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Issue	3
Date	April 2004

Train Protection and Warning System (TPWS) Selection of New Signals And Other Locations For Provision of TPWS (formerly RT/E/S/I0137)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are **UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.**

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Company Specification

Train Protection & Warning System - Selection of Signals and Other Locations for Provision of Track Sub-System

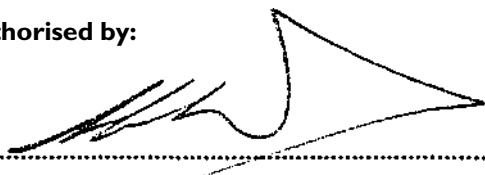
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Issue record

Issue	Date	Comments
1	January 1999	Original issue
2	October 2000	Updated
3	April 2004	Updated – supersedes TPWS Technical Instructions TPWS/TI/006 , TPWS/TI/014 , TPWS/TI/018 , TPWS/TI/024 , TPWS/TI/031 , TPWS/TI/046 and Technical Guidance Note TPWS/TGN/005 .

Implementation

This Specification shall be implemented from 3 April 2004.

Compliance

This Specification shall be complied with by 3 April 2004.

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Ref:	RT/E/S/10137
Issue:	3
Date:	April 2004

Contents

1	Purpose	4
2	Scope	4
3	Reference Documentation	4
4	Definitions and Abbreviations	5
5	General Description of TPWS	7
6	Provision of TPWS At Signals	7
7	Provision of TPWS at Buffer Stops	22
8	Provision of TPWS at Speed Restrictions	22
9	Recording of Selection Process	26
Appendix A	TPWS Signal Selection Flowchart	27
Appendix B	Typical Signalling Layout Sketches	29
Appendix C	PSR Initial Selection Flowchart	65
Appendix D	TSR Initial Selection Flowchart	68
Appendix E	TSR Initial Selection Flowchart - TSR up to 12 months duration	72
Appendix F	Speed Restriction Final Selection Flowchart	73

I PURPOSE

This Specification describes the process for assessing the requirement to provide Train Protection & Warning System (TPWS) equipment at signals, speed restrictions and Buffer Stops as defined in the Railway Safety Regulations 1999.

2 SCOPE

This issue of the Specification covers the selection of signals, speed restrictions and Buffer Stops at which the provision of TPWS is required to meet the Railway Safety Regulations 1999 ('the Regulations'). As such, this specification identifies the mandatory minimum provision of TPWS to satisfy the requirements of the Regulations.

However, in addition to the requirements of the Regulations, other legal requirements exist for managing safety on Network Rail infrastructure, which may lead to additional TPWS provision. The justification for providing TPWS in excess of the minimum mandated in this specification, shall be in order to manage risk ALARP in accordance with Network Rail's Railway Safety Case. Where additional fitment has been so justified, then this will override clauses in this specification which mandate TPWS shall not be provided.

This Specification does not include the following:

- selection requirements for the application of TPWS at Radio Electronic Token Block (RETB) signalled areas. These are contained in Company Specification [RT/E/S/10178](#) but shall be read in conjunction with this standard.
- Selection requirements for the application of TPWS+.
- Selection and fitment requirements for speed restrictions with Enhanced Permissible Speeds (EPS). Trains authorised to operate at EPS through speed restrictions will be protected using Tilt Authorisation & Speed Supervision (TASS). However, the speed restriction shall be considered for conventional (non-TASS protected) trains.

3 REFERENCE DOCUMENTATION

GE/RT8000	Rule Book
GK/RT0038	Signing of Permissible Speeds and Speed Restrictions
GK/RT0064	Provision of Overlaps, Flank Protection and Trapping
RT/E/S/10138	TPWS Transmitter Loop Requirements & Positioning
RT/E/S/10178	TPWS in Areas Where the Control of Train Movements is by RETB

Movements is by RETB

[ISBN 0 11 05076 9](#) The Railway Safety Regulations 1999 (SI 1999/2244)

[ISBN 0 7176 2442 0](#) Guidance to The Railway Safety Regulations 1999

4 DEFINITIONS AND ABBREVIATIONS

AB	Absolute Block
ALARP	As Low As is Reasonably Practicable
Attainable Speed	The highest speed at which trains normally approach a location taking account of the Permissible Speed and train acceleration capabilities from speed restrictions or stations on the approach.
Block Section	The section of line between the last stop signal (i.e. section signal or intermediate block home signal) controlled from one signal box and the first stop signal (i.e. home signal) controlled from the next signal box in the direction of travel.
Clear	A signal is said to be 'clear' when it displays such an aspect or is in such a position that the train may proceed past it.
Clearing Point (or Block Acceptance Point)	A point beyond the Home signal up to which the line must be set and clear before a signalled running move may approach the home signal. Generally each Clearing Point is defined in the Signaller's Local Box Instructions at each signal box.
Complex Approach	An approach to a signal or speed restriction that requires either multiple sets of OSS equipment (converging routes) or conditioning of equipment within the signal interlocking (diverging routes).
Conflict	A point within a track layout (generally the clearance point of a junction) at which a train passing a signal at Danger may cross, converge with, or otherwise impinge on the path of another train so as to cause a collision, except that it does not include where a train may collide only with the rear of another train travelling in the same direction on the same track.
Distant signal	A signal capable of displaying a caution aspect and controlled by a Signaller, that informs the driver of the state of the signals ahead, usually on the approach to a stop signal.
EPS	Enhanced Permissible Speed
ESR	Emergency Speed Restriction
ETB	Electric Token Block
HMRI	Her Majesty's Railway Inspectorate
Home signal	The first stop signal controlled by a signal box and the signal that controls the exit from an Absolute Block Section.

Inner [signal]	A signal directly protecting a point of conflict situated between itself and the next signal ahead, in the direction of travel, and within its overlap. See also 'Outer Signal'.
Non-passenger [train]	Any train not conveying fare-paying passengers, including empty passenger trains, light locomotives and on-track machines.
On	A signal is said to be 'On' when it displays such an aspect or is in such a position that the train needs to stop at the signal or be prepared to stop at the next signal (for a Distant signal).
OSS	Overspeed Sensor System
Other Location	Those parts of the infrastructure where an Overspeed Sensor is to be fitted for reasons other than protecting against SPADs.
Outer [signal]	A signal protecting a point of conflict situated beyond the signal ahead, but within the latter signal's overlap, in the direction of travel. See also 'Inner Signal'.
Overspeed Sensor	A facility whose function is to initiate a brake application on a train that approaches a signal showing a danger aspect or an Other Location at excessive speed.
Points and Crossings	Any arrangement of railway lines whereby lines join, separate or intersect such that collision between trains is possible, including turnouts, crossovers, acute and right-angled crossings, and areas of interlaced tracks, but excluding catch points provided solely for the purpose of trapping runaway vehicles.
PSR	Permanent Speed Restriction
Section	A stop signal controlling the entrance to an Absolute Block section or an intermediate block section.
Signal	Signal Passed At Danger
SPAD	Signal Passed At Danger
Station Limits	The section of line between the home signal and the section signal worked from the same signal box and in the same direction of travel.
TASS	Tilt Authorisation and Speed Supervision
TB	Tokenless Block
TCB	Track Circuit Block
TEP	Token Exchange Point
The Regulations	The Railway Safety Regulations 1999
TPWS	Train Protection & Warning System
Traffic Ground Frame	A Ground Frame or switch panel provided to locally control points and/or signals and at which routine operating movements take place. This does not include Emergency Crossovers.
Train Stop	A facility whose function is to initiate a brake application on a train that passes a signal at danger without authority.
TSR	Temporary Speed Restriction

Ref:	RT/E/S/I0137
Issue:	3
Date:	April 2004

TSS Train Stop System
WTT Working Time Table

5 GENERAL DESCRIPTION OF TPWS

TPWS is a system designed to reduce the number, and the consequences, of Signals Passed At Danger (SPAD) and overspeeding at Other Locations. When a signal is at Danger, track-mounted transmitter loops radiate electromagnetic signals at defined frequencies. When a trainborne receiver detects specific combinations of frequencies it determines whether to initiate a brake application on the train.

In addition to providing a Train Stop System (TSS) function at signals, TPWS also monitors train speed at a point on the approach to signals or Other Locations so that if excessive speed is detected at the monitoring point (the 'Overspeed Sensor System' - OSS), the train brakes will be applied.

6 PROVISION OF TPWS AT SIGNALS

6.1 General Principles

The following sections describe the process whereby signals and Other Locations are assessed to determine which will require provision of TPWS in order to comply with the Regulations.

Appendix A to this Specification comprises a Flowchart showing in graphical form the principles described below, together with explanatory notes.

Where a signal protects a number of geographical routes, and one or more of these routes leads to a possible conflict, either within the route or within an overlap of a signal ahead, the signal must be equipped with TPWS.

TPWS is not required where the signal and ALL trains operating past the signal under normal circumstances are provided with an alternative train protection system, approved by the HMRI as compliant with the Regulations.

TPWS is not required to protect against a train SPADing a signal and colliding with the rear of another train on the same track travelling in the same direction.

It is not required to assess signal fitment requirements for the following conditions:

- a train SPADing two signals consecutively to create a conflict;
- two trains simultaneously SPADing separate signals to create a conflict;
- a Signaller's error and a SPAD occurring simultaneously to create a conflict;

- the signalling system operating in degraded mode, e.g. Handsignalling or passing signals at Danger with authority.

6.2 The Signal Selection Flowchart

The Signal Selection Flowchart provided in Appendix A sets out in graphical form the selection process to determine the requirements for TPWS at signals.

Selection at each step is a straightforward 'Yes/No' decision, for which the following may be used as guidance. For each step, either the decision shall be recorded as shown, or the Flowchart followed to the next question. Where an outcome is reached that indicates that TPWS should not be fitted, an Exclusion Code shall be recorded as shown on the Flowchart.

The alphanumeric references (e.g. 'B6') correspond to specific decision points within the Flowchart, identified according to a column and row ('grid reference') system of co-ordinates.

6.3 Selection Criteria - Signals

Reference to the sketches in Appendix B may be found to be helpful; note that these sketches are illustrative only.

6.3.1 Type of Line (ref. C1)

Q. Is this signal on, or protecting, a Passenger Line?

TPWS is required by the Regulations on Railways (i.e. lines) normally used by passenger trains or to protect such lines (the definition of 'Railway' as excluding 'any part normally used other than for the carriage of fare paying passengers' is stated in the Schedule on page 15 of the Regulations).

Diversions routes shall only be considered for TPWS if it is a route which passenger trains are diagrammed over in the Working Time Table. All other diversions routes, including those used for occasional charter trains, should be considered as under emergency working, for which the 'guidance to the Regulations' does not require train protection to be fitted.

Where the only possible conflict on the passenger line is between two non-passenger trains then this shall not constitute a reason for non-fitting of TPWS. The following clarification has been agreed with HMRI:

1) - Collision potential which can only take place between 2 non-passenger trains on a **non-passenger line** shall not be protected by TPWS.

2) - Collision potential which can only take place between 2 non-passenger trains on a **passenger line** with another passenger line(s) immediately adjacent shall be protected by TPWS; except where the conditions in 2a) or 2b) below are met.

2a) - With respect to principle 2, collision potential which can only take place between 2 non-passenger trains on a passenger line with another passenger line(s) immediately adjacent but where there can be no other signalled passenger moves on the adjacent passenger line(s), shall not be protected by TPWS.

2b) - With respect to principle 2, collision potential which can only take place between 2 non-passenger trains on a passenger line with another passenger line(s) immediately adjacent being open to signalled moves, but where the SPAD collision risk only arises following a Signaller's error in signalling 2 trains into a directly opposing situation where neither could normally proceed any further towards the intended route, shall not be protected by TPWS.

TPWS shall not be provided on freight-only lines.

At the junction of an unfitted route (i.e. those not provided with TPWS) with a passenger-carrying route, including the exit from sidings and depots etc, the protecting signal shall be assessed for fitment as for any other passenger line.

Responses to question C1 should be as follows:

- **'Yes'** - if the signal is located on a line carrying passenger trains, including diversionary routes as described above. Go to question C2.
- **'Yes'** - if the signal is located on a line that does not carry passenger trains, but controls train movements on to a line that does carry passenger trains. Go to question C2.
- **'No'** - if neither of the above applies. Record Exclusion Code **'L'**.

6.3.2 Type of Signal (ref. C2)

Q. Is this signal provided for Shunting Purposes only?

The Regulations require provision of TPWS at all signals at which a train is required to stop, including Stop Boards.

Red lights on buffer stops, and signals provided for shunting purposes only (e.g. position-light, miniature arm, miniature colour-light or disc signals), as well as Limit of Shunt signals or signs, are excluded from the requirement for TPWS.

For the purposes of TPWS fitment, mid-platform marker boards used to segregate a platform for train operating purposes, e.g. St Andrew's Cross boards, are not considered as signals and hence shall not be fitted with TPWS.

Responses to question C2 should be as follows:

- **'No'** - if the signal can display a main running aspect, of either semaphore or colour-light type, or is a Stop Board. Go to question C3.
- **'Yes'** - if the signal is none of the above. Record Exclusion Code **'S'**.

Note that, where special arrangements have been made by the Infrastructure Controller for a shunting type signal to be used to control movements of passenger trains, such signals shall be assessed for fitment of TPWS as described in the following sections.

6.3.3 Stop Aspect (ref. C3)

Q. Is this signal capable of displaying a Stop aspect?

TPWS shall only be provided at signals capable of displaying a Stop aspect.

Responses to question C3 should be as follows:

- **'Yes'** - if the signal can display a Red aspect, if it is a colour-light type, or Stop in the case of a semaphore signal, or is a Stop Board. Go to question C4.
- **'No'** - if the signal is none of the above. Record Exclusion Code **'S'**.

6.3.4 Alternative Train Protection System (Ref C4)

Q. Does this signal and all trains using it have an alternative train protection system?

TPWS is not required where the signal and ALL trains operating past the signal under normal operating conditions are provided with an alternative train protection system approved by the HMRI as compliant with the Regulations. This includes mechanical Train Stops and Trip Cocks employed between Moorgate and Finsbury Park, between Richmond and Gunnersbury and on the tunnel sections of Merseyside;

and Automatic Train Protection (ATP) systems such as employed on the Heathrow Airport tunnel section.

Responses to question C4 should be as follows:

- **‘Yes’** - if the signal and all trains that operate past it during normal operating conditions are protected by an alternative train protection system accepted by HMRI as compliant with the Regulations. Record Exclusion Code **‘TS’**.
- **‘No’** – if the signal is not provided with an alternative approved train protection system or, if it is, not all trains operating past the signal under normal operating conditions are fitted with that train protection system. Go to question C5.

6.3.5 Absolute Block, Electric Token Block, Tokenless Block and No Signaller Token Remote areas (ref. C5)

Q. Is this a signal in an area controlled under Absolute Block, Electric Token Block or Tokenless Block Regulations?

In a number of areas, Absolute Block (AB), Electric Token Block (ETB) or Tokenless Block (TB) working is in operation between signalboxes. The layout of signals (the majority of which are mechanical semaphores) in these areas does not generally follow colour-light signalling practice, Stop signals being spaced at less than braking distance apart.

Selection of signals and Stop Boards for provision of TPWS will however generally follow the same rules as for colour-light signals in multiple aspect signalling installations, subject to a number of supplementary questions as described in section 6.3.12.

Responses to question C5 should be as follows:

- **‘Yes’** - if the signal is in an area where trains are operated under AB, ETB or TB Regulations. Go to question D5.
- **‘No’** - if the signal is none of the above. Go to question C6.

6.3.6 Signal Selection - Points and Crossings (ref. C6)

Q. Are there any points or crossings between this signal and the full overlap point of the next signal ahead?

A fundamental consideration affecting the provision of TPWS is whether the signal protects a Conflict which could occur between a train passing the signal at Danger without authority and another train legitimately traversing a signalled route or standing at an opposing signal (note ‘standing at an opposing signal’ does not include a train standing at the

Ref:	RT/E/S/10137
Issue:	3
Date:	April 2004

signal beyond going in the same direction of travel and which would result in a rear end collision).

Consideration of the requirement for TPWS shall extend as far as the end of the full overlap(s) of the next signal or signals ahead, corresponding to the section of line to be proved clear of obstruction before the signal may display a 'Proceed' aspect, or to an opposing signal where a train could be legitimately standing. However, this consideration shall not be applied to signals protecting opposing movements up to a Limit of Shunt signal or sign – see Appendix B Typical Layout No 10.

All routes leading from the signal and over which Main signal aspects apply must be considered. Responses to question C6 should be as follows:

- **'Yes'** - if there is any pointwork, including turnouts and fixed or moveable crossings, including points or crossings operated from Traffic Ground Frames, Switch Panels or other local control facility (but excluding Catch Points), between the signal and the end of the overlap beyond the next signal(s) ahead, or routes to an opposing signal where a train could be legitimately standing. Go to question C7.
- **'No'** - if there is no pointwork between the signal and the end of the overlap beyond the next signal(s) ahead. Go to question B6.

In the event that a 'No' is indicated, there is a further situation to consider, which is covered in section 6.3.7.

6.3.7 Signals Limiting Bi-directional Moves (ref. B6)

Q. Is this a signal limiting a bi-directional move?

Where a signal is provided to mark the limit of movement along a section of line signalled to allow movements to take place against the normal direction of traffic (e.g. where a train can enter a station platform up to a fixed red and then depart in the opposite direction), the signal, and the signal or signals protecting such opposing moves shall be provided with TPWS. Note that this requirement does not apply in the case of Limit of Shunt signals or signs (see section Type of Signal (ref. C3)).

Where the signalling arrangements are such that trains may terminate and change direction within an otherwise fully bi-directionally signalled section, TPWS shall be provided at both the signal defining the end of the terminating movement, and the signal protecting such opposing moves. However, where the conflict would entail the SPADding train

erroneously departing from a station in the wrong direction, then this shall not be provided with TPWS (refer to Typical Layout No. 9 in Appendix B).

Other intermediate signals in bi-directionally signalled sections that do not protect pointwork or other conflicts can be considered as fulfilling an equivalent function to automatic or plain-line signals which protect only against rear-end collision, and so do not require the provision of TPWS. However, where the interlocking permits trains to be signalled and stop with only one signal section separating the two trains, these signals should be considered as limiting the bi-directional movement and shall be provided with TPWS.

Responses to question B6 should be as follows:

- **‘Yes’** - if the signal limits bi-directional or terminating movements as described above. Provision of TPWS at the signal is required.
- **‘No’** - if the above does not apply. Record Exclusion Code **‘C’**.

6.3.8 Signal Selection - Emergency Crossovers (ref. C7)

Q is the only conflict with an Emergency Crossover where special operating procedures are used to control movements?

The Regulations require the provision of TPWS at all signals protecting possible points of conflict. A specific exception is made for Emergency Crossovers, which the Regulations define as ‘connections....used in an emergency or for engineering purposes in accordance with Special Procedures established by the Infrastructure Controller’.

Details of these procedures, which can be applied as mitigation against the occurrence of SPADs as an alternative to the provision of TPWS, are given in the Rule Book or in Local Instructions.

The responses to question C7 should be as follows:

- **‘Yes’** - if the only conflict protected by the signal occurs at an Emergency Crossover, and only under conditions where Special Operating Procedures are in force (e.g. under an engineering possession - Rule Book Section T, or during Single Line Working - Rule Book Section N). Record Exclusion Code **‘E’**.
- **‘No’** - if none of the above applies. Go to question C8.

6.3.9 Signal Selection – Diverging Routes (ref. C8)

Q. Do the points lead only to diverging routes, with no conflicts other than a head on conflict with an opposing move up to a limit of shunt signal?

Where a signal protects pointwork where routes only diverge, such as at the entrance to a loop line signalled for one direction of running, there is no possibility of a conflict occurring.

Note however that in situations where the length of such loop lines is less than the normal signal spacing, a separate signal on the main line protecting the exit from the loop may not be provided. In these cases, the signal controlling entry to the loop will also protect the convergence at the loop exit (refer to Typical Layout No. 6 in Appendix B).

Responses to question C8 should be as follows:

- **‘Yes’** - if none of the routes from the signal involves a conflict other than a head on conflict with an opposing move up to a Limit of Shunt signal/marker board. Record Exclusion Code **‘D’**
- **‘No’** - if the above does not apply and there is a conflict with one or more routes. Go to question C9.

6.3.10 Signal Selection – ‘Layout Protection’ (ref. C9)

Q. Does the track layout provide protection that will divert any SPAD movement away from a conflict?

In certain cases, the arrangement of the track layout beyond a signal may be so as to provide ‘acceptable’ mitigation of the effects of a SPAD without TPWS being fitted.

If a layout is arranged with facing points which can divert a train passing a signal at Danger away from a Conflict with a signalled route, or with trap points or a derailer that would arrest an unauthorised movement, this protection could obviate the requirement for TPWS.

Layout Protection provided by self-normalising points, route setting or the application of Signalling general instruction section 9.3 (Ref Module TSI of GE/RT8000) by the Signaller to catch points, trap points, derailleurs or points leading to shunting necks, sidings or depots shall constitute acceptable mitigation against fitment of TPWS. (Flank Protection provided by the action of the Signaller manually setting points is not a requirement of the Signalling general instruction section 9.3 and shall therefore not constitute acceptable mitigation against fitment of TPWS). Refer to Typical Layout No 16.

Ref:	RT/E/S/10137
Issue:	3
Date:	April 2004

Any 'Layout Protection' claimed shall fulfil all the following criteria:

- point setting intended to divert unauthorised movements away from an authorised route shall be considered only if there is a net reduction in risk by doing so, as defined in Railway Group Standard GK/RT0064 'Provision of Overlaps, Flank Protection and Trapping' (section 5.1.2);
- the protection is effective in all circumstances under which a SPAD could occur at the signal. This shall include all possible positions of points under all circumstances (with the exception of degraded mode operation) of route setting, resetting, cancellation or time-out etc.
- the protection assures freedom from Conflict at least as far as the overlap point of the next signal ahead, under all circumstances, with the following exceptions:
 - A Conflict does not include a collision potential only with the rear of another train travelling in the same direction. Thus always diverting SPADing trains into a siding, diverging line or parallel line of a railway signalled Up/Up/Down/Down, where all normal traffic movements take place in the same direction as the SPADing train will constitute effective Flank Protection;
 - A Conflict does not include a collision with a train moving towards or standing at an opposing Limit of Shunt signal or sign.
 - Conflicts that arise only as a result of a train consecutively SPADing 2 signals, or 2 trains concurrently SPADing separate signals;
 - Conflicts arising from moves made under Hand signalling conditions or other similar abnormal operating conditions.

Responses to question C9 should be as follows:

- **'Yes'** - if the layout arrangement ahead of the signal fulfils all the criteria set out above. Record exclusion code **'F'**.
- **'No'** - if the above does not apply. Go to question C10.

Typical Layouts nos. 1 - 3 in Appendix B illustrate a number of examples of potential Layout Protection, some of which obviate the need for TPWS and others of which do not.

6.3.11 Signal Selection – 'Sidings Secured Out Of Use' (ref. C10)

Ref:	RT/E/S/10137
Issue:	3
Date:	April 2004

Q. Does the signal protect the entrance or exit from a sidings secured out of use?

TPWS fitment is not required at signals where the only conflict that is possible is with a move out of a siding that is secured 'Out Of Use'. Additionally the exit signal of a siding secured 'Out Of Use' shall not be provided with TPWS.

Sidings that are secured 'Out Of Use' are defined as those connected to the operational railway by points which are disconnected but are not immediately removed, and are secured out of use by one of the following methods:

- points on timber sleepers with closed switch blades which are clipped and padlocked and further secured by a fish plate screwed to the sleeper by two screws or fang bolts;
- points on timber sleepers with open switch blades which are secured by all the stretcher rods being properly fitted with all their bolts and by the insertion of a scotch between the switch blade and the stock rail. The scotch must be screwed to the sleeper or otherwise secured;
- points on concrete sleepers with open and closed switch blades which are secured by locking plates and padlocked, as shown in local instructions;
- the arrangements for securing points on concrete sleepers may also be applied to points on timber sleepers.

These sidings shall not be used without a change of use process to cancel the 'Out Of Use' status. At this time consideration shall be given to the installation of TPWS.

Clipping and padlocking points out of use is insufficient alone to provide suitable protection from use.

Responses to question C10 should be as follows:

- **'Yes'** – if the only conflict is with points beyond the signal which are secured 'Out of Use' by one of the methods described above - code **'SS'**.
- **'No'** - if the above does not apply. Provision of TPWS at the signal is required.

Ref:	RT/E/S/10137
Issue:	3
Date:	April 2004

6.3.12 Absolute Block, Electric Token Block, Tokenless Block and No Signaller Key Token Remote Areas

6.3.12.1 General

As outlined in section 6.3.5 above, certain criteria for selection of signals for TPWS as applied to areas of multiple-aspect signalling or track-circuit block are inappropriate for signals in areas where AB, ETB, TB or NSTR working is in use. The following sections describe additional criteria for, and provide guidance on, the application of TPWS to particular signals within layouts signalled for AB, ETB or TB working.

Optimum protection of an AB, ETB or TB operated layout with conflicts within station limits will be given by equipping the Home signal used for Block acceptance with TPWS on the principle that this signal effectively protects the whole layout within station limits. This may appear irregular at first sight, as there may be no conflicts at all between the Home signal and the next signal ahead.

Within Station Limits, a significant level of SPAD mitigation is provided by the application of Signalling general instructions (Ref GE/RT8000 Module TSI), together with the fact that movements are at low speed. The protection provided by equipping other signals within station limits (i.e. those other than the Home signal for Block acceptance purposes) will, in the majority of cases, be limited or negligible, as there is often little or no overrun or overlap distance available in which emergency braking can take effect.

However, signals beyond the Home signal that are Platform Starter signals and that protect a conflict ahead, will require TPWS in order to mitigate against start against signal SPADs where station duties are involved.

Section signals should not generally be fitted with TPWS unless there is a conflict in the section ahead.

However, it is recognised that wide variation exists in signalling layouts, and in their operational, functional and geographical characteristics, and hence particular signals or layout configurations may require special consideration. Such signals will include:

- signals protecting moves over Traffic Ground Frames in the next Block Section (see Appendix B Typical Layout No. 13);
- signals forming 'enclaves' of multiple aspect signalling in otherwise AB, ETB or TB operated areas (see Appendix B Typical Layout No. 16);
- local operational arrangements (see Appendix B Typical Layout No. 16);
- platform starting signals at junctions and terminal stations (see Appendix B Typical Layout No. 18);
- signals where the only conflict is within the Clearing Point, directly ahead of the Home signal for Block Acceptance (see Appendix B Typical Layout No. 19).
- signals protecting single or bi-directional lines (see Appendix B Typical Layout Nos. 20, 21 and 22);

Optimum protection of an ETB or TB passing loop will be given by equipping the Home signal used for Block Acceptance with TPWS. Where the diverging points leading from a single line section into a passing loop in the direction of travel are within the Clearing Point of the Home signal, the conflict being protected is not the diverging points but the converging points ahead of the Section signal.

NSTR passing loops are only normally provided with a fixed Distant signal and a Stop Board within the Token Exchange Point. Fitment of the Stop Board will provide protection for the single line section.

6.3.12.2 Home Signal (ref. D5)

Q. Is this a Home signal for the purposes of Block Acceptance?

Within AB, ETB and TB areas, braking distance is normally provided only between the Distant and Home signal, and an allowance for overrun (Clearing Point) is normally only provided beyond the Home signals used for Block acceptance purposes.

Responses to question D5 should be as follows:

- **'Yes'** - if the signal is defined as a 'Home Signal' for the purposes of Block Acceptance. Go to question D6.
- **'No'** - if the above does not apply. Go to question E5.

6.3.12.3 Points in next block section (ref. D6)

Q. Are there any points or crossings between this Home signal and the Home signal at the next signal box ahead, that are not within the Clearing Distance or Block Acceptance Point?

Where a Home signal is provided solely for purposes of line capacity (i.e. to divide what would otherwise be an excessively long block section), or to protect a level crossing, there will be no conflict that requires protection, and hence TPWS will not be required at the Home signal.

Responses to question D6 should be as follows:

- **‘Yes’** - if there is a conflict (including points or crossings operated from Ground Frames, Switch Panels or other local control facility) between the signal and the Home signal controlled from the next signal box ahead, that is not in the signal’s Clearing Point or Block Acceptance point. Go to question C7.
- **‘No’** - if the above does not apply. Go to question E8.

6.3.12.4 Points ahead of signal (ref. E5)

Q. Are there any points or crossings between this signal and the next signal ahead?

The same basic consideration as for multiple aspect signalling areas is applied in areas of AB, ETB or TB operation to determine a requirement or otherwise for TPWS, namely, the existence of a conflict between a signal and the next signal ahead. If the signal under consideration is not a Home signal, provision of TPWS depends both on whether a conflict exists (question E5) and whether the signal protects a particular hazard (questions E7, E8 and E9).

If the only conflict is within the Clearing Point of the Home signal or Block Acceptance point at the signal box beyond, then TPWS is not required as the approach to the Home signal, when a conflict is present within station limits, is avoided by the application of Signaller’s General Instruction 7.3. See Typical Layout No. 19).

Responses to question E5 should be as follows:

- **‘Yes’** - if the signal is protecting points between itself and the next signal ahead. Go to question E7.

- **‘No’** - if the above does not apply. Record Exclusion Code **‘C’**.

6.3.12.5 Traffic Ground Frame in section (ref. E7)

Q. Is the Block Section signal protecting points worked by a Traffic Ground Frame?

Where one or more sets of points operated by a Traffic Ground Frame exist in an AB, ETB or TB Section between signal boxes, there is a risk of conflict if a train passes the Section (‘Starting’) signal at Danger. TPWS is therefore required at the Section signal.

Responses to question E7 should be as follows:

- **‘Yes’** – if the signal is a Block Section signal that protects points worked by a Traffic Ground Frame. Go to question C7.
- **‘No’** – if the above does not apply. Go to question E8.

Refer to Typical Layout No. 13 in Appendix B.

6.3.12.6 Platform Starting signals (ref. E8)

Q. Is this a platform starting signal?

The possibility of a ‘start-away’ SPAD must be considered if there is a conflict ahead of a Platform Starting signal.

Responses to question E8 should be as follows:

- **‘Yes’** - if the signal is at a platform end, or within 25m of a platform end, and functions as a platform starting signal (i.e. a train must not start from the platform unless the signal is displaying a Proceed aspect). Go to question C7.
- **‘No’** - if the above does not apply. Go to question E9.

Refer to Typical Layout No. 12 in Appendix B.

6.3.12.7 Single lines and passing loops (ref. E9)

Q. Does this signal protect a section of single line, or a line signalled for bi-directional running?

A particular hazard exists where a signal protects a single line, or a line effectively functioning as a single line by virtue of being signalled for bi-directional operation.

Responses to question E9 should be as follows:

- **Yes** - if the signal protects a section of either single line, or double line signalled for bi-directional running. Go to question C9.
- **No** - if the above does not apply. Record Exclusion Code 'C'.

It will be noted that responding 'Yes' to questions E8 or E9 returns the process to the principal selection criteria process at question C7 and C9 respectively (see sections 6.3.9 and 6.3.10 above).

6.3.13 Signals specifically not considered for TPWS

Interpretation of the Regulations as detailed in this Signal Selection standard will exclude some signals that may appear to be at risk, in addition to the particular types of signal excluded as described in Type of Signal (ref. C3). This Specification identifies the need to fit signals with TPWS so as to be compliant with the Regulations.

Particular types of signal excluded by this Specification include the following cases.

6.3.13.1 Intermediate signals on bi-directional lines

Where a line is signalled for bi-directional operation, intermediate signals may be provided in addition to the entry and exit signals to increase line capacity in the opposite direction of travel. In such cases it is normal that operation of the section is such that complete movements take place with one or more trains passing through the section in one direction, followed by one or more in the other direction.

However, where the interlocking permits trains to be signalled from both directions at the same time, and to stop with only one signal section separating the two trains, the signals should be considered as limiting the bi-directional movement and shall be provided with TPWS.

6.3.13.2 Level Crossing Protection

Where a signal protects only a level crossing on otherwise plain line TPWS will not normally be provided.

Ref:	RT/E/S/10137
Issue:	3
Date:	April 2004

6.3.13.3 Limit of Shunt

Where a signal protects a move up to a Limit of Shunt signal or sign TPWS shall not be provided.

7 PROVISION OF TPWS AT BUFFER STOPS

The Regulations require the provision of train protection on the approach to 'Other Locations' where overspeeding could have serious consequences. The fitment of TPWS is therefore required at certain Buffer Stops. The sole criterion of whether TPWS is required at Buffer Stops is that the platform in question can be used by passenger trains.

TPWS is not required for Buffer Stop protection where the Buffer Stops and ALL trains operating towards the Buffer Stops under normal operating conditions, are provided with an alternative train protection system approved by the HMRI as compliant with the Regulations. This includes mechanical Train Stops and Trip Cocks employed at Moorgate and Richmond; and Automatic Train Protection (ATP) systems such as employed at the Heathrow Airport tunnel section.

8 PROVISION OF TPWS AT SPEED RESTRICTIONS

8.1 Selection Process

The process of selection of which Speed Restrictions are required to be provided with TPWS is an iterative process. An **initial selection** process categorises those speed restrictions that require consideration for fitment. Those speed restrictions are then considered through the **final selection** process, as Attainable Speeds and the effects of TPWS OSS equipment on freight trains need to be determined to confirm the final fitment requirement. This shall be achieved by the mandatory use of Excel spreadsheet TI-014_6.xls. The **Initial Selection** and **Final Selection** Flowcharts in Appendices C, D, E and F set out in graphical form the selection process to determine the requirements for TPWS at permanent (PSR) and temporary (TSR) speed restrictions.

Selection at each step is a straightforward 'Yes/No' decision, for which the following may be used as guidance. For each step, either the decision shall be recorded as shown, or the Flowchart followed to the next question. Where an outcome is reached that indicates that TPWS should not be fitted, an Exclusion Code shall be recorded as shown on the Flowchart.

TPWS shall not be provided for speed restrictions where the speed restriction and ALL trains operating through the restriction, under normal operating conditions, are provided with an alternative train protection system approved

Ref:	RT/E/S/10137
Issue:	3
Date:	April 2004

by the HMRI as compliant with the Regulations. This includes mechanical Train Stops and Trip Cocks employed between Moorgate and Finsbury Park, between Richmond and Gunnersbury and on the tunnel sections of Merseyside; and Automatic Train Protection (ATP) systems such as employed on the Heathrow Airport tunnel section.

TPWS shall not be provided at speed restrictions on freight only lines. Diversionary routes shall only be considered for TPWS if it is a route which passenger trains are diagrammed over in the Working Time Table. All other diversionary routes, including those used for occasional charter trains, should be considered as under emergency working, for which the 'guidance to the Regulations' does not require train protection to be fitted.

Whenever a TSR is identified as falling within the scope of TSRs to be fitted under the Regulations, TPWS equipment shall be fitted as quickly as possible. Normally, fitment shall be planned to coincide with the start of the TSR.

8.1.1 Initial Selection

For **initial selection**, fitment shall only include those speed restrictions where the Permissible Speed on approach to the speed restriction being considered is 60 mph or greater, and the reduction in speed is one third or greater, for the fitment categories defined in 8.2.

Additionally, for TSRs only, consideration for fitment shall only include those TSRs that are **planned** to be in place for greater than six months (180 days). This requirement excludes both short duration TSRs (not exceeding 180 days) and Emergency Speed Restrictions (ESRs). TSRs planned for durations greater than 6 months (>180 days) but not exceeding 12 months (<=360 days) shall be subject to risk assessment in accordance with Flowcharts Appendices D & E. TSRs excluded via this Flowchart shall be coded Exclusion EX2). TSRs planned for durations exceeding 12 months shall be considered for fitment in line with Flowchart Appendix D.

Speed restrictions to be fitted with TPWS include those where the criteria in section 8.2 are met by a Cascade i.e. a succession of speed restrictions within a distance of 2 miles or less. If there is more than one qualifying speed restriction within the cascade, then each qualifying speed restriction shall be considered for fitment separately (this process is automated within the Excel spreadsheet).

For Differential speed restrictions, only the highest of permitted speeds shall be considered for TPWS fitment. If TPWS were applied to the lower speed, then trains permitted to pass at the higher speed would have to slow down to the lower speed or be tripped by TPWS.