भारतसरकार/GOVERNMENT OF INDIA
रेलमंत्रालय/MINISTRY OF RAILWAYS
(रेलवेबोर्ड) (RAILWAY BOARD)

सं/No. 2019/Track-I(P)/1175HT Rails/Vol.I

दिनांक/Date:14.08.2023

As per mailing list

विषय/Sub: Guidelines regarding adoption of R350HT grade rails on IR.
संदर्भ/Ref: RDSO's letter No. CT/Rail Handling dated 09.02.2023 (copy enclosed).

Indian Railway has taken a decision to improve the quality of rails and with significant indigenous efforts, R350HT grade rails have been developed. Their un-interrupted use is required on the Railways. Accordingly following Instructions are being issued regarding precaution to be taken during unloading, handling and advance preparation for laying of these rails for clarity and guidance of all concerned:

1. Guidelines for R350HT Grade Rails:

i. 350HT rails having minimum Elongation is 9% are considered more brittle than R260 and 880 grade rails which needs more smooth and gentle handling, and unloading requirements in the field. Hence, handling and unloading of long rail panels of 350 HT rails requires more mechanised and improved system. Accordingly, Revised "Guideline for handling and stacking of rails (CT-35) February-2023" after incorporating R350HT grade rails has been issued vide RDSO's letter dated 09.02.2023.

ii. R350HT grade rail of EN 13674-1, having UTS value of 1175MPa is already in extensive use over world Railways and considered as proven grade and hence no field trial is required. It is considered that separate trial of track components i.e. Turnouts, SEJs and Glued Joints manufactured with these rails would not be required (except Thick Web Switches (TWS) for which the provisions contained in "Policy on Domestic Rail Plants for Asymmetrical Rails of Different Grades, No. CT/Policy/02 dated 28.01.2022" shall be followed **Annexure-A**). Manufacture of these components would be done using R350 grade rails, following the same drawings and specifications as is being done for 880/R260 grade rails.
Therefore, this grade rail is included in IRS-T-12:2009. However, since this grade rails will be manufactured by Domestic rail manufacturer and will be used for the first time on IR, therefore, rails shall be kept under close monitoring for any unusual behaviour, if any, for a stipulated period as per provisions of "Policy on Domestic Rail Plants for Symmetrical Rails of different grades (No. CT Policy/01, Revised March 2023)" issued vide RDSO's letter dated 21.03.2023 (**Annexure-B**).

2. Development of Venders for AT welding and FB welding of 60 Kg/60E1 R350HT grade Rails

A. AT welding of R350HT grade Rails:

1. AT welding technique for 60 Kg/60E1 R350HT grade rails has been developed and two vendors (M/s The India Thermit Corporation, Kanpur and M/s Chakradhar Industries LLP, Mumbai) have been provisionally approved and included in the vendor list of

14.8.23

RDSO vendors for developmental orders. Firms will carry out the field trial of above technique in their first order, after availability of rails in field.

2. In addition to above, two more firms (M/s ORA IPL, Kanpur and M/s Oberoi Thermit Pvt. Ltd., Haridwar) have also been conditionally approved and included in the vendor list of RDSO vendors for developmental orders. These two firms are also eligible for participation in the tenders.

B. Combination AT welding of 60 Kg/60E1 R350HT & 60 Kg/60E1R260 grade Rails

1. Combination A.T. welding technique for 60 Kg/60E1 R350HT grade rails with 60Kg/60E1 R260 is also developed and one vendor (M/s Chakradhar Industries LLP, Mumbai) has been provisionally approved and included in the vendor list of RDSO vendors for developmental orders.

2. In addition to above, one more firm (M/s Oberoi Thermit Pvt. Ltd., Haridwar) have been conditionally approved and included in the vendor list of RDSO vendors for developmental orders.

C. Development of more vendors is in the pipeline and Railways may obtain latest details in this regard from RDSO websitehttps://rdso.indianrailways.gov.in and may consult ED/Track-I RDSO.

D. FB welding of R350HT grade Rails:

1. In case of stationary FB welding plants, FB welding can be developed as per requirement by Zonal Railways. For this "Revised Protocol for Development of FB Welding for 1175HT Grade Rails (re-designated as R350HT) dated 28.07.2022" **(Annexure-C)** shall be adhered to.
2. For in-situ FB welding by MFBWPs, FB welding will be developed in due course after availability of Rails in field.

This issues with the approval of AM/CE, Railway Board.

DA: As Above

14/8/23

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Mailing list:

1. **General Managers, All Indian Railways & Production Units.**
2. **General Manager (CON.), N.F. Railway, Guwahati.**
3. **General Manager/CORE, Allahabad.**

Principal Chief Engineer(s)

1. Central Railway, Mumbai CST-400 001
2. Eastern Railway. Fairlie Place, Kolkata-700 001
3. East Central Railway, Hajipur-844 101
4. East Coast Railway, Bhubaneshwar - 751016
5. Northern Railway, Baroda House, New Delhi - 110 001
6. North Central Railway, Allahabad-211 001
7. N.E. Railway, Gorakhpur-273 012
8. N.F. Railway, Malegaon, Guwahati-781 011
9. North Western Railway, Jaipur-302 001
10. Southern Railway, Park Town, Chennai-600 003
11. South Central Railway, Rail Nilayam, Secunderabad-500 371
12. South Eastern Railway, Garden Reach, Kolkata - 700 043
13. South East Central Railway, Bilaspur - 495 004
14. South Western Railway, Hubli-589 020
15. Western Railway, Churchgate, Mumbai- 400 020
16. West Central Railway, Jabalpur - 482 001
17. Metro Railway, Metro Bhawan, Kolkata-700 071

The Chief Administrative Officer (Construction)

1. Central Railway, Mumbai CST-400 001
2. Eastern Railway. Fairlie Place, Kolkata-700 001
3. East Central Railway, Hajipur-844 101
4. East Coast Railway, Bhubaneshwar - 751016
5. Northern Railway, Baroda House, New Delhi - 110 001
6. North Central Railway, Allahabad-211 001
7. N.E. Railway, Gorakhpur-273 012
8. N.F. Railway, Malegaon, Guwahati-781 011
9. North Western Railway, Jaipur-302 001
10. Southern Railway, Park Town, Chennai-600 003
11. South Central Railway, Rail Nilayam, Secunderabad-500 371
12. South Eastern Railway, Garden Reach, Kolkata - 700 043
13. South East Central Railway, Bilaspur - 495 004
14. South Western Railway, Hubli-589 020
15. Western Railway, Churchgate, Mumbai- 400 020
16. West Central Railway, Jabalpur - 482 001
17. CAO, COFMOW, Tilak Bridge, New Delh
18. **All CMDs/MDs of Indian Railway PSUs and SPVs**

Copy to

1. Director General, RDSO, Manak Nagar, Lucknow
2. Director General, NAIR, Vadodara
3. Director General, IRICEN, Pune-411 001
4. Director, IRIEEN, PB No 233, Nasik Road -422101
5. Director, IRISET, Taa Naka Road, Lalla Guda, Secunderabad-500017
6. Director, IRIMEE, Jamalpur-811214
7. Director, IRITM, Sarswati Residential Estate, IRITM Campus, Manak Nagar Lucknow

ANNEXURE - A

सत्यमेव जयते

भारत सरकार
रेल मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

POLICY ON DOMESTIC RAIL PLANTS FOR ASYMMETRICAL RAILS OF DIFFERENT GRADES

No. CT/Policy/02
(28.01.2022)

Issued by

TRACK DESIGN DIRECTORATE

अनुसंधान अभिकल्प एवं मानक संगठन लखनऊ- 11
Research, Designs and Standards Organisation, Lucknow-11

अअमासं RDSO
रेल अग्रदूत Transforming Railways
www.rdso.gov.in

POLICY ON DOMESTIC RAIL PLANTS FOR ASYMMETRICAL RAILS OF DIFFERENT GRADES

Policy for Asymmetrical rails of the following grades manufactured by domestic manufacturers to be used for manufacture of Thick Web Switches on IR and other rail networks in India is as under-

I. Rail grade 880/ R260/1080HH/1175HT

A. New Rail Plant

Vendor of a domestic rail plant which is not yet approved for any of these rail grades for symmetrical rail, would not be eligible for supply of asymmetrical rail. They have to first get approval for symmetrical rail of any of these grades as per Policy no. CT/Policy/01 (24.01.2022) for symmetrical rail for New Rail Plant. Subsequent to the vendor getting Approved status for symmetrical rail for a New Rail Plant for one of these rail grades, approval for asymmetrical rail would be considered following the provisions for Existing Rail Plant, as stipulated below.

B. Existing Rail Plant

i. Rail grades for which the vendor has already got the Approved status for symmetrical rail– Following direction from Railway Board, Technical assessment of rail manufacturing capability for the same rail grade for asymmetrical rail would be carried out by RDSO (Track and M&C) as per extant RDSO Specifications and Guidelines. Consequent to satisfactory Technical assessment by RDSO, the vendor would be considered as Approved for manufacture of asymmetrical rail of the concerned grade, with approval of Railway Board.

ii. Rail grades for which the vendor has already got the Provisionally Approved status for symmetrical rail- Following direction from Railway Board, Technical assessment of rail manufacturing capability for the same rail grade for asymmetrical rail would be carried out by RDSO (Track and M&C) as per extant RDSO Specificationsand Guidelines. Consequent to satisfactory technical assessment by RDSO, the vendor would be considered as Provisionally Approved for manufacture of asymmetrical rail of the concerned grade, with approval of Railway Board.

iii. Considering above, any vendor either having 'Approved status' or having 'Provisionally Approved status' for manufacturing and supply of Symmetrical rail through RDSO as stated above, shall be considered eligible (Approved or Provisionally Approved category as the case may be) to manufacture & supply Thick Web Asymmetrical (TWA) rail of the concerned grade subject to fulfilment of the following additional conditions:

1. Any such vendor would be considered as an approved vendor in any of the above category, only if he takes the responsibility of supplying end forged Thick Web Asymmetrical (TWA) rails of 60E1A1 profile into 60E1 rail profile. This would ensure that the onus of end forging quality lies with the manufacturer of Thick Web Asymmetrical rails only. TWA rail manufacturer may get the end Forging of TWA rails either in-house or through any agency having facilities of End Forging of TWA rails into 60E1 rail profile conforming to Indian Railway specification for supply of End Forged TWA rail. The inspection of TWA rails and its End Forging shall be done as stipulated in the Inspection Regime circulated by Railway Board vide letter dated 21.10.2016 and 25.05.2018.

2. The performance of end-forged thick web asymmetrical rails shall be required to be judged in the field conditions. For this purpose, 25 sets of Thick Web Switches manufactured from these end forged Thick Web Asymmetrical rails shall initially be laid on trial. Zonal Railways in association with RDSO would monitor the field performance of these thick web switches for a period of minimum 6 months on the standard proforma enclosed as Annexure.

3. Both type of vendors (whether an "Approved" or a "Provisionally approved") will be considered eligible for bulk order quantity. However, the supplies from a "Provisionally approved vendor" shall be regulated in such a manner that initial 25 sets of TWS are supplied first and their performance is certified and proven in the field as per RDSO instructions and annexure provided in this regard.

iv. Field performance of Thick Web Switches manufactured from asymmetric rail of Provisionally Approved vendor would be assessed as per protocol at **Annexure**. Zonal Railways/other domestic rail network would closely monitor the field performance of Thick Web Switch. In case any adverse performance is reported relating to asymmetrical rail, matter would be referred to Railway Board for decision on further supply.

v. Change in status of the vendor from Provisionally Approved to Approved for asymmetrical rail of the grade would be done based on a similar change of status for symmetrical rail of the grade and field performance report of thick web switches to be drawn by RDSO, with the approval of Railway Board.

II. Special/ New grades

As Thick web switches of these rail grades are not envisaged at present, Policy would be framed as the need arises.

III. With the above, the policy for procurement of thick web asymmetrical rails described vide Railway Board's letter No. 2013/Track-I/16/2 dated 25.05.2018 shall stand modified and Para 3.0 of its Annexure-I, shall stand modified as under:-

"3.0 Asymmetrical rails of Zu-1-60 / 60E1A1 Rails profile shall be sourced from rail manufacturer(s):

(a) Who have supplied asymmetrical rails as per IRS:T-12/2009, during last 7 (seven) years and current year upto the date of tender opening, for use in Thick Web Switches on Indian Railways or KRCL or RVNL or any State/Central Government owned Metro Railways in India. Certificate from user Railway Network about satisfactory performance of asymmetrical rails supplied in this regard should be submitted by the tenderer.

OR

(b) If manufacturing facilities of Asymmetrical rails are not located in India, then rail manufacturer should have supplied 60 Kg rails in India as per IRS: T-12/2009 during last 7 (seven) years and current year upto the date of tender opening and these rails should have been used on Indian Railways or KRCL or RVNL or any State/Central Government owned Metro Railways in India; AND should have supplied asymmetrical rails, during last 7 (seven) years and current year upto the date of tender opening, for fabrication of thick web switches to/for passenger/mixed traffic carrying Railway networks in minimum 3 (three) countries and which should have been used on such railway networks. Certificates from the user Railway networks of these countries about satisfactory performance of Thick web Switches manufactured from these rails should be submitted by the tenderer.

OR

(c) Domestic asymmetric rail manufacturers qualified as eligible, (Provisionally approved vendor or Approved vendor both) in accordance with the policy as detailed in Para I. B. (iii) above."

The above generic policy pertains to approval of Domestic Rail Plants only. As far as the imports are concerned, the eligibility and all other norms shall continue to be governed by the extant policies in vogue.

ADE/Track/RF	Director/Track-I	Director/Track-III	Page 3 of 5
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Annexure

Performance of Thick Web Switches (Using End Forged TWA rails manufactured by domestic manufacturer)

Location :- Section :- Point No. LH/RH T/O Initial Opening - Normal- Reverse -		GMT :- Straight/Curve :- Date of Installation:- Rail section :-		Angle of crossing :- 1:8.5/1:12 Type of sleepers :-	
SN	Description	Limit	Left	Right	Remarks
1.	Switch Assembly: (a) Condition of stock rail (b) Condition of tongue rail (c) Lateral & Vertical wear of stock rail (d) If SRJ is welded as per RDSO drg.	 Good/Satisfactory/Poor Good/Satisfactory/Poor As per IRPWM Yes/No			As per IRPWM the limit of lateral and vertical wear is -8mm for 60kg
2.	Condition of fittings of switch assembly (a) Slide chairs (b) Gauge tie plate (c) Nut bolts and spring washer	 Good/Satisfactory/Poor Good/Satisfactory/Poor Good/Satisfactory/Poor			
3.	Tongue rail flange hole condition	Snug fit/Loose			To be tested by Std. Pin. If loose and creating problem, plan rail replacement
4.	Indicate number of sleepers, up to which switch is housing properly.				
5.	Whether tongue rail resting on slide chairs, when set with stock rail?	Yes/No			
6.	Squareness of the a) Toe of switch b) Point machine sleeper	Within limit. (<10 mm,)			
7.	a) Gauge and cross level at the toe of switch in mm, at 150mm, from toe towards SRJ b) 5th sleeper c) 9th sleeper	As per IRPWM			As per Para 237 (1) (g) of IRPWM, the tolerances for gauge & cross level shall not be inferior to that applicable to the route. However, the cross level shall be as per Para 317 of IRPWM

ADE/Track/RF	Director/Track-I	Director/Track-III	Page 4 of 5
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8.	**Switch setting device (SSD)** a) Whether distance between gauge faces of stock rail at JOH is 1745±2mm for 60 Kg switch b) Whether open side clearance at JOH is 57mm or more? c) Insulation condition d) Squareness of arms, condition of base plate. Gap between bolt & Stopper of SSD e) Tightness of nut bolts and other fittings f) Location & position of SSD	Yes/No Yes/No Good/ Plan Rep/Imm. Rep Both arms shall be straight alignment Good/satisfactory/loose As per RDSO's drawing			The uncompressed spring length asper SSD drawing is 212.5mm. The compressed spring length should besuch that it should create a gap of 60+2/60-3 mm on the open side at JOH location both in normal as well as reverse conditions. As per RDSO's drawing the location & position of SSD is as follows: **For 1:16** – Location of SSD is at sleeper number 14 and distance of hole for fixing of tongue mouth from centerline of sleeper no 14 is 192mm **For 1:12** – Location of SSD is at sleeper number 13 and distance of hole for fixing of tongue mouth from center line of sleeper no 13 is 232mm **For 1:8.5** – Location of SSD is at sleeper number 8 and distance of hole for fixing of tongue mouth from center line of sleeper no 8 is 213mm
9.	Other comments, if any				
10.	Overall performance				

Sign./ Name / date
Railway official

NOTE:-1. The monitoring of trial shall be done for a period of minimum **six** months from the date of laying.
2. The inspection of trial quantity shall be done initially at the time of laying TWS and then after three months interval.
3. Prior to conducting trial, following shall be ensured by the trial conducting Zonal Railway at the trial locations:
   a) No missing/ displaced/ broken/ crushed fittings (Liners, ERC, Rubber Pad on sleepers, spring loaded key on slide chair, Cotter wedges ofchair plates) are there for stock rail holding,
   b) Packing under the switch assembly is proper,
   c) Lubrication of slide chairs and assembly, beyond 3 sleepers from the toe of switch and of moving parts of SSD is proper,
   d) Point machine is free from any obstruction (dust, rust or any foreign material).

ADE/Track/RF	Director/Track-I	Director/Track-III	
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सत्यमेव जयते

भारत सरकार
रेल मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

POLICY ON DOMESTIC RAIL PLANTS FOR SYMMETRICAL RAILS OF DIFFERENT GRADES

No. CT/Policy/01
(Revised March 2023)

Issued by

TRACK DESIGN DIRECTORATE

अनुसंधान अभिकल्प एवं मानक संगठन लखनऊ. 11
Research, Designs and Standards Organisation, Lucknow-11

अअमास संRDSO
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www.rdso.gov.in

Policy on Domestic Rail Plants For Symmetrical Rails of different grades

1. Grade of rails developed/ to be developed by different domestic manufacturers as per IRS-T-12-2009 can be divided into two categories as under:
   i. **Category-I**: 880 grade, R260 grade, 1080HH grade & R350HT (previously known as 1175HT) grade as per IRS-T-12-2009 are considered in Category-I.
   ii. **Category-II**: R260NC (previously known as 880NC) and any other grade rails as per IRS-T-12-2009 is considered in Category-II.
2. Policy to induct new grade of symmetrical profile of rails developed by domestic manufacturers to be used on IR and other rail networks in India is as under-

A. Category- I

a) New Rail Plant

i. Vendor of a domestic rail plant which is not yet approved for any of the rail grades would communicate with Railway Board for approval of a particular rail grade. On the direction of Railway Board, RDSO (Track & M&C Dte) would conduct Technical assessment of rail manufacturing capability for that rail grade as per extant RDSO Specifications/Manuals and Guidelines. Welding plant for FB welding of the rail grade would also be assessed as per extant RDSO Specifications/Manuals and Guidelines. Approval of QAP would also be done by RDSO at this stage.

ii. Based on satisfactory Technical assessment by RDSO, the manufacturer would be considered as New Vendor, with the approval of Railway Board, for supply of the particular grade of rail on any domestic rail network in India.

iii. A "New Vendor" with a "New Rail plant" is technically eligible for full Rail quantity for that particular grade Rails in a domestic Rail tender as a regular vendor. However, field performance of the initially supplied quantity of 25000T would be assessed for up-gradation of the status of the vendor as described hereunder. Supply would be halted during the above assessment.

iv. Performance of initially supplied quantity of 25000T rails would be assessed in the field on any domestic rail network of IR for up-gradation of the status of the vendor as per protocol at Annexure-A. In case any adverse performance is reported, matter would be referred to Railway Board for decision on further supply. Based on the satisfactory performance, RDSO would draw a report for change of status of the vendor for that particular rail plant from New Vendor to Approved Vendor for that particular rail grade, for decision by Railway Board.

v. Subsequent to the vendor getting Approved status for a New rail plant for one of the rail grades, approval for other rail grades would be done following the provisions for Existing rail plant, as stipulated below.

b) Existing Rail Plant

i. Vendor of a domestic rail plant which is already approved for any of the rail grades with IR would communicate with Railway Board for approval of another rail grade. On the direction of Railway Board, RDSO (Track & M&C Dte) would conduct Technical assessment of rail manufacturing capability for that rail grade as per extant RDSO Specifications/Manuals and Guidelines. Welding plant for FB welding of the rail grade would be assessed as per extant RDSO Specifications/Manuals and Guidelines. Approval of QAP would also be done by RDSO at this stage.

ii. Based on satisfactory Technical assessment by RDSO, the manufacturer would be considered as Provisionally Approved Vendor, with the approval of Railway Board, for supply of the particular grade of rail on any domestic rail network in India.

iii. A "Provisionally Approved Vendor" with an "Existing Rail plant" is technically eligible for full Rail quantity in case of Category-I Rails in a domestic Rail tender.

iv. Field performance of the initial supply of 10000T would be assessed for up-gradation of the status of the vendor and for any suggestion by RDSO. Supply would not be halted during the above assessment. Zonal Railways/other domestic rail network would closely monitor the field performance of rails as per Annexure-B. Based on the satisfactory field performance, RDSO would draw a report for change of status of the vendor for that particular rail plant from Provisionally Approved Vendor to Approved vendor for the particular grade of rail, for decision by Railway Board.

B. Category- II

Vendor of a domestic rail plant would communicate with Railway Board for approval of a particular rail grade. On the direction of Railway Board, RDSO (Track & M&C Dte) would frame separate trial protocol for lab and field testing. FB and AT weldability is also to be ensured by the rail manufacturer. These rails are to be laid as per protocol to be approved by Railway Board. RDSO (Track & M&C Dte) and Zonal Railways would closely monitor the performance of rails as per the protocol.

Based on the performance of trial, RDSO would draw a report for further decision of Railway Board.

Annexure-A

i. Rails of a New rail plant shall be laid in identified long stretches having maximum permissible speed of 110KMPH or more to facilitate close monitoring of its performance for 25 GMT or one year, whichever is earlier.

ii. Relaxation in frequency provided during test free/reduced frequency period will not be applicable for USFD Testing. USFD testing is to be carried out as per the normal frequency prescribed in USFD Manual, as applicable after test free/reduced frequency period.

iii. No painting or any other such treatment shall be done as these rails are under performance monitoring.

iv. Proper record of defects and performance of rail and weld shall be maintained as per the proforma attached i.e. Annexure-I, II.

v. Details of measurement regarding wear and corrosion shall be recorded every quarter jointly with the firm's representative. Railways shall procure rail profile measuring device if not available.

vi. All rail withdrawals (fracture pieces and IMR) of rail/ weld will be subjected to analysis in M&C lab of RDSO. For analysis, detailed proforma as per Annexure-III & IV of USFD Manual shall be submitted.

vii. During the regular trolley/foot inspections, Sr.DEN/DEN, ADEN, SSE (P.Way) In-charge and sectional SSE/JE (P. Way) will carry out careful visual inspection of the rails supplied against the initial quantity of 25000T and shall record any significant observations.

viii. Any unusual observation in performance of such rails shall be reported by the Railway to RDSO.

ix. RDSO would analyse the defects noticed during monitoring of rails and suggest improvement in the process of rail manufacturing, if required. Rail manufacturer shall implement the suggestions accordingly which would be further verified by RDSO. Technical assessment of rail manufacturing capability done earlier by RDSO shall be valid subject to implementation of the suggestions by the rail manufacturer. RDSO would decide, with the approval of Railway Board, whether Technical assessment of rail manufacturing capability is to be repeated.

x. Frequency of Feedback to RDSO - Quarterly

xi. Joint inspection with RDSO - Every six month

xii. Period of performance monitoring - 25 GMT or one year, whichever is earlier

(To be reckoned from the date when 80% rail of initially supplied quantity of 25000T is laid in track)

Annexure-B

i. The rails shall be laid in identified long stretches to facilitate close monitoring of its performance for 25 GMT or one year, whichever is earlier.

ii. Relaxation in frequency provided during test free/reduced frequency period will not be applicable for USFD Testing. USFD testing is to be carried out as per the normal frequency prescribed in USFD Manual, as applicable after test free/reduced frequency period.

iii. Proper record of defects and performance of rail and weld shall be maintained as per the proforma attached i.e. Annexure-I, II.

iv. All rail withdrawals (fracture pieces and IMR) of rail/ weld will be subjected to analysis in M&C lab of RDSO. For analysis, detailed proforma as per Annexure-III & IV of USFD Manual would be submitted.

v. During the regular trolley/foot inspections, Sr.DEN/DEN, ADEN, SSE (P.Way) In-charge and sectional SSE/JE (P.Way) will carry out careful visual inspection of the rails and shall record any significant observations.

vi. Any unusual observation in performance of such rails shall be reported by the Railway to RDSO.

vii. RDSO would analyse the defects noticed during monitoring of rails and suggest improvement in the process of rail manufacturing, if required. Rail manufacturer shall implement the suggestions accordingly which would be further verified by RDSO. Technical assessment of rail manufacturing capability done earlier by RDSO shall be valid subject to implementation of the suggestions by the rail manufacturer. RDSO would decide, with the approval of Railway Board, whether Technical assessment of rail manufacturing capability is to be repeated.

viii. Frequency of Feedback to RDSO - Quarterly

ix. Period of performance monitoring - 25 GMT or one year, whichever is earlier

(To be reckoned from date when the 80% of initial supply of 10000T is laid in track)

Annexure-I

WEAR AND CORROSION MEASUREMENT OF UIC 60/60E1 ..... GRADE RAILS

SSE (In charge) ADEN: Division: Railway: Date of inspection

Yard/Block Section KM: From .... To ..... UP/DN/ Single Line Annual GMT Quarter 1st /2nd /3rd /4th

Name of manufacturer	Sl. No.	Measurement Location (Km/TP)	Laying date	GMT carried	Degree of curve/ Straight	Rolling mark	Observation								Remarks
							Wear (mm)				Corrosion (mm)				
							Lateral wear		Vertical wear		Depth of corrosion at liner seat		General Corrosion		
							L	R	L	R	L	R	Foot	Web	
	1. 2. 3. .														

Note: 1. Measurement Locations to be paint marked and numbered on rail for subsequent periodic measurements.

2. Measurement shall be taken on 2 consecutive sleepers.

3. On Straight, measurements to be taken every 500m and on curve at the start, centre and end of curve.

Signature of ADEN

Signature of SSE (In charge)

Annexure-II

USFD DEFECTS, GAUGE CORNER CRACKING DEFECTS AND SURFACE DEFECTS OF UIC 60/60E1 ..... GRADE RAILS

SSE (In charge) ADEN: Division: Railway: Date of inspection

Yard/Block Section KM: From .... To ..... UP/DN/ Single Line Annual GMT Quarter 1st /2nd /3rd /4th

	USFD testing and defects						Details of Kidney Defect if any	Detail of fracture		Gauge Corner Cracking		Surface Defect		Remarks
Name of manufacturer	Date of testing	KM: From .... To	Location of USFD defect	Rolling mark	LH/RH	Defect position Head/Web/Foot		No. of Fracture	Fracture codes	No. of patches	Cumulative length	Location	Type of defect and remarks	

Note: 1. Data for USFD of rail and weld shall be given separately.
2. Detailed proforma to be enclosed as per USFD Manual for rail/weld fracture.

Signature of ADEN

Signature of SSE (In charge)

Annexure-C

(Reference item 1 of MoM dated 18.07.2022
and meeting dated 28.07.2022)

Revised Protocol for Development of FB Welding for 1175HT Grade Rails

To decide the FB weldability of 1175HT grade rails, protocol as under shall be followed:

1. **Submission of ITR:**
   - **1.1. Fixing of Welding Parameters**: Firm should decide provisional welding parameters for 1175HT grade rails by internal testing with the help of OEM.
   - **1.2.** By using provisionally fix welding parameters decided by the firm during internal test, 06 FB joints shall be made. All joints should meet the requirements of Para 5.6.4.1 to 5.6.4.6 of the Manual for Flash Butt Welding of Rails, Reprint 2022. Out of these, 3 joints shall be subjected for Transverse Testing as per Para 5.4.5 & 8.10.3 of BS EN 14587-1:2018 and remaining 3 joints for Macro Examination as mentioned in para 1.3 below. All joints shall pass the requirements. Provisions of Para 5.4.5 of BSEN (for TLT) are temporarily relaxed for expediting initial approval of stationary plant at rail manufacturing plant till installation/availability of higher capacity TLT machine is as under:

     For initial procedure approval for a stationary welding plant, the test shall be continued until fracture occurs or be terminated when the force limit of the press is reached, provided that the bend test values have reached the values given in Table A.1 of BSEN 14587-1:2018. For the latter case, the weld shall be notched to ensure that fracture occurs in the welding zone, and the test weld shall be fractured. **This relaxation is only for six month from the date of initial approval of stationary plant at rail manufacturing plant i.e. BSP, Bhilai and JSPL, Raigarh.**

   - **1.3. Macro Examination**: Three welds in finished condition shall be sectioned for macro examination. For macro examinations a longitudinal vertical section shall be taken centrally down the vertical axis of full rail and extend 50mm each side of fusion line. Similar section shall be taken from both sides of the foot, 10mm in board of the foot tip. The sections shall be polished to a suitable finish using a minimum 220 grit paper. One full depth rail sample and associated rail foot samples shall be etched to show the weld boundary lines.

     The etching agent shall be 5-10% Nitric Acid. Etching at room temperature shall be done for sufficient time, 20 minutes maximum, in order to show boundary lines clearly when examined. These welds shall conform to following requirements.

a) The visible heat affected zone shall be of a nominally symmetrical shape about weld line and fall within the width of 40mm maximum and 20mm minimum. The permissible deviation between the maximum and minimum dimension of visible heat affected zone on any weld shall not exceed 10 mm. This requirement shall apply equally to vertical axis cut through full rail depth and those taken from each rail foot.

b) There shall be no evidence of lack of bond, inclusion, cracks or shrinkage. Imperfections that cannot be positively identified by macro examination shall be inspected by micro examination.

c) In case that flat spots are found, they shall be checked by micro examination at 100 X magnification. If any cracks are found, the process is rejected.

1.4. **Micro examination**: Following completion of macro examination, a micro examination shall be carried out on one of the three welds taken for macro examination having maximum HAZ. The micro sample 15mm high and 25mm wide (it includes 2mm on one side of fusion line and 23 mm on other side of fusion line) shall be drawn from the foot 3mm above rail foot bottom surface. The micro structure shall be free from martensite and bainite and grain size shall not be coarser than ASTM-4 at 100X magnification.

1.5. In case of failure of any joint on any test, welding parameters shall be re-fixed and process shall be repeated until result of all 06 joints found satisfactory.

1.6. **Fatigue test**: After satisfactory results of all 06 joints, 03 more FB joints shall be made on the same welding parameters and Fatigue test shall be conducted with the past-the-post test method on all three FB welds as per procedure mentioned at Para 5.4.9 of BS EN 14587-1:2018. All the three samples need to pass the Fatigue test. Frequency of Fatigue testing (not prescribed in EN code) shall be any frequency between 8.33 Hz to 12 Hz.

Re-test: If the result of Fatigue test of any sample failed to meet the requirements of the fatigue test, the process of re-setting of welding parameters and repetition of process shall be taken up.

2. **Standardization of welding parameters**: After development of FB weldability of 1175HT grade rails and before starting the commercial production, RDSO shall standardize the welding parameters by conducting the test as per procedure mentioned below:

(i) Ten welds shall be made with the welding parameters given by the firm in ITR. All welds should pass in visual, dimensional & USFD test as per Para 5.6.4.1, 5.6.4.4 & 5.6.4.5 of FBW Manual-Reprint 2022.

(ii) Out of ten welds, five welds shall be subjected to Transverse Load Test as per Para 5.4.5 & 8.10.3 of BSEN 14587-1:2018 and Para 1.2 of this protocol. Before conducting Transverse Load Test, Brinnel hardness test shall be

conducted on the test weld samples as per Para 5.6.4.6 of FBW Manual, Reprint 2022.

(iii) Remaining five welds shall be subjected to Macro examination as per procedure mentioned at Para 1.3 above. Following completion of macro examination, a micro examination shall be carried out on one of the five welds taken for macro examination having maximum HAZ as per procedure mentioned at Para 1.4 above.

(iv) After passing all ten welds, Fatigue test on 03 FBW joints executed on the same welding parameters shall be carried out as per Para 5.4.9 of BS EN 14587-1:2018 at any frequency between 8.33 Hz to 12 Hz.

(v) Welding parameters proposed by the firm in the ITR shall be standardized, if all three welds pass in Fatigue test. In case of failure of any joint on any test, welding parameters shall be re-fixed by the firm and process shall be repeated.

3. **Verification of Transverse Load Test of FB welds**: After installation/availability of higher capacity TLT machine verification of stationary plant at rail manufacturing plant for FB welding of 1175HT rails shall be done after conducting Transverse Load Test on five welds as per Para 5.4.5 of BSEN 14587-1:2018 on test welds executed with the same welding parameters. In case of any joint not meeting the requirements, FB welding of 1175HT rails will be stopped and corrective action shall be taken by the firm for re-standardization of welding parameters.

4. **Frequency of Sample Testing in production of FB welds of 1175HT Grade Rails**:
   (a) **Hardness & Transverse Load Test:** 1 in 100 for first 1,000 joints welded by Flash Butt Welding Plant (both Stationary and Mobile plants) and subsequently at a frequency of 1 in 500 joints.
   (b) **Macro & Micro Examination**: One test joint for every 1,000 joints welded by Flash Butt Welding Plant (both Stationary and Mobile plants) shall be subjected to Macro examination and micro examination.
5. Inspecting agency shall maintain the record of flash butt welding of 1175HT grade rails and shall share their test results with RDSO on monthly basis for further decision.
6. Any provisions not covered in this protocol shall be followed as per FBW Manual Reprint 2022.

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No. CT/Rail Handling Date:09.02.2023

As per Mailing list

Sub: Guidelines for handling and stacking of rails

Ref: (i) This office letter of even no. dated 05.11.2014 and 07.08.2020.

(ii) Railway Board's letter no. 2019/Track-I(P)/1175HT Rails/Vol-I dated 08.02.2023.

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1. Vide letter referred at (i) above, RDSO has issued guidelines for handling and stacking of Rails (CT-35) for 90 UTS and above grade rails including R260 grade rails.

2. Subsequently, due to the introduction of R350HT (earlier known as 1175HT) grade Rails on Indian Railways, above guidelines (CT-35) has been revised by RDSO. Railway Board has approved revised Guidelines vide letter referred at (ii) above.

3. Revised "Guidelines for handling and stacking of rails (CT-35), February, 2023", has been attached herewith for information and necessary action. The copy of the same is also uploaded on RDSO website.

DA: As above

MAHENDRA KUMAR GUPTA
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Jt. Director/Track-I

GUIDELINES

FOR

HANDLING AND STACKING

OF

RAILS

February-2023

(No. CT-35)

RESEARCH DESIGNS AND STANDARDS ORGANISATION

LUCKNOW – 226011

Amendment History

Sr. No.	Amendment Year	Version	Reason for amendment
1.	13.11.2006	1.0	First Issued Guidelines
2.	05.11.2014	2.0	Revised
3.	February-2023	3.0	Revised

INSTRUCTIONS FOR HANDLING AND STACKING OF RAILS

1.0 INTRODUCTION:

1.1 On Indian Railways, various grade and sections of Rails are in use depending upon the traffic requirements. Use of higher UTS Rails has been necessitated to meet the requirement of traffic. Now almost all the new rails being manufactured are of 90 UTS and above. The 72 UTS rails (also known as MM Rails) used earlier were more ductile, hence were not susceptible to sudden fractures. Newly developed R260 and R350HT (earlier known as 1175HT) grade rail has been included in IRS-T-12/2009 specifications. R350HT grade rails have higher UTS and higher hardness value as compared to 90UTS rails. Rails of higher UTS (90 and above including R260 and R350HT Grade rails), being brittle in nature, are susceptible to sudden fracture from locations of even minor dents. The presence of dent/deformation at the edge of the rail foot has been found as the main cause of premature fractures investigated by RDSO. The dent/deformation on the edge of the rail foot is formed mainly due to rubbing of rails during unloading and handling of rails at site. This is indicative of fact that due care is not being taken in field in handling of rails. Improper handling may cause bending, indentation or damage to surface, leading to premature failure of rails. As such, handling of rails with care and attention is important for achieving required servicelife of rails. It is essential that P. Way officials at all levels are sensitized regarding precautions to be taken during unloading and handling of rails to prevent development of defects leading to premature or sudden failures.

1.2 The instructions regarding handling of rails are available in various guidelines/ Manuals of IR.

(a) Para 1.1.3 of Manual for Ultrasonic Testing of Rails and Welds (Revised-2022) states that incorrect handling of rails may cause plastic deformation, scoring and denting of rails.

(b) Para 610 of IRPWM contain the guidelines on handling and stacking of rails.

(c) Para 711 of IRPWM covers the guidelines on unloading of rails, Sleepers and Fastenings.

These guidelines shall be strictly adhered to minimize formation of dent/ deformation at the edge of the rail foot and other damages to rails.

1.3 The damage to rails including formation of dent/deformation at rail foot can be detected by inspecting rails before laying in track. Therefore, it becomes essential that Rails are thoroughly inspected at the level of SSE/P.Way for presence of damages to rails during transportation, unloading and handling, if any, before laying in the track. In case any damage including dent/deformation is noticed, such rails should not be used in track without removal of damaged portion of rails.

1.4 These comprehensive guidelines are being issued for sensitizing the field staff and other agencies involved in handling and laying of rails, so as to avoid damage to rails.

2.0 HANDLING AND STACKING OF RAILS:

2.1 Stacking and Handling of rails in rail manufacturing plants, Flash Butt Welding plants and other Bulk Storage locations:

2.1.1 Stacking of Rails and welded Panels:

(i) The rails shall be stacked on level and well drained base platform. For stacking on the level ground, unserviceable 90R or 52 kg rails should be embedded in the concrete bed of M- 20 grade concrete keeping rail head embedded in concrete and rail flange projecting above concrete surface as shown in Drawing No. RDSO/T-6219 (Annexure-I). Intermediate distance between them should be 4.0 m. A slope of 1:400 may be given in the concrete bed across the length of rails for drainage of water as mentioned in the drawing.

(ii) Mild steel flats of 100 x25 mm size should be used between two successive layers of rails and kept at a distance not more than 4.0 m center to center. Number of layers in a stack should not be more than 10.

(iii) One rail panel should be reduced from both sides after every third layer to achieve proper stacking of rails.

(iv) Drawing no. RDSO/T-6219 (Annexure-I) shall be followed for stacking of free rails and welded panels.

2.1.2 Handling of Rails:

(i) Rail should be lifted preferably through magnetic chucks. In case magnetic lifting devices for rails cannot be provided, all handling of rails shall be done with synchronized electric hoists and spreader beams. This can be possible only when rails are stacked in layers properly.

(ii) Slinging Principle:

The single point slinging increases risk of excessive bending and surface damage to the rails. The overhang portion of rail beyond the outer lifting point should not be greater than one-half the distance between two adjacent lifting points. Therefore, recommended locations of lifting points for various rail lengths shall be as per Table 1:

Table 1

Rail length (m)	No. of lifting points	Distance between two adjacent lifting points (m)	Max. rail end overhang (m)
12-13	2	6-6.5	3-3.25
26	4	6.5	3.25
39	6	6.5	3.25
130	20	6.5	3.25
260	40	6.5	3.25

2.2 Handling of Single/Three Rail Panels:

2.2.1 Loading of single rails/three rail panels:

(i) Wagon should be fit for loading and transportation of rails. Minimum three bolsters/cross beams, one at center and others at maximum inter-distance of 5.0m should be available in wagon platform to give it a uniform base for rail placement. The rails should be loaded to obtain equal overhang at each end beyond the end bolsters. Availability of both end bulk heads in BFRs shall be ensured before loading of rails.

(ii) All loaded rails should be tightened by suitably flexible but strong MS strip. While binding with MS strip, a card board or any other non-metallic material should be provided between rails and strip, so that abrasion/corrosion is avoided.

(iii) Mild steel spacers made of flat of 100x25 mm size should be provided between two layers of rails at every 4.0 m distance interval.

(iv) Shorter rails should be placed in upper layers so that each successive layer is of same or decreasing width to ensure centric and stable loading of wagons.

2.2.2 Unloading of single rails and 3 rail panels:

(i) Rails shall be unloaded fairly opposite to the position where they are to be laid. Care shall be taken to avoid unloading of materials in excess of actual requirement so as to avoid double handling.

(ii) Two or more ramps should be made in the middle of BFR using unserviceable rails, with a maximum distance of 6.5 m between them. Intermediate supports using pre-fabricated props etc. may also be given below the ramps to prevent excessive sagging. Proper greasing should be done on top surface of ramps for lubrication and easy sliding of rails downwards.

(iii) At the bottom end of ramp, gunny bag should be provided so that rails do not get damaged while unloading.

(iv) Rail should be held by 2 or 3 rail tongues in middle portion and placed on the ramp. Both ends of the rail should be tied by manila rope. After placing on ramp, rails should be slid slowly by gradually releasing manila rope to reach the rails to placement location.

2.3 Handling of Long Welded Rail Panels:

2.3.1 Loading of long rail panels in EURs:

(i) Availability of proper end unloading rakes as per standard arrangement shall be ensured for loading of long rail panels. The speed certificate and sanction of competent authority for operation of rake must be available.

(ii) The rake must be checked thoroughly before loading. All rollers should be available at their respective locations. Not even a single roller shall be missing or ineffective. It should also be checked that no roller is jammed i.e. it should be free to rotate.

(iii) Rail panels should be lifted by multiple slinging arrangements keeping intermediate distance not exceeding 6.5 m center to center following slinging principle mentioned at Para 2.1.2 (ii) above.

(iv) Shorter length panel should be loaded in pairs and placed on same tier keeping equal distance from center so that they can be unloaded at same location.

(v) Dynamic and localized loading in EUR rake shall be avoided.

2.3.2 Unloading of long rail panels from EURs:

For unloading of long rail panels from EUR, following general principles should be followed. In addition to these general guidelines, any of the specific instructions issued by OEMs should also be followed.

a. With Conventional Rail unloading arrangements requiring hole at panel ends:

(i) Unloading of rails from the End Unloading Rake(EUR) shall be done in traffic block.

(ii) The unloading shall be started from top layer panels. The protective rail and flap door of bulk head shall be opened during block only for the layer to be tackled. Once all the

rails of that layer are unloaded, next layer door shall be opened for unloading.

(iii) Rail panels should be tied with manila rope/slings with the help of HTS bolts through the holes provided at the end of panels. Only tested slings shall be used for unloading of welded panels.

(iv) Rope should be passed through the arrangement fixed in ramper and threader wagons attached at the end of EUR rake to prevent rails from bending while unloading.

(v) Height of rampers should be adjusted/ maintained with respect to the layer of rails being unloaded and it should be decreasing towards end of wagon. The height of ramper to be so adjusted that a smooth slope can be provided to the panels to be unloaded.

(vi) Other end of manila rope should be tied to any fixed structure capable of pulling rail load and allow the rake to move forward at very cautious speed not exceeding 15kmph so that in the event of any unusual/unsafe situation the rake can be stopped immediately.

(vii) Rail panels at equal distances from center line shall be unloaded. Eccentric unloading or unloading from only one side of BFR is strictly prohibited.

(viii) Just before complete unloading of first pair of rail panel, the rake should be stopped and next rail panel to be unloaded is tied with the near end of rail panel partially unloaded, with rope. Then, the rake should be moved forward to unload next rail panel. This process is to be continued for unloading of successive rail panels.

(ix) The EUR rake shall never be moved backward during unloading.

(x) The EUR rake shall not run either backward or forward with open door of bulk head in any circumstance except in block during unloading.

(xi) In case, traffic block is to be cleared before complete unloading of rake, the clamps for layers, where rail panels are left shall be re-fixed properly before movement of rake to avoid any chance of movement of panel during run.

(xii) Unloading shall not be undertaken at locations having vertical clearance less than 4500 mm from rail level to the fixed structure.

(xiii) Unloading of rail panels shall not be undertaken in platform area and on ballast-less open web girder bridges.

(xiv) Unloading of panels should be arranged in such a way that turnout and cross-overs are avoided.

b. With modified rail unloading arrangements not requiring holes at panel ends:

(i) Unloading of rails from the End Unloading Rake shall be done in traffic block.

(ii) The unloading shall be started from top layer panels. The protective rail and flap door of bulk head shall be opened during block only for the layer to be tackled. Once all the rails of that layer are unloaded, next layer door shall be opened for unloading.

(iii) In order to mitigate the issue of damage such as dent/deformation as a consequence of impact and sudden jerk during unloading, use of improved end unloading system for long rail panel provisions of 'Technical Specification of Improved End Unloading System for long Rail Panels (RDSO's Specification no. TM/HM/29/EUR/450 of 2018)' attached as Annexure III shall be followed.

(iv) For mechanized system for unloading and loading for long rail panels in field the provisions of 'Technical Specification of Improved In Field Unloading and Loading System for long Rail Panels for BG (1676mm) (RDSO's Specification no. TM/HM/29/449 of 2019) attached as Annexure IV shall be followed'.

(v) As there is no provision of holes in rails in these rail unloading arrangements, clamps or magnetic chucks should be used for lifting and unloading of rails.

(vi) In absence of holes at the ends of rail, while transportation of rails from manufacturing plant to unloading site, bulkhead or any other provision should be made in such a way so that loaded rails in BFR on rollers do not move and break/damage the bulkheads due to impact by acceleration/deceleration of rake or while moving on steep rising/falling gradient of track.

(vii) When all clamps are fully unlocked, rails should be lifted with extreme care to prevent accidental lifting of the nearby rails by the edges of the feet.

2.4 Placement of single rails and welded rail panels on cess:

(i) New single rails should be unloaded on one side of the track on the cess leaving the other side free for stacking released rails. Rails should be placed on cess away from toe of ballast profile to avoid any infringement and disturbance to ballast profile.

(ii) As far as possible, rail should be kept straight otherwise a smooth curvature may be given to cross any obstruction. Care must be taken not to unload rails one over the other as this causes bending of rails.

(iii) While carrying rails, they shall be supported by rail tongs or rail slings at locations mentioned in Para 2.1.2 (ii) above.

(iv) Rails should be so spread as to rest evenly along their entire length on supports closely spaced to prevent formation of kinks. Rails should be placed with head in upward direction. Drawing no. RDSO/T-8413 **(Annexure- II)** shall be followed for the purpose. Free rails should be supported at least at four points, evenly along their length.

(v) Kinky rails must be jim-crowed (except R350HT grade) and straightened before placing them in track.

(vi) Rails must be inspected visually for any dent/rubbing marks on the edge of rail foot. Such rails shall be placed in the track only after removal of damaged portion.

(vii) Punch marks on rails or marking by chisel should be prohibited as these cause incipient failures.

(viii) On bridges, unloaded panels are to be supported on sleepers outside the track so as not to allow them to sag downwards.

(ix) It shall be ensured that signaling bonds are not disturbed while placing the rails. In track circuited territory, the rails shall be handled in such a way that rail does not contact both rails of track together to prevent track circuit failures.

2.5 Precautions for handling of rails in Electrified areas:

(i) In Electrified territory, no work shall be done without obtaining “permit-to work”. Working under OHE shall becareful.

(ii) Touching of fallen wires should be avoided unless power is switched-off and the wire or wires are suitably earthed.

(iii) Loading and unloading shall be done under the supervision of an Engineering Official not below the rank of a SSE/P. Way who shall personally ensure that no tool or any part of body of worker comes within the “danger zone” i.e. within 2m of the OHE.

(iv) Rails should not touch each other to form a continuous metallic mast of length greater than 300m.

2.6 Handling of Rails at port:

(i) Availability of proper facilities for handling of rails at Ports as required by these guidelines should be ensured.

(ii) Magnetic lifting devices with suitable spreader beams should preferably be used. In case, it is not possible to provide magnetic lifting device for lifting of rails, electric hoists or cranes with suitable spreader beams may also be used so as to lift the rails in accordance with laid down basic principles.

(iii) Suitable enabling provisions in the contract for procurement of for rails shall be ensured for carrying out modifications in the existing facilities available at ports or to develop suitable method for unloading and handling of rails so as to avoid any

damage.

3.0 Precautions for preventing damage to rails:

3.1 Protection of straightness:

Proper straightness of rails is essential for smooth riding and preventing unusual stress during operation. Even the small variation of straightness, which is barely visible, (for example, a deflection of 0.75 mm over 1.5m span) renders a rail unacceptable. Therefore, careful handling and stacking shall be ensured particularly on following:

(i) Heavy static loading on rails should not be done. Also, sudden impact should not be imparted to rails while unloading and handling.
(ii) While stacking in layers, localised point or line contact loading should not be allowed. It should also be checked that rails are not stacked in criss-cross manner in alternative layers at right angles to each other.
(iii) Excessive rail end overhang should not be allowed while lifting and shifting of rails. Overhangs mentioned in Table 1 shall be followed.
(iv) Rails should be kept as horizontal and straight as possible while lifting/moving.
(v) Rail ends are to be protected against damage by any impact even after having been stacked.
(vi) Overlapping of flange in unloaded rail should be avoided.
(vii) It is important that any rail support, handling or clamping device and rail pinch rollers do not apply localized or point contact to the rail.
(viii) Long duration storage of rails should be restricted on sites/depot.
(ix) For R350HT grade rails, straightening or removal of small kinks in rail by application of reversible force with Jim-crowing shall be avoided, and if necessary, kinky rail portion shall be removed by cropping.

3.2 Protection of rail surface:

Rails are very sensitive to notches and dents/deformations at the edge of the rail foot. Surface notches of even less than 0.25 mm in depth are liable to cause rail fracture in service. Therefore, to prevent rail surface from any damage, following shall be strictly ensured:

(i) Rails shall be protected against impact or abrasion against separators in wagons, vehicles, hatches, ships etc. and also shall be protected against brushing, notching or scoring of

rail surface.

(ii) Electro-magnetic lifting devices shall be used for lifting of rails. In case of non-availability of such device, conventional slings made of flat link chains fitted with fabric sleeves can be used for lifting rails. Round link chain slings should not be used for securing the rails.

(iii) Any rail support, handling or clamping devices and rail pinch rollers shall not apply localized or point contact to the rail and must not have sharp edges. Wherever possible, the profile of rail support, handling and clamping devices should be contoured to rail profile.

(iv) Minor or light scoring or abrasion of rails can be extremely dangerous. Avoid impact or abrasion of rails and rail bundles against structures, buildings, wagons and vehicles.

(v) Potentially prejudicial materials shall not be stowed near or above the rails.

3.3 Prevention of metallurgical damages:

Rails, especially R350HT rails (due to heat treatment) are thermally very sensitive and are likely to develop metallurgical defects, if exposed to localized heating. The localized heating produces very hard and brittle metallurgical structures, which may lead to sudden failures. Therefore,

(i) No work of heating, flame cutting, spot welding on or adjacent to rails should be done.

(ii) Rails should not be in contact with (a) loose electric cables to produce arcs, and (b) molten metal splashes from adjacent welding operations.

3.4 Protection from contact with injurious substances:

All rail in general and 90 UTS or higher grade rails in particular due to higher carbon content, are sensitive to localized corrosion and pitting, which may cause subsequent rail fractures. Therefore, contact of rails with injurious substances causing corrosion of steel, i.e. acids, alkalis, salts, fertilizers, sulphate, chlorides, nitrates etc. should be avoided.

4.0 Safety of Personnel:

Safety of personnel involved in handling of rails is of utmost importance. Following precautions must be ensured for safety of personnel-

(i) The staff deputed for unloading of EUR rakes must never

travel on BFRs. They shall travel only in tool van/ separate wagon provided in rake composition. No staff shall be allowed on ramper/threader during movement of rake from one station to another station where rake is moving for non- block activity.

(ii) Trackmen/staff shall not be allowed to stand between bulkhead doors and panels on either side of the formation while rake is on run.

(iii) The staff must use protective gloves and clothing to minimize the risk of skin abrasion, lacerations and extremes of temperature.

(iv) Handling of rails shall be done using proper tools and equipment approved by SSE (P. Way) in-charge. No locally made arrangements shall be used.

(v) The staff must wear distinctive coloured helmet and clothing for easy identification by crane and other machine operators to avoid accidents.

(vi) The staff shall use steel toe-capped protective footwear.

(vii) The staff shall be properly trained and cautioned to avoid standing under suspended loads, sudden dropping and impact of rails.

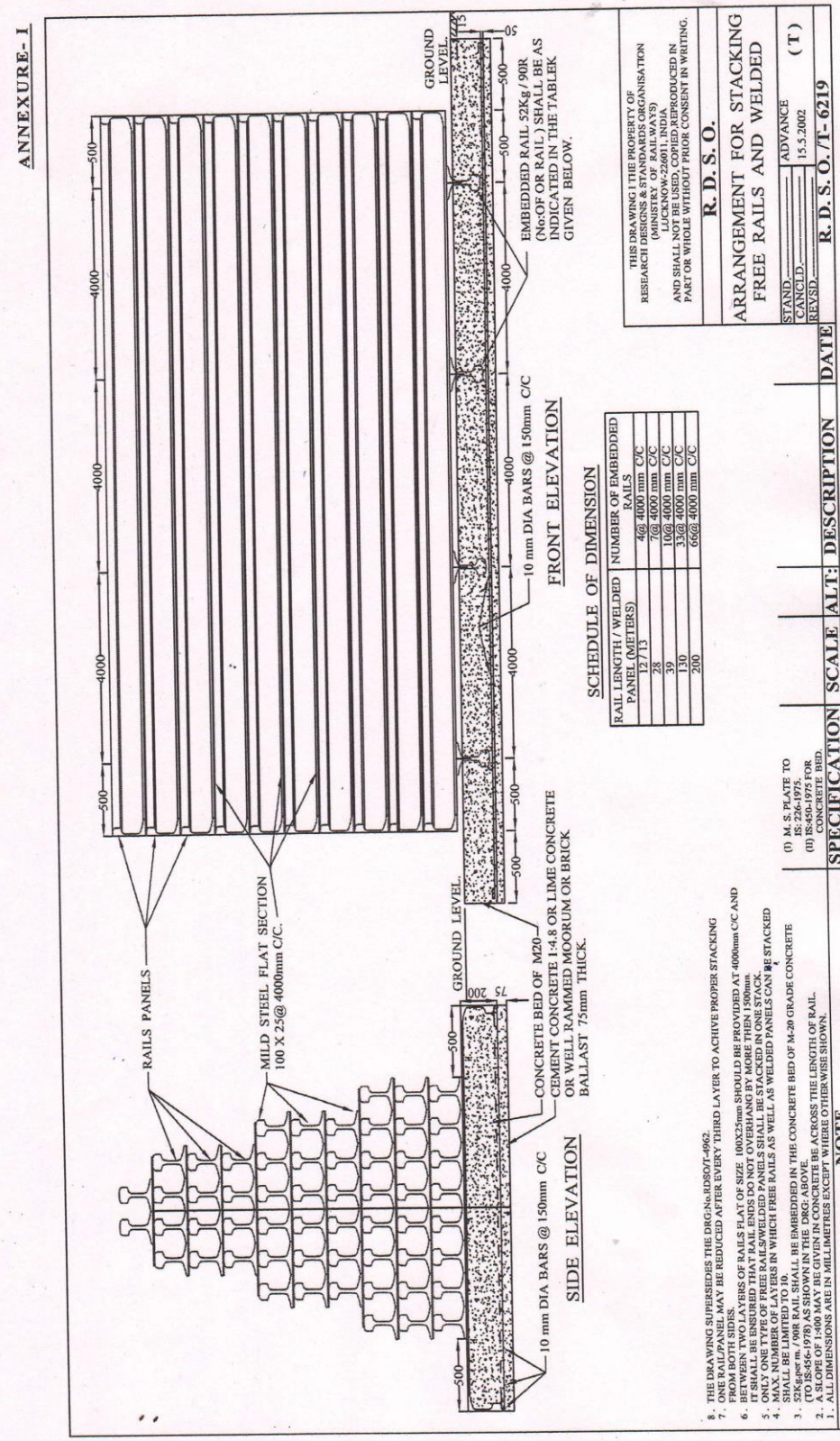
(viii) Safe working in the vicinity of electrical conductors and cables shall be ensured.

(ix) The rails should never be carried by staff on the head or shoulder.

(x) Necessary precaution for working at heights needs to be taken.

*****

ANNEXURE- I



SCHEDULE OF DIMENSION

RAIL LENGTH / WELDED PANEL (METERS)	NUMBER OF EMBEDDED RAILS
12/13	4@ 4000 mm C/C
28	7@ 4000 mm C/C
39	10@ 4000 mm C/C
130	33@ 4000 mm C/C
200	66@ 4000 mm C/C

NOTE

1. ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.
2. A GAP OF 1400 MAY BE GIVEN IN CONCRETE BE ACROSS THE LENGTH OF RAIL.
3. 52Kg/get m. /90R RAIL SHALL BE EMBEDDED IN THE CONCRETE BED OF M-20 GRADE CONCRETE (TO IS:456-1978). FOR DETAILS SHOWN IN THE DRG. ABOVE.
4. MAX. NUMBER OF LAYERS IN WHICH FREE RAILS AS WELL AS WELDED PANELS CAN BE STACKED SHALL BE LIMITED TO 10.
5. ONLY ONE TYPE OF FREE RAILS/WELDED PANELS SHALL BE STACKED IN ONE STACK.
6. IT SHALL BE ENSURED THAT RAIL ENDS DO NOT OVERHANG BY MORE THEN 1500mm.
7. ONE RAIL/PANEL MAY BE REDUCED AFTER EVERY THIRD LAYER TO ACHIVE PROPER STACKING FROM BOTTOM TO TOP.
8. THE DRAWING SUPERSEDES THE DRG.No.RDSO/T-4962.

SPECIFICATION	SCALE	ALT:	DESCRIPTION	DATE
(I) M. S. PLATE TO IS: 226-1975. (II) IS:450-1975 FOR CONCRETE USED.				

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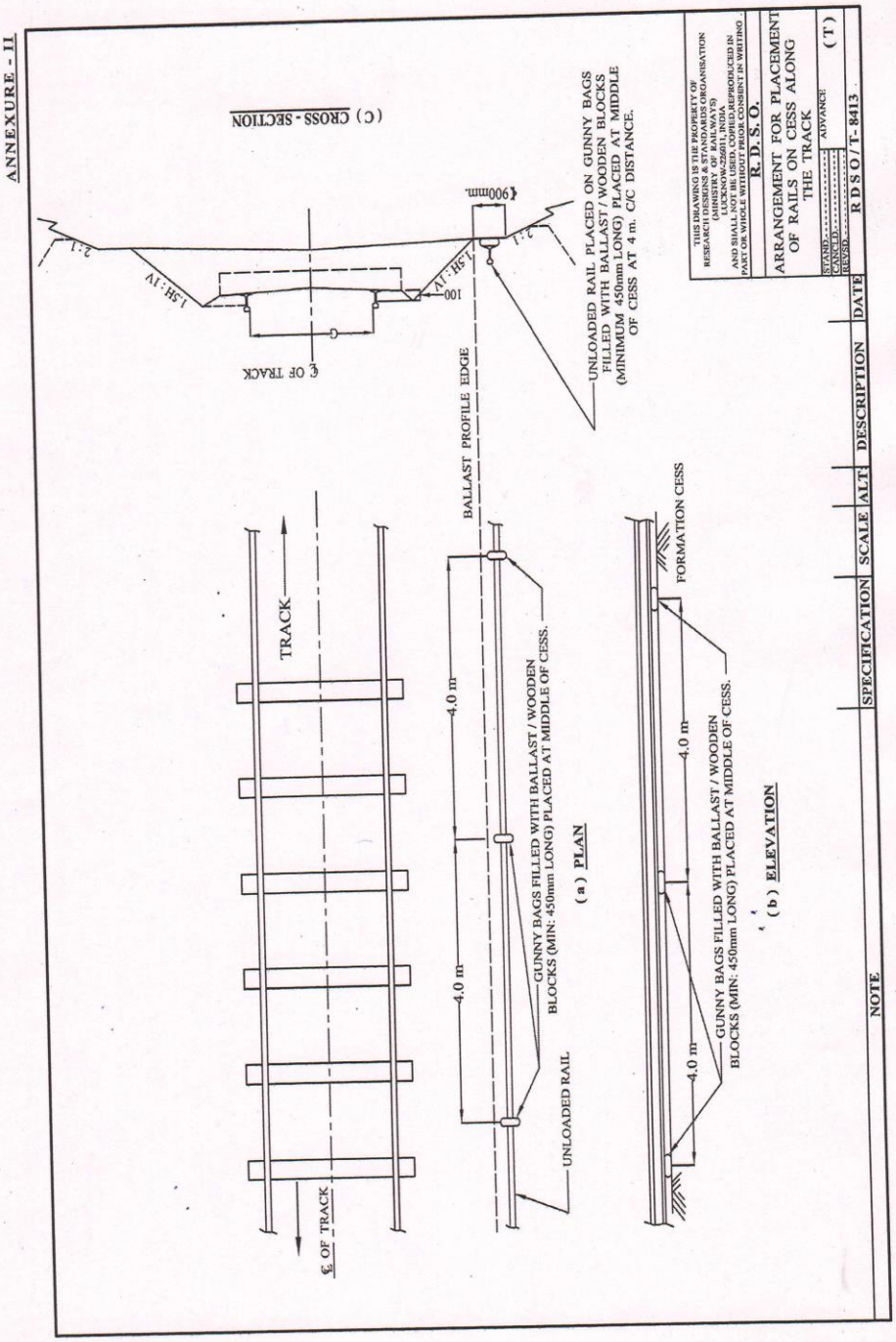
R. D. S. O.

ARRANGEMENT FOR STACKING FREE RAILS AND WELDED

STAND. ADVANCE (T)
CANCLD. 15.5.2002
REVSD.

R. D. S. O. /T- 6219

ANNEXURE - II



GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

सत्यमेव जयते

Technical Specification
Of
Improved End Unloading System for Long Rail Panels
(Specification no. TM/HM/29/EUR/450 of 2018)

S. No.	Month & Year of approval	Revision/Amendment	Reason for Amendment
1.	March-2019	Nil	First Issue

Signature				
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Issued by:

RESEARCH DESIGNS AND STANDARDS ORGANISATION,
MANAK NAGAR, LUCKNOW-226011

Technical Specification for Improved End Unloading System for Long Rail Panels (Specification No. TM/HM/29/EUR/450of 2018)

1.0 General

1.1 Long rail panels of 260m are being transported through End Unloading Roller (EUR) Rakes at present. In the present system, rails are tied to track by wire rope by drilling a hole in rail panels for unloading of long rail panels. Gap between two unloaded rail panels is large and requires extra effort for pairing and butting of all subsequently unloaded rail panels. Sometimes, the hook slips and causes injury to workmen involved and engaging the hooks to the clamps attached to the panel end requires human skills and correct timing. In the existing arrangement, end of the rail panels does not unload in a gradual manner and bears a sudden jerk, which may induce additional stresses in the rail panel. Damage such as dent marks/deformation as a consequence of this impact may occur, which may lead to rail fracture during service. To mitigate above issues, it becomes necessary to use such equipment for unloading of rail panels from available EUR rakes being used on Indian Railways which can overcome all the above mentioned hazards. This Specification has been prepared to cover service conditions and material, functional and other technical requirements of the "Improved End Unloading System for Long Rail Panel" hereinafter called "Unloading System".

1.2 The technical specification has been drafted to reflect the performance and quality requirements of the unloading system in a neutral manner without bias to any specific manufacturer. The unloading system comprises of dedicated wagons/BFRs fitted with suitable attachment like guide rollers, end unloading chutes, landing chute etc. The unloading system may include separate follower arrangements like guiding trolley at the rear of unloading wagon/BFR, connected with the rake by detachable arrangement like tie rod etc. Bidders are requested to study carefully the specification and assure that their unloading system fully comply therewith. If a bidder feels that his unloading system can substantially meet the performance and quality requirements of the machine but does not fully satisfy a particular system specification, he shall mention the same in the statement of deviation from the specifications, giving the details how the functional requirements are going to be met with.

1.3 The bidder shall specify the make/model of offered unloading system and furnish a detailed technical description of the same. System/ Subsystem of the working mechanism of the unloading system as per Para 3.0 in particular and all the items of the specifications in general shall be described in detail in the "technical description" along with sketches to show the manner in which the requirements of the specifications are accomplished by the unloading system (model) offered.

1.4 Photograph of the type of the unloading system offered, in working mode shall be enclosed with the offer. These shall also show the close-ups of various working assemblies/ systems and the full unloading system. The tenderer shall furnish a

compact disc or DVD or USB showing the working of unloading system in real time under field condition. Tenderer shall also submit the names of countries & Railways where the offered unloading systems are working and where their working at site can be visited by Indian Railway officials.

2.0 DIMENSIONAL AND OPERATING REQUIREMENTS

2.1 The design and dimensions of the unloading system and its components shall be to metric standards. Quality assurance during manufacturing of the machine shall be according to ISO-9001. The welding standard followed for manufacturing of the unloading system shall conform to ISO:3834, EN:15085 or any other equivalent standard for welding railway vehicle and components. The manufacturer shall specify the standard followed and certify that it meets the welding standard mentioned above.

2.2 The profile of the unloading system, including the additional fittings/components fitted on the wagons or their any part and supporting sub-system loaded on the wagon etc., longitudinally and in cross section, shall not infringe the Indian Railways schedule of dimensions-1676 mm (BG) revised 2004 print with the latest corrigendum and up to date correction slips issued during movement in train formation. The maximum moving dimensions are enclosed as Annexure-I. The tenderer shall provide sketches of the unloading system consist i.e. rail panel unloading unit/fittings fitted on the wagon, unloading supporting components/trolleys additionally tied/fitted with the wagons, in plan and shall give calculations to prove that the unloading system does not cause infringement while moving on a 10 degree curve at any cross section.

2.3 Adequate clearance shall be allowed so that no component /part infringe the minimum clearance of 102 mm from the rail level while travelling.

2.4 It shall be capable of negotiating curves up to 10 degree curvature (175 m radius), super elevation up to 185 mm and gradients up to 3% in travel mode in train formation.

2.5 The unloading system shall be capable of working continuously during the varying atmospheric and climatic conditions occurring throughout the year. The range of climatic conditions is as follows:

Ambient Temperature	: (-) 5^0 to (+)55^0 C
Altitude	: Up to 1750 m above mean sea level
Relative Humidity	: up to to 100%
Rail Temperature	: (-) 15^0C to (+) 76^0C
Rainfall	: Fairly heavy

2.6 **Service Conditions:**

2.6.1 Operating Conditions:

(i) 260 m rail panel to be transported through EUR rakes being used on Indian Railways.

(ii) Maximum speed of EUR rake: 75 kmph on straight track, station yards and curves 2^0&3^0 and 60 kmph on 5^0 curves on Indian Railways.

(iii) Electric Traction (Minimum): 2x25 KV or 25 KV AC or 1500 V DC

(iv) Track Circuits: DC in AC traction and non-electrified areas and AC in DC traction areas. On Indian Railways network, electrified traction consists of over head electric system of either 2x25KV AC or 1500V DC with residual return current passing through one of the rails in the track. The voltage for track circuits for signaling purpose is up to 12 Volts and the corresponding current up to 1 Amp passes through the other rail apart from traction return current. Traction return current, for 25KV AC traction, is of the order of 13.3 KA for short duration (i.e. <1 sec) and 1545/600A for long duration and for 1500V DC traction it is of the order of 4000A.

(v) In working mode, unloading speed shall not exceed as following:
Straight track: 10 kmph
Curve radius: 5 kmph
Last pair of rails: 3 kmph

2.6.2 **Track Structure:**

(i) Rail: IRS 52Kg/m and UIC 60/60 E1

(ii) Sleepers: Pre-stressed mono block concrete sleeper at 1540/1660 nos. per km.

(iii) Gauge: Broad Gauge- 1676mm

3.0 Working Mechanism:

3.1 The unloading system shall be compatible with EUR rakes being used for transportation of long rail panels on Indian Railways for which the drawings of wagons shall be provided by the purchaser.

3.2 The unloading system shall be such that, bending stresses induced in rails during the course of unloading are minimum. The rail ends shall slide through the support blocks and then through the inclined chutes onto the track bed gently. Rail handling process shall be as per "Guidelines for Handling and Stacking of Rails"(CT-35, Oct. 2014).

3.3 Tracking and retaining rollers in the rail guide heads shall ensure that the rails are unloaded without tipping over. There shall be scope for adjustment of the rail guide heads in vertical and horizontal directions.

3.4 Minimal longitudinal gap between two unloaded rail panels shall be ensured for ease of welding/pairing and butting and to avoid extra efforts for pulling purpose. Overlapping of the unloaded rail panels shall not be permitted. For minimizing the gap between two unloaded panels, suitable rail clamp/universal type clamp may be used.

3.5 For the smooth unloading of rails and to minimize the overhang length of the rail panel, there shall be a trolley mounted rail positioning unit attached with existing EUR rakes at a maximum distance of 6.5 m on the running track. The trolley mounted rail positioning unit shall be detachable type and shall be connected with the rear of the wagon. During unloading of panels the rail positioning unit shall be used. There shall be suitable arrangement to load and unload the rail positioning unit on the wagon.

3.6 System shall be able to unload the panels at equal distances from the centre line of the track. Eccentric unloading or unloading from one side of BFR is strictly prohibited.

3.7 The unloading System shall be such that no damage/disturbance occur to the existing track or any component i.e. fittings, fastenings and sleepers etc. Further, any component or part of the unloading system shall not infringe any provision of Schedule of Dimensions (SOD) for Broad Gauge (1676mm).

3.8 The unloading system shall be able to unload the long rail panel without requirement of drilling hole in the rail. There shall be suitable rail clamping arrangement for fastening two rail ends together permitting maximum gap of 25-35 mm in between.

3.9 Unloading belts/rope/chain shall have adequate strength for pulling off the rail panels of 260 m length of UIC 60 Kg / 68 Kg rail sections. If chain/wire rope is used for fastening first pair of rail panel with running line at the time of commencement of rail panel unloading, the same shall be covered with suitable material so that running rails do not get scratch/dents on touching the rail surface by the rope/chain.

3.10 While working on double line section, it shall not infringe the adjoining track and it shall be possible to permit trains at full speed at adjoining track.

3.11 The required output of the machine shall be as follows:

a) Unloading of 260 m long rail panels (each pair) from roller wagons : 6-8 min.
b) Minimum radius when pulling off the rails : 175 m
c) Maximum track super elevation when pulling off the rails : 185 mm

4.0 End Unloading Arrangement/System:

4.1 End unloading arrangement shall be mounted at the end of EUR to facilitate the unloading of long rails.

4.2 End unloading arrangement of the system shall consist of end unloading chute fitted with suitable rollers assembly for guiding the rails at top, side and bottom positions, being unloaded from the EUR. The end unloading arrangement shall be for both the rails separately.

4.3 There shall be an arrangement of troughs (troughs at BFR level to receive long rail panel from roller chute, inclined along with horizontal troughs allowing long rail panels to descend gradually from BFR and to land on the ground smoothly) at both side (for left and right side respectively) after the roller arrangement which shall be operated hydraulically or by spring action to guide the long rails to descend from BFR smoothly or without any jerk.

4.4 The end unloading arrangement shall be laterally sliding type across the width of the BFR end and shall be fixed at required location as per site condition i.e., whether unloading will be made at the centre of the track or outside the track. Such arrangement shall be adequately designed to avoid tilting of the rails during course of unloading.

4.5 There shall also be an arrangement of long rail panel holder at the starting end of unloading long rail panel which shall be adjustable to keep equal distance of the long rails, being unloaded, between each other and from running rails, whether unloading is done inside or outside the track.

4.6 For smooth unloading of the panels and to minimize the stress on the rail panels being unloaded, there shall be a suitable arrangement to provide intermediate support to overhanging length of the unloaded portion (between end unloading chute and the point at which the panels touch the ground) of the rail panels continuously by placing a moving support/trolley.

4.7 The moving support/trolley shall have roller arrangement through which the long rail panels can move smoothly. The roller arrangement position shall be adjustable according to site requirement of unloading long rail panel inside the track or outside the track. The height of this intermediate supporting arrangement from rail level shall be approximately half the height of end supporting chute of the end unloading system/buffer height of the wagon.

4.8 The intermediate support/trolley shall be tied with the end unloading system end by suitable connector so that the intermediate support/trolley moves on the track at the same speed of that of EUR.

4.9 The intermediate moving support/trolley shall have an arrangement of hinge type, spring loaded trough for both rails so that after passing through the support/trolley rollers, the rail ends will land on these inclined troughs which will gently lower the rail ends to the unloading ground level.

4.10 There shall be an arrangement of hydraulic / mechanical rail puller for connecting long rail panels to make a continuous strand with suitable /universal rail clamps without affecting the output efficiencyof the system. The universal rail clamps shall be able to function without drilling holes in rail panels.

4.11 Sufficient numbers of suitable/universal rail clamps for unloading 60 long rail panels shall be supplied. The transportation arrangement of universal rail clamps by trolley shall also be provided.

4.12 One portable diesel operated DC. welding plant (with the provision of auxiliary output of minimum 2.5 KW, 230 V AC for lighting) of reputed make (preferably made in India) with a minimum 5 KVA capacity capable of welding up to 5 mm diameter electrode at 60% duty cycle shall be supplied for welding, operating assemblies/sub-assemblies of unloading arrangement system, if required.

4.13 The minimum height of lower most part of the intermediate support/trolley and/or the EUR shall be 102 mm from rail level.

5.0 TOOLS AND INSTRUCTION MANUALS

5.1 Each unloading system shall be supplied with a complete kit of tools required by operator in emergency and for normal working of the unloading system. The list of tools to be provided shall also include all tools necessary for maintenance and repair of the entire system including specialized equipment. All special tools shall be listed and catalogued illustrating the method of application. The tenderer shall along with his offer submit the list of tools to be supplied along with each machine.

5.2 Detailed operating and service manual shall be specifically prepared in English language and four hard copies & soft copies of each of the same shall be supplied with each machine.

5.3 One set of all the manuals in hard as well as soft copy shall also be sent to the Principal/Indian Railways Track Machine Training Centre, Allahabad, one set to ED/TMM, RDSO, Lucknow, one set to DTK (MC)/Railway Board and one set to Director/IRICEN/Pune along with supply of first machine. In case, there is any subsequent amendment in above documents based on field performance, the amendment/amended documents shall also be sent to above mentioned authorities.

5.4 A draft copy of all documents to be supplied with the unloading system shall be sent 3 months in advance of inspection of the first system to RDSO for their review regarding adequacy and manner of detailing. Necessary modifications and further

detailing as per RDSO's comments shall be carried out and compliance shall be reported to RDSO as well as the Inspecting officer of the first machine.

6.0 SPARE PARTS

6.1 The expected life of the components, used in the unloading system, shall be advised by the tenderer along with their condemning limits. The unloading system shall be supplied with necessary spare parts for the operation and maintenance of the system for a period of two years. The spare parts required shall be detailed in a separate list indicating description, part number and whether imported or indigenous.

6.2 The manufacturer shall be responsible for the subsequent availability of spare parts to ensure trouble free service for the life of the machine.

7.0 MAKER'S TEST CERTIFICATE

7.1 Copies of the Maker's certificate guaranteeing the performance of the equipment shall be supplied in duplicate along with the delivery of the each machine.

8.0 OPERATORS

8.1 The number of operators and allied staff for working of the system under normal condition shall be indicated, specifying their duties and minimum qualifications.

9.0 INSPECTION OF THE UNLOADING SYSTEM

9.1 While inspecting the unloading system before dispatch from the supplier's premises, the inspecting officer shall verify the conformity of the system with respect to individual specification as above. The machine's conformity / non-conformity with respect to each item shall be jointly recorded before issue of the inspection certificate and approval for dispatch of the machine as per Annexure-II enclosed.

9.2 Following arrangements shall be made by the supplier/Manufacturer at the inspection premises for carrying out inspection of the unloading system by inspecting officials:

- The system to be compatible with Indian Railways standard flat wagon intended to be used in the EUR and roller wagons. The system thus fitted on wagon shall be stabled on straight & level BG track. The length of the track shall be at least 10 m more than buffer to buffer length of wagon.
- In order to check Maximum Moving Dimensions in cross section, a sturdy frame of Indian Railways Maximum Moving Dimensions shall be provided by the manufacturer and passed over the machine holding it perpendicular to track, centre aligned with track centre. Adequate arrangements shall be made to the satisfaction of inspecting official.

9.3 The following documents shall be provided to the Inspecting Officer at least 30 days before the proposed date of inspection.

i) One copy of complete technical literature mentioned in clause 5.0, in English language, including operation, service and field maintenance manuals/instructions and other relevant technical details as a reference documents in soft & hard copies for the inspecting officer.

ii) Cross section of the system fitted on Indian Railways standard flat wagon intended to be used in the EUR and roller wagons super imposed on Indian Railways Maximum Moving Dimensions envelope shall be provided to IO in advance.

iii) Clause by clause comments of the manufacturer to be sent to Inspecting Officer (IO) in advance for his review. Comments shall state manufacturer's conformity of compliance of each of the requirement stated in each clause, elaborating where necessary the details/manner in which the requirement has been complied. The pro-forma for the clause-wise comments is given below:

Clause no.	Clause	Comments of Supplier/ manufacturer	Comments of Inspecting Officer

iv) Manufacturer's Internal Quality Inspection Report of the machine.

v) Manufacturer's quality certificate and/or test reports for bought out assemblies/sub-assemblies to be provided to IO, containing serial number wherever applicable.

vi) Draft Inspection Report to be prepared by the manufacturer, containing all annexure mentioned at para 9.4.

vii) Details of arrangements made for checking Maximum Moving Dimensions for his approval.

Supplier will incorporate amendments/further clarification in the above documents to the satisfaction of the Inspecting Officer keeping in view the Inspecting Officer's comments, if any.

9.4 List of documents to be annexed in the draft Inspection Report shall include:

i. Maker's Test Certificate.
ii. Manufacturer's Internal Quality Inspection Report
iii. Quality Certificates of Bought out assemblies/sub-assemblies
iv. Cross section of the machine super imposed on the Indian Railways MMD
v. Vogel's diagram for calculating centre and end throw of the unloading system on curved track.
vi. List of spare parts to be dispatched along with the machine
vii. List of tools to be dispatched along with the machine

viii. List of Manuals, Drawings, Spare Parts Catalogues, etc. to be dispatched along with the machine, duly indicating the number of sets of each.

10.0 TRAINING OF INDIAN RAILWAYS OFFICIALS

10.1 On the job, operation and maintenance training for 2 weeks for 3 supervisors per system shall be provided during and/or post commissioning to the satisfaction of purchaser.

11.0 COMMISSIONING OF THE UNLOADING SYSTEM

Tenderer will arrange to commission the system within 60 days of its arrival at the ultimate consignee premises and will also arrange for tests to be conducted according to the contract as required by the purchaser or his nominee.

12.0 SERVICE ENGINEER

11.1 The service engineers shall be available for the commissioning of the system for regular service. E-Learning courses module shall be arranged for imparting training to railway operators during commissioning. In addition, the service engineer shall provide hands on training to railway staff in calibration, operation, repairing and maintenance of the system in field to make them fully conversant with the system. The engineers shall also advise the Railways on appropriate maintenance, testing, operating, repair and staff training facilities that are necessary for the efficient performance of the system.

13.0 ACCEPTANCE TEST

13.1 In addition to verification of the various items of specifications covered earlier, the following tests shall be carried out in India at the purchaser's premises by the purchaser's nominee at the time of the commissioning of the system.

13.2 Dimensional check of loading gauge, i.e. maximum moving dimensions, clearance and clearances on curves etc.

13.3 Testing for negotiability on 1 in 8.5 turnouts.

13.4 Construction and engineering of the system and its ability to perform all the functions as laid down in the specifications above.

ACTUAL OUTPUT AND PERFORMANCE TESTS: Actual output and performance tests to be conducted on first unloading system.

The general conditions of the tests shall be as follows:

a) Machine crew shall be either trained personnel of Indian Railways or the staff of the supplier.
b) Dry weather, ambient temperature between -5^0C to $+55^0$C.

c) Straight track or curve up to 1000 m radius.
d) Straight track with gradients up to 1/200.
e) Rails fastened to all the sleepers.
f) Concrete sleepers.

The machine shall be required to achieve an output of 260 m rail panel unloading over a period of 6-8 minutes to cover all the items required as per para 3.11.

14.0 WARRANTY

14.1 The unloading system shall be warranted for 1200 effective working hours or 18 months from date of commissioning and proving test of equipment or 24 months from date of delivery at ultimate destination in India whichever shall be earlier. Effective working hours for this purpose will be traffic block time during which the system is deployed for work of unloading of rail panel. Shall any design modification be made in any part of the equipment offered, the warranty period of 18 months would commence from the commissioning and proving test of the machine for the purpose of that part and those parts which may get damaged due to defects in the new replaced part. The cost of such modification shall be borne by the supplier.

15.0 MARKING & COLOUR OF MACHINE:

15.1 The wagon body and the fitted unloading components, sub system like following trolleys shall be painted in golden yellow colour of Indian Standard Colour code of 356 as per IS:5 The exterior painting shall be polyurethane binder based conforming to RDSO Specification No. M&C/PCN/100/2013 (Specification for Epoxy cum Polyurethane Painting System –Two packs for the Exterior Painting of Railway Coaches, Diesel and Electric Locomotives and other Industrial Applications) or ISO 12944.

15.2 Following shall be written in black on the wagon side at appropriate location in English & Hindi as per direction of Indian Railway official.

i) India Railways logo of height of optimum size.
ii) The text " INDIAN RAILWAYS" shall be written in bold and in black colour of size equal to or slightly smaller than the size of logo but of size not less than 150 mm on both side faces and below the Indian Railways logo.
iii) Machine model and manufacturing year shall be written in black colour and in letter of size less than the size in which Indian Railways is written but not less than 100 mm in any case below the text "INDIAN RAILWAYS" mentioned above.
iv) If required, the manufacturers name may be written in size not more than 150 mm and shall not be at more than four locations. Also the manufacturers logo may be provided at not more than two locations and shall be of size less than 100 mm.

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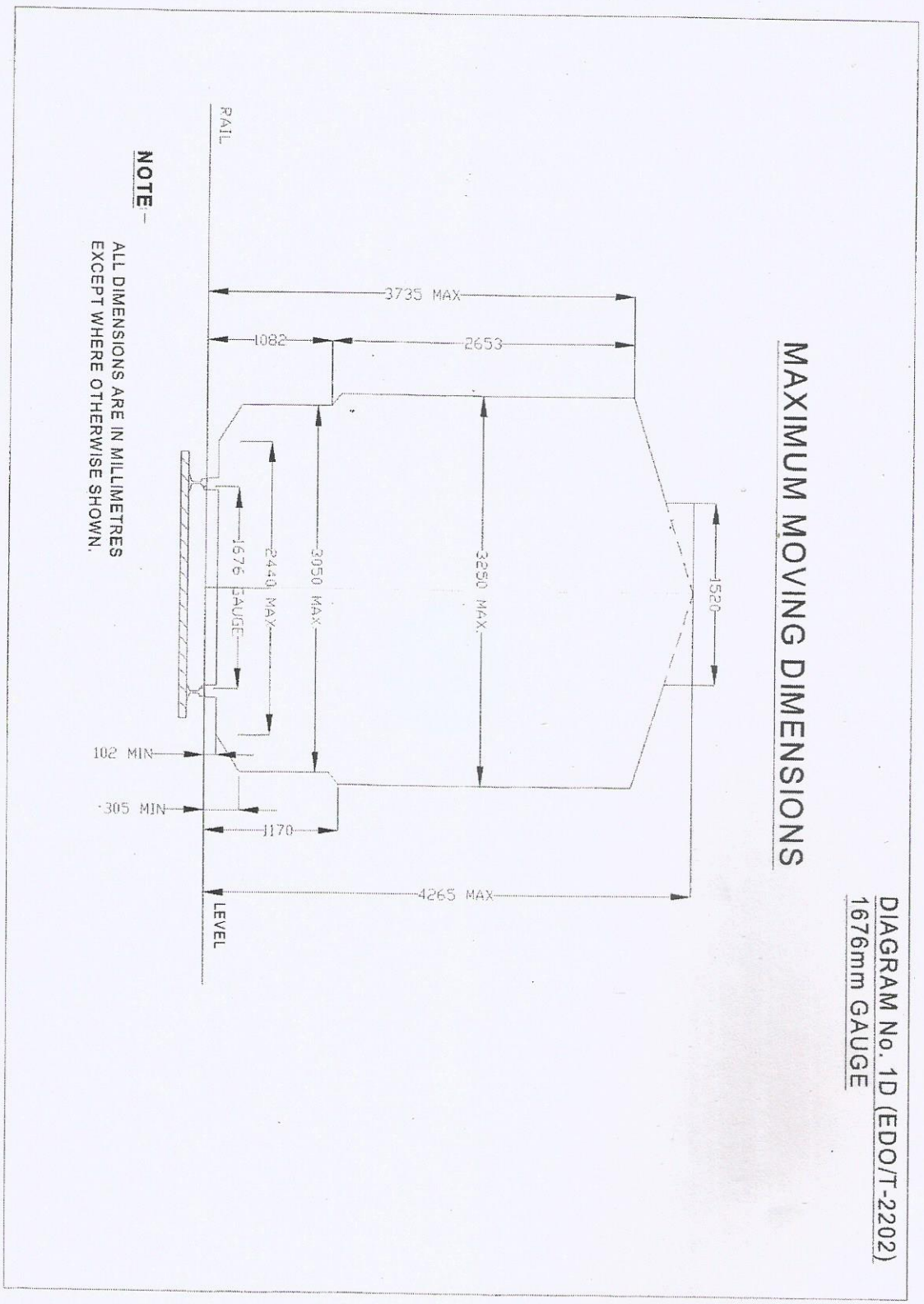
Annexure-I



Annexure-II

INSPECTION CERTIFICATE

CERTIFICATE OF INSPECTION OF TRACK MACHINE (.....)
BY INSPECTING OFFICIAL AND APPROVAL FOR DESPATCH OF MACHINES. (STRIKE OUT WHICHEVER NOT APPLICABLE)

This is to certify that I have inspected the machine (type)_____bearing Sr.No._____ from (date) _____to _____at (Place) _____ for its conformity/non-conformity with respect to the laid down Technical Specifications in contract Agreement No._____ dated_____ between President of India through Director Track (Machines) and M/s. (Name of Supplier) _____ _____.

The detailed Inspection Note regarding its conformity/non-conformity to the laid specifications is enclosed along with this certificate. It is observed that (strike out whichever is not applicable):-

- The Machine conforms to all the laid down specifications.
- The machine conforms to all the laid down specifications except those at Sl. No._____.
- The above deviations are minor/major affecting/not affecting the performance of the equipment in substantial way.

The following T and P/manuals/drawings are to be supplied along with the machine:

1. _____
2. _____
3. _____

Based on the above, the Machine is certified/not certified to be conforming to the specifications.

The machine is approved/not approved for dispatch to _____ _____(Consignee) Indian Railways.

For M/s._____
_____

SIGNATURE AND DATE
INSPECTING OFFICIAL
(NAME AND DESIGNATION)
for and on Behalf of President of India

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INDIAN RAILWAY

Technical Specification of Improved In Field Unloading and Loading System for Long rail Panels for BG (1676 mm)

(Specification No. TM/HM/29/449 of 2018)

S. No.	Month & Year of approval	Revision/Amendment	Reason for Amendment
1.	July-2019	Nil	First Issue

Signature	24.07.19 24/07/19	24.07.19 24.7.19	
Name & Designation	(Ravi Kumar) SSRE/TM (A. K. Chakraborty) SSE/TM **Prepared By**	(Muslim Ahmad) ARE/TM (Om Prakash) DTM-III **Checked By**	(S. C. Srivastava) ED/TM **Approved By**

Issued By:

Track Machine & Monitoring Directorate
Research Designs and Standards Organization
Manak Nagar, Lucknow-226011

Technical Specification of Improved In Field Unloading and Loading System for Long rail Panels for BG (1676 mm)

(Specification No. TM/HM/29/449 of 2019)

1.0 General

1.1 Unloading of long rail panels (130-260 m) in field is done through end unloading rakes (EUR) as per prevailing practice. The process of unloading of rail panels is partially mechanised and requires manual intervention which depends upon individual skill of workmen and also involves possibilities of accidents causing injuries to the workmen. Presently there is no system existing for loading of released rail on the empty rake. In view of this, mechanised improved system of unloading and loading of rail panels (130-260 m long) is required. This specification has been prepared to cover service conditions and material, functional and other technical requirements of the "in field unloading and loading system" for long rail panels hereinafter called "system". This system shall be equally capable for unloading of long rail panels from existing Indian Railways standard roller wagons without modifications and unloading of long rail panels from/loading of released rail panels to modified new built rail transport rake as mentioned in para 1.2. The system shall be capable of executing rail threading for relaying new rail panels and unloading of long rail panels independently.

1.2 The rail transport rake fitted with running rails for crane movement for unloading and loading of long rail panels shall be made by modifying the existing designs as per drg. Nos. RDSO/T 8403 to 8412. The new wagon (BRNA, BRNAHS) shall be supplied by Indian Railways for modified new built transport rake and in field unloading and loading system. The bidder shall submit the details and drawings of modified rail transport rake for unloading and loading of long rail panel with running rails for crane movement to Indian Railways. Detailed dimensional drawing of the in field unloading and loading system, shall also be submitted with the offer.

1.3 The technical specifications have been drafted to reflect the performance and quality requirements of the system in a neutral manner without bias to any specific manufacturer. Bidders are requested to carefully study the specification and assure that their system fully comply therewith. If a bidder feels that his system can substantially meet the performance and quality requirements of the system but does not fully satisfy a particular system specification, he should mention the same in the statement of deviation from the specifications, giving the details how the functional requirements are going to be met with.

1.4 The bidder shall specify the make/model offered system and furnish a detailed technical description of the same. System/ Subsystem of the working mechanism as per Para 3.0 in particular and all the items of the specifications in general shall be described in detail in the "technical description" along with sketches to show the manner in which the requirements of the specifications are accomplished by the system (model) offered.

1.5 Photograph of the type of the system offered, in working mode shall be enclosed with the offer. These shall also show the close-ups of various working assemblies/ systems and the full system. The tenderer shall furnish a compact disc or DVD or USB showing the working of system in real time under field condition. Tenderer shall also submit the names of countries & Railways where the offered systems are working and where their working at site can be visited by Indian Railways officials.

1.6 Since, the system under procurement comprises of a main unit/rail crane and several auxiliary smaller system/components, the tenderer must ensure that they are matching in capacity with respect to the targeted output mentioned in para. 3.16.

1.7 The bidder shall be entirely responsible for the execution of the contract strictly in accordance with the terms and conditions of the specification not withstanding any approval, which RDSO or the Inspecting Officer may have given:

- Of the detailed drawings prepared by the bidder.
- Of his sub- bidders for materials, components & sub-assemblies.
- Of other parts of the work involved in the contract.
- Of the tests carried out by the bidder/Sub- bidder or RDSO or the Inspecting Officer.

2.0 DIMENTIONAL AND OPERATING REQUIREMENTS

2.1 The design and dimensions of the system and its components shall be to metric standards. Quality assurance during manufacturing of the system shall be according to ISO-9001. The welding standard followed for manufacturing of system should conform to ISO: 3834, EN: 15085 or any other equivalent standard for welding railway vehicle and components. The manufacturer should specify the standard followed and certify that it meets the welding standard mentioned above.

2.2 The profile of the system consist i.e., rail panel unloading/loading unit fitted on the wagon, loading/unloading supporting components additionally fitted on the wagons or their any part, longitudinally and in cross section, shall not infringe the Indian Railways schedule of dimensions-1676 mm (BG) revised 2004 print with the latest corrigendum and up to date correction slips issued during movement in train formation. The maximum moving dimensions are enclosed as Annexure-I. The tenderer shall provide sketches of the system consist i.e. rail panel unloading/loading unit fitted on the wagon, loading/unloading supporting components additionally fitted on the wagons, in plan and shall give calculations to prove that the system does not cause infringement while moving on a 10 degree curve at any cross section.

2.3 Adequate clearance shall be allowed so that no component/part infringe the minimum clearance of 91 mm from the rail level while travelling up to condemnation limit of wheel.

2.4 It shall be capable of negotiating curves up to 10 degree curvature (175 m radius), super elevation up to 185 mm and gradients up to 3% in travel mode in train formation.

2.5 The system shall be capable of working continuously during the varying atmospheric and climatic conditions occurring throughout the year. The range of climatic conditions is as follows:

Ambient Temperature	: (-) 5^0 to (+) 55^0 C
Altitude	: Up to 1750 m to above mean sea level
Relative Humidity	: up to 100%
Maximum Rail Temperature	: (-)15^0 to (+) 76^0C
Rainfall	: Fairly heavy

2.6 All the system components vulnerable to rain water and moisture shall be covered where reasonably possible by roof or other suitable sturdy covering so that the system & components are not adversely affected during rains and the system is able to work continuously even during rains.

2.7 The system fitted on IR wagon shall be capable of being hauled at a speed not less than 100 kmph.

2.8 It shall be capable of working without requiring power block in electrified section. 25 KV or 2x25 KV AC power supply is used for traction through an overhead wire at 5500 mm above rail level. On bridges and tunnels, the height of OHE is restricted to 4800 mm.

2.9 While working on double line section, it shall not infringe the adjoining track and it shall be possible to permit trains at full speed on that track. Minimum centre to centre spacing of track is 4265 mm.

3.0 WORKING MECHANISM

3.1 The system shall consist of modified IR wagons fitted with components for movement of gantry crane type rail panel manipulator/system, panel supporting fixtures, panel guiding roller assemblies system, rail end supporting arrangement etc and rail threading assembly. The system shall be compatible for unloading of long rail panels from EUR (End Unloading Rake, RDSO Drg. Nos. RDSO/T 8403 to 8412) which is being used for transportation of long rail panels on Indian Railways.

3.2 The system shall be capable to unload long rail panels of 130 m to 260 m as well as load the released rail panels of 130 m to 260 m long at site on modified new built rail transport rake as mentioned in para 1.2.

3.3 The system shall have pulling system for pairing and butting of rail panels without drilling any holes in the rails. There shall be proper clamping arrangement for pairing and butting of rail panels without using rope/wire which shall not get loosened during unloading. Additional pairing and butting of rail panels, unloaded by the system, shall not be required. The pulling mechanism shall be capable of pulling the rail panels both in pairs and single rail panel.

3.4 There shall be a rail panel-positioning unit, following the unloading wagon for placing the long rail panels at required alignment. The positioning unit should move with the unloading rake by tying it with the rear wagon of the system. There shall be necessary arrangement to load and unload the rail panel positioning unit on the unloading wagon and in loaded condition adequate locking arrangement should be provided to secure the unit on the wagon floor against any movement during transportation of the system. The panel positioning unit, when loaded on wagon shall not infringe MMD of IRSOD (latest edition).

3.5 Whenever required, rail threading unit shall be used for relaying new rail panels along with the in-field unloading and loading system and the rail positioning unit shall move behind the unloading wagon on the existing rails and shall feed the new rail panels towards the rail threading unit for laying the rail on the track replacing existing rails. Sufficient distance between the rail positioning unit and rail threading unit shall be maintained so that the rail threading unit may get adequate length of newly laid track ahead of its movement as well as the rail positioning unit may move on the existing track before the rails of the track are removed by rail threading unit. The elastic rail clips of the existing track shall be removed simultaneously (done manually by a team of track men) ahead of rail threading unit for removing the existing rails from rail seats of the sleepers. After relaying, the elastic rail clips shall be inserted manually.

3.6 There shall be an arrangement of universal rail clamp for connecting long rail panels to make a continuous strand. The universal rail clamps shall be able to function without drilling holes in rail panels and shall be sufficient in numbers for unloading the rake loaded to full capacity of long rail panels. The transportation arrangement of universal rail clamps by trolley/wheelbarrow shall also be provided.

3.7 The system shall be able to unload the rail panels in the middle of the track and also on the ends of the sleepers up to 1.8 m away from the centre of the track on either side of the track requiring no manual intervention at ground level during normal unloading. Similarly, the system shall be able to load the released rail panels from the middle of the track and from the ends of the sleepers up to 1.8 m away from the centre of the track on either side of the track requiring no manual intervention.

3.8 System shall be such that, bending stresses induced in rails during the course of unloading and loading are minimum. The unloading system shall be suitably designed for rail profiles IRS52, UIC60 and 60EI. The rail handling crane/manipulator shall have four arms, two at each end. The arms shall be operated hydraulically to grip and pull the rail panels towards the unloading end of the rake.

3.9 The rail handling crane/manipulators shall be self-propelled and able to run on the wagons of in field unloading and loading system/new built rail transport rake. Gripping points shall be as per "Guidelines for Handling and Stacking of Rails" (CT-35, Oct. 2014).

3.10 Design of the system shall be such that unloading and loading of rail panels can take place without any damage/disturbance to track components like rails, fittings & fastenings and sleepers etc.

3.11 There shall be a guiding system for unloading of the rail panels so that minimal force is transmitted to track and there is no damage either to track or to the guiding system during unloading of rail panels.

3.12 The system shall be able to unload the rail panels in upright position without tilting at equal distances from the centre line of the track on outside as well as inside the track. Eccentric unloading or unloading of pairs of rails from one side of wagon is strictly prohibited. No additional personnel and wagon shall be used for positioning the rails.

3.13 The system shall be so designed that during unloading, the rail panels shall move smoothly either on rollers or on any suitable arrangement fitted on wagon. The rail panel shall move without sudden lateral/toppling movement and not get damaged. Rail panels shall be lifted mechanically without leaving any dent/mark on rail and placed in position for unloading without applying any extra force to rail panel. Rail panels shall not rub on the floor of the wagon or any other component of the wagon so that damage to rail is minimised during this activity. Rail ends shall gradually fall on the track passing through landing plates/chute attached at the end of the last wagon/BFR of the in field unloading and loading system. The rail panel shall be unloaded without use of steel core wire rope/any type of rope/wire etc. and also without any safety hazard in such a manner that need of fixing of the end of panel with track does not require.

3.14 The system shall be such that maintenance can be done without the need of removal of the gantry crane/rail manipulator or any other components.

3.15 In order to avoid mechanical injuries while the rails are being pulled off, the rails shall be pulled off over roller-bearing rail guide heads.

3.16 The required minimum output of the system shall be as follows:

a) Unloading of 260 m long rail panels (each pair) from rail transport wagons sets with crane running rails new built for this purpose provided by Indian Railways where pairing is not required and butting of rail panels is done by the crane : 4-6 min

b) Unloading of 260 m long rail panels (each pair) from Indian Railways standard EUR including pairing and butting from roller wagons : 8-10 min

c) Loading of 260 m long rail (each pair) rail transport wagons sets with crane running rails new built for this purpose : 6-8 min

d) Minimum radius when pulling off the rails from rail transport wagons sets with crane running rails new built for this purpose : 175 m (10^0 curvature)

e) Minimum radius when pulling off the rails from Indian Railways standard EUR : 350 m (5^0 curvature)

f) Maximum track super elevation when pulling/unloading off the rails : 185 mm

3.17 The arrangement of unloading system and rail guide system shall be so provided that the safety of trackmen working around or on the unloading system shall be ensured all the time.

3.18 The design life of the system shall coincide with the codal life of the wagons of EUR over which it will be installed.

3.19 One portable diesel operated D.C. welding plant (with the provision of auxiliary output of minimum 2.5 KW, 230 V AC for lighting) of reputed make (preferably made in India) with a minimum 5 KVA capacity capable of welding up to 5 mm dia electrode at 60% duty cycle shall be supplied for welding as well as power pack for operating assemblies/sub-assemblies of unloading system, if required.

4.0 Crane:

4.1 The crane shall be sturdy, hydraulically operated and can move on the unloading/loading wagon. It shall have four arms, two at each end for gripping the rail panels. The rail gripping system shall be so designed that there shall not be any point contact with rail section to avoid load/ stress concentration at point of grip.

4.2 The hydraulic system of the crane shall function for all the activities like travelling, gripping, lifting and pulling the rail panels simultaneously.

4.3 The crane shall be provided with suitable, ergonomically designed, AC, noise isolated cabin with comfortable seating arrangement for the operator. The cabin and engine shall be mounted on rubber buffer to minimise operational jerk in the cabin. The cabin shall have CC TV for proper rear viewing. The front view of working area shall not be obstructed during operation of carne for loading/unloading of long rail panels.

4.4 The gauges, instruments and controls shall be suitably located in the operator's panel so that they can be observed without undue fatigue to the operator. To enter into the cabin, it shall have pneumatically/hydraulically operated collapsible/folding ladder.

4.5 The electric supply in the control panel for operation of electrical instruments, gauges etc. shall not be more than of 110 V.

4.6 To the extent possible hydraulic and pneumatic (if used) component/assembly should be fixed at suitable location preferably on the side frame of the system so as to avoid the need of going on top of the system/ gantry crane frame for day-to-day maintenance schedules.

4.7 Onboard system for online filtration and monitoring the quality of hydraulic oil in hydraulic circuit should be provided. The gauge should clearly indicate if the hydraulic oil is contaminated beyond the permissible limits and requires immediate replacement.

5.0 Rail Threading Unit:

5.1 The rail-positioning unit & rail threading unit shall work independently. However, both these units will be capable of being worked simultaneously. Positioning unit shall move on old track just following the rear wagon of loading/unloading system for receiving the rail panels from unloading chute and guiding the same to lay on sleepers at correct alignment of existing rail. The rail threading unit shall follow the positioning unit within suitable distance and remove the old rail panel from the track spreading them out side of the track and laying the new rail into the rail seat compartment of sleeper. The old rail lying outside of the track can be loaded later to new built Indian Railway standard wagons (BRNA, BRNAHS) with certain modifications as mentioned in para 1.2.

5.2 The rail threading unit shall work self-sufficiently and independently with suitable distance from unloading system of long rail panels.

5.3 The rail positioning unit, adjacent to unloading wagon shall have hydraulic system for lateral movement of the rail positioning components. Hydraulic power may be taken from the power pack of the unloading wagon. The rail positioning unit shall receive the rail panels from the unloading wagon and lay the panels at proper alignment so that no additional effort is required for alignment of the newly laid rails. The rail positioning unit shall be connected with the unloading wagon with suitable connector.

5.4 The rail threading unit shall be self-propelled and hydraulically operated for removing the old rail from track and treading new rail in. The rail threading unit shall move on its own power.

5.5 No components/members of the entire system shall infringe the traffic movement on adjacent track during unloading, relaying and loading of long rail panels.

6.0 Roller Wagons and End Unloading Wagons:

6.1 New built Indian standard wagons/BFRs provided by IR shall be used for roller wagons on which the long rail panels shall be loaded in layers for new built rail transport rake as mentioned in para 1.2. There shall be provision of accommodating at least 40 long rail panels of length 130/260 m in the rake with sufficient numbers of wagons.

For unloading from existing IR standard Wagon to drawing nos. RDSO/T-8403 to 8412, there shall be provision of accommodating at least 60 long rail panels of length 130/260 m in the EUR rake.

6.2 The rake for carrying long rail panels shall have the suitably designed roller bunks (lever arm) for carrying rail panels. The roller bunks shall provide vertical support to the rail panels. Sufficient nos. of roller bunks shall be used and linear distance between two successive supports shall not be more than 6.5 m.

6.3 The roller bunks (lever arm) shall be fitted across the wagon width. The roller bunks shall be in two parts and splitted centrally, so that each half part may be slewed around the vertical pillar to rest on vertical support (end column) at edge of wagon/BFR and along the length of the wagon/BFR, whenever required. The roller bunks shall be attached to vertical pillars (end column) erected at side edge of the wagon/BFR. Other end of roller bunk (lever arm) shall rest on column erected at the centre as well as at the side of the wagon and with the alignment of the roller bunks (lever arm).

6.4 Each roller bunk shall have roller arrangement on which the rail panels shall move.

6.5 There shall be three ramper and threader wagons coupled at the end of rail panel loaded rake. There shall be suitable arrangement for moving of the crane/rail manipulator along these three wagons.

6.6 As the crane moves on its own power by double flanged wheels. Rail/steel beam matching the wheel profile, shall be fitted along the side wall of the wagons for crane movement. Fitting of such rails/steel beam shall not infringe MMD of IRSOD (latest version).

6.7 The joints of the rail/steel beam between wagons on which the crane is moving, shall be detachable type and flexible enough to negotiate 10^0 curves (175 m) while travelling and in working mode.

7.0 DIESEL ENGINE

7.1 The gantry crane/rail manipulator of the system and also rail threader (whenever supplied with the system) shall be powered by diesel engine preferably indigenous, with proven record of service in tropical countries. Robust construction and low maintenance cost are of particular importance. Adequate allowance shall be made for de-rating of diesel engine under the most adverse climatic conditions mentioned in this specification elsewhere.

7.2 High speed diesel oil to Indian Standard specification shall be normally used. A minimum fuel capacity sufficient for continuous operation for 16 hours will be desirable.

7.3 Sight glass type fuel measuring gauge preferably of full height shall be provided on the fuel tank.

7.4 The engine parameter monitoring gauges like temperature, rpm, lubricant oil pressure shall be direct reading type mounted on the engine, backed up by electrical / mechanical gauges in the operator's cabin console showing the absolute readings along-with safety limits suitably coloured. There shall be audio-visual warning (safety mechanism) to the operators in case of any of these parameters exceeding the safe limit and engine will shut down automatically.

7.5 In order to adhere to pollution Control norms, the diesel engine should be electronically controlled emmissionized engine with minimum compliance of tier 2 stage.

7.6 The engine should be enclosed in a weather protective, sound and dust resistant enclosure to minimize engine noise and to prevent oozing out of oil spills etc. from engine area to the adjacent system components, hoses, electrical cables fittings as a protection against fire. All doors on the enclosure shall be strategically located in areas as to allow ease of maintenance of the engine and allow good access to and visibility of instruments, controls, engine gauges, etc. Sufficient louvers shall be provided to allow the total engine cooling air requirements used in this application.

8.0 DRIVING MECHANISM

8.1 The gantry crane/rail manipulator of the system should be provided with an efficient traction drive system for traction during movement on the unloading wagons.

8.2 The driving mechanism should be rugged to perform satisfactorily during the life cycle of the gantry crane/rail manipulator. The driving system shall be through hydro-statically coupled power transmission arrangement capable of achieving required speed in both directions. The system should be so designed that all the driving wheels work in synchronization and there is no slippage/skidding of the wheel during the movement.

8.3 The system of the gantry crane/rail manipulator shall be such that whenever required the relative movement between the travelling wheels of the system and the rail/beam on which the system moves will be possible by disengaging/engaging the transmission power to the wheels.

9.0 COOLING SYSTEM

9.1 The cooling system for prime mover as well as hydraulic system oil shall be efficient and designed for a maximum ambient temperature of 55^0C. Tenderer may note that the system shall be working under extreme dusty conditions and the cooling mechanism should be maintainable under these conditions.

9.2 Adequate heat transfer arrangement for hydraulic system shall be designed and provided so that under extreme heat conditions as mentioned in 2.5 above, the system oil temperature does not go beyond specified range.

10.0 BRAKES

10.1 The system of the gantry crane/rail manipulator shall have suitable brake system applying on all the wheels. The brake system may be hydraulically or pneumatically operated.

11.0 HORN, HOOTERS AND SAFETY SWITCHES

11.1 The system of the gantry crane/rail manipulator shall be provided with dual tone (low tone & high tone) electric/pneumatic horns facing outwards at each end of the system at suitable locations for use during rail panel unloading and loading operation to warn the workmen of any impending danger. Control shall be provided in close proximity to the operator permitting the driver to operate either horn individually or both horns simultaneously. The horns shall be distinctly audible from a distance of at-least 400 m from the system and shall produce sound of 120-125 dB at a distance of 5 meter from horn (source of sound). The higher tone horn shall have fundamental frequency of 370 ±15 hertz.

11.2 Adequate numbers of safety stop switches should be provided all around so that in case of any danger to workers as well as hitting of any obstructions by working unit like signalling cable, joggle fish plate etc. during working, so that the operator can be warned or the working can be stopped immediately.

11.3 System shall be provided with emergency backup system to wind up the system in the event of failure of prime mover or power transmission system of the system to clear the traffic block for safe passage of traffic. The emergency backup system should be able to be operated manually also.

12.0 LIGHTING ARRANGEMENTS

12.1 The electric equipment to be provided shall conform to relevant standard specifications and shall be suitable for Indian climatic conditions. The system shall

be equipped with twin beam headlights conforming to RDSO's specification no. ELRS/SPEC/PR/0024 Rev-1, Sept 2004 with latest amendments ensuring a light intensity of 3.2 lux at ground level at track centre at a distance of 305 m. away on a clear dark night, at each end and with two front and rear parking lights at each end.

12.2 Powerful floodlights shall also be provided to illuminate the working area sufficiently bright for efficient working during night.

13.0 TOOLS AND INSTRUCTION MANUALS

13.1 Each system shall be supplied with a complete kit of tools required by operator in emergency and for normal working of the system. The list of tools to be provided shall also include all tools necessary for maintenance and repair of the entire system including specialized equipment. All special tools shall be listed and catalogued illustrating the method of application. The tenderer shall along with his offer submit the list of tools to be supplied along with each system.

13.2 Detailed operating manual, circuit diagrams of electrical, hydraulic, pneumatic and electronic circuits used on the system maintenance, trouble shooting manuals and service manuals shall be specifically prepared in English language and four hard copies & soft copies of each of the same shall be supplied with each system.

13.3 One set of all the manuals and diagrams in hard as well as soft copy should also be sent to the Principal/Indian Railways Track System Training Centre, Allahabad, one set to ED/TMM, RDSO, Lucknow, one set to DTK (MC)/Railway Board and one set to Director/IRICEN/Pune along with supply of first system. In case, there is any subsequent amendment in above documents based on field performance, the amendment/amended documents should also be sent to above mentioned authorities.

13.4 A draft copy of all documents to be supplied with the system should be sent 3 months in advance of inspection of the first system to RDSO for their review regarding adequacy and manner of detailing. Necessary modifications and further detailing as per RDSO's comments should be carried out and compliance should be reported to RDSO as well as the Inspecting officer of the first system.

14.0 SPARE PARTS

14.1 The expected life of the components, used in the system, shall be advised by the tenderer along with their condemning limits. The system shall be supplied with necessary spare parts for the operation and maintenance of the system for a period of two years. The spare parts required shall be detailed in a separate list indicating description, part number and whether imported or indigenous.

14.2 The manufacturer shall be responsible for the subsequent availability of spare parts to ensure trouble free service for the life of the system.

14.3 For indigenous parts and bought out components and assemblies, the source (original equipment manufacturers reference and part no.) and other relevant technical details shall be supplied while offering the first system for inspection.

15.0 MAKER'S TEST CERTIFICATE

15.1 Copies of the Maker's certificate guaranteeing the performance of the system shall be supplied in duplicate along with the delivery of the each system.

16.0 OPERATORS

16.1 The number of operators and allied staff for working of the system under normal condition shall be indicated, specifying their duties and minimum qualifications. Manpower required for loading/unloading including operating the system should not be usually high.

17.0 OPTIONAL EQUIPMENTS

17.1 Tenderer is expected to quote for optional equipment separately for each item giving the advantage/functions of such optional equipment. Tenderer shall also indicate whether such equipment is already in use on systems elsewhere indicating the user Railway system.

18.0 INSPECTION OF THE SYSTEM

18.1 While inspecting the system before dispatch from the supplier's premises, the inspecting officer shall verify the conformity of the system with respect to individual specification as above. The system's conformity/non-conformity with respect to each item shall be jointly recorded before issue of the inspection certificate and approval for dispatch of the system as per Annexure-II enclosed.

18.2 Following arrangements shall be made by the supplier/Manufacturer at the inspection premises for carrying out inspection of the system by inspecting officials:

- The system of the gantry crane/rail manipulator to be placed on Indian Railways standard flat wagon intended to be used in the EUR and new built rail transport rake. The system thus loaded on wagon shall be stabled on straight & level BG track. The length of the track should be at least 10 m more than buffer to buffer length of wagon.

- In order to check Maximum Moving dimensions in cross section, a Sturdy frame of Indian Railways Maximum Moving Dimensions shall be provided by the manufacturer and passed over the system holding it perpendicular to track, centre aligned with track centre. Adequate arrangements shall be made to the satisfaction of inspecting official.

18.3 The following documents shall be provided to the Inspecting Officer at least 30 days before the proposed date of inspection.

i) One copy of complete technical literature mentioned in clause 13, in English language, including operation, service and field maintenance manuals/instructions and complete electrical, hydraulic and pneumatic circuit diagrams, trouble shooting charts, component drawings/description and other relevant technical details as a reference documents in soft & hard copies for the inspecting officer.

ii) Cross section of the system of the gantry crane/rail manipulator placed on Indian Railways standard flat wagon intended to be used in the EUR and new built transport rake super imposed on Indian Railways Maximum Moving dimensions envelope shall be provided to Inspecting Officer (IO) in advance.

iii) Clause by clause comments of the manufacturer to be sent to Inspecting Officer (IO) in advance for his review. Comments should state manufacturer's conformity of compliance of each of the requirement stated in each clause, elaborating where necessary the details/manner in which the requirement has been complied. The pro-forma for the clause-wise comments is given below:

Clause no.	Clause	Comments of Supplier/ manufacturer	Comments of Inspecting Officer

iv) Manufacturer's Internal Quality Inspection Report of the system.

v) Manufacturer's quality certificate and/or test reports for bought out assemblies/sub-assemblies to be provided to IO, containing serial number wherever applicable.

vi) Draft Inspection Report to be prepared by the manufacturer, containing all annexure mentioned at para 18.4.

vii) Details of arrangements made for checking Maximum Moving Dimensions for his approval.

Supplier will incorporate amendments/further clarification in the above documents to the satisfaction of the Inspecting Officer keeping in view the Inspecting Officer's comments, if any.

18.4 List of documents to be annexed in the draft Inspection Report shall include:

i) Maker's Test Certificate.
ii) Manufacturer's Internal Quality Inspection Report
iii) Quality Certificates of Bought out assemblies/sub-assemblies
iv) Cross section of the system super imposed on the Indian Railways MMD
v) Vogel's diagram
vi) List of spare parts to be dispatched along with the system

vii) List of tools to be dispatched along with the system

viii) List of Manuals, Drawings, Spare Parts Catalogues, etc. to be dispatched along with the system, duly indicating the number of sets of each.

ix) Details and drawings of modified rail transport rake and in field unloading and loading system for long rail panel.

19.0 TRAINING OF IR OFFICIALS

19.1 Two officials for each system from Zonal Railways and 4 officials from RDSO/Railway Board shall be trained as under:

(a) Training for a period of two weeks in the manufacturing plant and field operation abroad (for foreign manufacturing), shall be provided by the supplier/Manufacturer at manufacturing plant on the following key points:

- Key aspects of Operation and Maintenance of the system;
- Driving of the vehicle and crane operation.
- Assimilating various maintenance schedules of the system;
- Cost of boarding, lodging and travel of IR Officials will be borne by the purchaser.

19.2 In addition to the above, on the job operation and maintenance training for 2 weeks for 3 system supervisors per system, shall be provided during and/or post commissioning to the satisfaction of purchaser.

20.0 COMMISSIONING OF THE SYSTEM

20.1 Tenderer will arrange to commission the system within 60 days of its arrival at the ultimate consignee premises and will also arrange for tests to be conducted according to the contract as required by the purchaser or his nominee.

21.0 SERVICE ENGINEER

21.1 The service engineers shall be available for the commissioning of the system for regular service. E-Learning courses module should be arranged for imparting training to railway operators during commissioning. In addition, the service engineer shall provide hands on training to railway staff in calibration, operation, repairing and maintenance of the system in field to make them fully conversant with the system. The engineers shall also advise the Railways on appropriate maintenance, testing, operating, repair and staff training facilities that are necessary for the efficient performance of the systems.

22.0 ACCEPTANCE TEST

22.1 In addition to verification of the various items of specifications covered earlier, the following tests shall be carried out in India at the purchaser's premises by the purchaser's nominee at the time of the commissioning of the system.

22.2 Dimensional check of loading gauge, i.e. maximum moving dimensions, clearance and clearances on curves etc.

22.3 Testing for negotiability on 1 in 8.5 turnouts.

22.4 Construction and engineering of the system and its ability to perform all the functions as laid down in the specifications above.

22.5 **ACTUAL OUTPUT AND PERFORMANCE TESTS:** Actual output and performance tests to be conducted on first system.

The general conditions of the tests shall be as follows:

a) System crew shall be either trained personnel of Indian Railways or the staff of the supplier.

b) Dry weather, ambient temperature between -5^0 C to $+55^0$ C.

c) Straight track or curve as per para 3.16.

d) Straight track with gradients as per para 2.4.

e) Rails fastened to all the sleepers.

f) Concrete sleepers.

g) Fittings not seized.

h) The system shall be required to achieve an output of 260 m rail panel unloading and loading over period with performance data stipulated as per para 3.16 of working to cover all the items required as per para 3.0.

22.6 Should any modification be found necessary as a result of the tests, the same shall be carried out by the supplier at his own expenses.

23.0 WARRANTY

23.1 The system shall be warranted for 1200 effective working hours or 18 months from date of commissioning and proving test of equipment or 24 months from date of delivery at ultimate destination in India whichever shall be earlier. Effective working hours for this purpose will be traffic block time during which system is deployed for work of unloading/loading of rail panel. Should any design modification be made in any part of the equipment offered, the warranty period of 18 months would commence from the commissioning and proving test of the system for the purpose of that part and those parts which may get damaged due to defects in the new replaced part. The cost of such modification should be borne by the supplier.

24.0 MARKING & COLOUR OF SYSTEM:

24.1 The rail crane/manipulator and the rake shall be painted in golden yellow colour of Indian Standard Colour code of 356 as per IS:5 The exterior painting shall be

polyurethane binder based conforming to RDSO Specification No. M&C/PCN/100/2013 (Specification for Epoxy cum Polyurethane Painting System –Two packs for the Exterior Painting of Railway Coaches, Diesel and Electric Locomotives and other Industrial Applications) or ISO 12944.

24.2 Following shall be written in black on the system at appropriate location in English & Hindi as per direction of Indian Railway official

i) India Railways logo of height between 300 mm to 600 mm as suitable on all four faces of the system.

ii) The text " INDIAN RAILWAYS" shall be written in bold and in black colour of size equal to or slightly smaller than the size of logo but of size not less than 250 mm on both side faces and below the Indian Railways logo.

iii) System model and manufacturing year shall be written in black colour and in letter of size less than the size in which Indian Railways is written but not less than 200 mm in any case below the text "INDIAN RAILWAYS" mentioned above.

iv) If required, the manufacturers name may be written in size not more than 150 mm and shall not be at more than four locations. Also the manufacturer's logo may be provided at not more than two locations and shall be of size less than 200 mm.

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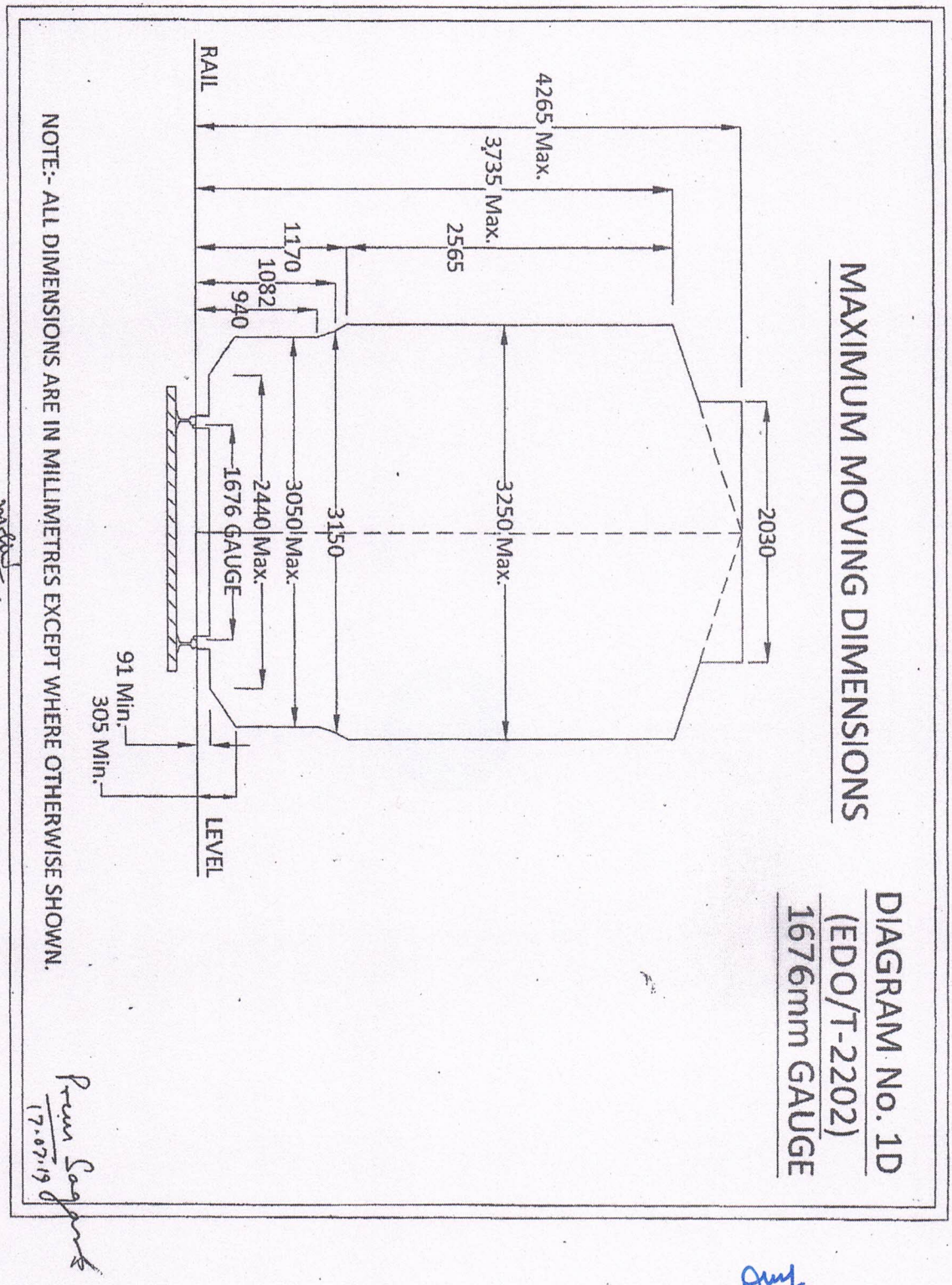
Annexure-I



Annexure-II

INSPECTION CERTIFICATE

CERTIFICATE OF INSPECTION OF TRACK SYSTEM (.....)

BY INSPECTING OFFICIAL AND APPROVAL FOR DESPATCH OF SYSTEMS. (STRIKE OUT WHICHEVER NOT APPLICABLE)

This is to certify that I have inspected the system (type)_____bearing Sl. No._____from (date)_____to _____at (Place) _____ for its conformity/non-conformity with respect to the laid down technical Specifications in contract agreement No._____ dated_____ between President of India through Director Track (Systems) and M/s. (Name of Supplier) _____ _____.The detailed inspection note regarding its conformity/non-conformity to the laid specifications is enclosed along with this certificate. It is observed that (strike out whichever is not applicable):-

- The System conforms to all the laid down specifications.
- The system conforms to all the laid down specifications except those at Sl. No._____.
- The above deviations are minor/major affecting/not affecting the performance of the equipment in substantial way.

The following T and P/manuals/drawings are to be supplied along with the system:

1. _____
2. _____
3. _____

Based on the above, the System is certified/not certified to be conforming to the specification.

The system is approved/not approved for dispatch to_____(Consignee) Indian Railways.

For M/s._____
_____

SIGNATURE AND DATE
INSPECTING OFFICIAL
(NAME AND DESIGNATION)
for and on Behalf of President of India