

SOUTH CENTRAL RAILWAY

Safety.387/Fly Leaf/2/2024.

Fly Leaf No. 2 / 2024

Attention..... All Concerned

HOT AXLE, CAUSES AND PREVENTION.

In the recent past, it was reported/observed that Train Crew and Station staff have failed to act promptly and observe the correct procedures, whenever unusual incidents/circumstances are arising out of train working. In order to prevent such failures, the following guidelines by connecting various instructions published in G&SR, Accident Manual, JPOs etc., from time to time are once again re-iterated for the benefit of staff.

Hot axle box in a railway vehicle occurs when inadequate wheel-bearing lubrication or mechanical flaws (bearing failure) cause an increase in temperature. If undetected, the bearing temperature can continue to rise until there is a bearing “burn-off” which may cause a derailment.

A hot box is the term used when an axle bearing overheats on hot axle journal of railway rolling stock. The term is derived from the journal-bearing trucks used before the mid-20th century.

Hot Axle is a phenomenon which causes due to breakage of ball bearing of wagons or Coaches which is moving on the rail track. It arises due to the overloading and faulty condition of the bearing. During Hot Axle, the wheel becomes very hot and the movement or the train stops due to jamming of bearing.

(A) CAUSES OF HOT BOX / HOT AXLE :

- I. Non-standard Lubricant
- II. Mechanical defects
- III. Irregularities in loading
- IV. Miscellaneous reasons

I. NON STANDARD LUBRICANT :

- Bad quality of grease.
- Excessive quantity of grease.
- Non availability / inadequate quantity of grease.
- Foreign material contained with grease.

II. MECHANICAL DEFECTS :

- ✚ Defects in journal
- ✚ Defective bearing
- ✚ Defects in Axle box
- ✚ Cage broken
- ✚ Oozing out of grease due to perished rubber seal

III. IRREGULARITIES IN LOADING :

- Uneven loading
- Over loading

IV. MISCELLANEOUS REASONS :

- ✓ Derailment
- ✓ Defects in rail track
- ✓ Excessive speed

(B) PROBABLE CAUSES LEADING TO HOT AXLE :

- Insufficient lubrication
- Incorrect fitment
- Improper mounting during maintenance
- Improper handling
- Excessive temperature or heating
- Excessive or uneven loading
- Impact loading
- Excessive Vibrations due to component wear and tear
- Contamination of lubricant (foreign particles, moisture)
- Earthing not proper for welding work.
- Poor engineman ship.
- Land slide or rolling of boulders.
- Sudden change of signal aspect.
- Poor maintenance of track.
- Wagon involved in Flood.

SYMPTOMS OF HOT AXLE / SEIZURE OF ROLLER-BEARING :

- ❖ Splashing / oozing of grease on wheel disc & Dis-colouring of grease.
- ❖ Smell of Burning grease.
- ❖ Dis-colouring of Axle Box paint (faceplate).
- ❖ Red glows during the night time only.
- ❖ Metallic noise after grease has worked out and roller have seized.
- ❖ Skidding of wheel at last stage.
- ❖ Tilting of springs in case of primary suspension.
- ❖ Light smoke from axle box.
- ❖ Axle box cover cut/missing.
- ❖ Hotness of axle box by feeling.
- ❖ Axle may be locked and wheel skidding.

- ❖ Marks of splashing of grease on wheel and axle box visible at low speed or at stationary.
- ❖ Discolouring of paint surrounded the axle box concerned.
- ❖ Burning out of molten front cover in case of coaches.

HOW TO DETECT HOT AXLE :

- During Rolling in Examination and Axle Box filling.
- While in Slow motion / Not in motion.

Day time	Night time
1. Smell of burning grease	1. Light smell of burning grease/EM pad
2. Splashing of grease on wheel disc & discolouring of grease	2. Axle Box cover becomes Red Hot
3. Light smoke from Axle box	3. Glowing of Axle Box
4. Discolouring of face plate	4. Hotness of axle box by filling / Non-contact thermometer.
5. Burning of EM pad over Axle Box	
6. Hotness of Axle box by feeling / Noncontact Thermometer	

WHILE RUN THROUGH :

Day Time	Night Time
1. Screeching Sound	1. Screeching sound
2. Axle may get locked and wheel skidding	2. Axle Box cover becomes Red Hot
3. Discolouring of Axle Box faceplate	3. Sparks on Rail due to skidding
4. Smell of burning grease	4. Burning of EM pad and flame over Axle Box
5. Vibrations of wagon /trolley	

TEMPERATURE ON NON-CONTACT THERMOMETER :

CTRB Axle box / Adopter temperature	State of bearing operating conditions	Action to be taken
Temp. of Axle Box found above 80°C	Excessively warm/Hot	Wagon to be detached
Temp. of Axle Box found above 65°C but below 80°C	Normal	Wagon allowed with C&W staff accompanied. Temperature to be checked / monitored en-route.

SPECIAL INSTRUCTIONS FOR AXLE BOX TEMPERATURE OF COACHES :

- If temperature is 80°C or beyond than coach should be detached from the train.
- Difference of temperature in same axle.

Sl. No.	Difference in temperature	Action to be taken
1.	Up to 10°C	Allowed in same condition
2.	> 10°C to 14°C	Inform to en-route C&W Examining point up to destination.

3.	> 14°C to 20°C	Accompany the coach by C&W staff up to destination
4.	Above 20°C	Coach to be detached.

PRECAUTIONARY MEASURES / PREVENTIVE ACTION TO BE TAKEN DURING ROH & POH TO AVOID HOT AXLES :

- (i) Earthing in wagons for welding should be done properly and very close to the welding area so that electric current does not pass through bearing, it will cause arcing between the rollers and raceways leading to failure.
- (ii) Work with clean tools in clean surroundings.
- (iii) Keep bearings wrapped in polythene sheet when not in use.
- (iv) Apply clean grease and keep grease in closed container when not in use.
- (v) Grease seal and locking plate should be replaced by new.
- (vi) RDSO approved brands of grease should be used.
- (vii) Never mix up the different greases of different grades or even different makes of same grade.
- (viii) Don't reuse locking plate.
- (ix) End cap screws properly tighten with the help of torque wrench at specified torque of 40 kg –meter (290 foot-pounds).
- (x) Each and every time lateral play of bearing must be check and UST of all Axles should be done.
- (xi) Load wear Zone area of bearing must be changed during fitment.
- (xii) All tabs of locking plate are properly bent up against the flats of the cap screw heads.
- (xiii) Damaged outer cup bearing should not be allowed in service.
- (xiv) It must be ensured by stamping particular of grease seal that the CTRB would not complete more than 72 months by the time it becomes due for next POH / ROH.
- (xv) The dismounting of bearing by oxy cutting strictly prohibited, as above such defects are considered very prone to generation of fatigue during service.
- (xvi) Overhauling cycle of new CTRB to take place of 72 months interval.
- (xvii) Final Mounting force (Value to observe) should be 37–42 tonnes (for Timken make) and 28–32 tonnes (for SKF make) on bearing installations.
- (xviii) Quantity of grease is used 400+30 gms. Now-a-days in place of 430 ± 30 gms.
- (xix) AAR approved Lithium base quality of grease must be used.

DUTIES OF RAILWAY SERVANTS IN CASE OF HOT AXLE ON RUNNING TRAIN :

- (i) Any railway servant, observing symptoms of hot axle, seizure of roller bearing is noticed / reported on a running train, Station staff should exhibit

danger hand signal and must do everything possible in their capacity to warn the train staff and to stop the train immediately.

- (ii) Inform TPC in case of electrified section to take immediate steps to switch off the electric supply of OHE and advise Loco Pilot of the circumstances when he contacts on emergency phone. (SR 4.42.8 (iii))
- (iii) Whenever station staff notices a train worked by an electric engine passing with a hot axle/any vehicle running in dangerous condition or smoke/fire emanating from a vehicle or with any other abnormality in the running train which is likely to endanger safety of the train/passengers, the Switchman/Station Master shall immediately take steps to stop the train. In case they fail to stop such train by normal means as laid down in G & SR, then, they shall immediately inform the TPC either directly or through SCOR to switch off the power supply of the OHE of the affected section under exchange of PNs. In case TPC has been directly informed, SCOR has also to be informed subsequently. (SR 17.09.1.11)
- (iv) If all attempts fail to draw attention of the train staffs, the Station Master / Cabin Master / SM / Switch Man shall inform to the SM of the station in advance to stop and examine the train through available communication and shall also inform the Section Controller.
- (v) If it is in block section and after the examination of GLP, it is LPs discretion with regard to restrict speed to clear then block section.
- (vi) On receiving the message "Stop and Examine the Train" the SM shall not admit the train directly at station unless he is satisfied that the train has come to a stop at the first stop signal. Then only the approach signals shall be taken OFF for admission of train on Main Line.
- (vii) On receiving the message "Stop and Examine the Train" or information about Hot Axle, the SM of the advance Station can receive the train on to main line or if not possible, shall not admit the train directly at station unless he is satisfied that the train has come to a stop at the first stop signal. Then only the approach signals shall be taken OFF for admission of train on to loop line.
- (viii) In the event of the main line being not available and the train is to be received on a loop line, the SM, after ensuring that the train has come to stop outside the first stop signal, shall arrange to advise the LP of the train of the reason of the train being so stopped through a Station Staff / Points Man. The speed of train, while admitting on loop line, shall not be more than 10 KMPH.
- (ix) The LP on being so advised shall examine the train to ascertain if it would be safe to work the train up to the station negotiating the crossover for entry into the loop line. The train, thereafter, shall be piloted up to the station after fixed signals have been taken OFF and it has been ascertained by the LP that it is safe to do so. The LP while negotiating the facing points shall observe the speed restriction, which under no circumstances, shall exceed 10 KMPH.
- (x) The vehicles / wagon with hot axle must not be worked onward with the train, if found running hot at a station, where the C&W staff are not provided, the vehicle shall be detached from the train. (SR 4.29.1)
- (xi) In case an axle box is observed/found running hot between stations (in the block section) the train shall be brought to a stand immediately and the axle box examined by the Loco Pilot after opening the axle box face plate. The

Loco Pilot should attend to the axle box and exercise his discretion with regard to the restricted speed at which it is safe for the vehicle to run. On arrival at the next station the vehicle shall be detached from the train. (SR 4.29.2)

- (xii) The Station Master receiving advice of a hot axle vehicle on a train shall receive it on the Main Line. If he is unable to do so, he shall bring the train to a stop outside the First Stop Signal (FSS) before admitting it on any other line. After the arrival of the train at the station, the hot axle vehicle shall be examined by the C&W staff, where provided or by the Loco Pilot of the train. The wagon shall be detached if considered unsafe to run. (SR 4.29.3)
- (xiii) When the Station Master receives advice of a vehicle on a train whose running gear is in any way considered dangerous, he shall bring the train to a stop outside the FSS and the train shall be thoroughly examined before being admitted into the station yard. (SR 4.29.4)
- (xiv) In the event of any vehicle derailing or meeting with an accident, no repairs, except those absolutely necessary, shall be carried out. No such vehicle shall be worked away from the station at which the accident took place or to which it has been brought for stabling from the accident spot except with the permission of the DRM, as it is important, in the event of any enquiry, to have the vehicle as near the scene of the accident and in the same condition as possible. The vehicle, before being moved with the permission of the DRM, shall be examined and certified by the C&W STAFF as fit to run. (SR 4.29.5)
- (xv) When a vehicle has been detached from a train due to defect or damage, the nearest C&W STAFF shall be advised. This vehicle shall be stabled and secured separately. Unnecessary shunting with or against such vehicle shall be avoided. The vehicle shall not be accepted again for traffic use or worked away from the station until certified fit by the C&W STAFF. (SR 4.29.6)
- (xvi) Water must not be poured on the Hot Axle for to cool it but wait until it gets cooled by itself. If there is fire on the hot box then fire extinguisher, sand, soil can be used to extinguish the fire.
- (xvii) The vehicles / wagons with hot axle shall be detached from the train on arrival at the station. And it will be entered in the Wagon Exchange Register and the concerned C&W STAFF shall be informed about it. Para 4.10 of BMW (Block Working Manual) shall be followed for other instructions.

ACTION TO BE TAKEN BY :

- 1. Station Staff :**
 - (a) Check for above symptoms while train passing.
 - (b) Alert the crew by shouting on Walkie-Talkie and displaying stop hand signal.
 - (c) Put-back the departure signal. Advise the train crew through VHF set to stop & examine the train.
 - (d) Inform the Gateman, SM of the next station & Section Controller.
 - (e) Advise the controller to arrange to stop the train as early as possible.
 - (f) Advise the SM in advance not to allow any train in the opposite direction under exchange of Private Number.

- (g) SM receiving advice of a hot axle vehicle on a train shall receive it on the Main Line. If he is unable to do so, stop the train at first stop signal and receive on to other line.
- (h) On arrival at the station, advise the C&W Staff or Loco Pilot to examine the vehicle and act accordingly for further movement.

2. Train crew :

- (a) Lookout while running on curves for any symptoms unusual.
- (b) Stop the train by first means.
- (c) Examine the effected vehicle.
- (d) Exercise your discretion and take decision.
- (e) Loco Pilot / Train Manager (Guard) should watch carefully the signals exhibited by station staff, gateman or any other railway servant and act immediately to control speed.

3. Engineering and S&T staff :

- (a) Be vigilant while train is passing through.
- (b) Inform about any unusual noticed in train to the nearest Station Master/Controller.
- (c) Show danger signal and try to alert the guard by shouting/warning.
- (d) Arrange to stop the train immediately.

4. Section Controller :

- (a) Arrange to stop the train if hot axle on train is reported by field staff and station staff.
- (b) Inform to concerned departments and get it examined by Guard/LP/Station staff.
- (c) Train should be stopped and checked as far as possible for any symptoms noticed.
- (d) Such train should be allowed to enter station only after it is checked.

5. C & W Staff :

- (a) Carry-out carefully Rolling-IN and Rolling-OUT examination on all trains at nominated stations/yards.
- (b) Feel the axle boxes immediately by non-contact thermometer (NCT) gun on arrival of trains.
- (c) Detach the vehicle if hot axle is noticed and axle box temperature is beyond 80° C.

PRINCIPAL CHIEF SAFETY OFFICER

SAFETY ORGANISATION

SOUTH CENTRAL RAILWAY