SLOVENSKI STANDARD
SIST EN 1993-4-2:2007/A1:2017

01-september-2017

Evrokod 3: Projektiranje jeklenih konstrukcij - 4-2. del: Rezervoarji

Eurocode 3 - Design of steel structures - Part 4-2: Tanks

Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 4-2: Tankbauwerke

Eurocode 3 - Calcul des structures en acier - Partie 4-2: Réservoirs

Ta slovenski standard je istoveten z: **EN 1993-4-2:2007/A1:2017**

ICS:

23.020.10	Nepremične posode in rezervoarji	Stationary containers and tanks
91.010.30	Tehnični vidiki	Technical aspects
91.080.13	Jeklene konstrukcije	Steel structures

SIST EN 1993-4-2:2007/A1:2017 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

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English Version

Eurocode 3 - Design of steel structures - Part 4-2: Tanks

Eurocode 3 - Calcul des structures en acier - Partie 4-2 : Réservoirs

Eurocode 3: Bemessung und Konstruktion von Stahlbauten - Teil 4-2: Tankbauwerke

This amendment A1 modifies the European Standard EN 1993-4-2:2007; it was approved by CEN on 3 March 2017.

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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 (EN 1993-4-2:2007/A1:2017) has been prepared by Technical Committee CEN/TC 250 "Structural Eurocodes", 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of an identical text or by endorsement, at the latest by June 2018, and conflicting national standards shall be withdrawn at the latest by June 2018.

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1 Modification to the Foreword

In the Foreword, in the section "National Annex for EN 1993-4-2", *in the 2nd paragraph, replace the whole list with the following one:*

"

- 2.2 (1)
- 2.2 (3)
- 2.9.2.1 (1)P
- 2.9.2.1 (2)P
- 2.9.2.1 (3)P
- 2.9.2.2 (3)P
- 2.9.3 (2)
- 3.3 (3)
- 4.1.4 (3)".

2 Modifications to 1.1, Scope

Replace Paragraph (1) with the following one (including the present Footnote 1)):

"(1) Part 4-2 of Eurocode 3 provides principles and application rules for the structural design of vertical cylindrical, conical and pedestal above ground steel tanks for the storage of liquid products with the following characteristics:

a) tanks with capacity greater than 100 m^3 (100 000 l);

b) tanks that have significant fabrication or assembly on site;

c) shop-fabricated tanks with conical bottoms, supported on skirts or columns;

d) tanks with characteristic internal pressures above the liquid surface not more negative than −0,1 bar and not greater than 0,5 bar [5];

e) design metal temperatures limited to the ranges:

   1) tanks constructed using structural steel grades, $-50°C < T < +300°C$;

   2) tanks constructed using austenitic stainless steels, $-165°C < T < +300°C$;

   3) tanks constructed with special steel grades that have defined yield strengths up to higher temperatures, $-165°C < T <$ the maximum defined temperature for the grade;

   4) tanks susceptible to failure by fatigue, $T < 150°C$;

f) in cylindrical ground-supported tanks, the maximum design liquid level not higher than the top of the cylindrical shell.".

Replace Paragraph (8) with the following one:

"(8) This Part 4-2 does not cover:

— tanks of rectangular planform;

5) All pressures are in bar gauge unless otherwise specified.

— tanks with capacity below 100 m^3;

— tanks exposed to fire (refer to EN 1993-1-2);

— tanks with dished ends and diameter less than 5 m;

— cylindrical tanks with an aspect ratio of height to diameter greater than 3.".

3 Modifications to 1.2, Normative references

Replace "EN 1990" *with* "EN 1990:2002".

In the list of the parts of EN 1993, replace "Part 1.6:" *with* "Part 1.6:2007:".

In the list of the parts of EN 1993, replace "Part 1.10:" *with* "Part 1.10:2005:".

In the list of the parts of EN 1993, replace "Part 4.1:" *with* "Part 4.1:2007:".

4 Modifications to 1.5, Terms and definitions

In 1.5.1, replace the last sentence with the following one: "In the tank construction industry, this term is also taken to have the special meaning of the vertical wall of a cylindrical tank, see 1.5.9.".

Delete Entry 1.5.3 and renumber the following numbered entries accordingly.

In 1.5.5 (new numbering 1.5.4), delete in the last sentence: "irrespective of whether the tank is circular or rectangular in plan".

Replace the content of Entry 1.5.6 (new numbering 1.5.5) with "This term is used to refer to the stress-free middle surface when a shell is subject to pure bending in any direction.".

In 1.5.8, (new numbering 1.5.7) replace the second sentence with: "In this standard it is assumed to be circular in plan.".

Replace the content of Entry 1.5.9 (new numbering 1.5.8) with: "The term shell is often used in the tank industry to refer to the vertical wall of a cylindrical tank. This usage is slightly confusing when compared with the general definition (see EN 1993-1-6) given in 1.5.1, it is quite widely used, so it is also used in this standard where appropriate. Where any confusion may arise, the term cylindrical wall is used instead.".

In 1.5.13 (new numbering 1.5.12), in the 1st sentence, delete "or flat plate elements".

In 1.5.13 (new numbering 1.5.12), in the 2nd sentence, delete "or box".

In 1.5.15 (new numbering 1.5.14), replace: "The shell-roof junction is the junction between the vertical wall and the roof. It is sometimes referred to as the eaves junction, though this usage is more common for solids storages." *with:* "The shell-roof junction, alternatively known as the top angle or eaves junction, is the junction between the vertical wall and the roof.".

In 1.5.17 (new numbering 1.5.16), in the first sentence, delete "or flat plate" *and* "or a vertical stiffener on a box".

In 1.5.18 (new numbering 1.5.17), delete the last sentence: "In a shell of revolution it is circular, but in rectangular structures is takes the rectangular form of the plan section.".

In 1.5.20 (new numbering 1.5.19), replace the first sentence with: "A ring girder or ring beam is a circumferential stiffener which has bending stiffness and strength in the plane of the circular section of a shell and also normal to that plane.".

In 1.5.20 (new numbering 1.5.19), delete in the second sentence: "or box structure".

In 1.5.23 (new numbering 1.5.22), replace: "An external tank structure to contain fluid that may escape by leakage or accident from the primary tank. This type of structure is used where the primary tank contains toxic or dangerous fluids." *with:* "An external tank structure to contain fluid that may escape by leakage or accident from the primary tank. This type of structure is usually used where the primary tank contains toxic or dangerous fluids. A catch basin also effectively reduces the requirement for an extensive area of fluid containment around the tank.".

5 Deletion of 1.7.2, Conventions for global tank structure axis system for rectangular tanks

Delete the whole Subclause 1.7.2, including Figure 1.2, and renumber Subclauses 1.7.3 and 1.7.4 as 1.7.2 and 1.7.3.

6 Modifications to 1.7.3 (new numbering 1.7.2), Conventions for structural element axes in both circular and rectangular tanks

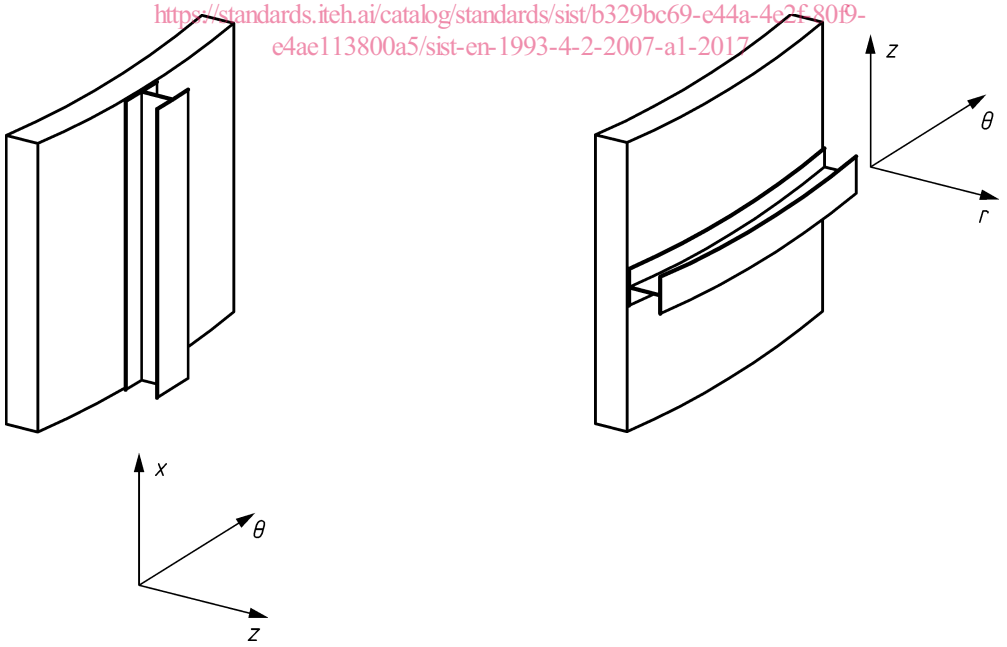
Replace the title of this subclause "Conventions for structural element axes in both circular and rectangular tanks" *with* "Conventions for structural element axes in circular tanks".

In Paragraph (1) replace "(see figures 1.3 and 1.4)" *with* "(see Figure 1.2)".

In Paragraph (2) replace "(see figure 1.3a)" *with* "(see Figure 1.2a)" *and delete* "(for both a shell and a box)".

Replace Figure 1.3 with the following new Figure 1.2:

"



a) Meridional stiffener **b) Circumferential stiffener**

Figure 1.2 — Local coordinate systems for meridional and circumferential stiffeners".

Delete Figure 1.4.

In Paragraph (3) replace "(see figure 1.4a)" *with* "(see Figure 1.2b)".

Delete Paragraph (4).

7 Modifications to 1.7.4 (new numbering 1.7.3), Conventions for stress resultants for circular tanks and rectangular tanks

Replace the title "Conventions for stress resultants for circular tanks and rectangular tanks" *with* "Conventions for stress resultants for circular tanks".

In Paragraph (1) replace the two references to Figure 1.5 with "Figure 1.3" *and delete:*

"n_y circumferential membrane stress resultant in rectangular boxes"

and

"σ_{my} circumferential membrane stress in rectangular boxes".

In Paragraph (2) replace the two references to Figure 1.5 with "Figure 1.3" *and delete:*

"m_y circumferential bending stress resultant in rectangular boxes"

and

"σ_{by} circumferential bending stress in rectangular boxes"

and

"σ_{siy}, σ_{soy} circumferential inner, outer surface stress in rectangular boxes

τ_{sixy}, τ_{soxy} inner, outer surface shear stress in rectangular boxes".

Renumber Figure 1.5 as Figure 1.3.

8 Modification to 2.2, Reliability differentiation

Replace Paragraphs (1) to (4)P with:

"(1) For reliability differentiation, see EN 1990.

NOTE The National Annex may define the Consequence Classes for tanks as a function of the location, type of stored fluid and loading, the structural form, size and operational aspects.

(2) Different levels of rigour should be used in the design of tank structures, depending on the Consequence Class chosen, the structural arrangement and the susceptibility to different failure modes.

(3) For this standard, three Consequence Classes are used, with requirements which produce designs with essentially equal risk in the design assessment and considering the expense and procedures necessary to reduce the risk of failure for different structures: Consequence Classes 1, 2 and 3.

NOTE The National Annex may choose appropriate values for the boundaries between the classes. Table 2.1 gives recommended values for the classification based on the size, structural form and stored contents into Consequence Classes when all other parameters result in medium consequences, see EN 1990:2002, B.3.1.

(4) The classification of flat-bottomed tanks that rest on the ground is based on the dimension U, which is related to the potential energy of the stored fluid.

$$U = \sqrt{DH} \tag{2.1}$$

where D is the tank diameter and H is the maximum depth of stored fluid (see Figure 2.1a)).