# SLOVENSKI STANDARD
# oSIST prEN 15512:2017

**01-marec-2017**

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**Stabilni jekleni sistemi za skladiščenje - Sistemi za nastavljive regale za palete - Načela dimenzioniranja**

Steel static storage systems - Adjustable pallet racking systems - Principles for structural design

Ortsfeste Regalsysteme aus Stahl - Verstellbare Palettenregale - Grundlagen der statischen Bemessung



Systèmes de stockage statiques en acier - Systèmes de rayonnages à palettes réglables - Principes applicables au calcul des structures



**Ta slovenski standard je istoveten z: prEN 15512**

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**ICS:**

| | | |
|---|---|---|
| 53.080 | Skladiščna oprema | Storage equipment |

**oSIST prEN 15512:2017** **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# DRAFT
# prEN 15512

January 2017

ICS 53.080

Will supersede EN 15512:2009

English Version

# Steel static storage systems - Adjustable pallet racking systems - Principles for structural design

Systèmes de stockage en acier - Systèmes de rayonnages à palettes réglables - Principes applicables au calcul des structures

Ortsfeste Regalsysteme aus Stahl - Verstellbare Palettenregale - Grundlagen der statischen Bemessung

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 344.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.



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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**



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## European foreword

This document (prEN 15512:2017) has been prepared by Technical Committee CEN/TC 344 WG 1 "Steel static storage systems", the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15512:2009.

This is intended to be a draft document consolidating the experiences and problems in working with the 2009 published version such that time constrained discussions within the CEN environment donnot affect the quality of the final version.

# Introduction

## 0.1 Racking

Racking systems are load bearing structures for the storage and retrieval of goods in warehouses. The goods to be stored are generally on pallets or in box-containers.

Racking is constructed from steel components including upright frames, beams and decking. Special beam to column (upright) connections and bracing systems are utilized, in order to achieve a three dimensional steel 'sway' or 'braced' structure with "aisles" to enable order pickers, industrial trucks or stacker cranes to reach the storage positions. Although components are standardized, they are only standard to each manufacturer. These components differ from traditional column and beam structures in the following regard:

1) continuous perforated uprights;

2) hook-in connections;

3) structural components for racking generally consist of cold formed thin gauge members.

## 0.2 Requirement for EN Standards for racking and shelving in addition to the Eurocodes

Because of the differences in shape of structural components, detailing and connection type's additional technical information to the Eurocodes are required, in order to have reliable state of the art guidance for the practicing designer involved in designing racking.



The scope of CEN/TC 344 is to establish European Standards providing guidance for the specification, design, methods of installation, accuracy of build and guidance for the user on the safe use of steel static storage systems.



This, together with the need for harmonized design rules was the reason that the European Racking Federation ERF / FEM Racking and Shelving has taken the initiative for CEN/TC 344. CEN/TC 344 is in the course of preparation of a number of European Standards for specific types of racking and shelving and particular applications which exist as European Standards (EN) and working group activities (WG) as follows:

— EN 15512: *Steel static storage systems — Adjustable pallet racking — Principles for structural design.*

— EN 15620: *Steel static storage systems — Adjustable pallet racking — Tolerances, deformations and clearances*.

— EN 15629: *Steel static storage systems — The specification of storage equipment.*

— EN 15635: *Steel static storage systems — The application and maintenance of storage equipment*

— EN 15878: *Terms and Definitions*.

— EN 16681: *Steel static storage systems — Adjustable pallet racking systems — Principles for seismic design*.

— WG 4: Technical Principles for the Design of Adjustable Drive-in and Drive-through Racking Systems.

— EN 16681: *Technical principles for the Design of Pallet Racking Systems in Seismic Regions*.

— WG 5b: Technical Principles for the Design of Drive-in and Drive-through Racking Systems in Seismic Regions.

— WG 6: Technical Principles for the Design of Shelving Systems.

— WG 7: Technical Principles for the Design of Cantilever Racking Systems.

— WG 8: Technical Principles for the Design of Mobile Racking Systems.

— WG 9: Principles of Health and Safety during the installation of Racking Systems.

The intention is for these EN-Series "Racking and Shelving" to be published sequentially over a period of ten years.

In drafting these documents, liaisons with other CEN/TC's will occur as appropriate.

## 0.3 Liaison

CEN/TC 344 "Steel Storage Systems" liaise with CEN/TC 250 "Structural Eurocodes", CEN/TC 135 "Execution of steel structures and aluminium structures" and CEN/TC 149 "Power-operated warehouse equipment".

## 0.4 Racking and Shelving and Work Equipment regulations

Although racking is a load bearing structure, national regulatory requirements may require that racking be considered as 'work equipment' and therefore may be subject to the European Directive 89/391/EEC. This document is not a stand alone document and is intended to be used in conjunction with EN 15620, EN 15629 and EN 15635.



## 0.5 Additional information specific to EN 15512



EN 15512 is intended to be used with EN 1990, Basis of Structural Design, EN 1991, *Actions on structures*, and the EN 1993 series for the *Design of steel structures*.

EN 1993-1 is the first of six parts of the EN 1993 series, *Design of Steel Structures*. It gives generic design rules intended to be used with the other parts EN 1993-2 to EN 1993-6. It also gives supplementary rules applicable only to buildings.

EN 1993-1 comprises eleven subparts EN 1993-1-1 to EN 1993-1-11, each addressing specific steel components, limit states or materials.

EN 15512 may also be used for design cases not covered by the Eurocodes (other structures, other actions, other materials) serving as a reference document for other CEN TC´s concerning structural matters.

EN 15512 is intended for use by:

— committees drafting design related product, testing and execution standards;

— designers and structural engineers;

— relevant authorities.

Numerical values for partial factors and other reliability parameters are basic values that provide an acceptable level of reliability assuming an appropriate level of workmanship and quality management.

As part of the design process, reference to EN 15629 and EN 15635 should be required to ensure that both specifier and designer are aware of the interface constraints in each other's responsibility and to allow an effective design to be produced.

# 1 Scope

This European Standard specifies the structural design requirements applicable to all types of adjustable beam pallet rack systems fabricated from steel members intended for the storage of unit loads and subject to predominantly static loads. Both un-braced and braced systems are included.

This European Standard gives guidelines for the design of clad rack buildings where requirements are not covered in the EN 1993 series. The requirements of this European Standard also apply to ancillary structures, where rack components are employed as the main structural members.

This European Standard does not cover other generic types of storage structures. Specifically, this European Standard does not apply to mobile storage systems, drive-in, drive-through, pallet live storage, push back, shuttle systems, systems where two or more cranes operates one above another in the same aisle and cantilever racks or static steel shelving systems.

For the specific design of adjustable pallet racking for use in Seismic areas, this standard should be used in combination with EN 16681 *Adjustable pallet racking systems — Principles for seismic design*.

# 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1990, *Eurocode - Basis of structural design*



EN 1991-1-1:2002[1], *Eurocode 1: Actions on structures - Part 1-1: General actions - Densities, self-weight, imposed loads for buildings*



EN 1993-1-1:2005[2], *Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings*

EN 1993-1-3:2006[3], *Eurocode 3 - Design of steel structures - Part 1-3: General rules - Supplementary rules for cold-formed members and sheeting*

EN 10143, *Continuously hot-dip coated steel sheet and strip - Tolerances on dimensions and shape*

EN 10162, *Cold rolled steel sections - Technical delivery conditions - Dimensional and cross-sectional tolerances*

EN 10346, *Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions*

EN 15620, *Steel static storage systems - Adjustable pallet racking - Tolerances, deformations and clearances*

EN 15629, *Steel static storage systems - Specification of storage equipment*

EN 15635, *Steel static storage systems - Application and maintenance of storage equipment*

EN 16681, *Steel static storage systems - Adjustable pallet racking systems - Principles for seismic design*

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[1] As impacted by EN 1991-1-1:2002/AC:2009.

[2] As impacted by EN 1993-1-1:2005/AC:2009 and EN 1993-1-1:2005/A1:2014.

[3] As impacted by EN 1993-1-3:2006/AC:2009.

EN ISO 6892-1, *Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1)*

EN ISO 7438, *Metallic materials - Bend test (ISO 7438)*

ETAG No 001, *Guideline for European Technical Approval of Metal Anchors for Use in Concrete*

## 3 Terms and definitions

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

NOTE The following terms and definitions have been retrieved from EN 15878.

**3.1**
**accidental action**
action, usually of short duration but of significant magnitude, that is unlikely to occur on a given structure during the design working life

**3.2**
**basic material**
flat steel sheets or coiled strip, possibly cold reduced from which the rack components are pressed or rolled

**3.3**
**batch of steel**
quantity of steel, all to the same specification, produced by one supplier at one time



**3.4**
**beam**
horizontal member linking adjacent frames and lying in the horizontal direction parallel to the operating aisle

**3.5**
**beam end connector**
connector, welded to, bolted to, or otherwise connected or formed as an integral part of the beams, which has hooks or other devices which engage in holes or slots in the upright

**3.6**
**compartment load**
load which can be loaded into one compartment of a rack or shelving structure from one side

**3.7**
**double entry rack**
run of racking accessible from two adjacent operating aisles connected by run spacers

**3.8**
**global analysis**
determination of a consistent set of internal forces, moments and displacements that represent the entire three dimensional load bearing rack structure, which are in equilibrium with a particular set of actions on the structure

**3.9**
**perforated member**
member with multiple holes regularly spaced along its length

**3.10**
**placement load**
load caused by deposit and picking operations of a unit load into and out of the system, reflecting good practice

**3.11**
**Quasi-rigid**
conceptual term allowing assuming full rigidity of the floor slab

Note 1 to entry: Limit values depend on rack type, rack installation accuracy and way of operation.

**3.12**
**single entry rack**
run of racking accessible from a single operating aisle

**3.13**
**spine bracing**
sway bracing in the vertical plane parallel to the main aisle of the rack, linking adjacent frames

**3.14**
**spring-back**
tendency of a cold-formed section to undergo spontaneous cross-sectional distortion when it is cut from a longer length



**3.15**
**stiffened element**
stiffened element of a cross-section is a part of the cross-section which is connected to the remainder of the section along both longitudinal edges



**3.16**
**sway**
horizontal displacement of structure in addition to any initial out of plumb

**3.17**
**system length**
distance in a given plane between two adjacent points at which a member is braced against lateral displacement in this plane, or between one such point and the end of the member

**3.18**
**theoretical/notional design working life**
period of time to be considered in the determination of applied loads (when applicable)

**3.19**
**unit load**
individual item which can be placed or retrieved in one operation, e.g. a pallet or a container with goods in a racking system, or an individual box or package in a shelving system

Note 1 to entry: More than one unit load may be handled in one operation.

**3.20**
**un-stiffened element**
<of a cross-section> part of the cross-section which is connected to the remainder of the section along one longitudinal edge only