

Welded static non-pressurized thermoplastic tanks —

Part 2: Calculation of vertical cylindrical tanks

The European Standard EN 12573-2:2000 has the status of a
British Standard

ICS 23.020.10

Confirmed April 2012

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

National foreword

This British Standard is the official English language version of EN 12573-2:2000.

The UK participation in its preparation was entrusted to Technical Committee PRI/62, Static thermoplastic tanks, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 18, an inside back cover and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This British Standard, having been prepared under the direction of the Sector Committee for Materials and Chemicals, was published under the authority of the Standards Committee and comes into effect on 15 November 2000

© BSI 11-2000

ISBN 0 580 34918 7

Amendments issued since publication

Amd. No.	Date	Comments

English version

Welded static non-pressurized thermoplastic tanks - Part 2: Calculation of vertical cylindrical tanks

Cuves statiques soudées en matières thermoplastiques
sans pression - Partie 2: Calcul des cuves cylindriques
verticales

Geschweißte ortsfeste drucklose Behälter (Tanks) aus
Thermoplasten - Teil 2: Berechnung von runden stehenden
Behältern (Tanks)

This European Standard was approved by CEN on 14 February 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. 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.

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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Contents

	Page
Foreword	3
1 Scope	3
2 Normative references	4
3 Symbols and abbreviations	4
4 General principles	7
5 Temperature	7
6 Cylinder dimensions	8
6.1 General	8
6.2 Lower band	9
6.3 Other bands	12
6.4 Cylinder made from sheets	13
7 Base thickness	14
8 Roof dimensions	15
9 Nozzles	16
10 Lifting lugs	16
Annex A (informative) A-deviations	18

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.

EN 12573:1999, Welded static non-pressurized 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 establishes rules for the design and calculation of welded static, vertical, non-pressurized, cylindrical, flat-bottom thermoplastic tanks. This standard applies to tanks fabricated in the following thermoplastics:

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

This standard does not take into account wind and/or snow loading. If wind or/and snow loading has to be taken into account additional calculations are necessary.

This standard is applicable to tanks in which the cylindrical shell is made of welded plates or a wound cylinder or an extruded pipe.

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: $0,000\ 5\ \text{N/mm}^2$ (0,005 bar)

Low pressure: $0,000\ 3\ \text{N/mm}^2$ (0,003 bar)

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.

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 12573-1:2000	Welded static non-pressurized 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 Symbols and abbreviations

For the purposes of this part of this standard, the following symbols and abbreviations apply.

a	is the depth of the weld seam, in millimetres
b	is the width of the nozzle compensation around the nozzle, in millimetres
C_1	is the load increase factor
C_2	is the material specific design factor
C_3	is the design factor for a two layered tank
C	is $C_1 \times C_2$
d	is the nominal inside diameter of the tank, in millimetres
d_A	is the nozzle outside diameter, in millimetres
d_L	is the diameter of hole in lifting lug, in millimetres
$E_{c(al),St}$	is the allowable creep modulus at the design condition for stability (temperature, stress, time, medium, safety), in newton per square millimetre, see EN 1778
f_l	is the long-term welding factor
g	is the acceleration due to gravity, in metre per square second ($9,81 \text{ m/s}^2$)
g_d	is the surface related weights, in newton per square millimetres
h_F	is the height at the maximum filling capacity, in millimetres
$h_{F(i)}$	is the height of the liquid above the lower edge of the band (i), in millimetres
h_Z	is the total cylindrical height, in millimetres
h_{ZF}	is the height of the lower band, in millimetres
l_m	is the height of the equivalent middle band from stability calculations, in millimetres
l_o	is the height of the equivalent upper band from stability calculations, in millimetres
l_u	is the height of the equivalent lower band from stability calculations, in millimetres
p_e	is the continuously active external pressure, in newton per square millimetres
p_i	is the continuously active internal pressure, in newton per square millimetres
p_{stat}	is the overpressure at the tank base due to the contents, in newton per square millimetres
$p_{stat(i)}$	is the overpressure at lower edge of the band (i) due to the contents, in newton per square millimetres
S	is the safety factor (see part 1)
T_A	is the temperature of the outside air, in degrees celsius
T_D	is the temperature of the roof, in degrees celsius
T_M	is the contents' temperature, in degrees celsius
t	is the calculated thickness of the band omitting the welding factor f_l from the calculation of σ_{al} , in millimetres
t_B	is the thickness of the base, in millimetres

t_D	is the thickness of the roof, in millimetres
t_m	is the thickness of the equivalent middle band from stability calculations, in millimetres
t_o	is the thickness of the equivalent upper band from stability calculations, in millimetres
t_u	is the thickness of the equivalent lower band from stability calculations, in millimetres
t_u^*	is the thickness of the equivalent lower band from the stress calculation, in millimetres
$t_{Z(i)}$	is the thickness of the band (i) in the case of varying skin thickness tanks, in millimetres
t_{ZF}	is the thickness of the lowest band of single layered tanks, in millimetres
t_{ZN}	is the thickness of the nozzle compensation plus the calculated element thickness, in millimetres
$t_{ZF'}$	is the overall thickness of the lowest band of a multilayered tank, in millimetres
$t_{Z0'}$	is the thickness of the outer wall of a multilayered tank, in millimetres
$t_{Z1'}$	is the thickness of the inner wall of a multilayered tank, in millimetres
V	is the filling volume, in cubic millimetres
V_A	is the weakening coefficient
α	is the angle of inclination of the roof, in degrees
ε	is the permissible edge expansions, in percent
λ	is the buckling coefficient
ρ	is the density of the thermoplastic material, in gram per cubic centimetres
ρ_F	is the density of the contents, in gram per cubic centimetres
$\sigma_{al.}$	is the allowable stress at the design condition, in newton per square millimetre, see EN 1778

The Figures 1 to 4 illustrate the main dimensions of tanks.

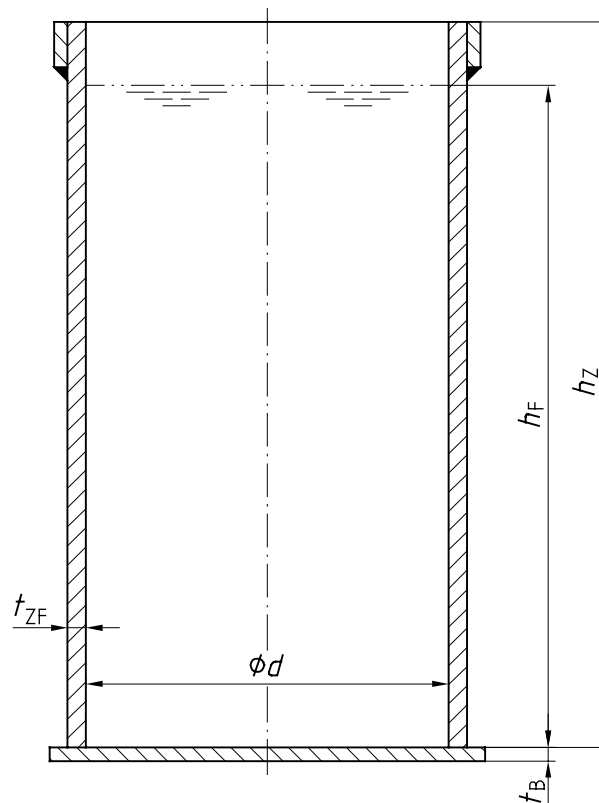


Figure 1 — Open flat-base tank with constant wall thickness