

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

Maintenance Instruction No. TI/MI/0035 Rev. 1

**Maintenance Instruction for Provision of Pipe On
Hex tie Rod Of Auto Tensioning Devices (ATD)**

1. OBJECTIVE

To evolve maintenance procedure for arresting panto entanglements at crossovers, turnouts, overlap type neutral sections and at all other such locations where ATDs are provided, due to breakage of S. S. Wire Rope of auto-tensioning device of concerned ATDs locations.

2. BACKGROUND

The crossover OHE is provided with FTA at one end and BWA at another end. The tension length of this OHE is normally 750 m or less. In many cases the tension length of this OHE is much less than 750m. The ATD provided at BWA carries a limiting device which is provided with hex tie rod of standard length to prevent the OHE from falling on the ground in case of breakage of stainless steel wire rope. Standard length of hex tie rod has been stipulated in the drawings to cater for taking up movement of movable pulley due to expansion or contraction of OHE conductors caused by temperature variations for maximum tension length of OHE i.e 750 m. Normally the crossover OHE has shorter length than 750 m and therefore, part length of hex tie rod becomes redundant. The crossover OHE is provided with section insulator. In the event of failure of SS wire rope of ATD, moving pulley of ATD moves away from the anchor till the spacer angle rests at the end of hex tie rod of limiting device. This causes sag in cross over OHE in such case the shorter the tension length of OHE, greater is the space for movement of movable pulley and therefore, larger the sag in OHE. In case of crossover OHE most of the sag takes place in the span carrying section insulator and therefore there is a greater possibility of disturbance of cross over OHE. Due to this phenomenon panto-entanglement takes place with OHE erected at crossover turn outs in case of breakage of SS wire rope of crossover OHE ATD.

At other locations such as neutral sections, insulated/uninsulated over lap the panto entanglement may take place due to breakage of S.S wire rope of ATD causing sag in anchor span in such cases also the tension lengths may be shorter than 750 m. To minimise the possibility of panto entanglement in all such cases the disturbance of OHE has to be minimised which can be achieved by inserting a pipe of suitable length in hex tie rod (on the OHE side) of ATD so that redundant length of this hex tie rod is bridged

and movement of movable pulley is restricted to minimum in case of breakage of stainless steel wire rope.

In this maintenance instruction the length of pipe to be inserted in the hex tie rod of ATD has been worked out for different tension lengths of OHEs and different minimum temperatures prevailing in the regions. The separate tables have been given for winch type, 3- pulley type and 3 pulley type (modified) ATDs. The tables give values of length of pipe for standard X/Z values. Practically there may be difference in actual and standard values of X/ Z. Therefore, procedure to arrive at length of pipe to be inserted has also been given for such cases.

3. PROCEDURE

Measure actual value of X/Z of ATD, say it is z_1 . Measure ambient temperature. Find out tension length of relevant OHE from OHE layout plan/records. From the relevant table given in drawing No. RE/33/G/00193 for winch type ATD, drawing No. ETI/OHE/G/00195 Rev. A for 3 pulley type (3:1 ratio) ATD and drg. No. TI/DRG/OHE/ATD/RDSO/00003/99/0 for 3 pulley type (3:1 ratio) modified ATD, evaluate standard X/Z value for the prevailing ambient temperature and tension length. Say this value is z_2 . Find the difference in actual and standard values of X/Z, say this is z_3 . Then, $z_3 = z_1 - z_2$, which may be positive or negative.

Now decide whether prevailing lowest temperature in the region is 0°C, 5°C, 10°C or 15 °C. According to this temperature and the tension length of relevant OHE find out length of pipe from the relevant tables 1 to 4 given in this maintenance instruction, say it is x mm. The actual length of pipe to be inserted in hex tie rod of ATD shall be $x - z_3$ mm. The pipe of this length may be inserted in the hex tie rod of ATD at the OHE end.

4. DETAILS OF PIPE

Material	-	GI
Nominal Diameter	-	20 mm.
Class	-	Medium.
Specification	-	IS: 1161 – 1979.

5. PERIODICITY OF IMPLEMENTATION OF SMI

The pipe of suitable length is to be inserted in the hex tie rod of ATDs of all locations . On new electrification projects this is to be done during installation of OHE. The condition of pipe should be checked annually and during POH of ATD and in case of doubt it should be replaced.

6. AGENCY FOR IMPLEMENTATION

Railways and RE project units.

TABLE No. 1

**PROVISION OF PIPE ON HEX TIE ROD OF 2200 mm
PROVIDED WITH WINCH TYPE ATD**

(REFERENCE: DRAWING NO. ETI/OHE/P/5300- Rev H and ETI/OHE/P/5350 -1 REV. C)

Tension length (m)	Length of pipe which can be provided (mm)			
	0°C	5°C	10 °C	15 °C
750	Nil	Nil	40	105
700	Nil	Nil	60	120
650	Nil	25	80	140
600	Nil	50	105	155
550	30	80	125	170
500	60	105	145	190
450	90	130	165	205
400	120	155	190	220
350	150	180	210	240
300	180	205	230	255
250	210	230	250	275
200	240	255	275	290

TABLE No. 2

**PROVISION OF PIPE ON HEX TIE ROD OF 2300 mm
PROVIDED WITH WINCH TYPE ATD**

(REFERENCE: DRAWING NO.ETI/OHE/P/5300 Rev H and ETI/OHE/P/5350-1 REV. C.

Tension length (m)	Length of pipe which can be provided (mm)			
	0°C	5°C	10 °C	15 °C
750	Nil	75	140	205
700	40	100	160	220
650	70	125	180	240
600	100	150	205	255
550	130	180	225	270
500	160	205	245	290
450	190	230	265	305
400	220	255	290	320
350	250	280	310	340
300	280	305	330	355
250	310	330	350	375
200	340	355	375	390

TABLE No. 3

**PROVISION OF PIPE ON HEX TIE ROD
 PROVIDED WITH THREE PULLEY TYPE ATD (3 : 1 RATIO)
 (REFERENCE: DRAWING NO. ETI/OHE/P/5500 –1 Rev –K Sheet 1)**

Tension length (m)	Length of pipe which can be provided (mm)			
	0°C	5°C	10 °C	15 °C
750	85	150	215	280
700	115	175	235	295
650	145	200	255	310
600	175	225	275	330
550	205	250	300	345
500	235	280	320	360
450	265	305	340	380
400	295	330	360	395
350	325	355	385	420
300	355	380	405	430
250	385	405	425	450
200	415	430	450	465

TABLE No.4

**PROVISION OF PIPE ON HEX TIE ROD
 PROVIDED WITH THREE PULLEY TYPE ATD (3 : 1 RATIO) (MODIFIED)
 (REFERENCE: DRAWING NO. TI/DRG/OHE/ATD/RDSO/00003/99/0)**

Tension length (m)	Length of pipe which can be provided (mm)			
	0°C	5°C	10 °C	15 °C
750	95	155	220	285
700	125	185	240	300
650	155	210	265	320
600	185	235	285	335
550	215	260	305	355
500	240	285	330	370
450	270	310	350	385
400	300	335	370	405
350	330	360	390	420
300	360	385	410	440
250	390	410	435	455
200	420	440	455	470