SLOVENSKI STANDARD

SIST EN 1916:2003

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Betonske cevi in fazonski kosi, nearmirani, z jeklenimi vlakni in armirani

Concrete pipes and fittings, unreinforced, steel fibre and reinforced

Rohre und Formstücke aus Beton, Stahlfaserbeton und Stahlbeton

Tuyaux et pieces complémentaires en béton non armé, béton fibré acier et béton armé

Ta slovenski standard je istoveten z: EN 1916:2002

ICS:

23.040.50

93.030

SIST EN 1916:2003 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1916

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ICS 23.040.50; 93.030

English version

Concrete pipes and fittings, unreinforced, steel fibre and reinforced

Tuyaux et pièces complémentaires en béton non armé, béton fibré acier et béton armé

Rohre und Formstücke aus Beton, Stahlfaserbeton und Stahlbeton

This European Standard was approved by CEN on 18 August 2002.

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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 Management Centre has the same status as the official versions.

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

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Contents

Foreword

This document EN 1916:2002 has been prepared by Technical Committee CEN/TC 165 "Wastewater engineering", the secretariat of which is held by DIN.

It is a companion standard to EN 1917 “Concrete manholes and inspection chambers, unreinforced, steel fibre and reinforced”.

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of an identical text or by endorsement, at the latest by April 2003, and conflicting national standards shall be withdrawn at the latest by October 2004.

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.

This European Standard includes eleven normative annexes and one informative annex. Annexes A, B, C, D, E, F, G, H, I, J and K are normative, annex ZA is informative.

When the text of this European Standard was approved, complete agreement could not be achieved for all requirements in the existing national specifications of CEN members and so it includes only those requirements and associated test methods for which a consensus could be reached. Consensus was achieved on the requirements for quality control.

NOTE For the time being, for specification purposes, complementary (i.e. non-conflicting) requirements and associated test methods outside the scope of this European Standard (see Table 1) will be needed at national level. In order not to create any barrier to trade, any call for conformity to complementary requirements should always be qualified by incorporating the words 'or equivalent' after the reference to them.

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, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies performance requirements as defined in Table 1 and describes test methods for precast concrete pipes and fittings, unreinforced, steel fibre and reinforced, with flexible joints (with seals either integrated in the units or supplied separately) and nominal sizes not exceeding DN 1 750 for units with a circular bore or WN/HN 1 200/1 800 for units with an egg-shaped bore, for which the main intended use is the conveyance of sewage, rainwater and surface water under gravity or occasionally at low head of pressure, in pipelines that are generally buried.

Provision is made for the evaluation of conformity of units to this European Standard.

Marking conditions are included.

Table 1 — Specified characteristics and exclusions

Characteristic	Exclusions
Materials	Specifications where relevant European Standards have not yet been published.
Concrete	Types and value(s) of minimum content of cement plus any pozzolanic or latent hydraulic addition, according to serviceability conditions.
Finish	Limitations on size of blemishes.
Geometrical characteristics	— nominal sizes; — internal dimensions with tolerances; — tolerances on the wall thickness; — tolerances on the internal barrel length; — deviation from straightness and from squareness of ends.
Joints and joint seals	— the choice of method from those listed in 4.3.4.2 for demonstrating the durability of joints; — provisions for interchangeability; — requirements for additional testing where watertightness of the joint assembly is dependent upon an internal pressure.
Crushing strength	Specific strength classes and corresponding minimum crushing loads.
Longitudinal bending moment resistance	None.
Watertightness	None.
Special requirements for steel fibre concrete pipes, reinforced concrete pipes, jacking pipes and pipes with inlet	— strength class exceeding class 165 for steel fibre and reinforced concrete units; — value(s) of minimum concrete cover for reinforced concrete units; — limitations on the spacing of reinforcement; — relationship between internal and external reinforcement cages; — requirements for weld testing of reinforcement cages; — tolerances on the external diameter of jacking pipes; — jacking pipe collars of materials other than weldable structural steel plate, stainless steel plate or reinforced plastics.
Marking	— symbols or letters for identifying the material of a unit; — symbols or letters for identifying serviceability conditions other than normal conditions as stated in 4.3.8.
NOTE Provisions for the following are also outside the scope of this European Standard: - units with nominal sizes greater than DN 1 750 or WN/HN 1 200/1 800; - units with a bore other than circular or egg-shaped; - lifting facilities; - resistance to high pressure jetting; - circumstances other than those stated; - any receiving inspection by, or on behalf of, the purchaser.	

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 (including amendments).

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

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

EN ISO 4287, *Geometrical product specification (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287:1997).*

EN ISO 4288, *Geometrical product specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture (ISO 4288:1996).*

ISO 3384, *Rubber, vulcanized or thermoplastic - Determination of stress relaxation in compression at ambient and at elevated temperatures.*

ISO 4012, *Concrete - Determination of compressive strength of test specimens.*

ISO 10544, *Cold reduced steel wire for the reinforcement of concrete and the manufacture of welded fabric.*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1
pipe
hollow precast concrete unit of uniform bore throughout its internal barrel length, except in the vicinity of the joint profile, manufactured with or without base. Joints of units are preformed as spigot and socket and incorporate one or more joint seals

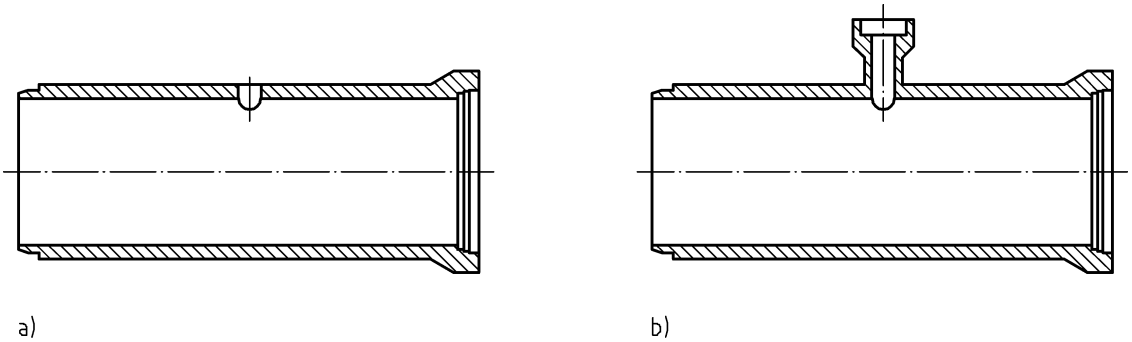
3.1.2
unreinforced concrete pipe
pipe that does not contain structural steel reinforcement or steel fibre strengthening

3.1.3
steel fibre concrete pipe
pipe that is structurally strengthened by steel fibres

3.1.4
reinforced concrete pipe
pipe that is structurally reinforced with one or more steel cages, suitably positioned to resist tensile stresses in the pipe wall

3.1.5
jacking pipe
unreinforced, steel fibre or reinforced concrete pipe, incorporating a flexible joint within the wall thickness, rebated or butt-ended with collar and which is intended for jacking

3.1.6
pipe with inlet
pipe as shown typically in Figure 1a, with one or more inlet-holes provided during or after manufacture



Key

a) Typical pipe with inlet

b) Typical junction with right-angled inlet

c) Typical junction with angled inlet

NOTE Types of joint other than those shown are available.

Figure 1 — Junctions and pipes with inlet

3.1.7
circular pipe
pipe whose barrel cross-section in a plane perpendicular to its longitudinal axis is described by two concentric circles

3.1.8
fitting
adaptor, bend, connecting pipe, junction or taper (reducer)

3.1.9
adaptor
fitting that provides for connections to structures, to pipes of other materials, or to valves

3.1.10
bend
fitting that provides for a change of alignment within a pipeline

3.1.11
connecting pipe
short pipe with plain, spigot or socket ends

3.1.12
junction
unit as shown typically in Figures 1b and 1c

3.1.13
taper (reducer)
fitting whose bore is reduced along its internal barrel length

3.1.14
unit
pipe or fitting

3.1.15
type
units of the same manufacturing process, cross-section and material (unreinforced, steel fibre or reinforced concrete)

3.1.16
nominal size
numerical designation of the size of a unit, which is a convenient integer approximately equal to the manufacturing dimension(s) in millimetres; for a circular unit it is the internal diameter (DN), for a unit with an egg-shaped bore it is the internal width/height (WN/HN)

3.1.17
internal barrel length
length between the base of the socket and the end of the spigot of a unit as shown in Figure 2

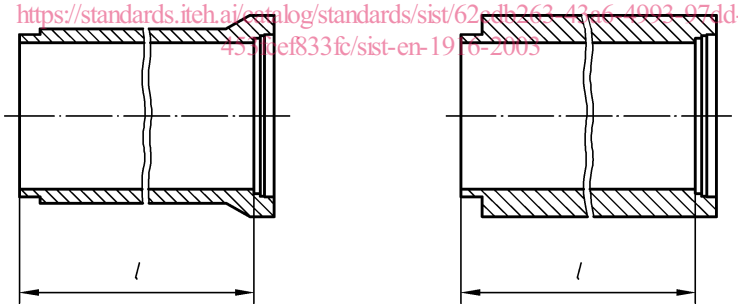


Figure 2 — Internal barrel length

3.1.18
integrated seal
seal incorporated into a unit during manufacture

3.1.19
strength class
minimum crushing load in kilonewtons per metre, divided by one thousandth of either a unit's nominal size (DN) or nominal width (WN)

3.1.20
minimum crushing load
load that a unit is required to withstand

3.1.21
ultimate (collapse) load
maximum load reached by the testing machine during a crushing test (i.e. when the load-recording facility does not show any further increase)

3.1.22
proof load
load that a steel fibre or reinforced concrete unit is required to withstand with a defined limit on cracking

3.1.23
concrete cover
actual thickness of concrete over any reinforcement

3.1.24
characteristic value
that value of a characteristic beyond which, with a 75 % confidence level, 5 % of the population of all possible measurements of the specified material may fall

NOTE A 75 % confidence level is recommended in ISO 12491.

3.1.25
inspection
process of measuring, examining, testing, gauging or otherwise comparing a unit with the applicable requirements

3.1.26
routine inspection
inspection by sampling at prescribed intervals in order to determine the acceptability of the items represented by the samples

3.1.27
continuous inspection
routine inspection according to a sampling plan which indicates the number of units from a specific process evaluated to have attained, and continue to be in, a state of control, and the associated acceptance criteria

3.1.28
sample
one or more units selected at random without regard to their quality

3.1.29
group
clearly identifiable collection of units, manufactured using the same process; units of different nominal sizes may be grouped together, provided that the ratio of largest to smallest nominal size is not greater than 2

3.1.30
specific process
manufacture of units of the same nominal size, strength class and type, essentially under the same conditions over any period of time

3.1.31
state of statistical control
state in which the variations among the observed sampling results can be attributed to a system of chance causes that does not appear to change with time

3.1.32
switching rules
rules that govern the decision to increase or decrease the severity of inspection

3.2 Symbols

Table 2 gives the meanings, units and references of symbols used in this European Standard.

Table 2 — Symbols

Symbol	Meaning	Unit	Reference
A_c	area of joint surface in compression	square metres	B.2, B.3.1, B.3.2, B.3.3, B.4.2
A_w	absorption of water by immersion	per cent	F.5
a_l	lever arm length	metres	D.3.2, D.4.1
a_s	distance between additional shear load and centre of joint seal	metres	E.5.3
b_t	effective tightened width	millimetres	4.3.4, A.1, A.2.5, A.2.6, A.2.7, A.3.2, A.3.3
C	constant equal to 0,013	kilonewtons per metre	4.3.6
d_e	external diameter of joint surface	metres	B.2, B.3.1, B.3.3, B.4.1, B.4.2
d'_e	diameter at front of rebated spigot	metres	B.3.1
d_i	internal diameter of joint surface	metres	B.2, B.3.1, B.3.3, B.4.1, B.4.2
d'_i	diameter of base of rebated spigot	metres	B.3.1
d_{so}	nominal internal diameter of socket	millimetres	4.3.4, A.1, A.2.5, A.2.7, A.3.2, A.3.3
d_{sos}	nominal internal diameter of socket at shear stop provision	millimetres	A.1, A.3.2, A.3.3
d_{sp}	nominal external diameter of spigot	millimetres	4.3.4, A.1, A.2.5, A.2.7, A.3.2, A.3.3
d_{sps}	nominal external diameter of spigot at shear stop provision	millimetres	A.1, A.3.2, A.3.3
E	modulus of elasticity	megapascals	A.1, A.3.2, A.3.3
e	load reduction (eccentricity) factor	-	B.2, B.3.3, B.4.2
F	measured tightening force	newtons	A.1, A.2.5, A.2.6, A.2.7
F'	jacking load applied on site	meganewtons	B.2, B.4.2
F_a	effective crushing test result	kilonewtons per metre	C.5, I.3.2, I.4.1
F_c	proof load	kilonewtons per metre	5.2.3, C.1, C.4.4, I.3.2, I.3.4, I.4.1
F_{cj}	maximum jacking load in closed joint situation	meganewtons	B.2, B.3.1, B.3.2, B.3.3, B.4.2
F_d	distributed unit force assumed to result from application of a specific shear load	newtons per millimetre	A.1, A.2.5, A.2.7
F_e	tightening force per unit length	newtons per millimetre	A.1, A.3.2, A.3.3
F_j	design jacking load	meganewtons	5.3.4, B.2, B.3.1, B.3.2, B.4.1, B.4.2
$F_{j\,max}$	maximum theoretical design jacking load	meganewtons	B.2, B.3.1, B.3.2, B.4.1, B.4.2
F_{oj}	maximum jacking load in open joint situation	meganewtons	B.2, B.3.1, B.3.3, B.4.2

Table 2 *(continued)*

Symbol	Meaning	Unit	Reference
F_n	minimum crushing load	kilonewtons per metre	4.3.5, 5.1.2, 5.2.3, C.1, C.4.4, I.1.1, I.3.2, I.4.1, I.4.2, K
F_s	shear load	kilonewtons	4.3.4, A.1, A.2.5, A.2.7, E.5.3, E.5.4
F_u	ultimate (collapse) load	kilonewtons per metre	5.1.2, C.1, C.4, I.1.1, I.3.2, I.3.4, I.4.1, I.4.2, K
f	mean pressure on test piece	megapascals	4.3.4, A.1, A.2.6, A.2.7, A.3.2, A.3.3
f_{bt}	bending tensile stress in concrete	megapascals	K
f_{ch}	characteristic bending tensile stress in concrete	megapascals	K
f_{ck}	characteristic concrete compressive strength	megapascals	5.3.2, B.2, B.3.1, B.3.2, B.3.3, B.4.1, B.4.2
f_{des}	design bending tensile stress in concrete	megapascals	K
G	test per group	-	H
h_j	nominal height of joint seal	millimetres	4.3.4, A.1, A.2.5, A.2.7, A.3.3
h_m	height of applied joint seal	millimetres	A.1, A.2.5, A.2.7, A.3.2, A.3.3
J	test per 500 produced per group, with a minimum of one per month	-	H
K	composite tolerance factor	-	A.1, A.3.2, A.3.3
k	acceptability constant	-	I.4.1, I.4.2, K
k_b	conversion factor for crushing test	-	C.5
l	internal barrel length	metres	3.1, 4.3.6, C.4.1, C.5
l_b	distance between bottom bearing strip centres	metres	D.3.3, D.4.2
l_l	distance between centres of adjacent joint seals	metres	E.5.3
l_s	support span	metres	D.3.2, D.4.1
l_t	length of test piece	millimetres	A.1, A.2.6, A.2.7
l_1	length of joint seal before application	millimetres	A.1, A.2.5, A.2.7, A.3.3
l_2	length of joint seal after application	millimetres	A.1, A.2.5, A.2.7, A.3.3
M	moment (BMR value)	kilonewtons metre	4.3.6, D.4.1, D.4.2
m_1	constant mass of immersed sample	kilograms	F.4.1, F.5
m_2	constant mass of dry sample	kilograms	F.4.2, F.5
N	test per type and nominal size	-	H
n	number of consecutive samples	-	I.4.1, I.4.2, K