SLOVENSKI STANDARD
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Stabilni jekleni sistemi za skladiģ enje - Uporaba in vzdrģevanje opreme za skladiģ enje

Steel static storage systems - Application and maintenance of storage equipment

Ortsfeste Regalsysteme aus Stahl - Anwendung und Wartung von Lagereinrichtungen

Systèmes de stockage statiques en acier - Utilisation et maintenance de système de stockage

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Steel static storage systems - Application and maintenance of storage equipment

Systèmes de stockage statiques en acier - Utilisation et maintenance de système de stockage

Ortsfeste Regalsysteme aus Stahl - Anwendung und Wartung von Lagereinrichtungen

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Foreword

This document (EN 15635:2008) has been prepared by Technical Committee CEN/TC 344 “Steel static storage systems”, the secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by May 2009, and conflicting national standards shall be withdrawn at the latest by May 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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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".

Because the determination of the safe load-bearing capacity of static storage systems 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 application and maintenance are considered as special requirements for racking and shelving products. This European Standard considers application and maintenance.

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 operates and maintains the structure in accordance with the design specification.

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).

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0.3 Additional information specific to EN 15635

This European Standard gives additional information to that in Eurocodes EN 1990 and EN 1991, to be used in the structural design of storage systems (see also prEN 15512) and is intended for use by:

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

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

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

d) relevant building control authorities.

Expertise in the technical properties of racking components and knowledge of the specific methods of calculation to determine the safe load carrying capacity data for the products shall be available normally from the manufacturer of that product. 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 prEN 15512 for more information on these aspects.

Users of storage equipment should refer to EN 15629 to ensure that the specified layout and configuration is not in conflict with the methods of operation, ensuring safe operating conditions in the workplace.

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

This European Standard is also relevant to specifiers and suppliers.

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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 European Standard minimizes the risk and consequences of unsafe operation or damage to the structure. Some other forms of storage equipment are only partially covered and further consideration, beyond the scope of this European Standard, can be required.

This European Standard gives guidance in conjunction with prEN 15512, EN 15620, and EN 15629 to ensure that the specifier, user and designer are aware of the constraints in each other's area to allow a safe design to be produced.

This European Standard specifically excludes storage equipment manufactured form materials other than steel (except for certain accessories) and equipment intended to be used for domestic storage purposes

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 15629, *Steel static storage systems — The specification of storage equipment*

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

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3 Terms and definitions

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

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3.1
adjustable pallet racking
APR
steelwork structure consisting of frames and beams adjustable in height, specifically designed to support load make up accessories and unit loads

3.2
allowable loading
beam, frame or shelf safe load capacity indicated by the storage equipment supplier to the user on the safe load warning notices based upon the data supplied by the specifier

3.3
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

3.4
clearance
nominal dimension between items

3.5
compartment load
load, which can be loaded into one compartment of a rack or shelving structure from one side

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3.6
competent person
person who by means of a combination of training, experience and education has the knowledge to carry out the task and safety requirements effectively

3.7
crane racking
pallet racking arranged as a very narrow aisle system and operated by a stacker crane running on a rail and laterally supported by the racking structure

3.8
frame load
total allowable weight of all the loads transmitted to the frame by the members attached to the frame

3.9
foundation
floor construction on which the equipment is erected and to which it is fixed to provide anchorage and stability

3.10
installer
trained and qualified as a competent person who assembles and builds the racking at the site location

NOTE The installer 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 workers and others is safeguarded.

3.11
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 part of the storage location concerned is used by the truck forks and load when turning to place or retrieve a pallet

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3.12
load make up accessory
LMA
storage unit for the handling of loads by lift trucks

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NOTE Examples of load make up accessories include pallets, containers, bins, boxes, barrels and stillages

3.13
mechanical handling equipment
MHE
equipment used to transport the unit load to be stored

3.14
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

3.15
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 racking

3.16
pallet safety back stop
safety back stop to prevent accidental collision of a pallet or its load with other unit loads or equipment, when that load is placed in the storage compartment

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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

3.17
pick up and deposit stations
P and D stations
storage locations at the end of an aisle used as an interface between different types of mechanical handling equipment

NOTE The P and D stations can be used as an interface between the unit load and handling equipment that is dedicated to the rack aisle (such as very narrow aisle (VNA) trucks or cranes) and the conveyors or free movement trucks which service the installation. The P and D stations can also be used to accurately fix the location of the unit load relative to the racking. This is often used by trucks or cranes having a fixed length of fork stroke and ensures accuracy in the X and Z directions when placing the unit load onto the racking beams.

3.18
person responsible for storage equipment safety
PRSES
person appointed by the warehouse management with responsibility for maintaining the safe operation of the warehouse storage system

3.19
specification
detailed description of the user's requirements including the racking specification and other data such as the ambient storage conditions, the floor construction, local authority requirements, etc. including all details affecting either the design of the installation or its construction

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3.20
specified allowable load
unit load allowed in the storage equipment

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3.21
specifier
person or company that provides the supplier with a specification based on the user's requirements

NOTE The specifier can be a consultant or other specialist, the end user or the equipment supplier acting as the specifier.

3.22
supplier
company that supplies the storage equipment

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

3.23
total racking or shelving load
total allowable load supported by all the primary load supporting members

NOTE This may be the total load from beams or shelves in a defined area of racking or shelving.

3.24
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.

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3.25
unit load
weight of an individual stored item that can be placed or retrieved in one operation

3.26
user
company or person who manages and operates the installation on a daily basis and is responsible for the continuing safety of the installation

3.27
90° stacking
placement or retrieval of a pallet where the forklift 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

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In order to determine a safe design of the storage equipment to be supplied for the load carrying capacity the following information shall be provided by the user to the specifier (see EN 15629):

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

b) properties of the floor used as the foundation for the storage and mechanical handling equipment;

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

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

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

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

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

h) specify who shall carry out the installation of the storage equipment (see 6.1);

i) 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:

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

b) building floor shall have a degree of strength, stiffness, surface levelness and flatness suitable for operational purposes;

c) in order to instruct the user of the system, a printed load warning 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;

NOTE For information to be supplied to the user see Annex A

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

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

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

g) 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 EN 15620);

h) user shall be responsible for ensuring that during normal working operations the MHE to be used shall be operated in accordance with the instructions of the supplier of that equipment such that it 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.

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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 accordance with the instructions provided by the supplier in a professional manner and is of equal importance to the provision of a safe structural design. The quality and accuracy of the works can have a profound influence on the performance of the storage equipment.

Supplier's workforces shall be trained to carry out installation and have the necessary industrial experience to do so safely. If it is specified that the installation work is not to be carried out 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 workforce.

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 affect the carrying capacity of the structure and should be in accordance with EN 15620 for APR unless otherwise specified by the designer.

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6.3 Aspects of installation work to be observed

Aspects of installation work to be observed include 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;

NOTE Where spine bracing and associated plan bracing is incorporated in a racking or shelving design, this is fundamental to the carrying capacity of the product.

c) single run, single tier hand loaded shelving systems without drawers and with a height of less than 2,5 m or single tier double runs less than 4,0 m in height, need not comply with the requirement regarding floor fixings if the ratio between height to topmost loaded shelf and overall depth is less than 4:1;

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 used for APR are coupled back to back in double runs 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. The number and location of the row spacers shall comply with the following minimum requirements:

   1) 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) 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.

      NOTE Run spacers fitted in these two positions provide some lateral support for accidentally damaged frames, however, while they can be of help they cannot be guaranteed to prevent the collapse of double runs.

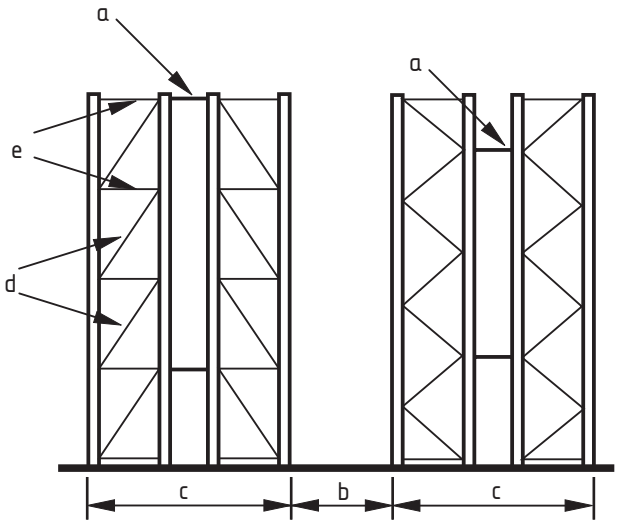
f) spacing of beams, cantilevers, shelving, etc. shall not be greater than values given by the rack supplier that correspond to their maximum loads or the maximum allowable load on the upright frame as shown on the safe load warning notice;

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

h) safe load warning notices shall be in position.

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Key

a run spacer
b aisle
c double run rack
d frame diagonals
e frame horizontals

Figure 1 — Location of run spacers

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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.

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

a) rack shall be unloaded prior to carrying out the alterations;

b) additions or changes to the storage equipment by welding or bolting shall not be allowed unless specifically approved by the equipment supplier;

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

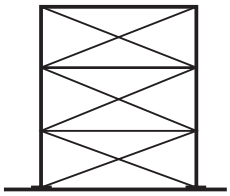
d) position of the bracing node points shall be changed if beam positions are changed in racking where back bracing is present. This can also require the repositioning of any horizontal bracing, which can be fixed between some beams (see Figure 2).

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.

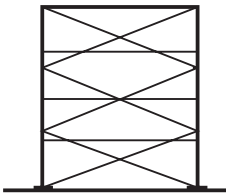
NOTE 2 Changes in the rack or shelving configuration will generally cause a change in the load-carrying capacity of the rack. In braced or un-braced racking, if the height to the first beam level, or the spacing between beams, is increased, the safe load capacity of the frames will be reduced.

NOTE 3 Storage structures that are braced down aisle will always have a higher load-carrying capacity than an identical un-braced structure built of the same components. The removal or faulty rearrangement of any bracing provided will substantially reduce the load carrying capacity of the installation.

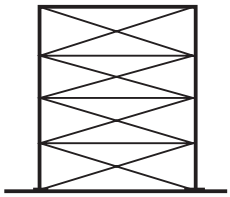
SIST EN 15635:2009



a) original configuration



b) beam positions altered with a possibly ineffective spine bracing



c) spine bracing altered to suite the new arrangement

Figure 2 — Changes to beam configuration may require changes to the vertical bracing

8 Use of the storage equipment

8.1 General safety

8.1.1 Person responsible for storage equipment safety PRSES

The user shall appoint a person responsible for storage equipment safety and the name of that person should be publicized to the warehouse staff. The PRSES shall be instructed to identify the supplier(s) of storage equipment, contact the supplier(s) and identify the training necessary to keep the storage equipment in a safe working condition.

The PRSES shall be aware of the nature of the operations in the warehouse (see 4) and the associated dangers on the basis of a risk assessment, as well as the precautions that are taken to prevent or limit the dangers, by means of instructions and/or signs.

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(https://ecommerce.sist.si)

8.1.2 Safe load warning notices

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Instructions with regard to the safe load capacity shall be displayed in a prominent location on or adjacent to the storage equipment so that they are clearly visible, in the national language and in a durable format. Where necessary, the instructions should be displayed in such a way that persons with inadequate knowledge of the national language could also understand them (see Annex B.) The safe load capacity of storage equipment is based on good practice in the placement and retrieval of unit loads.

8.1.3 Training

Operators shall receive adequate training in the use of the storage and handling equipment (see B.3).

NOTE Truck drivers employed should be certificated/licensed.

8.1.4 Access to storage levels

Safe access equipment shall be used for gaining access to storage levels above ground level. Standing or climbing on the racking or shelving shall not be allowed.

NOTE This does not apply to construction or repairs where a specific risk assessment and safety precautions apply.

8.2 Pallet or load carrying accessories

8.2.1 Loading

The pallet shall not be loaded beyond its rated capacity.