



SLOVENSKI STANDARD
SIST EN 12813:2004

01-oktober-2004

Časovna oprema za prenos obremenitve - Stupnežne stolpe iz predfabriciranih delov - Posebne metode oblikovanja

Temporary works equipment - Load bearing towers of prefabricated components - Particular methods of structural design

Temporäre Konstruktionen für Bauwerke - Stützentürme aus vorgefertigten Bauteilen - Besondere Bemessungsverfahren

Equipements temporaires de chantiers - Tours d'étaieiment en composants préfabriqués - Méthodes particulières de calcul des structures

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91.220 Gradbena oprema Construction equipment

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EUROPEAN STANDARD

EN 12813

NORME EUROPÉENNE

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June 2004

ICS 91.220

English version

Temporary works equipment - Load bearing towers of prefabricated components - Particular methods of structural design

Equipements temporaires de chantiers - Tours d'étaieiment en composants préfabriqués - Méthodes particulières de calcul des structures

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This European Standard was approved by CEN on 4 December 2003.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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 Central Secretariat has the same status as the official versions.

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

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Foreword

This document (EN 12813:2004) has been prepared by Technical Committee CEN/TC 053 “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of an identical text or by endorsement, at the latest by December 2004, and conflicting national standards shall be withdrawn at the latest by December 2004.

Annex A is informative, annex B is normative.

This document includes a bibliography.

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.

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EN 12813:2004 (E)**Introduction**

This European Standard is intended to provide information for those who specify load bearing towers made from prefabricated components and for the designer who has to prepare a scheme for their use.

This European Standard will be of interest to those who wish to develop particular items, or groups of items for load bearing towers of prefabricated components.

This European Standard describes how to establish structural data for load bearing towers made from prefabricated components.

Most of the figures illustrating the standard are of a particular type of tower but the procedures described are applicable to all towers.

There is a requirement for a global test to demonstrate that the modelling adopted in the analysis is sufficiently accurate and on the conservative side.

For materials this standard refers only to valid European Standards. However a large stock of equipment made of materials conforming to standards no longer valid is in use. This standard does not cover the use of this equipment.

NOTE This European Standard does not give information on site activities nor about safety requirements, for which reference should be made to E.C. directives, and national documents.

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1 Scope

This European Standard describes methods for establishing structural data for stiffness and resistance by calculation supported by tests for load bearing towers made of prefabricated components of steel or aluminium alloy. The vertical load capacity is established, both with or without horizontal loads and with the top restrained or free.

This European Standard specifies two methods of analysis, by first order theory, or by second order theory.

NOTE For definitions and requirements relating to structures and materials of the structure, specifications and loads, see EN 12812.

The European Standard is not intended for towers constructed with tubes and couplers: it is expected that they will be designed in accordance with EN 12812.

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).

ENV 1993-1-1, *Eurocode 3 — Design of steel structures — Part 1-1: General rules and rules for buildings.*

ENV 1999-1-1, *Eurocode 9 — Design of aluminium structures Part 1-1: General rules - General rules and rules for buildings.*

EN 12810-2, *Façade scaffolds made of prefabricated components — Part 2: Particular methods of structural design*

EN 12811-2, *Temporary works equipment - Part 2: Information on materials.*

EN 12811-3:2002, *Temporary works equipment - Part 3: Load testing.*

EN 12812:2004, *Falsework — Performance requirements and general design.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions of EN 12812 and the following apply.

3.1

base plate

plate used for spreading the load in a standard over a greater area

3.2

base jack

base plate which has means of vertical adjustment

NOTE It is intended to be positioned at the base of an upright. It usually incorporates a base plate.

EN 12813:2004 (E)**3.3****bracing**

component or components to increase stiffness and to provide greater vertical and lateral strength

NOTE In the horizontal plane this may comprise frames, platforms, or rigid linkages between the uprights. In the vertical plane the usual methods include closed frames, with or without gussets, open frames, ladder frames with open access, rigid assemblies between horizontal members and uprights, and diagonals.

3.4**fork head**

"U" shaped component for holding a beam

NOTE It is intended to be positioned at the top of an upright for locating and supporting a horizontal beam.

3.5**frame**

component which has at least one horizontal element permanently fixed to at least one upright element

3.6**fully triangulated load bearing tower**

tower in which a diagonal member is attached to each panel including either braced or unbraced jacks (see Figures 1a, 1b, 2)

NOTE A panel is bounded by two adjacent vertical and two adjacent horizontal members. The diagonals are considered to create full triangulation to each vertical plane, if they are attached within 200 mm of each node point.

3.7**head jack**

screw device both able to adjust height and to release the tower from the loading.

NOTE It is intended to be positioned at the top of an upright. It usually incorporates a fork head.

3.8**horizontal member**

component forming a horizontal connection between two uprights.

NOTE An upright may either be the vertical linear element of frames, or vertical components of a modular system.

3.9**load bearing tower**

tower with three or more uprights made of prefabricated steel or aluminium alloy components

NOTE The components are principally linear members or frames.

3.10**loading beam**

horizontal member positioned above the primary beams onto which the vertical imposed test load is centrally applied

3.11**not fully triangulated load bearing tower**

tower in which not all vertical planes are fully triangulated (see Figures 3a, 3b)

3.12**prefabricated component**

discrete part of a tower with permanently fixed connection devices which pre-determine dimensions

3.13**primary beam**

lowest horizontal beam distributing load at the top of a tower

3.14**storey**

part of the tower comprised between two consecutive horizontal planes

3.15**upright**

vertical load bearing element

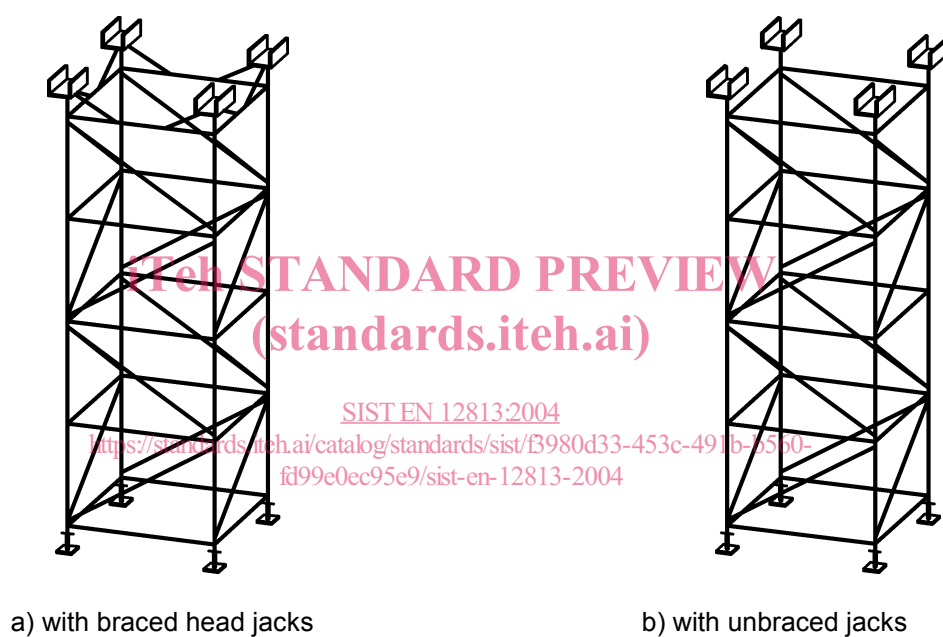


Figure 1 — Examples of fully triangulated towers

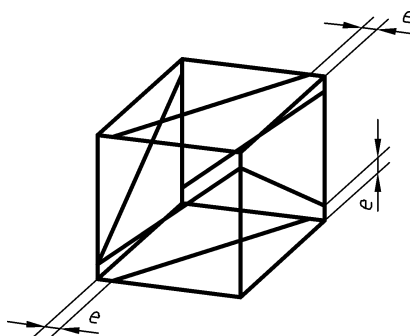
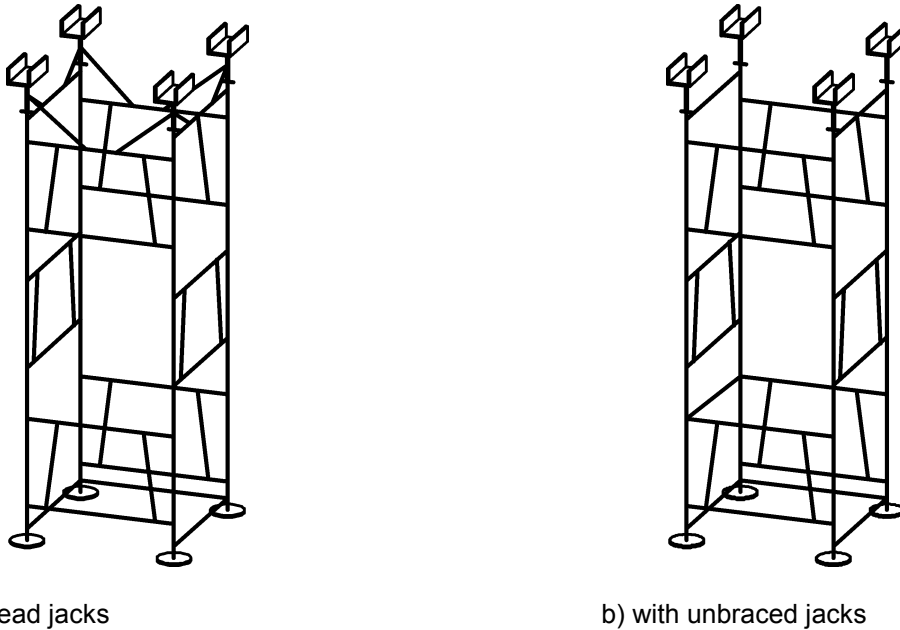


Figure 2 — Eccentricity "e" of the diagonals to members



a) with braced head jacks

b) with unbraced jacks

Figure 3 — Examples of not fully triangulated towers

4 Symbols

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(Table 1 — Symbols)

Number	Symbol	Denomination	Unit
1	A	Cross-sectional area	mm ²
2	d	Horizontal displacement	mm
3	e	Eccentricity	mm
4	E	Longitudinal modulus of elasticity	N/mm ²
5	F	External load applied to the structure	N
6	F_H	Horizontal load applied to the structure	N
7	F_{Hd}	Design value of the horizontal load	N
8	F_v	Vertical load applied to the structure	N
9	F_{vd}	Design value of the vertical load	N
10	F_{cr}	Buckling load of a face	N
11	$f_{y \text{ nom}}$	Nominal yield stress	N/mm ²
12	H, h	Height	m
13	L	Length	m
14	n	Number of uprights in a tower	
15	R_d	Design value of resistance	N/mm ²
16	S_d	Design value of the effects of actions	N/mm ²
17	γ_F	Partial factor for the actions	
18	γ_M	Partial factor for resistance	
19	α_{cr}	The lowest elastic buckling load factor to be applied to the design loads	

5 General information needed for structural analysis of a load bearing tower made in prefabricated components

See EN 12812:2004, for information about :

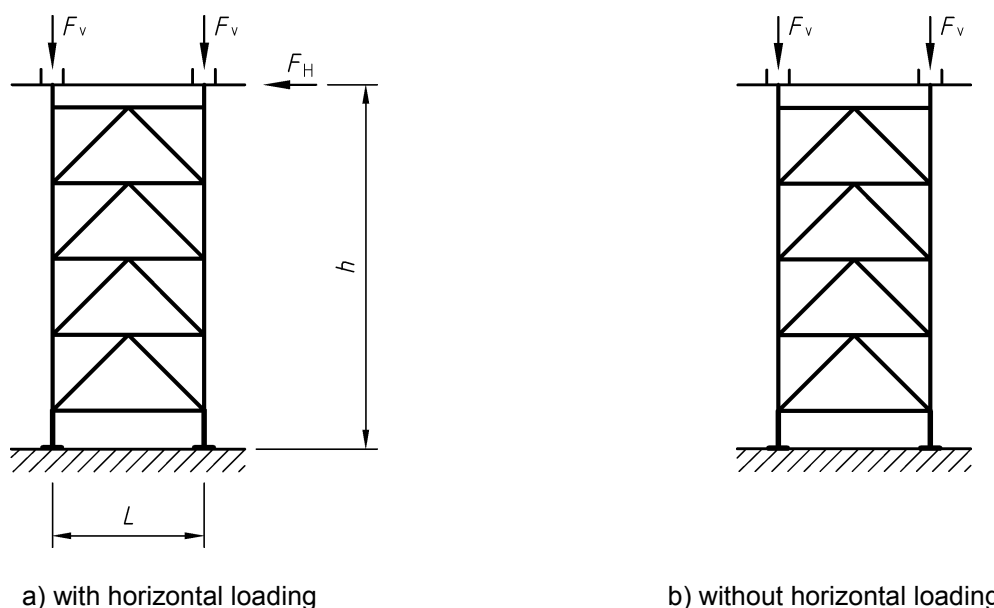
- materials, clause 5, (and also EN 12811-2)
- thickness of material, 7.2
- partial factors, 9.2.2
- imperfections and boundary conditions, 9.3
- classes, clause 4, 9.1.2
- differential settlement and thermal conditions 8.3.2
- actions, clause 8.

6 Analysis methods for the design resistance of a tower

6.1 Cases to be analysed

A tower shall be analysed with the following three sets of loads, and with base and head Jacks fully extended, unless design resistance for smaller extensions has to be established.

- Case 1 A tower unrestrained at the top subjected to vertical loading:
 Case 1a, Figure 4a) with horizontal loading
 Case 1b, Figure 4b) without horizontal loading
- Case 2 A tower with the top restrained, subjected to vertical loading (see Figures 4a), 4b), and 5).



For explanations of symbols see clause 4

Figure 4 — Typical loading conditions for a tower free at the top