FIAT BOGIE

FABRICA ITALINA DE AUTOMOBIL TORINO

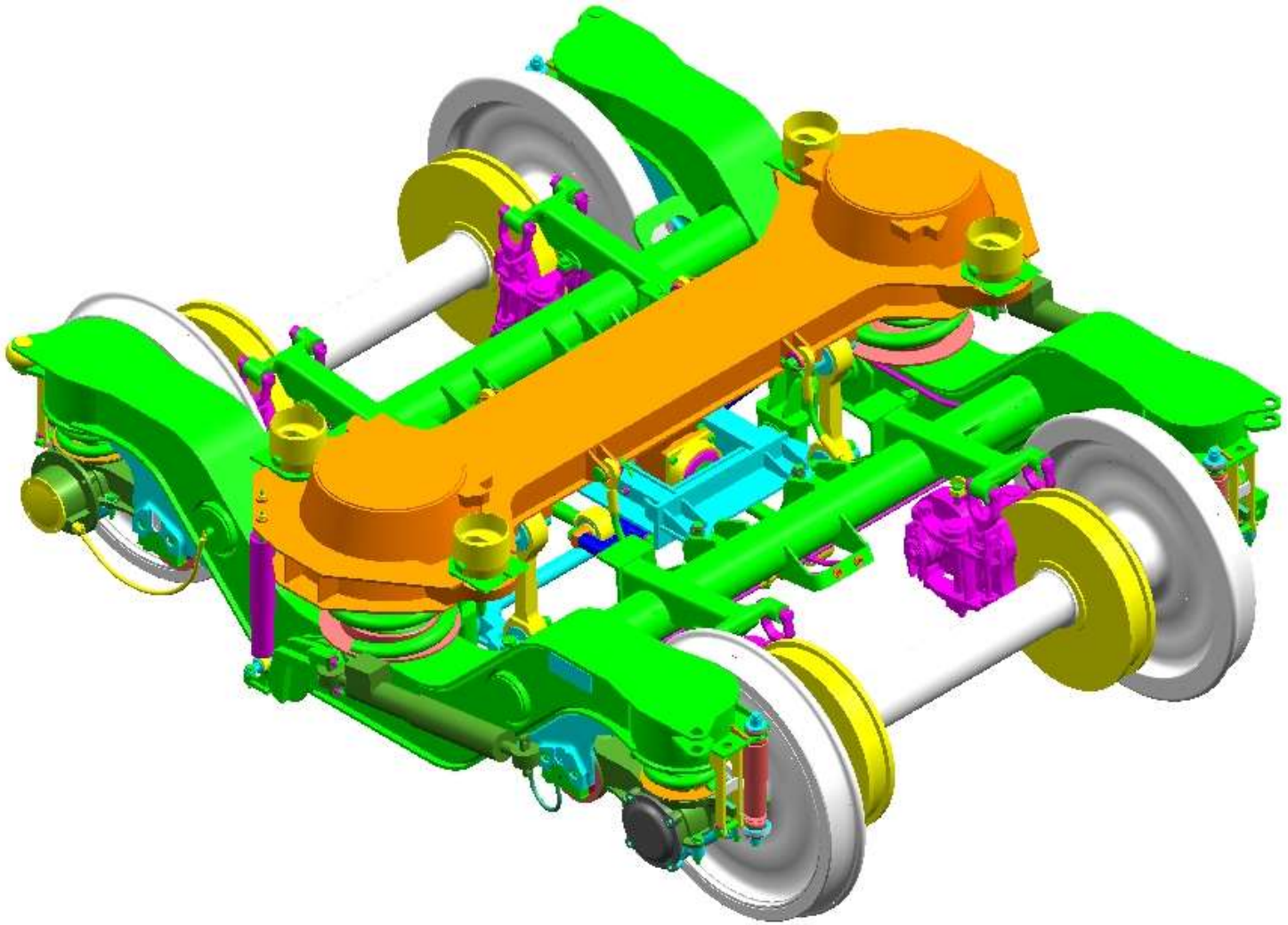
Presented By

D.SAHA

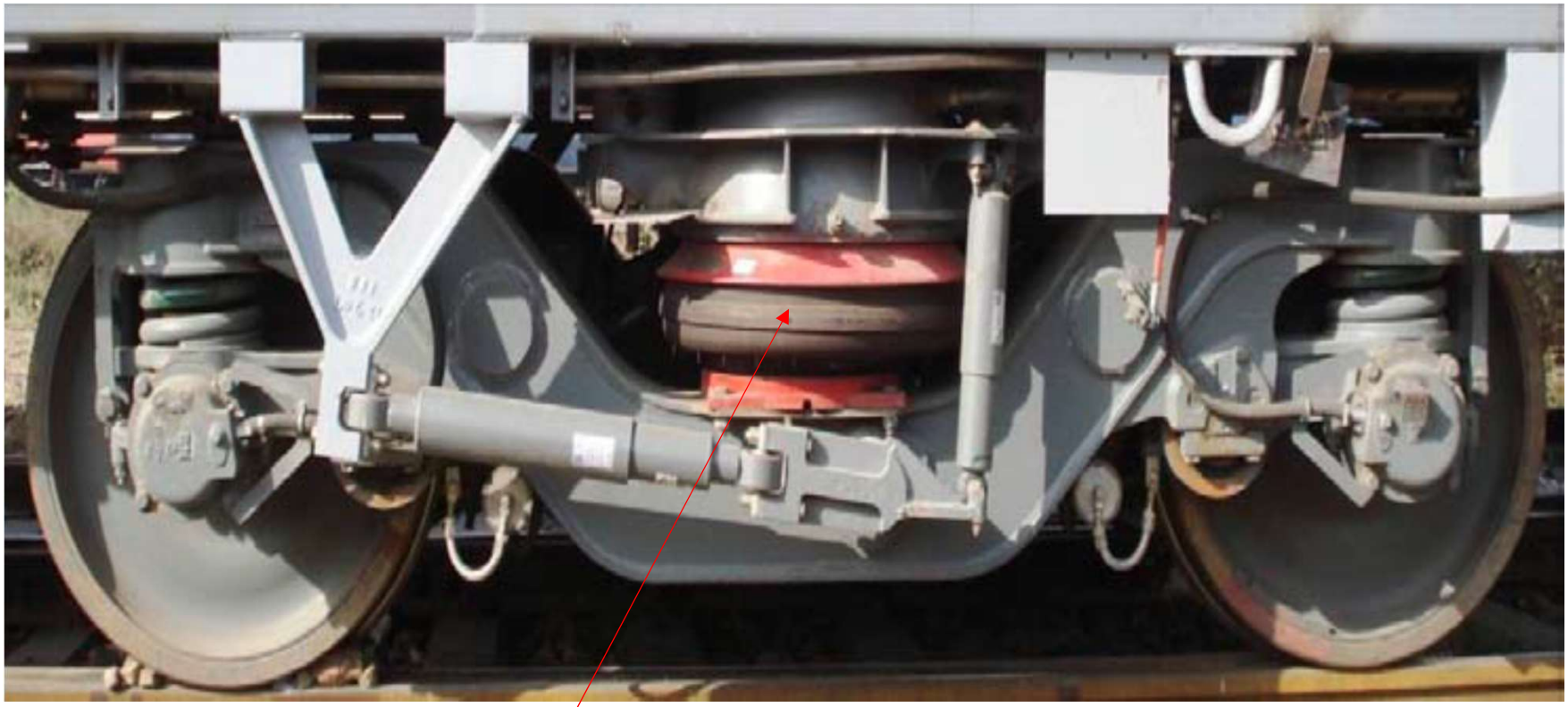
ROLLING STOCK Instructor

STC/KPA

VIEW OF FIAT BOGIE

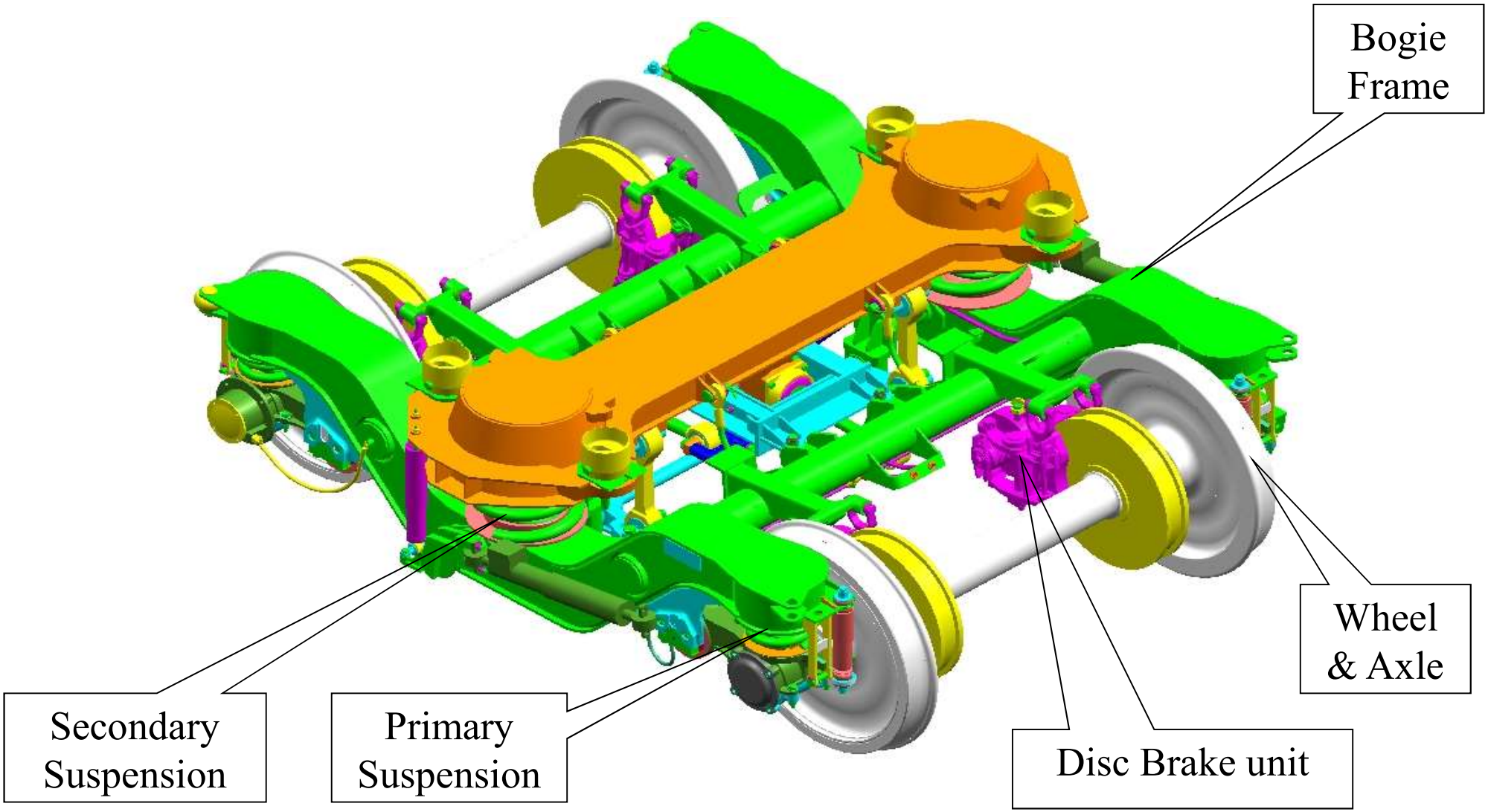


FIAT BOGIE with AIR SPRING (LS5)



- DESIGN OBTAINED FROM M/S ALSTOM-LHB, GERMANY AS PART OF LHB-TOT CONTRACT
- ADAPTED AT RCF FOR VARIOUS COACH VARIANTS
- FIT TO RUN UPTO 180 KMPH WITHOUT MODIFICATION
- SUPERIOR RIDE QUALITY
  - BUMP STOPS IN PRIMARY AND SECONDARY SUSPENSION
  - MINER PADS IN SECONDARY SUSPENSION
  - YAW, LATERAL AND VERTICAL DAMPERS
  - NESTED SPRING SETS WITH 2 HELICAL AND ONE RUBBER SPRING IN SECONDARY
- LESS WEAR AND TEAR

BOGIE Assembly

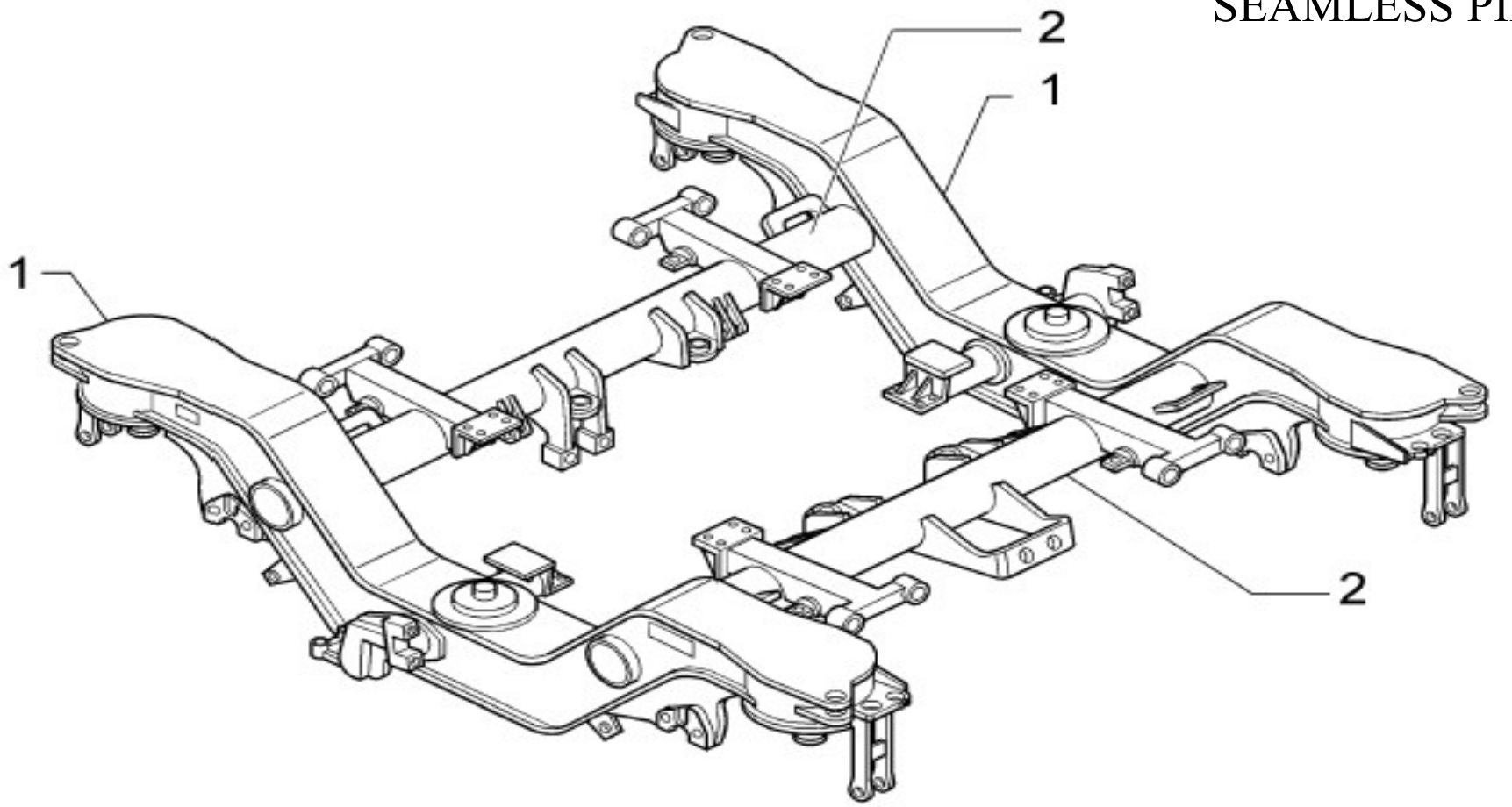


BOGIE FRAME

1.-SIDE FRAME

2-.CROSS BEAM

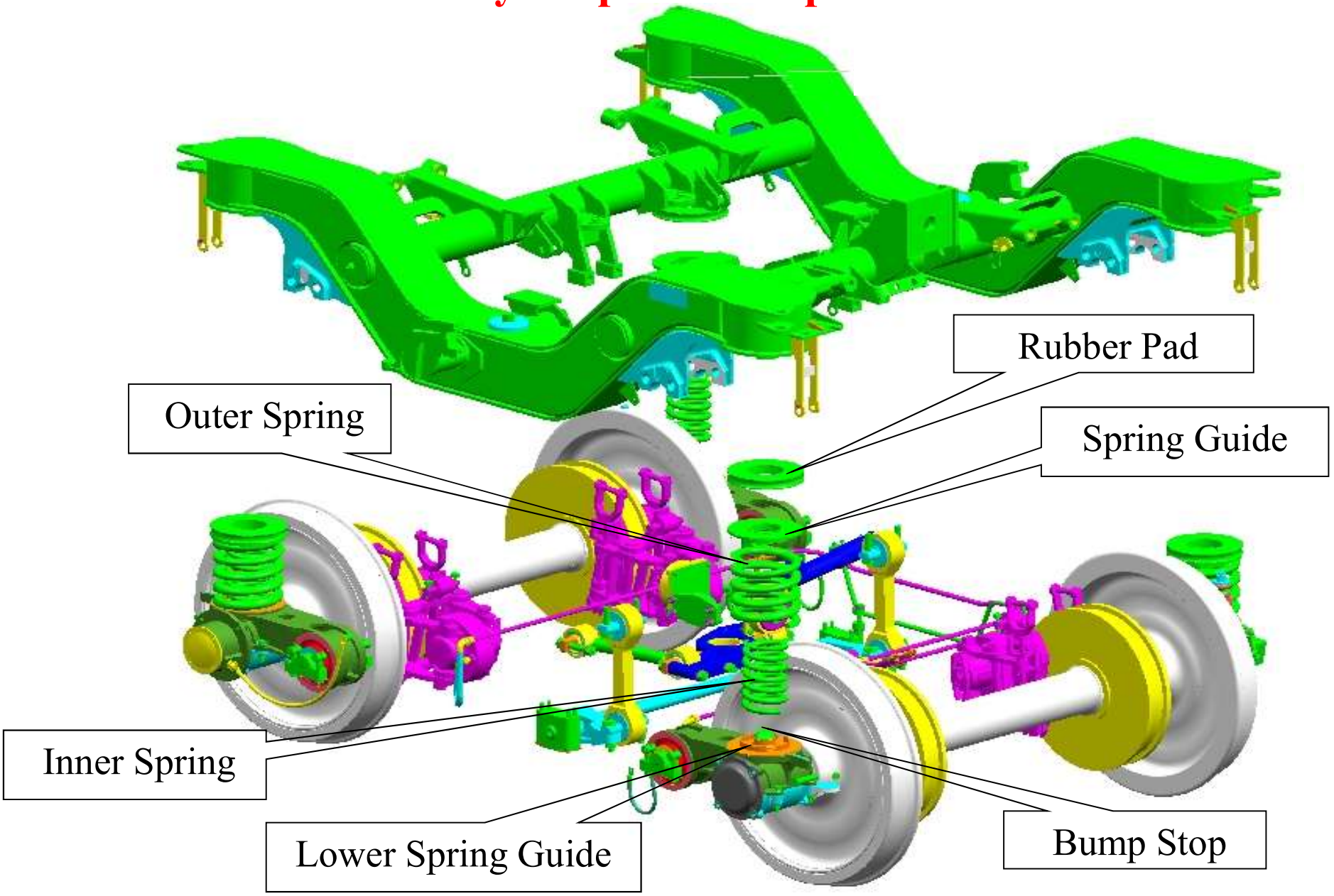
(Ø140X Ø168X2506 SEAMLESS PIPE)



BOGIE FRAME

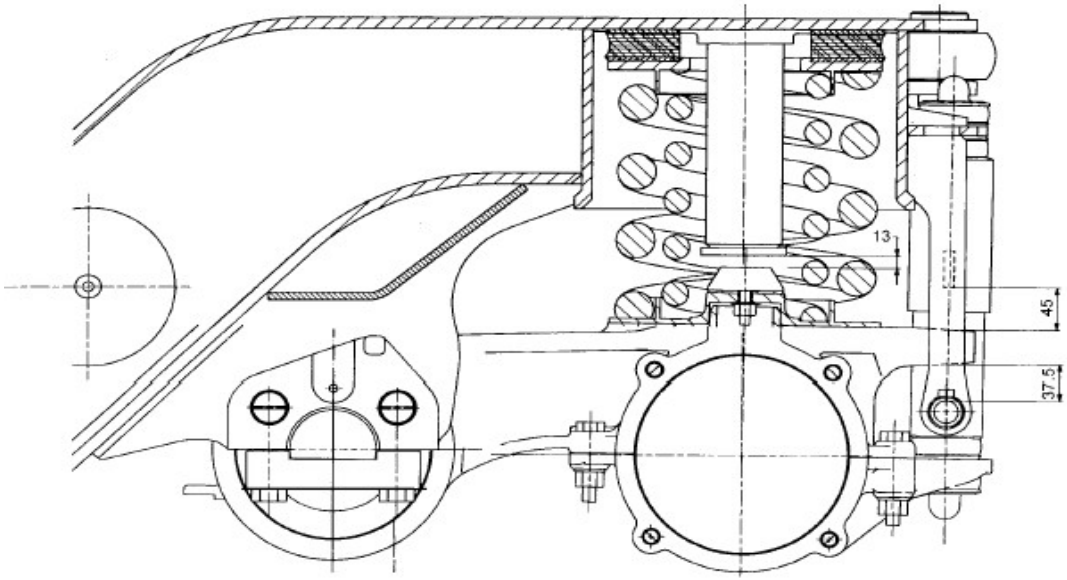
- SOLID WELDED FRAME -STEEL SHEETS(St-52) AND FORGED,STEEL CAST PARTS TO MATERIAL GS20Mn5V;DIN 17182 (WELDABLE).
- TWO SIDE FRAMES CONNECTED BY TWO CROSS BEAMS - SUPPORT BRAKE UNITS. VARIOUS BRACKETS ON FRAME.
- THE BOGIE FRAME RESTS ON THE PRIMARY SUSPENSION SPRING UNITS AND SUPPORTS THE VEHICLE BODY BY MEANS OF A BOLSTER BEAM. THE BOLSTER BEAM IS CONNECTED TO THE BOGIE FRAME BY SECONDARY SUSPENSION.

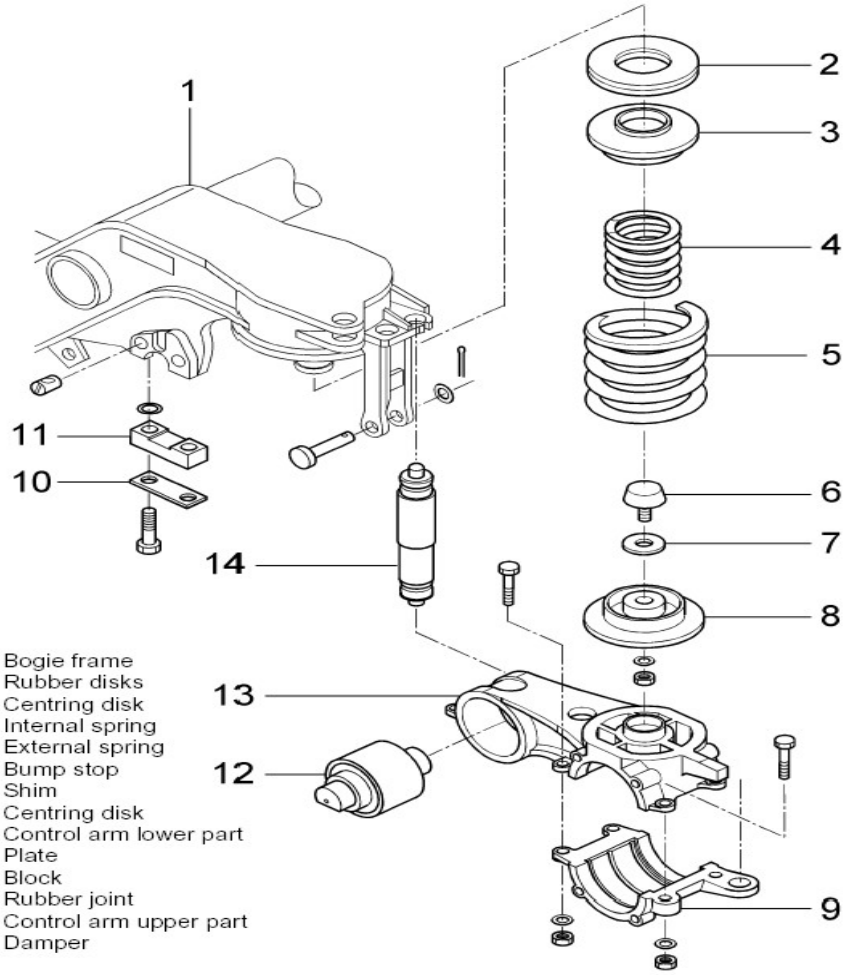
Primary Suspension exploded View



Primary suspension

- Two coil springs, one vertical damper, articulated control arm, elastic joints connecting the axle bearing to the bogie frame
- Better curve negotiation.

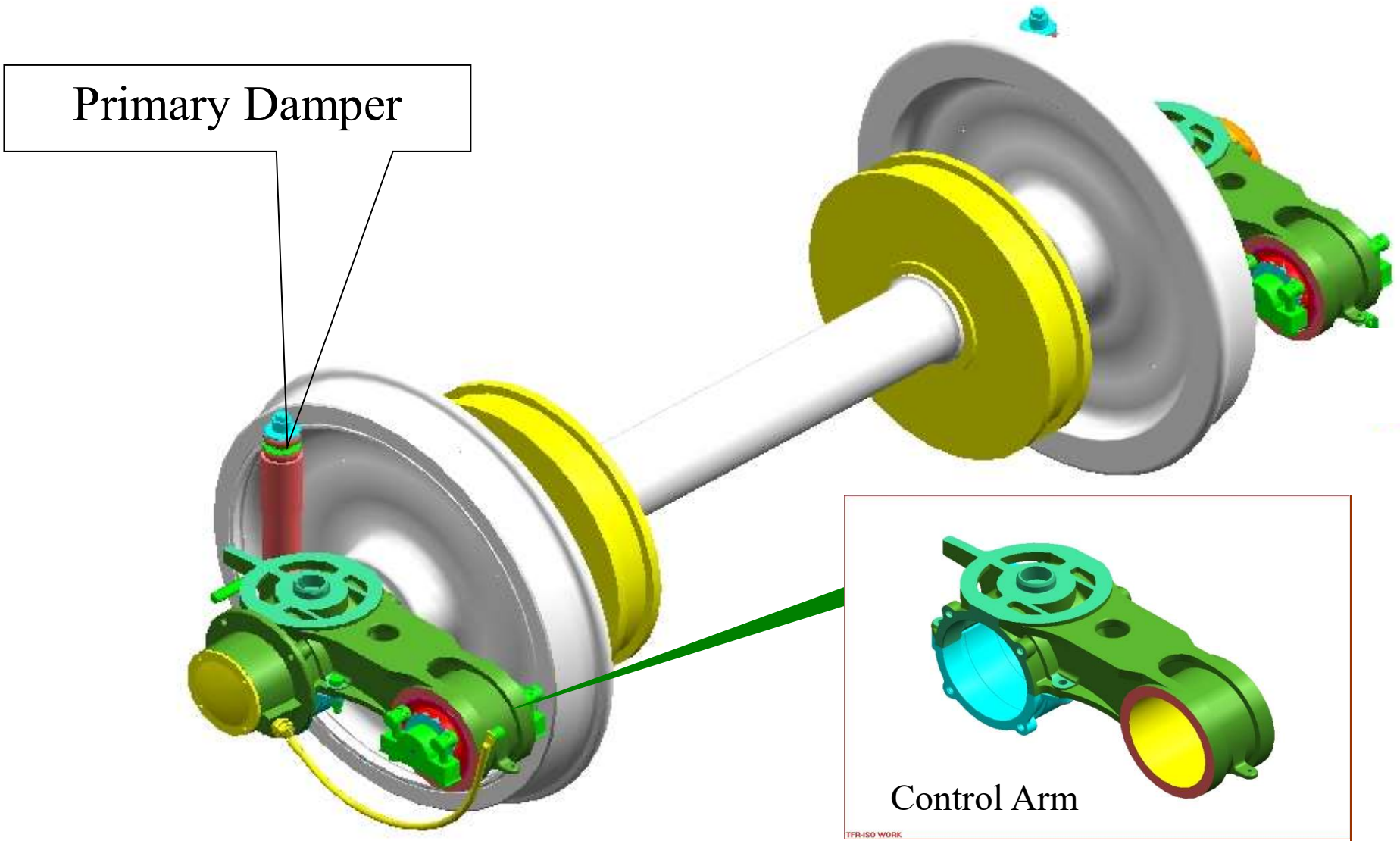




1. Bogie frame
2. Rubber disks
3. Centring disk
4. Internal spring
5. External spring
6. Bump stop
7. Shim
8. Centring disk
9. Control arm lower part
10. Plate
11. Block
12. Rubber joint
13. Control arm upper part
14. Damper

FIG. 1-8 PRIMARY SUSPENSION

Wheel sets without Primary Suspension



CURVE NEGOTIATION

AN ARTICULATED CONTROL ARM (SGCI TO IS:1865) IS CONNECTING AXLE BEARING AND SIDE FRAME THROUGH ELASTIC CONNECTION, WHICH WILL PROVIDE FLEXIBILITY BETWEEN AXLE AND SIDE FRAME.

Control Arm Corrosion & Wear

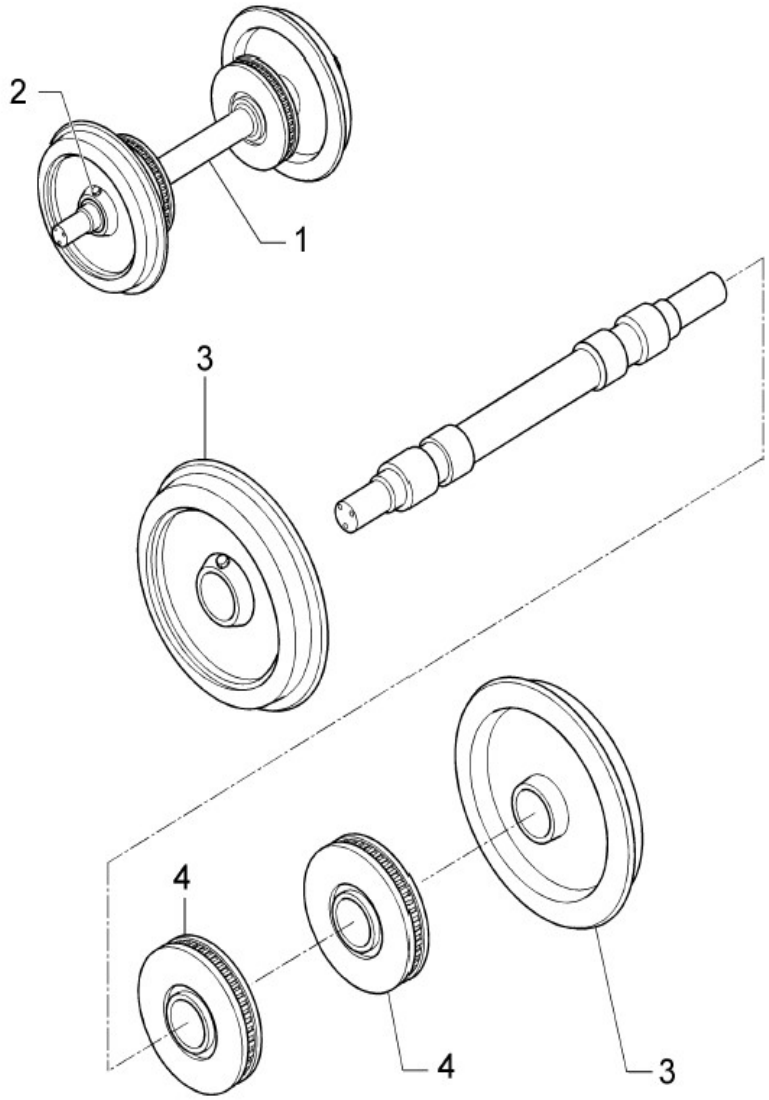
- Service limits set jointly by RCF, CAMTECH & RDSO.
- M/s FIAT had recommended to use Swiss made **Blasol-135** during fitment to minimize wear and to avoid corrosion. This needs to be ensured by zonal railways also.
  - Initially Cortec VCI368 was being used at RCF. The Swiss OEM company has now set up distribution network in India. RCF has recently started using BLASOL-135
  - RCF may also offer starter quantities of Blasol-135 to zonal railways.
- If wear observed beyond permissible values during POH, re-machining can be done with cut of 0.3 to 0.5 mm on the bottom face of control arm.
- Proper torquing to be ensured.

Wheel and Axles

- Two brake disks (4), diameter 640 mm and width 110 mm,

  96 mm (worn).
- Wheel Diameter New - 915mm,Worn-855mm, Shop Issue -862 mm.

(Wheel Diameter ICF NEW-915mm,WORN-825mm, ShopIssue-837mm)



1. Axle
2. Plug
3. Wheel
4. Brake disk

Axle bearings

- CARTRIDGETAPER ROLLER BEARING
- PRE-ASSEMBLED UNIT.
- MAINTENANCE FREE- OVERHAUL 12 LAKH KM.
- SENSORS FOR DETECTING SPEED

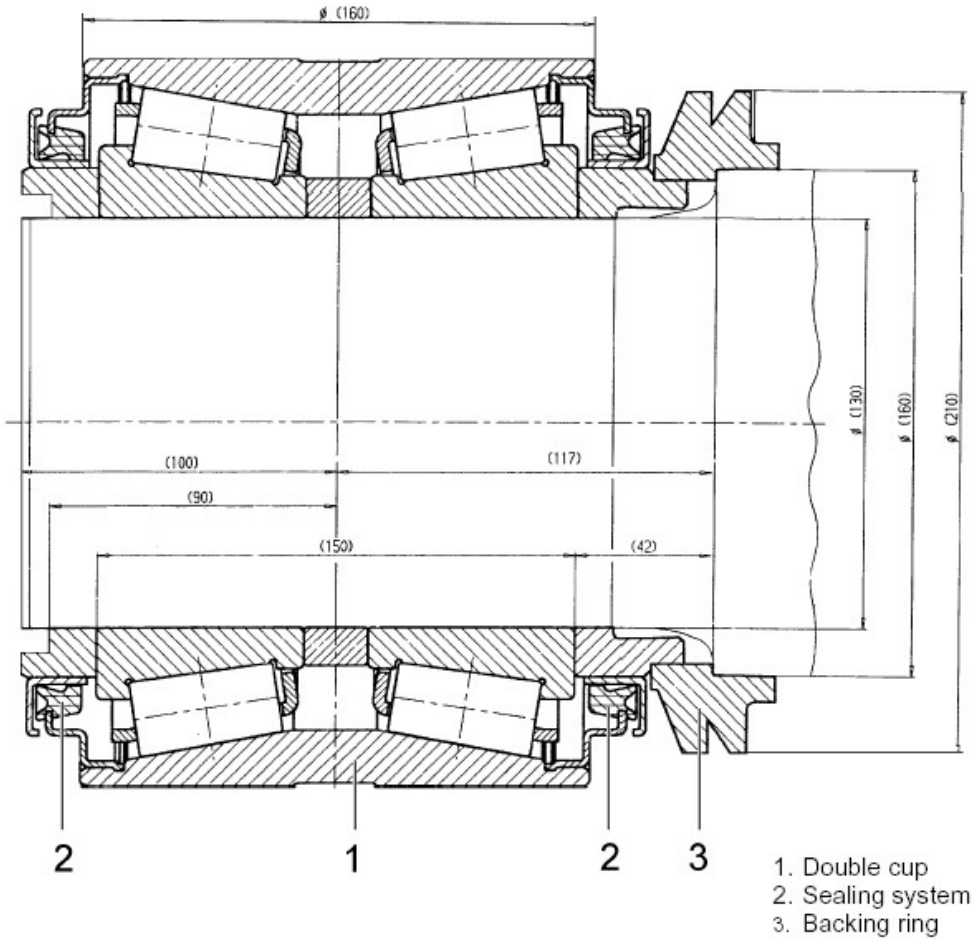
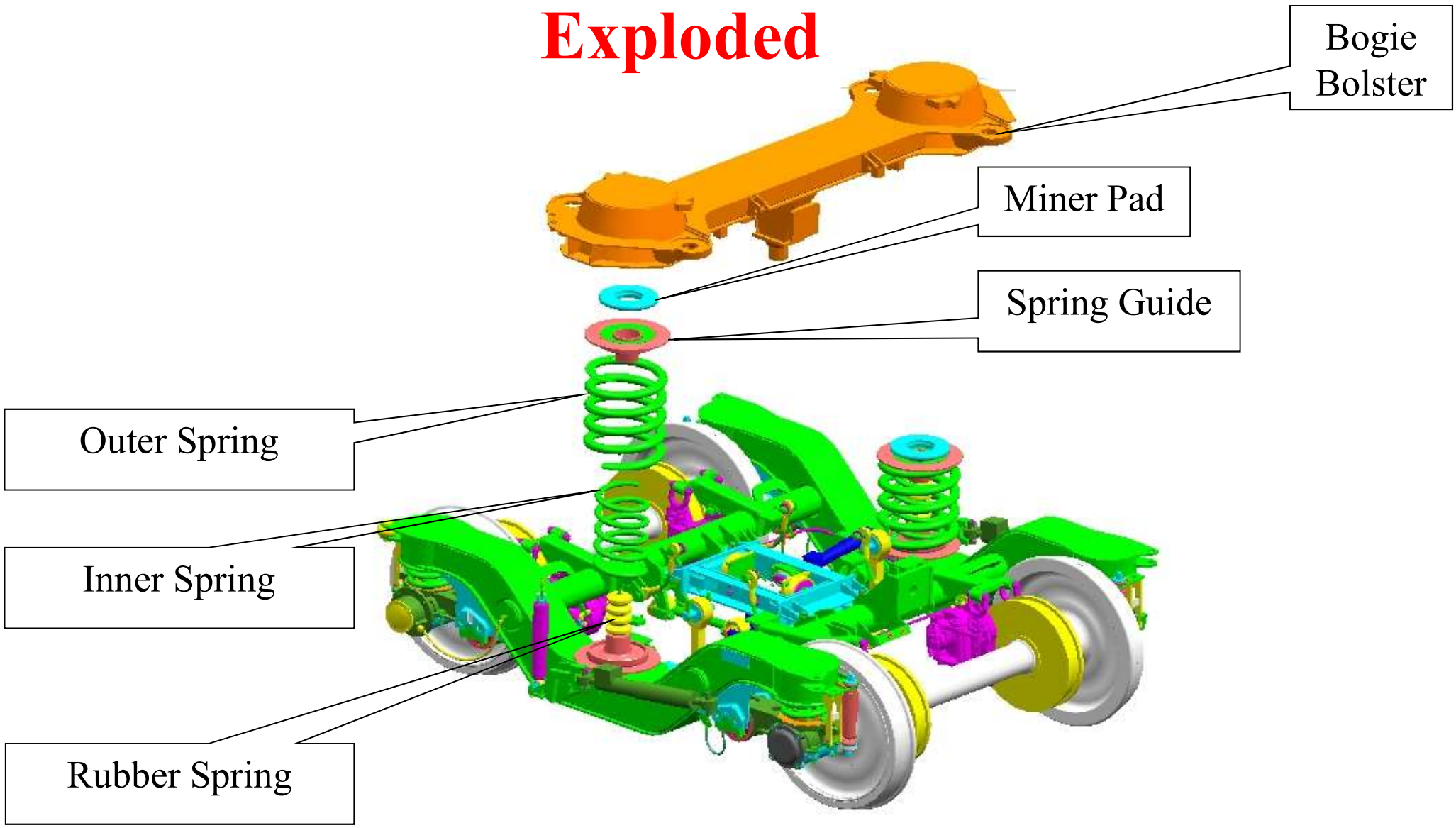


FIG. 1-4 AXLE BEARING LONGITUDINAL SECTION

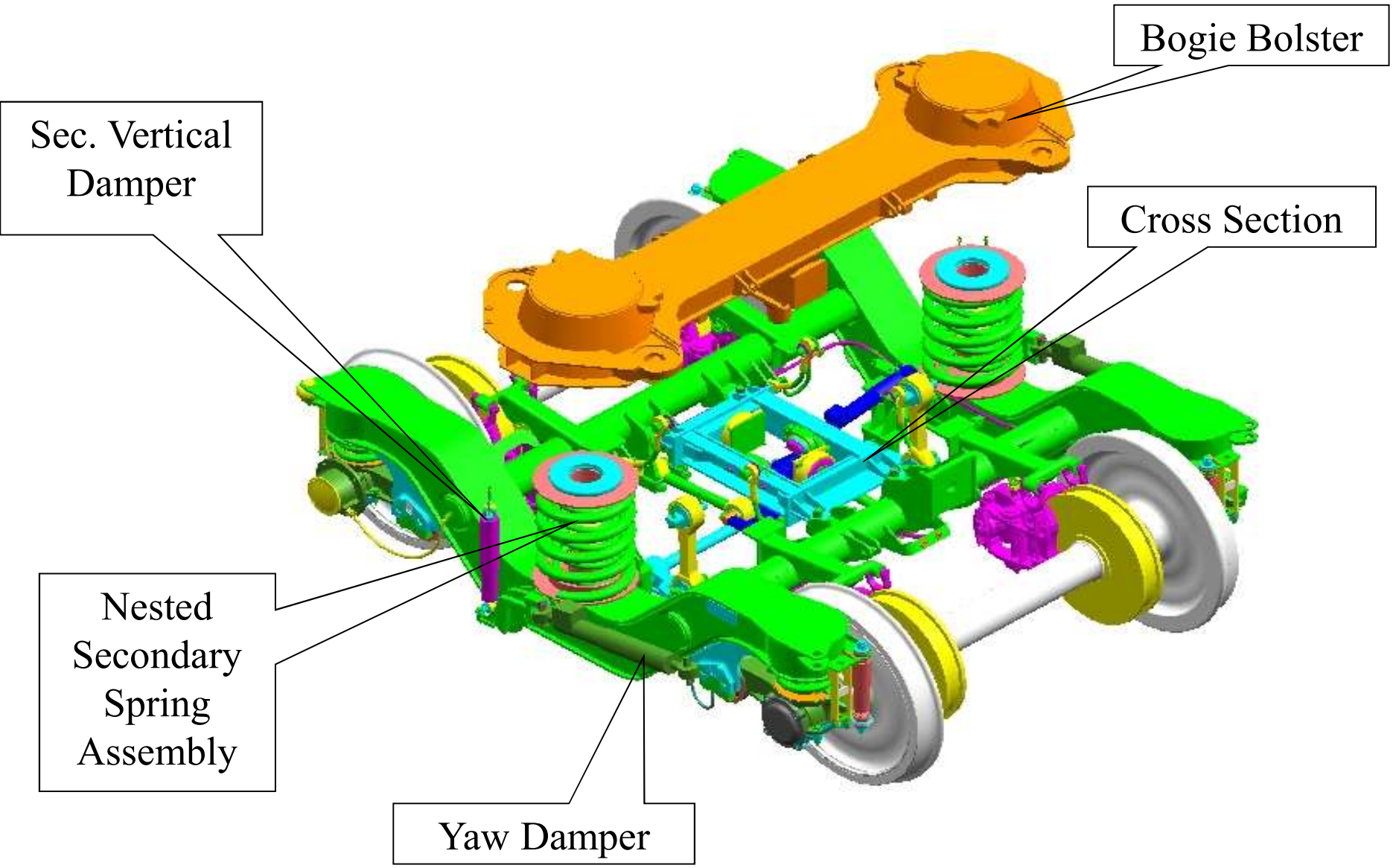
DISC BRAKE SYSTEM

- AXLE MOUNTED DISC BRAKE
- TWO DISCS PER AXLE OF DIA640
- INBUILT SLACK ADJUSTER IN BRAKE CYLINDERS
- 35mm BRAKE PADS, Cond 7mm

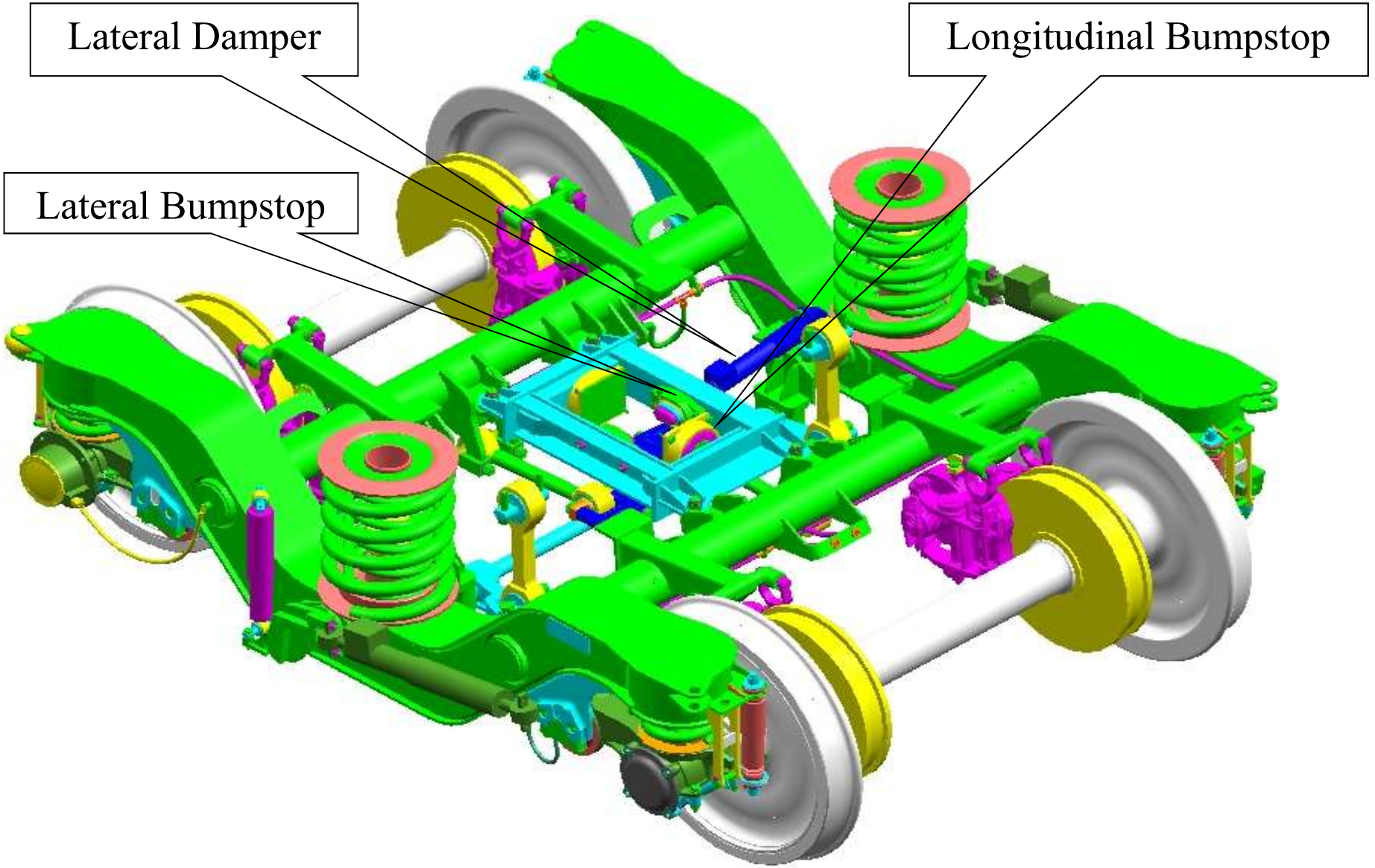
With Secondary Suspension System Exploded



With Bolster Lifted

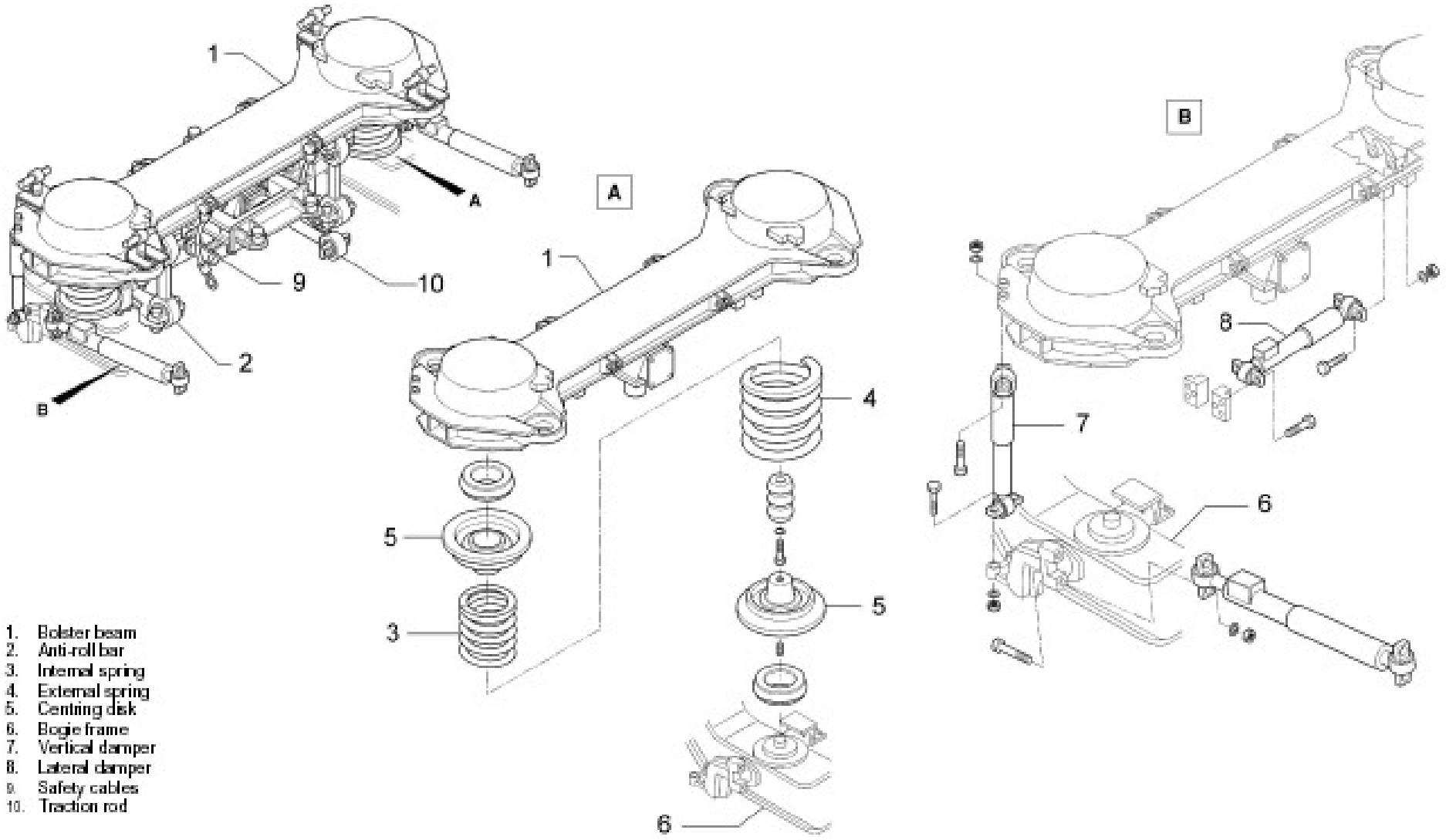


Bolster Removed



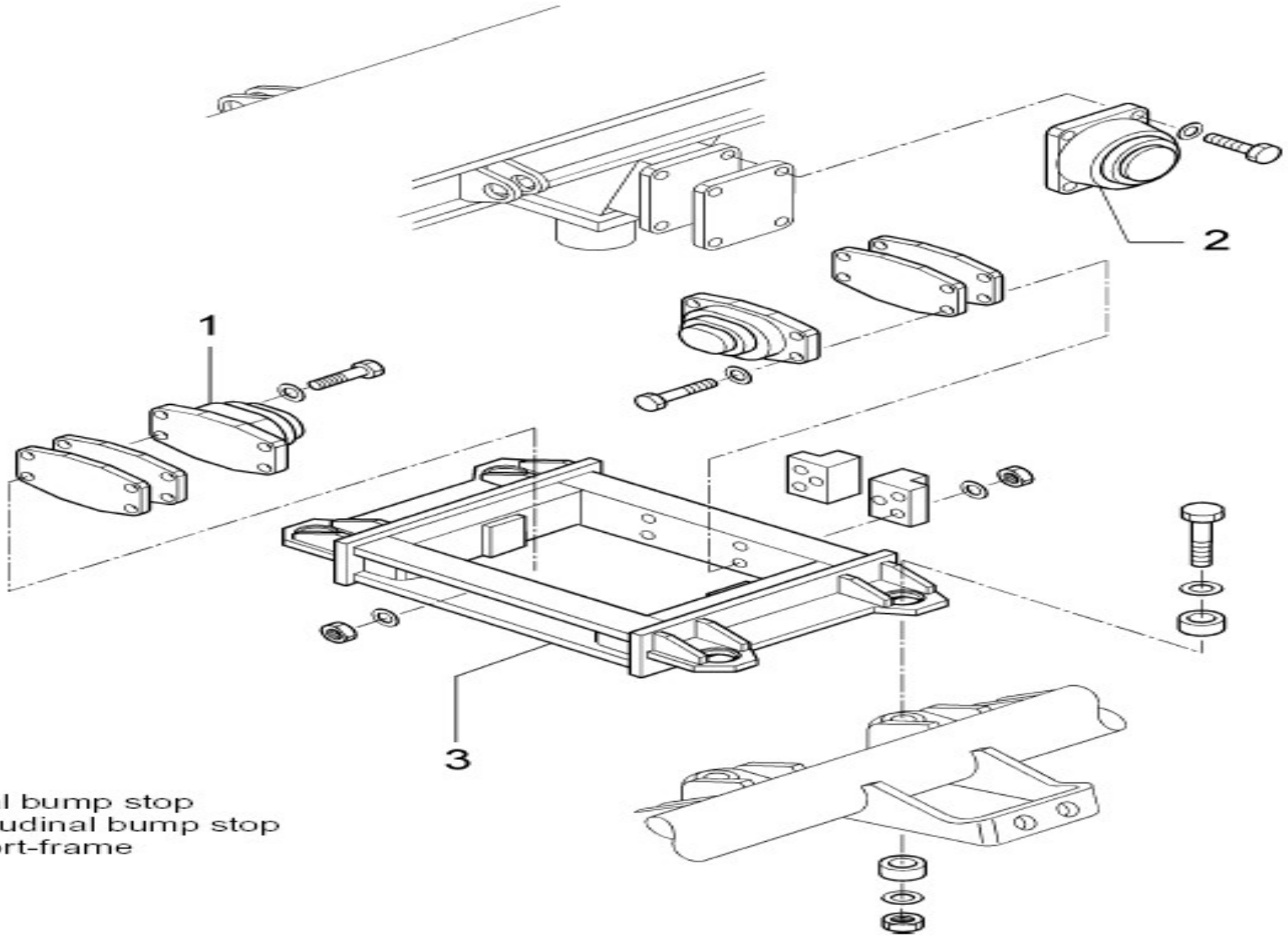
SECONDARY SUSPENSION

FIG. 1-10 SECONDARY SUSPENSION UNIT



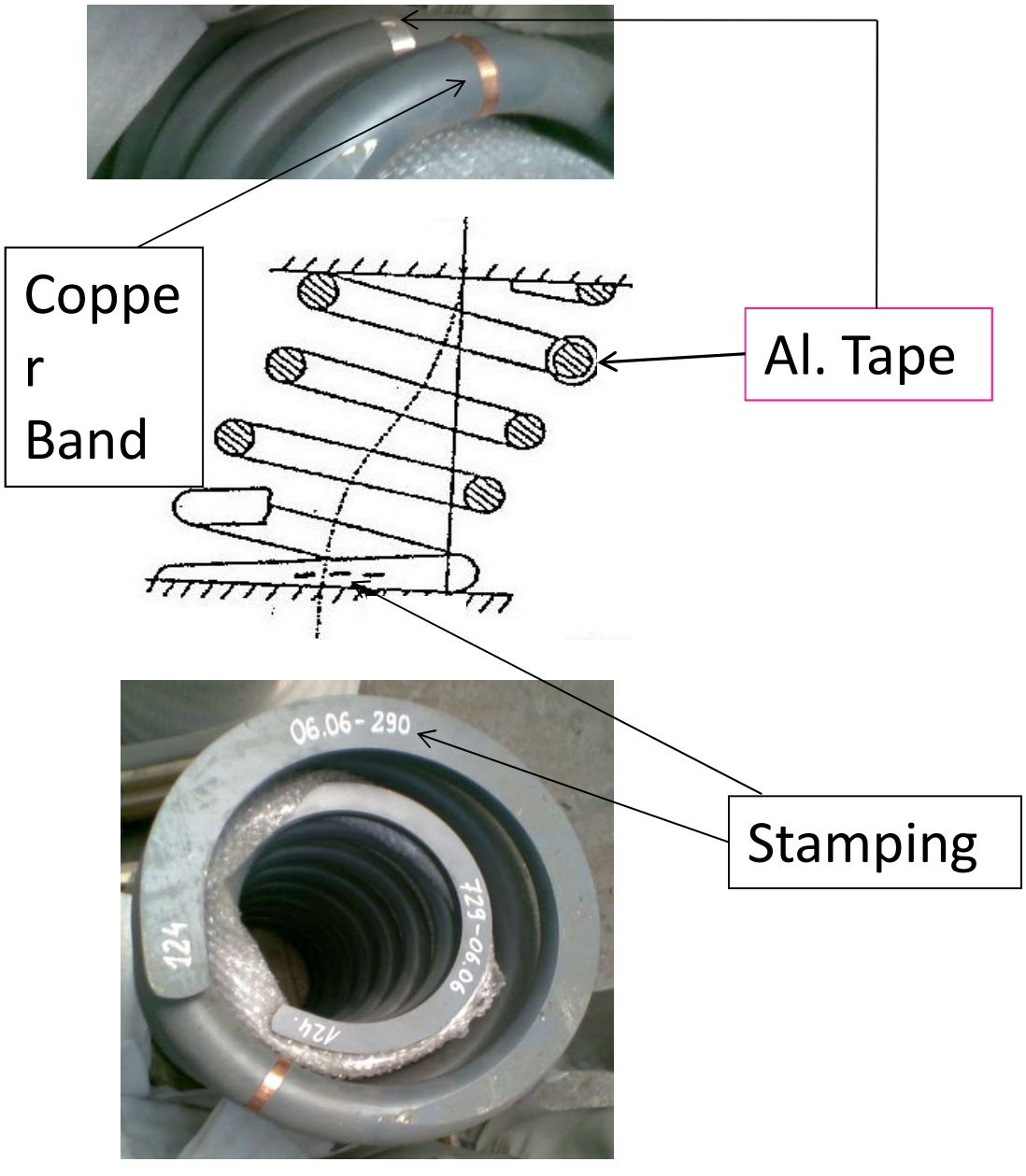
1. Bolster beam
2. Anti-roll bar
3. Internal spring
4. External spring
5. Centring disk
6. Bogie frame
7. Vertical damper
8. Lateral damper
9. Safety cables
10. Traction rod

Longitudinal and Lateral Bump Stops



1. Lateral bump stop
2. Longitudinal bump stop
3. Support-frame

Marking on Springs

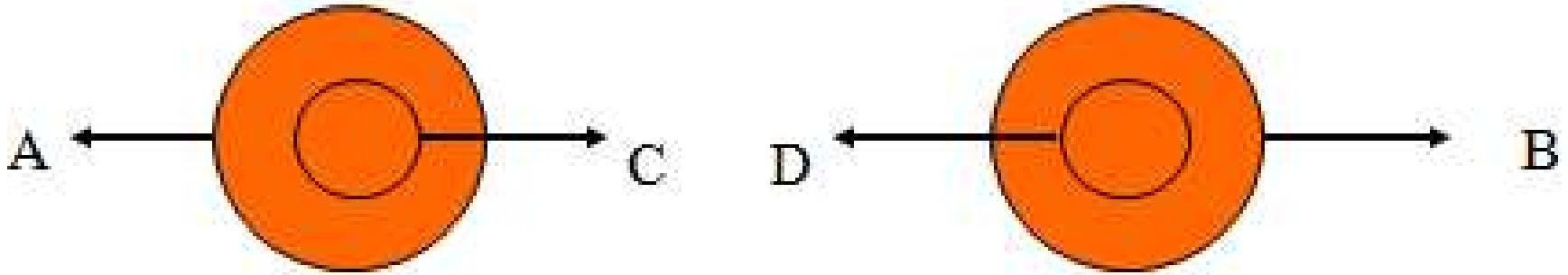


- Al. Tape – Indicates positive direction of the alignment deviation
- Copper Band – Gives length of the spring under test load and the value of the alignment deviation
- Stamping on flat portion – Gives month & year of manufacture and running serial number.

Alignment Deviation

(Spring Pairing)

- The difference between the alignment deviations of the two outer springs not to exceed 4mm and that of the inner springs 8mm.
  - A - B = 4 mm max, C - D = 8 mm max
- In addition, the outer and inner springs with the greater alignment deviations must be situated in the same spring assembly, that is:
  - If A greater than B, C should be greater than D



Coupling of New Spring

- PAIRING OF SPRING:-

I. The difference between the alignment deviation of the two outer spring should not exceed 4mm

II. The difference between the alignment deviation of the two inner spring should not exceed 8mm.

III. The outer and inner springs with the greater alignment deviation must be situated in the same spring assembly. Ie means the combination of inner and outer spring at any side should be greater deviation.

IV. The different between length over test load(L1) of outer spring should not be more than 2mm.

The difference between length over test load (L1) of inner springs should not be considerd.

Coupling of serviceable Spring

FOR SERVICEABLE SPRINGS

PAIRING OF THE SPRING:-

1. The difference between the alignment deviation of two outer springs should not exceed 8mm.
2. The difference between the alignment deviation of two inner springs must not be taken into consideration.
3. The outer & inner spring with the greater alignment deviation must be situated in the same spring assembly.ie the combination of inner and outer spring at any side should be of greater deviation.
4. The difference between length over test load (L1) of outer spring should not be more than 2mm

Speed restrictions

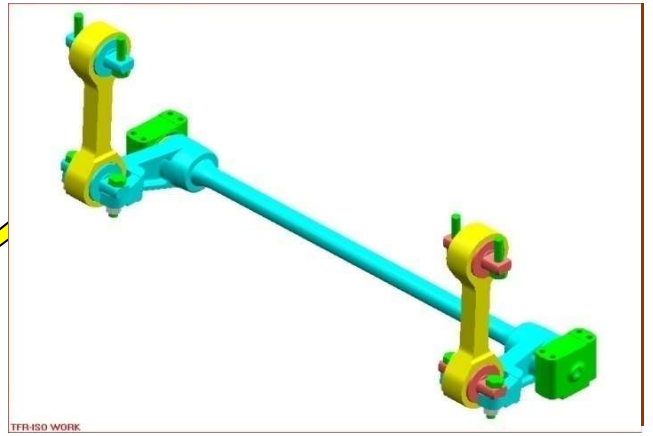
S. No.	Type of Coach	Type of Spring	Type of Suspension	Observation	Action taken	Speed restriction	Reference
1	ICF Coach & Hybrid Coach	Axle Spring	Primary	Breakage of Axle spring	If only one broken axle box coil spring with no excessive tilt of the axle box is detected enroute a running train, the coach may be allowed to continue journey upto the destination with the condition that the speed shall not exceed 100 kmph.	Maximum permissible speed 100 kmph.	(i) IRCA conference no. pt.IV (revised) para 4.20.2 pt. (iii) (ii) DG/Carr./RDSO's letter no. MC./SPC. Dated 17.01.1991.
2	ICF Coach	Bolster spring	Secondary	Breakage of Bolster Spring	A coach shall not be allowed to continue its journey in case of breakage of its bolster spring as unlike primary springs it may shift out of its position.	Not allowed	DG/Carr./RDSO's letter no. MC/SPC. Dated 17.01.1991.
3	Hybrid coach & LHB coach	Air spring	Secondary	Heavy leakage or deflated air spring	In case of heavy leakage or deflated air spring, the defective bogie is to be isolated with the help of isolating valves and driver should observe a speed restriction of 60 kmph upto terminal point for maintenance.	Maximum permissible speed 60 kmph.	(i) Pamphlet on air suspension system of fiat bogie coaches issued by CAMTECH (ii) ED/Carr./RDSO's letter no. MC/CB/MM Dated 09.09.2009.
4	LHB coach	Secondary outer flexi-coil spring	Secondary	Breakage of secondary outer flexi-coil spring	In case of en-route breakage of outer flexi-coil spring of secondary stage suspension the LHB Coach can be permitted to run with a restricted speed of 90 kmph upto the destination with txr staff to escort the train and critically monitor the broken spring. The following should be ensured while permitting such movement: (i) Only one spring is in broken condition. (ii) The spring is broken at one location which falls top or bottom two coils. (iii) The springs is not displaced from its position. (iv) Bump stop gap should not be zero.	Maximum permissible speed 90 kmph with txr staff to escort the train.	ED(Stds.)/Carriage/RDSO's letter no. SV.FIAT spring dated 05.02.2015
5	LHB coach	Primary outer flexi-coil spring	Primary	Breakage of primary outer flexi-coil spring	In case of en-route breakage of outer flexi-coil spring of primary stage suspension, the LHB Coach can be permitted to run upto the destination with escorting TXR staff at a restricted speed of 80 kmph The following should be ensured while permitting such movement: (i) Only one primary outer spring is broken and all other coil springs/ air springs in primary as well as secondary suspension are in good condition. All springs must be checked critically before permitting the coach with restricted speed. (ii) The primary outer spring is broken at only one location, which falls within one and a half (1.5) coil length form top / bottom end. The corresponding rubber pad primary bump stop must be intact and there should be no oil-leakage or any physical damage to the Primary Vertical Damper. Further, the control arm lug should not have any marks of hitting with the Head Brackett. (iii) The broken spring is not displaced from its position. (iv) The coach is to be escorted upto destination accompanied with TXR staff. Note: At the destination, the broken spring should necessarily be	Maximum permissible speed 80 kmph with txr staff to escort the train.	ED/Carriage/RDSO Letter no. SV. FIAT Spring dated: 08.11.2018

Colour Codes on LHB SPRING

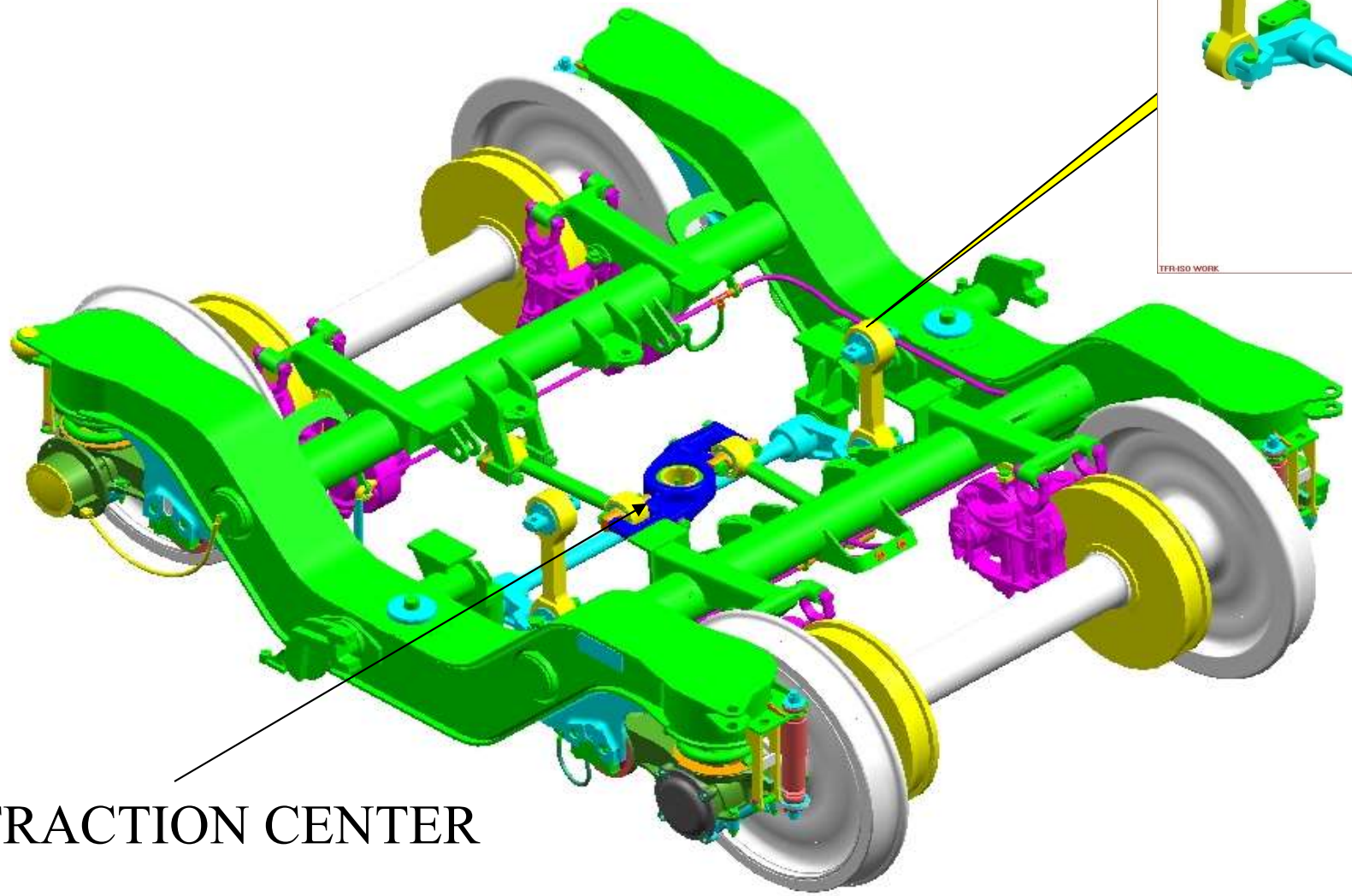
LOAD TEST CHART FOR SPRINGS OF FIAT BOGIE OF LHB COACH

PL No (Drg. No)	Nomenclature	No. of Coils	Free Height	Wire Dia	Outer Dia	Inner Dia	Height under Load KGF	mm	Colour Code
PRIMARY OUTER SPRING									
33503035 (1267411)	AC Two Tier AC Three Tier Pantry Car AC Ist Class AC Chair Car(Ist) AC Chair Car	5.5	324.5	38	257	181+3/-0	2948	264+0/-4	Green
33500368 (1277142)	Power Car	5.75	337	40	259	179+3/-0	4825	252+0/-4	Yellow
PRIMARY INNER SPRING									
33503047 (1267412)	AC Two Tier AC Ist Class Pantry Car AC Chair Car(Ist) AC Chair Car	7.5	324.5	26	164	112+3/-0	1736	264+0/-4	Green
33500356 (1277143)	AC Three Tier AC Three Tier Power Car	7.8	337	27	165	111+3/-0	2690	252+0/-4	Yellow
SECONDARY OUTER SPRING									
33503060 (1269514)	AC Two Tier AC Ist Class Pantry Car AC Chair Car(Ist) AC Chair Car	6.6	707	50	418	318+3/-0	4796	512+0/-5	Green
33500400 (1268836)	AC Three Tier Power Car Side-II	7	702	55	427	317+3/-0	6041	515+0/-5	Yellow
33500381 (1277146)	Power Car Side-I	7	708	56	429	315+3/-0	7291	512+0/-5	Blue
SECONDARY INNER SPRING									
33503059 (1269513)	AC Two Tier AC Ist Class AC Three Tier Pantry Car AC Chair Car(Ist) AC Chair Car	8.3	663	34	280+0/-2	212	2575	468+0/-5	Green
33500393 (1268837)	Power Car Side-II	8.5	658	37	280+0/-2	206	3488	471+0/-5	Yellow
33500370 (1277145)	Power Car Side-I	8.7	664	38	281+0/-2	205	3947	468+0/-5	Blue

ANTI-ROLL BAR ASSEMBLY & TRACTION CENTER



Anti-rollbar assly



TRACTION CENTER

Enlarged View of ANTI-ROLL BAR ASSEMBLY

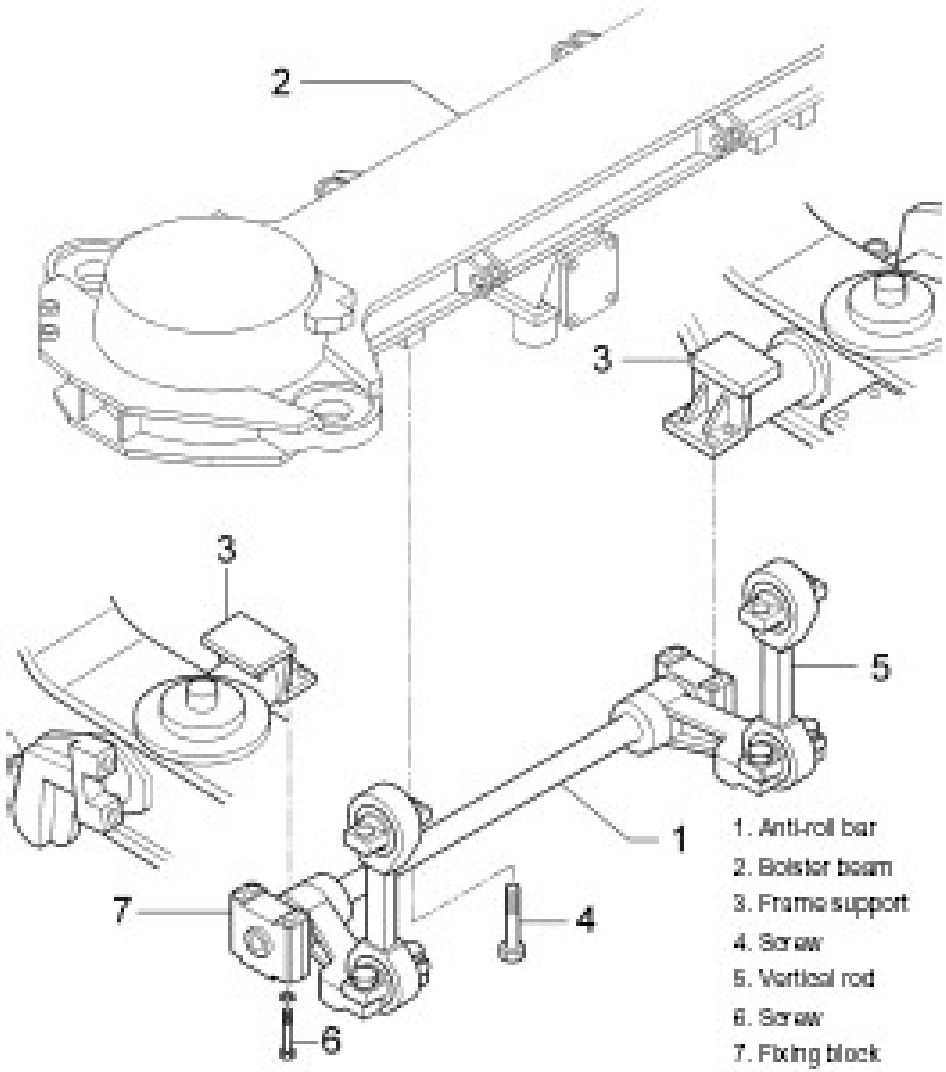
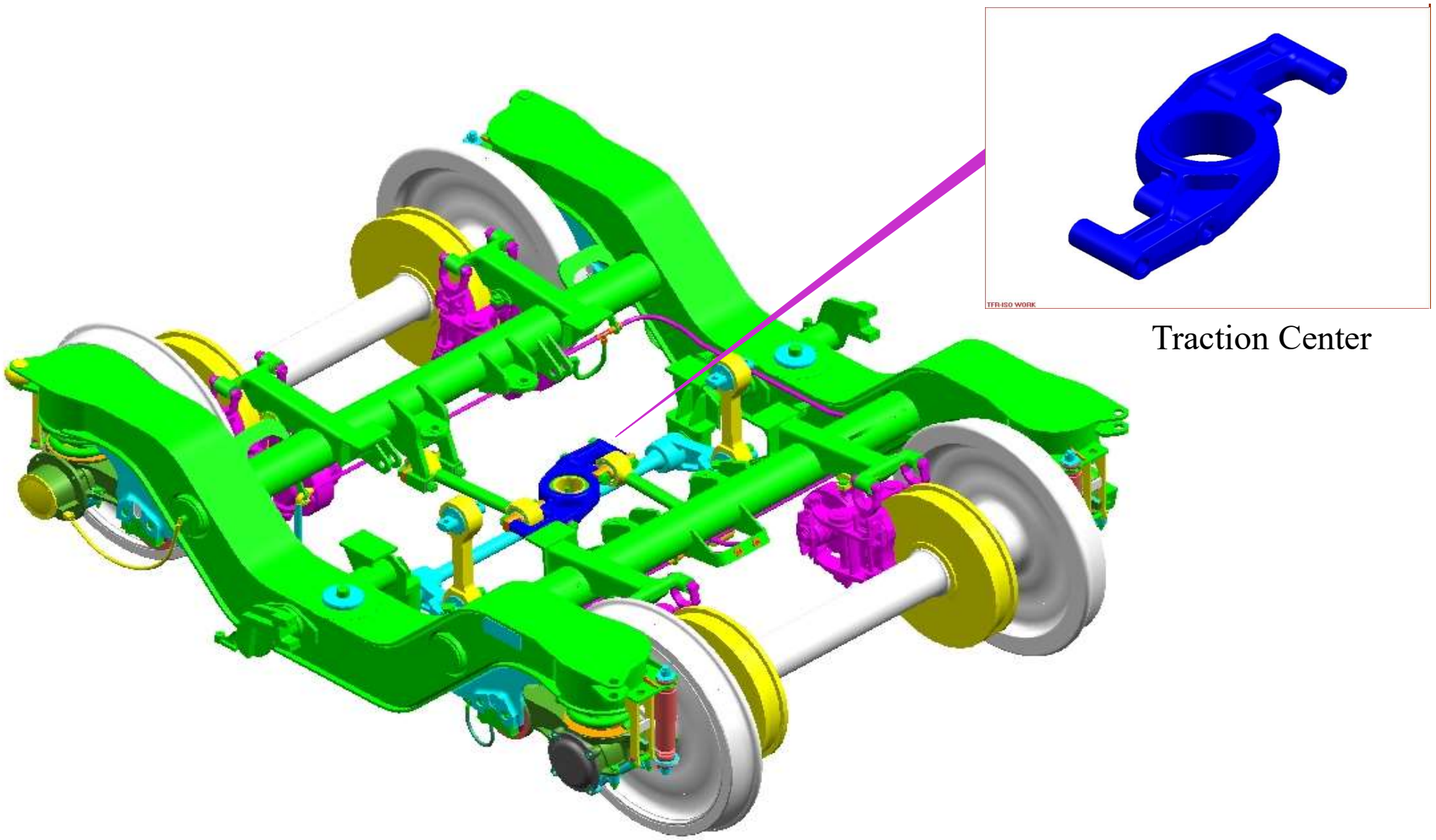


FIG. 3-6 REMOVAL OF THE ANTI-ROLL BAR

ANTI-ROLL BAR

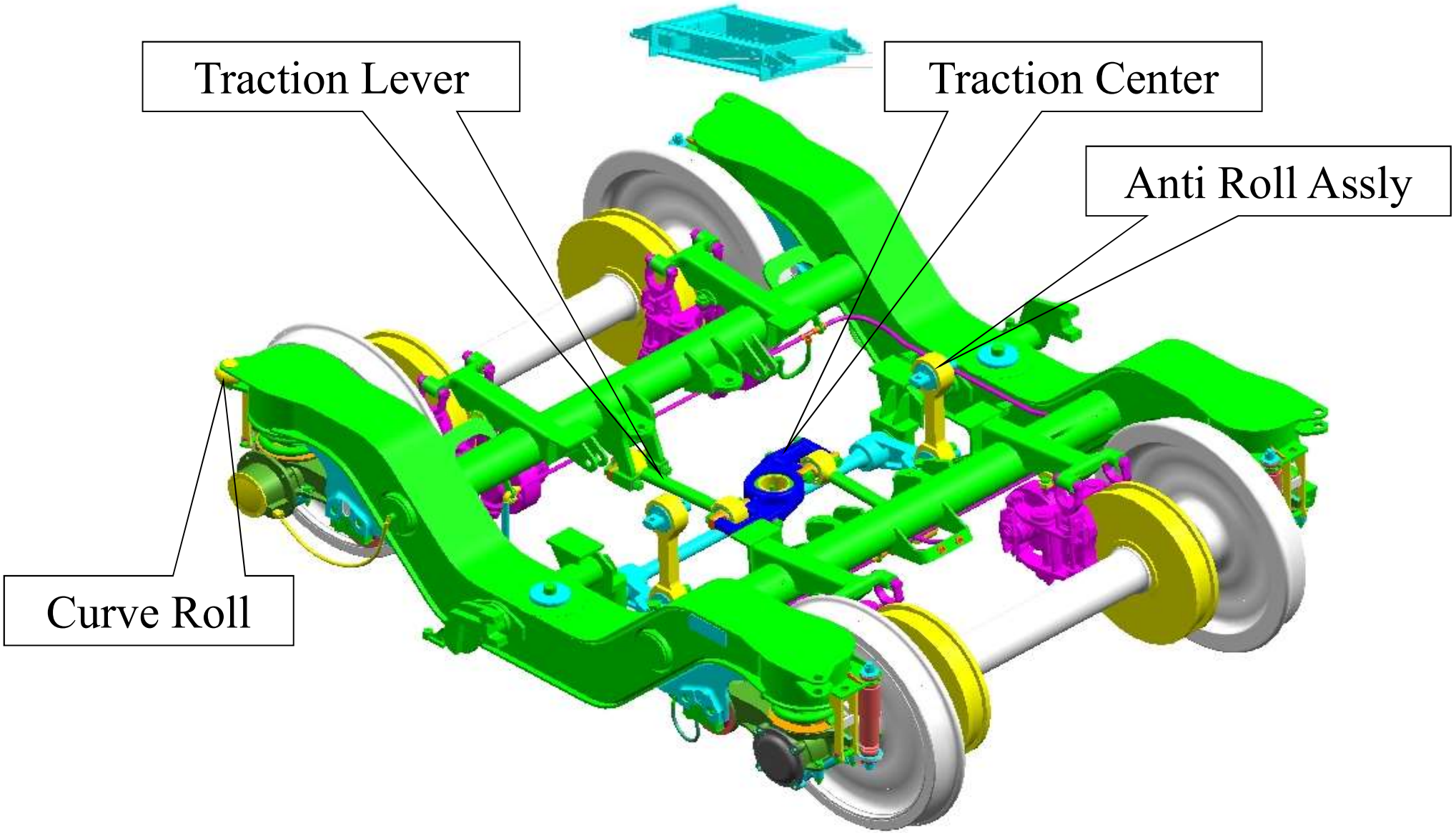
- A TORSION BAR HAVING TWO FORKS IS PROVIDED BETWEEN BOGIE FRAME TRANSVERS BEAM WITH THE HELP OF TWO LINKS TO RESIST ROLLING MOTION OF COACH.
- AS PER UIC515-1 TILTING CO-EFFICIENT ≤ 0.4

Enlarged View of Traction Center Assembly



Traction Center

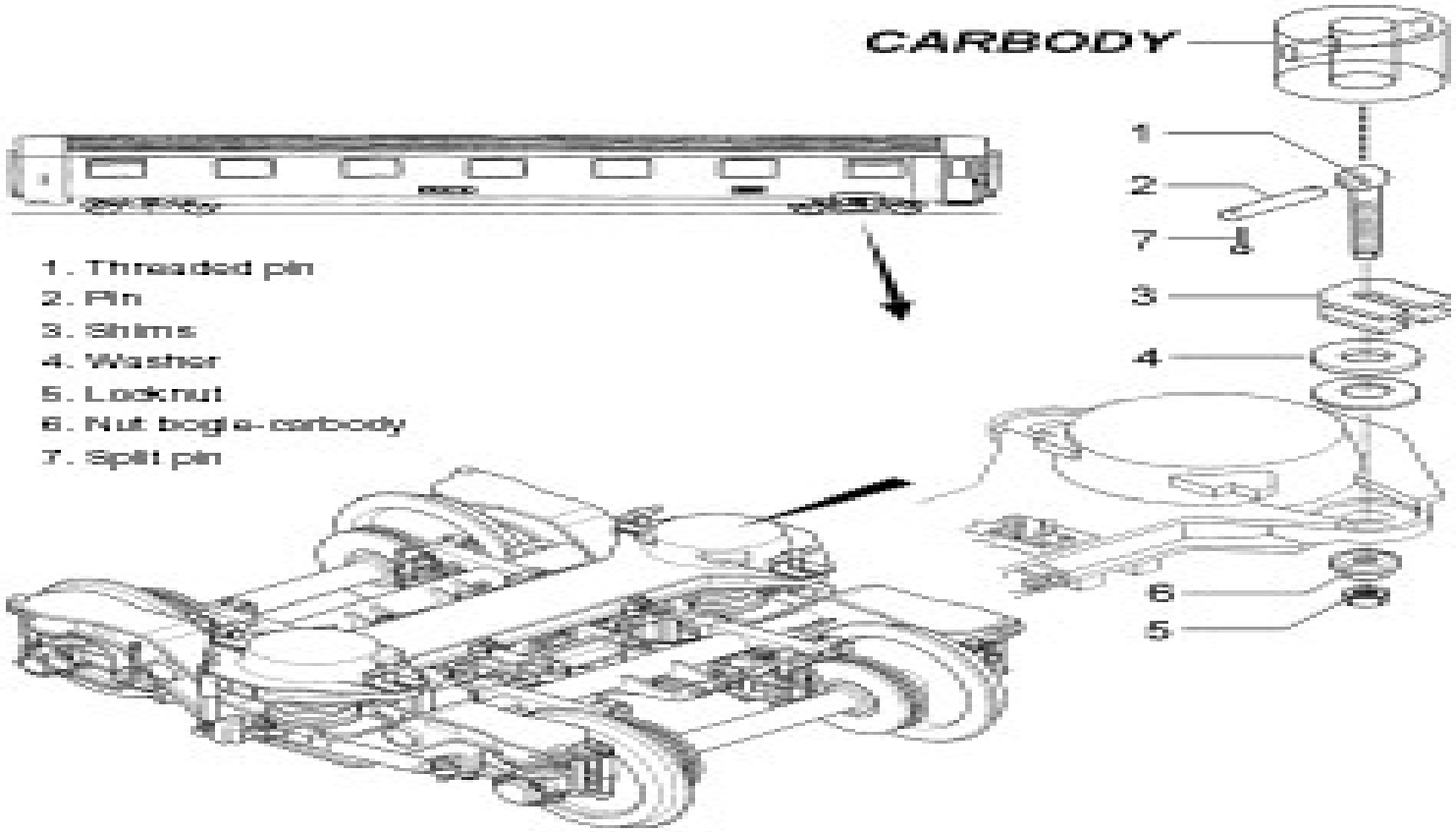
Traction Centre & Anti Roll Bar ASSEMBLY



BUFFER HEIGHT ADJUSTMENT

- By adding or removing shims from body/bogie connection as shown in figure.
- Shims will not be added/removed in Primary and Secondary Suspension for wheel wear compensation or buffer height adjustment.

BOGIE BODY CONNECTION



Principles of force transmission

- **Vertical forces:**
- BODY-SEC.SPRINGS-BOGIE FRAME-PRIMARY SPRINGS CONTROL ARM-AXLES.

Longitudinal traction efforts and braking powers:

- BODY-TRACTION CENTRE-TRACTION RODS-TRACTION LEVER-BOGIE FRAME-CONTROL ARM-AXLES.

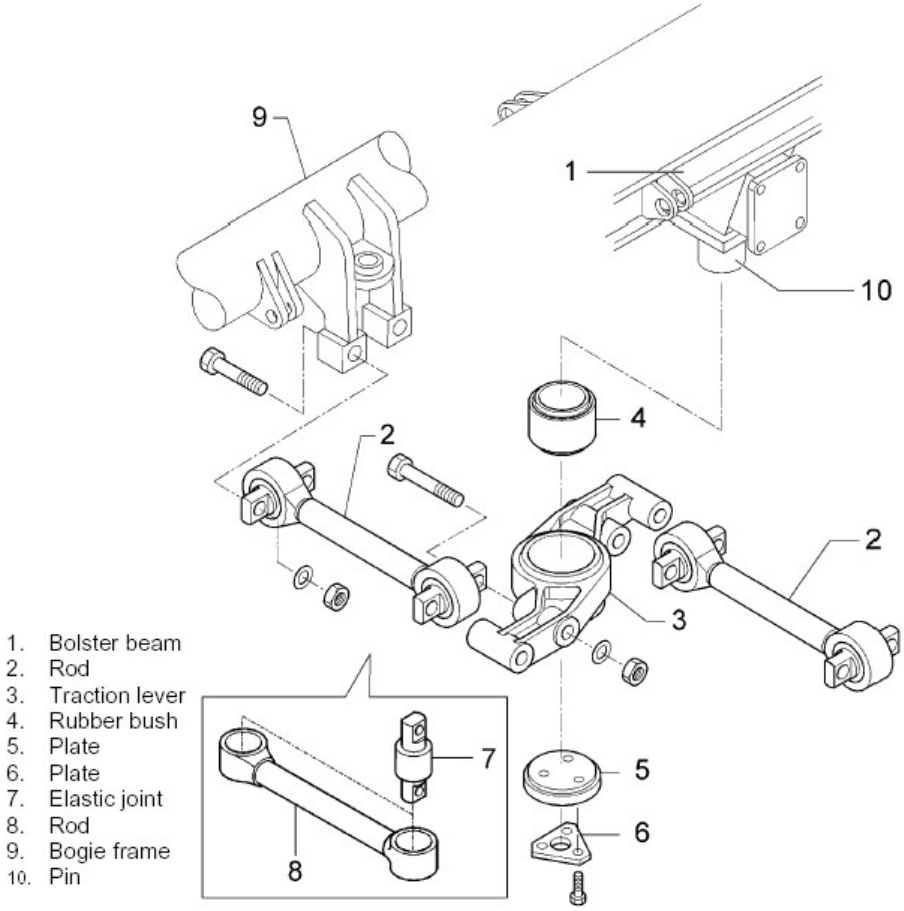
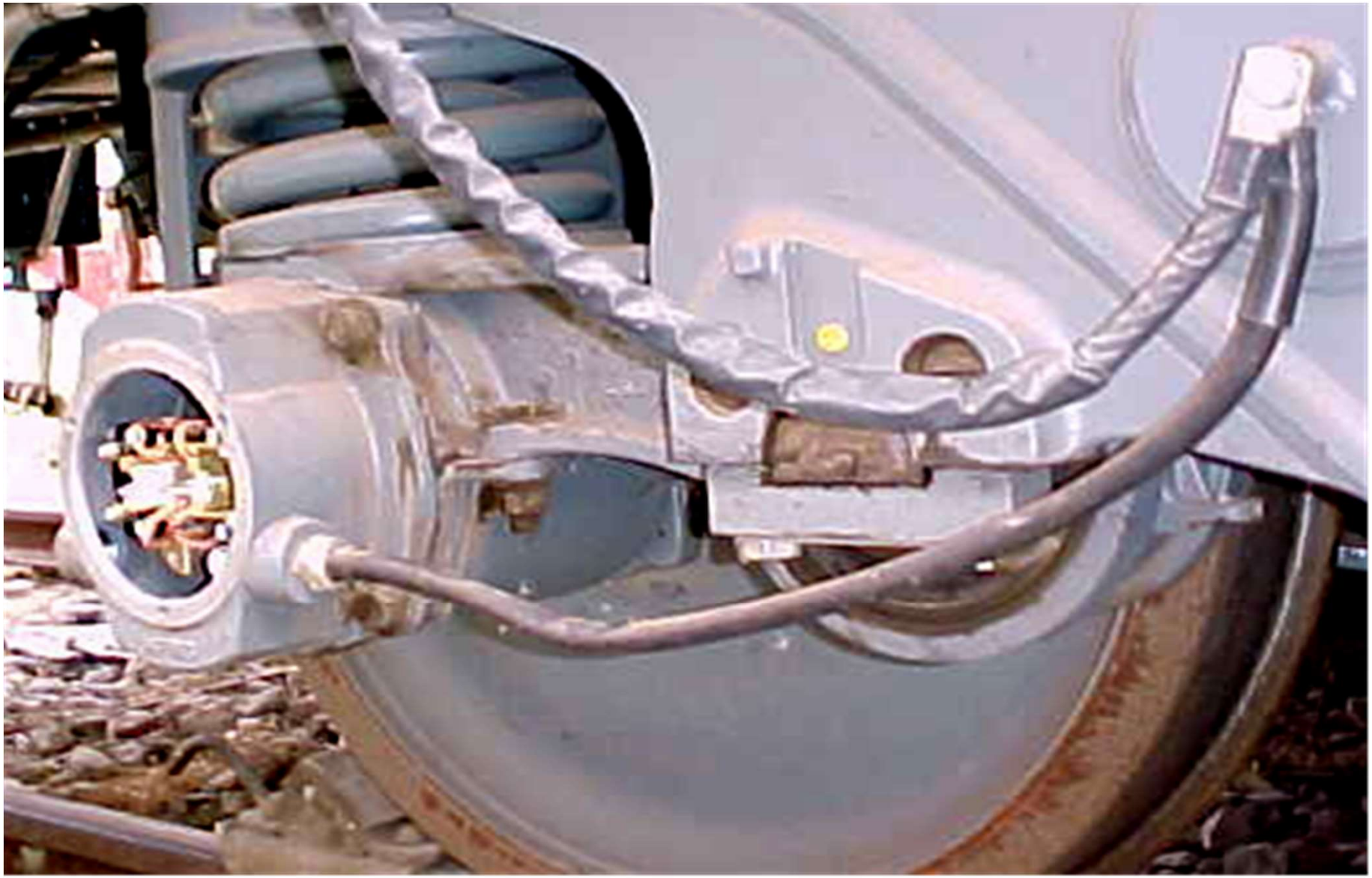
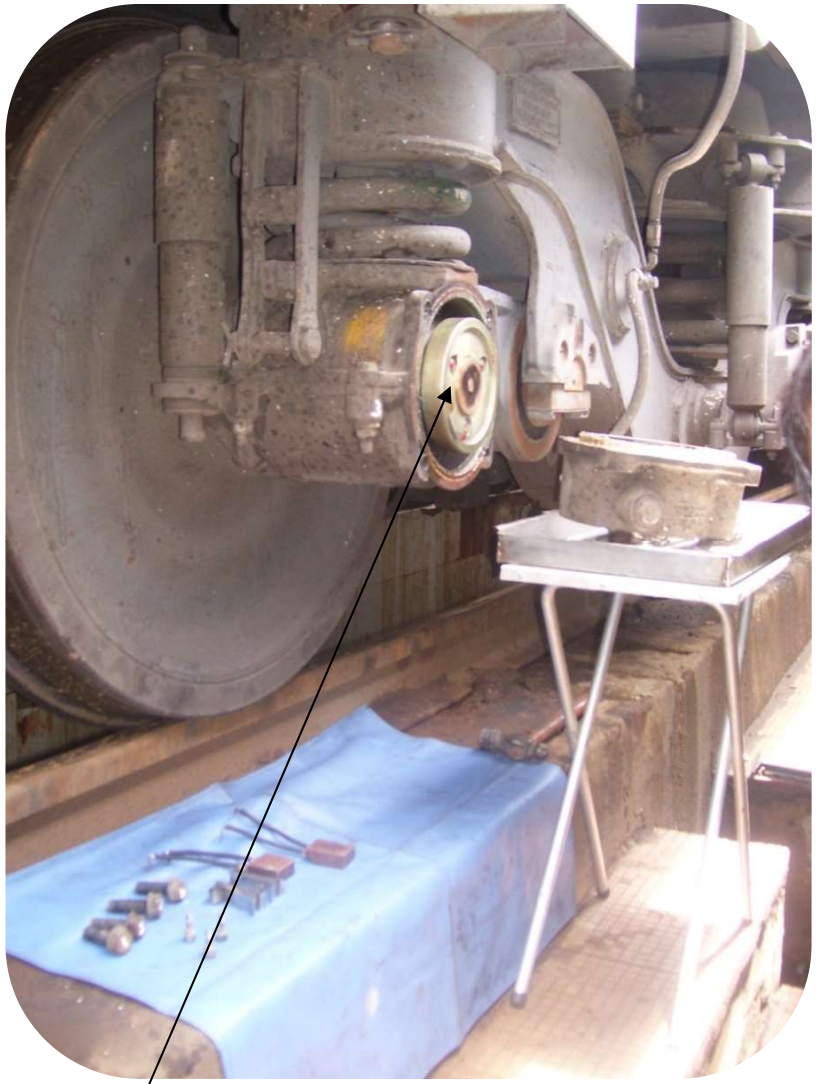


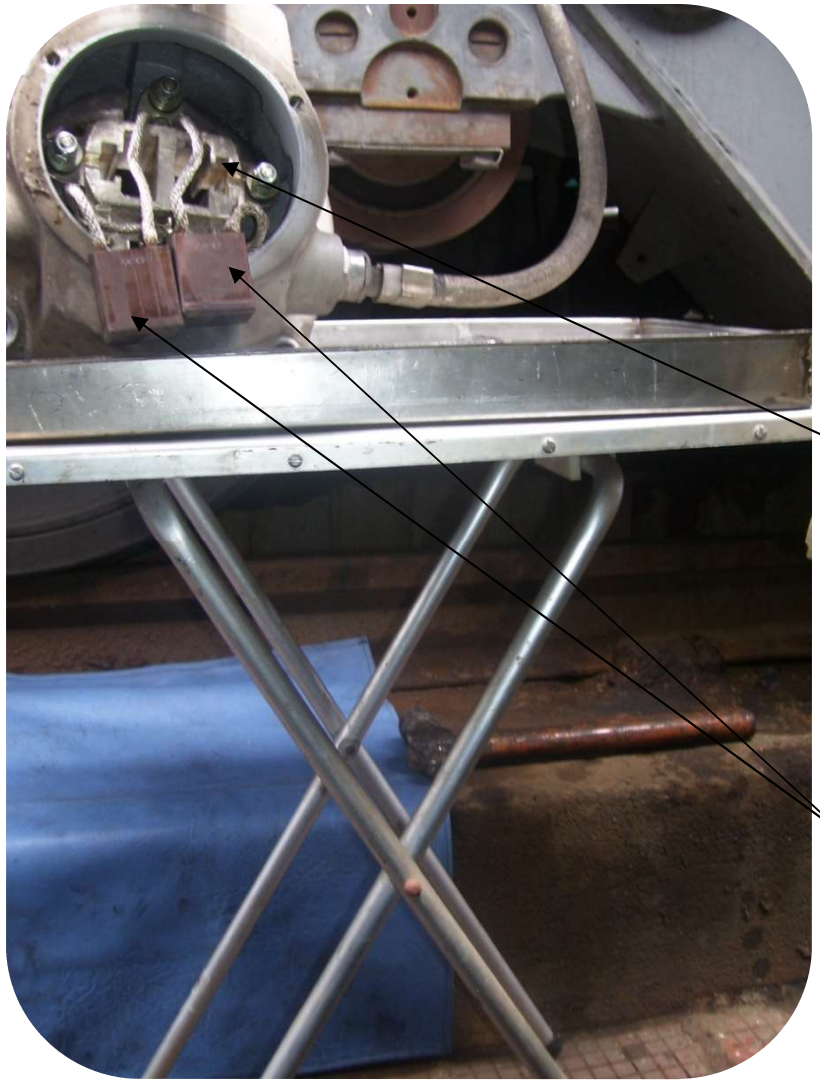
FIG. 1-11 TRACTION CENTRE

WHEEL EARTHING EQUIPMENT



Checking of Earthing device





HOLDE

BRUS

Table is used for keeping axle box cover so that cables should not be damaged

DISH

WHEEL SET EARTHING EQUIPMENT

- PREVENTS RETURN CURRENT FLOW THROUGH THE AXLE BEARING AND CREATES A CONNECTION BY MEANS OF CONTACT BRUSH TO THE ROTATING AXLE
- EARTHING BRUSH

ALLOWABLE CURRENT	- 400 A
MAX. CURRENT	- 600 A
NO. OF BRUSHES	- 2

- EARTHING RESISTOR

EARTHING RESISTOR	- 0.1 Ohms
WEIGHT	-1.3 Kgs

Important Dimensions

CBC/Buffer Height:	$1105\ ^{+0}_{-15}$ mm
Vertical Bump Stop Clearance:	$95\ ^{+0}_{-5}$ mm
Lateral Bump Stop Clearance:	$25\ ^{+5}_{-5}$ mm
Longitudinal Bump Stop Clearance:	$08\ ^{+5}_{-2}$ mm
Secondary Rubber Ring/Minor Pad Free Height:	90 – 95 mm
Secondary Rubber Ring/Minor Pad Height in tare:	48 mm
Maximum Adjusting Shim Height:	55 mm (11 nos. max.)
Gap between Safety Pin & Control Arm lug:	
(Top)	45 mm
(Bottom)	37.5 mm Gap between speed
sensor phonic wheel	0.9-1.4 mm
Brake pad new / condemn	35 mm /7 mm
Brake Disc width new/condemn	110 mm/ 96 mm
Gap between Brake Pad and Brake Disc	1mm - 1.5 mm
Wheel new/condemn	915 mm/ 855mm

COMPARISION OF SALIENT FEATURES OF FIAT BOGIE AGAINST I.C.F. BOGIE

S.N.	I.C.F.	FIAT
1	SPEED=140 KMPH	MAX OPERATING SPEED=160 KMPH TESTED SPEED=180 KMPH POTENTIAL FOR OPERATION=200 KMPH
2	BOGIE FRAME I TYPE	H TYPE CONSTRUCTION
3	WHEEL BASE =2896 MM	WHEEL BASE = 2560 MM

COMPARISION CONTD……

S.N.	I.C.F.	FIAT
7	PRIMARY SINGLE SPRING	PRIMARY NESTED SPRING =2 NOS.
8	LIMITED NOISE CONTROL FEATURES	NOISE CONTROLLED BY USING THICK RUBBER PAD
9	SECONDARY SPRING ON L.S. BEAM	SECONDARY SPRING DIRECTLY MOUNTED ON SIDE FRAME (NO L.S. BEAM)
10	COACH LOAD IS TRANSFERRED THROUGH	THROUGH BOGIE BODY CONNECTION TO SIDE FRAME VIA SEC. SPRINGS.

COMPARISION CONTD…..

S.N.	I.C.F.	FIAT
12	RIDE INDEX TRANSVERSE=3.5 VERTICAL=2.5	TRANSVERSE=2.75 VERTICAL=2.5
13	NO ANTI ROLL BAR	ANTI ROLL BAR HAS BEEN PROVIDED TO CURB THE TEDENCY OF ROLL.

Maintenance schedules

Schedule	Frequency	Attention at
Schedule D1	Every Trip	Maintenance depot
Schedule D2	Monthly +/- 3 days	
Schedule D3	Half yearly +/-15 days	
Shop Schedule – I	18 months or 06 lacs kms whichever is earlier	Depot
Shop Schedule – II	36 months or 12 lacs kms whichever is earlier	SHOP
Shop Schedule – III	72 months or 24 lacs kms whichever is earlier	

Reference: CAMTECH Maintenance Manual

THANK YOU