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**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**



**SCHEDULE OF TECHNICAL REQUIREMENTS
FOR
CONVERSION OF HCC BOGIES
OF EMU COCHES FOR
RETRO-FITMENT OF AIR SPRING IN SECONDARY STAGE**

S. No.	Month/Year of Issue	Revision /Amendment	Page No.	Reason for amendment
1.	September 2009	Rev. 1	1,2,3 3 4	Title and scope corrected Para 5.1.1, ii) b) added and respectively renumbered. Para 5.1.3, d) modified
2	September, 2020	Rev. 2	--	In para 2(a), reference specification no. updated and para. 4.0 replaced with new para. as vendors as per STR C9202 are not approved by RDSO.

Issued By

**Carriage Directorate
Research Designs and Standards Organisation
Manak Nagar Lucknow-226011**

Price: RS...../-

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**Conversion of HCC bogies of EMU Coaches for
Retro-fitment of air spring in secondary stage**

1. Scope and application:

This schedule lays down the technical requirements for the conversion of HCC bogies of EMU Coaches for Retro-fitment of air spring in secondary suspension of bogie.

2. Reference specifications:

The following specifications should be referred for description, drawing and quantity of items related to air springs and its associated equipments etc.

- a) RDSO specification no. RDSO/2020/CG-01 (Latest revision) for air spring.
- b) RDSO specification no. C-K 407(Latest revision) for air spring control equipments.
- c) CMI-9802 (Latest revision) for maintenance of air spring.
- d) IS specification no.5334/3658.
- e) M&C dte/RDSO, Lucknow Code of Practice No. MC-4 of November 1994 (Reaffirmed in March 2005).

3. Only those bogies with service life of less than 6-8 years should be taken up for retrofitment work. Further, it may be ensured that the bogie frame being converted does not have a history of cracks/defects causing an accumulation of more than 50 points as advised by RDSO's letter no. "EL/4.2.11, Dated 01.02.2002".

4. All the provisions contained in RDSO's ISO procedures laid down in Document No. QO- D-8.1-11 version 1.3 (titled "Vendor-Changes in approved status") and subsequent versions/ amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contacts floated by Railways to maintain quality of products supplied to Railways

5. ITEMS TO BE FITTED ON EMU HCC COACHES FOR COVERSION TO EMU COACHES WITH AIR SUSPENSION BOGIE:

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5.1 MODIFICATIONS & REPLACEMENTS:

5.1.1 HCC bogies:

- i) The existing primary springs shall be replaced with new primary springs to Drg.No.DC/EMUM2-0-1-203. (Necessary CR's may be provided to get correct buffer height).
- ii) The existing bogie frame shall be modified and re-used as follows:-
 - a) All the four BSS brackets shall be removed by oxy-cutting and proper grinding may be done to get a smooth surface to facilitate the proper welding of the air spring LS beam assembly. Suitable jig & fixtures may be used to avoid distortion of the side frame due to excessive heat. The bracket provided for hanging safety strap may be removed by oxy-cutting thereafter.
 - b) After the above cutting operation, the dimensions of bogie frame should be checked as per Annexure-II attached. In case of deviation, the subject frame should be rejected.
 - c) Weld the Lower spring beam to Drg. No.DMU/DPC10-0-3-002 under the bogie frame (refer Drg. No. AC/DC EMU/M2-0-3-201 for fitment of LS beam).
 - d) Bracket for lateral shock absorber to drg. No. DC/EMU/M/ASR-0-3-002 may be welded on bogie frame (refer Drg. No. AC/DC EMU/M2-0-3-201) the centre line of lateral shock absorber may be kept 150 mm from CL of bogie.
 - e) The existing bogie bolster shall be replaced with a new bogie bolster to Drg. No. DMU/DPC10-0-4-001. (The C.L. of lateral shock absorber may be kept same as (c) above.

5.1.2. Underframe:

- a) Suitable under frame members shall be provided for fixing of 150 litre Reservoir and relocate the existing auxiliary reservoir, refer drg. No. ICF/MRVC/C-3-5-002 for guidance.
- b) Make a branch line from feed pipe and provide isolating cock, two way dirt collector, non return valve, 150 litre air reservoir, pipe connections for air suspension and one isolating cock for each bogie (Refer drg.no. ICF/MRVC/C-3-5-002 for guidance).

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5.1.3. WELDING PROCEDURE:

- a) Filler metal
MIG welding process using CO₂ gas as shielding media shall be used for curved areas where as submerged arc welding shall be used for straight areas. RDSO approved brand of filler wire shall be adopted. The electrode used for welding shall be “D-Class” as per specification IRSM:28-2002.
- b) Welders qualification
Qualified welder as per IS: 817 shall be employed for fabrication work and Radiographic test shall be carried out. The edge preparation shall be in accordance with the thickness of the plates. The welding shall reveal high standard of workmanship. However, if welders employed are qualified to any other international approved standards, prior approval of Inspecting Agency is necessary.
- c) Joints
 1. Gaps and fit-ups shall be checked before starting the welding.
 2. Use of Backing plates below the gaps of the joints is not permitted.
- d) Position
All the weld joints shall be welded in down hand position, if necessary by using manipulators. It should be ensured that base metal is exposed by removing paint etc. before commencing welding.
- e) Weaving bead Technique and Interpass cleaning technique shall be adopted by grinding and using wire brushes.
- f) Welding parameters as recommended by the electrode manufactures may be followed.
- g) Pre-Heat
 1. Interpass temperature of 150 degree C to 200 degree C shall be maintained throughout the welding.
 2. Electrodes shall be pre-heated, in the electric ovens, to a temperature of 150 degree C to 250 degree C for 2 hours before they are used.

5.1.4. QUALITY OF WELD JOINTS:

- a) **Visual (By using magnifying glass if required)**
 1. Weld joints shall have uniform beading and smooth change over from weld deposit to the parent metal and thorough fusion between adjacent layers of weld metal and between weld metal and parent metal.

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2. They shall be free from cracks, craters, undercuts, overlaps, porosities, inclusions, blow-holes etc.
3. The fillet weld profile shall be made concave by grinding so that smooth transition occurs at the toe of weld maintaining correct size of the welds.
4. The slags shall be thoroughly removed and cleaned after each interpass.
5. The welds shall be ground to eliminate stress raisers and to improve fatigue life.
6. Members distorted by welding shall be straightened by carefully supervised application of heat. The temperature of heating areas shall not exceed 650 degree centigrade. Mechanical method may also be used with application of heat. All the rework and straightening operations shall be completed before stress relieving.

b) Magnetic Particle Test/Dye Penetrant Test

1. All the fillet weld joints shall be subjected to Dye Penetrant Test on all critical areas, as indicated in enclosed drawing no. CG - K9125 and all the butt weld joints (100%) shall be subjected to Magnetic Particle Test/Dye Penetrant Test for detection of weld flaws. The procedure and acceptance standard shall be as per IS specification no.5334/3658 respectively.
2. Evaluations
Discontinuities and defects shall be indicated by retention of the magnetic particles and rise of Dye Penetrating after applying developer on the surface of welds shall indicate discontinuities and defects. All such indications are not necessarily the defects, since excessive surface roughness, and the heat-affected zones etc. may produce similar indications. Even if indications are believed to be non-relevant, each type of indication shall be explored to determine if linear discontinuities are present.

c) Acceptance Standard

1. All linear discontinuities are un-acceptable and shall be removed and repaired by chipping or grinding and subsequent welding.
2. When defects appear, they shall be rectified and the area shall be re-examined by the same method to verify that they have been rectified completely.

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3. All test reports of Magnetic particle inspection/Dye Penetrant Test will be submitted for review to the Inspecting Agency.

d) Radiographic/Ultrasonic Examination

1. All the Butt weld Bevel joints shall be subjected to 100% Radiographic Tests at 2% sensitivity and 2.0-2.2 film density conforming to Blue Standard of International Institute of Welding (IIW).
2. As per the specified standards IIW Weld joints having cavities, undercuts and porosities shall be within the acceptable limits as per the specified standards.
3. The Radiographic examination shall be carried out by qualified personnel and radiographs shall be submitted to the inspecting agency for interpretation. In case of difference of opinion, the interpretation of Inspecting Agency will be final.
4. Alternatively Ultrasonic testing of welded joints shall be carried out as per M&C dte's Code of Practice No. MC-4 of November 1994 (Reaffirmed in March 2005).

5.1.5. STRESS RELIEVING:

The stress relieving of the bogie frame/bolster shall be carried out in an oil-fired furnace equipped with thermocouples and recorders. Adequate measures shall be taken to avoid any appreciable distortion of the bogie/bolster during heat treatment. If any resetting is required to be done after heat treatment in order to achieve required dimensions, the bogie frame/bolster shall be again suitably heat treated after such re-setting.

The heat treatment shall be carried out as specified in annexure-1.

5.2 ASSEMBLY PROCEDURE FOR AIR SPRING BOGIES:

- i) Place the bogie frame in even surface, resting over the bottom of L.S beam.
- ii) Insert the bogie bolster carefully from the side into the L.S beam of bogie frame.
- iii) With some overhead lifting device (crane) hold the bogie bolster top to touch the bottom of bogie side frame.

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- iv) Insert the air spring from the side. Align the air spring with the fixing holes on the L.S.beam and assemble the fixing screws to a tightening torque of 35 kgm.
- v) Carefully lower the bogie bolster on air spring engaging the spigot into the spigot housing of bolster. It is to be ensured that O-rings and orifice plate have been provided on spigot.
- vi) Complete the bogie assembly similar to any other bogie
- vii) a) Fix the lateral stop with suitable thickness of packing pieces to get the required lateral clearance.
b) Fix the vertical and lateral dampers of the following capacity; assemble the fixing screws to a tightening torque of 24 kgm.

Type of damper	Trailer coach
Vertical damper	300 kg/10 cm/sec.
Lateral damper	200 kg/10 cm/sec.

- viii) Install pneumatic pipe connections for air springs which involves
 - a) Fixing of 20 litre Additional reservoir on bogie bolster
 - b) Fixing of levelling valve on bolster
 - c) Fixing of duplex check valve on bolster
 - d) Fixing of piping connections as per drg. No.
DMU/DPC5-0-5-511/Col.I for M.S. piping & fittings
DMU/DPC7-0-5-702/Col.I for SS piping & double ferrule fittings
- ix) Fixing of installation lever between bogie bolster and bogie frame at L.S.beam
- x) Test the leakages in the piping arrangement for air springs. Ensure pressure drop is within 0.2 kg./sq.cm for one hour.
- xi) Complete the pneumatic pipe connections for bogie brake similar to any other bogie.

5.3 LOWERING OF COACH:

- a) Lower the coach carefully on the bogies.
- b) Install the flexible hoses connecting bogie pipings to the under piping. Test for leakages and arrest the leakages.
- c) Adjust the installation lever to get correct height of air springs as per Maintenance Manual CMI-9802.

5.4 TESTING:

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- a) Connect pressure gauges at the drain locations of all 150 ltr reservoir.
- b) Connect the 150 ltr air reservoir in the underframe to compressed air source of 7 Kg/sq.cm pressure.
- c) Close the isolating cock in the pipeline connecting MR pipe with 150 ltr reservoir.
- d) Connect the hosepipe on the underframe piping with the levelling valves of the bogies as shown in respective drawings.
- e) Provide packing in the gap between bolster and bogie frame.
- f) Allow air into the air springs to a value of 6 kg/sq.cm in the pressure gauge by adjusting the horizontal lever of the levelling valve and keep it in the same position.
- g) Test all pipe joints for leakages.
- h) Check the pressure gauge readings after one hour, the pressure drop should be 0.2 kgf/sq.cm.
- i) Release the air completely by dropping the lever.
- j) Remove the packing
- k) Disconnect the pressure gauges and replace.

5.5 LIST OF DRAWINGS REQUIRED FOR CONVERSION:

- a) AC DC/EMU/C2-0-0-201 - Bogie general arrangement
- b) DC/EMU/M2-0-1-203 - Helical spring for axle box
- c) DMU/DPC10-0-4-001 - Bogie bolster arrangement
- d) DMU/DPC10-0-3-002 - L.S Beam arrangement
- e) AC/DC EMU/M2 -0-3-201- Bogie frame arrangement
- f) RDSO/SK -K1050 - Installation lever
- g) DMU/DPC7-0-5-702 - Pneumatic piping arrgt.
- h) ICF/MRVC/C-3-5-002 - Layout of E.P. Braking

Annexure-I

RECOMMENDED STRESS RELIEVING PROCEDURE

- 1) The temperature of the furnace shall not exceed 315 degree centigrade at the time the welded assembly is placed in it.
- 2) Above 315 degree centigrade, the rate of heating shall not exceed 160 degree centigrade per hour. During the heating period, variation in temperature through the portion of the part being heated shall not be greater than 50 degree centigrade. The same shall be monitored by measurement of temperature using suitable

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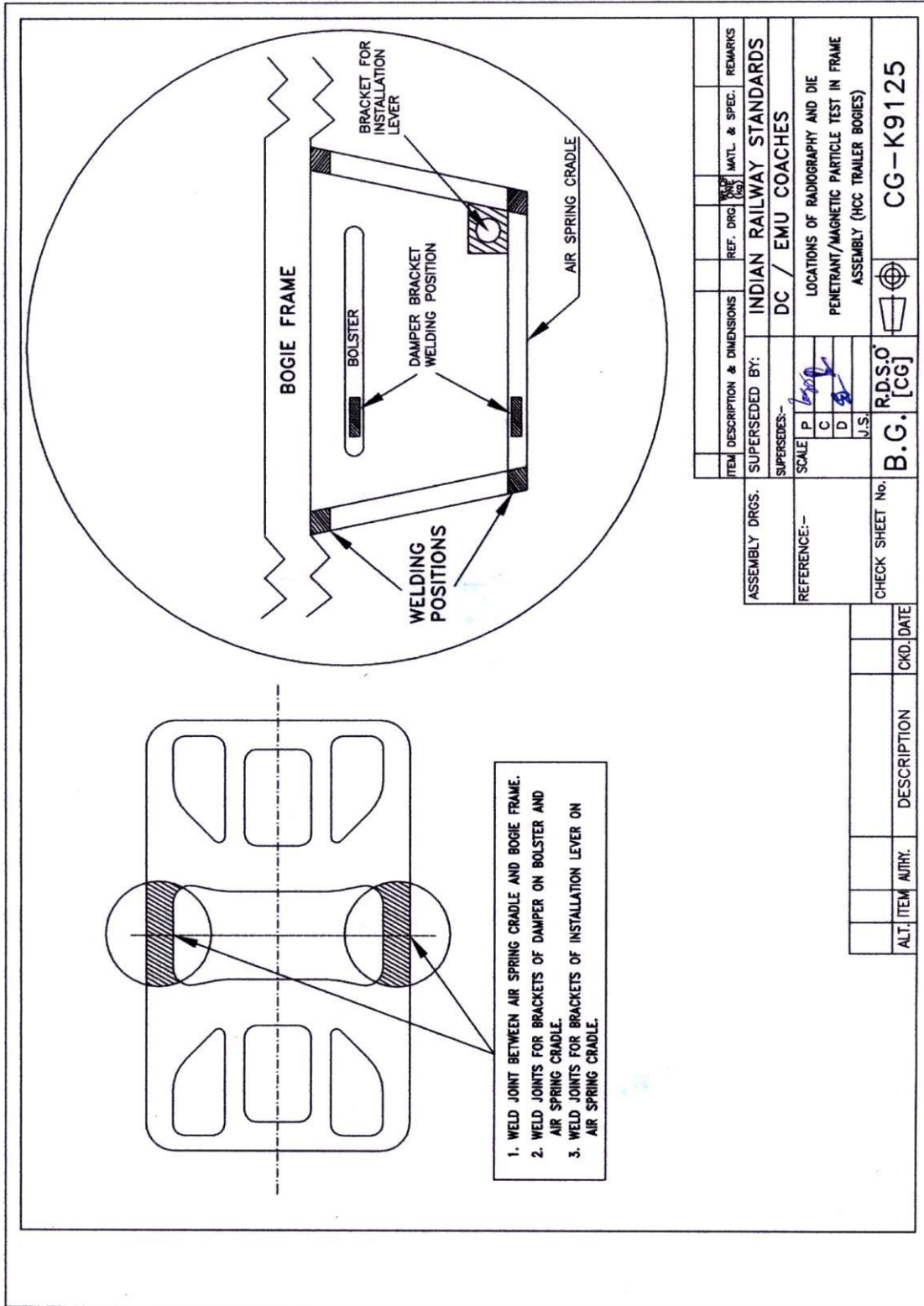
thermocouples. For bogie frame, 4 thermocouples shall be fixed at the four corners and two at the centre of the side beams.

- 3) Soaking temperature shall be between 600 degree centigrade and 650 degree centigrade. On reaching the temperature, the assembly shall be held within specified limits for a time not less than 1 hour per 25mm thickness of the plates.

In addition, for determining the soaking time, the thickness of the thickest part of the assembly shall be considered. During the soaking period, the difference between the highest and lowest temperature of the assembly shall not be greater than 50 degree centigrade.

- 4) During cooling cycle upto 315 degree centigrade cooling of the job shall be done in a closed furnace at a rate not greater than 100 degree centigrade per hour. From 315 degree centigrade, the assembly may be cooled in still air.
- 5) Suitable tie-bars shall be provided during stress relief operation for maintaining the critical dimensions. The assembly shall be kept in the furnace, bottom side up (inverted position) during the heat treatment.
- 6) The assembly shall be suitably supported while loading in the furnace to avoid any permanent deformation during stress relieving operation.
- 7) The heat-treating furnace temperature shall be effectively controlled by using thermocouples having associated recording equipment.

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ITEM	DESCRIPTION & DIMENSIONS	REF. DRG.	MATL. & SPEC.	REMARKS
ASSEMBLY DRGS.	SUPERSEDED BY:	INDIAN RAILWAY STANDARDS		
REFERENCE:--	SUPERSEDES:--	DC / EMU COACHES		
	SCALE	LOCATIONS OF RADIOGRAPHY AND DIE PENETRANT/MAGNETIC PARTICLE TEST IN FRAME ASSEMBLY (HCC TRAILER BODIES)		
		R.D.S.O. [cc]		
CHECK SHEET No.	B.G.	CG-K9125		

ALT. ITEM	AUTHY.	DESCRIPTION	CKD. DATE

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