

## **Permanent Way Institution**

Guidance for Heritage Railways on the Inspection and Maintenance of Permanent Way, and the Inspection and Assessment of other infrastructure that is necessary for the safety of the line

### **Document 4 - Carrying out a visual inspection (Patrol) of the track**

Target Audience:-	Patrollers
	Permanent Way Supervisors / Inspectors
	Professional Head of Track

This document is intended to be used as an aide memoire for track patrollers, to remind them what conditions they should look for, and what steps they should take on discovery of various defects.

#### **1. Your role in carrying out a visual inspection (patrol) of the track**

- a. When you visually inspect the track you are in the front line of ensuring that the railway is safe to operate. Your role is to visually examine the track and its immediate surrounds, looking for all the issues listed below. You are not required to measure any deficiencies that you observe, but you are required to record them, and to draw them to the attention of your supervisor.
- b. **However, if you consider that any section of track is not safe for trains to run, it is your duty to close the line immediately, in accordance with the Safety Management System (such as the rule book) of the railway on which you working at that time.**

#### **2. Your competence**

- a. To carry out a visual inspection your railway company must:
  - i. have certified you as competent to do this, and
  - ii. also certify you as competent in accordance with any relevant personal safety requirements required by its Safety Management System (for example Personal Track Safety, or Controller of Site Safety).

#### **3. Documentation required**

- a. You will be given several documents each time you carry out a visual inspection. These should enable you to:
  - i. demonstrate that you have the required competence to carry out the visual inspection,

- ii. identify the area and the lines that you are to inspect on that particular day, including start and finish mileages<sup>1</sup>, the track layout, and, where there is more than one line present, the names of the various lines,
- iii. identify the type and location of defects that have previously been reported on the section of track you are inspecting,
- iv. record in the laid down written format any changes in the state of the track that you identify, and
- v. record in the laid down written format any defects that you see which you consider merit immediate action.

#### **4. Items not covered by a visual inspection of the track**

- a. Your visual inspection should focus on the track and its immediate surrounds, such as the formation and drainage.
- b. You are not normally required to leave the immediate area of the track, that is the track itself, the cesses, and any space between tracks, when carrying out your inspection.
- c. If you can see any gross defects in lineside features such as bridges, fences or cuttings from the track, you should observe them so far as you safely can, and report them to your supervisor at the earliest opportunity. However, your railway company's Safety Management System should not depend on you doing this, as you cannot be expected to see all the details of features that are remote from the actual track.

#### **5. Equipment**

- a. When you are to carry out a visual inspection of the track, you should take with you:
  - i. a mobile phone, or other means of communication recognised under your employer's SMS, programmed with the numbers of those people necessary to contact if you have to close a line that you consider unsafe,
  - ii. a plan of your inspection, showing start and finish points, and the track layout,
  - iii. the existing defect register for the track covered by your inspection,
  - iv. a hammer or fishplate spanner as appropriate; you may be required to alternate between these, or to use a combined tool called a spammer,

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<sup>1</sup> The term mileage is used to mean a location to the nearest chain or 10 metres, depending whether a railway is measured in imperial or metric dimensions.

- v. a system to record defects as you observe them, and their location: this might be a note book and pen, a tape recorder, or a hand held data logger<sup>2</sup>, but will always include an electronic camera, and
- vi. such equipment or protection as the Safety Management System of your railway requires: this might include, for example, safety boots, high visibility clothing, gloves, a system to give lookout warning, or equipment to warn an approaching train or to block the line to moving trains.
- vii. List of any specific hazards to which you might be exposed, which might include:
  - (1) areas of restricted clearance, and
  - (2) locations where there are particular vegetation hazards such as Giant Hogweed

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<sup>2</sup> Although it does not indicate location a digital camera is easily carried, and could help to explain defects after you have completed an inspection

## 6. Reporting and Records from inspection

- a. The following section gives you guidance as to defects that require urgent action. You should report any item you consider to be affecting the safety of the line and in need of urgent immediate attention to the signaller (or control if appropriate) by telephone. You should then fill in an urgent defect report for this defect as soon as possible.
- b. You should make all other reports in writing. You should write up both any new defects you have observed, and any changes to existing defects you have observed, on the form specified by the professional head of track for your railway, immediately after the conclusion of the patrol, and before you book off duty.
- c. You should also fill in an urgent defect report for any defect that you consider would need remedial work before the next inspection if a speed restriction or line closure is to be avoided
- d. You should record the location of all defects you report, either in miles and chains, or to the nearest 10 metres or as laid down in your railway's systems.
- e. As well as recording the defects that you have identified you should record on the form:
  - i. The date and time when you carried out the inspection,
  - ii. The start and finish mileage & chainage (or kilometerage) of your inspection, and
  - iii. The direction in which you walked.
- f. You should write your name and sign the inspection report.
- g. After you have filled in the reports from your inspection, you should hand the completed forms to your supervisor as soon as practical, and at the latest by the end of your shift..

## 7. What to look for when inspecting

### a. Rail condition

- i. broken rails,
  - Clean breaks: **if seen, close the line immediately.**
  - Breaks in and around joints (especially 45° 'star' breaks from the fishbolt hole): **if seen, close the line immediately.**
- ii. rolling contact fatigue cracks,
- iii. wheel burns,

- iv. sidewear on high rail,
- v. mushrooming on low rail,
- vi. lack of head depth, particularly flanges striking chairs on bullhead rails,
- vii. signs of rails pulling through chairs or baseplates:
  - pull through marks in the rail web (bullhead) or on the foot (flat bottom),
  - rail anchors consistently not against sleepers, or
  - sleepers consistently out of square.

**b. Joint condition**

- i. cracked or broken fishplates: **if seen, impose 5 mph temporary speed restriction and report to your supervisor immediately,**
- ii. longitudinally dipped joints and welds, particularly if on only one rail,
- iii. battered rail ends at joints,
- iv. bent fishplates (mainly non-BR derived track),
- v. fishplates with a visible 'nib' at the expansion gap
- vi. wide open fishplate gaps in middle of warm winter days,
- vii. closed fishplate gaps in cool summer days / early mornings,
- viii. lack of lubrication at fishplates,
- ix. loose fishbolts: **if you have the correct spanner, tighten the bolts, but report that you have done so,**
- x. broken fishbolts
  - if **one fishbolt broken: report to supervisor at end of patrol.**
  - If **two or more fishbolts broken: impose 5 mph temporary speed restriction and report to your supervisor immediately**
- xi. failed insulation in insulated block joints,
- xii. signs of wheel flanges striking fishplates, or
- xiii. adjustment switches with incorrect overlap, or with overlap outside the clamps (LWR and CWR only).

- xiv. Combination of any of the above features with one or more of the features below: **impose 5 mph temporary speed restriction and report to your supervisor immediately.**

- broken baseplates, chairs or other fastenings (section 7 d below)
- defective sleepers (section 7 f below), or
- defective ballast (section 7 g below)

**c. Pads**

- i. Signs of pads between the rail and the sleeper or baseplate being worn or missing (flat bottom rail only, and particularly with concrete sleepers).

**d. Baseplates, chairs and sleeper fastenings**

- i. broken castings that affect the retention of the rail in place,
- ii. worn steel baseplates, especially at sharp corners in rolled steel baseplates,
- iii. loose clips or keys: **if you have a hammer, you may re-insert loose or missing keys, but you should report that you have done so (Do not attempt to reinsert Pandrol clips with a hammer unless you are certain that the particular type of clip can be hammered in. If the keys or clips do not grip tightly when re-inserted, then remove them, and arrange for them to be replaced ),**
- iv. holding down screws / bolts loose or pulling out,
- v. vertical movement between baseplate or chair and sleeper / timber,
- vi. missing ferrules under chair screws, or ferrules crushed to allow screws to contact chair / baseplate **(but note some narrow gauge lines do not use ferrules), or**
- vii. loose track spikes.

**e. Gauge variation**

- i. rails out of alignment with each other, in particular one rail visibly out of line from a distance from a distance,
- ii. chair / baseplate shuffle,
- iii. wheel marks moving across the head of the rail,
- iv. gauge widening sufficient to present a risk of a wheel falling between the rails (25mm of widening on standard gauge lines): **close the line immediately.**

- v. Loose or broken gauge tie bars. **If one tie bar is loose or broken report to your supervisor. If more than one consecutive tie bar is loose or broken close the line.**
- f. Sleeper deterioration**
- i. in timber sleepers, cracks, splitting and rot: **if there are three or more occurrences in a 60 ft. length (18.233m or 24 sleepers), report number per length to your supervisor,**
  - ii. in concrete sleepers, cracks, sections breaking out and fasteners pulled out: **if there are three or more occurrences in a 60 ft. length, report number per 60 ft. length to your supervisor, and**
  - iii. in all sleepers, indentation under the rail, chair or baseplate: **if there are three or more occurrences in a 60 ft. length, report number per 60 ft. length to your supervisor**
- g. Ballast deterioration**
- i. ballast erosion (wet beds), particularly under one rail only: **if three or more occurrences in a sixty ft. length, report number per 60 ft. length to your supervisor,**
  - ii. signs of clay pumping up through the ballast,
  - iii. evidence of severe voiding (sleepers going down under a moving train by 25mm (one inch) or more.
  - iv. gaps in the ballast at sleeper ends, particularly in hot weather: **if you see large gaps at sleeper ends, impose a 5 mph temporary speed restriction and report to your supervisor immediately,**
  - v. an inadequate ballast shoulder or empty ballast beds,
  - vi. blocked drainage (look in catchpits if you can do so without lifting lids), or
  - vii. weeds growing in the track.
- h. Loose / missing components: (if you are competent to do so and have the correct equipment you may rectify loose components, but you should record what that you have done.)**
- i. keys / clips rattling or out: **close the line if more than six keys or clips missing on a 60 foot length of rail, or**
  - ii. loose bolts in fishplates and S&C.
- i. Defects in switches and crossings (Points and crossings)**

- i. loose or missing bolts in stretcher bars: **if you find loose bolts you should tighten them if you have the correct equipment, but you should also report the defect to your supervisor,**
  - ii. cracked or fractured stretcher bars: **if a fractured stretcher bar on a facing point, close any affected line to traffic,**
  - iii. loose or missing bolts in fishplates, switch blocks, crossing nose and check rails: **if you find loose bolts, you should tighten them if you have the correct equipment, but you should also ensure that the defect is reported,**
  - iv. baseplate shuffle / sidewear at switch toes,
  - v. incorrect closure of switches, especially on facing points,
  - vi. switch toes struck by wheels,
  - vii. crossing nose struck by wheels (bruising),
  - viii. lack of contact between wheel back and check rail flangeway face alongside crossing nose: **if combined with crossing nose struck, report immediately to your supervisor,**
  - ix. horizontal or vertical rail cracks, especially around switches and crossing area: **report to supervisor at once,**
  - x. wide gauge elsewhere in S&C: symptoms as with plain line, or
  - xi. excess vertical movement under load, between components, or between the timbers and the ballast.
  - xii. Obstruction in flangeways and switch openings, particularly after flooding
- j. Gross changes in vertical or horizontal alignment**
- i. 'Three-penny bit' / 'fifty pence' curves with joints out of line, particularly in hot weather: **URGENT in hot weather, as this is evidence of a potential buckle. Report at once, close line if a gross defect;**
  - ii. Dips on embankments on outer rail: **URGENT – evidence of a potential bank slip. Report at once, close line if a gross defect;**
  - iii. Horizontal misalignment: **URGENT in hot weather – evidence of a potential buckle. Report at once, close line if a gross defect; or**
  - iv. Horizontal misalignment approaching a fixed point such as S&C, a bridge, or a level crossing: **URGENT in hot weather – evidence of a site with potential to buckle. Report at once, close line if a gross defect.**
- k. Level Crossing defects**

- i. changes of use leading to increased traffic over crossing: long term due to development, or seasonal agricultural changes,
- ii. signs of deterioration or defects of any part of the track system concealed in the crossing surface (for example, poor top),
- iii. worsening of the track condition that is affecting or may affect the safe use of the crossing by road or rail vehicles,
- iv. gaps in crossing surface that could trap cyclists, pushchairs or wheelchair users,
- v. crossing telephones not working (if provided): **report to signaller at once,**
- vi. road and rail traffic lights and sounders not working correctly, so far as can observe during visual inspection: **report to signaller at once,**
- vii. any road surface markings inadequately painted,
- viii. so far as you can observe from the track, any highway signs missing, incorrectly positioned or faded,
- ix. missing or faded railway safety signage
- x. vegetation restricting vision of oncoming trains (especially on passive crossings) or of signals / operational signs: **report to signaller and your supervisor at once,**
- xi. damaged fencing,
- xii. pedestrian and road gates not closing correctly,
- xiii. pot holes in the crossing surface, rocking deck units under load from road traffic, or check rails protruding vertically,
- xiv. damage or deterioration to trespass guards,
- xv. poor drainage affecting rail tracks or road surface, or
- xvi. obstructions in flangeway of crossing.

**I. Drainage and water course defects (so far as you can observe from the track)**

- i. signs of recent flooding – for example, vegetation ‘tide mark’,
- ii. ballast washed out or contaminated by flooding
- iii. water ponding in catch pits (if can see into the pits),
- iv. ponds of water in cess or at bottom of embankments, or
- v. major flows of water outside proper drains and ditches, particularly on cutting slopes where the ground slopes up away from the railway.

**m. Earthworks defects (so far as you can observe from the track)**

- i. Obvious signs of bulging at the toe of a slope: easier to see in cuttings than on banks, but vegetation can conceal. Look for leaning trees as a particular sign.  
**Report to supervisor at once;**
- ii. **Visible cracks in cutting or embankment slopes: Report to supervisor at once**
- iii. New falls of boulders in rock cuttings, even if they do not impinge on the track.  
**If rocks fallen on the track, close the line. If rocks fallen clear of the track, report to supervisor at once;**
- iv. signs of rodent / badger damage; or
- v. erosion by watercourses.

**n. Incursions (so far as you can observe from the track)**

- i. work above the railway that you have not been made aware of,
- ii. work that could interfere with the railway:
  - excavations at the foot of an embankment, even if outside the boundary
  - mobile plant working at the top of a cutting slope, even if outside the boundary
  - new highways,
  - new or amended drainage systems,
  - scaffolding on railway land, or where collapse could affect railway, or
  - new services – gas, water, electric, sewerage, etc., that might affect the railway

**Report to supervisor at once.**

**o. Fences (so far as you can observe from the track)**

- i. gaps in fence,
- ii. gates or styles in poor condition
- iii. signs of trespass routes or animal runs (paths, vegetation knocked down),or
- iv. changes in land use – for example, lambing.

**p. Structures (so far as you can observe from the track)**

- i. cracks that appear to have grown since the last inspection,

- ii. newly fallen brickwork or masonry from abutments, retaining walls, arches or tunnels: **report to signaller at once,**
- iii. coping stones displaced from structures
- iv. newly exposed concrete reinforcement – should expect to see debris below,
- v. obvious rust holes in the structure – floor or main beams (less important for non-structural parapets: **report to supervisor at once, or**
- vi. loose fastenings, particularly where longitudinal timbers support track, or sleepers are clamped down to the girders directly: **if you find loose bolts, you should tighten them if you have the correct equipment, but you should report the defect.**
- vii. Wheel rail contact marks showing rail rotation on longitudinal timbers
- viii. Tightness of holding down straps on longitudinal timbers

**q. Miscellaneous defects (so far as you can observe from the track)**

- i. missing lineside operational signs: level crossing controls, speed restrictions, mileposts, gradients, bridge numbers, SW boards,
- ii. PW or other material left by the lineside that could cause, or be used to cause, a derailment
- iii. lineside operational signs in need of painting, and
- iv. vegetation in need of cutting, whether inside or outside the boundary, because it:
  - strikes a passing train, or could injure train in open cabs
  - obstructs a place of safety for staff,
  - obstructs a train driver's view of signals / signs - **report to signaller at once,**
  - it obstructs a road user or pedestrian's warning time for an oncoming train on a passive crossing, as seen from the decision point (usually the level crossing sign): in this case, **report to signaller at once,** or
  - it is showing signs of distress and may fail to create any of the above risks,

**8. Observation of track under traffic**

- a. If you are carrying out a visual inspection of the track whilst trains are running you will have a safe system of work to ensure that you are clear of the line when trains approach. You should take the opportunity, whilst in this place of safety, to observe the dynamic behaviour of the track under the passage of the train, and particularly heavy vehicles such as locomotives, as this may reveal defects that are not visible in the unloaded state.

- b. If you are at a location where there is signalling equipment, which automatically includes most pairs of points, you should also observe, from a place of safety, for any loose signalling equipment. If you observe such equipment you **should report the defect to the signaller at once**