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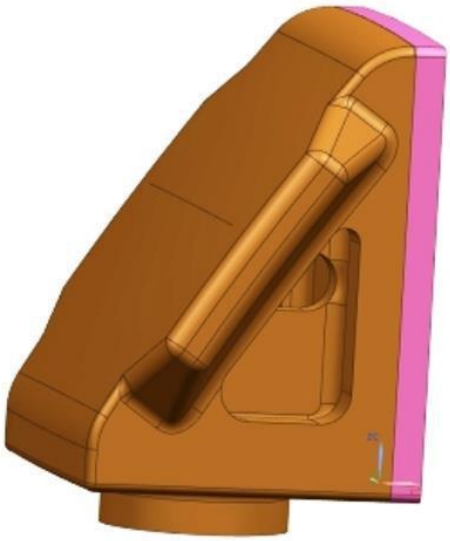
SPECIFICATION OF FRICTION WEDGE WITH SPECIFIED RANGE OF COEFFICIENT OF FRICTION FOR BROAD GAUGE FREIGHT BOGIES



ISSUED BY

WAGON DIRECTORATE

RESEARCH DESIGNS AND STANDARDS ORGANISATION

MINISTRY OF RAILWAYS

MANAK NAGAR, LUCKNOW-226011

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Contents

1.0 GENERAL

1.1 This specification is for Friction Wedges with specified range of coefficient of friction (COF) used in broad gauge freight bogies. It refers to either metallic wedge moulded with Non-metallic composite liner with specified range of COF on its vertical face/slope face/both vertical & slope faces or Complete metallic wedge with specified range of COF. The acceptance is subject to fulfilments of all applicable criteria given in this specification.

1.2 Friction Wedge used in Bogies is an important component as it controls the damping force. Friction Wedge is required to enhance damping characteristics, it improves dynamic behaviour and speed potential of the vehicle.

1.3 Wear in matching faces of Friction Wedge, bolster slope liners and bogie side frame column liners result in reduction of damping force, which adversely affects riding parameters of bogies. As liners on vertical and slope surface are made to IS: 3885 Part-I Gr. IV (with proper heat treatment to obtained hardness up to 380 to 420 BHN), wedge material should be designed so as to work optimally with the liner.

1.4 This specification covers the technical requirements of material, design, infrastructure, manufacture, tests requirements, performance criteria and purchase inspection for Friction Wedges. It does not include all the provisions required for manufacturing of the item.

1.5 This specification draws reference to some of the relevant IS specifications. Latest versions of these specifications shall be taken as reference unless mentioned otherwise.

2.0 SCOPE OF SUPPLY

2.1 Friction wedges shall be used in broad gauge wagons fitted with CASNUB/LCCF/LWLH/RAFTAAR bogies as per the Bogie General arrangement of the respective wagons.

2.2 Space envelop drawing no. WX-10046 (latest) is to be followed for the development of this item. For detailed drawing the RDSO drawing No. WD-22055-S/5 (latest) of Friction Wedge with specified range of COF shall be referred.

3.0 MATERIAL AND PROCESS

3.1 Generally, Friction Wedge with Composite Liner shall consist of two parts, metallic and non-metallic composite liner (without asbestos) combined with hot moulding process. Joining metallic and non-metallic parts by pasting/fastening or by any other means shall not be acceptable.

3.2 For Friction Wedge with Composite Liner, the metallic part shall be cast manganese steel to IS: 276 Grade-I. Firm may offer alternate material with consent of DG (Wagon) RDSO such that it meets the technical and functional requirements of the metallic part of the Friction Wedge as stipulated in this specification.

3.3 For Complete Metallic Wedge, the material shall be Austempered Ductile Iron (ADI) to ASTM A897/A897M and shall meet all technical and functional requirements of the Friction Wedge stipulated in this specification. These properties shall be established in laboratory testing as well as during field monitoring.

3.4 Firm shall submit the detailed test report, documentary evidences, and chemical/metallurgical properties of the material to Wagon Directorate/RDSO, Lucknow for obtaining approval. The material specification shall be submitted by the firm in the drawings/QAP at the time of registration.

4.0 QUALIFYING CRITERIA

4.1 Firms willing to register for manufacture and supply of friction wedges to Indian Railways shall have to fulfil any one of the following Criteria. They shall install adequate infrastructure for manufacturing of friction wedge/composite liner, testing of properties, coefficient of friction measurements and wear parameters as per this specification in India. However, necessary machinery and equipment for measurement of Coefficient of Friction (COF) and Wear Rate as stipulated in this specification may be installed latest before offering Prototype Inspection to RDSO.

4.1.1 Indian firms engaged-in the field of friction damping for Railway applications or in the field of friction lining in Automotive sector or in the field of any other Railway Rolling Stock applications.

4.1.2 Indian firms having collaboration with foreign firms supplying Friction wedges/composite liner to any Rail Road globally. They have to produce technical collaboration tie-up in the field of production and quality control in the form of a written Memorandum of Understanding (MOU). Such MOU must bear the guarantee from the collaborator for quality control and regular production for a minimum period of five years.

4.1.3 Joint venture of Indian and foreign firm or Indian subsidiary of foreign firm supplying Friction wedges/composite liner to any Rail Road globally.

4.2 Firms applying for Friction Wedge with Composite liner may purchase metallic part of the Friction wedge from reputed foundry having in-house manufacturing, heat treatment, laboratory testing facilities for castings with well-established quality control system or from existing RDSO approved metallic wedge manufacturers.

5.0 TECHNICAL REQUIREMENTS

5.1 Vertical face of Friction Wedge has to interact with silico-manganese side frame column liner face made to IS: 3885 Part-I Gr. IV (with proper heat treatment to obtained hardness up to 380 to 420 BHN). Testing of coefficient of friction (COF) and wear rate of composite liner/complete metallic Friction Wedge shall be with this base material. The thickness of composite liner (if applicable) shall be 10 mm. For design purpose of Friction Wedges, maximum permissible wear thickness of vertical and slope surface of the Friction Wedge shall be considered as 07 mm and 03 mm respectively.

5.2 Frictional and wear properties of vertical surface of offered Friction Wedge with matching face of side frame liner are important. Offered design of Friction Wedge shall have following functional properties with respect to silico-manganese liner to IS: 3885 Part-I Gr. IV (with proper heat treatment to obtained hardness up to 380 to 420 BHN):

a) Values of average dynamic coefficient of friction shall be in the range of 0.35 – 0.45.

b) Test shall be conducted on a suitable test machine with suitable procedure as explained in para 5.3.

c) Frictional force versus time graph at each frequency and normal force as stipulated in this specification for entire test shall also be recorded and submitted to RDSO.

d) Average values of COF in static (beginning of forward and reverse stroke) and dynamic state for each frequency and load shall be recorded and reported.

e) Wear rate should not exceed to 3.0 mm3 measured over span of 5 hours. Actual value obtained to be laid down in the Firm's QAP/Drawing approved by RDSO. Firm has to simulate wear rate in lab test so as to calculate the maximum permissible wear of liner/vertical face over entire warranty life of 05 years. Generally, the wagons have to run five lac kilometres in 05 years on IR operations.

5.3 For measuring static/ dynamic COF and wear rate, generally a cylindrical specimen of diameter 10 mm and length 20 mm of Friction wedge/composite liner and a matching square flat specimen of size 40x40x5 mm of side frame liner as per IS: 3885 Part-I Gr. IV (with proper heat treatment to obtained hardness up to 380 to 420 BHN) shall be prepared. Proper matching of mating surfaces (more than 80%) of specimens should be ensured before test for recording of data. Test to be done at room temperature. Different shape and size of the specimen of Friction Wedge/ composite liner can also be used with different normal forces accordingly for the testing of coefficient of friction and wear rate only with the prior approval of Wagon Directorate/RDSO, Lucknow.

5.4 For COF and wear rate measurement, above two specimen samples are placed together and a normal force is applied on sample made by Friction Wedge. One of

the samples is held in a fixed position, while a force is applied to the other sample until they begin to slip against one another. To measure Static and Dynamic coefficients of friction it is necessary to use an instrument in such a way that the relative reciprocating motion occurs between two mating surfaces. Specimens should be connected suitably with the computer to observe value of normal forces, frictional forces, stroke length and frequency given with live display and recording facility. For all other detailed processes, ASTM G-133-05 (latest) shall be followed.

5.5 Performance Characteristics and Evaluation Criteria:

a) Test parameters for COF to be submitted for performance characteristics of the Friction Wedge:

Normal force	Sample size in mm (dxl)	Frequency of oscillation	Stroke Length in mm	Test duration	Average Dynamic COF (0.35-0.45)
108 N	∅10X20	1Hz	25	60 minutes	
108 N	∅10X20	2Hz	25	60 minutes	
216 N	∅10X20	1Hz	25	60 minutes	
216 N	∅10X20	2Hz	25	60 minutes	

b) Test parameters for evaluation of COF and volumetric wear rate:

Normal force	Sample size in mm (dxl)	Frequency of oscillation	Stroke Length (in mm)	Test duration	Average Dynamic COF (0.35-0.45)	Wear rate ($3.0\ mm^3$ Max.)
108 N	∅10X20	2Hz	25	300 minutes		

Average dynamic COF and Wear rate of Friction Wedge specimen has to be in stipulated range.

5.6 Maximum permissible wear thickness of wedge/composite liner vertical face shall be 07 mm. For identification of maximum permissible wear thickness, all corner slots of 07 mm depth on vertical face are provided, as shown in drawing attached with this specification. After the slot is wear out, Friction wedge shall be condemned and replaced with new one.

5.7 Friction wedge experiences a normal load of 1200 Kgf to 2800 Kgf in empty to loaded condition of wagon with vertical face of Side Frame liner.

5.8 Apart from the above, following parameters regarding Friction Wedge have to be submitted by the firm to RDSO with their offer:

A. For Composite Liner of Friction Wedge (if applicable):
   i) Hardness
   ii) Internal Shear Strength
   iii) Compressive Strength
   iv) Density
   v) Water absorption.

These parameters shall be tested as per IS: 2742 or similar national/international specification as consented by RDSO.

Shear strength of bond shall be minimum of 20 Kg/cm^2 (for this test firm shall specify test method in QAP)

B. For metallic part/ complete metallic Friction Wedge:

Physical properties and chemical/ metallurgical test shall be as per relevant National/International specification as consented by RDSO. However, tests for following minimum parameters shall be done as applicable as per the requirement of materials specification:

i) Chemical composition
ii) Ultimate Tensile Strength
iii) Yield Strength
iv) Hardness
v) Elongation%
vi) ADI Microstructure (in case of complete metallic Friction Wedge)
vii) Impact Test as applicable
viii) To Check Casting Defects, following Non Destructive Test (NDT) shall be carried out:
   (a) Magnetic Particle Inspection (MPI) as per IS: 3703 of complete metal part of the Friction Wedge shall be done. No crack shall be permitted.
   (b) Dye Penetrant Test (DPT) as per IS: 11732 on sectioned portion after sectioning as detailed in drawing attached with this specification. No crack shall be permitted.

5.9 Metallic part of Friction Wedge shall be free from all types of casting defects and non-metallic part of wedge, if applicable shall also be smooth, free from air bubbles, surface streaks, splash marks, pinholes, voids, blistering etc. All the edges shall be smooth and neatly finished. Surface finish of metallic surface must be of Class A1 category, as compared with Steel Castings Research and Trade Association (SCRATA) Comparators as per ASTM A 802.

6.0 DRAWING, CRITICAL DIMENSIONS AND TOLERANCES

6.1 Firm has to submit its own drawing for Friction Wedge as per space envelope drawing no. WX-10046 (latest) attached with this specification.

6.2 Firm's drawing must include all critical and other necessary parameters required for manufacturing and inspection of the product.

6.3 Following dimensions as given in above space envelope/drawing are critical hence must be included in offered drawing:

(a) Dimension 113, 151, 69, 90, 130 and 170.

(b) Perpendicularity between springs seat & vertical surface butting against column liner, Radius 940 & 1500 and angle 35 degree.
(c) Wedge wing profile.
(d) Spigot Outer diameter, Inner diameter & Depth (As per material supplied).
(e) Proper slot of 07 mm depth to indicate maximum permissible wear thickness of the Friction Wedge/composite liner at all corners of vertical wear surface. Width of this slot should be minimum 5 mm.

6.4 Proper location for marking for RDSO drawing no. along with variant type and firm's initial with month and year of manufacture on metallic non wearing part of wedge shall be provided. Location should be as shown in attached drawing, suitable to cast min 6 mm size letters.

6.5 Friction Wedge shall be manufactured and inspected as per firm's drawing approved by RDSO. Therefore, firm shall provide dimensions with adequate tolerances on drawing sufficient for critical as well as quality inspection of components. Unspecified tolerances on casting dimension shall be as per IS: 4897 class- 1 categories.

6.6 Inspection of dimensional parameters shall be as per RDSO approved drawing. Gauging of Friction Wedge shall be done as per RDSO gauge drawing nos. WD-97031-S/15 to S/18 or firm's gauge drawings approved by RDSO. All the gauges shall be calibrated regularly with due date mentioned on it and record shall be available.

7.0 REGISTRATION/ APPROVAL PROCEDURE

7.1 The firms having adequate manufacturing and testing infrastructure in-house as per requirements of this specification and willing for registration/approval of their product may apply online as per latest ISO document QO-D-8.1-5 to Wagon Directorate, RDSO, Lucknow along with the documents required as per latest ISO procedure of RDSO.

7.2 The firm shall submit QAP in latest ISO format of RDSO for the product from purchase of raw material to finished product determining and controlling each critical stage in the process. QAP should clearly specify critical stages with their control parameters and system of their measurements.

7.3 RDSO will scrutinise the documents submitted by the firm and if found in order, a team shall be nominated for infrastructure verification and capability assessment (CCA) of the firm. In case of inappropriate/incomplete information during scrutiny, case shall be taken up as per the latest ISO procedure of RDSO and firm shall be informed accordingly.

7.4 After successful verification of infrastructure during CCA of the firm, firm may be registered as 'RDSO Vendor for Developmental Orders', with conditional approval for manufacturing and supply of Friction Wedge as per this specification. However

supply (even for field trials) shall commence only after approval of the prototype by the RDSO.

7.5 After registration of the firm as 'RDSO Vendor for Developmental Orders', with conditional approval, firm has to submit its own drawing of the product for Design Approval including all critical and other necessary parameters given in 'Para 6.0' above for manufacturing and inspection of the product as per space envelope drawing no. WX-10046 (latest) attached with this specification.

7.6 After successful Design & Drawing Approval Firm shall submit their internal test results (ITR) of offered Friction Wedge (with composite liner or complete metallic) for scrutiny, which shall include all required tests mentioned in 'Para 5.0.' to this specification. The firm shall submit functional and physical properties along with chemical/metallurgical properties of the offered Friction Wedge along with method of testing.

The firm willing to supply complete metallic Friction Wedge shall also submit the compliance of the material as per ASTM A897/A897M, duly certifying the ADI casting from a NABL lab/Govt. Lab along with above reports.

Testing of COF and volumetric wear rate as per 'Para 5.0' shall be done by any Govt. Lab or any other lab approved by DG (Wagon), RDSO and report to be sent to RDSO for scrutiny before offering Prototype Inspection of at least 50 Nos. Friction Wedge along with required no. of dumb bells for testing. The wedge shall be offered for inspection before painting. The testing charges will be borne by the manufacturer.

7.7 If firm's ITR and above reports found satisfactory, for Prototype inspection a team will visit firm premises and testing of samples shall be undertaken as per requirements to this specification.

7.8 On account of failure of Prototype case shall be taken up as per extant ISO procedure.

7.9 After successful prototype development, offered design shall be subjected to evaluation through field trial. Firm shall be permitted to supply maximum 20,000 nos. of Friction Wedge as development order to Railways/Wagon manufacturers out of which 1500 Nos. shall be extensively monitored for field trials. During these trials, performance monitoring shall be done in minimum three CC rakes of different wagons fitted with CASNUB 22 NLB/HS and LCCF-20(C) bogies for a period of 09 months. Proper marking/colour coding of trial Friction Wedges shall be done.

The firm shall submit all copies of the purchase order (issued by the purchaser) to RDSO. The wagon depots(s) where the Friction Wedges shall be supplied and fitted

will be nominated by RDSO (Wagon Directorate) in order to monitor their field trial.

The vendor shall also ensure that they do not secure total order quantity more than the limited quantity mentioned in the Vendor Directory.

Supply beyond the field trial quantity shall commence only after successful completion of the field trail.

7.10 The field trial shall be of 09 months period. Measurement of critical parameters shall be done in three CC Rakes during fitment and at the end of the field trial. During field trial period, Friction Wedges shall be examined by nominated depots staffs and in case of failure, Friction Wedge shall be replaced with proper record. Failed Friction Wedge should be retained for examination of the firms/RDSO. In case of abnormal/frequent failure of Friction Wedges during field trial, it should be informed to Wagon directorate, RDSO, Lucknow immediately.

7.11 At the end of the field trial (after 09 months), Friction Wedges shall be jointly examined extensively by RDSO and depot staff and a joint report shall be prepared. Firm representative may also join the inspection, if they wish.

7.12 During field trial period, failure should not be more than 2% of fitted Friction wedges.

7.13 Following shall be the failure criteria after 09 months of trial period for assessment:

a) Damage, De-bonding or separation of composite liner with metallic part (in case of Friction Wedge with Composite Liner) from sides/corners at one or more than one places and amounting to more than 10% of total area.
b) Major cracks/ chipping tendency/deformation in entire metallic/composite liner part.
c) Excess wear (≥1.5 mm) in vertical face and /or (≥1.0 mm) in slope surface of Friction Wedge.

7.14 After successful field trial performance of the offered design, firm may be upgraded from 'RDSO Vendor for Developmental Orders', with conditional approval to 'RDSO Vendor for Developmental Orders', for manufacturing and supply of Friction Wedge as per this specification.

7.15 If firm's Friction Wedges under field trial performance monitoring do not qualify Para 7.10. 7.12 and 7.13, further inspection and supply shall not be recommended. Firm will have to investigate the cause/s and a fresh application shall be made for.

7.16 Supply of minimum quantity of Friction Wedge as per RDSO Vendor Directory & satisfactory field performance are required for upgradation of vendors from 'RDSO Vendor for Developmental Orders', to "Approved Vendor". The provisions of ISO

document no. QO-D-8.1-11 (titled "Vendor-Changes in approved status") for upgradation of vendors as 'Approved vendor' shall be applicable.

7.17 All the provisions contained in RDSO's ISO procedures laid down in document No QO-D-8.1-11 (titled "Vendor-Changes in approved status") and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

7.18 To ensure and maintain the quality of Friction wedge supplied by Approved Vendor, two samples shall be picked up randomly from field for Sample/ Type test out of which one shall be sent to RDSO/Govt. Lab for testing of COF, wear rate and second shall be kept reserved in custody with RDSO. In case of complete metallic Wedge (ADI), two more samples to be picked up from the field and one sample shall be sent to RDSO or any government lab for Chemical and Micro Analysis as per ASTM A897/A897M also and second shall be kept with RDSO as reserved sample. RDSO at its discretion may send the samples to another laboratory as well. This process shall be part of Quality Audit and conducted during Quality Audit. Testing charges will be borne by the manufacturer.

If any above sample of Friction Wedge fail during type test, the approved manufacturer will be required to submit an explanation for the same. Based on the rationality of the explanation, the reserved second sample will be sent to retest. In case the second sample also fails during retesting, the Quality audit of the firm will be treated as failed and accordingly action will be taken against the firm as per extent policy.

8.0 PURCHASE INSPECTION: (Lot Size, Sampling and Confirmatory Tests)

8.1 Regular inspection of the Friction Wedge shall be carried out by the inspecting agency at the vendor's premises as per provision of latest ISO documents. The vendor shall provide material, equipment, tools and any other assistance, which the inspecting agency may consider necessary for tests and examination without any charges. The vendor shall make available manufacturing drawings and material specifications of the components to the inspecting agency at the time of inspection.

8.2 The lot size of Friction Wedge to be offered in one inspection shall be maximum 2000 nos. or part thereof. The vendor shall offer the lot for inspection after complete checking by them. The internal test results (ITR) shall be submitted to the inspecting agency.

8.3 Physical and chemical/metallurgical tests of the metallic part of the Friction Wedge shall meet all requirements of the specification given in the firm's drawings/QAP approved by RDSO.

8.4 Testing of COF and wear rate of the Friction Wedge shall be done in house and reports shall be submitted to the inspecting agency. However, Random samples

may be picked up during purchase inspection by RDSO inspecting agency for testing of COF, wear rate in addition to ADI microstructure (in case of Complete Metallic Wedge) of the Friction Wedge from any NABL accredited lab/ Govt. Lab, if required so. Expenses of these tests shall be borne by the firm.

8.5 From the lot offered for purchase inspection, the following samples shall be randomly drawn by the Inspecting agency for various tests of Friction Wedges:

S.No.	Properties to be checked	Number of Samples/Lot
	A. Common for all types of wedges	
1.	Visual inspection	10% or 100 wedges, whichever is less
2.	Dimensional checks	20 wedges
3.	Static and Dynamic Coefficient of friction	2 wedges
4.	Wear Rate	2 wedges
	B. Additional tests for Composite liner of Friction Wedge (if applicable)	
5.	Internal shear Strength	2 wedges
6.	Compressive strength	
7.	Shear strength of bond	
8.	Density	
9.	Water absorption	
10.	Hardness	
	C. Additional tests for metallic part of composite Liner / complete metallic Friction Wedge	
11.	Chemical composition	2 wedges
12.	Ultimate Tensile Strength	
13.	Yield Strength	
14.	Elongation%	
15.	Hardness	
16.	Impact Test (for ADI only)	
17.	ADI Microstructure (for complete metallic Friction Wedge only)	
18.	To Check Casting Defects, following Non Destructive Test (NDT) shall be carried out:-	
	a) Magnetic Particle Inspection (MPI) as per IS: 3703	10 wedges
	b) Dye Penetrant Test (DPT) of Sectioned Portion as per IS: 11732	1 wedge

NOTE: Samples for 5-6 above if applicable may be taken from composite liner slab of same lot of Friction Wedge

8.6 Material shall be offered for inspection within three months of manufacturing as marked on Friction Wedge.

8.7 Material offered for inspection shall not be withdrawn during the course of inspection. Any move to withdraw the material or interfere with the inspection in any way shall render the entire lot being rejected.

8.8 If any of the samples fails in any one or more criteria, double sample method prevailing as per ISO procedure in RDSO shall be applied for accepting or rejecting the entire lot offered. If double sample fails, entire lot shall be rejected. Inspection shall not be recommenced till further advice from RDSO. The firm shall investigate the cause of the failure, take remedial action to improve the quality of material & process control and also implement the same.

8.9 In the event of rejection, the entire lot offered for inspection shall be made unusable in the presence of the inspecting/purchasing authority. Record keeping format for disposal of failed/rejected lot shall be part of QAP.

8.10 Any failure in attribute checked on 100% of Friction Wedge internally as per the firm's own Quality Assurance Plan (QAP) will be considered very serious as it will indicate the failure of the firm's own QAP. In that case manufacturer will have to review their internal QAP and take corrective action accordingly advising details of action taken to RDSO.

8.11 The Friction Wedge, which has been inspected and passed, shall be double stamped by the Inspecting Agency. The entire quantity of Friction Wedges from which the sampling has been taken shall be stamped (single stamp mark) by the Inspecting Agency. Double stamping mark is to identify the samples, which were drawn for inspection for future reference in the event of any dispute.

8.12 The responsibility of lot offered for inspection shall be of manufacturer and the manufacturer shall submit a certificate that the entire lot offered for inspection was internally checked and it conforms to the technical requirements of RDSO approved drawings, QAP and this specification.

9.0 PERFORMANCE GUARANTEE

9.1 The offered design of Friction Wedge shall be guaranteed for a period of 5 years (sixty months) from the month and year of manufacture. The guarantee shall cover design, material and workmanship. The vendor shall replace complete Friction Wedge failed during guarantee period to the depot raised claim at his own expense and within reasonable time with intimation to Wagon Directorate, RDSO Lucknow.

9.2 The Zonal Railways shall log the warranty failure on the Online Portal decided by the Railway Board or as per the extant procedure of warranty logging. Whenever repeated/frequent failures are reported, firm shall investigate and come up with satisfactory reasons of failure and take remedial action to improve the quality.

9.3 Linking performance of the Friction Wedges with maintenance condition of bogie and Indian Railways operating conditions etc. for warranty compliance shall not be accepted.

9.4 Following shall be treated as failures for under guarantee replacement:

a. Damage/deformation in metallic casting and flatness in its slope surface.
b. Damage/chipping off, of non-metallic/composite part more than 20% of total area.
c. Excess wear thickness more than 7mm in composite liner/ metallic vertical wear surface and more than 03 mm in slope surface.
d. Bond failure or separation of composite liner part (more than 25% of total area), if applicable from metallic casting.

10.0 MARKING

10.1 Marking on each Friction Wedge as given below, shall be done by cast depressed embossing or engraving with letters size of at least 6 mm on non-wearing metallic surfaces at location as shown in attached drawing (side surfaces between vertical and slope wear surfaces) during manufacturing process itself. Stamping/punching and marking these information by any other method after manufacturing shall not be permitted. Non-compliance of marking particular shall be adequate reason for rejection of material.

a) RDSO Drawing number along with Variant Type.
b) Manufacturer's Initial/trade mark with Month and year of manufacture & Heat Number.

10.2 The embossed/ engraved letter shall be of the size and at the location shown in the drawing approved by RDSO.

11.0 PAINTING

11.1 Metallic part of Friction Wedge shall be spray painted with rust-resistance coating of dove grey colour as per specification no. IS: 2074 to prevent rusting.

12.0 PACKING AND STORAGE

12.1 Friction Wedges shall be packed in pairs, with diagonals face each other and in a suitable card board/wooden packing to protect against damage during transit and storage. The component shall be stored under cover and dry places.

12.2 In the event of sublet orders placed by bogie manufacturers, packing shall be as agreed to between the purchaser and the supplier.

SPACE ENVELOP DRAWING