BS EN 295-1:2013

BSI Standards Publication

Vitrified clay pipe systems for drains and sewers

Part 1: Requirements for pipes, fittings and joints

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National foreword

This British Standard is the UK implementation of EN 295-1:2013. It supersedes BS EN 295-1:1991 and, together with BS EN 295-2:2013, BS EN 295-4:2013, BS EN 295-5:2013, BS EN 295-6:2013, and BS EN 295-7:2013, it supersedes BS EN 295-10:2005, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/505, Wastewater engineering.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

Systèmes de tuyaux et accessoires en grès pour les réseaux de branchement et d'assainissement - Partie 1: Exigences pour tuyaux, accessoires et assemblages

Steinzeugrohrsysteme für Abwasserleitungen und -känale - Teil 1: Anforderungen an Rohre, Formstücke und Verbindungen

This European Standard was approved by CEN on 1 December 2012.

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Foreword

This document (EN 295-1:2013) has been prepared by Technical Committee CEN/TC 165 “Wastewater engineering”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 295-1:1991 and together with EN 295-2:2013, EN 295-4:2013, EN 295-5:2013, EN 295-6:2013 and EN 295-7:2013 it supersedes EN 295-10:2005.

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.

The main changes with respect to the previous edition are listed below:

a) new dimensions included in Table 13 and Table 14 and dimensions for products no longer manufactured deleted;

b) requirements for the resistance to high pressure water jetting added;

c) requirements for water absorption added;

d) reaction to fire added;

e) Annex ZA added;

f) editorially revised.

The standard series EN 295 "Vitrified clay pipe systems for drains and sewers" consists of the following parts:

— *Part 1: Requirements for pipes, fittings and joints* (the present document)

— *Part 2: Evaluation of conformity and sampling*

— *Part 3: Test methods*

— *Part 4: Requirements for adaptors, connectors and flexible couplings*

— *Part 5: Requirements for perforated pipes and fittings*

— *Part 6: Requirements for components of manholes and inspection chambers*

— *Part 7: Requirements for pipes and joints for pipe jacking*

Guidance on design, installation and operation of sewers and drains constructed from vitrified clay pipes is given in EN 295-1:2013, Annex B.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies requirements for vitrified clay pipes, fittings and flexible joints for buried drain and sewer systems for the conveyance of wastewater (including domestic wastewater, surface water and rainwater) under gravity and periodic hydraulic surcharge or under continuous low head of pressure.

This standard also specifies requirements for rubber, polyurethane and polypropylene materials and other components used for jointing clay pipes and fittings.

This standard specifies different strength classes, systems of joint dimensions, lengths and fittings.

NOTE 1 The specifiers/purchasers can select them according to their requirements.

This standard does not apply to special fittings, adaptors and compatible accessories, perforated pipes and fittings, manholes and inspection chambers and pipes and joints for pipe jacking, which are specified in other parts of the standard series EN 295.

NOTE 2 Corresponding provisions for the evaluation of conformity (ITT and FPC) and sampling and those for the test methods are further specified in EN 295-2 and EN 295-3, respectively.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 295-2:2013, *Vitrified clay pipe systems for drains and sewers — Part 2: Evaluation of conformity and sampling*

EN 295-3:2012, *Vitrified clay pipe systems for drains and sewers — Part 3: Test methods*

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

EN 681-4, *Elastomeric seals — Material requirements for pipe joint seals used in water and drainage applications — Part 4: Cast polyurethane sealing elements*

EN 1610:1997, *Construction and testing of drains and sewers*

3 Terms and definitions

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

3.1
nominal size
DN
numerical designation of size which is a convenient round number equal to or approximately equal to the internal diameter in millimetres

3.2
curvature
angle subtended by the length of a curved fitting at the centre of a circle of nominal radius through the centreline of the fitting

3.3
joint assembly
adjacent ends of pipes, fittings or adaptors and the means of joining them

3.4
joint system
dimensions of a joint related to spigot or socket

Note 1 to entry: Joint systems C, D and I are related to internal diameters of sockets, and joint systems E to H are related to the spigot outside diameters.

3.5
sealing element
factory made component which seals the joint

3.6
fairing
any component located within a joint to reduce dimensional tolerances of sealing surfaces

3.7
minimum internal diameter
smallest internal diameter measured within 100 mm of the ends of the pipe

3.8
pipe section
short length of pipe barrel equal to or greater than 300 mm

3.9
nominal length
numerical designation of length approximately equal to the internal length of the pipe barrel

4 Symbols and abbreviations

4.1 Symbols

F_N crushing strength, in kN/m

F_S shear load, in kN

d_3 spigot outside diameter, in mm

d_4 internal diameter of socket or fairing, in mm

p_0 initial air pressure, in kPa

Δp pressure drop, in kPa

W_{15} water addition needed to maintain watertightness test pressure, in l/m^2

4.2 Abbreviations

BMR bending moment resistance

CWT classified without the need for testing

5 Requirements for pipes and fittings

5.1 Materials, manufacture, water absorption and appearance

5.1.1 Materials

Pipes and fittings shall be made from suitable natural clays to enable the pipe body to be fired to vitrification that is with a glass matrix, so that the final product is in accordance with this standard.

5.1.2 Manufacture

Pipes and fittings shall be sound and shall be free from such defects as would impair their function when in service.

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

Fittings may be completed by fixing fired parts together. Products may be surface treated after firing. Applicable dimensional and performance requirements for fittings shall be as specified in Annex A.

5.1.3 Water absorption

Pipes and fittings shall have a water absorption value of less than 6 % when tested in accordance with EN 295-3:2012, Clause 28.

5.1.4 Appearance

Pipes and fittings can 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/or socket.

Visual imperfections, such as missing glaze, unevenness, 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.

5.2 Internal diameter

The internal diameter shall not be less than the values given in Table 1.

Table 1 — Internal diameter

Nominal size DN	**Minimum internal diameter** mm	**Nominal size** DN	**Minimum internal diameter** mm
100	96	450	439
125	121	500	487
150	146	600	585
200	195	700	682
225	219	800	780
250	244	900	878
300	293	1 000	975
350	341	1 200	1 170
400	390	1 400	1 365

Other nominal sizes can be manufactured to comply with this standard, providing that the minimum internal diameter shall be not less than 97,5 % of the nominal size, rounded to the nearest whole millimetre.

5.3 Length

The preferred nominal lengths of pipes of DN 200 and greater shall be either in accordance with Table 2 or in whole multiples of 0,25 m. There are no preferred nominal lengths for DN 100, DN 125 and DN 150 pipes or straight fittings.

Table 2 — Preferred nominal lengths

Nominal size DN	**Preferred nominal lengths** m				
200	1,5	–	2,0	2,5	–
225	1,5	1,75	2,0	–	–
250	1,5	–	2,0	2,5	–
300	1,5	–	2,0	2,5	–
≥ 350	1,5	–	2,0	2,5	3,0
NOTE Lengths of 1,0 m, 1,6 m and 1,85 m are also preferred for the range DN 200 to DN 450.					

The length shall be measured to the nearest whole millimetre. The tolerance on the declared nominal length of pipes and straight fittings shall be from – 1 % to + 4 %, or ± 10 mm, whichever is the larger.

5.4 Squareness of ends

When tested in accordance with EN 295-3:2012, 5.1, the deviation from squareness measured at the ends of pipes and straight fittings shall be not greater than 6 mm for sizes up to and including DN 300. For sizes greater than DN 300, the deviation shall not exceed 2 % of DN.

5.5 Deviation from straightness

When tested in accordance with EN 295-3:2012, Clause 6, the deviation from straightness of the barrel of a pipe, measured to the nearest whole millimetre, shall be not greater than the values given in Table 3.

Table 3 — Deviation from straightness

Nominal size	**Maximum deviation from straightness** mm/m of nominal length
DN < 150	5
150 ≤ DN < 200	4,5
200 ≤ DN ≤ 300	4
DN > 300	3

5.6 Water seal of trapped fittings

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

5.7 Angle of curvature and radius of bends

The preferred nominal angles of curvatures of bends and tolerances shall be as given in Table 4.

Table 4 — Angle of curvature of bends

Preferred nominal angle of curvature of bends	11,25°	15°	22,5°	30°	45°	90°
Tolerance on angle	± 3°		± 4°		± 5°	

The centreline radius shall be not less than the nominal size in millimetres. Shorter radius bends are permitted up to and including DN 150.

5.8 Branch angle of junctions

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

5.9 Crushing strength (F_N)

When tested in accordance with EN 295-3:2012, Clause 7, the crushing strength (F_N) of pipes or pipe sections shall be not less than the values given in Tables 5 to 7.

Table 5 — Crushing strength for DN 100, DN 125 and DN 150 pipes

Nominal size DN	**Minimum crushing strength** F_N kN/m		
100	28	34	40
125	–	34	–
150	28	34	40

Higher crushing strengths can be declared for DN 100, DN 125 or DN 150 pipes, provided that the increase is in steps of 6 kN/m.

Table 6 — Crushing strength for DN 200 to DN 600 pipes

Nominal size DN	Class						
	95	120	160	200	240	260	280
	Minimum crushing strength F_N kN/m						
200	–	–	32	40	48	52	56
225	–	28	36	45	–	–	–
250	–	–	40	–	60	65	70
300	–	–	48	–	72	–	–
350	–	–	56	70	–	–	–
400	–	48	64	80	–	–	–
450	–	54	72	–	–	–	–
500	–	60	80	–	–	–	–
600	57	–	96	–	–	–	–

Higher crushing strengths than those given in Table 6 can be declared for DN 200 to DN 600 pipes providing that they comply with the requirements of the next higher class. Classes are restricted to 95, 120,160, 200, 240, 260 and 280 and thereafter in increments of 40.

The crushing strength of nominal sizes other than those given in Table 6 and Table 7 shall be calculated in accordance with Formula (1).

$$F_N = \frac{\text{Class} \times \text{DN}}{1\,000} \quad (1)$$

Table 7 — Crushing strength for DN 700 to DN 800 pipes

Nominal size DN	Class		
	120	160	200
	Minimum crushing strength F_N kN/m		
700	84	112	140
800	96	128	160

Higher crushing strengths than those given in Table 7 for each class can be declared for DN 700 to DN 800 pipes provided that they comply with the requirements of the next higher class. Classes are restricted to 120, 160 and 200 and thereafter in increments of 10. For nominal sizes larger than DN 800, the crushing strength shall be declared.

5.10 Bending tensile strength

If it is required to determine the crushing strength where whole pipes or pipe sections are not available, for example after failure in use, a bending tensile strength test, in accordance with EN 295-3:2012, Clause 8, can be carried out on broken pipe pieces.

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

5.11 Bending moment resistance (BMR)

When tested in accordance with EN 295-3:2012, Clause 9, the bending moment resistance (BMR) for pipes with nominal sizes up to and including DN 225 and with nominal lengths greater than 1,1 m shall be not less than that given in Table 8.

Table 8 — Minimum bending moment resistance (BMR) **for crushing strength values** (F_N)

Nominal size DN	F_N (kN/m)	**BMR** (kNm)	F_N (kN/m)	**BMR** (kNm)	F_N (kN/m)	**BMR** (kNm)	F_N (kN/m)	**BMR** (kNm)	F_N (kN/m)	**BMR** (kNm)	F_N (kN/m)	**BMR** (kNm)
100	–	–	28	1,3	34	1,7	40	2,0	–	–	–	–
125	–	–	–	–	34	3,0	–	–	–	–	–	–
150	–	–	28	3,4	34	4,0	40	4,6	–	–	–	–
200	–	–	32	6,2	40	7,4	48	8,6	52	9,2	56	9,9
225	28	6,5	36	7,4	45	9,0	–	–	–	–	–	–

Pipes with higher declared values of crushing strength than those given in Tables 5 and 6 shall demonstrate proportionately higher values of bending moment resistance, when tested in accordance with EN 295-3:2012, Clause 9.

NOTE A pipe designed in cross section using a specified crushing strength, F_N, and meeting the relevant bending moment resistance requirement, BMR, does not fail in longitudinal bending before the design crushing load is exceeded. Therefore, only a calculation for cross sectional loading is needed for the purposes of structural design. Pipes larger than DN 225 or shorter than 1,1 m that meet the specified crushing strength do not fail in longitudinal bending.

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

5.12.1 Minimum bending tensile strength of the bond

Fabricated test specimens shall not fracture through the adhesive nor at the adhesive/clay interface under a bending tensile stress of 5 N/mm^2 after full curing when made and tested in accordance with EN 295-3:2012, Clause 10.

5.12.2 Minimum strength after immersion

If it is required, fabricated test specimens shall not fracture through the adhesive nor at the adhesive clay interface under a bending tensile stress of 5 N/mm^2 after full curing when made and tested in accordance with EN 295-3:2012, Clause 10, after immersion in test solutions as specified in EN 295-3:2012, Clause 23.

5.13 Fatigue strength under cyclic load

Where the resistance to fatigue under cyclic loads is required, it shall be demonstrated by testing in accordance with EN 295-3:2012, Clause 11, when test pieces shall not fail.

5.14 Watertightness of pipes and junctions

When pipes, junctions or pipe sections are tested in accordance with EN 295-3:2012, Clause 12, the water addition W_{15} needed to maintain the pressure of 50 kPa (0,5 bar) shall not exceed 0,04 l/m^2 of wetted internal pipe surface area and there shall be no visible leakage.

If pipes are required to withstand continuous working under low pressure, the test pressure and water addition W_{15} shall be agreed between manufacturer and purchaser with the maximum test pressure of 600 kPa (6 bar).

5.15 Chemical resistance

When tested in accordance with EN 295-3:2012, Clause 13, the loss of material from the test piece shall be declared.

NOTE Under normal conditions of use, vitrified clay pipes are considered to be resistant to chemical attack and expected to show typical values of loss of material between 0,1 % and 0,25 %.

5.16 Hydraulic roughness

Where the hydraulic roughness is required, it shall be demonstrated by testing in accordance with EN 295-3:2012, Clause 14 and the hydraulic roughness declared.

NOTE Vitrified clay pipes and fittings have a low hydraulic roughness (typically between 0,02 mm and 0,05 mm).

5.17 Abrasion resistance

Where the abrasion resistance is required, it shall be demonstrated by testing in accordance with EN 295-3:2012, Clause 15 and the mean depth of abrasion declared.

NOTE 1 Under normal conditions of use, vitrified clay pipes are considered to be resistant to abrasion and have shown typical values between 0,25 mm and 0,50 mm after 100 000 load cycles

NOTE 2 Vitrified clay pipes and fittings have a Mohs scratch hardness value of 7.

5.18 Airtightness

The airtightness of pipes, bends, junctions and pipe sections shall be tested under either positive or negative pressure in accordance with EN 295-3:2012, Clause 16.

The barrels of the pipes, bends, junctions and pipe sections shall be tested under positive pressure (using one of the methods LA, LB, LC or LD) given in Table 9 or negative pressure (using either method LCU or LDU) given in Table 10. The measured change in pressure Δp from an initial air pressure p_0 shall not be greater than the values given in Table 9 or Table 10 for the appropriate test method, nominal size (DN) and testing time.

NOTE 1 Procedures and values for positive pressure testing are consistent with EN 1610:1997, 13.2, which does not include negative pressure testing, stating that there is currently insufficient experience with the method.

Table 9 — Initial pressure, change in pressure and testing times under positive pressure

Test method	Initial pressure		Change in pressure		Nominal size DN						
					≤ 200	225	300	400	600	800	1 000
	p_0 kPa	p_0 mm water gauge	Δp kPa	p_0 mm water gauge	Testing time minutes						
LA	1	100	0,25	25	5	5	7	10	14	19	24
LB	5	500	1	100	4	5	6	7	11	15	19
LC	10	1 000	1,5	150	3	4	4	5	8	11	14
LD	20	2 000	1,5	150	1,5	1,5	2	2,5	4	5	7

Table 10 — Initial pressure, change in pressure and testing times under negative pressure

Test method	Initial pressure		Change in pressure		Nominal size DN								
					≤ 225	300	400	500	600	700	800	900	1 000
	p_0 kPa	p_0 mm water gauge	Δp kPa	p_0 mm water gauge	Testing time minutes								
LCU	-10	-1 000	+1,1	+110	2,5	3	4	5	6	7	8	9	10
LDU	-20	-2 000	+1,1	+110	1	1,5	2	2,5	3	3,5	4	4,5	5

NOTE 2 An equivalent head of water of 100 mm ≈ 1 kPa is used in Tables 9 and 10.

The air tightness for nominal sizes DN > 1 000 shall be tested according to EN 1610.

5.19 Tightness of fittings

Fittings, other than bends, junctions and terminal fittings such as gullies, shall be tested in accordance with EN 295-3:2012, Clause 16, using an air test or in accordance with EN 295-3:2012, Clause 12, using a water test.

When subjected to an air test, fittings shall withstand an initial air pressure of 1 kPa (≈100 mm water gauge) and the pressure shall not drop below 0,75 kPa (≈ 75 mm water gauge) in 5 min. When subjected to a water test, fittings shall withstand a water pressure of 50 kPa (0,5 bar) for 5 min without visible leakage.

5.20 Resistance against high pressure water jetting

The jetting resistance shall be tested in accordance with EN 295-3:2012, 17.2, at 12 MPa (120 bar) using a moving nozzle and/or EN 295-3:2012, 17.3, at 280 bar using a stationary nozzle. After testing, the appearance of the pipe shall be in accordance with 5.1.4.

NOTE Vitrified clay pipes and fittings are considered to be resistant to high pressure water jetting when tested as specified.

6 Requirements for joints and joint assemblies

6.1 Joint materials

6.1.1 Rubber sealing elements

Rubber sealing elements shall be in accordance with EN 681-1.

6.1.2 Polyurethane sealing elements

Polyurethane sealing elements shall be in accordance with EN 681-4.

6.1.3 Polypropylene sleeve couplings

6.1.3.1 Material requirements

Polypropylene sleeve couplings shall meet either the material requirements given in Table 11, when tested in accordance with EN 295-3:2012, Clause 19, or the performance requirements of 6.1.3.2.

Table 11 — Material requirements for polypropylene sleeve couplings

Test	Unit	Requirement	Test method according to EN 295-3:2012, Clause
Melt flow index	—	≤ 1,5 times nominal value	19.1
Tensile strength	N/mm^2	≥ 18	19.2
Elongation at break	%	≥ 200	19.2
Elevated temperature	—	No defects	19.3

6.1.3.2 Performance requirements

When tested in accordance with of EN 295-3:2012, Clause 20, polypropylene sleeve couplings shall withstand either:

a) a constant internal water pressure of 50 kPa (0,5 bar) for a minimum of 1 min without visible leakage, or

b) a constant internal air pressure of 25 kPa (0,25 bar) for 1 min whilst submerged in water without visible leakage.

6.1.4 Creep resistance of rigid fairing materials

6.1.4.1 General

Rigid fairing materials used in socket joints shall meet the requirements of either 6.1.4.2 or 6.1.4.3.

6.1.4.2 Deformation

When tested in accordance with EN 295-3:2012, 25.1, the initial deformation ε_0 shall be less than 5 % and the short term deformation $\Delta\varepsilon_{4;0}$ shall be less than 8 %.

6.1.4.3 Indentation

When tested in accordance with EN 295-3:2012, 25.2, the indentation after 24 h $^{+30}_{0}$ min shall be less than 0,5 mm.

6.1.5 Other jointing materials

Other materials used in joint assemblies shall comply with the relevant European Standard, European Technical Approval or the manufacturers' declared specification, as applicable, which shall also include requirements for long term behaviour.

6.2 Watertightness of joint assemblies under deflection and shear load

6.2.1 Test pressures

Joint assemblies shall satisfy the requirements of 6.2.2 and 6.2.3 when tested at both internal and external pressures of 5 kPa (0,05 bar) and 50 kPa (0,5 bar).

Where pipes and their joint assemblies are required to withstand continuous working under low pressure, the test pressure shall be declared.

A component of a joint assembly shall not be tested in more than one assembly.

6.2.2 Angular deflection

One pipe in a joint assembly shall be deflected by the method described in EN 295-3:2012, 21.2, by the amount specified in Table 12 and when so deflected, the joint assembly shall withstand the test pressures specified in 6.2.1 for 5 min without visible leakage.

Table 12 — Deflection

Nominal size	Deflection [a] mm
100 ≤ DN ≤ 200	80
200 < DN ≤ 500	30
500 < DN ≤ 800	20
DN > 800	10

[a] Per metre of deflected pipe length.

6.2.3 Shear resistance

A joint assembly shall withstand short term and long term shear load when tested according to EN 295-3:2012, 21.3. An external load shall be applied to one pipe to produce a minimum shear load at the joint assembly of 25 N/mm of nominal size. The joint assembly shall withstand the test pressures specified in 6.2.1 for 15 min without visible leakage.

NOTE 1 Joints passing this test are considered to be resistant to root penetration.

NOTE 2 Higher values for shear load resistance can be required when higher classes than those in Tables 6 and 7 are declared. On the basis that class 160 requires a shear load of 25 N/mm nominal size, class 200 will require a shear load of 31,25 N/mm nominal size (shear load factor 1,25) and class 240 will require a shear load of 37,5 N/mm nominal size (shear load factor 1,50). The shear load multiplication factor for other classes can be interpolated or extrapolated linearly.

6.3 Continuity of invert in joint assemblies

When tested in accordance with EN 295-3:2012, Clause 22, the calculated difference in invert levels between pipes and fittings shall not exceed the following values:

— 4 mm for sizes up to and including DN 400;

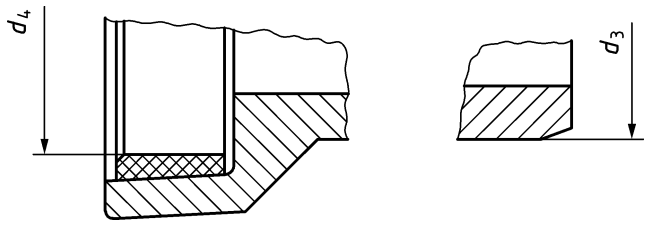
— 1 % of the nominal size in mm for sizes above DN 400.

If it is necessary for achieving continuity of invert, the pipes and fittings shall be marked to identify the orientation.

6.4 Joint interchangeability of pipes and fittings in joint assemblies

Pipes and fittings of the same joint system of the same nominal size and the same class shall be directly interchangeable.

Joint Systems C, D and I, for which the socket or socket fairing internal diameter d_4 is the controlling dimension, are specified in Table 13 (see Figure 1a)). Joint Systems E, F, G and H, for which the spigot outside diameter d_3 is the controlling dimension (see Figure 1 b)), are specified in Table 14. For joint Systems C to H the tolerances on d_3 and d_4 given in Tables 13 and 14 shall be met.



a) b)

Figure 1 — Joint dimensions

Other joint systems with different values of d_3 and d_4 are permitted provided that the pipes and fittings comply with 5.2 and the joint assemblies comply with 6.1, 6.2, 6.3 and 6.5 to 6.7.

Pipes of different strengths but with the same DN and joint dimensions should not normally be joined together unless specifically required by the pipeline design.

Table 13 — Dimensions and tolerances for socket controlled joint systems

Nominal size DN	Class	Crushing strength F_N kN/m	Socket or fairing internal diameter d_4 mm		
			System C	System D	System I
100	–	34	_	146,8 ± 0,5	–
150	–	28	208,0 ± 0,5	204,5 ± 0,5	–
150	–	34	208,0 ± 0,5	204,5 ± 0,5	–
150	–	40	208,0 ± 0,5	204,5 ± 0,5	–
200	160	32	260,0 ± 0,5	–	–
200	200	40	260,0 ± 0,5	269,0 ± 0,5	–
200	240	48	275,0 ± 0,5	–	260,0 ± 0,5
200	260	52	260,0 ± 0,5	–	–
200	280	56	–	269,0 ± 0,5	–
225	160	36	–	294,6 ± 0,5	–
225	200	45	300,0 ± 0,5	–	–
250	160	40	317,5 ± 0,5	331,3 ± 0,6	–
250	240	60	341,5 ± 0,5	331,3 ± 0,6	317,5 ± 0,5
250	260	65	317,5 ± 0,5	–	–
300	160	48	371,5 ± 0,5	385,8 ± 0,6	–
300	240	72	398,5 ± 0,5	385,8 ± 0,6	–
350	160	56	433,5 ± 0, 5	–	–
350	200	70	459,0 ± 0,5	–	–
400	120	48	483,5 ± 0,5	–	–
400	160	64	507,5 ± 0,5	521,0 ± 0,75	–
400	200	80	515,5 ± 0,5	–	–
450	120	54	–	583,1 ± 0,75	–
450	160	72	579,0 ± 0,5	583,1 ± 0,75	–
500	120	60	605,0 ± 0,5	651,5 ± 0,5	–
500	160	80	637,0 ± 0,5	–	–
600	95	57	720,0 ± 0,5	739,8 ± 0,5	–
600	160	96	758,0 ± 0,5	–	–
700	120	84	871,0 ± 0,5	–	–
700	160	112	892,0 ± 0,5	–	–
700	200	140	892,0 ± 0,5	–	–
800	120	96	976,0 ± 0,5	–	–
800	160	128	1 001,5 ± 0,5	–	–

Higher crushing strengths can be declared provided that they conform to the requirements of a higher class (see 5.9).

Table 14 — Dimensions and tolerances for spigot controlled joint systems

DN	Class	Crushing strength F_N kN/m	Spigot outside diameter d_3 [a] mm			
			System E	System F	System G	System H
100	-	28	–	–	131,4 ± 2	122 ± 1,5
100	-	34	–	131 ± 1,5	131,4 ± 2	–
100	-	40	122 ± 1,5	–	–	–
125	-	34	–	159 ± 2	–	–
150	-	28	–	–	187,75 ± 2,75	178 ± 1,5
150	-	34	–	186 ± 2	–	–
150	-	40	178 ± 1,5	–	187,75 ± 2,75	–
200	160	32	231 ± 2	242 ± 3	–	237 ± 2
200	200	40	–	242 ± 3	–	–
200	240	48	237 ± 2	–	–	–
200	280	56	–	–	254 ± 4	–
225	120	28	–	–	274 ± 4	–
225	160	36	–	271 ± 3	–	–
225	200	45	263 ± 2	–	278 ± 4	–
250	160	40	287 ± 3	–	–	296 ± 3
250	240	60	296 ± 3	–	–	–
250	280	70	–	–	318 ± 4	–
300	160	48	–	–	380 ± 4	–
300	240	72	357 ± 4	–	380 ± 4,	–

[a] d_3 is the mean value of the spigot outside diameter (i.e. circumference divided by π).

6.5 Chemical and physical resistance to effluent of joint assemblies

Joint assemblies shall be tested by the methods described in EN 295-3:2012, Clause 23, using all the test solutions specified. A separate joint assembly shall be used for each test solution. Each joint assembly which has been exposed to one of the test solutions shall withstand both the constant internal pressures specified in 6.2.1 for 5 min without visible leakage.

6.6 Thermal cycling stability of joint assemblies

Joint assemblies shall withstand cyclic temperature changes between (-10 ± 2) °C and (70 ± 2) °C without visible defect when tested in accordance with EN 295-3:2012, 24.1. A water tightness test shall then be carried out on the same test joint assembly using an internal pressure of 50 kPa (0,5 bar) for 15 min. There shall be no visible leakage.

6.7 Long-term thermal stability of joint assemblies

Joint assemblies shall withstand a long-term thermal stability test in accordance with EN 295-3:2012, 24.2, for seven days at a temperature of 45^{+5}_{0} °C. A water tightness test shall then be carried out on the same test joint assembly using an internal pressure of 50 kPa (0,5 bar) for 15 min. There shall be no visible leakage.

7 Common requirements for pipes, fittings and joints

7.1 Reaction to fire

Where the use of vitrified clay pipes and fittings with their joints is subject to national regulatory requirements on reaction to fire, their reaction to fire performance shall be declared. Vitrified clay pipes and fittings with their joints in use are classified as Class A1 without the need for testing in accordance with the relevant Commission decision[1)].

NOTE 1 Vitrified clay, as a homogeneously distributed material for these products, is considered as material of known and stable performance with respect to the reaction to fire performance as it does not consist of any organic material and consequently does not contribute to the fire. Under this condition, it may be considered as the Class A1 material.

NOTE 2 The class of reaction to fire performance of vitrified clay pipes and fittings with their joints is regarded as the class for the constituent material (i.e. vitrified clay).

Conversely, where use of this product is not subject to national regulatory requirements on reaction to fire, either the Class A1 (see above) or Class F (see Note 3) may be declared.

NOTE 3 Class F according to EN 13501-1 is equivalent to "No Performance Determined" (NPD).

7.2 Durability

Vitrified clay pipes, fittings and joints for drains and sewers are products of known and stable performance for defined end use applications with respect to their established durability for which experience has been accumulated over a long period of time.

Durability of crushing strength and longitudinal bending strength (if applicable) is ensured by meeting the requirements of 5.1, 5.15 and 5.20 for pipes and fittings.

Durability of tightness is ensured by meeting requirements of 6.5, 6.6 and 6.7 for joint assemblies.

1) See Decision of the Commission 96/603/EC of 1996-10-04 (see OJEU L 267 of 1996-10-19), as twice amended by 2000/605/EC of 2000-09-26 (see OJEU L 258 of 2000-10-12) and by 2003/424/EC of 2003-06-06 (see OJEU L 144 of 2003-06-12).

7.3 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets. In the absence of European harmonised test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction web site on EUROPA accessed through: *http://ec.europa.eu/enterprise/construction/cpd-ds/*".

8 Designation

Where required for specification and documentation purposes, the following designation shall be used:

— Block 1: Name of product;

— Block 2: Standard number (EN 295-1);

— Block 3: Individual item block:

  — Block 3.1: Nominal size, DN,

  — Block 3.2: Length, m,

  — Block 3.3: Crushing strength, FN,

  — Block 3.4: Joint system.

Example of the designation of a vitrified clay pipe according to EN 295-1 with a nominal size of 300 mm, a length of 2,00 m, a crushing strength of 48 kN/m and joint System C:

EXAMPLE 1 Pipe EN 295-1 – DN 300 – 2,00 – FN 48 – C

Example of the designation of a vitrified clay bend with an angle of 45° according to EN 295-1 with a nominal size of 200 mm, a crushing strength of 40 kN/m and joint System E:

EXAMPLE 2 Bend 45 EN 295-1 – DN 200 – FN 40 – E

9 Marking

9.1 Pipes and fittings

Pipes and fittings shall be marked with at least:

a) EN 295-1;

b) manufacturer's identification;

c) date of manufacturing;

d) nominal size (DN ...);

e) joint system.

In addition, pipes shall be marked with:

f) crushing strength, FN in kN/m;

g) bending moment resistance, BMR in kNm, if applicable.

In addition, bends and junctions shall be marked with:

h) angle.

Marking shall be indelible and wherever practicable impressed before firing.

NOTE 1 Because the marking is impressed before firing wherever practical, the marking of crushing strength is carried out as "FN" for better legibility instead of the symbol "F_N", as used in the standard.

NOTE 2 Where CE marking covers some of the marking requirements of this clause, such requirements need not be repeated.

9.2 Joints

Joints supplied as separate components shall be marked to identify the manufacturer and the joint system.

10 Evaluation of conformity

10.1 General

Products manufactured to this standard shall be subjected to evaluation of conformity procedures as follows:

a) initial type testing; and

b) factory production control by the manufacturer, including product assessment.

10.2 Initial type testing

Vitrified clay pipes, fittings and joints shall be subjected to initial type testing according to the relevant subclauses of EN 295-2:2013, 5.2 to show conformity with this European Standard.

10.3 Factory production control (FPC)

Vitrified clay pipes, fittings and joints shall be subjected to factory production control according to the relevant subclauses of EN 295-2:2013, 5.3 to ensure that the declared performance of each stated characteristic is maintained.

Annex A
(normative)

Requirements for vitrified clay fittings

Fittings are grouped according to Table A.1 and shall meet the requirements therein.

Table A.1 — Applicable dimensional and performance requirements for fittings

Fitting group	**Requirement according to clause** (in addition see Note 1 and Note 2)							
	5.2	5.3	5.6	5.7	5.8	5.12.1	5.14	5.18 and 5.19
	Minimum internal diameter [a]	Length	Water seal	Angle of curvature	Branch angle	Bond- [b] strength	Water-tight-ness	Airtightness and tightness of fittings
Taper & splay pipes	X	X	–	–	–	X	–	X
Access and inspection pipes & chambers, channels and taper channels	X	X	–	–	–	X	–	–
Bends, rest bends & taper bends	X	–	–	X	–	X	–	X
Channel bends, access and inspection bends, saddles & oblique saddles	X	–	–	X	–	X	–	–
Junctions	X	X	–	–	X	X	X	X
Channel junctions, access junctions, taper channel bends	X	X	–	X	X	X	–	–
Trapped gullies, low back traps, siphons and interceptors	X	–	X	–	–	X	–	–
Trapless gullies, hoppers and raising pieces	X	–	–	–	–	X	–	–

NOTE 1 For reaction to fire, see 7.1.

NOTE 2 For durability, see 7.2.

[a] Applies to pipeline connections only

[b] Where fittings are fabricated from fired parts.

Annex B
(informative)

Guidance on design, installation and operation of sewers and drains constructed from vitrified clay pipes

B.1 General

The properties of pipes and fittings meeting the requirements of this standard do not change over the entire service life of drain and sewer systems designed, installed, operated and maintained in accordance with the requirements of EN 752, EN 1610 and EN 12056-1 for use within building structures.

B.2 Hydraulic design

The hydraulic roughness values for use in hydraulic design of vitrified clay pipelines are the same as for all other pipe materials for the service life of the sewers or drains (which are governed by deposits and biological slimes). This applies to calculations using both the Colebrook-White (also known as Prandtl-Colebrook) and Manning/Strickler equations.

B.3 Structural design

For the purposes of structural design of drains and sewers to the methods specified in EN 1295-1, vitrified clay pipes and fittings are considered to be rigid. They can directly accommodate soil and traffic loads because of their inherent load-carrying capacity. Pipe deformation or change of pipe diameter does not occur during the entire period of drain or sewer operation under either external or internal load. The structural design is based on the crushing strength and takes into account the soil, traffic and other imposed loads. For this, the nominal wall thickness and/or nominal outside diameter are provided by the manufacturer.

The strength of vitrified clay pipes and fittings does not change during their service life. Vitrified clay pipes are also able to carry cyclic loads applied by road or railway traffic.

B.4 Installation

Installation of vitrified clay pipes and fittings should be carried out in accordance with the requirements of EN 1610 in open trenches and of EN 12889 for trenchless construction. Longitudinal flexibility of buried clay pipe drainage systems is achieved by the provision of flexible joints. These allow for settlement and other movements in the ground. The connection of pipelines to manholes or inspection chambers and buildings is made using sufficient flexible joints so that any additional strains from differential settlement are avoided at the interface between pipe and structure.

B.5 Operation and maintenance

Drain and sewer systems constructed from vitrified clay pipes and fittings satisfy the requirements of EN 752, EN 12056-2 and EN 12056-3. They are considered to be operational and fully functioning at all times due to:

— the high chemical resistance of vitrified clay pipes and fittings and their joints;

— functional pipe properties which do not change under the influence of waste water;

— easy removal of any deposits from the smooth internal ceramic pipe surface, which is unchanged during the operational life of the system;

— high resistance to cleaning with high-pressure water jets;

— high resistance to the effects of mechanical cleaning equipment and other maintenance devices;

— high mechanical resistances against abrasive loads;

— lack of restrictions on the use of any normal construction repair methods which may be required, either by replacing pipes in open trench or by trenchless replacement techniques or by repair or renovation methods.

NOTE For additional details, see EN 1610, EN 12889 and EN 752.

B.6 Economy

Long-term experience with vitrified clay pipes and fittings for sewers and drains meeting the requirements of EN 295 series of standards shows that they may be relied upon for a normal service life of at least 100 years.

Such longevity is due to the mineralogical characteristics of vitrified clay, which do not change after manufacture. Consequently, strength remains constant and provides durability. The joint design and characteristics of the sealing materials provide matching long-term performance.

B.7 Environmental characteristics

The environmental characteristics of vitrified clay pipes and fittings include:

— low energy consumption in production;

— production with care for environmental issues;

— protection of soil and groundwater in operating conditions;

— long service life for drains and sewers;

— problem-free complete recycling.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under the mandate M/131 "Pipes, tanks and ancillaries not in contact with water intended for human consumption", as amended, given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the construction products covered by this annex for the intended uses indicated herein; reference shall be made to the information accompanying the CE marking.

This annex establishes the conditions for the CE marking of the construction products for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

The scope of this annex is defined by Table ZA.1 and it is the same as in Clause 1.

Table ZA.1 — Relevant clauses and intended uses for vitrified clay pipes, fittings and pipe joints *(1 of 2)*

Construction products: Vitrified clay pipes, fittings and joints **Intended uses:** Buried drain or sewer systems for the conveyance of wastewater (including domestic wastewater, surface water and rain water) under gravity and periodic surcharge or under continuous low head of pressure			
Essential characteristics	**Requirement clauses in this standard**	**Levels and/or classes**	**Notes**
Reaction to fire [a]	7.1	A1 to F	A1 classified without need for testing (CWT)
Crushing strength [b]	5.9	–	tested acc. to EN 295-3:2012, Clause 7; expressed as value (in kN/m)
Longitudinal bending strength, as:			
Bending moment resistance (BMR) [b]	5.11	–	tested acc. to EN 295-3:2012, Clause 9; expressed as value (in kNm); only needed for pipes ≤ DN 225 and length >1,1m
Dimensional tolerances, as:			
— Internal diameter [b c]	5.2	–	measured acc. to the requirement clause; against the declared nominal value; expressed as “Pass” or “Fail”
— Length [b c]	5.3		measured acc. to the requirement clause; against the declared nominal value; expressed jointly as “Pass” or “Fail”
— Squareness of ends [b c]	5.4		measured acc. to the requirement clause; expressed as “Pass” or “Fail”
— Straightness [b]	5.5		measured acc. to the requirement clause; expressed as “Pass” or “Fail”
— Water seal of trapped fittings [c]	5.6		measured acc. to the requirement clause; expressed as “Pass” or “Fail”

Table ZA.1 *(2 of 2)*

Construction products: Vitrified clay pipes, fittings and joints

Intended uses: Buried drain or sewer systems for the conveyance of wastewater (including domestic wastewater, surface water and rain water) under gravity and periodic surcharge or under continuous low head of pressure

Essential characteristics	Requirement clauses in this standard	Levels and/or classes	Notes
— Angle of curvature and radius of bends [c]	5.7	–	measured acc. to the requirement clause against the declared nominal value; expressed as “Pass” or “Fail”
— Branch angle of junctions [c]	5.8		measured acc. to the requirement clause against the declared nominal value; expressed as “Pass” or “Fail”
— Continuity of invert [b c]	6.3		measured acc. to the requirement clause; expressed as “Pass” or “Fail”
— Joint inter-changeability [b c]	6.4		measured acc. to the requirement clause against the declared system; expressed as “Pass” or “Fail”
Tightness: Gas and liquid and permeability, as:			
— Watertightness of pipes or pipe sections and junctions[b, e]	5.14	–	tested acc. to EN 295-3:2012, Clause 12; expressed as “Pass” or “Fail”
— Airtightness of pipes, bends, junctions and pipe sections [b]	5.18	–	tested acc. to EN 295-3:2012, Clause 16; expressed as “Pass” or “Fail”
— Tightness of fittings [c]	5.19	–	tested acc. to EN 295-3:2012, Clause 16;expressed as “Pass” or “Fail”
Watertightness of joint assemblies [d, e], as:			
— Angular deflection	6.2.2	–	tested acc. to EN 295-3:2012, 21.2; expressed as “Pass” or “Fail”
— Shear resistance	6.2.3	–	tested acc. to EN 295-3:2012, 21.3; expressed as “Pass” or “Fail”
Release of dangerous substances	7.3	–	see 7.3
Durability of crushing strength and longitudinal bending strength, against:			
— Chemical resistance	5.1, 5.15	–	tested acc. to EN 295-3:2012, Clause 13, and expressed in % loss
— Resistance against high pressure water jetting	5.1, 5.20	–	tested acc. to EN 295-3:2012, 17.1 and 17.2, and expressed as “Pass” or “Fail”
Durability of watertightness, against:			
— Chemical and physical resistance to effluent	6.5	–	tested acc. to EN 295-3:2012, Clause 23, and expressed as “Pass” or “Fail”
— Thermal cycling stability	6.6	–	tested acc. to EN 295-3:2012, 24.1, and expressed as “Pass” or “Fail”
— Long term thermal stability	6.7	–	tested acc. to EN 295-3:2012, 24.2, and expressed as “Pass” or “Fail”

[a] Of the constituent material, i.e. vitrified clay.

[b] For pipes only.

[c] For fittings only.

[d] For joint assemblies only.

[e] For continuous working under low pressure, the test pressure used shall be declared.

The requirement on a certain characteristic is not applicable in those Member States (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor to declare the performance of their products with regard to this characteristic and the option "No performance determined" (NPD) in the information accompanying the CE marking (see ZA.3) may be used.

ZA.2 Procedures for the attestation of conformity of vitrified clay pipes, fittings and pipe joints

ZA.2.1 Systems of attestation of conformity

The systems of attestation of conformity of the vitrified clay pipes, fittings and pipe joints, indicated in Table ZA.1 in accordance with the Decision of the Commission 1999/472/EC of 1999-07-01 (see OJEU L184 of 1999-07-17), as amended by 2001/596/EC of 2001-01-08 (see OJEU L209 of 2001-08-02), as given in Annex III of the mandate M131 for “Pipes, tanks and ancillaries not in contact with water intended for human consumption”, as amended, are shown in Table ZA.2 for the indicated intended uses and relevant level(s) or class(es).

Table ZA.2 — Systems of attestation of conformity

Products	Intended uses	Level(s) or class(es)	Attestation of conformity systems
Pipes, fittings and joints	In installations for transport/disposal/storage of water not intended for human consumption	–	4
	In installations in areas subject to reaction to fire regulations, used for transport/disposal/storage of water not intended for human consumption	(A1, A2, B and C)* (A1, A2, B, C)**, D and E (A1 to E)***, F	1 3 4
System 1: See Directive 89/106/EEC, Annex III.2.(i), without audit testing of samples. System 3: See Directive 89/106/EEC, Annex III.2.(ii), second possibility. System 4: See Directive 89/106/EEC, Annex III.2.(ii), third possibility.			
* Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material). ** Products/materials not covered by footnote (*). *** Products/materials that do not require to be tested for reaction to fire (e.g. products/materials of Class A1 according to Commission Decision 96/603/EC).			

NOTE The attestation of conformity systems 1 and 3 with regard to installations of the products in areas subject to reaction to fire regulations as given in Table ZA.2 is not applicable because the material used for these products is deemed to satisfy requirements on the material not contributing to fire and which allows the reaction to fire performance of these products to be declared under system 4 (Class A1 without the need of testing).

The attestation of conformity of the products in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table ZA.3 resulting from application of the clauses of this European Standard indicated therein.

Table ZA.3 — Assignment of evaluation of conformity tasks for vitrified clay pipes, fittings and joints under system 4

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (FPC)	Parameters related to the characteristics of Table ZA.1 relevant for the intended use for which performance is declared	10.3
	Initial type testing by the manufacturer	Characteristics of Table ZA.1 relevant for the intended use for which performance is declared	10.2

ZA.2.2 EC declaration of conformity

When compliance with the conditions of this annex is achieved, the manufacturer or his agent established in the EEA shall draw up and retain a declaration of conformity (i.e. EC declaration of conformity), which entitles the manufacturer to affix the CE marking. This declaration shall include:

— name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE marking.

— description of the product (type, identification, use, ...), and a copy of the information accompanying the CE marking;

NOTE 2 Where some of the information required for the declaration is already given in the CE marking, it does not need to be repeated.

— provisions to which the product conforms (i.e. Annex ZA of this European Standard) and a reference to the ITT report(s) and factory production control records (if appropriate);

— particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions);

— name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or his authorised representative.

The above mentioned declaration shall be presented in the language or languages accepted in the Member State in which the product is intended to be used.

ZA.3 CE marking

ZA.3.1 General

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol shall be in accordance with Directive 93/68/EEC and the accompanying information shall be shown as indicated in ZA.3.2 and ZA.3.3.

ZA.3.2 CE marking on the product

The following information shall be affixed together with the CE marking symbol on each product:

a) manufacturer's name or identifying mark;

b) last two digits of the year in which the marking was affixed;

c) reference to this European Standard (EN 295-1);

d) description of the product as:

   1) nominal size(s),

   2) joint system(s),

   3) angle, where applicable;

e) performance of the following characteristic as listed in Table ZA.1:

   1) crushing strength (FN): (for pipes only).

Figure ZA.1 gives an example of the CE marking on the product (*e.g. vitrified clay pipe)*.

CE	*CE conformity marking symbol given in Directive 93/68/EEC*
Any Co Ltd	*Name or identifying mark of the manufacturer*
13	*Last two digits of the year in which the marking was affixed*
EN 295-1	*No. of European Standard*
DN 150 - E	*Description of the product*
FN 40	*Information on essential characteristics*

Figure ZA.1 — Example of CE marking on the product for a vitrified clay pipe

Figure ZA.2 gives an example of the CE marking on the product (*e.g. vitrified clay fitting (junction)*).

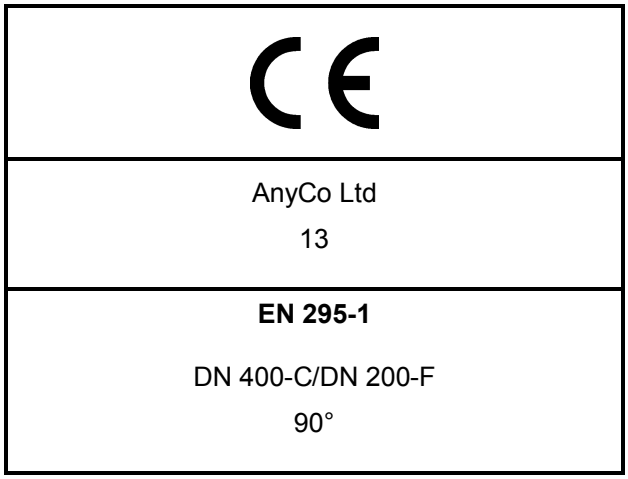


Figure ZA.2 — Example of CE marking on the product for a vitrified clay fitting

Figure ZA.3 gives an example of the CE marking on the product (*e.g. polypropylene sleeve coupling*).

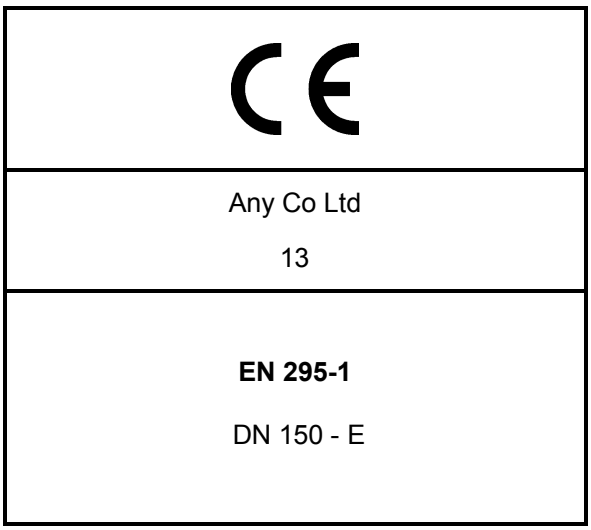


Figure ZA.3 — Example of CE marking on the product for a polypropylene sleeve coupling

ZA.3.3 CE marking in the accompanying documents

In addition to the CE marking on the product, the following information shall be given together with the CE marking symbol in the commercial documents (e.g. delivery note), accompanying the products:

a) name or identifying mark and the registered address of the manufacturer;

b) last two digits of the year in which the marking was affixed;

c) reference to this European Standard and its year of publication (i.e. EN 295-1:2013);

d) description of the product and its intended use;

e) designation of the product:

   1) nominal size(s),

2) length, expressed in m,

3) joint system(s),

4) angle, where applicable;

f) performance of the following characteristics, listed in Table ZA.1, which are to be declared for the relevant intended uses and, where relevant, expressed as “Pass” for the pass/fail requirements (where necessary), or “NPD“ (i.e. No performance determined), namely for:

1) reaction to fire;

2) crushing strength (F_N): (for pipes only);

3) longitudinal bending strength (*for pipes ≤ DN 225 and > 1,1 m long only*), dealt with by bending moment resistance (BMR);

4) dimensional tolerances: internal diameter, length, squareness of ends, straightness, angle of curvature and radius of bends, branch angle of junctions, water seal of fittings, continuity of invert, and joint inter-changeability expressed as “Pass”, where applicable”;

5) tightness (gas and liquid) and permeability, dealt with jointly by:

i) watertightness of pipes or pipe sections and junctions (*for pipes only*);

ii) airtightness of pipes, bends, junctions and pipe sections (*for pipes only*);

iii) tightness of fittings (for fittings only);

iv) watertightness of joints, dealt with by (for joints only) angular deflection and shear resistance and chemical and physical resistance to effluent of joints;

g) release of dangerous substances, where 7.3 applies;

h) durability:

1) of crushing strength and longitudinal bending strength

i) against chemical resistance,

ii) against high pressure water jetting resistance;

2) of tightness

i) against chemical and physical resistance to effluent,

ii) against thermal cycling stability,

iii) against long term thermal stability.

The “No performance determined” (NPD) option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State(s) of destination.

Figure ZA.4 gives an example of the CE marking to be given in the commercial documents accompanying the products (e.g. vitrified clay pipes).

CE	*CE conformity marking symbol given in Directive 93/68/EEC*
Any Co Ltd, (*P.O. Box 21, B-1050)* 13	*Name or identifying mark and registered address of the manufacturer.* *Last two digits of the year in which the marking was affixed*
EN 295-1:2013 Vitrified clay pipe for drains and sewers buried in ground **DN 150 – 1,50 – E**	*No. of European Standard and date of its publication* *Description of the product and its intended use and* *Designation of the product*

Reaction to fire, as class	A1
Crushing strength (F_N)	40 kN/m
Longitudinal bending strength:	
- Bending moment resistance (BMR)	4,6 kNm
Dimensional tolerances, concerning:	
- Internal diameter	Pass
- Length	Pass
- Squareness of ends	Pass
- Straightness	Pass
- Continuity of invert	Pass
- Joint inter-changeability	Pass
Watertightness (gas and liquid) and Permeability as:	
- Watertightness	Pass
- Airtightness	Pass
Release of dangerous substances	NPD
Durability of crushing strength and longitudinal bending strength, against**:**	
- Chemical resistance	0,15 %
- Resistance against high pressure water jetting	Pass

Information on mandated essential characteristics

Figure ZA.4 — Example of CE marking in the accompanying documents (for a pipe)

Bibliography

[1] EN 752, *Drain and sewer systems outside buildings*

[2] EN 1295-1, *Structural design of buried pipelines under various conditions of loading — Part 1: General requirements*

[3] EN 12056-1, *Gravity drainage systems inside buildings — Part 1: General and performance requirements*

[4] EN 12056-2, *Gravity drainage systems inside buildings — Part 2: Sanitary pipework, layout and calculation*

[5] EN 12056-3, *Gravity drainage systems inside buildings — Part 3: Roof drainage, layout and calculation*

[6] EN 12889, *Trenchless construction and testing of drains and sewers*

[7] EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

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