



Quality Audit report
of
Carriage Workshop
Lalaguda, SC Rly

Report no. 60/2012
MAY 2012

(Audit is done by CRSE, SR)

Co-ordinated by
Quality Assurance (Mechanical) Directorate
Research Designs & Standards Organisation
Manak Nagar, Lucknow - 226011

Quality audit Report of Lalaguda workshop, SC Railway

1.0 Introduction

Railway Board vide letter no. 2012/M (W)814/5 dated 20.03.12 has instructed Zonal Railways to conduct quality audit of coaching depots and workshops of other railways. Accordingly SR has been nominated to do quality audit of Lalaguda workshop of SC Railway.

- 1.1 **Audit Team** – S/Shri T Venkata Subramanian, CRSE, SR, Shri P S Rajagopal, Dy.CME/HQ/SR, Shri D Vijayakumar, SSE/INSP/CW/PER, Shri J Mohanraj, SSE/INSP/CW/PER, Shri S Somasundaram, SSE/INSP/CW/PER
- 1.2 **Dates of Audit** – 23.04.2012 to 25.04.2012
- 1.3 **Escorting Officials** – Shri S Vasudevaiah Dy CME, Shri Abid Pasha PE, Shri C K Ganesan WM
- 1.4 **Scope of Audit** – Wheel & Roller bearing shop, Bogie Repair shop, Brake block hanger maintenance, Air Brake shop and Interior furnishing.

2.0 Brief about Workshop

The Workshop was established on 30th September 1893, under the aegis of “THE NIZAM GUARANTEED STATE RAILWAYS” for undertaking periodic over hauling and repairs to BG and MG steam locomotives, coaches and wagons. Subsequently it was brought under the purview of “NIZAM STATE RAILWAYS”. On formation of South Central Railway on 2nd October 1966, it became a major workshop of the zone. It continued to be a composite workshop for MG and BG rolling stock till 1973. Due to phasing out of steam locos, the workshop took up POH of all types of BG coaches and was named as “Carriage Workshops”. The workshop is spread over an area of 13.97 hectares with 4.25 hectares of covered area. POH of AC coaches was commenced during 1981. POH of DMUs/DHMUs trailer coaches was commenced in 2003, EMUs trailer coaches and tower wagons in 2006, DEMU and DHMU power cars in 2011.

The present sanctioned staff strength (as on 1st February, 2012) of the workshop is 3660.

3.0 Strengths

- 3.1 All bogies including IOH bogies and components are sand blasted.
- 3.2 Sand blasting of coaches for 'A' schedule painting on limited scale is being done through outsourcing.
- 3.3 Sufficient information boards, instruction boards both in English and vernacular language are available and displayed in workshop.

4.0 Weaknesses

- 4.1 40 mm long hex. head screws are used for axle end locking arrangement instead of 50 mm long Hexagonal Head screw(Ref: ICF Drg. No. T-0-2-619 alt. t/12 (SN 30, Clause- 1005g (iii))
- 4.2 Reduction of brake head base plate width from 87 mm to 75 mm to avoid wheel flange rubbing is not being done (Ref: ICF- CAI No. B-2007 / 02 dt23.02.2007 (SN 44))
- 4.3 Intermediate wheel profiles of 26 & 28 mm are not incorporated.
- 4.4 LP sheet panel patches are also being provided at some locations to minimize extensive renewal work of LP sheets; however this is giving a very shabby look.
- 4.5 Wheel distance measuring gauge with 0.1 mm accuracy is not available. Also the dimensional checks are not recorded as per the format.
- 4.6 DP test is not being carried out on bearings, as stipulated, for detecting minute cracks.
- 4.7 Air Brake sub-assemblies are tested at 7 kg / sq.cm instead of 10 kg / sq.cm.
- 4.8 Window shutters are removed from the body shell on condition basis only as against the instruction that all the window units should be removed from coach during every 2nd POH.
- 4.9 Sliding doors of Upper classes and SLR Coaches are removed on condition basis only as against the instruction that all the sliding doors should be removed from coach during every POH.
- 4.10 Body main door Rubber sealing are replaced for 10 % of the coaches only.
- 4.11 Classification of welders into A & B categories has just been started; all the welders are yet to be classified.

4.12 Lower spring seat Testing - The cylindrical NO-GO plug gauge of 140.4 mm available now is not suitable to check the working area of the Lower Spring Seat which is about 100 mm below the edge. A suitable gauge to check the diameter at the working area inside the Lower Spring Seat need to be developed and used. Incidentally during the audit of KCG Depot, it was found that dashpot oil leak was excessive in many coaches.

Quality Assurance Directorate (Mechanical)
RDSO Lucknow
Check Sheet for Quality Audit of
Roller bearing, Wheels & Axles (ICF Wheels)
CAMTECH Maintenance Manual for BG coaches of ICF Design
and Technical Pamphlet C-7817

While doing the audit, ensure that the below mentioned activities are carried out as specified. Wherever the activities are not performed correctly indicate the method adopted or the nature of non-compliance.

SN	REQUIREMENTS	CLAUSE	OBSERVATIONS
1.	Check that wheel gauge (1600+2/-1) is being measured at 3 location 60° apart.	1001 c (ia)	Ensured. Measured with wheel distance gauge 1 mm accuracy at 3 locations 120° apart. Wheel distance measuring gauge with 0.1 mm accuracy is not available.
2.	Check that wheel dia is being measured with the help of trammel gauge with least count of 0.5mm or wheel dia measuring gauge of least count of 0.1mm. Check that wheel flanges are being checked with the help of wheel profile gauge and thickness and height of flanges is being measured. The difference in tread dia of the two wheels on the same axle permitted is 0.5mm max and this is being measured. Check that wheels turned out from wheel shop are according to shop issue sizes. ICF/BEML New-915 Shop issue-836 solid	1001 c (i) (b & d)	Measured with wheel diameter gauge with digital display of 0.1 mm accuracy. Wheel profile thickness and height being checked by worn wheel profile gauges with 25,27,29.4 mm flange thickness. Intermediate profiles of 26 & 28 mm not incorporated. 837 mm followed as per correction slip - 1.
3.	Check that each axles are being thoroughly cleaned for inspection & inspected for pitting, ovality, taper, ridges & ultrasonically as per RDSO procedure. Taper must not exceed – 0.015/0.01mm ● Out of roundness must not exceed- 0.015/0.02mm	1001 (i) (e)	Being done. visually inspected for pitting and ridges on the axle. Checked for ovality and taper with outside micrometer with digital display of 1 micron accuracy.
4.	Check that wheels are being categorised into following categories after pre-inspection. (i) Normal repair wheels. (ii) Wheels requiring replacement of Axle. (iii) Wheels requiring replacement of Wheel discs	1002	Ensured. Wheels are categorized as RA for Wheels requiring replacement of Axle and RD for Wheels requiring replacement of Wheel discs. Other wheels are categorized as normal repair.
5.	The wheel should be inspected for rejectable defects in accordance with CMI/K003.	1001 c (i) (c)	Pre inspection of wheels is carried out to identify CMI defects like shelled tread, heat checks, thermal cracks, spread rim

SN	REQUIREMENTS	CLAUSE	OBSERVATIONS
			and shattered rim. Profile turning is done for shelled tread and heat checks. wheels with defects like ,thermal cracks, spread rim and shattered rim are rejected.
6.	Check that wheels are being turned to WWP & machining standard is N11 to IS:3073.	C-7817	At present worn wheel profiles of 25,27,29.4 mm flange thickness is only followed. Intermediate profiles of 26 & 28 mm is yet to be implemented. surface finish tester is used to ensure the tread finish as per N11 standard.
7.	Check that when wheels sent for turning with roller bearings, a protective cover is provided.	C-7817	Yes, ensured.
8.	Check that new axles are being machined as per the correct drawing dimensions.	1003 b	Yes, being done.
9.	Check that dimensions of finished journals is being measured with micrometer at 3 points along length of the journal both on horizontal & vertical axis.	C-7817	Measured with outside micrometer with digital display of 1 micron accuracy at 3 points along length of the journal both on horizontal & vertical axis to check the dimensions.
10.	Check that axles are being given ultrasonic flaw detection test.	1001 c (e)	Yes, followed.
11.	Check that the bore & the wheel seats are having specified surface finish & correct interference fit and pressing in pressure interference allowed – 0.20 to 0.24mm Surface finish – 1.6 microns Pressing in pressure – 400 to 600 kg./mm dia of wheel seat.	1003	surface finish tester is used to ensure the wheel seat and wheel bore finish within 1.6 microns. Interference of 0.20 to 0.24mm is ensured. Pressing in pressure of 400 to 600 kg./mm dia of wheel seat is ensured.
12.	Check that after dropping of axle boxes and roller bearing dismounted, the journal dia is being checked and wheels are being ultrasonic tested for flaw detection.	1003	Yes, followed. UT is carried out for all the wheels.
13.	Check that cleaned wheel seat and bore on wheel is being lubricated with a mixture of basic carbonate white lead and boiled linseed oil in the proportion of 1.2 kg of white lead to 1 lt. of boiled linseed oil.	1003	Yes, ensured.
14.	Check that wheel press is equipped with a dial pressure gauge and pressure recording gauge with graph to record mounting pressure diagram and also is being recorded for each assembly.	1003	Wheel press is incorporated with computerized pressure graph recording system with digital display unit.
15.	Check that mounting particulars are being punched on journal face.	1003	Yes. Followed.

SN	REQUIREMENTS	CLAUSE	OBSERVATIONS
16.	Check that roller bearing shop is well laid out for easy work load and careful bearing handling and shop is having clean surrounding and dust free atmosphere and it has adequate equipment and facilities for repair.	1005	Wheel shop is going to be shifted to new bay for minimizing movements. The shop has adequate facilities for ensuring qualitative work.
17.	Check that : i) Only specified tools are being used for attention to the bearing. ii) Tools are being kept clean and placed on dry surface. iii) Bearings are being handled carefully and not being dropped. iv) Only cotton cloth, free from fluff is being used for bearing cleaning and it should be ensured that cotton waste is not used. v) Spare bearings are being stored in dry place and opened at the time of mounting only.	1007	Yes . All the points are being ensured.
18.	Check that all roller bearings must be cleaned, inspected and re-lubricated with fresh grease during each attention of wheel set / bearing in the shop.	RB' s guidelines	Yes being done.
19.	Check that bearings are being dismantled every alternate attention in the workshop for thorough inspection of components and renewal of felt ring.	RB' s guidelines	Yes being done.
20.	Check that exterior of axle boxes thoroughly cleaned.	1005 g (viii)	Yes being done.
21.	Check that : i) Grease with respect to its consistency, colour, contamination with water, foreign particles etc. is being examined. ii) Felt sealing ring and rear cover is being examined for damage. If found damage, bearings are being dismantled.	1005 d	Yes being ensured. Bearings are dismantled in case of discoloured grease, damaged rear cover even during IOH.
22.	Check that : i) Bearings are being thoroughly inspected after removing the grease for roller, cage, outer and inner ring, roller tracks of inner and outer ring of the bearing. ii) Radial clearance of the bearing in mounted condition is being measured.	1005 d	i)Yes being ensured. ii)Radial clearances in mounted condition is being measured and recorded.
	Dismounting of bearings and other components.		
23.	Check that bearings are being thoroughly cleaned in kerosene oil and petrol/white spirit and bearings are being inspected under concentrated light with a magnifying glass.	1005g 1006	Only kerosene is used for cleaning. Bearings are inspected under concentrated light with a magnifying glass.
24.	Check that bearings are being D.P. tested for	1006	DP test is not carried out but Zyglo

SN	REQUIREMENTS	CLAUSE	OBSERVATIONS
	checking of minute cracks.		testing is carried out for bearings of age more than 6 years.
25.	Check that defective parts are not being reclaimed and serviceable bearings are being kept in a dry, clean and dust free place.	1006	Yes being done.
26.	Check that axle box housing is thoroughly cleaned and being inspected for dimensions of bore and width of the box. Width of box is 216 ± 0.1 mm.	1005g (viii)	Axle box bore is checked with dial bore gauge of 1 micron accuracy. Width of the axle box is measured using Vernier calipers.
27.	Check that journal is being cleaned and inspected for conceity, ovality and dimensions, surface finish & cracks.	1001 c	Outside Micro meter with digital display of 0.001 mm accuracy is used for checking ovality and conicity. Surface finish is checked by surface finish tester. Visual inspection is carried for detecting cracks.
28.	Check that tapped holes of journal face are being checked for correct size and thread formation.	1008	Yes being done. Checked with thread plug gauge.
29.	Check that rear and front covers are being checked for cracks, dimensions & height of shoulders from the face.	1005g (vii)	Visually inspected for cracks and shoulder height is checked by RC and FC height gauges.
30.	Check that locking bolts are of correct size and of specified quality & are being inspected for any damage.	1005g (iii)	Locking bolts are checked with thread ring gauge. 40 mm long locking bolts are used instead of 50 mm long to ICF Drg No. T-0-2-619, alt-t.
31.	Check that retaining ring and ring are being inspected for flatness and dimensions.	1005g (iv)	Inspected for dimensions and checked for flatness in surface table.
32.	Check that dismantled collars are not being reused.	1005g (v)	No reuse of collars is ensured.100% new collars are used.
33.	Check that felt ring of dismantled box is not being reused and new felt ring is being fitted after proper treatment.	1005g (vi)	100% Felt rings are replaced after soaking in specified oil heated to 40 to 50 degrees for 30 minutes.
34.	Check that bearings are being heated in oil bath / induction heater before fitment in the temperature range of 100° C to 120° C and ensure that temperature of bearing does not exceed 120° C.	1006 b	Induction heater is used for heating the bearing at a temperature of 100 to 120 degrees. The heater has cycle time indicator and temperature indicator to ensure.
35.	Check that end locking bolts are being tightened with torque wrenches with specified torque value.	1005 d	12 kg-m is followed for M16 bolts .

SN	REQUIREMENTS	CLAUSE	OBSERVATIONS
	11 to 12 kgm for M16 bolts 15 to 16 kgm for M20 bolts.		
36.	Check that only specified quantity of grease is being used to pack the bearings. 2.0 kg for SKF make 1.75 kg for other makes.	1005 f	SKF bearings are being withdrawn from the service. For other makes specified quantity of grease is ensured by Volumetric containers.
37	Check that grease drums are being stored in vertical position in a covered space.	1005 f	Yes followed.

LIST OF TOOLS & PLANT FOR WHEELS & AXLES

S.N	M&P / Tools	Remarks
1	EOT crane 5 tonne	Available 5T -1 No 10T -2Nos
2	Wheel profiling lathe	2 Nos available
3	Axle journal turning and burnishing lathe	Available
4	Axle journal grinding machine for assembled wheel set	Not Available
5	Hydraulic wheel press with facility for mounting pressure diagram	Available
6	Axle turning lathe	Available
7	Vertical turning lathe	Available
8	Axle centering machine	Available
9	Axle end drilling machine	Available
10	Axle grinder	Not Available

LIST OF TOOLS & PLANT FOR ROLLER BEARINGS

S.N	M&P / Tools	Remarks
1	Automatic roller bearing cleaning plant with 3-stage cleaning of pre-wash, wash and hot water rinsing.	Available
2	Axle box cleaning plant with bosch tank and spray jet cleaning in closed chamber, having conveyor facility	Available
3	Axle box extractor	Available
4	Hydraulic dismounting equipment for direct mounted spherical roller bearing.	Available
5	Induction heater with demagnetising device	Available
6	Torque wrench and torque wrench tester.	Available

7	Feeler gauge set.	Available
8	Outside micrometer for journal and shoulder diameter measurement.	Available
9	Three legged inside micrometer with 0.05mm least count for inner race bore Measurement.	Available
10	Magnifying glass with light.	Available
11	Volumetric containers for grease.	Available
12	Thread ring gauges for end locking screw inspection.	Available
13	Thread plug gauges for end locking holes.	Available
14	Engraving/etching machine.	Available

Quality Assurance Directorate (Mechanical)
RDSO Lucknow

Check Sheet for Quality Audit of
BOGIE OVERHAUL
(Based on CAMTECH Maintenance Manual for BG coaches of ICF Design)

While doing the audit, ensure that the below mentioned activities are carried out as specified in the Coaching Maintenance manual. Wherever the activities are not performed correctly indicate the method adopted or the nature of non-compliance.

SN	ACTIVITY	CLAUSE	OBSERVATIONS
1.	Ensure that the bogies are washed with high pressure hot water jet to remove all the dust/dirt etc.	316a	100% bogies are cleaned by sand blasting.
2.	Ensure that all the components are dismantled as specified and sent to respective sections.	316b	Ensured.
3.	The bogie is checked for cracks. Also BSS bracket, axle guides, area surrounding the BSS brackets and axle guides and the welding joints of top and bottom Hangers of side frame are checked.	316c (i)	Yes. Checked.
4.	Ensure that down hand welding is ensured by using manipulator to repair the cracks.		Ensured.
5.	The BSS brackets or axle guides if worn/damaged or cracked are replaced.	316c (ii)	Yes. Worn out/misaligned axle guides/BSS brackets are replaced. Laser type measuring gauge is used to check the squareness / alignment of guides.
6.	Ensure that Safety wire rope arrangement and safety straps should be used for brake beams as per revised RDSO instructions.	316c (iv)	Safety straps are not used, safety wire ropes for brake beams are

SN	ACTIVITY	CLAUSE	OBSERVATIONS
			ensured as specified.
7.	Ensure that the squareness and alignment of BSS brackets and axle guides is checked using suitable gauges and relocated if necessary.	316c (v) 316c (vi)	Ensured. Calibrated gauges to check alignment of axle guides and BSS brackets are available. Gauge to check alignment of axle guide with respect to BSS bracket not available. Dimension checks are recorded in register. RDSO dimensional check report is not used.
8.	The axle guides should be attended for crack/worn threads.	316c (vii)	No thread type axle guide in service.
9.	Ensure that axle guides are welded with the help of welding fixtures.	316c (viii)	No welding fixture is available. Guide to be renewed is set with 3 alignment gauges and welded.
10.	The BSS bracket bushes and pins are replaced if damaged/worn.	316c (ix)	Yes. Checked and replaced.
11.	Ensure that anchor link brackets are replaced when worn/damaged and attended for M12 threaded hole.	316c (x)	Yes. Attended.
12.	Attention is paid to the brake hanger as specified.	316c (xi) 316c (xii)	Yes. 42 dia. Hole checked with NO GO gauge and Magnaflux testing done to check for crack. All the hangers are sand blasted.
13.	The bolster is checked for twist/cracks and corrosion etc. and repair/replaced.	316d	Yes. Bolsters are checked for twist.
14.	Ensure that the equalising stay brackets are repaired/replaced if necessary. Ensure that the various components i.e. the anchor link bracket, bushes in the stay rod bracket, centre pivot sleeve and bolster centre pivot sleeve is replaced/repared if found worn/damaged/cracked/corroded.	316f 316e	Yes. Corroded equalizing stay brackets on bolsters and Lower Spring Beams are replaced. Other components are attended as required.
15.	Ensure that centre pivot silent block and it's sealing cap is replaced if found torn/damaged/ perished.	316d (v) 316d (viii)	Ensured.
16.	Centre pivot pin is checked for choke lest and detection of cracks.	316d (ix)	Chalk test done to detect cracks
17.	Ensure that force fit between salient blocks and sleeve and tolerances on pivot pin is maintained in every POH/IOH.	316d (x)	Ensured.

SN	ACTIVITY	CLAUSE	OBSERVATIONS
18.	Ensure that side bearers are attended to as specified.	316d (xi)	Ensured.
19.	The locations where the repairs have been carried out or corroded are clean to bare metal and painted.	316d (xiii)	Black enamel paint is applied in lieu of black japan.
20.	The anchor links are replaced if worn/corroded or repaired if found cracked and tested by magna flux method.	316e (i)	Anchor links are replaced if corroded / cracked. Anchor links are not tested by magnaflux method.
21.	Ensure that the salient block is attended for rubber as well as force fit.	316e (ii)	Old design Silent blocs are replaced by 100 % while injection molded silent blocs are replaced on condition basis.
22.	Ensure that the equalising stay rod and pin are attended as specified.	316 f	Yes. Calibrated snap gauges are available.
23.	Clean the BSS hangers and check for cracks and wear. The hangers are replaced if wear exceeds 1mm.	316 h (i)	Yes. Complied with.
24.	Ensure that the magna flux crack detection equipment is used for checking the cracks.	316 h (i)	Ensured.
25.	Ensure that the repair to BSS hangers is done as specified.	316 h (ii)	No repair is carried out on BSS hangers.
26.	Hanger blocks are checked for cracks by magna flux test and worn hangers blocks are built up by using 2B electrodes and machined to size.	316 i	Visually checked for cracks, worn out hanger blocks are condemned and not built up by welding.
27.	Ensure that all the components i.e. upper and lower rubber washer, packing rings, guide rings, dust shield, guide bush dust shield spring and spring clip are replaced.	316j (ii)	Packing rings, circlip, guide bush and guide ring are must change items. Dust shield , dust shield spring , Hytrel upper and lower washers are reused on condition basis.
28.	The lower spring seat is checked and replaced/reclaimed if necessary.	317	The cylindrical “ NO-GO ” plug gauge of 140.4mm available now is not suitable to check the working area of the LSS which is about 100 mm below the edge. A suitable gauge to check the diameter at the working area inside the LSS to be developed and used.
29.	The springs are cleaned thoroughly in Bosch tank.		Yes, being ensured.
30.	The springs are inspected by magna flux/chalk test to detect cracks.		Springs are inspected by magnaflux test to detect cracks

SN	ACTIVITY	CLAUSE	OBSERVATIONS
31.	Each spring is subjected to incremental load as specified.		Yes, being ensured.
32.	After load deflection, the springs are painted.		Yes, being ensured.
33.	The springs are grouped into three groups as per deflection.		Yes, being ensured.
34.	Ensure that brake levers/bushes are replaced.	318	Brake levers are replaced on condition basis. Bushes are replaced as must change item.
35.	The components of brake gear such as worn brake beams, brake head shoes, brake gear pins are replaced/repared.		No repair is carried out on brake beams/brake heads. Brake gear pins are checked and replaced.
36.	The brake gear pins should be used which are case hardened, crown finish and chromium plated.	318	Pins to RDSO drg No. 93186.
37.	Ensure that maximum permissible clearance between brake gear pins and bush is 1.5mm.		yes ensured.
38.	All the brake gear components are given two coats of red oxide primer, 4 coats of bituminous solution and one coat of anti-corrosive black paint.		Only red oxide coating followed by black enamel paint.
39.	Ensure that a sub, store is available in the shop to ensure supply of proper components and sub assembly for bogie assembly.	319a	Ensured.
40.	Ensure that during assembly cotters are splitted min.mm.45” and not slack in the pins modified levers hanger pins are used to prevent the bush working of the lever hanger.	319b (ii)	Cotters are splitted to min 90 degrees. Modified levers hanger pins are used to prevent the bush working of the lever hanger.
41.	Ensure that while tightening guide cap guide bush sits tight against the rubber packing ring and holes, in the guide are in alignment with corresponding holes in the guide bush.		Guide cap type guides are not in service.
42.	Ensure that the wheel sets are selected in such a way that the variation in the diameter of the wheels in the same bogie and in the same coach does not exceed the specified limits.	319d (i)	Ensured.
43.	The assembled bogie should be load tested on a bogie test stand where it is lowered up to its normal working load and height of the bolster top surface from rail level should be measured for comparison with pre-determined dimension corresponding to correct coach buffer height.	319d (v)	Only 2 bogies against 12 bogies per day are load tested.
44.	Ensure that maximum modifications to different bogie components issued by RDSO are carried out during	Appendix D	1. All the bogies are modified with provision of stopper for brake hanger

SN	ACTIVITY	CLAUSE	OBSERVATIONS
	POH.		pins on bogie head stock. 2.Standardization of 16T equalizing stays is done. 3.All cap type guides are changed to circlip type guides. 4. ICF CAI No. B-2007 / 02 dt23.02.2007 - Reduction of width of brake head base plate from 87 mm to 75 mm is not done to eliminate wheel flange rubbing.
	<u>SHOCK ABSORBERS</u> :		
1.	Ensure that shock absorber are given POH when the capacity is beyond $\pm 20\%$ of the specified value on after 4 lakhs kms or alternate POH which ever is earlier.	319f	Yes , being ensured
2.	The shock absorber is tested to measure its capacity in both tension and compression by developing the existing force at a velocity of 10cm per sec.		Yes , being ensured
3.	Ensure that the shock absorbers are properly painted covered and stamped.		Yes , being ensured

LIST OF TOOLS & PLANTS FOR BOGIES

<u>LIFTING SHOP</u>	
Ball pein hammer	Available
Chisel	Available
Spanner	Available
<u>WASHING PLANT</u>	
Bosch tank	Not Available
Hot water jet system	Not Available
Waste water treatment plant	Not Available
Bins and pallets	Available
Jib crane	3 overhead cranes available, 30 tons each,
Fork lift	Two Available
Platform truck	Two Available
<u>BOGIE SHOP</u>	
Ball pein hammer	Available
Chisel	Available
Standard spanner set	Available
Welding transformer	Available
Gas cutting plant	Available
Bogie alignment gauges	Available
Spring testing machine	Available

Magna flux crack detector	Available
Paint brushes	Available
Floor scraper	Available
Platform truck	Available
Bogie test rig working stands	Available
Overhead crane	3 cranes available- 15, 10, 7.5 tons,
Bins and pallets	Available
Fork lift	Available
FITTING SHOP	
Ball pein hammer	Available
Chisel	Available
Welding transformer	Available
Gas cutting plant.	Available
Hydraulic press	Available
Measuring gauges	Available
Centre lathe	Available
Brake beam endturning m/c.	Not Available
Electrode heater	Available
BSS hanger testing machine	Available
Bins and pallets	Available
Fork lift	Available
Platform truck	Available

Quality Assurance Directorate (Mechanical)
RDSO Lucknow
Quality Audit of Maintenance for Brake Block Hanger for ICF coaches
Based on CAMTECH Maintenance Manual for BG coaches of ICF Design
& RDSO STR C9808 (Rev 2)

SN	Requirements	Observations
1	Railway must conduct audit checks on the new supply of brake hanger received by them and should maintain records	Ensured. Dimension check, CMT Lab test , fitment test are conducted on the new supplies.
2	Hanger should be removed from coaches during POH/IOH. They should be cleaned and checked visually for cracks, distortion or excessive corrosion. Hanger found serviceable should be <ul style="list-style-type: none"> • Checked for wear on the bore of the hole with the help of a plug gauge. • Magnaflux / chalk tested for any cracks before they are put into service. 	ensured ensured

Other observations:

1. TSO / LTO / Work instruction on maintenance of brake block hanger : TSO No. 4 / 99 , amendment – 1 dt 06.12.01 is available and being followed.
2. Rejection of brake block hanger: 27.7 %
3. Average POH/IOH attention: 6 POH & 4 IOH .coaches.
4. Procurement during last three years is as under:

Year	Total procurement
2006 -07	
2007 -08	
2008 -09	
2008-09	
2009 -10	Data Not available

5. Procurement status of brake block hanger as per revised drawing:

Year	Total procurement

2010-11	5700
2011-12	6263

6. Details of brake block hangers checked and rejected are detailed as under:

Month	BB hangers checked	Passed	Rejected	% rejection	Cause of rejection		
					Dimension	Pitted	M/flux
April 2011	2420	2085	335	13.8 %	280	---	55
May 2011	1821	1482	339	18.6 %	277	--	62
June 2011	2542	2122	420	16.5 %	326	--	94
July 2011	3475	2666	809	23.2 %	532	---	277
Aug 2011	2744	2024	720	26.2 %	534	---	186
Sep 2011	2700	1820	880	32.6 %	645	---	235
Oct 2011	1998	1404	594	29.7 %	515	---	79
Nov 2011	2820	1748	1072	38.0 %	914	----	158
Dec 2011	2012	1100	912	45.3 %	794	---	118
Jan 2012	1656	1004	652	39.3 %	566	---	86
Feb 2012	2435	1842	593	24.35 %	585	--	08
Mar 2012	2638	1861	777	29.45 %	740	---	37

7. Last quality audit done (internal): ISO External quality on 20.04.2012.

8. Other observation:

**Quality Assurance Directorate (Mechanical)
RDSO Lucknow**

Quality audit of air brake system

(Based on Maintenance Manual G-97 of Air Brake System for Freight Stock as well as Chapter 4 of CAMTECH Maintenance Manual for BG coaches and Chapter 8 of CAMTECH Maintenance Manual for Wagon)

(Ref :- CAMTECH Coaching Maintenance Manual)

SN	Requirements	Clause	Remarks
1.0	Distributor Valve (Annexure-I of G-97).		
1.1	Check that dismantling/assembly of DV assembly and Pipe bracket is being done as per maintenance manual of respective manufacturer.	2.1 of G 97	Yes, being done
1.2	Check that all the components have been replaced of POH kit irrespective of condition.	2.2 of G 97	Yes, being done
1.3	Check that DVs have been tested for all the parameters as given in their format on a test bench.	3.1 of G 97	Yes, being done
1.4	Check that pipe bracket is being tested for leakage with 10 kg/cm ² air pressure.	3.2 of G 97	Not done
1.5	DV of BOBRN/BOBR wagon shall be tested for parameters as covered in Annexure – XII	3.3 of G 97	NA
1.6	The distributor valves not meeting any of the requirement must be attended as per procedure covered in manufacturer maintenance manual and retested for all parameters.	3.4 of G 97	Yes , ensured
1.7	Check that overhauled DVs are being stenciled as below (i) Workshop & Railway. (ii) Month & Year. (iii)	4 of G 97	Yes, being done
1.8	Check that overhauled and tested DVs are being stored in a clean & dry place.	5 (I) of G 97	Yes, being done
1.9	Check that all inlet points of DV & pipe bracket are covered with protective cap.	5(II) of G 97	Yes, sticker provided to cover inlet points instead of protective cap.
1.10	Check that specified tools are available for DV repair.	6	Yes, specified tools are available.

SN	Requirements	Clause	Remarks
		of G 97	
1.11	Check that overhauling is being done by trained persons	8 of G 97	. Yes, being done by trained persons
2.0	Brake Cylinder (Annexure-II of G-97)		Not applicable since this is pertaining to Underframe mounted brake cylinder.
2.1	Brake cylinder is dismantled as specified with correct tools	2.0 of G 97	
2.2	Check that all the components of brake cylinder have been thoroughly degreased and cleaned.	2.1.8 of G 97	
2.3	Check that all the components have been thoroughly inspected for damage, cracks or welding, dent etc and ensure that damaged components have been replaced.	2.1 & 2.2 of G 97	
2.4	Check that release springs have been checked for their free height. (610mm min.)	2.2 of G 97	
2.5	Check that following components have been replaced and available in adequate nos. (i) Piston Packing (ii) Wear ring (iii) Bush	2.3 of G 97	
2.6	Check those small amounts of grease have been applied before assembly. Brake cylinder is assembled as specified with correct tools.	2.4 of G 97	
2.7	Check that strength test of cylinder with 10 kg/cm ² is being carried out.	3.1 of G 97	
2.8	Check that pressure tightness test is being carried out as per procedure.	3.2 of G 97	
2.9	Check that brake cylinders are being painted with black enamel.	4 of G 97	
2.10	Check that overhauled brake cylinders are being stored in proper way and inlet and outlet parts have been plugged with protective cap.	5.1.2 of G 97	
2.11	Ensure that a test stand is available for brake cylinder testing	6 of G 97	
2.12	Avoid damage to piston packing by dull edge thin bladed tool.		
3.0	Dirt-collector (Annexure-III)		
3.1	Check that all parts are being cleaned properly.	2.2 of G 97	Yes, being done
3.2	Check that Gasket & Leather washer is being renewed.	2.3 of G 97	Yes, being done

SN	Requirements	Clause	Remarks
3.3	Check that all the parts are being inspected for damage including filter.	2.4of G 97	Yes, being done
3.4	Check that dirt collector are being tested on test stand with the air pressure of 10 kg/cm ² .	3of G 97	Yes, being done with air pressure of 7 kg/ cm ² .
3.5	Check that overhauled dirt collectors are being stored in a dry & clean space and inlet & outlet parts are being plugged with protective cap.	5 of G 97	Yes, stored in a dry & clean space and inlet & outlet parts are being plugged with polythene tapes.
4.0	Angle Cock (Annexure-IV)		
4.1	Check that all the components are being cleaned properly.	2.2 of G 97	Yes, being done
4.2	Check that 'O' ring & seat are being renewed irrespective of condition.	2.3	Yes, being done
4.3	Check that all the components have been inspected for any damage.	2.4of G 97	Yes, being done
4.4	Check that spring is being checked for tension and also for dimension (12mm).	2.4.5of G 97	Yes, being done
4.5	Check that angle cock is being tested on a test stand with air pressure of 10 kg/cm ² .	3of G 97	Yes, being done with air pressure of 7 kg/ cm ² .
4.6	Check that overhauled angle cocks are being stored in a dry and clean space.	5of G 97	Yes, stored in a dry & clean space
4.7	Check that inlet & outlet parts are being plugged with protective caps.	6	inlet & outlet parts are being plugged with polythene tapes.
5.0	Auxiliary Reservoir (Annexure-V)		
5.1	The auxiliary reservoir should be overhauled in every POH. Check that auxiliary reservoir is being cleaned from outside and inside with wire brush and dry air jet after properly draining.	2.1 of G 97	Yes, being done.
5.2	Examine for visual damages. The auxiliary reservoir having deep cuts on surfaces may be rejected.	2.2 of G 97	Yes, being ensured.
5.3	Check that rust preventive is being applied from inside surface of reservoir.	2.3of G 97	No
5.4	Check that reservoir is being painted with black enamel from outside.	2.4of G 97	Yes, being done
5.5	Check that leather washer is being replaced irrespective of condition.	2.6of G 97	Yes, being done
5.6	Check that Teflon tape is being used over drain plug for making leak proof joints.	2.7 of G 97	Yes, being done
5.7	Check that reservoirs are being tested with 10 kg/cm ² hydraulic & air pressure for leakage.	3of G 97	Yes, being done with air & hydraulic pressure of 16kg/ cm ² .

SN	Requirements	Clause	Remarks
5.8	<p>The auxiliary reservoir should be stored in such a way to prevent the following:</p> <ul style="list-style-type: none"> a) Damage due to hitting each other. b) The flange surface should be prevented from damages. c) Outside paint should not be damaged. <p>Check that parts are being plugged with protective caps</p>	5 of G 97	Yes, being done with polythene tapes.
6.0	Hose Coupling (Annexure-VI)		
6.1	Check that hose coupling is being thoroughly inspected for any damage, corroded and ensure that damaged hose are not being used.	2 of G 97	Yes, being ensured.
6.2	Remove the gasket and thoroughly clean the coupling head specially the internal groove for housing gasket.	2.3 of G 97	Yes, being done
6.3	Check that hose coupling are being tested for leakage at the air pressure of 10 kg/cm ² .	3 of G 97	Yes, being done.
6.4	Check that hose coupling are being stored at dry & clean space and outlet & inlet parts are being plugged with protective caps.	5 of G 97	Yes, being done
7.0	Guards Emergency Brake Valve(Annexure-VII)		
7.1	Check that valves are being properly cleaned with the help of wire brush.	2.1of G 97	Yes, being done
7.2	Dismantle the valve completely as per manufacturer's procedure.		Yes, being done
7.3	Check that 'O' ring & sealing ring are being replaced.	2.3 of G 97	Yes, being done
7.4	Check that valves are being tested in accordance with manufacturer's	3of G 97	Yes, being done
7.5	Check that overhauled valves are being stored properly and inlet & out parts are being plugged with protective caps.	5of G 97	Yes, being done with polythene tapes
8.0	Isolating Cock (Annexure-VIII)		
8.1	Check that isolating cocks are being overhauled and tested in accordance with manufacturer's maintenance manual.	2&3 of G 97	Yes, being done
8.2	Check that equipment for testing is available.	4	Yes, being done
8.3	Check that repaired valves are protected from dust & moisture.	5	Yes, being done

SN	Requirements	Clause	Remarks
9.0	Pipes, Joints & Support bracket (Annexure-X)		
9.1	Check that gasket is being removed from flange joints and old one is scrapped.	2.1of G 97	Yes, being done
9.2	Check that pipes & joints are being cleaned from outside.	2.2of G 97	Yes, being done
9.3	Check that pipes & joints are being cleaned the inside by jet of dry air & all dirt and other particles are being removed.	2.3 of G 97	Yes, being done
9.4	Check that gaskets grooves of flange joints is being properly cleaned.	2.6of G 97	Yes, being done
9.5	Check that pipe is painted from outside.	2.8of G 97	Yes, being done
9.6	Check that pipes & joints are being re-cleaned by dry air at least 5 minutes.	2.9of G 97	Yes, being done
9.7	Check that ends of the pipes are being plugged with protection caps and are being only removed at the time of fitment.	2.10 of G 97	Yes, being done with polythene tapes
9.8	Check that testing of the pipe is being done with 10 kg/cm ² dry air pressure before removal and after refitment.	3of G 97	Yes, being done with air pressure of 7 kg/ cm ² .
9.9	Check that removed pipes are being kept in set and are being fitted on same wagon.	5 of G 97	Not applicable
9.10	Check that all gasket are being renewed.	6of G 97	Yes, being done
10.0	Others:		
10.1	POH kit for C3W and KE design DV as listed in annexure XIII/1 & 3 are stocked at depot	G 97	POH kit for C3W and KE design DV are stocked.
10.2	POH kits of other air brake components as listed in annexure are stocked at depot.	G 97	POH kit for other air brake components are stocked.
11.0	Slack adjuster		Not Applicable since Underframe brake cylinders are not used.
11.1	Overhauling facility for slack adjuster is available and all Tools & equipments are available.	812 (C)(a) CAMTEC H	Not Applicable
11.2	The slack adjuster shall be overhauled at the time of POH of rolling stock. While dismantling or assembling it is essential to use special tools . Each component of slack adjuster shall be examined. Worn out parts shall be checked according to the limits.	812 (C)(b) CAMTEC H	NA
11.3	Any spring which does not conform to the requirements should not be used.	812 (C)(b)-I	NA

SN	Requirements	Clause	Remarks
		CAMTEC H	
11.4	During POH must change items as per G-92 should be replaced	812 (C)(a)-II CAMTEC H	NA
11.5	After cleaning and inspection, all parts of slack adjuster should be coated with semi fluid grease SERVOGEM-2 or equivalent before undertaking re-assembly	812 (D) CAMTEC H	NA
11.6	The following should be ensured: a) The place of overhauling must be clean and free from dust. b) Ensure that no foreign matter/particle remain inside the subassemblies during re-assembly c) All rubber gasket, sealing ring, washers must be replaced during overhauling. d) Specified tools and fixtures be used for disassembly and assembly operations.	812 (E) CAMTEC H	NA
11.7	After overhauling, the testing of slack adjuster is carried out in a test rack for take up (Pay in test) and Pay out test	812 (F) CAMTEC H	NA
11.8	The slack adjuster is given a coat of anti-corrosive paint, excluding the adjuster tube 41	812 (G) CAMTEC H	NA
11.9	A & e dimension are adjusted correctly during brake rigging setting.	812 (H) CAMTEC H	NA
12.0	Passenger assembly alarm signal device for coaches (Chapter IV of CAMTECH)		
12.1	The passenger emergency alarm signal device should be completely dismantled and overhauled during every POH	419a	Yes, being done
12.2	The tools and fixtures required for overhauling of PESD are available.	419b	Yes, available.
12.3	The passenger emergency alarm signal device after removing from the coach should be disassembled as specified	419c	Yes, being done
12.4	Cleaning of Parts	419d	

SN	Requirements	Clause	Remarks
	<ul style="list-style-type: none"> ✓ Clean all the metallic parts using kerosene or equivalent solvent. ✓ Dry all the components using low pressure compressed air. ✓ Ensure smooth scratch less finish of the bore for the displacement of the piston assembly. 		Yes, being done
12.5	Replacement of Parts <ul style="list-style-type: none"> ✓ Inspect all moving parts for abnormal wear, tear, crack and deformation. ✓ Replace the part if found defective. ✓ Replace the 'O' ring and other rubber parts. ✓ Replace the spring of ramp in case of cracks, kinks or permanent set. ✓ Replace damaged threaded screws 	419e	Yes, being done
12.6	Assembly <ul style="list-style-type: none"> ✓ To assemble the passenger emergency alarm signal device follow the instruction for disassembly in the reverse sequence. ✓ Lubricate the pivot, roller and moving parts and ensure smooth operation of the components. 	419f	Yes, being done
12.7	Passenger emergency alarm signal device are tested for leakage test and functional test as specified. Test bench is available.	419g	Test bench available and being done.
13.0	Passenger emergency alarm valve (PEAV) (Chapter IV of CAMTECH)	420 of CAMTECH	
13.1	For effective and reliable functioning overhauling should be done every POH	420a	Yes, being done
13.2	Tools and fixtures as specified for overhauling are available.	420b	Yes, being done
13.3	PEAV is overhauled as per specified procedure.	420c & d	Yes, being done
13.4	During scheduled overhauling all rubber and rubber bonded parts should be replaced	420e	Yes, being done
13.5	Passenger emergency alarm valve are tested for electric test, leakage test and functional test as specified. Test bench is available.	420g	Yes, being done
14.0	Check valve (Chapter IV of CAMTECH)	421 of CAMTECH	

SN	Requirements	Clause	Remarks
14.1	The check valve with choke is completely dismantled and overhauled once in every POH	421	Yes, being done
14.2	Tools and fixtures as specified for overhauling are available.	421a	Yes, being done
14.3	Check valve is overhauled as per specified procedure	421b	Yes, being done
14.4	Replacement of Parts <ul style="list-style-type: none"> ✓ Replace all rubber parts. ✓ Replace the spring if it has kinks or crack mark or if the spring has lost its stiffness or is heavily corroded. ✓ Replace the choke of 3mm if screwing slot is damaged or threads are heavily corroded. ✓ Inspect the valve seat of body for any minor scratch and lap the seat to remove such scratch marks. 	421b (iii)	Yes, being done
14.5	After overhauling fix the check valve with choke on the test bench and test as per procedure.	421b (v)	Yes, being done
15.0	ISOLATING COCK (Chapter IV of CAMTECH)	422	
15.1	The isolating cocks are to be completely dismantled and overhauled once in everyPOH	422	Yes, being done
15.2	Tools and fixtures as specified for overhauling are available	422a	Yes, being done
	Isolating cocks are overhauled as per specified procedure Replace all rubber parts and gland packing etc	422b	Yes, being done
	After overhauling isolating cocks are tested on the test bench as per procedure.	422c	Yes, being done

	Bogie mounted Brake Cylinder	608	
	Brake cylinder is dismantled as specified with correct tools	608 f	Yes, being ensured.
	Wash all the parts in suitable cleaning fluid and wipe them carefully. Inspect pawls, Pawl housing ring, ratchet, tooth rollers, roller plate, thrust washer for wear and damage. Inspect threads of ratchet with adjusting screw and adjusting tube for the possible damage. Replace packing. Check all the springs for possible corrosion and distortion. It is	608 g	Yes, being ensured. OHK available and used.

	advisable to change the springs on every POH. Give all other parts a thorough visual inspection to detect apparent defects. Replace worn or damaged parts.		
	Brake cylinder is assembled as specified with correct tools	608 h	Yes , being ensured.
	Brake cylinder Testing procedure- Leakage test & operation test to be done as specified.	608 i	Yes , being ensured.
	Important Instructions for Reassembling the Brake Cylinder at the Workshops-as specified	608j	Yes , being ensured.

Quality Assurance Directorate (Mechanical)

RDSO Lucknow

Check Sheet for Quality Audit of Interior fittings (Furnishings)

(Based on Chapter 11 of CAMTECH Maintenance Manual for BG coaches of ICF Design)

While doing the audit, activities are checked with regard to as specified in the maintenance manual. Wherever the activities are not performed correctly, the method adopted is indicated or the nature of non-compliance is recorded.

SN	Requirements	Clause	Observations
1.0	Interior fittings such as panels, seats, berths, windows, lights, fans, sanitary fittings, etc. should be furnished as per Rly/RDSO standard for various types and classes of vehicle.	1101	Complied. LP Sheet panel, Rexine, Cushion, Compreg Flooring , Vynatile flooring, windows, and all other fittings are procured and fitted as per RDSO / ICF - Instruction / drawings / specification.
2.0	Amenity Fittings – Various passenger amenities fittings should be provided as per table no.11.1 of Chapter 11 of CAMTECH manual	1102	All the Passenger Amenities are provided as per CAMTECH Correction slip –1 of 07 / 2006 –
3.0	Plastics, FRP and various other synthetic materials are now a days used which are light in weight and requires less maintenance and give better aesthetics. Status of implementation during POH	1103	FRP window units comprising FRP glass shutter, louver shutter, banjo shutters are used. Litter bin used in AC Coaches.
3.1	Roof Paneling Sheet: 2 mm thick limpet asbestos sheet or 1.5 mm thick NFTC should be used.	1103a	Yes, being ensured
3.2	Side Wall Paneling: 3 mm thick thermosetting synthetic resin bonded decorative LP Sheets (C-9602) should be used.	1103b	3.0 mm thick to RDSO specification-CK –514 is used.
3.3	Use of other Plastic Materials : <ul style="list-style-type: none"> • SMC moulded window shutters, Wall protector and Axle box cover • Plastic Push Cock made of HDPE, PTMT and acetal material.. 	1103c	SMC moulded (FRP) window shutters only are procured and fitted. Plastic push cocks are not used. Only aluminium self closing Jayson cocks are used.
4.0	Attention in Workshop : <ul style="list-style-type: none"> • Inspect interior fittings for corrosion and damage, Missing, defective fittings should be refitted/repared. • All distorted/damaged panels should be replaced. No patch work allowed. While replacing the panels, care should be taken to match the colour and design. • After 5-7 years while attending corrosion on the roof sheets, deficient/damaged insulation should be 	1103d	A) Complied. - B) In some locations Patchwork is also done to avoid extensive renewal of LP sheets.

SN	Requirements	Clause	Observations
	replaced.		C) yes, being done
5.0	Anti Pilferage Measures: To prevent theft, anti pilferage measures should be taken as advised by CME or RDSO.	1103e	1. Anti pilferage Device cover sheet for Lavatory Banjo shutters (ICF/SK-5-5-024) are provided in all the Non AC Coaches. 2. No other anti pilferage measures carried out since there is no instruction and also no Complaint of Theft problem.
6.0	Window	1104	
6.1	Window of non-AC coaches – <ul style="list-style-type: none"> • Check balancing mechanism of glass shutter from dripping. • Check spring loaded safety latch to prevent Louvre shutter from falling 	1104a	Complied Complied
6.2	Window of AC Coaches : Sealed windows of both ICF or RCF design should meet the following requirement: 5.5 / 6 mm thick toughened safety glass (IS2553, Part-II) are used in window. A reflective sun control film of smoke grey colour is pasted on inside surface of outer glass.	1104b	Complied
6.3	Emergency openable window – It is provided as 4 nos. in Non AC coaches (3 rd window from both end). 2 nos. in AC coaches (3 rd window from both end)	1104c	Complied-
6.4	Lavatory Windows of Non AC coaches – FRP banjo type windows frosted glass are fitted in lab.	1104d	Complied
6.5	Lavatory windows of AC coaches – Sealed type windows with frosted glass are fitted in lavatory of AC coaches.	1104e	Complied
6.6	Maintenance of AC windows in workshops – <ul style="list-style-type: none"> • Replace broken, cracked, defected or scratched window. • Glass should be cleaned with lime and detergent before fitting. • The hinges of inner window frame should be checked well oiled before fitting. • The rubber beading between window and coach body should be replaced if found set, deteriorated or damaged to ensure air tightness. • The damaged FRP inner frames / holding frame should be replaced. 	1104f	Complied
6.7	Maintenance of windows of non-AC coaches in workshops – <ul style="list-style-type: none"> • All windows shutters should be fully removed from body shell at every 2nd POH or when found defective during pre-inspection. • When windows are not removed, the shutters should be checked for easy working by lifting and lowering them check, safety catches, rubber 	1104g	a) window shutters are removed from the body shell only for renewal of damaged glass / louver shutters or Unit. No complaints received. b) Easy working of shutters by lifting and lowering is ensured, c) Wire gauze shutters are not

SN	Requirements	Clause	Observations
	<p>channels.</p> <ul style="list-style-type: none"> • The entire window assembly should be dismantled and shutters removed. Broken or cracked glasses should be replaced with toughened glass. • Holes in the frames for safety catches, which have become oblong should either be plugged and re-drilled. • Torn, rusted or deteriorated wire gaze should be replaced by proper galvanized wire mesh. • The shutter should be checked for easy working in grooves after rubber channels are replaced. Balancing mechanism for the shutter should be dismantled and repaired. • Spring tension should be correctly adjusted such that the shutter can easily be lifted and positioned wherever required. • The wire gauge should be cleaned with a wire brush and blown with compressed air. • On body side door windows of Non AC coaches safety bars should be provided. 		<p>available.</p> <ul style="list-style-type: none"> d) Spring tension is correctly adjusted such that the shutter can easily be lifted and positioned. e) On body side door windows of Non AC coaches safety bars are already provided.
7.0	FLOOR	1105	
7.1	<p>Flooring arrangement in a coach – The flooring in a coach consists of a <u>compreg</u> sub-floor covered with PVC sheet. It should be done as per proper ICF drawing.</p>	1105b	Complied
7.2	<p>Material description</p> <ul style="list-style-type: none"> • 12 mm thick <u>compreg</u> floor board as per RDSO Sp. No.C-9407 (Revised) type-II should be used whenever floor boards of complete coaches require replacement. • When only part of the floor is to be replaced, repair to floor should be carried out by using plywood to IS-303-1975 Grade-A fully treated for protection against fungi, termite, marine bores and other insecticides and requirement of preventive treatment to IS:5539. • PVC flooring – 2 mm thick homogeneous vinyl flooring as per RDSO sp.no. C-8515 (Rev 2). Alternatively PVC flooring as per revised specification RDSO/2006/CG12 (Rev1) to be procured. • Adhesive – Neoprene based rubber adhesive of Dunlop S-758 or Fevicol SR-998 make or equivalent quality. 	1105c	<p>A)Only 12 mm thick <u>compreg</u> floor board as per RDSO Sp. No.C-9407 (Revised) type-II is used for coach flooring.</p> <p>B) 19 mm Plywood to IS-303 is not used.</p> <p>C) PVC Vinyl flooring – 2 mm thick to RDSO sp.no.RDSO/2006/CG12 (Rev1) and CK 604 is used.</p> <p>Adhesive – non-flammable solvent based adhesive to ICF / M / D Spec 093 is used.</p>
7.3	<p>Attachment & Fixing</p> <p>i) Laying procedure for sub flooring</p> <ul style="list-style-type: none"> • 12mm thick compreg floor board as per RDSO sp.no. C-9407 (Revised) type II should be laid properly in level to the cross member/trough floor. Compreg sheet should be coated with water sealing compound to Sp.no. IS:7084-1973. • Drill holes on the compreg floor board and cross member/trough floors and should be fixed by self tapping counter sunk screw as per drgs. • Any gap between compreg floor board should be filled with epoxy putty. Try to minimize the gap. 5 kgs of epoxy putty should be prepared as under: French Chalk - 2.1 kg Resin HSK - 2.1 kg Acetone commical - 0.4 kg Accelerator - 0.2 kg 	1105d	<p>A) complied</p> <p>B) complied</p> <p>C) all purpose putty is being used.</p>

SN	Requirements	Clause	Observations
	<p>Catalyst <u>- 0.2 kg</u> Total 5.0 kg</p> <ul style="list-style-type: none"> • The self tapping screw head should also be leveled by applying epoxy putty. • The coach floor should be swept and cleaned thoroughly before laying the PVC floor sheets/rolls. <p>ii) Laying of PVC Flooring</p> <ul style="list-style-type: none"> • PVC roll/sheet should be opened on half the width of coach and should be left for 30 to 40 minutes to enable it to lie flat on the floor. • Proper marking the position of pillars, seat frame etc on the PVC and cut neatly around the pillars and frames. • The roll should be folded half way and spread a thin and even layer of adhesive (Dunlop S-758 or Fevicol SR-998 make or equivalent) on the compreg sub-floor. • Adhesive should also be applied on the rough reverse side of PVC flooring thinly and evenly. • Approx. 30 minutes should be allowed for solvent evaporation to prevent solvent vapours being entrapped. • No welding operation should be allowed during laying of PVC as adhesive is flammable agent. • After adhesive work of 1st roll is over, apply pressure with a steel roller of 25 kgs to obtain perfect adhesion between PVC flooring and compreg sub-floor and also to eliminate air being entrapped. • The 2nd roll should be laid in position overlapping the 1st sheet by about 5 to 10 mm while spreading the roll, it should be ensured that the cuts on PVC flooring match with pillars or partition and seat frames. <p>iii) Thermo – welding (Hot Air Welding) Proper thermo welding of PVC flooring is necessary for obtaining satisfactory bonding/results.</p> <p>iv) Grooving A grooving tool (hand or automatic) along with a straight edge/scale should be used to groove the butting edges of the seam to approximately two third of the thickness of the wear layer of PVC flooring.</p> <p>v) Welding Seams should be thermo welded with a hot air gun using flexible transparent vinyl welding cord.</p> <p>vi) Trimming When the weld has cooled to room temperature, it should be trimmed off flush to the surface of the material with a trimming spatula.</p>		<p>Laying of PVC Flooring is ensured as laid down.</p>
7.4	<p>Lavatory Flooring The cracked damaged or worn out PVC sheets should be removed and a new single piece PVC sheet should be pasted over stainless steel inlay. No patch work should be done in the lavatory flooring.</p>	1105e	Complied

SN	Requirements	Clause	Observations
7.5	<p>Special Tools and Equipments</p> <ul style="list-style-type: none"> i) Hot air welding equipment – 750 watts capacity with control device on the torch. ii) Roller with handle for pressing the weld deposits. iii) Welding Rod 2 mm dia PVC electrode. iv) Recommended procedure for welding of flexible PVC-to IS : 8002 - 1976 v) Adhesive - Dunlop S-758 or Fevicol SR-998 make or equivalent vi) Water proof sealing compound to IS : 1580-1960 	1105f	Complied
7.6	<p>Maintenance Instructions</p> <ul style="list-style-type: none"> i) The cracked, damaged, or worn out PVC flooring sheets should be removed, Swollen or otherwise damaged floor boards should be renewed and a new PVC patch of same colour should be pasted. The joints of PVC patch should be properly thermo welded to prevent seepage of water. ii) The coaches undergoing corrosion repair should be provided with PVC flooring as per RDSO pamphlet no. C-9001. 	1105g	Complied
8.0	Seats and Berths	1106	
8.1	The upholstery material used for seats & berths of different classes of coaches should be provided as per latest guidelines of RB and RDSO	1106a	Complied
8.2	<p>Maintenance in Workshops</p> <ul style="list-style-type: none"> • The berths and seats found defective due to opening of stitches, cracks/tron/faded rexine or sagged cushion should be removed from coach and sent to Trimming shop for repairs. • After stripping the seats, backrest, berths, armrests, etc., completely the frame should be examined for distortion/crack. • Following measures should be taken to improve the quality of upholstery work. <ul style="list-style-type: none"> - Rounding of corners of berths and seats - Use of nylon sewing threads - Use of straight edge rexine cutting machine - Use of pneumatic staplers. • Reclining Seats of Chair Cars <ul style="list-style-type: none"> - The reclining chairs should be removed from the chair cars in every POH and sent to fitting and trimming shops for overhaul. - After the Chairs are repaired and assembled, they should be tested for easy movement and firm securing in all reclining positions. - The component should be painted all over except sliding and rotating surfaces which should be well greased. <p>After assembly, the chair should be tested for ease or rotation and proper locking.</p>	1106b	<p>Complied</p> <p>Reclining seats are removed and repaired on condition basis. No complaints received</p> <p>Yes , being done.</p> <p>Yes , being done.</p> <p>Yes , being done.</p>
9.0	DOORS	1107	
9.1	<p>Examination in workshop</p> <ul style="list-style-type: none"> i) Body side doors – <ul style="list-style-type: none"> • Doors should be checked for ease of working and 	1107a	Yes, being done

SN	Requirements	Clause	Observations
	<p>corrosion. If found heavily corroded, they should be removed and repaired as per RDSO technical pamphlet C7602 (Rev -1)</p> <ul style="list-style-type: none"> • The top and bottom bearing pivots should be checked for worn ridges. If ridges are found, they should be removed and if the condition warrants, the pivot should be replaced. • The door handles, guard key locks and safety latches on the doors should be checked for smooth and easy working. • • Dust excluding devices in the form of a rubber tube is fitted all around on the door. This should be checked and if perished, or torn or decayed should be renewed. • Of door safety latches are found bent or jammed they should be repaired ensuring proper working. <p>ii) Sliding Doors</p> <p>Sliding doors of upper class compartments</p> <ul style="list-style-type: none"> • Sliding doors should be removed in every POH. • Top roller race and top guide rails should be checked for smooth working and replaced when worn more than 1mm on each part. • The door stops at the top and bottom should be checked and adjusted. • The ball bearing in the top guide rollers should be checked, greased and refitted or replaced as necessary. The ridges from the roller V surfaces should be removed or, if worn too small, the rollers should be replaced. • The automatic lock, specially its lock casing should be checked for cracks at its flanges. If cracked, it should be replaced. • If the door operating rod is broken it should be replaced. • The pins of the lock should be cleaned, oiled and refitted. • The internal door locking latches and the tower bolts should be checked for ease of working. • Ensure that gap between the door and the panel does not exceed 4.5mm • Broken glass in the observation windows should be replaced. <p>Sliding doors of luggage vans</p> <ul style="list-style-type: none"> • Sliding doors should be removed at every POH. All corroded and damaged panels, louvers and members should be cut out and replaced. • Roller assembly should be removed and stripped. It should be replaced if found worn beyond 3 mm. • Other component should be examined and repaired or replaced as required. • Perished / torn rubber sealing should be replaced. • After assembling the components, the moving parts of the assembly should be greased before fitting them in position on the door. • The bottom guide, door handle and door locking arrangement should be examined and repaired or replaced as required. • After repair, the door assembly should be checked preferably in a fixture for its alignment of the top rollers and the bottom guide. 		<p>Yes, being done</p> <p>Yes, being done</p> <p>Rubber tubes are provided for Re-Furbishing coaches.</p> <p>Yes, being done.</p> <p>Sliding doors are removed on condition basis only. No complaints received</p> <p>Yes, being done.</p> <p>Yes, being done.</p> <p>Yes, being done.</p> <p>Yes, being done.</p> <p>Yes, being done.</p> <p>Yes, being done.</p> <p>Sliding doors are removed on condition basis and all doors are attended for corrosion and damage. No complaints received</p> <p>Roller assembly are removed on condition basis only.</p> <p>Yes, being done.</p> <p>Rubber sealings are replaced for 10 % of the coaches. No complaints received</p> <p>Yes, being done.</p> <p>Yes, being done.</p> <p>Doors are checked for alignment on fitment in the coach.</p> <p>Yes, being done.</p> <p>Yes, being done</p> <p>Yes, being done</p>

SN	Requirements	Clause	Observations
	<p>iii) Vestibule Doors</p> <p>a) sliding doors – these should be attended as given in section (ii) above</p> <p>b) Flap doors – they should be checked for ease of working damage to their panels, hinges, locking bolts and other parts and necessary repairs carried out.</p> <p>c) Rolling shutters – they should be checked for ease of working and damages and necessary repairs carried out.</p> <p>It should be ensured be ensured that the locking arrangement for the sliding doors / flap doors / rolling shutters are provided and are in working condition.</p> <p>iv) Corridor inter communication doors of air conditions coaches –</p> <p>All damaged or perished lining should be replaced to ensure proper sealing. Door closer should be tested and defective door closer should be overhauled before fitting.</p>		Yes, being done
10.0	VESTIBULE	1108	
10.1	<p>UIC type rubber vestibule (RDSO sketch-99056) and foot plate arrangement</p> <p>i) Conversion of UIC type vestibule</p> <p>ii) The existing stock may be provided with UIC type vestibule as per RDSO SK-99056.</p>	1108a	100% Conversion of UIC type vestibule Completed.
10.2	<p>Maintenance during POH</p> <ul style="list-style-type: none"> • Steel frame complete should be examined for deformation corrosion. Defective components should be repaired. The deformed vertical channels should be straightened by heating and putting inwards by suitable chain and screw tensioning mechanism. • LP sheet should be examined on the inside of frame. If found dirty and stained, should be washed and cleaned. For vestibules without LP sheet, painting may be done. • Conditions of upper and lateral rubber flanges should be examined for wear or cuts. The cracked portion upto 300mm on lateral side flange may be repaired by rubber patch and rubber solution. It should be replaced if found beyond repair. • The fixing screws and nuts for rubber flanges should be examined. It should be tighten if found loose or should be replaced if found missing. • The support brackets for foot plate should be examined. The deformed or corroded brackets which are beyond repair should be replaced. Perished or missing rubber sheets should be replaced. • The foot plate should be cleaned with wire brush to remove muck, dirt etc. the foot plate arrangement should be examined for wear, deformation or corrosion. If found beyond repair foot plate should be replaced. Broken bearing piece, holding bracket, pins should be examined for wear, broken or welding crack. The foot plate should be painted with anti corrosive paint. • The holding device for foot plate should be examined. It should be replaced/repared as per requirement. The hand rail should be examined for 	1108(b)	<p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p> <p>Yes, being done</p>

SN	Requirements	Clause	Observations
	breakage etc. <ul style="list-style-type: none"> • The bracket assembly and connecting components (if provided) should be examined for coupling the UIC vestibules with conventional vestibules. Reformed or missing components should be replaced. • After completion of repairs all components should be painted with one coat of red oxide zinc chromate primer. 		
11	Provision of upgraded material in coaches with 18 month POH interval. Items as per enclosed annexure are procured and fitted.		Upgraded materials used – Hytrel upper & Lower washers, brake block hanger, flexible poly vinyl chloride flooring , vinyl coated upholstery fabric, LP Sheet, DTB Cushion