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Test methods for screw for timber
structure

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Contents

	Page
1 Scope	1
2 Normative reference	1
3 Terms and definitions	1
4 Symbols	2
5 Test temperature	2
6 Test methods	2
6.1 Types of tests	2
6.2 Monotonic bending test	3
6.3 Repetitive bending test	13
6.4 Tensile strength test	13
6.5 Torsional strength test	14
7 Test report	17
7.1 Common report items	17
7.2 Report items for each test	17
Annex A (normative) Test data handling method	19
Annex B (informative) Method for wedge tensile strength test	20

Foreword

This Japanese Industrial Standard has been established by the Minister of Economy, Trade and Industry, through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Act.

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Test methods for screw for timber structure

1 Scope

This Japanese Industrial Standard specifies the methods of monotonic bending test, repetitive bending test, tensile strength test and torsional strength test on screws for timber structures used for mutually joining wood or timber to be mainly applied to the important portions of wooden structures for the structural proof strength.

2 Normative reference

Part or all of the provisions of the following standard, through reference in this text, constitute provisions of this Standard. The most recent edition of the standard (including amendments) indicated below shall be applied.

JIS B 0101 *Screw threads and fasteners — Vocabulary*

3 Terms and definitions

For the purpose of this Standard, the following terms and definitions, and those given in JIS B 0101 apply.

3.1

timber

wood or that machined for reconfiguration/bond-moulding

3.2

screw for timber structure

screw used for a joint in the important portions for the structural proof strength of wooden structure, capable of being worked without drilling a prepared hole in wood or timber

3.3

knurl

groove-worked portion provided on the surface of body of screw, which has a minimum diameter larger than the minor diameter of thread and is machined for the purpose of the pull between a main member and a side member or the workability improvement by enlarging the prepared hole in the drilled thread

3.4

bit

jig used to connect a recess on a screw head and a tool for work to rotate the thread

3.5

confidence level of 75 %

probability that the true value of an evaluation quantity falls within a predetermined interval is 75 % as the value taken by this evaluation quantity

3.6

95 % lower tolerance limit

value determined so that the ratio of the number of samples taking larger values than that value to the whole population of the samples is 95 %, in the distribution of the population assumed when a certain confidence level is specified

3.7

50 % lower tolerance limit

value determined so that the ratio of the number of samples taking larger values than that value to the whole population of the samples is 50 %, in the distribution of the population assumed when a certain confidence level is specified

4 Symbols

For the purpose of this Standard, the symbols used in this Standard are as given in Table 1.

Table 1 Symbols

Symbol	Unit	Content
d	mm	Nominal diameter (major diameter of external thread)
M_p	N·m	Full plastic bending moment
θ_c	°	Repetitive bending angle
N_f	Times	Number of repetitive bending
F_t	kN	Tensile proof stress
T_r	N·m	Maximum torsional torque

5 Test temperature

The test temperature shall be the ordinary temperature (5 °C to 35 °C).

6 Test methods

6.1 Types of tests

The types of tests, outlines and test methods are shown in Table 2.

Annex B shows the method for wedge tensile strength test, for reference.

Table 2 Types of tests, outlines and test methods

Type of test	Outline	Subclause No.
Monotonic bending test	Measurement of full plastic bending moment M_p	6.2
Repetitive bending test	Measurement of durability under repetitive bending stress (number of repetitive bending N_f)	6.3
Tensile strength test	Measurement of tensile proof stress in axial direction F_t	6.4
Torsional strength test	Measurement of maximum torsional torque T_r	6.5

6.2 Monotonic bending test

6.2.1 Test specimen

A product is used as a test specimen. If necessary, a screw head or other portion unnecessary for the test may be cut out. The portions to be tested shall be those constituting a screw for timber structure (such as thread, body and knurl) as well as the boundaries between such portions. One of the portions to be tested shall include the portion having a smallest cross-sectional area (except the screw end), which is expected to withstand the proof stress. The number of test specimens shall be at least six for each portion to be tested.

6.2.2 Classification/apparatuses/procedures of test methods

6.2.2.1 General

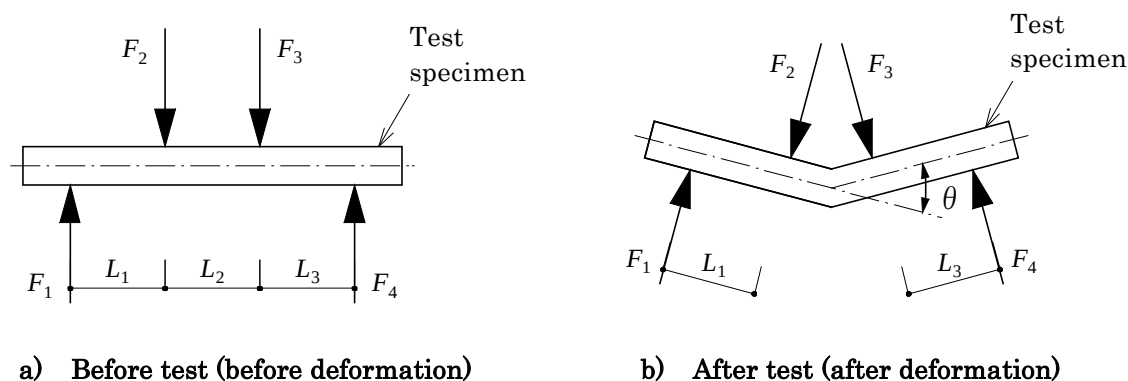
The monotonic bending test method shall be either of a four-point loading method or a loading method by grip and bend, and shall be as follows.

6.2.2.2 Four-point loading method

6.2.2.2.1 Outline of test method

As shown in Figure 1, forces are applied in such a manner that the loading points do not move along the test specimen and the loads remain normal to the axis of the test specimen during the test. The bending moment M applied to the test specimen and the bending angle θ shall be measured.

The intervals between forces L_1 and L_3 shall be not less than $2d$. The bias of forces shall not exceed 5 % against each other.



Key

F_1 to F_4 : forces

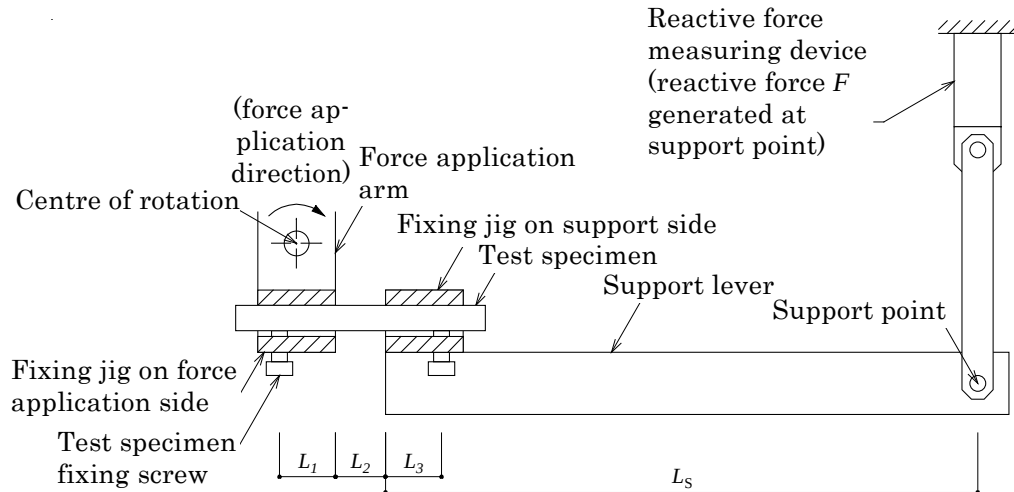
L_1 to L_3 : interval between forces

θ : bending angle of test specimen

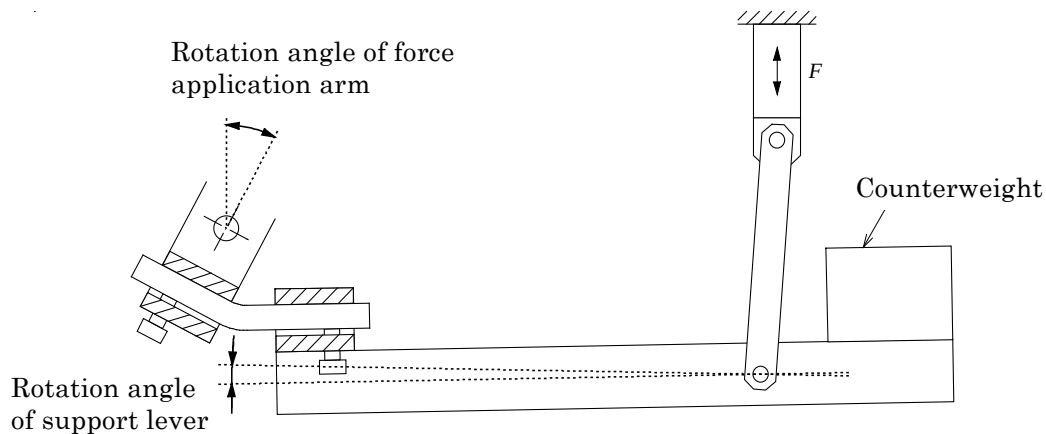
Figure 1 Forces applied to test specimen and deformation of test specimen

6.2.2.2.2 Test apparatus

Figure 2 shows an example of the test apparatus. The test apparatus shall be composed of a force application arm and a support lever, which is capable of measuring the rotation angle of the force application arm and the reactive force F generated at the support point of support lever. The force application arm shall be capable of applying a bending moment to the test specimen by the rotation of arm. The support lever is connected with a reactive force measuring device at the support point via a vertical rod, and the arm and the lever have a fixing jig of test specimen. The fixed lengths, L_1 and L_3 , on the force application side and the support side, do not differ by more than 5 % against each other. The rotation angle of the force application arm shall be deemed as the bending angle of the test specimen θ . A counterweight may be put on the support lever so that a bending moment due to its own weight of the support lever is not applied to the test specimen.



a) Test specimen at installation (example without counterweight)



b) Test specimen after deformation (example with counterweight)

Key

F : reactive force generated at support point

L_1 : fixed length on force application side (interval between forces)

L_2 : interval between fixing jigs (interval between forces)

L_3 : fixed length on support side (interval between forces)

L_s : distance from support point to edge of fixing jig on support side

Figure 2 Example of test apparatus

6.2.2.2.3 Fixing method of test specimen

Figure 3 shows an example of the fixing method of test specimen according to the portion to be tested. The test specimen shall be fixed with the fixing point being changed for each portion to be tested so that the portion to be tested comes to the important position at which a plastic deformation arises. Also the test specimen shall be fixed firmly (in such a manner that the thread ridge is slightly crushed when the test specimen is fixed at the thread) making each of the fixed lengths, L_1 and L_3 , not shorter than $2d$ so that the test specimen does not slip out of place in the test apparatus during