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Timber structures - Product requirements for prefabricated structural members assembled with punched metal plate fasteners

Structures en bois - Exigences de produits relatives aux fermes préfabriquées utilisant des connecteurs à plaque métallique emboutie

Holzbauwerke - Produktanforderungen an vorgefertigte Fachewerkträger mit Nagelplatten

This European Standard was approved by CEN on 22 July 2004.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 14250:2004: E

SLUTANVÄNDARLICENS

VIKTIGT – LÄS NOGGRANT IGENOM DESSA VILLKOR INNAN DU ANVÄNDER ELLER KOPIERAR DE PRODUKTER SOM TILLHANDAHÅLLES MED DENNA LICENS. GENOM ATT ANVÄNDA PRODUKTERNA GODKÄNNER DU OCH ACCEPTERAR VILLKOREN I DETTA LICENSAVTAL. OM DU INTE GODKÄNNER VILLKOREN I LICENSAVTALET OCH INTE VILL BLI BUNDEN AV DESSA KAN DU INTE ANVÄNDA PRODUKTEN.

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(c) Punkt 4(b) är en fullständig och uttömmande reglering av SIS Förlag och Upphovsrättsinnehavarens skadeståndsansvar avseende rättighetsintrång eller påstådda rättighetsintrång genom användning av Produkten.

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6. TILLÄMPLIG LAG

Svensk lag, förutom dess bestämmelser om lagkonflikter, skall tillämpas på detta avtal, och tvister skall avgöras genom förfarande vid svensk domstol.

7. ÖVRIGA BESTÄMMELSER

Detta Licensavtal utgör en fullständig reglering av vad som avtalats mellan parterna avseende användningen av Produkten och ersätter samtliga tidigare skriftliga eller muntliga avtal, utfästelser eller överenskommelser parterna emellan. Ändring i Licensavtalet kan endast ske genom särskild upprättad och av behöriga representanter för Dig och SIS Förlag undertecknad handling. Om en bestämmelse i Licensavtalet skulle förklaras ogiltig av någon anledning, skall Licensavtalet revideras endast i sådan omfattning som är nödvändigt för att göra Licensavtalet giltigt, och sådan revidering skall (i) inte påverka giltigheten av den ogiltigförklarande delen under andra omständigheter, eller (ii) påverka övriga delar av Licensavtalet. Rubriker skall inte beaktas vid tolkningen av Licensavtalet.

8. EXPORT

Du äger inte rätt att exportera eller re-exportera Produkten eller del därav, tillhörande information eller teknologi i strid med gällande svensk och annan tillämplig exportlagstiftning.

Contents

Foreword

This document (EN 14250:2004) has been prepared by Technical Committee CEN/TC 124 "Timber structures", the secretariat of which is held by SFS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2005, and conflicting national standards shall be withdrawn at the latest by May 2005.

This document supersedes EN 1059 :1999.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This document specifies product requirements for prefabricated structural members (e.g. trusses, beams and girders) for use in buildings and bridges made from members of structural timber (with or without finger joints) assembled with punched metal plate fasteners.

The standard also covers methods to carry out the evaluation of conformity and the marking.

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.

EN 335-1, *Durability of wood and wood-based products – Definition of hazard classes of biological attack – Part 1: General.*

EN 335-2, *Durability of wood and wood-based products – Definition of hazard classes of biological attack – Part 2: Application to solid wood.*

EN 336, *Structural timber –Sizes , permitted deviations.*

EN 350-2, *Durability of wood and wood-based products – Natural durability of solid wood – Part 2: Guide to natural durability and treatability of selected wood species of importance in Europe.*

EN 351-1, *Durability of wood and wood-based products – Preservative-treated solid wood – Part 1: Classification of preservative penetration and retention.*

EN 385, *Finger jointed structural timber – Performance requirements and minimum production requirements.*

EN 460, *Durability of wood and wood-based products – Natural durability of solid wood – Guide to the durability requirements for wood to be used in hazard classes.*

EN 844-3, *Round and sawn timber – Terminology – Part 3: General terms relating to sawn timber.*

EN 844-9, *Round and sawn timber – Terminology – Part 9: Terms relating to features of sawn timber.*

EN 1310, *Round and sawn timber – Method of measurement of features.*

EN 13183-2, *Moisture content of a piece of sawn timber – Part 2: Estimation by electrical resistance method.*

EN 13501-1, *Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests.*

EN 13823, *Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item.*

prEN 14081-1, *Timber structures – Strength graded structural timber with rectangular cross section – Part 1: General requirements.*

prEN 14545, *Timber structures – Connectors – Requirements.*

3 Terms and definitions

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

3.1
anchorage area
surface area of timber occupied by the plate projections in any particular member

3.2
batch
all the structural members produced according to the same specifications in one shift

3.3
dead knot
knot that on the surface considered is intergrown with the surrounding wood for less than one quarter of the cross-sectional perimeter, as defined in EN 844-9

3.4
effective thickness/width
the target thickness/width as defined in EN 336 minus any wane present on the edge being considered

3.5
internal bracing
element to prevent lateral buckling of a compression member

3.6
live knot (intergrown knot)
knot that on the surface considered is intergrown with the surrounding wood for more than three quarters of the cross-sectional perimeter as defined in EN 844-9

3.7
plate projection
plate tooth, plate nail or burst used for the purpose of transferring forces between members

3.8
punched metal plate fastener
metal plate having integral projections punched out in one direction perpendicular to the base of the plate, being used to join two or more pieces of timber of the same thickness in the same plane

4 Material requirements

4.1 Timber

4.1.1 Grading

Timber shall be strength graded using grading standards and methods complying with prEN 14081-1.

In addition to the specified grade requirements, timber shall meet the following criteria for spring, bow, twist and cup as defined in EN 844-3 and measured in accordance with EN 1310:

Spring: 4 mm maximum per 2 m length,

Bow: 6 mm maximum per 2 m length,

Twist: 2 mm maximum per 25 mm width per 2 m length,

Cup: 2 mm maximum per 100 mm of face.

4.1.2 Finger jointed timber

Finger jointed timber shall meet the requirements of EN 385 for the appropriate service class.

4.1.3 Resistance to biological organisms

The timber shall either have adequate natural durability in accordance with EN 350-2 for the intended service class as defined in EN 335-1 and EN 335-2, or be given a preservative treatment selected in accordance with EN 351-1 and EN 460.

4.2 Punched metal plate fasteners

The fasteners shall fulfil the requirements of prEN 14545 and shall correspond to the fasteners specified in the design.

If the timber is preservative treated against biological attacks and fire, the preservative used shall be compatible with the fastener's treatment against corrosion.

The fastener shall bear a mark that readily identifies the producer or supplier and the type of plate.

5 Product requirements

5.1 Strength and stiffness

The structural characteristics of the members shall be declared as either:

1) the geometrical and material properties of the components used, determined according to clause 4, sufficient to calculate the strength and stiffness of the structural members according to methods valid in the country of use (e.g. EN 1990, EN 1991 and prEN 1995-1-1 taking into account any National Annexes); or

2) a reference to national design documents produced (and held) by the manufacturer according to methods valid in the country of use (e.g. EN 1990, EN 1991 and prEN 1995-1-1 taking into account any National Annexes); or

3) a reference to the design documents produced by another party, together with information on the party responsible for the design.

NOTE For the initial type testing or assessment according to the method of declaration, see clause 7 and for marking requirements, see clauses 8 and ZA.3.

5.2 Reaction to fire

Where required, the reaction to fire class shall be declared by the producer. Structural elements made of timber in accordance with Table 1 may be classified without the need for further testing. Where the manufacturer seeks a higher classification (e.g. in the case of treated timber), the timber as a material shall be tested and classified in accordance with EN 13501-1, mounted, when tested according to EN 13823, in accordance with Footnote b of Table 1.

Table 1 – Structural timber considered as classified without further testing

Product[a]	Product details	Minimum density[c] (kg/m^3)	Minimum thickness (mm)	Class[b]
Structural timber	Visual and machine graded structural timber with rectangular cross-sections shaped by sawing, planing or other methods or with round cross-sections	350	22	D-s2, d0

[a] Applies to all species covered by the product standards.

[b] Class as provided for in Commission Decision 2000/147/EC Annex Table 1. For testing, the whole area of both wings in the SBI apparatus is covered with timber pieces mounted edge to edge (butt jointed), without jointing or bonding and orientated horizontally or vertically. Timber battens, minimum 40 mm by 40 mm, fixed to the test backing boards at 400-600 mm centres horizontally or vertically (perpendicular to the orientation of the timber pieces), support the timber pieces.

[c] At conditioning according to EN 13183-2.

5.3 Structural members

5.3.1 Timber sizes

Member size tolerances shall as minimum be in accordance with tolerance class 2 given in EN 336.

Target sizes shall be not less than:

Thickness (width), all members: 35 mm,

Depth, external (chord) members: 68 mm,

Depth, internal (web or diagonal) members: 58 mm.

The effective thickness, as defined in 3.4, of the outer face of any chord member shall not be less than 35 mm.

5.3.2 Wane

Wane shall not occur within the area of any jointing device or within support areas.

5.3.3 Joint gaps

Within the area of the fastener, the average gap between two adjacent members at the time of fabrication shall not exceed 1,5 mm.

5.3.4 Moisture content

The maximum moisture content of the timber and of timber wedges, if any, at the time of fabrication shall not exceed 22 %. The moisture content shall be estimated in accordance with EN 13183-2 using a calibrated electric resistance moisture meter.

5.3.5 Dimensional accuracy

The overall horizontal and vertical dimensions of the structural member shall not deviate from the specified dimensions by more than the following tolerances:

dimensions up to and including 10 m: 20 mm,

dimensions more than 10 m: 2 mm for each metre.

The dimensional variation between members within the same batch shall not differ by more than 10 mm.

5.3.6 Camber

At the time of fabrication, camber shall be within a tolerance of 25 % of the camber specified in the design.

5.4 Joints

5.4.1 Live knots

Live knots are permitted within the anchorage area, provided that the plate projections are satisfactorily embedded without visible distortion of the fasteners or splitting of the timber outside the knot.

5.4.2 Dead knots or fissures

Where a dead knot, knothole, or fissure occurs within the anchorage area, the number of effective plate projections, disregarding those in the dead knot, knot hole or on the line of the fissure shall be in accordance with that specified in the design. Fissures which do not extend more than 50 mm from the tooth, burst or plate nail, which apparently caused them, shall be disregarded.

5.4.3 Fastener positioning

Fasteners shall not be misplaced by more than 10 mm in any direction.

5.4.4 Fastener embedment

The plate projections shall be inserted perpendicular to the embedment surface of the timber and the plate surface shall be free of distortion. Any gap between the timber surface and the underside of a punched metal plate fastener shall not exceed 1 mm and shall not occur over more than 25 % of the anchorage area in any member in any joint.

5.4.5 Protruding fasteners

Punched metal plate fasteners shall not protrude outside the outer edges of the structural member. The lower edge of fasteners intended to be located over a point of support shall be at least 3 mm from the lower edge of the member in contact with the support.

NOTE It is important that consideration is given to the masking of protruding corners of fasteners; particularly those that protrude into walk spaces or other areas permitting access.

6 Product documents

Adequate drawings and written instructions shall be provided with the products relating to their transport, handling, storage, erection, positioning and internal bracing, together with any fixing details necessary to construct compound or multi-part structures.

7 Evaluation of conformity

7.1 General

The compliance of a structural member with the requirements of this standard shall be demonstrated by:

- initial assessment of produced members;
- factory production control by the producer, including product assessment.

7.2 Initial type testing and assessment

Initial type testing and assessment shall be performed to demonstrate compliance with this standard. Results from previously performed types testing or assessments in accordance with the provisions of this standard (same product, same characteristic(s), testing or assessment method, sampling procedure, system of attestation of conformity, etc.) may be taken into account.

Those characteristics requiring testing (i.e. strength and dimensions of fasteners, tolerances and reaction to fire, if tested) shall be subject to testing, while other characteristics (i.e. structural design, treatment and corrosion protection of fasteners) shall be subject to assessment. Where the manufacturer buys fasteners already shown to comply with the requirements of prEN 14545, no further testing of the fasteners is necessary to meet the requirements of this standard.

Where the manufacturer does the design calculations, checks shall be made on these calculations and checks shall be made to ensure that the structural members produced correspond to the design. Where the manufacturer makes structural members in accordance with a third party design, checks shall be made to ensure that the members produced correspond to the design.

Whenever a change occurs in materials including the fasteners or the production process, which would change significantly one or more of the characteristics, the tests and/or assessments shall be repeated for the appropriate characteristic(s).

7.3 Factory production control

7.3.1 General

The producer shall establish, document and maintain a factory production control system to ensure that the products placed on the market conform with the performance characteristics stated by the producer, and that the products are correctly fabricated in the accordance with the design. The factory production control system shall consist of procedures, regular inspections and test and/or assessments and the use of the results to control raw materials and other incoming products, equipment, the production process and the product.

A factory production control system conforming to the requirements of EN ISO 9001, and made specific to the requirements of this standard, is considered to satisfy the above requirements.

The results of inspections, test or assessments requiring action shall be recorded, as shall any action when control values or criteria are not met.

7.3.2 Daily control

The following shall be controlled once per production day or once per production shift or once per order, whichever is the most frequent:

- Before/at cutting:
  - Timber grade, see 4.1.1 and 4.1.2;
  - Timber sizes, see 5.3.1;
  - Geometrical defects, see 4.1.1;
  - Moisture content, see 5.3.4;
  - Resistance to biological organisms, if any, see 4.1.3.
- At beginning of assembly:
  - Fastener type, thickness and size, see 4.2.1 and 4.2.3;
  - Fastener positioning, orientation and installation, see 5.4.3, 5.4.4 and 5.4.5;
  - Joint gap, see 5.3.3;
  - Wane and knots within the anchorage zone, see 5.4.1 and 5.4.2;
  - Dimensional accuracy, see 5.3.5 and 5.3.6;
  - Marking, see clause 8.

7.3.3 Weekly control

In addition to the items mentioned in 7.3.2, the following shall be controlled for one batch (chosen at random) per production line:

- the dimensional variations, see 5.3.5;
- the production drawings and other documents, see clause 6.

7.3.4 Regular control

All measuring and testing equipment shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

7.3.5 Records

The following shall be kept at least 5 years.

- For each batch:
  - Job number and customer's name;
  - Production date and shift;
  - Production drawings showing timber quality and sizes, fastener type, sizes and positioning, wood protection (if any), the overall horizontal and vertical dimensions, and camber and the location of support and bracing (if any). In the case of the manufacturer doing the design, this will be the manufacturer's own drawings; where the manufacturer produces to a third party design, this will either be the third party drawings or a reference to these drawings;
  - Results of control in accordance with 7.3.2 and 7.3.3.
- For the equipment:
  - Results of calibration in accordance with 7.3.4.

8 Marking

Each structural member shall be clearly and indelibly marked with the following information:

- identification of producer;
- job and batch identification;
- reference to this standard.

Additionally the following shall be given either on the structural member or in an accompanying document:

- the location of support areas and any points at which internal bracing is required according to the design.

The marking on the structural member shall be placed in a common way so that it can be used as a reference for installation.

Where ZA.3 covers the same information as this clause 8, the requirements of this clause are met.

Annex ZA
(informative)

Clauses of this European standard addressing the provisions of the EU Constructions Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/112 "Structural timber products and ancillaries" given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC). Compliance with these clauses confers a presumption of fitness of the construction products covered by this annex for their intended uses indicated herein.

WARNING: Other requirements and other EU Directives not affecting the fitness for intended use may be applicable to the construction products falling within the scope of this standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (accessed through http://europa.eu.int/comm/enterprise/construction/internal/dangsub/dangmain.htm)

This annex establishes the conditions for the CE marking of prefabricated structural members using punched metal plate fasteners intended for uses in building and bridges.

The scope of this annex is defined by Table ZA.1, and is the same as clause 1 of this standard.

Table ZA.1 – Relevant clauses

Product: Prefabricated structural members assembled with punched metal plate fasteners **Intended use:** Buildings and bridges		
Essential characteristics	**Requirement clauses in this standard**	**Notes**
Strength	4.1.1, 4.1.2, 5.1, 5.3, 5.4	
Stiffness (dimensional stability)	4.1.1, 4.1.2, 5.1, 5.3, 5.4	
Durability	4.1.3, 4.2	
Reaction to fire	5.2	

ZA.2 Procedure for attestation of conformity of prefabricated structural members assembled with punched metal plate fasteners

ZA.2.1 System of attestation of conformity

The system of attestation of conformity of prefabricated structural members assembled with punched metal plate fasteners, in accordance with the Decision of the Commission 97/176/EC of 1997-04-29 as given in Annex III of the mandate for "Structural timber products and ancillaries", is shown in Table ZA.2 for the indicated intended use(s).

Table ZA.2 – System of attestation of conformity

Product(s)	Intended use(s)	Attestation of conformity system
Prefabricated structural members assembled with punched metal plate fasteners	Buildings and bridges	2+
System 2+: See Directive 89/106/EEC (CPD) Annex III.2.(ii), First possibility, including certification of the factory production control by an approved body on the basis of initial inspection of factory and of factory production control as well as of continuous surveillance, assessment and approval of factory production control.		

The attestation of conformity of the prefabricated structural members assembled with punched metal plate fasteners in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table ZA.3 resulting from application of the clauses of this European Standard indicated therein.

Table ZA.3 – Assignment of evaluation of conformity tasks for prefabricated structural members assembled with punched metal plate fasteners under system 2+

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (FPC)	Parameters related to all relevant characteristics of Table ZA.1	7.3
	Initial type testing and assessment by a notified test lab	All relevant characteristics of Table ZA.1 except reaction to fire, see below	7.2
	Initial type testing by the manufacturer	Reaction to fire where not classified without further testing	7.2
	Testing of samples taken at the factory	All relevant characteristics of Table ZA.1	7.3
Tasks under the responsibility of the Notified Body	Initial inspection of factory and of FPC	Parameters related to all relevant characteristics of Table ZA.1	7.3
	Continuous surveillance, assessment and approval of FPC	Parameters related to all relevant characteristics of Table ZA.1	7.3

ZA.2.2 Certificate and Declaration of conformity

When compliance with the conditions of this annex is achieved, and once the notified body has drawn up the certificate mentioned below, the manufacturer or his agent established in the EEA shall prepare and retain a declaration of conformity, which entitles the manufacturer to affix the CE marking. This declaration shall include:

- name and address of the producer, or his authorised representative established in the EEA, and the place of production;
- description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;
- provisions to which the product conforms (i.e. annex ZA of this EN);
- particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);
- the number of the accompanying factory production control certificate;
- name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The declaration shall be accompanied by a factory production control certificate, drawn up by the notified body, which shall contain, in addition to the information above, the following:

- the name and address of the notified body;
- the number of the factory production control certificate;
- the conditions and period of validity of the certificate, where applicable;
- the name of, and position held by, the person empowered to sign the certificate.

ZA.3 CE marking and labelling

The producer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EC and shall be shown on the product.

The following information on the product and its essential characteristics shall accompany the CE marking symbol:

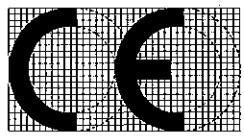
- identification number of the FPC certification body;
- name and registered address of the producer or identifying mark;
- the last two digits of the year in which the marking is affixed;
- number of the EC factory production control certificate;
- reference to this European Standard;
- description of the product: "Prefabricated structural member assembled with punched metal plate fasteners".

Figure ZA.1 gives an example of the information to be given on the product.

The CE marking symbol and the information given above, together with the following information, shall be given in the accompanying commercial documents:

- the strength and stiffness values (using one of the methods in 5.1);
- the reaction to fire class (including smoke and droplets);
- the intended service class;
- applied treatment, if any.

Figure ZA.2 gives an example of the information to be given in the accompanying commercial documents.



01234

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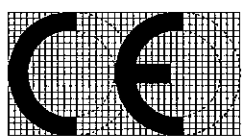
01234-CPD-00234

EN 14250

Prefabricated structural member assembled with punched metal plate fasteners

Figure ZA.1 – Example CE marking information on the product



01234

AnyCo Ltd, PO Box 21, DK-1050

04

01234-CPD-00234

EN 14250

Prefabricated structural member assembled with punched metal plate fasteners

Strength/stiffness : According to design document reference ABC by The Building Design Company

Reaction to fire : Class D-s2,d0

Service class : 1

Figure ZA.2 – Example CE marking information on the accompanying commercial documents

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned.

Bibliography

[1] EN 1990, *Eurocode – Basis of structural design.*

[2] EN 1991, *Eurocode 1: Actions on structures.*

[3] prEN 1995-1-1, *Eurocode 5: Design of timber structures – Part 1-1: General rules and rules for buildings.*

[4] EN ISO 9001, *Quality management systems – Requirements (ISO 9001:2000).*