MMRC

Mumbai Metro Rail Corporation Limited

(JV of Govt. of India and Govt. of Maharashtra)

Invitation for Bids "Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba - Bandra -Seepz) Rail Project."

Date: 23-08-2019
Loan Agreement No: ID-P 268
IFB No: MM3-CBS-TWK-04 (Package – 10D)

1.1 GENERAL

1.1.1 Name of Work:

Mumbai Metro Rail Corporation (MMRC) Ltd. invites Open Bid on International Competitive Basis (ICB) from eligible source countries of Japanese ODA loans, who fulfill Evaluation and Qualification criteria as stipulated in section III of Bid documents, for the work,

Contract MM3-CBS-TWK-04 (Package 10D): Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba - Bandra -Seepz) Rail Project.

Key details:

Bid Security amount	INR 6.31 Million or US$ 89670 Validity of Bid Security is 28 days after Bid Validity
Completion period of the Work	12 months from signing of agreement
Pre-Bid Meeting	**03.09.2019 at 15:00 Hrs at MMRC Office**
Bid Submission End Date and time	**09.10.2019 upto 14:00 Hrs.**
Date & time of opening of Bids	**09.10.2019 at 15:00 Hrs.**
Place for submission of cost of Bid & Bid Security (EMD), seeking clarifications on Bid documents and pre bid meeting	**Mumbai Metro Rail Corporation Ltd,** Line 3 Transit Office, Wing 'A' , North Side of City park 'E'- Block, Bandra-Kurla Complex, Bandra (East), Mumbai 400 051, India. Telephone: +91 22 26575123, Website: https://www.mmrcl.com

1.1.2 The Mumbai Metro Rail Corporation (MMRC) has received a loan from Japan International Cooperation Agency (JICA) towards the cost of Project Mumbai Metro Line 3 (Colaba-Bandra-SEEPZ). It is intended that part of the proceeds of this loan will be applied to eligible payments under the Contract for "Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12-2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project."

1.1.3 Bidding will be conducted through procedures in accordance with the applicable Guidelines for Procurement under Japanese ODA Loans, and is open to all Bidders from eligible source countries, as defined in the Loan Agreement.

1.1.4 International Competitive Bidding will be conducted in accordance with JICA's "Standard Bidding Documents" Under Japanese ODA loans "Procurement of Goods" (Version1.1) published by JICA in May 2013.

1.1.5 The complete Bid document has been uploaded on MMRCL website www.mmrcl.com for reference only.

1.1.6 A complete set of the Bidding Documents may be purchased between 27-08-2019 to 07-10-2019 from 10:00 Hrs. to 17:00 Hrs. by interested Bidders on the submission of a written application to the address above and upon payment of a non-refundable fee of INR 10,000.00 Ten Thousand Indian Rupees Only) or US$ 145.00 (One Hundred and Forty Five US Dollar Only) (Inclusive of GST) in the form of a crossed demand draft in favour of Mumbai Metro Rail Corporation, payable at Mumbai.

1.1.7 Bids must be delivered to the address above on or before 14:00 Hrs. on 09-10-2019 and must be accompanied by a Bid security as above.

1.1.8 The Bidders may obtain further information/ clarification, if any, in respect of these Bid documents from the office of Mumbai Metro Rail Corporation Ltd, Line 3 Transit Office, Wing 'A' North Side of City park 'E'- Block, Bandra-Kurla Complex, Bandra (East) Mumbai 400 051.

1.1.9 The Bids will be opened in the presence of the Bidders representatives who choose to attend.

1.1.10 Bids shall be valid for a period of 120 days (both days inclusive i.e. the date of submission of Bids and the last date of period of validity of the Bid).

1.1.11 MMRC reserves the right to accept or reject any or all proposals without assigning any reasons.

1.1.12 For any complaint Bidder may contact Mumbai Metro Rail Corporation Ltd, Line 3 Transit Office, Wing 'A' North Side of City park 'E'- Block, Bandra-Kurla Complex,Bandra (East) Mumbai 400 051, India. Telephone: +91 22 26575123, Website: http://www.mmrcl.com

SKG 23/8

Place: Mumbai,
Date: 23-08-2019

(S.K Gupta)
Director (Projects)
Mumbai Metro Rail Corporation (MMRC)

BIDDING DOCUMENTS

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

PART 1
BIDDING PROCEDURE

Section I
INSTRUCTIONS TO BIDDERS

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City park 'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

BIDDING DOCUMENTS
Composition of Documents

Part1	**Bidding Procedures**	
	Section I	Instructions to Bidders(ITB)
	Section II	Bid Data Sheet (BDS)
	Section III	Evaluation and Qualification Criteria
	Section IV	Bidding Forms
	Section V	Eligible Source Countries of Japanese ODA Loan
Part2	**Supply Requirements**	
	Section VI	Schedule of Requirements
Part 3	**Conditions of Contract and Contract Forms**	
	Section VII	General Conditions (GC)
	Section VIII	Particular Conditions (PC)
	Section IX	Contract Forms

Section I. Instructions to Bidders

Notes on Instructions to Bidders

The Instructions to Bidders governing this bidding process are the "Instructions to Bidders" included in **Section I** of the Standard Bidding Documents for Procurement of Goods (Version 1.1) published by JICA in May,2013. Those Instructions to Bidders are available on the JICA's web site shown below:

https://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/oda_op_info/guide/tender/c8h0vm0000aoesst-att/goods.pdf

A copy of the Instructions to Bidders is not attached to these Bidding Documents.

The Instructions to Bidders will not be part of the Contract.

BIDDING DOCUMENTS

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

PART 1

BIDDING PROCEDURE

Section II
BID DATA SHEET

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City park 'E'- Block,
Bandra-Kurla Complex,
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Section II

Bid Data Sheet

BID DATA SHEET (BDS)

A. General	
ITB 1.1	The number of the Invitation for Bid is **MM3-CBS-TWK-04.**
ITB 1.1	The Purchaser is **Mumbai Metro Rail Corporation Ltd. (MMRC).**
ITB 1.1	This bid document is for "Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project."
ITB 2.1	The Borrower is Government of India.
ITB 2.1	The number of the Loan Agreement is ID-P268. The amount of a Japanese ODA Loan is One Hundred (100) billion Japanese Yen. The signed date of the Loan Agreement is 29th March 2018.
ITB 2.1	The name of the Project is **Mumbai Metro Line 3 (Colaba-Bandra-SEEPZ)**.
ITB 2.2	The applicable Guidelines for Procurement under Japanese ODA Loans are those published in April 2012.
ITB 3.1(c)	A list of debarred firms and individuals is available at the World Bank's website: www.worldbank.org/debarr
ITB 7.1	For **seeking clarification only** , the purchaser's address is General Manager (Track)MMRCL Attention : Md.Aasim Sulaiman **MMRCL LINE 3 Transit Office** E-Block, Wing 'A', North Side of, City Park Road, E Block BKC, Bandra Kurla Complex, Bandra East, Mumbai, Maharashtra 400051.

	Telephone: +91 22 26575123 Email: md.aasim@mmrcl.com
ITB 7.1	Responses to any request for clarification, if any will be published on the Purchaser's web page. Webpage:www.mmrcl.com
ITB 8.2	Addenda, if any, will be published on the Purchaser's web page. Web page: www.mmrcl.com
C. Preparation of Bids	
ITB 10.1	The language of the Bid as well as of all correspondence is English.
ITB 11.1 (k)	Any other document required – "None"
ITB 14.1	For price variation refer PC 13.1
ITB 14.8 (a) (iii)	Place of final destination for inland transportation will be as given below: . 1. Store of Package 10B Contractor-Bandra Kurla complex Mumbai 400051 2. Store of Package10C Contractor- Govandi, Mankhurd – Gathkopar link road Mumbai, Pin: 400043 3. MMRCL stores - Bandra Kurla complex Mumbai 400051 and Govandi, Mankhurd – Gathkopar link road Mumbai, Pin: 400043 The material is to be delivered, unloaded and duly stacked in stores at final destinations. All cost of loading, unloading, transportation and insurance is to be borne by the Supplier. The custom duty as applicable will be reimbursed to the supplier as per documentary proof. All the work of project import registration and custom / port clearance is to be done by Supplier at his own cost. MMRCL will facilitate recommendation / sponsoring letter from the Government of Maharashtra for Project import registration for which the Supplier shall submit request letter and details at least one month in advance. Port handling charges as per documentary proof (paid to Port authority only) will be reimbursed to Supplier in the same currency as paid to port authority. Stamp duty charges if any shall be borne by the Supplier.

	Note: The Goods to be supplied to Package 10B will only be transported to store of Package 10B contractor but unloading and stacking will be done by the contractor of 10B
ITB 14.8 (b) (i)	The destination in Purchaser's Country is "Jawaharlal Nehru Port Trust, Sheva, Navi Mumbai, Maharashtra – 400702, India.
ITB 14.8 (b) (ii)	The location for final destination for inland transportation is same as given in BDS – 14.8 (a) (iii).
ITB 14.8 (C)	As Specified in Part-2, Section VI : The price to be quoted is inclusive of all inland transportation and related services
ITB 15.1	The currency of the Bid shall be as follows: (a) Goods supplied from outside the Purchaser's Country shall be quoted entirely in: JPY and/or USD or EUR or any combination of these. (b) Goods supplied from within the Purchaser's Country shall be quoted in the currency of the Purchaser's Country: INR (Indian Rupees) (c) Related Services, other than inland transportation and other services required to convey the Goods to their final destination shall be quoted in either foreign and/or local currency, depending upon the currency in which the costs are to be incurred.
ITB 19.1 (a)	Manufacturer's Authorization is required as per Bid Form 5
ITB 19.1 (b)	The Bidder is required to be represented by an agent in the country equipped and able to carry out the Supplier's maintenance, repair and spare parts-stocking obligations during Defect Liability Period
ITB 20.3 (a)	The adjustment factor for the fixed portion of the Contract price will be calculated on the basis of difference in WPI(Whole sale Price Index) for the month after 56 days of initial validity to the WPI for the month of validity extended. This will be applied in either side +ve or -ve. The adjustment factor shall apply to both local and foreign currency portion.
ITB 20.1	The Bid validity period shall be **One Hundred and Twenty (120)** days.
ITB 21.1	The amount of the Bid Security shall be: INR 6.31 Million or US$ 89670

ITB 21.2 (d)	Other types of acceptable securities: ***"None"***
ITB 22.1	In addition to the original copy of the bid, 2 copies of bids will be submitted on date, time and place mentioned in IFB.
ITB 22.2	The written confirmation of authorization to sign on behalf of the Bidder shall consist of: Notarized Power of Attorney by a person authorized by the resolution by Company's Board of Directors bearing the signature of both the authorizing as well as authorized persons. In case of partnership, consortium or joint venture, Power of Attorney(s) and Board Resolution(s) for each member of the partnership, consortium or joint venture shall be submitted. In case of Foreign Partners, Power of Attorney(s) and Board Resolution confirming authority on the persons issuing the Power of Attorney for such actions shall be submitted duly notarized by the notary public of country of origin and should be either stamped by Embassy/High Commission or Member Countries of Hague convention may submit this entire document with "Apostille" stamp. Also in case the documents are in foreign language the translation of the same shall be authenticated by Embassy/High Commission.
D. Submission and Opening of Bids	
ITB 24.1	For **Bid submission purposes** only, the Purchaser's address is: General Manager (Track)MMRCL Attention : Md.Aasim Sulaiman **MMRCL LINE 3 Transit Office** E-Block, Wing 'A', North Side of, City Park Road, E Block BKC, Bandra Kurla Complex, Bandra East, Mumbai, Maharashtra 400051. Telephone: +91 22 26575123 Email: md.aasim@mmrcl.com **Bids need to be submitted by 14:00 Hrs. on 09.10.2019**
ITB 27	**The bid opening shall take place at 15:00 Hrs. on 09.10.2019**, in the presence of the Bidders representative who choose to attend, below mentioned address: **Mumbai Metro Rail Corporation Ltd.** E-Block, Wing 'A', North Side of, City Park Road, E Block BKC, Bandra

	Kurla Complex, Bandra East, Mumbai, Maharashtra 400051. Telephone: +91 22 26575123
E. Evaluation, and Comparison of Bids	
ITB 36.1	**ITB 36.1 "Conversion to Single Currency"** Bid Prices expressed in different currencies shall be converted into: USD by using the exchange (bill selling) rate for these currencies at the close of business of the Reserve Bank of India twenty eight days before the latest date of tender submittal or www.xe.com.
F. Award of Contract	
ITB 41.1 Purchaser's Right to Vary Quantities at Time of Award	The maximum percentage by which quantities may be increased is: **30% at the same rate, terms and conditions.** The maximum percentage by which quantities may be decreased is: 10%. **Quantity Variation:** a. The quantities of items as shown in Section VI – Schedule of Requirements may vary and the supplier shall be bound to supply the quantities as varied at the same rate as specified in the Price schedule and other terms and conditions of contract subject to positive variation in the quantity being limited to 30% of the total original quantity in the contract. Maximum decrease in quantity is limited to 10% of total original quantity. The supplier shall obtain confirmation regarding actual quantity variation from the purchaser, after the supply has been done to the extent of at least 75% of quantity. **b.** Additional quantity of rails as per the above quantity variation when ordered shall be supplied in additional installments at mutually agreed interval but not later than 4 months from the date of last supply.
ITB 43.2	The Contract Agreement between the successful bidder shall be signed jointly by the authorized person of supplier and purchaser at MMRC Office *Mumbai.*

BIDDING DOCUMENTS

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

PART 1
BIDDING PROCEDURE

Section III
EVALUATION AND QUALIFICATION CRITERIA

August 2019
JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park 'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

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Table of Content

Evaluation and Qualification Criteria

1. Evaluation Criteria

1.1 Other Factors (ITB 37.6)

The Purchaser's evaluation of a Bid may take into account, in addition to the Bid Price quoted in accordance with ITB 14.8, one or more of the following factors as specified in ITB 37.2(f), using the following criteria and methodologies.

(a) Delivery schedule. (as per Incoterms specified in ITB14.7).

The Goods specified in the List of Goods are required to be delivered within the acceptable time range (after the earliest and before the final date, both dates inclusive) specified in Section VI, List of Goods and Delivery Schedule. No credit will be given to deliveries before the earliest date, and Bids offering delivery after the final date shall be treated as non-responsive.

(b) Deviation in payment schedule.

Bidders shall state their Bid Price for the payment schedule outlined in the Particular Conditions of Contract (PC). Bids shall be evaluated on the basis of this base price. Bidders are, however, permitted to state an alternative payment schedule and indicate the reduction in Bid Price they wish to offer for such alternative payment schedule. The Purchaser may consider the alternative payment schedule and the reduced Bid Price offered by the Bidder selected on the basis of the base price for the payment schedule outlined in the PC.

(c) Deleted

(d) Deleted

(e) Deleted

(f) Deleted

(g) Deleted

(h) **HH Rails – Performance Certificate**

The bidder shall furnish the details of supplies made and used for HH Rails as per international standards or as per the specification of this tender (IRS-T-12:2009), for (UIC60E1/UIC60). Details should include a performance certificate from the user, which should include purchase order details, name of manufacturer, name of purchaser, the railway projects involving passenger operations/ MRTS Project, where rails have been used. The design speed and axle load of the section should be stated by user. In case design speed, axle load is not included in the user certificate, the bidder shall certify the speed and axle load. Refer the **Bid Form – 20.**

1.2. Multiple Contracts (ITB 37.4)

Deleted

2. Qualification (ITB 32)

(i) Exchange Rate for Qualification Criteria

Wherever a Form in Section IV, Bidding Forms, requires a Bidder to state a monetary amount, Bidders should indicate the USD equivalent using the rate of exchange determined as follows:

(a) For turnover or financial data required for each year - Exchange rate prevailing on the last day of the respective calendar year.

(b) Value of single Contract - Exchange rate prevailing on the date of the Contract. Exchange rates shall be taken from the publicly available source **identified in BDS (36.1)** or, in case such rates are not available in the source identified above, any other publicly available source acceptable to the Purchaser. Any error in determining the exchange rates may be corrected by the Purchaser.

(ii) Qualification Criteria for Multiple Contracts

Deleted

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	**Factor/ Sub-Factor**	**Requirement**	**Single Entity**	**Joint Venture (existing or intended)**			**Submission Requirements**
				All Parties Combined	**Each Member**	**One Member**	
2.1. Eligibility							
2.1.1	**Nationality**	Nationality in accordance with ITB 4.3	Must meet requirement	N/A	Must meet requirement	N/A	Forms ELI – 1 and 2, with attachments
2.1.2	**Conflict of Interest**	No conflicts of interest in ITB 4.2	Must meet requirement	N/A	Must meet requirement	N/A	Letter of Bid
2.1.3	**JICA Ineligibility**	Not having been declared ineligible by JICA, as described in ITB 4.4	Must meet requirement	N/A	Must meet requirement	N/A	Letter of Bid Form ACK

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.2. Historical Contract Non-Performance							
2.2.1	**History of Non-Performing Contracts**	Non-performance of a contract (i) did not occur as a result of supplier's default since 1st October [2017].	Must meet requirement **(ii)**	N/A	Must meet requirement **(ii)**	N/A	Form CON
2.2.2	**Pending Litigation**	All pending litigation shall in total not represent more than 75% of the Bidder's net worth and shall be treated as resolved against the Bidder.	Must meet requirement **(ii)**	N/A	Must meet requirement **(ii)**	N/A	Form CON
2.2.3	**Litigation History**	No consistent history of court/arbitral award decisions against the Bidder (iii) since 1st October [2014].	Must meet requirement **(ii)**	N/A	Must meet requirement **(ii)**	N/A	Form CON

Notes for the Bidder

(i) Non-performance, as decided by the Purchaser, shall include all contracts

(a) where non-performance was not challenged by the supplier, including through referral to the dispute resolution mechanism under the respective contract, and

(b) that were so challenged but fully settled against the supplier. Non-performance shall not include contracts where Purchaser's decision was overruled by the dispute resolution mechanism. Non-performance must be based on all information on fully settled disputes or litigation, i.e. dispute or litigation that has been resolved in accordance with the dispute resolution mechanism under the respective contract and where all appeal instances available to the Bidder have been exhausted.

(ii) This requirement also applies to contracts executed by the Bidder as a JV member.

(iii**)** The Bidder shall provide accurate information on the related Bidding Form about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last five (5) years. A consistent history of awards against the Bidder or any member of a joint venture may result in failure of the Bid.

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.3. Financial Situation							
2.3.1	**Financial Performance**	The audited balance sheets or, if not required by the laws of the Bidder's country, other financial statements acceptable to the Purchaser, for the last 5 years ending 31st March *2018* for the countries where the financial year ending on 31st March or for the last five (5) years ending 31st December 2017 for the countries where the financial year ending on 31st December. shall be submitted and must demonstrate the current soundness of the Bidder's financial position and indicate its prospective long-term profitability. As the minimum requirement, a Bidder's net worth calculated as the difference between total assets and total liabilities should be positive.	Must meet requirement	N/A	Must meet requirement	N/A	Form FIN –1 with attachments

2.3.2	**Average Annual Turnover**	Minimum average annual turnover of USD 18.2 million, calculated as total certified payments received for contracts in progress and/ or completed, within the 5 years ending 31st March 2018 for the countries where the financial year ending on 31st March or for the last five (5) years ending 31st December 2017 for the countries where the financial year ending on 31st December, divided by 5 years.	Must meet requirement	Must meet requirement	Must meet 25 % of the requirement	Must meet 40% of the requirement	Form FIN – 2

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.3.3	**Financial Resources**	(i) The Bidder shall demonstrate that it has access to, or has available, liquid assets, unencumbered real assets, lines of credit, and other financial means (independent of any contractual advance payment) sufficient to meet the cash flow requirements estimated as USD 3.04 million for the subject contract(s) net of the Bidders other commitments.	Must meet requirement	Must meet requirement	Must meet 25 % of the requirement	Must meet 40 % of the requirement	Form FIR – 1
		(ii) The Bidders shall also demonstrate, to the satisfaction of the Purchaser, that it has adequate sources of finance to meet the cash flow requirements on contract currently in execution and for future contract commitments.	Must meet requirement	Must meet requirement	N/A	N/A	Form FIR – 1 and FIR – 2

Eligibility and Qualification Criteria			Compliance Requirements				Documentation
No.	Factor/ Sub-Factor	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
2.4. Experience							
2.4.1	**General Experience**	Experience under supply contracts in the role of prime supplier (single entity or JV member)[(i)] for at least the last 7 years, ending on 31st March 2019.	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 1
2.4.2	**Specific Experience**	(a) For rail supply contracts completed [(ii)] as a prime supplier (single entity or JV member)between 1st January 2012 and the Bid submission deadline, a minimum supply of 85000 Metric Tons,out of which Minimum 28300 MT shall have been supplied to the countries outside the country of production from the proposed rail manufacturing facility.	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP – 2

		(b) Out of above in clause (a) ,a minimum of 14000 MT supply shall be of Head Hardened (HH) Rails as per international standards or as per the specification of this tender (IRS-T-12 : 2009).	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP – 3
		(c) Further out of 14000 MT of HH[(iii)] Rails, minimum 8500 MT of rails supply shall be of UIC 60E1 / UIC 60 .	Must meet requirement	Must meet requirement	N/A	N/A	Form EXP – 4

Notes for the Bidder

(i) For contracts under which the Bidder participated as a JV member, only the Bidder's share, by capacity, shall be considered to meet this requirement.

(ii) The Bidder is required to submit End-user certificate for successful completion in Specific Experience and Production and Sales of Goods offered as on Bid submission date.

(iii) Documentary evidence of Head Hardened (HH) Rails manufacturing facilities certified by internationally accredited agency is to be submitted with the bid.

BIDDING DOCUMENTS

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

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PART 1

BIDDING PROCEDURE

Section IV

BIDDING FORMS

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park 'E'- Block,
Bandra-Kurla Complex,
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Section IV. Bidding Forms

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Bid Form 1: Letter of Bid

Date:
Loan Agreement No.: ID-P268
IFB No.: MM3-CBS-TWK-04

To:

The Managing Director
Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City park,
'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

We, the undersigned, declare that:

(a) We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instructions to Bidders (ITB 8): [*insert the number and issuing date of each Addendum*];

(b) We meet the eligibility requirements in accordance with ITB 4 and ITB 5;

(c) We have no conflict of interest in accordance with ITB 4;

(d) We offer to Supply in conformity with the Bidding Documents and in accordance with the Delivery Schedule specified in the Schedule of Requirnments, the following goods and related services. "Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

(e) The total price of our Bid, excluding any discounts offered in item (c) below is:
In case of only one lot, total price of the Bid [*insert the total price of the Bid in words and figures, indicating the various amounts and the respective currencies*]

[*In case of multiple lots, insert the total price of each lot*]
[*In case of multiple lots, insert the total price of all lots (sum of all lots)*];

(f) The discounts offered and the methodology for their application are: The discounts offered are: [*specify in detail each discount offered*]

The exact method of calculations to determine the net price after application of discounts is shown below: [*specify in detail the method that shall be used to apply the discount.*

(g) Our Bid shall be valid for a period of 120 days from the date fixed for the Bid submission deadline in accordance with the Bidding Documents, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(h) If our Bid is accepted, we commit to obtain a Performance Security in accordance with the Bidding Documents;

(i) We are not participating , as a Bidder in more than one Bid in this Bidding process in accordance with ITB 4.2 (c), other than alternative Bids submitted in accordance with ITB 13;

(j) We understand that this Bid, together with your written acceptance thereof included in your Letter of Acceptance, shall constitute a binding Contract between us, until a formal Contract is prepared and executed;

(k) We understand that you are not bound to accept the lowest evaluated Bid or any other Bid that you may receive; and

(l) We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of fraud and corruption.

Name of the Bidder*[*insert complete name of the Bidder*]

Name of the person duly authorized to sign the Bid on behalf of the Bidder**
[*insert complete name of person duly authorized to sign the Bid*]

Title of the person signing the Bid [*insert complete title of the person signing the Bid*] Signature of the person named above [*insert signature of person whose name and capacity are shown above*]

Date signed [*insert date of signing*] day of [*insert month*], [*insert year*]

*: In the case of the Bid submitted by a Joint Venture specify the name of the Joint Venture as Bidder

**: Person signing the Bid shall have the power of attorney given by the Bidder to be attached with the Bid.

Price Schedule Forms

Notes on Price Schedule Forms

The Bidder shall fill in these Price Schedule Forms in accordance with the instructions indicated. The list of line items in column 1 of the **Price Schedules** shall coincide with the List of Goods and Related Services specified by the Purchaser in the Schedule of Requirements.

Bid Form 2: Price Schedule: Goods Supplied from outside the Purchaser's Country

Currencies in accordance with ITB 15.1

Date:
IFB No: MM3-CBS-TWK-04

Alternative No: Not applicable
Page No of

1	2	3	4	5	6	7	8	9
Line Ite	Description of Goods	Country of Origin	Delivery date as defined by Incoterms	Quantity and physical unit	Unit price CIF in accordance with ITB 14.8(b)(i)	CIF Price per line item (Col. 5×6)	Price per line item for inland transportation and other services required in the Purchaser's Country to convey the Goods to their final destination specified in BDS	Total Price per line item (Col. 7+8)
		[insert *country of origin of the Goods*]	[*insert quoted delivery date*]		[*insert unit price CIF per unit*]	[*insert total CIF price per line item*]	[*insert the corresponding price per line item*]	[*insert total price of the line item*]
1.	Supply of Head Hardened Rails (UIC 60E1), 1080 Grade, 13 m long as per IRS-T-12:2009, (Class A) rates are inclusive of clearance at port, handling charges, all taxes, duties if any, including Loading, Unloading as per delivery requirement in section VI and BDS, Shipment, Stacking etc. all complete.			8490 MT				
							Total Price	

Name of Bidder [*insert complete name of Bidder*] Signature of Bidder [*signature of person signing the Bid*] Date [*insert date*]

Bid Form 3: Price Schedule: Goods Supplied from within the Purchaser's Country

Purchaser's Country
INDIA

Date:_____

IFB No: MM3-CBS-TWK-04
Alternative No: _____
Page No of

1	2	3	4	5	6	7	8	9
Line Item No	Description of Goods	Delivery date as defined by Incoterms	Quantity and physical unit	Unit price EXW	Total EXW price per line item (Col. 4×5)	Price per line item for inland transportation and other services required in the Purchaser's Country to convey the Goods to their final destination as per BDS 14.8 (a) (iii)	Total taxes payable per line item if Contract is awarded (in accordance with ITB 14.8(a)(ii)	Total Price per line item (Col. 6+7)
		[insert quoted delivery date]		[insert EXW unit price]	[insert total EXW price per line item]	[insert the corresponding price per line item]	[insert sales and other taxes payable per line item if Contract is awarded]	[insert total price per item]
1.	Supply of Head Hardened Rails (UIC 60E1), 1080 Grade, 13 m long as per IRS-T-12:2009, (Class A) rates are inclusive of handling charges, all taxes, duties if any, including Loading, Unloading as per delivery requirement in section VI and BDS, Shipment, Stacking etc. all complete.		8490 MT					
							Total Price	

Name of Bidder [*insert complete name of Bidder*] Signature of Bidder [*signature of person signing the Bid*] Date [*insert date*]

Bid Form 4: Price and Delivery Schedule - Related Services - DELETED

-

Bid Form 4A: Details of Taxes/Duties/Levies etc. included in the Bid Price

Sr. No.	Taxable Amount	Custom Duty		CGST		SGST		IGST		UTGST		Any Other Tax/Levy/Cess		Total Amount of all Taxes/Duties /Levies/Cess
		Rate %	Amount	Rate %	Amount	Rate %	Amount	Rate %	Amount	Rate%	Amount	Rate %	Amount	
1														
2														
3														
4														
5														
5														
Total														
Grand Total														

*Please mention similar group of goods/services which attracts same rate of tax under each schedule. You may add more rows wherever required. Refer notes below for an explanation of the above table.

Notes:

The Bidder is to give in his Bid offer, a breakdown of his fixed Lump Sum Price clearly detailing the following:

a) Custom duty on offshore manufactured Plant/ equipment, if any along with rate of Custom duty.

b) GST (CGST/SGST/IGST/UTGST etc) (after availing relevant Credit) on completely assembled/manufactured Plant/ equipment, if any along with rate of GST (CGST/SGST/IGST/UTGST etc).

c) Custom duty on imported spares, special tools, etc. along with rate of Custom duty.

d) GST (CGST/SGST/IGST/UTGST etc) on Spares, Jigs, Fixtures, Special tools, Testing and Diagnostic equipment etc. along with rate of GST.

e) GST (CGST/SGST/IGST/UTGST etc) on the completely assembled/manufactured Plant/ equipment along with the rate of GST.

f) GST (CGST/SGST/IGST/UTGST etc) on the indigenous finished Spares, Special tools and Testing Equipment etc. along with rate of GST.

g) GST (CGST/SGST/IGST/UTGST etc) on works along with applicable rate.

h) Octroi /Entry Tax/ Other levies/ Cess. Etc. (if any)

i) If the rates of taxes mentioned in above table is different from the actual applicable rates, then the actual applicable rates will be considered for variation purpose only, however no change in bid prices quoted in different schedules shall be considered.

Name of the Bidder	
Signature of the Bidder	

Bid Form 5: Form MAN Manufacturer's Authorization

[*The Bidder shall require the Manufacturer to fill in this Form in accordance with the instructions indicated. This letter of authorization should be signed by a person with the proper authority to sign documents that are binding on the Manufacturer. The Bidder shall include it in its Bid, if so indicated in BDS 19.1(a)***.**]

Date: xx.xx.2019
IFB No.: MM3-CBS-TWK-04

To: Mumbai Metro Rail Corporation Ltd.
WHEREAS

We [*insert complete name of Manufacturer or Manufacturer's authorized agent*], who are official manufacturers of [*insert type of goods manufactured*], having factories at [*insert full address of Manufacturer's factories*], do hereby authorize [*insert complete name of Bidder*] to submit a Bid the purpose of which is to provide the following goods, manufactured by us [*insert name and/or brief description of the goods*], and to subsequently negotiate and sign the Contract.

We hereby extend our full guarantee and warranty in accordance with Clause 26, Warranty, of the General Conditions of Contract, with respect to the goods offered by the above firm.

Name: [*insert complete name of person signing the Authorization*]

In the capacity of [*insert legal capacity of person signing the*

Authorization] Signed: [*insert signature of person whose name and*

capacity are shown above]

Duly authorized to sign the *Authorization* for and on behalf of: [*insert complete name of*
Manufacture]

Dated on _____ day of _____, _____ [*insert date of signing*]

Bid Form 6: Form ELI - 1: Bidder Information

[*The Bidder shall provide the following*

information.] Date: xx.xx.2019
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

1. Bidder's legal name: [*insert full name*]
2. In case of JV, legal name of the representative member and of each member: [*insert full name of each member in the JV and specify the representative member*]
3. Bidder's actual or intended country of registration: [*insert country of registration*]
4. Bidder's actual or intended year of incorporation: [*insert year of incorporation*]
5. Bidder's legal address in country of registration: [*insert street /number/town or city/country*]
6. Bidder's authorized representative information Name: [*insert full name*] Address: [*insert street/number/town or city/country*] Telephone/Fax numbers: [*insert telephone/fax numbers, including country and city codes*] Email Address: [*insert email address*]
7. Attached are copies of original documents of: Articles of Incorporation (or equivalent documents of constitution or association), and/or documents of registration of legal entity named above, in accordance with ITB 4.3. In case of JV, letter of intent to form JV or JV agreement, in accordance with ITB 4.1.
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Bid Form 7: Form ELI - 2: Bidder's Party Information

Date:
xx.xx.2019
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

[*The following form is additional to Form ELI-1, and shall be completed to provide information relating to each JV member (in case the Bidder is a JV) for any part of the Contract resulting from this process.*]

1. Bidder's legal name: [*insert full name*]
2. Bidder's Party legal name: [*insert full name of Bidder's Party*]
3. Bidder's Party country of registration: [*insert country of registration*]
4. Bidder's Party year of incorporation: [*insert year of incorporation*]
5. Bidder's Party legal address in country of registration: [*insert street/number/town or city/country*]
6. Bidder's Party authorized representative information Name: [*insert full name*] Address: [*insert street/number/town or city/country*] Telephone/Fax numbers: [*insert telephone/fax numbers, including country and city codes*] Email Address: [*insert email address*]
7. Attached are copies of original documents of: Articles of Incorporation or Registration of firm named in 2, above, in accordance with ITB 4.3.
8. Included are the organizational chart, a list of Board of Directors, and the beneficial ownership.

Bid Form 8: Form CON: Historical Contract Non Performance

[*The following table shall be filled in for the Bidder and for each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

1. History of Non-Performing Contracts

Non-Performing Contracts			
Contract non-performance did not occur since 1st October 2017, in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.1. Contract(s) not performed since 1st October 2017, in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.1 is(are) indicated below:			
Year	**Non-performed portion of Contract**	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and USD equivalent)**
[*insert year*]	[*insert amount and percentage*]	• Contract Identification: [*indicate complete contract name, number, and any other identification*] • Name of Purchaser: [*insert full name*] • Address of Purchaser: [*inser street/city/country*] • Reason(s) for non-performance [*indicate main reason(s)*]	[*insert amount*]

2. Pending Litigation

Pending Litigation				
☐ No pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.2. ☐ Pending litigation in accordance with Section III, Evaluation and Qualification Criteria, Sub- Factor 2.2.2 is indicated below:				
Year of dispute	**Amount in dispute (currency)**	**Outcome as Percentage of Net Worth**	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and USD equivalent)**
[*insert year*]	[*insert amount*]	[*insert percentage*]	• Contract Identification: [*indicate complete contract name, number, and any other identification*] • Name of Purchaser: [*insert full name*] • Address of Purchaser: [*insert street/ city/ country*] • Matter in dispute: [*indicate main issues in dispute*] • Status of dispute: [*indicate if it is being treated under Arbitration or being dealt with by the Judiciary*]	[*insert amount*]

3. Litigation History

Litigation History		
☐ No court/arbitral award decisions against the Bidder since 1st October 2014, in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.3.		
☐ Court/arbitral award decisions against the Bidder since 1st October 2014, in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.2.3 are		
Year of award	**Contract Identification**	**Total Contract Amount (current value, currency, exchange rate and USD equivalent)**
[*insert year*]	• Contract Identification: [*indicate complete Contract name, number, and any other identification*] • Name of Purchaser: [*insert full name*] • Address of Purchaser: [*insert street/city/country*] • Matter in dispute: [*indicate main issues in dispute*] • Party who initiated the dispute: [*indicate "Purchaser" or "Supplier"*] • Status of dispute: [*indicate if it is being treated by under Arbitration or being dealt with by the Judiciary*]	[*insert amount*]

Bid Form 9: Form FIN - 1: Financial Situation

[*The following table shall be filled in for the Bidder and for each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

1. Financial data

Type of Financial information in (currency)	**Historic information for previous** [*insert number*] **years (amount, currency, exchange rate, USD equivalent)**				
	Year 1	Year 2	Year 3	Year 4	Year 5
Statement of Financial Position (Information from Balance Sheet)					
Total Assets (TA)					
Total Liabilities (TL)					
Net Worth (NW)					
Current Assets (CA)					
Current Liabilities (CL)					
Information from Income Statement					
Total Revenue (TR)					
Profits Before Taxes (PBT)					
Profits After Taxes (PAT)					

2. Financial documents

The Bidder and its Parties shall provide copies of the financial statements for [*number of years*] years pursuant to Section III, Evaluation and Qualification Criteria, Sub-factor 2.3.1. The financial statements shall:

(a) reflect the financial situation of the Bidder or in case of JV member, of each member, and not an affiliated entity (such as parent company or group member).

(b) be independently audited or certified in accordance with local

legislation. (c) be complete, including all notes to the financial

statements.

(d) correspond to accounting periods already completed and audited.

Attached are copies of financial statements[1] for the [*number of years*] years required above; and complying with the requirements.

If the most recent set of financial statements is for a period earlier than twelve (12) months from the date of
Bid, the reason for this should be justified

Bid Form 10: Form FIN - 2: Average Annual Turnover

[*The following table shall be filled in for the Bidder and for each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

Annual Turnover Data			
Year	**Amount and Currency**	**Exchange rate**	**USD equivalent**
[*indicate year*]	[*insert amount and indicate currency*]	[*insert applicable exchange rate*]	[*insert amount in USD equivalent*]
Average Annual Turnover *			

* Total USD equivalent for all years divided by the total number of years, in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3.2.

Bid Form 11: Form FIR - 1: Financial Resources

[*The following table shall be filled in for the Bidder and for each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

[*Specify proposed sources of financing, such as liquid assets, unencumbered real assets, lines of credit, and other financial means, net of current commitments, available to meet the total cash flow demands of the subject Contract or Contracts as indicated in Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3.3.*]

Financial Resources		
No.	**Source of financing**	**Amount (USD equivalent)**
1		
2		
3		

Bid Form 12: Form FIR - 2: Current Contract Commitments

[*The following table shall be filled in for the Bidder and for each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

[*Bidders and each member of a JV should provide information on their current commitments on all contracts that have been awarded, or for which a letter of intent or acceptance has been received, or for contracts approaching completion, but for which an unqualified, full completion certificate has yet to be issued, in accordance with Section III, Evaluation and Qualification Criteria, Sub-Factor 2.3.3.*]

Current Contract Commitments					
No.	**Name of Contract**	**Purchaser's Contact Address, Tel, Fax**	**Value of Outstanding Work [Current USD Equivalent]**	**Estimated Completion Date**	**Average Monthly Invoicing Over Last Six Months [USD/month)]**
1					
2					
3					
4					
5					

Bid Form 13: Form EXP - 1: General Experience

[*The following table shall be filled in for the Bidder and for each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

[*Identify contracts that demonstrate continuous supply over the past [number] years pursuant to Section III, Evaluation and Qualification Criteria, Sub-Para 2.4.1. List contracts chronologically, according to their commencement (starting) dates.*]

General Experience			
Starting Year	**Ending Year**	**Contract Identification**	**Role of Bidder**
[*indicate year*]	[*indicate year*]	• Contract name: [*insert full name*] • Brief description of the supply performed by the Bidder: [*describe supply performed briefly*] • Amount of contract: [*insert amount, currency, exchange rate and USD equivalent*] • Name of Purchaser: [*indicate full name*] • Address: [*indicate street/number/town or city/country*]	[*insert "Prime Supplier"(Single entity or JV member)]*

Note

a) The Bidder is required to submit End-user certificate for successful completion in General Experience as on Bid submission date.
b) For contracts under which the Bidder participated as a JV member, only the Bidder's share, by capacity, shall be considered to meet this requirement.

Bid Form 14: Form EXP - 2: Specific Experience

[*The following table shall be filled in for contracts performed by the Bidder and by each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

[*Fill out one (1) form per contract, in accordance with Section III, Evaluation and Qualification Criteria, Sub-Para 2.4.2. as below*]

Contract of Similar Capacity				
Item	**Information**			
Contract Identification	[*insert contract name and reference identification number, if applicable*]			
Award Date	[*insert day, month, year, e.g., 15 June, 2015*]			
Completion Date	[*insert day, month, year, e.g., 03 October, 2017*]			
Role in Contract [*check the appropriate box*]	**Prime Supplier**			
	Single entity		JV member	
Total Contract Amount	[*insert total contract amount and currency(ies)*]		USD [*insert exchange rate and total contract amount in USD*	
Supply of Rails in MT performed under the contract per year or part of the year [*insert extent of participation indicating actual capacity performed*]	Total capacity in the contract (i)	Percentage participation (ii)	Actual capacity performed (i)x(ii)	Specify Location of supply outside country (if-applicable)
Purchaser's Name & Address	[*insert full name*]			
Address: Telephone/fax number E-mail:	[*indicate street / number / town or city / country*] [*insert telephone/fax numbers, including country and city area codes*] [*insert E-mail address, if available*]			

Note

a) The Bidder is required to submit End-user certificate for successful completion in Specific Experience as on Bid submission date.
b) For contracts under which the Bidder participated as a JV member, only the Bidder's share, by capacity, shall be considered to meet this requirement.

Bid Form 15: Form EXP - 3: Specific Experience

[*The following table shall be filled in for Goods offered by the Bidder, by each member of a JV*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

Information on HH Rails				
No.	**HH Rails**	**International Specification or IRS-T-12:2009**	**Years of Supply**	**Quantity of Rails supplied (MT)**
1	[*insert description of Good*]		[*insert years*]	
2				
3				

Note

a) The Bidder is required to submit End-user certificate for successful completion in Sales of Goods offered as on Bid submission date.

b) Documentary evidence of Head Hardened (HH) Rails manufacturing facilities certified by internationally accredited agency is to be submitted with the bid.

Bid Form 16: Form EXP - 4: Specific Experience

[*The following table shall be filled in for Goods offered by the Bidder, by each member of a JV.*]

Date: [*insert day, month, year*]
Bidder's Legal Name: [*insert full name*]
Joint Venture Party Legal Name: [*insert full name*]
IFB No.: MM3-CBS-TWK-04
Page [*insert page number*] of [*insert total number*] pages

Information on HH Rails			
No.	**HH Rails (UIC60E1/UIC60)**	**Years of Supply**	**Quantity of Rails supplied (MT)**
1	[*insert description of Good*]	[*insert years*]	[*insert number*]
2			
3			

Note

The Bidder is required to submit End-user certificate for successful completion in Sales of Goods offered as on Bid submission date.

Bid Form 17: ACK - Acknowledgement of Compliance with Guidelines for Procurement under Japanese ODA Loans

A) I, *[insert name and position of authorized signatory]*, being duly authorized by *[insert name of Bidder/members of joint venture ("JV")]* (hereinafter referred to as the "Bidder") to execute this Acknowledgement of Compliance with Guidelines for Procurement under Japanese ODA Loans, hereby certify on behalf of the Bidder and myself that all information provided in the Bid submitted by the Bidder for Loan Agreement No.: ID-P268 "Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra - Seepz) Rail Project." is true, correct and accurate to the best of the Bidder's and my knowledge and belief. I further certify, on behalf of the Bidder, that:

(i) the Bid has been prepared and submitted in full compliance with the terms and conditions set forth in the Guidelines for Procurement under Japanese ODA Loans (hereinafter referred to as the "Guidelines"); and

(ii) the Bidder has not, directly or indirectly, taken any action which is or constitutes a corrupt, fraudulent, collusive or coercive act or practice in violation of the Guidelines and is not subject to any conflict of interest as stipulated in the relevant section of the Guidelines.

<If debarment for more than one year by the World Bank Group is NOT imposed, use the following sentence B).>

B) I certify that the Bidder has NOT been debarred by the World Bank Group for more than one year since the date of issuance of Invitation for Bids.[2]

<If debarment for more than one year by the World Bank Group has been imposed BUT three (3) years have passed since the date of such debarment decision, use the following sentence B').>

B') I certify that the Bidder has been debarred by the World Bank Group for a period more than one year BUT that on the date of issuance of Invitation for Bids at least three (3) years had passed since the date of such debarment decision. Details of the debarment are as follows:

name of the debarred	starting date of debarment	ending date of debarment	reason for debarment

C) I certify that the Bidder will not enter into a subcontract with a firm which has been debarred by the World Bank Group for a period more than one year, unless on the date of the subcontract at least three (3) years have passed since the date of such debarment decision.

D) I certify, on behalf of the Bidder, that if selected to undertake services in connection with the Contract, the Bidder shall carry out such services in continuing compliance with the terms and conditions of the Guidelines.

E) I further certify, on behalf of the Bidder, that if the Bidder is requested, directly or indirectly, to engage in any corrupt or fraudulent action under any applicable law, such as the payment of a rebate, at any time during a process of public procurement, negotiations, execution or implementation of contract (including amendment thereof), the Bidder shall report all relevant facts regarding such request to the relevant section in JICA (details of which are specified below) in a timely manner.

JICA's information desk on fraud and corruption (A report can be made to either of the offices identified below.)

(1) JICA Headquarters:
Legal Affairs Division, General Affairs Department
URL: https://www2.jica.go.jp/en/odainfo/index.php
Tel: +81 (0)3 5226 8850

(2) **JICA India Office:**

The Chief Representative, Japan
international cooperation Agency (JICA)
(Government of Japan)
2nd and 3rd Floor, Dr. Gopal Das Bhawan,
28 Barakhamba Road,
New Delhi 110-001,
India

The Bidder acknowledges and agrees that the reporting obligation stated above shall NOT in any way affect the Bidder's responsibilities, obligations or rights, under relevant laws, regulations, contracts, guidelines or otherwise, to disclose or report such request or other information to any other person(s) or to take any other action, required to or allowed to, be taken by the Bidder. The Bidder further acknowledges and agrees that JICA is not involved in or responsible for the procurement process in any way.

F) If any of the statements made herein is subsequently proven to be untrue or incorrect based on facts subsequently determined, or if any of the warranties or covenants made herein is not complied with, the Bidder will accept, comply with, and not object to any remedies taken by the Purchaser and any sanctions imposed by or actions taken by JICA.

_____
Authorized Signatory
[*Insert name of signatory; title*]

For and on behalf of [*Insert name of the Bidder***]**
Date:

Bid Form 18A: Form of Bid Security (Bank Guarantee)

[*Guarantor letterhead*]

Beneficiary: Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City park,
'E'- Block, Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

IFB No.: MM3-CBS-TWK-04

Date: xx.xx.2019

BID GUARANTEE No.: [*insert guarantee reference number*]
Guarantor: [*insert name and address of place of issue, unless indicated in the letterhead*]

We have been informed that [*name of the Bidder, which in the case of a joint venture shall be the name of the joint venture (whether legally constituted or prospective) or the names of all members thereof*] (hereinafter called "the Applicant") has submitted or will submit to the Beneficiary its Bid (hereinafter called "the Bid") for the execution of "Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project", under Loan Agreement No. ID-P268.

Furthermore, we understand that, according to the Beneficiary's conditions, Bids must be supported by a bid guarantee.

At the request of the Applicant, we, as Guarantor, hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of [*insert amount in words, (insert amount in figures*)] upon receipt by us of the Beneficiary's complying demand, supported by the Beneficiary's statement, whether in the demand itself or a separate signed document accompanying or identifying the demand, stating that either theApplicant:

(a) has withdrawn its Bid during the period of Bid validity set forth in the Letter of Bid (hereinafter called "the Bid Validity Period"), or any extension thereto provided by the Applicant; or

(b) having been notified of the acceptance of its Bid by the Beneficiary during the Bid Validity Period or any extension thereto provided by the Applicant, (i) fails to execute the Contract Agreement; or (ii) fails to furnish the Performance Security in accordance with the Instructions to Bidders of the Beneficiary's Bidding Documents.

This guarantee will expire and shall be returned to the Applicant: (a) if the Applicant is

the successful Bidder, upon our receipt of copies of the Contract Agreement signed by the Applicant and the Performance Security issued to the Beneficiary in relation to such Contract Agreement; or (b) if the Applicant is not the successful Bidder, upon the earlier of (i) our receipt of a copy of the Beneficiary's notification to the Applicant of the results of the bidding process; or (ii) twenty-eight (28) days after the end of the Bid Validity Period.

Consequently, any demand for payment under this guarantee must be received by us at the office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458 [3].

_____

[signature(s)]

[*Note: All italicized text is for use in preparing this form and shall be deleted from the final product.*]

[3] As the case may be, ICC Publication No. 758 (or subsequent ICC Publications) may be used. In such cases, modify the Publication number

Bid Form 18B: Form of Bid Security (Bid Bond)

BOND NO. [*insert Bond No.*]

BY THIS BOND [*insert name of Bidder*] as Principal (hereinafter called "the Principal"), and [*insert name, legal title, and address of surety*], authorized to transact business in [*insert name of country of Purchaser*], as Surety (hereinafter called "the Surety"), are held and firmly bound unto [*insert name of Purchaser*] as Obligee (hereinafter called "the Purchaser") in the sum of [*insert amount of Bond in words and figures*][1], for the payment of which sum, well and truly to be made, we, the said Principal and Surety, bind ourselves, our successors and assigns, jointly and severally, firmly by these presents.

WHEREAS the Principal has submitted a written Bid to the Purchaser dated the [*insert day*] day of [*insert month*], 20 [*insert year*], for the execution of [*insert name of Contract*] (hereinafter called the "Bid").

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if the Principal:

(a) withdraws its Bid during the period of Bid validity specified in the Letter of Bid; or

(b) having been notified of the acceptance of its Bid by the Purchaser during the period of Bid validity; (i) fails or refuses to execute the Contract Form, if required; or (ii) fails or refuses to furnish the Performance Security in accordance with the Instructions to Bidders;

then the Surety undertakes to immediately pay to the Purchaser up to the above amount upon receipt of the Purchaser's first written demand, without the Purchaser having to substantiate its demand, provided that in its demand the Purchaser shall state that the demand arises from the occurrence of any of the above events, specifying which event(s) has occurred.

The Surety hereby agrees that its obligation will remain in full force and effect up to and including the date twenty-eight (28) days after the date of expiration of the Bid validity as stated in the Invitation for Bids or extended by the Purchaser at any time prior to this date, notice of which extension(s) to the Surety being hereby waived.

IN TESTIMONY WHEREOF, the Principal and the Surety have caused these presents to be executed in their respective names this [*insert day*] day of [*insert month*] 20 [*insert year*].

Principal: _____ Surety: _____
Corporate Seal (where appropriate)

_____ _____
(Signature) (Printed name and title) *(Signature) (Printed name and title)*

[1] The amount of the Bond shall be denominated in the currency of the Purchaser's Country or the equivalent amount in a freely convertible currency.

Bid Form 19: BIDDER'S TECHNICAL PROPOSALS

The Bidder shall prepare his Technical Proposals based on the contents of Technical Proposal section and Forms of Tender section under Part 1: Section IV- Bidding Forms of the Bidding documents and Schedule of requirements Section VI.

Bid Form 20: HH Rail (Performance certificate)

[The Bidder shall provide information for each field in the Table below.]

Head Hardened rail (UIC 60E1/UIC60)						
Proposed Manufacturer						
Country of manufacture						
Governing technical standard(s)						
Address, contact person, email, Telephone no. of user,						
Evidence of previous service history (including user's certificate)						
Project Name	User's Name	Date of Commissioning	Years in Service	Design Speed, Kmph	Axle Load, MT	Purchase order detail

Note: User's Certificate detailing above information to be enclosed.

BIDDING DOCUMENTS

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

PART 1

BIDDING PROCEDURE

Section V
Eligible Source Countries of Japanese ODA Loans

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park 'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

BIDDING DOCUMENTS
Composition of Documents

Part1	**Bidding Procedures**	
	Section I	Instructions to Bidders(ITB)
	Section II	Bid Data Sheet (BDS)
	Section III	Evaluation and Qualification Criteria
	Section IV	Bidding Forms
	Section V	Eligible Source Countries of Japanese ODA Loan
Part 2	**Supply Requirements**	
	Section VI	Schedule of Requirements
Part 3	**Conditions of Contract and Contract Forms**	
	Section VII	General Conditions (GC)
	Section VIII	Particular Conditions (PC)
	Section IX	Contract Forms

Section V. Eligible Source Countries of Japanese ODA Loans

[All countries and Areas]

BIDDING DOCUMENTS

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

PART 2

SUPPLY REQUIREMENT

Section VI Schedule of Requirement's

- Delivery Schedule
- Technical Specifications

August 2019

JICA LOAN AGREEMENTB ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park 'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

BIDDING DOCUMENTS
Composition of Documents

Part1	**Bidding Procedures**	
	Section I	Instructions to Bidders(ITB)
	Section II	Bid Data Sheet (BDS)
	Section III	Evaluation and Qualification Criteria
	Section IV	Bidding Forms
	Section V	Eligible Source Countries of Japanese ODA Loan
Part2	**Supply Requirements**	
	Section VI	Schedule of Requirements
Part 3	**Conditions of Contract and Contract Forms**	
	Section VII	General Conditions (GC)
	Section VIII	Particular Conditions (PC)
	Section IX	Contract Forms

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

Section VI.

Schedule of Requirements

Table of Contents

1 List of goods and Delivery Schedule:

Notice to Commencement of Work from the date of signing of contract agreement is Effective date.
The Rails are required to be supplied in installments as per the following schedule of Key dates:

Key Date Ref.	Lot no.	Weight in MT	Delivery time at Stores Mumbai – No. of days from effective date	Milestone
KD01	1	2600	122 days to be supplied to contractor package 10 B	Milestone
KD02	2	2000 1500	183 days to be supplied to contractor package 10 C Store 10 B Store	Milestone
KD03	3	1050 1100	274 days to be supplied to contractor package 10 C Store 10 B Store	Milestone
KD04	4	240	350 days to be supplied to purchaser store	Milestone
	Total Quantity	8490		

Notes on Key Dates:

1. The achievement of a Key Date shall be subject to the issuing of a Notice of No Objection from the Engineer.
2. The achievement of a Key Date shall require completion of all the works specified for achievement of the Key Date.
3. Delivery allowance of (-) 5 % of the lot quantity supplied will be acceptable, subjected to making up in next lot

2 List of Related Services and Completion Schedule

[This table shall be filled in by the Purchaser. The Required Completion Dates should be realistic, and consistent with the required Goods Delivery Dates (as per Incoterms)]

Service	Description of Service	Quantity	Physical unit	Place where Services shall be performed	Final Completion Date(s) of Services
1	Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra - Seepz) Rail Project.	8490	MT	Delivery in Stores at Mumbai	12 months from the Signing of Agreement as per delivery schedule
2	Port and Custom Clearance and Transportation of imported (UIC 60E1) Head Hardened Rails IRS-T-12:2009, 13 m long from CIF, Port in India to storage area / site in Mumbai including Loading, Unloading & Stacking etc all complete.	8490	MT	Delivery in Stores at Mumbai	12 months from the Signing of Agreement as per delivery schedule
3	The supply of Rails and Transportation, to package of contractor 10B by road to the store depot of 10B. Unloading will be done by 10B contractor	5200	MT	Delivery in Stores at Mumbai	As per delivery schedule
4	The supply of Rails and Transportation, to package of contractor 10C and Purchaser by road to the store depot of 10C and that of Purchaser. Unloading and Stacking will be done by the supplier of Package 10D contractor.	3290	MT	Delivery in Stores at Mumbai	As per delivery schedule

Name of Bidder

Signature of Bidder
Date

3 Technical Proposal

The Goods and Related Services shall comply with following Technical Specifications and Standards:

Item No	Name of Goods or	Technical Specifications and Standards
1.	Rails (UIC60E1) Head Hardened Rails, Grade 1080 *(Class "A")*	Compliance of Technical proposals as Annexure – 'A' and Indian Railway Specifications for flat bottom Railway Rails No. T-12-2009 HH Rails with all correction Slips/Corrigendum up to the date of submission of Tenders, placed at Annexure 'B'

ANNEXURE – A

Technical Proposal / Details to be submitted by the Tenderer's as a part of Technical Package

1. Proposal for No. of change over blooms will be in terms of Clause 4.3 of IRS-T-12-2009.
2. The tenderer shall furnish details of the steel making process including refining, vacuum degassing, controlled cooling of bloom/rails etc. which will be followed, in terms of Clause 5.1 of IRS-T-12-2009.
3. The Best accepted code of practice to be applied throughout manufacturing process to ensure that the rails meet the stipulations of this specification. The tenderer shall furnish the measures adopted for ensuring the same as per Clause 5.3 of IRS-T-12-2009. The Chemical Composition of Rails for 1080 Grade HH shall comply with date correction slips/corrigendum of IRS-T-12-2009.
4. Furnish the method of heat treatment adopted by the manufacturer. The Hardness is to be achieved by heat treatment process only.
5. Furnish details of on line ultrasonic testing of rails to be followed as per Clause 10.3 of IRS-T-12-2009.
6. Furnish the Clause-by-clause compliance/commentary on the provisions of IRS-T-12-2009 for 1080 Grade Head Hardened Rails.
7. Furnish the proposal for the values /results obtainable for all the qualifying criteria tests mentioned in IRS-T-12-2009 for 1080 Grade HH Rails when conducted as per provisions of IRS-T-12-2009.
8. Furnish the details of testing facilities, where the rails will be tested.
9. Furnish the proposal of packing and shipment to demonstrate that no damage will be caused to Rails up to Mumbai.
10. A confirmation in regard to weldability of 1080 HH grade rails proposed to be supplied as per IRS-T-12-2009 by short pre-heat process of Alumino-Thermic welding technique as specified in Indian Railway Specification IRS-T-19 (latest version) for Fusion welding of rails by Alumino-Thermic process duly following the provisions of Indian Railway Manual for Alumino-Thermic welding.
11. A confirmation in regard to use of 1080 Grade HH Rails supplied as per IRST-12-2009 for radius up to 190 m.
12. A confirmation in regard to the compliance of guidelines by RDSO CT-35 of October 2014 for handling and stacking of rails (placed at Annexure-C)

General Specifications:

3.1.1 **Health Safety and Environment (HSE) Manual**

Within 4 weeks of the notification of acceptance of the tender, the Contractor shall submit a detailed and comprehensive Contract specific **HSE** plan shall include the following but not be restricted to :

i) A statement of the Contractor's policy, organization and arrangement for HSE.

ii) The name(s) and experience of person(s) within the Contractor's proposed management who shall be responsible for coordinating and monitoring the Contractor's HSE performance;

iii) The number of HSE staff who shall be employed on the Works, their responsibilities, authority and line of communication with the proposed Contractor's agent.

iv) Details of the safety equipment which shall be provided by the Contractor, including personal protective equipment;

v) A statement of the Contractor's policy and procedures for ensuring that Contractor's Equipment used on the Project site are maintained in a safe condition and are operated in a safe manner;

vi) A statement of the Contractor's policy and procedures for ensuring that sub-contractors comply with the Contractor's safety plan;

3.1.2 **Lifting Appliances and Gear**

a) Lifting appliances means a crane, hoist machinery, derrick, winch, gin pole, sheer legs, jack, hoist drum, slewing machinery, slewing bearing fasteners, loffing machinery sheaves, pulley blocks, hooks or other equipment used for lifting materials, objects or building workers and lifting gears means ropes, chain slings, shackles, hooks, lifting lugs, wire ropes, lifting eyebolts and eyenuts and other accessories of a lifting appliance.

b) No machine shall be selected to do any lifting on a specific job until its size and characteristics are considered against:

i) the weights, dimensions and lift radii of the heaviest and largest loads

ii) the maximum lift height, the maximum lift radius and the weight of the loads that must be handled at each

iii) the number and frequency of lifts to be made

iv) how long the crane will be required on site

v) the type of lifting to be done (for example, is precision placement of loads important?)

vi) the type of carrier required (this depends on ground conditions and machine capacity In its operating quadrants) capacity is normally greatest over the rear, less over the side, and non-existent over the front

vii) whether loads will have to be walked or carried

viii) whether loads will have to be suspended for lengthy periods

ix) the site conditions, including the ground where the machine will be set up, access roads and ramps it must travel, space for erection and any obstacles that might impede access or operation

c) The contractor shall ensure that a valid certificate of fitness issued as per clause 21.5 is available for all lifting appliances including synchronized mobile jacks, pre-stressing hydraulic jacks, jacks fitted with launching girders etc. and Purchaser's approval before inducting to the site. Only after obtaining the approval from the Purchaser any lifting appliances and gear shall be used.

d) The laminated photocopies of fitness certificate issued by competent person, the Purchaser's approval letter, the operators' photo, manufacturer's load chart and competency certificate shall always be either kept in the operator cabin or pasted on the visible surface of the lifting appliances.

e) All lifting appliances and loose gears shall be clearly marked for its safe working load and identification by stamping or other suitable means.

f) The contractor shall also maintain a register containing a system of identification of all tools and tackles, its date of purchase, safe working load, competent person date of examination etc.

g) Test and periodical examination of lifting appliances and gears

i. All lifting appliances including all parts and gears thereof, whether fixed or movable shall be thoroughly tested and examined by a competent person once at least in every six months or after it has undergone any alterations or repairs liable to affect its strength or stability. Within the validity, if the lifting appliances are shifted to a new site, re-examination by the same competent person for ensuring its safety shall also be done.

ii. Contractors can utilize the services of any competent person as defined in Factories Act, 1948 and approved by Chief Inspector of Factories with the permission of the Purchaser.

iii. All alarms and signals like automatic safe load indicators (SLI), boom angle indicators, boom extension indicators, over lift boom alarm, swing alarm, hydraulic safety valves, mechanical radius indicators, load moment indicators etc. shall be periodically examined and maintained always in working condition

h) Automatic safe load indicators

3.1.3 As stipulated in Rule 57 of DBOCW Rules, every lifting appliances and gears like cranes, hydras etc, if so constructed that the safe working load may be varied by raising or lowering of the jib or otherwise shall be attached with an automatic indicator of safe working loads approved by Bureau of Indian standards/ International certifying bodies which gives a warning to the operator and arrests further movements of the lifting parts.

3.1.4 Qualification of operator of lifting appliances and of signaller etc

The contractor shall not employ any person to drive or operate a lifting machine like crane, hydra etc whether driven by mechanical power or otherwise or to give signals to work as a operator of a rigger or derricks unless he

i. is above twenty-one years of age and possesses a valid heavy transport vehicle driving license as per Motor Vehicle Act and Rules.
ii. is absolutely competent and reliable
iii. possesses the knowledge of the inherent risks involved in the operation of lifting appliances by undergoing a formal training at any institution of national importance acceptable to Purchaser
iv. is medically examined periodically as specified in schedule VII of BOCW Rules.

3.1.5 General requirements of appliances

i. Out of level
ii. One of the most severe effects of being out of fit level is that side loads develop in the boom. Because of side loads all mobile cranes lose capacity rapidly as the degree of out-of-level increases and therefore
iii. Boom

a) The boom is one of the more critical elements of the crane and must be in perfect condition at all time. No boom section with a bent lattice member shall be allowed
b) All welds shall be crack and corrosion free
c) No member of the boom shall be bent
d) All telescopic boom shall be free from cracks, rust, flaking or cracked paint, bulges, greases or varnishes

3.1.6 The sweep area (work area) of the construction machinery shall be always free from obstructions.

3.1.7 All hydraulic piping and fittings shall be maintained leak proof.

3.1.8 The operator cab shall possess good and safe:

i. structure, windows and windshield wipers
ii. Drivers chair and foot rest
iii. Control handles
iv. Cab instrumentation
v. Telecommunication
vi. Cab out fitting
vii. Wind indicator with an adjustable set point shall be in a position representative for the wind on the crane. The indicator shall give continuous information regarding constant speeds and gusts.

3.1.9 Mandatory rigging requirements

i. Rigging shall be done under experienced and qualified rigger only.

ii. The primary requirement in rigging shall be to assess the weight of load before attempting any lift.

iii. All hooks shall be fitted with Master Rings having certificate of fitness from the competent person, so that the hooks are subjected to balanced vertical loading only.

iv. Only four legged slings shall be allowed which includes master link (ring), intermediate master link (ring) if necessary, chain / wire rope sling, sling hook or other terminal fitting.

v. Hand spliced slings up to 32mm diameter shall not be used at site for any lifting purpose.

vi. No load shall be slewed over public areas without stopping the pedestrians and road traffic first.

vii. Requirements of outriggers

a) All outriggers shall be fully extended and at all tyres are clear of the ground
b) Heavy duty blocking having large bearing area shall be necessary to prevent sinking of floats

viii. All loads shall have tag-lines attached in order to ensure that the load can be controlled at all times.

ix. No close working to any live overhead power line is permitted without the operation of a strict Permit to Work.

x. Minimum lighting is to be ensured at all lifting operations.

xi. Failure to do any of the above shall attract penalty from the Purchaser as per relevant clause.

4 Drawings

These Bidding Documents include **"no"** additional drawings except as provided in IRS-T-12-2009 Specifications along with up to date correction slips.

5 Inspections and Tests

The following inspections and tests shall be performed:

5.1 The testing and inspection of HH Rails (UIC 60E1 IRS-T-12:2009), 1080 Grade shall be strictly in accordance with the Testing and Inspection plan approved by Purchaser.

5.2 The Supplier shall appoint with the approval of purchaser, the accredited Inspecting authority for pre-dispatch/pre-shipment inspection & testing of materials as per approved inspection and testing plan, at the Supplier's Cost. Where no procedure for testing is specified, the supplier shall propose suitable standard or particular procedures for Purchaser's Approval.

5.3 Periodically, during the Contract the purchaser/his authorized representative may conduct inspections of manufacturing, testing and inspecting activities at the premises of the supplier and those of his sub suppliers. Such inspections shall include quality procedure checks, witness inspections, both routine and prototype,

and shall also be for the purpose of monitoring progress. During each inspection suitably qualified staff shall be provided by the supplier.

5.4 The purchaser or his authorized representative may also witness the inspection and testing by the inspecting authority appointed under clause 5.2 and/or conduct test Checks.The expenses for the same shall be borne by the purchaser.

ANNEXURE – B (IRS-T12-2009 SPECIFICATIONS INCLUDING CORRECTION SLIPS)

भारत सरकार

Government of India

रेल मंत्रालय

MINISTRY OF RAILWAYS

सत्यमेव जयते

भारतीय रेल मानक विशिष्टि

INDIAN RAILWAY STANDARD SPECIFICATION

समतल आधार रेलों के लिये

FOR FLAT BOTTOM RAILS

IRST-12-2009

अनुसंधान अभिकल्प एवं मानक संगठन लखनऊ . 11

Research, Design and Standards Organisation, Lucknow-11

INDEX

Appendix

SERIAL NO. T-12-09

This specification was initially adopted in 1934 and subsequently revised in 1939, 1950, 1953, 1955, 1958, 1960, 1964, 1988 and 1996.

The present version has been adopted in 2009 specifying the requirements of the Prime rail and IU rails having ultimate tensile strength (UTS) of 880 MPa, 1080 MPa CR and 1080 MPa HH .This specification also specify the requirements of special class of rail steel such as Niobium (NB), Vanadium (VN), corrosion resistant rail steel Copper Molybdenum (CM), Nickel Chromium Copper (NC)

1. SCOPE

This specification applies to Flat bottom Railway Rails. It specifies quality of the steel, manufacturing process, chemical composition, acceptance tests/ retests, qualifying criteria and other technical conditions of supply.

2. RAIL SECTION

The Section of the flat bottom rails shall be in accordance with the section profiles shown in Appendix-I, II, IIA, III, unless otherwise specified by the purchaser.

3. TEMPLATES AND GAUGES

The manufacturer shall submit, at his own expenses, two sets of templates (internal and external) made of stainless steel for each section of rail ordered or contracted for as per approved drawings. Two sets of plus and minus limit gauges made of stainless steel, in accordance with the stipulated maximum and minimum tolerances, shall also be submitted for approval of the Purchaser or his Authorised Inspecting Agency. The approval of purchaser or his authorised inspecting agency shall be obtained before the rolling of rails is commenced. The templates and gauges shall be stamped by the Purchaser/Authorised Inspecting Agency as a token of approval.

One set of templates of plus and minus limit gauges (called hereinafter master gauges) shall remain in possession of the Purchaser/Authorised Inspecting Agency during the period of acceptance. Only gauge bearing the stamp of the Purchaser/Authorised Inspecting Agency shall be valid for checking purpose.

Each template/gauge shall be suitably engraved with the manufacturer's name and the number of the rail section together with such other marks as the Inspecting Agency or the purchaser may direct.

4. DEFINITIONS

4.1 Sequence-continuous casting

This term is used when a sequence of casts of the same grade of steel is poured through a continuous casting machine without interruption in flow of liquid steel into the moulds and strands. The pouring of the next cast from ladle into the tundish begins before the steel from the previous cast is completely poured off from tundish to the mould, leading to an inter-mixing of some liquid steel from the two successive casts.

4.2 Main cast

Blooms that are known to be entirely composed of steel from the same liquid steel melt.

4.3 Changeover, Overlap or Intermediate Bloom

Blooms that may contain steel from more than one cast i.e. material arising during the Changeover from one cast to the next in the sequence. Number of change over bloom will be mutually decided by manufacturer/Purchaser depending upon casting practice adopted by the manufacturer.

4.4 Classification of rails

52 kg/m , 60 kg/m ,68 kg/m & ZU-1-60 rails shall be classified as class 'A' and class 'B' based on tolerance in end straightness as specified in Clause 9.4.2.

5 MANUFACTURE

5.1 The steel used for the manufacture of rails shall be made by basic oxygen or electric arc furnace process and continuously cast. Any other method of casting shall have prior approval of the Purchaser. For molten steel secondary ladle refining is mandatory. The manufacturer in his offer shall furnish details of the steel making process including refining, vacuum degassing.

5.2 The cross sectional area of the bloom shall not be less than ten times that of the rail section to be produced.

5.3 The manufacturer shall apply the best accepted code of practice throughout manufacturing process to ensure that the rails meet the stipulations of this specification. The manufacturer shall, on request, inform the purchaser of the measures adopted for ensuring the above.

5.4 For head hardening, rails should be suitably heat treated to meet the requirements of this specification. The method of heat treatment adopted by the manufacturer should be made available to the purchaser and prior approval of the purchaser shall be taken before execution of the order.

6 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser shall provide the following information to the supplier when inviting tender for supply of rails according to this specification:

i) Rail steel grade (Table 1)
ii) Rail Section profile (Appendix I to III)
iii) Class of rail
iv) Length of rail.
v) Undrilled or drilled rails ends.
vi) Colour code requirements (Appendix IV)

7 GRADE, CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

The steel for rails shall be of fully killed quality and shall conform to chemical composition and mechanical properties given in Table 1. These limits for chemical composition are applicable both for tests on ladle samples and for check analysis of finished rails. The ladle and check analysis of the steel, when carried out by the method specified in the relevant part of IS: 228 or any other established instrumental/chemical method, shall be as specified in table-1.In case of any dispute, the procedure given in the relevant part of IS: 228 shall be referred to Table 1.

8 MARKING

8.1 Brand Marks

Brand marks shall be rolled in relief on one side of the web of each rail at least every 3.0 meters. The brand marks on the rails shall be clearly legible and shall be rolled in letters in relief at least 20mm in height and minimum 1.0 mm above surface of the web of the rail.

The brand mark shall include:

a) The rail section.

b) The grade of steel, i.e.

Grade 880	-	880
Grade 1080 HH	-	1080 HH
Grade 1080 Cr	-	1080 CR
Grade 880 Cu-MO	-	880 CM
Grade 880 Ni Cr Cu	-	880 NC
Grade 880 Vanadium	-	880 VN
Grade 880 Niobium	-	880 NB

c) Identification mark of the manufacturer

d) Month (using roman numbers) and last two digits of year of manufacture.

e) Process of steel making: -

i) Basic oxygen - O

ii) Electric - E

TABLE-1

Grade	Chemical Composition (percentage)											Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	V (max)	10^{-4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength ***(MPa)(Min.)	Elongation % on gauge length – 5.65√So (min)	Running surface hardness (BHN)
880	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	-	-	-	-	1.6 ppm	880	460	10.0	Min 260**
1080 Cr	0.60-0.80	0.80-1.20	0.50-1.10	0.025	0.025	0.004	0.20	0.80-1.20	0.20	20	1.6 ppm	1080	560	9.0	320-360
1080 HH	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	-	-	-	-	1.6 ppm	1080	460	10.0	340-390

So = Cross sectional area of tensile test piece in mm^2

* 0.035 maximum for finished rail

The chemical compositions specified as above are applicable to Ladle analysis and Product Analysis. Manufacture shall ensure that chemical composition at ladle analysis should be such that product analysis also satisfies the requirement of chemical composition as above.

** Desirable Value.

*** Frequency to be mutually agreed by purchaser and manufacturer.

SPECIAL RAIL STEEL

TABLE 1 –Contd...

Grade	Chemical Composition (percentage)												Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	V (max)	Nb (max)	10^{-4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength (Min)	Elongation % on gauge length – $5.65\sqrt{So}$ (min)	Running surface hardness (BHN)
NIOBIUM (NB)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	-	-	-	0.04	-	1.6 ppm	880	540	10.0	Min 260**
VANADIUM (VN)	0.60-0.80	0.80-1.30	0.10-050	0.025*	0.030*	0.015	-	-	0.20	-	20	1.6 ppm	880	630	9.0	Min 260

CORROSION RESISTANT RAIL STEEL

Grade	Chemical Composition (percentage)												Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	Cu	Ni	10^{-4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength (MPa)(Min.)	Elongation % on gauge length – $5.65\sqrt{So}$ (min)	Running surface min hardness (BHN)
Copper- Molybdenum (CM)	0.60-0.80	0.80-1.30	0.10-0.50	0.030 *	0.030*	0.015	0.2-0.3	-	0.25-0.35	-	-	1.6 ppm	880	460	10.0	260
Nickel Chromium Copper (NC)	0.60-0.80	0.80-1.30	0.10-0.50	0.030 *	0.030*	0.015	0.25	0.50-0.65	0.3-0.4	0.25-0.40	-	1.6 ppm	880	520	10.0	260

So = Cross sectional area of tensile test piece in mm^2

* 0.035 maximum for finished rail

The chemical compositions specified as above are applicable to Ladle analysis and Product Analysis. Manufacture shall ensure that chemical composition at ladle analysis should be such that product analysis also satisfies the requirement of chemical composition as above.

** Desirable Value.

8.2 Hot Stamping

Each rail shall be identified by a numerical, alphabetical or combined alphabetical and numerical code which will be distinctly hot stamped at least once every 4.0m on the web in figures and letters at least 15mm high from which following information can be obtained:

i) The number of the cast from which the rails has been rolled with letter 'C'
ii) Number of the strand.
iii) For rails from change over bloom, cast number should be the preceding cast number with prefix letter 'B'.

8.3 Cold Punching

8.3.1 Following should be cold punched on one of end face of each rail

a) Inspecting Agency Id and Group ID
b) Shift No in which product inspected
c) Date of Inspection

8.3.2 For IU rails

In addition to marking mentioned in this Specification, the letter "IU' (Industrial Use grade) as the case may be in 15 mm size shall be stamped on both end faces of rails.

8.4 Colour code

Rails shall be painted as per colour code given in Appendix-IV to distinguish grade, class, length and other special requirements. Paint of good quality should be used with the prior approval of the Inspecting Agency.

9 SECTIONS AND DIMENSIONS

Each section of rails shall be accurately rolled to its respective template within the tolerances specified in this clause.

9.1 Permissible Variations in Dimensions

The tolerances in sectional dimensions shown here under shall be allowed, provided,

For Prime quality rail the actual weight computed by weighing short pieces of rails, not less than 300mm each in length, shall fall within 0.5 percent below and 1.5 percent above the calculated weight shown in Appendix I, II and III for each rail section.

For IU Rail the actual weight computed by weighing short pieces of rails not less than 300 mm each in length is not less than the calculated weight shown in Appendix I ,II, II-A & III of this specification for each section of rail by more than 1.5%.

9.1.1 Tolerances in sectional dimensions (For Prime Quality rails)

Dimention	Tolerance	Remarks
Overall Height of Rails	+0.8 mm -0.4 mm	
Width of Head	± 0.5mm	This will be measured 14mm below the rails top
Width of flange	± 1.0mm	For section less than 60Kg/m
	+1.2 mm	For sections 60kg and above
	-1.0 mm	
Thickness of web	+1.0 mm	This will be measured at the point of minimum thickness
	-0.5 mm	
Verticality/Asymmetry	± 1.2mm	Measured by gauge shown in App. V)
Flange	The base of the rail shall be true and flat, but a slight concavity not exceeding 0.40mm shall be permissible.	
Fishing surface	The standard template for rail fishing surface shall not stand away from the contour of web by more than 1.20mm and the clearance at the fishing surfaces shall not exceed 0.2mm at any point.	

9.1.2 Tolerances in sectional dimensions (for IU rails)

Dimension	Tolerance	Remarks
Overall Height of Rails	+2.0 mm -1.0 mm	
Width of Head	+2.0mm	This will be measured 14mm below the rails top
	-2.0mm	
Thickness of web	+2.0 mm	This will be measured at the point of minimum thickness
	-1.0 mm	
Width of flange	+1.5 mm	
	-2.0mm	
Flange	The base of the rail shall be true and flat, but a slight concavity not exceeding 0.40mm shall be permissible.	
Fishing surface	The standard template for rail fishing surface shall not stand away from the contour of web by more than 1.20mm and the clearance at the fishing surfaces shall not exceed 0.2mm at any point.	

All other requirements as regards variation in dimensions, length and falling weight test shall be as per Prime Quality rail (Para 9.1.1).

9.2 Length of rails

The standard length of rails shall be 13m or 26m. However, in case rails are to be procured in longer lengths, the same shall be prescribed by the purchaser.

The manufacturer shall be entitled to supply in pairs short lengths up to 10% by weight of the quantity contracted for or ordered. Such shorter lengths shall not be less than 10.0 m in lengths for standard length of rails of 13m and shall not be less than 24 m

in lengths for standard length of rails of 26m. The short lengths shall be in multiples of 1.0m.

Type of Rail	Tolerance in length	
Prime Quality Rail	+20 mm	-10 mm
IU Grade	+30 mm	-30 mm

9.3 End Squareness

The deviation from square in both horizontal and vertical directions shall not exceed 0.60 mm on a length of 200mm.

9.4 Straightness

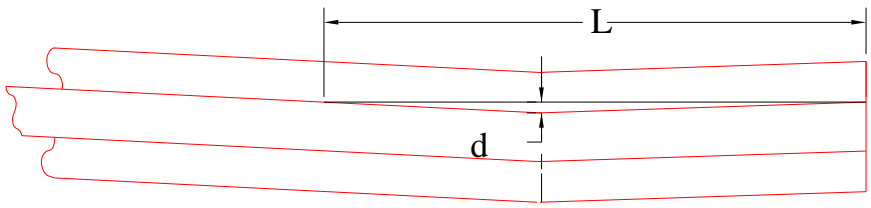
9.4.1 The straightness of the whole rail shall be judged by naked eye but in case of doubt or dispute, the affected portion shall be checked using 1.5 meters straight edge. The maximum permissible deviation shall be 0.7mm measured as the maximum ordinate on a chord of 1.5m. Wavy, kinky and twisted rails shall not be accepted.

9.4.2 End Straightness

The tolerances for end straightness shall be as indicated in Table 2 and as illustrated in figure 1 and 2.

Table –2

Sl. No	Straightness	Tolerance		
		Class 'A' rails	**Class 'B' rails**	**I U Grade rails**
1.	**Horizontal**	Deviation of 0.5 mm measured as maximum ordinate from the chord of 2.0 meters standard straight edge.	Deviation of 0.7 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge	Deviation of 1.5 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge
2.	**Vertical** **a) Up sweep**	Deviation of 0.4 mm measured as maximum ordinate from the chord of 2.0 meters standard straight edge.	Deviation of 0.5 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge.	Deviation of 1.5 mm measured as maximum ordinate from the chord of 1.5 meters standard straight edge.
	b)Down Sweep	NIL	NIL	NIL



L= Length of straight edge specified in Table 2
d= Maximum tolerance specified in Table 2.

Fig.1 TOP VIEW OF HORIZONTAL TOLERANCE AT RAIL ENDS

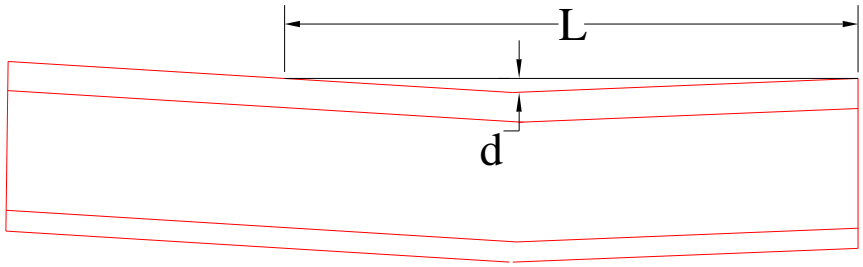


Fig.2: SIDE VIEW OF VERTICAL TOLERANCE AT RAIL ENDS

Any rail not complying with these requirements may be rectified once by the Manufacturer and offered for re-inspection.

10 FREEDOM FROM DEFECTS

10.1 The rails shall be free from all detrimental defects such as cracks of all kinds, flaws, piping or lack of metal etc. having an unfavorable effect on the behavior of the rail in service.

10.2 The absence of harmful internal defects shall be ensured by the continuous on-line ultrasonic examination. This examination shall be carried out for all rails under the responsibility of the manufacturer to the satisfaction of the Inspecting Agency.

10.3 The manufacturer in his offer shall furnish the detailed method of on-line ultrasonic testing of rails to be followed by him. The limits of permissible defects for ultrasonic testing of rails shall be as follows and the standard test piece shall be as shown in appendix-VI.

Head	:	1.5 mm dia through hole
Web	:	2.0 mm dia through hole
Web & foot junction	:	2.0 mm dia through hole
Foot	:	0.5mm deep, 12.5mm long and 1.0mm wide notch (inclined at 20^{o} with vertical axis)

All Flash Butt Welds executed by the manufacturer for welding of rails in to long panels shall be subjected to ultrasonic testing along with other acceptance criteria as per provisions of Manual for Flash Butt Welding of Rails .

10.4 EDDY CURRENT TESTING:

The manufacturer should have eddy current testing covering bottom area of the rail as also the top surface and sides of surface head. The ECT probes should cover complete area of rail bottom and at least 80% area of top surface and sides of the head. The system should be capable of detecting the defects more than or equal to 0.5 mm depth and more than 10 mm long.

10.5.1 SURFACE QUALITY

10.5.1.1 Surface quality for Prime Quality Rail

10.5.1.2 Hot marks

Depth of rolling guide marks anywhere on the rail should not exceed 0.5mm. A maximum of two guide marks are allowed per rail. The width of each rolling guide mark should not exceed 4.0mm.

Depth and width of guide marks must conform to the following:

Depth	Minimum width	Maximum width
mm	mm	mm
0.5	1.5	4.0
0.4	1.2	4.0
0.3	0.9	4.0

10.5.1.3 Cold Marks

Depth of longitudinal or transverse cold formed scratches anywhere on the rail should not exceed 0.5mm.

10.5.1.4 Seams

Rails with seams greater than 0.2 mm in depth are not acceptable and shall be ground. On the running surface of the rail, dressing shall be limited to 0.3mm deep and in other places; it shall be limited to 0.5 mm deep.

10.5.2 Surface Quality for IU rail

The rails shall be of uniform section throughout and shall be generally sound and free from twists, cracks and major surface defects.

The following maxima of dimensions of surface defects in the rail shall, however, be acceptable:-

Type of defect	Location	Permissible dimensions of defects
Seams	(a) Table of rails, side of the head of rail, bottom and side of the foot of rail (excepting middle third of the foot). (b) Middle third of the bottom surface of the foot of the rail.	Up to 3mm in depth Up to 2mm in depth
Scabs	Table of rail and side of the head of the rail.	75 mm x 25 mm not to exceed 3 mm in depth.

Number of scabs shall not be more than 3 in the standard rail lengths and shall be separated from each other by at least six times the length of the scab. There shall be no scab within 200mm from the end of the rail.

10.5.3 Protrusions

All protrusions in the head or foot of the rail shall be ground to match the parent contour. Protrusions on web greater than 1.5mm high and 20mm square shall be ground. All protrusions affecting the fitment of the fishplate shall be ground.

10.6 During examination on the inspection banks, any shrinkage cavity, inclusion & segregation visible to the naked eye shall result in rejection of such rail or cutting out of the defective portion and re-examination.

10.7 Any operation carried out either in the hot or cold state with the object of hiding a defect is strictly forbidden.

11 Finishing

11.1 Cold straightening shall be effected by means of gradual pressure without impact. The rails may be roller straightened only once in each direction. The markings must be protected from the action of the straightening rolls.

11.2 The rails must be cut to length when cold. Burrs shall be removed without any perceptible beveling of the section.

12 TESTING FACILITIES

The manufacturer shall, at his own expense, supply all templates and gauges, prepare and supply test pieces and sample of steel, sample rails and drillings, and supply

labour and apparatus/equipment, for testing which may be required by the Inspecting Agency for carrying out all the tests and render reasonable assistance in execution of such tests as desired by the Purchaser/Inspecting Agency.

13 QUALIFYING CRITERIA

The following test shall be done for each rail section, grade and class after any change in the process of manufacture which may affect the results or annually for first three years after adoption of the revised specification. If results of these three years are consecutively found satisfactory, this frequency may be relaxed to three years by Purchaser. The test shall be undertaken by the supplier to demonstrate compliance with the qualifying criteria. If so desired, the purchaser /Inspecting Agency should be provided all facilities to check the sample and witness the test.

a) Residual stress measurement.
b) Fracture toughness measurement
c) Fatigue test

The samples for these tests shall be collected from finished rails. These samples shall not be subjected to any further mechanical or thermal treatment. The tests shall be carried out by an accredited/recognised laboratory approved by the purchaser and the test results shall be reported to the purchaser. The purchaser shall have access to all test records, calibrations and calculation which contribute to the final results.

In case any sample fails to meet the requirement laid in the qualifying criteria the manufacturer shall review its process of manufacturing within six months to eliminate any shortcomings and fresh qualifying criteria test shall be undertaken under intimation to the Purchaser.

14 NATURE OF TESTS

All tests shall be carried out as per latest version of reference specifications mentioned in this document.

14.1 ACCEPTANCE TESTS

14.1.1 Following acceptance tests shall be conducted for Grade 880, 1080 CR , 880 CM, 880 NC, 880 VN & 880 NB Rails:

a) Chemical Analysis
b) Tensile Test
c) Sulphur Print
d) Hardness test (for information and record)
e) Falling Weight Test
f) Hydrogen content
g) Inclusion Rating Level

14.1.2 For Grade 1080 Head Hardened (1080 HH) Rails all the tests stipulated in Para 14.1.1 above shall be conducted except tensile test and hardness test, prior to heat treatment. Following tests shall be carried out after heat treatment:

a) Tensile Test
b) Hardness Test
c) Macroscopic Test

14.2 The choice of the test sample location within the cast and strand shall normally lie with the manufacturer. The test sample position within the bloom/rail shall be selected at the discretion of the Inspecting Agency.

14.3 The initial test pieces and also the samples intended for retest must not be taken from the change over or intermediate blooms. Tests will only be carried out on these blooms when part or the whole of the adjacent cast has been withdrawn as not conforming to specification, or for supplying supplementary information, if required by the purchaser.

14.4 The test methods and the conditions, under which the tests are carried out, shall conform to the standard in force in the country of manufacture, in so far as they are not defined in the present specification.

15 TEST SAMPLE

15.1 The samples drawn for preparation of the test pieces shall be marked and stamped under the supervision of the Inspecting Agency.

15.2 If during the preparation of test pieces, any marks have been removed, they shall be replaced on the actual test pieces in the presence of the Inspecting Agency.

15.3 The test pieces shall be machined in the cold state and must not be subjected to any cold or hot working or heat treatment except for stress relieving treatment at 100^{o} C for two hours for tensile test pieces at the option of the manufacturer.

16 CHEMICAL ANALYSIS

16.1 The manufacturer shall, at his own expense, make a complete ladle sample analysis of each cast from which the rails are to be rolled and shall submit an authenticated copy of the results to the Inspecting Agency in the proforma at Appendix-VII. The percentage of each specified element shall conform to the limits specified in table-1 of clause 7.

16.2 Extent of test (Product)

For casts	$\leq$	150t, one test per cast.
For casts	>	150t, two tests per cast, one sample taken from first half of the cast and the other from the second half and different strand.

16.3 If chemical analysis of any cast fails to conform to the provisions of clause 7, the cast shall be subjected to the retest as per provisions of clause 16.4.

16.4 Retest

Two additional chemical analyses shall be made. If both analyses pass, the casts shall be considered as complying with clause 7. If one or both of the analyses fail, the cast shall be rejected.

16.4.1 If a cast does not satisfy the conditions of the specification, the intermediate metal belonging to preceding and succeeding cast shall be rejected or subjected to a retest.

16.5 The chemical analysis for specified elements shall also be made either from drillings taken from a hole drilled in the rail, or by spectrography or any other approved method from the position shown (in fig.3), rolled from the same cast or from the tensile test piece or piece selected by the Inspecting Agency and the percentage of each specified element shall be within the range specified in table 1 of clause 7.

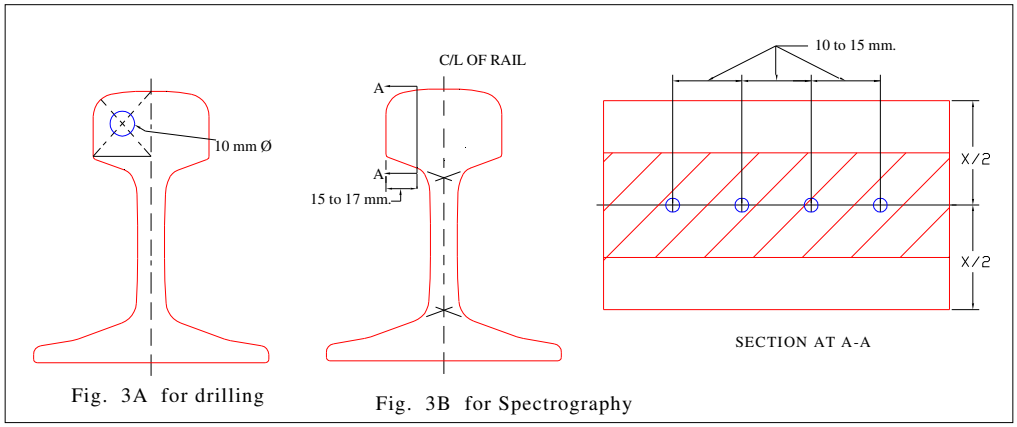


Fig. 3A for drilling

Fig. 3B for Spectrography

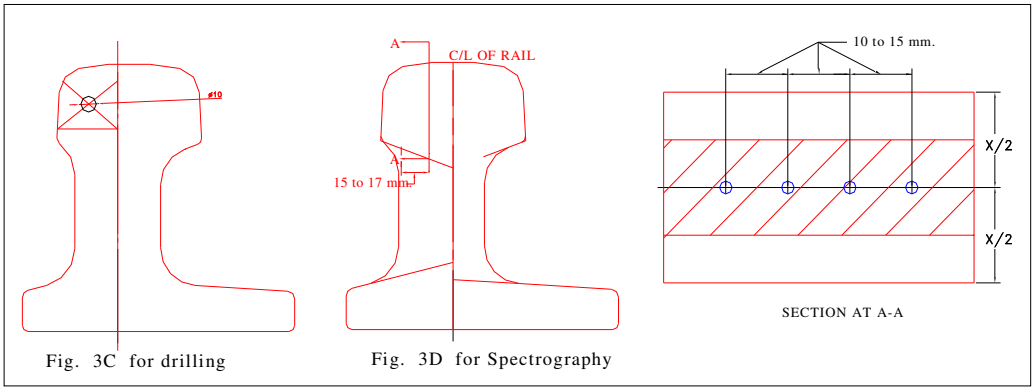


Fig. 3C for drilling

Fig. 3D for Spectrography

Fig. 3 Location Of Sample For Chemical Analysis

17 TENSILE TEST

17.1 For 880,1080 CR , 880 CM, 880 NC, 880 VN, And 880 NB grade Rails:

17.1.1 Nature of Tests

The manufacturer shall determine the tensile properties of the steel in accordance with the requirements of IS: 1608. Such tests shall be made on standard test pieces taken from position shown in figure 4.

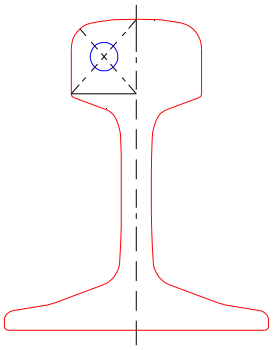


Fig .4 LOCATION OF TENSILE TEST PIECE

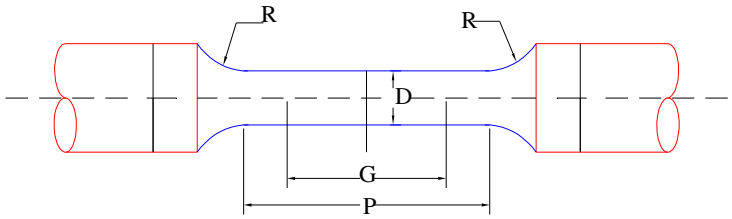


Fig . 5 STANDARD ROUND TENSILE TEST PIECE

Three sizes of the standard test piece, as shown in fig.5 are given in table 3, any of which may be adopted.

Table-3

Diameter	Area of cross section	Gauge length	Parallel length	Radius at Shoulder
D mm	A mm^2	G mm	P mm	R mm
20.64	333.33	100	120	18
14.56	166.67	75	90	13
10.00	78.50	50	55	10

17.1.2 Extent of Tests

For casts	≤	150t, one test per cast.
For casts	>	150t, two tests per cast, one sample taken from first half of the cast and the other from the second half and different strand.

17.1.3 Results to be obtained

The tensile strength obtained shall not be lower than the minimum value given in table 1, clause 7. Should the test piece break outside the middle half of the gauge length , it may be discarded and such breaks should not be considered as a failure of the test. A fresh test or fresh tests may be made by the manufacturer with a test piece or test pieces taken from rail from the same cast from which the discarded test piece was taken.

17.1.4 Retests

When the first tensile test does not give satisfactory result, three retests shall be made. The two retests shall be made on any of the rails from the same strand and the third retest on any of the rails from another strand of the same cast.

The check tests must not be carried out on rails produced from intermediate blooms of a sequential continuous cast.

If all the three retests are satisfactory, all the rails of the cast shall be accepted.

If any of the two retests from original strand does not give satisfactory result and the third retest from the other strand gives satisfactory result, all the rails of the original strand shall stand rejected and rest of the rails of the cast shall be accepted.

If third retest does not give satisfactory result, further retest shall be made strand by strand as above up to 50% of strands.

For sequential continuously cast material, in the event of rejection or withdrawal of rails from one or more strands of a cast, the rails rolled from the change over blooms between the ends of these strands of the previous and next cast in the sequence shall either be deemed not to comply with the requirements or shall be subjected to retest which shall be carried out, one on rail from the strand represented by the original test and the other from another strand. In the event of failure of either of these retests, rails rolled from change over blooms shall be rejected.

17.2 For 1080 HH (Head Hardened) Grade Rails

17.2.1 Nature of Test

The manufacturer shall determine the tensile properties of the steel in accordance with the requirements of IS: 1608.
Such test shall be made on standard test pieces taken from position as shown in fig.6 given below.

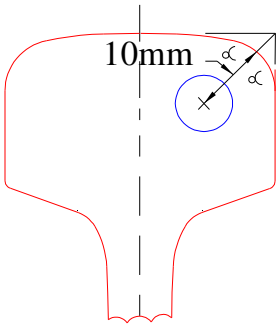


Figure -6

The diameter of the test piece shall be 6 mm with gauge length 3.54D or 21 mm.

17.2.2 Extent of Tests

One test per 1000 meter of heat treated rail from one heat.

17.2.3 Results to be Obtained

The minimum tensile strength after heat treatment shall not be less than 1080 MPa with a minimum elongation of 10% and 0.2% proof stress shall be measured and record maintained. If the test piece breaks outside the middle half of the gauge length, it may be discarded and such breaks shall not be considered as failure of the test. A fresh test or fresh tests may be made by the manufacturer with a test piece or test pieces taken from a rail from the same lot from which discarded test piece was taken. If the tests fail to meet the above requirements, the rails may be retreated at the option of the manufacturer and such rail may be retested as above.

18 Sulphur Print Test

18.1 For Grade 880/1080 Cr/1080 HH /880 CM/ 880 NC/ 880 VN & 880 NB Rails

18.1.1 Nature of test

A Baumann-type impression is obtained by the application of bromide paper, previously impregnated with a solution of Sulphuric acid, to the clean rail sections drawn from a location within the cast at the discretion of the Inspecting Agency.

The sections intended to be used for these tests are cold sawn and are then sufficiently cleaned on one surface in order to eliminate completely all machining marks and to obtain a sharp impression.

The initial samples and also those intended for the retests must not be taken from rails of changeover blooms. Tests will only be made on these rails when part or whole of the adjacent cast has been withdrawn as not conforming to specification.

18.1.2 Extent of Tests

Sulphur print tests shall be carried out at the rate of one each per cast for casts ≤ 150 t and two per cast for casts > 150 tones.

18.1.3 Results to be Obtained

The prints obtained must not reveal macrographic defects more marked than those of the limit prints shown in (or equivalent to those shown in) the album of macrographic prints given in Appendix-VIII.

18.1.4 Retests

If Macrographic examination (Sulphur print) conducted according to 18.1.3 does not give satisfactory results, three further samples, two from the same strand and one from the other strand shall be tested.

If all the retests are satisfactory, all the rails of the cast shall be accepted.

If any of the two retests from the original strand does not give satisfactory result but the third retest from the other strand gives satisfactory result, all the rails of the original strand shall stand rejected and rest of the rails of the cast shall be accepted.

If the third retest from the other strand does not given satisfactory result, further retest shall be conducted strand by strand.

For rails from sequential continuously cast blooms, in the event of rejection or withdrawal of rails from one or more strands of a cast as a result of macrographic test, the rails rolled from the change over blooms at the end of these strands of the next cast in sequence shall either be deemed not to comply with requirements or shall be subjected to retest which shall be carried out one on the rails from the strand represented by the original test and the other from any other strand. In the event of failure of either of these retests, the rails rolled from change over blooms shall be rejected.

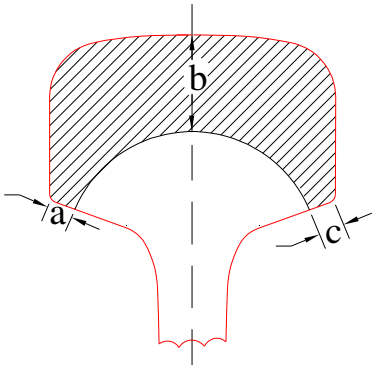
18.2 Inclusion Rating Level

18.2.1 The inclusion rating level, when examined as per IS: 4163, shall not be worse than 2.5 A, B, C, D thin or 2.0 A,B,C,D thick. Reporting for a parameter is to be in either thin series or thick series.

18.2.3 This test shall be done once every day at random .The record of the test results shall be communicated to purchaser.

18.3 Macro-Structure Test (For 1080 HH grade Rails)

One macro structure test of hardened layer per 1000 meter of heat treated rails shall be performed. Macro structure of heat affected zone shall confirm to figure 7.



a,c	≥	10 mm
b	≥	15 mm

Figure -7

19 Brinell Hardness Test

19.1 For 880/1080 CR ,880 CM, 880 NC, 880 VN & 880 NB Rails

19.1.1 Nature of Test

For carrying out this test, impression shall be made on the running tread of a test piece drawn at the discretion of the manufacturer. The test shall be performed in accordance with IS: 1500.

19.1.2 Extent of Test

Test on 10% of the casts shall be carried in case of 880 grade rails and 1080 grade rails for the purpose of records and for any corrective action as required. The hardness values should preferably be as under:

Grade 880 rails Minimum 260 BHN
Grade 1080 HH 340 - 390 BHN
Grade 1080 Cr 320- 360 BHN

Results of the test should be average of five observations on the same test piece.

19.2 For 1080 Grade (Head Hardened) Rails

19.2.1 Nature of Test:

The hardness test on the rail head surface shall be carried out for 10% of rails, at one end of the rail (after removing the decarburised surface), at regular interval of heat treatment and the hardness should be in the range of 340-390 BHN for 1080 HH Grade Rails. In case of non-conformance of any rail, 9 consecutive rails on either side of the rails having non- conformed value shall be checked for hardness in the sequence. Rails

not meeting the hardness stipulations maybe retreated only once at the option of the manufacturer and such rails may be retested as above."

19.2.2 Results to be obtained:

Hardness of rail head surface after heat treatment shall be within Brinell Hardness No. 340 to 390.

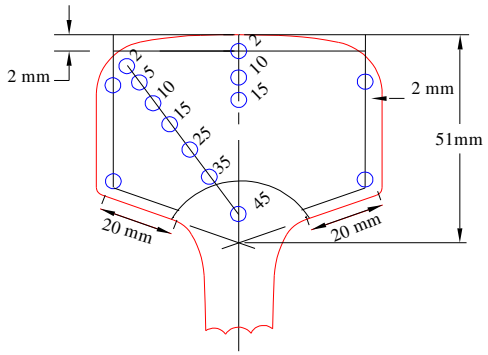


Figure -8 Hardness Distribution

19.2.3 Hardness Distribution Test

The hardness distribution test shall be conducted on transversely cut rail sections as shown in figure 8. Hardness value at any point shall not exceed 390BHN. The cross sectional hardness distribution of heat treated rails shall slope towards the inside. No sharp drop in hardness should be present. The hardness at 10 mm below, the rail head table at centre shall be 340 BHN minimum.
The hardness at 15 mm below, the rail head table at centre shall be between 315-325 BHN.

19.2.4 Extent of Test:

One hardness distribution test per 1000 m length of heat treated Rail shall be performed.

19.2.5 Microstructure :

Test piece for microstructure should be taken from the top of rail head. Test piece should be polished, etched and viewed under microscope X100 and X500 magnification. The microstructure shall be fine pearlite without formation of any martensite and Bainite. One test per 1000m of heat treated rail from one heat to be carried out.

20. FALLING WEIGHT TEST

20.1 Nature of Test

20.1.1 Falling weight test piece 1.5 meters long shall be cut from a location as per choice of the Inspecting Agency. For heat treated rails, the sample shall be taken after heat treatment. The test piece shall be placed in horizontal position with the head up on two iron or steel supports resting on a solid metal anvil. The weight of the metal anvil block shall not be less than 12 t and the area of the base not less than 4.2 sq.m. The

metal anvil block shall be supported direct on a concrete or masonry foundation weighing not less than 25 metric tons and having an area of not less than 9.3 sq.m. No timber or spring shall be permitted between the rail supports and the anvil or between the anvil and the foundation. Block guides shall be provided which shall permit free fall of the weight. The upper surface of the supports shall be curved to a radius of not more than 75mm.

One blow shall be delivered midway between the supports, by means of a freely falling iron weight or 'TUP', the striking face of which shall be rounded to a radius of not more than 125mm. the weight of the "TUP", the distance between the centre of the bearings , the height between the surface of the rail and the bottom of the "TUP", before the latter is released shall be as specified in table-4.

Table-4

Rail Section	Weight of Tup (kg)	Distance between centers of bearers (m)	Height of drop (m)
52 kg	1270	0.85	6.4
60kg	1270	0.85	7.4
ZU-1-60	1270	0.85	7.4
68 kg	1270	0.85	8.4

20.2 Extent of Tests

One Test per cast shall be carried out. Sample for 20% (minimum) of the fresh casts rolled per day shall be selected at random from straightened rails and the remaining samples shall be hot sawn. No retest shall be permitted on account of sample from straightened rails failed in Falling weight test. However, present provision of retests shall be applicable to rest 80% of samples taken from un-straightened rails. Choice of the test sample location within cast and strand shall normally lie with the manufacturer. The test sample position within bloom/ rail shall be selected at the discretion of the inspecting agency.

20.3 Results to be Obtained

20.3.1 The blow shall be sustained without fracture, and the permanent set resulting from the blow shall be measured after every test, over the specified distance between the centers of the bearer and recorded and advised to the purchaser.

20.3.2 The Inspecting Agency shall be entitled to test to destruction any rail piece subjected to the falling weight test or carry out any other test/examination/analysis in order to confirm that the rails are sound.

20.4Retest

Test sample shall be selected at random from the finished rails at the discretion of the Inspecting Agency.

If a falling weight test piece gives unsatisfactory result, three retests shall be made on two rails from the same strand and one from any other strand. If all the three tests are satisfactory, all the rails of the cast shall be accepted.

If either of the two tests from original strand gives unsatisfactory result and the third test from the other strand gives satisfactory results, all the rails of the original strand shall be rejected and other rails of the cast shall be accepted.

If the third test from the other strand gives unsatisfactory result, further retest shall be conducted strand by strand. For sequential continuous cast, if rails are rejected or withdrawn from one or more stands of a cast, the rails rolled from the changeover bloom at the end of the same strands of the previous and next cast in the sequence shall either be withdrawn or subjected to two retests, failure of either of retest shall result in rejection of the rails rolled form the changeover blooms of the same strand.

21 DETERMINATION OF HYDROGEN CONTENT

Vacuum degassing of liquid steel shall be done to reduce the hydrogen content. For this purpose RH degasser shall be used. The vacuum level and the duration for which liquid steel shall be kept under this vacuum level shall be decided mutually by the purchaser and the manufacturer. All measurement of hydrogen shall be done for the liquid steel in tundish or mould. Any other method of sampling or determination of hydrogen will require prior approval of the purchaser.

21.1 The measurement of hydrogen shall be done by following method:

21.1 (a) On-Line/Instantaneous Method-

HYDRIS is approved as method of on-line instantaneous measurement. The method of measurement as prescribed by the manufacturer of HYDRIS system shall be adopted with approval of the purchaser. Any other alternate method of determination of hydrogen will require prior approval of the purchaser.

(b) Pin Sample Method-

In case, the manufacturer has not installed the facility for on-line/instantaneous facility for measurement of hydrogen as described in Para (a) above, this method may be adopted with prior approval of the purchaser.

In this method, sample of liquid steel shall be taken by plunging the sampler 300 mm below the molten slag-metal interface. The sample should be held for 2 to 3 seconds and then quenched in cold water so that sample temperature falls to below 150^0C within 5 seconds.

The sample should be removed from cold water and packed in dry ice if analysis is carried out within 48 hours of sampling or placed in liquid nitrogen if analysis is to be carried out beyond 48 hours after sampling. Sampling should be done by 6 mm dia vacuum tube of Pyrex glass with wall of thickness of 1.0mm and approximately 0.5 mm thick in the fill-end. The tube should have desired vacuum of 10^{-3} mm of Hg.

The hydrogen sample can be analysed by inert gas fusion technique in which sample is to be fused at approximately 1900^0 C in an induction heating graphite crucible. A nitrogen carrier gas transports the released hydrogen to thermal conductivity cell. The amplified and integrated output of the cell is to be calibrated for hydrogen in ppm.

LECO – RH –2 Hydrogen Analyser may be used for Hydrogen determination.

Any other size and material of tube and method of hydrogen determination will require prior approval of the purchaser.

21.2 The level of hydrogen measured by the method described under Para 21.1 above shall be as under for acceptance of a heat for production of rail:

i) When measured by the method described under Para 21.1 (a) = 1.6 ppm max.

ii) When measured by the method described under Para 21.1 (b) = 2.0 ppm max.

22 QUALIFYING CRITERIA TESTS

22.1 Residual Stress Measurement

22.1.1 Residual stresses are measured by attaching electrical strain gauge at various locations on the rail surface. The surfaces to which the strain gauges are attached are progressively isolated from the rail and the relaxed strain are then used to estimate the stresses which have been relieved whilst the original residual stresses are taken to be these values but with a change of sign.

22.1.2 Procedure of Measurement of Residual Stresses

A test piece of 1.0 m length shall be cut from the sample rail. A 150 mm long area in the centre of the test piece shall be ground by hand using fine stones. During grinding it shall be ensured that the surface does not get overstressed. Final finishing shall be done using emery-paper. Strain gauges shall be fixed on minimum 7 & 12 locations on the rail as shown in figure 9.

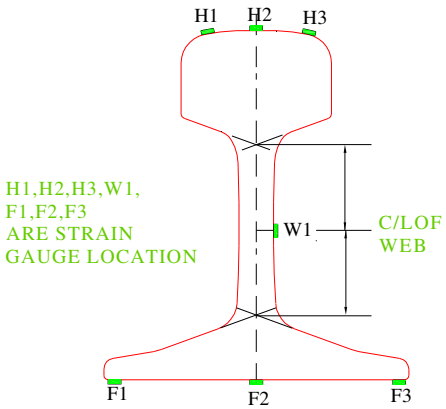


Fig 9-A

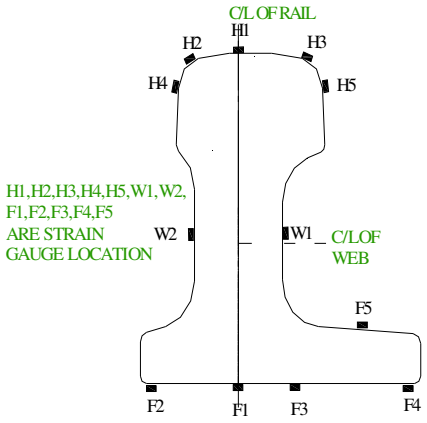


Fig 9-B

Figure 9 : Location of strain Gauges to measure surface longitudinal residual stresses

The strain gauge location shall be accurately marked and these locations shall be cleaned with the help of Acetone and cotton. Rust shall be cleaned by acid and the acid cleaned locations shall be treated by basic solutions. Strain gauges shall be fixed using

proper adhesive and then connecting wires and terminals are soldered. Null balancing of strain shall be done and reading of each strain gauge brought to zero using balancing bridge and strain indicator. The wires shall be disconnected from the balancing bridge and 60 to 80 mm length of samples shall be cut containing all the strain gauges. Wires shall be connected to the balancing bridge and reading of strain gauge taken using same setting of balancing bridge as was before cutting the samples. The reading of strain at the corresponding locations shall be converted to stress by multiplying with Young's modulus of elasticity for steel (2.05×10^6 Kg/cm^2). Residual stress will have same value as relieved stress with opposite sign.

22.1.3 Results to be obtained

Residual tensile stress anywhere in the rail section shall not exceed 190 MPa, anywhere in the section.

22.2 Fracture Toughness K_{1c}

22.2.1 Test pieces and test methods

Tests shall be performed in accordance with **APPENDIX-XI**

22.2.2 Qualifying Criteria:

The values of K1c shall comply with table given below:

Steel grade	Minimum single value K_{1c}(MPa m ½)	Minimum Mean K_{1c}(MPa m ½)
880	26	29
1080 Cr	24	26
1080 HH	30	32

Note: In some circumstances K_Q values can be used for the purpose of qualification – see B.6 of appendix XI.

22.3 Fatigue Test

22.3.1 The constant amplitude fatigue test shall be carried out in accordance with ASTM E606.

22.3.2 Test Pieces

The test pieces shall be machined from the sample rail at a location at least 2m from the rail ends.

22.3.3 Number of Tests and Test Conditions

A minimum of three tests shall be performed under the following conditions:-

Test temperature = Ambient

Control variable shall be axial strain amplitude.

Note:- Load control during the test is acceptable provided the requirements of ASTM E606, clause 10.2.1 are complied with.

The strain cycle shall be symmetrical about the initial zero load strain level.

22.3.4 Each sample should endure 10 million cycles at strain of 0.00135. For rails of Grade 1080 HH the each sample should endure 10 million cycles at strain of 0.00166.

23 INSPECTION

23.1 The purchaser/Inspecting Agency shall have free access to the works of the manufacturer at all reasonable times. The Inspecting Agency shall be at liberty to inspect at every stage the process of steel manufacture and rail production and cross check the results of the stipulated tests when so desired by it.

23.2 Rails rolled from passed heats only shall be inspected by the Inspecting Agency or as mutually agreed by purchaser and Inspecting Agency . The acceptance procedure should not interfere with the normal manufacturing process. When a cast is rolled in several batches, tests carried out on the first part of the cast may be considered valid for the remaining parts of the cast in agreement with the Inspecting Agency.

23.3 Before the rails are submitted to the Inspecting Agency, these rails shall be properly examined by the manufacturer's inspectors and all defective rails shall be conspicuously marked and segregated. Rails passed in internal inspection should only be offered for examination by the Inspecting Agency.

23.4 The analysis of all casts rolled together with a report on the manufacturer's rejections shall be submitted in proforma as appendix IX and X to the Inspecting Agency.

23.5 After inspection, every accepted rail shall be clearly stamped with the Inspecting Agency's stamp at one end in the presence of the Inspecting Agency and painted as per colour code specified in clause 8.4. Cast numbers shall be cold stamped on the faces of the rails at one end.

23.6 Passed rails should be properly stacked on leveled and well drained stacking area. Rails shall be stacked in head up position with 100 x 25mm mild steel flats as spacers at a distance of 3.0 meters between successive layers.

23.7 For lifting rails, single point slinging is not permitted. For 13m long rails, there should be two lifting point spaced at 6 to 7.5 m apart and the maximum rail end overhang beyond the lifting point should not be more than half of the distance between the lifting point. For lifting longer rails the spacing between lifting points shall not be more than 7.5 m. Lifting of rails using magnetic chucks shall be preferred.

23.8 Sudden impact on rails during loading, unloading, stacking or transferring from one point to the other shall be avoided.

24 METHOD OF PAYMENT

24.1 The calculated weights of rails given in appendix I , II , II-A and III of this specification shall be regarded as actual weights and payment shall be made on these weights unless otherwise agreed to.

25 SHIPMENT

25.1 No rail shall be loaded or dispatched until notification has been received from the Inspecting Agency that it has been inspected and has satisfactorily passed all specified tests.

25.2 Industrial Use (IU) rails should be loaded in one wagon and should not be mixed with other rails for dispatch.

25.3 Import Shipment

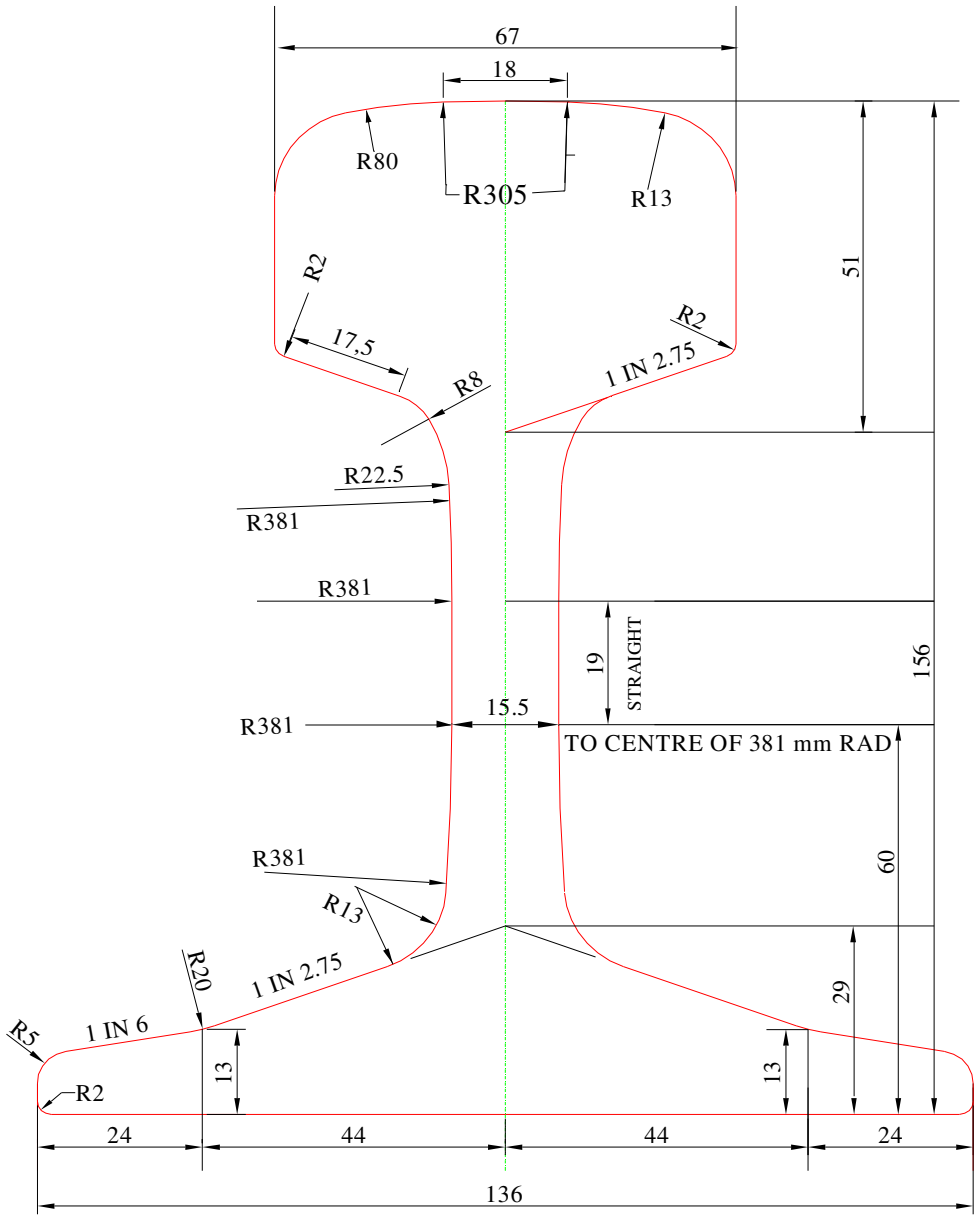
The rails shall be loaded in bundles of three rails each bundle containing one rail upside down placed in between two rails snugly fitting and suitable tied by M.S. straps at four or more places along the length of rails so that they will not get loosened during their transportation from manufacturer's place to site of work.

25.4 Rail Transport

Transportation within the country

Rails shall be loaded in wagons in layers with wooden/steel spacer flats between them so that the rails do not get damaged during transportation. Any missing bolster in BFRs/BRHs/BRNs shall be replaced by the manufacturer at his expense. The rails shall be tied as per the extant instructions.

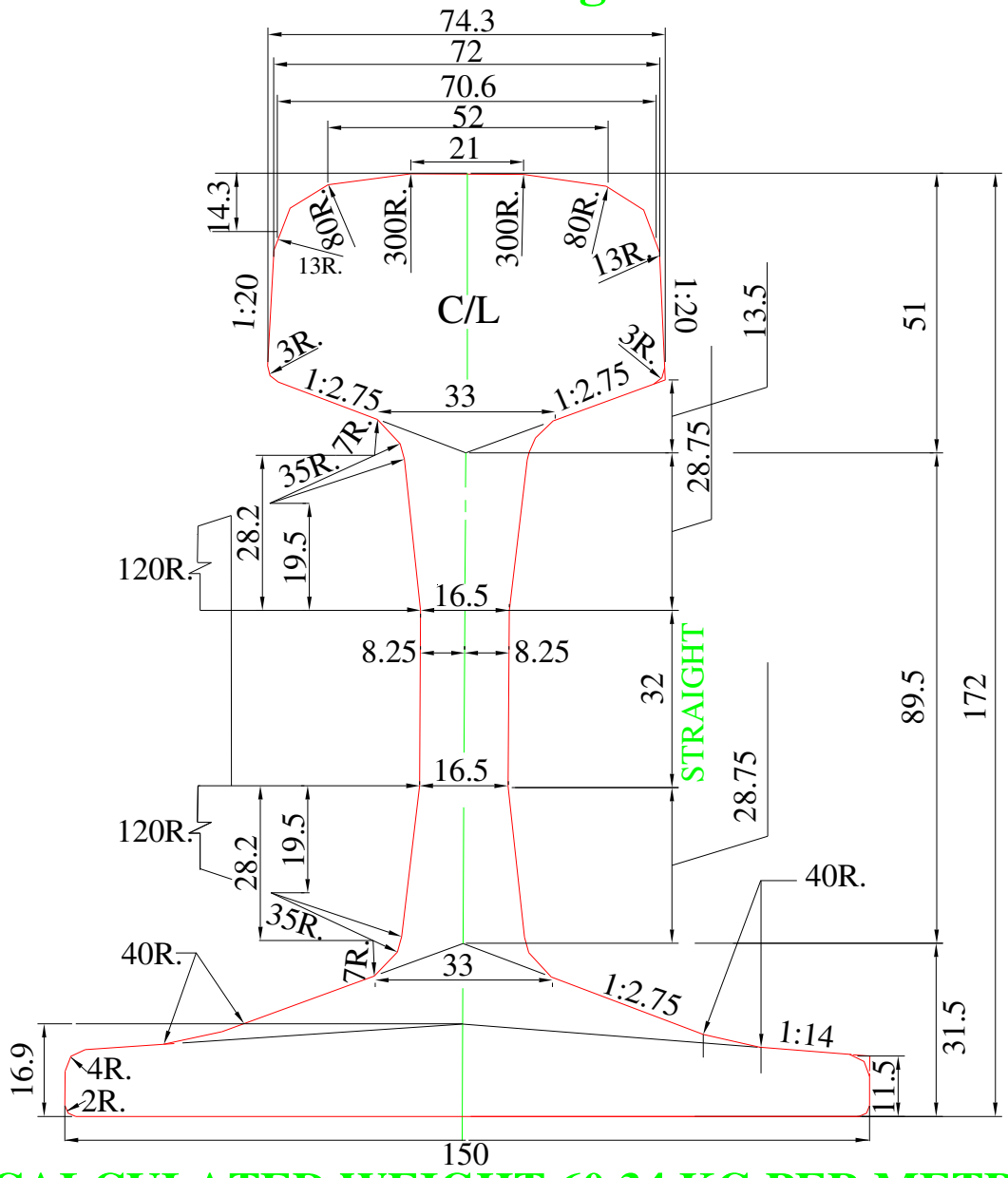
IRS- 52 kg/m APPENDIX-I



CALCULATED WEIGHT 51.89 kg per metre
CROSS SECTION AREA 66.15 sqcm

APPENDIX-II

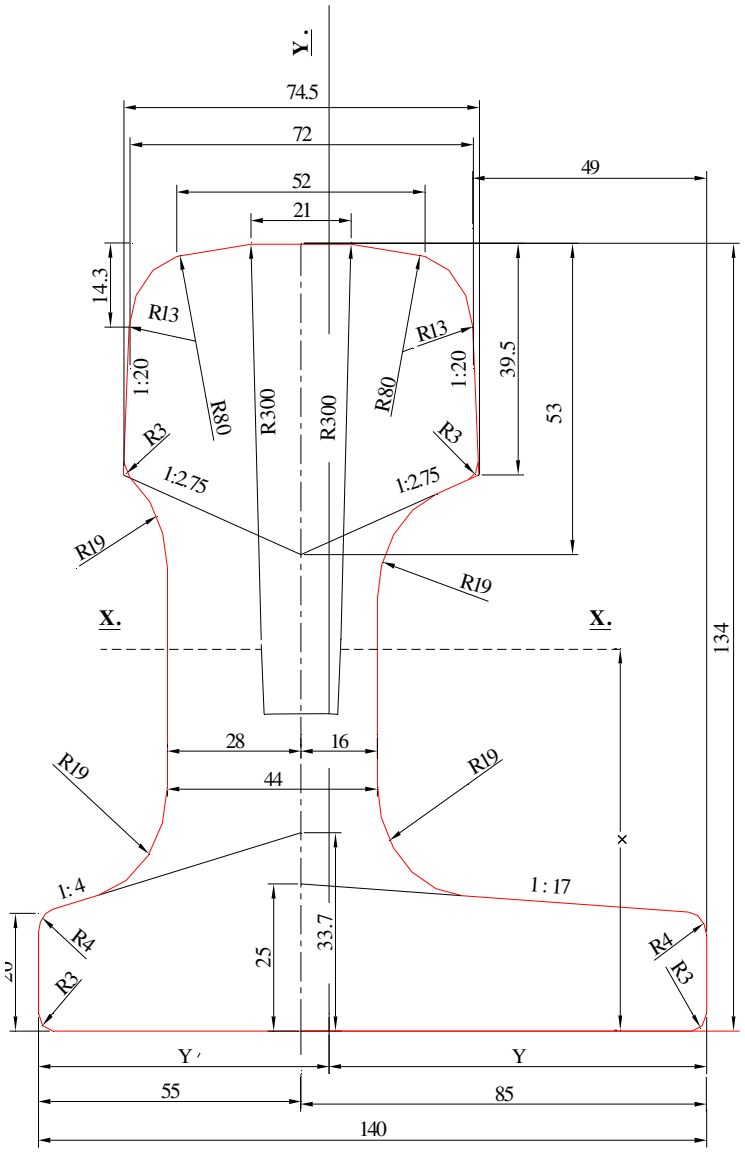
UIC 60 kg/m



CALCULATED WEIGHT 60.34 KG PER METRE

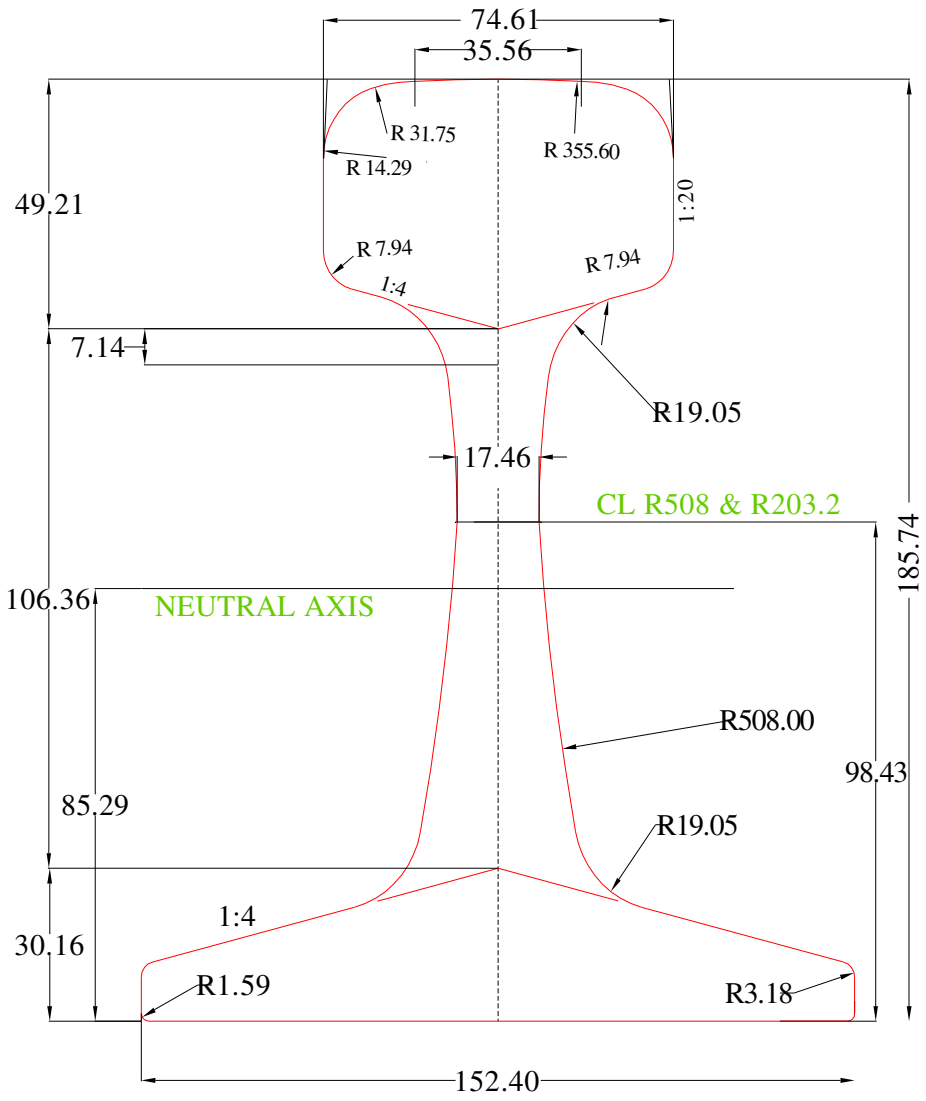
CROSS SECTION AREA 76.86 sqcm

ZU 1-60 PROFILE



WEIGHT PER METER	73 kg/m
AREA OF SECTION	93 cm²

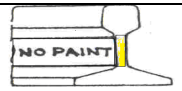
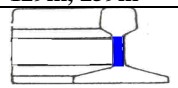
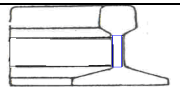
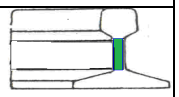
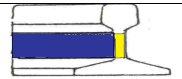
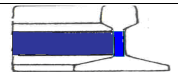
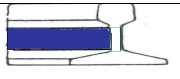
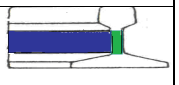
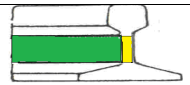
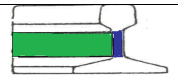
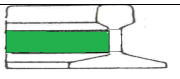
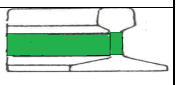
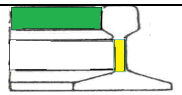
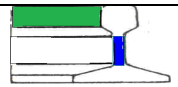
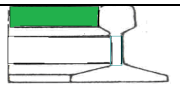
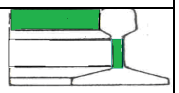
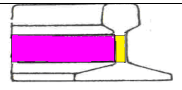
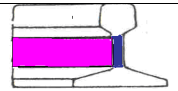
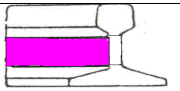
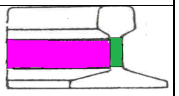
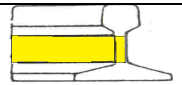
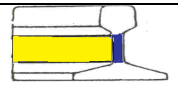
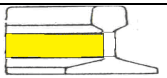
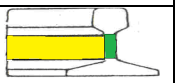
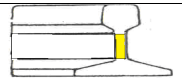
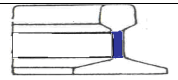
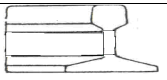
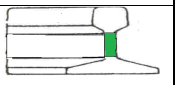
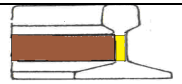
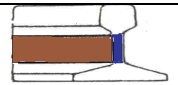
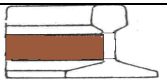
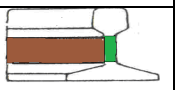
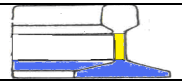
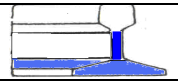
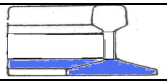
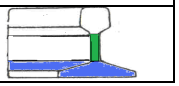
136 RE 14 (68 kg/m) APPENDIX -III



CALCULATED WEIGHT; 67.364 kg/m
SEC. AREA :86.131 sqcm
ALL DIMENSION ARE IN MILLIMETRES
FOR INDIAN RAILWAYS, HEAD SLOPE HAS BEEN KEPT 1:20 IN PLACE OF 1:40 AS AREMA PROFILE

COLOUR CODE FOR RAILS

APPENDIX – IV

S. No.	Grade	Colour Code	13m, 26m, 130m, 260m	12m, 25m, 129m, 259m	11m, 24m	10m
1	GR. 880	Only common length wise colour code and no paint on web surface				
2	GR.1080 H.H.	In addition to common length wise colour code, **Blue** paint on both sides of web surface for a distance of 500 mm from each end.				
3	Gr 1080 Cr	In addition to common length wise colour code, **Green** paint on both sides of web surface for a distance of 500 mm from each end.				
4	CLASS'A' RAIL	In addition to common length wise colour code, grade code as 1, 2 & 3 and **Green** paint on gauge/non gauge face for a distance of 500 mm from each end.				
5	NIOBIUM 880 NB	In addition to common length wise colour code, **Purple** paint on both sides of web surface for a distance of 500 mm from each end.				
6	VANADIUM 880 VN	In addition to common length wise colour code, **Yellow** paint on both sides of web surface for a distance of 500 mm from each end.				
7	Copper-Molybdenum 880 CM	In addition to common length wise colour code, **White** paint on both sides of web surface for a distance of 500 mm from each end.				
8	Nickel Chromium Copper 880 NC	In addition to common length wise colour code, **Brown** paint on both sides of web surface for a distance of 500 mm from each end.				
9	IU	In addition to common length wise colour code, **Blue** paint on end face of flange and both sides of flange for a distance of 500mm from each end.				

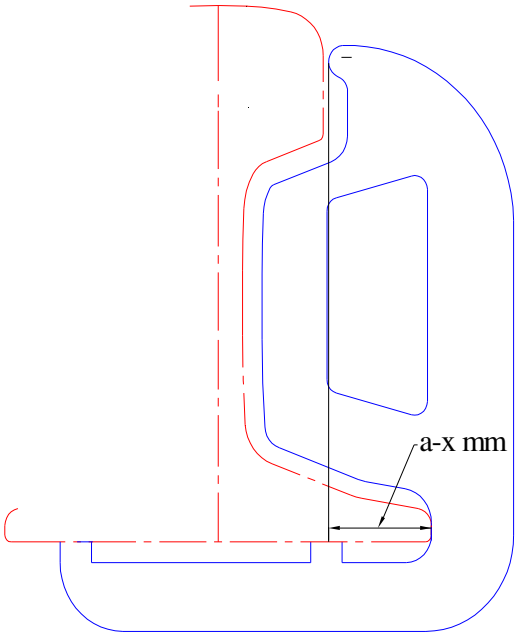
Common lengthwise colour code

1. No paint on gauge/non-gauge face indicates class 'B' rails.
2. Yellow paint on each end face on web region indicates 1**3m, 26m, 130m, and 260m** length.
3. Blue paint on each end face on web region indicates **12m, 25m, 129m, and 259m** length.
4. White paint on each end face on web region indicates **11m, 24m** length.
5. Green paint on each end face on web region indicates **10m** length.

Note: - This colour code is for new rails, for second hand rails Para 321 of IRPWM-1986 may be referred to.

GAUGE FOR CHECKING THE ASYMMETRY

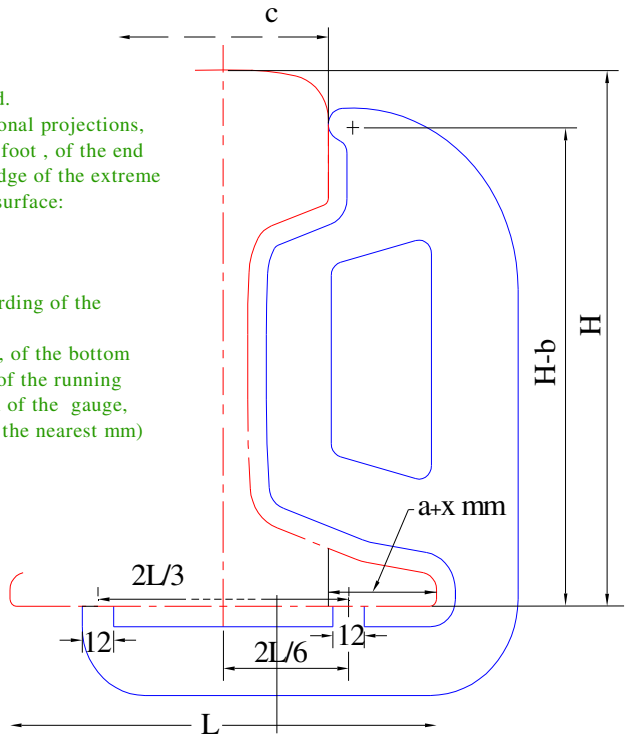
APPENDIX-V



H = Height of the rail.
L = Width of the railfoot.
C = nominal width of the railhead.
a = Distance between the orthogonal projections, measured on the base of the foot , of the end of the foot and the bottom edge of the extreme rounding all of the running surface:

$$a = \frac{L - C}{2}$$

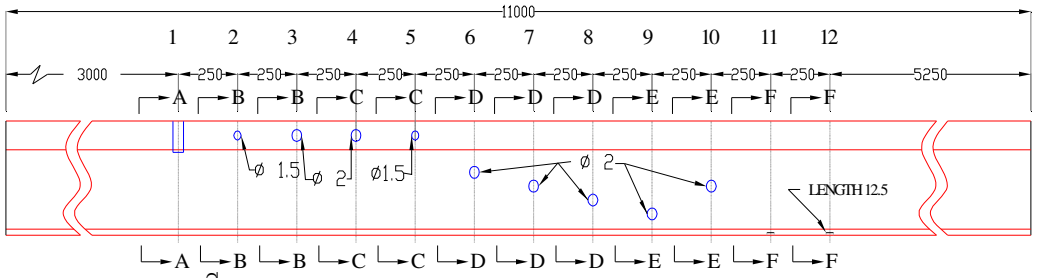
x = Depends on the section, according of the general table of tolerance.
b = Height ,relative to top of rail, of the bottom of the extreme rounding all of the running surface (for the construction of the gauge, H - b may be rounded off to the nearest mm)

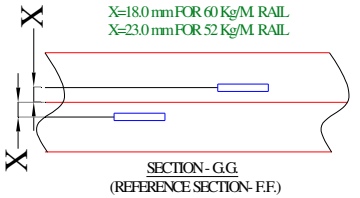


The (-) gauge, applied against the base of the railfoot , is pushed sideways towards the rail.
The (-) stop must not come into contact with the railhead.

The (+) gauge, applied against the base of the railfoot , is pushed sideways towards the rail.
The (+) stop must not come into contact with the railhead.

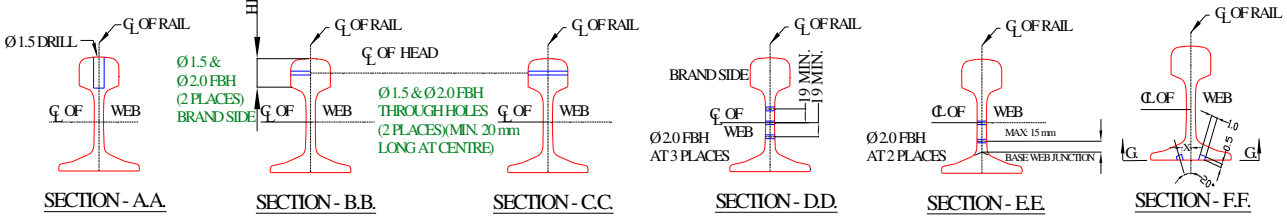
APPENDIX-V





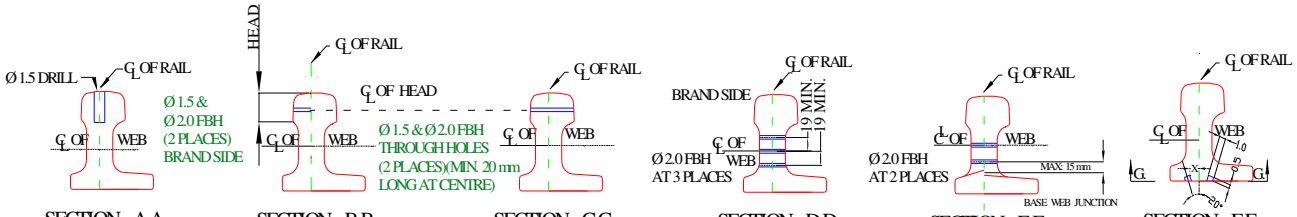
SECTION - G.G.
(REFERENCE SECTION- F.F.)

INCLINED NOTCH 20°
WITH VERTICAL
12.5 mm LONG
1.0 mm WITH
MINIMUM DEPTH
0.25 mm AT 20° ANGLE



SECTION - A.A. SECTION - B.B. SECTION - C.C. SECTION - D.D. SECTION - E.E. SECTION - F.F.

FOR SYMMETRICAL RAIL SECTION



SECTION - A.A. SECTION - B.B. SECTION - C.C. SECTION - D.D. SECTION - E.E. SECTION - F.F.

FOR ASYMMETRICAL RAIL SECTION

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FBH DENOTES FLAT BOTTOM HOLE.
3. DIMENSIONS ARE NOT TO SCALE.
4. HOLES AT LOCATIONS 1, 3, 4, 10 ARE KEPT FOR ALIGNMENT/ SETTING PURPOSE ONLY.
5. SENSITIVITY LEVEL SHALL BE WITH REFERENCE HOLES/ NOTCHES AT LOCATIONS 2, 5, 6, 7, 8, 9, 11, 12
   i.e. TOP HEAD Ø 1.5 THROUGH HOLE ---------- 1 NO.
   SIDE HEAD Ø 1.5 FBH ---------- 1 NO.
   WEB Ø 2.0 FBH ---------- 3 NO.
   FOOT WEB JUNCTION: Ø 2.0 THROUGH HOLE ---------- 1 NO.
   LEFT FOOT-12.5mm LONG , 1.0mm WIDE RECTANGULAR NOTCH INCLINED 20° WITH VERTICAL AXIS (SHORT EDGE 0.5 mm). ---------- 1No.
   RIGHT FOOT - 12.5mm LONG, 1.0mm WIDE RECTANGULAR NOTCH INCLINED 20° WITH VERTICAL AXIS (SHORT EDGE 0.5mm)

APPENDIX- VII

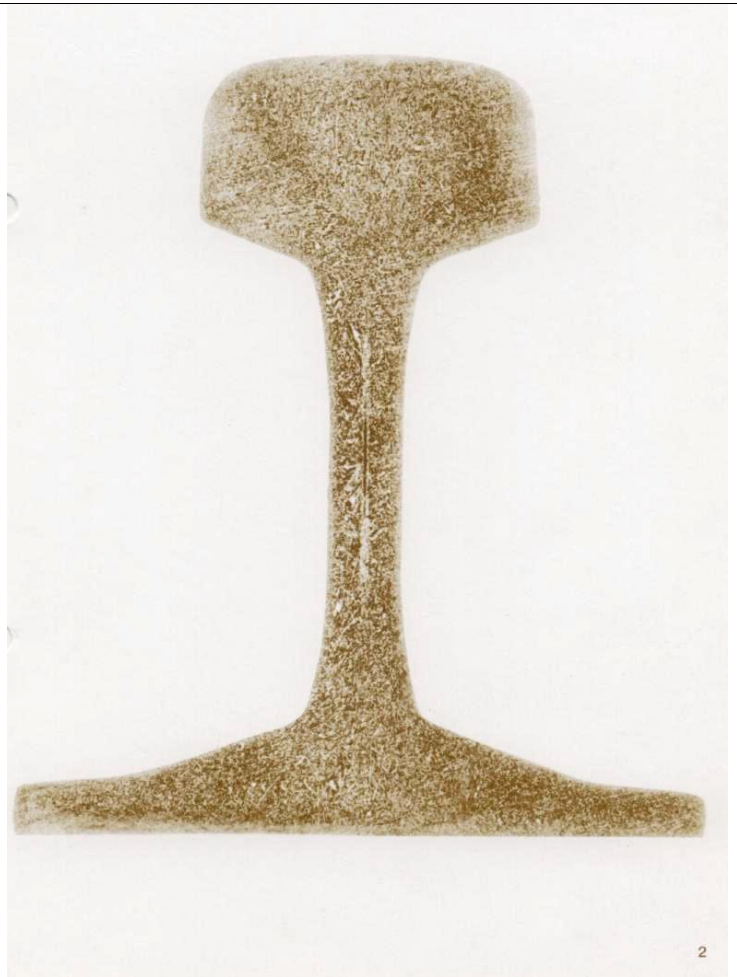
LADLE ANALYSIS OF RAIL STEEL

Date	HEAT NO	PERCENTAGE											H_2 PPM	O_2 PPM
		C	Mn	Si	S	P	Mo	Cr	V	Ni	Cu	Al		

APPENDIX- VIII

ALBUM
OF
MACROGRAPHIC PRINTS


1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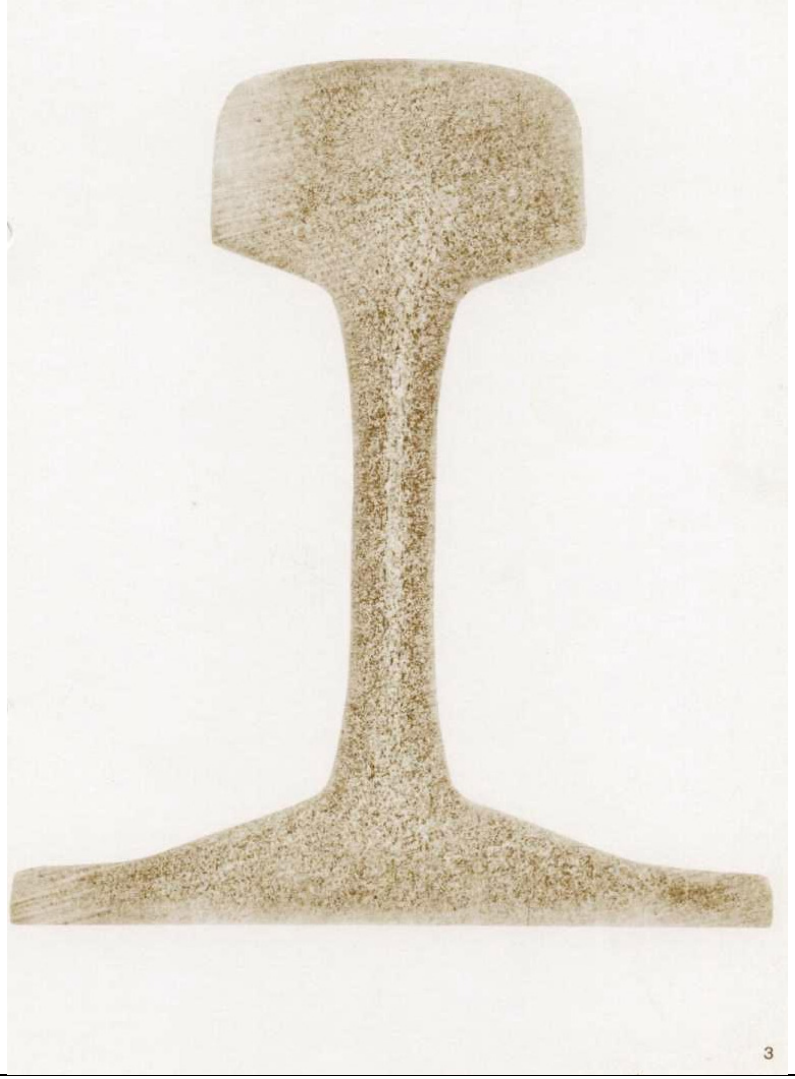

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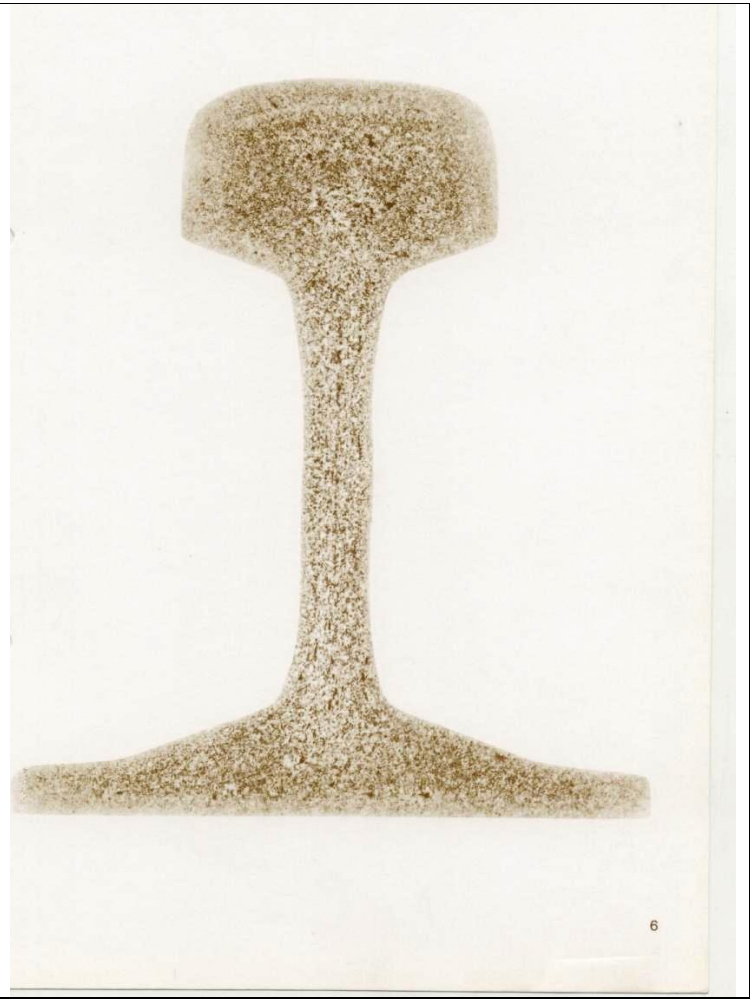
4


5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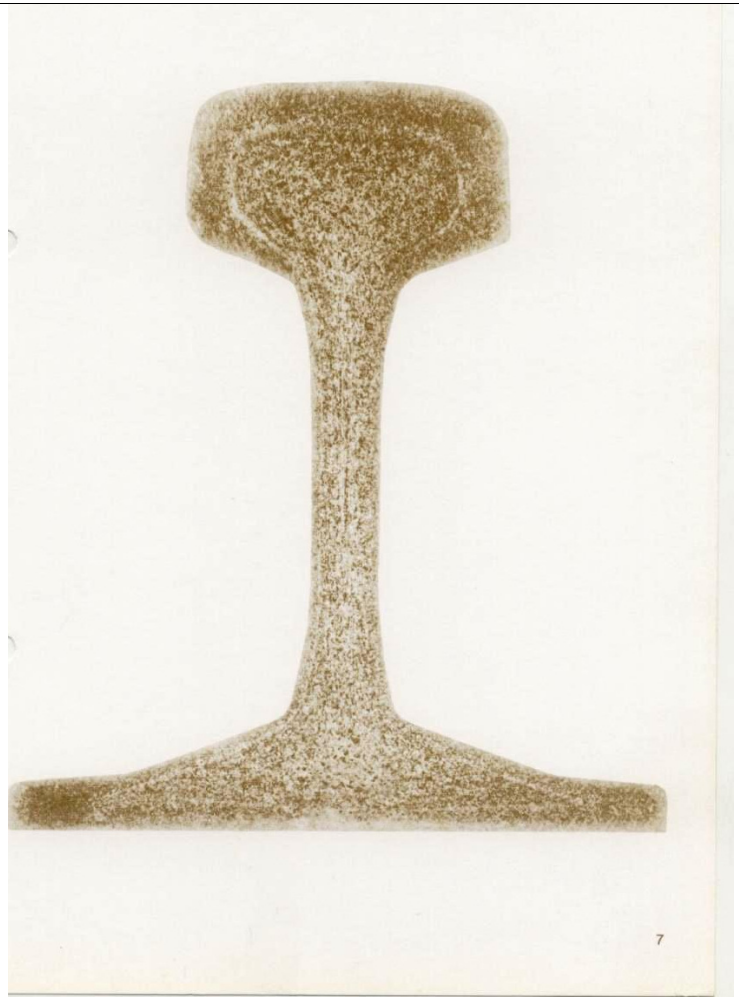
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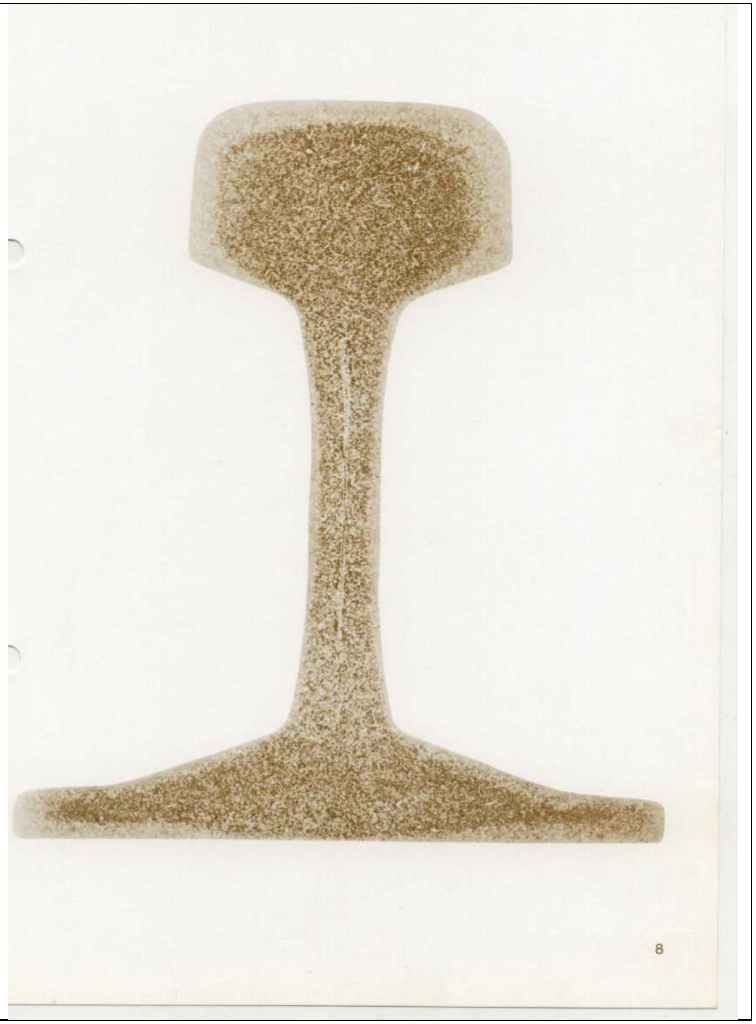
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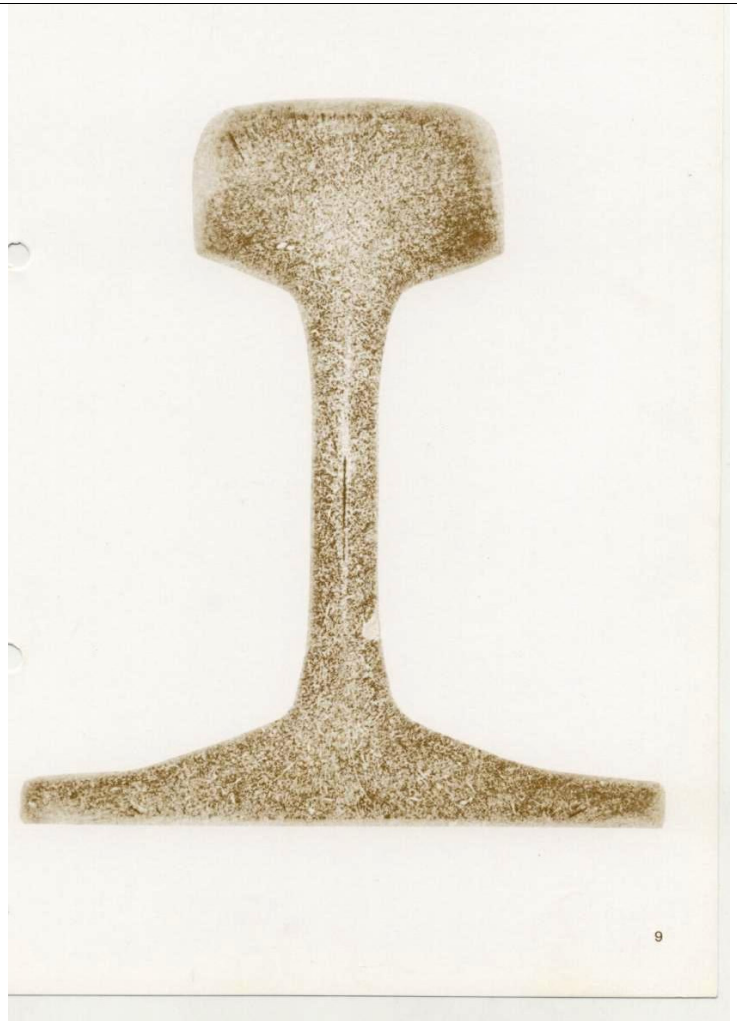
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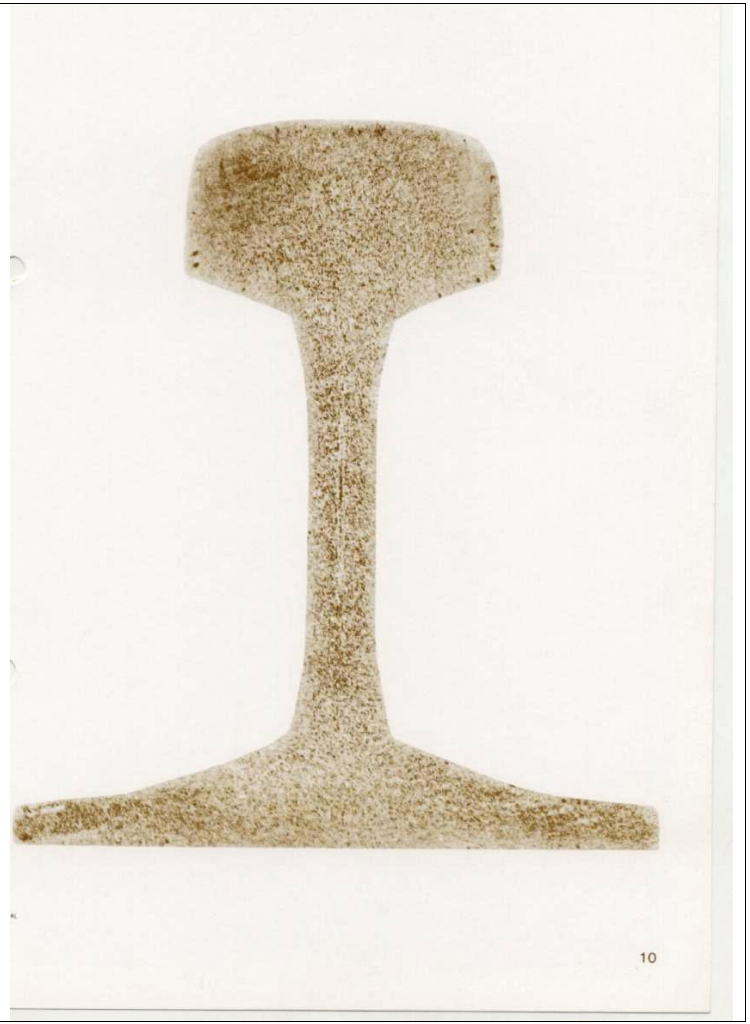
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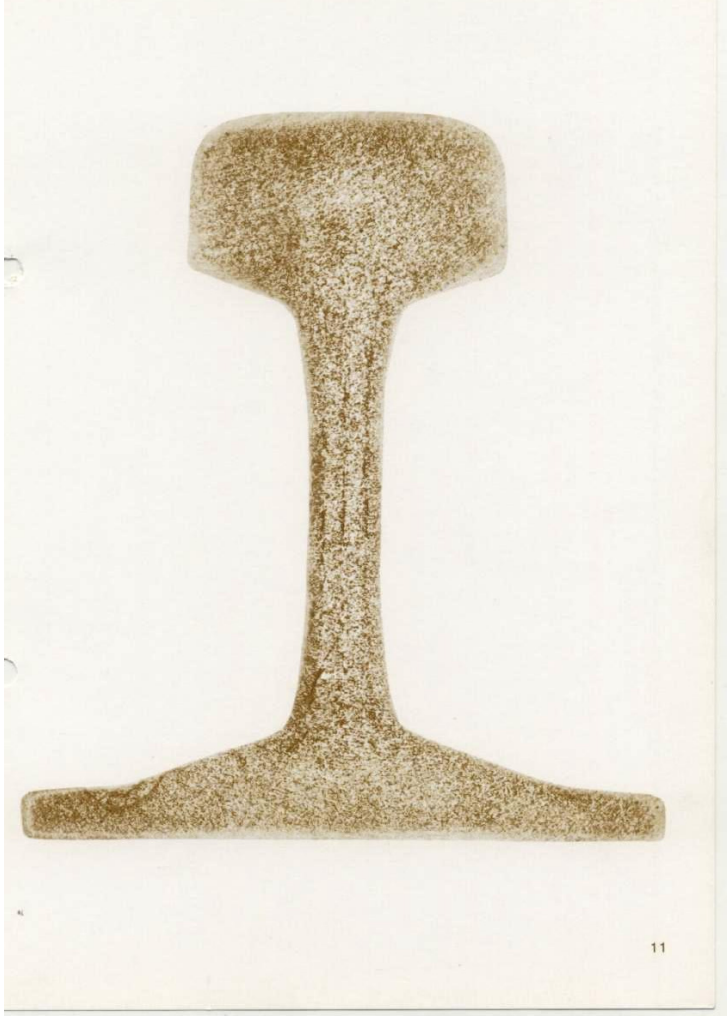


11

APPENDIX- IX

MECHANICAL PROPERTIES

DATE	HEAT NO	SPECIMEN		BEFORE FRACTURE	AFTER FRACTURE	% ELONGATION	BREAKING LOAD kg	YS MPa	UTS MPa	HARDNESS (BHN)	FALLING WEIGHT TEST	
		DIA mm	AREA mm^2	INITIAL GAUGE LENGTH mm	FINAL GAUGE LENGTH mm						BROKEN/ NOT BROKEN	DEFLECTION mm
1	2	3	4	5	6	7	8	9	10	11	12	13

APPENDIX- X

DETAILS OF RAILS OFFERED FOR INSPECTION

Date	Heat no	No of blooms produced from the heat	Wt. Of blooms produced from the heat	No of rails of length										No of rails found o.k. after internal inspection										No of rails rejected during internal inspection									
1	2	3	4	5										6										7									
				260 M	259 M	130 M	129 M	26 M	25 M	24 M	13 M	12 M	11&10 M	260 M	259 M	130 M	129 M	26 M	25 M	24 M	13 M	12 M	11&10 M	260 M	259 M	130 M	129 M	26 M	25 M	24 M	13 M	12 M	11 &10M

APPENDIX -XI

Standard test method for the determination of the plane strain fracture toughness (K_{1c}) of rails

B.1 Test methods

This test shall be performed in accordance with the requirements of ASTM E399 except where superseded by the requirements specified in this part of IRS T 12. The requirements specified in this part of the IRS T 12 apply only to the determination of plane strain fracture toughness of railway rail steels covered by the definitions and requirements of this standard.

B.2 Test pieces

B.2.1 The location of the test piece in the rail's transverse section is shown in Figure B.1.

B.2.2. The thickness "B" of all test pieces shall be 25 mm. For any rail head transverse profile the test piece width "W" shall be the maximum achievable of the following dimensions:

40 mm;
45 mm;
50 mm.

B.3 Number of tests

A minimum of 5 tests from each sample shall be performed.

B.4 Test conditions

B.4.1 Fatigue pre-cracking shall be carried out in the temperature range + 15^{o} C to + 25^{o} C using a stress ratio in the range > 0 <+0.1. Fatigue pre-cracking shall be carried out at a cyclic frequency in the range 15 Hz to 120 Hz. The final crack length to test piece width ratio shall be in the range 0.45 to 0.55.

B.4.2 The single edge notched bend test piece shall be loaded under displacement control using three point bending with a loading span (S) equal to four times the test piece width (W)

B.4.3 Tests shall be performed at a test temperature of -20^{o} C $\pm$ 2^{o} C. Test piece temperature shall be measured using a beadless thermocouple spot welded to the test piece at the location shown in figure B.2.

---

1) It is recommended that the chevron notch in ASTM E399 is used to avoid crack front curvature problems.

B.5 Analysis of test data

B.5.1The calculation of K_Q shall be in accordance with ASTM E399. The checks made to establish whether this value is a valid K_{1c} shall be in accordance with ASTM E399 except for the requirements of B.5.2 to B.5.6.

B.5.2 P_{max} / P_Q shall be less than 1.10 for force-crack mouth opening curves where pop-in does not occur before the intersection of the curve with the 95 % secant. There shall be no P_{max} / P_Q .criterion for other types of curve.

B.5.3 The linearity of force-crack mouth opening curves la. lb. lla and lll (see figure B.3) shall be checked in the following manner.

Measure the distance (υ_1) between the tangent OA and the force-crack mouth opening curve at a constant force of 0.8 P_Q Measure the distance (υ) between the tangent OA and the force-crack mouth opening curve at a constant force of P_Q .for a test result to be valid… $\upsilon_1 \leq 0.25\upsilon$

B.5.4 The linearity of force – crack mouth opening curves llb and llc (see Figure B.3) shall be checked in the following manner.

Measure the distance between the tangent OA and the force-crack mouth opening curve at constant forces of 0.8 P_Q.and P_Q.recording these values as υ_1 *and υ*..respectively.

Measure the crack mouth opening values arising from all "pop-ins" that occur up to P_Q.this is done by measuring the horizontal distance travelled along the crack mouth opening axis between the start and finish of each "pop-in". Sum the values for "pon-ins" occurring below 0.8 P_Q.and for those occurring between 0.8 P_Q.and P_Q.recording them as $\sum\upsilon_{1p1}$ and $\sum \upsilon_{p1}$.respectively.

For a test result to be valid …[. $\upsilon_1 - \sum\upsilon_{1p1}$] $\leq 0.25[\upsilon - (\sum\upsilon_{p1} + \sum\upsilon_{1p1})]$

B.5.5 The linearity criterion cannot be applied to force-crack mouth opening curve IV.

B.5.6 For all force-crack mouth opening curves the K_Q value shall be subjected to the validity check that the test piece thickness (B) and crack length (a) are equal to, or greater than, the value of $2.5(K_Q / R_{p0.2})^2$, where $R_{p0.2}$ ..is the 0.2% proof stress at the fracture test temperature of – 20°C.

B.6 Reporting of results

All measurements required to calculate the test result and to show that the test conditions were as specified in the test procedure shall be recorded.

All results shall be reported as either K_{1c} values K_{Q*}.values or K_Q.values; where K_{Q*}.values are those K_Q values which failed the validity criteria due only to one or more of the following:

i) P_{MAX} / P_Q >1.1;
ii) Exceedence of the $2.5(K_Q / R_{p0.2})^2$ criterion;
iii) Crack mouth opening displacement-force relationship.

The mean and standard deviation of both $K_{1c}$and K_{Q*}results shall be recorded. For each grade of rail tested these results shall be included in a table giving the following information.

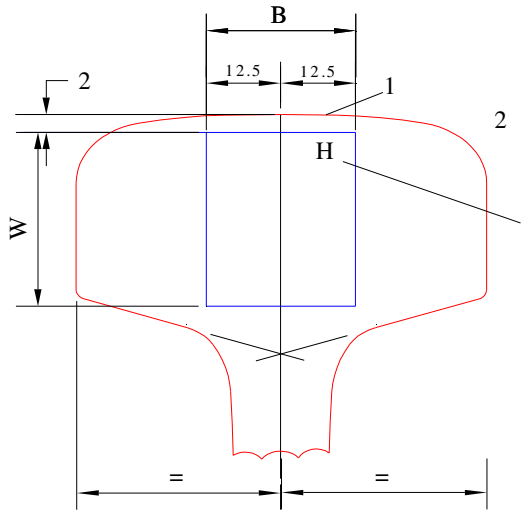
Steel Grade	0.2% proof stress at –20°CMPa	Mean K_{1c} (MPa $m^{1/2}$)	Number of K_{1c} results	Samples standard deviation (MPa $m^{1/2}$)	Mean (K_Q) (MPa $m^{1/2}$)	Number of K_Q.. Results	Sample standard deviation (MPa $m^{1/2}$)

The value to be used for the acceptance criteria is that of the mean K_{1c} and shall be based on a minimum of five K_{1c} values.

When five K_{1c} values have not been obtained any K_Q *.values shall be included with any K_{1c} values in the mean value to be used for the acceptance criteria. In this event the number of test results shall be at least ten.

All values of K_{1c} And K_{Q*} shall be above the minimum value specified in Table 2.

Dimension in millimetre



Figure

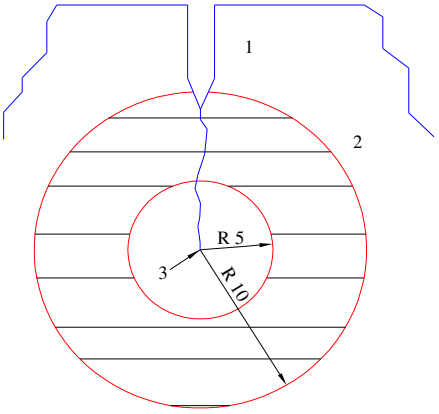
Key

1. Notch machined in this face
2. Section through rail heat
3. Letter ‘H’ to be stamped on end face of test piece as shown

B = 25
W = see B.2.2
For all other test piece proportions See ASTM E399

Figure B.1-Location and section of fracture toughness test pieces

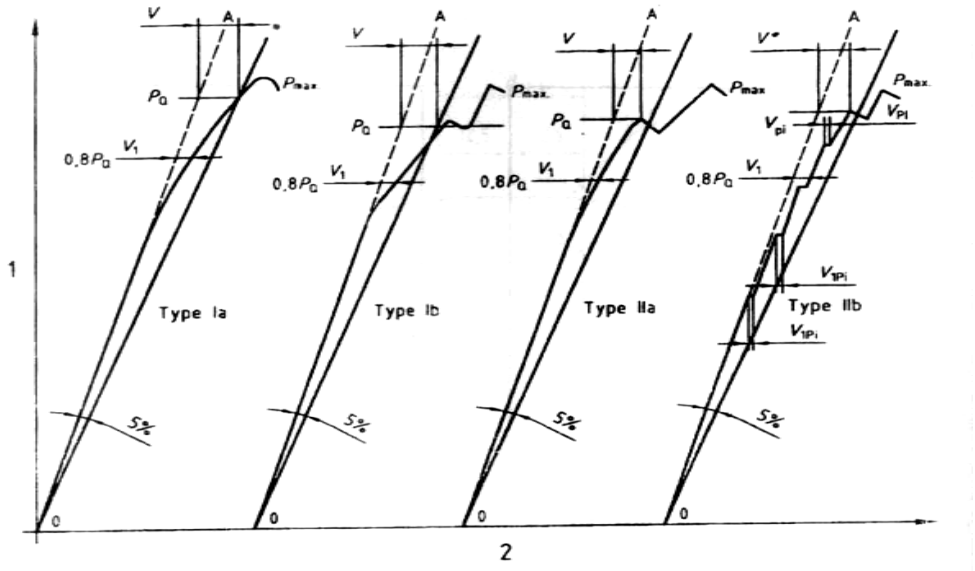
Dimension in millimetres



Key

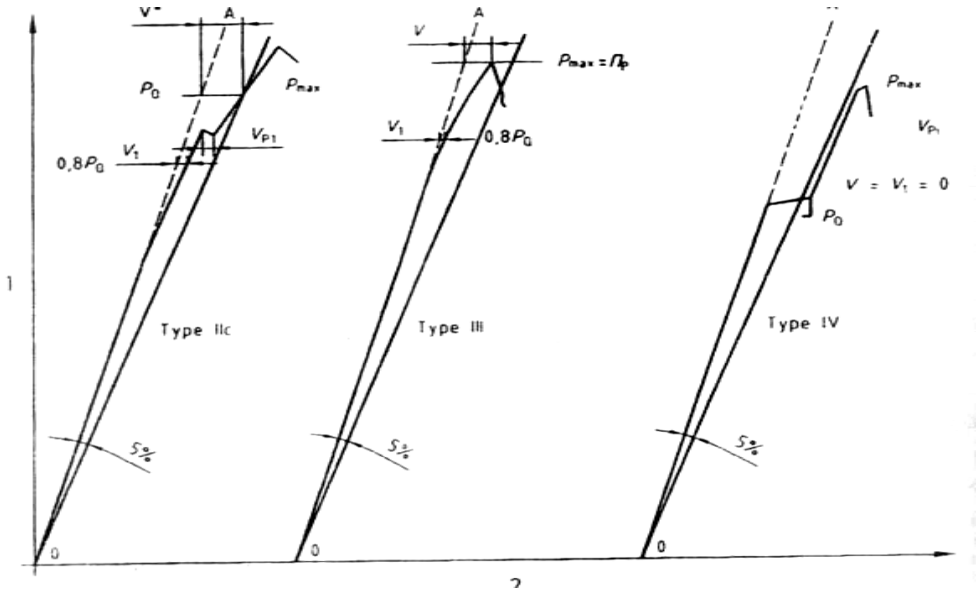
1. Notch
2. Thermocouple to be placed in the shaded zone
3. Fatigue crack tip

Figure B.2-Location of thermocouple on fracture toughness specimens



Key

1. Force, P
2. Crack mouth opening displacement (v)



Key

1. Force, P
2. Crack mouth opening displacement (v)

Figure B.3 – Force-Crack mouth opening curves

भारत सरकार - रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ - 226 011
EPBX (0522) 2451200
Fax (0522) 2458500

Government of India-Ministry of Railways
Research Designs & Standards Organisation
Lucknow - 226 011
DID (0522) 2450115
DID (0522) 2465310

No. CT/Specification/T-12

Dated: 29.09.2011.

As per list enclosed.

Sub: Addendum and Corrigendum Slip to Specification for Flat Bottom Rails – IRS T-12:2009.

विषय: समतल आधार रेलों के विशिष्टि – आई0 आर0 एस0 टी0 12 : 2009 में संशोधन।

Ref: (i) Railway Board's letter no. Track/21/2010/0513/7 dated 14.09.2011.
(ii) This office letter of even no. dated 22.07.2011.

संदर्भ: (i) रेलवे बोर्ड के पत्र संख्या ट्रेक/21/2010/0513/7 दिनांक 14/9/2011।
(ii) इस कार्यालय के सम संख्या पत्र दिनांक 22/07/2011।

****

Please find enclosed herewith Addendum and Corrigendum Slip No. 1 to Indian Railway Specification for Flat Bottom Rails, IRS T-12:2009.

This has the approval of competent authority.

DA: 05 Pages

(सोनवीर सिंह)
(कार्यकारी निदेशक/रेलपथ –1)
कृते महानिदेशक/ रेलपथ

ADDENDUM & CORRIGENDUM SLIP NO. 1
TO
INDIAN RAILWAYS STANDARD SPECIFICATION FOR FLAT BOTTOM RAILS
IRS T-12:2009

I. In Table No. 1 of chemical composition and mechanical properties corresponding to Clause 7 for corrosion resistant rail is replaced as per table enclosed herewith as Annexure-A.

II. Following note below table of Para 9.1.2 is deleted.
"All other requirements as regards variation in dimensions, length and falling weight tests shall be as per prime quality rail 9.1.1"

III. Appendix V (wrongly written) at Page no. 34 is replaced with Appendix VI and VI-A for test rail for USFD testing of rails referred in Clause10.3. Details of test rail for symmetrical rail section is shown in Appendix VI and details of test rail for asymmetrical rail section is shown in Appendix VI-A.

IV. Clause 23.6 at is to be replaced as under: -

"23.6 Passed rails should be properly stacked on leveled and well drained stacking area. Rails shall be stacked in head up position with 100 x 25 mm mild steel flats as spacers at a distance of 4.0 m between successive layers. Recommended arrangement for stacking of rails shall be as per RDSO drawing no. RDSO/T-6219, as Appendix XII."

TABLE 1 – Contd...

CORROSION RESISTANT RAIL STEEL

Grade	Chemical Composition (percentage)												Mechanical Properties			
	C	Mn	Si	S (max)	P (max)	Al (max)	Mo (max)	Cr	Cu	Ni	10^{-4}% (ppm) max by mass O	Hydrogen content in liquid steel (max.)	UTS (MPa) (Min)	Yield Strength (MPa)(Min.)	Elongation % on gauge length – $5.65\sqrt{So}$ (min)	Running surface min hardness (BHN)
Copper-Molybdenum (CM)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.2-0.3	-	0.25-0.35	-	-	1.6 ppm	880	460	10.0	260
Nickel Chromium Copper (NC)	0.60-0.80	0.80-1.30	0.10-0.50	0.030*	0.030*	0.015	0.25	0.50-0.65	0.3-0.4	0.25-0.40	-	1.6 ppm	880	550	10.0	260

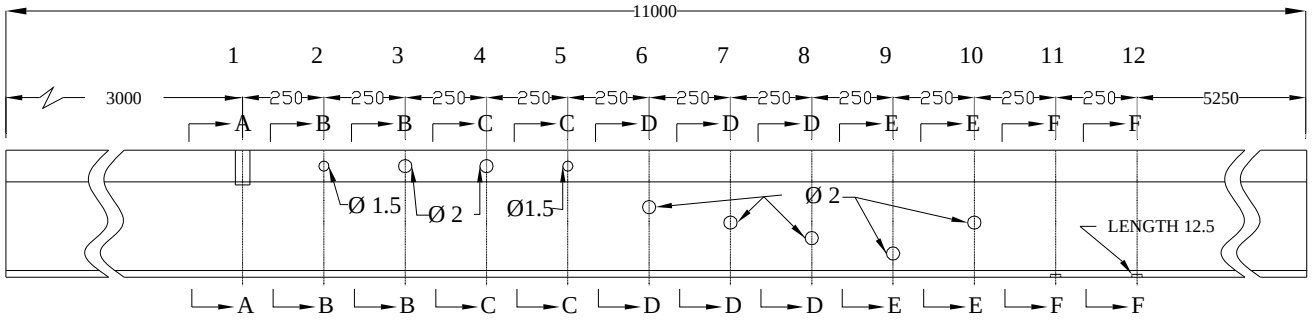
So = Cross sectional area of tensile test piece in mm^2

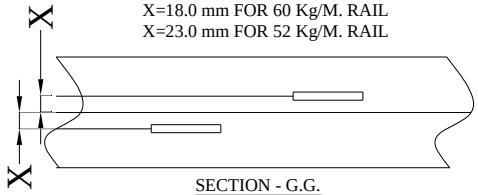
* 0.035 maximum for finished rail

The chemical compositions specified as above are applicable to Ladle analysis and Product Analysis. Manufacture shall ensure that chemical composition at ladle analysis should be such that product analysis also satisfies the requirement of chemical composition as above.

** Desirable Value.

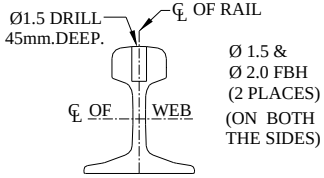
APPENDIX-VI



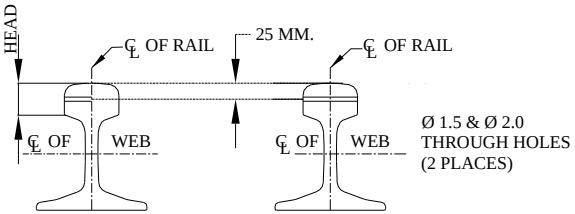


SECTION - G.G.
(REFERENCE SECTION- F.F.)

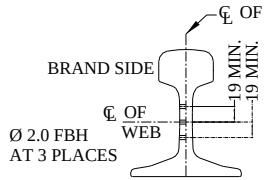
INCLINED NOTCH 20°
WITH VERTICAL
12.5 mm LONG
1.0 mm WIDTH
MINIMUM DEPTH
0.25 mm AT 20° ANGLE



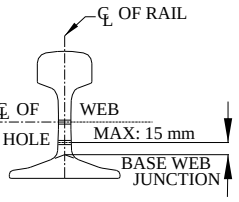
SECTION - A.A.



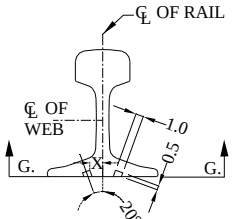
SECTION - B.B. SECTION - C.C.



SECTION - D.D.



SECTION - E.E.

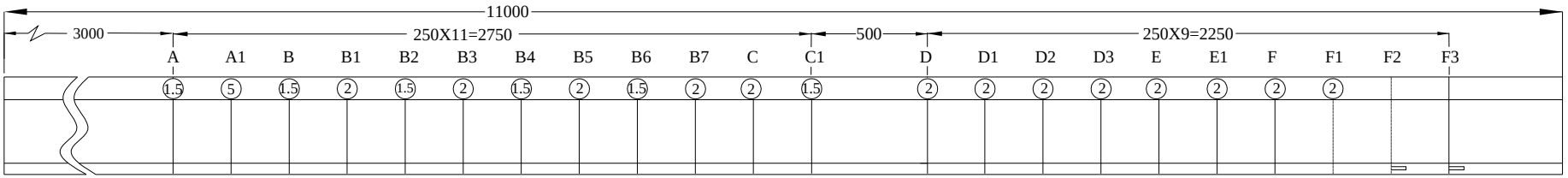


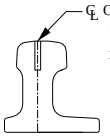
SECTION - F.F.

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FBH DENOTES FLAT BOTTOM HOLE.
3. DIMENSIONS ARE NOT TO SCALE.
4. HOLES AT LOCATIONS 1, 3, 4, 10 ARE KEPT FOR ALIGNMENT/ SETTING PURPOSE ONLY.
5. SENSITIVITY LEVEL SHALL BE WITH REFERENCE HOLES/ NOTCHES AT LOCATIONS 2, 5, 6, 7, 8, 9, 11, 12
   i.e. TOP HEAD Ø 1.5 THROUGH HOLE ---------- 1 NO.
   SIDE HEAD Ø 1.5 FBH ---------- 1 NO.
   WEB Ø 2.0 FBH ---------- 3 NO.
   FOOT WEB JUNCTION: Ø 2.0 THROUGH HOLE ---------- 1 NO.
   LEFT FOOT-12.5mm LONG , 1.0mm WIDE RECTANGULAR NOTCH INCLINED 20° WITH VERTICAL AXIS (SHORT EDGE 0.5 mm). ---------- 1No.
   RIGHT FOOT - 12.5mm LONG, 1.0mm WIDE RECTANGULAR NOTCH INCLINED 2O° WITH VERTICAL AXIS

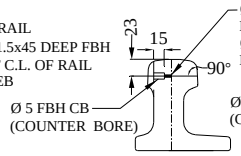
FOR SYMMETRICAL RAIL SECTION

APPENDIX-VI-A

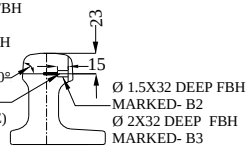




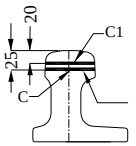
SECTION - AA



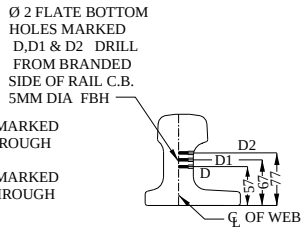
SECTION - BB
SECTION - B1B1



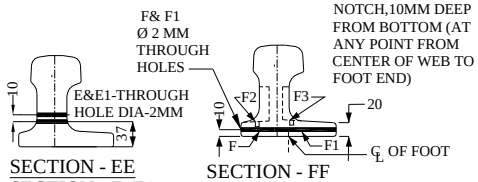
SECTION - B2 B2
SECTION - B3 B3



SECTION - C C
SECTION - C1C1

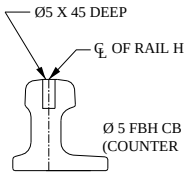


SECTION - DD
SECTION - D1D1
SECTION - D2D2

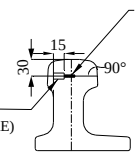


SECTION - EE
SECTION - E1E1

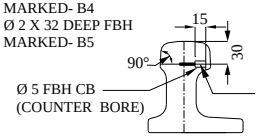
SECTION - FF
SECTION - F1F1



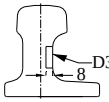
SECTION - A1A1



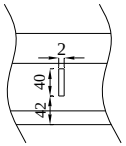
SECTION - B4B4
SECTION - B5B5



SECTION - B6B6
SECTION - B7B7



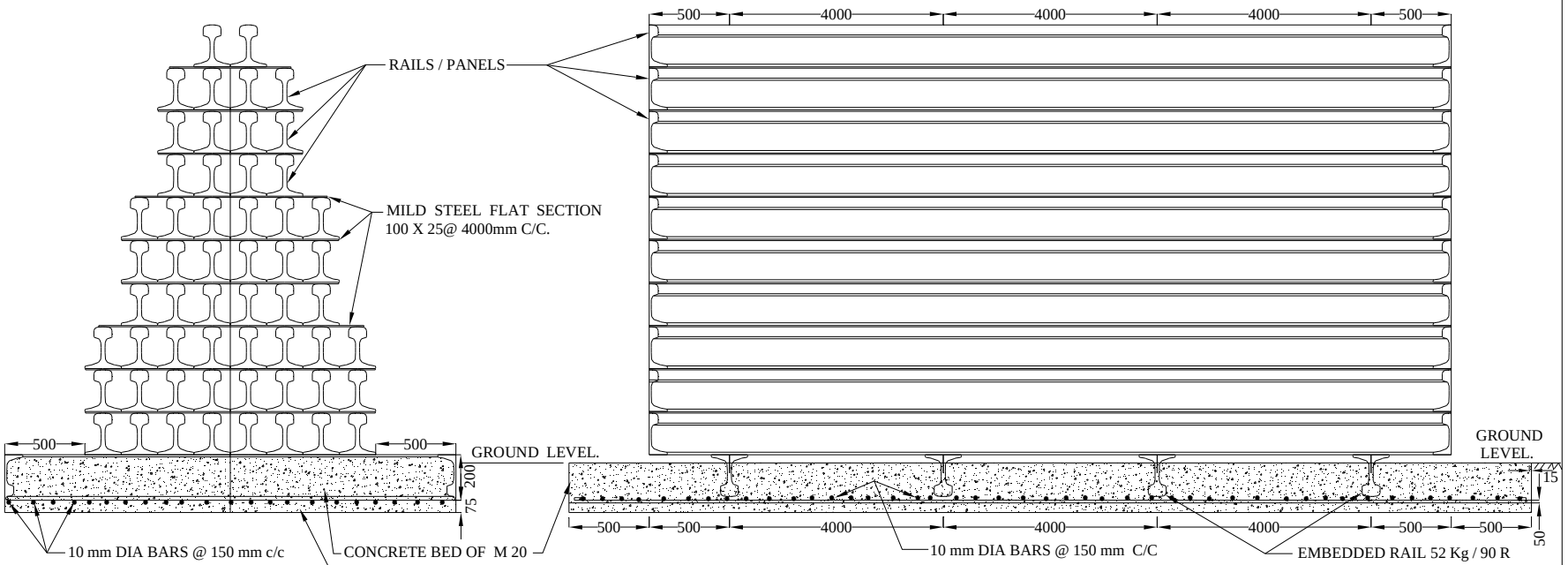
RECTANGULAR
SLOT AT WEB
MARKED D3



1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FBH DENOTES FLAT BOTTOM HOLE.
3. DIMENSIONS ARE NOT TO SCALE.
4. HOLES AT LOCATIONS A, A1, B1, B3, B4, B5 ,B6, B7, C1, D3 & E1 ARE KEPT FOR ALIGNMENT/ SETTING PURPOSE ONLY.
5. SENSITIVITY LEVEL SHALL BE WITH REFERENCE HOLES/ NOTCHES AT LOCATIONS B, B2, C, D, D1, D2, E, F, F1
   i.e. TOP HEAD Ø 1.5 THROUGH HOLE ---------- 1 NO.
   SIDE HEAD Ø 1.5 FBH ---------- 1 NO.EACH SIDE
   WEB Ø 2.0 FBH ---------- 3 NO.
   FOOT WEB JUNCTION: Ø 2.0 THROUGH HOLE ---------- 1 NO.
6. LEFT FOOT-Ø2.0 THROUGH HOLE (LENGTH MIN 20MM) AT THE CENTRE OF SIDE OF FOOT (AT ONE SIDE)-------1 NO.
   RIGHT FOOT-Ø2.0 THROUGH HOLE (LENGTH MIN 20MM) AT THE CENTRE OF SIDE OF FOOT
   (AT OPP NOT IN SAME LINE ALONG THE LENGTHSIDE) SIDE)-----1 NO.
7. IT IS ESSENTIAL THAT THE BOTTOM OF ALL BLIND HOLES ARE DRILLED FLAT FOR FB HOLES.
8. SPECIFIED HOLE TOLERANCE
   1.5 MM HOLE : 1.5 TO 1.55 MM
   2.0 MM HOLE : 2.0 TO 2.06 MM
   5.0 MM HOLE : 5.0 TO 5.08 MM
   (ALL OTHER TOLERENCES OF THE ABOVE HOLES SHALL BE IN ACCORDANCE WITH ASTM E 428).
9. NOT TO SCALE

FOR ASYMMETRICAL RAIL SECTION

APPENDIX-XII



SCHEDULE OF DIMENSIONS

RAIL LENGTH / WELDED PANEL (METRES)	NUMBER OF EMBEDDED RAILS
12 / 13	4@ 4000 mm C/C
26	7@ 4000 mm C/C
39	10@ 4000 mm C/C
130	33@ 4000 mm C/C
260	66@ 4000 mm C/C

8 . THE DRAWING SUPERSEDES THE DRG:No.RDSO/T- 4962.
7 . ONE RAIL/PANEL MAY BE REDUCED AFTER EVERY THIRD LAYER TO ACHIVE PROPER STACKING FROM BOTH SIDES.
6 . BETWEEN TWO LAYERS OF RAILS M.S.FLAT OF SIZE 100X25 mm SHOULD BE PROVIDED AT 4000 mm C/C AND IT SHALL BE ENSURED THAT RAIL ENDS DO NOT OVERHANG BY MORE THAN 1500 mm.
5 . ONLY ONE TYPE OF FREE RAILS/ WELDED PANELS SHALL BE STACKED IN ONE STACK.
4 . MAX. NUMBER OF LAYERS IN WHICH FREE RAILS AS WELL AS WELDED PANELS CAN BE STACKED, SHALL BE LIMITED TO 10.
3 . 52 Kg.per m. / 90 R RAIL SHALL BE EMBEDDED IN THE CONCRETE BED OF M-20 GRADE CONCRETE (TO IS:456-1978) AS SHOWN IN THE DRG: ABOVE.
2 . A SLOPE OF 1:400 MAY BE GIVEN IN CONCRETE BED ACROSS THE LENGTH OF RAIL.
1 . ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHER WISE SHOWN.

R. D. S. O.

ARRANGEMENT FOR STACKING FREE RAILS AND WELDED PANELS

STAND.---------- ADVANCE
CANCLD.----------
REVSD.----------
15.5.2002
(T)

NOTE	SPECIFICATION	SCALE	ALT:	DESCRIPTION	DATE	R. D. S. O. /T- 6219
	(I) M. S. FLAT TO IS: 226-1975. (II) IS:456-1978 FOR CONCRETE BED.					

भारत सरकार - रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ - 226 011
EPBX (0522) 2451200
Fax (0522) 2458500

Government of India-Ministry of Railways
Research Designs & Standards Organisation
Lucknow - 226 011
DID (0522) 2450115
DID (0522) 2465310

No. CT/Specification/T-12 Dated: 03.02.2012.

As per list enclosed.

Sub: Addendum and Corrigendum Slip to Specification for Flat Bottom Rails – IRS T-12:2009.

विषय: समतल आधार रेलों के विशिष्टि – आई0 आर0 एस0 टी0 12 : 2009 में संशोधन।

Ref: Railway Board's letter no. Track/21/2010/0513/7 dated 01.02.2012.

संदर्भ: रेलवे बोर्ड के पत्र संख्या ट्रैक/21/2010/0513/7 दिनांक 01/02/20112

****

Please find enclosed herewith Addendum and Corrigendum Slip No. 2 to Indian Railway Specification for Flat Bottom Rails, IRS T-12:2009.

This has the approval of competent authority.

DA: 01 Page

(सोनवीर सिंह)
(कार्यकारी निदेशक/रेलपथ –1)
कृते महानिदेशक/ रेलपथ

ADDENDUM & CORRIGENDUM SLIP NO. 2

TO

INDIAN RAILWAYS STANDARD SPECIFICATION FOR FLAT BOTTOM RAIL

IRS T-12:2009

26.0 WARRANTY

As a warranty for supply of rails free from manufacturing defects by rail suppliers, after initial USFD testing of new rails in rail manufacturing plants, a USFD test free period of 25% of service life of rails in terms of GMT as given below (Para 302 (i) (d) of IRPWM-2004 as amended from time to time) shall be applicable. This clause of test free period of 25% of service life of rails shall also be applicable for all types of 90 UTS (grade 880) and higher grade of rails of this specification.

Rail Section	Assessed GMT service life for 90 UTS rails
60 Kg	800
52 Kg	525
90 R	375

भारत सरकार - रेल मंत्रालय
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Government of India-Ministry of Railways
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Lucknow - 226 011
DID (0522) 2450115
DID (0522) 2465310

No. CT/Specification/T-12 Dated: 27.06.2012.

As per mailing list enclosed.

Sub: Addendum and Corrigendum Slip to Specification for Flat Bottom Rails – IRS T-12:2009.

विषयः समतल आधार रेलों के विशिष्टि – आई0 आर0 एस0 टी0 12 : 2009 में संशोधन।

Ref: Railway Board's letter no. Track/21/2008/0801/7 dated 22.06.2012.

संदर्भः रेलवे बोर्ड के पत्र संख्या ट्रैक/21/2008/0801/7 दिनांक 22/06/2012

****

Please find enclosed herewith Addendum and Corrigendum Slip No. 3 to Indian Railway Specification for Flat Bottom Rails, IRS T-12:2009.

This has the approval of competent authority.

DA: As above

(सोनवीर सिंह)
(कार्यकारी निदेशक/रेलपथ–1)
कृते महानिदेशक/ रेलपथ

ADDENDUM & CORRIGENDUM SLIP NO. 3

TO

INDIAN RAILWAYS STANDARD SPECIFICATION FOR FLAT BOTTOM RAIL

IRS T-12:2009 DATED 27.6.2012

The Rails in regard to their quality, manufacturing process, chemical composition, testing/ retesting, qualifying criteria, etc., shall be complying Indian Railway Specification IRS-T-12-2009 for Flat Bottom Rail with following amended clauses .

1. **Clause 5.4: Head Hardening Process**

For head hardening, rails shall be suitably heat treated to meet the requirements of the specification. The method of heat treatment adopted by the manufacturer should be made available to the purchaser. In-line established deep Head Hardening methods using air quenching process would be acceptable with the prior approval of the Purchaser. Any other process of Head Hardening would also be acceptable with the prior approval of the Purchaser.

2. **Clause 7: Grade, Chemical Composition and Mechanical Properties**

The steel for the rails shall be of fully killed quality and shall confirm to chemical composition and mechanical properties given in Table -1. Micro alloying elements of Cr(0.3% max.) & V (0.01% max.) may also be acceptable, as it helps in improving mechanical properties. The limits for chemical composition are applicable both for tests on ladle samples and for check analysis of finished rails. Ladle and check analysis of steel, will be carried out by the method specified in the relevant part of IS: 228 or by any other established instrumental/chemical method of testing with the approval of the purchaser. In case of any dispute, the procedure given in the relevant part of IS:228 shall be referred.

3. **Clause 8.1: Brand Marks**

With the prior approval of purchasers, brand marks of suitable size clearly legible, shall be rolled in relief on one side of web at 3.0 to 4.0 meters interval.

The brand mark shall include:

a) The rail section.
b) The grade of steel, i.e.
Grade 880 - 880

Grade 1080 HH	-	1080 HH
Grade 1080 Cr	-	1080 CR
Grade 880 Cu-MO	-	880 CM
Grade 880 Ni Cr Cu	-	880 NC
Grade 880 Vanadium	-	880 VN
Grade 880 Niobium	-	880 NB

c) Identification mark of the manufacturer

d) Month (using roman numbers) and last two digits of year of manufacture.

e) Process of steel making: -

i) Basic oxygen - O

ii) Electric - E

4. Clause 8.2: Hot Stamping

Each rail shall be identified by a numerical, alphabetical or combined alphabetical and numerical code which will be distinctly hot stamped at least once every 5.0m on the web in figures and letters of suitable size from which following information can be obtained:

i) The number of the cast from which the rails has been rolled with letter 'C'

ii) Number of the strand.

iii) For rails from change over bloom, cast number should be the preceding cast number with prefix letter 'B'.

5. Clause 8.3: Cold Punching

8.3.1 Following should be cold punched on one of end face of each rail

a) Inspecting Agency ID and Group ID
b) Shift No in which product inspected
c) Date of Inspection

To avoid damage to the HH rails, instead of cold punching, any other method of marking can be adopted, with the prior approval of the Purchaser.

6. **Clause 8.4:Colour code**

Rails shall be painted as per colour code given in Appendix-IV to distinguish grade, class, length and other special requirements. Paint of good quality should be used with the prior approval of the Inspecting Agency. Alternatively , different colour code may also be decided by the supplier with the prior approval of purchaser.

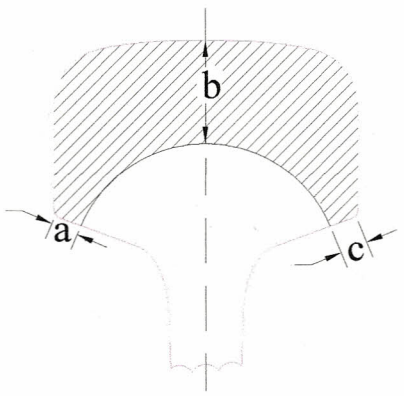
7. **Clause 9.2: Length of Rails**

The standard length of rail shall be 13 meters or 25 meters or 26 meters. The manufacturer shall be entitled to supply in pairs of short lengths up to 10% by weight of the quantity contracted for or ordered. Shorter lengths shall not be less than 10.0m in length for 13.0M and shall not be less than 23M in lengths for 25M and 24 M in lengths of rail for 26M. Short lengths shall be in multiples of 1.0M. In case of ZU 1-60, 1080 HH grade Rails, length shall be suitable for turnout design offered/proposed.

Type of Rail	Tolerance in length	
Prime Quality Rail	+20 mm	-10 mm
IU Grade	+30 mm	-30 mm

8. **Clause 18.3: Macro-Structure Test (For 1080 HH Grade Rails)**

One macro-structure test of hardened layer per 1000 meters of heat treated rails shall be performed. Macro structure of heat affected zone shall confirm to figure 7.



a,c	≥	10 mm
b	≥	15 mm

Figure -7

Due to specific process of heat treatment being adopted by the manufacturer e.g. inline air quenching method, Macro-structure of heat affected zone may not

show distinct zones, as shown above in figure-7, supplier should advise about the same to the purchaser in advance.

9. Clause 19.2.3: Hardness Distribution Test

The hardness distribution test shall be conducted on transversely cut rail section as shown in figure-8 . Hardness value at any point shall not exceed 390BHN. The cross sectional hardness distribution of heat treated rails shall slope towards the inside. No sharp drop in hardness should be present. The hardness at 10mm below, the rail head shall be 340BHN minimum. The hardness at 15 mm below the rail head table at centre shall be minimum 315BHN.

10. Clause 21: Determination of Hydrogen Content

Vacuum degassing of liquid steel shall be done to reduce the hydrogen content. For this purpose, RH degasser or REDA (Revolutional Degassing Activator) shall be used. In case, any other method of vacuum degassing is adopted, then the same will require prior approval of the Purchaser. The vacuum levels and the duration for which liquid steel shall be kept under this level shall be decided mutually by the purchaser and manufacturer. All measurement of hydrogen shall be done for the liquid steel in tundish or mould. Any other method of sampling or determination of hydrogen will require prior approval of the purchaser.

Clause 21.1 The measurement of hydrogen shall be done by following method:

Clause 21.1 (a) On-Line/Instantaneous Method-

HYDRIS is approved as method of on-line instantaneous measurement. The method of measurement as prescribed by the manufacturer of HYDRIS system shall be adopted with approval of the purchaser. Any other alternate method of determination of hydrogen will require prior approval of the purchaser.

(b) Pin Sample Method-

In case, the manufacturer has not installed the facility for on-line/instantaneous facility for measurement of hydrogen as described in Para (a) above, this method may be adopted with prior approval of the purchaser.

In this method, sample of liquid steel shall be taken by plunging the sampler 200mm - 300 mm below the molten metal surface in mould and molten slag-metal interface in tundish. The sample should be held for 2 to 3 seconds and then quenched in cold water so that sample temperature falls to below 150^0C within 5 seconds.

The sample should be removed from cold water and packed in dry ice if analysis is carried out within 48 hours of sampling or placed in liquid nitrogen if analysis is to be carried out beyond 48 hours after sampling. Sampling should be done by 6 mm dia vacuum tube of Pyrex glass with wall of thickness of 1.0mm and approximately 0.5 mm thick in the fill-end. The tube should have desired vacuum of 10^{-3} mm of Hg.

The hydrogen sample can be analysed by inert gas fusion technique in which sample is to be fused at approximately 1900^0 C in an induction heating graphite crucible. A nitrogen carrier gas transports the released hydrogen to thermal conductivity cell. The amplified and integrated output of the cell is to be calibrated for hydrogen in ppm.

LECO – RH –2 Hydrogen Analyser may be used for Hydrogen determination.

Any other size and material of tube and method of hydrogen determination will require prior approval of the purchaser.

21.2 The level of hydrogen measured by the method described under Para 21.1 above shall be 1.6 ppm maximum for acceptance of a heat for production of rail.

11. Clause 26: WARRANTY

As a warranty for supply of rails free from manufacturing defects by rail suppliers, after initial USFD testing of new rails in rail manufacturing plants , a USFD test free period of 25% of service life of rails in terms of GMT as given below (Para 302 (1) (d) of IRPWM-2004 as amended from time to time) shall be applicable. This clause of test free period of 25%of service life of rails shall also be applicable for all types of 90 UTS (grade 880) and higher grade of rails of this specification. If any rail fracture due to suspected manufacturing defect is detected within a period of 25% service life of rail in terms of Gross Million Tonne, then investigation will be conducted jointly by purchaser and supplier to ascertain the cause of failure".

Rail Section	Assessed GMT service life for 90 UTS rails
60 Kg	800
52 Kg	525
90 R	375

भारत सरकार - रेल मंत्रालय
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Research Designs & Standards Organisation
Lucknow - 226 011
DID (0522) 2450115
DID (0522) 2465310

No. CT/Specification/T-12 Dated: 04.03.2019

As per list enclosed

Sub:Addendum and Corrigendum Slip to Specification for Flat Bottom Rails – IRS T-12:2009.

Ref: (i) Railway Board's letter no. Track/21/2010/0513/7/2206 dated 06.07.2018
(ii) This office letter of even no. dated 18.05.2018

*****

Please find enclosed herewith Addendum and Corrigendum Slip No. 4 to Indian Railway Specification for Flat Bottom Rails, IRS T-12:2009.

DA: 28 Pages

(Nilmani)
Executive Director/Track-I
For Director General/Track

ADDENDUM & CORRIGENDUM SLIP NO. 4

TO

INDIAN RAILWAYS STANDARD SPECIFICATION FOR FLAT BOTTOM RAIL

IRS T-12:2009 DATED 04/03/2019

The following clauses of Indian Railway Specification IRS-T-12-2009 for Flat Bottom Rail are amended as under:

Sr. no.	Clauses and Items
1.	**2 Rail section** The Section of the flat bottom rails shall be in accordance with the section profiles shown in Appendix-I, II(Revised), IIA and III, unless otherwise specified by the purchaser.
2.	**4.4 Classification of rails** 52 kg/m, 60E1, 68 kg/m & ZU-1-60 rails shall be classified as class 'A' and class 'B' based on tolerance in end straightness as specified in Clause 9.4.2.
3.	**6 INFORMATION TO BE SUPPLIED BY THE PURCHASER** The purchaser shall provide the following information to the supplier when inviting tender for supply of rails according to this specification: i) Rail steel grade (Table 1) ii) Rail Section profile (Appendix I, II(Revised), IIA and III) iii) Class of rail iv) Length of rail. v) Undrilled or drilled rails ends. vi) Colour code requirements (Appendix IV)
4.	**8.1 Brand Marks** With the prior approval of purchasers, brand marks of suitable size clearly legible, shall be rolled in relief on one side of web atleast at every 4.0 meter interval. The brand mark shall include: a) The rail section. b) The grade of steel, i.e. Grade 880 880 Grade1080HH 1080HH Grade1080Cr 1080 CR

	Grade880Cu-MO 880 CM Grade880Ni Cr Cu 880 NC Grade880Vanadium 880 VN Grade 880 Niobium 880 NB c) Identification mark of the manufacturer d) Month (using roman numbers) and last two digits of year of manufacture. e) Process of Steel making i) Basic Oxygen – O ii) Electric – E
5.	**8.2 Hot Stamping** Each rail shall be identified by a numerical, alphabetical or combined alphabetical and numerical code which will be distinctly hot stamped at least once every 5.0m on the web in figures and letters of suitable size from which following information can be obtained: i) The number of the cast from which the rails has been rolled with letter 'C' ii) Number of the strand iii) For rails from change over bloom, cast number should be the preceding cast number with prefix letter 'B'. Alternatively, the identification system employed shall be such as to enable the hot stamped marking to be collated with the: a) number of the heat from which the rail has been rolled; b) number of the strand and position of bloom within the strand; c) Position of the rail in the bloom (A, B ... Y). Further, in the event of identification marks having been removed, omitted or requiring alteration, re-identification of such marks shall be made by rotary burr.
6.	**8.3 Cold Punching** 8.3.1 Following should be cold punched on one of end face of each rail: a) Inspecting Agency ID and Group ID b) Shift No in which product inspected c) Date of Inspection Alternatively, any other method of marking/identification of rail can be adopted containing above information on one of end face of each rail. To avoid damage to the HH rails, instead of cold punching, any other method of marking/identification on one of end face of each rail containing above information can be adopted.
7.	**9.1 Permissible Variations in Dimensions** The tolerances in sectional dimensions shown here under shall be allowed, provided, For Prime quality rail the actual weight computed by weighing short pieces of rails, not less than 300mm each in length, shall fall within 0.5 percent below and 1.5percent above the calculated weight shown in Appendix I, II(Revised), IIA and

III for each rail section.
For IU Rail the actual weight computed by weighing short pieces of rails not less than 300 mm each in length is not less than the calculated weight shown in Appendix I, II(Revised), IIA and III of this specification for each section of rail by more than 1.5%.
The weight test shall be conducted for each rail section, grade and class atleast once per 5000 MT quantity.

8. 9.1.1 Tolerances in sectional dimensions (For Prime Quality rails)

For profile as per Appendix I, II-A, III

Dimension	Tolerance	Remarks
Overall Height of Rails	+0.8 mm -0.4 mm	
Width of Head	± 0.5mm	This will be measured 14mm below the rails top.
Width of flange	± 1.0mm	For section less than 60Kg/m
	+1.2 mm	For sections 60kg and above
	-1.0 mm	
Thickness of web	+1.0 mm	This will be measured at the point of minimum thickness
	-0.5 mm	
Verticality/Asymmetry	± 1.2mm	Measured by gauge shown in App. V)
Flange	The base of the rail shall be true and flat, but a slight concavity not exceeding 0.40mm shall be permissible.	
Fishing surface	The standard template for rail fishing surface shall not stand away from the contour of web by more than 1.20mm and the clearance at the fishing surfaces shall not exceed 0.2mm at any point.	

For profile as per Appendix II(Revised) (Prime Quality rails)

Sr. No.	*Reference Points(see figure A1)		Profile (tolerance in mm)	Gauge/figure number(see Annex A)
	Location /property	Symbol		
1	Height of Rail[a]	*H	±0.6	A3

	2	Crown Profile -Class A straightness	*C	+0.6 -0.3	A4
		-Class B straightness		±0.6	
	3	Width of railhead	*WH	±0.5	A5
	4	Rail Assymetry	*As	±1.2	A6,A7
	5	Height of fishing	*HF	±0.6	A8
	6	Web thickness	*WT	+1.0 -0.5	A9
	7	Width of Rail foot	*WF	±1.0	A10
	8	Foot toe thickness	*TF	+0.75 -0.5	A11
	9	Foot base concavity	-	0.3 max.	-
	[a]The total height variation over any rail length shall not be greater than 1.2 mm for rails ≥ 165 mm.				
	Measurement will be done as per inspection gauges at Annexure-A				

9. **9.1.2 Tolerances in sectional dimensions (for IU rails)**

For profile as per Appendix I, II-A, III

Dimension	Tolerance	Remarks
Overall Height of Rails	+2.0 mm -1.0 mm	
Width of Head	+2.0mm	This will be measured 14mm below the rails top
	-2.0mm	
Thickness of web	+2.0 mm	This will be measured at the point of minimum thickness
	-1.0 mm	
Width of flange	+1.5 mm	
	-2.0mm	
Flange	The base of the rail shall be true and flat, but a slight concavity not exceeding 0.40mm shall be permissible.	
Fishing surface	The standard template for rail fishing surface shall not stand away from the contour of web by more than 1.20mm and the clearance at the fishing surfaces shall not exceed 0.2mm at any point.	

For profile as per Appendix II(Revised) (IU rails)

Sr. No.	*Reference Points(see figure A1)		Profile (tolerance in mm)	Gauge/ figure number (see Annex A)
	Location/ property	Symbol		
1	Height of Rail[a]	*H	+0.6 -1.1	A3
2	Crown Profile	*C	±0.6	A4
3	Width of railhead	*WH	+0.6 -0.5	A5
4	Rail Asymmetry	*As	±1.2	A6,A7
5	Height of fishing	*HF	±0.6	A8
6	Web thickness	*WT	+1.0 -0.5	A9
7	Width of Rail foot	*WF	+1.5 -1.0	A10
8	Foot toe thickness	*TF	+0.75 -0.5	A11
9	Foot base concavity	-	0.3 max.	-

[a]The total height variation over any rail length shall not be greater than 1.2 mm for rails ≥ 165 mm.

Measurement will be done as per inspection gauges at Annexure-A

10.

10.3 The manufacturer in his offer shall furnish the detailed method of on-line ultrasonic testing of rails to be followed by him. The limits of permissible defects for ultrasonic testing of rails shall be as follows and the standard test piece shall be as shown in drawing of Appendix-VI/1 and Appendix-VI/2 for symmetric rail

Head: 1.5 mm dia FBH at two locations
1.5mm dia and 2.0mm dia through holes
Web: 2.0 mm dia FBH at four locations
Web & foot junction: 2.0 mm dia drilled hole
Foot: 2.0 mm dia horizontal hole (both side)

The limits of permissible defects for ultrasonic testing and standard test piece of asymmetric rails shall be as shown in drawing of Appendix-VI A.

All Flash Butt Welds executed by the manufacturer for welding of rails in to long

	panels shall be subjected to ultrasonic testing along with other acceptance criteria as per provisions of Manual for Flash Butt Welding of Rails, 2012 with latest amendment.
11.	**10.4 Eddy Current Testing** The manufacturer should have eddy current testing covering bottom area of the rail as also the top surface and sides of surface head. The ECT probes should cover complete area of rail bottom and at least 80% area of top surface and sides of the head. The equipment used shall be able to detect artificial imperfections on the underside of the rail foot with sizes as shown in below table. For artificial imperfections, a tolerance of ±0.1 mm shall apply: Depth (mm) / Length (mm) / Width (mm) 1.0 / 20 / 0.5 1.5 / 10 / 0.5
12.	**13 QUALIFYING CRITERIA** The following test shall be done for each rail section, grade and class after any change in the process of manufacture which may affect the results or annually for first three years for each contract. The first set of tests would be conducted prior to commencement of production for supply of rail under the contract and will be witnessed by purchaser or his nominated inspecting agency. If results of these three years are consecutively found satisfactory, this frequency may be relaxed to three years by Purchaser. The test shall be undertaken by the supplier to demonstrate compliance with the qualifying criteria. If so desired, the purchaser /Inspecting Agency should be provided all facilities to check the sample and witness the test. a) Residual stress measurement. b) Fracture toughness measurement c) Fatigue test The samples for these tests shall be collected from finished rails. These samples shall not be subjected to any further mechanical or thermal treatment. The tests shall be carried out by an accredited/recognized laboratory approved by the purchaser and the test results shall be reported to the purchaser. The purchaser shall have access to all test records, calibrations and calculation which contribute to the final results. In case any sample fails to meet the requirement laid in the qualifying criteria the manufacturer shall review its process of manufacturing within six months to eliminate any shortcomings and fresh qualifying criteria test shall be undertaken under intimation to the Purchaser.

13 **20 FALLING WEIGHT TEST**

20.1 Nature of Test

20.1.1 The single guided falling weight test shall be carried out, the minimum height of the drop (in m) varying in relation of the mass per unit length of the profile M_r (in Kg) and the mass of the falling weight selected M_m (in Kg) according to the formula-

$$H = 150 \frac{M_r}{M_m}$$

Falling weight test piece minimum 1.3 meters long shall be cut from a location as per choice of the Inspecting Agency. For heat treated rails, the sample shall be taken after heat treatment. The test piece shall be placed in horizontal position with the head up on two iron or steel supports resting on a solid metal anvil. The weight of the metal anvil block shall not be less than 10,000 kg and its supporting base would be sufficiently rigid. No timber or spring shall be permitted between the rail supports and the anvil or between the anvil and the foundation. Block guides shall be provided which shall permit free fall of the weight. The upper surface of the supports shall be curved to a radius of not more than 125 mm.

One blow shall be delivered midway between the supports, by means of a freely falling iron weight or 'TUP', the striking face of which shall be rounded to a radius of not more than 125mm. The weight of the "TUP", the distance between the centre of the bearings, the height between the surface of the rail and the bottom of the "TUP", before the latter is released shall be as specified in table-4.

Table - 4

Rail section	*Weight of TUP (Kg)	**Distance between centers of bearers(m)	Height of drop (m)
52kg	1000	1.00	Measured from the top of the rail head and variable according to the above formula.
60kg	1000	1.00	
60E1	1000	1.00	
ZU-1-60	1000	1.00	
68kg	1000	1.00	

*1000Kg in principle but it may be vary according to the formula above

**1.00 m in principle but may vary between 1.00 m and 0.85 m

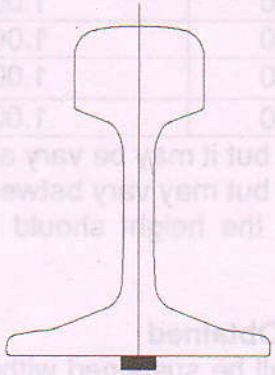
Note- The value of the height should be rounded to the nearest first digit of decimal.

20.3 **Results to be Obtained**

20.3.1 The blow shall be sustained without fracture or crack, and the permanent set resulting from the blow shall be measured after every test, over the specified distance between the centres of the bearer and recorded and advised to the purchaser.

14. **21: Determination of Hydrogen Content**

Vacuum degassing of liquid steel shall be done to reduce the hydrogen content. For this purpose, RH degasser or REDA (Revolutional Degassing Activator) shall be used. All measurement of hydrogen shall be done for the liquid steel in tundish or mould.

	21.1 The measurement of hydrogen shall be done by following method: On-Line/Instantaneous Method- HYDRIS is approved as method of on-line instantaneous measurement. The method of measurement as prescribed by the manufacturer of HYDRIS system shall be adopted. 21.2 The level of hydrogen measured by the method described under Para 21.1 above shall be 1.6 ppm maximum for acceptance of a heat for production of rail.
15	**22.1 Residual stress in rail foot** 22.1.1 Test method The residual stresses in the rail foot shall be determined in accordance with APPENDIX-XIII. 22.1.2 Test pieces For residual stress tests, there shall be 6 sample rails and the test pieces shall be taken at least 3m from each rail end. Each of the 6 test pieces from the rail section shall be 1 m in length. NOTE- Only a small part of the test piece will be destroyed for the purpose of measuring residual stress; the remainder can be used for other qualifying approval tests. 22.1.3 Measurements Longitudinal residual stress determinations shall be made on the rail foot of each of the 6 test pieces described in 22.1.2. The location of the measurements is shown in Figure 9(A) & 9(B). 'F' IS STRAIN GAUGE LOCATION  F Fig. 9A

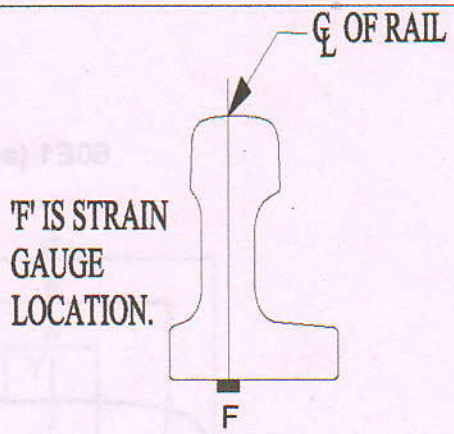
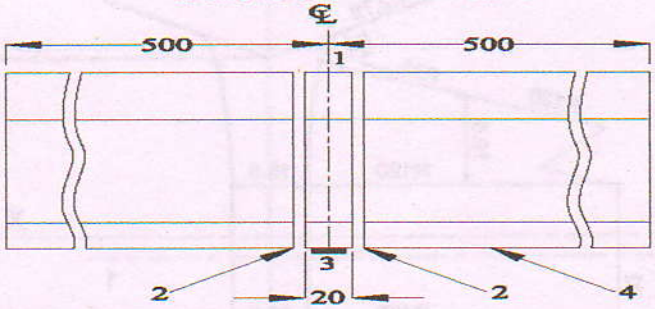


Fig. 9B

Dimensions in millimeters



Key: 1 centre line, 2 saw cut, 3 strain gauge, 4 rail foot

Fig. 9C- Slice removed from the rail

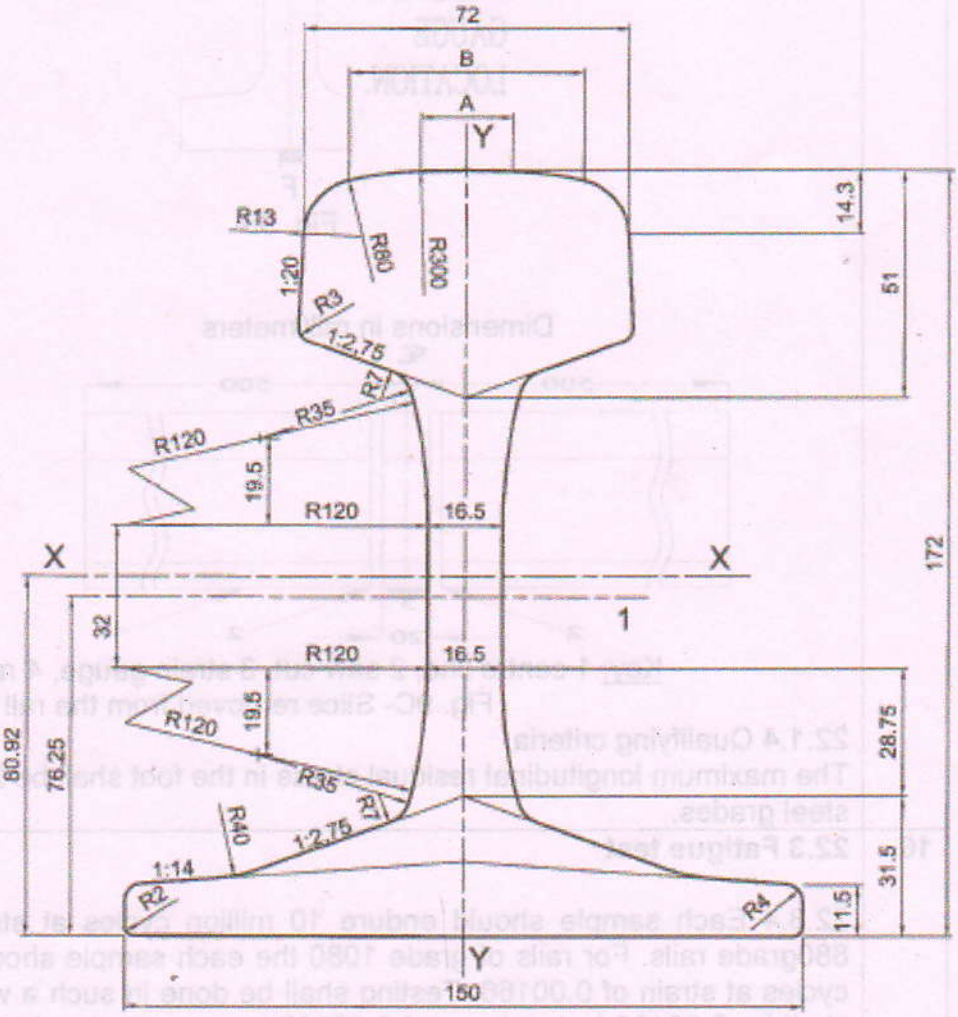
22.1.4 Qualifying criteria

The maximum longitudinal residual stress in the foot shall be 250 MPa for all steel grades.

16.	**22.3 Fatigue test** 22.3.4 Each sample should endure 10 million cycles at strain of 0.00135 for 880grade rails. For rails of grade 1080 the each sample should endure 10milion cycles at strain of 0.00166. Testing shall be done in such a way that peak strain shall be 0.00135 in tension and 0.00135 in compression for 880grade rails. For rails of grade 1080 the peak strain shall be 0.00166 in tension and 0.00166 in compression.
17.	**25.3 Import Shipment** The rails shall be loaded in bundles of three rails each bundle containing one rail upside down placed in between two rails snugly fitting and suitable tied by M.S. straps at four or more places along the length of rails so that they will not get loosened during their transportation from manufacturer's place to site of work. Alternatively, manufacturer may supply loose rails i.e. single rail without bundling. The manufacturer shall supply rail handling equipments free of charge in sufficient numbers to the satisfaction of purchaser so that unloading/ loading of rails is not delayed on this account.

Appendix II (Revised)

60E1 (as per EN 13674-1:2011+A1:2017(E))



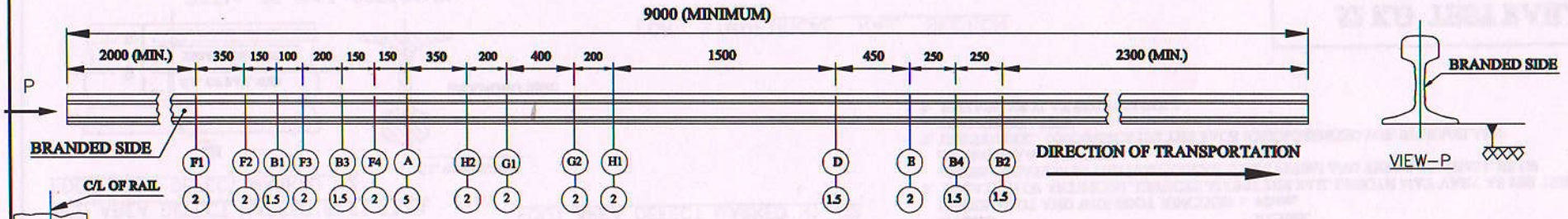
Key

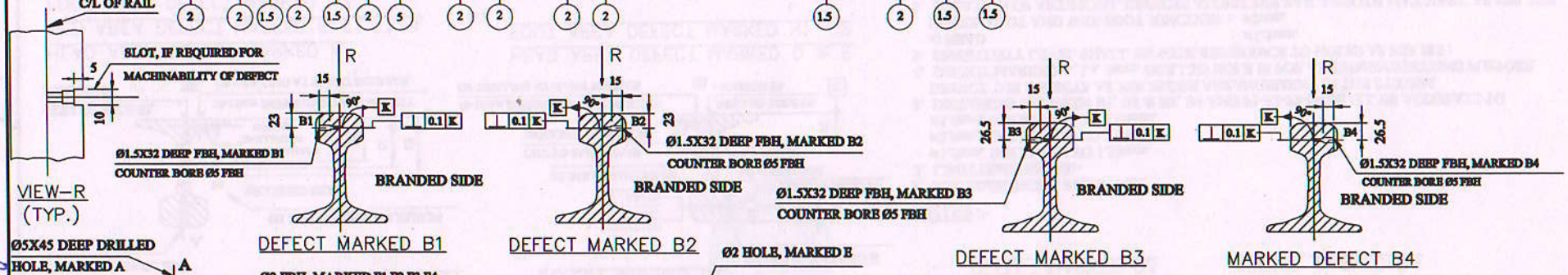
1 centre line of branding

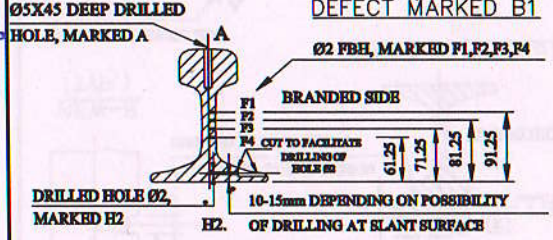
cross-sectional area	:	76,70	cm^2
mass per metre	:	60,21	kg/m
moment of inertia x-x axis	:	3 038,3	cm^4
section modulus - Head	:	333,6	cm^3
section modulus - Base	:	375,5	cm^3
moment of inertia y-y axis	:	512,3	cm^4
section modulus y-y axis	:	68,3	cm^3

indicative dimensions: *A* = 20,456 mm

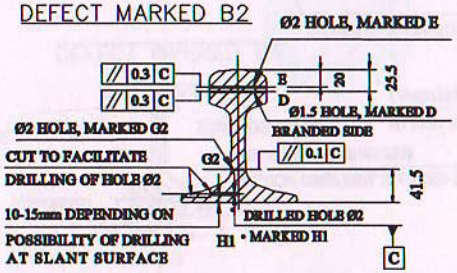
B = 52,053 mm



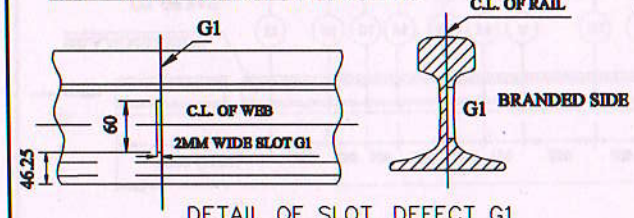




HEAD AREA DEFECT MARKED A
WEB AREA DEFECTS MARKED F1,F2,F3,F4
FOOT AREA DEFECT MARKED H2



HEAD AREA DEFECTS, MARKED D & E
FOOT AREA DEFECTS, MARKED H1,G2



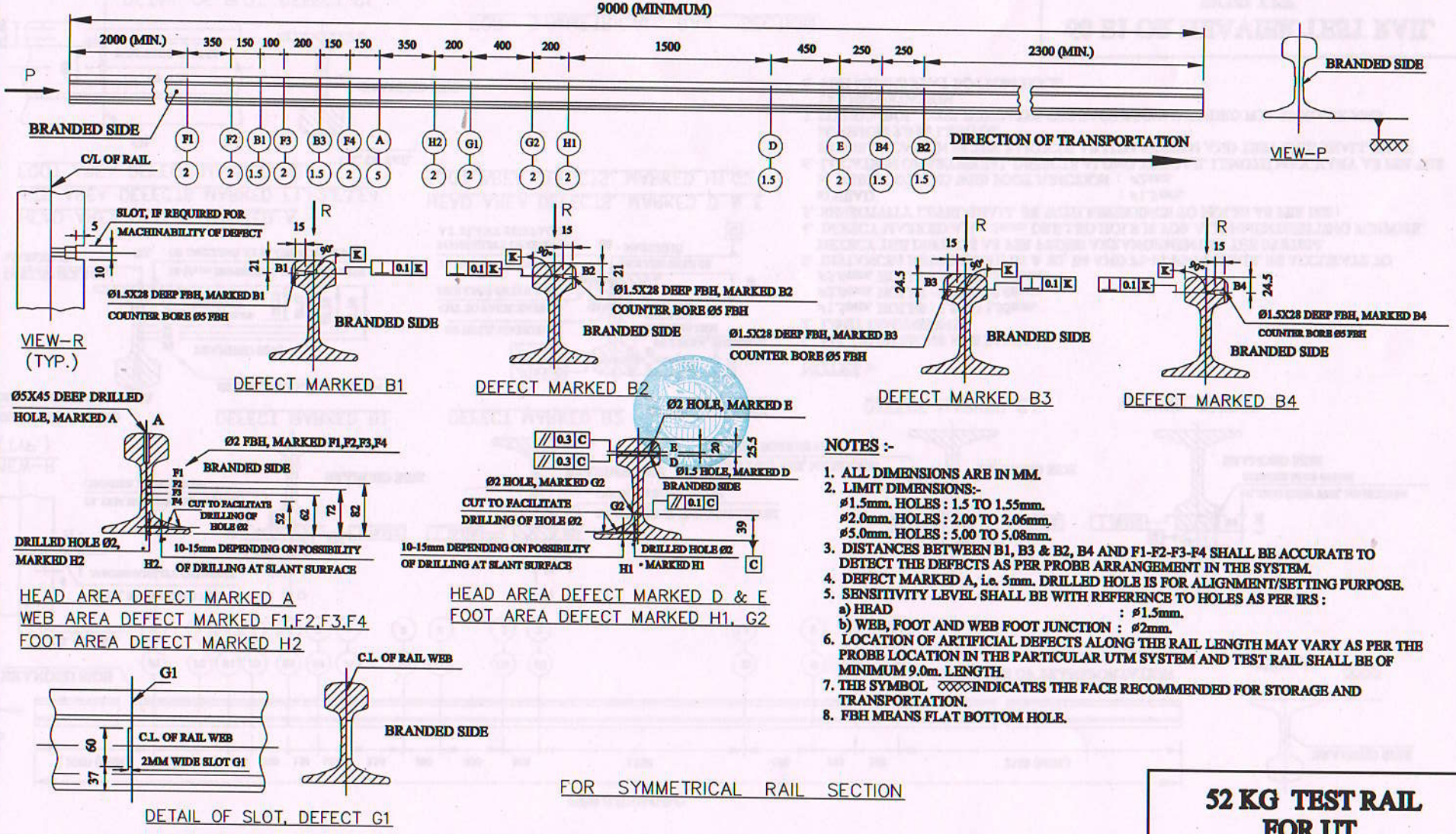
DETAIL OF SLOT, DEFECT G1

FOR SYMMETRICAL RAIL SECTION

NOTES :-

1. ALL DIMENSIONS ARE IN MM.
2. LIMIT DIMENSIONS:-
   ø1.5mm. HOLES : 1.5 TO 1.55mm.
   ø2.0mm. HOLES : 2.00 TO 2.06mm.
   ø5.0mm. HOLES : 5.00 TO 5.08mm.
3. DISTANCES BETWEEN B1, B3 & B2, B4 AND F1-F2-F3-F4 SHALL BE ACCURATE TO DETECT THE DEFECTS AS PER PROBE ARRANGEMENT IN THE SYSTEM.
4. DEFECT MARKED A, i.e. 5mm. DRILLED HOLE IS FOR ALIGNMENT/SETTING PURPOSE.
5. SENSITIVITY LEVEL SHALL BE WITH REFERENCE TO HOLES AS PER IRS :
   a) HEAD : ø1.5mm.
   b) WEB, FOOT AND WEB FOOT JUNCTION : ø2mm.
6. LOCATION OF ARTIFICIAL DEFECTS ALONG THE RAIL LENGTH MAY VARY AS PER THE PROBE LOCATION IN THE PARTICULAR UTM SYSTEM AND TEST RAIL SHALL BE OF MINIMUM 9.0 m. LENGTH.
7. THE SYMBOL ◇◇◇ INDICATES THE FACE RECOMMENDED FOR STORAGE AND TRANSPORTATION.
8. FBH MEANS FLAT BOTTOM HOLE.

60 E1 OR HEAVIER TEST RAIL FOR UT



NOTES :-

1. ALL DIMENSIONS ARE IN MM.
2. LIMIT DIMENSIONS:-
   ø1.5mm. HOLES : 1.5 TO 1.55mm.
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   ø5.0mm. HOLES : 5.00 TO 5.08mm.
3. DISTANCES BETWEEN B1, B3 & B2, B4 AND F1-F2-F3-F4 SHALL BE ACCURATE TO DETECT THE DEFECTS AS PER PROBE ARRANGEMENT IN THE SYSTEM.
4. DEFECT MARKED A, i.e. 5mm. DRILLED HOLE IS FOR ALIGNMENT/SETTING PURPOSE.
5. SENSITIVITY LEVEL SHALL BE WITH REFERENCE TO HOLES AS PER IRS :
   a) HEAD : ø1.5mm.
   b) WEB, FOOT AND WEB FOOT JUNCTION : ø2mm.
6. LOCATION OF ARTIFICIAL DEFECTS ALONG THE RAIL LENGTH MAY VARY AS PER THE PROBE LOCATION IN THE PARTICULAR UTM SYSTEM AND TEST RAIL SHALL BE OF MINIMUM 9.0m. LENGTH.
7. THE SYMBOL ◇◇◇ INDICATES THE FACE RECOMMENDED FOR STORAGE AND TRANSPORTATION.
8. FBH MEANS FLAT BOTTOM HOLE.

52 KG TEST RAIL FOR UT

Method for the determination of rail foot surface longitudinal residual stresses

1. Procedure

Residual stresses shall be estimated by first attaching an electrical strain gauge on the rail foot surface. The surface to which the gauge is attached shall be progressively isolated from the rail and the relaxed strains shall then be used to estimate the stresses which have been relieved whilst the original residual stresses are taken to be those values but with a change of sign.

2. Strain gauges and their location

Electrical strain gauges of the encapsulated type shall be used, 3 mm in length with gauge factor accuracy of better than ± 1 %.

The strain gauge shall be attached to the surface of the rail foot in order to measure longitudinal strain at the positions as shown in Figure Fig. 9A & Fig. 9B. The surface of the rail foot shall be prepared and the strain gauge shall be attached, in accordance with the recommendations of the strain gauge manufacturer.

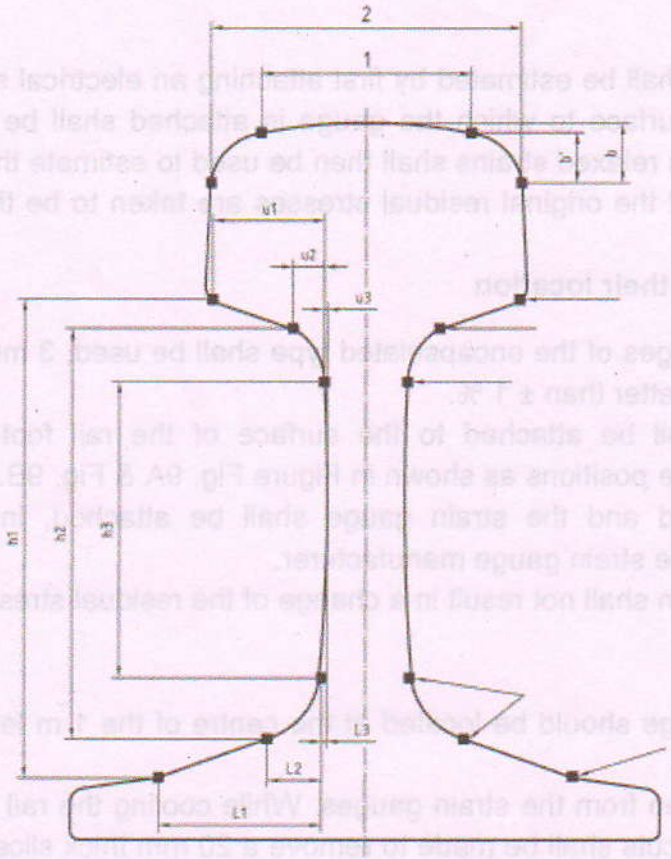
Any surface preparation shall not result in a change of the residual stresses in the rail foot.

NOTE- The strain gauge should be located at the centre of the 1 m length of the sample rail set aside for this work.

Readings shall be taken from the strain gauges. While cooling the rail to maintain a constant temperature, two saw cuts shall be made to remove a 20 mm thick slice from the centre of the rail length (Fig. 9C). A second set of measurements shall be taken.

The residual stresses shall be calculated from the differences between the first and second sets of measurements of relieved strains by multiplying with Young's modulus of elasticity for steel i.e. $2.05X10^6$ kg/cm^2.

Annexure-A



Key

■ transition point 0,01 mm

Table A- Rail transition references (see Figure A)

Rail profile	Dimension in mm												
	1	2	b	b'	h 1	h 2	h 3	L1	L2	L3	u 1	u 2	u 3
60E1	52.05	72.00	14.30	12.00	118.57	101.50	87.06	36.61	8.25	3.20	26.83	8.25	3.20

Figure A — Principal rail transition references

Gauges for inspection

The gauges for manufacture as specified in clause 9.1.1 and 9.1.2 for 60E1 profile as per appendix II (Revised) are summarised In Table A1

Table A1 — Summary of figures

Figure A1	Datum references for tolerances
Figure A2	Datum references for decision
Figure A3	Height of rail
Figure A4	Crown profile
Figure A5	Width or rail head
Figure A6 and A7	Asymmetry
Figure A8	Fishing height HF
Figure A9	Web thickness
Figure A10	Width of rail foot
Figure A11	Foot toe thickness
Figure A12 and A13	Drilling gauges

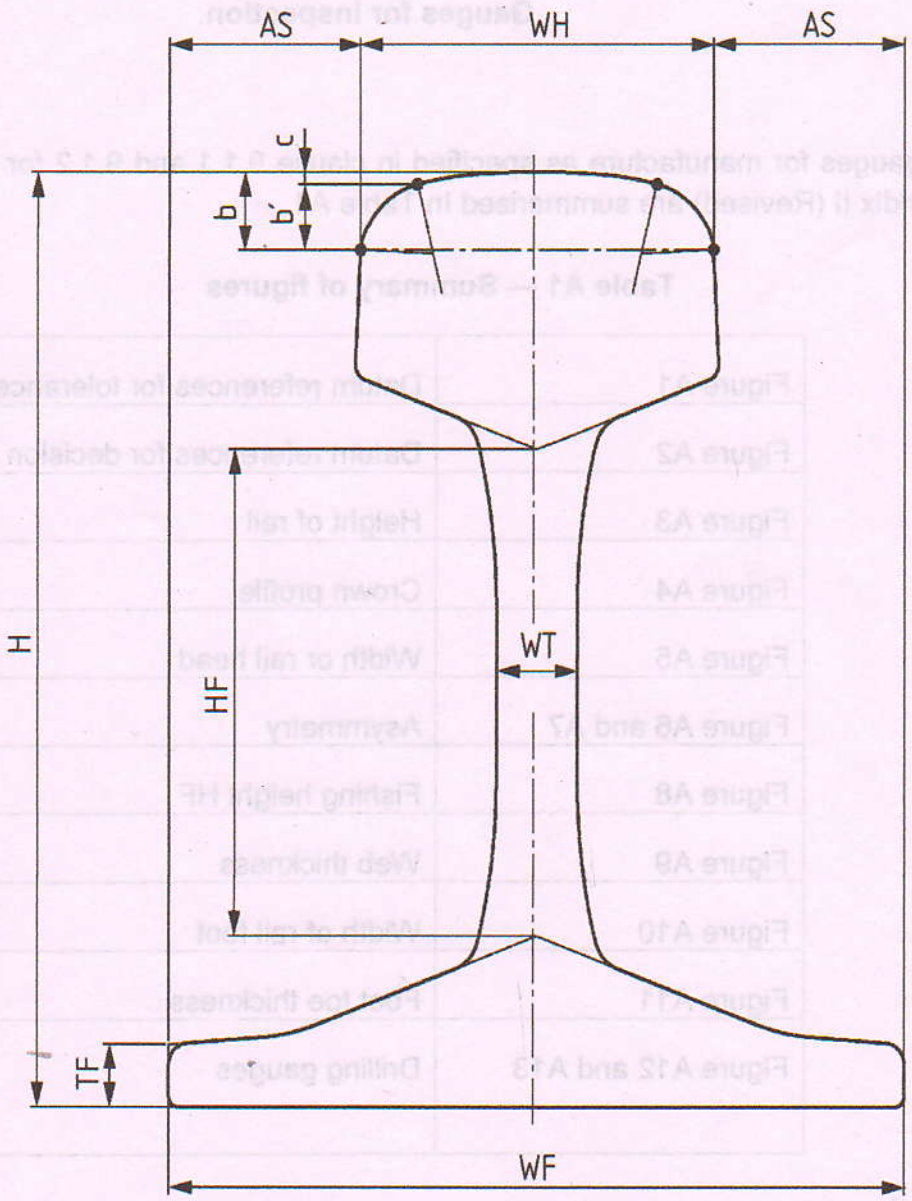
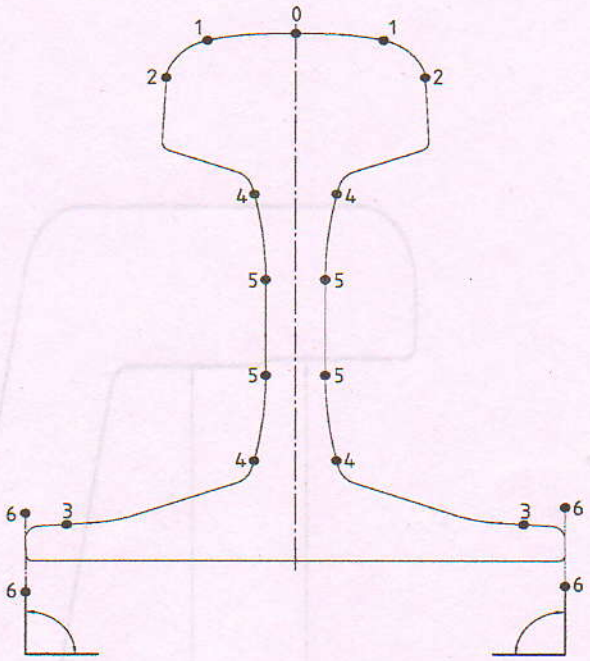


Figure A1- Datum references for tolerances (See Para 9.1.1, 9.1.2, Figure-A and Table-A)



Datum	Reference	Figure No.
0	height - must not + must pass	A3
0	crown profile - must + must not pass the wedge	A4
1	width of rail head - must not + must touch	A5
2	rail asymmetry - must not + must touch	A6, A7
4,5	height of fishplating - must + must not touch	A8
5	web thickness - must not + must pass	A9
3,6	foot toe thickness - must be within ± limits	A11
6	width of rail foot - must not + must pass	A10

Figure A2 — Datum references for decision

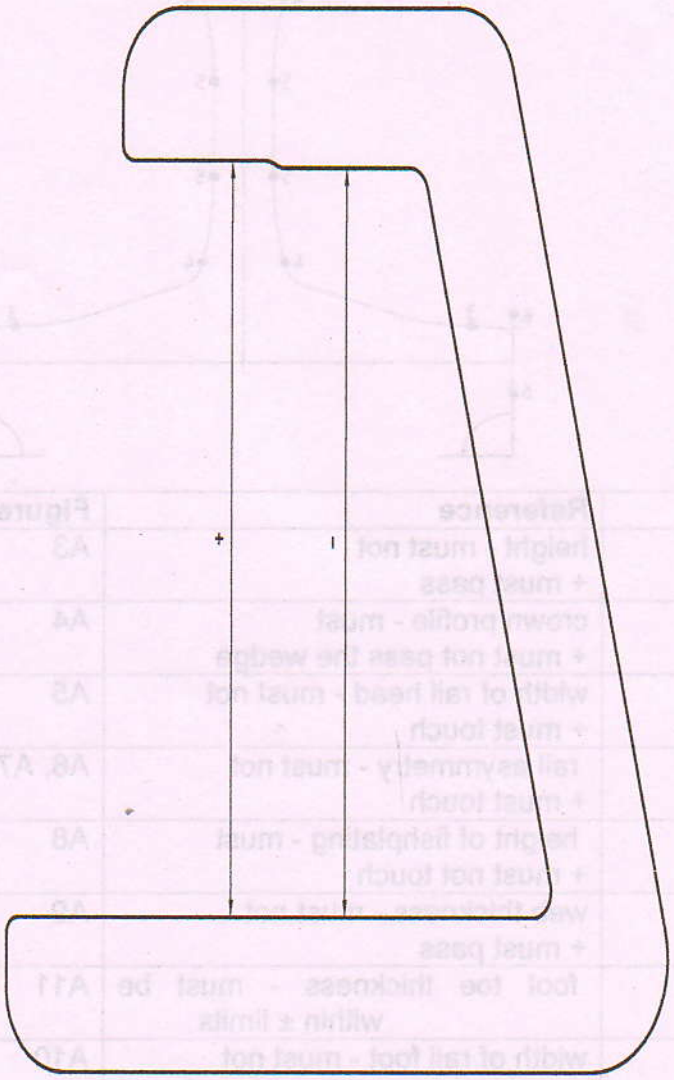
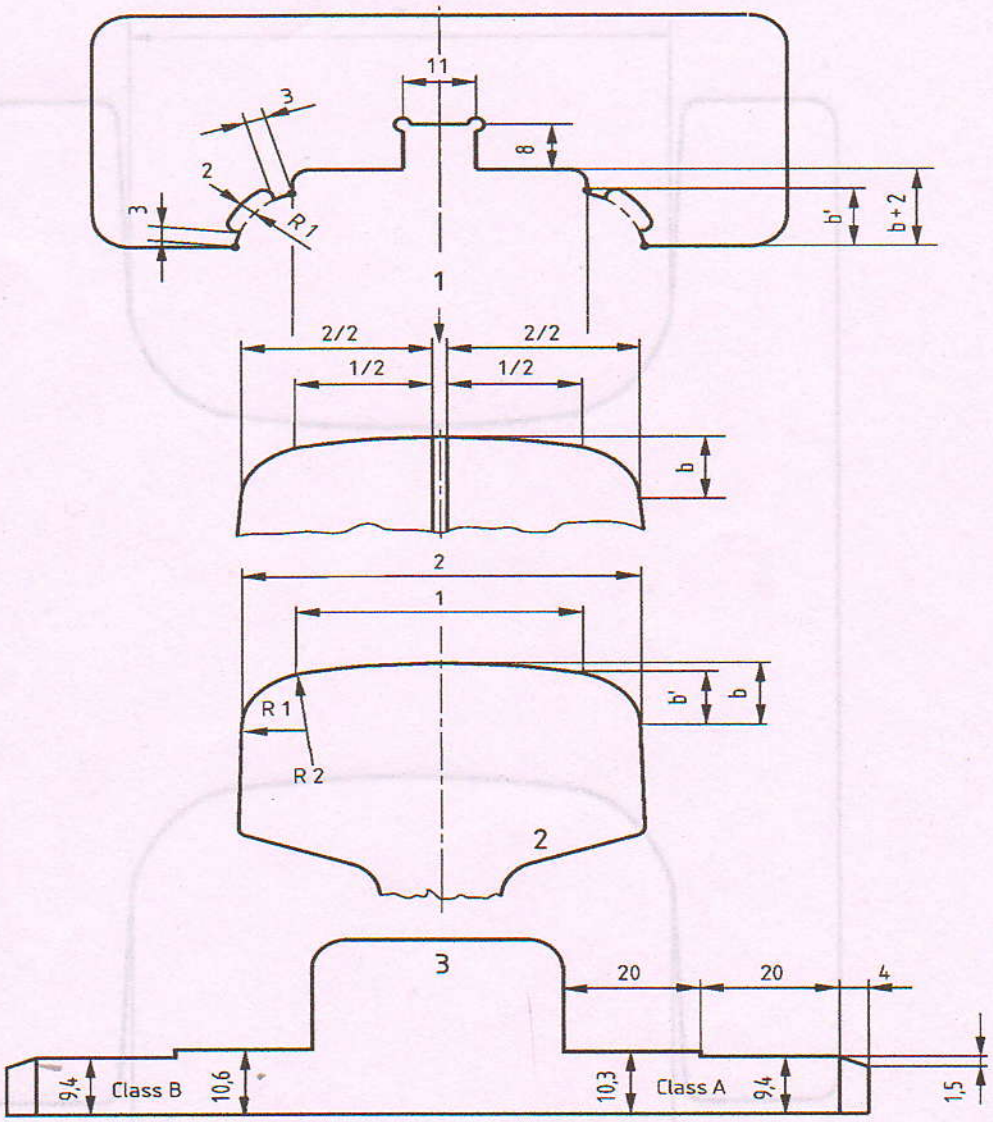


Figure A3- Height of Rail



Key-

1 Maximum width of rail head tolerance
2 Theoretical profile
3 Step gauge to check the table shape, 10mm thickness

Figure A4- Crown Profile

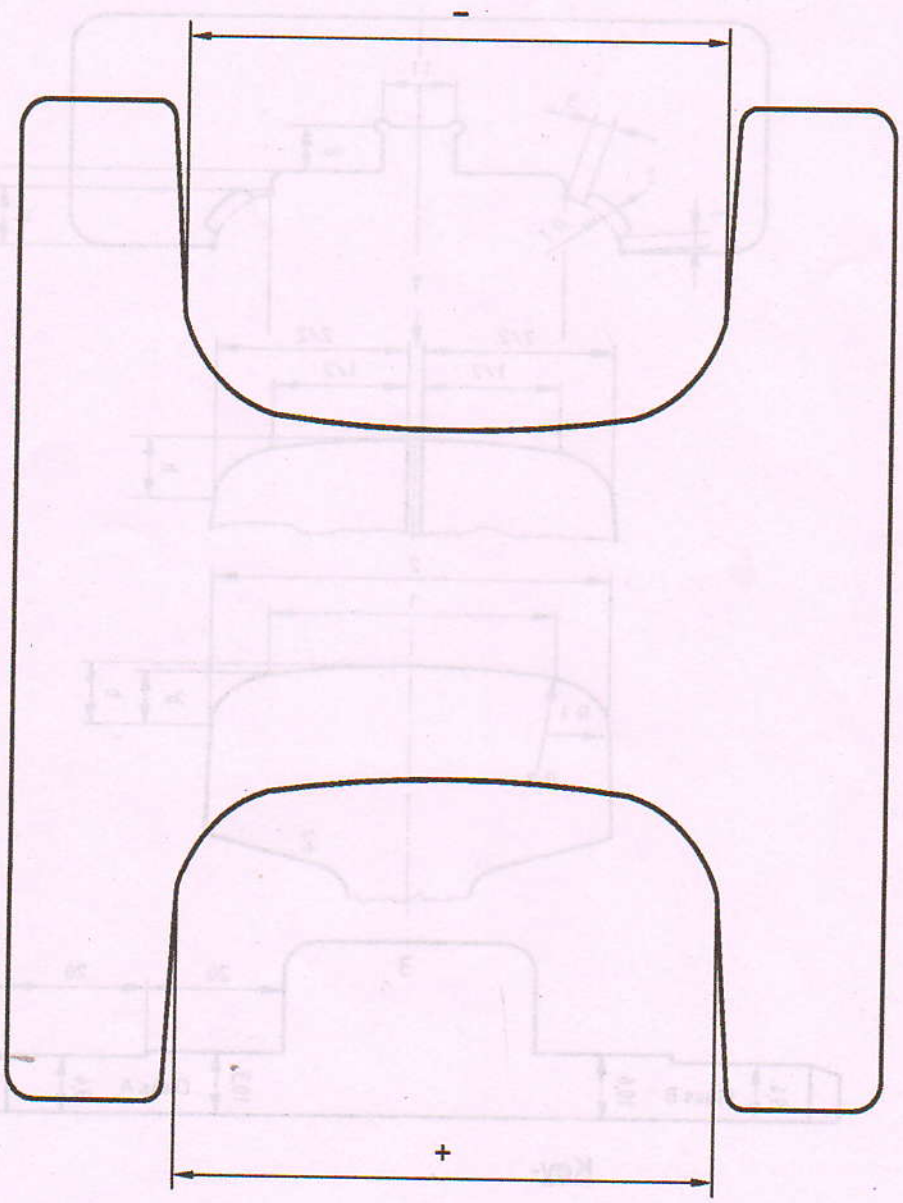


Figure A5- Width of Rail Head

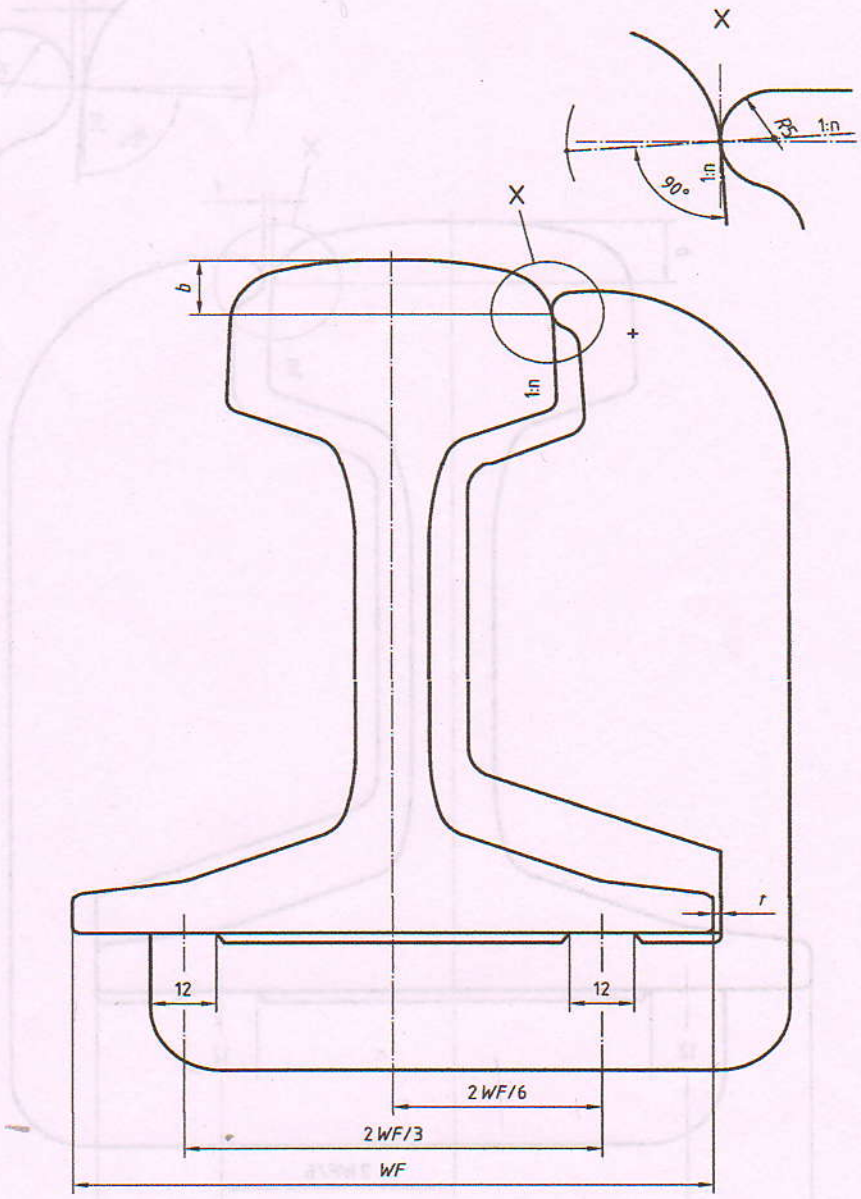


Figure A6 - Rail Asymmetry

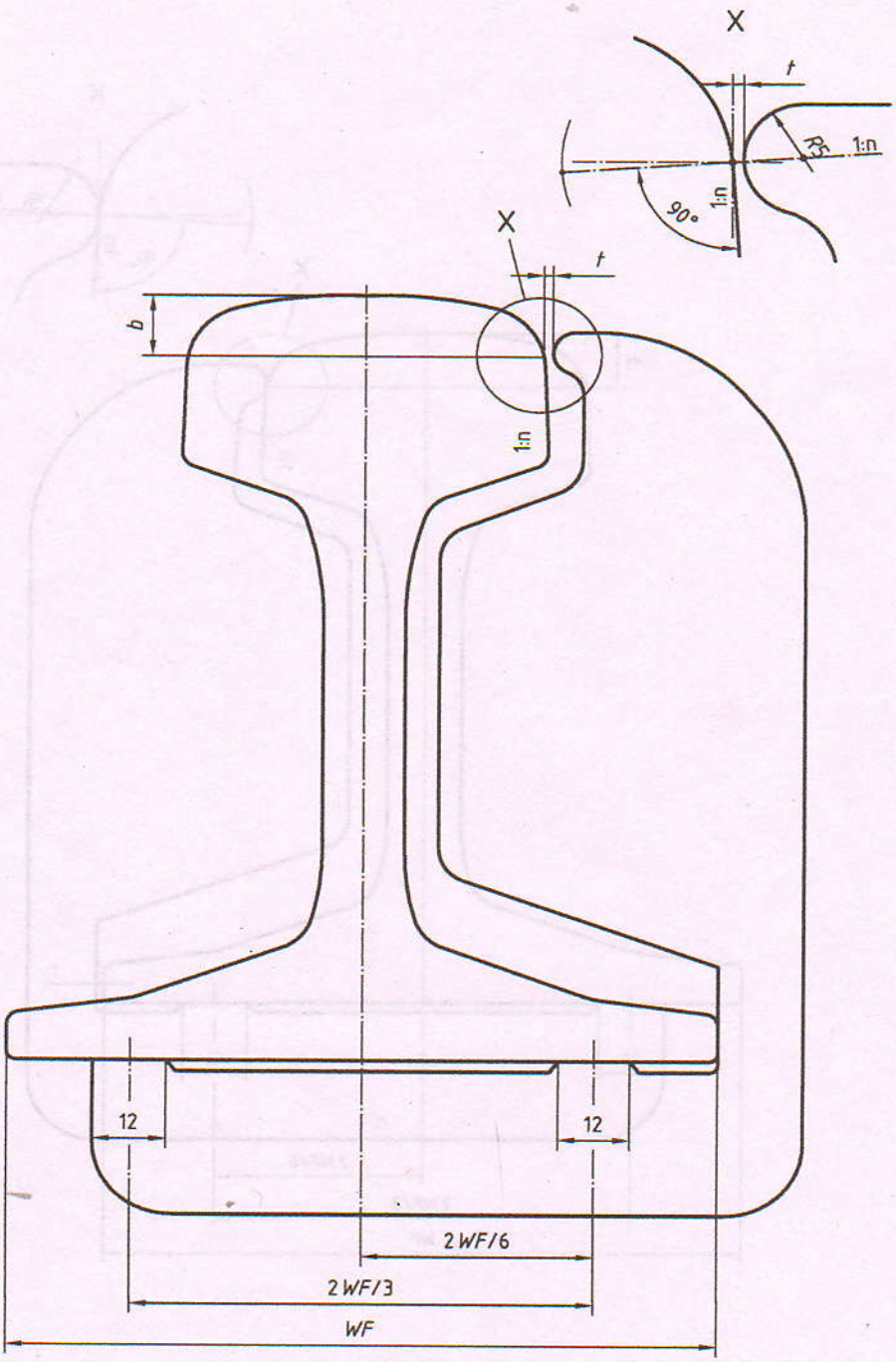
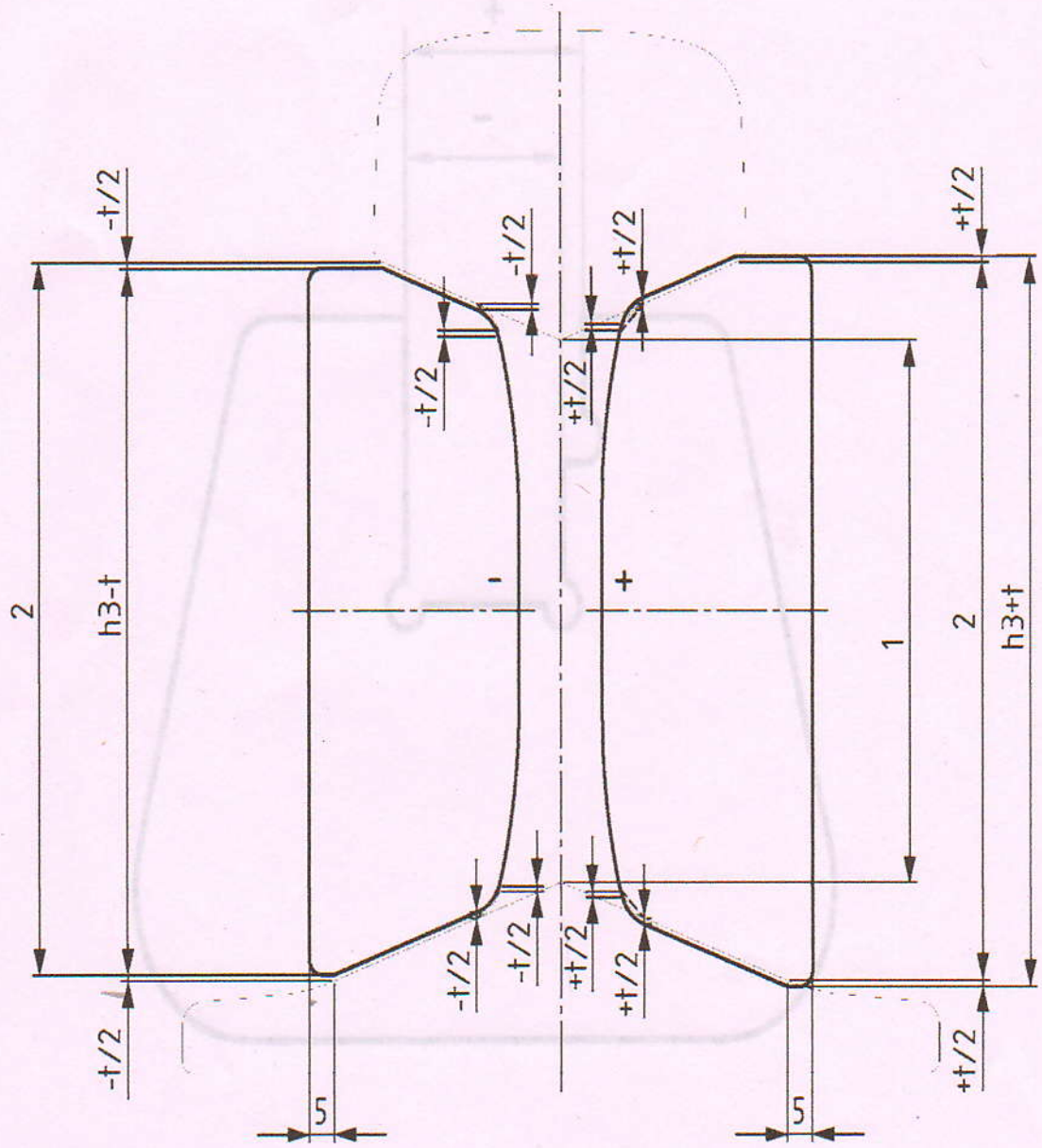


Figure A7- Rail Asymmetry



Key- 1 HF= Fishing height (see Figure A1) and
2 h 3= Theoretical

Figure A8- Fishing Height

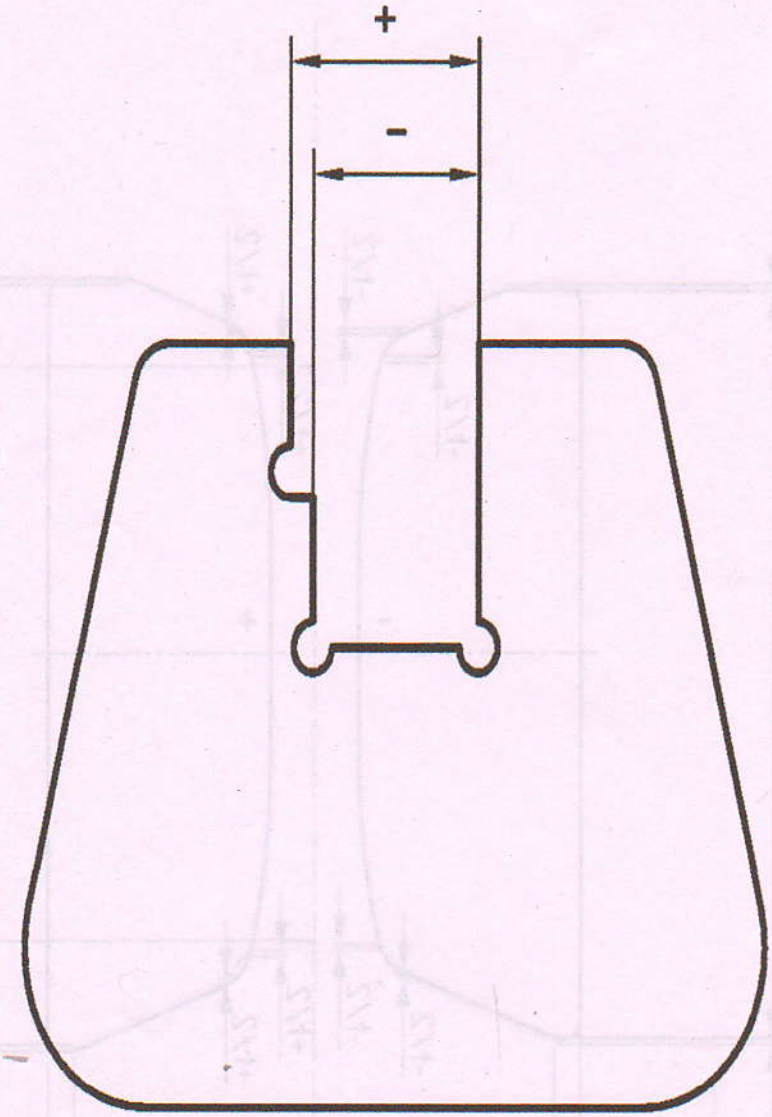


Figure A9- Web Thickness

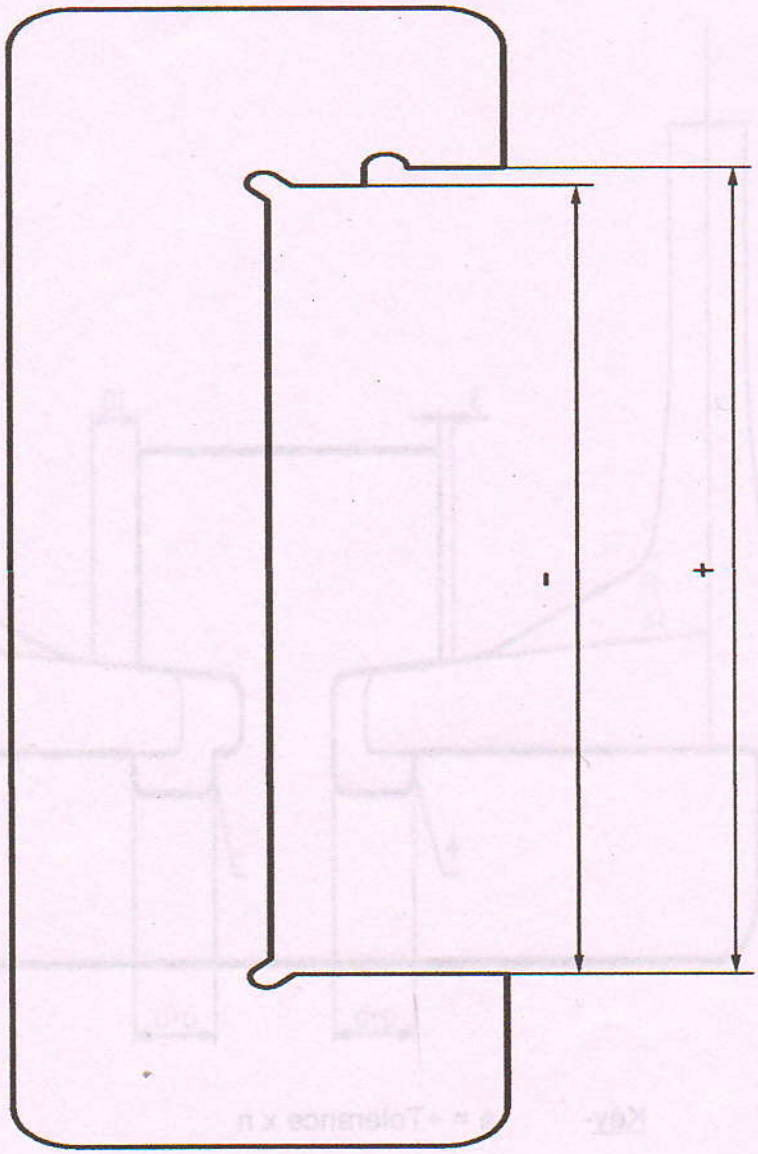
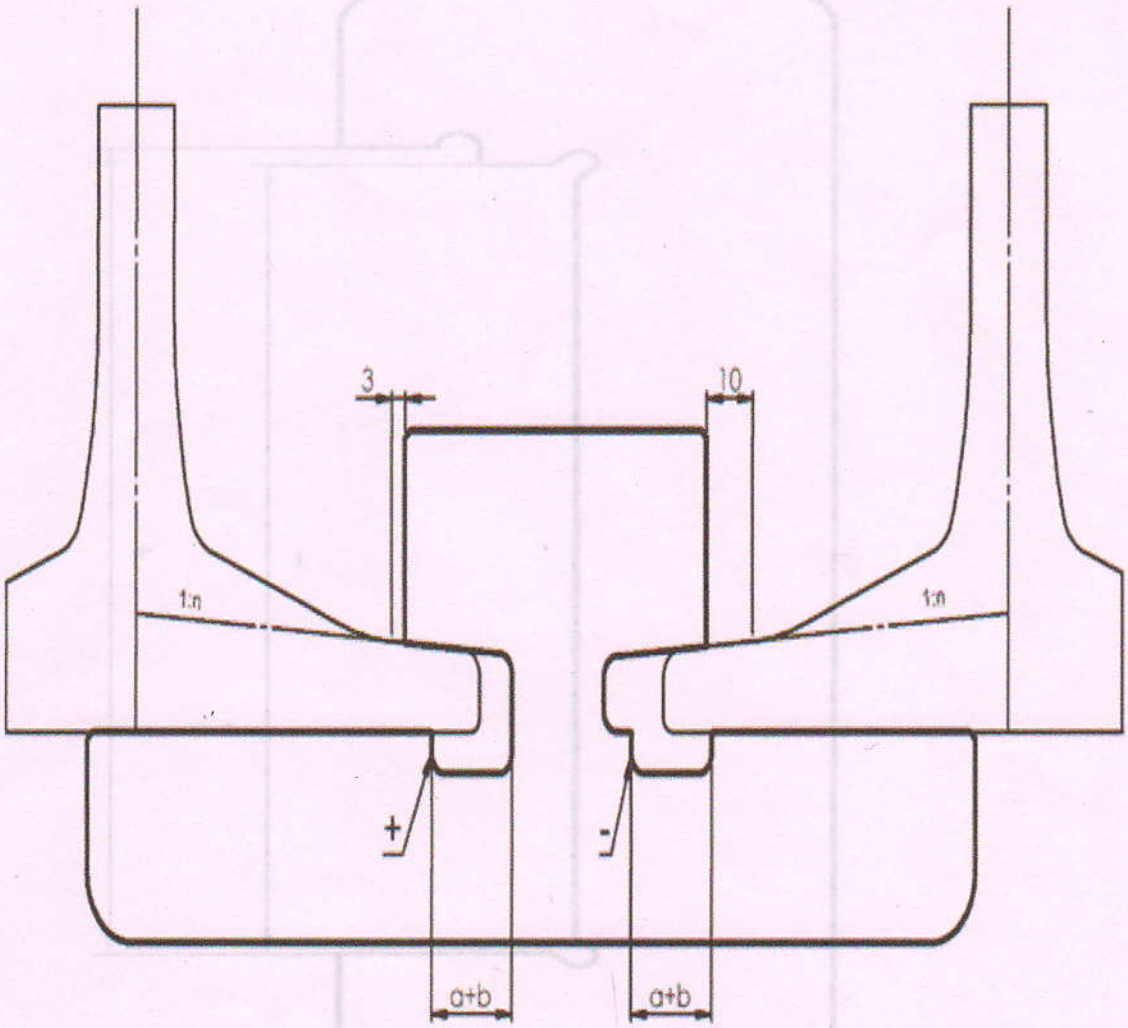


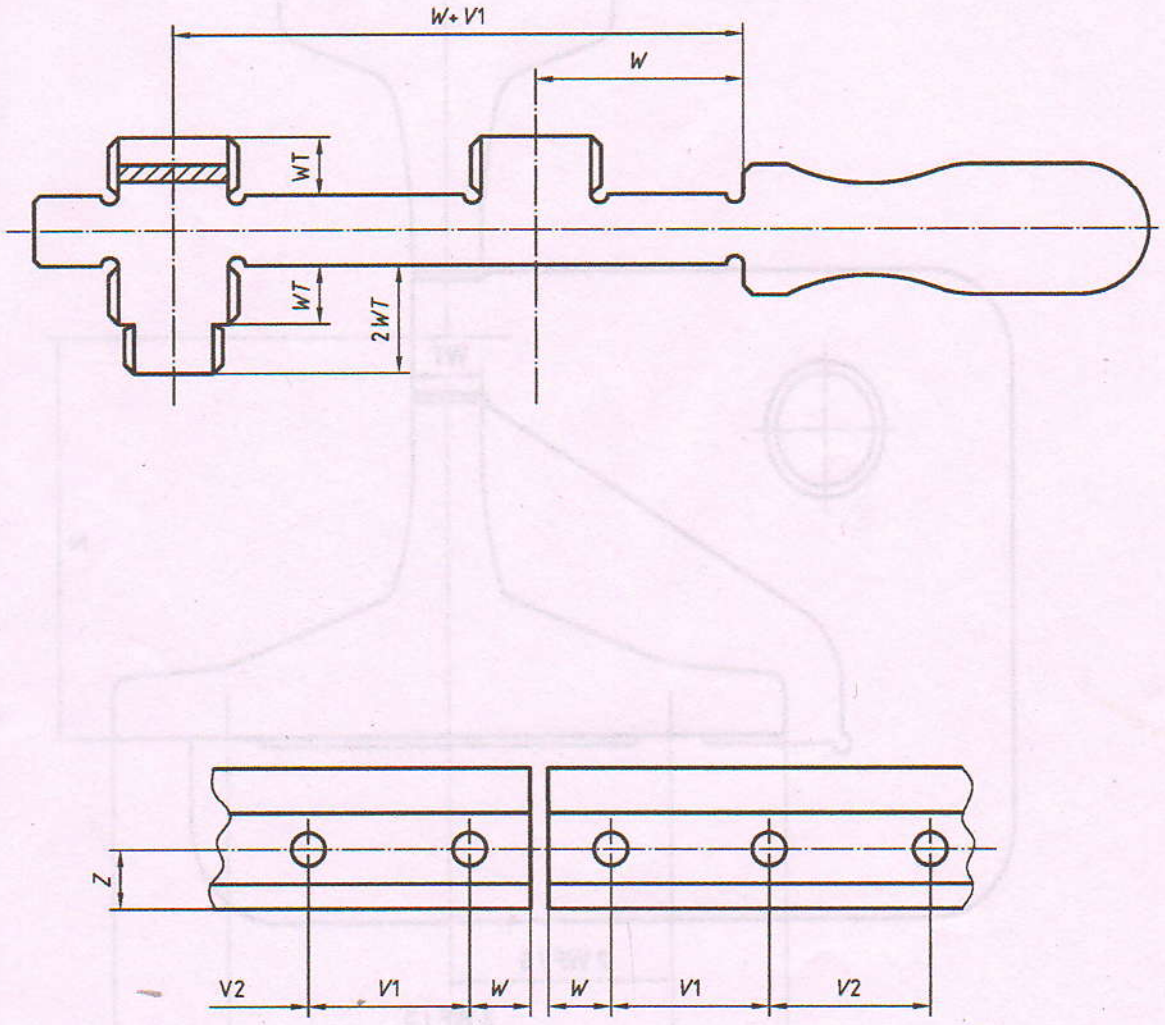
Figure A10- Width of Rail foot



Key- a = +Tolerance x n

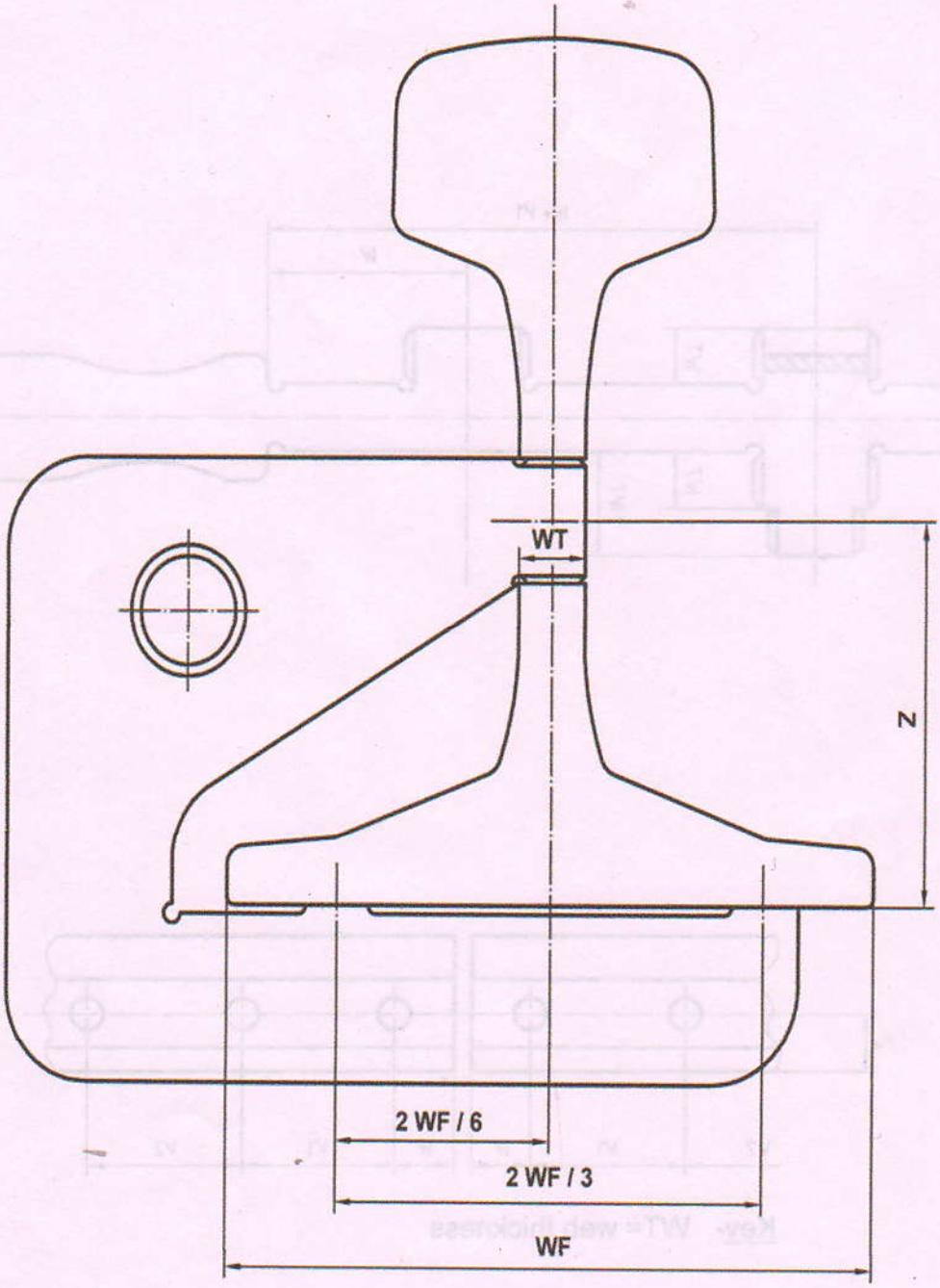
b = -Tolerance x n

Figure A11- Foot Toe Thickness



Key- WT= web thickness

Figure A12- Gauge for checking distance between holes and rail end and hole diameter



Key- WF= width of foot, WT= web thickness, Z= distance between center of the hole and base of the rail

Figure A13- Gauge for checking distance between holes and base of rail

ANNEXURE – C (HANDLING AND STACKING OF RAILS)

8.
25/11/14

भारत सरकार - रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ - 226 011
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Government of India-Ministry of Railways
Research Designs & Standards Organisation
Lucknow - 226 011
DID (0522) 2450115
DID (0522) 2465310

कार्यालय आशुलेख
Office S...
निदेशक
Director
आरडीएसओ RDSO
रेल अग्रदूत Transforming Railways
DTM
Date : 05.11.2014
SI/Tr.I
file.

No. CT/Rail Handling

As per Mailing List

Sub: Guidelines for handling and stacking of rails

Ref: Railway Board's letter no. Track/21/98/0508/7 dated 30.10.2014

****

1.0 The rails, being the most vital component of track, require careful handling to achieve desired service life. Improper handling of rails may cause bending, indentation or damage to surface, rendering the rails unserviceable and/ or leading to premature failure of rails. The use of higher UTS Rails has been necessitated to meet the requirement of traffic. The rails of higher UTS (90 and above), being brittle in nature, are particularly susceptible to sudden fracture from locations of even minor dents/deformity. 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. As such, 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.

2.0 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 is noticed, such rails should not be used in track without removal of damaged portion of rails.

3.0 These comprehensive guideline, approved by Railway Board vide letter under reference, are being issued for strict compliance at field level and sensitizing the field staff and other agencies involved in handling and laying of rails, so as to avoid damage to rails. The copy of "**Guidelines for handling and stacking of rails (CT-35) October 2014**" is enclosed herewith for information and strict compliance. The soft copy is also being e-mailed to Chief Track Engineers of Railway.

DA: As above

5/11/14

(Satish Kumar Pandey)
Executive Director/Track-I
for Director General/Track

GUIDELINES

FOR

HANDLING AND STACKING OF RAILS

OCTOBER-2014

(No. CT-35)

RESEARCH DESIGNS AND STANDARDS ORGANISATION

LUCKNOW – 226011

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. The 72 UTS rails (also known as MM Rails) used earlier were more ductile, hence were not susceptible to sudden fractures. Rails of higher UTS (90 and above), 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 service life 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.

(a) The detailed guidelines for handling of Rails were issued by RDSO vide letter no. CT/Rail/Handling dated 13.11.2006.

(b) Para 1.1.3 of Manual for Ultrasonic Testing of Rails and Welds (Revised - 2012) states that incorrect handling of rails may cause plastic deformation, scoring and denting of rails.

(c) Para 254 and Para 255 of IRPWM contains the guidelines on stacking of rails and the precautions to be taken during handling of rails in general.

(d) Para 310 of IRPWM covers the guidelines on unloading of rails.

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 100x25 mm size should be used between two successive layers of rails and kept at a distance not more than 4.0 m centre to centre. Number of layers in a stack should not be more than 10.

(iii) One rail panel should be reduced 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 centre to

centre 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:

(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) 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 centre 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.

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

(i) New 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 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 be careful.
(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.

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.

3.3 Prevention of metallurgical damages:

Rails 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.

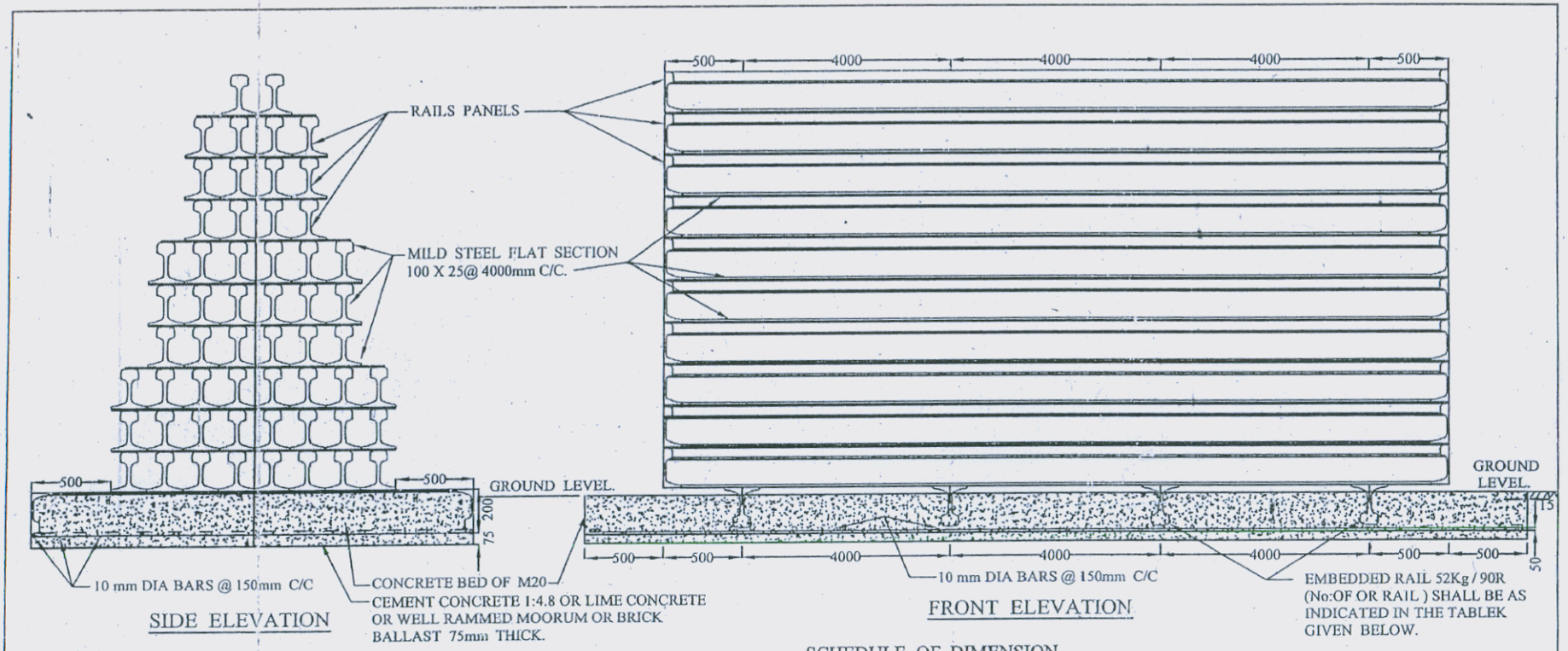
4.0 Safety of Personnel:

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 equipments approved by SSE (P.way) incharge. 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.



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

8. THE DRAWING SUPERSEDES THE DRG:No.RDSO/T-4962.
7. ONE RAIL/PANEL MAY BE REDUCED AFTER EVERY THIRD LAYER TO ACHIVE PROPER STACKING FROM BOTH SIDES.
6. BETWEEN TWO LAYERS OF RAILS FLAT OF SIZE 100X25mm SHOULD BE PROVIDED AT 4000mm C/C AND IT SHALL BE ENSURED THAT RAIL ENDS DO NOT OVERHANG BY MORE THEN 1500mm.
5. ONLY ONE TYPE OF FREE RAILS/WELDED PANELS SHALL BE STACKED IN ONE STACK.
4. MAX. NUMBER OF LAYERS IN WHICH FREE RAILS AS WELL AS WELDED PANELS CAN BE STACKED SHALL BE LIMITED TO 10.
3. 52Kg.per m. / 90R RAIL SHALL BE EMBEDDED IN THE CONCRETE BED OF M-20 GRADE CONCRETE (TO IS:456-1978) AS SHOWN IN THE DRG: ABOVE.
2. A SLOPE OF 1:400 MAY BE GIVEN IN CONCRETE BE ACROSS THE LENGTH OF RAIL.
1. ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE

(I) M. S. PLATE TO IS: 226-1975.
(II) IS:450-1975 FOR CONCRETE BED.

SPECIFICATION | SCALE | ALT: | DESCRIPTION | DATE

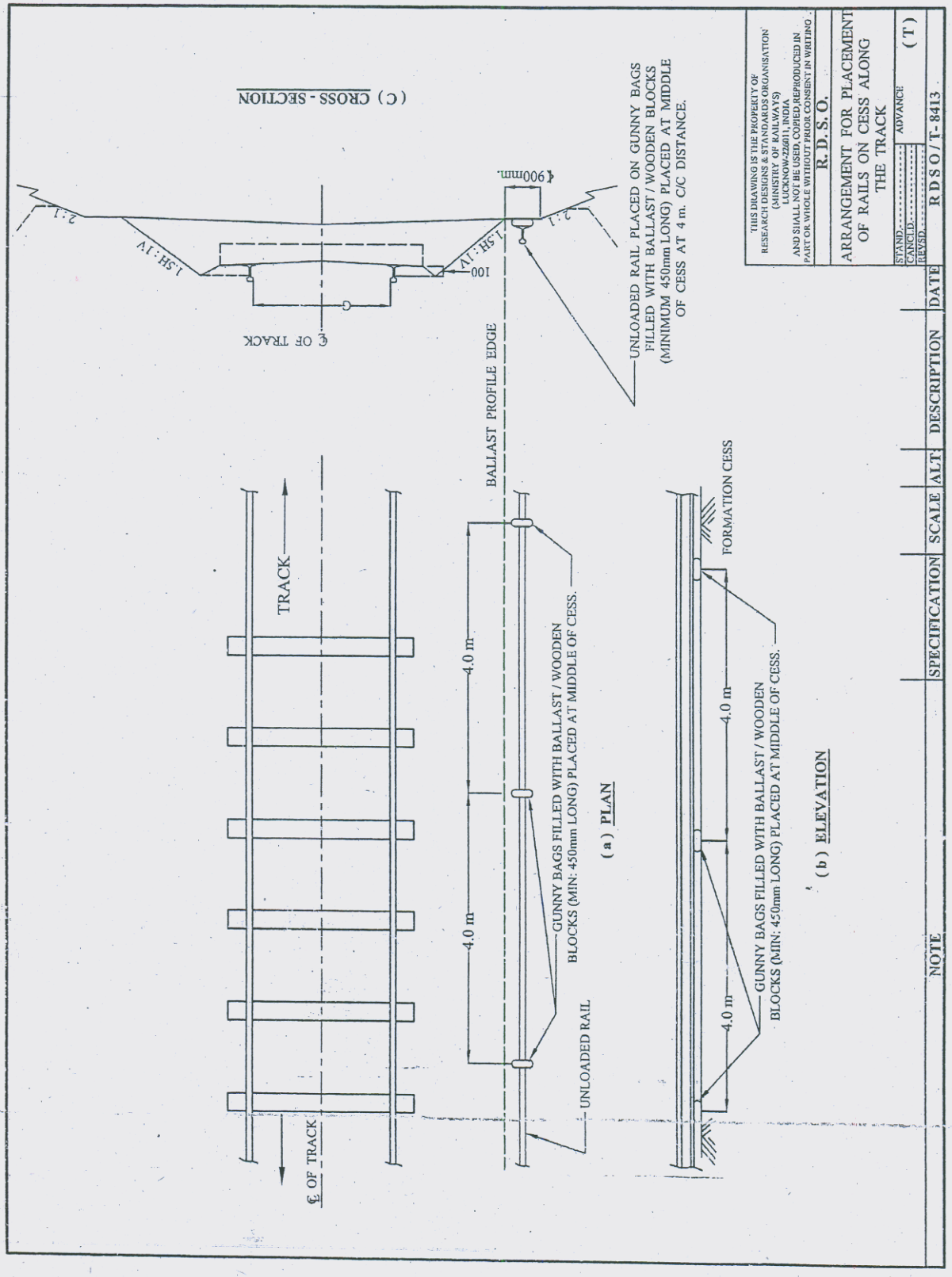
R. D. S. O.

ARRANGEMENT FOR STACKING FREE RAILS AND WELDED

STAND.
CANCLD.
REVSD.
ADVANCE
15.5.2002
(T)

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

ANNEXURE - II


(C) CROSS - SECTION
900mm
2:1
1.5H:1V
100
℄ OF TRACK
UNLOADED RAIL PLACED ON GUNNY BAGS FILLED WITH BALLAST / WOODEN BLOCKS (MINIMUM 450mm LONG) PLACED AT MIDDLE OF CESS AT 4 m. C/C DISTANCE.
BALLAST PROFILE EDGE
TRACK
4.0 m
GUNNY BAGS FILLED WITH BALLAST / WOODEN BLOCKS (MIN: 450mm LONG) PLACED AT MIDDLE OF CESS.
UNLOADED RAIL
(a) PLAN
FORMATION CESS
(b) ELEVATION
THIS DRAWING IS THE PROPERTY OF RESEARCH DESIGNS & STANDARDS ORGANISATION (MINISTRY OF RAILWAYS) LUCKNOW-226011, INDIA
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R. D. S. O.
ARRANGEMENT FOR PLACEMENT OF RAILS ON CESS ALONG THE TRACK
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BIDDING DOCUMENTS

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra - Seepz) Rail Project.

Part 3

CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VII	General Conditions of Contract(GC)
Section VIII	Particular Conditions of Contract (PC)
Section IX	Contract Forms

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park 'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

BIDDING DOCUMENTS

Composition of Documents

Part1	**Bidding Procedures**	
	Section I	Instructions to Bidders(ITB)
	Section II	Bid Data Sheet (BDS)
	Section III	Evaluation and Qualification Criteria
	Section IV	Bidding Forms
	Section V	Eligible Source Countries of Japanese ODA Loan
Part2	**Supply Requirements**	
	Section VI	Schedule of Requirements
Part 3	**Conditions of Contract and Contract Forms**	
	Section VII	General Conditions (GC)
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MUMBAI METRO LINE 3

(COLABA-BANDRA-SEEPZ)

CONTRACT - MM3-CBS- TWK-04

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Part 3

CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VII
GENERAL CONDITIONS (GC)

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park E'- Block,
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	Section VIII	Particular Conditions (PC)
	Section IX	Contract Forms

GENERAL CONDITIONS OF CONTRACT (GC)

The General Conditions governing this Contract are the Standard General Conditions of Contract set forth in the Standard Bidding documents for Procurement of Goods (Version 1.1) published by JICA in May 2013. The GCC is available in JICA's website shown below: https://www.jica.go.jp/english/our_work/types_of_assistance/oda_loans/oda_op_info/guide/tender/index.html

A copy of these General Conditions is not attached to these Bidding / Contract Documents for convenience.

BIDDING DOCUMENTS

MMRC

MUMBAI METRO LINE 3
(COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04
(Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

Part 3

CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section VIII
PARTICULAR CONDITIONS (PC)

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park 'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

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Particular Conditions (PC)

The following Particular Conditions of Contract (PC) shall supplement and/ or amend the General Conditions of Contract (GC). Whenever there is a conflict, the provisions herein shall prevail over those in the GC.

GC 1.1 (l)	The Project Site(s)/Final Destination(s) **is, Mumbai** (Delivery in Stores at Mumbai)
GC 1.1(m)	The Purchaser is: **MUMBAI METRO RAIL CORPORATION LIMITED**
GC1.1(n)	The Purchaser's country is **INDIA**
GC 5.1	The language shall be: **ENGLISH**
GC 11.1	Details of Shipping and other Documents to be furnished by the Supplier before arrival of goods are: Invoice , non-negotiable sea way bill/railway consignment note/ road consignment note, insurance certificate, Manufacturer's or Supplier's warranty certificate, inspection certificate issued by nominated inspection agency, Supplier's factory shipping details .
GC 13.1	The price shall be adjusted by the factor Pn,, the adjustment factor to be applied to the value of the supply made in month "n" which shall be applied to each different currency;,as follows: Pn = 0.15 + 0.85(Sn/So),, Where S_n and S_0 are the Wholesale Price indices of "mild steel- long products" as notified by Reserve Bank of India for the month of delivery at destination and the month of submission of bids respectively.
GC 14.1 Contracts price and Advance Payment	**for Goods supplied from abroad:** Payment of Supply of rails upto CIF Port in India shall be made in currency quoted by the tenderer in the following manner: **1.** Ten (10) percent of the Contract Price shall be paid, upon signing of the Contract, within Thirty (30) days after receipt of invoice and a bank guarantee for the equivalent amount valid until the Goods and Related Services are delivered and in the form provided in the Bidding Documents or another form acceptable to the Purchaser. 2. The standard payment terms subject to recoveries, if any, under

	the Liquidated Damages Clause in General Conditions of Contract will be as under: a) 80% payment on proof of inspection Certificate of material and shipment on receipt of all shipping documents, i.e. Bill of Lading and Proof of Marine Insurance Policy on each shipment/consignment. b) 10% payment on receipt of goods at Mumbai Store in undamaged condition. This payment shall be subject to submission of the bank guarantee referred to in PC clause 16.3 2. Payment of Supply of Rails (freely convertible international trading currency) portion shall be made to the supplier through Letter of Credit (LC). LC shall be irrevocable and divisible. Part payment is allowed. LC is opened through Banker's of the purchaser based at Mumbai. LC Opening charges shall be borne by the Purchaser. However, Bank charges on LC amendment, if any, at the request of supplier shall be to Supplier's account. All other charges shall be Supplier's account. 3. Payment of clearance and Transportation: 100% payment will be made on receipt of goods at Mumbai Store in undamaged condition on submission of invoice in two copies.(Refer Bid form No: 4) 4. **Payment of custom duty:** The custom duty at applicable concessional custom duty rate will be paid to Custom authority by the contractor. The custom duty paid will be reimbursed by the purchaser when the contractor furnishes the receipt of Custom Duty payment, Bill of Entry etc., to MMRC. The contractor will be responsible for final assessment of Custom duty by Custom authority. Port handling charges, stamp duty charges etc, if any shall be borne by the contractor. Payment for the Goods and Related Services supplied from within the Purchaser's Country- Ten (10) percent of the Contract Price shall be paid within, upon signing of the Contract, within Thirty (30) days after receipt of invoice and a bank guarantee for the equivalent amount valid until the Goods and Related Services are delivered and in the form provided in the Bidding Documents or another form acceptable to the Purchaser.
GC 14.2	The Employer may adopt either "Reimbursement Procedure" or "Commitment Procedure" for the contractual payments. However in case of commitment procedure the Employer's bank charges for opening, extension, amendment and maintenance of the LC shall be borne by the Employer.

GC 14.5	The interest shall be calculated at an interest rate equal to 3 % above the discount rate of Reserve Bank of India.
GC 15 Taxes and Duties	**15.2** For goods offered from within the Purchaser's country, the Supplier shall be entirely responsible for all taxes, duties, license fees, etc., incurred until delivery of the contracted Goods to the Purchaser. **15.3** If any tax exemptions, reductions, allowances or privileges may be available to the Supplier in the Purchaser's Country, the Purchaser shall use its best efforts to enable the Supplier to benefit from any such tax savings to the maximum allowable extent.
GC 16.1	The Supplier shall provide a Performance Security of: **10%** of the Contract Price.
GC 16.3 Performance Security	The Performance Security required in accordance with Clause 16 of the GCC shall be in the currency in which the Contract Price is payable. The value of the performance security may be reduced by 50% after 1 year of completion date of Contract. The required Performance Security may be submitted in any one of the following forms: (a) Irrevocable bank guarantee in the prescribed format, given in Section IX of Part 3 of bid documents. (b) Bank Draft in favour of Mumbai Metro Rail Corporation Ltd. payable at Mumbai from a Scheduled Commercial Bank based in India, or (c) Fixed Deposit Receipt of a Scheduled Commercial Bank/ Post offices based in India duly pledged in favour of Mumbai Metro Rail Corporation Ltd. In case of joint venture/consortium, the Performance Security is to be submitted in the name of the JV / Consortium. However, splitting of the performance security (while ensuring the security is in the name of JV / Consortium) and its submission by different members of the JV / Consortium for an amount proportionate to their scope of work is also acceptable. The Performance Guarantee should be valid for a period of 28 days after **24 (twenty four)** months beyond the completion date.
GC 21.2 Packing and Document	(i) The packing, marking and documentation within and outside the packages shall be: LABELLING MARKING: On at least two sides of packages / bundles the following address shall be written in English with permanent paint: Contract No. Supply of Rails to: Mumbai Metro Rail Corporation Ltd., Gross Weight …… MT. Net Weight ……. MT No. of Rails …….. Nos.

	Package / Bundle No. ……. (ii) The packing advices should bring out the weight, dimensions and size of each bundles/ package. Where it is not possible to give weight of the bundles/packages, the supplier must indicate the volume of the bundles/packages, the number of pieces per bundle/package, number of bundles/packages, and total weight of the items supplied. Where the materials are shipped in bundles/packages, the pieces in each bundle/package should be of uniform sizes to facilitate quick acceptance and payment. The number of pieces in each bundle/package should also be the same.
GC 22.1 Insurance	The supplier shall obtain insurances completed up to delivery at purchaser's storage areas in Mumbai.
GC 23.1Transportation	In accordance with the Section VI schedule of requirements.
GC 24.1 Inspections and Tests	The inspections and tests shall be as provided in the IRS – T- 12 – 2009 specification and inspection & Test Plan approved by purchaser.
GC 24.2 Inspections and Tests	The inspection and testing would be carried out in the supplier's premises.
GC 25.1 Liquidated Damages	The liquidated damage shall be 0.5 % per week of contract value of delivery of-delayed quantity of Rails at Mumbai stores, (CIF Price of rails plus inland transportation including all other services etc). This is subject to note no 3 below 'List of goods and delivery schedule', Part 2 Section VI.
GC 25.1 Liquidated Damages	The maximum amount of liquidated damages shall be 10 % of contract value.
GC 26.3 Warranty	The period of validity of the Warranty shall be 24 months after delivery.
GC 26.5 Warranty	In case of defects discovered after installation of Rails but within the warranty, the purchaser will replace the rail but the actual cost of rail including installation/ replacement thereof shall be borne by the supplier. However if the length of rail required for replacement is more than 100m length then the same will be supplied within 60 days by the supplier at his cost.
GC 31 Change orders and Contract Amendments	Add additional clause 31.5 Quantity Variation: a) The quantities of items as shown in Section VI – Schedule of

	Requirements may vary and the supplier shall be bound to supply the quantities as varied at the same rate as specified in the Price schedule and other terms and conditions of contract subject to positive variation in the quantity being limited to 30% of the total original quantity in the contract. Maximum decrease in quantity is limited to 10% of total original quantity. The supplier shall obtain confirmation regarding actual quantity variation from the purchaser, after the supply has been done to the extent of at least 75% of quantity. **b)** Additional quantity of rails as per the above quantity variation when ordered shall be supplied in additional installments at mutually agreed interval but not later than 4 months from the date of last supply.

BIDDING DOCUMENTS

MUMBAI METRO LINE 3 (COLABA-BANDRA-SEEPZ)

CONTRACT MM3-CBS-TWK-04 (Package 10 D)

Supply of 8490 MT Head Hardened (HH) Rails (UIC 60E1, IRS-T-12:2009, 1080 grade) for Track Work of Mumbai Metro Line 3 (Colaba-Bandra -Seepz) Rail Project.

Part 3

CONDITIONS OF CONTRACT AND CONTRACT FORMS

Section IX
CONTRACT FORMS

August 2019

JICA LOAN AGREEMENT ID - P 268

Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

Section IX. Contract Forms

Table of Forms

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Contract Agreement

THIS CONTRACT AGREEMENT is made

the [*insert number*] day of [*insert month*], [*insert year*].

BETWEEN

(1) [*insert name of Purchaser*], a [*insert description of type of legal entity, for example, an agency of the Ministry of {insert name of Ministry}. of the Government of {insert name of Purchaser's Country}, or corporation incorporated under the laws of {insert name of Purchaser's Country}*] and having its principal place of business at [*insert address of Purchaser*] (hereinafter called "the Purchaser"), and

(2) [*insert name of Supplier*], a corporation incorporated under the laws of [*insert country of Supplier*] and having its principal place of business at [*insert address of Supplier*] (hereinafter called "the Supplier").

WHEREAS the Purchaser invited Bids for certain Goods and Related Services, viz., [*insert brief description of Goods and Related Services*] and has accepted a Bid by the Supplier for the supply of those Goods and Related Services in the sum of [*insert amount(s) in foreign currency (ies) in words and figures*] and [*insert amount in local currency in words and figures*] (hereinafter called "the Contract Price").

The Purchaser and the Supplier agree as follows:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents shall constitute the Contract between the Purchaser and the Supplier, and each shall be read and construed as an integral part of the Contract:
   (a) This Contract Agreement
   (b) Purchaser's notification of award
   (c) Letter of Bid
   (d) Particular Conditions

(e) General Conditions

(f) Technical Requirements (including Schedule of Requirements and Technical Specifications)

(g) Other completed Bidding Forms submitted with the Bid

(h) Acknowledgement of Compliance with Guidelines for Procurement under Japanese ODA Loans

(i) [*Any other document(s) shall be added here*]

3. This Contract Agreement shall prevail over all other Contract documents. In the event of any discrepancy or inconsistency within the Contract documents, then the documents shall prevail in the order listed above.

4. In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the Goods and Related Services and to remedy defects therein in conformity in all respects with the provisions of the Contract.

5. The Purchaser hereby covenants to pay the Supplier in consideration of the provision of the Goods and Related Services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused this Agreement to be executed in accordance with the laws of [*insert name of country*] on the day, month and year indicated above.

Singed by, for and on behalf of the Purchaser

_____

[*Signature*]

_____

[*Title*]

in the presence of [*insert identification of official witness*]

Signed by, for and on behalf of the Supplier

`

_____

[*Signature*]

_____

[*Title*]

in the presence of [*insert identification of official witness*]

Performance Security

Option 1: (Bank Guarantee)

[*Guarantor letterhead*]

Beneficiary: Mumbai Metro Rail Corporation Ltd. (MMRC).
Date:[*insert date of issue*]

PERFORMANCE GUARANTEE No.: [*insert guarantee reference number*]

Guarantor: [*insert name and address of place of issue, unless indicated in the letterhead*]

We have been informed that [*insert name of Supplier, which in the case of a joint venture shall be the name of the joint venture*] (hereinafter called "the Applicant") has entered into Contract No. [*insert reference number of the Contract*] dated [*insert date*] with the Beneficiary, for the supply of [*insert description of Goods and Related Services*] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, a performance guarantee is required.

At the request of the Applicant, we as Guarantor hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of [*insert amount in figures*] ([*insert amount in words*])[1], such sum being payable in the types and proportions of currencies in which the Contract Price is payable, upon receipt by us of the Beneficiary's complying demand supported by the Beneficiary's statement, whether in the demand itself or in a separate signed document accompanying or identifying the demand, stating that the Applicant is in default under the Contract, without the Beneficiary needing to prove or to show grounds for its demand or the sum specified therein.

This guarantee shall expire no later than the [*insert number*] day of [*insert month*] [*insert year*][2], and any demand for payment under it must be received by us at this office on or before that date.

This guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No. 458[3], except that subparagraph (ii) of Sub-article 20(a) is hereby excluded.

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_____
[*signature(s)*]

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[1] The Guarantor shall insert the amount(s) specified in the PC and denominated, as specified in the PC, either in the currency(ies) of the Contract or a freely convertible currency acceptable to the Beneficiary.

[2] Insert the dates established in accordance with Sub-Clause 16.4 of the General Conditions of Contract ("GC"), taking into account any warranty obligations of the Applicant under Clause 26 of the GC intended to be secured by a partial performance guarantee.

[*Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.*]

Advance Payment Security Form

[*Guarantor letterhead*]

Beneficiary: Mumbai Metro Rail Corporation Ltd
Line 3 Transit Office, Wing 'A' North Side of City Park'E'- Block,
Bandra-Kurla Complex,
Bandra (East) Mumbai 400 051, India

Date: [*insert date of issue*]

ADVANCE PAYMENT GUARANTEE No.: [*insert guarantee reference number*]

Guarantor: [*insert name and address of place of issue, unless indicated in the letterhead*]

We have been informed that [*insert complete name and address of Supplier, which in the case of a joint venture shall be the name of the joint venture*] (hereinafter called "the Applicant") has entered into Contract No. [*insert reference number of the Contract*] dated [*insert date*] with the Beneficiary, for the supply of [*insert description of Goods and Related Services*] (hereinafter called "the Contract").

Furthermore, we understand that, according to the conditions of the Contract, an advance payment in the sum of [*insert amount in words*] ([*insert amount in figures*]) is to be made against an advance payment guarantee.#

At the request of the Applicant, we as Guarantor hereby irrevocably undertake to pay the Beneficiary any sum or sums not exceeding in total an amount of [*insert amount in figures*] ([*insert amount in words*]) [4] upon receipt by us of the Beneficiary's first demand in writing accompanied by a written statement stating that the Applicant is in breach of its obligation under the Contract because the Applicant used the advance payment for purposes other than toward supply of the Goods and the Related Services.

A demand under this guarantee may be presented as from the presentation to the Guarantor of a certificate from the Beneficiary's bank stating that the advance

payment referred to above has been credited to the Applicant on its account number [*insert number*] at [*insert name and address of Applicant's bank*].

This guarantee shall remain valid and in full effect from the date of the advance payment received by the Applicant under the Contract until completion date of supplies, as given in the delivery schedule section VI.] [5] . In case of delays in completing the supplies and recovery of the advance the guarantee shall be extended as required by the employer to cover the period/s of delays in recovery.

This Guarantee is subject to the Uniform Rules for Demand Guarantees, ICC Publication No.458[6].

[3] The Guarantor shall insert the amount(s) specified in the PC and denominated, as specified in the PC, either in the currency(ies) of the Contract or a freely convertible currency acceptable to the Beneficiary.

[4] As the case may be, ICC Publication No. 758 (or subsequent ICC Publications) may be used. In such cases, modify the Publication number

5. Insert the delivery date stipulated in the Contract Delivery Schedule.

_____

[*signature(s)*]

[*Note: All italicized text (including footnotes) is for use in preparing this form and shall be deleted from the final product.*]

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ADVANCE PAYMENT GUARANTEE must be payable in Maharashtra/ Mumbai
Branch of that particular Schedule Bank stationed in INDIA.