Guidance on Low Adhesion between the Wheel and the Rail –
Managing the Risk

Issue record

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Superseded documents

The following Rail Industry Guidance Note is superseded, either in whole or in part as indicated:

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GE/GN8540 issue one Guidance on Low Adhesion between the Wheel and the Rail – Managing the Risk, ceases to be in force and is withdrawn as of 05 September 2015.

Supply

The authoritative version of this document is available at [www.rgsonline.co.uk](http://www.rgsonline.co.uk). Enquiries on this document can be forwarded to enquirydesk@rssb.co.uk.
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Part 1  Introduction

G 1.1 Purpose of this document
G 1.1.1 This document gives guidance on interpreting the requirements of Railway Group Standard GE/RT8040 issue two Low Adhesion between the Wheel and the Rail – Managing the Risk. It does not constitute a recommended method of meeting any set of mandatory requirements.

G 1.2 The structure of this document
G 1.2.1 All requirements from Railway Group Standard GE/RT8040 are reproduced with a grey background in this document.

G 1.2.2 Guidance is provided as a series of sequentially numbered clauses prefixed ‘G’ immediately below the greyed text to which it relates.

G 1.2.3 Specific responsibilities and compliance requirements are laid down in the Railway Group Standard itself.

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G 1.4 Approval and authorisation of this document
G 1.4.1 The content of this document was approved by Traffic Operation and Management Standards Committee on 03 March 2015.

G 1.4.2 This document was authorised by RSSB on 01 May 2015.
Part 2  Guidance on Low Adhesion between the Wheel and the Rail – Managing the Risk

G 2.1 Joint requirements for infrastructure managers and railway undertakings

2.1 Joint requirements for infrastructure managers and railway undertakings

2.1.1 General requirements

2.1.1.1 Infrastructure managers and railway undertakings shall jointly implement measures to reduce the risks generated by low adhesion between the wheel and the rail that cannot be eliminated by local treatment at specific sites.

G 2.1.1 Railway Group Standard GE/RT8040 requires duty holders to work together in a process of co-operation to create site specific action plans to eliminate, or reduce the risks from low adhesion.

G 2.1.2 Infrastructure managers and railway undertakings should develop and maintain a close liaison so that information is shared on sites known or anticipated to be affected by low rail adhesion. Information can include, but not be limited to:

a) Historical records, including incidents and accidents.

b) Feedback from train crews.

c) Feedback from infrastructure maintenance staff.

d) Knowledge of local conditions.

e) Commissioned research.

f) Information from analysis of data recorders or other technical means.

g) Sandite sites from previous years.

G 2.1.3 The provision and sharing of information regarding predicted and encountered low adhesion enables planning of resources and the implementation of measures to mitigate the risks.

G 2.1.4 Infrastructure managers are provided with weather and leaf fall forecasts by external suppliers who use a number of criteria, including leaf fall rate and wind speed forecasts to predict the risk of low adhesion. Reports of weather conditions may also be received from other local sources as they occur.

G 2.1.5 Prior warning of low adhesion conditions enables the pro-active deployment of staff and the planning of railhead treatment activities, service levels, timetable changes and the provision of advice to drivers.

G 2.1.6 The infrastructure manager should carry out a risk assessment of the network. Network Rail are currently using a risk assessment model detailed within their Standards Operations Procedure NR/L2/OCS/095, which is designed to factor route information and historical data into a spreadsheet and, by a process of scoring, identify high risk sites requiring site specific action plans.

G 2.1.7 Assessment teams organised by the infrastructure manager will meet to decide on the most appropriate measures to put in place to control the risks identified at each site.

G 2.1.8 Where measures are already in place, the assessment team should consider whether such measures remain effective.
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G 2.1.9 Assessment teams should be selected to ensure relevant experience and expertise is provided, including:

a) Risk assessment experience.
b) Experience of autumn mitigation programmes.
c) Train driving or driver management experience.

G 2.1.10 Effective adhesion management relies on an ongoing liaison between all parties so that the following can be discussed:

a) Current low adhesion incident data.
b) Strategies and initiatives.
c) The effectiveness of measures in place.
d) Change to, or introduction of, new equipment.
e) Any initiatives to mitigate low adhesion.
f) Feedback from drivers about the effectiveness of measures already in place.

G 2.1.11 The Adhesion Working Group is an example of joint industry liaison. The group develops new concepts and shares information through conferences, events, videos and newsletters on subjects including:

a) Causes of wrong side track circuit failures related to leaf fall contamination.
b) Human factor issues.
c) Trials of an adhesion management system.
d) Reviews of local, national and international practice on addressing low adhesion.

G 2.1.12 Initiatives to manage low adhesion are being continually developed, and infrastructure managers and railway undertakings should maintain an ongoing dialogue to ensure all parties fully understand how such initiatives may affect existing site specific action plans.

2.1.2 Establishing site specific action plans

2.1.2.1 Infrastructure managers and railway undertakings shall jointly develop site specific action plans.

G 2.1.13 The assessment team should use their experience, site knowledge and historical data to decide on the most appropriate measures to apply at each site.

G 2.1.14 The measures chosen by the assessment team should best suit each site and should not be applied uniformly across the network. Because risks may well be unique to a site, a ‘one size fits all’ approach is not recommended. The measures selected should be those that will have the greatest impact on the identified risks.

G 2.1.15 Rolling stock fitted with trainborne systems to improve braking during low adhesion, provides additional risk mitigation for the routes it operates over. The provision or absence of such systems may need to be considered as part of site specific action plans.

G 2.1.16 Site specific action plans will be retained by the infrastructure manager.

2.1.2.2 Infrastructure managers and railway undertakings shall, within site specific action plans, set out measures to eliminate the risks identified during the assessment, or mitigate them if elimination is not reasonably practicable.
By identifying high risk sites, resources can be targeted more effectively and enable the most appropriate measures to be applied at each site.

Consideration should be given to the possible impact on service performance when deciding on the most suitable measures to be applied at each site.

New or changed risks may arise from the introduction of new rolling stock or changes to existing stock in use over a route. This may be the result of:

a) Different braking systems.

b) Different trainborne equipment to improve braking performance.

c) Using stock that is not fitted with trainborne equipment to improve braking performance.

d) Change to train formation.

Infrastructure managers and railway undertakings shall include, within site specific action plans, details of the following (as a minimum):

a) Any potential risks from low adhesion at each site.

b) The measures required to control identified risks from low adhesion.

c) The features at each site that may affect adhesion between the wheel and the rail.

d) The staff responsible for implementing the actions to be taken when conditions of low adhesion arise.

e) Any trainborne equipment fitted to reduce the risk of low adhesion.

The assessment team should take into consideration the features at each site and any potential hazards, for example:

a) Gradients.

b) Signals.

c) Level crossings.

d) Terminal platforms or buffer stops.

e) Rail flange lubricators.

f) Vegetation.

g) Contamination of the rails by grease, fuel and oil.

h) Industrial pollution.

i) Road traffic pollution.

j) Damp, dew, ice, frost or other climatic conditions.

Example of possible measures include:

a) Vegetation clearance.

b) Water jetting (including frequency).

c) Sandite application (including frequency).
d) Traction gel application.

e) Hand sanding.

f) SPAD prediction equipment fitted at level crossings.

g) Driver briefing.

h) Take signalled route out of use.

i) Special box instructions restricting certain moves.

j) Selected trains to perform running brake tests.

k) Train strengthening.

l) Use of tread braked stock instead of disc braked stock.

m) Fitting scrubbing devices to the wheels of rolling stock to eliminate or reduce contamination of the wheels.

n) Fitting devices to the wheels of rolling stock to enhance the performance of the braking system.

o) Fitting sanders to trains.

p) Turning off flange lubricators.

q) Monitoring and inspection of low adhesion sites.

G 2.1.22 Railway undertakings should review driver training and driving policies to ensure they remain effective in light of low adhesion incident trends or any initiatives that may impact on driving technique.

G 2.1.23 Railway undertakings should review and amend their driving policies and competence management systems to provide drivers with the skills and knowledge for driving in poor railhead conditions on lines operating under the European Railway Traffic Management System (ERTMS). Particular consideration should be given to the reliance drivers place on the indications and prompts normally displayed on the ERTMS Driver Machine Interface (DMI), as the braking curve is unlikely to take into consideration reduced rail adhesion levels. Therefore, drivers will be required to anticipate low rail adhesion levels and control their train in accordance with the railway undertaking’s driving policy.

G 2.1.24 Plans should identify those responsible for implementing the actions to be taken when low or exceptionally poor rail adhesion conditions have been reported, to ensure a prompt and effective response.

G 2.1.25 In developing the plans, consideration should be given to any trainborne equipment fitted to improve braking performance under conditions of low adhesion, including:

a) Optimised wheel slide protection (WSP) equipment.

b) Scrubber brakes.

c) Track brakes.

d) Sanding equipment including:

   i) Emergency sanding device.

   ii) Automatic sanding device.

   iii) Dual function sanders (braking and traction).

   iv) Variable rate sanders.
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G 2.1.26 Plans should also consider the benefits, where provided, of systems to detect wheel slide and alert the driver or systems that provide remote monitoring to alert drivers of low adhesion.

G 2.1.27 Consideration may be given to the provision of post-incident wheel-set inspections or the inspection of wheel-sets on vehicles before entering service to ensure no contamination is present.

G 2.1.28 Infrastructure managers and railway undertakings should review the training and briefing provided to staff following the low adhesion period to ensure they remain current and effective.

G 2.1.29 Where rolling stock is not fitted with systems to improve braking performance during low adhesion conditions, consideration may need to be given to providing additional control measures, or increasing the frequency of existing measures at the low adhesion sites where such rolling stock operates.

2.1.3.2 Infrastructure managers and railway undertakings shall determine whether the measures included in site specific action plans will introduce a risk of train detection system failures.

G 2.1.30 Where substances or compounds are applied to the railhead to improve rail adhesion, account should be taken of the possible effects on wheel-sets, damage to the railhead, the risk of failure to activate track circuits and the implications for ultrasonic or non-destructive testing.

G 2.1.31 Trainborne sanders, where fitted, provide additional mitigation against the effects of low adhesion by increasing adhesion levels between the wheel and the rail. Sanding equipment varies between different traction types and consideration may need to be given to the likelihood that sand, when used, may place a non-conductive layer between the wheel and the rail. The performance of track circuits may, as a result, be degraded, increasing the risk of failure to detect the train or part of the train applying the sand and any subsequent trains.

2.1.4 Review of site specific action plans

2.1.4.1 Infrastructure managers and railway undertakings shall monitor performance of site specific action plans.

G 2.1.32 Current train performance data and feedback from drivers provide valuable information on the effectiveness of the measures introduced to mitigate low adhesion and should form the basis for an ongoing dialogue between infrastructure managers and railway undertakings.

G 2.1.33 Plans should be reviewed following reports of low or exceptionally poor rail adhesion conditions, or where such conditions become evident.

G 2.1.34 Plans may need to be reviewed where additional risks (such as industrial pollutants) have been identified or where changes have been made to the infrastructure or types of rolling stock over a particular route.

2.1.4.2 Infrastructure managers and railway undertakings shall jointly determine the frequency that each site specific action plan needs to be reviewed.

G 2.1.35 Site specific action plans should be reviewed to ensure they continue to provide the most effective mitigation at each site.

G 2.1.36 Risk assessments should be reviewed each year, taking into account:

a) Data available from the most recent autumn season.

b) The impact of any measures carried out.

c) Feedback from drivers.
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G 2.1.37 Where current performance monitoring suggests that the measures put in place are not adequately addressing identified risks, further reviews may be necessary and a change made to the current measures.

G 2.1.38 Infrastructure managers should review the risk assessment model at the end of each autumn season. The review will consider whether there are any additional factors that may need addressing and whether the method of weighting the factors needs to be adjusted.

G 2.1.39 Railway undertakings should obtain the views of drivers regarding the effectiveness of the measures applied at sites of low adhesion and keep a record of comments so that these can be fed back to the infrastructure manager as part of action plan reviews.

G 2.1.40 Although driver comments are included as part of the review of site specific action plans, this should not discourage an ongoing dialogue between railway undertakings and infrastructure managers regarding low adhesion conditions on the network.

G 2.2 Requirements for infrastructure managers

2.2 Requirements for infrastructure managers

2.2.1 General requirements

2.2.1.1 The infrastructure manager shall control the risk of low adhesion between the wheels and the rail to a level that is as low as reasonably practicable.

G 2.2.1 Low adhesion should be managed by a combination of processes. The main control measures are vegetation management and railhead treatment, including water jetting and Sandite application.

2.2.1.2 The infrastructure manager shall identify sites where low adhesion may occur.

G 2.2.2 Infrastructure managers should assess the risks from low adhesion at identified sites across the network using a consistent process which takes into account factors such as gradients, the presence of level crossings and frequency of trains.

G 2.2.3 Various assessment methods are used, including site visits, railhead inspection and tests for contamination (handheld equipment is now available to measure the thickness of railhead contamination).

G 2.2.4 Consideration should also be given to historical data concerning adhesion related incidents that have occurred during the previous three years, together with any existing mitigating measures already in place.

G 2.2.5 All the information gathered during the risk assessment is used to populate a risk assessment spreadsheet. This will generate a score for each site and indicate a priority level. Sites where the assessment score is above a predetermined threshold will require a site specific action plan.

2.2.1.3 The infrastructure manager shall publish in the Sectional Appendix details of high risk sites.

G 2.2.6 All sites that have generated a score above a predetermined threshold and requiring a site specific action plan should also be listed in the Sectional Appendix as sites of known low adhesion.

G 2.2.7 High risk sites can also be identified by use of lineside signs.
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| **G 2.2.8** | Although risk assessments will establish high risk sites, it should be recognised that reports from drivers, or historical data, may identify sites not shown in the Sectional Appendix as being a potential high risk site. |
| **G 2.2.9** | When low or exceptionally poor rail adhesion is reported or becomes evident, the infrastructure manager should arrange for a site assessment to be undertaken so that a decision can be taken promptly about whether the measures agreed in the site specific action plan are appropriate for the current circumstances at that site. |
| **G 2.2.10** | Infrastructure managers should use the quickest means to advise railway undertakings of low or exceptionally poor rail adhesion conditions so that advice can be given to drivers at the earliest opportunity. |
| **G 2.2.11** | Infrastructure managers receive predictive warnings from external suppliers which rank the risk of low railhead adhesion over a five day period and include daily updates. This advice is used to direct resources and for providing advice to drivers of potential low adhesion conditions. Risks levels are graded using colour coding. |
| **G 2.2.12** | When low or exceptionally poor rail adhesion conditions are reported at a published site or is reported at an unpublished site, signallers are required to advise drivers in accordance with the Rule Book Module TW1. Care should be taken when deciding the best method of providing this advice, taking into consideration the possible risk of stopping trains at locations not normally stopped at (possible low adhesion sites) and the impact on service performance. |
| **G 2.2.13** | Railway undertakings may consider post-incident checks of rolling stock, including examination of wheel-sets for contamination and analysis of train braking performance. |
| **G 2.2.14** | No guidance is provided for this requirement. |
| **G 2.2.15** | A review of the measures agreed in the site specific action plan may be undertaken without a site assessment, provided the infrastructure manager is certain that the conditions at the site have not materially changed from previous site assessments. |
| **G 2.2.16** | If the site assessment or review confirms that the measures agreed in the site specific action plan are appropriate for the current circumstances, the infrastructure manager should arrange for the measures to be implemented as soon as possible. |
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G 2.2.17 If the assessment or review indicates that the measures agreed in the site specific action plan are not appropriate for the current circumstances, the infrastructure manager should arrange for the plan to be updated and the remedial action detailed in the revised plan to be implemented as soon as possible.

G 2.2.18 When low or exceptionally poor rail adhesion has been reported at a location not having a site specific action plan the infrastructure manager should arrange for a site assessment to be carried out by those able to quickly determine the measures required to deal with the circumstances at the location.

G 2.3 Requirements for railway undertakings

2.3 Requirements for railway undertakings

2.3.1 Railway undertakings responsibilities

2.3.1.1 Railway undertakings shall advise the infrastructure manager immediately when the process of urgent advice to drivers of low adhesion is introduced.

G 2.3.1 Railway undertakings should decide on the most appropriate method of advising drivers of conditions of low adhesion. When such advice is being given, railway undertakings should advise the infrastructure manager so that it may advise signallers there is no longer a need to stop trains and advise drivers.

2.3.1.2 Railway undertakings shall obtain the views of drivers on the effectiveness of action taken at sites of low adhesion and pass these to the infrastructure manager for inclusion in the review of any site specific action plans.

G 2.3.2 No guidance is provided for this requirement.
Definitions

Exceptionally poor railhead conditions
Conditions likely to cause more than the anticipated difficulties in stopping at a location listed in the Sectional Appendix.

High risk site
A site identified by use of a risk assessment model which is designed to factor route information and historical data into a spreadsheet and, by a process of scoring, identify high risk locations requiring site specific action plans.

Low adhesion
The level of adhesion between the wheel and the rail that has the potential to extend the braking distance beyond that required under normal conditions.

Site specific action plan
A plan developed jointly by infrastructure managers and railway undertakings to mitigate the risks arising from low adhesion conditions. The plan is retained by the infrastructure manager.

Urgent advice
The process used by railway undertakings to advise drivers under their control of urgent operational requirements that have recently been published.
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References

The Catalogue of Railway Group Standards gives the current issue number and status of documents published by RSSB. This information is also available from www.rgsonline.co.uk.

RGSC 01 Railway Group Standards Code
RGSC 02 Standards Manual

Documents referenced in the text

Railway Group Standards
GE/RT8040 Low Adhesion between the Wheel and the Rail – Managing the Risk
NR/L2/OCS/095 Standards Operations Procedure

Other relevant documents

Railway Group Standards
GE/RT8000 Rule Book
GM/RT2461 Sanding Equipment Fitted to Multiple Units and On-Track Machines

Other references
‘Gripping Stuff’ – The Adhesion’s Working Group newsletter