SOUTHERN RAILWAYS , SHORANUR

PALAKKAD DIVISION

INTERNSHIP REPORT

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In the partial fulfilment for the award of the degree

Of

BACHELOR OF TECHNOLOGY

In

MECHANICAL ENGINEERING

GOVERNMENT ENGINEERING COLLEGE

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We are grateful for the warm welcome and cooperation extended by everyone at IOH Shed, which made the internship both educational and enjoyable. This experience has strengthened our passion for railway engineering and will undoubtedly influence my future career aspirations positively.

SHORNUR IOH DEPOT

- IOH depot at SRR is an ISO 9001-2008 certified depot. The IOH of the all the Primary Maintained coaches of the division are done at SRR with an average 30 coaches per month.
- One CNC under floor pit wheel lathe of HEC make is available and being used for tyre turning of coaches, locos and MEMUs.
- For accident relief one class- A ART with 140 Ton crane is available. One SPART with Scale I ARME is also available at SRR.
- Primary Maintenance of 84 passenger coaches are under taken with one pit line of 12 coach, Clean Train Station (CTS) is operational at SRR.

CONTENTS

- **BOGIE.**
- **INTERMEDIATE OVERHAULING.**
- **BRAKING SYSTEM.**
- **OPERATION AND MAINTANCE OF 140N TONNE CRANE.**
- **PIT WHEEL LATHE.**
- **ACCIDENT RELIEF TRAIN.**
- **ROLLING EXAMINATION OF COACHES.**
- **PIT LINE MAINTENANCE.**
- **DISASTER MANAGEMENT.**
- **BIO TOILET.**
- **RAKE TEST.**

➢ BOGIE

- It is an independent until used under a long vehicle .
- It is usually mounted on two pairs of wheels. Normally two bogies are used under a coach
- Each bogie carries is half the load of the vehicle body and its loading
- Each bogies is provided with a pivot on its central transom or bolster foe engagement with male counterpart provide underneath the vehicle under frame

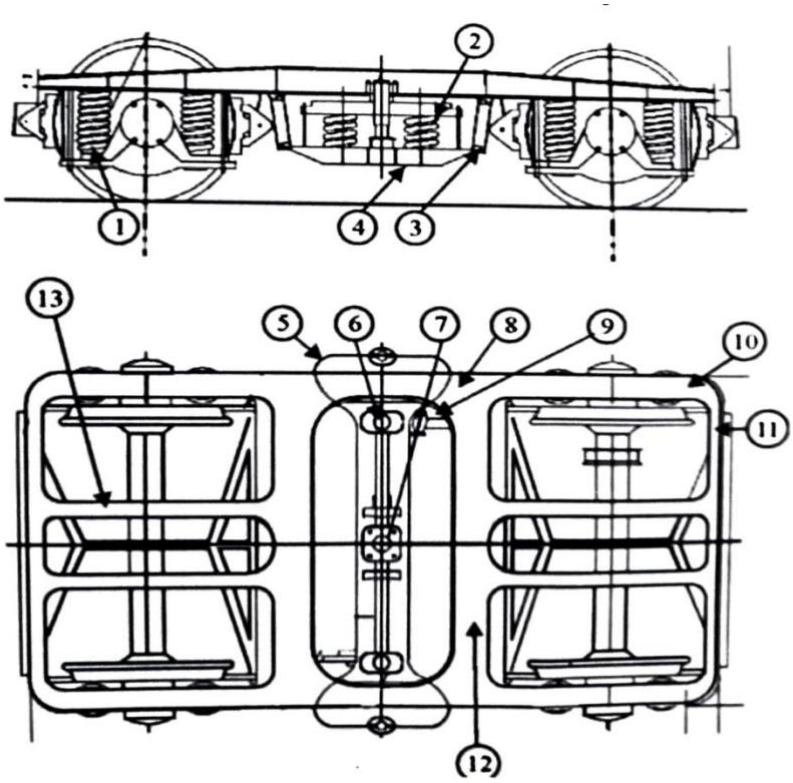


Figure 1. All-coil Bogie – General Arrangement

1. Axle Box /Primary Spring
2. Bolster /Secondary Spring
3. Swing Link Hanger
4. Lower Spring Beam
5. Bolster
6. Side Bearer
7. Centre Pivot
8. Bogie Frame
9. Anchor Link
10. Sole Bar
11. Head Stock
12. Transom
13. Longitudinal Bar

Figure 2. ICF All-coil Bogie

MAJOR COMPONENTS

Primary Suspension

- **Dashport Arrangement**

The primary suspension in an ICF Bogie is through a dashpot arrangement which is mainly a cylinder piston arrangement. Schematic arrangement is as shown in Figure 4. The lower spring seat sits on the washers (Rubber or HYTREL) and plays the role of a cylinder in the dashpot arrangement which is filled with oil. In the dashpot arrangement, the top portion is called the axle box guide. The axle box guide is welded to the bogie frame. The axle box guide works as a piston in the Lower spring seat filled with oil. This helps in damping the vibrations caused During running train operation. The bottom of the axle box guide has a guide cap with perforations so that during the downward movement of the axle guide in the lower spring seat, the oil in the dashpot rushes in the axle box guide. This provides the dampening of duration in a running coach.

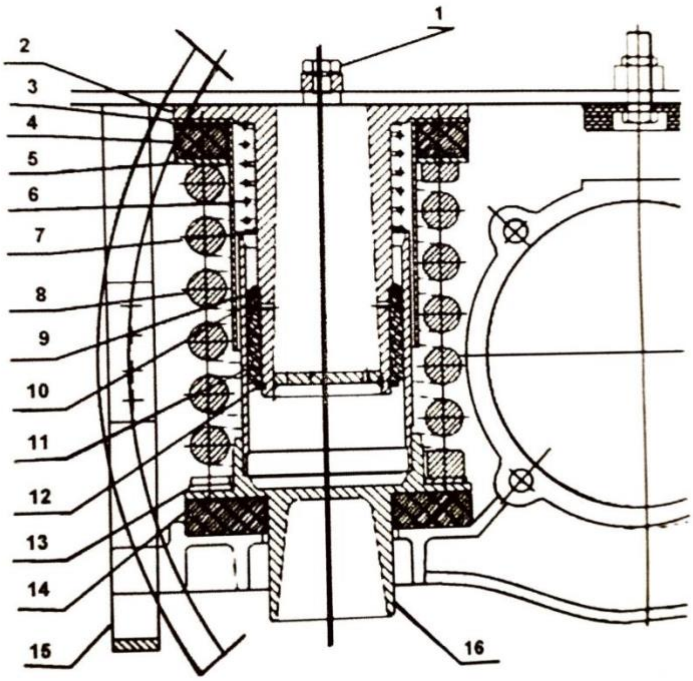


Figure 3. Axle Guide With Dash Pot

1. Screw with sealing washer
2. Guide
3. Protective tube
4. Upper Rubber washer
5. Top spring seat
6. Dust shield spring
7. Dust shield
8. Helical Spring
9. Guide Ring
10. Rubber Packing Ring
11. Guid Bush
12. Circlip

13. Compensating Ring 14. Lower Rubber washer 15. Safety Strap
16. Lower Sprinsg Seat

This type of rigid axle box guide arrangement eliminates any longitudinal or transverse relative movement between the axles and the bogie frame, through provision of bronze bushes at the lower end of he axle guide, and transmits lateral and longitudinal forces. Oil level (above top of guide cap) is measured by insertion of a flexible wire through the hole. A lower oil level would result in decrease in damping. which would adversely affect comfort and safety. The oil level should not be below 40mm (BG) in tare condition.

- **Primary Spring**

Helical springs are provided in the Primary suspension, called Axle Box spring

- **Secondary Suspension**

The secondary suspension arrangement of the ICF bogies is through bolster springs. The bogie bolster is not bolted or welded anywhere to the bogie frame. It is attached to the bogie frame through the anchor link. Weight of the coach is transferred through side bearers on the bogie bolster. The ends of the bogie bolster rests on the bolster helical springs placed over the lower spring beam suspended from the bogie frame. A photograph of the Secondary Suspension arrangement is shown in Figure 4.

- Lower Spring Beam

The bolster springs are supported on a lower spring beam. The lower spring beam is also a free-floating structure. It is not bolted or welded either to the bogie frame or the bogie bolster. It is attached to the bogie frame on the outside with the help of a steel hanger. They are called the BSS (Bolster Springs Suspension) Hangers.

Figure 4. ICF All-Coil Bogie - Secondary Suspension

- **Anchor Link**

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. (Figure 6 and 7). The links can swivel universally (both vertically and laterally) 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, in order to reduce the jerks during acceleration/ braking. The silent block is force fit in the anchor link and the silent block pin is slide fit in the anchor link bracket. A broken Anchor Link would result in eccentric transfer of longitudinal load, causing increased angular run and lateral forces.

Figure 5. Anchor Link

- **Swing Link / Hanger**

The tendency of jamming of swing links (at points of articulation in bogie frame and spring ink) during lateral swing would result in occurrence of higher flange forces (Y) and higher lateral celerations in the coach. Wear limits of Hanger block and limit of clearance inside length of Hanger are ipulated. Upon exceedance f the limits, these components are replaced. Else, chances of failure of langer would be high. Swing link is a vulnerable component. Hence, its failure should be observed at the lerailment site.

- **Defects in Swing Link:**

i) Check swing links for crack, wear on the rocking surfaces and elongation. If there is any sign of elongation or cracking or when the total wear exceeds 3mm the swing link is to be scrapped.
ii) The maximum permissible wear on diameter of hanger pin/bush is 1.5mm.
iii) Check swing link hanger blocks for any wear.

- **Secondary Spring**

Helical springs provided in the Secondary suspension are called secondary springs. Shock Absorber Two Hydraulic shock absorbers (one on each side), having a 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. Leakage of oil and physical damage are the common items to be observed. In case such defects are observed, it is to be checked whether damping force versus frequency of oscillation is as per the stipulation.

- **Centre Pivot**

The center pivot pin (Figure 8 and 9)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 centralize the bogie with respect to the body and to some extent, controls and damps the angular oscillations of the bogie. During assembly, graphite grease is applied on the Centre Pivot Pin to reduce friction and it is secured with a cotter and pin arrangement.

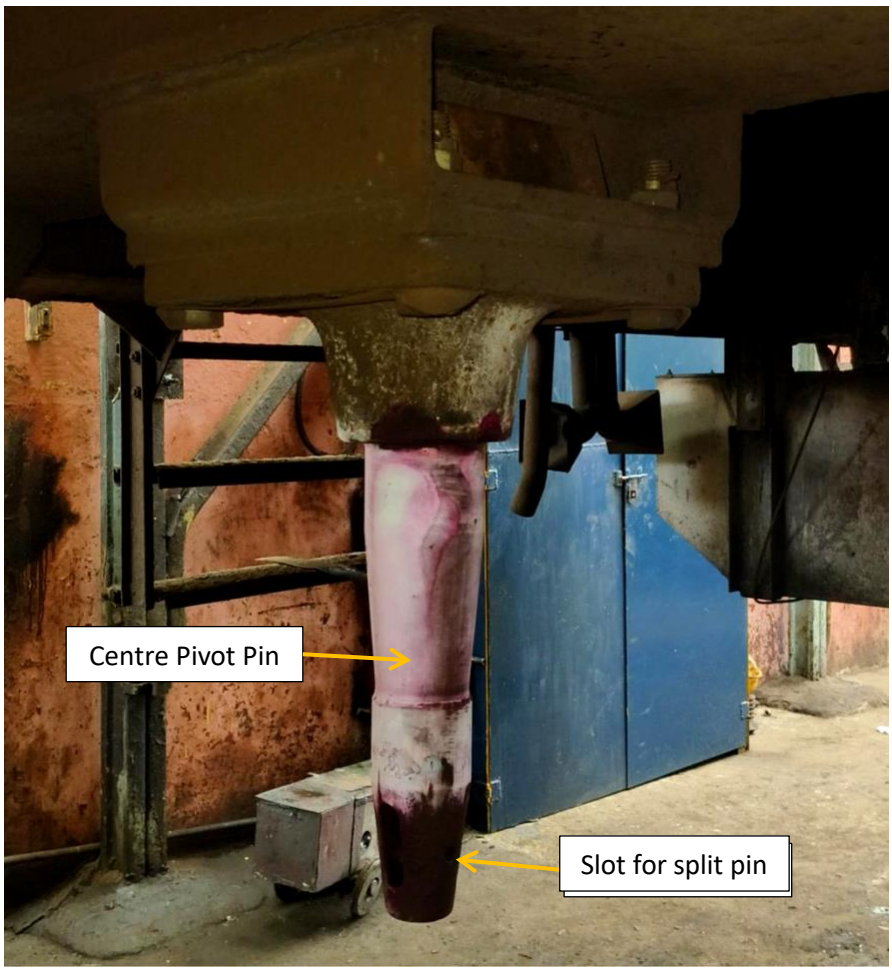
- **Defects in center pivot :**

i. Check whether pivot is damaged bent or cracked.

ii. Check the condition of bolts holding pivot to body is secured and tight.

iii. Cotter and cotter pin at pivot bottom are secured.

iv. Check verticality of pivot pin.


Centre Pivot Pin
Slot for split pin

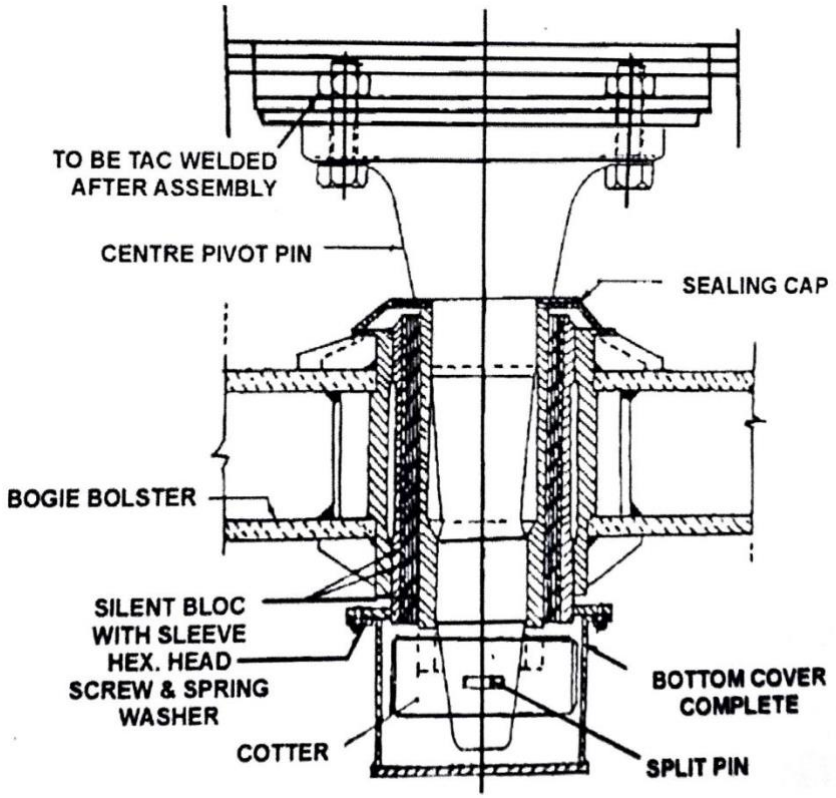


Figure 6. Centre Pivot Pin

- **Brake Gear**

On application of brakes, the brake pressure on the two wheels of an axle should be more or less equal; otherwise, the wheel which is braked less would tend to travel more, causing the axle to become angular. The axle would, thus, run persistently angular during the brake application. Conditions which could cause the above situation to occur are:

Brake block deficient.

-Incorrect centralization and adjustment of brake rigging and brake blocks.
-Uneven application of brake power and wear in gear.
-Uneven wear of brake blocks on the same axle.

- **Defects in Braking System:**

1. Inspect the condition of brake beam/levers for wear or damage.
2. The corroded, dented, damaged brake shoe head.

3. Check the wear, damage, etc. to the brake gear pins.
4. he composite brake blocks should not have worn out to thickness of 12 mm or below.

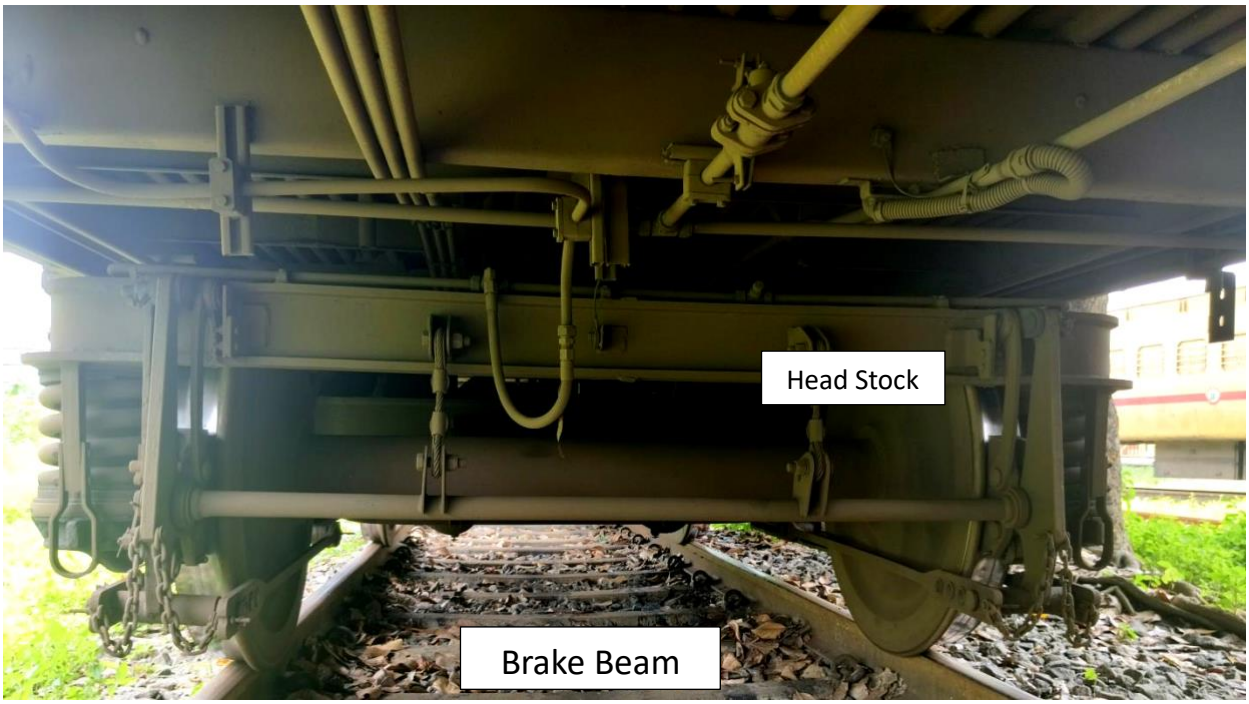


Figure 7. Brake Gear Assembly

- **Buffer Height:**

I. Maximum buffer height = 1105 mm (In empty condition) Minimum buffer height 1030 mm (In loaded condition)
II. Minimum buffer height of coaching stock should not be less than 1090 mm at the time of releasing of coach from POH Workshop. For checking irregular loading:Difference in buffer height from rail level between any two buffers on the same vehicle measured a at headstock should not be more than 64mm. Flange of any wheel should not be within 25mm of bottom of vehicle.
III. The measurement should be taken from the center of the buffer socket to the top of the of the buffer face rail head. The buffer height should never be taken from the centre because it will not give correct value. While recording buffer height, it should be ensured that buffer bolts are in tight condition and buffer is not drooping. If it is drooping, the amount of drooping should be measured and recorded.

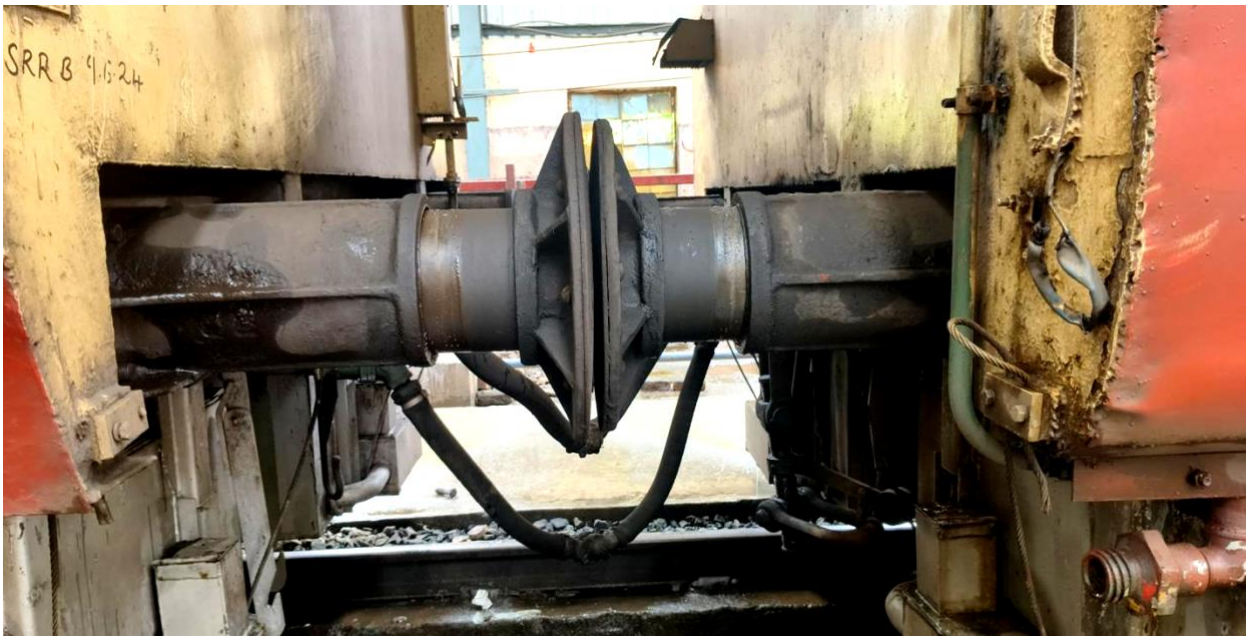


Figure 8. Measurement of Buffer Height

- **Buffer Projection Limits from Head Stock**

Maximum	Minimum
635mm	584mm

- LHB COACHES

LHB coaches are the passenger compartments of Indian railways that have been developed Linke- Hoffmann - Busch of Germany (renamed Alstom LHB in 1998) after the takeover by y Alstom) and produced by rail coachfactory Chennai.

Specifications of LHB Coaches:

Material of body	Stainless steel
Length over body	23540mm
Length over buffers	24000mm
Overall width	3240mm

Overall height	4039mm
Buffer height	1105mm
Wheel base	2560mm
Diameter of wheel	915mm
Maximum wear permitted on wheel	845mm
Brake type	Disc brake with slack adjusting mechanism
Diameter of brake disk	640mm
Coupler	AAR tight lock type centre buffer couple
Height of floor from rail level(tare)	1303mm
Maximum axle load permitted	16t
Riding index	2.5 to 2.75
Type of damper	Hydraulic
Wheel gauge	1600 +/- 1mm

- **Merits of LHB Coaches**

i. LHB coaches have an average speed of 160kmph and a top speed of 200kmph as compared to an average speed of 70kmph and a top speed of 140kmph in ICF coaches.
ii. Shorter stopping distance due to the disc brake system.
iii. Coupler system in LHB reduces the relative motion between two coaches and also prevents one coach rising on the other in case of accident.
iv. Good curve negotiation because of shorter wheel base.
v. Less maintenance required (IOH for every 5 lac kms, POH for every 10lac kms) compared to ICF coaches.
vi. xtra seating capacity than ICF due to 2mt extra length over body (3AC-72, 2AC-54 8).

LHB coaches have axle mounted suspension system and dampers which provides better riding comfort

- **FIAT BOGIE**

i. FIAT Fabrica Italina de Automobil Turin.
ii. Bogie frame on the Primary Springs and supports the vehicle body through the Bolster.
iii. Bogie is designed for maximum operating speed of 160 kmph and has potential for operation up to 200 kmph.
iv. Belongs to the two-axle type, with a primary and a secondary suspension.

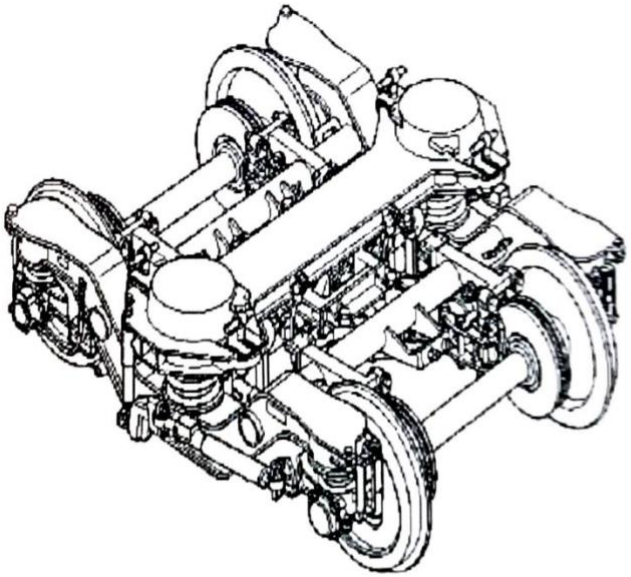


Figure 9. Fiat Bogie

➢ INTERMEDIATE OVERHAULING

IOH

I. IOH i.e. Intermediate Overhauling which is required to be given every nine months 30 days at the dominated primary depot.

II. Coaches are required to be detached from the rake and taken to the sick line for Examination and repairs. INDI

III. For maintenance of major break-down/ mal-functioning of any subassembly etc. the decision whether the coach is to be detached from the formation for attending to maintenance/replacement of major subassembly is dependent on maintenance requirements, operational convenience, time availability etc. The decision is taken by the Engineer (C&W). Coach failure report should be made.

PROCEDURE:

The activities performed to detach a coach with Air Brake system are as under-

I. Safety precautions shall be taken to prevent injury while detaching/attaching a coach.

II. Remove the clamps on the cut off angle cock.Close the cut-off angle cocks of the feed and brake pipe and brake pipe on both sides of the coach that has to be detached.

III. Close the cut-off angle cocks of the feed and brake pipe of adjacent coaches. This is to ensure that the air pressure locked up in the air hose coupling gets vented to atmosphere through the vent hole of the cut off angle cock.

IV. Observe above mentioned safety measures to close all the four cut-off angle cocks on either side of the coach to be detached so that while opening air hose coupling, it may not cause injury due to air pressure inside.

V. Release the brake of the coach to be detached by pulling the manual release lever of the distributor valve. The decision whether the coach is to be detached from the formation for attending to maintenance/replacement of major subassembly is dependent on maintenance requirements, operational convenience, time availability etc. The decision is taken by the Engineer (C&W). Coach failure report should be made.

VI. At depot, the coach that is detached for IOH is taken over to the washing line for cleaning.lubrication and minor maintenance. The coach that are detached due to a major defect in the distributor valve, brake cylinder, Auxiliary reservoir etc, is taken to the pit line for the replacement of such sub assemblies, on unit exchange basis. The detachment of coach is carried out so as to make the maintenance or testing activities convenient and faster so that the coach is made ready for use without delay.

VII. Open the Feed Pipe and Brake Pipe hose coupling from both sides of the coach.

VIII. If tne air pressure of brake cylinder does not vent by pulling the manual release valve of distributor valve, open the brake cylinder vent plug to drain the air pressure.

IX. Observe all other safety measures as prescribed.

The following items of work should be attended during IOH.

- **Buffer Maintenance:**

Buffers are horizontal shock absorbing parts with coupling the adjacent coaches of train so need regular arranging of self absorbing rubber pads.

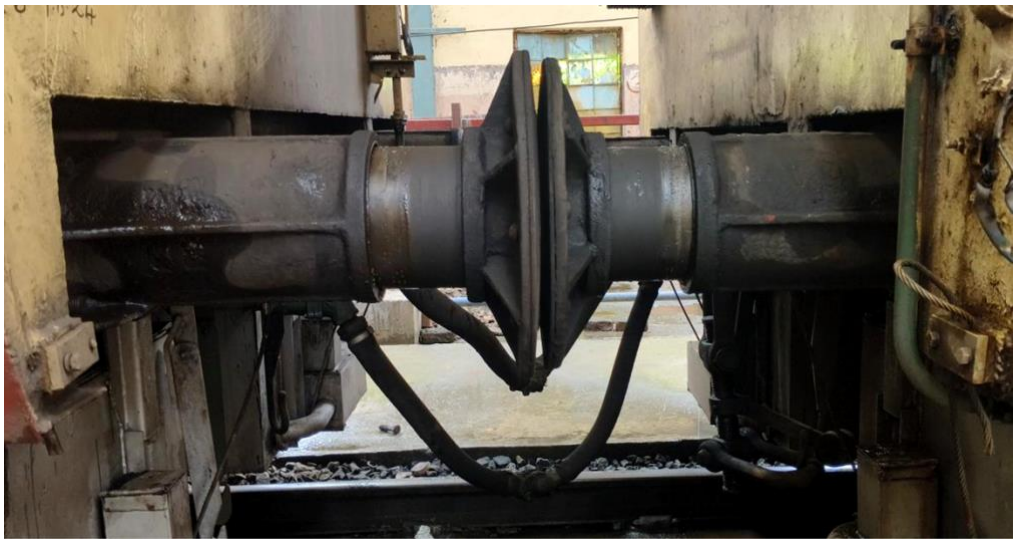


Figure 10. Buffer

- **Suspension Maintenance:**

In primary suspension mainly we have a spring and a dashpot provide damping arrangement so reguler refill of oil and changing of oil being done in the coach care center.

Figure 11. Suspension Maintenance

- **Air brake system maintenance:**

1. The maustenance of brakes consists of change of brake blocks, adjust stroke length, change of beske cylinder, leakage in the brake system etc.
2. Check working of PEASD & PEAV by hearing the hissing sound of exhaust ait. After resetting with the help of key the exhaust of air should stop. Replace the defective PEASD/PEAV.

Figure 12. Air braking system

- **Key Aspects of Intermediate Overhauling in Railways:-**

I. **Inspection and Testing** :- Thorough inspection of critical components like bogies, brakes, suspension systems, and electrical systems. Testing of various systems to ensure they meet the required operational standards.

II. **Component Replacement** :- Replacement of parts that show signs of wear and tear, such as brake pads, wheelsets, bearings, and couplings. Replacing or refurbishing specific mechanical or electrical components that are crucial for safety and performance.

III. **Lubrication and Cleaning**:- Cleaning of mechanical parts and systems to remove dirt, debris, and contaminants. Re-lubrication of moving parts to ensure smooth operation.

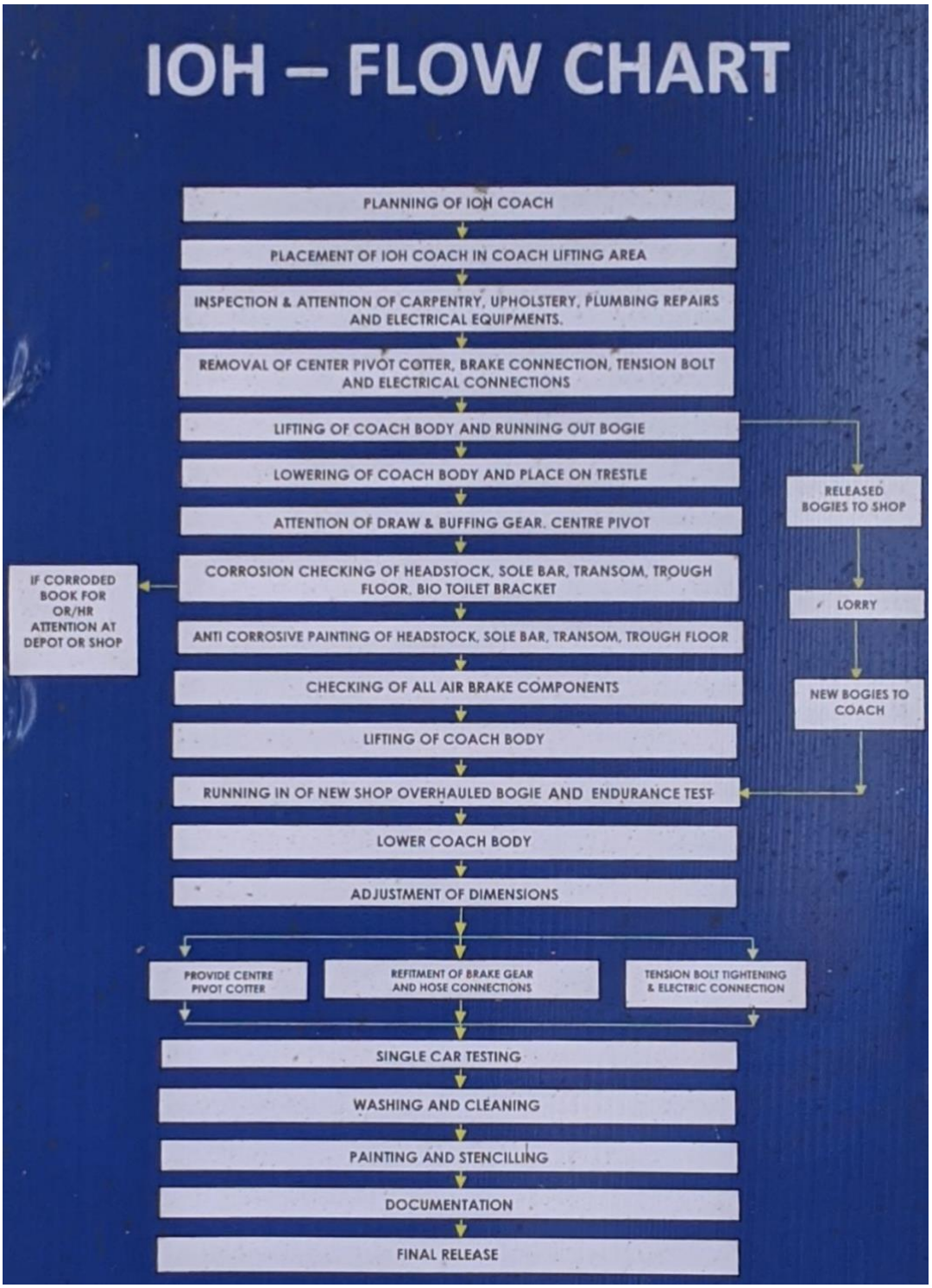
IV. **Electrical and Control Systems**:- Inspection and testing of electrical circuits, wiring, and control systems. Repair or replacement of faulty components like relays, switches, and control panels.

V. **Safety Checks**:- Verification of safety systems such as braking, signaling, and emergency systems. Ensuring that safety protocols and standards are met.

VI. **Structural Integrity**:- Examination of the structural components of the rolling stock, such as the frame and body, to detect any cracks, corrosion, or deformation. Minor repairs to structural elements if needed.

VII. I**nterior and Comfort Systems**:-For passenger coaches, this may include checking and repairing HVAC (Heating, Ventilation, and Air Conditioning) systems, seats, and other amenities. Ensuring that the interior is clean, functional, and comfortable for passengers.

VIII. **Operational Efficiency**: It ensures that the rolling stock operates smoothly and efficiently, reducing the risk of delays and improving reliability.



- **PERIODIC OVERHAULING(POH)**

1. The Periodic Overhauling will be done every 9 months at Trichy, Chennai under the southern Division.
2. Periodic Overhauling (POH) in railways is an extensive maintenance process performed on rolling stock, such as locomotives, passenger coaches, and freight wagons, at scheduled intervals.

3. It involves a complete disassembly of the vehicle, thorough inspection, and overhauling or replacement of worn-out components, including bogies, braking systems, electrical circuits, and structural elements.
4. The process also includes cleaning, reconditioning, and repainting to restore the rolling stock to nearly new condition.
5. Periodic overhauling is essential for extending the lifespan of railway assets, preventing accidents, and maintaining optimal performance in the railway network.

- **KEY ASPECTS OF PERIODIC OVERHAULING(POH)**

1. Comprehensive Inspection and Maintenance - Structural Inspection.
2. Replacement of Worn-Out Components - Wear and Tear
3. Safety Checks - Brake Testing
4. Cleaning and Repainting - Surface Cleaning
5. Interior Refurbishment - Passenger Comfort
6. Testing and Certificate - Post-Overhaul Testing:
7. Documentation and Record-Keeping - Maintenance Records
8. Compliance with Standards - Regulatory Standards

➢ COACH

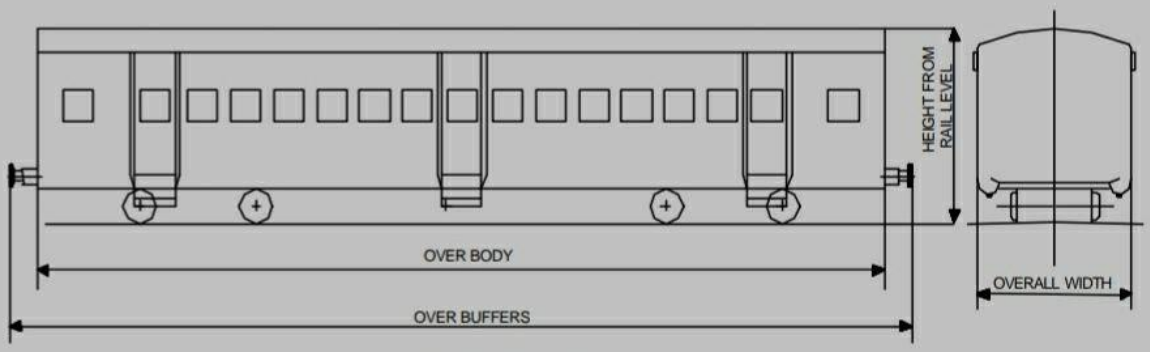
I. A "coach" in a train refers to one of the individual carriages or cars that make up the entire train. Each coach is designed for a specific purpose, typically to carry passengers, but some may be designated for luggage, dining, or other functions.

II. Coaches are connected in a series, forming the train, and each serves a different type of passenger class or utility.

- **CODAL LIFE OF COACHES**

I. Steel bodied coaches (including dining/pantry cars) 25 years
II. IRS coaches 30 years
III. Light utilisation categories of coaches 40years.

Coaches	Over Buffers (mm)	Over Body (mm)	Over all width (mm)	Height from Rail level (mm)
ICF/RCF	22297	21337	3245	4025
BEML	22296	21336	3250	3991
IRS	21996	21030	3251	3886



COACH SHELL

Figure 13. Coach

- **MAINTAINANCE OF COACH:-**

Preventive Maintenance: This involves scheduled inspections and routine servicing to prevent potential failures. It includes tasks like lubrication, checking the condition of bearings, inspecting brake systems, and testing electrical systems.

Corrective Maintenance: Also known as breakdown maintenance, this is carried out when a coach encounters a specific problem or failure. Repairs are made to bring the coach back to operational status.

- **Maintenance Activities:-**

I. Inspection and Testing: Regular inspections are conducted to check the structural integrity of the coach, including the undercarriage, bogies, wheels, axles, and suspension systems. Brake systems, electrical circuits, and signaling systems are also tested to ensure they function correctly.

II. Cleaning and Sanitation: Coaches are cleaned regularly to maintain hygiene. This includes washing the exterior, cleaning windows, and thorough interior cleaning of seats, floors, and lavatories. Special attention is given to pest control and maintaining air conditioning systems.

III. Lubrication and Fluid Checks: Critical moving parts such as bearings, gearboxes, and couplings are lubricated regularly to ensure smooth operation and reduce wear and tear. Fluids in hydraulic systems, if any, are checked and replenished.

IV. Repair and Replacement of Components: Worn-out or damaged parts are replaced during maintenance. This can include anything from seats, windows, and flooring to more complex components like wheels, axles, and electrical systems.

V. Upgrading and Modernization: Coaches may undergo upgrades to improve safety, comfort, or energy efficiency. This can include installing modern amenities, upgrading lighting to LED systems, improving HVAC (Heating, Ventilation, and Air Conditioning) systems, and incorporating new safety features like fire detection systems.

- **Maintenance Facilities:-**

I. Depots and Workshops: Maintenance of coaches is carried out at specialized railway depots and workshops. Depots handle routine and preventive maintenance, while workshops are equipped for major repairs, overhauls, and refurbishments.

II. Inspection Sheds: These are facilities where trains are brought in for quick inspections and minor repairs between journeys. Coaches are inspected for immediate safety concerns, and minor fixes are made on-site.

III. Washing Lines: Dedicated facilities where coaches are washed, both externally and internally, to maintain cleanliness and appearance.

IV. The maintenance of train coaches is a comprehensive and ongoing process that ensures trains are safe, comfortable, and reliable for passengers. It involves a combination of preventive, corrective, and predictive maintenance strategies, supported by skilled personnel and specialized facilities.

- **LIFTING THE COACH BODY**

Before lifting a coach, the following components should be removed, disengaged or disconnected:-

i Dynamo belt on the axle pulley in case of underframe mounted dynamos and disconnection of electrical connection from junction box on alternator in case of bogie mounted alternator.

ii Lavatory chute, if situated over the bogie.

iii Brake pull rod from bogie brake rigging.

iv Centre pivot cotter.

v Axle box safety straps.

vi Bolster safety straps.

vii Steel/ wooden blocks of requisite thickness should be inserted in between the bolster and bogie frame on both sides and of both the bogies so as to keep the bolster springs compressed.

viii Dismantle vertical shock absorbers.

ix Air vent screws on bogie frame above dash pots should be unscrewed completely after cleaning the area around the air vent holes properly.

x Vacuum/air brake fittings

xi Buffer and draw gear

xii Lavatory chutes

xiii Under slung water tanks & WRAS, where provided.

xiv Battery box and electrical fittings.

xv AC equipment in AC coaches.

Coach body will be lifted off the bogies either by 4 jacks of 25 tonnes capacity. The coach body will be lifted uniformly without jerks and will remain horizontal during the lifting/ lowering operation. Coach will not be lifted from any point other than at the lifting pads.

After lifting the coach body the bogie will be replaced with an Overhauled bogie from Chennai. And the old bogie will be transported to Chennai for Overhauling.

- **LOWERING THE COACH BODY**

I. After all the repairs are carried out refit all repaired sub-assemblies which are removed for maintenance and lower the coach body on the overhauled and tested bogies.

II. The Centre pivot cotter should be fitted into position and secured by means of a split pin. A bottom cover should be fitted in position to cover the entire assembly to prevent dust getting in.

- **STAINLESS STEEL ROOF MOUNTED WATER TANK IN COACH**

The Integral Coach Factory (ICF) coach can carry up to 1,800 litres of water. Non-AC ICF coaches have roof-mounted aluminium water tanks with a capacity of 450 litres. However, ICF has been using stainless steel water tanks made from 304 grade since 2015 to address issues with the aluminium tanks.

Presently roof mounted aluminium water tanks of 450 litres capacity are provided in non-AC coaches. With increase in production of coaches, requirement of water tank has gone up.

➢ BRAKING SYSTEM

● INTRODUCTION

In Braking system compressed air is used for operating the brake system. The locomotive compressor yes the feed pipe and the brake pipes throughout the length of the train. The feed pipe is connected to he auxiliary reservoir and the brake pipe is connected to the brake cylinder through the distributor valve. Brake application takes place by dropping the pressure in the break pipe.

PRINCIPLE OF OPERATION OF TWIN PIPE GRADUATED RELEASE AIR BRAKE SYSTEM

● CHARGING THE BREAK SYSTEM

I. Brake pipe throughout the length of train is charged with compressed air at 5 Kg/cm^3

II. Feed pipe throughout the length of train is charged with compressed air at 6 Kg/cm^3

III. Control reservoir is charged to 5 Kg/cm^2.

IV. Auxiliary reservoir is charged to 6 Kg/cm^3.

● BREAK APPLICATION STAGE

I. For brake application the brake pipe pressure is dropped by venting air from the driver's brake valve. Subsequently the following actions take place

II. The control reservoir is disconnected from the brake pipe

III. The distributor valve connects the auxiliary reservoir to the brake cylinder and the brake cylinder piston is pushed outwards for application of brakes.

IV. The auxiliary reservoir is however continuously charged from fzed pipe at 6 Kg/cm^3

- **BREAK RELEASE STAGE**

I. Brakes are released by recharging brake pipe to 5 Kg/cm³ pressure through the driver's brake valve.

II. The distributor valve isolates the brake cylinder from the auxiliary reservoirs.

III. The brake cylinder pressure is vented to atmosphere through DV and the Brake cylinder piston moves inwards.

I. **Brake Pads/Shoes**: These are subject to wear each time the brakes are applied. If not replaced regularly, worn brake pads can lead to reduced braking efficiency or damage to the wheels.

II. **Disc Brakes** (if present): Disc brakes can suffer from warping or cracking due to excessive heat during braking, especially in high-speed applications.

III. **Brake Rigging**: The mechanical linkages and rods that connect the brake system can become worn, loose, or misaligned, affecting braking performance.

Types of AIR Braking system in Railway :-

1. **Auto Braking or Indirect Braking**:- These braking system are provided through out the coaches and loco of a train. And can be applied by the loco pilot or by passengers through chain pulling. This braking also works when a coach is detached from the train and helps to stop automatically without causing any accidents. These braking occurs by the reduction of pressure from the Brake pipe (5 Kg/cm²).
2. **Direct Braking**:- The direct braking can be applied only by the Loco pilot and the Brake will be applied only to the LOCO of the train.
3. **Dynamic braking**:- In locomotives utilizes the train's traction motors to slow it down by converting kinetic energy into electrical energy, which is then dissipated as heat. This system is particularly effective in controlling speed on downhill grades and reducing wear on traditional brakes.

In the air brake system, the colors of the air pipes and their corresponding pressures are as follows:

I. Brake Pipe (BP): Identified by a green coupling, it operates at a pressure of 5 Kg/cm².

II. Feed Pipe (FP): Identified by a white coupling, it operates at a pressure of 6 Kg/cm².

- **Braking System Maintenance:**

I. **Brake Pad/Shoe Replacement**: Brake pads or shoes are regularly checked for wear and replaced when they reach their wear limits. A new brake pad will have maximum width of 40mm and should be replaced before it wear to 10mm or according to its condition.

II. **Brake Disc and Drum Inspection**: Brake discs (for disc brake systems) or drums (for drum brakes) are inspected for wear, cracks, or warping. They are machined or replaced as needed.

III. **Brake Rigging Adjustment**: Ensures that the mechanical linkages and rods in the braking system are correctly aligned and functioning properly.

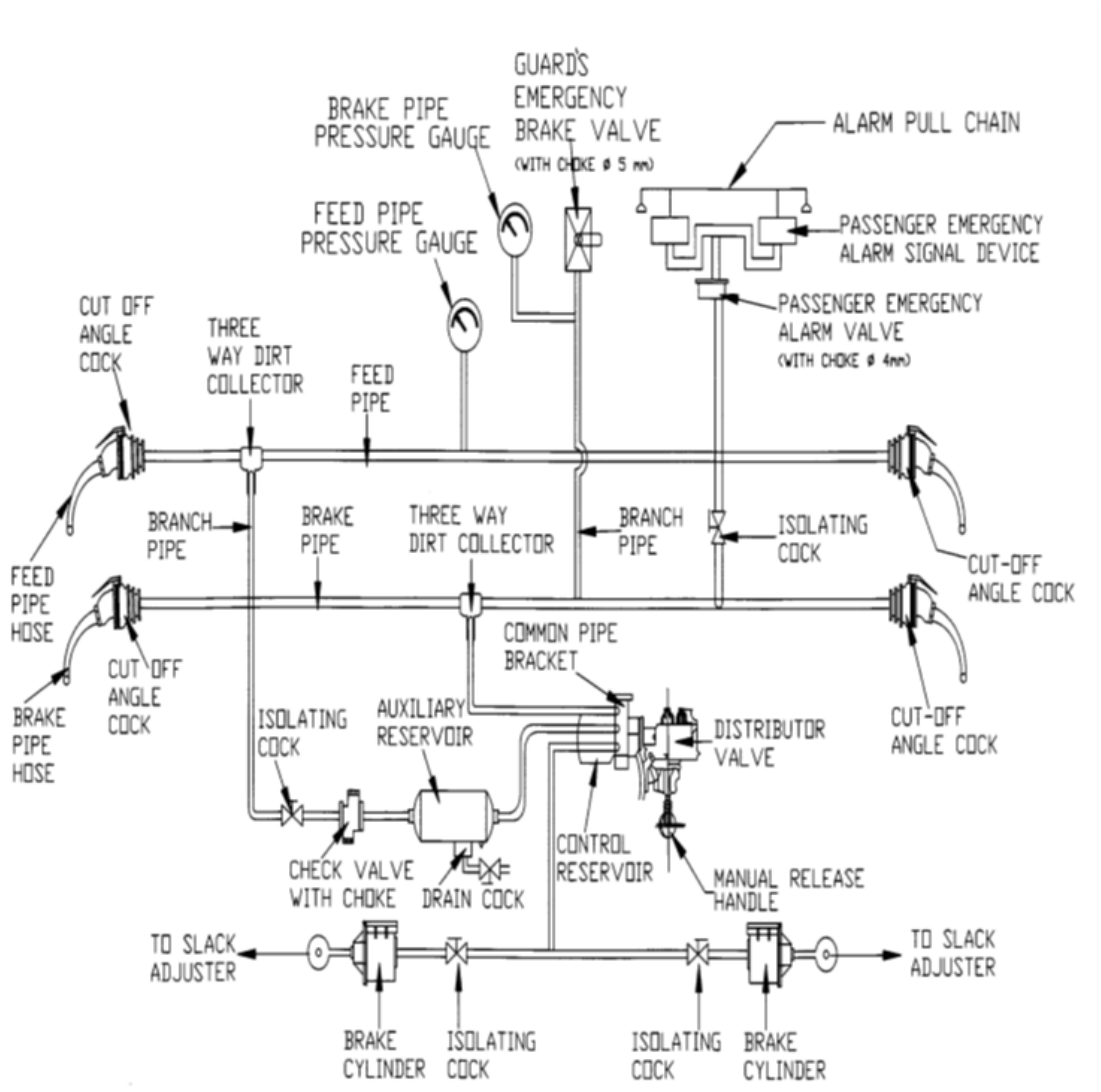
AIR BRAKE

The air brake system operates by utilizing compressed air to control the braking mechanism of trains. Initially, the locomotive compressor charges the brake pipe and feed pipe with compressed air, typically at pressures of 5 Kg/cm² for the brake pipe and 6 Kg/cm² for the feed pipe. When the driver initiates a brake application, the pressure in the brake pipe is reduced, which triggers the distributor valve to allow air from the auxiliary reservoir to flow into the brake cylinder, applying the brakes. The system can perform various types of brake applications, including emergency, full service, and graduated releases, each defined by specific pressure thresholds. For instance, an emergency application occurs when the brake pipe pressure drops to zero, causing the brakes to engage rapidly. Conversely, releasing the brakes involves recharging the brake pipe to 5 Kg/cm², which vents the brake cylinder pressure to the atmosphere, allowing the brake cylinder piston to retract. The twin pipe system enhances efficiency by allowing quicker recharging of the auxiliary reservoir during successive applications, ensuring a responsive and reliable braking system essential for train safety.

The air brake system in trains operates using compressed air to control braking. Initially, the locomotive compressor fills the brake pipe and feed pipe with compressed air, typically at pressures of 5 Kg/cm² for the brake pipe and 6 Kg/cm² for the feed pipe. When the driver applies the brakes, the pressure in the brake pipe is reduced, which activates the distributor valve, allowing air from the auxiliary reservoir to flow into the brake cylinder, thereby applying the brakes.

As the brake cylinder fills with air, it generates mechanical force that pushes the brake shoes against the wheels, slowing the train. For releasing the brakes, the pressure in the brake pipe is increased, which vents the brake cylinder pressure to the atmosphere, allowing the brake cylinder piston to retract and disengage the brakes. The system can perform various applications, including emergency stops, by rapidly dropping the brake pipe pressure to zero, ensuring quick and effective braking. The twin pipe design enhances responsiveness by allowing faster recharging of the auxiliary reservoir during successive brake applications.

Figure 14. Air brake diagram



- **The key components of the air brake system in trains include:**

I. Brake Cylinder: Converts air pressure into mechanical force to apply the brakes.

II. Distributor Valve: Regulates the flow of air to the brake cylinders for application and release. Also known as the heart of braking system.

III. Auxiliary Reservoir: Stores compressed air for use during brake applications.

IV. Control Reservoir: Maintains pressure for controlling the brake system.

V. Common Pipe Bracket: Supports various components and connects the distributor valve.

VI. Intermediate Piece: Blanks unused ports on the common pipe bracket for specific distributor valves.

VII. Brake Hoses: Transmit compressed air between different components of the system.

VIII. Slack Adjuster: Ensures proper clearance between brake shoes and wheels.

IX. Dirt Collector: Prevents contaminants from entering the brake system.

X. Isolating Cock: Allows for isolation of sections of the brake system for maintenance.

These components work together to ensure effective and safe braking in trains.

- **The specific components of the air brake system that are typically of interest for overhauling include:**

I. **Brake Cylinder**: Essential for converting air pressure into mechanical force to apply the brakes.

II. **Slack Adjuster**: Maintains proper brake shoe clearance and ensures effective braking.

III. **Distributor Valve**: Controls the flow of air to the brake cylinders during application and release.

IV. **Common Pipe Bracket and Intermediate Piece**: Supports the distributor valve and manages air distribution.

V. **Brake Hoses**: Transmit compressed air between components, requiring inspection for wear and leaks.

VI. **Auxiliary Reservoir**: Stores compressed air for brake applications, needing checks for pressure integrity.

These components are critical for the overall functionality and safety of the air brake system

- **Common signs that indicate a need for overhauling the air brake system components include:**

I. Reduced Braking Efficiency: Noticeable delays or reduced stopping power when brakes are applied.

II. Air Leaks: Audible hissing sounds or visible air leaks from hoses, fittings, or valves.

III. Worn or Damaged Parts: Visible wear, cracks, or deformation in components like brake cylinders, slack adjusters, or hoses.

IV. Inconsistent Pressure Readings: Fluctuations or failure to maintain proper pressure levels in the brake pipe or auxiliary reservoir.

V. Brake Warning Indicators: Activation of warning lights or alarms in the train's control system related to brake performance.

VI. Frequent Adjustments Needed: Regular need for manual adjustments to maintain brake performance or alignment.

These signs suggest that the air brake system may not be functioning optimally and require immediate attention to ensure safety.

- **CHAIN PULLING**

Chain pulling in Integral Coach Factory (ICF) coaches in Indian Railways involves a mechanical emergency braking system designed to allow passengers to stop the train during emergencies. The system is integrated into the air brake system of the train and operates through a series of mechanical linkages and valves.

Technical Explanation of Chain Pulling in ICF Coaches:

I. **Mechanical Linkages**:

Chain Mechanism: Each passenger coach in an ICF train is equipped with emergency chains, typically located near the doors and along the sides of the compartment. These chains are connected to a mechanical linkage system that runs along the coach.

Linkage to Brake Valve: When a passenger pulls the chain, it activates the linkage system, which transmits the pulling force to the emergency brake valve (Passenger Emergency Alarm Valve or PEAV). This valve is mechanically connected to the train's air brake system.

II. **Pneumatic Brake System**:

Brake Pipe (Main Reservoir Pipe): The ICF coaches are equipped with a continuous brake pipe that runs along the entire length of the train. This pipe maintains air pressure, which is essential for keeping the brakes in the released position during normal operations.

Emergency Brake Valve: The emergency brake valve, actuated by the chain pulling mechanism, is designed to release air pressure from the brake pipe when activated. This valve is a critical component of the pneumatic brake system and is directly responsible for triggering the emergency brakes.

III. **Chain Pulling Operation:**

Activation: When the chain is pulled, approximately requires 8 kg to 10 kg force. The mechanical linkage activates the emergency brake valve. This valve opens, causing a sudden release of compressed air from the brake pipe.

Pressure Drop: The reduction in air pressure within the brake pipe is detected by the brake control system in each coach. This pressure drop causes the automatic application of the brakes throughout the train.

Braking Action: The train's brake shoes are forced against the wheels due to the loss of air pressure, resulting in friction that slows down and eventually stops the train.

Manual Reset Required: After the train stops, the brake system needs to be reset manually. The train crew must restore the air pressure in the brake pipe to release the brakes. This is done by closing the emergency brake valve and recharging the brake pipe from the locomotive's air compressor.

Inspection: The train guard or ALP will inspect the coach where the chain was pulled to determine the cause of the emergency stop and to reset the system for normal operation.

- **Passenger Emergency Alarm Signal Device (PEASD)**

Passenger Emergency Alarm Signal Device (PEASD) is a modern safety mechanism used in Indian Railways to improve the response time and effectiveness of emergency alerts from passengers. PEASD is designed to alert the train crew of an emergency situation without immediately stopping the train, unlike the traditional chain-pulling system. This system is more advanced and efficient, offering better control over emergency responses.

Technical Explanation of PEASD:

1. **System Overview:**

   PEASD Components: The PEASD system consists of several key components, Including emergency alarm switches, signal transmission lines, control units, and an indicator panel in the driver's cabin.

   Location: The emergency alarm switches (sometimes referred to as buttons or levers) are strategically placed inside passenger coaches, typically near doors or at specific intervals along the carriage.

2. **Activation Mechanism:**

   Alarm Switch: When a passenger activates the PEASD by pressing the emergency alarm switch, it sends an electrical signal through dedicated transmission lines.

   Signal Transmission: This signal is transmitted to the locomotive driver's cabin, alerting the crew that an emergency alarm has been triggered. The signal might also include information on the specific coach where the alarm was activated, helping the crew quickly locate the issue.

3. **Driver's Control Interface:**

   Alarm Indicator: The driver's control interface is equipped with an alarm indicator panel that displays the status of the PEASD. When an alarm is triggered, the corresponding indicator light or alert sound is activated.

   Immediate Response: The driver receives the alert but does not apply the brakes automatically. Instead, the driver assesses the situation based on the alarm and can communicate with the on board staff or passengers to determine the nature of the emergency.

Alarm Reset: Once the situation is under control, the PEASD can be reset either by the train crew or automatically after a certain period, depending on the system's design. The reset process clears the alarm from the driver's interface.

The Passenger Emergency Alarm Signal Device (PEASD) in Indian Railways is an advanced safety system that allows passengers to alert the train crew in emergencies without directly triggering an immediate stop. It uses an electrical signal to notify the driver, who can then assess the situation and decide on the best course of action. The system offers greater control, efficiency, and safety compared to traditional chain-pulling mechanisms. Alarm Reset: Once the situation is under control, the PEASD can be reset either by the train crew or automatically after a certain period, depending on the system's design. The reset process clears the alarm from the driver's interface.

Guard Emergency Valve (GEV) in Indian Railways is a critical safety feature designed to allow the train guard to initiate an emergency stop if necessary. This system is particularly important for maintaining train safety and operational integrity in case of emergencies where immediate action is required.

System Overview:

I. **Purpose**: The GEV is a manual valve located in the guard's compartment or near the rear of the train. It provides the train guard with the capability to stop the train in emergency situations by initiating a brake application.

II. **Integration**: The GEV is integrated into the train's air brake system, which is responsible for controlling the application and release of the brakes throughout the train.

Components and Operation:

i. **Guard Emergency Valve (GEV)**: A mechanical or pneumatic valve controlled by the train guard. It is typically located in the guard's compartment or a designated emergency area.

ii. **Brake Pipe Connection**: The GEV is connected to the train's continuous brake pipe, which runs through all the coaches and links the braking system of the entire train.

Activation Mechanism:

I. **Manual Operation**: The guard operates the GEV manually by turning a handle or pulling a lever. This action opens the valve, which releases air from the brake pipe.

II. **Air Pressure Drop**: The release of air causes a sudden drop in the pressure within the brake pipe. This pressure drop is detected by the brake control system in each coach.

Braking Action.

i. **Automatic Brake Application:** The drop in air pressure triggers the automatic application of brakes in all coaches. The train's brake shoes press against the wheels, resulting in a gradual or immediate halt, depending on the extent of the pressure drop.

ii. **Braking Force:** The force of braking is proportional to the amount of air released; a larger release results in stronger braking.

The **Guard Emergency Valve (GEV)** in Indian Railways is a manual valve that allows the train guard to initiate an emergency stop by releasing air from the brake pipe. This results in the automatic application of brakes across all coaches, bringing the train to a halt. The system is essential for handling emergencies but requires careful management to prevent unnecessary delays and ensure safety.

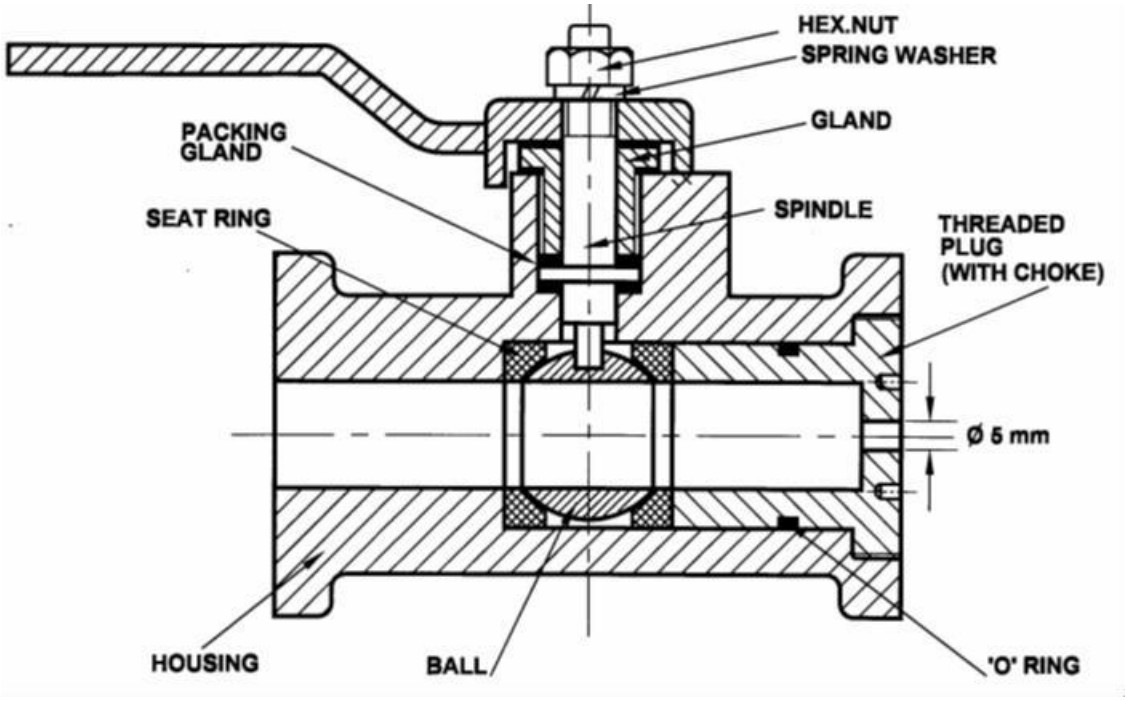
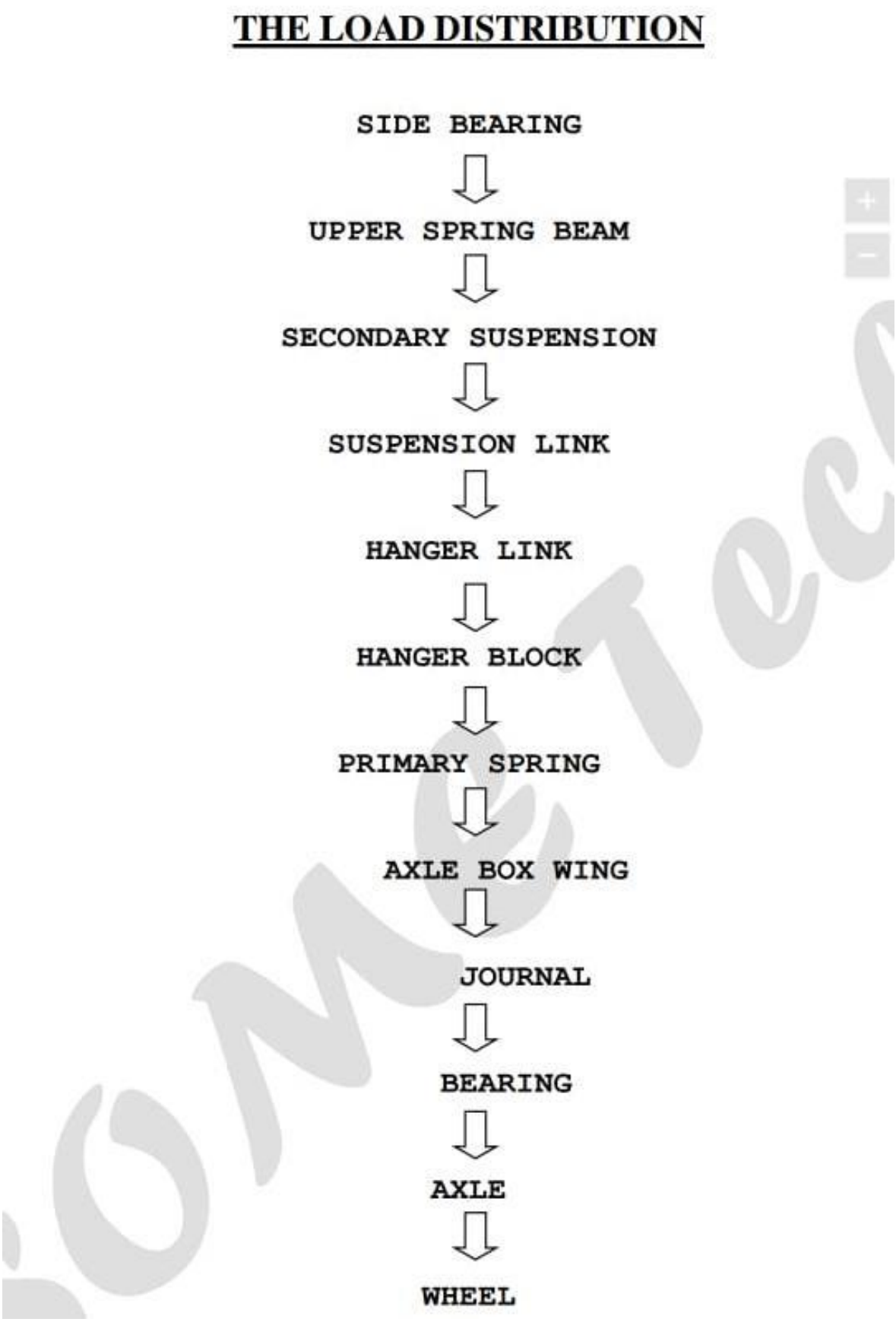


Figure 15. Guard Emergency Valve

LOAD DISTRIBUTION IN ICF COACHES :-



➢ OPERATION AND MAINTANCE OF 140N TONNE CRANE.

A 140-ton hydraulic crane used in railway operations is a powerful and versatile piece of heavy equipment designed to handle large loads and perform lifting and moving tasks on or near railway tracks. Here are some key features and aspects of such a crane:

Capacity: The crane has a lifting capacity of 140 tons, which allows it to handle substantial weights, such as rail components, large equipment, and heavy structures.

Hydraulic System: It uses a hydraulic system to provide the necessary force for lifting and moving heavy loads. This system consists of hydraulic cylinders, pumps, and fluid reservoirs that enable precise control and smooth operation.

Mobility: The crane is often mounted on rail wheels or a specialized rail vehicle, allowing it to move along the tracks.

Boom and Jib: It features an extendable boom and sometimes a jib, which can be adjusted to reach different heights and distances. This flexibility is crucial for accessing and handling materials in various positions.

Stabilizers: To ensure stability during operation, the crane is equipped with outriggers or stabilizers that extend from the base. These help distribute the weight and prevent tipping.

Control System: The crane is operated using a control system, which can be manually operated from a cabin or remotely controlled, providing precise maneuvering and lifting capabilities.

Applications: In railway operations, such a crane is used for tasks like rail track maintenance, replacing rails and sleepers, lifting and positioning railway infrastructure, and moving heavy components during repairs or upgrades.

Overall, the 140-ton hydraulic crane is a critical asset in railway maintenance and construction, offering the power and flexibility needed for efficient and safe handling of heavy loads.

Salient Features

1. All motions hydraulically controlled except brake system.
2. Provision of safe load indicators
3. Quick response in motions Maximum Speed 100 KMPH
4. Loaded Wagon Handling Slewing by 360° with 140 Ton load at 6M radius.

140T crane is having the following assemblies incorporating hydraulic, pneumatic, electrical and electronic equipment:-

a) **Match Truck:-**

Match Truck is Used to rest jib.

Keep main hoist & aux. hoist hook assembly.

Keep Counterweight slabs. Keep lifting tackles.

b) **Jib :-**

Jib/Boom 18.75m long

Minimum Working radius 5.5 meter and Maximum Working radius 18.0 meter

Jib main body is of hollow type and of box shape

Jib is lifted by two gantry ropes one of which is fitted with load sensing devices.

Boom angle sensor is mounted on the fork end inner side.

c) **Undercarriage:-**

Crane undercarriage is pivoted on two bolsters which are mounted on three axle bogie wheels. A Crane suspension in each bogie consists of four spring packs, each pack with two stacks of coil springs (inner and outer) and two stacks of disc springs diagonally arranged.

The spring suspension arranged can be blocked by axle blocking arrangement.

d) **Superstructure.**

Crane Bogie :-

Each Fabricated bogie with three axle sets.

Coil & Disc springs are fitted in suspension.

Brake disc fitted on each wheel.

Counter weights in B.D. Cranes :

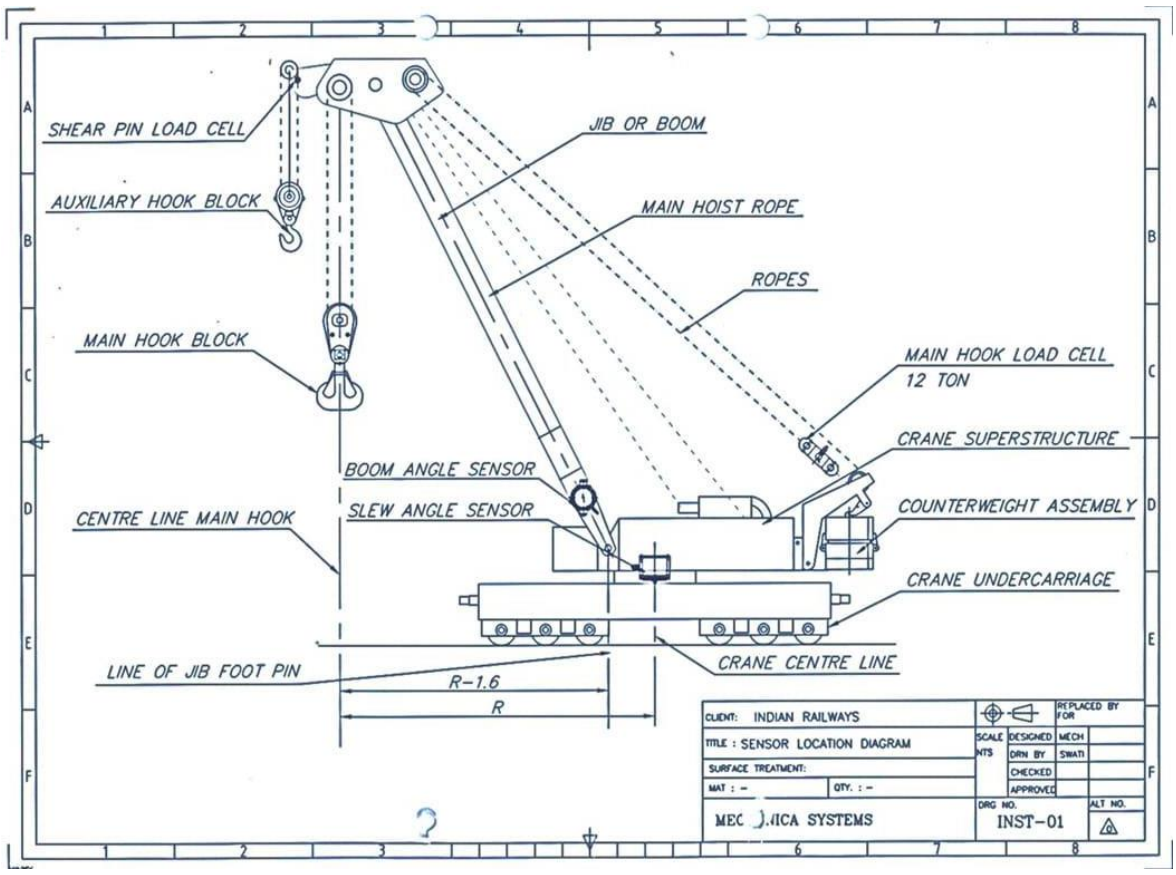
The counterweight consists of 3 counterweight slabs :

Counterweight 1 -24 t

Counterweight 2 - 15 t

Counterweight 3 -08 t

The counterweight slabs are combined by means of a connecting mechanism and spacer brackets and secured by means of locking claws onto the crane counterweight support.



BASIC CRANE MOTIONS

• Hoisting: The movement of the hook, main or auxiliary, with or without load, when being raised or lowered vertically, Jib remaining stationary.

• Slewing: The movement of the superstructure along with jib rotating about a vertical axis.

• Derricking: Raising and lowering of Jib in a vertical plane.

• Travelling: This is the self-travel of the crane.

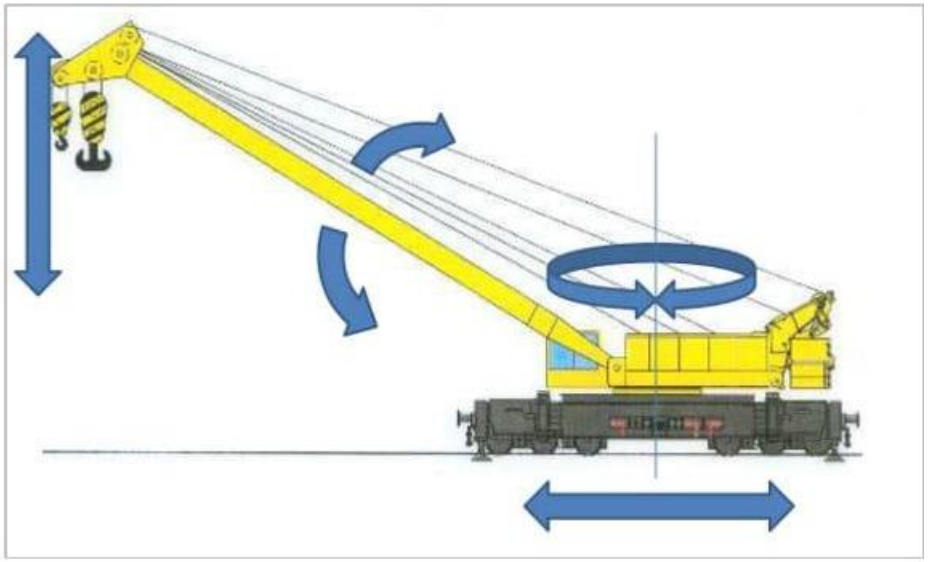


Figure 16. crane

Figure 17. 140 Tonne crane

➢ PIT WHEEL LATHE

Lathe Overview

The Underfloor Wheel Lathes, including models TF2000, TF2000HD, TF2000TM, and TF2000HDTM, are advanced CNC-controlled machines specifically designed for the reprofiling of wheels on trains, trams, and metros. These latches are engineered to accommodate various axle loads, with the TF2000 handling up to 20 tons and the TF2000HD up to 30 tons. Their ergonomic design ensures operator comfort and efficiency during the machining process.

The tools used in these lathes are precision cutting tools capable of exerting a maximum cutting effort of 1700 daN. They allow for a versatile cutting depth ranging from a minimum of 0.2 mm to a maximum of 10 mm, enabling the latches to perform detailed and accurate wheel profiling. This capability is essential for maintaining the safety and performance of railway vehicles.

The machining process is systematic and consists of five distinct cycles. It begins with vehicle positioning, followed by profile measuring before machining to assess the current state of the wheels. The lathe then performs wheel profiling and brake disc machining, after which a second profile measurement is conducted to ensure accuracy. Finally, the vehicle is removed from the lathe, completing the cycle.

For programming, the lathes utilise the SIEMENS 840D CNC model, which is known for its reliability and precision. The programming language employed is SIEMENS Step7 (Ladder), allowing for complex machining operations to be executed efficiently. Additionally, the system can store up to 100 programmed profile data, providing flexibility and adaptability for various wheel types and specifications.

Tool Used in CNC Underfloor Wheel Lathes

The CNC Underfloor Wheel Lathes utilise precision cutting tools specifically designed for wheel profiling and machining. These tools are capable of exerting a maximum cutting effort of 1700 daN, ensuring effective material removal and shaping of the wheel surfaces.

The cutting tools allow for a variable cutting depth, ranging from a minimum of 0.2 mm to a maximum of 10 mm, which enables the lathe to perform detailed adjustments and refinements on the wheel profiles. This versatility is crucial for maintaining the safety and performance of railway vehicles, as it allows for precise machining according to the specific requirements of different wheel types.

Additionally, the lathes may incorporate various tool accessories, such as chip disposal devices and smoke extractors, to enhance operational efficiency and

maintain a clean working environment during the machining process. Overall, the tools used in these lathes are integral to achieving high-quality results in wheel reprofiling.

Tungsten carbide tools are essential in CNC Underfloor Wheel Lathes due to their exceptional hardness, wear resistance, and ability to maintain sharp cutting edges, making them ideal for machining railway wheels. Their durability allows them to withstand high stresses and abrasive conditions, resulting in longer tool life and reduced downtime. Additionally, tungsten carbide's stability at elevated temperatures ensures precision and efficiency, enabling higher speeds and feed rates, which ultimately enhances productivity and ensures high-quality machining of critical railway components.

PROCESSING IN CNC PIT LATHE :-

1. First of all the Bogie is examined and according to that which Bogie is having major defect will be turned first according to other in proportion to other wheel set.
2. The wheel set which is having defect will be positioned in the CNC Pit Lathe for wheel turning.
3. The wheel set is placed between two rollers and the required profile is selected.
4. Then clamping is done for free rotation and the wheel is lifted and rail will be removed this response will be given in the link switch.
5. Then the Bearing adapter will clamp at the bearing on the both sides providing a downward support.
6. The Guide holder will provide the support to the wheel from the both sides.
7. And Roller carrier will roates the wheel and provide a vertical support.
8. The diameter of the wheels are determined by using the wheel guage(1600+2/-1)
9. Using the Wheel guage the diameter is determined from circumference of the wheel. And flange thickness is also determined.
10. Then after selecting the required diameter the cutting tool

    TUNGSTEN CARBIDE with 8 edges will turn the wheel and make the wheel to required dia and profile.

11. The RPM and feed of the cutting tool will be controlled by using a Regulator.

12. And finally before finishing the dia & flange thickness is measured to accurate finishing process.

IMPORTANT FACTORS TO NOTED DURING CNC TURNING:-

1. The wheel Diameter for ICF should be between 915mm – 825 mm.
2. The maximum difference between 2 wheels of the wheelset should be be 0.5mm .
3. The maximum difference between to wheelset of the same Bogie should not be greater than
   - 5mm for ICF Coaches.
   - 2mm for vandbharath.
   - 18mm for Goods.
4. The profile of wheel should be 1 to 2.

Figure 18. CNC Lathe

➢ ACCIDENT RELIEF TRAIN (ART)

The Accident Relief Train (ART) is a specialized train designed to provide immediate assistance and conduct rescue operations at the site of train accidents. It is equipped with essential tools and equipment to facilitate the relief and restoration process, ensuring that help reaches the affected area as quickly as possible. The ART is strategically stationed at various railway locations to minimize response time, with a target dispatch time of 30 minutes during the day and 35 minutes at night upon receiving an accident report.

ARTs are equipped with a variety of equipment, including cranes capable of lifting heavy loads, tool vans, and staff vans. The cranes have a minimum capacity of 140 tonnes for Broad Gauge (BG) and 60 tonnes for Meter Gauge (MG), allowing them to handle derailed or damaged rolling stock effectively. Additionally, the train carries

first aid supplies, fire extinguishers, and other safety items, ensuring that the crew can address immediate medical needs and safety concerns at the accident site.

When an accident occurs, the ART is dispatched with precedence over other trains, ensuring it reaches the site without delay. The crew, trained in emergency response, utilizes the equipment onboard to conduct rescue operations, restore communication, and assist injured passengers. Regular maintenance and inspections of the ART ensure that all equipment is in good working order, ready for deployment whenever needed.

The equipment used in ART includes:

1. HRE Sets: Heavy Rescue Equipment for various operations.
2. Cutting Equipment: Gas cutting and plasma cutting tools.
3. Air Compressor: With air bags for various applications.
4. Fire Extinguishers: DCP and water mist types for safety.
5. Safety Equipment: Life jackets, floating rings, and SCBA.
6. Measuring Tools: Track measuring tools and various types of tools.
7. Communication Devices: Walkie-talkies for coordination.
8. Lighting: Inflatable tower lights for visibility.
9. Ladders and Ropes:Portable aluminium ladders, wire ropes, and nylon ropes.

Figure 19. Accident relief train

SPART

Self Propelled Accident Relief Trains (SPART) are specialized trainsets designed for rapid response to railway accidents on the Indian Railways (IR). They are equipped to provide immediate medical assistance and rescue operations, ensuring that help reaches accident sites quickly and efficiently. SPART can operate at speeds of up to 160 km/h and are strategically stationed at key locations to cover areas within 150 to 200 kilometres in 1 to 2 hours.

Requirement and Services

SPART is required in the event of consequential train accidents, which include collisions, fires, and derailments that result in significant human injury or property damage. The trains carry essential medical equipment, emergency tools for extricating passengers, and provisions for medical care, including an operation theatre for emergency surgeries. They also provide supplies for the rescue team and affected passengers, such as food and drinking water.

Response Time

Upon receiving information about an accident, SPART is expected to be dispatched within a maximum of 20 minutes, and 25 minutes for one ended track. This rapid response capability is crucial for providing timely medical attention and facilitating the rescue of injured individuals. The design and operational protocols ensure that SPART can mobilize quickly to minimize the impact of railway accidents.

Special Features

SPART is designed for a lifespan of not less than 36 years and is built to require minimal unscheduled repairs during normal operations. The trainsets are equipped with advanced medical and rescue equipment, including hydraulic rescue devices and a fully furnished medical van. Their bi-directional operation capability allows for flexibility in responding to emergencies, making them a vital component of the disaster management system on Indian Railways.

Compartment Structure

A Self Propelled Accident Relief Train (SPART) typically consists of three compartments: a Tool Van, a Medical Van, and a Supervisor Van. The Tool Van is equipped with hydraulic rescue devices, cutting tools, and other emergency equipment necessary for extricating passengers from debris. The Medical Van contains an operation theatre, medical supplies, and facilities for emergency surgeries, ensuring that immediate medical care can be provided to injured individuals.

Equipment in SPART

The Self Propelled Accident Relief Train (SPART) is equipped with a variety of specialised tools and medical supplies tailored for emergency response. In the Tool Van, essential equipment includes Hydraulic Rescue Devices (HRD) such as cutters, hydraulic pumps, manual pumps, hoses, jacks, re-railing bridges, ladders, gas cutters, and inflatable air bags. This equipment is crucial for extricating passengers trapped in debris and managing the accident scene effectively.

Medical Equipment

The Medical Van is furnished with state-of-the-art medical equipment to provide immediate care to injured individuals. It includes an operation theatre equipped for emergency surgeries, anaesthesia apparatus, defibrillators, pulse oximeters, and a resuscitation kit. Additionally, the van carries sterilise dressing materials, splints, first aid supplies, blankets, clothing for the injured, and emergency medicines, ensuring comprehensive medical support is available on-site.

Coordination and Efficiency

Effective coordination among the staff in each compartment is essential for a successful response to accidents. The medical team assesses and treats injuries, while the rescue team works to clear debris and ensure the safety of the area. The Supervisor oversees the entire operation, ensuring that resources are allocated efficiently and that communication is maintained with control centres for ongoing support and updates. This structured approach allows SPART to deliver comprehensive and timely assistance during railway emergencies.

Figure 20. Self Propelled Accident Relief Train

- ROLLING EXAMINTION OF COACHES

All terminating trains should be given rolling in examination while entering a station/yard with a train examination depot. To carry out this examination the Train Examiner and his staff should take up positions on both sides of the lines short of the normal halting place on which the train is to be received. The following inspection should be carried out during the rolling in examination:

- In motion inspection and observation of under gear of wagons for any loose or dangling components and flat places on tyres/wheels.
- Immediately after the train has come to a halt, all axle boxes should be felt within 20 minutes of the train arrival and those, which are found running at high temperature, should be marked for opening/checking at the time of examination and attention if necessary.
- Examination of any abnormal behaviour of any of the vehicles or any other observation which may relate to unsafe working condition.
- The rolling in examination must be conducted to detect any skidded wheel. Defect in the brake system or faulty manipulation by the driver may cause skidding of wheels.
- Incoming BPC should be collected by yard C&W staff.
- The speed of a train during a rolling examination can vary based on several factors, including the type of examination being conducted, the specific procedures followed, and the regulations of the railway system in use. Typically, a rolling examination is performed while the train is in motion to check for various issues such as wheel wear, alignment, and other critical components.
- In many cases, the train might be traveling at a speed that allows for effective inspection while maintaining safety. This speed can range from very slow (a few kilo meters per hour) to moderate speeds, depending on the equipment and the requirements of the inspection. For detailed and precise information, it's best to consult the specific guidelines and regulations set by the railway operator or regulatory body overseeing the examination process.

➢ PIT LINE MAINTENANCE

Pit Lines are washing lines with open dumping pit at base, throughout the track. It is used for al type of cleaning and maintenance to make the compartment, for next journey. These pita Ines are utilized to drain out sewage water (Washroom & Coach Interior Cleaning) anda Thorough Checking & Repairing Coach Base parts. Every train is required to be cleaned prior to start its next journey. Availability of Pit lines at/nearby the stations would minimize the empty haulage of trains which occurs due to non-availability of these line at stations and the rakes have to be dispatched to yard for maintenance.

Figure 21. Pit line maintenance

➢ DISASTER MANAGEMENT

I. Three-coach self-suficient Self-propelled Accident Relief Train (SPART) capable of running at 140 kmph, for quicker initial response would be introduced.

II. Rationalization of existing locations of Accident Relief Trains (ART) and Accident Relief Medical Vans (ARMV) would be undertaken for faster availability at site.

III. For rescue operations, need to obtain police clearance would be obviated.

IV. It is the self-propelled vehicle, therefore, no need of locomotive to haul the ART

V. It is consisting of two nos, of engines having capacity 345 HP each (Under Stung Prime Mover) are installed which are synchronized to get optimum speed Incorporation With two nos, of transmission in axle driven units.

VI. In case of failure of one unit under the slung unit with the help of another unit, it can be driven by the rested speed of 30Kmph to clear block section.

VII. DTC/Tool van can equip S&T gears, HRE, Electrical fittings for illumination (i.e. ASKA light) and gas & cold cutting equipment, gauges, trolleys for material handling And different lubricating oil.

VIII. Its POH is carried out after an interval of 3.5 Years.

➢ BIO TOILET

Bio-toilets in trains are a type of toilet system that uses biological processes to decompose human waste, rather than traditional chemical-based systems. They are also known as "eco-friendly toilets" or "green toilets."

Working:

1. Human waste is collected in a tank.

2. Microorganisms (like bacteria and fungi) are added to the tank to break down the waste.

3. The microorganisms feed on the organic matter, converting it into carbon dioxide, water, and biomass.

4. The treated waste is then discharged as a harmless, odorless liquid.

Bio-toilets in trains offer several benefits:

1. Reduced water usage

2. Minimal waste generation

3. No need for chemical treatment

4. Low maintenance

5. Odor-free and hygienic

Indian Railways has been installing bio-toilets in trains since 2011 to reduce environmental pollution and improve passenger amenities.

Figure 22. Bio toilet

➢ RAKE TEST

Rake testing is a critical procedure performed on the air brake systems of railway coaches to ensure their safety and functionality. This testing is conducted at primary or secondary maintenance depots using a portable device known as a Test Rig or a locomotive. The process begins with transporting the rake to the maintenance depot, where the Test Rig is set up near the first coach. The brake pipe (BP) and feed pipe (FP) of the coach are connected to the Test Rig, allowing for the necessary air pressure to be applied.

In every 4 days the washing will be done in the Rake pit line and along with all the sufficient under gear Inspection will be done including the cleaning of dirt collector of the feed pipe and Brake pipe. The brake pad if worn will be replaced.

Along with electrical inspection will be done mainly checking the Alternator, electrical conducts and the interior overhead electrical equipments would be inspected.

The rake testing procedure involves several key activities. Initially, a visual examination is conducted to check for any loose suspension brackets, damaged brake or feed pipe hoses, and other potential issues. Following this, the setup for the rake test is prepared, which includes charging the feed pipe to a specified pressure and ensuring that all angle cocks are appropriately opened or closed. The system is then charged for a set duration, and the pressures in the BP and FP are monitored to ensure they meet specified standards.

Subsequent tests include leakage tests, service application tests, and release tests to verify the integrity and performance of the air brake assemblies. Additionally, manual brake release tests and micro switch tests are performed to ensure all components function correctly. The entire process is crucial for maintaining the safety of train operations, as it ensures that the air brake systems are in optimal working condition before the rake is put back into service. Regular rake testing is mandated after every round trip to uphold safety standards and prevent potential accidents caused by brake system failures.

Brake Power Certificate (BPC)

The Brake Power Certificate (BPC) is a critical document in the railway industry, serving as a formal assurance that a train's braking system is functioning effectively and safely. This certificate is essential for maintaining the operational integrity of trains, as it directly impacts the safety of passengers and cargo. The issuance of the BPC is the responsibility of railway authorities, specifically at the primary end of the train's journey. This means that before a train departs from its starting station, the relevant railway personnel conduct thorough checks and assessments of the braking system to ensure compliance with safety standards.

The validity of the BPC varies depending on the type of train and its operational parameters. For instance, for passenger trains equipped with toilets, the BPC is valid for a distance of 3500 kilometers or a duration of 96 hours, whichever comes first. In contrast, dedicated parcel trains have a longer validity period, allowing for 4500 kilometers or 10 days. This variability in validity is crucial, as it reflects the different operational demands and safety requirements associated with various types of trains. Additionally, certain categories of trains, such as Rajdhani and Duronto, require a fresh BPC to be issued from both ends of their journey, while others may only need it from the primary end.

Obtaining a BPC involves a systematic process that includes preventive maintenance schedules, under gear examinations, and brake system checks. These procedures are typically conducted at the pit line, where railway staff perform detailed inspections and maintenance tasks to ensure that all components of the braking system are in optimal condition. The BPC is issued only after these checks are satisfactorily completed, and it serves as a record of the train's braking capabilities. Furthermore, the BPC must be renewed or reissued after specific intervals or distances traveled, ensuring that the train remains compliant with safety regulations throughout its operational life.

The importance of the BPC cannot be overstated, as it plays a vital role in ensuring the safety of train operations. A valid BPC signifies that the train has undergone rigorous checks and that its braking system is capable of performing effectively under various conditions. This is particularly important in preventing accidents, as a malfunctioning brake system can lead to catastrophic failures, endangering the lives of passengers and crew members. Moreover, the BPC also serves as a legal document that can be referenced in case of any incidents or investigations, providing a clear record of the train's maintenance history and compliance with safety standards.

In addition to safety, the BPC also contributes to the overall efficiency of train operations. By ensuring that trains are equipped with reliable braking systems, railway authorities can minimize delays and disruptions caused by mechanical failures. This, in turn, enhances the reliability of train services, fostering public confidence in the railway system. Furthermore, the BPC is part of a broader framework of regulations and standards that govern railway operations, ensuring that all trains adhere to the same safety protocols and operational guidelines.

In conclusion, the Brake Power Certificate (BPC) is an indispensable element of railway safety and operational efficiency. Issued by railway authorities at the primary end of a train's journey, the BPC varies in validity based on the type of train and its operational parameters. The process of obtaining a BPC involves thorough inspections and maintenance checks, underscoring its importance in ensuring that trains operate safely and effectively. Ultimately, the BPC not only protects the lives

of passengers and crew but also enhances the overall reliability and efficiency of train services, making it a cornerstone of modern railway operations.

Maintenance Procedures for Issuing a Brake Power Certificate (BPC)

Before issuing a Brake Power Certificate (BPC), several critical maintenance procedures must be followed to ensure the train's braking system is safe and operational.

1. **Preventive Maintenance Schedules**: Regular preventive maintenance schedules must be adhered to at the pit line, focusing on the overall condition of the train and its components. This includes routine inspections and servicing to identify and rectify any potential issues before they escalate.

2. **Under Gear Examination**: A thorough under gear examination is conducted, which involves inspecting the train's braking system components, such as brake shoes, cylinders, and linkages. This examination must be performed at the primary end and is crucial for identifying wear and tear or any mechanical failures.

3. **Brake System Maintenance**: Maintenance of the brake system is essential and must be completed within specified limits, such as 3500 Kms or 96 hours after the original BPC is issued. This includes checking the functionality of the air brake system, ensuring that all components are in good working order, and making necessary adjustments or repairs.

4. **Internal Cleaning and Passenger Amenities**: Internal cleaning of the train is performed, along with attention to passenger amenities, ensuring a clean and comfortable environment for passengers. This includes checking and replenishing water supplies and ensuring that all facilities are operational.

5. **External Cleaning**: External cleaning of the train is also necessary, which involves washing the exterior and ensuring that all visible components are free from dirt and debris. This is typically done at the primary end with proper facilities.

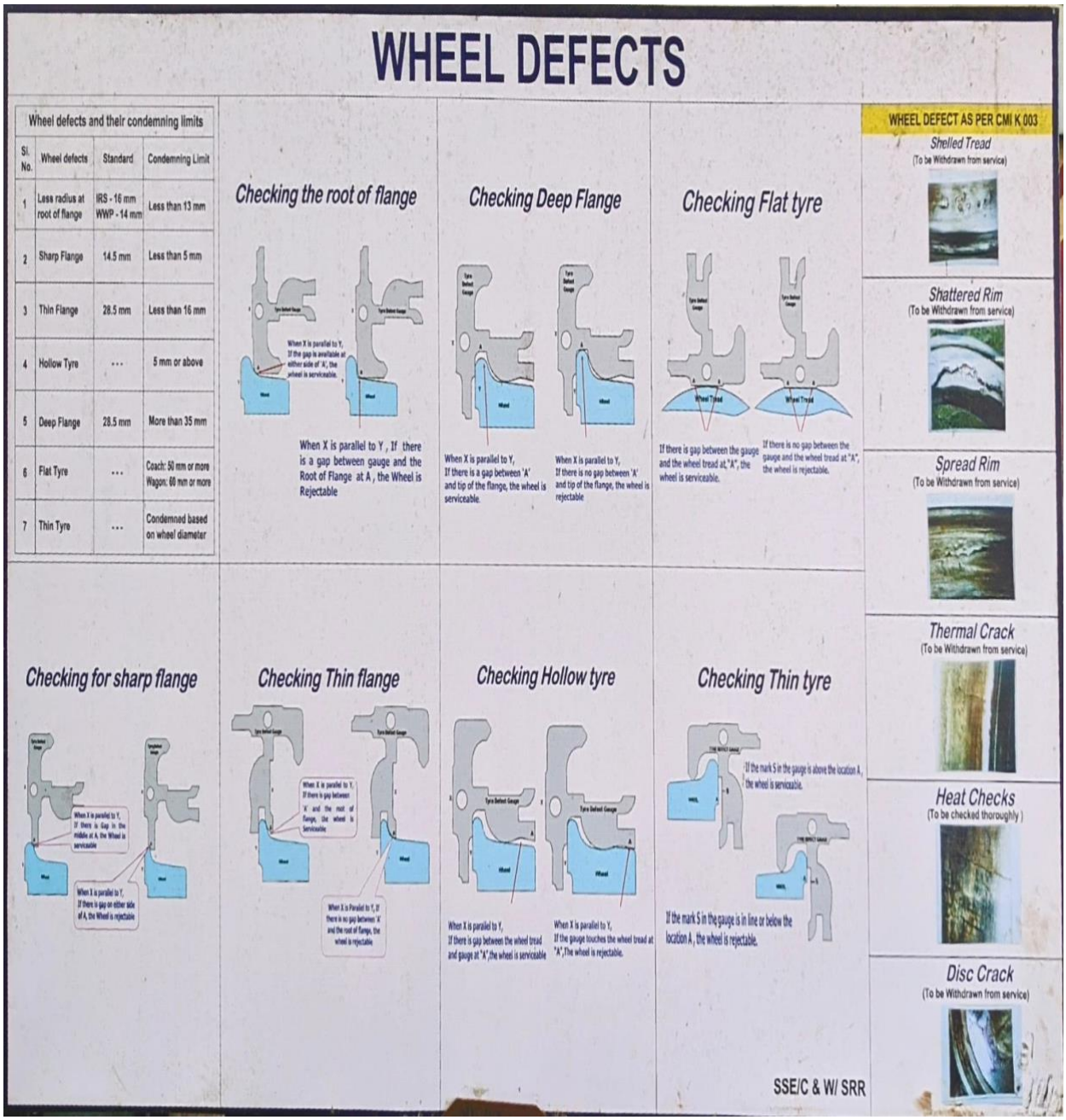
6. **Enroute and Terminating Examination**: Enroute examinations are conducted after every 250 to 350 kilometers of travel, with checks at designated locations. A terminating examination is also performed at the terminating station to ensure that the train is in good condition before it begins its next journey.

7. **Brake System Check**: A final brake system check is performed prior to departure at the platform. This includes a continuity check if the train is stabled at the platform or a complete brake power check with endorsement on the original BPC if it is not.

These maintenance procedures are essential for ensuring that the train's braking system is reliable and safe, ultimately leading to the issuance of a valid BPC.

Figure 23. Rake test

➢ WHEEL DEFECTS :-



HOT AXLE BOX DETECTION (HABD)

Hot Axle Box Detection is a train monitoring system that detects overheating in the bearings of railway vehicles. Hot Axle Box Detection helps to prevent serious railway incidents, such as derailments and fires, caused by overheated bearings.

The system helps to detect potential problems early on, allowing for timely corrective action to be taken. This can help to prevent costly repairs, improve the safety and reliability of railway operations, and enhance the overall customer experience. Failed bearings on rolling stocks present serious safety risks, potentially leading to catastrophic events such as derailment or fire. A rise in the heat generated by a bearing is found to be a good predictive diagnostic of a bearing about to fail .Thus, monitoring the hot axle box bearing temperature with EKE-Train net improves train safety by detecting wheel set bearings presenting a risk of failure.

Figure 24. Hot Axle Box Detection

CONCLUSION

This training focused upon increasing our knowledge and interest in the Production of Railway Carriage & Wagons. Because It is most efficient and necessary needs to peoples in these days so its production at most efficient method with minimum cost and in proper sequence with less wastage. It was a great experience. The internship increases

Our practical skills that's the main thing which we learnt in the training session. Thus, we believe that our training session will be beneficial for various purposes & hence our efforts will be fruitful.

THANK YOU