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भारत सरकार . रेल मंत्रालय

**GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS**

डीजल एवं इलेक्ट्रिक लोकोमोटिव के ब्रेक सिस्टम में प्रयोग  
हेतु MU-2B वाल्व की विशिष्टि और तकनीकी आवश्यकताओ की  
अनुसूची

**SPECIFICATION & SCHEDULE OF TECHNICAL  
REQUIREMENTS FOR MU-2B VALVE FOR ITS USE IN  
BRAKE SYSTEM FITTED ON DIESEL AND ELECTRIC  
LOCOMOTIVES**

विशिष्टि संख्या . एम.पी.0.01.00.37 (संशो.— 01)

जून — 2024

**SPECIFICATION NO. MP.0.01.00.37 (REV- 01)**

June -2024

अनुसंधान अभिकल्प एवं मानक संगठन

लखनऊ —226 011

**RESEARCH DESIGNS & STANDARDS ORGANISATION  
LUCKNOW - 226 011**

## LIST OF AMENDMENTS

S. No	Amendment Date	Rev.	Revised Para	Details
1.	June - 2024	1	2.7, 3.4, 4.1, 4.3, 4.6, 5.10, 7.6, 12(now 11)	Para has been revised to keeping in view of probable change in vendor approving agency.
			3.1.3	Revised, the standard for vibration & shock test has been referred as alternate method.
			7.1, 7.2	In view of M. P. Dte's note dt.19.03.2024, regarding "Vendor Approval Process ensuring transparency and competition" & Para 4.3.5.1 of ISO document QO-D-8.1-10 ver. 2.4, the para 7.1 & 7.2 has been revised.
			7.7	The document referred for quantity of the valve for field trial and field trial period has been obsolete. The qualifying quantity and period is mentioned in UVAM. Accordingly, the para has been revised.
			10	Para deleted & shifted to Part –B of this document. Accordingly para 11, 12 & 13 shifted to one place above & re-numbered.

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**PART A- Specification for MU-2B valve for its use in brake system fitted on diesel and electric locomotives**

**1 SCOPE:**

This specification covers the purchase, acceptance and technical requirements related to the performance, inspection and tests of MU-2B valve conforming to existing approved design. This valve is used in the twin pipe graduated release type brake system fitted on diesel and electric locomotives of Indian Railways.

**2 DEFINITIONS**

- 2.1 Tenderer -means firm/company from whom the offer for the supply of this air brake equipment is invited.
- 2.2 Contractor- means the present firm/company on whom the order for the supply of this air brake equipment is placed.
- 2.3 Purchaser- means the Indian Railways on behalf of the President of the Republic of India who are purchasing this air brake equipment.
- 2.4 Inspecting Authority- means the organisation or its representative nominated by the purchaser to inspect this air brake equipment.
- 2.5 The Research Designs and Standards Organization, 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, tenderer needs any clarification with respect to any clause of this specification or drawings, the tenderer may contact Motive Power Directorate, RDSO/Vendor Approving Agency.

**3 GENERAL CONDITIONS:**

3.1 Service Conditions

3.1.1 The valve/equipment shall be capable of operating efficiently inspite of dust, dirt, mist, torrential rains, sand storm and presence of oil vapours to which the locomotive is normally exposed in service.

3.1.2 The valve/equipment shall be capable of working satisfactorily under the site conditions indicated below:

- .1 Altitude : Mean sea levels to an altitude of 1000m.
- .2 Ambient temperature : -5 deg. C to 55 deg. C. The air temperature in-side the equipment compartment may reach up to 70 deg. C.
- .3 Relative Humidity : Up to 100%.

3.1.3 The valve/equipment with mounting arrangement shall be able to withstand the vibrations and shocks normally encountered during service. The conditions are indicated below:

- Maximum vertical acceleration 1.0g.  
Maximum longitudinal acceleration 3.0g.

Maximum transverse acceleration 0.5g.

('g' being acceleration due to gravity)

Or

Vibration testing shall be done in accordance with IEC-61373 (Category 1, Class A) or equivalent Indian Standards

### 3.2 Warranty

- 3.2.1 The contractor shall warrant the valve/equipment furnished hereunder, shall be free from all defects and faults in material, workmanship and manufacture and shall be of the highest grade.
- 3.2.2 The Warranty/Guarantee period will be 36 months from the date of delivery or 24 months from the date of commissioning whichever is earlier.
- 3.2.3 The contractor shall, if required, replace or repair the goods or such portion thereof as is rejected by the purchaser free of cost at the ultimate destination or at the option of the purchaser the contractor shall pay to the purchaser value thereof at the contract price.
- 3.2.4 All replacements and repairs that the purchaser shall call upon the contractor to deliver or perform under this warranty shall be delivered and performed by the contractor within six months (promptly and satisfactorily). If the Contractor so desires, the replaced parts can be taken over by him or his representative for disposal as he deems fit within a period of three months from the date of replacement of goods/parts. At the expiry of this period, no claim whatsoever shall lie on the Purchaser.
- 3.2.5 The decision of the purchaser in regard to contractor's liability and the amount, if any, payable under this warranty shall be final and conclusive.

### 3.3 After sales

- 3.3.1 Contractor shall supply one set of maintenance manual with every 5 sets of the equipment. Manual shall contain the details of the following information. Updated position of modifications, if any, shall also be incorporated.
- i) Mounting arrangement
  - ii) Sub-assemblies
  - iii) Principle of operation
  - iv) Maintenance schedules during Trip/Monthly/Half Yearly/3 Yearly and POH
  - v) Trouble shooting
  - vi) Part catalogue
  - vii) Testing procedure
  - viii) Test equipment and tools
- 3.3.2 At least one set of wall charts showing pictorial view of components along with part nos. will be given with every 5 sets. The copies of Maintenance Manual and wall charts are meant for wider circulation in Railways and fresh copies shall be furnished as stipulated even if there are no changes in the manual and wall charts furnished against earlier contract.
- 3.3.3 The contractor will impart training of working, operation and maintenance of the system to selected concerned personnel of Indian Railway.

### 3.4 Training

Sufficient number of technicians/engineers/officers shall be trained in consultation with the purchaser/RDSO/Vendor Approving Agency so that adequate trained personnel are available in the field for maintenance. This training shall be at the contractor's works for a suitable period and shall cover maintenance, testing, design and quality control.

The contractor shall undertake training of Indian Railway personnel free of cost.

### 3.5 Deviations

3.5.1 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 indicate the deviation CLAUSE-WISE with technical reasons.

3.5.2 The final decision regarding the acceptance of the deviations submitted by the contractor shall be at the discretion of the purchaser.

3.5.3 Clauses not covered in the Deviation Statement shall be deemed to be acceptable to the Tenderer in all respects. In case of Deviation Statement is not submitted it would be taken, as the complete specification is acceptable to the Tenderer.

## 4 GENERAL REQUIREMENTS:

4.1 Manufacturer willing to supply MU-2B valve for the use in brake system of diesel and electric locomotives shall register themselves with RDSO/Vendor Approving Agency.

4.2 Manufacturer shall provide sufficient evidence of their capability in support of the technology of manufacturing MU-2B valve conforming to existing approved design in view of the interchangeability of the assembly.

4.3 The manufacturer shall submit complete sets of GA (General Arrgt) drawing of MU-2B valve to RDSO/Vendor Approving Agency..

4.4 The manufacturers shall have all drawings, process sheets, test specification and test rig arrangement for manufacturing and testing of the valve/equipment conforming to existing approved design.

4.5 The manufacturer shall have adequate facilities for the manufacturing, assembly and testing of MU-2B valve conforming to existing approved design. The manufacturers shall also have facilities for inspection and testing of individual components and sub-assembly.

4.6 Manufacturer shall have an "internal quality assurance system" with proper documentation to sustain quality of products being manufactured. Firm will also prepare quality assurance plan as per ISO document of RDSO/Vendor Approving Agency.

## 5 TECHNICAL REQUIREMENTS:

5.1 The MU-2B valve shall be suitable for the brake system provided on diesel and electric locomotives on Indian Railways.

5.2 MU-2B Valve shall be used manually operated, two position and multi ported valve.

5.3 The two positions used in the MU-2B Valve are "Lead and Trail".

- 54 MU-2B Valve is fitted on Tri-plate panel.
- 55 MU-2B Valve provided to supply MR air to F-1 selector valve should be kept in “Lead” in the leading locomotive and in the “Trail” position in the trailing locomotive.
- 56 The equipment shall work satisfactory with Main reservoir pressure up to 10 kg/cm<sup>2</sup>.
- 57 The location and size of port is shown in RDSO drawing no. SK.DP-2420.
- 58 Proper heat treatment shall be given to attain required hardness on wearing components.
- 59 The general shape, envelop size and mounting dimension of MU-2B valve shall be as per RDSO drawing no. SK.DP-2420. The MU-2B should be fully interchangeable with respect to overall mounting dimensions & threads with valves of original manufacturer i.e. existing approved design.
- 5.10 Rubber components shall be procured from approved sources as given in UVAM portal and shall also conform to IRS.R-48-24 (latest) or to equivalent rubber specification.

## 6 PERFORMANCE TEST:

- 6.1 MU-2B brake valve shall be tested on AB test rack or alternative arrangement conforming to AB test rack. However, the diagrammatic arrangement of AB test rack is shown in RDSO drawing. No. SK.DP- 2664.
- 6.2 Test set up
  - 6.2.1 Mount the valve on the test rack.
  - 6.2.2 Maintain supply pressure to 140 Psi/10 Kg/cm<sup>2</sup> minimum.
  - 6.2.3 The feed valve of the test rack should be set at 120 psi.
  - 6.2.4 Conduct the test as per the test procedure given in table no. 1.

**TABLE-1**

Sl. No.	Test description	Standard values
1.	<p><b>LEAKAGE TEST</b></p> <ul style="list-style-type: none"> <li>• Start the test with all cocks closed and valve 'A' handle in position No. 8.</li> <li>• Secure valve to test rack as Figure 1</li> <li>• Move valve 'A' handle in to position no. 1.</li> <li>• Open cock 9, 16 and 19.</li> <li>• Operate the valve several times by moving valve handle alternately to both positions, finally leave handle in "Lead" or "Cut-in" Position.</li> <li>• Open cocks 4 and "D"</li> </ul> <p><b>NOTE:</b>                      If during the following test, leakage is to be determined with the Leakage Indicator, press the hose nozzle to against the exhaust opening specified and note that the time required for the water to rise from the second to the graduation indicated for each respective test is not less than specified.                      The Leakage Indicator must be checked to insure that the water level registers with the first graduation.                      If leakage is to be determined with the FLOWRATOR Meter, the float must rise not higher than specified.</p>	

	<p><b>SECTION 'A' - "LEAD' OR 'CUT-IN" POSITION</b></p> <p><b>(a) "O" Ring</b> Cock 'D' Leakage Test Fitting - Flowrator Meter - Leakage Indicator</p> <p><b>(b) "O" Ring</b> • Close cock 'D' and open cock "B". Cock 4 Leakage Test Fitting - Flowrator Meter - Leakage Indicator</p> <p><b>(c) "O" Ring</b> • Close cock 4 and open cock 11 &amp; 13. "EX" PORT - Soap test</p> <p><b>(d) Casting</b> ENTIRE PORTION - Soap test • Close cocks 11 and 13.</p> <p><b>SECTION 'B' - 'TRAIL OR DEAD' OR 'CUT-OUT' POSITION</b></p> <ul style="list-style-type: none"> <li>• Start test with cocks 9, 16, 19 and "B" open.</li> <li>• Move valve 'A' handle in position No.1.</li> <li>• Close cocks 16 and 19, then open cocks "C", "D", "E" and "F".</li> <li>• Move valve handle to 'Trail or Dead' or 'Cut-out' position.</li> <li>• Open cock 5.</li> </ul> <p><b>(a) "O" Ring</b> Cock 'D' Leakage Test Fitting - Flowrator Meter - Leakage Indicator</p> <p><b>(b) "O" Ring</b> • Close cock 'D' and open cock "A". Cock "F" Leakage Test Fitting- Flowrator Meter - Leakage Indicator</p> <p><b>(c) "O" Ring</b> • Close cock "F" and open cock 16. Cock "E" Leakage Test Fitting- Flowrator Meter - Leakage Indicator</p> <p><b>(d) "O" Ring</b> • Close cock "E" and open cock 19. "EX" PORT - Soap test • Open cocks 2 and 12.</p> <p><b>(e) Casting</b> ENTIRE PORTION - Soap test</p>	<p>No float rise No water rise</p> <p>No float rise No water rise</p> <p>No leakage</p> <p>No leakage</p> <p>No float rise No water rise</p> <p>No float rise No water rise</p> <p>No float rise No water rise</p> <p>No leakage</p> <p>No leakage</p>
<p>2.</p>	<p><b>CAPACITY TEST</b></p> <ul style="list-style-type: none"> <li>• Start the test with cocks 2, 5, 9, 12, 16, 19, "A", "B" and "C" open.</li> <li>• Move valve "A" handle in position No. 1</li> <li>• Move Valve handle in 'Trail or Dead' or 'Cut-out' position.</li> </ul> <p><b>SECTION 'A' - 'TRAIL OR DEAD' OR 'CUT-OUT' POSITION</b></p> <p><b>(a) Port 30 to Port 63</b> • Close cocks 12 and "B". • Open cock 11 and note: Q. SER. GAUGE –</p> <p><b>(b) Port 53 to 'EX'</b> • After Quick service has charged to 120 psi, close cock 11.</p>	<p>Charges to 100 psi in 3 to 6 seconds</p>

	<ul style="list-style-type: none"> <li>• Open cock 3 and note: B.C. RES. GAUGE –</li> <li>• Close cock 'C'.</li> </ul> <p><b>SECTION "B" - "LEAD" OR "CUT-IN" POSITION</b></p> <ul style="list-style-type: none"> <li>• Start test with cocks 2, 3, 5, 9, 16, 19 and "A" open.</li> <li>• Move valve "A" handle in position No. 1.</li> </ul> <p><b>(a) Port 30 to "EX"</b></p> <ul style="list-style-type: none"> <li>• Close cocks 9 and "A".</li> <li>• Move valve handle to 'Lead" or 'Cut-In' position and note: EMER. RES. GAUGE –</li> </ul> <p>• Close cocks 3, 5, 16 and 19, then open tocks 13 and "C".</p> <p><b>(b) Port 20 to Port 2</b></p> <ul style="list-style-type: none"> <li>• Open cook 15 and note: AUX. RES. GAUGE –</li> </ul> <p><b>(c) Port 13 to Port 3 "</b></p> <ul style="list-style-type: none"> <li>• Close cocks 15 and "C"</li> <li>• Open cocks 6, 16, 19 and "A"</li> <li>• Charge auxiliary reservoir to 120 psi, then close cock 16.</li> <li>• Open cock "B" and note: AUX. RES. GAUGE –</li> </ul> <p><b>(d) Port 63 to 53</b></p> <ul style="list-style-type: none"> <li>• Close cock 13</li> <li>• Open cocks 4.</li> <li>• Open cock 11 and note: Q. SER. GAUGE –</li> </ul> <p>At completion of test, move valve "A" handle to position No. 8. Open cock 16 and drain auxiliary reservoir, then close all cocks.</p>	<p>120 to 20 psi in 6 to 9 seconds.</p> <p>120 to 100 psi in 5 to 18 sec.</p> <p>120 to 40 psi in 6 to 9 sec</p> <p>120 to 40 psi in 6 to 9 sec.</p> <p>120 to 20 psi in 7 to 10 sec.</p>
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## 7 Type and Routine Test

- 7.1 The valve/equipment shall be offered for type test. Any change in design found necessary during type test shall be carried out by the contractor free of cost to ensure satisfactory performance of the valve.
- 7.2 Type test shall be carried out on two samples of MU-2B valve. If RDSO/Vendor Approving Agency feels necessary to conduct type test on some more units, the samples will be picked up at random for further validations of design and drawings. Following shall comprise type tests:

S.N	Test	Details
1.	Dimensional check	As per para 5.9
2.	Performance Test	As per para 6
3.	Vibrations and shocks	As per para 3.1.3
4.	Any other test specified in the approved QAP as well as desired by purchaser	As per QAP or as specified by the purchaser

7.3 Routine test (for regular Inspection) shall consist of visual check and performance test of MU-2B valve and these tests shall be done on all or sample of lot. Sampling shall be done as per IS 2500 (part 1). Details of routine test are as under:

S.N	Test	Details
1.	Dimensional check	As per para 5.9
2.	Performance Test	As per para 6
3.	Any other test specified in the approved QAP as well as desired by purchaser	As per QAP or as specified by the purchaser

7.4 The contractor shall provide without extra charge, all material equipment tools, labour for tests of every kind, which the purchaser or his nominee shall require to be made on the contractor's premises. The contractor shall also provide any other assistance, which the inspecting authority may consider necessary for any test, examination and dimensional checking.

7.5 At the time of inspection the supplier shall submit the internal test results necessary to prove that the MU-2B valve fulfils the technical requirements conforming to existing approved design for MU-2B valve.

7.6 If endurance test for components and sub-assemblies is required by RDSO, Lucknow, /Vendor Approving Agency the contractor will create facilities in his works for the same.

7.7 After inspection of the valve it will be subjected for field trials to monitor its performance on locomotive. Quantity of the valve for field trial and field trial period shall be as mentioned in the UVAM portal.

Field performance feedback format is as under:

S. No.	Shed/ Rly.	Loco No.	Date of fitment	Date of failure, if any	Reason of failure	Remarks

The acceptance criteria of field trial shall be the satisfactory field performance of equipment

## 8 Installation:

8.1 Installation and commissioning of the valve/ equipment of the first prototype shall be the responsibility of the supplier. Other equipment shall, however, be installed by purchaser. Assistance with regard to labour and other facilities which are available in the workshop would, however, be provided by the purchaser to the supplier. Additional equipment/fittings, not covered in the specification, if required, for installation of valve/ equipment, shall be supplied by the supplier.

The supplier shall submit tentative installation drawings along with the offer based on the availability of space in the locomotive. These drawings would, however, be finalised after fitment of the first prototype.

## 9 Technical Documents/Drawings

9.1 Following documents shall be submitted along with the offer:-

- i. Technical literature covering design and principle of operation, to have a general idea of the valve/equipment offered.
- ii. Detailed GA (General Arrgt) drawings indicating mounting arrangements.
- iii. Clause wise comments on specification.
- iv. Test program and details of testing facilities at manufacturer's works.
- v. List of recommended spares for maintenance of valve/equipment for two years.
- vi. List of special tools required for maintenance of valve/equipment.
- vii. Latest Copy of bill of material of all brake items with Drg. No. of individual components.

92 One copy per five set of the following documents shall be supplied by the supplier as part of contract:-

- i. Type and routine test specification and test reports.

### **10 Preference to Make In India**

The Government of India policy on 'Make in India' shall apply.

### **11 Vendor Changes in Approved Status**

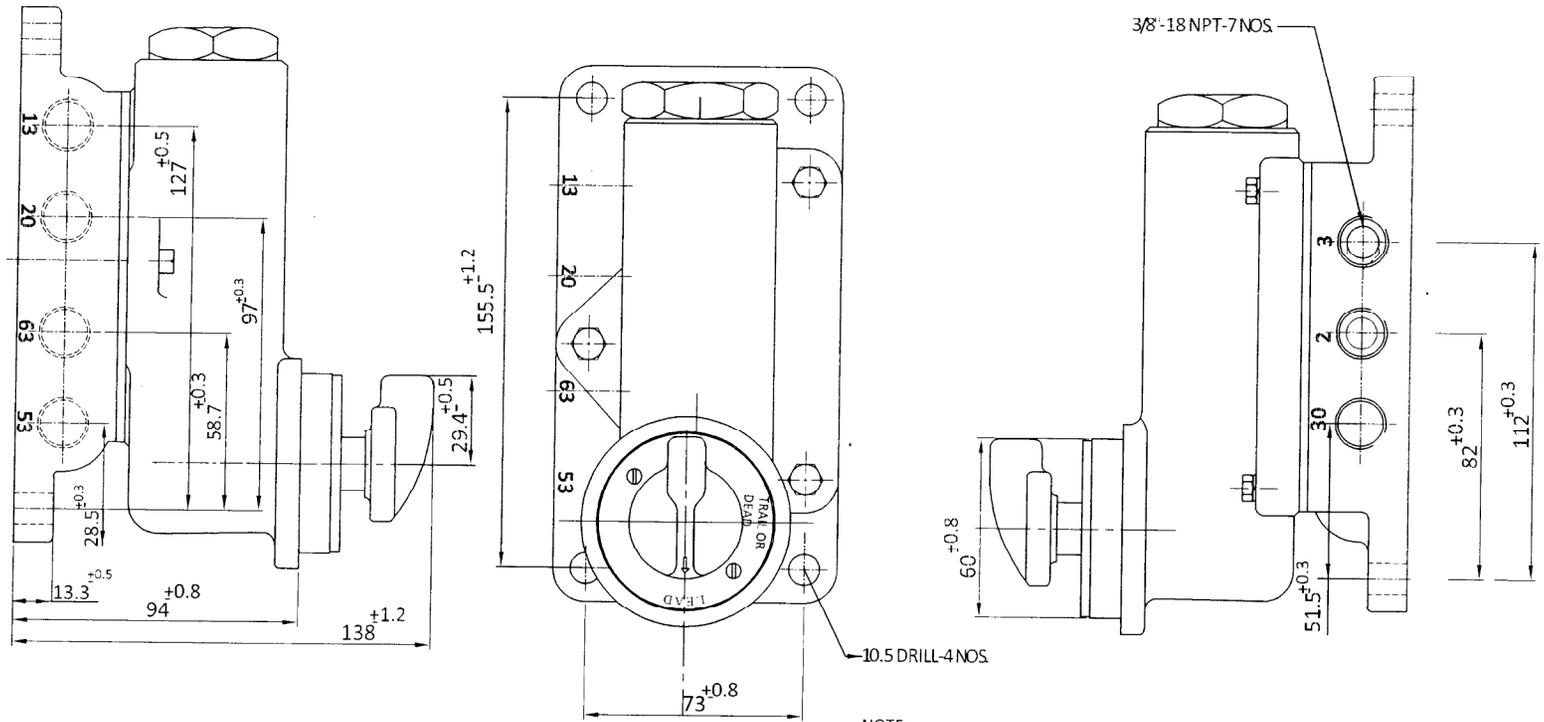
All the provisions contained RDSO's ISO procedures laid down in Document No. QO-D-8.1-11, dated (latest version).\- (Titled "Vendor-changes in approved status") and subsequent version/amendment thereof/respective ISO procedure of Vendor Approving Agency, shall be binding and applicable on the successful vendor/vendors in the contract floated by Railways to maintain of products supplied to Railways.

### **12 Date Of Enforcement**

The date of enforcement of the specification is with immediate effect i.e. date of issue of specification

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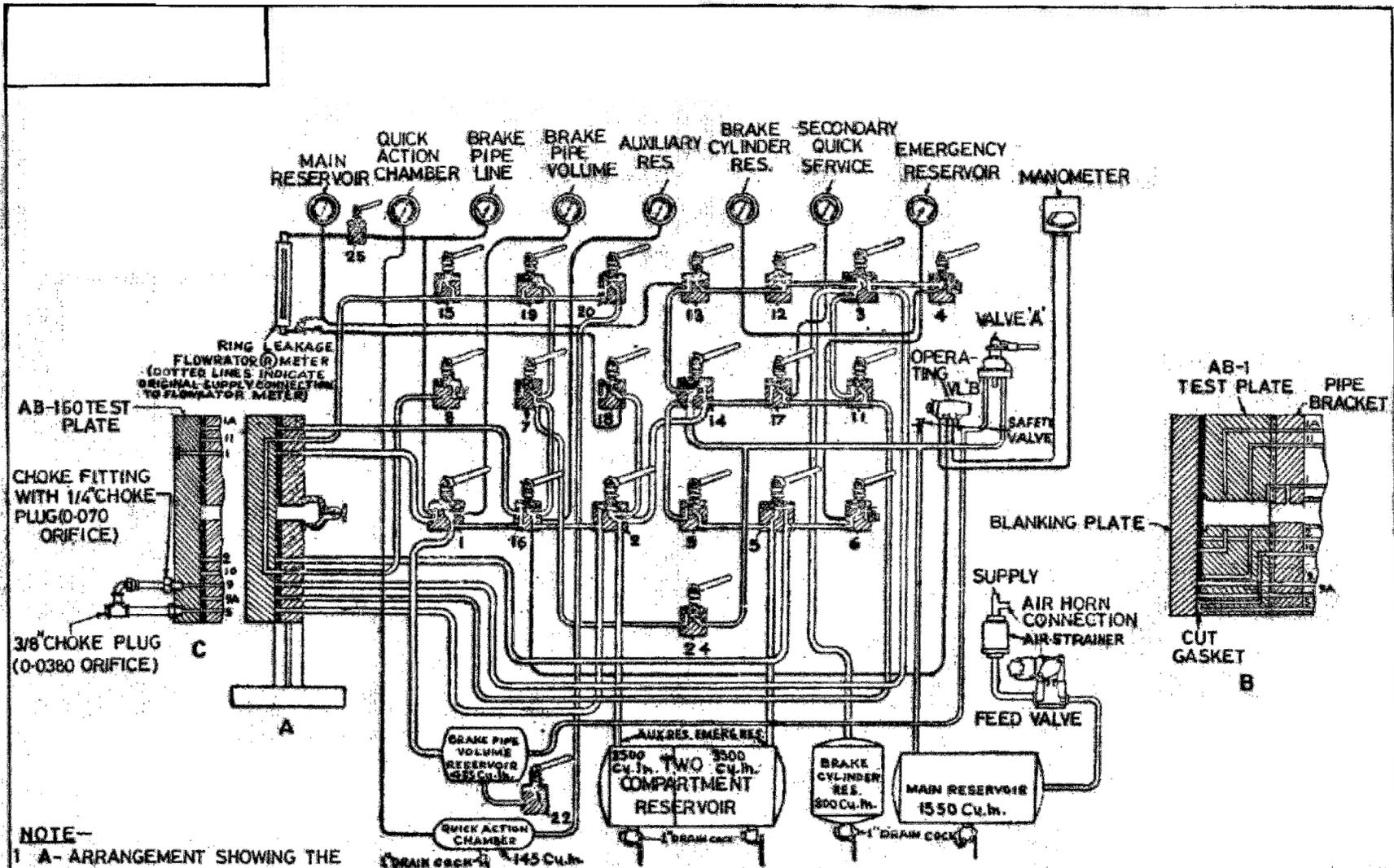
Specification & Schedule of Technical Requirements for MU-2B valve for its use in brake system fitted on diesel and electric locomotives



- NOTE:
1. ALL DIMENSION ARE IN MM, OTHERWISE SPECIFIED
  2. PIPE CONNECTION OPENING TO BE PLUGGED WITH PROTECTION CAP.
  3. MANUFACTURER'S NAME PLATE TO BE AFFIXED ON THE BODY.

D	DP Choubey
C	NK Saini
APPD	
DIR/MP BK	
Dt.	13.01.82

01		---	---	Drig. Revised & Redrawn	L3-230	13/11/23	13/11/23	SCALE	INDIAN RLYS RDSO (IMP)	APPLICABLE FOR	DSL/ELEC.LOCCO.	MU - 2B VALVE
ALT	REF NO	NO OF PLACES	DESCRIPTION	ALT. NOTE NO.	SIGN	DATED	INDIAN RLYS RDSO (IMP)	REF:				
										SKDP-2420		



- NOTE--**
- 1 A- ARRANGEMENT SHOWING THE BLANKING PLATE WITH STUDS WITH CURRENT AB TEST RACK.
  - B- ARRANGEMENT SHOWING THE BLANKING PLATE WITHOUT STUDS SUPPLIED WITH AB-1 TEST PLATE IN OLD TEST RACK.
  - C- ARRANGEMENT FOR CHECKING THE MECHANICAL MANOMETER.
- 2 - ALL DIAPHRAGM COCKS SHOWN IN CLOSED POSITION.

APPD	<i>WJS</i>
DI.	13-3-87
D	
T	<i>WJS</i>
C	<i>WJS</i>

'AB' TEST RACK FOR TESTING WABCO BRAKE VALVES		REF-WABCO PAMPHLET NO.5039-19 AND G-h 3219-5
R.D.S.O	SK.DP-2664	

**PART B –**

**Schedule of Technical requirements for MU-2B valve for its use in brake system fitted on diesel and electric locomotives**

**1. Minimum Requirements of Infrastructure, Manufacturing, Testing & Quality Control for Approval of Manufacturer**

1.1. The manufacturer shall have at least the following infrastructure and manufacturing facilities:

1.1.1. The Manufacturer shall have adequate space and covered area with proper floor to accommodate the following:

- Dust & Damp-free space for storage of raw materials.
- Manufacturing Activities.
- Finishing, Assembly
- Inspection and Testing.
- Storing and dispatch of finished products.

**1.1.2. M & P requirement:**

The following is the indicative list of Machineries and Plant to be available with the firm or its sub-vendor, as the case may be. The capacity of the machines shall be suitable for manufacturing the required job:

- a) Machine(s) having facilities of Bending, Cutting, Machining, Punching, Lapping and shearing facility
- b) Grinding Machine
- c) Drilling Machine
- d) Air compressor
- e) Humidifier or other facility (For storage of Rubber items)
- f) Painting Equipment

**1.1.3. List of Measuring and Testing Equipment**

The firm shall have facilities and major equipment's needed for conducting test as follows:

- a) Test Bench for Functional Testing of Brake Valves
- b) Surface Table
- c) Digital Vernier Caliper
- d) Dial Gauge
- e) Micrometer
- f) Measuring tapes
- g) Thread Plug Gauges
- h) Ring Gauges
- i) Steel Scale
- j) Digital Weigh scale
- k) Stop watch
- l) Torque Wrench
- m) Height Gauge

- n) Depth Micrometer

12. **Quality Control Requirements**

- a) The manufacturer shall have a system of easy traceability of the product from raw material stage to finished product stage.
- b) The manufacturer shall have a system to ensure that Equipment's are checked dimensionally and functionally prior to release for production and records of these checks are maintained.
- c) The calibration of the Testing/Measuring Equipment's/Weighing machines should be done at least once in a year unless stated otherwise.
- d) The manufacturer shall have a system of review of rejections detailing rejection rate, cause of rejection, corrective action taken etc. on regular basis and records thereof should be maintained.
- e) The manufacturer shall have a system of documentation in respect of rejection at customer end, warranty replacement and failure of brake valve in service.
- f) The manufacturer should have a system of recording plant, machinery & control equipment remaining out of service, nature of repairs done etc.
- g) Latest versions of relevant specifications and drawings shall be available with the manufacturer.