SLOVENSKI STANDARD
oSIST prEN 15635:2007

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Stabilni jekleni sistemi za skladiģ enje - Nastavljivi sistemi za palete - Smernica za varno uporabo

Steel static storage systems - Adjustable pallet racking - Guideline for safe use

Ortsfeste Regalsysteme aus Stahl - Verstellbare Palettenregale - Leitlinien zum sicheren Arbeiten

Systemes de stockage en acier - Rayonnages a palettes réglables - Lignes directrices pour une utilisation en toute sécurité

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53.080	Skladiģ na oprema	Storage equipment

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English Version

Steel static storage systems - Adjustable pallet racking - Guideline for safe use

Systèmes de stockage en acier - Rayonnages à palettes réglables - Lignes directrices pour une utilisation en toute sécurité

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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 (prEN 15635:2007) has been prepared by Technical Committee CEN/TC 344 “Steel static storage systems”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

0 Introduction

0.1 Structural Eurocodes for load-bearing structures and buildings

The Commission of the European Communities CEC initiated the work of establishing a set of harmonized technical rules for the design of building and civil engineering works, which would initially serve as an alternative to the different rules in force in the various member states and would ultimately replace them. These technical rules are known as the "Structural Eurocodes".

In 1990, after consulting their respective member states, the CEC transferred the work of further development, issue and updating of the Structural Eurocodes to CEN, and the European Free Trade Association Secretariat agreed to support the CEN work.

Because the determination of the safe load-bearing capacity of racking and shelving (including multi tier shelving is) a structural engineering task, the Eurocodes are relevant particularly EN 1993-1-1 and EN 1993-1-3 as far as the design is concerned. The codes and guidelines produced by CEN/TC 344 are intended to amplify and clarify the requirements of the Eurocodes since they particularly apply to design while specification, installation and safe use are considered as special requirements for racking and shelving products. This European standard considers safe use.

0.2 Additional European standards for racking and shelving

Due to the differences in the shape of structural components, detailing and connection types, additional technical information to the Eurocodes is required in order to provide state of the art guidance. This guidance is for the client or consultant specifying the requirement, the designer producing a sound structural design, the installer building the structure and the user who has to maintain the structure in a sound condition suitable for safe use throughout its working life.

This together with the need to provide harmonized design rules, is the reason that the European Racking Federation (ERF) has taken the initiative to support this development of a range of European standards for specific types of racking and shelving used in specific applications (see bibliography).

0.3 Additional information specific to WI 00344004

All CEN/TC 344 documents might also be useful for design cases not covered by the Eurocodes (other structures, other actions, other materials) and serve as a reference document for other CEN/TCs concerning structural matters.

WI 00344004 is intended for use by:

a) committees drafting design related product, testing and execution standards;

b) clients (e.g. for the formulation of their specific requirements);

c) designers, installers and end users of the product;

d) relevant building control authorities.

The racking manufacturer is expert in the technical properties of racking components and has knowledge of the specific methods of calculation to determine the safe load carrying capacity data of the products. These standardized products can have infinite variation in their configuration. Structural engineering in steel requires special attention for the cold formed sections normally in use and for flexural and (overall) frame instability. Users should refer to WI 00344005 for more information on these aspects.

Users of storage equipment have their own specific responsibilities for ensuring safe operating conditions for their workers, storage equipment and the stored goods.

This document deals with these user-defined aspects. A clear user specification for the provision of a safe storage equipment design is essential to provide and complement safe working conditions.

This standard is also relevant to specifiers and suppliers.

1 Scope

This European Standard gives guidelines for operational aspects relevant to structural safety of storage systems. Such systems operate with heavy mechanical handling equipment working in close proximity to static storage equipment. This standard minimizes the risk and consequences of unsafe operation or damage to the structure.

Some forms of storage equipment are partially covered but further consideration, beyond the scope of this document, might be required.

This European Standard shall be read in conjunction with prEN 15512, prEN 15620, and WI 00344005 to ensure that the specifier, user and designer are aware of the constraints in each other's area and to allow a safe design to be produced.

The user of the installation is responsible for ensuring that any information given to suppliers is accurate and reflects the operation in practice in order to ensure that equipment supplied is appropriate to the needs.

The user should recognize that there are safety implications in any alteration to the data affecting the method of operation or to the storage equipment used.

Consideration is given to the following recommendations:

— the installation and safe use of the storage equipment;

— changes in configuration or use of the storage equipment;

— inspection and damage assessment of the storage equipment.

Commentary is provided in Annexes A to E that is intended to provide relevant, detailed background information on the possible application of certain clauses of the document where this might be helpful to the user.

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 528, *Rail dependent storage and retrieval equipment — Safety*

EN 1992, *Eurocode 2, Design of concrete structures*

EN 1993, *Eurocode 3, Design of steel structures*

EN 1995, *Eurocode 5, Design of timber structures*

EN 1998, *Eurocode 8, Design of structures for earthquake resistance*

prEN 15512, *Steel static storage systems — Adjustable pallet racking systems — Principles for structural design*

prEN 15620, *Steel static storage systems — Adjustable pallet racking — Tolerances, deformations and clearances*

WI 00344005, *Steel static storage systems — Adjustable pallet racking systems — Guidelines for specification*

WI 00344006, *Steel static storage systems — Adjustable pallet racking — Terms and definitions.*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in WI 0034406 and the following apply.

3.1
allowable loading
beam, frame or shelf safe load capacity indicated by the storage equipment supplier to the user on the safe load notices based upon the data supplied by the specifier (see WI 00344005)

3.2
bay load
total allowable weight of all the unit loads in a bay of racking not including any unit loads that can be stored on the floor of the bay

3.3
compartment load
load, which can be loaded into one compartment of a rack or shelving structure from one side

3.4
competent person
person who by means of a combination of training, experience and education has the knowledge to carry out the task and safety effectively

3.5
crane racking
very narrow aisle racking system such that the placement and retrieval of pallets is carried out by a floor-mounted crane supported by the racking structure

NOTE Such systems are often automatically controlled and operated.

3.6
design clearances
clear separation spaces around and above each unit load

NOTE These clearances enable input and output of the load to take place without contact of the load with any other loads or any part of the storage equipment structure other than normal contact when the load is placed on the beams or other members provided for its support in storage.

3.7
frame load
total allowable weight of all the unit loads transmitted to the frame by the members attached to the frame

3.8
foundation
racking or shelving foundation is the floor construction on which the equipment is erected and to which it is fixed to provide anchorage and stability

3.9
installers
persons who assemble and build the racking at the site location

NOTE The installers should be trained and experienced in the work to be done and should be properly supervised and controlled to ensure that the health and safety of the workers and others is safeguarded.

3.10
intrusive stacking
placement or retrieval of a pallet where the turning radius or length of fixed-fork lift truck is greater than the aisle width and that part of the storage location for that pallet is used by the truck forks when placing or retrieving a pallet

3.11
pallet
portable platform, with or without superstructure, for the assembly of a quantity of goods to form a unit load for handling and storage by mechanical appliances (often used as a generic term)

3.12
pallet buffer back stop
buffering back stop which is specified as an aid for use by forklift truck drivers to deposit a unit load in the correct position in the rack

3.13
pallet safety back stop
safety back stop to prevent accidental damage, where design clearances are large enough to ensure that the safety pallet stop will only be accidentally impacted

type (a)
safety device, which protects against unintentional load movement within the racking and prevents loads from protruding or from falling into an aisle or into an area accessible to people

type (b)
backstop to prevent accidental damage, usually placed at the back of a storage compartment, to prevent the accidental collision of a pallet or its load with other equipment, such as sprinklers, when a load is placed in the storage compartment

3.14
pick up and deposit (P & D) station
accurately fixed locator for the unit load, relative to the racking, used by trucks having a fixed length of fork stroke for accurately placing the pallet onto the rack beams

NOTE P&Ds may be used as an interface between unit load handling equipment that is dedicated to the rack aisle (such as VNA trucks or cranes) or free ranging trucks which service the installation. The P&D may also be used as an accurately fixed locator of the unit load, relative to the racking, used by trucks or cranes having a fixed length of fork stroke that ensures a high degree of accuracy in the X and Z directions when placing the unit load onto the rack beams.

3.15
person responsible for safety (PRS)
person appointed by the warehouse management with responsibility for maintaining the safe operation of the warehouse system

3.16
specification
detailed description of the end user's requirements including other data such as the ambient storage conditions, the floor construction, local authority requirements, etc.

3.17
specified allowable load
unit load that is permitted in the storage system

3.18
specifier
person or company that provides the supplier with a detailed specification of the end user's requirements. The specifier can be a consultant or other specialist, the end user or the equipment supplier acting as the specifier.

3.19
storage media
pallet, container, bin, box, barrel, stillage or any other storage unit for the bulk handling of loads by lift trucks

3.20
supplier
company that supplies the storage equipment

NOTE The company can be the original manufacturer or an intermediate company acting as a distributor.

3.21
total rack or shelving load
total allowable load supported by all of the beams in a run of racking.

3.22
truck operator
person trained and responsible for the safe use of an individual fork lift truck or a range of such equipment.

NOTE This would normally be rider-controlled equipment but could also include pedestrian-controlled powered equipment together with hand-operated pallet trucks.

3.23
unit load
weight of an individual stored item that can be placed in one operation.

3.24
user
company or person managing and operating the installation on a daily basis and is responsible for the continuing safety of the installation.

3.25
90° stacking
placement or retrieval of a pallet where the fork lift truck makes a 90° turn to face the rack during the placement or retrieval process

NOTE In making this turn no part of the truck or load intrudes into the racking.

4 Operational requirements

4.1 System requirements

Before first use and continuously during the operation, the user shall verify that the data in the project specification is still valid.

4.2 Storage systems planning

In order to determine a safe design of the storage equipment to be supplied for the required load carrying capacity the following information shall be provided by the user to the specifier (see WI 00344005):

a) Details of the building in which the storage system is to be housed and its environment;

b) The properties of the floor used as the foundation for the storage equipment;

c) Details of the goods to be stored on the equipment and specification of any pallet or other type of load-carrying accessory;

d) The specification of the allowable loads for the storage equipment;

e) The required layout and configuration of the equipment to allow for sufficient design clearances to be provided for the safe depositing and retrieval of goods;

f) The specification of the handling equipment to be used, e.g. type of truck, etc. in relation to the storage equipment. (See prEN 15620 for information on a truck's turning radius and effective aisle width requirements);

g) The specified requirements for collision protection and resistance to impact;

h) Specify who is to carry out the installation of the storage equipment (see 6.1);

i) All known information about planned future changes to storage requirements.

5 Important data of relevance to the user

In order to ensure safe use of storage equipment:

a) the storage equipment shall be built in accordance with the specification, plans and the detailed directions for assembly provided by the supplier (see Annex A). Where the user constructs the installation, it shall comply with the installation instructions of the supplier (see 6.1);

b) the building floor, which is the racking foundation, shall be capable of withstanding the upright loads and of receiving the base plate floor fixings. The floor shall have a degree of surface level tolerance and flatness suitable for operational purposes (see prEN15620 recommendations relating to adjustable pallet racking);

c) in order to instruct the user of the system, a printed load notice shall be provided by the supplier giving sufficient loading information on the equipment and shall be permanently displayed by the user on, or adjacent to, the racking or shelving;

d) a user management procedure shall ensure that the maximum load conditions stated on the notice are not exceeded (see Annex B for typical load notice types.) The procedure shall also ensure that the quality and type of pallet or load carrying accessory to be used is suitable for the storage equipment;

e) the method of operation shall be in accordance with the supplier's instructions;

f) the lift truck chosen shall be compatible with the racking structure and shall be suitable for the safe loading and unloading of the racks;

g) the turning circle of the lift truck combined with the overall dimensions of the unit loads shall be compatible with the rack aisle width provided (see 8.4.8 and prEN 15620);

h) the user shall be responsible for ensuring that during normal working operations the handling equipment does not damage the storage equipment. Unless the specification includes a requirement for collision protection or a requirement for impact resistance, the storage equipment will be designed for no special effects other than the normal loads and forces arising from good practice in the careful use of the storage-handling equipment by well-trained operatives.

6 Assembly and installation

6.1 Skills required and provision of instructions

The correct assembly and installation of the storage equipment shall be carried out in a professional manner and is of equal importance to the provision of a safe structural design. The quality and accuracy of the work will have a profound influence on the performance of the storage equipment.

Supplier's workforces trained to carry out installation work have the necessary industrial experience to do so safely. If it is specified that the installation work is not to be done by the supplier then the supplier shall provide written assembly and installation instructions on the basis that the level of competence of the installers is equivalent to that of the supplier's work force.

If the user or the user's sub-contractor and not the supplier carry out this work, it shall be done strictly according to the instructions provided by the supplier.

6.2 Installation quality and structural design

The installation tolerances should be in accordance with prEN 15620 unless otherwise specified by the designer.

6.3 Aspects of installation work to be observed includes the following:

a) All storage equipment shall be fixed to the floor to prevent movement of the uprights where mechanical handling equipment is used at or near to the storage equipment. The number and type of floor fixings shall be specified by the storage equipment supplier and these shall be installed in accordance with the instructions of the fixing supplier;

b) Back or spine braced bays of racking or shelving provided for longitudinal (down aisle), stability shall be installed and anchored to the floor in accordance with the supplier's requirements. Bracing, when supplied, shall be installed in accordance with the manufacturer's instructions at all specified positions and shall not be removed or repositioned;

c) Single entry, single tier hand loaded shelving systems without drawers and with a height of less than 2,5 m or single tier double entry runs less than 4,0 m in height, are exempt from the requirement regarding floor fixings;

d) Base plates shall be in contact under their entire area with the floor of the building or any prepared plinth. The base plates shall be packed up with suitable steel shimming or grouting under the whole of the plan area of the base plate. Steel shims should be permanently located under the base plates or, if preferred, sufficiently strong and shrink-proof mortar can be injected under the base plates to fulfil a similar function. Specialists in this type of operation shall carry out the grouting;

e) When upright frames are coupled back to back in double entry racks at least two run spacers shall be provided. The position of the run spacer shall be as near as possible to a bracing node point to prevent local upright damage by bending if there is truck impact or a frame is damaged by other means. Location will be as follows:

   1) the lower run spacer – next to the second lowest horizontal bracing, and in the absence of horizontals next to the second lowest bracing joint (see Figure 1);

   2) the upper run spacer – next to the highest horizontal bracing member adjacent to a diagonal (see Figure 1);

   3) if applicable, a run spacer adjacent to a splice on spliced uprights;

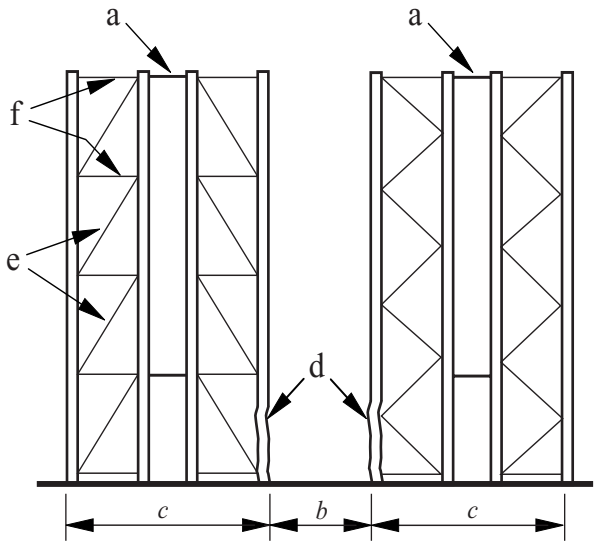
   4) If the minimum requirement of two run spacers is fitted, the optimum positions are shown in Figure 1. Run spacers fitted in these two positions shall provide some lateral support for accidentally damaged frames.

   NOTE Run spacers might be of help but might not prevent the collapse of double entry rack frames.

f) The spacing of beams, cantilevers, shelving, etc. shall not be greater than values given by the rack supplier that correspond to their maximum loads or the maximum allowable load on the upright frame as shown on the safe load warning notice;

g) All beams shall be locked in position as prescribed by the rack supplier;

h) All safe load warning notices shall be in position.



Key

a Run spacer,
b Aisle
c Double entry rack
d Damaged uprights within the damage limit rules for the assessment of upright damage
e Frame diagonals
f Frame horizontals

Figure 1—Required location of run spacers also typical upright damage

7 Changes to the storage equipment configuration

Changes in the safe carrying capacity can occur when the storage equipment is modified. In all cases of changes the supplier or an appropriate expert shall be consulted and any advice received shall be followed before any alterations are made.

Changes shall be made in accordance with the supplier's instructions which shall contain the following:

a) The rack shall be unloaded during the alterations;

b) Additions or changes to the storage equipment by welding or bolting are not permitted unless specifically approved by the equipment supplier;

c) Safe load notices shall be updated as necessary after all changes to rack configuration;

d) The position of the bracing node points shall be changed if beam positions are changed in racking where back bracing is present. This might also require the repositioning of any horizontal bracing, which can be fixed between some beams (see Figure 2).

NOTE 1 Changes in the safe load carrying capacity of the storage equipment can occur if it is relocated since changes in the floor conditions providing support for the equipment can cause changes in load capacity.

NOTE 2 A change in the rack or shelving configuration will generally cause a change in the load-carrying capacity of the rack. In braced or unbraced racking, if the height to the first beam level, or the spacing between beams, is increased, the safe load capacity of the frames will be reduced.