



AN INTRODUCTION TO BELGIAN SIGNALLING

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**AN INTRODUCTION TO
BELGIAN
SIGNALLING**

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A. INTRODUCTION

1. The HLT

The book HLT is the NMBS/SNCB drivers' rulebook. It contains full details of signal aspects and meanings.

2. The ARGSI/RGUIF

The ARGSI/RGUIF is effectively the infrastructure railway rulebook.

3. The SSP/PSS

The SSP/PSS are the comprehensive diagrams of all signalling and marker boards. Copies of these diagrams are available for inspection by train drivers at all booking-on points. Signals are indicated by a series of symbols. The drivers also have route maps as a help for route learning.

4. Gauge

The standard track gauge in Belgium is 1435mm.

B. BASIC PRINCIPLES

1. This paper will deal with modern colour light signalling

They're also:

- Two aspect semaphore mechanical signals; which is route related signalling and survives in a few areas.
- Three aspect semaphore mechanical signals; which has now disappeared and was a combination of route and speed related signalling.
- Semaphore signals of German origin of which a few survive.
- Modern colour light; which, combined with speed indication boards, is an entirely speed related system.

Before describing the actual signalling systems, it is essential to detail some fundamental terminology around which the signalling is based. The terms involved are "Characteristic of Movement", "Type of operations" and "Running".

2. Characteristics of Movement

There are two characteristics of movements:

Train - this is any movement which is allocated a train number and a timetable. The maximum speed of a "train" is indicated by the signalling.

Shunting - any movement other as a train described above. Such movement is subject to a maximum speed of 40 kph.

3. Types of operations

A train or shunting can travel in one of two types of operations:

"Large Movement", it will be referred to throughout simply "GB/GM". These are normally running moves with the maximum speed dictated by the signalling. It takes always place under predetermined regime

"Small movement", designated "KB/PM". These are subject to running at movement on sight, prepared to stop short of any obstruction with a maximum speed of 40 kph. An example of a "KB/PM" would be when a train passes a signal to couple to another train.

Stop signals for large movements (known as "great stop signals") apply to both "GB/GM" and "KB/PM". Stop signals for "KB/PM" (small stop signals) apply only to small movements (normally shunting).

4. Running (Regime)

Large movements are subject to a regime ("running" is the nearest English equivalent) - "normal track" and "against normal track" or wrong direction. A line on which the signalling allows trains to run in both directions, are "Bi-directional lines".

Normal track - the signals are normally placed to the left of the track, and in colour light format, exhibit a steady aspect.

Against normal track (against the normal flow of traffic) - the signals are normally placed to the right of the track and, in colour light format, exhibit flashing aspects. The flashes are at 1 Hz (one cycle per second).

Small movements are not subject to a running (regime); drivers running in KB/PM must obey all signals.

C. COLOUR LIGHT SIGNALLING

1. Colour light signals can be grouped as follows:

- . simple stop signal
- . combined stop signal
- . warning signal
- . small stop signal and simplified stop signal.

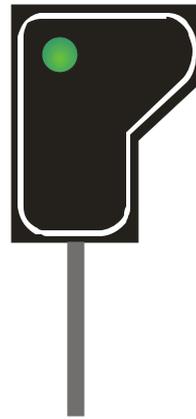
The first three of the above categories can be for the running (regimes) - "normal track" or "against normal track".

There are two styles of signal head:

Type 1



Type 2



It should be noted that type 1 is only used for a simple stop signal, and only shows red or green aspects.

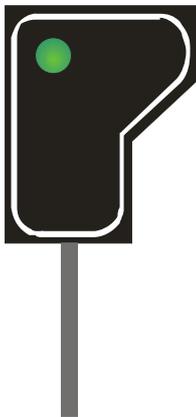
2. Type 2 signals

If the signal "point" towards the track to which they apply, thus with an "ear" to the right they will normally be placed to the left of the track and apply to normal track and with an ear to the left they will be to the right of the track and have flashing indications and apply to against normal track. It should be noted that there are exceptions to this, in which case the signal post will have a blue disc indicator with an arrow pointing to the track to which the signal applies:

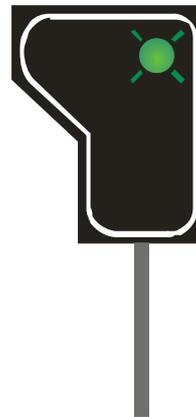


If the signal applies to both the left and right hand lines, there will be two discs.

normal track



against normal track



3. Stop signal

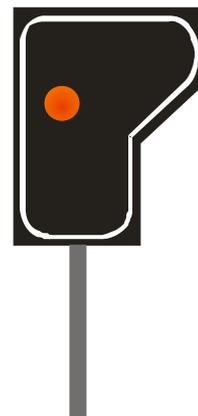
Type 1



Appearance - a single red light.

Function - an absolute stop on all movements.

Type 2



4. Warning signals

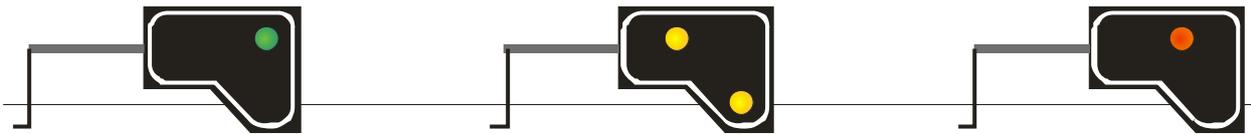
Appearance - two yellow lights diagonally arranged.



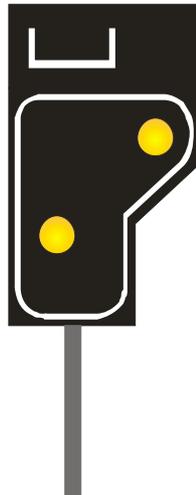
be prepared to stop at the next signal

Function - this indicates that the following signal is one of the following:
a stop signal
a lamp on a buffer stop
a simplified stop signal
a mobile stop signal - hand held or moveable signal.

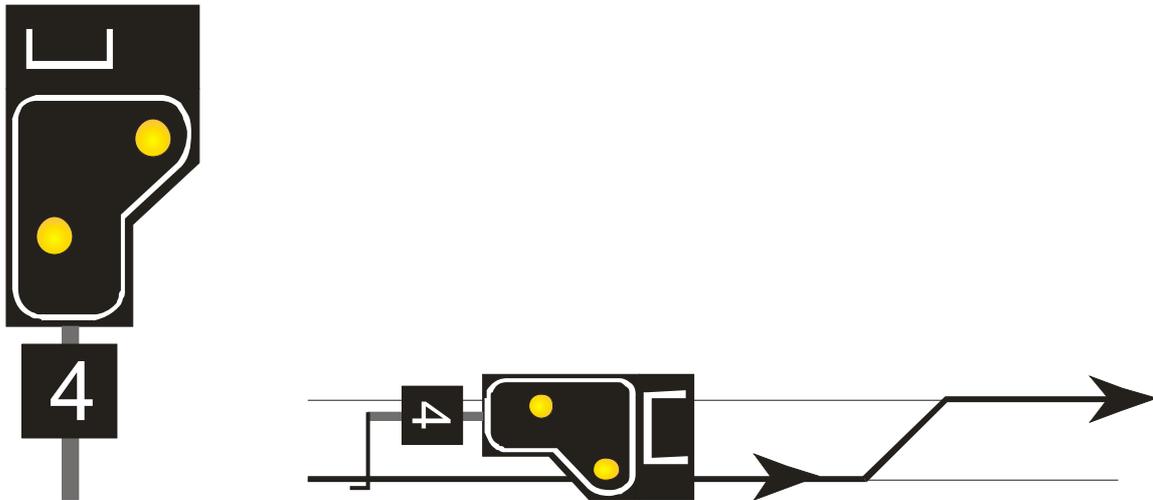
Example:



If there is an illuminated "U" sign above the signal, this indicates that the line to which the signal leads is a dead end:

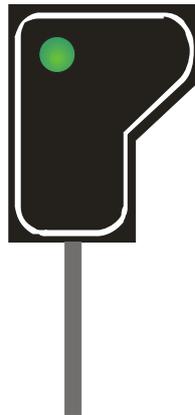


If the route is speed restricted, the maximum speed will also be displayed (as a tenth of the speed):



5.Green aspect.

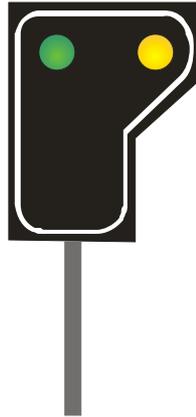
Appearance - a single green light.



Function - this indicates that a train may proceed in great movement without restriction up to the maximum authorized speed. The following signal will always be capable of displaying a warning aspect as a green light, cannot be followed by a stop indication.

5.1. Green and yellow lights horizontally displayed.

Appearance - green and yellow lights displayed horizontally.

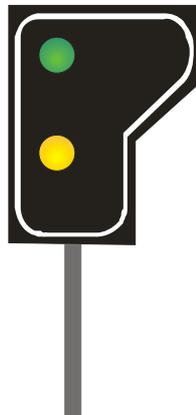


Function - this indicates that the following stop signal is open and thus displaying a proceed aspect but that it must be passed at reduced speed.

Unless indicated to the contrary, this speed restriction is 40 kph on passing the first set of points after this stop signal. In the situation where several speed restrictions can be indicated on the stop signal, and the difference between them is more than 30kph, a yellow number illuminates at the top of the main warning signal. This number indicates, in tens of kph, the reduced speed indicated by the stop signal. For the lowest speed (sometimes intermediate ones) the illuminated yellow number on the warning signal and the equivalent illuminated white number on the stop signal are surrounded respectively by a yellow and white border.

5.2. Green and yellow lights vertically displayed.

Appearance - green and yellow lights displayed vertically.



Function - this indicates that the following signal is open and thus displaying a proceed aspect but that one of the following applies:

- It will be displaying two yellows as an warning and the braking distance to the following stop signal is less than normal:
- It will be displaying two yellows as an warning giving access to a station line and the braking distance to the following signal, buffer stop, simplified stop signal, or a mobile stop signal, is less than normal.
- It will be displaying a green and yellow horizontally aspect and the braking to the following signal where a speed restriction is imposed is less than normal.

D. SIMPLE STOPSIGNALS, WARNING SIGNALS AND COMBINED SIGNALS

1. Simple stopsignals are those which can display two sequences of aspects only;

red - two yellows or
red - green

These signals are identified by a plate without a black dot, those for against normal track usually have an "X" after their identification letter. Identification for a stop signal is by white oblong plates with the identification letter shown as a capital:



normal track



against normal track

2. Warning signals

Warning signals, which cannot show a stop aspect, are identified by a circular yellow plate with the signal identification letter in lower case:

normal track



against normal track



3. Combined signals

Are stop signals which can also display the aspects of a warning for the following signal. They are identified as for a simple stop signal but with a black circle below the number:

normal track

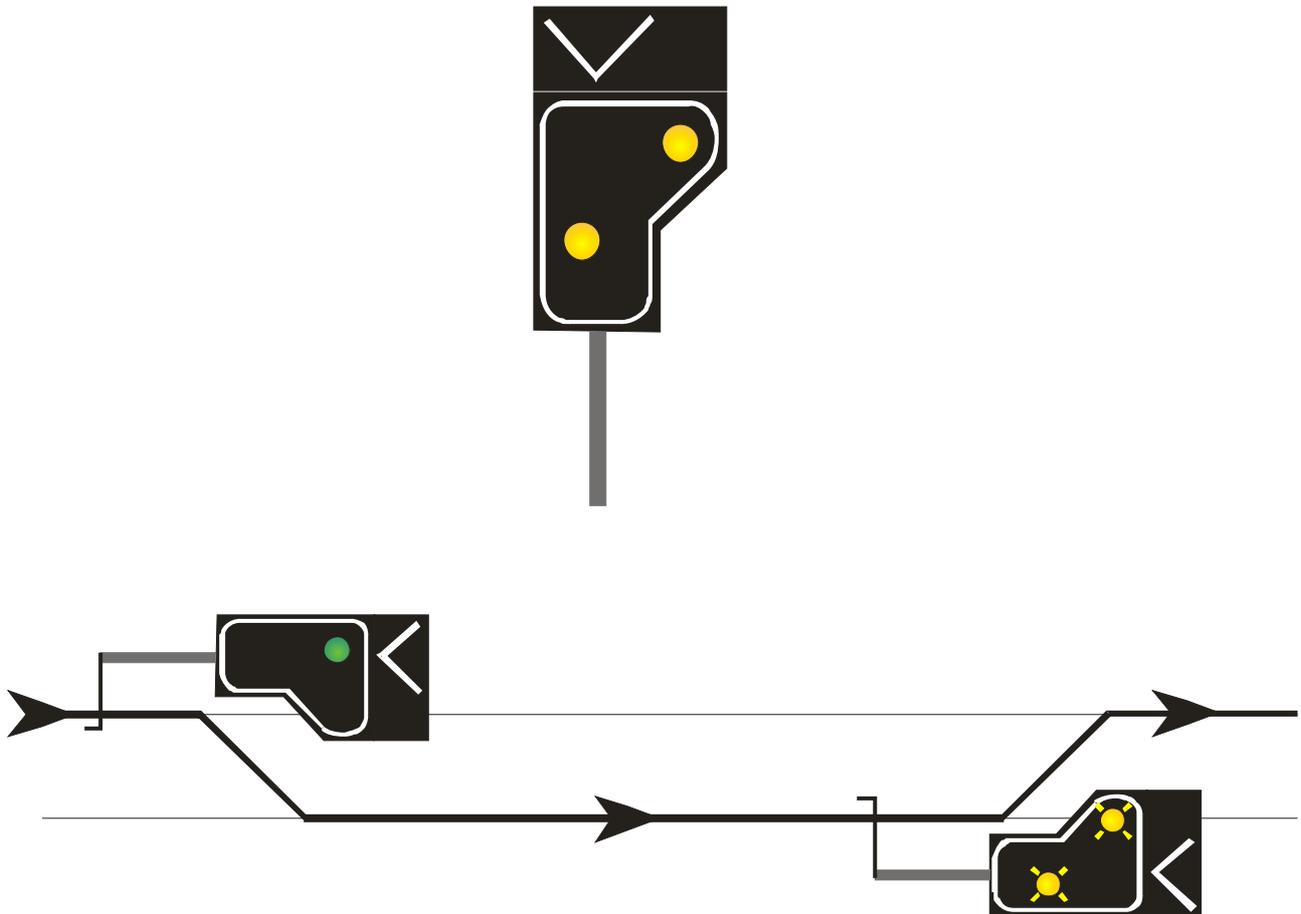


against normal track



E. CHANGE OF REGIME

When a train in great movement is about to be changed from normal track to against normal track, or vice-versa, this is indicated by the illumination of a 'V' symbol above the sign.
This can be illustrated as follows:

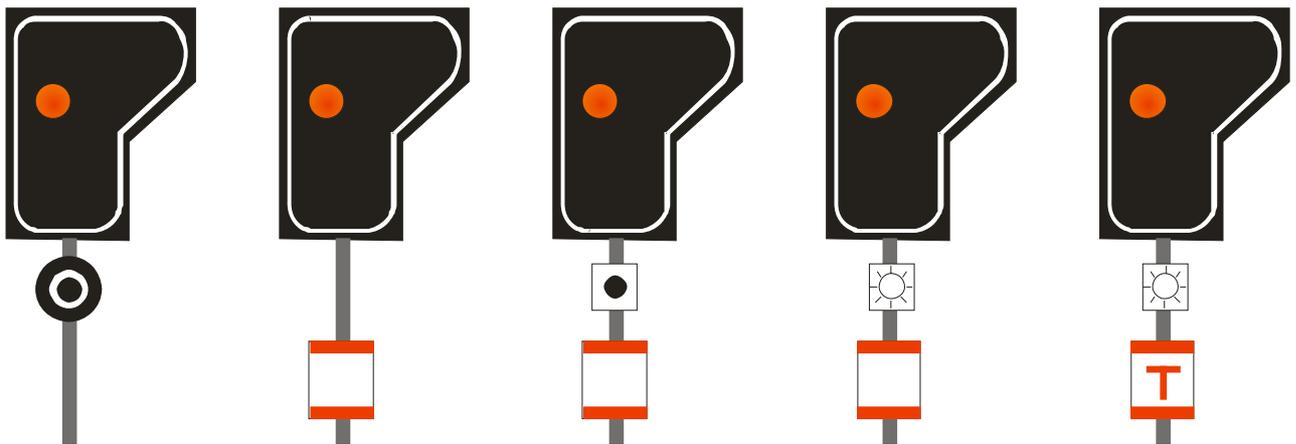


F. NON CONTROLLED SIGNALS (PERMISSIVE SIGNALS)

Certain stop signals are non controlled (permissive) and can be passed after carrying out procedures.

1. The signal is permanently non controlled (permissive)

It's indicated by what is known as "a passing corona" ore "a passing light".
Permanently non controlled



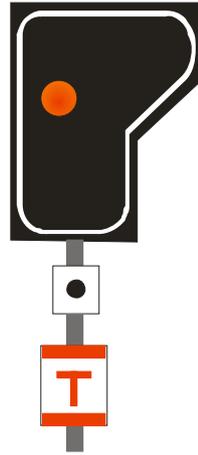
A non controlled signal is donated on the signal post by:

- either the presence of a passing corona this is reflective
- or the presence of a cabinet showing two red stripes. This signal may carry an passing light which may be either illuminated or not
- or the presence of an illuminated passing light fixed on the post of the signal which is equipped with a red T cabinet.

2. The signal is "occasionally non controlled"

The signal will have a passing light on the post. When the white light of this is illuminated, the signal becomes non controlled Here also, the passing light controls the normal working of level crossing(s). :

Occasionally non controlled (such as when the controlling signal box is closed)



After passing a closed non controlled signal the driver must proceed "on sight" as far as the next great stop signal - maintaining "on sight" until the signal is passed, even if it is observed from a distance to be displaying a proceed aspect.

3. The maximum speed on sight

The maximum speed on sight is in large movement calculated from the following:
In daytime, when visibility exceeds 200 metres, the speed must not exceed;

- 20 kph where maximum authorized speed of train is less than 60 kph .
- 40 kph where maximum authorized speed of train is 60 kph and less than 100 kph .
- 40 kph where maximum authorized speed of train exceeds 100 kph.

If the signal carries a plate indicating that there is a falling gradient in advance of the signal:



Then the speed on sight for trains with an authorized speed of above 60 kph and lower then 100 kph is reduced by 20 kph. As the speed on sight for trains with an authorized speed of 60 kph or less is only 20 kph, there is no further reduction enforced.

When visibility is less than 200 m or at night, the maximum speed must not exceed 20 kph.

In small movement, speed must not exceed 40 kph.

G. SIMPLIFIED STOP SIGNALS

Note the word "simplified" as opposed to "simple" - these are different from "simple stop signals".

The simplified stop signal applies to both great movements and small movements but does not change the nature of the movement. The red aspect requires all movements to stop at the signal, the yellow aspect authorizes the movement to pass.

These signals can be on a post or at ground level:



H. SHUNTING SIGNALS (SMALL MOVEMENT)

1. Shunting signal placed on a great stop signal.

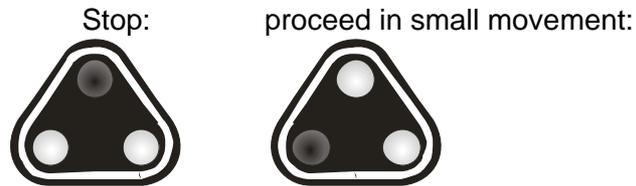
Appearance - a white aspect simultaneously exhibited with the red stop aspect.



Function - this authorizes a train to pass the signal in small movement, and transforms a great movement into a small movement.

2. Shunting signal with white aspects:

Appearance - ground fixed triangular signal with three white lights.



Function: two horizontal white lights means "stop".
Two diagonal white lights to authorize a small movement .

3. Shunting signal with violet and yellow aspects:

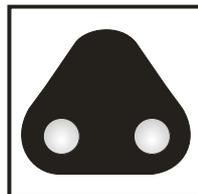
Appearance - ground based, with horizontal or vertical display.



Function: Violet aspect means "stop".
Yellow aspect to authorize a small movement .

4. Panel "Limit of small movement"

Appearance - white board with black drawing of triangular signal:



Function: this indicates the limit to which small movements may proceed. A form must be issued to pass this indicator.

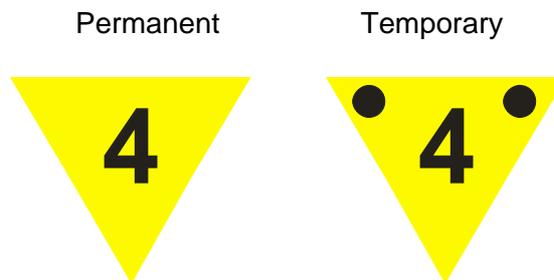
I. SPEED RESTRICTION INDICATORS

1. The speed restriction indicators,

which advise the maximum permissible speed (known as "reference speed") forms an integral part of the signalling system. Speed indications can be permanent or temporary and can be indicated by a display on the signal, a board on the signalpost or a separate line side board. All decreases in speed are given adequate warning. Indications are provided for both regimes, with signs to the right of the track for trains running against normal track.

As has already been explained, figures displayed indicate the reference speed in tenths of kph.

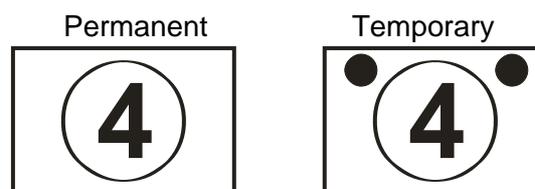
2. Type "a" - advance warning of a speed restriction:



Appearance - a yellow triangular board, point downwards, with the speed restriction figure as a black numeral. The temporary board also has two black "spots" at the top, and has at night two flashing yellow lights underneath.

Function - advance warning of a speed restriction. Placed at such a distance that if the driver commences to brake when he passes the board he will have slowed to the appropriate speed before he reaches the commencement board - the "origin".

3. Type "b" - Origin (Commencement of a speed restriction):

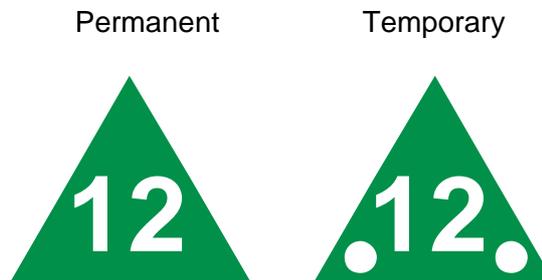


Appearance - an oblong white board with a black number in a circle. The temporary board has two black spots at the top.

Function - this marks the commencement of the speed restriction.

4. Type "c"

– reference speed (Commencement of a higher authorised speed):



Appearance - a green triangle, point upwards, with the speed numeral in white figures. The temporary board has two white spots at the bottom.

Function - these give the authority to run at, or return to, the line speed.

5. Type "bc" and "ac"

- authority to increase speed to a figure less than the line speed:

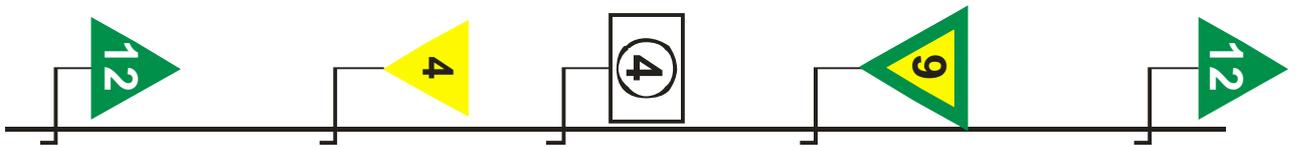


Appearance - a yellow triangle with a green border or vice versa, point downwards. The speed numeral appears as a black figure and the temporary board has two black spots at the top.

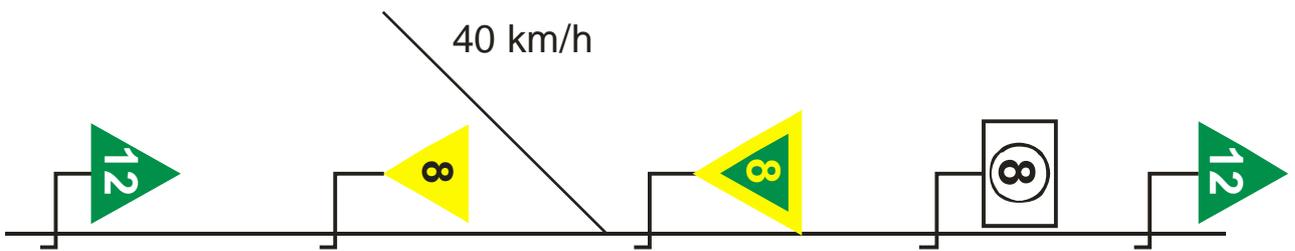
Function - this indicates the end of the reduced speed zone and advises of a higher authorized speed which is less than the reference speed.

6. Examples:

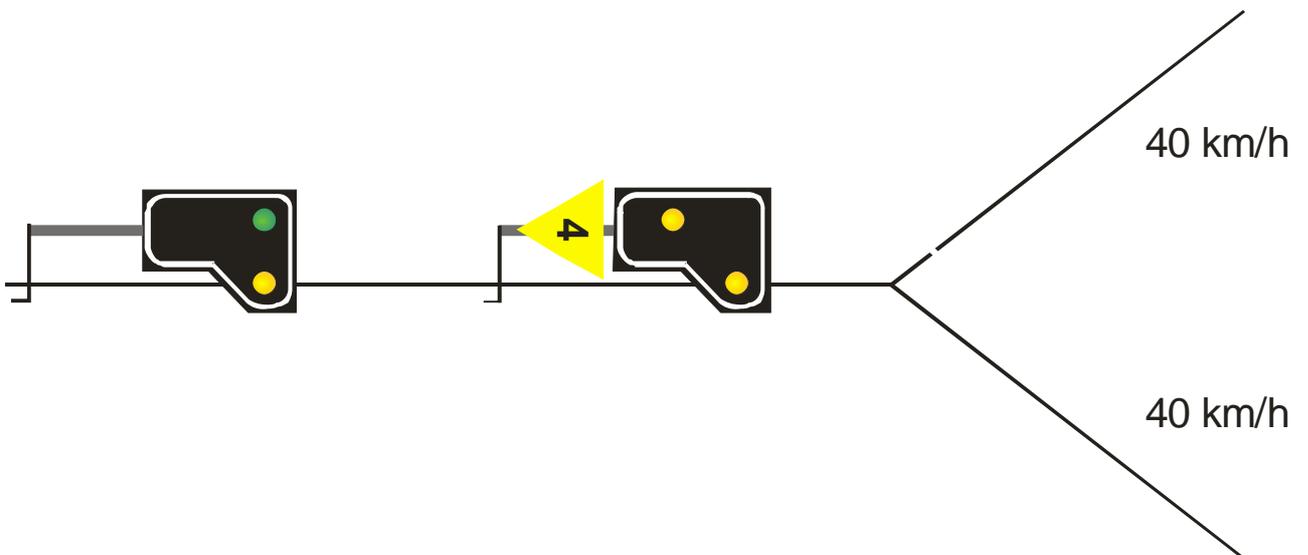
1. Simple restrictions:



2. Junction:



3. Combination with a signal:



- 4. The restriction can be indicated by an illuminated figure placed on a stop signal: If the speed restriction after a stop signal is always the same value and applicable, tan a black panel with white figures can be used.

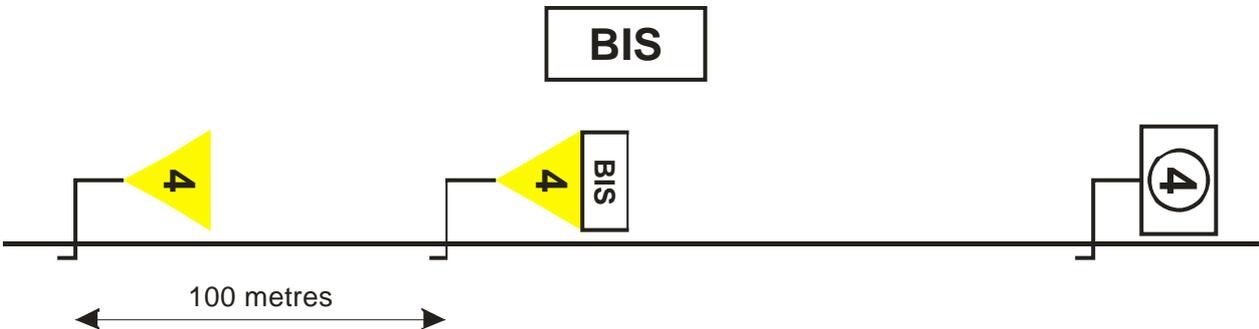


J. SPECIAL "SPEED" BOARDS

- 1. Some speed restrictions only apply to certain categories of trains or movements.
- 2. The restriction only applies to automotrices (ME) and autorails (MZ).



- 3. BIS- In certain cases of temporary speed restrictions, where the reduction is of more than 50 kph, the indication is repeated to increase safety:



- 4. Only applies to freight trains.



- 5. - Only applies to passenger trains.



Example:

60 kph for passenger trains and light locomotives

40 kph for all other trains.



6. - Only applies to electric locomotives.

LE

7. Only applies to diesel locomotives.

LZ

8. Only applies to bogie locomotives "light engine".

BOGIE

9. Only applies to small movements.

p.k.

10. The restriction applies in the direction of the line indicated by the number only (Note – all lines in Belgium are numbered - e.g., the line from Brussels to Ghent and Oostende is line 50A. Conveniently, these numbers are also used in the timetable. Thus:

L 50A

11. Moveable Signals of the track.

These can comprise flags, boards, lamps or flares.

They can be used at any time and in any place on the line. They apply equally to great and small movements, and do not alter the type of the movement. They're divided into four types:

11.1. Moveable Stop Signal.

This comprises a red flag, board, flare or lamp. Stop can also be indicated by any object (other than yellow or green in colour) being waved violently, or at night any light (other than yellow or green) waved violently.

This requires a driver to stop his train. It can be used to protect an obstruction, to replace a signal that is damaged or under repair, or as a temporary block signal.

11.2. Moveable Signal to impose a speed restriction.

This comprises a yellow flag, board or lamp. If a board is provided in emergency, it will be accompanied by two flashing yellow lights at night.

This authorises a driver to proceed at a speed not exceeding 20 kph, if no warning of the signal has been given proceed on sight is also imposed.

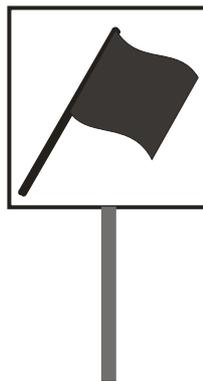
If yellow and green flags or lamps are displayed side by side, a speed restriction not exceeding 20 kph , and fifty metres in length is indicated.

11.3. Movable Signal to normal speed.

This comprise a green flag or lamp.
This authorises return to the line speed.

12. Protection of trains when work may foul a running line.

Equipment which may foul a running line is indicated by a rotating yellow light. If the work is protected by moveable signs, a special warning is provided, comprising a white board with a drawing of a black flag:



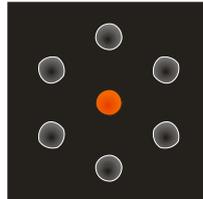
13. Detonators.

The explosion of a detonator dictates an immediate stop. A moveable stop signal is protected by three detonators, ten metres apart, 200 metres before the signal and with a further one at the signal.

K. STATION WORK COMPLETE INDICATOR" ("DAISY")

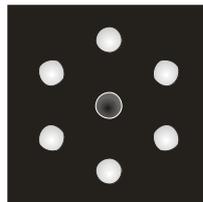
Appearance - a square indicator, with six white lights around the edge and one red central one, on a black background. The lights are normally extinguished.

When station work is complete, the station staff or train guard operate a switch which illuminates the central red lamp:



This warns the driver to prepare to depart.

After seven seconds, the red light goes out and the six white or yellow lights round the edge are illuminated:



The driver may then start the train. The white or yellow lights will not illuminate unless the platform "starting" signal is showing a proceed aspect.

L. MISCELLANEOUS SIGNS

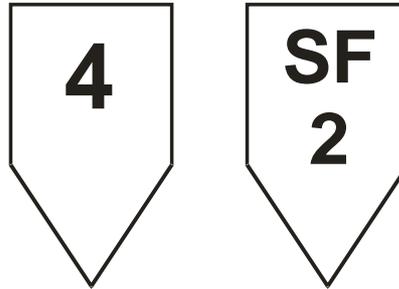
1. Test Crocodile.



This indicates that a test "crocodile" is ahead. The crocodile is an inducer for the in-cab signal repeater (known as Memor).

2. Speed restrictions for level crossings. Where a speed restriction applies over a level crossing this is indicated by special boards. The restriction (as always, indicated in tens of kph) applies until the whole train has passed the crossing.

The letters "SF" indicate that the whistle or horn should be sounded.



3. Change of signalling

At national borders, where the signalling system changes to that of another administration, an indication is provided:



This indicates to the driver that he is leaving Belgium and entering France, SNCF signalling and rules now applying.

4. Line number board.

At the exit of junctions and junction stations, an indication is given to the driver of the number of the line he is travelling on. This comprises white figures on a blue background:



5. Radio board

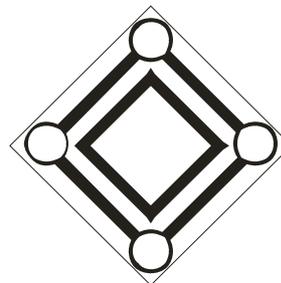
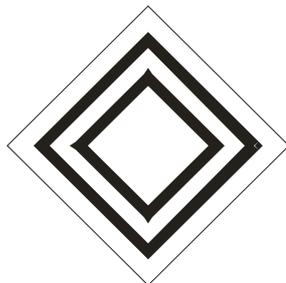
These indicate the radio channel appropriate to the line:
If the indicator board comprises the following:



the driver is required to announce his presence at the board over the radio channel previously indicated.

M. SIGNALS RELATING TO ELECTRIC TRACTION

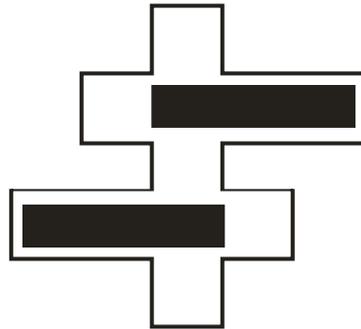
1. End of the catenary signs:



These indicate the end of the catenary. There are two types, the first being placed below the catenary or at cab height, the second on the ground. This latter has reflectorised "cat's eyes" at each corner.

These prohibit the passage of electric traction, unless hauled by a non electric locomotive or unit.

2. Lower pantograph signs:



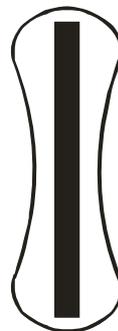
Warning sign - this is placed approximately 500 metres before a zone which must be passed with the pantographs lowered.

Action sign:



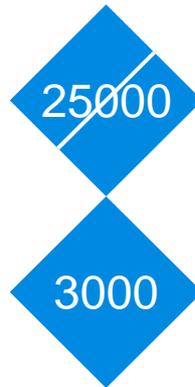
This is placed 30 metres before the start of the zone and must be passed with the pantographs lowered.

3. Raise pantographs:



Pantographs may be raised once all of them have passed this sign.

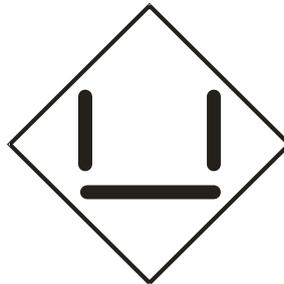
4. Change current sign:



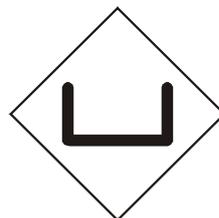
This is a blue board and is placed in the zone being passed with the pantographs lowered. The upper figure, with the number crossed through, indicates the previous voltage, the lower one is that ahead which must be selected by the driver.

6. Shut off and restore current sign

On occasion it is necessary for the current to be cut from the traction units. This is indicated by the following sign:



Authority to re-apply traction current to the traction unit is indicated by:



N. BLOCK WORKING

A note on the types of block working found on SNCB may be of interest to the reader.

1. Telephone Block.

Authority for a train to enter a block section and all other messages relating to the state of the section are given by telephone. All messages are recorded in books entitled "block books". Security is enhanced by each book having random reference numbers pre-printed on every line. These numbers are quoted every time a message is transmitted. All entries are recorded in the books at each end of the block section and the reference numbers quoted by the other signalman are added to prevent any subsequent dispute as to the authenticity of a message.

2. Manual block

This is the absolute block. The signals are controlled by the signaller.

3. Automatic block

Track circuits are used to operate the signals in automatic block.

4. Signal Boxes are identified by numbers. These normally appear on enamel plates on the signal box or station building and are usually visible from a passing train.