SLOVENSKI STANDARD
SIST EN 588-1:1996

01-december-1996

Vlaknatocementne cevi za odvod odpadne vode in kanalizacijo - 1. del: Cevi, spoji in fazonski kosi za težnostne sisteme

Fibre-cement pipes for sewers and drains - Part 1: Pipes, joints and fittings for gravity systems

Faserzementrohre für Abwasserleitungen und Abwasserkanäle - Teil 1: Rohre, Rohrverbindungen und Formstücke für Freispiegelleitungen

Tuyaux en fibres-ciment pour réseaux d'assainissement et branchements - Partie 1: Tuyaux, joints et accessoires a écoulement libre

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ICS:

23.040.50	Cevi in fitingi iz drugih materialov	Pipes and fittings of other materials
91.100.40	Cementni izdelki, ojačani z vlakni	Products in fibre-reinforced cement
93.030	Zunanji sistemi za odpadno vodo	External sewage systems

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EUROPEAN STANDARD

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EN 588-1

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ICS 23.040.30; 23.040.50

Descriptors: sanitation, sewage, gravity flow, piping:tubes, pipe joints, accessories, asbestos cement products, designation, classifications, geometric characteristics, mechanical properties, physical properties, tests, corrosion resistance, acceptability, marking

English version

Fibre-cement pipes for sewers and drains - Part 1: Pipes, joints and fittings for gravity systems

Tuyaux en fibres-ciment pour réseaux d'assainissement et branchements - Partie 1: Tuyaux, joints et accessoires à écoulement libre

Faserzementrohre für Abwasserleitungen und Abwasserkanäle - Teil 1: Rohre, Rohrverbindungen und Formstücke für Freispiegelleitungen

This European Standard was approved by CEN on 1996-06-17. 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.

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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

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 165 "Waste water engineering", the secretariat of which is held by DIN .

A distinction has been made between product appraisal (type tests) and routine quality control requirements (acceptance tests).

Attention is drawn to the need for observance of EU and/or EFTA Directives transposed into national legal requirements restricting the use of certain materials and to the related marking and labelling requirements.

The performance of a sewage network constructed with these products depends not only on the properties of the product as required by this standard but also on the design and construction of the network as a whole in relation to the environment and conditions of use.

This standard will be up-dated with the standard EN 476 "General requirements for components used in discharge pipes, drains and sewers for gravity systems" established by TC 165 WG 1 and the other functional standards as soon as these are available.

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 February 1997, and conflicting national standards shall be withdrawn at the latest by February 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This part 1 of EN 588 specifies requirements for fibre-cement pipes, joints and fittings suitable for gravity systems at atmospheric pressure intended for sewerage and drainage applications. It is applicable only to the more commonly used fittings i.e. angled branches or tees and bends.

It defines general composition, classification, geometrical, mechanical and physical characteristics, acceptance tests, type tests and quality control.

For pressurized sewers, fibre-cement pipes and joints in accordance with EN 512 will be used with additional consideration relevant to sewerage transport.

NOTE 1: EN 588-2 specifies requirements for fibre-cement manholes and inspection chambers.

NOTE 2: Occasional momentary overpressures of no more than 100 kPa are acceptable.

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. Dated references, subsequent amendments to or revisions of any of these publications will apply to this European Standard only when incorporated in it by amendment or revision. For undated reference the latest edition of the publication referred to applies.

ENV 197-1 : 1992	Cement - Composition, specifications and conformity criteria - Part 1: Common cements
EN 512	Fibre-cement products - Pressure pipes and joints
prEN 681-1	Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications - Part 1: Vulcanized rubber
EN ISO 9001	Quality systems - Model for quality assurance in design/ development, production, installation and servicing (ISO 9001 : 1994)
EN ISO 9002	Quality systems - Model for quality assurance in production, installation and servicing (ISO 9002 : 1994)
ISO 390 : 1993	Products in fibre reinforced cement - Sampling and inspection

ISO 2859-1 : 1989 Sampling procedures for inspection by attributes - Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection

ISO 3951 Sampling procedures and charts for inspection by variables for percent nonconforming.

3 Definitions

For the purposes of this standard the following definitions apply:

3.1 nominal diameter (DN)

Numerical denomination of size of a component, which is a convenient round number approximately equal to the manufacturing dimension in millimetres of the internal diameter.

3.2 acceptance test

Test to establish whether a batch of products conforms to a specification of the standard. The tests are performed on samples drawn either from continuous production or from a consignment [ISO 390 : 1993].

NOTE: Tests methods, specifications and limit values are specified in this standard. Sampling levels and acceptance criteria are specified in ISO 390.

3.3 type test

Test for approval of a new product and/or a fundamental change in formulation or method of manufacture, or both. The test is performed on the as delivered product.

The type test is not to be taken as evidence of the conformity to specification of products subsequently produced in quantity [ISO 390 : 1993].

3.4 acceptable quality level (AQL)

When a continuous series of batches is considered, the quality level which for the purposes of sampling inspection is the limit of a satisfactory process average [ISO 2859-1 : 1989].

NOTE: A sampling scheme with an AQL of 4% means that batches containing up to 4% defective items have a high probability of acceptance.

3.5 pipe barrel

Cylindrical part of the pipe with a uniform cross section excluding socket and spigot.

4 Pipes

4.1 General composition

Fibre-cement pipes shall consist essentially of cement or a calcium silicate formed by chemical reaction of a siliceous and a calcareous material, reinforced by fibres. The cement shall comply with relevant national standards of CEN members and/or ENV 197-1.

NOTE: Other components which are compatible with the composite and have no negative influence on the performance in use of the product, can be added.

Two types of fibre-reinforced cement products (pipes, joints and fittings) are included in this standard:

Type AT (Asbestos Technology) for products the formulation of which contains chrysotile asbestos.

Type NT (Non-asbestos Technology) for products the formulation of which does not contain asbestos.

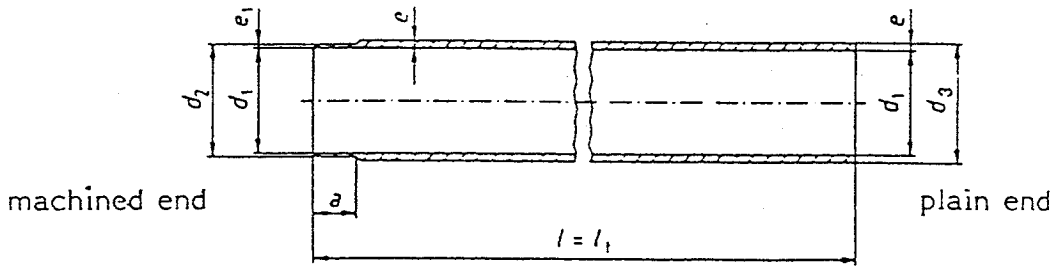
For products of type AT and NT all the requirements of this standard shall be fulfilled.

4.2 Classification

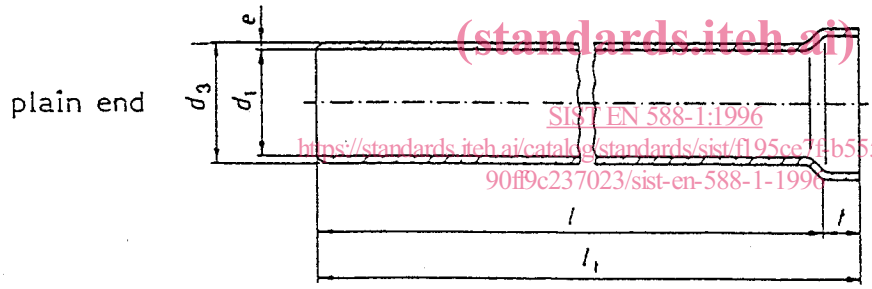
The pipes shall be classified in accordance with their minimum crushing strength in three classes based on load per unit internal area: 60 kN/m^2, 90 kN/m^2, 120 kN/m^2. The load per unit area is the breaking load in kilonewtons per metre length of pipe divided by the nominal diameter of the pipe in metres (1/1000 of the nominal diameter values).

4.3 Pipe ends

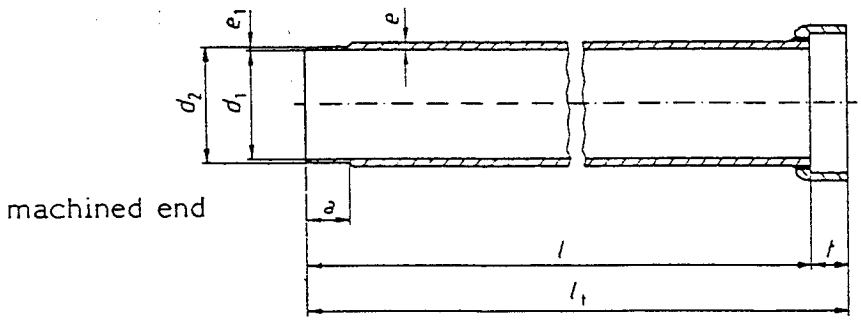
Pipes shall either have plain ends or with one end plain and the other end with a fixed socket. Plain ends may be machined or unmachined (see figure 1).



1a: Pipe with plain end



1b: Pipe with formed socket



1c: Pipe with adhesive jointed socket

a	length of machined end
d_1	internal diameter
d_2	external diameter of the machined end
d_3	external diameter of the barrel
e	thickness of the barrel
e_1	nominal thickness of the machined end

Figure 1: Pipe ends

4.4 General appearance and finish

The pipes shall be straight, uniform and regular. The shape of the finished end shall be fixed by the manufacturer to suit the type of joint used.

The end faces shall be free from breakout and machining burrs. The parts of the pipe where the rubber jointing rings are located shall be free from irregularities which could affect the watertightness of the joint.

NOTE: If necessary, the pipes can be impregnated and/or coated internally and/or externally to meet special working conditions as agreed between manufacturer and customer. The coating and finish should comply with the relevant national standards (transposing the European Standard), if existing.

4.5 Smoothness of bore

The internal surface of the pipe shall be regular and smooth. Slight scratches, indentations or small protrusions that do not affect the intended use or efficiency shall be acceptable.

4.6 Geometrical characteristics

4.6.1 Nominal diameter (DN)

Nominal diameters shall be as given in table 1. Nominal diameters without brackets are preferred.

Table 1: Nominal diameters (DN)

100	(1100)
125	1200
150	(1300)
200	1400
250	(1500)
300	1600
(350)	(1700)
400	1800
(450)	(1900)
500	2000
600	(2100)
(700)	2200
800	(2300)
(900)	(2400)
1000	2500

4.6.2 Internal diameter

When measured in accordance with 4.10.2.1 the internal diameter d_1 (see figure 1), expressed in millimetres, of the pipe shall be equal to the nominal diameter, limit deviations excluded.

4.6.3 Thickness of wall

When measured in accordance with 4.10.2.3 the nominal thickness of the wall of the pipe shall be the thickness of the barrel *e*, expressed in millimetres, (see figure 1) of the pipe, excluding the machined end.

This nominal thickness shall be stated by the manufacturer in his literature.

If the extremity of the pipe is machined, the nominal thickness e_1 of the machined end shall be at least 3,3% of the nominal diameter but not less than 6 mm.

4.6.4 External diameter

When measured in accordance with 4.10.2.2 the external diameter d_2 (see figure 1) of the pipe at the finished end where the rubber ring is located, expressed in millimetres, shall be stated by the manufacturer in his literature.

4.6.5 Length of pipes

When measured in accordance with 4.10.2.4 the nominal length *l* (see figure 1) of the pipe shall be the length measured between the extremities for pipes with plain ends and the total length l_t less the depth of the socket *t* for socketed pipes.

The nominal length shall be stated by the manufacturer in its literature in accordance with table 2.

Table 2: Nominal length of pipes

DN	Nominal length in m
100 to 2 500	2,0 2,5 3,0 4,0 5,0 6,0

Other pipe lengths than those stated in table 2 can be agreed on between purchaser and manufacturer by dividing the nominal length of table 2 by round numbers ($1/2$, $1/3$, $1/4$ length pipes).

In special cases. specified length can be agreed on between purchaser and manufacturer.

At least 90% of the pipes supplied shall be of the nominal length agreed upon (subject to limit deviation given in 4.6.7.4). The remainder can be shorter by no more than 1 m. However, the total length of the pipes supplied shall not be less than the length ordered.

4.6.6 Length of machined end

The length of the machined end *a* (see figure 1) shall not exceed the length of the coupling (or socket in case of socketed pipes) +10 mm.

NOTE: Longer machined end pipes can be supplied. In this case the manufacturer will indicate the minimum breaking load.

4.6.7 Limit deviations

4.6.7.1 Internal diameter

The limit deviation on the internal diameter shall be as given in table 3.

Table 3: Limit deviation on internal diameter

DN	Limit deviation mm
≤ 1 200 > 1 200	± (2,5 mm + 0,01 *d*) ± 15 mm
d being the nominal diameter, expressed in millimetres	

4.6.7.2 Thickness

The lower deviation on the thickness of the barrel and machined ends shall be as given in table 4.

Table 4: Lower deviation on barrel thickness

Thickness	Lower deviation
Up to 10 mm	- 1,5 mm
Over 10 mm up to 20 mm	- 2,0 mm
Over 20 mm up to 30 mm	- 2,5 mm
Over 30 mm up to 60 mm	- 3,0 mm
Over 60 mm up to 90 mm	- 3,5 mm
Over 90 mm	- 4,0 mm

The upper deviations on the pipe end thickness shall be such as the maximum thickness is as follows:

Table 5: Upper deviation on the pipe end thickness

DN	Upper deviation mm
≤ 300	$e_{max} = e_{min} + 6$
300 < DN ≤ 1000	$e_{max} = e_{min} + 0{,}02 \times DN$
> 1000	$e_{max} = e_{min} + 20$

where:

e_{max} is the maximum thickness at the end of the pipe (machined end or barrel) in millimetres;

e_{min} is the minimum thickness at the end of the pipe (machined end or barrel) equal to the nominal thickness stated by the manufacturer less the lower deviation of table 4, in millimetres.

4.6.7.3 External diameter at finished end covered by the coupling

The limit deviations on the external diameter d_2 of the pipe ends where jointing rings are located (plain ends), shall be established by the manufacturer in accordance with the type of joint used and taking into account the limit deviations acceptable in respect of the design of the joint and of the performance defined in 5.2 (see figure 1).

4.6.7.4 Length *l* (figure 1)

The limit deviation on the measurement shall be + 5 mm
- 20 mm

NOTE: Larger limit deviations can be agreed between customer and manufacturer.

4.6.7.5 Straightness

The maximum deviation *f* on straightness in accordance with the test method of 4.10.2.6 shall not exceed the following values given in table 6.

Table 6: Limit deviation on straightness

DN	Maximum deviation *f* mm
100 to 150	3,0 l_t
200 to 1 000	2,5 l_t
1 100 to 2 500	1,5 l_t
l_t is the length of the pipe in metres (see figure 1)	

4.6.8 Interchangeability

Interconnection between pipes of the same nominal diameter and class of different pipe end dimensions can be achieved by special couplings or special machining of the pipe ends.

4.7 Mechanical characteristics

4.7.1 Crushing strength

When tested in accordance with 4.10.3.1 the minimum breaking loads for pipes of nominal diameter up to DN 1 000 shall be as given in table 7.

Table 7: Minimum breaking load in kilonewtons per metre (kN/m)

DN	Class 60	Class 90	Class 120
100			20*)
125			21*)
150			22*)
200	15*	18	24
250	15	22,5	30
300	18	27	36
350	21	31,5	42
400	24	36	48
450	27	40,5	54
500	30	45	60
600	36	54	72
700	42	63	84
800	48	72	96
900	54	81	108
1 000	60	90	120

*) Minimum breaking loads exceed the calculated minimum requirement to satisfy other design criteria.

For DN > 1 000 the minimum breaking loads in kilonewtons per metre are given by multiplying the class in kilonewtons per square metre by 1/1000 the nominal diameter (diameter in metres).

e.g. when DN = 1 500 and pipe class is 90 kN/m^2 the minimum breaking load shall be:

$$\frac{90\ \text{kN} \times 1{,}5\ \text{m}}{\text{m} \times \text{m}} = 135\ \frac{\text{kN}}{\text{m}}$$

4.7.2 Bending loads

Breaking bending loads in accordance with 4.10.3.2 shall be as given in table 8.