

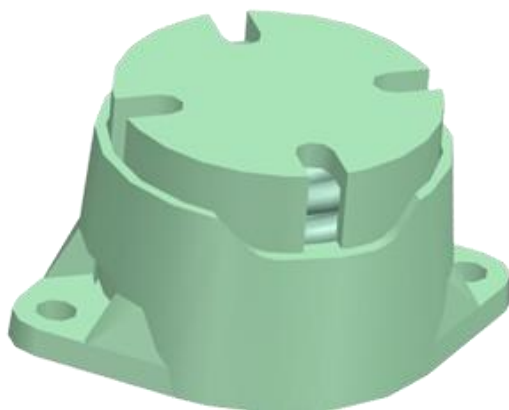
भारत सरकार – रेल मंत्रालय

Government of India- Ministry of Railways

केवल कार्यालय उपयोग के लिए

For Official Use Only**WD-62-MISC-17**

**TECHNICAL SPECIFICATION
FOR
CONSTANT CONTACT SIDE BEARERS
FOR
BROAD GAUGE BOGIE WAGONS**



	Month & Year of Issue	Revision/Amendment	Page no.	Reason for Amendment
1.	August 2021	Amendment-1	-	
2.	July 2025	Revision-1	-	Updated

Issued by:

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

July- 2025

PRICE:

PREFACE

The Specification No. WD-62-Misc-17 is applicable to Constant Contact Side Bearers (CCSB) used in the suspension systems of freight stock operating on Indian Railways.

This specification covers three variants of CCSB, designated as Variant-A, Variant-B, and Variant-C.

Details are as under:

S.No.	Design type	Application of CCSB in Freight Bogie
1.	Variant-A	Generally applicable for wagons having empty body weight up to 9.4t.
2.	Variant-B	Generally applicable for wagons having empty body weight between 9.4t to 12.7t
3.	Variant-C	Generally applicable for wagons having empty body weight over 12.7t.

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**SPECIFICATION FOR CONSTANT CONTACT SIDE BEARERS USED IN FREIGHT
BOGIES**

1.0 SCOPE

- 1.1 This specification covers the technical requirements relating to material, design and tests for Constant Contact Side Bearer (CCSB) used between bogie bolster and body bolster of Indian Railways' freight stock. This specification does not include all the necessary provisions required for a purchase & supply contract.
- 1.2 This specification covers the technical requirements, laboratory test requirements, product evaluation and their performance criteria and purchase inspection of the side bearers. These requirements are indicative and not exhaustive.
- 1.3 It shall be the responsibility of the supplier to work out suitable design of the side bearer to meet the technical requirements indicated in this specification. Only constant contact side bearer shall be accepted.
- 1.4 During service, the side bearer is subjected to different types of compressive load in static condition of the wagon body. In addition, the side bearers are subjected to dynamic loads during operation of wagon, especially while negotiating curves in loaded condition.
- 1.5 The CCSB shall have excellent compressive and shear strength properties. It shall be capable of withstanding wide climatic variations prevailing in India without deterioration and without any marked change in characteristics.
- 1.6 This specification draws reference to some of the relevant IS. Latest versions of these standards shall be taken as reference unless mentioned otherwise.
- 1.7 While preparing this specification, due consideration has been given to the latest development in the field of materials and process technologies, service requirements of the Indian Railways fleet of Broad-Gauge air brake four-axle wagons as per requirements of AAR specification M-948.
- 1.8 This specification is intended to cover the technical provisions relating to material, construction, process, quality control and tests.

2.0 REFERENCE DOCUMENTS AND STANDARDS

- 2.1 This specification draws reference to specifications and standards given below. In case of variation between the provisions contained in AAR/ASTM/IS and specific provisions given in this specification, the later will prevail.

- 2.2 All documents referred to in this specification (e.g., IS, ISO, ASTM, AAR, etc.) shall be of the latest applicable versions. The firm shall ensure possession of the most recent editions of these standards for reference and compliance.

Table 1: Reference of Standards

S. No.	Standard No.	Description
1.	ASTM A897/A897M	Standard Specification for Austempered Ductile Iron castings.
2.	IS:5517:1993 Gr.35Mn6Mo3	Steel for Hardening and Tempering-Specification
3.	BS970EN16	Manganese –Molybdenum Steel
4.	IS:3195 Gr.52Cr4Mo2V	Steel for the Manufacturing of Volute and Helical Springs (for Railway Rolling Stock)- Specification.
5.	IS:4897	Deviations on Untoleranced Dimensions and Mass of Steel castings
6.	IS:2102	General Tolerances
7.	IS:3073	Assessment of Surface Roughness
8.	IS:2016	Specification for Plane washers
9.	IS:2232	Specification for Slotted and Castle Nuts
10.	IS:1363	Hexagon Head Bolts, Screws and Nuts of product Grade 'C'
11.	IS:549	Split Pins- Specification
12.	IS: 2	Rules for rounding off Numerical Values.
13.	IS: 13871	Powder Coating Specification
14.	IS:3618	Specification for Phosphate Treatment of Iron and Steel for Protection against Corrosion
15.	AAR M-948	Association of American Railroads Manual of Standards and Recommended Practices for Truck Side Bearing
16.	IS:3885 Part-I, Gr.-IV	Steel for the Manufacture of Laminated Springs (Railway Rolling Stock)
17.	IS:7002	Prevailing Torque Type Hexagon Nuts (with Non-metallic Insert)
18.	WD-01-HLS-94	Specification for Hot Coiled/Cold Coiled Helical Springs
19.	ISO 9227/ ASTM B117	Salt spray (Fog) testing
20.	DIN 982	Nylon Insert Hexagon Stop Lock Nuts High Type

- 2.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.
- 2.4 The firm shall conform to this specification, relevant drawings with latest alteration number, and latest relevant specifications. In case of conflict among the STR/Drawings/Other relevant Specifications, the drawings shall take precedence over the STR and the Specification. The specification shall take precedence over the STR.

3.0 GENERAL CONDITIONS

- 3.1 The firm seeking approval for manufacturing and supply of Constant Contact Side Bearer shall apply to RDSO, Lucknow as per the extant RDSO ISO procedures and other guidelines.
- 3.2 The design of offered CCSB shall conform to the requirements of this specification. The firm shall submit a para-wise compliance of this specification along with their offered design.
- 3.3 The firm must have adequate facilities for manufacturing and testing of constant contact side bearers conforming to requirements of this specification.
- 3.4 Firm shall generally follow the infrastructure, manufacturing, testing and quality control requirement mentioned in this specification. However, the firm can also offer alternate process infrastructure, manufacturing, testing facilities etc. Firm shall submit the detailed test report, documentary evidences, and the justification/ evidence to establish that the same can provide consistent output to desired level of output/ accuracy/ performance of the offered solution vis-à-vis specified in the specification to the Director General (Wagon)/RDSO, Lucknow for obtaining approval before use.

4.0 SIDE BEARER REQUIREMENTS AND RELATED TERMS

- 4.1 Side bearers are fitted between bogie bolster and wagon body bolster, primarily for stability of wagon body. The Constant contact designs of side bearer also reduce the hunting tendency and thus improve riding behavior of the wagon.
- 4.2 Constant contact side bearers are generally designed to share up to 85% of empty wagon body weight for optimum level of rolling resistance to negotiate while on curve.
- 4.3 Metallic or non-metallic spring/s housed in between the cylindrical type top and bottom housing is required to suit the space requirements with standard fitment by high tensile castle nut-bolt fasteners/Nylock nut-bolt fasteners of $\Phi 21.5$ mm with inter-spacing 216

mm for Indian Railway BG wagons. For bolted applications, bolts must be IS: 1363 Grade 8.8/SAE Grade 5 or better or as per the relevant drawing of the CCSB and employ some means like castle nut with split pin or nylock nut to inhibit loosening.

- 4.4 The side bearing must accommodate bogie rotation up to 11° in either direction. It must not interfere with the car's ability to negotiate the minimum radius curve permitted on IR BG network.

4.5 **Technical terms related to constant contact side bearers**

4.5.1 **Set up height**

Set up height is the nominal installed height of side bearer in the empty wagon on leveled track. The designed set up height for all the variants is 128.5mm.

4.5.2 **Pre load**

Pre load is the vertical load taken by the side bearer at set up height in empty condition measured on a leveled track.

4.5.3 **Side bearer travel**

Side bearer travel is the compression of side bearer from nominal set up height to solid height. The minimum specified travel for long travel side bearers is 16mm.

4.5.4 **Solid Height**

Solid height is compressed height of CCSB at non yielding arrangement. It is nominal set up height minus travel of the CCSB. The maximum designed solid height for all the variants is 112.5mm.

5.0 **TECHNICAL PARAMETER OF CONSTANT CONTACT SIDE BEARERS**

- 5.1 This specification covers following three variants of constant contact side bearers to suit all the BG wagon fleet of Indian Railways.

- (i) **Variant 'A'** – Pre load (Kg) - $1750 \pm 0_{200}$

(Generally applicable for wagons having empty body weight up to 9.4t)

- (ii) **Variant 'B'** – Pre load (Kg) - $2000 \pm 0_{250}$

(Generally applicable for wagons having empty body weight between 9.4t to 12.7t)

- (iii) **Variant 'C'** – Pre load (Kg) - $2700 \pm 0_{300}$

(Generally applicable for wagons having empty body weight over 12.7t)

Note: CCSB shall be fitted in a wagon as per the relevant Center Pivot and Side Bearer arrangement (CP-SB) drawing of the wagon.

5.2 **All the three variants of CCSB shall meet the following parameters:**

- | | |
|---------------------|---|
| (i) Free height: | Unloaded height of CCSB (to be included in the drawing) |
| (ii) Setup height: | 128.5mm |
| (iii) Solid height: | 112.5mm (Maximum) |

- 5.3 A non-yielding arrangement is to be provided to restrict compression of CCSB beyond solid height.
- 5.4 Preload of CCSB with non-metallic springs shall be taken after 24 hours of compression at set-up height. However, for measuring pre-load of CCSB with metallic springs, 24 hours compression is not mandatory.
- 5.5 Load at solid height of CCSB should not be more than FOUR times of nominal preload.
- 5.6 Common housing for all variants of CCSB is mandatory. However, a firm offering any AAR approved design meeting the requirement of this specification may be permitted to offer their own CCSB Design.
- 5.7 Minimum physical properties for top and bottom housing of CCSB shall be as per following table.

Table 2: Minimum Physical Properties of CCSB Housing

Properties	Casting	Forging
	ASTM A897/A897M Gr.2 (1050-750-7)	IS: 5517:1993 Gr 35Mn6Mo3/ BS970EN16
Tensile strength	1050MPa	1050MPa
Yield strength	750MPa	700MPa
Elongation	7% (Min)	14% (Min)
Charpy V notch	---	55J (min)
Charpy un-notch	80J (min)	---
Hardness	302-400 BHN	302-400 BHN

Samples shall be tested from finished product. In case, preparation of sample from finished product is not feasible, integral cast/ representative forging test coupons may be accepted. Other quality parameters (like chemical composition, micrographic examination etc.) shall be checked as per national/ international standards of casting /material used in forging.

6.0 RDSO DESIGN CONSTANT CONTACT SIDE BEARERS AND REQUIREMENTS

- 6.1 RDSO has designed Constant contact side bearers of three variants as per this specification with cast top and bottom housing (common for all variants) to material as per ASTM A897/897M Grade-2(1050-750-7) and metallic spring to specification no. IS: 3195 Grade 52Cr4Mo2V & RDSO specification for Helical Spring WD-01-HLS-94. However, for housings, forging material IS: 5517:1993 Gr.35Mn6Mo3/BS970EN16 with physical properties given in Para-5.7 may also be used.

Drawing numbers for these RDSO designed variants of CCSB are

- (i) Variant 'A' : Drawing No.- WD-17025-S/1
- (ii) Variant 'B' : Drawing No.- WD-12008-S/1
- (iii) Variant 'C' : Drawing No.- WD-12007-S/1

6.2 These CCSBs have been finalized based on testing conducted at the manufacturers /RDSO laboratory in accordance with the requirements of this specification, and their performance has also been evaluated under field conditions.

6.3 The vendor seeking registration for manufacture and supply of Constant Contact Side Bearer (CCSB) to this specification shall meet one of the following conditions.

6.3.1 RDSO Vendors for Helical Coiled Springs as per Specification No. WD-01-HLS-94, having all testing facilities for the CCSB as per this specification and meeting the following conditions:

- a) Having Foundry with in-house facilities for manufacturing, heat treatment, and laboratory testing of ADI castings, and employing at least two mechanical or metallurgical engineers with: a degree and minimum five years of experience, or a diploma and minimum eight years of experience in the relevant field of manufacturing or quality control.

OR

- b) Having Forging facilities with in-house manufacturing, heat treatment, and laboratory testing facilities for forged housings as per this specification, and employing at least two mechanical or metallurgical engineers with: a degree and minimum five years of experience, or a diploma and minimum eight years of experience in the relevant field of manufacturing or quality control.

N.B: Spring manufacturers mentioned in para a) & b) above can have above foundry/forging facilities in the same work address as that of spring manufacturing or separate facility of same firm as per extant ISO norms.

OR

- c) Procuring housings from RDSO Vendors for CCSB as per this specification manufacturing housing in accordance with the following:
 - (i) Cast housings made of material conforming to ASTM A897/897M Grade 1050-750-7 or better as per Clause 5.7 duly inspected by RDSO/authorised inspecting agency.

OR

- (ii) Forged housings made of material conforming to IS: 5517:1993 Grade 35Mn6Mo3 or BS970 EN16 or better, with physical properties as specified in Clause 5.7, duly inspected by RDSO/authorised inspecting agency.

6.3.2 Foundries with in-house facilities for manufacturing, heat treatment, and laboratory testing of ADI castings and CCSB assemblies, and employing at least two mechanical or metallurgical engineers with: a degree and minimum five years of experience, or a diploma and minimum eight years of experience in the relevant field of manufacturing or quality control, may apply for registration of complete CCSB. For CCSB assembly, springs must be procured from RDSO Vendors for Helical Coiled Springs as per Specification No. WD-01-HLS-94 and duly inspected by RDSO/authorised inspecting agency.

6.3.3 Forging firms with in-house facilities for manufacturing, heat treatment, and laboratory testing of forged housings and CCSB assemblies, and employing at least two mechanical or metallurgical engineers with a degree and minimum five years of experience, or a diploma and minimum eight years of experience in the relevant field of manufacturing or quality control, may also apply for registration of complete CCSB. For CCSB assembly, springs must be procured from RDSO Vendors for Helical Coiled Springs as per Specification No. WD-01-HLS-94 and duly inspected by RDSO/authorised inspecting agency.

7.0 OTHER THAN RDSO DESIGN CONSTANT CONTACT SIDE BEARERS AND REQUIREMENTS

7.1 Indian firm or Indian associate firm of a foreign firm's design having experience in designing of Constant Contact Side Bearer (CCSB) to any Railroads system worldwide, can offer their CCSB design (cylindrical type only) meeting the requirements to this specification.

7.2 Foreign firms having experience in manufacturing and supplying Constant Contact Side Bearer (CCSB) to Railroads abroad may also apply for the registration. The offered design of CCSB shall be proven in any rail road globally wherein 5000 CCSBs have completed minimum 5 years successful service in freight cars. Terms and conditions for registration of the foreign firm shall be as per extant Indian Railways/RDSO ISO guidelines.

7.3 For own design/Indian associate firm of foreign firm's design, Foundries which have in house manufacturing, heat treatment, laboratory testing facilities for ADI castings/CCSB assembly and have at least two mechanical/metallurgical engineers with degree plus five year experience or diploma with eight year experience in relevant field

of manufacturing/quality control may apply for registration of complete CCSB. Applying firm must have all laboratory testing facilities as per requirements to this specification. Firms manufacturing housing may procure metallic/non-metallic spring element(s) used in CCSB from any Indian/foreign source having proven design of Side Bearer/Spring Element for constant contact side bearer used in freight wagons, adequate experience in manufacturing and supply of the Side Bearer/Spring Element to any Rail Road globally with 5000 CCSBs have completed minimum 5 years successful service in freight wagons. A proper written MOU for minimum 5 years in this regard is to be submitted by the firm applied for registration with Indian/foreign source having proven design of Side Bearer/Spring Element for constant contact side bearer used in freight wagons. In case of firm outsourcing spring element applying firm shall be fully responsible for quality control, physical and functional requirement, warranty requirement etc. given in this specification in totality.

- 7.4 For own design/Indian associate firm of foreign firm's design, Forging firms having in house manufacturing, heat treatment, laboratory testing facilities for forging/CCSB assembly and have at least two mechanical/metallurgical engineers with degree plus five-year experience or diploma with eight-year experience in relevant field of manufacturing/quality control may apply for registration of complete CCSB. Applying firm must have all laboratory testing facilities as per requirements to this specification. Firms manufacturing housing may procure metallic/non-metallic spring element(s) used in CCSB from any Indian/foreign source having proven design of Side Bearer/Spring Element for constant contact side bearer used in freight wagons, adequate experience in manufacturing and supply of the Side Bearer/Spring Element to any Rail Road globally with 5000 CCSBs have completed minimum 5 years successful service in freight wagons. A proper written MOU for minimum 5 years in this regard is to be submitted by the firm applied for registration with Indian/foreign source having proven design of Side Bearer/Spring Element for constant contact side bearer used in freight wagons. In case of firm outsourcing spring element applying firm shall be fully responsible for quality control, physical and functional requirement, warranty requirement etc. given in this specification in totality.
- 7.5 Indian/foreign source having proven design of Non-Metallic Spring Element for constant contact side bearer used in freight wagons, adequate experience in manufacturing and supply of the Non-Metallic Spring Element to any Rail Road globally can also be permitted for complete CCSB as per this specification and can procure housings made from ADI castings/forging from RDSO approved sources as per clause 5.7 & 6.1. Further, such firm can also procure housings made from ADI

casting/forgings as per clause 5.7 from outside with their own quality control, in this case RDSO shall inspect/test housing parameters applying for registration. In case of the foreign firm's design, the offered design of CCSB shall be proven in any rail road globally wherein 5000 CCSBs have completed minimum 5 years successful service in freight cars.

- 7.6 Adequate testing infrastructure for evaluation of constant contact side bearer design as per Para 9 to this specification shall be available in-house with the firm.

8.0 REGISTRATION PROCEDURE FOR CONSTANT CONTACT SIDE BEARERS

RDSO document 'Vendor application processing' ISO Document No. QO-D-8.1-6 (latest) shall be followed for the registration and approval of the firm. For document scrutiny the firm shall refer the ISO Document No. QO-F-8.1-1 (latest) and No. QO-F-8.1-7 (latest). For Capability assessment the firm shall refer the ISO Document No. ISO QO-F-8.1-8 (latest), this specification and QAP.

8.1 For RDSO Designs

- 8.1.1 The firms having adequate manufacturing and testing infrastructure in-house as per requirements of 'para 6' to this specification and willing for registration to manufacture and supply of Constant Contact Side Bearer may apply online to Wagon Directorate, RDSO, Lucknow along with required documents as per prevailing UVAM procedure with registration fees.
- 8.1.2 Applying firm shall be responsible for quality checks for all physical and technical property requirements as per this specification.
- 8.1.3 RDSO document 'Vendor application processing' ISO Document No. QO-D-8.1-6 (latest) shall be followed for the registration and approval of the firm. For document scrutiny the firm shall refer the ISO Document No. QO-F-8.1-1 (latest) and No. QO-F-8.1-7 (latest). For Capability assessment the firm shall refer the ISO Document No. ISO QO-F-8.1-8 (latest), this specification and QAP.
- 8.1.4 Based on successful completion of above, the firm shall be required to submit Internal Test Results (ITR) of their product to Director General (Wagon)/RDSO, which shall include all required tests mentioned in Para-5 and Para-9 to this specification except tests in Para-9.6 to this specification. After that prototype testing shall be undertaken. Decision shall be conveyed to manufacture 20 nos. (Each variant) of prototype CCSB to this specification along with provisionally approved QAP.
- 8.1.5 On receipt of permission for prototypes manufacturing, the manufacturer shall then give 15 days' notice to DG (Wagon)/RDSO, Lucknow for witnessing of critical manufacturing activities/process as per provisionally approved QAP. Besides witness

by RDSO complete process shall be video graphed arranged by firm and submitted to RDSO in a hard drive duly labelled.

8.1.6 After successful completion of above, confirmatory testing as mentioned in Para-5 and Para-9 to this specification except tests in Para-9.6 to this specification shall be carried out at RDSO or any other lab approved by DG (Wagon)/RDSO, Lucknow for which firms shall submit samples to Director General (Wagon)/RDSO and necessary charges shall be paid by firm in advance as per the extant guidelines.

8.1.6.1 For housing manufacturers: Ten (10) sets of CCSB Housings for each variant (5 set shall be painted as per this specification and 5 set shall be unpainted) along with test coupon (for conducting physical, chemical and micro-structure testing as per this specification), Ten (10) sets springs of each variant (pre-inspected and DM) are to be submitted which shall be drawn by the concerned RDSO field Unit or any official as nominated by DG (Wagon)/RDSO from a minimum lot of 20 sets for each design.

Following tests shall be done for each variant as per this specification/RDSO approved Check sheet no. MW/WD/PICS/BD/CCSB/01(Latest).

- a) Dimensional check of 10 CCSBs
- b) Visual inspection of 10 CCSBs
- c) Compressive load deflection test of 10 CCSBs
- d) Physical, Chemical, Micrographic properties and Hardness of 01 CCSB per heat
- e) Structural integrity test of 5 CCSBs
- f) Friction saturation test of 3 CCSBs
- g) Fatigue test- 1(one)
- h) Any other test as mentioned in the prototype testing check sheet

8.1.6.2 For spring manufacturers: Ten (10) sets of CCSB Housings for each variant (5 set shall be painted as per this specification and 5 set shall be unpainted (pre-inspected and DM)), Ten (10) sets springs for each variant are to be submitted which shall be drawn by the concerned RDSO field Unit or any official as nominated by DG (Wagon)/RDSO from a minimum lot of 20 numbers for each design.

Following tests shall be done for each variant as per this specification/RDSO approved Check sheet No. MW/WD/PICS/BD/CCSB/01(Latest) & MW/WD/PICS/BD/Spring (Latest).

- a) Dimensional check of 10 CCSBs
- b) Visual inspection of 10 CCSBs
- c) Compressive load deflection test of 10 CCSBs
- d) Structural integrity test of 5 CCSBs
- e) Friction saturation test 3 CCSBs

- f) Fatigue test- 1(one) sample for each variant.
- g) Each Variant of the spring shall be tested as follow
 - (i) Spring Stiffness of 5 Springs
 - (ii) Static load testing of 5 Springs
 - (iii) Core and Surface Hardness tests of 3 Springs
 - (iv) Chemical Composition of 1 Springs
 - (v) Depth of decarburization of 3 Springs
 - (vi) Inclusion rating of 3 Springs
 - (vii) Macro etching of 3 Springs
 - (viii) Microstructure Examination of 1 Springs
- h) Any other test as mentioned in the prototype testing check sheet

8.1.7 The test results of para-8.1.6 shall be put up to Director General (Wagon)/RDSO, Lucknow for approval.

8.1.8 The provisions of ISO document No. QO-D-8.1-11 (titled "Vendor-Changes in approved status") for upgradation of vendors as 'Approved vendor' shall be applicable.

8.1.9 All other provisions contained in RDSO's ISO procedures laid down in document no. QO-D-8.1-11 (titled "Vendor-Changes in approved status") and subsequent versions/amendments thereof, shall be binding on all approved firms.

8.2 **For Other than RDSO Design**

8.2.1 For firms own designs or Indian associate firm with foreign collaborator's designs, the firms having adequate manufacturing and testing infrastructure in-house as per requirements of 'para 7' of this specification and willing for registration to manufacture and supply of Constant Contact Side Bearer may apply online to Wagon Directorate, RDSO, Lucknow along with required documents as per prevailing UVAM procedure with registration fees. Applying firm shall be responsible for quality checks for all physical and technical property requirements as per this specification.

8.2.2 The firm out sourcing housing of CCSBs must have written collaboration (MOU) with out-sourcing firm for supply of housings and an undertaking regarding adequate infrastructure for producing housings as per requirements to this specification for minimum five years.

8.2.3 RDSO document 'Vendor application processing' ISO Document No. QO-D-8.1-6 (latest) shall be followed for the registration and approval of the firm. For document scrutiny the firm shall refer the ISO Document No. QO-F-8.1-1 (latest) and No. QO-F-8.1-7 (latest). For Capability assessment the firm shall refer the ISO Document No. ISO QO-F-8.1-8 (latest), this specification and QAP.

- 8.2.4 After successful completion of CCA stage, firm shall submit the detailed Design and Drawings of the offered CCSB assembly/component along with functional properties and test criteria. CCSB assembly and component drawings submitted shall be at least with dimensions for all functional parameters along with any other relevant information confirming to the requirement of this specification, to Director General (Wagon)/RDSO for approval. Firm shall also submit any patent cover of offered design of CCSB.
- 8.2.5 Based on successful completion of above, the firm shall be required to submit Internal Test Results (ITR) of their product to Director General (Wagon)/RDSO which shall include all required tests mentioned in Para-5 and Para-9 to this specification. After that prototype testing shall be undertaken. Decision shall be conveyed to manufacture 20 nos. (Each variant) of prototype CCSB to this specification along with provisionally approved QAP.
- 8.2.6 On receipt of permission for prototypes manufacturing, the manufacturer shall then give 15 days' notice to DG (Wagon)/RDSO, Lucknow for witnessing of critical manufacturing activities/process as per provisionally approved QAP. Besides witness by RDSO complete process shall be video graphed arranged by firm and submitted to RDSO in a hard drive duly labeled.
- 8.2.7 After successful completion of above, confirmatory testing as mentioned in Para-5 and Para-9 of this specification shall be carried out at RDSO or any other lab approved by DG(Wagon)/RDSO, Lucknow for which firms shall submit samples to Director General (Wagon)/RDSO and necessary charges shall be paid by firm in advance as per the extant guidelines.
- 8.2.8 Ten (10) sets of CCSB for each variant (5 set shall be painted as per this specification and 5 set shall be unpainted) along with test coupon (for conducting physical, chemical and micro-structure testing as per this specification) are to be submitted which shall be drawn by the concerned RDSO field Unit or any official as nominated by DG (Wagon)/RDSO from a minimum lot of 20 numbers for each design.
- Following tests shall be done for each variant as per this specification/RDSO approved Check sheet No.MW/WD/PICS/BD/CCSB/02 (Latest).
- Dimensional check of 10 CCSBs
 - Visual inspection of 10 CCSBs
 - Compressive load deflection test of 05 CCSBs
 - Physical, Chemical, Micrographic properties and Hardness of 01 CCSB per heat
 - Structural Integrity test of 5 CCSBs
 - Friction saturation test on 3 CCSBs

- g) Dual axis simulated service test on 1 sample
- h) Fatigue test- of 1(one) sample
- i) Any other test as mentioned in the prototype testing check sheet

8.2.9 After successful prototype development and testing, the test results of para-8.2.8 shall be put up to Director General (Wagon)/RDSO, Lucknow for approval and the offered design of constant contact side bearer shall be subjected to evaluation through field trial.

8.2.10 Upon successful completion of the above process, the firm shall submit a copy of the first purchase order (issued by the purchaser) to RDSO. A total of 750 (seven hundred fifty) CCSBs of any design manufactured by the firm, duly inspected by the concerned QA Mechanical Unit of RDSO or an official nominated by the DG (Wagon), RDSO, shall be monitored for field performance on three CC rakes by RDSO, Lucknow. The vendor shall inform RDSO (Wagon Directorate) of the wagon depot(s) where these CCSBs are to be supplied and fitted, to facilitate monitoring of their field performance over a period of 12 (twelve) months from the date of fitment.

Failure criteria shall be as follows:-

- (i) During field performance monitoring, Railways shall maintain and provide Quarterly performance details of CCSB to Wagon Directorate. The performance details shall include Quarterly fitment details (Month & Year of Manufacturing, Month & Year of Fitment and Fitment Quantity), Quarterly failure details (Month & Year of Manufacturing, Month & Year of Failure and Failure Quantity). The data for field trial of side bearer is to be recorded as per RDSO Trial Scheme.
- (ii) During field performance monitoring, failure of CCSB shall not be more than 2 % of CCSB fitted during the trial period.
- (iii) If the CCSB failure is more than 2% of total CCSB under field performance monitoring period (Twelve months), the field trials may be extended for another Six months. However, the failure upto the extended period should not be more than 2.5 %. The Firm shall not be allowed to supply any further material in the extended trial period.
- (iv) During field performance monitoring, detailed field performance of CCSB shall also be monitored.
- (v) For this, 40 CCSBs shall be fitted in nominated wagons in presence of Wagon Directorate Officials. Firm shall provide a unique serial number to each of these 40 CCSB. Free height and setup height of each of these CCSB shall be jointly recorded by the Zonal Railway, firm and RDSO. After completion of twelve

months, 20 CCSB shall be randomly picked from the field for detailed examination. These CCSB shall be checked for cracking, perishing and damage, if observed, during the field trials shall be recorded. The CCSB shall be considered as 'failed', if any one of the following limits is observed:

- a) Housing crack, breakage and deformation.
- b) CCSB shall be tested for load deflection characteristics. The condition of all components should be good and vertical load of CCSB assembly must not be less than 65% of nominal pre load of that variant.
- c) Wear in head of top housing more than 2 mm.
- d) Crack, plastic deformation or crushing in spring.
- e) Any other defects

Apart from above, the CCSB shall also be checked as per as per the RDSO Trial Scheme. Total failure of CCSB shall not be more than 2 CCSB. This shall also be added to work out % at para (iii) above.

- 8.2.11 Supply beyond the field trial quantity including sub-components shall commence only after successful completion of the field trial.
- 8.2.12 After successful field trial, firm shall be registered as 'RDSO Vendor for Developmental Orders'. Final approval shall be accorded as per existing procedure prevailing at that time.
- 8.2.13 If firm's CCSB under field performance monitoring does not qualify para 8.2.10, further inspection and supply shall not be recommended. Firm will have to come up with complete investigation report of reason/s and their remedial action for consideration of RDSO. If investigation report is accepted by competent authority, firm may be given more opportunity for performance monitoring as per extant procedures of ISO QO-D-8.1-6 for fulfilling the requirements of para 8.4.8.
- 8.2.14 All the provisions contained in RDSO's ISO procedures laid down in document No. QO-D-8.1-11 latest (Title: 'Vendor-Changes in approved status') and subsequent versions/amendments thereof, shall be binding and applicable on the registered vendor/vendors for upgradation of vendors as 'Approved vendor' and manufacture and supply against the tenders floated by Railways to maintain quality of products supplied to Railways.
- 8.2.15 All terms and conditions for vendor registration/approval of foreign firms shall be applicable as stipulated in RDSO ISO document QO-D-8.1-5 (latest version) title, Application for registration of vendor'. In case of any contradiction between the clauses of this specification and ISO document QO-D-8.1-5 regarding the vendor registration/approval of foreign firms, the clauses of ISO document shall prevail.

9.0 PRODUCT EVALUATION FOR FUNCTIONAL REQUIREMENTS FOR VENDOR APPROVAL

Following tests shall be carried out on test samples of each variant produced by the firm for CCSB validation during vendor registration for developmental orders for which internal test results have been submitted:

- 9.1 Ten (10 no.) assembled CCSB to be tested for free height, Preload and solid height. Load observed at solid height shall be less than four times of nominal pre load. For preload test of CCSB with non-metallic springs, minimum three (03 nos.) samples shall be tested for 24 hours. Balance may be tested for shorter period (30 minutes & 08 hours) and pre load values shall be compared with 24 hours tests. Appropriate capacity universal testing machine with recording facility shall be available with firm. A minimum of three randomly selected are to be tested at by application of a static load equal to 1.175 times the preload. Each sample must settle to a height at or below the designed setup height within 24 hours or as applicable.
- 9.2 The CCSB assembly without spring should have to be tested for a vertical load of 94.8t. For this test, Five (05 Nos.) CCSB assembly without spring are to be tested at 94.8t vertical load on a suitable test machine, holding the load for 2-3 minutes. Adequate capacity hydraulic press should be available. During and after the test, any component of the assembly should not exhibit any catastrophic failure or permanent deformation or any crack. The tested CCSBs (both top and bottom housing) shall be checked for any crack through suitable crack detection method (MPI/DPT/ZYGLO).
- 9.3 The side bearing must be designed so that the longitudinal resistive force is saturated after no more than 3 mm of longitudinal motion at setup height. Three (03 no.) assembled CCSB shall be tested for friction saturation test at set up height. Distance travelled in friction saturation shall not be more than 03mm. Appropriate capacity dual axis machine should be available with the firm.
- 9.4 One CCSB assembly with springs has to be fatigue tested as per table 3. One vertical fatigue test machine with minimum capacity of 10 t sinusoidal load and minimum 50 mm peak to peak stroke is required. Fatigue test machine should have recording features in graphical mode in load verses time and displacement verses time. One assembled CCSB to be fatigue tested in displacement mode about setup height for 14,92,500 cycles as per table 3. For fatigue test, a frequency of 2 Hz or more shall be applied.
- 9.5 The vertical load shall be measured by compressing the CCSB from its free height to its solid height and then returning to free height. Each compression cycle should last a

minimum of one minute. The reported load value must represent the average force measured at the specified setup height. Initial measurements should begin during the third cycle to ensure consistency. The vertical force and the free height of the CCSB must be recorded at both the start and end of the testing process. After the final test cycle, the measurement process must begin within ten minutes. Additionally, force-displacement graph generated during the test must be included.

Photographs of the CCSB and spring elements are to be provided from before and after the testing.

Table 3 : Fatigue Test Scheme for CCSB

S.No.	Amplitude (mm)	Peak to Peak (mm)	Cycles
1.	3.2	6.4	12,00,000
2.	6.4	12.8	2,40,000
3.	9.5	19.0	40,000
4.	12.7	25.4	10,000
5.	Travel	2 x Travel	2,500
Total			14,92,500
<u>Criteria:</u> Preload of CCSB after fatigue test must be more than 65% of pre load before fatigue test.			

9.6 Dual Axis Simulated Service Test

- 9.6.1 Constant contact side bearer should meet requirement of dual axis simulated service test on appropriate capacity dual axis machine. Hysteresis energy shall be calculated before and after the dual axis simulated service test. CCSB must meet the hysteresis ratio criteria.
- 9.6.2 Assembled CCSB is to be subjected to a dual axis simulated service test for 69 hours 20 minutes for Hunting simulation and curving simulation as per following details. Detail of hunting and curving simulation is given in table 4.
- 9.6.3 Testing must be conducted using equipment capable of accurately controlling and measuring both vertical and longitudinal displacements, as well as measuring the corresponding forces in each direction. The system must also be able to control the phase angle of displacement between the two perpendicular axes. Vertical and longitudinal forces must be fully de-coupled to ensure independent measurement. All instrumentation must be calibrated. Digital data acquisition systems must be capable of recording at a minimum rate of 125 samples per second per channel.

9.6.4 **Hunting Simulation (Block 'A')**

Vertical cycle : Set up height ± 1.6 mm at 3 Hz for 43200 cycles.

Longitudinal cycle : Centered ± 3.2 mm at 3 Hz for 43200 cycles.

Both axes must be cycled simultaneously and remain in phase as shown in **Figure 1 (Graph-1)**.

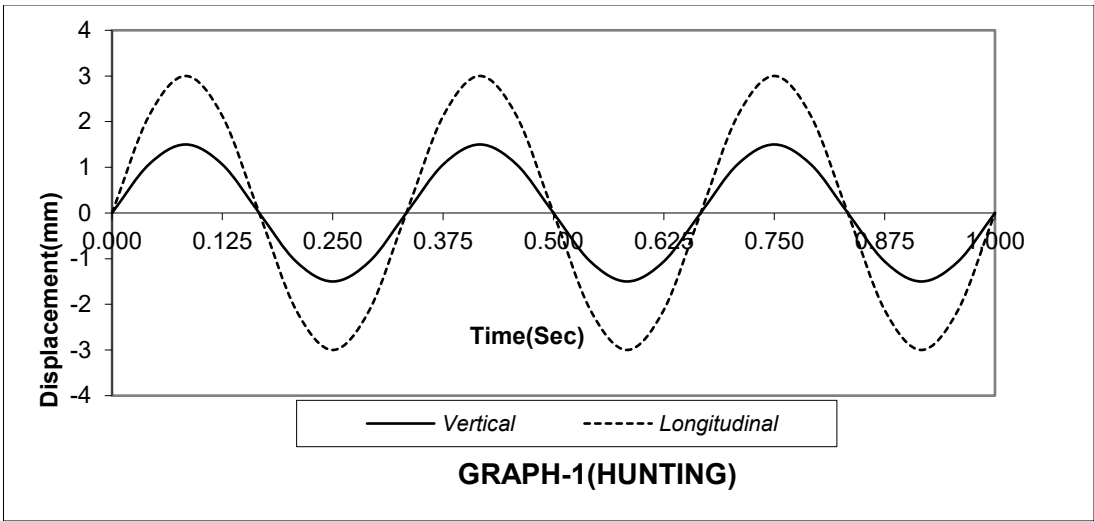


Figure 1: Hunting Simulation Graph

9.6.5 **Curving Simulation (Block 'B')**

Vertical cycle: Set up height ± 5 mm at 2.15 Hz for 36120 cycles.

Longitudinal cycle : Centered ± 12.7 mm at 0.43 Hz for 7224 cycles

Both axes must be cycled simultaneously and remain in phase as shown in Figure 2 (Graph-2).

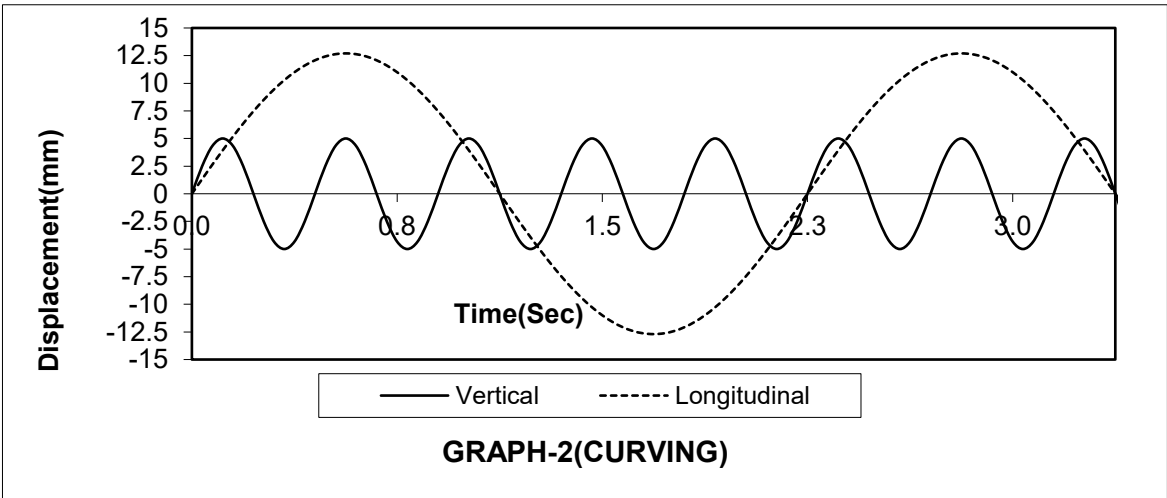


Figure 2 : Curving Simulation Graph

Table 4 : Table for dual axis simulated service test

S.No.	Description	Duration	Cumulative duration	Cumulative Vertical	cycle Longitudinal
Initial measurements					
1.	Block 'A'	4 Hours	4 Hours	43200	43200
2.	Block 'B'	4Hrs. 40 Minutes	8Hrs. 40 Minutes	79320	50424
Input Reset not to exceed 5 minutes.					
3.	Block 'A'	4 Hours	12Hrs. 40 Minutes	122550	93624
4.	Block 'B'	4Hrs. 40 Minutes	17Hrs. 20 Minutes	158640	100848
Input Reset not to exceed 5 minutes.					
5.	Block 'A'	4 Hours	21Hrs. 20 Minutes	201840	144048
6.	Block 'B'	4Hrs. 40 Minutes	26Hrs.	237960	151272
Input Reset not to exceed 5 minutes					
7.	Block 'A'	4 Hours	30Hrs.	281160	194472
8.	Block 'B'	4Hrs. 40 Minutes	34Hrs. 40 Minutes	317280	201696
Input Reset not to exceed 5 minutes.					
9.	Block 'A'	4 Hours	38Hrs. 40 Minutes	360480	244896
10.	Block 'B'	4Hrs. 40 Minutes	43Hrs. 20 Minutes	396600	252120
Input Reset not to exceed 5 minutes.					
11.	Block 'A'	4 Hours	47Hrs. 20 Minutes	439800	295320
12.	Block 'B'	4Hrs. 40 Minutes	52Hrs.	475920	302544
Input Reset not to exceed 5 minutes.					
13.	Block 'A'	4 Hours	56Hrs.	519120	345744
14.	Block 'B'	4Hrs. 40 Minutes	60Hrs. 40 Minutes	555240	352968
Input Reset not to exceed 5 minutes.					
15.	Block 'A'	4 Hours	64Hrs. 40 Minutes	598440	396168
16.	Block 'B'	4Hrs. 40 Minutes	69Hrs. 20 Minutes	634560	403392

9.6.6 Procedure for Longitudinal Hysteresis Test: -

Before and after dual axis simulated service test, longitudinal hysteresis energy test shall be done as per following procedure for calculation of hysteresis energy.

- Test results must include all relevant graphs, hysteresis area (energy), hysteresis ratio, and associated calculations. During testing, any specimen transferred into or out of the test fixture must be allowed no more than 10 minutes to relax before resuming the test.
- To evaluate performance, a 3.0 Hz sinusoidal longitudinal (car wise) motion with a peak-to-peak displacement of 12.7 mm shall be applied between side bearer and body wear plate, while maintaining the designed setup height. Either the wear plate or the side bearing may be translated to generate the required motion.

- (iii) Longitudinal displacement, longitudinal force, and vertical force must be accurately measured and recorded throughout the test. Data acquisition must occur at a minimum of 100 scans per second per channel with the help of digital instrumentation to ensure sufficient resolution. These values form the basis for calculating dynamic performance characteristics, particularly the hysteresis behaviour of the component under test.
- (iv) Actual Hysteresis area is to be calculated using data taken in a typical cycle after third cycle. This value is calculated as the enclosed area on a plot of longitudinal force versus longitudinal displacement. The hysteresis ratio is then computed as the final hysteresis area divided by the initial hysteresis area, providing insight into performance consistency and energy dissipation over time.
- (v) Hysteresis ratio (Rh) is to be calculated as hysteresis area final (after fatigue) / hysteresis area initial (before fatigue).
- (vi) Due to potential friction variability in laboratory conditions, the measured data must be normalized to a coefficient of friction of 0.6. Normalized hysteresis area values, both initial and final, should be reported individually. When calculating the hysteresis ratio, the 0.6 normalization factor will cancel out, ensuring the ratio remains valid regardless of normalization. Hysteresis ratio calculated shall not be less than 0.5.

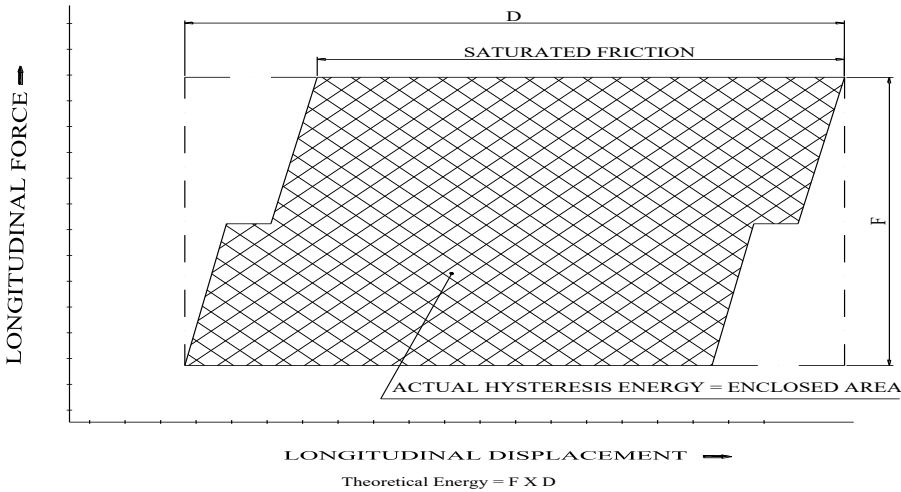


Figure - Hysteresis Energy

Figure 3 : Hysteresis Energy

10.0 EXPECTED SERVICE LIFE AND GUARANTEE PERIOD

- 10.1 The offered design of constant contact side bearer assembly including housings and spring element/s is expected to work satisfactorily for a period of 72 months on Indian Railway's working conditions. Hence offered CCSB shall be guaranteed for a period of 05 years (Sixty months) from the month and year of manufacturing. The guarantee shall cover design, material and workmanship. The firm shall replace complete CCSB or component/s failed during guarantee period to the depot raised claim at his own expense within reasonable time as per the extant guideline. Conditional offers regarding guarantee period of CCSB linked to bogie maintenance practices and Indian Railway's working conditions etc. shall not be acceptable.
- 10.2 Following shall be treated as failures of any of the housing(s) or suspension element/spring (s) for replacement under warranty period:
- a) Crack/ breakage in top/bottom housing.
 - b) Wear of 3 mm or more in top face of top housing and increase/decrease more than 3 mm in diameter of bottom/top housing measured from nominal values.
 - c) Crushing, tears, breakage or crack in any suspension element. However minor surface crack which do not affect properties may be ignored.
 - d) A permanent set in spring elements observed equal or more than half of the difference between nominal free height of CCSB and nominal set up height for the wagon. For example, if nominal free height of CCSB is 163.0mm, then half of deflection $(163.0-128.5)/2 = 17.25\text{mm}$

11.0 PURCHASE INSPECTION

- 11.1 Purchase inspection shall be carried out only at the premises of registered vendor of RDSO. Lot size for purchase inspection shall be 1000 Nos. or part thereof. All components including bolts etc. as per drawing shall be in scope of supply.
- 11.2 Inspection shall be carried out for parameters as per relevant RDSO/approved drawing and firm's approved Quality Assurance Plan (QAP) for the product. All the test facilities with proper recording system required for purchase inspection must be available with the firm in house.
- 11.3 Metallic springs shall be inspected as per latest RDSO specification WD-01-HLS-94 with additional tests on the drawing. Spring material other than metallic spring shall be inspected as per firm's approved drawing and strictly as per approved QAP.
- 11.4 Minimum ten CCSB samples shall be measured for dimensional accuracy as per RDSO/ Approved drawing. Free height, load deflection characteristics from free to set up height, solid height and load at solid height of side bearer assembly shall be measured

on all 10 samples. For non-metallic suspension element CCSBs, minimum three samples shall be tested for 24 hrs. Remaining samples may be tested for shorter time period (30min. & 8 hrs.) to correlate the load deflection characteristics.

- 11.5 Five CCSB samples (without spring) shall be tested for a vertical load of 94.8t for structural integrity test as per Para 9.2 of this specification.
- 11.6 Chemical composition, micro examination and physical testing of housings must be checked by the firm in-house as per approved QAP/drawing and record to be presented to the inspecting official. Inspecting official shall counter check one sample per lot for chemical composition, micrographic examination and physical properties as per approved QAP/drawings to ensure the material properties to be as per specification. Physical properties shall be in line with para 5.7 to this specification.
- 11.7 One side bearer assembly shall be fatigue tested in vertical mode as per procedure given in para 9.4 to this specification. The fatigue test shall be done per ten thousand supplies or one year period from previous supply, whichever is earlier.
- 11.8 Material shall be offered for inspection within three months of manufacturing i.e. any component of the CCSB manufactured in January of a year, CCSB assembly must be offered for inspection by March of that year.
- 11.9 If any sample fails in any one or more criteria, double sample method prevailing in RDSO shall be applied for accepting or rejecting the entire lot offered. If double sample fails, entire lot shall be rejected. Inspection shall not be recommenced till further advice from RDSO. Firm shall investigate the cause and come up with remedial action for the failure and implement the same.
- 11.10 Material once offered for inspection shall not be withdrawn during the course of inspection. Any move to withdraw the material or interference in the inspection in any way shall render the entire lot being rejected.
- 11.11 Apart from the above, detailed process/stage inspection shall be carried out of the different process/stages detailed in this specification and the approved QAP by the concerned official of QA unit or as nominated by DG(Wagon)/RDSO once every 12 months or as approved by DG(Wagon)/RDSO.

12.0 QUALITY AUDIT

The quality audit of the firm shall be carried out to ensure the adherence to its quality assurance plan and its general quality consciousness as per extant RDSO ISO procedures. This quality audit may also be carried out on the need basis in case of reports of severe premature failures of the product are received from Railways. For establishing this, the samples shall be collected from Railways and sent to RDSO,

Lucknow as and when required for carrying out the tests mentioned in this Specification. During Quality Audit, all tests as required during the prototype approval stage shall also be carried out.

13.0 QUALITY ASSURANCE PLAN (QAP)

- 13.1 The manufacturer shall prepare a Quality Assurance Plan (QAP) as per the relevant ISO Document No. i.e. QO-F-8.1-7 (latest) and submit it for approval to the DG (Wagon)/RDSO, Lucknow and shall obtain his approval before commencing the manufacture of the CCSB. Besides other aspects, the following salient points shall be taken into consideration for the preparation of QAP to be submitted to the Approving Authority.
- 13.2 Ensure that the incharge of the Quality Control Section is having a qualification of minimum bachelor's degree in the relevant field and have minimum 5 yrs. experience or a diploma holder with minimum 08 years' experience. The person should be actively involved in day-to-day activities of quality control/stage inspection/compliance of QAP etc.
- 13.3 There should be a system to ensure use of correct raw material and traceability of the product from raw material stage to finished product stage. This system should also facilitate to identify the raw material composition from the finished product stage.
- 13.4 Ensure that there is a system to identify defective components at various stages of manufacture, the reasons for occurrence of defects and also a system for disposal of those defective rejected components.
- 13.5 Ensure that proper analysis is being done on monthly basis to study the rejection/defect at various in internal stages, and to take corrective action thereafter.
- 13.6 Ensure that a proper documentation of all the above steps is there, which is to be presented on demand by the engineer.
- 13.7 Ensure the proper record of complaints received from customers of Railway and corrective action take thereof, is maintained.
- 13.8 Following parameters are to be included in QAP, Section- (E)
 - 13.8.1 Details of Incoming Raw Materials: Details that includes Grade of the material, Supplier Certificate including test parameters, Parameters for Inspection, Mode of Inspection, Equipment used for testing, Acceptable Limit, National/International Standards if any, frequency of testing/Inspection of following raw material shall be incorporated.
 - 13.8.2 Details of In-process Inspection and Product Inspection: Details that includes Machine Process Parameters to be controlled and checked, Quality Check Points, Characteristics of Product Parameters, Characteristics of Process Parameters, Mode of Inspection,

Equipment used for testing, Acceptable Limit, National/International Standards if any, frequency of testing/inspection, of following major process shall be incorporated.

- a) Storage of raw material and semi-finished and finished product
- b) Complete Manufacturing Process for Spring Element
- c) Complete Manufacturing Process for Housing
- d) Marking
- e) Painting
- f) Testing and Gauging
- g) Product Inspection
- h) Packing, Storage and dispatch.

14.0 MARKING AND PAINTING

14.1 Marking on Top, Bottom housing and spring element of Constant Contact Side Bearers must be embossed/depressed of minimum 0.5 mm and letters size of minimum 5mm on non- wearing surfaces during manufacturing processes as per RDSO/ firm's approved drawing. Stamping/punching and marking by any other method after manufacturing shall not be permitted. For marking on metallic springs, the RDSO specification No. WD-01-HLS-94 (Latest) shall be followed.

14.2 All variants of CCSB (springs and CCSB assembly) are to be coated with Powder Coating as per this specification/relevant drawing as under-

Variant 'A' : Epoxy Polyester Powder confirming to Grade 'C' to IS:13871 (Latest). The colour of coating after curing shall be Salmon Pink confirming to RAL - 3022

Variant 'B' : Epoxy Polyester Powder confirming to Grade 'C' to IS: 13871 (Latest). The colour of coating after curing shall be Mid Brunswick Green confirming to RAL-6451.

Variant 'C' : Epoxy Polyester Powder confirming to Grade 'C' to IS: 13871 (Latest). The colour of coating after curing shall be Sky Blue confirming to RAL- 5015.

N.B.: Powder coating as per above shall not be mandatory on Mating surface of CCSB assembly.

15.0 PROTECTION AGAINST CORROSION

15.1 Phosphating:

15.1.1 All the housings shall be phosphated by using zinc phosphate. The thickness coat shall be more than 5 μ m of fine crystalline nature and it can be evaluated as per method

given in IS: 3618 (latest). The class of phosphate coating shall be Class C, as per IS: 3618 (latest).

15.1.2 Phosphating and final painting procedure shall be part of QAP. Firm can also use any alternate method with similar or superior results with prior approval from DG (Wagon), RDSO.

15.2 Final Painting :

15.2.1 Powder coating as per IS: 13871 shall be done on the housings for protection of corrossions and thickness shall be minimum 60 microns outside housings. Powder coating film thickness layer shall be checked by Elcometer.

15.2.2 Salt Spray Test: A salt spray test shall be carried out to verify the quality of paint system. For springs fully painted as per painting scheme/drawing of the spring, the test piece shall be passed in salt spray test performed according to ISO 9227/ ASTM B 117 for minimum 720 hours or as specified in the drawing of the spring and shall not indicate any sign of corrosion & deterioration up to duration indicated in the specification i.e. no more than one minor red rust, no more than 8 blisters and no loss of adhesion. Salt Spray Test shall be the part of process/stage inspection also.

16.0 PACKAGING AND STORAGE

The constant contact side bearer assemblies shall be suitably packed in wooden/corrugated boxes in two sets/one set with the aim of easy handling and to protect them against damage during transit. The supplier should ensure proper securing of loose items (bolts, washer etc.) during packing. CCSB assemblies are to be stored under cover and dry places. The vendor may also use any alternate packaging and storage scheme with prior approval from DG (Wagon)/RDSO. Packaging and storage scheme shall be covered in QAP.
