South Central Railway

Supervisors Training Centre, South Central Railway

BOOKLET ON

LHB COACH PITLINE MAINTENANCE PRACTICES

Supervisors Training Centre

Secunderabad

September 2017

LHB – LINKE HOFMANN BUSCH

FIAT – FABBRICA ITALIANA AOTOMOBILI TORINO

BROAD PARAMETERS AND DIMENSIONS OF LHB COACH

➢ Length of the coach (end to end)	23540mm
➢ Length of the coach (CBC to CBC)	24000 mm
➢ Height of the coach from rail level (except Chair Car)	4039mm
➢ Height of the coach from rail level (Three tier AC coach)	4250mm
➢ Width of the coach	3240mm
➢ Wheel base	2560 mm
➢ Distance between the centre pivots	14900 mm
➢ Minimum height of coach component from rail level	102 mm
➢ Maximum height of CBC in tare condition	1105 mm
➢ Minimum height of CBC in tare condition	1090 mm
➢ Minimum height of CBC in loaded condition	1030 mm
➢ Maximum difference in heights of mating CBC s	75 mm
➢ Maximum dia. of wheel	915 mm
➢ Minimum dia. of wheel	845 mm
➢ Dia. of Brake disc	640 mm
➢ Width of Brake disc	110 mm
➢ Maximum permissible wear in brake disc (width) both side individually i.e., total 14 mm	7 mm
➢ Maximum speed of the coach	160 kmph, can be increased up to 200kmph
➢ Ride Index	2.5 at 160 kmph
➢ Gathering range of CBC (horizontal plane)	±110 mm
➢ Gathering range of CBC (vertical plane)	±90 mm
➢ Lateral bump stop clearance	25±5 mm
➢ Longitudinal bump stop clearance	8 +5/-2 mm
➢ Secondary vertical bump stop clearance	95 +0/-5 mm
➢ Air pressure in Brake cylinder	3 kg/cm^2
➢ Thickness of Brake pad (New)	35 mm
➢ Thickness of Brake pad (Cond)	07 mm
➢ Max. allowed Bearing temperature	80^0C
➢ Total brake cylinders in a coach	8 Nos. of Ø 255 mm
➢ Brake pads	16 Nos.
➢ Type of bearing	CTRB of TIMKEN / SKF

EXAMINATION OF LHB COACHES IS DIVIDED INTO THREE PARTS:

1. PITLINE EXAMINATION INSIDE

2. PITLINE EXAMINATION ON BOTH SIDES

3. AIR BRAKE SYSTEM / WSP TESTING

1. BUFFERS

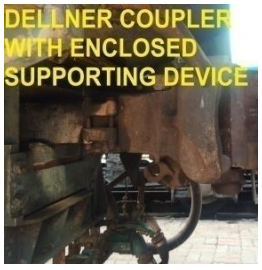
✓ Check the mounting bolts of buffers. If the bolts are loose / deficient, provide with new bolts of size Ø24X90mm and tighten with a torque of 590Nm.

✓ Check for any cracks in the buffer casing, plunger and faceplate. If any cracks found, renew the items. If not possible to attend it on pit line take into sick line.

✓ Measure the length of the buffer from head stock to face plate. The length of buffer should be between 584 mm to 655 mm.

2. EXAMINATION OF CBC:

✓ Check the mounting bolts of CBC supporting device of size M20X50 mm, if found loose, tighten with a torque of 450Nm.



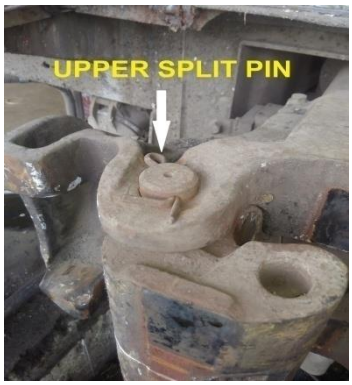
✓ Check supporting device top wear plate. If it is excessively worn more than 3 mm, change it. Thickness of wear plate in new condition is 5+1 mm.

✓ Check the silent block of central pin of ESCORTS's Balanced Draft Gear CBC for any displacement, if so, withdraw the coach from service for attention.

✓ Check compression springs for mechanical damage, replace if damaged/broken.

✓ Check the CBC shank from outside for any cracks. If any crack is found detach the coach for replacement.

✓ Check the split pin on the upper side of CBC knuckle pin for breakage / deficiency. Also check the safety pin at lower side of knuckle pin.



✓ Check the uncoupling device lever with rotary lock and its sliding rod for any bent. Check bolts and nuts of mounting bracket for breakage / slackness, if so attend them.

✓ Check CBC tell tale recess in coupled position, it should be clear and check for positive locking pin whether it is inserting in the tell tale recess or not.

✓ Tighten the locking screw of uncoupling lever by universal key so that nobody can open it.

✓ Clean the wear plate of supporting device and sliding rod of uncoupling lever and apply grease.

✓ Measure the buffer height from rail level. For empty coach the buffer height should not be more than 1105mm and should not be less than 1090mm. if it is not within limits, sick mark the coach and attend it in sick line.

✓ Check the CBC of the power car and ensure its proper working. Close the knuckle and check whether the lock is falling freely. Observe full dropping of rotary lock assembly and proper sitting of uncoupling lever in the bracket. Ensure the rotary lock rib vertically downwards.

ANTI CREEP TEST:

Inspection for anti - creep protection is made through the front of the coupler.

✓ With the coupler in the locked condition insert a pry bar through the front of the coupler between the knuckle tail shelf and lock, forcing lock upward.

✓ Force the lock upward as far as it will engage the top of the toggle with the bottom of the knuckle tail shelf.

✓ Insert a pry bar between the leg of the lock and the front of the lock hole.

✓ Pull towards the front of the coupler to force the lock leg rearward.

✓ If the front edge of the toggle is 1/8 " or more forward of the rear corner of the knuckle tail shelf, the anti- creep is unacceptable, replace the lock lift assembly.

✓ If any actual measurement is desired, inscribe a line on the toggle along the rear face of the knuckle tail shelf, measurement must not be less than 3/8".

✓ If it fails the anti creep test, rectify by changing the locking piece, knuckle and rotary lock.

✓ Ensure there is no oil or grease present on the inner parts of CBC. If any lubricant is present, open the knuckle and wipe off with cloth.

✓ Double headed restrictor should be provided on free end CBC of power car to restrict vertical movement of locomotive CBC. Check it properly and tighten the nut, provide split pin.

✓ Likewise check other parts of CBC i.e. supporting device, uncoupling lever, draft gear and shank. Check the springs of the supporting device for breakage and loose bolts. If any spring is broken or bolt broken/ loose then repair it or change the supporting device.

✓ Check the arrangement of uncoupling lever, uncoupling lever rod which is connected to rotary lock. It should allow clear telltale recess so that positive locking pin can be inserted.

✓ Check uncoupling lever bracket and its securing bolts and nuts. Bolts and nuts should not be loose / deficient.

✓ Lift the uncoupling lever and see that CBC opens freely so that there will not be any problem in manual uncoupling of CBC enroute. Opening of CBC through uncoupling lever, knuckle should open easily.

✓ Check the draft gear face whether CBC shank is rubbing with the buff plate. Wear should not be more than 3mm, if it is more, replace it.

✓ Check draft gear and central pin for correct seating. If any excess wear found on central pin, replace it.

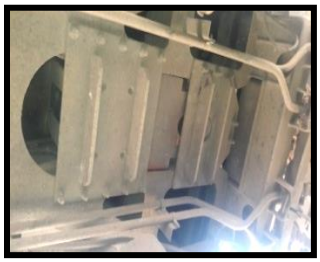
✓ Now check for any crack in the trough floor plate at the top of the draft gear due to dislocation of central pin of CBC. If so mark the coach sick for investigation and correction.

✓ Inside the pit line check the bolts and nuts of support and base plates of CBC and draft gear, if any nut or bolt is broken / missing, replace them. Always use high tensile steel bolts and nuts of 10.9 grade of reputed brand i.e. TVS, UNBRAKO or LPS. **The size of the new bolt is M16X65mm** and tightens with a torque of 200Nm.

✓ Thoroughly check base plate below the central pin for any deformation due to hitting of central pin, if so check whether central pin has moved downwards and pierced through base plate. Then coach should be marked sick for investigation.

✓ Check the guided rod fitted at the rear of the draft gear for any breakage, if found defective, coach should be withdrawn from service for replacing the draft gear.

✓ Check all the visible elastomeric pads inside the draft gear. If any pad is perished / cracked, draft gear needs replacement.



✓ Check the base bolts of support plate below the balanced draft gear of FTIL make for any slackness. If so attend it.

✓ After completion of all the repairs, pull the rake with loco and see whether any gap is there in between couplers, if any gap found, fill with the required thickness of shims. Normal thicknesses of shims are 3mm, 5 mm, 8 mm, 10mm and 12 mm.

COACH BODY

- ✓ Check the end body of the coach for any crack, rust and corrosion. If so attend by scraping and proper painting.
- ✓ Check the head stock of the coach for any crack / welding failure. If so attend the coach in the sick line.
- ✓ Check hand rails mounted on both sides of the doors, if anyone is loose / broken, attend them.
- ✓ Check the luggage doors of power cars on both sides. Check the lower guide rail and upper rollers for any missing or jam. Lubricate it by oil or grease.

- ✓ Check the luggage racks in the luggage compartment for breakage. Check the latch of the doors. If defective, repair it.

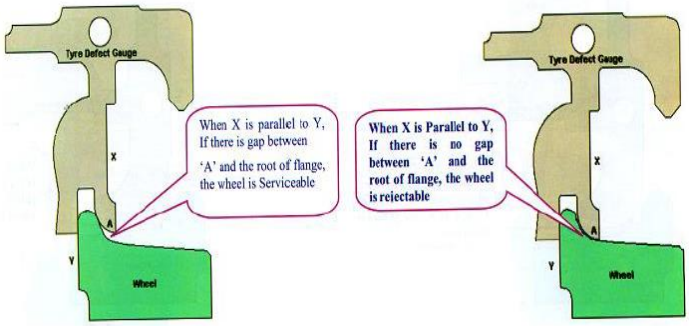
3. BOGIE INSPECTION

3.1. WHEEL AND AXLE

- ✓ Check the wheels of the coach for tread and flange defects i.e. sharp flange, thin flange, deep flange, less root radius, hollow tyre, flat tyre, wheel shelling and thin tyre. If the defects are beyond the prescribed limits the coach should be marked sick for wheel changing.

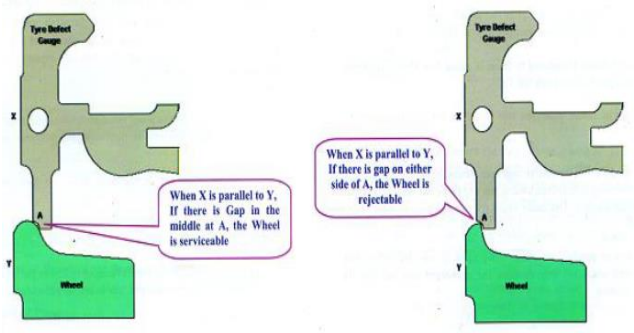
3.1.2. Application of Tyre Defect Gauge for checking the various tread and flange defects is illustrated below.

Wheel Defects	Causes
1.Thin Flange	When the flange thickness reduces from 28.5mm (New) to 22 mm (Condemn) or less, then the flange is called thin flange. Flange thickness is measured at a depth of 13 mm from the tip of the flange. **Repercussion**:- Chances of bursting of point due to entering of flange between Tongue rail and Stock rail.



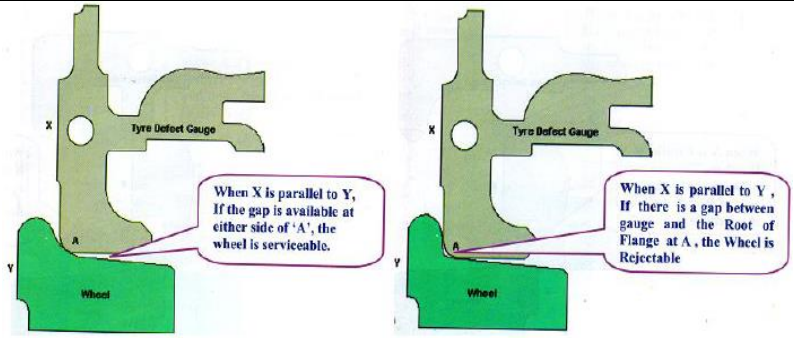
Thin Flange

2.Sharp Flange	When the radius given at the tip of flange is worn out from 14.5mm (New) to 5 mm (Condemn) or less is called Sharp Flange. **Repercussion**: - Shearing of fish plate bolts at rail joints.



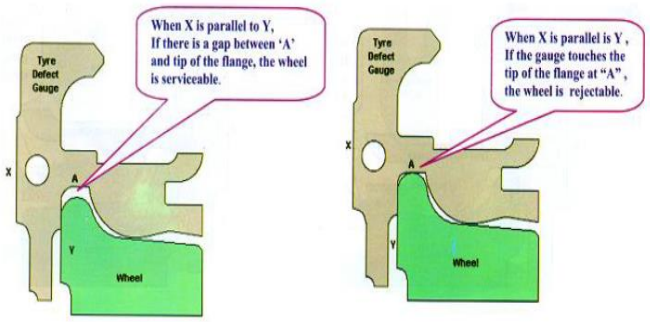
Sharp Flange

3.Radius too small at the root of flange	New Radius of flange at the root is 16R, when it is reduced to 13R or below, it is called Radius too small at the root of flange. **Repercussion**: - Excessive lateral play result in chances of mounting of flange over rail.



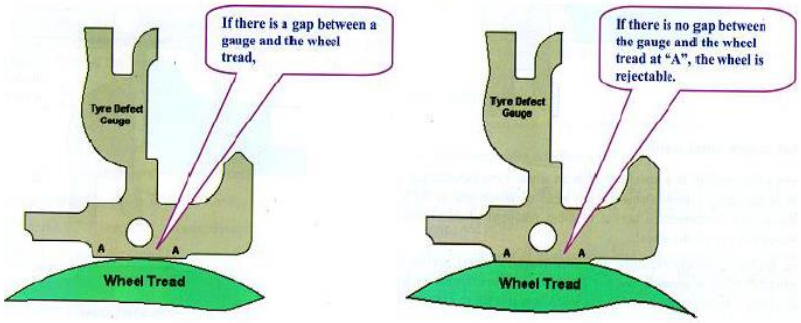
Radius too small at the root of flange

4.Deep Flange	The New height of the flange is 28.5mm, when it increased up to 35mm or more is called Deep Flange **Repercussion**: - Shearing of fish plate bolts at rail joints.



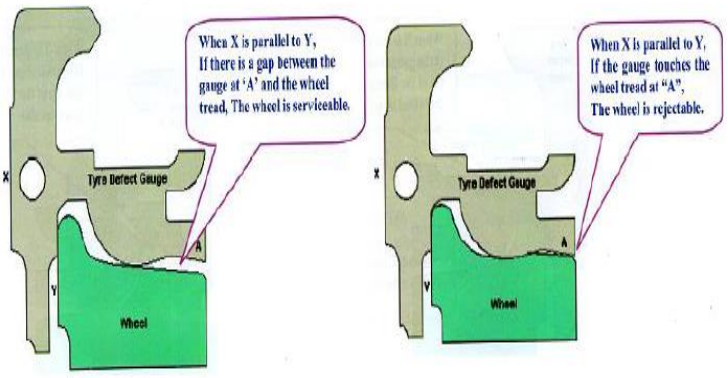
Deep Flange

5.Flat Tyre	Flatness on wheel circumference is called Flat faces on tyre. 1. For Coaching Stock in Primary Maintenance is 30 mm allowed 2. For Coaching Stock in Enroute is 30 mm allowed **Repercussion**: - Chances of rail fracture due to hammering effect on rail.



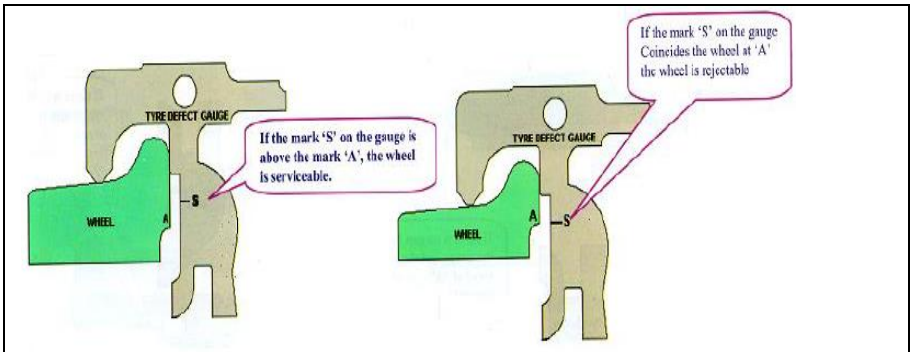
Flat faces on Tyre

6.Hollow Tyre	If the groove on the wheel tread is up to 5 mm or more, it is called Hollow tyre. **Repercussion**:- Chances of entanglement of tongue rail nose with wheel.



Hollow Tyre

7.Thin Tyre	If the remaining thickness of tyre is less than 25 mm, it is called thin tyre. **Repercussion**: - probability of breakage of tyre.



Thin Tyre

3.1.3. WHEEL DEFECTS AS PER RDSO CMI-03:

Shattered Rim	A wheel with a fracture on the tread or flange must be withdrawn from service. 
Spread Rim	If the rim widens out for a short distance on the front face, an internal defect may be present. Spreading of the rim is usually accompanied by a flattening of the tread. Such wheels must be withdrawn from service. 
Wheel shelling	Shelling can be identified by pieces of metal breaking out of the tread surface in several places more or less continuously around the rim. Shelling takes place when small pieces of metal break out between the fine thermal checks. These are generally associated with small skid marks or chain sliding". Such wheels should be withdrawn from service and sent to workshops for re-profiling  **Effects of Wheel Shelling-**Due to constant hammering effect due to wheel shelling following failure will arise. • Springs breakage • Bearing failure • Dampers failure • Track Damage • Breakage of Wheel Disc • Failure of Control Arm • Riding Quality-Riding quality of the coach will be poor creating a great discomfort to passenger.

Thermal Cracks	Thermal cracks appear on a wheel tread due to intense heating of the wheel arising out of severe brake binding. Such cracks occur on the tread and generally progress across the tread in a transverse & radial direction. Whenever such a crack becomes visible on the outer face of the rim or tread crack has reached the outer edge (non-gauge face) of the rim, the wheel should be withdrawn from service. 
Heat Checks	Thermal cracks are deeper and need to be distinguished from fine superficial cracks visible on the tread on or adjacent to the braking surface. These are called heat checks. Heat checks are caused on the tread due to heating and cooling cycles undergone by the wheel during normal braking. Such wheels do not need to be withdrawn but should be carefully distinguished from the rejectable thermal cracks. 

3.1.4. Now check the axles for crack / bent. In case of bent axle, measure the distance between the two wheels by using Wheel Distance Gauge at three different locations. Distance between two wheels on the same axle should be 1600±1 mm. If not within limits, change the wheel.

3.1.5. Check for wheel disc for shifting / displacement from the wheel seat. It can be identified by a shining mark on the wheel seat.

3.2 BRAKE DISC

Check the brake disc for the following defects.

✓ Mounting bolts of the brake disc fitted on the axle for missing / breakage.
✓ Mounting lugs of the brake disc for cracks / breakage.
✓ Check the brake disc, which is also called friction ring from both sides for cracks / uneven rubbing.

✓ Check the cooling ribs or fins of the brake disc for breakage / cracks. Two consecutive broken cooling ribs can be allowed to run. But more than two consecutive broken ribs should not to be allowed to run in the service.

✓ **If any of the above defects are found, mark the coach sick for replacement of wheel along with disc.**

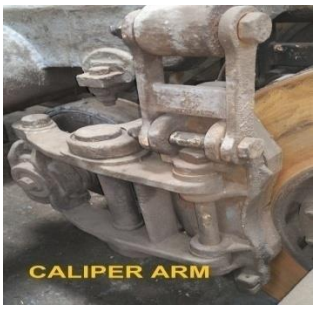
3.3 INSPECTION OF BRAKE CYLINDER AND BRAKE CALIPER UNIT

✓ Thoroughly check brake caliper, brake cylinder and brake pad holder units mounted on the brake beam of the trolley frame.

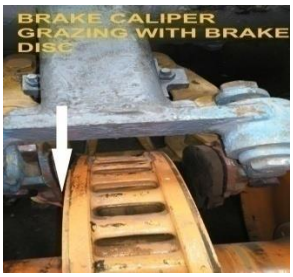
✓ Check Mounting bolts for missing / slackness of caliper unit and for damage of silent block. **Use bolt and nuts of size M16X65 mm.**
✓ Check the jamming of brake cylinder and brake caliper unit. With jamming of these items brakes will not release. Remove pins, clean them with kerosene, apply grease and refit and check again.
✓ Check mounting pins of brake pad holder for breakage / missing / excessive wear.

✓ Check the lock of brake pad holder for breakage / open condition.

✓ Check for excess wear on brake cylinder yoke and caliper arm. Check bushes and pins for any damage.



✓ Check whether brake caliper is hanging or grazing against brake disc which may result breakage of caliper or brake disc.



✓ Check the brake pads for breakage / missing / unequal thickness / condemning size.

✓ **New brake pad thickness is 35mm and condemn size is 7mm.** Always use brake pads of equal thickness and of same make. Replace the brake pads as a set in any disc.

✓ Check for rubber bellow fitted on the brake cylinder for its availability. If the bellow is torn or twisted, replace it. Replace missing circlip if noticed. Otherwise brake cylinder may malfunction due to dust ingress.

If any of the above defects are not possible to attend in pit line, the coach to be taken into sick line.

3.4 AXLE BOX BEARING

✓ Check bolts and nuts fixing the lower control arm with axle box for breakage / missing. **The size of the bolts M16X70 and M16X38 mm** and these should be of HT 10.9 grade and to be tightened with 170Nm torque.

✓ Check the lower control arm for any grease marks. If found open the axle box cover and check for any grease oozing from the axle box and damage of the bearing seal. Check the rear side of the bearing for checking the condition of backing ring.

✓ Check if any of the axle box cover found in open condition, check the bolts of phonic wheel of WSP system and also axle end bolts. **The size of the bolts is M16X45 mm and M16X50 mm and to be tightened with 170Nm.**

✓ Check phonic wheel fixing bolts of size M8X35 mm and tighten with 21Nm.

✓ Maintain the correct gap between phonic wheel and speed sensor probe, should be between 0.9 to 1.4 mm. Check this gap with a feeler gauge. Open the dummy plug on the axle box cover and insert the feeler gauge.

EARTHING DEVICE AND CABLES

✓ Check the earthing device cover and bolts for missing / breakage / slackness.

✓ Check the connecting earthing cables from bogie to trolley. And check resistor cables for breakage / missing / loose. With these defects the continuity of earthing will be lost.

✓ If cover noticed in open condition, check the earthing device items such as carbon brushes, holder, wheel slip assembly, clip assembly, springs for availability.

✓ Close the inspection cover and tighten the cover bolts. Size of the bolts is M8X25 mm properly.

If any of the above defects are not possible to attend in pit line, the coach to be taken to sick line.

3.5 FIAT BOGIE AND ITS COMPONENTS

CURVE ROLL – check pin and split pin of curve roll mounted on outer corners of the trolley. Check the roller for free rotation. If it is jammed, apply oil and makes it free to rotate.

3.5.1. CONTROL ARM

✓ Check silent block of control arm for cracks / shifting inside or outside. The crack more than 10mm is not allowed. If the silent block is shifted, the coach should be withdrawn from service and silent block to be renewed.

✓ Check the fixing bolts of Control Arm Block Pin for slack / crack / missing. **The sizes of the bolts are M20X100 mm and M20X46 mm and tighten them with 340Nm**.

✓ Check for any gap between trolley frame bracket and control arm silent block pin. If there is a gap, tighten the bolts. If the gap is still there, then change the control arm.

3.5.2 INSPECTION OF TRACTION CENTER AND TRACTION RODS

✓ Check for tightness of three bolts and locking plate fitted to traction center bottom. Replace if the bolts are loose / missing. **The new size of the bolts is M16X70mm and to be tightened with 170Nm torque**.

✓ Check for any cracks in silent blocks of traction center, if the crack is more than 6 mm depth, mark the coach sick and change the traction center in sick line.

✓ Check two traction rods in each trolley for damages in silent blocks and mounting bolts. If the silent block is cracked beyond 8 mm depth, change the traction rod and tighten the bolts with 540Nm torque. **The size of the mounting bolts of traction rods is M24X150mm and M24X200mm.**

3.5.3 ANTI ROLL BAR

Anti Roll Bar will prevent lifting of coach form the bogie. In curvature it will minimize the excess movement of the bogie.

✓ Visually check for any crack / breakage of anti roll bar.

✓ Check for slackness / missing of mounting bolts of Anti Roll Bar fixing bracket on both ends. If any bolt is slack / missing, should be replaced and tightened with 170Nm torque. **The new bolt size is M16X160 mm.**

✓ Check the gap between Anti Roll Bar fixing block and fork. The gap should not be more than 24 mm and check rubber gasket for any cracks. If the gap is more, Anti Roll Bar bearing failure can be suspected. Mark the coach sick.

✓ If Anti Roll Bar is shaking between two fixing blocks, apply the HSNS synthetic grease with grease gun. Greasing **to** be done regularly at an interval of three months.

3.5.4 ROLL LINK

In each trolley two numbers of roll links are fitted connecting anti roll bar fork and bolster.

✓ Check for correct fitment of these items.

✓ Check for slackness / missing of mounting bolts. Tighten the bolts with 590Nm torque. **The new size of the bolt is M24X100 mm.**

✓ Check the Roll Link silent blocks for cracks / displacement. Crack up to 10 mm depth is allowed. If it is more, mark the coach sick and change the Roll Link in sick line.

3.5.5 LATERAL DAMPER

In each trolley one lateral damper is provided connecting bolster and bump stop support frame.

✓ Check for oil leakage / cracks in the damper. If the damper is leaking or cracked it should be changed.

✓ **The fixing bolts of lateral damper is M12X55 mm and to be tightened with 70Nm torque.**

3.5.6 LATERAL BUMP STOP AND LONGITUDINAL BUMP STOP CLEARANCES

Lateral bump stops are provided on both lateral ends of Bump Stop Support Frame and longitudinal bump stops are provided on two longitudinal ends of Support Frame.

✓ Check the mounting bolts for breakage / slackness. If so, change the bolts and nuts with a size of M20X100 mm and tighten with 340Nm.

✓ Check Lateral Bump Stop and its rubber pads for breakage / bonding failure. If so, change the bump stop and tighten with 170Nm.

The size of the mounting bolts is M16X100mm.

✓ After fixing the lateral bump stops, measure the clearance between bump stop and Central Pin. It should be within 25±5 mm. If it is not within this limit, check for any rail level difference. If any rail level difference is found, coach to be pulled to the other place where rail level is correct.

Lateral Bump Stop

Longitudinal Bump Stop

✓ In the same way check four numbers of mounting Allen bolts of Longitudinal Bump Stop. If any bolt is loose / missing, bump stop is shaking or any bump stop pad is excessively worn, then change the Longitudinal Bump Stop.

✓ The longitudinal bump stop clearance should be 8 +5/-2 mm.

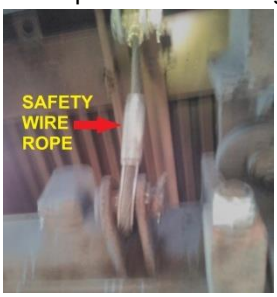
✓ If lateral and longitudinal clearances are not in the prescribed limits, the coach to be taken to sick line, lifted and secondary springs are to be adjusted for proper seating in the bolster dome.

3.5.7 SECONDARY BUMP STOP BOLSTER CLEARANCE OR VERTICAL BUMP STOP CLEARANCE

The clearance between bogie frame bump stop and bolster bump stop should be 95 +0/-5 mm in tare condition. It can be maintained by using 5 mm or 10 mm metallic or acrylic shims. If any secondary spring is broken / weak, this clearance will be reduced.

3.5.8 SAFETY WIRE ROPE

There are four wire ropes connecting brake beam and bolster to hold the trolley along with the bolster. It should be checked every time. If any wire rope is cut / missing, replace it.



3.5.9 BOLSTER BEAM

✓ Check the bolster beam from the bottom side of the mounting bracket. Check the bolster dome top plate from inside for welding cracks. If any crack found, coach to be taken to sick line for attending.

✓ Check the body bogie connection, if any nut or eye bolt is loose / broken, replace it a new one.

3.5.10 PRIMARY SUSPENSION

✓ Primary suspension is provided with inner and outer coil springs on the axle boxes.

✓ Check outer spring, inner spring, centering disc and primary vertical damper for breakage / cracks. If any defect found, replace the item.

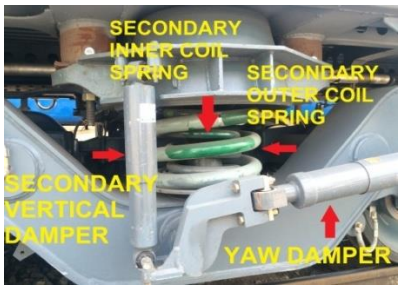
3.5.11 SECONDARY SUSPENSION

✓ Check the outer and inner secondary bolster coil springs mounted on both sides of trolley frame. If any spring found weak / broken / rubber spring dropped or rubbing with coil springs, mark the coach sick and attend in sick line.

✓ Check the orientation of secondary coil springs.

✓ The Aluminum band on the outer coil spring should be visible from the checking side.

✓ Check the coil spring seating inside the bolster dome for proper seating. If the spring nest is not properly seated in the dome, there is a chance of disturbance in the lateral and longitudinal bump stop clearances. If such defects found, mark the coach sick, lift the coach in sick line and rectify the problem.



✓ Check Minor Pad in the secondary spring for any displacement / damage. If so, replace in sick line.

✓ Check lower and upper bracket of Secondary Vertical Damper for any breakage / crack. Check bolts and nuts at upper and lower side for slackness / deficiency. Replace with a new bolt of size M12X100mm (upper) and M12X70MM (lower) and tighten with a torque of 70Nm,

✓ If any oil leakage / cracks on damper body noticed, change the Secondary Vertical Damper.

✓ Check the mounting brackets of Yaw Dampers which is fixed with “Y” frame of coach body for any crack / breakage.

✓ Check the damper body. If any oil leakage / breakage the damper should be replaced.

✓ Check the mounting bolts of lower and upper side of yaw damper for breakage or slackness. Renew with M16X120 mm bolts and to be tighten with 170Nm.

3.5.12 SECONDARY SUSPENSION - AIR SPRING

✓ Visually check for external damages, bulging of bellow, air leakage by using soap water, infringement of any fittings etc.,

✓ Remove dust, mud and oil deposits if any, on air spring and control equipments.

✓ Check the position of isolating cock, should be in ON position and check the drain cock, its position should be in OFF.

✓ Clean the leveling valve filter.

✓ Check the installation lever with inflated air spring for normal function.

✓ Tighten the installation lever nuts and bracket of all flexible hoses.

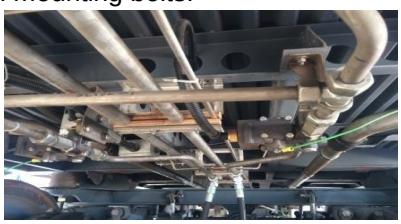
✓ Tighten the protection screen nuts.

4 UNDER FRAME AND UNDER SLUNG ITEMS

4.1 PIPELINES AND FITTINGS

✓ Check for any air leakage and water leakage from the respective pipe lines in the coach under frame.

✓ Check for missing / broken mounting bolts.

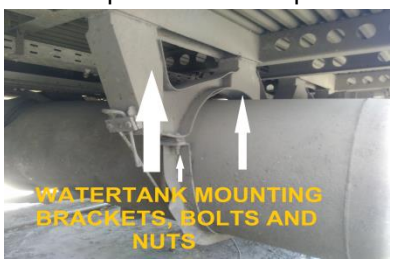


✓ If any of the above defects noticed, attend and rectify them.

4.2 WATER TANK

In LHB coaches the water tanks of capacity 685 liters and 450 liters are suspended on the under frame.

✓ Check water tank mounting brackets, mounting bolts, safety wire ropes and its brackets for missing and breakage. If any defects found replace it. If not possible on the pit line repair in sick line.



✓ Now check the water tank connecting pipes, drain cocks for breakage / missing.

✓ Check the water filling pipeline on both sides of the coach.

✓ Check the strainer and the pipe connected to the water pump from the water tank for breakage / missing. If so, repair it. Clean the filter / strainer once in every 15 days.

4.3 BRAKE PANEL MOUNTING AND OTHER AIR BRAKE FITTINGS

✓ Check the brake panel frame, auxiliary reservoir mounting bolts for missing / breakage.

✓ Check the upper mounting bracket welding for cracks, if any failure, attend it.

✓ Check other parts that are suspended to the under frame i.e. PEV valve, dump valves, brake accelerator, brake pipe, brake cylinder pipeline and its brackets etc... If any defects found, repair them.

✓ Check BP and FP air hose carriers on both ends of the coach for their availability and proper fitment.

4.4 HAND BRAKE CABLE ARRANGEMENT

✓ Total two brake cylinders are connected with this hand brake arrangement in Power Cars.

✓ For each brake cylinder two hand brake cables are connected and these will be connected to hand brake wheel in the guard compartment.

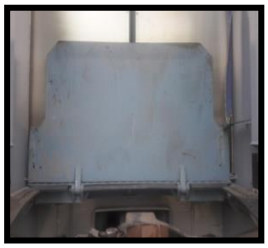
✓ Check handbrake cable arrangement for bent / breakage / disconnection from brake cylinder lever. If it is bent, it will not allow the brake cylinder to release. If it is broken, hand brake will not be applied.


4.5 CDTS / BIO-TOILET RETENTION TANKS

CDTS or Bio Toilet retention tanks are mounted to under frame of the coach from all four toilets.

- ✓ Check the mounting plate and bolts for breakage / missing.
- ✓ Check retention tanks for any damages. If any defects found, attend and rectify**.**

4.6 FALL PLATES AND VESTIBULES




- ✓ Check the coach Fall Plate mounting bolts, leaf spring beside the mounting pin for breakage / bent. If any defect found, attend them.
- ✓ Check the Vestibule brackets for cracks and rubber bellows for breakage / torn / damage. If found defective, attend them.
- ✓ Check mounting brackets and mounting bolts of Foot Boards for slackness / weld failures.

5.0 AIR BRAKE TESTING

LHB coaches are equipped with axle mounted disc brake system.

AIR BRAKE TESTING PROCEDURE WITH RTR

- ✓ On arrival of the rake on pit line, completely drain the AR tank (125 liters & 75 liters) of all the coaches by opening the drain cock, to remove the moisture in air.

NRV TEST:

- ✓ Initially, couple the BP hose of the test rig with the BP hose of the rake & then charge the BP pressure to 5.0 kg/cm^2. Keep the FP angle cock of both end power cars in close position. Check the FP gauge fitted in the power car, if the gauge does not show any pressure, the NRV of all the coaches are OK. If, FP gauge shows any pressure, the NRV of any coach in the rake is defective. In this condition, check the rake for NRV defective by taking the coaches in parts. NRV found defective in particular coach should be replaced.

BRAKE APPLICATION AND BRAKE RETENTION TEST:

- ✓ Open all the four cocks of rake, couple BP & FP air hoses of test rig with the BP & FP hose pipe of the rake. Charge the BP & FP to 5.0 kg/cm^2 & 6.0 kg/cm^2 respectively. After building of pressure in BP & FP, disconnect the test rig BP & FP hose pipe from the rake hose pipes & open both the angle cocks, due to which air pressure will be exhausted in atmosphere & brake will be applied. Wait for 20 to 25 minutes.
- ✓ After 20 to 25 minutes, check the complete rake from one end. Note down the coach nos. found with release brake cylinder. Check whether AR tank of the coach is charged or empty. If AR tanks found empty, write down Empty AR on the respective coach. If found charge, pull manual release of DV to check whether CR tank is charged / empty. If CR found empty, write down Empty CR on respective coach. With this, all the defects in the rake can be checked.

LEAKAGE TEST:

- ✓ Again, connect BP & FP hose pipe of the rake & test rig & then charge BP to 5.0 kg/cm^2 & FP to 6.0 kg/cm^2. Connect BP & FP gauges with dummy on free end of other power car.
- ✓ Check the BP & FP pressure gauges in front power car, BP pressure should show 5.0 kg/cm^2 & FP pressure should show 6.0 kg/cm^2. If there is any difference in any pressure, check by fitting master gauge if still the pressure is not showing 5.0 kg/cm^2 in BP & 6.0 kg/cm^2 in FP, check for leakage & attend.
- ✓ Close the BP & FP angle cock of test rig for 03 minutes. Monitor the leakage in both BP & FP. The leakage should not be more than 0.6 kg/cm^2 in 03 minutes.
- ✓ Attend the coaches in which AR empty & CR empty are found. Check the AR tank & pipe line from the back of the brake panel for leakage. Similarly, check CR tank & pipe line & dummy plug on the brake panel. If defect is still noticed after attending the leakage, then mark the coach sick for detailed investigation & single car testing in sick line.

BRAKE APPLICATION AND RELEASE TEST:

- ✓ Start the pressure & charge the BP to 5.0 kg/cm^2 & FP to 6.0 kg/cm^2. Drop the BP pressure by 1.6 kg/cm^2, brake should apply in all coaches. Start the leakage checking with the help of soap solution from one end. During soap solution testing, check all the BP & FP hose pipe, all hose pipe connectors, Main pressure pipe line, Angle cocks, Brake cylinder pipe line, CDTS pipe line. Similarly, check & attend leakage in components on Brake panel like DV, FP & BP filter, NRV, all isolating cock, brake indicator, brake accelerator & brake cylinder with soap solution.
- ✓ Components on Brake panel like DV, FP & BP filter, NRV, all isolating cock, brake indicator, brake accelerator & brake cylinder with soap solution.
- ✓ Isolate the isolating cock on Brake panel & check all brake calipers & brake pad of all cylinders. In isolated condition, all brake pads should be released simultaneously. Similarly, on opening of isolating cock all Brake cylinder should operate & brakes should apply.

BRAKE INDICATORS TEST:

- ✓ Check the brake indicator when brakes are applied, indicator should display red color. However, when the brakes are released from isolating cock the brake indicator should display green color. If on brake release condition, brake indicator is not showing green or on brake applied condition brake indicator is not showing red, then the brake indicator is defective. Repair / replace the brake indicator.

CONTINUITY TEST:

- ✓ The BP & FP pressure gauges in the other end power car should show pressure 3.4 kg/cm^2 & 5.8 - 6.0 kg/cm^2 respectively. If any difference in above pressure is noticed that means there is

any cross connection in BP & FP connection. Attend the same & ensure BP pressure 3.4 kg/cm^2 & FP pressure 5.8 - 6.0 kg/cm^2.

- ✓ Check for any significant difference in time for dropage of BP pressure to 0.0 kg/cm^2 between front & rear power cars. If any, there may be blockage in BP line of any coach. If found, attend the same. Continuity test of the rake is now completed.
- ✓ Charge the BP & FP pressure to 5.0 kg/cm^2 & 6.0 kg/cm^2 respectively. Check the brake indicator of complete rake, all coaches should be in released condition. If any coach is not released, it means that the CR of that particular coach may be overcharged & there is an internal defect in DV. Mark the coach sick for detailed investigation.

PEASD TESTING:

- ✓ Check PEASD of at least 03 coaches. During PEASD checking, brakes should apply in all coaches & the brake accelerator should operate. Coach numbers should be noted in maintenance dairy.

GEV TEST:

- ✓ Now close the pressure supply from the test rig. Operate the emergency guard van valve of front power car guard van. BP pressure should become 0.0 kg/cm^2 in approx. 25 to 30 sec in front power car & approx. 40 to 50 sec in rear power car. Open the pressure supply & charge BP & FP to 5.0 kg/cm^2 & 6.0 kg/cm^2 respectively. Now again closed the pressure supply from the test rig. Operate the emergency guard van valve of rear power car guard van. BP pressure should become 0.0 kg/cm^2 in approx. 25 to 30 sec in rear power car & approx. 40 to 50 sec in front power car.

- ✓ In both the power cars, check the condition & mounting of hand brake cables fitted on both the brake cylinders. Rotate the hand wheel fitted in guard van clockwise to apply the brakes, after full rotation brake should apply in both the brake cylinders & hand brake indicator should show red. Rotate the hand wheel anti clockwise, now brakes of both the cylinders should get release & hand brake indicator should show green.
- ✓ Charge the BP & FP to 5.0 kg/cm^2 & 6.0 kg/cm^2 respectively. Close the BP & FP angle cock of test rig for 03 minute. Monitor the leakage in both BP & FP. The leakage should not be more than 0.6 kg/cm^2 in 03 minutes.
- ✓ Isolate the isolating cock of BP & FP of the test rig & angle cock of BP & FP of the cock. Uncouple both hose pipes & open both the angle cocks of coach. After draining of pressure from both the BP & FP hose, release the complete rake by pulling the manual release handle of the DV of each coach & ensure the brake indicator of all coaches should display green color. Ensure that all BP, FP & BC gauges fitted in power car are calibrated & showing correct reading.

WSP Testing

- ✓ Initially with no pressure, the WSP processor in all the coaches should be OFF. If any processor is in ON condition, there is problem in any of pressure switch, wiring or K-05 relay. Attend the same.
- ✓ Start the BP & FP pressure. The processor should automatically turn “ON” when BP pressure in M/s KNORR WSP system & FP pressure in M/s FTIL WSP system reaches to 1.6 to 2.0 kg/cm^2. Check & attend for loose / proper fitment of WSP components like speed sensor, junction box, dump valve, dump valve connector & pressure switch.

- ✓ Drop the BP pressure by 1.6 kg/cm^2, brake should apply in all the coaches. Now check the WSP processor for correct reading '99' on the electrical panel inside the coach. If the reading shows '99', it means that the WSP system is OK.
- ✓ Operate the test button on the processor to check the proper working of dump valves. The dump valve should operate in a sequence & pressure should be exhausted from brake cylinder. If the dump valve is not operated in proper sequence, attend the same. Similarly, check & attend the WSP system of all the coaches. All the WSP system should be in operating condition in the rake.

DEFECT CODES WITH TROUBLESHOOTING (FAIVELEY WSP SYSTEM)

Failure code	Meaning	Action to be taken
10/20/30/40	Hardware Watchdog MV 1/2/3/4 triggered resp.	• Reset WSP system by removing fuse of 63 and 65 • Replace MV card
11/21/32/41	Short circuit or interruption of speed sensor of axle 1/2/3/4 respectively	• Check the gap between Phonic Wheel and Speed sensor • Check red light indicator of speed sensor. Perhaps change of speed sensors with another axle to check. • Check wires from WSP electronic to speed sensor if there is any short circuit or interruption • Check terminal connections and SUB-D-cable • GE from terminal to WSP electronic. • Replace GE-board to check. • Replace
13/23/33/34	Short circuit of solenoid valve axle 1/2/3/4 respectively	• Disconnect dump valve cable and check dump valve for short circuit. • Check cable from terminal to dump valve junction box for short circuit. • Check SUB-D cable MV for short circuit • Replace MV card/CPU card
14/24/34/44	Interruption of solenoid valve axle 1/2/3/4 respectively	• Disconnect dump valve cable and check dump valve for interruption. • Check cable from terminal to dump valve junction box for interruption. • Check SUB-D cable MV and terminal for interruption Replace MV card • Replace CPU card
System Off		• Check fuse 63 and 65 if blown replace fuses • Check K-05 and pressure switch wiring • Check cable of N2 card and wiring in Wagon. • Replace card N2, if ok then replace permanent.

70/71	Internal relays test fault	• Replace RE card for testing and if necessary permanent • Replace CPU card for testing and if necessary permanent • When both replaces don't bring success, check the complete processor
72	Failure at one axle	• Press "Display" button to see what failure code is saved. Further information you can find at the failure code description. Attend according to failure code

DEFECT CODE IN FAIVELEY WSP TESTING:

Axle	Code	Description
1	10	Safety shut - down MV (Dump Valve)
	11	Short circuit / interruption GE (Speed Sensor)
	13	Short circuit MV (Dump Valve)
	14	Interruption MV (Dump Valve)
2	20	Safety shut - down MV (Dump Valve)
	21	Short circuit / interruption GE (Speed Sensor)
	23	Short circuit MV (Dump Valve)
	24	Interruption MV (Dump Valve)
3	30	Safety shut - down MV (Dump Valve)
	31	Short circuit / interruption GE (Speed Sensor)
	33	Short circuit MV (Dump Valve)
	34	Interruption MV (Dump Valve)
4	40	Safety shut - down MV (Dump Valve)
	41	Short circuit / interruption GE (Speed Sensor)
	43	Short circuit MV (Dump Valve)
	44	Interruption MV (Dump Valve)
	70/71	Failure in electronic card RE (relay output)
	72	WSP disturbance, one axle
	73	WSP disturbance, several axles
	HF	Global hardware failure
	Pr	Processor
	EP	EPROM
	EE	EEPROM
	Hd	Hardware watchdog
	8888	Segment test
	89	Test run

	95	Intermittent fault
	99	Good indication

DEFECT CODE WITH TROUBLE SHOOTING (KNORR BREMSE WSP SYSTEM)

Failure code in display	Meaning	Action to be taken
10/20/30/40	Hardware Watchdog MV1/2/3/4 triggered respectively	• Reset WSP system by removing fuse of 63 and 65 • Replace EB01
11/21/32/41	Short circuit or interruption of speed sensor of axle 1/2/3/4 respectively	• Check the gap between Phonic Wheel and Speed sensor • Check wires from WSP electronic to speed sensor if there is any short circuit or interruption • Check terminal connections • MB04 W1.1 from terminal to WSP electronic. • Replace MB04 W1.1-board to check.
12/22/32/42	Signal error	• Check the gap between Phonic Wheel and Speed sensor, adjust if found beyond limit. • Check wires from WSP electronic to speed sensor if there is any circuit break or interruption • Check terminal connections • MB04 W1.1 from terminal to WSP electronic. • Replace MB04 W1.1-board to check.
13/23/33/34	Short circuit of Dump Valve axle 1/2/3/4 respectively	• Disconnect dump valve cable and check dump valve for short circuit. • Check cable from terminal to dump valve junction box for short circuit. • Check MB04 W1.2 cable for short circuit. • Replace MB04 W1.2 card/cable.
14/24/34/44	Interruption of Dump Valve axle 1/2/3/4 respectively	• Disconnect dump valve cable and check dump valve for interruption. • Check cable from terminal to dump valve junction box for any circuit break. • Check MB04 W1.2 cable for circuit break. • Replace MB04 W1.2 card/cable.
15/25/35/45	Safety monitor defective (test run)	• Reset WSP system by removing fuse of 63 and 65 • Replace MB04
70/71	Speed signal fault, door control	• Check EB01 connector and card if required replace.
72	Failure at one axle	• Press "Display" button to see what failure code is saved. Further information you can find at the failure code description, attend failure accordingly.
73	Failure at several axles.	• Press "Display" button to see what failure code is saved. Further information you can find at the failure code description, attend failure accordingly.
74	Safety monitor fault	• Reset WSP system by removing fuse of 63 and 65 Board • Replace MB04
c8	Activation fault, cumulative fault signaling	• Reset WSP system by removing fuse of 63 and 65 Board • Replace EB01
S2	Connector defect board EB01A	• Check EB01 W1.2 cable for short circuit/break circuit • Replace EB01 Cable
S3	Connector defect board MB04A	• Check MB04 W1.2 cable for short circuit/break circuit • Replace MB04 Cable

8888	Display test	• Acknowledge.
89	Test running	• Acknowledge.
95	Volatile faults	• There was a failure in the past. • Press "Display" button to see what failure code is saved. Further information you can find at the failure code description.
99	System good	• Healthy system
System Off		• Check fuse 63 and 65 if blown replace fuses • Check K-05 and pressure switch wiring • Check cable of PB03 card and wiring in wago. • Replace card PB03

TABLE OF FAILURE CODES (KNORR BREMSE):

Display	Fault	Problem Source	Connected with
02	Digital I/Os	Board EB01A	
03	Central processing unit	Board MB04A	
10	Time out	Board MB04A	Wheel set 1
11	Short circuit / open circuit	Speed sensor 1/feeder	
12	Signal error	Speed sensor 1/feeder	
13	Short circuit	Dump Valve 1/feeder	
14	Open circuit	Dump Valve 1/feeder	
15	Safety monitor defective(test run)	Board MB04A	
20	Time out	Board MB04A	Wheel set 2
21	Short circuit / open circuit	Speed sensor 2/feeder	
22	Signal error	Speed sensor 2/feeder	
23	Short circuit	Valve 2/feeder	
24	Open circuit	Valve 2/feeder	
25	Safety monitor defective(test run)	Board MB04A	
30	Time out	Board MB04A	Wheel set 3
31	Short circuit / open circuit	Speed sensor 3/feeder	
32	Signal error	Speed sensor 3/feeder	
33	Short circuit	Valve 3/feeder	
34	Open circuit	Valve 3/feeder	
35	Safety monitor defective(test run)	Board MB04A	
40	Time out	Board MB04A	Wheel set 4
41	Short circuit / open circuit	Speed sensor 4/feeder	
42	Signal error	Speed sensor 4/feeder	
43	Short circuit	Valve 4/feeder	
44	Open circuit	Valve 4/feeder	
45	Safety monitor defective(test run)	Board MB04A	
70	Speed signal fault, door control		
71	Speed signal fault, electromagnet track brake	Board EB01A	
72	Fault at one wheel set		
73	Fault at several wheel sets		
74	Safety monitor fault	Board MB04A	
c8	Activation fault, cumulative fault signaling	Board EB01A	
S2	Connector defect board EB01A	Board EB01A	
S3	Connector defect board MB04A	Board MB04A	
8888	Display test		
89	Test running		
95	Volatile faults		
99	System good		

6.0 SIZE OF FASTENERS OF UNDER GEAR COMPONENTS WITH RECOMMENDED TORQUE VALUE

PART NAME	SIZE OF BOLT / NUT	TORQUE	SPANNER
Anti Roll bar Bearing Bracket Bolt	M 16 X 160/44	170 Nm	24
Antiroll bar Plug	M 16 X 32	170 Nm	24
Axle Box Bearing End Plate Stud	M 20 X 60	200 Nm	30
Axle Box Cover Bolt	M 16 X 45	170 Nm	24
Axle Box Cover with Earthing equipment Bolt	M 16 X 50	170 Nm	24
Bogie Air Brake Pipe Line Nut and Bolt	M 10 X 30 & M 10 X 12	---	15/16
Bolster Clearance, Bump Stop Nut and Bolt	M 8 X 60	---	12/13
Bolster Nut	M 30	250Nm	46
Brake Calliper Mounting Bolt	M 16 X 65	170 Nm	24
Lateral Bump Stop Nut and Bolt	M 16 X 100	170 Nm	24
CBC Supporting Device Front Stud	M 20 X 50	450 ±50 Nm	30
CBC Supporting Device Spring Bolt	M 16 X 125	170Nm	24
Control Arm Locking Stud Bottom	M 20 X 100 / 46	340Nm	30
Control Arm Lower /Upper Half mounting Bolt	M 16 X 70/38	170 Nm	24
Earthing Device Cover Ellen Bolt	M 8 X 20		12/13
Earthing Device Slip Assembly	M 8 X 25	21 Nm	12/13
Handbrake Cable Nut and Bolt	M 8 X 35	---	12/13
Lateral Damper Bolt and Nut	M 12 X 55/30	70 Nm	18/19
Phonic Wheel Stud	M 8 X 35/22	21 Nm	12/13
Primary Damper Nut	M 16	100 Nm	24
Return Cable Bolt (Earthing)	M 10 X 25 & M 10 X 16	---	15/16
Roll link Upper and Lower Nut and bolt	M 24 X 100	590 Nm	36
Support Frame Nut and Bolt Fastening to Bogie Frame	M 20 X 100/46	340 Nm	30
Traction Centre Bottom Bolt	M 16 X 70/38	170 Nm	24
Traction Rod Bolt with Bogie Frame	M 24 X 150/80	590 Nm	36
Traction Rod Bolt with Traction Centre	M 24 X 200/80	590 Nm	36
S Vertical Damper Lower Bolt and	M 12 X 70/30	70 Nm	18/19
S Vertical Damper Upper Bolt And Nut	M 12 X 100/30	70 Nm	18/19
Yaw Damper Nut and Bolt	M 16 X 120	170 Nm	24

7.0 MAINTENANCE SCHEDULES:

Schedule D1: Trip / weekly at nominated PM depot
Schedule D2: Monthly ± 3 days at nominated PM depot
Schedule D3: Half yearly ± 15 days at nominated PM depot sick line

1.0	Coach	D1	D2	D3
1.1	Coach should be washed both from outside & inside.	√	√	√
1.2	Disinfect and spray insecticide at corner and crevices of coaches after washing all coaches	√	√	√
1.3	Intensive cleaning of coach	√	√	√
2.0	**Shell**			
2.1	Visually check body panels/end walls for damages	√	√	√
2.2	Visually inspect destination boards brackets.	√	√	√
2.3	Visually inspect window bars for damage/missing	√	√	√
2.4	Examine body side doors for working/ damages	√	√	√
2.5	Inspect door handles for damages/missing	√	√	√
2.6	Inspect vestibule and its Rubber fittings for damages/missing, repair if necessary	√	√	√
2.7	Visually check vestibule fall plate, mounting brackets, pins and lock lever for ease of operation, damages/ deficiency	√	√	√
2.8	Thoroughly clean and remove dust, rust accumulated at pillars with coir brush and compressed air	-	-	√
2.9	Examine for corrosion of sole bar and other under frame members with torch light or inspection lamp	-	-	√
2.10	Touch up damaged paint both inside & outside	-	-	√
2.11	Check roof ventilator for damages	-	-	√
3	**BOGIE & AIR BRAKE**			
	Bogie Frame and Bolster Assembly			
3.1	Perform a visual check on longitudinal beams, cross beams & bolster for cracks, damages and corrosion.	√	√	√
3.2	Perform a visual check on brake supports, damper supports, traction centre supports and anti roll bar supports for cracks, damages and corrosion.	√	√	√
3.3	Check bogie bolster such assembly and brackets for cracks, damages and corrosion.	√	√	√
3.4	Wash the bogie frame thoroughly with water jet, making sure that water is not directed towards pneumatic / elect. Connections and axle bearings.	-	√	√
3.5	Examine the bogie frame for corrosion / damages, especially at critical locations.	-	-	√
3.6	Carry out paint touch up with high built epoxy primer and paint as per RCF specifications MDTS – 166.	-	-	√
4	**Brake Equipments**			
4.1	Check functionality of brake equipment and Hand brake equipment.	√	√	√
4.2	Perform a visual check on Brake cylinders/ brake levers and Hand brake equipment for damage, cracks and corrosion.	√	√	√
4.3	Perform a functional test on pneumatic brake system. Make sure that no leaks are present.	√	√	√
4.4	Perform a visual check on hoses.	√	√	√
4.5	Visually inspect steel piping for cracks/ damages/ ballast hitting. Repair/ replace as necessary.	√	√	√
4.6	Perform a visual check on brake discs. Verify absence of axial movement along the axle.	√	√	√
4.7	Verify that the clearance between each pad and disc surface is 1-1.5 mm.	-	√	√
4.8	Check wear of brake pads/ brake discs.	-	√	√
4.9	Lubricate the brake levers, fixings and all moving parts.	-	√	√
5	**Axle Bearing Instruments**			
5.1	Perform a visual check on all grounding cables & WSP equipment cables for breaks/ damages.	√	√	√
5.2	Visually check equipment for absence of damages, cracks, and corrosion marks.	√	√	√
5.3	Check functioning of WSP equipment.	√	√	√
5.4	Inspect the Earthing equipment for wear of slip assembly / carbon bars.	-	√	√

5.5	Monthly / Quarterly inspection of WSP equipment to be carried out as per schedule given by OEM.	-	√	√
6	**Primary & Secondary Suspension**			
6.1	Visually check springs for cracks, damages, corrosion or foreign objects presence.	√	√	√
6.2	Check miner pads for cracks, damages and ageing.	√	√	√
6.3	Visually check safety cables for damages, cracks and corrosion.	√	√	√
7	**Primary/Secondary/Yaw dampers**			
7.1	Perform a visual check on dampers for damage, cracks and oil leaks.	√	√	√
7.2	Perform a visual check on all fixings for loosening and/or missing components.	√	√	√
7.3	Perform a visual check on rubber elements for cracks and ageing.	√	√	√
8	**Bearings**			
8.1	Carry out bearing feeling for detection of hot bearing.	√	√	√
8.2	Check bearings for grease leakage.	√	√	√
9	**Wheel & Axle**			
9.1	Perform a visual check on wheels for cracks	√	√	√
9.2	Check by wheel profile gauge	√	√	√
9.3	Check axle for cracks and signs of corrosion	√	√	√
9.4	Check tread diameter and wear of wheel profile. If necessary, perform re-profiling.	-	-	√
9.5	Check wheels offset on axle (1600± 1 mm)	-	√	√
10	**Control Arm**			
10.1	Perform a visual check on all fixings for loosening and / or missing components.	√	√	√
10.2	Visually check control arm parts for damages, cracks or corrosion marks.	√	√	√
10.3	Inspect the rubber joint until it is visible for cracks, damages and ageing.	√	√	√
11	**Anti Roll bar assembly**			
11.1	Perform a visual check on Anti roll bar, links and Brackets for cracks, damages and corrosion.	√	√	√
11.2	Perform a visual check on rubber joints for cracks, damage and ageing.	√	√	√
11.3	Visually inspect for grease oozing out of anti roll bar bearings, which may result in bearing failure.	√	√	√
11.4	Perform visual check on all fixing for loosening/missing fittings.	√	√	√
12	**Traction Centre**			
12.1	Perform a visual check on the traction centre lever and on the rods for cracks, damages and corrosion.	√	√	√
12.2	The assembly should be free to move, and not blocked by any foreign objects.	√	√	√
12.3	Perform a visual check on all fixings for loosening.	√	√	√
12.4	Perform a visual check on rubber joints for cracks/damages.	√	√	√
13	**Rotation Limiter**			
13.1	Perform a visual check of rotation limiter, components	√	√	√
14	**Rubber and Rubber/Metal Bonded parts**			
14.1	Perform a visual check on Rubber and Rubber/Metal bonded parts for cracks, damages and ageing.	√	√	√
15	**Pins and bushes**			
15.1	Lubricate all pins and Bushes.	-	√	√
16	**Body works -**			
16.1	General inspection of Vehicle body work (paint work, glazing).	-	√	√
16.2	Replenish supplies.	√	√	√
17	**Draw & Buffing Gear - (Ref: CMI No: RDSO/2006/CG/CMI/01 Rev No: Nil)**			

17.1	Visual Inspection of coupler head for damage.	√	√	√
17.2	Visual Inspection of Knuckle for damage.	√	√	√
17.3	Checking of coupler operating mechanism for damage, loose, bolts etc.	√	√	√
17.4	Greasing of glide rod of coupler operating mechanism.	√	√	√
17.5	Checking tell tale recess for ensuring proper coupling.	√	√	√
17.6	Inspection of coupler carriers/supporting device & its spring for cracks & breakage	√	√	√
17.7	Inspection of loose/broken/missing nuts & bolts (M-16) of coupler pin support plate & draft gear support plate.	√	√	√
18	**Corridor Connections -**			
18.1	Check corridor connections for external damage & foreign bodies.	√	√	√
18.2	Check vestibule connection for external damage & foreign bodies.	√	√	√
19	**Pressure Air Equipment**			
19.1	Safety valve check for correct function.	√	√	√
19.2	Dry out air - filter	-	√	√
19.3	Clean air - filter	-	√	√
19.4	Clean airline - filter	-	√	√
19.5	Drain air tanks.	√	√	√
20	**Interior fitting passenger accommodation-**		√	
20.1	General visual check for damage	√	√	√
20.2	Check for regulation provision of rubbish bins & operational fire extinguishers.	√	√	√
20.3	Check hand rails, sliding door, shutters, toilet doors, vestibule doors, functioning.	√	√	√
20.4	Check bath room fitting (visual)	√	√	√
20.5	Clean top & bottom guide rails of luggage doors of power cars & greasing of guide bearing.	√	√	
20.6	Inspect seats & check for completeness.	-	√	√
20.7	Inspect luggage racks & check for completeness.	-	√	√
20.8	Check handrails manually for fitment of fixing.	-	√	√
20.9	Inspect floors.	-	√	√
20.10	Checks stick-on notices and directions for condition & completeness.	-	√	√
20.11	1-leaf sliding door - general function check (ease of movement, how it shuts)	√	√	√
20.12	2-leaf connection door - general function check (ease of movement, how it shuts)	√	√	√
21	**Passenger Doors**			
21.1	General function checks (ease of movement)	√	√	√
21.2	Lubricate door seals with silicone paste.	-	-	√
21.3	Clean & lubricate door mechanisms.	-	√	√
22	**Water supply system -**			
22.1	Check tanks pipes for leakage.	√	√	√
22.2	Check tank mountings.	√	√	√
22.3	Rinsing the pipes & water tanks		√	√
23	**Pantry**			
23.1	Check for damages & deficiencies in the pantry construction & fittings	√	√	√
23.2	Check water supply & drainage of the pantry area.	√	√	√
24	**Sanitary Equipment**			
24.1	Check functioning of toilet system.	√	√	√

* * * * *