

Contact Details for comments on Spec/STR's

Draft Spec. No. - C-K013 (Rev.2)

Title - Specification for Bogie Mounted Brake Cylinder for BG Mainline & EMU Coaches

- 1) RDSO has revised the above specification/STR in line with latest technological developments in the field, modify clauses not relevant in the present context and making them more enabling with focus on functional requirements.
- 2) It is requested that your comments / suggestions with regard to improvements / modifications in specification / STR of this item may be submitted in the following format along with the justification for the changes required.

Part A: Basic Information

SN	Particulars	Information
1	Name	
2	Designation	
3	Professional Qualification	
4	Organization / Firm's Name	
5	Address for Correspondence	
6	Contact No.	
7	Email ID	
8	<u>In case of Firm / Individual:</u> Manufacturing experience of item (or similar Item) on which comments are offered	
9	<u>Where relevant:</u> Whether any technical document to support suggested changes is available / enclosed for better appreciation	

Part B: Comments / suggestions on the specification

SN	Clause No. of RDSO STR / Spec	Clause, as exists in RDSO STR / Spec	Clause , as it should read after incorporation of comments / suggestions in the RDSO Spec / STR	Justification for changes

Comments may be sent to:

Executive Director /Carriage
Research Designs and Standards Organization
Manak Nagar, Lucknow – 226011
Email: edcar.rds@gmail.com, director.carr.es@gmail.com

INDIAN RAILWAYS**SPECIFICATION**

for
BOGIE MOUNTED BRAKE CYLINDER

for
BG MAINLINE AND EMU COACHES

SN	Month & Year of issue	Revision / Amendment	Page No.	Reason for Amendment
1	November, 2000	-	-	First issue
2	October, 2012	1	All	1. Reformatted. 2. Para 5.1.1.2.f added. 3. Test no. 3 in Annexure B for Endurance testing of BMBC added.
3	July, 2020	2	3,4,6,7 & 11	To make the specification more enabling with focus on functional requirements

Issued By:**RESEARCH DESIGNS AND STANDARDS ORGANISATION****MINISTRY OF RAILWAYS****MANAK NAGAR, LUCKNOW- 226011**

Signature			
Name & Designation	Prepared by: D Kulshrestha JE/Carriage	Checked by: Vivek Anand SSE/Carriage	Approved by: S K Sharma Director/Carriage

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Signature			
Name & Designation	Prepared by: D Kulshrestha JE/Carriage	Checked by: Vivek Anand SSE/Carriage	Approved by: S K Sharma Director/Carriage

SECTION -A

Specification for Bogie Mounted Brake Cylinder with Built in Slack Adjuster for EMU and Main Line Passenger Coaches

1. Scope

- 1.1 This specification covers the technical requirements related to material, dimensions, inspection and testing of brake cylinder used on bogie mounted air brake system and does not include other necessary provisions of the contract.
- 1.2 Where vendor approval is done by RDSO, all the provisions contained in RDSO's ISO (titled "Vendor – Changes in approved status") latest, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.

2. Particular Requirements

- 2.1 Air brake manufacturers should seek approval from ~~RDSO~~ vendor approving authority for manufacture of brake cylinder with built in slack adjuster clearly bringing out the input given at their works or sub-contractors, if any.
- 2.2 The manufacturer shall have adequate facilities for the manufacture, testing and Quality control requirement of brake cylinder conforming to as per annexure 'B' of this specification.
- 2.3 ~~Rubber items shall be procured from RDSO approved sources only. However, the manufacturers shall be fully responsible for satisfactory performance of the rubber items.~~

3. Material

- 3.1 The material of brake cylinder with built in slack adjuster shall conform to the latest revision of RDSO drawing nos. RDSO/SK-81200, 81201, 81202, 81203, 81204, 81205 and 81206.
- 3.2 All the components shall be manufactured / procured to the material specification indicated against each component in the drawings.
- 3.3 The castings shall be sound, clean and sharp without defects or blemishes of any kind and conform to the requirement of the specification.
- 3.4 The rubber item shall be smooth, free from pin holes, blisters, porosities and other visual flaws.
- 3.5 The fabrication and welding of fabricated cylinder body shall conform to the requirements of Section II of IS: 2825 (code for unfired pressure vessel).
- 3.6 Testing of other items shall be carried out in accordance with the procedure laid down in RDSO pamphlet no. G-72 (Rev -+ 3 or latest).
- 3.7 The piston packing shall conform to the requirements laid down in Annexure-A.

4. DIMENSIONS AND TOLERANCES

- 4.1 The dimensions and tolerances of brake cylinder shall be as indicated in the latest revision of RDSO drawing indicated at para 3.1 above.
- 4.2 All dimensions identified in the drawing shall be gauged. The manufacturers shall have the necessary gauge available with them. Gauge drawings shall be got approved from ~~RDSO~~ vendor approving authority prior to the manufacture.

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- 4.3 Discrepancies in dimensions, if noticed shall be brought to the notice of ~~RDSO~~ **vendor approving authority** at the developmental stage and sorted out.

5. DEVELOPMENTAL INSPECTION

- 5.1 Developmental inspection shall be carried out at the manufacturer's premises at the time of fresh registration of the firm with ~~RDSO~~ **vendor approving authority** and at the time of Renewal of registration.

The following procedure shall be followed for the developmental inspection:-

- 5.1.1 The inspecting authority shall verify and ensure that the manufacturer is having and strictly following a well-documented system of the 'Internal Quality Assurance Plan'. After having done the same, the following procedure shall be followed:-

- 5.1.1.1 The manufacturer shall offer five brake cylinders complete in all respects and two brake cylinder bodies with test plates in accordance with the layout corresponding to fig. 8.2 of IS:2825 Section III.

- 5.1.1.2 The inspecting authority shall carryout the following test/check on the five complete brake cylinders as per details given below:-

- a) Checking of dimensions and tolerances interchange-ability of components and general workmanship.
- b) Pressure test as per details given at para 7.1.
- c) Leakage test with 7 Kg/cm² hydraulic pressure as per details given at para 7.2.
- d) Two numbers piston packing shall be tested for conformity as per Annexure-A.
- e) Two nos. dust excluders as per requirements of spec. R-48/88 mentioned in the drawing shall be tested for conformity.
- f) Endurance test on one Brake cylinder as per details given in Annexure B.

- 5.2 In case samples offered fail in any of the test/check indicated at para 5.1.1.2 the complete lot of developmental order placed on the firm shall be rejected.

6. PURCHASE INSPECTION

- 6.1 Purchase inspection shall be carried out at the premises of manufacturer who are cleared for the regular manufacture of brake cylinder. The following procedure shall be followed for the purchase inspection:-

- 6.1.1 The inspecting authority shall make audit checks of the manufacturing procedure /internal quality assurance system to ensure that the brake cylinder offered for inspection is manufactured strictly as per internal quality assurance system and the manufacturer has carried out all tests/inspection during manufacturing stage to ensure that brake cylinder offered are strictly to the specification. During such audit checks, the inspecting authority shall also see from the records of internal quality assurance that the raw material used for the manufacture of brake cylinder is as per specification laid down.

- 6.1.2 Inspecting authority shall conduct following checks from a lot of not more than 100 nos.

- 6.1.2.1 Two percent brake cylinder picked up at random shall be checked for dimensions with respect to RDSO assembly drawings.

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- 6.1.2.2 One percent brake cylinder shall be dismantled and dimensions and general work man ships of each component checked as per RDSO drawings.
- 6.1.2.3 Ten percent brake cylinder picked up at random shall be subjected to tests as given at para 7.1 and 7.2 of this specification.
- 6.1.2.4 Two piston packing rings every contract shall be tested for conformity as per Annexure-A.
- 6.1.2.5 Two Nos. dust excluder per every contract shall be tested for conformity as per R-48/88 mentioned in the drawing.
- 6.2 In case the samples picked up fail in any of the tests/checks indicated in para 6.1.2.1 to 6.1.2.5, the reasons for such failure shall be identified. The inspecting authority shall verify the reasons by conducting audit check on internal Quality Assurance system. It is found that such failures are due to non-implementation of internal Quality Assurance system, the entire lot of brake cylinder shall be rejected. In case the failures are on account of reasons other than non- implementation of internal Quality Assurance system, the manufacturer may re-offer the lot after rectifying the defects. However, in such cases, double the quantity of the samples shall be picked up and tests/checks conducted as per para 6.1.2.1 to 6.1.2.5. In case the samples again fail in any of the tests/checks, the entire lot shall be rejected.

7. TESTS

7.1 Leakage & Function Test for Brake Cylinder Complete

The leakage and function test of the brake cylinders should be conducted in accordance with Annexure-B.

7.2 Hydraulic Test

These tests shall be conducted on cylinder body. The cylinder body shall be subjected to hydraulic pressure of 7 Kg/cm² for 5 minutes and there should be no leakage.

8. PAINTING

The exterior of the brake cylinder shall be painted with black enamel paint.

9. PACKING

- 9.1 The manufacturer shall ensure that all external ports of brake cylinders are suitably covered with protection caps to prevent ingress of foreign matter during handling and storage.
- 9.2 The manufacturer shall also ensure that brake cylinders in assembled condition are adequately packed before dispatch to prevent damage in handling and storage.

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ANNEXURE-A

PISTON PACKING FOR 203.2mm BOGIE MOUNTED BRAKE CYLINDER**1.0 SCOPE**

1.1 This specification covers the requirements for piston packings used in bogie mounted brake cylinders of main line and EMU coaches.

1.2 Type

1.2.1 The piston packing shall conform to item 10 of RDSO SK-81204 with latest alteration.

1.3 Requirements**1.3.1 Material:**

1.3.1.1 The rubber used in the manufacture of piston packings shall be Butadiene Acrylonitrile without insertion.

1.3.2 Construction, Workmanship and Finish:

1.3.2.1 The piston packing shall be smooth, free from pin holes, blisters, porosity and other visual defects. The dimensions and tolerances of the piston packings shall be as indicated in the drawing mentioned in clause 1.2.1.

1.3.3 Physical Properties of Rubber

The rubber used in the manufacture of piston packing shall conform to the following requirements:

SN	Property	Requirements
1.	Hardness	80 \pm 5 shore A
2.	Tensile strength kg/cm ² (min.)	105.5
3.	Elongation at break %age (min.)	100
4.	Compression set (%), max. at 100 \pm 1 ⁰ C for 24 +0/-2 hours	70
5.	Swelling hy-volume (%) max. in grease at 100 \pm 1 ⁰ C for 72 +0/-2 hours. Brand of grease	+10/-0 % SERVOGEM-RR-3
Accelerated ageing: After ageing at 100 \pm 1 ⁰ C in an air oven for 168 hours, the hardness, tensile strength, elongation at break shall not vary by more than the following from the values obtained with un-aged specimens.		
a.	Hardness (shore A)	+5/-0
b.	Tensile strength	+5 %
c.	Elongation at break	50 %
6.	Tension set at 20 \pm 2 ⁰ C for 10 minutes.	2% (Max.)

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ANNEXURE-B**TESTING PROCEDURE OF AIR BRAKE CYLINDER
WITH BUILT IN SLACK ADJUSTER****1.0 PREPARATION FOR TEST:**

The test layout is shown in the attached SK-98108. A special pin will be required to locate the crosshead between the angle iron slots. During Testing Cock 2 must be opened slowly whenever the cock is used to admit air under pressure to the cylinder.

- Connect the air supply to the cylinder body.
- Commence with all cocks closed.

2.0 TESTING PROCEDURE**TEST NO. 1 - Leakage test:**

- Open Cock 1 to charge the MR to 7 kg/cm² pressure
- Open Cock 2 to charge the cylinder 0.7 kg/cm² pressure
- The piston stroke must be limited to 32/40 mm, wait for one minute for settlement and there must be no drop in pressure shown in the leakage volume gauge for a further minute. Also observe that leakage does not exceed 0.1 kg/cm² in 10 minutes.
- Repeat this test with the cylinder charged to 3.8 Kg/cm² pressure and with cock 3 closed limiting the maximum piston stroke to 95mm. Observe that the leakage does not exceed 0.1 kg/cm² in 10 minutes.
- Open Cock 3 to exhaust the cylinder pressure to zero.

TEST NO.2 - Operation Test:**A. Full Stroke**

- Close Cock 3 and Open Cock 2.
- Observe the full stroke of the piston. This must be within ± 1.0 mm of the max. Stroke value.

B. Take-up Stroke

- Close Cock 2 and Open Cock 3 to exhaust the cylinder pressure to zero.
- Close Cock 3.
- Open Cock 2 and allow the piston to move out slowly until the operating pawl is heard to "click over" then close Cock 2.
- Measure the take up stroke. This must be 32/40 mm for main line self-generating coaches and ~~between 54mm to 60mm~~ for EMU coaches for cylinders of 95 mm stroke.
- Close Cock 2 and open Cock 3.
- As the cylinder returns to release the locking pawl must be heard to click into position.

NOTE:

1. Operate the piston at full stroke at least 18 times to test all ratchet teeth.

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2. Observe that the Adjuster operates at each Release and the Adjusting tube and crosshead being 'Inched' out along the stroke.
3. The movement of the Piston must be smooth without any tendency to stick at any part of the stroke.

C. Take-up Length (Without Quick Resetting Gear)

- Close Cock 2 and Open Cock 3.
- Remove the pin from the crosshead and unscrew the Adjusting tube until the red resetting mark on the Adjusting Tube is visible.
- Disengage resetting latch and screw in the Adjusting Tube.
- Re-engage resetting latch.
- Check that the Dust Excluder Collar is free and does not twist when the Adjusting Tube is being rotated.
- Close Cock 1 and open Cock 2.
- Close all cocks when the system is at atmospheric pressure.

D. Take-up Length (With Quick Resetting Gear)

- Close Cock 2 and open Cock 3.
- Remove the pin from the crosshead and turn the resetting screw until the red resetting mark on Adjusting tube is visible.
- Screw in the Adjusting Tube with the resetting screw. Check that the Dust Excluder Collar is free and does not twist when the Adjusting tube is rotated.
- Close Cock 1 and open Cock 2.
- Close all cocks when the system is at atmospheric pressure.

TEST NO.3 - Endurance Test:

1. Carry out leakage test as per Test no. 1 of para 2.
2. Charge the brake cylinder with air @ 3.8 Kg/cm².
3. With 32/40 mm piston stroke, measure the force on load cell.
4. Carry out endurance test for 2,00,000 cycles at frequency 1 cycle/minute with 32/40 mm piston stroke.
5. After completion of endurance test measure the force on load cell at 32/40 mm piston stroke.
6. Force on load cell at 32/40 mm piston stroke should not be differ by $\pm 2\%$ of force measured at beginning of endurance test.
7. Repeat the leakage test as per para Test no. 1. Brake cylinder should pass the Test no. 1.
8. Conduct the operation test as described in Test no. 2. Brake cylinder should pass the Test no. 2.

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SECTION-B

INFRASTRUCTURE - MANUFACTURING AND TESTING FACILITIES

1.0 SCOPE

The schedule of technical requirements covers the norms for manufacturing of Air Brake cylinder 203mm with built in slack adjuster for coaching stock.

2.0 REQUIREMENTS

The vendors seeking approval shall comply with all the below mentioned requirements.

GENERAL & MANUFACTURING FACILITIES:

- 2.1 Covered area with adequate space for machine shop, Assembly Sections, performance test benches, welding section, standard room laboratory, storage of raw material and finished product should be available.
- 2.2 The vendor should have adequate machining facilities such as turning, facing, boring, milling, drilling, tapping, grinding, honing and threading for carrying out the required machining operations on the components. The operations involved for each component should be specified machine wise in the process flow chart with accuracy of the machine.
- 2.3 The firm should have a honing machine for honing of cylinder body.
- 2.4 The firm should have adequate supply of compressed air at 8 kg/cm² minimum on the shop floor for performance testing of the equipment.
- 2.5 It is to be ensured that all the hardware items are of reputed make and adhere to the required specifications.
- 2.6 There should be a painting booth for painting the components.

3.0 TESTING FACILITIES

- 3.1 The firm should have facilities of testing the Brake cylinders to meet the requirements mentioned in Section-A of this specification.
- 3.2 The firm should have a test stand for conducting endurance testing of brake cylinders.
- 3.3 A hydraulic pressure testing arrangement of capacity 15 kg/cm² to conduct hydraulic test of brake cylinder should be available.
- 3.4 Firm should have a shadow graph for checking profile of the rubber packing ring.
- 3.5 Firm should have a surface finish tester for measuring the surface finish of cylinder bore.
- 3.6 Spring load testing machine for testing stiffness of
 - i) Plunger spring.
 - ii) Pawl spring.
 - iii) Latch spring.
 - iv) Release spring.
- 3.7 Hardness testing machine for measuring hardness of
 - i) Rocker arm tip.
 - ii) Plunger.
 - iii) Pawl.
 - iv) Latch.

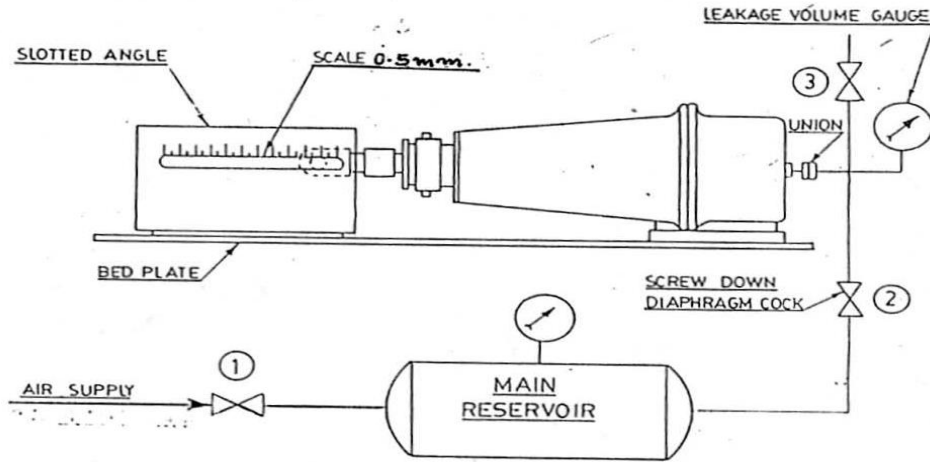
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- 3.8 Shore hardness tester for checking hardness of rubber items.
- 3.9 In addition to above machine the standard room should also have the following instruments:
- Surface plate.
 - Three point bore gauge of 250 mm.
 - Vernier depth gauge of 300 mm.
 - Bevel protector for measuring angle.
 - Minimum one Vernier height gauge of 300mm.
 - Minimum two sets of outside micrometer up to 75 mm.
 - Plug, Go-No-Go and thread gauges as per requirement of the components.

4.0 QUALITY CONTROL REQUIREMENTS

- 4.1 It is to be ensured that head of the Quality control is a graduate engineer with 5 years' experience or a diploma holder in relevant field with 10 years' experience. He should have full knowledge of the product and should be involved in day to day activities of quality control, stage inspection and also compliance of QAP.
- 4.2 The firm should have acquired ISO-9000 series certification and the product for which the approval is sought should be broadly covered in the scope of the certification for manufacturing and supply.
- 4.3 The quality manual of the firm should clearly indicate control over manufacturing process, system of measuring and testing.
- 4.4 The firm should have Quality Assurance Plan as per extant RDSO guidelines. available on RDSO website.
- 4.5 There should be a methodical approach for calibration and record keeping of Gauges, Instruments, Jig and Fixtures.
- 4.6 There should be an established and working system for assessing the quality of the sublet vendors.
- 4.7 ~~Rubber packing ring should be procured from RDSO approved sources only.~~
- 4.8 Despite obtaining test certificates from sublet vendors for non-ferrous and malleable casting items, a system should exist to get samples tested periodically and records should be maintained.

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Name & Designation	Prepared by: D Kulshrestha JE/Carriage	Checked by: Vivek Anand SSE/Carriage	Approved by: S K Sharma Director/Carriage



SUPERSEDED BY		
SUPERSEDES		
SCALE	P	M/1980
	C	1/1984
	D	2/1984
	T	
	J.S	CD/25/98
B.G.	R.D.S0 (C)	SK- 98108

TEST LAYOUT FOR BRAKE CYLINDER WITH BUILT IN SLACK ADJUSTER

Signature			
Name & Designation	Prepared by: D Kulshrestha JE/Carriage	Checked by: Vivek Anand SSE/Carriage	Approved by: S K Sharma Director/Carriage