सत्यमेव जयते

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**MW/APB/BMB/Escorts** **Date: 30.06.2025**

**Principal Chief Mechanical Engineer,**

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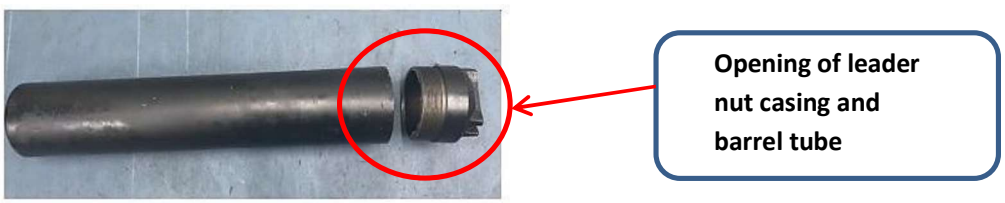
6. North Central Railway, Allahabad.-211001
7. North Western Railway, Jaipur-302006
8. North Eastern Railway, Gorakhpur-273001
9. Southern Railway, Park Town, Chennai-600003
10. South Central Railway, Secunderabad-500071
11. South Eastern Railway, Garden Reach, Kolkata-700043
12. South East Central Railway, R.E. Complex, Bilaspur 495004
13. South Western Railway, Hubli 580023
14. Northeast Frontier Railway, Maligaon, Guwahati-781011
15. Western Railway, Churchgate, Mumbai-400020
16. West Central Railway, Jabalpur-482001

**Sub :**- Modification in M/s Escorts design BMBS
**Ref**:- RDSO letter no. MW/APB/BMB/Escorts dated 04.08.2023

1. Zonal Railways have reported several cases where the threaded joint of leader nut casing & barrel tube opened and adjuster spindle came out in BMBS of M/s Escorts. Analysis of reported cases, corrective & preventive measures taken and design improvement exercise were discussed in the Workshop on freight reliability held on (26-27) March, 2025, at New Delhi along with several other issues.

2. The OEM (M/s Escorts) was consulted on above issue, and after detailed technical analysis, the followings have been recommended :-

   i. **Opening of Leader nut casing from SAB barrel:-** On investigation of failures of leader nut casing opening from barrel tube, it was found that locking force of leader nut casing with barrel tube was in-sufficient, leading to loosening of threaded joint and consequential failures during service.

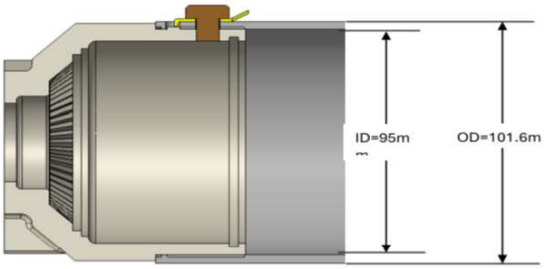


Accordingly, following modification have been done in design of barrel tube of M/s Escorts makes BMBS for proper securing arrangement:-

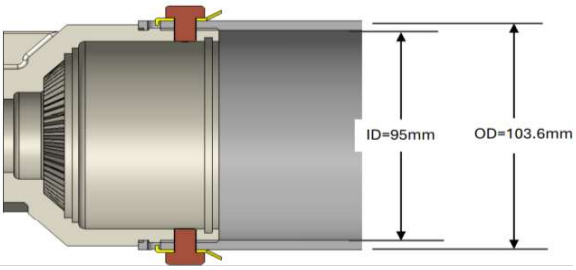
a) Wall Thickness of Barrel tube increased by 1.0 mm by increasing outer diameter from existing 101.6 mm to 103.6 mm.

b) Length of locking screw M 8 * 1.25 increased from 9.5 mm to 10.5 mm to accommodate the increased thickness of barrel tube and additional locking screw added 180º apart.

c) Sleeve Bellow ID is changed from 102 mm to 104 mm to avoid infringement with barrel pipe assembly.




**Existing Design**




**New Design**

ii. **<u>Adjuster spindle Coming out</u>**:- On investigation of failures, it was found out that adjuster spindle coming out due to failure of spindle stopper i.e Counter sunk socket head crew M8×25 (CSSH Screw):

Spindle stopper

Spindle stopper with adjuster spindle

Accordingly, following modification have been done in design of spindle stopper:-

a) CSSH Screw M8×25 is replaced with longer length Hex Head Screw M8×30.
b) Spring Lock Washer has been introduced with M8×30 screw for improved locking force of hex head screw of spindle stopper.

Above design improvements have been included in revised Operation and Maintenance Manual of Escorts make BMBS Rev.8 dated 28/10/2024. Prototype brake cylinder with above modifications was manufactured by M/s Escorts in Feb. 2025 which has been tested by Wagon Design Dte. and approved for regular implementation. Therefore Zonal Railways are advised to ensure that any further procurement of M/s Escorts make bogie mounted brake cylinder (BMBC) for maintenance purpose is done as per revised Operation and Maintenance Manual no RED-RD-BS-19-OM-01 which is attached herewith as **Annexure A.**

APURVA

Digitally signed by APURVA
DN: cn=APURVA, c=IN, st=Uttar Pradesh, o=Indian Railways, serialNumber=271e15674f0356c540db2a07aca7a284298f258d9576c97e5e92f3ca83a331fc
Date: 2025.06.30 10:31:24 +05'30'

**Apurva**
**Jt. Director/ Wagon**
**For Executive Director Wagon/RDSO**

**Copy to-**

1. EDME/Freight/RB- for kind information please.
2. ED/QA (M)/DLI, KOL & Mumbai - for information and necessary action.
3. M/s Escorts Kubota Ltd- for information and necessary action.

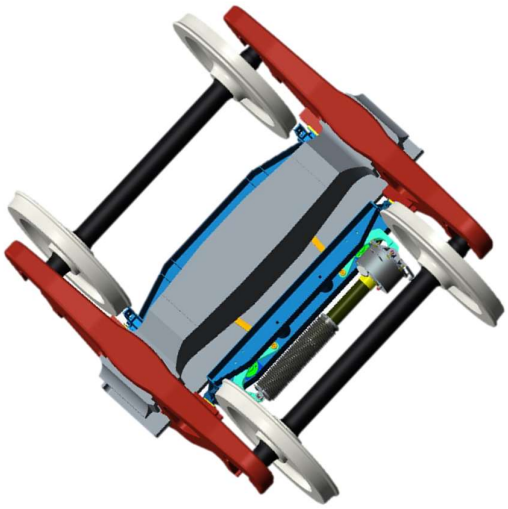
Annexure-I

# OPERATION AND MAINTENANCE MANUAL

# BOGIE MOUNTED BRAKE SYSTEM (BMBS)
# FREIGHT STOCK WITH CASNUB BOGIE

**Doc. No. RED-RD-BS-19-OM-01**

**RDSO Spec No. WD-23-BMBS-2008 (Rev.01) Amendment No.1 of Sept.-2016**



## Document Revision History

| Rev. | Date | Changes and reasons for change | Prepared by | Reviewed by | Approved by |
|---|---|---|---|---|---|
| 00 | 04/03/2017 | Initial Release | Biswajit Bose | Sumit Ahlawat | Samit Kar |
| 01 | 19/06/2019 | Drawing Change | Biswajit Bose | Sumit Ahlawat | Satish Kumar I |
| 02 | 25/07/2020 | New Inputs | Biswajit Bose | Sumit Ahlawat | Satish Kumar I |
| 03 | 04/08/2022 | New Inputs | Nagababu Krovi | KV Ramaprasad | Satish Kumar I |
| 04 | 14/09/2022 | Company name and Logo Changed | Nagababu Krovi | KV Ramaprasad | Satish Kumar I |
| 05 | 11/08/2023 | Manual updated | Lalit Jangra | Neeraj Bansal | Harender Singh Keena |
| 06 | 08/10/2023 | Manual updated | Lalit Jangra | Neeraj Bansal | Harender Singh Keena |
| 07 | 03/09/2024 | Manual updated | Bharat Sharma | Neeraj Bansal | Harender Singh Keena |
| 08 | 28/10/2024 | Grease detail added for Brake Cyl., APM, Slack Adjuster and B C Assy changes. | Lalit Jangra | Neeraj Bansal | Harender Singh Keena |

**Escorts Kubota Limited**

**(Formerly Escorts Limited)**

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## TABLE OF FIGURES

# 1 DESCRIPTION AND MAINTENANCE MANUAL

## 1.1 GENERAL DESCRIPTION OF M/S ESCORTS MAKE BMBS

In continuation to the tradition of launching latest and technologically advanced products for Indian Railways, Escorts Ltd. India, has introduced Bogie Mounted Brake System for freight cars designated as BMBS.

The developed BMBS unit is compatible with all type of railway wagons, currently in application, including BOBRN, BOXN, BOXNHL, BCN, BCNA, etc.

The BMBS unit (Refer Fig.2) consists of two major structural items named as Primary Beam and Secondary Beam. It consists of Push Rods and Bell crank levers. The actuation of rigging arrangement is done with an 11 inch brake cylinder having inbuilt automatic double acting slack adjuster. This BMBS system is capable of fitment into any standard CASNUB bogie and used with K Type 58 mm Composite brake block. The brake cylinder is mounted transversely to the track. The load sensing device for automatic changeover of brake cylinder pressure is also developed by Escorts Kubota Ltd. This Automatic Pressure Modification Device is able to convert pressure from 3.8±0.1 Kg/cm$^2$ to 2.2±0.25 Kg/cm$^2$ depending on load situation. The Escorts make BMBS system is also provided with a hand brake mechanism. One Brake Cylinder per Bogie.

The brake beams are well tested in static as well as dynamic mode and complied to the RDSO specification WD-23-BMBS-2008 (Rev.01) Amendment No.1 of Sept.-2016. The Brake system has successfully completed Function test, Environmental test, Vibration Test also as per the specification and field trial of one and half year.

## 1.2 TECHNICAL FEATURES OF M/S ESCORTS MAKE BMBS

- This system is designed according to Indian railways specification No. WD – 23 – BMBS – 2008 – Rev.1 Amendment No.1 of Sept.-2016.
- BMBS pipes are as per RDSO drawings and specification no. 04-ABR-2002 for different types of wagons and can be fitted easily with inlet and outlet of all components supplied by Escorts Ltd.
- BMBS hand brake items, as per RDSO drawings can be fitted easily with bogie items supplied by Escorts Ltd.
- All air brake items, as per RDSO specification 02-ABR-2002 (Latest) can be fitted easily with bogie items supplied by Escorts Ltd.
- Escorts BMBS is very unique and can be easily fitted on any standard bogie without making any modification. All rigging items remain same for all wagons, whether it is Tanker wagon, Flat wagon or Hopper wagon.

- This system is designed for fitment of BMBS during manufacturing of new wagons as well as during Retro Fitment of BMBS on existing In-Service wagons.
- Escorts BMBS is designed for Casnub Bogie with a wheel base of 2000 ± 5 mm.
- Escorts BMBS consist of one Brake Cylinder per bogie which generates the required braking force for complete wagon, to achieve the specified stopping distance.
- Escorts BMBS utilizes the existing K Type Composite Brake Block with 58 mm thickness and no new brake block variant is added for Indian railways.
- Escorts BMBS is capable of generating two stage (Empty/Loaded) braking using the ERV (APM) device. This device is developed for BMBS unit which is able to convert pressure to 60% of max value in case the wagon is running empty. This prevents the train from toppling while hard braking, reduces wheel wear, and increases brake block life.
- Uniform wheel loading is achieved through well designed rigging arrangements.
- Escorts BMBS is equipped with Hand Brake provision through two heavy duty flexible metallic ropes. These ropes are attached to the main rigging arrangement and can be easily actuated by using hand brake wheel, with maximum force of 25 Kg.
- Escorts BMBS works with both solid and through hole bolster truck designs. It results in less weight and lower application cost.
- All brake cylinders (With Hand Brake & Without Hand Brake) are equipped with stroke indicator arrangement. This helps in easy visualization of brake application status in fitted condition.

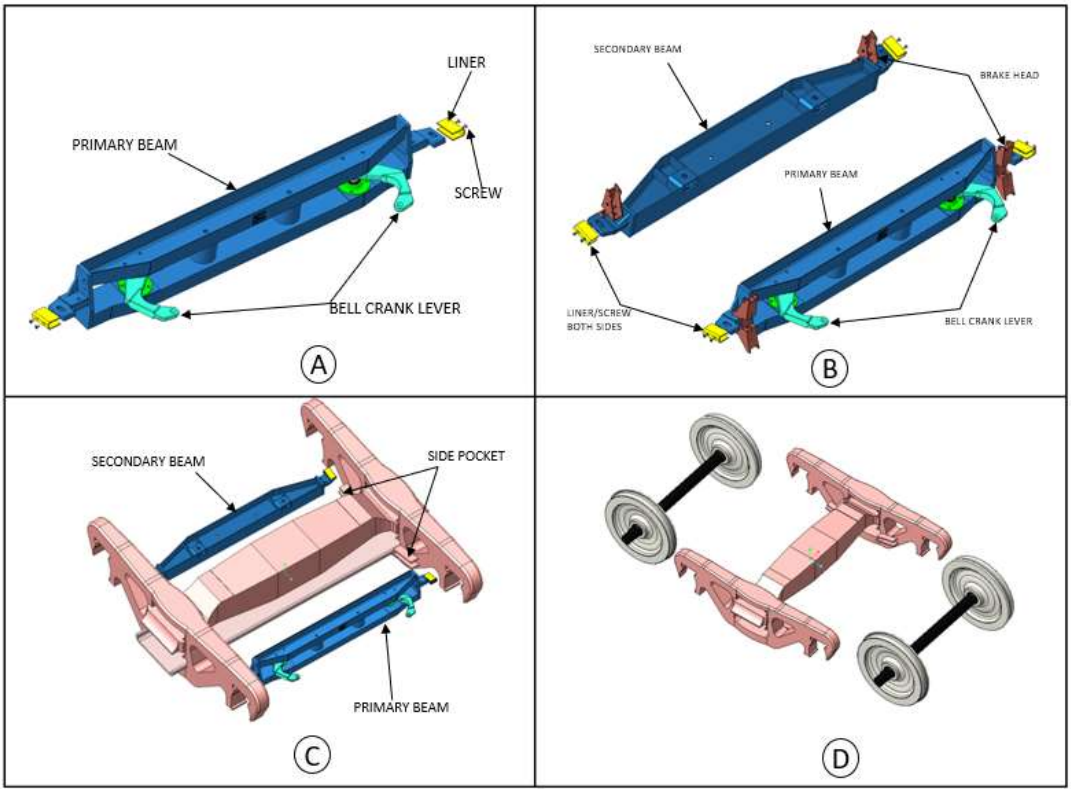
## 1.3 GENERAL INSTALLATION OF ESCORTS MAKE BMBS

Refer fig. 1(A, B, C, D), 6 & 31 for details.

1. Install bell crank levers (5,6) in the Primary beam along with Spherical bearing, Ball bearings and Lever seat using T- head bolts (14), Spring Washers (16) and Hex Nylock nuts (15) .(Ref. Fig 1A , 31 & 6)
2. Fit the Brake head (8) on both ends of the beams (1,2) in the slot provided. (Ref. Fig 6,1B).
3. Put the Brake Head Pin (12) and lock it with a split pin (26).
4. If Retro-Fitment is being done in existing wagons, then in order to install Escorts BMBS in CASNUB Bogie, it is required to dismantle the complete bogie and also remove both the axles. Now slide both of the Brake Beams (Primary & Secondary) in the side frame pockets.
5. If being installed fresh, first install both beams inside frame and then assemble it with both the axles. (Ref. Fig 1C & 1D).

6. Fit all K Type Composite Brake Blocks (WD-00006-S-01 Alt Latest) on the Brake Head (8) of Brake Beam (1, 2) using Key (W/BG-6150).
7. Once the proper position of Brake Beams (1,2) is achieved, install both the Push Rods (7) connecting with Bell Crank Lever using Pin dia. 24x80 (11) & Bulb Cotter with Plain Washer (40) (Left & Right are similar). The Push Rod on other side is connected to Secondary Beam using pin dia. 24x120 (9) & Bulb Cotter with Plain Washer (40)
8. Install the Brake Cylinders (3,4) in between Bell Crank Levers (5,6) with Indicator facing outwards using Pin dia. 24x70 (10), Bush (13) and Spring Dowel Sleeve (17).
9. Join the cables of Brake Cylinder with Hand Brake to the Equalizing Lever (32) through Pin for Cable (36), Washer (46) and Split Pin 4x35 (47) .
10. Attach the Equalizer Lever (32) and extension piece with vertical lever through pin joint.

Figure 1: Sequence detail of general Arrangement of Bogie Mounted Brake System (BMBS)



**Caution!**

- The wagon has to be placed in a Sick-line/ ROH Depot
- Use Overhead crane for lifting heavy parts
- The workmen has to wear helmet, Hand gloves and Safety shoes.
- Use of proper tools

**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.

## 1.4 AIR BRAKE SYSTEM WITH BMBS

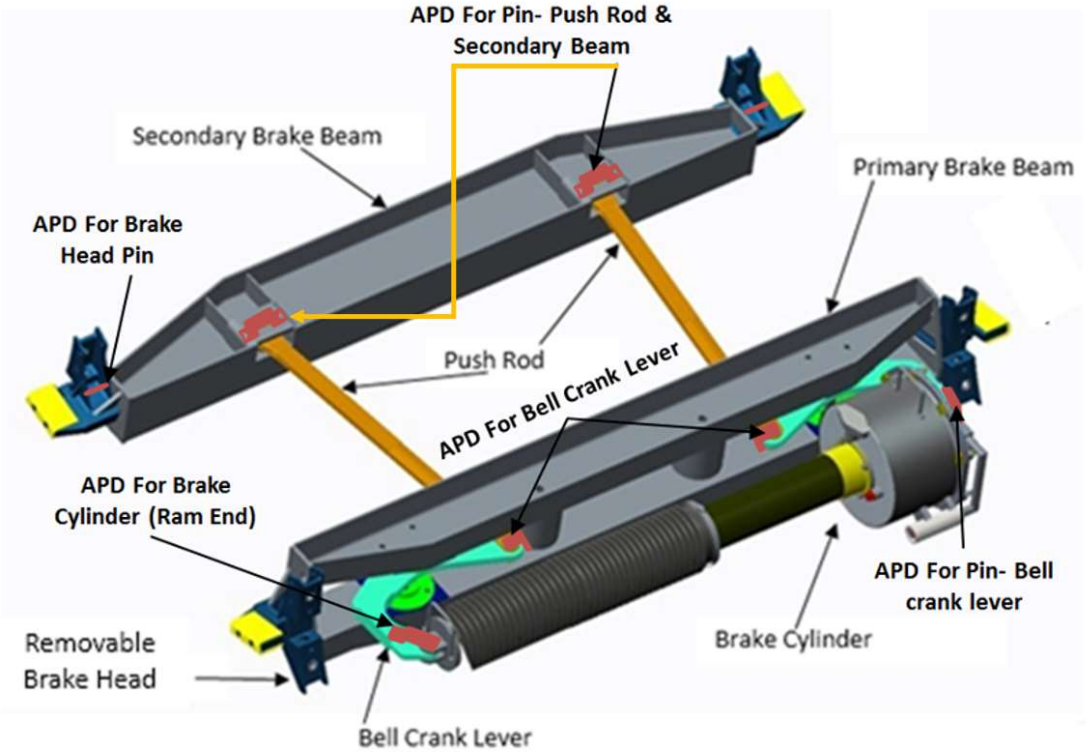



Figure 2: General Arrangement of Bogie Mounted Brake System (BMBS)

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 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. 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 ± 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 change over mechanism between ERV/APM underframe and side frame of the bogie. The mechanism gets actuated at a pre-determined change overweight 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$^2$ in case 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 ERV/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 ERV/APM device. Based on the position of sensor arm of ERV/APM device, 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 1.3 to 1.6 kg/cm$^2$ in Brake Pipe 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.

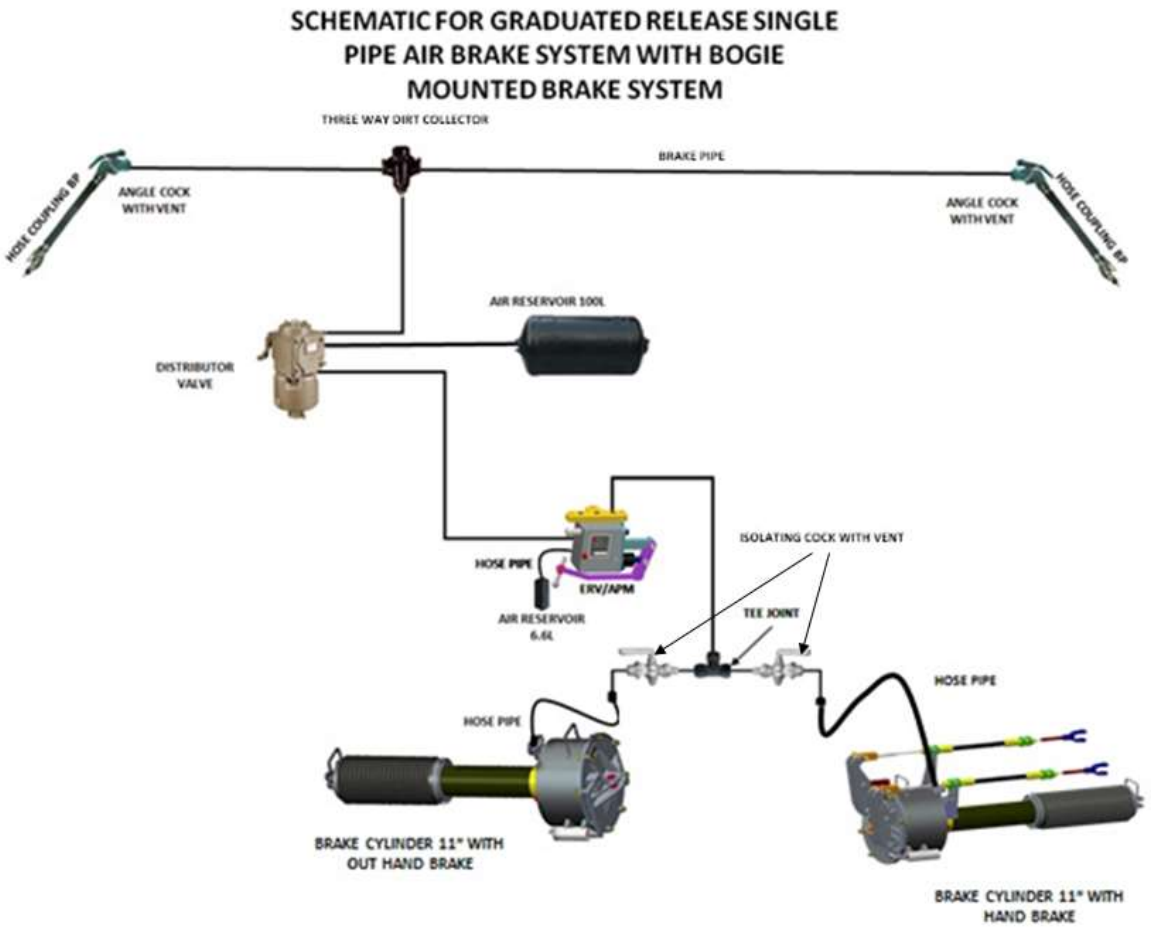



Figure 3: Schematic for graduated release Single Pipe Air Brake System with Bogie Mounted Brake System (BMBS)

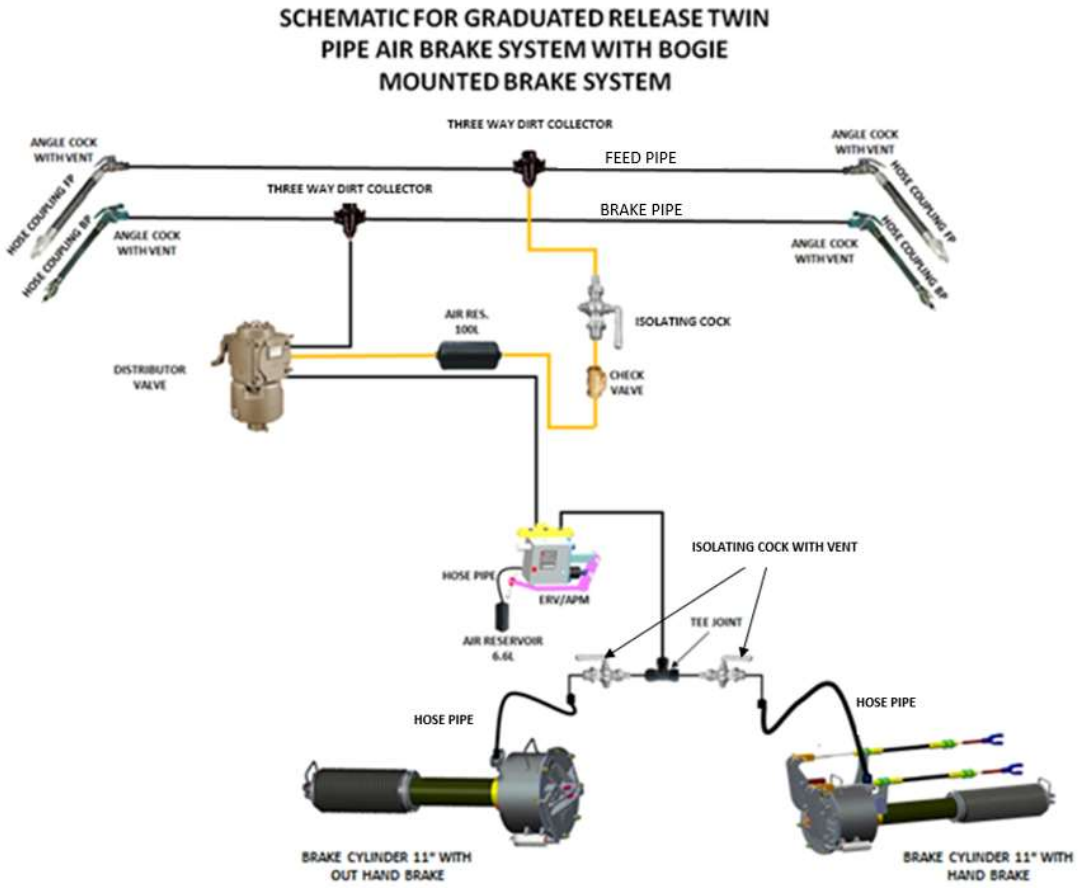



Figure 4: Schematic for graduated release Twin Pipe Air Brake System with Bogie Mounted Brake System (BMBS)

### 1.4.1 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.

### 1.4.2 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.

### 1.4.3 HOSE COUPLING FOR BRAKE / FEED PIPE

The hose couplings are provided to connect brake pipeline & feed pipeline 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. Rubber gasket is used in the coupling head to make the joint leak proof.

### 1.4.4 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 achieve by centrifugal action.

### 1.4.5 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.

### 1.4.6 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.

### 1.4.7 PIPES

ERW stainless steel pipes as per RDSO specification 04-ABR-2002 (Latest) 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 airflow.

### 1.4.8 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.

### 1.4.9 GENERAL ADJUSTMENTS FOR BRAKE SHOE CHANGE

Adjustment of all components is done after final assembly only. Once the air connection (3.8 kg/cm$^2$) is attached to the brake cylinder, the brake cylinder starts adjusting the stroke and ensures the gap between brake block and wheel.

The brake cylinder automatically adjusts pay-out and pay-in of the gaps. The Escorts BMBS brake cylinder is equipped with In-Built Automatic double acting slack adjuster. It maintains automatically a constant piston travel by taking up or paying out slack with each stroke of brake application. The piston stroke indicator, which is mounted on brake cylinder body ensures visibility of indicator during brake application and release.

In order to change the brake shoe, rotate the automatic double acting slack adjuster barrel to create gap between brake shoe and wheel.

Put a new brake block of 58 mm thickness in the brake head and fix it using brake block key

### 1.4.10 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.

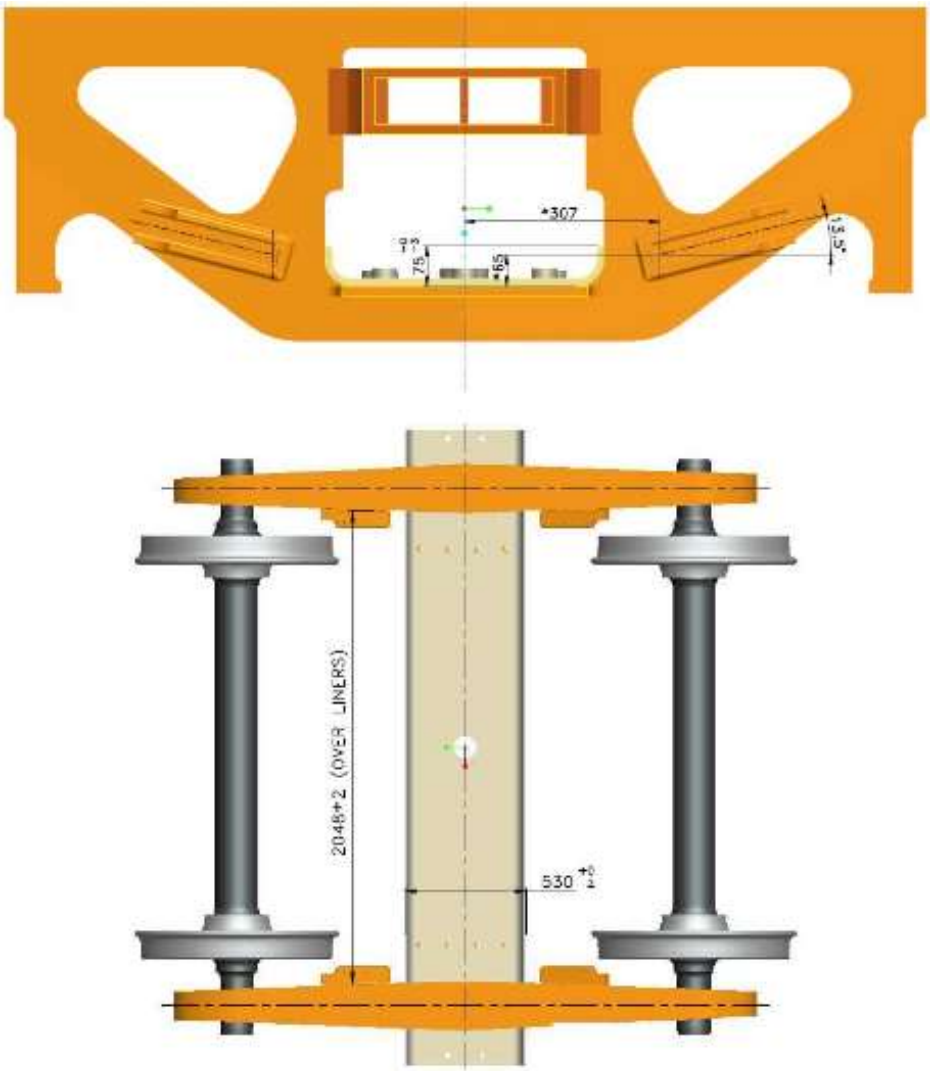



Figure 5: Critical Bogie dimensions for BMBS Bogie

## 1.5 MAJOR COMPONENTS OF BMBS

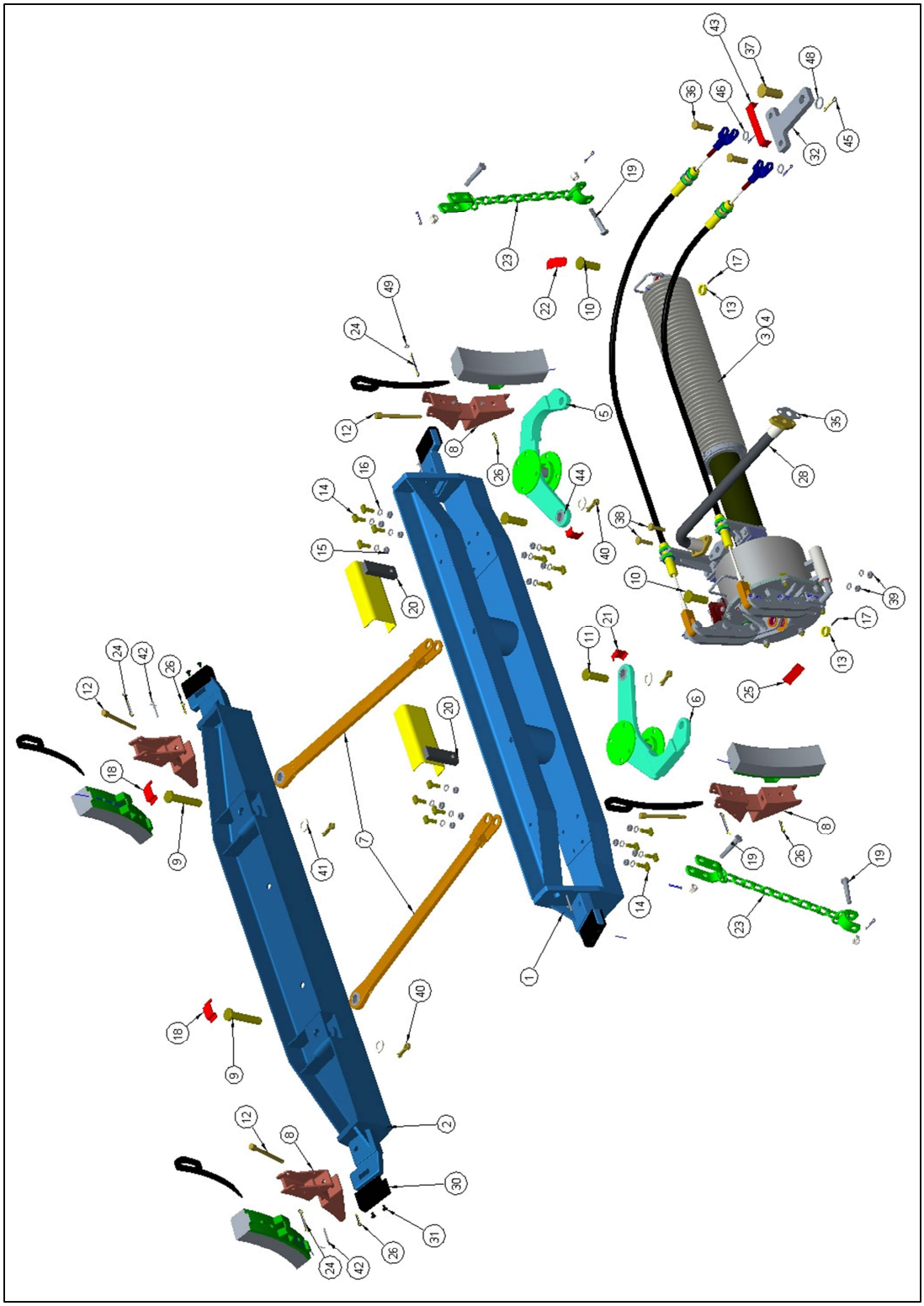


Figure 6: Exploded View of BMBS system

| S. No. | LONG Description | Drawing No. | Quantity | Spares | MCK/ ESIO (Essentially change if opened or removed)/ CB | ROH | POH |
|---|---|---|---|---|---|---|---|
| 1 | (SCI*) PRIMARY BRAKE BEAM ASSEMBLY | 3EB5521 | 2 | ✓ | X | X | X |
| 2 | (SCI*) SECONDARY BRAKE BEAM ASSEMBLY | 3EB5522 | 2 | ✓ | X | X | X |
| 3 | (SCI*) BC 11" WITH DOUBLE ACTING SLACK ADJUSTER ASSY (W/O HAND BRAKE) | 3EB7347 | 1 | ✓ | X | X | X |
| 4 | (SCI*) BRAKE CYLINDER 11" WITH DOUBLE ACTING AUTOMATIC SLACK ADJUSTER & HAND BRAKE CABLE | 3EB7348 | 1 | ✓ | X | X | X |
| 5 | (SCI*) BELL CRANK LEVER-LH ASSY | 3EB9792 | 2 | ✓ | X | X | X |
| 6 | (SCI*) BELL CRANK LEVER-RH ASSY | 3EB9791 | 2 | ✓ | X | X | X |
| 7 | (SCI*) PUSH ROD SUB-ASSY | 3EB9790 | 4 | ✓ | X | X | X |
| 8 | BRAKE HEAD | 3EB7375 | 8 | ✓ | X | X | X |
| 9 | (SCI*) PIN DIA24x120 | 4EB10264 | 4 | ✓ | X | X | X |
| 10 | (SCI*) PIN DIA24x70 | 4EB10262 | 4 | ✓ | X | X | X |
| 11 | (SCI*) PIN DIA24x80 | 4EB10263 | 4 | ✓ | X | X | X |
| 12 | (SCI*) BRAKE HEAD PIN | 4EB9764 | 8 | ✓ | X | X | X |
| 13 | BUSH | 4EB10261 | 4 | ✓ | X | X | ✓ |
| 14 | (SCI*) TEE HEAD BOLT M12X35 | 4EP5042 | 32 | ✓ | X | X | X |
| 15 | NYLOCK NUT M12 PLATED | DIN982 | 32 | ✓ | ✓ | X | ✓ |
| 16 | SPRING WASHER B12 | DIN127 | 49 | ✓ | X | X | X |
| 17 | SPRING DOWEL SLEEVE 6x35-ST | 4EB10260 | 4 | ✓ | ✓ | X | ✓ |
| 18 | ANTI PILFERAGE DEVICE | 4EB8149 | 4 | ✓ | X | X | X |
| 19 | HEX HEAD BOLT M16x90 WITH HOLE | 4EB10269 | 8 | ✓ | X | X | X |
| 20 | BC HOLDING BRACKET | 3EB10268 | 4 | ✓ | X | X | X |
| 21 | ANTI PILFERAGE PLATE FOR PUSH ROD PIN | 4EB9573 | 4 | ✓ | X | X | X |
| 22 | ANTI PILFERAGE PLATE FOR BELL CRANK PIN | 4EB9572 | 2 | ✓ | X | X | X |
| 23 | (SCI*) BC HOLDING CHAIN | 4EB10266 | 4 | ✓ | X | X | X |
| 24 | SPLIT PIN 6.3x75 | IS:549 | 8 | X | X | X | ✓ |
| 25 | ANTI-PILFERAGE PLATE FOR BC BACK COVER | 4EB10265 | 2 | ✓ | X | X | X |
| 26 | SPLIT PIN 5x32 PLATED | IS:549 | 8 | X | X | X | ✓ |
| 27 | BRAKE HOSE FOR APM(ERV) | 3EB9763 | 1 | ✓ | X | X | X |
| 28 | BRAKE HOSE FOR BRAKE CYLINDER | 3EB5536 | 2 | ✓ | X | X | ✓ |
| 29 | AUXILIARY RESERVOIR FOR APM (6.6 LITERS) | 3EB7408 | 1 | ✓ | X | X | X |
| 30 | LINER | 4EB9831 | 4 | X | ✓ | ✓ | ✓ |
| 31 | SCREW M8x1.25x15 | 4EB9832 | 8 | X | ✓ | ✓ | ✓ |
| 32 | EQUALIZER | 4EB9785/2 | 1 | ✓ | X | X | X |
| 33 | O-RING 17x3 | 4EB9786 | 2 | ✓ | X | X | X |
| 34 | O-RING | 4KB1889 | 2 | ✓ | X | X | X |
| 35 | GASKET | 4EB10043 | 2 | ✓ | X | X | X |
| 36 | (SCI*) PIN FOR CABLE | 4EB5567 | 2 | ✓ | X | X | X |
| 37 | (SCI*) PIN FOR TIE ROD | 4EB9975 | 1 | ✓ | X | X | X |
| 38 | HEX HEAD BOLT M12X50 | DIN931 | 11 | X | X | X | X |
| 39 | HEXAGON NUT M12 ZINC PLATED | DIN934 | 13 | X | X | X | X |
| 40 | BULB COTTER | 4EB9905 | 8 | ✓ | X | X | X |
| 41 | PLAIN WASHER 25MM | IS:2016-1967 | 8 | ✓ | X | X | X |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 42 | ANTI PILFERAGE DEVICE FOR BRAKE HEAD PINS | 4EB10027 | 8 | ✓ | X | X | X |
| 43 | APD FOR PINS ON EQUALIZER | 4EB9830 | 1 | ✓ | X | X | X |
| 44 | PLAIN SPHERICAL BEARING | 4EB5585 | 4 | X | X | X | ✓ |
| 45 | SPLIT PIN DIA6.3x50 ZINC PLATED | IS:549 | 1 | ✓ | X | X | X |
| 46 | FLAT WASHER B20 | IS:2016 | 2 | ✓ | X | X | X |
| 47 | SPLIT PIN 4X35 | DIN94 | 2 | ✓ | X | X | X |
| 48 | MACHINED WASHER 31X56X4 | IS:2016 | 1 | ✓ | X | X | X |

| Abbreviation | |
|---|---|
| ✓ | Required |
| X | Not required |

## 1.6 DESCRIPTION FOR BOGIE MOUNTED BRAKE CYLINDER 11" (WITH HAND BRAKE-3EB7348 & WITHOUT HAND BRAKE CABLE-3EB7347)

Brake Cylinder (With Hand Brake) and Brake Cylinder (Without Hand Brake) are similar in construction internally. Pull lever assembly and cable mounting bracket are externally added in case of Brake cylinder with hand brake. Brake cylinder also has in built automatic double acting slack adjuster.

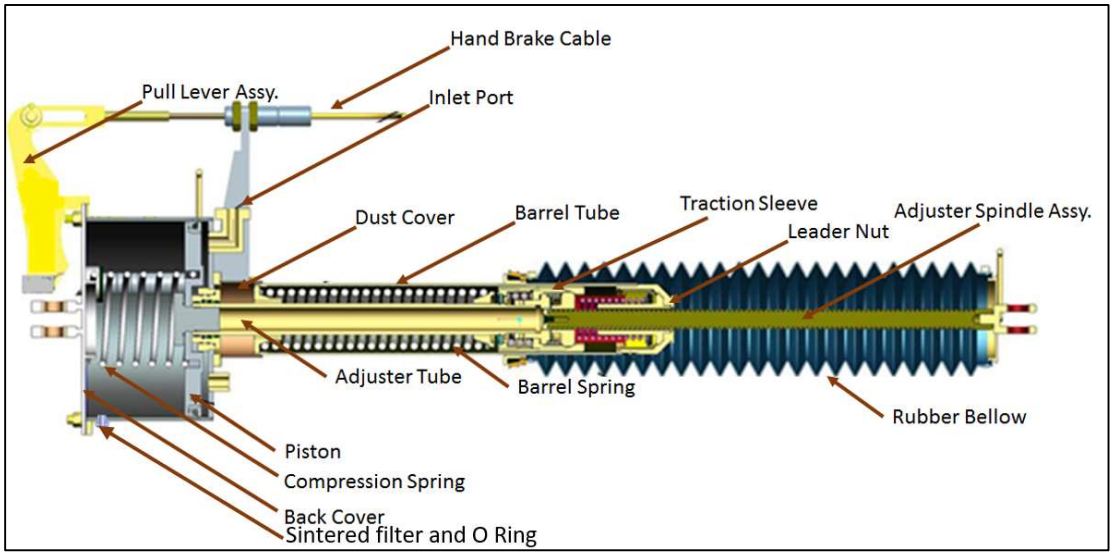



Figure 7: Sectional view of Brake Cylinder – 11 Inch with hand brake arrangement

1. Extended length is 1380mm (First installed, Brake released)
2. Minimum length is 885 mm (After Slack Adjustment, Brake Applied)
3. Stroke length at pressure 3.8 ±0.1kg/cm$^2$ on loaded condition is 70±10mm.
4. Stroke length at pressure 2.2±0.25 kg/cm$^2$ on Empty condition is 55±10mm. The integral automatic 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 automatic double acting slack adjuster has a total make-up capacity of 500 mm, which will compensate for total combination of shoe wear, wheel wear and clearance.

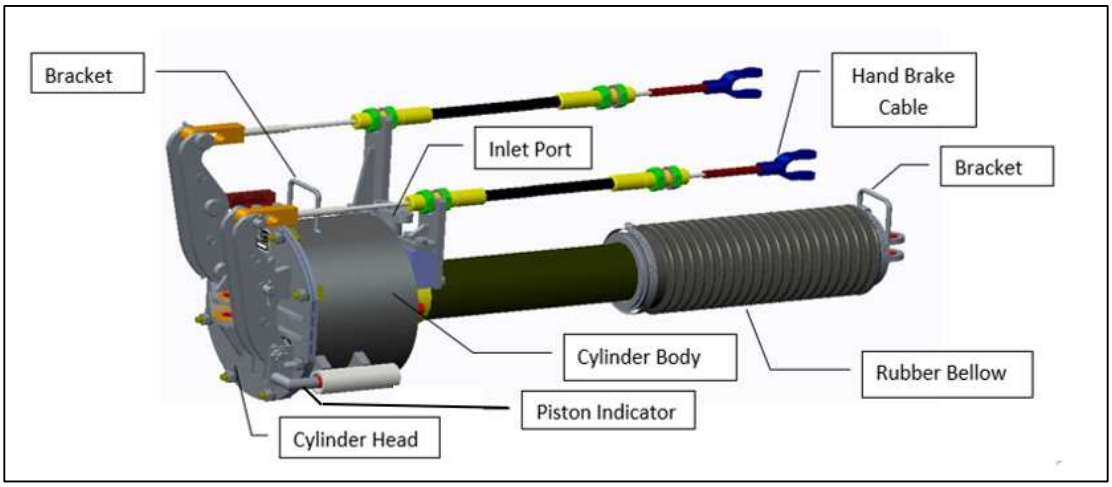



Figure 8: Brake Cylinder – 11 Inch with hand brake arrangement (Drg. No.3EB7348 Alt. Latest)

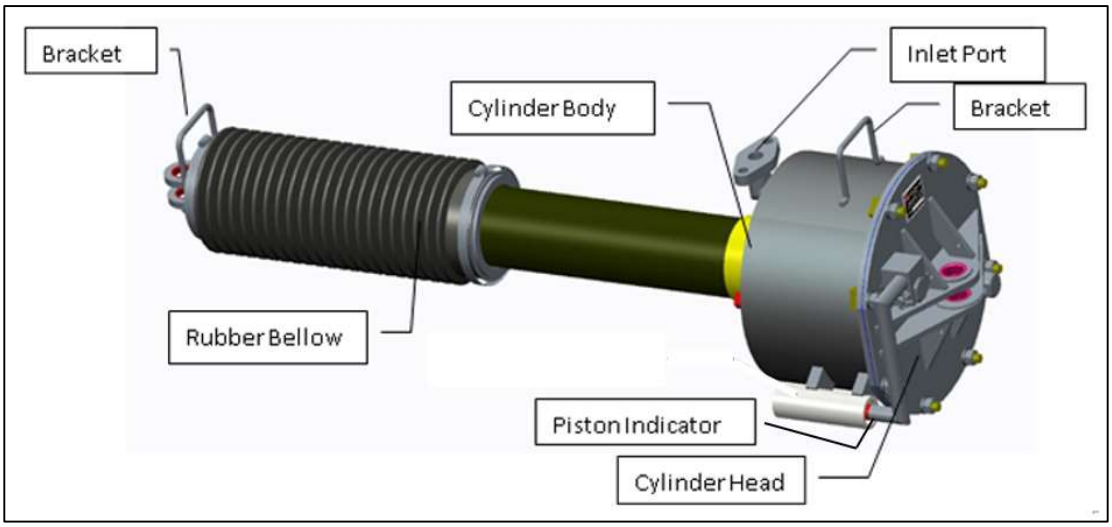



Figure 9: Brake Cylinder – 11 Inch without hand brake arrangement (Drg. No.3EB7347 Alt. Latest)

## 1.7 BRAKE BEAMS

Brake beams are an integral part of BMBS system. There are two kinds of brake beams viz. Primary & Secondary which transmit brake force.

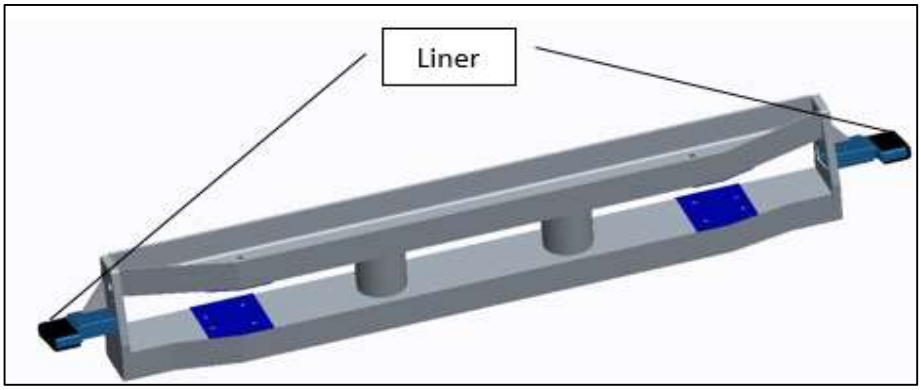



Figure 10: Primary Brake Beam Assy. (Drg. No.3EB5521 Alt Latest)

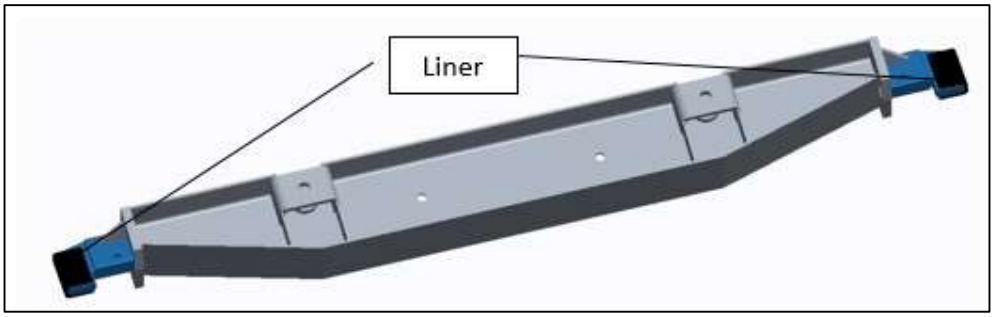



Figure 11: Secondary Brake Beam (Drg. No.3EB5522 Alt Latest)

# 2 PRINCIPAL OF OPERATION

BMBS Brake Cylinder is an actuation device and is different from the traditional actuators. Its end distance (centre to centre) reduces while applying force on brake blocks, and centre to centre distance increases when brakes are released. It works in following two modes of operations as below.

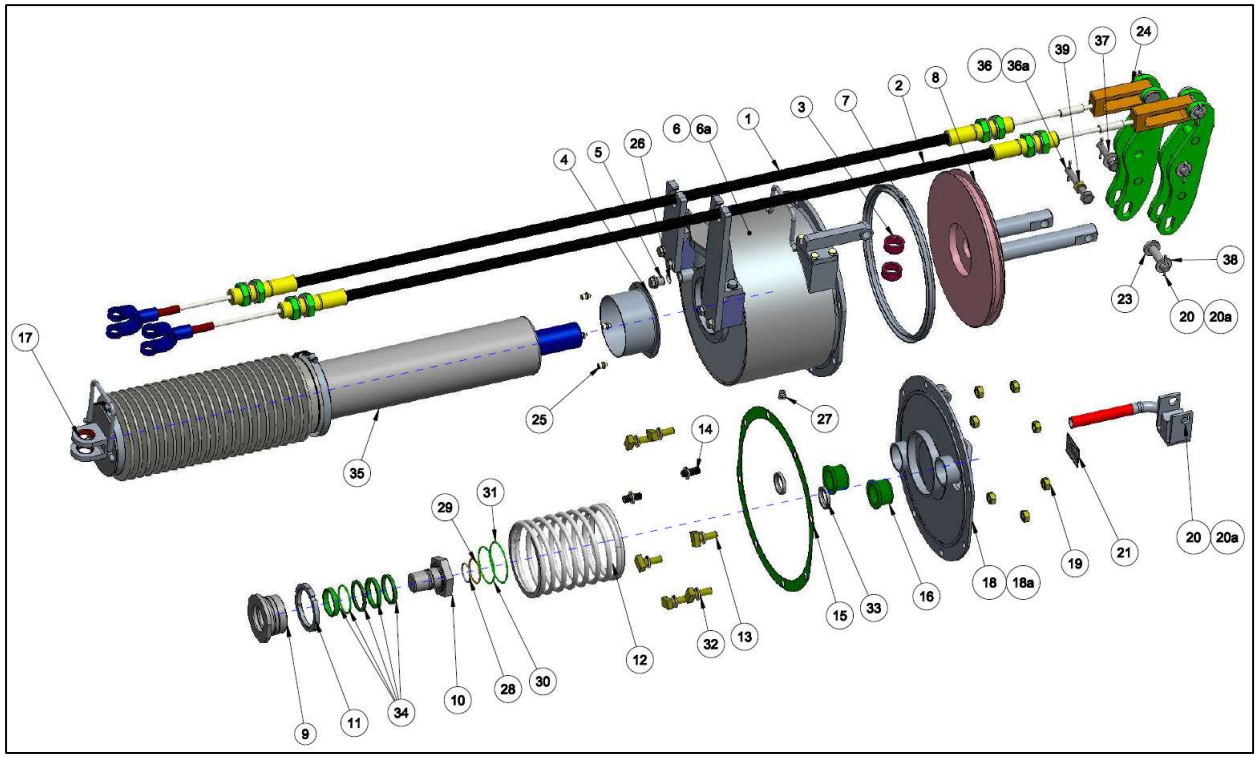



Figure 12: Brake Cylinder-11 Inch with Hand Brake Cable

| S. No. | LONG Description | Drawing No. | Quantity | Spares | MCK/ ESIO (Essentially change if opened or removed)/ CB | ROH | POH |
|---|---|---|---|---|---|---|---|
| 1 | WIRE ROPE ARRANGEMENT | 3EB6158/1 | 1 | ✓ | X | X | X |
| 2 | WIRE ROPE ARRANGEMENT | 3EB6158/2 | 1 | ✓ | X | X | X |
| 3 | BUSH | 4EB7394 | 2 | X | X | X | X |
| 4 | DUST COVER (14 GAUGE SHEET) | 4EB7820 | 1 | X | X | X | X |
| 5 | TEST PLUG (3/8") | 4EB9808 | 1 | X | X | X | X |
| 6 | CYLINDER BODY 11" FABRICATED (WITH HAND BRAKE) | 2EB9537 | 1 | ✓ | X | X | X |
| 6a | CYLINDER BODY 11" FABRICATED (WITHOUT HAND BRAKE) | 2EB9540 | 1 | ✓ | X | X | X |
| 7 | PISTON PACKING (BC 11") | 3EB6112 | 1 | X | X | X | ✓ |
| 8 | PISTON ASSY. | 3EB7623 | 1 | X | X | X | X |
| 9 | GLAND BUSH | 3EB7712 | 1 | X | X | X | X |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10 | LOCKING SCREW (FOR BC 11") | 4EB7583 | 1 | X | X | X | X |
| 11 | CHECK NUT FOR GLAND | 4EB7707 | 1 | X | X | X | X |
| 12 | COMPRESSION SPRING | 4EB7619 | 1 | X | X | X | ✓ |
| 13 | (SCI*)TEE HEAD BOLT M12X35 | 4EP5042 | 7 | ✓ | X | X | X |
| 14 | STUD M12x1.75x33 | 4EB8973 | 1 | X | X | X | X |
| 15 | SEALING RING | 4EB7397 | 1 | X | X | X | ✓ |
| 16 | BUSH(OILON) | 4EB7715 | 2 | X | X | X | ✓ |
| 17 | BUSH | 4EB7529 | 2 | X | X | X | X |
| 18 | BACK COVER W/O HAND BRAKE ARRANGEMENT | 3EB7719 | 1 | X | X | X | X |
| 18a | BACK COVER WITH HAND BRAKE ARRANGEMENT | 3EB7624 | 1 | X | X | X | X |
| 19 | HEXAGON NUT M12 ZINC PLATED | DIN934 | 8 | X | X | X | X |
| 20 | PISTON INDICATOR (11" BR. CYL.) WITHOUT HAND BRAKE | 3EB9534 | 1 | ✓ | X | X | X |
| 20a | PISTON INDICATOR (11" BR. CYL.) WITH HAND BRAKE | 3EB9533 | 1 | ✓ | X | X | X |
| 21 | NAME PLATE | 4EB7844 | 1 | X | X | X | ✓ |
| 22 | SPLIT PIN DIA4x36 | IS:549 | 6 | X | X | X | ✓ |
| 22a | SPLIT PIN DIA 3.2x32(W/O HAND BRAKE) | IS:549 | 1 | X | X | X | ✓ |
| 23 | PIN (STROKE INDICATOR WITH PULL LEVER (W/O) HAND BRAKE | 4EB7988/2 | 4 | X | X | X | X |
| 24 | CABLE END | 4EB7670/1 | 2 | X | X | X | X |
| 25 | SPRING WASHER B6 | DIN127 | 4 | X | X | X | ✓ |
| 26 | O-RING (13.6x2.3) | 4EP6196/1 | 1 | X | X | X | ✓ |
| 27 | WIREMESH FILTER | 1J101000086 | 1 | ✓ | X | ✓ | X |
| 28 | O-RING (DIA 31-OR 30003100) | 4EB9336 | 1 | X | X | X | ✓ |
| 29 | O-RING (DIA 42-OR 30004200) | 4EB9337 | 1 | X | X | X | ✓ |
| 30 | O-RING DIA (63x3) | 4EB9338 | 1 | X | X | X | ✓ |
| 31 | O-RING (70x3) | 4EB9339 | 1 | X | X | X | ✓ |
| 32 | SPRING WASHER B12 | DIN127 | 8 | ✓ | X | X | X |
| 33 | WIPER SEAL | 1J101000031 | 2 | X | X | X | ✓ |
| 34 | SET OF SEAL KIT(GLYD RING-4EB9331(GA-45x50x9.7), SEAL-4EB9332(RTB-45x56x4.2), O-RING-4EB9333(50x3.5), SEALING RING-4EB9334 (SUD-45x55x8), SCRAPER-4EB9335(WS-45x53.6x7) | 05ITEMS | 1 | X | X | X | ✓ |
| 35 | SLACK ADJUSTER ASSEMBLY | 3EB7531 | 1 | ✓ | X | X | X |
| 36 | HEX. HEAD BOLT (M12x80) WITH HOLE | 1J101000057 | 1 | ✓ | X | X | ✓ |
| 36a | HEX HEAD BOLT M14x1.5x58 (W/O HAND BRAKE) | 4EB8972/1 | 1 | ✓ | X | X | ✓ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37 | HEX. HEAD BOLT (M12x60) WITH HOLE | 1J101000056 | 1 | ✓ | X | X | ✓ |
| 38 | WASHER DIA.17X30X3-MILD STEEL FE/ZN PLATING -IS:2016 | IS:2016 | 5 | X | X | X | ✓ |
| 39 | CASTLE NUT M14x1.5x16 ZINC PLATED(W/O HAND BRAKE) | IS:5368 | 1 | X | X | X | ✓ |

| Abbreviation | |
|---|---|
| ✓ | Required |
| X | Not required |

## 2.1 ESCORTS MAKE AUTOMATIC DOUBLE ACTING SLACK ADJUSTER

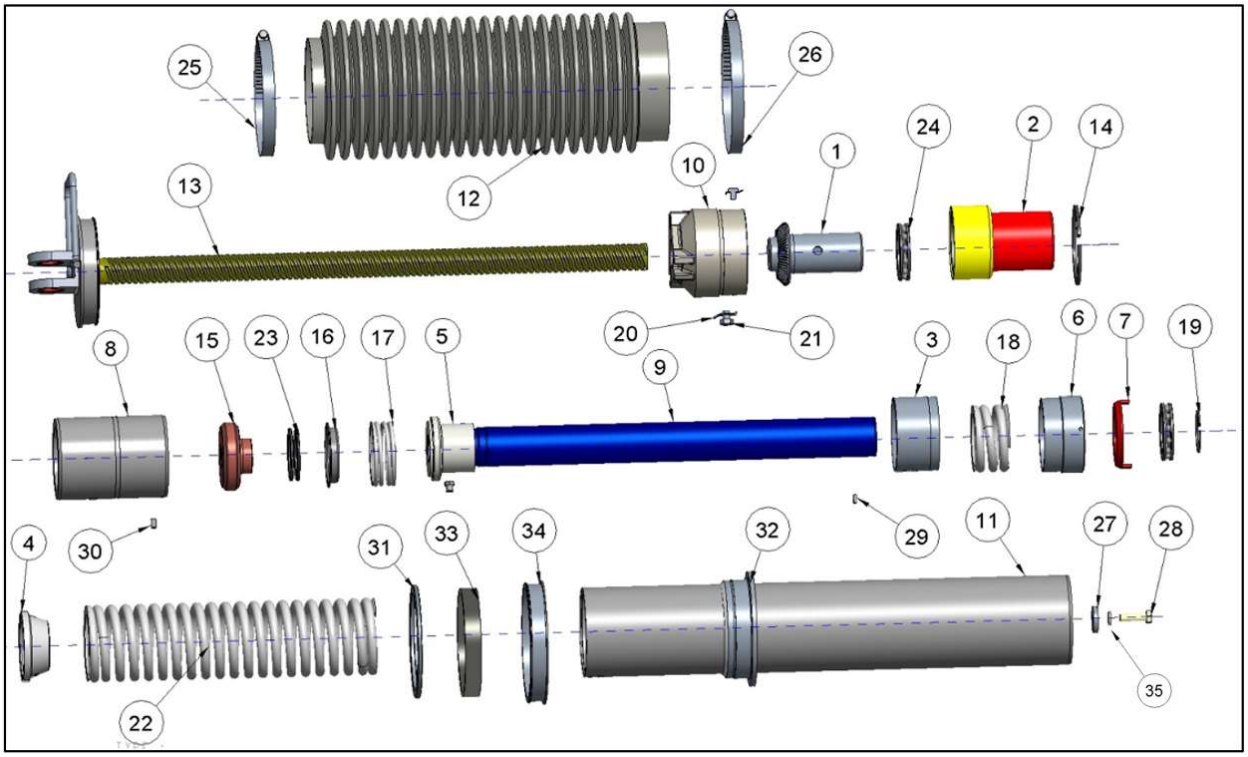



Figure 13: Automatic double acting slack adjuster Exploded view

| S. No. | LONG Description | Drawing No. | Quantity | Spares | MCK/ ESIO (Essentially change if opened or removed)/ CB | ROH | POH |
|---|---|---|---|---|---|---|---|
| 1 | (SCI*)LEADER NUT M/C | 3EB6196 | 1 | X | X | X | X |
| 2 | SPRING SLEEVE | 3EB6201 | 1 | X | X | X | X |
| 3 | ACTUATING SLEEVE MACHINED | 3EB6210 | 1 | X | X | X | X |
| 4 | CLUTCH RING | 3EB6213 | 1 | X | X | X | X |
| 5 | ADJUSTER TUBE SOCKET | 3EB6222 | 1 | X | X | X | X |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | CLUTCH SLEEVE MACHINED | 3EB6223 | 1 | X | X | X | X |
| 7 | CLUTCH PLATE | 3EB6225 | 1 | X | X | X | X |
| 8 | TRACTION SLEEVE ASSEMBLY | 3EB6236 | 1 | ✓ | X | X | X |
| 9 | ADJUSTER TUBE | 3EB7407 | 1 | X | X | X | X |
| 10 | LEADER NUT CASING(BMBS) POWDER COATED | 3EB7491 | 1 | ✓ | X | X | X |
| *11 | BARREL PIPE SUBASSEMBLY | 3EB7510/ 1J101000281 | 1 | ✓ | X | X | X |
| 12 | BELLOW | 3EB7517 | 1 | ✓ | X | X | ✓ |
| 13 | ADJUSTER SPINDLE ASSY(WELDING & PAINTING) | 3EB7528 | 1 | X | X | X | X |
| 14 | CIRCLIP 85 X 3 H ( B TYPE ) | 4EB6200 | 1 | X | X | X | ✓ |
| 15 | ADJUSTER NUT MACHINED | 4EB6206 | 1 | X | X | X | X |
| 16 | BEARING COVER | 4EB6208 | 1 | X | X | X | ✓ |
| 17 | TAKE UP SPRING | 4EB6209 | 1 | X | X | X | X |
| 18 | CLUTCH SPRING | 4EB6211 | 1 | X | X | X | X |
| 19 | CIRCLIP 45 X 1.75 ( A TYPE ) | 4EB6224 | 1 | X | X | X | ✓ |
| 20 | TAB WASHER | 4EB6230 | 1 | X | X | X | ✓ |
| *21 | LOCK SCREW | 4EB6231 1J101000274 | 2 | X | X | X | X |
| 22 | BARREL SPRING DRV 450 DULYZN. PLATED | 4EB6400 | 1 | X | X | X | ✓ |
| 23 | BEARING 51108 | 4EB6234 | 1 | X | X | X | ✓ |
| 24 | BEARING 51109 | 4EB6233 | 2 | X | X | X | ✓ |
| 25 | JUBILEE CLAMP-DIA 130 | 4EB8935 | 1 | ✓ | X | X | ✓ |
| 26 | JUBILEE CLAMP-DIA 150 | 4EB8936 | 1 | ✓ | X | X | ✓ |
| 27 | SAFETY WASHER | 4EB7580 | 1 | X | X | X | ✓ |
| *28 | Hex Head Screw | DIN 933 | 1 | X | ✓ | X | ✓ |
| 29 | SPRING DOWEL PIN (4 X 9) | 4EB6212/1 | 1 | X | X | X | ✓ |
| 30 | SPRING DOWEL PIN (6*10) | 4EB6212/2 | 1 | X | X | X | ✓ |
| 31 | NUT | 4EB7516 | 1 | X | ✓ | X | ✓ |
| *32 | SLEEVE BELLOW | 4EB7515/ 1J101000273 | 1 | X | ✓ | X | ✓ |
| 33 | OILON SLEEVE | 4EB7511 | 1 | X | X | X | ✓ |
| 34 | ROTATING SLEEVE FOR BELLOW | 4EB7518 | 1 | X | X | X | X |
| *35 | SPRING LOCK WASHER 8 | IS 6735 | 1 | X | X | X | ✓ |

| Abbreviation | |
|---|---|
| ✓ | Required |
| X | Not required |

**Changes incorporated in (*) marked parts is as follows:**

| Old Description | New Description | S. No. | Old Drawing no | New Drawing no | Change |
|---|---|---|---|---|---|
| Barrel Pipe Subassembly | Barrel Pipe Subassembly | 11 | 3EB7510 | 1J101000281 | Barrel Pipe OD 101.6 mm changed to 103.6 mm |
| Lock Screw | Lock Screw | 21 | 4EB6231 | 1J101000274 | Length of Lock screw changed from 15 mm to 16 mm |
| Sleeve Bellow | Sleeve Bellow | 32 | 4EB7515 | 1J101000273 | Sleeve Bellow ID changed from 102 mm to 104 mm |
| CSSH Screw M8x25 | Hex Head Screw | 28 | IS 6761 | DIN 933 | CSSH Screw M8x25 replaced with Hex Head Screw M8X30 |
| NA | Spring Lock Washer 8 | 35 | NA | IS 6735 | New added |

## 2.2 BRAKE APPLICATION (Ref. Fig. 12)

Air enters the brake cylinder from the ERV/APM Device. Compressed air is admitted through the Inlet port in brake cylinder between piston (8) and cylinder body (6/6a). The compressed air forces the piston (8) and allows the automatic double acting slack adjuster assembly to move inside.

The automatic double acting slack adjuster assembly moves inward against the main compression spring of Brake Cylinder. The Bell Crank Levers can move in a curved path to suit the brake rigging.

The stroke indicator is attached with the Piston Rod. This enables Stroke Indicator (20) to move out from the white-coloured tube welded over cylinder body. The RED coloured portion of stroke indicator displays brake application.

In case of Brake Cylinder with Hand Brake provision, all internal components and brake application procedure remain similar to that of Brake Cylinder without Hand Brake. The piston rods which are coming out of Back Cover are attached to the Pull Lever Assembly. Pull lever assembly is hinged to Back Cover. When the wire rope is pulled (using Hand Brake Wheel), the Piston movement initiates Brake application.

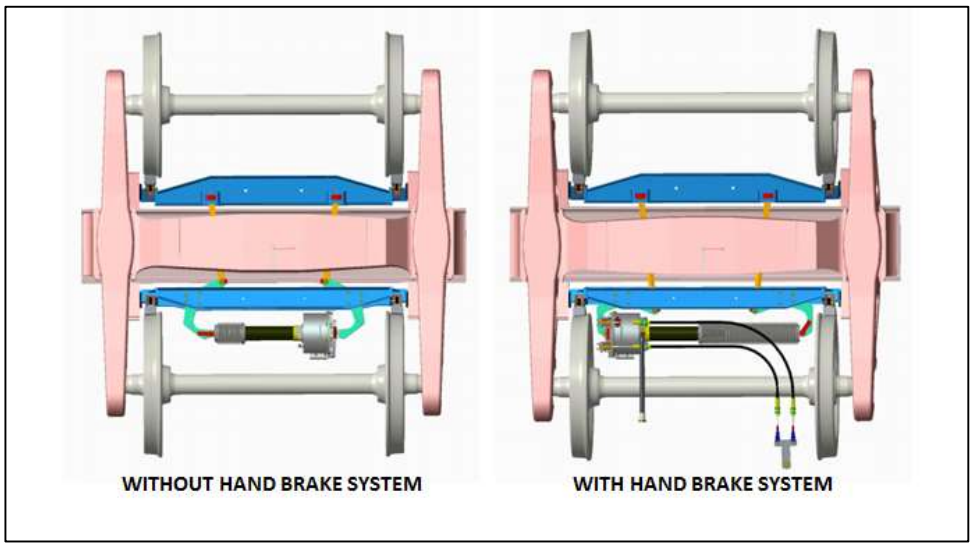



Figure 14: Brake Application condition in BMBS

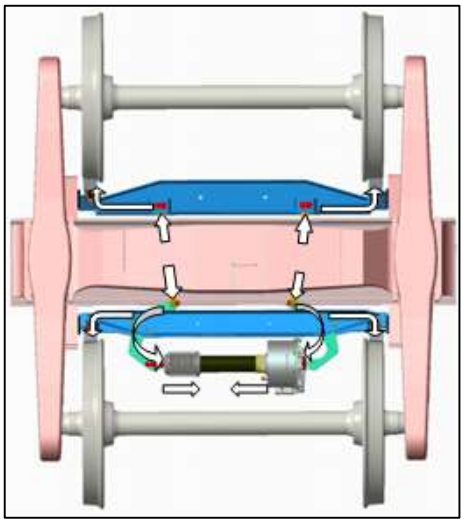


Figure 15: Force Transfer from Brake Cylinder to Wheels

## 2.3 BRAKE RELEASE (Ref. Fig. 6 & 12)

During release mode, the air is released through Distributor Valve. This decreases the brake cylinder pressure and as a result the Piston (8) moves back. This motion is transmitted to the Automatic Double Acting Slack Adjuster assembly also and as a result center to center distance of Brake Cylinder increases.

The Stroke Indicator (20) also moves in and its RED color disappears showing brake release condition.

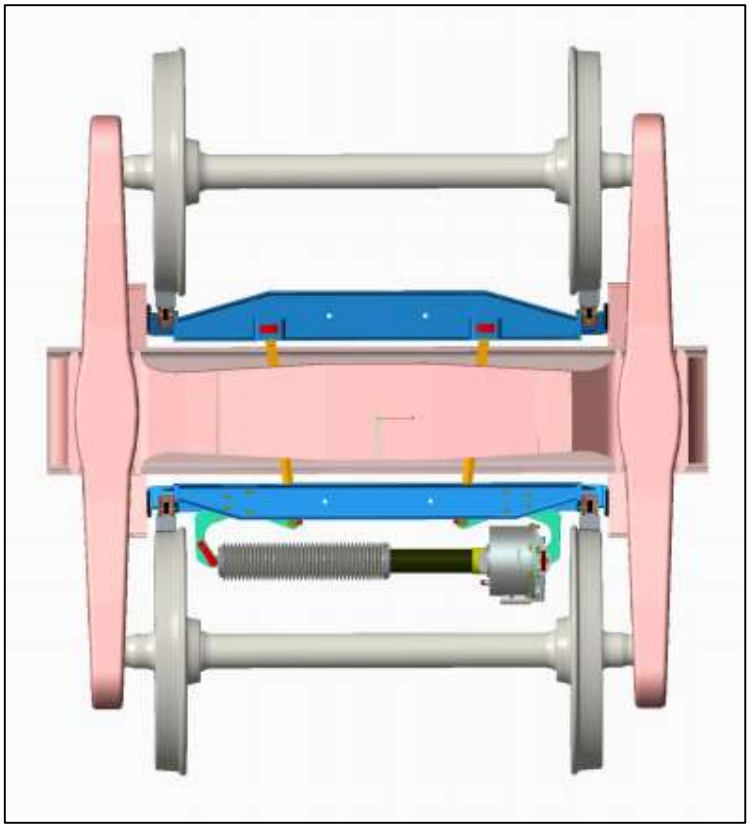


Figure 16: Brake Release condition in BMBS

## 2.4 PROCEDURE TO CONNECT THE HAND BRAKE CABLE WITH THE CABLE EQUALIZER AND TIE ROD

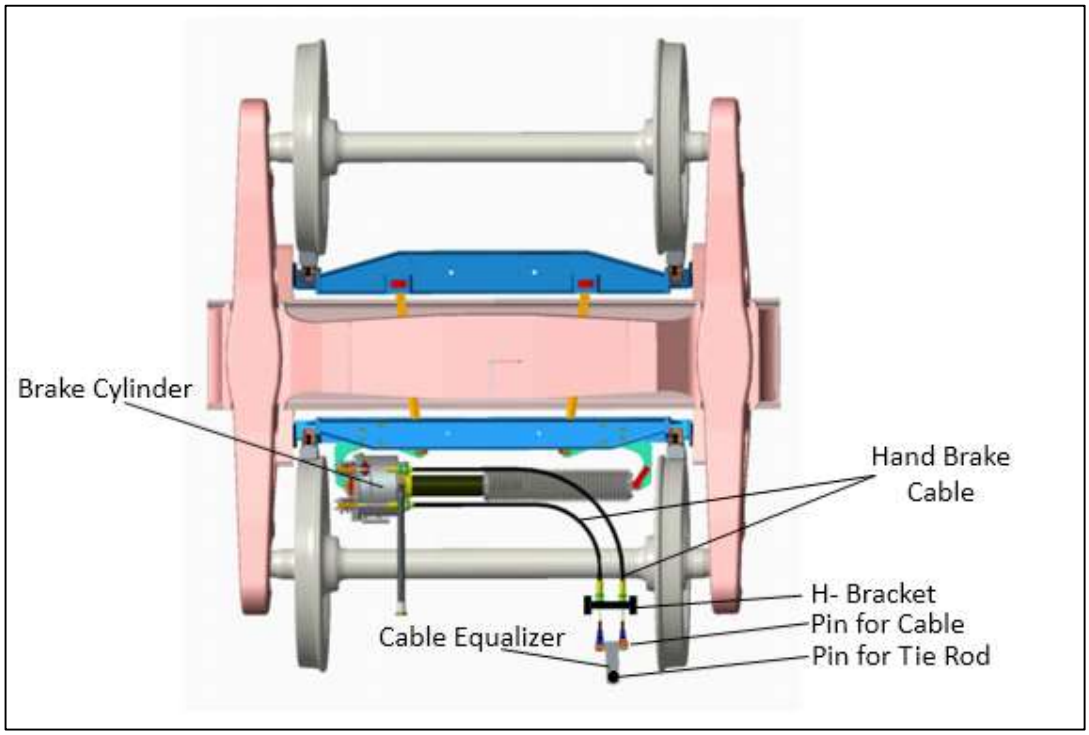



Figure 17: Hand Brake Cable with the Cable Equalizer and Tie Rod

1. Connect the outer cover of Hand Brake cables with cable H-bracket.
2. Ensure that the hand brake wheel and air brake are in fully released condition.
3. Pull out the cables fully from the brake cylinder in outward direction manually.
4. Connect cable with the cable equalizer
5. Now connect the cable equalizer to the Tie rod
6. Apply to check that during the service brake application, cables should not move/bend.
7. Secure the cable pin and tie rod pin with APD.

5. Note :-Avoid carrying out any Heat generation process near to Hand brake cables to prevent deformation of cable sleeve resulting in cable stuck up condition.

## 2.5 ESCORTS RATIO VALVE (ERV/APM) (Ref. Fig. 18)

Automatic Brake Cylinder Pressure Modification Device is an Empty/Load Changeover valve for Railway Wagons. The Empty/Load type brake cylinder pressure control device for a railway freight car employs a two-stage valve, which adjusts the pressure required to actuate the Brake cylinder.

Automatic Brake Cylinder Pressure Modification Device as shown below is an ERV/APM device. Empty position refers to the condition when the wagon is unloaded while loaded position refers to the condition when the wagon is loaded, it gives maximum braking pressure of 2.20 $\pm$0.25 kg/cm$^2$ and in loaded position it gives maximum braking pressure of 3.80$\pm$0.1 kg/cm$^2$. ERV/APM is provided with a sensing arm, which senses the empty and loaded condition of the wagon during braking. ERV is provided with Indicator, which shows condition of brake application after the sensor arm touches the side frame. While the actuation of brake application is depicted by sensor arm touching the side frame of the bogie; the loaded / empty condition of brake application is depicted by red colour indicator (red colour visible in Empty condition and not visible is loaded condition) by ERV indicator. Brake cylinder pressure checkpoint is also provided in ERV/APM.

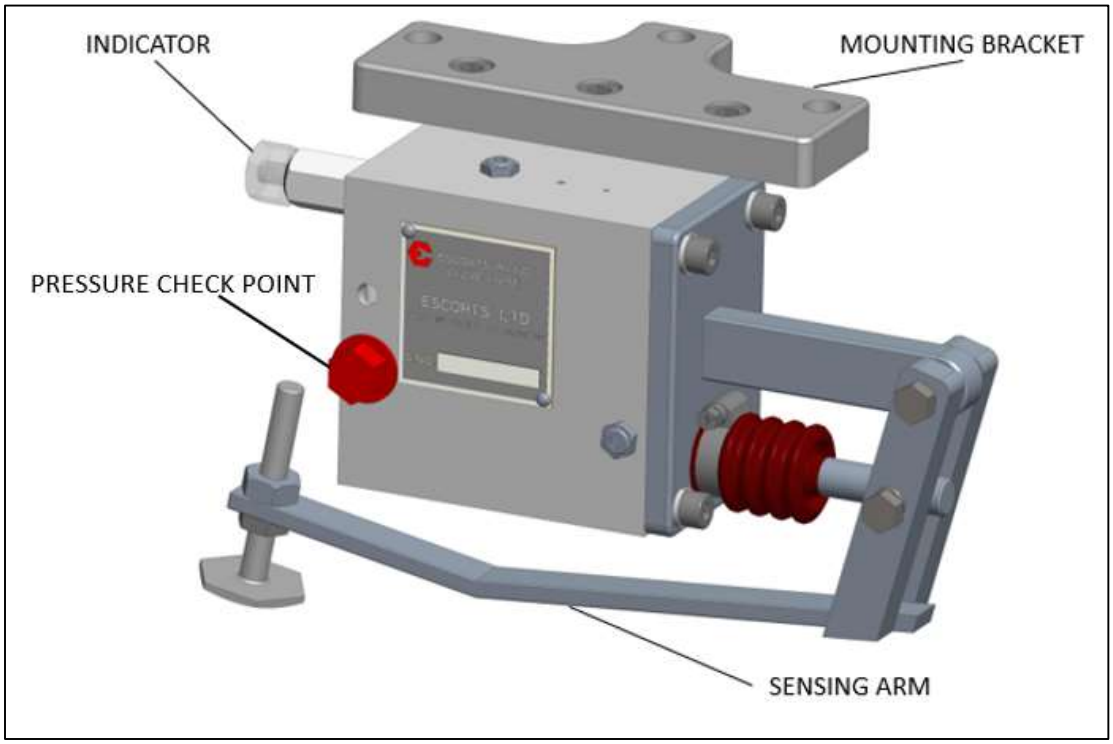



Figure 18: 3D view of ERV/APM device

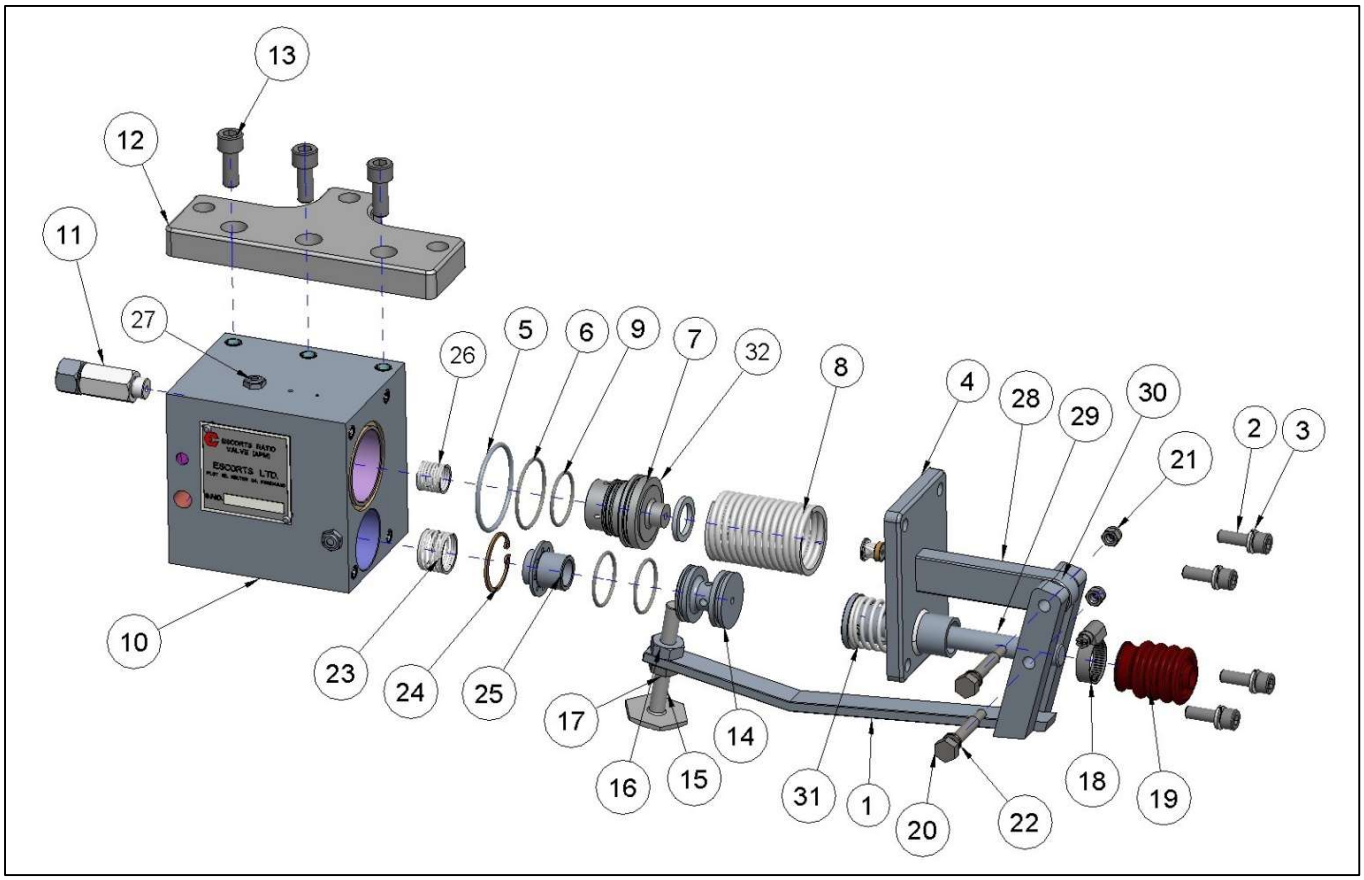



Figure 19: Exploded view of ERV/APM device

| S. No. | LONG Description | Drawing No. | Quantity | Spares | MCK/ ESIO (Essentially change if opened or removed)/ CB | ROH | POH |
|---|---|---|---|---|---|---|---|
| | (SCI*) ESCORTS RATIO VALVE(APM) ASSEMBLY | 3EB7346 | 1 | ✓ | X | X | X |
| 1 | SENSOR ARM | 3EB7385 | 1 | ✓ | X | X | X |
| 2 | ALLEN SCREW M8X25 | DIN912 | 4 | X | X | X | X |
| 3 | SPRING WASHER B8 | DIN127 | 4 | X | X | X | X |
| 4 | SIDE COVER ASSEMBLY | 3EB7472 | 1 | ✓ | X | X | X |
| 5 | O-RING | 4EB7442 | 1 | X | X | X | ✓ |
| 6 | O-RING WITH ID 40.6MM | 4EB7430/2 | 1 | X | X | X | ✓ |
| 7 | RATIO PISTON VULCANISED | 4EB7537 | 1 | X | X | X | X |
| 8 | COMPRESSION SPRING FOR RATIO PISTON | 4EB7461B | 1 | ✓ | X | X | X |
| 9 | SEALING RING | 4EB7430/1 | 1 | X | X | X | ✓ |
| 10 | ERV HOUSING MACHINED | 1EB8837 | 1 | X | X | X | X |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 11 | INDICATOR ASSY. | 4EB9509 | 1 | ✓ | X | X | X |
| 12 | TOP MOUNTING FLANGE | 4EB7443 | 1 | X | X | X | X |
| 13 | SOCKET HEAD CAP SCREW M10x25 | DIN912 | 3 | X | X | X | X |
| 14 | MOVEMENT PISTON VULCANISED | 4EB7590 | 1 | X | X | X | X |
| 15 | RIVETED HEAD BOLT M10x1x70 | 4EB4781 | 1 | X | X | X | X |
| 16 | HEXAGON NUT M10X1 | DIN936 | 1 | X | X | X | X |
| 17 | HEX NYLOCK NUT M10x1 | DIN:982 | 1 | X | X | X | X |
| 18 | JUBILEE CLAMP-CLIPLOCK 6X HC 35A ZINC YELLOW PLATED | IS:4762 | 1 | ✓ | X | X | ✓ |
| 19 | BELLOW | 4EB7440 | 1 | ✓ | X | X | ✓ |
| 20 | HEX. HEAD SCREW | 4EB7591 | 2 | X | X | X | |
| 21 | NYLOCK NUT ( M6) | DIN:982 | 2 | X | ✓ | X | ✓ |
| 22 | PLAIN WASHER B6 | DIN125 | 2 | X | X | X | ✓ |
| 23 | COMPRESSION SPRING FOR VALVE HEAD | 4EB7594 | 1 | X | X | X | ✓ |
| 24 | INTERNAL CIRCLIP B35 | IS:3075-2/DIN472 | 1 | X | X | X | ✓ |
| 25 | VALVE HEAD FOR MOVEMENT PISTON | 4EB7589 | 1 | X | X | X | ✓ |
| 26 | BASE SPRING FOR ERV HOUSING | 4EB7987 | 1 | X | X | X | ✓ |
| 27 | SINTERED FILTER | 4EB7693 | 2 | X | X | X | ✓ |
| 28 | SENSOR ARM ASSY. | 2EB9030 | 1 | ✓ | X | X | X |
| 29 | SENSOR PISTON ASSEMBLY | 4EB7694 | 1 | ✓ | X | X | X |
| 30 | BUSH | 4EB7471 | 1 | X | X | X | ✓ |
| 31 | COMPRESSION SPRING (SENSOR PISTON) | 4EB7706 | 1 | X | X | X | ✓ |
| 32 | RATIO PISTON SUB ASSY. | 4EB9029 | 1 | X | X | X | ✓ |
| 33 | MOVEMENT PISTON ASSY. | 4EB9031 | 1 | X | X | X | ✓ |
| 34 | O-RING | 4A40125/13 | 1 | X | X | X | ✓ |
| 35 | COMPRESSION SPRING | 4A30485/9 | 1 | X | X | X | ✓ |
| 36 | SCREW | 4EB9508 | 1 | X | X | X | ✓ |
| 37 | ROUND CORD RING | 4A36518 | 1 | X | X | X | ✓ |

| Abbreviation | |
|---|---|
| ✓ | Required |
| X | Not required |

## 2.6 ADJUSTMENTS OF ERV/APM DEVICE (Ref. Fig. 19)

1. Ensure that all the bolts of ERV/APM assembly are properly tightened.
2. Check the sensor arm, for any unwanted bending or damage. Move the arm downward and confirm proper working of the valve.
3. ERV/APM is installed using a Mounting Flange for mounting with the under frame before the pipe assembly.
4. After successful installation, ERV/APM device can be tested using Single Wagon Test Rig (SWTR). Ensure the wagon is not loaded before the testing of ERV Device.
5. Check ERV/APM Valve for leakage from all ports, no Leakage is permitted.
6. In empty condition brake cylinder pressure must be 2.2 ±0.25 kg/cm$^2$
7. Release brakes using SWTR. Put a block of 1 inch between 'sensing arm bolt head' and 'side frame'. ERV/APM device is acting in loaded mode now. Apply brakes by SWTR. The output pressure of ERV/APM device shall display 3.8±0.1 kg/cm$^2$
8. Check ERV/APM Valve for leakage from all ports, no Leakage is permitted.
9. Release brakes and remove the block. Adjustment & Installation of ERV device is now completed.
10. The ERV/APM is mounted in such a way that all standard pipes can be fitted as per RDSO pipe drawing.
11. ERV/APM indicator shows the empty/load condition of the air brake application. It is also provided with a Pressure Test Plug for checking Brake Cylinder pressure.

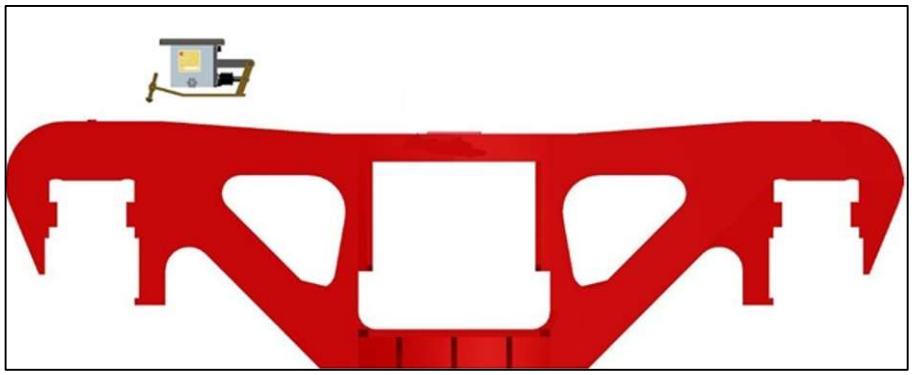


Figure 20: ERV (APM) Installation position

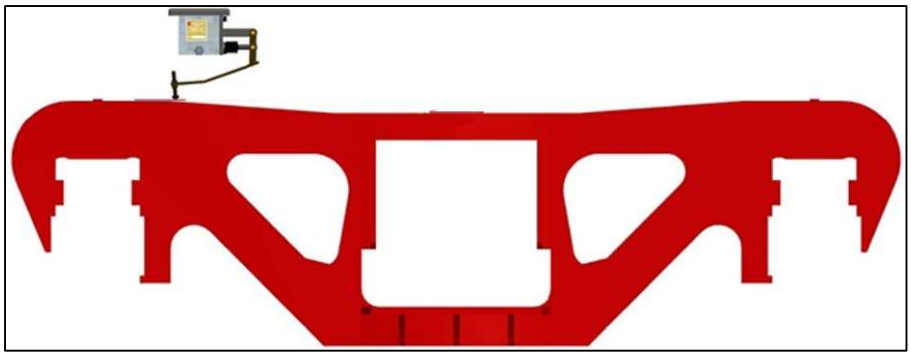


Figure 21: ERV (APM) No load position

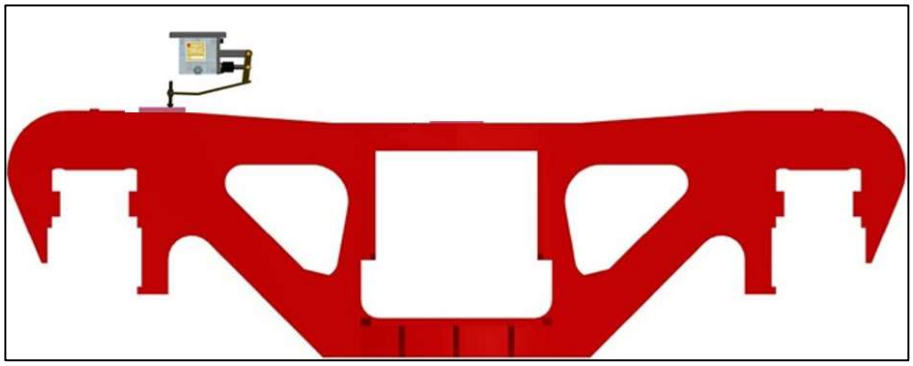


Figure 22: ERV (APM) Loaded position (Block added)

## 2.7 GAP BETWEEN SENSOR POINT AND SIDE FRAME

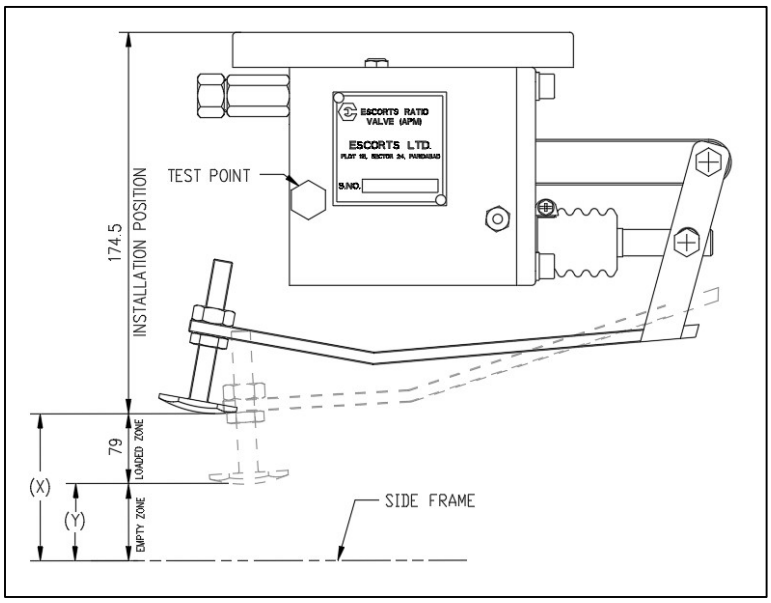



Figure 23: ERV (APM) Loaded & Empty zones

Depending on the type of wagon:

X =79+Y

Y =Deflection of the bogie from tare to changeover weight. Which is dependent on the spring characteristic of bogie, tare and changeover weight of the wagon.

| Sl. No. | Wagon | Check | Specified |
|---|---|---|---|
| 1 | BOSTHSM2 | ERV/APM sensor arm movement from initial position to bogie side frame top. | 99±1 mm |
| 2 | BOXNHL (MBS) & BCNLH MBS | ERV/APM sensor arm movement from initial position to bogie side frame top. | 96±1 mm |
| 3 | BOXN NLB 20.32 T | ERV/APM sensor arm movement from initial position to bogie side frame top. | 92±1 mm |
| 4 | BOXN NLB 22.9 T | ERV/APM sensor arm movement from initial position to bogie side frame top. | 90±1 mm |
| 5 | BOXN HS 20.32 T | ERV/APM sensor arm movement from initial position to bogie side frame top. | 94.5±1 mm |
| 6 | BOXN HS 22.92 T | ERV/APM sensor arm movement from initial position to bogie side frame top. | 94±1 mm |
| 7 | BTFLN 20.32 T | ERV/APM sensor arm movement from initial position to bogie side frame top. | 94±1 mm |

## 2.8 APD for ERV/APM

APD for ERV/APM mounted on the same mounting holes of ERV/APM as shown below

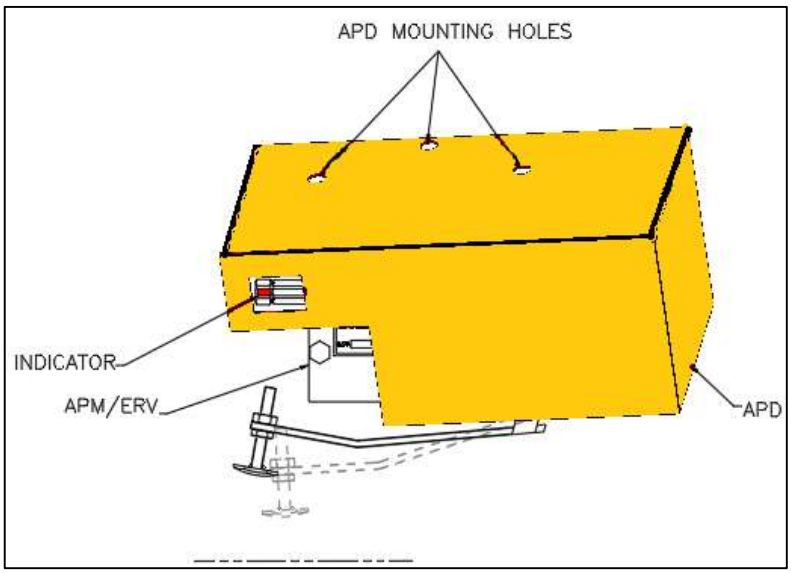



Figure 24: APD for ERV (APM)

## 2.9 PROCEDURE FOR INSTALLATION OF BMBS PARTS

### 2.9.1 PRIMARY AND SECONDARY BRAKE BEAMS

Slide the Primary and Secondary Brake Beams in the side pockets of side frame of the Bogie without wheel and axle assembly.

Fix the Push rod to both the beams with Pins. Then lock the Pins with Bulb Cotter and Washer.

### 2.9.2 BRAKE CYLINDER 11" (WITH HAND BRAKE-3EB7348 AND WITHOUT HAND BRAKE CABLE-3EB7347)

Mount the Brake Cylinder on the Bell Crank Lever fitted on the Primary Beam with the help of pins. Then lock the Pins with Bush and spring dowel sleeve. Properly tighten the Wire mesh Filter (Drg. No. 1J101000086) by applying Loctite. Now tighten the pneumatic hose flange with Bolt, Nut and Spring Washer.

In case of Brake Cylinder with Hand Brake Cable, mount the Hand Brake Cables to H- Bracket of the Under Frame and connect the cable fork to the equalizer with pins and then lock the pins with split pins which further connect to the tie rod.

### 2.9.3 ESCORTS RATIO VALVE (ERV/APM)

Mount the ERV/APM on the under frame just above the side frame of the bogie with 3 nos. M12 Bolt, Spring Washer and Nut.

Now fit all the three Line Connections to the ERV/APM line as below and tighten them.

1. Pipe from Brake Cylinder
2. Pipe from DV
3. Hose from 6.6 L. Reservoir

### 2.9.4 BRAKE HEAD AND BRAKE BLOCK

Place the Brake Heads on to the Primary and Secondary Brake Beams (with locking position on top) and fit the pins to hold the Brake Heads in their respective location. Lock the Pins with Split Pins.

Mount the Brake Block on the Brake Head matching the wheel profile and insert the brake block keys. Now lock the keys with split pins.

## 2.10 APD FOR BRAKE CYLINDER AND RIGGING ARRANGEMENTS.

Weld the suitable APD's at following locations as shown in the figure:-

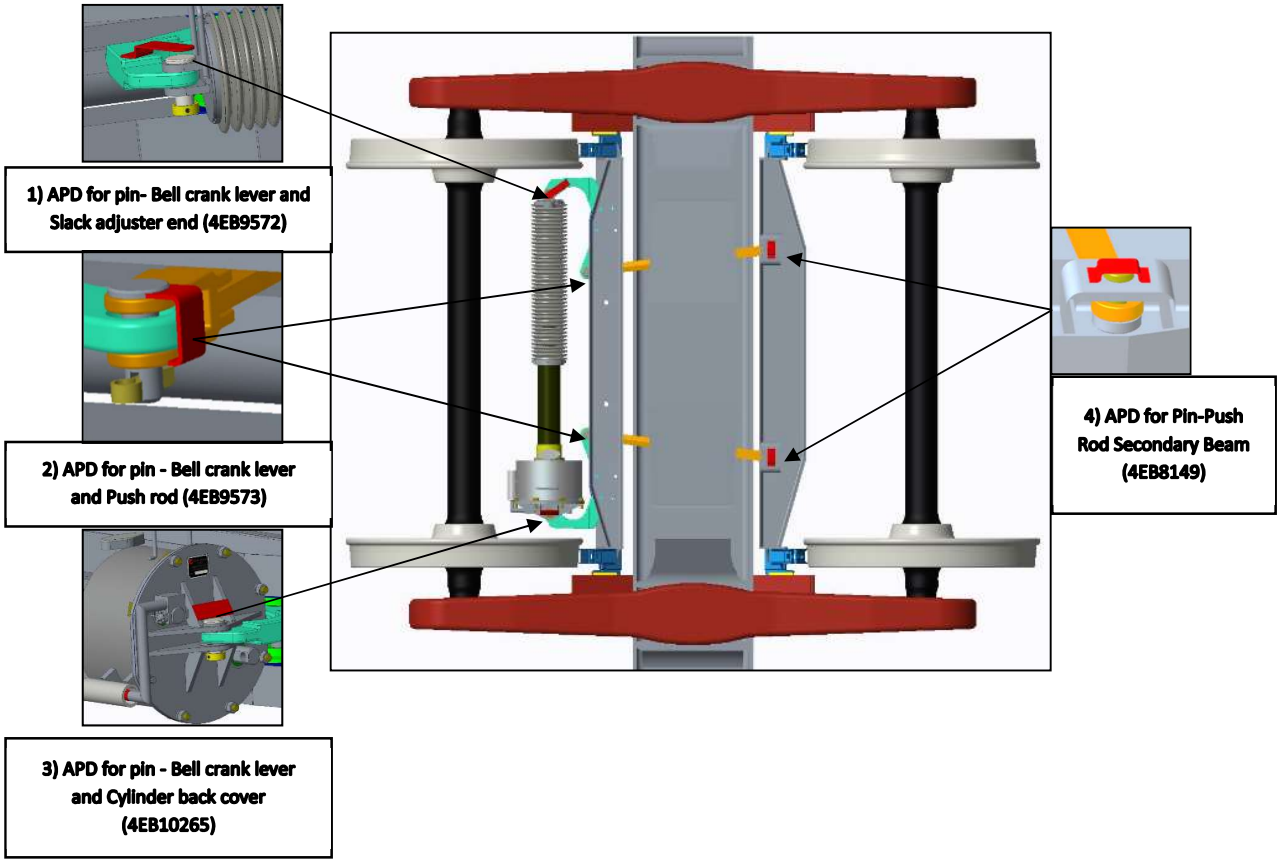
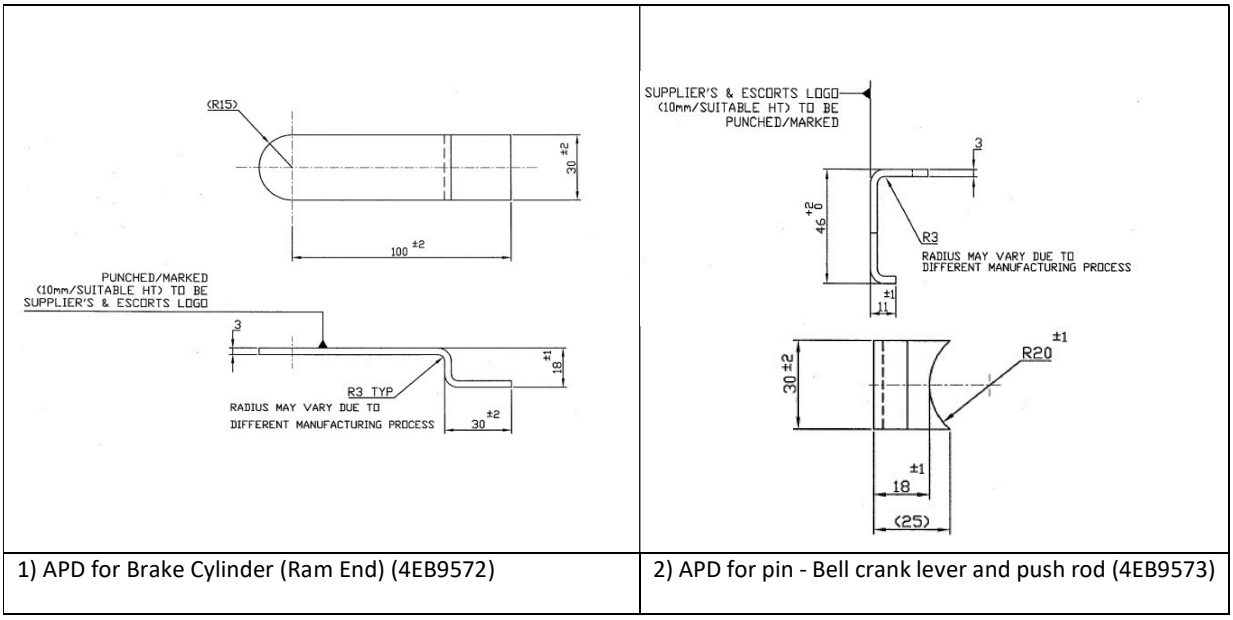
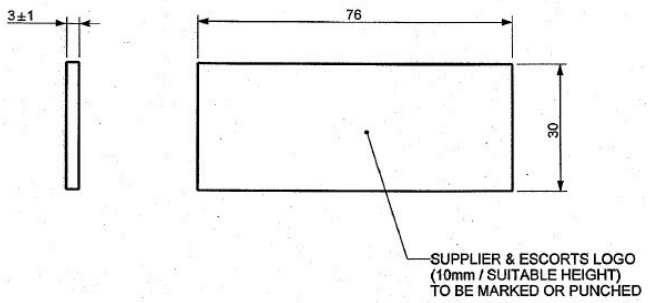


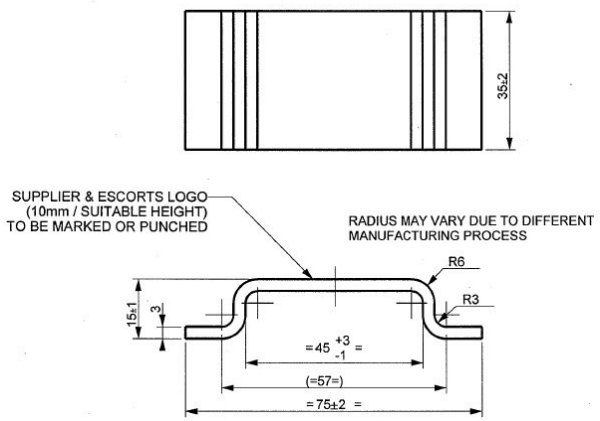

Figure 25: APD Locations



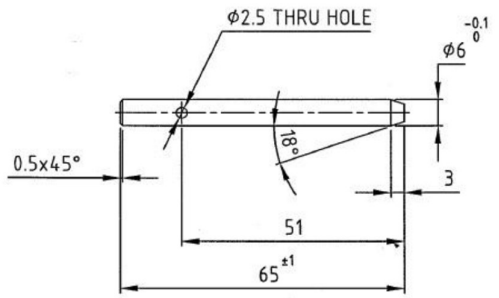

| 1) APD for Brake Cylinder (Ram End) (4EB9572) | 2) APD for pin - Bell crank lever and push rod (4EB9573) |
|---|---|



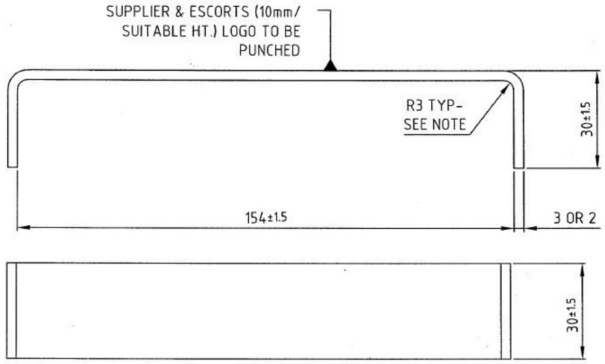

3) APD for pin - Bell crank lever (4EB10265)




4) APD for Pin-Push Rod Secondary Beam (4EB8149)




**5) APD for Brake Head Pin (4EB10027)**




**6) APD for Equalizer Pin (4EB9830)**

Figure 26: APD Locations (Brake Cylinder and Rigging Parts)

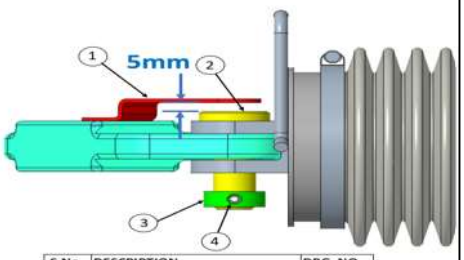
## 2.11 DO`s and DON'T`s for APD of BRAKE CYLINDER AND RIGGING ARRANGEMENTS.

Don't's

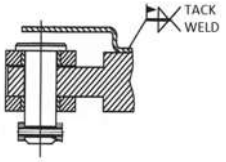
Do's

**Right Process:**
- Gap between Pin & APD should be approximate 5 mm
- Only Tack welding to be done for fixing APD
- Specified APD, Pin & Dowel pin to be used for maintaing gap

**Rectification process:**
1. If gap is less/ no gap; remove APD, use specified parts & Tack weld
2. Check gap with slip gauge.



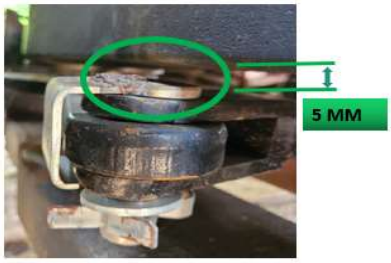

| S.No | DESCRIPTION | DRG. NO |
|---|---|---|
| 1 | ANTI PILFERAGE PLATE | 4EB9572 |
| 2 | PIN Dia 24X70 | 4EB10262 |
| 3 | BUSH | 4EB10261 |
| 4 | SPRING DOWEL SLEEVE Dia 6X35 | 4EB10260 |




**ASSEMBLY OF BRAKE CYLINDER SPINDLE WITH BELL CRANK LEVERS**

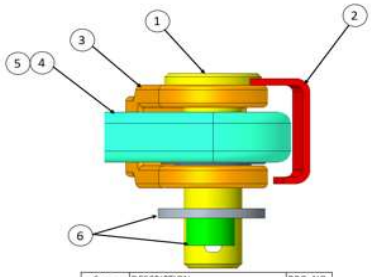
Don't's

Do's

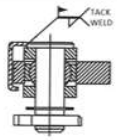



**Right Process:**
- Gap between Pin & Beam should be approximate 5 mm
- Only Tack welding to be done for fixing APD with Pin
- APD should not be welded to Beam
- Specified APD, Pin, Washer & Bulb Cotter to be used for maintaining gap

**Rectification process:**
1. If gap is less/ no gap; then remove APD, use specified parts & Tack weld
2. Check gap with slip gauge.




| S.no | DESCRIPTION | DRG. NO |
|---|---|---|
| 1 | PIN Dia 24X80 | 4EB10263 |
| 2 | ANTI PILFERAGE PLATE | 4EB9573 |
| 3 | PUSH ROD ASSY. | 3EB9790 |
| 4 | BELL CRANK LEVER ASSY RH | 3EB9791 |
| 5 | BELL CRANK LEVER ASSY LH | 3EB9792 |
| 6 | BULB COTTER WITH PLAIN WASHER 25MM | 4EB10271 |



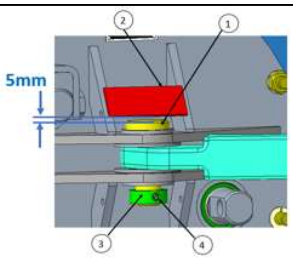

**ASSEMBLY OF BELL CRANK LEVERS AND PUSH ROD**

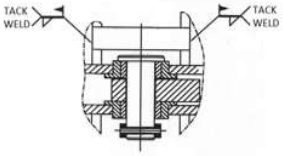
**Don't's**

**Do's**

**Right Process:**
- Gap between Pin & APD should be approximate 5 mm
- Only Tack welding to be done for fixing APD
- Specified APD, Pin & Dowel Pin to be used for maintaining gap

**Rectification process:**
1. If gap is less/ no gap; then remove APD, use specified parts & Tack weld
2. Check gap with slip gauge.



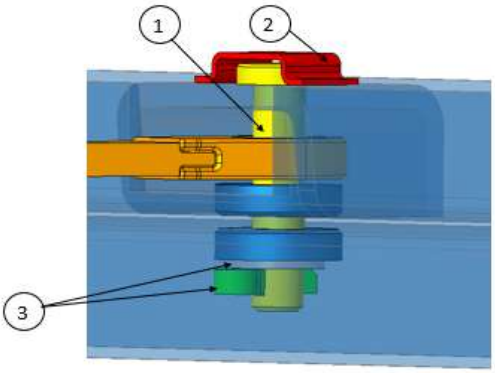




| S.no | DESCRIPTION | DRG. NO |
|---|---|---|
| 1 | PIN Dia 24X70 | 4EB10262 |
| 2 | ANTI PILFERAGE PLATE | 4EB10265 |
| 3 | BUSH | 4EB10261 |
| 4 | SPRING DOWEL SLEEVE Dia 6X35 | 4EB10260 |

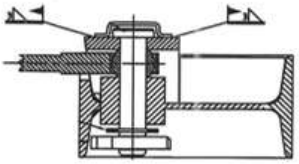
**ASSEMBLY OF BRAKE CYLINDER BACK COVER SIDE WITH BELL CRANK LEVERS**

**Do's**

**Right Process:**
- Tack Welding to be done on APD
- Specified APD, Pin, Washer & Bulb Cotter to be used




| S.no | DESCRIPTION | DRG. NO |
|---|---|---|
| 1 | PIN Dia 24X120 | 4EB10264 |
| 2 | ANTI PILFERAGE DEVICE | 4EB8149 |
| 3 | BULB COTTER WITH PLAIN WASHER 25MM | 4EB10271 |



**ASSEMBLY OF SECONDARY BRAKE BEAM AND PUSH ROD**

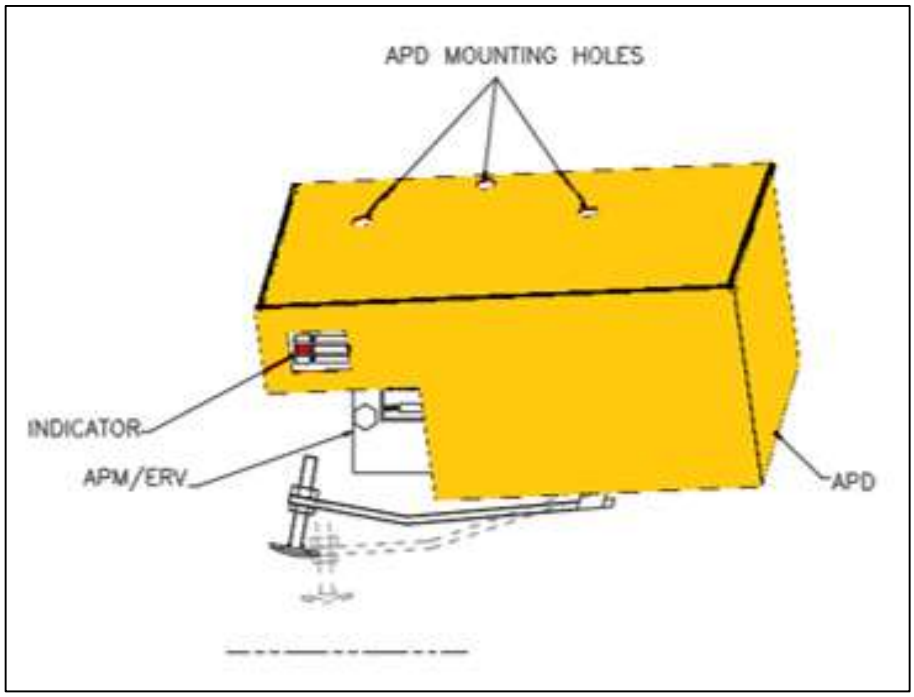



Figure 27: APD Location (ERV/APM)

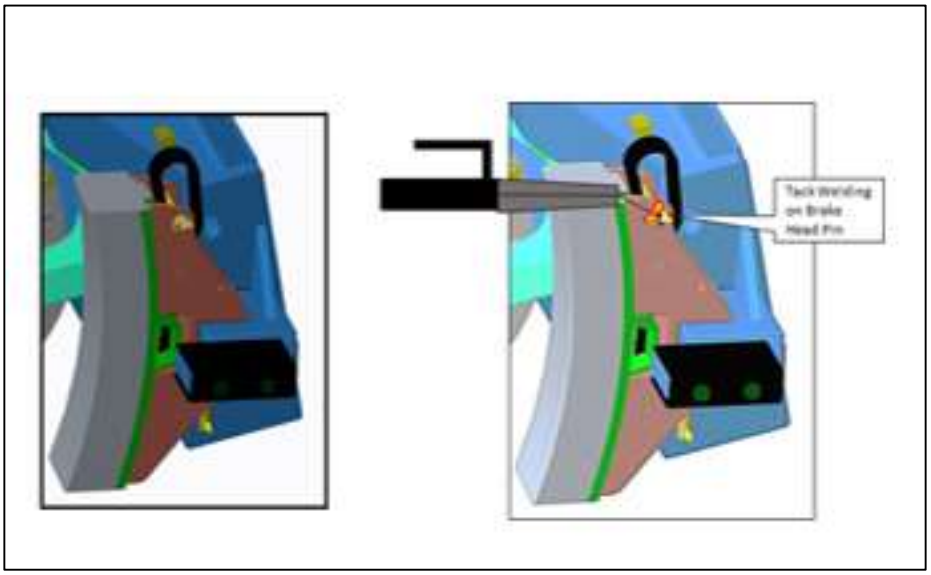
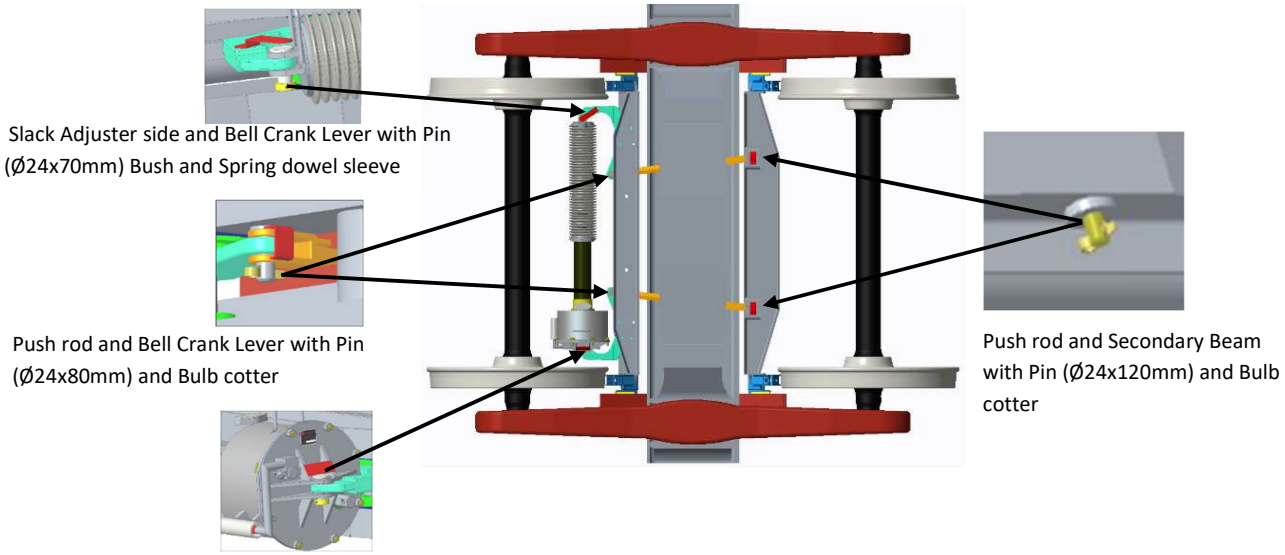
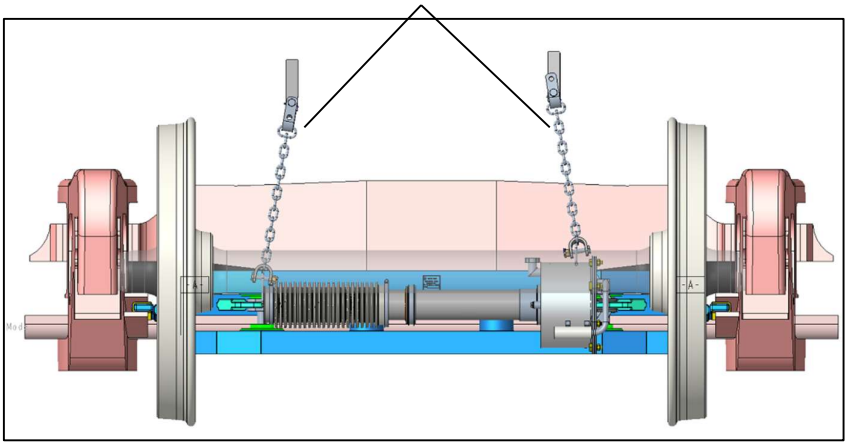



Figure 28: APD Location (Brake Block Key)

## 2.12 MOUNTING ARRANGEMENT OF BMBS




Chain clamped to welded U bracket on the underframe with bolt and nut



Chain arrangement for securing Brake cylinder mounting

Figure 29: Mounting Arrangement of BMBS

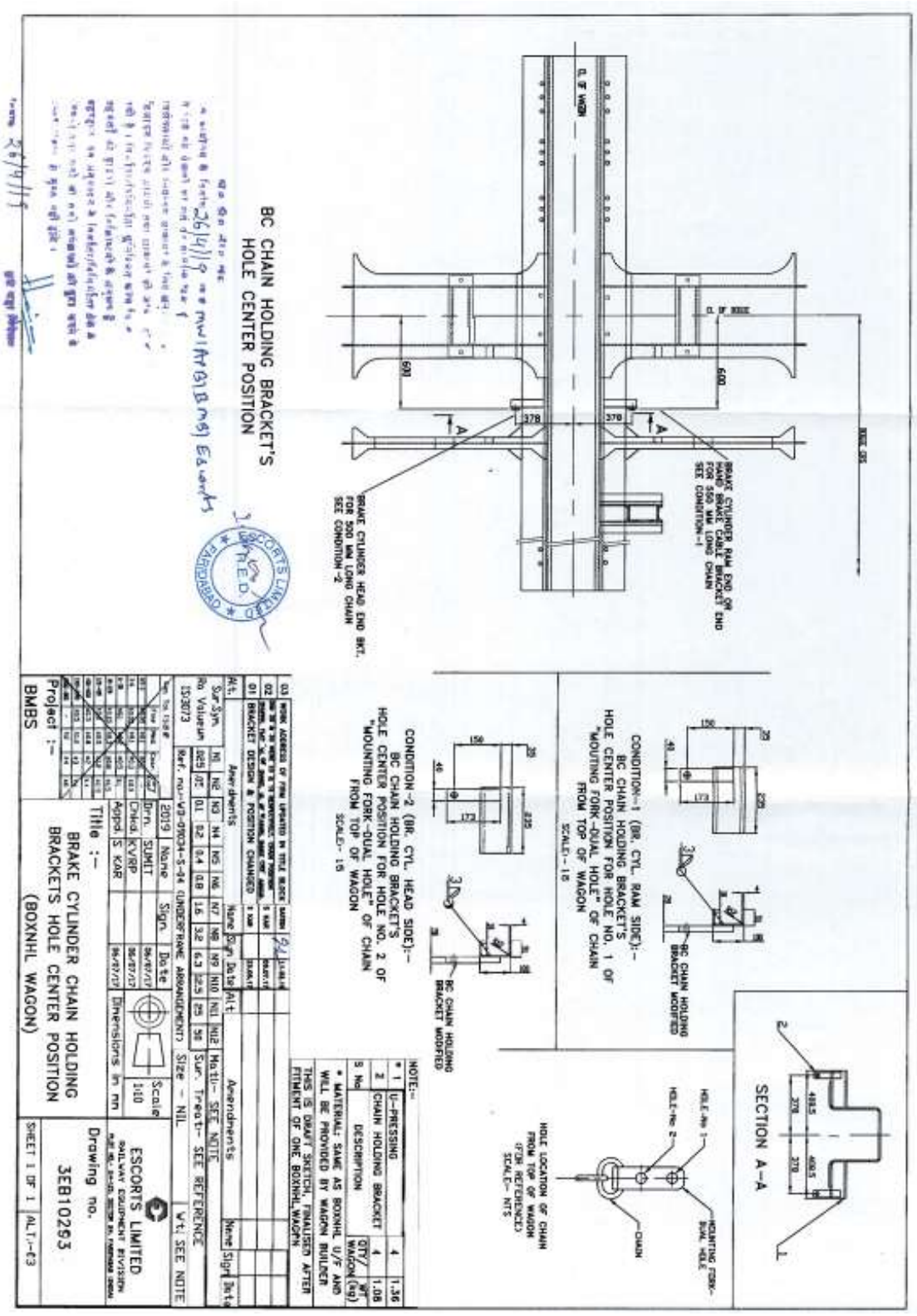



Figure 30: Brake Cylinder chain holding brackets hole centre position (BOXNHL WAGON)

# 3 PROCEDURE FOR CHANGING OF BMBS PARTS

## 3.1 ISOLATION OF BRAKE CYLINDER (Ref. Fig. No. 3 & 4)

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

## 3.2 CHANGING OF BRAKE HEAD (8) (Ref. Fig. No. 6)

1. Rotate the barrel tube of brake cylinder creating the space between the brake block and the wheel by using Special Tool (1J101000083) as mentioned in 4.4 TOOLS AND GAUGING.
2. Remove the brake block key and then the brake block
3. After obtaining enough clearance between the wheel & the brake heads, remove the split pin (26) & the brake head pin (12) consecutively to remove the desired brake head (8).
4. Install a new brake head (8).and secure it with brake head pin (12) then a split pin (26). Bend the split pin legs outwards.
5. Place the brake block on the new brake head and secure the brake block with the brake block key.
6. The automatic double acting slack adjuster will automatically adjust the brake shoe clearance to the proper value when the brakes are applied and released. This usually takes after a few brake applications.

## 3.3 CHANGING OF BRAKE CYLINDER WITH AND WITHOUT HAND BRAKE (3 & 4) (Ref. Fig. No. 6)

1. Ensure, the brakes are released and the brake cylinder is completely vented. Retract the brake cylinder (3) (4). Rotate the barrel tube to force the brake cylinder to retract completely.
2. Disconnect the air hose from the cylinder assembly flange.
3. In case of brake cylinder with hand brake cable, remove the pins (36, 37) from both ends of equalizer (32) i.e. tie rod end as well as hand brake cable end. Then, loosen the nuts from H-bracket to free the hand brake cable.
4. Remove the pin (10) on both sides of the cylinder. Install a new brake cylinder assembly; secure the brake cylinder with pins, dowels and APD.
5. Reconnect the air hose (28) to the cylinder assembly flange.
6. Apply partial brakes 2-3 times in order to restore the internal slack adjuster's position

**Notification!**

**For cylinders equipped with the hand brake cables**

- Disconnect the cable clevises from the equalizer by removing the two pins and cable pins.
- Remove the two cables from the cable bracket.

**Caution!**

- The wagon has to be placed in a Sick-line/ROH depot
- The workmen has to wear helmet, Hand and gloves and Safety shoes.
- Use of proper tools

**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.

## 3.4 CHANGING OF BELL CRANK LEVER ASSEMBLY (5 & 6) (Ref. Fig. No. 6)

1. This change will be required if this part has been damaged or worn out.
2. Remove the split pin and the pull rod pin with push rod. Remove the pin with brake cylinder. Loosen the T-head M12 mounting bolts, remove 8 nos M12 bolts, M12 nuts and B12 spring washers. Pull the bell crank lever (5, 6) RH & LH from the beam assembly. Install a new lever RH & LH as applicable by mounting and tightening the 8 nos M12 bolts, M12 nuts and B12 spring washers. Install push rod pins and split pins. Install pins with the brake cylinder, bend the split pin legs.
3. The automatic double acting 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.

**Caution!**

- The wagon has to be placed in a shed
- The workmen have to wear Helmet, Hand gloves and Safety shoes.
- Use of proper tools

## 3.5 CHANGING OF PUSH ROD (7) (Ref. Fig. No. 6)

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

1. Remove the split pin and the rod pin with bell crank lever. Remove the split pin and the pin rod eye with secondary brake beam (2). Remove the Push rod (7) from bell crank lever assembly RH and LH. Push the rod from the secondary beam (2). To install a new Push rod, align the rod end hole with the mounting holes in the secondary beam and then insert the pin and the split pin. Bend the split pin legs. Do the same procedure on the other end of the rod by aligning the rod with the bell crank lever assembly RH and LH with pin and split pin.
2. The automatic double acting 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.

## 3.6 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.

## 3.7 CONDEMNING LIMITS OF SYSTEM COMPONENTS

### 3.7.1 BRAKE HEAD

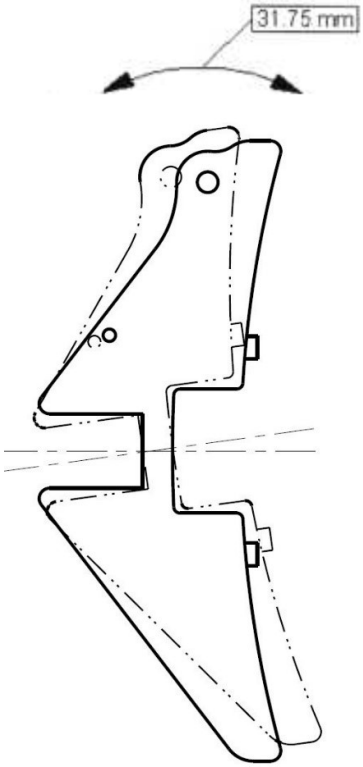



Figure 31: Brake Head

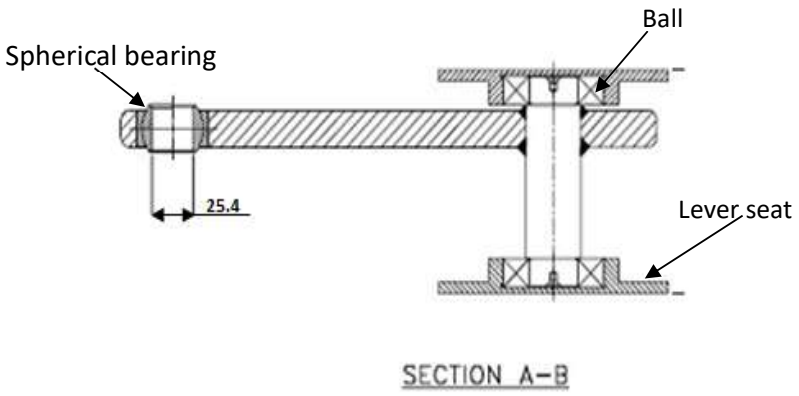
Brake Head should be replaced if the following exists.

Check brake head tip travel. Push brake head forward and measure travel by pulling brake head all the way back. Tip travel should NOT exceed 31.75 mm.

### 3.7.2 BELL CRANK LEVER ASSEMBLY RH & LH

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



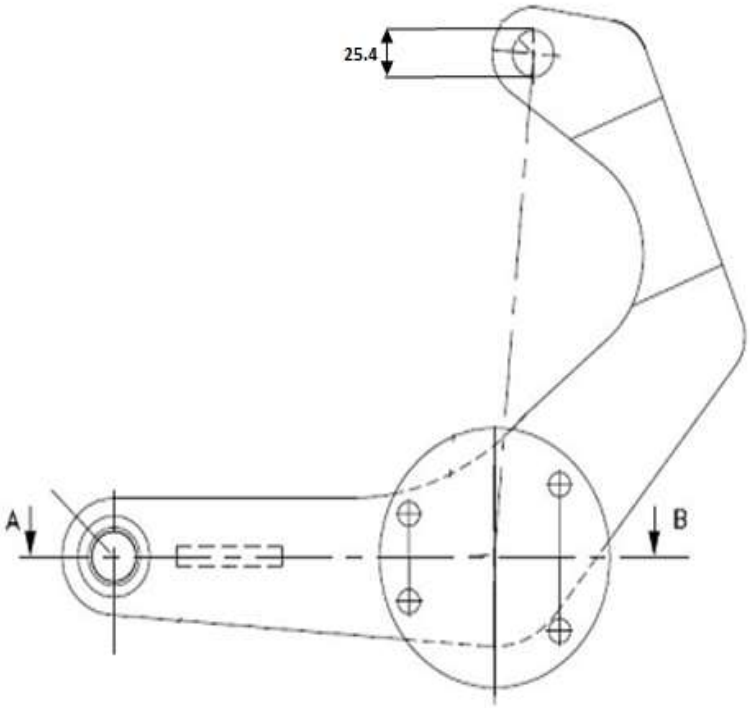




Figure 32: Bell Crank Lever Assembly

### 3.7.3 PUSH ROD

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

1. Any part of the push rod is bent.
2. Cracked or Damaged Welds
3. Excessive Wear on any surface (Excessive is anything> 1.6 mm)
4. Worn, Damaged or Broken Spherical Bearing
5. Worn/Enlarged Pin Hole 25.4 mm Hole exceeds 26.7 mm in any direction (ie. oval condition)
6. Pin End Gap 25.5mm exceeds 27.9 mm.

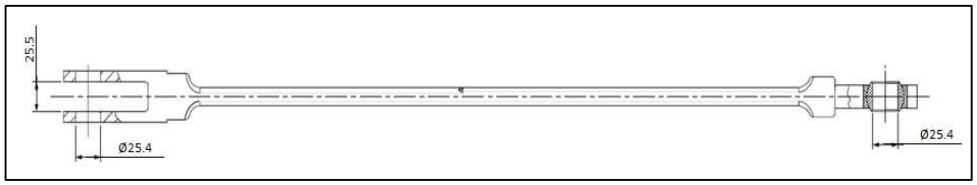



Figure 33: Push Rod Assy

### 3.7.4 BRAKE BEAMS

Brake Beam should be replaced in following conditions: -

1. Remove Brake Head and inspect Brake Head pinhole in Beam. If hole exceeds 20.32 mm in any direction (i.e., oval condition), replace Beam. If not, replace brake head and recheck as described earlier.
2. Tip should not exceed 31.75 mm (from first check above as mentioned in clause No-3.7.1 fig 30). If Tip travel exceeds 31.75 mm, replace Beam and Brake Head.

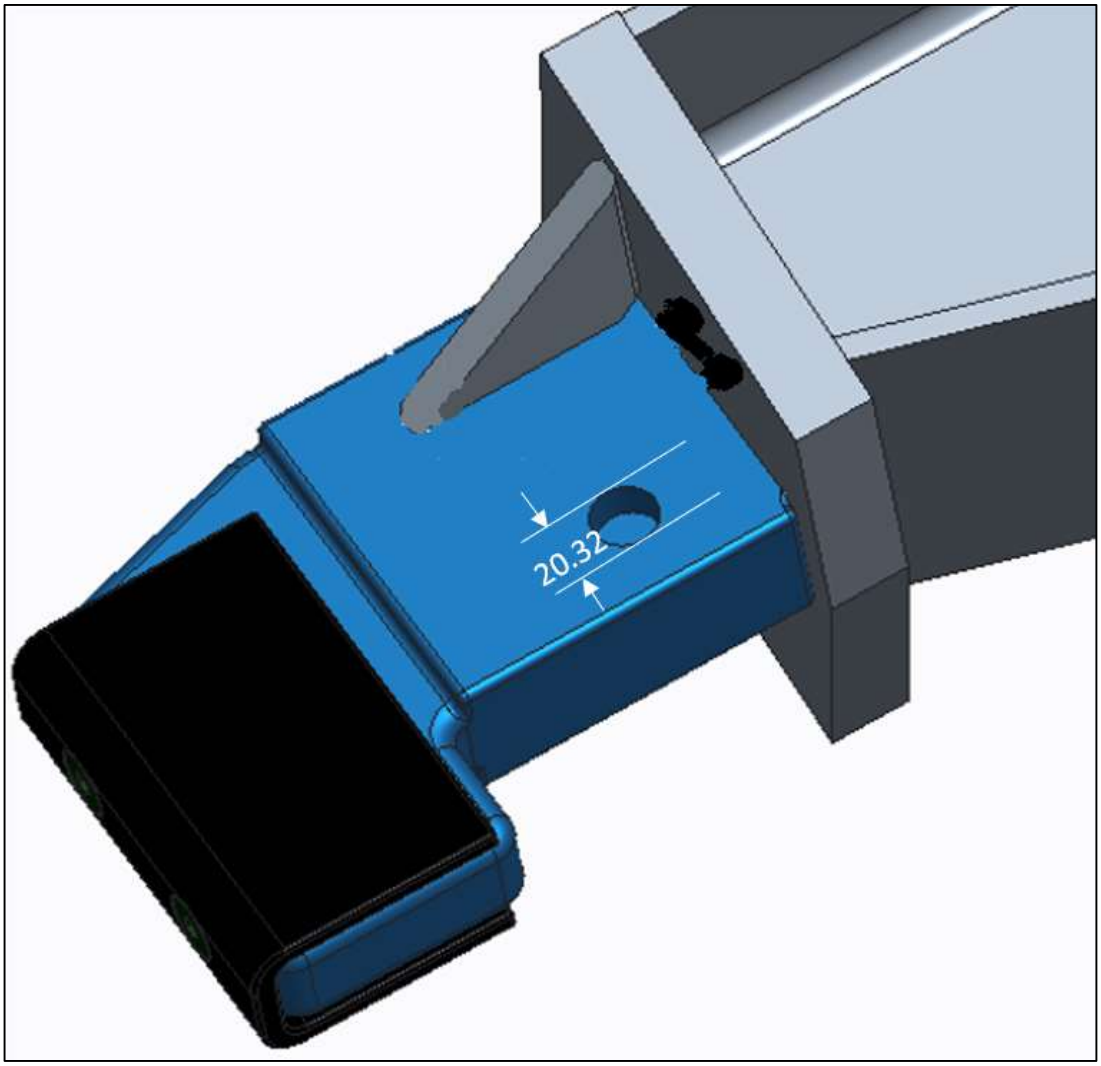



Figure 34: Brake Beam End Worn Condition

# 4 MAINTENANCE INSTRUCTION FOR BOGIE MOUNTED BRAKE SYSTEM

**General Instructions for OPEN LINE /ROH/POH**

1. Check all the pin joints for any missing parts (pins, split pins, spring dowel, etc), if missing, provide the same.
2. Check the components for missing or any physical damage, if found replace them.
3. Check that the APD is provided on all the pins and on the ERV/APM.
4. Check all the hoses for any cracks/damage, if so replace them.
5. Check that all hoses are properly tightened and are not threatened to be damaged by axle or wheel. If so, properly clamped them.
6. Check all the pipe joints for leakage, if so tighten them properly.
7. Check thickness of Brake Block it should be adequate for the complete trip.
8. Replace Liner if found in Worn (2 mm wear limit either side) or Damage Condition.
9. Replace Beam if Beam end found in Worn (2 mm wear limit either side) or Damage Condition.
10. The BC isolating cocks in the BC line have their vent side towards the Brake cylinder (Both sides) and their handles are parallel to pipeline.
11. The brake hoses for Brake cylinder are properly secured and not resting on axle or rubbing with any other under frame members.
12. The brackets for hand brake arrangement are properly secured, the movement of the hand brake system is smooth and unrestricted.

## 4.1 MAINTENANCE INSTRUCTION FOR BOGIE MOUNTED BRAKE SYSTEM IN OPEN LINE

### HAND BRAKE RIGGING/BRAKE BEAMS/BELL CRANK LEVERS & PUSH RODS

1. Check all the pin joints for any missing parts (pins, split pins, spring dowel, etc), if missing, provide the same.
2. Check the components for missing or any physical damage, if found replace them.
3. Check the condition of wire rope at bends, if damaged to be replaced.
4. Replace all the PINS, washer, split pins, dowel pins.

### BRAKE CYLINDER

1. Check for any physical damage of components.
2. Check that the piston indicator is fully in.
3. In case of brake cylinder with hand brake cables, the cables are not entangled or resting / touching the axle.
4. Check that hand brake cables should not bend during the service brake application.
5. Wire mesh Filter (Dwg. No-1J101000086) must be cleaned every three Month and to be replaced if found damaged.
6. Check bellow is not damaged & clamped properly at the ends.

### ERV/APM DEVICE

1. Check for any physical damage to the valve.
2. Check Indicator is in release condition.
3. Check the tightness of the lock nuts on sensor arm lever, if found loose, tighten them and also verify the Gap as specified with the help of ERV/ APM gap adjusting gauge.
4. Check that the valve's sensing arm is moving freely.

**HAND BRAKE RIGGING**

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

## 4.2 MAINTENANCE INSTRUCTION FOR BOGIE MOUNTED BRAKE SYSTEM (BRAKE RIGGING ITEMS) IN ROH

Performance Testing of BMBS using with SWTR (Single wagon test rig) test as per RDSO format.

The following action should be taken for the defects / discrepancies found in below mentioned parts during testing.

**BRAKE BEAM**

1. Check for any physical damage, crack etc., if found replace them. Check for rusting & corrosion and if found repaint them.
2. Replace all the PINS, washer, split pins, dowel pins from OEMs.
3. Check the GAP at pivot pin on the primary brake beam as shown in the condemning limit of the system components.
4. Check brake head for loosening or damage as shown in the condemning limit of the system components.
5. Replace Beam end Liner & Screws (Must change item)

**BELL CRANK LEVERS & PUSH RODS**

1. Replace the Bell crank lever, if any of the parameters specified in the condemning limits is observed.
2. Replace the push rod, if any of the parameters specified in the condemning limits is observed.
3. DPT to be done at the time of ROH and POH.

**BOGIE & BRAKE CYLINDER 11" (WITH AND WITHOUT HAND BRAKE CABLE)**

1. Push rod & spring plank clearance (min 10mm). Check with slip gauge.
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.

**Caution!**

- The wagon has to be placed in an Open - line/ROH depot.
- The workmen have to wear Helmet, Hand gloves and Safety shoes.
- Use of proper tools

## 4.3 MAINTENANCE INSTRUCTION FOR BOGIE MOUNTED BRAKE SYSTEM (BRAKE RIGGING ITEMS) IN POH

### BRAKE RIGGING

Replace all the Pins, Clevis, Washers, and split pins.

### BRAKE BEAMS

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

### BELL CRANKS LEVERS & PUSH RODS

1. Replace the Bell Crank levers, if the critical parameters found in condemning limits as specified.
2. Replace the Push Rod, if the critical parameters found in condemning limits as specified.
3. DPT to be done at the time of ROH and POH.

### HAND BRAKE RIGGING

1. Check for any physical damage components, if found replace them.
2. Brake rigging brackets, bolts and nuts should be examined for rusting, looseness, damaged threads etc. and replaced.
3. The brackets for hand brake arrangement are properly secured, the movement of the hand brake system is smooth and unrestricted.

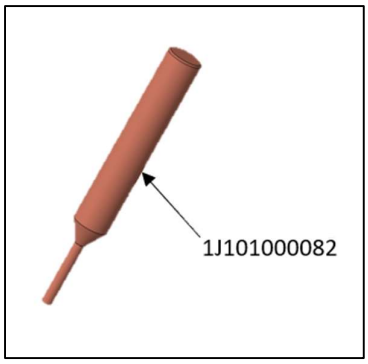
**Caution!**

- The wagon has to be placed in a Workshop.
- The workmen has to wear Helmet, Hand gloves and Safety shoes.
- Use of proper tools

## 4.4 TOOLS AND GAUGING

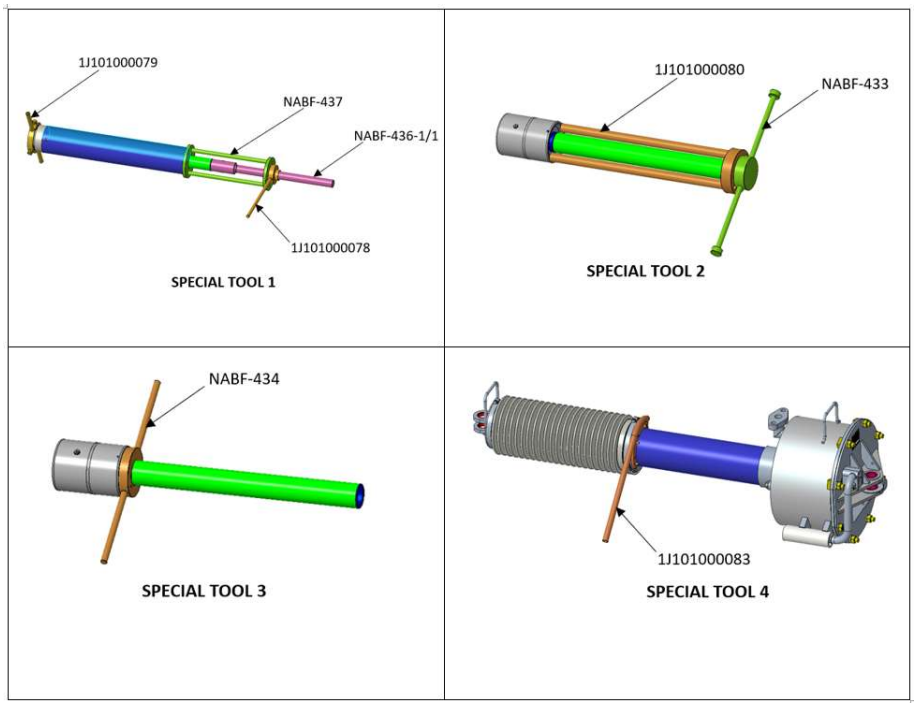
### Spring Dowel sleeve too for Brake cylinder

To remove the spring dowel sleeve from the brake cylinder pin during replacing/changing of brake cylinder a tool mentioned below is required.




### Special Tools for Brake Cylinder

As per fig below ref special tools (Special tool 1,2.3) for overhauling and Slack Adjustment (Special tool 4)



## Gauge FOR APM (ERV)

To adjust the gap between the side frame of bogie and adjuster screw of APM (ERV), this gauge is required. It is adjustable and can be adjusted as per the required gap and placed on the side frame. Now touch the head of the head of adjuster screw by loosening/tightening it. Lock the position of adjuster screw by tightening the lock screw.

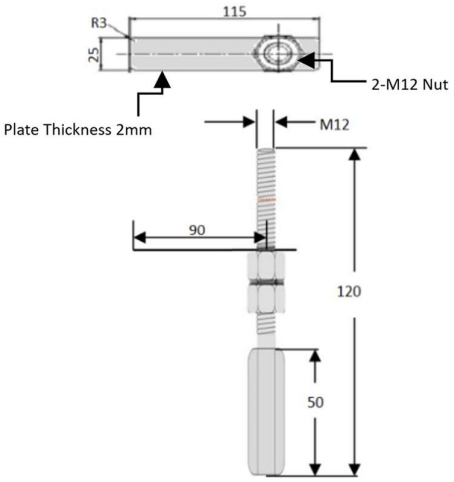



Figure 35: Gap measuring Gauge

## MANDATORY TOOLS REQUIRED DURING POH OF BMBS (BRAKE CYLINDER, ERV, RIGGING)

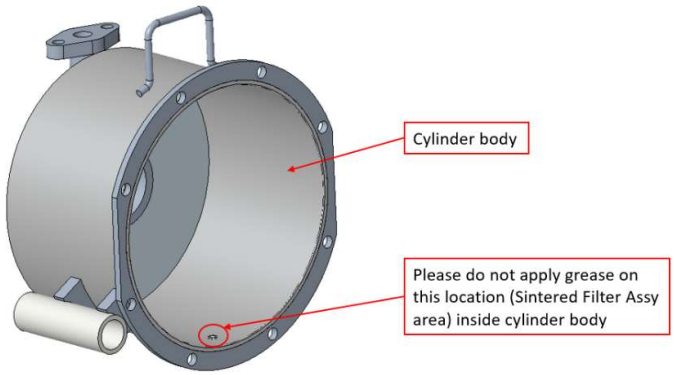
| S. No. | Tool Description |
|---|---|
| 1 | Socket Wrench, M8 |
| 2 | Socket Wrench, M12 |
| 3 | Impact Wrench, M12 |
| 4 | Socket Extension, 4" |
| 5 | Allen Wrench, M4 |
| 6 | Hammer |
| 7 | Special Tool 1 (for Adjuster Tube Assembly) |
| 8 | Special Tool 2 (For Circlip) |
| 9 | Special Tool 3 (For Clutch Sleeve) |
| 10 | Flat Chisel |
| 11 | Ring Spanner 19 |
| 12 | Spanner 16-17 |
| 13 | Tool for Spring Dowel Sleeve |
| 14 | Allen Key M8 |
| 15 | Allen Key M12 |
| 16 | Special Tool 1 |
| 17 | Open Spanner 20-22 |
| 18 | Open Spanner 36-41 |
| 19 | Ring Spanner 20-22 |
| 20 | Special Tool 4 |

## 4.5 DESCRIPTION & MAINTENANCE INSTRUCTION FOR BRAKE CYLINDER 11'' (WITH AND WITHOUT HAND BRAKE)

**Caution!**

- The wagon has to be placed in a Sick-Line/ROH Depot
- The workmen has to wear Helmet, Hand gloves and Safety shoes.
- Use of proper tools

1. Check for any physical damage of components or leakage.
2. Check that the piston indicator is fully in released condition.
3. 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.
4. Check for any damage in the dust protector bellow. If found remove and replace the bellow.
5. Apply Grease OKS-475/222 (Qty 0.2 kg) inside cylinder body. Also, do not apply grease on Sintered Filter port area as shown in the image below.




### 4.5.1 WORKING OF BRAKE CYLINDER 11" (WITH AND WITHOUT HAND BRAKE CABLE)

Bogie Mounted Braking System (BMBS) is a Braking system used in Wagons. This system is designed according to Indian railways specification No. WD-23-BMBS-2008 (Rev01) Amendment No.1 of Sept.-2016. This system is designed for fitment of BMBS during manufacturing of new wagons as well as during Retro Fitment of BMBS on existing In-Service wagons.

This system has the following advantages:

1. Improved Braking Efficiency
2. Reduced weight
3. Less number of parts
4. Uniform brake shoe wear & wheel wear
5. Increased reliability
6. Easy maintenance

BMBS (Bogie Mounted Brake System) is used in railway. During Brake application, the air is supplied to brake cylinder, which pushes the piston along with double acting slack assembly. The brake cylinder is floating in nature, as a result the brake cylinder end-to-end distance shortest equally both the sides. This shortening of brake cylinder causes the rotation of the Bell crank lever on their pivot (which is on primary brake beam) and forces the push rod to move towards secondary beam. This movement causes the secondary brake beam to move towards wheels and applies force on the wheel. Simultaneously reaction force is developed, which causes the Primary Brake Beam continue to move until it touches the wheels and apply force on the wheel.

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 double acting slack assembly back to its originally position. The bell crank levers rotate, causing the beam to move back to their earlier positions. The Brake cylinder is equipped with a automatic double acting slack adjuster. If there is any wear (brake Shoe/Wheel) or slackness in the structure, it will be automatically compensated by the built in automatic double acting slack adjuster, which pays out & fill the gap.

Brake cylinder with In – Built automatic double acting slack adjuster has following features:

#### 4.5.1.1 DOUBLE ACTING

The brake shoe clearance is adjustable to its correct value in both directions, either wheel it has become too large owing to wear of the brake blocks and wheels, or when it has become too small, e.g. owing to renewal of worn brake blocks, or due to loading of the wagon altering the brake shoe clearance.

#### 4.5.1.2 RAPID ACTION

Correct brake shoe clearance is automatically restored after one or two brake application.

#### 4.5.1.3 VERIFICATION

If resistance occurs in the brake application, caused by corrosion, icing on brake blocks etc., it does not pay out slack immediately, but indexes the amount of slack to be paid out. If the slack really is too small, the automatic double acting slack adjuster will pay out this indexed slack at the next brake application. Thus false payout will not occur.

#### 4.5.1.4 TRUE SLACK ADJUSTER

Adjustment based on total piston stroke must cause verification of the slack. The automatic double acting slack adjuster adjusts on slack only, thus giving the brake its best possible range of piston strokes, and ensuring a smooth and efficient braking force at all times.

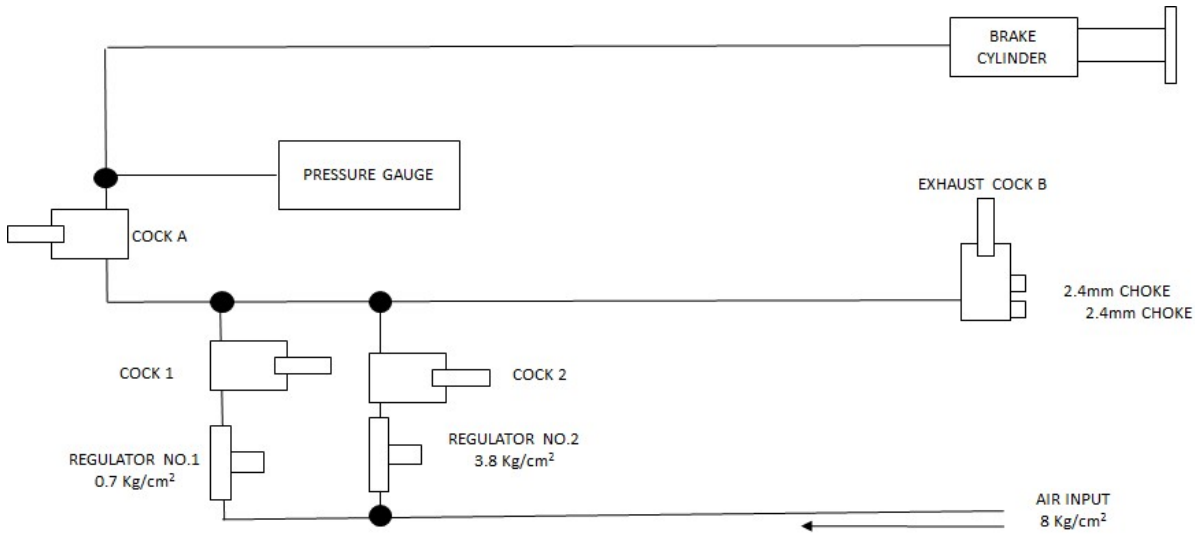



Figure 36: Schematic Diagram for Brake Cylinder Test Bench

### 4.5.2 ROH SCHEDULE FOR WAGONS FITTED WITH BMBS BRAKE CYLINDER 11" (WITH HAND BRAKE-3EB7348 AND WITHOUT HAND BRAKE-3EB7347)

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.

**Caution!**

- The wagon has to be placed in a Sick-Line/ROH Depot
- The workmen has to wear helmet, Hand gloves and Safety shoes.
- Use of proper tools

### 4.5.3 DISASSEMBLY OF BRAKE CYLINDER (WITH & WITHOUT HAND BRAKE CABLE) (Ref. Figure 12)

**Warning**

- Component springs within this unit are under compressive loads. Exercise care when disassembling this unit to prevent parts from inadvertently flying out and causing personal injury. While dismantling, when air pressure is required, use a maximum of 0.7kg/cm2 exceeding this limit could result in personal injury or damage to equipment.
- Parts may be inadvertently expelled by force of spring wear eye protection and exercise care during disassembly. Failure to observe these safety precautions can lead to injury.

For ease of disassembly and safety, cylinder must be in a horizontal position:

1. Rotate the barrel pipe (11) with the help of hands or using Special Tool 4 and fully expand the barrel pipe assembly (11) as shown in Fig. 37A

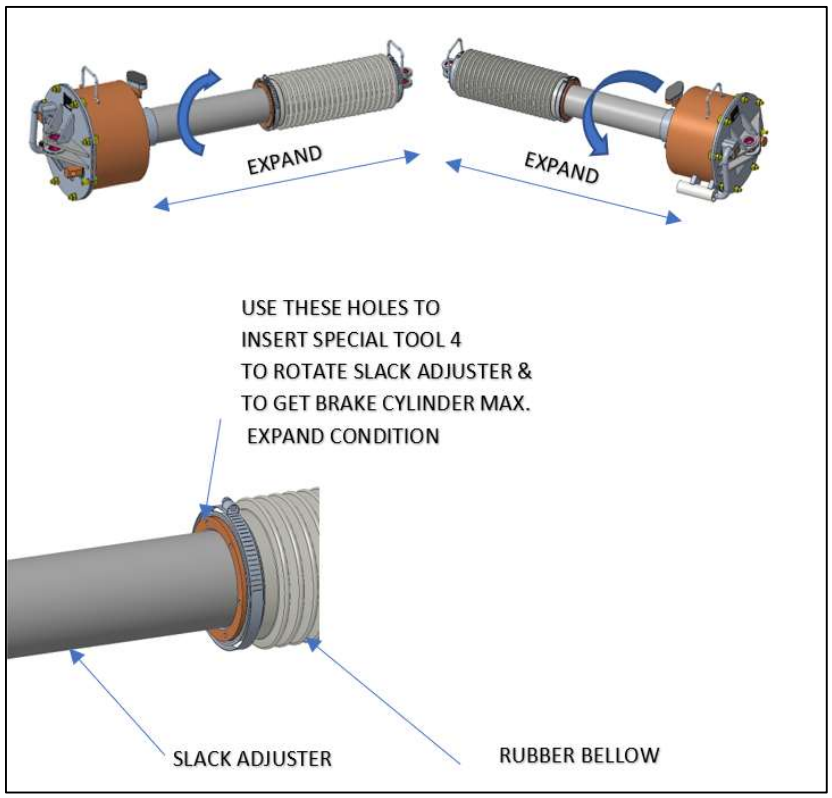



Figure 37A: Rotating the Barrel Pipe

2. Proper clamping to be done to hold the Back cover with cylinder body.
3. Loosen the back cover bolts using M12 Torque wrench (Caution under spring Pressure)
4. Remove the indicator (20), then back cover (18) & spring (12).
5. Unlock the locking screw (10) & check nut for gland (11).
6. Remove the piston assy. (8) and check for piston packing condition.

#### 4.5.3.1 BODY ASSEMBLY (6)

1. Inspect body (6). If damaged or worn, the body (6) must be replaced.
2. Inspect the two bushes on back cover (18). If damaged or worn, the bushes must be replaced.
3. If repair is necessary, use the proper tools to press bushes from body (6). Press new bushes into place in back cover (18)

### 4.5.4 CLEANING OF BRAKE CYLINDER

Wash all parts in a suitable solvent that will dissolve oil or grease and permit all the parts to be thoroughly cleaned without abrasion (i.e. mineral spirits). Then dry with jet of dry compressed air.

### 4.5.5 INSPECTION AND REPAIR OF BRAKE CYLINDER

1. Replace all rubber parts, seal kits,. “O” Rings and self-locking screws.
2. In general, replace all parts that are cracked, broken, worn, damaged, or in such a condition as would result in faulty operation.
3. Inspect all springs for rust pits, distortion, or permanent set. Replace wherever necessary

### 4.5.6 HAND BRAKE CABLE ASSEMBLY (FOR BRAKE CYLINDERS WITH HAND BRAKE)

1. Inspect the hand brake cable. If damaged or not usable, the cable must be replaced
2. If repair is necessary, use proper tools to replace the cables.
3. Tight the mounting bracket using M12 bolts.
4. Pull the hand brake cables in outward direction.
5. Remove both the screw from the anti-rotation tubes of Piston assembly (8) using socket and impact wrench.

### 4.5.7 DISMANTLING THE AUTOMATIC DOUBLE ACTING SLACK ADJUSTER (Fig. 13)

**Warning**

- Springs are in loaded condition, so do not open the automatic double acting slack adjuster Assy without suitable tools

1. Hold the slack adjuster assy on a vice
2. Loosen the Jubilee clamps (25,26) on both ends of the Bellow (12)
3. Remove the Bellow (12)
4. Remove the safety washer (27) by unscrewing the screw (28)
5. Unscrew the Adjuster Spindle assy. (13)
6. Insert the Jacking tool on the Adjuster Tube Assy. on the face of the Barrel Pipe Sub-Assy.
7. Load the Jacking tool and fix it.
8. Unscrew Locking screw (21) and remove the Tab Washer (20).
9. Unscrew the Leader Nut Casing (10). From the barrel pipe with the help of tool
10. Slowly release the Jacking Tool.
11. Remove the Traction Sleeve assy. (8) from barrel pipe.
12. Remove the Barrel pipe (11) from vice.
13. Hold the Traction Sleeve assy. (8) vertically on the vice.
14. Remove the clutch ring. (4)
15. Remove the bearing (23)
16. Insert Jacking tool and put load.
17. Remove circlip (19) with the help of circlip plier
18. Remove the Spring Dowel sleeve inside Adjuster Tube assy.
19. Unscrew the clutch sleeve.
20. Remove all components from inside
21. Remove the Leader nut casing Assy.
22. Remove the circlip (14) with the help of Circlip plier.
23. Remove all components from inside

#### 4.5.7.1 CLEANING THE AUTOMATIC DOUBLE ACTING SLACK ADJUSTER PARTS

Wash all parts in a suitable solvent that will dissolve oil or grease and permit all the parts to be thoroughly cleaned without abrasion (i.e. mineral spirits). Then dry with jet of dry compressed air.

#### 4.5.7.2 INSPECTION

Inspect all the parts after cleaning and replace all the damaged and broken parts.

#### 4.5.7.3 RE-ASSEMBLING OF AUTOMATIC DOUBLE ACTING SLACK ADJUSTER

1. Place the Adjuster nut (15), Bearing (23), Bearing Cover (16), Take up spring (17), Adjuster tube assy (9), Actuating Sleeve (3), Clutch Spring (18), Tighten Clutch Sleeve (6) inside the Traction Sleeve (8).
2. Fit the Spring Dowel matching the holes of Traction Sleeve (8) and Clutch Sleeve (6).
3. Insert the Clutch Plate (7) on Clutch Sleeve (6),
4. Put the Circlip by using Jacking Tool.
5. Insert bearing (24) and Clutch Ring (4)
6. Fill Grease Servo-Gem RR3 (Qty. 0.75 kg) in Slack Adjuster Assembly.
7. Hold the Leader Nut Casing (10) vertically and fill grease inside, then insert Leader Nut, Bearing (24) and Spring Sleeve Assy (2). Then insert Circlip (14) to lock.
8. Grease the Barrel tube (11) inside and then insert greased Barrel Spring (22).
9. Grease the Traction Sleeve Assy (8) and insert it into the Barrel Pipe Assy (11)
10. Put Jacking Tool and load the Jacking Tool By rotating its handle.
11. Fit the Leader Nut Assy into the Barrel Pipe Assy (11) and tightening the Leader Nut Assy.
12. Put Tab Washer (20) and tighten with Locking Screw (21).and bend the washer to lock the screw.
13. Remove Jacking Tool from the Assy.
14. Grease the spindle.of the Adjuster Spindle Assy.(13).
15. Put the Adjuster Spindle Assy. (13) into the Barrel Pipe Assy.by rotating it on its thread.
16. Lock the Adjuster Spindle Assy. (13) with a Safety Washer (27) and Screw (28) by using anabond/loctite.

**Caution**

- Ensure that Tapped hole in the Adjuster Spindle Assy.(13) is clean and Dry

17. Fix the Bellow (12) on the Spindle (13) and Barrel Pipe (11) and clamp with Jubilee Clamps (25, 26).

#### 4.5.8 RE-ASSEMBLING OF BRAKE CYLINDER (Ref Fig. No.12)

1. For ease of Assembly and Safety, clamp the automatic double acting slack adjuster Assy. in vertical position.
2. Fix the Guiding tool on the Adjuster Tube.
3. Insert Body Assembly (6) from the top through the Guiding tool.
4. Remove Guiding Tool and fasten the Check Nut for gland (11)

5. Insert Piston Assy. (8), and fix it with Locking Screw (10)
6. Insert Spring (12), sealing Ring (15) and Back Cover (18)
7. Proper clamping to be done to hold the Back cover (18) with cylinder body.
8. Tighten the Back Cover (18) with M12 T-Head Bolts (13) using M12 Torque wrench (Caution under spring Pressure).
9. Place the indicator (20) onto the piston rod.
10. Tighten the Test Plug (5).

### 4.5.9 TESTING OF BRAKE CYLINDER FOR REPLACEMENT

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

1. Check the brake cylinder for any physical damage or leakage.
2. In case of brake cylinder with hand brake cables, check that the movement of cables is free
3. Ensure that the piston indicator is in fully released condition.

### 4.5.10 SWTR TESTING

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

### 4.5.11 BOGIE & BRAKE CYLINDER 11" (WITH AND WITHOUT HAND BRAKE CABLE)

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.

## 4.6 POH SCHEDULE FOR WAGONS FITTED WITH BMBS AIR BRAKE CYLINDER 11" (WITH AND WITHOUT HAND BRAKE)

**Caution!**

- The wagon has to be placed in a Sick-Line/ROH Depot
- The workmen has to wear Helmet, Hand gloves and Safety shoes.
- Use of proper tools

### 4.6.1 BRAKE CYLINDER 11" (WITH AND WITHOUT HAND BRAKE CABLE)

1. Overhaul the Brake Cylinder as per procedure explained in para no **5.2.2--5.2.8**
2. Check the condition base items, if found worn or damaged, replace them.
3. Test the brake cylinder as per the procedure given in the manual.

**Notification!**

- Brake Block force is also to be checked as per relevant RDSO Drawings for different types of wagons.

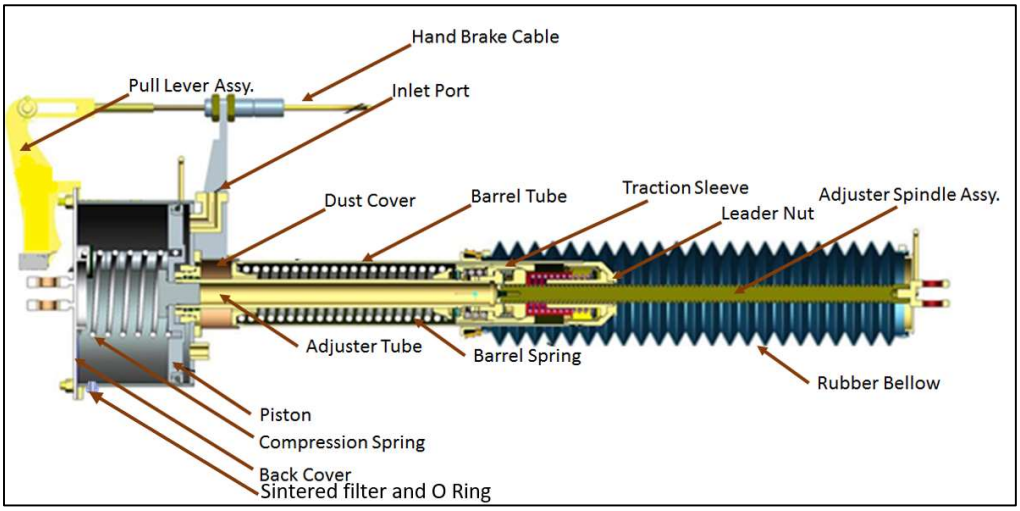



Figure 37: Brake Cylinder – 11 Inch with hand brake arrangement

# 5 DESCRIPTION AND MAINTENANCE INSTRUCTION FOR AUTOMATIC PRESSURE MODIFICATION DEVICE

The ERV/ APM is used to achieve 2 stages of braking i.e. empty and loaded in a wagon. To overcome the wheel slippage, ERV/ APM model is used for two stage braking i.e. empty and loaded. ERV/ APM is a contact type of load sensing device. ERV is provided with Indicator, which shows condition of brake application after the sensor arm touches the side frame. While the actuation of brake application is depicted by sensor arm touching the side frame of the bogie; the loaded / empty condition of brake application is depicted by red colour indicator (red colour visible in Empty condition and not visible is loaded condition) by ERV indicator. It can be mounted on under frame of the wagon or on the bolster of the bogie. The valve installed on the under frame of the wagon senses the gap between the under frame and the side frame of the bogie. It is also provided with the indicator, which shows empty as well as loaded brake condition of the wagon.

## 5.1 WORKING OF ERV/ APM

### INITIAL/RELEASE CONDITION

Ideally the ERV/APM Sensor Arm (1) remains close to the housing in the initial/release condition). Both Movement & Ratio Piston (2, 3) remain on the left side against spring (4,5) force.

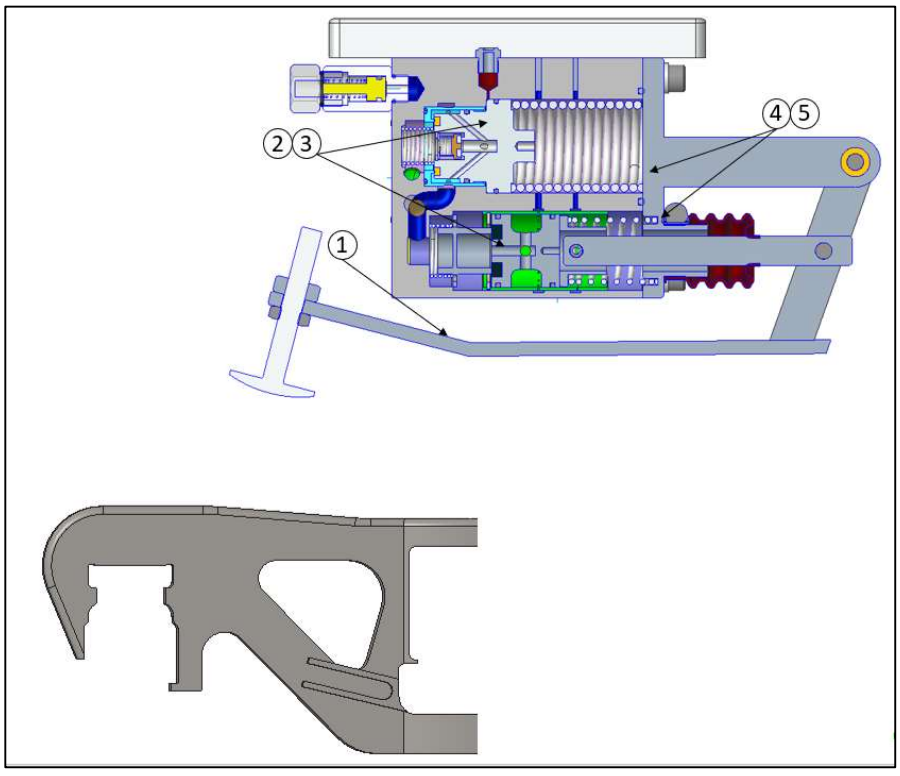



Figure 38: ERV /APM Initial Condition

## EMPTY CONDITION

In the empty position, the Movement Piston and Ratio Piston (2, 3) shifts towards the right side as air pressure is more than spring (4, 5) force. After crossing the transition position, air enter into the reservoir and empty condition is achieved delivering 2.2kg/cm$^2$ output.

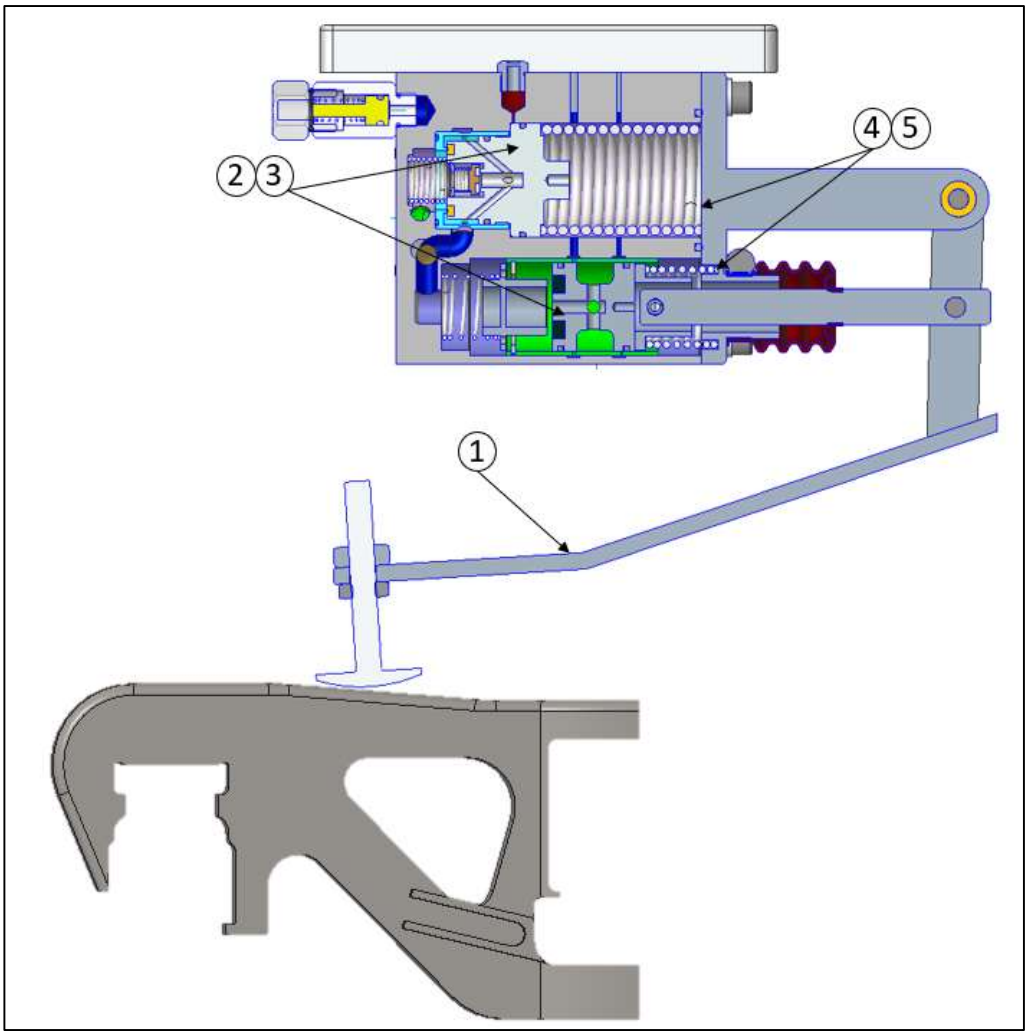



Figure 39: ERV /APM Empty Condition

## TRANSITION/CHANGEOVER CONDITION

In the Changeover position, the Movement Piston and Ratio Piston (2, 3) shifts towards the right side as air pressure is more than spring (4, 5) force. After reaching the transition position, air enter into the reservoir and transition condition is achieved. As pressure increases in the DV port it equalizes the volume with the brake cylinder by resetting the ratio piston.

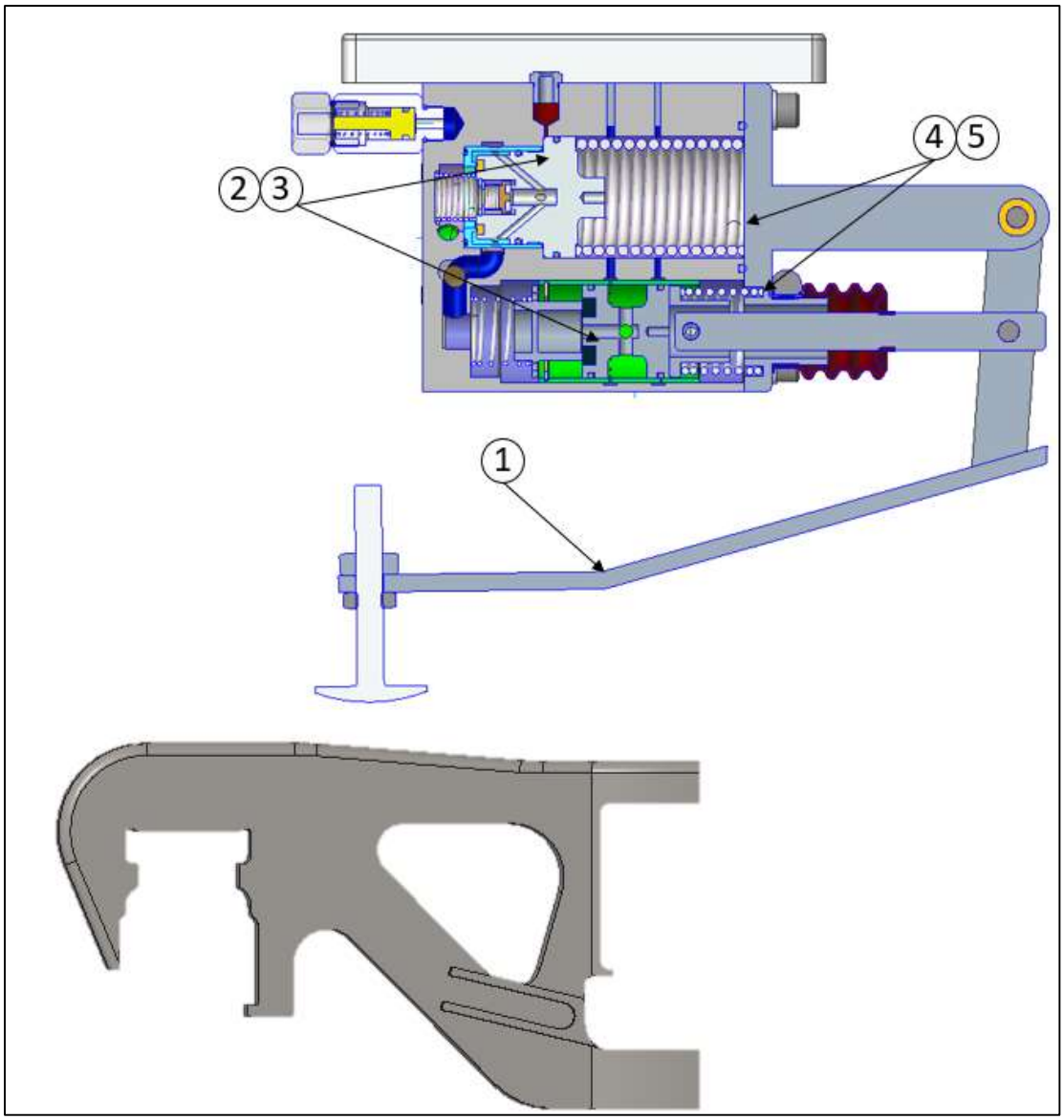



Figure 40: ERV /APM Changeover Condition

## LOADED CONDITION

In Loaded Position, Movement and Ratio piston (2, 3) moves towards the right side until sensor arm (1) touches the side frame. Hence movement Piston (2) stops before Transition position resulting in output pressure of 3.8 kg/cm$^2$.

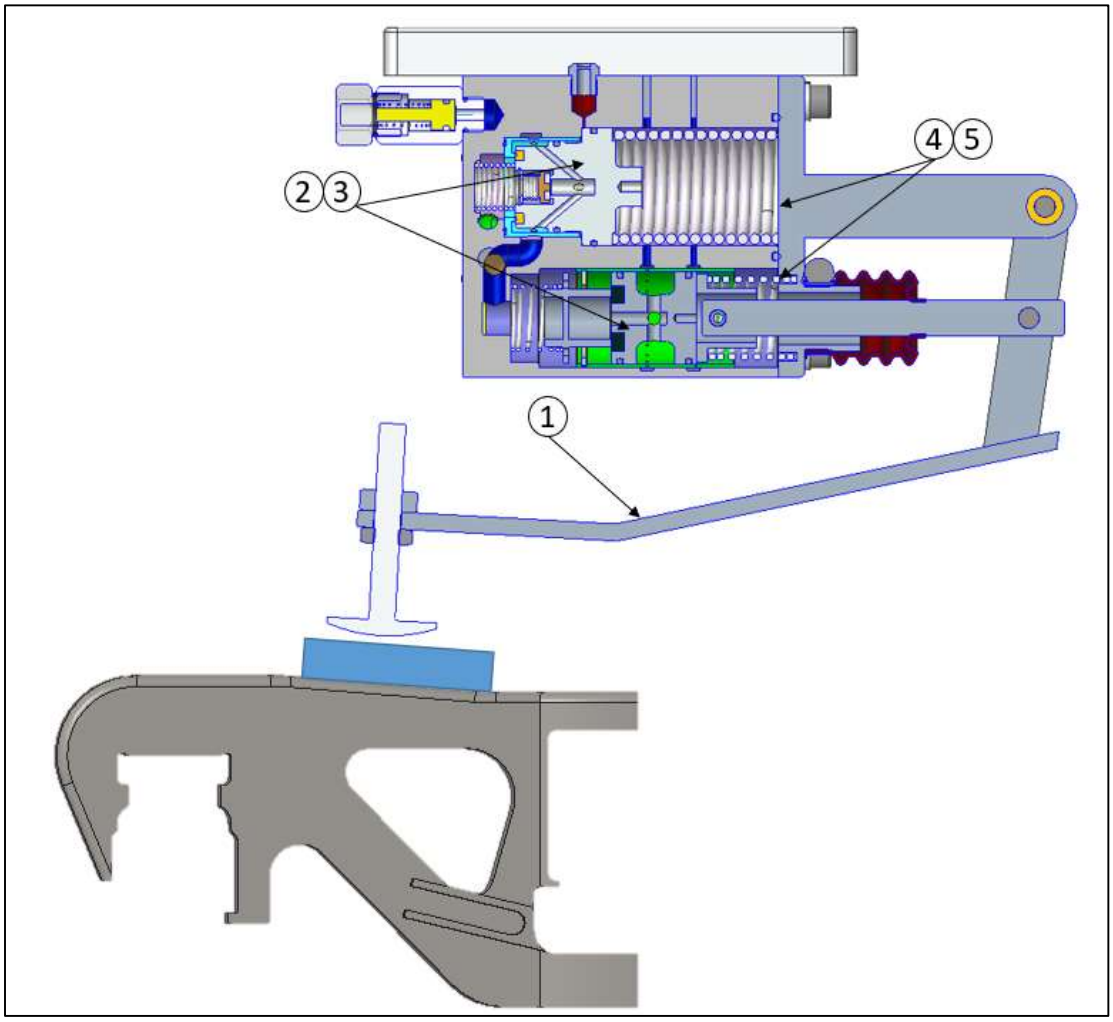



Figure 41: ERV /APM Loaded Condition

**SALIENT FEATURES**

The valve is designed such that it does not require two stages distributor Valve. Standard wagon type distributor valve can be used. The device does changeover of brake cylinder pressure from empty to load and vice-versa. The mounting and pipeline connecting parameters of the device are according to the standard pipes and flange used in Indian Railways, so no change is required in the piping connections. Only brake cylinder pipeline between distributor valve and brake cylinder needs to be modified. A visual indicator is provided on the valve, which shows empty brake condition. There is no physical contact of the sensor arm of LSD with the side frame of the bogie during release & running (both Empty & Loaded condition). The contact of sensing arm with side frame of the bogie occurs during braking only. The sensing arm is angular type of lever; hence it does not lead to any bending movement. Simplified piping; requires only three connections for the ERV/ APM. The ERV/ APM load-sensing device is lightweight, with a minimum no. of parts. Load and empty adjustment can be easily done on the wagon.

## 5.2 ROH SCHEDULE FOR WAGONS FITTED WITH APM/ERV (Ref. Fig. 19)

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.

**Caution!**

- The wagon has to be placed in a Sick-Line/ROH Depot
- The workmen has to wear helmet, Hand gloves and Safety shoes.
- Use of proper tools

**TOOLS REQUIRED FOR ROH & POH**

1. Allen key, M8
2. Allen key, M12
3. Special Tool 1 (Ref. Fig 44)
4. Open Spanner 20-22 2 nos.
5. Ring Spanner 20-22Spanner 24-27


Figure 42: Special Tool 1

## DISASSEMBLY OF ERV/APM (Ref. Fig. 19)

**Warning**

- Component springs within this unit are under compressive loads. Exercise care when disassembling this unit to prevent parts from inadvertently flying out and causing personal injury.
- Parts may be inadvertently expelled by force of spring wear eye protection and exercise care during disassembly. Failure to observe these safety precautions can lead to injury.

1. Remove all the three hoses connected to ERV housing with the help of Allen key M8 and Open spanner 20-22.
2. Remove all the three mounting bolts using two no. Open spanner 20-22.
3. Hold the ERV properly on a vice.and remove the side cover by dismantling 4nos M8 socket head bolts.
4. Remove the movement piston as well as ratio piston with the help of spl. tool
5. Remove the 'O' Ring (9) followed by spring removal.

## CLEANING OF ERP/APM (Ref. Fig. 19)

1. Wash all parts in a suitable solvent that will dissolve oil or grease and permit all the parts to be thoroughly cleaned without abrasion (i.e., mineral spirits). Then dry with jet of dry compressed air.

## INSPECTION AND REPAIR OF ERP/APM (Ref. Fig. 19)

1. Replace all "O" Rings
2. In general, replace all parts that are cracked, broken, worn, damaged, or in such a condition as would result in faulty operation.
3. Check the ERV/APM valve.
   - Any physical damage
   - Valve's sensing arm is moving freely
   - Check the leakage
   - Tightness of the lock nuts on sensor arm lever, if found loose, tighten the same.
   - Check the gap between the sensor arm and the side frame, if required re-adjust.
4. Inspect all springs for rust pits, distortion, or permanent set. Replace wherever necessary

## RE-ASSEMBLING OF ERV/APM (Ref. Fig. 19)

1. Fit the Ratio Piston and Movement Piston in the respective chamber of ERV housing.
2. Insert the spring behind the Ratio Piston.
3. Place the side cover in location and fasten it with 4nos. of M8 socket head bolt with the help of M8 Allen Key.
4. Adjust the Sensor Arm with the help of M12 nuts (Ref. table in Para 2.7)
5. Apply grease Fuchs Renolit HLT 2 (Quantity. - 0.005 Kg).

## TESTING OF ERV/APM FOR REPLACEMENT

1. Check & replace ERV by tested ERV if following defects are identified
2. Check the ERV for any physical damage or leakage.
3. Ensure that the ERV indicator is in fully released condition i.e., red portion is not visible.

## SWTR TESTING

1. SWTR test for wagon to be done as per RDSO format .ERV/APM DEVICE
2. The ERV/APM Device is mounted properly and its sensor arm is touching in middle of side frame.
3. 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.
4. Check that the ERV/APM Device hose is properly tightened & secured through clamp on under-frame.

## TEST PROCEDURE

1. Place a 25 mm high block between the sensor arm and the stopper plate.
2. Open cock A and apply the main supply pressure. Pressure gauge no.1 should show 3.8kg/cm2 pressure.
3. Open cock B and apply 3.8kg/cm2 pressure to the load-sensing device.
4. As the sensor arm comes in contact with the block, note the reading at pressure gauge no.2. It should be 3.8 ± 0.1kg/cm2.
5. Check the actuation of indicator.
6. Check the leakage at all joints and ports. No leakage is allowed.
7. Close cock A and B and reduce pressure to 0kg/cm2.
8. Remove the 25mm block from between the sensor arm adjusting screw and the stopper plate.
9. Now, open cock A and apply the main supply pressure. Pressure gauge no.1 should show 3.8kg/cm2 pressure.
10. Open cock B and apply 3.8kg/cm2 pressure to the load-sensing device.

11. As the sensor arm stops moving further down, note the reading at pressure gauge no.2. It should be 2.2 ± 0.1kg/cm2.
12. Check the leakage at all joints and ports. No leakage is allowed.
13. Close cock A and B and reduce pressure to 0kg/cm2

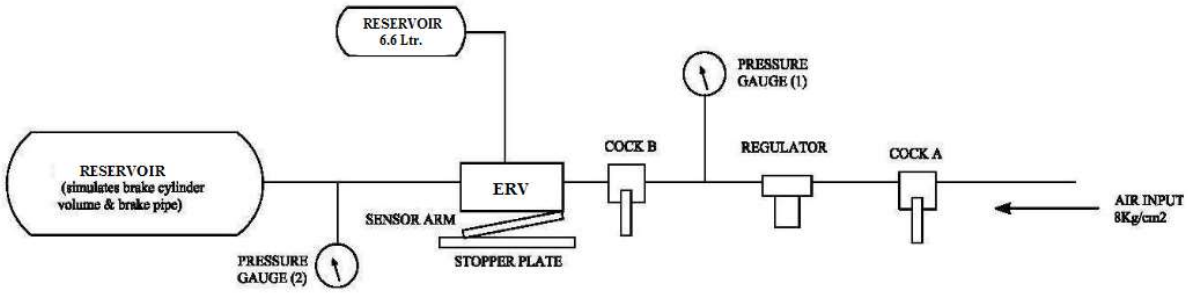



Figure 43: Schematic of ERV/ APM Testing

## 5.3 POH SCHEDULE FOR AUTOMATIC PRESSURE MODIFICATION DEVICE

### ERV/APM DEVICE

1. Overhaul the ERV/APM valve as per procedure explained para no. 5.2
2. Check the conditions all items if found worn or damaged, replace them.
3. Test the ERV/APM device as per the procedure given in para no. 5.2
4. Check the gap between the sensor point and the side frame surface and readjust the same as specified for the wagon type in para no. 2.6

# 6 TROUBLE SHOOTING FOR BMBS

**Caution!**

- The wagon has to be placed in a shed
- The workmen has to wear Helmet, Hand gloves and Safety shoes.
- Use of proper tools

## 6.1 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 are found inside the cylinder body. Dirt particles mixed with grease are also found inside the Brake cylinders.

### ACTION BY OPERATING STAFF

Isolate the defective BC with the help of isolating cock.

### ACTION BY DEPOT / WORKSHOP

Brake cylinder to be replaced and defective BC to be repaired.

### PREVENTIVE ACTION

- 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

## 6.2 BRAKE CYLINDER - IMPROPER FITMENT OF BC FLEXIBLE HOSES

### ACTION BY OPERATING STAFF

Tighten the bolts properly to prevent leakage, else isolate the defective BC with the help of isolating cock.

### ACTION BY DEPOT / WORKSHOP

Tighten the bolts properly if possible, else replace the bolts with correct size bolts.

### PREVENTIVE ACTION

Care should be taken to ensure that correct size of hardware is used and is properly tightened to ensure trouble free service.

## 6.3 BRAKE CYLINDER - IMPROPER HANDLING & STORAGE RESULTING IN DAMAGE TO BRAKE CYLINDER

### ACTION BY OPERATING STAFF

If the outer tube is damaged and the brake cylinder is not working, isolate the defective BC with the help of isolating cock.

If the hand brake cable is damaged, hand brake may become inoperative.

### ACTION BY DEPOT / WORKSHOP

Replace the Brake cylinder and the defective BC is to be repaired.

### PREVENTIVE ACTION

Proper care should be taken in storage & handling of brake cylinders. Use trolley for movement of wooden cases of Brake cylinders.

## 6.4 BRAKE CYLINDER NOT RELEASING

### ACTION BY OPERATING STAFF

1. Due to malfunctioning of DV
2. Due to malfunctioning of BC

### ACTION BY DEPOT / WORKSHOP

1. 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.
2. 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. Suitably tie the push rod and lever to prevent it from touching the wheel.

### PREVENTIVE ACTION

- Repair / replace the DV.

1. Replace the Brake cylinder and same to be repaired. Re-connect the system and provide the necessary APDs. Apply brakes to adjust the system.

## 6.5 ERV/APM DEVICE – IMPROPER FITMENT

The bracket of ERV/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 OPERATING STAFF

No action is possible

### ACTION BY DEPOT / WORKSHOP

The position of the bracket is to be corrected to ensure that the working of ERV/APM valve is proper.

### PREVENTIVE ACTION

Care should be taken during the welding of ERV/APM Device bracket on under-frame. It should be ensured that the sensor arm is correctly touching in the centre of the side frame.

## 6.6 ERV/APM DEVICE – IMPROPER FITMENT OF FLEXIBLE HOSES

If the ERV/APM Device flexible hoses are not properly fitted, they can get cut / damaged.

### ACTION BY OPERATING STAFF

Tie the flexible hose properly through some suitable means to under-frame member.

### ACTION BY DEPOT / WORKSHOP

Provide suitable clamp to ensure that the flexible hose is not loosely hanging.

### PREVENTIVE ACTION

Care should be taken during the fitment by providing suitable clamp / bracket.

## 6.7 ERV/APM DEVICE LEAKAGE FROM THE MOUNTING BRACKET CONNECTING THE PIPES

### ACTION BY OPERATING STAFF

Tighten the bolts properly to prevent leakage.

### ACTION BY DEPOT / WORKSHOP

Tighten the bolts properly if possible. In-case an incorrect bolt size has been used, it could have damaged the bracket also. Bracket needs to be replaced.

### PREVENTIVE ACTION

Care should be taken to ensure that correct size of bolts are used and properly tightened to ensure trouble free service.

## 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.

### ACTION BY OPERATING STAFF

Isolate the bogie by operating the isolating cock to close position.

### ACTION BY DEPOT / WORKSHOP

Install the new parts which have been damaged. Provide split pins & APDs in a proper manner.

### PREVENTIVE ACTION

Care should be taken to ensure that split pins and APDs are properly provided.

## 6.8 MISSING OF SPLIT PINS – BOGIE COMPONENTS DAMAGED

### ACTION BY OPERATING STAFF

Isolate the bogie by operating the isolating cock to close position.

### ACTION BY DEPOT / WORKSHOP

Install the new parts which have been damaged. Provide split pins & APDs in a proper manner.

### PREVENTIVE ACTION

Care should be taken to ensure that split pins and APDs are properly provided.

## 6.9 MISSING OF APD SPLIT PIN USED ON BRAKE CYLINDER PIN

### ACTION BY DEPOT / WORKSHOP

Provide the bush and dowel on the pin.

### PREVENTIVE ACTION

Care should be taken to ensure that the bush and the dowel should be used on brake cylinder mounting pins.

## 6.10 MISSING OF APDs ON THE PIN OF PRIMARY BRAKE BEAM

### ACTION BY DEPOT / WORKSHOP

APDs to be provided over the mounting pins.

### PREVENTIVE ACTION

Care should be taken to ensure that the mounting pins are provided with APDs.

## 6.11 MISSING OF APDs ON THE PIN OF SECONDARY BRAKE BEAM

### ACTION BY DEPOT / WORKSHOP

APDs to be provided over the mounting pins.

### PREVENTIVE ACTION

Care should be taken to ensure that the mounting pins are provided with APDs.

## 6.12 MISSING OF APDS ON THE PIN OF PUSH ROD

### ACTION BY DEPOT / WORKSHOP

APDs to be provided over the mounting pins.

### PREVENTIVE ACTION

Care should be taken to ensure that the mounting pins are provided with APDs.

## 6.13 INAPPROPRIATE APDs ON ERV/APM DEVICE

### ACTION BY DEPOT / WORKSHOP

Proper APD to be provided over the ERV/APM Device.

### PREVENTIVE ACTION

Care should be taken to ensure that the APD provided on the ERV/APM Device is appropriate so that it perform its intended function.

## 6.14 HAND BRAKE - INCORRECT LOCATION OF BRACKETS

### ACTION BY DEPOT / WORKSHOP

Brackets to be moved to its correct location as per RDSO drawing.

### PREVENTIVE ACTION

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.

## 6.15 MISSING OF APDs ON THE PIN OF PRIMARY BRAKE BEAM

### ACTION BY DEPOT / WORKSHOP

APDs to be provided over the mounting pins.

### PREVENTIVE ACTION

Care should be taken to ensure that the mounting pins are provided with APDs.

## 6.16 MISSING OF APDs ON THE PIN OF SECONDARY BRAKE BEAM

### ACTION BY DEPOT / WORKSHOP

Do the necessary correction and check whether the brakes are functional.

### PREVENTIVE ACTION

Necessary precautions to be taken to have a proper welding of the APD on the Beam.

### ACTION BY OPERATING STAFF

Tie the hanging part to the under frame to prevent it from touching the moving parts of wagon.

### ACTION BY DEPOT / WORKSHOP

Install new component. Provide the APDs to prevent reoccurrence.

### PREVENTIVE ACTION

APDs should be provided to prevent the moving out of components during service.

## 6.17 WRONG USE OF ISOLATING COCK IN BC LINE

### ACTION BY OPERATING STAFF

In case, wherein wrong isolating cock has been used, if required isolate the wagon through DV instead of bogie.

### ACTION BY DEPOT / WORKSHOP

Replace the isolating cock to with-vent type and check its working.

### PREVENTIVE ACTION

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.

# 7 SCOPE OF SUPPLY

The generalized Scope of supply for complete BMBS system as per QAP is given below. This scope of supply may vary depending on scope of supply mentioned in the purchase order.

**ESCORTS Scope of Supply (SOS-BMBS-003, Rev-03) Reference: WD-23-BMBS-2008 Rev 01, Amendment No.1 of Sept.-2016**

**Date 04-03-2017**

| SL No. | Name | Drg. No. | Qty | RDSO Drg. No. |
|---|---|---|---|---|
| 1 | PRIMARY BRAKE BEAM ASSY. | 3EB5521 Alt-11 | 2 | WD-08093-S/2 Item-1 |
| 2 | SECONDARY BRAKE BEAM ASSY. | 3EB5522 Alt-10 | 2 | WD-08093-S/2 Item-2 |
| 3 | BRAKE CYLINDER 11" WITH DOUBLE ACTING AUTOMATIC SLACK ADJUSTER | 3EB7347 Alt-10 | 1 | WD-08093-S/2 Item-3 |
| 4 | BRAKE CYLINDER 11" WITH DOUBLE ACTING AUTOMATIC SLACK ADJUSTER & HAND BRAKE CABLE | 3EB7348 Alt-11 | 1 | WD-08093-S/2 Item-3 |
| 5 | BELL CRANK LEVER- LH ASSY | 3EB9792 Alt-01 | 2 | WD-08093-S/2 Item-4 |
| 6 | BELL CRANK LEVER- RH ASSY | 3EB9791 Alt-01 | 2 | WD-08093-S/2 Item-5 |
| 7 | PUSH ROD ASSY | 3EB9790 Alt-01 | 4 | WD-08093-S/2 Item-6 |
| 8 | BRAKE HEAD | 3EB7375 | 8 | NA |
| 9 | PIN Ø24x120 | 4EB10264 | 4 | NA |
| 10 | PIN Ø24x70 | 4EB10262 | 4 | NA |
| 11 | PIN Ø24x80 | 4EB10263 | 4 | NA |
| 12 | BRAKE HEAD PIN | 4EB9764 | 8 | NA |
| 13 | BUSH | 4EB10261 | 4 | NA |
| 14 | T-HEAD BOLT M12x35 | 4EP5042 | 32 | NA |
| 15 | HEX NYLOCK NUT M12 | DIN982/EQV. | 32 | NA |
| 16 | SPRING WASHER B12 | DIN127/EQV. | 49 | NA |
| 17 | SPRING DOWEL SLEEVE 6x35 | 4EB10260 | 4 | NA |
| 18 | ANTI PILFERAGE DEVICE | 4EB8149 | 4 | NA |
| 19 | M16x90 BOLT WITH NUT & SPLIT PIN | 4EB10272 | 8 | NA |
| 20 | BC CHAIN HOLDING BRACKET | 3EB10268 | 4 | NA |
| 21 | ANTI PILFERAGE PLATE | 4EB9573 | 4 | NA |
| 22 | ANTI PILFERAGE PLATE | 4EB9572 | 2 | NA |
| 23 | BC HOLDING CHAIN | 4EB10266 | 4 | NA |
| 24 | SPLIT PIN 6.3x75 | IS 549/EQV. | 8 | NA |
| 25 | ANTI PILFERAGE PLATE | 4EB10265 | 2 | NA |
| 26 | SPLIT PIN 5x32 | IS 549/EQV. | 8 | NA |
| 27 | BRAKE HOSE (6.6 LTS RESERVOIR) | 3EB9763 Alt-03 | 1 | NA |
| 28 | BRAKE HOSE(BC) | 3EB5536 Alt-04 | 2 | NA |
| 29 | ANTI PILFERAGE DEVICE FOR APM | 2EB8148 | 1 | NA |
| 30 | AIR RESERVOIR (6.6 LTS) | - | 1 | WD-09048-S-01 |
| 31 | ERV(APM) | 3EB7346 Alt-09 | 1 | NA |
| 32 | EQUALIZER | - | 1 | As per different types of wagon drawings |
| 33 | O-RING | 4EB9786 | 2 | NA |
| 34 | O-RING | 4KB1889 | 2 | NA |

| | | | | |
|---|---|---|---|---|
| 35 | GASKET | 4EB10043 | 2 | NA |
| 36 | PIN FOR CABLE | 4EB5567 | 2 | NA |
| 37 | PIN FOR TIE ROD | 4EB9975 | 1 | NA |
| 38 | HEX HEAD BOLT M12x50 | DIN931/EQV. | 11 | NA |
| 39 | HEX NUT M12 | DIN934/ EQV. | 13 | NA |
| 40 | BULB COTTER WITH PLAIN WASHER 25mm | 4EB10271 | 8 | NA |
| 41 | HEX HEAD SCREW M12x30 | DIN933/EQV. | 6 | NA |
| 42 | SPRING WASHER B8 | DIN127/EQV. | 4 | NA |
| 43 | HEX HEAD SCREW M8x30 | IS 13726/EQV. | 2 | NA |
| 44 | HEX HEAD SCREW M8x25 | DIN933/EQV. | 2 | NA |
| 45 | SPLIT PIN 6.3x50 | IS 549/EQV. | 1 | NA |
| 46 | WASHER B20 | IS 2016/EQV. | 2 | NA |
| 47 | SPLIT PIN 4x35 | DIN 94/EQV. | 2 | NA |
| 48 | PUNCHED WASHER A30 | IS 2016/EQV. | 1 | NA |
| 49 | PLAIN WASHER B6 | DIN125/EQV. | 8 | NA |

# 8 ANNEXURE 1

## 8.1 POH and ROH periodicity of freight stocks

भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय MINISTRY OF RAILWAYS
रेलवे बोर्ड RAILWAY BOARD

No. 2008/M(N)/951/28 New Delhi, Dt. 14.11.2017

**The Chief Mechanical Engineers,**
All Indian Railways

**Sub:- POH and ROH periodicity of freight stocks**

**Ref:-** This office letter of even number dated 31.08.2016

An incidence has come to the notice of RDSO in which while examining the wagon No. ECoR 2212111987 BOXNHL, off POH from KGP workshop return date was marked after 6 years from the POH date.

It is clarified that POH periodicity subsequent to first POH of BOXNHL wagons has been revised from 6 years to 4.5 years vide letter under reference. In this regard, a copy of Board's letter dated 31.08.2016 revising the POH periodicity of BOXNHL wagons (mentioned under reference (i)) is enclosed herewith in which the POH/ROH interval of BOXNHL has been advised and incorporated in the Maintenance Manual for wagons and IRCA-III.

Further, it is clarified that POH & ROH periodicity of BOXNLW wagon shall be treated similar to BOXNHL wagons periodicity as mentioned in Board's letter mentioned under reference.

It is requested to ensure marking of the Return date of the wagons as per schedules mentioned in Board's letter mentioned under reference and in line with guidelines issued in the Maintenance Manual and IRCA Rules-Pt. III.

DA: As above

Vivek 14/11/17

**( Vivek Mohan )**
**Dir. Mech. Engg. (Frt.)**
Railway Board.

**Copy to: 1. ED(Wagon)/RDSO** for information in reference to letter No. MW/BOXNHL dated 09.08.2017.
**2. ED/CAMTECH –** For correction in Maintenance Manual for Wagons & IRCA Part III.

Please issue

**Government of India**
**Ministry of Railways**
**(Railway Board)**

**No. 2008/M(N)/951/28** **Date: 31.08.2016**

**ED/CAMTECH**
**Gwalior**

**Sub: Corrections in ROH and POH periodicity in Revised Maintenance Manual for Wagons & IRCA-III.**
**Ref: CAMTECH LETTER No. IRCAMTECH.M.GWL.WMM dated 30.08.2016.**

With reference to your letter mentioned above, following corrections in ROH and POH periodicity should be incorporated in table No. 2.1 and 2.2 of chapter No.02 in Revised Maintenance Manual for Wagons and para No. 2.4.3.1 and Para 2.4.3.3 of IRCA-III (revised draft).

***A. Table 2.1 (Para 206 POH and ROH interval)***

(i) Periodicity of subsequent **POH of BOXNHL** (at Sr. No. 04) should be corrected from **6** years to **4.5 years** and be placed at sr. No. 01 in table.
(ii) Periodicity of **subsequent POH of BCN, BCNA & BCNHS** (Sr. No. 03) should be corrected from **4.5** years to **6 years.**
(iii) BCNHL (**Sr. No. 04)** should be placed at **Sr. No. 03** in table with BCN wagon variants.
(iv) Accordingly Sr. Nos. should be re-arranged as revised table 2.1 of ANNEXURE-A

***B. Table 2.2 (Para 206 POH and ROH interval)***

(i) Table 2.2 para 206 shall have three columns under periodicity of ROH, first ROH, subsequent ROH of first POH cycle and ROH of subsequent POH cycle.
(ii) ROH periodicity of BOX-NHL will be 24, 24 & 18 months in first ROH, subsequent ROH of first POH cycle and ROH of subsequent POH cycle
(iii) ROH periodicity of BLC/BLL will be 24, 18 & 18 months in first ROH, subsequent ROH of first POH cycle and ROH of subsequent POH cycle.
(iv) ROH periodicity of BCN,BCNA,BCNAHS & BCNHL will be 24, 24 & 24 months in first ROH, subsequent ROH of first POH cycle and ROH of subsequent POH cycle.
***Revised Table 2.2 will be as per ANNEXURE – "A"***

All corrections should be made and correction slip should be uploaded on the CAMTECH website for communication to all Zonal Railways. The Wagon Maintenance Manual should be sent for printing and copies should be issued to Zonal Railways under advise to Railway Board.

01.09.16.

**(Ajay Nandan)**
**EDME(Freight)**
**Railway Board**

**Copy to: EDS/ Wagon/RDSO/LKO for kind information.**

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**ANNEXURE-"A" to Letter No. 2008/M(N)/951/28 Dated 31.08.2016 ]**

## Revised TABLE 2.2

### ROH INTERVAL OF WAGONS

| Sr. No. | Wagon Stock | ROH (Months) | | |
|---|---|---|---|---|
| | | First ROH | Subsequent ROH of First POH Cycle | ROH of Subsequent POH Cycle |
| 1. | BOXN,BOXNHS, ,BOXNHA, BOXNCR, BOXNR | 18 | 18 | 18 |
| 2. | BOXNHL | 24 | 24 | 18 |
| 3. | BOST, BOSTHS, BOSTHSM2 | 18 | 18 | 18 |
| 4. | BLCAM/BLCBM, BLLA, BLLB, BLC-A/BLC-B | 24 | 18 | 18 |
| 5. | BFKN (Container) | 18 | 18 | 18 |
| 6. | BCN, BCNAHS, BCNA, BCNHL | 24 | 24 | 24 |
| 7. | BCCNR | 24 | 24 | 24 |
| 8. | BOXNLW | 24 | 24 | 24 |
| 9. | BRN,BRNA,BRNAHS, BRN22.9, BFNS, BRHNEHS, | 18 | 18 | 18 |
| 10. | BOBR, BOBRN,BOBRNEL,BOBSNM1 | 24 | 24 | 24 |
| 11. | BTPN, BTPH, BTALN, BTAL, BTFLN, BTOH,BTALNM | 18 | 18 | 18 |
| 12. | BTCS, BTPGLN | 24 | 24 | 24 |
| 13. | BOY | 18 | 18 | 18 |
| 14. | BOBYN | 24 | 24 | 24 |
| 15. | BOXNEL, BOYEL | 12 | 12 | 12 |
| 16. | BVZI, BVZC, BVCM Brake Van | 12 | 12 | 12 |
| 17. | BOMN, BRSTN, BWTB | 24 | 24 | 24 |
| 18. | BCACM, BCACBM | 18 | 18 | 18 |
| 19. | BCFC | 18 | 18 | 18 |
| 20. | BAFRDR | 18 | 18 | 18 |

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**[ ANNEXURE-"A" to Letter No. 2008/M(N)/951/28 Dated 31.08.2016 ]**

## Revised TABLE 2.1

### POH INTERVAL OF AIR BRAKE STOCK

| Sr. No. | Wagon Stock | POH (Years) First | POH (Years) Subsequent |
|---|---|---|---|
| 01 | BOXN, BOXNHS, BOXNHA, BOXNCR, BOXNHL | 6 | 4.5 |
| 02 | BOXNR | 4.5 | 4.5 |
| 03 | BCN, BCNA, BCNAHS, BCNHL | 6 | 6 |
| 04 | BOST, BOSTHS, BOSTHSM2 | 6 | 4.5 |
| 05 | BRN,BRNA, BRNAHS, BRN22.9, BFNS, BRHNEHS, BLC-A, BLC-B, BLL-A, BLL-B | 6 | 4.5 |
| 06 | BLCAM/BLCBM | 6 | 4.5 |
| 07 | BFKN (Container) | 4 | 3.5 |
| 08 | BOY | 3 | 3 |
| 09 | BTPH | 4.5 | 4.5 |
| 10 | BTPN | 6 | 6 |
| 11 | BOBR & BOBRN, BOBYN | 6 | 6 |
| 12 | BTPGLN, BTCS | 4 | 4 |
| 13 | BTALN, BTALNM | 4.5 | 4.5 |
| 14 | BOXNLW Stainless steel wagons | 6 | 6 |
| 15 | BOXNEL, / BOYEL (25 t axle load) | 3 | 3 |
| 16 | BOBRNEL, BOBSNM1 | 3 | 3 |
| 17 | BVZI, BVZC Brake van | 2 | 2 |
| 18 | BVCM Brake van | 2 | 2 |
| 19 | BOMN | 6 | 4.5 |
| 20 | BRSTN, BWTB | 6 | 6 |
| 21 | BCACM, BCACBM | 4.5 | 4.5 |
| 22 | BTFLN, BTOH | 6 | 6 |
| 23 | BCFC | 6 | 4.5 |
| 24 | BCCNR | 6 | 6 |
| 25 | BAFRDR | 6 | 4.5 |

**Note:**

1. Wagons become due POH on the last date of the month indicated in the return date.
2. Empty wagon will be marked sick for POH up to 30 days in advance of the due date
3. Loaded wagons will be allowed up to 30 days after the due date of POH.

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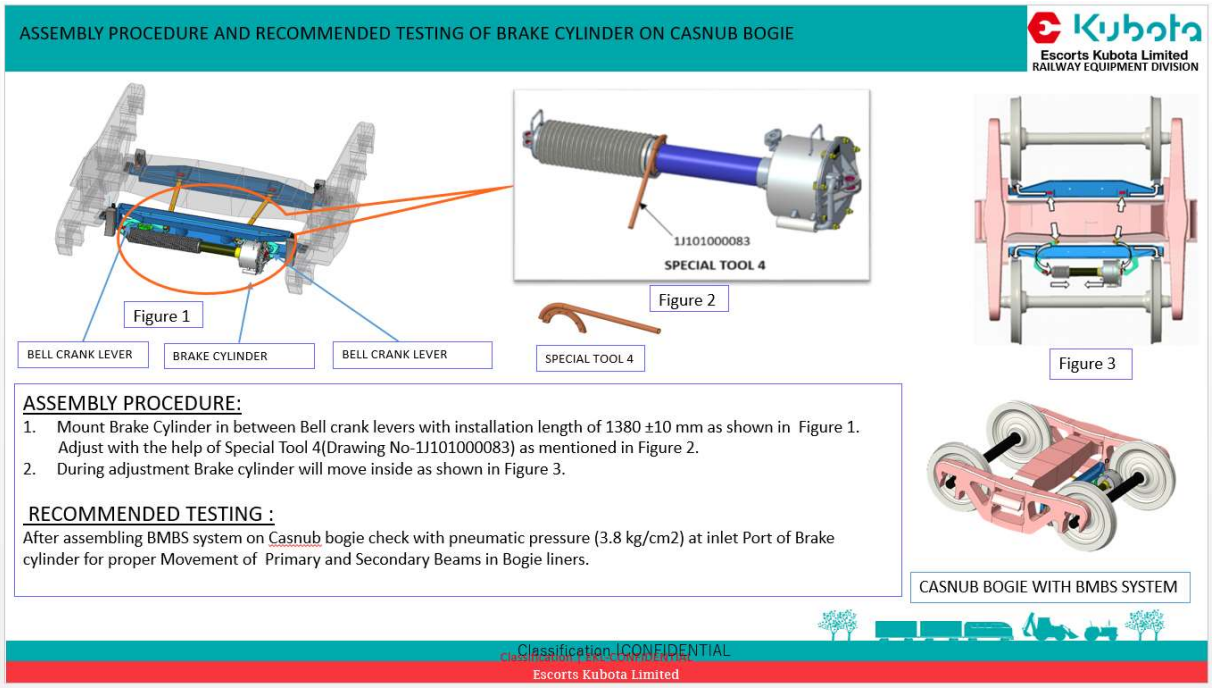
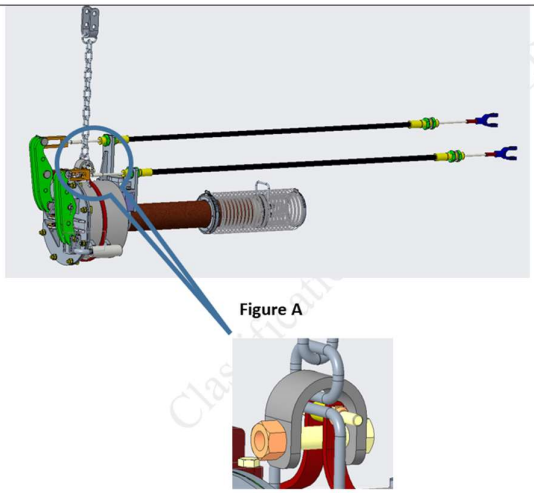
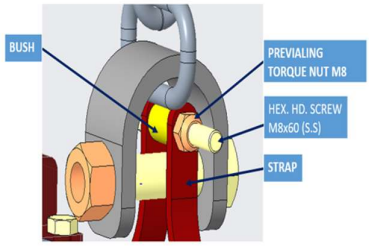
## 8.2 Recommended Assembly and Testing Instructions:



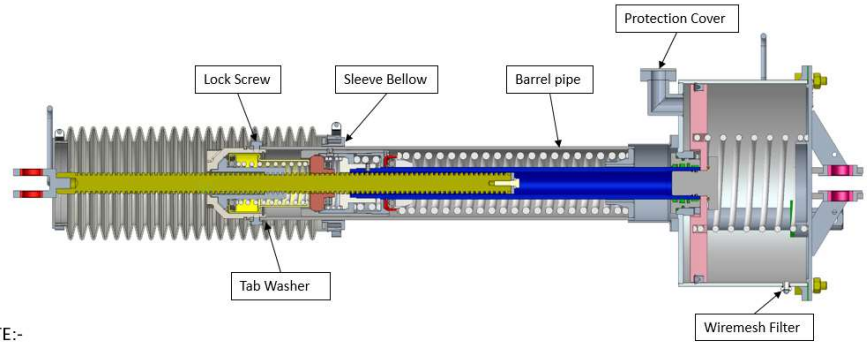

## 8.3 Assembly Instruction for Strap Assembly (Drawing No-1J101000230)

| S.NO | Problem Statement | Solution Image | Solution |
|---|---|---|---|
| 1. | Strap Need to Assemble On brake cylinder |  Figure A | 1. Assemble Strap on Brake cylinder as shown in Figure A.<br>2. Assemble Chain as per Figure C with torque of (25-30 Nm) tighten HEX. HD. SCREW M8x60 (S.S) with Prevailing torque nut M8 with Bush in between strip.   Figure C |

## 8.4 RDSO Approved Changes in Brake Cylinder Assembly

**BRAKE CYLINDER ASSEMBLY CHANGES(DRAWING NO-3EB7347 Alt-10,3EB7348 Alt-11)**

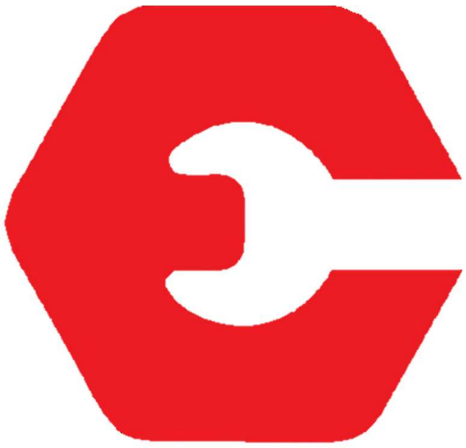
Kubota
Escorts Kubota Limited
RAILWAY EQUIPMENT DIVISION




NOTE:-

1. Existing Barrel pipe ,Sleeve Bellow and lock screw updated with new numbers as dimension of Barrel pipe changed from 101.6mm to 103.6mm
2. For redundancy, extra lock screw and Tab washer added.
3. Wire mesh filter and protection cover added.
4. Weight updated.

# NOTES



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