सत्यमेव जयते

INDIAN RAILWAYS

SPECIFICAITON

OF

ELASTOMERIC PAD

NO. WD-20-MISC-95 (Revision – 4)

'SUITABLE FOR CASNUB – 22W, 22 W (M), 22 NL, 22 NLB, 22 HS, LCCF 20 (C), IRF108HS AND LWLH25 BOGIES'

S. No.	Month & Year of issue	Revision / Amendment	Page No.	Reason for Amendment
1.	July 2021	Revision - 4	-	Updated

ISSUED BY

RESEARCH DESIGNS AND STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR, LUCKNOW – 226 011

July 2021 PRICE: Rs.

CONTENTS

INDIAN RAILWAYS
SPECIFICATION OF ELASTOMERIC PADS
FOR
`CASNUB – 22W, 22 W (M), 22 NL, 22 NLB, 22 HS, LCCF 20 (C), IRF108HS AND LWLH25 BOGIES'

0.0 FOREWORD

0.1 This specification is intended to cover the technical provisions relating to material, construction and tests and does not include all the necessary provisions of the contract.

0.2 This specification draws reference to specifications and standards given below. The firm shall have a copy of latest versions of these specifications:

S. No.	Specification No.	Description
1	IS:3400 (Part-1)	Method of Test for Vulcanised Rubbers -Tensile stress-Strain properties
2	IS:3400 (Part - 2)	Method of Test for Vulcanised Rubber - Determination of Hardness
3	IS:3400 (Part - 4)	Method of Test for Vulcanised Rubber - Accelerated ageing
4	IS:3400 (Part- 9)	Methods of Test for Vulcanised Rubber - Determination of density
5	IS:3400 (Part-X)	Method of Test for Vulcanised Rubbers - Compression set at constant strain
6	IS:3400 (Part-14)	Method of Test for Vulcanised Rubber-Adhesion of Rubber to Metal
7	IS:3400 (Part-22)	Method of Test for Vulcanised Rubber - Chemical Analysis
8	IS:2102 Part-1	General tolerance – tolerances for linear & angular dimensions without individual tolerance indications
9	IS: 2062	Hot Rolled Medium and High Tensile Structural Steel — Specification
10	IS: 1852	Specification for rolling and cutting tolerances for hot-rolled steel products
11	ASTM D 1171	Standard Test Method for Rubber Deterioration – Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
12	ASTM D 2137	Standard Test Methods for Rubber Property – Brittleness point of flexible Polymer and Coated Fabrics
13	ANSI/UL 94-2001	Standard for Test for Flammability of Plastic Materials for Parts in Devices and Appliances

14	ISO: 3302-1	Rubber-Tolerances for products- Dimensional tolerances
15	ISO 4664-1	Rubber, vulcanized or thermoplastic – determination of dynamic properties
16	ISO 4650	Rubber- Identification - Infrared Spectrometric method

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1.0 SCOPE

1.1 This Specification specifies the requirements and methods of tests for metal bonded elastomeric pads of RDSO design to drawing no WX-21015 (A, B, C & D) or any other Approved Design offered by firm to RDSO envelop Drawing No WX-21017. This is applicable to 'Casnub 22W (modified adapter), 22W (M), 22NL, 22NLB, 22HS, LCCF 20 (C), IRF108HS and LWLH25 Bogies on freight stock of Indian Railways.

1.2 The elastomeric pad placed between side frame and adapter is subjected to compressive and shear loads developed in freight bogies fitted in Wagons of upto 25 tons axle load on Indian Railways Track Conditions. It is primarily used to reduce wheel wear and also acts as an anti-vibration member. The pad shall be capable of withstanding wide climatic variation prevailing in India (temperature range of –10 ºC to +50 ºC) including maximum permitted operating temperature (90 ºC) of bearings on Indian Railway freight stock. The elastomeric pad shall operate without adverse effect on safety, reliability, physical deterioration and any marked change of its characteristics, over service life.

2.0 DEFINITIONS

2.1 **Purchaser -** means Zonal Railways/Workshop/PU or any other agency procuring the material on behalf of the President of India.

2.2 **Engineers** - means Wagon Directorate, Research Designs and Standards Organisation, Ministry of Railways, Lucknow (India) – 226 011.

2.3 **Inspecting Officer** – means the person, firm or department nominated by the purchaser to inspect the work on his behalf and the deputies of the Inspecting Officer so nominated.

3.0 REQUIREMENTS

3.1 **MATERIALS**

3.1.1 **Elastomer**: Natural rubber or elastomers or a blend thereof suitably compounded shall be used for the manufacture of elastomeric pads so as to conform to the requirements stipulated in this specification. The Pad shall be manufactured from virgin base rubber/elastomer only and Reclaimed/re-refined/recycled/regenerated rubber/elastomer shall not be used.

3.1.2 Firm may offer its own design of EM Pad conforming to RDSO boundary envelop Drawing No WX-21017 and/or any other compound with prior approval of DG (Wagon), RDSO, Lucknow to conform to the requirements stipulated in this specification.
In Case the Firm is offering its own design and/or any material other than Natural Rubber, the firm shall submit the detailed test report as specified in this specification, documentary evidences, physical and functional properties of the material, Dynamic Mechanical Analysis (DMA-Glass transition temperature (Tg), modulus, viscoelasticity (storage modulus, loss modulus, tan delta), stress relaxation, shrinkage and shrinkage forces) as per relevant ASTM/ISO standards, FTIR as per ISO-4650, TGA as per ASTM E1131, working temperature range of the product, etc. to Wagon Directorate/RDSO, Lucknow for obtaining approval before use. The details of the Design of EM Pad and the material specification shall be submitted by the firm in the drawings and QAP at the time of registration.

3.1.3 Temperature-Resistance Elastomer: elastomer pad must operate satisfactorily at adapter temperatures from – 10 ºC to 90 ºC.

3.1.4 **STEEL:** The end mounting plates and stiffening plates shall conform to Standard IS 2062: 2011 (Reaffirmed 2016) - Grade E 350 Quality B0.
Firm may offer alternate material with consent of RDSO such that it meets the technical and functional requirements as stipulated in this specification. Firm shall submit the detailed test report, documentary evidences, and chemical properties of the material to Wagon Directorate/RDSO, Lucknow for obtaining approval before use. The material specification shall be submitted by the firm in the drawings/QAP at the time of registration.

3.2 **DIMENSIONS AND TOLERANCES**

The pads shall conform to any of the following Design

RDSO Design to drawing no WX21015 (A, B, C & D) latest alteration. The dimensions and tolerances shall be as per the drawing. Untoleranced rubber dimensions shall have tolerances as per ISO 3302 (Class M3 of Table I).

OR

Any other Design offered by firm conform to RDSO boundary envelop Drawing No WX -21017 and approved by DG (Wagon), RDSO, Lucknow. The dimensions and tolerances shall be as per the drawing. Untoleranced rubber dimensions shall have tolerances as per ISO 3302 (Class M3 of Table I).

3.2.1 Un-tolerance dimensions of steel plate shall have tolerances as per standard IS: 2102 (medium).

3.3 CONSTRUCTION AND FINISH

3.3.1 The metal plates shall be shot /grit blasted and chemically cleaned before bonding with rubber. The metal plates must be degreased before mechanical cleaning. It has to be ensured before bonding that the metal surface is free from rust, moisture, metal oxide, non-oily contaminants and other foreign matter. The process adopted for bonding of rubber to metal plate shall be a proven one using “Chemlok-205” for primer & “Chemlok-6411” for Cover Coat or superior grade bonding agent (Chemlok) to achieve the required durable bond strength under the operating condition & temperature mentioned in this specification. Any other bonding agent superior to mentioned additive can also be used with prior approval of Director General (Wagon), RDSO, Lucknow. The process of adhesive application should be got audited regularly by the firm supplying the bonding agent. The manufacturer of EP will mention it in QAP along with periodicity of audit as decided in consultation with the firm supplying bonding agent.

3.3.2 Elastomeric pads shall be manufactured by Injection moulding process.

3.3.3 The construction shall be as per RDSO design to Drawing no WX21015 **(A, B, C & D)** or any other Design offered by firm to RDSO envelop drawing No WX-21017 approved by DG (Wagon), RDSO, Lucknow. In case of any deviation, drawing shall be sent to the Engineer for approval with proper technical justification/support before taking up bulk manufacture.

3.3.4 The rubber shall be smooth and free from pin holes, blisters and other visual flaws. All sharp edges and burrs shall be removed from the steel plates. The metal to rubber bonding shall be uniform and to fulfil the standards laid down in this specification.

3.4 TECHNICAL REQUIREMENTS

3.4.1 **PHYSICAL PROPERTIES OF RUBBER**

Physical properties of rubber compound carried out from the finished product shall be as under:-

S.N.	Properties	Permissible Limit	Method/Standard
i	Tensile strength (Kg/cm^2)	225 min.	IS:3400 (Part-1)
ii	Elongation at break (%)	400 min.	IS:3400 (Part-1)
iii	Compression set at Constant Strain at $85^{\pm 1}$ °C for $24^{+0/-2}$ hours, (%)	20 max.	IS:3400 (Part-X)
iv	Hardness (Shore 'A')	$70^{\pm 10}$	IS:3400 (Part-2)
v	Ash content not to exceed	7%	IS:3400 (Part-22)
vi	Specific gravity not to exceed	1.3	IS:3400 (Part-9)
vii	Resistance to Ozone Test (Quality retention rating) (%)	85 min	ASTM 1171
viii	Dynamic Mechanical Analysis (DMA) a) Glass transition temperature b) Modulus c) Viscoelasticity (storage modulus, loss modulus, tan delta)	As specified in the QAP	As per relevant ASTM/ISO Standards

Note:
(1) Deviations from above specified values, if any, required for achieving deflection characteristics [compressive, & shear (lateral & longitudinal)] and other functional requirements as specified in the specifications mentioned may be permitted with prior approval of DG (Wagon), RDSO, Lucknow.
(2) Variation of hardness on entire surface of pad and at core shall not be more than 20 shore "A".

3.4.2 **ACCELERATED AGEING**

The manufacturer shall carry out accelerated ageing tests on test pieces prepared from the same pad which was used for preparing test pieces for checking physical properties of rubber compound as stated in Para 3.4.1. The method for conducting accelerated ageing test shall be as per the Standard stated in Para- 0.2 of this specification.
After ageing at 85$^{\pm 1^{o}}$C in an air oven for 72 hours, the hardness, tensile strength and elongation at break (percentage) shall not vary from the values obtained with the un-aged specimens by more than the limits given below:

Hot Air Oven aged at 85 $^{\pm 1^{\circ}}$C for 72 Hours		
S. No.	Properties	Permissible Limit
1	Hardness change, points (shore 'A')	+5/- 0
2	Tensile strength change, %	± 15
3	Elongation at break change, %	+5/-15

It shall be the responsibility of the manufacturer to carry out Accelerated ageing tests as above. The manufacturer shall carry out these tests on test pieces prepared out of 4 pads for every 1000 pads manufactured. Records of this testing shall be put up to Inspecting Officer along with every lot offered for inspection. Apart from inspection of these records, Inspecting Officer shall carry out accelerated ageing tests during confirmatory test.
For compound other than rubber, firm shall provide physical properties, mechanical properties and other information and the variation in properties after ageing with respect to properties of un-aged final product. Ageing tests as described above shall be carried out accordingly.

3.4.3 **COMPRESSIVE LOAD DEFLECTION CHARACTERISTICS :**

The test shall be carried out at a machine speed of $10^{\pm 5}$ mm/minute. The pad shall be subjected to three successive loadings of 20 tonnes. During the fourth cycle, the deflection at a load of 10.0, 15.0 and 20.0 tonnes tones shall be recorded with the help of dial gauges(s) / digital readout. At the beginning of the fourth cycle, the elastomeric pad should be compressed with a load of 50 kg. and deflection taken as zero at this point. The resultant load-deflection value shall lie within the range bounded by standard values as given in Table-1. The gauge for measuring load shall be suitably calibrated to be able to indicate the required loads.

TABLE – 1

S. No.	Applied vertical load on one Pad (tons)	Deflection (mm)	Permitted Tolerance (deflection)
1	10.0	2.0	± 20%
2	15.0	2.5	± 20%
3	20.0	3.0	± 20%

3.4.4 LATERAL SHEAR LOAD - DEFLECTION CHARACTERISTIC

The test shall be carried out at a machine speed of $10^{\pm5}$ mm/minute. The pads shall be subjected three times to a compressive load of 12 tonnes at a rate of $10^{\pm5}$ mm/ minute machine speed in a suitable jig as shown in RDSO Sketch No. WD2-7561-S/1 (copy enclosed). During the fourth compression, the pad shall be held at a compressive force of 12 tonnes. This assembly then shall be subjected to shear force in the lateral direction. The load shall be applied to the wooden block and the end plates of pads three times successively upto 7.5 tonnes. Deflection values as per Table-2 up to 7.5 tonnes shall be recorded during the fourth cycle. Any other Design offered by firm shall meet the deflection characteristics as per Table-2.

The deflection values at different load condition should be as below:-

TABLE – 2

S. No.	Applied lateral load on two pads (tonne)	Deflection (mm)	Permitted Tolerance (deflection)
1	2.5	4.00	± 20%
2	5.0	7.50	± 20%
3	7.5	9.50	± 20%

3.4.5 **LONGITUDINAL SHEAR LOAD - DEFLECTION CHARACTERISTICS**

The elastomeric pad in longitudinal (shear)-load deflection characteristics value shall be measured by the manufacturer and the measured value shall be intimated to Wagon directorate of RDSO and after approval of the same, the value may be mentioned in their Quality assurance Plan (QAP).

Applied longitudinal load on two pads (tonne)	Deflection (mm)
2.5	To be measured for each load case and recorded
5.0	
7.5	

The test is similar lateral (shear) - deflection test and the same assembly is to be used. The only difference is that the shear load application is in longitudinal mode.

The fixture given in RDSO's sketch number WD2-7561-S/1 has to be modified to suit for elastomeric pad and direction of loading. The elastomeric pads shall be subjected three times to a compressive load of 12 tonnes at a rate of $10^{\pm 2.5}$ mm/minute machine speed in the modified fixture. During the fourth compression, the elastomeric pad shall be held at a compressive force of 12 tonnes. This assembly then shall be subjected to shear force in the longitudinal direction. The load shall be applied to the wooden block for three times successively up to 7.5 tons deflection values as per table up to 7.5 tons shall be recorded during the fourth cycle.

3.4.6 **SHEAR BOND STRENGTH**

The bond strength between metal and rubber shall be minimum 40 kg/cm^2. To assess the bond strength method 'B' as given in IS: 3400 -1984 (Part 14) (Reaffirmed in 2019) shall be followed. All the precautions taken for metal preparation and bonding for preparing TEST PIECE shall also be followed for batch production. The unvulcanised rubber disc for preparing the TEST PIECE shall be taken from the rubber compound prepared for batch production. Record of batch member & test results should be maintained by the manufacturer and in case of any doubt the Inspecting officer shall also get a fresh test piece prepared and tested in his presence.

3.4.7 SHEAR FATIGUE TEST

The shear fatigue test shall be conducted only when the results of load-deflection characteristics are verified and the samples conform to the permissible limits. If the load-deflection characteristics of the pad do not conform to the specified limits, then fatigue test on the pad shall not be carried out.

3.4.7.1 PROCEDURE/METHODOLOGY

The test pad shall be shear fatigue tested for 5,00,000 (Five lakh) cycles to determine the fatigue life. The load to be applied for this purpose on the elastomeric pad shall be varying from 7 to 22t as per RDSO Drg. No. WDX-91/7 Alt.1 (copy enclosed). The load has to be applied at a frequency of 2 Hz.

This test shall be carried out in the supplier's premises, for which necessary testing machine shall be installed. Fatigue testing machine should satisfy following parameters –

i) It should be able to apply fatigue load as per RDSO Drg. No. WDX-91/7 Alt.1.
ii) It should be possible to read load applied as well as number of cycles directly on the machine.
iii) The loading cycle should be sinusoidal.
iv) The pad should be placed in such a direction that shear component of the force applied is in same direction as stated in para 3.4.4 (SK No. WD2-7561-S/1).
v) The dynamic load may get relaxed as the fatigue loading test progresses. The maximum load should not be allowed to relax below 20t and should be readjusted to 22t using shims if necessary.
vi) Testing shall be carried out continuously (without any break) for complete fatigue cycles. Temperature of the elastic element, metal element and room temperature shall be measured and recorded after every 20,000 cycles.

3.4.7.2 OBSERVATIONS/EVALUATION OF FATIGUE TEST

(1) The load-deflection characteristics of elastomeric pads shall be checked as per procedure mentioned in Para 3.4.3, 3.4.4 and 3.4.5 of this specification before and after the completion fatigue test. The observed value shall be within the tolerance range as specified in the specification or approved QAP.

(2) Viscoelasticity (storage modulus, loss modulus, tan delta) of the elastomer shall also be measured as per procedure mentioned in the standard ISO-4664 before and after the completion of the fatigue test. The observed value shall be within the tolerance range as specified in the approved QAP.

(3) The free height of the pad shall be recorded 30 minutes after completion of fatigue test and permanent set shall be recorded. The permanent set in the pad shall not be more than 1.5 mm from the initial measured value at any location.

(4) The Pad shall be checked for cracking, perishing and bond failure, if observed, during fatigue testing shall be recorded and action shall be taken as detailed below. The pad shall be considered as "failed" if any one of the following limits is exceeded:

i) If a crack in the rubber exceeds 20 mm in length and 6 mm in depth in

any layer.

ii) If de-bonding of rubber from metal plate exceeds 15 mm in depth on any one rubber/metal interface.

iii) If crack is observed in any of the metal plate.

iv) The permanent set in the pad is more than 1.5 mm from the initial value.

Note: A certain amount of superficial cracking (crazing) of the rubber surface is not unusual or detrimental to performance of the EM Pad.

3.4.8 For infrastructural, Manufacturing, Testing and Quality Control requirements for Metal Bonded Rubber Components (Elastomeric pads), the supplier shall comply with STR IL-05:2000 (latest) issued by QA (Mechanical) Directorate of RDSO.

4.0 LOT SIZE, SAMPLING AND PURCHASE INSPECTION

4.1 The lot size of elastomeric pads to be offered in one inspection shall be: - 1500 nos. to 3000 nos.

4.2 From the above lot offered for inspection, the following samples shall be drawn by Inspecting Officer for various tests:-

i) Dimensions : 1% subject to minimum of 15 samples.

ii) Visual examination : 1% subject to minimum 15 nos.

iii) Compressive load deflection test : 0.5% subject to minimum of 8 samples.

iv) Shear load deflection :

Lot Size	No. of samples
1500-1799	8
1800-2199	10
2200-2599	12
2600-2999	14
3000-3399	16
3400-3799	18
3800-4199	

and so on.

v) Shear bond : No. of samples shall be one sample every calendar month, during the period of manufacture of elastomeric pads.

vi) Shear fatigue test : For the purpose of shear fatigue test, lot size shall consist of 2000 no. one sample shall be picked up on random basis from each lot for fatigue testing. If the sample fails, then 4 samples will be taken from the same lot and if any sample fails out of these, the entire lot of 2000 will be mandatorily rejected and destroyed. Inspection shall not be recommenced until the firm has investigated and come up with satisfactory reasons for the failure, taken remedial action to improve the quality of material and improved process control and has also implemented the same.

vii) Mechanical Properties of Metal Plates : Metal plate shall be taken from any pad, which is used for above destructive testing. Number of samples shall be one for each heat (same heat) of metal plates used, during the period of manufacture of elastomeric pads.

viii) Physical properties of the rubber for metal plate examination :

Lot size	**No. of samples**
1500-2000	2
2000-2500	3
2500 & above	4

ix) Specific gravity and ash content : 0.25% subject to min. 4 nos.

- **Note:** The same pads will be subjected to compressive load - deflection test, shear bond and shear load-deflection tests, as far as possible.

4.2.1 For the manufacturers who have been approved for the supply of elastomeric pads for more than one year and against whom there have been no adverse reports during purchase inspection of the last five lots in the previous six months, the samples size can be reduced for various tests as follows:-

i) Dimensions : 0.7% subjected to a minimum of 10 samples.

ii) Visual examination : 0.7% subject to minimum of 10 samples.

iii) Compressive load deflection : 0.4% subject to minimum of 6 samples

iv) Shear load deflection test **:**

Lot size	No. of samples
1500-1799	6
1800-2199	8
2200-2599	10
2600-2999	12
3000-3399	14
3400-3799	16
3800-4199	18 and so on.

There will be no change in sample size for tests at 4.2 (v) to 4.2 (viii).

4.3 Material shall be offered for inspection within two months of its manufacture.

4.4 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.

4.5 If the samples fail in one or more of the criteria in para 4.2, “double” the samples will be drawn and tested against the criteria in which the failure had occurred. If the “double” samples pass, the lot shall be accepted. Failure of the “double” sample will, however, result in the rejection of the lot. No further inspection shall be carried out until the firm has investigated and come up with satisfactory reason for the failure as well as the remedial action to improve the quality of material and also implemented the same.

4.5.1 A certificate to the effect that the remedial measures suggested by the firm have been implemented must be furnished by the Inspecting official to the DG (QA), RDSO, Lucknow for approval before undertaking inspection again. This procedure shall be followed for all the items of para 4.2 except para 4.2 (vi) i.e. shear fatigue test which will be carried out at RDSO as per the prescribed norms.

4.6 In the event of rejection, the entire lot offered for inspection shall be made unusable for Railway application in the presence of the inspecting /purchasing authority.

4.7 Each pad which has been passed by the Inspector shall be stamped.

5.0 PROCESS AUDIT CHECK

This is an audit check regarding firm’s adherence to its own quality assurance programme and its general quality consciousness. For establishing this, Inspecting officer shall collect samples for carrying out the audit check at RDSO as detailed below.

5.1 Three sets of samples each consisting of 4 pads, six dumbles per tensile stress-strain properties (as per IS:3400 Part- 1), 3 button for compression set (as per IS: 3400 Part -X), 2 samples for shear bond test, 2 samples for specific gravity and 2 samples for ash content to be submitted.

The pads shall be drawn at random from a lot offered for inspection and one set of samples shall be sent to Engineer, once in six months.

All tests listed under para 4.2 to be conducted on these samples except for para 4.2 (vi), regarding which para 5.2 may be referred.

5.2 Out of 4 pads, two shall be shear fatigue tested for 500,000 cycles once in a year to determine the fatigue life. The load to be applied for this purpose on the elastomeric pad shall be varying from 7 to 22t as per RDSO Drg. No. WDX-91/7 Alt.1. The pad should not show signs of any failure as described in para 3.4.8.

5.3 If any of the samples sent to RDSO, Lucknow for testing as referred in Para 5.1 and 5.2 fails in one or more attributes, future inspection at the firm's premises shall be discontinued and the double sample drawn earlier shall be sent for testing against the attributes in which the failure had occurred. If the double sample fails, the process audit check will be deemed to be unsatisfactory and the inspection shall not be recommended until the firm has investigated and come up with satisfactory reasons for the failure, taken remedial action to improve the quality of material and has also implemented the same, in addition to successfully going through the test prescribed in Clause 5.1 and 5.2 on fresh set of samples.

5.4 Inspecting officer at his discretion can draw samples (2 nos.) at random basis from field i.e. Depots/Workshops/Wagon Builders/E.M. Pad manufacturers' premises and get them tested in RDSO for compression, shear load- deflection and fatigue tests.

5.4.1 Any failure in attributes checked on 100% of pads internally as per the firm's own quality assurance plan will be considered very serious as it will indicate the failure of firm's own quality assurance plan. In that case, manufacturers will have to review their internal quality assurance programme and take corrective action accordingly and get re-registered with RDSO.

5.5 Results of the process audit check shall be sent to the Engineer for approval.

5.6 Inspecting officer will take results of audit checks also in consideration while reviewing registration of the manufacturer.

6.0 QUALITY ASSURANCE PROGRAMME (QAP)

6.1 The firm's internal Quality Assurance Programme for the product must detail the following aspects:-

- Organisational chart
- Process flow chart.
- Stage inspection details

- Various parameter and control over them.

6.2 The organisational chart shall show the different key positions, personnels manning the positions, their qualifications & experience.

6.2.1 There should be at least one full time rubber technologist having a minimum bachelor's degree in relevant field with 5 years experience or a diploma in relevant field with 12 years experience. He should be free from day to day production, testing & quality control responsibility. He should be mainly responsible for development of a product, analysis of products, control over raw material, corrective action in case of difficulties in achieving the parameters.

6.2.2 Ensure that the incharge of the Quality Control Section I s having a qualification of minimum bachelor's degree in the relevant field and have minimum 5 yrs. experience or a diploma holder with min.12 yrs experience. He should be actively involved in day to day activities of quality control/stage inspection/compliance of QAP etc.

6.3 There should be a system to ensure use of correct raw material and traceability of the product from raw material stage to finished product stage. This system should also facilitate to identity the raw material composition from the finished product stage.

6.4 Ensure that there is a system to identify defective components at various stages of manufacture, the reasons for occurrence of defects and also a system for disposal of those defective rejected components.

6.4.1 Ensure that proper analysis is being done on monthly basis to study the rejection/defect at various in internal stages, and to take corrective action thereafter.

6.4.2 Ensure that a proper documentation of all the above steps is there, which is to be presented on demand by the engineer.

6.5 Ensure the proper record of complaints received from customers of Railway and corrective action take thereof, is maintained.

7.0 RECORD KEEPING

7.1 The manufacturer shall keep all the relevant records of Internal Quality Programme for future reference /investigations. The manufacturer shall present their records as and when asked by Purchaser / Inspecting Official or Engineer.

7.2 Manufacturer shall submit a half yearly statement to Inspecting Officer giving particulars of number of pads supplied to the consignee, failure detail , warranty disposal and corrective action taken thereon. .

8. PROCEDURE OF APPROVAL

The procedure to be followed for approving firms desiring to supply this item is given below.

8.1 A request for registration should be made to Engineer alongwith list of M&P, copy of complied orders in last three years etc.

8.2 The firm shall have all the facilities including steel fabrication shot/grit blasting facilities, cleaning facilities, injection moulding facilities, rubber testing facilities and fatigue testing machine in-house as per STR IL:05:2000 (latest). Firm shall have minimum 5 years experience in manufacturing of rubber to metal bonded components for heavy duty operations.

8.3 The firm shall have trained manpower to produce quality product as given in para 6.0.

8.4 On ascertaining the compliance of STR and QAP of the product, the firm shall be required to submit in house test results of their product to Director General QA/Mech., RDSO. The details of tests are shown in para 8.6 below.

8.5 On successful completion of para 8.4, samples shall be submitted to RDSO for confirmatory testing for which necessary charges shall be paid by the firm in advance. The sample shall consist of six dumbles for tensile stress strain properties as per the IS: 3400 Part-1, three buttons for compression set (as per IS: 3400 Part-X) two samples for shear bond test (as per para 3.4.6), two samples for specific gravity and two samples for ash content. All these samples except for shear bond test are to be cut from finished pad. 10 no. elastomeric pads are also to be submitted which shall be drawn by the Inspecting Officer from a minimum lot of 50 numbers.

8.6 Following tests shall be done:-

a) Dimensional check on all the 10 pads (para 3.2).
b) Visual check (para 3.3.2).
c) Physical properties (para 3.4.1)
d) Accelerated ageing (para 3.4.2)
e) Compressive load deflection characteristics on all the 10 pads (para 3.4.3).
f) Lateral Shear load- deflection characteristics & Longitudinal Shear load-deflection characteristics on all the 10 pads (Para 3.4.4, 3.4.5).
g) Shear bond strength (para 3.4.6).
h) Shear fatigue test on any 4 pads (para 3.4.8).
i) Ash content (para 3.4.1 (v))
j) Specific gravity (para 3.4.1 (vi))
k) Mechanical properties of metal plate (Para 3.1.2 & 4.2(vii))

8.7 The test results of Para 8.6 shall be put up to Director General QA /Mech.,

RDSO for approval of the firm.

8.8 Based on successful completion of above tests, the firm shall be approved as 'RDSO Vendors for Developmental Order' to supply of elastomeric pads. The firm shall submit a copy of the first purchase order (issued by purchaser) to RDSO. First 1500 Nos. (One thousand and five hundred numbers) of elastomeric pads manufactured by the firm duly inspected by QA/Mech. shall be put on Service trial for monitoring the field performance on Closed Circuit rakes by RDSO Lucknow. The wagon depot(s) where these elastomeric pads shall be supplied and fitted will be nominated by RDSO (Wagon directorate) in order to monitor their field performance for a period of one ROH or more from the date of fitment. The firm shall be generally permitted to supply 10000 (Ten thousand only) nos. of elastomeric pads duly inspected by QA (Mech.) until the field performance is certified by RDSO.

8.9 During field performance, failure of elastomeric pads shall not be more than 2 % of pads fitted during the trailed ROH period.

8.10 The Pad shall be checked for cracking, perishing and bond failure, if observed, during the field trials shall be recorded. The pad shall be considered as "failed" if any one of the following limits is exceeded:

i) If a crack in a rubber exceeds 25 mm in length and 6 mm in depth in any layer.
ii) If de-bonding of rubber from metal plate exceeds 20 mm (any layer of rubber between the metal plates) long on any one rubber/metal interface.
iii) If crack is observed in any of the metal plate.
iv) Permanent set of more than 1.5 mm.
v) Any other defects

8.11 **In-Service problem:** in the event problems develop in service, the manufacturer will report to RDSO and provide any information necessary to resolve the issue. RDSO may require, but is not limited to, any of the following:

- Suspension of further applications
- Restoring in accordance with applicable specification
- Revocation of conditional approval
- Restart of the entire approval process
- Decertification of the facility
- Remove of Parts from service

8.12 After successful field trial, firm shall be registered as 'approved vendor for developmental orders'. Final approval shall be accorded as per existing procedure prevailing at that time.

8.13 CHANGES IN PRODUCT: Elastomeric pad to be supplied under this specification shall be essentially identical with the product submitted for approval tests. The test results of the approved sample of the manufacturer shall be

included in the approved Quality Assurance Plan. Evidence of unauthorised changes in composition or methods of manufacture will be sufficient cause for withdrawal of RDSO approval. After RDSO approval, the manufacturer desiring any change at any stage in the product or Approved Quality Assurance Plan, RDSO must be informed about it with justification for each change. These changes will be incorporated only when approved by RDSO.

8.14 All the provisions contained in RDSO's ISO procedures laid down in document No. QO-D-7.1-11 dated 19/07/2016 (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.

8.15 All terms and conditions for vendor registration/approval of foreign firms shall be applicable as stipulated in RDSO ISO document QO-D-8.1-5 (latest version) title "Application for registration of vendor". In case of any contradiction between the clauses of this specification and ISO document QO-D-8.1-5 regarding the vendor registration/approval of foreign firms, the clauses of ISO document shall prevail.

9.0 MARKING

9.1 Top plate & flange of the Elastomeric Pad shall be legibly marked/ punched in the following sequence: -

i) Manufacturer's name (initials or trademark). XYZ

ii) Month & Year of manufacturer (e.g. 06 21 for June- 2021), month code in two digit & last two digits of the year. The month will be shown from 1 to 12 covering January through December, while the last two numbers of the year of manufacture are sufficient.

iii) **'**G-30' Where 'G' stands for Guarantee and '30' stands for period in months.)

9.2 There must be at least one blank space or dash between each items. There must also be a dash, asterisk, or blank space between the month and year of manufacture. Example: XYZ - 06 21- G 30. Character must be at least 6 mm high and depth 0.13 mm. The marking location to be ensured as shown RDSO drawing or drawing approved by RDSO. The marking shall be such that it shall withstand and readable till the life of Elastomeric pads.

10.0 PAINTING

Each Elastomeric Pad shall be painted with following Color Scheme:

(i) "Deep Bronze Green" (IS: 5-2007, ISC No. 224) on the steel plates of RDSO Design to Drawing no WX 21015 (A, B, C & D) only after application of primer etc. to ensure long durability of the paint/colour.

(ii) "Turquoise Blue" (IS: 5-2007, ISC No. 102) on the steel plates of any other Design offered by firm to RDSO envelop Drawing No WX-21017 approved by DG (Wagon), RDSO, Lucknow only after application of primer etc. to ensure long durability of the paint/colour.

11.0 GUARANTEE

11.1 The vendor shall guarantee elastomeric pad for a period of 30 (thirty) months from the month and year of manufacturing. In case of premature service failure of elastomeric pads, Wagon Depot In-charge in Zonal Railways will report the failure to vendor, with copy to DG (Wagon) & DG QA (Mech.), RDSO. Vendor will make free replacement of failed elastomeric pad to the depot, where failure has been reported. The replacement should be made within reasonable time.

Whenever repeated failures of elastomeric pads are reported, vendor shall investigate and come up with satisfactory reason(s) for failure and take remedial action to improve the quality of elastomeric pads.

11.2 The Zonal Railways will send the information in the following format while claiming guarantee replacement. Following shall be treated as failures for warrantee replacement:-

i) If a crack in a rubber exceeds 20 mm in length and 6 mm in depth in any layer or if the accumulated crack in any layer exceed 50 mm.

ii) Any crack/failure in metal plate/s, crushing/perishing of rubber or othe compound.

iii) De-bonding of rubber from metal plate exceeds 50 mm long on any on rubber/metal at any surface of the rubber/other compound.

iv) Permanent set of elastomeric pad of more than 4 mm from the nominal value of elastomeric pad.

S. No.	Wagon No.	ROH/ POH date	Make of EM pad	Month & year of manufacture	Date of failure	Causes of Failure
						Crack in any of the metal plate
						Rubber/other compound crushed/Perished
						Crack in a rubber exceeds 20 mm in length (any layer of rubber between the metal plates) and 6 mm in depth in any layer or if the accumulated crack in any layer exceed 50 mm.
						Permanent set of elastomeric pad of more than 4mm from the nominal value of elastomeric pad.
						De-bonding of rubber from metal plate exceeds 50 mm (any layer of rubber between the metal plates) long on any one rubber metal at any surface of the rubber/other compound

12.0 PACKING

12.1 The rubber pads shall be dusted with French Chalk and suitably protected against damage during transit and storage.

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

13.0 FIELD PERFORMANC MONITORING

The supplier shall regularly collect data and samples of previous supply from field to access the actual life obtained nature of defects occurring in the service and should take necessary corrective action to improve quality. Half-yearly report should be submitted to Director General (Wagon) RDSO/ LKO on data, samples collected and corrective action taken.

14.0 STORAGE

The rubber pads shall be stored in a cool and dry place

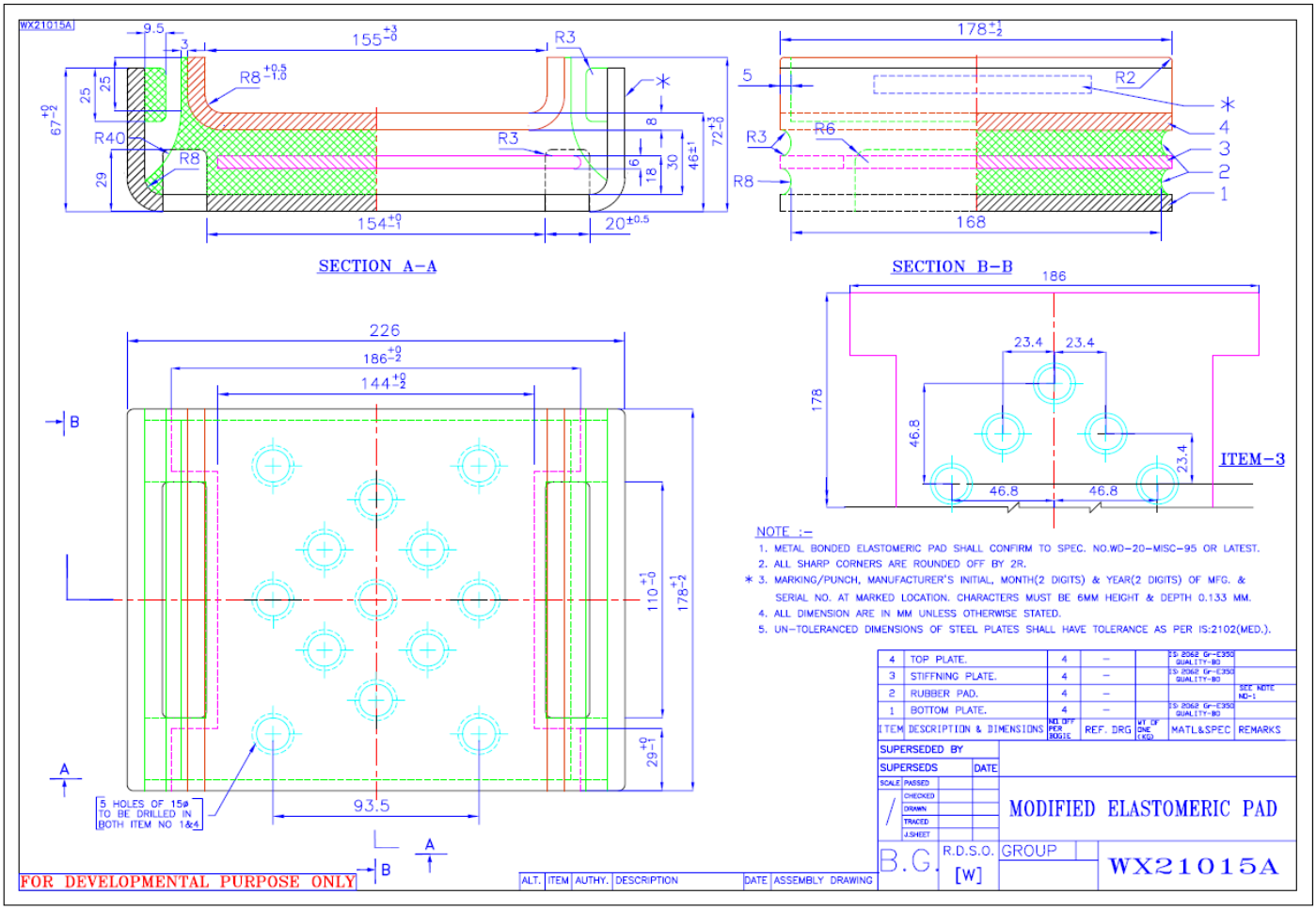
15.0 LIST OF ENCLOSED DRAWING

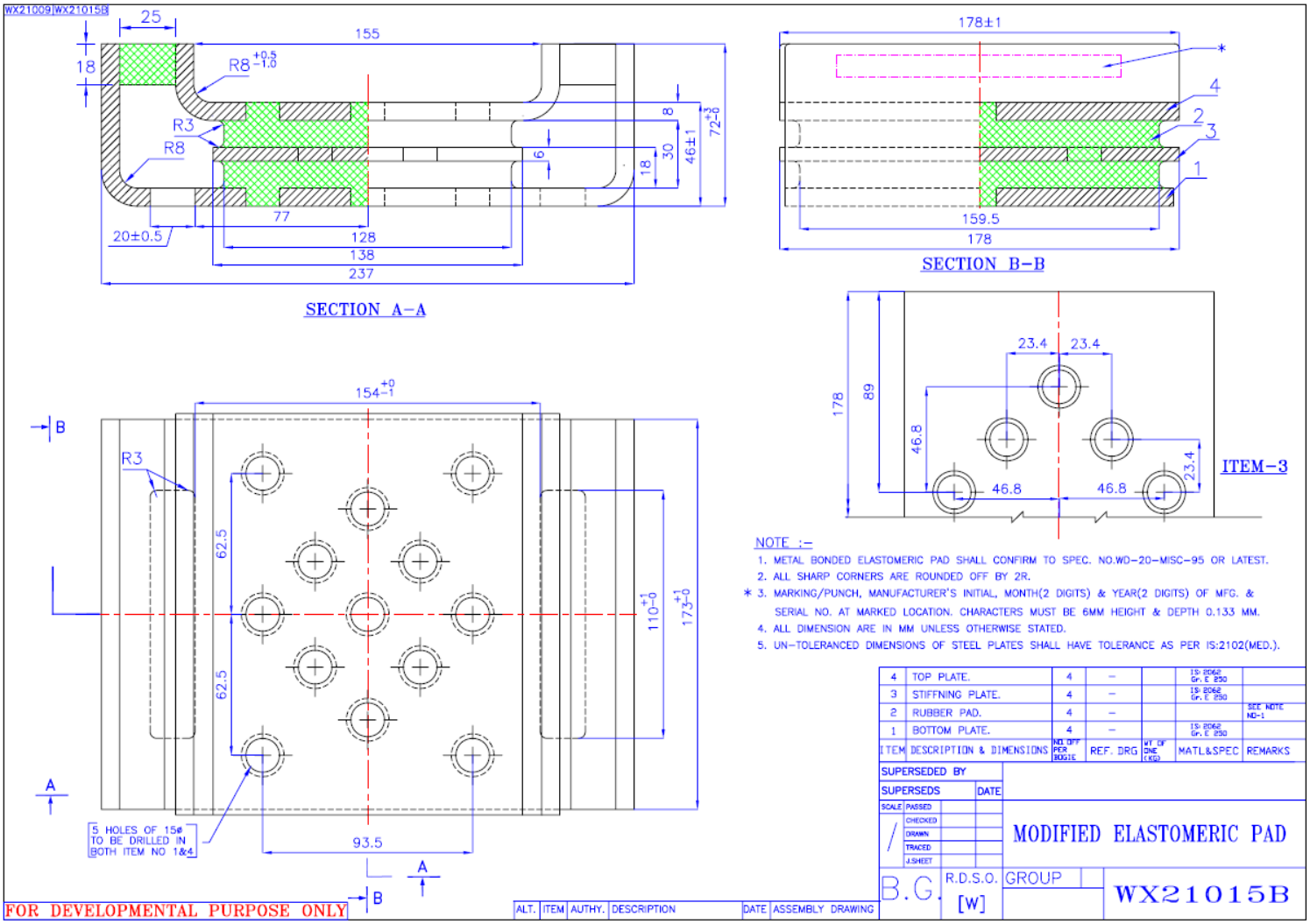
15.1 RDSO Design - Modified Elastomeric pad to RDSO drawing no. Drawing No. WX-21015 (A, B, C & D)

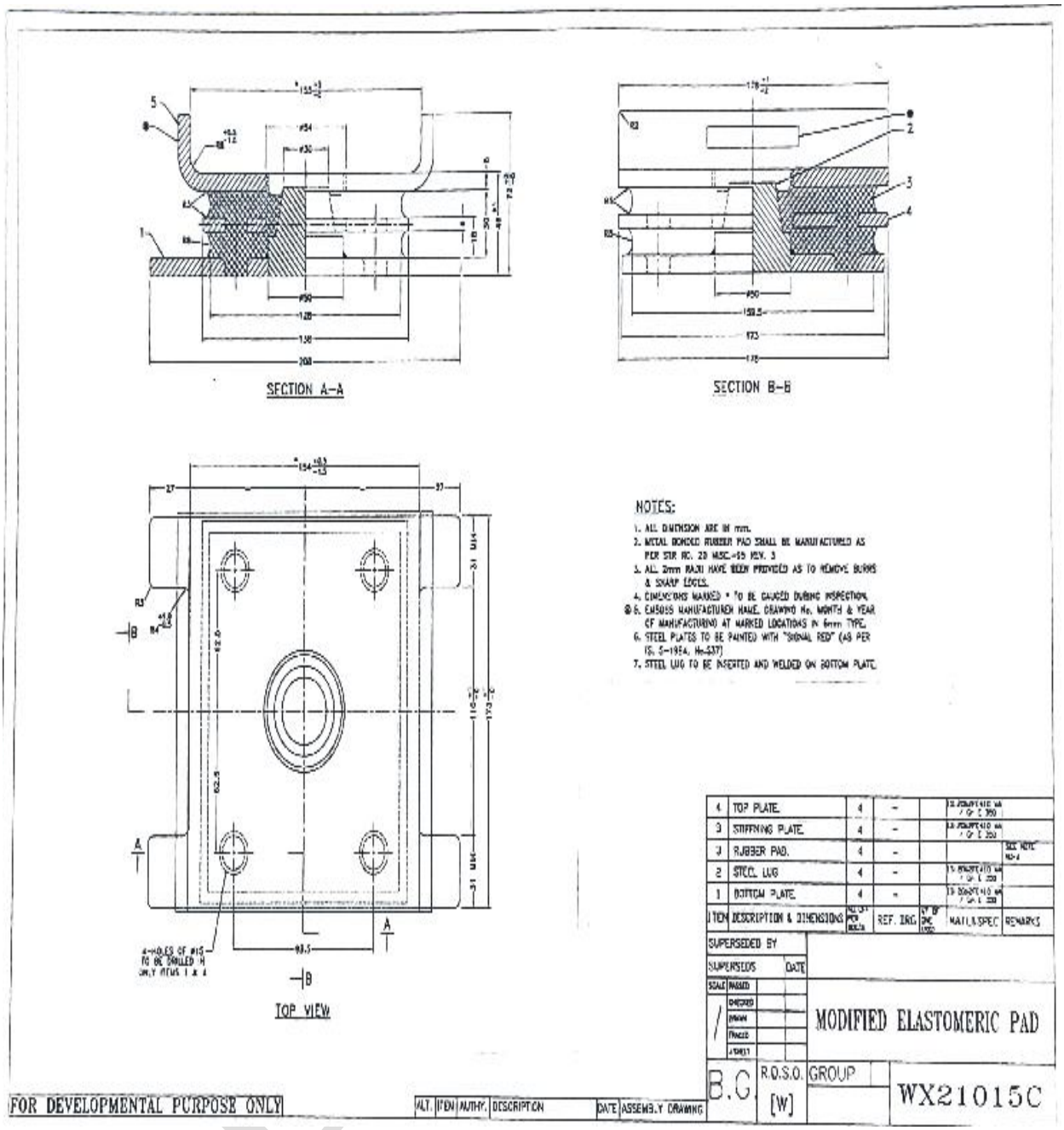
15.2 Boundary envelop to RDSO Drawing No. WX-21017

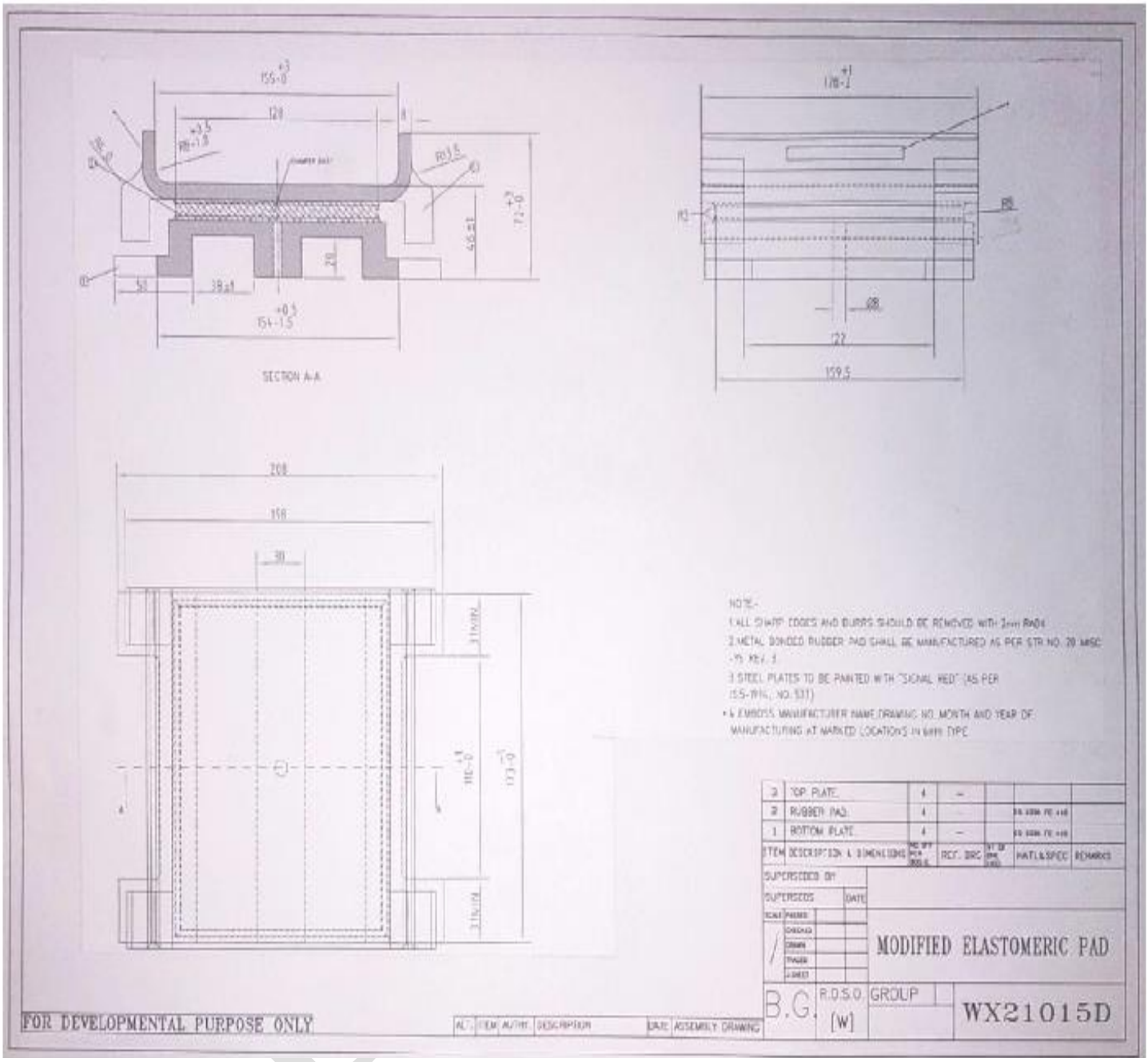
15.3 Testing Rig for Elastomeric Pad to drawing no. WD2-7561-S-1
Note: (this drawing need to modified for EM pad to drg. no WX-21015 & WX-21017)

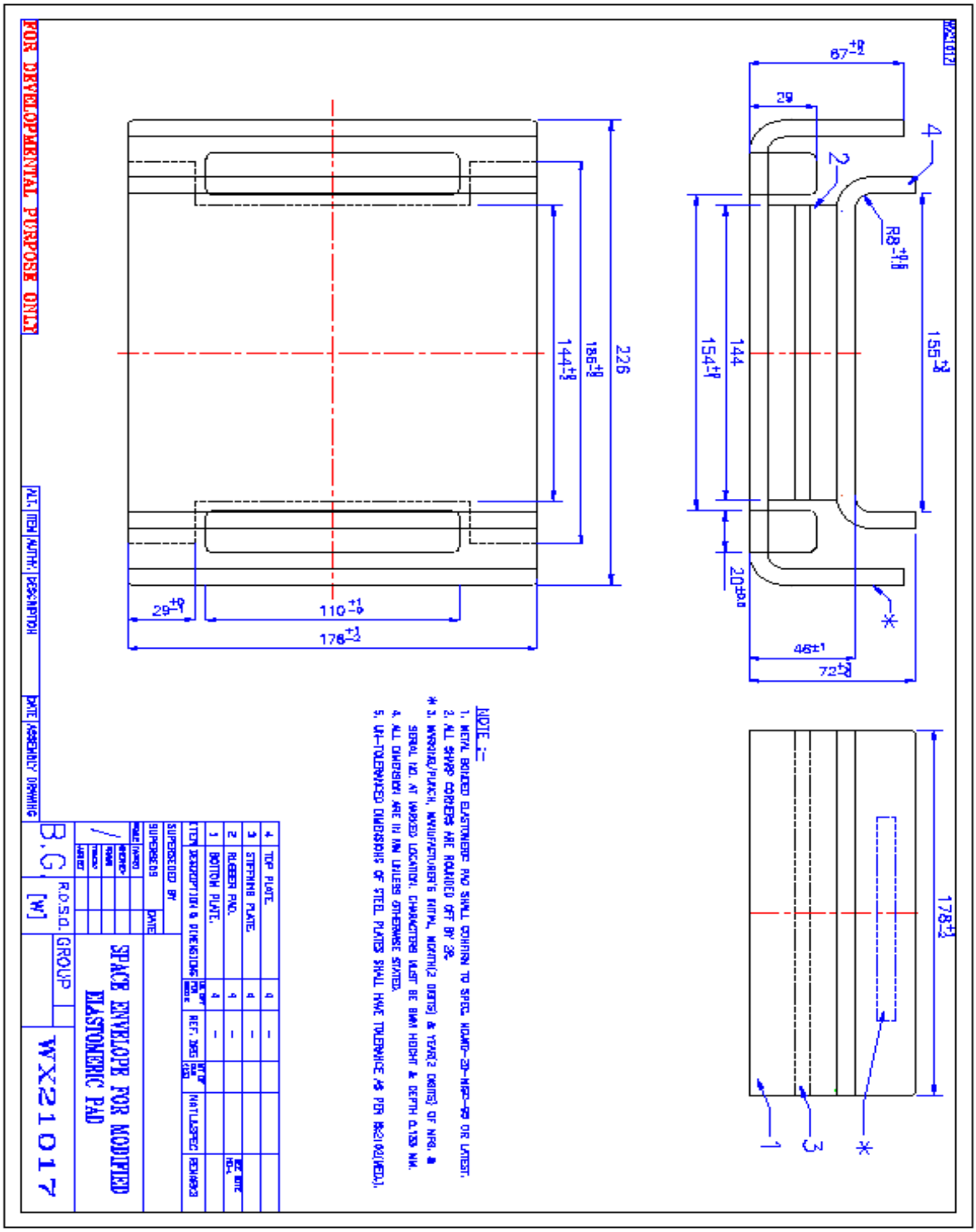
15.4 Shear fatigue test procedure for Elastomeric-Pad to Ref. drawing no. WD-X-91/7
Note: (this drawing need to modified for EM pad to drg. no WX-21015 & WX-21017)

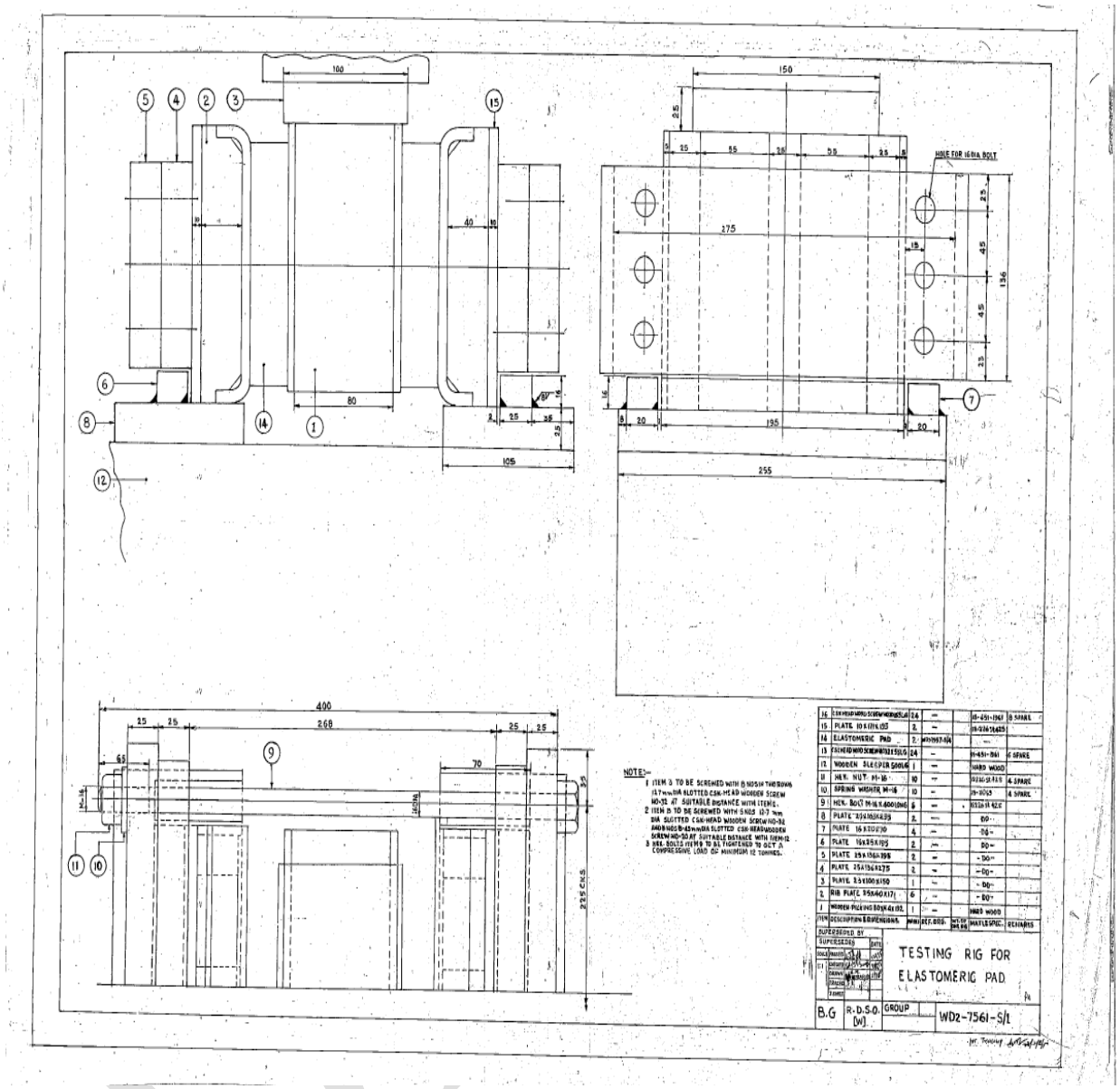

WX21015AJ
SECTION A–A
SECTION B–B
ITEM–3
NOTE :–
1. METAL BONDED ELASTOMERIC PAD SHALL CONFIRM TO SPEC. NO.WD–20–MISC–95 OR LATEST.
2. ALL SHARP CORNERS ARE ROUNDED OFF BY 2R.
* 3. MARKING/PUNCH, MANUFACTURER'S INITIAL, MONTH(2 DIGITS) & YEAR(2 DIGITS) OF MFG. & SERIAL NO. AT MARKED LOCATION. CHARACTERS MUST BE 6MM HEIGHT & DEPTH 0.133 MM.
4. ALL DIMENSION ARE IN MM UNLESS OTHERWISE STATED.
5. UN–TOLERANCED DIMENSIONS OF STEEL PLATES SHALL HAVE TOLERANCE AS PER IS:2102(MED.).
4 TOP PLATE. 4 – IS 2062 Gr–E350 QUALITY–BO
3 STIFFNING PLATE. 4 – IS 2062 Gr–E350 QUALITY–BO
2 RUBBER PAD. 4 – SEE NOTE NO–1
1 BOTTOM PLATE. 4 – IS 2062 Gr–E350 QUALITY–BO
ITEM DESCRIPTION & DIMENSIONS NO OFF PER BOGIE REF. DRG WT OF ONE (KG) MATL&SPEC REMARKS
SUPERSEDED BY
SUPERSEDS DATE
SCALE PASSED CHECKED DRAWN TRACED J.SHEET
MODIFIED ELASTOMERIC PAD
B.G. R.D.S.O. [W] GROUP
WX21015A
FOR DEVELOPMENTAL PURPOSE ONLY
ALT. ITEM AUTHY. DESCRIPTION DATE ASSEMBLY DRAWING
5 HOLES OF 15ø TO BE DRILLED IN BOTH ITEM NO 1&4


WX21009/WX21015B
SECTION A–A
SECTION B–B
ITEM–3
NOTE :–
1. METAL BONDED ELASTOMERIC PAD SHALL CONFIRM TO SPEC. NO.WD–20–MISC–95 OR LATEST.
2. ALL SHARP CORNERS ARE ROUNDED OFF BY 2R.
* 3. MARKING/PUNCH, MANUFACTURER'S INITIAL, MONTH(2 DIGITS) & YEAR(2 DIGITS) OF MFG. & SERIAL NO. AT MARKED LOCATION. CHARACTERS MUST BE 6MM HEIGHT & DEPTH 0.133 MM.
4. ALL DIMENSION ARE IN MM UNLESS OTHERWISE STATED.
5. UN–TOLERANCED DIMENSIONS OF STEEL PLATES SHALL HAVE TOLERANCE AS PER IS:2102(MED.).
4 TOP PLATE. 4 – IS: 2062 Gr. E 250
3 STIFFNING PLATE. 4 – IS: 2062 Gr. E 250
2 RUBBER PAD. 4 – SEE NOTE NO-1
1 BOTTOM PLATE. 4 – IS: 2062 Gr. E 250
ITEM DESCRIPTION & DIMENSIONS NO. OFF PER BOGIE REF. DRG WT. OF ONE (KG) MATL&SPEC REMARKS
SUPERSEDED BY
SUPERSEDS DATE
SCALE PASSED CHECKED DRAWN TRACED J.SHEET
MODIFIED ELASTOMERIC PAD
B.G. R.D.S.O. [W] GROUP
WX21015B
5 HOLES OF 15ø TO BE DRILLED IN BOTH ITEM NO 1&4
FOR DEVELOPMENTAL PURPOSE ONLY
ALT. ITEM AUTHY. DESCRIPTION DATE ASSEMBLY DRAWING


SECTION A–A
SECTION B–B
TOP VIEW
NOTES:
1. ALL DIMENSION ARE IN mm.
2. METAL BONDED RUBBER PAD SHALL BE MANUFACTURED AS PER STR NO. 20 MISC-95 REV. 3
3. ALL 2mm RADII HAVE BEEN PROVIDED AS TO REMOVE BURRS & SHARP EDGES.
4. DIMENSIONS MARKED * TO BE GAUGED DURING INSPECTION.
5. EMBOSS MANUFACTURER NAME, DRAWING No. MONTH & YEAR OF MANUFACTURING AT MARKED LOCATIONS IN 6mm TYPE.
6. STEEL PLATES TO BE PAINTED WITH "SIGNAL RED" (AS PER IS: 5-1994, No-537)
7. STEEL LUG TO BE INSERTED AND WELDED ON BOTTOM PLATE.
4 TOP PLATE 4 –
3 STIFFNING PLATE 4 –
2 RUBBER PAD. 4 –
2 STEEL LUG 4 –
1 BOTTOM PLATE 4 –
ITEM DESCRIPTION & DIMENSIONS REF. DRG. MAT'L & SPEC REMARKS
SUPERSEDED BY
SUPERSEDES DATE
SCALE 1/1
MODIFIED ELASTOMERIC PAD
B.C
R.D.S.O. [W]
GROUP
WX21015C
FOR DEVELOPMENTAL PURPOSE ONLY
ALT. ITEM AUTHY. DESCRIPTION DATE ASSEMBLY DRAWING


SECTION A-A
159.5
208
158
30
NOTE-
1 ALL SHARP EDGES AND BURRS SHOULD BE REMOVED WITH 2mm RADII
2 METAL BONDED RUBBER PAD SHALL BE MANUFACTURED AS PER STR NO. 20 MISC -95 REV. 3
3 STEEL PLATES TO BE PAINTED WITH "SIGNAL RED" (AS PER IS:5-1994, NO. 537)
4 EMBOSS MANUFACTURER NAME DRAWING NO. MONTH AND YEAR OF MANUFACTURING AT MARKED LOCATIONS IN 6mm TYPE
3 TOP PLATE 4
2 RUBBER PAD 4
1 BOTTOM PLATE 4
ITEM DESCRIPTION & DIMENSIONS
MAT'L & SPEC
REMARKS
SUPERSEDES BY
SUPERSEDES
DATE
MODIFIED ELASTOMERIC PAD
B.G.
R.D.S.O.
GROUP
[W]
WX21015D
FOR DEVELOPMENTAL PURPOSE ONLY


FOR DEVELOPMENTAL PURPOSE ONLY
ALL DIMENSIONS IN MM
87
29
4
2
R8
155
154
144
20
46±1
72
178±1
226
186±1
144±1
110±1
178±1
29
1
3
*
NOTE :-
1. METAL BONDED ELASTOMERIC PAD SHALL CONFORM TO SPEC. NO.WD-20-MISC-95 OR LATEST.
2. ALL SHARP CORNERS ARE ROUNDED OFF BY 2R.
* 3. MANUFACTURER'S LOGO, MANUFACTURER'S INITIAL, MONTH(2 DIGITS) & YEAR(2 DIGITS) OF MFG. & SERIAL NO. AT MARKED LOCATION. CHARACTERS MUST BE 8MM HEIGHT & DEPTH 0.15MM.
4. ALL DIMENSION ARE IN MM UNLESS OTHERWISE STATED.
5. UN-TOLERANCED DIMENSIONS OF STEEL PLATES SHALL HAVE TOLERANCE AS PER IRS:M-30(REVISED).
4 TOP PLATE 4 -
3 STIFFENER PLATE 4 -
2 RUBBER PAD. 4 -
1 BOTTOM PLATE. 4 -
ITEM DESCRIPTION & DIMENSIONS NO. OF ITEMS REQ. PER UNIT REF. DRG. NO. MATL.SPEC. REMARKS
SUPERSEDED BY
SUPERSEDES
DATE
MADE (NAME)
CHECKED
TRACED
VERIFIED
B.G. [W]
R.D.S.O. GROUP
WX21017
SPACE ENVELOPE FOR MODIFIED ELASTOMERIC PAD
ALT. ITEM AUTH. DESCRIPTION INITIAL DATE ASSEMBLY DRAWING


TESTING RIG FOR
ELASTOMERIC PAD
B.G
R.D.S.O. (W).
GROUP
WD2-7561-S/L
NOTE:-

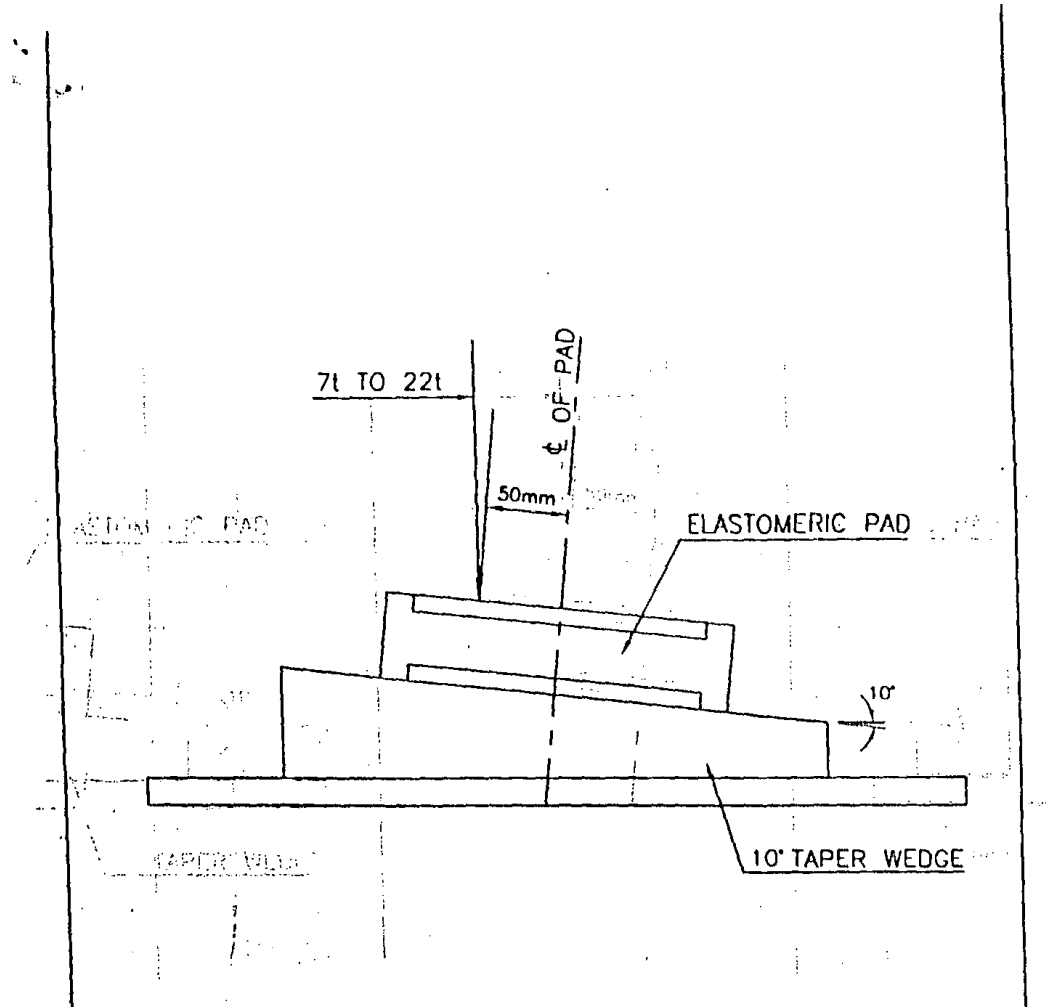


FIG:- SHEAR FATIGUE TEST PROCEDURE FOR ELASTOMERIC-PAD

REF. DRG. NO.	WD-X-91/7