

Provision of Overlaps, **Flank** Protection and Trapping

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Synopsis

This document specifies a range of controls to be applied to mitigate the consequences of a train overrunning a signal at danger.

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Provision of Overlaps, Flank Protection and Trapping

Contents

Section	Description	Page
Part A		
	Issue Record	2
	Technical Content	2
	Responsibilities	2
	Compliance	2
	Health and Safety Responsibilities	2
	Supply	2
Part B		
1	Purpose	3
2	Scope	3
3	Definitions	3
4	Overlaps	4
5	Flank Point Protection	9
6	Trap Points	9
7	Overrun Detection	11
8	Restoration of Points	11
References		12

Provision of Overlaps, Flank Protection and Trapping

Part A

Issue Record

This document will be updated when necessary by distribution of a complete replacement.

Issue	Date	Comments
One	December 2000	Original Document In conjunction with GI/RT7006 , Issue 1, this document supersedes GK/RT0078, Issue 5.

Technical Content

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Responsibilities

Railway Group Standards are mandatory on all members of the Railway Group * and apply to all relevant activities that fall into the scope of each individual's Railway Safety Case. If any of those activities are performed by a contractor, the contractor's obligation in respect of Railway Group Standards is determined by the terms of the contract between the respective parties. Where a contractor is a duty holder of a Railway Safety Case then Railway Group Standards apply directly to the activities described in the Safety Case.

* The Railway Group comprises Railtrack and the duty holders of the Railway Safety Cases accepted by Railtrack.

Compliance

The provisions in this document are mandatory for design and implementation work undertaken on all schemes for which the signalling scheme plan is first approved on or after 07 April 2001.

Where a signalling scheme plan is to be re-approved after this date, consideration shall be given to the reasonable practicability of bringing it into line with the requirements of this document.

Any Railway Group member deviating from the requirements set out in this document shall ensure that the situation is regularised in accordance with the requirements of [GA/RT6001](#), GA/RT6004, or GA/RT6006.

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Supply

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Provision of Overlaps, Flank Protection and Trapping

Part B

1 Purpose

The purpose of this document is to define the safety requirements for the provision of overlaps, flank protection and trapping so as to control the risk of collision between an authorised train movement and a movement overrunning a signal at danger.

2 Scope

The overall scope of Railway Group Standards is as specified in Appendix A of [GA/RT6001](#).

This document contains requirements which are applicable to the duty holders of the Infrastructure Controller category of Railway Safety Case.

Specifically, the contents of this document apply to all lineside stop signals, shunting signals and signs which perform the function of signals that are part of Railtrack controlled infrastructure.

This document does not include:

- a) the requirements for setting, locking and release of overlaps and flank points (see [GK/RT0060](#)).
- b) the requirements for proving of foul track circuits in point and signal controls (see [GK/RT0060](#)).
- c) the process for risk assessment to prevent and mitigate overruns (see [GI/RT7006](#)).

3 Definitions

Area of Conflict

A section of line ahead of a signal at danger on which a head-on, crossing or same direction converging collision with another legitimately positioned train (whether moving or stationary) could occur in the event of the signal being passed at danger. See also [GI/RT7006](#).

Authorised Movement (as applied to this document)

A movement made with the authority of the signaller via the signalling system and indicated to the driver by a lineside signal displaying a proceed aspect.

Flank Points

Points which, if traversed by an overrunning train in the facing direction, could direct that train towards a route or overlap that has been set for an authorised train movement.

Flank Point Protection

The setting of flank points to the position whereby an overrunning train will be diverted away from a route and overlap that has been set for an authorised train movement.

Overlap

The distance beyond a stop signal which must be clear, and where necessary locked, before the stop signal preceding the signal in question can display a proceed aspect:

- a) **Full Overlap** - An overlap of at least 180 metres (or 400 metres in the case of a semaphore signal where the preceding caution signal is also a semaphore type).
- b) **Reduced Overlap** - An overlap that is shorter than the minimum permitted length of a full overlap, where the permitted approach speed is below a specified level which still allows an unrestricted approach to a signal at danger (ie approach control is not necessary).

Provision of Overlaps, Flank Protection and Trapping

- c) **Restricted Overlap** - An **overlap** that is shorter than the minimum permitted length of a full **overlap**, which is available only when the preceding signal is subject to approach control by selection of a warning class route.

Overrun

Passing the end of movement authority (the end of movement authority is the point where a train is required to come to a stand on completion of a signalled movement). On lines signalled with lineside signals, the conventional terminology for an **overrun** is a Signal Passed At Danger (**SPAD**). The definition includes both failure to come to a stand at a signal at danger and starting from rest against a signal at danger.

Release Speed

The speed of a train approaching a warning class route entrance signal at danger at which the signal clears to a caution aspect, such that the train speed through the route can generally be uniform (until braking for the exit signal is required).

Route (as applied to this document)

The path along a section of track between one signal and the next, along which an authorised movement is to be made. See also [GK/RT0060](#).

Track Circuit Interrupter

A rail mounted device usually positioned at catch or **trap points** which maintains a track circuit(s) in its occupied state after the passage of a vehicle which may have been derailed.

Train Protection System

A system that automatically applies the brakes on a train to control the **risk** of an **overrun** arising from driver error. Automatic Train Protection (ATP) systems, Train Protection and Warning System (TPWS) and trainstops are all forms of train protection systems. The Automatic Warning System (AWS) does not constitute a train protection system for the purposes of this document.

Trap Points

Facing **points** provided at an exit from a siding or converging line to derail an unauthorised movement, thus protecting movements on the adjacent running line.

Warning Class Route

A route from one main signal to the next main signal with a restricted **overlap**, where a full or reduced **overlap** is not available or not required. The entrance signal is approach controlled (ie held at danger) until the speed of a train has been reduced to the release speed.

Other defined terms are included in [GK/RT0002](#).

4 Overlaps

4.1 Requirement for Overlaps

4.1.1

An **overlap** shall be provided beyond each stop signal on a running line (whether passenger or non-passenger) for movements up to it (including shunt movements), except as permitted by section 4.5.

4.1.2

Non-block stop signals (eg signals provided solely for level crossing protection) shall, so far as is reasonably practicable, be located **overlap** distance clear of potential obstructions (eg level crossings).

4.2 Full overlaps

4.2.1

An **overlap** provided to meet the requirements of section 4.1 for a route from one main stop signal to the next shall have a minimum length which is in accordance with Table 1, except where permitted by sections 4.3 and 4.4.

Provision of Overlaps, Flank Protection and Trapping

Caution Signal(s)	Stop Signal	Overlap Length
Colour Light	Colour Light	180m
Colour Light	Semaphore	180m *
Semaphore	Semaphore	400m *
Fixed	Stop board	180m

Table 1: Full Overlap Lengths

* In other than Track Circuit Block (TCB) areas the quoted **overlap** lengths are modified by the Regulations for Train Signalling [GO/RT3062](#) for working during fog or falling snow.

4.2.2

An **overlap** provided to meet the requirements of section 4.1 for a shunt class route on a running line (whether passenger or non-passenger) shall have a minimum length of 180m, except where permitted by section 4.3.

4.2.3

Sections 4.3 and 4.4 permit the use of overlaps of shorter length than that specified in this section 4.2. However, wherever reasonably practicable, overlaps shall be provided that meet the requirements of this section (4.2), in preference to providing reduced or restricted overlaps.

4.3 Reduced Overlaps

4.3.1

In TCB areas with colour light signals where it is not reasonably practicable to provide a full **overlap** for a main or shunt class route, it is permissible, subject to **risk assessment** (see section 4.9), for the **overlap** length to be less than that specified in section 4.2, subject to minimum values set out in Table 2.

The **overlap** lengths quoted in Table 2 represent the absolute minima which are permitted. Wherever reasonably practicable, the reduced **overlap** length shall be greater than the minimum.

Maximum Permissible/Attainable Speed not Exceeding	Minimum Overlap Distance
15 mile/h	45m
20 mile/h	55m
25 mile/h	60m
30 mile/h	70m
35 mile/h	75m
40 mile/h	80m
45 mile/h	90m
50 mile/h	105m
55 mile/h	125m
60 mile/h	135m

Table 2: Reduced Overlap Lengths for Colour Light Signals in TCB Areas

4.3.2

The maximum speed shown in table 2 represents the permissible speed on the approach to the signal that is located at the start of the **overlap** under consideration.

Provision of Overlaps, Flank Protection and Trapping

In the case of main class routes, the permissible speed shall apply for at least the distance from the signal itself back to the point on the approach at which the train can brake from the permissible speed to a stand at the signal.

This distance shall be calculated using the same method as was used to determine the signal spacings on the line (ie using the relevant Appendix in [GK/RT0034](#), or using the alternative method of calculation permitted by that Railway Group Standard). However, this distance shall not be less than 400m.

Where differential speeds already exist on the approach to a signal, the distance shall be calculated using the highest of the speeds.

4.3.3

It is permissible to apply a permanent speed restriction in order to implement a reduced **overlap**. However, it is not permissible to implement a differential speed restriction for this purpose.

4.3.4

Where the maximum speed attainable by any train approaching the signal when running under clear aspects is less than the permissible speed, it is permitted that the maximum attainable speed is used as the basis for calculating the minimum **overlap** length. However, when attainable speed is used, the following requirements apply:

- a) A lower permissible speed shall be imposed on the approach to the signal. The lower permissible speed shall be implemented at the time that the reduced **overlap** based on the attainable speed is first introduced, and shall be no greater than the maximum attainable speed of trains authorised to operate at the location under consideration at the time of implementation. The distance over which the lower permissible speed applies shall be calculated in accordance with section 4.3.2.
- b) The attainable speed, acceleration data and signals affected shall be recorded in the signalling design documentation (see [GK/RT0207](#)) and in the infrastructure records (see [GI/RT7001](#)).

Requirements for controlling changes to permissible speed are contained within [GK/RT0007](#).

4.3.5

In other than TCB areas, it is permissible for reduced **overlap** lengths to be applied, subject to **risk assessment** (see section 4.9). The length of the reduced **overlap** shall be commensurate with the likely extent of any **overrun** due to driver misjudgement.

4.4 Restricted Overlaps

4.4.1

Where trains are required to approach a main signal at danger beyond which it is not reasonably practicable to provide an **overlap** of at least the required minimum length (as specified in sections 4.2 and 4.3), a warning class route with approach control shall be provided from the stop signal preceding the signal with the restricted **overlap**.

A restricted **overlap** is usually provided, where required, in addition to either a full or a reduced **overlap**.

4.4.2

The point at which the aspect of the approach controlled signal is released from red shall be calculated such that the speed of the train approaching the signal is reduced to a level whereby (assuming that the train does not then accelerate between the signals) the restricted **overlap** beyond the next signal is sufficient to mitigate any likely misjudgement by the driver in bringing his train to a stand at that signal. The release speed shall not exceed 30 miles/h except where **risk assessment** shows that it is safe to do so.

Provision of Overlaps, Flank Protection and Trapping

The other controls to be applied to warning routes are set out in [GK/RT0060](#).

4.4.3

Where a restricted **overlap** of 45 metres or less is provided, interlocking shall be applied to prevent conflicting or directly opposing movements from taking place less than 45 metres beyond the signal until a train approaching the signal at danger has come to a stand.

4.4.4

In respect of a stop signal positioned part-way along a platform it is permissible, where essential for operational reasons, not to provide an **overlap**. A warning class route shall still be provided, with interlocking applied to prevent conflicting or directly opposing movements from taking place less than 45 metres beyond the signal until a train approaching the signal at danger has come to a stand.

4.4.5

In all cases where consideration is being given to the use of restricted overlaps, including the special case in section 4.4.4, a **risk assessment** shall be conducted (see section 4.9).

4.5 Where Overlaps need not be Provided

4.5.1

Overlaps are not necessary in the following circumstances:

- a) in respect of a stop signal which has no signal reading up to it (eg a terminal or bay platform starting signal);
- b) for stop signals on sidings and other non-running lines (but see section 6.1.1 for requirements relating to the protecting of running lines against overruns from sidings and non-running lines);
- c) in other than TCB areas, for a stop signal beyond the home signal and within station limits, providing that the preceding signal is subject to approach control (enforced by the signalling system or by signaller's instructions);
- d) beyond stop boards at the exit from single line passing loops where the permissible speed at the loop entrance does not exceed 15 mile/h (eg due to the provision of hydro-pneumatic **points**);
- e) for movements towards a stop signal where part of the route is, or could be, occupied by another train (ie permissive movements and some shunt movements).

4.5.2

Where essential for operational reasons, it is permissible not to provide overlaps on non-passenger running lines, subject to **risk assessment** (see section 4.9). However, an **overlap** shall always be provided ahead of any signal on a non-passenger running line that protects a convergence with a passenger line, except where **trap points** are provided in accordance with section 6.1.

4.6 Compatibility with Train Protection Systems

Where a train protection system is provided with the intent that an overrunning train is brought to a stand by the system within the **overlap** of a signal, the **overlap** length shall be compatible with that train protection system.

4.7 Overlaps into Goods Lines and Sidings

4.7.1

It is not permissible for the **overlap** beyond a signal on a passenger line to lead into a goods line or siding unless the line is proved clear for the required **overlap** distance and:

- a) a route is set from the signal into the goods line or siding; or
- b) the trapping arrangement in the goods line is proved to be effective.

Provision of Overlaps, Flank Protection and Trapping

4.7.2

Where practicable, the **overlap** beyond a signal shall lead towards a line signalled in the same direction.

4.8 Overlap Occupancy Indications

4.8.1

A separate **overlap** track circuit (or equivalent train detection system) shall usually be provided for the **overlap** of a signal, such that an **overrun** is indicated to the interlocking and to the signaller.

4.8.2

The start of the **overlap** track circuit (or equivalent train detection system) shall be as close to the signal as possible, subject to the constraints in [GK/RT0060](#) in relation to signal replacement.

4.8.3

Where necessary in order to reduce **overrun risk** to levels that are acceptably low, the indication to the signaller shall be supplemented by other appropriate alarms (the requirement for this would be determined through the **overrun risk assessment** process set out in [GI/RT7006](#) and [GI/GN7606](#)).

4.8.4

It is permissible to waive the requirement to provide a separate **overlap** track circuit (or equivalent train detection system), for instance in respect of automatic signals or non-block signals, where all the following apply:

- a) No route locking is required for the **overlap** and route ahead.
- b) There is no calling-on or shunt class route up to the signal.
- c) The signal is not within the strike-in point of an automatic level crossing.
- d) A combined berth and **overlap** indication is unlikely to mislead the signaller (eg into making an error when authorising trains to pass signals at danger).

It is also permissible not to provide a separate **overlap** track circuit (or equivalent train detection system) for a restricted **overlap**.

4.9 Risk Assessments for Overlaps

4.9.1

Where a **risk assessment** is conducted in connection with a proposal to use reduced or restricted overlaps, the assessment shall usually form part of the **overrun risk assessment** process mandated by [GI/RT7006](#).

4.9.2

For both reduced and restricted overlaps, the **risk assessment** shall include consideration of the following issues:

- a) The likely extent and consequences of any **overrun** due to driver misjudgement, in order to decide what length of **overlap** is appropriate.
- b) The relationship between signal sighting distance and the **overlap** length. A long sighting distance generally reduces the **risk** of an **overrun** extending beyond the **overlap**. Conversely, the combination of minimum sighting distance and a reduced/restricted **overlap** increases the **risk**.

4.9.3

In the case of a restricted **overlap**, consideration shall also be given to:

- a) The **risk** of **overrun** at the approach controlled signal as a result of the driver anticipating clearance when it is held at danger.
- b) The **risk** of a driver accelerating after passing the approach controlled signal, and then being unable to stop at the signal with the restricted **overlap**. This requires an **assessment** of the relationship between the release speed at the approach controlled signal and the distance to travel before reaching the signal with the restricted **overlap**.

Provision of Overlaps, Flank Protection and Trapping

5 Flank Point Protection

5.1 Provision of Flank Point Protection

5.1.1

Flank point protection shall usually be provided to protect the route and overlap for a signalled train movement.

5.1.2

Subject to risk assessment, it is permissible to waive the requirement to provide flank point protection where:

- a) permissible traffic movements would be unreasonably restricted; or
- b) a net reduction in risk would not be achieved; or
- c) the flank points are not free to be set to the protecting position at the time that the route is being set (eg because a signalled movement is in progress away from the area of conflict via the points in their non-protecting position).

5.1.3

Flank points shall usually be set at the time that the route requiring protection is set but, in the case of (c), it is permissible for the flank points subsequently to be moved to the protecting position when they become free.

5.2 Preferred Arrangements for Flank Point Protection

Where practicable, the line onto which the unauthorised movement is diverted by the flank points shall be:

- a) used predominantly for trains in the same direction; or
- b) a goods line, loop or siding which is protected by trap points.

5.3 Risk Assessment for Flank Point Protection

Where a risk assessment is conducted in accordance with section 5.1, it shall usually take place as part of the overrun risk assessment process mandated by GI/RT7006.

6 Trap Points

6.1 Provision of Trap Points

6.1.1

Trap points shall be provided in the following circumstances:

- a) For the protection of passenger lines against sidings and any other non-running lines (unless other suitable points exist which can be used for this purpose).
- b) At the approach to moveable bridges, in the absence of other protection.
- c) Where vehicles are left unattended on a falling gradient steeper than 1 in 500, in the absence of other protection.

The mandatory requirement to provide trap points does not necessarily indicate that they provide sufficient control of overrun risk. Their adequacy shall be considered as a part of the overrun risk assessment process mandated by GI/RT7006.

6.1.2

It is permissible for trap points to be provided as an overrun risk reduction measure at the convergence of two running lines, but only if:

- a) other risk reduction measures are not sufficient to control the risk; and
- b) the secondary risks of using trap points have been assessed as acceptably low (see section 6.5).

Provision of Overlaps, Flank Protection and Trapping

6.2 Design and Location of Trap Points

6.2.1

Trap points shall be located so as to:

- a) guide derailed vehicles away from other lines, structures and any other hazards; and
- b) keep derailed vehicles, as far as is practicable, upright and in line.

6.2.2

It is permissible to provide a derailer in lieu of **trap points** to protect passenger lines from overruns from sidings, where no running movements approach the protecting signal and speeds are low. Alternatively, it is permissible to provide a scotchblock to give protection from stationary vehicles.

6.2.3

Where necessary, in order to stop a train safely when it has derailed on **trap points**, a suitable arresting device such as a sand-drag shall be used.

6.2.4

Details of design requirements for **trap points**, derailleurs and scotchblocks are contained in [GI/RT7004](#).

6.3 Restoration of Trap Points

6.3.1

Trap points shall be restored to the trapping position after completion of a movement through them. This shall usually be by operation of the signaller's point control device. A visual and/or audible indication to remind the signaller shall be provided.

6.3.2

Automatic restoration after a suitable time delay shall be provided where there is a serious **risk** of the running line being fouled by the unauthorised movement of vehicles through **trap points** left in the non-trapping position. The **risk** of premature movement of the **points** shall be adequately controlled (see also section 8.2).

6.4 Detection of Derailed Vehicles

[GK/RT0011](#) specifies the requirements for the provision of track circuit interrupters. Where vehicles derailed at **trap points** could foul lines other than the one to which the track circuit interrupter applies, operation of the track circuit interrupter shall place or maintain protecting signals at danger on those lines and provide an indication to the signaller:

- a) by causing an appropriate track circuit (or equivalent train detection system) on each affected line to indicate occupied; or
- b) by means of a separate indication.

6.5 Risk Assessment for Trap Points

The application of **trap points** as permitted by this section (6) shall be subject to **risk assessment** to determine their suitability and sufficiency as an **overrun risk** reduction measure, including consideration of the secondary risks associated with derailment at the **trap points**. The **risk assessment** shall usually take place as part of the **overrun risk assessment** process mandated by [GI/RT7006](#).

The secondary risks requiring consideration include:

- a) vehicles failing to remain upright.
- b) vehicles fouling other lines.
- c) deceleration rates that could cause injury to the occupants of the train.

Provision of Overlaps, Flank Protection and Trapping

7 Overrun Detection

7.1 Provision of Overrun Detection

7.1.1

Overrun detection shall usually be provided so that where a train overruns a stop signal which protects an area of conflict, other stop signals protecting the same area of conflict are automatically placed or maintained at danger. The replacement of signals to danger shall take place as quickly as possible after an overrun occurs.

7.1.2

It is permissible to waive the requirement to provide overrun detection where risk assessment (see section 7.3) indicates that such provision would not significantly reduce the overrun risk, or where sufficient other risk reduction measures are present, for instance:

- a) A train protection system is in use on the line that would stop all overrunning trains from reaching the area of conflict; or
- b) Flank point protection is provided; or
- c) Trap points are provided (but see requirements of section 6.4).

7.1.3

GE/RT8027 specifies the requirements for overrun detection at signals that protect level crossings.

7.2 Acceptable Arrangements for Overrun Detection

7.2.1

The design of overrun detection arrangements shall be such as to minimise risks associated with signals having to be passed at danger as a consequence of failure of the overrun train detection equipment. It is permissible for the overrun detection controls to require sequential operation (eg first track circuit beyond the signal occupied, after berth track circuit has been occupied) in order to achieve this.

7.2.2

To provide operational flexibility, it is permissible for overrun detection controls on a signal to be inhibited when a signalled movement is in progress away from the area of conflict.

7.3 Risk assessment for Overrun Detection

Any risk assessment conducted in connection with a proposal to omit overrun detection shall usually take place as part of the overrun risk assessment process mandated by GI/RT7006.

8 Restoration of Points

8.1 Provision of Automatic Restoration of Points (other than trap points)

As an additional overrun risk reduction measure, it is permissible for points located within or beyond an overlap to be automatically restored to the normal position, when not required to be in the reverse position (eg in the case of crossovers forming part of a ladder junction).

See GI/RT7004 for the criteria used to define the normal position of points. The automatic restoration of trap points is addressed in section 6.3.

8.2 Controlling the Risk of Premature Movement of Points

Where train detection through the points is achieved by track circuits, there is a risk of premature movement. This risk shall usually be controlled by requiring that the track circuit is proved to be clear for a suitable period of time before restoration takes place.

8.3 Risk Assessment for Automatic Restoration of Points

Proposals to use automatic restoration as an overrun risk mitigation measure shall usually be considered in the context of the overrun risk mitigation process mandated by GI/RT7006.

Provision of Overlaps, Flank Protection and Trapping

References

- [GA/RT6001](#) Railway Group Standards Change Procedures
- [GE/RT8027](#) Level crossings (in draft at the time of publication of this document)
- [GI/GN7606](#) Guidance Note: Prevention and Mitigation of Overruns – [Risk Assessment](#)
- [GI/RT7001](#) Management of Safety Related Records of Elements of the Infrastructure
- [GI/RT7004](#) Requirements for the Design, Operation and Maintenance of [Points](#)
- [GI/RT7006](#) Prevention and Mitigation of Overruns : [Risk Assessment](#)
- [GK/RT0002](#) Glossary of Signalling terms
- [GK/RT0007](#) Alterations to Permissible Speeds
- [GK/RT0011](#) Train Detection
- [GK/RT0034](#) Lineside Signal Spacing
- [GK/RT0060](#) Interlocking Principles
- [GK/RT0207](#) Signalling Design Production
- [GO/RT3062](#) Signaller's General Instructions

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