



SLOVENSKI STANDARD
SIST EN 13377:2002

01-december-2002

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Prefabricated timber formwork beams - Requirements, classification and assessment

Industriell gefertigte Schalungsträger aus Holz - Anforderungen, Klassifizierung und Nachweis

Poutrelles de coffrage préfabriquées en bois - Exigences, classification et évaluation

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EUROPEAN STANDARD

EN 13377

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English version

Prefabricated timber formwork beams - Requirements, classification and assessment

Poutrelles de coffrage préfabriquées en bois - Exigences,
classification et évaluation

Industriell gefertigte Schalungsträger aus Holz -
Anforderungen, Klassifizierung und Nachweis

This European Standard was approved by CEN on 29 May 2002.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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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

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Foreword

This document EN 13377:2002 has been prepared by Technical Committee CEN/TC 53 "Temporary works equipment", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by February 2003, and conflicting national standards shall be withdrawn at the latest by February 2003.

The annexes A, B, C and D are normative, the annexes E and F are informative.

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

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Introduction

This European Standard is a product standard primarily for use in the field of falsework and formwork.

Formwork beams should be made so that the properties specified in clause 5 are retained under site conditions such as exposure to water, water vapour and cement.

Whilst this European Standard deals with the two most common types of prefabricated timber formwork beams in use it is not intended to prevent development of other types of formwork beams made of timber and wood based materials.

Research and development in the field of panel materials is continuous. Even if formwork beams are made with materials which do not conform with this European Standard, the principles of this European Standard should be considered in the design and assessment of such beams.

To obtain test results and their statistical evaluation annexes A and B respectively can be used. The values for strength and stiffness given in Tables 1 and 2 have been established from experience. To use these values, the partial safety factor for actions, γ_f , should be taken into account as well as the partial safety factor for the material, γ_M , and modification factor, k_{mod} , for timber, (see ENV 1995-1-1). Annex E gives some guidance. For more information on timber see the Bibliography in annex F.

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1 Scope

This European Standard specifies classification, requirements and assessment procedures for prefabricated timber formwork beams. It also gives information on production control requirements.

Prefabricated timber formwork beams are intended for use in falsework and formwork and to be loaded in the direction of the beam depth.

They are of glued I-shaped construction consisting of two identical flange members of solid timber connected by a single web of wood based material with beam depths of 160 mm, 200 mm and 240 mm, or connected by or a lattice of solid timber members with a beam depth of 240 mm beam depth.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 301, *Adhesives, phenolic and aminoplastic for load bearing timber structures — Classification and performance requirements.*

EN 310, *Wood-based panels – Determination of modulus of elasticity in bending and of bending strength.*

EN 317, *Particleboards and fibreboards — Determination of swelling in thickness after immersion in water.*

EN 319, *Particleboards and fibreboards — Determination of tensile strength perpendicular to the plane of the board.*

EN 323, *Wood based panels — Determination of density.*

EN 338, *Structural timber — Strength classes.*

EN 385:1995, *Finger jointed structural timber — Performance requirements and minimum production requirements.*

EN 408, *Timber structures — Solid timber and glued laminated timber — Determinations of some physical and mechanical properties.*

EN 518, *Structural timber — Grading — Requirements for visual strength grading standards.*

EN 519, *Structural timber — Grading — Requirements for machine strength graded timber and grading machines.*

EN 636-3, *Plywood — Specifications — Part 3: Requirements for plywood for use in exterior conditions.*

ENV 1995-1-1:1993, *EUROCODE 5: Design of timber structures — Part 1-1: General rules and rules for buildings.*

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

prEN 13353, *Solid-wood-panels — Requirements.*

prEN 13354, *Solid-wood-panels — Bonding quality — Test method.*

3 Terms, definitions and symbols

3.1 Terms and definitions

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For the application of this European Standard, the following terms and definitions apply.

3.1.1

formwork beam

beam in formwork construction and loaded in the direction of the beam depth

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3.1.2

timber formwork beam

glued prefabricated I-shaped beam consisting of two identical flange members of solid timber connected by a web of wood based panel material or a lattice of solid timber members

3.1.3

panel web beam

timber formwork beam in which the web is made of a wood based panel material (see Figure 1a))

3.1.4

lattice web beam

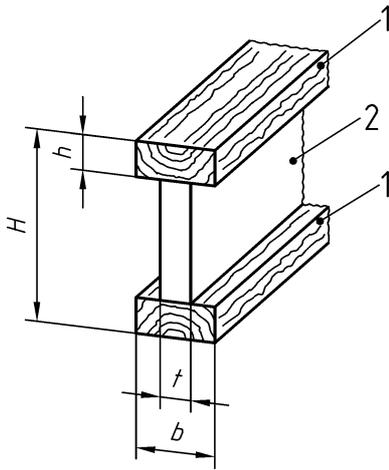
timber formwork beam made with lattice struts (see Figure 1b)).

3.1.5

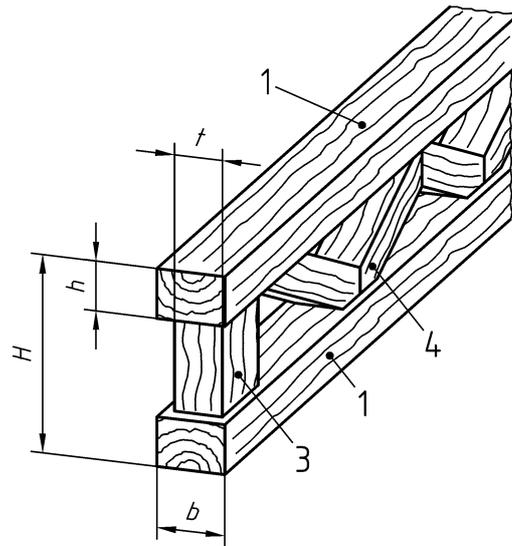
lattice strut

member, positioned diagonally or at right angles to the flange, which connects two parallel flange members (see Figure 1b))

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**Key**

| | |
|-----|-----------------------------|
| H | Depth of beam |
| b | Flange width |
| h | Depth (thickness) of flange |
| t | Thickness of web |

**Key**

| | |
|---|----------------|
| 1 | Flange |
| 2 | Panel web |
| 3 | Vertical strut |
| 4 | Diagonal strut |

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a) Panel web beam (type P) [SIST EN 13377:2002](https://standards.iteh.ai/catalog/standards/sist/f752ad1b-7bcb-47ce-85e7-9f5aac88cf3/sist-en-13377-2002) b) Lattice web beam (type L)

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Figure 1 — Timber formwork beams
General construction and symbols used for the dimensions

3.2 Symbols

The principal symbols used in this standard are listed below:

| Number | Symbol | Denomination | Unit |
|------------|------------------|--|--------------------|
| 1 | a | module of the lattice web beam | mm |
| 2 | b | flange width | mm |
| 3 | e | distance of proportion at load positions | |
| 4 | E | modulus of elasticity | kN/mm ² |
| 5 | E_I | bending stiffness | kNm ² |
| 6 | F | action | kN |
| 7 | H | depth of beam | mm |
| 8 | h | depth (thickness) of flange | mm |
| 9 | I | second moment of area | mm ⁴ |
| 10 | k_{mod} | modification factor | |
| 11 | k_s | statistical factor | |
| 12 | L | span of beam | m |
| 13 | M | bending resistance | kNm |
| 14 | n | number of specimens | |
| 15 | R | resistance | kN/mm ² |
| 16 | s | standard deviation | |
| 17 | t | thickness of web | mm |
| 18 | V | shear resistance | kN |
| 19 | W | section modulus | mm ³ |
| 20 | y | mean value | |
| 21 | y_i | single value | |
| 22 | γ_F | partial safety factor for actions | |
| 23 | γ_M | partial safety factor for material | |
| Subscripts | | | |
| 24 | ...b | bearing | |
| 25 | ...d | design level in limit state | |
| 26 | ...i | typical/any value | |
| 27 | ...k | characteristic value (limit state) | |
| 28 | ...m | "supported between node points" | |
| 29 | ...mod | modification | |
| 30 | ...n | "supported at node point" | |
| 31 | ...s | statistical | |
| 32 | ...u | ultimate (limit state) | |
| 33 | ...y | value related to transformed values | |
| 34 | ...5 | 5 % quantile value | |

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4 Classification

This standard specifies types of beam; the classification is based on:

- the web construction: Type P for a panel web beam;
Type L for a lattice web beam;
- the overall depth, H : the two digits in the identification symbols represent the depth in centimetres.

The nominal load bearing and rigidity properties for each class are listed in Tables 1 and 2.

For classification see Tables 1 and 2. The identification symbols are given in column 1 of Tables 1 and 2.

Table 1 — Classification, dimensions and structural properties of panel web beams

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------|------------------------|----------------------------------|------------------------------|---------------|-------------------|----------------|
| Class | beam depth H [mm] | minimum flange width b [mm] | E_I [kNm ²] | V_k [kN] | $R_{b,k}$ [kN] | M_k [kNm] |
| P16 | 160 | 65 | 200 | 18,4 | 36,8 | 5.9 |
| P20 | 200 | 80 | 450 | 23,9 | 47,8 | 10.9 |
| P24 | 240 | 80 | 700 | 28,2 | 56,4 | 14.1 |

NOTE 1 For explanation of symbols, see 3.2.
NOTE 2 For calculation of "safe working loads", see annex E.

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Table 2 — Classification, dimensions and structural properties of lattice web beams

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------|------------------------|----------------------------------|------------------------------|---------------|---------------------|----------------------------|--------------------|----------------------------|
| Class | beam depth H [mm] | minimum flange width b [mm] | E_I [kNm ²] | V_k [kN] | $R_{b,n,k}$ [kN] | $R_{b,m,k}$ [kN] | $M_{n,k}$ [kNm] | $M_{m,k}$ [kNm] |
| | | | | | supported at nodes | supported in between nodes | supported at nodes | supported in between nodes |
| L24 | 240 | 80 | 800 | 28,2 | 60,7 | 43,4 | 15,2 | 8,7 |

NOTE 1 For explanation of symbols, see 3.2.
NOTE 2 For calculation of "safe working loads", see annex E.

To obtain the required bearing area, the lateral compression strength for the strength class C 24 with 5,3 N/mm² in accordance with EN 338:1995 shall be used.

5 Performance requirements

5.1 General

Beams shall conform to the requirements of this clause according to their class. Conformity with the requirements shall be verified, see clauses 6 and 7, and manufacturing shall be subject to production control, see clause 8 and annex C.

All requirements should be met with a moisture content of solid timber members of $(12 \pm 2) \%$ (manufacturing target moisture content).

5.2 Material and assembly requirements

5.2.1 Solid timber components – strength class

Members of solid timber shall at least conform to strength class C 24 of EN 338.

NOTE It is recommended that the growth ring width is less than 4 mm and the amount of compression wood does not exceed 20 %.

5.2.2 Wood based panel components

The web shall be made of one of the following materials:

- a) plywood conforming to EN 636-3;
- b) solid wood panels for use in exterior conditions conforming to prEN 13353;
- c) any other wood based material, which conforms after passing the wet-dry-cyclic test (see annex D) with the subsequent requirements:
 - i) tension strength perpendicular to the plane determined in accordance with EN 319 shall not be less than $0,1 \text{ N/mm}^2$ (see D.3.1); and
 - ii) irreversible swelling shall not exceed 20 % (see D.3.2).

The following properties of this wood based material shall be made available:

- density established in accordance with EN 323;
- bending strength established in accordance with EN 310;
- thickness swelling established in accordance with EN 317;
- internal bond established in accordance with EN 319.

The established properties shall be used as requirements for production control (see annex C).

5.2.3 Shear strength of the glue line in beam sections with webs conforming to 5.2.2c

After applying the wet-dry cyclic testing procedure given in annex D, the mean value of the shear strength of beam sections shall be at least 9 kN (see D.4.6).

5.2.4 Glued finger joints

Glued finger joints in flanges shall conform to EN 385.

5.2.5 Glue

Glue shall fulfil the requirements of type I of EN 301.