

SRI LANKA STANDARD 881 : PART 4 : 1990

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GREY CAST IRON

PART 4 - METHOD OF TEST FOR TRANSVERSE STRENGTH

SRI LANKA STANDARDS INSTITUTION

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SRI LANKA STANDARDS INSTITUTION

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This standard does not purport to include all the necessary provisions of a contract.

SRI LANKA STANDARD
GREY CAST IRON

PART 4 : METHOD OF TEST FOR TRANSVERSE STRENGTH

FOREWORD

This standard was authorized for adoption and publication as a Sri Lanka Standard by the Council of the Sri Lanka Standards Institution on 1990-12-12, after the draft, finalized by the Drafting Committee on Grey Cast Iron, had been approved by the Mechanical Engineering Divisional Committee.

The standard on grey cast iron is presented in six parts, namely;

Part 1 Specification for grey cast iron for general purposes

Part 2 Specification for grey cast iron for automotive industry

Part 3 Method of test for tensile strength

Part 4 Method of test for transverse strength

Part 5 Metallographic evaluation of grey cast iron

Part 6 Heat treatment of grey cast iron

When all these parts are approved by the Council as Sri Lanka Standards, SLS 178 will be withdrawn.

A transverse bending test on an as-cast test bar of grey cast iron is useful as a rapid and inexpensive means for estimating the approximate strength of the material. The test yields easily measured deflection values which are useful for comparing the relative ductilities of different test bars of grey cast iron.

All values in this standard are given in SI units.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or an analysis, shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

The Sri Lanka Standards Institution gratefully acknowledges the use of relevant publications of the International Organization for Standardization (ISO), the Bureau of Indian Standards and the Society of Automotive Engineers of the United States of America in the preparation of this standard.

1 SCOPE

This standard specifies the method of testing transverse strength of grey cast iron.

2 REFERENCES

CS 102 Presentation of numerical values.

3 PRINCIPLE OF TEST

The transverse strength of grey cast iron is determined by applying constantly increasing single load at the centre of the test bar, arranged as a beam between two supports until fracture occurs.

4 DEFINITIONS

For the purpose of this standard the following definitions shall apply :

4.1 modulus of rupture in bending : The bending moment at the fracture divided by the section modulus.

4.2 transverse test : A test generally applied to brittle materials like cast iron by subjecting a suitable test piece of the material to transverse loads when held between two horizontal supports in a testing machine.

4.3 transverse strength : The load required to fracture a standard test bar.

5 SYMBOLS

The following symbols have been used in this standard:

Symbol	Description
P	Load at fracture (N)
d	Diameter of the test bar (mm)
d_0	Mean diameter of test bar (mm)
L_s	Distance between supports (mm)
L	Length of test bar (mm)
f_b	Modulus of rupture in bending (MPa)

6 TEST BAR

6.1 The test bar shall be cast as a uniform cylindrical bar of nominal diameter 30 mm. The minimum length of the test bar shall be 500 mm.

6.2 Test bars shall be cast in separate sand moulds. They shall be cast at the same time and from the same melt as the casting they represent.

6.3 When castings are subjected to heat treatment, the test bars shall be treated simultaneously under the same conditions as the casting they represent.

6.4 All test bars shall be suitably marked, to identify them with the castings they represent, in such a way not to interfere with the test.

6.5 Test bar is normally tested unmachined. The surface of the test bar shall be free from unevenness and seams which may be removed by careful grinding. The diameter shall be measured at the centre of the test bar in two directions perpendicular to one another. The difference between the two measurements shall not exceed 1.50mm. The mean value of the two diameters shall be the diameter d_0 of the test bar. The permissible variation from the nominal diameter and the accuracy of measurement of the diameter shall be in accordance with Table 1.

TABLE 1 - Testing condition and accuracy of reading

Diameter of test bar	30 \pm 1.2 mm
Distance between centers of supports	450 mm
Pre - load	300 \pm 100N
Measuring accuracy of diameter of test bar	0.1 mm
Measuring accuracy of deflection at fracture	0.2 mm
Measuring accuracy of load at fracture	100 N

7 METHOD OF TEST

7.1 The supports and the loading fixture shall be designed to give essentially point contact with the test bar. Satisfactory contact is considered to exist when each of the supports and the loading fixture have contact surfaces rounded to a radius of 13 ± 7 mm and when these surfaces are positioned normal to the length of the test bar.

7.2 The test bar shall be placed symmetrically on the horizontal supports and the load shall be applied vertically at the centre of the bar. The load is to be applied in line with the minimum diameter (see Figure 1.)

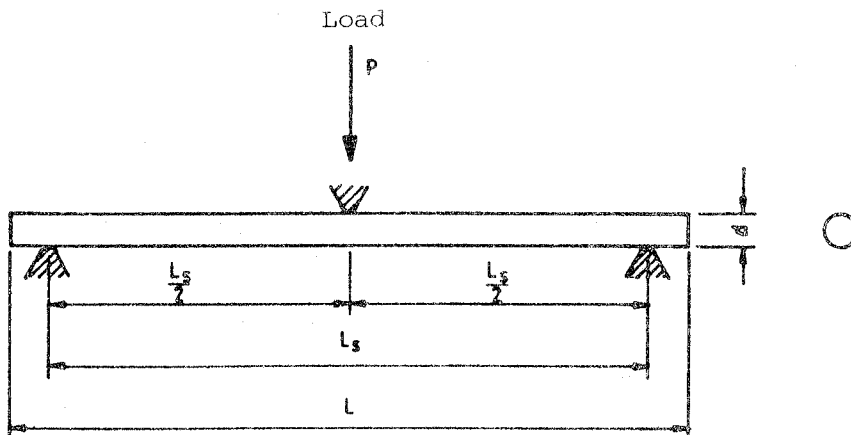


FIGURE 1 - Cast transverse test bar and illustration of method of loading

7.3 Increase the load uniformly and free from shock until the bar fractures. The load shall be applied in such a way that the rate of increase of load does not exceed 60 N per second. Determine the load at the fracture of the test bar with the accuracy indicated in Table 1.

7.4 Determine the deflection of the centre of the test bar at fracture. In order to eliminate any errors in measuring the deflection, the measurement shall be started after applying a small pre-load as given in Table 1.

8 TEST RESULTS

8.1 The test report shall include:

- a) Transverse strength, calculated as follows :

$$\text{Transverse strength(N)} = A \times \text{measured load at fracture (N)}$$

- b) Equivalent deflection at fracture on a bar of standard diameter, calculated as follows :

$$\text{Equivalent deflection(mm)} = B \times \text{measured deflection at fracture(mm)}$$

The correction factors A and B for each diameter are given in Table 2.

TABLE 2 - Conversion/correction factors for transverse test bars

d ₀	A	B	K
28.8	1.130 1	0.960 0	0.048 0
28.9	1.118 4	0.963 3	0.047 5
29 0	1.106 8	0.966 6	0.047 0
29.1	1.095 6	0.970 0	0.046 5
29.2	1.084 2	0.973 3	0.046 0
29.3	1.073 1	0.976 6	0.045 6
29.4	1.062 5	0.980 0	0.045 1
29.5	1.051 6	0.983 3	0.044 6
29.6	1.041 0	0.986 6	0.044 2
29.7	1.030 6	0.990 0	0.043 7
29.8	1.020 2	0.993 3	0.043 3
29.9	1.009 9	0.996 6	0.042 9
30.0	1.000 0	1.000 0	0.042 4
30.1	0.990 1	1.003 3	0.042 0
30.2	0.980 3	1.006 7	0.041 6
30.3	0.970 3	1.010 0	0 041 2
30.4	0.960 9	1.013 3	0.040 8
30.5	0.951 6	1.016 6	0.040 4
30.6	0.942 1	1.020 0	0.040 0
30.7	0.932 9	1.023 3	0.039 6
30.8	0.924 0	1.026 6	0.039 2
30.9	0.914 9	1.030 0	0.038 8
31.0	0.906 2	1.033 3	0.038 5
31.1	0.897 5	1.036 6	0.038 1
31.2	0.888 9	1.040 0	0.037 7

8.2 Optionally the modulus of rupture in bending may be calculated as follows :

Modulus of rupture in bending(MPa) = $K(\text{mm}^{-2}) \times$ measured load
at fracture(N)

OR

using the formula:

$$f_b = \frac{8 P L_s}{\pi (d_o)^3}$$

Where π is the ratio of the circumference of a circle to its diameter. For the calculation purpose the value of π may be taken as 3.14.

The value should be calculated to an accuracy of 0.5 MPa.

The conversion factor K for each diameter is given in Table 2.

SRI LANKA STANDARDS INSTITUTION

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The principal objects of the Institution as set out in the Act are to prepare standards and promote their adoption, to provide facilities for examination and testing of products, to operate a Certification Marks Scheme, to certify the quality of products meant for local consumption or exports and to promote standardization and quality control by educational, consultancy and research activity.

The Institution is financed by Government grants, and by the income from the sale of its publications and other services offered for Industry and Business Sector. Financial and administrative control is vested in a Council appointed in accordance with the provisions of the Act.

The development and formulation of National Standards is carried out by Technical Experts and representatives of other interest groups, assisted by the permanent officers of the Institution. These Technical Committees are appointed under the purview of the Sectoral Committees which in turn are appointed by the Council. The Sectoral Committees give the final Technical approval for the Draft National Standards prior to the approval by the Council of the SLSI.

All members of the Technical and Sectoral Committees render their services in an honorary capacity. In this process the Institution endeavours to ensure adequate representation of all view points.

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