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Structural timber — Characteristic values of strength-graded timber — Sampling, full-size testing and evaluation

Bois de structure — Valeurs caractéristiques du bois classé selon la résistance — Échantillonnage, essais en grandeur nature et évaluation

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 13910 was prepared by Technical Committee ISO/TC 165, *Timber structures*.

Introduction

This International Standard provides requirements for sampling, testing and assessing characteristic values of structural properties for a specific grade and size of sawn timber for use in a timber engineering design code. In accordance with the requirements of performance-based International Standards, it is concerned with the measurement of properties similar to those that occur under service conditions and the derived characteristic strength values are intended for use in structural design codes. For the characteristic strength values, the intent is to obtain a reliable load capacity. Hence, terms such as “bending strength”, “shear strength”, “bearing strength”, etc. relate to the loading configuration used and to the targeted mode of failure.

It is not the intent to imply that every property of every grade and size of timber used in building construction needs to be assessed according to this International Standard. The requirements for any assessment typically are specified in building regulations, quality manuals or other material standards and specifications.

This document is an internationally-agreed reference standard for measurement of structural properties of strength-graded timber. Other standards related to the measurement of structural properties may be deemed to comply with this International Standard, provided that the adjustments necessary to establish equivalency between this and other standards are applied appropriately.

This first edition includes clauses dealing with sampling, testing and evaluation of the characteristic values of strength-graded timber. ISO/TC 165 plans to revise this International Standard once additional standards (dealing with the sampling, testing, and evaluation subjects separately) have been developed.

Structural timber — Characteristic values of strength-graded timber — Sampling, full-size testing and evaluation

1 Scope

This International Standard specifies sampling, full-size testing and evaluation procedures for the assessment of the characteristic values of the structural properties of sawn timber for use in codes dealing with structural engineering design. It provides methods for establishing equivalency with other standards for the testing and evaluation of characteristic properties of structural timber.

It is applicable to sawn timber of rectangular cross-section subjected to a short-duration (approx. 1 min) load. Its evaluation procedure is not intended to be used for quality-control purposes or for acceptance of parcels of timber.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM D198, *Standard test methods of static tests of lumber in structural sizes*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
characteristic value
percentile of a statistical distribution estimated with a specified degree of accuracy

NOTE The characteristic values used are either the mean value of the sample or an estimate of the 5-percentile value.

3.2
grade
population of timber with defined characteristic values

3.3
p-percentile
value for which the probability of getting lower values is p percent

3.4
piece of timber
timber of rectangular cross-section and length manufactured for construction purposes

3.5
population of strength-graded timber
all available pieces of structural timber that are covered by a defined set of parameters such as source, species, size and grade

3.6
reference population
population of strength-graded timber, for which the measured characteristic strength properties can be expected to remain constant

3.7
sample size
number of pieces or specimens selected from a specified population

3.8
test specimen
length of timber, cut from a piece, for purposes of testing to evaluate a timber property

3.9
thickness
d
lesser dimension, perpendicular to the longitudinal axis of a piece of timber

3.10
width
b
greater dimension, perpendicular to the longitudinal axis of a piece of timber

4 Symbols and abbreviated terms

4.1 General notation

b width of a rectangular piece or specimen of timber, expressed in millimetres

b_c width of a rectangular piece or specimen of timber under compression, expressed in millimetres

CV coefficient of variation

d thickness of a rectangular piece or specimens of timber, expressed in millimetres

E modulus of elasticity parallel to direction of grain, expressed in newtons per square millimetre

F applied load, expressed in newtons

f strength, expressed in newtons per square millimetre

G shear modulus of rigidity, expressed in newtons per square millimetre

K grain stiffness

k_{imp} importance factor

k_{samp} sampling factor

k_{size} size factor

L length along a piece or specimen of timber, expressed in millimetres

L_T length test specimen subjected to torsion forces, expressed in millimetres

l_h length cut from a specimen, expressed in millimetres

l_t lever arm of applied torsion load, expressed in millimetres

N sample size

p percentile

e displacement of beam, expressed in millimetres

m mass of specimen, expressed in kilograms

w mass of water/mass of wood equivalent to moisture content

x_i data value

θ rotational deformation in a torsion test, in radians

ρ density, expressed in kilograms per cubic metre,

ρ_{12} density, expressed in kilograms per cubic metre, at 12% by mass moisture content

ρ_{test} density, expressed in kilograms per cubic metre, at time of test

4.2 Subscripts

0,1b value at deformation of 0,1b

0,05 5-percentile value

0 property in a direction 0° to the grain

90 property in a direction of 90° to the grain

c compression

data statistical property of the data

k characteristic value

l lower limit of a characteristic value

m bending

mean mean value

ref value for a reference size

spec value for a specific size

std standard

t tension

tail property related to the tail of a statistical distribution

u upper limit of a characteristic value

ult value at failure

v shear

y value for specific value of y on graph

5 Sampling

The parameters defining the reference population shall be comprehensively defined in terms of species and other factors such as source, size, grade and method of grading.

All test specimens shall be cut from pieces that have been selected to be representative of a reference population. Representation of the reference population may be obtained by selecting pieces at random from the reference population. However, improved representation can be obtained if all population parameters, such as the proportion of pieces produced by each mill, are replicated in the sample selected for testing.

A minimum sample size of 40 shall be used for each grade or size or property to be evaluated. A sample size of greater than 40 is recommended so as to provide more reliable characteristic values for strength without having to introduce a penalty factor as related to sample size (see 9.2.1).

6 Test specimens

All test specimens are of full-size cross-section. The length required for a test specimen shall be related to the specific test (see Clause 8).

Test specimens shall be selected from random locations within a piece of timber. Specimens cut from pre-defined locations (centre of a piece of timber, a randomly selected end within a piece or clear sections, etc.) may be deemed to comply with this requirement provided this does not produce any bias in the measured properties.

Each test specimen for a given size or grade or property shall be cut from a different piece of timber and more than one type of test specimen may be cut from each piece.

As specified in Clause 5, a minimum sample size of 40 shall be used for each grade/size/property.

7 Test conditions

Unless otherwise specified in this International Standard, test procedures shall be in accordance with ASTM D198. The reference moisture content at the time of testing should be consistent with conditioning at a temperature of 20 °C and 65 % relative humidity. Other test procedures and conditioning criteria may be used provided they are more conservative; otherwise, an equivalency in performance for these alternative procedures and conditions shall be established.

For the reference conditioning temperature and humidity, the equilibrium moisture content for solid timber shall be approximately 12 %.

The reference temperature at the time of testing shall be 20 °C.

The rate of loading shall be one that leads to failure at about one minute.

At the time of testing, the moisture content of the timber, the temperature of the timber, and the time to failure shall be recorded.

8 Test configurations

8.1 Density

The specimens for the measurement of density shall comprise the full cross-section of the piece of timber. The length of the test specimen shall be not less than b. The mass, m, and moisture content, w, are measured for each test specimen. The density at the time of test, ρ_{test}, shall be calculated from

$$\rho_{test} = \frac{m \times 10^9}{Ldb} \tag{1}$$

The density at 12 % by mass moisture content, ρ_{12}, shall be calculated from

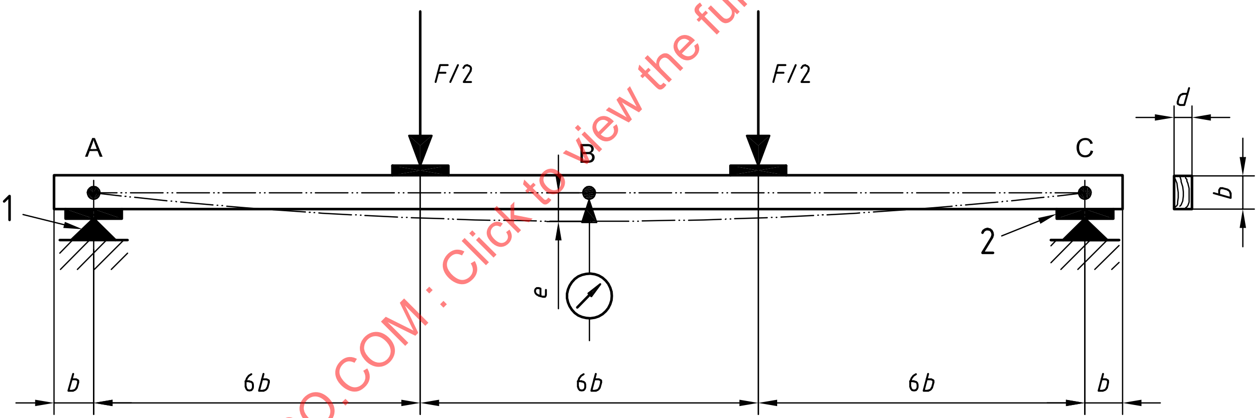
$$\rho_{12} = \rho_{test}\left(\frac{1{,}12}{1+w}\right) \tag{2}$$

where w is the moisture content at the time of test as determined by the oven-dry method.

Alternatively, it may be sufficiently accurate to measure moisture content by means of an electrical resistance meter, provided that the meter is calibrated against moisture content measurements determined by the oven dry method. Where such electrical moisture meter measurements are made, they should be made at two or three locations along each specimen.

8.2 Bending strength and stiffness

The bending strength and stiffness test configuration shall be as shown in Figure 1. A beam of span 18b shall be loaded at two points equally spaced between the end supports, with each load equal to F/2. A random edge of the beam shall be chosen to be the tension edge. If the beam has a slenderness where there could be a tendency to buckle during loading, then lateral restraints may be used to restrain the buckling. Such restraints shall not provide any resistance to movement in the direction of the loading.



Key

1 rocker slider

2 bearing plate

Figure 1 — Test set-up for measuring bending strength and stiffness

Measurement of the modulus of elasticity, E, shall be undertaken by measurement of e, the centrepoint deflection of the centreline of the beam relative to the position of the centreline at the ends of the beam, the deflection of point B relative to points A and C as shown in Figure 1. Where this is not possible, an acceptable conservative alternative is to measure the deflection of the centrepoint of the bottom surface of the beam relative to the end supports of the beam.

The applied load F shall be increased until the beam fails in bending or in a mode other than bending.

To evaluate the modulus of elasticity in bending, E_m, the incremental deflection Δe for an incremental load ΔF shall be selected from the linear elastic part of the load deformation graph and calculated from

$$E_m = \frac{23}{108} \times \left(\frac{L}{b}\right)^3 \times \left(\frac{\Delta F}{\Delta e}\right) \times \frac{1}{d} \tag{3}$$

The range of 10 % to 40 % of the maximum load should be used to determine $\Delta F / \Delta e$.

E may be evaluated by the measurement of the movement of points other than those described above, provided that an acceptable equivalency for these procedures is established.

The bending strength f_m shall be calculated from

$$f_m = \frac{F_{ult} L}{d b^2} \tag{4}$$

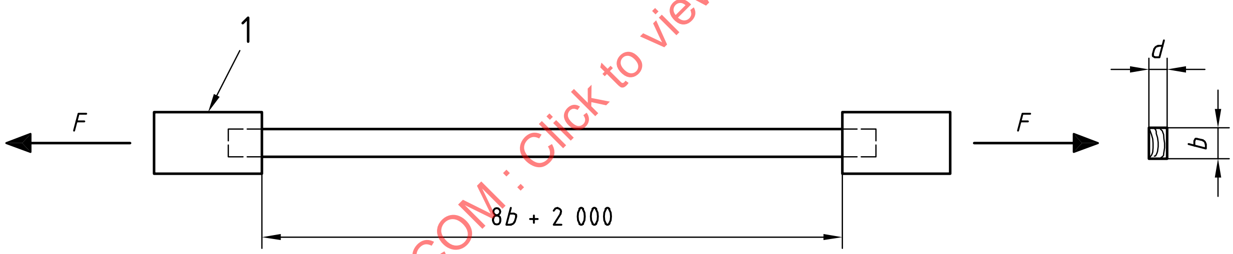
where

F_{ult} is the value of the applied load at failure (ultimate load).

8.3 Tension strength parallel to the grain

The tension strength parallel to the grain test configuration shall be as shown in Figure 2. The specimen length between grips shall be $8b$ + 2 000 mm. The specimen shall be loaded to failure.

Dimensions in millimetres



Key

1 tension grip

Figure 2 — Test set-up for measuring tension strength parallel to the grain

The tension strength $f_{t,0}$ shall be calculated from

$$f_{t,0} = \frac{F_{ult}}{d b} \tag{5}$$

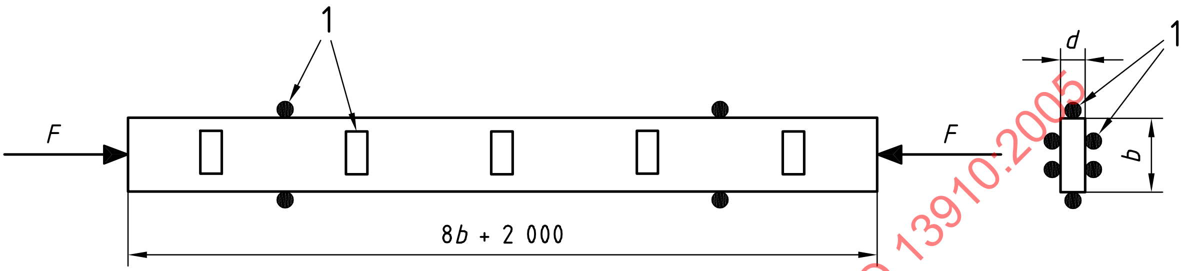
where

F_{ult} is the value of the applied load at failure (ultimate load).

8.4 Compression strength parallel to the grain

The compression strength parallel to the grain test configuration shall be as shown in Figure 3. The test specimen shall be of a total length $8b$ + 2 000 mm. It shall be compressed axially by a load F until failure occurs. The specimen should be restrained against lateral buckling with the spacing of the lateral restraints not greater than $10d$ for buckling about the minor axis and $10b$ for buckling about the major axis. The lateral restraint shall not provide any resistance in the direction of the loading.

Dimensions in millimetres



Key

1 lateral restraint

Figure 3 — Test set-up for measuring compression strength parallel to the grain

The compression strength $f_{c,0}$ shall be calculated from

$$f_{c,0} = \frac{F_{ult}}{db} \tag{6}$$

where

F_{ult} is the value of the applied load at failure (ultimate load).

An alternative procedure may be used. The test specimen may be cut into shorter specimens not greater than $10d$ provided that no cut shall be made through any major defect. Each of these specimens shall be then loaded to failure in axial compression. The ultimate load shall be then taken to be the minimum of the ultimate loads for all the short specimens.

8.5 Shear strength parallel to the grain

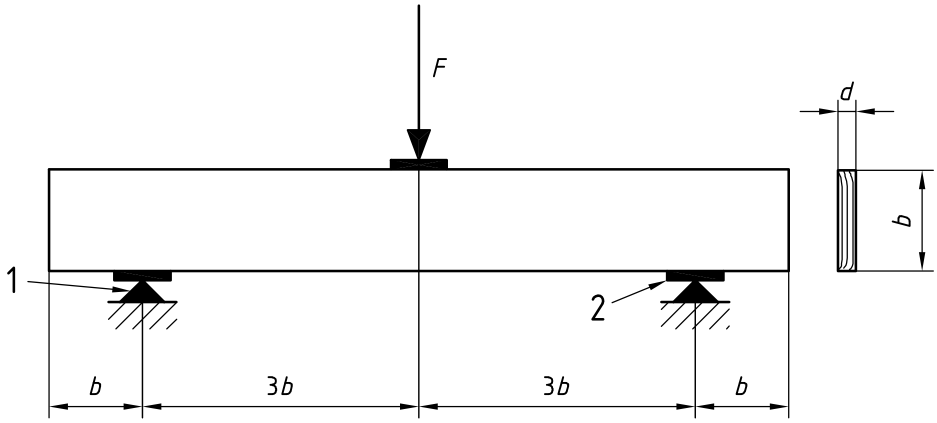
The shear strength parallel to the grain test configuration to be used shall be as shown in Figure 4. F shall be increased to F_{ult}, the value at which failure of the specimen occurs. The shear strength f_v shall be calculated from

$$f_v = \frac{0{,}75 F_{ult}}{db} \tag{7}$$

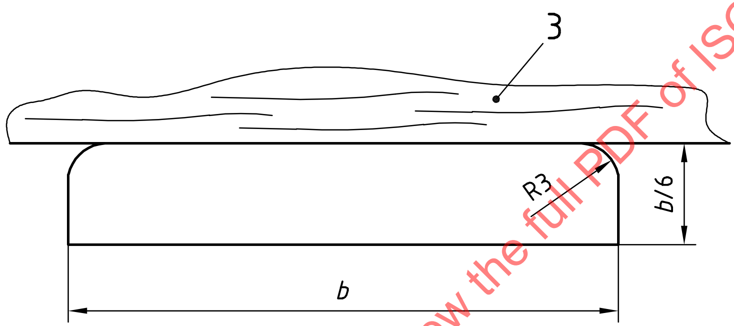
Some beams may fail in modes other than shear, e.g. in bending or compression perpendicular to the grain. However, all test results shall be used to evaluate shear strength properties. Equation (7) gives the nominal shear strength of a beam by providing a normalized description of the load-carrying capacity of the beam.

An alternative double-span loading configuration, such as the configuration given in Appendix B, or other shear test methods, may be used provided that an effective equivalency to the single-span configuration of this subclause is established.

Dimensions in millimetres



a) Loading configuration



b) Steel-bearing plate

Key

1 rocker slider

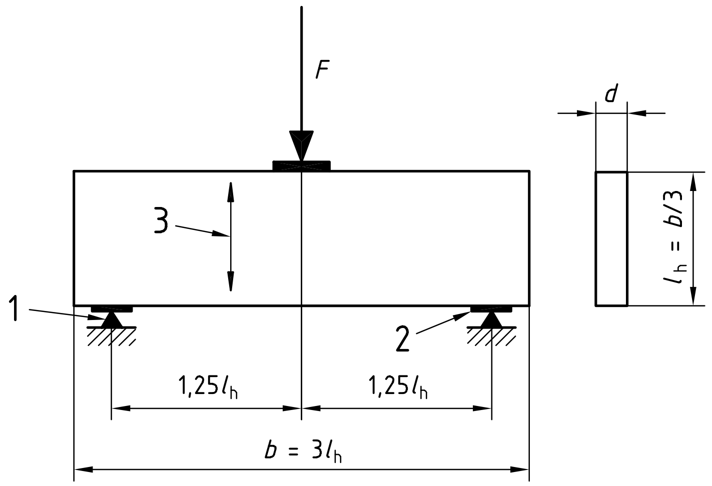
2 bearing plate

3 timber

Figure 4 — Test set-up for measuring shear strength parallel to the grain

8.6 Tension strength perpendicular to the grain

The test set-up for tension strength perpendicular to the grain shall be as shown in Figure 5. The specimen for the measurement of tension perpendicular to the grain shall comprise the full cross-section of the piece of timber. The length, l_h, cut from the piece shall be equal to b/3. The specimen shall be loaded in a three-point bending as shown in Figure 5.



Key

1 rocker slider

2 bearing plate

3 grain direction

Figure 5 — Test set-up for measuring tension strength perpendicular to the grain

The tension strength $f_{t,90}$ shall be calculated from

$$f_{t,90} = \left(\frac{3{,}75 F_{ult}}{dh} \right) \times \left(\frac{0{,}03 d l_h^{\ 2}}{800^3} \right)^{0{,}2} \qquad (8)$$

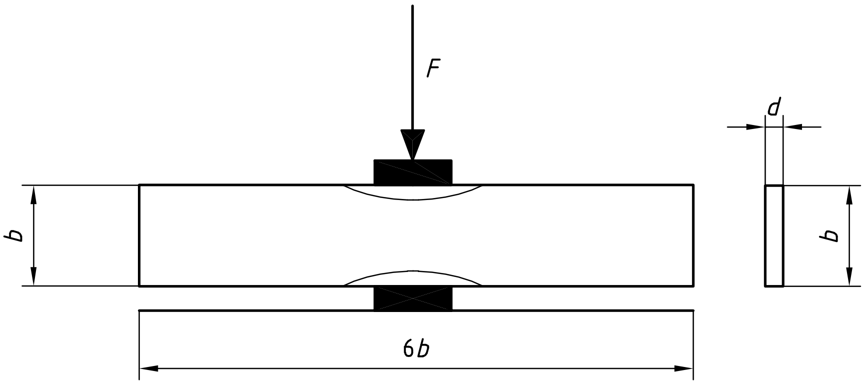
where F_{ult} is the value of the applied load at failure (ultimate load).

NOTE The factor $(0{,}03\ d l_h^{\ 2}/800^3)^{0{,}2}$ normalizes the tension strength to the equivalent value for a cube of timber of side length equal to 800 mm.

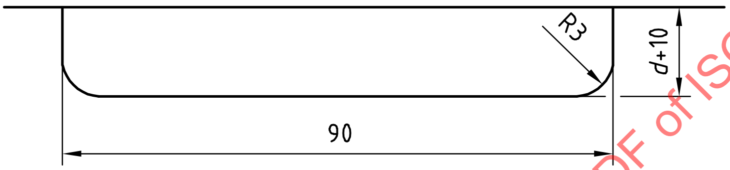
8.7 Compression strength and stiffness perpendicular to the grain

The test set-up for compression strength and stiffness perpendicular to the grain shall be as shown in Figure 6 a). The load F shall be applied through a pair of steel-bearing plates of length 90 mm and width equal to $d + 10$ mm. The head of the testing machine shall be fixed against rotation. During loading, a load deformation plot shall be made [see Figure 6 c)] and the test specimen shall be loaded to failure or to a deformation of 20 mm, whichever occurs first. If the specimen tends to buckle during loading, lateral restraints may be used to resist the buckling.

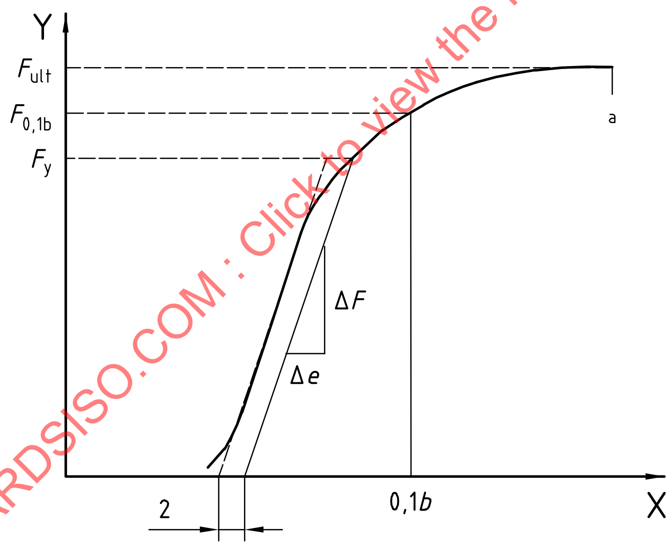
Dimensions in millimetres



a) Loading configuration



b) Dimensions of steel-bearing plate



c) Notation for load deformation graph

Key

X deformation, e expressed in millimetres

Y applied load, F expressed in newtons

a Failure.

Figure 6 — Configuration for strength and stiffness perpendicular to the grain

The compression strength $f_{c,90}$ shall be calculated as the lesser of

$$f_{c,90} = \frac{F_{ult}}{90d} \tag{9}$$

and

$$f_{c,90} = \frac{F_{20}}{90d} \tag{10}$$

where

F_{ult} is the value of the applied load at failure (ultimate load);

F_{20} is the load at a deformation of 20 mm.

The yield strength $f_{c,90y}$ shall be calculated from

$$f_{c,90y} = \frac{F_y}{90d} \tag{11}$$

where

F_y is the load at the intersection of a line parallel to the elastic slope of the load deformation graph and offset by 2 mm [see Figure 6 c)].

The compression perpendicular to the grain stiffness, $K_{c,90}$, shall be calculated from

$$K_{c,90} = \frac{(\Delta F/\Delta e)}{90d} \tag{12}$$

where

$\Delta F/\Delta e$ is the elastic slope of the load-deformation graph.

8.8 Torsional rigidity

The torsional test configuration shall be as shown in Figure 7. The test specimen has a length of L_T between the clamped end and a torque plane as shown in Figure 7. The torque shall be applied via a load F acting through a lever arm of length l_t.

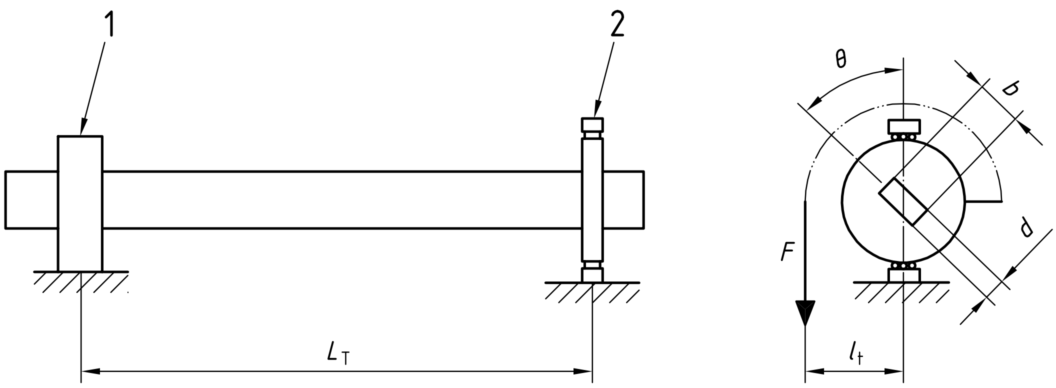
The torsional rigidity, $G_{t,o}$ shall be calculated from

$$G_{t,0} = \frac{L_T l_t}{bd^3 \left[1 - 0{,}63(b/d)\right]} \times (\Delta F/\Delta \theta) \tag{13}$$

where

θ is the rotational deformation angle;

$\Delta F/\Delta \theta$ is the slope of the load-deformation graph.



The appropriate lengths shall be

— 18d for the test specimen, L_T, and

— 500 mm for the load lever arm, l_t.

Key

1 clamped end

2 torque plane

Figure 7 — Test set-up for measuring rigidity in torsion

9 Evaluation of characteristic values of properties tested

9.1 Adjustment for non-standard test conditions

When required, adjustment factors for any property may be based on any available technically appropriate test information.

For timber tested at a moisture content, temperature and time to failure greater than those of the reference conditions, it is not necessary to apply a correction factor.

For samples having a mean moisture content in the range 10 % to 19 %, the following adjustments may be made:

a) for bending and tension strength, no adjustment;

b) for compression strength parallel to the grain, a 3 % change for every percentage point difference in moisture content, and/or

c) for modulus of elasticity and modulus of torsional rigidity, a 2 % change for every percentage point difference in moisture content;

d) for other properties such as shear, tension perpendicular and compression perpendicular, technically sound adjustment procedures based on clear wood property tests.

If the loading rates used are faster than the reference value, then suitable adjustments, based on test information, shall be applied to strength and stiffness measurements.

For tension tests in which the span of the test specimens, L_{test}, shall be shorter than the standard length $L_{standard}$, as specified in 8.3, the measured characteristic strength shall be reduced by the factor $(L_{test}/L_{standard})^{CV_t}$, where CV_t is the measured coefficient of variation of the tension strength.

9.2 Statistical processing

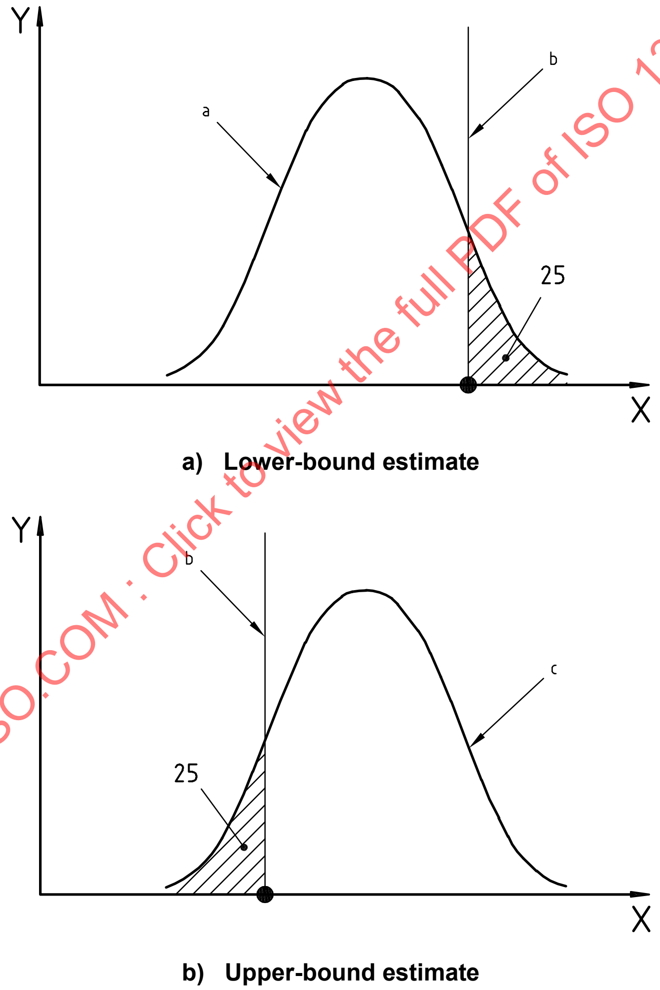
9.2.1 General

The following presents the principles for deriving characteristic values. Some statistical methods for doing this are given in Annex C.

9.2.2 Characteristic values for strength

Characteristic values of strength f_k are related to an estimate of the 5-percentile value of strength. These estimates are taken as the lower bound, $f_{data,0,05,l}$, which shall be an estimate having a 25 % chance of being greater than the true 5-percentile value of the reference population (see Figure 8 a)].

Values in percent



Key

X strength

Y frequency

a $f_{0,05,l}$, lower-bound estimate of 5-percentile.

b True 5-percentile of reference population.

c $f_{0,05,u}$, upper-bound estimate of 5-percentile.

Figure 8 — Lower- and upper-bound estimates of 5-percentile strength based on sample test data

If the characteristic value is based on data from a single size, then f_k shall be calculated from

$$f_k = f_{data,0,05,l} \qquad (14)$$

where

f_k is the characteristic value for that size.

Methods for computing $f_{data,0,05,l}$ may be according to Annex C.

9.2.3 Characteristic values of stiffness

The characteristic values of stiffness are taken to be the mean value and the 5-percentile value of the test data.

EXAMPLE The characteristic values E_{k1} and E_{k2} of the modulus of elasticity E are given by $E_{k1} = E_{data,mean}$ and $E_{k2} = E_{data,0,05}$, where $E_{data,mean}$ and $E_{data,0,05}$ are the mean value and 5-percentile value of the measured data of E.

9.2.4 Use of pooled data

Data from several sizes, but of the same grade/property, may be pooled so as to increase the effective sample size. One method of pooling the data that may then be used is the following.

First, choose a reference size f_{ref}. Then select a size factor k_{size} for each size of timber tested.

The value of k_{size} may be conveniently chosen as the ratio of the measured 5-percentile values for the reference size and any other specific size. Many design codes and standards, including ASTM D1990, specify expected size effects for timber, and these may be used to derive k_{size}.

Using the selected reference size, f_{ref}, transform the data for all pieces of structural timber of every size to equivalent data for the reference size from

$$f_{ref} = \frac{f_{meas}}{k_{size}} \qquad (15)$$

where

f_{meas} is the strength measured for a specific piece of wood;

f_{ref} is the equivalent strength for a reference size.

Use these pooled data to produce a characteristic value of the reference size $f_{ref,k}$ by calculating from

$$f_{ref,k} = f_{ref,0,05,l} \qquad (16)$$

where

$f_{data,0,05,l}$ is the lower-bound estimate of the 5-percentile value of the pooled data.

Then, for any specific size, calculate the characteristic value $f_{spec,k}$ as the lesser of

$$f_{spec,k} = k_{size} f_{ref,k} \qquad (17)$$

and

$$f_{\text{spec,k}} = f_{\text{spec,0,05u}} \tag{18}$$

where $f_{\text{spec,0,05,u}}$ is the upper-bound estimate, an estimate that has a 25 % chance of being lower than the true 5-percentile value for the population of that specific size [see Figure 8 b)], of the 5-percentile value, based on the data of that specified size.

10 Design strength properties

Design strength properties are based on the derived characteristic values and are given in relevant design codes and standards. These properties can depend on parameters additional to the characteristic values as derived from this International Standard, for example, the coefficient of variation of the design property and the importance related to failure.

11 Test report

The test report shall include the following information:

a) mention of this International Standard, i.e. “ISO 13910”;

b) name of laboratory, authority or organization which performed the test;

c) rationale of the sampling plan and a description of the sampling procedures;

d) definition of reference population including

   1) timber source,

   2) species,

   3) method of grading,

   4) size,

   5) grade,

   6) moisture content, and

   7) other factors as appropriate;

e) dimensions of timber pieces from which test specimens were cut;

f) test configurations, including dimensions of test specimens;

g) variations from the reference test conditions specified in Clause 7;

h) test data and the range of load used to calculate the modulus of elasticity;

i) estimates of means, coefficients of variation and 5-percentile values;

j) derived characteristic values of strength and modulus of elasticity;

k) assumed size factor if the data is pooled according to 9.2.4.

The evaluation report may include any additional information deemed to be important.

Annex A
(informative)

Equivalence with other standards

Equivalence with other standards is best obtained from test data, extrapolated if possible by the use of statistical theories. The relationship between characteristic values obtained through the application of this International Standard and those obtained by the application of alternative standards may be written:

$$f_{\text{ISO},0,05} = k_{\text{eq}} f_{\text{alt},0,05} \quad \text{(A.1)}$$

$$E_{\text{ISO,mean}} = k_{\text{eq}} E_{\text{alt,mean}} \quad \text{(A.2)}$$

$$\rho_{\text{ISO,mean}} = k_{\text{eq}} \rho_{\text{alt,mean}} \quad \text{(A.3)}$$

where

$f_{\text{ISO},0,05}$, $f_{\text{alt},0,05}$ are the 5-percentile values of strength evaluated according to this International Standard and an alternative standard, respectively;

$E_{\text{ISO,mean}}$, $E_{\text{alt,mean}}$ are the mean values of the modulus of elasticity evaluated according to this International Standard and an alternative standard, respectively;

$\rho_{\text{ISO,mean}}$, $\rho_{\text{alt,mean}}$ are mean values of density evaluated according to this ISO International Standard and an alternative standard;

k_{eq} denotes an equivalency factor.

Values of k_{eq} that are suitable for application to softwood species are given in Table A.1. Interpolation may be used for other grades and sizes. They may also be suitable for hardwoods, but data to assess this are not yet available.

In Table A.1, the terms 60 % grade and 30 % grade are intended to denote grades that comprise largely clear wood with only minor strength-reducing features and grades that contain large strength-reducing features, respectively. The use of percentage grades ought to be related to traditional North American concepts and they are defined roughly as follows:

— for timber graded according to AS 2858, the grades are designated structural grades No. 2 and No. 4, respectively;

— for timber graded according to EN 518, the grades are designated C24 and C30, respectively;

— for timber graded according to NLGA and NLGA standard grading rules, the grades are designated Structural No. 1 and Structural No. 3, respectively.

Table A.1 — Equivalence factors for softwood species

Property	Equivalence factor k_{eq}					
	ASTM International Standards		AS/NZS 4063		EN 384	
	⩾ 60 % grade	⩽ 30 % grade	⩾ 60 % grade	⩽ 30 % grade	⩾ 60 % grade	⩽ 30 % grade
Mean density at 12 % moisture content	[a]	[a]	[a]	[a]	1,0	0,95
Mean modulus of elasticity						
b = 100 mm	1,0	1,0	1,0	1,0	1,1	1,2
b = 300 mm	1,0	1,0	1,0	1,0	1,0	1,1
Mean shear modulus parallel to the grain	1,0	1,0	[a]	[a]	[a]	[a]
5-percentile bending strength						
b = 100 mm	1,0	1,1	1,0	1,0	1,2	1,3
b = 300 mm	1,0	1,0	1,0	1,0	1,0	1,1
5-percentile tension strength parallel to grain						
b = 100 mm	1,0	1,0	1,0	1,0	1,0	1,0
b = 300 mm	1,0	1,0	1,0	1,0	1,0	1,0
5-percentile compression strength parallel to grain						
b = 100 mm	1,0	1,0	0,95	0,90	[a]	[a]
b = 300 mm	1,0	1,0	0,95	0,95	[a]	[a]
5-percentile shear strength parallel to grain						
b = 100 mm	[a]	[a]	1,0	1,0	[a]	[a]
b = 300 mm	[a]	[a]	1,0	1,0	[a]	[a]
5-percentile tension strength perpendicular to grain	[a]	[a]	[a]	[a]	[a]	[a]
5-percentile compression strength perpendicular to grain	[a]	[a]	[a]	[a]	[a]	[a]
Mean shear modulus parallel to grain	[a]	[a]	1,0	1,0	[a]	[a]

[a] Current standards that do not include methods of assessment based on full-size structural timber.

Annex B
(informative)

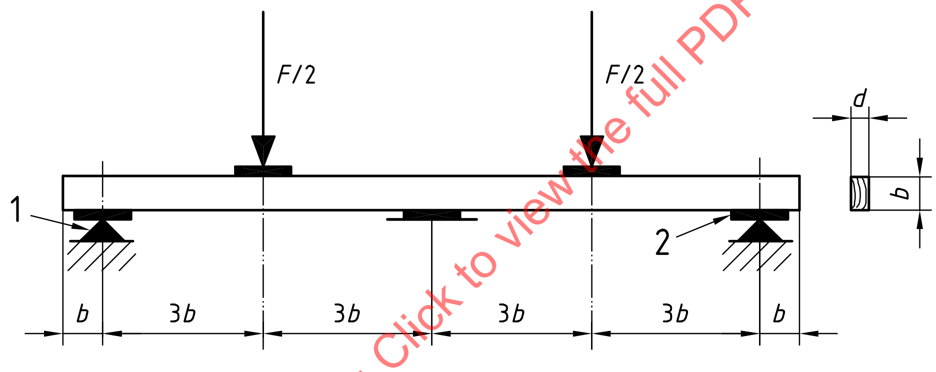
Double span configuration for shear strength test

As an alternative, to the single-span configuration shown in Figure 4, a double span configuration as shown in Figure B.1 may be used. For this case, care must be taken to ensure that all support points are carefully seated prior to the time that loading commences.

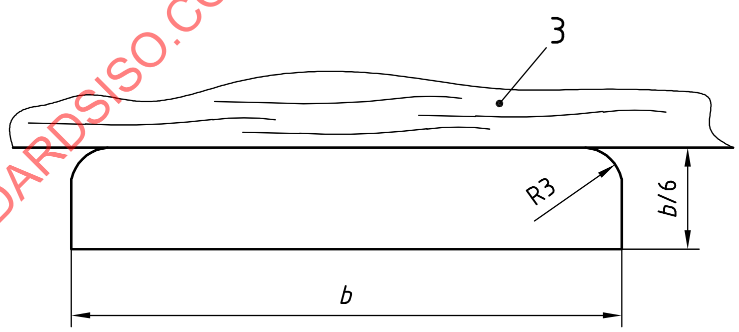
The value of the applied load at which failure occurs, F_{ult}, should be used to evaluate the shear strength f_{v} by

$$f_{\text{v}} = 0{,}516 \frac{F_{\text{ult}}}{db} \tag{B.1}$$

The double-span configuration tends to produce a higher bound to the shear strength than does the single-span configuration, and hence should be the preferred configuration for evaluating the shear strength of softwood species that have a high shear strength to bending strength ratio.



a) Loading configuration



b) Dimensions of steel-bearing plate

Key

1 rocker slider

2 bearing plate

3 timber

Figure B.1 — Double-span test set-up for shear strength test

