

CHAPTER 3

BOGIES

301 GENERAL

The main constructional and design features of the ICF/RCF all-coil bogies, used on mainline BG coaches are briefly described in the following paragraphs. Leading Parameters of ICF bogie are as under:

Table 3.1

| S. No. | Description | Parameters |
|--------|------------------------------------|--|
| 1. | Maximum Axle load bearing capacity | 16.25t, 13t |
| 2. | Wheel base | 2896mm |
| 3. | Wheel diameter (New) | 915mm |
| 4. | Axle guidance | Telescopic axle guide with oil damping |
| 5. | Primary suspension | Coil spring |
| 6. | Secondary suspension | Coil spring |
| 7. | Shock absorbers | i) Vertical dashpot in primary suspension. ii) Hydraulic double acting vertical shock absorber in secondary suspension. |
| 8. | Transfer of coach body weight | Through bogie side bearer pitched at 1600mm. |

302 ALL-COIL ICF BOGIE

302a The bogies being currently manufactured by ICF/RCF which have been accepted as standards of the Indian Railways and are of an all welded light weight construction. Axles are located on the bogie by telescopic dash pot and axle guide assemblies. Helical coil springs are used in both the primary and the secondary stages. The axle guide device provides viscous damping across primary springs while hydraulic dampers are provided across the secondary stage. Dampers are protected against misalignment by resilient fittings. Isolation of vibration is effected by rubber pads in primary and secondary suspension.

302b Deflection due to the tare weight is almost equally divided between axle and bolster springs. Weight of coach body is transferred to its bogie by side bearers pitched 1600 mm apart. Side-bearers consist of lubricated metal slides immersed in oil baths. No vertical weight transfer is effected through bogie pivot and the pivot acts merely as a centre of rotation and serves to transmit tractive/braking forces only.

303 BOGIE ASSEMBLY (see figure 3.1)

The bogie frame and components are of all-welded light construction with a wheel base of 2.896 metre. The wheel sets are provided with self-aligning spherical roller bearings mounted in cast steel axle box housings. Helical coil springs are used in both primary and secondary suspension. The weight of the coach is transferred through side bearers on the bogie bolsters. The ends of the bogie bolsters rest on the bolster helical springs placed over the lower spring beam suspended from the bogie frame by the inclined swing links at an angle 7°. Hydraulic shock absorbers and dash pots are provided in the secondary and primary suspensions respectively to damp vertical oscillations.

304 AXLE BOX GUIDE WITH DASH POT ARRANGEMENT (see fig. 3.2a & 3.2b)

Axle box guides are of cylindrical type welded to the bottom flanges of the bogie side frame with close dimensional accuracy. These guides together with lower spring seats located over the axle box wings, house the axle box springs and also serve as shock absorbers. These guides are fitted with guide caps having nine holes of diameter 5 mm equidistant through which oil in the lower spring seat passes under

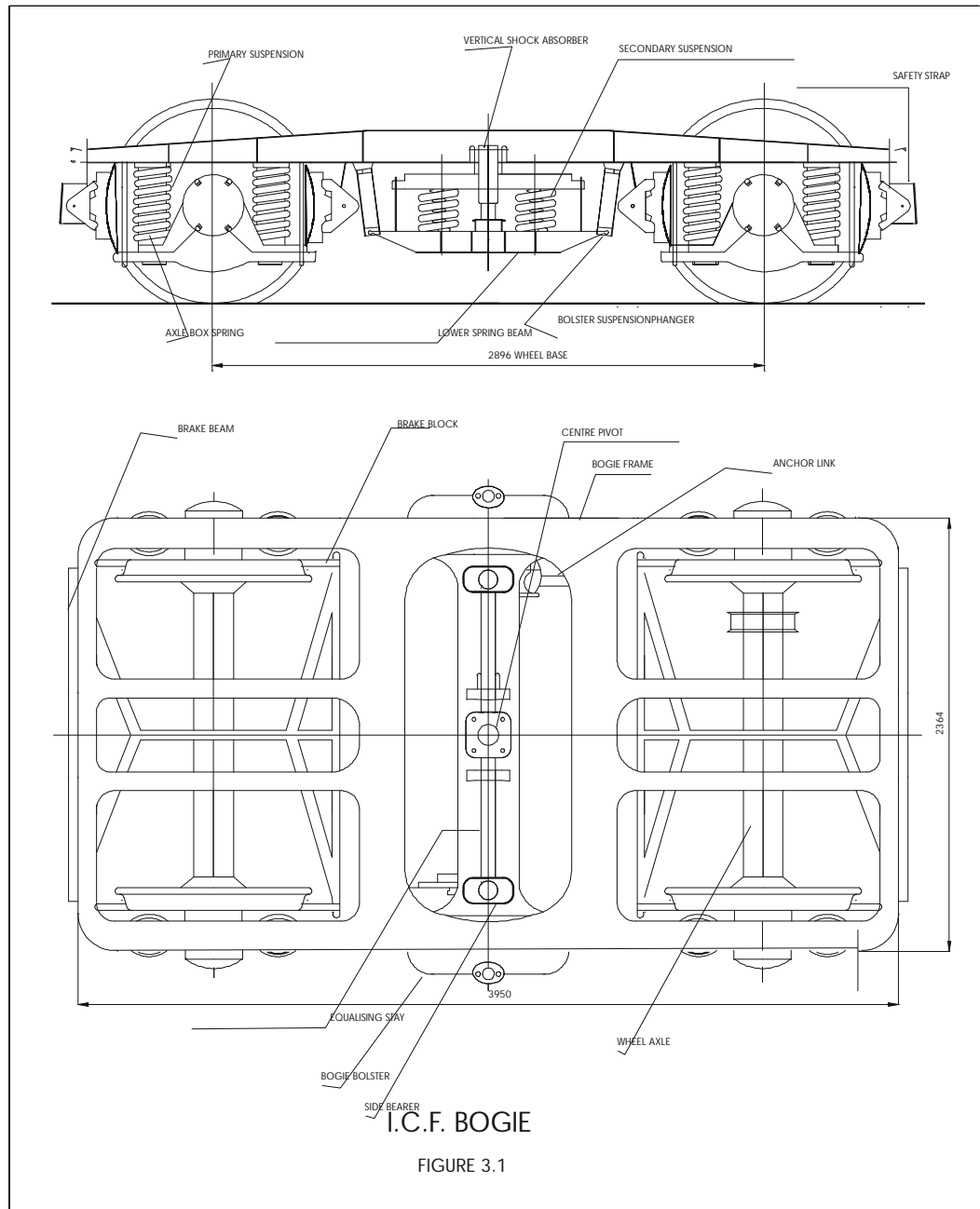


FIGURE 3.1

pressure during dynamic oscillation of coach and provide necessary damping to primary suspension to enhance better riding quality of coach. This type of rigid axle box guide arrangement eliminates any longitudinal or transverse relative movement between the axles and the bogie frame.

Figure 3.2a & 3.2b show modified and unmodified guide arrangement respectively. The quantity of oil required to achieve **40 mm** oil level above the guide cap in modified arrangement is approximately **1.6 liters** and in unmodified arrangement is approximately **1.4 liters**. As it is not possible in open line to distinguish between modified and unmodified arrangements, **40 mm** oil level is standardised for both.

305 AIR VENT SCREWS

On the bogie side frames, directly above the dash-pots, tapped holes are provided for replenishing oil in the dash pots. Special screws with copper asbestos washers are screwed on the tapped hole to make it air tight.

306 BOGIE BOLSTER SUSPENSION

The bolster rests on the bolster coil springs - two at each end, located on the lower spring beam which is suspended from the bogie side frame by means of bolster-spring-suspension (BSS) hangers on either side. The two anchor links diagonally positioned are provided with silent block bushes. The links prevent any relative movement between the bogie frame and coach body.

307 SPRINGS

In ICF bogie, helical springs are used in both primary and secondary suspension. The springs are manufactured from peeled and centreless ground bar of chrome vanadium/chrome molybdenum steel conforming to STR No. WD-01-HLS-94 (Rev.1)

308 CENTRE PIVOT ARRANGEMENT

The centre pivot pin joins the body with the bogie and transmits the tractive and braking forces on the

bogies. It does not transmit any vertical load. It is equipped with rubber silent block bushes which tend to centralise the bogies with respect to the body and, to some extent, control and damp the angular oscillations of the bogies. (see **figure 3.3**)

309 SIDE BEARERS

The side bearer arrangement consists of a machined steel wearing plate immersed in an oil bath and a floating bronze-wearing piece with a spherical top surface kept in it, on both sides of the bogie bolster. The coach body rests on the top spherical surface of these bronze-wearing pieces through the corresponding attachments on the bottom of the body-bolster. The whole arrangement is provided with a cover to prevent entry of dust in the oil sump. (see **figure 3.4**)

Table 3.2

Wear limit for wearing plate

| New size | Shop renewal size | Condemning size |
|----------|-------------------|-----------------|
| 10 mm | 9 mm | 8.5 mm |

Wear limit for wearing piece

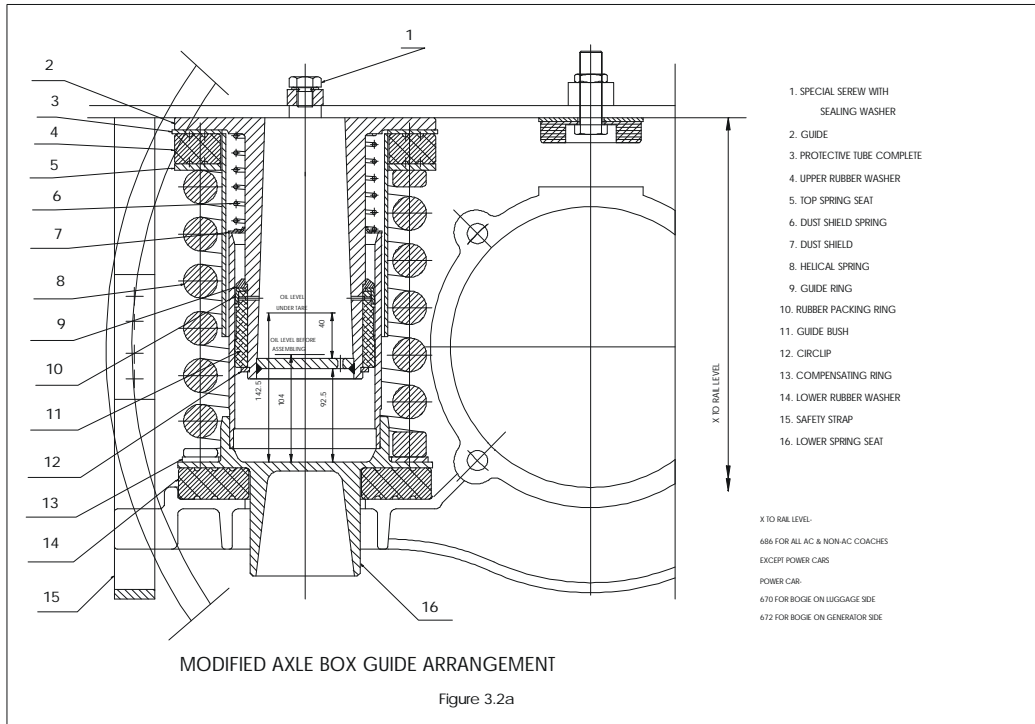
| New size | Shop renewal size | Condemning size |
|----------|-------------------|-----------------|
| 45 mm | 43.5 mm | 42 mm |

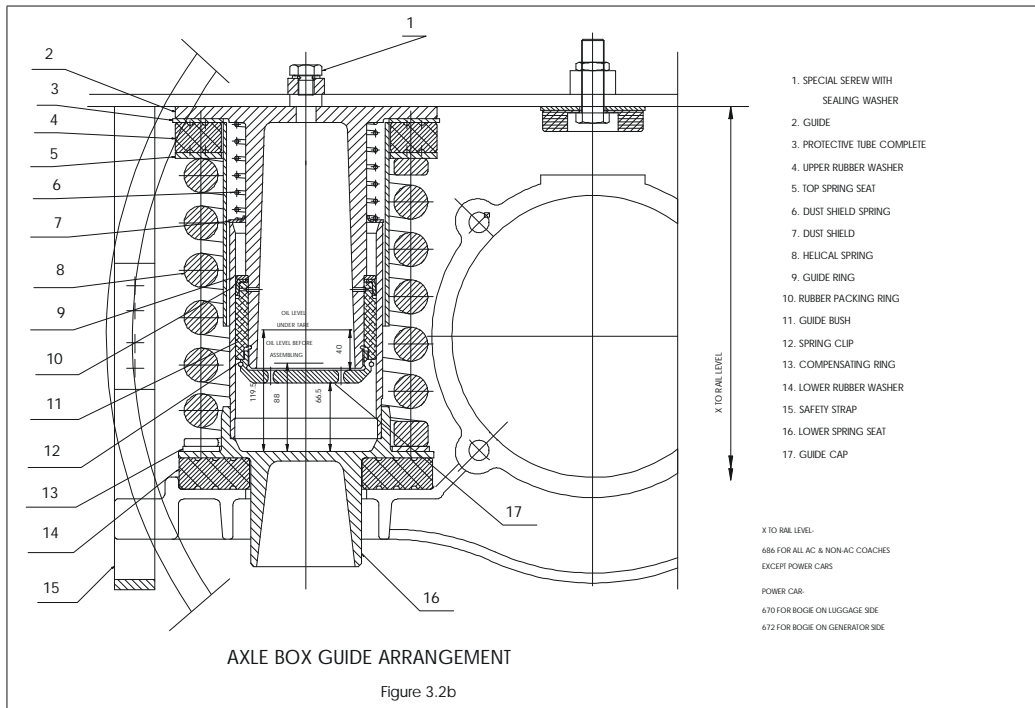
310 ANCHOR LINKS

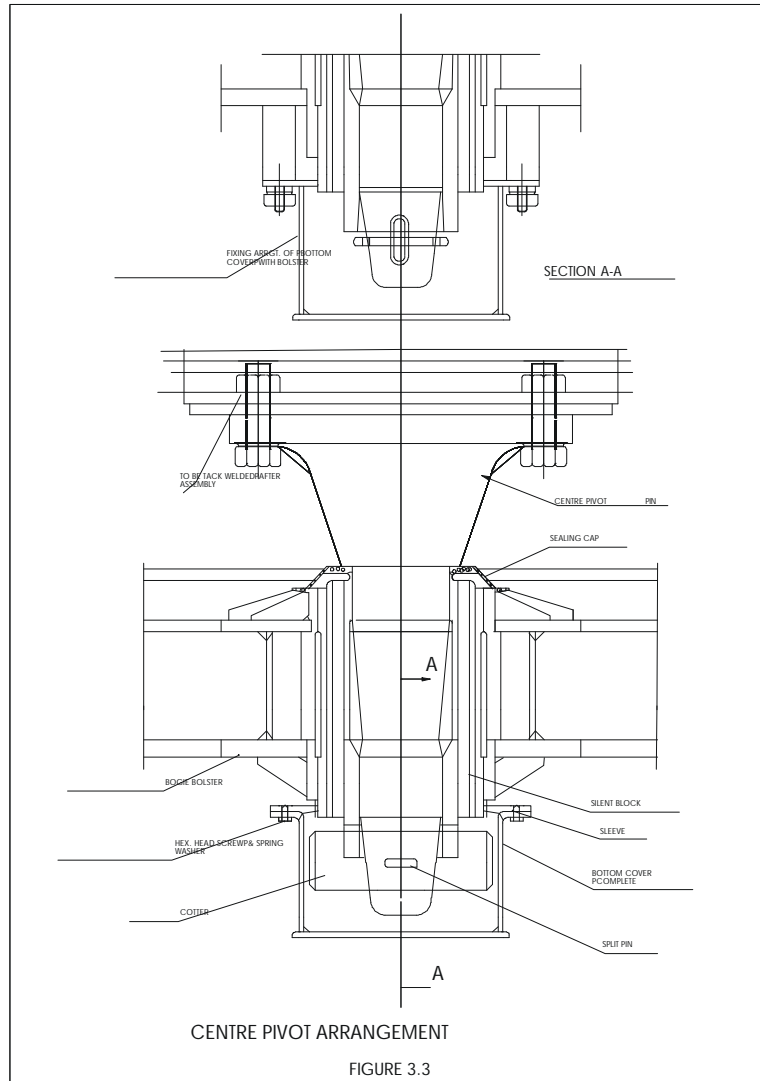
The floating bogie bolster which supports the coach body is held in position longitudinally by the anchor links which are pinned to the bolster sides and the bogie Transoms. One anchor link is provided on each side of the bolster diagonally across. The links can swivel universally to permit the bolster to rise and fall and sway side wards. They are designed to take the tractive and braking forces. The anchor links are fitted with silent block bushes (see **figure 3.5**)

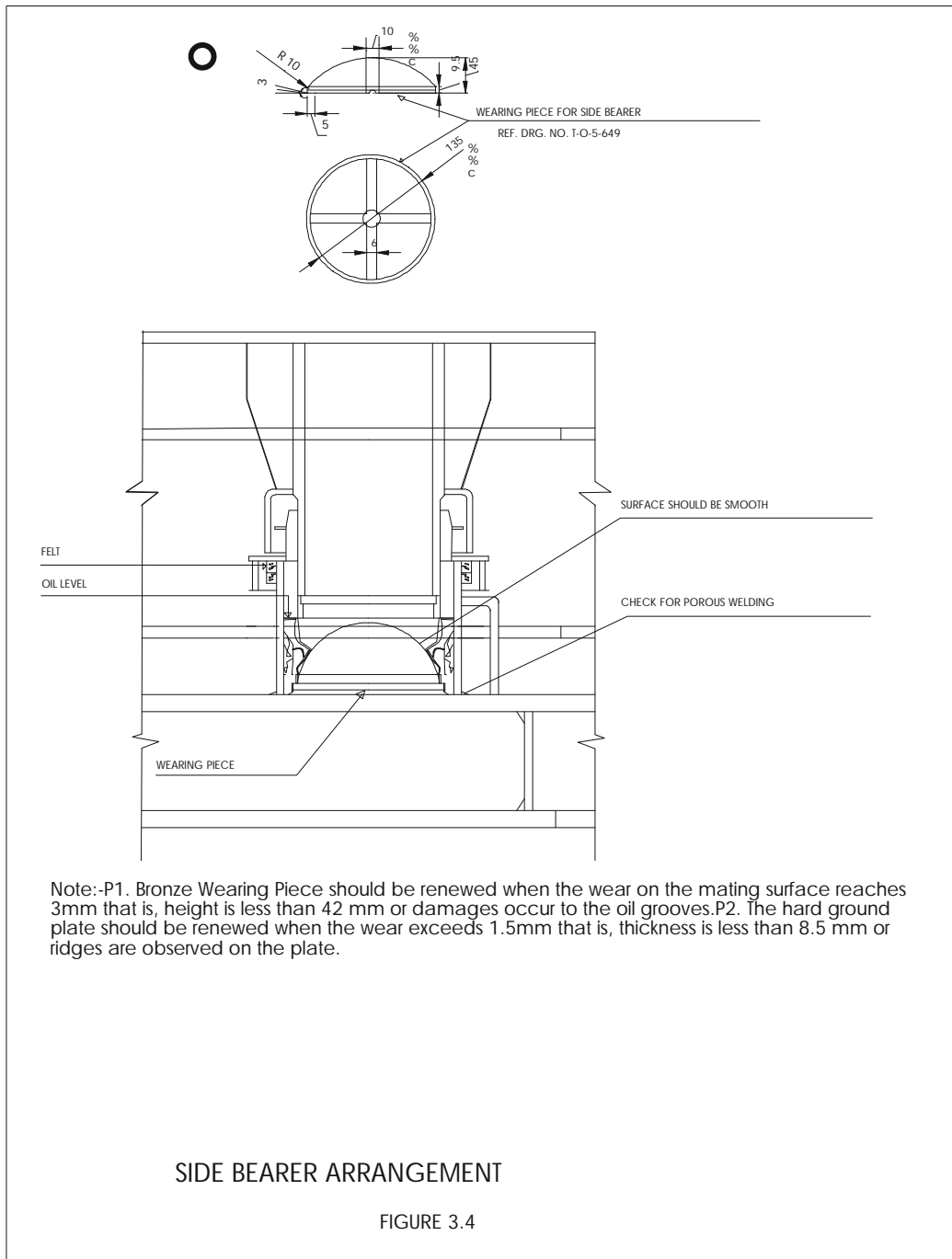
311 SILENT BLOCK

This is a synthetic rubber bush fitted in anchor link and center pivot of ICF bogies to transmit force without shock and reduce noise.









Note:-P1. Bronze Wearing Piece should be renewed when the wear on the mating surface reaches 3mm that is, height is less than 42 mm or damages occur to the oil grooves.P2. The hard ground plate should be renewed when the wear exceeds 1.5mm that is, thickness is less than 8.5 mm or ridges are observed on the plate.

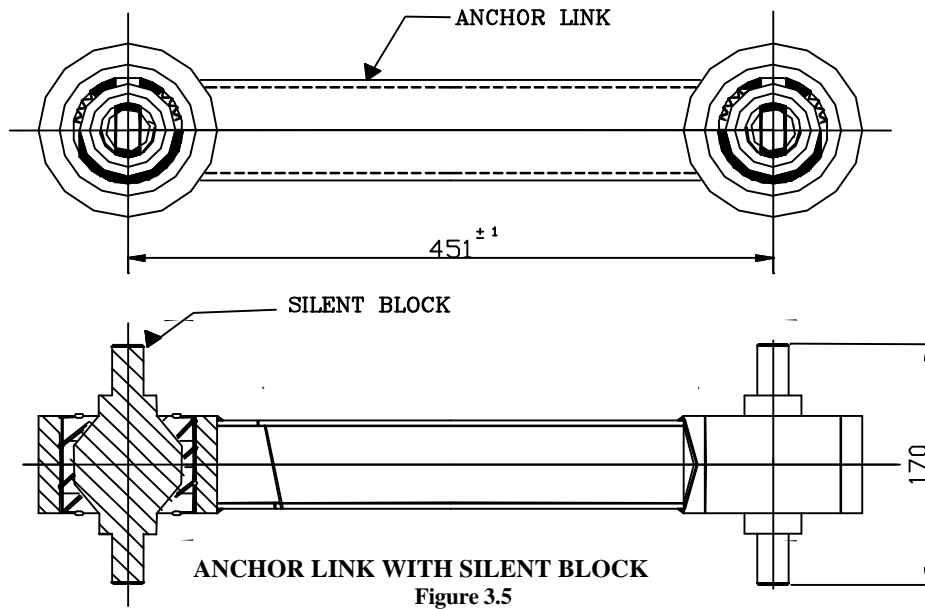


Figure 3.5

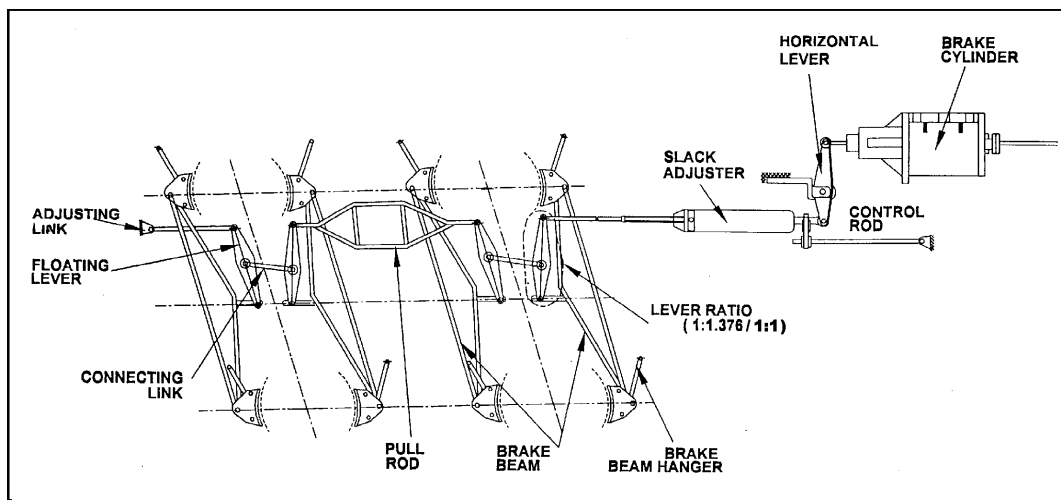
312 BRAKE RIGGING

Brake rigging is provided to control the speed of the coach by transferring the braking force from the brake cylinder to the wheel tread. Brake rigging can be divided into two groups i.e. Bogie mounted brake rigging and coach under frame mounted brake rigging.

312a Coach Under Frame Mounted Brake Rigging

The brake rigging is as per **figure 3.6**. In 16.25 t axle load bogie the four lever used in bogie brake rigging are each with lever ratio of **1:1.376** and hence the total Mechanical advantage in a bogie is **5.504**.

The components details of 16 t bogie are given in table 3.3 (Refer ICF drawing No. WTAC₃-3-2-305).



COACH UNDERFRAME BRAKE RIGGING

Figure 3.6

Table 3.3

| Sr.No. | Description | Ref. Drg. NO (ICF) | Quantity |
|--------|--|-----------------------|----------|
| 1 | Brake Head & block complete (L.H. Assembly) | T-3-1-919 | 8 |
| 2 | Brake Head & block complete (R.H. Assembly) | T-3-1-619 | 8 |
| 3 | Short lever | WLRRM 3-2-002 | 12 |
| 4 | Long lever | WLRRM-3-2-002 | 8 |
| 5 | Brake Block Hanger | T-3-2-645 | 16 |
| 6 | Adjusting link | WT AC3-3-2-302 | 2 |
| 7 | Lever Hanger | HIG AC 3-3-2-302 | 16 |
| 8 | Pull rod | WLRRM3-2-002 | 4 |
| 9 | Pull rod | T-3-2-616 | 2 |
| 10 | Pin | T3-2-048 | 50 |
| 11 | Washer | ICF/STD 3-2-003 | 50 |
| 12 | Split Cotter | T-3-2-632 | 50 |
| 13 | Pin | T-3-2-648 | 8 |
| 14 | Washer | ICF/STD 3-2-103 | 24 |
| 15 | Split Cotter | T-3-2-632 | 8 |
| 16 | Pin for lever Hanger | ICF/SK-3-2-179 | 16 |
| 17 | Pin for safety wire rope | WT AC3/3-2-307 | 32 |
| 18 | Plain washer M20 | IS: 2016-67 T.2type A | 32 |
| 19 | Split cotter | EMU-3-2-048 | 32 |
| 20 | Brake beam | T-3-2-804 | 8 |
| 21 | Safety wire rope | T-3-2-651 | 16 |
| 22 | Safety straps fixing Arrangement | WT AC-3-2-304 | 8 |

In 13 t axle load bogie the four lever used in bogie brake rigging are each with lever ratio of 1:1 and hence the total Mechanical advantage in a bogie is 4.

The components details of 13 t bogie are given in table 3.4 (Refer ICF drawing No. T-3-2-601).

Table 3.4

| Sr.No. | Description | Ref. Drg. NO (ICF) | Quantity |
|--------|-----------------------------|--------------------|----------|
| 1 | Brake Head & block complete | T-3-1-601 | 16 |
| 2 | Brake Beam | T-3-1-602 | 8 |
| 3 | Long lever | T-3-2-605 | 8 |
| 4 | Short lever | T-3-2-604 | 8 |
| 5 | Pull rod | T-3-2-607 | 4 |
| 6 | Pull rod | T3-2-616 | 2 |
| 7 | Adjusting Link | T-3-2-609 | 2 |
| 8 | Lever Hanger | T-3-2-611 | 16 |
| 9 | Safety Strap | T3-2-612 | 4 |
| 10 | Safety Strap | T-3-2-621 | 4 |
| 11 | Pin | T3-2-048 | 8 |
| 12 | Pin | T3-2-048 | 50 |
| 13 | Hex head screw ½" BSWx 38 | BS :3083 –64 | 64 |
| 14 | Spring Washer M-12 | IS: 3063-72 | 64 |
| 15 | Hex. Nut ½" BSW | BS:1083-65 | 64 |
| 16 | Washer | DL-0-5-034 | 50 |
| 17 | Washer | DL-0-5-034 | 24 |
| 18 | Pin for lever Hanger | ICF/SK-3-2-179 | 16 |
| 19 | Split cotter | T-3-2-632 | 50 |

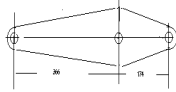
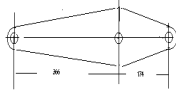
i) CONVENTIONAL AIR BRAKE COACH POWER CAR (refer figure 3.7)

| TYPE OF COACH | BUILDER | TARE WEIGHT IN TONNES | % OF BRAKING |
|-----------------------------|---------|-----------------------|--------------|
| POWER CAR TO WLRRM6-9-0-601 | ICF | 53.7 | 118 |
| HIGH CAPACITY POWER CAR | ICF | 60 | 105.6 |

ii) CONVENTIONAL AIR BRAKE COACH SELF GENERATING AC COACHES (refer figure 3.8)

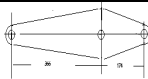
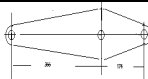
| TYPE OF COACH | BUILDER | TARE WEIGHT IN TONNES | % OF BRAKING |
|---------------|---------|-----------------------|--------------|
| WGACCW | ICF | 50.0 | 114.8 |
| | RCF | 49.1 | 120.9 |
| WGACCN | RCF | 50.1 | 118.6 |
| WGSCZAC | ICF | 49.3 | 123.7 |
| WGFAC | ICF | 49.7 | 119.5 |
| WGFSCZAC | ICF | 50.0 | 118.8 |

Levers for Power car & self generating AC coaches

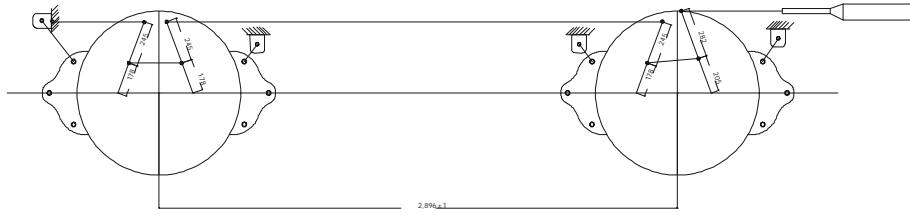
| Sr. No. | Size | Shape/Drg. | Types of coaches fitted | Drawing no. |
|---------|-----------|---|--|---------------------|
| 1. | 282 x 205 |  | POWER CAR TO WLRRM6-9-0-601, HIGH CAPACITY POWER CAR, WGACCW, WGACCN, WGSCZAC, WGFAC, WGFSCZAC | SK-93373 & SK-93371 |
| 2. | 245 X 178 |  | -DO- | -DO- |

iii) CONVENTIONAL AIR BRAKE COACH NON AC COACHES (refer figure 3.9)

Levers

| Sr. No. | Size | Shape/Drg. | Types of coaches fitted | Drawing no. |
|---------|-----------|---|---|-------------|
| 1. | 230 X 230 |  | GS,FC,SLEEPER, SLR, Second day coach, SCNLR, PANTRY CAR | SK-93372 |
| 2. | 200 X 200 |  | -DO- | -DO- |

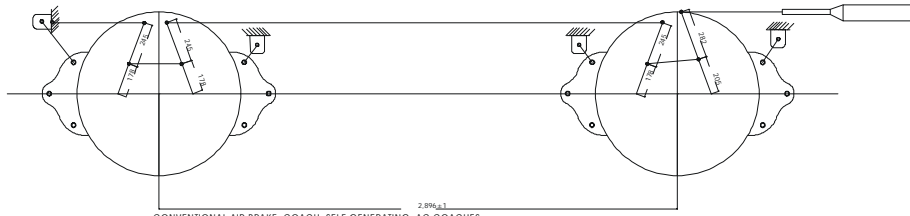
| TYPE OF COACH | BUILDER | TARE WEIGHT IN TONNES | % OF BRAKING |
|----------------------|---------|-----------------------|--------------|
| GENERAL SECOND CLASS | ICF | 36 | 120 |
| | RCF | 37.4 | 115.5 |
| SECOND DAY COACH | ICF | 37 | 116.7 |
| | RCF | 37.3 | 115.8 |
| SLEEPER | ICF | 39.5 | 109.3 |
| | RCF | 39.45 | 109.5 |
| FIRST CLASS | ICF | 41.8 | 103.3 |
| SLR | ICF | 40.6 | 106.4 |
| | RCF | 40.0 | 108.0 |
| SCNLR | ICF | 41.0 | 105.3 |
| PANTRY CAR | ICF | 41.3 | 104.6 |



CONVENTIONAL AIR BRAKE COACH (POWER CAR)

RDSO DRAWING NO. SK-93373

FIGURE 3.7



CONVENTIONAL AIR BRAKE COACH SELF GENERATING AC COACHES

RDSO DRAWING NO. SK-93371

FIGURE 3.8



312b Bogie Mounted Brake Rigging

Bogie brake rigging has been modified to incorporate a total mechanical advantage of **7.644** per bogie for non-ac coaches and **8.40** per bogie for ac coaches.

The components of bogie mounted air brake (16 t bogie) to ICF drawing no. WTAC₄-3-3-401 is given in table 3.5.

Table 3.5

| Sr.No. | Description | Ref. Drg. No. (ICF) | Quantity |
|--------|----------------------------------|---------------------|----------|
| 1 | Brake Head & block complete (LH) | T-3-1-801 | 8 |
| 2 | Brake Head & Block complete (RH) | T-3-1-801 | 8 |
| 3 | Brake beam | T-3-2-650 | 8 |
| 4 | Safety wire rope | T-3-2-651 | 16 |
| 5 | Lever | WTAC4 -3-2-402 | 8 |
| 6 | Lever | WTAC4 -3-2-402 | 8 |
| 7 | Lever Hanger | WTAC4 -3-2-402 | 8 |
| 8 | Pull rod | WTAC4 -3-2-402 | 8 |
| 9 | Brake block Hanger | T3-2-645 | 16 |
| 10 | Pin | T-3-2-648 | 44 |
| 11 | Plain Washer | ICF/ISD 3-2-003 | 64 |
| 12 | Split cotter | T-3-2-632 | 52 |
| 13 | Pin | T3-2-648 | 4 |
| 14 | Plain Washer | ICF/STD 3-2-003 | 4 |
| 15 | Pin | T-3-2648 | 4 |
| 16 | Pin for lever Hanger | T-3-2-801 | 16 |
| 17 | Pin for Safety wire rope | WT AC3 -3-2-307 | 32 |
| 18 | Pin Washer M 20 | IS: W 16-67 | 32 |
| 19 | Split cotter | EMU-3-2-048 | 32 |

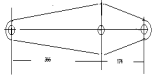
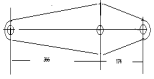
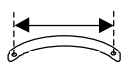
The components of bogie mounted air brake (13 t bogie) to ICF drawing no. T-3-2-801 is given in table 3.6

Table 3.6

| Sr. No. | Description | Ref. Drg. NO ICF) | Quantity |
|---------|--|-------------------|----------|
| 1 | Brake Head & block complete (L.H. Assembly) | T-3-1-801 | 4 |
| 2 | Brake Head & block complete (R.H. Assembly) | T-3-1-801 | 4 |
| 3 | Brake beam | T-3-1-804 | 4 |
| 4 | lever | T-3-1-802 | 4 |
| 5 | lever | T-3-1-802 | 4 |
| 6 | lever Hanger | T-3-1-802 | 4 |
| 7 | Pull rod | T-3-2-802 | 2 |
| 8 | Brake block Hanger | T-3-1-645 | 8 |
| 9 | Pin | T3-2-648 | 22 |
| 10 | Plain Washer | ICF/STD-3-2-103 | 32 |
| 11 | Split Cotter | T-3-2-632 | 26 |
| 12 | Pin | T-3-2-648 | 2 |
| 13 | Plain Washer | ICF/STD 3-2-103 | 2 |
| 14 | Pin | T-3-2-648 | 2 |
| 15 | Pin for lever Hanger | T-3-2-802 | 8 |
| 16 | Pin for safety wire rope | WFT AC3/3-2-307 | 16 |
| 17 | Plain washer M20 | IS: 2016-67 | 16 |
| 18 | Split cotter | EMU-3-2-048 | 16 |
| 19 | Safety wire rope | T-3-2-651 | 8 |

i) AC COACHES WITH BOGIE MOUNTED AIR BRAKE CYLINDER (refer figure 3.10)

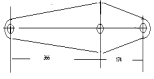
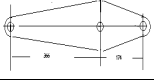

Levers

| Sr. No. | Size | Shape/Drg. | Types of coaches fitted | Drawing no. |
|---------|-----------|---|--|-------------|
| 1. | 366 x 174 |  | WGSCZAC, WGSCWAC, WGFAC, WGFSCZ, WSCZAC, WSCWAC, WFAC, WCBAC | SK-98032 |
| 2. | 311 X 148 |  | -DO- | -DO- |
| 3. | 412 |  | -DO- | -DO- |

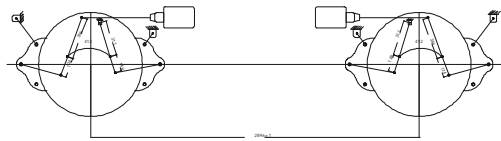
| TYPE OF COACH | TARE WEIGHT IN TONNES | % OF BRAKING |
|---------------|-----------------------|--------------|
| WGSCZAC | 50.95 | 40.56 |
| WGSCWAC | 52.10 | 39.66 |
| WGFAC | 49.90 | 41.41 |
| WGFSCZ | 50.00 | 41.33 |
| WSCZAC | 48.90 | 42.26 |
| WSCWAC | 49.40 | 41.83 |
| WFAC | 46.20 | 44.73 |
| WCBAC | 47.90 | 43.14 |

ii) NON - AC COACHES WITH BOGIE MOUNTED AIR BRAKE CYLINDER (refer figure 3.11)

Levers

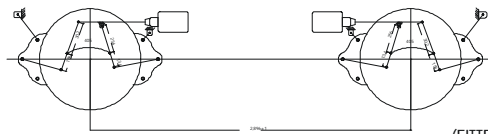
| Sr. No. | Size | Shape/Drg. | Types of coaches fitted | Drawing no. |
|---------|-----------|---|--------------------------|-------------|
| 1. | 302 X 158 |  | GS,SCN,SDC,WCB, SLR, WFC | SK-98027 |
| 2. | 256 X 134 |  | -DO- | -DO- |
| 3. | 405 |  | -DO- | -DO- |

| TYPE OF COACH | TARE WEIGHT IN TONNES | % OF BRAKING |
|---------------|-----------------------|--------------|
| GS | 36.00 | 52.23 |
| SCN | 37.55 | 50.08 |
| SDC | 36.50 | 51.52 |
| WCB | 40.40 | 46.54 |
| SLR | 40.60 | 46.32 |
| WFC | 41.80 | 44.99 |



AC COACHES WITH BOGIE MOUNTED AIR BRAKE CYLINDER (FITTED WITH K TYPE COMPOSITION BLOCK) RDSO DRAWING NO. SK-98032

FIGURE 3.10



NON-AC COACHES WITH BOGIE MOUNTED AIR BRAKE CYLINDER (FITTED WITH K TYPE COMPOSITION BLOCK) RDSO DRAWING NO. SK-98027

FIGURE 3.11

313 EQUALISING STAYS

This device has been provided on bogies between the lower spring plank and the bolster to prevent lateral thrust on the bolster springs which have not been designed to take the lateral forces. These links have pin connections at both ends and, therefore, can swivel freely. (see figure 3.13)

314 BOLSTER SPRING SUSPENSION HANGERS (BSS HANGERS)

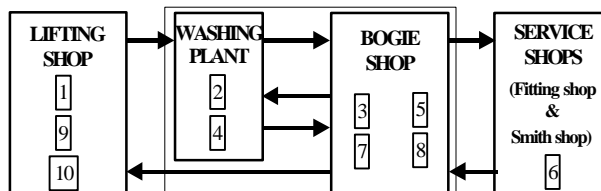
In the secondary suspension, the bolster is supported on helical coil springs which are placed on the lower spring plank. The lower spring plank is suspended from the bogie side frame through BSS hangers on hanger blocks. (see figure 3.14)

315 SHOCK ABSORBERS

Hydraulic shock absorbers with capacity of ± 600 kg at a speed of 10 cm/sec. are fitted to work in parallel with the bolster springs to provide damping for vertical oscillations.

316 WORKSHOP MAINTENANCE-BOGIE SHOP

**MAINTENANCE OF BOGIES
(Flow Diagram)**



1. Coach lifting
2. Bogie cleaning
3. Bogie dismantling
4. Component cleaning
5. Attention to components
6. Repair of components
7. Bogie assembly
8. Load testing and adjustment
9. Lowering of coach
10. Final adjustment

Figure 3.12

After lifting the coach body (refer para 105 of chapter 'Coach'), roll out the bogies and send them to bogie washing plant in bogie shop.

316a Washing Plant

- i) Remove all the oil from the side bearer oil bath.
- ii) Wash the bogie with high pressure hot water jet to remove all dust, mud, scales, grease and other muck without damaging the base primer coating.

After washing and drying, roll the bogies to dismantling line.

316b Dismantling

- i) Make sure that the vent screws are opened. Lift the bogie frame along with the bolster using overhead crane till all the eight axle guides disengage from the lower spring seats.
- ii) Lower the bogie frame and bolster on to the shop floor.
- iii) Remove and collect the axle box guide components and helical springs in respective bins/ pallets and send to washing plant for thorough cleaning.
- iv) Wheel sets must be first cleaned thoroughly in the washing plant and then sent to wheel shop.
- v) Remove vertical shock absorber and send to shock absorber maintenance section.
- vi) Disconnect anchor links. Dismantle bolster suspension hangers by placing a dead weight on the bogie frame and by using a jack.
- vii) Disconnect equalising stays. Lift the bolster off the bolster springs and remove the bolster springs.
- viii) Collect anchor links, equalising stays, bolster spring suspension (BSS) hanger pins, BSS hanger blocks (stones), BSS hangers, pins of equalising stays, brake rigging components and bolster springs into respective bins/ pallets and send to washing plant for thorough cleaning.
- ix) Send the bogie frame, bolsters, and lower spring planks to washing plant for thorough cleaning and drying.

Transport the cleaned and dried bogie frame, bolster and spring planks to inspection and repair stands. Place the bogie frame on repair stands in the inverted position.

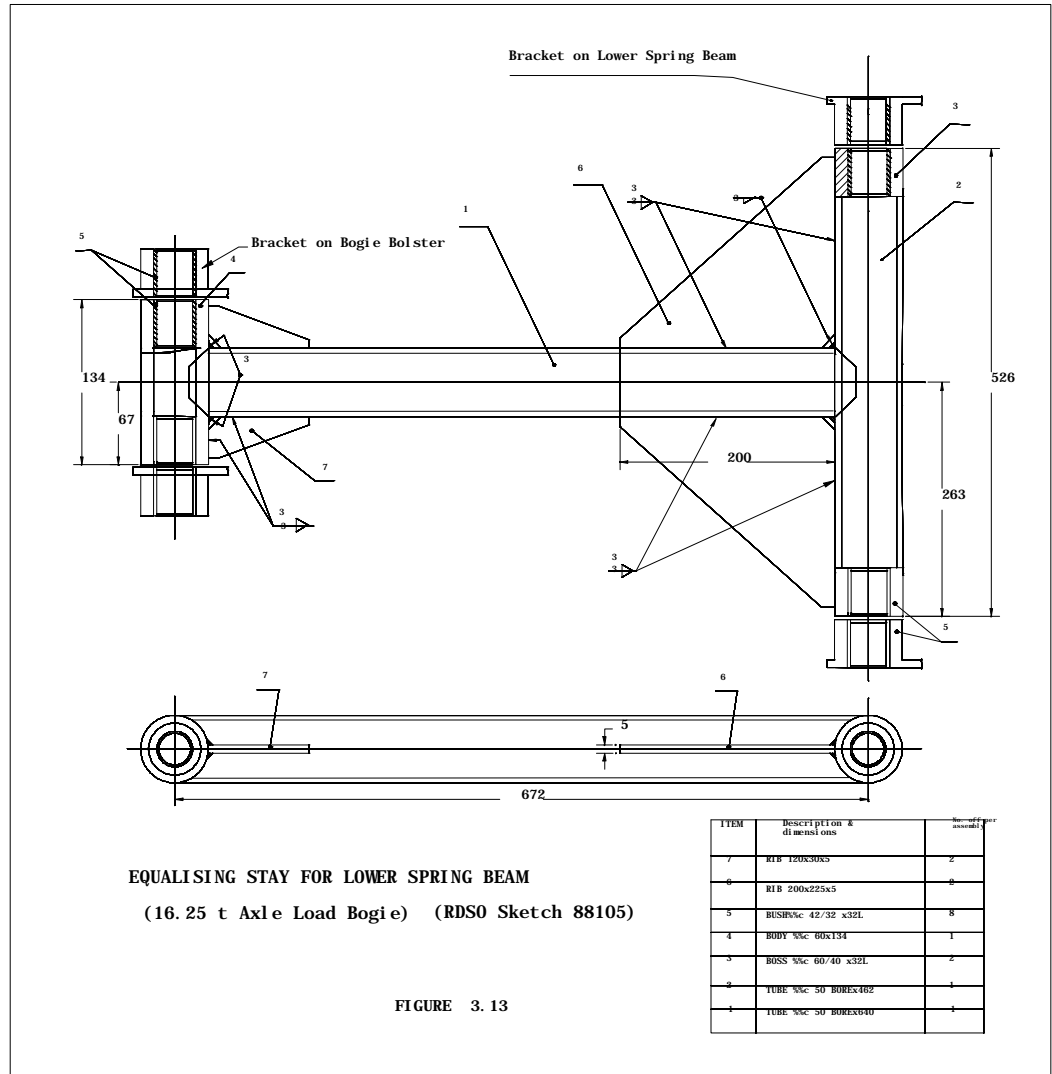
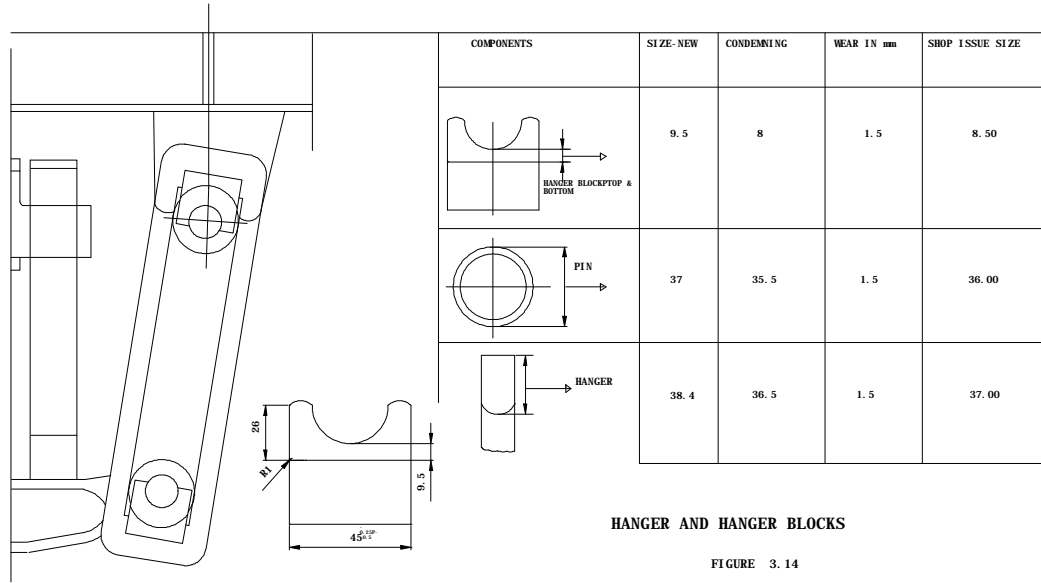


FIGURE 3.13



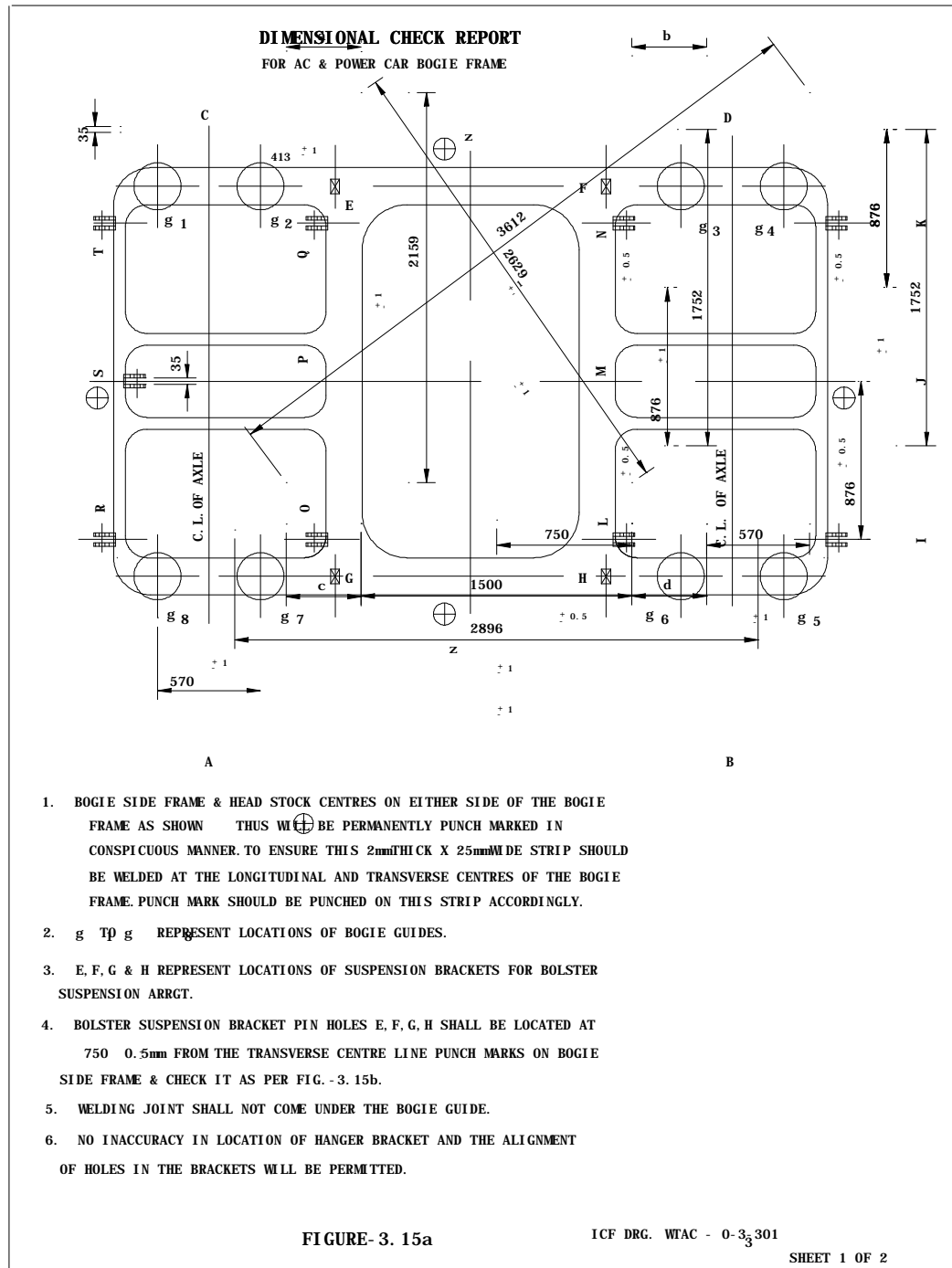
316c **Attention to Bogie Frame**

- i) Check the bogie thoroughly for any possible cracks. Check the BSS brackets, axle guides, area surrounding the BSS bracket and axle guide and all the welding joints of bogie frame. If cracks are detected, hold the bogie frame in bogie manipulator. After proper gouging, weld the cracks and finish by grinding.
- ii) If the BSS brackets or axle guides are worn (limits: **1 mm** for axle guide and **0.5 mm** for BSS bracket bush), damaged or cracked, they should be replaced.
- iii) Bent or damaged suspension straps should be attended to as required.
- iv) Safety wire rope arrangement and safety straps should be used for brake beams as per revised RDSO instructions.

Table 3.7

| Suggested BSS bracket and axle guide alignment gauges | 13t bogies | 16.25t bogies |
|--|---|---|
| Longitudinal gauge for BSS brackets | 1400±1.0 mm (700±0.5 mm from longitudinal center-line) | 1500±1.0 mm (750±0.5 mm from longitudinal center-line) |
| Transverse gauge for BSS brackets | 2159 ±1.0 mm | 2159 ± 1.0 mm |
| Diagonal gauge for BSS brackets | 2573 ±1.0 mm | 2629 ± 1.0 mm |
| Longitudinal gauge for axle guide | 570±1.0 mm (equidistant from center-line of axle) | 570 ± 1.0 mm (equidistant from center-line of axle) |
| Transverse gauge for axle guide | 2159±1.0 mm | 2159±1.0 mm |
| Diagonal gauge for axle guide | 3612±1.0 mm | 3612±1.0 mm |
| Distance between BSS bracket and adjacent axle guide | 463±1.0 mm | 413±1.0 mm |
| Longitudinal gauge for suspension strap | 870±1.0 mm (equidistant from center-line of axle) | 870±1.0mm (equidistant from center-line of the axle) |

- v) Check the squareness and alignment of BSS brackets and axle guides with the help of transverse, longitudinal, diagonal gauges and straight edge. Axle guide alignment should be checked with reference to the BSS brackets and recorded in RDSO dimensional check report. A coordinate measuring machine, preferably CNC type, can do these checks accurately.
- vi) If the BSS brackets do not lie within the tolerances, relocate one or more BSS brackets with correct alignment. After ensuring correct alignment of the BSS brackets, measure the location of the axle guide from the BSS brackets and record in RDSO dimensional check report. If the measurements deviate from the standard measurements, relocate mis-aligned pair of axle guides.
- vii) The relevant axle guides should be cut using special gouging nozzles (PO 18 or 19) to prevent undercutting of bogie frame. Axle guides found bent/cracked should also be cut out and replaced.
- viii) Weld the new axle guides with the help of axle guide welding fixture, if the axle guides are damaged or worn. Check the alignment of new axle guides with respect to other axle guides using master gauges and straight edge. Any slight discrepancy in location can be rectified by suitable local heating of the frame. After complete rectification, record important dimensions in RDSO dimensional check report. (See **fig. 3.15 a&b, fig. 3.16 a&b**)
- ix) Replace the BSS bracket bushes and pins if they were damaged or worn.



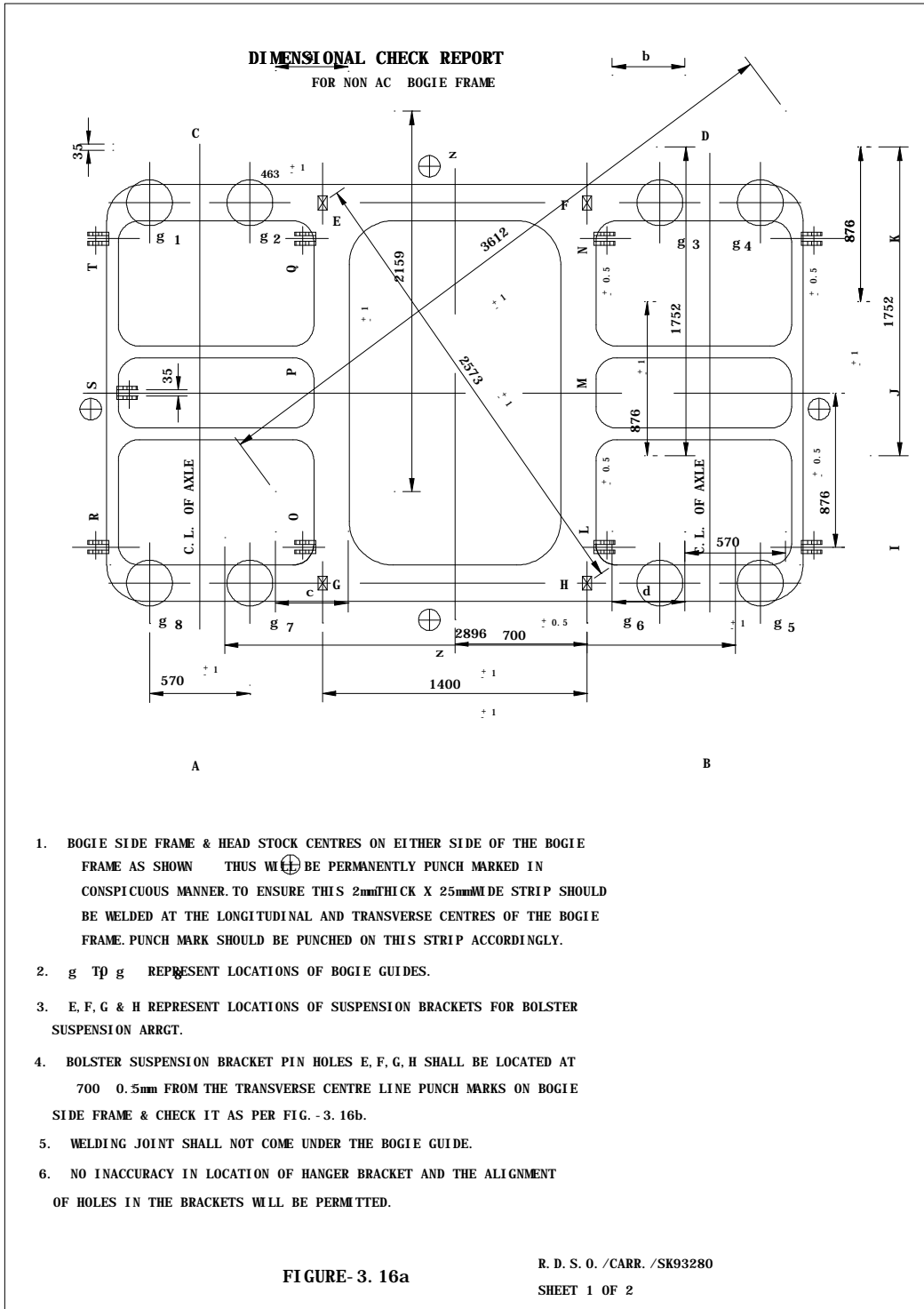
DIMENSIONAL CHECK REPORT FOR BOGIE FRAME (AC TYPE)

No.

| ICF DRG. NO. WTAC3 0-3-301 | Measuring Point | Nominal Size (mm) | Actual Size (mm) | Variation (mm) | Measuring Point | Nominal Size (mm) | Actual Size (mm) | Variation (mm) |
|----------------------------|-----------------|-------------------|------------------|----------------|-----------------|-------------------|------------------|----------------|
| | E - F | 1500 ± 1.0 | | | I - J | 876 ± 0.5 | | |
| | G - H | 1500 ± 1.0 | | | J - K | 876 ± 0.5 | | |
| | E - G | 2159 ± 1.0 | | | L - M | 876 ± 0.5 | | |
| | F - H | 2159 ± 1.0 | | | M - N | 876 ± 0.5 | | |
| | E - H | 2629 ± 1.0 | | | O - P | 876 ± 0.5 | | |
| | F - G | 2629 ± 1.0 | | | P - Q | 876 ± 0.5 | | |
| | a | 413 ± 1.0 | | | R - S | 876 ± 0.5 | | |
| | b | 413 ± 1.0 | | | S - T | 876 ± 0.5 | | |
| | c | 413 ± 1.0 | | | I - K | 1752 ± 1.0 | | |
| | d | 413 ± 1.0 | | | L - N | 1752 ± 1.0 | | |
| | g1 - g2 | 570 ± 1.0 | | | O - Q | 1752 ± 1.0 | | |
| | g3 - g4 | 570 ± 1.0 | | | R - T | 1752 ± 1.0 | | |
| | g5 - g6 | 570 ± 1.0 | | | g1 - g6 | 3612 ± 1.0 | | |
| | g7 - g8 | 570 ± 1.0 | | | g2 - g5 | 3612 ± 1.0 | | |
| z - F | 750 ± 0.5 | | | g3 - g8 | 3612 ± 1.0 | | | |
| z - H | 750 ± 0.5 | | | g4 - g7 | 3612 ± 1.0 | | | |

SHEET 2 OF 2

Figure - 3.15b



DIMENSIONAL CHECK REPORT FOR BOGIE FRAME (AC TYPE)

No.

| RDSO/SK/93280 | Measuring Point | Nominal Size (mm) | Actual Size (mm) | Variation (mm) | Measuring Point | Nominal Size (mm) | Actual Size (mm) | Variation (mm) |
|---------------|-----------------|-------------------|------------------|----------------|-----------------|-------------------|------------------|----------------|
| | E - F | 1400 ± 1.0 | | | I - J | 876 ± 0.5 | | |
| | G - H | 1400 ± 1.0 | | | J - K | 876 ± 0.5 | | |
| | E - G | 2159 ± 1.0 | | | L - M | 876 ± 0.5 | | |
| | F - H | 2159 ± 1.0 | | | M - N | 876 ± 0.5 | | |
| | E - H | 2573 ± 1.0 | | | O - P | 876 ± 0.5 | | |
| | F - G | 2573 ± 1.0 | | | P - Q | 876 ± 0.5 | | |
| | a | 463 ± 1.0 | | | R - S | 876 ± 0.5 | | |
| | b | 463 ± 1.0 | | | S - T | 876 ± 0.5 | | |
| | c | 463 ± 1.0 | | | I - K | 1752 ± 1.0 | | |
| | d | 463 ± 1.0 | | | L - N | 1752 ± 1.0 | | |
| | g1 - g2 | 570 ± 1.0 | | | O - Q | 1752 ± 1.0 | | |
| | g3 - g4 | 570 ± 1.0 | | | R - T | 1752 ± 1.0 | | |
| | g5 - g6 | 570 ± 1.0 | | | g1 - g6 | 3612 ± 1.0 | | |
| | g7 - g8 | 570 ± 1.0 | | | g2 - g5 | 3612 ± 1.0 | | |
| z - F | 700 ± 0.5 | | | g3 - g8 | 3612 ± 1.0 | | | |
| z - H | 700 ± 0.5 | | | g4 - g7 | 3612 ± 1.0 | | | |

SHEET 2 OF 2

Figure - 3.16b

- x) Replace the anchor link brackets if they are worn or damaged. The M12 threaded hole should be cleaned and checked and attended to, as required.
- xi) Bent, damaged, or worn brake hanger brackets should be replaced. If the holes are not aligned/located as per drawing, replace the brackets. Use single piece design of brake hanger bracket for renewal. Replace the bushes in the brake hanger brackets at every POH.
- xii) Replace the brake lever hanger brackets if the holes are oblong/worn or damaged.
- xiii) Replace all the axle box housing crown bolt and screwing piece by rubber stoppers.

Table 3.8

| WEAR LOCATIONS (Dimensions in mm) | | |
|-----------------------------------|-------------------------------------|---------------------------|
| Part name | Wear location | Drg. Nos. |
| Brake hanger bracket bush | 32 H7 Hole $^{+0.025}/_{-0.00}$ | T-0-3-669 & WTAC3-0-3-316 |
| Brake hanger bracket | 35 gap | T-0-3-675 |
| Brake hanger bracket | C.D.1752 ± 1.0 | T-0-3-675 |
| Axle guide | 115g6 $^{-0.034}/_{+0.00}$ diameter | T-0-3-670 alt. 2/f |
| Axle guide | 120 diameter | T-0-3-670 alt. 2/f |
| BSS bracket bush | 38 dia. Hole | T-0-3-626 alt. 9/h |
| Pin for BSS | 37 diameter | T-0-5-637 alt. m/12 |
| Bracket for anchor link | 25 $^{+0.021}/_{-0.0}$ slot | T-0-3-635 alt. j/16 |
| Brake lever hanger bracket | 32 dia hole | T-0-3-631 & T-0-3-632 |

- xiv) The locations where the repairs have been carried out should be cleaned to bare metal and painted with two coats of primer to IS:2074 to a minimum Dry Film Thickness (DFT) of **50 microns** followed by one coat of anti-corrosive Black Japan Type-B to IS:341 to a DFT of 35 microns, after which entire bogie frame is to be given one coat of Black Japan Type-B to IS:341 to a minimum DFT of **35 microns**.
- 316d **Attention to Bogie Bolster Arrangement**
(Refer drg. no. WTAC3-0-5-301 & WLRRM-0-4-001 for 16.25t bogie and T-0-5-601 & T-0-4-601 for 13t bogie)
- i) Check the bolster for twist, crack, corrosion, etc. Repair or replace the bolster as required, and attend to the lug as required.
- ii) Repair or replace the equalising stay bracket if found bent, damaged, or corroded.

Table 3.9

| Part name | Wear location (all dimensions in mm) | Drg. Nos. |
|----------------------------------|---|---------------------|
| Side bearer wearing plate | 10 mm thick top wearing surface | T-0-5-648 alt 10/L |
| Side bearer wearing piece | 45 mm thick bottom wearing surface | T-0-5-649 alt 17/h |
| Bolster Centre Pivot sleeve | Hole 155 H7 ($^{+0.040}/_{-0.0}$) c9 ($^{0.2}/_{-0.3}$) | T-0-6-606 |
| Centre-Pivot silent block sleeve | Hole 140 H7 ($^{+0.040}/_{-0.0}$) | T-0-6-606 |
| Centre Pivot silent block | Hole dia. 90 $^{+0.15}/_{+0.30}$ | T-0-6-611 alt. 16/p |
| Centre Pivot silent block | Hole dia. 75 $^{+0.1}/_{+0.2}$ | -do- |
| Centre Pivot silent block | Out side dia 140 U6 ($^{+0.195}/_{+0.170}$) | -do- |
| Centre Pivot pin | Out side dia. 90 c9 ($^{-0.017}/_{-0.267}$) & 75 c9 ($^{-0.150}/_{-0.257}$) | T-0-6-602 alt.s (w) |

- iii) Replace the anchor link bracket by holding in bolster repair fixture, if found worn or damaged.
- iv) Replace the bushes in the stay rod brackets, if found worn or damaged.
- v) Replace the centre pivot silent block if found worn, damaged or rubber has perished.
- vi) Replace the centre pivot sleeve if worn or damaged or corroded.
- vii) Replace the bolster centre pivot sleeve if worn or cracked.
- viii) Replace the rubber sealing cap of centre pivot silent block, if torn or damaged or perished.
- ix) Replace the centre pivot pin if worn or cracked. Chalk test the centre pivot pin 'in position' or 'off position' to detect cracks.
- x) Force fit between silent block and sleeve and tolerance on pivot pin, i.e., $c9^{+0.18}/_{-0.27}$ should be maintained in every POH/IOH.
- xi) Ensure that there is no leakage of oil from the side bearer oil-bath welding portion. Replace the hard ground plate in side bearer, if worn more than 1.0mm (**ref. table 3.2**) in thickness or ridges formed on the plate. Replace the bronze wearing piece for side bearer, if worn more than **1.5 mm** in thickness. Sharp edges on wearing piece should be rounded off before re-use. Ensure that the dust seal cover sits effectively all around without any gap on the oil-bath and the sleeves slide freely on the guide to ward off dust and moisture coming in contact with the oil. Clean refilling passages and deficient or damaged oil refilling cups with caps and pipes should be replaced. The oil filling plugs should be well secured by chain to prevent it from dropping.
- xii) Repair or replace the bent or damaged or broken equalising stay rod safety loops.
- xiii) The locations where the repairs have been carried out or found corroded should be cleaned to bare metal and painted with two coats of primer to IS:2074 to a minimum Dry Film Thickness (DFT) of **50 microns** followed by one coat of anti-corrosive Black Japan Type-B to IS:341 to a DFT of **35 microns**, after which entire bogie bolster is to be given one coat of Black Japan Type-B to IS:341 to a minimum DFT of **35 microns**.

316e Anchor Link

(Ref: Drawing No. T-0-7-603 and T-0-7-607)

- i) Replace the anchor link, if worn or corroded. Repair the anchor link, if found cracked (normally at weld joints) under magna flux testing, by re welding after gouging. Refit new silent block in every POH.
- ii) Replace the silent block, if the rubber is perished (indicated by fretting) or loose in the anchor link housing, or the silent block pin is worn thin or loose in silent block rubber. The silent block should be force fit in the anchor link and the silent block pin should be slide fit in the anchor link bracket.
- iii) The locations where the repairs have been carried out should be cleaned to bare metal and painted with two coats of primer to IS: 2074 to a minimum Dry Film Thickness (DFT) of **50 microns** followed by one coat of anti-corrosive Black Japan Type-B to IS:341 to a DFT of **35 microns**, after which entire anchor link is to be given one coat of Black Japan Type-B to IS:341 to a minimum DFT of **35 microns**.

Table 3.10
(all dimensions in mm)

| Part name | Wear location | Drng. No. |
|------------------------------|--|-------------------------|
| Anchor link silent block pin | 25 mm $^{-0.012}/_{-0.052}$, thick ends | RDSO-Sketch-94101 alt.1 |
| Anchor link silent block | Outer dia. 90.5 $^{+0.05}/_{+0.025}$ | RDSO-Sketch-94101 alt.1 |
| Anchor link housing | Hole dia 90.5 $^{+0.015}/_{-0.03}$ | T-0-7-605 |

316f **Equalising Stay Rod and Pins (Small & Big)**

(Ref: Drawing No. RDSO Sk-88105 Alt.2 for 16.25t bogie and Sk-88018 Alt.6 for 13t bogie)

- i) Hot dip galvanised equalising stay of 16.25t bogie is used on all new coaches. The choice of retro-fitment of these stays on existing coaches is left to the Railways. For fitment of equalising stays to Sk-88105 Alt.2 on 13t bogies, follow RDSO Sk-93236.
- ii) Replace the corroded equalising stays with new hot dip galvanised stays. If any repair like welding or straightening is carried out, which damages the galvanising, repaint the equalising stay with epoxy paint.
- iii) Bushes should be replaced in every POH and fitted with washers and split pins. Replace the equalising stay pins if worn out more than **1 mm** in diameter.

Table 3.11

| Wear Location (Dimensions in mm) | |
|---|-------------------------------|
| Part name | Wear location |
| Pins for 16.25t axle load bearing capacity equalising stay | Dia.31 ($^{+0.5}/_{-0.2}$) |
| Pins For 13t axle load bearing capacity equalising stay | Dia. 24 ($^{+0.2}/_{-0.1}$) |

316g **Lower Spring Beam**

(Ref: Drawing No. WLRRM - 0 - 5 - 002 for 16.25t bogie and T-0 - 5 - 643 for 13t bogie)

- i) Check the lower spring beam (plank) for cracks, corrosion, etc. and repair or replace as required.
- ii) The following parts of the lower spring plank should be inspected and repaired or replaced as required:
 - bolster suspension straps if bent or damaged
 - stay rod brackets if worn, bent or corroded
 - shock absorber fixing bosses if damaged
 - spring guide rings if required
 - lug if damaged.

- iii) Replace the following parts:
 - bushes of BSS brackets if worn beyond permissible limits
 - equalising stay bracket bushes
 - BSS pins if worn beyond permissible limits.
- iv) The locations where the repairs have been carried out or found corroded should be cleaned to bare metal and painted with two coats of primer to IS: 2074 to a minimum Dry Film Thickness (DFT) of **50 microns** followed by one coat of anti-corrosive Black Japan Type-B to IS:341 to a DFT of **35 microns**, after which entire lower spring beam is to be given one coat of Black Japan Type-B to IS:341 to a minimum DFT of **35 microns**.

Table 3.12

(all dimensions in mm)

| Part name | Wear location | Dr. No. |
|------------------|-------------------------------------|-----------------|
| BSS bracket bush | Hole 38 H11 ($^{+0.16}/_{-0.00}$) | WLRRM-0-5-002 |
| Eq. Stay bracket | Hole 42 H7 ($^{+0.025}/_{-0.0}$) | WLRRM - 0-4-002 |

316h **BSS Hanger**

(Ref: Drawing No. T - 0 - 5 - 639)

- i) Check the cleaned hangers for cracks and wear. Replace the hangers if cracked or wear exceeds **1 mm**. Magna flux crack detection equipment shall be used for checking.
- ii) The horizontal wearing surface may be built up using 2B electrodes, filed and ground to size. Then hard powder coating may be applied. Hardness value should be **55-60 Rockwell-C**
- iii) The vertical gap should be within the permissible limit i.e., **384 $^{+0.0}/_{-1.0}$ mm**. All the hangers should be tested to tensile load of **8 tonnes** and replaced if any permanent set is observed in the hangers.
- iv) After repair and testing all the BSS hangers should be painted with one coat of anti corrosive black paint. Write the actual length between the wearing arms on the BSS hanger with paint.

Table 3.13
(all dimensions in mm)

| Part name | Wear location | Drg. Nos. |
|--------------|--|-----------|
| BSS hanger | distance between horizontal wearing arms 384 | T-0-5-639 |
| BSS hanger | thickness of vertical arm 25.5 | -do- |
| BSS hanger | horizontal wearing surface 42 | -do- |
| Hanger block | Thickness - 9.5 | T-0-5-638 |
| Hanger block | slot 29 ($^{+0.4}/_{-0.2}$) | -do- |
| BSS pin | 29 ($^{+0}/_{-0.1}$) | T-0-5-637 |

316i **Hanger Block (Stone)**
(Ref: Drawing No.WLRRM - 0 - 5 – 203 and T-0-5-638)

- i) Replace the hanger blocks if cracked. Worn hanger blocks may be built up by welding with 2B electrodes and machined to size. After repair and testing all the hanger blocks should be painted with one coat of anti-corrosive Black Japan Type-B to IS:341.

316j **Axle Box Guide Assembly**
(Ref: Drawing No.WTAC3 - 0 - 1 – 301 and T-0-1-636)

- i. Use the modified guide cap (RDSO sketch no. 85070 Alt.3) and its securing arrangement on existing bogies. New bogies are fitted with dash- pot guide arrangement to T-0-1-641.
- ii. Replace the upper rubber washer, lower rubber washer, packing ring, guide ring, dust shield , guide bush, dust shield spring, and spring clip as a kit.

Table 3.14

| Critical Dimensions (dimensions in mm) | | |
|---|------------------------------------|---------------------|
| Component | Dimension | Drg. no. |
| Lower spring seat | hole 140 H7 ($^{+0.04}/_{-0.0}$) | RDSO Sk-90005 Alt.2 |
| Guide bush | O.D. 140 A9 ($^{-0.3}/_{-0.6}$) | RDSO SK-84102 Alt.5 |
| Guide bush | hole dia 115 ($^{+0.15}/_{-0}$) | -do- |
| Guide Ring | hole 115 H7 ($^{+0.04}/_{-0}$) | -do- |

- iii. Replace the lower spring seat if worn, cracked, scored, etc.

- iv) Whenever an axle guide is replaced due to damaged/misalignment, preferably modified guide with circlip arrangement may be fitted.
- v) Common defects found in axle guide assembly during POH and their reasons and remedies are given in **Annexure 3.1**.

317 COIL SPRINGS

- i. Coil spring should be maintained as per C-8419 (Rev.1)
- ii. Clean the spring thoroughly, remove any oil, grease, etc. by putting them in a Bosch cleaning tank. After that carry out visual inspection of the spring coil by coil. Carry out magna flux test to detect cracks. Springs having cracks, dents or hitting marks should be rejected and scrapped. Records should be maintained of rejected springs with details of defects noticed.
- iii. Each spring should be subjected to incremental load up to the figure indicated in the table 3.16 and 3.17 and the load should be maintained for a period of **2 minutes**, after which the corresponding height of spring under load is determined.
- iv. Replace the upper rubber washer, lower rubber washer, packing ring, guide ring, dust shield , guide bush, dust shield spring, and spring clip as a kit.
- v. Replace the lower spring seat if worn, cracked, scored, etc.
- vi. Each spring may be tested for other deflections/loads indicated in drawing and the spring characteristics plotted. The spring should be replaced if its characteristics are not within specified limits.

Table 3.15**Drawing code of springs for ICF BG coaches**

(Reference RDSO Amendment slip no. 5 of September 2001 to STR WD-01-HLs- 94
(Rev.1 May 95)

| Type of spring | Type of bogies | ICF Drg. No | Dr. Code No. |
|----------------|--------------------------|----------------|--------------|
| Axle box | All Non AC ICF type | F-0-1-006 | A01 |
| | All AC ICF type | WTAC-0-1-202 | A03 |
| | Power car | WLRRM2-0-1-202 | A04 |
| | Double decker | DD-0-1-001 | A06 |
| | High capacity Power Car | WLRRM8-0-1-802 | A09 |
| | High capacity parcel van | RDSO /SK-98017 | A10 |
| Bolster | All Non AC ICF type | F-0-5-002 | B01 |
| | All AC ICF type | WTAC-0-5-202 | B03 |
| | Power car | WLRRM2-0-5-202 | B04 |
| | Double decker | DD-0-5-003 | B06 |
| Bolster | High capacity Power car | WLRRM8-0-5-802 | B11 |
| | | | B13 |
| | High capacity Parcel van | RDSO /SK-98018 | B15 |
| | | | B16 |

Table 3.16**Load deflection testing and grouping of Axle box spring (B.G Main line coaches)**

| Code | Wire dia | Free height | Test Load | Acceptable height under test load | Groups as per loaded spring height | | |
|------|----------|-------------|-----------|-----------------------------------|------------------------------------|--------------|---------|
| | | | | | A | B | C |
| | | | | | Yellow | Oxford Blue* | Green |
| A01 | 33.5 | 360 | 2000 | 279-295 | 279-284 | 285-289 | 290-295 |
| A03 | 33.5 | 375 | 2800 | 264-282 | 264-269 | 270-275 | 276-282 |
| A04 | 35 | 372 | 3000 | 265-282 | 265-270 | 271-276 | 277-282 |
| A06 | 36 | 337 | 2400 | 269-284 | 269-273 | 274-279 | 280-284 |
| A09 | 37 | 360 | 3000 | 277-293 | 277-282 | 283-288 | 289-293 |
| A10 | 39 | 315 | 1800 | 276-289 | 276-279 | 280-284 | 285-289 |

* As per RDSO's letter no. MC/SPG dated 25.7.01

Table 3.17

**Load deflection testing and grouping of Bolster spring
(B.G Main line coaches)**

| Code | Wire dia | Free height | Test Load | Acceptable height under test load | Groups as per loaded spring height | | |
|------|----------|-------------|-----------|-----------------------------------|------------------------------------|---------------|---------|
| | | | | | A | B | C |
| | | | | | Yellow | Oxford Blue # | Green |
| B01 | 42 | 385 | 3300 | 301-317 | 301-305 | 306-311 | 312-317 |
| B03 | 42 | 400 | 4800 | 291-308 | 291-296 | 297-303 | 304-308 |
| B04 | 47 | 400 | 6100 | 286-304 | 286-291 | 292-297 | 298-304 |
| B06 | 36 | 416 | 4200 | 280-299 | 280-286 | 287-292 | 293-299 |
| B11 | 47 | *386 | 6700 | 306-322 | 306-311 | 312-317 | 318-322 |
| B13 | 34 | | | | | | |
| B15 | 40 | 393** | 6000 | 256-272 | 256-261 | 262-267 | 268-272 |
| B16 | 32.5 | 286 ** | | | | | |

* Combined load deflection test is done

** As per RDSO's letter no. MC/MV dtd. 21.11.01

As per RDSO's letter no. MC/SPG dtd. 25.7.01

- v. After load deflection test, the acceptable springs should be given one coat of Red Oxide Zinc Chromate primer to IS:2074 to a minimum DFT of **50 microns**. A coat of Black Japan Type-B to IS:341 to a minimum DFT to **35 microns** should follow the primer coat to have better abrasion resistance and corrosion resistance. Then the springs have to be painted with **50 mm** wide vertical stripes at three locations, equispaced on the circumference using different colours of paints to IS:8662 as given below:

| Spring group | Colour code |
|--------------|-------------|
| A | Yellow |
| B | Oxford Blue |
| C | Green |

- vi. All the springs should be grouped in three groups as shown in table above, depending upon their deflection under test load. For pairing, springs should be selected from the same group. Height under test load should be painted on all springs to enable selection of springs.

318 BOGIE BRAKE GEAR

- i. Repair or replace the worn, damaged, corroded bogie brake levers. Replace the bushes in the bogie brake levers. Nylon 66 brake gear bushes to RDSO STR No. C-8107 should be fitted in brake gear.
- ii. Repair or replace the corroded, cracked, or worn brake beams.
- iii. Repair or replace the corroded, dented, damaged brake head shoes. Replace the worn bushes, adjuster, weakened spring, etc., in all the serviceable brake head/shoe.
- iv. Replace the worn, damaged, etc. brake gear pins with new ground finished and chromium plated pins. 'Z' lever pin shall be to RDSO Sketch 98127.
- v. Replace the brake blocks if worn out to thickness of **20 mm** or below.
- vi. Replace the weak and damaged brake shoe key.
- vii. All the brake gear components should be given one coat of red oxide primer and one coat of anti-corrosion Black Japan Type-B to IS: 341.

319 BOGIE ASSEMBLY**319a General**

Bogie assembly can be systematically carried out, if it is organised under three workstations described hereunder. A sub store in the bogie shop may be necessary to ensure supply of proper components and sub-assemblies for bogie assembly.

319b Brake Gear and Axle Guide Assembly Work Station

- i. After the inspection, repair and alignment of BSS brackets, axle guides and the bogie frame, place the bogie frame in the normal position on assembly stands.
- ii. Assemble the brake gear components including brake blocks on the bogie frame with pins, washers and split cotters. Ensure that the cotters are split minimum 90° and not slack in the pins. Modified lever hanger pins (RDSO sketch no. 98127) should be used to prevent the bush working out of the lever hanger. Ensure that the maximum dimensional clearance between the pins and bushes is **1.5 mm**.
- iii. Apply some lubricating oil on axle guide outer surface and on inside surface of guide bush. Assemble the axle guide components on the axle guide and secure them with guide cap (whose 9 holes should be cleaned before securing) as per RDSO sketch no. 85070 Alt.3. While tightening the guide cap, it should be ensured that guide bush sits tight against the rubber packing ring and the holes in the guide are in alignment with corresponding holes in the guide bush. New coaches are fitted with modified axle guide arrangement to T-0-1-641.

319c Bolster Assembly Work Station

- i. Grease the BSS pins, hanger blocks, anchor link silent block pins and anchor link brackets with graphite grease. Ensure that bolster springs with height (under test load) variation within **2 mm** are selected in the same group of springs for each bogie assembly.
- ii. Assemble lower spring planks, compensating rings, bolster spring, rubber washer and other secondary suspension components. Compensating rings shall be specified in relevant suspension diagram issued by PUs. Additional compensating ring to maintain bolster clearance of **40±3** can be added. Lower the bogie frame assembled with brake gear and axle guide assembly on the bolster assembly. Connect the bogie frame and lower spring plank with BSS hanger with the help of a dead weight. Connect the lower spring planks and bolster with equalising stays and pins. Secure the equalising stay pins with washers and split pins. Ensure that the split pins are split to **minimum 90°** and not slack in the pins. Connect the bogie frame and bolster with anchor links. Secure the anchor links in the brackets with M12 hexagonal head screws and spring washers.
- iii. Replace the rubber sealing cap on the centre pivot silent block.

319d Bogie Lowering Work Station

- i. Select the wheel sets such that the maximum variation in tread diameter between the wheels on same axle as **0.5 mm**, between two wheel sets in same bogie as **5 mm** and among the four wheel sets in the same coach as **13 mm**. Select axle box springs in the same group of springs as given in table 3.16.

- ii. Assemble the lower rubber washer, lower spring seat, compensating ring, hard packing ring, selected axle box springs, upper spring seats, upper rubber washer, protective tube, etc., as per the drawing for axle box guide arrangement. Put dash pot oil of approved brand in lower spring seat to a level of **60 mm** from bottom. The approved brands of dash pot oil are the following:

a. Servoline - 100 of
IOC b. Yantrol - 100
of HPC c. Bharat univol –
100 of BPC

- iii. For obtaining correct buffer height when the coach body is lowered on the bogies, while assembling the bogie hard rubber, UHMWPE or NFTC packing of required thickness, depending on the wheel diameter, should be provided under the flanges of the lower spring seats. Packing rings of thickness as given in **table 3.18** and as shown in **figure 3.17** (RDSO sketch 77354) should be used. Compensating rings of suitable thickness as per suspension diagram for relevant coach should be placed over the flange of the lower spring seat.

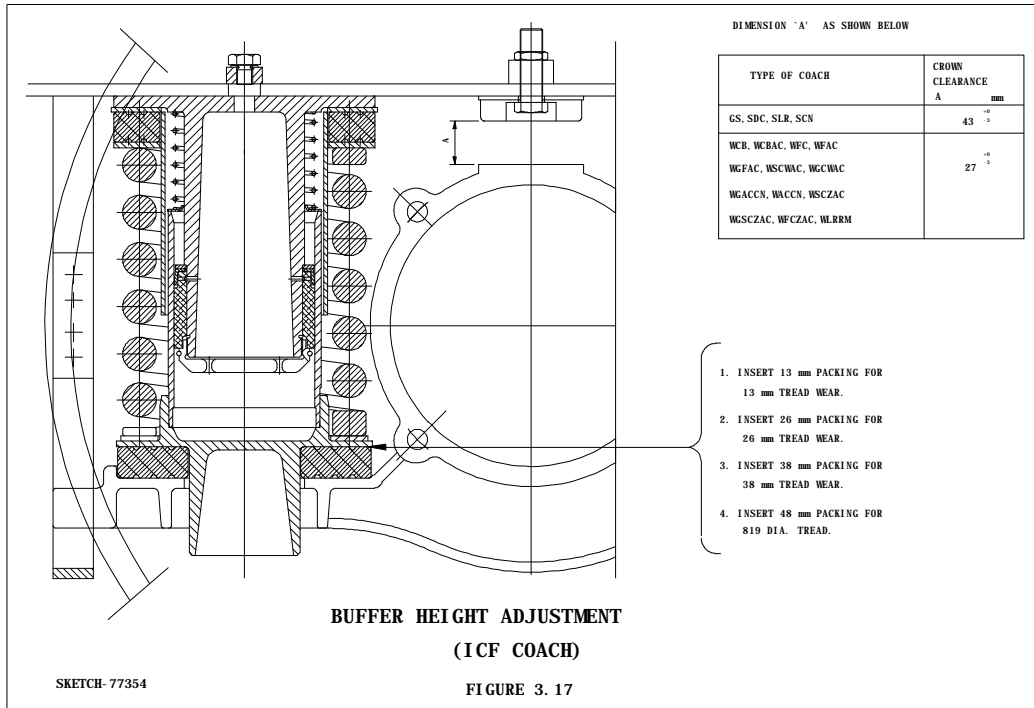
Table 3.18

| Average tread diameter of two wheel sets of bogie | Thickness of hard packing ring |
|---|--------------------------------|
| 889 to 864 mm | 13 mm |
| 863 to 840 mm | 26 mm |
| 839 to 820 mm | 38 mm |
| 819 mm | 48 mm |

- iv. Lower the bogie frame with the bolster assembly on the wheel sets thus prepared, taking care to ensure that the rubber packing ring does not get damaged while lowering the guide bushes on to the lower spring seat. The maximum diametrical clearance between the lower spring seat and guide bush should not

exceed **1.6 mm**. The bogie should sit evenly on the four axle boxes.

- v. The assembled bogie should be load tested on a bogie test stand where it is loaded up to its normal working load and the height of bolster top surface from rail level should be measured for comparison with pre-determined dimension corresponding to correct coach buffer height. Adjustment for getting correct buffer height should be made, if needed. If the buffer height requires further adjustment, the load on the axle box spring should be released and compensating rings should be inserted below the axle box spring ensuring that the bogie frame height is **686 ± 5 mm**.
- vi. Safety straps of the axle box wing lugs and bogie bolster should be adjusted so as to ensure a minimum clearance of **40 mm** between the lugs and bottom of safety straps.
- vii. Fit the vertical shock absorber between the bolster and bottom spring plank.
- viii. Check the oil in the dash pots with the flexible wire gauge and if necessary, top up the dash pots with the approved brand of dash pot oil to bring the level to **60 mm** from under surface of dash pot. If the flexible gauge indicates a higher level of oil, the guide cap may have fallen in dash pot. This should be checked and attended to.
- ix. Axle box rubber bump stopper should be adjusted to obtain the required clearance between the axle box crown and the bogie frame.
- x. After testing and making adjustments for correct buffer height, dispatch the bogie to Lifting shop for lowering the coach body.



LIFTING SHOP**319e Lowering the Coach Body in Lifting Shop**

- i. Place the wearing plate and wearing piece in side bearer oil-bath. Fill each side bearer oil-bath with **2 litres** of any of the following approved brands of oils.
 - Servoline – 100 of IOC
 - Yantrol – 100 of HPC
 - Bharat univol – 100 of BPC
- ii. Apply graphite grease on Centre pivot pin and lower the coach body on the side bearer wearing pieces. Care should be exercised to make sure that the side bearers are resting properly. Place the cotter in position in Centre pivot pin and secure it with a split pin. A bottom cover should be fitted for covering the entire assembly to prevent dust ingress. Tighten the air vent bolt with gasket to prevent spilling of dash pot oil.

319f Shock Absorbers

Reference may be made to RDSO specification C-8703 (Rev.1) for hydraulic shock absorbers for coaching stock.

1. Periodicity of overhaul

- i) **Schedule overhaul:** Shock absorbers should be given a schedule overhaul:
 - a. When their capacities vary beyond **±20%** of their specified values, or
 - b. After 4 lakh kilometers or alternate POH, whichever is earlier.
- ii) **Non schedule overhaul:** Shock absorbers should also be overhauled whenever suspected to be defective,

which is indicated primarily by oil leakage or when they are physically damaged.

2. Testing

- i) The shock absorber is tested on the special purpose machine (*RDSO sketch nos. 69.2.04.00 to 69.2.04.08*) which can measure its capacity in both tension and compression by developing the resisting force at a velocity of **10 cm/sec**. The length of the shock absorber and its stroke should be within the limits specified in the **table 3.19**.
- ii) The shock absorber must be tested at every POH and reused if overhauling is not due and the capacity is within **± 20%**. A register should be maintained in the shock absorber section wherein the test results of each shock absorber should be recorded before the shock absorber is certified fit for use on coaches.
- iii) After the testing and certification, the protection cover of the shock absorber should be pressed into position on the piston rod disc and spot welded at six points around the periphery.
- iv) The shock absorber should then be extended on the mounting fixture and painted. When the paint dries, it should be compressed and then removed from the fixture.
- v) The date of testing, the date of overhauling and the name of the shop where overhauled should invariably be stamped on the name plate of the shock absorber before it is sent for fitment.

Table 3.19

| Maker's Type | Length (mm) | | | Nominal Stroke (mm) | Variation from Nominal | |
|----------------------------------|----------------|----------------|----------------|---------------------|------------------------|-----------|
| | Compressed | Nominal | Extended | | Min. (mm) | Max. (mm) |
| Vertical shock absorbers: | | | | | | |
| M/s ESCORTS | 250 ± 3 | 320 ± 3 | 360 ± 3 | 110 | -70 | 40 |
| M/s KNORR BREMSE | | | | | | |
| M/s GABRIEL ICF/SK-0-5-015 | | | | | | |

320 LIST OF TOOLS AND PLANT

| | |
|--|---|
| <p>LIFTING SHOP</p> <p>Ball peen hammer Chisel Spanner</p> <p>WASHING PLANT</p> <p>Bosch tank Hot water jet system Bins and pallets Jib crane Fork lift Platform truck</p> <p>BOGIE SHOP</p> <p>Ball peen hammer Chisel Spanner set Welding transformer Gas cutting plant Bogie alignment gauges Spring testing machine Magnaflux crack detector Paint brushes Floor scraper Bogie frame repair fixture Bolster repair fixture Bogie test rig Working stands Overhead crane Bins and pallets Fork lift Platform truck</p> | <p>FITTING SHOP</p> <p>Ball peen hammer Chisel Welding transformer Gas cutting plant Hydraulic press Measuring gauges Center lathe Brake beam end turning m/c Electrode heater Hard surface plant BSS hanger testing m/c Bins and pallets Fork lift Platform truck</p> <p>SMITH SHOP</p> <p>Helical spring repair tools & plant Shot peening plant Heat treatment plant Smith's tongs, hammers & blocks</p> |
|--|---|

321 **EXAMINATION AND REPAIR PRACTICE IN CARRIAGE MAINTENANCE DEPOT**

Depot maintenance staff should ensure the following things in respect of proper functioning and safety of Bogie & Bogie components.

321a **Bogie Frame**

i) Primary/Secondary Examination, Schedule A & B Examination

- Examine visually condition of bogie side frame, transom, longitudinals and all welded locations.
- Examine rubber stopper/stop screw of axle box crown for damage/missing/loose.
- Inspect axle box safety straps/loops for damage/broken/missing.
- Bolster safety straps/loops for damage/broken/missing.
- Brake hanger brackets for damages.
- Inspect safety brackets for brake hanger pins.
- Check visually BSS hanger brackets.
- Examine visually anchor link brackets.
- Visually examine centre pivot mounting bolts and attend if needed.
- Visually inspect centre pivot cover.
- Side bearer oil to be replenished in A & B schedules, if needed.

ii) Schedule C Examination

- Examine as per (i) above.
- Examine condition of wearing piece and wearing plate
- Examine oil level in side bearer oil baths and replenish if oil level has gone down below the level of last thread of oil filling cup.

321b **Primary Suspension**

i) Primary/Secondary Examination

- Visually examine axle box springs for breakage.
- Visually examine dash pot oil filling special screw for deficiency.
- Check oil leakage in dash pot through defective seals/vent screws.
- Visually examine axle box clearance

ii) Schedule A & Schedule B

- Examine as per (i) above.
- Add specified grade of oil in dash pot.
- Visually examine axle box clearance.

iii) Schedule C

- Examine as per (ii) above.
- Check and attend axle guide assembly if necessary.
- Check axle box clearance with gauge

321c **Secondary Suspension**

i) Primary/Secondary Examination, Schedule A, B & C examination

- Visually examine bolster springs breakages/damages.
- Visually examine Bolster lower spring beam.
- Visually examine BSS hangers, hanger blocks, BSS pins.
- Check bolster clearance between top of bolster and bottom of bogie frame.
- Visually examine equalising stay rods and pins (small and big).
- Visually check anchor links.

- Examine Visually anchor link securing bolts and attend if needed.
- Visually examine Equalising stay rod brackets.
- Examine and attend safety loops of bolster.
- Check and attend safety loops of Equalising stay rod.
- Examine vertical shock absorbers for damages.

321d **Brake Rigging**

i) **Primary / Secondary Examination**

- Check brake gear and adjust so that the piston stroke is within the limit.
- Examine brake beams breakages/damages.
- Check and attend brake beam safety wire ropes/safety straps.
- Check and attend brake shoe head and key & replace if necessary.
- Check and replace worn brake blocks.
- Visually inspect and replace brake hangers, brake gear pins and cotters/split pins if necessary.
- Visually inspect and replace damaged/missing brake gear bushes if necessary.

ii) **Schedule A, B & C Examination**

- Examine as per (i) above.
- Check and attend brake block adjuster.
- Examine and attend brake levers.

- Examine and attend floating lever suspension brackets
- Examine lever hanger pins.

321e **Bogie to be run out if found necessary/During IOH following should be done**

- Examine and replace all the brake gear components found deficient / worn out.
- Examine and replace primary and secondary suspension components as required.
- Examine wheel profile and thickness and gauge in case they appear to be near condemning limit

322 **SAFETY PRECAUTIONS**

- Whenever a coach is examined at maintenance depot, it should be ensured that the prescribed number of safety straps, safety wire rope, axle box safety strap, bolster safety loop, centre pivot cap, hangers or brackets of specified dimension and sections required for various components are fitted at specified location.
- All fasteners e.g. bolts, nuts, cotters etc. used in under frame equipments, brake gear, buffing and draw gear should be checked.

Annexure - 3.1

COMMON DEFECTS FOUND IN AXLE GUIDE ASSEMBLY

| S.No. | Defects | Reason | Remedies |
|-------|---|--|---|
| 1. | Perished rubber packing ring | Poor quality of rubber packing ring | 1) Replace rubber packing ring at every examination. 2) Use only rubber packing rings conforming to IRS specification no. R-47-72 and the relevant drawing. |
| 2. | Axle guide found worn on one side | 1) Misaligned fitment of axle guides to bogie frame. 2) Dust ingress to lower spring seat. | 1) The alignment of axle box guide should be checked with alignment gauges and corrected. 2) Vent hole should be sealed with gaskets. Screw to be tightened well after oil topping. |
| 3. | Axle box spring rubbing upper spring seat | Do | Do |
| 4. | Guide bush worn | Do | Do |
| 5 | Lower spring surface worn | Do | Do |
| 6. | Guide ring broken | 1) Axle guide is hitting lower spring seat 2) Weld joint of lower spring seat and tube is porous or cracked | 1) Guide securing bolt should not project out of guide cap. 2) Use good quality upper and lower rubber washers and correct number of compensating rings in the axle guide assembly. 3) Adjust A, B and C clearances on leveled track. 4) Strip and reweld lower spring seat correctly. |
| 7 | Guide cap securing assembly broken | Do | Do |
| 8. | Lower spring seat scored and dent mark on guide cap | Do | Do |
| 9 | Dust shield spring broken or distorted | Do | Do |
| 10 | Leakage from lower spring seat | Do | Do |
