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Level 3

Lubrication of Plain Line Running Rails, Check Rails and S&C

Endorsement and Authorisation

For endorsement and authorisation, please refer to
NR/L3/TRK/3510

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Issue record

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Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 4 June 2011 (clause 13 from April 2012).

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of the standard.

Reference documentation

NR/L2/TRK/2102, *Design and construction of track.*

NR/L2/TK/001/B01, *Inspection and maintenance of permanent way – Rail management.*

NR/L2/TK/001/E01, *Inspection and maintenance of permanent way – Installation requirements, maintenance limits and intervention limits.*

NR/L3/TRK/002/F22, *Track – Rail mounted lubricators (Maintain and install)*

NR/L3/TRK/TEF3040, *Rail friction management equipment – inspection and maintenance record*

NR/L3/TRK/TEF3219, *Rail friction management equipment – site specific assessment*

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1 Purpose

This standard gives the minimum requirements for the installation, inspection, filling and maintenance of rail-mounted gauge face lubrication systems designed and approved for Network Rail's permanent way.

NR/L3/TRK/3510/A01 supersedes and replaces Level 2 standard NR/L2/TRK/8006 (Issue 2) which is withdrawn.

2 Scope

Unless otherwise stated, the requirements of this standard shall apply to all rail-mounted gauge face and check rail lubricator systems fitted or proposed to be fitted to running and check rails, plain line and S&C.

This standard applies to permanent way that is undergoing renewal as well as to permanent way which is in normal maintenance.

3 Roles and responsibilities

The requirements of this standard shall be complied with by anyone involved in the specification, purchase, installation, commissioning, inspection, filling and maintenance of rail-mounted rail head friction management systems.

4 Definitions

For the purposes of this standard, the following terms and definitions apply.

Term	Definition
actuator	Rail mounted component within a hydraulic lubricator system that makes contact with passing train wheels (via the plunger) and transmits the force from contact to the hydraulic hose in order to activate the grease pump.
cartridge lubricator	A lubrication system consisting of a small battery-powered grease reservoir that pumps grease continuously at a controlled rate, usually through a single GDU.
check rail lubrication	Applying approved greases to the wearing face of check rails to reduce wheel-rail friction to 0.1-0.2 thereby to reducing wear caused by contact between the back of wheels and the check rail front face.
competent person	Individual with the ability to perform a particular activity to a prescribed standard, in this case the installation, inspection, filling and maintenance of track-mounted lubricators. The ability to undertake responsibilities and to perform activities to a recognised standard on a regular basis. A combination of practical thinking skills, experience and knowledge and may include a willingness to undertake work activities in accordance with agreed standards, rules and procedures, in addition to having undertaken an approved training course covering the equipment to be installed / maintained.

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Term	Definition
electric lubricator	Gauge face lubrication system using an electrically-powered pump and non-contact wheel sensor to activate the pump.
excessive wear (plain line and S&C)	Rail side wear limits rail life to less than 200EMGT or 5 years, whichever is the lower.
gauge face lubrication	Applying approved greases to the gauge face of the rail head to reduce wheel-rail friction to 0.1-0.2 thereby reducing wear caused by contact between wheel flanges and the rail head. Also known as flange lubrication.
gauge face / check rail lubricator system or equipment	Assembly delivering grease to the gauge face of high rails in curves or to check rails, consisting of grease reservoir, grease pump, rail-mounted actuator or wheel sensor, rail mounted GDUs and all interconnecting hoses and couplings.
GDU	Grease distribution unit, the rail mounted component that deliver grease onto the gauge face of the rail.
grease pump	Mechanical lubricator – rail-mounted components including a plunger, which mechanically activates the delivery of grease from the reservoir to the GDUs. Hydraulic lubricator – component part of the trackside grease reservoir, linking the actuator to the GDUs. Electric lubricator – electrically powered gear pump located inside the trackside lubricator cabinet.
high rail	The outer rail in a curve, generally raised up relative to the inner rail due to the applied cant.
hydraulic lubricator	Gauge face or check rail lubrication system using contact between wheel treads and a plunger to pump grease via a hydraulic hose between plunger and pump body.
low rail	The inner rail in a curve, generally lower than the outer rail due to the applied cant.
mechanical lubricator	Gauge face or check rail lubrication system using contact between wheel treads and a plunger to pump grease.
plunger	Component part of a mechanical lubricator pump body or hydraulic lubricator actuator that is struck by passing wheels in order to activate the lubrication system grease pump.

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5 Identifying sites for gauge face lubrication

5.1 Site selection

New gauge face lubricators shall be fitted at locations according to the criteria listed below. Existing gauge face lubricators shall be reinstated or replaced when track is renewed or re-railed.

5.1.1 Plain line

Lubricators shall be fitted at all possible locations where high lateral forces between wheel and rail are known or observed to exist (using the rail wear pattern as a guide). Such sites would meet the criteria below:

- All curves exhibiting or having had a history of excessive gauge face wear.
- All curves with a radius of less than 1000 metres or cant deficiency greater than 50mm.
- All curves with continuous check rails installed due to curvature. In such instances the check rail is to be lubricated to reduce noise and wear (lubrication of the gauge face of the high rail should not be necessary if the check rail is correctly positioned and lubricated).
- All curves where noise generated by wheel flange contact is severe (e.g. generates complaints from Network Rail's neighbours) and requires correction.
- All curves identified as "at risk" (by the Route Asset Manager [Track] or their delegated representative) due to the introduction of new rolling stock or a significant increase in traffic tonnage.

Consideration shall be given (and decisions documented) to providing lubrication on curves with:

- A radius between 1000m and 1500m.
- A history of rolling contact fatigue (RCF), in order to help preserve a satisfactory transverse rail profile.
- Other locations where non-uniform gauge face wear patterns are reported.

5.1.2 Switches & crossings

Lubricators shall be fitted to the high rails (stock and switch) in all S&C exhibiting or having a history of excessive gauge face wear.

Consideration shall be given (and decisions documented) to providing lubrication on S&C where non-uniform gauge face wear patterns are reported.

5.2 Site justification

Prior to installation of new or enhanced gauge face lubricators, a site inspection will be carried out by the Route Asset Manager [Track] or delegated representative to identify the extent and triggers of rail wear or RCF.

When the triggers for rail wear or RCF are discrete track features (e.g. poorly aligned joints), the root causes should be addressed through corrective maintenance.

Where rail wear is triggered by vehicle curving characteristics inherent in the vehicle-track system, a full site inspection and engineering justification shall be completed

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and recorded by the Route Asset Manager [Track] or delegated representative using form NR/L3/TRK/003/TEF3219.

Note 1. Network Rail's Track-Ex software can also be used to model curves with and without gauge face lubrication as part of the cost benefit analysis.

During the site inspection the optimum grease pickup area should be noted. This point is usually where wheel flange – rail contact first begins. This can be seen by a contact 'scar' on or just below the gauge corner. Contact patch investigation using contrast paint can help identify the location of first flange contact on the approach or entry to a curve.

New lubrication sites and enhancement of existing lubricators must be approved by the Route Asset Manager [Track] or delegated representative prior to the installation of new equipment, using form NR/L3/TRK/003/TEF3219.

6 Selection of equipment

Selection and specification of gauge face lubricator equipment shall be carried out during the pre-installation site inspection described in section 5.2.

6.1 Plain line

Individual rail wear sites up to 800m long with line speeds up to 100mph can be treated using mechanical or hydraulic lubricators. Single curves require two GDUs fitted to the high rail. Short reverse curves or sequences of curves require two GDUs per rail (i.e. four in total per lubricator).

Longer sequences of curves between 800m and 6400m long or single curves with line speed > 100mph should be fitted with electric lubricators, using two or four GDUs fitted to each rail requiring lubrication, i.e. both rails are lubricated for a series of reverse curves. Electric lubricators can also provide a solution to sites where, due to track access restrictions or clearance limitations, it is necessary to locate the lubricator reservoir further away from the GDUs.

There are four options for powering electric lubricators: solar, wind, solar and wind or mains operated. The risk of vandalism should be considered when selecting the method of powering electric lubricators. The location of the main unit should be carefully selected so as to best suit the method of power delivery.

Where available, quick release or hinged GDUs, pumps, actuators and wheel sensors shall be specified for new lubricator installations or lubricator enhancement schemes. Quick release components enable lubricator equipment to be removed and refitted more quickly on track around engineering work such as re-railing, rail grinding, stoneblowing and tamping, as well as enabling easy exchange of lubricator equipment and maintenance of damaged components off track.

6.2 Switch and crossings

For a single S&C unit, mechanical / hydraulic lubricators shall be used to lubricate the switch rails, with a single GDU per switch/stock 'high' rail half set.

In order to lubricate multiple S&C units in more complex track layouts, electric lubricators with up to four GDUs per rail to be treated should be considered for