Annexure-C

(For official use only)
केवल सरकारी प्रयोग हेतु

भारत सरकार
रेलमंत्रालय

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

FUNCTIONAL REQUIREMENT SPECIFICATION (FRS)
FOR
NON-METALLIC LINERS / PACKING PLATES FOR USE IN CASNUB BOGIES

(FRS/WD/BD/01/2024)
May 2024

Issued by
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मानक नगर, लखनऊ- 226 011
RESEARCH DESIGNS AND STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW– 226011

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1. INTRODUCTION:

1.1. Indian Railway wagons are fitted with various variant of CASNUB bogies. CASNUB bogies are fitted with Silico Manganese & Manganese Steel liners and Wear plates to protect the wear of bogie components i.e. Centre Pivot, Brake Beam etc. Packing Plates has been provided below / over the Elastomeric Pads to maintain the required height of the bogie with low diameter wheels.

1.2. Wagon Directorate of RDSO is now planning to adopt latest technology products being used worldwide by Rail industries for their liners / packing plate application. Through this EOI, RDSO is planning to adopt proven latest technology product and to achieve lower wear rate, low maintenance, less weight, dynamically suitable, cost effective material for their liners / packing application in place of existing metallic liners / packing plates.

1.3. These non-metallic liners for centre pivot, brake beam pocket and packing plates shall be used on CASNUB bogies to RDSO's drawing / sketch number WD-97049-S/3, SK-69597 and WD-91074-S/1 respectively.

1.4. The brake beam pocket liners are subjected (over approximate area of 52 square centimeters) to compressive forces of 1340 Kgs and longitudinal forces of 86 Kgs.

1.5. The centre pivot liners are subjected to static and dynamic loadings in compressive mode. The horizontal liner is subjected to a maximum loading of about 55t, while vertical liners are subjected to a maximum loading of about 25t.

1.6. The packing plates are subjected to static and dynamic loadings in compressive mode. The packing plate is subjected to a maximum loading of about 11t.

1.7. A factor of safety of 2.0 over yield strength is to be taken into consideration while designing the non-metallic liners / packing plates.

1.8. The liners / packing plates shall have excellent wear resistance, toughness and tear strength properties. It shall be capable of withstanding wide climatic variations prevailing in the country without deterioration and without any marked change in characteristics.

1.9. The Functional Requirement Specification (FRS) has been prepared to empanel eligible firms having expertise in the relevant field, for manufacturing & supply of Non-metallic liners / Packing plates, for use in CASNUB Bogies on trial basis and further development of the final specification.

1.10. Tentative requirement of the material qualities, physical properties and their standards have been specified in the FRS for ready reference only. However, the firm may suggest their own material for the application along with its properties and performance advantages.

1.11. The product offered should be successfully running in any Rolling stock since at-least four years. The details of supply during last 10 years, product type, rolling stock type, testing details of the products etc. shall be provided by the OEM along with the performance certificate from the user Railways with the EOI.

1.12. RDSO will scrutinize the documents submitted by the respective firms and user Railway's performance certificates and shortlist the firms and their product for verification of its properties and service worthiness trials.

1.13. The samples of the products shall be provided by the firm for technical properties verification. The properties of the product shall be verified by RDSO at its testing laboratory.

1.14. Based on the documents submitted, testing reports and standard committee recommendations, the prototype items will be developed by the firm in association with RDSO.

1.15. Service worthiness trials of the above items will be performed by RDSO in two rakes of BLC / BCN type wagons over the Indian Railways (IR) tracks for 1 year for performance evaluation.

1.16. Based on the trial performance report, the specification of the non-metallic liners / packing plates shall be finalised by RDSO.

1.17. Further, based on the trial performance report, the decision for replacement of the existing metallic liners with the non-metallic liners / packing plates shall be taken by the standard committee. If recommended, the replacement may be performed by the Zonal Railways during Periodic Over-hauling (POH) schedule.

2. DETAILS OF LINERS / PACKING PLATES FOR CASNUB BOGIES:

2.1. The details of the liners of CASNUB bogies are as follows:

S. No.	Item's Description	Material's Specification (Existing)
1.	Centre Pivot (Horizontal wear liner) Item No. 3 of Drawing No. WD-97049-S/3	IS: 276, Grade-1, Hardness to IRS-R65
2.	Centre Pivot (Vertical wear liner) Item No. 4 of Drawing No. WD-97049-S/3	
3.	Brake Beam pocket wear liner / plate Item No. 9 of Drawing No. SK-69597	IS: 3885, Part-1, Grade 4
4.	Packing Plate (12mm) Item No. 1 of Drawing No. WD-91074-S/1	IS: 2062, Gr. E-250
5.	Packing (37mm) Item No. 2 of Drawing No. WD-91074-S/1	IS:1875 Class 3 / IS:1030 Gr. 280-520N

2.2. Technical details and drawings of these liners / packing plates are given in **Annexure I, II and III.** Most of the technical information of the above items being used by IR has been provided through this FRS. However, the firm may ask any other additional information, in any, required by them or discuss it with RDSO.

3. MATERIAL

Wear resistant material (non-metallic) having following desirable properties may be used for these liners / packing plates as per the requirement of the application:

(a) High resistance to wear and abrasion.
(b) High load strength, very low creep rate under load and high fatigue strength.
(c) Water swell resistant.
(d) Low coefficient of thermal expansion.
(e) Suitable for unlubricated and dirty applications.
(f) Excellent cold flow resistance.
(g) Ability to withstand high impact loads.
(h) Coefficient of friction should remain consistent even with a rise in temperature.

(i) A self-lubricating and nonstick surface.
(j) Excellent high temperature (up to 90^0 C) and low temperature (-10^0 C) properties.
(k) Any other properties required for better performance, if any.

4. PHYSICAL PROPERTIES

Following physical properties of material of non-metallic item shall be checked from the finished product wherever practicable and the remaining checks shall be carried out from the test specimen prepared under the identical conditions of moulding of non-metallic items using the same raw material. The checks shall be conducted as per methods given in relevant standards to the raw material of non-metallic item. The values recorded shall be in the following format: -

S. No.	Property	Test Method	Units	Permissible Limit
1	Specific Gravity	ASTM D 792	-	To be decided by the firm as per their item's raw material
2	Hardness	ASTM D 2240	Shore 'D'	
3	Tensile Strength at yield	ASTM D 638	MPa	
4	Compressive strength at 5% deflection	ASTM D 695	MPa	
5	Izod Impact Strength (Notch)	ASTM D 256	Joules / m	
6	Melting Point	ASTM D 3148	^{0}C	
7	Flexural Modulus	ASTM D 790	MPa	
8	Water absorption	ASTM D 570	%	
9	Coefficient of friction (between polymer and steel)	ASTM D 1894	-	
10	Compression Set	ASTM D 395	%	
11	Wear rate	ISO 7148-2	µm / km	

The firm may suggest their own material, properties, permissible limits and standards for their offered items. Based on the documents submitted, testing reports and their performance certificate from the OEM, RDSO may accept the material for development of the prototype and further service worthiness trials, as described above.

5. ENVIRONMENTAL CONDITIONS:

The subject wagons shall have to work over all BG Routes (1676 mm) of IR under the following conditions:

1.	Altitude	Up to 1800m from mean sea level (M.S.L.)
2.	Operating Temperature	-1^0C to 55^0C During dry weather, the atmosphere is likely to be dusty.
3.	Humidity	Up-to 100%
4.	Rainfall	Very heavy in certain areas.

6. SCOPE OF WORK:

6.1 The firms having experience in this field, having quality product to survive without any check for at-least 18 months Routine Over-hauling (ROH) schedule and interested for empanelment regarding manufacture and supply the CASNUB bogie's non-metallic liners for trial, may participate the Expression of Interest (EOI).

6.2 The firm shall provide the technical properties, testing details, supply, product type & it's application, rolling stock details (Axle load, Track Gauge, Operational speed,

Vehicle & Bogie type, User Railways & Country etc.) of the offered item. The same shall be supported by the certified copy of purchase order, performance certificate from the concerned Railways and any other relevant documents.

6.3 The manufacturer shall provide the advantage for the use of non-metallic liners / packing plates over the metallic liners / packing plates. The technical details in terms of the wear rate / expected life of the products shall be provided.

6.4 The firm shall give clause by clause compliance to the FRS as acceptable or not. Any deviation, if required, shall be clearly described along with the supporting documents.

6.5 The non-metallic liners for centre pivot, brake beam pocket and packing plates shall be such that it may replace the existing items without any issue.

6.6 The properties of the non-metallic liners / packing plates shall be verified by the RDSO testing laboratory w.r.t the respective specification / other requirements. The firm shall also provide the fixing / locating arrangements of each non-metallic item, so that it works properly at its position during the service.

6.7 The firm may suggest a single material or different materials for each item, based on the operational conditions.

6.8 Service worthiness trials of the above items supplied by the successful tender will be performed by Indian Railways in two rakes of BLC / BCN types of wagons over the IR tracks for 1 year for performance evaluation.

6.9 The racks shall be fitted with existing (metallic liners / packing plates) as well as non-metallic liners / packing plates (supplied by the firms) for comparative performance study.

6.10 IR may float a limited tender / open tender (based on their requirement) and recommendation of the standard committee, with all conditions like Eligibility Criteria etc. and the participation in this EOI doesn't guarantee any qualification to that tender.

7. TYPE OF APPLICANT

7.1. The firm shall be capable to manufacture and supply the non-metallic liners / packing plates as per the specification / operational requirements of that item.

7.2. The applicant can be a single entity, proprietary firm, partnership Firm, Limited / Public Limited Company, Indian Railways PSUs.

7.3. A firm is not permitted to submit application for empanelment in more than one name or a Firm.

7.4. A partner of a firm or a Director of a firm for which EOI is received cannot be a partner/director in any other firm for which EOI is received by RDSO for the instant empanelment.

8. COST OF PROPOSAL:

The Firm / Agency shall be responsible for all the costs associated with the preparation of their proposal and their participation in the selection process. RDSO will not be responsible or in any way liable for such costs, regardless of the conduct or outcomes of the selection process.

9. EVALUATION OF CREDENTIALS FOR EMPANELMENT:

The Firms / Agencies shall be empanelled with RDSO for the subject work based on their following details and scrutiny of the submitted documents / facts by RDSO:

S. No.	Item
1.	Details of employed personnel having expertise in the design of various non-metallic liners of freight / passenger / railway vehicle, their qualifications, field of specialisation, details and number of years of their experience.
2.	Details of supplies made by the firm in last 10 years of the Non-metallic liners / packing plates of freight / passenger / railway vehicle along with vehicle's details i.e. Axle load, track gauge, operational speed, bogie type, operational Railway / Country and its performance details i.e. field life, wear rate etc. along with performance certificate from the operational Railway / Country.
3.	Details of supplies of Non-metallic liners / packing plates of freight / passenger / railway vehicle along with vehicle's details i.e. Axle load, track gauge, operational speed, bogie type, operational Railway / Country and its performance details i.e. field life, wear rate etc. along with performance certificate from the operational Railway / Country made by the firm across globe for Railways in last 10 years.
4.	Details of Patent held, Intellectual Property Right (IPR) held and MoU/agreement signed.
5.	Average Financial Turnover/contract receipts during last 3 financial years and the current financial year up to the end of the previous month in which EOI is invited: Year in which no turnover is shown would also be considered for working out the average turnover.

10. EVALUATION CRITERIA AND METHOD OF EVALUATION:

10.1. The Shortlisting of Firm / Agency shall be done, based on the information submitted by them as per Para 3, 4, 6 & 9, evaluation of firm's experience, credential etc.

10.2. Screening of EOIs shall be carried out as per criteria decided by RDSO and based on testimonials submitted.

10.3. Agencies who qualified as per the eligibility conditions may be required to make a presentation, if required, to a selection committee show-casing their proposals.

10.4. Proposals submitted by the agencies will be scrutinised by the standard committee and based on their recommendation, appropriate action regarding preparation of specification, further process to adopt for manufacturing, testing and supply of the non-metallic liners / packing plates shall be finalised and communicated to the participants of the EOI.

10.5. Based on the standard committee recommendations, the prototype will be developed and service worthiness trials of the above items will be performed by Indian Railways in two rakes of wagons over the IR tracks for 1 year for performance evaluation.

10.6. After the service worthiness trial's performance, the specification shall be revised and finalised.

11. INFORMATION TO BE SUBMITTED BY THE APPLICANT:

As asked under Para 3, 4, 6 & 9 of this document.

12. ACCESSING / PURCHASING OF EOI DOCUMENTS:

The EOI document can be downloaded free of cost from the "Expression of Interest" link on the left bottom side of the RDSO official website's i.e. **www.rdso.indianrailways.gov.in** Home page.

13. MODE OF SUBMISSION:

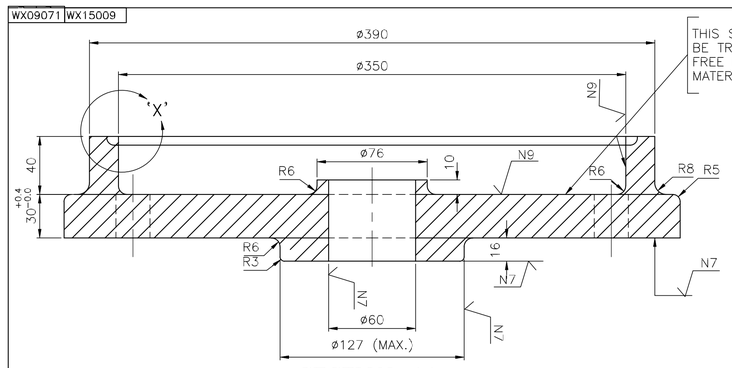
This EOI document and credentials required for scrutiny as mentioned in EOI shall be duly signed on all pages by authorized signatory and company stamped & submitted "off-line" i.e. in Hard Copy or "on-line" in scanned copy. The authorised signatory of the applicant must be in possession of Power of Attorney before submitting the signed documents against EOI.

14. ADDRESS FOR COMMUNICATION:

Abhishek Kumar Gautam
Director (Bogie),
Wagon Directorate
Annexe-I (Manak Bhawan) Building,
RDSO, Lucknow
Mob no. 9794863259
Email: abhishek.agautam@gmail.com

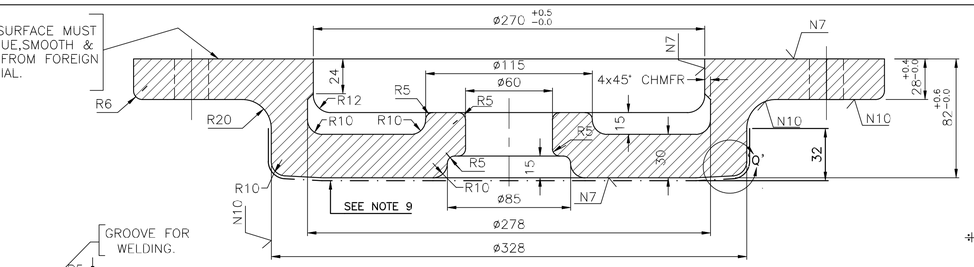
ANNEXURE-IA

WX09071 WX15009

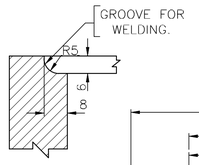


SECTION–AA

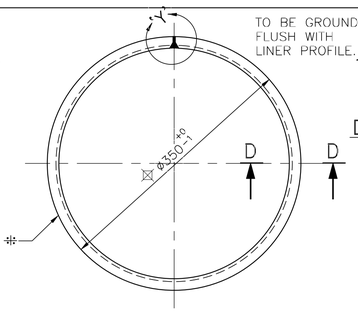
THIS SURFACE MUST BE TRUE,SMOOTH & FREE FROM FOREIGN MATERIAL.



SECTION–BB

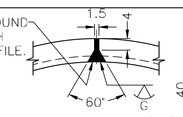


DETAIL AT 'X'

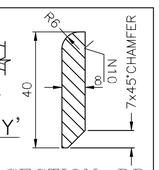


4

TO BE GROUND FLUSH WITH LINER PROFILE.



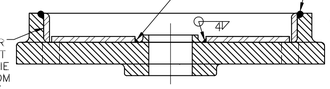
DETAIL AT 'Y'



SECTION–DD

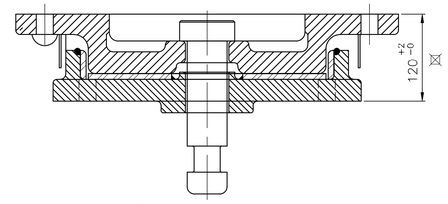
CONTINOUS WELD NOT TO EXTEND BEYOND TOP SURFACE OF HORIZONTAL WEAR LINER.

ALL ROUND WELD DO NOT GRIND WELD FLUSH. WELD BEAD APPROX. 1.5mm ABOVE CASTING IS ACCEPTABLE.

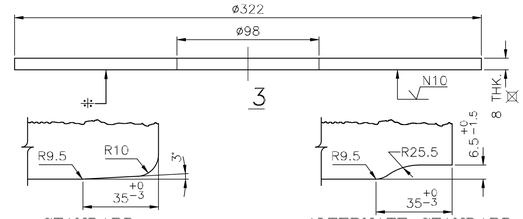


VERTICAL WEAR LINER MUST BE IN CONTACT WITH INSIDE OF BOGIE CENTRE PIVOT BOTTOM RIM AND BOTTOM OF THE RING MUST SEAT TIGHTLY BEFORE WELDING.

BOTTOM PIVOT WITH LINERS



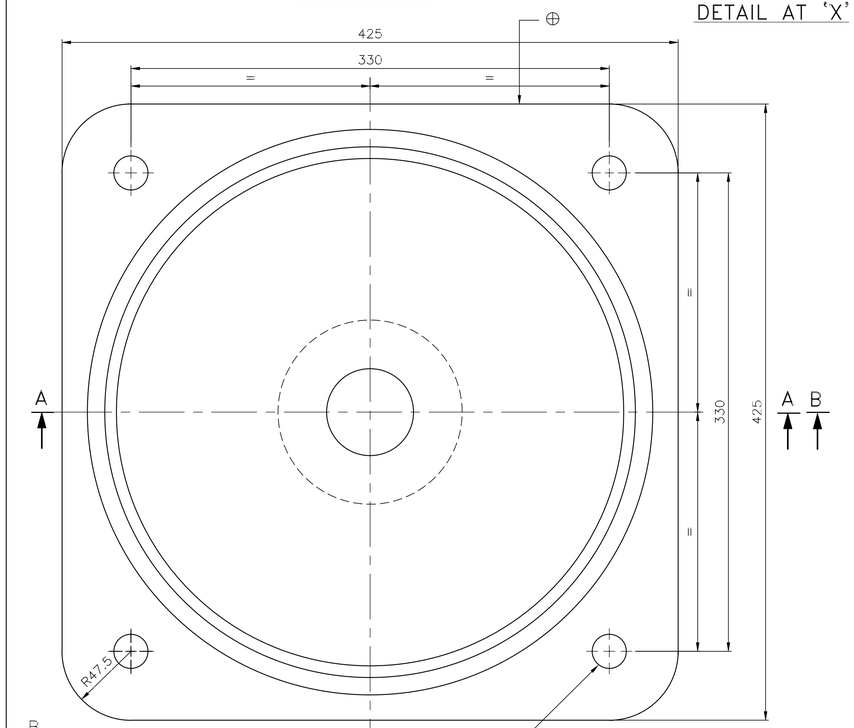
ASSEMBLED VIEW



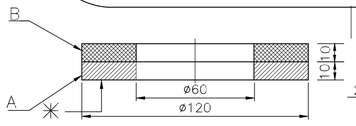
3

STANDARD ALTERNATE STANDARD

ENLARGED DETAIL AT 'Q'



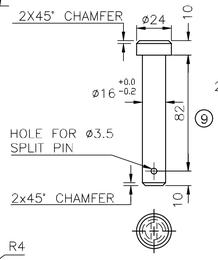
1



5

REF.LET	MATERIAL	SPECN.
A	STEEL	IS:2062 E–250A
B	VULCANIZED NATURAL RUBBER BASED BLACK COMPOUND.	IS:5192

PART 'B' TO BE GLUED/BONDED TO 'A' IN A DIE.



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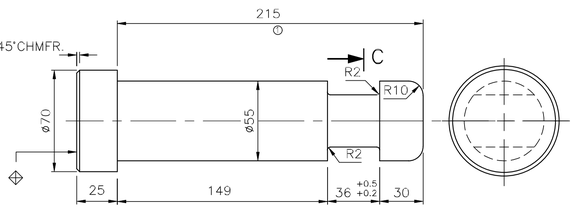

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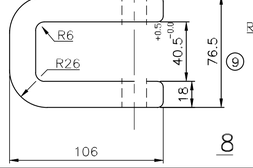

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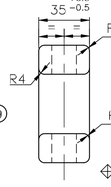

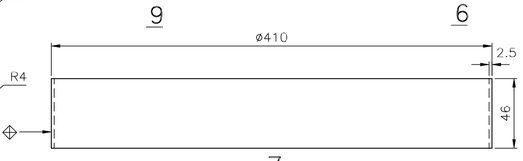

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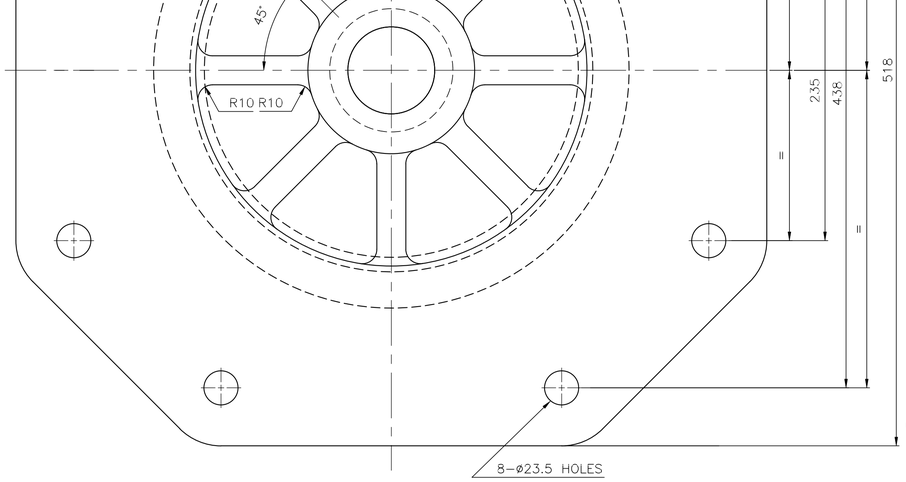
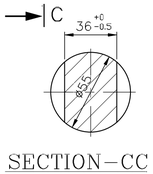


2



SECTION–CC

NOTE:–

1. SURFACE ROUGHNESS VALUES TO IS:3073.
⑨ ⊕ 2. STAMP DRG.NO./ITEM NO.,MANUFACTURER'S INITIAL,MONTH & YEAR OF MANUFATURING IN 6 mm. TYPE.
✳ 3. EMBOSS DRG.NO./ITEM NO.,MANUFACTURER'S INITIAL, MONTH & YEAR MANUFACTURE ON PART 'A' IN 6mm. TYPE.
4. CENTRE PIVOT BOTTOM & TOP (ITEM 1 & 2) ARE TO BE PROCURED FROM SOURCES APPROVED BY R.D.S.O.
⊕ 5. DRG.NO.,ITEM NO.,MANUFACTURER'S INITIAL,S.NO. OF CAST, MONTH & YEAR OF MANUFACTURING TO BE CAST IN 10mm RAISED LETTERS TYPE.
6. DIMENSION MARKED AS ⊠ IS TO BE STRICTLY MAINTAINED. (ONLY FOR ITEM NO.6)
7. SURFACE FINISH OF 'N7' ALL OVER, UNLESS OTHERWISE STATED.

⑧ 8. MATERIAL FOR ITEM–3 AND 4:–

A. MATERIAL SPECIFICATION TO IRS:R65–78

B. MECHANICAL PROPERTIES AND CHEMICAL COMPOSITION SHALL CONFORM TO IS:276–1969 Gr–1 EXCEPT HARDNESS

C. HARDNESS – AS PER SPCIFICATION IRS:R65–78

9. HEAT TREATMENT
THE HEAT TREATMENT CYCLE SUITABLY ADJUSTED BY MANUFACTURER TO ACHIEVE FULLY AUSTENITIC STRUCTURE.

10. SURFACE MARKED''– – –'' THUS OF CENTRE PIVOT TOP (ITEM 2) SHALL BE SURFACE HARDENED UPTO DEPTH OF 3mm. VALUE OF HARDNESS SHALL BE 300 BHN MINIMUM AT 3 MM DEPTH.

⑯ ✳ 11. MANUFACTURERS INITIAL, MONTH & YEAR OF MANUFACTURING SHALL BE MARKED BY METAL LASER ENGRAVING IN 6mm SIZE & 0.1mm DEPTH MIN. LINER SHALL BE FITTED IN SUCH A WAY THAT MARKING LIES ON OPPOSITE TO WEARING SURFACE.

ITEM	DESCRIPTION & DIMENSIONS	NO.OFF PER BOGIE	REF.DRG	WT.OF ONE (Kg)	MAT.& SPEC	REMARKS
9.	LOCK PIN	1	–		IS:1875Cl–III	NORMALISED
8.	SHACKLE LOCK	1	–		IS:2004 Cl–2	
7.	DUST SHIELD	1	–		IS:1079 Gr–2	
⑨ 6.	CENTER PIVOT PIN	1	–		IS:2062,Gr.E450A	
5.	WASHER	1	–		SEE TABLE	
4.	VERTICAL WEAR LINER	1	–		SEE NOTE–8	
3.	HORIZONTAL WEAR LINER	1	–		SEE NOTE–8	
2.	BOGIE CENTRE PIVOT TOP	1	–		M–201 Gr.'C'	HARDNESS 179–241 BHN
1.	BOGIE CENTRE PIVOT BOTTOM	1	–		M–201 Gr.'C'	HARDNESS 179–241 BHN

ALT.	ITEM	AUTHY.	DESCRIPTION	DATE	CKD	ASSEMBLY DRAWING
⑩	3,4	WD–23092	NOTE–11 ADDED.	11/23		
⑨	8,9&6	WD–23008	DIMENSION REVISED IN ITEM NO.8&9, NOTE 2 REVISED, MATERIAL CHANGED FOR ITEM NO.06	02/23		
⑧	3&4	WD–18058	NOTE–8 REVISED	08/18		
⑦	–	WD–15027	PRELIMINARY SKETCH: ONLY FOR PROTOTYPE APPLICATION (UNDER GUIDANCE TO RDSO) DELETED FROM INDEX.	06/15		

SUPERSEDED BY

SUPERSEDES DATE

SCALE PASSED

1:2 CHECKED dixit.S.C 11/97

1:2.5 DRAWN sharma.s.k 11/97

TRACED

J.SHEET WD–97049

CASNUB 22HS, CASNUB 22HS(MOD–I) & IRF–108HS BOGIE

CENTRE PIVOT ASSEMBLY AND DETAILS

B.G. R.D.S.O. [W]

GROUP

WD–97049–S/3

ANNEXURE-IB

IRS : R65-78

GOVERNMENT OF INDIA

MINISTRY OF RAILWAYS

(RAILWAY BOARD)

INDIAN RAILWAY

STANDARD SPECIFICATION

for

ROLLED/FORGED AUSTENITIC MANGANESE STEEL PINS, BUSHES AND LINERS
(Tentative)

Serial No. R65-78

Issued by

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(Railway Board)

INDIAN RAILWAY

STANDARD SPECIFICATION
for

ROLLED/FORGED AUSTENITIC MANGANESE STEEL PINS, BUSHES AND LINERS

(Tentative)
Serial No.R65-78

0. FOREWORD

0.1 This Specification is issued unde the fixed serial No. R65, the final number indicates the year of original adoption as standard, or in the case of revision, the year of last revision,

ADOPTED 1978

0.2 Rolled or forged austenitic manganese steel pins, bushes and liners are used extensively on the Indian Railways roling stock, particularly on the bogies, on account of their wear-resistance properties. So far no comprehensive IS or IRS specification exis's for these components and this Standard has been prepared with a view to facilitate indigenous development of these components.

0.3 The following specifications have been referred to in preparing this standard

IS : 276-1969	..	Specification for Austenitic manganese steel castings (second revision).
UIC Code 893	...	Specification for sheets for wearing plates or wear plates in manganese steel.
SNCF Specn. No. 61-F		Technical Specification for the Supply of forgings (wrought steel pieces) of manganese steel.

0.4 This standard, as formulated at present, envisages the components to be delivered in austenitic state with a certain amount of cold working, so as to achieve the specified hardness and thickness limits of Cl, 7.1.1 & 4.1 respectively. Cold-rolled and gauged plates, showing heavy cold-working and precise gauging, such as to Category E of U. I. C. 893 are not covered in this standard as facilities for achieving heavy cold-working necessary for precise gauging, are not easily available in the country. As and when indigenous technology is developed in this regard, the inclusion of liners and plates, such as to Category E of U. I. C. 893, would be considered.

0.5 Whenever reference to the standard mentioned in this specification, it shall be taken as a reference to the latest version of the standard.

0.6 This specification is intended chiefly to cover the technical provisions relating to supply of the material and so does not include all the provisions of a contract.

1. SCOPE

1.1 This standard covers the technical requirements for forged/rolled austenitic manganese steel pins, bushes and liners, for use on the rolling stock of Indian Railways, particularly on the bogies.

2. MANUFACTURE

2.1 All pins, bushes and liners shall be manufactured from austenitic manganese steel, produced by open hearth, electric or a combination of these processes, followed by a process of forging or rolling or, by a combination of rolling and forging. In case any other process for manufacture of steel and the finished component is employed, prior approval of purchaser should be obtained.

2.2 The supplier should submit the details of the sequence of forging, and/or rolling operation for prior approval of purchaser.

2.3 All operations shall be carried out with utmost skill and correct procedure, so as to ensure homogeneity of micro-structure and freedom from surface and internal defects.

3. MATERIAL

3.1 The steel used for the manufacture of pins, bushes and liners shall conform to Grade I (i. e. CS120 Mn12) to IS:276-1969.*

* Indian Standard Specification for austenitic manganese steel castings. (second revision).

4. DIMENSIONAL TOLERANCES

4.1 The tolerance on the dimensions shall be as indicated in the relevant drawings of the components. Failing such indication, for the liners, the following tolerances, expressed in mm, shall be achieved.

Length	Width	Thickness	Flatness (checked transversely and longitudinally).
±2.0	±2.0	±0.2	≤1.5%

The tolerance on the thickness, may be achieved by slight cold working. In addition, the thickness of the liners shall not differ, between any two points, by more than 0.05 mm.

5. FREEDOM FROM DEFECTS

5.1 The pins, bushes and liners shall be free from any internal defects. Further the surfaces of pins, bushes and liners shall be smooth and free from any crack, flaw, burr, groove, fold, lack of metal or any other injurious defect. The edges and faces of the liners shall be carefully cut to profile as per relevant drawings and all sharp edges shall be deburred and well dressed.

5.2 By mutual agreement between the manufacturer and the purchaser/Inspecting Authority, any superficial defect may be eliminated by slight grinding without heating of the pieces, within the permissible dimensional tolerance limits. Concealment of defects shall be strictly forbidden and entails rejection of the complete supply.

6. HEAT TREATMENT

6.1 All the components shall be suitably heat treated to render them tough and ductile. The heat-treatment cycle shall be suitably adjusted by the manufacturer to achieve fully austenitic structure at the ambient temperature.

6.2 A record of heat-treatment of the components shall be maintained by the manufacturer, a copy of which shall be supplied to the purchaser or his representative, as and when required by latter.

7. TESTS

7.1 Hardness

7.1.1 The hardness of the components in heat-treated condition, when tested in accordance with IS:1500-59,* shall not exceed 250 HB unless otherwise agreed to between the manufacturer and the purchaser/Inspecting authority.

7.2 Bend Test

7.2.1 The bend test shall be carried out in accordance with IS; 1599-74.**

7.2.2 The test bar size for the pins shall be 20 x 13 mm in cross section and 200 mm long, with the edges rounded to a radius of 1.5 mm maximum.

* Indian Standard Specification for Methed for Brinell Hardness Test for Steel.

** Indian Standard Specification for Methed for Bend Test for Steel Products other than sheet, strip, wire and tube.

7.2.3 The test bar size for bushes and liners shall be, 40 mm wide, 200 mm long, and of the same thickness as the liners/bushes it represents.

7.2.4 The test bar, as specified in Cl. 7.2.2/7.2.3, shall be capable of being bent cold, without any fissure or crack, around a mandral of 50 mm dia., through an angle of 150°.

7.3 Microstructure

7.3.1 One representative sample, from each heat treatment batch, shall be tested for micro-structure examination.

8. SAMPLING

8.1 The complete chemical analysis of the steel used, shall be supplied by the manufacturer for each cast. For cross check, samples as desired by the purchaser/inspecting authority, shall be supplied by the manufacturer.

8.2 Sampling for hardness, bend tests and micro-structure examination.

8.2.1 One representative sample shall be taken for each heat treatment batch, per cast. The frequency of testing shall be as per mutual agreement between the manufacturer and the purchaser/inspecting authority.

9. SUBMISSION FOR ACCEPTANCE

9.1 The pins, bushes and liners shall be submitted for inspection in lots of each size, with details of cast/heat-treatment batches and the results of chemical and mechanical tests.

9.2 Dimensional check shall be carried out individually on all the components offered for acceptance.

10. RETESTS

10. Should any of the original test pieces/samples fail to comply with any of the requirements of clauses 3 and 7, two further samples representing the same lot of components, shall be selected and tested in the same manner. If the failure is in respect of micro-structure, hardness and bend tests, the manufacturer shall have the right, if he so desires, to reheat treat (not more than twice) the batch, before two further retest samples are selected. Should the two further test samples satisfy the requirements of this standard, the batch represented by them shall be accepted. Should either of the test samples fail, the batch represented shall be deemed as not complying with this standard.

11. OPTIONAL TESTS

11.1 Should the purchaser/inspecting authority so desire, the following additional tests shall be conducted by mutual agreement between the manufacturer and the purchaser. The frequency of testing is also to be decided by mutual agreement.

12.TENSILE TEST FOR PINS

12.1 The test piece for tensile test shall be rough forged from circular section, and then machined to a diameter of 20mm and it shall undergo the same heat-treatment as the batch it represents. The following properties shall be achieved:

UTS	90 Kg/mm² minimum
Yield	33 Kg/mm² minimum
Elongation (GL $5.65\sqrt{So}$)	40% minimum

Where So=Area of cross-section.

NOTE : Any other size of the test piece shall be mutually agreed to between the manufacturer and purchaser/inspecting authority.

13. CRUSHING TEST FOR BUSHES

13.1 The representative sample bushes shall be subjected to cold crushing or squeezing to such an extent that its internal diameter is reduced to 1/3, without the appearance of any visual crack or fissure.

14. TESTING AND INSPECTION FACILITIES

14.1 The manufacturer shall provide all testing facilities required for tests free of charge and shall at his own cost supply all labour, appliances, tools and gauges necessary for testing and inspection in accordance with this standard.

15. PROTECTION AND PACKING

15.1 The surfaces of the components shall be protected by a coat of non-drying oil free from foreign bodies and evenly spread so that the conditions of transport handling and storing do not cause any rusting for at least six months.

15.2 The component shall be protected by an appropriate packing, in order to avoid any damage or distortion, during handling and transport.

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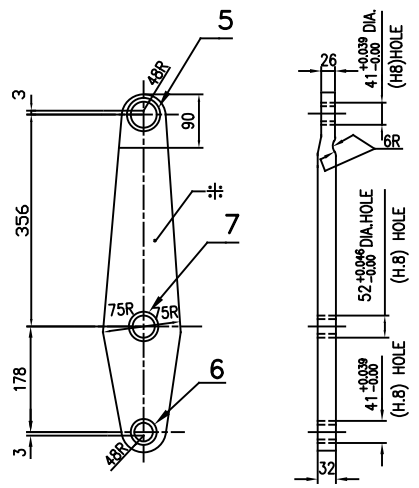
WX06055 | WX23024

ANNEXURE-II



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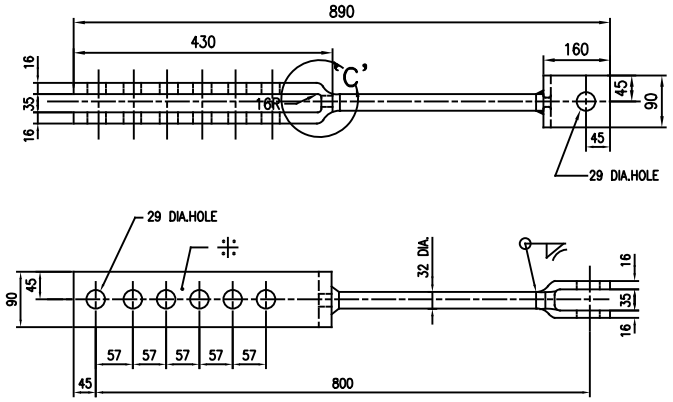

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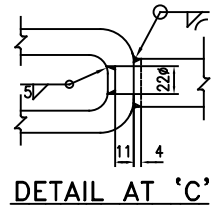

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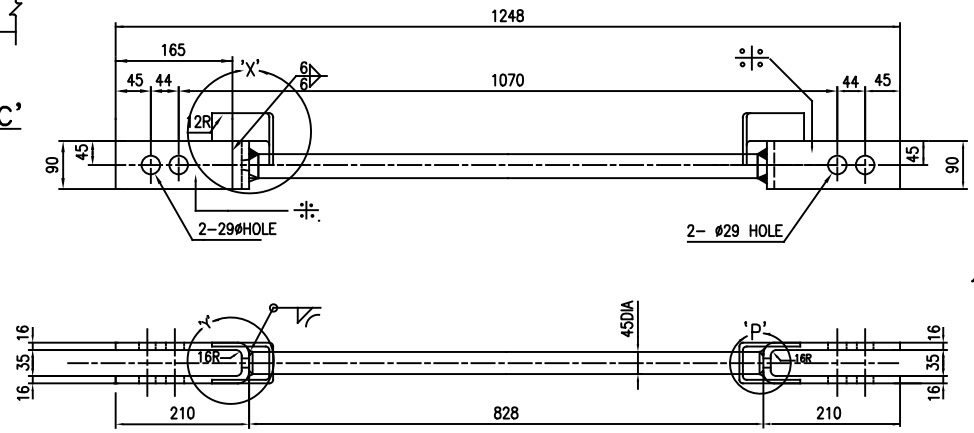

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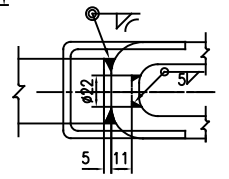

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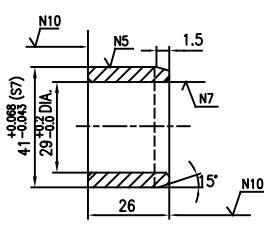

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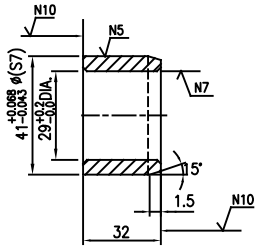

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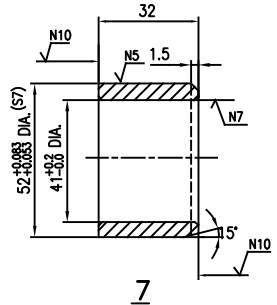

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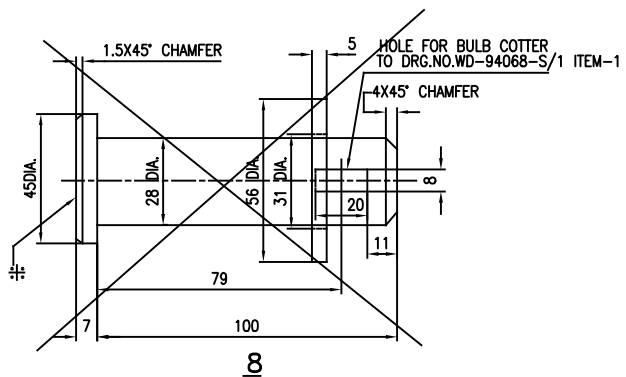

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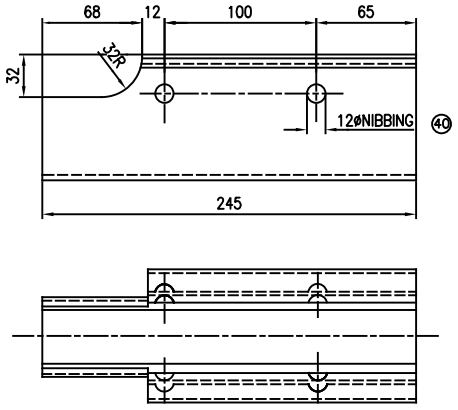

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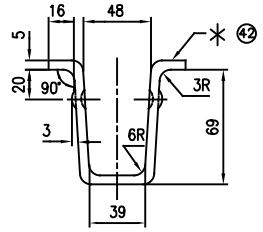

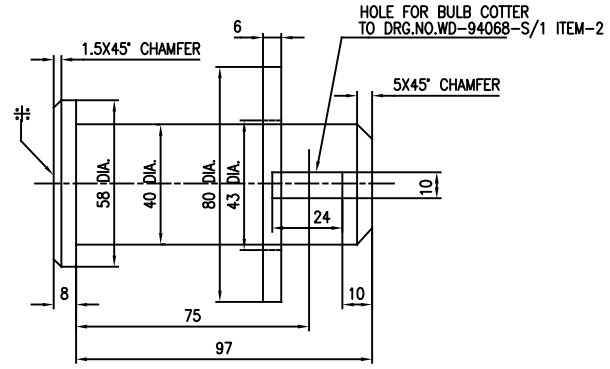

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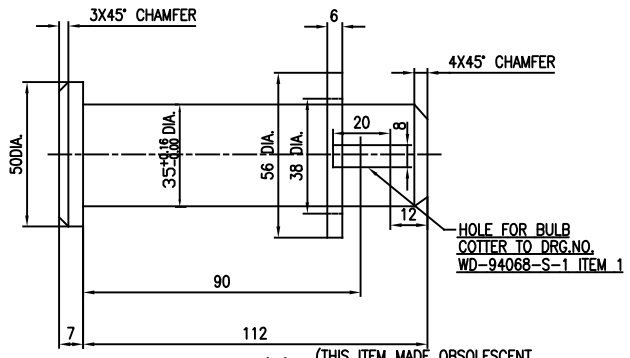
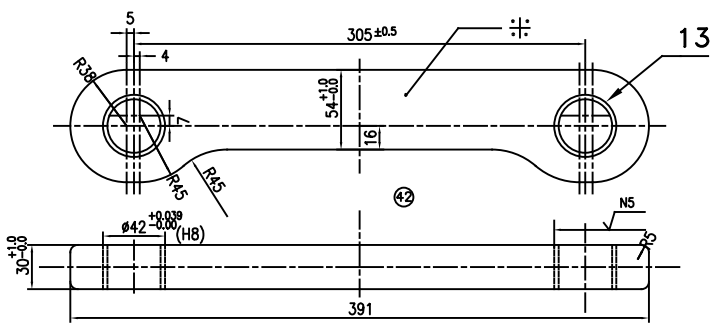


11 (THIS ITEM MADE OBSOLESCENT &SUPERSEDED BY ITEM-15)



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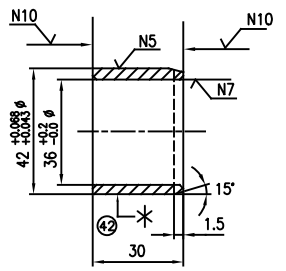

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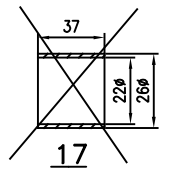

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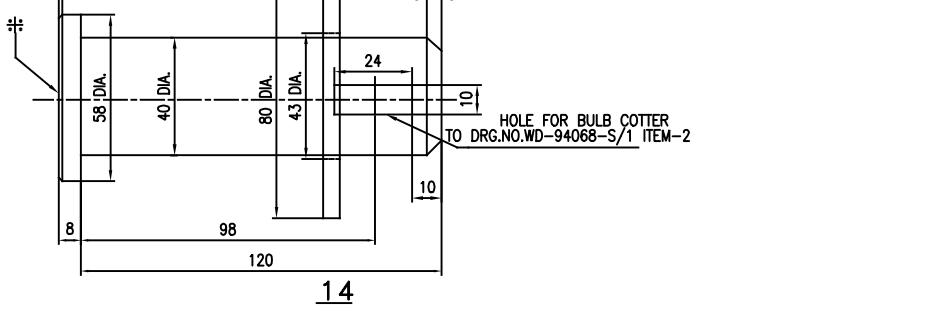

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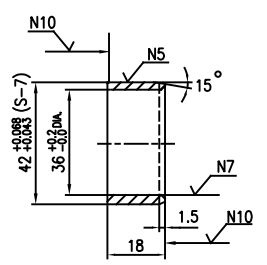

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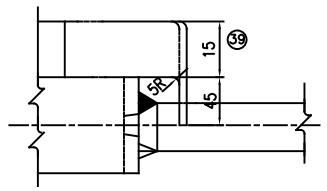

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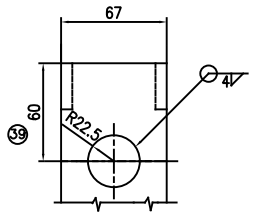
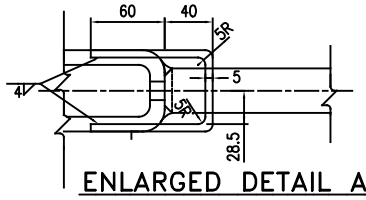


VIEW FROM 'X'



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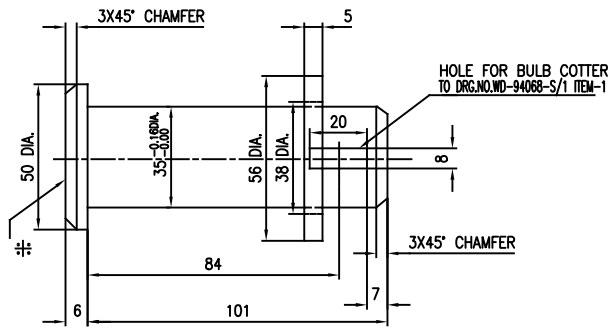


15

NOTE:-

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. DELETED.
3. ITEM NO.2 & 3 SHALL BE TESTED FOR A LOAD OF 18t. APPLIED AXIALLY.
42 ✠ 4. STAMP DRG. NO.,MANUFACTURERS INITIAL, MONTH & YEAR OF MANUFACTURING IN 6mm TYPE.
5. SURFACE ROUGHNESS VALUES SHALL BE AS PER IS:3073.
6. HARDNESS OF PINS & BUSHES TO BE 250 – 300 BHN.
✡ 7. MATERIAL FOR PIN AT ITEM NO.10,11,14 & 15 IS TO BE AS PER IS:5517,45,C-8 AND MATERIAL FOR WASHER AT ITEM NO.10,11,14 & 15 IS TO BE AS PER IS:2062 Fe 410 WA
41 8. ITEM NO 8 HAS BEEN REPLACED BY STANDARD PIN TO DRG. NO. W/PN-90. (REFER BOGIE BRAKE GEAR ARRANGEMENT OF CASNUB BOGIES.)
42 ✠ 9. MANUFACTURERS INITIAL, MONTH & YEAR OF MANUFACTURING SHALL BE MARKED BY METAL LASER ENGRAVING IN 6 MM SIZE & 0.1mm DEPTH MINIMUM.

42	9	WD–23092	NOTE NO. 4, ITEM-12 REVISED AND NOTE 9 ADDED. MARKING ON ITEM-13 ADDED.	11/23
41	8	WD–06058	NOTE NO. 8 ADDED.	08/06
40	9	WD–06013	BHN NO. OF ITEM NO.9 CHANGED FROM 380–420 TO 330–401.	03/06
			DRAWING REDRAWN.	10/04
39	3	WD–03026	DIMENSION 53MM CHANGED TO 15MM & DIMENSION 98MM CHANGED TO 60MM.	5/03
ALT	ITEM	AUTHY	DESCRIPTION	DATE

ASSLY. DRG

ITEM	DESCRIPTION & DIMENSION	NO. OFF	REF.DRG.	WT.OF ONE(KG)	MATL.&SPEC	REMARKS
17	~~SPACER~~	2	–	–	IS:2062, Fe410WA.	
16	BUSH	8	–	–	IS:5517,45 C–8	H/TEMPERED
15	PIN WITH WASHER & BULB COTTER	4	–	–	✡	
14	PIN WITH WASHER & BULB COTTER	2	–	1.36	✡	
42 13	BUSH FOR BRAKE BEAM HANGER	8	–	–	IS:5517,45 C–8	H/TEMPERED
42 12	BRAKE BEAM HANGER MODIFIED	4			IS:2004 CL4	NORMALIZED
11	PIN WITH WASHER & BULB COTTER	4			✡	
10	PIN WITH WASHER & BULB COTTER	2		1.065	✡	FOR FABRICATED BRAKE BEAM
42 9	BRAKE WEAR PLATE	4		1.798	IS:3885Pt–1 Gr. IV	330 – 401 BHN
41 ~~8~~	~~PIN WITH WASHER & SPLIT COTTER (W/KY=20)~~	~~5~~		~~1.037~~	~~IS:2062, Fe410WA.~~	
7	BUSH	2		0.120	IS:5517,45 C–8	H/TEMPERED
6	BUSH	2		0.139	IS:5517,45 C–8	H/TEMPERED
5	BUSH	2		0.113	IS:5517,45 C–8	H/TEMPERED
4	–	–		–	–	
3	BOGIE BRAKE PUSH ROD	1		20.410	IS:2062, Fe410WA.	
2	BOGIE END PULL ROD	1		14.780	IS:2062, Fe410WA.	
1	EQUALISING LEVER	2		17.000	IS:2062, Fe410WA.	

SUPERSEDED BY
SUPERSEDES
DATE

SCALE	PASSED	sd.
1:1	CHECKED	sd.
1:2	DRAWN	sd.
1:5	TRACED	
	J.S.NO.	

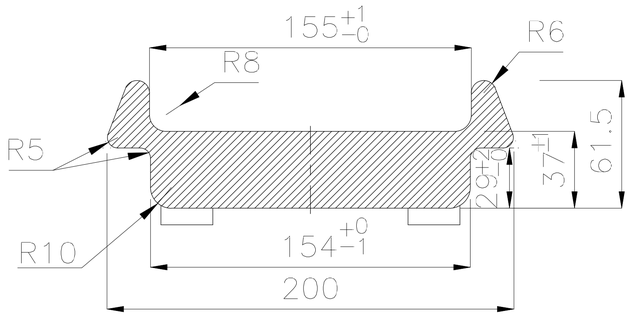
CASNUB 22W,22W(M),22NL, 22NLB, 22-H.S. & 22 NLM BOGIES

BOGIE BRAKE GEAR DETAILS

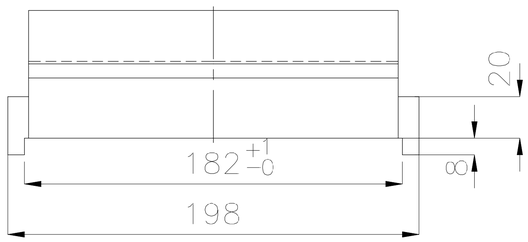
B.G. | R.D.S.O. [W] | GROUP | SK–69597

ANNEXURE-III

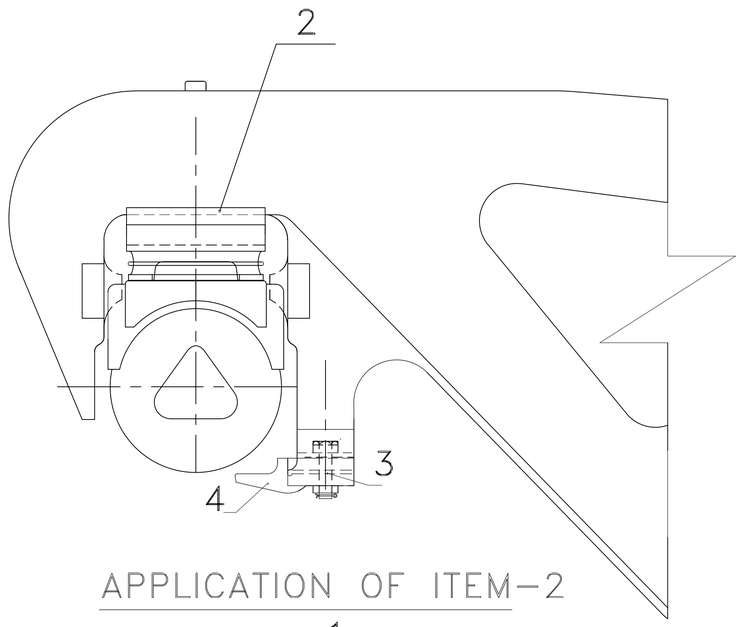
WX21021



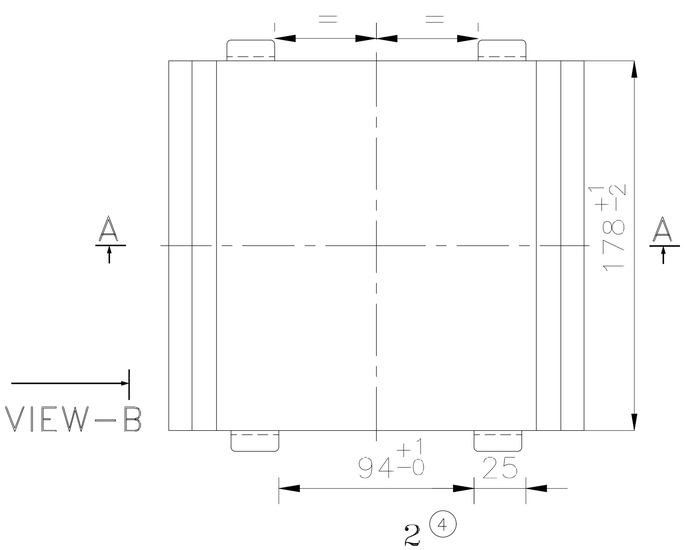
SECTION-AA



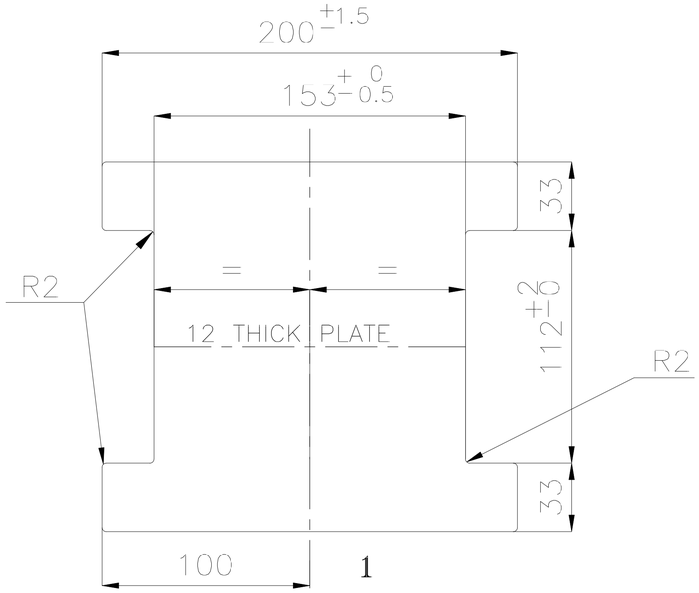
VIEW-B



APPLICATION OF ITEM-2



2 ④



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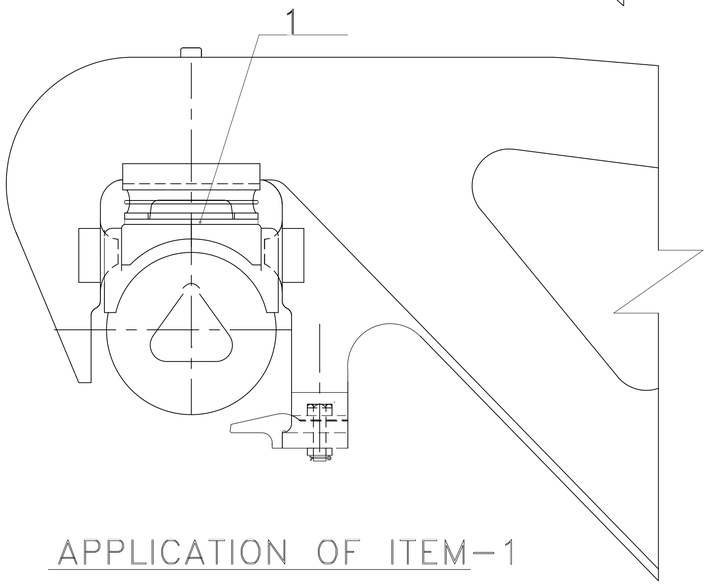

APPLICATION OF ITEM-1

NOTE :-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE STATED. SHARP CORNERS SHALL BE ROUNDED OFF. FOR UNTOLERANCED DIMS. AS LAID DOWN IN IS:2102 (PART-1) MEDIUM CLASS SHOULD BE FOLLOWED.
2. ITEM-1 SHALL BE ASSEMBLED BETWEEN STANDARD NARROW JAW ADAPTER TO DRG. NO. WD-89067-S/9 AND ELASTOMERIC PAD TO DRG.NO.-WD-95005-S/1. WHEN WHEEL TREAD DIAMETER REACHES 954mm SIDE FRAME KEY, KEY BOLT, SPG. WASHER, SPLIT PIN(ITEM-3&4) SHALL BE ASSEMBLED IN USUAL POSITION AS SHOWN IN APPLICATION OF ITEM-1.
3. AS SOON AS WHEEL DIAMETER REACHES 930mm, ITEM-1 SHALL BE REMOVED, ITEM-2 SHALL BE ASSEMBLED BETWEEN ELASTOMERIC PAD & SIDE FRAME, ITEM-3 & 4 SHALL BE ASSEMBLED IN REVERSE POSITION AS SHOWN IN APPLICATION OF ITEM-2.
4. TOP PLATE OF ELASTOMERIC PAD, LUGS OF ADAPTER MAY BE GROUND, IF REQUIRED FOR PROPER SEATING OF THE PACKING.

ITEM	DESCRIPTION & DIMENSIONS	NO. OFF PER BOGIE	REF. DRG	WT OF ONE (KG)	MATL&SPEC	REMARKS
4	SIDE FRAME KEY	4	SK-69594 ITEM-6			
3	KEY BOLTNUT, SP. WASHER	4	SK-69594 ITEM-9			
② 2	PACKING (37MM)	4	–		IS: 1875 CL3 OR IS: 1030 Gr. 280-520N	
1	PACKING PLATE (12MM)	4	–		IS: 2062 Gr. E-250	

ALT.	ITEM	AUTHY.	DESCRIPTION	DATE	ASSEMBLY DRAWING
④	--	WD-23125	ITEM NO. 2 REVISED.	12/23	
③	2	WD-21056	RETRACED IN AUTOCAD & REVISED	7/21	
②	1&2	WD-16013	MAT. SPEC. FOR ITEM NO.1 & 2 REVISED	3/16	
--	--	--	RETRACED	12/97	
①	--	WD-93056	CASNUB22NLM & 22H.S.-ADDED	9/93	

SUPERSEDED BY

SUPERSEDS DATE

SCALE

PASSED	Sd/MEERA	03/92
CHECKED	DIXIT	03/92
DRAWN	SURESH	08/91
TRACED	S.PURI	12/97
J.SHEET		

CASNUB 22NLB, 22HS, 22HS(MOD-I)
① 22HS (MOD-II) & IRF-108HS BOGIES

PACKING FOR HEIGHT ADJUSTMENT

B.G. R.D.S.O. [W] GROUP

WD-91074-S/1