



Certificate of Derogation from a Notified National Technical Rule

(in accordance with part 6 of the Railway Group Standards Code)

1. Type of deviation

Derogation

Deviation Number: 12/128/DGN

2. Details of applicant:

Southern Chief Engineer, Southern Railway Limited, Selhurst Traincare Depot, Selhurst Road, London, SE25 6LJ

3. Your reference number:

NC-31

4. Status of applicant:

Railway Undertaking, RSSB Member

5. Title of certificate:

TPWS functionality on Class 377/6 fleet

6a. Details of Railway Group Standard (RGS):

| RGS Number: | Issue No: | Issue Date: | Title: |
|-------------|-----------|---------------|---|
| GE/RT8030 | Four | December 2011 | Requirements for the Train Protection and Warning System (TPWS) |

6b. RGS clause(s):

The deviation splits into a number of sections, all related to Appendix F of GE/RT8030 and one clause of GE/RT8035. There are a number of areas where full compliance is not achieved:

- Enhanced Functionality – Identification of type of AWS/TPWS brake application:
GE/RT8030 App. F - F.2.1.2/.3/.5, F.2.3.2/.3/.5-.9, F.2.4.1, F.3.4.1.6
- Enhanced Functionality – Separate brake application acknowledgement and brake reset:
GE/RT8030 App. F - F.2.8.1-.4, F.2.9.1-.3, F.3.3.2/.3, F.3.3.4.1-.5
- Audible Alerts and Warnings
GE/RT8030 App. F - F.2.7.1.1-.7, F.2.7.2.1-.3, F.2.7.3.1/.2/.5, F.3.4.1.2/.6, Appendix H
- AWS Fault Handling
GE/RT8030 App. F - F.3.4.1.3/.4
- AWS Power-up Test Fault Indication
GE/RT8030 App. F - F.2.5.3
- Enhanced OTDR Interface
GE/RT8030 App. F - F.3.5.1
- Control Unit Not Backward Compatible
GE/RT8030 App. F - F.3.6.1
- Design & Labelling of Existing Controls
GE/RT8030 App. F - F.2.6.5, F.2.10.1-.4/.6/.7
- No set-up per Unit
GE/RT8030 App. F - F.3.6.2.

6c. RGS clause requirements:

Please refer to copy of GE/RT8030 issue 4 for full text of standard.

7. Scope of deviation:

Class 377/6 (26 five-car trains / 52 cabs) plus a contract option for additional 40 vehicles.

8. Impacts of complying with the current RGS requirement:

There are two areas of impact from complying with the RGS requirements:

- The manufacturing and validation timescales for compliant TPWS equipment do not meet the overall Class 377/6 programme and would lead to a project delay.
- Achieving full compliance with the requirements would require a number of design changes from the Class 379 and Class 377/5 designs, on which the Class 377/6 design is based. These changes would have a significant impact on the project, and are likely to delay the project.

Enhanced TPWS equipment is being manufactured by two suppliers, but both suppliers' equipment is still under development and testing. Delivery of the equipment is required in September 2012, which cannot be achieved. Full validation of the equipment would be required to support certification for on-track testing in May 2013. There is no assurance that suppliers' validation programmes will definitely achieve these dates.

The Class 377/5 and Class 379 units were fitted with Thales Mk.1 TPWS control units. Modifying these designs to achieve full compliance with GE/RT8030 Issue 4 would require:

- Installation of a new control unit, which, depending on the supplier, may be considerably larger
- Installation of a new, larger TPWS driver machine interface (DMI), which will displace some existing controls, changing the overall desk layout
- Installation of a new speaker / audible warning unit in the cab interior, which will also cause changes to the cab desk layout
- Changes to vehicle schematics and wiring to provide the enhanced functionality
- Additional data to be sent to and recorded on the Train Data Recorder
- Depending on the supplier, changes to other TPWS equipment such as aerials and power supply.

These design changes would require a significant amount of re-engineering, causing a delay to the project programme. This is covered in more detail in document 3EER400017-1076.

In addition, if enhanced TPWS were fitted, there would be changes to the layout of a number of controls – both the TPWS DMI and other controls. As the Class 377/6 units are operated as part of a wider Class 377 fleet, this could lead to confusion and errors, particularly in emergency situations. A consistent desk layout across the fleet is considered to offer the clearest interface to drivers.

9. Proposed alternative actions:

It is proposed that the new Class 377/6 units will be based on the design of the Class 377/5 with the following changes:

- A new Thales Mk.3 TPWS control unit will replace the Mk.1 unit fitted to other Class 377s
- The Train Control and Monitoring System (TCMS) fault reporting message will be updated to ensure drivers are reminded of the correct actions following a TPWS brake application.

The control unit has the same fit and form as the Mk.1 control unit, but includes a number of improvements. In particular, the new control unit:

- prevents a brake application from being cleared through resetting the cab;
- includes in-service testing of the TPWS; and
- makes a number of reliability improvements.

The Mk.3 control unit complies with the arming frequency hold time, which was a non-compliance for previous Class 377s.

The new control unit interfaces with the existing Driver Machine Interface (DMI). On Class 377, this interface is made up of standard desk pushbuttons/indicators which are fitted directly into the desk.

In addition to the cab desk interface, the units' Train Control and Monitoring System (TCMS) will be used to provide the driver with a Category A ('urgent') fault in the event of an AWS/TPWS brake application. This will give an audible warning and will display a detailed message on the in-cab TCMS display informing the driver that a potential SPAD has occurred, and advising of the actions that should be taken.

The driver must cancel this message independently from cancelling the AWS/TPWS brake application.

10. Impacts of the alternative actions:

The partially-enhanced Mk.3 control unit will not achieve a number of functions and features required by Appendix F of the GE/RT8030 Issue 4. However, the proposed Class 377/6 design is considered to adequately manage the known risks and issues with TPWS, as summarised in document 3EER400017-1076.

- **Enhanced Functionality – Identification of type of AWS/TPWS brake application:**
Issue 4 requires that the cause of the AWS/TPWS brake application is identified to the driver. Additional indicators are required for this purpose. This function assists the driver in diagnosing the cause of a brake application when communicating with the signaller, and highlights when a SPAD has occurred.
The proposed design will not have the enhanced DMI and will not identify the source of brake application, but will remind the driver to speak to the signaller, and will warn the driver that a SPAD may have occurred. If the driver contacts the signaller, it will be possible to determine if a SPAD has occurred.
- **Enhanced Functionality – Separate brake application acknowledgement and brake reset:**
Issue 4 requires that separate actions are required to acknowledge the brake application and to release the brakes following communication with the signaller. This prevents the driver inadvertently cancelling the brake application and the system timing-out and resetting prior to the driver determining the cause of the brake application.
The proposed design will have two independent indicators of a TPWS/AWS brake application – the TPWS DMI and the TCMS screen. The brakes will be released as per the current design, but the warning will remain on the TCMS screen until separately acknowledged. This gives a reminder to the driver and the two separate steps to acknowledge the brake application and release the brakes, increasing the opportunity for the driver to take the correct actions.
- **Audible Alerts and Warnings:**
Issue 4 requires specific spoken audible alerts to accompany SPAD and overspeed brake applications to warn the driver to contact the signaller. A further audible alert confirms successful completion of the start-up test.
The Mk.3 control unit does not provide these spoken alerts. Following an AWS/TPWS brake application, there will be an audible warning (i.e. a tone), and a text reminder to contact the signaller given via the TCMS screen. By not using spoken alerts, the risk of confusion between TPWS and GSM-R audible alerts is avoided. The TPWS DMI will visually indicate successful completion of a power-up test, or a fault in the system.
- **AWS Fault Handling:**
Issue 4 requires that should the AWS 'horn' sound not cancel as requested, a fault shall be shown on the TPWS panel.
The Mk.3 control unit does not have this functionality; the horn will sound indefinitely. This is clearly a fault and it is clear to the driver that the system is not working correctly.
- **AWS Power-up Test Fault Indication:**
Issue 4 requires that AWS faults during the power-up test are indicated, as TPWS faults, through flashing the 'temporary isolation / fault' indicator.
The Mk.3 control unit indicates an AWS fault through all three indicators remaining lit. This clearly identifies a fault, and differentiates the fault from TPWS.
- **Enhanced OTDR Interface:**
Issue 4 requires the enhanced TPWS is required to have an enhanced interface with the On-Train Data Recorder.
The Mk.3 control unit does not have all of the enhancements required by GE/RT8030 Issue 4, and hence does not supply any extra data to the data recorder. Sufficient information is available from the data recorder and signalling systems to re-create the exact sequence of events.
- **Control Unit Not Backward Compatible:**
Issue 4 requires that a unit design fitted with an enhanced TPWS cannot be retro-fitted with an un-enhanced system.
The Mk.3 control unit is specifically designed with the same fit and form as the Mk.1 control unit. This enables gradual replacement on existing units, but prevents compliance with this requirement.

- **Design & Labelling of Existing Controls:**
There are very specific requirements regarding design and labelling of each control.
 - The Class 377s uses standard pushbuttons/indicators manufactured by EAO. The 'train stop override' pushbutton is round. Issue 4 requires it to be square.
 - The arrangement of the words TEMPORARY ISOLATION / FAULT is on two lines. Issue 4 requires this on three lines.
 - The labels are mounted to the desk and are positioned below the controls in 3 mm font. Issue 4 requires the labels above the controls and 5 mm font.
 Maintaining the existing controls and labels keeps a common interface for Southern's drivers. There is no evidence that the existing controls are confusing to operate, and so it is considered that there is no negative impact from this non-compliance.
- **Individual Isolation of AWS/TPWS:**
GE/RT8030 requires that TPWS can be isolated, which can be achieved by isolating the whole AWS / TPWS. GE/RT8035 requires that AWS can be isolated independently from the TPWS, which cannot be achieved. Providing separate isolation would permit one system to be maintained if the other fails, while a unit is taken out of service.
The Mk.3 control unit does not permit separate isolation. Given that the Mk.3 unit contains reliability improvements and that the Class 377/6 units will operate relatively short distances from depots (compared to freight locomotives or Intercity trains) there is not considered to be any significant impact from not providing isolation.

There is a further non-compliance where GE/RT8030 appears to be contradictory:

- **No set-up per Unit:**
Appendix F of the standard requires TPWS control units to need no setup, regardless of the unit in which they are installed. This contradicts clause 2.4.2.2 which requires TPWS to be set up for either 'Passenger' or 'Freight' braking performance. The Mk.3 control unit complies with clause 2.4.2.2.

In summary, there is no negative impact on operation of the new Class 377/6 units in comparison with existing Class 377 units. The new units will benefit from in-service testing and an improved TCMS message, and hence are enhanced compared to existing in-service units.

The proposed design will appear identical to drivers and so will benefit from reduced training requirements and reduced chance of confusion between the two systems.

The proposed design addresses the issues raised with the original TPWS design and reduces the risk that the system is misused or has an undetected fault in service.

11. What other options have been considered?

Fitment of a fully-compliant system was not considered reasonable because of the cost and delay.

Delivering the vehicles with Mk.3 TPWS, but later upgrading this to an Issue 4 – compliant system has been considered, but this solution would be subject to the same issues as fitting the units with enhanced TPWS from build. The cost of retro-fitting enhanced TPWS would be higher than fitting the equipment at build.

There would be significant cost with retrofitting the units and the enhanced TPWS is not considered to offer significant benefits over the proposed Class 377/6 design. In addition, if enhanced TPWS were fitted, there would be changes to the layout of a number of controls – both the TPWS DMI and other controls. As the units are operated as part of a wider fleet, this could lead to confusion and errors, particularly in emergency situations. A consistent interface across the fleet is considered to offer the clearest interface to drivers.

12. Consultation with affected parties

The design of the on-board TPWS equipment does not affect the interface with the infrastructure, and hence this deviation does not affect Network Rail.

Network Rail does not object.

13. Additional actions/observations:

Upon receipt, the applicant is required to identify affected, interfacing parties and copy this certificate, together with supporting information, to those parties.

Attachments:

- Proposed TPWS Solution and Risk Assessment Ref. 3EER400017-1076 – Southern 377/06
- Breakdown of costs for Enhanced TPWS.

14. Method of elimination:

N/A

15. Start and end date:

N/A

16. Signature of applicant:

Southern Chief Engineer

Date of application:

26/07/2012

17. Status in respect of National Technical Rules:

GE/RT8035 Issue 4 is currently on the list of National Technical Rules under the:

- Control Command and Signalling (published) Conventional Rail TSI
- Control Command and Signalling (published) High Speed Rail TSI.

18. Status in respect of National Safety Rules:

GE/RT8030 Issue 4 is not on the list of the proposed National safety Rules under the Conventional or High Speed Rail TSIs.

19. Lead Standards Committee details:**Name of Committee:**

Control Command and Signalling

Date of meeting

16/08/2012

Minute reference:

12/CCS/08/159

Authorised by:

Signed by Jeff Allan on 17/09/2012

Date of Authorisation:

17/09/2012

Jeff Allan

Head of Delivery, Control Command & Signalling, and Energy