

SPECIFICATION No. 02-ABR-02
(Supersedes 02-ABR-94)

GOVERNMENT OF INDIA

INDIAN RAILWAYS

**SPECIFICATION FOR AIR BRAKES
FOR
FREIGHT AND PASSENGER STOCK
OF
INDIAN RAILWAYS**

02-ABR-02

**Amendment No. 1 of Feb.2007
Amendment No. 2 of Jan.2010
Amendment No. 3 of April.2010
Amendment No. 4 of Sept.2016**

ISSUED BY:-

RESEARCH DESIGNS & STANDARDS ORGANISATION

MINISTRY OF RAILWAYS

LUCKNOW-226011.

OCTOBER - 2003

Price Rs.

Amendment No.4 of September 2016, to specification 02-ABR-2002 For Air Brake For Freight and Passenger Stock of Indian Railways.

Add the following paragraph under clause 3.1 “**Scope**”

“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 version/ 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”

**AMENDMENT NO. 3 OF APRIL 2010 TO SPECIFICATION NO. 02 – ABR – 02 FOR
AIR BRAKE FOR FREIGHT AND PASSENGER STOCK.**

In Appendix – D.

- 1) Replace existing clause 8 painting with the following clause.

“The angle cock shall be given anti-corrosive treatment and shall be painted with Mid Brunswick Green paint to ISC No.226 of IS: 5–2007 Ready mixed paint to IS: 119 for Angle cock of brake pipe & ready mixed white finish paint to IS:127 for Angle cock of feed pipe.”

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**AMENDMENT No. 2 OF JANUARY 2010 OF SPECIFICATION No. 02-ABR-02 FOR AIR BRAKES FOR
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In Appendix- A 1.

Add Para 4.1.1.1 after Para 4.1.1

“The material of distributor valve body (C3W2) for BLCA/BLCB Wagon can also be Aluminum to grade and specification as recommended by the Principle manufacturer / Collaborator. In such cases, APD as per RDSO drawing will also be supplied by the DV manufacturer.”

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**AMENDMENT No. 1 OF FEBRUARY 2007 OF SPECIFICATION No. 02-ABR—02
FOR AIR BRAKE FOR FREIGHT AND PASSENGER STOCK.**

In Appendix – F

- (a) Para 5 'Purchase Section' shall be read as 'Purchase Inspection'
- (b) Clause 4.1 written under para 5 of 'Purchase Inspection' shall be read as clause 5.1
- (c) Clause 4.2 written under para 5 of 'Purchase Inspection' shall be read as clause 5.1.2
- (d) Tests written under para 5 shall be read under para 6

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**SPECIFICATION FOR AIR BRAKES FOR
FREIGHT AND PASSENGER STOCK OF INDIAN RAILWAYS**

PART 1- GENERAL CONDITIONS

1 FOREWORD

- 1.1 This specification is issued under the fixed serial 02- ABR. The number after ABR indicates the year of adoption/revision.

Adopted - 1980

Revised -1981, 1984, 1989, 1991, 1993, 1994, 2002.

- 1.2 In preparing this specification assistance has been obtained from UIC Specification 540, 541, 547 & AAR Specification S-400, S-401 and IS Specifications IS:2825, IS:11574 & IS:3624.

2 DEFINITION

- 2.1 'TENDERER' means firm /company from whom the offer for the supply of Air Brake equipment is invited.
- 2.2 'CONTRACTOR' means the present firm/company on whom the order for the supply of the Air Brake Equipment is placed/will be placed.
- 2.3 'PURCHASER' means the Indian Railways on behalf of the President of the Republic of India who are Purchasing the Air Brake Equipment.
- 2.4 'INSPECTING AUTHORITY' means the organisation or its representative nominated by the Purchaser to inspect the Air brake equipment on his behalf.
- 2.5 The Research Designs and Standards Organisation, Manak Nagar, Lucknow-226011 is hereafter referred to as RDSO.
- 2.6 Indian Railways is hereafter referred to as I.R.
- 2.7 In case of Tenderer needs any clarification in respect of any clause of this specification or regarding the drawings the Tenderer shall obtain in same from DG(W)/ DG (Carriage), RDSO for clarification.

3 SCOPE

- 3.1 This specification covers purchase and acceptance requirements of Graduated Release Compressed Air Brake Equipment (excluding pipes and joints) for use on freight and passenger stock of Indian Railways.

4 WARRANTY/GUARANTEE

- 4.1 The warranty/guarantee period will be 36 months from the date of delivery or 24 months from the date of commissioning for all components whichever is earlier except distributor valve for coaching stock ,the warranty of which will be governed by clause 9 of specification C-K 209. In case of failure under warranty, a warranty claim shall be lodged by the purchaser or his representative to the firm. A joint inspection of the failed Distributor Valve shall be carried out between the firm's representative and the purchaser or his representative. A failed Distributor Valve shall be taken back by the supplier for repair and re-supply to the Railways after RDSO Inspection alongwith an extended warranty period as applicable to the new supply.

5 AFTER SALES

- 5.1 The contractor shall arrange for adequate service engineers at his own cost to ensure that the equipment supplied performs satisfactorily. Contractor shall also depute his staff on request by the Purchaser / RDSO, to investigate and attend to specific problems that may come up during actual operation of Air Brake Equipment.
- 5.2 The Contractor shall arrange to supply along with the equipment Maintenance Manuals for proper maintenance of his own proprietary equipment. The number of manuals to be supplied shall be 50 against every Contract and shall be supplied free of cost. Manuals shall be illustrated, containing information pertaining to the principle of operation, maintenance schedule of all the proprietary items of equipment being supplied. The Manual shall also contain information on the following :-
- a) Details of attention during IOH / ROH / POH.
 - b) Test equipments.
 - c) Special tools
 - d) Trouble shooting
 - e) List of spares for day to day maintenance and for POH in the form of POH kit.
 - f) Updated position of modifications carried out.
- 5.3 The Contractor shall also arrange to supply along with equipment Wall Charts of all equipment being supplied by them for display in maintenance depots. These shall be supplied @ 50 sets against every contract and shall be supplied free of cost. These charts shall be pictorial, showing all components along with their part Nos. for each item of equipment.

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- 5.4 The Contractor shall supply revised Maintenance Manuals and Wall Charts incorporating necessary changes in the Manuals and Wall Charts already supplied by them for earlier contracts. The copies of maintenance manuals and wall charts are meant for wider circulation on Railway and fresh copies shall be furnished as stipulated even if there are no changes in the manuals & wall charts furnished against earlier contract.
- 5.5 Two sets of cut models of distributor valve & other components of air brake equipment shall be supplied free of cost by the firm for the purpose of education and training of staff at Railway Technical Schools and in RDSO.

6 TRAINING

- 6.1 The Contractor shall undertake to train the following Indian Railway personnel free of cost.
- 6.1.1 Railway Technicians-Sufficient number of technicians shall be trained in consultation with the purchaser/Railways so that adequate trained personnel are made available. This training shall be at the Contractor's works for a minimum period of 1 month & shall cover maintenance and testing of the complete Air Brake equipment.
- 6.1.2 Officers and Engineers- 1 Officer and 2 Engineers for every 1000 sets of Air Brake Equipment or part there of, shall be trained at the works of the principles for a minimum period of 1 month. This training shall cover all the aspects of Air Brake system like design, manufacture, quality control, maintenance and testing.

7 DEVIATIONS

- 7.1 In case the offer does not correspond to this specification in any respect a "Deviation Statement" shall be submitted by the Tenderer. This statement shall clearly give the deviation CLAUSE-WISE with technical reasons for the same, if necessary.
- 7.2 Clauses not covered by the Deviation Statement shall be deemed to be acceptable to the Tenderer in all respects. In case a Deviation Statement is not submitted it would be taken as the complete specification is acceptable to the Tenderer.

8 PRICE

- 8.1 The Contractor shall give price of total air brake equipment per wagon/coach set and shall also submit the prices of various items of the equipment giving break-up prices of all the components of the various items.
- 8.2 The Purchaser reserves the right to either buy the complete equipment as offered or any part thereof based on items wise break-up of cost indicated by the Contractor.

9 SPARE PARTS

The offer shall include recommended list of spare parts required for day to day maintenance of the air brake equipment and spares in the form of kit for the various sub assemblies for the maintenance at the time of POH. The list shall give the part number, quantity and price of each components.

PART II- TECHNICAL REQUIREMENT**10 EQUIPMENT DESIGN AND SCOPE OF SUPPLY**

10.1 The scope of supply for freight and passenger stock is given at para 10.2 & 10.3 below. The tenderer shall quote depending upon the type of stock being procured.

10.2 For Freight stock

10.2.1 The scope of supply for air brake equipment (single pipe/ twin pipe) for freight stock shall be as given below :-

Item No.	Description	Specification	No. of per wagon		Remarks
			Single pipe	Twin pipe	
1	Distributor valve including adaptor with Isolating Cock pipe bracket with control reservoir and gasket.	Appendix – A of this Specification.	1 set	1 set	
2	Brake Cylinder	Appendix-B of this Specification	1	1	355mm for bogies wagon and 300mm for Brake Vans
3	Auxiliary Reservoir 100lt / 75 lt.	Appendix-C of this Specification	1	1	100 lt. For bogie Wagons and 75 lt. For Brake Vans.
4	Cut off angle cock	Appendix-D of this Specification	2	4	
5	Dirt collector	Appendix-E of this Specification.	1	2	
6	Hose coupling assembly for brake pipe	Appendix-F of this Specification	2	4*	* 2 Nos for B.P 2 Nos for F.P.
7	Guards emergency brake valve	Appendix-G of this Specification	1	1	For Brake Vans only
8	Relay valve which shall be a part of distributor valve, load weighing valve and flexible hose.	Part III of this Specification.	1set	1set	For wagon fitted with automatic Control devices for empty loaded equipment of two stage type only

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9	Isolating Cock	Appendix-I of this Specification	1(For Brake Vans only)	3*	* 2 Nos for brake van. 1 No. for wagon
10	Quick coupling without plug.	Appendix-N of this Specification	1	2	For Brake Vans only
11	Check valve	Appendix-I of this Specification	-	1	Wagon fitted with relay valve conforming to part-III of the specifications.
12	Single piece load sensing device	Appendix-P of this Specification	1	1	
13	Pressure gauge for B.P. and F.P.	Appendix-O of this Specification	1	2	For Brake Vans only

10.2.2 Particular specification for each type of wagon for which air brake equipment to be supplied shall be referred to for the type and details of brake system.

10.3 For Passenger Stock

10.3.1 The scope of supply for air brake equipment for passenger stock (twin pipe) shall be as given below: -

Item No.	Description	Specification	No. of per coach	Remarks
1	Distributor valve with relay valve including adaptor with Isolating Cock, pipe bracket with control reservoir and gasket.	As per Carriage Dte. Specification No. C-K 209.	1 set	
2	Brake Cylinder	Appendix-B of this Specification	2	
3 ₂	Brake Cylinder for Bogie Mounted	As per Carriage Dte. specification NO. C.-K-013	4	
4	Auxiliary Reservoir 200 lt.	Appendix-C of this Specification	1	
5	Cut off angle cock	Appendix-D of this Specification	4	
6	Dirt collector	Appendix-E of this Specification.	2	
7	Hose coupling assembly for	Appendix-F of this	2	

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	BP	Specification		
8	Hose coupling assembly for FP	Appendix-F of this Specification	2	
9	Isolating Cock	Appendix-I of this Specification	4	
10	Check Valve	Appendix-I of this Specification	1	
11	Passenger alarm apparatus	Appendix-J of this Specification	1set	
12	Guards emergency brake valve	Appendix-G of this Specification	1	For Brake Vans only
13	Pressure gauge for Brake pipe and feed pipe	Appendix-H of this Specification	1 each	For Brake Vans only

11 PERFORMANCE REQUIREMENTS

11.1 For Freight Stock

- 11.1.1 The air brake equipment shall be single pipe/twin pipe as per requirement of the contract, graduated release type and its performance shall conform to the latest revision of UIC Specification 540 and 547 for freight train application.
- 11.1.2 The air brake equipment shall give a trouble free service without any attention for a period of six years from the date of commission.

11.2 For Passenger Stock

- 11.2.1 The air brake equipment shall be twin pipe graduated release type and its performance shall conform to the latest revision of UIC Specification 540 and 547 for passenger train application.
- 11.2.2 The air brake equipment shall give a trouble free service without any attention for a period of six years from the date of commission.
- 11.2.3 Twin pipe air brake system is to be provided on coaches using air brake equipment to this specification. A typical air brake equipment and pipe layout is shown in RDSO SK-85155. The tenderer shall confirm suitability of air brake equipment offered by him for use with this layout. Tenderer may also indicate modifications, if any that will be necessary in arrangement shown in this sketch for fitment of air brake equipment offered.
- 11.2.4 The air brake equipment covered in this specification is suitable for the braking effort exerted through the clasp tread brakes. The equipment shall however, be suitable for conversion for operation of a system whereby the braking effort shall be exerted through Axle / wheel mounted disk brakes or Disk brake in conjunction with clasp brakes with

appropriate blending characteristics.

- 11.2.5 The air brake equipment shall permit the fitment of speed sensitive braking and anti skid control device, if so desired by purchaser at a later date. Tenderer shall give brief description of these devices suitable for use with air brake equipment offered by him along with particulars of their interface with air brake equipment.
- 11.2.6 The air brake equipment shall have the provision for fitment of Accelerator Valve, if desired to be fitted by the purchaser at a later date. Brief description of Accelerator Valve suitable for use with Air Brake equipment offered and the interface with air brake equipment shall be submitted with tender offer.
- 11.2.7 The distributor valve offered shall be suitable to function with electro-pneumatic (EP) system, if so required at a later date . This shall be possible without any major modification to the proposed distributor valve.

12 DRAWING

- 12.1 Tenderer shall submit along with the offer complete set of drawings of all items other than Brake Cylinder, Cut off angle cock, Auxiliary reservoir & Dirt collector which shall contain details regarding material specification, weight, testing parameters, reference to detailed manufacturing / original collaborator's drawings etc., besides the dimensions as required in the relevant RDSO drawings. A list of drawings is given at Appendix-M. The Tenderer can obtain these drawings from DG(Wagon or DG(Carriage), RDSO, Lucknow-226011 on payment.
- 12.2 Separate drawings in A1/A2 size for each of the item of Air Brake equipment shall be submitted . Each drawing shall show sufficiently sectioned view of the particular equipment so that every component/item of the equipment is identified.

13 DRAWING APPROVAL

- 13.1 The Contractor shall submit complete set of drawings of all items other than Brake cylinder, Cut off angle cock, Auxiliary reservoir and Dirt collector to RDSO well in time for approval. These drawings shall contain the necessary details as specified and shall also take into account all the requirements of the contract.
- 13.2 Further changes/modifications in the Air Brake equipment may be called for with a view to achieve standardization and interchangeability. Contractor shall be obliged to incorporate necessary changes in the design of his equipment for this purpose.
- 13.3 The general approval by RDSO of manufacturer's drawings of various items of Air Brake equipment, however, will not absolve the Contractor from the responsibility of proper design, manufacture and function of the Air Brake equipment. The Contractor shall ensure that design details, material and dimensions are in conformity with the collaborator's drawings

and specifications.

- 13.4 After the initial set of drawings are approved, Contractor shall then submit these drawings on reproducible to enable copies to be taken out for distribution.

14 MANUFACTURE

- 14.1 The contractor shall manufacture the equipment strictly to the RDSO / collaborators drawing. Any change in the manufacturing drawing shall require prior approval of RDSO.

15 INSPECTION

- 15.1 The complete Air Brake equipment to be supplied shall be inspected and accepted by Inspecting Authority.
- 15.2 The development/ purchase inspection shall be carried out in accordance with the procedure given in the specifications of individual items furnished along with this specification as appendices.
- 15.3 The complete Air Brake equipment along with pipes and joints as fitted on wagon shall also be tested for its performance. Contractor shall be responsible for the proper functioning of the complete Air Brake equipment as per procedure laid down.
- 15.4 Inspecting authority shall have access to all detailed manufacturing/original collaborator's drawings for all items of equipment. Contractor shall be obliged to table these drawings as and when called for.
- 15.5 The Inspecting authority may deviate from the agreed procedure if and when found necessary to reassure that the material is being furnished in accordance with these specifications. In this regard the Contractor shall not be entitled to object on any ground what- so ever on the nature and procedure of testing that may be followed by the Inspecting Authority.
- 15.6 The Contractor shall also furnish and provide the complete details of testing equipment to RDSO for their approval.
- 15.7 The performance test and Inspection shall be carried out at the works of manufacturer as per relevant specification. The Inspection shall be deemed complete only after establishing the results on each single car unit at the works of Air Brake equipment manufacturer as well as at the works of wagon builder/ coach factory after assembly as per relevant UIC code. Necessary equipment for such test shall be provided by the Contractor.

**PART-III - SPECIFICATION FOR AUTOMATIC CONTROL DEVICES FOR EMPTY -
LOADED EQUIPMENT OF TWO STAGE TYPE.**

1 SCOPE

- 1.1 This specification covers acceptance requirements of Automatic control Devices for the empty-loaded equipment of two-stage type.

2 SCOPE OF SUPPLY

- 2.1 This equipment shall be supplied only for such wagons where the particular specification for that wagon stipulates it specifically.
- 2.2 The scope of supply of Automatic Control Devices for the empty- loaded equipment of two stage type shall include the following items:-
- a) Relay Valve, which shall be part of the distributor valve.
 - b) Load weighing valve.
 - c) Flexible Hoses.

3 ESSENTIAL REQUIREMENTS:

- 3.1 Only UIC approved distributor valve incorporating the relay valve and other equipment shall be acceptable.
- 3.2 Characteristics and tests of automatic control devices for the empty -loaded equipment shall be in accordance with UIC code 541-1 Section XII.
- 3.3 The equipment offered shall be suitable for fitment on wagons identified in the particular specification.
- 3.4 The fitment of equipment shall be in accordance with the layout drawing indicated in the particular specification of the wagon.
- 3.5 The equipment shall be suitable for providing brake cylinder pressure under empty as indicated in the brake diagram of the particular wagon to be provided with this equipment. The brake cylinder pressure under loaded condition shall be $3.8 + 0.1 \text{ kg/cm. sq.}$
- 3.6 General conditions and technical requirements specified in Part I & II shall be complied with

Specification for Distributor Valve including Adaptor with Isolating Cock, Pipe Bracket with Control Reservoir and Gasket for Air-brake System of Freight Stock on Indian Railways.

1 SCOPE

This specification covers the technical requirements related to the performance, inspection and test of Distributor Valve conforming to UIC Specification No. 540 & 547 including adaptor with Isolating Cock, Pipe bracket with Control Reservoir and gasket used on Air-brake system of freight stock and does not include other necessary provisions of the contract.

2 PARTICULAR REQUIREMENT

- 2.1 Manufacturers willing to supply Distributor Valve including adaptor with Isolating Cock, Pipe bracket with Control Reservoir and gasket for the use of Indian Railways shall register themselves with RDSO.
- 2.2 The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-27:2000 (latest revision) The manufacturers shall have adequate facilities for the manufacture and assembly of distributor valve including adaptor and Isolating Cock, Pipe bracket with control reservoir and gasket conforming to the design and drawings of their respective collaborator. The manufacturers shall have facility for inspection and testing of individual components and assembly to ensure that these are manufactured strictly to the design and quality standard laid down by the principle manufacturer.
- 2.3 Manufacturers shall have a well documented ``Internal Quality System`` to ensure sustained quality of products being manufactured. The Quality Assurance System shall also cover the following: -
 - 2.3.1 The components shall be identified as imported, in house manufactured, semi-finished purchased from sub-let vender, finished components purchased from sub-let vender other than rubber item, rubber items and standard hardware item.
 - 2.3.2 The system to ensure that correct raw-material is being used for the components manufactured in house, purchased as semi-finished and purchased as finished.
 - 2.3.3 System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly.
 - 2.3.4 System to ensure that bought-out components, finished or semi-finished are strictly as per requirement laid down in the specification/drawing as received from collaborator.

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- 2.3.5 System to ensure that rubber components are manufactured by sub-let vendor strictly as per the specification and drawings of the collaborator. System also to ensure that the rubber components are purchased from the sources for which sample has been tested and certified by the collaborator.
- 2.3.6 System to maintain strict control of dimension and workmanship of the components and assembled product.
- 2.3.7 System to test and establish that the items manufactured by the firm conform to the requirement laid down by the collaborator and meets the requirements of the relevant UIC specification.
- 2.3.8 System of periodical calibration of the equipment/gauges to ensure accuracy of the product.

3 EQUIPMENT DESIGN**3.1 Distributor Valve including adaptor and Isolating Cock**

- 3.1.1 The following design of distributor valve shall only be acceptable and therefore the tenderer shall offer the equipment accordingly.
 - 3.1.1.1 Type KEO of Knorr Bremse West Germany (cast iron version).
 - 3.1.1.2 Type C3W of M/S SAB WABCO (cast iron version).
- 3.1.2 The equipment shall be manufactured indigenously strictly to the laid down quality standard as specified by the principle manufacturers/collaborators. No change shall be done without the approval of collaborators and RDSO. The equipment shall be procured from the RDSO approved sources only. The following test certificates of the distributor valve (at least two nos.) manufactured indigenously by the firm are required directly from the collaborator for RDSO approval.
 - 3.1.2.1 Certificate from collaborator or copy of collaboration agreement in which the collaborator has certified that the firm is capable of manufacturing distributor valve to their standard and they will provide all necessary assistance as and when required to maintain the quality standard.
 - 3.1.2.2 Distributor valve performance test certificate to UIC specification (freight) including endurance test performance.
 - 3.1.2.3 Test certificate to certify that components are manufactured to collaborator's specification, drawings and quality standards.

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- 3.1.2.4 Certificate regarding test reports of individual rubber item to confirm that they meet the collaborator's quality standards, material and drawing.
- 3.1.2.5 The indigenously manufactured Distributor Valves shall be sent to the collaborator after identification and stamping by the inspecting authority.

3.2 Pipe bracket with Control reservoir and Gasket

- 3.2.1 The general design and controlling dimensions of pipe bracket with Control reservoir and gasket shall conform to the latest revision of RDSO drg.No.WD9-7951-S-10 and WD-83062-S-01 respectively.
- 3.2.2 The pipe bracket with control reservoir and gasket shall be manufactured indigenously strictly to the laid down quality standard as specified by the principle manufacturer/collaborator. No change shall be done without the approval of collaborator and RDSO.

4 MATERIAL

- 4.1.1 The material of distributor valve body shall be to cast iron to the grade and specification as recommended by the principle manufacture/collaborator. The material for other items, pipe bracket with control reservoir and gasket shall be to the specification laid down by the principle manufacturer/collaborator.
- 4.1.2 All rubber components of D.V. shall be imported preferably from the principals. In case, indigenous rubber components are used, they shall be manufactured by injection moulding method. The air brake equipment supplier shall procure rubber components only from their sub vendor having injection moulding facilities for manufacture of rubber components

5. PERFORMANCE REQUIREMENTS

- 5.1 The distributor valve shall be graduated release type and its performance shall conform to the latest revision of UIC specification 540 and 547 for freight train application.
- 5.2 The distributor valve shall be suitable for operation with the following locomotive brake control system:
 - a) 26 LAV-1
 - b) 28 LAV-1
 - c) Dual Air Brake System of WSF.
 - d) IR-AB-1/IR-AVB-2 system of Indian Railways.

Note: - Details of these can be obtained from Director General/Motive Power, RDSO, Lucknow.

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- 5.3** The Distributor Valve shall also be suitable for fitment / operation with 32 mm brake / Feed and 20 mm branch pipes and joints to RDSO specification No. 04-ABR-02.
- 5.4** The Distributor valve shall have fixed “G” position and shall cater for different brake cylinder including bogie mounted brake system having different diameter and shape without any change in design or requiring additional fitments. However, clear identification to distinguish valves for different brake cylinders should be available on the valve itself.
- 5.5** The Distributor Valve shall be suitable for fitment with pipe bracket and gasket to RDSO drg.No.WD9-7951-S-10 and WD-83062-S-01 respectively.
- 5.6** The Distributor Valve body shall be provided with appropriate size of casting tag at appropriate location so that it can be chipped off when required after fitment of the same on the wagon.
- 5.7** The Distributor Valve shall be suitable for obtaining maximum brake cylinder pressure of 3.8 ± 0.1 kg/cm² at full application.
- 5.8** Vertical and horizontal position of the handle of Isolating Cock shall indicate open and closed position respectively.
- 5.9** Use of components having brass/bronze composition shall be minimised. Tender shall review the design of the distributor valve offered and make specific proposals for improving the fastening/security devices to minimize risk of pilferage of high scrap value items.
- 5.10** The distributor valve shall be suitable for use with cast iron Brake blocks. However it shall also be suitable for use with Composition brake blocks.

6. DEVELOPMENTAL INSPECTION

- 6.1** The developmental inspection shall be carried at the time of registration of the firm with RDSO, and at the time of renewal of registration. In addition to the other requirements for registration, the Inspecting Authority shall verify that the manufacture of the distributor valve is strictly controlled by the “Internal Quality Assurance System” conforming to the requirements of the collaborator and distributor valve & its components are in conformity with specification/drawings of collaborator.

APPENDIX A-1**7. PURCHASE INSPECTION**

7.1 The purchase inspection shall be carried out at the premises of the manufacturers who are cleared for the regular manufacture and registered with RDSO. The following procedure shall be followed: -

7.1.1 The Inspecting authority shall make audit checks of the manufacturing procedure/ 'Internal Quality Assurance System' to ensure that the lot offered for inspection is manufactured strictly as per 'Internal Quality Assurance' System and the manufacturer has carried out all the tests/inspection during manufacturing stage to ensure that the items are manufactured strictly to the specification/drawing and quality standard of the collaborator.

7.2 After having satisfied the quality standards ten percent of each lot of 100 distributor valve shall be tested as per procedure given in para 8.1 Ten percent of each lot of 100 pipe bracket with control reservoir and gasket in the assembled condition shall be tested as per procedure given at para 8.2. If any of the sample fails in the test prescribed in clause 8.1 and 8.2 respectively, the lot will be rejected.

7.3 Once in every year or every contract two distributor valves shall be subjected to endurance test as per the procedure given in Appendix-A2.

8. TESTS

8.1 The distributor valve shall be mounted on the test bench and tested for the following features: -

	Check	Specified Valves	As Observed
8.1.1	Charging Time a) Time for auxiliary reservoir (AR) pressure to rise from 0 to 4.8 kg/cm ² . b) Time for Control reservoir (CR) pressure to rise from 0 to 4.8 kg/cm ² .	-- --	
8.1.2	Leakage Test Leakage from mounting of sub-assemblies during i) Release ii) Service Application iii) Emergency	No leakage No leakage No leakage	
8.1.3	Brake Cylinder (BC) filling time from 0 to 3.6 kg/cm ² under service and emergency application.	18-30 Sec.	

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8.1.4	Brake Cylinder draining time from 3.8 to 0.4 kg/cm ² after service and emergency application.	45-60 Sec.	
8.1.5	Maximum Brake Cylinder pressure under service and emergency application.	3.8 ± 0.1 kg/cm ²	
8.1.6	Sensitivity Test Response of brakes when Brake pipe (BP) pressure is reduced at a rate of 0.6 kg/cm ² in six seconds when BP is isolated from Main reservoir.	Brake should apply within 6 Sec.	
8.1.7	Insensitivity Test Response of brakes when Brake pipe (BP) pressure is reduced at a rate of 0.3 kg/cm ² in 60 seconds when BP is isolated from Main reservoir.	Brake should not apply	
8.1.8	Refeeding Test Response of valve when Brake cylinder pressure is slowly exhausted.	Refeeding should be available.	
8.1.9	Brake Cylinder pressure attained when Brake pipe pressure is reduced in steps (at least seven steps).	--	
8.1.10	Maximum brake cylinder pressure at full application.	3.8 ± 0.1 kg/cm ²	
8.1.11	Brake pipe pressure when cylinder pressure is 0.4 kg/cm ²	4.85 kg/cm ² Approx.	
8.1.12	Automatic exhausting of Brake Cylinder and Control reservoir-test of quick release valve.	Cr & BC pressure should automatically exhaust to zero.	
8.1.13	Over Charge Protection		
	Overcharge Brake Pipe (BP) to 6 kg/cm ² after full service "application"	Control Reservoir (CR) Pressure should not rise within 25 sec.	

Note: - Specified values of test indicated at para 8.1.1 (a), 8.1.1 (b) & 8.1.9 shall be furnished by the manufacturer on the basis of test certificate of their collaborators.

8.2 The pipe bracket with control reservoir and gasket shall be mounted on a suitable test stand and tested for leakage at 10 kg/cm² air pressure. There shall be no leakage.

APPENDIX A-1**9. PAINTING**

The distributor valve including adaptor with Isolating Cock and pipe bracket with control reservoir shall be given suitable anti-corrosive treatment and the exterior excluding the flange faces shall be painted with black enamel paint.

10. PACKING

The manufacturer shall ensure that all external ports of distributor valve and pipe bracket shall be suitably covered with protector caps and the complete assembly of distributor Valve including adapter with Isolating Cock, and pipe bracket with control reservoir and gasket shall be padded with thermo cool and packed in wooden carat before dispatch to prevent damage in handling and storage.

Scheme for conducting endurance test on distributor valve

The procedure to be followed for conducting endurance test on Distributor Valve to Check the performance and rubber items are given below: -

1. The inspecting authority shall select two DV out of a lot of not less than 20 DV for endurance test and put identification mark.
2. Tests these DV one by one in the DV test rig and check all the parameters indicated below and record the values.
 1. Charging time for AR.
 2. Charging time for CR..
 3. Full service application time.
 4. Release time after full service application.
 5. Max. Brake Cylinder pressure after full service.
 6. Protection against overcharging of CR.
 7. Sensitivity.
 8. Insensitivity.
 9. Graduated application.
 10. Pressure tightness in brake released & applied condition.
 11. Graduated release
 12. Refeeding test.

These values should be strictly to UIC standard/manufacturer's collaborators standard.

3. The DV and the counter of the testing machine shall be properly sealed to prevent any tampering during the course of testing. DV shall not be displaced or attended without permission of Jt. Director (I&L) and as per procedure of this scheme.
4. Conduct endurance test under accelerated condition till 1 lakh application and release.
5. After 1 lakh brake application and release the DV shall be removed from the testing machine in the presence of authorised representative of Inspecting Authority and conduct all the tests indicated at para 2 above on the DV test rig.
6. If there are no significant variation in the values of test conducted now with the earlier test before the start of endurance test, the DV shall be again fitted back to the endurance test machine and continue the test upto 5 lakh of brake application and release. If major variation is found, the DV shall be examined in details and reasons recorded. The test will end at this point if defects are due to failure of rubber components. Otherwise repair the DV and again put up on next stage of test.

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7. After 5 lakh of brake application and release, remove the DV from the testing machine in the presence of authorised representative of Inspecting Authority and conduct all the tests indicated at para 2 above on the DV test rig. If major variation is found, the DV shall be examined in details and reasons recorded. The test will end at this point if defects are due to failure of rubber components. Otherwise repair the DV and again put up on next stage of test.
8. If there are no significant variation in the values of test conducted now with the initial test values, the DV shall be fitted back to the endurance test machine and continue the test upto 10 lakh brake application and release.
9. After 10 lakh brake application and release, remove the DV shall be removed in the presence of authorised representative of Inspecting Authority and conduct all the tests indicated at para 2 above on the DV test rig and record the value. There shall be no significant variation of the value obtained now with the initial test values. Similarly second DV shall be tested for endurance.
10. Both the DV shall then be dismantled in the presence of authorised representative of the Inspecting Authority and examine the rubber components. If there are no damage, the components and DV can be considered to be passed the endurance test by Jt. Director (I&L). the position be advised to RDSO/Lucknow.
11. In case during the course of test the DV becomes defective, the matter should be referred to the Inspecting authority. The DV shall be removed in the presence of Inspecting Authority representative and dismantled. Items found defective shall be identified. If the failure has been on account other than failure of rubber components the fault may be rectified and the test can be continued till 10 lakh brake application and release is completed as explained above after the DV is properly sealed.

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Specification for brake cylinder for air brake system of rolling stock on indian railways.

1. SCOPE

This specification covers the technical requirements related to material, dimension, Inspection and test of Brake Cylinder used on Air Brake system and does not include other necessary provisions of the contract.

2. PARTICULAR REQUIREMENT

2.1 Manufacturers willing to supply Brake Cylinder for the use of Indian Railways shall register themselves with RDSO.

2.2 The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-31:2000 (latest revision) and conforming to RDSO drawing.

2.3 The manufacturers shall have a well documented ``Internal Quality Assurance System`` to ensure sustained quality of products being manufactured. The Quality Assurance System shall generally cover the following: -

2.3.1 System to ensure that correct raw material is being used.

2.3.2 System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly of Brake Cylinder.

2.3.3 System to ensure that bought out components are strictly as per requirements laid down in the specification/drawing.

2.3.4 System to maintain strict control of dimension and workmanship of the components and assembled product.

2.3.5 System to test and establish that the Brake Cylinder manufactured by the firm meets all the requirement laid down in specification/drawing.

2.3.6 System of periodical calibration of the equipment/gauges to ensure accuracy of the product.

2.3.7 System to ensure that quality of bought out hardware items, as per the relevant specification.

2.3.8 System to ensure that the manufacture and workmanship of Brake Cylinder shall conform

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to the requirements of Section II of IS:2825 (code for unfired pressure vessels) and as specified in the drawings.

- 2.4 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 for freight stock shall conform to the latest revision of RDSO Drg. No.WD-92051-S-06, WD-92051-S-07, WD-92051-S-08, WD-92051-S-09, WD-94048-S-01 and WD-92051-S-10 for 355mm. dia cylinder and drg. No.WD-92051-S-11, WD-92051-S-12, WD-92051-S-13, WD-92051-S-14 and WD-92051-S-15 for 300mm dia cylinder.

- 3.1.1 The material of brake cylinder for passenger stock shall conform to the latest revision of RDSO Drg. No.WD-92051-S-06, WD-92051-S-07, WD-92051-S-08, WD-92051-S-09, and WD-92051-S-10 for 355mm dia brake cylinder.

- 3.2 All the components shall be manufactured/procured to the material specification indicated against each component in the drawings.

- 3.3 The casting 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 items shall be smooth, free 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 Fabrication, welding of other items shall be carried out in accordance with the procedure laid down in RDSO pamphlet No. G-72 (Rev. 1).

- 3.7 Material for wear ring shall be `Acetal Resin to` RDSO specification given in Appendix-L of this specification.

- 3.8 The piston packing shall conform to the requirements laid down in UIC Code 831-R. The hardness shall be shore A 85 ± 5 .

4. DIMENSIONS AND TOLERANCES

- 4.1 The dimensions and tolerances of Brake cylinder shall be as indicated in the latest revision of RDSO drawings indicated at para 3.1 above.

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- 4.2 All dimensions identified in the drawing shall be gauged. The manufacturer have the necessary gauges available with them. Gauge drawings shall be got approved from RDSO prior to the manufacture.
- 4.3 Discrepancies in dimensions if noticed shall be brought to the notice of RDSO 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 registration of the firm with RDSO 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 being strictly following a well documented system of the `Internal Quality Assurance` as given at para 2.3 of this specification. After having done the same, the following procedure shall be followed: -

- 5.1.1.1 The manufacturer shall offer three brake cylinders complete in all respects and two brake cylinder body (if fabricated) 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 carry out the following test/check on the three complete brake cylinders as per details given below: -

- a) Checking of dimensions and tolerances interchangeability of components and general workmanship.
- b) Pressure test as per details given at para 7.1

- 5.1.1.3 The Inspecting Authority shall carry out the following test on the two cylinder bodies:

- a) Mechanical test on fusion welded seam on test plates as per details given at para 7.3 (for fabricated cylinder body)
- b) Checking for metallic projections, cavities, discontinuities, defective castings, incomplete casting & inclusions (for cast iron cylinder body)
- c) One piston packing shall be tested for conformity with UIC Code 831-R.
- d) Leakage test with 10 kg/cm² hydraulic pressure as per details given at para 7.2

- 5.2 In case samples offered fails in any of the test/check indicated at para 5.1.1.2, & 5.1.1.3 the complete lot of developmental order placed on the firm shall be rejected.

6. PURCHASE INSPECTION

- 6.1** The purchase inspection shall be carried out at the premises of manufacturers 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 the 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** The Inspecting Authority shall conduct the 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 drawing.
- 6.1.1.2** One percent brake cylinder shall be dismantled and dimensions and general workmanship of each component checked as per RDSO detailed drawings. Gauges manufactured to RDSO approved drawings shall be made available by the manufacturer.
- 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** One fabricated brake cylinder per every contract shall be subjected to mechanical test of Fusion welded Seam Production test plate as given in para 7.3 of this specification. One percent of cast iron cylinder body shall be checked for metallic projection, cavities, discontinuities, defective castings, incomplete castings & inclusions.
- 6.1.2.5** Two piston packing per every contract shall be tested for conformity with UIC code 831-R.
- 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``. If it is found that such failures are due to non-implementation of ``Internal Quality Assurance System`` the entire lot of brake cylinders shall be rejected. In case the failures

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are on account of reasons other than non-implementation of ``Internal Quality Assurance System`` the manufacturers 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 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 test for brake cylinder complete.**

- a) The brake cylinder shall be mounted on the fixture to limit the piston stroke to 85mm. Apply 0.7 kg/cm^2 air pressure and observe the leakage is not exceeded 0.1 kg/cm^2 in 10 minutes.
- b) Adjust the piston stroke to 130mm and apply 3.8 kg/cm^2 air pressure and observe the leakage is not exceeded 0.1 kg/cm^2 in 10 minutes.

7.2 Hydraulic test

This test shall be conducted on cylinder body. The cylinder body shall be subjected to Hydraulic pressure of 10 kg/cm^2 for 5 minutes and there should be no leakage.

7.3 Mechanical Tests of Fusion Welded seams Production Test Plates.

These tests shall be carried out on test specimen taken from Test plates for medium duty vessels in accordance with the procedure given at para 8.5 & 8.6 of Section III of IS: 2825 (code for unfired pressure vessels)

8. PAINTING

The exterior of the brake cylinder shall be painted with black enamel paint. Cast iron cylinder body shall be given suitable anti corrosive treatment before painting.

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.

APPENDIX- C**Specification for Auxiliary Reservoir for Air Brake System of Rolling Stock on Indian Railways.****1. SCOPE**

This specification covers the technical requirements related to material, dimension, inspection and test of Auxiliary Reservoir to RDSO Drg. No.WD-92051-S-01 and WD-92051-S-02 used on air brake system for freight stock and Auxiliary Reservoir of 200 lt. for passenger stock and does not include other necessary provision of the contract.”

2. PARTICULAR REQUIREMENT

- 2.1** Manufacturers willing to supply Auxiliary reservoir for the use of Indian Railways shall register themselves with RDSO.
- 2.2** The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-31:2000 (latest revision) and conforming to RDSO drawing.
- 2.3** The manufacturers shall have a well documented ``Internal Quality Assurance System`` to ensure sustained quality of products being manufactured. The `Quality Assurance System` shall generally cover the following: -
 - 2.3.1** System to ensure that correct raw material is being used.
 - 2.3.2** System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly.
 - 2.3.3** System to ensure that bought out components are strictly as per requirements laid down in the specification/drawing.
 - 2.3.4** System to maintain strict control of dimensions and workmanship of components and assembled product.
 - 2.3.5** System to ensure that the manufacture and workmanship of Auxiliary reservoir shall conform to the requirements of Section II of IS:2825 (code for unfired pressure vessels) and as specified in the drawings.
 - 2.3.6** System to test and establish that the Auxiliary reservoir manufactured by the firm conforms to the requirements laid down in Section III of IS:2825 (code for unfired pressure vessels) and as specified in the drawings.

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- 2.3.7** System of periodical calibration of the equipment/gauges to ensure accuracy of the product.

3. MATERIAL

- 3.1** The material of Auxiliary reservoir shall conform to the latest revision of RDSO Drg. No. WD-92051-S-01 for 100lt. and WD-92051-S-02 for 75lt.
- 3.1.1** The material of Auxiliary reservoir of 200 ltr for passenger stock shall be submitted by manufacturer to RDSO Lucknow for approval.”
- 3.2** All the components shall be manufactured/procured to the material specification indicated against each component in the drawings.

4. DIMENSIONS AND TOLERANCES

- 4.1** The dimensions and tolerances of Auxiliary reservoir shall be as indicated in the latest revision of RDSO drawing No.WD-92051-S-01 and WD-92051-S-02.
- 4.1.1** The manufacturer shall submit drgs of 200lt. Auxiliary Reservoir for passenger stock to RDSO Lucknow for approval. The drg. Shall include complete dimensions tolerances and important dimensions identified for gauging at the time of inspection.
- 4.2** All dimensions identified in the drawing shall be gauged. The manufacturer shall have the necessary gauges available with them. Gauge drawings shall be got approved from RDSO prior to the manufacture.
- 4.3** Discrepancies in dimensions if noticed shall be brought to the notice of RDSO 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 registration of the firm with RDSO 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 being strictly following a well documented system of the `Internal Quality Assurance` as given at para 2.3 of this specification. After having done the same, the following procedure shall be followed: -

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- 5.1.1.1** The manufacturer shall offer three reservoirs complete in all respects and two 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 carry out the following test/check on the three complete reservoirs as per details given below: -
- a) Checking of dimensions and tolerances and general workmanship.
 - b) Hydraulic test as per details given at para 7.1.
- 5.1.1.3** The Inspecting authority shall carry out mechanical test on fusion welded seam on the two reservoirs provided with test plates as per details given at para 7.2
- 5.2** In case samples offered fails in any of the test/check indicated at para 5.1.1.2, & 5.1.1.3, the developmental order placed on the firm shall be cancelled.
- 6. PURCHASE INSPECTION**
- 6.1** Purchase inspection shall be carried out at the premises of manufacturers who are cleared for the regular manufacture of Auxiliary reservoir. 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 lot offered for inspection is manufactured strictly as per "Internal Quality Assurance System" and the manufacturer has carried out all the tests/ inspection during manufacturing stage to ensure that auxiliary reservoir offered are strictly to the specification. During such audit checks the Inspecting Authority shall also see from the record of "Internal Quality Assurance" that the Raw Material used for the manufacture of Auxiliary reservoir is as per specification laid down.
- 6.1.2** The Inspecting Authority shall conduct the following checks from a lot of not more than 100 numbers of reservoirs.
- 6.1.2.1** Two reservoirs picked up at random shall be checked for dimensions with respect to RDSO assembly drawing.
- 6.1.2.2** Ten percent reservoirs picked up at random shall be subjected to hydraulic tests as given at para 7.1 of this specification.
- 6.2** In case the samples picked up fails in any of the tests/checks indicated in para 6.1.2.1 & 6.1.2.2, the reasons for such failures shall be identified. The Inspecting Authority shall verify the reasons by conducting audit check on "Internal Quality Assurance System". If it is found that such failures are due to non-implementation of "Internal Quality Assurance System" the entire lot of reservoirs shall be rejected. In case, the failures are

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on account of reasons other than non-implementation of “Internal Quality Assurance System” the manufacturers 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 para 6.1.2.1 & 6.1.2.2. In case the samples again fail in any of the tests/checks, the entire lot shall be rejected.

7 TESTS**7.1 Hydraulic test**

The Auxiliary reservoir shall be subjected to a hydraulic test of pressure 16 kg/cm^2 . the reservoir shall be maintained at the specified test pressure for a sufficient time to permit a thorough examination to be made of all seams and joints but in no case less than 10 minutes. Whilst under pressure, the Reservoir to be well hammered on both sides of and close to the welded seams. There shall be no leakage.

7.2 Mechanical Tests of Fusion Welded seams Production Test Plates.

These tests shall be carried out on test specimen taken from Test plates for medium duty vessels in accordance with the procedure given at para 8.5 & 8.6 of Section III of IS: 2825 (code for unfired pressure vessels)

8. PAINTING

The auxiliary reservoir excluding the flange faces shall be painted on the exterior with two coats of zinc Chromium primer & one coat of black enamel. Interior shall be rinsed with Rustoline and then with Esso-Rust 392 or equivalent.

9. Packing**9.1** The manufacturer shall ensure that all ports of Auxiliary reservoir are suitably covered with protection caps to prevent ingress of foreign matter during handling and storage.

Specification for Cut off Angle Cock for Air Brake System of Rolling Stock on Indian Railways.

1. SCOPE

This specification covers the technical requirements related to material, dimension, Inspection and test of cut off angle cock to RDSO Drawing No.WD-88123-S-01 used on Air Brake system and does not include other necessary provisions of the contract.

2. PARTICULAR REQUIREMENTS

- 2.1** Manufacturers willing to supply angle cocks for the use of Indian Railways shall register themselves with RDSO.
- 2.2** The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-32:2000 (latest revision) and conforming to RDSO drawing.
- 2.3** The manufacturers shall have a well documented ``Internal Quality Assurance System`` to ensure sustained quality of products being manufactured. The `Quality Assurance System` shall generally cover the following: -
- 2.3.1** System to ensure that correct raw material is being used.
- 2.3.2** System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly of angle cocks.
- 2.3.3** System to ensure that bought out components are strictly as per requirements laid down in the specification/drawing.
- 2.3.4** System to maintain strict control of dimension and workmanship of components and assembled product.
- 2.3.5** System to test and establish that the angle cocks manufactured by the firm meet all the requirements laid down in specification/drawing.
- 2.3.6** System of periodical calibration of the equipment/gauges to ensure accuracy of product.
- 2.3.7** System to ensure that quality of bought out hardware items, as per the relevant specification.
- 2.4** Rubber items shall be procured from RDSO approved sources only. However, the

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manufacturers shall be fully responsible for the satisfactory performance of the rubber items.

3. MATERIAL

- 3.1** The material of cut off angle cocks shall conform to the latest revision of RDSO Drg. No. WD-88123-S-01 and WD-88123-S-02.
- 3.2** All the components shall be manufactured/procured to the material specification indicated against each component in the drawings.
- 3.3** The casting 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 items shall be smooth, free from pin holes, blisters, porosities and other visual flaws.
- 3.5** The Angle Cock for passenger coaches shall also be provided with reducing bush to ICF Drg. No. EMU/M-3-5-053 (items-7).

4. DIMENSIONS AND TOLERANCES

- 4.1** The dimensions and tolerances of cut off angle cocks shall be as indicated in the latest revision of RDSO drawing No. WD-88123-S-01 and WD-88123-S-02.
- 4.2** All dimensions identified in the drawing shall be gauged. The manufacturer shall have the necessary gauges available with them. Gauge drawings shall be got approved from RDSO prior to the manufacture.
- 4.3** Discrepancies in dimensions if noticed shall be brought to the notice of RDSO 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 registration of the firm with RDSO 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 being strictly following a well documented system of the `Internal Quality Assurance` as given at para 2.3 of this specification. After having done the same, the following procedure shall be followed: -

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- 5.1.1.1** The manufacturer shall offer 10 angle cocks and the inspecting authority shall carryout following tests.
- a) One sample shall be tested for physical and chemical properties of materials used for components.
 - b) Four samples shall be tested for the following.
 - i) Checking of dimensions and tolerances of components as per drawings.
 - ii) Interchangeability of components.
 - iii) General workmanship and surface finish.
 - c) All the angle cocks excluding the one tested for material shall be subjected to operational and leakage test as given at para 7.1 and 7.2 of this specification.
- 5.2** In case of samples picked up fails in any of the test/checks indicated at para 5.1.1.1 the entire lot shall be rejected and reasons for the failure shall be identifies. Incase the failures not on account of non-imlementation of 'Internal Quality Assurance System' a fresh 10 angle cocks shall be offered and all the tests/checks given at para 5.1.1.1 shall be conducted.
- 6. PURCHASE INSPECTION**
- 6.1** Purchase inspection shall be carried out at the premises of manufacturer who are cleared for the regular manufacture of cut off angle cocks. 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 lot offered for inspection is manufactured strictly as per ``Internal Quality System`` and the manufacturer has carried out all test/inspection during manufacturing stage to ensure that angle cocks 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 angle cocks against the contract is as per specification laid down.
- 6.1.2** The Inspecting Authority shall conduct the following checks from a lot of not more than 100 numbers of angle cocks.
- 6.1.2.1** Two angle cocks picked up at random shall be checked for dimensions with respect to RDSO assembly drawing.
- 6.1.2.2** One angle cock picked up at random shall be dismantled and dimensions and general workmanship of each component checked as per RDSO detailed drawings. Gauges manufactured to RDSO approved drawing shall be made available by the manufacturer.

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- 6.1.2.3** Ten percent angle cocks picked up at random shall be subjected to operational and leakage tests as given at para 7.1 and 7.2 of this specification.
- 6.2** In case the samples picked up fails in any of the tests/checks indicated in para 6.1.2.1 to 6.1.2.3 the reasons for such failures shall be identified. The Inspecting Authority shall verify the reasons by conducting audit checks on ``Internal Quality Assurance System``. If it is found that such failures are due to non-implementation of ``Internal Quality Assurance System`` the entire lot of angle cocks 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 para 6.1.2.1 to 6.1.2.3. In case the samples again fail in any of the tests/checks, the entire lot shall be rejected.

7 TESTS**7.1 Operational Tests**

The procedure for conducting operational test is given below:

- a) Connect the straight end of angle cock to a supply line of 10 kg/cm² air pressure.
- b) Move the handle a few times alternatively to open and close position.
- c) Observe that handle moves smoothly.

7.2 Leakage Test

The procedure for conducting leakage test is given below:

- a) Connect the straight end of angle cock to a supply line of 10 kg/cm² air pressure.
- b) Keep the handle in closed position. Check the leakage at the outlet port and at the joints by using soap water. There shall be no leakage.
- c) Plug the outlet port and move the handle to open position. Check for leakage from joints, vent and all over the body with soap water. There shall be no leakage.

8. PAINTING

The angle cock shall be given anti corrosive treatment and shall be painted with black enamel paint.

9. PACKING

- 9.1** The manufacturer shall ensure that the threaded portions of the angle cock are suitably covered with thread protection caps to prevent ingress of foreign matter/damage to threads during handling and storage.
- 9.2** The manufacturer shall also ensure that angle cocks in assembled condition are adequately packed before dispatch to prevent damage in handling and storage.

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APPENDIX- E**SPECIFICATION FOR DIRT COLLECTOR FOR AIR BRAKE SYSTEM OF ROLLING STOCK ON INDIAN RAILWAYS.****1. SCOPE**

This specification covers the technical requirements related to material, dimension, Inspection and test of Dirt collector to RDSO drg. No.WD-92051-S-03 and SK-97005 used on Air Brake system and does not include other necessary provisions of the contract.

2. PARTICULAR REQUIREMENTS

- 2.1** Manufacturers willing to supply Dirt collector for the use of Indian Railways shall register themselves with RDSO.
- 2.2** The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-32:2000 (latest revision) and conforming to RDSO drawing.
- 2.3** The manufacturers shall have a well documented ``Internal Quality Assurance System`` to ensure sustained quality of products being manufactured. The `Quality Assurance System` shall generally cover the following: -
 - 2.3.1** System to ensure that correct raw material is being used.
 - 2.3.2** System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly.
 - 2.3.3** System to ensure that bought out components are strictly as per requirements laid down in the specification/drawing.
 - 2.3.4** System to maintain strict control of dimensions and workmanship of components and assembled product.
 - 2.3.5** System to test and establish that the Dirt collector manufactured by the firm meet all the requirements laid down in specification/drawing.
 - 2.3.6** System of periodical calibration of the equipment/gauges to ensure accuracy of product.
 - 2.3.7** System to ensure that quality of bought out hardware items are as per the relevant specification.
- 2.4** Rubber items shall be procured from RDSO approved sources only. However, the manufacturer shall be fully responsible for the satisfactory performance of the rubber items.

APPENDIX- E**3. MATERIAL**

- 3.1** The material of Dirt collector shall conform to the latest revision of RDSO Drg. No. WD-92051-S-03, WD-92051-S-04 , WD-92051-S-05 and SK-97005
- 3.2** All the components shall be manufactured/procured to the material specification indicated against each component in the drawings.
- 3.3** Casting shall be sound, clean and sharp without defects or blemishes of any kind and conform to the requirements of the specification.
- 3.4** The filter shall be of Polyamide (Nylon 6) conforming to the requirements laid down in the RDSO specification No.RDSO/M&C/RP-178/93 (placed at Annexure-K) The filter cloth shall be to variety 9 to IS: 11574-86.

4. DIMENSIONS AND TOLERANCES

- 4.1** The dimensions and tolerances of Dirt collector shall be as indicated in the latest revision of RDSO drawing No.WD-92051-S-03, WD-92051-S-04 , WD-92051-S-05 and SK-97005
- 4.2** All dimensions identified in the drawing shall be gauged. The manufacturer shall have the necessary gauges available with them. Gauge drawings shall be got approved from RDSO prior to the manufacture.
- 4.3** Discrepancies in dimensions if noticed shall be brought to the notice of RDSO 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 registration of the firm with RDSO 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 being strictly following a well documented system of the `Internal Quality Assurance` as given at para 2.3 of this specification. After having done the same, the following procedure shall be followed: -
 - 5.1.1.1** The manufacturer shall offer 10 Dirt collectors and the inspecting authority shall subject them to the following tests.

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- a) One samples shall be tested for physical and chemical properties of materials used for Components.
 - b) Four samples shall be tested for the following.
 - i) Checking of dimensions and tolerances of components as per drawings.
 - ii) Interchangeability of components.
 - iii) General workmanship and surface finish.
 - c) All the Dirt collector excluding the one tested for material shall be subjected to the tests indicated at para 7 of this specification.
- 5.2 In case of samples picked up fails in any of the test/checks indicated at para 5.1.1.1 the entire lot shall be rejected and reasons for the failure shall be indicated. In case of failures are not on account of non-imlementation of ``Internal Quality Assurance System`` a fresh 10 Dirt collector shall be offered and all the tests/checks given at para 5.1.1.1 shall be conducted.
- 6. PURCHASE INSPECTION**
- 6.1** Purchase inspection shall be carried out at the premises of manufacturer who are cleared for the regular manufacture of Dirt collector. 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 lot offered for inspection is manufactured strictly as per ``Internal Quality System`` and the manufacturer has carried out all tests/inspection during manufacturing stage to ensure that Dirt collector 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 Dirt collector is as per specification laid down.
- 6.1.2** The Inspecting Authority shall conduct the following checks from a lot of not more than 100 numbers of Dirt collector.
- 6.1.2.1** Two Dirt collector picked up at random shall be checked for dimensions with respect to RDSO assembly drawing.
- 6.1.2.2** One Dirt collector picked up at random shall be dismantled and dimensions and general workmanship of each component checked as per RDSO detailed drawings. Gauges manufactured to RDSO approved drawings shall be made available by the manufacturer.
- 6.1.2.3** Ten percent Dirt collector picked up at random shall be subjected to tests as given at para 7 of this specification.

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- 6.2** In case the samples picked up fails in any of the tests/checks indicated in para 6.1.2.1 to

6.1.2.3 the reasons for such failures shall be identified. The Inspecting Authority shall verify the reasons by conducting audit checks on ``Internal Quality Assurance System``. If it is found that such failures are due to non-implementation of ``Internal Quality Assurance System`` the entire lot of Dirt collector 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 para 6.1.2.1 to 6.1.2.3. In case the samples again fail in any of the tests/checks, the entire lot shall be rejected.

7 TESTS

The outlet ports of Dirt collector shall be blocked and feed air through inlet port at 10 kg/cm² pressure. Check for leak all over the body and joint. No leak is permitted.

8. PAINTING

The Dirt collector shall be given suitable anti-corrosive treatment and the exterior except the flange faces shall be painted with green enamel paint for passenger and black enamel paint for freight application.

9. PACKING

- 9.1** The manufacturer shall ensure that all ports of Dirt collector are suitably covered with protection caps to prevent ingress of foreign matter during handling and storage.

SPECIFICATION FOR HOSE COUPLING ASSEMBLY FOR AIR BRAKE SYSTEM OF ROLLING STOCK ON INDIAN RAILWAYS.

1. SCOPE

This specification covers the technical requirements related to the performance, inspection and test of hose coupling assembly to RDSO Drg. No. SK- 73547 & WD-81027-S-01 used on Air- brake system and does not include other necessary provisions of the contract.

2. PARTICULAR REQUIREMENT

2.1 Manufacturers willing to supply Hose coupling assembly for use on Indian Railways register themselves with RDSO.

2.2. The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-27:2000 (latest revision) & as per the design given in the RDSO drgs. and to the detailed manufacturing drawing of their respective collaborators. The manufacturers shall have facility for inspection and testing of individual components and assembly to ensure that the hose couplings are manufactured to the quality standard laid down by principle manufacturer.

2.3 Manufacturers shall have a well documented “Internal Quality Assurance System” to ensure sustained quality of products being manufactured. The Quality Assurance System shall also cover the following:-

2.3.1 The components of hose coupling assembly shall be identified as in house manufactured, semi-finished purchased from sub-let vendors finished components purchased from sub-let vendors other than rubber item and rubber items

2.3.2 The system to ensure that correct raw material is being used in components manufactured in house purchased as semi-finished and purchased as finished.

2.3.3 System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly

2.3.4 The system to ensure that bought-out components, finished or semi-finished are strictly as per requirement laid down in the specification/ drawing as received from collaborator.

2.3.5 The system to ensure that rubber components are manufactured by sub-let vendor strictly as per the specification and drawings of the collaborator. System also to ensure that the rubber components are purchased from the sources for which sample has been tested and certified by the collaborator.

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- 2.3.6** System to maintain strict control of dimension and workmanship of the components and assembled product.
- 2.3.7** System to test and establish that hose coupling assembly manufactured by the firm conform to the requirement laid down by the collaborator.
- 2.3.8** System of periodical calibration of the equipment /gauges to ensure accuracy of the product.

3. EQUIPMENT DESIGN

- 3.1** The general design, controlling dimensions, material and specification of components shall conform to the latest revision of RDSO drg No. SK-73547 and WD-81027-S-01 for hose coupling assembly for BP and hose coupling assembly for FP respectively.
- 3.2** The hose coupling assembly shall be manufactured indogeneously strictly to the laid down quality standard as specified by the principle manufacture / collaborators No change shall be done without the approval of collaborator and RDSO.

4. DEVELOPMENTAL INSPECTION

- 4.1** The developmental inspection shall be carried out at the time of registration of the firm with RDSO and at the time of renewal of registration. In addition to the other requirements for registration the inspecting authority shall verify that that manufacture of the hose coupling assembly is strictly controlled by the 'Internal Quality Assurance System' conforming to the requirements of the collaborator and they are in conformity with the laid down specification and drawings.

5. PURCHASE SECTION

- 4.1** The purchase inspection shall be carried out at the premises of the manufactures who are cleared for the regular manufacture of hose coupling assembly with RDSO. The following procedure shall be followed: -
 - 5.1.1** The Inspecting Authority shall make audit checks of the manufacturing procedure/ "Internal Quality Assurance System" to ensure to that lot offered for inspecting is manufactured strictly as per "Internal Quality Assurance System" and the manufacturers has carried out all the test/ inspection during manufacturing stage to ensure that the hose coupling assembly and its components are manufactured strictly to the specification / drawing and quality standard of the collaborator.

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- 4.2** After having satisfied about the quality standards, ten percent of each lot of 100 hose coupling assembly shall be tested as procedure given in para 6.

5. TESTS

Use a dummy coupling head to block the outlet port of hose coupling and subject the hose coupling assembly to an air pressure of 10-kg/ cm². Check for through the washer joints and all over by immersing the hose coupling in a tub of water. No leakage is permitted.

7. PAINTING

The coupling head and nipple shall be given suitable anti-corrosion treatment. Coupling head of BP coupling shall be painted with Mid-Brunswick green paint to ISC No. 226 of IS: 5-1978 ready mixed paint to IS: 119. Coupling head of FP coupling shall be painted with ready mixed white paint to IS: 127.

8. PACKING

The openings of coupling head and nipple shall be covered with suitable protection caps. Coupling assembly shall be packed suitably before dispatch to prevent damage in transit, handling and storage.

APPENDIX-G**SPECIFICATION FOR GUARD'S EMERGENCY BRAKE VALVE FOR AIR – BRAKE SYSTEM OF ROLLING STOCK OF INDIAN RAILWAYS.****1. SCOPE**

This specification covers the technical requirements related to the performance, inspection and test of Guard's emergency Brake Valve used on Air – Brake system and does not include other necessary provisions of the contract.

2. PARTICULAR REQUIREMENT

- 2.1** Manufacturers willing to supply Guards emergency Brake Valve use on Indian Railways shall register themselves with RDSO.
- 2.2** The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-32:2000 (latest revision) The manufacturers shall have adequate facilities for the manufacture and assembly of guard's emergency brake valve to the design and drawing of their respective collaborators. The manufacturers shall have facility for inspection and testing of individual components and assembly to ensure that these are manufactured strictly to the design and quality standard laid down by principal manufacturer.
- 2.3** Manufacturers shall have a well documented 'Internal Quality System' to ensure sustained quality of products being manufactured. The 'Quality Assurance System' shall also cover the following :-
 - 2.3.1** The components of guard's emergency brake valve shall be identified as imported, in – house manufactured, semi-finished purchased from sub-let vendor, finished components purchased from sub-let vendor other than the rubber item, rubber items and standard hardware item.
 - 2.3.2** The system to ensure that correct raw material is being used in components manufactured in-hose, purchased as semi-finished and purchased as finished.
 - 2.3.3** System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly.
 - 2.3.4** System to ensure that bought-out components, finished or semi-finished are strictly as per requirement laid down in the specification/drawing as received from collaborator.
 - 2.3.5** System to ensure that rubber components are manufactured by sub-let vendor strictly as per the specification and drawings of the collaborator. System also to ensure that the rubber components are purchased from the sources for which sample has been tested and

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certified by the collaborator.

- 2.3.6** System to maintain strict control of dimension and workmanship of the components and assembled product.
- 2.3.7** System to test and establish that guard's emergency brake valve manufactured by the firm conform to the requirement laid down by the collaborator.
- 2.3.8** System of periodical calibration of the equipment /gauges to ensure accuracy of the product.

3. EQUIPMENT DESIGN

The general design controlling dimensions of guard's emergency brake valve shall conform to the latest revision of RDSO drg. No. SK-73549. A choke of 5 mm shall be provided in the exhaust port of valve for passenger stock use. The material of the components shall to the specification laid down by the principal manufacturers/ collaborator. No change shall be made without approval of collaborator and RDSO.

4. DEVELOPMENTAL INSPECTION

- 4.1** The developmental inspection shall be carried out at the time of registration of the firm with RDSO and at the time of renewal of registration. In addition to the other requirements for the registration, the inspecting authority shall verify that manufacture of the guard's emergency brake valve is strictly controlled by the 'Internal Quality Assurance System' conforming to the requirement of the collaborator and they are in conformity with the laid down specification and drawings.

5. PURCHASE INSPECTION

- 5.1** The purchase inspection shall be carried out at the premises of the manufactures who are cleared for the regular manufacture of guard's emergency brake valve and registered with RDSO. The following procedure shall be followed: -
 - 5.1.1.** The Inspecting Authority shall make audit checks of the manufacturing procedure, "Internal Quality Assurance System" to ensure the lot offered for inspection is manufactured strictly as per 'Internal Quality Assurance System' and the manufacturers has carried out all the tests/ inspection during manufacturing stage to ensure that the guard's emergency brake valve as well as their components are manufactured strictly to the specification/ drawing and quality standard of the collaborator.
- 5.2** After having satisfied about quality standards, ten percent of each lot of guard's emergency brake valve shall be tested as per procedure given in para 6.

APPENDIX-G**6. TESTS**

- 6.1** Place the handle in closed position. Connect the cock to an air pressure of 10 kg/ cm² and observe no leakage at the outlet port.
- 6.2** Place the handle in open position. Close the outlet port using a blank plate. Connect the cock to an air pressure of 10 kg/cm² and check leakage all over the body. There shall be no leakage.

7. PAINTING

The guard's emergency brake valve shall be given suitable anti-corrosive treatment and the exterior excluding the flange faces shall be painted with black enamel paint.

8. PACKING

The manufacturer shall ensure that the all external ports of guard's emergency brake valve shall be suitably covered with protector caps and the complete assembly shall be adequately packed before dispatch to prevent damage in handling and storage.

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APPENDIX- H**SPECIFICATION FOR PRESSURE GAUGE FOR AIR BRAKE SYSTEM OF
PASSENGER STOCK OF INDIAN RAILWAYS****1. SCOPE**

This specification covers the technical requirements of pressure gauge to RDSO Drawing No. SK-73553 for brake pipe and WD – 83062- S-05 for feed pipe used in the air brake system in brake vans and does not include other provisions of the contract.

2. PARTICULAR REQUIREMENT

- 2.1 The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-33:2000 (latest revision) The pressure gauge shall be flush be mounted type conforming to IS: 3624 with the controlling dimensions and additional requirements as per the latest revision of RDSO Drawing No. SK – 73553 for brake pipe and WD-83062-S-05 for feed pipe.
- 2.2 The pressure gauge shall be procured from RDSO approved sources only.

3. INSPECTION

- 3.1 The inspecting Authority shall ensure that the pressure gauge being procured strictly conforms to IS: 3624 and to the latest revision of RDSO Drawing No. SK-73553/ WD-83062-S-05.

**SPECIFICATION FOR ISOLATING COCK AND CHECK VALVE FOR AIR BRAKE
SYSTEM OF ROLLING STOCK OF INDIAN RAILWAYS**

1. SCOPE

This specification covers the technical requirements related to the performance, inspection and test of Isolating Cock to RDSO drawing No. Sk-89021, Sk-97002 & Sk-98013 (for passenger stock) WD-83062 –S-4 (for freight stock) and Check Valve to RDSO Drg. No. WD-83062-S-03 of Air Brake system of passenger stock and does not include other necessary provisions of the contract.

2. PARTICULAR REQUIREMENTS

- 2.1 Manufacturers willing to supply Isolating Cock and Check Valve for the use of Indian Railways shall register themselves with RDSO.
- 2.2. The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-32:2000 for isolating cock (latest revision) The manufacturers shall have adequate facilities for the manufacture and assembly of the items to the design and drawing of their respective collaborators. The manufacturer shall facilities for inspection and testing of individual components and assembly to ensure that these are manufactured strictly to the design and quality standard laid down by principle manufacturer.
- 2.3 Manufacturers shall have a well documented ‘Internal Quality System’ to ensure sustained quality of products being manufactured. The Quality Assurance System shall also cover the following:-
 - 2.3.1 The components of the Isolating Cock and Check Valve shall be identified as in house manufactured. Semi- finished purchased from sub- let vendor and finished components purchased from sub-let vendor other than the rubber items, rubber item and standard hardware item
 - 2.3.2 The system to ensure that correct raw material is being used in components manufactured in house purchased as semi-finished and purchased as finished.
 - 2.3.3 System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly.
 - 2.3.4 System to ensure that bought-out components finished or semi-finished are strictly as per requirement laid down in the specification /drawing as received from collaborator.

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- 2.3.5** System to ensure that rubber components are manufactured by sub-let vendors strictly as per the specification and drawings of the collaborator. System also to ensure that the rubber components are purchased from the sources for which sample has been tested and certified by the collaborator.
- 2.3.6** System to maintain strict control of dimension and workmanship of the components and assembled product.
- 2.3.7** System to test and establish that Isolating Cock and Check Valve manufactured by the firm conform to the requirement laid down by the collaborator.
- 2.3.8** System of periodical calibration of the equipment /gauges to ensure accuracy of the product.

3. EQUIPMENT DESIGN

- 3.1** The general design and controlling dimensions of Isolating Cock and check valve shall conform to the latest revision of RDSO drg. No. SK- 89021/WD-83062-S-04 and WD-83062-S-03 respectively. The material of the components shall be to the specification laid down by the principle manufacture/collaborator. No change shall be made without the approval of collaborator and RDSO.

4. DEVELOPMENTAL INSPECTION

- 4.1** The developmental inspection shall be carried out at the time of registration of the firm with RDSO and at the time of renewal of registration. In addition to the other requirements for the registration, the inspecting authority shall verify that the manufacture of the Isolating Cock and Check Valve is strictly controlled by the 'Internal Quality Assurance System' conforming to the requirements of the collaborator and they are in conformity with the laid down specification and drawings.

5. PURCHASE INSPECTION

- 5.1** The purchase inspection shall be carried out at the premises of the manufactures who are cleared for the regular manufacture of Isolating Cock and Check Valve and registered with RDSO. The following procedure shall be followed: -
- 5.2** The Inspecting Authority shall make audit checks of the manufacturing procedure/ 'Internal Quality Assurance System' to ensure that the lot offered for inspection is manufactured strictly as per 'Internal Quality Assurance System' and the manufacturer has carried out all the test/ inspection during manufacturing stage to ensure that the Isolating Cock and Check Valve as well as their components are manufactured strictly to

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the specification /drawing and quality standard of the collaborator.

After having satisfied about the quality standards ten percent of each lot of 100 nos. Isolating Cock /Check Valve shall be tested as per procedure given in para 6.

6. TESTS**6.1 Isolating Cock**

- 6.1.1 Place the handle in closed position. Connect the cock to an air pressure of 10 kg/cm² and observe no leakage at the outlet port.
- 6.1.2 Place the handle in open position. Close the outlet port using a blank plate. Connect the cock to an air pressure of 10 kg/cm² and check leakage all over the body. There shall be no leakage.

6.2 Check Valve

- 6.2.1 Connect air supply at 10 kg/ cm² to the port. Air should flow freely through the outlet port.
- 6.2.2 Block outlet port and permit air at 10 kg/ cm² through the inlet port. Check for leakage all over the body and joints by soap water. There should be no leak.
- 6.2.3 Connect air supply at 2 kg/ cm² to the outlet port. There should be no air flow/leak through the inlet port. Repeat the test at 5 kg/ cm² air pressure.

7. PAINTING

The Isolating Cock and Check Valve shall be given suitable anti-corrosive treatment and the exterior excluding the flange faces shall be painted with black enamel paint.

8. PACKING

The manufacturer shall ensure that all external ports of Isolating Cock and Check Valve shall be Suitably covered with protector caps and the complete assembly shall be adequately packed before dispatch to prevent damage in handling and storage.

APPENDIX- J**SPECIFICATION FOR PASSENGER ALARM APPARATUS FOR AIR BRAKE
SYSTEM OF PASSENGER STOCK OF INDIAN RAILWAYS****1. SCOPE**

This specification covers the technical requirements related to the performance, inspection and test of apparatus in passenger alarm system to RDSO drawing No. Sk-82055 used on Air- brake system and does not include other necessary provisions of the contract.

2. PARTICULAR REQUIREMENT

- 2.1 Manufacturers willing to supply Passenger emergency valve and passenger emergency alarm signal device for use on India Railways shall register themselves with RDSO
- 2.2 The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-32:2000 (latest revision) The manufacturer shall have adequate facilities for the manufacture and assembly of Passenger emergency valve and Passenger emergency alarm signal device to the design and drawing of their respective collaborators. The manufacture shall have facilities for inspection and testing of individual components and assembly to ensure that these are manufactured strictly to the design and quality standard laid down by principle manufacturer.
- 2.3 The Manufacturers shall have a well documented 'Internal Quality Assurance System' to ensure sustained quality of products being manufactured. The 'Quality Assurance System' shall generally cover the following: -
 - 2.3.1 The components of Passenger emergency valve and Passenger emergency alarm signal device identified as imported, in-house manufactured, semi- finished purchased from sub-let vendor and finished components purchased from sub-let vendor other than the rubber item, rubber items and standard hardware item.
 - 2.3.2 The system to ensure that correct raw material is being used in components manufactured in hose purchased as semi-finished and purchased as finished.
 - 2.3.3 System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly.
 - 2.3.4 System to ensure that bought out components, finished or semi-finished are strictly as per requirement laid down in the specification/ drawing as received from collaborator.
 - 2.3.5 System to ensure that rubber components are manufactured by sub-let vendor strictly as

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per the specification and drawings of the collaborator. System also to ensure that the rubber components are purchased from the sources for which sample has been tested certified by the collaborator.

- 2.3.6 System to maintain strict control of dimension and workmanship of the components and assembled product.
- 2.3.7 System to test and establish that passenger emergency valve and passenger emergency alarm signal device manufactured by the firm conform to the requirement laid down by the collaborator.
- 2.3.8 System of periodical calibration of the equipment /gauges to ensure accuracy of the product.

3. EQUIPMENT DESIGN

- 3.1 The general design and controlling dimensions shall conform to the following drawings:
 - a) Passenger emergency alarm signal device to RDSO SK.81163.
 - b) Passenger emergency valve to RDSO SK.81164
- 3.2 The material of the components shall be to the specification laid down by the principal manufacturers / collaborator. No change shall be made without the approval of collaborator and RDSO.
- 3.3 The general arrangement of passenger alarm actuation system for air braked coaches is shown in the latest revision of RDSO drawing No. Sk. 82055. Details of interface of passenger alarm apparatus with the air brake circuit and passenger alarm actuation system shall be submitted by the tenderer along with the Offer.
- 3.4 The passenger alarm shall be provided with a choke of 4mm at the exhaust port so that it does not cause heavy pressure surge in brake pipe, thereby causing excessive inter-coupler forces developed as a result of alarm chain pull during emergency.
- 3.5 The passenger alarm resetting square for guard's key shall be to 8mm square and design shall be such that resetting can be done by guard's key to RDSO Drg. No. 81209.

4. DEVELOPMENTAL INSPECTION

- 4.1 The developmental inspection shall be carried out at the time of registration of the firm with RDSO and at the time of renewal of registration. In addition to the other requirements for the registration, the inspecting authority shall verify that the manufacture of the passenger emergency valve and Passenger emergency alarm signal

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device is strictly controlled by the 'Internal Quality Assurance System' conforming to the requirement of the collaborator and they are in conformity with the laid down specification and drawings.

5. PURCHASE INSPECTION

- 5.1** The purchase inspection shall be carried out at the premises of the manufactures who are cleared for the regular manufacture of guard's emergency brake valve and registered with RDSO. The following procedure shall be followed: -
- 5.1.1** The Inspecting Authority shall make audit checks of the manufacturing procedure 'Internal Quality Assurance System' to ensure to that the passenger emergency valve and Passenger emergency alarm signal device offered for inspection is manufactured strictly as per 'Internal Quality Assurance System' and the manufacturer has carried out all the tests inspection during manufacturing stage to ensure that the passenger emergency valve and Passenger emergency alarm signal device as well as their components are manufactured strictly to the specification /drawing and quality standard of the collaborator.
- 5.2** After having satisfied about the quality standards, ten percent of each lot of 100 Passenger emergency valve and Passenger emergency alarm signal device shall be tested as per procedure given in para 6.

6. TESTS**6.1 PASSENGER EMERGENCY VALVE**

- 6.1.1** The valve is tested on the test bench by connecting the portion provided for brake pipe side and plugging the out let portion provided for the connection to the alarm signal device. Charge the valve to a pressure of 10 kg/cm^2 . There should not be any leakage if checked with soap water.
- 6.1.2** Now slowly open the outlet portion, the air should start escaping through the exhaust provided on the valve.

6.2 PASSENGER EMERGENCY ALARM SIGNAL DEVICE:-

- 6.2.1** The alarm signal device is tested on the test bench. Apply air at a pressure of 10 kg/cm^2 through the portion provided for the connection to PEAV and check for the leakage with soap water.
- 6.2.2** Now pull the lever vertical up of this valve. The air should start escaping through the exhaust provided in the valve.

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6.2.3 Check for resetting of alarm signal device by alarm valve reset key to RDSO-Sk. 81209.

7. PAINTING

The passenger emergency valve and Passenger emergency alarm signal valve shall be given suitable anti-corrosive treatment and the exterior excluding the flange faces shall be painted with black enamel paint.

8. PACKING

The manufacturer shall ensure that all external ports of passenger emergency valve and Passenger alarm signal device shall be suitably covered with protector caps and the complete assembly shall be adequately packed before dispatch to prevent damage in handling and storage.

SPECIFICATION NO. RDSO /M&C/RP-178/93
Indian Railways Standard specification for
Polyamide –6 (Nylon -6) components (Tentative)-1993.

1. SCOPE

- 1.1 This specification covers the requirements, methods of sampling and tests for polyamide-6 (nylon-6) components of rolling stock & track and other railway equipment.

2. REQUIREMENTS**2.1 Material**

- 2.1.1 Polyamide-6 conforming to the requirements stipulated in this specification shall be used in the manufacture of the components. Unless otherwise specified the colour of the material shall be its natural colour.

2.2 Construction Workmanship & Finish

- 2.2.1 The components shall be as per the relevant drawing and shall be moulded on an automatic screw type injection moulding machine. The surface finish of the components shall be smooth and free from voids, porosities, warpage, blisters, laminations and any other surface defects.

2.3 Conditioning/Annealing

- 2.3.1 The components shall be conditioned/annealed in hot boiling water to a moisture level of 3% min. by manufactures.

2.4 Dimension and Tolerances

- 2.4.1 Dimension and tolerances of the components shall be as per the relevant drawings.

2.5 Physical Properties of Polyamide-6 (Nylon-6)

S. N.	Properties	Value	Method of Test
1.	Specific gravity	1.12to1.15	ASTM D—792
2.	Tensile strength* (MP a) min.	70	ASTM D—638
3.	Elongation at break*(%)	20-60	ASTM D –638
4.	Hardness (Rockwell-R), min	110	ASTM D—785
5	Melting point (°C)	215-225	BS: 2782
6	Water absorption (%) at 27±2 °C for 24hrs, min.	2.0	ASTM D—570

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Note: Tests shall be carried out on finished product wherever practicable. The tests be conducted on “as moulded specimens”. “As moulded specimens” are defined as those which, upon immediate removal from the mould are sealed in containers, impermeable to moisture.

* The speed of testing shall be 5mm / minute.

3. SAMPLING CRITERIA FOR CONFORMITY**3.1 Tests**

3.1.1 The Test shall constitute type test and acceptance tests.

3.1.2 Type tests:

The type tests shall be conducted for all the requirements including acceptance tests as laid down in this specification and are mandatory for product approval or approval of manufactures. However, approving / purchasing authority reserves the right to repeat the tests at their discretion at a certain time interval.

3.1.3 Acceptance Tests :

The acceptance tests shall constitute the following: -

- a) Visual observation
- b) Dimensional check
- c) Specific gravity
- d) Melting point

3.1.4 The lot shall consist 100 nos. or 1000 nos. when the quantity ordered/offered exceeds 1000 nos. or part thereof.

3.1.5 The no. of samples to be selected from the lot for acceptance tests shall be as under :-

a)	Visual observation	Min. 10 or 1% of the lot Which ever is less.
b)	Dimensional check	
c)	Specific gravity	3 nos. (Destructive tests as required)
d)	Melting point	

3.1.6 Each sample undertaken for acceptance test shall conform to the requirements as laid down in this specification. Should any one of the test sample fails to meet the requirements of acceptance tests double the no. of samples from the same lot shall be drawn for retesting. Should any of the retested samples fail the entire lot shall be rejected.

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- 3.1.7 In case of non-compliance in regard to dimensional check (Clause 3.1.3) the manufacturer shall be permitted to segregate the lot in respect of dimensions and re-offer.
- 3.1.8 In the event of rejection of the entire lot after retesting of the samples, the lot offered shall be made unusable in presence of purchasing / inspecting authorities.

4. MARKING

- 4.1 Each component shall be marked as moulded with the following legends on the portion shown in the relevant drawing.
- a) manufacturers name / Initial /Trade mark
 - b) Year of manufacture
 - c) Drawing no.

5. PACKING

- 5.1 The components shall be securedly packed in stout wooden boxes to avoid any damage in transit.

**SPECIFICATION FOR WEAR RING OF BRAKE CYLINDER USED IN THE AIR
BRAKE SYSTEM OF ROLLING STOCK OF INDIAN RAILWAYS**

1. SCOPE

This specification covers the requirements sampling and tests for wear ring of brake cylinder to RDSO drawing No. WD – 92051-S-09 & WD –92051-S-14 used in air brake system.

2. REQUIREMENTS

2.1 Material

- 2.1.1 Plastic used in the manufacture of wear ring shall be acetal resin with martial conforming to the requirements stipulated in this specification. Use of regenerated /re-constituted martial is not permitted. Unless otherwise specified the colour of wear ring shall be of natural colour of the resin. i.e. off white.

2.2 Construction Workmanship and Finish

- 2.2.1 The wear ring shall be moulded as per the latest alteration of RDSO drawing WD-92051-S-09 item 3 for 355mm dia cylinder and WD-92051-S—14 item 3 for 300 mm dia cylinder from acetal resin in an automatic screw type injection moulding machine. Surface of wear ring shall be smooth, free from bubbles, surface streaks, splash marks, voids crazing, blistering etc. All the edges shall be neatly finished free from flash.

- 2.2.2 The wear ring after manufacture shall be suitably annealed / conditioned.

2.3 Dimensions and Tolerances

The dimensions and tolerances of wear ring shall be to the latest revision of RDSO drawing No. WD -92051-S-09 item-3 for 355 mm dia cylinder and WD-92051-S-14 item – 3 for 300 mm dia. cylinder.

3. PHYSICAL PROPERTY

S. No.	PROPERTY	VALUE	METHOD OF TEST (ASTM)
1	Specific gravity	1.40-1.45	D792
2	Hardness (Rockwell-R) min.	115	D785
3	Met. Flow index (I) @ 190 & 2.16kg load (g/10 min) max.	2.5	D1238
4	Tensile strength (MP a) min.	60.0	D 638

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5	Elongation at break (%) mm	60	D 638
6	Compressive strength for 1% deflection (MP a) min.	30	D695
7.	Izod Impact strength (j/m) minimum	60	D256
8	Water absorption (%) for 24 +0/-2hrs, at 27±1 ⁰ c (max)	0.25	D570

Note:

Tests shall be carried out on finished product wherever practicable. The tests be conducted on “as moulded specimens”. “As moulded specimens” are defined as those which upon immediate removal from mould are sealed in containers impermeable to moisture.

4. INSPECTION

- 4.1** The inspection Authority shall make audit check of the manufacturing procedure / ‘Internal Quality Assurance System’ to ensure that the lot offered for inspection is manufactured strictly as per ‘Internal Quality Assurance System’ and the manufacturer has carried out all the test / inspection during manufacturing stage to ensure that the wear ring has been manufactured strictly to the requirement of this specification and drawings.

5. MARKING

Each wear ring shall be marked with following legend

- .1 Manufacturer’s. Name / initials /Trade mark
- .2 Year of manufacturer
- .3 Drawing number

6. PACKING

The wear ring shall be packed suitably to avoid damage during transit.

7. STORAGE

The wear rings shall be stored in cool and dry place free from constraint in the original packing.

APPENDIX-M

LIST OF DRAWING

S. No.	DESCRIPTION	DRG.	ALT. NO.
1	Pipe bracket with control reservoir	WD9-7951-S-10	3
2	Pipe bracket gasket	WD-83062-S-01	1
3	Brake cylinder 355 mm	WD-92051-S-06	5
4	Cylinder body (for 355 mm BC)	WD-92051-S-07	5
5	Cylinder body Cast Iron version (for 355 mm BC)	WD-94048-S-01	1
6	Piston & Piston rod (for 355 mm BC)	WD-92051-S-08	Nil
7	Details of Brake cylinder (for 355 mm BC)	WD-92051-S-09	2
8	Piston packing (for 355 mm BC)	WD-92051-S-10	Nil
9	Brake cylinder 300 mm	WD- 92051-S-11	3
10	Cylinder body (for 300 mm BC)	WD-92051-S-12	2
11	Piston & Piston rod (for 300 mm BC)	WD- 92051-S-13	1
12	Details of Brake cylinder (for 300 mm BC)	WD-92051-S-14	3
13	Piston packing (for 300 mm BC)	WD-92051-S-15	Nil
14	Auxiliary Reservoir (100 lts.)	WD-92051-S-01	3
15	Auxiliary Reservoir (75 lts.)	WD-92051-S-02	2
16	Cut off angle cock with vent	WD-88123-S-01	2
17	Details of cut of angle cock with vent	WD-88123-S-02	5
18	Dirt collector assembly	WD-92051-S-03	2
19	Details of dirt collector (sheet-1)	WD-92051-S-04	1
20	Details of dirt collector (sheet-2)	WD-92051-S-05	3
21	Hose coupling assembly for Brake pipe.	SK-73547	12
22	Hose coupling assembly for Feed pipe.	WD-81027-S-01	10
23	Guard's emergency brake valve	SK-73549	3
24	Check Valve	WD-83062-S-03	2
25	Isolating Cock (for coaches)	SK-89021	2
26	Pressure gauge (100 mm) for brake pipe.	SK-73553	4
27	Pressure gauge (100 mm) for feed pipe	WD-83062-S-05	3
28	Passenger alarm actuation system	SK-82055	3
29	Airbrake equipment and pipe layout	SK-85155	1
30	Blanking piece	WD-92032-S-01	Nil
31 ♦	Reducing Bush	ICF Drg. No. EMU/M-3-5 -053 (item No. 7)	---
32	Isolating Cock (for Brake van)	WD-83062-S-04	2
33	Socket of quick coupling Arrangement & details.	WD-91101-S-05	5
34	Pressure gauge (63 mm) for brake pipe.	WD-92047-S-01	2
35	Plug of quick coupling Arrangement & details	WD-91101-S-05	5
36	Passenger emergency valve	SK-81164	Nil
37	Pressure emergency Alarm signal device.	SK-81163	Nil
38	Alarm valve reset key (Guard's key)	SK-81209	Nil
39	Isolating Cock OLP type (Ball type).	SK.97002	2
40.	Details of Isolating Cock.	SK.97003	5
41.	Two way dirt collector (for branch type).	SK.97005 (Sheet-1)	2
42.	Details of dirt collector (for branch type).	SK.97005 (Sheet-2)	2
43.	Auxiliary Reservoir (200 liters).	SK.96081	3
44.	Details of Auxiliary Reservoir (200 liters).	SK.96082	2

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45.	Brake cylinder 355mm	SK.97015	Nil.
46.	PEASD with fixed key	SK-97017	2
47.	Details of PEASD with Fixed key arrangement	SK-97018 (Sheet 1)	4
48.	Details of PEASD with fixed key arrangement	SK-97018 (Sheet 2)	3
49.	Passenger Emergency alarm valve	SK-97029	3
50.	Housing sub assembly (PEAV)	SK-97030 (Sheet 1)	2
51.	Details of (PEAV)	SK-97030 (Sheet 2)	4
52.	Details of Check Valve	SK-98111	1
53.	Check Valve assembly	SK-98112	Nil
54.	Isolating Cock OLP type with cut hole for brake cylinder	SK-98013	Nil
55.	Single Piece Load Sensing Device	WD-01065-S-01	NIL
56.	Pressure gauge (63mm) for feed pipe	WD-92047-S-02	NIL

NOTE: -

1. The drawings can be obtained from DG (Wagon) / DG (Carriage) RDSO Lucknow 226011 on payment.
2. ♦ Drg. of item No. 31 can be obtained from GM/M, ICF MAS. on payment
3. Quick coupling plug fitted with pressure gauge shall be part of train guard equipment and Railways will make its procurements.

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APPENDIX-N

**SPECIFICATION FOR QUICK COUPLING ARRANGEMENT FOR DETACHABLE
PRESSURE GAUGE FOR AIR BRAKED BRAKE VANS**

0. Foreword

- 0.1** This specification is intended to cover the technical provision related to material, dimensions, inspection and tests of socket and plug of quick coupling arrangement to RDSO Drg. WD-91101-S-05 for detachable pressure gauge arrangement and does not include all necessary provisions of the contract.
- 0.2** This specification draws reference to specification No. IS: 3468, IS: 8500, IS: 6603, IS: 2898, IS: 4454 & RDSO specification No. C-8215.

1. SCOPE

- 1.1** This specification covers the requirements for supply of socket and plug of quick coupling arrangement for detachable pressure gauge arrangement.

2. PARTICULAR REQUIREMENT

2.1 General Arrangement

This general arrangement of socket and plug of quick coupling shall be to the latest revision of RDSO Drg. No. WD-91101-S-05 (item no.1 for plug & assembly of item no. 2 to 14 for socket).

2.2 Material and Dimensions

The material and dimensions of the components of socket and plug shall be as given in the latest revision of RDSO Drg. NO. WD-91101-S-05. Manufacturer can approach RDSO for any clarification required regarding general arrangement, material, dimension of components and working of quick coupling before starting production.

3. Testing

The manufacturer shall ensure 100% inspection of item 1&5 of Drg. No. WD-91101-S-05 for dimensional accuracy before assembly of socket. The manufacturer shall ensure during production that 100% socket with & without plug are tested for leakages at 10 kg / cm² air pressure and there is no leakage.

4. Purchase Inspection

Purchase inspection shall cover the following:

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- 4.1 20% of each lot shall be checked for dimensions of item No.1 and 5 of the drawing No.WD-91101-S-05 either by standard gauge or by micro meter. The gauges, if used for checking of dimensions, shall be checked for accuracy by the Inspecting Officer.
- 4.2 Audit check of the manufacturers records shall be done by the Inspecting Officer for verification of the material used.
- 4.3 10% socket shall be checked for leakage at 10 kg/cm² air pressure. These sockets fitted with plug alongwith pressure gauge shall also be checked for leakage at 10 kg/cm² air pressure. If any of the socket or socket fitted with plug is found defective, the complete lot shall be checked for leakage. Defective socket and plug having leak shall be rejected and replaced by sockets and plugs testing for leakages and found acceptable.
- 4.4 The fitment of plug with socket should be smooth. The Inspecting Officer shall check 20% of sockets from each lot for smooth fitment of plug on socket. In case a defective socket is found full lot shall be checked for smooth fitment and defective identified shall be replaced by socket having smooth fitment with plug.
5. The warranty shall be as per general condition of the contract of Indian Railways.

6. Packing

The manufacturers shall ensure proper packing of plug and socket of quick coupling to avoid any damages during transit.

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APPENDIX-O

**SPECIFICATION FOR PRESSURE GAUGE OF AIR BRAKE
SYSTEM OF BRAKE VANS OF INDIAN RAILWAYS**

1. SCOPE

This specification covers the technical requirements of pressure gauge to RDSO Drg. WD-92047-S-01 for brake pipe and WD-92047-S-02 for feed pipe used in the air brake system in brake vans and does not include other provisions of the contracts.

2. PARTICULAR REQUIREMENTS

- 2.1 The supplier shall have infrastructure, manufacturing, testing and quality control requirements as per schedule of technical requirement No.IL-33:2000 (latest revision) The pressure gauge shall be industrial type direct mounting bottom connection and concentric scale type conforming to IS: 3624 with controlling dimensions, additional requirements as per latest revision of RDSO Drg. WD-92047-S-01 for brake pipe and WD-92047-S-02 for feed pipe.
- 2.2 The pressure gauge is supposed to be fitted in brake van of freight trains and running of train may result continuous vibration of pressure gauge. Hence the pressure gauge should be able to perform satisfactory under vibration.
- 2.3 The pressure gauge along with plug (item 1 of RDSO Drg. WD-91101-S-05) shall be a personal store of Guard.

2. MATERIAL AND CONSTRUCTION

- 3.1 The case and base shall be manufactured from mild steel and shall be given suitable anti – corrosive treatment.
- 3.2 The pressure element shall be bourdon tube type with Phosphor Bronze tubing conforming to Appendix D& E of IS : 3624 – 1979.
- 3.3 Material and construction of all other items shall be in accordance with IS: 3624-1979.

4 INSPECTION

The Inspection Authority shall ensure that the pressure gauge being procured strictly conforming to this Specification, IS: 3624 and the latest revision of RDSO Drg. WD-92047-S-01/WD-92047-S-02. Records of manufacturer shall be checked to ensure that material of pressure element conform to this specification requirements (Para 3.2).

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APPENDIX-O**5 PACKING**

The manufacturer shall ensure that the pressure gauge is suitably packed before dispatch to avoid damage during transit.

APPENDIX-P**SPECIFICATION FOR SINGLE PIECE LOAD SENSING DEVICE FOR AIR-BRAKE SYSTEM OF ROLLING STOCK OF INDIAN RAILWAYS.****1. SCOPE**

This specification covers the technical requirements related to the performance, inspection and test of Single Piece Load Sensing Device to RDSO drawing No. WD-01065-S-01 used on Single pipe Graduated Release Air-brake system being used on wagons on Indian Railways.

2. PARTICULAR REQUIREMENT

- 2.1** Manufacturers willing to supply Single Piece Load Sensing Device for use on Indian Railways shall register themselves with RDSO.
- 2.2** The manufacturers shall have adequate facilities for the manufacture and assembly of single piece load sensing device as per the design and drawing of their respective collaborators or as per manufacturer drawings approved by RDSO. The manufacturers shall have facility for inspection and testing of individual components and assembly to ensure that these are manufactured strictly to the design and quality standard laid down by the principle manufacturer or as per QAP approved by RDSO.
- 2.3** Manufacturers shall have a well-documented ``Internal Quality System`` to ensure sustained quality of products being manufactured. The `Quality Assurance System` shall also cover the following: -
 - 2.3.1** The components of Single Piece Load Sensing Device shall be identified as imported, in-house manufactured, semi-finished purchased from sub-let vendor, finished components purchased from sub-let vendor other than rubber items and standard hardware item.
 - 2.3.2** System to ensure that correct raw material is being used in components manufactured in house, purchased as semi-finished and purchased as finished.
 - 2.3.3** System to ensure that components having manufacturing defects are identified and destroyed so that such components are not used during assembly.
 - 2.3.4** System to ensure that bought-out components, finished or semi-finished are strictly as per requirement laid down in the specification/drawing as received from collaborator/approved by RDSO.

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- 2.3.5** System to ensure that rubber components are manufactured by sub-let vendor strictly as per the specification and drawings of the collaborator/RDSO approved. System also to ensure that the rubber components are purchased from the sources for which sample has been tested and certified by the collaborator/RDSO.
- 2.3.6** System to maintain strict control of dimension and workmanship of the components and assembled product.
- 2.3.7** System to test and establish that Single Piece Load Sensing Device manufactured by the firm conform to the requirement laid down in the drawings & specification.
- 2.3.8** System of periodical calibration of the equipment/gauges to ensure accuracy of the product.

3 EQUIPMENT DESIGN

The general design and controlling dimensions of Single Piece Load Sensing Device shall conform to the latest revision of RDSO drg. No. WD-01065-S-01 for use. The material of the components shall be to the specifications laid down by the principle manufacturers/collaborator. No change shall be made without the approval of Collaborator and RDSO.

4. TECHNICAL REQUIREMENTS

- (i)** The Single Piece Load Sensing Device shall be maintenance free design requiring overhauling at 6 to 8 years of interval.
- (ii)** The supplier will furnish minimum 25 number of operative maintenance manuals and wall charts for line and workshop staff against each contract.
- (iii)** The supplier should also quote for spares and consumable required for maintenance of Single Piece Load Sensing Device.
- (iv)** The supplier shall give details of tools and equipment's required for repair and testing of Single Piece Load Sensing Device. The supplier shall quote for these items in the tender and also supply these items against purchase placed by railways.
- (v)** The supplier should also under take repair/overhauling of Single Piece Load Sensing Device on Railways requirement and quote for the same in tender.

5. DEVELOPMENTAL INSPECTION

- 5.1** Developmental inspection shall be carried out at the manufacturer's premises at the time of the registration of the firm with RDSO and at the time of renewal of registration. The following procedure shall be followed for the developmental inspection.

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5.1.1 The inspecting authority shall verify and ensure that the manufacturer is having and being strictly following a well documented system of the 'Internal Quality Assurance' as given at para 2.3 of these specification. After having done the same, the following procedure shall be followed.

5.1.1.1 The manufacturer shall supply 10 Single Piece Load Sensing Device and the inspecting authority shall suggest them to the following tests:

- a) One sample shall be tested for physical and chemical properties of materials used for the components.
- b) Four samples shall be tested for the following:
 - i) Checking of dimensions and tolerance of components as per drawing.
 - ii) General workmanship and surface finish.
- c) All the Single Piece Load Sensing Device excluding the one tested for materials shall be subjected to test indicated at para 7 of the specification.

5.2 In case of samples picked up fails in any of the test/checks indicated at para 5.1.1.1 the entire lot shall be rejected and reasons for the failure shall be indicated. In case the failures are not on account of non-implementation of 'Internal Quality Assurance System' a fresh 10 Single Piece Load Sensing Device shall be offered all the tests/checks given at para 5.1.1.1. Shall be conducted.

6. PURCHASE INSPECTION

6.1 The purchase inspection shall be carried out at the premises of the manufacturers who are cleared for the regular manufacture of Single Piece Load Sensing Device and registered with RDSO, The following procedure shall be followed: -

6.1.1 The inspecting authority shall make audit checks of the manufacturing procedure 'Internal Quality Assurance System' to ensure that the lot offered for inspection is manufactured strictly as per 'Internal Quality Assurance System' and the manufacturers has carried out all the tests/inspection during manufacturing stage to ensure that the Single Piece Load Sensing Device as well as their components are manufactured strictly to the specification/drawing and quality standard of the collaborator.

6.2 After having satisfied about quality standards, ten percent of each lot of Single Piece Load Sensing Device shall be tested as per procedure given in para 7.

7. TESTS

APPENDIX-P

- 7.1 Each sub assembly of Single Piece Load Sensing Device shall be tested individually for proper function before going for further assembly. The complete assembly shall be tested on the test bench as per testing scheme given below.

The test set up as shown in the Figure 'X'.

7.2 Leakage test of single piece load Sensing Device.

The procedure for leakage test shall be as follows (Test set up as shown in figure 'X')

The exhaust port of Single Piece Load Sensing Device shall be blocked and feed air through in-let port at 10 kg/cm^2 pressure. Check for leak all over the body and joints for two minutes. No leak is permitted. The gauge (4) should not indicate any pressure.

7.3 Functional test of Single Piece Load Sensing Device.

The procedure for functional test shall be as follows (Test set up as shown in figure 'X')

- (a) With Isolating Cock (2) open, but Single Piece Load Sensing Device un-actuated no pressure should build up in pressure gauge(4) when a air supply at pressure 5 kg/cm^2 is given through inlet port.
- (b) Now operate the single Piece Load Sensing Device by pressing piston 5mm inside. The pressure 5 kg/cm^2 should build up pressure gauge (4) within 10 ± 2 second.
- (c) Now press the piston fully inside the body. The gauge (4) pressure should remain 5 kg/cm^2 .
- (d) Now release the piston so that it comes out fully. The gauge (4) pressure should reduce to zero within 10 ± 2 seconds.
- (e) Repeat the process as covered in a, b, c, and d above 5 times.

- 7.4 Piston shall be subjected to a load of 48 Kgs. and see that the application is within 70 ± 2.0 mm.

8. PAINTING

The Single Piece Load Device shall be given suitable anti-corrosive treatment and the exterior shall be painted with black enamel paint.

APPENDIX-P**9. PACKING**

The manufacturer shall ensure that all external ports of Single Piece Load Device shall be suitably covered with protector caps and the complete assembly shall be adequately packed before dispatch to prevent damage in handling and storage.

10. The manufacturer will furnish the following information to RDSO at the time of offer.
 - a) Life of Single Piece Load Device.
 - b) Maintenance periodicity.
 - c) Copy of Maintenance instruction/Manuals/Wall charts.
 - d) List of spare, tools, gauges, & facilities required for maintenance & testing.
 - e) Complete set of assembly & detailed drawings.
11. The supplier will also provide training to the railway staff for assembly & maintenance of Single Piece Load Device supplied to Indian Railways.

APPENDIX-P

