BRITISH STANDARD

PD CLC/TR
50511:2007

Railway applications — Communications, signalling and processing systems — ERTMS/ETCS — External signalling for lines equipped with ERTMS/ETCS Level 2

ICS 93.100

BSI
British Standards

National foreword

This Published Document is the UK implementation of CLC/TR 50511:2007.

The UK participation in its preparation was entrusted by Technical Committee GEL/9, Railway electrotechnical applications, to Subcommittee GEL/9/1, Signalling and communications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 September 2007

ISBN 978 0 580 58469 5

Amendments issued since publication

Amd. No.	Date	Comments

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CLC/TR 50511

August 2007

ICS 93.100

English version

Railway applications - Communications, signalling and processing systems - ERTMS/ETCS - External signalling for lines equipped with ERTMS/ETCS Level 2

Applications ferroviaires - Systèmes de signalisation, de télécommunications et de traitement - ERTMS/ETCS - Signalisation extérieure pour les lignes équipées de ERTMS/ETCS Niveau 2

Eisenbahnanwendungen - Systeme für die Kommunikation, Signalisierung und Datenverarbeitung - ERTMS/ETCS - Außensignale für mit ERTMS/ETCS Level 2 ausgestattete Strecken

This Technical Report was approved by CENELEC on 2007-06-01.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. CLC/TR 50511:2007 E

Foreword

This Technical Report was prepared by SC 9XA, Communication, signalling and processing systems, of Technical Committee CENELEC TC 9X, Electrical and electronic applications for railways.

The text of the draft was submitted to vote in accordance with the Internal Regulations, Part 2, Subclause 11.4.3.3 (simple majority) and was approved by CENELEC as CLC/TR 50511 on 2007-06-01.

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Contents

1 Scope

The scope of this Technical Report is to present the different line side information used in 2006 on the ERTMS/ETCS Level 2 lines and required for the application of the ERTMS/ETCS Level 2 operational rules.

NOTE The signs described in this Technical Report are only referring to ERTMS/ETCS Level 2 operations. On lines equipped with ERTMS/ETCS Level 2 there may be some additional signs needed for maintenance, degraded modes, transition to and from other signalling systems and other operational rules. These signs are not necessarily described in this Technical Report.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12899-1:2001, *Fixed, vertical road traffic signs – Part 1: Fixed signs*

CLC/TS 50459-1, *Railway applications – Communication, signalling and processing systems – European Rail Traffic Management System – Driver-Machine Interface – Part 1: Ergonomic principles for the presentation of ERTMS/ETCS/GSM-R information*

CLC/TS 50459-2, *Railway applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 2: Ergonomic arrangements of ERTMS/ETCS information*

CLC/TS 50459-3, *Railway applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface – Part 3: Ergonomic arrangements of ERTMS/GSM-R information*

CLC/TS 50459-4, *Railway applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 4: Data entry for the ERTMS/ETCS/GSM-R systems*

CLC/TS 50459-5, *Railway applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 5: Symbols*

CLC/TS 50459-6, *Railway applications – Communication, signalling and processing systems - European Rail Traffic Management System - Driver-Machine Interface - Part 6: Audible information*

UIC 651, *Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers*

3 Terms and definitions

For the purposes of this Technical Report, the following terms and definitions apply.

3.1
beyond
track location according to Figure 1

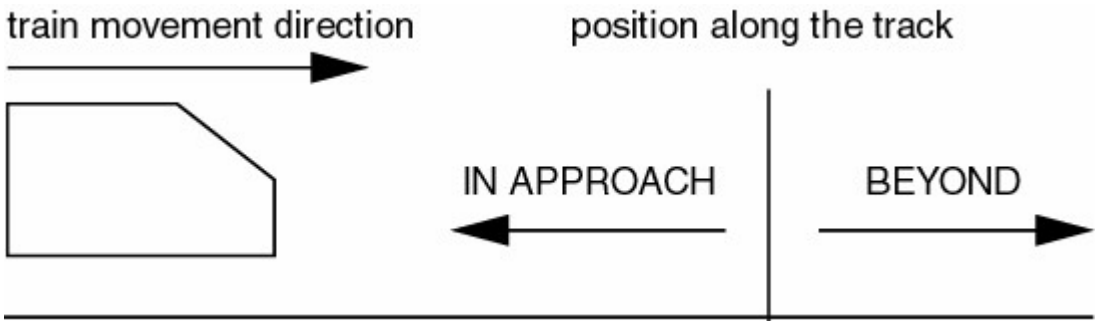

Figure 1— In approach and beyond

3.2
in approach
track location according to Figure 1

4 Symbols and abbreviations

ADIF Administrador de Infraestructuras Ferroviarias (current owner of the Spanish railways infrastructures)

ASFA Anuncio de Señales y Frenado Automático (Signal Announcement and Automatic Brake, signal repetition system used in Spain, for HSL and conventional lines)

BAB Bloqueo Automático Banalizado (Automatic Blocking for Double Track for either direction of two-way working, automatic block system used in Spain under RGC rules, for lines with double track, normally equipped with track circuits)

BAD Bloqueo Automático en Vía Doble (Automatic Blocking for Double Track, automatic block system used in Spain under RGC rules, for lines with double track, normally equipped with track circuits)

BCA Bloqueo de Control Automático (Automatic Block Control, cab signal used on Spanish HSL Madrid-Ciudad Real-Córdoba-Sevilla, HSL branch La Sagra-Toledo and HSL branch Córdoba-Antequera)

BLAU Bloqueo de Liberación Automática (Automatic Blocking Liberation for Single Track, automatic block system used in Spain under RGC rules, for lines with single track, normally equipped with axle counters)

BSL Bloqueo de Señalización Lateral (Line side Signalling Block, used on Spanish HSL Madrid-Zaragoza-Barcelona-Figueres for non fitted trains with ERTMS/ETCS equipment)

CTC Control de Tráfico Centralizado (Centralised Traffic Control, line under supervision from the central control operator of the railway traffic, under RGC rules)

ERTMS European Rail Traffic Management System

ETCS European Train Control System

GIF Gestor de Infraestructuras Ferroviarias (former owner of HSL Madrid-Zaragoza-Barcelona-Figueres, HSL Zaragoza-Huesca, HSL branch La Sagra-Toledo and HSL branch Córdoba-Antequera infrastructures, among other lines under construction)

HSL High Speed Line

LGVEE Ligne à Grande Vitesse Est Européenne (high speed line to east of Europe)

LZB Linien Zug Beeinflussung (Loop line to Train Control-Command, cab signal technology of ALCATEL-SEL, basis of the Spanish BCA block system)

MBF Madrid-Barcelona-Francia (Acronym of the HSL Madrid-Zaragoza-Barcelona-Figueres)

NEC Normas Específicas de Circulación (rules to be applied for the operation of trains on the HSL Madrid-Ciudad Real-Córdoba-Sevilla, HSL La Sagra-Toledo, HSL Córdoba-Antequera and the section called "ámbito de Madrid Puerta de Atocha" of the HSL Madrid-Zaragoza-Barcelona-Figueres)

PTO Prescripciones Técnicas Operativas (rules to be applied for the operation of trains on the HSL Madrid-Zaragoza-Barcelona-Figueres, in the section Madrid-Roda de Barà, except in the section called "ámbito de Madrid Puerta de Atocha")

RENFE Red Nacional de los Ferrocarriles Españoles (former owner of HSL Madrid-Ciudad Real-Córdoba-Sevilla infrastructure and the rest of the conventional broad gauge lines of Spain)

RFF Réseau Ferré de France (owner of the French railways infrastructure)

RFI Rete Ferroviaria Italiana (Italian infrastructure manager)

RGC Reglamento General de Circulación (rules to be applied for the operation of trains on the HSL Zaragoza-Huesca, only in the section Bifurcación Huesca-Tardienta-Huesca for 1 435 mm and 1 668 mm. gauge trains, and the rest of the conventional broad gauge lines of Spain)

RSC Ripetizione Continua dei Segnali in macchina (Italian signal repetition system)

TVM Transmission Voie Machine (Track to Train Transmission, cab signal system used on French HSL)

5 General principles

This Technical Report defines the graphical presentation and arrangement of the information shown on the different external signs on European lines equipped with ERTMS/ETCS Level 2 defined hereafter.

The given dimensions of the graphical (text or drawing) elements are always considering their seen part.

The colour of the different elements shall be uniform in the entire surface.

The parts shall show in their external face smooth surfaces, without wrinkles, cracks, holes, stains or other superficial defaults.

6 Line side equipment on the Belgian HSL

6.1 Indication of a required stopping location

Figure 2 shows the shape, the colours and the sizes of the marker.

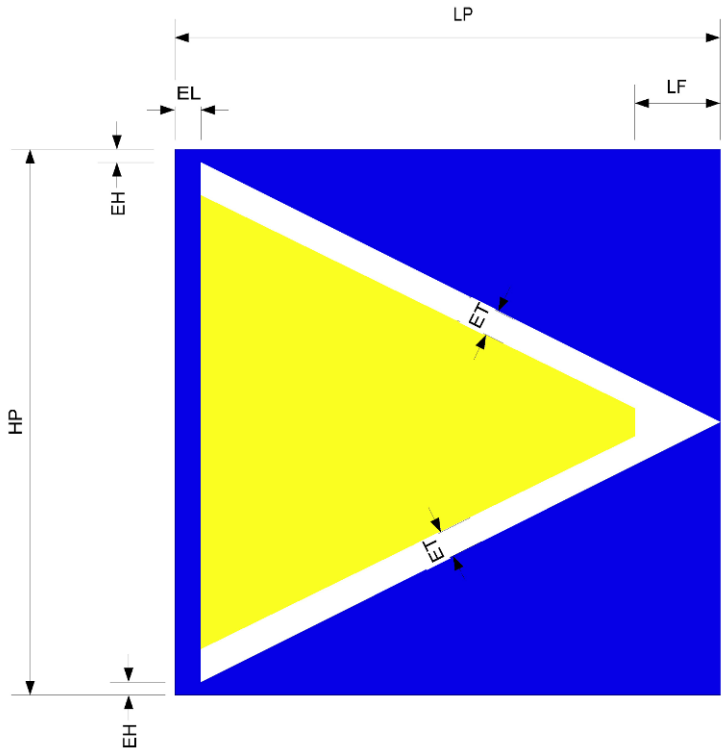

Figure 2 — Belgian marker

The blue, the white and the yellow are reflective and defined in Tables 6 and 9 of EN 12899-1.

Table 1 defines the values applicable in Figure 2.

Table 1 — Values for the Belgian marker

Dimensions in mm

Name on Figure 2	Values
HP	830
LP	830
EH	20
ET	40
EL	40
LF	130

7 Line side equipment on the Dutch HSL and Betuwe Line

7.1 Indication of a required stopping location

7.1.1 Marker

The Dutch reference number of this sign is 227b.

Figure 3 shows the shape, the colours and the sizes of the marker.

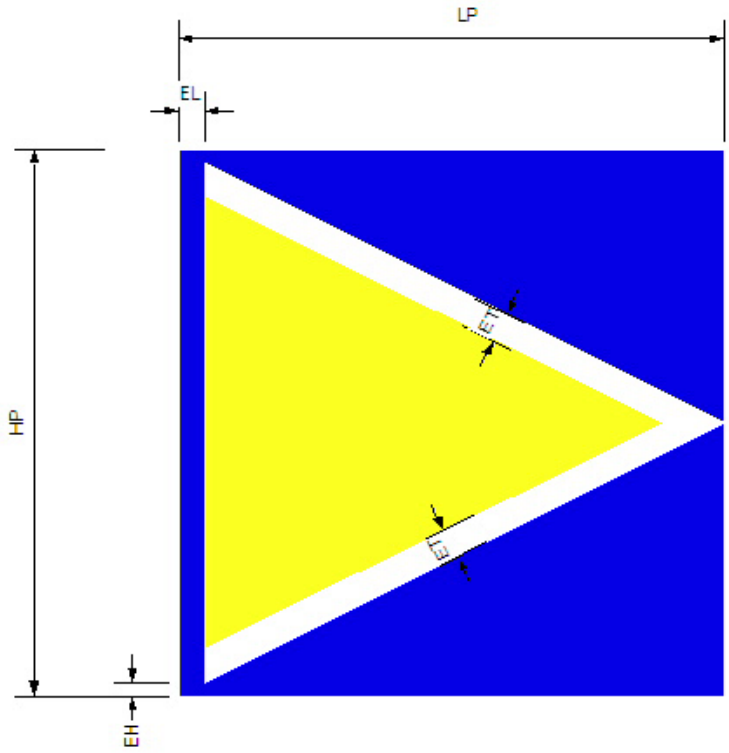

Figure 3 — Marker

For trains complying with ERTMS/ETCS operational rules the marker defines the required stopping location.

The blue, the white and the yellow are reflective and defined in Tables 6 and 9 of EN 12899-1.

The arrow on the marker always points to the track to which it applies.

Table 2 gives the values applicable for Figure 3.

Table 2 — Values applicable for figure

Dimensions in mm

Name on Figure 3	Values
HP	500
LP	500
EH	20
ET	40
EL	40

7.1.2 Marker with white lamp illuminated

The Dutch reference number of this sign is 227a.

Figure 4 — Example with white lamp illuminated

ERTMS/ETCS Level 1 active beyond this marker. The marker may be passed. After having passed the marker, follow the ERTMS/ETCS cab signalling rules.

7.1.3 Marker with white lamp not illuminated

The Dutch reference number of this sign is 227c.

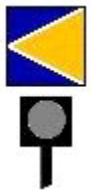

Figure 5 — Example with white lamp not illuminated

For trains complying with ERTMS/ETCS operational rules the marker defines the required stopping location.

7.1.4 Colour light signal used to indicate the required stopping location

The Dutch reference number of this sign is 228.

The three colour lamps are extinguished only when the vertical dot line is illuminated.

Figure 6 — Example of the colour light signal extinguished with the vertical dot line illuminated

Trains not equipped with ERTMS/ETCS must not pass this signal.

For trains complying with ERTMS/ETCS operational rules the marker defines the required stopping position.

7.1.5 Commencement of the cab signal area

The Dutch reference number of this sign is 336.

Figure 7 shows the shape and the sizes of this sign.

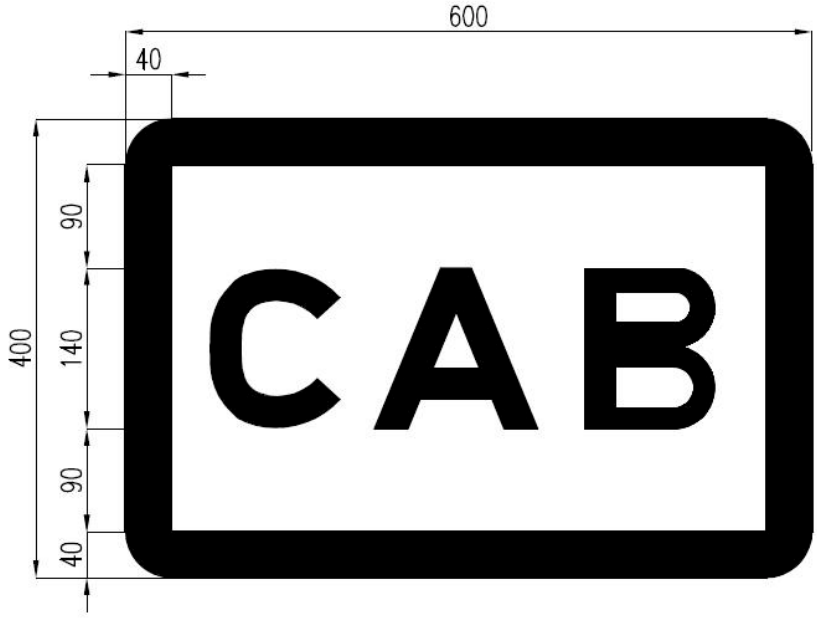

Figure 7 — Commencement of cab signal

7.1.6 Termination of the cab signal area

The Dutch reference number of this sign is 337.

Figure 8 shows the shape and the sizes of this sign.

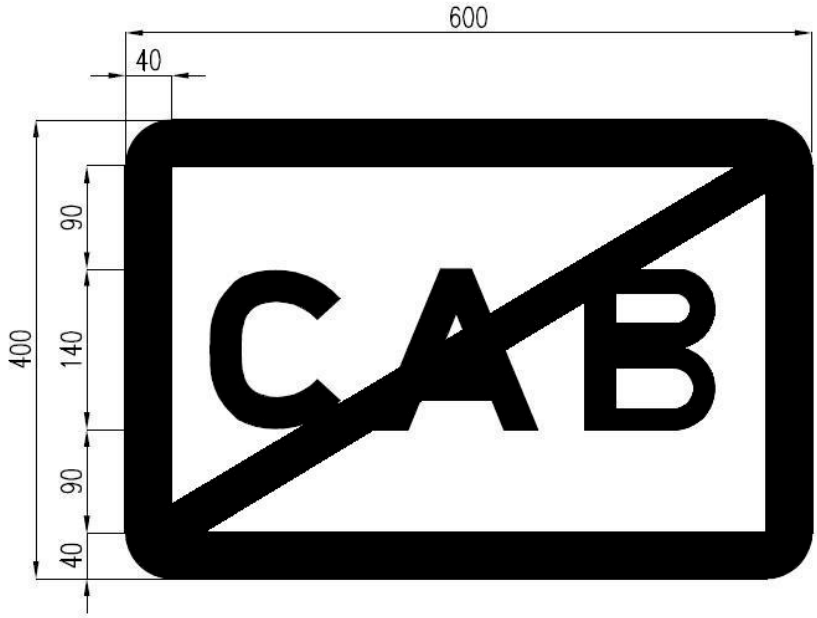

Figure 8 — Termination of cab signal

7.1.7 Indication of a special danger

This sign is a indication of a special danger point beyond the line side signal or the marker.

The Dutch reference number of this sign is 251a/l.

Figure 9 shows the visual aspect of this sign.

Figure 9 — Attention or Danger indicator

7.1.8 Reflectorised sign

This sign is an indication on the distance approaching a marker or a line side signal.

On Figure 10 the signs are only the square plates along the track.

— One square means nominal 100 m

— Two squares mean nominal 200 m

— Three squares mean nominal 300 m

The Dutch reference number of this sign is 251a.

Figure 10 shows an example of use of the "Reflectorised sign".

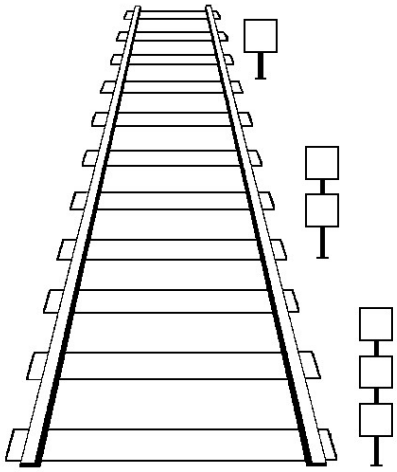

Figure 10 — Example of use of the Reflectorised sign

7.2 Electric Traction Orders

7.2.1 Start of neutral section

The Dutch reference number of this sign is 306a.

Figure 11 shows the visual aspect of this sign.

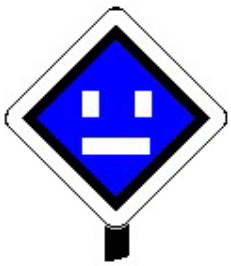

Figure 11 — Start of neutral section

7.2.2 End of neutral section

The Dutch reference number of this sign is 307a.

Figure 12 shows the visual aspect of this sign.

Figure 12 — End of neutral section

If the additional lower sign is used, the traction power may only be switched on if the train consists of not more rolling stock coaches than the number indicated on the lower sign.

7.2.3 Announcement to lower pantograph

The Dutch reference number of this sign is 308a.

Figure 13 shows the visual aspect of this sign.

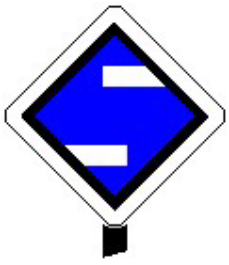

Figure 13 — Announcement to lower pantograph

7.2.4 Lower pantograph

The Dutch reference number of this sign is 309a.

Figure 14 shows the visual aspect of this sign.

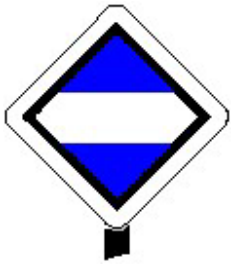

Figure 14 — Lower pantograph

On this picture, the sign at the top indicates to the driver the possibility to raise the pantograph and the sign at the bottom indicates to the driver that the on left track is not equipped with overhead line. These signs are small signs.

7.2.5 Raise pantograph

The Dutch reference number of this sign is 310a.

Figure 15 shows the visual aspect of this sign.

Figure 15 — Raise pantograph

If the additional lower sign is used, the authorisation to raise the pantographs is only allowed if the train consists of not more rolling stock coaches than the number indicated on the lower sign.

7.2.6 Limit of movement with raised pantograph

The Dutch reference number of this sign is 311 (l)/(r).

— (l): the arrow points to the left and the upper sign is located at the left side of the main sign. Figure 16 shows this case.

— (r): the arrow points to the right and is located at the right side of the main sign.

Figure 16 shows the visual aspect of these signs.

Figure 16 — Passing the sign with raised pantographs is not allowed

If the additional upper sign is used, passing of the sign is not allowed in the direction where the arrow points at.

7.2.7 Change of the catenary voltage

Indication of the location where the overhead line system changes. The existing is shown above and the new system is below.

Figure 17 shows an example of the change from 1,5 kV to 3 kV.

Figure 17 — Change from 1,5 kV to 3 kV

7.3 Advisory speed for non passenger and special trains

The Dutch reference number of this sign is 282a. The Dutch name is "Adviessnelheidbord".

This sign is an indication of an advisory speed given by the number shown. This applies only for drivers of trains intended for freight transport and for trains designated by the affiliated train company.

Figure 18 shows an example of this sign for an advisory speed of 40 km/h.

Figure 18 — Example of advisory speed

7.4 GSM-R sign for voice communication

GSM-R change-over manually to the indicated network:

a) to the Dutch network (NL);

b) to the German network (D);

Figure 19 shows the example to indicate the change to the German network.

Figure 19 — Change of the GSM-R network

8 Line side equipment on the French HSL "LGVEE"

8.1 Indication of a required stopping location for ERTMS/ETCS fitted trains

Figure 20 shows the shape, the colours and the sizes of the ERTMS/ETCS Level 2 marker.

The arrow on the marker always points to the track to which it applies.

NOTE Only ERTMS/ETCS rules are applicable in approach of this marker.

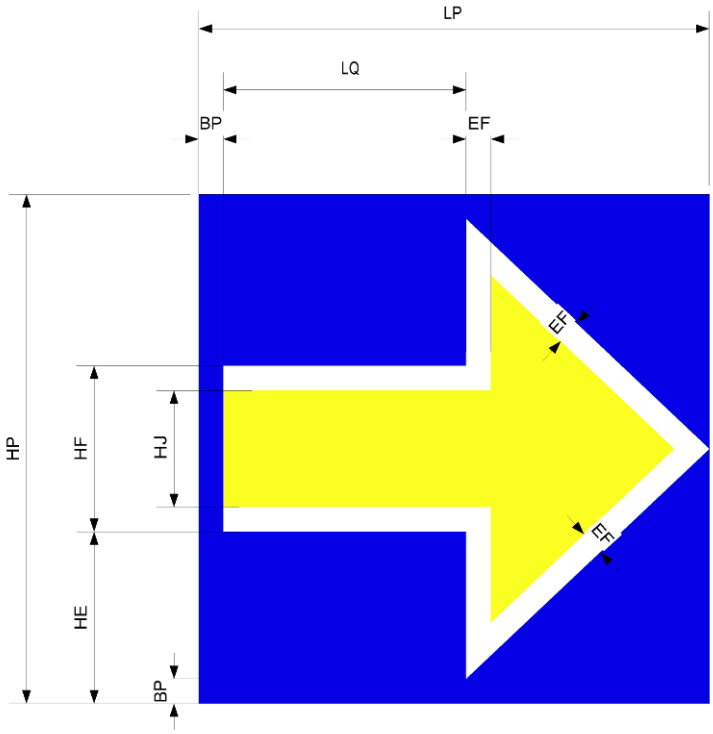

Figure 20 — ERTMS/ETCS Level 2 marker along the French LGVEE

The blue and the yellow are reflective and defined in Tables 6 and 9 of EN 12899-1, the white is defined in the NF X08-002 and is not reflective.

Two types of marker are used, the large sized or the small sized marker. Table 3 defines the values which shall be used.

Table 3 — Values for the two types of ERTMS/ETCS Level 2 marker

Dimensions in mm

Name on Figure 20	Large marker	Small marker
HP	830	700
LP	830	700
HE	280	235
HF	270	230
HJ	190	160
BP	40	35
EF	40	35
LQ	395	330

8.2 Indication of a required stopping location for TVM fitted trains

Figure 21 shows the shape, the colours and the sizes of the TVM marker.

The arrow on the marker always points to the track to which it applies.

NOTE Only the TVM system rules are applicable at the approach to this marker. Other signs accompany this marker for the application of the rules.

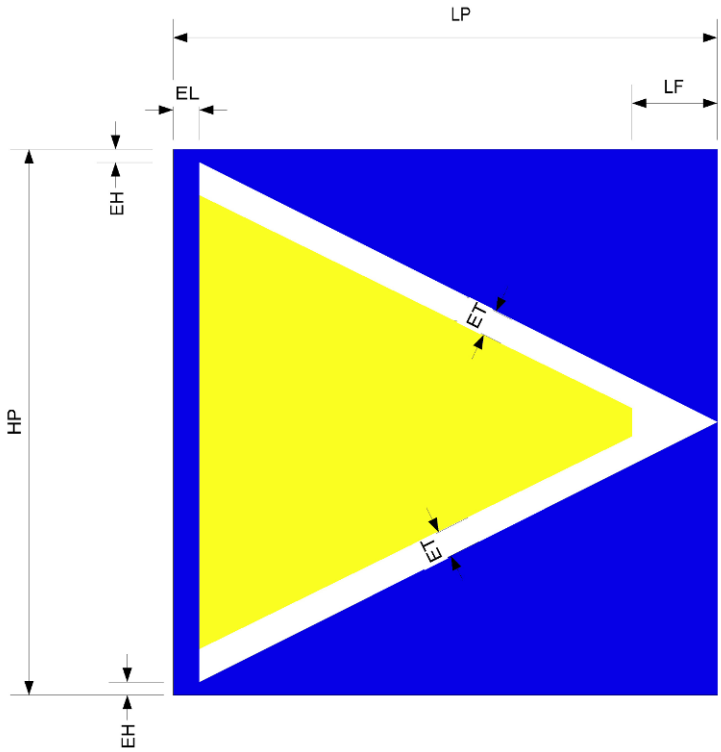

Figure 21 — TVM marker along the French LGVEE

The blue and the yellow are reflective and defined in Tables 6 and 9 of EN 12899-1, the white is defined in the NF X08-002 and is not reflective.

Three sizes of marker are used, the size A, the size B or the size C markers. Table 4 defines the values which shall be used.

Table 4 — Values for the three sizes of TVM marker

Dimensions in mm

Name on Figure 21	Size A	Size B	Size C
HP	830	700	500
LP	830	700	500
EH	20	21	15
ET	40	35	25
EL	40	35	25
LF	130	112	80

8.3 Transition

8.3.1 Limit of the cab signal line

Figure 22 gives the different sizes applicable for the three signals (announcement, commencement and termination).

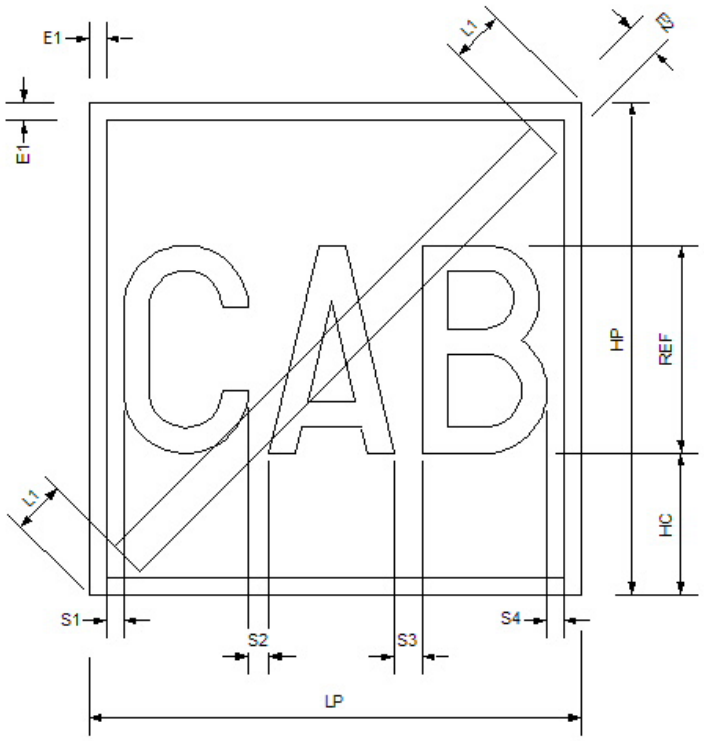

Figure 22 — "CAB"

Table 5 gives the values applicable for Figure 22.

Table 5 — Values for the three types of signal "CAB"

Dimensions in mm

Name in Figure 22	Value
E1	30
E2	60
HC	240
HP	830
L1	90
LP	860
S1	28
S2	36
S3	48
S4	28
REF	350

8.3.2 Announcement

One signal is used to inform the driver when he is approaching of a cab signal line, the signal shall be a square plate, 830 mm x 830 mm, with the text "CAB" in black on a white background.

The different sizes are given in Figure 22 and Figure 23 gives an overview.

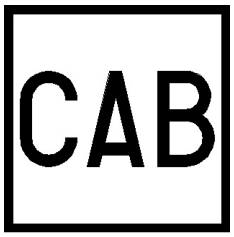

Figure 23 — Announcement of cab signal line

The reference 350 in the table defined in 4.2.1.3 of NF F 01-003, document [16] in the bibliography, is used for the sizes of the characters A, B, C.

The black is the colour 2603 or 3603 as defined in the NF X08-002, document [17] in the bibliography.

The white is defined in Tables 5 and 8 of EN 12899-1.

8.3.3 Commencement

The commencement of a cab signal line is shown on a plate, 830 mm x 830 mm, with the text "CAB" in white on a black background.

The different sizes are given in Figure 22 and Figure 24 gives an overview.

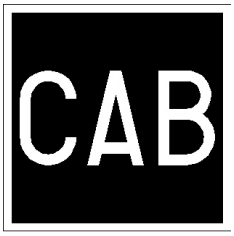

Figure 24 — Commencement of a cab signal line

The reference 350 in the table defined in 4.2.1.3 of NF F 01-003 shall be used for the sizes of the characters A, B, C.

The black is the colour 2603 or 3603 as defined in the NF X08-002.

The white is defined in Tables 5 and 8 of EN 12899-1.

8.3.4 Termination

The termination of a cab signal line is shown on a plate, 830 mm x 830 mm, with the text "CAB" in white on a black background and a red line striking the signal.

The different sizes are given in Figure 22 and Figure 25 gives an overview.

Figure 25 — Termination of a cab signal line

The black is the colour 2603 or 3603 as defined in the NF X08-002.

The white and the red are defined in Tables 5 and 8 of EN 12899-1.

The reference 350 in the table defined in 4.2.1.3 of NF F 01-003 shall be used for the sizes of the characters A, B, C.

8.3.5 Limit between cab signal system – ERTMS/ETCS Level 2 and the TVM

One sign is used to inform the driver when the train is running from TVM 430 to ERTMS/ETCS Level 2. This sign is a plate with text on two lines first line contains “ERTMS”, the second line contains “N2”.

An another sign is used to inform the driver when the train is running from ERTMS/ETCS Level 2 to TVM 430. this sign is a plate with text on two lines first line contains “TVM 430”, the second line “VOIE 1” or “VOIE 2”.

The black is the colour 2603 or 3603 as defined in the NF X08-002.

The white is defined in Tables 5 and 8 of EN 12899-1.

The reference 150 in the table defined in 4.2.1.3 of NF F 01-003 shall be taken into account for the sizes of the characters and numbers.

The height and the length are 830 mm.

Figures 26 and 27 give an overview of these two signs.

Figure 26 — Transition to TVM 430 track 2

Figure 27 — Transition to ERTMS/ETCS Level 2

8.4 Electric Traction Orders

These signs can be illuminated or reflectorised.

8.4.1 Announcement to lower pantograph

Figure 28 gives the shape of the announcement to lower the pantograph.

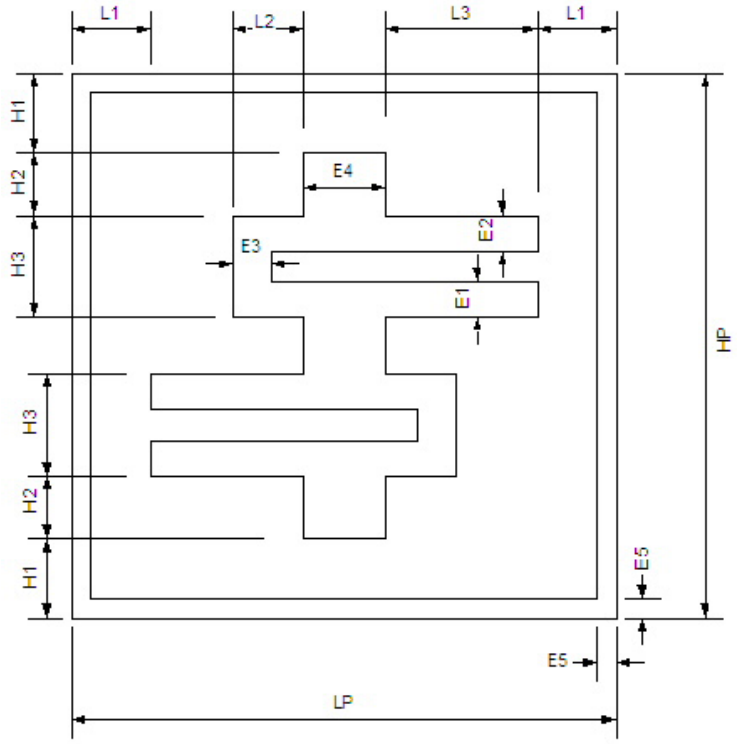

Figure 28 — Announcement to lower the pantograph

Table 6 defines the values applicable for Figure 28.

Table 6 — Values for the announcement to lower the pantograph

Dimensions in mm

Name in Figure 28	Value
E1	55
E2	55
E3	60
E4	130
E5	30
H1	125
H2	100
H3	160
HP	860
L1	125
L2	110
L3	240
LP	860

Figure 29 shows the use of the colours for the announcement.

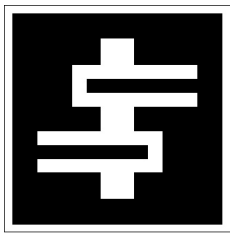

Figure 29 — Colours used for the announcement to lower the pantograph

8.4.2 Lower Pantograph

Figure 30 gives the shape and the sizes for the sign “Lower Pantograph”.

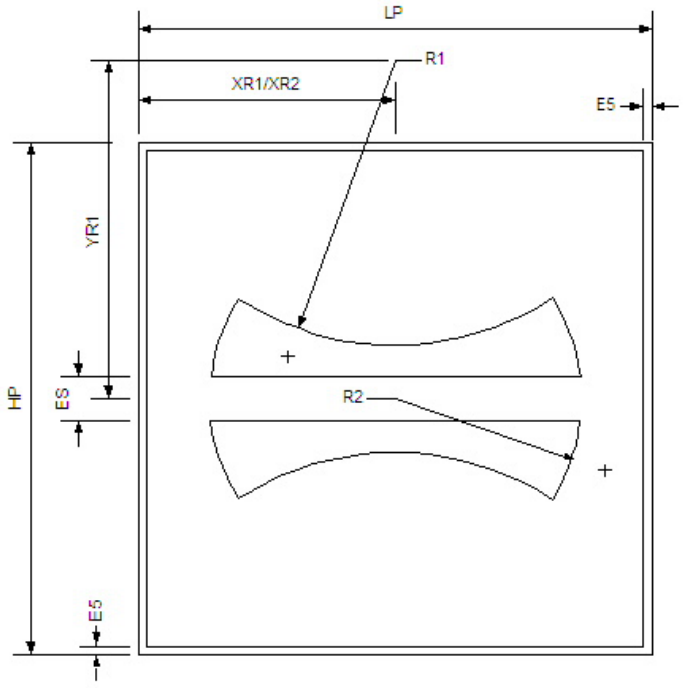

Figure 30 — Lower Pantograph

Figure 31 shows the use of the colours for this order.

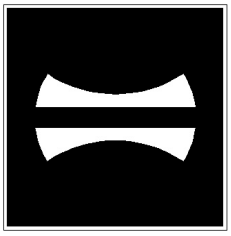

Figure 31 — Colours used for the order “Lower Pantograph”

Table 7 defines the values applicable in Figure 30.

Table 7 — Values for the sign "Lower Pantograph"

Dimensions in mm

Name in Figure 30	Value
ES	75
E5	30
HP	860
LP	860
R1	478
XR1	415
YR1	563
R2	310
XR2	415
YR2	0

8.4.3 Raise Pantograph

Figure 32 gives the shape and the sizes for the sign "Raise Pantograph".

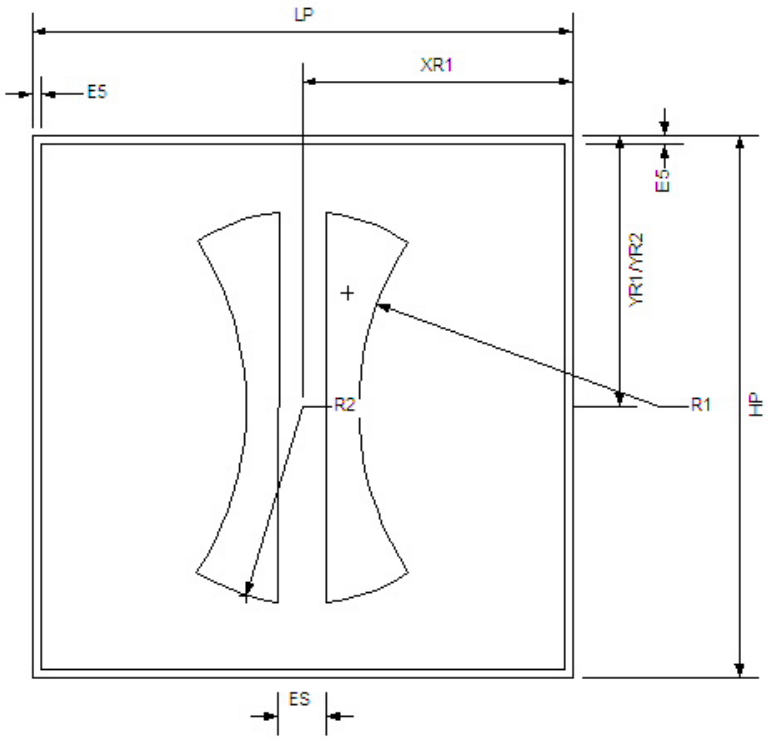

Figure 32 — Raise Pantograph

Table 8 gives the values applicable in Figure 32.

Table 8 — Values for the sign "Raise Pantograph"

Dimensions in mm

Name in Figure 32	Value
ES	75
E5	30
HP	830
LP	830
R1	478
XR1	563
YR1	415
R2	310
XR2	0
YR2	415

This signal is accompanied with plate to present the type of catenaries and the voltage (e.g. 25 000 LGV).

Figure 33 shows the use of the colours for this sign.

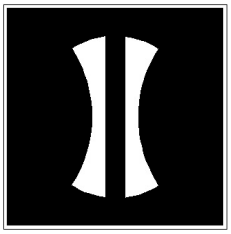

Figure 33 — Colours used for the sign "Raise Pantograph"

8.4.4 Neutral section announcement

This sign is a plate with text on two lines first line contains "SEC^{T} A", the second line contains the announcement distance, generally on the high speed line this distance is 1 000 m.

The height of the plate is 850 mm and the length is 1 000 mm.

The text colour shall be black on a white background.

Figure 34 gives an example of the sign.

Figure 34 — Neutral section announcement

8.4.5 Start of a neutral section

Figure 35 gives the shape and the sizes for the sign used to mark the start of a neutral section.

NOTE The driver shall switch off the main circuit breaker of his engine.

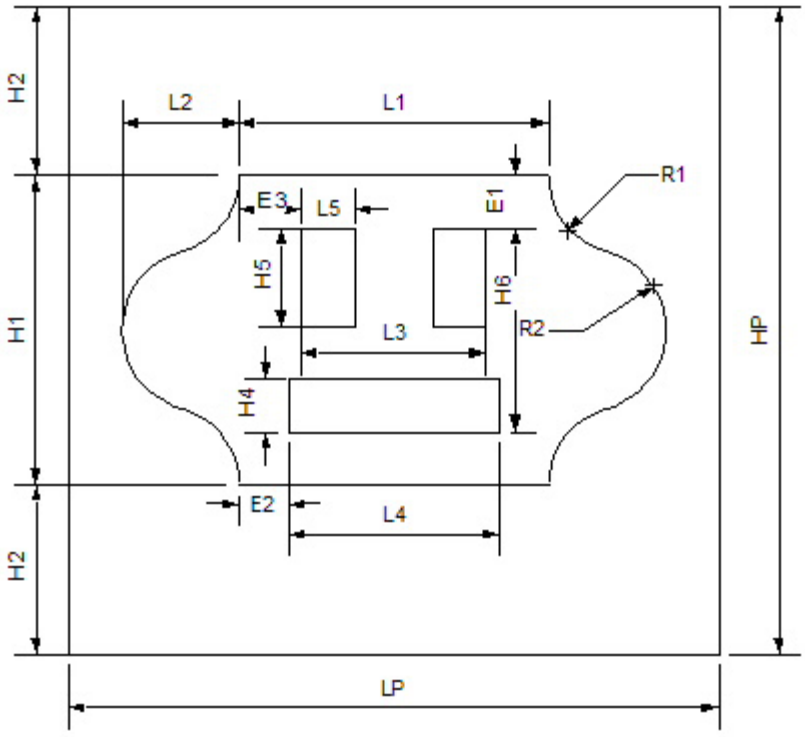

Figure 35 — Start of a neutral section

Table 9 gives the values applicable in Figure 35.

Table 9 — Values for the sign "Start of a neutral section"

Dimensions in mm

Name in Figure 35	Value
E1	58
E2	65
E3	83
H1	410
H2	225
H4	70
H5	130
H6	269
HP	820
L1	410
L2	155
L3	244
L4	280
L5	70
LP	860
R1	100
R2	108

Figure 36 defines the colour used for the sign "Start of a neutral section".

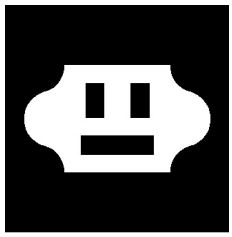

Figure 36 — Colours used for the sign "Start of a neutral section"

8.4.6 End of a neutral section

Figure 37 gives the shape and the sizes for the sign used to mark the end of a neutral section.

NOTE After his engine has passed this signal, the driver is allowed to switch on the main circuit breaker.

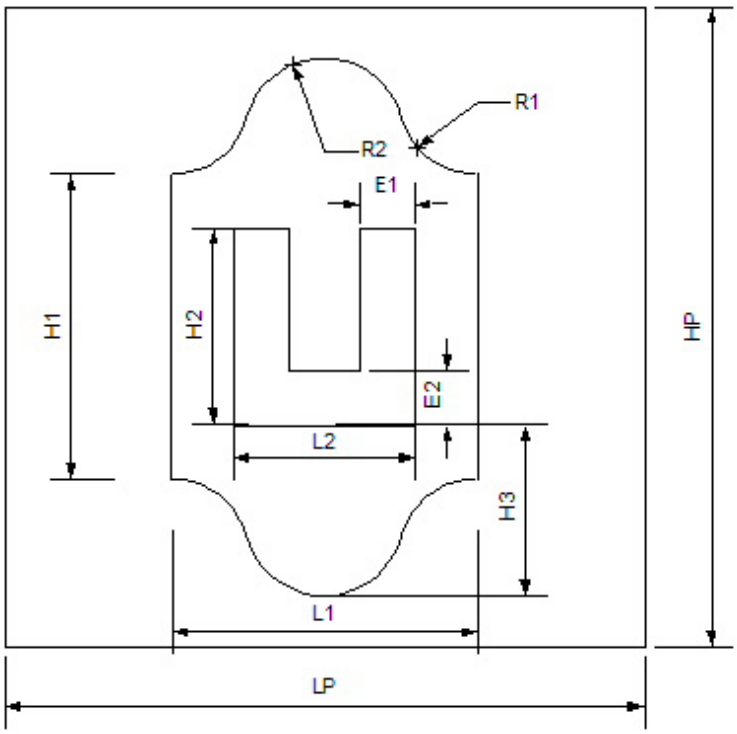

Figure 37 — End of a neutral section

Table 10 gives the values applicable in Figure 37.

Table 10 — Values for the sign "End of a neutral section"

Dimensions in mm

Name in Figure 37	Value
E1	74
E2	74
H1	410
H2	264
H3	228
HP	860
L1	410
L2	244
LP	860
R1	100
R2	100

Figure 38 defines the colour used for the sign “End of a neutral section”.

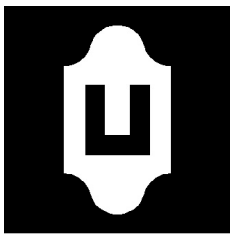

Figure 38 — Colours used for the sign “End of a neutral section”

9 Line side equipment on the Italians HSL ERTMS/ETCS Level 2 "Roma-Napoli" and “Torino-Novara”

9.1 Indication of a required stopping location before point work

Figure 39 shows the shape, the colour and the size of the ERTMS/ETCS Level 2 marker before point work.

The arrow points to the track to which it refers.

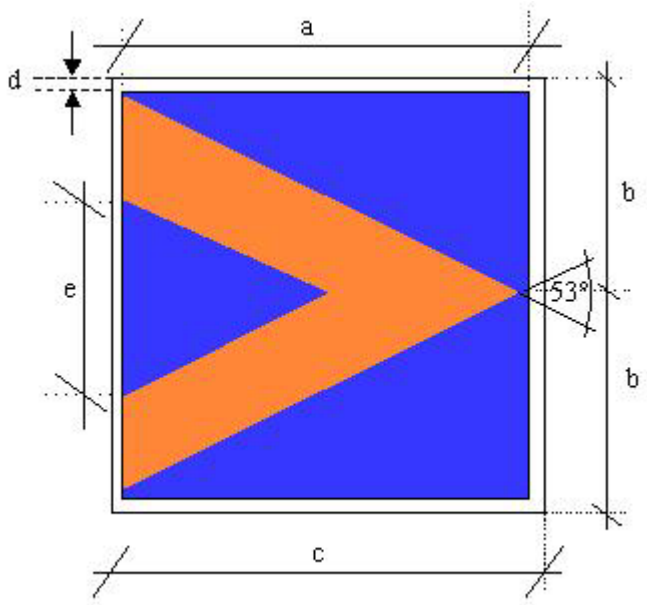

Figure 39 — ERTMS/ETCS Level 2 marker before point work on the Italians HSL

Two types of marker are used, the large sized or the small sized marker (inside tunnels and everywhere it is needed).

The blue is blue Scotchcal™ 100/37 RFI IS 743.

The orange is pantone 1375 retro-reflective (Class 3) RFI IS 743.

The white layer is retro-reflective Class 3.

Table 11 gives the values applicable for Figure 39.

Table 11 — Values for the two types of ERTMS/ETCS Level 2 marker before point work

Dimensions in mm

Name on Figure 39	Large marker	Small marker
a	640	470
b	350	250
c	700	500
d	20	15
e	240	145

This sign is always accompanied with an identifier (550 mm x 350 mm) (maximum four digits number and the letter d for the signs putted on the right side, text high 130 mm) and the kilometre point (text high 80 mm), interline 60 mm. The digits are black Scotchcal™ 100 RFI IS 743, the white is retro-reflective Class 2. See the example given in Figure 40.

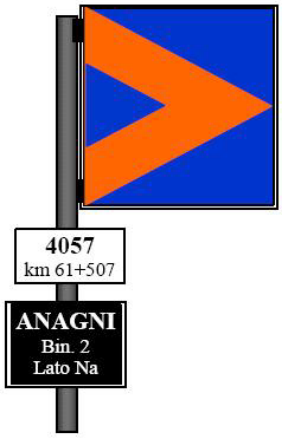

Figure 40 — Example of a starting signal

NOTE 1 This sign can be accompanied with an identification plate (550 mm x 550 mm) to distinguish a starting signal. This complementary sign contains the location (text high 100 mm), the track (text high 70 mm), and the direction (text high 70 mm), interline 70 mm. The black is Scotchcal™ 100 RFI IS 743, text is white retro-reflective Class 2.

In a station [1)] an additional information sign may be implemented along the track to inform the driver that he is outside the station and there is no more point work. Figure 41 shows this sign.

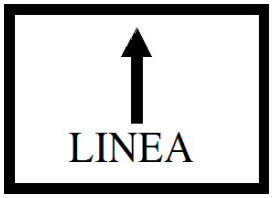

Figure 41 — Sign for "End of Station"

In a station track where it is possible to trigger the Start of Mission procedure (awakening track), a rectangular marker board indicating the position of the first balise group shall precede the starting signal. Figure 42 shows this sign.

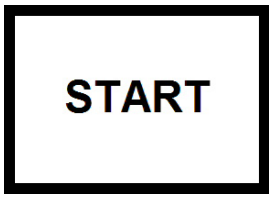

Figure 42 — Sign START

1) Refer to the RFI definition of "Station".

NOTE 2 From the current position the train, during the Start of Mission, will reach in Staff Responsible mode this marker board and here will send the first position report to Radio Block Centre. Then the train will reach the starting signal where, if it is possible, he will receive a "Track Ahead Free" request. After the acknowledge, he will receive the first Full supervision mode.

NOTE 3 Some points may be accompanied by a sign to indicate if the switch is in the correct position and in correspondence with the route. Figure 43 shows this sign.

Figure 43 — Point work identification

9.2 Indication of a required stopping location on the line (not before point work)

Figure 44 shows the shape, the colour and the size of the ERTMS/ETCS Level 2 marker on the line (not before point work). The arrow points to the track to which it refers.

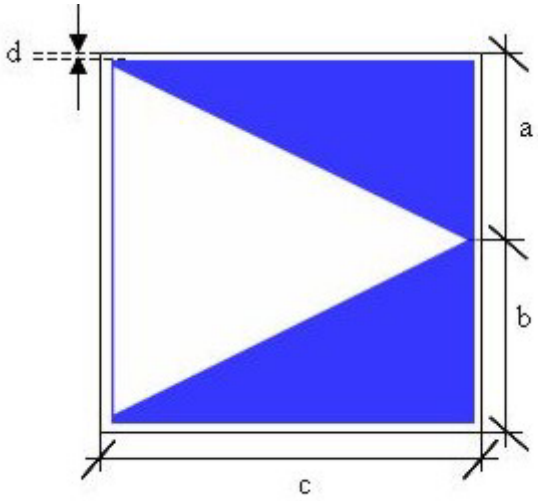

Figure 44 — ERTMS/ETCS Level 2 marker on the Italians HSL

Table 12 defines the values which shall be used.

The blue is blue Scotchcal™ 100/37 RFI IS 743.

The white is reflective Class 3 RFI IS 743.

Table 12 — Values for the two types of ERTMS/ETCS Level 2 marker (not before point work)

Dimensions in mm

Name on Figure 44	Marker
a	225
b	225
c	450
d	270

This sign is always accompanied with an identifier (a maximum four digits number and the letter d for the signs putted on the right side) and the kilometre point.

9.3 Signs put in at the approach the markers defined in 9.1 and in 9.2

Two signs are used to inform the driver when he is approaching the limit of ERTMS/ETCS Level 2 Movement Authority.

Figure 45 shows the sizes, the shape and the colours of the sign type B used before the marker defined in 9.2.

Figure 46 shows the sizes, the shape and the colours of the sign type A used before the marker defined in 9.1.

NOTE The sign with two arrows is to indicate a minimum distance of 200 m, the one arrow is to indicate a minimum distance of 100 m.

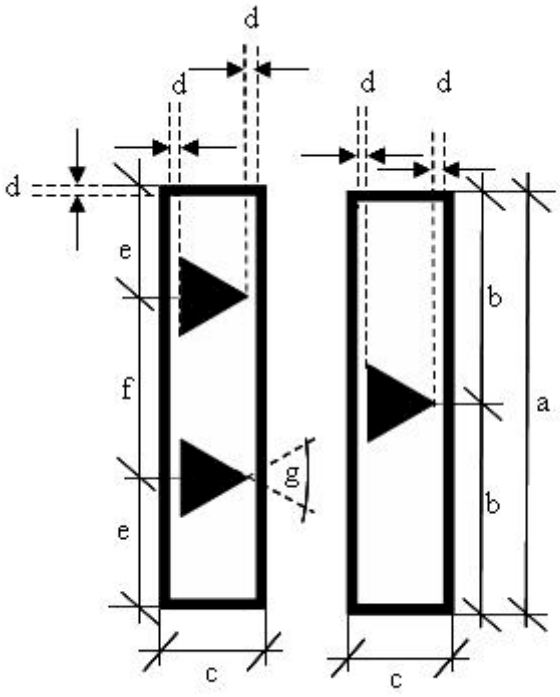

Figure 45 — Type B

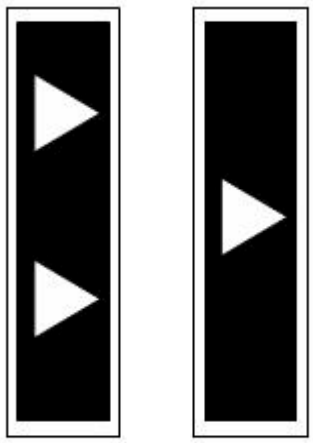

Figure 46 — Type A

The arrow points to the track to which it refers.

For the type A and the type B there is a large sized or a small sized marker (inside tunnels and everywhere it is needed).

The black is a serigraphy RFI IS 743.

The white is retro-reflective Class 3.

Table 13 defines the values which shall be used.

Table 13 — Values for the two types of the sign type A and type B

Dimensions in mm

Name on Figure 45	Large marker	Small marker
a	1 400	1 400
b	700	700
c	287	194
d	20	15
e	350	350
f	700	700
g	60°	60°

9.4 Transition

9.4.1 Commencement of a cab signal line

Figure 47 shows the shape and the size of the sign for the commencement of a cab signal line (ERTMS/ETCS L2). The text is in black on a white background.

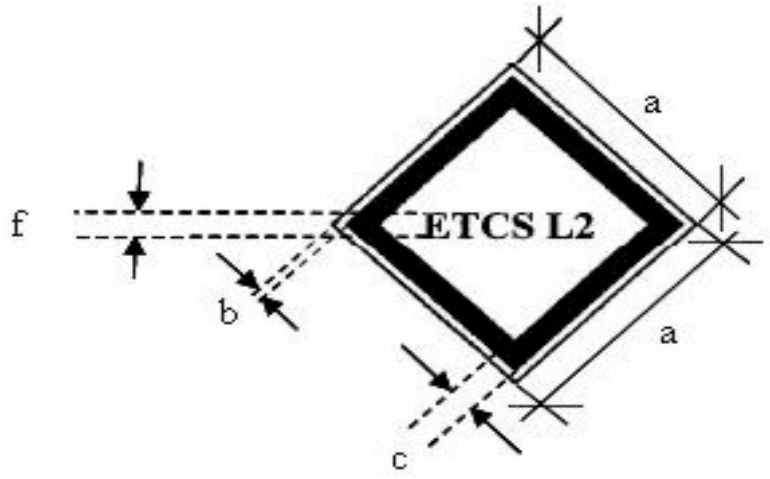

Figure 47 — "Commencement of cab signal Line (ERTMS/ETCS L2)"

The text depends of the system. It can be "RSC" in case of commencement of a national signal repetition system (RSC).

Table 14 gives the values applicable for Figure 47.

Table 14 — Values for the "Commencement of cab signal line"

Dimensions in mm

Name in Figure 47	Value
a	500
b	15,5
c	40
f	100

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.4.2 Announcement of commencement

This sign is used to inform the driver when approaching a cab signal line, the text is in black on a white background.

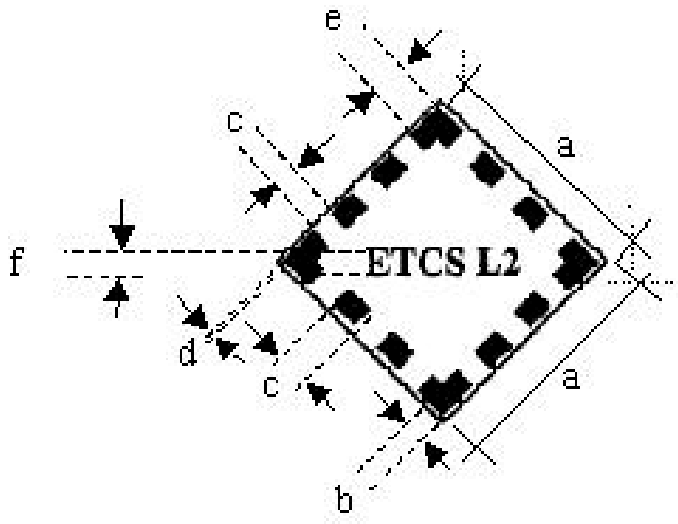

Figure 48 — "Announcement of commencement of cab signal line (ERTMS/ETCS L2)"

The text depends of the system. It can be "RSC" in case of commencement of a national signal repetition system (RSC).

Table 15 gives the values applicable for Figure 48.

Table 15 — Values for the signal "Announcement of commencement of cab signal line"

Dimensions in mm

Name in Figure 48	Value
a	500
b	40
c	63
d	15,5
e	77
f	100

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.4.3 Limit of a cab signal line

The limit of a cab signal line is showed in Figure 49.

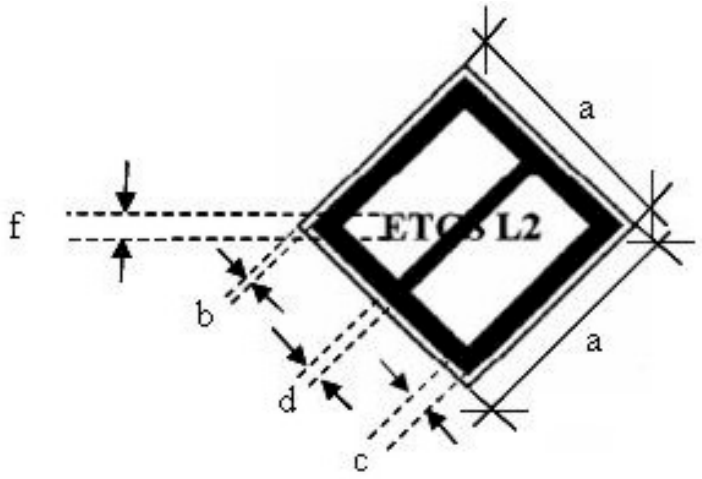

Figure 49 — Limit of a cab signal line

The text depends of the system. It can be "RSC" in case of termination of a national signal repetition system (RSC).

Table 16 gives the values applicable for Figure 49.

Table 16 — Values for “Limit of a cab signal line"

Dimensions in mm

Name in Figure 49	Value
a	500
b	15,5
c	40
d	30
f	100

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.4.4 Announcement of limit of a cab signal line

This signal is used to inform the driver when approaching of a cab signal line, the text is in black on a white background.

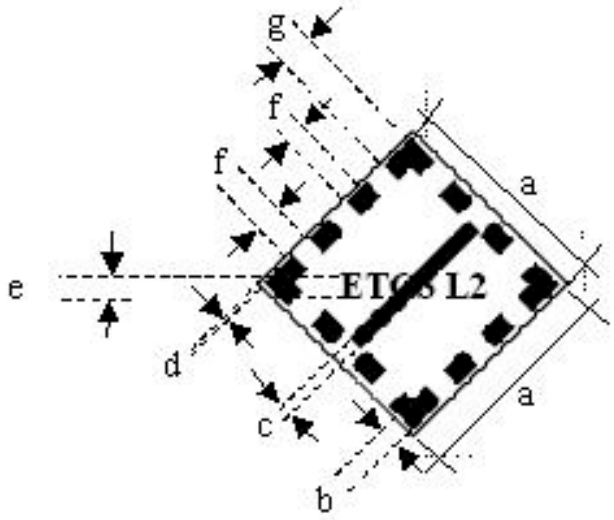

Figure 50 — Announcement of limit of a cab signal line (ERTMS/ETCS L2)

The text depends of the system. It can be "RSC" in case of announcement of the end of an external signalling line with the signal repetition system on board.

Table 17 gives the values applicable for Figure 50.

Table 17 — Values for the signal “Announcement of entrance in a cab signal line"

Dimensions in mm

Name in Figure 50	Value
a	500
b	40
c	30
d	15,5
e	100
f	63
g	77

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.5 Electric Traction Orders

9.5.1 Announcement of Lower Pantograph

Figure 51 gives the shape of the announcement of the order to lower the pantograph.

It shall be at least 500 m in approach of the signal “lower pantograph”.

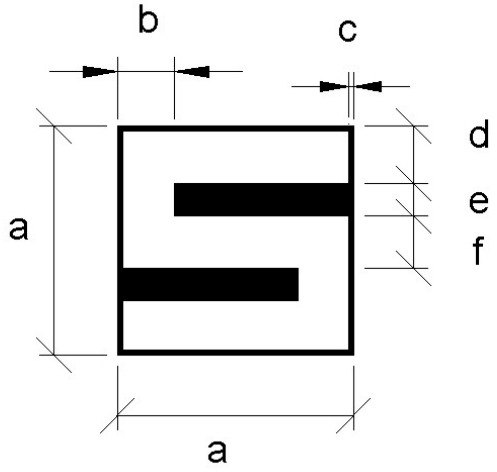

Figure 51 — Announcement to lower the pantograph

Table 18 defines the values applicable for Figure 51.

Table 18 — Values for the announcement to lower the pantograph

Dimensions in mm

Name in Figure 51	Value
a	550
b	190
c	20
d	100
e	110
f	130

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.5.2 Lower Pantograph

Figure 52 gives the shape of the order “Lower Pantograph”. It shall be 50 m in approach of the section where to run with lowered pantograph.

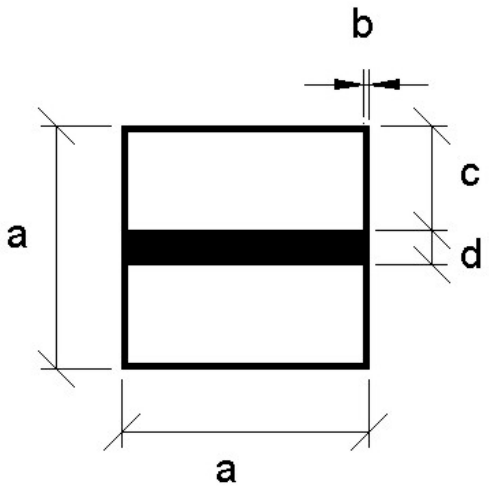

Figure 52 — Lower Pantograph

Table 19 defines the values applicable in Figure 52.

Table 19 — Values for the order “Lower Pantograph”

Dimensions in mm

Name in Figure 52	Value
a	550
b	20
c	220
d	110

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.5.3 Raise Pantograph

Figure 53 gives the shape and the sizes of the order “Raise Pantograph”.

The text colour shall be black on a white background and indicates if the pantograph will be under 25 kV or 3 kV.

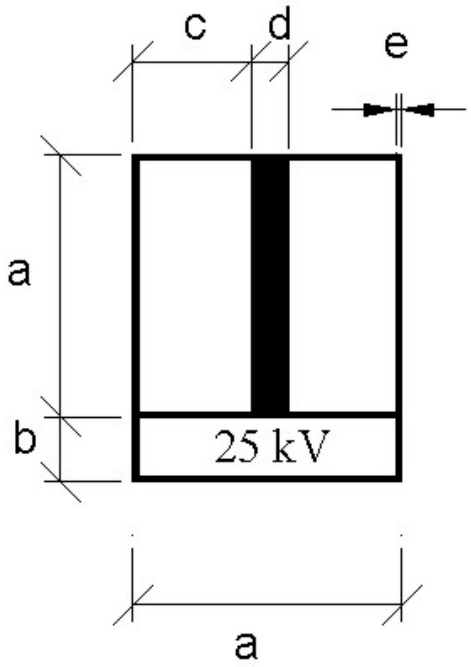

Figure 53 — Raise Pantograph (e.g 25 kV)

Table 20 gives the values applicable in Figure 53.

Table 20 — Values for the order “Raise Pantograph”

Dimensions in mm

Name in Figure 53	Value
a	550
b	110
c	220
d	110
e	20

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.5.4 Neutral section announcement

Figure 54 gives an example of the announcement of a neutral section sign.

It shall be at least 500 m in approach of the start of a neutral section.

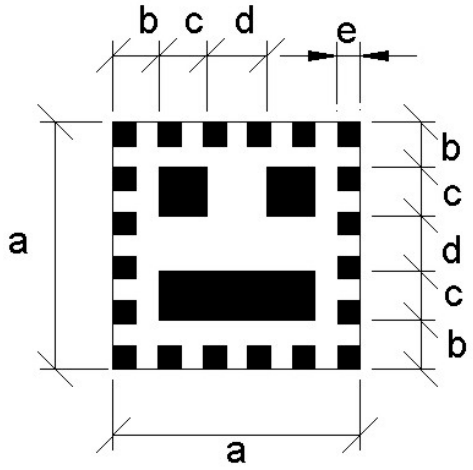

Figure 54 — Neutral section announcement

Table 21 gives the values applicable in Figure 54.

Table 21 — Values for the neutral section announcement

Dimensions in mm

Name in Figure 54	Value
a	550
b	115
c	100
d	120
e	50

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.5.5 Start of a neutral section

Figure 55 gives the shape and the sizes of the sign used to mark the start of the neutral section.

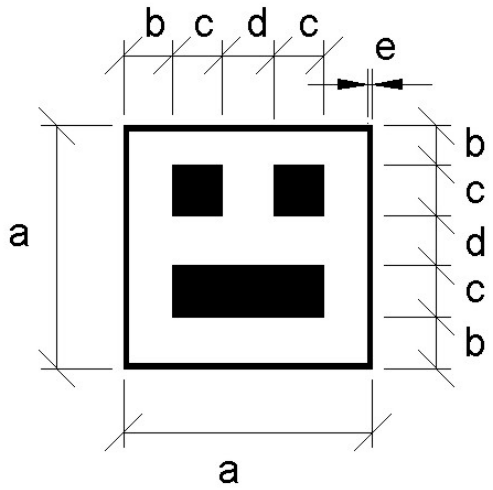

Figure 55 — Start of neutral section

Table 22 gives the values applicable in Figure 55.

Table 22 — Values for the signal "Start of neutral section"

Dimensions in mm

Name in Figure 55	Value
a	550
b	100
c	110
d	130
e	20

Figures 56 and 57 give the shape and the sizes of the sign used to mark the start of the neutral section before point work, Figure 56 shows the sign used for the right route and Figure 57 for the left route.

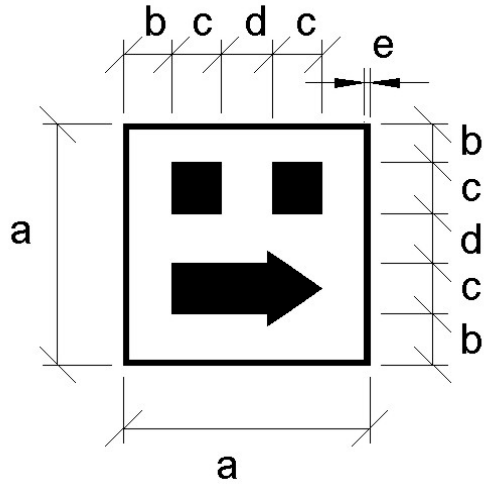

Figure 56 — "Start of neutral section" in approach point work, right route

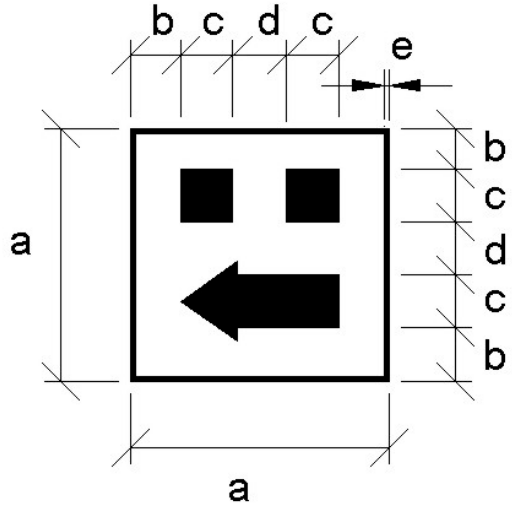

Figure 57 — "Start of neutral section" in approach point work, left route

The sizes for these two figures are the same as defined in Table 22.

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

9.5.6 End of a neutral section

Figure 58 gives the shape and the sizes of the sign used to mark the end of the neutral section.

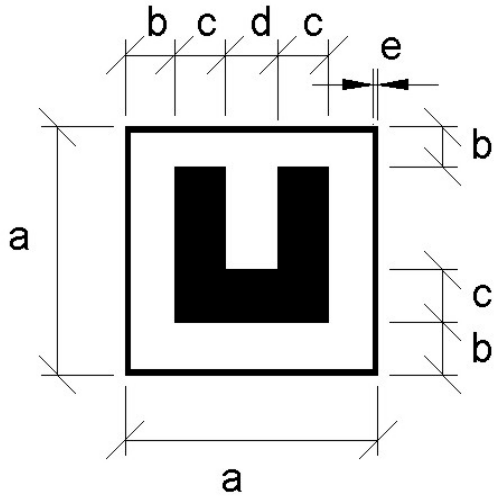

Figure 58 — End of the neutral section

Table 23 gives the values applicable in Figure 58.

Table 23 — Values for the sign "End of the neutral section"

Dimensions in mm

Name in Figure 58	Value
a	550
b	100
c	110
d	130
e	20

The white is retro-reflective Class 3.

The black is a serigraphy RFI IS 743.

10 High Speed Lines in Spain

10.1 Overview of the existing High Speed Lines in Spain

Figure 59 shows the current existing High Speed Lines in Spain at the 18h December 2006. This information is given in order to locate the different high-speed lines.

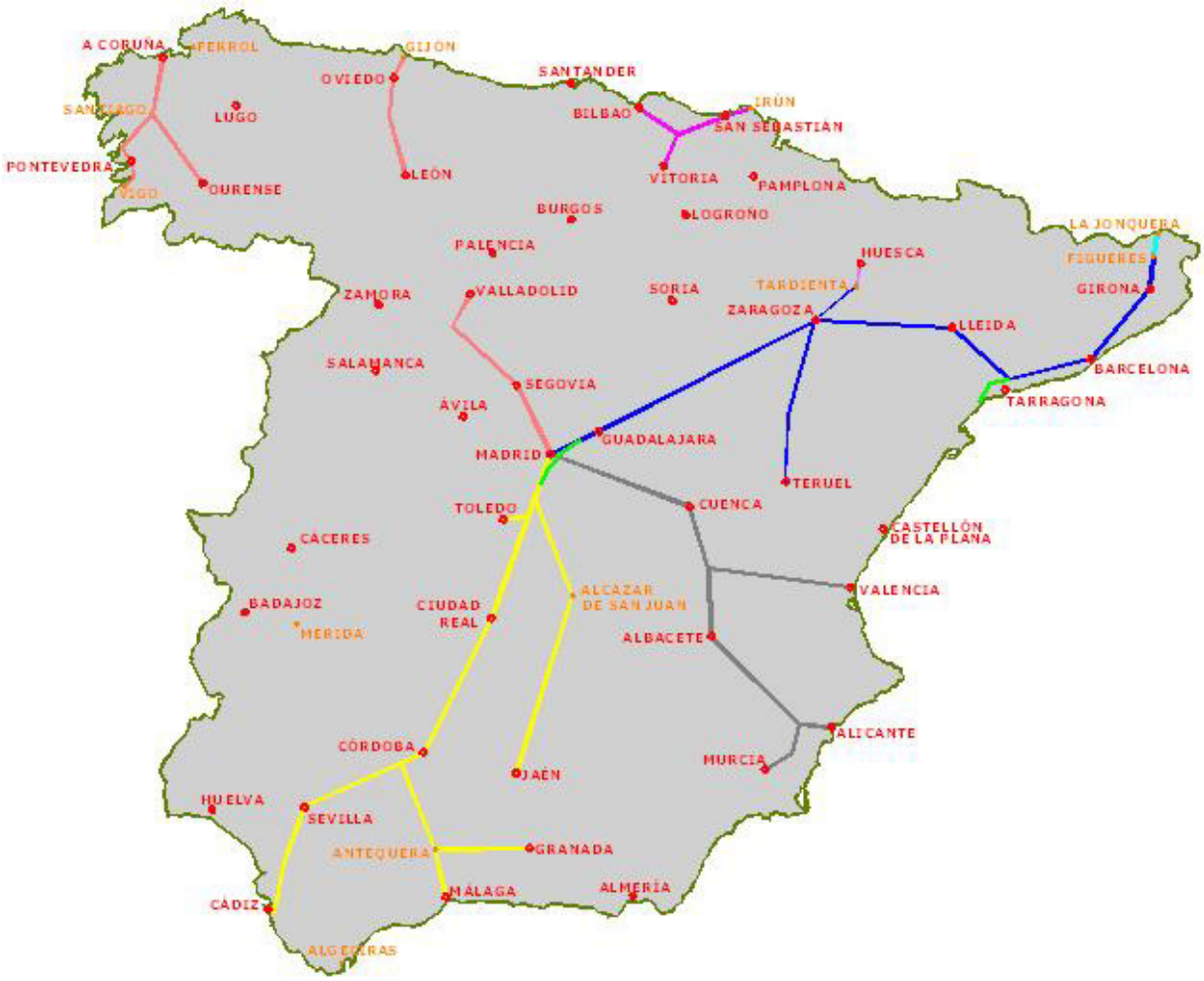

Figure 59 — HSL in Spain

These are the main features and characteristics of each HS:

HSL in operation:

— Line 1: Madrid-Ciudad Real-Córdoba-Sevilla, 1 435 mm gauge, double track;

— Line 2: Madrid-Zaragoza-Lleida-Camp de Tarragona-Roda de Barà, 1 435 mm gauge, double track;

— Line 3: Zaragoza-Huesca, 1 435 mm single track between Zaragoza and Tardienta; single track with three rails between Tardienta and Huesca, with one rail shared for both gauges 1 435 mm and 1 668 mm;

— Line 4: La Sagra-Toledo, 1 435 mm, double track;

— Line 5: Córdoba (Almodóvar del Río) – Antequera Santa Ana, 1 435 mm, double track.

HSL partially in operation:

— Line a: Atlantic Corridor *(Eje Atlántico* [2] *)*, 1 668 mm. The track is made with polyvalent sleepers in order to change the gauge in the future, from 1 668 mm to 1 435 mm. Double track;

— Line b: Bypass of Alpera *(Variante de Alpera)* [3], 1 668 mm. The track is made with polyvalent sleepers in order to change the gauge in the future, from 1 668 mm to 1 435 mm. Double track.

Level of Equipment of each Line:

— Line 1: Automatic Control Block *(Bloqueo de Control Automático, BCA)*. It is based in the LZB technology of ALCATEL-SEL. It is also fitted with ASFA as endorsement system in case of failure of the BCA;

— Line 2: ERTMS/ETCS Level 1 (in operation) and ERTMS/ETCS Level 2 (under tests). It is also fitted with ASFA as endorsement system in case of failure of the ERTMS/ETCS Level 1. In case of failure of ERTMS/ETCS Level 2, it is foreseen the use of ERTMS/ETCS Level 1, if it is available;

— Line 3: BLAU with CTC as blocking system, based on axle counters and ASFA national signal repetition system;

— Line 4: Automatic Control Block *(Bloqueo de Control Automático, BCA)* of ALCATEL-SEL technology. It is also fitted with ASFA as endorsement system in case of failure of the BCA;

— Line 5: Automatic Control Block *(Bloqueo de Control Automático, BCA)* of ALCATEL-SEL technology. It is also fitted with ASFA as endorsement system in case of failure of the BCA. ERTMS/ETCS Level 1 is under tests;

— Line a: BAB with CTC as blocking system, based on track circuits without joints and ASFA national signal repetition system;

— Line b: BAB with CTC as blocking system, based on track circuits without joints and ASFA national signal repetition system.

HSL under refurbishment or new construction:

— Antequera-Málaga;

— Antequera-Granada;

— Sevilla-Cádiz;

— Roda de Barà-Barcelona-Girona-Figueres;

— Madrid-Segovia-Valladolid-Norte/Noroeste [4];

— Madrid-Levante [5];

— Ourense-Santiago de Compostela;

— Atlantic Corridor;

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[2] Ferrol-A Coruña-Santiago-Pontevedra-Vigo-Portuguese Border.

[3] Between Chinchilla and Almansa in the broad gauge conventional main line Madrid-Alicante.

[4] Madrid-Segovia-Valladolid-Galicia/Principality of Asturias/Cantabria/Basque Country.

[5] Madrid-Castilla La Mancha-Comunidad Valenciana-Region of Murcia.

— Zaragoza-Teruel;

— Alcázar de San Juan – Jaén;

— Link between Mediterranean Corridor *(Corredor Mediterráneo)* and Madrid-Zaragoza-Barcelona-Figueres;

— Bypass of Pajares (Variante de Pajares [6]);

— "Y" Basque ("Y" Vasca [7]);

— Figueres-Perpignan (International Concessionaire “TP Ferro”).

Side of circulation of the trains in double track:

— In all the lines mentioned above, the normal side of circulation of the trains is on the right. It is to be defined the change of side between Spain and France, in the Figueres-Perpignan international line.

10.2 Line side equipment on the Spanish HSL "Madrid–Zaragoza–Barcelona–Figueres"

10.2.1 Commencement of ERTMS/ETCS Level 2 in the MBF

This marker is not as yet defined. It will probably be designed when the National Authority approves the operation under ERTMS/ETCS Level 2 in the MBF. Today, in practical terms, 10.2.2.1 applies to begin the operation under ERTMS/ETCS Level 1, and hopefully in ERTMS/ETCS Level 2 in the future.

10.2.1.1 Indication of a required stopping location on the line

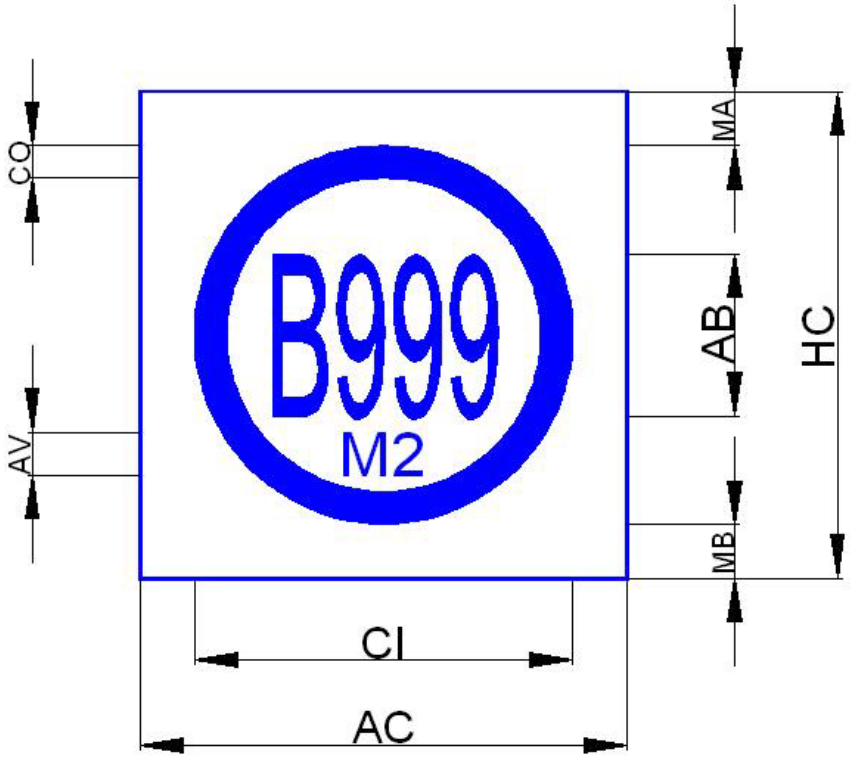

Figure 60 — Marker for indication of a required stopping location

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[6] Between León-Oviedo/Principality of Asturias.

[7] Bilbao/Vitoria-San Sebastián-Irún.

Table 24 gives the values applicable in Figure 60.

Table 24 — Values applicable for Figure 60

Dimensions in mm

Name in Figure 60	Value
AC	450
HC	450
CI	350
AB	150
AV	40
CO	30
MA	50
MB	50

The letter “B” inside the label contained in the marker board means block (*bloqueo*). The three numbers of the label indicate the approximate kilometric point of the line. The below label indicates the number of the track and the direction of travel. For this line “M” means Madrid, and “F” indicates Figueres or France. Number “1” is for the impair track, and number “2” is for the pair track.

The fonts for those text labels are:

— Arial black of 150 mm, condensed 45 % for the block number;

— Arial black of 40 mm, for the track identifier.

10.2.1.2 Indication of a required stopping location (in approach of a point work)

It is not implemented. This line is fitted with ERTMS/ETCS Level 1 and the national signal repetition system ASFA. Consequently, both systems are for degraded situations (ERTMS/ETCS Level 1 will be an endorsement system in the future). In those cases, the conventional light signals placed before those points are equivalent to the ERTMS/ETCS Level 2 marker boards.

10.2.2 Transition between ERTMS/ETCS and other national systems

10.2.2.1 Limits of the High Speed Line MBF and respective rules

10.2.2.1.1 Commencement of the PTO rules section

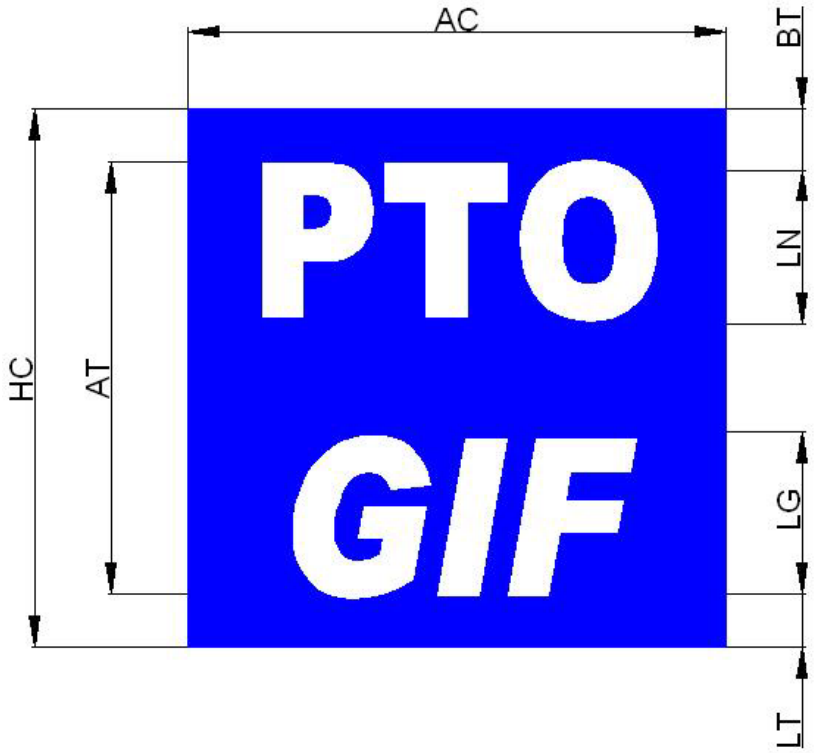

Figure 61 — Commencement of the PTO rules section

Table 25 gives the values applicable in Figure 61.

Table 25 — Values applicable for Figure 61

Dimensions in mm

Name in Figure 61	Value
AC	700
HC	700
AT	560
LN	200
LG	200
LT	70
BT	70

This marker defines the commencement of the section under PTO rules for the operation of the trains in the HSL MBF. In the future this marker will probably be located at the commencement of the ERTMS/ETCS Level 2 section.

The fonts for those text labels are:

— Arial bold of 200 mm for “PTO”;

— Fruit-Bi of 200 mm for “GIF”.

10.2.2.1.2 Termination of the PTO rules section

This marker is not yet defined. Today, in practical terms, 10.2.2.1.3 is applied.

10.2.2.1.3 Commencement of the NEC rules section

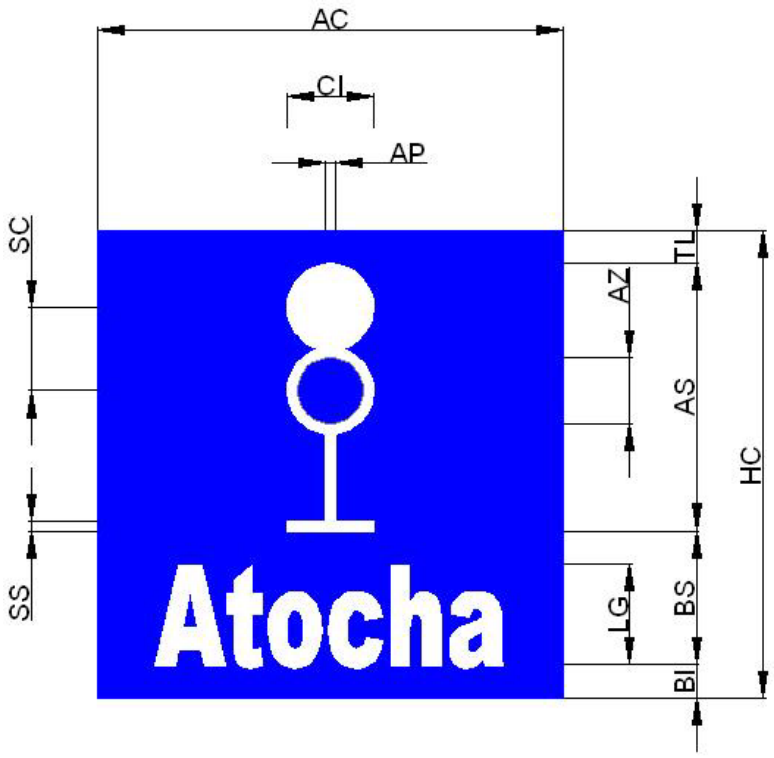

Figure 62 — Commencement of NEC rules section

Table 26 gives the values applicable in Figure 62.

Table 256 — Values applicable for Figure 62

Dimensions in mm

Name in Figure 62	Value
AC	700
HC	700
AS	400
BS	200
LG	150
CI	130
SC	125
AZ	100
TL	50
BI	50
AP	15
SS	15

This marker defines the commencement of the section under NEC rules for the operation of the trains near Madrid Puerta de Atocha station. In the future this marker will probably be located at the termination of the ERTMS/ETCS Level 2 section.

The font for the text label “Atocha”:

— Arial bold of 150 mm, condensed 64 %.

10.2.2.1.4 Termination of the NEC rules section

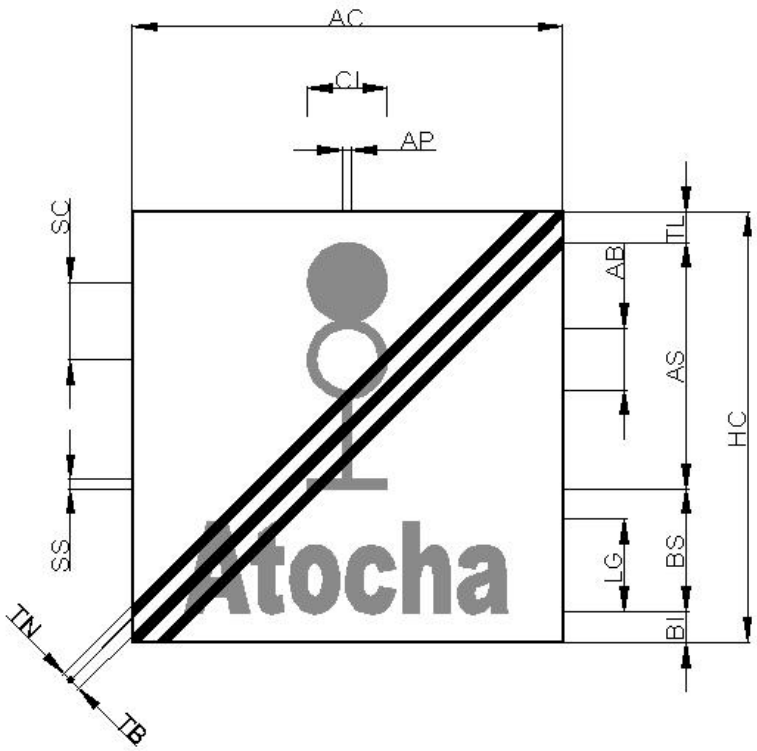

Figure 63 — Termination of NEC rules section

Table 27 gives the values applicable for Figure 63.

Table 27 — Values applicable for Figure 63

Dimensions in mm

Name in Figure 63	Value
AC	700
HC	700
AS	400
BS	200
LG	150
CI	130
SC	125
AB	100
TL	50
BI	50
AP	15
SS	15
TB	20
TN	15

This marker defines the termination of the section operated under NEC rules near Madrid Puerta de Atocha station.

Today, in practical terms, 10.2.2.1.1 is applied.

10.2.2.1.5 Commencement of the RGC rules sections

Figure 64 — Commencement of ASFA

Figure 65 — Commencement of BLAU

Figure 66 — Commencement of BAB

The three above figures give examples of commencement signs for RGC rules application.

The first line “EMPIEZA” means "*Commencement*". The second line defines the system.

Figure 64 gives the example for the “ASFA” (Spanish signal repetition system).

Figure 65 gives the example for the “BLAU" with "CTC” and Figure 66 gives the example for the “BAB”.

The background is always black, except in the case of BAB block system, where the background colour is blue.

For further details of these types of signs, consult the RGC document [7] in the bibliography. Other technical characteristics could also be found in the N.R.V. 5-0-1.0 First edition of March 1994 - Norma RENFE Vía, document [5] in the bibliography.

10.2.2.1.6 Termination of the RGC rules sections

Figures 67, 68 and 69 show the information for the limit for the application of the RGC rules.

Figure 67 — Termination of ASFA

Figure 68 — Termination of BLAU with C.T.C

Figure 69 — Termination of BAB

The first line “TERMINA” means "*Termination*". The second line defines the system. The rest of details are defined in 10.2.2.1.5.

10.2.3 Limit for shunting

This sign indicates the limit for shunting operations. The letter “M” is an abbreviation for "*maniobra"* (shunting).

Figure 70 defines the shape and the sizes for the sign.

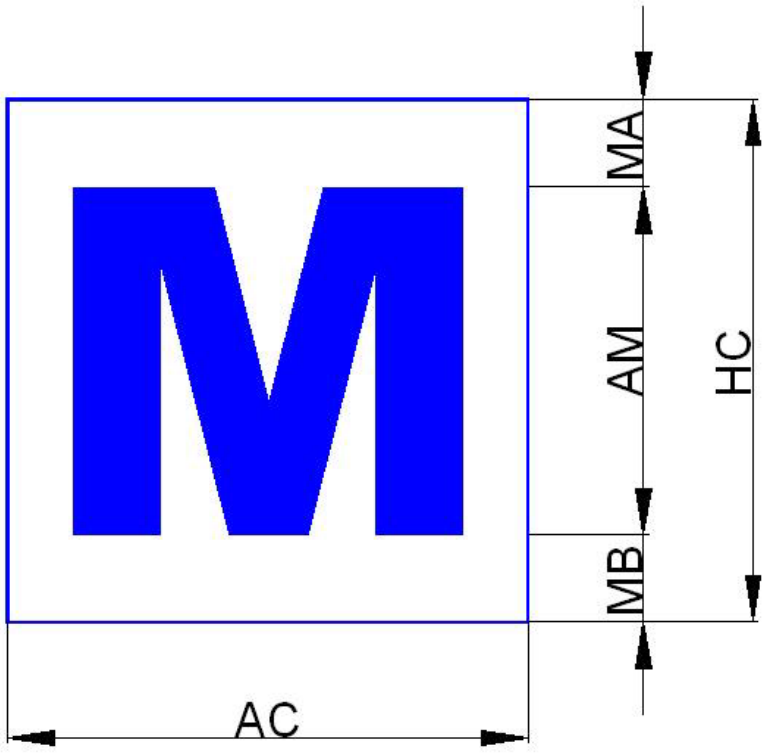

Figure 70 — Limit of shunting area

Table 28 gives the values applicable in Figure 70.

Table 268 — Values applicable for Figure 70

Dimensions in mm

Name in Figure 70	Value
AC	450
HC	450
AM	300
MA	75
MB	75

The font used in the text labels containing the letter “M” is:

— Arial black of 300 mm.

10.2.4 Electric Traction Orders

10.2.4.1 Raise Pantograph

Figure 71 gives the shape of the order.

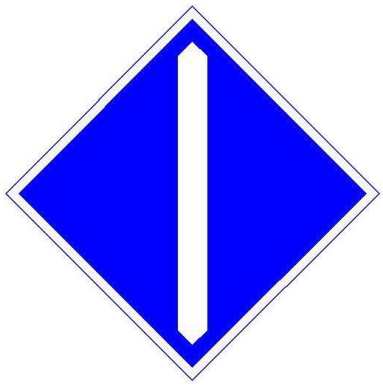

Figure 71 — Raise Pantograph

NOTE This sign is not yet installed at the HSL MBF. According with the PTO rules, when it is necessary to implement a rule not currently included in the PTO, it applies the RGC rules. Consequently, here is shown the shape of the RGC rule raise pantograph sign.

10.2.4.2 Lower Pantograph

Figure 72 gives the shape of the order.

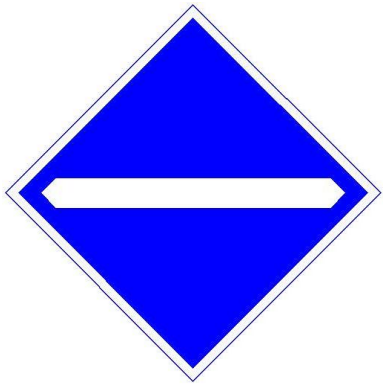

Figure 72 — Lower Pantograph

NOTE This sign is not yet installed at the HSL MBF. According with the PTO rules, when it is necessary to implement a rule not currently included in the PTO, it applies the RGC rules. Consequently, here is shown the shape of the RGC rule lower pantograph sign.

10.2.4.3 Approach to a neutral section

This marker indicates the driver he is approaching to a neutral section. When the background colour is yellow, it means it is a temporary situation.

Figures 73 and 74 define the shape and the sizes of the sign.

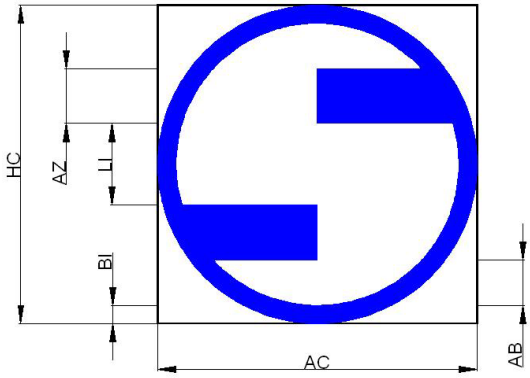

Figure 73 — Approach of a neutral section

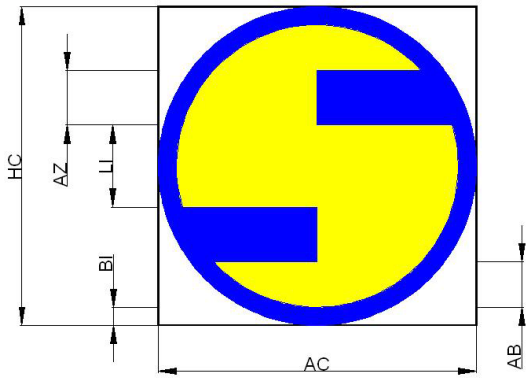

Figure 74 — Approach of a temporary neutral section

Table 29 gives the values applicable in Figures 73 and 74.

Table 279 — Value applicable for Figures 73 and 74

Dimensions in mm

Name in Figures 73 and 74	Value
AC	700
HC	700
LI	180
AZ	120
AB	100
BI	40

10.2.4.4 Start of neutral section

This sign indicates to the driver the start point of a neutral section.

Figure 75 defines the shape and the sizes for the sign.

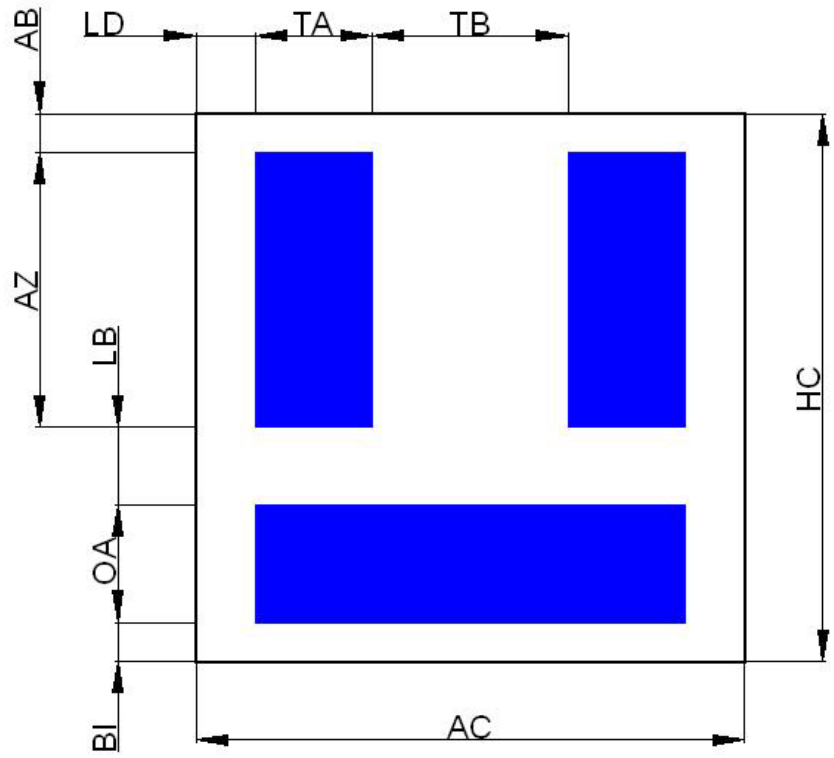

Figure 75 — Start of neutral section

Table 30 gives the values applicable in Figure 75.

Table 30 — Values applicable for Figure 75

Dimensions in mm

Name in Figure 75	Value
AC	700
HC	700
AZ	350
TB	250
OA	150
TA	150
LB	100
LD	75
AB	50
BI	50

10.2.4.5 End of neutral section

This sign indicates to the driver the end of a neutral section.

Figure 76 defines the shape and the sizes for the sign.

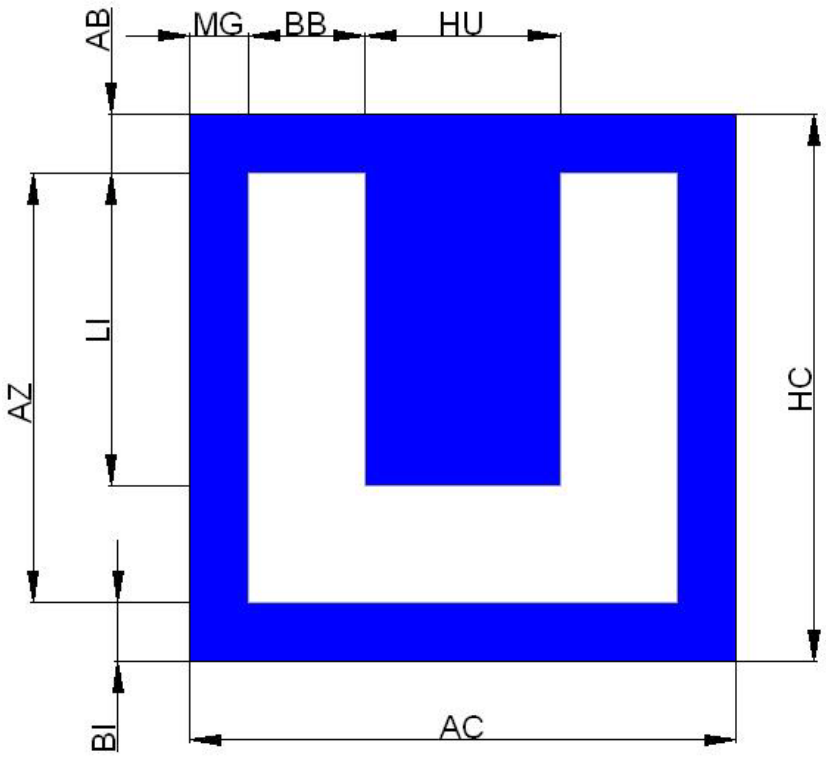

Figure 76 — End of neutral section

Table 31 gives the values applicable in Figure 76.

Table 31 — Values applicable for Figure 76

Dimensions in mm

Name in Figure 76	Value
AC	700
HC	700
AZ	550
LI	400
HU	250
BB	150
AB	75
BI	75
MG	75
AB	50

10.2.4.6 Complementary signs for the end of neutral section

These two signs are located at 200 m and 400 m, respectively, beyond the end of a neutral section. This information helps the driver to identify the position of the rear pantograph.

Figures 77 and 78 define the shape and the sizes for the signs.

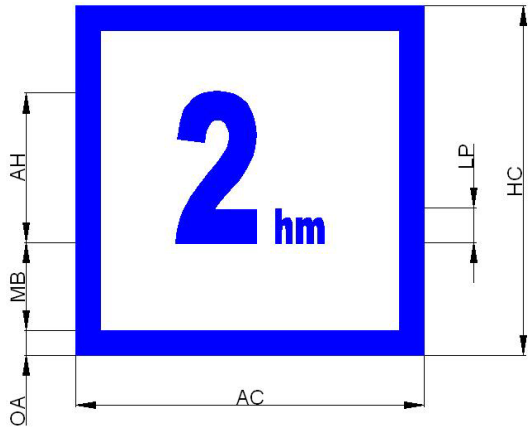

Figure 77 — 200 m beyond the end of a neutral section

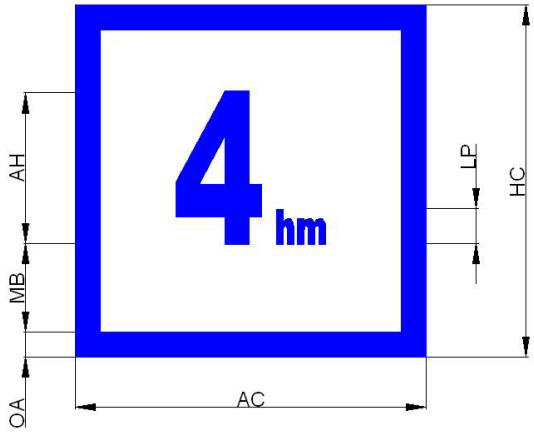

Figure 78 — 400 m beyond the end of a neutral section

Table 32 gives the values applicable for Figures 77 and 78.

Table 32 — Values applicable for Figures 77 and 78

Dimensions in mm

Name in Figures 77 and 78	Value
AC	700
HC	700
AH	300
MB	175
LP	70
OA	50

The fonts used in the text label indicating the hectometre information are:

— Arial bold of 300 mm, condensed 65 %;

— Arial bold of 70 mm, condensed 65 %.

10.2.4.7 End of overhead line power supply

This sign indicates to the driver the limit of the movement for electric trains. Normally, this marker is located at the end of the sections fitted with overhead line power supply.

Figure 79 defines the shape and the sizes for the sign.

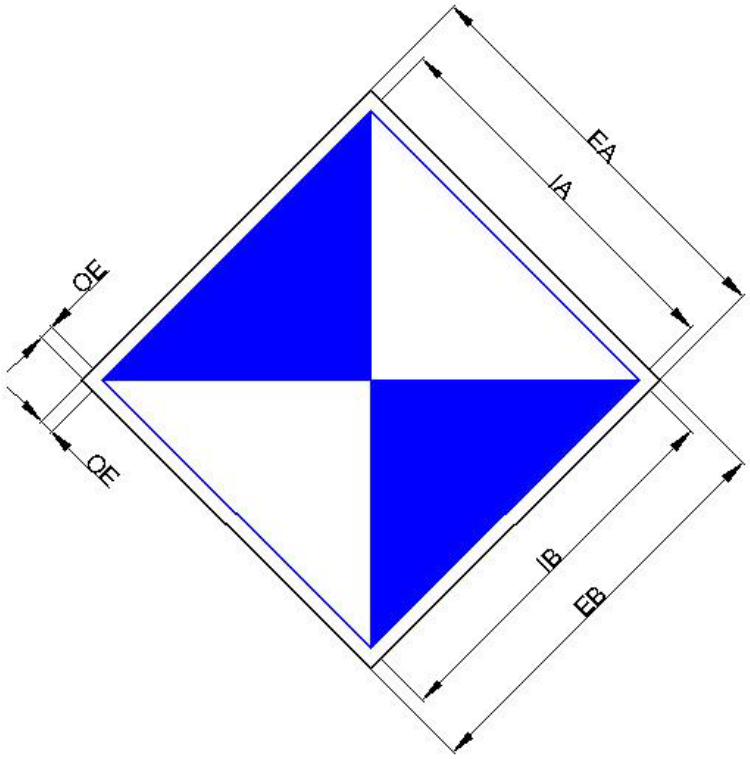

Figure 79 — End of overhead line power supply

Table 33 gives the values applicable in Figure 79.

Table 33 — Values applicable for Figure 79

Dimensions in mm

Name in Figure 79	Value
EA	700
EB	700
IA	650
IB	650
OE	25

10.2.4.8 Change of voltage on overhead line power supply

This sign indicates the point of change of voltage of the overhead line power supply. In Figure 80, it shows the end of the 3 000 V DC power supply, and the beginning of the 25 000 V AC 50 Hz. In Figure 81, it shows the inverse case. Consequently, the change is from 25 000 V AC 50 Hz to 3 000 V DC.

Figures 80 and 81 define the shape and the sizes for the signs.

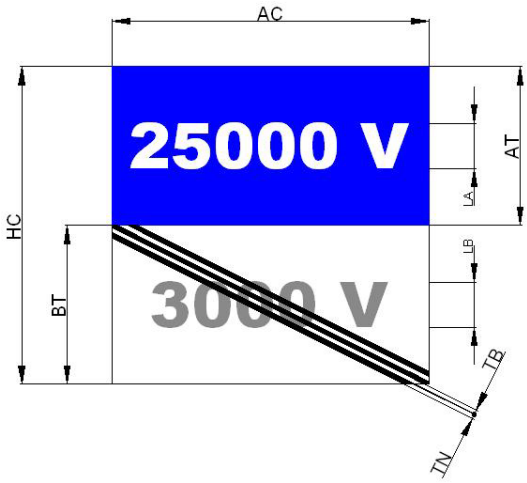

Figure 80 — Change 3 000 V to 25 000 V

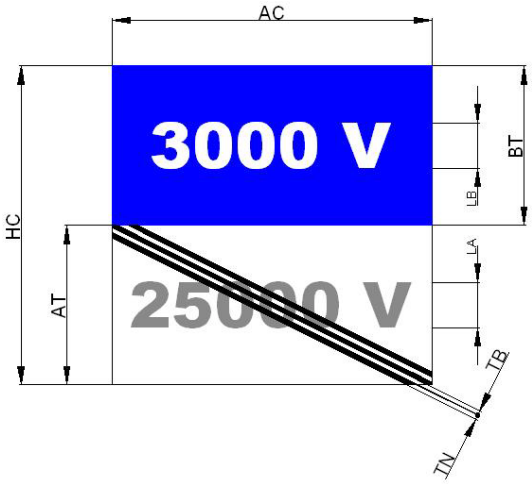

Figure 81 — Change 25 000 V to 3 000 V

Table 34 gives the values applicable in Figures 80 and 81.

Table 34 — Values applicable for Figures 80 and 81

Dimensions in mm

Name in Figures 80 and 81	Value
AC	700
HC	700
BT	350
AT	350
LA	100
LB	100
TN	10
TB	10

The font for the text labels containing the voltage values is:

— Arial black of 100 mm.

10.2.5 Change of gauge facility

10.2.5.1 Change of gauge from 1 435 mm to 1 668 mm.

This sign is located at the entrance to facilities for changing the gauge. Figure 82 shows the sense of change from 1 435 mm gauge to 1 668 mm Spanish National gauge.

Figure 82 defines the shape and the sizes for the sign.

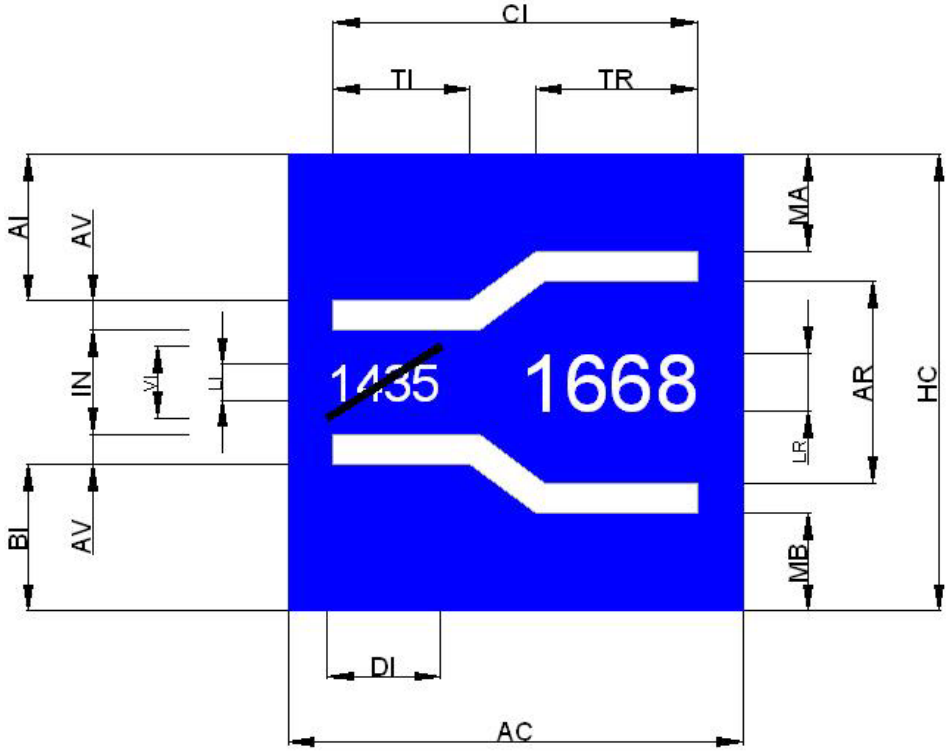

Figure 82 — Change gauge 1 435 mm to 1 668 mm

Table 35 gives the values applicable in Figure 82.

Table 35 — Values applicable for Figure 82

Dimensions in mm

Name in Figure 82	Value
AC	700
HC	700
CI	560
AR	310
IN	160
AI	150
BI	150
DI	175
VI	110
MA	150
MB	150
TI	210
TR	250
AV	45
LR	90
LI	55

The fonts used in the text labels indicating the measure of gauge are:

— Arial black of 90 mm for the 1 668 mm gauge;

— Arial black of 55 mm for the 1 435 mm gauge.

10.2.5.2 Change of gauge from 1 668 mm to 1 435 mm

This sign is located at the entrance to facilities for changing the gauge. Figure 83 shows the sense of change from 1 668 mm Spanish National gauge to 1 435 mm gauge.

Figure 83 defines the shape and the sizes for the sign.

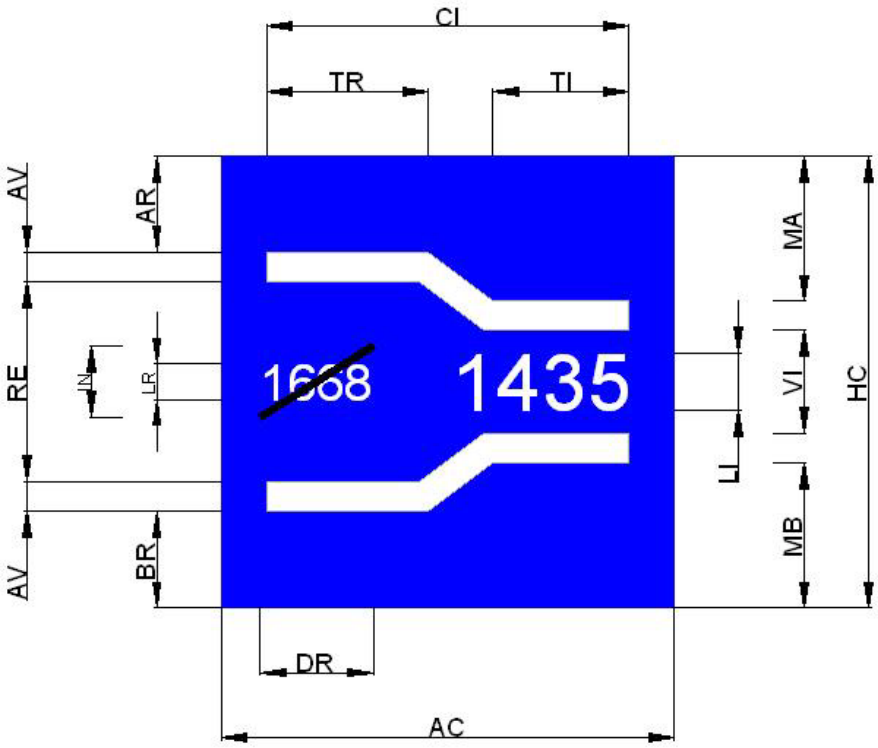

Figure 83 — Change of gauge 1 668 mm to 1 435 mm

Table 36 gives the values applicable in Figure 83.

Table 36 — Values applicable for Figure 83

Dimensions in mm

Name in Figure 83	Value
AC	700
HC	700
CI	560
RE	310
VI	160
AR	150
BR	150
DR	175
IN	110
MA	225
MB	225
TI	210
TR	250
AV	45
LR	55
LI	90

The fonts used in the text labels indicating the measure of gauge are:

— Arial black of 90 mm for the 1 435 mm gauge;

— Arial black of 55 mm for the 1 668 mm gauge.

10.2.5.3 Complementary signs for the change of gauge operations

There are other complementary signs to help the driver for the operations of change of gauge. These signs are not included in the PTO rules. They are installed in accordance with the technology of the change of gauge facility and the type of train.

The texts of the labels may vary depending the technical specifications of each change of gauge facility, or the operations required for the type of train. Figures 84, 85 and 86 show the signs which are typically found in a change of gauge facility.

Figure 84 – Start of change of gauge facility

Figure 85 – End of change of gauge facility for single trainset

Figure 86 – End of change of gauge facility for two coupled trainsets

The label “CA” is an abbreviation of “Cambiador de Ancho”. It means *Change of Gauge facility*. It shows the commencement of the operations for the change of gauge.

The label “FCA” is an abbreviation of “Fin de Cambiador de Ancho”. It means *End of Change of Gauge facility*. The rest labels inside this marker, below the label “FCA”, are complementary. “US” is an abbreviation of “Unidad Sencilla”, and “UA” is “Unidad Acoplada”. The meaning is *Single Unit (Automotive)* and *Coupled Units (Automotive)*, respectively.

There are many other complementary signs not belonging to this series. Figure 87 shows an example:

Figure 87 – Head of train

The label “CABEZA DE TREN” means *Head of Train*.

According with the PTO rules, those signs are not included in the rules. Consequently, the rules of RGC are applied. The background of all these signs is black.

For further details, here also applies the final paragraph of 10.2.2.1.5.

10.2.6 Limit of B.C.A block section on the HSL Madrid-Ciudad Real-Córdoba-Sevilla, the HSL branch La Sagra-Toledo and HSL branch Córdoba - Antequera

This sign indicates the location of separation of the different block sections in these HSL. It is used for the LZB – B.C.A. block system installed alongside these lines. The number shown on the sign is related to the datum code linked to the kilometre point of the line.

Figure 88 defines the shape and the sizes for the sign.

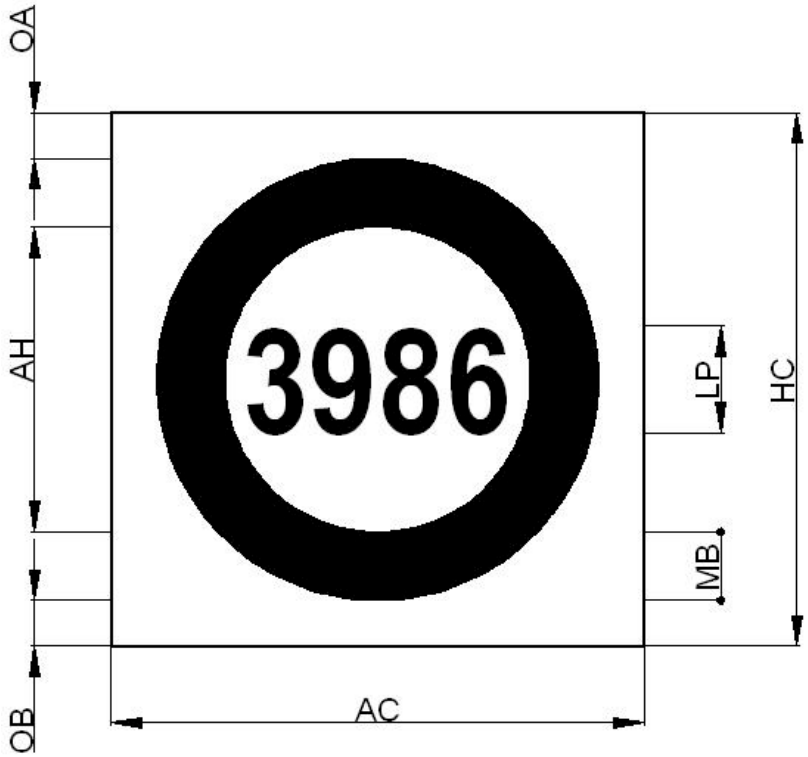

Figure 88 — Limit of B.C.A. block section

Table 37 gives the values applicable in Figure 88.

Table 37 — Values applicable for Figure 88

Dimensions in mm

Name in Figure 88	Value
AC	700
HC	700
AH	400
LP	140
MB	90
OA	60
OB	60

The font for the numeric label is:

— Arial black of 140 mm, condensed 80 %.

10.3 Technical characteristics of the Spanish marker boards

For adequate nocturnal visibility, the signs shall be retro-reflective at least with Level 2 (see UNE 135334, document [18] in the bibliography).

11 Line Side Equipment on the Swiss ERTMS/ETCS Level 2 Lines

11.1 Swiss ERTMS/ETCS Level 2 Lines

Currently Switzerland has two lines equipped with the ERTMS/ETCS Level 2 signalling system:

1) Neubaustrecke Mattstetten – Rothrist.

2) Lötschbergbasislinie.

Additional lines, especially newly built lines, are planned to be equipped with ERTMS/ETCS Level 2 signalling system in the future. An overview of the current and planned lines is shown in Figure 89.

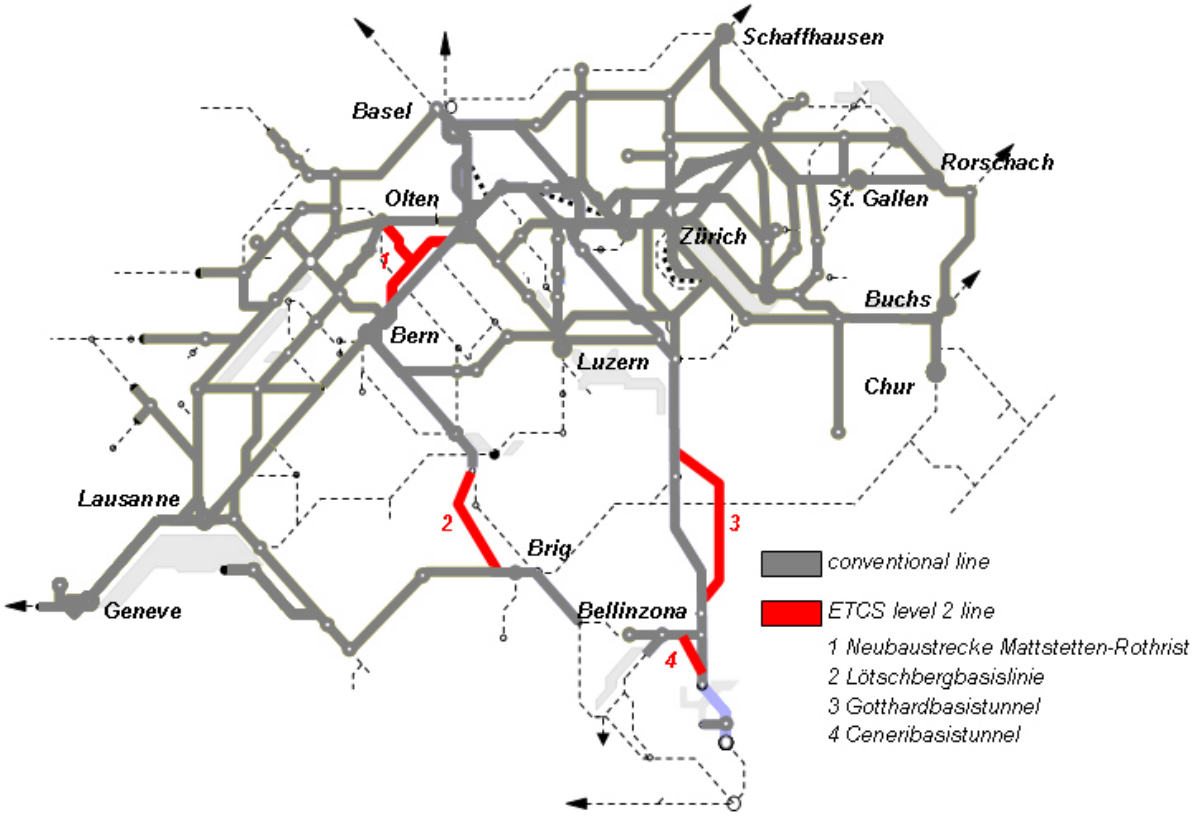

Figure 89 — Overview of Swiss ERTMS/ETCS Level 2 lines

It was planned that the Neubaustrecke Mattstetten – Rothrist will be equipped only with an ERTMS/ETCS Level 2 signalling system. However due to technical delays the line had to be also equipped with a conventional signalling system and was opened in December 2004 for revenue service. On July 2nd 2006, a partial ERTMS/ETCS-based revenue service was permitted to operate (during the evening). It is planned to extend the ERTMS/ETCS revenue service on this line in December 2006.

The Lötschbergbasislinie is planned to go into revenue service in December 2007. The Lötschbergbasislinie will not have conventional signalling equipment.

11.2 Signals in Direct Context with the cab signalisation

11.2.1 Commencement of the cab signal area (ERTMS/ETCS Level 2)

The Swiss reference number of this sign is 601.

Figure 90 shows the visual aspect of the sign.

Figure 90 — Commencement of cab signal area

The original name is given in three languages:

— German: Führerstandsignalisierung – Anfang;

— French: début de la signalisation en cabine;

— Italian: Inizio della segnalazione in cabina di guida.

NOTE When a train is approaching this sign, it must stop if:

— the leading vehicle is not equipped with a cab signal system (ERTMS/ETCS Level 2) or;

— the cab signal system is not operational/activated or;

— the engine driver is not permitted/licensed to operate with cab signalling.

11.2.2 Termination of the cab signal area (ERTMS/ETCS Level 2)

The Swiss reference number of this sign is 602.

Figure 91 shows the visual aspect of the sign.

Figure 91 — Termination of cab signal area

The original name is given in three languages:

— German: Führerstandsignalisierung – Ende;

— French: fin de la signalisation en cabine;

— Italian: Fine della segnalazione in cabina di guida.

NOTE 1 The train driver continues running under authority of conventional line side signalling.

NOTE 2 A special sign may be used to inform the driver that the distant signal is not provided in approach of the main signal.

The Swiss reference number of this sign is 563.

Figure 92 shows the visual aspect of this sign.

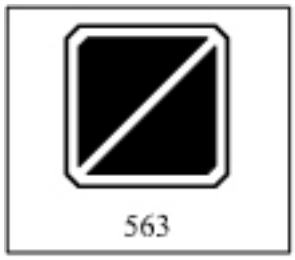

Figure 92 — Missing distant signal

The original name is given in three language:

— German: Fehlendes Vorsignal zum Einfahrsignal;

— French: absence de signal avancé d'entrée;

— Italian: Segnale d'entrata privo di segnale avanzato.

11.2.3 Marker Board for Main Signal

The Swiss reference number of this sign is 603.

Figure 93 shows the visual aspect of the sign. The arrow points to the track for which the signal is valid.

Figure 93 — Marker board for main signal

The original name is given in three languages:

— German: Merktafel Hauptsignal;

— French: panneau signal principal;

— Italian: Tavola di avviso segnale principale.

NOTE If no movement authority is given the driver shall stop in approach of this sign.

11.3 Signals for Train Movements and Shunting

11.3.1 Indication boards

11.3.1.1 Commencement of station [8] area

The Swiss reference number of this sign is 267.

This sign indicates the limit of shunting area at the boundary between station area and line. The abbreviation of the station name is printed on the board.

Figure 94 gives an example of the sign.

Figure 94 — Commencement of station area

The original name is given in three languages:

— German: Bahnhofanfang;

— French: début de la gare;

— Italian: Inizio della stazione.

11.3.1.2 Termination of station area

The Swiss reference number of this sign is 268.

This sign indicates the limit of shunting area at the boundary between station area and line. The abbreviation of the station name is printed on the board. Figure 95 gives an example of this sign.

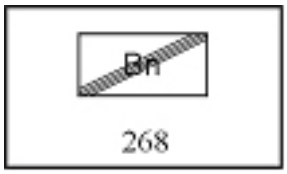

Figure 95 — Termination of station area

The original name is given in three languages:

— German: Bahnhofende;

— French: fin de la gare;

— Italian: Fine del territorio di stazione.

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[8] Refer to the Swiss definition of "Station".

11.4 Signals for Shunting Movements

11.4.1 Signalisation at Shunting Signals

The Swiss reference number of this sign is 303.

Figure 96 shows the visual aspect of the light signal used to stop the shunting movement in approach of them.

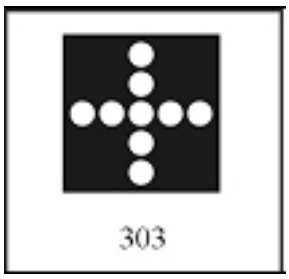

Figure 96 — Light signal "Stop" for shunting movement

The original name is given in three languages:

— German: Halt für Rangierbewegung;

— French: arrêt pour le mouvement de manœuvre;

— Italian: Fermata per movimento di manovra.

Figure 97 shows the visual aspect of the sign used to stop a shunting movement in approach of them.

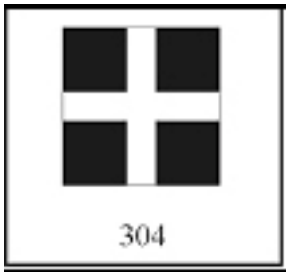

Figure 97 — Sign "Stop" for shunting movement

11.5 Signals for Train Movements

11.5.1 Indication Boards

The following sign is used to show the location of the stop point for passenger trains. The number gives the length in hectometres. This signal is used in the service/emergency stopping point in tunnels.

The Swiss reference number of this sign is 578.

Figure 98 shows the visual aspect of this sign.

Figure 98 — Stop point

The original name is given in three languages:

— German : Halteort;

— French : point d'arrêt;

— Italian : Posto di fermata.

11.6 Signals for Electrical Operation

11.6.1 Neutral section announcement

The Swiss reference number of this sign is 708.

Figure 99 shows the visual aspect of this sign.

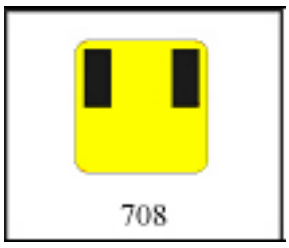

Figure 99 — Neutral section announcement

The original name is given in three languages:

— German : Vorsignal zum Ausschaltsignal;

— French : signal avancé de déclenchement;

— Italian : Segnale d'avviso per il segnale di disinserimento.

11.6.2 Start of neutral section

The Swiss reference number of this sign is 710.

Figure 100 shows the visual aspect of this sign.

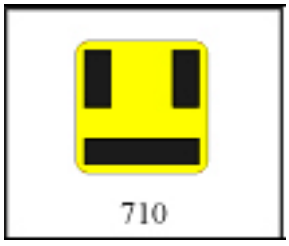

Figure 100 — Start of neutral section

The original name is given in three languages:

— German : Ausschaltsignal;

— French : signal de déclenchement;

— Italian : Segnale di disinserimento.

11.6.3 End of neutral section

The Swiss reference number of this sign is 712.

Figure 101 shows the visual aspect of this sign.

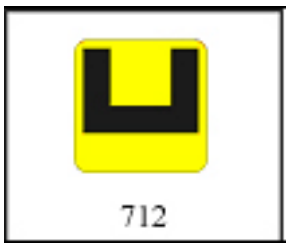

Figure 101 — End of neutral section

The original name is given in three languages:

— German : Einschaltsignal;

— French : signal d’enclenchement;

— Italian : Segnale d’inserimento.

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