SLOVENSKI STANDARD
SIST EN 295-1:1996

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Keramične cevi, fazonski kosi in spoji za odvod odpadne vode in kanalizacijo - 1. del: Zahteve

Vitrified clay pipes and fittings and pipe joints for drains and sewers - Part 1: Requirements

Steinzeugrohre und Formstücke sowie Rohrverbindungen für Abwasserleitungen und -kanäle - Teil 1: Anforderungen

Tuyaux et accessoires en gres et assemblages de tuyaux pour les réseaux de branchement et d'assainissement - Partie 1: Exigences

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93.030	Zunanji sistemi za odpadno vodo	External sewage systems

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English version

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This European Standard was approved by CEN on 1991-10-02
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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.

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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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Contents

Foreword

This part of the European Standard for vitrified clay pipes is the first of three parts which was drafted by WG2 "Vitrified clay pipes" of the technical Committee CEN/TC 165 "Waste water engineering" secretariat of which is held by DIN.

"Vitrified clay pipes and fittings and pipe joints for drains and sewers Part 2: Quality control and sampling" contains the complete quality control. "Vitrified clay pipes and fittings and pipe joints for drains and sewers Part 3: Test methods" contains the necessary statements on the testing methods. Other parts may be added later.

On drafting this standard the provisional results already available of CEN/TC 165/WG1 "General requirements on pipes, fittings, pipe joints including sealings and manholes" or other relevant working group of TC165 with general responsibilities were taken into account. When further results are received, any necessary amendments will be made.

In accordance with the Common CEN/CENELEC Rules, 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 United Kingdom.

Vitrified clay pipes in permanent or in temporary contact with water intended for human consumption will not affect the quality of that water. Therefore this standard does not contravene the EC-Council Directives 75/440, 79/869, 80/778.

This standard takes into account the essential requirements of the EC-Council Directive for construction products (89/106) and the Draft Directive on the treatment of municipal waste water (COM (89) 518).

1. General

1.1 Object and field of application

This part of this European Standard specifies requirements for flexibly jointed vitrified clay pipes and fittings with or without sockets for the construction of drainage and sewerage systems. Although normally operated under gravity, the pipes and fittings covered by this Standard will accept periodic hydraulic surcharge.

If pipes are required to withstand continuous working under low pressure, the pressure used in tests in this standard shall be agreed between the manufacturer and the purchaser with a maximum test pressure of 600 kPa (6,0 bar).

The preferred dimensions for pipe lengths, curvature of bends and angles of junction arms are specified in this standard. Other values for these dimensions are acceptable providing the products meet all the relevant performance requirements and are marked correctly.

Fittings groups covered by this part of this standard are given in Table 2 of EN 295-2.

Where this standard provides for different strength classes, different systems of jointing dimensions, different lengths and different fittings, the specifiers/ purchasers may select according to their requirements.

1.2 References

EN 295-2	1991	Vitrified clay pipes and fittings and pipe joints for drains and sewers : Part 2 : Quality control and sampling.
EN 295-3	1991	Vitrified clay pipes and fittings and pipe joints for drains and sewers : Part 3 : Test methods.
EN 29002	1987	Quality Systems - Model for quality assurance in production and installation.
ISO/DIS 4633	1986	Rubber seals - Joint rings for water supply, drainage and sewerage pipelines - Specification for materials

1.3 Definitions

For the purposes of this European Standard the following definitions apply :

1.3.1 Nominal Size (DN). A numerical designation of size which is a convenient round number equal to or approximately equal to the bore in millimetres.

1.3.2 Curvature. The angle subtended by the length of a curved fitting at the centre of a circle of nominal radius through the centreline of the fitting.

1.3.3 Joint assembly. The adjacent ends of pipes, fittings or adaptors and the means of joining them.

1.3.4 Bearing elements : Spigots and sockets or couplings designed to include sealing elements with or without fairings.

1.3.5 Sealing elements : Factory made components which seal the joints, and are supplied by the pipe manufacturer.

1.3.6 Fairings : Any components located between bearing and sealing elements to reduce tolerances of sealing surfaces.

1.3.7 Minimum bore : smallest bore measured within 100 mm of the ends of the pipe.

1.3.8 Pipe section: A short length of pipe barrel equal to or greater than 300mm.

1.3.9 Nominal length: Numerical designation of length approximately equal to the internal length of the pipe barrel.

2. Pipes and fittings

2.1 Materials and manufacture

Pipes and fittings shall be made from suitable clays and fired to vitrification. The clays shall be of such a quality and homogeneity that the final product is in accordance with this standard. Pipes and fittings shall be sound and free from such defects as would impair their function when in service.

Visual defects, such as missing glaze, uneveness, creasings in the transition from pipe to socket and slight surface damage are acceptable, providing the impermeability, durability and flow characteristics of the pipes and fittings are unaffected.

Pipes and fittings may be unglazed or glazed on the interior and/or exterior. When glazed they need not be glazed on the jointing surfaces of the spigot and socket.

Pipes and fittings are regarded as rigid (stiff), the joints as flexible, and all have a high corrosion resistance.

Fittings may be completed by fixing fired parts together.

Products may be surface treated after firing.

2.2 Minimum bore

The minimum permissible bore is given in table 1.

Table 1 - Minimum bore

Nominal size (DN)	Minimum bore (mm)
100	96
150	146
200	195
225	219
250	244
300	293
350	341
400	390
450	439
500	487
600	585
700	682
800	780
1 000	975
1 200	1 170

Other nominal sizes > DN 100 may be manufactured to comply with this standard, providing that the minimum permissible bore is not more than 2,5% less than the nominal size, rounded to the nearest mm.

2.3 Length

The preferred nominal lengths of pipes of DN 200 and greater either shall be as in table 2 or they shall be whole multiples of 250 mm. There are no preferred nominal lengths for DN 100 and DN 150 pipes.

Table 2 - Preferred nominal lengths

Nominal size (DN)	Length (m)
200	1,5 2,0
225	1,5 1,75 2,0
250	1,5 2,0
300	1,5 2,0 2,5
≥ 350	1,5 2,0 2,5 3,0

Moreover lengths of 1,0m, 1,6m and 1,85m are also preferred for the range DN 200-450.

The limits of tolerance on the nominal length for pipes measured to the nearest whole mm shall be - 1 % + 4%, with minimum limits of tolerance of ±10 mm. For straight fittings the same tolerance shall apply to the manufacturer's stated nominal length.

2.4 Squareness of ends

The deviation from squareness measured at the pipe ends shall be not greater than 6mm up to and including DN 300.

Greater than DN 300, the deviation shall not exceed 2% of DN. The test method is given in clause 2 of EN 295-3.

2.5 Deviation from straightness

When tested in accordance with clause 3 of EN 295-3, the permissible deviation from straightness of the barrel of a pipe shall be not greater than the values given in table 3, measured to the nearest whole mm.

Table 3 - Deviation from straightness

DN <150	DN ≥150 ≤250	DN >250
6	5	4

mm/m nominal length

2.6 Water seal of fittings

Trapped fittings for drainage outside buildings and sewerage shall provide a minimum water seal depth of 50 mm.

2.7 Angle of curvature and radius of bends

The preferred nominal curvatures of bends are 11,25° - 15° - 22,5° - 30° - 45° - 90°.

The tolerance of curvature shall be ±3° on the nominal value for bends of 11,25° and 15°, ±4° for bends of 22,5° and 30° and ±5° for bends of 45° and 90°.

The radius, measured to the neutral axis, shall be not less than the nominal size in mm except for knuckle bends, which are allowed up to DN 150.

2.8 Branch angle of junctions

The preferred nominal angles of junction arms are 45° and 90°. The tolerance for the branch angle shall be ±5° on the nominal value.

2.9 Crushing strength (FN)

When tested in accordance with clause 4 of EN 295-3, the crushing strength (FN) of pipes or pipe sections shall be not less than the values given in tables 4 and 5.

Table 4 - Crushing strength (FN) in kN/m
DN 100 and 150

Nominal size (DN)	Crushing strength (FN)		
100	22	28	34
150	22	28	34

Higher crushing strengths may be declared for DN100 or DN150 pipes, provided that the increase is in steps of 6kN/m.

Table 5 - Crushing strength (FN) in kN/m
≥ DN200

Nominal size (DN)	Class L*	Class Number 95	120	160	200
200			24	32	40
225			28	36	45
250			30	40	50
300			36	48	60
350			42	56	70
400		38	48	64	
450		43	54	72	
500	48	48	60	80	
600	48	57	72		
700	60	67	84		
800	60	76	96		
1 000	60	95			
1 200	60				

* Lower strength pipes

The crushing strength of other nominal sizes other than Class L shall be calculated from the formula

$$\text{Crushing strength} = \frac{\text{Class Number} \times DN}{1000} \quad \text{(kN/m)}$$

Higher crushing strengths may be declared providing that they conform to the requirements of the next higher class. Class numbers are restricted to 95, 120, 160 and 200, thereafter in increments of 40.

Note: For the purpose of structural design the nominal wall thickness and/or nominal outside diameter should be declared by the manufacturer.

2.10 Bending tensile strength

Where whole pipes or pipe sections are not available a bending tensile strength test in accordance with clause 5 of EN 295-3 may be carried out on broken pipe pieces to determine the crushing strength of a pipe.

The crushing strength of the pipe shall be calculated from the mean bending tensile strength of at least 10 test pieces.

2.11 Bending moment resistance (BMR)

When tested in accordance with clause 6 of EN 295-3 the bending moment resistance for pipes with nominal sizes up to and including 225 and with nominal lengths greater than 1,1 m shall be not less than that given in table 6.

Table 6 - Bending moment resistance (BMR) in kN.m for crushing strength values (FN) in kN/m

Nominal size (DN)	FN	BMR	FN	BMR	FN	BMR
100	22	1,0	28	1,3	34	1,7
150	22	2,8	28	3,4	34	4,0
200	24	5,2	32	6,2	40	7,4
225	28	6,5	36	7,4	45	9,0

Higher bending moment resistance values may be required if higher values for crushing strength than those in tables 4 and 5 are declared.

2.12 Bond strength of adhesive used for fixing fired clay parts together

2.12.1 Minimum bending tensile strength
Fabricated test specimens shall not fracture through the adhesive nor at the adhesive clay interface under a bending tensile stress of 5 N/mm² after full curing when made and tested in accordance with clause 7 of EN 295-3.

2.12.2 Minimum strength after immersion
Test as in 2.12.1 but after immersion in test solutions as specified in clause 20 of EN 295-3.

2.13 Fatigue strength under pulsating load

Vitrified clay pipes specified in this standard are resistant to fatigue from pulsating loads. For special circumstances of application the resistance to fatigue shall be verified by cyclic loading of 2 x 10^6 cycles with an equivalent load varying between 0,1 & 0,4 times the crushing strength of the pipe. The specimens shall withstand the test in accordance with clause 8 of EN 295-3 without failure.

2.14 Watertightness of pipes

When pipes or pipe sections are tested in accordance with clause 9 of EN 295-3 the water addition W_{15} needed to maintain the pressure of 50 kPa (0,5 bar) shall not exceed 0,07 litres/m² of internal pipe surface area without leakage.

2.15 Chemical resistance

Vitrified clay pipes and fittings specified in this standard are resistant to chemical attack. For special circumstances of application the chemical resistance may be determined by the use of the test in clause 10 of EN 295-3.

2.16 Hydraulic roughness

Vitrified clay pipes and fittings specified in this standard have a low hydraulic roughness. For special circumstances of application the hydraulic roughness may be verified by the use of the test in clause 11 of EN 295-3.

2.17 Abrasion resistance

Vitrified clay pipes and fittings specified in this standard are resistant to abrasion. For special circumstances of application the abrasion resistance may be determined by the use of the test method in clause 12 of EN 295-3.

2.18 Impermeability of fittings

Fittings shall be tested in accordance with clause 13 of EN 295-3 either using an air or water test.

When subjected to an air test, the barrels shall withstand an initial air pressure of 100 mm water gauge and this shall not drop below 75 mm water gauge in 5 minutes.

When subjected to an internal water test, the barrels shall withstand an initial water pressure of 50 kPa (0,5 bar) for 5 minutes without leakage.