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About This Standard

All road/rail intersections (grade or level crossings) are provided with either passive or active protection. Passive protection is by signage only which provides an unchanging warning to the road user whether or not a train is approaching the crossing.

Active protection varies the warning provided to the road user and, in some cases, blocks access to the crossing when a train is within a pre-determined distance of the crossing.

This Principle addresses the terms and definitions relating to those locations where active level crossing warning or protection devices have been provided for the safety of both road users, including pedestrians, and rail traffic.

These terms and definitions are used throughout these Principles and have regard to the wording used in the current Australian Standards, ARTC standards and other State Rail Documents.

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18. Level Crossings

18.1 Principle No 18.1-Level Crossings: Definitions, Types and Classifications

18.1.1 Introduction

All road/rail intersections (grade or level crossings) are provided with either passive or active protection. Passive protection is by signage only which provides an unchanging warning to the road user whether or not a train is approaching the crossing.

Active protection varies the warning provided to the road user and, in some cases, blocks access to the crossing when a train is within a pre-determined distance of the crossing.

This Principle addresses the terms and definitions relating to those locations where active level crossing warning or protection devices have been provided for the safety of both road users, including pedestrians, and rail traffic.

These terms and definitions are used throughout these Principles and have regard to the wording used in the current Australian Standards and other State Rail Documents.

The arrangements proposed for each level crossing shall be approved by the RTA, Council ARTC, State Rail, Local Traffic Management Authority before a design can be commenced. The Project Manager for the work shall be responsible to ensure that the necessary parties are in agreement by signing off for the proposed level crossing arrangement.

18.1.2 Protected Level Crossing (Public or Private Road) - Definition

A Protected Level Crossing is defined to be a road-rail intersection at which a risk assessment has determined that the hazard is such that provision of active warning and/or protection devices is required in the interests of the safety of the road users, including pedestrians, but in particular road traffic, and rail traffic.

The active warning devices provide the total protection for the crossing and there are no passive devices such as "GIVE WAY" or "STOP" signs

Types of Active Level Crossing Protection

These are defined in accordance with Australian Standard 1742.7 as

- Level Crossing controlled by Flashing Lights.
- Level Crossing controlled by Flashing Lights and Half-Boom Gates.

In these Principles the term Half-Boom Gate shall be synonymous with the term Half Boom Barrier and the term Gates shall be synonymous with the term Full Boom Barriers.

18.1.3 Protected Pedestrian Level Crossing - Definition

A Protected Pedestrian Crossing is defined to be a pedestrian-rail intersection at which a risk assessment has determined that the hazard is such that provision of active warning and/or protection devices is required in the interests of the safety of pedestrians.

Types of Pedestrian Level Crossing Protection

These are defined as

- Pedestrian level crossing controlled by lights.
- Pedestrian level crossing controlled by lights and boom barriers or swing gates.

18.1.4 Level Crossing Signs - Definition

A level crossing sign is a warning device provided to advise road users of the potential hazards associated with road-rail intersections.

18.1.5 Types of Level Crossing Signs

All level crossing signs, both at and approaching the level crossing, shall be in accordance with Australian Standard 1742.7 except that in specific situations, supplementary signage may be added to define a particular function or requirement.

18.1.6 Warning Lights

The assembly for a protected public level crossing shall be the RX-5 flashing light assembly defined in AS 1742.7.

Where the usage and type of road traffic justifies private level crossings may also be fitted with the RX5 assembly,

In these Principles the term RX-5 shall be synonymous with the term Type F Highway signal.

18.1.7 Advance Warning Lights - Definition

Two side by side yellow flashing lights mounted on the same post as the W7-4B (or C) road sign, generally within a sign reading "Prepare to Stop". Used where the road layout or obstructions limit the motorist's view of the Type F signals at the level crossing. Advance warning lights can be provided on level crossings fitted with Type F lights only and on level crossings fitted with Type F lights and booms.

18.1.8 Supplementary Warning Lights - Definition

Steady red lights fitted as a supplement to the passive “STOP” or “GIVE WAY” signage protection, generally at private level crossings, where limited sighting of approaching trains significantly increases the risk to road users and trains.

Supplementary warning lights may also have application to minor secondary unsealed public roads subject to negotiation between the rail and local road authorities.

18.1.9 Level Crossing Controls - Definition

Crossing Controls are defined to be the electrical (or electronic) controls necessary to initiate, maintain and end the operation of the warning and protection devices at a level crossing.

The Crossing Controls may be initiated automatically or manually or by a combination of both.

The Crossing Controls may have to be interlocked with railway signalling equipment controlling the passage of trains over the level crossing and depending on the complexity of the arrangements a number of “special controls” may be required.

At some locations it may be necessary to integrate the crossing controls with other systems, for example those controlling highway traffic lights.

18.1.10 Level Crossing Operation - Definition

Operation is defined to be the sequence and mode in which the Crossing Controls operate including the manner in which the level crossing warning and protection devices operate.

The mode of operation for all types of level crossing arrangements shall generally be in accordance with the recommended practices of the AAR for Railroad - Highway Grade Crossing Practices.

18.1.11 Level Crossing Warning Time - Definition

The absolute minimum warning times applicable to road level crossings shall be in accordance with the Association of American Railroads Manual Part 3.3.10.

Design minimum warning times for road and pedestrian crossings shall be:-

- 25 seconds for Type F light installations
- 30 seconds for Type F light and boom installations with a gate delay of 7 seconds. Where long road vehicles (eg. B doubles, road trains) are permitted to operate on the road over the level crossing, the delay time shall be increased from 7 to 11 secs.
- 19 seconds for pedestrian crossings with lights

- 25 seconds for pedestrian crossings with lights and booms or swing gates

Note: where the pedestrian crossing is associated with a road crossing, the times for the road crossing will apply.

Care shall be exercised in relation to ascertaining the minimum warning time of the fastest trains for various level crossing applications having regard to the avoidance of excessive warning times as a result of slow or stopping train patterns.

While the minimum warning times specified herein must be met for Supplementary Warning Lights, significantly longer warning times are acceptable if advantage can be taken of existing track circuits in the area.

18.2 Principle No.18.2 - Level Crossing Controlled By Flashing Lights Only

18.2.1 Introduction

This Principle addresses the requirements for a level crossing controlled by flashing lights only including its mode of operation and the determination of the appropriate crossing controls and indications.

18.2.2 Provision of the Arrangement

This particular arrangement shall only be provided where a public road intersects a single line public railway. Refer to figure 1.

Other arrangements may apply to private roads and railways.

18.2.3 Statutory Requirements

These shall be in accordance with AS1742.7 for a level crossing controlled by Type F highway signals only.

18.2.4 Additional Requirements

A pedestrian warning bell, or other approved audible warning device, shall be provided at the level crossing and shall surmount the Country side Type F highway signal post. The audible warning may be suppressed when the front of the train passes over the level crossing.

18.2.5 Local & Environmental Requirements

Local and environmental requirements shall determine the need to:

- provide additional Type F highway signals.
- position the warning bell on the Sydney side Type F highway signal post.
- provide an additional warning bell.
- mute warning bells. (Note: A controlled volume warning siren may be used as a substitute for the bell at night where required, and exceptionally at other times where specially approved.)
- Advance warning lights may also be provided on one or both road approaches to the level crossing where the motorists view of the type F signals is compromised by the road layout or by other uncorrectable obstructions. (For advance warning light positioning and cable sizes required for various applications refer to specification SCP 18)

18.2.6 Sequence of Operation

If no train is approaching the level crossing then the Type F highway signals shall be extinguished and the warning bell shall be silent.

If a train is approaching the level crossing then the Type F highway signals, together with advance warning lights (where fitted), shall commence and continue to flash alternately and the warning bell shall commence and continue to sound.

When the rear of the train passes clear of the level crossing then the Type F highway signals and advance warning lights shall become extinguished and the warning bell shall be silenced.

18.2.7 Warning Time

The warning time interval between the Type F highway signals commencing to flash and a train travelling at the maximum permissible speed applicable to a particular level crossing arriving at the level crossing shall be designed to provide 25 seconds warning.

Exception:- In those locations in the Southwest, West and Northwest of the state where road trains and B-triples are permitted to operate the warning time is to be increased to 30 seconds.

Where the intersection between the road and the railway deviates from 90° consideration shall be given to increasing the warning time to enable long vehicles to clear the crossing. Refer to table 1.

18.2.8 Crossing Controls

The operation of the level crossing shall be initiated and maintained automatically by the occupation of a controlling section of track on the approach side to the level crossing.

The length of this controlling section of track shall be determined to ensure that the prescribed warning time can be met.

Generally this section of track shall comprise a dedicated track circuit. It shall be designated UXT for trains approaching the level crossing and travelling towards Sydney and DXT for trains approaching the level crossing and travelling away from Sydney unless other Track Circuit naming requirements take precedence. Refer to figure 1.

The operation of the level crossing shall also be maintained by the occupation of a short section of track over the level crossing.

The length of this section of track shall be kept as short as practicable having regard to minimum permissible length to ensure the level crossing operation ceases promptly when the rear of a departing train has passed clear of the level crossing.

This section of track shall always comprise a dedicated track circuit designated XT unless other Track Circuit naming requirements take precedence. Refer to figure 1.

Controls shall also be provided to prevent the continued operation of the level crossing when a departing train occupies the section of track circuit controlling the operation of the level crossing for trains approaching from the opposite direction.

These controls shall be proved to have operated correctly in signal circuits, staff lines or by other approved techniques.

18.2.9 Local Test Switch and Manual Operation Switch

A local test switch shall be provided to enable the highway signals and the warning bell to operate directly from the standby power supply, with the main power supply switched-off. A manual operation switch shall also be provided in an SL locked box. This switch shall not switch off the mains power supply to the level crossing equipment.

18.2.10 Emergency Switches

Emergency switches shall be provided to enable the independent extinguishing of the Sydney side highway signal, the Country side highway signal and the silencing of the warning bell in the event that the level crossing remains in operation as a result of a failure of the crossing controls or in the event of damage to a highway signal or to facilitate maintenance activities.

18.2.11 Crossing Indications (Local)

A power supply indication shall be provided to enable the voltage of the standby battery to be determined when the test switch is activated.

This shall be an indication lamp operating from a voltage sensing device.

The lamp shall be illuminated when the test switch box is opened and the voltage of the standby battery is equal to or above a predetermined level.

The lamp shall remain extinguished when the test switch box is opened if the voltage of the standby battery is less than a predetermined level.

18.2.12 Crossing Monitoring

All level crossing functions shall be monitored locally.

Remote monitoring and testing of the level crossing functions should also be provided whenever suitable communications facilities are available.

18.2.13 Circuit Integrity

Duplicated flasher units (or single units with internally duplicated flashers) and wiring shall be provided and the flasher units shall be “ring” wired out to each Type F highway signal such that the failure of one flasher or the open circuit failure of one wire or connection point shall not result in the total loss of all the highway signals on one side of the crossing.

Advance warning light shall be wired so that each light on any one approach is connected to a separate flasher.

18.2.14 Power Supply

A main 240V council supply shall be provided unless a high voltage SRA supply is available.

A standby battery and battery charger shall be provided permanently connected to the supply.

The standby battery shall be of sufficient capacity to ensure the proper operation of the crossing equipment for at least 24 hours under normal operating conditions.

18.2.15 Approach Warning Signs (Rail)

W7-4B warning signs to AS 1742.7 and AS 1743 shall be erected immediately to the left of the running line and adjacent to the approach track circuit block joints advising drivers that they are approaching an actively protected level crossing and to avoid bringing their trains to a stand on level crossing approach track circuits.

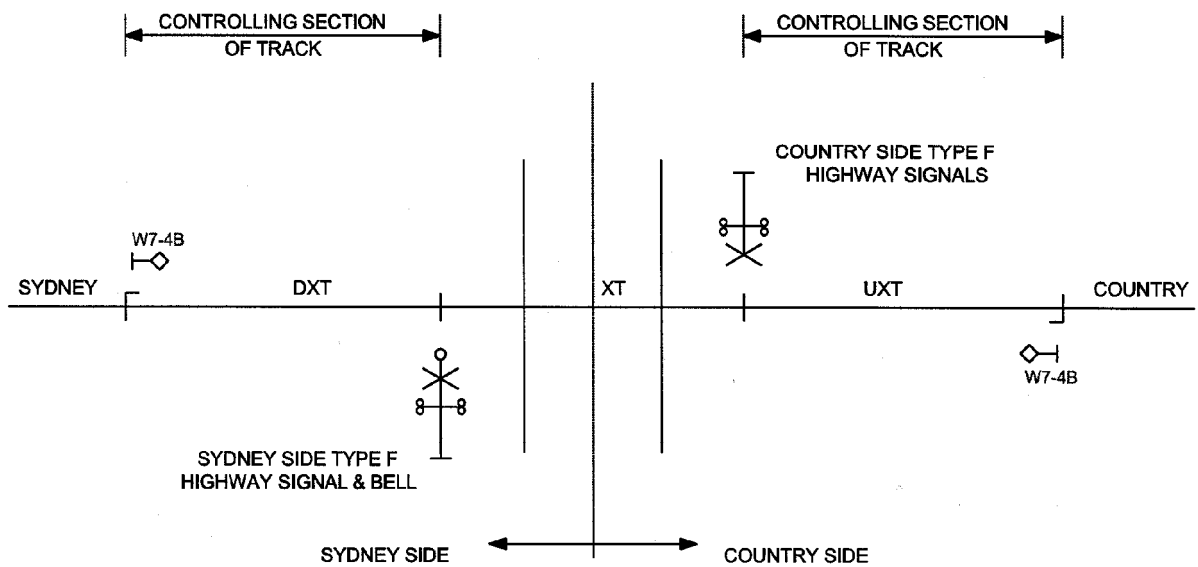


FIGURE 1

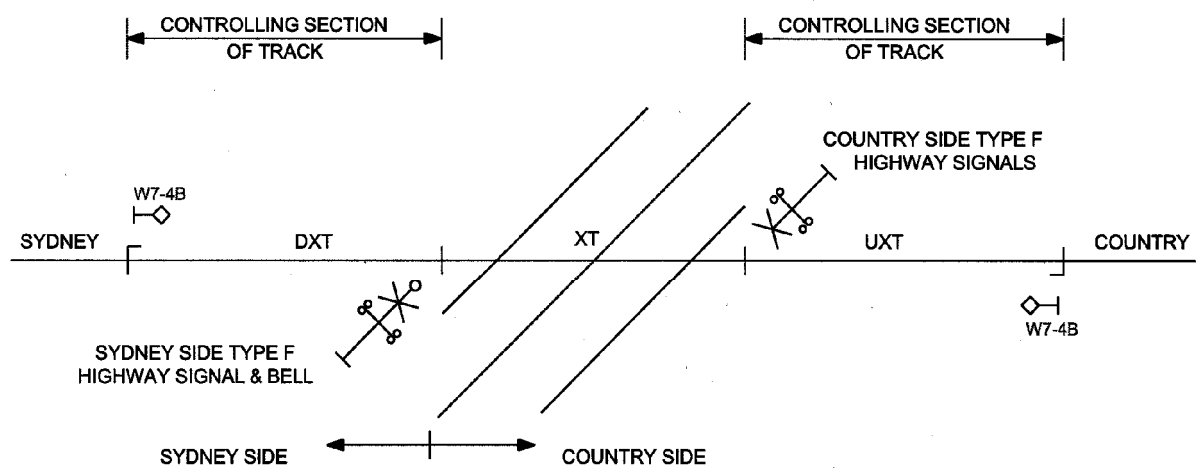


FIGURE 2

ARRANGEMENT OF LEVEL CROSSING

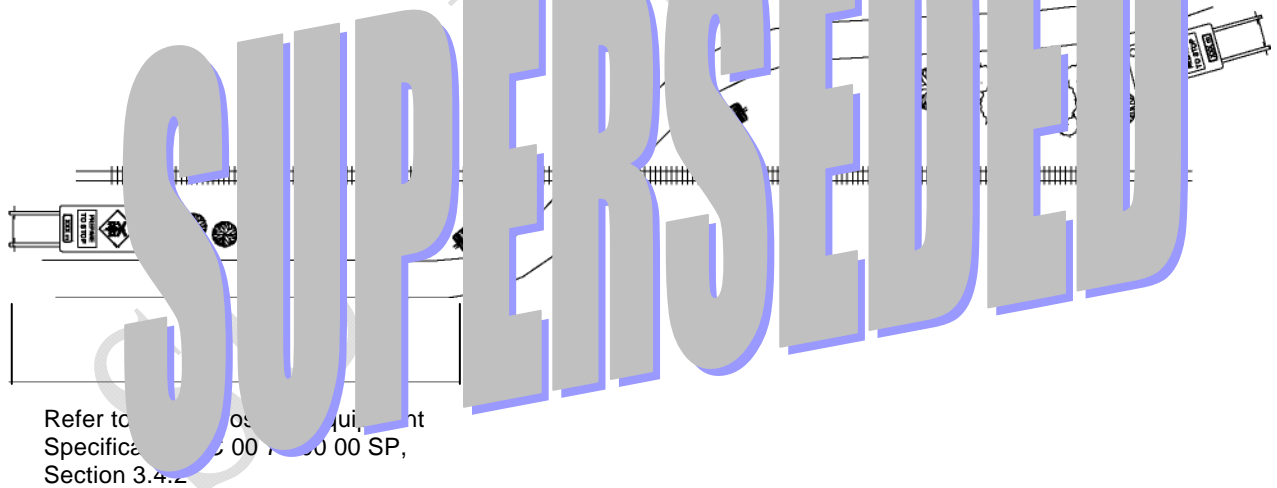
PRINCIPLE 18.2



Figure 3

NOTES

- 1 Type F lights at the crossing should be visible to the motorist within 3 seconds of passing the advance warning lights (Distance = 3 x road speed in metres/sec)
- 2 The location of the Advance Warning Lights is determined by consultation with the RTA or local road authorities



TYPICAL APPLICATION
APPROACH WARNING LIGHTS

Figure 4

PRINCIPLE 18.2

MAXIMUM PERMISSABLE SPEED FOR FASTEST TRAIN APPROACHING THE LEVEL CROSSING (km/hr)	LENGTH OF CONTROLLING SECTION OF TRACK FOR 25 SECOND WARNING (metres)	LENGTH OF CONTROLLING SECTION OF TRACK FOR 30 SECOND WARNING (metres)
40	280	340
45	320	375
50	360	420
55	390	460
60	420	505
65	460	545
70	490	585
75	520	630
80	560	680
85	600	710
90	640	750
95	660	800
100	700	840
105	740	880
110	780	920
115	800	960
120	840	1010
125	880	1045
130	920	1190
135	950	1130
140	980	1170
150	1040	1260
160	1120	1360

TABLE 1

PRINCIPLE 18.2

18.3 Principle No.18.3 - Level Crossing Controlled By Flashing Lights and Half-Boom Barriers

18.3.1 Introduction

This Principle addresses the requirements for a level crossing controlled by flashing lights and half-boom barriers including its mode of operation and the determination of appropriate crossing controls and indications.

18.3.2 Provision of the Arrangement

This particular arrangement shall be provided where a public road intersects two or more running lines of a public railway and is the preferred arrangement for double lines. Refer to figure 1.

Other arrangements may apply to private roads or railways.

18.3.3 Statutory Requirements

These shall be in accordance with AS1742.7 - 1993 for a level crossing provided with Type F highway signals.

18.3.4 Additional Requirements

Two pedestrian warning bells, or other approved audible warning devices, shall be provided at the level crossing such that one shall surmount the Sydney side Type F highway signal post, and one shall surmount the Country side Type F highway signal post.

The pedestrian audible warning on one side of the level crossing shall be silenced when both the half-boom barriers are fully lowered.

In those locations where pedestrians barriers and lights are fitted both the level crossing audible warnings can be suppressed if required when the booms are fully lowered provided that the pedestrian crossing is fitted with controlled volume warning sirens.

18.3.5 Local & Environmental Requirements

Local and environmental requirements shall determine the need to:

- provide additional Type F highway signals.
- mute or conditionally suppress warning bells at night.
- substitute controlled volume warning sirens in lieu of the bells at night and, if specially approved, during the day.

18.3.6 Sequence of Operation

If no train is approaching the level crossing then the Type F highway signals shall be extinguished, the half-boom barriers shall be in the fully raised position and the warning bells shall be silent.

If a train is approaching the level crossing then the Type F highway signals shall commence and continue to flash alternately and the warning bells shall commence and continue to sound.

After a predetermined time interval the half-boom barriers shall commence to lower.

After a predetermined time interval the half-boom barriers shall reach the fully lowered position and one of the warning bells shall be silenced.

After a predetermined time interval the front of the approaching train shall reach the level crossing.

If the rear of the approaching train passes clear of the level crossing then both the half-boom barriers shall commence to rise and the other warning bell shall be silenced.

When both half-boom barriers reach the fully raised position the Type F highway signals shall become extinguished.

If a second train is approaching the level crossing as the rear of the first train passes clear of the level crossing and there is insufficient time for the half-boom barriers to rise and remain in the fully raised position for a predetermined time interval before commencing to lower for the second train then they shall remain lowered until the rear of the second train has also passed clear of the level crossing.

18.3.7 Warning and Operating Times

The warning time interval between the Type F highway signals commencing to flash and the front of a train travelling at the maximum permissible speed applicable to a particular level crossing arriving at the level crossing shall be designed to provide 30 seconds warning.

During the warning time interval the half-boom barrier equipment shall operate as follows.

- Generally, 11 seconds after the highway signals have commenced to flash the half-boom barriers shall commence to lower. Where long road vehicles (eg. 25m B doubles, road trains or B-triples) are permitted to operate on the road over the level crossing, the delay time shall be increased from 7 to 11 seconds. (Contact RTA to identify the roads over which these vehicles are permitted to run)
- 10 to 12 seconds after the half-boom barriers have commenced to lower they shall reach the fully lowered position.

Where the intersection between the road and the railway deviates from 90° consideration shall be given to increasing the warning time to enable long vehicles to clear the crossing. Refer to figure 2.

18.3.8 Crossing Controls

The operation of the level crossing shall be initiated and maintained automatically by the occupation of a controlling section of track on the approach to and immediately over the level crossing.

The length of this controlling section of track shall be determined to ensure that the prescribed warning time can be met.

The operation of the level crossing shall also be maintained by the occupation of a holding section of track on the approach side of the controlling section of track.

The length of this holding section of track shall be determined to ensure that a minimum holding time of 15 seconds is provided for the second train.

If bi-directional movements take place over the level crossing then a separate local track circuit shall be provided.

The length of this section of track shall be kept short as practicable having regard to minimum permissible length to ensure the level crossing operation ceases promptly when the rear of a departing train has passed clear of the level crossing.

If bi-directional movements take place then controls shall also be provided to prevent the continued operation of the level crossing when a departing train occupies the section of track circuit controlling the operation of the level crossing for trains approaching in the other direction.

If the level crossing is situated on a single line than these controls shall be proved to have operated correctly in signal circuits, staff lines or by other approved techniques.

At some installations shunters push buttons may be provided to operate the level crossing when shunting movements are taking place over the crossing on normally non track circuited sidings.

An additional track circuit may be provided in the siding to hold the crossing down and provide an auto reclear feature when the shunting movement has passed clear.

18.3.9 Local Test Switch

A test switch shall be provided to enable the highway signals, the half-boom barriers and the warning bells to operate directly from the standby power supply, with the main supply switched off.

18.3.10 Emergency Switches

In the event that the level crossing remains in operation as a result of a failure or to facilitate maintenance activities or for other reasons, independent emergency switches shall be provided enabling a manual control for:

- extinguishing each of the flashing light highway signals.
- disconnecting each of the half-boom barriers to allow them to be tied up.
- silencing both of the warning bells.

18.3.11 Crossing Indications (Local)

A power supply indication shall be provided to enable the voltage of the standby battery to be determined when the test switch is activated.

This shall be an indicating lamp operating from a voltage sensing device.

The lamp shall be illuminated when the test switch box is opened and the voltage of the standby battery is equal to or above a predetermined level.

The lamp shall remain extinguished when the test switch box is opened if the voltage of the standby battery is less than a predetermined level.

18.3.12 Crossing Monitoring

All level crossing functions shall be locally monitored.

Remote monitoring and testing of the level crossing functions should be provided wherever suitable communications facilities are available.

18.3.13 Circuit Integrity

Duplicated flasher units (or single units with internally duplicated flashers) and wiring shall be provided and the flasher units shall be “ring” wired out to each Type F highway signal such that the failure of one flasher or the open circuit failure of one wire or connection point shall not result in the total loss of all the highway signals lights on one side of the crossing.

18.3.14 Power Supply

A main 240V council supply shall be provided unless a high voltage SRA supply is available.

A standby battery and battery charger shall be permanently connected to the supply.

The standby battery shall be of sufficient capacity to ensure the proper operation of the crossing equipment for at least 24 hours under normal operating conditions.

18.3.15 Approach Warning Signs (Rail)

W7-4B warning signs to AS1742.7 and AS 1743 shall be erected immediately to the left of the running line and adjacent to the approach track circuit block joints advising drivers that they are approaching an actively protected level crossing and to avoid bringing their trains to a stand on level crossing approach track circuits.

SUPERSEDED

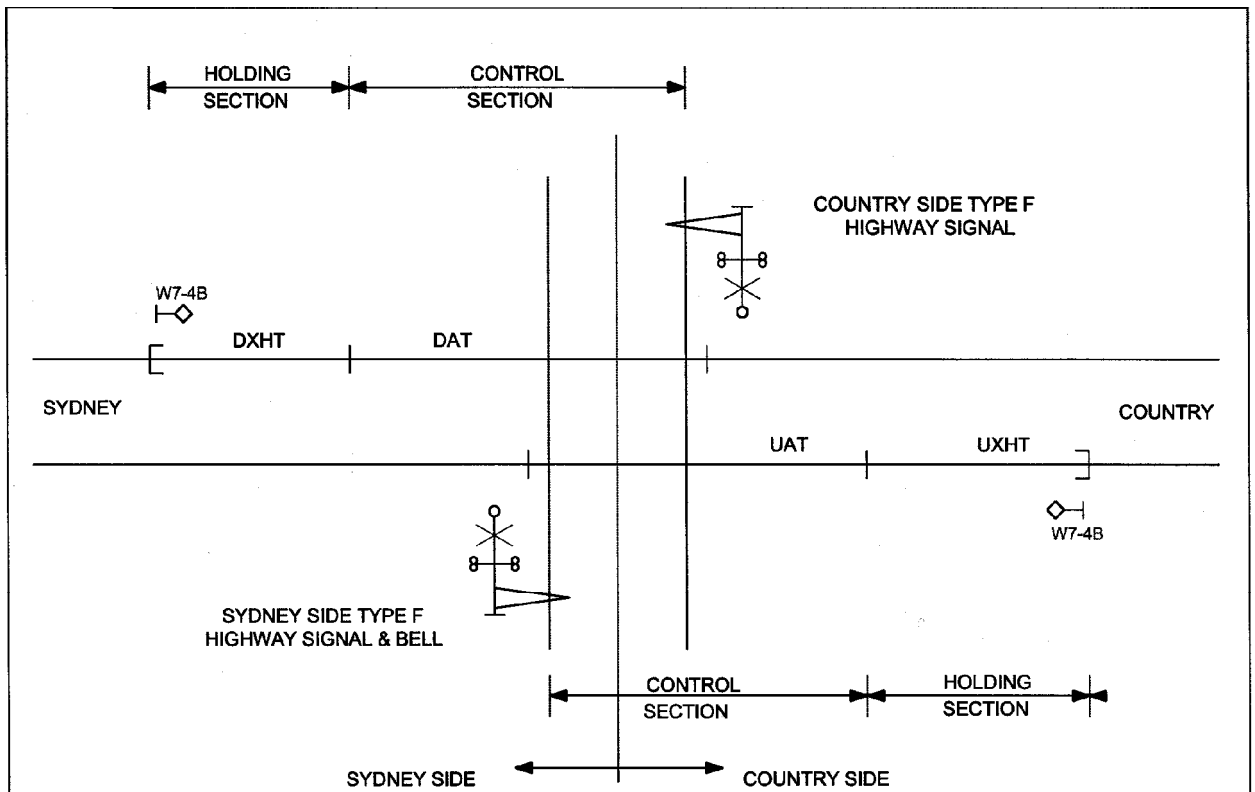
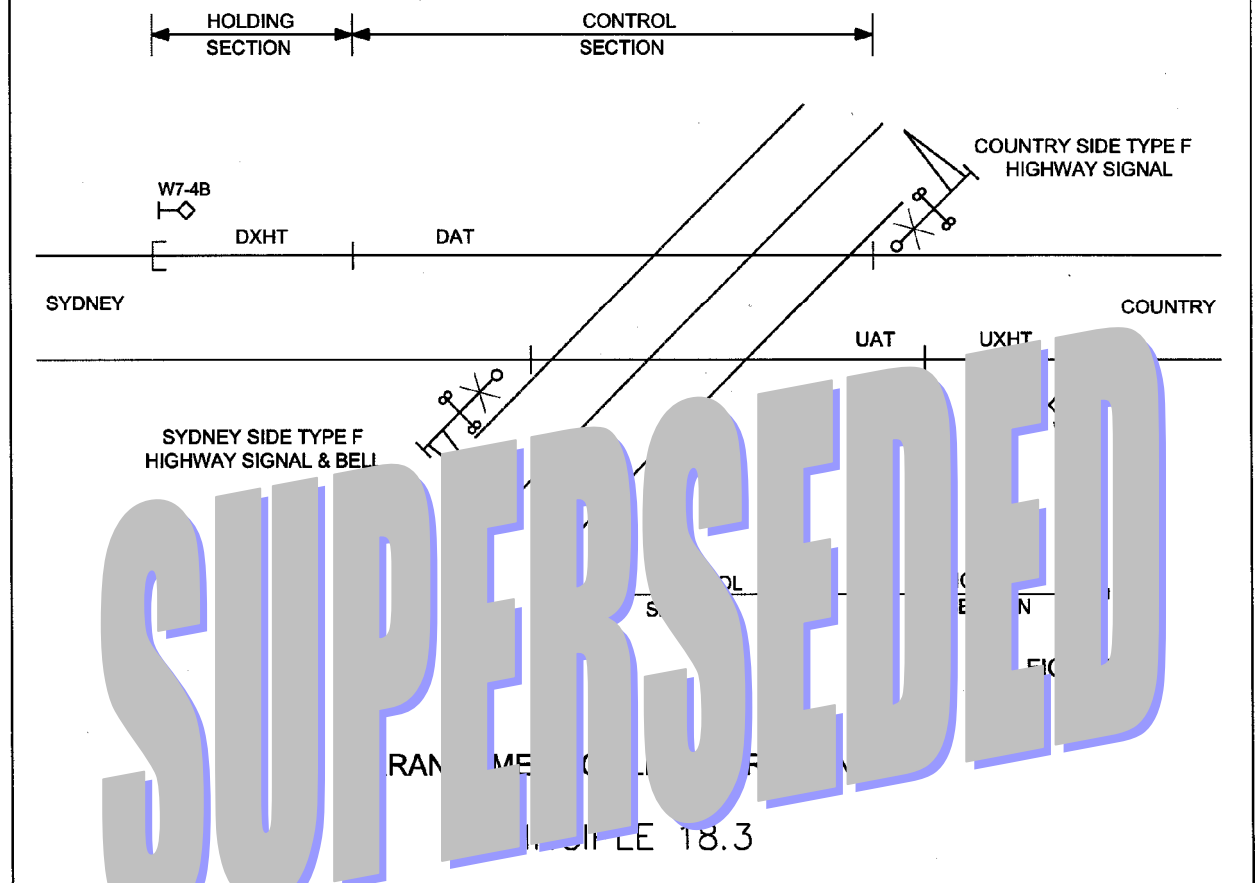


FIGURE 1



18.4 Principle No.18.4 - Private Level Crossing fitted with Supplementary Warning Lights

18.4.1 Introduction

This Principle addresses the requirements for a level crossing fitted with warning lights which are supplementary to the passive signage protection and includes the mode of operation and the determination of the appropriate crossing controls and indications.

The warning lights are secondary to the primary RX1 or RX2 level crossing assembly which must be obeyed by the motorist irrespective of the state of the warning lights.

The warning lights shall be red LED units 90 to 110 mm diameter.

18.4.2 Provision of the Arrangement

This particular arrangement shall generally only be provided where a private road intersects no more than a double line public railway and a normal Type F installation cannot be justified. Refer to figures 1 and 2.

By specific agreement and authorisation it may be applied where a minor secondary, unsealed public road intersecting a single line public railway.

18.4.3 Statutory Requirements

The passive protection (signage) at the crossing shall be in accordance with AS1742.7 figure 1(a) RX1 or RX2 assembly for a level crossing with passive protection.

18.4.4 Additional Requirements

Signage describing the function of the supplementary warning lights shall be provided at the crossing. Refer to figures 1 and 2

No audible warning device is required.

18.4.5 Local & Environmental Requirements

Not applicable.

18.4.6 Sequence of Operation

If no train is approaching the level crossing then the warning lights shall be extinguished.

If a train is approaching the level crossing then the warning lights shall illuminate and remain illuminated. (Steady, not flashing, lights)

When the rear of the train passes clear of the level crossing then the warning lights may become extinguished. (For this application only some "tail flashing" is acceptable)

18.4.7 Warning Time

The warning time interval between the warning lights becoming illuminated and a train travelling at the maximum permissible speed applicable to a particular level crossing arriving at the level crossing shall be designed to provide a minimum of 25 seconds warning.

While minimum warning times must be maintained, extended warning times, up to 75 seconds, are permissible and consideration should be given to using existing track circuits or other detection devices where these are available.

18.4.8 Crossing Controls – Single Track

The operation of the level crossing shall be initiated and maintained automatically by the occupation of a controlling section of track on the approach side to the level crossing.

The length of this controlling section of track shall be determined to ensure that the prescribed warning time can be met.

Generally this section of track shall comprise a dedicated track circuit. It shall be designated UXT for trains approaching the level crossing and travelling towards Sydney and DXT for trains approaching the level crossing and travelling away from Sydney unless other Track Circuit naming requirements take precedence. Refer to figure 1.

A track over the level crossing is not required for supplementary warning lights

Controls shall also be provided to prevent the continued operation of the level crossing when a departing train occupies the section of track circuit controlling the operation of the level crossing for trains approaching from the opposite direction.

These controls shall be proved to have operated correctly in signal circuits, staff lines or by other approved techniques.

18.4.9 Crossing Controls – Double Track

The operation of the level crossing shall be initiated and maintained automatically by the occupation of a controlling section of track on the approach to the level crossing.

The length of this controlling section of track shall be determined to ensure that the prescribed warning time can be met.

The operation of the level crossing shall also be maintained by the occupation of a holding section of track on the approach side of the controlling section of track.

The length of this holding section of track shall be determined to ensure that a minimum holding time of 15 seconds is provided for the second train.

If bi-directional movements take place then controls shall also be provided to prevent the continued operation of the level crossing when a departing train occupies the section of track circuit controlling the operation of the level crossing for trains approaching in the other direction.

18.4.10 Local Test Switch

A local test switch shall be provided to enable the warning lights to operate directly from the standby power supply, with the main power supply switched-off.

18.4.11 Emergency Switches

Local emergency switches are not required.

18.4.12 Crossing Indications (Local)

A power supply indication shall be provided to enable the voltage of the standby battery to be determined when the test switch is activated.

This shall be an indication lamp operating from a voltage sensing device.

The lamp shall be illuminated when the test switch box is opened and the voltage of the standby battery is equal to or above a predetermined level.

The lamp shall remain extinguished when the test switch box is opened if the voltage of the standby battery is less than a predetermined level.

18.4.13 Crossing Monitoring (Remote)

Remote monitoring (of power supply and lamp failure indications as a minimum) should be provided whenever suitable communications facilities are available. Remote testing may be provided if desired.

18.4.14 Circuit Integrity

Individual wiring shall be run from the location to each warning light and each warning light shall be individually fused so that failure of a fuse or wiring connection shall result in the loss of not more than one warning light.

18.4.15 Power Supply

A main 240V council supply shall be provided unless a high voltage SRA supply is available.

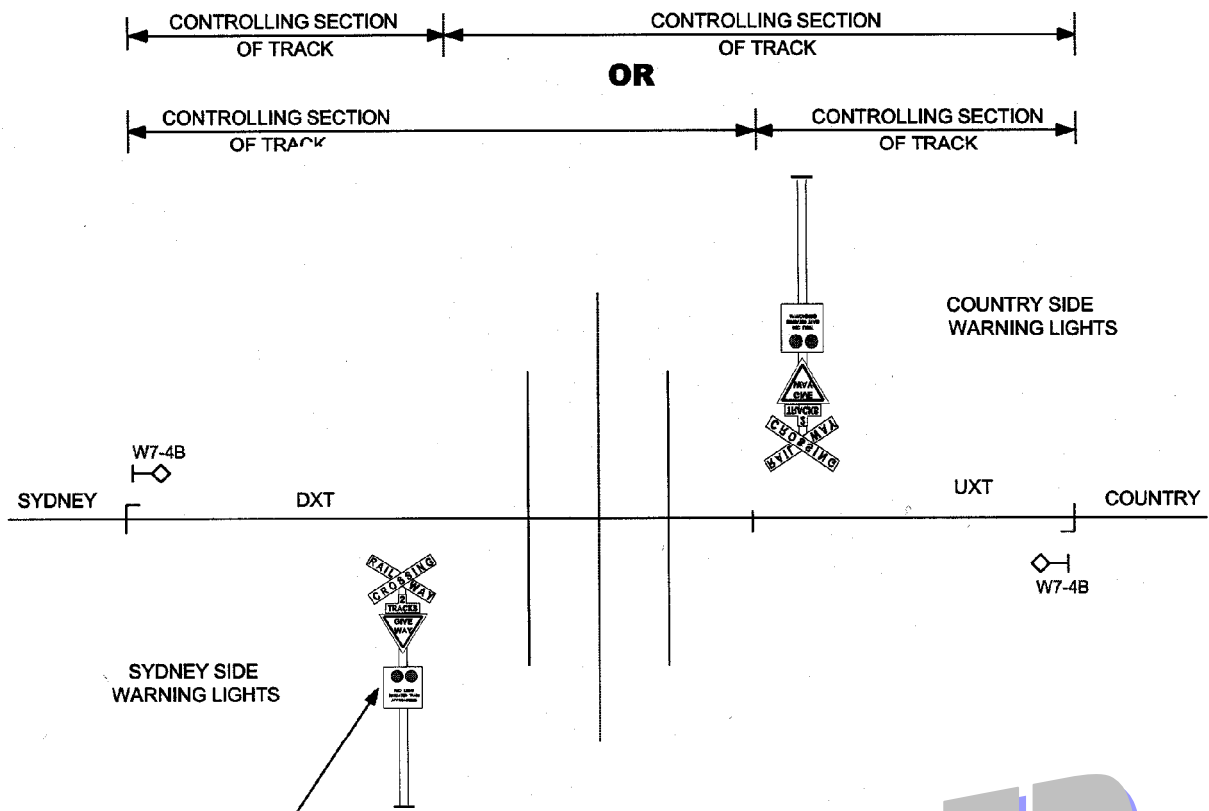
A standby battery with duplicated battery chargers shall be provided permanently connected to the supply.

The battery shall be of sufficient capacity to operate the warning lights for 24 hours.

18.4.16 Approach Warning Signs (Rail)

W7-4B warning signs to AS 1742.7 and AS 1743 shall be erected immediately to the left of the running line and adjacent to the commencement of the approach track circuit advising drivers that they are approaching an actively protected level crossing to avoid bringing their trains to a stand on level crossing approach track circuits.

SUPERSEDED

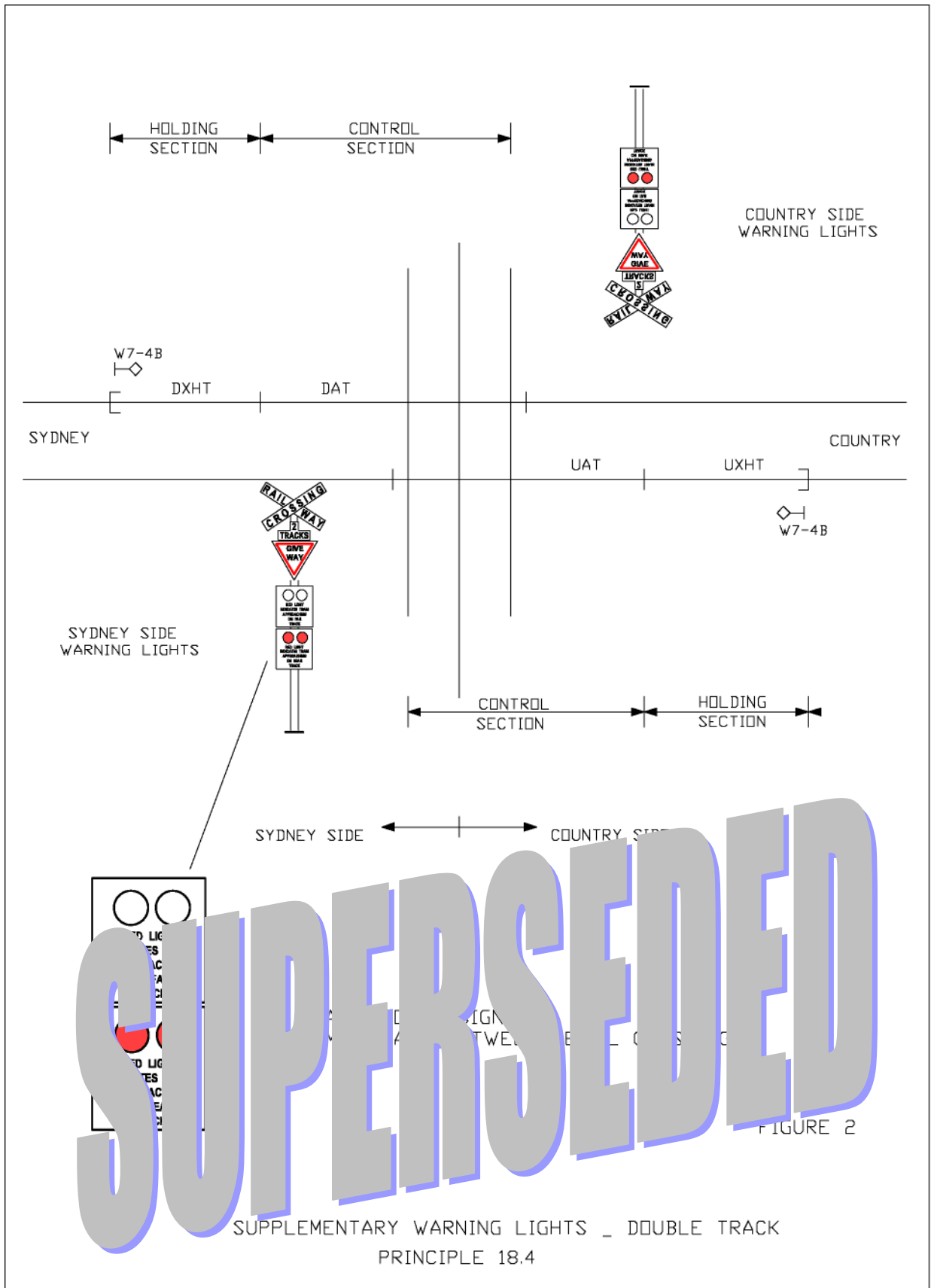


SUPERSEDED

FIGURE 1

SUPPLEMENTARY WARNING LIGHTS - SINGLE LINE

PRINCIPLE 18.4



18.5 Principle No.18.5 - Pedestrian Level Crossing Controlled By Lights Only

18.5.1 Introduction

This Principle addresses the requirements for pedestrian level crossings controlled by red lights and supplemented by controlled volume audible warning sirens. It includes the mode of operation of the level crossing and the method of determination of appropriate crossing controls.

18.5.2 Provision of the Particular Arrangement

This particular arrangement shall only be provided where a public pedestrian way intersects a single line public railway and there is no more than a moderate volume of pedestrian and rail traffic. Refer to figure 1.

18.5.3 Requirements

These shall be in accordance with the guidelines applicable to Pedestrian Level Crossings.

18.5.4 Local & Environmental Requirements

Local and environmental requirements shall determine the need to:

- provide additional warning lights.

18.5.5 Sequence of Operation

If no train is approaching the pedestrian level crossing then the warning lights shall be extinguished and the audible warning devices shall be silent.

If a train is approaching the pedestrian level crossing then the warning lights shall display and maintain steady red lights and the audible warning devices shall commence and continue to sound.

If the rear of the train passes clear of the pedestrian level crossing then the warning lights shall become extinguished and the audible warning devices shall be silenced.

18.5.6 Warning Time

The warning time interval between the red warning lights being displayed and a train travelling at the maximum permissible speed applicable to the pedestrian level crossing arriving at the level crossing shall be designed to provide a minimum of 19 seconds warning. Refer to figure 2.

18.5.7 Crossing Controls

The operation of the pedestrian level crossing shall be initiated and maintained automatically by the occupation of a controlling section of track on the approach side to the level crossing.

The length of the controlling section of track shall be determined to ensure that the prescribed warning time can be met. Refer to figure 3.

If bidirectional movements take place over the level crossing then a separate track circuit shall be provided.

The length of this section of track shall be kept short as practicable having regard to minimum permissible length to ensure the level crossing operation ceases promptly when the rear of a departing train has passed clear of the level crossing.

If bidirectional movements take place then controls shall also be provided to prevent the continued operation of the level crossing when a departing train occupies the section of track circuit controlling the operation of the level crossing for trains approaching in the normal direction.

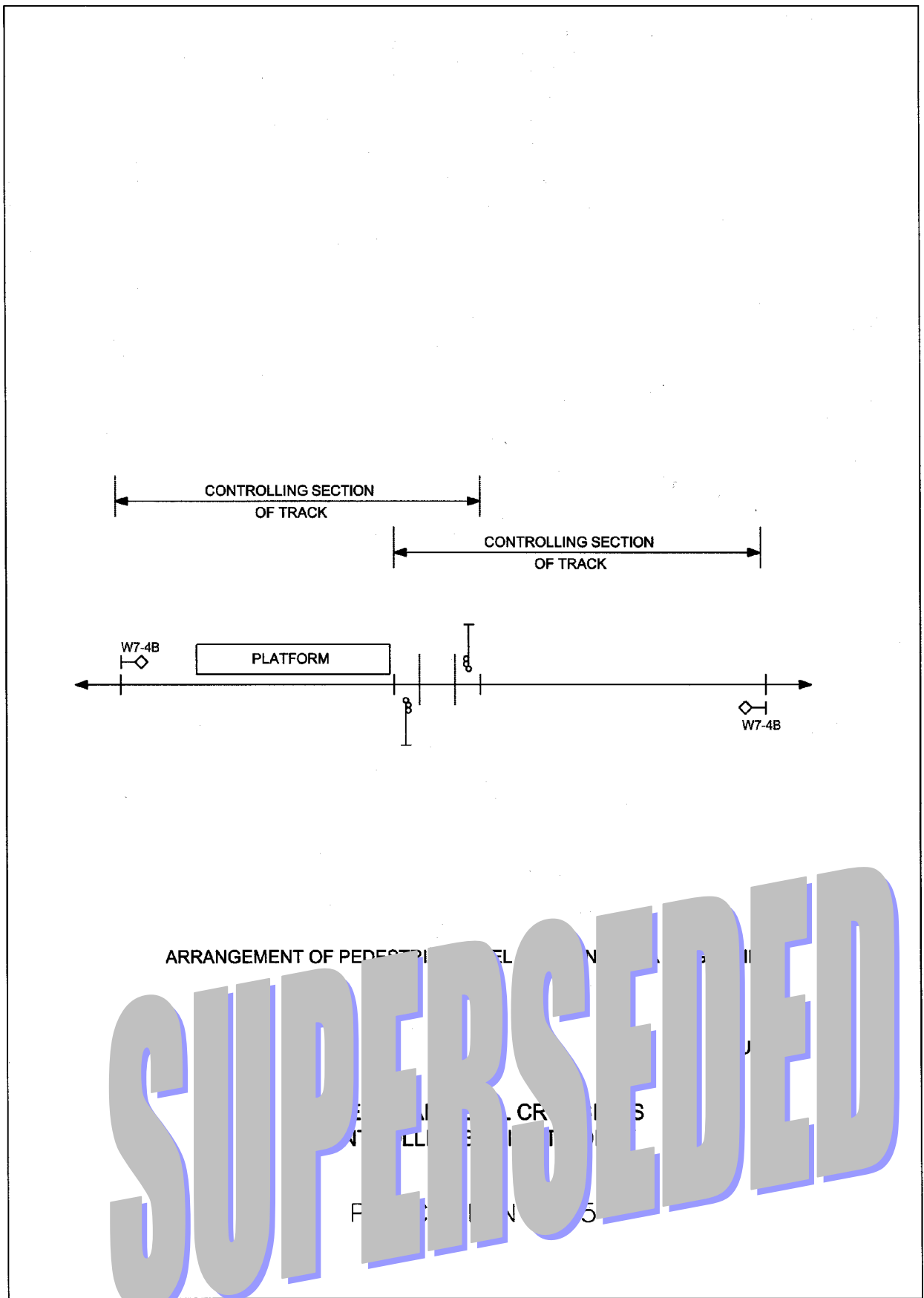
If the level crossing is situated on a single line than these controls shall be proved to have operated correctly in signal circuits, staff lines or by other approved techniques.

18.5.8 Power Supplies

The pedestrian level crossing shall be provided with standby power supply arrangements. Normally this is provided by batteries. If batteries are not used for standby power supply then a failure of the standby power supply shall also fail the signals over the crossing.

18.5.9 Approach Warning Signs (Rail)

W7-4B warning signs to AS 1742.7 and AS 1743 shall be erected immediately to the left of the running line and adjacent to the approach track circuit block joints advising drivers that they are approaching an actively protected level crossing and to avoid bringing their trains to a stand on level crossing approach track.



18.6 Principle No.18.6 - Pedestrian Level Crossing Controlled By Lights and Barriers or Swing Gates

18.6.1 Introduction

This Principle addresses the requirements for pedestrian level crossings controlled by red lights and barriers or swing gates and supplemented by controlled volume audible warning devices. It includes the mode of operation of the level crossing and the method of determination of appropriate crossing controls. Barriers should preferably be type approved swing gates.

18.6.2 Provision of the Particular Arrangement

This particular arrangement shall be provided where a pedestrian way intersects two or more lines of a public railway and there is a moderate volume of pedestrian and rail traffic, or where a pedestrian way intersects a single line public railway and there is a high volume of pedestrian and rail traffic. Refer to figure 1.

Note: A pedestrian crossing should only be used over more than two lines where rail traffic volumes and speeds are low.

18.6.3 Requirements

These shall be in accordance with the guidelines applicable to Pedestrian Level Crossings.

18.6.4 Local & Environmental Requirements

Local and environmental requirements shall determine the need to:

- provide additional warning lights.

18.6.5 Sequence of Operation

If no train is approaching the pedestrian level crossing then the warning lights shall be extinguished, the barriers shall be in the fully open position and the audible warning devices shall be silent.

If a train is approaching the pedestrian level crossing then the warning lights shall display and maintain steady red lights and the audible warning devices shall commence and continue to sound.

After a predetermined time interval the barriers or gates shall commence to close.

After a predetermined time interval the barriers or gates shall reach the fully closed position.

After a predetermined time interval the front of the approaching train shall reach the level crossing.

If the rear of the approaching train passes clear of the level crossing then both the barriers or gates shall commence to open and the audible warning devices shall be silenced.

After a predetermined time interval both barriers or gates shall reach the fully open position and the warning lights shall become extinguished.

18.6.6 Warning and Operating Times

The warning time interval between the warning lights commencing to display a steady red light and the front of a train travelling at the maximum permissible speed applicable to a particular pedestrian level crossing arriving at the pedestrian level crossing shall be designed to provide 25 seconds warning.

If the pedestrian level crossing spans a single track, as in an Island Platform arrangement, during the warning time interval the barrier equipment shall operate as follows.

- 5 to 7 seconds after the warning lights have been displayed the barriers or gates shall commence to close.
- Within 10 seconds after the barriers or gates have commenced to close they shall reach the fully closed position.

If the pedestrian level crossing spans two or more tracks then during the warning time interval the barrier equipment shall operate as follows.

- 10 to 12 seconds after the warning lights have been displayed the barriers or gates shall commence to close.
- Within 10 seconds after the barriers or gates have commenced to lower they shall reach the fully closed position.

18.6.7 Crossing Controls

The operation of the pedestrian level crossing shall be initiated and maintained automatically by the occupation of a controlling section of track on the approach to and immediately over the level crossing.

The length of this controlling section of track shall be determined to ensure that the prescribed warning time can be met.

If bi-directional movements take place over the level crossing then a separate track circuit shall be provided.

The length of this section of track shall be kept short as practicable having regard to minimum permissible length to ensure the level crossing operation ceases promptly when the rear of a departing train has passed clear of the level crossing.

If bi-directional movements take place then controls shall also be provided to prevent the continued operation of the level crossing when a departing train occupies the section of track circuit controlling the operation of the level crossing for trains approaching in the other direction.

These controls shall be proved to have operated correctly in signal circuits, staff lines or by other approved techniques.

18.6.8 Crossing Controls If the Pedestrian Level Crossing Is Located Adjacent To A Public Road Level Crossing

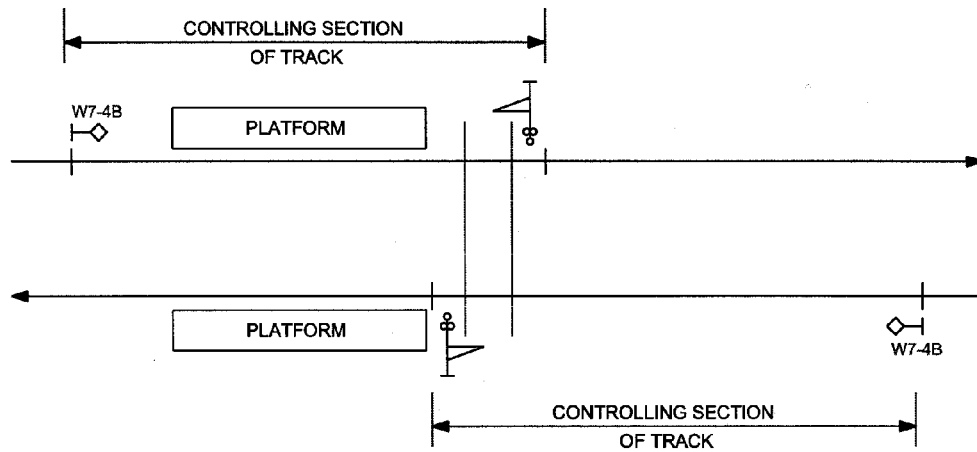
If the pedestrian level crossing is located adjacent to a public road level crossing controlled by flashing highway signals only, it shall have a common sequence of operations, warning times and controls as for the highway crossing. Where flashing highway signals and half boom barriers are installed, a separate pedestrian gate delay of 10-12 seconds is required if B doubles and road trains are not permitted to operate, and where B doubles and road trains are permitted to operate, a common sequence of operations, warning times and controls as for the highway crossing is required.

18.6.9 Power Supplies

If supplied from a secure signalling supply arrangement, the pedestrian level crossing with barriers which close on loss of supply need not be provided with battery backed power supply arrangements.

18.6.10 Approach Warning Signs (Rail)

W7-4B warning signs to AS 1742.7 and AS 1743 shall be erected immediately to the left of the running line and adjacent to the approach track circuit block joints advising drivers that they are approaching an actively protected level crossing and to avoid bringing their trains to a stand on level crossing approach track circuits.



ARRANGEMENT OF PEDESTRIAN LEVEL CROSSING ON A DOUBLE LINE

FIGURE 1

SUPERSEDED

18.7 Principle No.18.7 - Level Crossings Near Interlockings & Sidings

18.7.1 Introduction

At locations where protected level crossings exist at interlockings, arrangements need to be made to prevent unnecessary operation of the level crossing warning equipment while trains are shunting at the interlocking, or standing at platforms, or waiting (for some other reason) on the level crossing warning approach track circuiting.

Refer also to Principle 19.7

18.7.2 Requirement

Where trains regularly approach level crossings, but where the movement over the crossing is not made for some time, the level crossing warning should not operate until the train is ready to proceed.

If this is an infrequent occurrence, arrangements may be made to cancel the level crossing warning operation after the train has come to a stand.

However, where trains regularly approach the crossing but do not proceed over the crossing, the crossing warning should not operate on the train's initial approach.

18.7.3 Crossing Warning Cancelled after Train Comes to a Stand

In the situation where a siding exists within the approach track circuit of a level crossing, or where trains would come to a stand on the approach track for an extended period, and where this occurs less than 3 times per week, it is necessary to provide arrangements to permit the level crossing warning to be cancelled.

ETS/OTS Staff Token Sections (For Per Way and other little used sidings)

Arrangements would consist of a mechanical duplex lock whereby the top lock is unlocked by the key on staff or receptacle key for the section releasing a key from the bottom lock to operate the ground frame. Removal of the key from the bottom lock makes an electrical contact on the duplex lock to cancel the level crossing warning operation. After restoring the key from the bottom lock to the ground frame, the level crossing begins to operate with the train on the approach tracks and the staff or receptacle key can be removed from the top lock. Refer to figure 1.

Train Order Working Areas (For Per Way and other little used sidings)

Arrangements would consist of a mechanical duplex lock located on a Mechanical Point Indicator, whereby the top lock is unlocked by an operator's key releasing a key from the bottom lock to operate the ground frame. Removal of the key from the bottom lock puts the Mechanical Point Indicator to stop and makes an electrical contact on the duplex lock to cancel the level crossing warning operation. After restoring the key from the bottom lock to the ground frame, the Mechanical Point Indicator clears and the level crossing warning begins to operate with the train on the approach tracks and the operator's key can be removed from the top lock. Refer to Figure 2

General

If, after cancellation, shunting is to occur across the level crossing, then push buttons must be provided to initiate and cancel level crossing warning operation.

Where this operation is to be used, the level crossing shall be in close proximity to the duplex lock, so that the train crew are aware of their interaction with the level crossing, or if distant from the level crossing a sign should be installed. Refer to figure 2.

Special care needs to be taken with these arrangements to ensure reliable proving of direction stick functions, and to prevent the proving circuitry from timing out and unnecessarily operating the crossing during shunting. Additional track circuits may be required to initiate the proving system, and it should be established that these are not adversely affected by train length.

Where these arrangements are difficult to apply, a signal (or Main Line Indicator) should be installed as in 18.7.4.

18.7.4 Level Crossings Protected by Signals

Where trains regularly approach level crossings 3 or more times per week but the movement over the crossing is not proceeded with, then a signal (or a Main Line Indicator) should be provided to protect the level crossing. Refer to figure 3.

This signal or Main Line Indicator may be operated by one of the following methods:

- Operators Key and/or duplex lock
- Staff Contact box
- Staff Lock
- Driver's push buttons
- Remotely controlled via the level crossing monitor or other remote control system
- Whistle activation or other method suitable for the situation

Wherever arrangements exist for the signal or Main Line Indicator to be cleared without the train being present, then the track circuited approach must be arranged for the fastest non-stopping train, and time releasing of approach locking is to be provided. This must be particularly addressed when lines operated by token systems are converted to train order working.

18.7.5 Power Arrangements and Circuit Configuration

Where normal and back up A.C. power supplies are not available it will be permissible for the system to be configured such that a failure of the signal lights (or the Main Line Indicator lights) does not cause a failure of the level crossing, although the level crossing warning may consequently operate for longer periods or when the warning would normally not occur.

Signal or Main Line Indicator lighting is not normally supplied from the level crossing battery due to the necessity to ensure the battery is not exhausted prematurely, under A.C. power failures, by the lighting drain. Consequently the signal or Main Line Indicator may be supplied from a separate battery-backed supply. Where infrequent loss of the 120volt A.C. supply occurs and is within acceptable availability criteria, the signal or Main Line Indicator may be supplied at 120volt A.C., that is directly from the available supply; in this situation it is essential for all functions that would normally qualify level crossing controls to drop away during failure of the lighting supply.

Additionally, signal normal or approach locking times must prove the red light lit on the signal or Main Line Indicator. Basic level crossing functions are to be retained on the level crossing battery supply.

As a guide, the following circuit supply arrangements would be typical:-

Level Crossing Battery Supply:	XR, XPR, direction sticks, DSJR
Other Battery Supply:	Solar fed track circuits; store 70 fed track circuits
Non Backed Up Supply:	NJR, XNR, XRJR, push button relays, signal control relays, signal lights.

Level crossing monitors should be provided to give remote alarms of any power failure.

18.7.6 Special Arrangements

Where a level crossing is remote, and signals or main line indicators are provided to protect the crossing, a failure of an approach track circuit, may after the elapse of a suitable time period, replace the signal or main line indicator to stop. Following the release of any approach locking it is permissible to qualify the level crossing operation and thus prevent unnecessary level crossing operation. This will minimise unnecessary obstruction of the road traffic while waiting for maintenance staff to attend and repair the failed track circuit.

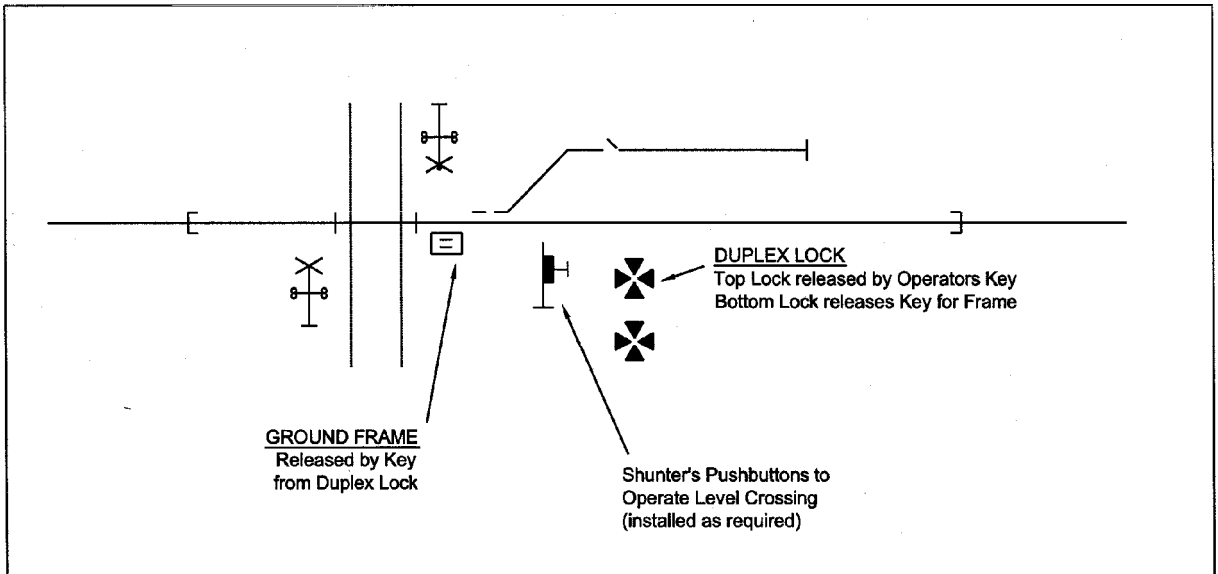
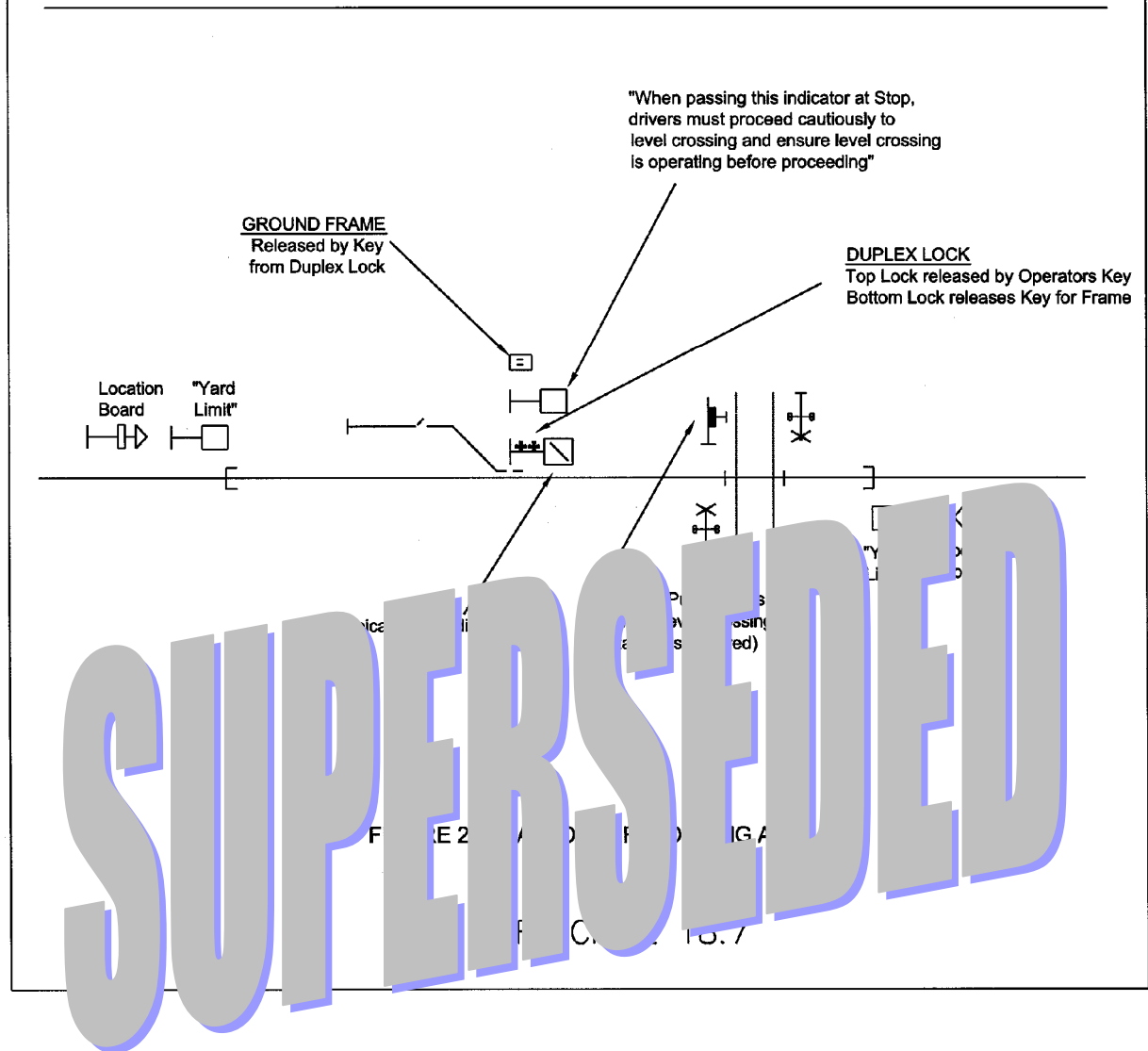


FIGURE 1. ETS/OTS SECTION



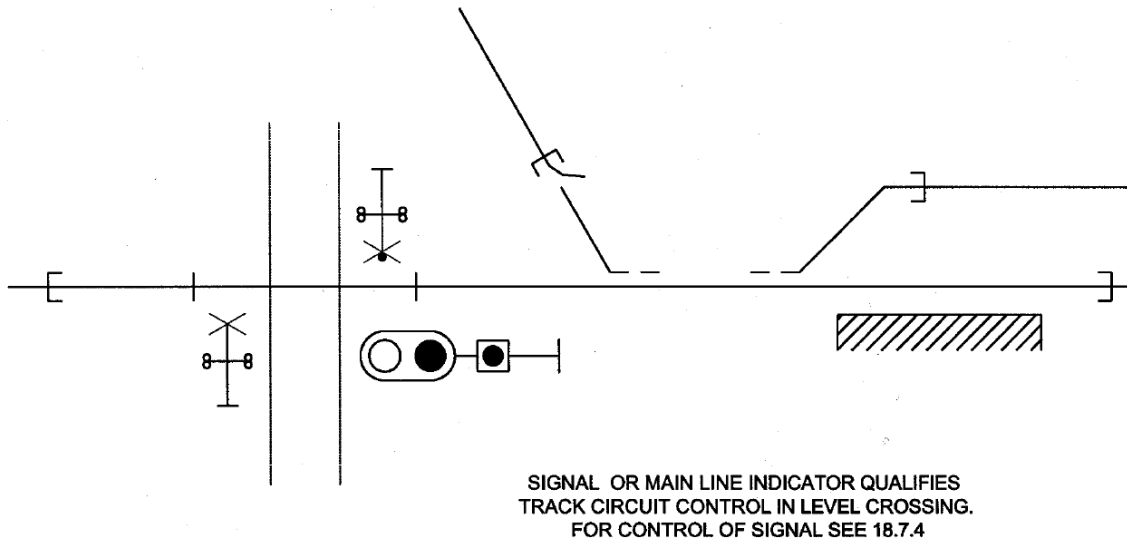


FIGURE 3

PRINCIPLE 18.7

18.8 Principle No.18.8 - Level Crossing Operations in Train Order and Token Areas

18.8.1 Functional Requirements

Where level crossings are located in Train Order or other locations, Main Line Indicators will be needed to protect the level crossing where shunting may take place on the approach track circuits.

The aim is to:

- Ensure the level crossing only operates when necessary on train approach.
- As far as possible, minimise level crossing operation during shunting.
- As far as possible maintain warning times so that neither inadequate nor excessive warning is given.
- This description focuses on the use of Main Line Indicators, however these concepts will also be generally applicable to signals.

18.8.2 Basic Scenario

The Main Line Indicators may be configured:

- Normally clear – the usual application where trains do not stop on the approach
- Normally at stop – used when most trains stop on the approach, to avoid excessive warning time.

18.8.3 Normally Clear Indicators

- As the travel time over the approach track circuits is likely to be less than the time required to brake from line speed, all MLIs shall have an NJR set to a minimum of 2 minutes, for qualification of approach track circuits.
- Each MLI protecting a level crossing requires a lever stick circuit.. This circuit also prevents the MLI reclearing for a train in the departing direction (i.e. away from the facing direction of the indicator).
- Each MLI will detect all points beyond the indicator (up to the next indicator in the case of a yellow and usually into the section for a pulsating white).
- Where points are located in advance of the MLI, a Duplex Lock will be provided (released by Operators Key and releases key for the frame). Operation of the Duplex Lock will place the MLI to stop by dropping out the lever stick. Reclearing of the MLI can then only occur under two conditions as follows:
 1. When the Duplex Locks are restored and the track circuits are clear, (i.e. the train has left or is wholly within the loop).
 2. When the Operators push button is pressed.

- Shunters push buttons are provided at the crossing for activation during shunting movements.
- When provided with shunters pushbuttons for operating and cancelling the crossing, crossing reverse timers (XRJR) should always be provided to prevent manipulation of the buttons causing the booms to change direction mid rise.
- Operators push buttons for clearing of the MLI (and cancelling) are located at the MLI. Additional push buttons may be located adjacent to points from which trains may depart if necessary. Operation of a push button may qualify a Duplex Lock being reverse, to facilitate departure from the loop past the MLI.
- Designers should consider that Duplex Locks may be operated irregularly (for example after a through train has passed a frame in anticipation of one leaving a loop). Consequently quick releasing of NJR should not be provided while ever a train is on the approach.
- Quick releasing of NJR's is required for trains travelling in the opposite direction to the MLI. This quick releasing path must be carefully designed to ensure a single point failure will not simultaneously return the MLI to stop and quick release the NJR.
- When MLI's at level crossings clear three processes are likely:
 1. The indicator will clear and the level crossing operate together. This will apply if the MLI is set back from the crossing, and the crossing would have operated for a sufficient time before the train reaches it.
 2. The crossing operates initially for either 10-15 seconds (or until the booms are lowered) before the MLI clears. This generally applies if the MLI is located at the crossing.
 3. The indicator will clear and the level crossing will then operate when the approach track is occupied by the train.
- Detection of the MLI red aspect lit is to be provided for the NJR to release.
- Wherever possible trains should not stand on level crossing approach operating tracks while Duplex Locks are used to cancel level crossing operation.

18.8.4 Normally at Stop Indicators

- These present less difficulty than normally clear indicators as there should be no scenario where they are placed to stop in advance of a train.
- Clearance of these MLI's is the same as for normally clear indicators.