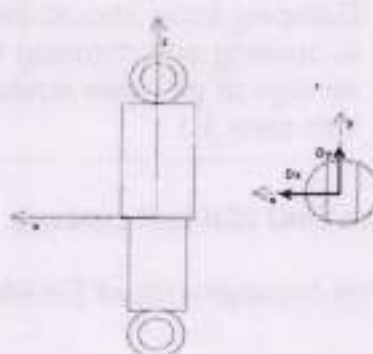


Table 14

Type of dampers	Offset Dx {mm}	Offset Dy {mm}
Primary suspension dampers	5	10
Secondary suspension dampers	13	38
Anti-yaw dampers (if fitted with ball joints)	0	0



4.3.8.3 Dynamic test of silent block

Endurance test of silent block should be done as per EN-13913. Test protocol shall be proposed by the vendor & approved by the RDSO.

4.3.9 Priming Test:

Table: 15

Purpose	To verify the correct function of the damper after the self-priming is done, under normal ambient conditions.
Equipment	Computer Controlled Testing Machine
Test Position	As per RDSO approved drawings of dampers
Test Stroke	As per respective drawing
Priming velocity	0.1 m/s
Test conditions	Measurement with attachment elements.
Test Procedure	<ul style="list-style-type: none"> At first damper shall be aerated by moving the damper "upright down". Mounted the damper in test machine. Provide stroke mentioned in drawing & priming velocity 0.1 m/s.

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	<ul style="list-style-type: none"> Test the damper, after 10 priming cycles, there should be no sign of air in the cylinder.
Measurement	Test velocity & test stroke as mentioned in concern drawings.
Analysis	Damping force should be within the tolerance limit specified in drawing and damping force vs displacement graph shows no sign of air / free stroke & graph should be in compliance with para 3.1.

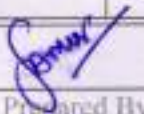
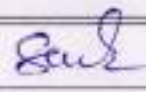

4.3.10 Paint Fire Resistance Test (On test pieces):

Paint should comply the requirements of EN 45545 (fire protection: Hazard level – HL3 – R7).

4.3.11 Specifications for the Final Acceptance

Table 16

Test	Clause	First Article Testing Homologation	Acceptance Testing (Purchase inspection)	Remarks
Weight	2.3.3	Yes	Yes	Minimum 2 or 2 % samples whichever is more (for acceptance testing).
Surface protection	2.8.1 to 2.8.5	Yes	Yes (2.8.1, 2.8.4 & 2.8.5)	
Dimension of the geometry	4.2.1	Yes	Yes	
Production tests	4.3.1	----	Yes	
Visual check	4.3.2	Yes	Yes	
Routine testing	4.3.3	Yes	Yes	
Welding seams	4.2.2 4.2.3	Yes	Yes	Welding Certificate Visual for 2 nos.
Dynamical stiffness	4.3.4	Yes	----	2 nos. chosen at random in a lot upto lot size of 500 nos. and 3 nos. for 500 < Lot size < 1000 and 4 nos. for 1000 < Lot size < 2000 and 5 nos. beyond that (Except First Article Testing, test only if it is specially mentioned in order).

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Series stiffness and Damping coefficient	4.3.5	Yes	----	----
Extreme temperature	4.3.6	Yes	----	----
Leakage Test	4.3.7	Yes	----	----
Fatigue test	4.3.8	Yes	----	----
Vibrational Qualification	2.3.2	Yes	----	----
Priming Test	4.3.9	Yes	Yes	02 nos during purchase inspection.
Paint Fire Resistance Test	4.3.10	Yes	----	----

NOTE: The quantity and other details on first article testing are given under para 7.

5 QUALITY ASSURANCE, TESTING, FINAL ACCEPTANCE

5.1 Acceptability testing

As indicated in clause 4.3.11

5.2 Product Audit

The manufacturer undertakes to ensure that the manufacturing process produces a series part which corresponds to the type-tested part. Particular attention is given to the conformity with the test criteria.

5.2.1 Quality Records

All testing carried out is to be certified by the manufacturer with an acceptance Certificate according to EN 10204 3. 1B and delivered with the product.

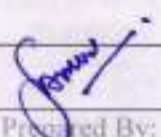
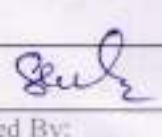
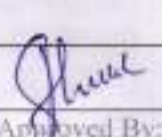
The recorded individual test results will be kept by the manufacturer/supplier for a period of 7 years following delivery and can be viewed upon demand.

5.2.2 Qualification of the lots

For each lot of dampers, the supplier, working in Quality Assurance conditions, shall supply:

- The declaration of the conformity
- The safe data sheets for the materials
- A statement signed by the suppliers' quality control manager

and whatever else is necessary, according to the instructions of the customer as per tender.

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5.3 Auditing

RDSO is authorized, following prior notification or otherwise, to audit the final testing by the manufacturer.

6 ORGANISATIONAL AND ADMINISTRATIVE PROVISIONS

6.1 Maintenance instructions

Service and maintenance instructions, together with a list of replacement parts, are to be included in delivery by the manufacturer, containing all data necessary for service and maintenance of the dampers. Do/ not do and probable failures along with their reasons and remedial action/ trouble shooting during the train service/ maintenance also to be mentioned in manual. Each Zonal Railway shall be supplied with soft copy of these manual where dampers are supplied by a manufacturer of damper.

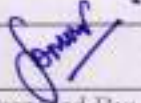
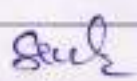
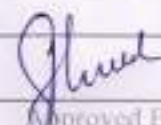
6.2 Modifications

Modifications which result in the loss of ability to replace the dampers or replacement parts may be carried out only after authorization by IR/RDSO.

7 Procedure for Testing of Prototype Dampers


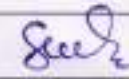
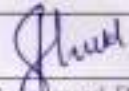
The vendor shall offer a lot of min. 10 dampers of a particular type for prototype testing at the time of registration. The inspector shall select random 5 dampers from this lot for prototype testing as per para 4.3.11. Sample size for various testing during prototype testing (first article testing) shall be as under:

Test	Clause	Sample size for testing	Remarks
Weight	2.3.3	05 nos.	On 05 nos. selected dampers.
Surface protection	2.8.1	05 nos. (visual)	On 05 nos. selected dampers.
	2.8.2	02 nos.	Out of 05 nos. selected dampers.
	2.8.3	01 nos.	Out of 05 nos. remaining samples.
	2.8.4	05 nos. (visual)	On 05 nos. selected dampers.
Thickness of the paint layer (DFT)	2.8.5	05 nos.	On 05 nos. selected dampers.
Dimension of the geometry	4.2.1	02 nos.	Out of 05 nos. selected dampers.
Visual check	4.3.2	05 nos.	On 5 nos. selected dampers.

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Routine testing	4.3.3	05 nos.	On 5 nos. selected dampers.
Welding seams	4.2.2 4.2.3	02 nos.	Out of 05 nos. remaining samples after removing the paint from welding area or 02 nos. unpainted parts may be taken.
Dynamical stiffness	4.3.4	03 Nos.	On 5 nos. selected dampers.
Series stiffness and Damping coefficient	4.3.5	01 nos.	Out of 05 nos. selected dampers.
Extreme temperature	4.3.6	01 nos.	Out of 05 nos. selected dampers.
Leakage Test	4.3.7	01 nos.	Out of 05 nos. selected dampers.
Fatigue test (Static and Dynamic)	4.3.8.1 and 4.3.8.2	01 nos.	Out of 05 nos. selected dampers.
Vibrational Qualification	2.3.2	01 nos.	Out of 05 nos. selected dampers.
Priming Test	4.3.9	02 nos.	Out of 05 nos. selected dampers.
Paint Fire Resistance Test:	4.3.10	Min. 03 Nos.	On test pieces.

- 7.1 **Condition for dispensation for prototype testing / field trials / vendor status upgradation for Vande Bharat-ver. 1.0 or Vande Bharat-ver. 2.0 or EMU-US / MEMU-US Rolling Stock.**
- 7.2 **Prototype Testing:** If prototype / type testing of damper of any vendor has been conducted & accepted under any earlier contract of Indian Railways, type / prototype testing shall not be repeated and earlier type / prototype test report shall be accepted. However, if any testing parameters mentioned in this RDSO specifications were not covered in earlier above-mentioned type / Prototype test report and source of any critical component is changed, the necessary compliance as per the specification shall be completed at the time of fresh registration.
- 7.3 **Upgradation:** If any vendor has supplied damper against earlier IR contract, more than the minimum required quantity as specified in this specification for upgradation from developmental vendor to approved vendor. The same shall be considered for upgradation.


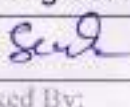
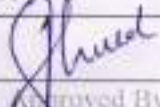
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- 7.4 **Field Trials:** if any vendor has already supplied number of damper for respective bogie designs (Vande Bharat-ver.1.0 or Vande Bharat-ver.2.0 or EMU-US/MEMU-US) more than the minimum quantity of damper for field trials under any earlier contract of Indian Railways and the same damper had been in service for more than the mandatory field trials period as specified in specification, service field trials of damper of such vendors for respective type of bogie i.e. Vande Bharat-ver.1.0 or Vande Bharat-ver.2.0 or EMU-US / MEMU-US, shall not be repeated.

8 Regular Procedure for Inspection and Testing of Production Dampers

- 8.1 Purchase inspection shall be carried out at the premises of manufacturer who are cleared for the regular manufacture of production damper. The following procedure shall be followed for the purchase inspection.
- 8.1.1 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 tests/inspection during manufacturing stage to ensure that damper 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 materials used for the manufacturer of damper is as per approved QAP.
- 8.1.2 The inspecting authority shall conduct the checks from the offered lot of dampers as per para 4.3.11.
- 8.1.3 In case any of the samples picked up fail in any of the tests indicated in para 4.3.11, manufacturer shall find out the reason for such failure to the satisfaction of inspecting authority. In case inspecting authority is convinced that the failure was on account of non-implementation of 'Internal Quality Assurance System', the entire lot of dampers shall be rejected. In case, the failure is on account of reasons other than non-implementation or Internal Quality Assurance System, the manufacturer may re-offer the lot after rectifying the defects. However, in such cases double the quantity of sample shall be picked up and tests/checks conducted as per para 4.3.11. In case any of the samples again fails in any of the tests/checks, the entire lot shall be rejected.
- 8.1.4 In the event of a dispute between the inspecting authority and the manufacturer, the decision of purchaser/RDSO shall be final and binding.
- 8.1.5 In normal course, testing of production damper offered by the manufacturer shall form part of the 'Internal Quality Assurance System' for which proper record shall be maintained and presented to the inspecting authority on demand.

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8.1.6 To ensure consistency in quality of damper, one damper of each type shall be subject to fatigue test in every five years as part of the quality assurance programme. Test shall be conducted by vendors and report shall be submitted to RDSO. Plan and schedule of fatigue test shall be communicated to RDSO. RDSO might depute its personnel to witness the test by suitable means including video call.

8.1.7 Leakage testing of weld parts of dampers (100%) & stiffness/load testing of springs, stiffness testing of silent block/rubber bush used in dampers should be check at specified value/parameter decided by the OEM's before assembly of dampers (sampling plan will be decided by the OEM's & it should be maximum) & record of the same should be kept for verification of RDSO official/inspection official at least warranty period.

9 PARTICULAR REQUIREMENTS

9.1 Manufacturer willing to supply damper for the use of Indian Railways shall register themselves with RDSO.

9.2 The manufacturer shall have adequate facilities for the manufacture and testing of damper conforming to this specification.

9.3 The manufacturers shall have a well-documented 'Internal Quality Assurance System' to ensure sustained quality of product being manufactured and shall submit his internal Q.A.P. in triplicate. 'Quality Assurance System' Shall generally cover the following: -

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

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


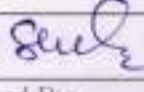
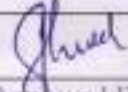
9.3.3 System to ensure that bought out components are strictly as per requirements laid down in the specification / drawing.

9.3.4 System to maintain strict control of dimensions and workmanship of components and assembled products.

9.3.5 System to test and establish that the damper manufactured by the firm meets all the requirements laid down in the specification/drawings.

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

9.3.7 System to ensure that the quality of bought out hardware items are as per the relevant specifications.

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- 9.4 Manufacturers should have the ISO 9001-2015 Certificate & IRIS certificate for manufacture of dampers.

10 GUARANTEE / WARRANTY

- 10.1 The supplier shall ensure the efficiency of the dampers over 06 years from the date supply or 05 years from the date of fitment or 1.2 million kilometers in service, whichever is earlier.

During the warranty period if the dampers display any inefficiency they shall be replaced/attended at the expenses of the supplier.

By inefficiency of the dampers it is meant:


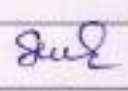
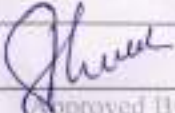
- A problem detected in service conditions
- A defect undermining its functionality
- Oil leak or infiltration in the sealing gaskets.
- The rubber of the elastic joints undergoes a deterioration process that undermines its functionality.
- The values of the characteristic do not remain within the tolerance limits specified in section 3.2

- 10.2 The manufacturer shall furnish a guarantee that each new damper supplied, shall function satisfactorily without attention and in accordance with the requirements of this specification over 06 years from the date supply or 05 years from the date of fitment or 1.2 million kilometers in service, whichever is earlier. A format of the certificate is given at **Appendix-V**.

- 10.3 The warranty shall survive inspection, payment for and acceptance of the goods, but shall expire over 06 years from the date supply or 05 years from the date of fitment or 1.2 million kilometers in service (whichever is earlier), except in respect of complaints, defects, inefficiency and/or claims, notified to the contractor within 3 months of such date. Any approval or acceptance by the purchaser of the stores of the material incorporated herein shall not in any way limit the contractor's liability.

11 GENERAL

- 11.1 All welded joints of the damper shall be free from welding defects and shall be sufficiently strong to withstand the loads.
- 11.2 The damper shall be assembled in such a manner that the damping shall be uniform throughout the stroke.


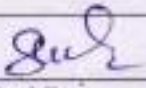
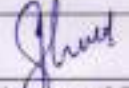
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- 11.3 The external dimensions, design, construction, characteristics or materials used in the manufacture of the damper shall not be altered by the manufacturer without the prior written consent of RDSO. Unless otherwise specified in the respective drawing, the tolerance in compressed and extended length of all types of dampers shall be within ± 3 mm of the specified dimension.
- 11.4 The damper shall be manufactured, assembled & tested at the manufacturer's own works.
- 11.5 Damper found to be defective after delivery within the warranty period will be returned to the manufacturer for replacement at his own expenses, not with standing that they may have passed the tests required by this specification and have been accepted by the Inspector.
- 11.6 Damper shall not be dispatched from the manufacturers works before dispatch memo certificate has been obtained from the Inspector and this certificate shall be forwarded to the office from which the order was issued attached to the invoice as evidence that the dampers have been duly inspected.
- 11.7 Any minor deviation from drawings/design/testing parameters mentioned in this specification shall be permitted only after approval by Carriage Directorate RDSO.

12 GENERAL INSPECTION

- 12.1 All the materials or fittings used in dampers shall be subjected to inspection by the Inspecting Authority and shall be compliant to the specification.
- 12.2 The manufacturer shall supply the necessary man power and appliances for testing and inspection of the dampers and mountings and shall supply to inspector a copy of the test results signed by manufacturer or his representative.
- 12.3 The Inspecting Authority shall have right to: -
- 12.3.1 Adopt any means he may think advisable to satisfy himself that the materials or fittings as per the specifications are actually used in the construction.
- 12.3.2 Take samples of components/parts for such tests, as he may consider necessary by an approved metallurgist selected by him whose report shall be final and binding on the manufacturer.
- 12.3.3 Reject any material or fittings, which do not conform the relevant specifications or good practice. These shall be marked in a distinguishable manner and shall be

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disposed of in such a manner as the inspecting authority directs. Such rejected parts shall be replaced by the manufacturer without extra charges.

12.3.4 In the event of a dispute between the inspecting authority and the manufacturer the decision of the purchaser shall be final and binding.

13 TRAINING AND INFRASTRUCTURAL FACILITIES.

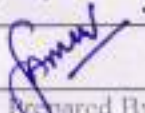
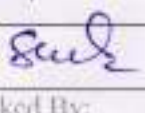
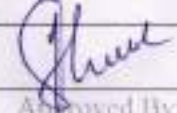
Whenever required, the manufacturer shall provide the requisite training to the staff of purchaser to use, repair and overhaul the dampers. He shall also supply 25 set of maintenance/instruction manuals in soft (in pen drive)/ hard copy indicating dimension of critical items and its permissible wear, specification and quantity of oil etc. to RDSO. In addition to this, firm will provide maintenance/ instruction manual to any consignee who demands it. In event of any change in manual/ instruction, it will be intimated to RDSO and all the consignees with updated soft/ hard copy of maintenance/ instruction manual.

14 PACKING

The manufacturer shall ensure that dampers are suitably packed in wooden / corrugated boxes/ polyethylene covers/ bubble sheet using suitable cartons to prevent ingress of foreign matter and damage during handling and storage.

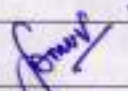
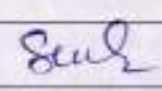
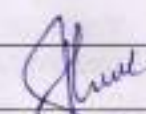
15 SPECIAL CONDITIONS:

- LHB damper & VB Damper for Passenger coaches require higher reliability. As these components are critical for reliable performance of Bogie and its sub-assemblies, Vendors will be required to source the critical parts (i.e Oil seal/O-ring, piston rod, piston valve, silent block/rubber disc etc.) from OEMs/suppliers who have supplied the critical parts (i.e Oil seal/O-ring, piston rod, piston valve, silent block/rubber disc etc.) to Railway Industries / Automobiles / Defence Sector and the components have completed satisfactory performance for minimum three years (proof to be enclosed by firm). The same details to be incorporated in the QAP.
- Moreover, vendor is also permitted to have collaboration with a OEM having 3-year experience for supply of dampers to Railway Industries / Automobiles / Defence Sector. In such case vendor shall entering into a valid technical MOU / agreement with OEM. The MOU should clearly state that the OEM undertakes to fulfill support obligation with respect to technology up-gradations as and when required for the LHB dampers & VB dampers, even in case the MOU is rescinded at some later stage.
- Vendor along with their OEM (if applicable) or principal / allied /sister concern / group company shall have adequate facilities / infrastructure for

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manufacturing, designing, and testing and quality control requirements of LHB dampers & VB dampers as stipulated in "APPENDIX IV" of this specification.

- d) If any test outsourced from outside agency same should be clearly specified in QAP and got approved.
- e) Since Dampers for LHB Coaches/ VB coaches are a safety related item, in-service trials shall be necessary for each design before full clearance is given for vendor registration as "Vendors for Developmental Order" status for manufacture and supply of Dampers for LHB coaches/ VB coaches.
- f) The Dampers for LHB Coaches/ VB coaches of a particular design shall be subjected to field trials on a minimum of ten coach sets on IR's system for vendor registration as "Vendors for Developmental Order" status for manufacture and supply of Dampers for LHB coaches & VB coaches. The field trial period shall be as follows:
 - For LHB coach dampers: 12 months from the date of coach commissioning/the actual period in the field.
 - For VB coach dampers: 18 months from the date of coach commissioning/the actual period in the field.
- g) After completion of service trial period, two samples of the Dampers for LHB Coaches/VB coaches shall be subjected to the tests in RDSO/Rly/Firm/NABL approved lab to verify the properties laid down in Appendix-I of this Specification/ Approved drawing. In case these values are beyond permissible limits, the design of that type of Dampers for LHB coaches/ VB coaches shall be deemed to have failed the service trials. Replacement of dampers removed for testing to verify the properties shall be made by the respective firms.
- h) In case of any failure during field trials attributable to poor design or material, one additional chance may be given to repeat the service trail subject to submission of details analysis report for causes of failure & corrective action taken and accepted by RDSO.
- i) A Vendor shall be considered eligible for upgradation to "Approved Vendors" status on completing successful supply of a minimum of 250 coach sets of the particular type of Dampers for LHB Coaches/ VB coaches as a 'list of RDSO vendors for developmental order' along with the fulfillment of conditions mention in latest apex ISO document of RDSO for "Vendor-Changes in approved status" (document no. QO-D-8.1-11 latest).

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

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- j) After type tests of a particular design are approved by RDSO, vendors shall ensure that Dampers for LHB Coaches/ VB coaches to the particular specification are supplied with components manufactured from the sources as indicated at the time of design approval and included in QAP. However, in case of change of sub vendor or source of any component of Dampers for LHB Coaches/ VB coaches is changed or any additional new source is introduced, the firm shall get approval of their modified QAP from RDSO before manufacturing and supply of Dampers for LHB coaches/ VB coaches. The vendor should provide the detailed information of the source changed/ additional source introduced along with the documentary evidences for the record of this office. Firm shall validate the source in all respects i.e. material, manufacturing process, quality control and inspection & testing etc. to conform to originally approved design and process. Compliance to all obligations including guarantee/warranty shall remain the responsibility of vendor.


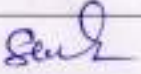
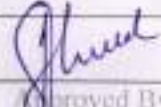
- k) The type test shall be witnessed by authorized representative of RDSO at the time of design approval of the vendor as per RDSO ISO procedure.

Any additional tests if considered necessary shall also be arranged by vendor free of cost. All necessary arrangements for witnessing the type test of Dampers for LHB Coaches/ VB coaches at firm's premises shall be done by the vendor. RDSO reserves the right to witness the type test again if changes in approved design/drawings are carried out which are likely to alter design / performance characteristics of the Dampers for LHB Coaches/ VB coaches.

- l) In case design of any component of a damper changed, prior information given to RDSO with details of changes to be made. On the basis of reasons for change and extent of modification, RDSO will decide whether afresh service trials / type testing of damper is required or not. Status of registered vendor will not be changed if, there is any design up-gradation / improvement in approved design / drawing of damper to meet the upgraded requirements of Indian Railways, with approval of Competent Authority.
- m) In case design/source of critical components (i.e. silent block, piston rod, oil seal, O-rings & end mounting rubber bush of primary vertical damper etc.) of damper is changed. Fresh Type test shall be required except surface protection test & welding seams test.

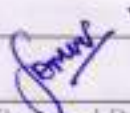
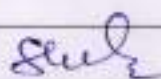
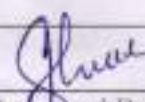
16 SUBMISSION OF OFFER:

- 16.1 Vendors desirous of seeking approval from RDSO for supply of dampers for LHB coaches/ VB coaches as per this specification, shall apply online and submit their proposal as per ISO guidelines and also accompanied by the documents containing the following information to RDSO: -

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

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- 1) Dimensional drawing of Dampers for LHB Coaches/ VB coaches.
 - 2) Weight of one Dampers for LHB Coaches/ VB coaches.
 - 3) Whether proposed Dampers for LHB Coaches/ VB coaches is being used by any other rail-road system? If yes, details regarding quantity, type of stock, max. operating speed, type of service, average annual running kilometers, life cycle obtained by the user rail-road and maintenance cycle followed by them shall be furnished.
 - 4) Details of deviation from the specification.
 - 5) Content of indigenous and imported items in offered Dampers for LHB Coaches/ VB coaches.
 - 6) Expected life cycle in operating and environmental conditions enumerated in this specification.
 - 7) A write-up giving broadly the maintenance requirements on time/distance basis along with the facilities that would be needed for proper maintenance/upkeep of the offered Dampers for LHB Coaches/ VB coaches.
 - 8) A detailed write-up giving the details of "Quality Assurance System" being followed for manufacture of the offered items.
 - 9) Details of manufacturing and testing facilities available with the manufacturer.
- 16.2 New Vendor must apply for all types of dampers of LHB coaches or VB coaches in a single application. Application for individual/partial dampers of LHB or VB dampers shall not be entertained.
- 16.3 The information as received above shall be used for preliminary evaluation of the firm's capability in meeting with the requirements of this specification.
- 16.4 The firm shall be required to submit a internal Type Test Report of a proposed design after the preliminary evaluation carried out & found satisfactory.
- 16.5 RDSO reserves complete right in granting approval or otherwise to a firm.

Signature			
Name & Designation	Prepared By: Samcer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir/VDG

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Appendix-I

REQUIREMENTS OF DAMPERS FOR LHB COACHES-

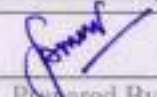
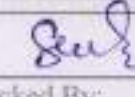
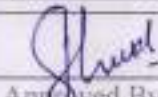
- 1) Requirements of dampers for LHB coaches are as under-
 - i) **Primary Vertical Dampers**
Requirements of Primary Vertical Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/21047 Alt. 3 or latest.
 - ii) **Secondary Vertical Damper for LHB AC Coaches**
Requirements of Secondary Vertical Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/21046 Alt. 3 or latest.
 - iii) **Secondary Lateral Damper for all coil FIAT Bogie**
Requirements of Secondary Lateral Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/21045 Alt. 3 or latest.
 - iv) **Yaw Damper**
Requirements of Yaw Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/21048 Alt. 3 or latest.
 - v) **Secondary Lateral Damper for Air Spring Bogie**
Requirements of Secondary Lateral Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/21049 Alt. 3 or latest.
 - vi) **Secondary Vertical Damper for Non AC Coaches**
Requirements of Secondary Vertical Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/21018 Alt. 3 or latest.
- 2) Requirements of dampers for VB coaches are as under:
 - i) **Primary Vertical Dampers**
Requirements of Primary Vertical Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/25009 or latest.
 - ii) **Secondary Vertical Damper**
Requirements of Secondary Vertical Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/ 25010 or latest.
 - iii) **Secondary Lateral Damper**
Requirements of Secondary Lateral Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/25011 or latest.
 - iv) **Yaw Damper**
Requirements of Yaw Dampers shall be as per RDSO drawing no. RDSO/CG/DRG/25012 or latest.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

APPENDIX-II

Details of acceptance criteria of various tests during Prototype Testing (First article testing) of dampers

S. No.	Test Parameters	Specifications	Mode of Inspection	Acceptance Criteria	Remarks	
1	Dynamic Stiffness	Measurement as per clause 4.3.4 of this specification	Computer Controlled machine	As per Specification	(Graphical representation will not be much differ at lower amplitude & higher amplitude.)	
2	Series Stiffness & Damping Co-Efficient	Measurement of series stiffness and damping coefficient as per clause 4.3.5 of this specification	Actuator Testing Machine	As per Specification		
3	Extreme temperature	Measurement of extreme temperature as per clause 4.3.6 of this specification for velocity specified on drawings.	$\frac{F_{(-20^{\circ}\text{C})} - F_{(+40^{\circ}\text{C})}}{F_{(-20^{\circ}\text{C})}} \leq 30\%$ $\frac{F_{(+20^{\circ}\text{C after})} - F_{(+20^{\circ}\text{C before})}}{F_{(+20^{\circ}\text{C after})}} \leq 5\%$		Force denoted as	Force measured at
					F(-20°C)	At -20°C for test parameters specified on drawing
					F(+40°C)	At +40°C for test parameters specified on drawing
					F(+20°C), before	At +20°C for test parameters specified on drawing, before starting the test process
					F(+20°C), after	At +20°C for test parameters specified on drawing, after completion of test
4	Fatigue test	Static Load test-20KN in compression & extension as per clause 4.3.8.1 of this specification	Computer Controlled Testing Machine	No Structural Damage. Damping force after test should be as per respective RDSO drawing.		
		Dynamic/endurance test as per clause 4.3.8.2 of this specification for ten million cycles	Computer Controlled / Hydraulic / Crank type Testing Machine	As per para. 4.3.8.2 of Specification	Test procedure as per para. 4.3.8.2 of this specification.	
	Vibration test	Vibration Testing as per clause 2.3.2 of this specification	Computerized Vibration Shaker	No Structural Damage. Damping force after test should be as per respective RDSO drawing.		
5	Coating	Paint adhesion test as per ISO2409	Standard tape test	No peel off		
		Resistance to salt environment as ISO:9227 for 720 hrs	Salt spray testing machine	No red rust after 720 hrs.		
6	Leakage test	As per para. 4.3.7 of this spec	Computer Controlled Testing Machine	No oil leakage after test.		
7	Priming Test	As per para. 4.3.9 of this spec		Damping force within tolerance limit specified in drawing & graph behavior in compliance to para 3.1.		
8	Paint Fire resistance Test	As per para. 4.3.10 of this spec	As per EN 45545	As per EN 45545 (HL3-R7)		

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG


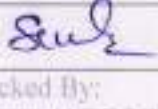
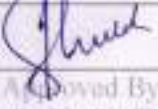
Note: Sample quantity shall be as per clause 7 of this specification

APPENDIX-III

Details of acceptance criteria of various tests during Prototype Testing (First article testing) / Routine Testing of Dampers (Acceptance testing)

S. No.	Test Parameters	Specifications	Mode of Inspection	Acceptance Criteria	Remarks
1	Appearance	No Dents ,Cracks, Pitting, Sharp Edges, Leakage of Oil, uniform coating & no damage on coating etc.	Visual	As per specification	
2	Production Testing	Damping Force to be recorded at two different frequencies as per spec.	Damper Testing Machine	Force to be within specified values	
3	Routine Testing	Measurement as per clause 4.3.3 of this specification	Damper Testing Machine	As per specification	
4	Dimension	As per approved drawing	Steel scale/ vernier	To be within tolerance	
5	Weight	Weight of complete damper	Electronic weighing machine	As per drawing/ QAP approved	
6	Hydraulic Oil	Type and viscosity of hydraulic oil	-----	As per approved QAP / Drawing	
7	Packing	Packing to ensure no damage during transit	visual	As per clause 2.4 & 14 of this specification	
8	Welding	Welding seam non-destructive test	ISO 5817/ EN25817/ EN15085	Under cutting is not allowed*	
			ISO 23277, ISO 17638 & ISO 23278	WPS/ PQR Records for the lot	
9	Coating	DFT of paint as per clause 2.8.5 of this specification	DFT tester	Should confirm	
		Colour shade as per clause 2.8.4 of this specification	Visual	Should confirm	
10	Priming Test	Measurement as per clause 4.3.9 of this specification	Damper Testing Machine	Damping force within tolerance specified in drawing & graph behavior in compliance to para 3.1.	
11	Marking of Damper	As per clause 2.7 of this specification	Visual	Should confirm	

Note: Sample quantity shall be as per clause 4.3.9 of this specification for Acceptance Testing and as per clause 7 for first article testing.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prahari R. Shukla/Die/VDG

APPENDIX-IV

Schedule of the Technical Requirement (STR) for manufacturing, testing and quality control of Dampers for LHB Coaches/ VB coaches.

1) GENERAL INFRASTRUCTURES:

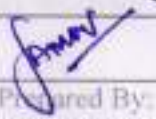
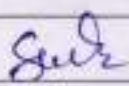
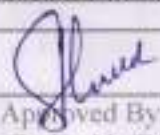
The manufacturer shall have adequate space and covered area with material handling facility of adequate capacity covering the following activities:

- Raw Material Storage.
- Laboratories for material testing.
- Machining Facilities as per Quality Assurance Plan.
- Manufacturing facilities along with assembly line.
- Dust free enclosed environment for assembly and testing.
- Painting facility.

2) MANUFACTURING FACILITIES:

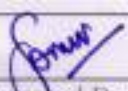
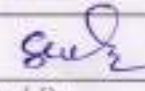
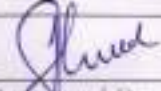
2.1 The following manufacturing facilities shall be available with the firm:

S. No.	Facility	Remarks
1	Welding machine	The firm shall have the availability of special purpose welding machine / robotic welding machine and fixture for welding work on the main shell (casing tube), protection covers, damper eye etc. Vendor must have EN 15085-2 CL-1 certification for plant/works (if welding work is required on damper/parts).
2	Machining facilities	The firm shall have following machining facilities in-house or at Sister / Allied concern for manufacturing / machining of child parts of dampers: <ul style="list-style-type: none"> • Grinding Machine • CNC Machine • Lapping / Buffing Machine (if required, as per manufacturing process) • Drilling OR Tapping Machine • Power saw machine for cutting of shaft and tubes Outsourcing of machining facilities with experienced sub-

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Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

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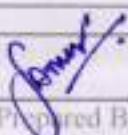
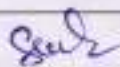
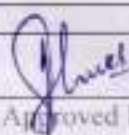
		vendors under quality control of vendor (who supply dampers to IR) is permitted. However, same shall be intimated by vendor during initial registration. (The outsourced machining facility may be verified by the RDSO representative, if required.)
3	Identification Marking Machine	The firm shall have identification marking machine for identification marking on the dampers as per the specification. Outsourcing of marking facility is permitted. However, same shall be intimated by vendor during registration.
4	Oil filling machine	The firm shall have PLC based oil filling machine, capable of oil filling in the dampers during assembly to minimise manual intervention.
5	Component Cleaning Machine	The firm shall have pressurised water jet component cleaning machine to clean the damper components with suitable cleaning agent.
6	Ultrasonic Cleaning Machine	The firm shall have ultrasonic cleaning machine of adequate capacity for cleaning of the critical components of damper before assembly.
7	Painting Facility	The firm shall have the environment friendly painting facility for damper components which shall consists of a painting line covering all the processes/requirements involved and suitable system for drying of the paint in a sequential manner so that the dirt and dust does not get embedded with paint. In case, the firm is not having painting facilities in-house, the firm shall take prior approval to outsource the painting process. (The outsourced painting facility may be verified by the RDSO representative, if required.)
8	Hydraulic / Hydro pneumatic Press	The firm shall have hydraulic press of suitable capacity along with required fixtures to press the silent block / end mountings in the eye-ring of dampers and other small job works during assembly of dampers.
9	Assembly Line	The firm shall have required number of jig/ fixtures along with tooling of suitable size & capacity and these shall be installed in proper sequence for the assembly of damper.
10	Leakage testing facility for the weld parts of dampers.	The firm shall have leakage testing machine/arrangement for welded parts of dampers with suitable facility.

Signature			
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3) INSPECTION & TESTING FACILITIES

The firm shall have the following inspection & testing facilities:

S. No.	Facility	Remarks
1	Laboratory for material testing	<p>The firm shall have laboratory facilities of material testing for metallic as well as rubber components as per the requirements of the drawings & specification(s).</p> <p>In case, the firm is not having complete laboratory facilities in-house, the firm shall take prior approval to carry out the test from NABL accredited testing laboratory / Govt. Lab having capability to get the tests done as per the requirement of specification / approved drawing.</p>
2	Damping force testing machine	The firm shall have a computer controlled servo hydraulic testing machine, to check the damping force of the dampers on variable frequency at different strokes in accordance to specification.
3	Testing machine for twisting and cardanic angles	The firm shall have testing facilities with suitable fixtures for testing of twisting and cardanic angles of the dampers in assembled condition as per the requirements of the drawings / specification.
4	Endurance test machine	The firm shall have a separate computer controlled/ servo hydraulic / crank type machine endurance testing machine with suitable fixtures for endurance testing of dampers inhouse OR at Sister / Allied concern OR at original works (in case of approval as additional unit) as per the requirements of the specification.
5	Vibration testing machine	<p>The firm shall have a vibration testing machine with suitable fixtures for vibration testing of dampers as per the requirements of the specification.</p> <p>In case, the firm is not having Vibration Testing Machine, the firm shall take prior approval to carry out the test from 'International Centre for Automotive Technology (ICAT), Manesar' or 'Automotive Research Association of India (ARAI), Pune' or any other government accredited testing laboratory having capability to get the test done as per the requirement of specification.</p>


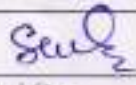
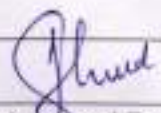
Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satvendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

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6	Surface roughness tester	The firm shall have surface roughness tester for surface finish of cylinder & piston rod of dampers as per the requirements.
7	Elcometer	The firm shall have Elcometer/ dry film thickness gauge to check the paint thickness, as per the requirements of specification.
8	Measuring Instruments/ Gauges	Vernier, micrometer, bore gauge, bevel protector, dial indicator, inner caliper, thread ring & plug gauge, radius gauge, filler gauge, pitch gauge, angle gauge etc. The firm shall maintain the above said instruments duly calibrated for inspection / checking of the components, as per the requirement.
9	Salt Spray test	Salt Spray test shall be carry out from NABL accredited testing laboratory / Govt. Lab having capability to get the tests done as per the requirement of specification.
10	Environment Chamber	The firm shall have an environment chamber in-house OR at Sister / Allied concern OR at original works (in case of approval as additional unit) for Measurement of damping forces at extreme temperature as per the requirements of the specification.
11	Stiffness/Load testing machine	The firm shall have stiffness/load testing machine facility for the spring used in dampers as per the requirements.
12	Millipore test apparatus	The firm shall have Millipore testing facility to verify any contamination on cleaned parts before assembly of dampers.

4) Quality control requirements:

- 4.1 Firm shall have an internal system of checking of chemical properties of the steel as well as rubber components or through NABL accredited laboratory.
- 4.2 The firm shall have a system of component level traceability right from raw material to the finished product stage.
- 4.3 There shall be proper stacking of raw material and their record. FIFO system should be implemented, especially for non-metallic components. Non-metallic components shall be kept in proper dust & moisture free atmosphere.
- 4.4 The firm shall submit a Quality Assurance Plan (QAP) in the standard format, for the product detailing various manufacturing aspects for approval.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

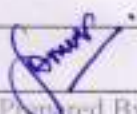
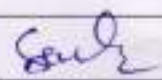
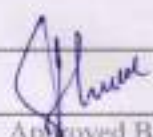
5) Qualification of Man Power

- 5.1 The Quality Control Section shall be separately headed by a full time technical expert having a minimum bachelor's degree in Mechanical/ Automobile/ Mechatronics with at least 5 years of experience or diploma in Mechanical/ Automobile/ Mechatronics with at least 8 years of experience. He shall be free from day-to-day production & testing responsibilities. He shall be mainly responsible for development for product, failure analysis, planning corrective and preventive action, control over raw material, devising actions in case of difficulties in achieving the parameters etc.
- 5.2 Production/ inspection activities shall be headed by a graduate engineer with at least 5 years of experience or a diploma holder with at least 8 years of experience. He shall be actively involved in day-to-day activities of stage inspection / compliance of QAP etc.

6) General

Requirements of infrastructure & facilities for type testing & manufacturing in clause 1, 2 and 3 of this Annexure are bare minimum requirements. Any other facilities required to comply this specification or required for fully functional performance of dampers shall also be ensured by the vendor.

However, vendor may also propose for alternate methodology/ processes for manufacturing / type testing, which might require different set of M&P and tools. For such alternate of methodology & process, vendor shall establish that such M&P and facilities are adequate for manufacturing & testing of dampers and compliance of this specification.

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

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APPENDIX-V

QUALITY ASSURANCE & GUARANTEE CERTIFICATE

(Reference – Clause 10 of specification)

No : Dated

Railway :

P.O. No. : Dated

Quantity : Consignee


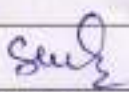
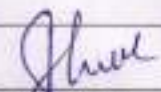
Damper Description & S. Nos.

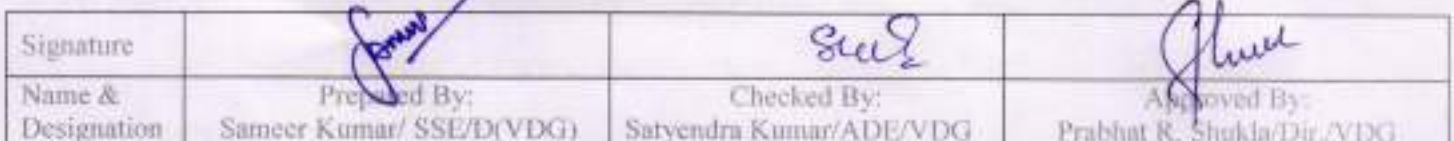
- i) THIS IS TO CERTIFY THAT THE DAMPERS INDICATED IN THIS PURCHASE ORDER HAVE BEEN SUBJECTED TO OUR INSPECTION AND TEST PROCEDURES AND ARE FOUND TO CONFORM TO THE ORDER/ DRAWING/ SPECIFICATION REQUIREMENTS.
- ii) THE QUALITY CONTROL PROCEDURES IN RESPECT OF THIS SUPPLY ARE IN ACCORDANCE WITH OUR QUALITY MANUAL.
- iii) THIS IS TO CERTIFY THAT EACH DAMPER SUPPLIED AGAINST THIS PURCHASE ORDER SHALL FUNCTION SATISFACTORILY AS PER CLAUSE 10 OF SPECIFICATION NO. RDSO/CG-18005 (LATEST ISSUE).

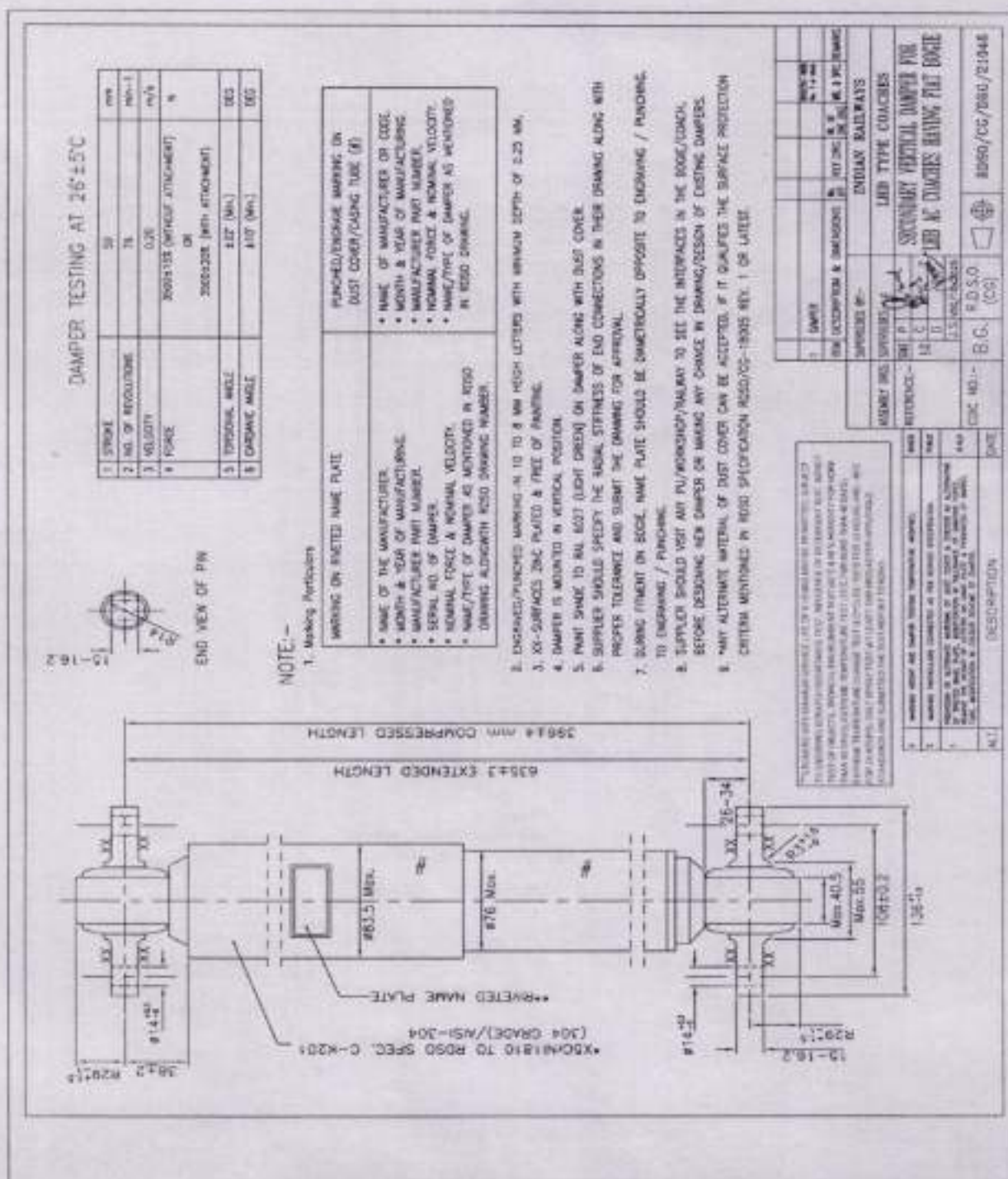
Q.C. INCHARGE




(SIGNATURE & SEAL OF THE MANUFACTURER)

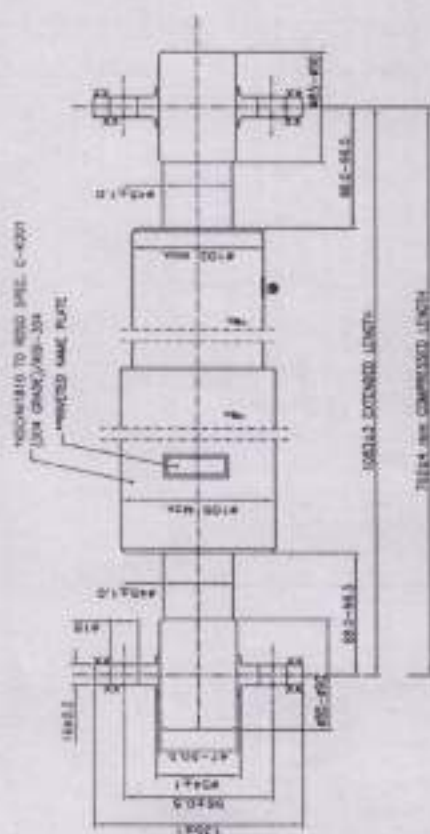
DATED:

Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satyendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG





Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satvendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

DAMPER TESTING AT $26 \pm 5^\circ\text{C}$

1. STRIPS	25	mm
2. NO. OF REVOLUTIONS	28	rev./s
3. VELOCITY	0.12	m/s
4. FORCE	15000 N (WITHOUT ATTACHMENT) 15000 N (WITH ATTACHMENT)	N
5. TENSILE ANGLE DYNAMIC ANGLE	45° (Max.) 45° (Max.)	DEG DEG

[illegible][illegible]




NOTE—

T. Munksgaard, Portland, Oregon

MARKING ON FINISHED NAME PLATE	<ul style="list-style-type: none"> NAME OF THE MANUFACTURER ADDRESS & YEAR OF MANUFACTURING MANUFACTURER PART NUMBER DATE, NO. OF SHAPERS SOURCE, FORCE & SHAPING VELOCITY NAME/TYPE OF SHAPERS AS MENTIONED IN DESIGN DRAWING
PUNCHES/TROUSSE MARKING ON USED COVER/CHANGING TUBE (If)	<ul style="list-style-type: none"> NAME OF MANUFACTURER OF COIL ADDRESS & YEAR OF MANUFACTURING MANUFACTURER PART NUMBER DATE, NO. OF SHAPERS SOURCE, FORCE & SHAPING VELOCITY NAME/TYPE OF SHAPERS AS MENTIONED IN DESIGN DRAWING

2. ENGRAVED/PUNCHED MARKING IN 10 TO 30 MM HEIGHT LETTERS WITH MINIMUM DEPTH OF 0.25 MM.
3. NO SURFACES ARE PLATED & FREE OF PAINTING.
4. DAMPERS IS MOUNTED IN HORIZONTAL POSITION.
5. DURING FITMENT ON BODY, NAME PLATE SHOULD BE DIRECTIONALLY SUPPORTED TO ENGLANDING / PUNCHING.
6. NAME PLATE SHOULD BE 100 TO 120 (HEIGHT) MOUNTED ON DAMPER ALONG WITH DUST COVER.
7. IF MANUFACTURER SHOULD ENgrave THE WORD "DOWN" / "UP" ON THE FACE OF SAME NAME WHICH WILL BE TOWARDS DOWNWARD / UPWARD DURING FITMENT (TITL OF ENGLANDING : MM. TO MM)
8. MINIMUM COMPRESSIVE FORCE ON SUBJECT PART= 200000000N.
9. SUPPLIER SHOULD VERIFY THE RIGID STIFFNESS OF TWO CONNECTING IN THEIR DRAWING ALONG WITH PROPER TOLERANCE AND SUBMIT THE DRAWING FOR APPROVAL.
10. TITL AND SIZE OF DAMPERS SHOULD NOT BE DEVIATE FROM ADDITIONAL AISE.
11. SUPPLIER MAY NOT ANY PLY/PORECE/ALUMINUM TO GET THE INTERFACES IN THE COCK, ROTARY DESIGN AND NUMBER OF DAMPER ANY CHANGE IN DAMPER / DESIGN OF DUSTING DAMPERS.
12. NO ALTERNATE MATERIAL OF DUST COVER CAN BE ACCEPTED IF IT DAMAGED THE SURFACE PROTECTION.
13. CRITERIA : MONITORING IN RESS SPECIFICATION RES/RES-10000 MEX 1 OR LATEST.
14. IF ASTM AND ISO 9001-5 SMALL PART, DAMPERS OF UPPER AND LOWER STIM MAY BE INSPECTED
15. 100% TESTED IN 45 MIN.


DATE	DESCRIPTION	AMOUNT	BALANCE
10/1/00	OPENING BALANCE	100.00	100.00
10/1/00	SALES	10.00	110.00
10/1/00	SALES	10.00	120.00
10/1/00	SALES	10.00	130.00
10/1/00	SALES	10.00	140.00
10/1/00	SALES	10.00	150.00
10/1/00	SALES	10.00	160.00
10/1/00	SALES	10.00	170.00
10/1/00	SALES	10.00	180.00
10/1/00	SALES	10.00	190.00
10/1/00	SALES	10.00	200.00
10/1/00	SALES	10.00	210.00
10/1/00	SALES	10.00	220.00
10/1/00	SALES	10.00	230.00
10/1/00	SALES	10.00	240.00
10/1/00	SALES	10.00	250.00
10/1/00	SALES	10.00	260.00
10/1/00	SALES	10.00	270.00
10/1/00	SALES	10.00	280.00
10/1/00	SALES	10.00	290.00
10/1/00	SALES	10.00	300.00
10/1/00	SALES	10.00	310.00
10/1/00	SALES	10.00	320.00
10/1/00	SALES	10.00	330.00
10/1/00	SALES	10.00	340.00
10/1/00	SALES	10.00	350.00
10/1/00	SALES	10.00	360.00
10/1/00	SALES	10.00	370.00
10/1/00	SALES	10.00	380.00
10/1/00	SALES	10.00	390.00
10/1/00	SALES	10.00	400.00
10/1/00	SALES	10.00	410.00
10/1/00	SALES	10.00	420.00
10/1/00	SALES	10.00	430.00
10/1/00	SALES	10.00	440.00
10/1/00	SALES	10.00	450.00
10/1/00	SALES	10.00	460.00
10/1/00	SALES	10.00	470.00
10/1/00	SALES	10.00	480.00
10/1/00	SALES	10.00	490.00
10/1/00	SALES	10.00	500.00
10/1/00	SALES	10.00	510.00
10/1/00	SALES	10.00	520.00
10/1/00	SALES	10.00	530.00
10/1/00	SALES	10.00	540.00
10/1/00	SALES	10.00	550.00
10/1/00	SALES	10.00	560.00
10/1/00	SALES	10.00	570.00
10/1/00	SALES	10.00	580.00
10/1/00	SALES	10.00	590.00
10/1/00	SALES	10.00	600.00
10/1/00	SALES	10.00	610.00
10/1/00	SALES	10.00	620.00
10/1/00	SALES	10.00	630.00
10/1/00	SALES	10.00	640.00
10/1/00	SALES	10.00	650.00
10/1/00	SALES	10.00	660.00
10/1/00	SALES	10.00	670.00
10/1/00	SALES	10.00	680.00
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10/1/00	SALES	10.00	700.00
10/1/00	SALES	10.00	710.00
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10/1/00	SALES	10.00	800.00
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10/1/00	SALES	10.00	880.00
10/1/00	SALES	10.00	890.00
10/1/00	SALES	10.00	900.00
10/1/00	SALES	10.00	910.00
10/1/00	SALES	10.00	920.00
10/1/00	SALES	10.00	930.00
10/1/00	SALES	10.00	940.00
10/1/00	SALES	10.00	950.00
10/1/00	SALES	10.00	960.00
10/1/00	SALES	10.00	970.00
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10/1/00	SALES	10.00	1000.00

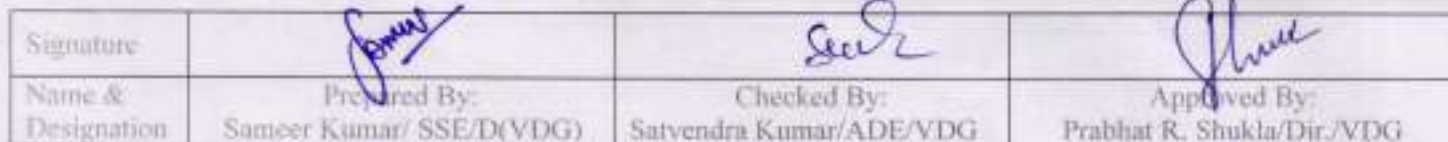
Signature			
Name & Designation	Prepared By: Sameer Kumar/ SSE/D(VDG)	Checked By: Satvendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dir./VDG

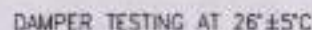


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1		Design		REVISED	
FOR DESCRIPTION & DIMENSIONS		NO. OF	REVISED	NO. OF	REVISED
APPROVED BY:-		INDIAN RAILWAYS			
APPROVED BY:-		VANDRE BHARAT COACHES			
REFERENCE:-		SPACE ENVELOPE FOR SECONDARY VERTICAL DAMPER			
CODE NO.:-		RDSO/CG/TEG/25010			

Signature			
Name & Designation	Prepared By: Sameer Kumar/SSE/DE/VDG	Checked By: Suryendra Kumar/ADE/VDG	Approved By: Prabhat R. Shukla/Dic/VDG





1	STROKE (mm)	25	----
2	SAMPLING FORCE (N) (WITHOUT ATTACHMENT)	8500±15% @ 0.03 m/s 11000±15% @ 0.1 m/s	-----
3	SAMPLING FORCE (N) (WITH ATTACHMENT)	8500±20% @ 0.03 m/s 11000±20% @ 0.1 m/s	-----
4	WEGA, STIFFNESS BUSH ENDS (N/MM)	70 ± 10%	-----
5	TORSIONAL ANGLE	±10° (Max.)	
6	CARDANIC ANGLES	±10.5° (Max.)	Supplier should specified the values of cardanic angles of both arms

*BIOCHORS WITH MINIMUM SERVICE LIFE OF A YEAR MAY BE PERMITTED SUBJECT TO ENDURING A CRYOCHAMBER ASSISTANCE TEST, INFLUENCE OF DEPENDENT TEST, IMPACT TEST OF OBJECTS, TROPICAL ENVIRONMENT TEST (HOT & WET) IN A MEDIUM FOR MORE THAN 30 DAYS, EXTREME TEMPERATURE TEST (HOT & COLD) FOR MORE THAN 30 DAYS, EXTREME TEMPERATURE CHANGE TEST IN CYCLES 100°C FOR 24 HOURS AND -10°C FOR 24 HOURS, GALT SPRAY TEST AT LEAST 2000 PSI AS PER APPLICABLE STANDARDS AND QUALITY TEST THE REQUIREMENTS TO PASS.

[illegible]

NOTE:-

3. Modeling Particulars

MARKING ON MATED NAME PLATE	PUNCHED/ENGRAVED MARKING ON BUSH COVER/CAUSE TYPE (f)
* NAME OF THE MANUFACTURER, MONTH & YEAR OF MFG. MANUFACTURER PART NUMBER SERIAL NO. OF DAMPER NOMINAL FORCE & NOMINAL VELOCITY NAME/TYPE OF DAMPER AS MENTIONED IN RESO DRAWING ALONGWITH RESO DRAWING NUMBER	* NAME OF MANUFACTURER OR CODE MONTH & YEAR OF MFG. MANUFACTURER PART NUMBER NOMINAL FORCE & NOMINAL VELOCITY NAME/TYPE OF DAMPER AS MENTIONED IN RESO DRAWING

2. ENGRAVED/PUNCHED MARKING IS 10 TO 8 MM HIGH LETTERS WITH MINIMUM DEPTH OF 0.25 MM.
3. XX-SURFACES ZINC PLATED & FREE OF PAINTING.
4. DAMPER IS MOUNTED IN HORIZONTAL POSITION.
5. DURING FITMENT ON DOOR, NAME PLATE SHOULD BE DIAMETRICALLY OPPOSITE TO ENGRAVING / PUNCHING.
6. PAINT SHADE TO RAL 7012 (BASALT GREY) ON DAMPER ALONG WITH DUST COVER.
7. IF MANUFACTURER SHOULD ENGRAVE THE WORD "DOWN" / "BELOW" ON THE FACE OF CASING TUBE WHICH WILL BE TOWARDS GROUND / FLOOR DURING FITMENT (DIST. OF ENGRAVING : MIN. 10 MM).
8. TEST ANGLE OF DAMPER SHOULD BE 10 DEGREE FROM HORIZONTAL AXIS.
9. SUPPLIER SHOULD VISIT ANY PLANT/WORKSHOP/FACTORY TO SEE THE INTERFACES IN THE COACH, BEFORE DESIGN NEW DAMPER OR MAKING ANY CHANGE IN DRAWING/ DESIGN OF EXISTING DAMPERS.
10. ANY ALTERNATE MATERIAL OF DUST COVER CAN BE ACCEPTED, IF IT QUALIFIES THE SURFACE PROTECTION CRITERIA MENTIONED IN ROLO SPECIFICATION 8000/CO-18005 REV. 1 OR LATEST.
11. PERMISSIBLE TOLERANCE ON EXTENDED AND COMPRESSED LENGTH SHALL BE ± 3 MM.