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Timber structures — Bending applications of I-beams —

Part 2: Component performance and manufacturing requirements

Structures en bois — Résistance à la flexion des poutres en I —
Partie 2: Performances des composants et exigences de production

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 22389-2:2012), which has been technically revised. The main changes compared to the previous edition are as follows:

— The update of dimensional tolerances in 5.2.

A list of all parts in the ISO 22389 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Prefabricated wood-based I-beams are being produced in many different countries under different national standards and these products are being exported from one country to another. While the national standards have many similarities there are also many areas of dissimilarity. Thus, there is a need for the development of an International Standard to establish consistency among these national standards to ensure the suitability of prefabricated wood-based I-beams for end use applications, regardless of the country of manufacture or of end use. This document will be of benefit to industry, consumers, governments and distributors.

Timber structures — Bending applications of I-beams —

Part 2:
Component performance and manufacturing requirements

1 Scope

This document specifies the component performance and manufacturing requirements for prefabricated wood-based I-beams used as structural members in bending applications. It does not cover fire performance, formaldehyde requirements and biological durability.

This document gives requirements for manufacturing, in-house quality assurance and periodic re-evaluation of prefabricated wood-based I-beams.

Wood-based I-beams tested according to this document are intended for use in covered conditions and utilizing components that are able to resist the effects of moisture on structural performance due to construction delays or other conditions of similar severity, but not permanently exposed to the weather.

NOTE The service conditions are similar to "Service class 2" as defined in ISO 20152-1.

Testing, evaluation and performance characterization requirements for prefabricated wood-based I-beams are covered in ISO 22389-1.

This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate health and safety practices and determine the applicability of regulatory limitations prior to use.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 20152-1, *Timber structures — Bond performance of adhesives — Part 1: Basic requirements*

ISO 22389-1:2010, *Timber structures — Bending strength of I-beams — Part 1: Testing, evaluation and characterization*

ISO 22390, *Timber structures — Laminated veneer lumber — Structural properties*

EN 789, *Timber structures — Test methods — Determination of mechanical properties of wood based panels*

ASTM D5456, *Standard Specification for Evaluation of Structural Composite Lumber Products*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
prefabricated wood-based I-beam
structural member manufactured using sawn or *structural composite lumber* (3.2) flanges and structural panel webs, forming an "I" cross-sectional shape, bonded together with a structural wood adhesive that possesses the moisture resistance suitable for the conditions specified

Note 1 to entry: These members are primarily used as joists in floor and roof construction.

Note 2 to entry: The service conditions are similar to "Service class 2" as defined in ISO 20152-1.

[SOURCE: ISO 22389-1:2010, 3.1, modified — The original NOTE 2 has been removed; new Note 2 to entry has been added.]

3.2
structural composite lumber
composite of wood elements bonded with a structural wood adhesive that possesses the moisture resistance suitable for the conditions specified and intended for structural use in dry service conditions

Note 1 to entry: The service conditions are similar to "Service class 2" as defined in ISO 20152-1.

Note 2 to entry: Examples of wood elements include wood strands, strips, veneer sheets or a combination thereof.

[SOURCE: ISO 22389-1:2010, 3.3, modified — Note 1 to entry has been added; the original NOTE 2 has been removed; the original NOTE 1 has been changed to Note 2 to entry.]

4 Component requirements

4.1 Flange stock

When the flange material is structural composite lumber, the following properties shall be determined in accordance with ISO 22390, ASTM D5456 or EN 789: modulus of elasticity, tension parallel to grain and compression parallel and perpendicular to grain. End joints in flange stock are permitted provided the joints conform to the general requirements of this document and ISO 22389-1:2010, 5.8.

4.2 Web material

Web materials covered by this document shall be able to resist the effects of moisture on structural performance due to construction delays or other conditions of similar severity.

NOTE The service conditions are similar to "Service class 2" as defined in ISO 20152-1.

4.3 Adhesives

Adhesives used to fabricate components as well as the finished products shall conform to ISO 20152-1.

5 Manufacturing requirements

5.1 General

Wood-based I-beams shall be manufactured with components and adhesives that support the properties of the I-beams that are evaluated in accordance with ISO 22389-1.

5.2 Dimensional tolerances

The tolerances permitted at the time of manufacture shall be as follows.

a) **Flange width**: ±3,0 mm

b) **Flange thickness**: ±3,0 mm.

c) I**-beam depth**: +0 mm or −3,5 mm.

NOTE 1 The +0 mm tolerance for the I-beam depth is intended to prevent a direct bearing from the floor loads above onto the I-beam ends, which can cause lateral instability of the I-beam. The floor loads above at the I-beam ends are typically designed to be carried by squash blocks or rim boards.

NOTE 2 When the structural properties such as "I" are calculated for the cross-section, the lower end of the tolerance range for all dimensions can be used.

6 In-house quality assurance

6.1 Manufacturing standard

6.1.1 General

A manufacturing standard shall be written and maintained for each product and each production facility and shall be the basis for the quality assurance at that location. As a minimum, it shall include the following:

a) material specifications, including incoming material inspection and acceptance requirements, and specifications for regrading flange stock, when applicable;

b) process controls for each operation in the production of the product;

c) quality control, inspection and testing procedures and frequencies;

d) finished product identification, handling, protection and shipping requirements;

e) when applicable, the minimum permitted flange end joint spacing.

6.1.2 Inspection personnel

All in-house persons responsible for quality control shall demonstrate that they have adequate knowledge of the manufacturing process, of the inspection and test procedures used to control the process, of the operation and calibration of the recording and test equipment used and of the maintenance and interpretation of quality control records.

6.1.3 Record keeping

All pertinent records shall be maintained on a current basis and be available for review. As a minimum, such records shall include:

a) all inspection reports and records of test equipment calibration,

b) all test data, including retests and data associated with rejected production, and

c) details of any corrective actions taken and the disposition of any rejected production, resulting from tests or inspections.

6.1.4 Testing equipment

Testing equipment shall be properly maintained, calibrated and evaluated for accuracy and adequacy.

6.2 I-beam quality control testing

6.2.1 Objectives

The following objectives shall be met simultaneously by the quality-control testing programme:

a) provide test data for use in maintaining and updating characteristic values, and

b) verify production process and material quality on a daily basis.

NOTE A characteristic value is a value of a property taken to represent the property of a designated population using a process of sampling, testing and evaluation. Characteristic values for strength and stiffness are described in and determined by the requirements of ISO 22389-1.

6.2.2 Initial quality control

When plant qualification is based on no more than the minimum testing required in this document, the producer shall initiate higher daily test frequencies and retest levels. All new producers shall consider intensify quality control in early production.

6.2.3 Required tests

The following shall be the scope of a minimum testing programme.

a) Test methods shall be identical to those specified in ISO 22389-1.

b) The shear strength test described in ISO 22389-1 shall be used for quality control of the shear strength.

c) If flanges contain end joints qualified in accordance with ISO 22389-1, daily tension tests of full-section joints shall be conducted and failure loads recorded. The manufacturing standard shall include the characteristic joint spacing that will be maintained in production. Durability tests of such joints are required only at such frequency as required to verify adhesive performance in accordance with ISO 22389-1.

d) When flange material is qualified by test in accordance with ISO 22389-1:2010, A.1 b) or c), the testing of that section shall be included in daily quality control tests. In all cases, quality assurance provisions shall be established to maintain qualification strength.

e) When moment capacity is determined empirically, the test detailed in ISO 22389-1:2010, 5.4.1 shall be conducted as part of the daily quality-control programme. All depths produced shall be tested in this programme, and the tests shall include deflection measurement.

f) Stiffness measurement of the flange material shall be part of the quality-control programme.

6.2.4 Data collection and analysis

Test frequency, minimum test values and rejection criteria for all tests shall be chosen to yield quality-control performance which is consistent with characteristic values assigned to the product and its intended use.

NOTE A characteristic value is a value of a property taken to represent the property of a designated population using a process of sampling, testing and evaluation. Characteristic values for strength and stiffness are described in and determined by the requirements of ISO 22389-1.

7 Qualification and quality assurance of I-beam components manufactured by others

7.1 Producer's responsibility

When the I-beam producer purchases material which would require qualification and quality control under the provisions of this document, they shall be responsible for assuring that, as a minimum, such material conforms to the requirements of this document.

7.2 Record keeping

The I-beam producer shall obtain and maintain records of certification from the outside producer that the components supplied conform to the requirements of this document.

7.3 Identification

All such components shall be appropriately marked as agreed upon between the component and I-beam producers.

8 Periodic re-evaluation of structural capacities

8.1 Re-evaluation required

8.1.1 General

Each capacity monitored using the required tests of 6.2.3 shall be re-evaluated on a periodic basis. As a minimum, re-evaluation shall be accomplished at the end of the first six months of production by any new manufacturer and for any new product line, and thereafter each such capacity shall be re-evaluated at the end of each successive year of production.

8.1.2 Reaction capacity re-evaluation

A one-time re-evaluation of reaction capacity shall be accomplished at the end of the first six months of production by any new manufacturer and for any new product line. The re-evaluation shall be based on data from specimens selected randomly throughout the six-month period and tested when convenient. Tests are to be conducted in accordance with ISO 22389-1:2010, 5.3.

8.1.3 Regraded sawn timber flanges

As a minimum, re-evaluation shall be conducted every six months for regraded sawn timber flanges as described in ISO 22389-1:2010, A.1. The testing shall be as specified in 6.2.3 d).

8.2 Minimum database in periodic evaluation

8.2.1 Shear and flange material tests

The minimum number of tests to be included in the analysis is that required for qualification in accordance with ISO 22389-1:2010, Clause 5. When it becomes apparent that this requirement will not be met by the initial test frequency established, the frequency of testing shall be increased. Evaluation of test frequency shall be accomplished early in the evaluation period to ensure that test data is representative of production in the period and will be randomly accumulated at time intervals spaced throughout the period.