



No. MW/APB/BMB

Dated: 15.07.2022

Exe. Dir. Mech. Engg. Freight  
Railway Board  
Rail Bhawan  
New Delhi.

(Kind Attn: Shri V.K. Agarwal)

Sub: Investigation of issues reported related to Brake Power in BOXNHL rakes and sudden dropping of BP pressure in LHB rakes.

Ref: Your Letter No. 2022/M(N)/60/3 dated 24.03.2022 & 31.03.2022.

In reference to the above, Committee was nominated for Investigation of issues reported related to i) Brake Power in BOXNHL rakes and ii) Sudden dropping of BP pressure in LHB rakes.

The first part of Investigation into Issues reported related to Brake Power in BOXNHL rakes has been completed by the Committee. Report of the Committee is enclosed herewith for kind perusal please.

DA: Committee report on Brake Power issues in BOXNHL rakes with all references as Annex-I to Annex-IX.

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(Sunil Kumar)  
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& Convener

Copy to: 1. DG/RDSO for kind information.  
2. ED/Wagon/RDSO for information please.  
3. CRSE/Frt/SER, CME(D&D)/NR & CELE/WCR for information please.

REPORT NO: MW/APB/BMB  
DT 15.07.2022

**COMMITTEE REPORT  
OF  
INVESTIGATION OF ISSUES  
RELATED TO  
BRAKE POWER IN **BOXNHL RAKES****

REF: Railway Board L/No. 2022/M(N)/60/3 dated 24.03.2022 & 31.03.2022

COMMITTEE MEMBERS:

1. Sunil Kumar, PED/Traction/RDSO
2. Manish Thaplyal, ED/Wagon/RDSO
3. Deepak Grewal, CELE/WCR
4. Atul Singh, CME/D&DM/NR
5. S.K. Sharma, CRSE/Frt/SER

## REPORT OF THE COMMITTEE ON BRAKE POWER IN BOXNHL RAKES

**Sub:** Investigation of issues reported related to Brake Power in BOXNHL rakes.  
**Ref:** Railway Board's letter no. 2022/M (N)/60/3 dt. 24.03.2022 & dt. 31.03.2022 (Enclosed as Annexure-I)

**1.0 Vide above references, the Committee formed was tasked to:**

- a) Undertake Technical examination of the issues reported by the ZRs.
- b) Formulate Scheme for field trials for investigation of the issues. Trials may be carried out on SCR, ECR, ECoR, SER & SR on BOXNHL rakes under supervision of CRSE (Freight) and CELE]
- c) Take necessary remedial action, as required, on the basis of outcome of field trial.

**2.0 Issues reported by Zonal Railways:**

Based on the incidents taken place in the Zonal Railways & trials conducted by them in reference to Railway Board's letter No. 2022/Elect(TRS)/113/BOXNHL dated 24.01.2022, the following issues have been reported (detailed reports enclosed in Rly Bd's letter dated 24.03.2022 under ref):

- I. **EBD of loaded BOXNHL (BMBS) rakes is higher** than EBD calculated through RDSO EBD calculator. In trials the data has been found to vary by 33 to 258 meters in braking distances (as reported by SCR) The Zonal Railway has commented that the reason for higher braking distances may be due to **higher BC application times than specified** (sometimes up to 170 sec), **Malfunctioning of APM, APM's arm sensors in bent condition or not at the centre of side frame.**
- II. **Improper clearance between APM sensor & bogie**, APM may sense loaded wagon as empty & BC will be charged to 2.2 kg/sqcm only as in empty wagon. This may lead to poor brake power of train.
- III. **Brake application time of Full Service (FS) application is stipulated as 18-30 sec**, but **actual time comes as 45-60 sec.**
- IV. As only one APM is provided per wagon, that also on one side of wagon body, **Gap between APM sensor & bogie frame may increase in down gradient or down gradient with curvature** due to off-loading of rear body of wagon & effect of super elevation on body of wagon on the outer side of curve. Two APM fitted diagonally opposite in a wagon may be explored making it independent of curves & gradient.
- V. **Slack adjuster** may also be responsible for poor brake power.
- VI. LPs do not use Emergency application during normal operation & when they apply the EB application, it has already reached uncontrolled situation resulting in derailment/accident.

**3.0 Field Trials:**

To further examine the issues reported by Zonal Railways under Para 2 above, following trial & testing scheme was undertaken:

3.1 Vide letter no.MW/APB/BMB dt.04.04.2022 (Enclosed as **Annexure-II**), the five Zonal Railways were advised to conduct trials as under:

South Railway	Central	Full Service brake application in single pipe mode with rake 1 & 2 with three types of locomotives
East Central Railway		Emergency brake application in single pipe mode with rake 1 & 2 with three types of locomotives
South Railway	Eastern	Emergency brake application in single pipe & twin pipe modes with rake 1 with three types of locomotives
East Coast Railway		Emergency brake application in single pipe mode with rake 1 & 3 with three types of locomotives
Southern Railway		Emergency brake application in single pipe & twin pipe modes with rake 1 & 2 with three types of locomotives

- Rake 1 (R1): One BOXNHL CC rake having at least 90% of the wagon with BMBS and BPC issued 15-20 days ago.
- Rake2 (R2): One BOXN/BOXNHL rake having at least 90% of the wagon with conventional brake system and BPC issued 15-20 days ago.
- Rake 3 (R3): One BOXNHL CC rake having at least 90% of the wagon with BMBS and BPC issued 0-2 days ago.

- 3.2 Field trials were conducted in nominated Railways except with Rake 2 in Southern Railway where this rake could not be made available.
- 3.3 The Zonal Railways were advised to send joint reports of trials done. The joint reports have been received by the Committee (placed under **Annexure-III to Annexure-VII**). Summarised Results are as under:

**EAST CENTRAL RAILWAY (Comparison with STOP, R1 & R2)**

LOCO TYPE	Rake No.-1 SPEED	Rake No-1 Brake Percentage	EBD By STOP Programme	EBD OBSERVED IN TRIAL	% variation b/w Observed/ STOP EBD	Rake No.-2 SPEED	Rake No-2 Brake Percentage	EBD By STOP Programme	EBD OBSERVED IN TRIAL	% variation b/w Observed/ STOP EBD
<b>ON LEVEL TRACK</b>										
WDG4	56 kmph	94.8 %	448 m	558 m	24.6	57 kmph	89.89 %	448 m	420 m	-6.3
WAG7	54 kmph		420 m	476 m	13.3	52 kmph		383 m	356 m	-7.0
WAG9	59 kmph		491 m	594 m	21.0	60kmph		486 m	456 m	-6.2
<b>ON 1 in 100 DOWN GRADIENT TRACK</b>										
WDG4	64 kmph	94.8 %	750 m	695 m	-7.3	72 kmph	89.89 %	853 m	819 m	-4.0
WAG7	68 kmph		831 m	1069 m	28.6	71 kmph		829 m	819 m	-1.2
WAG9	70 kmph		876 m	1138 m	29.9	69 kmph		792 m	695 m	-12.2

**EAST COAST RAILWAY (Comparison with STOP, R3 & R1)**

LOCO TYPE	Rake No.-3 SPEED	Rake No-3 Brake Percentage	EBD By STOP Programme	EBD OBSERVED IN TRIAL	% variation b/w Observed/ STOP EBD	Rake No.-1 SPEED	Rake No-1 Brake Percentage	EBD By STOP Programme	EBD OBSERVED IN TRIAL	% variation b/w Observed/ STOP EBD
<b>ON LEVEL TRACK</b>										
WDG4	43 kmph	99.15 %	274 m	302 m	10.2	43kmph	99.15 %	274 m	312	13.9
WAG7	50 kmph		356 m	375 m	5.3	40kmph		239 m	263	10.0
WAG9	48 kmph		332 m	394 m	18.7	40kmph		239 m	255	6.7
<b>ON 1 in 100 DOWN GRADIENT TRACK</b>										
WDG4	45 kmph	99.15 %	391 m	376 m	-3.8	45kmph	99.15 %	391 m	366 m	-6.4
WAG7	50 kmph		467 m	543 m	16.3	48kmph		435 m	300 m	-31.0
WAG9	50 kmph		468 m	440 m	-6.0	45kmph		389 m	380 m	-2.3

**SOUTH CENTRAL RAILWAY (Comparison with STOP, R1 & R2, Full Service BD)**

LOCO TYPE	Rake No-1 SPEED	Rake No-1 Brake Percentage	FSBD By STOP Programme	FSBD OBSERVED IN TRIAL	% variation b/w Observed FSBD/ STOP EBD	Rake No.-2 SPEED	Rake No-2 Brake Percentage	FSBD By STOP Programme	FSBD OBSERVED IN TRIAL	% variation b/w Observed FSBD/STOP EBD
<b>ON LEVEL TRACK</b>										
WDG4	60	96.55 %	529 m	591 m	11.7	60	94.9 %	471 m	443 m	-5.9
WAG7	60		527 m	684 m	39.3	63		469 m	425 m	-9.4
WAG9	60		528 m	531 m	0.6	61		470 m	515 m	9.6
<b>ON 1 in 100 DOWN GRADIENT TRACK</b>										
WDG4	60	96.55 %	702 m	915 m	30.3	60	94.9 %	602 m	601 m	-0.1
WAG7	60		698 m	901 m	29.9	63		599 m	595 m	-0.6
WAG9	60		700 m	833 m	19.0	61		600 m	668 m	11.3

**SOUTH EASTERN RAILWAY (Comparison of EBD in Single & Twin Pipe, R1)**

LOCO TYPE	SINGLE / TWIN PIPE SYSTEM	SPEED	Rake No-1 Brake Percentage	EBD By STOP Programme	EBD OBSERVED IN TRIAL	% variation b/w Observed/STOP EBD
<b>ON 1 in 100 DOWN GRADIENT TRACK</b>						
WAG7	Single Pipe	62 KMPH	93.33 %	717 m	714 m	-0.4
WAG7	Twin Pipe	62 KMPH		717 m	590 m	-17.7
WAG9	Single Pipe	60 KMPH	90.83 %	696 m	720 m	3.5
WAG9	Twin Pipe	60 KMPH		696 m	580 m	-16.7
WDG4	Single Pipe	60 KMPH	90.83 %	698 m	710 m	1.7
WDG4	Twin Pipe	60 KMPH		698 m	1080 m	54.7
WDG4	Twin Pipe	60 KMPH	90.83 %	698 m	910 m	30.4

**SOUTHERN RAILWAY (Comparison of EBD in Single & Twin Pipe, R1)**

LOCO TYPE	SINGLE / TWIN PIPE SYSTEM	SPEED	Rake No-1 Brake Percentage	EBD By STOP Programme	EBD OBSERVED IN TRIAL	% variation b/w Observed/STOP EBD
<b>ON 1 in 70 DOWN GRADIENT TRACK- Rake-1</b>						
WAG7	Single Pipe	55 KMPH	94.54 %	575 m	1200 m	65.1
WAG7	Twin Pipe	55 KMPH	94.54 %	575 m	1660 m	188.7
WAG9	Single Pipe	55 KMPH	91 %	596 m	850 m	42.6
WAG9	Twin Pipe	55 KMPH	91 %	596 m	1240 m	108.1
WDG4	Single Pipe	55 KMPH	91 %	599 m	1650 m	175.5
WDG4	Twin Pipe	55 KMPH	91 %	599 m	1530 m	155.4

It is understood that EBD calculator of RDSO gives indicative values of stopping distances considering mean values. This has been taken as a reference to see the variations in stopping distances. The braking distances will have a natural variation based on local conditions, the exact load and condition of the rake, the brake system of locomotive etc. However the variation should be within acceptable bands. It is observed that **same BMBS rake is having inconsistent EBD at same speed & section** as above in some Zonal Railways. In each case, the loco was tested for brake parameters in line with RDSO TC 113 & found in order. It can be seen that the **BMBS rakes with systems of M/s Knorr Bremse are having inconsistent/ erratic behaviour with respect to braking distances**. It is noted that BMBS system in BOXNHL was implemented with single pipe system in 2010. At a later stage, it was decided to provide twin pipe in all wagons including BOXNHL-BMBS. The twin pipe system will primarily facilitate early release of brake release after application in rake with 58/59 wagons. This will avoid development of excessive force on wagon couplers which in-turn would minimise the breakage of CBC knuckle / coupler due to start of train without release of brake in the last 20 to 10 wagons. Twin pipe system has minimum impact on brake application time. Railways were operating both single pipe or twin pipe BOXNHL-BMBS rake since 2010 but no such SPAD case were reported initially. However, problems and issues like SPAD cases were reported in some Zonal Railways since past few years.

3.4 The committee has also taken the cognizance of the following recent SPAD/Averted SPAD cases involving BMBS rakes:

- **BSP Division/SECR dated 28.03.2022:**

Train No. **BRN/KAV**, 58 BOXNHL, 5344Ton overshot home signal and collided with Train No. N/GZB from rear end at Janta Stn on BSP Divn., BPC : 94.9% (29.04.22) ,87.17% in joint inspection on 02.05.22,Wagons provided with **BMBS of M/s Knorr Bremse**, Loco no. 41397 WAG9 provided with E-70 (M/s FTRIL), BT propulsion system, Gradient : Falling 1:125, 1:100

LP passed distant signal at 47kmph and tried to reduce speed by dropping BP pr. by 0.8 kg. Sensing train is not under control, emergency brakes were applied at speed of 41 kmph but speed kept on increasing and dashed with N/GZB at a speed of 54 kmph.

- **NKJ division/WCR dated 21.04.2022:**

Train No. APLS(ADANI-01) with **BOXNHL (BMBS of Knorr** make, Manufactured in Mar'2021) travelled 14 km after application of brakes, Loco No- 32504 WAG-9HC provided with E-70 (M/s FTRIL), Medha propulsion,

LP started brake application at 60 kmph at 17:22 hrs. However train continued to gain speed on 1 in 100 falling gradient. Train after attaining peak speed of 90 kmph stopped at 17:35 hrs, after 13 mins of brake application and approx. 14 kms of travel. Train was escorted by CLI and SSE/C&W during the incident. Earlier on 21.04.2022, escorting staff recorded that after dropping 1 kg BP pressure in locomotive, no change in BP observed in Brake van.

RDSO team visited Sagoni /NKJ division on 22.04.2022 for investigation. Stationary and running trials of formation were conducted and observed to be normal. Examination of air brake pipes by Endoscope was done and **2 nos of obstructions found in BP pipe** (13th wagon) **and FP pipe** (30th wagon).The obstruction in BP pipe hindered proper brake propagation in the entire formation leading to partial braking in formation.

- **JHS division/NCR dated 04.05.2022:**

Train No. JAB/DN with **BFNSM (having BMBS of Knorr** make, manufactured in Feb 2021) travelled 2.2 km after application of Emergency brakes. Loco No- 33124 WAG-9H provided with E-70 (M/s FTRIL), BT propulsion, Load 5344 ton, Gradient: 1 in 200 falling

LP applied emergency brake at 54 kmph (08:28:32 VCU Timings) & through BPEMS at 08:28:43 at a speed of 51 kmph. Train stopped after 2.2 kms of emergency brake application

RDSO team visited JHS on 05.05.2022 for investigation. Stationary and running trials of formation were conducted and observed to be normal. Examination of air brake pipes through video scope

was done. **No obstruction found**. The testing of locomotive conducted at TKD and observed to be normal.

- **New Khurja/DFCCIL dated 07.05.2022:**

Train No. SOG Goods with **BOXNHL(BMBS)** 5285t running at a speed of 97 kmph, travelled 2.1 km after application of emergency brakes, Mixed rake - BMBS in 33 wagons, 25 conventional brake system, Loco no. 60001 WAG12 Alstom, CCB Knorr brake.

Formation travelled 2.1 km after application of emergency brakes and about 2.3 kms from application of full service application. The testing of locomotive conducted at GZB and observed to be normal.

- **New Khurja/DFCCIL dated 28.06.2022:**

Train No. UP NTCD Goods with **BOXNHL(BMBS)** 5265t running at a speed of 97 kmph, travelled 2.56 km after application of emergency brakes, Load – 58 + BV, Loco no. 32013 WAG9, CCB Knorr brake.

As speed was not reducing as desired after Em brake application, LP applied loco brakes also by SA-9. Train stopped 2 masts before Red Home signal.

- **New Kanchausi/DFCCIL dated 12.07.2022:**

Train No. Dn BSCS Goods with **BOXNHL(BMBS)** 5263t running at a speed of 96 kmph, travelled 3.0 km after application of emergency brakes, Load- 58 + BV, Loco no. 32205 WAG9, CCB Knorr brake.

ALP further operated RS valve & pressed BPEMS, but the train stopped after passing New Kanchausi Home signal in ON condition by 165 m.

- **Trials in DFCCIL network:**

In addition to the three incidences reported by NCR above (2 at New Khurja & one at New Kanchausi) in DFC network, NCR has also cited data of trials conducted by them in DFC area, as under:

Trials conducted: No. of trials= 7. Loads- 5180 T to 5299 T, Trial speeds- 82 to 100 kmph. EBD found- 1.71 km to 2.37 km. Extra distance travelled in comparison to RDSO STOP calculation- 533 m to 1000 m.

RDSO team also conducted trials in DFC area of Prayagraj Divn on 12.07.2022, wherein EBD was noted as 1800 m on 95 kmph, 1162 m on 85 kmph & 892 m on 75 kmph with 58 BOXNHL BMBS rake with load of 5263 T.

Reports placed at **Annexure-IX**.

In all the above recent cases of SPAD of train with BMBS rake, there has been **no report by LP of poor brake power** and the **train has worked normally before the incident took place**. But at a particular instance, poor brake power has been observed by Loco Pilot in the train which caused SPAD. **In all the above cases the brake system was supplied by M/s Knorr**. Thus, **BMBS rakes with M/s Knorr systems are having erratic/inconsistent behaviour with regard to brake power & in-turn varying EBD**. Taking this into account **RDSO has temporarily delisted M/s Knorr wrt BMBS of freight wagons**.

3.5 Instrumented trials have been conducted on Train No. APLS(ADANI-01) with **BOXNHL(BMBS)** of Knorr make, Manufactured in Mar'2021 in WCR and wide variations have been observed in the braking distances. From the results it is seen that BP is dropping in the Locomotive, there is concomitant drop in BP in the instrumented wagons including 58<sup>th</sup> wagon and the rise in BC pressure is acceptable in the instrumented wagons including the 58<sup>th</sup> wagon. Thus it can be seen that variation in braking distances is due to varying braking forces.

3.6 During investigations into the cause of varying brake forces, it has been found that **frictional losses are occurring at the pin joint with brake beam**. In order to increase the brake force and reduce these losses, **new design of bell crank lever with higher rigging ratio against 4.87 in existing design with bearings has been proposed**. Further, detailed investigation is also being carried out in workshops and OEM wrt compression springs and brake cylinder functioning to find causes of inconsistent behaviour. The specification for BMBS is being revised with higher braking force. The braking force is proposed to be similar to that of underframe mounted brake system in BOXN wagons, as a long term solution.

3.7 **The issue of APM has been examined and the following is noted:**

3.7.1 There is **no reduction in DV pressure by APM in loaded condition**. It will pass through the DV pressure to BC as per the position of A-9 handle. In case of **Full Service or Emergency brake application, the APM will continue to provide 3.8 kg even if there are leakages in it or the indicator is not working or the APM arm travels less than 79mm**. Thus the design is such that APM has no role in loaded condition provided the gap between the APM arm and side frame for BOXNHL rakes is proper otherwise may sense a loaded wagon as empty wagon.

3.7.2 The **gap between the APM arm and side frame for BOXNHL rakes is prescribed as 96 plus/ minus 1 mm**. In **loaded condition this gap would be around 53mm**. As such there is a margin of about 26mm in the gap between the APM arm and side frame in empty condition. **The APM arm heights are to be adjusted as per prescribed norms**.

3.8 **The following is noted regarding brake system in the Locomotive:**

In all the reported cases, the trains were either being hauled by conventional electric locos (WAG7, WAG5) fitted with IRAB brake system or by WAG9 electric locos fitted with air brake systems of Knorr Bremse (CCB) / Faiveley (E70) or by Diesel locos WDG4 fitted with CCB brake system. Also, in all these cases, the brake systems fitted on the locomotive were found to be in healthy condition. All the locos are provided with Service brake, Regenerative/dynamic brakes, Loco independent brake and emergency brake through A9 Brake handle or Emergency Brake valve or Assistant driver emergency brake valve. Under any circumstance Emergency brake is fully available to apply train and loco brake. The Brake system in locomotive is also provided with Vigilance Control feature where EB gets applied automatically in case of driver not being vigilant enough. It is also to be noted that **whenever brake is applied through any of the above means, it will result in traction cut-off**. In all the cases no defect in locomotive was found. Notwithstanding, the proper checking of locomotive shall be ensured during different schedule maintenance especially the braking parameters of locomotives.

#### 4.0 **Recommendations**

In light of above paras, the committee recommends the following measures-

4.1 **Design related:**

4.1.1 **During manufacturing** of wagons, it is essential to **validate that the Brake Force as per Design is achieved**. Against each new contract of manufacturing, whether Railway or Private order, **brake force test** is to be carried out in representative wagons manufactured **by wagon builder jointly with air brake system supplier and RDSO** to ensure that proper system of brake gear, desired dimensions and clearances in the brake assembly are ensured.

4.1.2 During the trials at ECR it has been found that **EBDs with conventional rake are lower** than the estimated distances from STOP while they are generally **higher with BMBS rakes**. The LPs have a sense of braking distances through **brake power test, the brake feel test** and their experience on the routes of running. It has been reported that since there is variation in the stopping distances of different stocks especially at higher speeds or steep gradients, there are incidences of

misjudgement. To avoid the incidences of misjudgement of LPs about brake power of train due to this variation, there could be a need to have similar braking behaviour of the existing rolling stock. The committee recommends that the braking effort of existing BOXNHL should be increased to the extent possible in the existing design. **Further, the design of BMBS shall be reviewed to bring the EBD values closer to that of conventional rakes.** Till that time, manufacturing shall be allowed with mandatory brake force tests as suggested in Para 4.1.1 above.

4.1.3 Facility for recording & downloading the Loco speed data & unusual incident exists in the 3-phase electric locomotives. However, provisions in locomotives to continuously record the brake system parameters i.e. A9 control pressure, Brake Pipe (BP), Feed pipe (FP), Air flow & Brake Cylinder (BC) pressures data etc. is necessitated to facilitate post-accident investigation and possibility to be explored for the purpose. Designs of CCB (Electric & Diesel Locos) shall be reviewed & it shall be ensured that during Emergency braking, **PVEF/Bail-off shall remain ineffective i.e. loco brake shall come into effect during any type of emergency brake.**

#### 4.2 **Maintenance related:**

4.2.1 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 the 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 take the underframe mounted brake cylinder as equivalent to two cylinders.**

4.2.2 All freight depots should have adequate **stock of DV suitable for BMBS, APM and Brake cylinder** at their end for arranging replacement of defective items. **Maintenance kits for APM** should also be available with freight depots **with test bench** for ensuring attention of APM as required. **Brake cylinders and DVs are to be overhauled and collected from nominated workshop** by freight depots. **Defective APMs are to be replaced** during ROH attention and CC / premium examination of rake.

4.2.3 **Training of Maintenance staff** for BMBS including APM attention and checking during ROH attention is to be ensured. Freight depot staffs are to be counselled for **proper setting arm of APM and ensure correct gap** as recommended. **Checking of BC pressure with provision of pressure gauge for both empty and loaded condition** of checking is to be ensured **during SCTR** testing of wagons.

4.2.4 Workshop should also procure **maintenance kits for both brake cylinder portion as well as slack adjuster portion** for complete overhauling of BMBS cylinder as well as kits for **DVs and APMs** to ensure complete overhauling of brake system during POH attention of BOXNHL rake. A confirmation for availability of resources/capacity for complete overhauling of brake system of BOXNHL-BMBS rake is to be taken from Zonal Railway workshops,

4.2.5 Ensuring provision of **air drier for freight examination** is essential. It is also essential that **leakage in BP / FP system should be within the limits.** **Dirt collector should be cleaned during ROH** attention. A confirmation for proper system for air brake testing of BOXNHL-BMBS rake is to be taken from Zonal Railways.

4.2.6 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 scopy** wherein a camera is inserted into the pipes and visual seen on a hand held monitor.

4.2.7 Zonal Railways shall strictly adhere to the existing maintenance instructions /guidelines of locomotives especially of brake system during different schedule maintenance to ensure fail safe operation of brake system. The Technical Circular 0113 & 0116 must be followed for the purpose.

#### 4.3 Operational related :

- 4.3.1 That the **braking distance for BOXNHL wagons with BMBS will be more is already known** to all Zonal Railways and instructions to this effect have also been issued vide Railway Board's letter no. 2017/Elect(TRS)/113/Safety Misc. dt.11.09.2017 amongst other similar instructions issued by Zonal Railways. **Crew needs to be counselled** accordingly as about 1 lakh wagons with BMBS are available in the system.
- 4.3.2 RDSO vide letter no. EL/3.2.19/3-Phase dated 10.05.2022 (Enclosed as **Annexure-VIII**) have issued instructions to be implemented by ZRs for safer operations of BOXNHL rakes with BMBS. **All wagons with BMBS are provided with twin pipe system and Railways are to run them in twin pipe mode for higher average speed** of freight trains along with more safe operations on long steep gradients. With respect to twin pipe working, 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.
- 4.3.3. **BPC should clearly mention with attention mark that the rake is fitted with BMBS with APM**. Also, it should mention the **summary of conventional type & BMBS type for ready reference** to Loco Pilot.
- 4.3.4 Zonal Railways shall 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. Zonal Railways have conducted trials themselves as well as in response to instructions of Board. There is enough experience and data to decide the maximum speeds on down gradients. This should be done without delay. As is known that **braking distance would vary non-linearly wrt speeds**. In **down gradients the situation is aggravated**. The results of East Coast show consistent safe performance of BMBS rakes at speeds between 45 to 50 kmph on down gradients. At higher speeds and higher down gradients there is inconsistent performance in SCR and SR. SR has already issued instructions for operation of trains in graded sections. This has been found to be effective. **Other Zonal Railways should follow the practices of SR. Since there are known deficiency in the Knorr make BMBS and as there are about 69,000 such wagons on line, speeds upto maximum 50 kmph on down gradients of 1 in 100, 65 kmph on level over IR and 80 kmph over DFC seem suitable for the present. Zonal Railways can however examine local conditions and take appropriately safe decision till design is reviewed as in para 4.1.2 above.**
- 4.3.5 The **Loco Pilots shall be counseled** on the following:
- To **control the loaded trains (more than 3000 T) with minimum brake pressure drop of 1kg/cm<sup>2</sup>**. Regenerative/Dynamic braking may also be used as per requirement to control the speed.
  - 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.
  - 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.
  - For not pressing of PVEF/pulling of Bail-off ring during Emergency Brake application in locos fitted with KBIL CCB.**

Board may kindly examine the above recommendations. Accordingly, action will be taken and instructions issued to Zonal Railways.

DEEPAK GREWAL  
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CME(D&DM)/NR  
& Member  
Digitally signed by SUNIL KUMAR  
Date: 2022.07.15 12:21:08 +05'30'  
(Sunil Kumar)  
PED/Traction/RDSO  
& Convener

SUNIL KUMAR SHARMA  
Digitally signed by SUNIL KUMAR SHARMA  
Date: 2022.07.15 15:54:28 +05'30'  
(S.K. Sharma)  
CRSE/Frt/SER  
& Member

MANISH THAPLYAL  
Digitally signed by MANISH THAPLYAL  
Date: 2022.07.15 15:05:58 +05'30'  
(Manish Thaplyal)  
ED/Wagon/RDSO  
& Member

ATUL SINGH  
Digitally signed by ATUL SINGH  
DN: c=IN, o=INDIAN RAILWAYS, ou=GOVERNMENT, 2.5.4.20=4e505814c6a1629347a2f8a18661227f52f771b59a6985d69a5829363444b52d, postalCode=110001, st=Delhi, serialNumber=71320147D4FFEF792F9EE40564F1617FC768EA56A0C173039C7F7541D4475A58, cn=ATUL SINGH  
Date: 2022.07.15 18:29:04 +05'30'

