Introduction and Use of Axle Counters – Managing the Risk

Synopsis
This document mandates requirements for managing the risk arising from the introduction and use of axle counters.

Signatures removed from electronic version

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# Introduction and Use of Axle Counters - Managing the Risk

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Part A

A1 Issue record

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

A2 Implementation of this document

The publication date of this document is 1 February 2003.

This document comes into force on 5 April 2003.

The dates by which compliance with the requirements of this document is to be achieved are set out in Part B2. Where those dates are later than the date on which this document comes into force, this is to give Railway Group members additional time to plan and commence implementation so as to achieve full compliance by the dates set out in Part B2.

Railway Safety recognise that the widespread introduction of axle counters is a new and ongoing development for those parts of Britain's mainline railway network within the scope of Railway Group Standards.

This standard, GE/RT8217, is being published at this time to support the ongoing introduction and use of axle counters, but it is accepted that during the development of the early axle counter projects, it will become clear which of the permissible emerging methods and processes are the most appropriate, and it is therefore Railway Safety's intention to review this standard sooner that the usual five-year period. This review will be undertaken with a view to removing the need to mandate the production and maintenance of a concept safety case, and instead to set out requirements more explicitly within this standard.

It is anticipated that issue two of GE/RT8217 will generate a number of non-compliances for many current or proposed axle counter schemes as processes for introducing and using axle counters are developed. Where authorised, these non-compliances will be taken account of in issue three.

This document supersedes the following Railway Group Standard, either in whole or in part as indicated:

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GE/RT8217 Issue 1 is withdrawn with effect from 5 April 2003.

A3 Scope of Railway Group Standards

The overall scope of Railway Group Standards is set out in Appendix A of GA/RT6001. The specific scope of this document is set out in Part B2.
A4 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 PLC, Railway Safety, and the train and station operators who hold railway safety cases for operation on or related to infrastructure controlled by Railtrack PLC.

Railtrack PLC is known as Railtrack.

A5 Health and safety responsibilities

In issuing this document, Railway Safety makes no warranties, express or implied, that compliance with all or any documents published by Railway Safety is sufficient on its own to ensure safe systems of work or operation. Each user is reminded of its own responsibilities to ensure health and safety at work and its individual duties under health and safety legislation.

A6 Technical content

The technical content of this document has been approved by:

Richard Evans, Principal, Operations, Railway Safety
Jon Taylor, Principal Track and Structures Engineer, Railway Safety
Jeff Allan, Principal Signalling and Telecoms Engineer, Railway Safety

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A7 Supply

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Part B

B1 Purpose

This document mandates requirements for managing the introduction and use of axle counters, such that the overall level of risk on the network is either maintained or reduced.

B2 Application of this document

B2.1 To whom the requirements apply

This document contains requirements that are applicable to Railway Safety and duty holders of the following categories of Railway Safety Case:

a) infrastructure controller
b) station operator
c) train operator.

Under the Railways (Safety Case) Regulations 2000, the duty holder (as defined in those Regulations) is responsible for ensuring that the requirements of Railway Group Standards are complied with. Contractual arrangements (including a lease) do not of themselves relieve the duty holder of his obligations under those Regulations.

B2.2 Compliance requirements

B2.2.1 Infrastructure controller

These requirements apply to the introduction and use of train detection by axle counters, and apply to all such axle counter installations on the controlled infrastructure that are commissioned or upgraded after 5 April 2003.

All the requirements of GE/RT8217 apply to duty holders of the infrastructure controller category of Railway Safety Case.

B2.2.2 Station operator

These requirements apply to the introduction and use of train detection by axle counters, and apply to all such axle counter installations on the controlled infrastructure that are commissioned or upgraded after 5 April 2003.

Many of the requirements of GE/RT8217 are not mandated upon duty holders of the station operator category of Railway Safety Case, however such duty holders are advised to make themselves aware of their potential role in the various consultations and advisory groups that are mandated upon the infrastructure controller.

B2.2.3 Train operator

These requirements apply to the introduction and use of train detection by axle counters, and apply to all such axle counter installations on the controlled infrastructure that are commissioned or upgraded after 5 April 2003.

Many of the requirements of GE/RT8217 are not mandated upon duty holders of the train operator category of Railway Safety Case, however such duty holders are advised to make themselves aware of their potential role in the various consultations and advisory groups that are mandated upon the infrastructure controller.

B2.2.4 Railway Safety

These requirements apply to the introduction and use of train detection by axle counters, and apply to all such axle counter installations on the controlled infrastructure that are commissioned or upgraded after 5 April 2003.
Introduction and Use of Axle Counters - Managing the Risk

Many of the requirements of GE/RT8217 are not mandated upon Railway Safety, however Railway Safety is advised to make themselves aware of their potential role in the various consultations and advisory groups that are mandated upon the infrastructure controller.

**B2.2.5 General compliance requirements**
Until the compliance date, or the date by which compliance is achieved (if earlier), the applicable requirements of the predecessor documents shall continue to be met (see Part A for details).

After the above compliance date or after the date by which compliance is achieved (if earlier), Railway Group members shall not deviate from the requirements set out in this document.

Where it is considered not reasonably practicable to comply with the requirements set out in this document, authorisation not to comply shall be sought in accordance with GA/RT6001, GA/RT6004 or GA/RT6006.

**B2.3 Exclusions from the application of this document**
The requirements of this document do not apply to axle counter installations that will be used over the same route as, and be subordinate to, a system of train detection by track circuits.

**B2.4 Related requirements in other documents**
The technical requirements for the design of train detection systems using axle counters are set out in Railway Group Standard GK/RT0217 – Technical Requirements for Axle Counters.

**B3 Definitions**

**Application Safety Case**
For the purposes of this document, an Application Safety Case is a specific safety case for the use of axle counters within a particular named scheme. (This is equivalent to a ‘specific Application Safety Case’ as defined in ENV 50129.)

**Approval body**
The approval body is an independent team formed within the organisation of the infrastructure controller, with the necessary competence to approve those documents and submissions required by this standard. (The functioning of the approval body is the responsibility of the infrastructure controller.)

**Axle counter installation**
Throughout this document the term ‘axle counter installation’ refers to all the axle counters being installed within the geographic limits of a particular named scheme.

**Axle counter system**
A method of train detection in which track-mounted equipment counts the number of axles entering and leaving a track section at each extremity, and this information is evaluated to determine whether the track section is occupied or clear.

**Concept safety case**
A concept safety case is a generic safety case for the use of axle counters on the network. (This is equivalent to a ‘generic Application Safety Case’ as defined in ENV 50129.) Throughout this document the term ‘concept safety case’ refers to the current axle counter concept safety case held by the infrastructure controller (see section C1.1).
Equivalent level of safety
A level of safety that maintains risk at or below the level that existed previously, or would have existed previously had the system of train detection then in use been functioning as intended.

Expert group
A group of persons who by virtue of their qualifications and experience can be regarded as expert in the subject matters within the scope of this standard.

GSM-R
A digital radio system (Global System for Mobile communications – Railways) based on the GSM Mobile communication standard adapted for use on European railways. The GSM-R system for the purposes of this document is one that complies with the EIRENE Functional Specification (version 5) and the System Requirement Specification (version 13).

Interface group
A group of persons representing those organisations directly affected by a proposed axle counter installation.

Reset
The action of setting the number of axles registered in a track section to zero.

Restoration
The final action in accepting an axle counter back into service after failure, disturbance or miscount.

Scheme
A systematic plan to install or upgrade axle counters.

Track circuit
For the purposes of this document, the term ‘track circuit’ refers to the detection of trains, within a particular section of track, by means of the electrical circuit created between the running rails by one or more train axles.

Upgrade
The significant improvement of, or the replacement of a significant part or quantity of, an existing installation.

B4 Background
The railway industry is looking increasingly towards using axle counter systems, rather than track circuits, as the primary means of train detection.

This document mandates the requirements to be adopted when introducing and using axle counter systems.

In making the change to axle counters from some other method of train detection, it is essential to take account of the relative benefits and dis-benefits of the two methods, for that particular site.

In comparing the existing system of train detection with axle counters it is important to base the comparison on the existing system in its fully functional state. This therefore does not allow high levels of risk to be acceptable on the basis that the existing train detection system was operating beyond its design life or had been poorly maintained.

The benefit analysis is undertaken to ensure that the level of risk on the network as a whole does not increase as a result of the replacement of the existing method with axle counters, and that the distribution of risk between Railway Group members is not changed significantly. Wherever there is the opportunity to reduce risk levels, this should be taken to further the objective of continuous improvement.
With any axle counter system, one of the principal issues is the need to control the risk arising from the method adopted for resetting and restoring the axle counter system.

When undertaking the replacement of track circuits by axle counters as the primary train detection system, additional issues are:

a) the loss of a method of emergency protection

b) the loss of a method of broken rail detection

c) the loss of a method of obstruction detection

d) the need to protect axle counter equipment during maintenance activities.

This document mandates a requirement on the infrastructure controller both to produce an Application Safety Case and, in the role of approval body, to approve the Application Safety Case. The infrastructure controller is also mandated to ensure that for any particular Application Safety Case, independent teams undertake the functions of author, and approval body.
Part C
General requirements

C1 Safety case regime

C1.1 Requirement to have a concept safety case
The infrastructure controller shall produce, and maintain up-to-date, a concept safety case for axle counters.

Within the concept safety case, the infrastructure controller shall address the issues for and against the use of axle counters as a means of train detection across the network, and shall include quantitative analysis of the risk.

In assessing the risk associated with axle counters, the infrastructure controller shall suggest within the concept safety case suitable mitigation measures. The infrastructure controller shall ensure that the concept safety case contains a template for use in producing an Application Safety Case.

C1.2 Requirement to have an Application Safety Case
The infrastructure controller shall produce an Application Safety Case for each axle counter scheme.

In producing an Application Safety Case, the infrastructure controller shall address, as a minimum, the following items:

a) reliability and availability issues, including vulnerability to route crime
b) electro-magnetic compatibility (EMC) issues
c) maintenance requirements and procedures
d) installation and commissioning procedures
e) impact on other operations and activities, for example track maintenance
f) reset and restoration procedures
g) product type approval
h) the mitigation measures to be taken in respect of sections E1 to E5 inclusive of this document
i) the traction system
j) the effect of planned or prospective future changes to the route, for example the introduction of new rolling stock
k) the identification of axle counter sections to avoid confusion between track circuits and axle counters
l) the interface with adjacent sections of route without axle counters
m) the interaction of items a) to l) above.

With regard to the particular axle counter equipment that it is intended to use, the infrastructure controller shall demonstrate in the Application Safety Case that any inherent constraints or product limitations are taken account of, both in the design of the system, and in the procedures to be adopted. Further technical requirements are set out in Railway Group Standard GK/RT0217.

Within the Application Safety Case, the infrastructure controller shall address those EMC issues relating to the introduction of the axle counter equipment. This shall take into account all the railway infrastructure in that location, and shall
include a demonstration that the axle counter equipment will be compatible with all the existing trains and systems operating on the route.

Railway Group members shall put procedures in place for making susceptibility information available to train operators for use in EMC assessments of any new trains they wish to operate over the route (see GE/RT8015).

Consideration shall be given by the infrastructure controller, within the Application Safety Case, to the impact on the possession arrangements used on the route, as a consequence of the installation and use of axle counters (see also section E5).

In producing the Application Safety Case, the infrastructure controller shall make reference to the guidance in ENV 50129 and ‘The Yellow Book’.

C1.3 Requirement to approve an Application Safety Case

All approvals required by this document shall be in writing.

The infrastructure controller shall ensure that the concept safety case, a scheme specific Application Safety Case, and type approvals for the axle counter equipment to be used on the scheme, support every proposed installation of axle counters.

The infrastructure controller shall establish an approval body independent of the team responsible for the production of the Application Safety Case, to undertake peer review and approve the Application Safety Case for any proposed axle counter installation.

The decision of the approval body to approve the Application Safety Case shall be demonstrably based upon technical and safety considerations, and the decision of the approval body shall not be subject to commercial, programme or other pressures.

The infrastructure controller shall ensure that axle counter systems are only commissioned as the primary means of train detection, once the Application Safety Case has received the approval of the approval body.

Further requirements when replacing track circuits with axle counters are set out in section D4.

C1.4 Requirement to inform

The infrastructure controller shall inform the train operators (including freight) that use the line affected, of the intention to introduce an axle counter system, whilst in the feasibility stage of such a project. The infrastructure controller shall ensure that this notification includes all the organisations that are responsible for the operation of vehicles on the route in question, for example, infrastructure contractors using on-track machines. The infrastructure controller shall ensure that the process is arranged to allow the recipients at least four working weeks in which to comment upon the proposed scheme. The infrastructure controller shall notify a closing date for the return of comments at the time the documents are issued.

Once informed of the proposed changes, the train operators shall reply to the infrastructure controller by the notified date, with details of the safety effects to their operation as a consequence of the introduction of axle counters.

Prior to the commissioning of the axle counter system, the infrastructure controller shall demonstrate to train operators that use the line affected, that the requirements of this document have been met. In confirming the mitigation measures adopted, the infrastructure controller shall make use of, but not be limited by:
Introduction and Use of Axle Counters - Managing the Risk

a) an Application Safety Case relating to the implementation of the axle counters on the route concerned

b) risk modelling to demonstrate that appropriate control measures are in place to reduce risk to an equivalent level of safety.

C2 Requirement to brief and train staff

C2.1 Requirements for the infrastructure controller
The infrastructure controller shall clearly identify to all train operators, the lines where axle counters are in use.

The infrastructure controller shall brief its staff and contractors on the changes to the network and its operation, resulting from the change to axle counters.

The infrastructure controller shall notify those Railway Group members that are affected, of the need to brief their staff and contractors on the changes to the network resulting from the change to axle counters. The infrastructure controller shall make available to Railway Group members any information they reasonably require for the purpose of completing these briefings.

C2.2 Requirements for all Railway Group members
When the duties of the staff or contractors of a Railway Group member change as a result of the introduction of axle counters, the Railway Group member shall ensure that the staff or contractors receive training and written instructions on the changes to their specific duties before they work the affected route. A record shall be kept by the Railway Group member of those staff or contractors that have received this training.

C3 Commissioning of axle counter installations

Where it is stated within the Application Safety Case that mitigation measures or systems shall be in place before the axle counter system is commissioned, then the infrastructure controller shall ensure that the axle counters shall not be commissioned as the primary means of train detection until these mitigation measures or systems are in place and operating as intended.

Commissioning shall be in accordance with the requirements of GC/RT5101.

Where post-commissioning work is required by this document, such as the removal of rail joints previously associated with track circuits, the infrastructure controller shall provide, in consultation with train operators, a time-based action plan for this work to be done. This action plan shall be put in place by the infrastructure controller prior to the commissioning of the axle counter system.

The infrastructure controller shall report on the progress against the plan to the train operators, at agreed intervals.

C4 Records of axle counter installations

For each axle counter scheme, the infrastructure controller shall maintain records comprising, as a minimum, the following:

a) the approved version of the concept safety case upon which the installation was based

b) the approved Application Safety Case for the installation

c) all returned consultation comments and the replies issued to the consultees

d) all written approvals and agreements required by this standard

e) all assessments and records required by this standard.
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Part D
Requirements for the introduction of axle counters

D1  Introduction of axle counters

Expert groups specific to the scheme shall be established by the infrastructure controller to consider the items listed in section C1.2, and to recommend suitable mitigation measures. The infrastructure controller shall ensure that the expert groups are representative of the Railway Group members affected by the scheme and, where appropriate, consult with other stakeholders that are not necessarily themselves Railway Group members.

The infrastructure controller for the scheme shall establish an interface group consisting of, as a minimum, the principal trade unions, train operators and maintenance contractors that work the affected route. All Railway Group members shall co-operate with the operation of the interface group. The infrastructure controller shall ensure that the interface group is used to discuss operational issues, such as emergency communication, that arise from the introduction of axle counters, and that they collaborate to establish all the safety benefits and dis-benefits, and the additional controls required. The infrastructure controller shall ensure that the interface group identify any changes needed to standards, and all affected Railway Safety Cases.

The infrastructure controller shall review the proposed scheme against the concept safety case and use the results of this review to produce an Application Safety Case specific to the scheme.

The infrastructure controller shall ensure that the review process and resulting Application Safety Case take into account the recommendations of the expert groups and the interface group on the issues raised in section C1.2. The infrastructure controller shall ensure that the review process is documented.

The infrastructure controller shall ensure that commissioning of axle counters, and any equipment related solely to their use, shall not proceed until the approvals required by this document have been received.

D2  Use of the Application Safety Case

The infrastructure controller shall demonstrate within the Application Safety Case, that an equivalent level of safety is maintained both throughout the introduction of axle counters and during subsequent operation.

The infrastructure controller shall explain in the Application Safety Case, the mitigation measures required to achieve an equivalent level of safety. The level of actual risk on the route before, and the level of projected risk after, the installation of axle counters shall also be compared in the Application Safety Case.

The infrastructure controller shall use whole life techniques, within the Application Safety Case, to quantify the net safety benefit of installing axle counters in that particular location.

D3  Requirement for consultation on application safety cases

Upon completion of an Application Safety Case, but before it is submitted to the approval body for approval, the infrastructure controller shall arrange for consultation on the Application Safety Case to take place with stakeholders.
As a minimum, the consultees shall include:

a) the train operators that use the affected route

b) the infrastructure controller’s staff responsible for the operation of the route

c) the infrastructure maintenance contractors working on the route, including those that will be required to maintain or work around the axle counter system and its equipment

d) the interface group established under the requirements of section D1

e) the expert groups established under the requirements of section D1.

Where appropriate other organisations, such as Her Majesty’s Railway Inspectorate, and the relevant trade unions, shall be included in the consultation.

All Railway Group members shall co-operate with the consultation process.

The infrastructure controller shall arrange the consultation process so that it allows stakeholders at least six working weeks in which to comment upon the Application Safety Case. A closing date for the return of comments shall be notified to those consulted at the time the documents are issued to them.

Within eight working weeks of the close of the consultation, and provided the comments were received before the closing date, those consulted shall receive a considered response from the infrastructure controller to each individual comment that they returned.

Within the considered response, the infrastructure controller shall indicate either the acceptance or the rejection of the comment. Where the response is a rejection, a reason shall be given for the rejection.

In considering whether to approve an Application Safety Case, the approval body shall consider the comments received during consultation and the associated responses to them.

The approval body shall not approve an Application Safety Case until they are satisfied that the Application Safety Case is able to demonstrate that the risk on the affected part of the network after the change to axle counters is such that an equivalent level of safety exists. The approval body shall also satisfy itself that there has been no disproportionate change in the distribution of risk both between individual Railway Group members, and between Railway Group members and other exposed groups, such as track workers.

The approval body shall not approve an Application Safety Case until they have obtained written agreement to the change to axle counters in that location, from all the train operators that use the affected route. Train operators shall not unreasonably withhold such agreement.

Where axle counters are introduced as a temporary measure, for example in response to the failure or unexpected unavailability of the existing track circuits, such approval shall not be required. However, approval shall be required if it is subsequently decided to make the temporary installation permanent, or if the period of deployment lasts for more than twelve months, or if such usage does not represent a safer way of working than the reasonably practicable alternative temporary measures.
If the period of deployment lasts for more than six months the infrastructure controller shall seek approval under the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations (1994).

D5   Review of axle counter installations following commissioning

Within the six months following the commissioning of an axle counter installation, the infrastructure controller shall review the as-installed scheme to assess whether the mitigation measures described in the Application Safety Case are in place and effective. Records shall be kept by the infrastructure controller of this review, and copied to the consultees (including those organisations who would have been consultees had they been in place at the time).

Where it is found that the mitigation measures are not in place, or are no longer effective, the infrastructure controller shall ensure that a plan of action to rectify this situation is put in place. This plan of action shall be set against a timescale for completion, where the timescale is appropriate to the risk, and shall allow for a future review to take place to confirm that the action has been completed correctly. A record shall be kept by the infrastructure controller of each required action, the timescale for its completion, and in due course, the date of its actual completion. This record shall be distributed by the infrastructure controller with the records described in the paragraph above.
E1 Reset and restoration to service

E1.1 Principles

When axle counters fail, or become disturbed, it is physically possible to reset them without the section itself being clear of traffic. The infrastructure controller shall ensure that the process adopted for restoration to service proves that the section the axle counter relates to is clear.

The infrastructure controller shall demonstrate in the Application Safety Case that the risk of a train being given a proceed aspect into an occupied track section, as a result of an erroneous reset and restoration of an axle counter, is no higher than that risk which existed before the introduction of axle counters.

E1.2 Methods of mitigation

The process to be adopted for the reset and restoration to service of an axle counter section within a particular axle counter scheme shall be described by the infrastructure controller in the Application Safety Case for that installation. This process shall be based on, but not limited to, the following principles:

a) the provision of appropriate interlocking and software-based checking routines

b) the reset and restoration process consisting of two separate stages:
   i) reset action shall place the affected axle counter section in a state that is suitable for the track section to be restored back into operational service
   ii) restoration action shall bring the affected track section back into operational service

c) the design of equipment, including its positioning in the signal box; software and processes to minimise the instances of human error, including the provision of training simulators and data logging

d) the use of a proving system, such as conditional logic, that does not allow an axle counter section to be restored, without the involvement of a technician, while the axle counter system is showing that section as occupied

e) the examination of the line to ensure that it is clear. The line shall be examined, after restoration of the axle counter system, in accordance with the applicable requirements of GO/RT3000 and GO/RT3062/1

f) the logging of all restorations, and all attempts to restore

g) a task and workload assessment of staff required to operate the new axle counter sections.

The infrastructure controller shall incorporate axle counter arrangements into its competence management system for signallers. The infrastructure controller shall also ensure the competence of those technicians involved in reset and restoration procedures.

The process of restoring axle counters to service shall require the verification of the signaller’s actions by a second competent person or proving system, and a
record shall be made of the information and instructions exchanged between them.

The infrastructure controller shall produce detailed working instructions for the reset and restoration process of the axle counter system. These working instructions shall be subject to a consultation with the relevant train operators and shall be published in local operations instructions; a copy of these instructions shall be provided to the appropriate signal box. The infrastructure controller shall ensure that any signal box has only one process for axle counter reset and restoration. Requirements for issuing local operations instructions are set out in GE/RT8004.

In producing the Application Safety Case, the infrastructure controller shall give consideration to the safest form of reset and restoration to adopt. This consideration shall take account of, as a minimum, the exact equipment that it is intended to install, the number of axle counter sections, the nature of the route, and the traffic upon it. The infrastructure controller shall state in the Application Safety Case the reset and restoration process to be adopted.

Where a number of measures from sections E1 to E5 inclusive are combined to achieve a required level of risk mitigation, the effect of this combination shall be taken into account in assessing and reporting upon the new risk level.

**E2 Emergency protection**

**E2.1 Principles**

In an emergency, track circuits allow the use of track circuit operating clips as a means by which the train crew or others can warn the signaller of a problem, and set the protecting signals to danger. Track circuit operating clips do not function with axle counters, and so when replacing track circuits with axle counters, alternative measures shall be put in place by the infrastructure controller (see GO/RT3000).

The infrastructure controller shall ensure that the alternative measures for arranging emergency protection result in the overall risk of a secondary collision, or of a train running into an obstruction, being equal to or lower than it would be if track circuits and track circuit operating clips were in use. The infrastructure controller shall give consideration to the provision of an immediate, reliable and continuously available means of communication between the train crew and the signaller.

On lines where train detection was not previously provided by track circuits, the mitigation measures set out in section E2.2 do not apply. In this case, the infrastructure controller shall demonstrate that the arrangements for emergency protection provide at least an equivalent level of safety to that provided by the previous arrangements for emergency protection on the line concerned.

**E2.2 Methods of mitigation**

The infrastructure controller shall ensure that the mitigation measures shown in the Application Safety Case, as being required for a particular installation, are in place and shown to be effective before the associated track circuit system is taken out of service. Suitable measures include, but are not limited to, the following:

a) the provision of an appropriate train crew/signaller communication system, either as a new system or by enhancing the existing driver/signaller communication systems

b) the emergency communication system being accessible and useable from more than one location within the train
c) the completion of appropriate training for those staff identified in section C2, such that they are competent in the applicable emergency protection procedures.

In producing the Application Safety Case, the infrastructure controller shall state the communications arrangements to be adopted for use in emergencies, and shall include within the Application Safety Case an estimate of the time that would elapse from the point where the train crew realise the need to make contact, to the point when the protecting signals are set to danger.

The infrastructure controller shall state in the Application Safety Case how communication equipment is to be made available to train crew in the event of an incident that affects the integrity of the driver’s cab.

Within the Application Safety Case, consideration shall be documented by the infrastructure controller as to whether human factors issues require the emergency communication procedures to be applied consistently throughout the routes associated with the axle counter installation, rather than just over the area of the installation itself.

The infrastructure controller shall ensure that any persons on or about the line that are required to be in the possession of track circuit operating clips in track circuit block areas, in the pursuance of their duties, have access to, and are competent in the use of, a direct means of communication with the appropriate signaller.

Where a number of measures from sections E1 to E5 inclusive are combined to achieve a required level of risk mitigation, the effect of this combination shall be taken into account in assessing and reporting upon the new risk level.

E3 Broken rail detection

E3.1 Principles
Track circuits have an inherent ability, incidental to their main function, to detect some broken rails. Axle counters do not have this ability, and so when replacing track circuits with axle counters, alternative measures shall be put in place by the infrastructure controller.

The infrastructure controller shall ensure that these alternative measures ensure that the overall risk of derailment of a train on an axle counter fitted line at the time of axle counter fitment or at any time in the future, due to a broken rail, is no higher than the risk that existed before the introduction of axle counters.

On lines where train detection was not previously provided by track circuits the mitigation measures set out in section E3.2 do not apply. In this case, the infrastructure controller shall demonstrate that the arrangements for broken rail detection provide at least an equivalent level of safety to that provided by the previous arrangements for broken rail detection on the line concerned.

E3.2 Methods of mitigation
With the exception of item a) of this section, the infrastructure controller shall ensure that those mitigation measures shown in the Application Safety Case as being required for a particular installation, are in place and shown to be effective before the associated track circuit system is taken out of service. Suitable measures include, but are not limited to, the following:

a) the appropriate and timely removal of fish-plated joints, including redundant insulated joints

b) revisions to the rail integrity management regime that compensate for the removal of track circuits.
The infrastructure controller shall include in the Application Safety Case, details of the process and timescale to be adopted for the works described in item a) of this section.

In producing the Application Safety Case, the infrastructure controller shall gather data on current broken rail performance and management, and shall include an analysis of the number, and speed, of trains likely to pass over a particular broken rail before it is detected and some form of protection put in place, within the Application Safety Case. Appropriate mitigation measures against undetected broken rails shall be proposed by the infrastructure controller in the Application Safety Case.

Where a number of measures from sections E1 to E5 inclusive are combined to achieve a required level of risk mitigation, the effect of this combination shall be taken into account in assessing and reporting upon the new risk level.

E4 Detection of obstructions

E4.1 Principles
Track circuits have an inherent, albeit limited, ability, incidental to their main function, to detect certain types of obstruction, for example landslips. Axle counters do not have this ability, and so when replacing track circuits with axle counters, alternative measures shall be put in place by the infrastructure controller.

These alternative measures shall ensure that the overall risk of a train colliding with an obstruction on the line is equal to, or lower than, the risk of such a collision if that same line was fitted with track circuits.

On lines where train detection was not previously provided by track circuits, the mitigation measures set out in section E4.2 do not apply. In this case, the infrastructure controller shall demonstrate that the arrangements for the detection of obstructions provide at least an equivalent level of safety to that provided by the previous arrangements for the detection of obstructions on the line concerned.

E4.2 Methods of mitigation
The mitigation measures shown in the Application Safety Case to be required for a particular installation shall be in place and shown to be effective before the associated track circuit system is taken out of service. Suitable measures include, but are not limited to, the provision of dedicated detection systems at locations known to be at risk from obstructions.

In producing the Application Safety Case, the infrastructure controller shall gather data on the current risk of obstruction to the route over which the axle counters are to be installed. This data shall include, but not be limited to, the following factors:

a) the likelihood of route crime (especially vandalism), including the probability of people intent on such acts accessing the infrastructure
b) the stability of natural ground, embankments, cuttings and tunnels, and the likelihood of landslips
c) the proximity to public roads and airports
d) the likelihood of flooding.

Appropriate mitigation measures shall be proposed by the infrastructure controller in the Application Safety Case.
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Where a number of measures from sections E1 to E5 inclusive are combined to achieve a required level of risk mitigation, the effect of this combination shall be taken into account in assessing and reporting upon the new risk level.

E5 Engineering activities

E5.1 Principles
Engineering activities have the potential to affect the axle counters system. When introducing axle counters, measures shall be put in place by the infrastructure controller to ensure that the risk from damaged, missing or misaligned axle counter heads is mitigated.

The infrastructure controller shall ensure that for all engineering activities, careful planning is undertaken in connection with:

a) the removal of axle counter heads:
   i) to protect the axle counter equipment
   ii) to permit maintenance activities to be executed properly (for example, tamping)

b) the disturbance of axle counter heads by engineering plant and machines

c) the risk of leaving plant on the track.

In planning and executing engineering works the infrastructure controller shall take account of the risk associated with disturbing the axle counters, as well as those associated with the infrastructure conditions necessitating the proposed engineering works.

E5.2 Methods of mitigation
The infrastructure controller shall state in the Application Safety Case how the risk arising from the following is to be mitigated:

a) axle counter heads fouling engineering equipment and plant

b) the need to remove, replace and reset axle counter heads to allow certain tasks to be undertaken (for example, tamping, or rail grinding).

Maintenance instructions shall be amended, by the infrastructure controller, to reflect changes required as a result of the introduction of axle counters, and to emphasise at which locations these changes apply. These amendments shall include addressing the potential for a wrong-side failure when engineering plant is used on, or removed from, the track without passing across an axle counter head.

Where a number of measures from sections E1 to E5 inclusive are combined to achieve a required level of risk mitigation, the effect of this combination shall be taken into account in assessing and reporting upon the new risk level.
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References

Railway Group Standards and other Railway Group Documents
- GA/RT6001 Railway Group Standards Change Procedures
- GA/RT6004 Temporary Non-Compliance with Railway Group Standards
- GA/RT6006 Derogations from Railway Group Standards
- GC/RT5101 Technical Approval Requirements for Changes to the Infrastructure
- GE/RT8004 Local Operations Instructions
- GE/RT8015 Electromagnetic Compatibility between Railway Infrastructure and Trains
- GO/RT3000 Master Rule Book – (Section B part iii and Section M part i)
- GO/RT3062/1 Track Circuit Block Regulations

Other References
- ENV 50129 Railway Applications – Safety Related Electronic Systems for Signalling
- Engineering Safety Management, Issue 3 ‘The Yellow Book’