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Offshore containers and associated lifting sets - Part 1: Offshore container - Design, manufacture and marking

Offshore-Container und zugehörige Anschlaggarnituren - Teil 1: Offshore-Container - Auslegung, Herstellung und Kennzeichnung

Conteneurs pour manutention en mer et dispositifs de levage associés - Partie 1: Conteneurs pour manutention en mer - Conception, construction et marquage

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Offshore containers and associated lifting sets - Part 1: Offshore container - Design, manufacture and marking

Conteneurs pour utilisation en mer et dispositifs de levage associés - Partie 1: Conception, construction et marquage

Offshore-Container und zugehörige Anschlaggarnituren - Teil 1: Offshore-Container - Auslegung, Herstellung und Kennzeichnung

This European Standard was approved by CEN on 9 March 2006.

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Foreword

This document (EN 12079-1:2006) has been prepared by Technical Committee CEN/TC 280 “Offshore containers and associated lifting sets”, 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of an identical text or by endorsement, at the latest by October 2006, and conflicting national standards shall be withdrawn at the latest by October 2006.

This document, together with EN 12079-3:2006, supersedes EN 12079:1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This part of EN 12079 specifies requirements for the design, manufacture 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.

This part of EN 12079 specifies only transport related requirements.

Other parts of the standard are:

EN 12079-2, Offshore containers and associated lifting sets - Part 2: Lifting sets – Design, manufacture and marking

EN 12079-3, Offshore containers and associated lifting sets - Part 3: Periodic inspection, examination and testing

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 287-1, *Qualification test of welders — Fusion welding — Part 1: Steels*

EN 473, *Non destructive testing - Qualification and certification of NDT personnel - General principles*

EN 571-1, *Non destructive testing - Penetrant testing - Part 1: General principles*

EN 970, *Non-destructive examination of fusion welds — Visual examination*

EN 1289, *Non-destructive examination of welds - Penetrant testing of welds - Acceptance levels*

EN 1290, *Non-destructive examination of welds - Magnetic particle examination of welds*

EN 1291, *Non-destructive examination of welds - Magnetic particle testing of welds - Acceptance levels*

EN 1435, *Non-destructive examination of welds - Radiographic examination of welded joints*

EN 1712, *Non-destructive examination of welds - Ultrasonic examination of welded joints - Acceptance levels*

EN 1714, *Non-destructive examination of welds - Ultrasonic examination of welded joints*

EN 10002-1, *Metallic materials — Tensile testing — Part 1: Method of test at ambient temperature*

EN 10025-1, *Hot rolled products of structural steels - Part 1: General technical delivery conditions*

EN 10025-2, *Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels*

EN 10025-3, *Hot rolled products of structural steels - Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels*

EN 10025-4, *Hot rolled products of structural steels - Part 4: Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels*

EN 10045-1, *Metallic materials — Charpy impact test — Part 1: Test method*

EN 10164, *Steel products with improved deformation properties perpendicular to the surface of the product - Technical delivery conditions*

EN 10204, *Metallic products — Types of inspection documents*

EN 10210-1, *Hot finished structural hollow sections of non-alloy and fine grain structural steels - Part 1: Technical delivery requirements*

EN 10219-1, *Cold formed welded structural hollow sections of non-alloy and fine grain steels - Part 1: Technical delivery requirements*

EN 10250-2, *Open die steel forgings for general engineering purposes — Part 2: Non-alloy quality and special steels*

EN 10250-3, *Open die steel forgings for general engineering purposes — Part 3: Alloy special steels*

EN 12517-1, *Non-destructive testing of welds - Part 1: Evaluation of welded joints in steel, nickel, titanium and their alloys by radiography - Acceptance levels*

EN 30042, *Arc-welded joints in aluminium and its weldable alloys - Guidance on quality levels for imperfections (ISO 10042:1992)*

EN ISO 5817, *Welding - Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) - Quality levels for imperfections (ISO 5817:2003)*

EN ISO 7500-1, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system (ISO 7500-1:2004)*

EN ISO 9606-2, *Qualification test of welders - Fusion welding - Part 2: Aluminium and aluminium alloys (ISO 9606-2:2004)*

EN ISO 15607, *Specification and qualification of welding procedures for metallic materials - General rules (ISO 15607:2003)*

EN ISO 15609-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure specification - Part 1: Arc welding (ISO 15609-1:2004)*

EN ISO 15614-1, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys (ISO 15614-1:2004)*

EN ISO 15614-2, *Specification and qualification of welding procedures for metallic materials - Welding procedure test - Part 2: Arc welding of aluminium and its alloys (ISO 15614-2:2005)*

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*

International Maritime Dangerous Goods (IMDG Code)

ATEX Directive 94/9/EC

3 Terms and definitions

For the purposes of this European Standard, the following terms and 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.

Offshore containers are subdivided into 3 categories:

3.1.1
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.

3.1.2
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

3.1.3
offshore 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.

3.2
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 /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
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

3.6
owner
legal owner of the offshore container or the delegated nominee of that body.

3.7
lifting set
items of integrated lifting equipment used to connect the offshore container to the lifting appliance

3.8
Visual inspection
inspection of the characteristics of a product and determination of its conformity with specified requirements where applicable and based on professional judgement where general requirements apply

3.9
Visual examination
examination in accordance with EN 970

4 Symbols

R rating i.e. the maximum gross mass of the container including permanent equipment and its cargo, in kg; but excluding the lifting set;

T tare mass i.e. the mass of an empty container including any permanent equipment but excluding cargo and lifting set, in kg;

P payload i.e. the maximum permissible mass of cargo which may be safely transported by the container, in kg;

S mass of the lifting set 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 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 von Mises equivalent stress, expressed in MPa or N/mm^2;

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

5 Design

5.1 General

5.1.1 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.

5.1.2 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. For dedicated purpose containers (e.g. bottle racks and tank containers) the actual centre of gravity shall be used.

5.1.3 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.

5.1.4 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.

5.1.5 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.

5.1.6 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 1 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.

NOTE 2 When preparing the specification for a service container, it is advised that the rating is chosen higher than the estimated fitted out mass, i.e. to specify a certain payload even if the container is not intended to carry cargo. This will allow for changes in the amount and mass of equipment fitted in a container during its operational life, and it may also be useful to be able to carry a certain amount of non-permanent equipment.

NOTE 3 For containers with special features, additional design requirements may apply. See informative Annex for guidance.

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 calculated as $\sigma_e = 0,85\,C$,

where:

for steel: $C = \mathrm{R_e}$

for aluminium: Base material $C = R_{0.2}$

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-H32

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

(see Table 4**)**

5.2.2.2 Lifting with lifting set

The design force on the primary structure shall be calculated as $2{,}5\ Rg$.

g is the acceleration due to gravity (in m/s^2 i.e. 9,80665).

The internal load shall be taken as $(2{,}5\ R - T)g$ 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 $3\ Rg$.

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 ° unless otherwise specified.

For containers with only one pad eye, that pad eye shall be designed for a total vertical force of $5\ Rg$.

NOTE Containers without a roof may have insufficient strength and stiffness to pass the 2 point lifting test (7.3.3). In order to avoid building prototypes that will not pass the test, the ability of an open top container to withstand the load occurring in the 2-point lifting test should be checked by a suitable calculation method. In these calculations, the nominal yield stress of the material should not be exceeded. These calculations do not replace the prototype testing.

5.2.2.3 Lifting with forklift truck

The weight of the lifting set shall be taken into account when calculating the strength of the fork pockets.
The design force on the primary structure shall be calculated as 1,6 *(R+S)g.*
The internal load shall be taken as *(*1,6 *(R+S)-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+S)g.*