

Welded static non-pressurised thermoplastic tanks - Part 3: Design and calculation for single skin rectangular tanks

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Part 3: Design and calculation for single skin
rectangular tanks

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 12573-3:2000 sisaldab Euroopa standardi EN 12573-3:2000 ingliskeelset teksti. Käesolev dokument on jõustatud 12.09.2000 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 12573-3:2000 consists of the English text of the European standard EN 12573-3:2000. This document is endorsed on 12.09.2000 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.
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Käsitlusala: This part of European standard specifies the design and calculation for single skin rectangular tanks, fabricated from the following thermoplastics: Polyethylene (PE), Polypropylene (PP), Poly (vinyl chloride) (PVC), Poly (vinylidene fluoride) (PVDF).	Scope: This part of European standard specifies the design and calculation for single skin rectangular tanks, fabricated from the following thermoplastics: Polyethylene (PE), Polypropylene (PP), Poly (vinyl chloride) (PVC), Poly (vinylidene fluoride) (PVDF).
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Võtmesõnad:

English version

Welded static non-pressurized thermoplastic tanks

Part 3: Design and calculation for single-skin rectangular tanks

Cuves statiques soudées en matières
thermoplastiques sans pression –
Partie 3: Conception et calcul des
cuves parallélépipédiques rectangles
à simple paroi

Geschweißte ortsfeste drucklose
Behälter (Tanks) aus Thermoplasten –
Teil 3: Konstruktion und Berechnung
von einwandigen Rechteckbehältern
(-tanks)

This European Standard was approved by CEN on 2000-02-14.

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 266 "Thermoplastic static tanks", 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 2000, and conflicting national standards shall be withdrawn at the latest by September 2000.

The informative annex A gives some construction details of rectangular tanks as examples.

prEN 12573:1999 "Welded static non-pressurised thermoplastic tanks" consists of:

- Part 1: General principles
- Part 2: Calculation of vertical cylindrical tanks
- Part 3: Design and calculation of single skin rectangular tanks
- Part 4: Design and calculation of flanged joints

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 the design and calculation for single skin rectangular tanks, fabricated from the following thermoplastics:

Polyethylene (PE)
Polypropylene (PP)
Poly (vinyl chloride) (PVC)
Poly (vinylidene fluoride) (PVDF)

The tanks may be strengthened on the outside by means of ribs or frames made of the same or other materials. This standard is only applicable to tanks which are not intended to withstand internal pressure or vacuum, other than that which may occur during the transfer of fluids (including gases) in their normal operation. The calculation takes into account short-term and long-term active pressures as well as the hydrostatic loading. The following values are long-term pressures and represent the limiting values:

Overpressure: $0,0005 \text{ N/mm}^2$ (0,005 bar)
Low pressure: $0,0003 \text{ N/mm}^2$ (0,003 bar)

Plate theory was used as the basis of the calculation in this document. Reference to membrane theory is given in Annex B.

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.

prEN 12573-1:1999 Welded static non-pressurised thermoplastic tanks – Part 1: General principles

EN 1778 Characteristic values for welded thermoplastic constructions – Determination of allowable stresses and moduli for design of thermoplastic equipment

3 Definitions, symbols and abbreviations

For the purposes of this part of this Standard the following definitions, symbols and abbreviations apply:

3.1 Definitions

- 3.1.1 Skin:** Basic structural element of the tank.
- 3.1.2 Stiffener:** Section attached horizontally or vertically to the skin of the tank.
- 3.1.3 Wall:** Skin of the tank plus stiffeners.
- 3.1.4 Panel:** Area of the skin between stiffeners.
- 3.1.5 U-frame:** Stiffener running beneath the base and vertically up the side of the tank.

3.2 Symbols and abbreviations

E	is the elastic modulus of the stiffener material (with plastics, this corresponds to E_c), in Newton per square millimetre
$E_{c(al.)D}$	is the allowable creep modulus at the design condition for deformation (temperature, stress, time, medium), in newton per square millimetre, see EN 1778
F	is the force, in newton
f	is the maximum deflection, in millimetre
J	is the moment of inertia of stiffener, in millimetre to the fourth power
k	is the correction coefficient for the deflection of the wall
M	is the bending moment, in newton millimetre
N	is the rigidity coefficient
p	is the excess pressure on the tank base, in newton per square millimetre
p_D	is the uniformly distributed load acting on the cover, in newton per square millimetre
p_m	is the mean value of excess pressure for calculation of skin thickness, in newton per square millimetre
p_1	is the mean value of excess pressure for calculation of the stiffener, in newton per square millimetre
t	is the skin thickness, in millimetre
W	is the moment of resistance of rim stiffeners, in cubic millimetre
x	is the length of the tank or distance between the vertical stiffeners, in millimetre
x'	is the effective length of panels assigned to stiffeners, in millimetre
y	is the depth of the tank or distance between the horizontal stiffeners, in millimetre
y'	is the effective depth of panels assigned to stiffeners, in millimetre
z	is the width of the tank or panel, in millimetre
$\alpha_1 \dots \alpha_5$	is the deformation coefficient
$\beta_1 \dots \beta_5$	is the stress coefficient
$\sigma_{al.}$	is the allowable stress, in newton per square millimetre, see EN 1778