



Inspection and Assessment of Track Geometry

Purpose This document defines requirements for inspection and assessment of track geometry.

This document applies to all infrastructure on the Victorian Regional Infrastructure Lease managed by V/Line Passenger, Regional Network & Access Division.

History Replaces revision R03.

Revision R02 replaced portions of CEC 7/86 – Instructions Relating to the Operation of the EM100 Track Recording Car and CEC 8/86 – Track Geometry Standards, with minor changes to requirements.

Revision R03 incorporated standards for Class 2M tracks and tight gauge.

Definitions Please refer to the V/Line Passenger Corporate Dictionary for abbreviations and terms used in this document.

Process

1. INSPECTIONS

Inspection types and frequencies are specified in NIPR: 2701 – Track and Civil Technical Maintenance Plan and NIPR: 2701.1 – Technical Maintenance Plan Schedule.

Track classes are specified in the Network Service Plan, Network Operating Requirements.

Patrol Inspections

Track Patrol inspections should look for geometry defects or conditions which could affect the integrity of the track structure.

Possible such defects or conditions include:

- Irregular alignment or surface;
- Indications of problems with the underlying track and civil infrastructure;
- Abnormal rates of deterioration; or
- Evidence of recent or current movement.



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General Inspections

General Inspections (Walking Inspections) should look for the defects and conditions nominated for Patrol Inspections.

General Inspections should also include measurement of gauge and cant at locations of suspected defects, and assessment against the limits specified in this document.

Detailed Inspections

Detailed Inspections comprise Geometry Recording, and checking line and level against monuments (Alignment Examination), in accordance with this document.

Geometry Recording

Track geometry is to be recorded in accordance with the instructions for operation of current track geometry recording equipment.

2. ASSESSMENT AND RESPONSE

Geometry Exceedence Levels

Geometry standards for Class 1 tracks are set out in Attachment 1.

Geometry standards for Class 2M tracks are set out in Attachment 2.

Geometry standards for Class 2 tracks are set out in Attachment 3

Geometry standards for Class 3 tracks are set out in Attachment 4.

Geometry standards for Class 4 tracks are set out in Attachment 5.

Geometry standards for Class 5 tracks are set out in Attachment 6.

Geometry standards for sidings are set out in Attachment 7.

The specified geometry standards are applicable to broad and standard gauge tracks.

Track geometry reports must be assessed to ensure that a combination of faults at a particular location does not present a serious condition, despite individual parameters being within allowable limits.



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Track Recording Car

Maintenance Supervisor or competent delegate must travel on the Track Recording Car while it is recording in their section. They must:

- (i) Review the car’s output and make immediate assessment of all A faults;
- (ii) Arrange immediate action for high risk faults or combinations of faults;
- (iii) Set the priority and arrange for the A faults to be inspected, verified and repaired;
- (iv) Arrange for a suitably qualified and competent employee to promptly inspect, verify and repair their allotted faults and report daily the action taken on a NIFO: 2706.3, Track Recorder Fault Check Sheet or similar;
- (v) Monitor progress on a daily basis until all A faults are addressed; and
- (vi) Program and arrange the removal of B faults

A faults are to be managed in accordance with NIPR: 2606, Management of Inspection Outcomes. All faults which have not been repaired within one week must have their management plan documented and forwarded to the Maintenance Manager, Track and Civil. Attachment 8, A Fault Priority Guidelines, includes guidance on fault management.

All A faults should be visually inspected during track inspections until repaired. Where deterioration is likely A faults should be re-inspected on foot and measurements taken, where possible, at least weekly. The other A faults except tight gauge should be re-inspected on foot and measurements taken, where possible, at least every 4 weeks.

Where a fault is shown by inspection to be a measurement error or limitation in measurement technique (such as line faults detected in turnouts when traversed in the diverge move by the Track Recorder Car) the Maintenance Supervisor is to change the status to “NOT FAULT” in Maximo without physical action being taken.

Track Geometry Quality

Track geometry quality on Passenger and Freight lines, assessed separately for each line, is to be maintained to achieve the target values in Table 1.

Class	1	2M	2	3	4	5
Target VQI	40	45	51	61	71	81

Table 1: Standards for Track Geometry Quality

Variations

Exceedences or asset conditions which deviate from the specified



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requirements are to be managed in accordance with NIPR: 2606 – Management of Inspection Outcomes. Long-term high risk or greater issues are to be managed in accordance with SAPR: 009, Enterprise Risk Management (EWRM) Guide.

Related Documents

- SAPR: 009, Enterprise Risk Management (EWRM) Guide
- NIPR: 2606 – Management of Inspection Outcomes
- NIPR: 2701 – Track and Civil Technical Maintenance Plan
- NIPR: 2701.1 – Technical Maintenance Plan Schedule
- NIPR: 2705 – Inspection and Assessment of Operating Standards for Clearances
- NIFO: 2706.3 - Track Recorder Fault Check Sheet



Inspection and Assessment of Track Geometry
 (Attachment 1 – Geometry Standards for Class 1 Tracks)

Parameter		Exceedence Levels [†]	
		Sub-Level A	Sub-Level B
Wide Gauge ^a	Measured by track recorder [#]	18 mm	12 mm
Tight Gauge		10 mm	7 mm
Line	On 10 m chord	18 mm	10 mm
Twist	In 3.5 m chord	15 mm	10 mm
	In 10 m chord	30 mm	18 mm
Cant [^]		28 mm	18 mm
Top	Defects in 10 m chord	18 mm	12 mm

^a Absolute gauge limit is 38 mm, trains are not permitted to operate above this limit.

[#] Gauge as measured by the track recorder may be greater than that measured in the field due to the dynamic nature of the measurement. Nominally for gauge measured in the field, 4 mm should be added to the measurements. Also add measurements for working plates etc.

[^] Maximum maintenance tolerances for deviation from design cant on straights, curves or in transitions is 18mm.

[†] Exceedence sub-level A = Priority Exceedence: faults of this level must receive prompt attention, be repaired as soon as possible, or have speed restrictions applied where considered appropriate.
 Exceedence sub-level B = General Maintenance Exceedence: the levels applicable to Track Patrols and Walking Inspections, to be used to programme general track maintenance.



Inspection and Assessment of Track Geometry
(Attachment 2 – Geometry Standards for Class 2M Tracks)

Parameter		Exceedence Levels [†]	
		Sub-Level A	Sub-Level B
Wide Gauge ^a	Measured by track recorder [#]	18 mm	13 mm
Tight Gauge		10 mm	7 mm
Line	On 10 m chord	20 mm	12 mm
Twist	In 3.5 m chord	18 mm	12 mm
	In 10 m chord	35 mm	20 mm
Cant [^]		30 mm	20 mm
Top	Defects in 10 m chord	21 mm	13 mm

^a Absolute gauge limit is 38 mm, trains are not permitted to operate above this limit.

[#] Gauge as measured by the track recorder may be greater than that measured in the field due to the dynamic nature of the measurement. Nominally for gauge measured in the field, 4 mm should be added to the measurements. Also add measurements for working plates etc.

[^] Maximum maintenance tolerances for deviation from design cant on straights, curves or in transitions is 20mm.

[†] Exceedence sub-level A = Priority Exceedence: faults of this level must receive prompt attention, be repaired as soon as possible, or have speed restrictions applied where considered appropriate.
Exceedence sub-level B = General Maintenance Exceedence: the levels applicable to Track Patrols and Walking Inspections, to be used to programme general track maintenance.



Inspection and Assessment of Track Geometry

(Attachment 3 – Geometry Standards for Class 2 Tracks)

Parameter		Exceedence Levels [†]	
		Sub-Level A	Sub-Level B
Wide Gauge* ^a	Measured by track recorder [#]	18 mm	15 mm
Tight Gauge		14 mm	10 mm
Line	On 10 m chord	25 mm	18 mm
Twist	In 3.5 m chord	20 mm	15 mm
	In 10 m chord	40 mm	30 mm
Cant [^]		35 mm	25 mm
Top	Defects in 10 m chord	25 mm	20 mm

* Gauge may be permitted to exceed the specified exceedence levels where the excess is due solely to wear and provided there is no evidence of rail working or back canting.

^a Absolute gauge limit is 38 mm, trains are not permitted to operate above this limit.

[#] Gauge as measured by the track recorder may be greater than that measured in the field due to the dynamic nature of the measurement. Nominally for gauge measured in the field, 4 mm should be added to the measurements. Also add measurements for working plates etc.

[^] Maximum maintenance tolerances for deviation from design cant on straights or curves is 25mm and in transitions is 20mm.

[†] Exceedence sub-level A = Priority Exceedence: faults of this level must receive prompt attention, be repaired as soon as possible, or have speed restrictions applied where considered appropriate.

Exceedence sub-level B = General Maintenance Exceedence: the levels applicable to Track Patrols and Walking Inspections, to be used to programme general track maintenance.



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(Attachment 4 – Geometry Standards for Class 3 Tracks)

Parameter		Exceedence Levels [†]	
		Sub-Level A	Sub-Level B
Wide Gauge* ^a	Measured by track recorder [#]	22 mm	15 mm
Tight Gauge		14 mm	10 mm
Line	On 10 m chord	30 mm	20 mm
Twist	In 3.5 m chord	28 mm	22 mm
	In 10 m chord	45 mm	35 mm
Cant [^]		40 mm	30 mm
Top	Defects in 10 m chord	28 mm	22 mm

* Gauge may be permitted to exceed the specified exceedence levels where the excess is due solely to wear and provided there is no evidence of rail working or back canting.

^a Absolute gauge limit is 38 mm, trains are not permitted to operate above this limit.

[#] Gauge as measured by the track recorder may be greater than that measured in the field due to the dynamic nature of the measurement. Nominally for gauge measured in the field, 4 mm should be added to the measurements. Also add measurements for working plates etc.

[^] Maximum maintenance tolerances for deviation from design cant on straights or curves is 30mm and in transitions is 25mm.

[†] Exceedence sub-level A = Priority Exceedence: faults of this level must receive prompt attention, be repaired as soon as possible, or have speed restrictions applied where considered appropriate.

Exceedence sub-level B = General Maintenance Exceedence: the levels applicable to Track Patrols and Walking Inspections, to be used to programme general track maintenance.



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(Attachment 5 – Geometry Standards for Class 4 Tracks)

Parameter		Exceedence Levels [†]	
		Sub-Level A	Sub-Level B
Wide Gauge* ^a	Measured by track recorder [#]	25 mm	18 mm
Tight Gauge		18 mm	14 mm
Line	On 10 m chord	35 mm	25 mm
Twist	In 3.5 m chord	30 mm	25 mm
	In 10 m chord	55 mm	40 mm
Cant [^]		55 mm	45 mm
Top	Defects in 10 m chord	35 mm	25 mm

* Gauge may be permitted to exceed the specified exceedence levels where the excess is due solely to wear and provided there is no evidence of rail working or back canting.

^a Absolute gauge limit is 38 mm, trains are not permitted to operate above this limit.

[#] Gauge as measured by the track recorder may be greater than that measured in the field due to the dynamic nature of the measurement. Nominally for gauge measured in the field, 4 mm should be added to the measurements. Also add measurements for working plates etc.

[^] Maximum maintenance tolerances for deviation from design cant on straights or curves is 45mm and in transitions is 30mm.

[†] Exceedence sub-level A = Priority Exceedence: faults of this level must receive prompt attention, be repaired as soon as possible, or have speed restrictions applied where considered appropriate.

Exceedence sub-level B = General Maintenance Exceedence: the levels applicable to Track Patrols and Walking Inspections, to be used to programme general track maintenance.



Inspection and Assessment of Track Geometry
 (Attachment 6 – Geometry Standards for Class 5 Tracks)

Parameter		Exceedence Levels [†]	
		Sub-Level A	Sub-Level B
Wide Gauge* ^a	Measured by track recorder [#]	25 mm	20 mm
Tight Gauge		18 mm	14 mm
Line	On 10 m chord	40 mm	35 mm
Twist	In 3.5 m chord	40 mm	30 mm
	In 10 m chord	60 mm	50 mm
Cant [^]		55 mm	45 mm
Top	Defects in 10 m chord	40 mm	30 mm

* Gauge may be permitted to exceed the specified exceedence levels where the excess is due solely to wear and provided there is no evidence of rail working or back canting.

^a Absolute gauge limit is 38 mm, trains are not permitted to operate above this limit.

[#] Gauge as measured by the track recorder may be greater than that measured in the field due to the dynamic nature of the measurement. Nominally for gauge measured in the field, 4 mm should be added to the measurements. Also add measurements for working plates etc.

[^] Maximum maintenance tolerances for deviation from design cant on straights or curves is 45mm and in transitions is 40mm.

[†] Exceedence sub-level A = Priority Exceedence: faults of this level must receive prompt attention, be repaired as soon as possible, or have speed restrictions applied where considered appropriate.
 Exceedence sub-level B = General Maintenance Exceedence: the levels applicable to Track Patrols and Walking Inspections, to be used to programme general track maintenance.



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(Attachment 7 – Geometry Standards for Sidings)

Parameter		Exceedence Levels [†]	
		Sub-Level A	Sub-Level B
Wide Gauge * a		30 mm	20 mm
Tight Gauge		18 mm	14 mm
Line		No sharp changes in alignment	
Twist	In 2 m chord	20 mm	10 mm
	In 10 m chord	60 mm	50 mm
Cant **		75 mm	50 mm
Top		No sharp changes in vertical alignment	
<p>* Gauge may be permitted to exceed the specified exceedence levels where the excess is due solely to wear and provided there is no evidence of rail working or back canting.</p> <p>a Absolute gauge limit is 38 mm, trains are not permitted to operate above this limit.</p> <p>** Cant should not normally be applied to sidings.</p> <p>† Exceedence sub-level A = Priority Exceedence: faults of this level must receive prompt attention, be repaired as soon as possible, or have speed restrictions applied where considered appropriate. Exceedence sub-level B = General Maintenance Exceedence: to be used to programme general track maintenance.</p>			



Inspection and Assessment of Track Geometry
 (Attachment 8 – A Fault Priority Guidelines)

	Track Classes					
	1	2M	2	3	4	5
Passenger Speed	160	130	115	100	65	40
Freight Speed	80	80	80	80	65	40
A Fault Priority	Fault Thresholds (mm)					
	Twist 3.5m					
Low	15	18	20	28	30	40
Medium	20	20	28	30	40	>40
High	28	28	30	40	40	>40
	Twist 10m					
Low	30	35	40	45	55	60
Medium	40	40	45	55	60	65
High	45	45	55	60	65	65
	Top					
Low	18	21	25	28	35	40
Medium	25	25	28	35	40	>40
High	28	28	35	40	40	>40
	Line					
Low	18	20	25	30	35	40
Medium	25	25	30	35	40	>40
High	30	30	35	40	40	>40
	Wide Gauge					
Low	18	18	18#	22#	25#	25#
Medium	22	22	22#	25#	30#	>30#
High	25	25	25#	25#	30#	>30#
	Tight Gauge					
Low	10	10	14	14	18	18
Medium	14	14	14	14	18	21
High	14	14	18	18	21	21
	Cant Transitions*					
Low	18	20	20	25	30	40
Medium	20	25	25	30	40	40
High	25	30	30	40	40	40
	Cant Curve*					
Low	18	20	25	30	45	45
Medium	25	25	30	45	45	45
High	30	30	45	45	45	45

Notes :

For high priority, twist, top, line, cant*, tight gauge and wide gauge# A faults, the speed must be restricted to the speed of the class of track where the medium fault priority has been exceeded. For example, on class 1 track a twist 3.5 m of 32 mm, exceeds the class 3 medium fault priority of 30mm so speed should be restricted to 100 kph.

Combinations of twist/top, line or gauge should be treated as one priority higher.

*Cant variation from the curve register.

Except where it is due to rail wear.