भारत सरकार (GOVERNMENT OF INDIA)
रेल मंत्रालय (MINISTRY OF RAILWAYS)
रेलवे बोर्ड (RAILWAY BOARD)
****

No. 2018/CE-II/CS/1 New Delhi, dated 26.08.2019

The General Managers (Engg.)- CR, ER, ECR, ECoR, NR, NCR, NER, NFR, NWR, SR, SCR, SER, SECR, SWR, WR, WCR and Metro Railway/Kolkata.
The General Manager (Const.), N.F.Railway, Guwahati.
The General Manager/CORE/Allahabad.

Principal Financial Advisor, All Indian Railways
The CAO/Const. All Indian Railways.
The General Managers (Engg.) – ICF/Chennai, RCF/Kapurthla, DLW/Varanasi, CLW/Chittranjan, Rail Wheel Factory /Yelahanka, Bangalore & DMW/Patiala.

The Director General (Track), RDSO/Alambagh, Lucknow.
Chief Commissioner of Railway Safety, Lucknow.

Managing Director, IRCON, New Delhi.
Managing Director, RITES, RITES (RITES BHAWAN) NBo.1 Sector-29 Gurgaon-122001.
Managing Director, DMRC, Metro Bhawan, Barakhamba lane, New Delhi.
Managing Director, CONCOR, New Delhi.
Managing Director, RVNL, August Kranti Bhawan, Bhikaji Cama Place, New Delhi.
Managing Director, DFCCIL, Pragati Maidan, Metro Station, New Delhi.
Managing Director, PIPAVAV Railway Corp. Ltd., 14th Floor, B-Wing, Statesman House 148, Barakhamba Road, Canaught Place New Delhi Central Delhi
Managing Director, MRVC, Church Gate station Building 2nd Floor, Mumbai – 400020.
Managing Director, RLDA, IRCON Office Compound, Next to Safdarjang Rly. station, Motibagh-I, New Delhi.
Managing Director, Konkan Railway Corporation Ltd, Belapur Bhawan, Sector-11, CBD Belapur. Mumbai. Pin - 400614.

Director, IRICEN, Pune.
Director, IRIEEN, Nasik.
Director, IRISET, Secunderabad.
Director, IRIMEE, Jamalpur.
Director, IRITM, Vill. Kanausi, Hardoi, Manik Nagar, Lucknow.
Director General, Railway Staff College, Vadodara.
Genl. Secretaries, AIRF, NFIR, IRPOF, FROA, AIRPFA, DAI (Railways) Rail Bhawan, New Delhi.

Sub: Correction Slip No. 150 to the Indian Railways Permanent Way Manual.
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Ministry of Railways (Railway Board) has decided that correction/addition as indicated in the enclosed Correction Slip No.150 dated 26.08.2019, to relevant para of the IRPWM, be made.

Receipt of this letter may please be acknowledged.

26/8/19

(Pradeep Nagar)
Director Civil Engg.(P)
Railway Board

No. 2018/CE-II/CS/1 New Delhi, dated. 26.08.2019

Copy to :
Sr. PPS/PS to CRB, FC, ME, MRS, MS, MT, M(Tr.), Secretary.

AM(CE), AM(Works), AM(Budget), AM(Elect.), AM(Fin.), AM(Sig.), AM(Plg.), AM(Staff), AM(Mech. Engg.), AM(PU.), AM(Tele.), AM(TT), PED(Bridge), PED(Vigilance), PED(Stn.Dev.Engg.) PED(Safety), DG(RS), AM(C&IS), AM(T&C), AM(Comml.).

EDCE(P), EDTK(M), EDTK(MC), EDTK(P), EDCE(G), EDCE(B&S), ED(L&A)I, ED(Stn. Dev. Engg.) ED(Works), ED(WP), EDV(E), ED(Project Monitoring), ED(Safety), EDF(X)I, EDF(X)II, ED/INFRA/Civil. ED/E(Co-ord),
DTK(MC), DTK(M), DTK(P), DCE(B&S), DCE(B&S)II, Dir(Works)-I, Dir(Works)-II, Dir.Works(Plg.), DVE-I & DVE-II,

Director/C&IS - for uploading on Railway Board website.

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INDIAN RAILWAYS PERMANENT WAY MANUAL
ADDENDUM AND CORRIGENDUM SLIP NO. 150 DATED 26.08.2019

1. The existing Para 224 (2) (e) (v) of Indian Railways Permanent way Manual shall be replaced by following:

Para 224 (2) (e) (v) - Gauge in Floating Condition:

While it is desirable to maintain correct gauge, variation in gauge may be there due to age and condition of the rail, sleeper and fastenings. The limits of gauge as per measurement in floating condition, for the guidance of the Engineering officials regarding condition of track from passenger comfort perspective, shall be as given below, provided that generally a uniform gauge can be maintained over long lengths. In case of exceedance of these limits, the results of last TRC/OMS shall be analyzed for planning suitable maintenance action.

Broad Gauge	
a) On straight	*-6mm to +6mm*
b) On curves with radius 440 m or more	*-6mm to +15mm*
c) On curves with radius less than 440 m	*upto +20mm*

Note : These tolerances are with respect to nominal gauge of 1676 mm.

Metre Gauge	
a) On straight	*-3mm to +6mm*
b) On curves with radius 290m or more	*-3mm to +15mm*
c) On curves with radius less than 290 m	*upto +20mm*

Note : These tolerances are with respect to nominal gauge of 1000mm.

Narrow Gauge	
a) On straight	*-3mm to +6mm*
b) On curves with radius 175m or more	*-3mm to +15mm*
c) On curves with radius less than 175 m	*upto +20mm*

Note: The above tolerances are with respect to nominal gauge of 762mm.

2. A new Para 224 (2) (f) (xii) in Indian Railways Permanent way Manual shall be added as under:

Para 224 (2) (f) (xii) - Twist in Floating Condition:

It is desirable to maintain the track geometry for a comfortable ride at the Sectional Speed. The limits of twist as per measurement in floating condition, for guidance of the Engineering officials regarding condition of track from passenger comfort perspective, shall be as under (to be measured on a base of 3.0 m)

a) On straight and curve track, other than transition – 3.5 mm/m
b) On transition of curve – 2.1 mm/m (Local defects above Designed value)

In case of exceedance of above limits, the results of last TRC/OMS shall be analyzed for planning suitable maintenance action.

3. A new **Para 224 (2) (f) (xiii)** in Indian Railways Permanent way Manual shall be added as under:

Para 224 (2) (f) (xiii) - Following track parameters, in floating conditions, for guidance of field officials are stipulated for maintenance of track where speeds are low such as worksite, yard line, etc:

Speed band (in kmph)	Peak value of UN in mm at 3.6 m chord	Peak value of Twist in mm at 3.0 m chord	Permissible gauge range
45	22	18	-10 to +27 mm
30	24	21	-10 to +27 mm
15	33	25	-12 to +27 mm

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4. The existing **Para 604(2)** of Indian Railways Permanent way Manual shall be replaced by following:

Para 604(2) Parameters Measured

- Unevenness of Left & Right Rail (on two user selectable chords)
- Alignment of Left & Right Rail (on two user selectable chords)
- Twist (calculated on two user selectable bases)
- Variation of gauge (on 50 metre moving average) and/or variation of gauge over nominal gauge.
- Vertical and lateral accelerations on coach floor above bogie pivot
- Curve details (only in contactless laser based TRCs)
- Speed of Recording

5. A new **Para 604(5)** in Indian Railways Permanent way Manual shall be added as under:

Para 604(5) Track Quality Index (TQI) : TQI is prescribed for overall assessment of Track quality for IR routes categorized in four different speed bands.

Calculation of parameter wise Indices and TQI – Using the values of standard deviation, the value of two indices viz. Unevenness Index (UNI) &Alignment Index (ALI) on short and long chord and the Track Quality Index (TQI) for each block of 200 m is computed as explained below:

$$UI\text{-}S = 100*e^{[-((SD_M_AUN\text{-}S) - (SD_NTL_UN\text{-}S))/((1.3*SD_NBML_UN\text{-}S) - (SD_NTL_UN\text{-}S))]}$$

$$UI\text{-}L = 100*e^{[-((SD_M_AUN\text{-}L) - (SD_NTL_UN\text{-}L))/((1.3*SD_NBML_UN\text{-}L) - (SD_NTL_UN\text{-}L))]}$$

$$AL\text{-}S = 100*e^{[-((SD_M_AAL\text{-}S) - (SD_NTL_AL\text{-}S))/((1.3*SD_NBML_AL\text{-}S) - (SD_NTL_AL\text{-}S))]}$$

$$AL\text{-}L = 100*e^{[-((SD_M_AAL\text{-}L) - (SD_NTL_AL\text{-}L))/((1.3*SD_NBML_AL\text{-}L) - (SD_NTL_AL\text{-}L))]}$$

Where

UI-S	=	Unevenness Index on short chord i.e on 9.0 meter chord
UI-L	=	Unevenness Index on long chord i.e on 18.0 meter chord
AI-S	=	Alignment Index on short chord i.e on 9.0 meter chord
AI-L	=	Alignment Index on long chord i.e on 15.0 meter chord
SD_M_AUN-S	=	Average of measured SD value of unevenness of left and right rail on short chord
SD_NTL _UN-S	=	SD value of New Track Limit of unevenness on short chord
SD_NBML _UN-S	=	SD value of Need Based Track Limit of unevenness on short chord
SD_M _AUN-L	=	Average of measured SD value of unevenness of left and right rail on long chord
SD_NTL _UN-L	=	SD value of New Track Limit of unevenness on long chord
SD_NBML_UN-L	=	SD value of Need Based Track Limit of unevenness on long chord
SD_M_AAL-S	=	Average of measured SD value of alignment of left and right rail on short chord
SD_NTL _AL-S	=	SD value of New Track Limit of alignment on short chord
SD_NBML_AL-S	=	SD value of Need Based Track Limit of alignment on short chord
SD_M_AAL-L	=	Average of measured SD value of alignment of left and right rail on long chord
SD_NTL_AL-L	=	SD value of New Track Limit of alignment on long chord
SD_NBML_AL-L	=	SD value of Need Based Track Limit of alignment on long chord

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Proposed Track Quality Index on Short Chord

TQI-S = (UI-S + AI-S)/2

Proposed Track Quality Index on Long Chord (For Speed > 100 kmph only)

TQI-L =(UI-L + AI-L)/2

Proposed Composite Track Quality Index (For Speed > 100 kmph only)

TQI-C = (UI-S + UI-L + AI-S + AI-L)/4

TQI is only an indicator for overall assessment of track quality. Maintenance of track has to be planned on the basis of SD and peak based tolerances of different track parameters.

6. The existing **Para 605(a)** of Indian Railways Permanent Way Manual shall be replaced by following:

Para 605(a) Details of every block of 200 Metre

- Standard Deviation value of Unevenness of Left & Right Rail on two user selectable chords
- Standard Deviation value of Alignment of Left & Right Rail on two user selectable chords
- Average speed for 200 metre block
- Parameter Index for Unevenness (UI), Alignment (AI) on both user selectable chords.
- Track Quality Index (TQI) on both user selectable chords.
- Composite Track Quality Index for Sections having Speed > 100 kmph (TQI-C)
- Maintenance Instructions corresponding to Unevenness and Alignment over PML and NBML
- Vertical and Lateral Ride Index
- Average of variation of gauge over nominal gauge (1676 mm)

7. The existing **Para 607(1), (2), (3), (4), (5)** of Indian Railways Permanent Way Manual shall be replaced by following:

Para 607(1) Maintenance Limits for Alignment, Unevenness, Gauge and Twist Parameters based on TRC Results – For planning/ taking up maintenance w.r.t. above parameters based on TRC results, track shall be categorized under following three categories:

(i) Track requiring planned maintenance
(ii) Track requiring need based maintenance
(iii) Track requiring urgent maintenance

'Planned Maintenance Limit (PML)'- These tolerances provide maintainer a guidance to plan through maintenance of track in a complete block section. These Limits, if exceeded, require that track geometry condition be analyzed and considered for planned maintenance operations. The Planned Maintenance Limits (PML) for Unevenness and Alignment are based on Standard Deviation (SD) values, as these parameters affect Ride quality.

'Need Based Maintenance Limit (NBML)'- These limits are for applying timely correction before the defect size grows to the level of 'Urgent Maintenance Limit (UML)', requiring a traffic slow down. Allowable time for attention to defects exceeding the NBML would depend upon the magnitude of the defect and various factors affecting track geometry deterioration such as sectional speed, axle load, traffic volume etc. The Need Based Maintenance Limits (NBML) are based on Standard Deviation and Peak Values for Unevenness and Alignment. For Gauge and Twist, these limits are based on Peak Values.

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'Urgent Maintenance Limits (UML)'- These limits are so specified that upon their excedance, the permitted speed should be slowed down and restored only after attending the track. These are laid in terms of acceleration limits on comfort consideration and peak values for Gauge and Twist.

Para 607(2) Based on TRC and OMS results, various limits of PML, NBML and UML for Unevenness, Alignment, Gauge and Twist parameters for different speed bands are stipulated as below:

(a) Speed upto 100 kmph

SN	Parameter	Planned Maintenance Limits (PML)	Need Based Maintenance Limits (NML)	Urgent Maintenance Limits (UML)
1	**Unevenness**			
1.1	UN-1	SD- 5.0 mm	SD-6.8mm Peak-20mm	Vertical and lateral acceleration peak of 0.30g
1.2	UN-2	-	-	
2	**Alignment**			
2.1	AL-1	SD- 3.3mm	SD-4.9mm Peak-15mm	
2.2	AL-2	-		
3	**Gauge**			
3.1	**Mean gauge over 200m section over nominal gauge**			
(a)	Straight	-	-8mm to +10mm	-10mm to +12mm
(b)	Curve with radius 440m or more	-	-5mm to +14mm	-7mm to +17mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)	-	-5mm to +18mm	-7mm to +20mm
3.2	**Isolated defects- Nominal track gauge to peak value**			
(a)	Straight	-	-10mm to +12mm	-12mm to +15mm
(b)	Curve with radius 440m or more	-	-7mm to +17mm	-11mm to +20mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)	-	-6mm to +22mm	-8mm to +25mm
4.	**Twist (TW-1)**		5 mm/m	7mm/m

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(b) **Speed above 100 kmph and upto 110 kmph**

SN	Parameter	Planned Maintenance Limits (PML)	Need Based Maintenance Limits (NML)	Urgent Maintenance Limits (UML)
1	**Unevenness**			
1.1	UN-1	SD- 3.8 mm	SD-5.5mm Peak-17mm	Vertical and lateral acceleration peak of 0.30g
1.2	UN-2	SD- 5.4mm	SD-7.5mm Peak-23mm	
2	**Alignment**			
2.1	AL-1	SD- 2.5mm	SD-3.9mm Peak-12mm	
2.2	AL-2	SD- 4.1mm	SD-6.7mm Peak-20mm	
3	**Gauge**			
3.1	**Mean gauge over 200m section over nominal gauge**			
(a)	Straight	-	-8mm to +10mm	-10mm to +12mm
(b)	Curve with radius 440m or more	-	-5mm to +14mm	-7mm to +17mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)	-	-5mm to +18mm	-7mm to +20mm
3.2	**Isolated defects- Nominal track gauge to peak value**			
(a)	Straight	-	-10mm to +12mm	-12mm to +15mm
(b)	Curve with radius 440m or more	-	-7mm to +17mm	-11mm to +20mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)		-6mm to +22mm	-8mm to +25mm
4.	**Twist (TW-1)**		4 mm/m	7mm/m

(c) **Speed above 110 kmph and upto 130 kmph**

SN	Parameter	Planned Maintenance Limits (PML)	Need Based Maintenance Limits (NML)	Urgent Maintenance Limits (UML)
1	**Unevenness**			
1.1	UN-1	SD- 3.3 mm	SD-4.9mm Peak-15mm	Vertical and lateral acceleration peak of 0.25g
1.2	UN-2	SD- 5.1mm	SD-7.4mm Peak-22mm	
2	**Alignment**			
2.1	AL-1	SD- 2.5mm	SD-3.6mm Peak-11mm	
2.2	AL-2	SD- 3.5mm	SD-5.3mm Peak-16mm	

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3	**Gauge**			
3.1	**Mean gauge over 200m section over nominal gauge**			
(a)	Straight	-	-8mm to +10mm	-10mm to +12mm
(b)	Curve with radius 440m or more	-	-5mm to +14mm	-7mm to +17mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)		-5mm to +18mm	-7mm to +20mm
3.2	**Isolated defects- Nominal track gauge to peak value**			
(a)	Straight	-	-10mm to +12mm	-12mm to +15mm
(b)	Curve with radius 440m or more	-	-7mm to +17mm	-11mm to +20mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)	-	-6mm to +22mm	-8mm to +25mm
4.	**Twist (TW-1)**		4 mm/m	6mm/m

(d) Speed above 130 kmph and upto 160 kmph

SN	Parameter	Planned Maintenance Limits (PML)	Need Based Maintenance Limits (NML)	Urgent Maintenance Limits (UML)
1	**Unevenness**			
1.1	UN-1	SD- 2.9 mm	SD-4.4mm Peak-13mm	Vertical and lateral acceleration peak of 0.20g
1.2	UN-2	SD- 4.4mm	SD-6.6mm Peak-20mm	
2	**Alignment**			
2.1	AL-1	SD- 1.9mm	SD-3.6mm Peak-11mm	
2.2	AL-2	SD- 2.5mm	SD-4.9mm Peak-15mm	
3	**Gauge**			
3.1	**Mean gauge over 200m section over nominal gauge**			
(a)	Straight	-	-6mm to +10mm	-8mm to +12mm
(b)	Curve with radius 440m or more	-	-5mm to +13mm	-7mm to +15mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)	-	-5mm to +18mm	-7mm to +20mm
3.2	**Isolated defects- Nominal track gauge to peak value**			
(a)	Straight	-	-8mm to +12mm	-10mm to +15mm
(b)	Curve with radius 440m or more	-	-6mm to +16mm	-9mm to +20mm
(c)	Curve with radius less than 440m (Permissible speed as per relevant para of IRPWM)	-	-6mm to +22mm	-8mm to +25mm
4	**Twist (TW-1)**		3.5 mm/m	5mm/m

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Notes for all Tables above:

1. **SD** – Standard Deviation
2. For measurement of gauge and twist in floating condition, IRPWM Paras 224(2)(e)(v), 224(2)(f)(xii) and 224(2)(f)(xiii) should be referred to.
3. Peak based limits are not stipulated for unevenness and alignment for planned maintenance as the planned maintenance is to be carried out by track machines for which the planning will be based on standard deviation value.
4. In case of curve, the limits for alignment are above average versine. In addition to above, instructions regarding maintenance of curves stipulated under Para 421 shall be applicable.
5. In case of acceleration peak exceeding the UML for a speed band, the permitted speed should be reduced to a lower speed level keeping in view the aforesaid criteria and be restored only after attending the track.
6. Tolerance in gauge above are with respect to nominal gauge of 1676 mm. Isolated defects are for measurement of gauge at sleeper locations. For maintenance of gauge on the Turnout, tolerances stipulations under para 237 of IRPWM would be applicable, which are as per measurement in floating condition.
7. Twist to be measured on 3.0 m base (TW-1).

Para 607(3) The stability of train against derailment depends upon on several factors such as track geometry, vehicle characteristics and state of their maintenance and speed of the particular vehicle at relevant point of time etc. Rail wheel interaction is, thus, a complex phenomenon and, therefore, safety tolerance for track alone cannot be prescribed in Isolation. Accordingly, safety tolerances for maintenance of track have not been prescribed on Indian Railways. Each derailment case, therefore, needs careful examination of all available evidences, in respect of track, rolling stock, speed and other factors considered relevant, to arrive at the cause.

The provisions and tolerances mentioned in Para 607 (1), (2) and elsewhere in this Manual are with a view to maintain track geometry for good riding comfort.

8. The existing **Para 610 and Para 614** of Indian Railways Permanent Way Manual shall be replaced by following:

Para 610 Action to be taken on Track Recording Results – Spots/blocks requiring attention as per parameter limits, and acceleration peak limits set as UML under para 607(2) should be noted by the ADEN and SSE accompanying the car and requisite attention should be given to these spots/blocks. Track Recording results should be analyzed in the Divisional Office. A comparison of the records of each section shall be made with the previous run. Analysis shall be done for identifying the locations needing attention for onward transmission to concerned maintenance units. Special attention should be paid by the maintenance units to the places where magnitude of irregularities is high and where the defect locations are reappearing in successive recording runs.

Para 614 Oscillation monitoring System-

(1) General- OMS equipments are used for Oscillation monitoring by using a portable accelerometer and transducers converting the oscillations to electrical signals which can be recorded electronically and processed on PC.

(2) Operation- OMS equipment is kept on the coach floor of the fastest train in the section, as close to the bogie pivots as possible. It is preferable that same coach and the same vehicular position are used in successive runs. The accelerations are transferred to electronic recorder and are readable on the LCD display on real time basis. The stored data can be transferred to TMS Computer for maintenance planning.

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This equipment measures the track performance by measurement of vehicles response in terms of vertical and lateral accelerations. The real time output of the equipment is in the form of value of peaks exceeding the limiting value, their location and Ride index. These values are available for both vertical and lateral accelerations.

(3) Frequency of Recording-

A) Broad Gauge-
Speed above 100 Kmph - Once every month
Others - Once in two months

B) Metre Gauge-
Speed above 75 Kmph - Once every month
Others - Once in two months

(4) Recording of Defects- To assess the track quality, vertical and lateral acceleration peaks exceeding the values as below, are to be considered.

Broad Gauge :
Routes above 110 Kmph on A & B routes – Greater than 0.15 g.

Other routes up to 110 kmph- Greater than 0.2 g.

Metre Gauge : Greater than 0.2 g.

(5) Classification of Track Quality- Following criteria is to be used (average total number of peaks per km) to classify a continuous section for track quality (SSE/Pway's jurisdiction/Subdivision/division) :

	Very Good	Good	Average
Speed above 110 kmph	Less than 1.0	1-2	Greater than 2
Others	Less than 1.5	1.5-3.0	Greater than 3

The above criteria are for only judging the quality of track.

(6) Action shall be taken in accordance to Para 607(1) and (2) for attention to track.

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