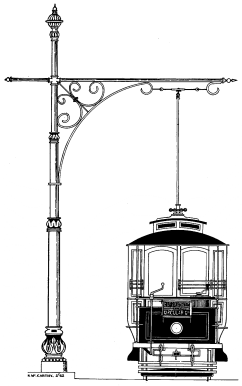

# SYDNEY TRAMWAY MUSEUM

## LEVEL CROSSING OPERATION MANUAL

~~MARCH 2016~~May 2020

**SYDNEY TRAMWAY MUSEUM**

# Document Control Record

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| 2.3 | 23/10/2009 | Changed of STM6033 to Occurrence form. |
| 2.4 | 25/05/2010 | Amended procedure with regard to manual operation. |
| 2.5 | 15/11/2011 | Minor changes to the operation including the horn. |
| 2.6 | 16/11/2012 | Amend the checking of the RNP crossing lights |
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## 3. Distribution List

| Position | Date | Location of Documents |
|---|---|---|
| Rail Safety Manager | | Original held on GOOGLE secure Website |
| STM WEB SITE | | Updated regularly and put onto the STM Web site. |
| STM Office | | STM Office Computer |
| STM Office | | STM Office cupboard |

**SYDNEY TRAMWAY MUSEUM**

# Level Crossing Operation Manual

## 1. Purpose

To explain the operation of the level crossing at the Princes Highway.

## 2. Scope

This manual applies only to the Princes Highway level crossing where the Royal National Park line crosses the highway.

## 3. Responsibilities

STM personnel are responsible for understanding the operation and reporting any faults on the Occurrence Report Form (STM6033) as soon as they are noticed.

## 4. References

STM6033 - Occurrence Report Form

~~STM6194~~ STM6027 - Track and Structure Inspection and Maintenance Report~~Princes Highway Level Crossing Inspection Report~~

## 5. Definitions

OIC – Officer in Charge– the person appointed on a day-to-day basis to supervise all operations and work parties for the Society.

PLC - Programmable Logic Controller

STM - Sydney Tramway Museum, a trading name of South Pacific Electric Railway Co-Operative Society Limited.

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# WARNING: DO NOT PARK A TRAM OVER INDUCTIVE LOOPS IN AUTOMATIC MODE

## IF, FOR ANY REASON, A TRAM MUST PARK OVER THE LOOPS, SET THE SYSTEM TO MANUAL OR TURN IT OFF.6. Actions

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### 6.1 General

The control equipment is housed in a secure hut adjacent to the tramway. A master switch is provided on the northern side of the crossing to enable the system to be switched on and off as required in normal operations and switched to manual operation or off in an emergency such as bushfire or accident damage.

If an emergency vehicle approaches the level crossing (with lights flashing and siren going) after the crossing lights are activated, the tram MUST continue with the process and cross the Princes Highway once the signal has been given. The reason for this is that the process only takes a short time and allowing an emergency vehicle to continue whilst the lights are crossing flashing will also

encourage to other vehicles to cross against the lights. HOWEVER DO NOT CROSS IF THERE IS A POSSIBILITY OF A COLLISION WITH THE EMERGENCY VEHICLE.

The height of the trolley contact wire is 5.9m above the roadway.

### 6.2 Road Traffic Signals

The road traffic is controlled by standard railway level crossing "F-type" flashing light warning signals with electric warning bells. The Roads and Maritime Services provide advance warning signs and flashing warnings.

### 6.3 Testing of Crossing Signals

The signals are checked on the first operating run of the operating day or ~~will require to be~~ visually tested ~~on the first Saturday each month~~if any changes are made to the system. The ~~workshop~~ Infrastructure staff will perform this function.

The test will involve manually switching on the signalling system and observing that:

- The signal lamps facing the road traffic are working correctly;
- All other signal lamps are working correctly;
- The bells are heard to be ringing; and
- The horn working.

Once the inspection is completed, the system will be switched off.

When the inspection is completed, a Track and Structure Inspection and Maintenance Report~~*Princes Highway Level Crossing Inspection Report* (STM6194~~STM6027) must be updated and filed in the office.

### 6.4 How Does It Work?

A Programmable Logic Controller (PLC) monitors loops between the rails and controls the level crossing signalling system at the Princes Highway on the line to the Royal National Park. When a tram is going to cross the Highway from either direction it passes over two loops between the rails as it approaches the level crossing. These loops initiate the PLC to set up the automatic operation of the crossing.

Once the second loop is passed over the orange remote lights flash to indicate to the tram driver that the tram has been detected and the system will soon operate the crossing lights and bells. At this stage the Advance Warning lights are flashing to warn motorists that the crossing will soon be operating. After 10 seconds of the Advance Warning lights flashing, the red lights at the crossing will begin flash and the warning bell will begin to sound, the highway traffic should be stopping at these red lights. After a further 10 seconds the “Bar” light will go out and the “T” lights will come on and the horn will sound for approximately 5 seconds indicating that the tram can proceed across the crossing, after the tram driver has ascertained that the Highway traffic has stopped in both directions. Once the tram has crossed the highway passing over the loops on that side it cancels the operation of the crossing and the flashing orange remote lights will go out.

A time delay is built into the PLC program, which prevents the operation of the crossing for 5 minutes to allow the Highway traffic to clear. If the tram does not cross the Highway after starting the process then the PLC will cancel the process after 2 minutes of operation.

The control system for the Princes Highway level crossing has been upgraded to enable automatic operation for convoy working. Timers have been added to ensure that the warning equipment will continue to operate for at least a necessary minimum time (approximately 19 seconds) after each tram enters the crossing. The warning will terminate:

1. at the end of this period if a tram was detected exiting the crossing in the final 4 seconds of this period, or
2. immediately a tram is detected exiting after this period, or
3. after 2 minutes of operation.

### 6.5 Convoy working

Drivers of leading trams are reminded to be aware of the position of following trams when approaching the crossing. Stop short of the marked detection points and do not advance until all trams in the convoy are in position to proceed.
Drivers of following trams are advised to keep between three (3) and five (5) seconds behind the preceding tram. Closer operation is not necessary, and increases the risk of collision if the leading tram stops unexpectedly. Operating at greater spacing may increase the risk of road users not noticing a following tram and proceeding into the path of the tram.

**'T' Lights**

The operation of the 'T' lights has been altered such that the 'T' lights will revert to '–' indication approximately 15 seconds after the last detected tram entered the crossing. If the driver of a following tram in a convoy notices this, they should attempt to stop before reaching the detection point. If the driver is unable to stop before reaching the detection point, and the warning has not yet ceased, the 'T' lights may illuminate again and the tram may proceed. If the tram can be stopped clear of the crossing, wait 5 minutes after the warning stops, and then proceed to the detection points. If the tram has reached the detection points, but the '–' indication remains, set back off the detectors and wait 5 minutes after the warning stops before proceeding again onto the detection points.

### 6.6 Speed of travel

The timers have been set according to normal operating speeds (i.e. up to full series). If a tram travelling singly, or the final tram in a convoy, clears the crossing in a shorter time then the warning equipment may continue to operate.

### 6.7 Manual Operation

An operator can be stationed at the section hut near the RNP crossing and can control the crossing lights manually. The operator can manually turn the lights ON and OFF. However with the new changes to the operation, it should not be necessary to manually use the manual mode.

In order to avoid the crossing being left in manual mode indefinitely after use, the system has been changed so that when in manual mode, a time limit of 2 minutes has been set before the lights would automatically cancel. They cannot be turned on again for another 5 minutes.

(A) Procedure to activate the National Park level crossing automatic system.

1. Approach the level crossing from the depot and stop the tram near the National Park substation.
2. Open the green telephone box on the wall of the National Park substation and turn the switch inside to the "ON" position.
3. Check that the white horizontal "Bar" signal is illuminated on the other side of the highway.
4. Lock the green telephone box.

(B) Procedure to deactivate the National Park level crossing automatic system.

1. Open the green telephone box on the wall of the National Park substation and turn the switch inside to the "OFF" position.
2. Check that the white horizontal “Bar” signal is extinguished on the other side of the highway.
3. Lock the green telephone box.

(C) Procedure to cross the National Park level crossing (Automatic Mode).

1. Approach the crossing and slow down to walking pace and, continue moving until adjacent to the "STOP" mark before of the crossing, stop at this mark and wait.
2. Check that the orange flashing light signal ahead of the tram is functioning; this indicates that the automatic system has started and the Roads and Maritime Authority highway Advanced Warning lights are operating.
3. Approximately ten seconds after crossing the automatic detection loops the highway level crossing lights will flash and the bells will ring.
4. Approximately ten seconds later the white horizontal “Bar” signal will be extinguished and the two white "T" signals will be illuminated and the horn will sound for approximately 5 seconds.
5. Once it is obvious that the highway traffic is stopped then proceed across the crossing.
6. Observe the flashing orange light signal and ensure that it has been extinguished before the tram passes this signal.
7. If all the above has taken place then the system is functioning properly and the tram can continue on with the run.

(D) Procedure to follow in the event of failure of the automatic system.

1. If when the level crossing is approached in the manner as in (C) above but the white horizontal bar signal is not illuminated, check to see that the system has been activated as described in (A) above. If the system has been started but is not working properly then try a second approach to the crossing, if this fails then DO NOT ATTEMPT TO CROSS THE HIGHWAY, return to the depot and advise the Officer in Charge and fill out an Occurrence Report Form (STM6033).
2. If when the level crossing is approached in the manner as in (C) above and the white horizontal bar signal is illuminated but the orange flashing light signal does not flash and after waiting approximately twenty (20) seconds the white "T" signals have not been illuminated. DO NOT ATTEMPT TO CROSS THE HIGHWAY, return to the depot and advise the Officer in Charge and fill out an Occurrence Report Form (STM6033).
3. If when the level crossing is approached in the manner as in (C) above and the white horizontal bar signal is illuminated and the orange flashing light signal is flashing but after waiting approximately twenty (20) seconds the two white "T" signals have not been illuminated. DO NOT ATTEMPT TO CROSS THE HIGHWAY, return to the depot and advise the Officer in Charge and fill out an Occurrence Report Form (STM6033).
4. If all signals functioned correctly and the crossing was completed but the flashing orange light signal is still flashing as the tram approaches it, the tram must be stopped and the driver must open the green telephone box mounted on the pole below the signal using a traffic key to open this box and press the red reset button and lock the box before proceeding with the run. After returning to the depot as usual, advise the Officer in Charge and fill out an Occurrence Report Form (STM6033).

5. If the crossing worked properly on the way to the Royal National Park but on the return journey the crossing will not activate, check that more than 5 minute has elapsed since the crossing stopped, and if so then the green telephone box on pole 102 should be opened and the green button pressed to activate the crossing.

(E) Procedure to cross the National Park level crossing (Manual Mode).

1. Open the door of the signal cabin and turn the Mode switch on the front panel of the box from "Auto" to "Manual".
2. When the tram is ready to proceed press the "Start" pushbutton momentarily. The relays inside the box will start the pulse, and the orange remote lights will start operating.
3. After the tram or trams have reached the other side of the highway press the "Stop" pushbutton momentarily. The relays will stop pulsing and the orange remote lights will stop operating.
4. When finished return the Mode switch from "Manual" to "Auto" and lock the door to the signal cabin.

## 6.8 Emergency Operation

### 6.8.1 TRAM FAILURE ON CROSSING

The level crossing is reconstructed with a 1 in 30 (approximate) gradient along the centre line of the tramway. Therefore, in the event of an electrical failure to the tram, it is expected that it will be able to be coasted off the crossing under the terms of the coasting provisions of the Tramway Working Orders.

In the event of a mechanical failure, the crew must advise the Officer-in-charge immediately to call out the tramway breakdown crew and must advise the Sutherland Police to arrange emergency traffic control.

### 6.8.2 SIGNAL FAILURE

In the event that the driver of a Park-bound tram cannot arrange for the traffic signals to function properly, the trip will be terminated at the western side of the highway.

In the event that the signal failure takes place against a Sutherland-bound tram, the driver will call the OIC who in turn will call the Sutherland Police to stop the traffic to allow the stranded tram to cross. In any case of tram or signal failure, the tram service will be suspended forthwith and not resumed until the line has been cleared or the signals repaired. Other transport may have to be arranged as necessary for intending passengers who might be otherwise stranded between the Princes Highway level crossing and the Royal National Park terminus.

The signal failure must be reported on the Occurrence Report form (STM6033) as soon as possible.

### 6.8.3 Faults and Failures

Tram crew are reminded to observe the flashing yellow lights as they depart the crossing. If the lights do not stop flashing, stop the tram and use the manual stop pushbutton located in the green box on the pole below the flashing lights.
Please report any problems with the level crossing, including failure to cease operating, so that the timers can be reviewed and adjusted if necessary.

## 6.9 Trouble Shooting

### 6.9.1 Signalling Will Not Actuate

Check that the R.T.A. switch on the right hand side of the hut is in automatic mode. The Programmable Controller will not start if this switch is in either "Manual" or "Off Mode".

Check the "Manual/Automatic" switch on the Control Panel. All information from the inductive loop network is ignored if the switch is in "Manual". ***The switch must be set to Automatic***.

### 6.9.2 Loop Detector Failure

In the case of a failure of the loop detector system one or more of the loops may signal to the controller that it has been activated even though nothing has passed over the loop/loops. This is a standard built-in safety feature.

If a failure does occur one of the following will happen:

## SYSTEM STARTS WITHOUT BEING ACTIVATED

**Remedy**: - Switch OFF at the Power-on Remote Switch or Emergency Off in the hut;
- Switch to manual on the Control Panel;
- Switch on power; and
- Operate manually.

## SIGNALLING WON'T START

6.9.3 Remedy**: - Switch to manual operation. System Fails Power-Up.**

When the Power-on Remote-switch is turned ON, the white bar light between the "cross now" (T) lights should come on. If not the following may be the cause:

a) One of the globes in the facing signal may have failed. If so report the problem on the *Occurrence Report Form (STM 6033)*.

b) Check the "Emergency OFF" button on the Control Panel. This button should be **OUT**. If it is not, a slight turn in the direction of the arrow on the button will unlock the switch.

c) Power not turned ON. This switch is located under the cabinet at the right hand side.

d) Mains power is OFF. Check to see if the circuit breaker in the distribution room is turned OFF. This is located in the opposite end of the signal hut.

e) If all of the above fail, an internal fault may be the cause. Seek assistance from qualified personnel.

**N.B. DO NOT PARK THE TRAM OVER THE LOOPS WHEN CHECKING THE ABOVE. RECTIFICATION OF FAULT WILL RESULT IN CROSSING BEING ACTIVATED IMMEDIATELY**.