

**Government of India
Ministry of Railways
Research, Designs & Standards Organisation
Manak Nagar, Lucknow - 226 011**

No. EL/3.2.30

Dated : 25-9-1992.

**SPECIAL MAINTENANCE INSTRUCTIONS NO.
RDSO/ELRS/SMI/144
FLASHING INSIDE THE SELECTOR OF TAP CHANGER No. 32**

1. OBJECT

Railways have reported cases of flashing inside selector assembly. The probable reasons and remedial measures to minimise these flashovers are listed in the following enclosed instructions for compliance.

2. INSTRUCTIONS

- i. Flashing inside selector, probable reasons and remedial measures
Annexure - 1)
- ii. Cause effect diagram (Annexure - 2)
- iii. Guidelines for correction of making and breaking angles of contact segments and load switch contact of tap changer (Annexure - 3)
- iv. Check sheet for the flashing inside selector (GR) of tap changer No. 32
(Annexure - 4)
- v. Modification in insulating ring (1218, 1219) fixing arrangement
(Already issued by RDSO WAM4/157 on 3.11.1989)

3. REFERENCE

Instructions already circulated to Railways by M/s ABB during co-ordination meeting held on 8.1.1992 at Baroda.

4. INSTRUCTION DRAWING

Nil

5. APPLICATION TO CLASS OF LOCOMOTIVE

All locomotives fitted with No. 32 tap changer of M/s ABB make

6. AGENCY OF IMPLEMENTATION

Sheds/Shops

7. PERIODICITY OF IMPLEMENTATION

As per the instructions enclosed.

8. DISTRIBUTION

All Chief Electrical Engineers



(Arun Srivastava)
Krite Maha Nideshak/Vidyut.

Encl./As above

ANNEXURE (I)

**FLASHING INSIDE SELECTION, PROBABLE REASONS AND
REMEDIAL MEASURES.**

- 1 Deterioration of transformer oil due to moisture absorption & copper deposition.
- 2 Tracking of insulating ring/contact plate due to copper deposition
- 3 Incorrect making and breaking angle of contacts and load switch.
- 4 Looseness of contact segments
- 5 Looseness of insulating ring
- 6 Discontinuity of contact of central gearing with 16th notch
- 7 Discontinuity of 1 lakh ohm resistor across load switch
- 8 Lesser contact pressure between roller and taps
- 9 Wrong assembly
- 10 Failure of connection of condenser bushing
- 11 Failure of RGR
- 12 Sticking of SMGR

(II) The probable cause of moisture absorption of transformer oil are --

1. Through Air breather
2. Suction of air through oil pump pipe connection joints
3. Safety valve and condenser bushing sealing becoming ineffective

(III) The copper deposition inside selector could be due to

1. Non functioning of oil pump
2. Periodic cleaning/replacing of filter element of PHGR not being done

(IV) To prevent flash over inside selector the following guidelines are suggested

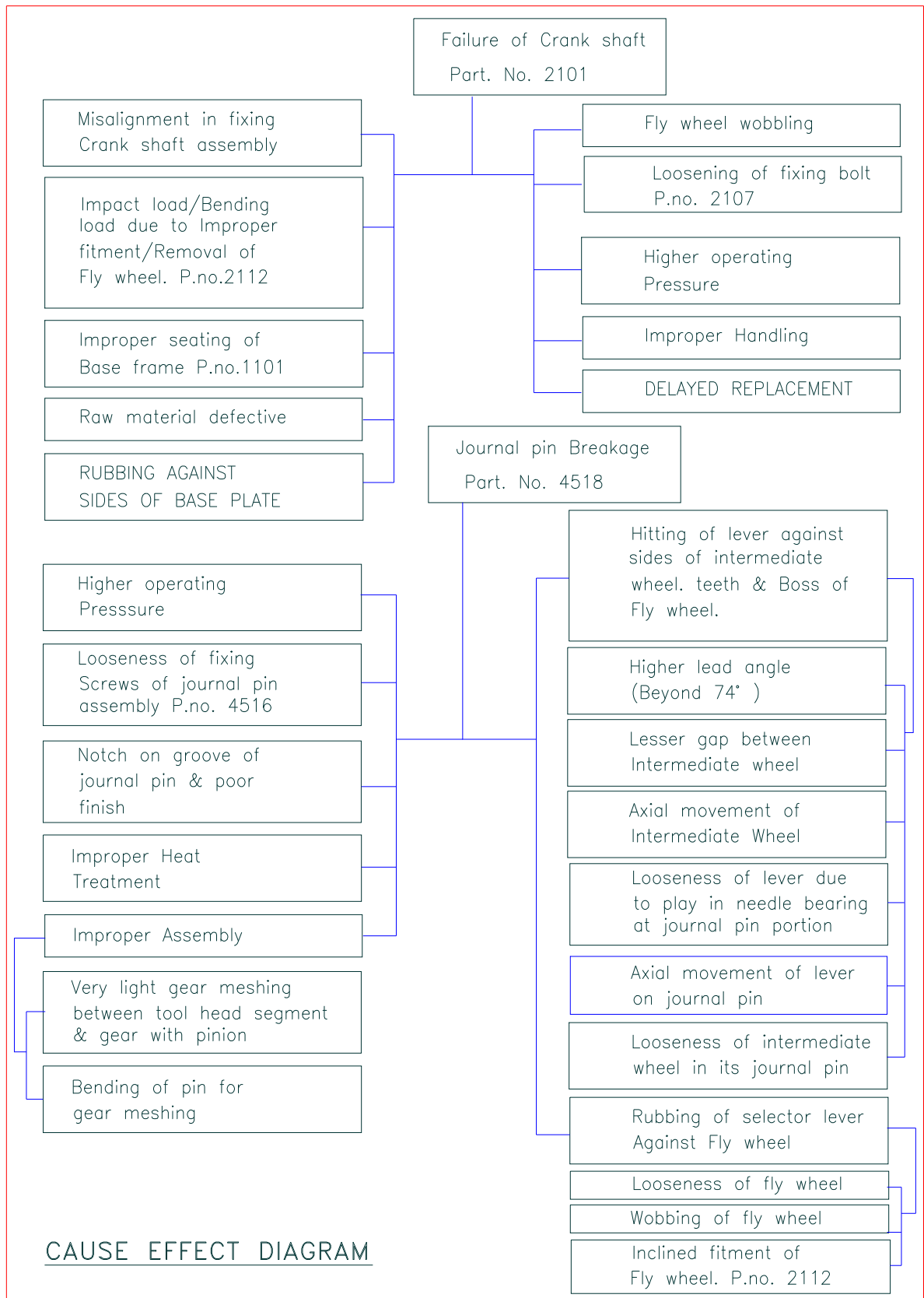
--

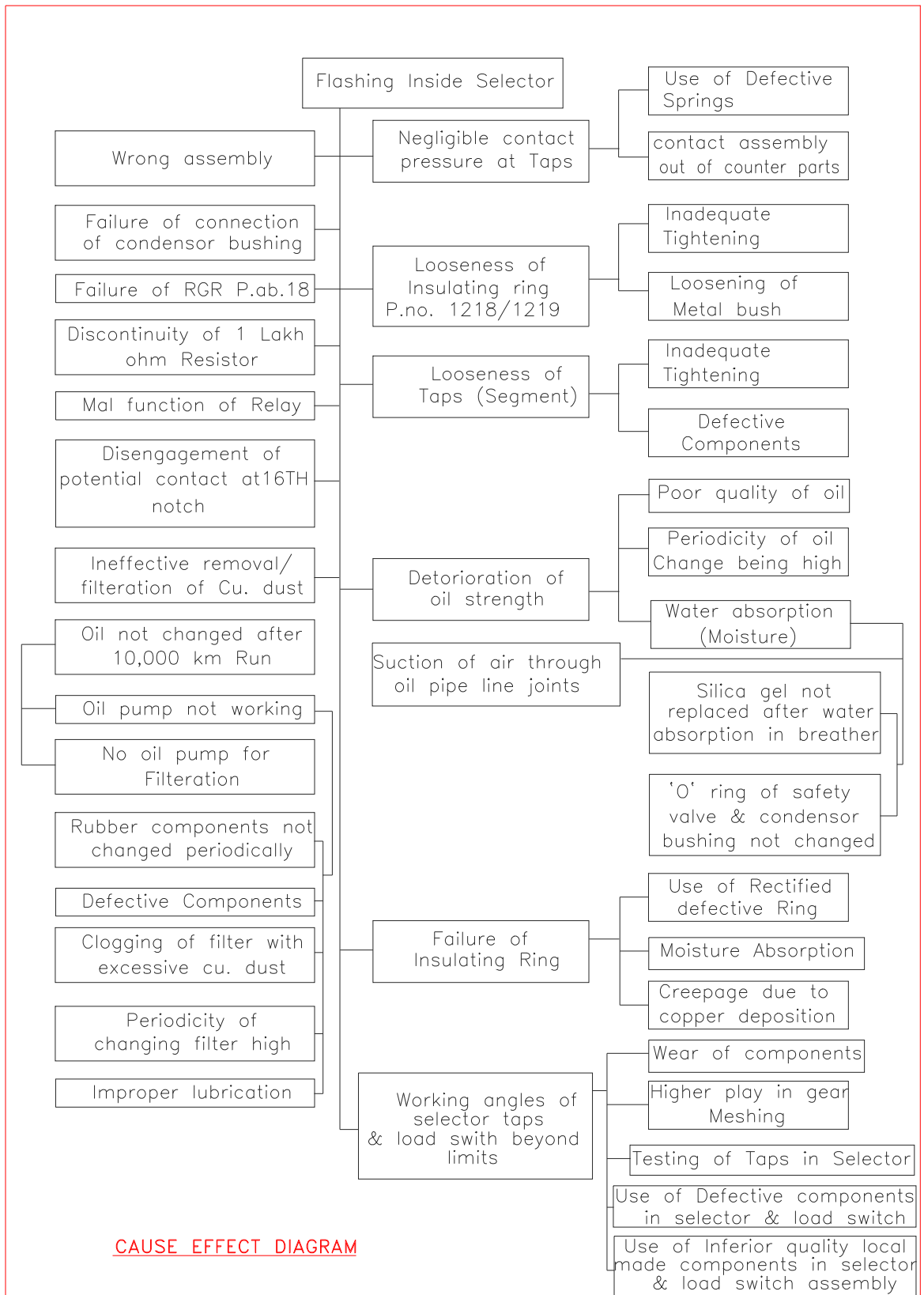
1. During trip inspection / IA /IB 10,000 Km run condition of silica gel in the breather to be observed. If it has turned to pink it should be changed.
2. The 'o' ring of safety valve condenser bushing to be changed every IOH
3. Proper functioning of oil pump is to be ensured. During every AOH all the 'o' rings and cup seals (32 , 3235) are to be changed, only BharatMP2 grease is to be used for lubricating slide valve housing 3269 and cylinder 3243.

It is some times observed that the piston complete 3270 gets stuck up and the pump stops functioning. This is mainly due to higher frictional force exerted due to swelling of cup seal, leakage at the joints and poor finish of housing itself. These points are to be taken care and as a final check the free movement of piston complete to be checked with a load 800 gm. It should move freely from one end to other at this load

4. When oil pump is running, oil flow in the oil flow indicator is to be observed. If there is no clear oil and air bubbles are seen air is being sucked into the selector. To prevent the same all pipe joints are to be made leak proof. Oil pump 'O' rings are to be changed every AOH.
5. Replace filter in AOH
6. The making and breaking angles of contact and load switch are to be checked during every AOH. The wear and tear of components , the play in the assemblies affect these angles. (Refer Annexure - 3_)
7. The contact segments are to be tightened with 2.5 kg meter torque. While tightening care should be taken to see that the segments are not tilted. This can be done with the help of shims. Further the tightness of segments to be checked by hand. (Refer RDSO/SMI/113 dated 16.3.1984)
8. The special hex. bolts of insulating ring are to be tightened with 0.5 kg metre torque
9. In the case of insulating ring having under gone a years service, during AOH they can be heated at 70 to 80 C for 4 to 6 hours to drive away the moisture . Soon after the heating they should be kept in the filtered oil or Elmo-luft 1A of Dr. Beck's varnish may be applied which is an air during varnish.
10. Continuity of potential contact with 16th notch to be ensure during every AOH.

11. After 10,000 km. run, after commissioning of loco the transformer oil in GR to be changed with fresh filtered oil. The oil strength should be min. 48 kv/mm
12. It is recommended to incorporate the 1 x mm spacer between stud and insulating ring at their fixing points to increase the creep distance. The modification to be done as per sketch TG-118. The special bolt 1221 also to be changed to accommodate the spacer (6.4 x 14 x 1) (Refer RDSO Modification Sheet No. WAM4/157 dated. 3.11. 1989)
13. The moisture content and acidity test of transformer oil of GR to be done during every IC inspection and if required oil is to be changed.





**GUIDE LINES FOR CORRECTION OF MAKING AND BREAKING
ANGLES OF CONTACT SEGMENTS AND LOAD SWITCH
CONTACT OF TAP CHANGER NO. 32**

The making and breaking angles of contact segments and load switch cams are maintained within $\pm 3^0$ during manufacturing.

The various factors which determine the accuracy of these angles are :

1. Play between level gear pairs 1924/1925, 1408/1480.3, 1481.7/1449, 2103/1490.1, 2109/2209
2. Play between coupling pin 1435 and coupling shaft 1480.5/1481.5
3. Play between lantern gear roller 1470.2 and drive wheel 1457.
4. Play between actuating plug 1470.4 and stepping wheel slot 1501.
5. Correct positioning of contact plate 1201
6. Correct positioning of contact segment 1215/1216
7. Proper Assembly of contact arm complete 15
8. Component accuracy of insulating rings 1218/1219, contact segment 1215/1216, contact roller 1515 stepping wheel 1501, drive wheel 1457, lantern gear 1470, contact plate 1201, roller housing 1513 and other associated components.

In service the wear and tear of the following components affect these angles

- a.) Insulating ring 1218/1219
- b.) Contact roller 1515
- c.) Contact segment 1215/1216
- d.) Lantern gear roller 1470.2
- e.) Lantern gear pin 1470.4

- f.) Wear on teeth profile of stepping wheel 1501
- g.) Drive wheel profile wear 1457
- h.) Coupling pin 1435
- i.) Bevel gear
- j.) Cam Disc. complete 2220.1/2220.2/2220.3
- k.) Looseness of coupling pin 2102.3
- l.) Wear of contact 259

A variation of $\pm 4.5^\circ$ is permitted to take care of the wear and tear of above components. In case the angles are going beyond the above limits attention is to be paid to the above points/components and change the components, if required, to bring the angle within limits. The permissible play between the affecting components are given below for necessary checking.

1. Max. permissible play 0.2mm between Bevel gear pairs 1924/1925, 1408/1480.3, 1481.7/1449, 2103/1490.1, 2109/2209.
2. Max. permissible play 0.2 mm between coupling pin 1435 and coupling shaft 1480.5/1481.5
3. Max. permissible play 1mm between lantern gear roller 1470.2 and drive wheel 1457.
4. Max. permissible play of 0.3 mm between actuating plug 1470.4 and stepping wheel slot 1501
5. Max. permissible tilting of 0.25 mm of contact segment 1215/1216 from the normal position
6. Max. 0.5 mm groove may be permitted on contact segment 1215/1216

The following dimensions can be taken as guide line for changing the components.

- a. Contact roller \varnothing 17mm (1515)
- b. Lantern gear roller \varnothing 15.5mm (1470.2)

c. Lantern gear pin Ø 9.8mm	(1470.4)
d. Coupling pin dim. 9.8mm	(1435)
e. Cam disc. complete Ø 109mm	(2220.1), (2220.2) (2220.3)
f. Contact wear max. 5mm	(2529)_

The maximum contact arm (part No. 15) play permissible in full notch condition is 10 mm and in half notch condition is 4 mm.

It should be noted that the above limits are given for guidance purpose only. If the limits of many of the components are on the extreme side the angles may still go out due to the combined effect. In that case some components may have to be replaced to minimise the play.

If the contact segment angles are going beyond the limits. Following procedure may be adopted.

- 1) Check the Titling of Contact Segment. Maximum permissible Tilting 0.25mm. Reposition Segment within the permissible value and check angle.
- 2) Reposition Insulating ring utilising the play in its fixing bolts and measure the angle.
- 3) Check wear on the Insulating Ring milled edges. If the edges are tapered off due to wear change the Insulating Ring and measure angle.
- 4) Measure the Contact Arm play in full notch and half notch position. If they are beyond 10mm and 4mm respectively then measure play of mating components as detailed above and change/adjust the play of components to bring the contact arm play within limits.
- 5) If Contact Arm play is within the limits and still Angles are going out it is an indication that the initial contact arm position itself is shifted. In that case gear plate assembly 1477 alongwith gear box assembly 1453 is to be repositioned utilising the play in the fixing bolts. Alternatively the play is to be minimised by changing new components which are detailed above.

If load switch cam angles are going beyond limits adopt the following procedure.

1. Check and minimise Bevel gear play 2103/1490.1, 2109/2209, 1924/1925
2. Measure Contact wear. If it is very near to the limiting pt. change the Contacts.
3. Measure wear on cam disc complete 2220 and replace if necessary
4. Check looseness of coupling pin 2102.3. If looseness is found change the coupling shaft 2102
5. Check the looseness of cam disc complete 2202.1 in the hex. shaft 2220.4. If looseness is found avoid play using suitable shims between shaft and cam disc complete.

(K.K. Rao)

CHECK SHEET FOR THE FLASHING INSIDE SELECTOR
(GR) OF TAP CHANGER NO 32

GENERAL :

1.	Sr. No. of selector (GR)	<div></div>
2.	Loco Sr. No./Type	<div></div>
3.	Commissioning date	<div></div>
4.	Whether it is a line failure . if not when detected.	<div></div>
5.	When last AOH done	<div></div>
6.	When oil was changed (of GR)	<div></div>
7.	When last BD value of GR oil checked. What was the value?	<div></div>
8.	Whether oil pump was working	<div></div>
9.	What is the colour of silica gel. in Breather of failed Tap changer	<div></div>
10.	Whether Q44 Relay has operated	<div></div>
11.	When contact angle measurement last done	<div></div>
12.	Whether there is any failures in the associated equipments.	<div></div>
	If yes, what is the failure	
13.	Whether 1 lakh ohm resistor is ok	<div></div>
14.	Whether there is any associated failures of Air Motor/Load Switch.	<div></div>
	If yes, give details	
15.	Whether safety valve has operated	<div></div>
16.	Whether oil changed after first 10,000 km.	
	If yes, when changed.	<div></div>

After opening the selector record the following :

1. Whether there is copper deposition. Whether it is heavy medium or light.

Heavy

Medium

Light
2. Whether there is continuity of potential contact at 16th notch

Yes

No.
3. Whether there is flash mark in the central gearing.

Yes

No.
- If yes which part
4. Whether there is flash mark at the selector housing/cover.

Yes

No.
5. Are the contact flashed.

Yes

No.
- If yes which are the contacts
- 5.1 Does the flashing is at the leaving and making portion of contact.

Yes

No.
- If No. explain with sketch
6. Does Insulating Rings affected.

Yes

No.
- If yes give details.
7. Has the roller flashed.

Yes

No
- If yes give details.
8. If there is flash mark on contact rings.

Yes

No.
- If yes give details.
9. Is there flash mark on connection of condenser bushing.

Yes

No.
10. Condition of contact plate..

Good

Carbonised

Broken

If carbonised/broken give details with sketch.

Make of contact plate

Imported

HBB

Local
11. Explains condition of contact Arm
12. Any other abnormal condition inside selector which might have caused failure