SLOVENSKI STANDARD
oSIST prEN 877:2019

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Cevni sistemi iz litega železa za hišne vodne odtoke - Karakteristike in preskusne metode

Cast iron pipes systems for the evacuation of water from works - Characteristics and test methods

Rohrsystem aus Gusseisen, zur Entwässerung von Gebäuden - Merkmale und Prüfverfahren

Systèmes de tuyaux en fonte, destinés à l'évacuation des eaux des bâtiments - Caractéristiques et méthodes d'essais

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 203.

If this draft becomes a European Standard, 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.

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

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European foreword

This document (prEN 877:2019) has been prepared by Technical Committee CEN/TC 203 “Cast iron pipes, fittings and their joints”, the secretariat of which is held by AFNOR (in cooperation with CEN/TC 165).

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 877:1999.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

It is one of a series of standards for cast iron products for pipelines for various applications.

It deals with subjects covered by the International Standard ISO 6594. The major difference is the inclusion of requirements for joints and for product performance.

This standard is in conformity with the general requirements already established by CEN/TC 165 in the field of waste water engineering, as required by EN 476.

1 Scope

This document specifies product characteristics, test/assessment methods and of how to express test/assessment results. Cast iron pipelines kits are usually composed by cast iron pipes, fittings, joints and accessories.

This document covers the range of nominal diameter from DN /40 to DN 600 inclusive.

The cast iron includes grey cast iron and ductile cast iron.

The roof gullies used for siphonic systems are outside the scope of this standard.

Sewerage applications are outside the scope of this standard.

It is intended to be used for the construction of gravity or vacuum discharge pressurized or unpressurised networks installed inside and/or outside Works, above and/or below ground, in construction works.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 598:2007+A1:2009, *Ductile iron pipes, fittings, accessories and their joints for sewerage applications — Requirements and test methods*

EN 681-1, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 10088-1, *Stainless steels — Part 1: List of stainless steels*

EN 10088-2, *Stainless steels — Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

EN 10088-3, *Stainless steels — Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*

EN 10088-4, *Stainless steels — Part 4: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for construction purposes*

EN 10088-5, *Stainless steels — Part 5: Technical delivery conditions for bars, rods, wire, sections and bright products of corrosion resisting steels for construction purposes*

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

EN 13501-1:2007+A1:2009, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 13823:2010+A1:2014, *Reaction to fire tests for building products — Building products excluding floorings exposed to the thermal attack by a single burning item*

EN ISO 898-1, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread (ISO 898-1)*

EN ISO 898-2, *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes — Coarse thread and fine pitch thread (ISO 898-2)*

EN ISO 1514, *Paints and varnishes — Standard panels for testing (ISO 1514)*

EN ISO 1716, *Reaction to fire tests for products — Determination of the gross heat of combustion (calorific value) (ISO 1716)*

EN ISO 2409, *Paints and varnishes — Cross-cut test (ISO 2409)*

EN ISO 2808:2007, *Paints and varnishes — Determination of film thickness (ISO 2808:2007)*

EN ISO 2812-1, *Paints and varnishes — Determination of resistance to liquids — Part 1: Immersion in liquids other than water (ISO 2812-1)*

EN ISO 3506-1, *Mechanical properties of corrosion-resistant stainless steel fasteners — Part 1: Bolts, screws and studs (ISO 3506-1)*

EN ISO 3506-2, *Mechanical properties of corrosion-resistant stainless steel fasteners — Part 2: Nuts (ISO 3506-2)*

EN ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering (ISO 4628-2)*

EN ISO 4628-3, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 3: Assessment of degree of rusting (ISO 4628-3)*

EN ISO 6506-1:2014, *Metallic materials — Brinell hardness test — Part 1: Test method (ISO 6506-1:2014)*

EN ISO 6892-1:2016, *Metallic materials — Tensile testing — Part 1: Method of test at room temperature (ISO 6892-1:2016)*

EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227)*

EN ISO 11664-4, *Colorimetry — Part 4: CIE 1976 L*a*b* Colour space (ISO 11664-4)*

EN ISO 11925-2, *Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test (ISO 11925-2)*

ISO 185:2005, *Grey cast irons — Classification*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
discharge system for buildings
system of pipes, fittings, accessories and joints used to collect and drain waste water and rainwater from a building; it comprises discharge pipes, stack ventilation and rainwater pipes, installed within the limits of a building or attached to the building. This includes pipes between the building and the inspection chambers

Note 1 to entry: This applies to gravity or vacuum, inside and outside buildings, above and below ground.

3.2
drain
system of pipes, fittings, accessories and joints installed outside the limits of a building in order to connect the discharge system of this building to a sewer or a septic tank

3.3
sewer
system of pipes designed to collect waste water and rainwater from buildings and surface water and to convey them to the point of disposal or treatment

3.4
cast iron
alloy of iron and carbon in which graphite can be present in different forms

3.5
kit
kit is a construction product placed on the market by a single manufacturer as a set of at least two separate components that need to be put together to be incorporated in the construction work

Note 1 to entry: The wording Cast iron pipes systems is here in this standard equivalent to Cast Iron pipes kits.

3.6
pipe
pipe is a kit component casting of uniform bore, straight in axis, normally having plain ends but which can also be socketed

3.7
fitting
fitting is a kit component in cast iron which allows a deviation, a change of direction or diameter, including access elements and traps

3.8
coupling
coupling is a kit component. It is a Jointing element for pipes and/or fittings subjected to internal or external pressure

3.9
gasket
gasket is a kit component providing sealing function to joints

3.10
clamping
clamping is a kit component, a Securing element for pipes and/or fittings subjected to internal pressure, providing axial restraint to the end thrust arising from a change of direction, blank end etc., e.g. grip collars

3.11
grip collars
grip collar is a kit component providing a mechanical reinforcement to joints as it is mounted over the joints

3.12
joint
connection between the ends of pipes and/or fittings, including the coupling or clamping component, with sealing effected by elastomeric gasket(s). Joint is a kit as soon as it is an assembly of several kit components as coupling, clamping or gaskets

3.13
accessory
accessory is a kit component, any element used in a network, e.g. for maintenance or inspection reasons

3.14
nominal size (DN)
alphanumerical designation of size for components of a pipework system, to be used for reference purposes, which comprises the letters DN followed by a dimensionless which is indirectly related to the physical size, in millimetres, of the bore or outside diameter of the end connections

[SOURCE: EN ISO 6708:1995]

Note 1 to entry: In this standard, it is the bore.

3.15
length
effective length of a pipe or fitting

Note 1 to entry: For double spigot pipes and fittings, the effective length is equal to the overall length. For spigot and socket pipes and fittings, the effective length is equal to the overall length minus the spigot insertion depth as given by the manufacturer.

3.16
range of products
design system produced by one manufacturer for which the test results for one or more characteristics from any one product within the range are valid for all other products within this range

3.17
cast iron pipe systems under vacuum
siphonic system for draining rainwater and vacuum system for waste waters

3.18
design systems
collection of components from which a “kit” may be created for subsequent installation in the works

Note 1 to entry: A design system may, for example, be presented in a supplier’s catalogue, from which the purchaser may make a choice. A design system may give rise to one or many different “kits”, the system itself cannot be bought.

3.19
assembled system
kit after it has been installed in the works

Note 1 to entry: An "assembled system" may be made up only of the "kit" or it may comprise the "kit" assembled with one or more other products which may or may not themselves be construction products.

4 Cast Iron Pipe systems characteristics

4.1 Crushing strength (only for grey cast iron)

Pipes, fittings and accessories shall have the minimal crushing strength given in Table 7.

4.2 Impact resistance

This test aims to evaluate the impact resistance of cast iron pipes to guarantee its integrity during transport and handling.

After the test samples shall show neither visible cracks nor visible breaks, to be declared impact resistant.

Samples with a minimum wall thickness > 4.0mm are declared impact resistant without need to be tested.

A range of product including different DN is declared impact resistant from the moment each DN sample is declared impact resistant.

Test device, and load are described in 5.15.

4.3 Tightness: gas and liquid

4.3.1 Lengths of fittings and sealing zone

Lengths of fittings shall be given in the manufacturers' catalogues. When measured in accordance with 5.2.7 the lengths of fittings shall be within a tolerance of ± 5 mm.

The ends of the fittings shall have sealing zones straight in axis and free from marking and free from defects which could impair the fitness for use.

The length *T* (see Figure 1) of this sealing zone shall comply with the values given in Table 1.

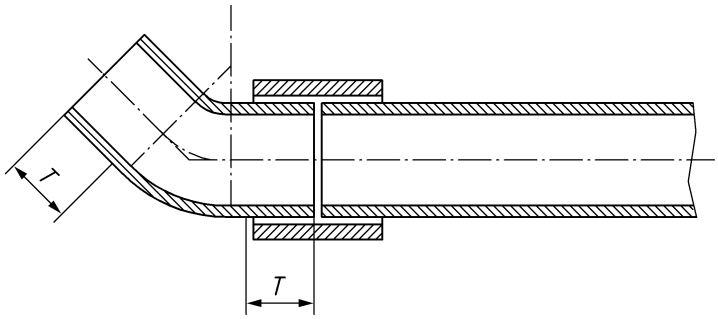

Figure 1 — Length of the sealing zone

4.3.2 Geometry of fittings and accessories

The geometry of fittings and accessories is not part of this standard. Fittings and accessories of geometry presently used in various countries are in conformity with this standard as long as they comply with all other technical requirements of this standard.

Table 1 — Sealing zone of fittings

DN	Length *T* of sealing zone **mm**	Lower deviation on *T*[a] **P mm**
40	30	- 5
50	30	
70	35	
75	35	
100	40	
125	45	
150	50	
200	60	- 4
250	70	
300	80	
400	80	
500	80	
600	80	

a Upper deviations are not given and sealing zones with a length greater than *T* are permitted.

4.3.3 Water Tightness

4.3.3.1 Water tightness of pipes and fittings

4.3.3.1.1 Water tightness of pipes

Pipes manufactured with cast iron in conformity with this standard (material, dimensions, etc.) shall withstand the pressure given in Table 2. This can be demonstrated by the following calculation.

$$P = \frac{20 \times e \times R_{\mathrm{m}}}{D \times S_{\mathrm{F}}}$$

where

e is the minimum pipe wall thickness, in millimetres;

D is the mean pipe diameter ($DE - e$), in millimetres;

DE is the nominal pipe external diameter (see Table 6), in millimetres;

R_m is the minimum tensile strength of cast iron, in Megapascals.

(420 MPa for spheroidal graphite cast iron and 200 MPa for grey cast iron; see 4.11.2);

S_F is a safety factor of 3.

For a DN 100 pipe in grey cast iron, the internal pressure strength is more than 35 bars.

4.3.3.1.2 Water tightness of fittings

4.3.3.1.2.1 Fittings without access or door

Fittings without access or door manufactured with cast iron in conformity with this standard (material, dimensions, etc.) shall withstand the pressure given in Table 2 and the demonstration used for pipes can work for these fittings.

4.3.3.1.2.2 Fittings with access or door

When tested in accordance with 5.8, fittings with access or door shall exhibit no visible leakage from the access or door when subjected to the internal hydrostatic test pressure given in Table 2.

Table 2 — Water tightness of fittings with access or door - performance requirements

Internal test pressure in bar	
DN ≤ DN 200	DN > DN 200
0 to 5[a]	0 to 3[a]
[a] 0 to 0,5 bar water pressure for fittings which will only carry limited pressures because of their intended use and installation.	

4.3.3.2 Water tightness of joints

4.3.3.2.1 General

When tested in accordance with 5.9.4 and 5.9.5, on test apparatus preventing any excessive axial displacement and subjected to the test conditions and hydrostatic pressures given in Table 4, the joints shall exhibit no visible leakage.

Table 3 specifies the hydrostatic test pressures for the following test conditions:

a) joint with pipes aligned;

b) joint with pipes deflected to an angle of at least:

- 3° for nominal sizes up to and including DN 200;
- 1°45’ for nominal sizes greater than DN 200;

c) joint subject to a shear force of at least 10 DN in newtons, with pipes aligned.

Table 3 — Water tightness of joints - performance requirements

Test condition	Hydrostatic test pressure in bar			
	DN ≤ DN 200		DN > DN 200	
	internal	external	internal	external
a) aligned	0 to 5 [a]	0 to 0,5 [b c]	0 to 3 [a]	0 to 0,5 [b c]
b) deflected	0 to 5 [a]	--	0 to 3 [a]	--
c) subject to shear force	0 to 1 [a b]	--	0 to 1 [a b]	--

[a] 0 to 0,5 bar water pressure for joints which will only carry limited pressures because of their intended use and installation; 0 to 0,1 bar water pressure for joints connecting to sanitary ware, e.g. WC, washbasin and non-pressurized gravity flow.

[b] Applicable to socketed joints only when they are to be buried.

[c] Does not apply to nominal sizes less than DN 100 and does not apply to joints connecting to sanitary ware, e.g. WC, washbasin.

4.3.3.2.2 Water tightness for buried systems

For joints which are used exclusively for buried kits, the internal hydrostatic test pressure specified in Table 3 lines a) and b) may be limited to 1 bar. This may limit to 1 bar also the test pressure specified in Table 4 for buried grip collars.

4.3.3.2.3 Water Tightness for rainwater systems installed outside buildings

Joints shall be watertight at least to non-pressurised gravity flow. See note a) in Table 3.

4.3.3.3 Resistance to end thrust with grip collars

When tested in accordance with 5.10.3, on test apparatus preventing any excessive axial displacement and subjected to the test conditions:

— joint with pipes aligned;

— internal hydrostatic pressures given in Table 4;

the grip collars shall limit the axial movement of pipes. During each stage in pressure, there shall be no axial movement of the pipes.

Table 4 — Resistance to end thrust of grip collars - performance requirements

Test condition	Internal test pressure in bar	
	DN ≤ DN 200	DN > DN 200
aligned	0 to 5	0 to 3

4.3.4 Air Tightness

In order to ensure a seal against odours, all joints shall be tight against positive internal air pressure of 0 mbar to 10 mbar when tested in accordance with 5.9.6.

4.4 Vacuum Tightness (only for under vacuum evacuation of water from works)

4.4.1 Pipes resistance to vacuum

Pipes manufactured with cast iron in conformity with this standard (material, dimensions, etc.) shall withstand the pressure given in Table 5; see 4.3.3.1.1.

4.4.2 Fittings – resistance to vacuum

4.4.2.1 Fittings without access or door

Fittings without access or door manufactured with cast iron in conformity with this standard (material, dimensions, etc.) shall withstand the pressure given in Table 3. The demonstration used for pipes can work for these fittings.

4.4.2.2 Fittings with access or door

When tested in accordance with 5.8, fittings with access or door shall withstand a negative pressure. An initial negative pressure of -0,8 bar is generated and after a waiting time of 1 h, the final pressure shall not reach the limiting values given in Table 5.

4.4.3 Joints – resistance to vacuum

In addition to the technical requirements of 4.3.3.2, 4.3.4 and 4.13 and when tested in accordance with 5.13, the joints shall withstand a negative pressure. An initial negative pressure of -0,8 bar is generated and after a waiting time of 1 h, the final pressure shall not reach the limiting values given in Table 5.

Table 5 — Resistance to vacuum - performance requirements

Test condition	Test pressure in bar	
	DN ≤ DN 200	DN > DN 200
aligned	-0,7	-0,4

4.5 Maximum load for admissible deformation (only for kits below ground)

The load bearing capacity expressed by the load per unit length uniformly distributed on the top of the pipe are evaluated by means of the formula below:

$$f \geq \frac{\pi.\sigma.e_{\min}^2}{3\left(DE_{\max} - e_{\min}\right)}$$

where

f is the ultimate load per unit length on the top of the pipe, in newtons per millimetre;

$e\mathrm{B}_{\min}$ is the minimum wall thickness of the pipe, in millimetres;

$DE\mathrm{B}_{\mathrm{max}}$ is the maximum external diameter, in millimetres;

σ is the ring crush strength in accordance with Table 7, in megapascals.

4.6 Release of dangerous substances (regulated substances)

For dangerous substances, there may be requirements applicable to the products falling within the scope of this standard (e.g. transposed European legislation and national laws, regulations and administrative