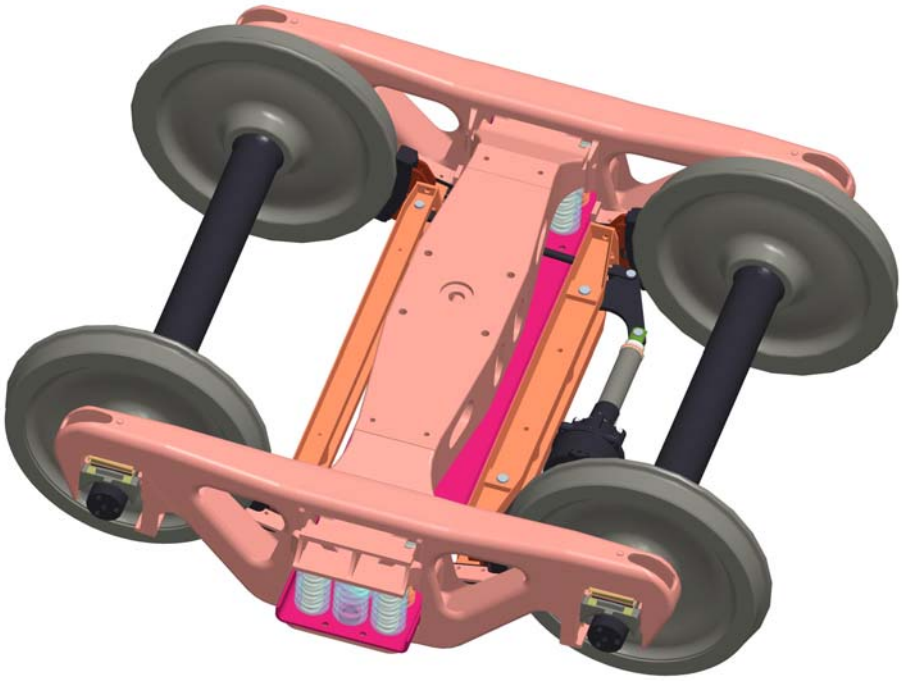
Bogie Mounted Brake System

For Freight Cars



Description & Maintenance Manual

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GENERAL DESCRIPTION

The BMBS equipment (see figure-1) consists of a transversely mounted pneumatic actuator (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 actuator 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 actuators (one per bogie) to deliver reliable braking performance and is light in weight. It fits into any standard IR casnub bogie and uses 58mm 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.

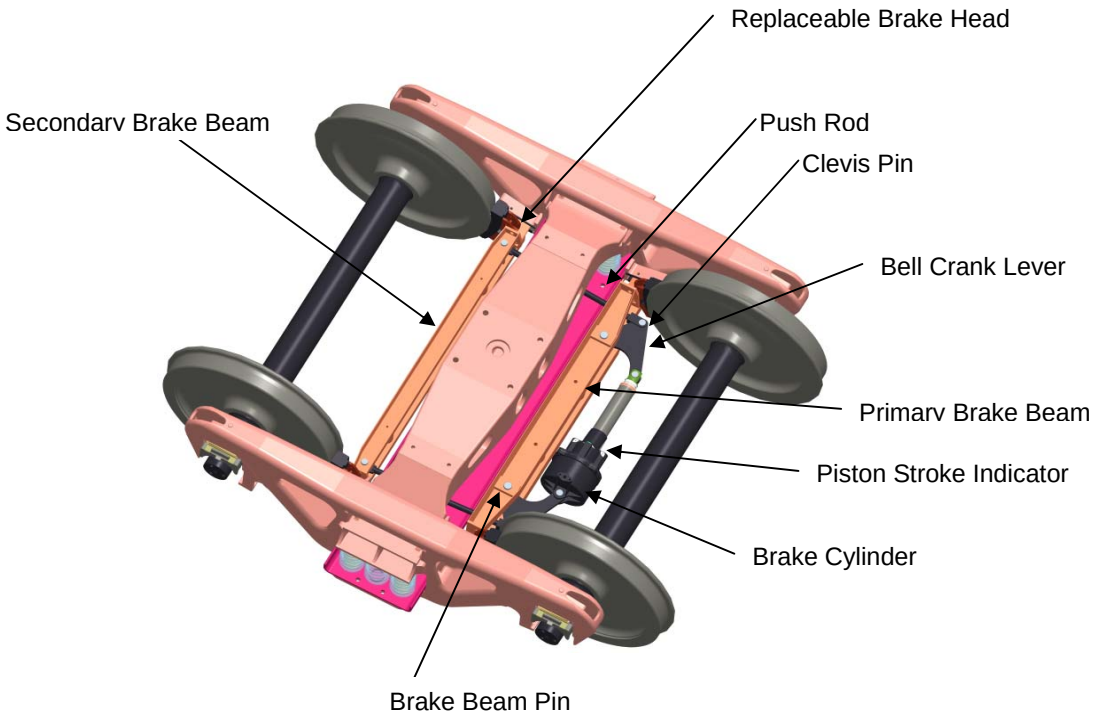


Figure 1

WORKING DESCRIPTION OF BMBS

(Refer figure 2.)

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.

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.

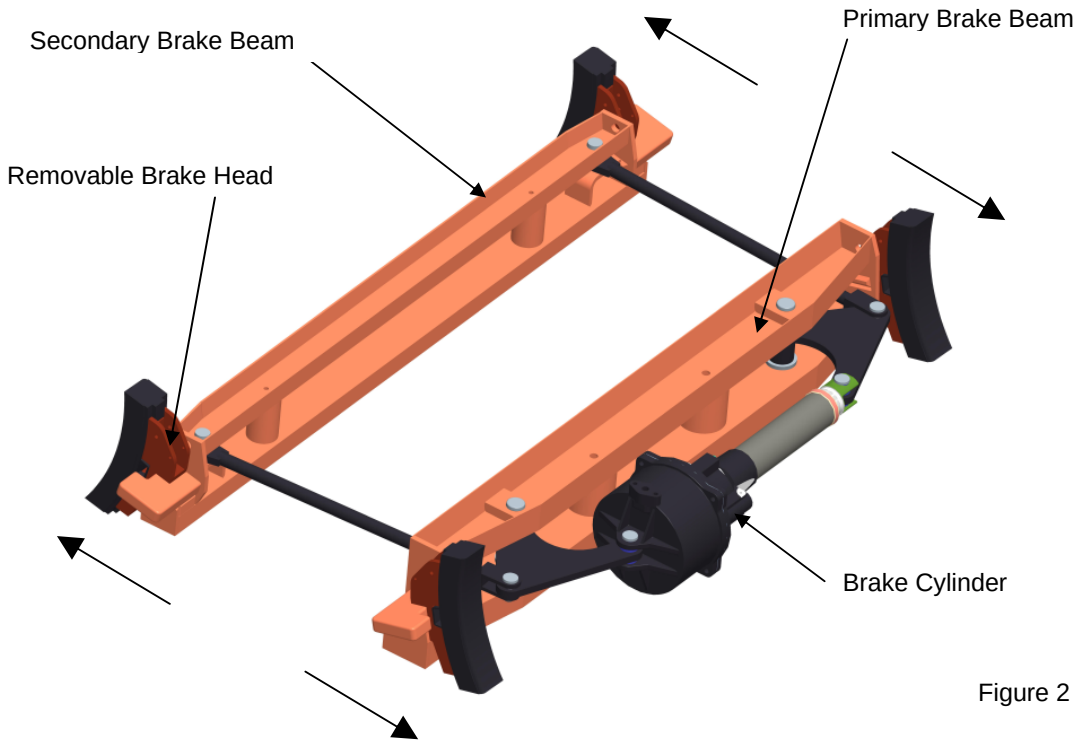


Figure 2

FEATURES

- This is proprietary design of KNORR BREMSE that 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 58mm 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 500mm, 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 handbrake 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 (EL-60 valve) for two stage braking (empty / loaded). It is fitted between wagon under frame and the bogie side frame.

Air Brake System with 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 sketches below. 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.

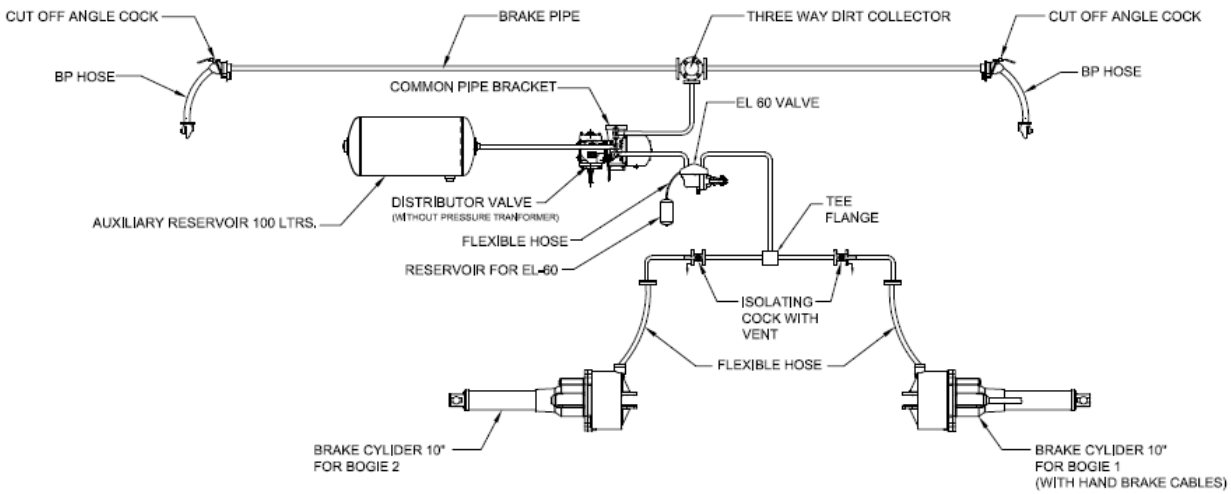
The wagons are provided with automatic pressure modification (APM) device EL-60 valve to cater for higher brake power in loaded condition instead of the conventional manual empty load device.

With the provision of this, brake cylinder pressure of 2.2 ± 0.25 kg/cm^2 is obtained in empty condition and 3.8 ± 0.1 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 ± 0.25 kg/cm^2 to 3.8 ± 0.1 kg/cm^2 incase of changeover from empty to loaded and vice-versa

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 (EL-60 valve) and thereby applying the brake.

SCHEMATIC FOR GRADUATED RELEASE SINGLE PIPE AIR BRAKE SYSTEM WITH BOGIE MOUNTED BRAKE SYSTEM

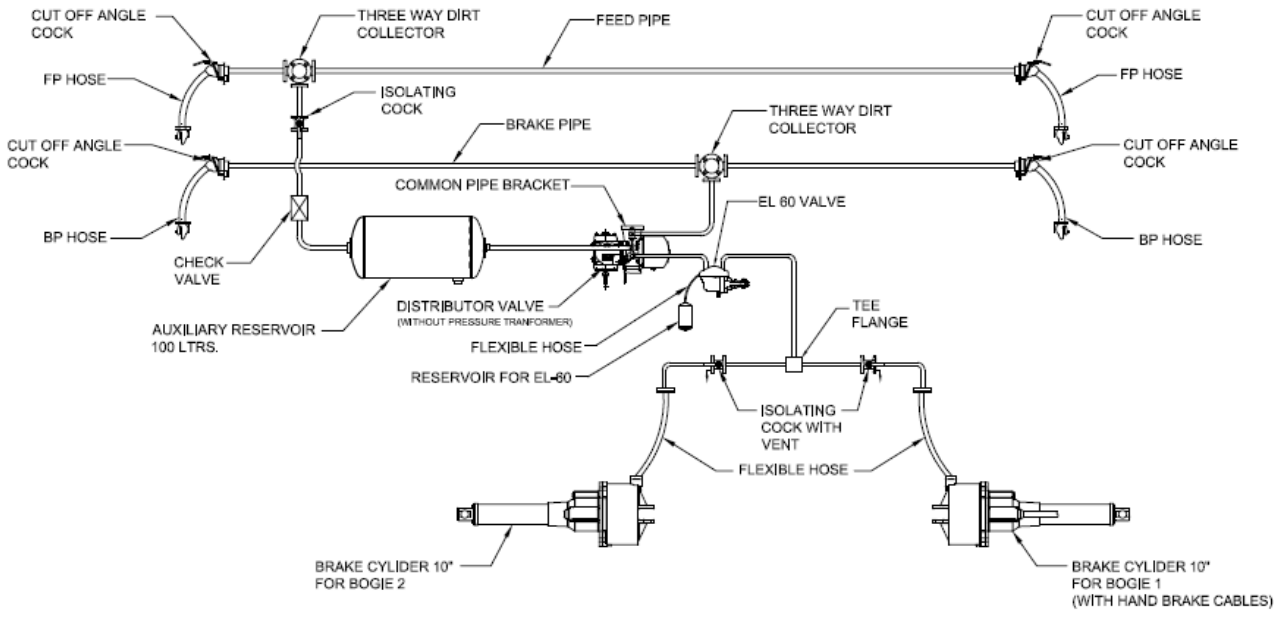


The distributor valve gives an output pressure of 3.8 kg/cm^2 for the brake cylinder which is routed through the APM device (EL-60 valve). Based on the position of sensor arm of APM device (EL-60 valve), it gives an output of 2.2 ± 0.25 kg/cm^2 for empty position braking and an output of 3.8 ± 0.1 kg/cm^2 for loaded position braking in the wagon.

During full service brake application, a reduction of 1.4 to 1.6 kg/cm^2 takes, a maximum brake cylinder pressure of 3.8 ± 0.1 kg/cm^2 in loaded condition and 2.2 ± 0.25 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.

SCHEMATIC FOR GRADUATED RELEASE TWIN PIPE AIR BRAKE SYSTEM WITH BOGIE MOUNTED BRAKE SYSTEM



Description of Equipments

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 02-ABR but with a stroke of 110mm 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 (EL-60 valve). 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.

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 (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 fro interface with the hand brake arrangement on the wagons.

APM Device (EL-60 valve)

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 ± 0.25 kg/cm^2 in empty condition of the wagon and allows the brake cylinder pressure of 3.8 ± 0.1 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.

The complete movement of the sensor point is 104 mm. The first 79 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 79 to arrive at the total movement of the sensor point to be adjusted on particular type of wagon.

The factory setting for the movement of the sensor point is 104 mm.

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 ± 0.25 kg/cm^2. When there is no indication in the indicator, it is loaded condition with 3.8 ± 0.1 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 incase 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 fro 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

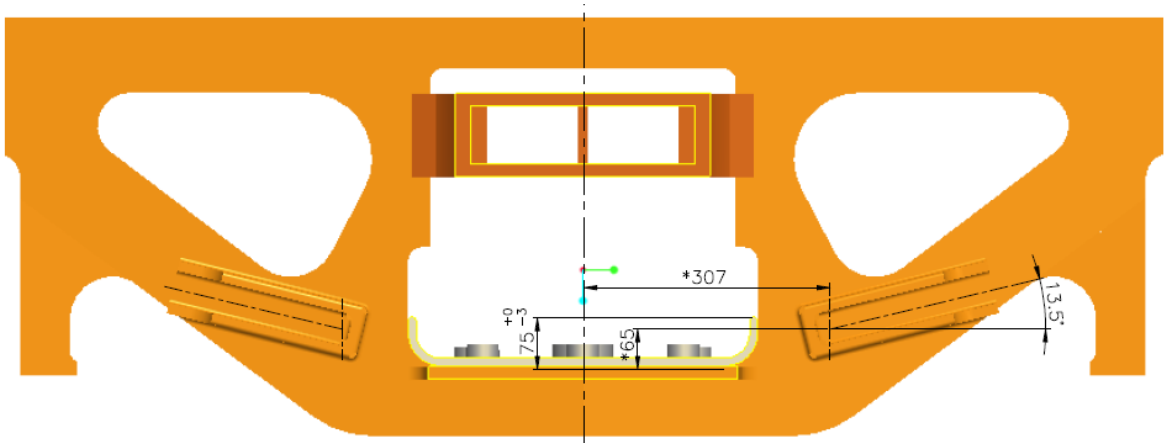
ERW stainless steel pipes as per RDSO specification 04-ABR are used for wagons with Bogie Mounted Brake System. Pipes of 32 & 20 mm nominal bore are generally employed. The pipes are cold bend with the help of bending equipment. The radius of the bends is to be kept to the maximum possible so as to reduce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

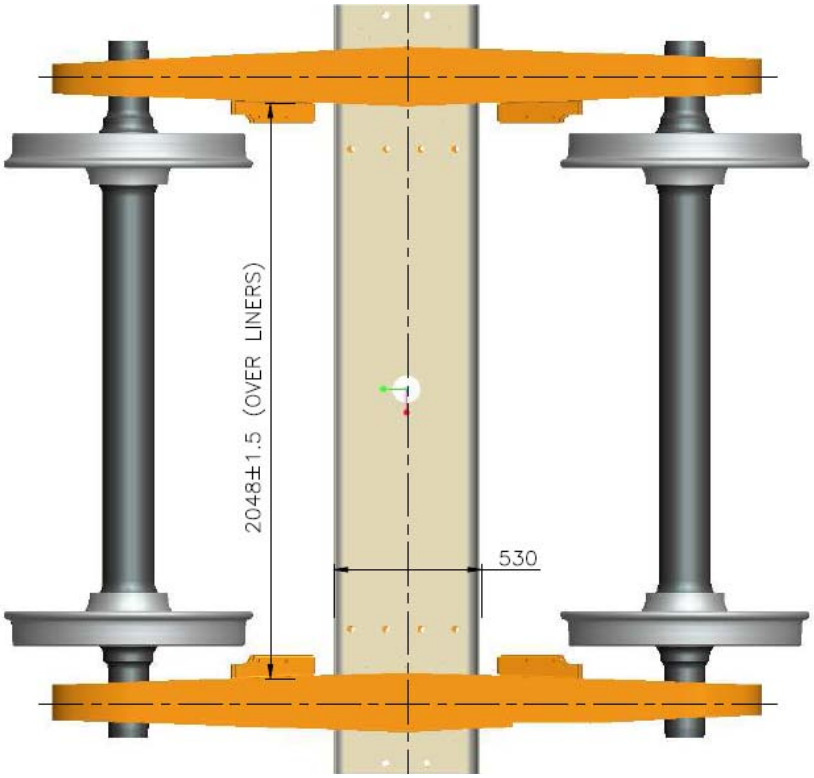
Pipe fittings

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.

Critical Bogie Dimension for 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.





INSTALLATION ON BOGIE

Tools Required

Pry Bar, Pliers, hammer.

Installation Procedure

Refer figures 3, 4, & 5 for Installation of Equipment and its adjustments;

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 3 inside the side pockets in the side frame. Place the bell crank levers 5 & 6 in the primary beam assembly 3. Push the Pin 9 through the beam 3 and bell crank levers 5 & 6. Bend the Cotter pin 14 after inserting inside the Pin 9. Slide the secondary beam assembly 4 inside the side pockets on the other side.
2. Install the push rods 7 between the bell cranks and the secondary beam 4. Secure the push rods to the secondary beam with the pin 10 and cotter pin 15.
3. Secure the push rod 7 with bell crank levers with pin 8 and cotter pin 15 on primary beam sides.
4. Attach the Brake Cylinder 1or 2 to the bell crank levers with two sets of pins 11, bush 18 and dowel sleeve 19 after aligning the mounting holes in the brake cylinder and the bell crank levers.

Note

a. Air connection flange and Ram of brake cylinder 1 or 2 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 Cable Bracket.

b. Brake cylinder 1 or 2 ram should be in fully retracted position prior to installation.

5. Place the brake heads 17 on the guide plates of the brake beams 3 & 4. Secure the brake heads to brake beams with pin 12 and lock the same with cotter pin 13. Don't forget to place the washer before bending the cotter pin. After bending the cotter pin, tack weld the same with washer.
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 (3 & 4) on brake heads 17. Insert brake block keys 29 to hold brake blocks to the removable brake heads.
8. Connect flexible air hose 20 from BC pipe line to the flange on top of brake cylinders 1 & 2.

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 cable bracket (welded on the under frame of the wagon) by placing one nut and one washer on each side of cable bracket.
11. Tighten the lock nut to secure the cables to the bracket properly.
12. Connect both cables on the brake cylinder to the cable equalizer 24 using pins 25 and cotter pins 28.

Hand brake Rigging

13. Handbrake system requires a set of rigging between cable equalizer 24 and the handbrake wheel as per requirement of particular type of wagon.
14. Apply brakes 2-3 times from SWTR 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.

Adjustments

Adjustment is completely automatic and is accomplished by the in built 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.

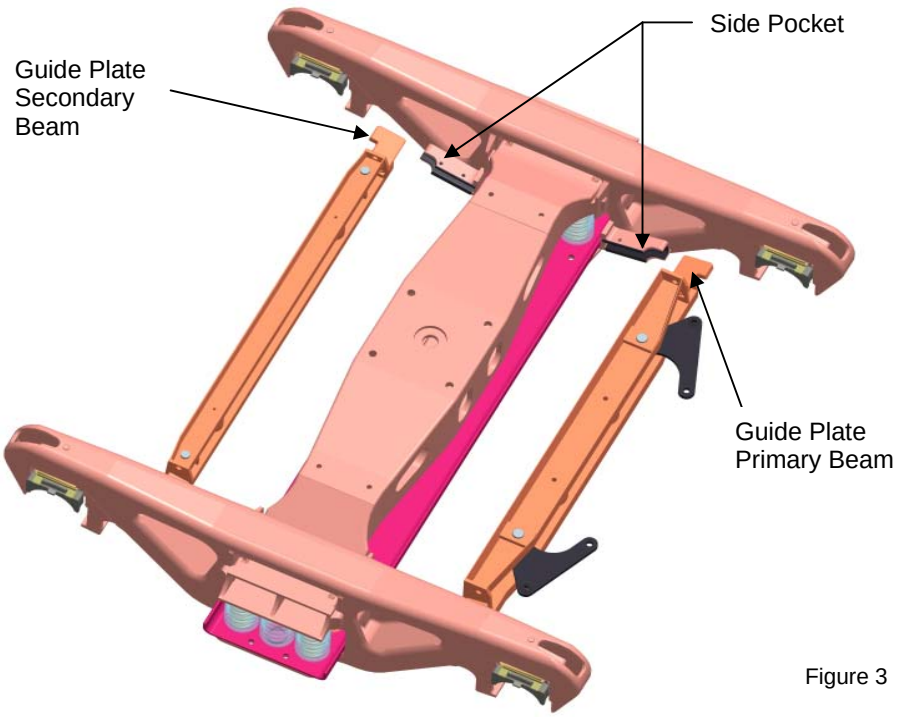


Figure 3

Figure 4

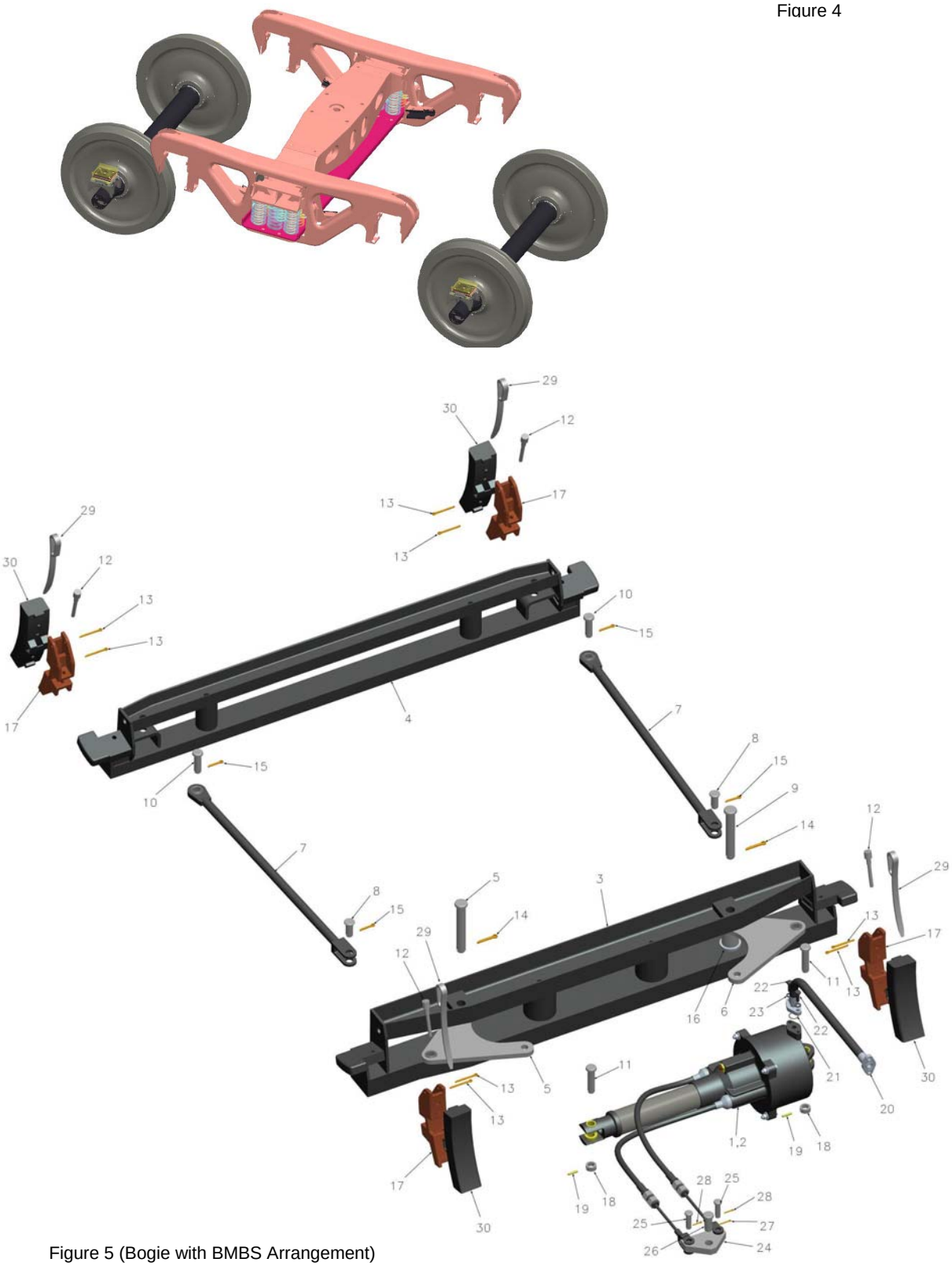


Figure 5 (Bogie with BMBS Arrangement)

List of BMBS Parts

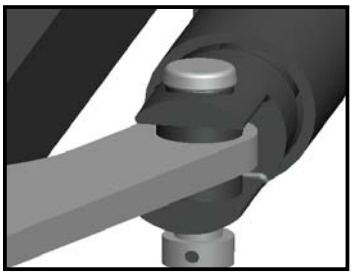
S. No.	Part Description	KB Part No.	Qty / Wagon
1	Cylinder Assembly without Handbrake Cables	I.3.5113	1
2	Cylinder Assembly with Handbrake Cables	I.4.2034	1
3	Primary Brake Beam	I.3.5111	2
4	Secondary Brake Beam	I.3.5112	2
5	Lever Assy; Right Hand	I.3.5108	2
6	Lever Assy; Left Hand	I.3.5109	2
7	Push Rod Assy	I.3.5110	4
8	Pin; Clevis	778110	4
9	Pin; Clevis	778085	4
10	Pin; Clevis	778109	4
11	Pin; Clevis	778111	4
12	Pin; Brake Head	778112	8
13	Pin; Cotter Ø 6.3 X 75	778116	16
14	Pin; Cotter Ø 8 X 50	778114	4
15	Pin; Cotter Ø 6.3 X 50	778115	8
16	Washer;	778084	4
17	Brake Head;	778113	8
18	Bush	C140445	4
19	Dowel Sleeve	C140446	4
20	Hose Assy. 1" With Flange	I.4.2036	2
21	O-Ring	A27763/17	2
22	Screw, Hex Head; Zinc Plated	748645	8
23	Washer, Lock; Cad Plated	735734	8
24	Equalizer; Cable	776622	1
25	Pin; Cable	776621	2
26	Pin Tie Rod	I.3.2044	1
27	Split Pin (BMBS)	I.4.2062	1
28	Split Pin (BMBS)	I.4.2063	2
29	Brake Block Key	I.F.2172	8
30	'K' – Type Brake Block	I.F.1217	8

APDs to be provided on Bogie Mounted Brake System

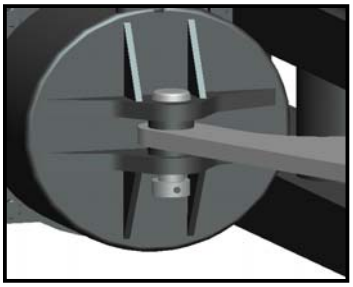
On Brake cylinder Pins

The pin connecting the brake cylinder with lever is to be fitted with Bush & Dowel Sleeve.

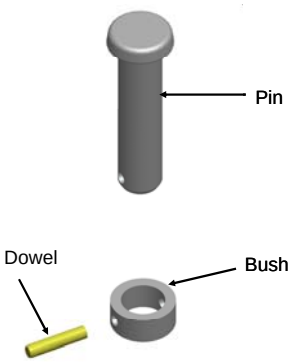
Brake Cylinder Front End



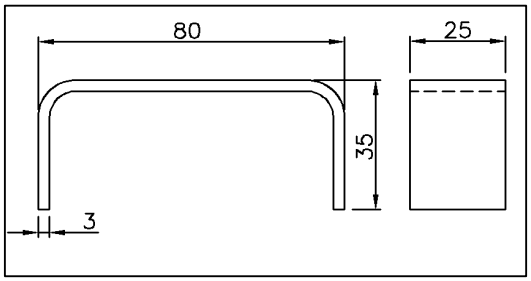
Brake Cylinder Rear End



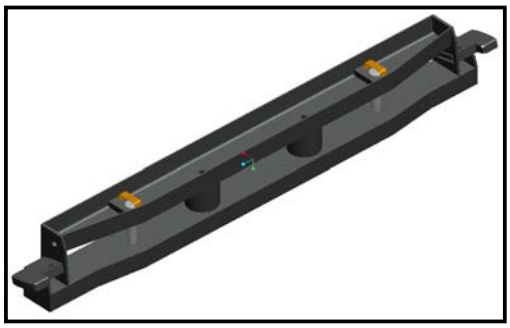
Exploded view of Assembly



APD for Primary & Secondary Beams



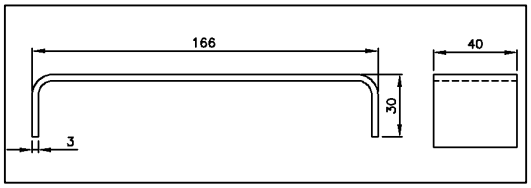
APD on Primary Beams



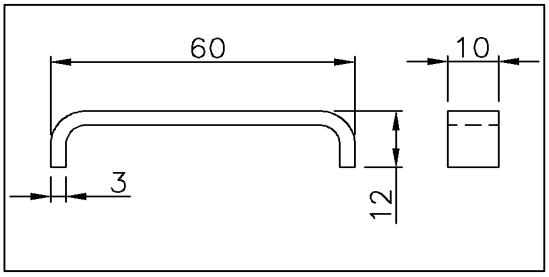
APD on Primary Beams

APD on Secondary Beams

APD for Cable equalizer

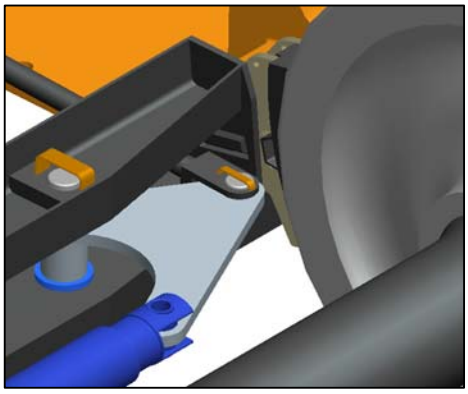


APD for Push Rod

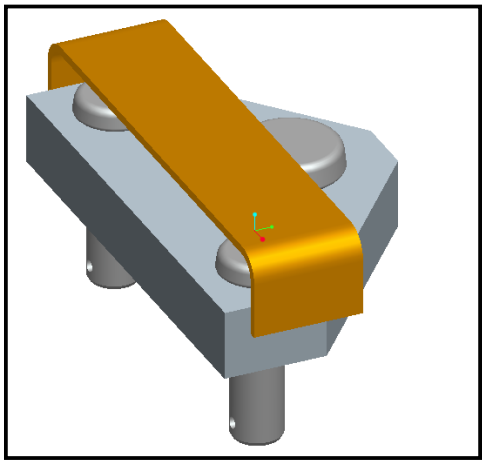


APD on Secondary Beams

APD on Push Rod

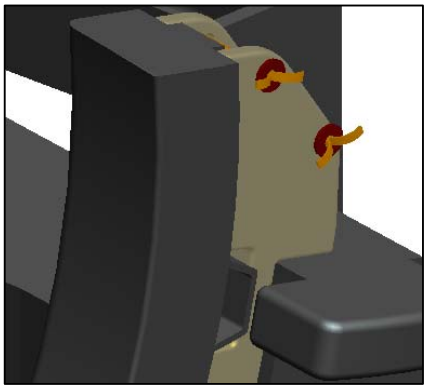


APD on Cable Equalizer



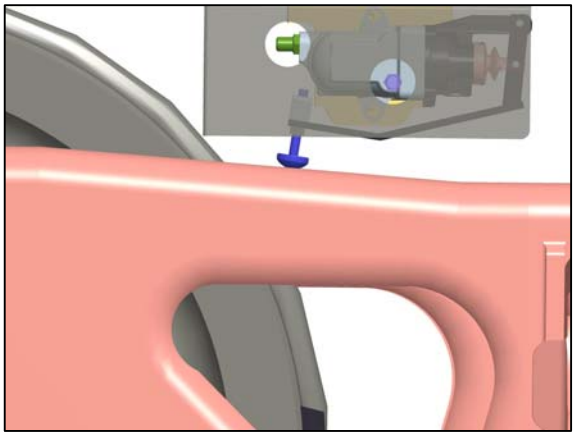
On Brake Head Pin

Split pins over the brake pin have to be Tack welded with washers as shown below.

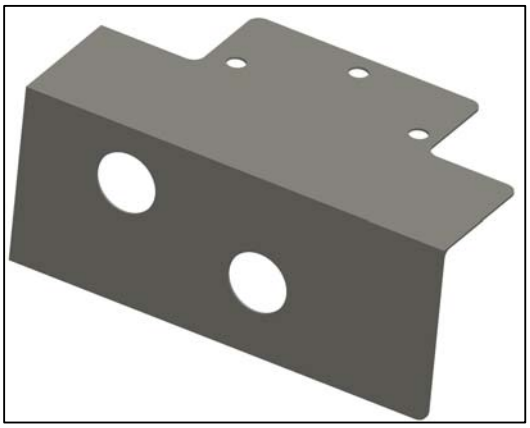


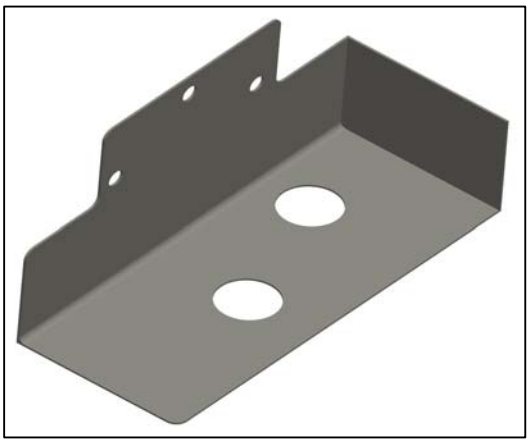
Washer Details
OD 20 mm
ID 8 mm
Thickness 2-3 mm

APD on APM Device (EL-60 valve)

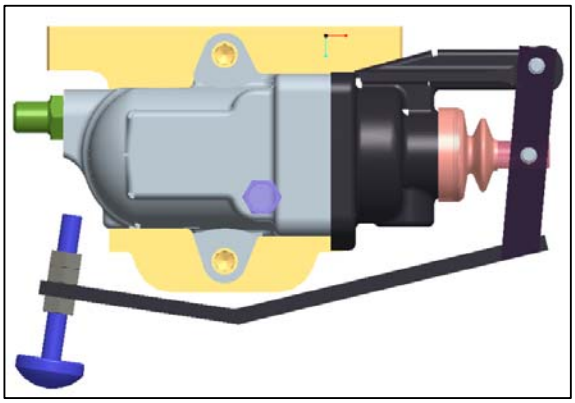


APD for APM Device (EL-60 Valve)





Lock nut on sensor arm



Additional Lock nut has to be provided on the sensor arm screw after the Gap has been adjusted.

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

Do's

Bogie Rigging

- ✓ Do ensure that the fitment dimensions in Bogie, critical for fitment of BMBS are maintained within their specified limits.
- ✓ Do ensure that the side frame pockets are of correct dimension and free of all restriction.
- ✓ 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 90º 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.
- ✓ 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 Valve (EL-60)

- ✓ Do ensure correct gap between the sensing point of APM valve & 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 below the sensor point and side frame.
- ✓ Do ensure that empty / load indicator of the APM valve (EL 60) (Orange colored) is visible during empty condition.
- ✓ Do ensure that the reservoir for EL-60 valve 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 (EL 60) 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 current 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

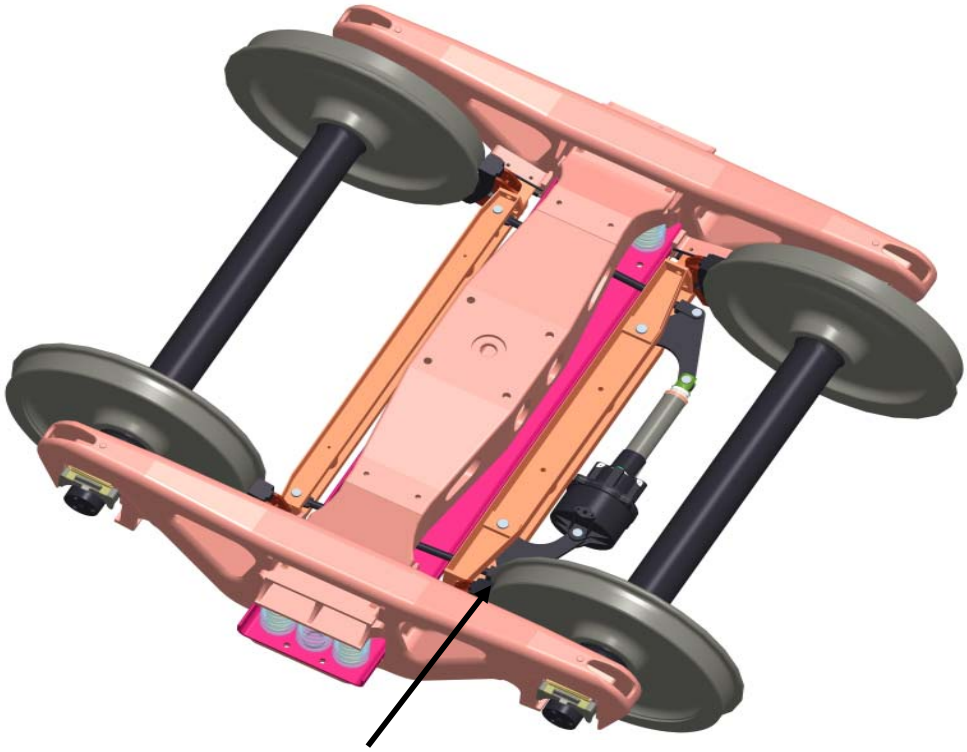
- ✘ Do not fit BMBS system if the Bogie parameters are not within the specified limits.
- ✘ Do not tack weld the BMBS pins / split pins on the bogie.
- ✘ Do not hammer on beams and brake block.
- ✘ Do not hit the indicator on the brake cylinder.
- ✘ Do not carry bogies by cranes fitted with cylinder 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.

Wagon operating procedures

Procedure for changing of Brake Blocks

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.



Position of Pry in order
to change the Brake Block

Figure 6

TYPICAL SERVICE / OPERATING PROCEDURES

Isolation of Brake Cylinder (1 & 2)
(See figure 5)

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.

Brake Head (17) Changing
(See figure 5 & 6)

a. Ensure that the brakes are released. Slip in a pry bar between the brake block 30 & 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 29 and then the brake block 30.

c. After obtaining enough clearance between the wheel & the brake heads 17, remove the cotter pin 13 & the brake head pin 12 consecutively to remove the desired brake head.

d. Install a new brake head 17 and secure it with brake head pin 12 then a cotter pin 13. Bend cotter pin legs outwards.

e. Place brake block 30 on the new brake head and secure the brake block with the brake block key 29 and the cotter pin 13.

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.

Brake Cylinder (1 & 2) Changing
(See figure 5 & 6)

a. Ensure, the brakes are released and the brake cylinder is completely vented. Retract the brake cylinder, use pry bar between wheels & brake blocks on both the secondary beam 4 & the primary beam 3. Force the brake cylinder to retract completely.

b. Disconnect the flexible air hose 20 from the cylinder assembly flange.

c. Remove the dowel pin 19 & bush 18. Then remove the pin 11 from both sides of the cylinder. Install the new brake cylinder assembly, being sure the cylinder is of the same size and aligned in the same way as the previous cylinder, using pin 11. Secure the brake cylinder with bush 18 & dowel pin 19.

d. Reconnect the flexible air hose 20 to the cylinder assembly 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. 5), it is necessary to:

f. Disconnect the cable equalizer 24 from the hand brake cables by removing the two cotter pins 28 and cable pins 25.

g. Remove the two cables from the cable bracket.

Lever Assembly Changing RH (5) & LH (6)
(See figure 5)

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

a. After removing the APD, remove the cotter pin 15 and the pin 15 with pull rod. Now, remove the bush 18, dowel sleeve 19 and the pin 11 with brake cylinder. Remove the cotter pin 14 and pin 9 with the primary brake beam 3. Pull the bell crank lever RH 5 & LH 6 from the beam assembly 3. Install a new lever RH 5 or LH 6 as applicable using the pin lever 9 and the cotter pin 14. Install pin 8 and cotter pin 15 with pull rod 7. Install pin 11 with bush 18 & dowel sleeve 19. Bend cotter pin legs and provide the required APDs.

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.

Push Rod (7) Changing
(See figure 5)

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

a. Remove the cotter pin 15 and the pin 8 with bell crank lever 5 or 6. Remove the cotter pin 15 and the pin 10 with secondary brake beam 4. Remove the pull rod from lever assembly RH 5 or LH 6. Remove 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 4 and then insert the pin 10 and the cotter pin 15.

b. Do the same procedure on the other end of the pull rod by aligning the pull rod with the lever assembly RH 5 or LH 6 with pin 8 and cotter pin 15. Bend the cotter pin legs and provide the required APDs.

c. 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 2-3 brake applications.

Lifting of under frame from Bogie

1. Disconnect the flexible air hose 20 from the flange of brake cylinder without hand brake cables by unscrewing the bolts.
2. Disconnect the flexible air hose 20 from the flange of brake cylinder with hand brake cables by unscrewing the bolts.
3. Disconnect both the cables from the equalizer cable 24 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.

CONDEMNING LIMITS OF SYSTEM COMPONENTS

Brake Head (17)
(See figure 7)

Brake Head 17 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.

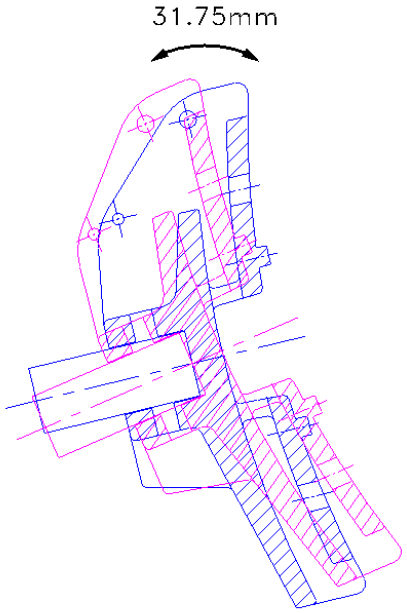


Figure 7

Bell Crank Lever Assembly RH (5) & LH (6)

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

1. Excessive Wear on any surface, anything > 1.6 mm
2. Worn, Damaged or Broken Spherical Bearing
   - 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 (7)

Push Rods should be replaced if any one of the following conditions exist:

- Any part of the push rod is Bent
- Cracked or Damaged Welds
- Excessive Wear on any surface, anything > 1.6 mm
- 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)
- Clevis End Gap Exceeds 27.9 mm.

Brake Beams 3 & 4
(See figure 8)

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

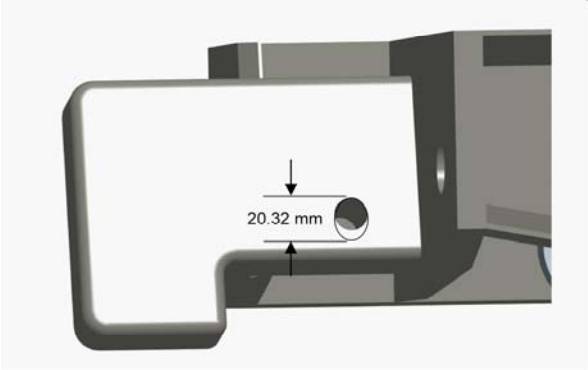


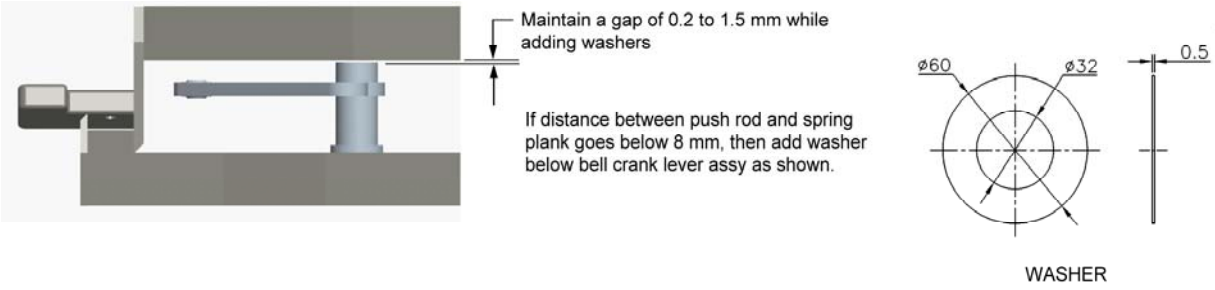
Figure 8 – Worn Condition

Gap between Bell crank lever RH 5 & LH 6 and the upper channel of Primary brake beam 3
(See figure 9)

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 sketch below.)

Use washers as demonstrated below to adjust the gap.



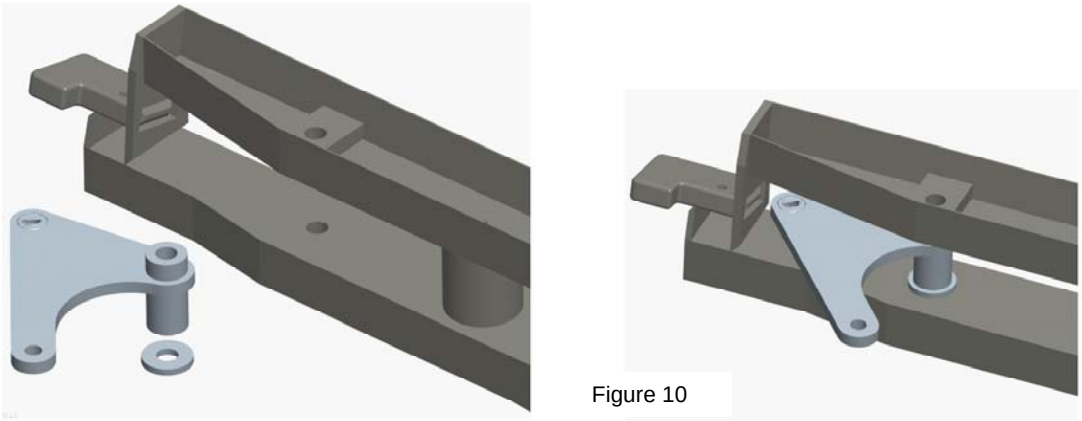


Figure 10

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 EL-60 valve.
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.
b) Check that the piston indicator is fully in.
c) Incase of brake cylinder with hand brake cables, the cables are not entangled or resting / touching the axle.

3. APM DEVICE (EL-60)

a) Check for any physical damage to the valve.
b) Check that the indicator in during the release.
c) Check the tightness of the lock nuts on sensor arm lever, if found loose, tighten them and also verify the Gap as specified.
d) 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 of M/S KNORR- BREMSE to be maintained in open lines / ROH Depots

List of items to be maintained for replacement against missing or damaged parts

Bogie Equipment			
	Component Description	KB Part No.	Qty/ Wagon
1	Cylinder Assy; without Handbrake	I.3.5113	1
2	Cylinder Assy; With Handbrake	I.4.2034	1
3	Valve Assy;El-60	I.3.5114	1
4	Reservoir; El-60	I.3.5115	1
5	Primary Beam	I.3.5111	2
6	Secondary Beam	I.3.5112	2
7	Lever Assy; Right Hand	I.3.5108	2
8	Lever Assy; Left Hand	I.3.5109	2
9	Push Rod Assy;	I.3.5110	4
10	Brake Head;	778113	8
Pins, Split Pins (Bogie Equipment)			
1	Pin; Clevis	778110	4
2	Pin; Clevis	778085	4
3	Pin; Clevis	778109	4
4	Pin; Clevis	778111	4
5	Pin; Brake Head	778112	8
6	Pin;	778116	16
7	Pin;	778114	4
8	Pin;	778115	8
9	Washer;	778084	4
Hoses & Hardwares (Bogie Equipment)			
1	Hose Assy. 1/2" With Flange	I.4.2037	1
2	Hose Assy. 1" With Flange	I.4.2036	2
3	O-Ring	I.4.1050	2
4	O-Ring	A27763/17	2
5	Spring Washer	I.H.0062	4
6	Screw, Hex Head; Zinc Plated	748645	8
7	Washer, Lock; Cad Plated	735734	8
8	Locknut; Zinc Plated	755896	1
9	Screw, Hex Head; Zinc Plated	734734	4

ROUTINE OVERHAUL (ROH) OF BMBS SYSTEM FOR FREIGHT CARS

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.

1.1 Brake Cylinders

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 fully in released condition.

1.2 BRAKE BEAMS

Check for any physical damage, crack, etc, if found replace them. Check for rusting & corrosion and if found repaint them.

(a) Replace all the PINS, washer, split pins, dowel pins from OEMs.
(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 limit of the system components.

1.3 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.

1.4 APM VALVE (EL-60)

(a) Clean the Indicator.

(b) Check the APM valve;

I. Any physical damage

II. Valve's sensing arm is moving freely and is fully in.

III. Check the leakage.

IV. 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 readjust as specified.

1.5 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.

1.6 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.

PERIODIC OVERHAUL (POH) OF BMBS SYSTEM FOR FREIGHT CARS

BOGIE RIGGING

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

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.

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.

HAND BRAKE RIGGING

a) Check for any physical damage of 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.

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.

APM DEVICE (EL-60 VALVE)

a) Overhaul the El-60 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 El-60 valve 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.

HOSES, PIPES & PIPE JOINTS

a) Check the hoses for any cracks / damage. If so, replace them.

b) Clean the pipes as per the procedure laid down by RDSO.

Must change items during POH) For M/S KNORR- BREMSE brake system

	Component Description	KB Part No.	Qty/ Wagon
Bogie Equipment			
1	Pin; Clevis	778110	4
2	Pin; Clevis	778085	4
3	Pin; Clevis	778109	4
4	Pin; Clevis	778111	4
5	Pin; Brake Head	778112	8
6	Pin;	778116	16
8	Pin;	778114	4
9	Pin;	778115	8
10	Washer;	778084	4
Hand Brake Equipment			
1	Pin, Cable	776621	2
2	Pin, Tie Rod	I.3.2044	1
3	Pin Cotter, Cable pin	I.4.2063	2
4	Split Pin (BMBS)	I.4.2062	1

Items to be replaced on conditional basis

	Component Description	KB Part No.	Qty/ Wagon
1	Hose Assy. 1/2" With Flange	I.4.2037	1
2	Brake Head;	778113	8
3	Hose Assy. 1" With Flange	I.4.2036	2
4	Spring Washer	I.H.0062	4
5	O-Ring	I.4.1050	2
6	O-Ring	A27763/17	2
7	Screw, Hex Head; Zinc Plated	748645	8
8	Washer, Lock; Cad Plated	735734	8
9	Screw, Hex Head; Zinc Plated	734734	4