

EUROPEAN STANDARD

EN 295-1:1991

NORME EUROPEENNE

EUROPAISCHE NORM

October 1991

UDC 621.643.2.06-033.64:628.2:620.1

Descriptors : Water pipelines, sewage, pipes, tubes, pipe fittings, sandstone products, specifications, joining, dimensions, dimensional tolerances, marking

English version

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

Tuyaux et accessoires en grès et assemblages de tuyaux pour les réseaux de branchement et d'assainissement - Partie 1: Exigences	Steinzeugrohre und Formstücke sowie Rohrverbindungen für Abwasserleitungen und -kanäle - Teil 1: Anforderungen
---	--

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

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

Central Secretariat: rue de Stassart 36, B-1050 Brussels

(c) CEN 1991 Copyright reserved to all CEN members

Ref. No. EN 295-1:1991 E

Contents

	Page		Page
1 General	4	2.15 Chemical resistance	7
1.1 Object and field of application	4	2.16 Hydraulic roughness	7
1.2 References	4	2.17 Abrasion resistance	7
1.3 Definitions	4	2.18 Impermeability of fittings	7
1.3.1 Nominal size	4	3 Joint assemblies	8
1.3.2 Curvature	4	3.1 Jointing materials	8
1.3.3 Joint assembly	4	3.1.1 Rubber sealing elements	8
1.3.4 Bearing elements	4	3.1.2 Polyurethane sealing elements	8
1.3.5 Sealing elements	4	3.1.3 Polypropylene sleeve couplings	8
1.3.6 Fairings	4	- material requirements	8
1.3.7 Minimum bore	4	3.1.4 Polypropylene sleeve couplings	8
1.3.8 Pipe Section	4	- performance requirement	8
1.3.9 Nominal Length	4	3.1.5 Other jointing materials	8
2 Pipes and fittings	4	3.2 Watertightness of joints	8
2.1 Materials and manufacture	4	3.2.1 Internal pressure	8
2.2 Minimum bore	5	3.2.2 External pressure	9
2.3 Length	5	3.3 Angular Deflection	9
2.4 Squareness of ends	5	3.4 Shear resistance	9
2.5 Deviation from straightness	5	3.5 Invert conformity	9
2.6 Water seal of fittings	6	3.6 Joint interchangeability	9
2.7 Angle of curvature and radius of bends	6	3.7 Chemical and physical resistance to effluent	11
2.8 Branch angle of junctions	6	3.7.1 Joint assemblies	11
2.9 Crushing strength (FN)	6	3.7.2 Jointing materials	11
2.10 Bending tensile strength	6	3.8 Thermal cycling stability	11
2.11 Bending moment resistance (BMR)	7	3.9 Long-term thermal stability	11
2.12 Bond strength of adhesive used for fixing fired clay parts together	7	4 Sampling for tests	11
2.12.1 Minimum bending tensile strength	7	5 Designation	11
2.12.2 Minimum strength after immersion	7	6 Marking	12
2.13 Fatigue strength under pulsating load	7	7 Quality Assurance	12
2.14 Watertightness of pipes	7		

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 specifier/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, 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.

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	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

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

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)	22		28		34	
	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 2×10^6 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.

3. Joint assemblies

3.1 Jointing materials

3.1.1 Rubber sealing elements

Rubber sealing elements shall be in accordance with ISO/DIS 4633.¹

Where rubber sealing elements are attached to the pipes they shall in addition, when tested in ozone, show no visible cracking when tested in accordance with clause 14 of EN 295-3.

3.1.2 Polyurethane sealing elements

Polyurethane sealing elements shall meet the material requirements given in Table 7 when tested in accordance with clause 15 of EN 295-3.

Table 7 - Material requirements for polyurethane sealing elements

Test	Units	Requirement	Test Clause in EN 295-3
Tensile strength	N/mm ²	≥2	15.2
Elongation at break	%	≥90	15.2
Hardness	Shore A or IRHD	67±5	15.3
Compression set at 24hrs 70°C	%	<20	15.5
Compression set at 70hrs 23°C	%	<5	15.5
Resistance to ageing hardness	Shore A or IRHD	67±5	15.6
Stress relaxation at $\Delta_{ol.4}$	%	≤14	15.4
Stress relaxation at $\Delta_{ol.5}$	%	≤15	15.4
Behaviour at low temperature	Shore A or IRHD	≤80	15.7

¹ To be changed to EN ... when published

3.1.3 Polypropylene sleeve couplings - material requirements

Polypropylene sleeve couplings made by manufacturers who hold a certification mark licence to EN295 shall meet the material requirements given in Table 8 when tested in accordance with clause 16 of EN 295-3.

Table 8 - Material requirements for polypropylene sleeve couplings

Test	Units	Requirement	Test Clause in EN295-3
Melt flow index	-	≤1,5 times nominal value	16.1
Tensile strength	N/mm ²	≥20	16.2
Elongation at break	%	≥200	16.2
Elevated temperature	-	No defects	16.3

3.1.4 Polypropylene sleeve couplings - performance requirement

Polypropylene sleeve couplings purchased from an outside supplier shall withstand either :

a) a constant internal water pressure of 60 kPa (0,6 bar) for a minimum of 1 minute without visible leakage,

or

b) a constant internal air pressure of 30 kPa (0,3 bar) for 1 minute whilst submerged in water without visible leakage,

when tested in accordance with clause 17 of EN 295-3.

3.1.5 Other jointing materials

Other materials used in joint assemblies shall be in accordance with the pipe and fitting manufacturer's declared specification, which shall include requirements for long term behaviour.

3.2 Watertightness of joints

3.2.1 Internal pressure

Joint assemblies shall satisfy the requirements of 3.3 and 3.4 when tested at internal pressures of 5 kPa (0,05 bar) and 50 kPa (0,5 bar).

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

3.2.2 External pressure

Joint assemblies shall satisfy the requirements of 3.3 and 3.4 when tested at external pressures of 5 kPa (0,05 bar) and 50 kPa (0,5 bar).

3.3 Angular Deflection

One pipe in a joint assembly shall be deflected by the method described in clause 18 of EN 295-3 by the amount specified in table 9 for its relevant nominal size and when so deflected shall withstand constant pressures of both 5 kPa (0,05 bar) and 50 kPa (0,5 bar) as specified in 3.2 for 5 minutes without visible leakage.

Table 9 - Deflection

Nominal size (DN)	Deflection per metre of deflected pipe length (mm)
100-200	80
225-500	30
600-800	20
> 800	10

3.4 Shear resistance

A joint assembly shall be tested by the methods described in clause 18 of EN 295-3. An external load is applied to one pipe to produce a shear load at the joint assembly of 25 N per mm of nominal size.

The joint assembly shall withstand both constant pressures specified in 3.2 for 15 minutes without visible leakage.

Higher figures for shear load resistance may be required if higher crushing strengths than those in table 4 or 5 are declared.

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

3.5 Invert conformity

When tested in accordance with clause 19 of EN 295-3 the difference in invert levels of adjacent pipes and fittings shall not exceed the following values :

5 mm up to and including DN 300
6 mm for greater than DN 300 up to and including DN 600

1 % of the nominal size in mm above DN 600

3.6 Joint interchangeability

Tables 10 and 11 contain seven dimensional jointing systems which are available in Europe. Table 10 is for dimensional jointing systems A, B, C and D, for which the socket or socket fairing internal diameter (d_1) is the controlling dimension. Table 11 covers dimensional jointing systems E, F and G for which the spigot outside diameter (d_2) is the controlling dimension (see figure 1).

Pipes and fittings of the same dimensional jointing system with socket controlled dimensions (Table 10) of the same nominal size, and the same class are directly interchangeable. There is no interchangeability between pipes and fittings of the same size and different classes.

Pipes and fittings of the same dimensional jointing system with spigot controlled dimensions for pipes of nominal size equal to or greater than DN 250 (Table 11) of the same nominal size and the same class are directly interchangeable.

Other dimensional jointing systems with different values of d_1 and d_2 are permitted provided that the pipes and fittings also comply with 2.2 and provided the joint assemblies comply with 3.1 where appropriate and 3.2 to 3.5, 3.7 to 3.9.

Manufacturers of dimensional jointing systems with dimensions differing from tables 10 and 11 shall, when necessary, offer adaptors to connect to the dimensional requirements of systems given in tables 10 and 11.

Table 10 - Dimensions and tolerances for socket controlled jointing systems

 d_i = internal diameter of socket or socket fairing

DN	Class Number	FN kN/m	System A		System B		System C		System D	
			d_i mm	+ mm	d_i mm	+ mm	d_i mm	+ mm	d_i mm	+ mm
100	-	28							146,8	0,5
150	-	28					197,0	0,5	204,5	0,5
150	-	34					202,0	0,5	212,5	0,5
150	-	(40)	185,8	0,2	195,0	0,5	208,0	0,5		
200	120	24					256,0	0,5		
200	160	32			250,0	0,5	260,0	0,5	265,0	0,5
200	200	40	244,5	0,2	252,0	0,5	269,0	0,5	269,0	0,5
200	(240)	48	248,5	0,2	254,0	0,5	275,0	0,5		
225	120	28								
225	160	36	276,0	0,2					294,6	0,5
225	200	45	281,0	0,2					306,0	0,5
250	120	30					315,0	0,5		
250	160	40	306,8	0,2	309,0	0,5	317,5	0,5	331,3	0,6
250	200	50	313,0	0,2	313,0	0,5	328,0	0,5	336,5	0,6
250	(240)	60	319,0	0,2	319,0	0,5	341,5	0,5		
300	120	36					375,5	0,5	385,8	0,6
300	160	48	367,7	0,25			371,5	0,5	404,4	0,6
300	200	60	373,7	0,25			402,0	0,5	409,8	0,6
350	120	42					431,5	0,5	443,0	0,7
350	160	56					433,5	0,5	455,0	0,7
350	200	70					459,0	0,5	474,3	0,7
400	95	38					481,0	0,5		
400	120	48					483,5	0,5	521,0	0,75
400	160	64					507,5	0,5	529,0	0,75
400	(200)	80					515,5	0,5	545,0	0,75
450	95	43							572,0	0,75
450	120	54					547,0	0,5	583,1	0,75
450	160	72					579,0	0,5	600,0	0,75
500	95	48					609,0	0,5	639,0	0,5
500	120	60					605,0	0,5	651,5	0,5
500	160	80					637,0	0,5	662,3	0,5
600	L	48					697,0	0,5		
600	95	57					720,0	0,5	739,8	0,5
600	120	72					737,5	0,5	751,0	0,5
600	(160)	96					758,0	0,5		
700	L	60					826,5	0,5	842,0	0,6
700	95	67					840,0	0,5	854,4	0,6
700	120	84					871,0	0,5		
800	L	60					932,0	0,5	958,6	0,7
800	95	76					950,0	0,5	967,6	0,7
800	120	96					976,0	0,5		
1 000	L	60					1 152,5	0,5	1 179,3	0,8
1 000	95	95					1 203,0	0,5	1 195,5	0,8
1 000	(120)	120								
1 200	L	60					1 380,0	0,5		

No value of d_i when taken to an extreme of tolerance may approach within 1,0mm of the range for any other system specified in this table.

Table 11 - Dimensions and tolerances for spigot controlled jointing systems

d_3 = Mean value of the spigot outside diameter
(i.e. circumference $\div \pi$)

DN	Class	FN	System E		System F		System G	
			d_3 mm	\pm mm	d_3 mm	\pm mm	d_3 mm	\pm mm
100	-	22						
100	-	28					131,40	2,00
100	-	34			131	1,5	139,10	2,00
100	-	(40)	122	1,5	138	2,0		
150	-	22					187,20	3,50
150	-	28					187,75	2,75
150	-	34			186	2,0	196,20	3,50
150	-	(40)	178	1,5	194	2,0		
200	120	24					244,90	4,00
200	160	32	231	2,0	242	3,0	244,75	2,25
200	200	40	234	2,0	248	3,0	252,90	4,00
200	(240)	48	237	2,0				
225	120	28			280	2,0	272,75	2,25
225	160	36	259	2,0	271	3,0	278,00	4,00
225	200	45	263	2,0			284,00	4,00
250	120	30					310,00	3,50
250	160	40	287	3,0	287	3,0	320,00	3,50
250	200	50	292	3,0	292	3,0		
250	240	60	296	3,0	296	3,0		
300	120	36					374,00	4,00
300	160	48	348	4,0			380,00	4,00
300	200	60	354	4,0				
400	95	38					486,00	5,00
400	120	48	459	5,0			498,00	5,00
400	160	64	469	5,0				

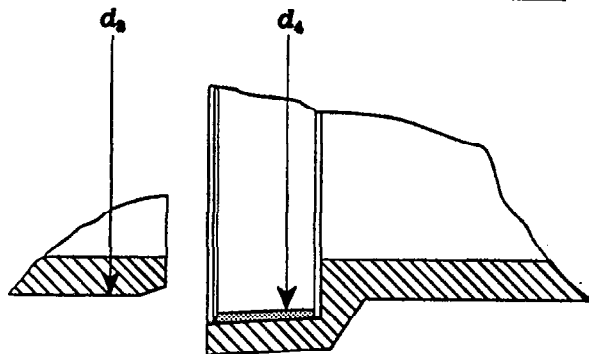


Figure 1. Joint dimensions

3.7 Chemical and physical resistance to effluent

3.7.1 Joint assemblies

Joint assemblies shall be tested by the methods described in clause 20 of EN 295-3 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 3.2 for 5 minutes without visible leakage.

3.7.2 Jointing materials

Clause 22 of EN 295-3 gives a method of determining the chemical resistance index (CR) of jointing materials for use in pipes carrying effluents which are more aggressive than normal sewage.

3.8 Thermal cycling stability

Joint assemblies shall withstand cyclic temperature changes between -10°C and $+70^{\circ}\text{C}$ without visible impairment when tested in accordance with clause 21.1 of EN 295-3.

Finally, a water tightness test as specified in 3.2.1 shall be carried out.

3.9 Long-term thermal stability

Joint assemblies shall withstand a long-term thermal stability test in accordance with clause 21.2 of EN 295-3 for seven days at a temperature of $45^{\circ}\text{C} + 5^{\circ}\text{C} - 0^{\circ}\text{C}$.

Finally, a water tightness test as specified in 3.2.1 shall be carried out.

4. Sampling for tests

Sampling for pipes, fittings and joint assemblies is given in EN 295-2.

5. Designation

The following shall be used for the designation of pipes and fittings:

Block 1	Denomination
Block 2	EN 295-1
Block 3	Individual Item Block
Block 3.1	Nominal Size
Block 3.2	Strength
Block 3.3	Jointing system

Example 1: PIPE EN295-1-DN300-FN48-C

Example 2: BEND45 EN295-1-DN200-FN40-E

6. Marking

- 6.1 All pipes and fittings shall be marked with :
- EN295 -1
 - CE symbol (To be added after confirmation of the EC Council Regulation on the use of the CE symbol)
 - identification symbol of the third party certification body
 - manufacturer's identification
 - date of manufacturing
 - nominal size (DN...)
 - dimensional jointing system

In addition pipes shall be marked with :

- crushing strength in kN/m
- bending moment resistance in kN.m if appropriate

This marking shall preferably be impressed before firing, or, if this is not possible, shall be indelibly done after firing on each pipe and fitting.

In addition bends and junctions shall be marked to indicate the angle.

6.2 All flexible mechanical joints supplied as separate components shall be marked to identify the manufacturer and the dimensional jointing system. Connectors and adaptors shall be marked to identify the dimensional jointing systems which they are designed to connect.

6.3 Products shall be marked with the number of this standard only if certified in accordance with clause 7 by a third party certification body.

7. Quality Assurance

Quality Assurance shall be in accordance with EN 295-2.