



# TRACK INSPECTION AND MAINTENANCE PROCEDURE

**Work Procedure: WPT-02**

## Permanent Way Section

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## **1.0 PURPOSE**

To establish standard practices to be followed when undertaking track inspection of the SteamRanger Heritage Railway network. This procedure provides details of frequency, methods used, corrective actions to be taken and reporting requirements.

## **2.0 SCOPE**

SteamRanger Heritage Railway's rail network shall be inspected to a level consistent with this procedure by a rail safety worker who has been issued with a certificate of competency.

## **3.0 REFERENCES**

Maintenance instructions and processes located within document TMT-01 Basic Perway Practice  
National Code of Practice for the Defined Interstate Network Volume 4 Track, Civil and Electrical Infrastructure Part 1: Infrastructure Management June 2002  
State Transport Authority Basic Perway Practice  
SteamRanger Heritage Railways Work Procedures

#### **4.0 MONITORING AND MAINTENANCE**

Monitoring and maintenance is the process used to ensure the track infrastructure condition stays within intended limits compatible with the operating parameters when in use, and includes the functions of inspection, assessment and execution of actions where necessary.

The objectives of the monitoring and maintenance practices described in this procedure are as follows:

- (a) To inspect and test infrastructure elements to determine their condition.
- (b) To record irregularities or defects that may affect, or have the potential to affect, the capability of the infrastructure to safely perform its required function.
- (c) To carry out assessment of the inspection and test results to determine the infrastructure capacity.
- (d) To take corrective or preventive actions where the infrastructure is unable to carry out its required function (e.g. where conditions are outside prescribed limits).

The monitoring and maintenance practices are supported by the following

- (a) Use of documented inspection and assessment practices (e.g. standard inspection sheets).
- (b) Assignment of responsibilities for monitoring activities.
- (c) Verifying the competencies of worker(s) that perform monitoring and maintenance activities.
- (d) Control, calibration, and maintenance of inspection and testing equipment.
- (e) Adherence to approved documentation systems to record results of monitoring and maintenance practices.

#### **5.0 ASSIGNMENT OF RESPONSIBILITIES**

The SteamRanger Infrastructure Services Manager or appointed delegate is responsible for monitoring and maintenance on all SteamRanger Track Infrastructure (excluding railway signalling equipment maintenance). Track Inspection requirements however will include routine operation testing of crossing warning devices in the Length Inspection program. The Infrastructure Services Manager is therefore required to determine and allocate competent workers to undertake track inspection.

#### **6.0 CERTIFICATION OF WORKER COMPETENCIES**

Details of the process for gaining competency are detailed in Infrastructure Services Quality Assurance Procedures.

## **7.0 RECORDS OF INSPECTION AND MAINTENANCE**

### **7.1 General**

The objective of documentation is to ensure the relevant information is recorded so that the capacity of the infrastructure to perform its required function can be ensured and audited. The documentation must include:

- (a) A system for defining infrastructure location
- (b) For inspections to include:
  - (i) frequency of Patrol and scheduled inspection;
  - (ii) type, purpose(s) and scope of each inspection;
  - (iii) date the inspection was carried out;
  - (iv) a record of identified defects; and
  - (v) Certification by the accredited worker carrying out the inspection.
- (c) For maintenance to include:
  - (i) location of defect;
  - (ii) description of defect;
  - (iii) an assessment of the priority of the defect for repair;
  - (iv) record of who made the priority assessment; and
  - (v) record of temporary action initiated e.g. speed or load restriction pending programmed repair.

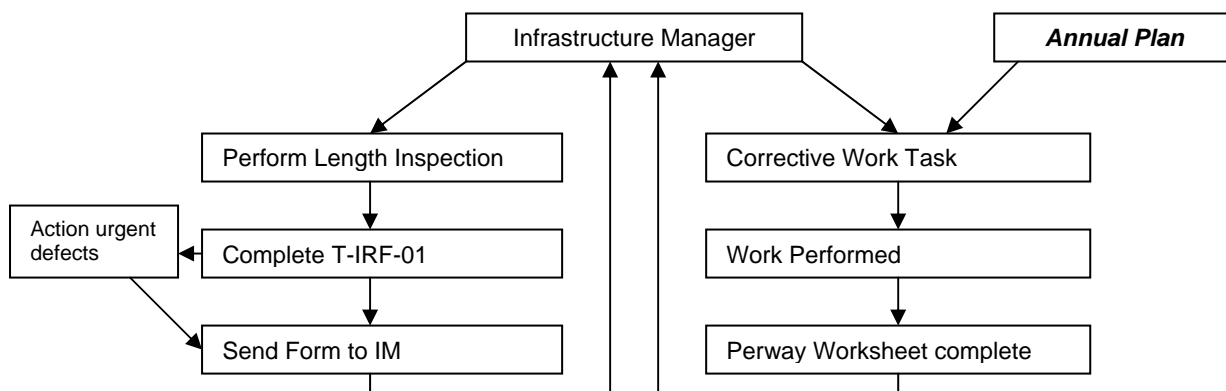
Inspection and maintenance records need to be maintained for a period of seven years.

### **7.2 Rail Safety Worker Documentation Responsibility**

Rail Safety Workers inspecting track shall complete an inspection record sheet during the inspection process. The relevant forms are detailed in document WPT-03.

Rail Safety Workers undertaking maintenance or corrective work shall complete a corrective work record sheet after the maintenance or corrective action has been completed. This is known as T-CWF-01 Perway Work Sheet.

#### **7.2.1 Documentation Flow Chart**



## **8.0 INSPECTION**

### **8.1 Types of Inspection**

Inspection is the process by which information on the condition of the infrastructure is collected and recorded. Inspection is a whole of life activity and may be divided into two complementary types of inspection:

- (a) Scheduled inspections; and
- (b) Unscheduled inspections.

Each inspection type may take the form of a Patrol Inspection, a General Inspection, or a Detailed Inspection. Inspections may be carried out in a manner and at a speed consistent with the scope of the inspection.

The following table details the track inspection strategy implemented by SteamRanger:

<b>TYPE</b>	<b>FREQUENCY</b>	<b>METHOD</b>
Schedule track patrol inspection (Walking or on-rail vehicle) Known as Length Inspection (a)	All main lines at intervals not exceeding 7 calendar days (Cockle Train) OR 96hrs prior to scheduled service (all effectively 7 days during normal operations) Crossing loops – during main line inspection	Visual inspection  On-rail vehicle where used  Manual measuring equipment as required
Scheduled on train inspection Known as General Inspection (b)	All main lines at intervals not exceeding 12 months	Visual inspection  Vehicle ride
Scheduled track geometry car inspection or equivalent	All main lines at intervals not exceeding 3 years	Measuring car with ability to measure gauge, top, horizontal alignment, cross level, short twist, and long twist  Record type, size and location of defects
Scheduled track detailed inspection (c)	All main lines at intervals not exceeding 12 months, except when track geometry car inspection has been undertaken	Walking
Un-scheduled inspection in response to defined or other events	As necessary to ensure safety where for any reason (eg slips, floods, earthquakes, driver reports, irregularity report etc) it may be suspected that the geometry may have been significantly affected	As required

The regular inspection types are detailed below:

- (a) Patrol inspections, known as Length Inspection (or 'run the length') are required within a 96-hour period prior to a scheduled passenger service on any part of the network. This inspection is required to look for any obvious conditions (including suspected defects), changes in condition, or evidence of rates of deterioration of the infrastructure (e.g. track geometry defects due to movement of under track structures) that indicate unacceptable risk to operations. Length inspections are required to conduct some general

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inspections at specific locations according to Victor Harbor Line inspection schedules in document WPT-03 "Track Inspection Schedule Victor Harbor Line" (e.g. road crossing warning devices must be operated and results recorded).

A Length Inspection is required to report by exception and record any detected defects requiring further action to be taken by the worker carrying out the Inspection or others. General Inspection items included in the Patrol Inspection must be specifically reported.

A "nil" report indicating no further actions are needed is required if no defects were detected.

An on-rail vehicle may be used to carry out the length inspections.

- (b) A General Inspection by the Track Supervisor or delegate is required on intervals not greater than 12 months travelling on a typical train using the track to assess track condition under active load conditions and normal track speeds. This inspection specifically looks for defects, which would not be detected, when Length Run Inspections are conducted using a light on-rail vehicle. A "nil" report indicating no further actions is required when no defects were detected.
- (c) An annual inspection (by foot) is required on all track infrastructures including crossing and track-side signs, which will include detailed inspection and measurements where appropriate. This inspection requires a competent worker to walk the whole length of the track. A record of inspection including test results and defects found is required.

Unscheduled inspections will be undertaken in response to specific local circumstances as directed by the Track Supervisor or delegate. The unscheduled inspection may be a Length Inspection, General Inspection or a Detailed Inspection. An example of this type of unscheduled inspection could be a patrol of the track section following high winds to ensure fallen trees are clear of the track. A record shall be made and maintained for all inspections.

## **8.2 Method of Inspection**

### **8.2.1 Method of Inspection - General**

As detailed in section 8.1 Types of Inspection, SteamRanger has implemented a three tiered inspection process. Each type of inspection has a particular general method to be applied. Track inspection methods include walking the length, running track inspection vehicles for visual inspection over the track or by train. At times a track recording car can be contracted to run over the track. This vehicle measures the gauge, superelevation and variations to top and line of the rails and records the data on hard disk. The data can be printed out in numerical or graphical form and in this data is used to prioritise maintenance work and assist in long term job planning.

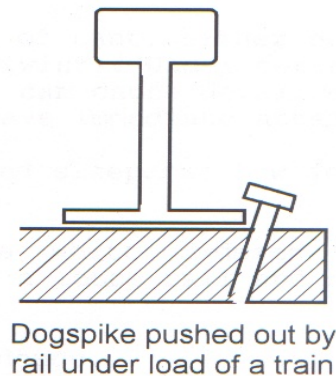
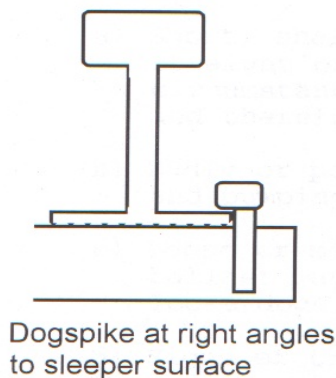
8.2.2 Method of Inspection - Plain Line

8.2.2A Identification of Wide Gauge (Track Vehicle)

- a) All curved track should be checked for WIDE GAUGE during length running from a track vehicle.
- c) WIDE GAUGE is 1619mm or more.

Procedure

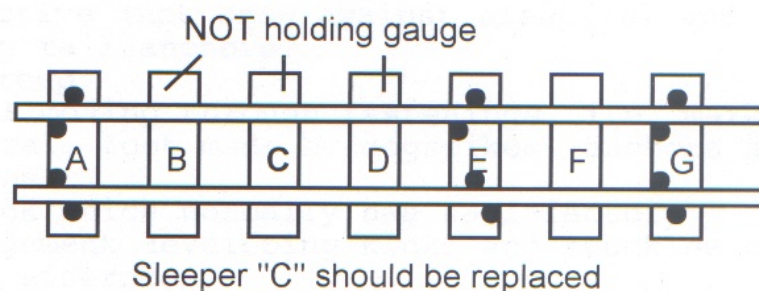
- a) When traversing a curve check all the dogspike heads securing the outer legs of both rails are parallel to the surface of the sleepers. If THREE or more are found to be pushing (head at an angle to the sleeper surface) check the gauge.
- b) The gauge is the measured rail gauge PLUS the SUM of the dogspike distortion. See Diagram below.



The rail is pushed OUT under the load of a train but may spring back when no traffic is on the line. It is **VERY IMPORTANT** to identify this wide gauge and correct it.

Corrective Action

Either by redogging or resleepering when 3 or more consecutive sleeper lengths are found defective. See diagram below.



If any sleepers are found to be broken they must be replaced at the earliest opportunity.

8.2.2B Identification of Narrow Gauge (Track Vehicle)



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- a) All curved track should be checked for NARROW GAUGE during a length run from a track vehicle.
- b) NARROW GAUGE is 1595 millimetres or less.

Procedure

When inspecting track NARROW GAUGE is usually detected by the presence of slewed sleepers. Often high pitched squeal can be detected from the track vehicle.

Corrective Action

Remove all ballast from the trailing edge of the sleepers then with the aid of bars, push the sleeper back into its correct alignment, at right angles to the rail.

8.2.3 Method of Inspection - Length Inspection General

- a) Short, sharp changes of cant, either on straight or curves (twist). Under certain circumstances twists can cause derailments and therefore must have immediate attention.
- b) Badly or poorly packed sleepers. Low joints and pumping sleepers.
- c) Loose or missing dogs, white powdered ballast may indicate a loose rail and hence loose dogs.
- d) Signs of track subsidence.

8.2.4 Method of Inspection - Visual Inspection by foot (walking)

- a) Broken or cracked fishplates.
- b) Loose, bent or broken fishbolts.
- c) Broken or cracked rail, especially near welds and rail ends (sometimes the fishplate hides the crack).
- d) Defective rail, including wheel burns.
- e) Badly seated rail.
- f) Incorrect expansion gaps.
- g) Ineffective (not snug against sleepers) and missing rail anchors.
- h) Rail creep.
  - \* Rail moving through fastenings, i.e. marks on rail foot made by dogspikes, anchors and clips.
  - \* Track which normally has satisfactory alignment developing kinks and knuckles on hot afternoon.



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- \* Varying sleeper spacing where sleepers are intermittently anchored.
  - \* Excessive top and side wear of rails.
- (i) Examine the web as well as the top of the rail during inspections. Pay particular attention to curves, because the outer rail has to withstand greater lateral pressure and may tend to tip over. Furthermore cracks in rails may develop between the head and the web, and between the foot and web.
- (j) All track should be checked for WIDE GAUGE once per year by foot.
- (k) All track should be checked for NARROW GAUGE once per year by foot.

Further specific details of the inspection process for each sub section of rail infrastructure is given in document TMT-01 section 9.

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**8.2.5 Method of Inspection Rubric**

<b>INSPECTION METHOD</b>					
<b>Item</b>	<b>Sub-Item</b>	<b>Walking Observe for:</b>	<b>Track Inspection Vehicles Observe for:</b>	<b>Train Observe for:</b>	<b>Remedial Action</b>
Track Geometry	Alignment	Irregular or surface, too many cross levels, wide gauge, etc. Refer to section 7.2.4 above.	Irregular alignment of surface, excessive cross levels, wide gauge. Refer to section 7.2.2 above.	Irregular alignment or surface, excessive cross level, centre bound roll symptoms, ride quality.	Refer to TMT-01 section 9.4.1 to 9.4.4.
	Rail	Broken, vertical or horizontal split heads, crushed heads, corrugation, wear, shelling, engine burns, rail end defects, discolouration, rust streaks, damage by equipment.	Broken, vertical split heads, crushed heads, engine burns, discolouration.	Broken	Refer to TMT-01 sections 7.2, 9.9, 9.10.
	Rail Joints	Broken, bent, cracked fishplates, insulation defects.	Broken fishplates, loose fishplates	Loose fishplates	Cracked or broken fishplates between the middle two bolt holes must be replaced immediately.
	Track Bolts	Loose, missing, bent, frozen	Loose, missing	N/A	Tighten loose bolts, replace missing, bent or frozen bolts.  Trains must not exceed 25km/h over any joint having fewer than 2 bolts in each end of rail.
	Sleepers	Broken, split, spike killed, plate cut, skewed, slewed, damaged by equipment	Broken, slewed, damaged by equipment	N/A	Replace sleepers as necessary to comply with TMT-01 section 7.5.1.  Check joints are properly supported by one sleeper. Replace one sleeper if necessary.  Replace enough sleepers to ensure that no more than three sleepers side by side are defective (will not perform their function of supporting track or maintaining gauge).
	Dog spikes	High, missing, bent, throat cut, broken, leaning (pushed)	High, missing, broken, leaning (pushed)	High	High or missing dog spikes must be immediately attended. Ensure that at least 3 sleepers are fully dogged out of every four adjacent sleepers on each side of every sleeper where spikes are missing. Pushing dogs must be rectified by redogging else a speed restriction applied Refer to TMT-01 section 9.5.1.
Ballast & Formation	Ballast	Lack of ballast, pumping, hanging sleepers	Pumping (holes)	Pumping (holes)	Reballasting, Refer TMT-01 section 7.7, Lift and pack, refer TMT-01 section 9.4.
	Drainage	Culverts blocked, cess blocked, capture drains, hanging sleepers	Culverts blocked	High water	If drainage culverts are found blocked, immediately contact Train Controller to arrange safe working. Advise Track Supervisor. Try to clear blockage.

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<b>INSPECTION METHOD</b>					
<b>Item</b>	<b>Sub-Item</b>	<b>Walking Observe for:</b>	<b>Track Inspection Vehicles Observe for:</b>	<b>Train Observe for:</b>	<b>Remedial Action</b>
Points	Turnouts	According to TMT-01 section 8	Misalignment or damaged components	Ride quality	According to TMT-01 section 8
Bridges	General	Irregular surface and line on bridge and approaches, structural damage.	Irregular surface and line on bridge and approaches, structural damage	Irregular surface and line on bridge and approaches, structural damage.	Irregular surface and line, structural damage to bridge or any other irregularity must be reported to the Track Supervisor. If there is any doubt about the safety of trains, protect trains.
	Track on Bridges	Sleeper breakage or dislodgment, bolts shorting out electrical circuits against the sleeper plates, condition of fastenings, rails, joints, condition and security of check rails.	Sleeper breakage, condition of fastenings, rails, joints and check rails.	N/A	Refer to TMT-01 sections 7.8.1 & 9.1.5.
Corridor (Right of Way)	Track signs	Defective or missing	Defective or missing	Defective or missing	Any missing or damaged signs must be reported to the Track Supervisor.
	Signal Equipment	Damaged or missing	Damaged or missing	N/A	Damage or missing signal components must be reported to the Signal & Telegraph Manager
	Cuttings & Embankments	Erosion, rock falls, incomplete slopes	Erosion, rock falls	Erosion	If severe erosion is occurring, or if rock falls are reaching the track, immediately contact Train Control. Advise Track Supervisor.
	Fencing	Damage, open gates	Damage, open gates	Open Gates	Close gates, repair fence holes if possible.
	Clearance	Vertical and horizontal clearances, including vegetation	Vertical and horizontal clearances, including vegetation	N/A	Refer to TMT-01 section 13.
Level Crossings	Active Level crossings	Missing or defective signs, damage, sight lines for healthy state indicators.	Function testing of crossing protection equipment. Sight lines for Healthy State IndicatorsRefer WPT-02	Malfunction of crossing protection equipment. Sight lines for Healthy State Indicators	Report any observance to the Signal & Telegraph Manager. Advise Train Control of defects.
	Passive Level Crossings	Condition of road surface, track approaches and in road, foot paths and fencing	Condition of road surface, footpaths and fencing.	N/A	Refer to TMT-01 section 9.1.8

### **8.3 TRACK INFRASTRUCTURE ASSESSMENT**

In general the track and civil infrastructure is a system of components that deteriorate in condition through usage, aging and other factors. Assessment is the process by which the condition and deterioration of the infrastructure, as determined by inspection, is evaluated to determine the necessary actions.

After each scheduled or unscheduled inspection an assessment should be made.

The assessment may be determined using one or any combination of the following assessment standards:

- (a) Predetermined condition standards for defects or irregularities, which comprise a series of acceptable dimensional criteria, or limits for various infrastructure elements. They are used to assess the condition of infrastructure and determine the necessary actions.
- (b) In the absence of condition standards, predetermined quantitative assessment procedures or rules may be implemented to assess the condition of infrastructure and determine the necessary rules.
- (c) In the absence of either of the above as changes in condition are detected the necessary actions may be determined on the basis of engineering analysis.

The worker, who may be the inspecting worker, responsible for assessing the infrastructure should initially identify any conditions that render the infrastructure unsuitable for the continued passage of trains at the authorised speed. Where such conditions are found Track Supervisor or delegate must be immediately notified. The Track Supervisor or delegate will determine what actions should be taken prior to the passage of the next train to ensure compatibility of the infrastructure with the passage of trains or other functional requirements.

Where the nominated worker is unable to assess the conditions (e.g. where the worker is not competent or assessment practices do not cover the particular condition detected) operating restrictions should be implemented or operations halted so that risks are reduced to acceptable levels pending the Track Supervisor, delegate or specialist advice.

## **8.4 DEFECT CATEGORY**

When the inspection and assessment process identifies a defect on the track infrastructure it needs to be allocated a priority for rectification. Three levels of defect priority are used as follows:

### **Priority 1**

Defines a defect that requires immediate action (e.g. prior to the passage of the next train), such as restriction, removal, strengthening etc. because the condition is below the minimum acceptable level for the expected load and speed rating of the expected train movements.

### **Priority 2**

Defines a defect that is expected to deteriorate to a condition below the minimum acceptable level for the expected load and speed rating of the expected train movements before the next scheduled inspection. These defects require a programmed action, for example a planned action to re-inspect or remove the defect prior to the next scheduled inspection.

### **Priority 3**

Defines a defect that requires no action prior to the next inspection because it is not expected to deteriorate to a condition below the minimum acceptable level for the expected load and speed rating of the expected train movements before the next scheduled inspection.

## **9.0 DOCUMENTATION**

T-IRF-01 Track Inspection Record Sheet - Length Inspection  
T-IRF-02 Track Inspection Record Sheet - Walking Inspection  
T-CWF-01 Perway Work Sheet