



AUSTRALIAN RAIL TRACK CORPORATION LTD

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## Engineering Practices Manual Civil Engineering

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# Guidelines for the Assessment of Broken Rails

## RC 2410

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### 1. Purpose

These guidelines have been prepared to assist staff with the assessment of broken rails and the determination of operating restrictions that are to apply until repairs can be carried out.

They are intended primarily for use on metropolitan lines and class 1 (or better) lines in the freight area where repair may not be possible prior to the passage of the next train.

They should only be used as a temporary measure to defer full repair until after a daily peak traffic period.

### 2. Reason and Nature of Change

Document reissued as ARTC Engineering Practice Manual.

### 3. Definitions

Track Assessor: a person who is qualified in Track Examination and has been assessed as competent in the competency "Record and Analyses Track Parameters".

Monitor: Visually assess gap and check and retighten clamps

#### 4. Assessment of Broken Rails

Specific guidelines for broken rails that HAVE NOT yet been plated are contained in Table 1. Answer ALL of the questions in Table 1 (There is no need to continue answering questions once a STOP TRAINS response has been established). SELECT the appropriate speed response for EACH answer. When ALL questions have been answered, the LOWEST speed selected for ANY answer is the speed restriction that can be applied.

Guidelines for broken rails that HAVE been plated are contained in Table 2.

Note that action is required following a broken rail repair to ensure track adjustment has been restored. These actions are detailed for CWR track in ARTC Engineering Practice RTS 3640.

#### 5. Required Competency

The assessment of broken rails must be carried out by a worker with Track Assessment competency "Record and Analyse Track Parameters" (Track Assessor).

An assessment may be carried out remotely by a Track Assessor using interactive communications with lesser qualified staff on-site. In such cases the communications should be sufficient to determine:-

- the size of the gap
- whether the break is clean and square and with the gauge face of the ends aligned
- whether the track is in reasonable condition (not obviously boggy or distressed)

The Track Assessor will also need to know the curvature of the track and the type of traffic that runs over it (this can be from local knowledge).

Where an assessment is carried out remotely:-

- the maximum permissible track speed is to be 10kph
- if the track break is not clean and square or there is any doubt as to the condition of the break or track support, trains should not be permitted to pass.
- the person must remain on-site and monitor the situation as directed by the Track Assessor until the qualified person arrives.
- a Track Assessor must inspect the site as soon as possible

**TABLE 1 – RAILS THAT HAVE NOT BEEN PLATED**

Answer **ALL** of the 13 questions below. **SELECT** the appropriate speed response for **EACH** answer. When **ALL** questions have been answered, (There is no need to continue answering questions once a **STOP TRAINS** response has been established) the **LOWEST** speed selected for **ANY** answer is the speed restriction to apply.

	QUESTIONS	IF YES	STOP TRAINS	Check after each train	Speed (km/hr)				
					10	20	30	40	N/A
1	If the break is <b>NOT</b> a clean break is other cracking that could lead to additional pieces falling out (do not consider fine cracking on the rail head that is continuous along the rail)?	Trains may <b>NOT</b> pass unless a detailed assessment of cracking potential indicates further cracking will not lead to an unsafe situation. <b>(Maximum speed 10kph and check cracking after each train)</b>							
2	Are there any problems with the rail in the vicinity of the break? Including:- - any fine cracking visible on the top of the rail head running along the rail - wheelburns or rail dips - significant rail wear	<b>Maximum speed of 20kph</b> for any of the following: -fine cracks (with no spalling), minor wheelburns, minor rail dips, rail wear at reportable level. <b>Maximum speed of 10kph</b> for any of the following:- heavy cracks (with spalling), large wheelburns, large rail dips or rail wear at or near condemning level							
3	Is the break non-vertical (ie not square like a rail joint) and more than 30 degrees to the vertical?	Trains <b>SHOULD NOT</b> be permitted to pass unless a detailed assessment (of the crack slope, wheel impact, axle load, rail condition, track support condition) indicates the rail end will cope without collapse <b>(Maximum speed 10kph and check after each train)</b>							
4	Does the break pass through or within 50mm of a bolt hole on the web of the rail?	Trains <b>SHOULD NOT</b> be permitted to pass unless a detailed assessment (of the crack slope, wheel impact, axle load, rail condition, track support condition) indicates the rail end will cope without collapse <b>(Maximum speed 10kph and check after each train)</b>							
5	Is the broken rail on the high rail of a curve of less than 500m radius?	Trains <b>SHOULD NOT</b> be permitted to pass unless the gap is less than 50mm and there are no ragged edges that could pick up a sharp flange on a wheel <b>(Maximum speed 10kph)</b>							
6	Does the rail gap behave like a foul joint in one direction?	Trains <b>SHOULD NOT</b> be allowed to pass in that direction							
7	Is the track vertical or lateral support poor such that the track will flog or the rail subject to excessive bending or movement? This should include consideration of: the size of the rail, the sleeper spacing, the type and condition of the sleeper/fastening, the ballast condition	Reduce train speed appropriately. If too severe trains <b>SHOULD NOT</b> be allowed to pass							
8	Is the rail unrestrained (eg a switch)	Trains <b>SHOULD NOT</b> be allowed to pass							
9	Is the track subject to 30t axle load coal trains?	30t axle trains should only be allowed to pass if the track is in good condition and well supported and at a <b>maximum speed of 20kph.</b>							
10	Is the track poorly tied considering the curvature?	Assess condition, fastening and sleeper type and track curvature and apply speed restriction or stop trains <b>(0 to 20kph depending on condition)</b>							

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Answer **ALL** of the 13 questions below. **SELECT** the appropriate speed response for **EACH** answer. When **ALL** questions have been answered, (There is no need to continue answering questions once a **STOP TRAINS** response has been established) the **LOWEST** speed selected for **ANY** answer is the speed restriction to apply.

	QUESTIONS	IF YES	STOP TRAINS	Check after each train	Speed (km/hr)					
					10	20	30	40	N/A	
11	Is there a thermit weld or joint (not including a broken rail within the joint itself)?	≥ 1m but < 2m from the break <b>AND</b> with at least 2 good sleepers in between.	Assess the support condition of the intervening sleepers and fastenings and apply appropriate speed restriction	(Maximum 20kph).						
		≥ 0.5m but < 1m from the break <b>AND</b> with at least 1 good sleeper in between.		(Maximum 10kph).						
		within 0.5m of the break <b>OR</b> in the same sleeper bay	Trains <b>MAY NOT</b> pass							
12	Is the joint break at or beyond the back bolted bolthole (ie the furthest from the joint gap)?	Trains <b>MAY NOT</b> pass								
13	Is the gap	< 30mm?	Assess gap, track curvature and track support conditions and apply restriction	(Maximum 40kph for best case <sup>4</sup> )						
		≥ 30mm but < 50mm?		(Maximum 30kph for best case <sup>4</sup> )						
		≥ 50mm but < 70mm?		(Maximum 20kph for best case <sup>4</sup> )						
		≥ 70mm but < 100mm?		(Maximum 10kph for best case <sup>4</sup> and check after each train)						
		≥ 100mm?	Trains <b>SHOULD NOT</b> be permitted to pass							

**Notes on Table 1.**

1. The most severe condition must at least be applied of any that are applicable. The maximum possible speed from Table 1 is 40km/hr.
2. All broken rails that are un-plated should be monitored continuously, at least for the passage of each train. This can be from a safe position away from the track provided the behavior of the track can be observed. Where "Check after each train" is nominated in Table 1, then the monitoring must be undertaken. If the rail gap appears to have changed it should be re-measured.
3. The potential increase in rail gap under a train should be assessed and added to the static gap measured before determining the response required. For elastic fastenings the increase should be 5mm for passenger trains, 10mm for freight trains. For non-elastic fastenings 10mm for passenger trains and 15mm for freight trains. These values can be adjusted by observing actual trains in service. For constrained situations such as within a crossing or turnout, no allowance need be made.
4. The best case is where the track is straight and well supported and restrained considering the operating loads.

**TABLE 2 – RAILS THAT HAVE BEEN PLATED**

PLATING	RESTRICTION
Plated and held with G Clamps	<b>Maximum Speed of 30kph</b> under ideal conditions <sup>1</sup> with monitoring after each train.
Plated and held with "Robel" Clamps	<b>Maximum Speed of 40kph</b> under ideal conditions <sup>1</sup> with monitoring after each train.
Plated and held with "Robel" Clamps (if gap is less than 20mm)	<b>Maximum Speed of 60kph</b> under ideal conditions <sup>1</sup> with monitoring after each train.
Plated with one bolt each side of gap	<b>Maximum Speed 40kph</b> under ideal conditions <sup>1</sup>
Plated with at least two bolts each side of gap	<b>Maximum Speed 60kph</b> under ideal conditions <sup>1</sup>

**Notes on Table 2**

- 1. Ideal conditions are a single break, clear of joint or weld with a gap less than 30mm, and if on the high rail, a curve more than 500m radius, and with good track support. The speed should be reduced for less than ideal conditions. For gaps > 30mm the restrictions relating specifically to rail gap from Table 1 are to be applied even if the broken rail is plated but no allowance need be made for opening under load (under Table 1-Note 3).*
- 2. Monitoring of plated broken rails should be arranged for a frequency depending on the condition of the break and the type and frequency of rail traffic.*
- 3. For break types that are not clean and square the effectiveness of plating needs to be carefully assessed. In some cases there would be no net improvement and the only option will be to replace the rail with a closure. In other situations there may be a limited improvement sufficient to sustain the rail until the broken section can be replaced.*
- 4. Plated broken rails that are not clean/ square should be repaired or replaced within 5 hours in any case.*
- 5. For clean square breaks the following restrictions in Table 2 are to apply. Plated clean square broken rails should be repaired or replaced within 8 hours in any case. If the break cannot be repaired in that time its condition must be reassessed and additional monitoring should be arranged.*