SLOVENSKI STANDARD
SIST EN 12810-2:2004

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Nadomešča:
SIST HD 1000:2000

Fasadni odri iz predizdelanih elementov – 2. del: Posebne metode dimenzioniranja

Façade scaffolds made of prefabricated components - Part 2: Particular methods of structural design

Fassadengerüste aus vorgefertigten Bauteilen - Teil 2: Besondere Bemessungsverfahren und Nachweise

Echafaudages de façade a composants préfabriqués - Partie 2: Méthodes particulieres de calcul des structures

Ta slovenski standard je istoveten z: **EN 12810-2:2003**

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91.220	Gradbena oprema	Construction equipment

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EUROPEAN STANDARD

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English version

Façade scaffolds made of prefabricated components - Part 2: Particular methods of structural design

Echafaudages de façade à composants préfabriqués - Partie 2: Méthodes de conception particulière et d'évaluation

Fassadengerüste aus vorgefertigten Bauteilen - Teil 2: Besondere Bemessungsverfahren und Nachweise

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

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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.

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

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Contents

Foreword

This document (EN 12810-2:2003) 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of an identical text or by endorsement, at the latest by June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

Annexes A, B and C are normative.

This European Standard will supersede the European Harmonisation document HD 1000:1988 "Service and working scaffolds made of prefabricated elements; Materials, dimensions, design loads and safety requirements".

This European Standard is one of a series of standards as listed below.

EN 12810-1, *Façade scaffolds made of prefabricated elements — Part 1: Product specifications.*

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

EN 12811-1, *Temporary works equipment — Part 1: Scaffolds — Performance requirements and general design.*

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

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

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European standard applies to façade scaffold systems conforming with EN 12810-1. It defines rules for the structural analysis and design of these systems by calculation and testing, in addition to those defined in EN 12811-1,prEN 12811-2, EN 12811-3 and EN 12810-1.

Basic requirements are given in ENV 1993-1-1 and ENV 1999-1-1.

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 12810-1:2003, *Façade scaffolds made of prefabricated components — Part 1: Product specifications.*

EN 12811-1, *Temporary works equipment — Part 1: Scaffolds — Performance requirements and general design.*

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

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

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 12810-1 and EN 12811-1 apply.

4 Structural design

4.1 General

Structural design of the system configurations of the standard set of each prefabricated scaffold system shall be carried out in accordance with the requirements of EN 12811-1, prEN 12811-2 and EN 12811-3 and EN 12810-1 and this European Standard.

The structural design shall follow one of the paths in Table 1, see also Figure 1.

Table 1 — Stages of the structural design

Design stage	Path 1		Path 2
	Modular and frame systems		Frame systems only
1	Tests for configurations, connection devices and components		
2 / 3	Calculation for each system configuration of the standard set		
2			Determination of α_{cr}
			Continuation of path 2 only if $\alpha_{cr} \geq 2$; if $\alpha_{cr} < 2$ change to path 1
3	3a	Analysis of the structure to determine the distribution of forces and moments using	
		Second order theory	First order theory with amplification factors on the basis of α_{cr}
	3b	Analysis of the individual components and connection to verify that the resistance is adequate	
4	One test on a representative section of a system configuration		
	Type 1 For the verification of significant load displacement behaviour		Type 2 For the verification of α_{cr}
α_{cr} is the lowest elastic buckling load factor to be applied to the design loads			

Path 1 is the preferred path. Path 2 may only be used for frame systems and only when the quotient α_{cr} is not less than 2.

Stages 2 and 3 shall be carried out for each system configuration of the standard set in accordance with the requirements set out in clause 8 of EN 12810-1:2003.

Stage 3b shall include the analysis of all components and the connection devices considering their most unfavourable loading situation. If member imperfections have not been included in the analysis model, component stability shall be checked separately.

For the determination of internal forces and moments, elastic methods shall be used. The non-linear structural characteristics of modular nodes and horizontal planes, determined in accordance with the requirements of EN 12811-3, shall be used in the analysis.

The load bearing capacity of a system configuration is reached if

— either for one cross section, the resistance in accordance to EN 12811-1 is reached;

— or the resistance of a component, of a connection device or of a spring is reached.

NOTE Such resistances are evaluated from test results.

In path 1, the equilibrium of the displaced system shall be taken into account directly by the use of a second order analysis. In path 2, the equilibrium of the displaced system shall be taken into account indirectly by the use of a first order analysis with amplification factors.

A test at stage 4 shall be carried out on a representative section of a system configuration.

4.2 Models for structural analysis

The arrangement of horizontal and vertical components, the disposition and frequency of bracing components, and the position and frequency of ties shall be in accordance with the product manual.

Figure 2 shows a typical system configuration. This spatial system shall be considered either by carrying out a three-dimensional analysis or by splitting it into separate planar systems, to be checked separately, provided that the interaction between them is adequately taken into account.

Figure 2 also shows examples of vertical plane substitution systems normal to the facade. Figures 3, 4 and 5 show an example of a vertical plane substitution system parallel to the façade.

In the treatment of any substitution system the boundary conditions shall be chosen so that the response of the substitution system is representative of the behaviour of the whole structure.

The restraining, destabilising and loading effects of components, not lying in the plane under investigation, shall be taken into account. In particular, although the system lies in one plane, out of plane buckling shall be examined.

The relevant load deformation behaviour of the configurations and the connection devices, for instance between transoms, ledgers, diagonals and standards shall be incorporated in the analysis model.

Linearisation by chords in accordance with 10.10 of EN 12811-3:2002 and assumptions on the conservative side are permitted.

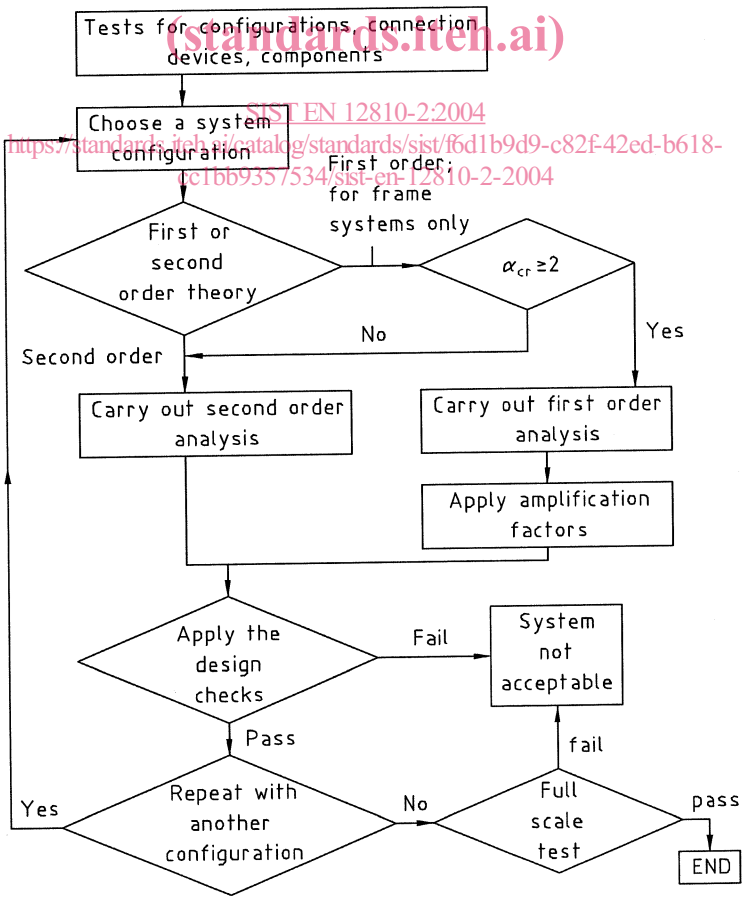


Figure 1 — Flow diagram of the stages of the structural design

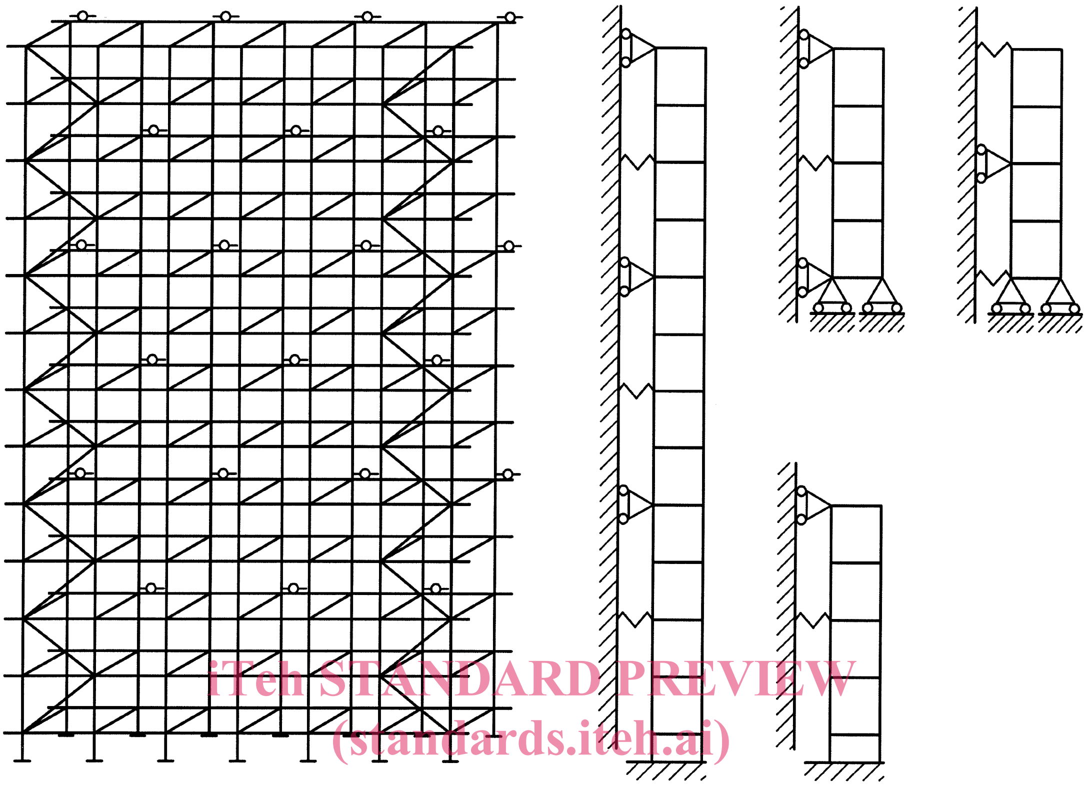


Figure 2 — Examples of plane vertical substitution systems normal to the façade for the anchorage pattern shown

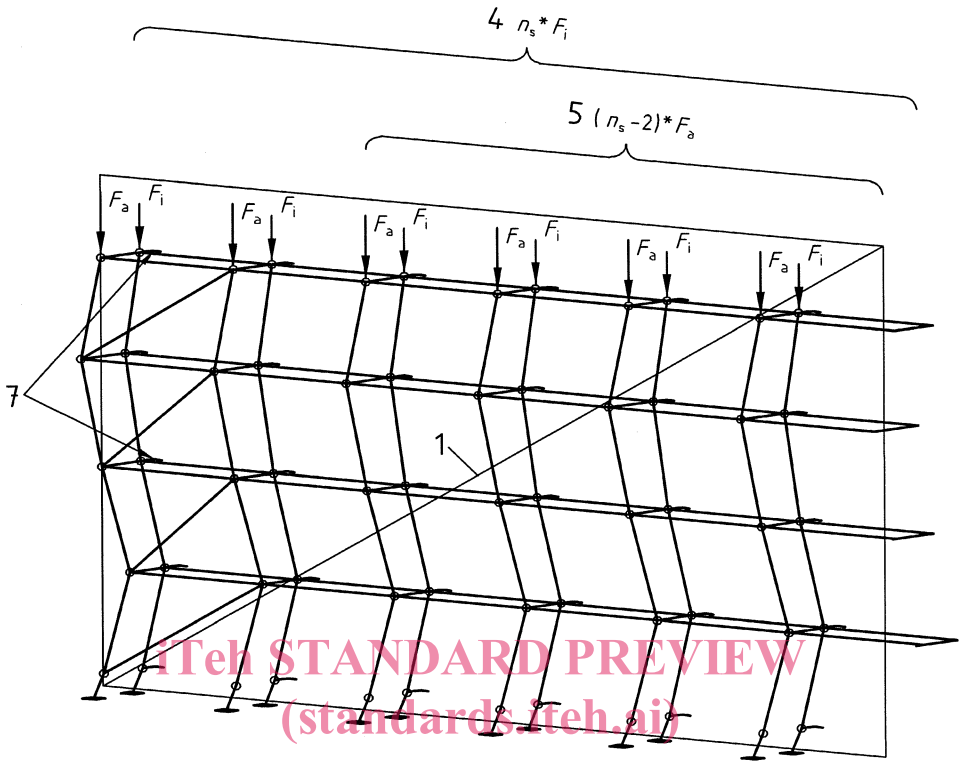


Figure 3 - Development of a substitution system parallel to the façade (Key see Figure 5)

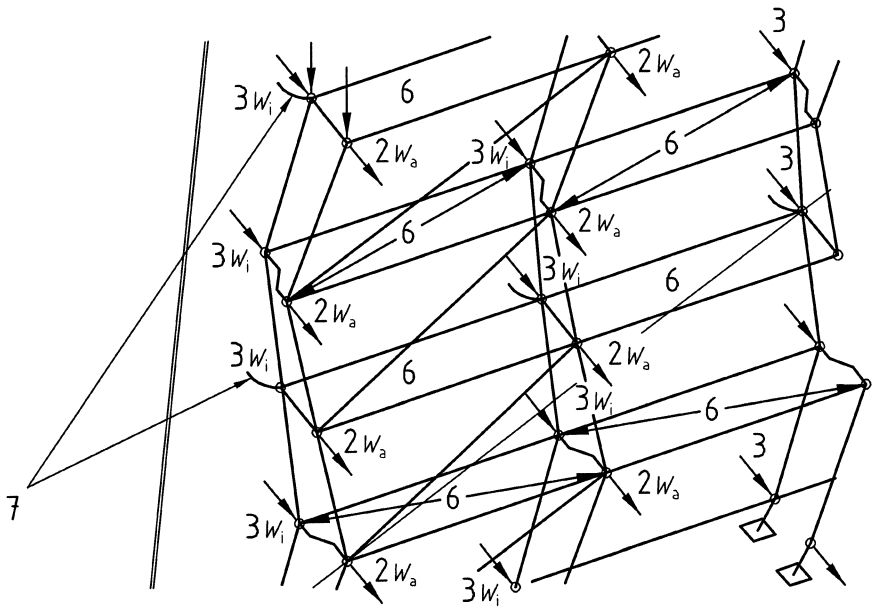
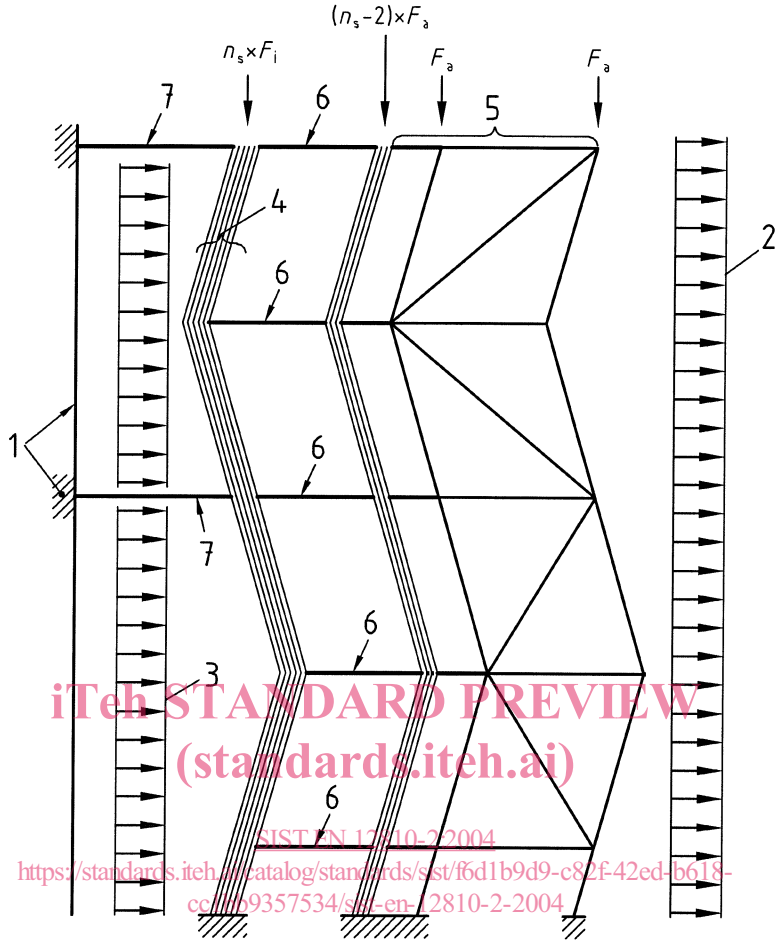


Figure 4 - Detail of Figure 3 (Key see Figure 5)



Key

F_i;; F_a	maximum forces from the scaffold above on the outer and inner standards
n_s	number of standards to be stabilised in the example
n_t	number of tie members in the group of standards to be stabilised
I_s	moment of inertia of a standard
A_s	area of a standard
c_h	horizontal stiffness parallel to the façade of one bay
c_t	stiffness of a tie member parallel to the façade

Key

1	facade
2	wind loads on the outer plane
3	wind loads on the inner plane
4	inner plane: n_s x I_s, n_s x A_s
5	outer plane: n_s x I_s, n_s x A_s
6	spring with the stiffness (n_s – 1) x c_b
7	spring with the stiffness n_t x c_t

Figure 5 — Example of a vertical substitution system parallel to the façade for the configuration in Figure 2