Transport Roads & Maritime Services

NSW GOVERNMENT

Test method T1105

Shear force/deflection relationships for elastomeric bridge bearings

NOVEMBER 2012

Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added	D. Dash	June 2001
Ed 2/ Rev 0	All	Reformatted RMS template	J Friedrich	November 2012

Note that Roads and Maritime Services is hereafter referred to as 'RMS'.

The most recent revision to Test method T1105 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T1105

Shear force/deflection relationships for elastomeric bridge bearings

1. Scope

This test method sets out the procedures for the determination of the shear force/deflection characteristics of elastomeric bridge bearings under constant compressive load

2. Apparatus

(a) A compression testing machine with a table bed such as is used in transverse testing, with a surface area larger than the surface area of the bearing to be tested. The range of the machine to cover the required design compressive force to be applied to the bearing.

(b) A special upper platen to be fitted to the machine so designed as to provide a large surface area suitably braced sot that no local deformation of the surface takes place under the compressive force. The bearing face of the platen to be maintained plane with a tolerance of 50 m within the width of the specimen to be tested.

(c) Steel plates machined and sand-blasted on both sides and maintained plane within a tolerance of 50 m within the width of the specimens to be tested. The plates to be of such a size as to overlap the bearing under test by at least 25 mm all round. The upper platen described above in (b) may be used directly if of suitable size.

(d) A shearing plate machined and sand-blasted on both sides and maintained plane within a tolerance of 50m within the width of the specimens to be tested. The shear plate to be the same width as the plates under (c) above and 75 mm longer.

(e) A reaction plate capable of being fixed rigidly in a position vertical to the bed of the compression machine and to which the fixed plates may be anchored during the shear test. The plate to be so constructed as to accommodate two dial gauges to measure the movement of the shear plate.

(f) Direct reading dial gauges reading to 25 m and with a travel in excess of the expected shear deflection of the bearings under test.

(g) A shearing jack, fixed to the bed of the testing machine, acting in a horizontal direction with a travel of at least 75 mm.

(h) A spherical seat through which the shear force may be applied.

(i) A roller system having a low resistance to movement for use when only one bearing is to be tested.

3. Procedure

(a) When two or three bearings are to be tested, position them two at a time directly under the upper platen of the compression testing machine in the following system illustrated in Figure 1:

Fixed steel plate (top)
First bearing.
Shear plate
Second bearing
Fixed steel plate (bottom)

(b) If only bearing is to be tested the bearing is set up in the compression testing machine in the following system illustrated in Figure 2:

Fixed plate (top)
Roller plate
Shear plate
Bearing

Ensure that the plates and bearings are all centrally located and properly seated.

(c) Apply the required compressive force to the system and fix the dial gauges in position with the ends of their shafts against the shearing plate.

(d) Apply the shearing force to produce 1.5 times the design deflection to condition the bearings, examining the bearings carefully for signs of distress. Remove the shearing force.

(e) In the case of unreinforced bearings remove the compressive force and free the bearings from the steel plates.

(f) Reposition the plates and bearings carefully, re-apply the compressive force and bring the dial gauges once more in contact with the shear plate.

(g) In the case of bearings reinforced with steel plates proceed as in (f) without removal of the compressive force.

(h) Set the dial gauge at zero and apply the shear force steadily and continuously. Record the deflections in mm at force intervals approximately equal to deflections of 10, 30, 60, 90, 120 and 150 per cent of the design deflection.

(i) When there are three bearings, repeat the testing procedure with each pair of bearings so that for three bearings, three sets of readings are obtained.

4. Calculations

(a) Plot for the single bearing or for each pair of bearings, the deflection in mm recorded for each selected increment in shear force in kN.

(b) Calculate the deflections in mm equivalent to 10, 30, 60, 90, 120 and 150 per cent of the design deflection.

(c) Read from the graph the force, Fs, required to produce these deflections either for the single bearing or for each pair of bearings.

(i) When only one pair of bearings has been tested the force required to deflect each bearing is taken as $\frac{Fs}{2}$

(ii) When three bearings have been tested calculate the forces required to deflect each bearing to 10, 30, 60, 90, 120 and 150 per cent of the design deflection form the following quotations:

$$Fs_a = fs_1 + fs_2$$

$$Fs_b = fs_1 + fs_3$$

$$Fs_c = fs_2 + fs_3$$

where Fsa, Fsb, Fsc are the forces required to deflect each of the three pairs of bearings and fs1, fs2 and fs3 are the forces required to deflect bearing 1, bearing 2 and bearing 3 respectively.

5. Report

Prepare a plot of the stress in MPa against the percentage strain. The stress/strain plot is presented as the report.
If only one bearing was tested, report that the roller system was used in the test.

6. Technique

It is preferable to test bearings in groups of three as this enables the characteristics of each bearing to be determined. When only two bearings are tested the result is an average of the characteristics of the two bearings rather than the actual characteristics of each.

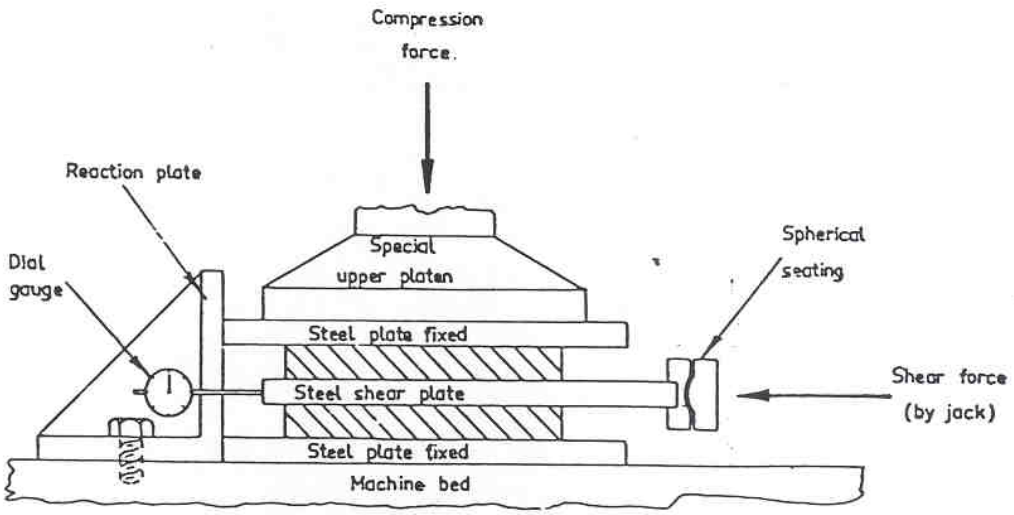

Fig.1: Arrangement of plates and bearings when two bearings are being tested together.

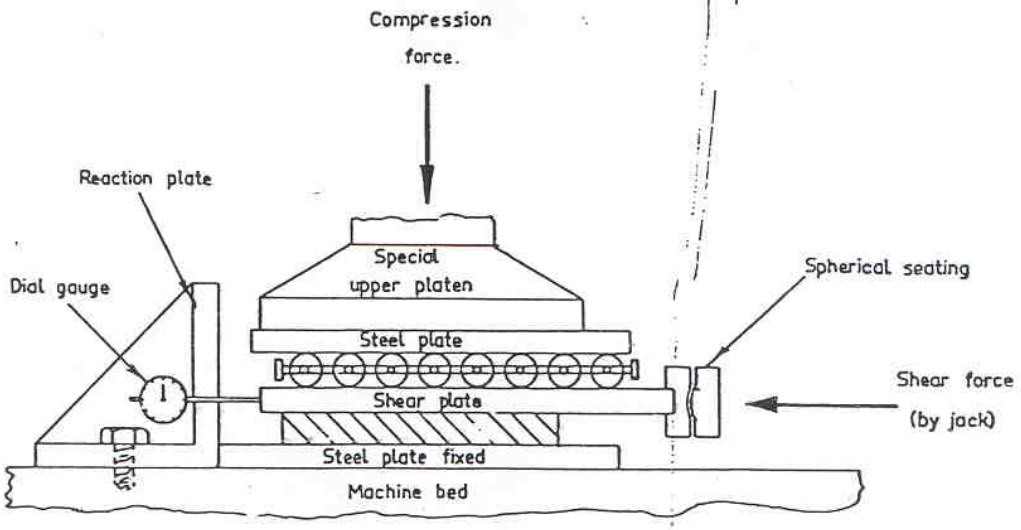

Fig.2: Arrangement of plates, bearings and rollers when only one bearing is being tested.

SHEAR CHARACTERISTICS OF ELASTOMERIC BEARINGS