

## STANDARD QUALITY ASSURANCE PLAN FOR ELASTOMERIC BEARINGS

1. Name of Manufacture : ..... 2. Drg. No. : .....  
 3. Name of Project/Railway: ..... 4. Authority (CA No./LOA No./Order No.) : .....

S. No.	Component Operation	Characteristic Checks & Tolerances	Frequency & Type of check	Reference Document	Fabricator's quality control	Inspection details		Type of Records	Acceptance criteria	Remarks
						Inspecting Agency	Extent of Inspection			
1	2	3	4	5	6	7	8	9	10	11
1.0 1.1	<b>RAW MATERIAL</b> Elastomer ( Only virgin Polychloropr ene (CR) is permitted & preferable grades are- Neoprene WRT, Bayprene 110, Skyprene B-5 and Denka S-40V)	<b>Physical Test</b>  With values of characteristics specified  a) Hardness  b) Min. Tensile strength  c) Min. Elong. at break  d) Max. Compression set  e) Accelerated ageing test  I) Max. Change in Hardness  II) Max. Change in Tensile strength  III) Max. Change in Elongation.  (f) Adhesion strength of Elastomer to Steel Plates	As per manufacturer certificate & test required by Authorized inspector of zonal Railway from Govt./ NABL approved lab  IRHD ( 60 ± 5 )  17 MPa  400%  35%  100 ± 1°c for 70 Hours  +15% w.r.t. value of (a)  -15% w.r.t. value of (b)  -30% w.r.t. value of (c)  Min. 7 KN/m	Manufacturer test certificate & Challan	Verification of reference document.	Authorized Inspector appointed by Zonal Railway	From batches at Random and at discretion of Inspector	Fabricators record.	IRC:83 (Part-II) & IS:3400 (as per relevant test procedure)	Examination of Test Certificates is required Test Certificate shall be furnished by manufacturers for following tests. (i) Composition (ii) Hardness (iii) Tensile strength (iv) Elongation at Break (v) Compression set (vi) Accelerated Ageing test (vii) Adhesion Strength  <b>IMPORTANT:</b> Properties of Elastomer should be as per Table 1 of IRC:83 Part-II Polychloroprene Content ≤ 60 % Ash content ≥ 5% Note: (i) No reclaimed rubber, vulcanized wastes or natural rubber shall be used. (ii) EPDM (Ethyle propylene Dimonomer), IIR (Isobutane Isoprene Copolymer), CIIR (Chloro-Isoprene Copolymer) are not permitted for manufacture of bearings.  Adhesion strength test to be conducted as per IS: 3400 Part XIV.

Note:- Large lot means if number of bearings are ≥ 24 & tests for Acceptance level 1 to be conducted. Small lot means if numbers of bearings are < 24 where Acceptance level 2 tests are done. Lot size to be approved by the engineer. In large lot 2 extra bearings to be made which are consumed in destructive testing.

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1.1 Cont.	Elastomer	<b>Chemical Test</b> i) Determination / Identification of polymer  ii) Polymer content  iii) Ash content  (iv) Specific gravity  (V) Ozone resistance	As per manufacturer certificate & test required by Authorized inspector of zonal Railway from Govt./ NABL approved lab  min 60%  Max 5%	Manufacturer test certificate & Challan	Verification of reference document.	Authorized Inspector appointed by Zonal Railway	From batches at Random	Fabricators record.	IRC:83 (Part-II) Ash content as per IS:3400 part XXII and Polychloroprene content as per ASTM-D297 Identification of polymer as per ASTM D 3677 (as per relevant test procedure)	Examination of Test Certificates is required Test Certificate shall be furnished by manufacturers for following tests. (i) Polymer Identification (ii) Polymer content (iii) Ash content (iv) Specific gravity (V) Ozone resistance  <b>Preferably test of polymer identification, polymer content and Ash content should be either witnessed or sealed sample to be sent to NABL LAB for evaluation.</b> <b>Note:</b> For acceptance testing level I, <b>(a)</b> Ash content on specimen from test bearing shall be compared with those for specially moulded test pieces and Max variation permitted is $\pm 0.5\%$ <b>(b)</b> Specific gravity on specimen from test bearing shall be compared with those for specially moulded test pieces and Max variation permitted is $\pm 0.2\%$ <b>(c)</b> For other test max. and min. limits to be adhered. <b>(d)</b> Ozone resistance can be waived by test engineer as per note 2 of Para 918.4.1.2 of IRC83 Part II.

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2.0 cont.	& Breadth) (e) Thickness of laminate (f) Parallelism of laminate with respect to bearing base as datum (g) Hardness during manufacturing (h) Over all Thickness	±10 %  1 in 100  IRHD 60±5  -0,+5%	Visual & Measurement	As per approved drawing	Measurement of dimension	Manufacturer inspecting agency	At Discretion	Fabricator's record.	IRC 83 Part-II & as per drawing	-do-
<b>3.0</b>	<b>Final inspection</b>									
3.1	Visual examination and dimensional check a) Over all plan dimension (Length & Breadth) b) Over all Thickness c) Parallelism of top surface of bearing with respect to the bottom surface as datum d) Parallelism of one side surface with respect to the other as datum	Dimensions of bearing as per specified tolerances as under :  -0,+6mm  -0,+5%  1 in 200  1 in 100	Visual and measurement	As per relevant drg. & specification	Measurement of dimension	Authorized Inspector appointed by Zonal Railway	100%	Fabricator's record & test report.	As per table 2 of IRC 83 Part-II	All bearings to be visually inspected for absence of any defects in surface finish, shape or any other discernible superficial defect. Also after load testing, during visual examination of bearing no defects should be noticed in surface finish, shape or other noticeable superficial defects.  Authorised inspector has to carry out 100% dimensional check for item a) & b) <b>and random check for item c) &amp; d) to be done till full satisfaction.</b>

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3.2 3.2.1	<b>Chemical &amp; Physical Test</b>	<p><b>Chemical Test</b></p> <p>i) Determination/ Identification of polymer.</p> <p>ii) Polymer content</p> <p>iii) Ash content</p> <p>iv) Specific gravity</p> <p>v) Ozone resistance</p>	As per manufacturer certificate & test required by Authorized inspector from Govt./ NABL approved lab min 60% max 5%	Manufacturer Test Certificate & Challan	Verification of reference document.	Authorized Inspector appointed by Zonal Railway	From batches at Random	Fabricators record.	IRC:83 (Part-II) Ash content as per IS:3400 part XXII and Polychloroprene content as per ASTM-D297 Identification of polymer as per ASTM D 3677 (as per relevant test procedure)	<p>Test certificate shall be furnished by manufacturers. <b>For level I acceptance</b> sample from randomly selected bearing of each lot of Elastomer bearing as prescribed in procedure in IS3400 and IRC83 (Part-II) shall be drawn by authorized inspector and tested in house lab. or in Govt./ NABL approved laboratory for all the 5 tests. These test are in addition to tests conducted on specially moulded test pieces prepared at the time of manufacture of bearing.</p> <p><b>For Level II acceptance</b> tests on specially moulded test pieces to be done.</p> <p>Tests to be done for</p> <p>(i) Polymer Identification</p> <p>(ii) Polymer content</p> <p>(iii) Ash content</p> <p>(iv) Specific gravity</p> <p>(v) Ozone resistance</p> <p><b>Preferably test of polymer identification, polymer content and Ash content should be either witnessed or sealed sample to be sent to Govt./NABL LAB for evaluation.</b></p> <p><b>For Level-I Acceptance additional</b> test will be,</p> <p><b>(a)</b> Ash content on specimen from test bearing shall be compared with these for specially moulded test pieces and Max variation permitted is <math>\pm 0.5\%</math></p>

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1	2	3	4	5	6	7	8	9	10	11
										<p>(b) Specific gravity on specimen from test bearing shall be compared with these for specially molded test pieces and Max variation permitted is <math>\pm 0.2\%</math></p> <p>(c) For other test max. and min. limits to be adhered.</p> <p>(d) Ozone resistance can be waived by test engineer as per note 2 of Para 918.4.1.2 of IRC83 Part II. Polychloroprene Content <math>\leq 60\%</math> Ash content <math>\geq 5\%</math> Note: (i) No reclaimed rubber, vulcanized wastes or natural rubber shall be used. (ii) EPDM (Ethylene propylene Dimonomer), IIR (Isobutane Isoprene Copolymer), CIIR (Chloro-Isoprene Copolymer) are not permitted for manufacture of bearings.</p>
3.2.2	Elastomer (Only virgin Polychloroprene (CR) is permitted & preferable grades are- Neoprene WRT, Bayprene 110, Skyprene B-5 and Denka S-40V)	<p><b>Physical Test</b> With values of characteristics specified</p> <p>a) Hardness b) Min. Tensile strength c) Min. Elong. at break</p>	As per manufacturer certificate & test required by Authorized inspector from Govt./ NABL approved lab	Manufacturer test certificate & Challan	Verification of reference document.	Authorized Inspector appointed by Zonal Railway	From batches at Random	Fabricators record.	IRC:83 (Part-II) & IS:3400 (as per relevant test procedure)	<p>Test certificate shall be furnished by manufacturers. (For level 1 acceptance sample from each lot of Elastomer as prescribed in specification shall be drawn by authorized inspector and tested in either In-house Lab. or in NABL/ Govt. Approved laboratory. For level 2 acceptance, tests on specially molded test pieces to be done.</p> <p>Tests to be done are (i) Composition (ii) Hardness</p>

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3.2.2 Cont.		d) Max. Compression set e) Accelerated ageing test i) Max. Change in Hardness ii) Max. Change in Tensile strength iii) Max. Change in Elongation. (f) Adhesion strength of Elastomer to Steel Plates	35%  $100 \pm 1^\circ \text{c}$ for 70 Hours +15% w.r.t. value of (a) -15% w.r.t. value of (b)  -30% w.r.t. value of (c)  Min. 7 KN/m							(iii) Tensile strength (iv) Elongation at Break (v) Compression set (vi) Accelerated Ageing test (vii) Adhesion Strength  <b>IMPORTANT:</b> Properties of Elastomer should be as per Table 1 of IRC:83 Part-II  Adhesion strength test to be conducted as per IS: 3400 Part XIV.
3.3	<b>Load Test on complete bearings</b> a) Axial load test  b) Elastic Modulus test	Upto 15MPa  Test to be conducted as per Annexure 2 of IRC: 83 (Part-II) acceptance value of $E_a = \pm 20\% 1 \div (0.2/S^2 + 0.0005)$ MPa where "S" is shape factor	All bearing of the lot shall be tested.  Load testing on Two test bearings.	As per relevant drg. and specification	Fabricators record.	Authorized Inspector appointed by Zonal Railway	100%  In case of large lot	Fabricators record.	IRC 83 Part-II	For both Acceptance Level 1 & Acceptance Level 2, all 100% bearings to be Checked for axial load tests as per Para 918.4.1.1(3), check for misalignment of plates, poor bonding of elastomer and laminated steel plate, surface defect, low stiffness etc. Variation in stiffness of any one bearing shall not be larger than 20% of mean of measured values. <b>Note:-</b> For acceptance level I sample from randomly selected bearing of each lot (for destructive testing) of elastomeric bearing as prescribed in procedure of IS: 3400 & IRS:83 (Part –II) shall be drawn by authorized inspector and all test mention from (b) to (e) are to be got done either in house lab or in

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3.3 Cont.	(c) Shear Modulus test	Test to be conducted as per Annexure 2 of IRC: 83 (Part-II) value of G for acceptance from 0.8MPa to 1.2 MPa	Load testing on Two test bearings.							Govt./NABL approved lab. (A) These tests are in addition to tests conducted on specially moulded test pieces prepared at the time of manufacture of bearings. Note that the bearing selected for test will not be reused and destructive test will be done on sample prepared from them.  (B) For acceptance level 2 shear modulus tests is mustwhich will be done on randomly selected bearings and which after test can be used in the bridge.  <b>Ultimate Compressive Strength test.</b> There should be no failure of steel laminate or irreversible squeezing out of elastomer upto load of 60MPa.
	(d) Stripping strength test / Adhesive strength test	Test to be conducted as per Annexure 2 of IRC: 83 (Part-II) examination for evidence of cracking/ peeling both in strained (Strain value 2.0) and unstrained state.	Load testing on Two test bearings.							
	(e)Ultimate compressive strength test	<60MPa	Load testing on Two test bearings for Destructive Test.							

Note:- Large lot means if number of bearings are  $\geq 24$  & tests for Acceptance level 1 to be conducted. Small lot means if numbers of bearings are  $< 24$  where Acceptance level 2 tests are done. Lot size to be approved by the engineer. In large lot 2 extra bearings to be made which are consumed in destructive testing.

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