

MAINTENANCE INSTRUCTION No. TI/MI/00034 (Rev. 0)**SPECIAL MAINTENANCE INSTRUCTIONS (SMI'S)**
FOR CONTACT WIRE IN OOR OHE**1. OBJECTIVE:**

To evolve maintenance procedure for arresting the failures of contact wire in Out -Of-Run (OOR) OHE.

2. BACK GROUND:

2.1 RDSO started analysis of all the cases of contact wire failures form May'97. Based on the information furnished by the Railways to RDSO, analysis of the failures upto December'98 has been carried. The study reveals that 43% of the total failures reported to RDSO (41% of the failures from May'97 to Dec.'98) have occurred at out-of-run (OOR) contact wire in anchor spans where as the extent of OOR OHE is only 13% of the total OHE. Thus failures/unit length of contact wire are 5 times more in OOR OHE compared to the failures in in-run (IR) OHE. During 1998, out of total 30 failures, 14 have occurred at OOR OHE containing 11 failures at/close to Raised Register Arm (RRA) clamp, 1 joint failure and 2 at other locations. Also these failures in OOR OHE are not related to the age of the contact wire. Details of the failures w.e.f. May' 97 are given in annexure -I with the breakup in annexure-II.

2.2 The failures have been examined critically in TI Lab and M&C directorate of RDSO. Mode of fracture as seen on Scanning Electron Microscope (SEM) indicated both overload in tension & bending. To investigate into the excessive failures taking place at OOR OHE, various locations in the field were inspected jointly by the officials of TI and M&C Directorate's.

2.3 Being not used for current collection, the OOR OHE is not subjected to the stresses and wear which the OHE in- run (IR) is subjected to. The investigations revealed that at RRA clamps, vibrations caused by movement of train, wind etc. result the edge of the clamp to dig into the wire causing considerable reduction in area & even occasional cracks on wire. During maintenance, the staff sometimes hit/hammer the RRA clamp while plumbing the cantilever assembly which results in excessive mechanical stresses/fatigue, damage to the wire at the clamp fitting. The location becomes more susceptible to failure due to bending of the wire for anchoring.

- 2.4 In ACTM (para 20326 and 20329, vol. II part I), in case of contact wire, maintenance of kinks/twists, PG clamps/clips and jumpers only is specified. No specific instructions for maintenance of contact wire in the OHE at OOR is prescribed. Keeping in view the majority of failures at/near RRA clamp, it is considered necessary that special maintenance be introduced at such locations to arrest these failures.

3.0 **PROCEDURE:**

3.1 **One time inspection drive:**

Before a regular schedule at the specified periodicity for special maintenance checks is followed, *it is necessary that one time special drive is undertaken to inspect the OOR OHE thoroughly and necessary corrective measures are taken. Special attention may be paid to locations where the failures have occurred repeatedly. Maintenance checks are given below in para 3.2 below.*

3.2 **Checks to be carried out**

I) At RRA clamp (Part No. 1370-1): -

a) **Periodicity:**

Annual or whenever the location of the clamp is changed.

b) **Work to be carried out:**

- **Open the RRA clamp.**
- **Check for cracks/damages to the contact wire and sharp edges/defect in the clamp fitting with the help of magnifying glass, check for deformation of RRA clamp.**
- **Take corrective action as required.**
- **Check for cracks/damages to the contact wire in the vicinity of RRA clamp specifically at the previous positions of the clamp. Take corrective action such as changing the contact wire/providing splice/contact wire ending clamp as deemed necessary.**

c) **Shifting of RRA clamp:**

Whenever there is any need for shifting the position of RRA clamp, it should be ensured that the clamp bolts are loosened properly & then only the shifting is done. Under no circumstances, should the clamp be hit/hammered for shifting as the contact wire is liable to be damaged in the process.

- ii) G-Jumper, anti theft jumper and PG Clamps: -**
- a) **Periodicity -**
Annual or whenever the location of the clamp is changed.
- b) **Work to be carried out-**
- The G-jumper should properly be fixed with adequate allowance for travel during expansion/contraction of the wire. At locations near substations and liable to carry large amount of current, it should be ensured that the G-jumper are provided as per the arrangement given in RDSO Drg. No. ETI/OHE/G/05102
 - Check for damage to the jumper wire strands & replace if necessary.
 - Open out the PG clamps, check for damage to the jumper wire/contact wire. Check the PG clams for any corrosion/over heating/sharp edges etc. and take corrective action.
 - Before restoring connections clean the grooves & wire properly.
 - Tighten the clamps with the help of torque wrench to avoid over tightening.
- iii) Contact Wire ending clamp fittings (Part No. 1110-2 & 1120-1): -**
- a) **Periodicity: During POH**
- b) **Work to be carried out:**
- Open the clamp and check for damage to the contact wire and sharp edges/deformation in the ending clamp.
 - Provide new ending clamp if required.
 - If any damage to the contact wire is noticed, cut the piece of the contact wire, provide the ending clamp and adjust the OHE with the help of adjuster.
- iv) Equalizing Plate of ATD (Part No. 5191):-**
- a) **Periodicity: During POH**
- b) **Periodicity: During POH**
- It should be checked that the equalizing plate is in vertical position so that the tension in contact wire and catenary wires is equal. In case, its is not vertical, the adjustment should be carried out by adjusters or by cutting of conductors as required.

Annexure –1

Sl. No	Date of failure	Year of failure	Rly/ Section	Manufacturer	Year of commission	Type of C.W	Remarks	Location	Cause of Failure
1.	13/05/97	1997	SC Rly	JME	1989	NK	OOB	Dist from support clamp 18 m	Joint failure
2.	14/06/97	1997	SE Rly	Veekay	1991	NK	OOB	Snapped at end clamp fitting	End clamp fitting
3.	24/07/97	1997	W Rly	Veekay	1985	Jointed	OOB		Parting
4	31/07/97	1997	E Rly	CDL	1997				**not due to material failure
5	09/10/97	1997	SE Rly	NICCO	1986	NK	IR	2m from swivel clip	
6	16/10/97	1997	W Rly	NICCO	1983	Jointed	IR		Parting
7	22/10/97	1997	SC Rly	JME	1989	NK	IR	Mid of span	material failure , CW snapped
8	28/01/98	1998	C Rly	NK*	1984	Jointed	IR		Joint failure
9	06/02/98	1998	W Rly	Veekay	1990	Jointed	OOB	At RRA Clamp	
10	11/02/98	1998	C Rly	NK*	1988	NK	OOB	At RRA Clamp	
11	26/02/98	1998	SE Rly	Veekay	1991	NK	OOB	At the edge of RRA Clamp	
12	11/03/98	1998	S Rly	NICCO	1992	NK	IR	6m from RRA Clamp	** Inclusion of foreign material
13	17/03/98	1998	C Rly	Veekay	1988	NK	IR		Joint failure
14	23/03/98	1998	W Rly	NICCO	1973	Jointed	OOB		Joint failure
15	11/04/98	1998	C Rly	JME	1988	NK	IR		**Joint failure
16	21/04/98	1998	C Rly	JME	1988	NK	IR		Joint failure
17	26/04/98	1998	W Rly	NICCO	1997	Jointed	OOB		Impurity in CW
18	20/05/98	1998	W Rly	Veekay	1995	Jointed	IR	Dist from support 5m	Material failure
19	23/05/98	1998	SE Rly	JME	1994	NK	OOB	At RRA Clamp	
20	24/05/98	1998	W Rly	Veekay	1987	Jointed	OOB	At RRA Clamp	
21	28/05/98	1998	SE Rly	Veekay	1995	NK	OOB	Exit point of contact ending clamp	
22	16/06/98	1998	N Rly	Veekay	1982	Jointed	IR	2m from support	Joint failure
23	16/06/98	1998	SC Rly	NK*	1984	NK			Joint failure
24	29/06/98	1998	N Rly	Veekay	1993	Jointed			Joint failure
25	30/06/98	1998	C Rly	NK*	1994	Jointed	IR	33.5 m from support	Joint failure
26	15/07/98	1998	W Rly	NICCO	1987	Jointed	OOB	Near RRA Clamp	** no defect in material
27	20/07/98	1998	SC Rly	JME	1997	NK	IR	Mid of span	Material failure
28	28/07/98	1998	SC Rly	JME	1994	NK	IR	Mid of span	Material failure
29	14/09/98	1998	SE Rly	Veekay	1990	NK			Joint failure
30	14/08/98	1998	W Rly	Veekay	1990	Jointed	NK		**Joint failure
31	19/09/98	1998	SE Rly	NICCO	1990	NK	OOB	At the edge of RRA Clamp	** Reduction in area at RRA clamp
32	03/11/98	1998	N Rly	Veekay	1994	NK	OOB	At RRA Clamp	
33	05/11/98	1998	SE Rly	BICC	1969	Jointed	OOB	5 cm from RRA Clamp	** Severe arcing , Cause not established
34	12/11/98	1998	C Rly	Veekay	1984	NK	OOB	Near RRA clamp, G-jumper	**Due to heating at G jumper
35	28/11/98	1998	C Rly	Veekay	1988	Jointed	IR		Material failure
36	17/12/98	1998	C Rly	NICCO	1993	NK	OOB	At RRA Clamp	
37	31/12/98	1998	N Rly	Veekay	1982	Jointed	IR	Between 1 st & 2 nd dropper	Joint failure

NK – Not known

IR – In run

OOB – Out of run

** Investigated by RDSO

Annexure II**Analysis of Contact Wire failures reported to RDSO**

Year	No of failures				Total Failures
	On OOR CW		Joint Failures	Others	
	At RRA Clamp	Others			
May'97 to Dec'97	-	2	1	4	7
During 1998	11	2	12	5	30

