

Track handbook 8

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Emergency track repairs

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1 Purpose

The purpose of this handbook is to give practical guidance regarding the action that may be taken to achieve emergency track repairs. It should be noted that some repairs may be temporary and that speed restrictions may be imposed until the track is restored to a safe condition to permit normal train services to resume.

2 Scope

This handbook covers situations where the track is the sole asset category involved, such as broken rails or blockjoint failures, and those which affect more than one category of asset, for example derailments or damage to trackside structures.

The following types of situation are addressed in this handbook:

- ◆ derailment
- ◆ train collision
- ◆ track component failure
- ◆ track geometry defect
- ◆ structural failure or collapse
- ◆ obstruction on the track
- ◆ flooding on the track
- ◆ aftermath of fire on the track
- ◆ chemical leak or spillage on the track
- ◆ hot weather buckle
- ◆ extreme winter weather.

These situations fall within the category of medium incidents as defined in the incident reporting and investigation standard, S1556. The factor that characterises them as emergencies is the actual or potential risk of loss of life or serious injury they present to customers or staff, combined with the risk of loss to the track asset and train service.

The scope of this handbook does not include:

- ◆ emergencies such as fatality or injury on the track, which do not normally involve track repairs
- ◆ emergencies related to signalling systems or train-borne equipment
- ◆ asset conditions that are expected to be put right by line personnel as part of their maintenance responsibilities and which do not normally involve the Emergency Response Unit
- ◆ organisational responsibilities in emergency situations
- ◆ procedures for notifying and reporting emergencies as defined in S1556
- ◆ administrative arrangements or responsibilities for mobilising and managing emergency maintenance teams, which Business Units will wish to co-ordinate in ways that conform with the LU Railway Safety Case and match their individual operational needs.

3 Introduction

This handbook is one of a series intended to help those responsible for managing the track asset achieve standards and meet LU corporate objectives.

Most of the emergencies which line staff are likely to meet in their day-to-day work involve track component failure. Emergencies related to particular forms of component failure are treated in detail in Section 4 of this handbook, which sets out check lists for action in specific types of track emergency. Section 5 offers guidance to help track staff investigate emergencies, analyse their causes and contributory factors, and develop measures to reduce the risk of similar incidents occurring. Section 6 outlines the process for handing back the track when repairs are completed.

This handbook should be used in conjunction with standard S1159 which identifies the parameters to be used for maintenance purposes in measuring the geometry of the track and assessing the condition of track components. The track parameters have been developed into three levels as described below:

Safety standard (SS) - for a given track parameter, the obligatory threshold value consistent with the safety of the track. Measurement of the parameter shall not give a reading at or beyond the safety standard;

Maintenance limit (ML) - for a given track parameter, the threshold value representing the level beyond which the parameter should not be allowed to deteriorate. Where measurement of a track parameter gives a reading at or beyond this value, corrective maintenance is to be undertaken according to standard S1159;

Maintenance target (MT) - in the case of parameters which are recorded statistically over sections of the track, the value that is to be achieved or bettered on not less than 90% of the length of the track. In the case of parameters such as chair gall or side wear, which are measured in the form of discrete occurrences, the value that is to be achieved or bettered in all locations where normal conditions apply. The margin of tolerance allows for locations untypical of the track as a whole, where track characteristics impose particularly complex maintenance requirements, for example in junctionwork, or where track components are scheduled for renewal.

At the end of each section there is a list of sources of further information. **In the event of any conflict between this handbook and LU standards, the latter shall prevail.**

4 Emergency repair checklists

For each emergency situation involving repairs to the track asset, the checklists in this section outline, as appropriate:

- ◆ the asset conditions which constitute an emergency
- ◆ the immediate action to be taken by track staff
- ◆ options for correcting the asset conditions
- ◆ tasks for the Track Manager's office to undertake in following up the emergency
- ◆ the track standards and handbooks that provide more detailed technical information.



Though the checklists summarise and, in some instances, tabulate the minimum actions required in track standards, they cannot - reproduce this information in its entirety and so are not a substitute for reading and understanding the specific track standards and handbooks relevant to each aspect of track maintenance.

At the end of each checklist there is a list of sources of further information. **In the event of any conflict between this handbook and LU standards, the latter shall prevail.**

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1 Derailment

Track conditions to look for

- ☐ track twist, caused by voids under the sleepers, track collapse or incorrect installation
- ☐ gauge spread, caused by loose, broken, worn or missing track fastenings, chairs and baseplates and sleepers with splits through screw holes
- ☐ track buckle, caused high temperatures and weak lateral support such as a lack of ballast or poor ballast consolidation
- ☐ points run through, due to damaged switch tip or badly fitting switch and stock rails or broken or distorted stretcher bar, or debris preventing switch from closing properly
- ☐ worn or damaged crossing nose and cover check rail, allowing the wheel to take the wrong path
- ☐ displaced conductor rail or ramp
- ☐ displaced or worn negative splay - excessive differential wear between main and lean-to rails or causing a ridge or damaged or missing filler piece
- ☐ broken rail, particularly head out, creating an unchecked track discontinuity
- ☐ broken fishplates - significant only when both fishplates are broken through and the joint is opening
- ☐ missing clips or keys
- ☐ badly side cut rails beyond limit
- ☐ object on track.

Immediate action

1. Get to site as soon as possible – preferably before the train is re-railed or moved.
2. Determine what caused the derailment.

Repair the track

- ☐ Examine the track for damage to components and evidence of defects that may have contributed to the derailment.
- ☐ Determine whether a temporary repair can be effected to allow traffic to run before the end of traffic hours:
 - if it can, agree the action with the Incident Officer (Silver Control), assess the materials, equipment and people required and arrange to repair immediately when access is available
 - if a temporary repair is not feasible, arrange, through the Track Manager, for the track to be fully repaired immediately when access is available.

1 Derailment - continued

Determine the cause of the derailment

- ☐ Take photographs of the derailment site with the derailed train in place.
- ☐ Once the train has been re-railed, try to ensure there is no interference with the section of track until measurements have been taken.
- ☐ Undertake a detailed site examination.
 - Look for marks of where the wheels first left the rails, particularly climb or drop-off marks or lines on running face of the rail head.
 - Look for components or debris left on the track and for any environmental contamination or damage resulting from the derailment.
 - Access top and line by eye and, if you suspect these features may have contributed to the derailment, arrange through the Track Manager for a survey of top and line to be undertaken over a distance of 140 sleepers on the approach to the derailment point and, if practicable, 20 sleepers after the derailment point, also measure crosslevel and gauge at each sleeper over this distance to determine for excessive twist and gauge spread.

Note: it may be necessary to run a test loco over the track to obtain dynamic load data.

- ☐ Take photographs of any relevant marks which might aid analysis of the incident.
- ☐ Check the condition, gauge and position of conductor rails and ramps, negative splays and slipper runs.
- ☐ Prepare a site plan showing all relevant track features and marking on the exact position of each derailed wheel and other relevant information and the position of any damaged components or equipment.
- ☐ Record the make-up of the train, note the type of rolling stock used and its order in the train.
- ☐ Record all vehicle identification numbers and note which units were derailed.

Follow up action

- ☐ Determine if the track is fit for traffic
 - if it is, determine what repair work is necessary and arrange for it to be done as soon as practicable
 - if not, would it be fit for traffic with:
 - the imposition of an emergency speed restriction?
 - with a temporary repair?
 - if these measures cannot enable trains to operate, traffic needs to remain suspended until a full repair to the track can be made, in which case:
 - determine what needs to be done to bring the track back to a level above the safety standard defined in the current version of track standard S1159
 - confirm that local maintenance staff and facilities can be mobilised and undertake the work immediately.
- ☐ Gather all necessary data to enable the cause of the derailment to be determined, and ensure that steps are taken to prevent a recurrence
- ☐ If no apparent track fault visible instigate rolling stock enquiry.

For more information

Standard S1556 *Incident reporting and investigation*

Rule Book 2, *Incident organisation and management*

Track Handbook 19 *Managing the critical aspects of track*

2 Train hitting object on or adjacent to the track

Track conditions to look for

- ☐ damaged track components and lineside equipment caused by the train striking them or by debris striking them after being hit by the train
- ☐ track misalignment
- ☐ broken rail or fishplates
- ☐ voids under sleepers
- ☐ loose, broken, worn or missing track fastenings, chairs and baseplates and sleepers with splits through screw holes
- ☐ track buckle, caused by high temperatures and weak lateral support such as a lack of ballast or poor ballast consolidation
- ☐ all of these conditions could have contributed to the train lurching toward the lineside structure.

Immediate action

1. Get to site as soon as possible and preferably before the object is moved.
2. Determine what caused the incident.

Repair the track:

- ☐ Examine the track for damage to components. If the object struck by the train was a track component in situ, determine whether a repair can be effected to allow traffic to run.
 - if it can, agree the action with the Incident Officer (Silver Control), assess the materials, equipment and people required and arrange to repair immediately when access is available
 - if a temporary repair is not feasible, arrange, through the Track Manager, for the track to be fully repaired immediately when access is available.

Determine the cause of the incident

- ☐ Take photographs of the object before it is removed from the track and note its origin (if possible) and location.
- ☐ Undertake a site survey to determine:
 - if the object struck was the primary cause of the incident or did the train move to an abnormal position due either to problems with the train or with the track
 - if components are worn beyond limits causing the train to strike the component (e.g. wheel flange striking fishplate due to worn rail)
 - abnormalities in track geometry which might have led to the train striking a component or lineside structure.

2 Train hitting object on or adjacent to the track - continued

Determine the cause of the incident (continued)

- the origin of the struck object:
 - was the struck object in its correct location when it was struck or is the object out of place?
 - is the object a track component, a tool or item of equipment, or is the object foreign material not associated with LUL?
- was it meant to be where it was? Was it a track component, tool or equipment or other foreign body?
- is it a train part? If so, label and photograph it; include this information with your report.
- look for evidence of where the object was when the train hit it - particularly important in the case of a foreign object thrown or deliberately placed on the track
- look for damaged components or debris left on the track.
- ☐ Prepare a site plan showing all relevant track features and any relevant information like the position of or cause of any damage to components or equipment.
- ☐ Remove object from the track and/or secure in a safe position to allow trains to operate safely. Remove object to a safe place for further investigation.
- ☐ Check for damage to track components, equipment and lineside structures.

Follow up actions

- ☐ Determine if the track fit for traffic
 - if it is, determine what repair work is necessary and arrange for it to be done as soon as practicable
 - if not, would it be fit with:
 - the imposition of an emergency speed restriction?
 - with a temporary repair?
 - if these measures cannot enable trains to operate, traffic need to remain suspended until a full repair to the track can be made, in which case:
 - determine what needs to be done to bring the track back to standard
 - confirm that local maintenance staff and facilities can be mobilised and undertake the work immediately.
- ☐ Gather all necessary data to enable the cause of the incident to be determined, and ensure that steps are taken to prevent a recurrence.

For more information

Track Handbook 5 *Managing the track environment*

3 Train colliding with platform

Track conditions to look for

- ☐ track misalignment or twist
- ☐ damaged track components and lineside equipment caused by the train striking them or by debris striking them after the train collided with the platform
- ☐ broken rail or fishplates
- ☐ voids under sleepers
- ☐ loose, broken, worn or missing track fastenings, chairs and baseplates and sleepers with splits through screw holes
- ☐ damaged drains causing track to sink
- ☐ loose, damaged, misplaced nosing stones
- ☐ whether platform has been recently resurfaced
- ☐ whether new nosing shoes have recently been laid
- ☐ track buckle, caused by high temperatures and weak lateral support such as a lack of ballast or poor ballast consolidation
- ☐ whether track is in a temporary state during major renewals

All of these conditions could have contributed to the train lurching toward the platform.

Immediate action

1. Get to site as soon as possible and preferably before the object is moved.
2. Determine what caused the incident.

Repair the track:

- ☐ Examine the track for damage to track components and determine whether a repair can be made to allow traffic to run.
 - If it can, agree the action with the Incident Officer (Silver Control), assess the materials, equipment and people required and arrange to repair immediately when access is available.
 - If a temporary repair is not feasible, arrange, through the Track Manager, for the track to be fully repaired immediately when access is available.
- ☐ Correct any track defects found that might cause a recurrence of the incident.

3 Train colliding with platform - continued

Determine the cause of the incident

- ☐ Take photographs of the track and platform paying particular attention to any scrape or impact marks.
- ☐ Undertake a site survey to determine:
 - the line and level of the track and platform particularly at the point of impact
 - if the train has scraped the platform edge, check whether platform nosing was loose or has been dislodged
 - abnormalities in track geometry which might have led to the train striking the platform, in particular look for:
 - humps in the top which might exaggerate twist
 - vertical and lateral movement under load or evidence of trains rolling or twisting.
- ☐ In all cases, check:
 - platform offsets and heights: are the platform clearances allowing for end/centre throw and cant effects of the train on curved platforms?
 - if nosing stones are new are they correctly installed?
 - signs of track movement: is the track closer to the platform than it should be? Use the platform gauge as a quick check (don't forget to apply any end/centre throw)
 - if any defects are causing the track to move
 - if ballast has been lost or shifted
 - six-foot dimensions, if applicable
 - for evidence that trains have been rubbing the platform for some time
 - look for damaged components or debris left on the track
 - in a tube or sub-surface sections, check platform with tunnel gauge (don't forget to apply any end/centre throw).
- ☐ Prepare a site plan showing all relevant track features and the position of any damaged components or equipment.
- ☐ Check for damage to track components, equipment and lineside structures.
- ☐ Does the platform need to be taken out of commission?

Follow up actions

- ☐ Determine if the track is fit for traffic.
 - If it is, determine what repair work is necessary and arrange for it to be done as soon as practicable.
 - If not, would it be fit for traffic with:
 - the imposition of an emergency speed restriction?
 - with a temporary repair?
 - If these measures cannot enable trains to operate, traffic need to remain suspended until a full repair to the track can be made, in which case:
 - determine what needs to be done to bring the track back to standard
 - confirm that local maintenance staff and facilities can be mobilised and undertake the work immediately.
- ☐ Gather all necessary data to enable the cause of the incident to be determined, and ensure that steps are taken to prevent a recurrence.
- ☐ Determine if any track defect is the result of temporary works.
- ☐ If no apparent track or platform fault exists instigate rolling stock enquiry.

4 Train colliding with train

Track conditions to look for:

- ☐ damaged track components and lineside equipment resulting from the incident
- ☐ broken rail or fishplates
- ☐ tell tale signs of voids under sleepers
- ☐ loose, broken, worn or missing track fastenings, chairs and baseplates and sleepers with splits through screw holes
- ☐ track buckle, caused high temperatures and weak lateral support such as a lack of ballast or poor ballast (consolidation)
- ☐ missing fouling point markers if the incident is within a depot or siding
- ☐ serious lateral movement of track

All of these conditions could have contributed to the trains leaning toward each other

Immediate action

- ☐ Undertake a site survey to determine:
 - abnormalities in track geometry which might have led to the tracks the trains were on being too close together, in particular look for:
 - humps in the top which might exaggerate twist
 - if service not suspended vertical, lateral movement under load or evidence of trains rolling towards the adjacent track
 - clearances at fouling points and between tracks (six foot)
 - check that the fouling point plate or stopping plate is in the correct position
 - in all cases check for signs that the track may have moved.
- ☐ Correct any track defects found that might cause a recurrence of the incident.

Follow up action

- ☐ Determine if the track is fit for traffic.
 - If it is, determine what repair work is necessary and arrange for it to be done as soon as practicable.
 - If not, would it be fit for traffic with:
 - the imposition of an emergency speed restriction?
 - a temporary slew of one or both roads to restore clearances?
 - If these measures cannot enable trains to operate, traffic need to remain suspended until a full repair to the track can be made, in which case:
 - determine what needs to be done to bring the track back to standard
 - confirm that local maintenance staff and facilities can be mobilised and undertake the work immediately.
 - Gather all necessary data to enable the cause of the collision to be determined, and ensure that steps are taken to prevent a recurrence.

5 Broken rail in plain line track and junctionwork

Track conditions to look for:

- ☐ broken rail - for types of rail failures see Track Handbook 23 *Managing rail defects*

Immediate action

- ☐ Minimum actions to be taken for each type of rail failure are set out in Track Handbook 23 *Managing rail defects*. Depending on the type and extent of the break, it may not be necessary to stop traffic but allow it to run under a speed restriction of either 5mph or 10mph.
- ☐ In junctionwork, it may be possible to clip and scotch one or more sets of points to take the junction out of commission and allow traffic to operate on the alternative route.
- ☐ Check whether emergency clamped fishplates or temporary bolted joints can be fitted.
- ☐ If they cannot, and if the rail is free to move (e.g. a switch rail) and the fracture is not supported by the blocks and bolts or multi-groove locking pins, or if no other rail support is available, stop traffic.
- ☐ Depending on the nature of the break (see S1158), stop traffic or implement an emergency speed restriction.
- ☐ If traffic is suspended and a temporary measure cannot be adopted, it will be necessary to change the rail.
- ☐ Make sure current has been discharged before replacing the broken rail
- ☐ Check joints needing to be bonded.
- ☐ Check blockjoints needing new nylon inserts and tee pieces.
- ☐ Check for abnormal wear patterns on head or foot.
- ☐ Check whether any components bolted to the rail needs to be replaced e.g. greaser.
- ☐ Decide whether the condition of the newly installed rail needs to be monitored, for example through 3-hourly inspections and ensure the Track Manager is advised.
- ☐ Advise train operations management of the actions you need to take and keep the Line Service Centre advised of progress

Follow up actions

- ☐ Determine what needs to be done to bring the track back to standard
- ☐ Confirm that local maintenance staff and facilities can be mobilised and undertake the work immediately.
- ☐ Decide if newly installed rail needs to be monitored.
- ☐ Complete rail failure report as required in track standard S1158.
- ☐ Gather all necessary data to enable the cause of the broken rail to be determined.
- ☐ Arrange for the removed rail (part of) to be sent for analysis.

For more information

Track Handbook 19 *Managing the critical aspects of track*

Track Handbook 23 *Managing rail defects*

Track standard S1158

6 Defective rail in plain line track and junctionwork

Track conditions to look for:

- ☐ defective rail - for types of rail defects see Track Handbook 23 *Managing rail defects*

Immediate action

- ☐ Minimum actions to be taken for each type of rail defect are set out in track standard S1158. Generally, no defect is serious enough for the service to be suspended.
- ☐ Stop traffic if necessary.
- ☐ If traffic is suspended and a suitable temporary measure cannot be adopted, it will be necessary to change the rail.
- ☐ Advise train operations management of the actions you need to take and keep the Line Service Centre advised of progress.

Follow up actions

- ☐ Determine what needs to be done to bring the track back to standard.
- ☐ Confirm that local maintenance staff and facilities can be mobilised and undertake the work immediately.
- ☐ Gather all necessary data to enable the cause of the collision to be determined, and ensure that steps are taken to prevent a recurrence.

For more information

Track Handbook 4 *Maintaining junctionwork*

Track Handbook 19 *Managing the critical aspects of track*

Track Handbook 23 *Managing rail defects*

Track standard S1158

7 Rail lubrication

Track conditions to look for

- ☐ lubricator failure.

Immediate action

- ☐ It is important to make sure that staff are briefed appropriately on the requirements of the following:
 - Control of Substances Hazardous to Health Regulations 1994
 - Health and Safety at Work etc. Act 1974
 - Management of Health and Safety at Work Regulations 1992
 - Provision and Use of Work Equipment Regulations 1992
 - LU requirements for the safe storage and use of oils and greases in the Underground.
- ☐ Hand grease the rail. Using an applicator, smear a thin layer of grease along the worn gauge face of the running rail or contact area of check rail for a distance of 2 sleeper bays. Take care not to apply excessive amounts or blobs of grease. Remove any excess grease.
- ☐ Use a guard to prevent grease getting on the crown of the rail.
- ☐ Wipe away immediately with a clean rag any grease that gets on the top of the gauge edge or the crown of the rail.
- ☐ Extent of application:
 - on curves with radius <200m - every 15 sleepers
 - on curves with radius 200m-600m - every 20 sleepers
 - on curves with radius >600m - every 30 sleepers.

Take extreme care at all times when hand greasing. You have to observe health and safety regulations and wear the correct PPE.

Follow up actions

- ☐ Repair or replace the failed lubricator.
- ☐ Check that lubricators are being filled and maintained at the required frequency for the site.

For more information

Track Handbook 19 *Managing the critical aspects of track*