SLOVENSKI STANDARD
SIST EN 12079:2000

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Offshore containers - Design, construction, testing, inspection and marking

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Offshore-Container - Bemessung, Konstruktion, Prüfung, Überwachung und Kennzeichnung

Conteneurs pour utilisation en mer - Conception, construction, essais, inspection et marquage

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ICS:

55.180.10 Veļ namenski kontejnerji General purpose containers

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Conteneurs pour utilisation en mer - Conception, construction, essais, inspection et marquage

Offshore-Container - Bemessung, Konstruktion, Prüfung, Überwachung und Kennzeichnung

This European Standard was approved by CEN on 13 February 1999.

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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 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 European Standard has been prepared by Technical Committee CEN/TC 280 "Offshore containers", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by September 1999, and conflicting national standards shall be withdrawn at the latest by September 1999.

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

1. Scope

This standard specifies transport related requirements for the design, construction and marking of offshore freight and service containers with maximum gross mass not exceeding 25000 kg, intended for repeated use to, from and between offshore installations and ships. It establishes a system for plating of offshore containers, linked to a defined scheme for periodic examination and test and introduces a requirement for pre-trip inspection of offshore containers.

Guidance as to the knowledge and experience, required by those responsible for carrying out inspections in relation to the system of periodic inspections specified in this standard, is given in annex A

Requirements for the lifting set and for non-transport related requirements, relating to offshore service containers, e.g. requirements for installation and use, are outside the scope of the standard.

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.

EN 287-1	Approval testing of welders — Fusion welding — Part 1 : Steels
EN 287-2	Approval testing of welders — Fusion welding — Part 2 : Aluminium and aluminium alloys
EN 288-1	Specification and qualification of welding procedures for metallic materials— Part 1 : General rules for fusion welding
EN 288-2	Specification and approval of welding procedures for metallic materials— Part 2 : Welding procedure specification for arc welding
EN 288-3	Specification and approval of welding procedures for metallic materials— Part 3 : Welding procedure tests for the arc welding of steels
EN 288-4	Specification and approval of welding procedures for metallic materials— Part 4 : Welding procedure tests for the arc welding of aluminium and its alloys
EN 970	Non-destructive examination of fusion welds - Visual examination
EN 1011-1	Welding - Recommendations for welding of metalic materials — Part 1: General guidance for arc welding
prEN 1011-2	Recommendations for welding of metalic materials — Part 2 : Guidance for ferritic steels
EN 10002-1	Metallic materials - Tensile testing — Part 1: Method of test (at ambient temperature)
EN 10025	Hot-rolled products of non-alloy structural steels-Technical delivery conditions
prEN 10250-2	Open die steel forgings for general engineering purposes — Part 2: Non-alloy quality and special steels
prEN 10250-3	Open die steel forgings for general engineering purposes — Part 3: Low alloy special steels
EN 10113-1	Hot-rolled products in weldable fine grain structural steels — Part 1 : General delivery conditions
EN 10113-2	Hot-rolled products in weldable fine grain structural steels — Part 2 : Delivery conditions for normalized/normalized rolled steels

EN 10113-3	Hot-rolled products in weldable fine grain structural steels — Part 3 : Delivery conditions for thermomechanical rolled steels
EN 10204	Metallic products - Types of inspection documents
EN 10045-1	Metallic materials - Charpy impact test —Part 1: Test method
EN ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing (ISO 9002:1994)
EN 45004	General criteria for the operation of various types of bodies performing inspections
ISO 209-1	Wrought aluminium and aluminium alloys - Chemical composition and forms of products — Part 1: Chemical composition
ISO 1161	Series 1 freight containers — Corner fittings — Specification
ISO 1496-1	Series 1 freight containers — Specification and testing—Part 1: General cargo containers for general purposes
ISO 1496-3	Series 1 freight containers — Specification and testing — Part 3: Tank containers for liquids, gases and pressurized dry bulk
ISO 1496-4	Series 1 freight containers — Specification and testing — Part 4: Non-pressurized containers for dry bulk

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1 offshore container: portable unit for repeated use in the transport of goods or equipment, handled in open seas, to, from and between fixed and/or floating installations and ships.

NOTE: The unit incorporates permanently installed equipment for lifting and handling and may include equipment for filling, emptying, cooling, heating, etc.

3.2 permanent equipment: equipment that is attached to the container and which is not cargo.

NOTE: This may include, e.g. lifting sets, refrigeration units, shelves, securing points, garbage compactors.

3.3 primary structure: Load carrying and supporting frames and load carrying panels. Primary structure is divided into two subgroups:

3.3.1 Essential and non-redundant primary structure main structural elements which transfer the cargo load to the crane hook(i.e. forming the "load path" from the payload to the lifting sling) and will include, at least:

top and bottom side rails
top and bottom end rails
corner posts
pad eyes.

although other primary structure may also be considered as essential / non-redundant.

3.3.2 Non-essential primary structure other structural elements for which the main function is other than that described in 3.3.1 e.g. floor plates and protective frame members. Side and roof panels, including corrugated panels, are not considered to be part of the primary structure.

3.4 secondary structure: parts which are not considered as load carrying for the purposes of the design calculations, including the following components:

- doors, wall and roof panels
- panel stiffeners and corrugations
- structural components used for tank protection only
- internal securing points.

NOTE: not all container walls are corrugated.

3.5 offshore freight container: offshore container built for the transport of goods.

NOTE : Examples of offshore freight containers are:
- general cargo container: A closed container with doors.
- cargo basket: An open top container for general or special cargo.
- tank container: A container for the transport of dangerous or non-dangerous fluids.
- bulk container: A container for the transport of solids in bulk.
- special container: A container for the transport of special cargo e.g. garbage containers, equipment boxes, gas cylinder racks.

3.6 offshore service container: offshore container built and equipped for a special service task, usually as a temporary installation e.g. laboratories, workshops, stores, power plants, control stations.

3.7 waste skip: open or closed offshore container used for the storage and removal of waste.

NOTE: Normally constructed from flat steel plate forming the load bearing sections of the container, with bracing in the form of steel profiles e.g. channel or hollow section, being fitted horizontally and/or vertically around sides and ends. In addition to the pad eyes for the lifting set, these containers may have side mounted lugs suitable for use with the lifting equipment mounted on a skip lift vehicle.

3.8 prototype: equipment item, used for type testing, considered to be representative of the product for which conformity is being claimed. It may either be fabricated especially for type testing or selected at random from a production series.

3.9 owner: legal owner of the offshore container or his delegated nominee.

3.10 lifting set: items of integrated lifting equipment used to connect the offshore container to the lifting appliance.

4 Symbols

R	The rating i.e. the maximum gross mass of the container and its cargo, in kg;
T	The tare mass, i.e. the mass of an empty container (without cargo and excluding lifting set), in kg;
P	The payload, i.e. the maximum permissible mass of cargo which may be safely transported by the container, in kg;

NOTE 1:P = R - T
NOTE 2:R, T and P are, by definition in units of mass, kilograms (kg). Where design requirements are based on the gravitational forces derived from these values, those

forces are indicated thus: Rg, Tg and Pg the units of which are in newtons or multiples thereof.

T_D The design air temperature, i.e. a minimum reference temperature used for the selection of steel grades used in offshore containers and equipment expressed in degrees centigrade;

σ_e The von Mises equivalent stress, expressed in MPa or N/mm^2 ;

R_e The specified minimum yield stress, expressed in MPa or N/mm^2 ;

5 Design

5.1 General

An offshore container shall have sufficient strength to allow loading and unloading from supply vessels offshore operating in a sea state with significant wave heights of 6 m and to withstand impact from heavy seas.

NOTE: Local impacts, e.g. from hitting other deck cargo or rigid parts of the ship structure, may cause extreme loads in such conditions.

To prevent the containers from overturning (tipping) on a moving deck, they shall be designed to withstand tilting at 30 ° in any direction, without overturning when loaded at its maximum gross mass, with the centre of gravity considered to be at the half height of the container.

Protruding parts on the outside of the offshore container that may catch other containers or structures shall be avoided. Protruding parts (doors handles, hatch cleats, etc.) shall be so placed or so protected that they do not catch the lifting set.

Where containers are designed for stacking, and the lifting set hangs over the side of the top frame they shall be fitted with a method of protection for those exposed parts, e.g. corners raised to sufficient height above the frame and roof to prevent unintentional contact, with and damage to, the lifting set.

Containers shall be designed as structural frames (primary structure), with non-load bearing cladding where necessary (secondary structure). Only the primary structure shall be considered in the design calculations; however, on certain types of containers, e.g. waste skips with trapezium shaped sides, with only a non-stressed cover above the bracing where the pad eyes are attached, the whole structure may be considered as a primary structure, and the design calculations may treat such a container as a monocoque construction.

T_D shall not be higher than the (statistically) lowest daily mean temperature for the area where the offshore container is to operate and in no case shall be higher than -20°C.

NOTE: For containers with exposed aluminium, the danger of sparks caused by the impact of aluminium against corroded steel (the thermite reaction) should be taken into account.

5.2 Structural strength

5.2.1 General

The required strength of a container shall be determined by calculation and verified by type tests, as described in clause 7.

5.2.2 *Lifting loads*

5.2.2.1 For design loads defined in 5.2.2.2 and 5.2.2.3, no equivalent stress level, σ_e, shall exceed the figure as calculated as $\sigma_e = 0{,}85\ C$, where

for steel: $C = R_e$

for aluminium :

Base material $C = R_{0,2}$ for aluminium outside the heat affected zone.

Heat affected zone $C = 0{,}7\ \beta\ R_m$

where R_m is the tensile strength of aluminium

β is 0,8 for ISO AlMg4,5Mn-HAR/AA5083 (H329 see table 4)

or is 0,7 for all other aluminium alloys and tempers

5.2.2.2 Lifting with lifting set

The design force on the primary structure shall be calculated as 2,5 *Rg*.

To achieve this the internal load shall be taken as (2,5R - T)g evenly distributed over the container floor. For tank containers, the actual distribution of the tare mass shall be used for the calculations.

Pad eyes shall be designed for a total vertical force of 3 R*g*.

The force shall be considered to be evenly distributed between (n - 1) pad eyes where n is the actual number of pad eyes.

To determine the resulting sling force on the pad eyes, the sling angle shall be taken into account, so that the resulting sling force on each pad eye is calculated as follows:

$$F = \frac{3R_g}{(n-1)\cos v}$$

where

F is the resulting sling force, in newtons;

n is the actual number of pad eyes (for calculation purposes n shall not exceed 4 and shall be not less than 2);

v is the angle between a sling leg and the vertical, in degrees and shall be assumed to be 45° for design purposes with ISO 10' containers. For lengths less than 10', v should be defined differently by arrangement between the purchaser / manufacturer.

NOTE: For containers with only one pad eye, that pad eye shall be designed for a total vertical force of 5 R*g*.

5.2.2.3 Lifting with fork lift truck

The design force on the primary structure shall be calculated as 1,6 *Rg*.

To achieve this the internal load shall be taken as (1,6R - T)g evenly distributed over the container floor.

Where fork pockets are intended only for handling of the empty container, the design load shall be taken as 1,6 T*g*.

5.2.3. Impact loads

5.2.3.1 General

Impact loads are dynamic loads of very short duration. Ideally, dynamic calculations or tests should be carried out to verify the ability of a container to withstand such loads. However, for most applications it shall be sufficient to carry out simplified static calculations as specified in 5.2.3.2 and 5.2.3.3 and to perform a drop test for vertical impact on corners, in accordance with 7.4

When simplified calculations are used, and each beam is considered separately, any assumptions concerning support conditions shall be stated.

5.2.3.2 Horizontal impact

The main frame structure shall be dimensioned to withstand a local horizontal impact force acting at any point. This force may act in any horizontal direction on the corner post. On all other frame members in the sides the load may be considered as acting at right angles to the side.

The calculated (static equivalent) stresses due to impact shall be combined with the lifting stresses resulting from static lifting forces (R*g*).

Equivalent stresses shall not exceed:

$\sigma_e = C$ (see 5.2.2.1)

The following values shall be used for the static equivalents to an impact force:

For container posts and side rails of the bottom structure: - 0,25 R*g*
For other frame members of the side structure, including the top rails:- 0,15 R*g*

Maximum calculated deflections at these loadings shall not exceed:

For corner posts and bottom side rails $\frac{l_n}{250}$

where

l_n is the total length of the rail or post in mm.

For other frame members $\frac{1_n}{250}$

where

1_n is the length of the shortest edge of the wall being considered.
NOTE: 1_n is a (nominal) reference length and will often be different from the actual span of a beam.

For horizontal impact on tank containers for dangerous cargoes see 5.5.4.

5.2.3.3 *Vertical impact*

A vertical impact test shall be carried out in accordance with 7.4. In addition, the side rails and end rails in the base shall be able to withstand vertical point forces of 0,25 R*g* at the centre span.

Equivalent stresses shall not exceed:

σ_e = C (see 5.2.2.1)

Calculated deflections shall not exceed $\frac{1_n}{250}$

where

1_n is the total length of the rail.

NOTE: Maximum vertical impact forces are likely to occur when a container is lowered onto the deck of a heaving supply vessel. If the deck is at an angle, the first impact will be on a corner. Such impact forces cannot be readily simulated by static forces. As dynamic calculations would be very complex, it is usually sufficient to verify the strength by a vertical impact test as described in 7.4.

5.2.4 Internal forces on container walls

Each container wall, including the doors, shall be designed to withstand an internal force of 0,6 P*g* evenly distributed over the whole surface, without suffering any permanent deformation.

5.2.5 Minimum material thickness

The following minimum material thickness (t) requirements shall apply.

a) for external parts of corner posts and bottom rails i.e. parts forming the outside of the container:

for R ≥ 1000 kg, t = 6 mm
for R < 1000 kg, t = 4 mm

b) for all other parts of the primary structure: t = 4 mm.
c) for secondary structure made from metallic materials: t = 2 mm.
d) for waste skips of monocoque design (see 5.1)
within an area of up to 100 mm from the side edges : t = 6 mm
for the remaining parts of the side structure: t = 4 mm.