

Government of India
Ministry of Railways
Research Designs & Standards Organisation
Manak Nagar, Lucknow - 226011

MAINTENANCE INSTRUCTION NO.TI/MI/0028 REV - 2

**SPECIAL MAINTENANCE INSTRUCTION (SMI) FOR OVERHEAD
EQUIPMENT ON TURNOUTS/CROSSOVERS TO AVOID PANTO-
ENTANGLEMENTS**

1. **TITLE** Adjustment of Overhead Equipment (OHE) on turnouts/cross-overs to avoid panto entanglements.
2. **APPLICATION** All cases of turnouts and crossovers.
3. **OBJECTIVE** Points and crossings are one of the important locations which need special attention in respect of erection as well as maintenance, because wrong erection / maladjustment of the OHEs at the structures, particularly at the obligatory structure may lead to pantograph entanglements causing disruption in traffic.
4. **REFERENCE DRAWINGS AND SPECIFICATIONS**
 - (i) Drg.No ETI/OHE/G/02141 Rev. C - General arrangement of regulated OHE at turnouts(Overlap & crossed type)
 - (ii) Drg.No ETI/OHE/G/02151 -General arrangement of regulated OHE at crossovers (Overlap & crossed type)
 - (iii) Specification No. ETI/OHE/53(6/88) – Principles of OHE Layout Plans & Sectioning Diagrams for 25 kV ac traction with A & C slip Nos 1 to 4
 - (iv) Design Manual , July 1994, Vol.3, Chapter-4 - Wiring of points and crossings.
 - (v) ACTM Vol-II (Part-I) 1994 Chapter-III -Overhead equipment.
5. **INSTRUMENTS AND APPLIANCES REQUIRED**

Tower Wagon and other T & P items as usually required for erection/ maintenance of OHE.

6. DETAILS SPECIAL INSTRUCTIONS.

- 6.1 Before checking turnout, check the pantograph of tower wagon for following:-
- (a) Clean and check panto pan for grooves, horizontally (with spirit level when raised) or any other abnormality. The permissible depth of groove is 1 mm. If it exceeds, replace the strips. Check whether the strip fixing screws are projecting beyond the strip surface. If yes, tighten loose screws. Check the strips for sharp edges and projecting particles. Round off the edges of strips with a file.
 - (b) Check the main springs for cracks/breakage. In case of cracks / breakages, replace the springs.
 - (c) Check the bow plunger for free sliding while pressing. In case of jamming, loosen the sleeves fixing the spring boxes and turn them around their vertical axis until jamming is removed.
- 6.2 Check that the overhead equipment (OHE) at points & crossings on main lines is overlap type as shown in drawing nos. ETI/OHE/G/02141 Rev. C and ETI/OHE/G/02151. If not, modify it according to the drawings. If for any reason, crossed type OHE is erected on mainline, convert it to overlap type, if possible, otherwise impose speed restriction of 100 km/h.

6.3 Obligatory Structure

- (a) Check the track separation at obligatory structure. For best results, the track separation should be between 500 mm and 700 mm. However, if due to site conditions it is not possible to locate obligatory structure as mentioned above, it should be located at the position where the track separation is 150 to 700 mm.
- (b) Ensure that the turnout span is 54 m or less in case of overlap type arrangement. In case of crossed type arrangement the limitation of turnout spans shall be as per Drg, ETI/OHE/G/02141 Rev.C
- (c) Ensure that the drop bracket is provided for supporting the steady arm assembly with steady arm hook and the vertical distance between register arm axis and contact plane in this case is 300 mm. In case where steady arm with eye piece and steady arm clamp is provided the distance between register arm axis and contact plane should be 250 mm.
- (d) Measure the implantation of obligatory structure. If it is less than 3 m, take corrective action to increase it to 3 m.
- (e) Ensure that the register arm tubes of the bracket assembly are in horizontal position and not displaced.

(f) Ensure that the passing clearance of nearest obstruction i.e. bracket insulator , register arm tube etc. from the dynamic panto swept zone is more than 100 mm but at the same time the electrical clearance between extreme of panto swept zone and any nearest earthed structure should not be less than 320 mm.

6.4 Auto- Tensioning Device (ATD)

6.4.1 For ATD of turnout, crossover and concerned mainline OHE tension lengths the following should be observed :-

- (a) Redundant length of hex tie-rod of limiting device should be bridged by inserting pipe of suitable length on OHE side as indicated in SMI No. TI/MI/0035 Rev.1.
- (b) Ensure that SMI No. TI/MI/0029 Rev.1 and SMI No. TI/MI/0018 Rev.1 are followed.

6.5 Turnout/Crossover OHE

6.5.1 The turn out OHE adjustments should be done and values of different parameters should be checked with the movements of tower wagon as under :-

- i.) From main line to turnout
 - ii.) From turnout to main line
 - iii) On main line
- (a) Measure the stagger of contact wires at support at obligatory structure. Compare these values with the values indicated in as erected drawing and adjust if required , taking care that the horizontal separation of two contact wires at support is not less than 50mm. In no circumstances the stagger of contact wire of turnout OHE should exceed 300mm.
 - (b) Measure sag of contact wires of mainline and turnout OHEs on either side of obligatory structure. If it is not as per standards, redropper the OHE.
 - (c) Measure the heights of contact wires of the mainline OHE and turnout OHE at support point at obligatory structure without any upward/downward thrust on the contact wires. The contact wire of the mainline OHE should be 50mm below the contact wire of turnout OHE . If not so ,then taking the reference of contact wire of main line OHE, the height of contact wire of turnout OHE should be adjusted so that it is 50 mm above the contact wire of main line OHE.
 - (d) Measure the difference in heights of contact wire of main line OHE and contact wire of turn out OHE in the entire danger zone which falls within 10 m towards turnout from obligatory structure. In the entire danger zone, ensure that the contact wire of turnout OHE is 50 mm above the contact wire of main line OHE. However , at 10 m from obligatory structure towards turnout the

vertical difference in the height of two contact wires shall not be less than 30 mm.

- (e) Run the tower wagon on main line and check whether the pantograph touches contact wire of turnout OHE in the over - lapping zone. If yes, adjust OHE of turnout to ensure that pantograph does not touch the contact wire of turnout OHE.
- (f) Check with the tower wagon running on turnout track towards main line track, that the pantograph of tower wagon takes up the contact wire of main line OHE smoothly at a point 650mm to 720mm from its centre line. If it does not takeover smoothly, then check the vertical difference between the two contact wires and if required, adjust it.
- (g) Check with tower wagon running from main line track to turnout track ,that pantograph glides smoothly from main line contact wire to secondary line contact wire . If not, adjust the OHEs to ensure the same.
- (h) In case of unregulated OHE, retensioning of conductors should be adopted prior to change of season. The turnout/crossover OHE should be checked up thoroughly and, if required, adjusted to maintain the above mentioned parameters.
- (i) In case of crossed type turnout check the following :-
 - (i) Check that the contact wire of turnout OHE is above that of main line OHE and centrally passes through the contact wire crossing bar in case the contact wire crossing is used. The contact wire of the turnout OHE should not rest over the contact wire of main line OHE and crossing contact wire is free to move. Check that there is no abrasion between the contact wire of main line OHE and that of turnout OHE at the crossing point. Check that the crossing contact wire does not infringe with the PG clamps of the contact wire crossing bar assembly. If it infringes, shift the location of contact wire crossing bar assembly suitably.
 - (ii) Check the condition of contact wire crossing assembly for looseness of fasteners of P.G. clamps and alignment of crossing bar. Tighten the P.G. clamps , align the crossing bar or replace deformed crossing bar, if required.
- (j) In case of diamond crossings with slips equipped with crossed type OHE, measure the distance between two knuckle tube assemblies. It should be 9m. Check that two knuckle tube assemblies are horizontal and located symmetrically on either side of centre line of diamond crossing. If not, adjust the position and alignment of knuckle tube assemblies. Check the knuckle tube assemblies for looseness. If required, tighten the fasteners.

- (k) Check that all other fittings/ components are sound and free from corrosion, rusting, crack, deformation etc. If any abnormality is noticed the particular component should be replaced.

6.6 'G' Jumper

- (a) Check that 'G' jumpers are provided at a distance of 5.6m from obligatory structure. If the distance is less, shift the 'G' jumper to the specified location. The arrangement of 'G' jumper should comply with that indicated in drawing No.ETI/OHE/G/05102 Rev. C
- (b) Ensure that the nuts & bolts at PG clamps are neither too tight nor too loose.
- (c) Ensure that the length of 'G' jumper is as specified in Drg. No. ETI/OHE/G/05102 Rev.C. If less, replace the 'G' jumper with jumper of specified length.

6.7 Section Insulator (SI)

- (a) Ensure that the location of section insulator is as per the principles of OHE layout plan & sectioning diagrams.
- (b) Check with spirit level that the runners of section insulator are in the same horizontal plane. If not, the level should be adjusted by section insulator adjustable droppers.
- (c) Check that the panto passage under section insulator is smooth and runners are not hit by panto pan.
- (d) Measure the track separation at the location of section insulator. It should be equal to or more than 1.65 m if the section insulator is erected with the free ends of the runners towards the centre of the turnout and equal to or more than 1.45 m if the section insulator is erected with free ends of the runners away from the centre of turnout. If these distances are below the values indicated above, location of section insulator should be shifted away from the centre of the turnout. The track separation is measured at the extreme end of the part of section insulator assembly towards the centre of the turnout.
- (e) Measure the stagger at section insulator. It should be within +/-100 mm.
- (f) Measure the sag of section insulator. It should be zero. If not, adjust it to zero by adjustable droppers of section insulator and/or by re-droppering the OHE of the span.

- (g) Check contact wire ending clamp of section insulator and ensure that any slipping of contact wire has not taken place. Take corrective action in case of contact wire slipping.
- (g) Check for all the components/ parts of section insulators and replace the defective parts.

7. PERIODICITY OF IMPLEMENTATION OF SMI

The arrangement of OHE at turnouts and crossovers for regulated OHE should be checked annually and adjustments carried out, if necessary , so that the equipment is maintained as per the standards. In case of unregulated OHE, re-tensioning of the OHE should be done prior to change of season and the turnout /crossover OHE should be checked up thoroughly and, if required, adjusted.

Proper records of turnout/crossover, ATD and section insulator assembly should be maintained as per details given in Annexure 'A' . If any change in profile due to track shifting etc is noticed, Engg. Branch should be informed and efforts should be made to restore original standards parameters. If it is not possible to achieve the original standard parameters the new values to be set but strict vigil should be kept on such turnouts/crossovers.

8. AGENCY FOR IMPLEMENTATION

Railways and RE project units.

ANNEXURE – A**FORMAT FOR RECORDING THE OBSERVATIONS/MEASUREMENTS**----- **RAILWAY**----- **DIVISION****TRACTION DISTRIBUTION BRANCH****TURNOUT/CROSSOVER NO.**

S.N	Description		Std. value	Measured value			
1	Particulars of Turnout/crossover(Give the number i.e.1:8½, 1:12 etc.)		-	-	-	-	-
2	Section		-	-	-	-	-
3	Location No.		-	-	-	-	-
4	Date Checked		-	-	-	-	-
5	Type of Arrangement - Crossed type/Overlap type		-	-	-	-	-
6	Height of Contact Wire above rail level at support at Obligatory Structure	Main Line Contact Wire (mm), (H)					
		Turnout Contact Wire (mm)	H+50 *				
7	Turnout span (m)	54 (Max)					
8	Height of Contact Wire in Overlapping Zone	Mainline Contact Wire (mm) (H1)					
		Turnout Contact Wire (mm)	H 1+50 *				
9	Stagger of Contact Wire at Obligatory Structure	Mainline Contact wire (mm)	200 max.				
		Turnout Contact wire(mm)	300 max.				
10	Sag of section insulator of Turnout/Crossover		Zero				
11	Movement of tower wagon from mainline to turnout		650 mm to 720 mm from centre line of pantograph				
	a) Take off		---				
12	Movement of tower wagon from turnout to mainline		650 mm to 720mm from centre line of pantograph				
	a)Take on		---				
13	Stagger of section insulator at turnout/crossover		+/- 100 mm				
	b) Point of take off (in m from O/S)						

14	Track separation at the location of section insulator (m) (a) Runners towards the centre of turnout (b) Runners away from the centre of turnout		1.65 Min 1.45 Min				
15	Condition of ATD of turnout/mainline OHE		Free to move				
16	Length of pipe provided in hex tie rod of limiting device to bridge redundant length of hex tie rod.		As per SMI No. TI/MI/0035 Rev.1				
17	Setting distance (implantation) of obligatory structure (m)		3.0 Min				
18	Track separation at obligatory structure (mm)		150 to 700				
19	Distance of 'G' jumper from obligatory structure (m)		5.6				
20	Length of 'G' jumper. (m)		4.0				
21	Deviations from SEDs						
22	Adjustments done ,if any						
23	Remarks						
24	Name of supervisor and designation						
25	Signature of Supervisor						

*** In case of overlap type arrangement.**