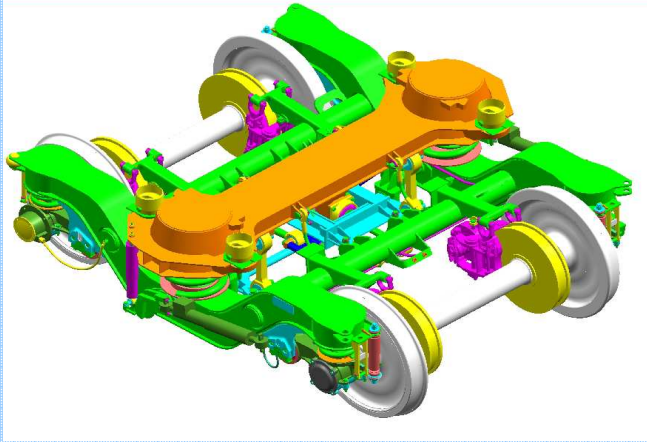




(Govt. of India)
(Ministry of Railways)

Introduction Handbook on FIAT Bogie फिएट बोगी पर परिचय हस्त पुस्तिका



(For official use only)
IRCAMTECH/M/12-13/FIAT Bogie/1.0

July 2012

अभिसंRDS
रेल अग्रदूत Transforming Railways



Indian Railways
Centre for Advanced Maintenance Technology

MAHARAJPUR, GWALIOR -474005

महाराजपुर, ग्वालियर

प्राक्कथन/Foreword

This hand book has covered introduction, constructional detail of FIAT Bogie, instructions and precautions during inspection and maintenance. Wherever required, sketches and colored photographs have been provided to make the understanding clear.

I am sure that the handbook will be useful to the concerned staff to ensure trouble free service of the train operation.

Technological up-gradation and learning is a continuous process. Hence feel free to write us for any addition / modifications or in case you have any suggestion to improve the Hand Book, your contribution in this direction shall be highly appreciated.

We welcome any suggestion for addition and improvements from our readers.

Place: CAMTECH/GWL
Date: 30/06/2012

(A R Tupe)
Exe. Director

भूमिका /Preface

FIAT bogie is a vital part of the LHB coaches. These type of coaches have already been introduced on Indian Railway having better riding index and higher reliability.

Knowledge of proper maintenance of FIAT bogie is necessary to ensure higher reliability and timely availability of coaches in workshop as well as on line.

The purpose of this hand book is to enhance knowledge and competence of C&W staff in dealing with LHB coach maintenance.

It is clarified that this handbook does not supersede any existing procedures and practices laid down in the maintenance instructions issued by manufacturers or by RDSO/LKO.

30th June 2012
CAMTECH GWALIOR

(K.P.Yadav)
Director/Mech

CORRECTION SLIPS

The correction slips to be issued in future for this handbook will be numbered as follows:

CAMTECH/M/12-13/FIAT Bogie/1.0/C.S. # XX
date

Where “XX” is the serial number of the concerned correction slip (Starting from 01 onwards)

CORRECTION SLIPS ISSUED

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संशोधन पर्ची

इस पुस्तिका के लिये भविष्य में प्रकाशित होने वाली संशोधन पर्चियों को निम्नानुसार संख्यांकित किया जाएगा :

कैमटेक / याँ / 12-13 / फिएट बोगी / 1.0 / xx दिनांक

जहाँ “ XX ” सम्बन्धित संशोधन पर्ची की क्रम संख्या है (01 से प्रारम्भ होकर आगे की ओर)।

प्रकाशित संशोधन पत्रियाँ

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Introduction Handbook on FIAT Bogie

फिएट बोगी पर परिचय हस्त पुस्तिका

फिएट बोगी /FIAT BOGIE

1.0 फिएट बोगी की मुख्य विशेषताएँ /Salient Features of Fiat Bogie

- The FIAT Bogie is an adoption of EUROFIMA design.
- Bogie frame is a Y frame fabricated and machined structure.
- Four nested springs for primary suspension and two-nested flexi-coil springs for secondary suspension.
- Axle mounted disc brake system.
- Hydraulic shock absorbers used conforming to UIC stipulation.

Each FIAT Bogie is provided with four primary vertical, two secondary vertical, one secondary lateral and two yaw dampers

1.1 मुख्य टेक्नीकल डाटा /Main Technical Data

Axle distance	2560	mm
Diameter of new wheels	915	mm
Diameter of max. worn wheel	845	mm
Distance between the wheels	1600	mm
Brake disc diameter	640	mm
Bogie width	3030	mm
Bogie length	3534	mm
Bogie weight	6300	Kg

1.2 टेक्नीकल विवरण /Technical Description

The FIAT Bogie is two-axle type, with a primary and a secondary suspension. The bogie assembly is shown in

fig. 1-1 & 1.1 A. Main Technical features of FIAT Bogie are:

- **Solid welded Bogie Frame** made up of two longitudinal components connected by two cross beams. The bogie frame rests on the primary suspension spring units and supports the vehicle body by means of Bolster beam. The Bolster beam is connected to the bogie frame by secondary suspension.
- **Primary suspension** consist of two steel coil springs (internal/external) laid out on the Control Arm upper part.
- **Secondary suspension** consists of two spring packs which sustain the bolster beam over the bogie frame. Each spring pack is made up by an internal and external spring. An Anti roll bar fitted on the bogie frame realizes a constant, reduced inclination coefficient during running. The bogie frame is linked to the bolster beam through two vertical dampers, a lateral damper, four safety cables and the traction rods. The bogie frame is linked to the coach body through two yaw dampers.
- **Traction Centre** - The traction Centre transmits traction and braking forces between bogie frame and body by a traction lever on the bolster beam pin and two rods.
- **Disk Brakes** – The FIAT bogie is fitted with pneumatic disk brakes. The pneumatically operated brake cylinders are fitted with automatic device for taking up the clearances.
- **Taper Roller Cartridge Bearing** – Fiat Bogie is fitted with 130 mm Cartridge type roller bearings.

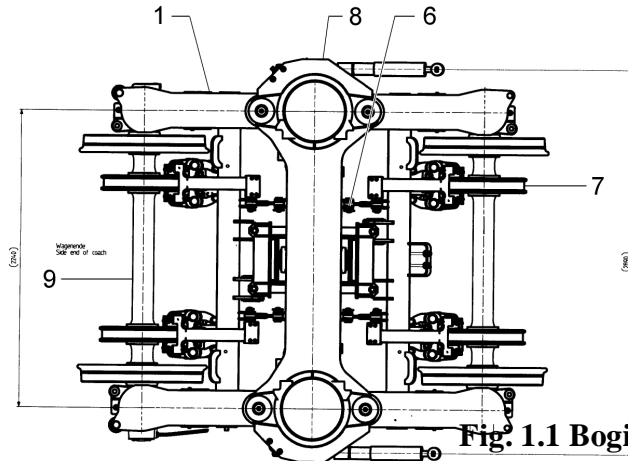
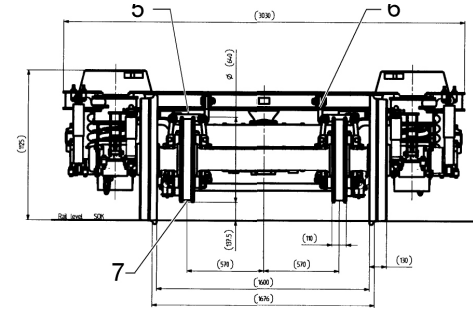
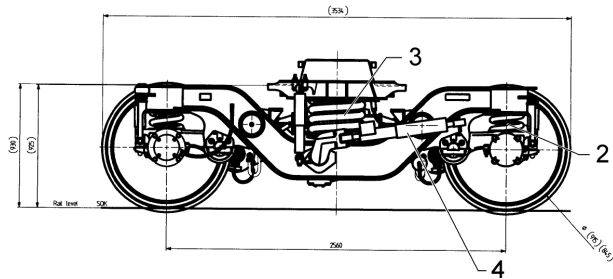


Fig. 1.1 Bogie Assembly

1. Bogie frame
2. Primary suspension
3. Secondary suspension
4. Yaw damper
5. Lateral damper
6. Safety cables
7. Brake disc
8. Bolster beam
9. Axle

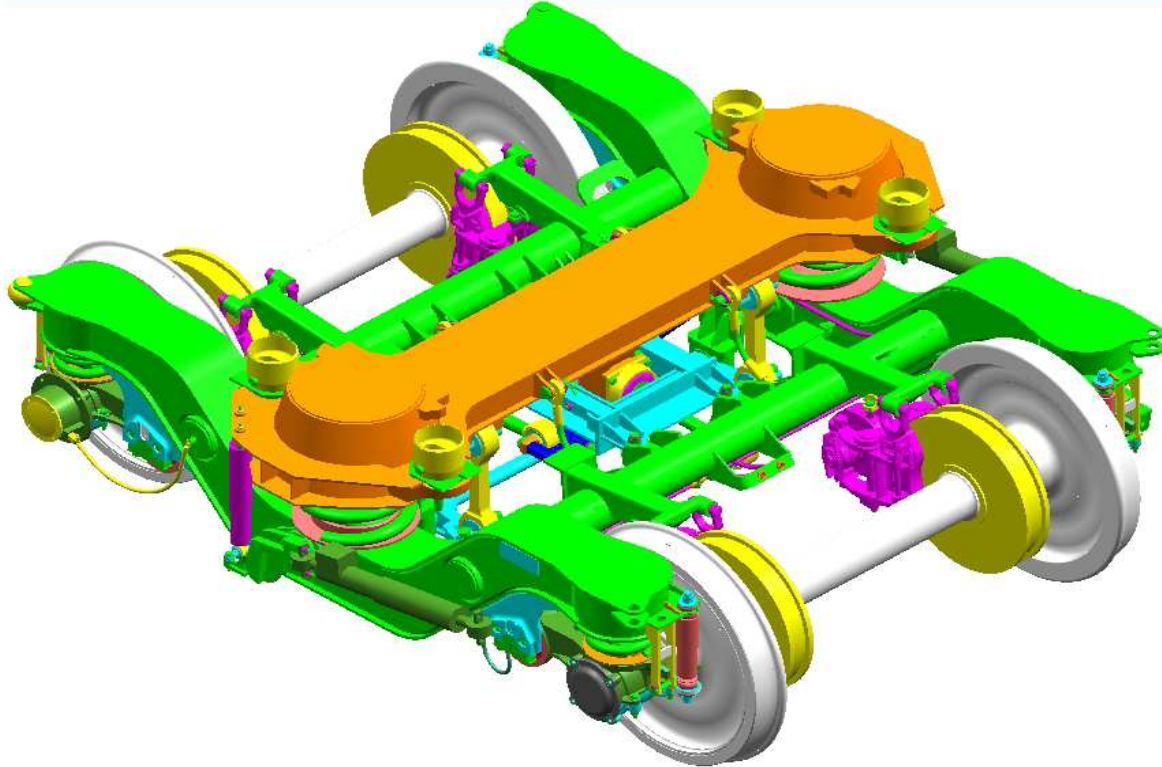


Fig. 1.1 A Exploded View of FIAT Bogie

There are four variants of the bogie: 1267400, 1267334, 1267700 and LW08001. The main differences in these variants are shown in **Table 1**.

**Table 1 BOGIE DIFFERENCES
DRAWING NUMBERS AND CHARACTERISTICS FOR
DIFFERENT ITEMS**

Component Item	AC- Chair Car (1st & 2nd), Hot buffet, AC-2T/EOG, FAC/EOG Side 1+2 (each)	Gen-Van Side 1	Gen-Van Side 2 (luggage compartment)	AC-3T EOG
Bogie main assembly	1 267 400	1 267 334	1 267 700	LW 00001
Primary suspension assembly	1 268 732	1 272 174	1 272 174	LW01001
Spring (outer)	1 267 411	1 277 142	1 277 142	1267411
Spring (inner)	1 267 412	1 277 143	1 277 143	1277143
Secondary suspension assembly	1 268 801	1 268 838	1 277 151	LW05001
Spring (outer)	1 269 514	1 277 146	1 268 836	1268836
Spring (inner)	1 269 513	1 277	1 268 837	1269513

		145		
Frame assembly	LW 03007	LW 03008	LW 03007	LW03007
Handbrake support	No	Yes - 1 267 798	No	No
Brake assembly	1 268 820	1 272 116	1 272 112	1268820
Ratio of brake-caliper	1 : 2.17	1 : 2.48	1 : 2.48	1:2.17
Handbrake/Flexball	No	Yes 1272184 201/026 7060000 1272185 201/026 7050000	No	No.

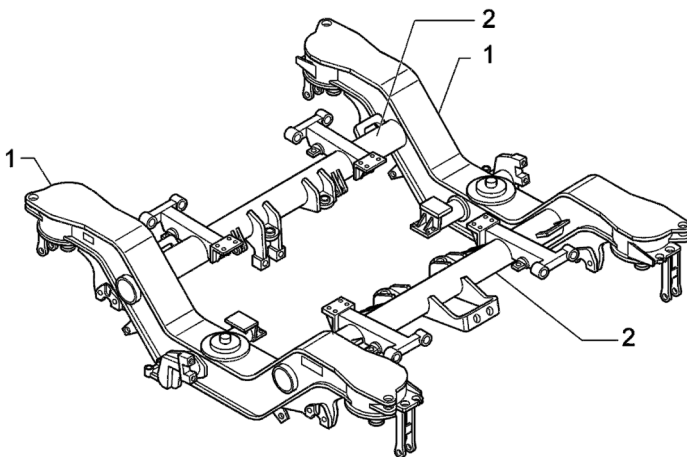
1.3 फिएट बोगी के पार्ट्स का विवरण /FIAT Bogie Parts Description

1.3.1 बोगी फ्रेम /Bogie Frame

The bogie frame is a solid welded frame made by steel sheets and forged or cast parts. The frame is made up of two longitudinal components (1) connected by two



cross-beams (2) which also support the brake units. The various supports which connect the different bogie components are welded to the 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 the secondary suspension.



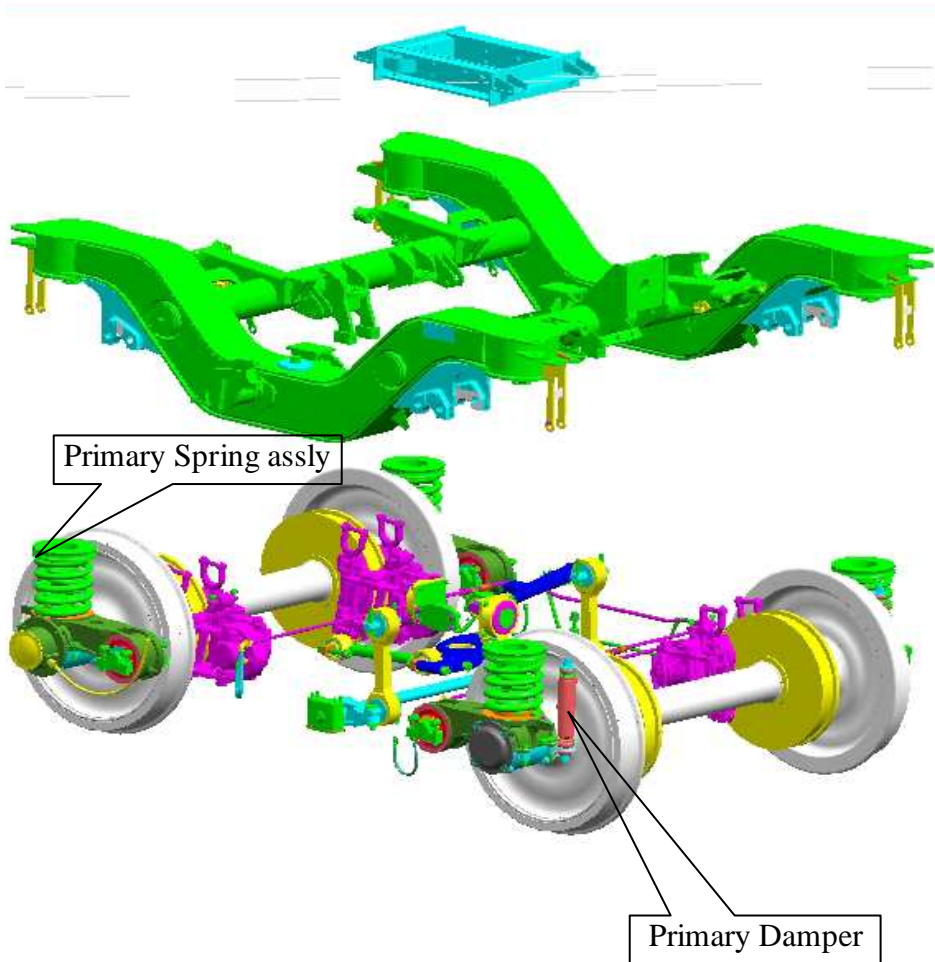
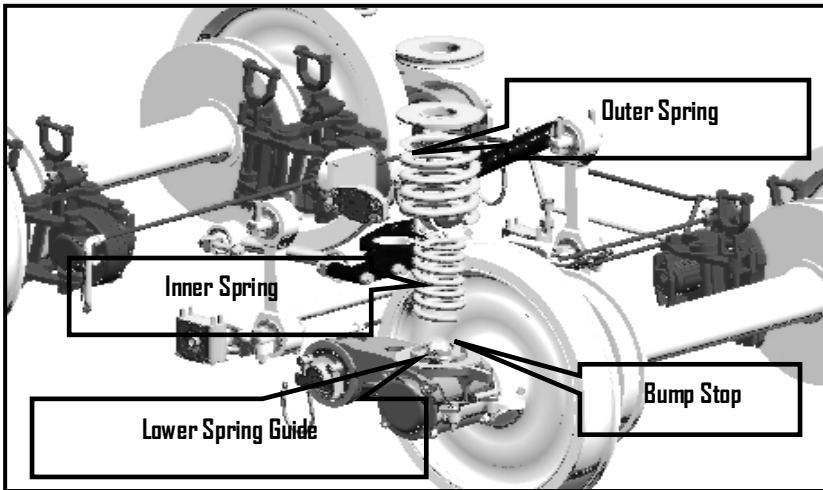


Fig. 1.2 A Exploded View of Bogie Frame Lifted

1.3.2 प्राइमरी सस्पेंशन / Primary Suspension



Primary suspension is implemented by two units (see Fig. 1-3) of two steel coil springs internal (4) and external (5) laid out on the control arm upper part (13) by a centering disc (8) and adjustment shims, (if required). The suspension is also completed by the following components:

Control arm (13), fitted with twin-layer elastic joints (12), connecting the axle bearing to the bogie frame and transmitting, lateral, longitudinal and part of the vertical forces;- a vertical damper (14). Rubber elements (2) separate the primary suspension from the bogie to realize noise reduction. Stops and protections are mounted on the bogie frame for lifting.

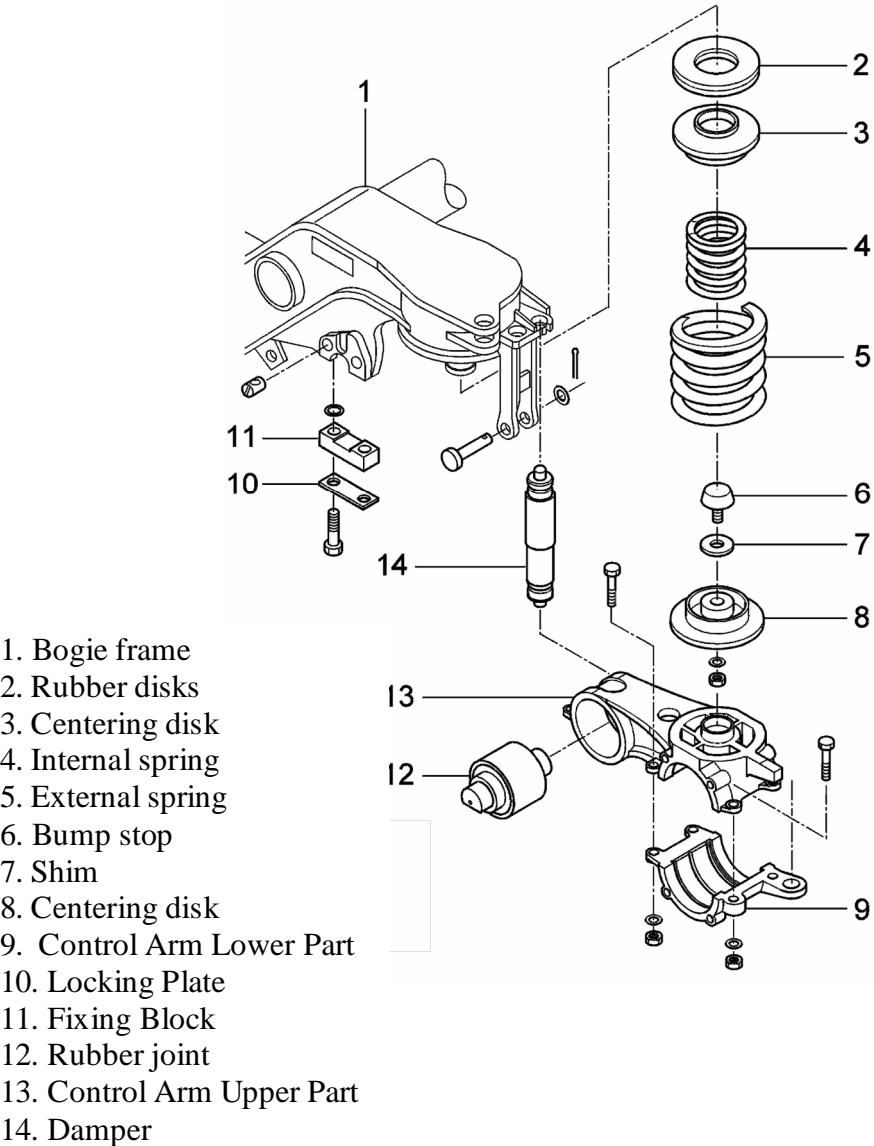
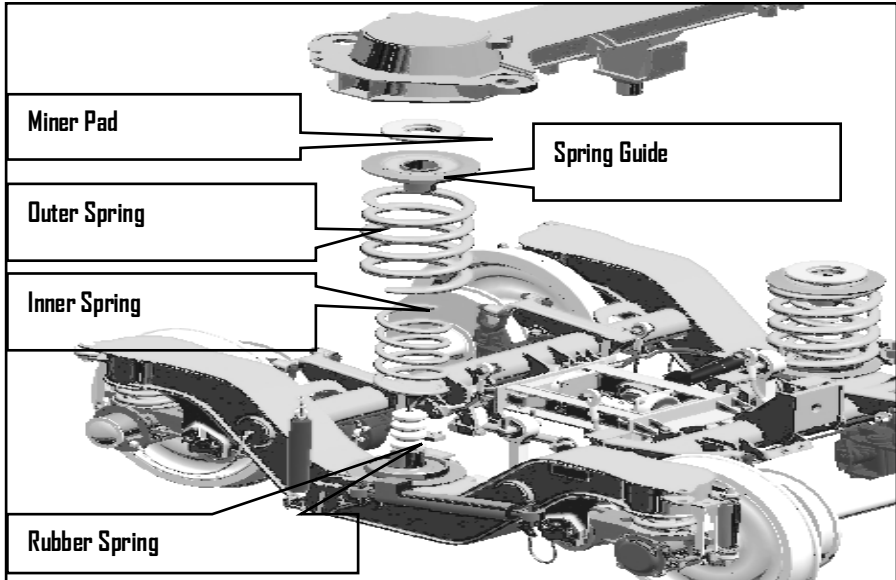


Fig. 1.3 Primary Suspension Unit

1.3.3 सैकेन्ट्री सस्पेंशन /Secondary Suspension

सैकेन्ट्री सस्पेंशन स्टेज में स्टील कॉयल स्प्रिंग / Steel Coil Spring in Secondary Suspension Stage



The secondary suspension enables lateral and vertical displacements and bogie rotation with respect to body when running through curves. It is implemented by two spring packs (Fig. 1.4) which sustain the bolster beam (1) over the bogie frame (6). Each spring pack is made up by an internal (3) and an external spring (4), mounted and positioned through the centering discs (5). An anti-roll bar (2), fitted on the bogie frame (6), realizes a constant reduced inclination coefficient during running. The bogie frame is linked to the bolster beam through two vertical dampers (7), a lateral damper (8), four safety cables (9)

and the traction rods (10). The bogie frame is also linked to the coach body through two yaw dampers (11).

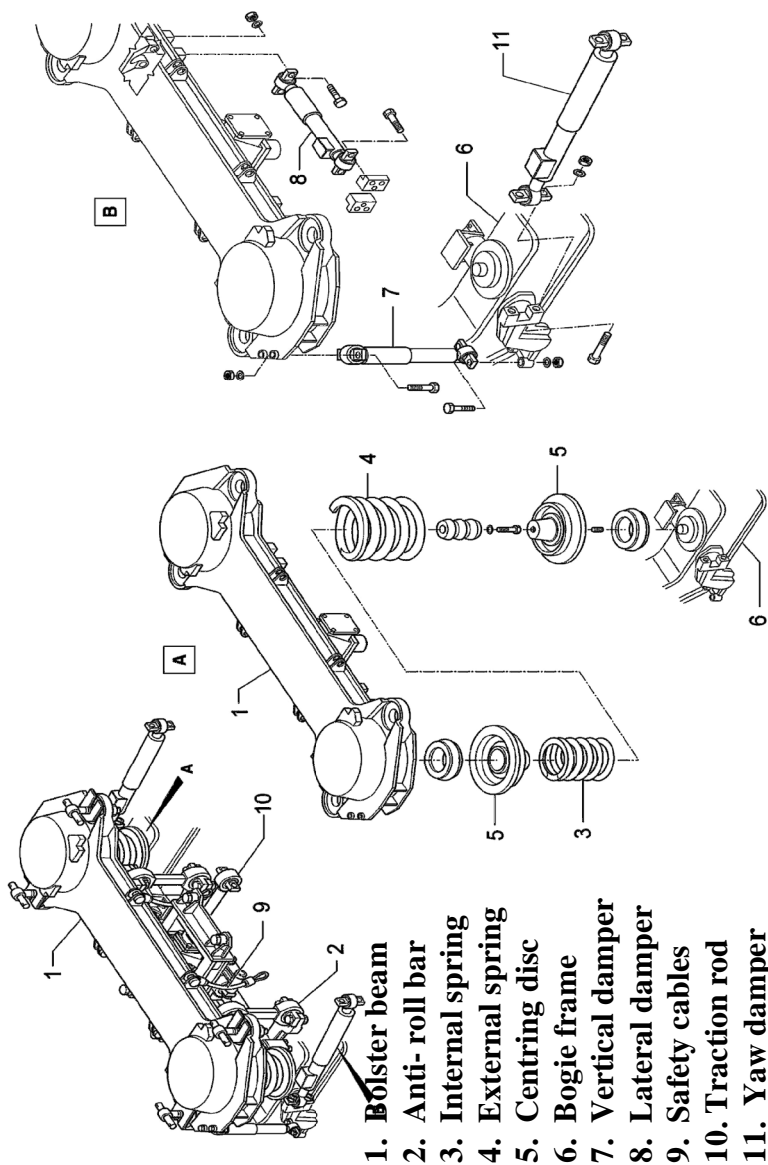


Fig 1.4 Secondary Suspension Unit

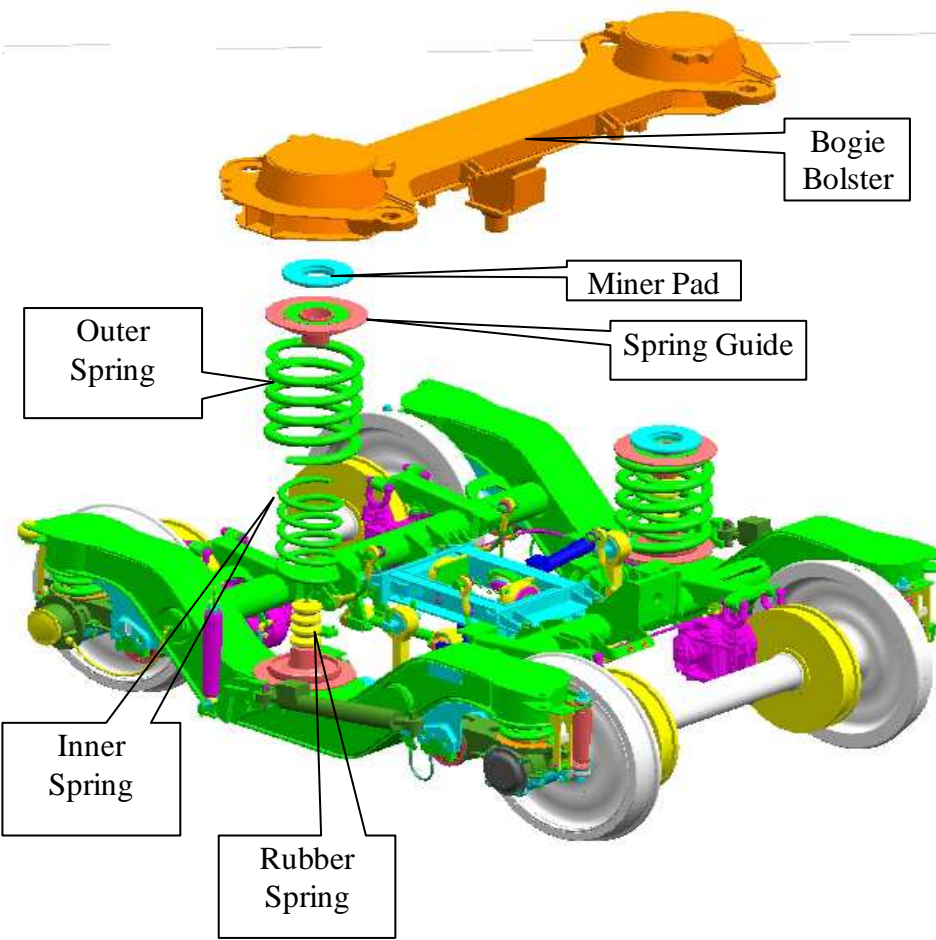


Fig 1.4 A (With Secondary Spring System Exploded)

सैकेन्ड्री सस्पेंशन स्टेज में एयर स्प्रिंग / Air Spring in Secondary Suspension Stage

परिचय / Introduction

Air suspension is a suspension where properties of air are used for cushioning effect (springiness). Enclosed Pressurised air in a pre-defined chamber called air spring, made up of rubber bellow & emergency rubber spring, provides various suspension characteristics including damping. Air springs are height-controlled load levelling suspension devices. With changing loads, air spring reacts initially by changing the distance between air spring support and vehicle body. The height monitoring valve (called levelling valve) is in turn actuated, either taking the compressed air pressure to the air spring or releasing air pressure from it to the atmosphere. This process continues until the original height is restored. This mechanism ensures a constant floor height on coaches provided with air springs, irrespective of the load. This greatly reduces problems associated with low buffer / coupler heights.

संरचना / Construction details

Construction details of air spring are shown in Fig. a (air spring with internal emergency spring), & Fig. b (air spring with external emergency spring).

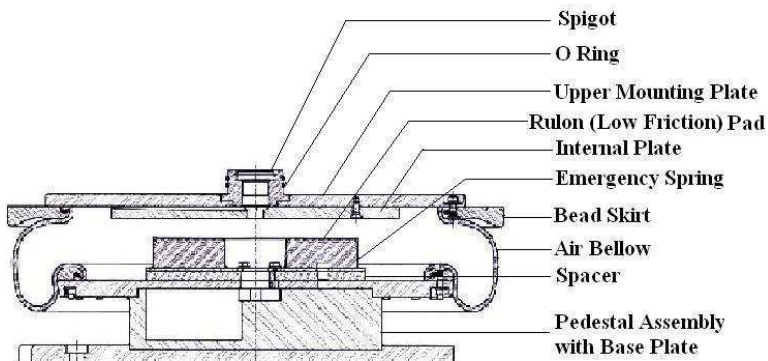


Fig. a Air Spring Assembly with Internal Emergency Spring

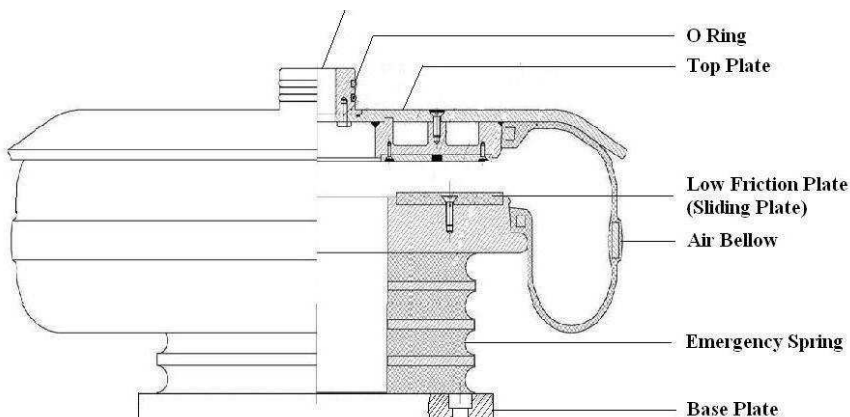
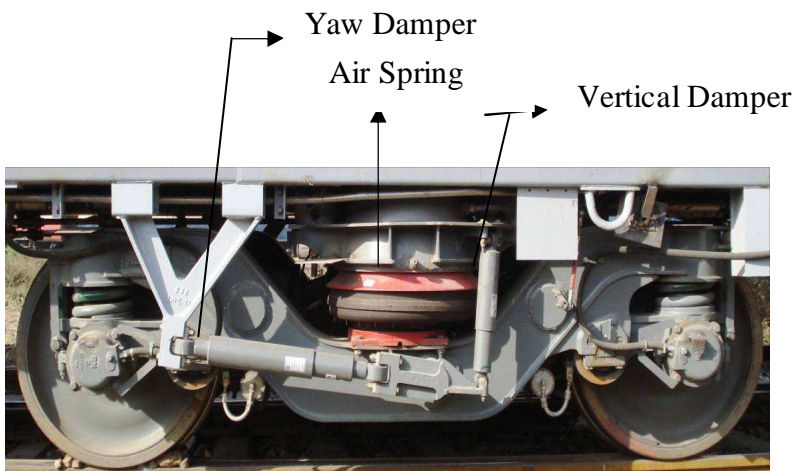


Fig. b Air Spring Assembly with External Emergency Spring

Modification for fitment of air spring if required:

बोगी फ्रेम और सस्पेंशन / Bogie Frame & Suspension:

- Air spring has been installed at secondary stage replacing steel coil springs.
- A square platform (base) to accommodate the air spring has been provided on Y- frame of bogie.
- A lateral hydraulic damper and lateral bump stop have been provided at secondary stage.
- Primary springs have been retained as steel spring.
- Details are shown in picture below.
- Leveling valve provided between bogie frame and bogie bolster.



Bogie bolster:

- Provision is made for air inlet to air spring.
- Dome of Bolster beam has been used as an additional reservoir of 60 lit. for each air spring.

- Duplex check valve is provided.

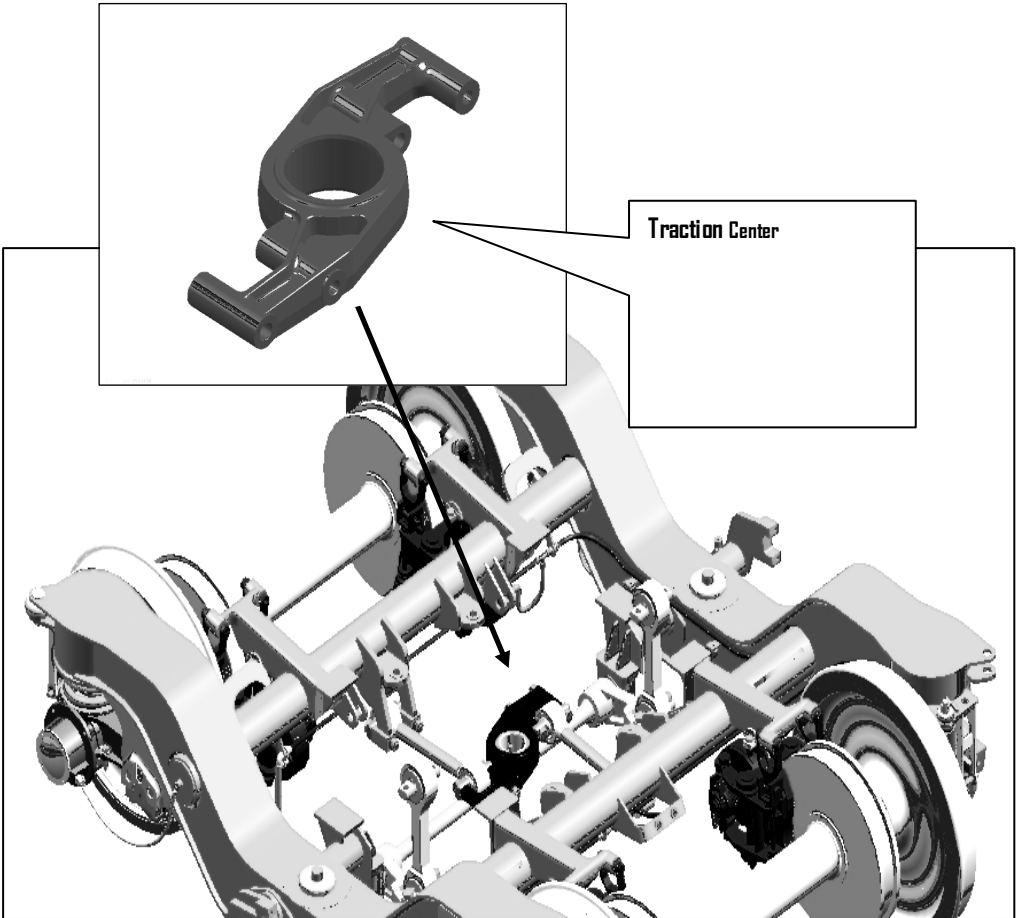
अन्डर फ्रेम /Under frame:

- A pipeline is drawn from M.R pipe (feed pipe) for pneumatic suspension.
- One isolating cock, one non return valve, one 150 lit air reservoir (auxiliary reservoir) one air filter and two separate isolating cocks to isolate each bogie have been provided.

बेस प्लेट / Base plate:

- Base plate shall be as per drawing No. RDSO CG-K5057 alt 'b'.

1.3.4 ट्रेक्शन सेन्टर /Traction center



The traction center (see Fig. 1-5) transmits traction and braking forces between bogie frame and body by a traction lever (3), on the bolster beam pin (10), and two rods (2). The traction lever is connected to the bolster beam by means of a rubber bush (4), two plates (5, 6) and screws, while rods are connected to the bogie frame and to the traction lever by elastic joints (7) and screws.

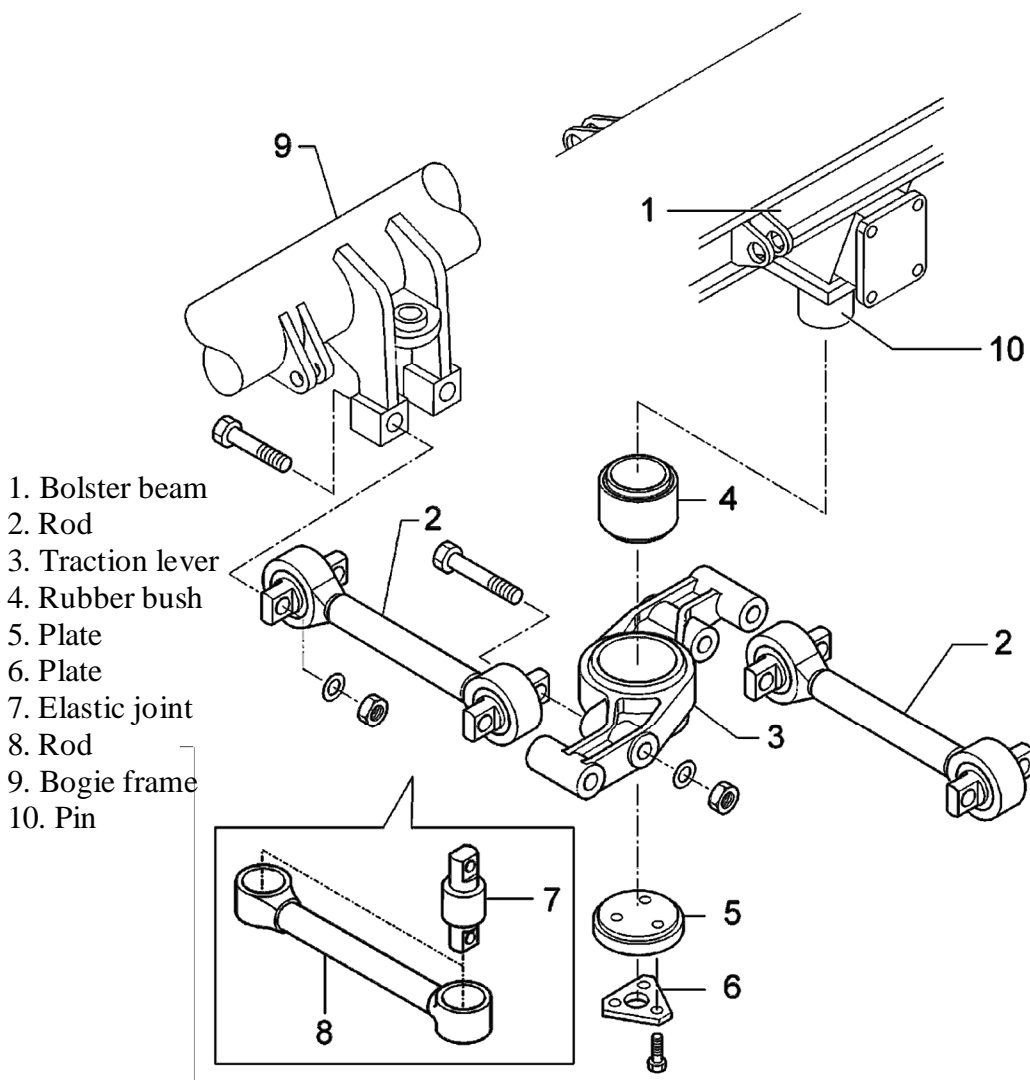
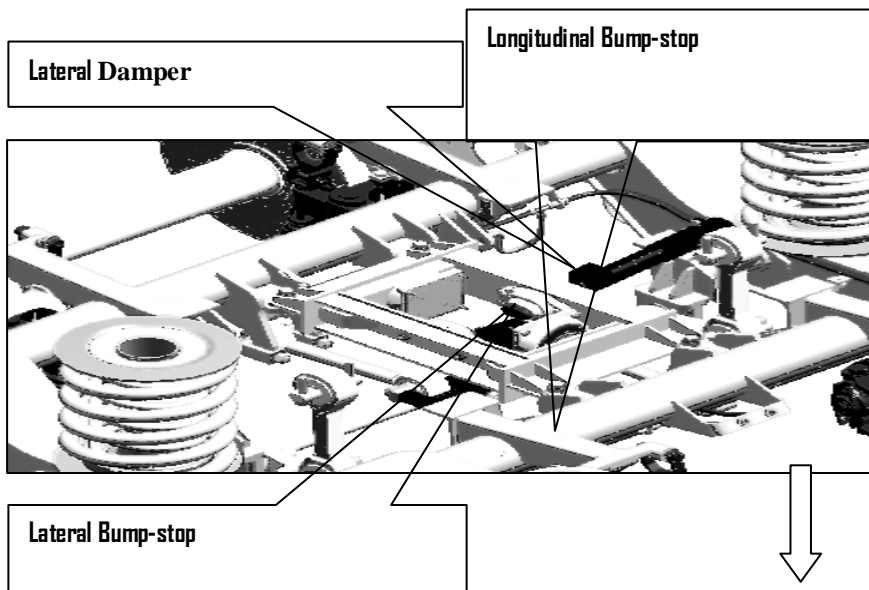
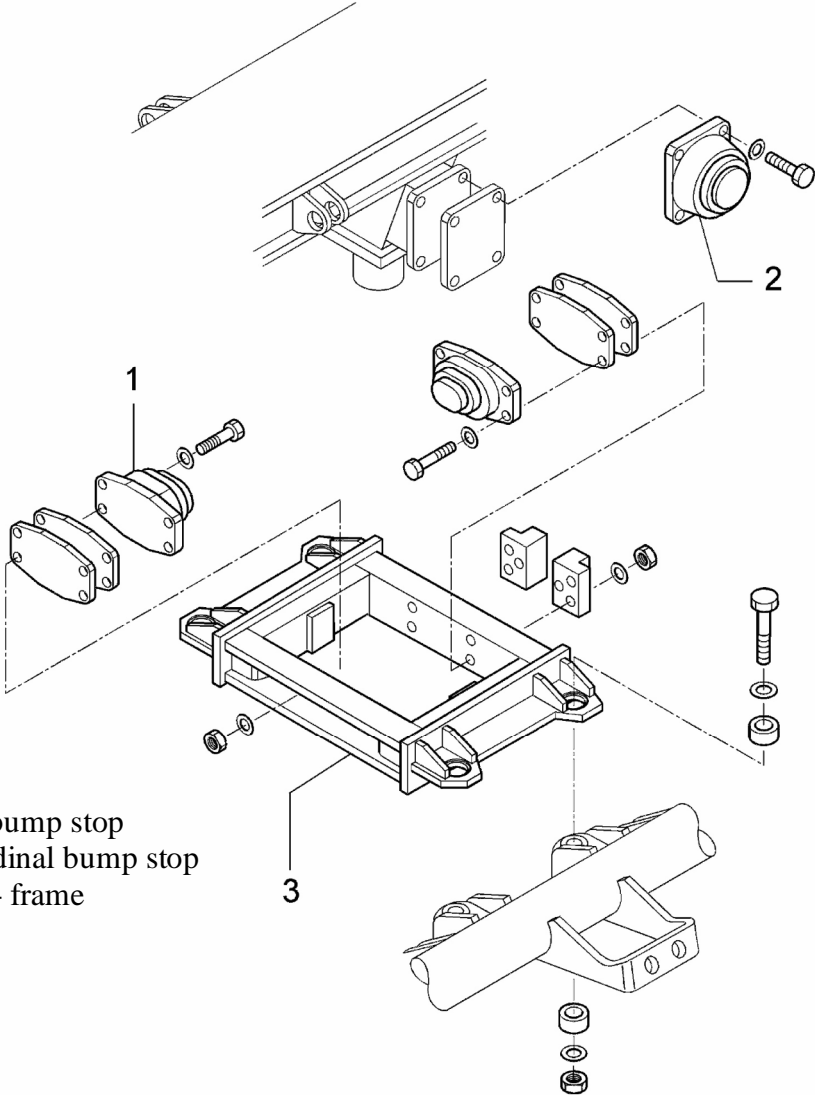


Fig. 1.5 Traction Centre

1.3.5 ऑक्जीलरी अवयव /Auxiliary Components



The bogie is completed by a device for limiting the longitudinal and lateral displacements of the bolster beam, made by four bump stops (Fig. 1.6), two longitudinal (2) and two laterals (1).



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

The four of them are supported by a small frame (3) screwed to the bogie frame.

Fig. 1.6 Longitudinal and Lateral Bump Stops

At the two outer corners of the frame it is also mounted a roll (1-Fig. 1.7) which prevents excessive rotation of the bogie when under the coach body. The roll (1) is fixed by a pin (2), a washer (3) and a safety split pin (4)

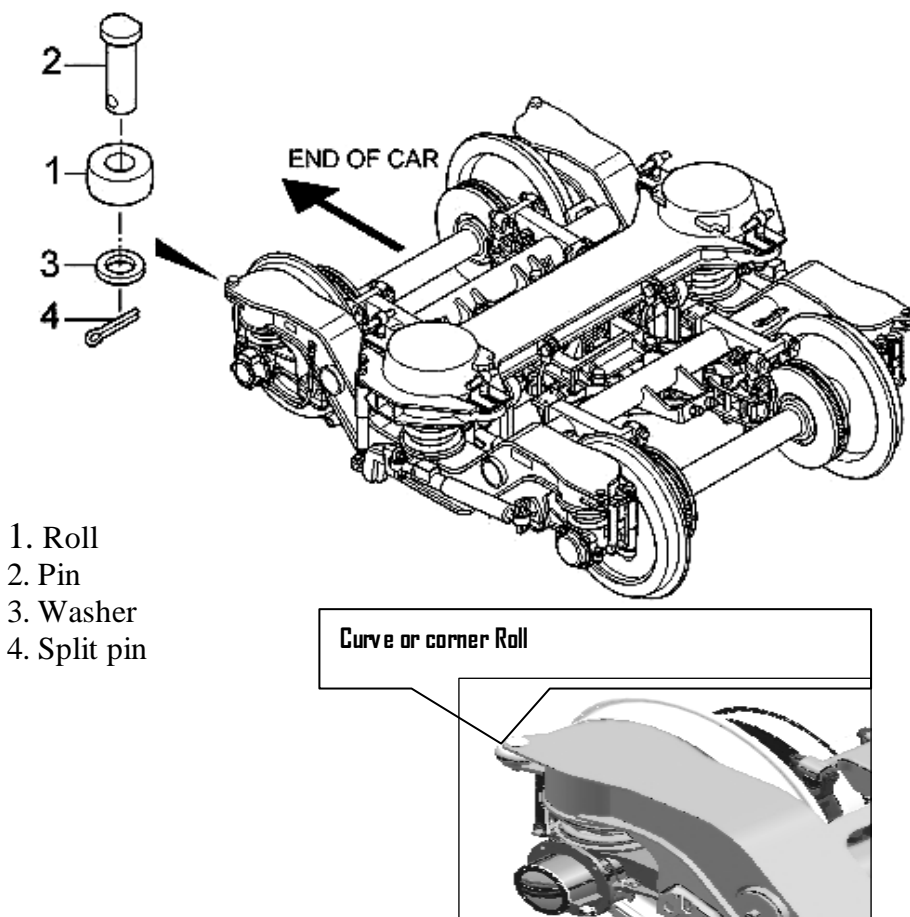


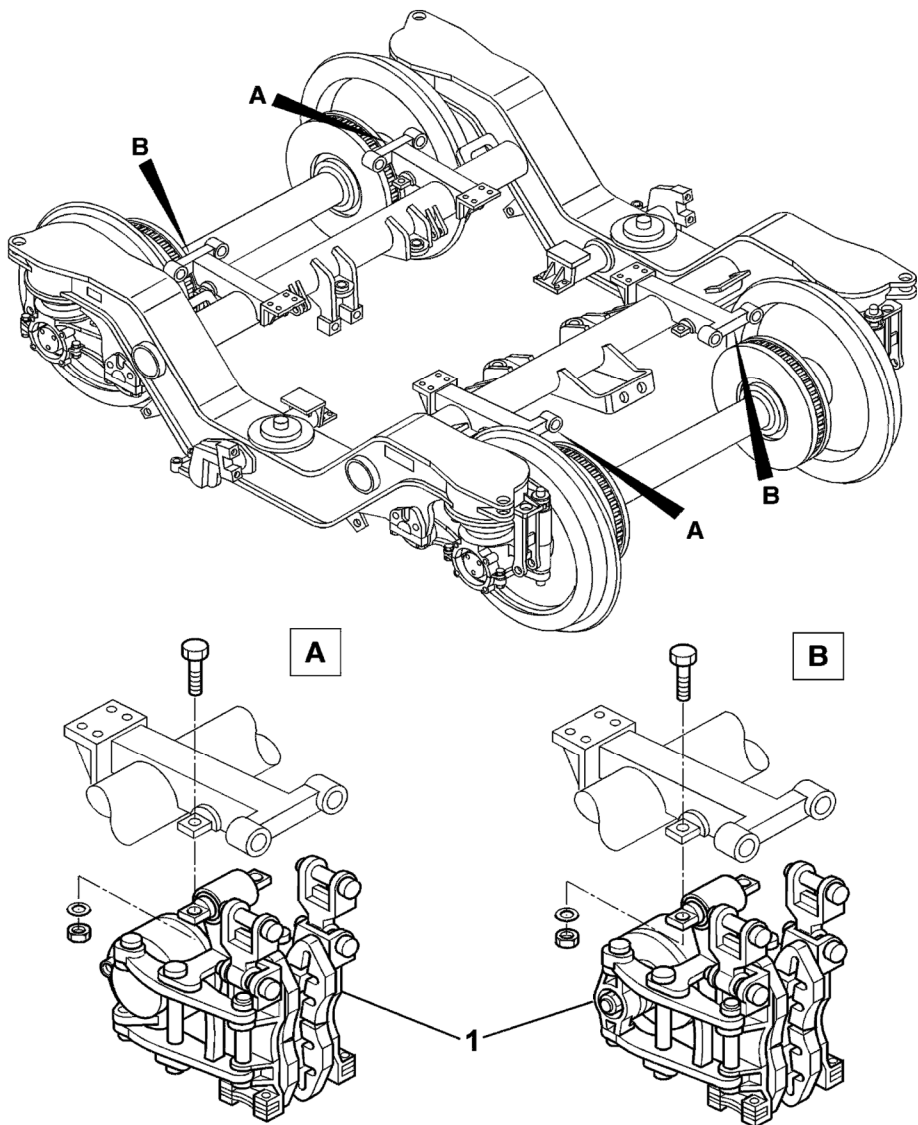
Fig. 1.7 Corner Rolls

1.3.6 इन्स्टॉल्ड ब्रेकिंग पद्धति / Installed Braking Systems

The pneumatic braking systems acting on the bogie are as follows:

- Pneumatic disk braking only (see Fig. 1.8), covering the whole speed range and acting on both axles for bogies 1267400 and 1267700.
- Pneumatic disk braking and hand-operated brakes acting on both axles for bogie 1267334.

Pneumatic braking is implemented by pneumatically operated brake cylinders fitted with an automatic device for taking up clearances. Air to spring brake cylinders is supplied through two compressed air pipes, one for the brakes of the first axle, and the other for the second axle. Brake cylinder action is transmitted, through two levers and a balancing arm, to a pair of pad holders, which perform braking on relevant disk.



1. Brake unit

Fig. 1.8 Braking System for Bogies 1267400 And 1267700

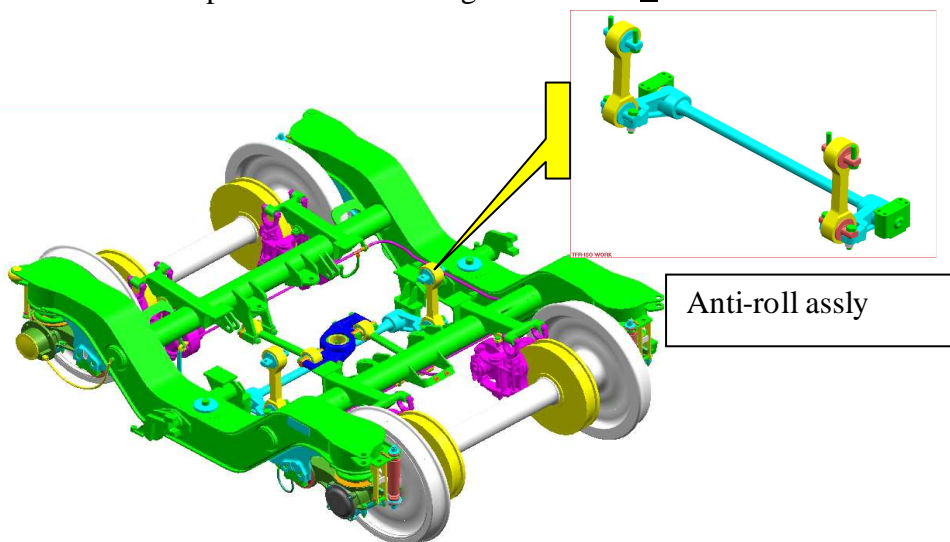
1.3.7 ब्रेक केलीपर यूनिट / Brake Calliper Units

- Axle mounted disc brake
- Inbuilt slack adjuster in brake cylinders
- 35 mm brake pads



1.3.8 एन्टी-रोल बार /Anti-Roll Bar

- A torsion bar with two forks- between bogie frame & bolster, connected by roll links.
- Resists rolling motion of coach.
- As per UIC 515-1 tilting co-efficient ≤ 0.4 .



1.3.9 ब्रेक डिस्कस / Brake Discs

On the bogie each axle (1) is fitted with two brake disks (4), diameter 640 mm and width 110 mm. Disks belong to the type with a low ventilation; friction lining in organic material operate on each disk, by means of proper links, by the relevant brake cylinder fitted with an automatic device for taking up clearances.

Note: Please refer to chapter on Air Brake system for more details

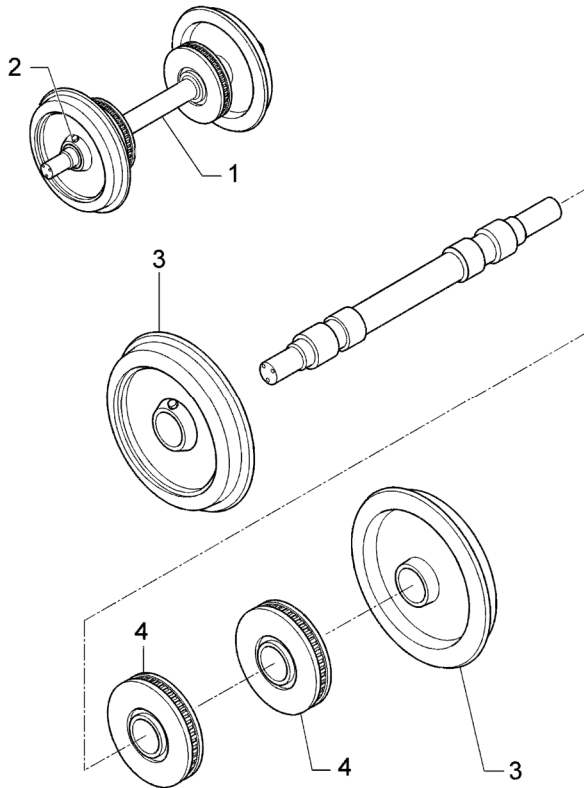


Fig 1.9 Bogie Axles

1.3.10 पहिए / Wheels

At axle ends are fitted wheels. Wheels are fitted with a side pipe, sealed by a plug, for letting in high pressure oil during wheel removal.

Part of Wheel Sat

1. Axle
 2. Plug
 3. Wheel
 4. Brake disk
- Two brake disks -diameter 640 mm and width 110 mm.
 - Two wheel discs of dia 915 (New), 845 (worn).

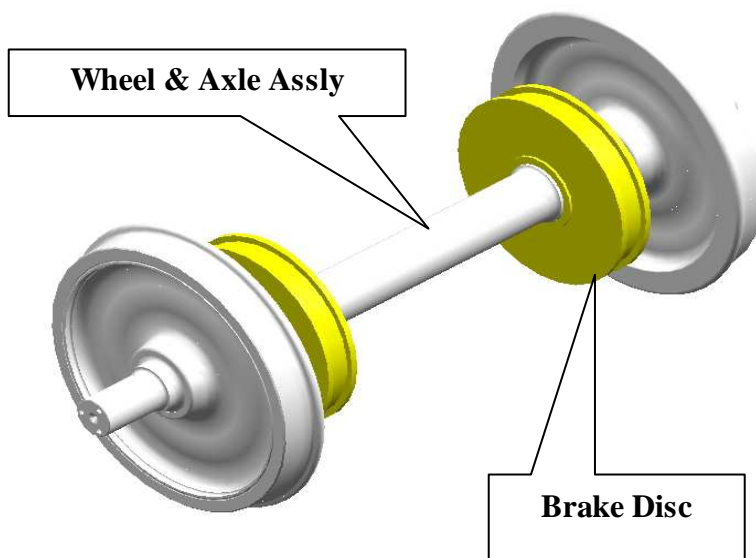
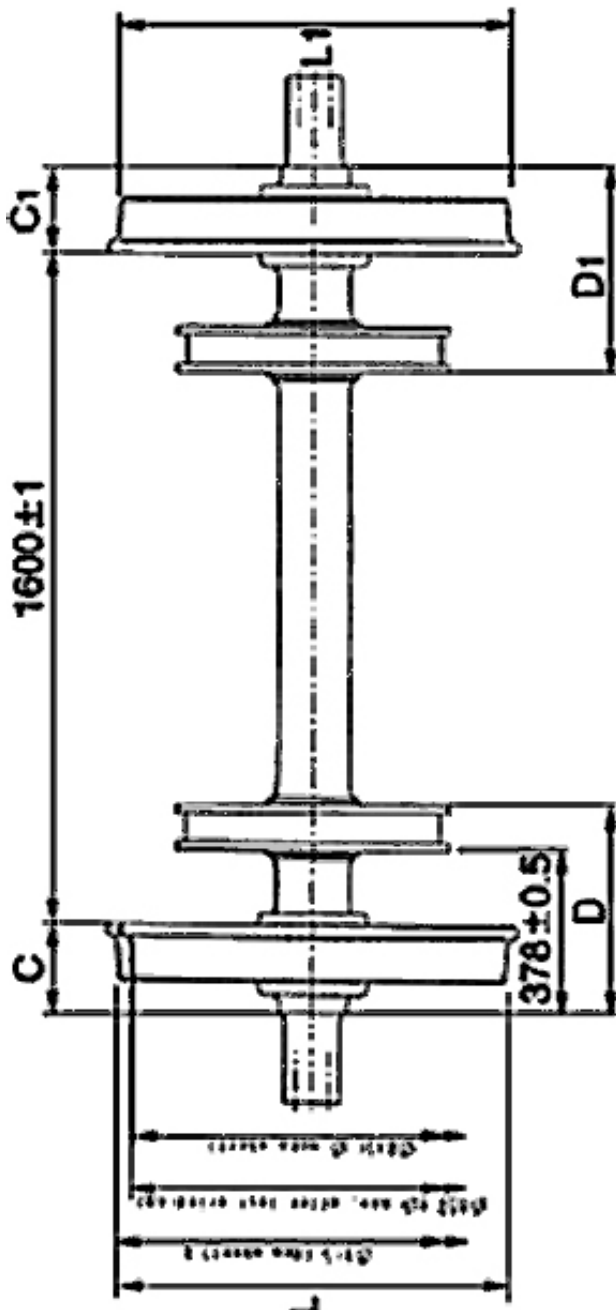


Fig 1.9 A Exploded View of Wheel & Axle Assembly



The following differencies must be respected:

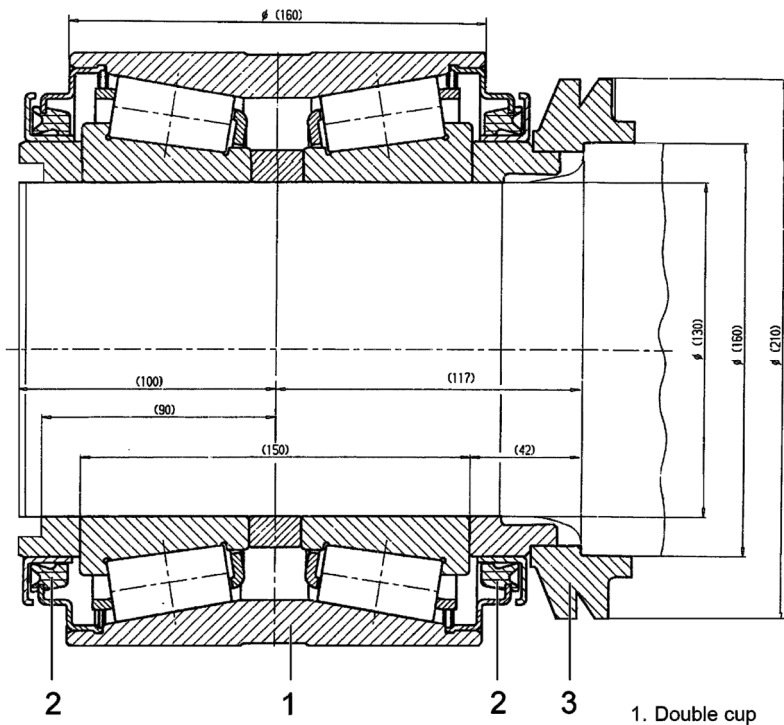
- $|L - L_1| \leq 0.5 \text{ mm}$
- $|C - C_1| \leq 0.5 \text{ mm}$
- $|D - D_1| \leq 0.5 \text{ mm}$

Dimensions of Wheel Set



1.3.11 एक्सल बियरिंग्स /Axle Bearings

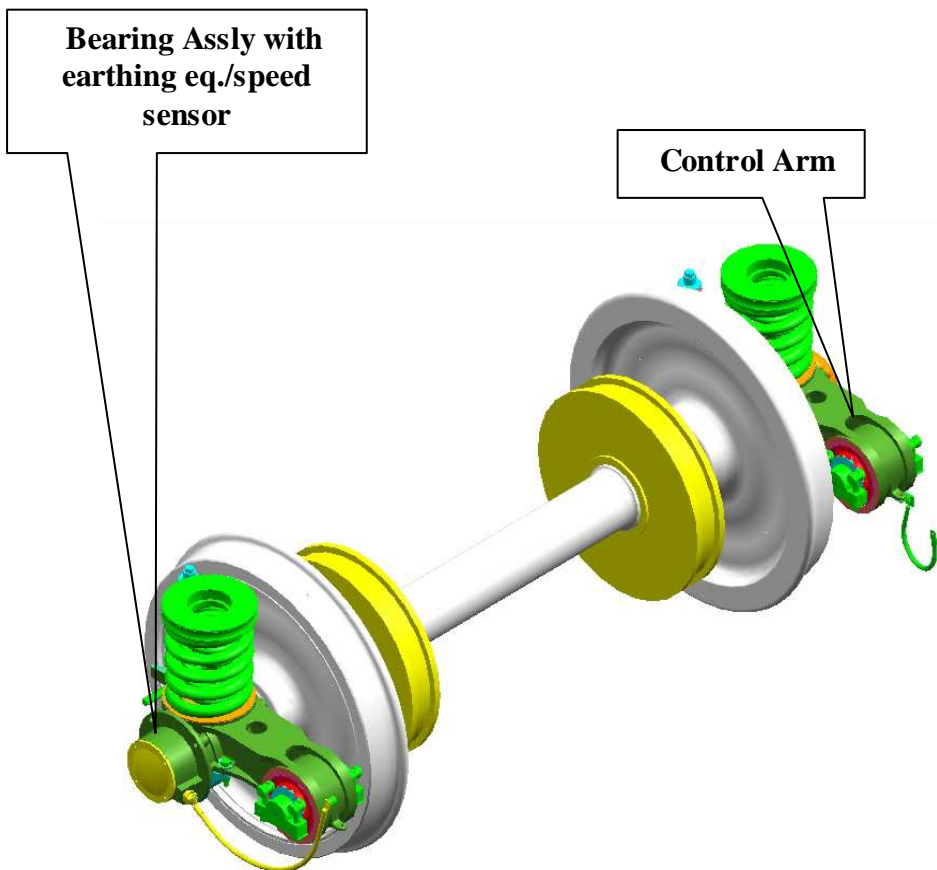
Axle bearings belong to the taper roller cartridge type bearing is used and it makes up a pre-assembled unit not requiring any further intervention, such as clearance adjustments. The axle bearings on the bogie are fitted with sensors for detecting speed (whose signal is elaborated by the ant slipping system) and a current return device.



1. Double cup
2. Sealing system
3. Backing ring

Fig. 1.10 Axle Bearing Longitudinal Section

The ends of the control arms are fitted with centering devices for the primary suspension spring assembly. The bearing-lubricating plug is fitted in the lower part.



Wheel set with Primary suspension

1.4 फोर्स ट्रान्समीशन के सिद्धान्त / Principles of force transmissions

Forces concerning the bogie are transmitted as follows.

Vertical forces: from the body to the bogie frame- through the secondary suspension springs; from the bogie frame to the axles- through the primary suspension springs and frame - axle bearing control arm.

Crosswise forces: from the body to the bogie frame- through the secondary suspension springs; from the bogie frame to the axles- through the elastic elements of the frame – axle bearing control arm.

Longitudinal traction efforts and braking powers: from the body to bogie frame- through the traction center rods and the traction lever; from the bogie frame to the axles through the frame - axle bearing control arm.

2.0 कोच बॉडी का उठाना / LIFTING THE BODY

WARNING: Before lifting the coach body or the complete coach, check the primary lift pins and the secondary security cables and pins.

2.1 बोगी के विच्छेद क्रम / Bogie disconnection sequence

In order to disconnect the bogie from the coach body, follow this sequence:

- Disconnect the pneumatic connections of the brakes. Disconnect the cables of the hand brake (just for bogie 1267334)
- Disconnect the electric cables from the sensors mounted on the axle bearings
- Disconnect the ground cable between coach body and bogie frame.
- Disconnect the yaw dampers from the coach body.
- Disconnect the bolster beam from the coach bottom.
- Lift the coach body.
- Roll the bogie away

2.2 ब्रेक के न्यूमेटिक कनेक्शन्स का विच्छेद क्रम / Disconnection of the pneumatic connections of the brake

WARNING: *Be sure that no pressure is inside the pneumatic system : Discharge compressed air before proceeding*

After the pressure inside the system has dropped, disconnect the two pneumatic connections (1 and 2, Fig. 2.1), which supply compressed air from the coach body air generation equipment to the brake cylinders.

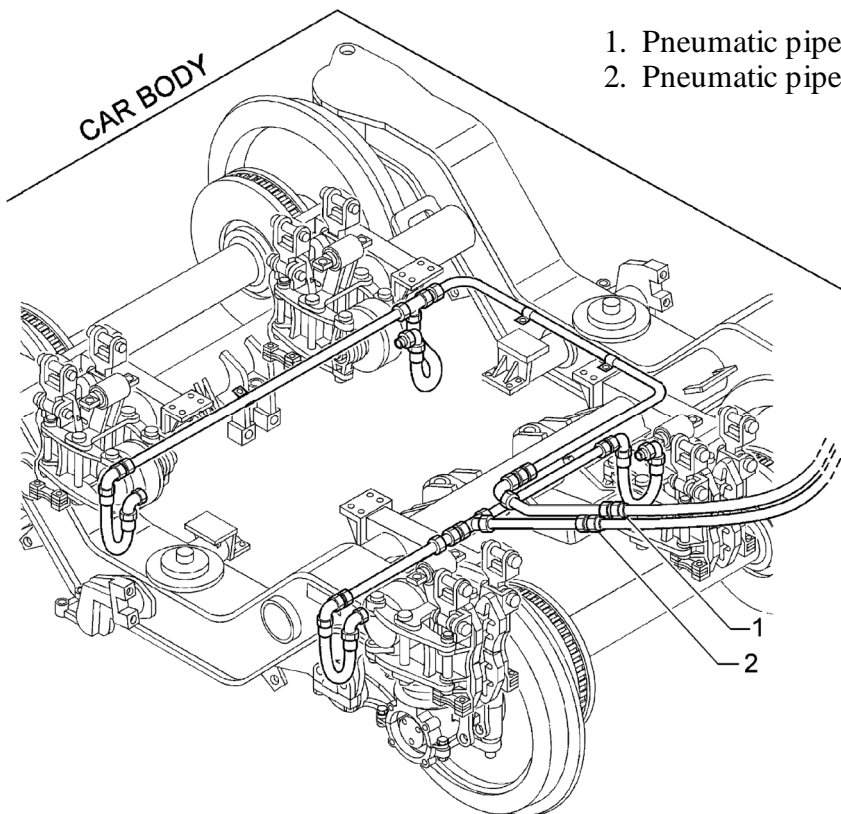


Fig. 2.1 Disconnect Pneumatic Feed Pipes

2.3 हस्त ब्रेक तारों का विच्छेद (जनरेटर कार /एस. एल. आर के लिए) Disconnection of the hand brake cables (For GEN. car/SLR Coaches)

When working on bogie of Generator car it is necessary to disconnect the hand brake cables (1-) Fig. 2.2 - after releasing the hand brakes: extract the split pin (3) and the pin (2), then un-tighten the nuts (4) and remove the cables (1) from the frame support.

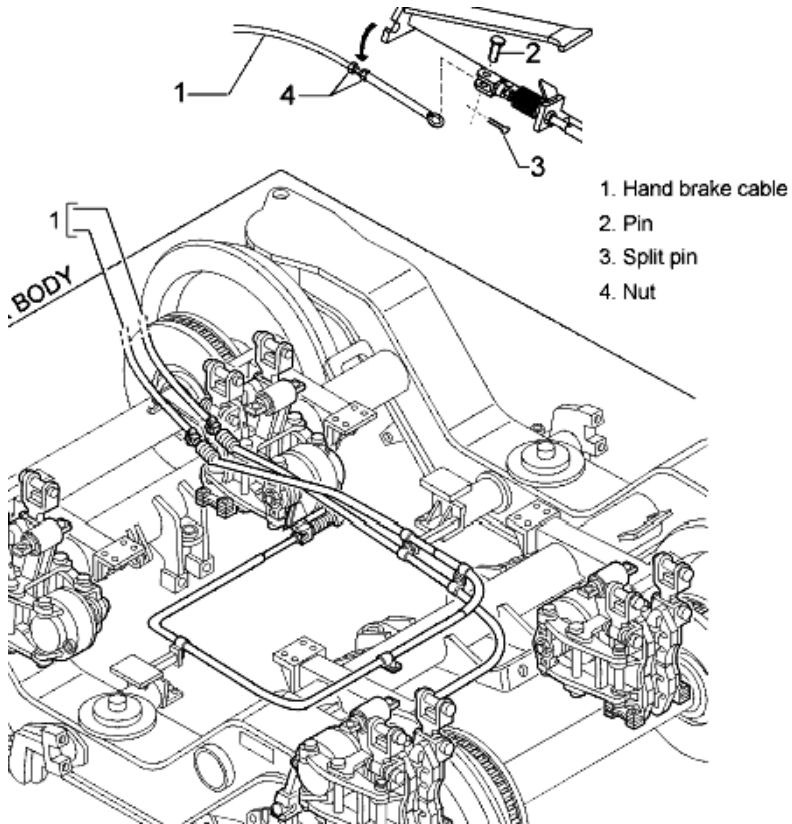


Fig.2.2 Disconnection of the hand brake cable

2.4 एक्सल बियरिंग्स सेन्सरस से सिग्नल एवं ग्राउन्ड केबलों का विच्छेद

Disconnect signal and ground cables from the axle bearings sensors

Disconnect the cables (1, 2 - Fig. 2-3) which link the sensors on the axle-bearings to the car body equipment, and the ground cable (3) between the car body and the frame.

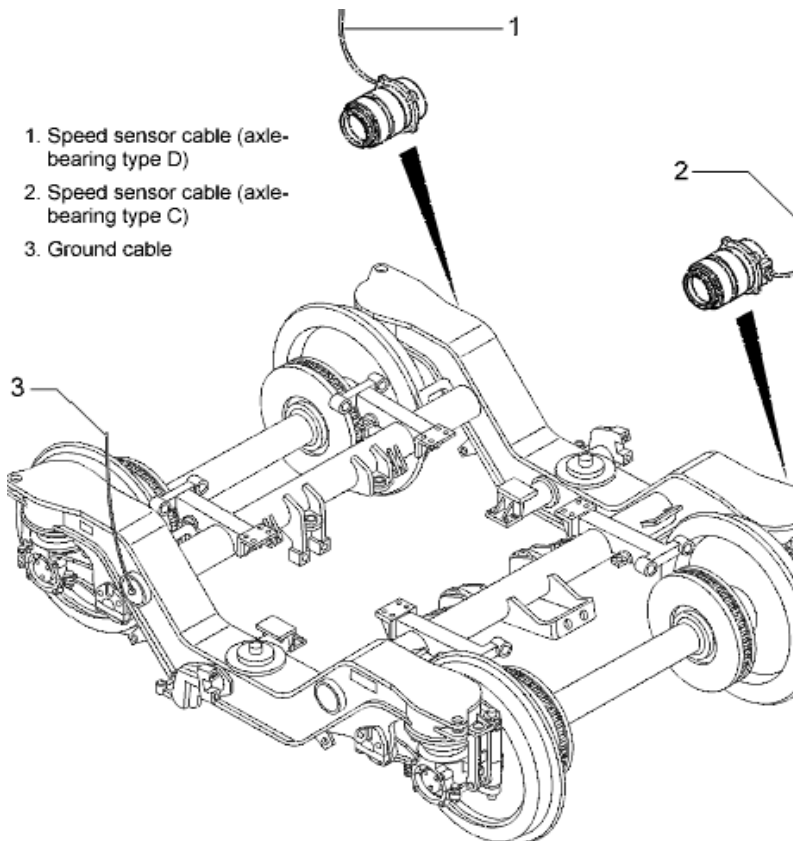
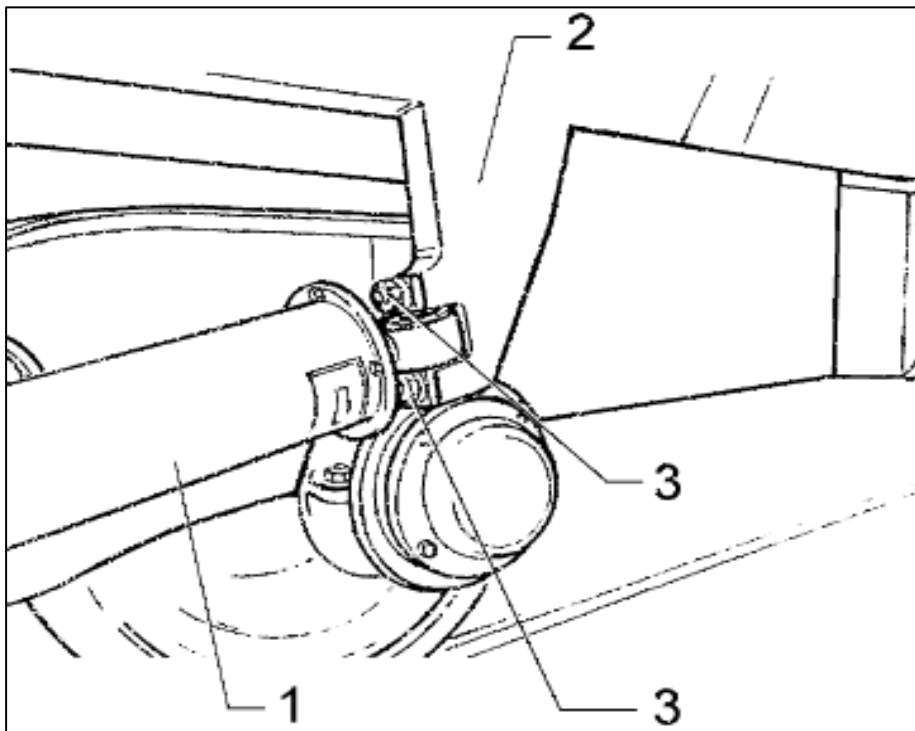


Fig. 2.3 Disconnection of the Sensor Cable

2.5 या डैम्परस का विच्छेद / Disconnection of the Yaw Dampers

Disconnect the yaw damper (1 - Fig. 2-4) connected to the car body support (2) extracting the fixing screws (3).



1. Yaw damper,
2. Car body support,
3. Screw

Fig. 2.4 Disconnection of the Yaw damper

2.6 कार बॉडी से बोल्स्टर बीम का विच्छेद / Disconnection of the bolster beam from the car body

Unscrew the locknut (5 - Fig. 2-5) and the nut linking body and bogie (6). The bogie is disconnected from the car body. When the car body is lifted, check that washers (4) and shims (3) remain on the bolster beam. Items (1), (2) and (3) remain attached to the car body: in order to remove them, extract the split pins (7), remove the pin (2) and finally the threaded pin (1).

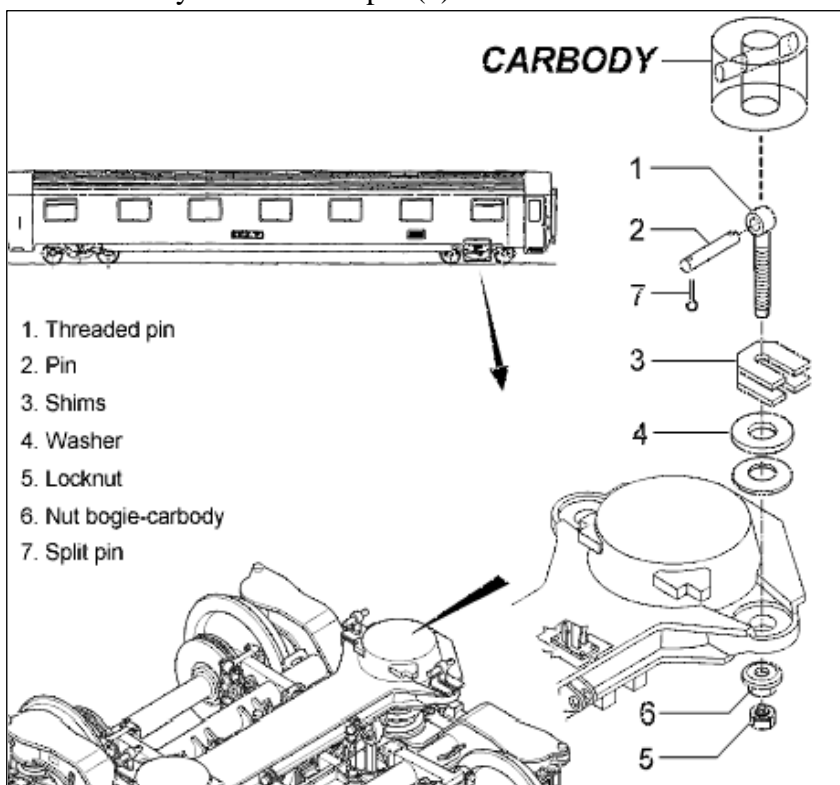


Fig. 2.5 Disconnection of The Bolster Beam

2.7 कोच बॉडी का उठाना / Lifting the car body

After performing the operations described in the previous paragraphs of this chapter, it is possible to remove the bogies from under the car body.

Proceed as follows:

- A. Put four hydraulic lifters (1 - Fig. 2.6) under the sides of the car body (please refer to the car body Maintenance Manual for the exact location of lifting points).
- B. Operate the lifters and lift the car body until the bogie bolster beams disengage the car under frame.
- C. Roll the bogies away

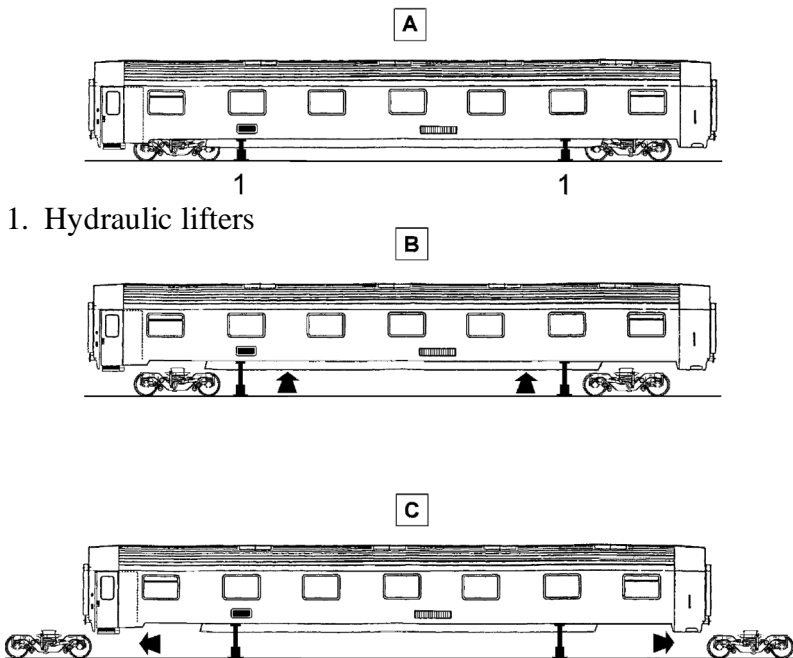
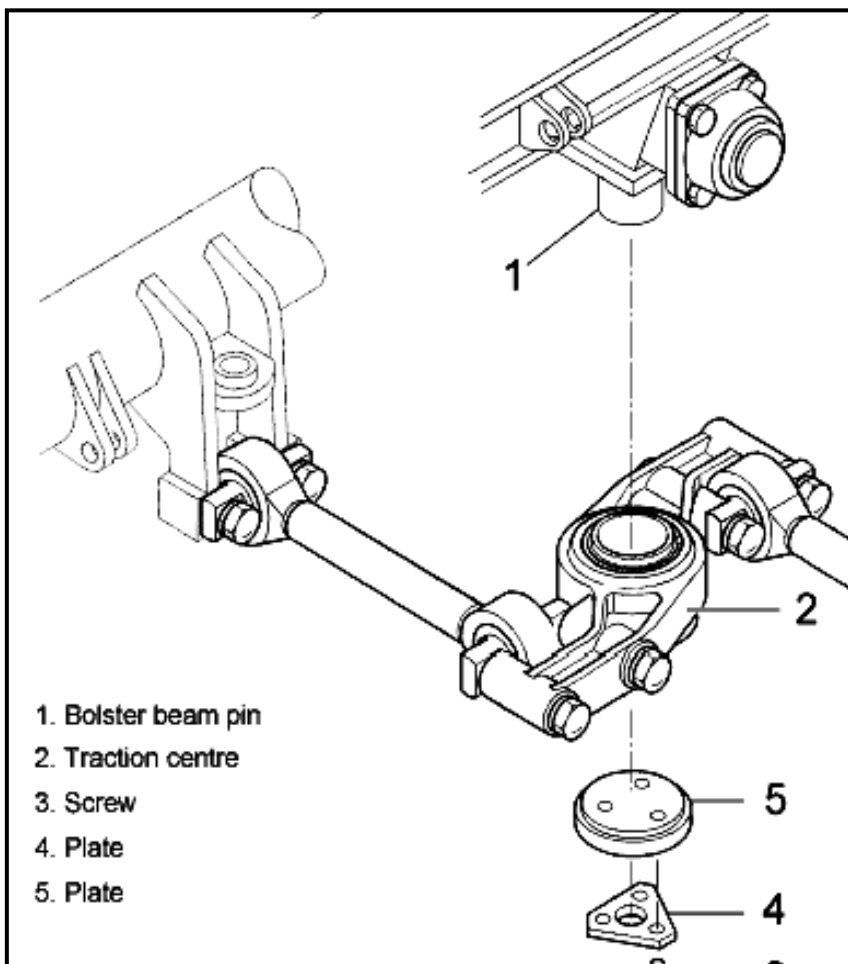


Fig. 2.6 Removing the Bogie from Under the Car Body



After disconnection, verify that the traction center (2) complete with its rubber bush is free against the bolster beam pin (1).

3.0 बोगी डिस-असेम्बली /BOGIE DISASSEMBLY

After having disconnected the bogie from the body, clean it accurately, taking into account the following advice:

- a. Do not wash with atomized fuel oil.
- b. Before washing with chemical detergents, make sure that they do not damage rubber parts (do not use hydrocarbons);
- c. During washing, liquid temperature must be kept below 80 °C.
- d. Avoid water jets directed onto axle, bearing cartridge labyrinth rings and into electrical and pneumatic connections.

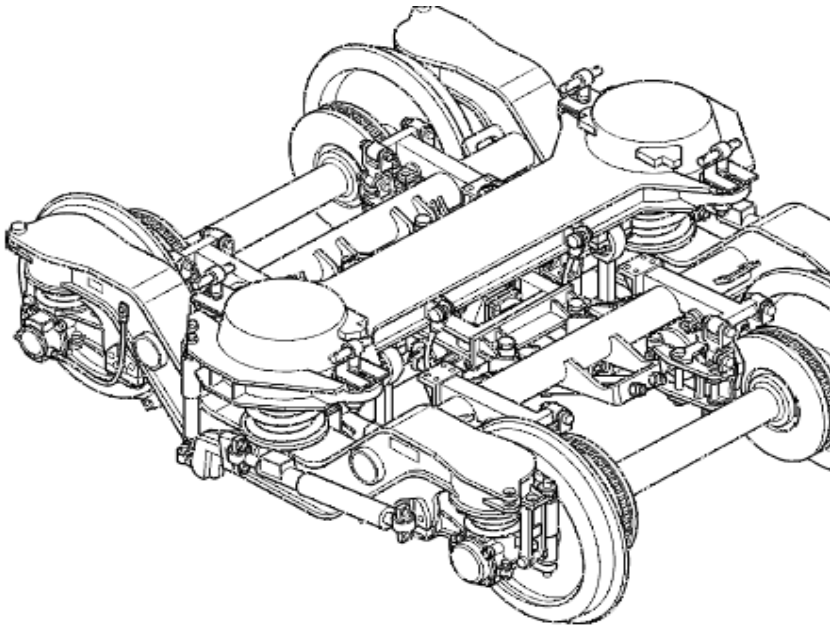


Fig. 3.1 Bogie Disconnected from the Car Body

3.1 सेकेन्ड्री सस्पेंशन डिसमाउन्टिंग / Secondary suspension dismounting

In order to completely remove the secondary suspension from the bogie it is necessary to perform the operations described in the following paragraphs.

3.1.1 ऊर्ध्वकार एवं लेटरल डैम्पर्स को हटाना / Removal of Vertical and lateral dampers

Remove both vertical dampers (Fig. 3.2) extracting the screws (2), which fix the upper end to the bolster beam (3) and those (4) fixing the lower end to the bogie frame (5). In both cases recover the washers (6) and the nuts (7).

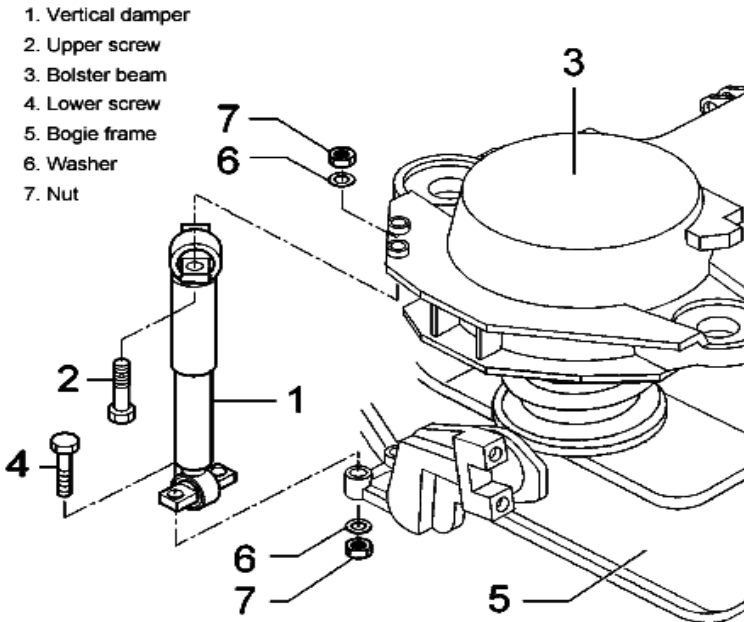


Fig. 3.2 Vertical Damper Removal

Remove the lateral damper (Fig. 3.3) extracting the screws (2), which fix one end to the bolster beam (3) and the other to the frame. Recover the washers (4) and the nuts (5).

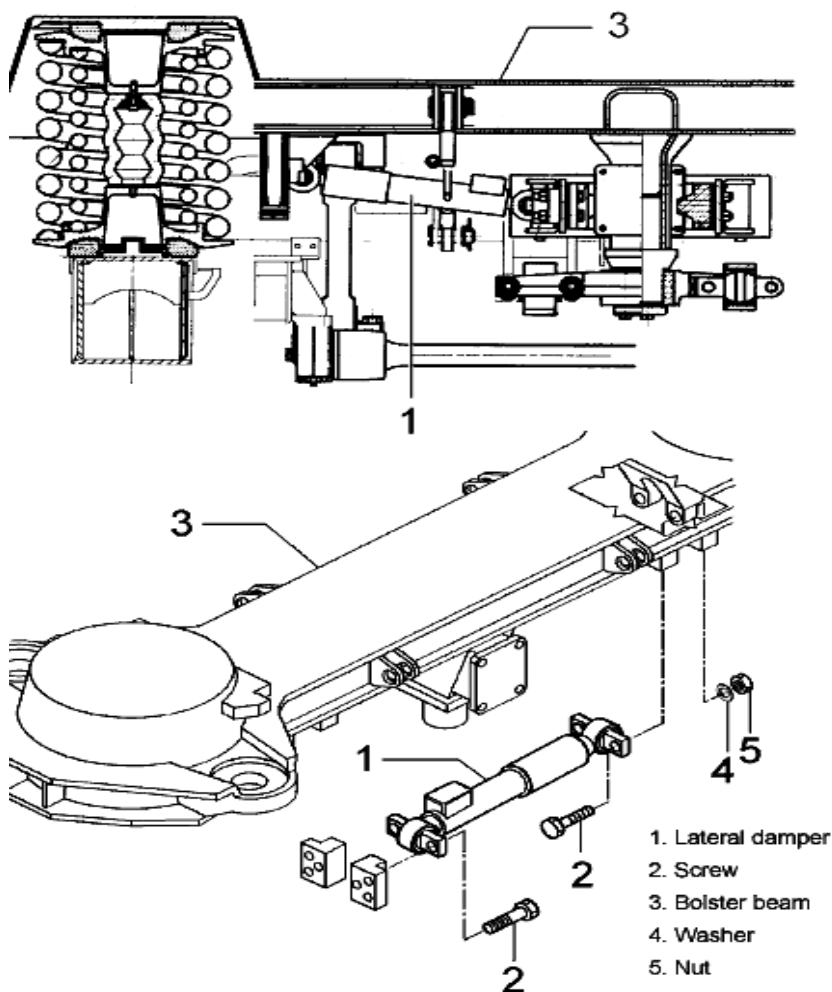


Fig. 3.3 Lateral Dampers Removal

3.1.2 बोलस्टर बीम को दबाना / Pressing the bolster beam

The separation of the bolster beam from the traction center (Para. 3.1.3), from the anti-roll bar (Para. 3.1.4) and the removal of the safety cables (Para. 3.1.5) requires the use of the press 2613037500 (Fig. 3.4). The press is secured to the brake support beam (3) through hooks (2). On its top the press has a small compressor, which operates two actuators. Before pressing the bolster beam, put a wooden cube block (100 mm side) under the actuators. Operate the compressor and press the bolster beam.

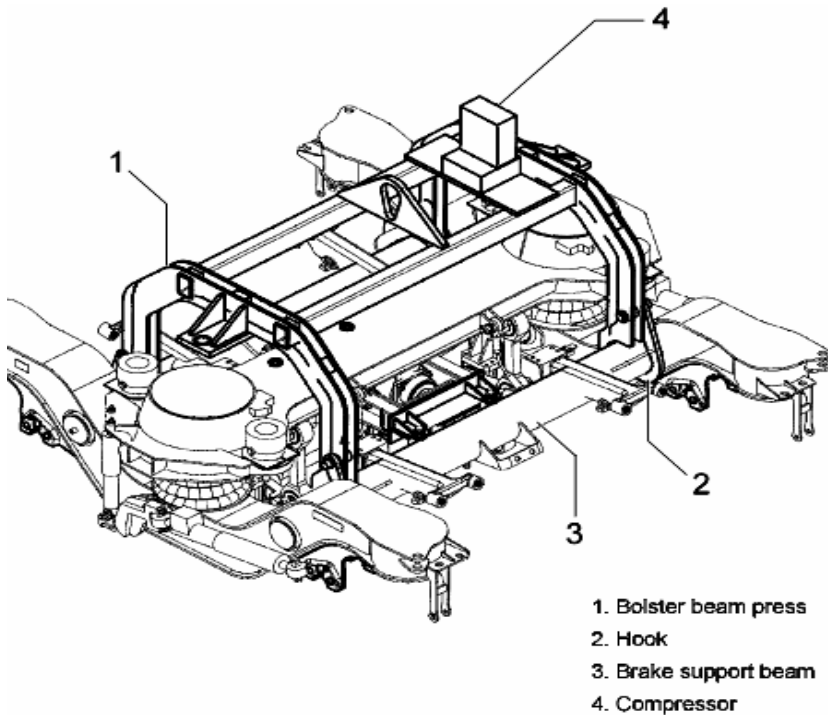


Fig. 3.4 Pressing the Bolster Beam

3.1.3 ट्रेक्शन सेन्टर से बोल्स्टर बीम का विच्छेद / Disconnecting bolster beam from traction center

After pressing the bolster beam, as described in Para. 3.1.2, disconnect the bolster beam central pin (Fig. 3.5) from the traction center (2) extract the screws (3) which fix the plates (4) and (5).

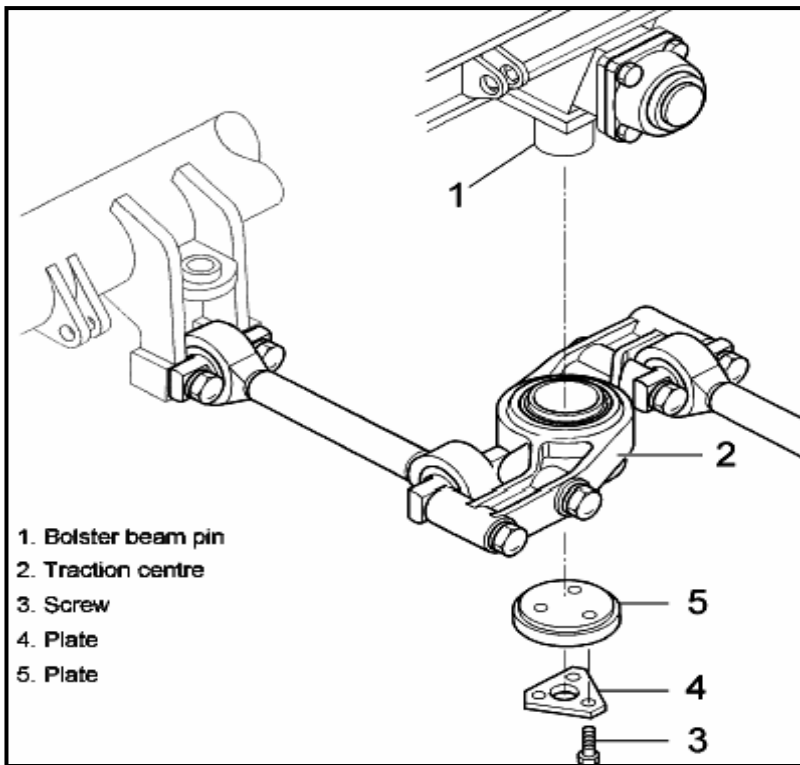


Fig. 3.5 Disconnection from Traction Center

After disconnection, verify that the traction center (2) complete with its rubber bush is free against the bolster beam pin (1).

3.1.4 एन्टी रोल बार को हटाना / Remove the anti-roll bar

The anti-roll bar (Fig. 3.6) must be disconnected both from the bolster beam (2) and from the frame supports (3) in order to allow removal. Extract the screws (4) which link the anti-roll bar links (5) to the bolster beam, then extract those (6) fixing the brackets (7) to the frame supports (3). It is then possible to remove the complete a

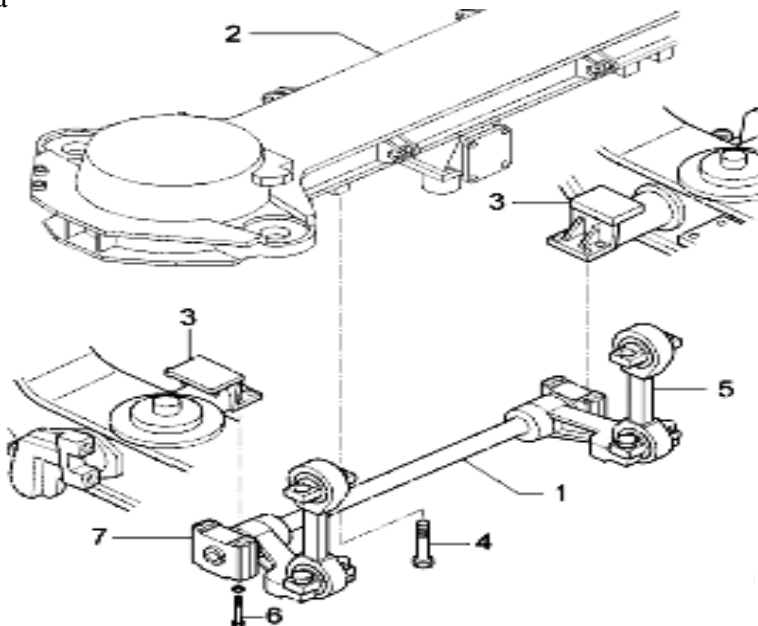


Fig. 3.6 Removal of the Anti-Roll Bar

1. Anti- roll bar, 2. Bolster beam, 3. Frame support, 4. Screw, 5. Anti-roll bar link, 6. Screw, 7 Bracket

3.1.5 सुरक्षा तारों को हटाना / Remove safety cables

In order to remove the four safety cables (Fig. 3.7) which link the bolster beam to the bogie frame, extract the split pins (2), extract the pins (3) from both ends and recover the washers (4).

1. Safety cable,
2. Split pin,
3. Pin. 4. Washer.

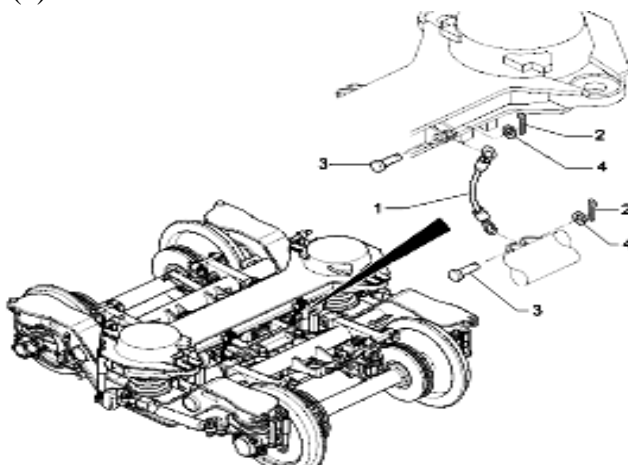


Fig-3.7 Removal of safety cables

3.1.6 बोलस्टर बीम को उठाना / Lifting the Bolster Beam

After performing the operations described in the previous paragraphs, it is possible to remove the bolster beam (Fig. 3-8) from the bogie by lifting it using proper crane equipment.

WARNING: Pay attention when lifting the bolster beam in order to avoid any injury to personnel. Any person not involved in the operation must stay away from the working area. Take care not to damage the bolster beam surface when operating. Pay attention that no upper disc or ring of the

secondary suspension remains attached to the bolster beam: it could be dangerous if they fall after lifting.

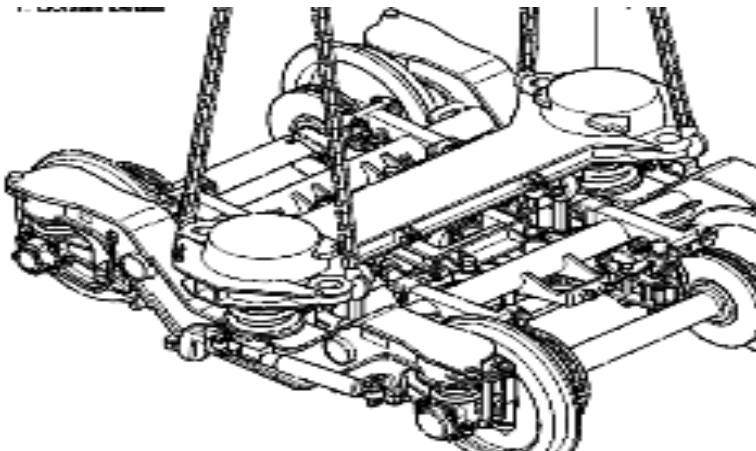


Fig-3.8 Bolster Beam

Before removing springs, take note of the following:

- Mark each couple of inner / outer spring.
- Take note of which bogie each couple is mounted on.

Link the crane equipment to the bolster beam and begin lifting it with care. The above procedure is needed to mount the springs again in the same position and location they were before removal. The spring packs (Fig. 3.9) of the secondary suspension can then be dismantled in the following manner: Remove the upper rubber ring (8). Remove the upper centering disc (1) together with the rubber spring (5), the washer (4) and the screw (2). Extracting the screw (2) it is possible to separate items (1), (2) and (5). Then it is possible to remove the inner spring (6), the outer spring (7). Extract the threaded pin (3) in order to remove the lower centering disc (1) and the lower

rubber ring (8). Then put the bolster beam on two supports. It is finally possible to remove the longitudinal bump stops (1) and the shims (5) from the bolster beam (2), extracting the screws (3) and the washers (4). Remove the shims (6) and the wear plate (8) under the bolster beam extracting the screws, nut and washers (7).

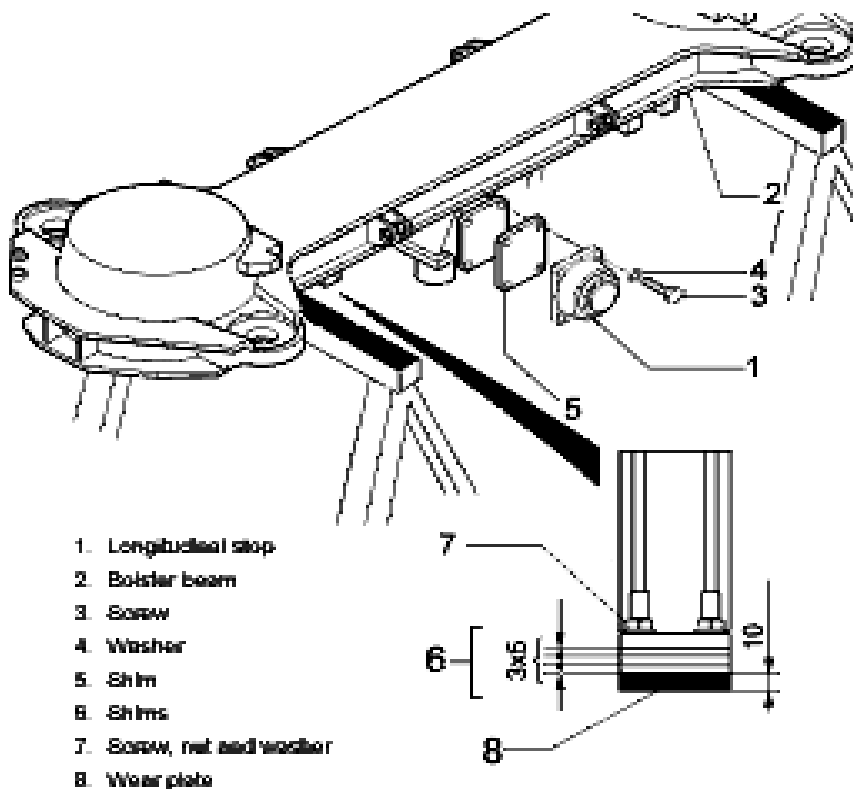


Fig. 3.9 Removing Bump Stops and Shims from the Bolster Beam

3.2 फ्रेम से डिस्असेम्बलीज का बिच्छेदन / Dismounting assemblies from the frame

On the bogie frame without the bolster beam, it is possible to operate the removal of its main assemblies.

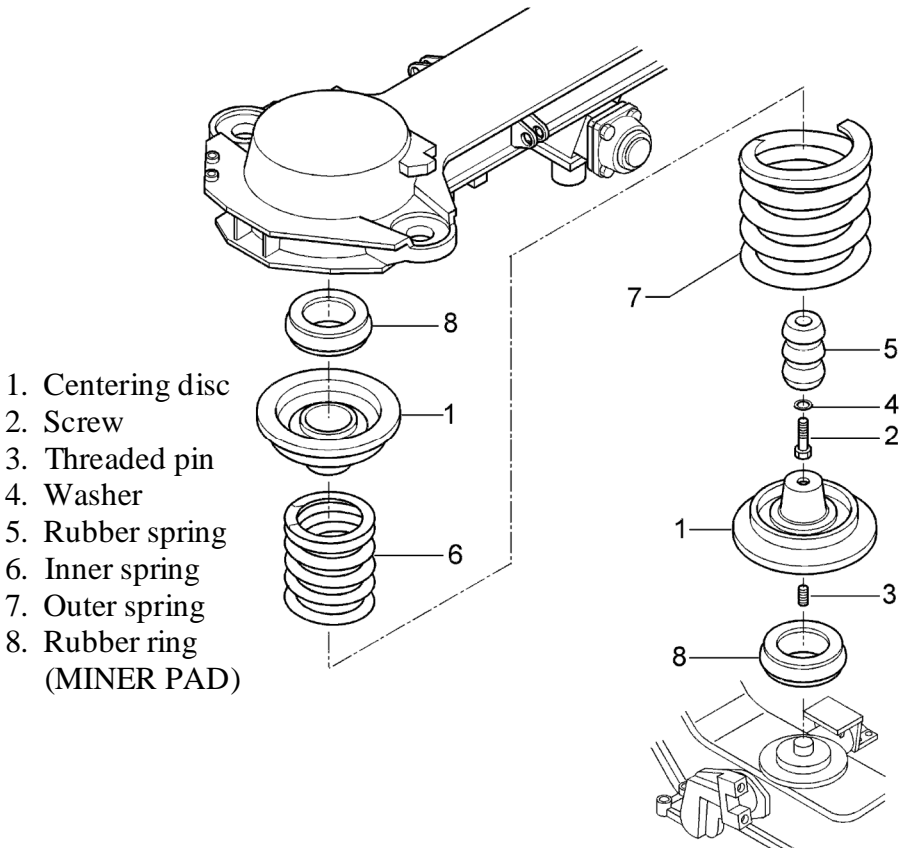


Fig. 3.10 Spring Pack Dismounting.

3.2.1 या डैम्पर्स को हटाना / Removal of Yaw Dampers

In order to remove the yaw dampers (Fig. 3.11), extract the screws (2), the washers (3) and the nuts (4), which fix their ends to the bogie frame side supports (5).

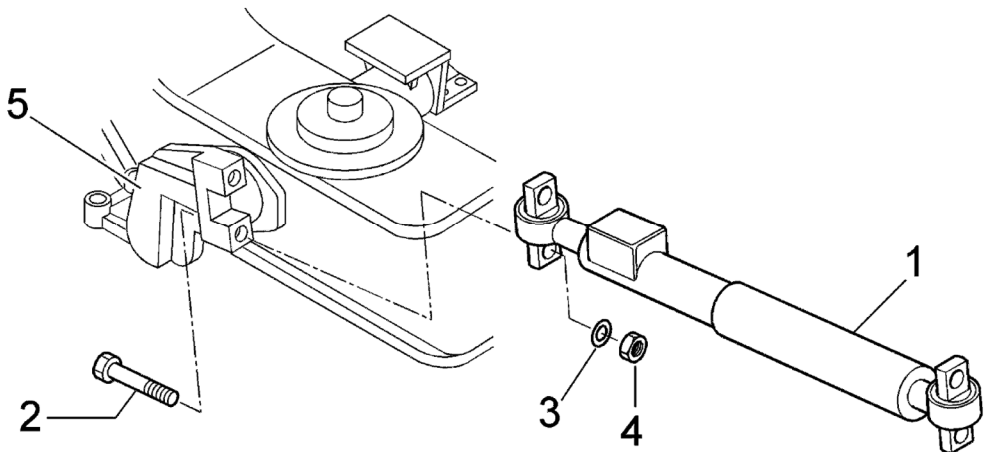
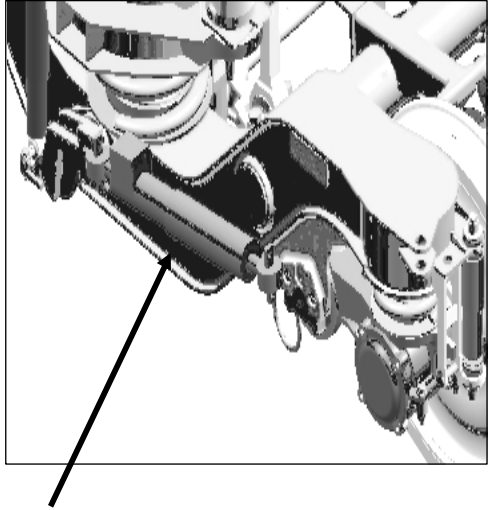


Fig. 3.11 Removing a Yaw Damper

3.2.2 लेटरल बम्प स्टॉप को हटाना / Removal of lateral bump stops

Remove the lateral bump stops (Fig. 3.12) from the small frame (2) extracting the screws (3), the washers (4) and the nuts (5). When dismantling them, the support (6) for the lateral damper can also be removed.

Then proceed with dismantling the small frame (2) from the bogie frame (7), extracting the screws (8), the washers (9), the discs (10) and the nuts (11).

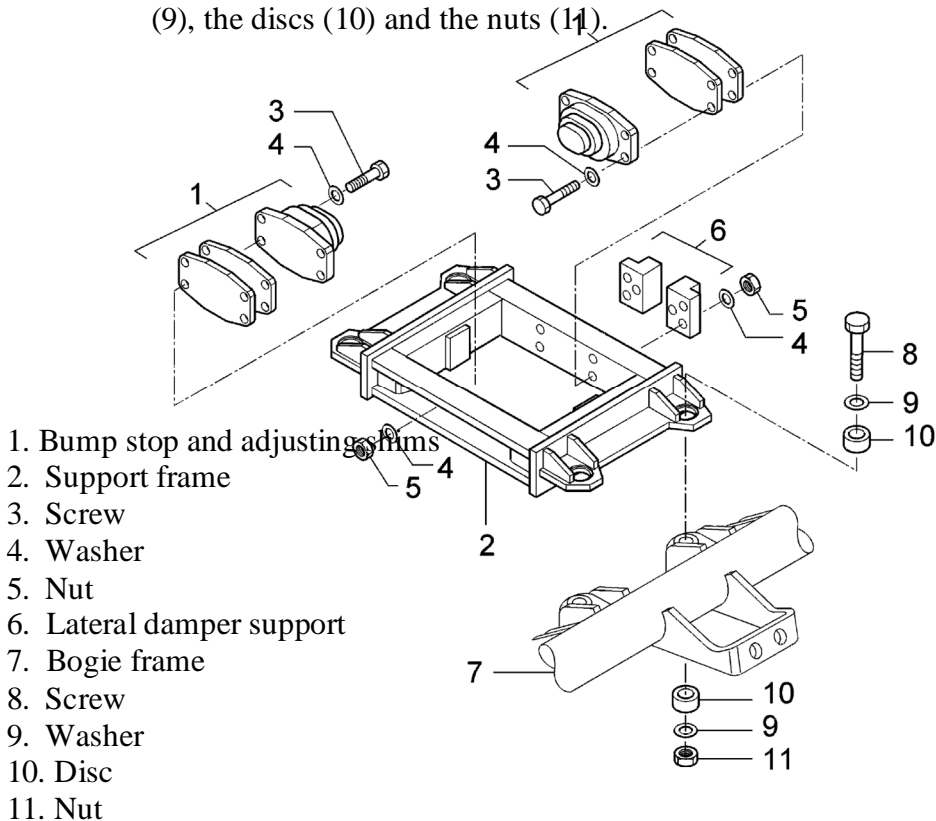


Fig.3.12 Removing Bump Stops from the Bogie Frame

3.2.3 ट्रेक्शन सेन्टर का विच्छेद / Dismounting the traction center

In order to dismount the traction center (Fig. 3.13), disconnect the rods (1) from the bogie frame (2), extracting the screws (3), the washers (4) and the nuts (5). Then separate the rods (1) from the traction lever (6) extracting the screws (7), the washers (8) and the nuts (9). Then extract the bush (10) from the traction lever (6) using a press.

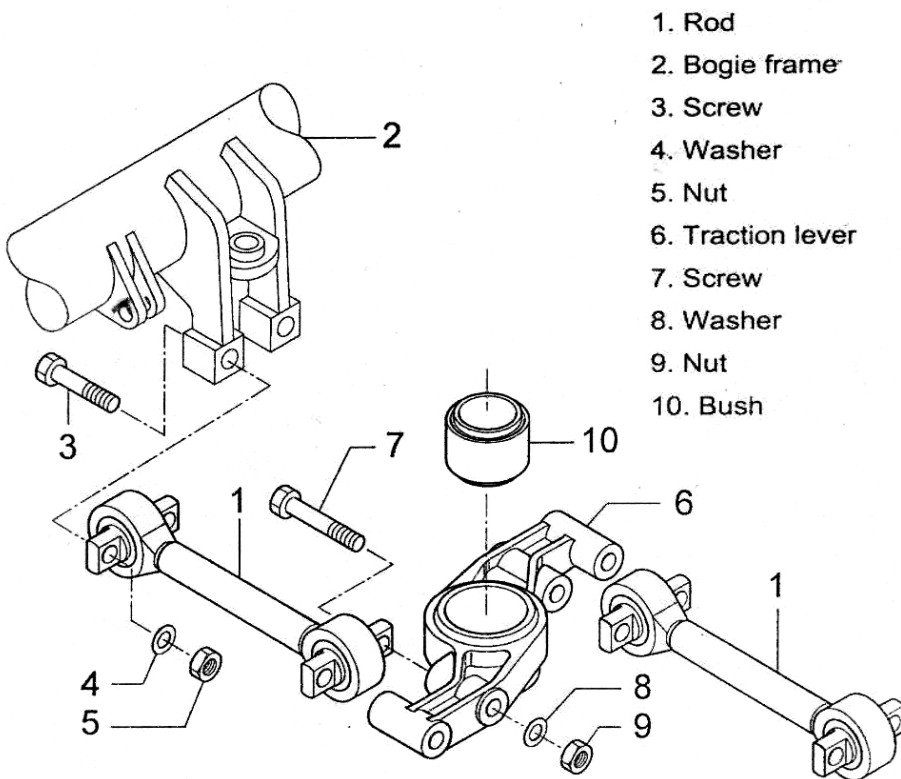


Fig. 3.13 Dismounting the Traction Center

3.2.4 कॉर्नर रोलस का विच्छेदन / Dismounting Corner Rolls

Remove the two rolls (Fig. 3.14) at the outer corners of the bogie frame: extract the split pin (4) and remove the washer (3) and the pin (2).

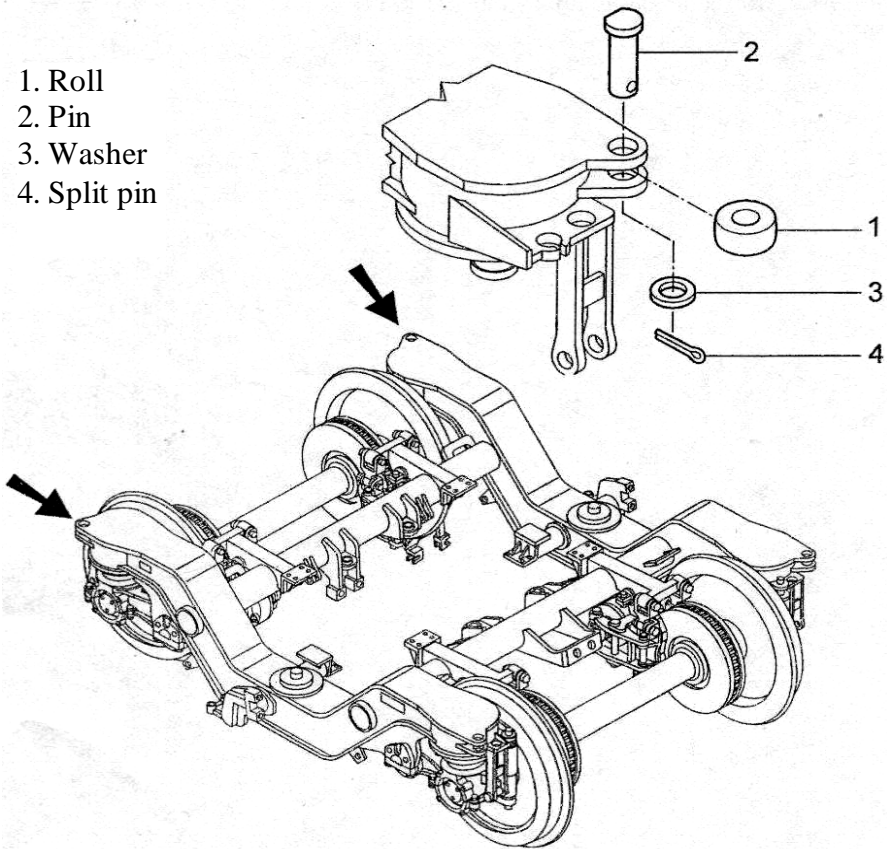


Fig. 3.14 Dismounting Corner Rolls

3.2.5 न्यूमेटिक यंत्र का बिच्छेदन / Dismounting the pneumatic equipment

The pneumatic equipment (see Fig. 3.15) of the brakes can be dismounted into its simple components and completely removed from the bogie.

Warning: Before proceeding be sure that no pneumatic feed is connected to the system and that no pressure is inside.

The complete equipment is made of several pipes (1) and hoses (8) connected together by various types of records (2). The pipes are kept into position on the bogie frame (3) by means of brackets (4) fixed to the frame by screws (5), washers (6) and nuts (7).

1. Pipe
2. Raccord
3. Bogie frame
4. Bracket
5. Screw
6. Washer
7. Nut

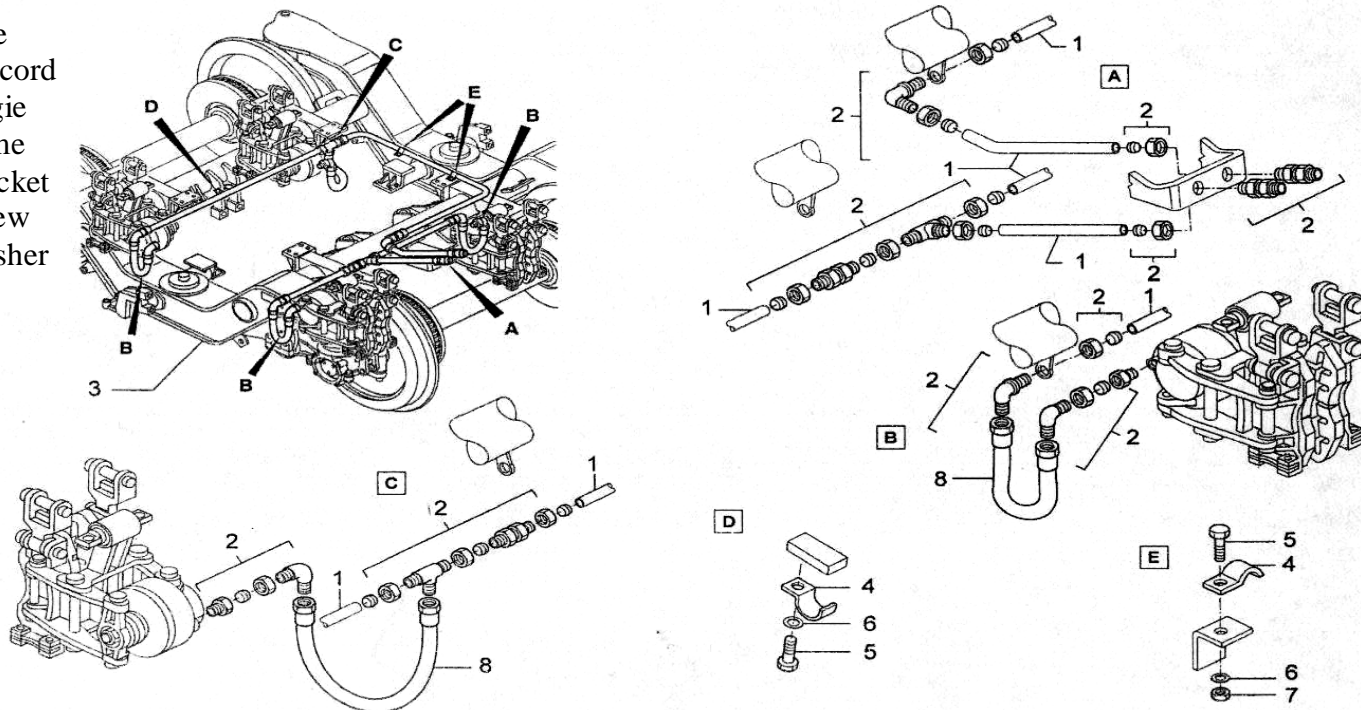


Fig. 3.15 Pneumatic Equipment Removal

3.2.6 बोगी से व्हील सेटों को अलग करना / Separation of the wheel sets from the bogie

The first step for operating the separation of the wheel sets from the bogie frame is the removal of the four vertical dampers (Fig. 3.16) of the primary suspensions. In order to do so, loosen the nuts (2) and (3) at both damper ends and remove it.

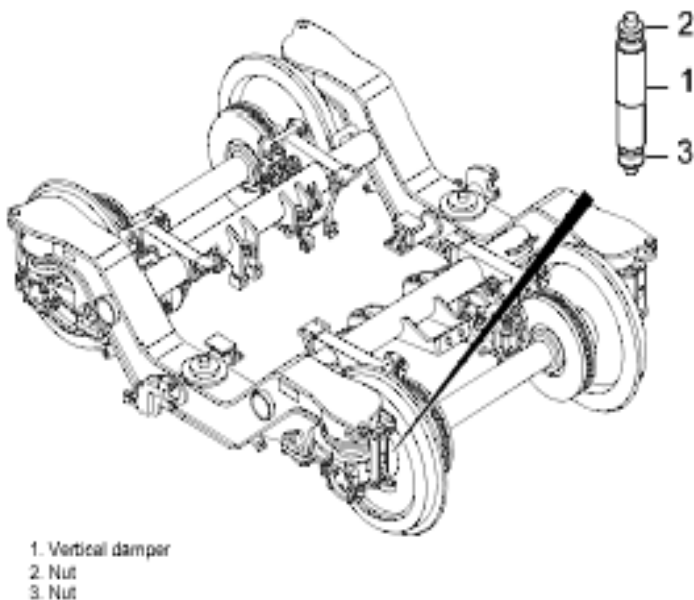
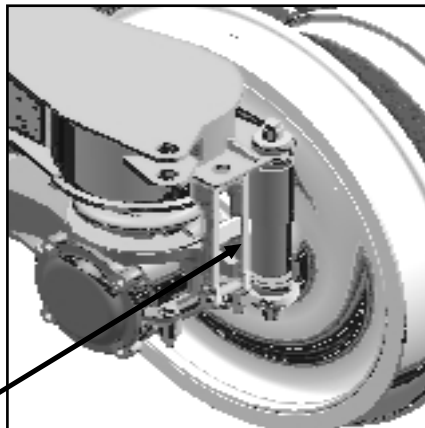


Fig. 3.16 Removal of Vertical Damper

Then proceed with removal of the lower part (Fig. 3.17) of the control arms (2), extracting the screws (3), the washers (4) and the nuts (5). Proceed with all the four control arms.

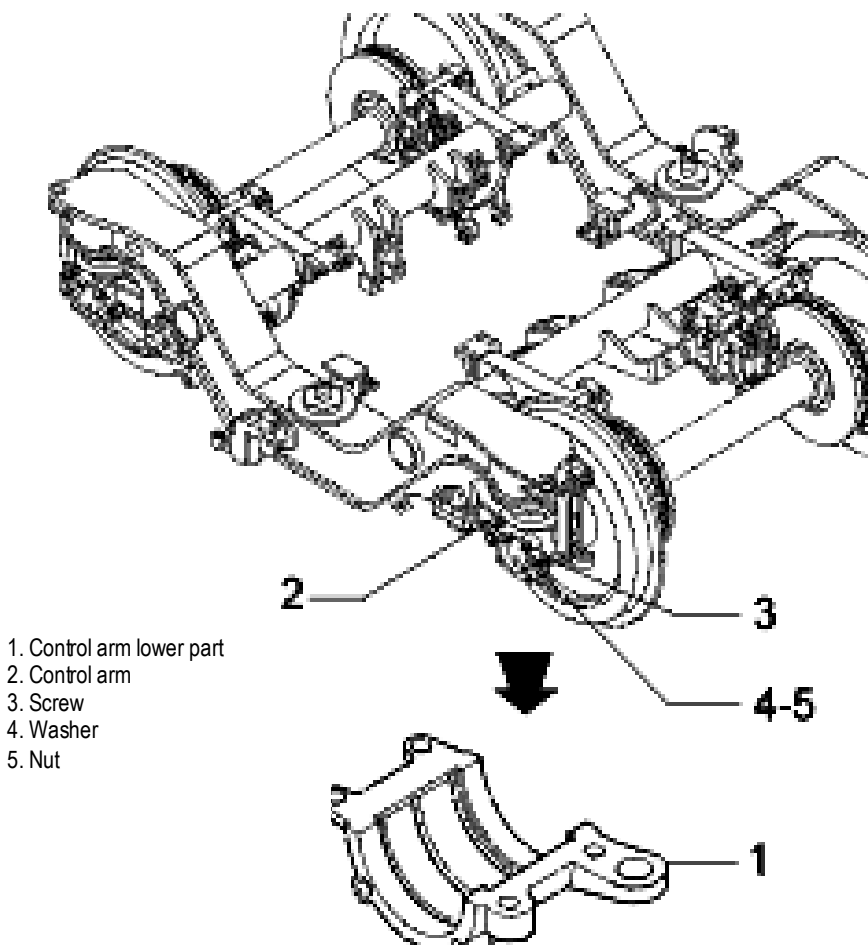


Fig. 3.17 Removal of the Lower Part of the Control Arm

It is then possible to proceed with lifting the bogie frame (see Fig. 3.18). However, make sure that both wheel sets are secured with wooden blocks (4) from both sides. Be sure that the brake levers are in OPEN position: if not, turn the nut on the brake cylinder using a wrench. Then hook the crane equipment (1) to the frame (2) and then lift it with care. The two wheel sets (3) remain on the floor and can be rolled away.

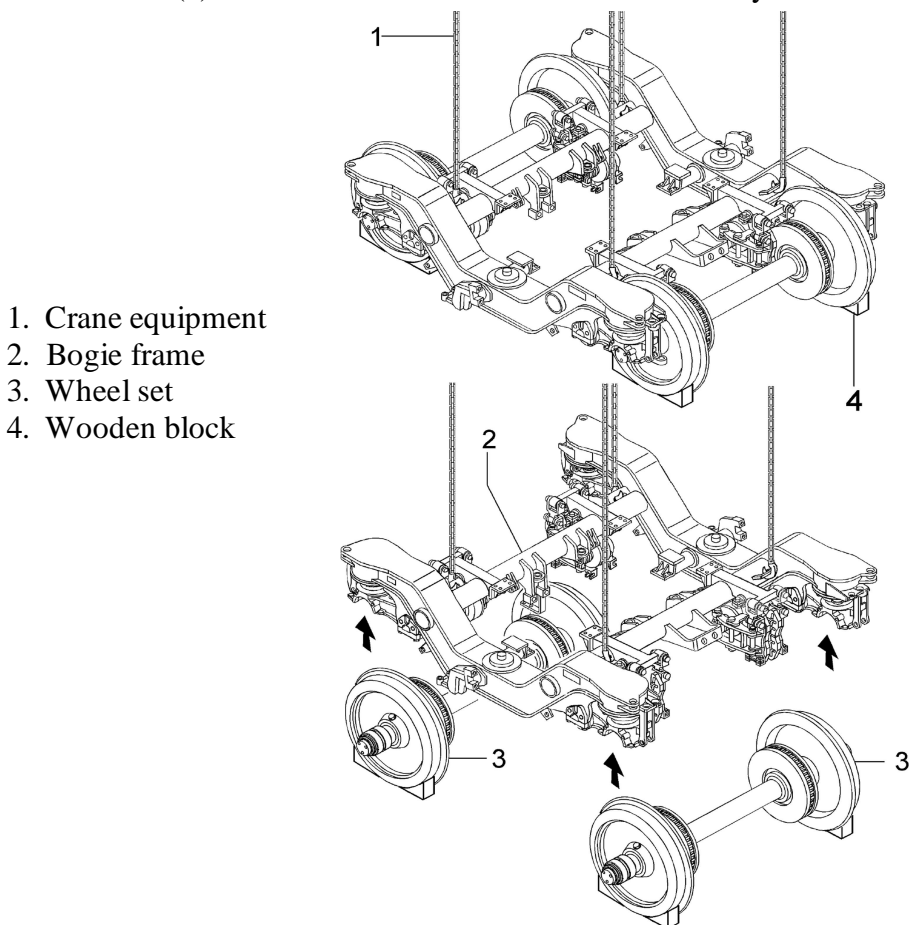


Fig 3.18 Lifting the Bogie Frame

3.2.7 प्राथमरी सस्पेंशन से ग्राउन्ड तारों को अलग करना Removing ground cables of the primary suspension

Remove the ground cables (Fig. 3.19) from the primary suspension (2) extracting the screw (3) and washer (4), which fix the bracket (5) to the control arm and the nuts (6) and washer (7), which fix the resistance (8) to the bogie frame (9). It is then possible to completely separate the bracket (5) from the cable (1) extracting the screw (10) with the washer (11) and the nut (12), and also the resistance (8) extracting the screw (13) and the washer (14).

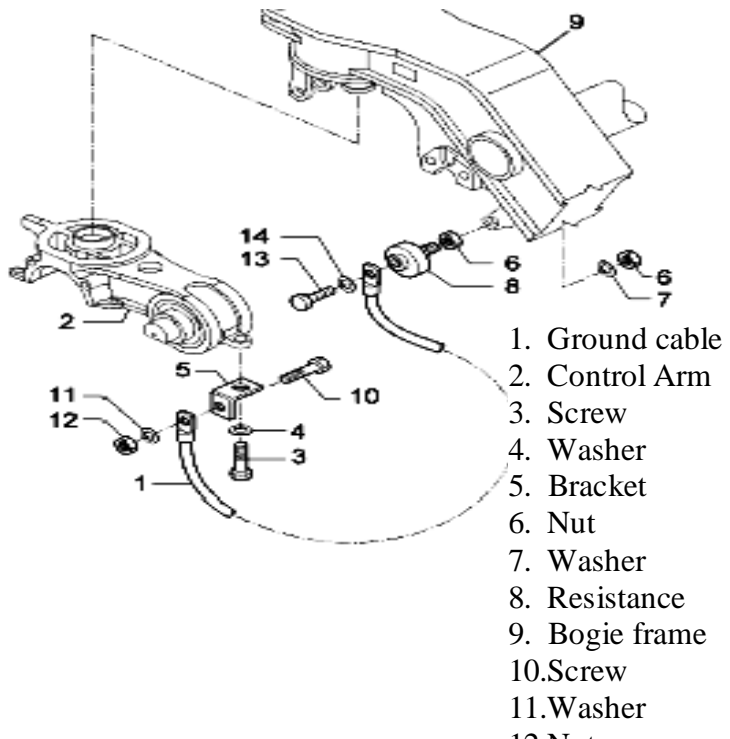


Fig. 3.19 Removing the Ground cables

3.2.8 प्राथमरी सस्पेंशन का बिच्छेदन / Dismounting the Primary Suspension

In order to dismount the primary suspension, it is necessary to put it under press (Fig. 3-20). Before pressing, put wooden blocks (2) between the press (1) and the bogie, to avoid damaging the control arm and the frame.

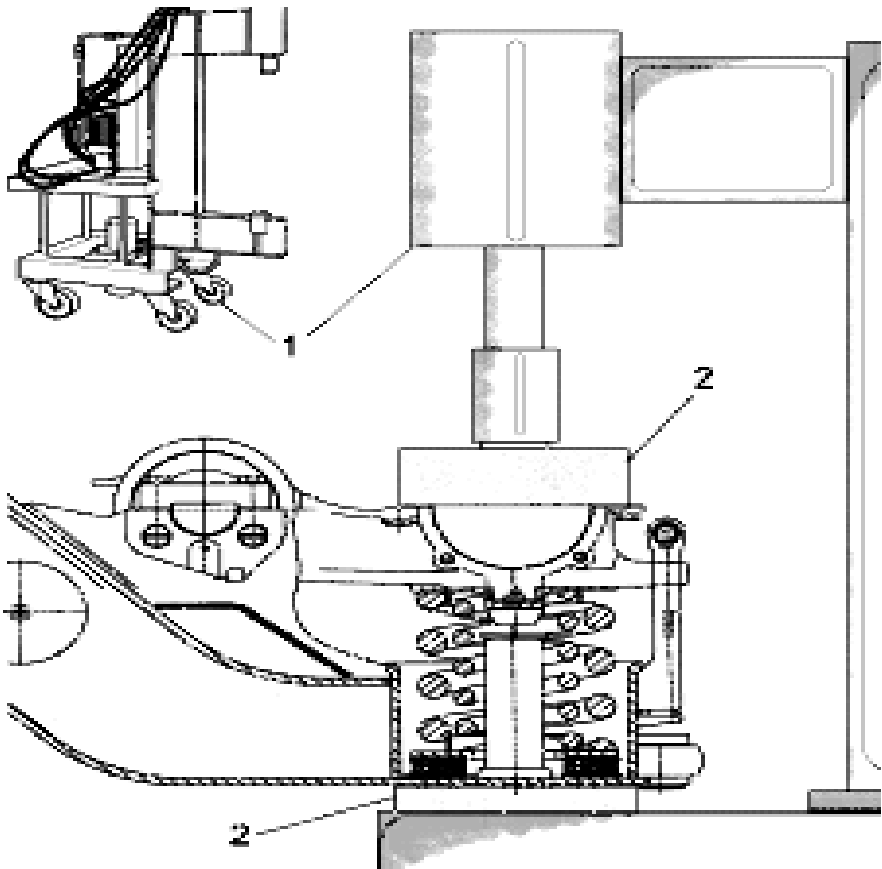


Fig. 3.20 Primary Suspension Under Press

After pressing the spring pack, remove the safety pin (Fig. 3-21) extracting the split pin (3) and the washer (4). Separate the control arm (1) from the bogie removing the fixing blocks (5), the plates (7), the washers (8) and the threaded pins (9) by unscrewing the screws (6). Release carefully the pressure until it is possible to remove the external (10) and internal (11) springs, and the upper centering discs (12). Remove the lower centering disc (17), and then unscrew the bump stop (13) removing the nut (14), the washer (15) and the disc (16).

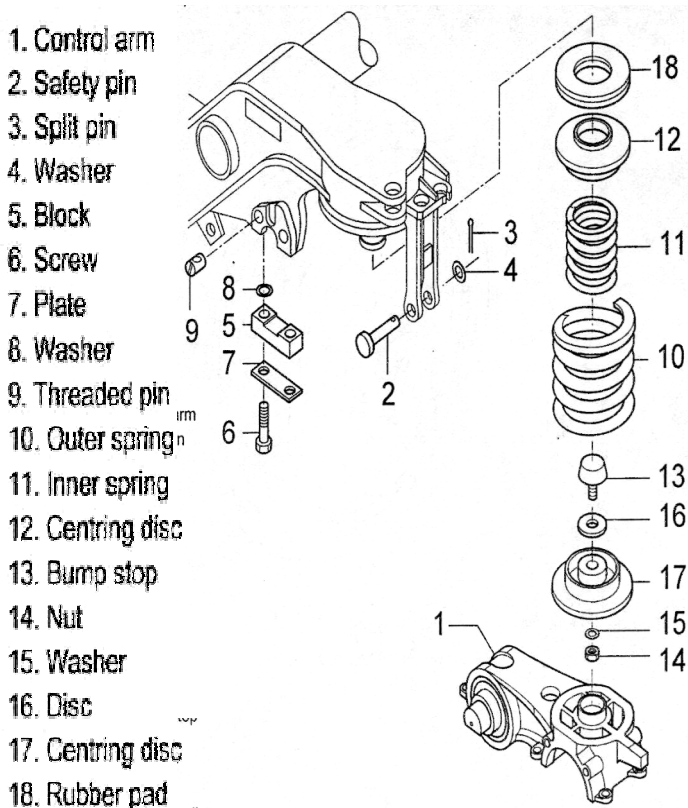


Fig. 3.21 Dismounting the Primary Suspension

3.2.9 एन्टी रोल बार का बिच्छेदन /Dismounting the Anti-Roll Bar

Separate the anti-roll bar links (Fig. 3.22) from the anti-roll bar (2) extracting the screws(3), the washers (4) and the nuts (5). Then separate the brackets (6) extracting the screw (7) and the washer (8). Remove the sealing ring (9), the spacer (10), the bearing (11) and the bush(12)

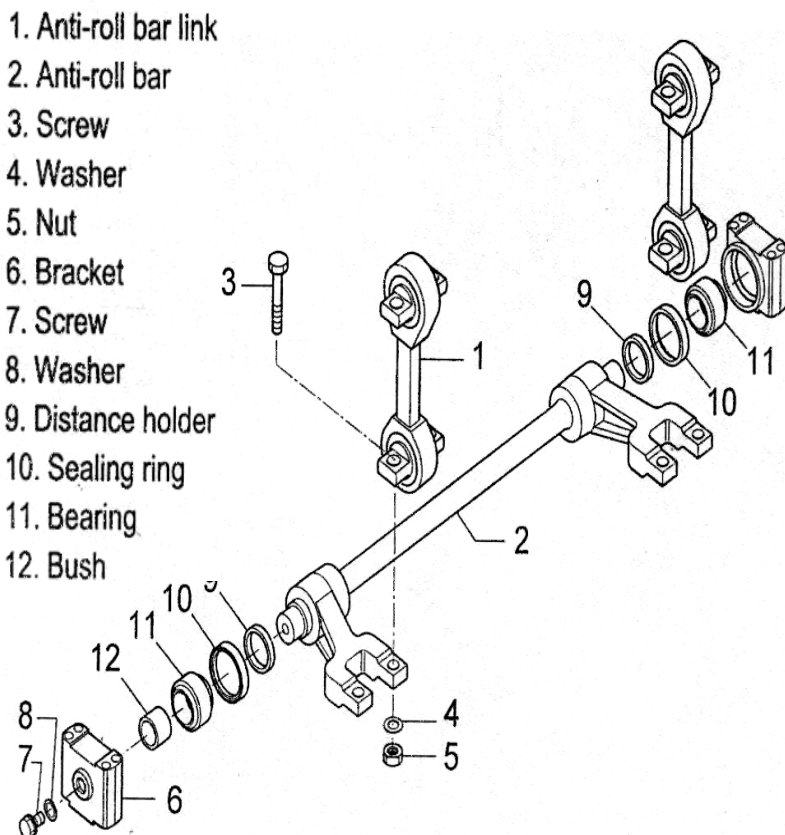


Fig. 3.22 Dismounting the Anti-Roll Bar

3.2.10 रबर जोड़ों को हटाना / Extraction of the rubber joints

The rubber joints (Fig. 3.23) from the anti-roll bar links (2), from the control arm (3), from the traction rods (5) can be extracted using a press (4). In the same way, it is possible to extract the bush (6) from the traction lever (7).

Use special tools listed below for removal of different components:

- Control arm joint removal tool 12.613.0402
- Anti-roll bar joint removal tool 12.695.0177
- Traction center bush removal tool 12.695.0178

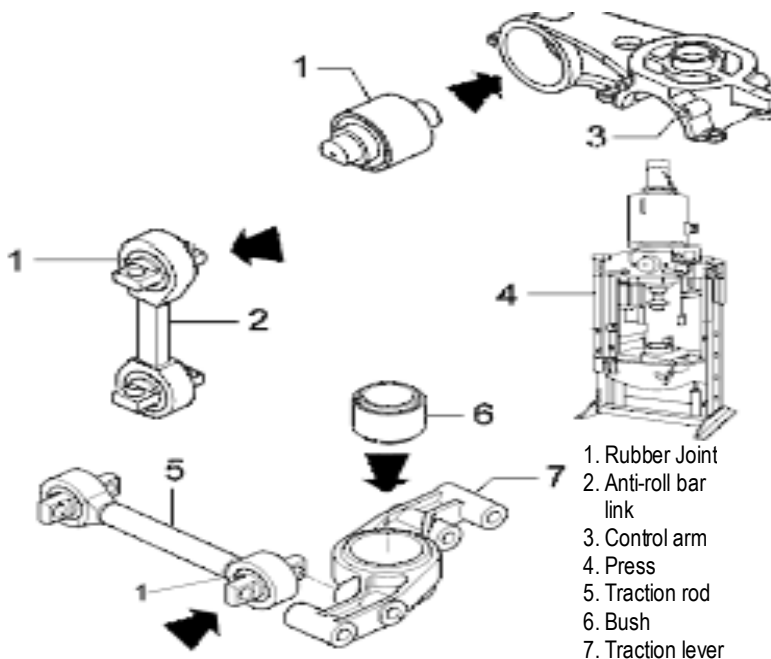


Fig. 3.23 Extraction Of The Rubber Joints

4.0 बोगी असेम्बली / BOGIE ASSEMBLY

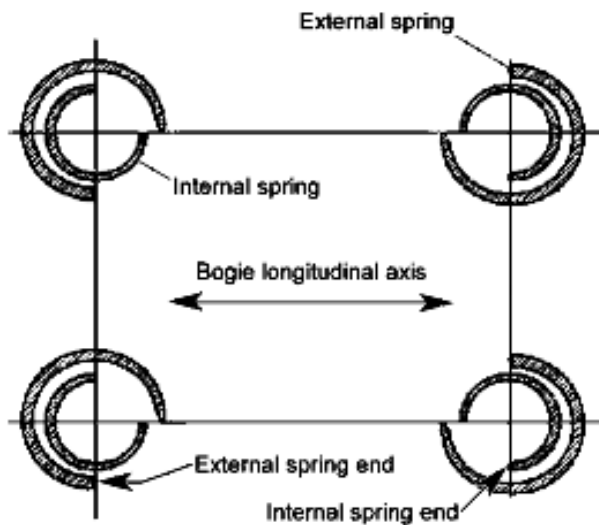
4.1 सामान्य टिप्पणी / General note

Before starting, it is necessary to clean the bogie frame and in particular all the threads and the seats for the bump stops, the dampers, the rubber elements, etc. All rough surfaces and screws must be well greased with AUTOL TOP 2000.

- Security plates and split pins can be used only once.
- When dismounting screws and other fixings at revision, replace them with new ones.

4.2 असेम्बली को जोड़ना / Mounting assemblies

(The procedure of assembling Primary & Secondary suspension will be just reverse of disassembling procedure)



Correct positioning of Primary spring

4.2.1 रबर जोड़ों का निरीक्षण / Insertion of the rubber joints

Clean the control arm (Fig. 4.1) hole and lubricate with AUTOL 2000. Clean the rubber joint. Mount the rubber joint using the press (4). After mounting, check parallelism using the tool No.12.841.0502. **The differential tolerance is $\pm 0,5 \text{ mm}$.** If necessary perform the required correction. Mount the rubber joints (1) into the anti-roll bar vertical rods (2) and on the traction rods (5) using the press (4). Mount the bush also (6) into the traction lever (7)

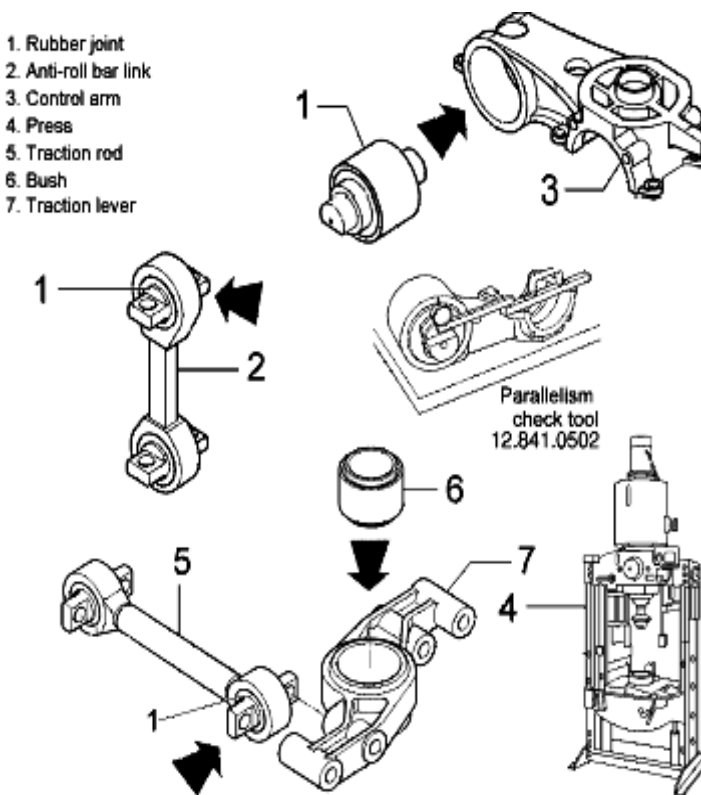


Fig. 4.1 Insertion of Rubber Joints

4.2.2 एन्टी रोल बार का प्रथम जोड़ना / Pre-mounting the anti-roll bar

Assemble the anti-roll bar as shown in Fig. 4.2: respect the shown mounting angles and the tightening torques for nuts and screws. First mount the brackets (6), the bush (12) and the bearing (11), the distance holders (9) and the sealing rings (10). Then mount the anti-roll bar links (1).

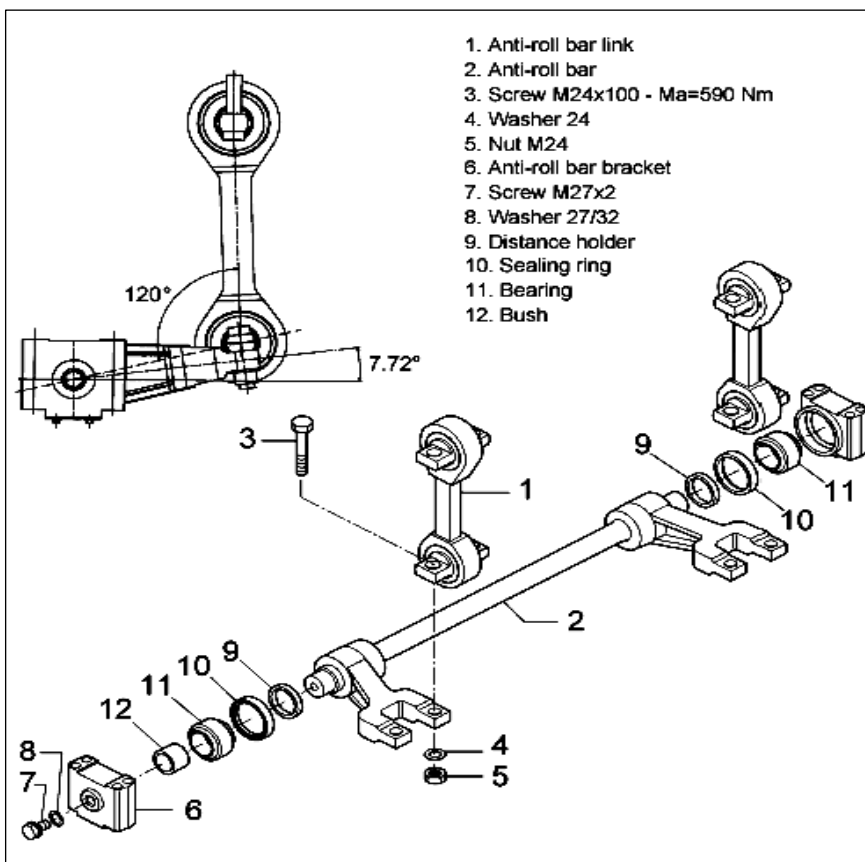


Fig. 4.2 Anti Roll Bar Assembling

4.2.3 ट्रेक्शन सेन्टर की माउन्टिंग / Mounting the traction center

In order to mount the traction center (Fig. 4-3), first assemble the traction lever (6) with the bush (10) and the rods (1). Then connect the free ends of the rods (1) to the bogie frame (2) using the screws (3), the washers (4) and the nuts (5).

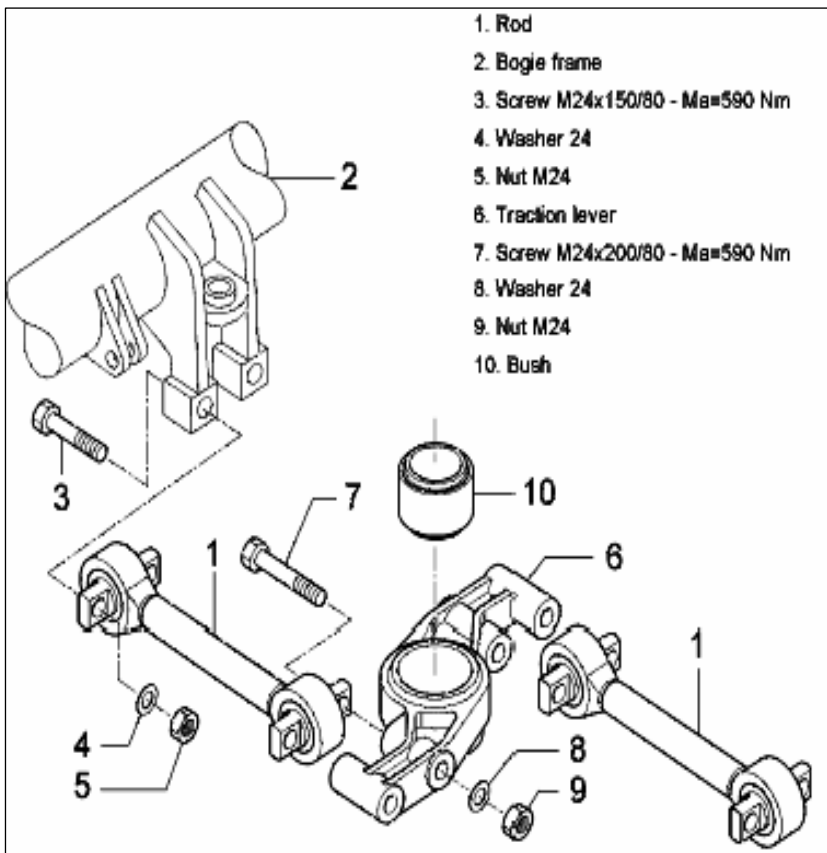


Fig. 4.3 Mounting the Traction Center

4.2.4 Mounting the axle bearing equipments

Assemble the four different types of equipments (Type A, B, C and D - Fig. 4.4) according to the disposition shown in Fig. 4.4A. Tighten the screws at the prescribed torques.

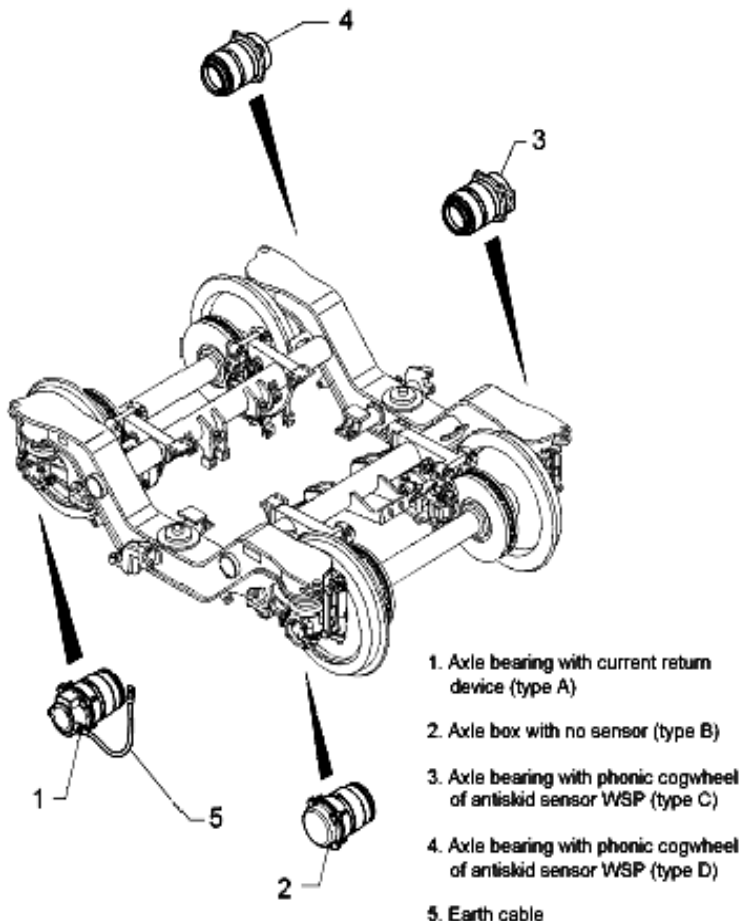


Fig. 4.4 Mounting the axle bearing equipments

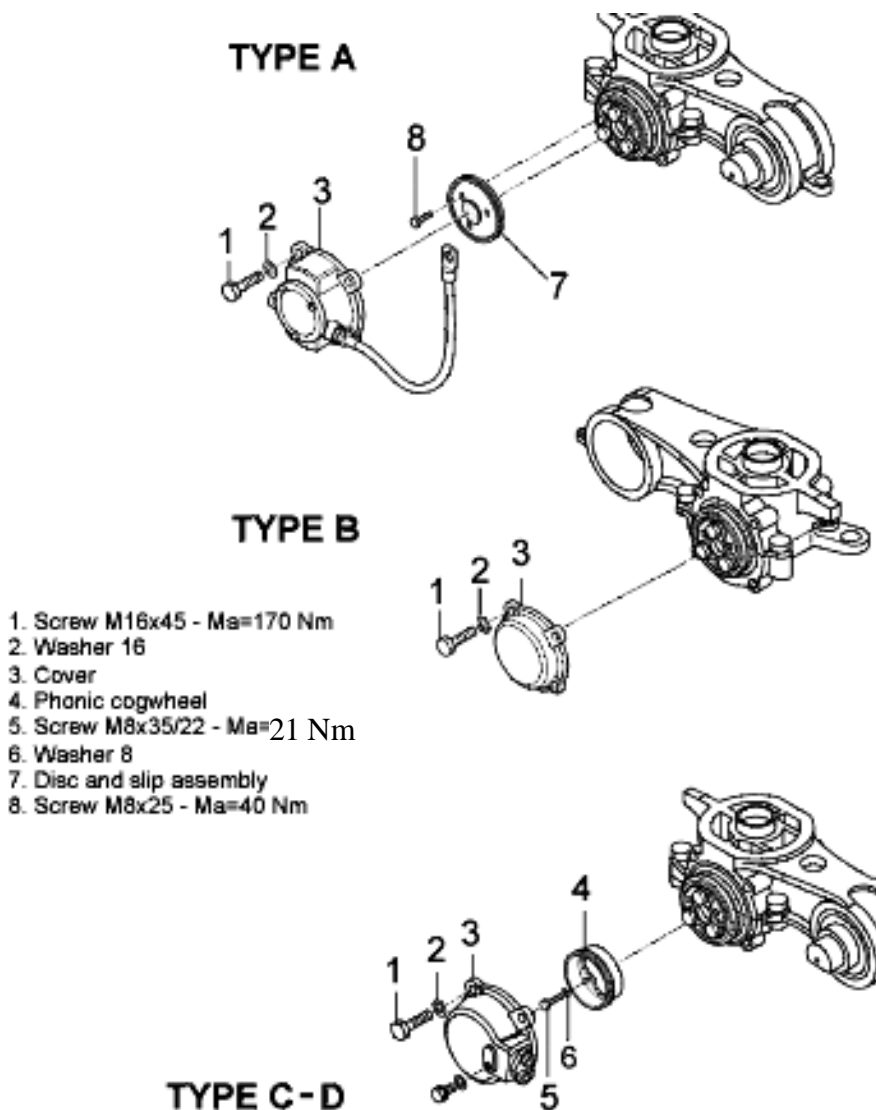


Fig. 4.4A

4.2.5 बोल्स्टर बीम के नीचे शिमिंग की जाँच /Check shimming under the bolster beam

Under tare load conditions, check that distance between the shims (Fig.4-5) under the bolster beam (2) and the bogie frame stops (3) lies within the shown values (95^{+5}_{-5} mm). The shim pack (1) is made of three 5 mm and one 10 mm wear plate (7). The same check must be performed after mounting the bogie under the car body.

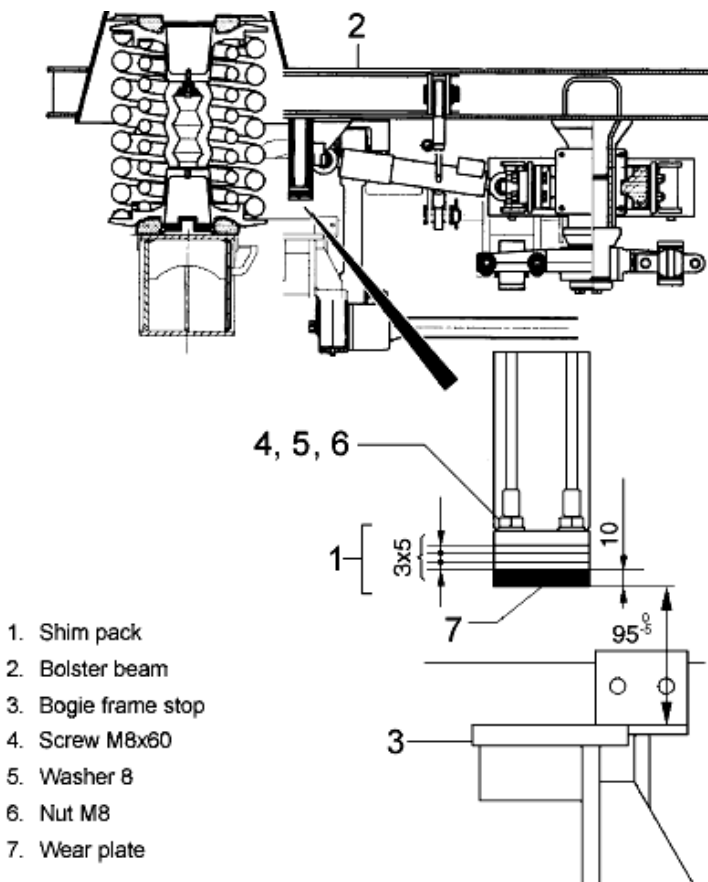


Fig 4.5 Bolster beam shims

4.3 स्क्रूड कनेक्शन / Screwed connections

All the screwed connections used in the bogie design are mounted according to the Tightening torques and are calculated according to a required pre-load and other functional parameters. The torque max dispersion lies within $\pm 10 \%$.

4.3.1 टॉर्क कन्ट्रोल को कसना / Torque controlled tightening

‘Torque controlled tightening’ means the use of dynamometric wrenches provided with an indicator and torque-controlled motors for the tightening. The tool requisites are defined according to DIN 25202 and include the tightening coefficient (preload and applied torque dispersion) and must comply to B Class screwed connections according to DIN 25202

4.3.2 मिलने वाली सतहें /Contact surfaces

In screwed connections subjected to heavy working loads (those having a specified tightening torque), the contact surfaces A, B, C and D (Fig. 4.6) must be worked out without varnishing and base coating. Contact areas must be machined in order to be plain E and F surfaces must comply to ISO 898 rules.

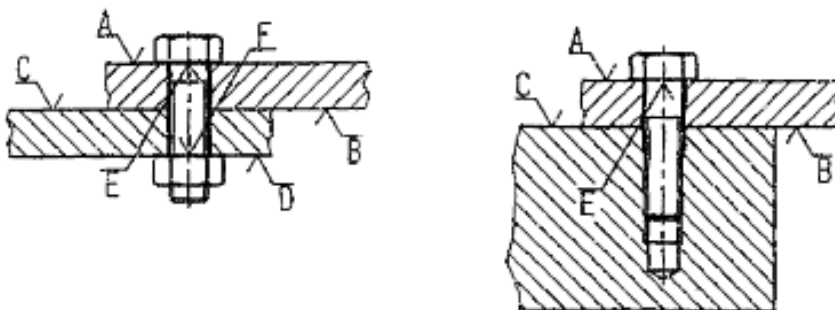


Fig. 4.6 Contact Surfaces in Screwed Connection

4.4 द्रव्य ग्लू के साथ जोड़ों की जाँच / Securing a connection with liquid glue

In order to secure a screwed connection, it is possible to use special glues, which generate a rigid junction (with dismounting possibilities) between the internal and external threads of a screwed connection. Before using such glues, it is necessary that both threads of a connection are clean and Un-greased.

4.5 टॉकों को कसना / Tightening torques:

In the tables below are listed the tightening torques to be used when mounting screwed assemblies.

Torques for class B screwed assemblies according to DIN 25202.

Screw type	Tightening torque Ma	Preload mounting Fm at
M 8	21 Nm	17 900 N
M 10	40 Nm	28 500 N
M 12	70 Nm	41 500 N
M 16	170 Nm	78 000 N
M 20	340 Nm	126 000 N
M 24	590 Nm	182 000 N
M 30	1170 Nm	290 000 N

Torques for class C and D screwed assemblies according to DIN 25202.

Screw type	Tightening torque Ma	Preload at mounting Fm
M 8	12 Nm	10 600 N
M 10	24 Nm	17 100 N
M 12	42 Nm	25 100 N
M 16	100 Nm	46 000 N
M 20	210 Nm	77 000 N
M 24	355 Nm	109 000 N
M 30	700 Nm	172 000 N

Note: These torques are to be used when no other special torque is stated

4.6 फिएट बोगी के लिए खास यंत्र / Special tools for FIAT Bogie

- Press for secondary suspension
- Mounting tool for bearing
- Dismounting tool for bearing
- Anti-roll bar elastic joint mounting tool
- Anti-roll bar elastic joint removal tool
- Anti-roll bar bearing mounting
- Parallelism check tool
- Traction center bush mounting
- Traction center bush removal
- Traction center mounting
- Press for axle bearing
- Control arm elastic joint mounting
- Control arm elastic joint removal
- Axle bearing mounting tool
- Axle bearing removal tool
- Press for MINER springs
- Tool for wheel set transportation
- Press for primary suspension

4.7 फिएट बोगी के ओपन लाइन में रखरखाव के लिए निर्देश **Guideline for Open Line Maintenance for Fiat Bogie**

The following maintenance schedules are to be carried out.

Coaching Depot Schedule

Schedule D1	: Every Trip/Weekly
Schedule D2	: Monthly \pm 3 days
Schedule D3	: Half Yearly \pm 15 days

Schedule D1 (Every Trip/Weekly)

The following items shall be attended during schedule D1.

Bogie Frame and Bolster Assembly

- Perform a visual check on longitudinal beams, cross beams & bolster for cracks, damages and corrosion.
- Perform a visual check on brake supports, damper supports, traction centre supports and anti roll bar supports for cracks, damages and corrosion.
- Check bogie bolster sub-assembly and brackets for cracks, damages and corrosion.

Primary & Secondary Suspension

- Visually check springs for cracks, damages, corrosion or foreign objects presence.
- Check miner pads for cracks, damages and ageing.
- Visually check safety cables for damages, cracks and corrosion.

Primary/Secondary/Yaw dampers

- Perform a visual check on dampers for damage, cracks and oil leaks.
- Perform a visual check on all fixings for loosening and/or missing components.
- Perform a visual check on rubber elements for cracks and ageing.

Bearings

- Carry out bearing feeling for detection of hot bearing.
- Check bearings for grease leakage.

Wheel & Axle

- Perform a visual check on wheels for cracks, damages and tyre defects.
- Check by wheel profile gauge, the wheel flange thickness and profile.
- Check axle for cracks and signs of corrosion, if any.

Note: Please refer to RDSO CMI – K 003 (Guidelines for interpretation of wheel defects) and ‘Maintenance Manual for ICF design BG coaches’ for details.

Control Arm

- Perform a visual check on all fixings for loosening and / or missing components.
- Visually check control arm parts for damages, cracks or corrosion marks.
- Inspect the rubber joint until it is visible for cracks, damages and ageing.

Anti Roll bar Assembly

- Perform a visual check on Anti roll bar, links and brackets for cracks, damages and corrosion.
- Perform a visual check on rubber joints for cracks, damage and ageing.
- Visually inspect for grease oozing out of anti roll bar bearings, which may result in bearing failure.
- Perform visual check on all fixings for loosening/missing fittings.

Traction Centre

- Perform a visual check on the traction centre lever and on the rods for cracks, damages and corrosion.
- The assembly should be free to move, and not blocked by any foreign objects.
- Perform a visual check on all fixings for loosening.
- Perform a visual check on rubber joints for cracks/damages.

Rotation Limiter

- Perform a visual check of rotation limiter-components.

Rubber and Rubber/Metal Bonded Parts

- Perform a visual check on rubber and rubber/metal bonded parts for cracks, damages and ageing.

Axle Bearing Instruments

- Perform a visual check on all grounding cables & WSP equipment cables for breaks/ damages.

- Visually check equipment for absence of damages, cracks, and corrosion marks.
- Check functioning of WSP equipment. Verify that the signal arrives correctly to the diagnostic equipment.

Schedule D2 (Monthly)

Perform all the items of schedule D1. In addition to this perform the activities- as given below.

Bogie Frame

- Wash the bogie frame thoroughly with water jet in washing line, making sure that water is not directed towards pneumatic / electrical connections and axle bearings.

Axle Bearing Instruments

- Inspect the Earthing equipment for wear of slip assembly / carbon bars.
- Monthly / Quarterly inspection of WSP equipment to be carried out as per schedule given by OEM.

Wheel & Axle

- Check treads diameter and wear of wheel profile. If necessary, perform re-profiling.

Pins and Bushes

- Lubricate all pins and bushes.

Schedule D3 (Half Yearly)

Perform all the activities of schedule D2. In addition to this, perform the activities, as given below.

Bogie Frame

- Examine the bogie frame for corrosion / damages, especially at critical locations.
- Carry out paint touch up with high built epoxy primer and paint as per RCF specifications MDTs – 166.

Wheel & Axle

- Check wheels offset on axle (1600 mm \pm 1 mm)

Control Arm

- Renew protection treatment with Tectyl /Cortec VC 1368 on the rubber joint on visible areas.

Axle Bearing Instruments

- Replace all carbon brushes on earthing devices.

हमारा उद्देश्य

अनुरक्षण प्रौद्योगिकी और कार्यप्रणाली को उन्नयन करना तथा उत्पादकता और रेलवे की परिसम्पत्ति एवं जनशक्ति के निष्पादन में सुधार करना जिससे अन्तर्विषयों में विश्वसनीयता, उपयोगिता और दक्षता प्राप्त की जा सके।

यदि आप इस संदर्भ में कोई विचार और विशेष सुझाव देना चाहते हों तो कृपया हमें इस पते पर लिखें।

संपर्क सूत्र : निदेशक (याँत्रिक)

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OUR OBJECTIVE

To upgrade maintenance technologies and methodologies and achieve improvement in productivity and performance of all Railway assets and man power which inter-alia would cover reliability, availability, utilisation and efficiency.

If you have any suggestions and any specific comments, please write to us.

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