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(Govt. of India)
(Ministry of Railways)

Trouble Shooting Guide on Brake Binding in Coaching Stock



(For official use only)

IRCAMTECH/2013/Mech/BB/1.0

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अभ्यास RDS
रेल अग्रदूत Transforming Railways



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Centre for Advanced Maintenance Technology**

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FOREWORD

Brake binding is a burning problem in all types of Coaching rolling stocks and its repercussions are resulting in detentions to the trains enroute, punctuality loss, increasing ineffective percentage and unscheduled maintenance of coaching stock etc.

This hand book contains important trouble shootings repeatedly experienced on line by the loco pilots as well as by open line maintenance (C&W) staff. The photographs have also been given in the trouble shooting charts to facilitate staff in doing faster actions by easy identification of location of components.

I am sure that the “Handbook on Brake Binding in Coaching Stock” will be very much useful to the concerned staff, to ensure trouble free service.

30th September, 2013
CAMTECH, GWALIOR
Director

(A. R. Tupe)
Executive

PREFACE

Proper knowledge of trouble shooting of faults in brake binding in Coaching stock is necessary to ensure reliability and availability of Coaching stock. This book on brake binding in Coaching stock has been prepared by CAMTECH with the objective that those involved in operation and maintenance of Coaching stock, must be aware of sufficient knowledge of trouble shootings.

Technological Up gradation and learning is a continuous process. Hence feel free to write to us for any addition / modifications or in case you have any suggestion to improve the handbook. Your contribution in this direction shall be highly appreciated.

30th Septembert, 2013
CAMTECH GW ALIOR

(K.P.Yadav)
Director/Mech

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*Trouble Shooting Guide on
Brake Binding
In
Coaching Stock*

CHAPTER -1

Brake Binding

INTRODUCTION

1.0 Brake Binding in Coaching stock:

Whenever brake block grips the wheel with excessive braking force, it is termed as brake binding. It is the burning problem of the day in all types of rolling stock. Repercussions of brake binding in operation are as under:-

1. Detention to trains causing loss of punctuality of trains.
2. Flat places on tyre of wheel leading to bearing failure, weld failure/rail fracture etc.
3. As a preventive measure, detachment of coach/wagon en-route causing inconvenience to the passengers during their journey.
4. Ineffective percentage of coaching stock increases and thus, maintenance cost is also increasing.
5. More Tractive force needed by locomotive to haul even light load train.

2.0 Brake Binding

The brake binding occurs in all types of rolling stocks irrespective of air brake or disc brake. During release even after restoration of brake pipe pressure to 5.0 Kg/Cm², the brakes do not release due to various reasons and thus wheels not move freely on the track. This phenomenon is called brake binding.

3.0 What are the effects of brake binding?

- It damages the wheels

- It damages the bearings
- It gives discomfort to the passengers
- It leads to detention to the trains
- It leads to detachment of rolling stock enroute
- It leads to train parting
- It leads to High power / fuel consumption
- It also damages the track.

4.0 Causes of brake binding:

The main causes of brake binding due to failure in the.

1. Brake power creations system (Pneumatic system)
2. Brake power transmission system (Brake rigging)
3. Human Failure/Negligence
4. Miscellaneous Factors:

4.1 Causes of Brake Binding in the power creation system:

All the components which are available for the passage of compressed air between loco and the brake cylinder come under the power creation system. Any failure in these parts between loco and the brake cylinders results in brake binding.

The main parts come under power creation system are:

- MU washer
- Palm ends

- Air hoses
- Cut-off angle cock
- Brake pipe,
- PEAS,
- Guard Emergency brake Van valve
- Dirt collector
- Auxiliary reservoir
- Control reservoir
- Distributor valve
- Brake cylinder
- Feed pipe

Brake binding due to air pressure leakages:

- Defects in MU Washer
- Defective Palm Ends
- Defective Air Hoses
- Leakage through Cut- off Angle Cock
- Leakage through Brake pipe
- Leakage through Dirt Collector
- Leakage through DV joints
- Leakage through AR
- Leakage through Brake cylinders
- Leakage through PEAS

- Leakage through GEV

4.1.1 Defects related to DV

- i) Mounting of DV on common pipe bracket.
- i) Assembly of DV with Intermediate flange.
- ii) Malfunctioning of DV.

4.1.2 Brake binding due to overcharging of CR

- 1) Due to difference in calibration of brake pipe pressure gauges in the locomotives, there is a chance of over charging/under charging of BP pressure during loco changing, even though pressure gauge indicates 5.0 Kg/Cm^2 Pressure which results in brake binding throughout the formation due to differential pressures in the incoming/ outgoing locos.
- 2) Whenever the locos are reversed at the junction stations. Some times it becomes difficult to charge 5.0 Kg/Cm^2 pressure in rear most vehicle, whereas, CR already remains charged with 5.0 Kg/Cm^2 before the reversal of locomotives. This difference of the pressures causes brake binding in the rear portion of the train.

4.2 Brake power transmission system: (Brake rigging)

- Brake cylinder defective.
- Improper alignment of Brake Cylinder

- Uneven thickness of brake block on the same truss beam.
- Hand brake fully or partially on.
- Brake block mounting over the wheel.
- Brake shoe jamming.
- Brake beam rigid.
- Improper manual adjustment of brake gear.
- Fitment of wrong type of brake block (L-type instead of K-type and vice versa).

The system through which the brake force that available on the piston is transmitted to the wheel is called power transmission system.

4.3 Human Failure/Negligence

- i) Non releasing of the DV manually during engine changin g/reversal.
- ii) Mis-understanding of Brake block release as CR charged during Engine change/reversal.

4.4 Miscellaneous Factors:

i.) Dust/Dirt & Moisture in the Air supplied.

ii.) Mixing of different Stocks:

- Under Frame Mounted with BMBC Stock.
- BMBC stock with and without relay

iii.) Pressure Gauges:

- Non-use of standard Pressure gauge.

- Non-calibration of Pressure gauges at regular interval.

❖ **Breakages in the pipe connection between DV and the Brake cylinder causes brake binding. How?**

Breakage in the pipe connection between DV and the brake cylinder leads to excessive leakages of air from AR after the brake application. This excessive leakage drops the MR pressure abruptly. Once MR pressure drops, it is not possible to restore the BP pressure to 5.0 Kg/Cm² during release, results in brake binding in the entire formation.

Remedial measures: - Detect and Isolate the DV:

❖ **How the leakages in the Auxiliary reservoir causes brake binding?**

In case of single pipe, auxiliary reservoir is charged through brake pipe. Excessive leakage in the A.R due to working out of drain plug or corrosion and foreign body hitting on the AR, prevents recharging of BP to 5.0 Kg/Cm² results in brake binding on the entire formations.

Remedial measures: -Detect and Isolate the D.V.

❖ **What are the common defects in the brake cylinder that causes brake binding?**

The brake binding can happen due to the defects developed within the brake cylinder due to the,

- a. Bent piston rod

- b. Weak/ broken return spring
- c. Jammed piston

❖ **What are the defects in the SAB causes brake binding?**

The defects in the automatic slack adjuster cause malfunctioning of the same on enroute. This sometimes results in the brake regulator not paying out slack after brake application and subsequent release. This results in brake binding. Though the brake regulators are not to be repaired in the open-line, but it is necessary to ensure that the following precautions are observed during maintenance.

1. Use the correct length of pull rod for the particular type of coach, otherwise this may result in incorrect 'e' dimension and consequent failure on run.
2. While welding the pull rod to the adjuster spindle ensure that the return lead of the welding machine is connected close to the point of welding. This will help to minimise the chances of craters forming inside the leader nut or adjuster nut assembly, which in turn jamming of SAB.

Remedial measures: -

1. Change SAB & at the time of overhauling the leader nut, adjuster nut and spindle rod to be replaced as a whole unit.
2. Never use a slack adjuster, if it behaves erratically even once. Send it to shops for inspection and repairs.
3. Set the “A” dimension prescribed for the particular type of coach correctly. Always ensure correct “A” dimension, whenever brakes regulator is changed.

Important guidelines & recommendations for better maintenance

1. BP & FP Hose pipes should be tested with 10 kg/cm² pressure before fitting in the coaches at the time of POH/IOH.
2. Cut off angle cock should be overhauled in the coaches at the time of POH.
3. Filter in Centrifugal Dirt Collector shall be changed at every IOH and POH.
4. Testing of DVs shall be computerized to ensure accurate checking.
5. Only the specified Grease shall be used to DVs and Bogie Mounted Brake Cylinder overhauling.
6. Rake test rig & Single car test rig shall be calibrated at regular interval.
7. Usage of Stainless Steel pipe in WCB, SLR & GS coaches may be introduced.

8. Proper alignment of Bogie Mounted Brake Cylinders on Bogie frames shall be ensured.
9. The subject of CR release before loco change may be audited at different level to avoid brake binding.
10. Staff are lacking in the knowledge of air brake system and the seriousness of brake binding. Training for the staff to focus on identifying DV defects like release choke defect, atmospheric Port leak and difference between brake release and CR Release and remove their ignorance on such areas.
11. Air brake equipment supplier may be advised for maintaining quality of material especially rubber in their products and go for the technologically advanced and durable supplies bearing in mind the occurrence of brake binding due to material failures like Choke Valve, diaphragm follower, lip seal and toothed ring etc.
12. To prevent the accidental isolation of DV on run by external factors like meddling by miscreants or a hitting by flying ballast, all supplying firms may be advised to provide a locking arrangement in the DV isolation handle as being done by M/s Escorts and M/s Faiveley in their make. Similarly the shops may also be advised to provide such a locking arrangements in the DVs during POH.
13. Nylon Filter may be fitted at the very entry point of PERV to ward off the dust from entering.
14. TXR and other running staff should be given training in the basics and importance of air pressure releasing during engine change-over, and reversal of

engine at turn-round point to save the train from brake binding.

15. If the release-wire is found missing in any one of the coaches coming for primary maintenance the same should be replaced with the standard release wire rope without fail.
16. Air Driers fitted to Compressors in Pit lines are to be maintained and checked for proper working with a hygrometer at regular intervals.
17. Drivers may be advised to avoid unwanted interference with A-9 Valve setting once the Power is attached and Air Pressure given through. Drivers shall not by-pass the application of Air Drier during attachment of Engine to avoid purging process under the pretext of minimizing delay.
18. All shunting Locos shall be fitted with Air Drier by taking up the work in Diesel sheds.
19. The quality of Air Pressure gauges available in Air compressor, Locomotives and Brake van should be upgraded. Specification of gauges with longer life and better reliability should be standardized as per RDSO instructions. Since they are low cost items but have a huge impact on trouble free operation. Calibration schedule should also be clearly specified.
20. Air pressure gauges may be converted to digital gauges where possible to reap the benefits of better accuracy and reliability.

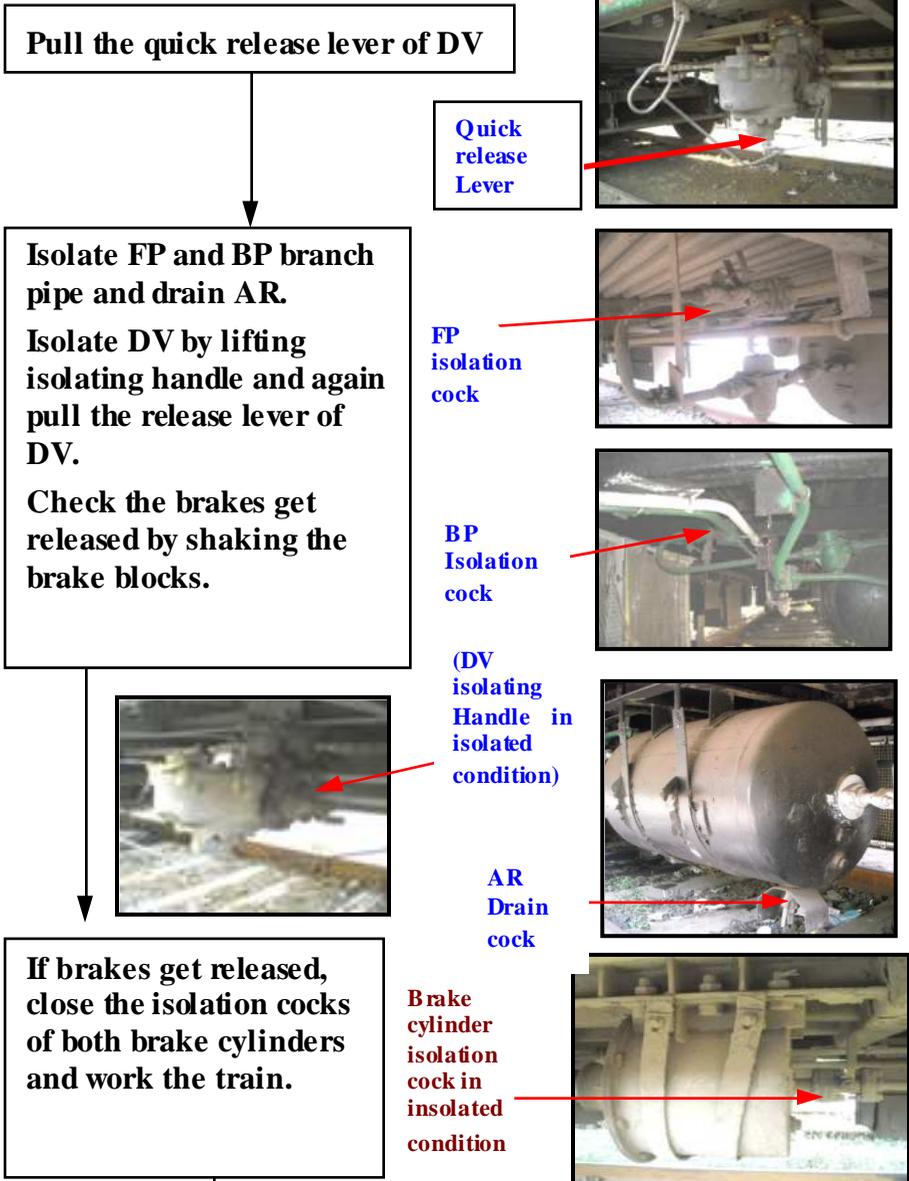
21. Air pressure brake indicators, as available in the technically updated LHB coaches, may be considered for provision in all non-LHB coaches also for easy understanding whether the brake is in released or applied condition.
22. Endurance test should become a must on each and every DVs and Brake Cylinders before fitting in the coaches in the Workshops to filter out components likely to fail prematurely.
23. The subject of providing Relay in bogie mounted coaches on war-footing may be considered to bring about uniform release time among all types and groups of coaches.

CHAPTER - 2

Trauble Shooting Charts

- 1.- ICF Coach***
- 2.- ICF BMBC Coach***
- 3.- LHB Coach***
- 4.- Dauble Decker Coach***
- 5. - Air Spring Coach***

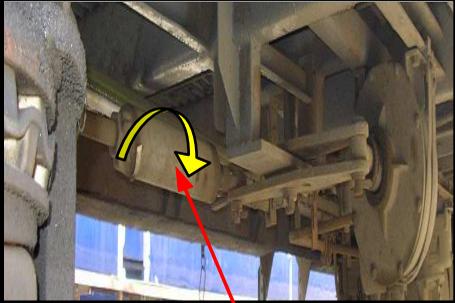
Procedure to Release and isolate Brake Binding at enroute stations (for Conventional Air Brake Coaches)



↓
If not released
↓

If brake blocks are gripping the wheels in one bogie, then close the isolation cock of the brake cylinder and rotate the slack adjuster of the affected bogie in anti-clockwise direction while facing the bogie.

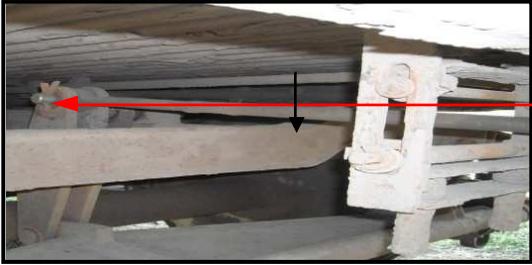
Ensure that brakes are released by shaking the



Slack adjuster

↓

In case brake blocks are still gripping the wheels of a particular bogie, remove the SAB pull rod pin of the affected bogie, secure the SAB pull rod and work the train.



SAB pull rod pin

Procedure to Release and isolate Brake Binding at enroute stations (for Loco Pilots & Guards.)
(BOGIE MOUNTED BRAKE CYLINDER COACH)

Pull quick release Lever of DV

Quick release lever



Isolate FP and BP branch pipe and drain AR.

FP isolation cock



Isolate DV by lifting isolating handle and again pull the release lever of DV.

BP Isolation cock



Check that brakes are released by shaking the brake blocks.

AR Drain cock



If brakes are released, close the isolation cocks of both brake cylinders and work the train.

DV isolating Handle in isolated condition



Draft of Trouble shooting Guide on Brake-F

IF NOT RELEASED

In case of crimped / bent flexible pipe, straighten the flexible pipe to allow BC pressure to release.

If brakes are released, close the isolation cocks of both brake cylinders and work the train.

Crimped flexible pipe



BC isolation cock in closed condition



IF NOT RELEASED

If brake blocks are gripping a particular pair of wheels, then close the isolation cock of the brake cylinder,

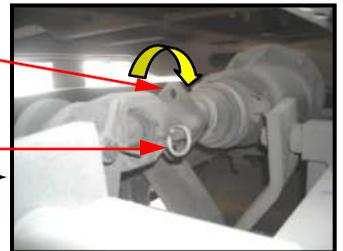
pull the latch of the brake cylinder and rotate the resetting plate in clockwise direction to release the brakes.

Ensure that brakes are released by shaking them.

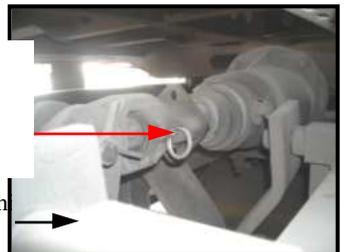
If brakes are released, close the isolation cocks of both brake cylinders and work the train.

Resetting plate

Latch

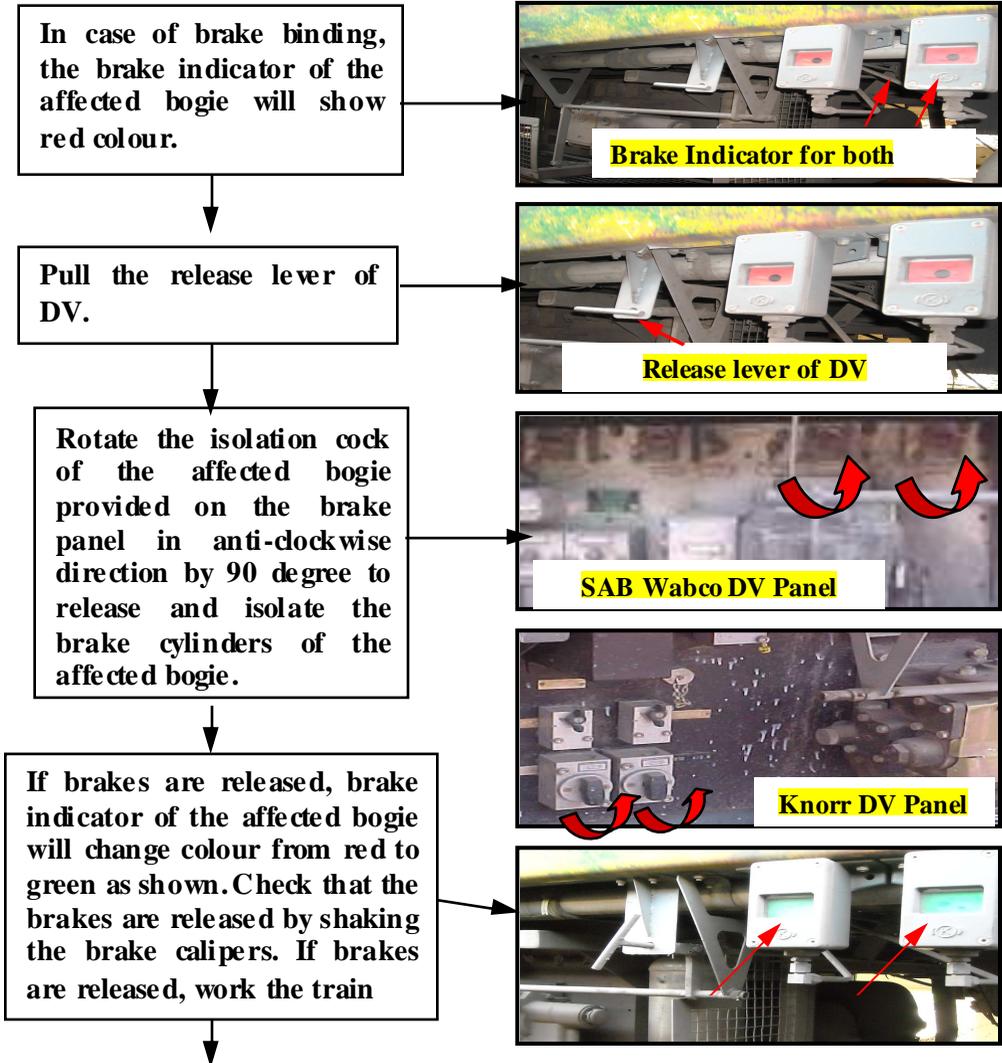


Brake cylinder piston rod pin



In case of problem in pulling the latch, remove the brake cylinder piston rod pin and work the train

Procedure to Release and isolate Brake Binding of LHB Coach with FIAT trolley at enroute stations (for Loco Pilots & Guards.)

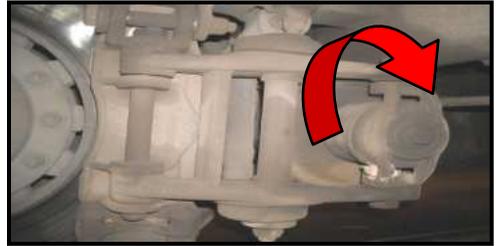




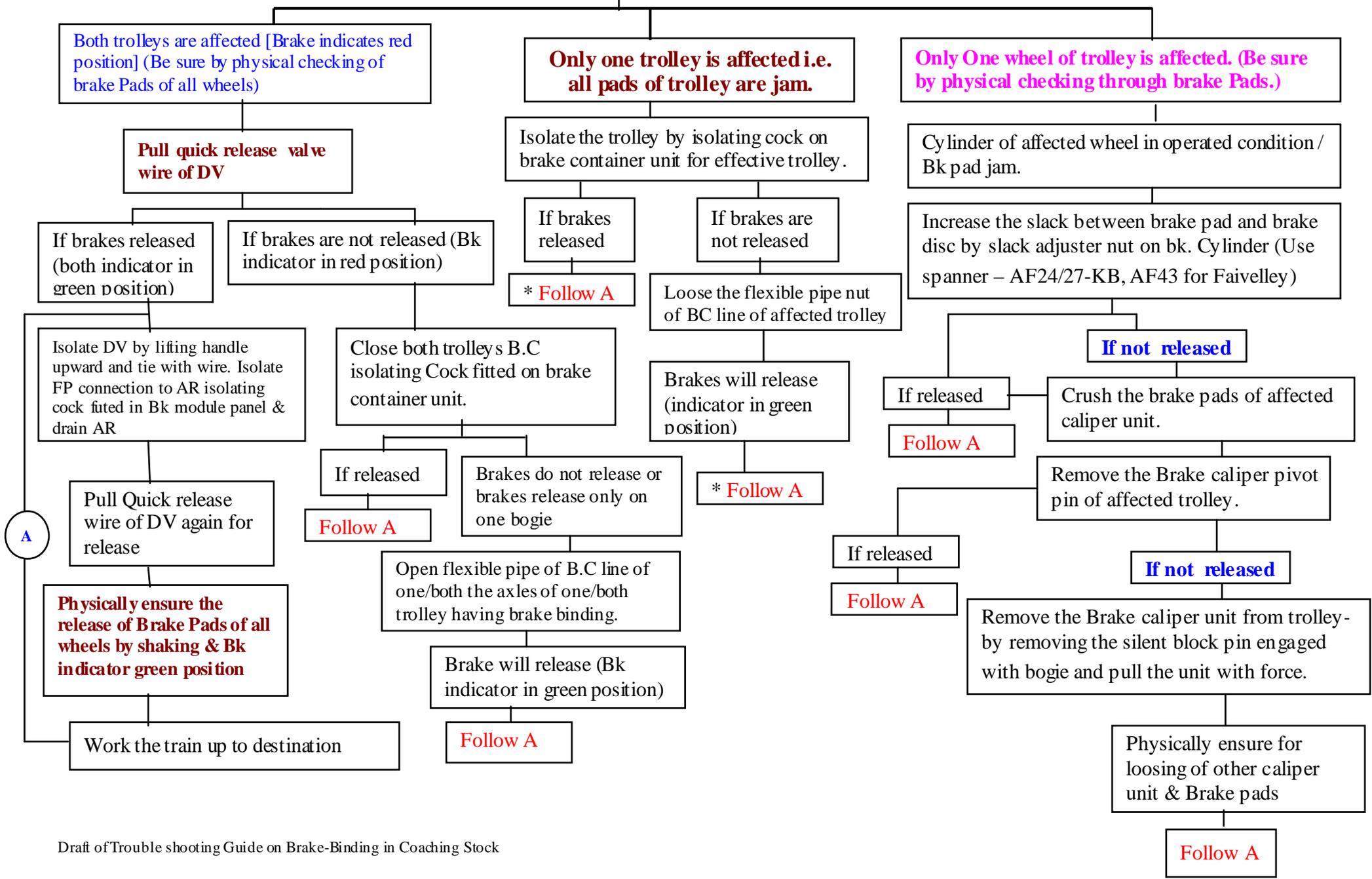
If not released



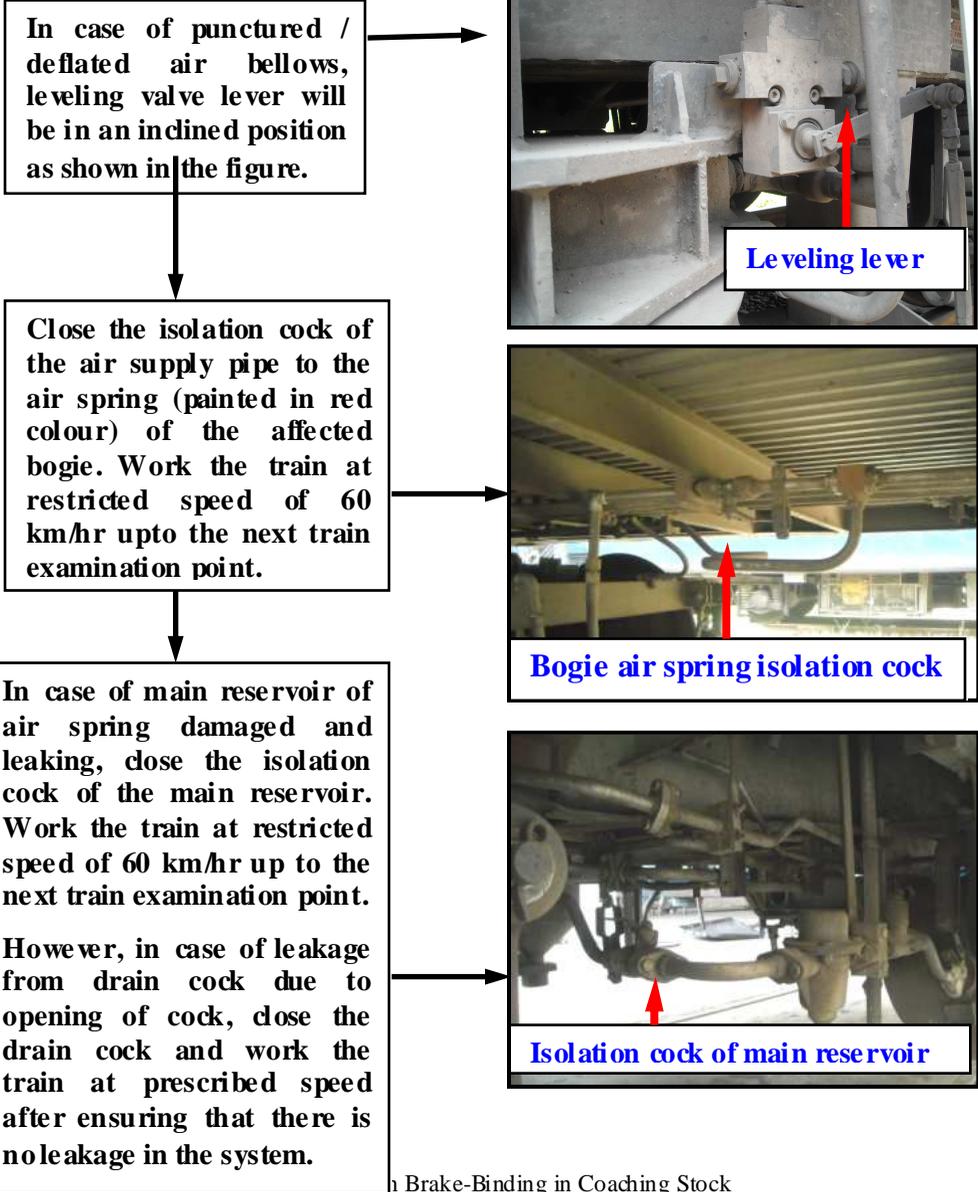
Loosen the hexagonal nut of the brake cylinder by 27 no. or 46 no. spanner. Check that the brakes are released by shaking the calipers and work the train.



Brake binding in LHB Coach



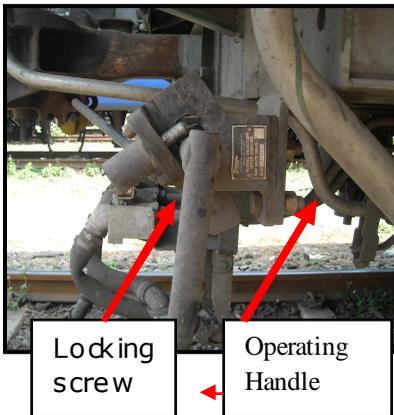
Trouble shooting of Air Springs provided in Secondary Suspension of Bogies



COUPLING/UNCOUPLING PROCEDURE OF CBC FITTED COACHES

Coupling Procedure:

- 1) Bring the coaches near each other at a slow speed and stop the coach at approximately one meter distance of each other.
- 2) Ensure that locking screw is in unlocked position otherwise unlock the operating handle by rotating locking screw anticlockwise with key.
- 3) Lift the operating handle and turn it in clockwise direction (by minimum 90°) to a horizontal position to open the CBC.
- 4) Check alignment and position of coupler centers and attach at approximately 2 to 3 km/hr speed.
- 5) Check position of tell tale device for proper coupling (location of the tell tale is shown in figure).



Tell tale sign should be clear after coupling of loco/coaches as indicated to ensure proper coupling.

- 6). Lock the operating handle by rotating the locking screw clockwise with key.
- 7). After coupling of the CBC, pull the train slightly for reconfirming positive coupling.

Uncoupling procedure:

1. Unlock the handle by rotating locking screw anti-clockwise.
2. Lift the handle and turn it in clockwise direction to a horizontal position by minimum 90^0 and pull the loco/coaches apart.
3. Before uncoupling, make sure that the couplers are not subjected to any tensile load and the operating handle is free to rotate.

Trouble shooting of coaches having LHB shell

1. Provision of spare BP and FP air hoses at each ends of Hybrid and LHB coaches :

These coaches are provided with two BP and two FP air hoses at both ends of the coach. All the air hoses are coupled to the air hoses of adjacent coaches and all the cut off angle cocks are kept in open condition.



- a. In case of BP or FP air hose failure between two coaches, close the cut off angle cock of the affected air hose and also close the cut off angle cock opposite to the affected air hose coupled to it.
- b. Conduct air pressure continuity test and proceed.

2. Working of Duronto Exp. in case of en-route BP/FP metallic pipe failure:

(1) FP failure:

- a. Bring the flexible coupling pipe having FP palm end of one coach length, kept in Guard's compartment / Pantry car or at any other location as mentioned on the BPC.
- b. Lay the flexible coupling pipe from one end of the coach to the other end from outside / inside of the affected coach. Secure / clamp the coupling pipe to prevent it from falling off / hanging.
- c. Close the FP cut off angle cocks of the coach in the front and of the affected coach. Uncouple any one of FP air hoses. Couple the palm end of the flexible pipe to the palm end of the uncoupled FP air hose of the coach at the front of the affected coach.

- d. Close the FP cut off angle cocks of the coach in the rear and of the affected coach. Uncouple any one of FP air hoses. Couple the palm end of the flexible pipe to the palm end of the uncoupled FP air hose of the coach at the rear of the affected coach.
- e. First open the FP cut off angle cock of the coach at the rear and then open the FP cut off angle cock of the coach at the front of the affected coach.
- f. Isolate the brake system of the affected coach. Ensure that brakes are released
- g. Conduct air pressure continuity test
- h. Work the train at restricted speed of **60 km/hr** in case of Hybrid coach (i.e. coach having LHB shell and ICF bogie) and at prescribed speed in case of LHB coach with FIAT bogie

(2) BP failure:

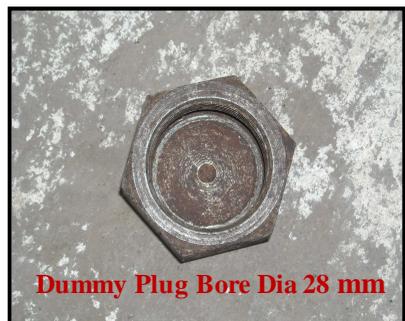
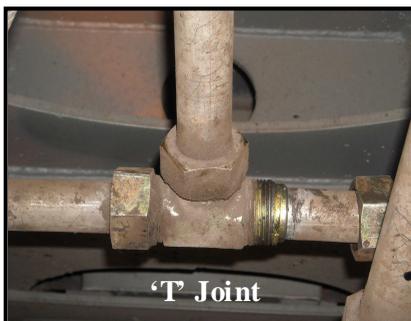
- a. Bring the flexible coupling pipe having BP palm end of one coach length, kept in Guard's compartment / Pantry car or at any other location as mentioned on the BPC.
- b. Lay the flexible coupling pipe from one end of the coach to the other end from outside / inside of the affected coach. Secure / clamp the coupling pipe to prevent it from falling off / hanging.
- c. Close the BP cut off angle cocks of the coach in the front and of the affected coach. Uncouple any one of BP air hoses. Couple the palm end of the flexible pipe to the palm end of the uncoupled BP air hose of the coach at the front of the affected coach.
- d. Close the BP cut off angle cocks of the coach in the rear and of the affected coach. Uncouple any one of

BP air hoses. Couple the palm end of the flexible pipe to the palm end of the uncoupled BP air hose of the coach at the rear of the affected coach.

- e. First open the BP cut off angle cock of the coach at the rear and then open the FP cut off angle cock of the coach at the front of the affected coach.
- f. Manually release and isolate the brake system of the affected coach.
- g. Conduct air pressure continuity test and work the train at prescribed speed.

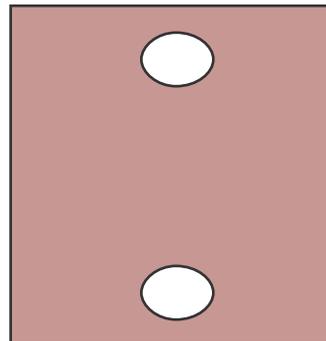
3. Trouble shooting in case of BP-FP cut off angle failure on the last coach (LHB coach FIAT Bogie)

1. Close rear Cut off angle cock of adjacent coach of the affected pipe.
2. Loosen the check nut fitted on 'T' joint and affected angle cock pipe.
3. Disconnect the affected pipe from 'T' joint by loosening holding clips.
4. Tighten the Dummy plug to that end.



4. Trouble shooting in case of BP-FP cut off angle cock failure on the last coach (Hybrid coach)

1. Close rear Cut off angle cock of adjacent coach of the affected pipe.
2. Loosen and remove the both bolts.
3. Make gap between block and affected angle cock pipe.
4. Insert Dummy plate between block and affected pipe flange.
5. Insert and tighten both bolts.



MS Dummy Plate
(98x65x2 mm)

**Procedure for By-passing BP pressure of a coach in case of
Brake pipe failure at enroute stations (for Loco Pilots &
Guards.)**

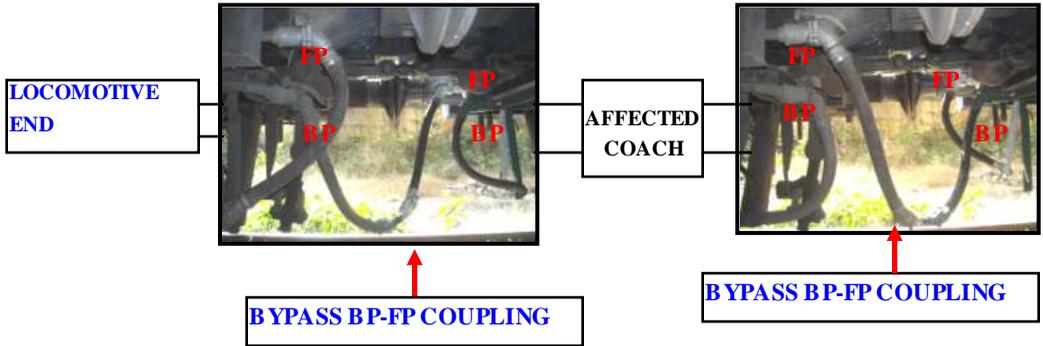


Fig. 1

ig. 2

- a. Collect two nos. of BP-FP BY-PASS Coupling from Pantry Car/AC II or Guard cab as per provision made.
- b. Close the FP and BP cut off angle cocks of loco end adjacent coach and the affected coach respectively. Wait till pressure of both air hoses releases. Uncouple BP and FP air hoses. Couple BP-FP BYPASS coupling between BP air hose of loco end adjacent coach and FP air hose of the affected coach. Place the spare hanging air hoses on hooks as in Fig. 1
- c. Similarly close cut off angle cocks of FP and BP of rear end adjacent coach and the affected coach. Uncouple BP and FP air hoses. Couple BP-FP BYPASS coupling between BP air hose of rear end adjacent coach and FP air hose of the affected coach. Place the spare hanging air hoses on hooks as in Fig.2
- d. Open cut off angle cocks of BP of rear end adjacent coach, both FP cut off angle cocks of affected coach and BP cut off angle cock loco end adjacent coach respectively.
- e. Manually release and isolate the affected coach.
- f. Conduct air pressure continuity test and work the train.

**CHECK LIST FOR INVESTIGATION OF BRAKE
BINDING IN COACHING STOCK**

1 General Particulars:

Date		Time	
Division		Section	
Caution order		Block section	
Weather condition		Km No.	

2. Train particulars:

Train no.		Loco no.	
Load		Banker no.	
BPC no.		Last examination station	
Type of stock		Primary depot	

3. Particulars of Driver:

Name		HQ	
Date of appointment		Date of promotion	
Safety category		Last PME	
Involved in Train parting / Accident in last two years			
Details of Ghat Driver		-	
Guard's name		HQ	

4. Particulars of affected wagons:

Coach no.		Type	
Built date		POH	
IOH		R/D	
Position from loco		condition of brake blocks/Disc	

Whether due/overdue sch.		Nomenclature	
--------------------------	--	--------------	--

5. Type of DV and make :

Make		Last overhauling	
Sr. no.		-	
Charging time		Releasing time	
Any leakage from DV		-	

6. Brake binding reporting:

Station	
Reported by (Dy. SS/Gateman/Guard/ Driver/ Points man/C&W staff of any other)	
Reporting time	

7. Other information

Whether cattle run over	
Any Loco changed enroute	
Any shunting carried out enroute	
Signals on approach	
Any Caution order observed before brake binding	
Any air leakage on train	
Condition of Hand brake	
Condition of w heels	
Condition of Air brake equipments	

a) Working of DV (Working / Isolated)	
b) Brake cylinder (Working / any leakage/ Piston sticky)	
c) Piston stroke: 60-70 mm for modified & 32-40 mm for BMBC Coaching stock	
d) Condition of SAB (Working / Not working)	
e) 'A' dimension: 22+2-0 mm for Coaching stock f) 'E' dimension: 375±25 mm for coaching	
Brake gear system (standard / non standard pins fitted or related parts missing)	
End pull rod hole position with respect to wheel diameter(Correct /Incorrect)	
Any application of emergency braking during run	
Whether Loco pilot did brake feeling test at first opportunity and given Releasing time to release the train fully.	
Whether complete train was released or not after Traction change , if any.	

8. Brief History:

9. Statement of Loco pilot:

10. Statement of Guard:-

11. Analysis: 1. 2.

12. Conclusion:

13. Responsibility:

14. Repercussion:

OUR OBJECTIVE

To upgrade maintenance technologies and methodologies and achieve improvement in productivity and performance of all Railway assets and man power which inter-alia would cover reliability, availability, utilization and efficiency.

If you have any suggestions and any specific comments, please write to us.

Contact person : Director (Mech.)

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