RIVET GAMES

Train Simulator 2019

Gotthardbahn
Erstfeld to Bellinzona

1 Route Information

1.1 **History**

The Gotthard railway (German: Gotthardbahn) is the Swiss railway line from northern Switzerland through to the canton of Ticino. The line is an important international railway link between northern and southern Europe. This product features the line from Erstfeld to Bellinzona as it was in 2012 during the construction phase of the Gotthard Base Tunnel, which was opened in 2016.

The railway is the second highest standard gauge railway in Switzerland, penetrating the Alps by means of the Gotthard Tunnel at 1,151 metres (3,776 ft) above sea level. The line then descends to Bellinzona, at 241 metres (791 ft) above sea level. The extreme differences in altitude required the use of long ramped approaches on each side of the tunnel, together with several spirals.

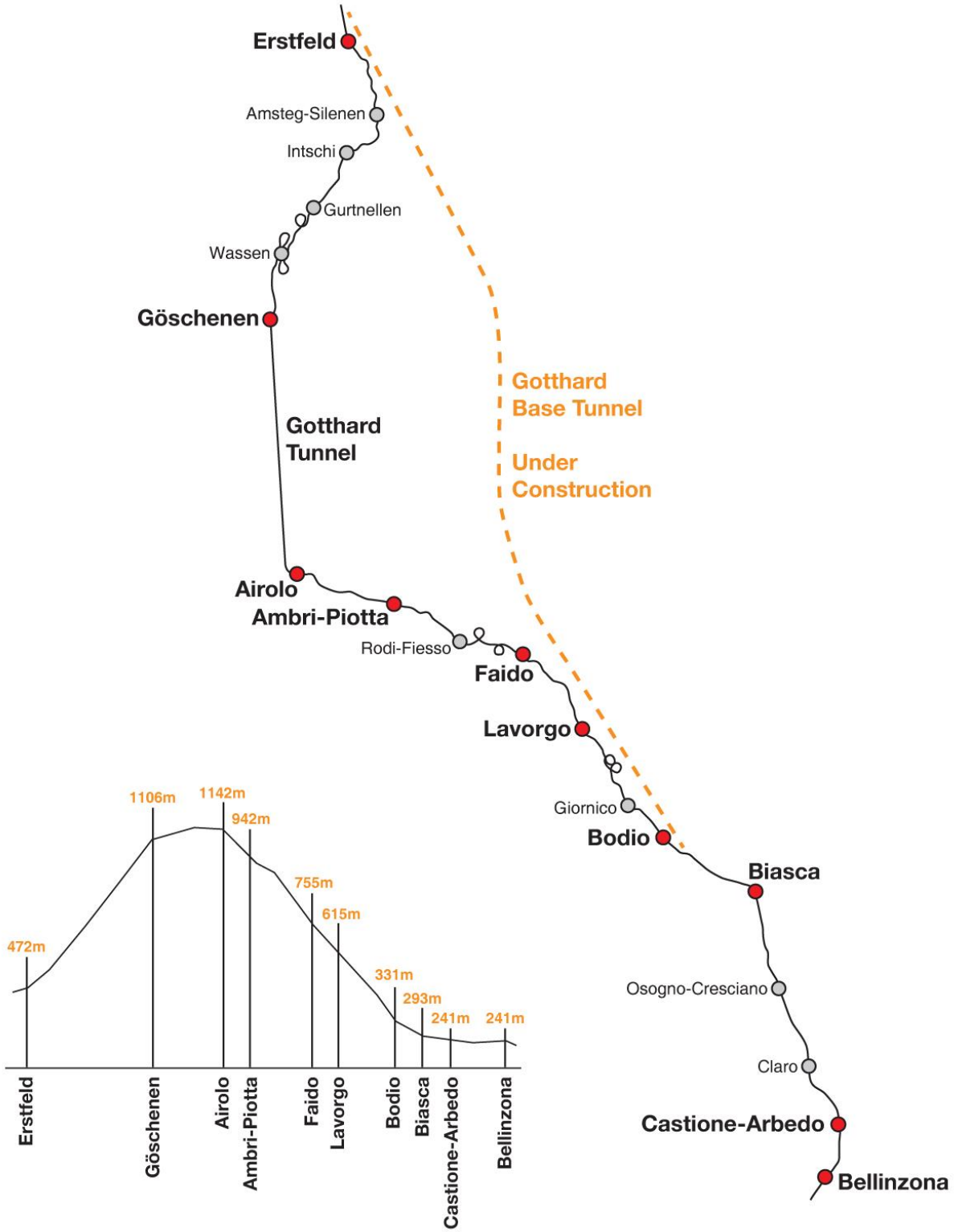
Construction of the line started in 1872 and the full line opened in 1882, following completion of the Gotthard Tunnel. The line was incorporated into the Swiss Federal Railways in 1909, and electrified in 1922.

The approaches to the existing tunnel continued to restrict speed and capacity on this important international route, and in 1992 it was decided to build a new lower level route on the Gotthard axis as part of the NRLA project. This route involved the construction of the new Gotthard Base Tunnel. The base Tunnel was completed and integrated with the existing route in 2016 and is the longest railway tunnel in the world.

1.2 **Route Features**

- 110km route from Erstfeld to Bellinzona
- SBB L and N type signalling system with custom designed signal models and features including:
    - Animated Brake Test and Abfahrbefehl (departure indicators)
    - Operating "Besetztes Gleis" indicators for entering occupied platforms
    - Three state ground signals that function correctly between main signals
    - Integra Signum Safety System track magnets and in-cabin equipment
    - Zub Safety System cabin display
- Over 60 new building models to capture the unique architecture of the region
- Over 200 overhead line equipment and catenary models
- Custom bridge and tunnel portal models designed to accurately represent the stunning engineering of the route
- 15 Highly detailed station models designed from our survey of the route in early 2019 along with many other feature models along the Gotthard line
- Re 460 Electric Locomotive in branded SBB livery featuring animated wing mirrors and exterior driver character that automatically moves to the driving end of the loco.
- EWIV coaches in three variants (A, B and Bt). The A coach includes a highly detailed passenger view with 5 camera positions. The Bt driving coach features a fully functional driving cabin allowing pull-push operation of trains.
- Res flat wagons. Both unloaded and concrete barrier loaded versions are included
- Route fully configured for Quick Drive scenarios
- 7 x Career Scenarios including a guided tutorial for the Re 460 locomotive
- 2 x Railfan Mode Scenarios

1.3 **Route Map**



2 Other Information

This document is provided as a guide to Rivet Games' Gotthardbahn add-on route for Train Simulator, a product provided for entertainment purposes.

There is more information on this route at www.rivet-games.com/Gotthardbahn along with links to detailed reference material.

If you do notice errors in this document, please let us know at support@rivet-games.com.

Please give feedback on the Rivet Games forums: forums.rivet-games.com.

3 Acknowledgements

We would like to thank SBB for their assistance in developing this route and for permission to use their branding on models included with this product.

We also wish to thank the Dovetail Games third party partner team and beta testers for their help and support.

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Re 460 Locomotive and EWIV A B and Bt Driving Coach

1 The Re 460 Locomotive

1.1 **Locomotive History**

The Re 460 series are modern four-axle electric locomotives of the Swiss Federal Railways. They were introduced as part of Rail 2000, a project to modernise and improve capacity on Switzerland's railways. Upon their entry into service in the early 1990s they displaced older Re 4/4 II series locomotives into lesser duties.

The series was originally designed as a multipurpose locomotive, they are now primarily used for passenger services. Their freight role has been assumed by Re 482s.

1.2 **Design & Specification**

Number Range	**460 000 – 460 118**
Wheel Arrangement	Bo-Bo
Weight	84 tonnes
Length	18.5m
Width	3m
Power at Rail	8,180hp (6,100kW)
Max Speed	230km/h

1.3 **Driving the Re 460 and EWIV Bt Driving Coach**

Learning to drive the vehicles takes a little time and so to introduce you to the key driving elements, we have provided a scenario to teach you the basic operation. We strongly suggest you complete this training before trying any of the harder scenarios.

The tutorial can be found in the Career tab of the Drive menu and is called *Re 460 SBB Locomotive Tutorial*

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1.4 **Cabin Controls for Re 460 and EWIV Bt Driving Coach**

Refer to the illustrations on page 4

1	Locomotive Brake	19	Zub Warning System Display
2	Train Brake	20	Vigilance Reset Pedal
3	Reverser	21	Instrument Dimmer Switch
4	Combined Throttle and Dynamic Brake	22	Train Doors Open Indicator
5	V-Controller (cruise control speed set)	23	Emergency Brake Indicator
6	V-Controller Speed Set Indicator	24	Speedometer (Km/h)
7	Headlight Controls	25	Brake Pipe Pressure Needle
8	Cab Light Switch	26	Brake Cylinder Pressure Needle
9	Main Switch (raise pantograph)	27	Main Reservoir Pressure Needle
10	Lower Pantograph	28	Air Brake Indicator
11	Windscreen Wipers Switch	29	Handbrake Control Buttons
12	Safety System Acknowledge Switch and Indicator	30	Sander Button
13	Horn	31	Wheel Slip Indicator Lamp
14	Zub Warning System Maneuver Switch	32	Train Weight Reminder Display (Tonnes)
15	Parking Brake Indicator Lamp	33	Train Length Reminder Display (Metres)
16	Traction and Dynamic Braking Effort Indicator	34	Vigilance System Indicator (system off by default, press SHIFT + keypad ENTER to toggle on and off)
17	Catenary Voltage Indicator	35	Main Running Lights Indicator Lamp
18	Clock	36	Moveable Power / Brake Console Arm

Refer to controls list on page 2

1.5 **Additional Keyboard Controls**

L – Toggle Cab Light On / Off	**Y** – Increase V-Controller Speed
I – Increase Instrument Lights	**C** – Decrease V-Controller Speed
SHIFT+**I** – Decrease Instrument Lights	**M** – Toggle Zub Manoeuvre On/Off
Q – Integra Safety System Acknowledge	**F** – Free Zub Safety System

1.6 **Integra Signum Safety System**

You are alerted by the Integra safety system when you pass a distant signal (Vorsignal) that is displaying a warning. The safety system acknowledge lamp will illuminate yellow accompanied by an audio tone. You must turn the acknowledge switch immediately to the right otherwise the emergency brakes will be applied automatically. Once pressed there will be six further lamp flashes and two audio beeps to remind you that you are driving under a distant signal caution. An Integra safety system alert will also be activated when you pass a main signal (Hauptsignal) displaying Aspect 6 (Short Journey – Expect Obstruction).

1.7 **Zub Safety System**

You are alerted by the Zub safety system when you pass a distant signal (Vorsignal) that is displaying a warning. The Zub display will show the target speed in km/h that you must achieve before reaching the next main signal where the target speed restriction will begin. If the distant signal is warning of a danger (stop) signal ahead then the target speed will be zero and the display will show “0”.

After passing a main signal at the required target speed the Zub display will be updated to show “8888” accompanied by two audio tones. This denotes that the speed is now being monitored.

When passing signals displaying a clear aspect the Zub display will be updated to show “----“ to denote the line ahead is clear. This will again be accompanied by two audio tones.

1.8 **Re 460 Running Numbers**

When creating scenarios running numbers for the Re 460 locomotives are generated randomly including a letter that controls the display of the correct nameplate on the side of the loco corresponding to the generated number. The twenty six valid running numbers and nameplates are as follows:

0003a - Grauholz	0508n - Züspa
0055b - Val d'Anniviers	0540o - Dreiländereck
0078c - Junior	0581p - La Côte
0128d - Erguël	0680q - Gütsch
0136e - North Vaudois	0789r - Monte Generoso
0144f - Val-du-Trent	0961s - Furttal
0300g - Säntis	1050t - Fürstenland
0342h - Aare	1068u - Munot
0382i - Hauenstein	1126v - Thurtal
0391j - Rochers-de-Naye	1134w - Irchel
0417k - Mendrisiotto	1175x - Lake Zurich
0424l - Albis	1183y - Gottardo
0474m - Maderanertal	0219z - Blank

2 EWIV Coaches

2.1 **Bt Driving Coach Destination Displays**

If you wish to make use of the coaches in your own scenarios, it is possible to customise the destination display of the EWIV Bt driving coach during the creation of a scenario. In order to display a specific destination the correct value must be entered into the vehicle properties window. This number consists of a 5 digit value containing both numbers and a letter.

The 5 digit value is arranged like so: **VVVVD**

VVVV = the Vehicle number (the white number displayed on the side of the coach)
D = the Destination (the destination text displayed on the LED screens)

Example shown above: 9250S *(where "S" is for Bellinzona) – see valid destinations below:*

A - Arth-Goldau
B - Basel
C - Chur
D - Bern
E - Erstfeld
F - Flüelen
G - Geneva
H - Göschenen
I - Brig
J - Sargans
K - St Gallen
L - Lausanne
M - Milano
N - Lugano
O - Olten
P - Spiez
Q - Interlaken
R - Luzern
S - Bellinzona
T - Thun
U - Unloaded
V - Zug
W - Blank
X - Geneva Airport
Y - Montreux
Z - Zürich

If "U" is used to configure any EWIV coach as unloaded then the passengers will be removed from the interiors. This is useful for coaches that are placed in sidings that are not in service.

3 Other Information

This document is provided as a guide to Rivet Games' Re 460 add-on locomotive for Train Simulator, a product provided for entertainment purposes.

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Swiss Signalling

1 Signals

This guide proves a summary of the signaling used in Switzerland for mainline (standard gauge) railways (the signaling used on narrow gauge lines is subtly different).

Two main types of signalling are used - the “L-Type” system and the “N-Type” system. The N-type is a more modern system and has replaced some L-type signalling.

In Switzerland signals are normally positioned on the left hand side, but where there is reduced visibility or multiple tracks they can be also positioned on the right hand side of the track.

1.1 **L-Type Signal Heads and Permissible Speeds**

L-Type signals use separate main and distant “heads” (the name given to the physical signal display) as shown below.

These can either be mounted individually to form an Hp (Hauptsignal- main) or a Vr (Vorsignal -distant) or both heads can be mounted on the same signal post to form an HpVr signal.

The Main signal aspects indicate either that the next section of track is blocked or the line is clear at the current line speed or they can display a reduced speed that must be met by the driver before passing the main signal.

Distant signals provide advanced warning of a speed reduction commencing from the next main signal and usually provide Integra Safety System protection (see below).

There are also some additional signal indicators and the following examples illustrate the most common combinations along with an explanation of their use.

This is a main signal (Hauptsignal) that is currently showing Aspect 2 to alert the driver that 40 km/h is the maximum permissible speed allowed beyond this point.

Head 1 is the Main Signal Head

Head 3 is a co-acting Ground Shunt Signal

Head 4 is a Brake Test / Departure Indicator

If vehicles are uncoupled or coupled to a train then it is essential that the driver carries out a brake test before departure. During the brake test the ground staff communicate with the driver using this indicator as follows:


Apply Brakes


Release Brakes


Brake Test Successful


Ready for Departure (Abfahrbefehl)

These indicators are animated in this simulation for effect but do not need to be obeyed while driving a scenario.

This is a combined signal that is currently showing Aspect 3 on the Main Signal Head to alert the driver that that 60 km/h is the maximum permissible speed allowed beyond this point. The Distant Signal Head is showing that the next signal ahead is displaying Aspect 0 (Stop).

Head 1 is the Main Signal Head

Head 2 is the Distant Signal Head

Head 6 is the Occupied Track Head (Besetztes Gleis), this is described later in this chapter.

Distant signals usually provide Integra Safety System protection.

This is a Distant Signal that is currently showing that the next signal ahead is displaying Aspect 0 (Stop).

Distant signals are identified with a **single star** on the number plate.

Head 2 is the Distant Signal Head

Distant signals usually provide Integra Safety System protection.

This is a Distant Repeater Signal that is currently showing that the next signal ahead is displaying Aspect 0 (Stop).

Distant Repeater signals are identified with **two stars** on the number plate.

These signals are located between a Main Signal and its preceding Distant Signal at locations where visibility is restricted such as on tight curves or where bridges obstruct the view.

Head 5 is the Distant Repeater Signal Head

*Repeater signals **DO NOT** provide Integra Safety System protection.*

This combined signal on approach to a station has an additional Occupied Track Indicator.

If you need to proceed past a signal showing a Stop aspect in to an occupied track then you will need to press TAB during the scenario to ask the signaller for permission. If permission is granted then the signaller will set the Main Signal Head will display Aspect 2 to limit your speed to 40 km/h and the Occupied Track Indicator (Besetztes Gleis) will illuminate with four horizontal lights.

Head 1 is the Main Signal Head

Head 2 is the Distant Signal Head (goes dark)

Head 6 is the Occupied Track Head (Besetztes Gleis)

If the Main Signal Head does not have the lights necessary to display Aspect 2 then Aspect 0 (Stop) will continue to be displayed and the Occupied Track Indicator will illuminate with four diagonal lights instead meaning you have permission to overrun the signal.

This table illustrates the L-Type signal aspects and associated permissible speeds that are used on the mainline Swiss network (different speeds may apply for narrow-gauge routes).

Note: All Shunting operations should take place at a maximum of 40 km/h in station areas.

Aspect	Meaning	Distant Signal (Vorsignal)	Main Signal (Hauptsignal)
Aspect 0	**Stop**		
Aspect 1	**Clear** – Maximum speed is as shown on relevant speed signs		
Aspect 2	**40 km/h** Maximum Speed		
Aspect 3	**60 km/h** Maximum Speed		
Aspect 5	**90 km/h** Maximum Speed		
Aspect 6	**40 km/h** Maximum Shunting Speed (Short Journey – Expect Obstruction) You are alerted by the Integra Safety System when you pass the distant signal ***and*** the main signal that is displaying Aspect 6.		

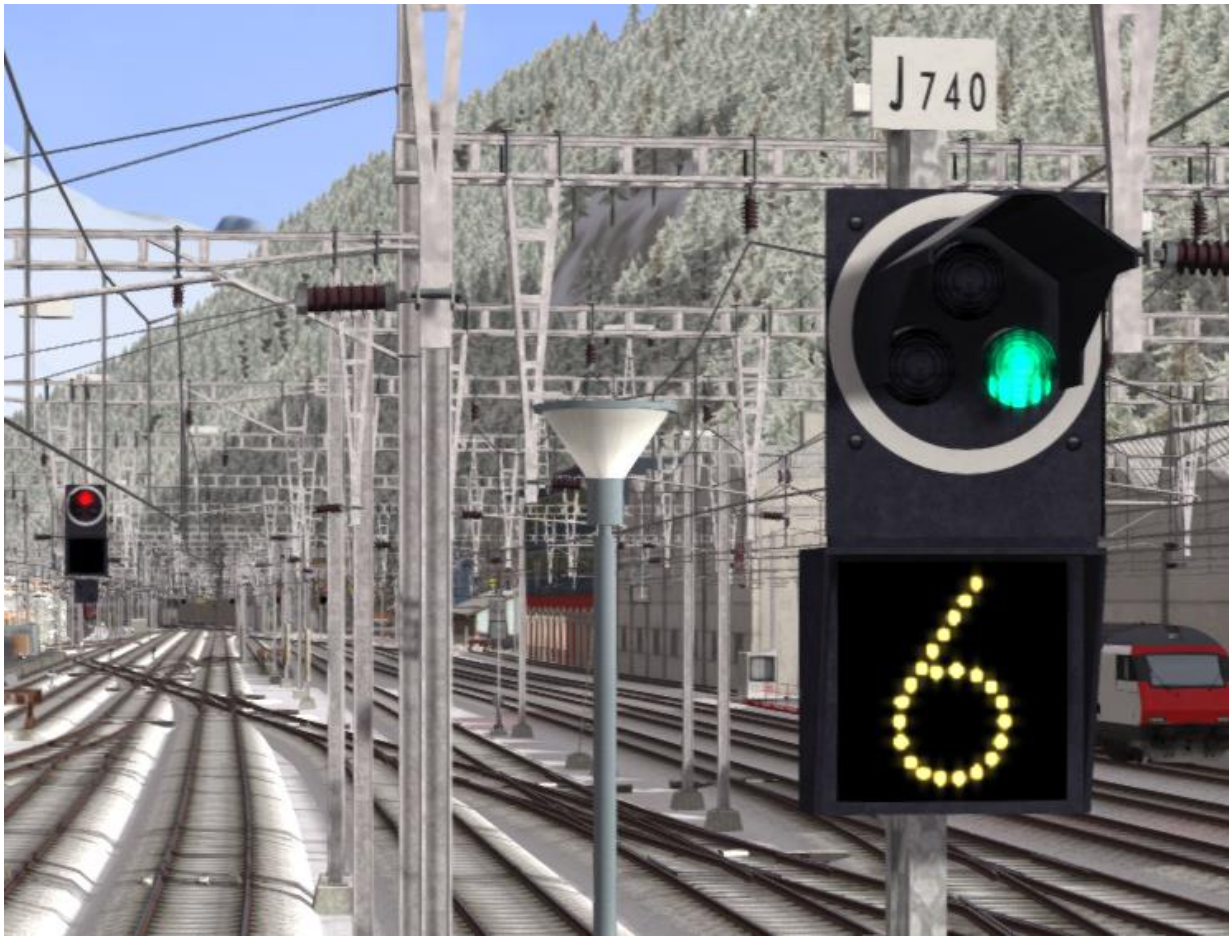
1.2 **N-Type Signal Heads and Permissible Speeds**

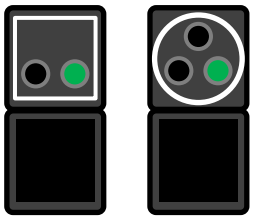
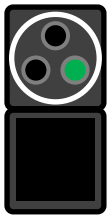
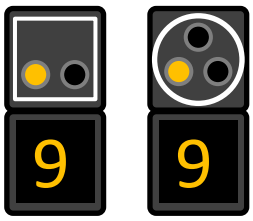
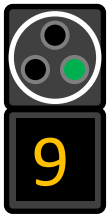
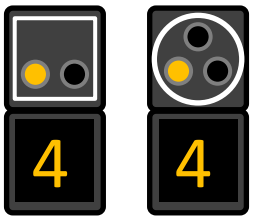
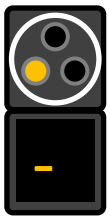
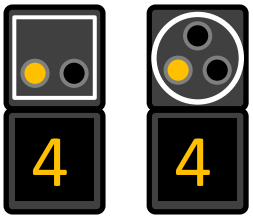
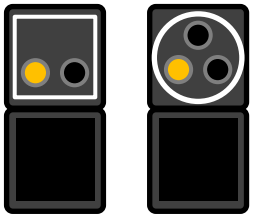
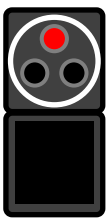
N-Type signals are gradually replacing L-Type signals on the SBB rail network and are starting to be installed by other Swiss operators including BLS. Not all N-Type home signals are preceded by a distant signal because all N-Type signals are capable of displaying speed signalling aspects and can also play the role of a distant signal.

Unlike the L-Type system, these signals display a number below the signal head to indicate either the warning speed or the speed restriction. If a green light is displayed without a number then the track ahead is clear. If a green light is displayed with a number below then the speed restriction starts from this signal. The number displayed is the speed in Km/h divided by ten. For example a “6” means 60 km/h.

A yellow light still communicates a warning, either of a speed restriction if a digit is displayed, or a yellow light on its own indicates that the next signal is at danger. A red light remains an absolute stop signal.

In order to distinguish between main and distant only signals, distant signals use square back plates while main signals use circular back plates.

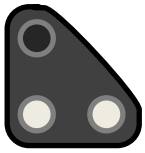
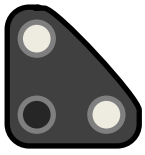
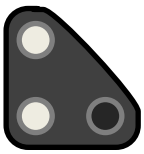


Distant Aspect	Meaning	Home Aspect
	Track clear, proceed at line speed.	
	Speed restriction - displayed number x 10 km/h (here 90 km/h)	
	Obstruction close ahead, speed limit 40 km/h, the next signal is at stop and closer than normal stopping distance.	
	Track occupied, speed limit 40 km/h, the next section is obstructed and the driver must be ready to stop the train.	 (the yellow dash flashes)
No distant aspect	Advance warning, reduce speed to be able to stop at the signal after the next one, which is showing a danger 'stop' aspect.	
	Danger - stop at the signal.	

1.3 **Ground Shunt Signals**

These signals are normally mounted on short ground posts, however at stations they are sometimes mounted below the platform canopy.

When they are located alongside a main signal they co-act and display the appropriate aspect according to the aspect the main signal is set to.

Aspect	Meaning	Ground Shunt Signal
Stop	Stop at this signal	
Warning	The next main signal or shunt signal is at stop or you are entering a siding / end of line	
Clear	The next signal is displaying a proceed aspect	

1.4 **Integra Signum Safety System**

In suitably equipped locomotives, the Integra Signum Safety system generates an alert when you pass a distant signal (Vorsignal) that is displaying a warning.

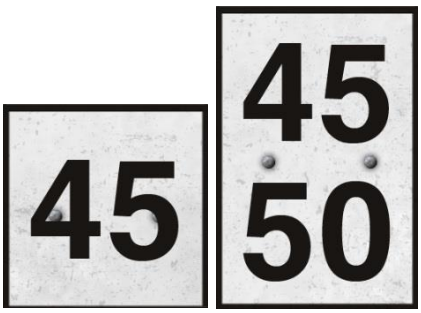
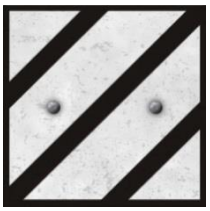
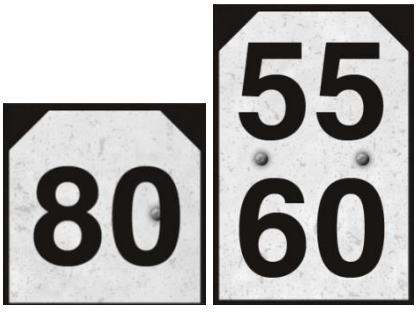
The safety system acknowledge lamp will illuminate yellow accompanied by an audio tone. You must acknowledge the warning or the emergency brakes will be applied automatically. Once acknowledged, there will be six further lamp flashes and two audio beeps to remind you that you are driving under a distant signal caution.

An Integra safety system alert will also be activated when you pass a main signal (Hauptsignal) displaying Aspect 6 (Short Journey – Expect Obstruction).

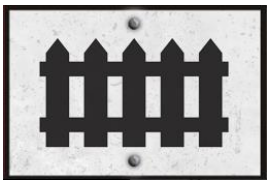
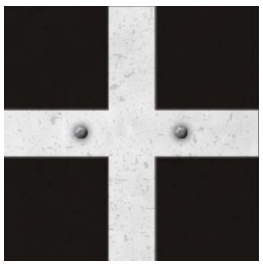
2 Trackside Signs

2.1 **Speed Signs**

The permissible line speed on Swiss routes is advised using track speed signs. For a reduction in speed the driver first sees a reduce speed sign that indicates the target speed. The driver must then reduce his speed before passing a commencement sign situated ahead of the first sign. Main signals always override any speed indicated by a trackside sign.

	Meaning	Signs
Reduce Speed	Reduce your speed to that shown on this sign before you reach the next speed restriction commencement sign. *If the sign shows two speeds the higher speed applies to passenger trains and the lower speed to freight trains.*	
Speed Restriction Commencement Sign	Your train must have reduced speed to that advised at the previous reduce speed sign before passing this sign.	
End of Speed Restriction Sign	If the speed restriction is on a short section of the line then this sign indicates that the driver can return to the speed prior to the speed restriction once the rear wagon or coach has passed this sign.	
Increase Speed	This sign indicates that the driver can increase the train speed once the rear wagon or coach has passed this sign to the speed shown. *If the sign shows two speeds the higher speed applies to passenger trains and the lower speed to freight trains.*	

2.2 **Other Signs**

	Meaning	Signs
Whistle Sign	The driver should sound his whistle or warning horn at this sign.	
Level Crossing Sign	This sign is mounted on signal posts prior to a level crossing.	
Limit of Shunting Sign	Outside station areas these signs indicate the limit of shunting operations. During scenarios you do not need to obey these signs as they are only positioned for visual completeness.	
End of Electrification Sign	Where the overhead catenary wires end, these signs are used to alert the drivers of electric trains to proceed no further than the sign. They are suspended from the catenary wires or mounted on the junction indicators where only one route ahead in not electrified as shown below.	

3 Other information

This document is provided as a guide to the Swiss signalling implemented in Rivet Games add-ons for Train Simulator, a simulator provided for entertainment purposes.

While this guide describes some of the characteristics of Swiss signalling, not all operational features are described and this guide ***must not be used for any commercial purposes***. It is for entertainment only.

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