



INDIAN RAILWAYS

SPECIFICATION FOR DESIGN, DEVELOPMENT AND SUPPLY OF PREMIUM ELASTOMERIC PADS FOR BROAD GAUGE FREIGHT BOGIES

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**SPECIFICATION FOR DESIGN, DEVELOPMENT AND SUPPLY
of
PREMIUM ELASTOMERIC PADS
for
BROAD GAUGE FREIGHT BOGIES
(UPTO 25t AXLE LOAD)**

1.0 INTRODUCTION

- 1.1 Indian Railways is currently using Elastomeric Pad (EM Pad) that interface between the roller bearing-adapter crown and bogie side frame for better steering ability, curve negotiation of a three-piece bogie of Freight stock.
- 1.2 The objective of this specification is to develop Premium Elastomeric Pad (PEM Pad) with improved reliability and performance for freight bogies upto 25 tons axle load and high speed on Indian Railways.

2.0 SCOPE

- 2.1 This specification specifies the evaluation of physical and functional properties, laboratory testing and field performance requirements for elastomeric pads to space envelope Drawing No. WX-21002 and Premium Elastomeric pad to Detailed Drawing No. WX-21003.
- 2.2 These elastomeric pads shall be used in LWLH25, LCCF 20 (C) and CASNUB type bogies on Freight stock of Indian Railways upto 25t axle loads and high speed.
- 2.3 The elastomeric pad placed between bogie side frame and adapter is subjected to compressive load and shear load. In static conditions the EM pad experiences around 10-12 tons vertical loads (there are four EM pads in a bogie at each axle-box/adapter level). In the dynamic conditions, there is an augment to this force. The lateral and longitudinal clearances between side frame and adapter of freight bogies used on IR are generally in the order of 16 mm (25 mm for LCCF Bogie) and 9 mm (10 mm for LCCF Bogies) respectively. The PEM shall be an integral single unit of elastomeric element with metallic plates.
- 2.4 The elastomeric pad shall be capable of withstanding wide climatic variation prevailing in India (temperature range of -10°C to $+50^{\circ}\text{C}$) and maximum permitted operating temperature (90°C) of bearing. The elastomeric pad must operate without adverse effect on safety, reliability, physical deterioration and any marked change of its characteristics, over service life.

3.0 REFERENCE TO SPECIFICATIONS AND STANDARDS

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	Steel for General Structure Purposes
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	ISO: 3302-1	Rubber-Tolerances for products- Dimensional tolerances

4.0 MATERIAL

4.1 MATERIAL OF COMPOUND

- a) Natural rubber or elastomer or a blend of elastomer suitably compounded shall be used for the manufacturing of elastomeric pads.

- b) Any other compound may also be used with prior approval of RDSO to conform to the requirements stipulated in this specification. For this vendor shall obtain the raw material and manufacturing technology/process from reputed firms. The vendor shall submit a copy of memorandum of understanding/agreement in this regard to Wagon Directorate, RDSO, Lucknow at the time of application. Firm shall submit the detailed test report, documentary evidences, physical and functional properties of the material, working temperature range etc. 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.

4.2 MATERIAL OF METAL PLATES

- i) Metal plate's steel shall conform to IS 2062 Grade E410.
- ii) Firm may offer alternate material with consent of RDSO such that it meets the technical and functional requirements as stipulated in this specification.

5.0 PHYSICAL PROPERTIES

5.1 RUBBER COMPOUND (Finished product)

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

S.N.	Properties	Permissible limit	Method/Standard
1.	Tensile strength (Kg/cm ²), minimum	225	IS:3400 (Part-1)
2.	Elongation at break (%), minimum	400	IS:3400 (Part-1)
3.	Compression set (%) at 100 ±1 °C after 24 ^{+0/-2} hours, maximum	20	IS:3400 (Part-X)
4.	Hardness (Shore 'A')	70 ±10	IS:3400 (Part-2)
5.	Ash content not to exceed	8 %	IS:3400(Part-22)
6.	Specific gravity not to exceed	1.22	IS:3400 (Part-9)
7.	Resistance to Ozone Test (Quality retention rating)(% minimum)	85	ASTM 1171
8.	Low temperature resistance at -40 °C for 3 minutes	Non brittle and no crack	ASTM D 2137

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 Wagon directorate of RDSO.

5.2 ACCELERATED AGEING

The manufacturer shall carry out accelerated ageing tests on test pieces prepared from the same elastomeric pad which was used for preparing test pieces for checking physical properties of rubber compound as stated in Para 5.1. The method for conducting accelerated ageing test shall be as per the Standard/ specification stated in para 3 of this specification.

After ageing at 100 ± 1 °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 100 ± 1 °C for 72 Hours		
S. No.	Properties	Permissible Limit
1	Hardness change, points (shore 'A')	+5/- 0
2	Tensile strength change, %	± 20
3	Elongation at break change, %	+10/-30

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 also carry out accelerated ageing tests during purchase inspection for confirmatory purpose. The inspecting officer shall carry out accelerating ageing of least 2 pads randomly selected for every 1000 pads manufactured.

For compound other than rubber, firm shall provide in QAP the variation in properties after aging with respect to properties of unaged final product. Aging tests as described above shall be carried out accordingly.

6.0 FUNCTIONAL PROPERTIES AND TEST REQUIREMENTS

6.1 COMPRESSIVE LOAD DEFLECTION CHARACTERISTICS

The elastomeric pad shall have compression load deflection characteristics as under :-

S. No.	Applied vertical load on one Pad (tons)	Deflection (mm)	Permissible Tolerance (deflection)
1	7.5	1.2	$\pm 20\%$
2	15	2.2	$\pm 20\%$
3	25	3.0	$\pm 20\%$

TEST PROCEDURE AND OTHER REQUIREMENTS:

The test shall be carried out at ambient temperature and a machine speed of $10^{\pm 2.5}$ mm/minute. The elastomeric pad shall be subjected to three successive loadings from 0 to 25 tons. After third cycle, load of 50 kg is to be applied on pads and deflection readout reading to be set at zero. The deflection readings are to be recorded at loads on 7.5 tons, 15 tons and 25 tons with the help of digital readout. The load-deflection values shall be within the specified range as given in Table. The digital readout should be suitable to read a minimum variation of 10 kg.

6.2 LATERAL SHEAR LOAD - DEFLECTION CHARACTERISTICS

The elastomeric pad shall have following load deflection characteristics in lateral shear mode:-

S.No.	Applied lateral load on 2 pads (tons)	Deflection (mm)	Permissible Tolerance (deflection)
1	3	4.0	±20%
2	6	7.0	±20%
3	9	9.0	±20%

TEST PROCEDURE AND OTHER REQUIREMENTS

This test shall be carried out with combination of two elastomeric pads in a fixture conceptualize in RDSO Sketch No.WD2-7561-S/1 (Copy enclosed). The elastomeric pads shall be subjected to a compressive load of 12 tons three times at a ram speed rate of $10^{\pm 2.5}$ mm/ minute in the fixture. During the fourth compression, the pad shall be held at compressive load of 12 tons. 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 up to 9.0 tons. Deflection values as per table up to 9.0 tons shall be recorded during the fourth cycle.

Lateral and longitudinal shear load deflection tests can also be carried out on dual axis machine. For this, suitable fixtures shall be used.

6.3 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 Programme (QAP).

S.No.	Applied longitudinal Load on 2 pads (tons)	Deflection (mm)
1	3	To be measured for each load and recorded
2	6	
3	9	

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 tons 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 tons. 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 9 tons deflection values as per table up to 9.0 tons shall be recorded during the fourth cycle.

6.4 SHEAR BOND STRENGTH

The shear bond strength between metal plates and rubber of elastomeric pad shall be minimum 50.0 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 number & 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

6.5 DAMPING/HYSTETISIS TEST

Damping properties of the PEM pads shall be determined by cycling the PEM pads at 3 Hz frequency in three principle directions i.e. vertical, lateral and longitudinal. The damping in lateral and longitudinal directions shall be determined by cycling the PEM pads in lateral and longitudinal directions while withstanding a constant vertical load on the pad, typically of 12 tons respectively. For measurement of damping in lateral direction, the pad shall be given cyclic load for a deformation of 9 mm in either side from the mean position in lateral direction. Similarly, for the measurement of damping in longitudinal and vertical direction the pad shall be given cyclic load for the deformation equivalent to 6 mm in either side from the mean position and 3 mm in vertical directions (compressive) respectively. The force vs displacement loop to be plotted for the measurement of damping characteristics as shown in of Figure -1. The damping of the pad shall be determined by measuring the area within the force-displacement loop. The amount of the pad damping over a stipulated displacement range is directly proportional to the area contained within the loop at the stipulated frequency. These tests shall be a type test and conducted during development of the product or during the quality audit of the product. The firm shall conduct these tests and value observed shall mention in their QAP.

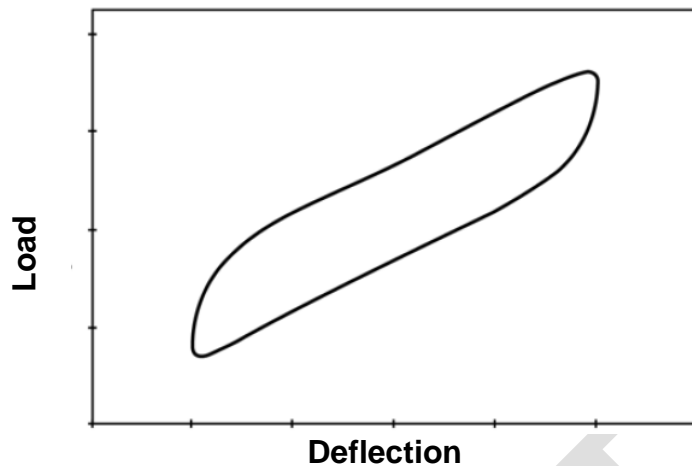


Fig.1: a typical load-deflection loop

6.6 FATIGUE TEST

The fatigue test shall be conducted only when the results of load- deflection characteristics are verified and the sample 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.

6.6.1 Procedure/Methodology

One elastomeric pad shall be subjected to fatigue test on dual axis fatigue testing machine for 1 million vertical compressive load cycles along with 0.6 million lateral load cycle to check the quality of manufacturing process by the way of verifying the product fatigue life. This test shall be carried out in the manufacturer's premises, for which necessary testing infrastructure shall have all the necessary testing facilities available with the firm. For this dual axis fatigue testing machine of suitable capacity should be available. The machine shall be capable to apply and record (in digital mode) load as well as deflection.

The excitation in vertical direction shall be sinusoidal and can be represented as= $13+A \cdot \sin(2\pi f_1 t)$;

The excitation in lateral direction shall also be sinusoidal and can be represented as = $B \cdot \sin(2\pi f_2 t)$;

Where;

A is Vertical load amplitude in tons and equal to 6 tons,

B is Lateral displacement amplitude in mm and equal to 7 mm,

f_1 is vertical load frequency in herz and equal to 2Hz and 3 Hz,

f_2 is lateral displacement frequency in herz and equal to 1Hz and 2 Hz,

t is time in second,

The cycles shall be divided into two stages of 0.4 million and 0.6 million cycles. The vertical and lateral excitation to PEM for fatigue testing shall be as below;

Stage	Vertical Excitation	Lateral Excavation	No of Cycles
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	(tons)	(mm)	
1	$13+6 * \text{Sin}(2\pi*2*t)$	$7 * \text{Sin}(2\pi*1*t)$	0.4 million
2	$13+6 * \text{Sin}(2\pi*3*t)$	$7 * \text{Sin}(2\pi*2*t)$	0.6 million

6.6.2 Observations/Evaluation of Fatigue test

- (1) The load-deflection characteristics of elastomeric pads shall be checked as per procedure mentioned in para 6.1, 6.2 and 6.3 of this specification before and after the completion of each stage of fatigue test. The observed value shall be within the tolerance range as specified in the specification or approved QAP.
- (2) Damping of the PEM shall also be measured as per procedure mentioned in para 6.5 of this specification before and after the completion of each stage of 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 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/tear in an elastomer exceeds 20 mm in length and 6 mm in depth in any layer.
 - ii) If de-bonding of rubber from metal plate exceeds 20 mm long 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.

7.0 DIMENSIONS AND TOLERANCES:

- i) The elastomeric pads shall be manufactured as per firm drawing approved by RDSO. Firm drawing shall conform the envelop size for elastomeric pad to Drawing No. WX-21002.
- ii) Un-tolerance dimensions of steel plate shall have tolerances as per IS: 2102 (medium).
- iii) Un-tolerance rubber dimensions shall have tolerances as per Table 1 of ISO: 3302-1 Class- M3.

7.1 CONSTRUCTION, FINISH AND MOULDING PROCESS

- i. Rubber and its compound for elastomeric pads shall conform to space envelope Drawing No. WX-21002 and Detailed Drawing of premium elastomeric pad to Drawing No. WX-21003. Firm may offer any other drawing with prior approval of Wagon Directorate of RDSO maintaining the envelope Drawing No. WX-21002.
- ii. The Pad shall be manufactured by injection moulding process.
- iii. The metal plates shall be degreased, shot/grit blasted to Sa 2.5 and chemically cleaned with tri chloroethylene, benzene, toluene or naphtha before bonding with rubber. The shots/grits shall be as per IS: 9139-G-M30. The metal plates must be degreased before mechanical cleaning as well as after mechanical cleaning. It has to be ensured before bonding that the metal surface is free from dust, rust, moisture, metal oxide, oily contaminants and other foreign matter. Chemlok primer shall be applied on dry plates within one hour of last chemical cleaning. 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 range 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.
- iv. The rubber (after injection moulding) shall be smooth and free from pinholes, blisters and any other visual flaws. All sharp edges and burrs shall be removed from the steel plates. Before applying primer coat for achieving the required bond strength between metal plates and rubber, the metal plates, which are ready for use, should be stored suitably to avoid contamination of the metal surface. The metal to rubber bonding shall be uniform and to the standard laid down later in this specification.
- v. The temperature and moulding time of Injection moulding process shall be optimized for proper curing of rubber. Rheometer shall be used for this optimization.
- vi. For other than rubber/rubber compound, firm shall provide all relevant information regarding dimension with tolerances, construction process and finish on the drawing and QAP of the product.
- vii. A uniform thickness of Elastomer shall be preferred.
- viii. In the elastomeric pad the lateral edges and the longitudinal outer edges and any other edge of the elastomeric portion shall include an internally recessed contour.

7.2 Firm shall also submit following test value, properties in their QAP:-

Test Name	Test method /specified value	Observed value
Rebound resilience test	IS 3400 (Part-11) or equivalent	
Fire resistance test	ANSI/UL 94-2001 or equivalent	
Tear propagation resistance	IS 3400 (Part-17) or equivalent	
Lateral Hysteresis at 12 t vertical load (compressive) and lateral load (4.5t) and 3 Hz frequency	Para 6.5 of this specification	
Longitudinal hysteresis at 12 t vertical load, lateral load (4.5t) and 3 Hz frequency	Para 6.5 of this specification	
Elastomer blend grade/rubber grade used for Pad i.e % of natural rubber & % of other elastomer in blend etc.		

8.0 INFRASTRUCTURE REQUIREMENTS AND APPROVAL PROCEDURE

The procedure to be followed for approving vendors for premium Elastomeric Pad to this specification is given below:-

- 8.1** Firm willing to develop and register for premium elastomeric pad shall apply to Wagon Directorate, RDSO, Lucknow along with list of M&P, drawing, applicable MOUs if any, QAP and copy of complied orders of elastomeric pads (if any) for last three years.
- 8.2** Firm shall have all the facilities including steel fabrication shot/grit blasting facilities, cleaning facilities, injection moulding facilities, rubber testing facilities, hysteresis-testing facilities/damping testing facilities and fatigue testing machine in-house as per STR QMS: 05 (latest).
- 8.3** Scrutiny of submitted documents shall be done for the compliance of STR/ product processing M&P, QAP of the firm and internal test results submitted by firm as per para 5, 6 & 7.2. On ascertaining the compliance, RDSO official shall be deputed for infrastructure verification and sample testing at firm's premise. Minimum 20 samples of elastomeric pads shall be offered for dimensional measurements and testing as per para 5 & 6.
- 8.4** On successful completion of infrastructure verification and sample testing as given in para 8.5, firm shall be permitted to supply 1500 Nos premium elastomeric pad for service trials on LWLH25 or LCCF and CASNUB type bogies fitted wagons for a period of one ROH or more for performance & reliability evaluation:-

- i) During field performance, failure of premium elastomeric pads shall not be more than 2 % of pads fitted during the trialed ROH period.
 - ii) After completion of one ROH (18 - 24 months), Eight PEM pads shall be randomly picked from the field for detailed testing. These pads will be subjected to load deflection tests as mentioned in para 6.1, 6.2, 6.3 and 6.4. The measured value shall be within the specified range as given in the specification or approved QAP. These PEM shall also be subject to damping tests as per para 6.5 of this specification and the measured values shall be within the specified range given in approved QAP.
 - iii) If more than 2% pad fail during one ROH period of trials, the field trials may be extended for one more year again. However, the failure upto the extended period should not be more than 4% (four percentages) on cumulative basis. In case, failure is less than 4% on cumulative basis, Eight PEM pads shall be randomly picked from the field for detailed testing as mentioned in para 8.4 (ii) above.
 - iv) 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 20 mm in length and 6 mm in depth in any layer.
 - (ii) If de-bonding of rubber from metal plate exceeds 20 mm 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
 - v) 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
- 8.5** 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.
- 8.6** 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.

- 8.7** Vendor-Changes in Approved status: All the provisions contained in RDSO's ISO procedures laid down in Document No. QO-D-8.1-11 version No:1.7 date effective 22.01.2021 (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.

9.0 PURCHASE INSPECTION - LOT SIZE, SAMPLING AND CONFIRMATORY TESTS

- 9.1** The Inspecting Agency for the purpose of inspection of the product in reference to a Purchase Order shall carry out the checks as given below:
- 9.2** The Inspecting Agency shall verify the following before carrying out inspection of elastomeric pad:
- a) The delivery period of the Purchase Order is valid.
 - b) Check the Internal inspection record carried out at various stages of manufacture of the product by the manufacturer's quality control for the product being offered and the results of the internal inspection records are in order.
 - c) Verify that the manufacturer is strictly adhering to all the stipulations of its "Quality Assurance Plan (QAP)" during manufacturing.
 - d) The measuring instruments, gauges, testing facilities, etc are in working order and they are calibrated.
 - e) The latest copies of all reference specifications mentioned in Para - 3 are available with the manufacturer.
 - f) Check the record and witness for fatigue test of the product carried out by the firm as per Para 6.6 of this specification.
 - g) The sample size, which shall be drawn by the Inspecting Agency from each lot elastomeric pad offered for inspection is detailed below. These samples are to be tested for conformance with the permissible values given in Para 4, 5 & 6 of this specification.
 - h) Maximum lot size to offer of elastomeric pads for inspection shall be 2000 nos.
 - i) Material shall be offered for inspection within two months of its manufacture.
 - j) Visual inspection of 100% pads in general for defects and records of elastomeric pads produced shall be checked before proceeding further.
 - k) Out of offered lot 20 number pads shall be drawn randomly by inspecting Officer for following various checks/tests

Non-Destructive Test:

S.No.	Test	No. of Pads
1	Visual examination	20
2	Dimensions as per drawing	20
3	Compressive Load-deflection characteristics	10
4	Shear load-Deflection Characteristics (lateral & longitudinal)	10

Destructive Testing:

S.No.	Test	No. of Pads
1	Physical properties of Rubber Compound	02
	i) Tensile strength (kg/cm ²)	
	ii) Elongation at break, %	
	iii) Compression set, %	
	iv) Hardness (shore 'A')	
	v) Ash Content, %	
	vi) Specific Gravity	
2	Accelerated Ageing of Rubber compound	02
	i) Hardness (shore "A")	
	ii) Tensile strength	
	iii) Elongation at break	
3	Resistance to Ozone Test (Quality retention rating) (% minimum) (Para 5.1-vii)	01
4	Low temperature resistance at - 40 °C for 3 minutes (Para 5.1-viii)	
5	Shear Bond Strength	01
6	Physical Properties of Metal Plates	Metal plate shall be taken from any pads, which is used for above destructive testing.
7	Fatigue test (para 6.6)	01

Note: The same pads shall be subjected to compressive load deflection test, shear bond and shear load-deflection tests:-

- a) 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.
- b) If the samples fail in one or more of the criteria in para 5.2, "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 raw material and/or improved process and implemented the same.
- c) Improvements in raw material quality and/or improved process shall be put to competent authority for approval before undertaking inspection again.
- d) In the event of rejection, the entire lot offered for inspection shall be made unusable for Railway application destroyed/defaced in the presence of the inspecting authority.
- e) Each pad, which has been passed by the Inspecting official, shall be stamped.

10.0 GUARANTEE

10.1 The firm shall stand guarantee of premium elastomeric pad for service period of 36 (Thirty-six) months from the month and year of manufacturing. All aspects of the design, workmanship and material shall be covered by this guarantee. In case of any premature failure of pads, firm will be liable to make free replacement within reasonable time to the depot where failure has been reported. Whenever repeated failures are reported, firm shall investigate and come up with satisfactory reasons for failure and take remedial action to improve the quality.

10.2 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 other compound.
- iii. De-bonding of rubber from metal plate exceeds 50 mm long on any one rubber/metal at any surface of the rubber/other compound.
- iv. Permanent set of elastomeric pad of more than 4mm from the nominal value of elastomeric pad.

S. No.	Wagon No.	ROH/ POH date	Make of EM pad	Date of failure	Month of manufacture	Causes of failure
						Bond failure
						Rubber/other compound crushed/Perished
						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.
						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 long on any one rubber/metal at any surface of the rubber/other compound

11.0 PROCESS AUDIT CHECK

This is an audit check regarding firm's adherence to its own quality assurance plan and its general quality consciousness. This audit may be required to be carried out in case reports of premature product failure are received from railways. For establishing this, the samples shall be collected from Railways and sent to RDSO,

Lucknow as and when required for carrying out the tests mentioned in para 9.2 (k) generally however other test like Damping test, hysteresis test, TGA for polymer, FT-IR for polymer may also be carried out.

12.0 MARKING

- 12.1** Outer face of top plate - flange of the Elastomeric Pad shall be legibly marked/punched in the following sequence: -
- i. Manufacturer's name (initials or trademark).
 - ii. Manufacture date, month and last two digits of the year.

There must be at least one blank space between items i), ii) and between the month and year of manufacturer. Character must be at least 6 mm high and depth 0.13 mm. The marking location to be ensured as shown RDSO drawing no. WX-21003. The marking shall be such that it shall withstand and readable till the life of PEM pads.

13.0 PAINTING

Each Elastomeric Pad shall be painted with two coats of beach brown enamel to IS: 8662 No.490 on the steel plates only after application of two coats of primer red oxide zinc chromate to IS: 2074. Powder coating on plates is permitted.

14.0 PACKING

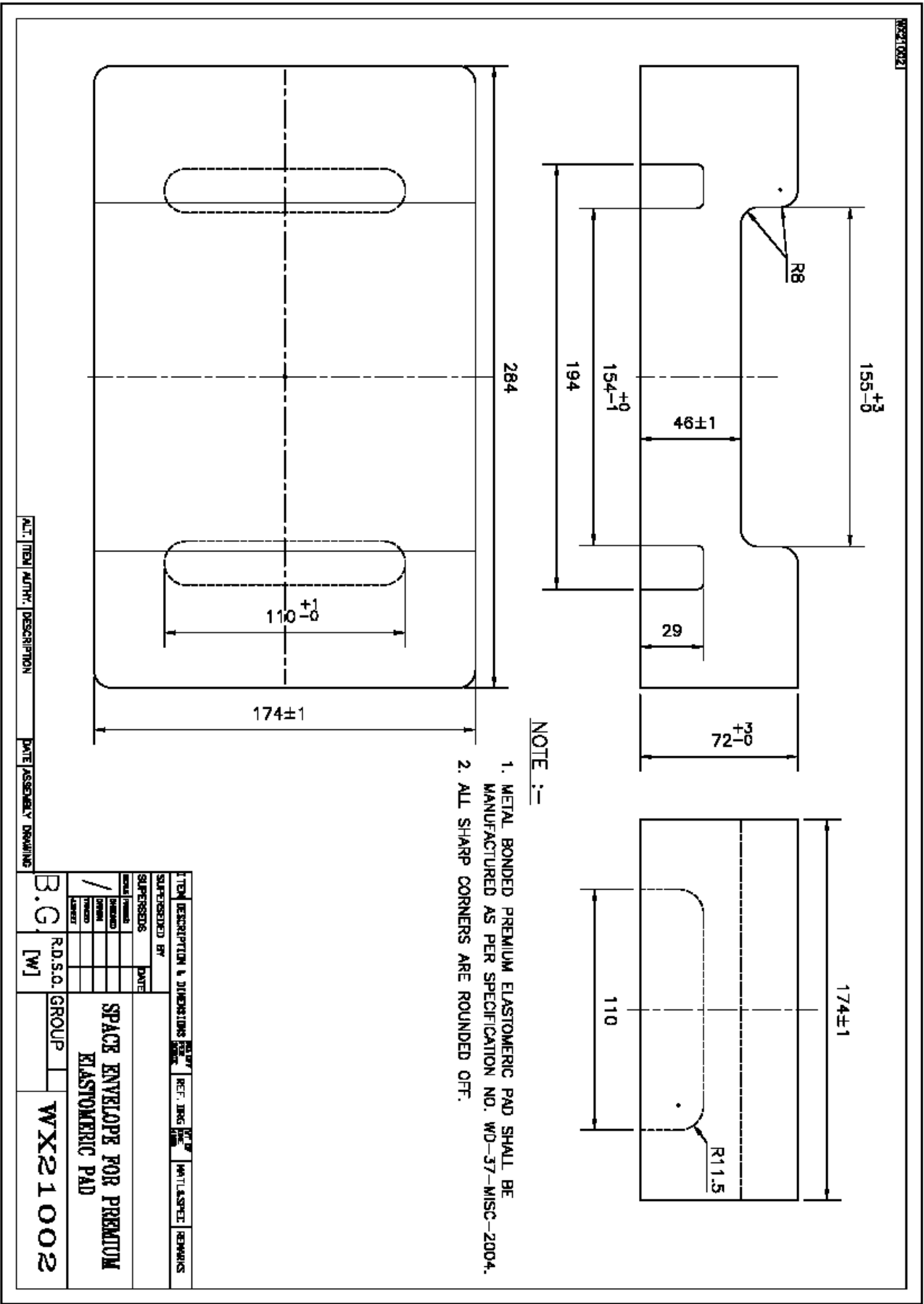
- 14.1** The elastomeric pads shall be dusted with French chalk and suitably protected against damage during transit and storage.
- 14.2** In the event of sublet orders from bogie manufacturers, packing shall be as agreed to between purchaser and the supplier.

15.0 STORAGE

These elastomeric pads shall be stored in a cool and dry place.

16.0 LIST OF ENCLOSED DRAWING

- 16.1** Space envelope for Premium Elastomeric pad to RDSO drawing no. WX 21002
- 16.2** Premium Elastomeric pad to RDSO is drawing no. WX-21003
- 16.1** Testing Rig for Elastomeric Pad to RDSO is drawing no. WD-7561/S1

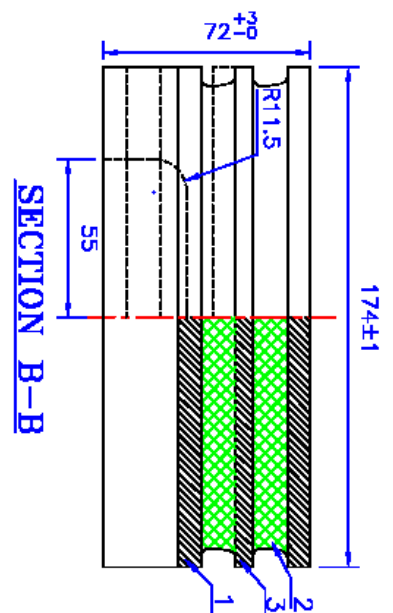
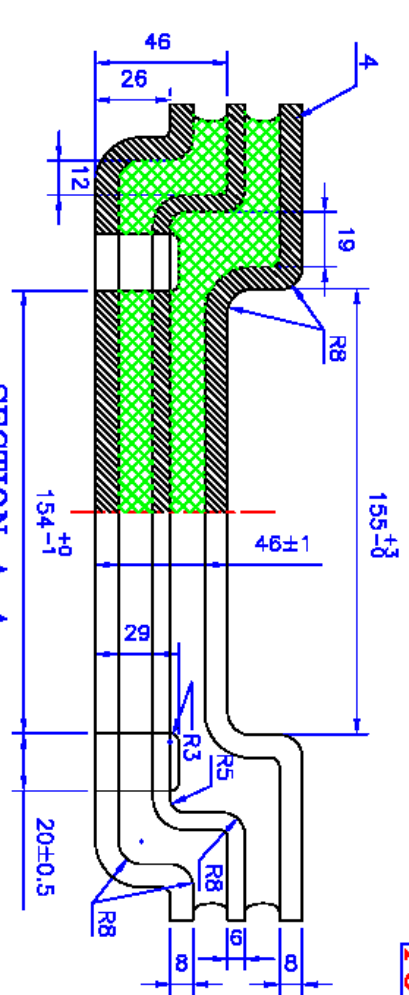


NOTE :-
 1. METAL BONDED PREMIUM ELASTOMERIC PAD SHALL BE MANUFACTURED AS PER SPECIFICATION NO. WD-37-MISC-2004.
 2. ALL SHARP CORNERS ARE ROUNDED OFF.

ALT. / REV. / AUTH. / DESCRIPTION DATE / ASSEMBLY DRAWING

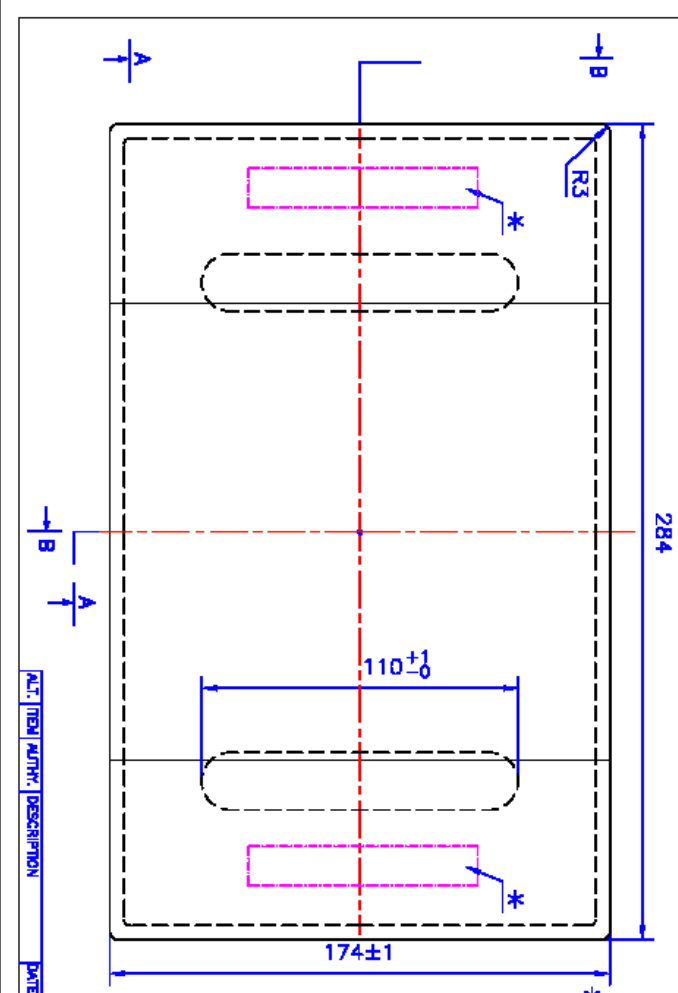
ITEM NO.	DESCRIPTION & DIMENSIONS PER DRAWING	REV. NO.	REF. DIMS PER DRAWING	DATE	APPROVED BY	REMARKS
SUPERSEDED BY						
DATE						
DESIGNED BY	SPACE ENVELOPE FOR PREMIUM ELASTOMERIC PAD					
CHECKED BY						
DRAWN BY						
DATE						
LAYER						
B.G.	R.D.S.O.	GROUP	WX21002			
[W]						

FOR DEVELOPMENTAL PURPOSE ONLY



NOTE :-

1. METAL BONDED ELASTOMERIC PAD SHALL CONFORM TO SPEC. NO. WD-37-MISC-2004 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.).



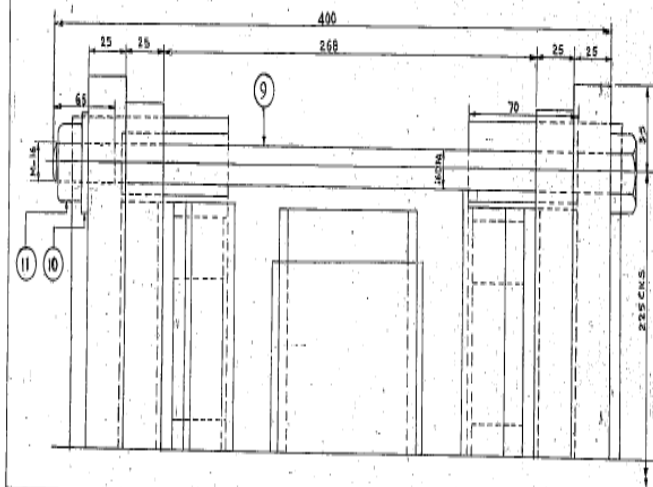
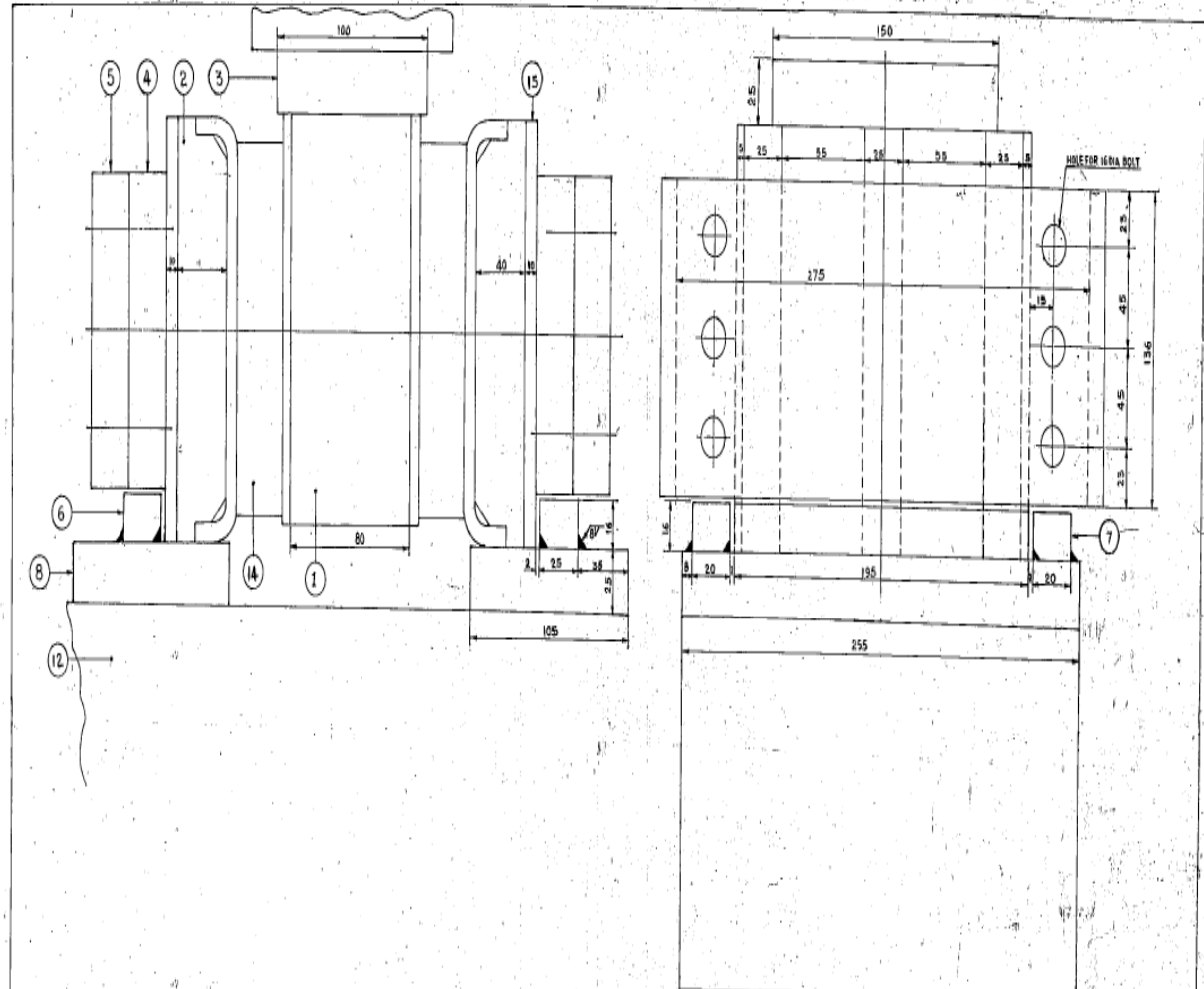
ALT.	ITEM	AUTH.	DESCRIPTION	DATE	ASSEMBLY DRAWING

NO.	DESCRIPTION & DIMENSIONS	REV.	BY	CHK.	DATE	WHITELABEL	REMARKS
4	TOP PLATE	4	-	-	25.02.20		
3	STIFFENING PLATE	4	-	-	25.02.20		
2	RUBBER PAD	4	-	-	25.02.20		
1	BOTTOM PLATE	4	-	-	25.02.20		

SUPERSEDED BY	
NO.	DATE

DESIGNED		PREMIUM ELASTOMERIC PAD
CHECKED		
DRAWN		

B.G.	R.D.S.O.	GROUP	WX21003
[W]			



NOTE:-
 1 ITEM 3 TO BE SCREWED WITH 10MM DIA THRU PIN
 17MM DIA FLOTTED CON. HEAD WOODEN SCREW
 NUTS AT SUITABLE DISTANCE WITH ITEM 1.
 2 ITEM 8 TO BE SCREWED WITH 5MM 10-7 MM
 DIA SLOTTED CON. HEAD WOODEN SCREW NUTS
 AND 10-8MM DIA FLOTTED CON. HEAD WOODEN
 SCREW NUTS AT SUITABLE DISTANCE WITH ITEM 8
 & HEX. BOLT ITEM 9 TO BE TIGHTENED TO OBTAIN
 COMPRESSIVE LOAD OF MINIMUM 12 TONNES.

ITEM	DESCRIPTION & DIMENSIONS	QTY	UNIT	REF. QTY.	DATE	SCALE	REMARKS
15	PLATE 15X10X105	2	---	10-251-1061	10-251-1061	10-251-1061	10 SPRING
14	ELASTOMERIC PAD	2	---	10-251-1061	10-251-1061	10-251-1061	10 SPRING
13	SCREW WOOD SCREW 10X150	24	---	10-451-041	10-451-041	10-451-041	4 SPRING
12	WOODEN SLICE 10X10X10	1	---	10-451-041	10-451-041	10-451-041	4 SPRING
11	HEX. NUT M-16	10	---	10-251-1061	10-251-1061	10-251-1061	4 SPRING
10	SPRING WASHER M-16	10	---	10-251-1061	10-251-1061	10-251-1061	4 SPRING
9	HEX. BOLT M16X400MM	6	---	10-251-1061	10-251-1061	10-251-1061	4 SPRING
8	PLATE 20X10X105	2	---	80			
7	PLATE 16X10X10	4	---	70			
6	PLATE 16X8X105	2	---	60			
5	PLATE 15X10X105	2	---	50			
4	PLATE 15X10X125	2	---	40			
3	PLATE 15X10X100	1	---	30			
2	RIB PLATE 15X40X12	6	---	20			
1	WOODEN PILE 10X10X10	1	---	100			

TESTING RIG FOR
ELASTOMERIC PAD

B.G. R.D.S.O. GROUP WD2-7561-S/I