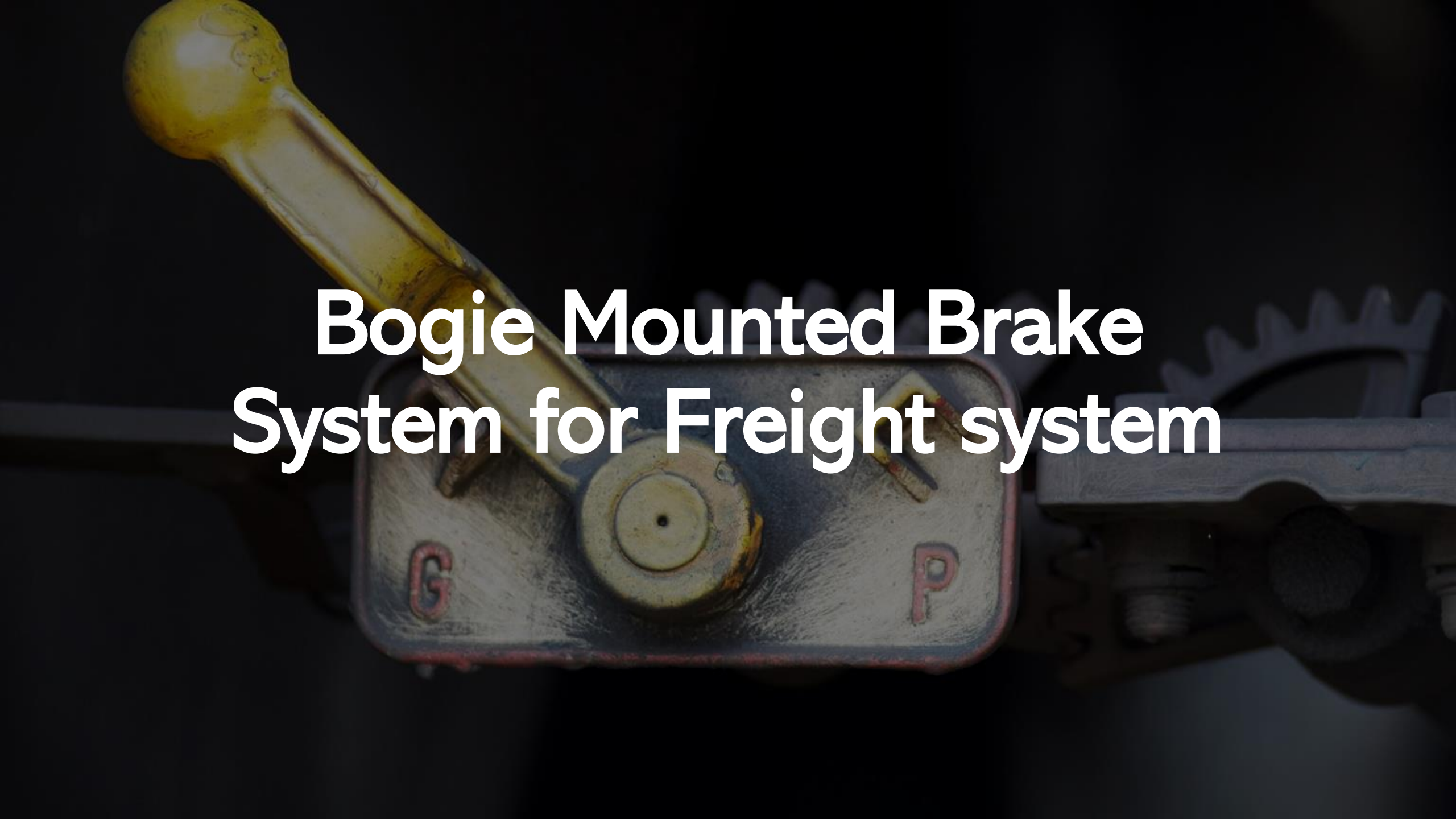


Bogie Mounted Brake System for Freight system

Contents

- Need for adoption of BMBS
- Salient features of BMBS
- Construction of Knorr design BMBS
- Construction of Escorts design BMBS
- Comparison Knorr vs Escorts design
- Brief functioning of slack adjuster- Knorr design
- Maintenance Aspects
- Investigation done in recent incidences

NEED FOR ADOPTION OF BMBS IN FREIGHT STOCK

- In order to overcome the problem faced in conventional bogie breakage, missing components and malfunctioning of SAB.
- In BMBS fitted wagons, BC is equipped with in built SAB.
- In conventional BOXN/BCN wagons due to frequent theft of control rod, main pull Rod, End pull rod & Brake Rigging parts in tripling operation of wagons causing poor brake power in Rakes, resulting Detentions of wagons.
- In BMBS, wagons these Items are eliminated.
- In order to Improve Mechanical efficiency of brake power. In a Normal Rake of BOXN wagon Fitted with conventional type brake system there was around 18% Brake fading after a trial run of 1000 Km. But In case of BMBS fitted Rakes No brake fading is observed after around 5000 km Trial Run.
- Braking distance of conventional Rake of 58 +1 wagons of BOXN is 1350 m. However, in BMBS wagons it is 880 m (approx).
- In conventional wagons setting of 'A' Dimension was a major problem. If any change made in sleeve nuts of adjustment device that may create to heavy loss of wagon creating brake binding / wheel skidding. In order to overcome this, BMBS fitted wagons came into field which contains in built slack adjuster.
- In case of BMBS system Automatic Load sensing Device is used which Gives 2.2Kg/cm2 Pressure to brake cylinder during empty condition 3.8 Kg/cm2 pressure during loaded for avoiding the above Problems.

Salient features of BMBS

- Less number of linkages, hence higher overall efficiency.
- Brake Cylinder with built-in double acting Slack Adjuster.
- Simplifies brake design, suitable for all types of wagons.
- Ease of on-car maintenance; modular design.
- Floating system.
- Variable leverage ratio.
- APM- No manual intervention required.

The Bogie Mounted Brake system equipment

- Transversely mounted pneumatic Brake Cylinder with a self-contained, double acting slack adjuster,
- Two brake beams,
- Two bell crank levers and
- Interconnecting push rods.
- The hand brake arrangement is available as a mechanical model with two flexible handbrake cables.

The Bogie Mounted Brake system equipment

- The pneumatic Brake Cylinder is 10" in diameter for application with high friction brake shoe (K type) on CASNUB type bogies.
- The system consists of a unique design with two pneumatic Brake Cylinder (one per bogie) to deliver reliable braking performance and is light in weight. It fits into CASNUB bogie and uses 58 mm thick brake shoes.
- Brake cylinder contains an integral double acting slack adjuster, which provides optimal braking force and minimizes shoe & wheel wear. The design is with high strength and minimal brake beam deflection.

Salient Features

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

- **Reliability** –
  - Instead of one 14" cylinder, two 10" cylinders have been provided per wagon (one per bogie).
  - This increases the system reliability as in case of failure of one cylinder the wagon can be moved on another cylinder with the isolation of failed cylinder.

- **Cost Reduction** –
  - Maintenance cost reduced as two cylinders are provided with inbuilt slack adjuster, re-screwing of slack adjuster is automatic and can be done from the side of the wagon by a crow bar.
  - The system simplified installation and even shoe wear helps extend the turn round time between wagon maintenance intervals.
  - It is very easy to assemble
  - No special training or tools are required for assembly.
  - Minimizing weight.
  - System has reduced the tare weight of wagon which in turn helps in reducing the Pay load cost

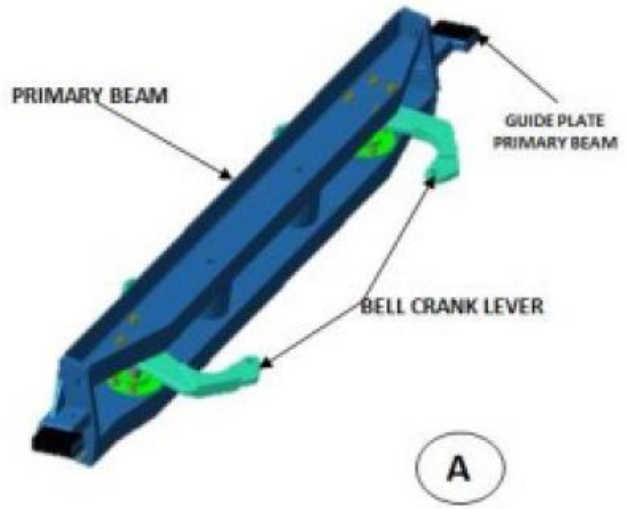
- **Replaceable Brake Heads** –
  - Replaceable brake heads which do not require disassembly of the bogie for installation.

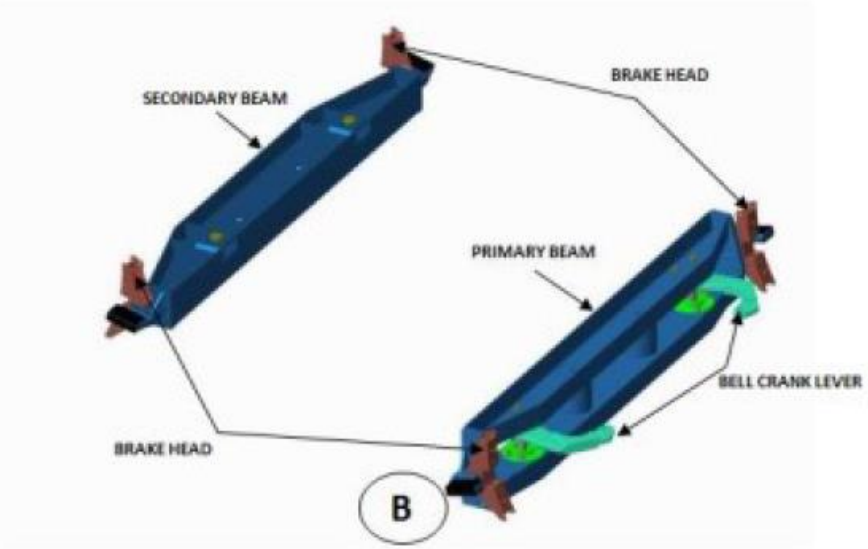
- **Integral Double Acting Slack Adjuster** –
  - Integral double acting slack adjuster maintains a constant **56 mm** piston stroke.
  - The slack adjuster has a total make up of 500 mm, compensating for 192 mm of nominal brake shoe wear and 188 mm of nominal wheel wear.

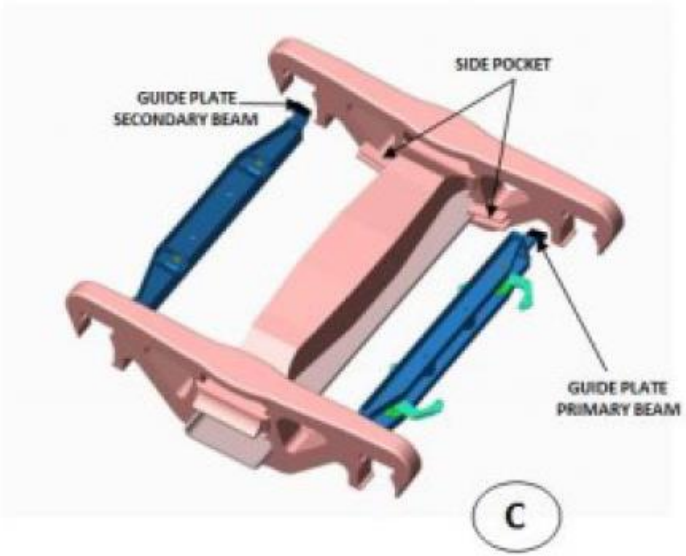
- **Beam Design** –
  - In this system, cylinder is mounted parallel to the brake beams and transfers forces through the bell cranks.
  - This parallelogram design improves the efficiency and aligns the braking forces with the wheels, which reduces the shoe and wheel wear.
- **Under Bolster Design** –
  - In this system push rods are positioned under the bolster and can be configured to work with all bogie designs.

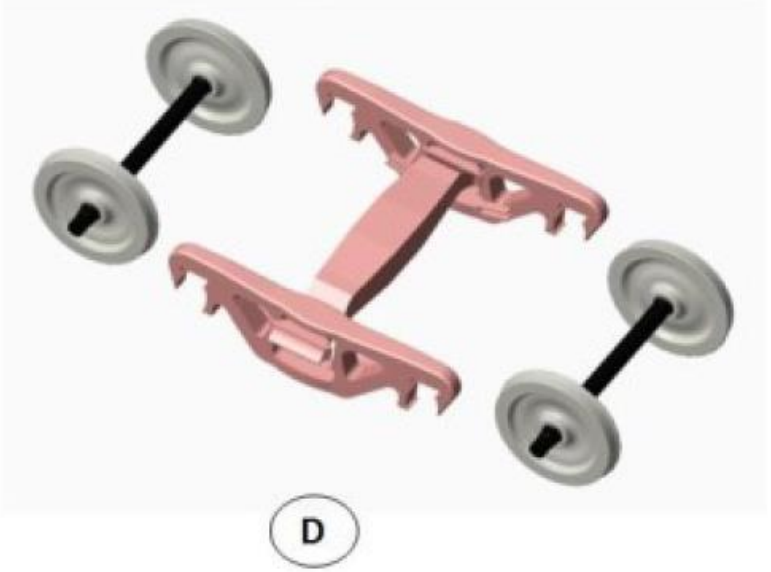
REASONS FOR SWITCHING OVER TO BMBS IN FREIGHT STOCK

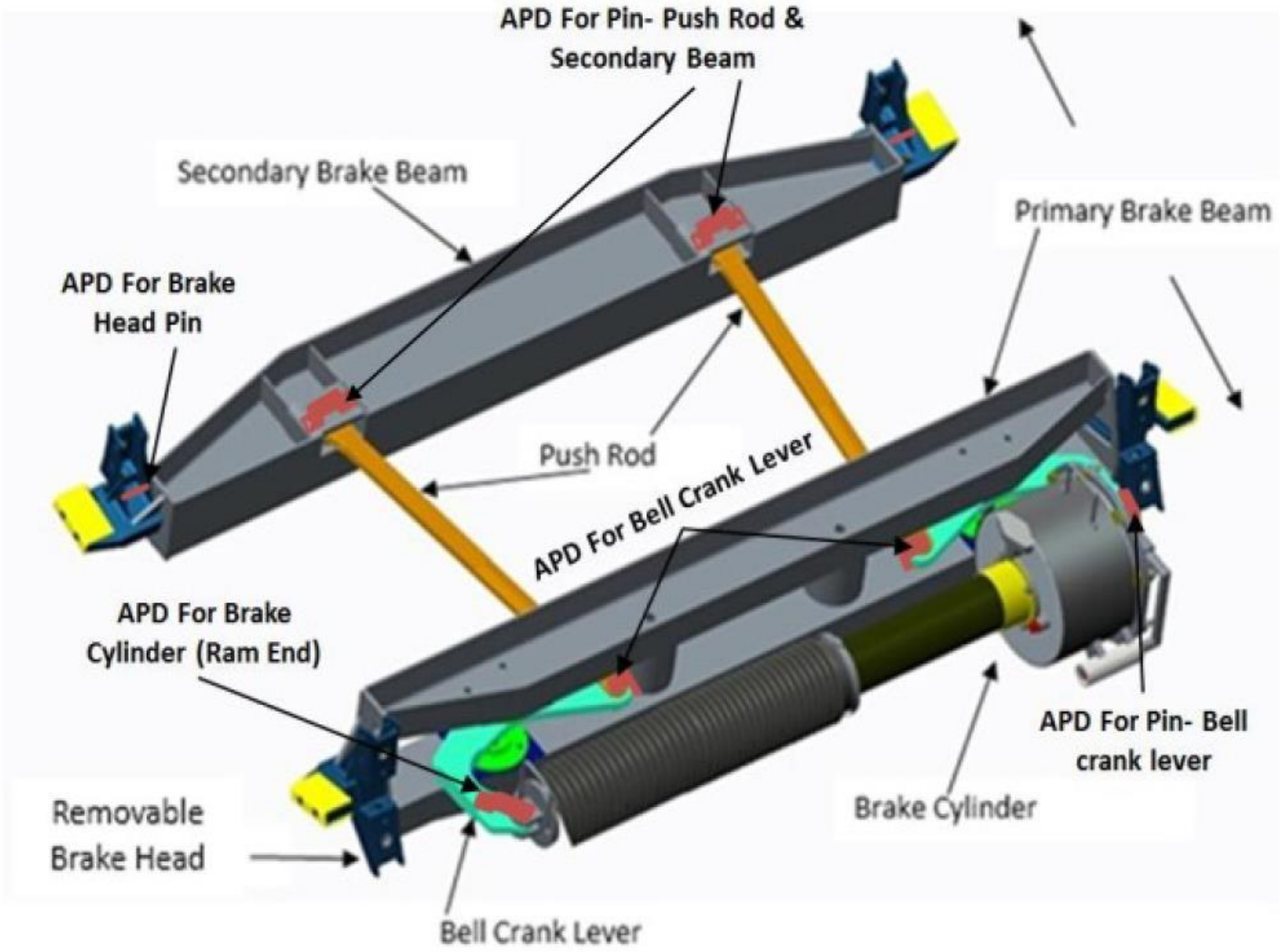
- Improved braking efficiency.
- Reduced weight of brake rigging.
- Less No. of parts.
- Uniform wear of Brake shoe & Wheel.
- Increased reliability.
- Easy maintenance.


PRIMARY BEAM
GUIDE PLATE
PRIMARY BEAM
BELL CRANK LEVER
A


SECONDARY BEAM
BRAKE HEAD
PRIMARY BEAM
BELL CRANK LEVER
BRAKE HEAD
B


SIDE POCKET
GUIDE PLATE
SECONDARY BEAM
GUIDE PLATE
PRIMARY BEAM
C


D


APD For Pin- Push Rod &
Secondary Beam
Secondary Brake Beam
Primary Brake Beam
APD For Brake
Head Pin
Push Rod
APD For Bell Crank Lever
APD For Brake
Cylinder (Ram End)
APD For Pin- Bell
crank lever
Brake Cylinder
Removable
Brake Head
Bell Crank Lever

Brake cylinder with hand brake

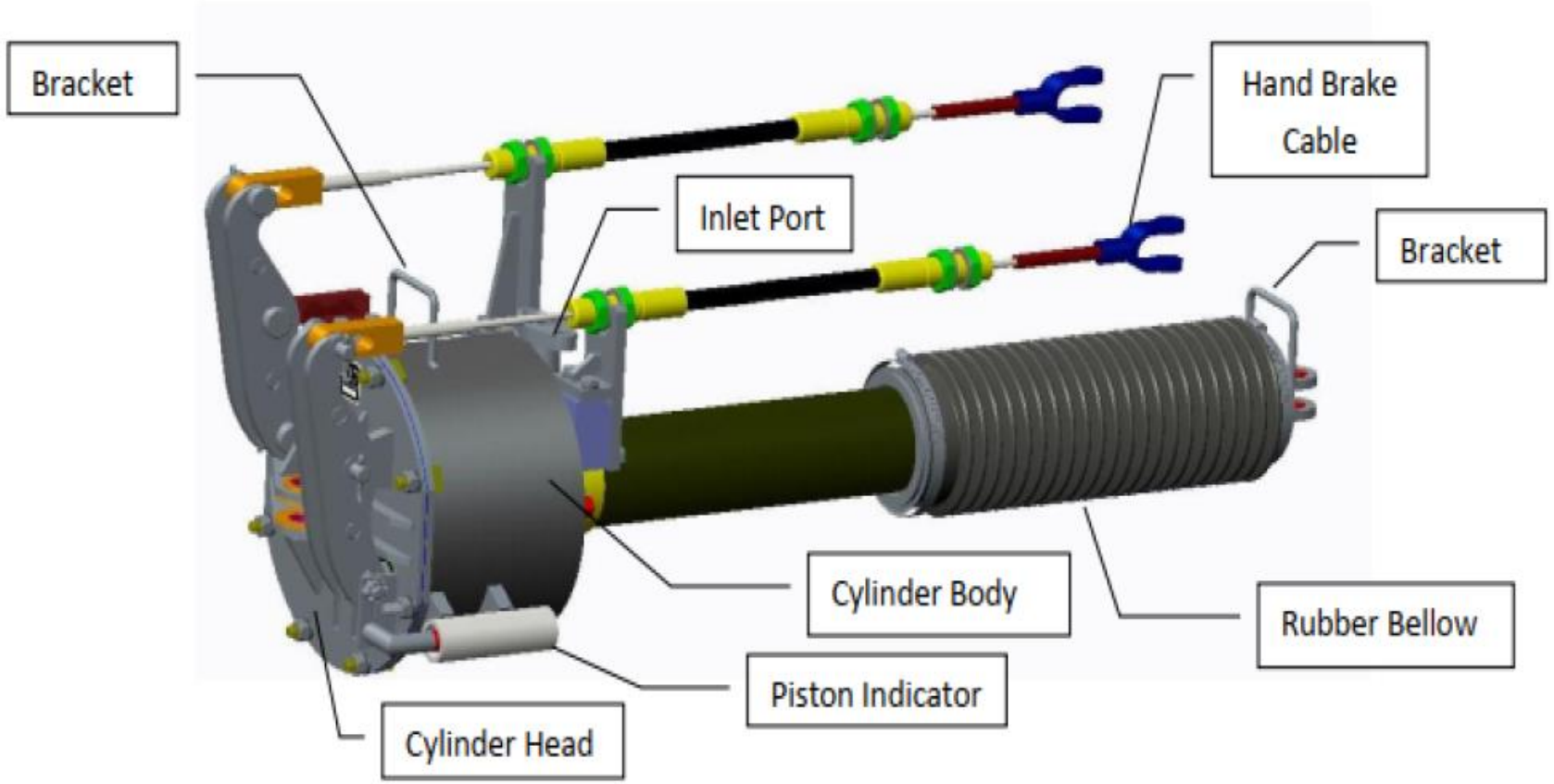


Figure 8: Brake Cylinder – 11 Inch with hand brake arrangement (Drg. No.3EB7348 Alt. Latest)

Brake cylinder without hand brake

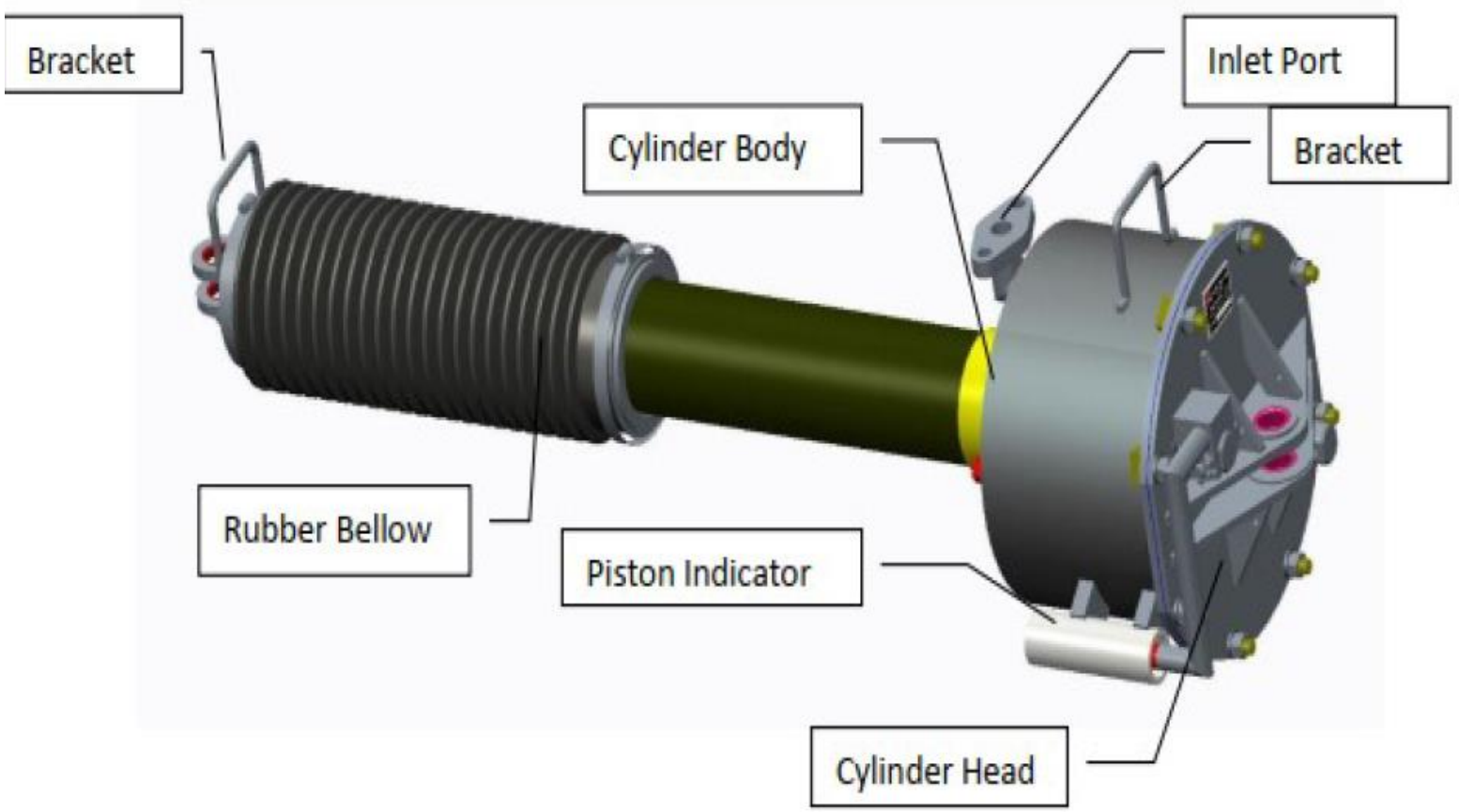
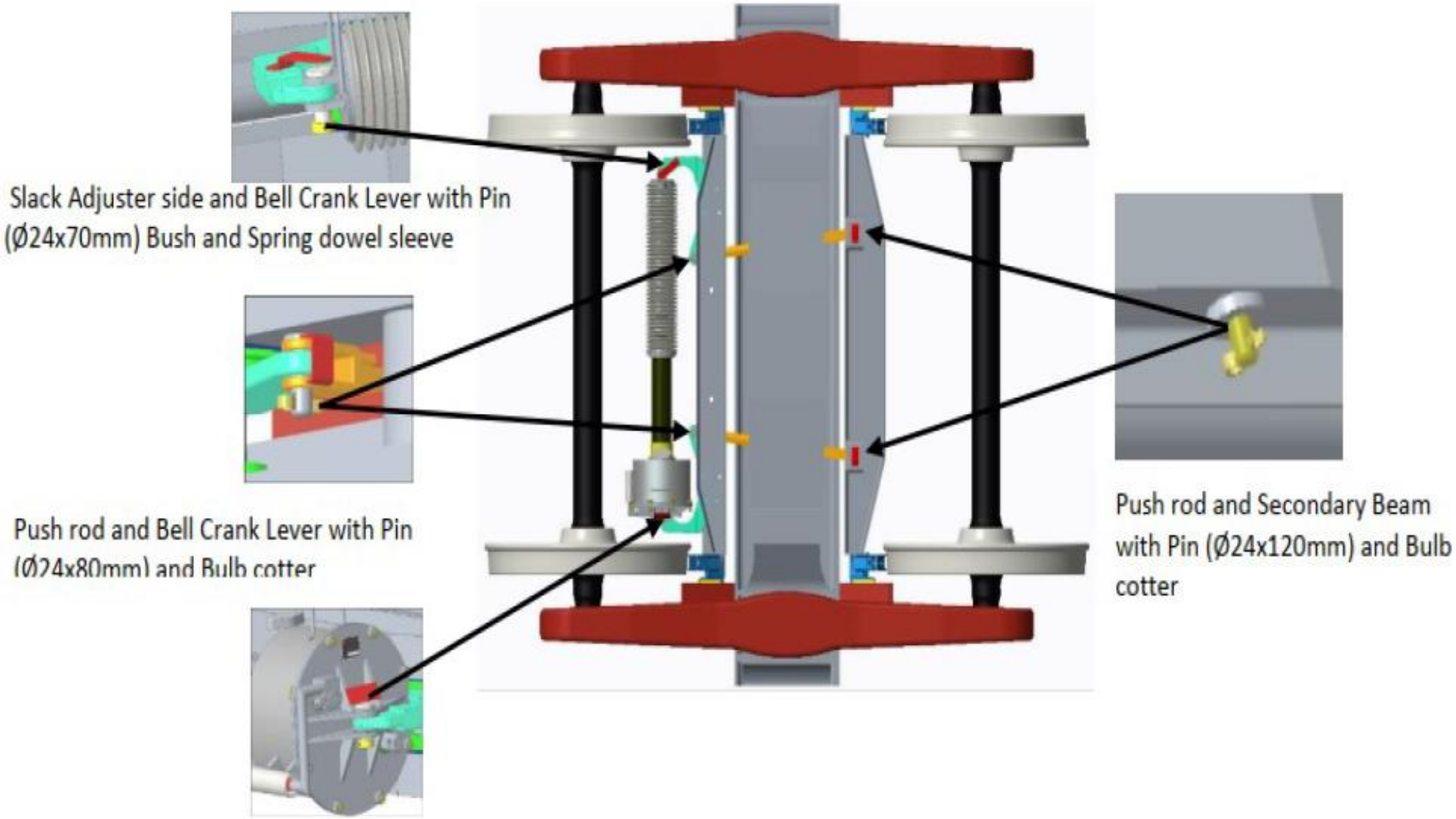
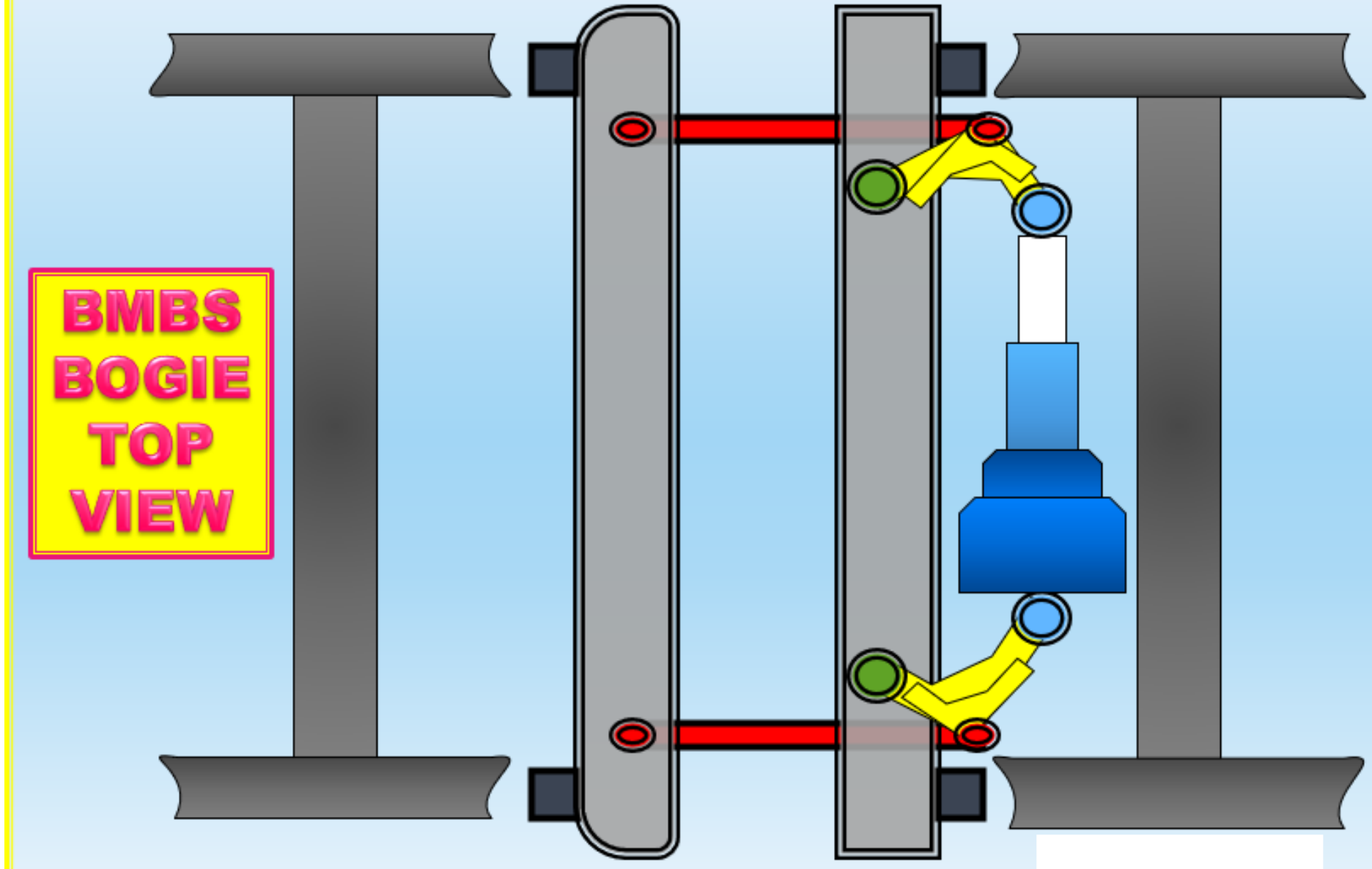


Figure 9: Brake Cylinder – 11 Inch without hand brake arrangement (Drg. No.3EB7347 Alt. Latest)

Mounting arrangement of BMBS



BOGIE MOUNTED BRAKE SYSTEM



WORKING DESCRIPTION OF BMBS

- During application, the air is introduced into the brake cylinder, which forces out the piston along the ram assembly.
- The brake cylinder is floating in nature, as result the brake cylinder extends equally on both the sides.
- This extension of brake cylinder causes the rotation of the bell crank levers on their pivot (which is on primary brake beam) and forces the push rod to move towards the secondary beam.

WORKING DESCRIPTION OF BMBS

- This movement causes the secondary brake beam to move towards the wheels and apply force on the wheels.
- Simultaneously a reaction force is developed which causes the primary brake beam (along with levers and brake cylinder) to move towards the wheels.
- The primary brake beam continues to move until it touches the wheels and apply force on the wheels.
- When the brakes are released, the air from the brake cylinder is exhausted to the atmosphere through the Distributor valve.

- The return spring inside the brake cylinder pushes the piston along with the ram assembly back to its original position.
- The bell crank levers rotate back, causing the beams to move back to their earlier positions.
- The brake cylinder is equipped with a double acting slack adjuster. If there is any wear (Brake Shoe/Wheel) or any slackness in the structure, it will be automatically compensated by the built in slack adjuster which pays out to fill the gap.
- The hand brake systems uses two steel hand brake cables pulled through standard hand brake rigging as a means to apply the hand brakes. The cables provide a flexible and lightweight interface to the hand brake actuator.

DESIGN FEATURES OF “BMBS” Escorts make

- Beam mounted cylinder is of diameter 11”in Escorts and 10”’in KB.
- Brake cylinder has in built slack adjuster.
- Total slack adjustment capacity is 447 mm
- Piston stroke of cylinder is 70 ± 10mm (Loaded condition) and 55 ± 10mm (Empty condition)
- APM (Automatic Pressure Maintainer) will regulate the pressure supplied to the brake cylinder according to the load/empty condition of the wagon.
- Weight of the system is approx. 250kg.

Comparison Knorr vs Escorts design

S. No.	Parameters	M/s Escorts	M/s Knorr
1.	Brake cylinder		
	Type	Compression type	Expansion type
	Size	11”	10”
	Maximum dome dia.	330±2 mm	282mm
2.	Slack adjuster		
	Type	Built-in automatic double acting slack adjuster	Built-in automatic double acting slack adjuster
	Capacity	447 mm	500 mm
	Brake block Force: (Loaded)	2127 kg	2109 kg
3	EBD (for BOXNHL 22.9t axle load) at speed 75 kmph		
	Braking Distance (Loaded)	782 m	787 m

S. No.	Parameters	M/s Escorts	M/s Knorr
4.	APM		
	Indicator	Red Indicator shows brake application in empty condition only	Orange Indicator shows brake application in empty condition only
5.	Maintenance Related		
	Changing of Brake Block	Brake Blocks can be changed by rotating brake cylinder barrel by hand (as in conventional slack adjusters) and creating a gap between wheel and brake block.	Brake Blocks can be changed by placing a pry bar between wheel and brake block & pressing brake block to create a gap between wheel and brake block

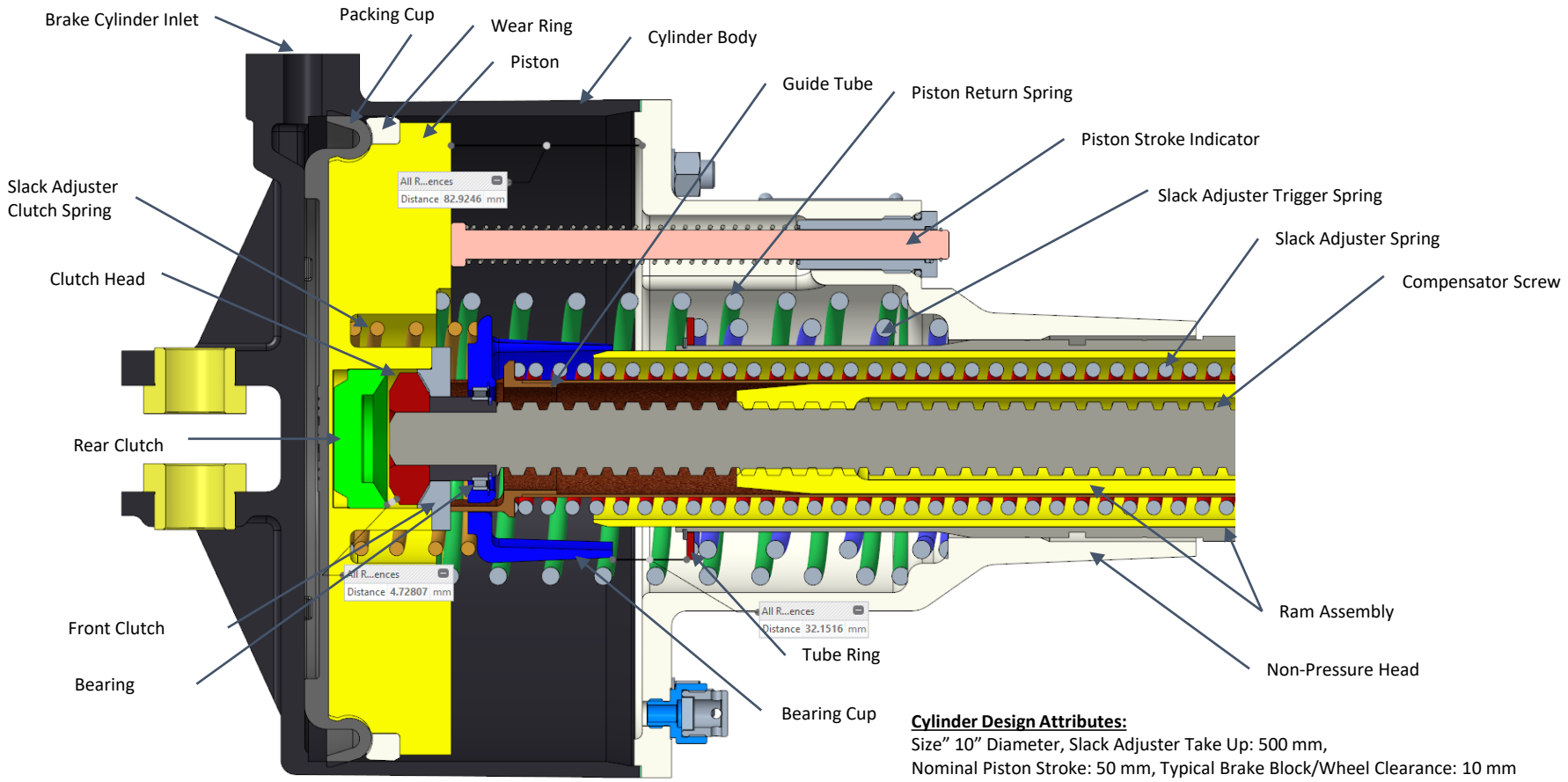
S. No.	Parameters	M/s Escorts	M/s Knorr
5.	For Changing Brake cylinder	Brake Cylinder barrel tube is rotated by hand to retract the brake cylinder. Then pins can be removed.	A pry bar is placed between wheel and brake block and pressed hard to retract the brake cylinder. Then pins can be removed.
6.	Piston Stroke in Empty	Empty 55 ± 10 mm Loaded 70 ± 10 mm	Empty 54 ± 10 mm
7.	Push Rod Section and Size	Rectangular Sec : 16 X 42 mm	Circular Section: Dia. 32 mm
8.	Brake Beams End Piece	Polyamide liner on brake beam end piece	No liner provided

To be continued

S. No.	Parameters	M/s Escorts	M/s Knorr
9.	Bell Crank Lever	Bearing arrangement provided at pivot point	No bearing arrangement, pin provided at pivot point
10.	APM Pressure Reduction Ratio	Varies 90% to 60% (decreases with increases in BC pressure)	60%, constant throughout entire range of operation in empty condition after one kg BC pressure is achieved.

Slack adjuster- Knorr design

TMB60 Brake Cylinder – Identifying Part



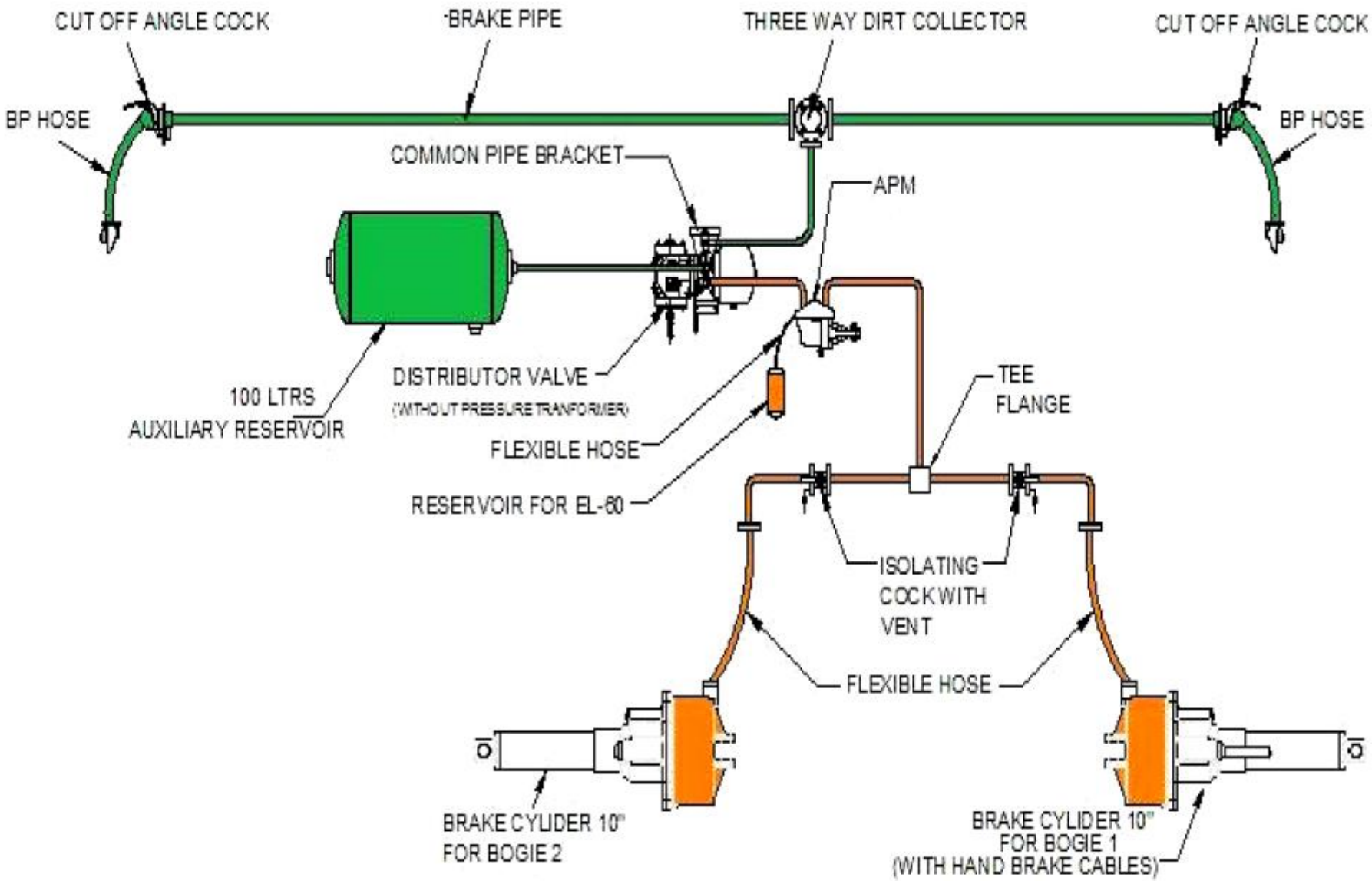
Cylinder Design Attributes:

Size" 10" Diameter, Slack Adjuster Take Up: 500 mm,
Nominal Piston Stroke: 50 mm, Typical Brake Block/Wheel Clearance: 10 mm

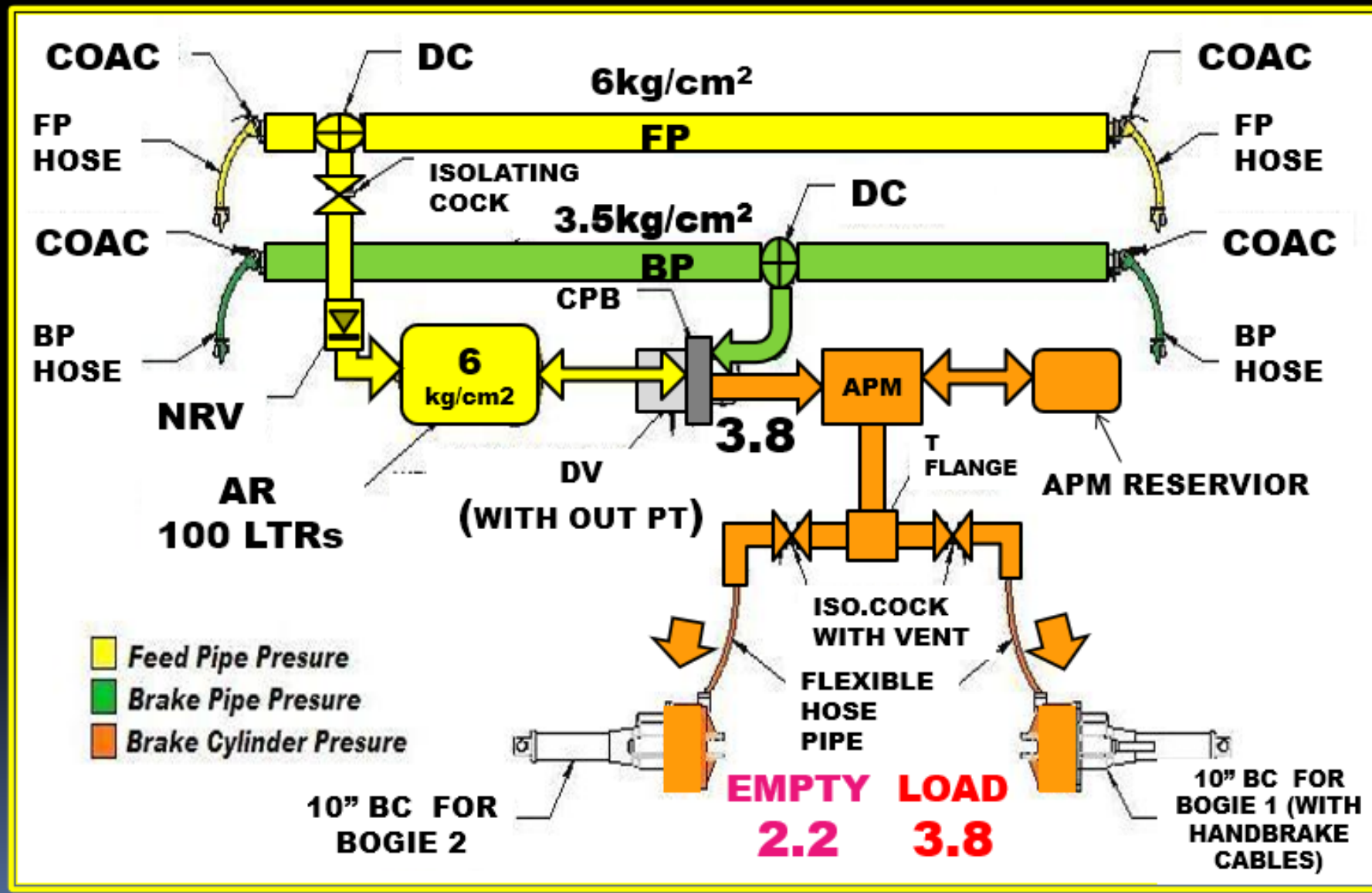
Slack Adjuster Operation

- Basic Slack Adjuster Specs:
  - The BMBS Brake Cylinder automatically adjusts up to 500 mm of wear.
  - Nominal piston stroke is approximately 50 mm at 3.4 Kg/cm2 brake cylinder pressure.
  - Slack Adjuster designed to maintain approximately 10 mm of brake block/wheel clearance.
  - Slack Adjuster automatically maintains a constant piston travel by taking up or letting out slack with each brake application.
- Basic Slack Adjuster Function:
  - The slack adjuster will lengthen or shorten based on the total brake block/wheel clearance.
  - The built-in trigger point (defined by the Control Distance), maintains the approximate 10 mm brake block/wheel clearance.
  - As wear occurs, the piston begins to overstroke. Once the overstroke exceeds the trigger point, the clutches are disengaged allowing the ram to extend the amount of the wear.
  - Conversely, if the brake block/wheel clearance is less than 10 mm, the cylinder will shorten by that amount.
  - Under normal operating conditions, the slack adjuster will make very small length adjustments, ~1-1.5 mm.
  - During normal operation, the small length adjustments are made without losing brake block force.
  - In the case of excessive brake block/wheel clearance, for example 80 mm the cylinder will require 2-3 applications to fully adjust. During the first adjustment application, the brake block force will be lower than specification

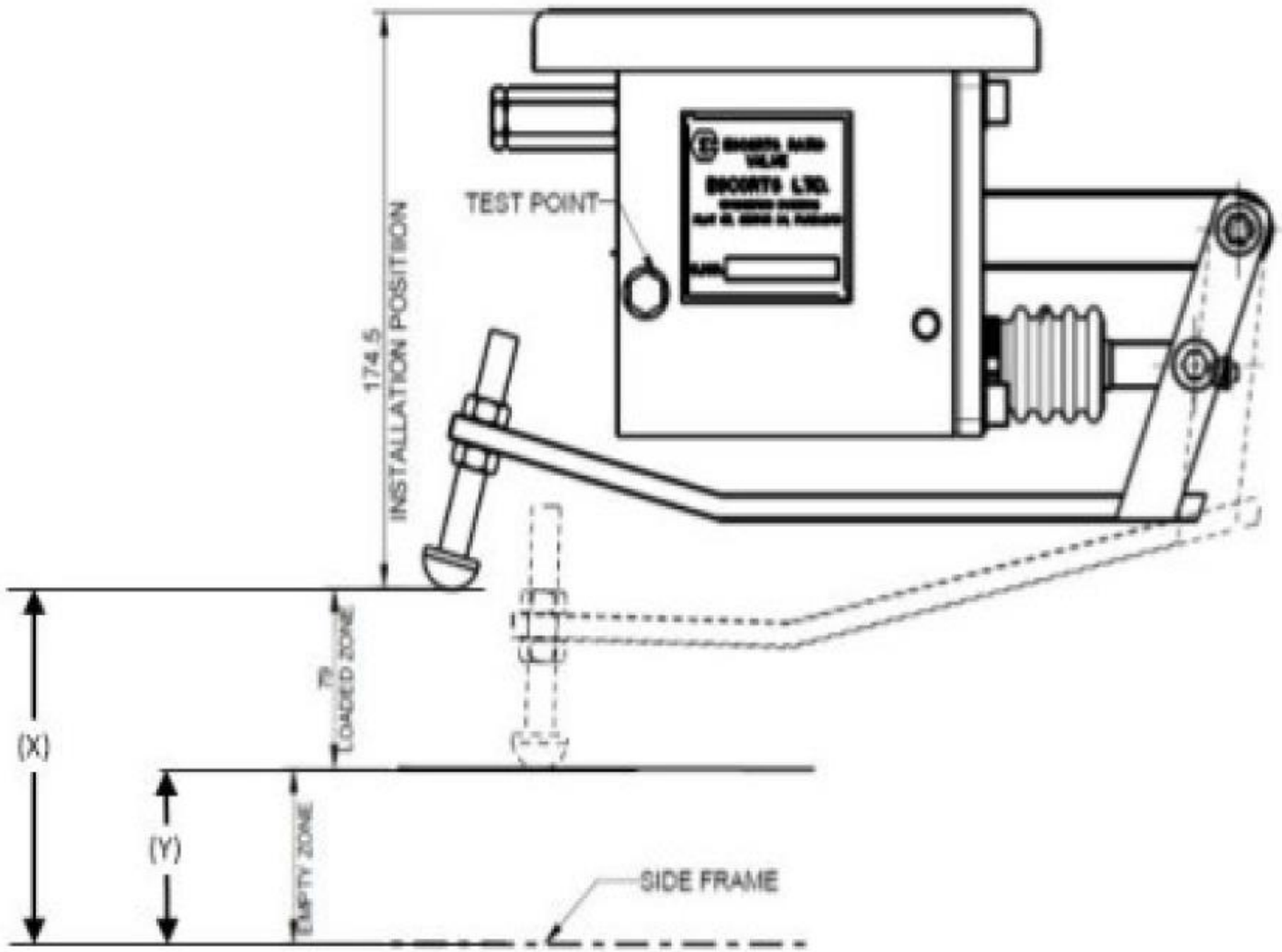
SINGLE PIPE AIR BRAKE SYSYTEM WITH BMBS



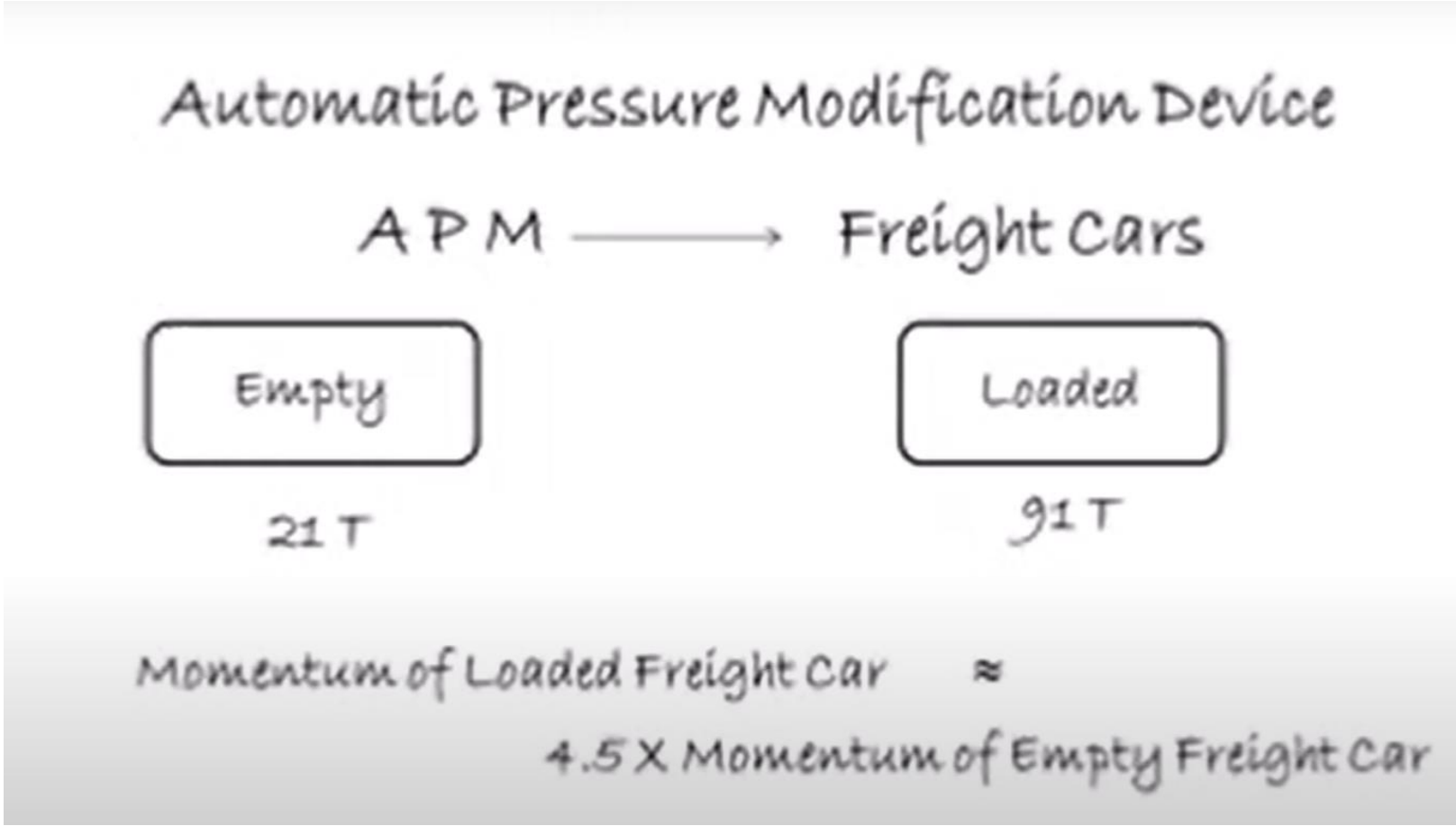
BOGIE MOUNTED BRAKE SYSTEM



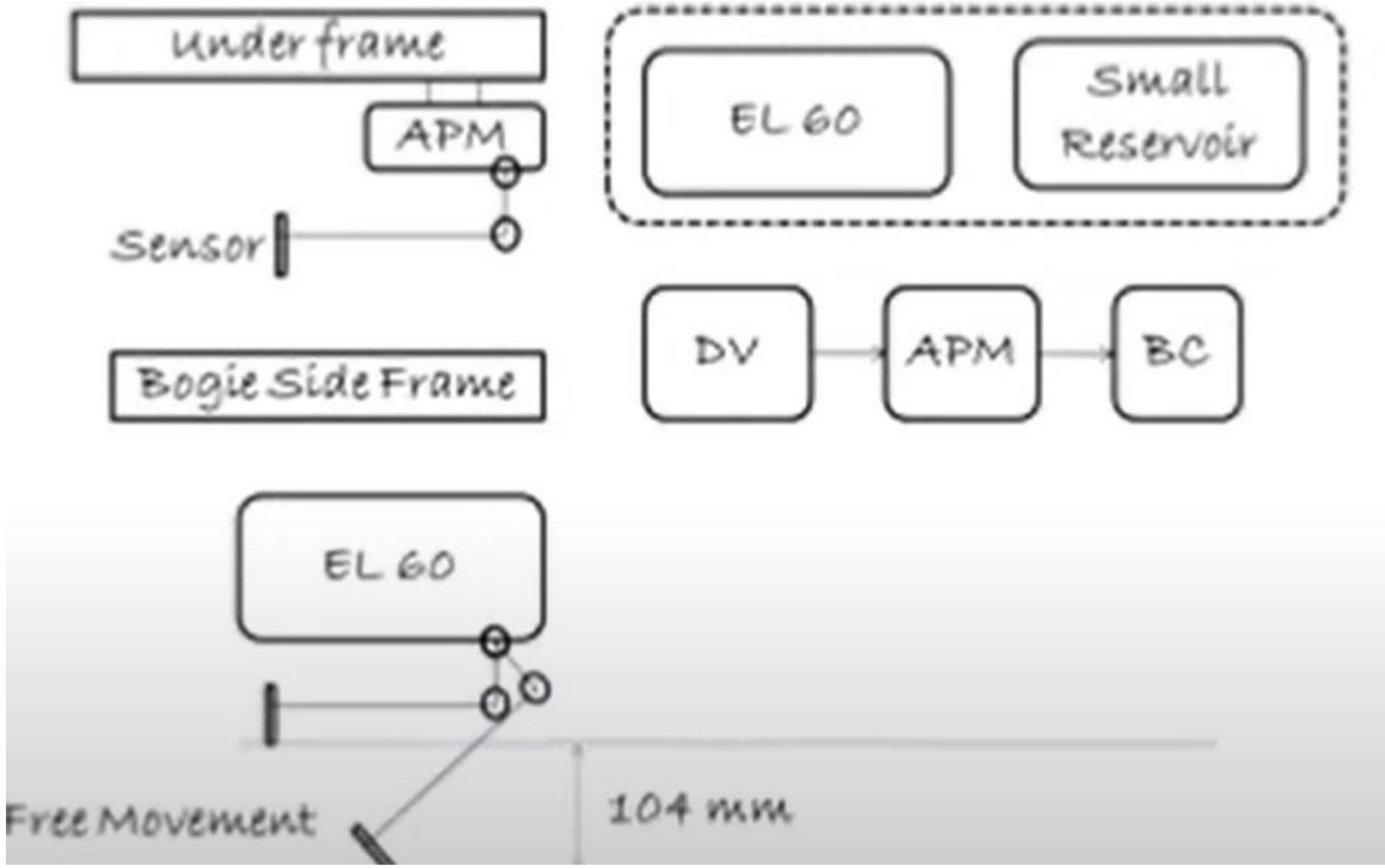
Automatic Pressure Maintainer

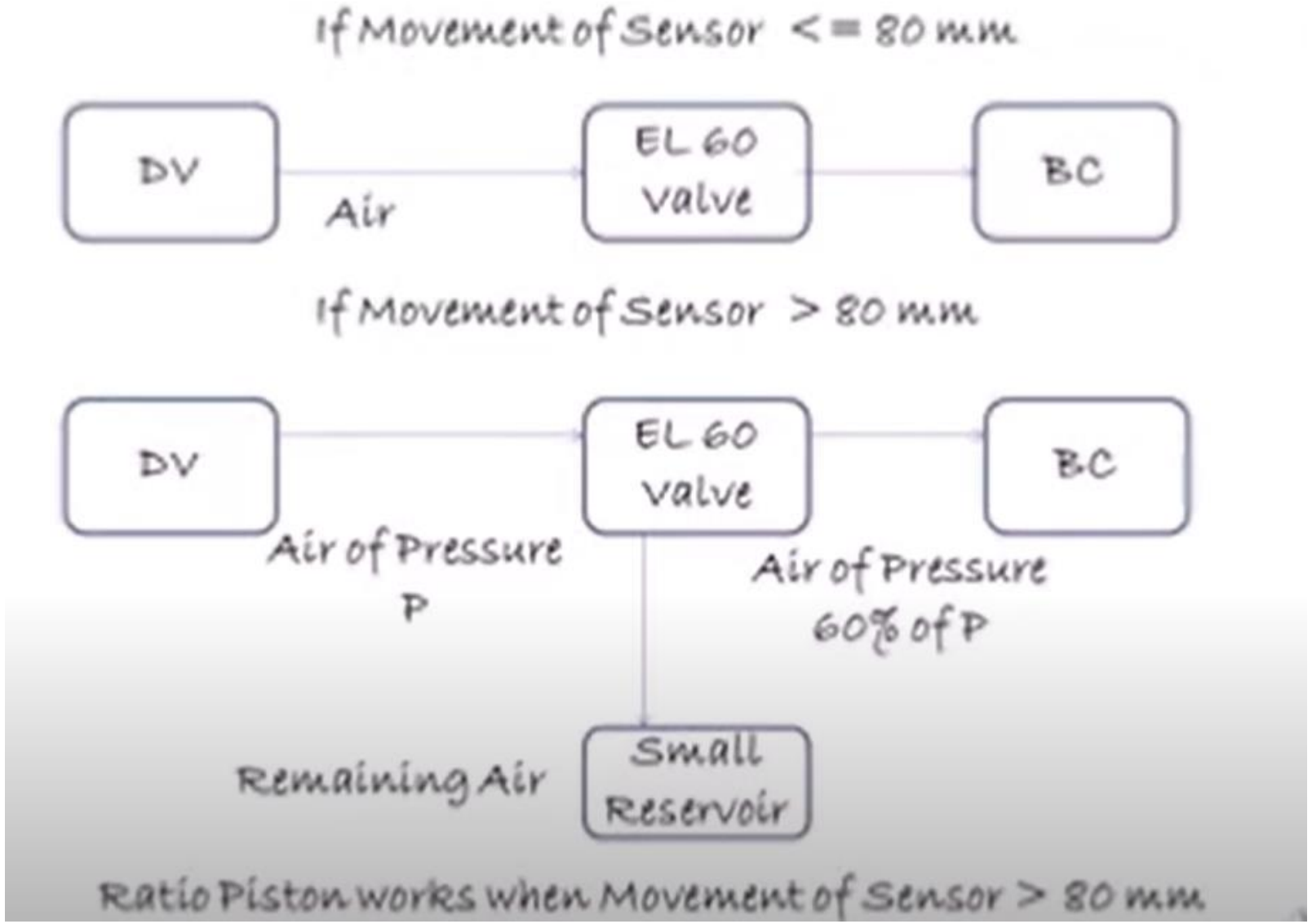

TEST POINT
174.5
INSTALLATION POSITION
(X)
75
LOADED ZONE
(Y)
EMPTY ZONE
SIDE FRAME

Braking force required for loaded wagon is more than that of empty wagon



Automatic Pressure Modification Device




If Movement of Sensor <= 80 mm
DV
Air
EL 60 Valve
BC
If Movement of Sensor > 80 mm
DV
Air of Pressure P
EL 60 Valve
BC
Air of Pressure 60% of P
Remaining Air
Small Reservoir
Ratio Piston works when Movement of Sensor > 80 mm

Automatic Pressure Maintainer

- Fitted to the under frame of the wagon body just above one of the side frames of the CASNUB bogie
- The wagons are provided with Automatic brake cylinder pressure modification device (APM) valve to cater for higher brake power in loaded condition instead of the conventional manual empty load device
- During brake application air pressure enters into APM, regulated and then enters into the Brake Cylinder.
- APM allows a pressure of 2.2 ± 0.25 kg/Cm2 & 3.8 ± 0.1 kg/Cm2 into brake cylinder in empty & load conditions respectively.
- This is achieved depending on the deflection of the sensor arm of the APM.

Automatic Brake Cylinder Pressure Modification Device (APM) Valve

- To obtain this, a changeover mechanism, APM valve is interposed between the under-frame and side frame of the bogie. The mechanism gets actuated at a pre-determined change over weight of the wagon and changes the pressure going to the brake cylinder from 2.2 ± 0.25 kg/cm2 to 3.8 ± 0.1 kg/cm2 in case of changeover from empty to loaded and vice-versa

Reasons for poor brake power in BOXNHL BMBS wagons

1) Failure of SAB function of BMBS cylinder

2) Leakage in APM reservoir & APM back side connections leakage

3) Poor APM performance

4) BOGIE leverage (un even push rods length, bell crank lever deficiency, primary & secondary beams out of alignment)

5) Poor performance on curves and gradients due to malfunctioning of APM

All of the above points may be present / may be only one problem, so if there are 5 to 10 wagons persist in above problems, it causes the total formation of poor brake power.

Recent poor brake power incidences

S.no	Date	Divn	Rly.	Wagon Type	Load	Grad.	Speed (kmph)	Loco Type	T/Elec.	Brake system	BMBS Make & Year of M/u
1	28.03.2022	BSP	SECR	BRN	3683	1:100	41	WAG 9	BT	E70	Knorr, 2020
2	21.04.2022	NKJ	WCR	BOXNHL	5259	1:100	60	WAG 9	Medha	E70	Knorr, 2021
3	04.05.2022	JHS	NCR	BFNSM	5344	1:201	54	WAG9	BT	E70	Knorr, 2020 & 2021
4	07.05.2022	KHURJA	DFCCIL	BOXNHL	5285	LEVEL	97	WAG 9	Alstom	CCB	Knorr, MIXED
5	11.06.2022	BSL	CR	BTPGLN	2405	1:150	69	WDG4		CCB	Knorr, 2020
6	28.06.2022	KHURJA	DFCCIL	BOXNHL	5265	LEVEL	97	WAG9	BHEL	CCB	Knorr, MIXED
7.	12.07.2022	KNSN	DFCCIL	BOXNHL	5263	LEVEL	96	WAG9	CGL	CCB	Knorr, MIXED
8.	04.09.2022	SUR	CR	BCFCM	5200	1:150	44	WAG9	BT	CCB	Knorr, 2021
9.	03.10.2022	NKJ	WCR	BOXNHL	5303	1:100	50	WAG9	CGL	E70	Knorr, 2021
10.	16.10.2022	SECR	BSP	BOXNHL	5182	1:100	49	WAG9	CGL	E70	Knorr, Mixed
11.	26.10.2022	ECR	DHN	BOXNHL	5108	1:80	45	WAG9	MEDHA	E70	Knorr, Mixed

Investigation done in recent incidences

- Instrumented trial done in WCR with M/s Knorr and Escorts make BMBS in same formation alternatively.
- Examination of rake done through video scope
- Air pressure continuity check
- Rake leakage test.
- Examination of rake done through video scope
- Measurement of APM outlet pressure after emergency brake application
- Measurement of APM sensing arm gap with bogie side frame
- Measurement of BC filling time of wagons

- Checking of brake application & piston movement during cyclic brake application
- Checking Back Charging of BP
- Flushing of brake pipe of wagons to investigate any obstruction in BP pipe
- EBD trials

Recent instructions issued by RDSO

- Vide letter dated 04.05.2022, ZRs advised for checking possibility of obstructions in rakes having significantly higher braking distance.
- Vide letter dated 10.05.2022 and 23.07.2022, instructions issued regarding operation and maintenance aspects of wagons having BMBS.
- Vide letter dated 22.06.2022, instructions issued to have availability of boroscope/ viedoscope and load cell.
- Vide letter dated 06.09.2022, instructions issued to ensure availability of standard APDs in push rod of BMBS .

- Vide letter dated, instructions issued for bypassing of APM in privately owned rakes.

Some noteworthy aspects

- Dynamic bell crank lever ratio- Varies with slack take up condition of the slack adjuster. (Knorr- 4.44- 5.17, Escorts-4.52-4.96).
- Gap between wagon underframe and bogie side frame must be properly maintained.
- Piston stroke should be within specified range 55+_10mm.Higher piston stroke indicates undesirable clearances.
-

RDSO & Railway Board Letter related to Poor Brake Power in BMBS rakes.

No. 2015/M (N)/951/1 Rail Bhavan, New Delhi-110001, Dated 10.01.2019

Principal Chief Mech. Engineers
All Indian Railways

Sub: Operation of BMBC fitted BOXNHL/BCNHL/other wagons
Ref: 1) RDSO's letter No.MW/APB/BMB dt.23.08.2018
2) WCR's letter No.WCR/M/N/03116 dt.08.01.19

Railways from time to time have been reporting detention of BMBC fitted wagons during night time in winters on account of BP pressure not being maintained. Such detention had also been reported during the previous years from various railways. Some of the issues that have been brought by checking of such rakes are as:

i) In most cases such wagons have been found to have overdue overhaul BMBCs.
ii) The wire mesh filter provided in breather valve is non-existent/chocked, which leads to dust accumulation at the non-working side of the piston. For prevention of dust entry, the wire mesh filter must be replaced in all ROH and POH as per RDSO advice vide Ref (i).

In light of above, it is advised that necessary action be taken ensuring the following two activities:

(a) Workshops must have either an adequate quantity of BMBC and APM overhaul kits available or adequate contractual arrangement with OEM for overhaul of BMBS components, so as to ensure that all wagons received for POH are turned out only after completion of overhaul of BMBC and APM.
(b) All ROH depots must ensure that after ROH, the wagons are always fitted with BMBC and APM so that the due date of overhaul of BMBC equipments as far as possible coincides with the date of POH due date of the wagons.
(c) Ensuring fitment/replacement of new wire mesh filter in breather valve during ROH/POH as per RDSO advice.

Railways may take necessary action to ensure immediate implementation of the (a), (b) & (c) above. The above requirement shall be NTXR rejectable item w.e.f.1-4-19 for item (a) above and 1/2/19 for item (b) and (c).

No. 2015/M(N)/951/1 Rail Bhavan, New Delhi-110001, Dated 28.02.2019

Principal Chief Mech. Engineers
All Indian Railways

Sub: Maintenance of Bogie Mounted Brake System in POH shops and ROH depots.
Ref: Board's letter of even no. dated 10.01.2019

Incidences of leakages from bogie mounted brake system had been reported from many Zonal Railways particularly during winter season. Investigation into such cases of detention has brought out that there is a significant backlog (of more than 10,000 wagons) of overhauling of bogie mounted brake cylinders and APMs. Most of this backlog is arising out of those cases where workshops have not been able to overhaul the BMBC and APM during POH of the wagons. Further to the advice earlier vide letter referred above, the following action has to be taken immediately by all railways:

i) All workshops undertaking repair at BMBS fitted wagons must ensure that BMBC and APM are compulsorily overhauled during POH.
ii) During overhaul, old rubber components must necessarily be replaced. For this purpose adequate quantity of overhauling kits should be arranged by the shops. Till such time the actual supplies materialised, Railways may undertake overhaul of the cylinders through works contract with the OEMs.
iii) Subsequent to overhaul, the workshops must ensure that an aluminium tag with properly embossed overhauling date and next overhauling due date is provided on the BMBC and APM
iv) ROH depots need to ensure that the POH due date of the wagons and overhauling due date of the BMBCs fitted after ROH on all wagons are matched so that the possibility of overhauling due wagons not going to shop is eliminated. For example, if the R/date of the wagon turned out from ROH in Jan 19 is July '20, the BMBC fitted to the wagon should also have its overhauling due date is July'20 ± 3 months.
v) All ROH depots must maintain a record of each wagon, that come for ROH duly indicating the overhauling due date of the BMBC with which the wagons have been turned out. This record shall be checked by all inspecting officers during their inspections.
vi) POH shops and ROH depots must ensure that breather valve with wire mesh filter is fitted with before the wagons are turned out.

Railways may take necessary action to ensure immediate implementation of the above action plan.

(A.K. AGARWAL)
Additional Member (Mech. Engg.)
Railway Board

Sub: Poor Brake Power in newly manufactured BOXNHL (MBS) rake.

Jabalpur Division/WCR reported a case of SPAD/runaway case on 21.04.2022 of a newly manufactured BOXNHL rake provided with BMBS. This rake was under monitoring as there were cases of poor brake power on earlier occasions also.

Upon examination by RDSO through video scope, it was revealed that there was an obstruction in the BP pipe as well as FP pipe. The obstruction was due to leftover protection plugs which are fitted at the end of air brake pipes during manufacture.

Video-scope view	After removal from dirt collector
	

Blockage in BP pipe

In view of the above, it is advised that Zonal Railways should consider the possibility of blockages in runaway cases/significantly higher braking distance for both conventional as well as BMBS rakes.

During major maintenance schedule i.e. ROH & POH, the wagons to be checked for blockages in FP and BP through either of the following:

- Removal of dirt collector and conducting blow through from both ends.
- Video scopy wherein a camera is inserted into the pipes and visual seen on the hand-held monitor.

Digitally Signed by
Shailendra Kumar Sharma
Date: 04-05-2022 17:15:16
Reason: Approved

(शैलेन्द्रकुमारशर्मा)
निदेशक/वैगन
कृतेमहानिदेशक /वैगन

Copy to- EDME/Freight/RB- for kind information

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सत्यमेव जयते

No. EL/3.2.19/3-Phase

Date: 10.05.2022

All General Managers,
Zonal Railways.
Managing Directors,
DFCCIL & KRCL.

Sub: Running of loaded trains (more than 3000T) BOXNHL and similar rakes with BMBS.
Ref: Railway Board's L/No. 2017/Elect(TRS)/113/Safety Misc dated 11.9.2017.

1.0 Railways have reported incidents of poor/inadequate brake power of BOXNHL and similar rakes provided with BMBS vis-a-vis brake power of BOXNM1 wagons with underframe mounted brakes. Further to Railway Board's instructions vide letter under reference (copy enclosed), the following is advised on the subject.

2.0 A comparative position of estimated EBD of BOXNM1 rake (underframe mounted conventional rake) and BOXNHL rake (Bogie mounted brake system with APM) through STOP simulation is placed below:

Type of Rake (Brake Power)	Level Track	Gradient 1 in 100	
	75 kmph	50 kmph	60 kmph
BOXNM1 (85%)	735 m	492 m	662 m
BOXNHL (BMBS) (85%)	868 m ✓	592 m	822 m

2.1 It may be seen that the braking distance of BOXNHL rake provided with BMBS is more than that of BOXNM1 with underframe mounted brake system. On level track, this difference is about 18% and on down gradient of 1 in 100 at 50 kmph, the difference in braking distance is 20.32 % (approx.) and at 60 kmph, it is 24.2 %.

3.0 Brake Pressure drop of 1kg/cm^2 in BMBS rakes is nearly equivalent to 0.8 kg/cm^2 drop in case of underframe mounted brake. Similarly, 1.2 kg/cm^2 drop of BP pressure is nearly equivalent to 1 kg/cm^2 drop in underframe mounted brake system and 1.6 kg/cm^2 drop in BMBS is equivalent to 1.2 kg/cm^2 drop of underframe mounted brakes.

4.0 In view of above, following instructions may be followed in case of running of loaded trains of more than 3000 T provided with BMBS.

4.1 Zonal Railways shall conduct trials and specify the attacking speed for operation of such trains on down gradients. The attacking/approaching speed should be based on the topography and layout of signals.

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4.2 The Loco Pilots shall be counseled to control the loaded trains (more than 3000 T) with minimum brake pressure drop of 1kg/cm^2. Regenerative/Dynamic braking may also be used as per requirement to control the speed especially on down gradients.

4.3 The Loco Pilots shall be counseled that in case it is felt that Train is not getting controlled with Full Service Brakes through A9, then shall apply Emergency Brakes through A9 as well as RS/Flap valve should also be immediately opened.

4.4 The Loco Pilots shall be counseled to call Train Manager through VHF or any other means to apply emergency brakes immediately from Brake Van also. Proper functioning of VHF sets should be ensured by Zonal Railways.

4.5 Zonal railways shall endorse in BPC the type of rake (whether BMBS or conventional or mixed-BMBS and conventional) and the number of wagons with BMBS in the rake.

4.6 Instructions regarding 100% BPC during CC examination shall be strictly adhered to.

4.7 All maintenance instructions regarding the correct functioning of APM and adjustment of gap as prescribed shall be strictly ensured.

4.8 Ensure timely replacement of worn out brake blocks.

4.9 Twin pipe working of rakes with BMBS should be ensured.

Zonal Railways are advised to adhere to aforesaid instructions for operation of rakes provided with BMBS on their system.

Encl: Ref.

(Manish Thaplyal)
ED/Wagon/RDSO

10/5/22
(Sunil Kumar)
PED/Traction/RDSO

No. MW/APB/BMB/KNORR **Date:** 30.12.2022

1. **The General Manager**
   All Zonal Railways

2. **The Managing Director**
   DFCCIL & KRCL

Sub: Instructions for bypassing of Automatic Pressure Modification Device (APM) in rakes with wagons fitted with Knorr Design BMBS.

Ref: (i) This office letter No. MW/APB/BMB dt. 13.09.2022.
(ii) This office letter No. MW/APB/BMB dt. 20.12.2022.

1.0 Vide ref. (i) above, it was advised to by-pass APM on trial basis in privately owned rakes (manufactured after 2019) with wagons fitted with BMBS supplied by M/s. KBIPL.

2.0 Vide ref. (ii) above, it was requested that feedback regarding any abnormality/unusual incidence in any of the rakes on which APM are bypassed be sent to RDSO.

3.0 Till date, no adverse feedback has been received from any of the Zonal Railways.

4.0 Based on above, it is advised that these trials be continued on all rakes i.e. IR owned and privately owned rakes, irrespective of the year of manufacture. The APM should be bypassed for all rakes with more than 90% of wagons provided with BMBS supplied by M/s. KBIPL.

5.0 For by passing the APM, the travel of sensor arm of the APM has to be constrained (by tying the APM sensor arm) so that it is artificially made to sense the wagon always in loaded condition and output of DV in both loaded and empty condition is provided to the brake cylinder without any modification.

6.0 Any abnormality/unusual incidence observed in any rake may be immediately informed to RDSO and trial may be stopped immediately.

7.0 This measure may be carried out as a trial for the next three months and fortnightly feedback sent to RDSO at **abwd.rdso@gmail.com** for taking further necessary action.

No. MW/APB/BMB **Date: 05.01.2023**

1. **The General Managers**
   All Zonal Railways

2. **The Managing Directors**
   DFCCIL & KRCL.

Sub: Committee's Report on Investigation of issues reported related to Brake Power in BOXNHL rakes and Recommendations made.

Ref: (i) Board's letters No. No.2022/M(N)/60/3 dated 24th Mar'22& 31st Mar'22
(ii) This office letter of even No. dated 04.05.2022
(ii) RDSO's letter no. MW/APB/BMB dated 15th July'22
(iii) Presentation by Committee members in Board on 20th July'22
(iv) Board's letter No.2022/M(N)/60/3 New Delhi, dated: 23rdJuly'22
(v) This office letter of even no. dated 06.09.2022.
(vi) This office letter no. MW/APB/BMB/Knorr dt. 30.12.2022.

1. Zonal Railways had reported issue of poor brake power and erratic braking behaviour of BMBS. The issue had been investigated by RDSO and it was found that the BMBS supplied by M/s KBIPL has lesser brake force than specified. The erratic behaviour occurs in this design due to response of slack adjuster to higher than expected frictional resistance in the brake rigging system. It results in malfunctioning of the slack adjuster at times i.e. it does not 'pay out' as required or 'pays in' when not required. As such, the brake block does not fully grip the wheel during brake application.

2. The matter has been pursued with M/s KBIPL, who have now proposed following changes in the BMBS-

a. Longer bearing cup – to increase the piston over stroke capability.

b. Additional Bush at front of Ram spring- to increase the Ram spring force and hence capability of slack adjuster to overcome higher frictional forces in the system.

c. Addition of stops on beams- to centralize the beams during dynamic condition and restrict the lateral movement of beam.

Static trials of the modified BMBS have been completed. The modified BMBS with above mentioned modifications have been delivered to premises of a wagon builder and the instrumented trials are planned to be conducted in order to validate the efficacy of above modifications.

3.1. Instruction for Speed Restriction

Speed limits for operation of freight trains in loaded condition on IR track consisting of more than 50% wagons with Bogie Mounted Brake System (BMBS) shall be as under:

Sr. No.	Track terrain	Max. Speed limit (Kmph)
1	Level	60
2	Down gradient of 1:200 to <1:150	50
3	Down gradient of 1:150 to ≤ 1:100	40
4	Down gradient of >1:100	30

3.1.1 On DFC, the speed will be up to 80 kmph for loaded trains with more than 50% wagons with BMBS.

3.1.2 The BPC shall clearly mention the percentage of wagons with BMBS in the train formation.

3.2. **Operations Related:**

3.2.1 Actively pursue mixing of BOXNHL wagons having Knorr make BMBS with BOXNHL wagons having other make of BMBS/Conventional brake system to the extent possible, depending upon the availability of BOXNHL wagons having other make of BMBS/Conventional brake system, targeting max. 50% wagons with Knorr make BMBS in a freight train. It is a desirable condition, not a mandatory one.

Priority be given to rakes manufactured after 2019 and to those rakes in which incidents have been reported repeatedly.

3.2.2 For other than BOXNHL type of wagons having Knorr make BMBS, efforts to be made for mixing with compatible wagons having other make of BMBS/Conventional brake system to the extent possible, depending upon the availability of compatible wagons having other make of BMBS/Conventional brake system, targeting max. 50% wagons having Knorr make BMBS in a freight train. It is also a desirable condition, not a mandatory one.

Priority be given to rakes manufactured after 2019 and to those rakes in which incidents have been reported repeatedly.

3.2.3 All wagons with BMBS are provided with twin pipe system and Railways are to run them in twin pipe mode. Extant instructions of Board on the subject including those contained in RB letter No 2017/M/(N)/60/3 dated 19.04.2022 are to be followed.

3.2.4 The Loco Pilots shall be counselled on the following:

(i) To control the loaded trains (more than 3000 T) with minimum brake pressure drop of 1kg/cm2. Regenerative/Dynamic braking to be used as per requirement to control the speed.

(ii) In case it is felt that Train is not getting controlled with Full Service Brakes through A9, then shall apply Emergency Brakes through A9 as well as RS/Flap valve should also be immediately opened.

(iii) To call Train Manager through VHF or any other means to apply emergency brakes immediately from Brake Van also. Proper functioning of VHF sets should be ensured by Zonal Railways.

(iv) For not pressing of PVEF/pulling of Bail-off ring during Emergency Brake application.

3.3. **Maintenance related:**

3.3.1 During ROH/POH, Zonal Railways should ensure checking of wagons for blockages in FP and BP pipes either through removal of dirt collector and conducting blow through from both the ends or through video scope wherein a camera is inserted into the pipes and visual seen on a hand held monitor.

3.3.2 It should be ensured that 100% pistons are working and brake is being applied on all wagons while issuing BPC after CC examination. Efforts should be made to rectify non- working brake cylinders during course of any maintenance check. In mixed rakes i.e. with under frame mounted brakes and BMBS, the method of calculation of brake power on BPC should consider the under frame mounted brake cylinder as equivalent to two cylinders.

3.3.3 The Zonal Railways should ensure that the APD fitted in the BMBS system are of appropriate design and there is no infringement with the primary brake beam (Ref.: RDSO's letter no MW/APB/BMB dt 06.09.2022).

3.3.4 APM of Knorr design BMBS be bypassed and Zonal Railways shall submit trial report of running such rakes in terms of letter no.MW/APB/BMB/Knorr dt.30.12.2022.

3.3.5 Zonal Railways to procure STRABURAGS NBU30 PTM Grease and apply it in brake beam pocket liners in terms of this office letter no MW/APB/BMB/Knorr dt. 30.12.2022.

DID (0522) 2450115
DID (0522) 2465310

13 FEB 2023

NWR Railway
JAIPUR

MW/APB/BMB/Knorr

Date: 10.02.2023

PCMEs
All Zonal Railways

Sub: APD for Bogie Mounted Brake Cylinders of M/s Knorr Bremse.
Ref: This office letter of even number dated 10.12.2022.

1. Vide ref. above, this office issued drawing and guidelines for welding a Z-shaped plate on Bell Crank Lever near brake cylinder end as an Anti-Pilferage Device (APD) to prevent the pin connecting brake cylinder and bell crank lever from coming out.
2. In connection and continuation to above, please find enclosed a detailed revised drawing of above mentioned APD. The revised drawing also details the welding location of APD on lever assembly.
3. It is advised that APD be ensured as per enclosed drawing in KB design BMBS in order to avoid possibility of working out of pin connecting brake cylinder and bell crank lever falling off and consequent falling of brake cylinder. Provision of other APDs are also to be ensured as per existing guidelines of maintenance manual of OEM.

Encl.-Drawing No. KP-1981443 for APD as per para 2 above.

Digitally Signed by
Shailendra Kumar Sharma
Date: 10-02-2023 13:38:46
Reason: Approved

(Shailendra Kumar Sharma)

No. MW/APB/BMB Dated: 13.09.2022

CRSE /Freight
All Zonal Railways

Sub: Checking of locking arrangement of sensor bolt /screw on APM sensing arm in Bogie Mounted Brake System

1. Proper maintenance of gap between APM sensing arm / screw and bogie side frame is essential to ensure proper working of Bogie Mounted Brake System.
2. In view of this, zonal railways are advice to ensure proper gap between sensor arm of APM and bogie side frame. It is also advised to check all the APM whether the sensing bolt / screw is properly locked on the sensing arm through lock nuts and ensure that the threads on sensor arm screw as well as sensing arm, lock nut are in proper condition.
3. Zonal Railways are advised to ensure the above in the wagons fitted with Bogie Mounted Brake System during yard examination.

SN	Wagon No.	Proper No. of lock nuts available	Condition of threads of sensor arm screw	Condition of internal thread of sensor arm	Date of examination of APM sensor arm screw	Remarks

Railways are advised to conduct proper check and send summary of deficiency observed (if any) as per the above format to this office.

Latest Instructions regarding mixing of BOXNHL & BTFLN wagons having Bogie Mounted Brake System (BMBS)

Note: Changes in clause 3.1 (a) & (c), 3.2 (a) & (c) and 3.3 (a) to (c) in Annexure "A" of Board's letter of even no. dated 17th Jan'23 are shown in Italics in font size 14 & in Bold letters

3. Mixing of Wagons:

3.1. Efforts to be made for mixing **of Railway Owned**wagons having Knorr designBMBS with wagons having other design of BMBS/Conventional brake system to the extent possible, depending upon the availability of suitable wagons, targeting following max. % wagons with Knorr Design BMBS in a freight train:

SN	Type of Rakes	Target max. percentage of wagons with Knorr design BMBS in a freight train	Condition
a)	***BOXNHL***	***50%***	***Mixing to be done within BOXNHL and with other BOXN variant wagons***
b)	BOXNHL25	70%	Mixing to be done within **BOXNHL25 type wagons ONLY**
c)	***BTFLN***	***50%***	***Mixing to be done within BTFLN and with BTPN wagons***
d)	BCFC	85%	Mixing to be done within BCFC wagons ONLY
e)	BOXNS	0%	Mixing not required as all **BOXNS** wagons having conventional brake system
f)	Wagon types other than mentioned in point a) to e) above	35%	Mixing to be done within compatible wagons ONLY

3.2. For avoidance of doubt, it is reiterated that

a. ***Mixing of BOXNHL type wagons is to be done within BOXNHL and with other BOXN variant wagons***
b. Mixing of BOXNHL25 wagons is to be done within BOXNHL25 type wagons ONLY
c. ***Mixing of BTFLN wagons is to be done within BTFLN and with BTPN wagons***
d. Mixing of BCFC wagons is to be done within BCFC type wagons ONLY

04/05/2023

14/5/23

Condemning Limits of Bell Crank Lever Assembly

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

- Excessive Wear on any surface, anything > 1.6 mm
- 25.4 mm Hole exceeds 26.7 mm in any direction (i.e.: oval condition)
- 32 mm Hole exceeds 33 mm in any direction (i.e.: oval condition)

MAINTENANCE IN OPEN LINE

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

- a) Check the components for missing or any physical damage, if found replace them.
- b) Check all the pin joints for any missing parts (pins, split pins, spring dowel, etc.), if missing, provide the same.
- c) Check that the APD is provided on all the pins and on the EL-60 valve is proper design or missing.
- d) Check that the all hoses are properly tightened and are not threatened to be damaged by axle or wheel. If so, properly clamped them.
- e) Check the thickness of Brake Block. It should be sufficient for complete trip.

(2) BRAKE CYLINDER

- a) Check for any physical damage of components.
- b) Check that the piston indicator is fully in.
- c) Ensure the piston stroke according to the prescribed limit
- c) Incase of brake cylinder with hand brake cables, the cables are not entangled or resting / touching the axle.
- d) Check that hand brake cables should not bend during the service brake application.

(3) APM DEVICE (EL-60)

- a) Check for any physical damage to the valve.
- b) Check that the indicator in during the release. Red indicator for empty condition in brake application for Escorts (orange for Knorr)
- c) 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 EL-60 gap adjusting gauge.
- d)Check that the valve’s sensing arm is moving freely.

(4) HAND BRAKE RIGGING

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

THANK YOU