



(भारत सरकार/Govt. of India)
(रेल मंत्रालय/Ministry of Railways)

Handbook on Bogie mounted Brake System for Freight Stock

मालगाड़ी में प्रयुक्त बोगी माउन्टेड ब्रेक सिस्टम
पर हस्तपुस्तिका



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Indian Railways
Centre for Advanced Maintenance Technology
Maharajpur, Gwalior – 474 005

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**Handbook on
Bogie Mounted Brake
System
for
Freight Stock**

PREFACE

Bogie mounted Brake System (BMBS) has been introduced for freight stock. Recently, Air Brake freight stocks with BMBS on Indian Railway are working with single pipe/twin pipe graduated release air brake system. Air brake system with BMBS is most efficient and reliable braking system used to run heavy and long trains at high speeds. The maintenance details of BMBS for freight stocks are given in this handbook.

The objective of this book is to provide a tool to the staff involved in maintenance of freight trains fitted Air brake system with BMBS to reduce cases of brake system failures thereby improving safety & reliability of freight stock. This handbook prepared by the CAMTECH with the purpose of disseminating the information to all those in freight stock maintenance field.

This hand book is aimed at assisting concerned staff and does not supersede any existing instructions from Railway Board, RDSO or IRCA etc. Most of data and informations mentioned here in are available in some form the other in various books and manuals or other printed matter. If any changes are made, these will be used in the form of correction slips. For convenience, this book includes a proforma for entering all correction slips serially.

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

Date: - 26.09.2012

**K.P. Yadav
Director/ Mech
CAMTECH/GWL**

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Where "XX" is the serial number of the concerned correction slip (starting from 01 onwards).

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BOGIE MOUNTED BRAKE SYSTEM FOR FREIGHT STOCK

1.0 INTRODUCTION

In the air brake system, a lot of developments have taken place such as bogie mounted Air brake system, Twin pipe air brake system, Automatic load sensing device etc,. As a result, the maintenance and requirements have changed considerably.

Recently, Bogie mounted Brake System (BMBS) has been introduced for freight stock. The details and maintenance of BMBS are given in this handbook.

2.0 DESCRIPTION OF BMBS

The Bogie Mounted Brake system (BMBS) equipment (Given in figure-1) consists of a transversely mounted pneumatic Brake Cylinder with a self-contained, double acting slack adjuster, two brake beams, two bell crank levers and interconnecting push rods. The hand brake arrangement is available as a mechanical model with two flexible handbrake cables. The pneumatic Brake Cylinder is 10" in diameter for application with high friction brake shoe (K type) on casnub type bogies. The system consists of a unique design with two pneumatic Brake Cylinder (one per bogie) to deliver reliable braking performance and is light in weight. It fits into CASNUB bogie and uses 58 mm thick brake shoes.

Brake cylinder contains an integral double acting slack adjuster, which provides optimal braking force and minimizes shoe & wheel wear. The design is with high

strength and minimal brake beam deflection.

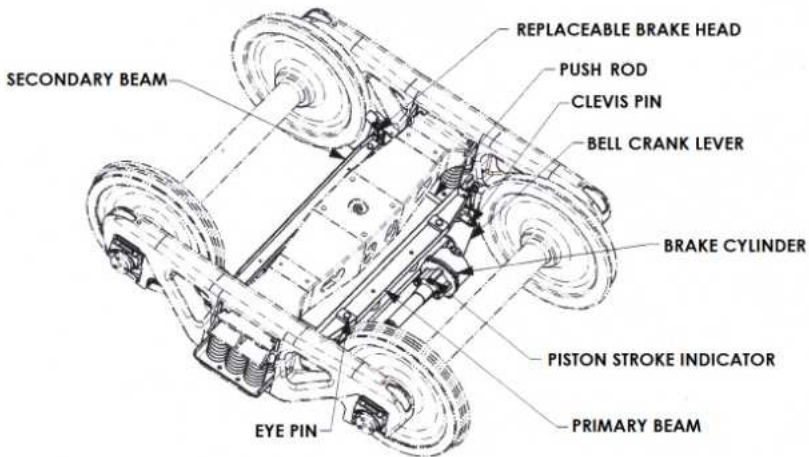


FIGURE -1

3.0 WORKING DESCRIPTION OF BMBS

During application, the air is introduced into the brake cylinder, which forces out the piston along the ram assembly. The brake cylinder is floating in nature, as result the brake cylinder extends equally on both the sides. This extension of brake cylinder causes the rotation of the bell crank levers on their pivot (which is on primary brake beam) and forces the push rod to move towards the secondary beam. This movement causes the secondary brake beam to move towards the wheels and apply force on the wheels. Simultaneously a reaction force is developed which causes the primary brake beam (along with levers and brake cylinder) to move towards the wheels. The primary brake beam continues to move until it touches the wheels and apply force on the wheels.

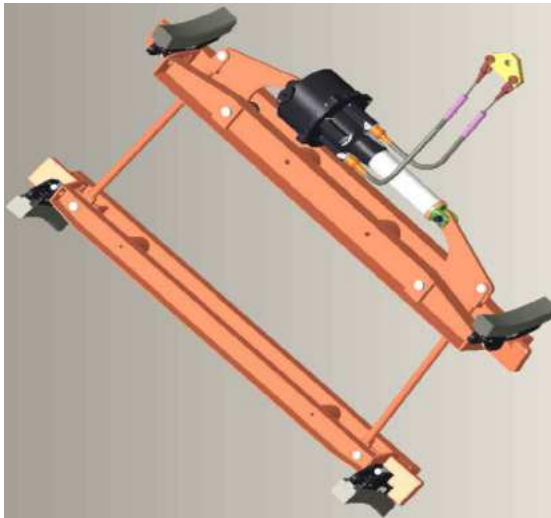
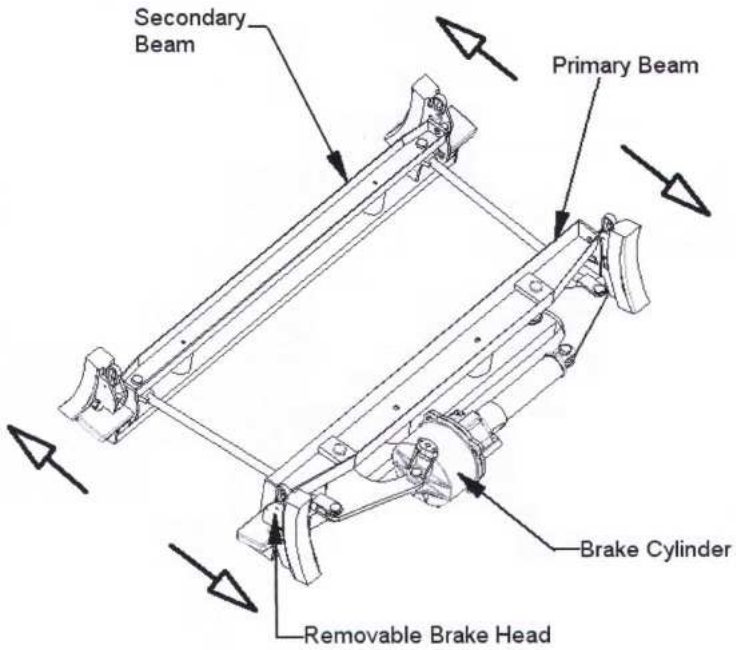


FIGURE -2

**FIGURE -3**

When the brakes are released, the air from the brake cylinder is exhausted to the atmosphere through the Distributor valve. The return spring inside the brake cylinder pushes the piston along with the ram assembly back to its original position. The bell crank levers rotate back, causing the beams to move back to their earlier positions. The brake cylinder is equipped with a double acting slack adjuster. If there is any wear (Brake Shoe/Wheel) or any slackness in the structure, it will be automatically compensated by the built in slack adjuster which pays out to fill the gap.

4.0 SELIANT FEATURES

More Safety

Two nos. of 10" brake cylinders with inbuilt double acting slack adjuster have been used per wagon. Along with this an automatic load-sensing device has been used for two stage braking (empty / loaded). This delivers optimum braking performance and hence increases safety parameters.

Reliability

Instead of one 14" cylinder, two 10" cylinders have been provided per wagon (one per bogie)., This increases the

system reliability as in case of failure of one cylinder the wagon can be moved on another cylinder with the isolation of failed cylinder.

Cost Reduction

a) Maintenance cost

Two cylinders are provided with inbuilt slack adjuster, re-screwing of slack adjuster is automatic and can be done from the side of the wagon by a crow bar. The system simplified installation and even shoe wear helps extend the turn round time between wagon maintenance intervals.

b) Fitment cost

The BMBS is drop in fit product as new brake beams are provided to slide in the existing chutes of bogie. It is very easy to assemble no special training or tools are required for assembly.

c) Pay load cost

A unique design that delivers optimum braking performance while minimizing weight. With the system has reduced the tare weight of wagon.

Easy Retro fitment

This brake system can be easily fitted on any standard bogie without making any modifications. This is a drop in fit system and does not require any kind of modifications in the existing bogie.

Simplified Hand Braking Installation

In this system, hand brake is easy to install provides improved reliability and safety. There is minimum number of levers in the hand brake mechanism.

Replaceable Brake Heads

Improved features replaceable brake heads which do not require disassembly of the bogie for installation. This system is a direct acting system and does not require levers

or reverse direction devices.

Integral Double Acting Slack Adjuster

Integral double acting slack adjuster maintains a constant 56mm piston stroke, resulting in uniform and efficient braking performance even as the brake shoes and wheel wear. The slack adjuster has a total make up of 500 mm, compensating for 192 mm of nominal brake shoe wear and 188 mm of nominal wheel wear.

Beam Design

The Beam design dramatically reduces bending loads in the beams, enabling the use of lighter structure with no sacrifice in the performance. In this system, cylinder is mounted parallel to the brake beams and transfers forces through the bell cranks. This parallelogram design improves the efficiency and aligns the braking forces with the wheels, which reduces the shoe and wheel wear.

Under Bolster Design

In this system push rods are positioned under the bolster and can be configured to work with all bogie designs.

- ❖ BMBS is reduces bending loads in the beams, enabling the use of lighter structure with no sacrifice in the performance. The brake cylinder is mounted parallel to the brake beams and transfers forces through the bell cranks. This parallelogram design improves the efficiency and aligns the braking forces with the wheels, which reduces the shoe and wheel wear.
- ❖ The system delivers optimum braking performance while minimizing weight.
- ❖ The system can be easily fitted on any IR standard casnub bogie without making any modifications. This is a drop in fit system and does not require any special tools and training for installation/assembly.
- ❖ To achieve uniform wheel loading, the loads are applied to the ends of the brake beam instead of center.
- ❖ The system uses IR standard 58 mm thick K type brake

blocks.

- ❖ A replaceable brake head design permits the reuse of the beam in the event that the brake heads gets damaged. Replacement of the brake head is quickly accomplished by removal of only one pin.
- ❖ The push rods are positioned under the bolster. With this system the track clearance has been increased, as there is nothing under the spring plank of the bogie.
- ❖ Instead of one 14" cylinder, the system uses 2 nos. of 10" brake cylinders per wagon, one per bogie. This increases the system reliability as in case of failure of one brake cylinder, the wagon can be moved on with other brake cylinder with the isolation of failed brake cylinder.
- ❖ The integral double acting slack adjuster of the brake cylinder maintains a constant piston stroke resulting in uniform brake performance even as the brake shoes and wheels wear. The slack adjuster has a total make-up capacity of 500 mm, which will compensate for total combination of shoe wear, wheel wear and clearance.
- ❖ Re-screwing of slack adjuster is automatic and can be done from the side of the wagon by a pry bar.
- ❖ All cylinders are equipped with an automatic piston stroke indicator.
- ❖ The hand brake systems uses two steel hand brake cables pulled through standard hand brake rigging as a means to apply the hand brakes. The cables provide a flexible and lightweight interface to the hand brake actuator.
- ❖ Simplified installation and even shoe wear helps extend the turn round time between wagon maintenance intervals.
- ❖ The system also has an automatic pressure modification (APM) device for two stage braking (empty / loaded). It is fitted between wagon under frame and the bogie side frame.

5.0 SINGLE PIPE GRADUATED RELEASE AIR BRAKE SYSTEM

Some of the Air Brake goods stock on IR is fitted with single pipe graduated release air brake system. In single pipe, brake pipes of all wagons are connected. Also all the cut off angle cocks are kept open except the front cut off angle cocks of BP of leading loco and rear end cut off angle cock of BP of last vehicle. Isolating cocks on all wagons are also kept in open condition. Auxiliary reservoir is charged through distributor valve at 5.0 kg/cm^2 .

A. Charging stage

During this stage, brake pipe is charged to 5 kg/cm^2 pressure which in turn charges control reservoir and auxiliary reservoir to 5 kg/cm^2 pressure via distributor valve. At this stage, brake cylinder gets vented to atmosphere through passage in Distributor valve.

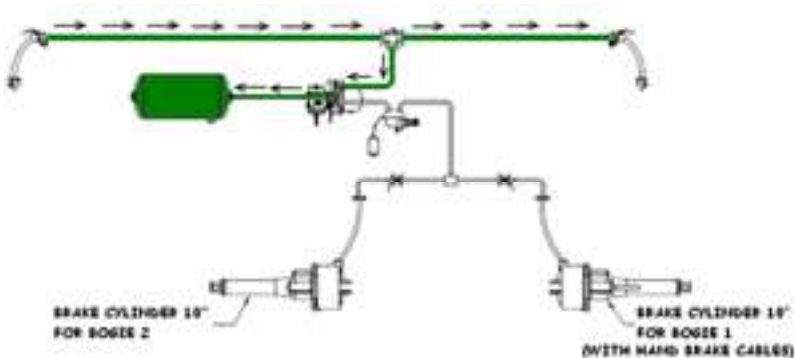


FIGURE -4. CHARGING

B. Application Stage

For application of brakes, the pressure in brake pipe has to be dropped. This is done by venting air from driver's brake valve. Reduction in brake pipe pressure positions

the distributor valve in such a way that the control reservoir gets disconnected from brake pipe and auxiliary reservoir gets connected to brake cylinder. This results in increase in air pressure in brake cylinder resulting in application of brakes. The magnitude of braking force is proportional to reduction in brake pipe pressure.

Note: Brake Application takes places when Brake pipe pressure is dropped by Intentional or Accidental.

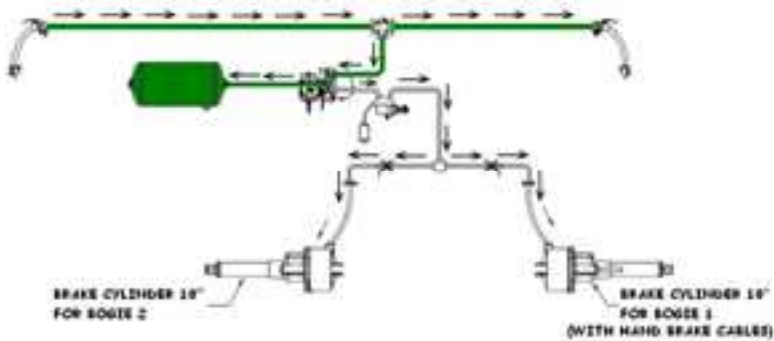


FIGURE -5 . APPLICATION

C) Release stage

For releasing brakes, the brake pipe is again charged to 5 kg/cm² pressure by compressor through driver's brake valve. This action positions distributor valve in such a way that auxiliary reservoir gets isolated from brake cylinder and brake cylinder is vented to atmosphere through distributor valve and thus brakes are released.

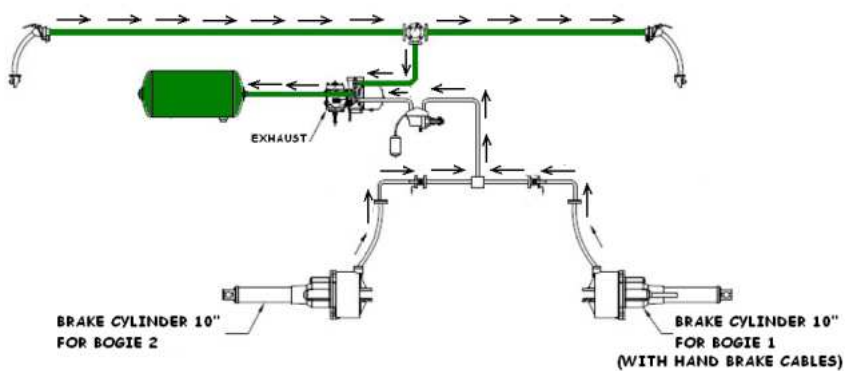


FIGURE -6. *RELEASE*

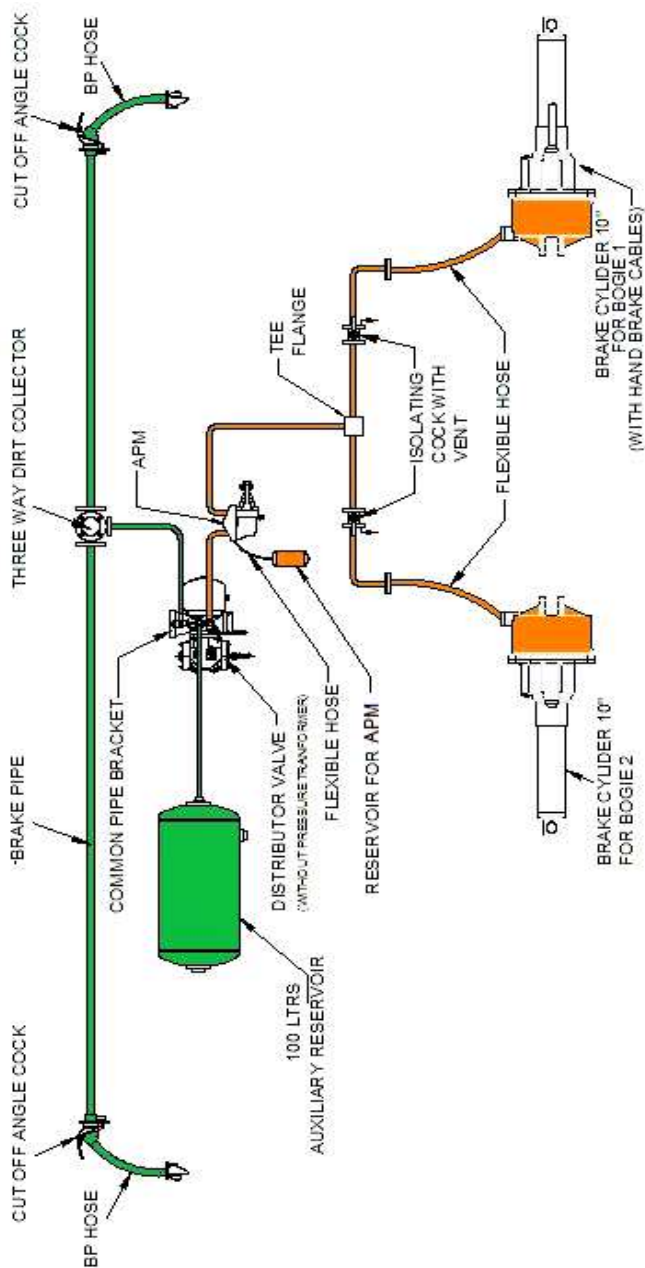


FIG. 7. LAYOUT OF SINGLE PIPE AIR BRAKE SYSTEM

6.0 TWIN PIPE GRADUATED RELEASE AIR BRAKE SYSTEM

Some of the Air Brake goods stock is fitted with Twin pipe graduated release air brake system. In Twin pipe, brake pipes and feed pipes of all wagons are connected. Also all the cut off angle cocks are kept open except the front cut off angle cocks of BP/ FP of leading loco and rear end cut off angle cock of BP and FP of last vehicle. Isolating cocks on all wagons are also kept in open condition. Auxiliary reservoir is charged to 6.0 Kg/cm^2 through the feed pipe.

A. Charging stage

During this stage, brake pipe is charged to 5 kg/cm^2 pressure and feed pipe is charged to 6 kg/cm^2 pressure which in turn charges auxiliary reservoir to 6 kg/cm^2 pressure. At this stage, brake cylinder gets vented to atmosphere through passage in Distributor valve.

B. Application Stage

For application of brakes, the pressure in brake pipe has to be dropped. This is done by venting air from driver's brake valve. Reduction in brake pipe pressure positions the distributor valve in such a way that the control reservoir gets disconnected from brake pipe and auxiliary reservoir gets connected to brake cylinder. This results in increase in air pressure in brake cylinder resulting in application of brakes. The magnitude of braking force is proportional to reduction in brake pipe pressure

Note: Brake Application takes places when Brake pipe pressure is dropped by Intentional or Accidental.

C. Release stage

For releasing brakes, the brake pipe is again charged to 5 kg/cm^2 pressure by compressor through driver's brake valve. This action positions distributor valve in such a way that auxiliary reservoir gets isolated from brake cylinder and brake cylinder is vented to atmosphere through distributor valve and thus brakes are released.

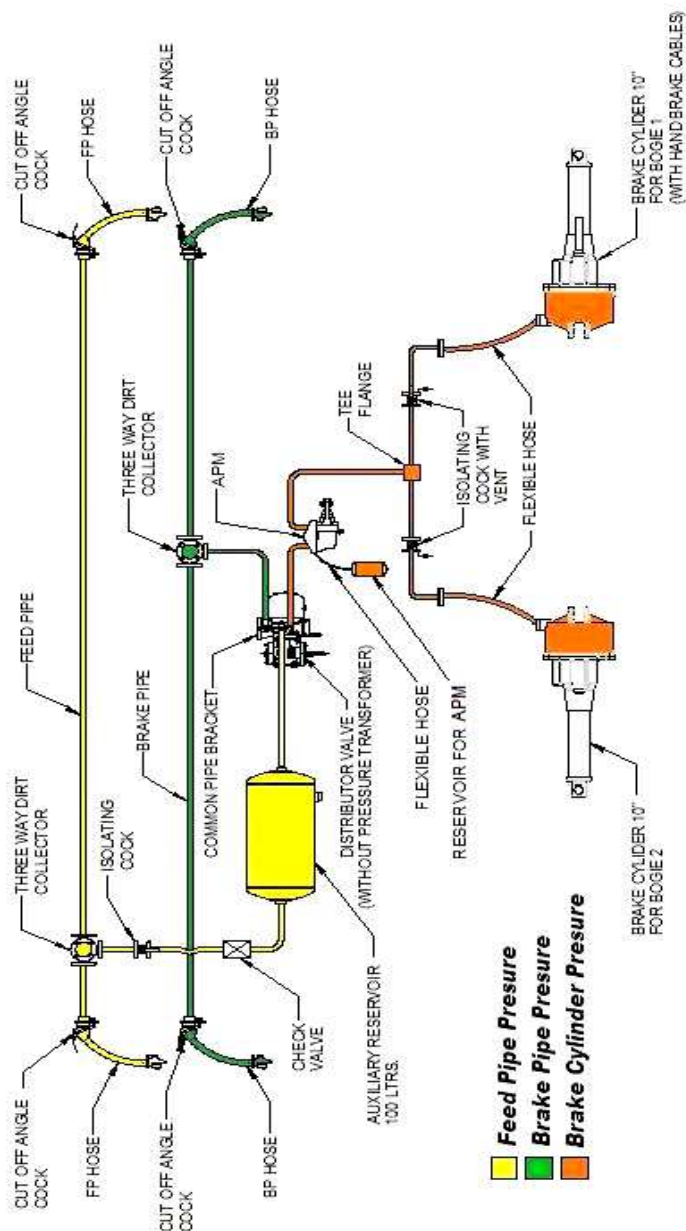


FIG. 8. LAYOUT OF TWIN PIPE AIR BRAKE SYSTEM

7.0 WORKING PRINCIPLE OF BMBS HAVING APM VALVE

The brake system provided on the wagons with BMBS is single / twin pipe graduated release system with automatic two stage braking. Its operating principle is as follows.

Schematic layout of single / twin pipe graduated release air brake system as provided on the wagons is shown in figures 6 & 7. Brake pipe / Feed pipe runs through the length of wagon. Brake pipes / Feed pipes on consecutive wagons in a train are coupled to one another by means of hose coupling to form a continuous air passage from the locomotive to the rear end of the train. Brake pipe is charged to 5 kg/cm^2 through the compressor of the locomotive. Brake pipe is charged to 5 kg/cm^2 through the compressor of the locomotive. Feed pipe is charged to 6 kg/cm^2 .

The wagons are, provided with Automatic pressure modification (APM) device to cater for higher brake power in loaded condition instead of the conventional manual empty load device. With the provision of this, brake cylinder pressure of $2.2 \pm 0.25 \text{ kg/cm}^2$ is obtained in empty condition and $3.8 \pm 0.1 \text{ kg/cm}^2$ is obtained in the loaded condition.

To obtain this a change over mechanism, APM under-frame and side frame of the bogie. The mechanism gets actuated at a pre-determined change over weight of the wagon and changes the pressure going to the brake cylinder from $2.2 \pm 0.25 \text{ kg/cm}^2$ to $3.8 \pm 0.1 \text{ kg/cm}^2$ in case of changeover from empty to loaded and vice versa

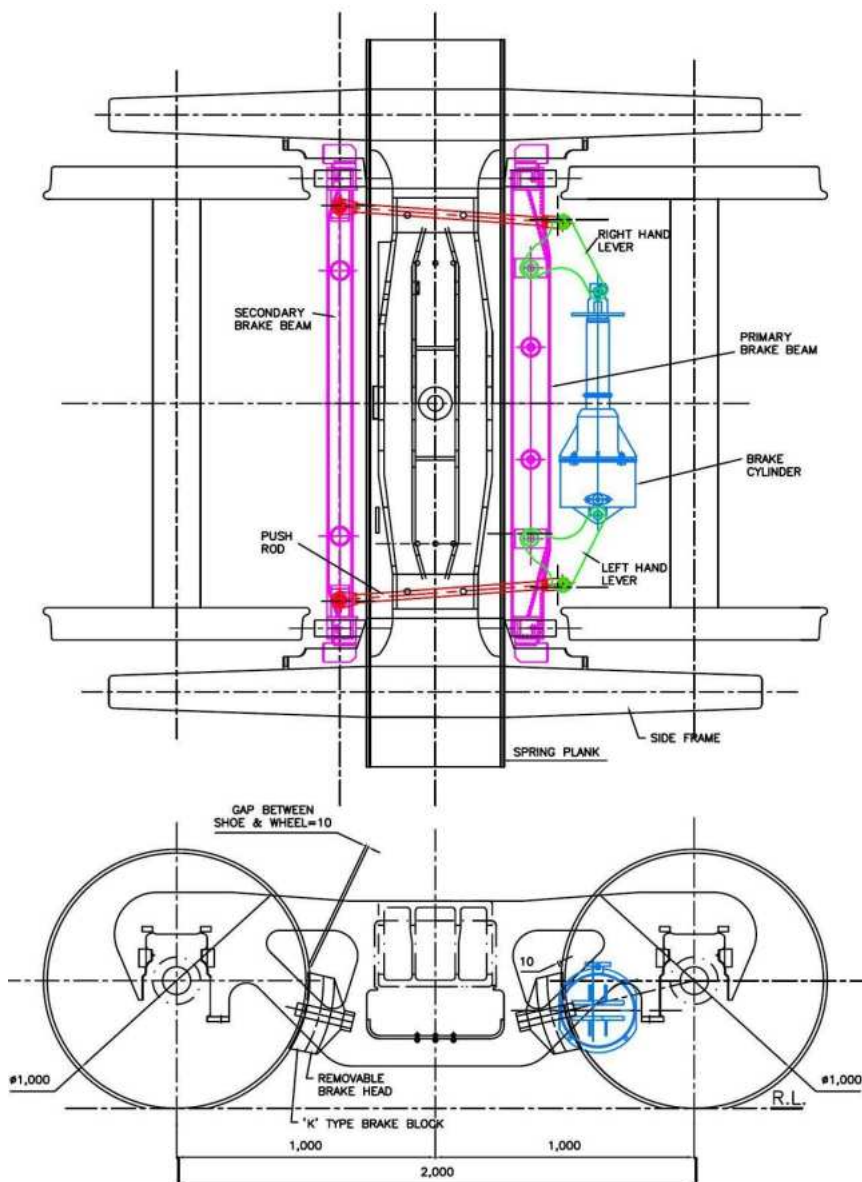


FIG. 9. DIAGRAM OF BOGIE FITTED WITH BMBS

For application of brake, air pressure in the brake pipe is reduced by venting it to the atmosphere from driver's brake valve in the locomotive. The reduction of the brake pipe pressure, positions the distributor valve in such a way that the auxiliary reservoir is connected to the brake cylinder through the APM device and thereby applying the brake. The distributor valve gives an output pressure of 3.8 kg/cm^2 for the brake cylinder which is routed through the APM device. Based on the position of sensor arm of APM device, it gives an output of $2.2 \pm 0.25 \text{ kg/cm}^2$ for empty position braking and an output of $3.8 \pm 0.1 \text{ kg/cm}^2$ for loaded position braking in the wagon.

During full service brake application, a reduction of 1.3 to 1.6 kg/cm^2 takes, a maximum brake cylinder pressure of $3.8 \pm 0.1 \text{ kg/cm}^2$ in loaded condition and $2.2 \pm 0.25 \text{ kg/cm}^2$ in empty condition is achieved. Any further reduction of brake pipe pressure has no effect on the brake cylinder pressure. During emergency brake application, the brake pipe is vented to atmosphere very quickly; as a result the distributor valve acquires the full application position also at a faster rate. This result in quicker built up of brake cylinder pressure but the maximum brake cylinder pressure will be the same as that obtained during a full service brake application.

For release of brakes, air pressure in the brake pipe is increased through driver's brake valve. The increase in the brake pipe pressure results in exhausting the brake cylinder pressure through the Distributor valve. The decrease in the brake cylinder pressure corresponds to the increase in the brake pipe pressure. When the brake pipe pressure reaches 5 kg/cm^2 , the brake cylinder pressure exhausts completely and the brakes are completely released.

8.0 EQUIPMENTS DESCRIPTION OF BMBS

Distributor Valve with Common Pipe Bracket and Control Reservoir

The distributor valve assembly consists of distributor valve, common pipe bracket, adapter, control reservoir and gasket. All pipe connection to distributor valve is through the common pipe bracket. The distributor valve along with the adapter can be removed from the pipe bracket without disturbing the pipe connection for maintenance purpose.

The control reservoir of 6 liters volume is directly mounted to the pipe bracket. An isolating cock (R-charger handle) is provided on the distributor valve to isolate the distributor valve when found defective. The handle of the R-charger will be placed in vertical position when the distributor valve is in open position and horizontal when the distributor valve in closed position. A manual release handle is provided at the bottom of the distributor valve by which the brake in a particular wagon can be released manually by pulling the handle.

The distributor valve used with bogie mounted brake system has a different set of Application & Release chokes to achieve the timings as specified in the RDSO specification 02-ABR. The choke sizes to be used for Distributor valve fitted on wagons with BMBS for KE Version of distributor valve are 1.42 mm for Application & 1.52 mm for release. The other makes of distributor valves should be adopted with suitable choke sizes to achieve Brake Application & release timings as specified in 02ABR but with a stroke of 110 mm of 14" Brake Cylinder. For identification, the Distributor Valve is equipped with a name plate" BMBS " on choke cover.

Brake Cylinder with built-in Double acting Slack Adjuster

The brake cylinder receives pneumatic pressure from auxiliary reservoir after being regulated through the distributor valve and APM device. Brake cylinder develops mechanical brake power by outward movement of its piston with ram assembly.

The piston rod assembly is connected to the brake shoes through a system of rigging arrangement to amplify and transmit the brake power. The compression spring provided in the brake cylinder brings back the ram thus the rigging is also brought to its original position when brake is released.



FIG. 10. BRAKE CYLINDER - 10\"DIA.

The built-in slack adjuster compensates for the wear of brake blocks during the brake application through equivalent pay-out. For paying-in, a pry bar is applied between the brake shoe and wheel and the rigging is pushed in.

The brake cylinder has got a double acting slack adjuster as a result the actuator of brake cylinder will continue to move out till all the slack in the system is take care off and

reaction force of the wheels is encountered. This ensures that every time every time the brake application takes place, sufficient brake force is delivered on the wheels.

The brake cylinder compensates for any change in gap between brake block and wheel through the inbuilt slack adjuster. Therefore it maintains a constant gap between the shoe and wheel and hence a constant piston strike. The slack adjuster works in both the condition whether there is an increase or decrease in gap. Since the brake cylinder maintains a constant piston stroke, there is no need to measure the piston stroke time and again.

There is an indicator on the brake cylinder to show the "APPLIED" or "RELEASED" condition of the Brake Cylinder. Don't hit the indicator, it may retract slowly. Hitting can bend / damage the indicator.

The brake cylinder has slack adjustment of 500 mm which could compensate of brake block wear of 48 mm (From 58 to 10 mm) and wheel wear of 47 mm (i.e., wheel dia reduce from 1000 mm to 906 mm).

The brake cylinders used on the bogie mounted brake system are of two types; with hand brake cables and without hand brake cables. The brake cylinder with hand brake cables are used for interface with the hand brake arrangement on the wagons.

APM Device

APM device is interposed between bogie side frame of casnub bogie and the under frame of the wagon. It is fitted for achieving 2-stage load braking with automatic changeover of brake power. Only one APM is required per wagon. It restricts the brake cylinder pressure coming from the Distributor valve to $2.2 \pm 0.25 \text{ kg/cm}^2$ in empty condition of the wagon and allows the brake cylinder

pressure of $3.8 \pm 0.1 \text{ kg/cm}^2$ in loaded condition of the wagon. The sensor arm of the APM device comes down for sensing only during the brake application.

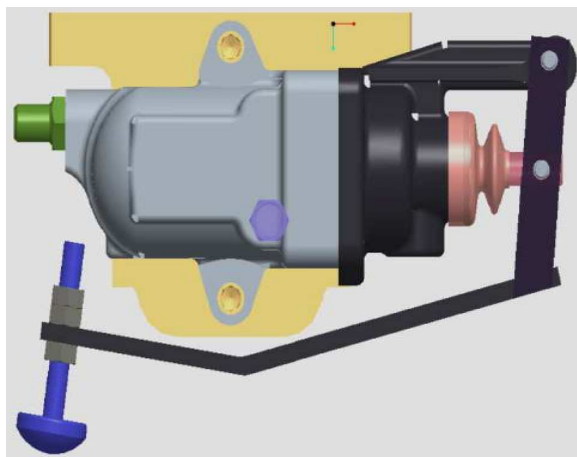


FIGURE: 11- APM DEVICE

The complete movement of the sensor point is 104 mm. The first 80 mm of the sensor point is for the loaded zone and the balance is for the empty zone. The deflection of the bogie from tare to changeover weight is added to 80 mm to arrive at the total movement of the sensor point to be adjusted on the wagon. The gap between the sensor point and the bogie is to be measured at the point it touches the top surface of the side frame. Also ensure that the sensor point touches in the middle of the side frame.

It has an indicator to show the empty or loaded position. Whenever the indication is "ON" i.e., it is showing the orange colour, it is indicating the empty condition with brake cylinder pressure of $2.2 \pm 0.25 \text{ kg/cm}^2$. When there is no indication in the indicator, it is loaded condition with $3.8 \pm 0.1 \text{ kg/cm}^2$ going to the brake cylinder. It has a quick connect socket to connect the gauge to the check the pressure through the pressure gauge.

Auxiliary Reservoir

An auxiliary reservoir of 100 liters is provided on each wagon to store compressed air. It is charged to 5 Kg/cm^2 pressure through the distributor valve in case of single pipe system. However in case of twin pipe system, it is charged to 6 Kg/cm^2 through the feed pipe.

The auxiliary reservoir is made out of sheet metal. On both the ends of the reservoir, flanges are provided for pipe connection. One end of the reservoir is kept blanked for operation with single pipe brake system. A drain plug is provided at the bottom of the reservoir for draining the condensate.

Cut-Off Angle Cock

Cut off angle cocks are provided at the ends of brake pipe / feed pipe on each wagon. These cocks are closed at the time of uncoupling of wagons. The vent provided in the cock facilitates easy uncoupling of hose coupling by venting the air trapped in the hose coupling when the cock is closed. The handle of angle cock is spring loaded having a self locking type of arrangement to avoid any inadvertent movement from open to close position or vice versa. The handle has to be lifted to operate the angle cock. When the handle is parallel to the pipe the cock is in open position and when at right angles to the pipe it is in closed position.

Hose Coupling for Brake / Feed pipe

The hose couplings are provided to connect brake pipeline & feed pipe line throughout the train. It consists of rubber hose connected to coupling head and nipple by "Band it" type of clamps. The nipple goes into the angle cock and the coupling heads are coupled together. Rubber gasket is used in the coupling head to make the joint leak proof.

Dirt Collector

Dirt collector is provided at the junction of the main brake pipe and branch pipe. This is meant for removing dust from the air prior to entering the distributor valve. This is achieved by centrifugal action.

Isolating Cock

Isolating cock without vent is provided in the FP line of the twin pipe wagons. The isolating cock is used to isolate the FP pressure to the Auxiliary reservoir. The isolating cocks are OLP type meaning that when the handle is parallel to the body, it is an open position for the cock.

Isolating Cock with vent

Isolating cocks with vent are provided in BC lines for isolating the mal-functioning brake cylinders on the wagon. The vent side of the isolating cock is to be maintained towards the brake cylinders in order to exhaust the pressure from the brake cylinder whenever the need arise. The isolating cocks are OLP type meaning that when the handle is parallel to the body, it is an open position for the cock.

Pipes

ERW stainless steel pipes as per ROSO specification 04-ABR is used for wagons with Bogie Mounted Brake System. Pipes of 32 mm & 20 mm nominal bore are generally employed. The pipes are cold bend with the help of bending equipment. The radius of the bends is to be kept to the maximum possible so as to reduce restriction of air flow.

Pipe fittings

Welded and swivel flange fittings are used for pipe joints. Fixed flanges are rigidly welded to pipes; whereas the Swivel flanges are used to align to the fixed locations. Rubber gaskets are used to seal the joints.

9.0 CRITICAL BOGIE DIMENSION FOR FITMENT OF BMBS

In order to ensure trouble free fitment of the Bogie mounted brake system, it is necessary that the following Bogie dimension are checked and maintained before fitment.

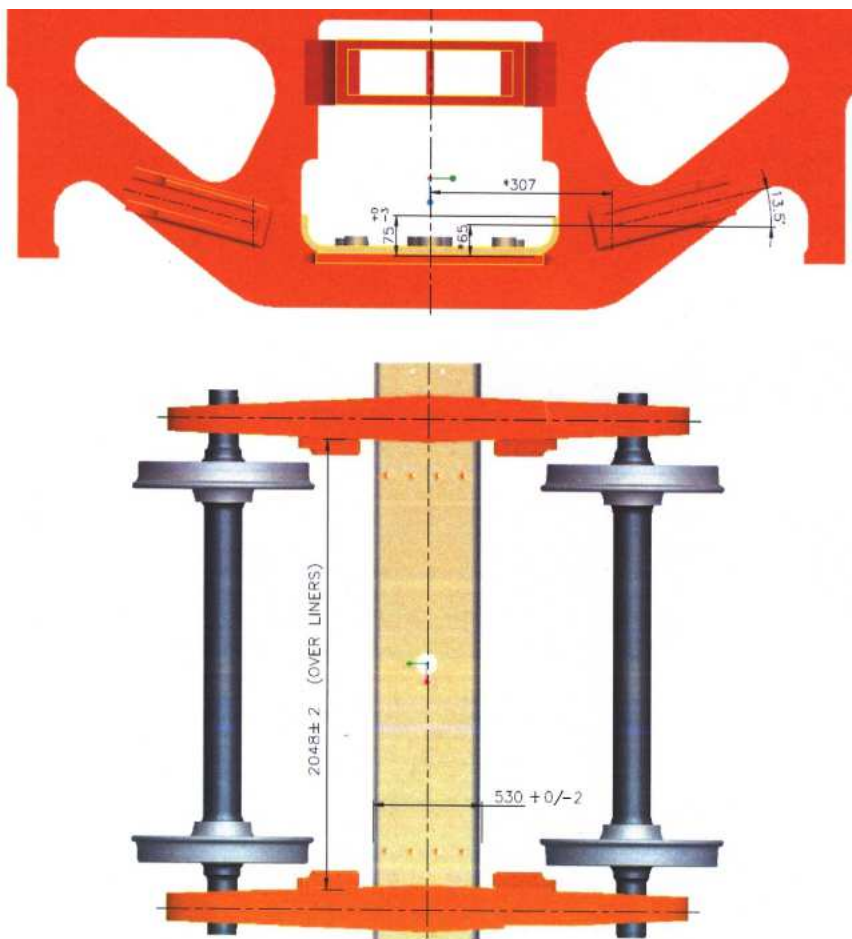


FIGURE: 12- CRITICAL BOGIE DIMENSION

10.0 PROCEDURE FOR INSTALLATION OF BMBS ON CASNUB BOGIE

Installation Procedure

Refer figures 13, 14, 15 & 17 for Installation of Equipment and its adjustments;

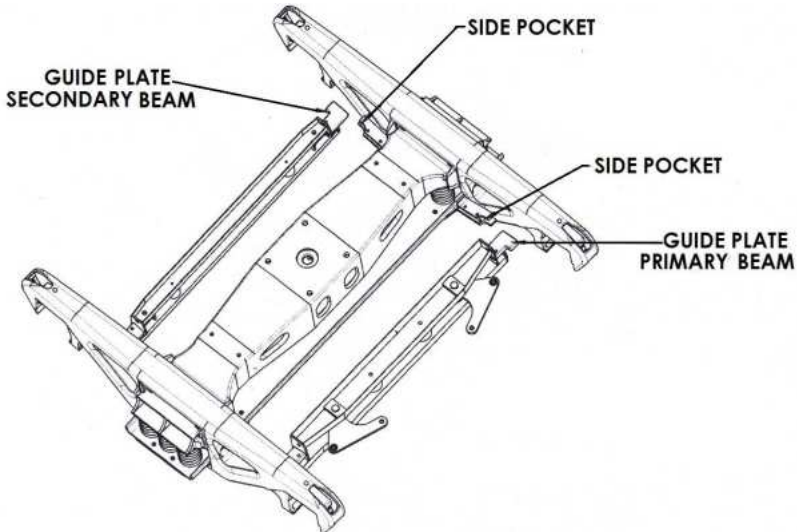


FIGURE: 13

Tools Required

- i. Pry Bar
- ii. Pliers

1. To install the beams it is necessary to split the bogie. Lift the bolster and move the axles with wheels outside the side frame. Slide the primary beam assembly 1A inside the side pockets in the side frame. Place the bell crank

levers 10 & 18, as per their respective position on the primary beam assembly 1A. Push the Pin 19 through the beam 1 A and bell crank levers 10 & 18. Bend the Cotter pin 23 after inserting inside the Pin 19. Slide the secondary beam assembly 1 B inside the side pockets on the other side.

2. Install the push rods 3 between the bell cranks and the secondary beam 1 B. Secure the push rods to the secondary beam with the pin 4 and cotter pin 6.
3. Secure the push rod 3 with bell crank levers with pin 5 and cotter pin 6 on primary beam sides.
4. Attach the Brake Cylinder 11 to the bell crank levers with two sets of pins 4, bush 25 and dowel sleeve 24 after aligning the mounting holes in the brake cylinder and the bell crank levers.

Note

- ❖ Air connection flange and Ram of brake cylinder 11 to be oriented / fitted as per the Air Brake Equipment and Under Frame Gear Arrangement drawings. Cylinder with hand brake is to be installed considering the location of Bracket 16.
 - ❖ Brake cylinder 11 ram should be in fully retracted position prior to installation.
5. Place the brake heads 7 on the guide plates of the brake beams 1A & 1 B. Secure the brake heads to brake beams with pin 8 and lock the same with cotter pin 9.
 6. Assemble the bogie by lowering the bolster with side frame on the axle and wheel assembly.

7. Install new 58mm K-type brake shoe to beam assemblies (1A & 1B) on brake heads 7. Insert brake block keys 21 to hold brake blocks to the removable brake heads.
8. Connect air hose from BC pipe line to the flange on top of cylinder 11.

For Brake cylinders with Hand Brake Cables

9. Bracket for cable end support is welded to a convenient place on the under frame of the wagon such that the bend radius of the cables is not less than 255 mm. (Refer under frame equipment installation drawings of the concerned wagon).
10. Attach the cable conduits to the bracket 16 by placing one nut and one washer on each side of bracket 16.
11. Tighten the lock nut to secure the cables to the bracket properly.
12. Connect both cables 13 to the cable equalizer 17 using pins 14 and cotter pins 15.
13. Connect air hose from BC pipe line to the flange on top of cylinder 11.

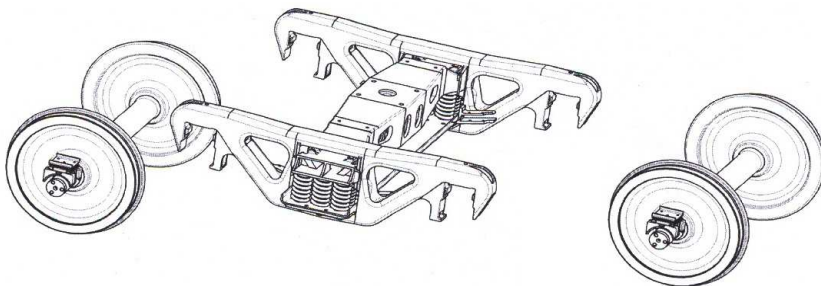
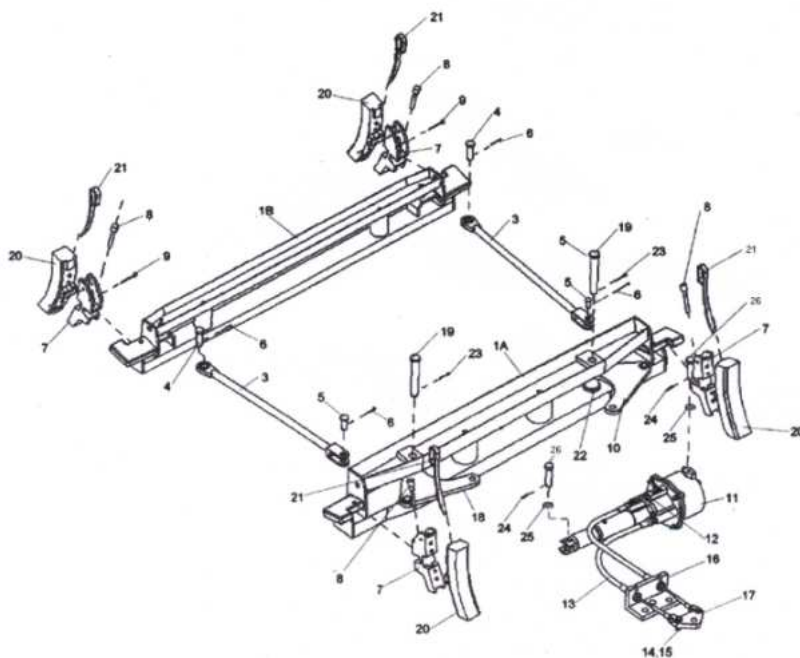
Hand brake rigging

14. Handbrake system requires a set of rigging between equalizer 17 and the handbrake wheel as per requirement of particular type of wagon.
15. Apply brakes, 2-3 times to the brake cylinder 11 to ensure correct piston stroke is achieved. Release air pressure.

Warning

To avoid personal injury from movement of the various

parts when operating the system, all personnel must be clear of Bogie and Brake pads before the cylinder is pressurized.

**FIGURE: 14****FIGURE: 15**

Adjustments

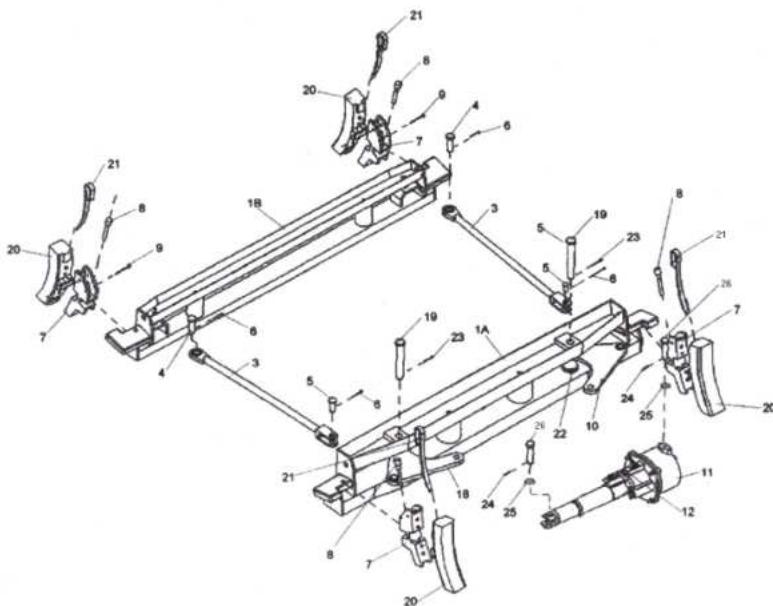
Adjustment is completely automatic and is accomplished by the inbuilt slack adjuster. The slack adjuster in the brake cylinder is double acting. It automatically maintains a constant piston stroke by taking up or letting out slack with each brake application. The piston stroke indicator is mounted on top of the non-pressure body of the brake cylinder (See figure 1). The extension of the brake cylinder ram will increase as the shoes and wheels wear. On a wagon in service, it will be clearly visible as a shiny ring near the ram scraper on the cylinder.

Components of Bogie with Hand Brake Arrangement (See Figure – 15)

1.	Set of Brake Beams
1(A)	Beam, Primary
1(B)	Beam, Secondary
3)	Push Rod Assy.
4)	Secondary Beam Pin
5)	Push Rod Pin
6)	Pin, Cotter (6.3mm dia x 50mm)
7)	Brake Head
8)	Pin, Brake Head
9)	Pin, Cotter (6.3mm dia x 75 mm)
10)	Lever Assy. (RH)
11)	Cylinder Assy. 10" with Hand Brake

Cylinder Assy. 10" with Hand Brake	
12)	Piston Stroke Indicator
13)	Cable Assy.

14)	Pin, Cable
15)	Pin, Cotter
16)	Cable Bracket
17)	Cable Equalizer
18)	Lever Assy. (LH)
19)	Primary Beam Pin
20)	Brake Block
21)	Brake Block Key
22)	Washer, Thrust
23)	Pin, Cotter (8mm dia x 50mm)
24)	Dowel Sleeve
25)	Bush
26)	Brake Cylinder Pin

**FIGURE: 16**

Components of Bogie without Hand Brake Arrangement (See Figure – 15)

1)	Set of Brake Beams
1A)	Beam, Primary
1B)	Beam, Secondary
3)	Push Rod Assy.
4)	Secondary Beam Pin
5)	Push Rod Pin
6)	Pin, Cotter (6.3 dia x 50mm)
7)	Brake Head
8)	Pin, Brake Head
9)	Pin, Cotter (6.3 dia x 75)
10)	Lever Assy. (RH)

Cylinder Assy. 10" without Hand Brake	
11)	Cylinder Assy. 10" without Hand Brake
12)	Piston Stroke Indicator
18)	Lever Assy. (LH)
19)	Primary Beam Pin
20)	Brake Block
21)	Brake Block Key
22)	Washer, Thrust
23)	Pin, Cotter (8 mm dia x 50)
24)	Dowel Sleeve
25)	Bush
26)	Brake Cylinder Pin

Procedure for changing of Brake Blocks (Refer figure 17)

- a. Changing the brake shoe with BMBS is easy and fast. Ensure that the brakes are released. Slip in a pry bar between the brake block & wheel on any one wheel of the bogie. Force back the brake block from the wheel, thus retracting the double acting slack adjuster and creating space for inserting new brake blocks between the brake head and wheel. To get more gap push the beam across the side pockets.
- b. Remove the brake block keys and replace the brake blocks. Secure the new brake blocks with the brake block keys. The slack adjuster will automatically adjust the brake shoe clearance to the proper value when the brakes are' applied and released. This usually takes from two to three brake applications.

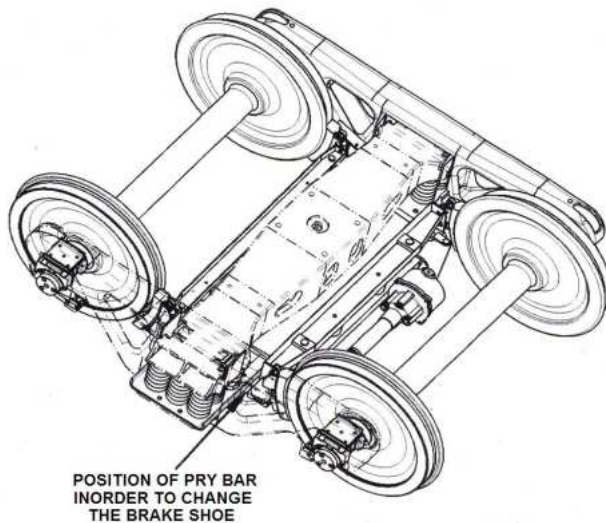


FIGURE: 17

11.0 PROCEDURE FOR CHANGING OF PARTS AND LIFTING OF UNDERFRAME

Isolation of Brake Cylinder

- a. There are two isolating cocks with vent in BC line for isolating each brake cylinder in the wagon.
- b. To isolate any particular Bogie / Brake Cylinder, move the isolating cock (OLP types) handle to closed position. This will stop the further feeding of corresponding brake cylinder and the air already present in the brake cylinder will get exhausted to atmosphere, thus, releasing the brakes in that particular bogie.

Changing of Brake Head (7)

(See figure 15 & 16)

- a. Ensure that the brakes are released. Slip in a pry bar between the brake block 20 & wheel on any one wheel of the bogie. Force back the brake block from the wheel, thus retracting the double acting slack adjuster (figure-6) and creating the space between the brake block and the wheel.
- b. Remove the brake block key 21 and then the brake block 20.
- c. After obtaining enough clearance between the wheel & the brake heads 7, remove the cotter pin 9 & the brake head pin 8 consecutively to remove the desired brake head.
- d. Install a new brake head 7 and secure it with brake head pin 8 then a cotter pin 9. Bend cotter pin legs outwards.
- e. Place the brake block on the new brake head and secure the brake block with the brake block key.

- f. The slack adjuster will automatically adjust the brake shoe clearance to the proper value when the brakes are applied and released. This usually takes from one to three brake applications.

Changing of Brake Cylinder (11)
(See figure 15 & 16)

- a. Ensure, the brakes are released and the brake cylinder is completely vented. Retract the brake cylinder 11, use pry bar between wheels & brake blocks on both, the secondary beam 1 B & the primary beam 1 A. Force the brake cylinder 11 to retract completely.
- b. Disconnect the air hose from the cylinder assembly (11) flange.
- c. Remove the dowel pin 24, bush 25 then rod eye pin 4 on both sides of the cylinder. Install a new brake cylinder assembly 11, being sure the cylinder is of the same size and aligned in the same way as the previous cylinder, using rod eye pin 4. Secure the brake cylinder with bush 25 & dowel pin 24.
- d. Reconnect the air hose to the cylinder assembly 11 flange.
- e. Apply partial brakes 2 - 3 times in order to restore the internal slack adjuster's position.

Note

For cylinders equipped with the hand brake cables (see fig. 15), it is necessary to:

- f. Disconnect the cable clevises from the equalizer 17 by removing the two cotter pins 15 and cable pins 14.
- g. Remove the two cables 13 from the cable bracket 16.

Changing of Lever Assembly {RH (10) & LH (18)}
(See figure 15 & 16)

This change will be required if this part has been damaged or worn out.

- a. Remove the cotter pin 6 and the rod clevis pin 5 with pull rod. Remove the bush 25, dowel sleeve 24 and the rod eye pin 4 with brake cylinder. Remove the cotter pin 23 and pin lever 19 with the primary brake beam 1A. Pull the bell crank lever RH 10 & LH 18 from the beam assembly 1 A. Install a new lever RH 10 or LH 18 as applicable using the pin lever 19 and the cotter pin 23. Install pins 5 and cotter pin 6. Install pin 4 with bush 25 & dowel sleeve 24. Bend cotter pin legs.
- b. The slack adjuster will automatically adjust the brake shoe clearance to the proper value when the brakes are applied and released. This usually takes from one to three brake applications.

Changing of Push Rod (3) (See figure 15 & 16)

This change will be required if this part has been damaged or worn out.

- a. Remove the cotter pin (6) and the rod clevis pin (5) with bell crank lever. Remove the cotter pin (6) and the pin rod eye (4) with secondary brake beam 1 B. Remove the pull rod from lever assembly RH 10 or LH 18. Pull the rod from the secondary beam. To install a new push rod,

align the rod end hole with the mounting holes in the secondary beam 1 B and then insert the pin 4 and the cotter pin 6. Bend the cotter pin legs. Do the same procedure on the other end of the rod by aligning the rod with the lever assembly RH 10 or LH 18 with pin 5 and cotter pin 6.

- b. The slack adjuster will automatically adjust the brake shoe clearance to the proper value when the brakes are applied and released. This usually takes from one to three brake applications.

Lifting of under frame from Bogie

1. Disconnect the air hose from the flange of brake cylinder without hand brake cables by unscrewing the bolts.
2. Disconnect the air hose from the flange of brake cylinder with hand brake cables by unscrewing the bolts.
3. Disconnect both the cables from the equalizer cable by removing the split pins and the pins.
4. Detach the cables from the cable bracket by loosening the nuts on either side of the cable bracket. Remove the cables from the bracket after the nuts have been loosened and enough space is created for easy removal.

After the removal of brake cylinder hoses and the hand brake cables from the under frame, the wagon under frame can be lifted from the bogies.

The bogie can be dismantled or assembled with the bogie mounted parts by following maintenance instruction described earlier.

12.0 CONDEMNING LIMITS OF SYSTEM COMPONENTS

Brake Head (7)

(See figure 17 & 18)

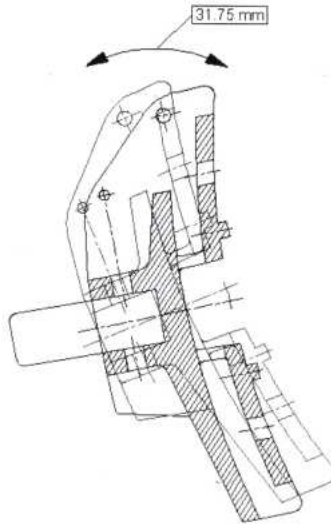


FIGURE -18 - Brake Head

Brake Head 7 should be replaced if the following exists.
Check brake head tip. Push brake head forward and measure travel by pulling brake head all the way back. Tip travel should NOT exceed 31.75 mm.

Bell Crank Lever Assembly RH (10) & LH (18) (See figure 17)

Bell Crank Levers should be replaced if anyone of the following exists:

1. Excessive Wear on any surface

- ❖ Excessive is anything > 1.6 mm

2. Worn, Damaged or Broken Spherical Bearing

- ❖ Worn/Enlarged Pin Holes
 - 25.4 mm Hole exceeds 26.7 mm in any direction (i.e.: oval condition)
 - 32 mm Hole exceeds 33 mm in any direction (i.e.: oval condition)

Push Rod (3) (See figure 17)

Push Rods should be replaced if anyone of the following exists:

- ❖ Any part of the push rod is Bent
- ❖ Cracked or Damaged Welds
- ❖ Excessive Wear on any surface
 - Excessive is anything > 1.6 mm
- ❖ Worn, Damaged or Broken Spherical Bearing
- ❖ Worn/Enlarged Pin Hole
 - 25.4 mm Hole exceeds 26.7 mm in any direction (ie.: oval condition)

- ❖ .Clevis End Gap Exceeds 27.9 mm.

Brake Beams 1 A & 1 B (See figure 17 & 19)

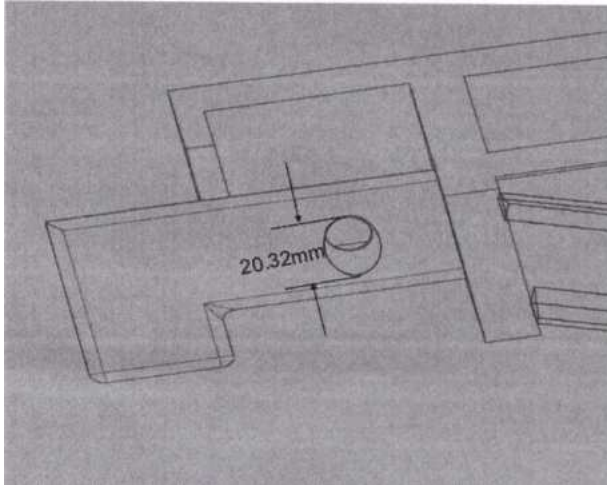


FIGURE -19 – Worn Condition

Brake Beam should be replaced if the following exists.

Remove Brake Head and inspect Brake Head pin hole in Beam. If hole exceeds 20.32 mm in length, replace Beam. If not, replace brake head and recheck tip as described earlier. Tip should not exceed 31.75 mm (from FIRST check above). If tip does exceed 31.75 mm, replace Beam and Brake Head

Gap between Bell crank lever RH 10 & LH 18 and the upper channel of Primary brake beam 1A

(See figure 20 below)

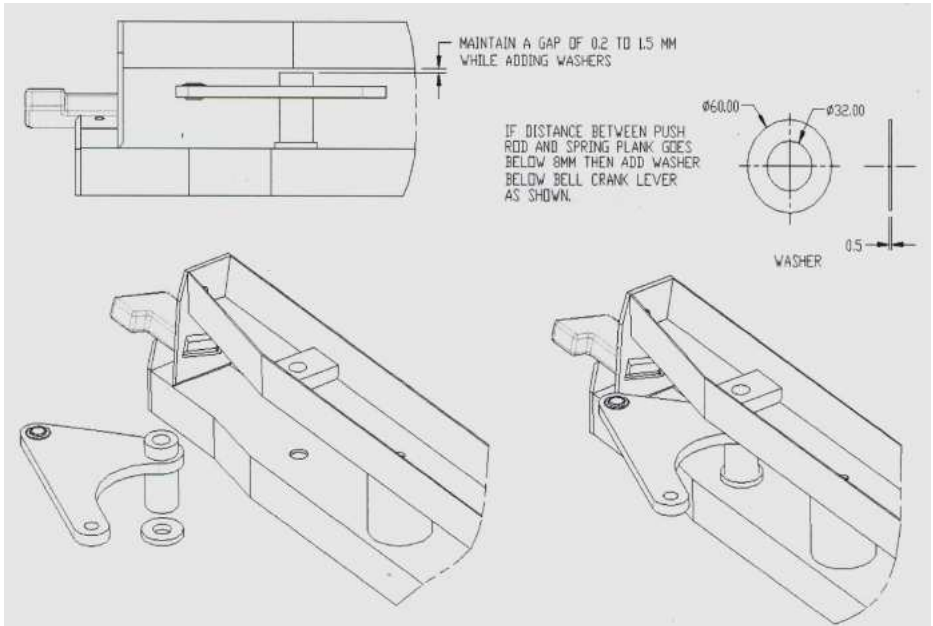


FIGURE -20 – Worn Condition

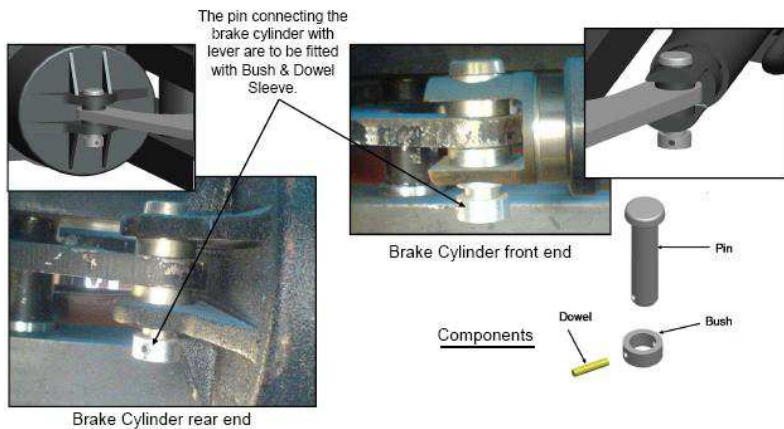
Measure the bell crank lever dimension with reference to the lever being supported inside the primary brake beam. Measure the maximum pass through gap.

Note the locations of the measurement for the lever and the position of the lever in regards to the primary brake beam. (See figure-20 .)

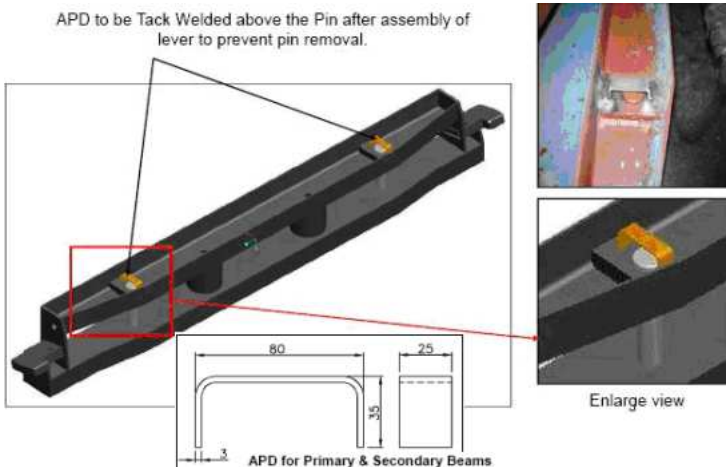
Use washers as demonstrated below to adjust the gap.

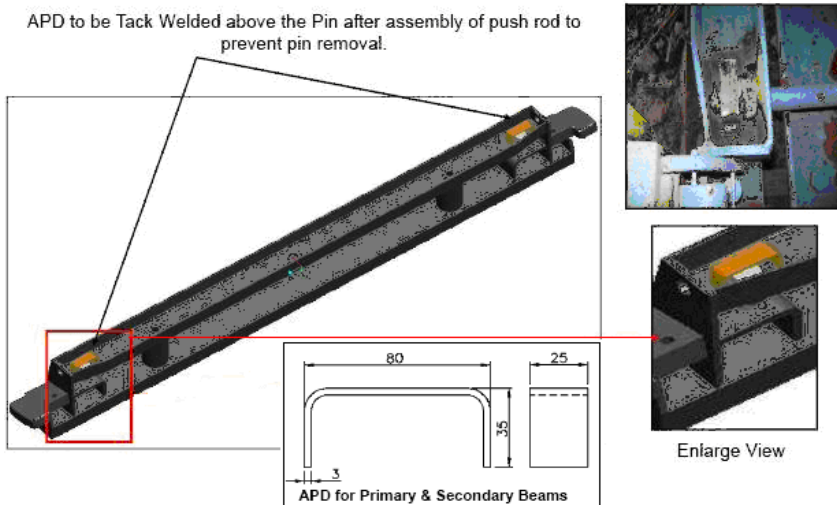
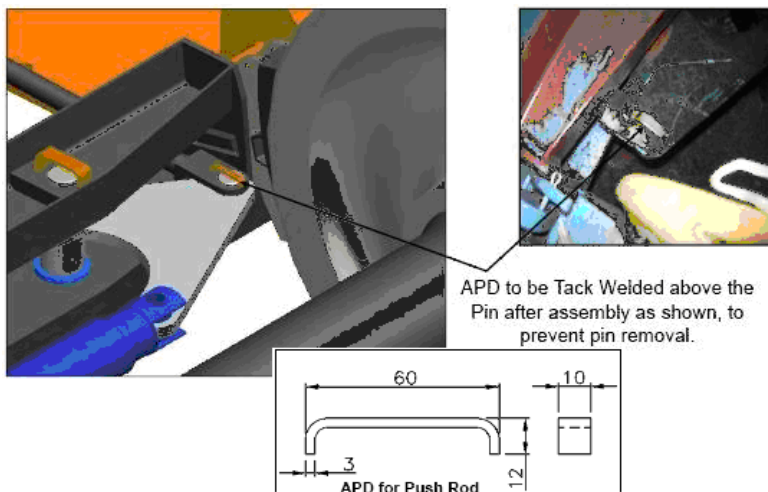
13.0 Anti Pilferage Devices (APDs)

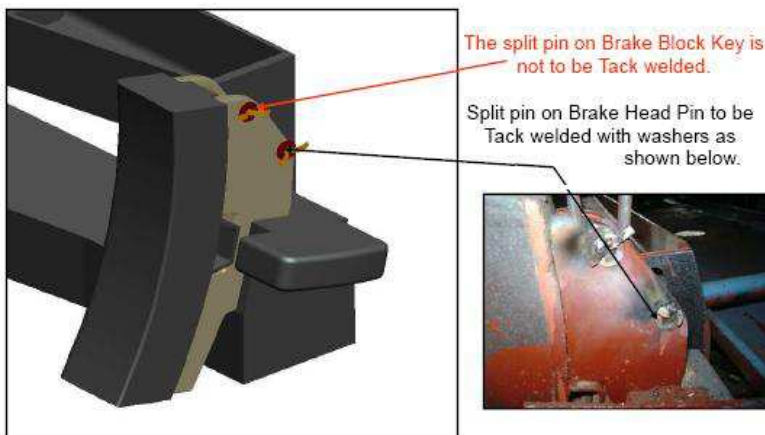
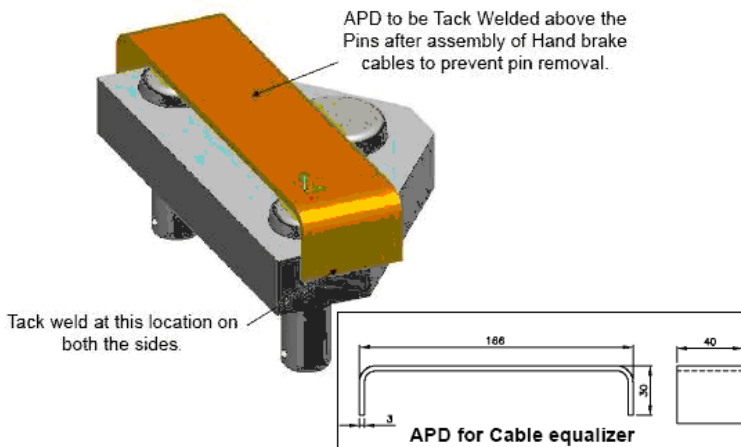
(A) APD for Pins on Bogie Brake Cylinder



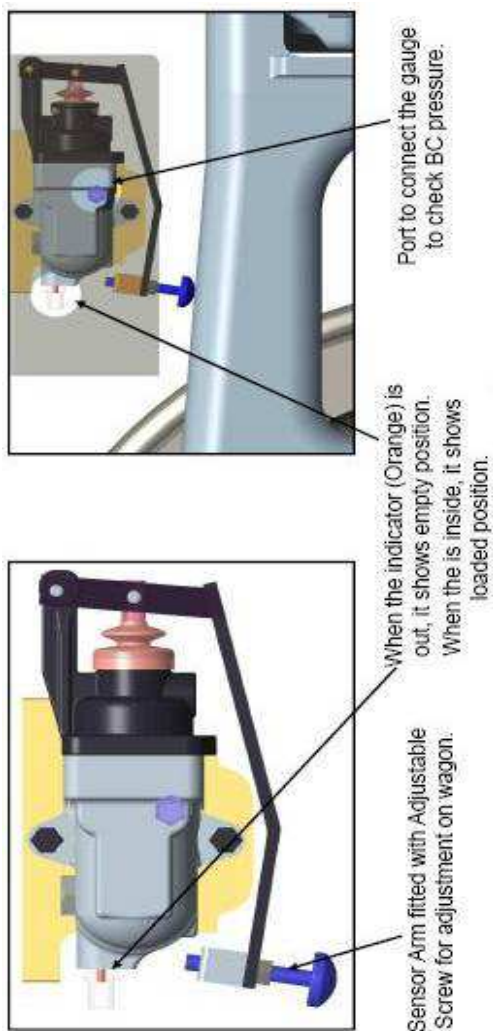
(B) APD for Primary Brake Beam



(C) APD for Secondary Brake Beam**(D) APD for Push Rod**

(E) APD for Brake Head**(F) APD for Cable Equalizer**

(H) Lock nut on APM



14.0 MAINTENANCE IN OPEN LINE

1. BOGIE RIGGING; BRAKE BEAMS, BELL CRANKS LEVERS & PUSH RODS

- a) Check all the pin joints for any missing parts (pins, split pins, spring dowel, etc), if missing, provide the same.
- b) Check the components for missing or any physical damage, if found replace them.
- c) Check that the APD is provided on all the pins and on the APM.
- d) Check that the all hoses are properly tightened and are not threatened to be damaged by axle or wheel. If so properly clamped them.

2. BRAKE CYLINDER

- a) Check for any physical damage of components or leakage.
- b) Check that the piston indicator is fully in released condition.
- c) In case of brake cylinder with hand brake cables, the cables are not entangled or resting / touching the axle check the movement, cable is free.

3. APM DEVICE

- a) Check for any physical damage to the valve.
- b) Check that the indicator in during the release.
- c) Clean the Indicator.
- d) Check the tightness of the lock nuts on sensor arm lever, if found loose, tighten them and also verify the Gap as specified.
- e) Check that the valve's sensing arm is moving freely.

4. HAND BRAKE RIGGING

- a) Check all the pin joints for any missing parts (pins, split pins, spring dowel, etc), if missing, provide the same.
- b) Check the components for missing or any physical damage, if found replace them.

Spares to be maintained in open lines /ROH Depots

Following items to be maintained in the open lines /ROH depot for replacement against missing or damaged parts.

Bogie Equipment

	Component Description	Qty/ Wagon
1	Cylinder Assembly without Handbrake	1
2	Cylinder Assembly with Handbrake	1
3	APM Valve Assembly	1
4	Reservoir for APM	1
5	Primary Beam	2
6	Secondary Beam	2
7	Lever Assembly (Right Hand)	2
8	Lever Assembly (Left Hand)	2
9	Push Rod Assembly	4
10	Brake Head	8

Pins, Split Pins (Bogie Equipment)

1	Pin; Clevis	4
2	Pin; Clevis	4
3	Pin; Clevis	4
4	Pin; Clevis	4

5	Pin; Brake Head	8
6	Pin	16
7	Pin	4
8	Pin	8
9	Washer	4

Hoses & Hardware (Bogie Equipment)

1	Hose Assy. 1/2" With Flange	1
2	Hose Assy. 1" With Flange	2
3	O-Ring	2
4	O-Ring	2
5	Spring Washer	4
6	Screw, Hex Head; Zinc Plated	8
7	Washer, Lock; Cad Plated	8
8	Locknut; Zinc Plated	1
9	Screw, Hex Head; Zinc Plated	4

15.0 ROH SCHEDULE FOR WAGONS FITTED WITH BMBS AIR BRAKE SYSTEM

In routine overhaul, first test the brake system of BMBS using single wagon test rig. Following action should be taken for the defects / discrepancies identified during testing.

15.1 BRAKE CYLINDER

Check & replace brake cylinder by tested brake cylinder if following defects are identified:

- (a) Check the brake cylinder for any physical damage or leakage.
- (b) In case of brake cylinder with hand brake cables, check that the movement of cables is free
- (c) Ensure that the piston indicator is in fully released condition.

15.2 BRAKE BEAMS

- (a) Check for any physical damage, crack, etc, if found replace them. Check for rusting & corrosion and if found repaint them.
- (b) Replace all the PINS, washer, split pins, dowel pins from OEMs.
- (c) Check the GAP at pivot pin on the primary brake beam as shown in the condemning limit of the system components.
- (d) Check brake head for loosening or damage as shown in the condemning limit of the system components.

15.3 LEVERS & PUSH RODS

- (a) Replace the Bell crank lever, if any of the parameters

specified in the condemning limits is observed.

- (b) Replace the push rod, if any of the parameters specified in the condemning limits is observed.

15.4 APM DEVICE

- (a) Clean the Indicator.
- (b) Check the APM valve;
 - ❖ Any physical damage
 - ❖ Valve's sensing arm is moving freely and is fully in.
 - ❖ Check the leakage.
 - ❖ Tightness of the lock nuts on sensor arm lever, if found loose, tighten them.
- (c) Check the Gap between the sensor arm and the side frame, if required re-adjust.

15.5 HAND BRAKE RIGGING

- (a) Check the pin joints / components for missing or any physical damage, if found replace them.
- (b) Replace all the PINS, washer, split pins, dowel pins, plastic bushes.

15.6 HOSES & PIPE JOINTS

- (a) Check the hoses for any cracks / damage. If so, replace them.
- (b) Check that the hoses are properly tightened and are not threatened to be damaged by axle or wheel. If so properly clamped them.
- (c) Check the pipe joints for leakages, if so, tighten them properly.

16.0 Critical check points for wagons fitted with BMBS

SWTR Testing

1. SWTR test for wagon to be done as per RDSO format.

Bogie & Brake cylinder

1. Push rod & spring plank clearance (min 10mm).
2. The split pin over the Brake head pin is tack welded with washer.
3. The brake cylinder pins are locked with bush and dowel sleeve.
4. Split pins are provided on all pins, bent properly & provided with APDs.

APM DEVICE

1. The APM Device is mounted properly and its sensor arm is touching in middle of side frame.
2. The gap between the sensing point and side frame bottom is adjusted as specified for the wagon and is provided with additional check nut and APD.
3. Check that the APM Device hose is properly tightened & secured through clamp on under-frame.

Under frame & Piping

1. The BC isolating cocks in the BC line have their vent side towards the Brake cylinder (Both sides) and their handles are parallel to pipe line.
2. The brake hoses for Brake cylinder are properly secured and not resting on axle or rubbing with any other under frame members.
3. The brackets for hand brake arrangement are properly secured, the movement of the hand brake system is smooth and unrestricted.

17.0 POH SCHEDULE FOR WAGONS FITTED WITH BMBS AIR BRAKE SYSTEM

17.1 BOGIE RIGGING

Replace all the must change items as listed in the list below on the Bogie.

17.2 BRAKE BEAMS

- a) Check the beams for rusting & corrosion and if found repair & repaint them.
- b) Check the GAP at pivot pin on the primary brake beam as shown in the condemning limit of the system components.
- c) Check brake head for loosening or damage as shown in the condemning limits of the system components.

17.3 BELL CRANKS LEVERS & PUSH RODS

- a) Replace the Bell Crank levers, if the critical parameters found to in condemning limits as specified.
- b) Replace the Push Rod, if the critical parameters found to in condemning limits as specified.

17.4 HAND BRAKE RIGGING

- a) Check for any physical damage components, if found replace them.
- b) Brake rigging brackets, bolts and nuts should be examined for rusting, looseness, damaged threads, etc and replaced.
- c) Replace all the pins, washer, split pins, dowel pins from OEMs.
- d) The plastic bushes should be changed.

17.5 BRAKE CYLINDER

- a) Overhaul the brake cylinder as per procedure explained in the manual.
- b) Replace the must change items.
- c) Check the condition base items, if found worn or damaged, replace them.
- d) Test the brake cylinder as per the procedure given in the manual.

17.6 APM DEVICE

- a) Overhaul the APM valve as per procedure explained in the manual.
- b) Replace the must change items as enlisted in the manual.
- c) Check the condition base items, if found worn or damaged, replace them.
- d) Test the APM device as per the procedure given in the manual.
- e) Check the Gap between the sensor point and the side frame surface and readjust the same as specified for the wagon type.

17.7 HOSES, PIPES & PIPE JOINTS

- a) Check the hoses for any cracks / damage. If so, replace them.
- b) Clean the pipes as per the procedure lay down by ROSO specification no. 04-ABR.

Must change items during POH for Bogie Mounted brake system

Bogie Equipment

SNo.	Component Description	Qty/Wagon
1	Pin; Clevis	4
2	Pin; Clevis	4
3	Pin; Clevis	4
4	Pin; Clevis	4
5	Pin; Brake Head	8
6	Pin;	16
8	Pin;	4
9	Pin;	8
10	Washer;	4

Hand Brake Equipment

1	Pin, Cable	2
2	Pin, Tie Rod	1
3	Pin Cotter, Cable pin	2
4	Split Pin (BMBS)	1

Items to be replaced on conditional basis

SNo.	Component Description	Qty/ Wagon
1	Hose Assy. 1/2" With Flange	1
2	Brake Head;	8
3	Hose Assy. L" With Flange	2
4	Spring Washer	4
5	a-Ring	2
6	a-Ring	2
7	Screw, Hex Head; Zinc Plated	8
8	Washer, Lock; Cad Plated	8
9	Screw, Hex Head; Zinc Plated	4

18.0 Do's & Don'ts for Bogie Mounted brake System

Dos

Bogie Rigging

- ❖ Do ensure that the side frame pockets are of correct dimension and free of all restriction.
- ❖ Do ensure that the fitment dimensions in Bogie, critical for fitment of BMBS are maintained within their specified limits.
- ❖ Do ensure that all the side frame pocket liners are properly cleaned & are within the specified limits.
- ❖ Do ensure there is free sliding of Brake Beams inside the side frame pocket liners.
- ❖ Do ensure that there is proper push rod & spring' plank clearance. If push rod clearance is less, then check the necessary bogie dimensions.
- ❖ Do ensure that there is proper fitment of brake block key with Brake block and brake head.
- ❖ Do ensure that there is sufficient gap (after the system is retracted) to change the brake blocks.
- ❖ Do ensure to use bush and dowel pin to lock the brake cylinder pins.
- ❖ Do ensure that all split pin are in place and are bent properly with their arms 90° apart.
- ❖ Do ensure that APDs are provided on all the pins of the bogie rigging.

Brake Cylinder

- ❖ Do ensure to blow the steel pipes connecting the brake cylinder before fitment to prevent the dirt particles going into the brake cylinder. This can be

done by making 2-3 brake applications before connection of Hose pipe with Brake Cylinder.

- ❖ Do ensure that the cables are not pulled out of the brake cylinder on making hand brake connections.
- ❖ Do ensure that there is no rubbing of two hand brake cable together or resting on the axle.

APM Device

- ❖ Do ensure correct gap between the sensing point of APM device & surface of side frame. If not, then adjust the same.
- ❖ Do ensure to put the additional check nut on the adjusting screw to lock the same in position.
- ❖ Do ensure that changeover takes place after putting 25mm block between the sensor point and side frame.
- ❖ Do ensure that empty / load indicator of the APM device (Orange coloured) is visible during empty condition.
- ❖ Do ensure that the reservoir for APM device is secured properly with the underframe.

Piping layout and fitment

- ❖ Do ensure proper orientation of Check Valve & Bogie Isolating Cocks. The vent side of the isolating cock with vent should be on the brake cylinder side.
- ❖ Do ensure to use the correct size of bolts, screws, nuts and washers as specified. Use of wrong size bolts / screw could damage the threads on the brake cylinder / APM valve.
- ❖ Do ensure proper clamping of APM Valve hose with under frame.
- ❖ Do ensure that there is no rubbing of rubber hoses

with axle, wheel or underframe members.

Hand Brake Arrangement

- ❖ Do ensure to weld the hand brake cable bracket at its correct location. It should be welded straight and cables should be properly tightened to the bracket.
- ❖ Do ensure to weld the horizontal lever bracket at its correct location.
- ❖ Do ensure that the horizontal lever is properly supported by support brackets and have unrestricted movement.
- ❖ Do ensure that there is proper hand brake arrangement movement. After applying the hand brake, there should not be any ringing sound after striking wheels.
- ❖ Do ensure that there is no obstacle during return of hand brake cable after releasing hand brake. Investigate the restriction for the cables and do the necessary rectification.
- ❖ Do ensure to properly lubricate the hand brake screw, nut and pivots to reduce the friction and ensure smooth movement.

Don'ts

- ❖ Do not fit BMBS system if the Bogie parameters are not within the specified limits.
- ❖ Does not tack weld the BMBS pins / split pins on the bogie.
- ❖ Do not hammer on beams and brake block.
- ❖ Do not hit the indicator on the brake cylinder.
- ❖ Do not carry bogies by cranes fitted with cylinder and without wheeling, by fastened by chain wrapped in

center. Use fork lifter or chain should hook in side frame holes only.

- ❖ Do not use L-type brake blocks with Bogie Mounted Brake system.
- ❖ Do not use the non-standard pin, bolts for the fitment of BMBS items.

19.0 TROUBLE SHOOTING FOR BMBS FOR FREIGHT STOCK

1.	Brake Cylinder – Leakage		
	It is observed that dust and dirt enters the brake cylinder through the flange area, hereby causing leakage of Brake cylinder. Part of plastic cap etc. used on Pipes found inside the cylinder body. Dirt particles mixed with grease are also found inside the Brake cylinders.		
	Action by en-route operating Staff	Action by Depot / Workshop	Preventive Action
	Isolate the defective BC with the help of isolating cock.	Brake cylinder to be replaced and defective BC to be repaired.	<ul style="list-style-type: none"> ➤ The protection cap over the brake cylinder should be removed prior to its connection with hose pipe only. ➤ Blow the BC pipeline before connecting the Brake cylinder. This can be done by making few Brake applications.
2.	Brake Cylinder - Improper fitment of BC Flexible Hoses		
	Tighten the bolts properly to prevent leakage, else isolate the defective BC with the help of isolating cock.	Tighten the bolts properly if possible, else replace the bolts with correct size bolts.	Care should be taken to ensure that correct size of hardware is used and is properly tightened to ensure trouble free service.
3.	Brake Cylinder - Improper handling & storage resulting in damage to Brake cylinder		
	If the outer tube is damaged and the	Replace the Brake cylinder and the	Proper care should be taken in storage

	brake cylinder is not working, Isolate the defective BC with the help of isolating cock.	defective BC is to be repaired.	& handling of brake cylinders. Use trolley for movement of wooden cases of Brake cylinder.
	If the hand brake cable is damaged, hand brake may become inoperative.	Replace the Brake cylinder and the defective BC is to be repaired.	Proper care should be taken in storage & handling of brake cylinders. Use trolley for movement of wooden cases of Brake cylinder.
4.	Brake Cylinder – Not releasing		
	1. Due to malfunctioning of DV	Move the handle of Isolating cocks to close position to vent the air from brake cylinder. Isolate the DV by moving the R-charger handle to close position.	Repair / replace the DV.
	2. Due to malfunctioning of BC	The internal mechanism of brake cylinder is damaged. Isolate the defective BC with the help of isolating cock. It will release the air pressure from the Brake cylinder. If this doesn't work, remove the pin connecting the push rod and lever to free the system.	Replace the Brake cylinder and same to be repaired. Re-connect the system and provide the necessary APDs.

		Suitably tie the push rod and lever to prevent it from touching the wheel.	Apply brakes to adjust the system.
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5.	APM Device – Improper fitment The bracket of APM Device is not properly fitted on the underframe, as a result, the sensor arm is not properly touching the side frame on the Bogie.		
	Action by en-route operating Staff	Action by Depot / Workshop	Preventive Action
	No action is possible.	The position of the bracket is to be corrected to ensure that the working of APM valve is proper.	Care should be taken during the welding of APM Device bracket on under-frame. It should be ensured that the sensor arm is correctly touching in the centre of the side frame.
6.	APM Device – Improper fitment of flexible hoses If the APM Device flexible hoses are not properly fitted, they can get cut / damaged.		
	Tie the flexible hose properly through some suitable means to under-frame member.	Provide suitable clamp to ensure that the flexible hose is not loosely hanging.	Care should be taken during the fitment by providing suitable clamp / bracket.

7.	APM Device – Leakage from the mounting bracket connecting the pipes		
	Action by en-route operating Staff	Action by Depot / Workshop	Preventive Action
	Tighten the bolts	Tighten the bolts	Care should be taken

	properly to prevent leakage.	properly if possible. Incase an incorrect bolt size has been used, it could have damaged the bracket also. Bracket needs to be replaced.	to ensure that correct size of bolts are used and properly tightened to ensure trouble free service.
8.	Missing of split pins – Brake Head Damage / Missing The absence of split pin above Brake head pin can result in pin moving out. Further, this could result in dropping of brake head and thereby causing the Brake Beam to touch the wheel and get damaged.		
	Isolate the bogie by operating the isolating cock to close position.	Install the new parts which have been damaged. Provide split pins & APDs in a proper manner.	Care should be taken to ensure that split pins and APDs are properly provided.
9.	Missing of split pins – Bogie Components damaged		
	Isolate the bogie by operating the isolating cock to close position.	Install the new parts which have been damaged. Provide split pins & APDs in a proper manner.	Care should be taken to ensure that split pins and APDs are properly provided.

10.	Missing of APDs – Split pin used on Brake Cylinder Pin	
	Action by Depot / Workshop	Preventive Action
	Provide the bush and dowel on the pin.	Care should be taken to ensure that the bush and the dowel should be used on brake cylinder mounting pins.
11.	Missing of APDs – On the pin of Primary Brake Beam	
	APDs to be provided over the mounting pins.	Care should be taken to ensure that the mounting pins are provided with APDs.

12.	Missing of APDs – On the pin of Secondary Brake Beam	
	Action by Depot / Workshop	Preventive Action
	APDs to be provided over the mounting pins.	Care should be taken to ensure that the mounting pins are provided with APDs.

13	Missing of APDs – On the pin of Push Rod	
	Action by Depot / Workshop	Preventive Action
	APDs to be provided over the mounting pins.	Care should be taken to ensure that the mounting pins are provided with APDs.
14.	Inappropriate APDs on APM Device	
	Proper APD to be provided over the APM Device.	Care should be taken to ensure that the APD provided on the APM Device is appropriate so that it perform its intended function.
15.	Hand brake - Incorrect location of Brackets	
	Brackets to be moved to its correct location as per RDSO drawing.	Care should be taken to ensure that the brackets locations are correct as per the drawing. This can be checked by applying the brakes for proper functioning.
16.	Missing of APDs – On the pin of Primary Brake Beam	
	APDs to be provided over the mounting pins.	Care should be taken to ensure that the mounting pins are provided with APDs.
17.	Missing of APDs – On the pin of Secondary Brake Beam	
	Do the necessary correction and check whether the brakes are functional.	Care should be taken during the fitment of hand brake arrangement. Check the working of the hand brake arrangement by applying the brakes.

18.	Missing of APDs – On the pin of Secondary Brake Beam		
	Action by en-route operating Staff	Action by Depot / Workshop	Preventive Action
	Tie the hanging part to the under frame to prevent it from touching the moving parts of wagon.	Install new component. Provide the APDs to prevent re-occurrence.	APDs should be provided to prevent the moving out of components during service.
19.	Wrong use of Isolating cock in BC Line		
	In case, wherein wrong isolating cock has been used, if required isolate the wagon through DV instead of bogie.	Replace the isolating cock to with-vent type and check its working.	Care should be taken to use isolating cocks with vent in the BC line. During the testing, check the vent position of isolating cock by moving the handle to close during application and ensuring that the BC pressure gets exhausted.

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.

Contact person : *Director/Mech*

Postal address : *Indian Railways,
Centre for Advanced
Maintenance Technology,
Maharajpur, Gwalior.
Pin code - 474 005*

Phone : 0751- 2470890

Fax : 0751- 2470841

Email address : dirmech@gmail.com