AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Signalling) **Category: Standard**

Signals

SDS 01

Applicability

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1.2	14 Mar 05	Disclaimer	Minor editorial change Document reformatted
2.0	25 Aug 06	1.6.4	Tonnage Signals section added

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Contents

1 Signals

1.1 Principle No. 1.1 - Form of Signals

1.1.1 Introduction

This Principle addresses the form of signals referenced throughout these Principles and with regard to the descriptions and definitions currently accepted and in use.

1.1.2 Running Signals

If a signal controls the movement of trains in the normal direction of traffic over a section of line at their normal operating speeds (or where bi-directional running is applied, in either direction) then it shall take the form of a running signal and display full size single or double light colour light aspects to the driver of a train ensuring the best possible visibility.

Exceptionally, smaller size aspects may be used in special circumstances or in sections of underground railway.

Depending on the application a running signal may be controlled or automatic.

Depending on its specific purpose a controlled running signal may be further designated an Outer Home, Home, Starting or Accepting Signal.

Depending on its mode of operation a Distant Signal may be either a controlled or an automatic signal.

1.1.3 Subsidiary Signals

If a signal controls the movement of trains over a section of line at specifically restricted speeds and is mounted on the same post, or within the same cage, as a running signal then it shall take the form of a subsidiary signal beneath the running signal and display a single small size colour light aspect to the driver of a train in addition to the full size stop aspect.

Depending on its specific purpose a subsidiary signal may be further designated a Low Speed, Call On, Shunt or Shunt-Ahead. The Low Speed aspect is to be considered a running signal aspect although it may be time approach cleared and not part of the running aspect sequence. The subsidiary Call On signal is utilised for a call on movement on the same route as the running signal when it is necessary to pass the running signal at stop, eg. when the running signal has failed.

The term ‘Call On’ is no longer preferred and ‘shunt’ shall be used in new work.

1.1.4 Shunting Signal

If a signal controls the movement of trains in the normal or opposite direction of traffic over a section of line at restricted speed for shunting or non-running movements only then it shall take the form of a shunting signal and display small size colour light aspects in either horizontal or vertical form to the driver of a train.

The preferred form shall be the horizontal form.

Exceptionally, the vertical form shall be used where clearance prevents the installation of horizontal form.

1.1.5 Co-acting Signal

A signal provided to co-act with and repeat the indications of an adjacent signal for sighting purposes.

1.1.6 Repeater Signal

A signal provided to indicate the condition of a running signal in advance with restricted sighting.

1.1.7 Shunt Repeater

A subsidiary signal provided to indicate the proceed indication of the subsidiary shunting signal next in advance.

1.1.8 Low Speed Repeater

A subsidiary signal provided to indicate the proceed indication of a low speed subsidiary signal next in advance.

1.1.9 Other Signals

If a signal is used for purposes not described under one of the above forms of signal then it shall constitute another form of signal.

1.2 Principle No. 1.2 - Numbering of Signals and Points and Provision of Identification Plates

1.2.1 Introduction

This Principle addresses the requirements for systematically numbering signals on track plans, control tables and related documents and drawings, the need to provide prefixes and/or suffixes to these numbers and the characters to be shown on signal identification plates for the various forms of signals in colour light territory.

1.2.2 General Method of Numbering

Generally odd and even numbers shall be used for the down and up directions respectively with low numbers always commencing at the Sydney end and ascending towards the Country end.

Wherever possible the numbering of the signals on each track whether even or odd should be correlated to ensure that the numbers are systematically sequenced across any adjacent track and along the track in ascending number order from top to bottom and left to right respectively when Sydney is to the left of the track plan. Refer to figure 1.

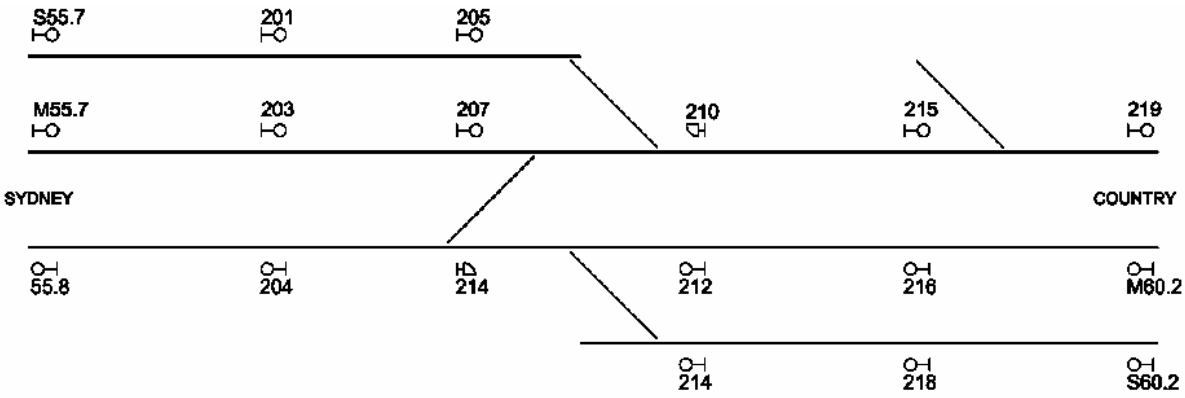


FIGURE 1

It is expected that some spare numbers will arise from this approach which will be available for any future needs, particularly at the low and high ends of the numbering sequence.

1.2.3 Points

All points are to have a distinctive number not exceeding four digits. For power operated points the number is to be followed by an 'A', 'B' or 'C' either as per the track plan to indicate the end or as follows:

A End nearest to Sydney

B End furthest from Sydney (country end)

C Catchpoint (only used for triple ended set)

e.g. 530A for the A end of 530 points. 17 for either single ended power or mechanically operated 17 points.

Also identify which way the points failed to go in characters 9 and 10. e.g. 530A NR 530A points failed to go from normal to reverse.

1.2.4 Track Circuits

All track circuits are to have a distinctive number not exceeding four digits plus letters and a decimal point as required, or a name consisting purely of letters, as indicated on the track plan.

Every track circuit name is to end with a 'T'.

Location id letters are not to precede the identification number as is standard in new route setting installations, but where they indicate the line and are an essential part of the identification, they are to be included. e.g. 376AT, M13.4BT, MUCT.

The kilometerage of a track circuit is to be taken from the relay end blockjoint.

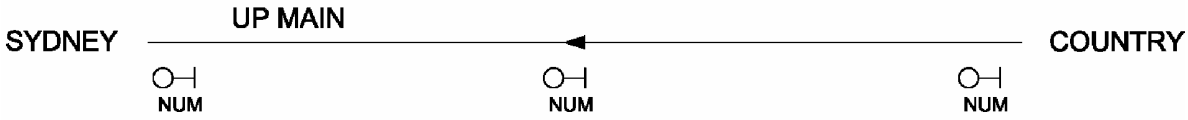
1.2.5 Train Stops

Naming of train stops will be identical to its signal. Train stops without signals (intermediate trains stops etc) are to be named and shown on the circuit book or track plan.

1.2.6 Signals

1.2.6.1 Automatic Running Signals

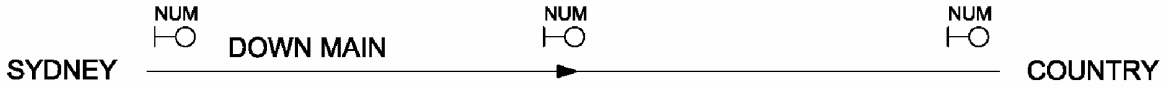
If an automatic signal controls up direction movements towards Sydney then it shall be given an even identification number related to its distance from Sydney. Refer to figure 2.



DISTANCE BASED NUMBERING
FOR AUTOMATIC SIGNALS
UP DIRECTION

FIGURE 2

If an automatic signal controls down direction movements away from Sydney then it shall be given an odd identification number related to the distance from Sydney. Refer to figure 3.



DISTANCE BASED NUMBERING
FOR AUTOMATIC SIGNALS
DOWN DIRECTION

FIGURE 3

Either mileage or kilometerage based distances shall be used to determine the identification number which shall be expressed in miles or kilometres to the nearest one tenth of a mile or kilometre.

Consideration shall be given to the basis for determining a new numbering sequence where conflict with an existing numbering sequence could arise.

If there is more than one running line in the same direction then an alphabetic prefix not exceeding two characters shall be appended to the number to identify the particular line to which the automatic signal applies. Refer to figure 4.

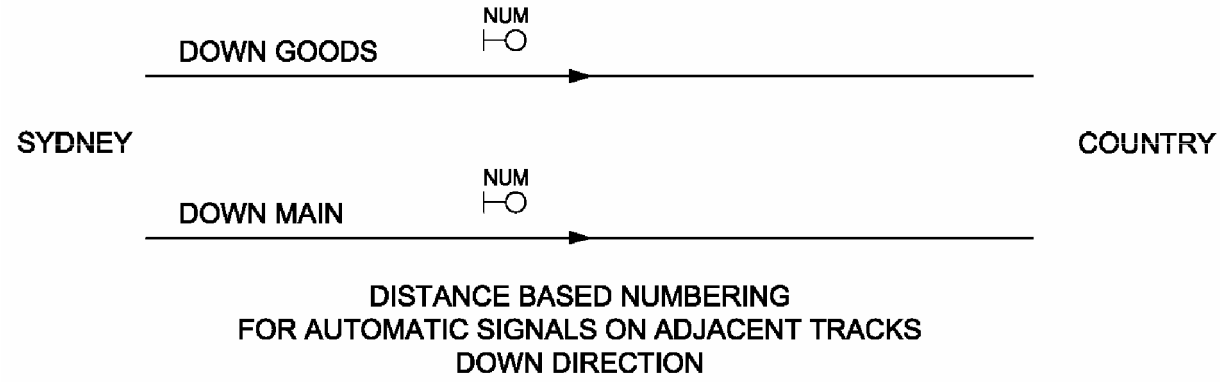


FIGURE 4

1.2.6.2 Controlled Running Signals

If a controlled signal controls up direction movements towards Sydney then it shall be given an even identification number unique to the interlocking area in which it is located. Refer to figure 5.

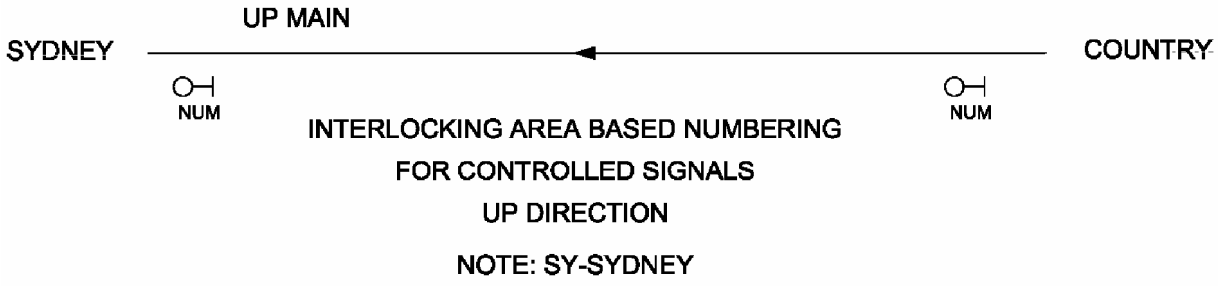


FIGURE 5

If a controlled signal controls down direction movements away from Sydney then it shall be given an odd identification number unique to the interlocking area in which it is located. Refer to figure 6.

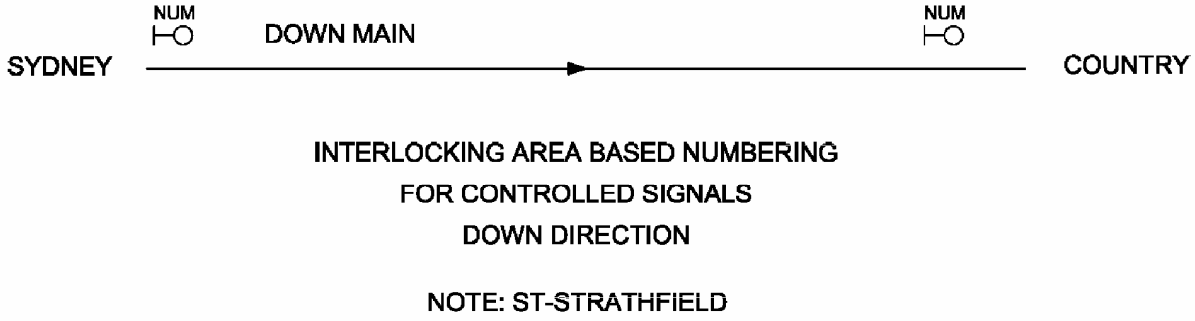


FIGURE 6

In addition an alphabetic prefix not exceeding two characters shall be appended to the number to identify the supervising control centre, signal box or interlocking. Refer to figures 5 & 6.

If necessary an alphabetic suffix not exceeding two characters shall be appended to the number to identify the particular line to which the controlled signal applies. Refer to figure 7.

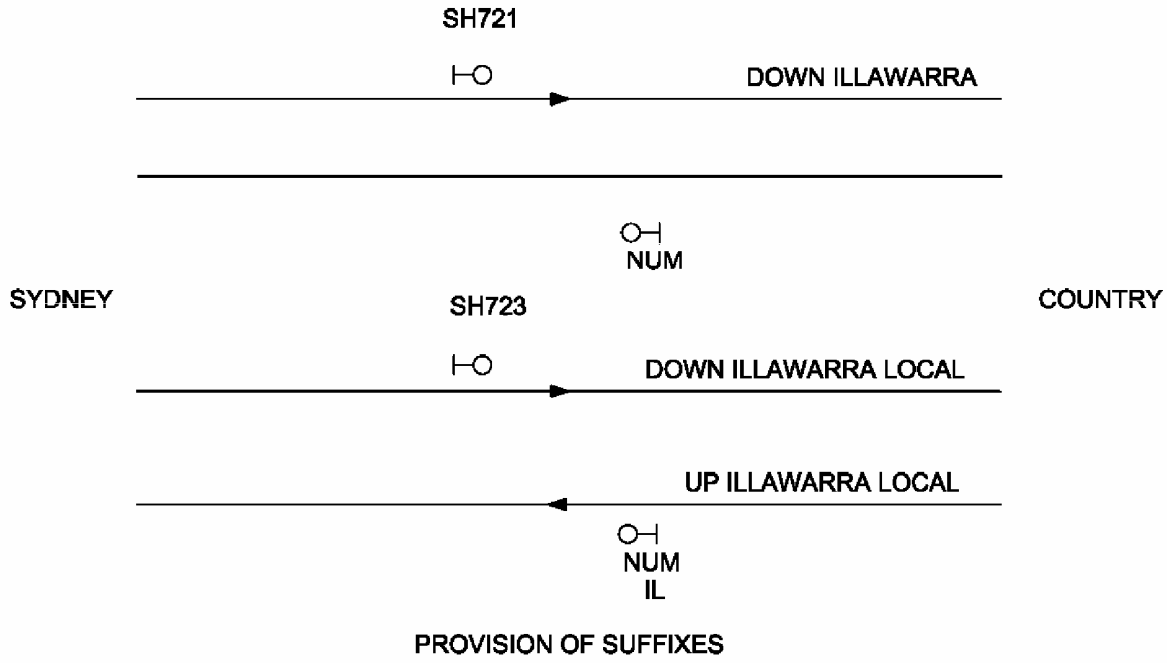


FIGURE 7

Note: The prefix or suffix shall not generally be used on control tables or in circuit books unless describing a running signal in an adjacent interlocking area.

1.2.6.3 Co-acting Signals

If a situation arises which requires the provision of a co-acting signal then it shall take the number of the signal to which it applies but in addition the number shall be prefixed CO-ACTING.

Note: On Drivers Diagrams the co-acting signal reference shall be "Co-acting for" followed by the signal number to which it applies.

1.2.6.4 Repeating Signals

If a situation arises which requires the provision of a repeating signal then it shall take the number of the signal to which it applies but in addition the number shall be prefixed REP.

Note: On Drivers Diagrams the Repeating Signal reference shall be "Repeater for" followed by the signal number to which it applies.

1.2.6.5 Isolated Distant Signals

If a situation arises which requires the provision of an isolated distant signal then it shall be numbered with the same number as the stop signal to which it applies but in addition the number shall be prefixed DIS.

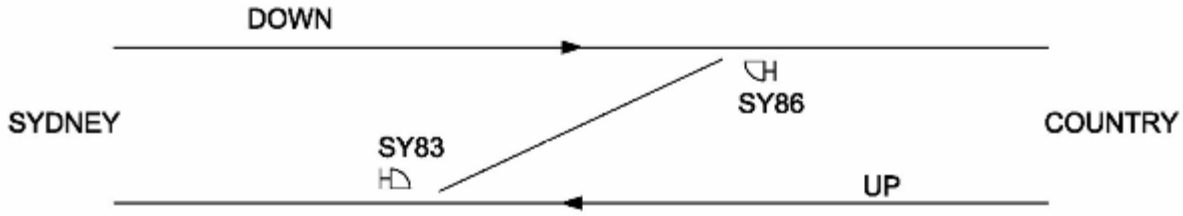
Note: On Drivers Diagrams the Distant Signal reference shall be "Distant for" followed by the number of the signal to which it applies.

1.2.6.6 Shunt Signals

If a shunt signal controls up direction movements towards Sydney it shall be given an even identification number unique to the interlocking area in which it is located.

If a shunt signal controls down direction movements away from Sydney it shall be given an odd identification number unique to the interlocking area in which it is located.

In addition to the identification number an alphabetic prefix of not more than two characters shall be given to identify the supervising control centre, signal box or interlocking. Refer to figure 8.



INTERLOCKING AREA NUMBERING FOR SHUNTING SIGNALS

FIGURE 8

1.2.7 Identification Plates

Generally if a signal is capable of displaying a stop aspect then it shall be provided with an identification plate.

The alphanumeric characters to be displayed on an identification plate shall be retroreflective white (silver) on a black background.

1.2.7.1 Identification Plates For Automatic and Controlled Running Signals

Identification plates displaying alphanumeric characters as described in Principle No. 1.2.1 and 1.2.2 and reading from left to right or top to bottom on horizontal and vertical plates respectively shall be provided on running signals.

Refer to figures 9 and 10.

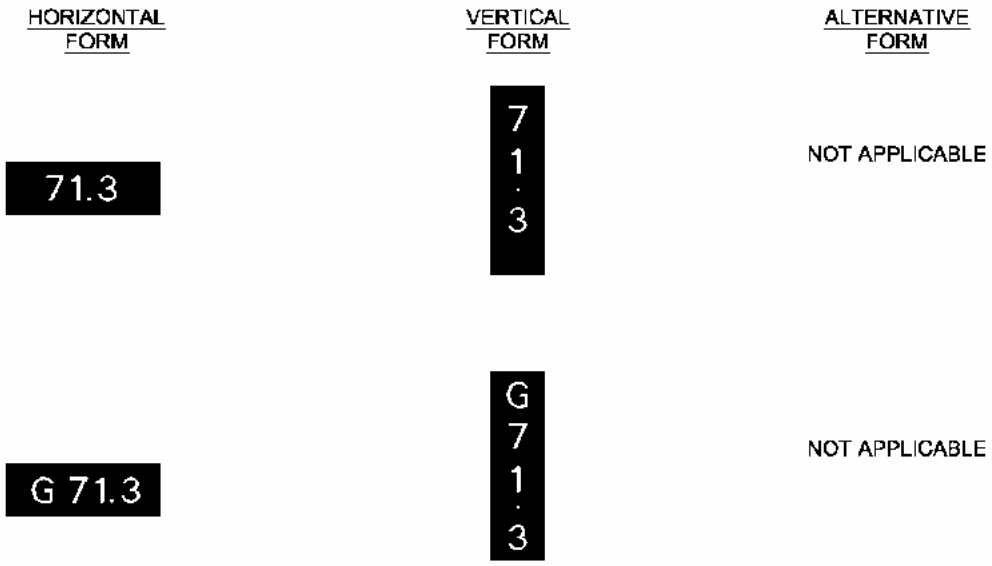


FIGURE 9

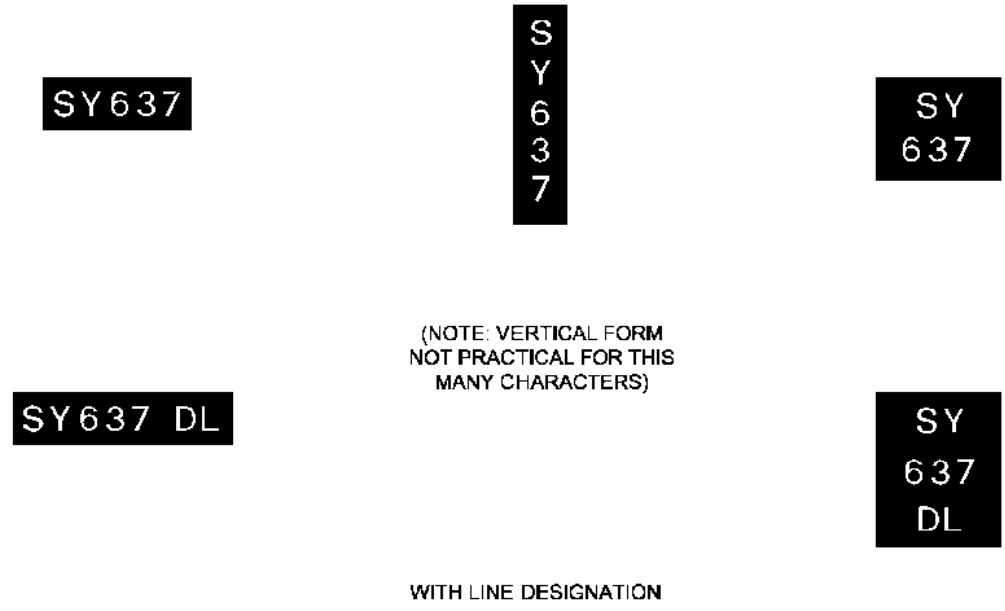


FIGURE 10

In either case, if a suffix is required, a space equivalent to one character shall be inserted between the number and the suffix. Refer to figure 10.

The vertical form of identification plate shall only be used where tight clearance occurs and the horizontal form would infringe the clearance requirements.

If necessary the prefix may be displayed above the number and the suffix below the number. Refer to figure 10.

1.2.7.2 Fixed Reds Aspects

No form of identification plate shall be provided.

1.2.7.3 Identification Plates for Co-acting Signals

Small size identification plates displaying the word CO-ACTING below the number of the running signal to which it applies shall be provided on indicator signals. Refer to figure 11.

Figure 11

1.2.7.4 Identification Plates for Repeating Signals

Identification plates displaying 'REPTR' below the number of the running signal to which it applies shall be provided on repeating signals. Refer to figure 12.

Figure 12

1.2.7.5 Identification Plates for Isolated Distant Signals

If an isolated Distant Signal shows a stop aspect then an identification plate displaying the word DISTANT below the number of the running signal to which it applies shall be provided on the Distant Signal. Refer to figure 13.

Figure 13

1.2.7.6 Identification Plates for Shunt Signals

Small size identification plates displaying a series of alphanumeric characters as described in Principle No. 1.2.6 and reading from left to right shall be provided on shunt signals. Refer to figure 14.

Figure 14

In addition, if a shunt signal is located on the wrong side of the track then in addition an arrow plate pointing to the track to which the signal applies shall be fitted. Refer to figure 15.

Figure 15

1.2.7.7 Identification Plates for Shunt Repeaters

Small size identification plates displaying the words SHUNT REPEATER shall be provided above the shunt repeater signal. Refer to figure 17.

Figure 17

1.2.8 Fitting Identification Plates to Signals

It is important that identification plates are fitted in a consistent manner to enable drivers to easily identify the type and location of any signal at which they are stopped.

1.2.8.1 Fitting Identification Plates to Running Signals

If the horizontal form of identification plate is fitted to a single light colour light signal then it shall be positioned immediately below the running aspects but above any subsidiary signal or associated equipment if fitted to the signal. Refer to figure 18.

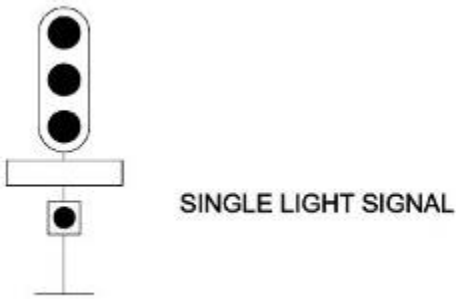


FIGURE 18

If the horizontal form of identification plate is fitted to a double light colour light signal then it shall be positioned between the two running aspects. Refer to figure 19.

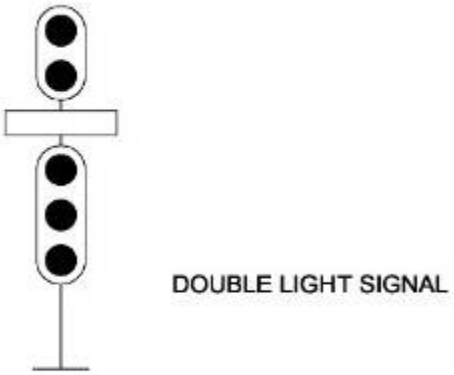


FIGURE 19

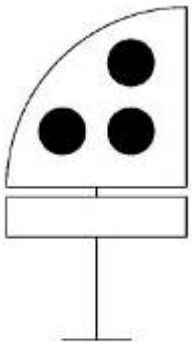
If there is insufficient space or the form of the signal does not allow then it shall be fitted to an adjacent structure, typically a tunnel wall, such that it is readily visible to a driver.

This may require the identification plate to be mounted at a suitable angle.

1.2.8.2 Fitting Identification Plates to Shunt Signals

Generally identification plates shall be fitted beneath shunt signal aspects.

Refer to figure 20.



SHUNT SIGNAL

FIGURE 20

1.2.9 Deleted

1.2.10 Signals Located on the Wrong Side of the Track

Where necessary, an arrow plate pointing to the track the signal applies to may be fitted if the signal is positioned on the wrong side of the track. Refer to Figure 15.

1.3 Principle No 1.3 – Designation of Class and Direction of Routes

1.3.1 Introduction

This Principle addresses the requirements for designating the class and/or direction of routes as applicable to running signals, running signals fitted with subsidiary and shunting signals in colour light territory.

1.3.2 Class of Route

Main Routes

If a route is associated with a controlled running signal then it shall be classified as a main route and designated (M).

To identify a particular main route the class designation shall appear as a first suffix to the running signal number. Refer to figure 1.

Subsidiary Routes

If a route is associated with a subsidiary signal then it shall be classified as a subsidiary route and designated (S).

To identify a particular subsidiary route the class designation shall appear as a first suffix to the running signal number. Refer to figure 2.

Shunt Routes

If a route is associated with a shunting signal then it shall be classified as a shunt route and designated (S).

To identify a particular shunting route the class designation shall appear as a first suffix to the shunting signal number. Refer to figure 3.

1.3.3 Direction of Route

If a route is associated with a signal which controls diverging movements then the route applicable to each possible divergence shall be allocated a route direction designation in addition to the class designation.

The route direction designation shall be a unique alphabetic character.

The alphabetic characters shall be allocated such that the most left-hand diverging route is designated A. Refer to figure 4.

If there is a divergence ahead of a signal to which no signalled move exists then a reserved route direction shall be allocated for future use. Refer to figure 4.

If the direction of a main and subsidiary class of route is coincidental they shall be allocated the same route designation character. Refer to figure 4.

To identify a particular diverging route the route designation character shall appear as second suffix to the signal number and class of route. Refer to figure 4.

FIGURE 1

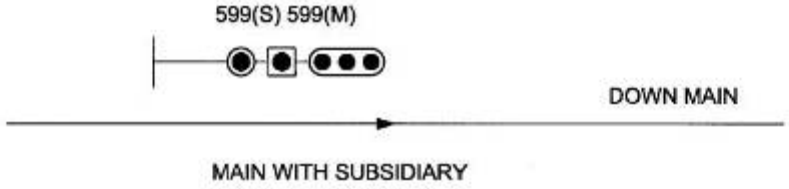


FIGURE 2

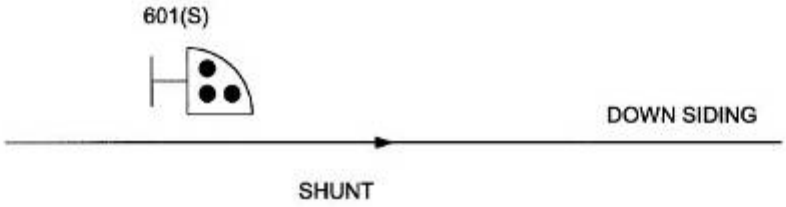


FIGURE 3

ROUTE CLASSIFICATION

PRINCIPLE N° 1.3

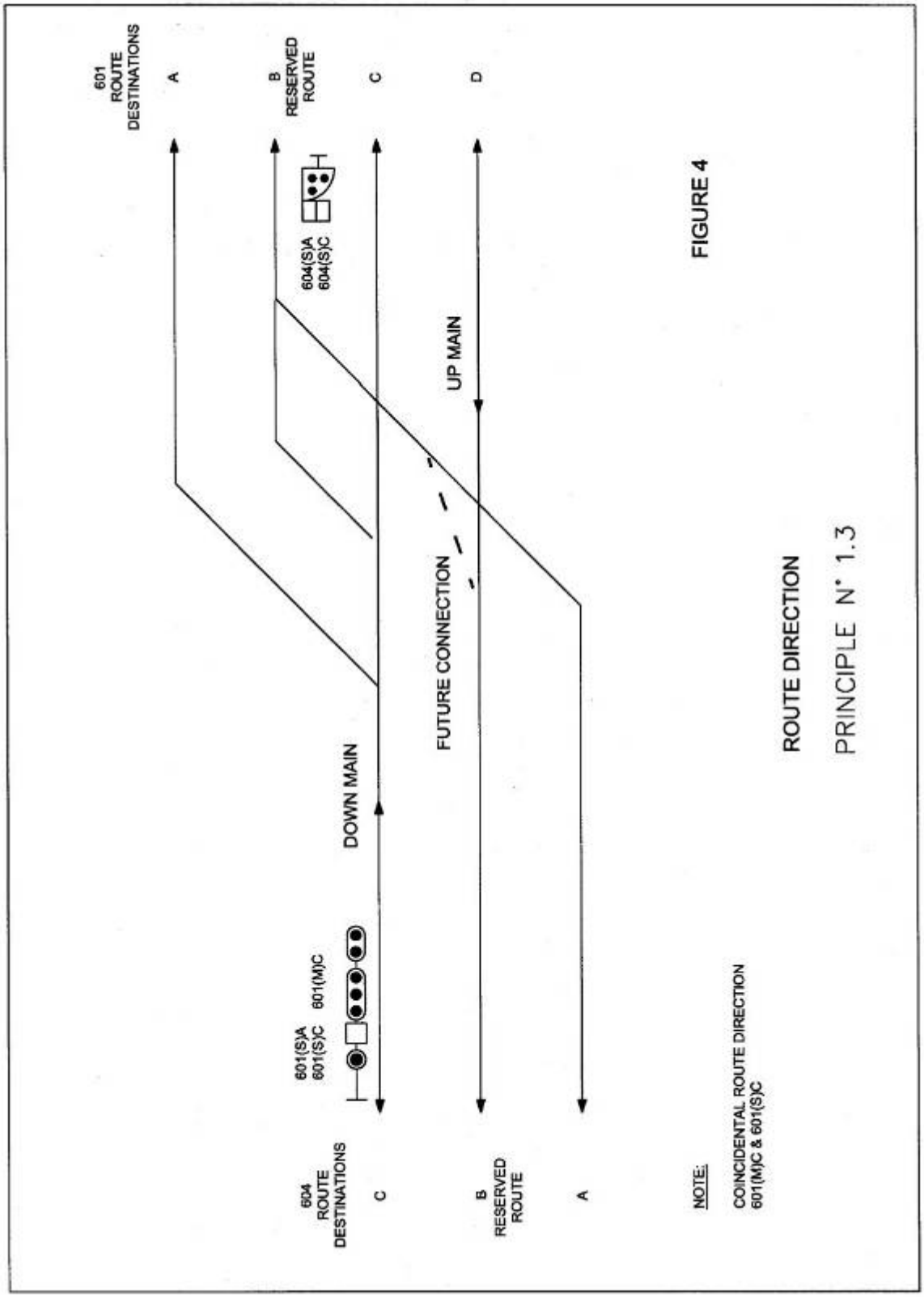

601 ROUTE DESTINATIONS
A
B RESERVED ROUTE
C
D
604(S)A 604(S)C
UP MAIN
FUTURE CONNECTION
DOWN MAIN
601(S)A 601(S)C 601(M)C
604 ROUTE DESTINATIONS
C
B RESERVED ROUTE
A
ROUTE DIRECTION
PRINCIPLE N° 1.3
NOTE:
COINCIDENTAL ROUTE DIRECTION 601(M)C & 601(S)C

FIGURE 4

1.4 Principle No. 1.4 - Route Indicators and Turnout Repeaters

1.4.1 Introduction

This Principle addresses the requirements for providing route indicators and turnout repeaters on running signals and route indicators on subsidiary signals and shunting signals in colour light territory to supplement the proceed aspect by displaying an indication of the route destination.

1.4.2 Route Indicators Fitted To Running Signals

Double Light Colour Light Signals

If a double light colour light signal applies to more than one diverging route then it shall be fitted with a main line route indicator to supplement the turnout indication. Refer to figures 1 and 2.

Single Light Colour Light Signals

If a single light colour light applies to more than one diverging route to the left or the right then it shall be fitted with a main line route indicator to supplement the turnout indication. Refer to figures 3 and 4.

Colour Light Signals Reading to Several Terminal Roads

If a colour light signal is the last signal which applies to several terminal roads then it is permissible to provide a main line route indicator to supplement the caution indication.

Position of Main Line Route Indicators

Generally the main line route indicator shall be mounted immediately above the top most running aspect unless:

- Sighting would be impaired typically for example in the vicinity of station structures.
- Space is restricted typically for example in a gantry cage or beneath an overhead bridge.
- Refer to figure 5.

1.4.3 Route Indicators Fitted To Subsidiary Signals Subsidiary Signals

If a subsidiary signal applies to more than one route or the route leads to a "wrong road" situation then it shall be located directly beneath the main aspect and be fitted with a route indicator to supplement the proceed indication. Where the subsidiary shunt signal applies only to a turnout route then the signal may be bracketed to the side of the post in the direction of the turnout and no route indicator is required. Refer to figures 6 & 7.

Position of Stencil Route Indicator

Generally the route indicator shall be mounted immediately above the subsidiary aspect to which it applies unless space is restricted typically in a gantry cage. Refer to figure 8.

1.4.4 Route Indicators Fitted To Shunting Signals Shunt Signals

If a shunting signal applies to more than one route or the route leads to a "wrong road" situation then it shall be fitted with a route indicator to supplement the proceed indication. Refer to figures 9 & 10.

Position of Stencil Route Indicators

The route indicator shall be mounted immediately above the shunt signal to which it applies. Refer to figures 9 & 10.

Restricted Clearance

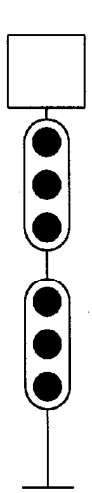
If a shunting signal is located such that there is insufficient clearance to fit for example, a stencil type route indicator then a miniature multilamp type route indicator shall be fitted. Refer to figure 11.

1.4.5 Characters To Be Displayed In Route Indicators

These shall be alphanumeric and preferably limited to a single alphanumeric character.

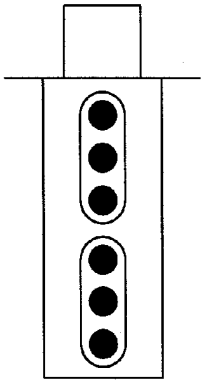
1.4.6 Turnout Repeaters Fitted to Running Signals

Where it is required to provide advance warning that the turnout route is set at a junction, a turnout repeater shall be fitted on the first warning signal in the rear of the turnout signal. Refer to figure 12 and Principle 1.6. Turnout repeaters provide drivers of trains an early warning that a turnout route through the junction is set for the train and enables train speed to be more readily controlled to the turnout speed.



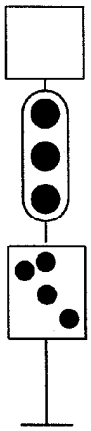
MAIN LINE R.INDR ABOVE
POST MOUNTED
DOUBLE LIGHT

FIGURE 1



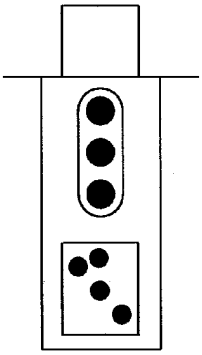
MAIN LINE R.INDR ABOVE
GANTRY MOUNTED
DOUBLE LIGHT

FIGURE 2



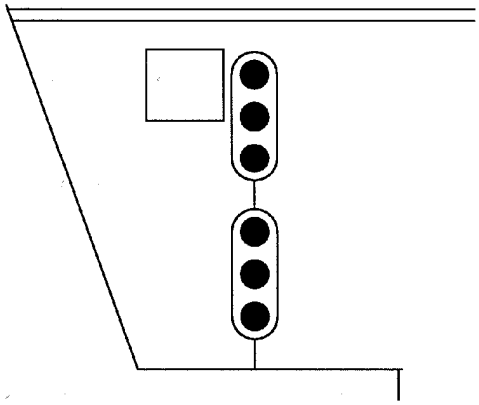
MAIN LINE R.INDR ABOVE
POST MOUNTED
SINGLE LIGHT

FIGURE 3



MAIN LINE R.INDR ABOVE
GANTRY MOUNTED
SINGLE LIGHT

FIGURE 4

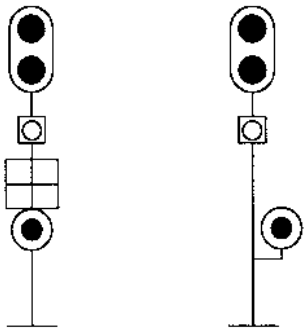


MAIN LINE R.INDR ADJACENT
TO TOP HEAD DUE TO
RESTRICTED CLEARANCE

FIGURE 5

ROUTE INDICATORS

PRINCIPLE N° 1.4

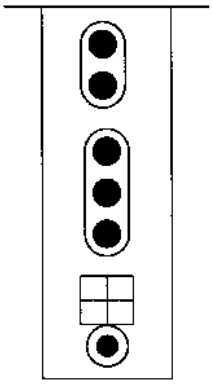


POST MOUNTED SUBSIDIARY

FIGURE 6A

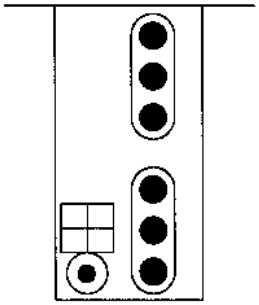
POST MOUNTED SUBSIDIARY

FIGURE 6B



GANTRY MOUNTED SUBSIDIARY

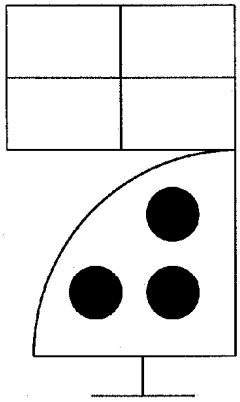
FIGURE 7



STENCIL MOUNTED ABOVE SUBSIDIARY SIGNAL, ADJACENT TO LOWER HEAD, DUE TO RESTRICTED CLEARANCE

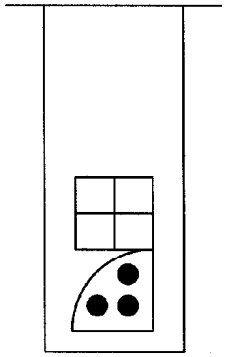
FIGURE 8
ROUTE INDICATORS

PRINCIPLE N° 1.4



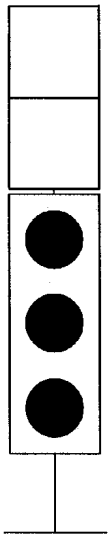
HORIZONTAL FORM OF
SHUNT SIGNAL

FIGURE 9



GANTRY MOUNTED
SHUNT

FIGURE 10

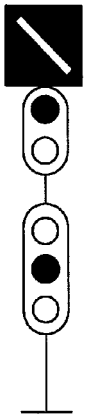


VERTICAL FORM OF SHUNT SIGNAL FOR RESTRICTED CLEARANCE SHOWN FITTED WITH A SINGLE MINIATURE MULTILAMP UNIT

FIGURE 11

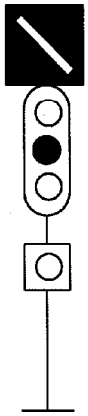
ROUTE INDICATORS

PRINCIPLE N° 1.4



TURNOUT REPEATER
ABOVE POST MOUNTED

DOUBLE LIGHT



TURNOUT REPEATER
ABOVE POST MOUNTED

SINGLE LIGHT

FIGURE 12

TURNOUT REPEATERS

PRINCIPLE N° 1.4

1.5 Principle No. 1.5 - Form of Aspects

1.5.1 Introduction

This Principle addresses the form of colour light signal aspects displayed to drivers as referred throughout these principles.

1.5.2 Running Signal Aspects

These forms of aspects for running signals other than the stop aspect shall authorise running movements at the appropriate operating speed.

1.5.2.1 Double Light Colour Lights

i. The form of the Stop aspect shall be Red over Red.

ii. The form of the Caution aspect shall be Green over Red.

iii. The form of the Medium aspect shall be Green over Yellow.

iv. The form of the Preliminary Medium aspect shall be Green over Pulsating Yellow.

v. The form of the Clear aspect shall be Green over Green.

vi. The form of the Caution Turnout shall be Yellow over Red.

vii. The form of the Medium Turnout shall be Yellow over Yellow.

viii. The two running signal aspects on controlled double light colour light signals shall be vertically aligned on the centre line of the signal. Refer to Principle No. 1.11.

ix. The two running signal aspects on automatic double light colour light signals shall be vertically staggered with the lower aspect to the right of the top aspect. Refer to Principle No. 1.11.

1.5.2.2 Single Light Colour Light Signals

i. The form of the Stop aspect shall be Red. (A red marker light shall also be shown.)

ii. The form of the Caution aspect shall be Yellow.

iii. The form of the Medium aspect shall be pulsating Yellow. Refer to Principle No. 1.5.8

iv. The form of the Clear aspect shall be Green.

v. The form of the Caution Turnout shall be a band of three yellow lights appropriately inclined at 45o to indicate if turning out to the left or the right of the straight line. This shall be displayed in addition to the Stop aspect but without the marker light. Refer to Principle No. 1.11.

vi. The form of the Medium Turnout shall be a band of three pulsating yellow lights as described in (v) above. This shall be displayed in addition to the Stop aspect but without the marker light. Refer to Principle No. 1.5.8

vii. The form of the Normal Authority aspect shall be a pulsating white.

1.5.3 Subsidiary Signal Aspects

These forms of aspects for subsidiary signals shall authorise movements at the appropriate restricted operating speed past the running signal to which they are fitted and only if the running signal is displaying a Stop aspect.

1.5.3.1 Low Speed Signal

The form of the proceed aspect shall be green.

1.5.3.2 Shunt Signal

The form of the proceed aspect shall be yellow.

1.5.3.3 Shunt-Ahead Signal

The form of the proceed aspect shall be flashing yellow and this shall only apply on single lines and on bi-directional lines. Refer to Principle 1.5.6.

1.5.4 Shunt Signal Aspects

These forms of aspects for shunt signals other than the Stop aspect shall authorise movements at the appropriate restricted speed for shunting or other non-running move purposes.

1.5.4.1 Horizontal Form

i. The form of the Stop aspect shall be two Reds.

ii. The form of the Proceed aspect shall be a Yellow.

iii. The Proceed aspect shall be located immediately above the Stop aspect in the horizontal form of shunt signal.

1.5.4.2 Vertical Form

i. The form of the Stop aspect shall be two Reds.

ii. The form of the Proceed aspect shall be a Yellow.

iii. The Proceed aspect shall be located between the two red aspects in the vertical form of Shunt signal.

1.5.5 Shunt Repeater Signal Aspect

The subsidiary aspect for indicating that the next subsidiary shunting signal is displaying a proceed indication is two white diagonal lights. A notice board "Shunt Repeater" is displayed above the subsidiary signal.

1.5.6 Speed Repeater Signal Aspect

The subsidiary aspect for indicating that the next subsidiary low speed signal displaying a proceed indication is two diagonal white lights.

1.5.7 Co-Acting Signal Aspects

These forms of aspects shall be as far as possible the same as the main signal, although using smaller lampcases.

Where a double light co-acting signal cannot be installed due to space limitations, then it will be permissible to use a single light type co-acting signal. When necessary, caution, medium, caution turnout and medium turnout can be displayed via a single yellow in the co-acting signal together with a route indicator.

Shunt aspects on co-acting signals shall be visibly separate from main aspects.

1.5.8 Repeater Signal Aspects

These forms of aspects shall be a horizontal band of white light when the next signal is at stop, or displaying any subsidiary aspect, and a vertical band of white light, when the next signal is cleared to any running aspect.

1.5.9 Pulsating Aspects

If the form of aspect required is to be pulsating then it alternately switches the lamp for periods of 640 (on) and 200 milliseconds (off) respectively. This produces a pulse rate of approximately 70 per minute.

1.5.10 Flashing Aspects

If the form of aspect required is to be flashing then it shall vary between full intensity and out by alternately switching the signal lamp on and off for a period of 500ms.

This produces a flash rate of approximately 60 per minute.

1.5.11 Turnout Repeater Aspect

The form of the turnout repeater is a band of white inclined at 45° in the direction of the turnout. Refer to Principle 1.11

1.5.12 Main Line Indicator Aspects

Main Line Indicators (MLIs) may be used in Train Order, Electric or Ordinary Train Staff and other systems where approved.

Main Line Indicators can display the following aspects:

Aspect	Indication	Meaning
RED	STOP	Stop-points are unlocked or out of position and/or level crossing protection is qualified.
YELLOW	CAUTION	Drivers may proceed in accordance with their authority, prepared to stop at the indicator ahead.
PULSATING LUNAR WHITE	NORMAL AUTHORITY	Drivers may proceed in accordance with their authority.
RED OVER INCLINED LUNAR WHITE BAND OF LIGHTS	TURNOUT AUTHORITY	Points set for turnout. Drivers may proceed in accordance with their authority.

A white retro-reflective diamond is provided on the post as a marker in the event of the indicator lights failing, to identify the structure as a Main Line Indicator.

The indicator name is displayed in black letters on the white retro-reflective diamond.

Main Line Indicators are used for their longer sighting distance where it is desirable to maintain higher train speeds than would be possible due to the restricted sighting of mechanical point indicators, and where electrical protection is necessary in conjunction with motor worked points or level crossings.

Main Line Indicators are normally lit but can be approach lit or time cleared if required.

A landmark, location board or repeater must be provided prior to a Main Line Indicator.

A Main Line Repeater conveys to the driver the indication displayed by the indicator ahead. The train movement itself is made on the authority of the train order.

Main Line Repeaters can display the following aspects:

Aspect	Indication	Meaning
PULSATING LUNAR WHITE	NORMAL AUTHORITY	Drivers may proceed in accordance with their authority.
YELLOW	CAUTION	Drivers may proceed in accordance with their authority, prepared to stop at the indicator ahead.
PULSATING YELLOW	MEDIUM	Drivers may proceed in accordance with their authority, the next indicator is displaying a turnout authority.

A white retro-reflective diamond with the indicator ahead name and the word "REPTR' in black letters is provided on the post as a marker in the event of the repeater lights failing, to identify the structure as a Main Line Repeater.

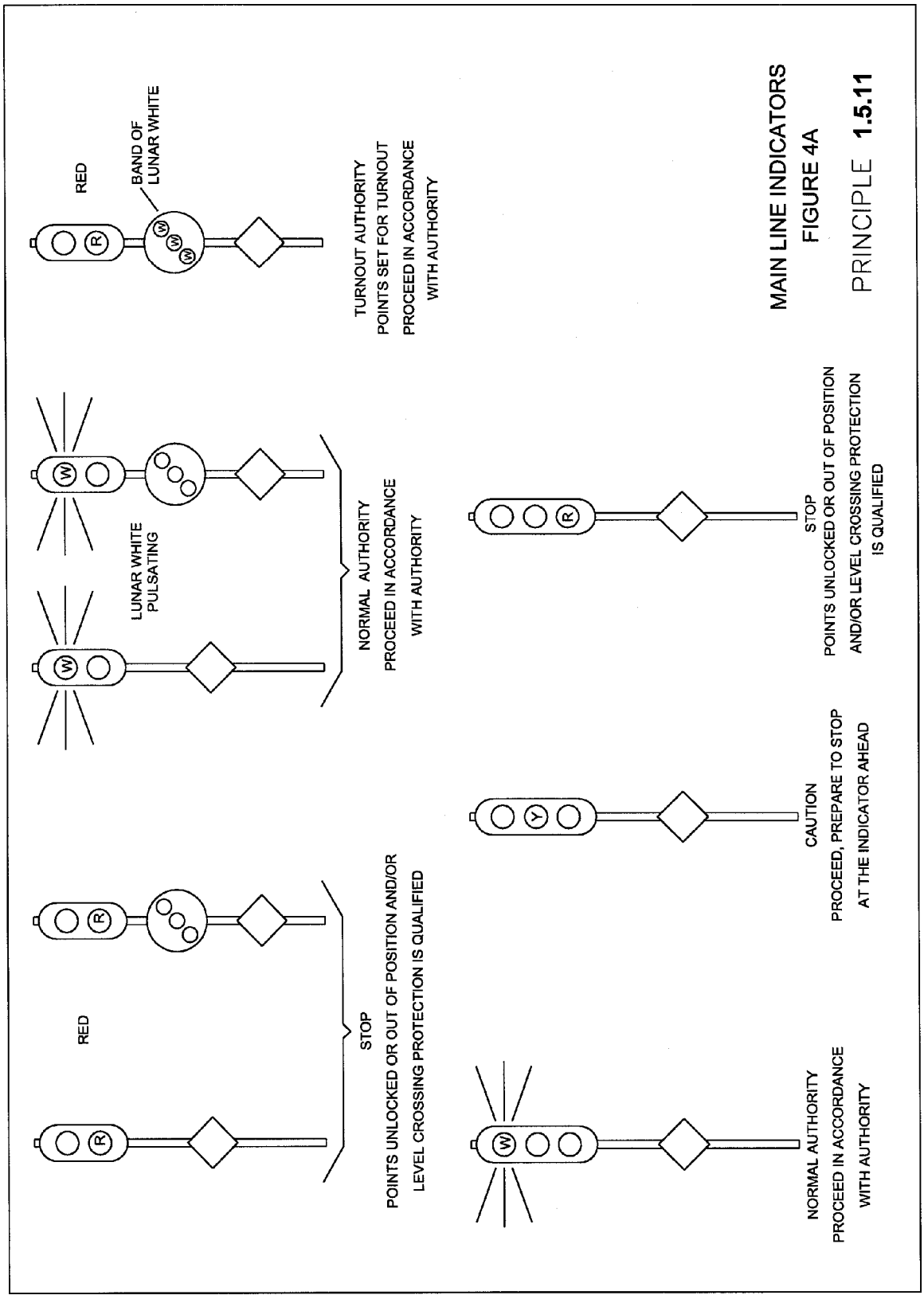
Main Line Repeaters are normally lit but can be approach lit if required.

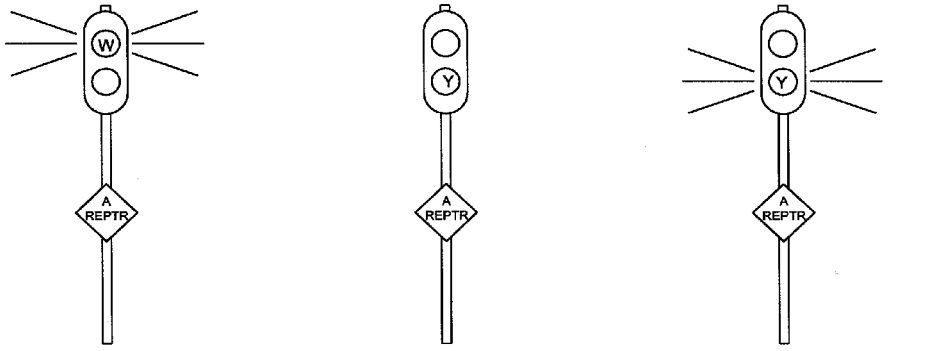
Main Line Repeaters may negate the need for a landmark or location board.

NOTE: Location boards are always required in Train Order areas to ensure drivers are aware of the name of the location.

If there is insufficient braking distance between the Main Line Repeater and the Main Line Indicator, then the landmark or location board must be provided prior to the Main Line Repeater at a minimum of braking distance to the Main Line Indicator.

A diagram of the indications is shown in figures 4A and 4B.


MAIN LINE INDICATORS
FIGURE 4A
PRINCIPLE 1.5.11
RED
BAND OF LUNAR WHITE
TURNOUT AUTHORITY
POINTS SET FOR TURNOUT
PROCEED IN ACCORDANCE WITH AUTHORITY
LUNAR WHITE PULSATING
NORMAL AUTHORITY
PROCEED IN ACCORDANCE WITH AUTHORITY
STOP
POINTS UNLOCKED OR OUT OF POSITION
AND/OR LEVEL CROSSING PROTECTION IS QUALIFIED
RED
STOP
POINTS UNLOCKED OR OUT OF POSITION AND/OR
LEVEL CROSSING PROTECTION IS QUALIFIED
CAUTION
PROCEED, PREPARE TO STOP AT THE INDICATOR AHEAD
NORMAL AUTHORITY
PROCEED IN ACCORDANCE WITH AUTHORITY



MAIN LINE REPEATERS

FIGURE 4B

Principle 1.5.11

1.6 Principle No. 1.6 - Application of Aspects

1.6.1 Introduction

This Principle addresses the requirements for the provision of particular aspects for specific applications.

1.6.2 Running Signals

1.6.2.1 Caution Aspect

If it is required to clear a running signal as far as the buffer stop on a platform line at a terminal station then a caution aspect shall be displayed. Refer to figure 1.

1.6.2.2 Conditional Caution Aspect

If it is required to clear a running signal and a full overlap is not available but a reduced overlap has been provided and is available then a conditional caution aspect shall be displayed.

The conditional caution aspect shall be cleared after the berth track circuit has been occupied for an appropriate period of time to ensure that the train speed has been reduced commensurate with its approach to the reduced overlap. Refer to Principle No. 4.7.

1.6.2.3 Caution Turnout Aspect

If it is required to clear a running signal to show a running turnout and the running signal in advance is displaying a stop aspect then the running turnout signal shall display a caution turnout aspect.

1.6.2.4 Medium Aspect

If it is required to clear a running signal to show a caution aspect and the caution aspect is less than braking distance from the stop signal to which it applies then the running signal immediately in rear of the signal required to show the caution aspect shall display a medium aspect. Refer to figure 2.

The signal required to display the medium aspect shall be at or at greater than braking distance from the stop signal to which it applies.

1.6.2.5 Preliminary Medium Aspect

Where multiple aspects are required for braking distance, approaching the stop or turnout signal, the signals up to the medium before the caution or turnout aspect, may display preliminary medium.

1.6.2.6 Medium Turnout Aspect

If it is required to clear a running signal to show a running turnout and the running signal in advance is displaying a caution aspect or better or if no signal is provided but the block section in advance is clear then the running turnout signal shall display a medium turnout aspect.

1.6.2.7 Medium Aspect with Turnout Repeater

If it is required to clear a home signal to show a caution turnout or medium turnout aspect then the running signal immediately in rear, if it is at sufficient braking distance from the home signal[1] shall display a medium aspect with turnout repeater. Refer to figure 3.

Where multiple medium aspects are required in advance of the turnout signal due to the braking distance required, the signal immediately in advance of the turnout signal shall display a medium, and any further signals in advance of that shall display a preliminary medium indication. The first preliminary medium may be provided with a turnout repeater.

[1] The braking distance required to reduce the train speed from line speed to turnout speed.

It will also be permissible for a turnout repeater to be provided on subsequent preliminary mediums or medium should a number of signals be provided between the first turnout warning signal and the signal at the turnout. Situations where additional turnout repeaters should be considered are:

- Where drivers may normally approach the turnout signal at stop and the signal may be cleared on approach.
- Where a platform exists after the first turnout repeater is displayed.
- Where there are possible sources of distraction for drivers.
- Where the speed differential from line speed to turnout speed is high.

Refer to figure 6

1.6.2.8 Turnout Aspects – Combinations

Where equal 80 Km/h or higher medium/high speed junctions exist (ie track speed is equal for all routes), the following indications are displayed on the approach and home signals leading up to the medium/high speed junction. The home signal is fitted with a main line route (M.L.R) indicator. Refer to figure 4.

Approach Signal Indication	**Home Signal Indication**
Caution	Stop
Medium with Turnout Repeater	Caution with M.L.R. Indicator
Clear with Turnout Repeater	Medium with M.L.R. Indicator
Clear with Turnout Repeater	Clear with M.L.R. Indicator

For all other applications where the speed through the turnout is lower than the main route speed, the home signal is only fitted with a main line route indicator if there is more than one turnout route. Refer to figure 5

Approach Signal Indication	**Home Signal Indication**
Caution	Stop
Medium	Caution
Medium with Turnout Repeater	Caution Turnout
Clear	Medium
Medium with Turnout Repeater	Medium Turnout
Clear	Clear

For all other applications, *in double light signalled areas only*, where the speed through the turnout is lower than the main route speed and there is insufficient braking distance between the home signal and the signal in the rear, the following indications are displayed on the two (2) approach signals and the home signal leading up to the turnout. The home signal is only fitted with a main line route indicator if there is more than one turnout route. Refer to figure 6.

1st Approach Signal	**2nd Approach Signal**	**Home Signal**
Medium	Caution	Stop
Preliminary Medium	Medium	Caution
Preliminary Medium with Turnout Repeater	Medium – (refer to Note 1)	Caution Turnout
Clear	Clear or Preliminary Medium	Medium
Preliminary Medium with Turnout Repeater	Medium – (refer to Note 1)	Medium Turnout
Clear	Clear	Clear

Note 1: Turnout repeaters may also be provided on these signals.

Should the turnout repeater fail to illuminate when required, the aspects approaching the junction signal shall be the same as if the junction signal were at stop.

If a junction signal is cleared after the train has passed the signal with the turnout repeater, then the aspect approaching the junction must not step up unless turnout repeaters are provided on the other signals.

1.6.3 Subsidiary Signals

1.6.3.1 Low-Speed Aspect (in Trainstop Territory)

If it is required to clear a running signal fitted with a low speed subsidiary and no overlap or a reduced overlap is available then a low speed aspect shall be displayed. Refer to figure 7.

The low speed aspect shall be cleared after the berth track circuit has been occupied for an appropriate period of time to ensure that the train speed has been reduced commensurate with its approach to the running signal in advance without the safety margin provided by a full overlap.

The low speed aspect shall only clear in conjunction with the clearing of the trainstop at the signal.

The form of this aspect shall be a green light. Refer to Principle No1.5.

Note: The existing low speed aspects on the City Underground, Eastern Suburbs Line, Sydney-Strathfield and some other areas are an exception to the above requirement.

1.6.3.2 Low-Speed Aspect (Single Light Signals in CTC Territory)

If it is required to clear a home signal fitted with a low speed subsidiary and the main line or loop starting signal is at stop and no overlap or a reduced overlap is available then a low speed aspect shall be displayed. Refer to figure 8.

If the Stop aspect of the home signal is proved to be alight then the clearing of the low speed aspect shall not be subject to berth track circuit occupancy control.

If the Stop aspect of the home signal is proved to be out then the clearing of the low speed aspect shall be delayed until the train is closely approaching the signal. Refer to Principle 1.17.4 (iv.).

The form of this aspect shall be a green light. Refer to Principle No.1.5.

1.6.3.3 Shunt Ahead Aspect (Single or Bidirectional Lines)

If it is required to clear a starting signal fitted with a subsidiary shunt for the purpose of shunting ahead into the section in advance then a subsidiary shunt ahead aspect shall be displayed.

The form of this aspect shall be a flashing yellow light. Refer to Principle No.1.5.

1.6.4 Tonnage Signals

1.6.4.1 Requirement for Tonnage Signals

On long steep grades, freight trains at 75% or greater of rated load may have difficulty in starting a train from stop on the grade. The problems could be inability to lift the load, wheel burns in starting the load or broken couplers in starting the load.

Tonnage signboards at a signal at the base of a grade require that the prescribed train should not proceed unless the nominated aspect is displayed on the signal. The aspect sequence of the tonnage signal ensures that the signal will only display the nominated aspect provided there is a clear path over the crest of the grade.

If the aspect is less than the nominated aspect, then the train is required to stop until the nominated aspect is displayed.

The prescribed trains are those with 75% or more of full load.

1.6.4.2 Signal Aspect for Tonnage Signal

With 3 aspect single light signals it is not possible to provide advance warning of the restrictive tonnage aspect. The 4 aspect sequence including the pulsating yellow medium aspect must be used for tonnage signals. The medium aspect (pulsating yellow) provides the proceed aspect for the prescribed trains at the tonnage signal.

In cases where a medium aspect cannot be displayed, then a "T" indicator is lit. This permits the driver to ignore the instructions of the Tonnage sign. This "T" indicator is only lit where there is a clear path over the grade.

Where there are multiple signals on the grade, then the aspect sequence is designed to only provide the medium aspect when there is a clear path over the crest of the grade.

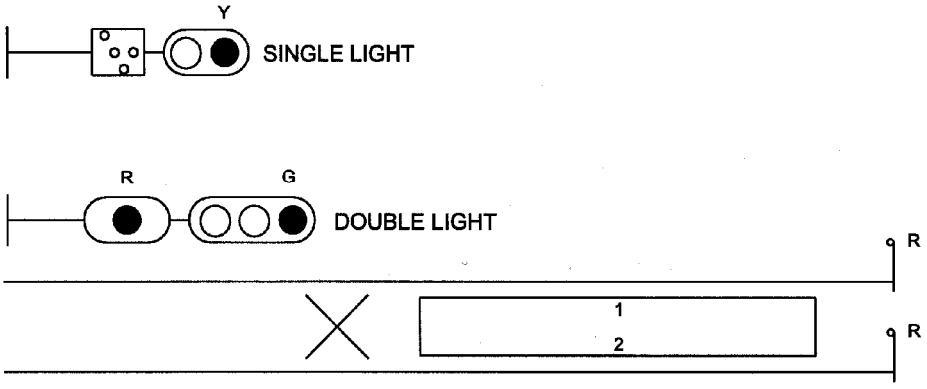
1.6.4.3 Distant for Tonnage Signal

It is required to provide advance warning to prescribed trains that the tonnage proceed aspect is being displayed. The required aspect sequence is for a full clear at the signal preceding the tonnage signal, which indicates that the tonnage signal has a medium or full clear aspect. Where this can not be provided, then a "T" indicator is to be used and to be lit when the Tonnage signal provides a medium or higher aspect.

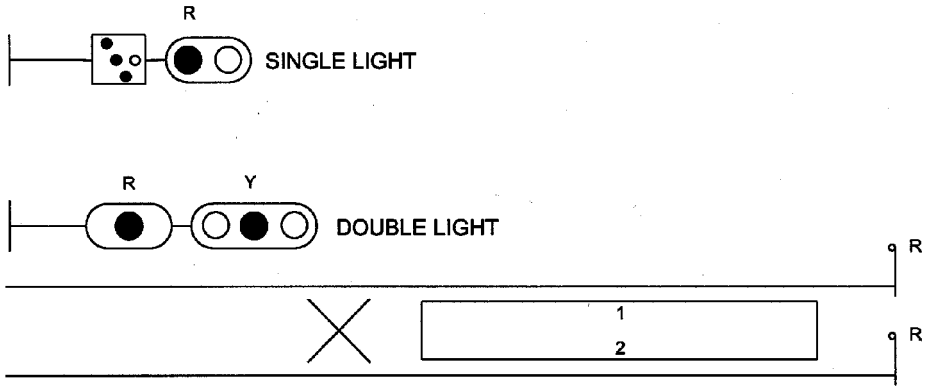
1.6.4.4 Tonnage Sign

A Tonnage sign is provided adjacent to the Tonnage signal with the text:

"DRIVERS OF GOODS TRAINS WITH 75% OF FULL LOAD MUST WAIT HERE UNTIL SIGNAL SHOWS MEDIUM"



PROVISION OF CAUTION ASPECT INTO TERMINAL PLATFORM 1

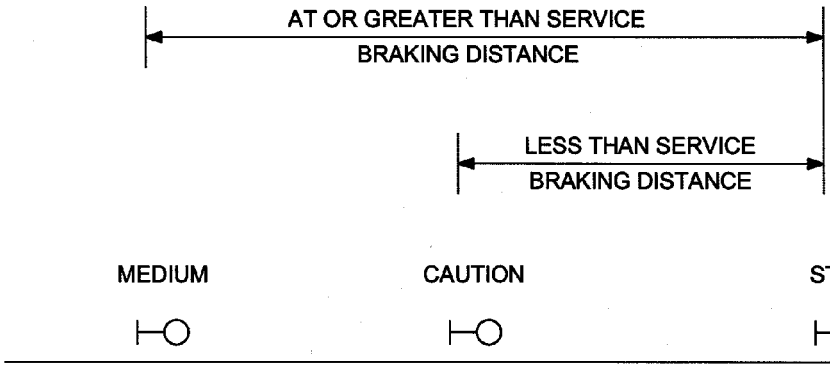


PROVISION OF CAUTION ASPECT INTO TERMINAL PLATFORM 2

FIGURE 1

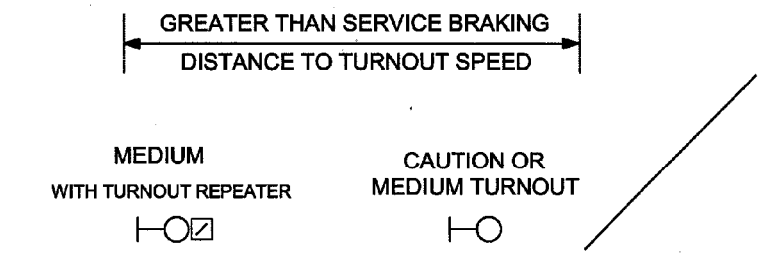
APPLICATION OF ASPECTS

PRINCIPLE N° 1.6



PROVISION OF A MEDIUM ASPECT IN REAR OF CAUTION ASPECT

FIGURE 2



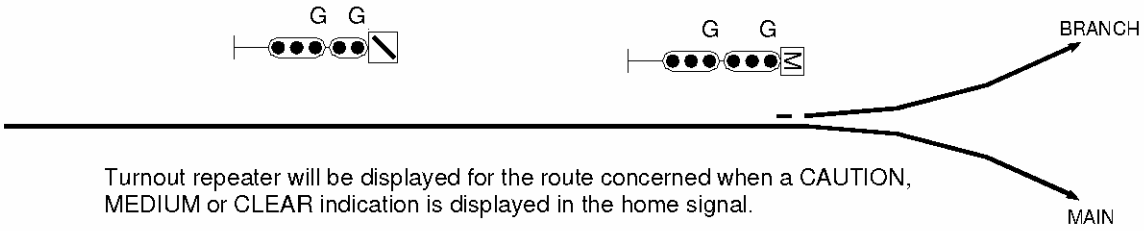
PROVISION OF A MEDIUM ASPECT IN REAR OF A CAUTION
OR MEDIUM TURNOUT

FIGURE 3

APPLICATION OF ASPECTS

PRINCIPLE N° 1.6

EQUAL MEDIUM / HIGH SPEED JUNCTION

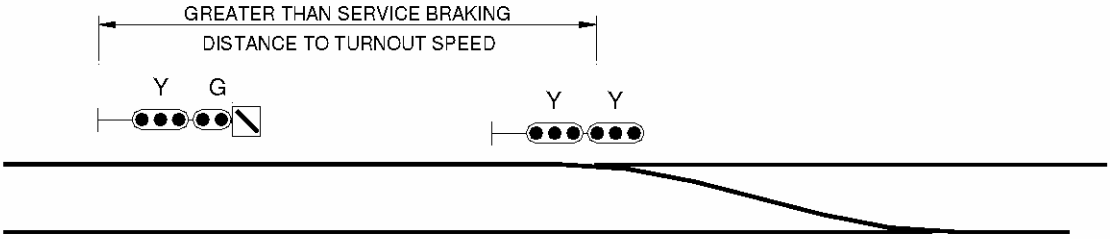


Turnout repeater will be displayed for the route concerned when a CAUTION, MEDIUM or CLEAR indication is displayed in the home signal.

APPROACH SIGNAL INDICATION			HOME SIGNAL INDICATION		
Lampcase:-	Bottom	Top	Lampcase:-	Bottom	Top
	R	G		R	R
	Y	G ↗		R	G B
	Y	G ↘		R	G M
	G	G ↗		Y	G B
	G	G ↘		Y	G M
	G	G ↗		G	G B
	G	G ↘		G	G M

FIGURE 4

OTHER TURNOUTS



Turnout repeater will be displayed for the turnout route when a CAUTION turnout or MEDIUM turnout indication is displayed in the home signal.

APPROACH SIGNAL INDICATION				HOME SIGNAL INDICATION	
Lampcase:-	Bottom	Top	Lampcase:-	Bottom	Top
	R	G		R	R
	Y	G	STRAIGHT ROUTE	R	G
	Y	G ↘	TURNOUT ROUTE	R	Y
	G	G	STRAIGHT ROUTE	Y	G
	Y	G ↘	TURNOUT ROUTE	Y	Y
	G	G	STRAIGHT ROUTE	G	G

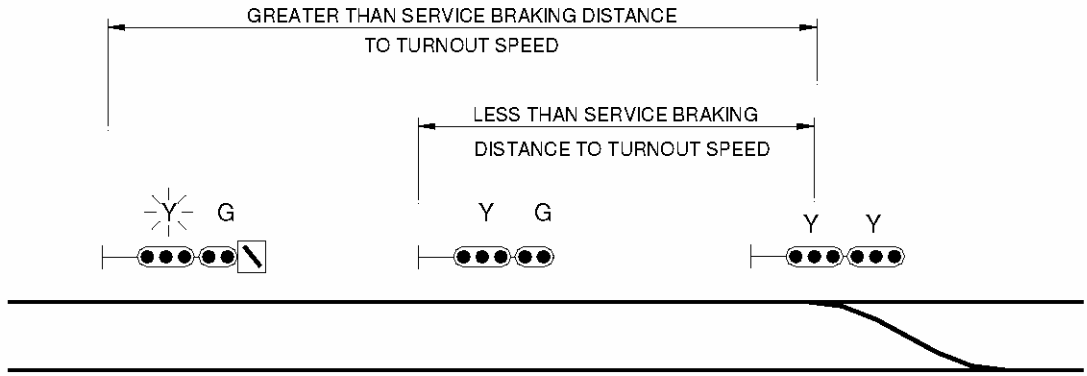
FIGURE 5

APPLICATION of ASPECTS

PRINCIPLE N° 1.6

DOUBLE LIGHT SIGNAL AREAS ONLY

SECOND WARNING SIGNAL AT LESS THAN BRAKING DISTANCE FROM HOME SIGNAL



Junction repeater and preliminary medium indication will be displayed for the turnout route when a CAUTION turnout or MEDIUM turnout indication is displayed in the home signal.

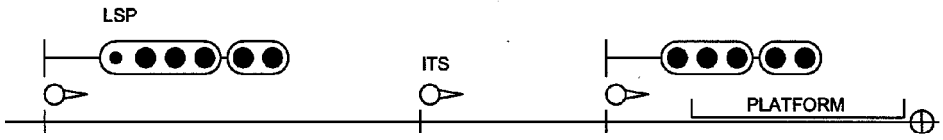
1st APPROACH SIGNAL INDICATION			2nd APPROACH SIGNAL INDICATION			HOME SIGNAL INDICATION		
Lampcase:-	Bottom	Top	Lampcase:-	Bottom	Top	Lampcase:-	Bottom	Top
	Y	G		R	G		R	R
	G	G		Y	G	STRAIGHT ROUTE	R	G
	Y	G ↖		Y	G	TURNOUT ROUTE	R	Y
	G	G		Y	G	STRAIGHT ROUTE	Y	G
	Y	G ↖		Y	G	TURNOUT ROUTE	Y	Y
	G	G		G	G	STRAIGHT ROUTE	G	G

ASPECT PROGRESSION WHERE THREE WARNING INDICATIONS ARE NECESSARY TO OBTAIN REQUIRED BRAKING DISTANCE

In this situation, if the turnout repeater does not illuminate, both the first and the second approach signals are to step back to MEDIUM and the third approach signal is to step back to CAUTION.

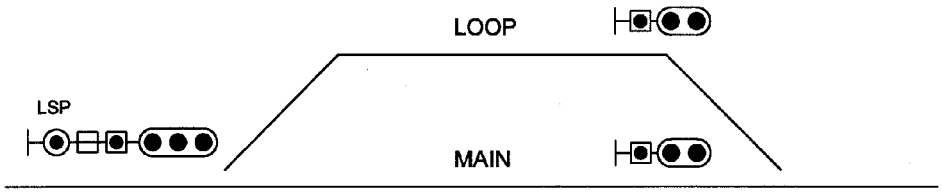
FIGURE 6
APPLICATION of ASPECTS

PRINCIPLE N° 1.6



PROVISION OF LOW SPEED ASPECT FOR REDUCED OR NO OVERLAP CONDITION

FIGURE 7



PROVISION OF LOW SPEED ASPECT FOR MAIN OR LOOP IF STARTING SIGNALS
AT STOP AND SUBJECT TO OVERLAP CONDITIONS IN ADVANCE

FIGURE 8

APPLICATION OF ASPECTS

PRINCIPLE N° 1.6

1.7 Principle No. 1.7 - Signals Displaying Fixed Red Aspects

1.7.1 Introduction

This Principle addresses the requirements for providing signals which display fixed red running aspects where a line continues but running movements terminate.

1.7.2 Provision of Signals Displaying Fixed Red Aspects Where the Line Continues

If it is necessary to terminate all running movements at a specific point on a line which continues onwards then a signal displaying one red running aspect and a red marker light or two fixed red running aspects shall be provided in single light and double light areas respectively.

1.7.2.1 Typical Arrangements

The following typical arrangements should be taken as guidelines for the application of this Principle.

1.7.2.1.1 In Platforms where all running movements terminate and the train reverses out

All running movements entering a platform must terminate within the limits of the platform and must leave the platform in the opposite direction of travel. Refer to figure 1

1.7.2.1.2 In platforms where all running movements terminate but the train may move forward in the same direction under subsidiary signals.

All running movements entering a platform must terminate within the limits of the platform and must leave the platform in the opposite direction of travel or proceed in the original direction under the control of a subsidiary signal. Refer to figure 2.

1.7.2.1.3 At locations where all running movements terminate but where the train must then move forward on to a line under the control of shunting or some other form of signalling.

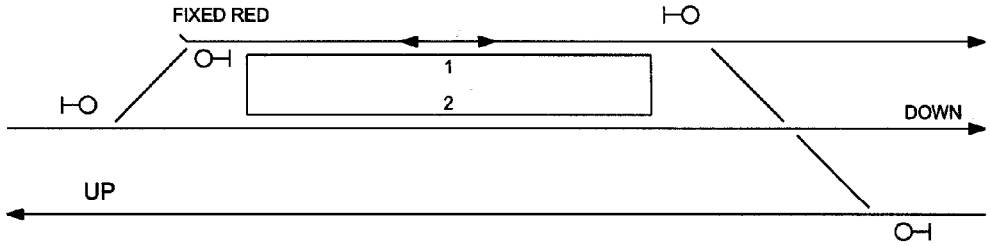
All running movements into a balloon loop arrangement must terminate and then proceed under the control of a subsidiary signal. Refer to figure 3.

1.7.3 Where The Line Does Not Continue

Where it is necessary to terminate a running movement on a line which does not continue onwards the usual arrangements regarding the provision of buffer stops and buffer stop lights shall apply.

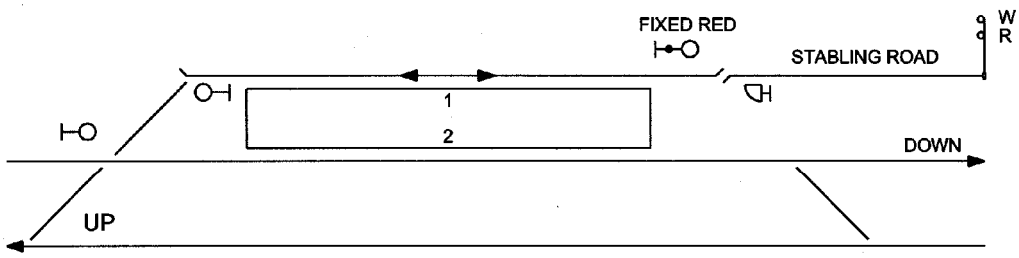
Where the provision of a red buffer stop lamp may be mistaken as a stop signal by the driver of a train travelling on an adjacent line a white light shall be fitted above the red light.

Refer to figure 2 and figure 4



LINE CONTINUES BUT IS NOT SIGNALLED

FIGURE 1



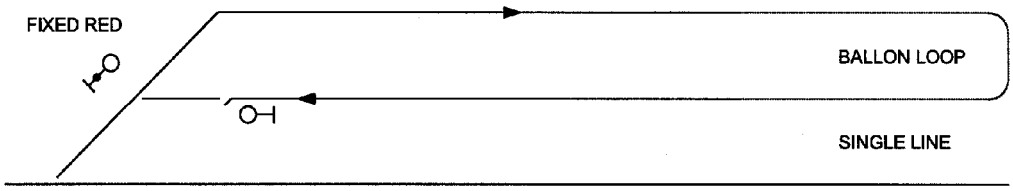
ALL DOWN DIRECTION RUNNING MOVEMENTS INTO PLATFORM 1
MUST TERMINATE BUT TRAIN MAY CONTINUE EMPTY INTO
STABLING ROAD ON SUBSIDIARY SIGNAL

FIGURE 2

PROVISION OF FIXED RED ASPECTS

PRINCIPLE N° 1.7

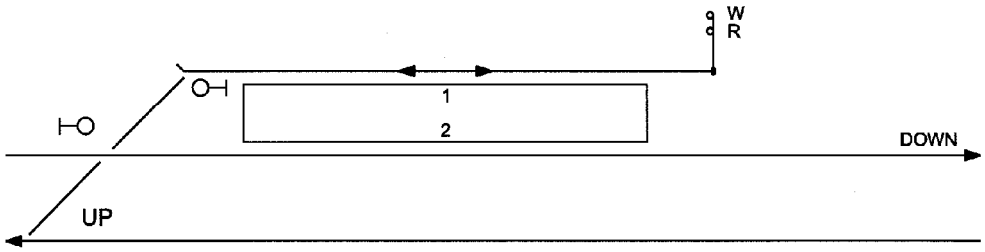
PROVISION OF FIXED RED ASPECTS



ALL RUNNING MOVEMENTS TOWARDS BALLOON LOOP
MUST TERMINATE AT PERMANENT STOP SIGNAL.
TRAIN MAY PROCEED INTO BALLOON LOOP
ON SUBSIDIARY SIGNAL

FIGURE 3

PROVISION OF BUFFER STOP & BUFFER STOP LIGHTS



LINE DOES NOT CONTINUE

FIGURE 4

PRINCIPLE N° 1.7

1.8 Principle No. 1.8 - Emergency Replacement of Automatic Signals

1.8.1 Introduction

This Principle addresses the requirements for the provision of replacement switches at a supervisory signal box or main control centre for the purpose of restoring an automatic signal to stop should an emergency situation arise.

1.8.2 Provision of Emergency Replacement Switches

If an automatic signal is located at the departure end of a platform situated in an underground section of line then an individual replacement switch shall be provided to enable the particular signal to be placed to stop should an emergency situation arise.

1.8.3 Visual Indication of Replacement Action

A visual indication shall be provided for each individual emergency replacement switch in the supervisory signal box or main control centre to bring to the operator's attention the fact that the emergency replacement has been initiated.

1.8.4 'A' Lights

Automatic signals provided with emergency replacement switches shall be fitted with 'A' lights which shall be extinguished if the signal is replaced.

1.9 Principle No. 1.9 - 'A' Lights

1.9.1 Introduction

This Principle addresses the concepts and requirements for fitting 'A' lights to both controlled and automatic running signals to advise the driver of a train the status of the signal which may operate in either controlled or automatic mode.

1.9.2 'A' Light - Concept

To provide operating flexibility it is sometimes desirable to work a controlled signal in automatic mode and an automatic signal in controlled mode.

Such circumstances typically arise when a controlling signal box is switched-out in which case the controlled signals operate in automatic mode or when shunting is taking place at an intermediate siding in an automatic section in which case one or more automatic signals effectively operate in controlled mode when providing protection for the shunting movements at the siding.

By illuminating or extinguishing a letter 'A' fitted to these particular signals their operation, either in automatic or controlled mode, can be indicated to the driver of a train who will then apply the appropriate rules and regulations.

The failure of an 'A' light indicating that a signal is operating in automatic mode will logically result in the driver of a train applying the rules and regulations for a controlled signal which are more restrictive than those for an automatic signal.

1.9.3 'A' Light - Definition

An indication in the form of a letter 'A' which when illuminated instructs the driver of a train to treat the signal to which it applies as an automatic signal.

1.9.4 'A' Light - Description and Fitting

A light unit located on the centre line of a signal post which when illuminated displays the letter 'A'. Refer to figure 1.

If provided on a double light running signal then it shall be positioned either immediately beneath the lower running aspects which shall be in line with the upper aspect or, if fitted, beneath any subsidiary signals. Refer to figure 2.

If provided on a single light running signal then it shall be positioned either immediately beneath the marker light which shall also be located on the centre line of the signal post or, if fitted, beneath any subsidiary signals. Refer to figure 3.

1.9.5 Provision of 'A' Lights on Controlled Signals

If it is required to switch-out a signal box controlling one or more running signals, then each running signal which is required to be clear when the signal box is switched out shall be fitted with an 'A' light. Refer to figure 4.

The 'A' light shall not be illuminated before the "switching out" mechanism has been operated.

The 'A' light shall be extinguished immediately the "switching in" mechanism has been operated.

If the 'A' light is located at mechanical interlocking then it shall detect all facing points up to the next running signal.

If the 'A' light is located in power signalled area it shall detect all sets of electrically operated points up to the next running signal.

1.9.6 Provision of 'A' Lights on Automatic Signals

If an automatic signal is provided with an emergency replacement facility or reads directly over trailing, facing or flat crossing connections or any combination thereof forming part of an intermediate siding arrangement then it shall be fitted with an 'A' light. Refer to figures 5 and 6.

If all the following conditions are satisfied then the 'A' light shall be illuminated.

- The releasing switch proved normal and locked.
- The ends of all points providing trapping protection detected normal.
- Facing points in the main line, if any, including the Facing Point Lock detected normal.

Note: Mechanically operated trailing points in the main line shall not be detected in 'A' lights.

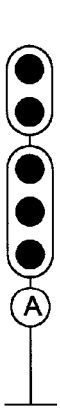
If any one of the above conditions is not satisfied, then the 'A' light shall be extinguished immediately.

1.9.7 Provision of 'A' Lights - Special Cases

In some cases it may be necessary to fit 'A' lights in automatic signals in rear of the signal protecting the intermediate siding due to the nature of the train movements made at the siding e.g. A wrong direction propelling movement out to the main line which passes beyond the signal protecting the siding. Refer to figure 7.

Each case shall be considered and the appropriate measures taken to provide the necessary degree of protection to all train movements involved.

FIGURE 1

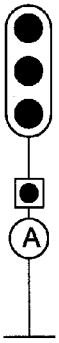


WITHOUT SUBSIDIARY SIGNAL

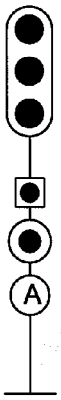
WITH SUBSIDIARY SIGNAL

FIGURE 2

DOUBLE LIGHT SIGNALS



WITHOUT SUBSIDIARY SIGNAL



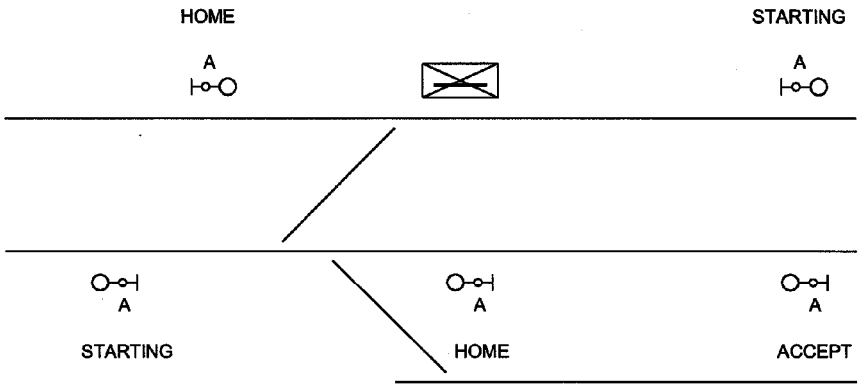
WITH SUBSIDIARY SIGNAL

FIGURE 3

SINGLE LIGHT SIGNALS

FITTING OF 'A' LIGHTS

PRINCIPLE N° 1.9

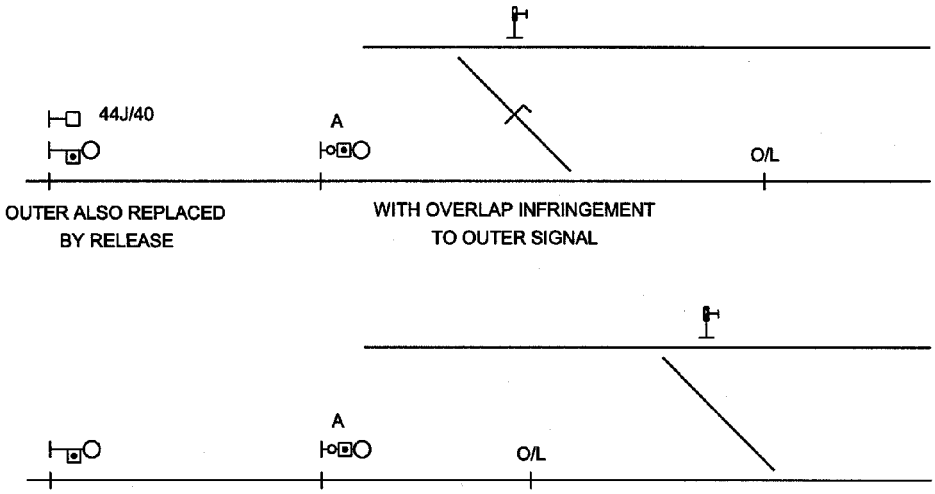


ALL SIGNALS CLEAR
WHEN SIGNAL BOX SWITCHED OUT

FIGURE 4

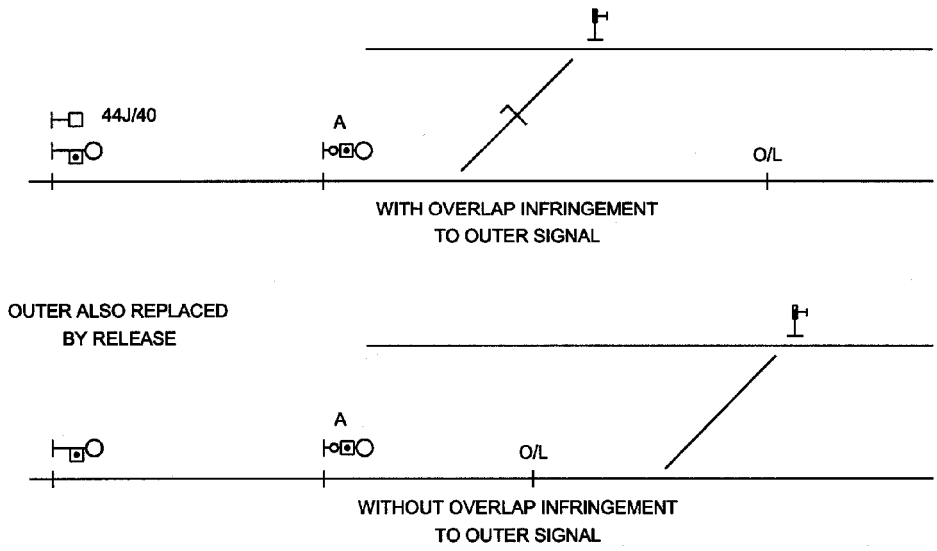
'A' LIGHTS ON CONTROLLED SIGNALS

PRINCIPLE N° 1.9



INTERMEDIATE TRAILING
SIDING CONNECTION

FIGURE 5

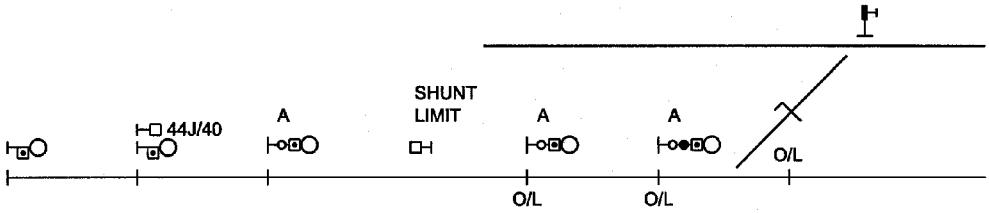


INTERMEDIATE FACING
SIDING CONNECTION

FIGURE 6

'A' LIGHTS ON AUTOMATIC SIGNALS

PRINCIPLE N° 1.9



SPECIAL CASE

FIGURE 7

'A' LIGHTS ON AUTOMATIC SIGNALS

PRINCIPLE N° 1.9

1.10 Principle No. 1.10 - Section Intentionally Left Blank

1.11 Principle No. 1.11- Signal Profiles

1.11.1 Introduction

This Principle addresses the relationship between the various forms of signals and aspects and the requirements for combining these into standard profiles.

1.11.2 Running Signals

1.11.2.1 Automatic (Double Light Signals)

The top and bottom signal heads shall be vertically staggered such that the aspect displayed in the bottom head is always to the right relative to the aspect displayed in the top head. Refer to figure 1.

If the signal heads are post mounted then the top head shall be mounted directly on top of the signal post and the bottom head shall be offset to the right.

The signal identification plate shall be mounted between the top and bottom signal heads

Refer to Principle No.1.2.

1.11.2.2 Automatic (Single Light Signals)

The signal head and the marker light shall be vertically staggered such that the marker light is always to the right relative to the aspect displayed in the signal head

Refer to figure 2.

If the signal head is post mounted then it shall be mounted directly on top of the signal post and the marker light shall be offset to the right.

The signal identification plate shall be mounted between the signal head and the marker light. Refer to Principle No.1.2.

1.11.2.3 Controlled (Double Light Signals)

The top and bottom signal heads shall be vertically aligned one above the other so that the aspect displayed in the top head is directly above the aspect displayed in the lower head. Refer to figure 3.

If the signal heads are post mounted then the top head shall be mounted directly on top of the signal post and the bottom head shall be directly underneath.

The signal identification plate shall be mounted between the top and bottom signal heads. Refer to Principle No.1.2.

1.11.2.4 Controlled (Single Light Signals)

The running signal head and the marker light shall be vertically aligned one above the other so that the aspect displayed in the running signal head is above the marker light. Refer to figure 4

If the running signal head is post mounted then the marker light shall be set forward immediately in front of and on the centreline of the signal post.

If the running signal is fitted with a running turnout then the marker light shall be incorporated in the running turnout which shall be set forward immediately in front of and on the centreline of the signal post and beneath the running signal head. Refer to figure 5.

The signal identification plate shall be mounted between the signal head and the marker light or the running turnout unit. Refer to Principle No.1.2.

1.11.3 Subsidiary Signals

1.11.3.1 Low Speed (Double Light Signals)

The subsidiary low speed aspect shall be mounted below the lower running signal head. Refer to figure 6.

Depending on the particular requirements it may be incorporated into the lower signal head.

1.11.3.2 Low Speed (Single Light Signals)

The subsidiary low speed signal shall be separate from the running signal head and mounted immediately below the marker light or running turnout if provided.

If the subsidiary low speed signal is associated with a route indicator then it shall be mounted immediately below the route indicator.

If the running signal is post mounted then the subsidiary low speed signal shall be on the centre line of the signal post.

1.11.3.3 Shunt (Double Light Signals)

The subsidiary shunt signal shall be separate from the running signal heads and mounted immediately below the lower head, or any low speed aspect. Refer to figure 6.

If the subsidiary shunt signal is associated with a route indicator then it shall be mounted immediately below the route indicator.

If the running signal is post mounted then the subsidiary shunt signal shall be on the centre line of the signal post.

1.11.3.4 Shunt (Single Light Signals)

A subsidiary shunt signal shall be separate from the running signal head and mounted immediately below the marker light or running turnout or subsidiary low speed if one or more of these are provided. Refer to figure 7.

If the subsidiary shunt signal is associated with a route indicator then it shall be mounted immediately below the route indicator.

1.11.4 Other forms of Signals

1.11.4.1 A Lights

1.11.4.1.1 On Automatic Running Signals

If an 'A' light is provided on an automatic running signal then it shall be mounted below the running aspects. Refer to figures 8(a) and 8(b).

If the running signal is post mounted then the 'A' light shall be set forward immediately in front of and on the centreline of the signal post.

1.11.4.1.2 On Controlled Running Signals

If an 'A' light is provided on a controlled running signal then it shall be mounted below the running aspects or running turnout or the lowest of any subsidiary signals which may be fitted to the running signal.

Refer to figures 9(a) and 9(b).

If the running signal is post mounted then the 'A' light shall be set forward immediately in front of and on the centreline of the signal post.

1.11.4.2 Turnout Repeater

On both single and double light signals the turnout repeater shall be mounted directly above and in line with the top running lampcase.

Exceptionally, where space is restricted, the turnout repeater may be mounted to one side of the top lampcase; on the left for a left hand turnout and on the right for a right hand turnout.

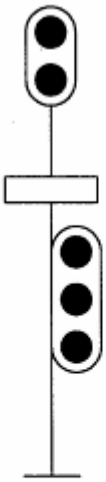


FIGURE 1

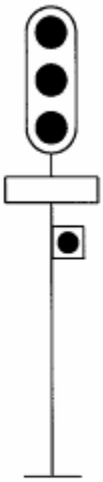


FIGURE 2

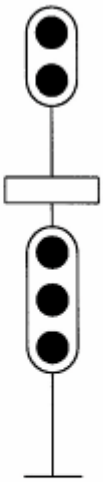


FIGURE 3

FIGURE 4

FIGURE 5

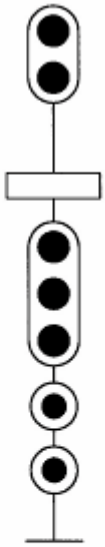


FIGURE 6

SIGNAL PROFILES

PRINCIPLE N° 1.11

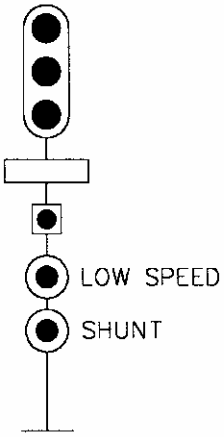


FIGURE 7

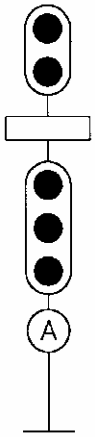


FIGURE 8 (a)

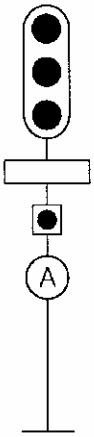


FIGURE 8 (b)

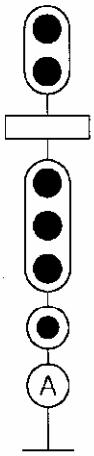


FIGURE 9 (a)

FIGURE 9 (b)

SIGNAL PROFILES

PRINCIPLE N° 1.11

1.12 Principle No. 1.12 - Positioning and Sighting of Signals

1.12.1 Introduction

This Principle addresses the requirements for positioning and sighting the various forms of signals with respect to their specific purpose as indicated on track plans, their intended physical location on site, and the necessity to provide the train driver with an unambiguous indication of the status of the track ahead.

1.12.2 Running Signals (and where fitted Subsidiary Signals)

1.12.2.1 Location of Running Signals with respect to the Track

Except where otherwise permitted, running signals shall be positioned immediately to the left of the running line to which they apply.

Guidelines for exceptions:

a) where it is physically impossible to position the signal without incurring excessive costs in providing a special mounting arrangement or an overhead structure or undertaking substantial earthworks and the resultant relocation does not result in ambiguity or less than acceptable sighting;

b) where trains start from sidings or other non-running line situations;

c) where trains start from terminal platforms;

d) where the running signal is a main or loop starting signal into a single line section;

e) where signals apply to the wrong running direction in bi-directional signalled double line sections. These signals should be placed to the right of the line.

f) where the signal is likely to conflict with the positions of other signals already sighted.

In cases a) b) c) and f) if the running signal is proposed to be located on the right hand side of the respective track then consideration shall be given to also providing a dwarf indicator signal in the correct position to the left of the track.

1.12.2.2 Location of Running Signals with respect to Platforms

Where running signals are situated at the departure ends of platforms, the signal shall be placed a minimum of 15 metres from the end of the platform (or the top ofthe platform ramp) unless track geometry or other obstruction forces the signal closer to platform.

1.12.2.3 Location of Running Signals with respect to Sighting

As a rule, each running signal should be located to provide the train driver with the best possible sighting of that signal.

The selection of location should take into account:-

- Fixed obstructions such as cuttings, retaining walls, foliage (make allowance for growth), structures.
- Other trains:-whether a train approaching on an adjacent track will obscure the signal, notably on right hand curves; whether rolling stock standing in a siding will obscure the signal, notably on left hand curves.
- Background lighting:- whether traffic lights, street lights, floodlights will overpower the signal aspect or tend to mislead the driver
- "Reading through":- whether the driver will be misled by sighting past the signal to another brighter or more obvious signal.
- Where bi-directional running applies, the possibility of sighting the signal on the wrong road before the correct signal. In this instance staggering the location of the signals may be necessary.

Running signals should be located to provide:-

- The longest, most continuous sighting of the signal after passing the signal in the rear.
- Preferably a minimum of 200 metres sighting distance for speeds to 100 kph and 300m for speeds over 100 kph.
- A minimum of 6 seconds sighting at line speed. Distances which equate to 6 seconds are given in table 1.12.1

Generally signal sighting distances should be maximised where signals are widely spaced and speeds are high.

It is not necessary that sighting be totally uninterrupted except for the final approach to the signal (50 metres approximately). However interruptions should be of only short duration and in total should not apply for more than 20% of the total sighting distance to the signal.

If the minimum sighting distances cannot be achieved having regard to the guidelines for exceptions listed under section 1.12.2. then the Corridor Manager or nominated Signalling representative shall examine and review the requirements and make the appropriate recommendations.

Sighting may be regarded as unacceptable when:-

- The signal is likely to be frequently approached at stop and it would be advantageous for train operation to advise the driver that the signal has cleared before the aspects become visible.
- The signal is a junction signal and the sighting is such that the driver would be required to slow the train more than is necessary for the diverging route.
- Local conditions are exceptional and such that it is reasonable to predict that drivers may have particular difficulty in properly observing and stopping at the signal.

In addition to providing for the driver's view of the signal, the selection of location shall also take into account:-

- Safe access for drivers to alight and use telephones. Walkways may need to be provided and handrails placed for protection on embankments or from other tracks.
- Overhead wiring air gaps. Avoid locating signals such that an electric train stopped at the signal will span an air gap. Since the last pantograph on an 8 car intercity electric set is approximately 175 metres from the front of the set, the signal should be placed at least 200 metres from the centre of the overlap (air gap) bay, if the air gap is on the approach side of the signal.

Note: This requirement does not apply to bridged or switched overlaps, only to air gaps at substations and sectioning huts.

- Live overhead wiring. Avoid locating signals such that any part of the signal or the maintainer servicing the signal is within 1.5 metres of any live overhead pull-off or isolating insulator.
- Whether there is likely to be a possibility of phantom effects or a reduction in visibility from sunlight shining into the lens.

1.12.2.4 Provision of Appropriate Lenses

Consideration shall be given to the proposed location and purpose of a running signal to determine the optimum type of lens to be fitted to signals with incandescent lamps.

Generally running signals on sections of line which have continuous visibility of the aspect and a sighting distances in excess of 250m shall be fitted with long range lenses.

Generally running signals on sections of line which have poor or intermittent visibility and/or sighting distances of less than 250m shall be fitted with spread light lenses.

Focus or alignment of the signal is equally as important as location in providing the train driver with acceptable sighting of signal indications.

For running signals (except turnouts on single light signals) the signal should be aligned toward the defined sighting point (Principle 2.1) or the previous signal whichever is the least distance.

Turnouts on single light signals should be aligned for best sighting at 100 - 150 metres if indicating a route off the main line and at approximately 25 metres if indicating the route from a refuge or siding.

Exception:- Where the turnout is indicating a route through a medium speed turnout (turnout speed 40 kph or higher) the optimum sighting distance should be increased to 200 - 250 metres.

Subsidiary and shunt signals should generally be aligned to provide best visibility at approximately 50 metres from the signal.

With LED signals, the "standard" range LED signals with a viewing range of around 500 metres shall generally be used.

Exceptionally where the spacing between signals is 2 km or more and there is 800 metres or more of clear viewing of the signal, long range versions of LED signals may be used where the additional sighting will benefit the train driver.

Standard and long range versions shall not normally be placed adjacent to one another except that, at the end of a loop, a standard range signal may be used in the loop and a long range on the main line.

1.12.2.5 Multiple Track Sections

Running signals applying to parallel running lines in the same direction of travel should generally be of the same height and not longitudinally staggered.

This is to minimise the possibility of drivers misreading adjacent signals especially through curved sections of track.

Guidelines for exceptions:

a) where it is physically impossible to position the signals in line due to minor track obstructions or the permanent way layout they may be subject to a degree of stagger which should be limited to 60m.

b) where at platforms it is possible to position a signal to be obscured from the adjacent running lines.

c) where bi-directional signalling on double line sections applies and the signal for the wrong running direction on the adjacent track can be sighted well before the correct signal, the signals may be staggered to provide as close as practical to simultaneous sighting.

d) at interlockings where signalling arrangements require signals on adjacent roads to be longitudinally staggered and the sighting of the signals in these positions is clear and unambiguous.

e) where the headway requirements on adjacent parallel lines are widely different, then the signalling should be arranged such that the signals on the line with the greater signal spacing align with signals on the other line with the additional signals on that other line spaced in between.

1.12.2.6 Height of Running Signals above the Track

Except where otherwise permitted, the red aspect of post mounted running signal aspects should be positioned to provide a stop aspect as close as practical to drivers eye level and in accordance with the requirements of the structure gauge, and having regard to the different types of trains likely to pass the signal.

Guidelines for exceptions:

a) where it is necessary to observe an aspect over the top of a train on an adjacent track.

b) where it is necessary to observe an aspect over a rise.

c) where it is necessary to observe an aspect through a series of curves.

d) where it is necessary to observe the aspect which would otherwise be obscured by physical lineside obstructions such as the face of a rock cutting or the locality of bridge piers, etc.

Nominally this height shall be approximately 3m above rail level for single aspect signals and 2.3m for double aspect signals but shall also depend on the fitting of subsidiary signals and route indicators if required and shall be subject to sighting and operating considerations.

For a single light colour light signal the centre of the most restrictive aspect shall act as one datum for all height references and the top of the railhead of the nearest rail of the track to which the signal applies shall act as the other. Refer to figure 1.

For a double light colour light signal the centre of the most restrictive aspect of the lower head shall act as one datum for all height references and the head of the nearest rail of the track to which the signal applies shall act as the other. Refer to figure 2.

If a signal is to be located at a point where the track is significantly canted then the top of the rail head reference shall be obtained using a level horizontal datum off the rail concerned and without reference to the height of the opposite rail. Refer to figure 3.

1.12.2.7 Distance of Running Signals from the Track

Post mounted running signal aspects shall be positioned close to the nearest rail of the track to which they apply and in accordance with the requirements of the structure gauge.

Nominally this distance shall be between 1750 and 2150 mm where there are overhead wiring structures and 2500 mm outside electrified areas but this shall be subject to sighting and operating considerations and the positioning of signals in or over drains is to be avoided.

If a running signal is post mounted then the centre line of the post shall act as one datum for all distance references and the running edge of the nearest rail of the track to which the signal applies shall act as the other Refer to figure 4.

1.12.3 Shunt Signals

1.12.3.1 Location of Shunt Signals with respect to the Track

Except where otherwise permitted shunt signals shall be positioned immediately to the left of the line to which they apply and in the direction of travel for the signal and in accordance with the requirements of the structure gauge. Refer to figure 5.

1.12.3.2 Location of Shunt Signals with respect to Sighting Height of Shunt Signals above the Track

Except where otherwise permitted shunt signals shall be positioned at ground level and in accordance with the requirements of the structure gauge.

Guidelines for exceptions:

a) where the visibility of the shunt signal is impaired or obscured by permanent obstructions on or about the track such as bridge piers and platforms; or,

b) where the visibility of the shunt signal is impaired or obscured by irregular obstructions such as trains waiting in loops or at siding outlet signals or where rolling stock is frequently marshalled or stabled;

Then the shunt signal may be elevated to provide adequate visibility subject to sighting and operating considerations. Refer to figure 6

This height shall be subject to specific sighting and operating considerations.

1.12.3.3 Distance of Shunt Signals from the Track

Shunt signals shall be positioned close to the nearest rail of the track to which they apply and in accordance with the requirements of the structure gauge.

Nominally this distance shall be 2.5m but shall also be subject to sighting and operating considerations, clearance from adjacent tracks and walkways or pathways.

The centre line of the shunt signal or if elevated, the centre line of the post shall act as one datum for all distance references and the running edge of the nearest rail. See figure 7.

1.12.4 Other forms of Signal

Except where permitted indicator and repeating signals shall be positioned immediately to the left of the running line to which they apply and in accordance with the requirements of the structure gauge.

Guidelines for exceptions:

a) where it is physically impossible to position the signal without incurring excessive costs in providing a special mounting arrangement or an overhead structure or undertaking substantial earthworks and the resultant relocation does not result in ambiguity or less than acceptable sighting;

b) where it is considered by the Signal Sighting Committee that the purpose for which this form of signal is provided is better served by placing the signal to the right of the line to which it applies subject to sighting and operating considerations.

1.12.4.1 Buffer Stop Lights

Buffer stops lights shall be positioned at the buffer stops or stop block, in the centre of the track, with the red light at a height of 1200 to 1400 mm above rail level.

Table 1.12.1 Distances equal to six seconds sighting

Service Speed	Distance	Service Speed	Distance
40	73	100	183
50	93	115	200
60	110	130	239
70	129	145	266
80	147	160	294
90	165		

Note: these distances include a 10% speed tolerance but must be treated as minimum distances

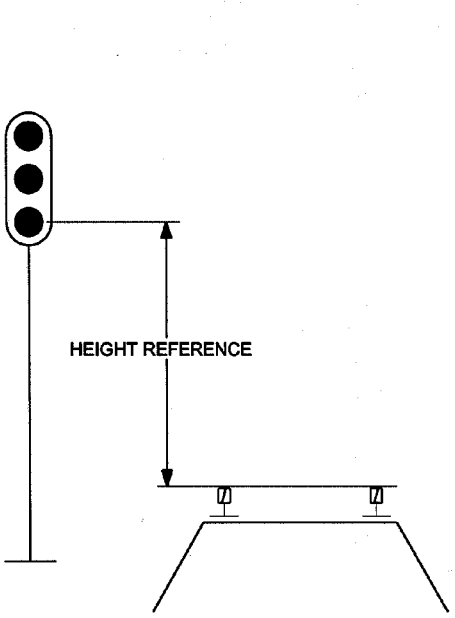


FIGURE 1

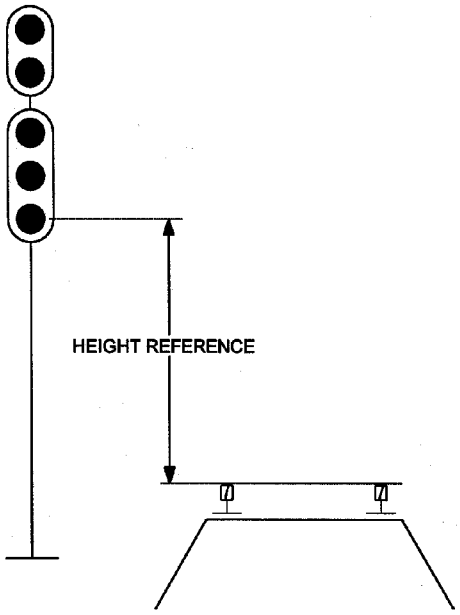


FIGURE 2

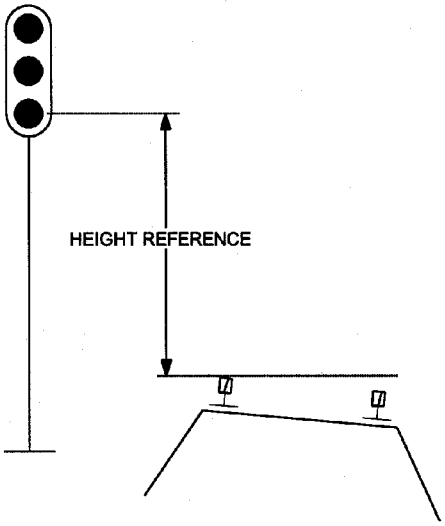


FIGURE 3

POSITIONING AND SIGHTING OF SIGNALS

PRINCIPLE N° 1.12

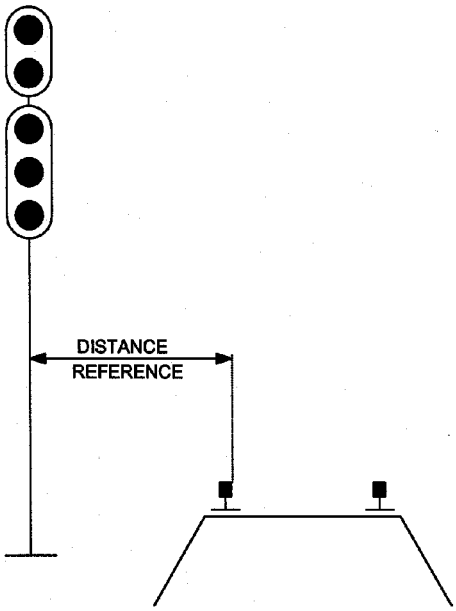


FIGURE 4

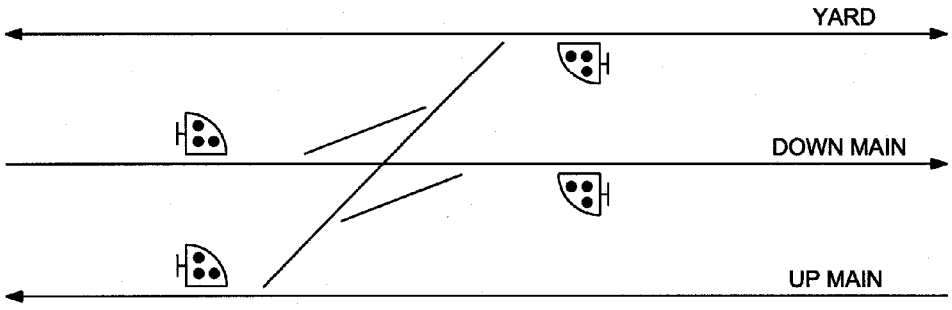


FIGURE 5

POSITIONING AND SIGHTING OF SIGNALS

PRINCIPLE N° 1.12

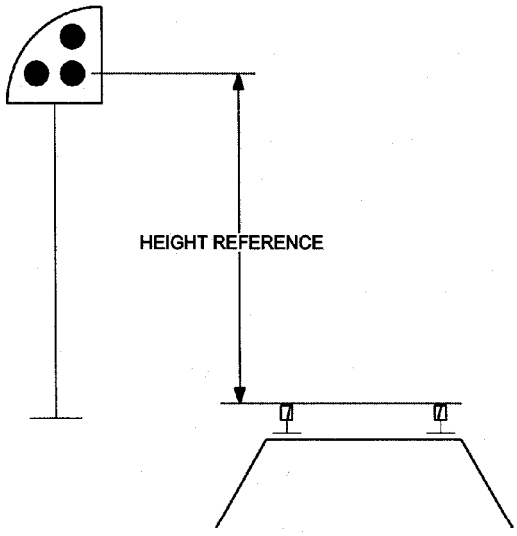


FIGURE 6

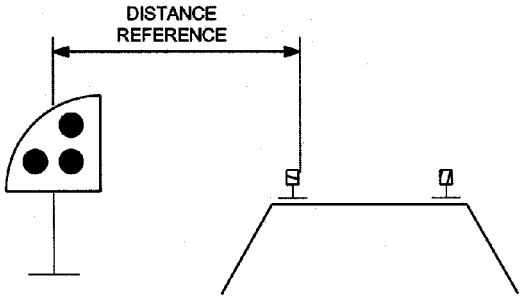


FIGURE 7

POSITIONING AND SIGHTING OF SIGNALS

PRINCIPLE N° 1.12

1.13 Principle No. 1.13 - Positioning of Signals Reading Over Power Operated Points

1.13.1 Introduction

This Principle addresses the requirements for limiting the distance between a signal reading over a set of power operated points and the points.

1.13.2 Requirements

Signals are to be positioned to protect points, opposing movements and other hazards and to meet operational requirements, informing the driver of the route set and the conditions for safety proceeding including preparing to stop or be turned out through points.

Signals shall also be positioned in relation to points with consideration of containing the delays incurred when operating under the regulations for passing failed signals at stop and also of minimising the risk with keys obtained for emergency manual operation of points after trains have passed the immediate protecting signal.

Preferably the first set of power worked points should be within 300 metres of the protecting signal and the last preferably within 750 metres.

Except where track geometry, storage capacity of loops or sidings or obstruction (such as platforms) prevents, signals should not be placed within 15 metres of the tip of the points.

1.14 Principle No. 1.14 - Reading Through

1.14.1 Introduction

This Principle addresses the concept of "Reading Through", the circumstances under which it is likely to occur and the methods of minimising its occurrence.

1.14.2 Concept

The term "Reading Through" arises from situations under which the aspect displayed by a running signal is readily visible to the driver of a train and conflicts with the aspect displayed by the signal towards which the train is approaching or at which the train is already at a stand.

Should the driver of the train inadvertently respond to a less restrictive aspect displayed by the signal in advance, then depending on circumstances, the possibility of a dangerous situation arising could occur.

1.14.3 Provision of Controls to Minimise Reading Through

If a situation arises regularly under which a signal displays a more restrictive aspect than the aspect displayed by the running signal in advance which is also readily visible to a driver, then consideration shall be given to the provision of aspect controls to minimise the possibility of "Reading Through" occurring.

1.14.4 Typical Arrangements

The following typical arrangements should be taken as guidelines for the application of this Principle.

1.14.4.1 At Facing Points

If a train turns-out through a facing connection, then it may be desirable to maintain the signal next in advance on the straight line at stop if the facing points are reverse. Refer to figure 1.

Where separate berth track circuits are provided this condition shall be overridden by the berth track circuit occupied.

1.14.4.2 At Trailing Points

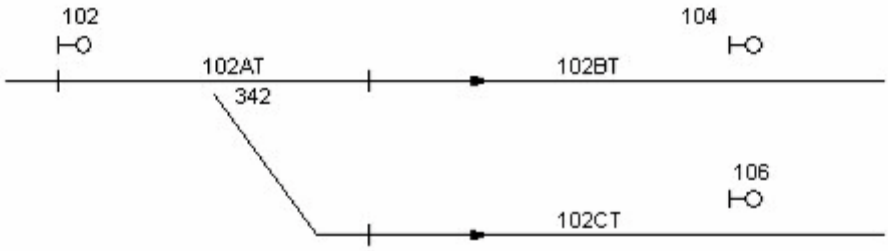
If a train movement is through a trailing connection which is laying the other way to facilitate another train movement then it may be necessary to maintain the signal next in advance of the trailing connection at Stop unless its berth track circuit is occupied by the other train movement. Refer to figure 2.

1.14.4.3 At Flat Crossings

If a train passes over a flat crossing, then it may be necessary to maintain the signal in advance at Stop unless its berth track circuit is occupied. Refer to figure 3.

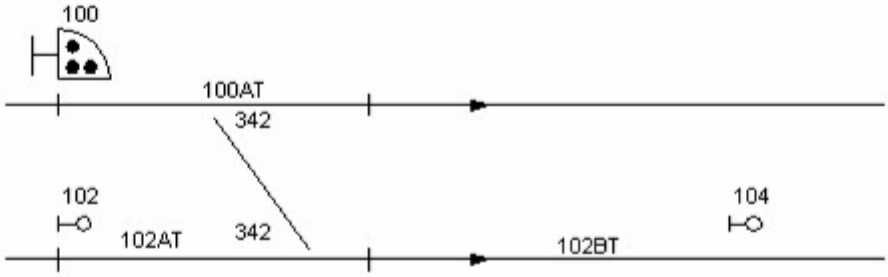
1.14.4.4 Between Old and New Signals

If a train is detained at an existing signal and the signal is fitted with lamps of low intensity or is of a different type, or is sighted in an unfavourable position then it may be necessary to maintain the new signal next in advance at Stop. Refer to figures 4 and 5. Also refer to Principle 1.16.4.



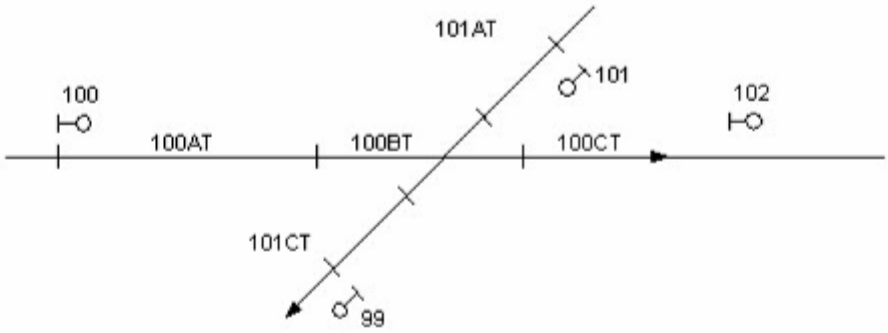
104 REQUIRES 102BT OCCUPIED OR 342 NOT REVERSE
FACING POINTS

FIGURE 1



104 REQUIRES 102BT OCCUPIED OR 342 NOT REVERSE
TRAILING POINTS

FIGURE 2



102 REQUIRES (100CT OCCUPIED OR 101 NORMAL) 101AT CLEAR
99 REQUIRES (101CT OCCUPIED OR 100 NORMAL) 100AT CLEAR
FLAT CROSSING

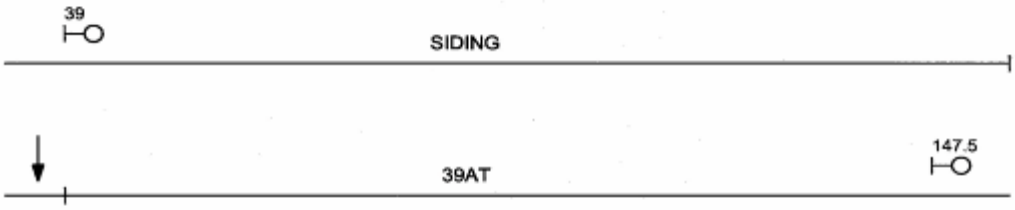
FIGURE 3

PRINCIPLE 1.14

147.5 REQUIRES 39AT OCCUPIED OR 39 REVERSE

MIXED TYPES OF SIGNAL

FIGURE 4



147.5 REQUIRES 39AT OCCUPIED OR 39 CLEAR

SIGNAL IN AN UNFAVOURABLE SIGHTING POSITION

FIGURE 5

READING THROUGH

PRINCIPLE 1.14

1.15 Principle No. 1.15 - Intermediate Shunt Signals

1.15.1 Introduction

This Principle addresses the designation of and requirements for intermediate shunt signals including locking and aspects to be shown.

1.15.2 Designation of an Intermediate Shunt Signal

If a shunt signal is positioned such that a proceed aspect shown by a running signal in rear authorises a movement which passes the shunt signal then the shunt signal shall be designated an intermediate shunt signal and be shall capable of being overset by the running signal in rear. Refer to figure 1 and figure 2.

1.15.3 Requirements

1.15.3.1 Aspects

If it is required to clear the running signal immediately in rear of an intermediate shunt signal then the running signal shall over-set the intermediate shunt signal and the intermediate shunt signal shall be proved clear before the running signal is permitted to clear.

If it is required to clear the running signal immediately in rear of an intermediate shunt signal, but as a condition of the aspect sequence it is not possible to display a full proceed (ie. clear) aspect in the running signal, then the intermediate shunt signal shall show a yellow aspect.

If it is required to clear a running signal immediately in rear of an intermediate shunt signal and as a condition of the aspect sequence it is possible to display a full proceed (ie. clear) aspect in the running signal then the intermediate shunt signal shall show a green aspect.

1.15.3.2 Route Indicators

If the intermediate shunt signal is fitted with a route indicator then this shall be displayed if the shunt signal has been over-set by the running signal in rear to show a yellow aspect.

The route indicator shall not be displayed if the shunt signal has been over-set by the running signal in rear to show a green aspect.

1.15.3.3 Aspect Replacement

If the intermediate shunt signal has been over-set by the running signal in rear then it shall not be replaced unless an authorised running movement passes it or it has been manually replaced by an operator even though the running signal in rear has been replaced.

1.15.3.4 Aspect Controls

The control of the green aspect on the intermediate shunt signal shall include all the track circuit sections up to the running signal next in advance and the first track circuit ("A" track) beyond.

1.15.3.5 Setting, Locking, Approach Locking and Route Holding

Full independent setting, locking and route holding shall be provided for the intermediate shunt signal which when over-set shall operate in parallel with that provided for the running signal in rear.

If the intermediate shunt signal has been over set by the running signal in rear then the approach locking of the intermediate shunt signal shall be extended by the addition of the approach locking applicable to the main running signal.

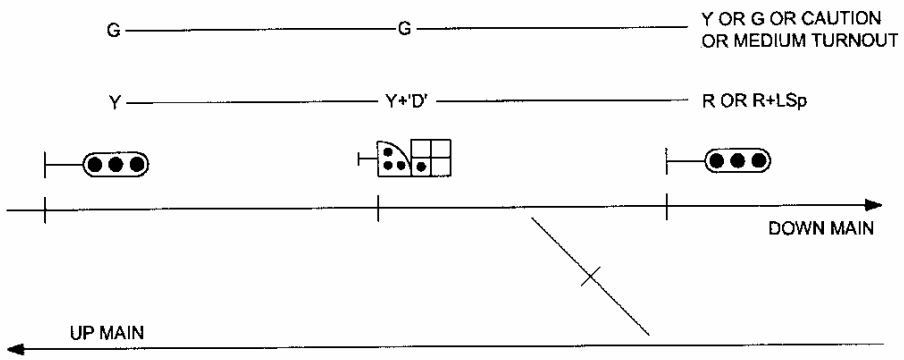


FIGURE 1

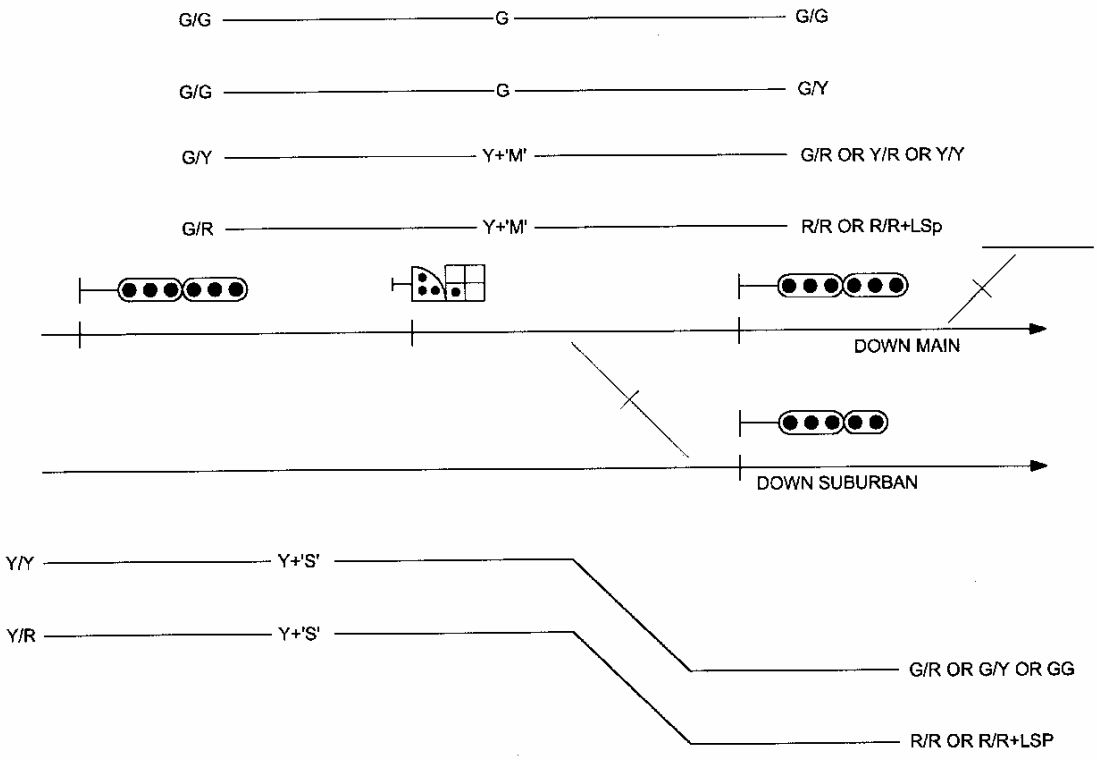


FIGURE 2

INTERMEDIATE SHUNT SIGNALS

PRINCIPLE N° 1.15

1.16 Principle No. 1.16 – Incandescent Lamps for Colour Light Signals.

1.16.1 Introduction

This Principle addresses the need to minimise and standardise the types of incandescent lamps to be used in colour light signalling territory and for isolated colour light signals.

1.16.2 Type of Lamp for Running Signals

1.16.2.1 Requirement

This shall be a double filament lamp type SL35 to BS 469 rated at 12V 24/24 watts and fitted to all main running aspects and where additionally provided to:

- Running turnout aspects
- Subsidiary aspects
- Marker Lights
- 'A' lights

Exception: Lamps in tunnel type running signals with small size aspects located in underground sections of railway not subjected to any natural sources of light either in front of or behind the aspect may be rated at a lower wattage.

1.16.2.2 Operating Voltage

SL35 lamps shall be operated within the voltage range 11.3 - 11.7V measured across the terminals of the lamp holder.

Exception 1 (excluding SSI Interlockings): SL35 Lamps fitted to marker lights shall be operated within the voltage range 10.2 - 10.7V measured across the terminals of the lamp holder

Exception 2 : Edison screw type lamps fitted to tunnel type running signals shall be operated within the voltage range 10.7 - 11.2V

Exception 3: AAR Lamps fitted to tunnel type running signals shall be operated within the voltage range 9.4 - 9.7V

1.16.3 Type of Lamp for Shunting Signals

1.16.3.1 Requirement

This shall be a single filament standard bayonet cap lamp rated at 130V 60 watts (conventional) or 120V 40 watts (SSI interlocking) and fitted to the horizontal and vertical forms of shunting signals.

Exception: If lamps are to be operated from solar power supplies they may be SL35 lamps.

1.16.3.2 Operating Voltage

The 130V 60 Watt and 120V 40 watt lamps shall be operated at the supply bus bar voltage, 120V nominal.

Exception: Lamps operating as marker lights in shunting signals shall be underrun by operating them in series with a 100 ohm resistor rated at 60 watts.

1.16.4 Retrospectivity

Consideration shall be given to situations where the replacement of running signals fitted with SL35 lamps could give rise to "reading through" conditions from existing running signals in rear. Refer to Principle No. 1.12.

1.17 Principle No. 1.17 - Signal Lamp Proving

1.17.1 Introduction

This Principle addresses the concepts and requirements for the provision of fail-safe signal lamp proving and controls for single light colour light and double light colour light running signals.

It also provides definitions of various types of signal lamp proving.

1.17.2 Lamp Proving - Concept

Where provided this feature enforces a fail-safe control to be exercised on the signal (or signals) in rear of the signal at which a running signal lamp has failed thus restricting the movement of a train towards the "dark" signal.

Consequently the potential for a derailment on a turnout or a rear end collision caused by an approaching train running past the "dark" signal is reduced to an extent depending on the nature of the vital controls exercised and the spacing of the signals in the system.

On double light colour light signals, a single green light may be misleading to train drivers and lamp proving is to include one or both main running lights out.

1.17.3 Lamp Proving - Definitions

A fail-safe method of monitoring the integrity of the filaments in a running signal lamp such that a total failure of the signal lamp which should be operating shall result in a change-of-state of a fail-safe lamp proving function.

Lamp proving which detects that the lamp filament is intact when the normal operating current is passing through the filament is known as hot proving.

Lamp proving which detects that the lamp filament is intact when the lamp is not operating using current sensing methods is known as cold proving.

NOTE: In the future when microprocessor based systems are installed both systems of proving will probably be available for application.

1.17.4 Signal Lamp Proving and Controls

i. For signals with incandescent lamps, lamp proving shall be provided on all single light colour light signals and new double light colour light signals.
For LED signals, lamp proving shall be provided on all single light signals but only on the first three double light signals at interfaces between single and double light signals.
(Exception: where lamp proving is part of the type of CBI interlocking used)

ii. If a signal lamp which should be operating is proved to be out then the aspect of the running signal in rear shall be restricted to caution or caution turnout if applicable.

iii. On single light signals, if a signal lamp which should be operating is proved to be out then the marker light on the signal shall be illuminated.

iv. On single light signals, if a signal lamp which should be operating is proved to be out and it is the lamp for the stop aspect of the first home signal controlling movements off a single line section in C.T.C. territory, then, to avoid a possibility that the subsidiary signal might be initially interpreted as a running signal proceed indication, any subsidiary signal fitted to the first home shall not display a proceed aspect until a train is closely approaching the signal whereby it's speed will have reduced to a speed commensurate with that required for the subsidiary signal movement. Refer to Principle 1.6.3.

v. Where advantageous, additional and separate lamp proving of the green light aspect on a single light signal shall be provided such that when the green light which should be operating is proved to be out the yellow or pulsating yellow aspect is displayed.

1.18 Principle No. 1.18 - Signal Lamp Failure

1.18.1 Introduction

This Principle addresses the concepts and provision of first filament failure of incandescent lamps, total lamp failure and the associated warnings, alarms and indications to be provided.

1.18.2 First Filament Failure Warning Concept

This feature enables a non vital warning to be given to an operator which indicates that the first filament of a double filament incandescent signal lamp has failed and is therefore in need of replacement.

This warning avoids the regular time-based replacement of signal lamps prior to the failure of their first filament.

1.18.2.1 Requirement

First filament failure warning shall be provided for all colour light running signals and, where economically viable, for subsidiary signals, when incandescent lamps are used.

Marker lights and 'A' lights need not be provided with first filament failure warning.

1.18.3 Lamp Failure Alarm Concept

This feature enables a non vital alarm to be given to an operator which indicates a total failure of a signal lamp occurred, the signal is not displaying a running aspect, and that the lamp is in need of urgent replacement.

1.18.3.1 Requirement

Lamp failure alarms shall be provided for all single light colour light running signals in colour light territory.

1.18.4 Grouping of First Filament Failure Warnings and Lamp Failure Alarms

First filament failure warnings and lamp failure alarms shall be logically grouped to ensure that a common warning or alarm can service all the running signals in a particular group.

Particular groups can be formed by applying a hierarchy of geographical sorting criteria generally as follows:

- Automatic Section or Interlocking Area.
- Up line or Down line.
- Other significant lines.
- East (North) or West (South) end of Auto section or Interlocking Area, or Line.

At very large installations it may be necessary to limit the number of running signals in each group to a particular number.

1.18.5 Lamp Out Indication

1.18.5.1 Concept

This feature enables a lamp out indication to be given to an operator which indicates a total lamp failure usually by failing the signal clear repeater.

1.18.5.2 Requirement

Light out indications shall be provided for all controlled single light colour light running signals.

1.19 Principle No. 1.19 - Track Circuit Control of Running Signal and Subsidiary Aspects

1.19.1 Introduction

This Principle addresses the requirements for the control of caution, conditional caution, low speed and subsidiary shunt aspects on running signals by track circuits but is not applicable to the City underground.

1.19.2 Requirements Caution Aspect

If all the track circuits are clear from a running signal to the end of its caution overlap then subject to any other controls the running signal may display a caution aspect. Refer to figure 1.

1.19.2.1 Conditional Caution Aspect

If the distance between running signals is less than 500 metres and if all the track circuits are clear from a running signal to a point nominally 100m and an absolute minimum of 50m past the running signal next in advance then following the expiry of a time delay on the berth track circuit and subject to any other controls the running signal may display a conditional caution aspect. Refer to figure 1.

If the signal spacing is greater than 500 metres the conditional caution aspect must not be displayed unless the track circuits are clear from a running signal to an available overlap not less than 200 metres.

1.19.2.2 Low Speed Aspect

If the distance between running signals is less than 500 metres and if all the track circuits are clear from a running signal to an available overlap which is less than 50m then a conditional low speed aspect shall be displayed following the occupation of the berth track circuit for a sufficient period to bring the train to a stand or nearly to a stand.

Note 1: The operation of trainstops shall be in accordance with Principles Nos. 15.2, 15.3 and 15.4.

Note 2: The locking of the overlap shall be in accordance with Principle No.4.12 as applicable.

1.19.2.3 Subsidiary Shunt Aspect

If it is required to move a train beyond a running signal into an occupied section as far as the line is clear or perform a shunting movement then generally a shunt aspect shall be displayed unconditionally although it may be desirable to clear certain shunt signals conditionally.

The trainstop is not normally proved in the shunt signal.

Subsidiary shunt aspects do not usually operate the train stop. Where it is necessary to operate the train stop, such as for regular movements into terminating roads, or electric car maintenance depots, the train stop shall be conditionally cleared subject to the speed of the train being proved to be at or less than 35km/h. Lower timing speeds may be appropriate in some circumstances.

Train stops are not usually lowered when the aspect is used for closing up purposes, or in the event of track circuit failure.

Track circuit controls shall not normally be provided in the shunt aspect other than for a lever stick feature or hold clear on berth track occupancy feature depending on operational requirements. Refer to figure 1.

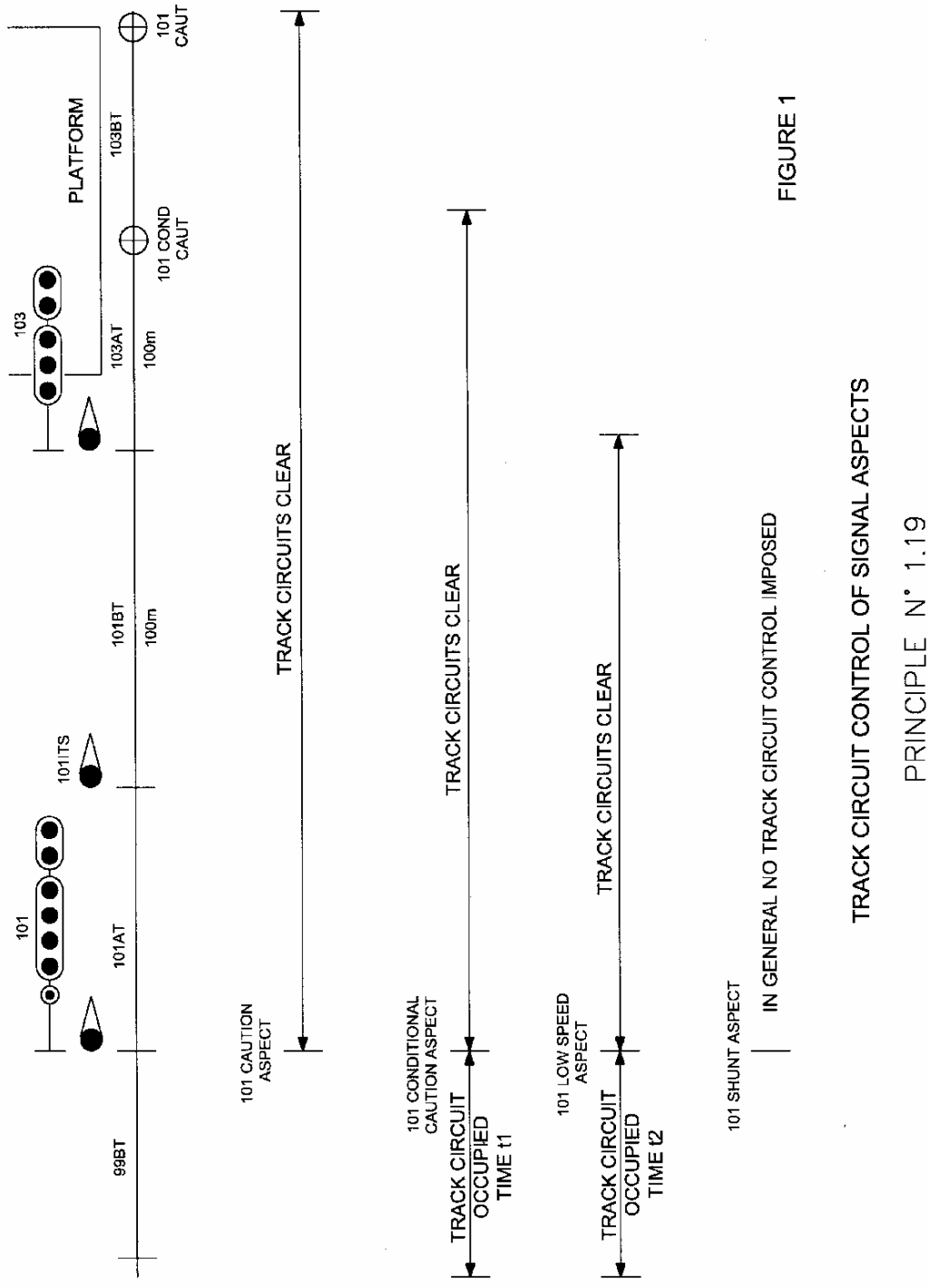


FIGURE 1

TRACK CIRCUIT CONTROL OF SIGNAL ASPECTS

PRINCIPLE N° 1.19

1.20 Principle No. 1.20 - Track Circuit Control of Ground Shunting Signals

1.20.1 Introduction

This Principle addresses the requirements under which track circuit controls may be applied to shunting signal aspects.

1.20.2 Requirements

Generally, except where detailed hereunder, no track circuit control of ground shunt signals is required. However ground shunt signals control a variety of low speed movements and each specific or special application should be considered on its merits.

A short lever stick track circuit should be provided to ensure signal replacement, or, depending on operational requirements, approach track circuit occupancy and hold clear features may be provided in special cases to effect the signal replacement when the train has fully passed the signal.

Consideration should be given to including platform track circuits in the control of a shunt signal leading into the platform if a train conveying passengers is likely to be at a stand in the platform.

Where a train stop is provided (exceptionally) at a ground shunting signal, the operation of the train stop will be as described in 1.19.2, Subsidiary Shunt Aspects.

1.21 Principle No. 1.21 - Replacement of Controlled Signals

1.21.1 Introduction

This Principle addresses the requirements for the provision of enforced replacement of controlled running signals following the passage of a train, ie. lever stick control.

1.21.2 Purpose

The purpose of lever stick control is to prevent a controlled signal from automatically reclearing once all the track circuits controlling the lowest proceed aspect are clear.

Automatic reclearing may be undesirable where it has the potential for allowing following trains to be signalled in the wrong direction, in the wrong order or into a situation where restricted locking is applied if the operator inadvertently fails to normalise the route after the first train has passed the signal.

1.21.3 Requirements

All controlled running signals shall be provided with enforced replacement (lever stick control) which requires the replacement of the route to the normal state before it is again reversed and the signal recleared for the following train.

Lever stick control shall not be effective if a controlled signal has been selected to operate in automatic reclearing mode if provided. Refer to Principle No. 1.22

1.22 Principle No. 1.22 - Automatic Reclearing Of Signals

1.22.1 Introduction

This Principle addresses the requirements for the provision of automatic reclearing of controlled running signals.

1.22.2 Purpose

Automatic reclearing enables a controlled running signal which has already been set to operate in the same manner as automatic signals and thus avoid the need for the operator to "restroke" the signal.

1.22.3 Requirements

Automatic reclear shall be provided on all controlled running signals which require to be repeatedly cleared by an operator for the passage of non diverging following trains.

An individual automatic reclear push/pull button or an equivalent individual keyboard command shall initiate and cancel the automatic reclear feature.

The automatic reclear feature shall only be available and initiated if the route has already been set.

The cancellation of the automatic reclear feature shall be effected either by the automatic reclear feature being disabled or the signal being restored and the route normalised by the operator.

1.22.4 Control Tables

The routes of controlled running signals which are provided with an auto reclear feature shall be clearly marked in the control tables.

1.22.5 Controls

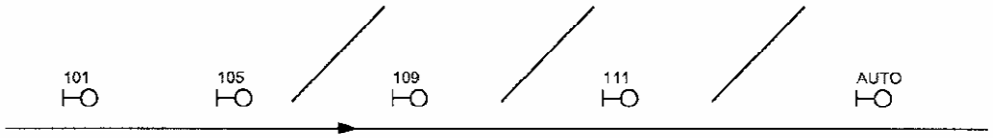
While the automatic reclear feature is in operation it shall inhibit the operation of the lever stick and automatic normalisation controls.

Signals may be provided with an individual auto reclear feature or they may be suitably grouped and provided with a common auto reclear feature.

The control may be enabled by a push button or suitable keyboard or mouse commands.

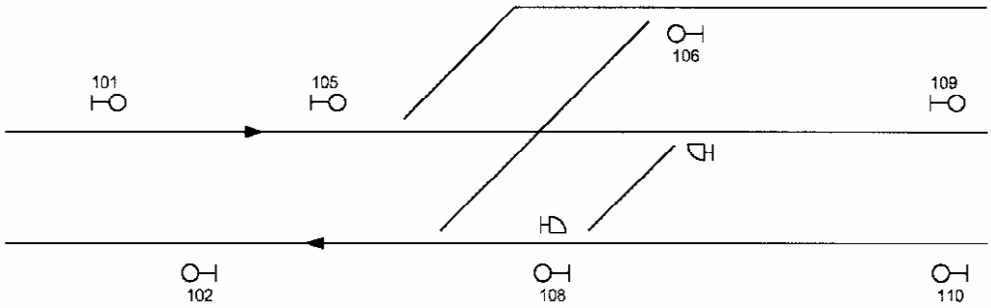
1.22.6 Indications

An indication shall be displayed for each individual or group reclear feature when it has been enabled.



DOWN MAIN GROUP 101 & 105
DOWN MAIN INDIVIDUAL 109 & 111

FIGURE 1



UP MAIN GROUP 102, 108 & 110
DOWN MAIN GROUP 101, 105 & 109

FIGURE 2

AUTOMATIC RECLEARING OF SIGNALS

PRINCIPLE N° 1.22

1.23 Principle No. 1.23 – Guards Indicators.

1.23.1 Introduction

Guards Indicators are provided to give an indication to the guard that the signal at the end of the platform is clear and the driver can be belled to depart.

Platform markers are provided which designate the location at which each type of train consist must be positioned.

The driver must stop the train at the correct marker in order to ensure that the guard is in a position to observe the correct guards indicator from the guards work station.

1.23.2 Purpose

The indicator, in conjunction with the Network Rules, prevents a guard giving the "right away" bell with the signal at stop and reduces the possibility of the driver reacting and passing the signal at stop.

1.23.3 Requirements

1.23.3.1 Provision of Guards Indicators

A guards indicator is to be provided where a signal is provided at the end of the platform, or less than a train length from the end of the platform.

1.23.3.2 Form of Guards Indicators

The guards indicator shall take the form of a lunar white (old standard) or light blue light.

A "Guards Indicator" sign is mounted below the light.

1.23.3.3 Control of Guards Indicators

The guards indicator is to illuminate when any aspect (including a shunt indication) on the signal at the end of the platform is cleared.

1.23.3.4 Location of Guards Indicators

Guards indicators are to be visible to the guard from any locations that the guardmay be positioned. At some locations additional guards indicators may be required at other locations along the platform.

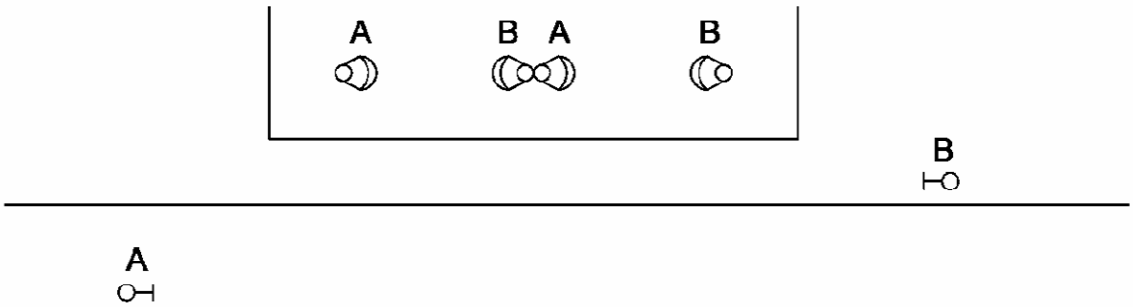
Guards indicators are to be oriented so that the guard is to view the indicator in the direction the train is to move.

On platforms with two way operations separate guards indicators are to be provided for each direction.

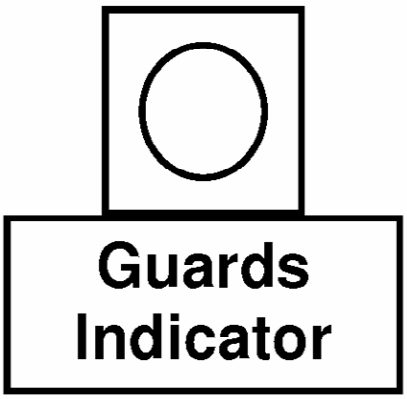
1.23.3.5 Previous Arrangements of Guards Indicators

Where arrangements of Guards indicators exist and operate together, the installation of repeat guards indicators for each direction at the same location must be assessed in view of the existing installations.

This may involve the upgrading of all guards indicators arrangements at that site, to be direction orientated.



GUARDS INDICATORS TYPICAL ARRANGEMENT DIAGRAM



1.24 Principle No. 1.24 – Dual Controlled Signals.

1.24.1 Introduction

Where there is a requirement for a signal to be dual controlled from two interlockings, this principle determines the identification plates to be provided on the signal plus the control panel inscriptions and indications.

Dual control is required where one signal has interlocking requirements from two separately controlled and located interlockings.

1.24.2 Form of Plates

The form of the plate shall be in accordance with Principle 1.2.

1.24.3 Identification to be Shown on Plates.

It is important that both signalling panels that control the signal identify the signal by the same number as shown on the signal nameplate.

The signal box identifier to be used is to be chosen after consideration of:

- The risk that exists immediately after the signal
- The controlling signal box that the signal post telephone contacts
- The interlocking that is required for that signal to clear.

Generally, a signal that protects points will be plated with the signal box that controlled the points.

Accepting and Home functions are to take priority over starting signal functions on double lines.

On single lines, home and starting functions will take priority over Accepting functions.

1.24.4 Control Panels

Dual controlled signals on control panels are to be provided with an additional inscription, such as

"Controlled by B1" or "Accepted by B1"

to identifying the control lever in the adjacent signal box.

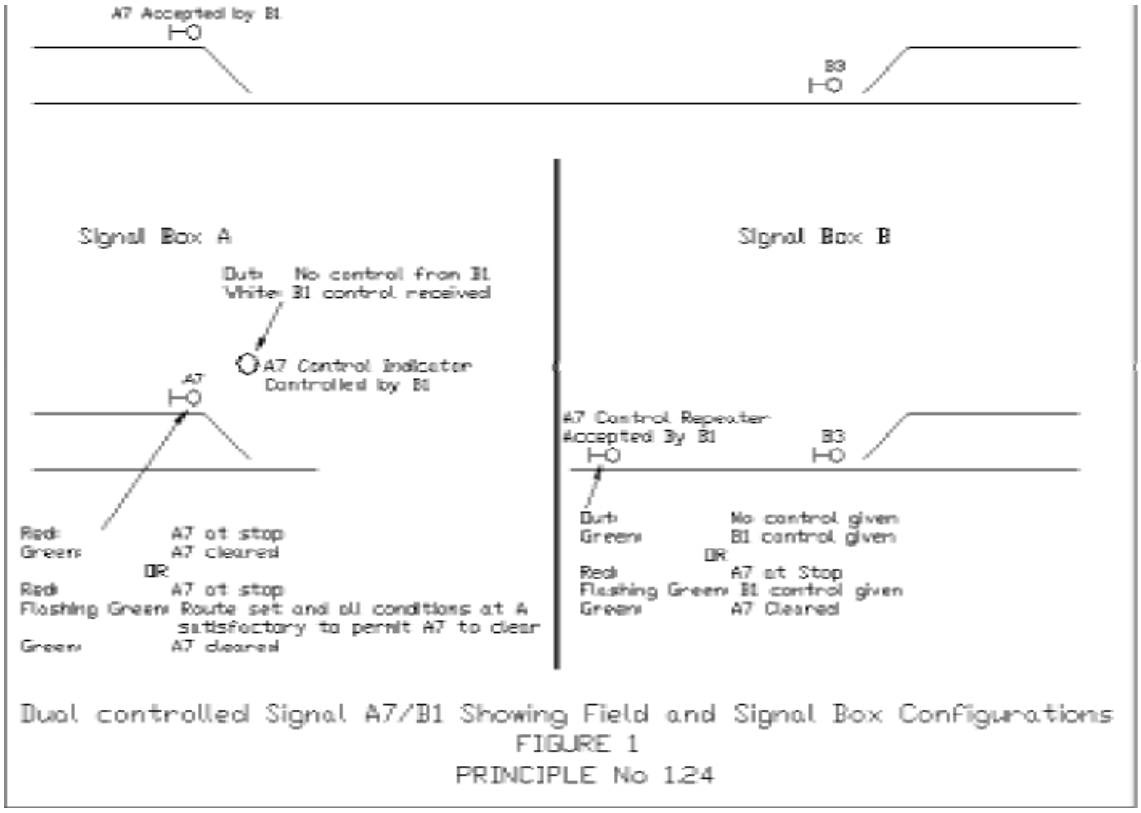
Control indicator (white) lights are to be provided for signals departing the interlocking. These are a separate light to the signal repeater.

Control repeater (green) lights are to be provided for signals accepted by the interlocking. These signals may not be provided with a signal repeater, as the adjacent signal box may have prime control on this signal.

Where signal repeaters are provided in conjunction with control repeaters, the following indications shall be displayed:

Red	Signal at stop.
Flashing Green	Signal at Stop but controlling route has been set. The signal will clear when the adjacent box sets the route.
Green	Signal cleared.

A typical arrangement is shown in Figure 1.



Dual controlled Signal A7/B1 Showing Field and Signal Box Configurations
FIGURE 1
PRINCIPLE No 1.24

1.24.5 Dual Controlled Signals Controlled by the One Signaller.

When two adjacent interlockings are controlled from the one location, the dual control indication arrangements (ie control indicators and control repeaters) are not required.

1.24.6 VDU Systems

The precise application of Control Indicators and Control Repeater Indications may vary with VDU systems, as type approved for that system.