



Transport
Roads & Maritime
Services

Test method T341

Load testing of precast concrete box culverts

OCTOBER 2012



Revision Summary

Ed/Rev Number	Clause Number	Description of Revision	Authorisation	Date
		Reformatted and Revision Summary Added	D.Dash	May 1999
		Date on Test Method Revised to Agree with Date on Revision Summary	D.Dash	Feb 2001
Ed 1/ Rev 0	All	Reformatted RMS template	J Friedrich	October 2012

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

The most recent revision to Test method T341 (other than minor editorial changes) are indicated by a vertical line in the margin as shown here.

Test method T341

Load testing of precast concrete box culverts

1. Scope

This method sets out the procedure for the load testing of precast reinforced concrete box culverts. This method is based on that described in Australian Standard 1597 - Part I.

2. Definition

Term	Definition
Proof Loads	(a) Are the test loads which the culvert sections are required to sustain without developing test cracks during application of the loads and without residual test cracks, permanent distortion or other visible defects remaining after removal of the loads
Ultimate Loads	(b) Are the test loads which the culvert sections will sustain before complete failure occurs
Test Crack	(c) Is a crack into which the point of a test-crack measuring gauge 0.15 mm thick may be inserted to a depth of 2 mm over a length of at least 300 mm at intervals not exceeding 50 mm
Residual Test Crack	(d) Is a crack into which the point of a residual test-crack measuring gauge 0.08 mm thick may be inserted to a depth of 2 mm over a length of at least 300 mm at intervals not exceeding 50 mm
Permanent Distortion	(e) Is any local or general deflection at the centre of the span or walls of the culvert sections under test, greater than one percent of the span or height of the walls, remaining after removal of the test load or loads
Complete Failure	(f) Is the stage reached in the application of test loads, beyond which no additional load or loads, whether horizontal or vertical, can be sustained

3. Apparatus

- (a) A testing machine so substantial and rigid that the distribution of the test load along the length of the culvert will not be appreciably affected by the deformation or yielding of any part of the machine during the application of the load
- (b) A load measuring device fitted to the testing machine and capable of indicating the applied load to within ± 2 percent of the correct load in the range of use
- (c) Equipment capable of applying a horizontal load; fitted with suitable gauges capable of indicating the applied load within ± 2 percent of the correct load in the operating range.
- (d) Hardwood bearing blocks 500 mm long, 150 mm wide and 100 mm high
- (e) Hardwood bearing blocks 1.2 m long, 150 mm wide and 100 mm high
- (f) Rubber pads 1.2 m long, 150 mm wide, 10 mm thick, of Shore durometer hardness 45 - 55
- (g) Rubber pads 2.4 m long, 150 mm wide, 10 mm thick, of Shore durometer hardness 45 - 55
- (h) A sand-bed of sufficient area to accommodate the culvert (see Fig 1). The sand-bed shall be 75 mm deep with the top and bottom surfaces level, on an unyielding base. (For use with u-shaped culverts only)

- (i) A test invert slab of size appropriate to the culvert under test. (This shall be a precast invert slab where it is included as a component section of the culvert under test)
- (j) Crack measuring gauges 0.15 mm thick and 0.08 mm thick, having the dimensions shown in figure 4.

4. Positioning of Culvert in Testing Machine

Position the test culvert on a test invert slab or sand-bed and appropriate with component sections properly assembled as in service (Fig 1, 2 or 3). Mortar or sand not more than 5 mm thick; or bituminous felt or a layer of rubber 10 mm thick, may be used in the longitudinal joints between the section and the test invert slab to reduce any damage to the concrete surfaces during the application of the test loads.

5. Application of Load

5.1 A. 1.2 m Long Culvert Sections

- (a) Apply the vertical test load to the deck of the culvert through a wooden bearing block and rubber pad, with the loading beam and bearing block parallel to a vertical plane through the longitudinal axis of the culvert as shown in Fig 1. The test load is to be applied through the mid-point of the timber bearing blocks.
 - (i) For the zero to 1 metre fill loading, the block shall be 500 mm long by 150 mm wide and 100 mm high, located with one end of the block coincident with one end of the culvert section.
 - (ii) For other fill loadings the block shall be 1.2 m long, 150 mm wide and 100 mm high.
- (b) If specified, apply the horizontal test load at the mid-point of the walls through the mid-point of a block of timber or steel and rubber pad of length equal to the length of the section, with its length parallel to the axis of the culvert and the end of the pad flush with the end of the culvert section.
- (c) Increase the loads at uniform rate so that the specified proof loads are reached in 5 minutes. Maintain the test loads on the culvert for no longer than is necessary to observe and record the loads and to examine the culvert for test cracks.
- (d) Remove the loads and examine the culvert for any residual cracks, permanent distortion or other visible defects.
- (e) If specified, reapply the test loads at the uniform rate applied in (c) above until the culvert sustains the specified ultimate loads.
- (f) Test loads shall be applied, as specified, in accordance with one or more of the following methods of loading:
 - (i) Vertical loads simultaneously with horizontal loads on both walls
 - (ii) Horizontal loads on both walls without vertical load
 - (iii) Vertical load without simultaneous horizontal loads

5.2 B. 2.4 m Long Culvert Sections:

- (a) Apply the vertical test loads to the deck of the culvert through wooden bearing blocks and rubber pads with the loading beam and bearing blocks parallel to a vertical plane through the longitudinal axis of the culvert as shown in Fig 3.
 - (i) For the zero to 1 metre fill loading, the blocks shall be 500 mm long by 150 mm wide and 100 mm high, at each end of the culvert located with one end of the block coincident with the end of the culvert section. (Fig 3)
 - (ii) For other fill loadings the blocks shall be 1.2 m long, 150 mm wide and 100 mm high.
- (b) If specified apply the horizontal test load simultaneously 0.6 m from each end of the culvert and at the mid-height of the walls through two blocks of timber or steel each 1.2 m long and rubber pad with its length parallel to the axis of the culvert and one end of the block coincident with the end of the culvert. The load shall be applied through the mid-point of the timber or steel blocks.

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- (c) Increase the loads at uniform rate so that the specified proof loads are reached in 5 minutes. Maintain the test load on the culvert for no longer than is necessary to observe and record the loads and to examine the culvert for test cracks.
 - (d) Remove the loads and examine the culvert for any residual cracks, permanent distortion or other visible defects.
 - (e) If specified, reapply the test loads at the uniform rate applied in (c) above until the culvert sustains the specified ultimate loads.
 - (f) Test loads shall be applied, as specified, in accordance with one or more of the following methods of loading:
 - (i) Vertical loads simultaneously with horizontal loads on both walls
 - (ii) Horizontal loads on both walls without vertical load
 - (iii) Vertical load without simultaneous horizontal loads

6. Reporting

- (a) Report the specified proof loads applied to the nearest 1.0 kN. If test cracks appear during loading to the specified proof loads and/or if residual cracks, permanent distortion or visible defects are present on removal of the loads then report the culvert section as "failed to achieve specified proof loads". If no test cracks appear during loading to the specified proof loads and if no residual cracks, permanent distortion or visible defects are present on removal of the loads then report the culvert as "achieved specified proof load"
- (b) Report the specified minimum ultimate loads and the loads applied to the nearest 1.0 kN. If the ultimate loads achieved are less than the specified minimum ultimate loads then record as "failed to achieve specified minimum ultimate loads". If the specified minimum ultimate loads are achieved then report as "achieved specified minimum ultimate load"

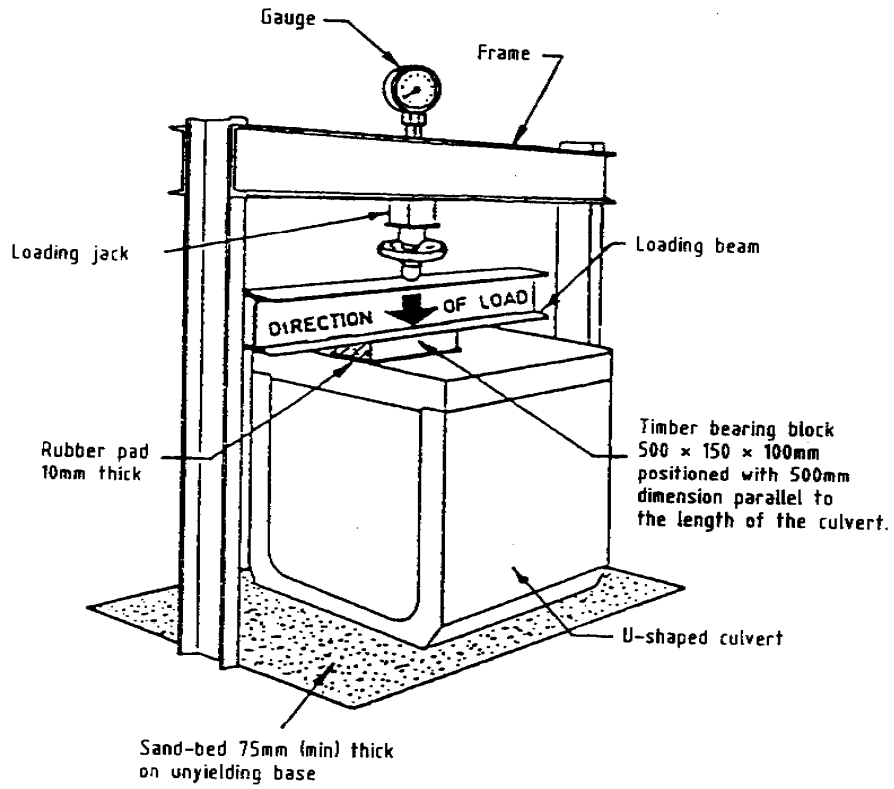


Fig. 1 LOAD TESTING MACHINE
[1.2m Long Culvert section - Zero Fill Loading]

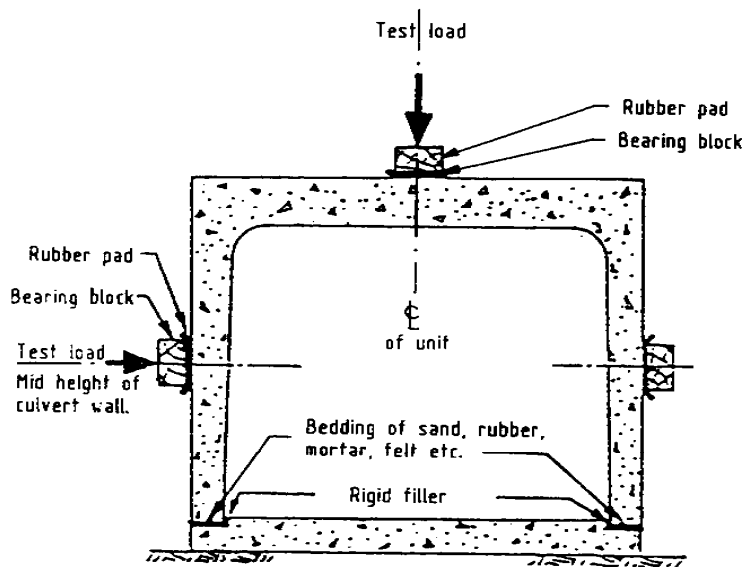
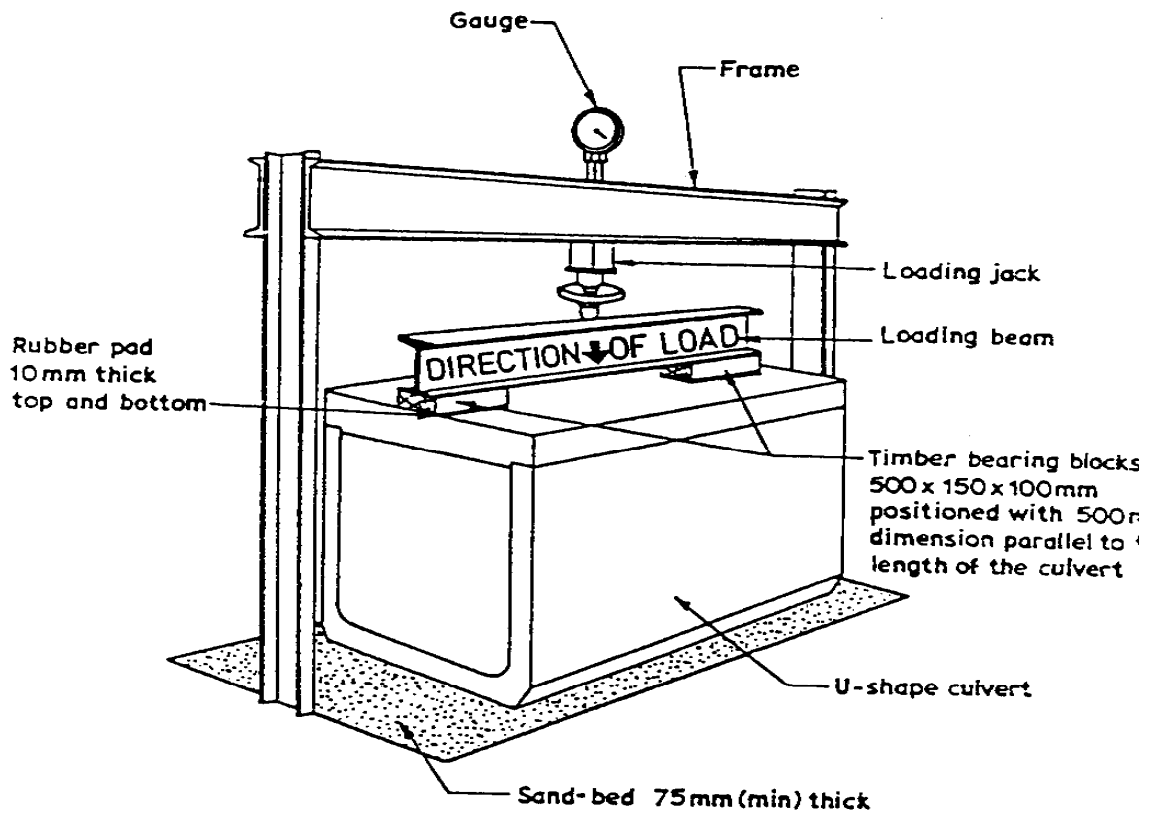


Fig. 2 METHOD OF RESTRAINT FOR
INVERTED U-SHAPED CULVERTS



**FIG. 3. LOAD TESTING MACHINE
(2.4m Culvert - Zero Fill Loading)**

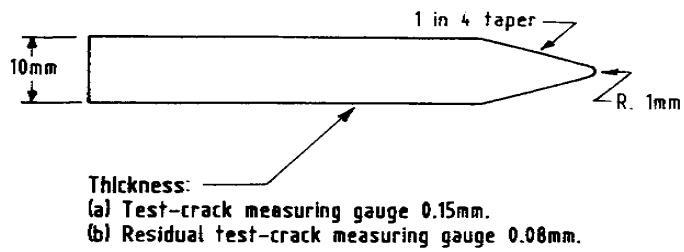


Fig 4. CRACK MEASURING GAUGES.