

## SPG 0723

# LEVEL CROSSING EQUIPMENT MANUFACTURE AND ASSEMBLY

Version 1.3

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## Document control

Version	Date	Summary of change
1.1	13/05/2008	Replaced part of <i>SC 07 60 00 00 SP Level Crossings v 4.1</i> of 20 October 2006 Reformatted, moved installation details to new Specification SPG 0724 'Installation of Level Crossing Equipment'. Removed incandescent lamp/lens details. Various changes to all sections
1.2	May 2010	Application of TMA 400 format.
1.3	15 March 2013	Section 4.3 replaced text "Spec ESG 100.0 and" with text "the Signalling Design Principles". Updated ref to drawings M06-315 sheet 1-4, M06-313 sheet 1-5 and M06-316 sheet 1-4.

## Summary of changes from previous version

Summary of change	Section
Replaced text "Specification ESG 100.0 and" with text "the Signalling Design Principles".	4.3
Reference to drawing M06-309 changed to M06-315 sheet 1-4.	4.3
Reference to drawing M06-110 changed to M06-313 sheet 1-5.	4.3
Reference to drawing M06-311 changed to M06-316 sheet 1-4.	4.3

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# 1 Introduction

## 1.1 Scope

This specification defines the requirements for the manufacture and assembly of the equipment which provides active protection at road and pedestrian level (grade) crossings. It is applicable to all level crossings constructed on the RailCorp rail system within New South Wales.

This specification applies to equipment for public road level crossings and pedestrian level crossings.

This specification does not cover the equipment requirements for passive level crossing protection although some aspects of the active pedestrian crossing equipment will be applicable to both.

It includes the requirements for flashing signal lanterns, advance warning lights, road boom mechanisms, pedestrian swing gates, signs, train detection systems, control equipment, power supply and status monitoring.

It is to be read in conjunction with RailCorp:-

ESG-100.0 "Introduction - Signal Design Principles" which defines the operating parameters for level crossings,

ESG-100.18 "Level Crossing - Signal Design Principles" which addresses the terms and definitions relating to active level crossings,

SPG 0724 "Installation of Level Crossing Equipment",

SDG 001 "Standard Signal Circuit Design Standards" which defines the circuits to be used for control and operation of the equipment.

## 1.2 Warranty

All equipment supplied to this specification shall be warranted free of defects in manufacture or assembly for a period of twelve months from date of delivery. This warranty shall cover, but not be limited to, such items as, lampcases, LED light units, crossarms, posts and bases, boom and swing gate mechanisms, boom arms, swing gates, audible warning devices and signs. LED warranty shall comply with the requirements defined in Specification SPG-1571.

All of the equipment, including consumables, shall be warranted as complying with this or any referenced specification and as being fit for purpose. For the purposes of this specification "consumables" shall mean:- LED lamps, fuses, batteries and lightning/surge protection equipment.

## 1.3 Quality

The standard of materials and workmanship, shall ensure that the assembled equipment is fit for purpose over the lifetime of the asset in its physical and operational environment.

Equipment (LED light units, signs, boom arms and consumables excepted) shall be manufactured and assembled to provide a minimum service life of 20 years when maintained and/or overhauled at the manufacturer's recommended intervals.

LED light units, signs, boom arms and consumables shall be manufactured, assembled and finished to maximise the operability and durability of the materials from which they are constructed.

Quality of materials and workmanship shall also ensure that the necessity for regular preventative maintenance tasks to retain the safety, reliability and useability of the asset over its lifetime is minimised.

Where equipment is 'supply only', the equipment shall be suited for integration into the intended level crossing and according to the standards and specification listed herein.

## 1.4 Definitions

**Active** level crossing protection means visible and/or audible warning devices and/or barriers which are activated automatically at the approach of a train or must be manually activated (eg: shunter control) before the railway signalling can be cleared for the passage of a train.

**AREMA** American Railway Engineering and Maintenance of way Association.

**Flashing Signal Lanterns** A pair of 200mm nominal diameter flashing red lights mounted on, and as part of an RX-5 Assembly by means of a cross arm.

**Passive** level crossing protection means signage or other visible devices which provide permanent warning of a road / pedestrian rail intersection.

**RailCorp** Infrastructure Owner.

**RX-5 Flashing Signal Assembly** As defined in AS1742.7: 2007. Referred to as an 'RX-5 Assembly' in this document. Also commonly known as a 'Type-F Assembly'.

**RX-5 Flashing Signal Assembly with Road Boom** Also referred to as an 'RX-5 Assembly with Boom' in this document.

## 1.5 References

### AREMA Manual

<i>Part 3.2.5</i>	<i>Recommended Design Criteria and Functional/Operating Guidelines for Overhead Bridge and Cantilever Structures and Placement of Highway-Rail Grade Crossing Warning Devices</i>
<i>Part 3.2.10</i>	<i>Recommended Design Criteria and Functional/Operating Guidelines for Combination Cantilever/Gate Mechanism</i>
<i>Part 3.2.15</i>	<i>Recommended Design Criteria for Gate Arm Operating Mechanisms</i>
<i>Part 3.2.35</i>	<i>Recommended design Criteria for Electric Light Unit</i>
<i>Part 3.2.40</i>	<i>Recommended design Criteria for Electric Light Unit on Gate Arm</i>
<i>Part 3.2.50</i>	<i>Recommended Design Criteria for Crossarm for Lights without Gates</i>
<i>Part 3.2.51</i>	<i>Recommended Design Criteria for Crossarm for Lights with Gates</i>
<i>Part 3.2.60</i>	<i>Recommended design Criteria for an Electro-mechanical Crossing Bell</i>
<i>Part 3.2.61</i>	<i>Recommended design Criteria for an Electronic Crossing Bell</i>
<i>Part 7.1.10</i>	<i>Recommended Design Criteria and Functional/Operating Guidelines for Signal Roundels, Lenses, Disks and Cones.</i>
<i>Part 7.2.36B</i>	<i>Recommended Design Criteria for Junction Box Bases</i>
<i>Part 7.2.41B</i>	<i>Recommended Design Criteria for Junction Box Bases</i>

*Part 14.2.1 Recommended Design Criteria and Functional/Operating Guidelines  
for Incandescent Electric Lamps*

**Australian/New Zealand Standards:-**

AS1742.7	<i>Manual of Uniform Traffic Control Devices - Railway Crossings.</i>
AS1743	<i>Road Signs Specifications.</i>
AS1074	<i>Steel Tube.</i>
AS1734	<i>Aluminium Sheet and Plate.</i>
AS1874	<i>Aluminium Ingots and castings.</i>
AS2144	<i>Traffic Signal Lanterns.</i>
AS2979	<i>Traffic Signal Mast Arms</i>

**RailCorp Specifications**

The following standards and documents are referenced in this Specification:-

SDG 001	<i>Standard Signal Circuit Design Standards</i>
ESG-100.0	<i>Introduction - Signal Design Principles.</i>
ESG-100.18	<i>Level Crossings - Signal Design Principles .</i>
SPG-0708	<i>Small Buildings Location Cases Terminal Cases and General Purpose Cases (previously known as SC12200000SP).</i>
SPG 0724	<i>Installation of Level Crossing Equipment.</i>
SPG 1210	<i>Signs, Notice Plates and Instruction Plates.</i>
SPG 1571	<i>Specification - Light Signals.</i>
SPG 1025	<i>Power Supply Units for Signalling Equipment – Battery Chargers.</i>
ESC 220	<i>Rail and Rail Joints (Civil).</i>

**RailCorp Drawings**

The following RailCorp Drawings are applicable to this Manufacturing Standard :-

M06-203	<i>Level Crossing Boom Gate Assembly – Type ‘F’ Signal.</i>
M06-212	<i>Level Crossing Signs – Manufacturing Details</i>
M06-213	<i>Level Crossing – Train Drivers Approach Sign.</i>
M06-215	<i>Active Pedestrian Crossing warning Sign W7-14-3 - Details.</i>
M06-229	<i>Type ‘F’ Level Crossing Signal Assembly with Separate Crossarms. For general reference only.</i>
M06-230	<i>Type ‘F’ Level Crossing Signal General Arrangement. For general reference only.</i>
M06-235	<i>Railway Level Crossing Signals - Assembly Details, Angled Crossarm for Additional Front Lights. For general reference only.</i>
M06-240	<i>Level Crossing Boom Gates - Spacing of LED Boom Lights.</i>
M06-241	<i>Level Crossing Booms - Mtg. of Gate LED Lights, Details.</i>
M06-242	<i>Level Crossing Booms - Mtg. of Gate LED Lights, Parts List.</i>
M06-244	<i>Pedestrian Crossing – General Arrangement Details (drawing provided for reference purposes only).</i>
M06-245	<i>Level Crossing Booms - Cabling of Boom Gate Lights, Details.</i>

<i>M06-246</i>	<i>Level Crossing Booms - Cabling of Boom Gate Lights, Assembly details and Parts List.</i>
<i>M06-247</i>	<i>Pedestrian Crossing Emergency Exit Signs - Details.</i>
<i>M06-248</i>	<i>Pedestrian Crossing Emergency Exit Swing Gate - General Assembly Layout.</i>
<i>M06-249</i>	<i>Level Crossing Boom - Gate Kit Details.</i>
<i>M06-251</i>	<i>Pedestrian Crossing - Motorised Pedestrian Gate, General Arrangement Details.</i>
<i>M06-252</i>	<i>Pedestrian Crossing - Pedestrian Emergency Exit Gate, General Arrangement Details.</i>
<i>M06-253</i>	<i>Pedestrian Crossing - Active Maze Post, General Arrangement Details.</i>
<i>M06-254</i>	<i>Typical Pedestrian Crossing Lighting – General Arrangement.</i>
<i>M06-255</i>	<i>Active Pedestrian Crossing Emergency Exit Gate Push Button Kit – Assembly.</i>
<i>M06-256</i>	<i>Pedestrian Crossing Emergency Exit Gate Latch – Electromagnet Sub-Assembly.</i>
<i>M06-257</i>	<i>Level Crossing Posts – Post Extensions for Additional Lights.</i>
<i>M06-258</i>	<i>Type F Light Enlarged Background – Manufacturing Detail.</i>
<i>M06-262</i>	<i>Pedestrian Crossing - Cyclist Dismount Sign.</i>
<i>M06-263</i>	<i>Railway Crossing Sign R6-25B - Manufacturing Details.</i>
<i>M06-269</i>	<i>Level Crossing Ancillary Mast Assembly – Type ‘F’ Signal.</i>
<i>M06-272</i>	<i>Cycle hazard Sign.</i>
<i>M06-274</i>	<i>Emergency Exit Gate Mechanical Magnet Latch – Assembly.</i>
<i>M06-275</i>	<i>Emergency Exit Gate Mechanical Magnet Latch – Manufacturing Detail.</i>
<i>M06-276</i>	<i>Emergency Exit Gate Mechanical Magnet Details.</i>
<i>M06-309</i>	<i>Level Crossing Test Box - Manufacturing Details.</i>
<i>M06-310</i>	<i>Level Crossing Emergency Box - Manufacturing Details.</i>
<i>M06-400</i>	<i>Level Crossing Advance Warning Lights Assembly - Major Roads.</i>
<i>M06-401</i>	<i>Level Crossing Advance Warning Lights Sign - Major Roads - Speed &gt;80kph.</i>
<i>M06-402</i>	<i>Level Crossing Advance Warning Lights - 200mm Indication Lampcase and Bracket.</i>
<i>M06-403</i>	<i>Level Crossing Advance Warning Lights Assembly - Secondary Roads.</i>
<i>M06-404</i>	<i>Level Crossing Advance Warning Lights Sign - Secondary Roads – Speed &lt;=80kph.</i>
<i>M06-405</i>	<i>Level Crossing Advance Warning Lights Sign - “On Side Road” Application.</i>
<i>M06-406</i>	<i>Level Crossing AWL Assembly - Side Roads.</i>
<i>M06-407</i>	<i>Level Crossing Advance Warning Lights – Foundations.</i>



## 2 Vehicular Level Crossing Equipment

### 2.1 RX-5 Flashing Signal Assembly – Highway Crossing Signal

#### 2.1.1 General

The RX-5 Assembly shall be constructed to drawing M06-269.

The RX-5 Assembly with boom shall be constructed to drawing M06-203.

Drawings M06-229, M06-230 and M06-235 are provided as general guidance for alternative configurations.

#### 2.1.2 Flashing Signal Lanterns

Flashing Signal Lanterns shall be a nominal 200mm diameter, complying with the requirements of the AREMA Manual Part 3.2.35.

The casing of the lantern shall preferably be made from a cast Aluminium Alloy which meets the requirements of AS1874 for a medium strength, high corrosion resistant cast aluminium alloy. Other materials such as GRP or polycarbonate may be accepted as alternatives, provided service life and robustness are not compromised.

##### 2.1.2.1 Flashing Signal Lantern – Incandescent Lamps

Incandescent lanterns are not to be used for new works or upgrading of existing works.

##### 2.1.2.2 Flashing Signal Lantern – LED

The number of LEDs provided within the Flashing Signal Lantern shall be dependent upon the optics provided in the cover over the LEDs but shall not be less than 110.

The type of LEDs and/or the optics in front of the LEDs shall provide the beam pattern defined in Table 1 and shall result in the light being visible at the distances shown in Table 2.

15° L	10° L	5° L	Axis 0°	5° R	10° R	15° R
25	55	80	100	80	55	25
	10° D	5° D	Axis 0°	5° U	10° U	
	20	60	100	60	20	

**Table 1 – LED Unit Beam Intensity Distribution**

Intensities are expressed as a percentage of the on-axis intensity.

L = left, R = right, U = up, D = down

Viewing Angle	Axis 0°	5° L/R	10° L/R	15° L/R
Distance metres	500	400	275	140

**Table 2 LED Unit Visibility**

The distances detailed in Table 2 are defined as the minimum distances that the light is clearly visible and distinct under bright sunlight conditions with the sun at or near the

zenith. The distances shall be determined with 12 Volts applied at the lantern with the hood and background fitted to the lantern.

While LED units must meet the specified visibility distances, intensity shall not be so high that significant impairment to night vision is caused to a motor vehicle driver approaching the crossing at night.

LED colour shall be red with a colour wavelength in the range 615 to 630 nm.

The LED's shall be arranged and powered so that open circuit failure of a single LED or circuit board track/connection affects no more than 25% of the indication. Preferably, short circuit failure of up to 50% of the LED's in any one string is possible before the entire string fails. LED strings shall, so far as is possible be randomly located throughout the indication.

Operating voltage shall be 8 – 18 Volts DC (units which accept either AC or DC are acceptable) and power consumption shall not exceed 16W.

Lanterns shall not emit light at less than 4 Vac or 4 Vdc.

The lantern shall be capable of operating in an environment of –10 to +50°C ambient and 0-95% relative humidity. In-built surge protection shall be provided.

The cover over the LED's shall be manufactured from polycarbonate and shall be clear in colour. Red lenses are not permitted.

Side lights are not required.

LED lantern shall comply with the general requirements as defined in Specification SPG-1571.

Approved Flashing Signal Lantern LED modules are listed on drawing M06-203.

### **2.1.3 Flashing Signal Lantern - Assembly Details**

The Flashing Signal Lanterns shall be fixed, at approximately 760 mm horizontal centres, to a cross arm assembly similar to and providing at least the same amount of light as that described in AREMA manual part 3.2.50.

The crossarm shall preferably be made from a cast Aluminium Alloy which meets the requirements of AS 1874 for a medium strength, high corrosion resistant cast aluminium alloy. Alternatively, if fabricated, a medium strength, high corrosion resistant wrought aluminium alloy to AS 1734 may be used.

Cross arms may be painted gloss white or left natural aluminium.

The crossarm shall contain a termination box at the centre of the arm which contains a minimum of 6 terminals equivalent to Klippon SAK 6.

Assemblies shall be available in two lantern (uni-directional) and four lantern (bi-directional) form. Back to back mounting centres for four lantern assemblies shall be as shown in AREMA manual part 3.2.50 figure 3.2.50.1 for Flashing Signal Lantern installations and in figure 3.2.51.1 & 2 for Flashing Signal Lantern with boom gates.

Note that for level crossings without booms, where front and back lantern must be sharply angled to one another, the assemblies shown for boom gate installations may be required to achieve the required angle.

Flashing Signal Lanterns shall be fitted with hoods and backgrounds of the minimum size specified in AREMA Manual Part 3.2.35.

The centre of the lantern shall be 2600 – 2800mm above road level.

Additional crossarms, where required, shall be mounted a minimum of 625 mm above the basic crossarm assembly. Where a retro-fit post extension is required, it shall be manufactured according to RailCorp drawing M06-257.

### **2.1.4 Enlarged Background**

When specified, a large background as detailed in drawing M06-258 may be fitted to the Flashing Signal Assembly. This background shall be additional to the standard backgrounds fitted to the Flashing Signal Assembly.

## **2.2 Audible Warning Devices**

Audible alarms/warnings shall take the form of bells.

Bells may be either solid state or mechanical in their design.

### **2.2.1 Bells**

The level crossing bell shall generally comply with AREMA manual Part 3.2.60 if electro-mechanical or part 3.2.61 if electronic. The bell shall be designed to mount directly on the top of a 125 nominal bore heavy steel tube (140 mm outside diameter) and be provided with an adaptor where required to mount on top of a 100 mm nominal bore heavy steel tube (114 mm outside diameter).

Nominal operating voltage shall be 10V DC.

The mechanical bell shall operate to specification (150 to 200 strokes per minute) within the range 8 – 18 Volts DC. Mechanical bells are normally fitted with a metal hammer.

A nylon (soft) hammer option is available for reducing the sound level in approved instances. Approved 'soft' hammer is RailCorp Stock Code 1025857.

The Western-Cullen-Hayes model 0777 electronic bell needs to be set to maximum volume in order to replicate the mechanical bell sound level when fitted with the metal hammer. The electronic bell requires the fitment of a 12V DC regulator. The DC regulator shall operate over the input range of 8 – 18 Volts DC and shall maintain a steady output of 12 Volts DC. The approved DC regulator is RailCorp Stock Code 1879485.

Approved bells are listed on drawing M06-203.

## **2.3 RX-5 Assembly Posts (Masts)**

Posts shall be galvanised steel and mounted into a cast aluminium junction box base complying with AREMA manual part 7.2.36B for Flashing Signal Assemblies, and part 7.2.40B for Flashing Signal Assemblies and booms.

The cast base shall provide a frangible element in the post assembly to mitigate the damage to a vehicle that may impact it.

Fully fabricated steel post designs are not permitted, as they are not frangible.

Posts shall be corrosion protected to provide a minimum life of 20 years without the necessity to reapply the corrosion protection. Where there is no bell mounted on top of the post, sealing caps shall be provided. Whatever corrosion protection is used must be compatible with the aluminium bases.

For RX-5 Assemblies without boom, the post shall be a 100mm nominal bore (114mm OD) medium steel tube (4.5mm wall thickness) to AS 1074. Refer to drawing M06-269 for construction details.

For RX-5 Assemblies with boom, the post shall be a 125mm nominal bore (140mm OD) medium steel tube (4.9mm wall thickness) to AS 1074. Refer to drawing M06-203 for boom gate post construction details.

## 2.4 Cantilever / Gantry Assemblies

RX-5 Assemblies with cantilevered supports shall generally comply with the requirements of AREMA manual parts 3.2.5 and 3.2.10 although the design may be varied to utilise tubular (round or square) construction throughout. The structure shall be designed to :-

- withstand the maximum wind loadings predicted to be encountered within New South Wales,
- comply with AS2979 (Traffic Signal Mast Arms), and
- RTA design requirements for use within a clear zone.

The minimum clearance from the highest point of the road to the underside of any part of the structure projecting over the road shall be 5.7 metres.

In consideration of installing a structure protruding over a road, maintenance issues associated with the replacement of lamps, the placement of the support post relative to the rail tracks and the road edge, as well as the potential for part of the structure to be knocked onto the track or into the overhead 1500V, all need to be carefully assessed.

## 2.5 Road Boom Barrier Mechanisms

Boom barrier mechanisms shall preferably be operated by an electric motor driving through a gearbox and shall be provided with an effective low current hold-clear device.

Mechanisms shall generally comply with the requirements of AREMA manual part 3.2.15 and shall meet the following requirements:-

Power down drive _____	between 90° and 45°
Descent time _____	15 seconds max
Raise time	
9 volts at motor _____	20 seconds max
16 volts at motor _____	9 seconds max
Maximum current _____	15 amps @ 9 volts

Mechanisms shall be “2 Power Wire” type, ie, both power up and power down motor operation shall be controlled by a vital motor control relay within the mechanism. No external switching of motor loads shall be required. Mechanisms shall be equivalent to Western Cullen Model 3593-131-MI, 2 wire control, 7 contacts.

The circuit controller shall provide, in addition to the contacts necessary for control and operation of the gate mechanism, a minimum of one contact made 0 - 5° to operate the Crossing Normal relay and a minimum of one contact made 85 - 90° for light control.

## 2.6 Road Boom Barriers

Boom barriers shall be rectangular tubular telescopic type manufactured with aluminium butt sections and Glass Reinforced Polycarbonate extendible sections.

The maximum length of the aluminium butt section, measured from the centre-line of the post, should not exceed 5.25 metres. However, where the boom is to be considerably longer and there is potential for the boom to be knocked into the OHW, the telescopic boom sections may all be made from Glass Reinforced Polycarbonate.

The nominal length of a boom shall be measured from the centre line of the post, on which the mechanism is mounted, to the tip of the boom.

Booms shall be fitted with breakaway mechanisms and incorporate shear pins where attached to the gate arm support. A stainless steel tether cable shall be fitted between the post and the boom.

Each side of the boom shall be finished in class 1 retro-reflective red and white diagonal stripes using 100mm (preferably) or 75 mm wide self adhesive reflective tape.

Where screws penetrate into the hollow section of the boom, the screws shall be kept to the minimum length and be of a stub end type that have no sharp points which could damage cables which are run within the boom section.

An approved inline plug/socket shall be installed in the cable between the mechanism and the boom. The inline plug/socket is required to separate without damage to the cable, in the event of the boom separating from the mechanism as a result of impact with a motor vehicle.

Refer to drawing M06-249 for standard boom kit selection.

The gate mechanism shall be mounted so that the bottom of the boom arm in the horizontal position will be between 1000mm and 1250mm above road level.

Booms longer than 9140mm (as measured from centre of boom post to tip) are required to be fitted with a 'Buffer Leg Assembly' and 'High Wind Bracket'.

Refer to drawing M06-249 for selection of standard boom gate kits.

Also refer to drawing M06-203 for general assembly details.

## 2.7 Road Boom Barrier Lights

The Boom Light shall take the form of single sided round, square or rectangular LED light units with a minimum 36sq cm indication area, mounted on both sides of the boom.

Six lights minimum (three each side) shall be provided on all booms. The boom lights shall be positioned on the boom such that each traffic lane has at least one light in it.

Lights shall be spaced according to guidelines shown on drawing M06-240.

Cables are to be run within the hollow boom section and cabled up according to drawings M06-241, 242, 245 and 246.

## 2.8 Advance Warning Light (AWL)

### 2.8.1 AWL Assembly

AWL's shall be manufactured to the following RailCorp drawings:-

- Major Roads >80kph, Drawing M06-400 and M06-401.
- Secondary Roads <= 80kph, Drawings M06-403 and M06-404.
- Side Road Application, Drawings M06-405 and M06-406.

### 2.8.2 Flashing Yellow Light

AWL unit lamp cases shall consist of a single unit railway signal main line lamp case fitted with a nominal 200mm diameter yellow LED indication. Refer to the above-referenced drawings for further detail.

Lampcase units shall be fitted with the bracket detailed on Railcorp drawing M06-402.

The indication shall have a minimum of 110 LED's that are covered with a reduced reflectivity polycarbonate cover with minimal diffusion (but not completely clear).

LED shall be yellow with a colour wavelength within the range 590 – 595 nm , a viewing angle of 5 – 16 degrees and a minimum intensity of 2500 mcd.

LEDs shall be arranged and powered so that open circuit failure of a single LED or circuit board track/connection affects no more than 25% of the indication. Preferably short circuit failure of up to 50% of the LEDs in any one string is possible before the entire string fails. LED strings shall, so far as is possible, be randomly located throughout the indication.

For this specific application only, the yellow LED may be operated at or near maximum rated forward current to maximise intensity.

Operating voltage shall be 8 – 18 Volts DC (units which accept either AC or DC are acceptable) and power consumption shall not exceed 18W for 200mm units.

### 2.8.3 AWL Posts

AWL posts shall be 90mm nominal bore medium, galvanised and mounted on a cast aluminium 'breakaway' base as specified in drawing M06-407.

The cast base shall provide a frangible element in the post assembly to mitigate the damage to a vehicle that may impact it.

## 2.9 Signs

All signs used on the road level crossing signals or on the road approaches to the level crossing shall, with the exception of the AWL sign, strictly comply with AS 1742.7 and shall be manufactured in accordance with AS1743. Refer to AS1742.7 for general information on the below-referenced standard signage types:-

R6-24A, R6-25B, W7-2-2A, R6-9, W7-4B and 4C, W7-14-3, D4-3, G9-58, G9-67-2 and RX-9.

## 2.9.1 Rail Authority Basic Signage

The standard RX-5 Assembly shall consist of the following signage:-

- The "Railway Crossing" sign R6-25B which shall be manufactured to drawing M06-263. Also see note below.
- The "Tracks" sign W7-2-2A which shall be manufactured to drawing M06-212.
- The "Stop On Red Signal" sign R6-9 which shall be manufactured to drawing M06-212.

Note: The "Railway Crossing" sign R6-24A together with the "Tracks" sign W7-2-1A may be used for high wind applications such as on the tip of an overhead cantilever post.

## 2.9.2 The Train Drivers Approach Sign

The Train Drivers Approach sign W7-4B shall be manufactured to drawing M06-213.

# 3 Pedestrian Crossing Equipment

## 3.1 Gates

Pedestrian Swing Gates shall be of an approved design and shall be power operated.

### 3.1.1 Swing Gates

Swing gates shall be of welded galvanised steel construction of sufficient strength so as not to distort or sag with a vertical load of 150kg applied at the tip of the gate.

Gate supports shall not bend, twist or distort with similar loads applied or with a load of 250kg applied to the top of the gate support in any direction.

Gates may be finished gloss white or left in the galvanised state.

The approved left hand swing gate is RailCorp Stock Code 1879469.

The approved right hand swing gate is RailCorp Stock Code 1879451.

The motor enclosure shall make provision for the mounting and connection of an approved tone generator.

### 3.1.2 Swing Gate Mechanism

The swing gate motor-mechanism shall be capable of operating swing gates up to 1.5 metres in width. Nominal operating voltage shall be 110V (90 – 130V) 50hz AC. A 12V (8 – 18V) DC solution may be considered.

The mechanism shall be:-

- Designed such that hazards to persons associated with the swinging gate leaf and crank arms are minimised and the gate leaf not capable of causing crush injuries to pedestrians.
- Capable of closing the gate (through 95°) in 8 seconds or less.
- Capable of tolerating the gate being restrained part way through its arc for an indefinite period without detriment to the motor or mechanism for an indefinite period.
- Capable of resuming movement in the intended direction when restraint is removed.



- Fitted with a minimum of two independent volt free contacts when the gate is closed and a minimum of 2 independent volt free contacts when the gate is open. Contacts shall be rated at a minimum 10 Amp at 240Vac and 1 Amp at 24Vdc.
- Capable of tolerating being forced from the closed or open position without detriment to motor or mechanism.
- Capable of returning to the correct position when the force is removed.
- Capable of closing the gate on loss of power.

The gate drive crank arms shall be double secured to prevent the crank arms coming free. A split pin through the pivot bolt is acceptable.

Hinges are to be of a type that will not corrode or seize and do not require oil lubrication. Hinges fitted with grease nipples will be accepted.

### 3.1.3 Emergency Exit Swing Gate

The emergency exit gate shall be of galvanised steel construction, provided with a self closing mechanism usually taking the form of spring close hinges and an automatic latch with local release. The gate design shall generally comply with the requirements defined in AS1742.7.

Where a non standard width gate is required for retro-fit upgrade purposes, the overall width of the gate may be varied slightly with the approval by the Chief Engineer.

The latch shall be:-

- Robust in nature.
- Capable of being released by persons with a range of physical disabilities.
- Reliable in operation.

#### 3.1.3.1 Electric Release Gate

The emergency exit swing gate with an electric release latch shall be manufactured in accordance with drawings M06-248 and M06-252.

The magnetic latch shall be manufactured in accordance with drawing M06-256.

The latch release push buttons shall be manufactured in accordance with drawing M06-255.

Nominal operating voltage shall be 12V (8 – 18V) DC.

The magnet is fitted with a position status switch which, when wired up to a monitoring system allows the closed or otherwise position status of a gate to be detected.

#### 3.1.3.2 Mechanical Release Gate

The emergency exit swing gate with a mechanical release latch (i.e. non electric) is only to be installed as an interim measure at existing crossings. The gate shall be manufactured in accordance with drawings M06-274, M06-275 and M06-276.

## 3.2 Signs

The signs to be manufactured for gated pedestrian crossings shall comply with the latest version of the following drawings:-

- "Warning" sign W7-14-3 shall be manufactured to drawing M06-215.
- "Emergency Exit" sign shall be manufactured to drawing M06-247.



- "No thoroughfare" sign shall be supplied to drawing M06-244.
- "Emergency Exit" sign shall be manufactured to drawing M06-247.
- "Emergency Exit Arrow" sign shall be manufactured to drawing M06-247.
- "Cyclists Dismount" sign G9-58 shall be manufactured to drawing M06-262.
- "Cycle Hazard" sign shall be manufactured to drawing M06-272.

Also refer to Specification SPG 1210 for any general signage manufacturing requirements.

### 3.3 Audible Warning Devices

The pedestrian crossing audible alarm (tone generator) shall be omni-directional. The brand/model shall be as specified on drawing/s M06-251 or 253.

In the case of an active maze crossing, the tone generator shall be mounted in the top of the light post, as detailed on drawing M06-253.

In the case of a gated crossing, the tone generator shall be mounted within the pedestrian swing gate mechanism enclosure as detailed on drawing M06-251.

Depending on the power supply at the pedestrian crossing, the tone generator shall be selected for either nominal 12V DC (8 – 18V DC) or 110V AC (90 – 130V) operation.

Note: All new crossings shall be 12V DC type.

In order to achieve adequate sound levels, tone generators shall be set to maximum volume. Refer to drawing M06-244 for adjustment detail.

### 3.4 Warning Light Units

Pedestrian warning light Units for crossings whether fitted with lights only or with swing gates shall be 'Don't Walk ('Red Man') lights (using symbolic indications) to AS 2144. Unless otherwise specified, there shall be two lights on each side of the crossing, one light facing oncoming pedestrians and one light facing across the railway tracks.

'Don't Walk' lights shall be LED illuminated with the LED assemblies configured for either nominal 12V DC (8 – 18V DC) or 110V AC (90 – 130V) operation depending on the power supply at the pedestrian crossing.

Note: All new crossings shall be 12V DC type.

Open circuit failure of a single LED shall not result in more than 33% loss of indication and the indicated symbol shall remain identifiable.

Approved lights are as specified on drawings M06-251 or 253.

## 4 Control Equipment

### 4.1 Control of Lights / Booms / Gates

Equipment used to control the operation of the Flashing Signal Assemblies, Advance warning Lights, Flashing Signal Assemblies with boom barriers, pedestrian lights and pedestrian gates shall have the same safety and reliability characteristics as that required for railway signalling systems and equipment.

The principles of operation shall be as described in Specifications ESG 100.0 and ESG 100.18.

The standard circuits shall be as described in Specification SDG 001.

## 4.2 Power Supply

### 4.2.1 Batteries

Batteries shall be of the nickel cadmium or sealed lead-acid type. Sealed lead-acid type batteries are only allowed where there is a backed up AC supply. Minimum battery capacity shall be 135Ahr, in some circumstances 256Ahr battery capacity shall be required.

Note that under some circumstances, where normal and emergency railway power supplies are available, batteries may not be required for isolated pedestrian level crossings. Batteries shall always be provided for road or combined road/pedestrian level crossings.

Batteries shall be single cell construction.

Approved single cell nominal 1.2V battery is: SAFT brand 135Ahr nickel cadmium battery model SBL135-1. RailCorp Stock Code 1880764.

Where road booms are fitted, 12 cells shall be provided, otherwise 10 cells.

### 4.2.2 Battery Charger

Battery chargers shall be to the requirements of Specification SPG 1025. Input voltage shall be 120 Volts 50 Hz nominal, and the unit shall be of a design suited to the characteristics of the type of battery used.

The transformer within the battery charger shall be an isolating type and all 120 Volt connections within the charger shall be labelled 120 Volts and shall either be fully insulated and covered terminals or shall be behind a separate cover within the battery charger case.

240V AC units may be considered on application to the Chief Engineer Signals.

Approved chargers are RailCorp models:-

- 'Store 74' (20Amp) for Lights only crossing, RailCorp Stock Code 1873207.
- 'Store 74-30A' (30Amp) for lights and booms crossing, RailCorp Stock Code 1042357.

## 4.3 Test, Emergency and Manual Control Boxes

The Test Box, Emergency Box and Manual Control Box shall operate in accordance with the requirements of the Signalling Design Principle ESG 100.18 and shall be designed to be mounted on the outside of the level crossing bungalow.

The Test Box shall be manufactured according to drawing M06-315 sheet 1-4.

The Emergency Box shall be manufactured according to drawing M06-313 sheet 1-5.

The Manual Control Box shall be manufactured according to drawing M06-316 sheet 1-4.

## 4.4 Level Crossing Equipment - Housing

Equipment for the control and operation of the level crossing shall be suited for housing in a pre-cast concrete walk-in bungalow (hut), in compliance with Specification SPG 0708.

## 4.5 Level Crossing Identification Signage

The level crossing shall be fitted with identification plates providing kilometreage, crossing name and contact phone details in accordance with drawing M06-265 and shall be positioned in accordance with Specification SPG 0724.