of the main spring (7) and the corresponding force exerted by the link hanger on the toe of clip.

Measurement of toe load :

- Select one sleeper/100 sleeper randomly for measurement.
- Note the type and condition of ERC, Liner and rubber pad. Liners are observed for cracks, breakage and corrosion. Rubber pads are particularly observed for permanent set or worn-out condition.
- Place the device on three supporting legs with one leg (5) resting on the rail top and other two legs (4a & 4b) resting on the sleeper surface.
- Adjust horizontally the base plate (3) by means of the nut of levelling leg (5).
- Engage the steel tong (1) on the toe of the Elastic Rail Clips.
- Turn handle (12) clockwise to pull link hanger (2) until the toe leaves contact with the liner, creating air gap between liner and toe of clip. A feeler gauge of thickness (0.1mm) or piece of paper is used to make sure that the toe of ERC has just left contact.
- Handle (12) is then turned anticlockwise so that the feeler gauge/paper comes under a normal pressure. Again turn the handle clockwise, simultaneously pulling the feeler gauge/paper out gently. Movement of feeler gauge/paper indicates the incipient point of lifting of toe of clip.
- Reading on the graduated scale is then noted which when multiplied by spring constant gives the toe load exerted by clip.

Toe load = Graduated scale reading **X** Spring constant

General precautions:

- Remove oil, dirt and dust thoroughly from the inside of the box and surface of main spring before use.
- Lubricate surface between compression block (8) and rotating handle nut (12), in case the thrust bearing (11) is not provided in the equipment.
- Ensure that the base plate (3) is horizontal, with link hanger vertical to the toe of clip.
- Engage steel tong (1) firmly to the clip to avoid slippage on application of load. Ensure that there is no oily substance on the surface of tong to prevent slipping during operation.
- Check calibration of the main spring from time to time.
- Keep spare links/ tong for replacement.
- After use, oil the inside of the spring box (6) and the surface of the main spring (7) before storing, if the equipment is not to be used for more than a week.
- While using the machine in the field, operator should not lean over the device.

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Our Objective

To upgrade Maintenance Technologies and Methodologies and achieve improvement in productivity and performance of all Railway assets and manpower which inter-alia would cover Reliability, Availability, Utilisation and Efficiency.

The contents of this pamphlet are for guidance only & are **not statutory**. It also does not supersede any existing instructions from Railway Board, RDSO and zonal Railways & the provisions of IRPWM on the subject. If you have any suggestion & any specific comments, please write to us :

Contact person : Director (Civil)

Postal Address : Indian Railways
Centre for Advanced
Maintenance Technology
Maharajpur, Gwalior (M.P.)
Pin Code - 474 020

Phone : 0751-2470869
0751-2470803

Fax : 0751-2470841

E-mail :

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GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

TOE LOAD MEASUREMENT OF ERCs

CAMTECH/C/2005/TOE-LOAD/1.0
SEPTEMBER - 2005

Centre for Advanced Maintenance TECHnology

उच्च अनुरक्षण प्रौद्योगिकी केन्द्र

EXCELLENCE IN MAINTENANCE

Maharajpur, Gwalior - 474 020 (INDIA)
✆ 0751 - 2470869 • Fax : 0751 - 2470841

TOE LOAD MEASUREMENT OF ERCs

General : Elastic fastenings are the latest type of rail to sleeper fastening mainly used on concrete sleeper (PSC mono block) track for laying long welded rail. It comprises of elastic rail clip (ERC), metal/Glass Filled Nylon-66 liner and rubber pad.

These fastening hold the rail with sleeper under continuous vertical pressure (i.e. toe load), and provide longitudinal /creep resistance in both the directions, therefore ideally suited for laying LWR/CWR.

Parameter, which governs the effectiveness and the efficiency of this fastening is the force by which clip holds the rail flange with the sleeper i.e. **toe load**. During service, actual toe load depends upon condition of rubber pad and liner, beside condition of ERC. Hence, loss of toe load reflects condition of ERCs as well as of rubber pad and liner.

To ensure that the fastenings are effective and functioning properly, in service measurement of actual toe load is carried out periodically with the help of toe load measuring device (TLMD).

Toe load of ERCs : The standard combination of rubber pad and liner for various ERCs, and their prescribed toe load & deflection are as under:

Type of ERC	Toe load (Kg.)	Toe Def. (mm)	Track (Rail/PRC Sleeper)	Liners		Rubber pad
				Metal	GFN-66	
Round Toe RDSO/ T-1892	645-800	11.4	52kg rail on 52kg sleeper (BG)	RDSO/ T-645 (5 mm)	RDSO/ T-2505 (6 mm)	RDSO/ T-3480 (4.5mm)
			60kg rail on 60kg sleeper (BG)	RDSO/ T-2465 (5 mm)	RDSO/ T-3516 (6 mm)	RDSO/ T-3716 (4.5mm)
Flat toe MKII RDSO/ T-3722	700-900	11.2	90 R (MG)	RDSO/ T-3739 (8 mm)	RDSO/ T-3723 (8 mm)	RDSO/ T-3724 (6mm)
Flat toe MK -III RDSO/ T-3701	850-1100	13.5	52kg rail on 52kg sleeper (BG)	RDSO/ T-3738 (8 mm)	RDSO/ T-3702 (8 mm)	RDSO/ T-3703 (6 mm)
			60kg rail on 60kg sleeper (BG)	RDSO/ T-3740 (8 mm)	RDSO/ T-3706 (8 mm)	RDSO/ T-3711 (6 mm)
			52kg rail on 60kg sleeper (BG)	RDSO T-3741 & RDSO/ T-3742	RDSO/ T-3707 & RDSO/ T-3708	RDSO/ T-3711 (6 mm)
Flat toe MK -V RDSO/ T-5919	1200 -1500	13.5	52kg rail on 52kg sleeper (BG)	RDSO/ T-3738 (8 mm)	RDSO/ T-3702 (8 mm)	RDSO/ T-3703 (6 mm)
			60kg rail on 60kg sleeper (BG)	RDSO/ T-3740 (8 mm)	RDSO/ T-3706 (8 mm)	RDSO/ T-3711 (6 mm)
			52kg rail on 60kg sleeper (BG)	RDSO/ T-3741 & RDSO/ T-3742	RDSO/ T-3707 & RDSO/ T-3708	RDSO/ T-3711 (6mm)

Figure in bracket indicates thickness of that component.

Periodicity of toe load measurement: In service, measurement of actual toe load is carried out as under :

(i) Sample size: 1% of ERCs randomly on every 100 sleepers i.e. 4 ERCs/ 100 sleepers. All 4 ERCs to be measured on one sleeper.

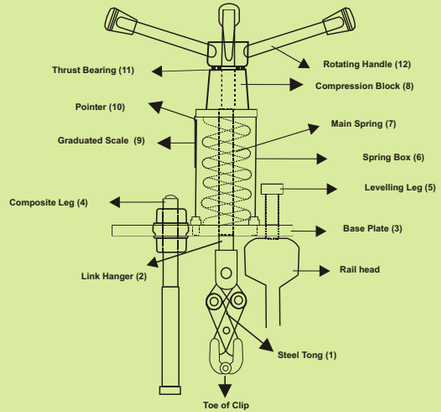
(ii) Testing frequency:

- **Initial testing:** *In normal areas,* after four years of laying or passage of 200 GMT of traffic, whichever is earlier. *In corrosion prone areas*, after two years or passage of 100 GMT, whichever is earlier.

- **Subsequent testing:** Every four years or 200 GMT in *normal areas* and two years or 100 GMT in *corrosion prone areas*, whichever is earlier.

  However, if 20% or more of sample size records toe load below 600 kg, both frequency of inspection and sample size is to be doubled.

Toe load measuring device (TLMD) : As shown in figure, basically consists of a base plate (3) provided with three supporting legs (4 & 5). One adjustable levelling leg (5) rests on the rail head and the other two composite legs (4) on the sleeper. The base plate (3) can be adjusted horizontally through an adjustable leg (5). The base plate (3) is provided with two slotted holes for adjusting composite legs for using the device on different types of sleepers. Base plate supports a pre-calibrated main spring (7).



Toe Load Measuring Device (TLMD)

A link hanger (2) having threads at top passes through a spring box. At bottom, hanger is provided with steel tong (1) to engage the toe of clip. At top of hanger, a rotating handle (12) is provided with thrust bearing (11) and compression block (8). Compression block works against the indicator plate resting on top of main spring.

The indicator plate has a pointer (10) extending outwardly through a vertical slot in the spring box (6) with a graduated scale (9) fixed along the slot. The movement of indicator is measured on the graduated scale, indicating the compression