



Flowtite Pipe Systems

Gravity Sewer



AMIATIT PIPE SYSTEMS

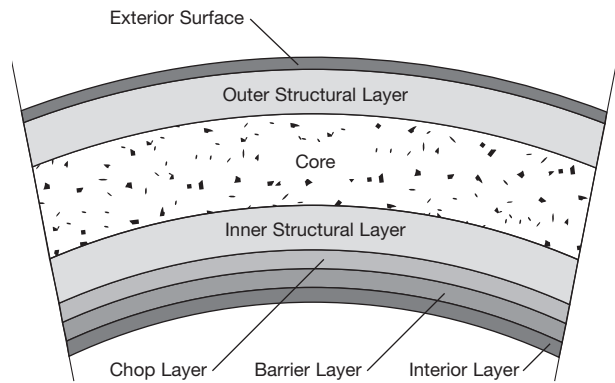
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1 Production Process

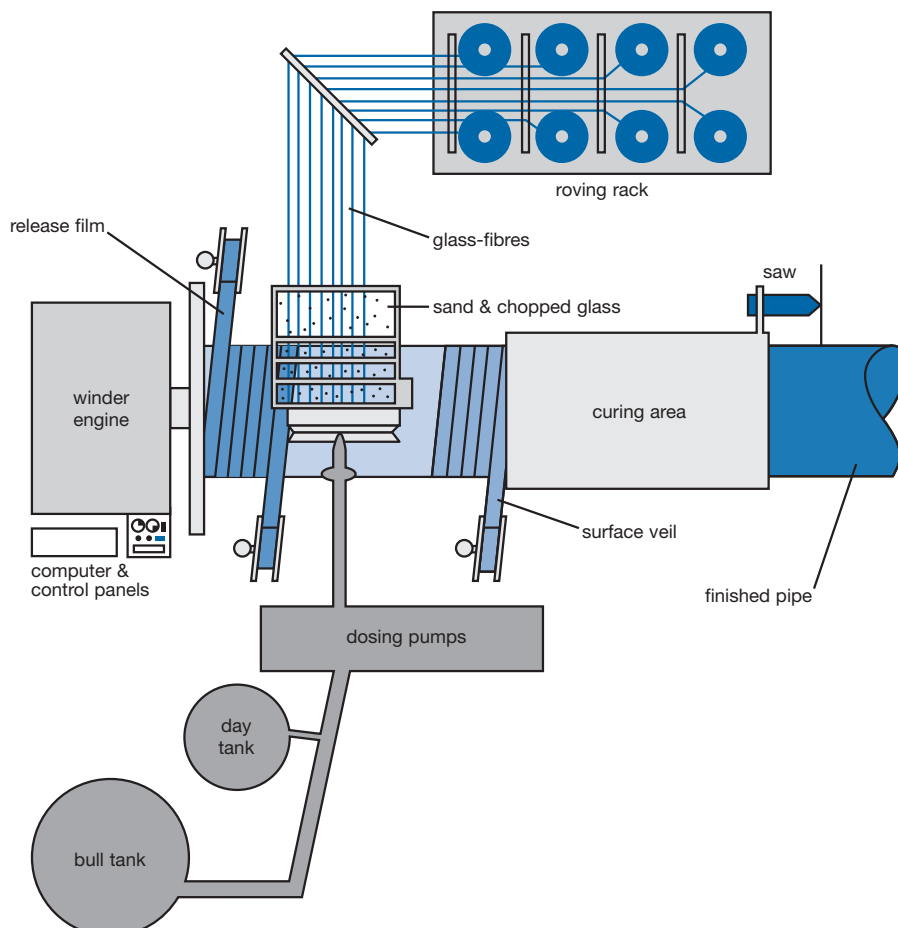
The basic raw materials used in the FLOWTITE pipe's manufacturing are resin, fibreglass and silica sand. Usually unsaturated polyester resins are used since they give good performance for potable water applications.

FLOWTITE pipes are manufactured using the continuous advancing mandrel process, which represents the state of the art in GRP pipe production. This process allows the use of continuous glass fibre reinforcements in the circumferential direction. For a pressure pipe or buried conduit, the principle stress is in the circumferential direction, thus incorporating continuous reinforcements in this direction yields a higher performing product at a lower cost. Using technology developed by material specialists, a very dense laminate is created that maximizes the contribution from three basic raw materials. Both continuous glass fibre rovings and choppable roving are incorporated for high hoop strength and axial reinforcement. A sand fortifier is used to provide increased stiffness by adding extra thickness, placed near the neutral axis in the core. With the FLOWTITE dual resin delivery system, the equipment has the capability of applying a special inner resin liner for severe corrosive applications while utilising a less costly resin for the structural and outer portion of the laminate.

Taking advantage of the winding process, other materials, such as a glass veil or polyester veil can be used to enhance the abrasion resistance and the finishing of the pipe.



The figure above shows a typical cross section of a pipe laminate. This section, as well as the way of applying and placing different raw materials, can differ depending on the pipe application.



2 Product Advantages

FLOWTITE Technology has been able to bring a product to the market that can provide a low cost, long-term piping solution to customers around the world. The long list of features and benefits add up to provide the optimum installed and life cycle cost system.

Features & Benefits

Corrosion-resistant

- Long, effective service-life materials
- No need for linings, coatings, cathodic protection, wraps or other forms of corrosion protection
- Low maintenance costs
- Hydraulic characteristics essentially constant over time

Light weight

(1/4 weight of ductile iron; 1/10 weight of concrete and clay)

- Low transport costs (nestable)
- Eliminates need for expensive pipe handling equipment

Short and long standard lengths

(up to 18 metres with individual lengths on request)

- Fewer joints reduce installation time
- More pipe per transport vehicle means lower delivery costs

Extremely smooth bore

- Low friction loss means lower operating costs
- Minimum slime build-up can help lower cleaning costs

Precision FLOWTITE

with elastomeric gaskets

- Tight, efficient joints designed for coupling to eliminate infiltration and ex-filtration
- Ease of joining, reducing installation time
- Accommodates small changes in line direction without fittings or differential settlement

Flexible manufacturing

- Custom diameters can be process manufactured to provide maximum flow volumes with ease of installation for rehabilitation lining projects

High technology pipe design

- Lower wave celerity than other piping materials can mean less cost when designing for surge and water hammer pressures

High technology pipe manufacturing system

- High and consistent product quality worldwide which produces pipe ensures a reliable product that complies to stringent performance standards (AWWA, ASTM, DIN, EN, etc.)

- Quick and easy installation with construction site equipment due to light weight
- Fast installation with a reduced number of couplings due to pipe lengths up to 18 m
- simple and inexpensive tightness tests
- long usage with consistently high flow rates
- minimal effort for repairs and maintenance
- excellent corrosion resistance
- reinforced inner surface with a high resistance against abrasion

Due to these factors, projects made with FLOWTITE pipe systems are very economical and long-lasting with low maintenance efforts over the years.

3 Certificates and Approvals

FLOWTITE pipe systems have been tested and approved for the conveyance of gravity sewer lines meeting many of the world's leading authorities' and testing institutes' criteria, including:

- SABS South African bureau of standards
- Kitemark – UK
- Bureau of Indian standards
- AENOR Asciacionpanole de normalizacion y certificacion – Spain
- COBRTI INSTAL – Poland
- IRAM – Instituto de Racionalización de Materiales – Argentina
- Kiwa – Komo product certificate K22463/03 – The Netherlands
- BCCA Belgian Construction Certification Association BENOR BB 652-665 – Belgium
- ON Österreichisches Normungsinstitut ON-N 2005 085 - Austria
- IGH Certifikat sukladnosti br. 23-070/06 – Croatia
- Institut pro Testování a certifikaci, A.S.01 0187 V/AO/a – Czech Republic
- Igmata Certifikat kontrole proizvodnje VOL2P-CPD-0067 – Slovenia
- CSTB Centre Scientifique et Technique du Bâtiment CSTBat-1/01-AS-136 FLOWTITE G – France
- Centralny Ośrodek Badawczo - Rozwojowy Techniki InstalacyjnejAT/2002-02-1285-03 – Poland
- Deutsches Institut für Bautechnik (DIBt) Z-42.1-317 – Germany

FLOWTITE pipe systems fulfil the product standards AWWA, ASTM, DIN, ISO and EN. Other local approvals are also available, dependent on country specific requirements. Amiantit is participating in the development of all these standards with representatives of all the worldwide organisations, thereby ensuring performance requirements will result in reliable products.

4 Quality Characteristics

4.1 Raw Materials

Raw materials are delivered with vendor certification demonstrating their compliance with FLOWTITE quality requirements. In addition, all raw materials are sample tested prior to their use. These tests ensure that the pipe materials comply with the specifications as stated. Raw materials should be, according to FLOWTITE quality requirements, pre-qualified in such a way that their suitability to be used in the process and in the final product is demonstrated.

Raw Materials used in pipe production are:

- Glass
- Resin
- Catalyst
- Sand
- Additives

Only FLOWTITE approved raw materials can be used for the production of the FLOWTITE pipe.

Glass

Glass is specified by tex which is = weight in grams/1000 meters length

Hoop roving: Continuous roving used in different tex for the production of the FLOWTITE pipe

Chop roving cut directly on the machine to provide strength in different directions.

Resin

Only qualified resin for the winding process. Usually it is delivered in drums or bulk. The resin is prepared in day tanks at the winder. Normal application temperature is 25°C. Resin is delivered from the producer and may be diluted before use on the winder with styrene to reach the required and acceptable viscosity, as defined by FLOWTITE Technology.

Catalyst

The right amount of catalyst is added to the resin for curing the mix right before application on the mandrel. Only approved catalysts are used in the manufacturing process of the FLOWTITE pipes.

Sand

Sand is added to the core of the pipe and the inner layer of couplings. High silica sand must be within the FLOWTITE specifications for approved raw material.

Additives

Additives are used as accelerator for the resin and are mixed with it in the day tanks. The additives are available in different concentration and may be diluted by the producers in mineral spirit to reach the required concentration needed for the production of the FLOWTITE pipes.

4.2 Physical Properties

The manufactured pipe's hoop and axial load capacities are verified on a routine basis. In addition, pipe stiffness and deflection tests are carried out in accordance with our internal FLOWTITE quality regulations.

4.3 Finished Pipe Properties

100% of all finished pipes for gravity sewer are checked for the following:

- Visual inspection
- Barcol hardness
- Wall thickness
- Section length
- Diameter

4.4 Other Quality Characteristics

More detailed information about many other quality characteristics such as:

- Long-term Ring Bending
- Hydro-testing
- Surge and Water Hammer
- Load Capacity Values
- Hoop Tensile Load Capacity
- Axial Tensile Load Capacity
- Flow Velocity
- UV Resistance
- Poisson's Ratio
- Flow Coefficients
- Abrasion Resistance

can be found in our brochure "Technical Characteristics" of FLOWTITE pipes.

5 Product Range

FLOWTITE pipe systems are supplied in nominal diameters ranging from DN 80 up to DN 4000 mm. The nominal diameter is considered as the inside diameter. The **standard** diameter range in mm is defined as below:

100 · 150 · 200 · 250 · 300 · 350 · 400 · 450 · 500 · 600 · 700 · 800 · 900 · 1000
1100 · 1200 · 1400 · 1600 · 1800 · 2000 · 2200 · 2400 · 2600 · 2800 · 3000

The locally manufactured standard diameter range varies according to manufacturing facilities. For detailed information, please do not hesitate to contact your on-site contact. Larger diameters than DN 3000 up to 4000 mm and other diameters are available on request.

5.1 Stiffness Classes

FLOWTITE pipe systems show the following specific initial stiffness (EI/D^3) expressed in N/m^2 and the FLOWTITE standard is defined as follows:

Stiffness Class SN	Stiffness (N/m^2)
2500	2500
5000	5000
10000	10000

Table 5-1 Stiffness Class

Other stiffness classes are available on request. We also supply custom-designed pipe systems with a stiffness tailored to the needs of the project.

5.2 Pressure

Our FLOWTITE pipe systems for gravity sewer applications are supplied in the standard pressure class 1.

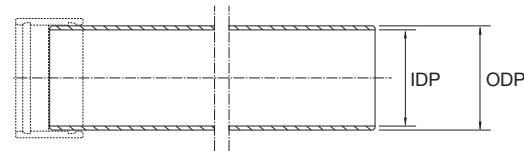
Custom-designed pipes with pressure tailored to the needs of the project are available on request.

5.3 Length

Our FLOWTITE Pipes for gravity sewer are available in standard length of 3, 6, 12 and 14 m. Other tailor-made lengths are available on request.

5.4 Standard Pipe and Coupling Data Sheet

Our FLOWTITE pipe systems for gravity sewer applications are supplied in the standard diameter range, pressure and stiffness classes as listed below. Other diameters and pressure classes are available on request.



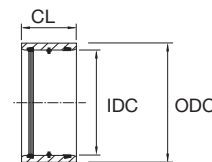
Pipe FSP

"B2" - OD Series	SN	10000			
	PN	1			
		DN	IDP +0.5	ODP -0.5	kg/m*
		mm	mm	mm	
		100	109.2	116.0	1.9
		150	158.8	168.0	4.0
		200	208.9	220.5	6.9
		250	258.3	272.1	10.3

* Approx. Weights

Table 5-2 Small Diameters - Data & Weight

SN = Pipe stiffness, PN = Nominal Pressure, IDP = Inside diameter of pipe, ODP = Outside diameter of pipe



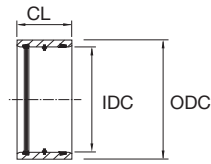
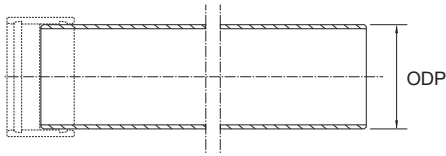
Double Bell Coupling FSC

"B2" - OD Series	SN	10000				
	PN	1				
		DN	IDC	ODC	CL	kg/pc*
		mm	mm	mm	mm	
		100	116.5	138.9	150	1.2
		150	168.5	190.9	150	1.5
		200	222.0	256.4	175	3.6
		250	273.6	308.0	175	4.4

* Approx. Weights

Table 5-3 Small Diameters - Data & Weight

SN = Pipe stiffness, PN = Nominal Pressure, ODC = outside diameter of coupling, IDC = Inside diameter of coupling, CL = Coupling length



Pipe FSP

DN	ODP	SN 2500	SN 5000	SN 10000
	0 +/- 0.7	Weight	Weight	Weight
	mm	kg/m*	kg/m*	kg/m*
300	324.25	9.1	11.3	14.0
350	376.15	12.2	15.1	18.8
400	427.05	15.5	19.3	24.2
450	477.95	19.3	24.3	29.6
500	529.85	23.8	29.4	36.9
600	616.75	32.4	40.3	49.5
700	718.75	43.5	54.3	66.0
800	820.75	56.7	70.1	85.9
900	922.75	71.9	87.9	109.4
1000	1024.75	87.8	108.0	134.3
1100	1126.75	105.4	131.6	161.8
1200	1228.75	126.1	155.6	192.8
1300	1330.50	148.5	183.0	224.8
1400	1432.75	170.9	211.1	260.8
1500	1534.75	195.7	241.5	298.6
1600	1636.75	222.7	275.0	338.9
1700	1738.70	280.8	347.5	428.0
1800	1840.75	280.8	347.5	428.0
1900	1942.70	346.0	426.4	527.9
2000	2044.75	346.0	426.4	527.9
2100	2146.50	380.4	469.4	581.2
2200	2248.75	416.6	514.3	636.7
2300	2350.70	456.3	563.1	696.9
2400	2452.75	495.3	611.6	756.1
2500	2554.75	535.7	666.1	819.7
2600	2656.75	580.8	719.6	888.8
2700	2758.75	624.5	774.6	957.4
2800	2860.75	673.2	831.6	1029.6
2900	2962.75	721.1	890.5	1102.7
3000	3064.75	769.4	951.3	1180.0

* Approx. Weights

Table 5-4 Large Diameters – Data & Weight

Double Bell Coupling FSC

SN	2500 / 5000 / 10000			
	Length CL	IDC +/-0.5	ODC	
	DN	mm	mm	kg/pc*
300	240	328.0	357.5	6.9
350	240	379.9	409.4	8.0
400	240	430.8	460.3	9.0
450	240	481.7	511.2	10.0
500	240	533.6	563.1	11.0
600	240	620.5	650.0	12.8
700	240	722.5	752.6	15.2
800	240	824.5	856.0	18.1
900	240	926.5	959.0	21.0
1000	240	1028.5	1061.8	23.8
1100	240	1130.5	1164.4	26.6
1200	240	1232.5	1266.8	29.3
1300	240	1334.5	1369.6	32.5
1400	240	1436.5	1472.6	36.0
1500	240	1538.5	1575.4	39.5
1600	240	1640.5	1678.4	43.1
1700	240	1742.5	1824.2	46.8
1800	240	1844.5	1884.2	50.8
1900	240	1946.5	2090.8	55.3
2000	240	2048.5	2090.8	60.2
2100	240	2150.5	2194.2	65.4
2200	240	2252.5	2297.4	70.5
2300	240	2354.5	2400.8	76.0
2400	240	2456.5	2504.0	81.6
2500	240	2555.0	2607.6	87.0
2600	240	2660.5	2710.8	93.0
2700	240	2762.5	2814.2	100.0
2800	240	2864.5	2918.0	106.0
2900	240	2966.5	3021.6	112.0
3000	240	3068.5	3125.0	119.0

* Approx. Weights

Table 5-5 Large Diameters – Data & Weight

6 Pipe joining

Double Bell Coupling (FSC)

FLOWTITE pipe sections are typically joined using FLOWTITE gravity sewer couplings (FSC). Pipe and couplings may be supplied separately, or the pipe may be supplied with a coupling installed on one end. The FLOWTITE coupling utilises an elastomeric gasket for sealing. The gasket sits in a precision-machined groove in each end of the coupling and seats and seals against a spigot surface.

! **Note:** Detailed installation instructions can be found in our separate publications for pipe installation.

Joint Angular Deflection

The joint is extensively tested and qualified in accordance with ASTM D4161, ISO DIS8639 and EN 1119. Maximum angular deflection (turn) at each coupling joint, measured as the change in adjacent pipe centre lines, must not exceed the amounts given in table below.

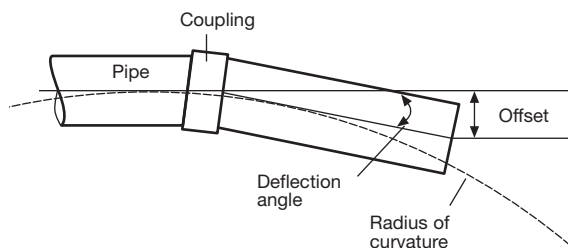


Figure 6-1 Offset and Radius of Curvature

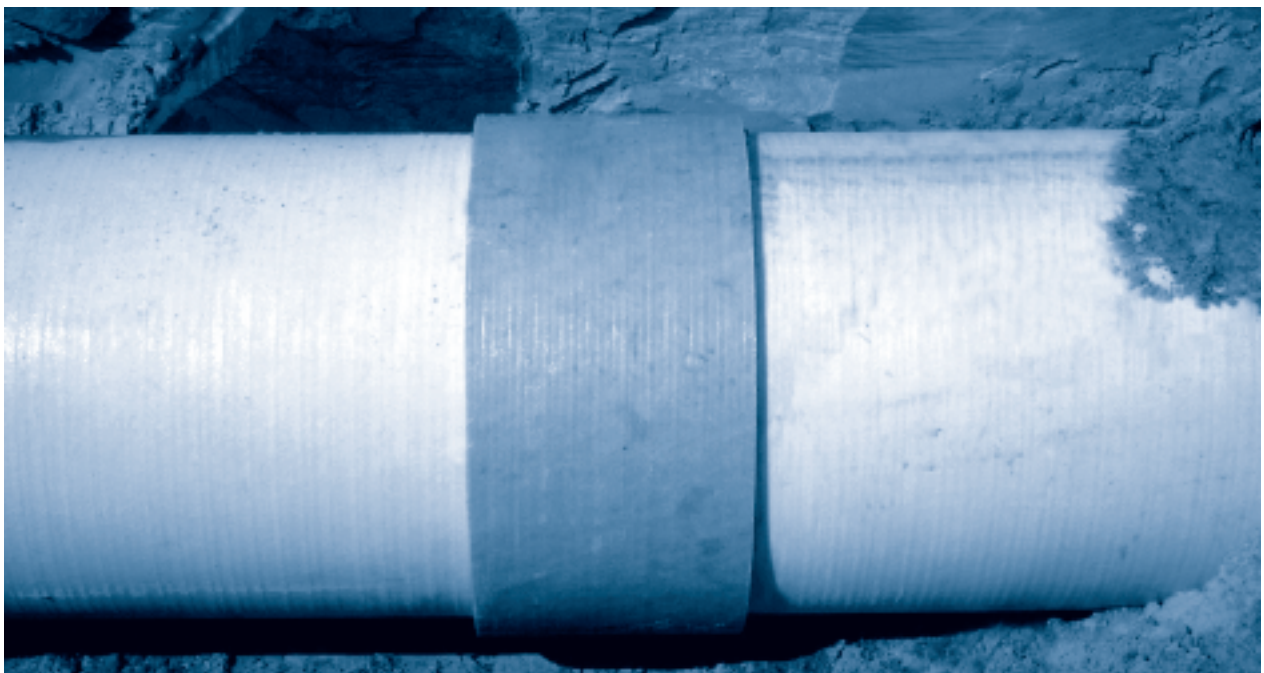
The pipes must be joined in a straight alignment, but not all the way to the home line, and thereafter deflected angularly as required (**Figure 6-1**).

Nom Pipe Diameter (mm)	Angular deflection (degrees)
DN ≤ 500	3.0
15 < DN ≤ 800	2.0
900 < DN ≤ 1800	1.0
DN > 1800	0.5

Table 6-1 Angular Deflection at Double Coupling Joint

Angle of Deflection (deg)	Maximum Offset (mm) Pipe length			Radius of Curvature (m) Pipe length		
	3 m	6 m	12 m	3 m	6 m	12 m
3.0	157	314	628	57	115	229
2.5	136	261	523	69	137	275
2.0	105	209	419	86	172	344
1.5	78	157	313	114	228	456
1.3	65	120	240	132	265	529
1.0	52	105	209	172	344	688
0.8	39	78	156	215	430	860
0.5	26	52	104	344	688	1376

Table 6-2 Offset and Radius of Curvature



7 Accessories

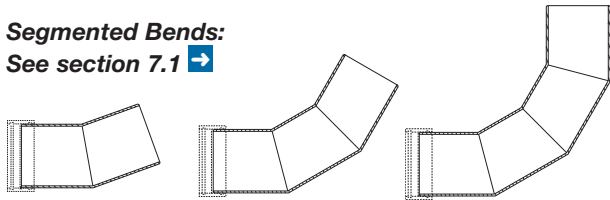
- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08

FLOWTITE Technology has created a standardised line of GRP fittings that are moulded or fabricated using the same materials that are used to produce FLOWTITE gravity sewer pipe. One of the benefits of this pipe system is the ability to fabricate a wide assortment of fittings, standard as well as non-standard.

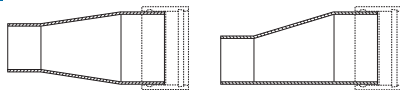
The standard delivery of our fittings include the coupling pre-mounted at one/two ends. Additionally we are able to supply complete spools with pre-installed flange connections. The manufacturing of our accessories follows internationally well accepted ISO standards.

By ordering fittings in dimensions above DN 1600 it has to be checked if the requested fittings can be transported or if it has to be delivered in parts and assembled on site!

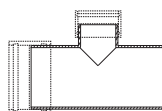
Segmented Bends:
See section 7.1 →



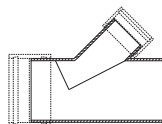
Segmented Reducers
– Concentric & Eccentric – :
See section 7.2 →



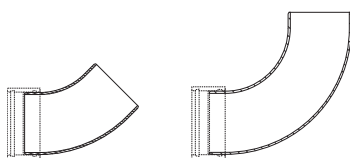
Segmented Tees
– Equal & Reduced – :
See section 7.3 →



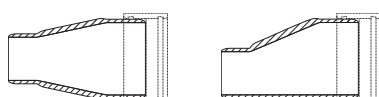
Segmented Branches 45°
– Equal & Reduced – :
See section 7.4 →



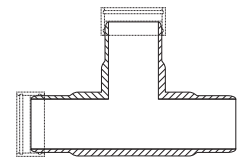
Moulded Bends:
See section 7.5 →



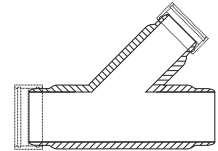
Moulded Reducers
– Concentric & Eccentric – :
See section 7.6 →



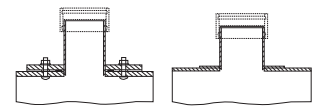
Moulded Tees
– Equal & Reduced – :
See section 7.7 →



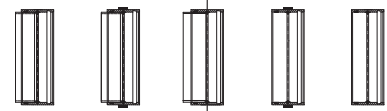
Moulded Branches 45°
– Equal & Reduced – :
See section 7.8 →



Saddle Pieces
– Screwed & Glued – :
See section 7.9 – 7.12 →



Wall Couplings:
See section 7.13 →



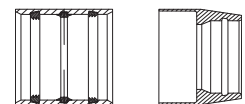
End-Caps:
See section 7.14 →



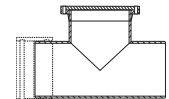
Socket Plugs:
See section 7.15 →



Adapter Couplings
– Clay & PVC – :
See section 7.16 – 7.17 →



Segmented Inspection Pieces:
See section 7.18 →



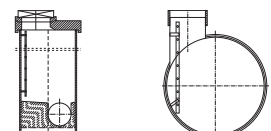
Wall Connection Pieces:
See section 7.19 – 7.21 →



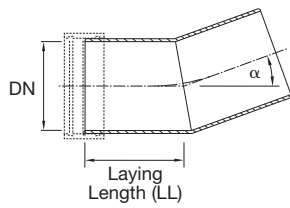
Short Section Pipes:
See section 7.22 →



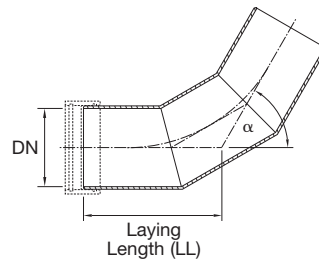
Manholes:
See section 7.23 →



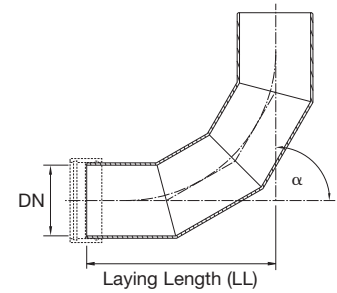
7.1 Segmented Bends



One Segmented Bend



Two Segmented Bend



Three Segmented Bend

"B2" OD Series	Angle α						
	11.25°	15°	22.5°	30°	45°	60°	90°
DN	No. of Mitres with Laying Length (LL)						
mm	1	1	1	1	2	2	3
100	250	250	250	250	250	300	350
150	250	250	250	250	300	300	400
200	250	250	250	300	350	400	500
250	300	300	300	300	400	450	600
300	400	350	400	400	500	550	750
350	400	400	400	450	550	600	800
400	450	450	450	450	600	650	900
450	450	450	500	500	600	700	1000
500	450	450	500	500	650	750	1050

Table 7-1-1 Small Diameters – Laying Length LL in mm – Stiffness Classes acc. to Table 5-1

	Angle α						
"B1" OD Series	11.25°	15°	22.5°	30°	45°	60°	90°
DN	No. of Mitres with Laying Length (LL)						
mm	1	1	1	1	2	2	3
600	400	400	400	450	600	700	1100
700	400	400	450	450	650	800	1200
800	450	450	450	500	700	850	1350
900	450	450	500	550	800	950	1500
1000	450	500	500	550	850	1000	1650
1100	500	500	550	600	900	1100	1800
1200	500	550	600	600	950	1200	1950
1300	600	600	650	700	1050	1300	2100
1400	600	600	650	700	1100	1350	2250
1500	650	650	700	750	1200	1450	2400
1600	650	700	750	800	1250	1550	2550
1700	650	700	750	800	1300	1600	2700
1800	700	750	800	850	1350	1700	2850
1900	700	750	800	850	1400	1750	2950
2000	700	750	800	900	1450	1800	3100
2100	700	750	800	900	1500	1850	3200
2200	700	750	800	900	1550	1950	3350
2300	700	750	800	950	1550	2000	3450
2400	700	750	800	1000	1550	2100	3600
2500	700	750	800	1000	1600	2200	3750
2600	700	800	900	1000	1700	2200	3800
2700	800	800	900	1000	1800	2200	4000
2800	800	800	900	1000	1800	2300	4100
2900	800	800	900	1000	1900	2400	4200
3000	800	800	900	1100	1900	2400	4300

Table 7-1-2 Large Diameters – Laying Length LL in mm – Stiffness Classes acc. to Table 5-1

01

02

03

04

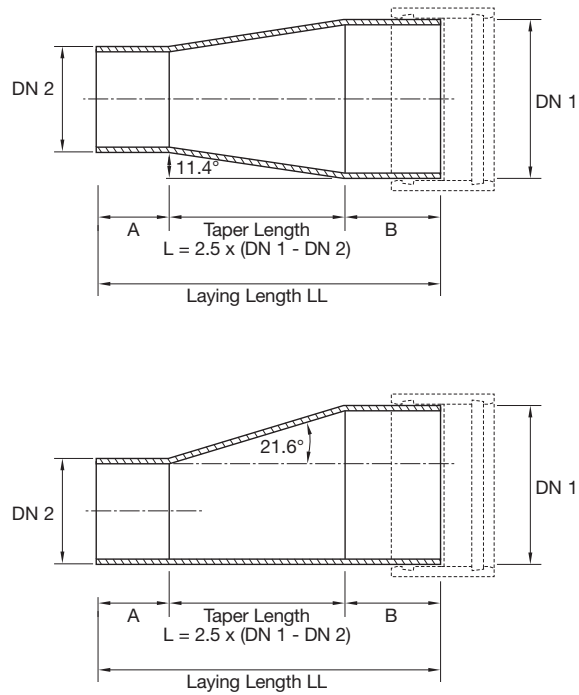
05

06

07

08

7.2 Segmented Reducers – Concentric & Eccentric –



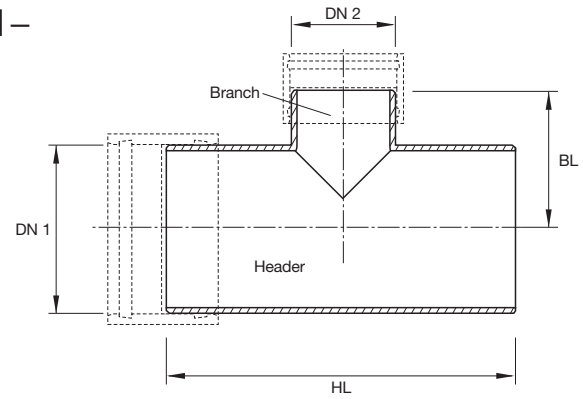
DN 1 [mm]	DN 2 [mm]	Taper Length L [mm]	Pipe Length A=B [mm]	Laying Length LL [mm]
150	100	125	300	725
200	100	250	300	850
200	150	125	300	725
250	150	250	300	850
250	200	125	300	725
300	200	250	400	1050
300	250	125	400	925
350	250	250	400	1050
350	300	125	400	925
400	300	250	400	1050
400	350	125	400	925
450	350	250	400	1050
450	400	125	400	925
500	400	250	400	1050
500	450	125	400	925
600	400	500	500	1300
600	450	375	400	1175
600	500	250	400	1050
700	500	500	400	1300
700	600	250	400	1050
800	600	500	400	1300
800	700	250	400	1050
900	700	500	400	1300
900	800	250	400	1050
1000	800	500	400	1300
1000	900	250	400	1050
1100	900	500	500	1500
1100	1000	250	500	1250
1200	800	1000	500	2000
1200	1000	500	500	1500
1200	1100	250	500	1250
1300	1100	500	500	1500
1300	1200	250	500	1250
1400	1200	500	500	1500
1400	1300	250	500	1250

Table 7-2-1 Concentric & Eccentric Reducers – Stiffness Classes acc. to Table 5-1

DN 1 [mm]	DN 2 [mm]	Taper Length L [mm]	Pipe Length A=B [mm]	Laying Length LL [mm]
1500	1300	500	600	1700
1500	1400	250	600	1450
1600	1200	1000	600	2200
1600	1400	500	600	1700
1600	1500	250	600	1450
1700	1500	500	600	1700
1700	1600	250	600	1450
1800	1600	500	600	1700
1800	1700	250	600	1450
1900	1700	500	600	1700
1900	1800	250	600	1450
2000	1800	500	600	1700
2000	1900	250	600	1450
2100	1900	500	600	1700
2100	2000	250	600	1450
2200	2000	500	600	1700
2200	2100	250	600	1450
2300	2100	500	600	1700
2300	2200	250	600	1450
2400	2200	500	600	1700
2400	2300	250	600	1450
2500	2300	500	600	1700
2500	2400	250	600	1450
2600	2200	1000	600	2200
2600	2400	500	600	1700
2700	2500	500	600	1700
2700	2600	250	600	1450
2800	2400	1000	600	2200
2800	2600	500	600	1700
2900	2700	500	600	1700
2900	2800	250	600	1450
3000	2600	1000	600	2200
3000	2800	500	600	1700

Table 7-2-2 Concentric & Eccentric Reducers – Stiffness Classes acc. to Table 5-1

7.3 Segmented Tees – Equal & Reduced –



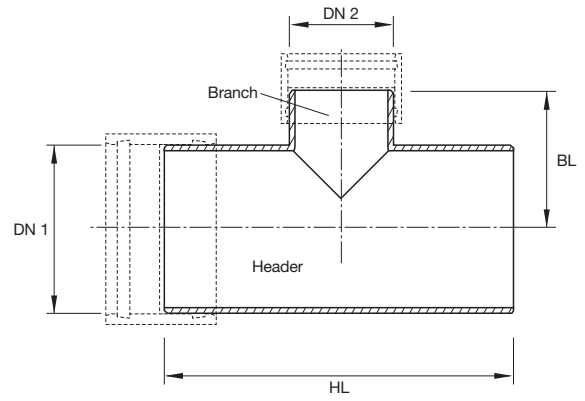
DN 2 = 100 – 1300 mm

DN 1 [mm] \ DN 2 [mm]	100		150		200		250		300		350		400		450	
	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL
300	720	380	780	380	820	400	880	400	920	460	-	-	-	-	-	-
350	720	400	780	400	820	420	880	420	920	500	980	500	-	-	-	-
400	720	440	780	440	820	440	880	440	920	520	980	520	1020	520	-	-
450	720	460	780	460	840	480	880	480	940	540	980	540	1040	540	1100	560
500	720	480	780	480	840	500	880	500	940	560	1000	580	1040	580	1100	580
600	780	520	840	520	900	540	940	540	1000	620	1060	620	1100	620	1180	640
700	800	580	860	580	900	600	960	600	1020	660	1060	660	1120	680	1180	680
800	800	620	860	640	900	640	960	660	1020	720	1080	720	1120	720	1180	740
900	800	680	860	680	920	700	980	700	1020	780	1080	780	1140	780	1200	780
1000	850	750	900	750	950	750	1000	750	1050	850	1100	850	1150	850	1200	850
1100	850	800	900	800	950	800	1000	850	1050	900	1100	900	1150	900	1200	900
1200	850	850	900	850	950	900	1000	900	1050	950	1100	950	1150	950	1250	950
1300	850	900	950	900	1000	950	1050	950	1100	1000	1150	1000	1200	1000	1250	1000
1400	900	950	950	950	1000	1000	1050	1000	1100	1050	1150	1050	1200	1050	1250	1050
1500	900	1000	950	1000	1000	1050	1050	1050	1150	1100	1200	1100	1250	1100	1300	1100
1600	950	1050	1000	1050	1050	1100	1100	1100	1150	1150	1200	1150	1250	1150	1300	1150
1700	950	1100	1000	1100	1050	1150	1100	1150	1150	1200	1200	1200	1250	1200	1300	1200
1800	1000	1200	1050	1200	1100	1200	1150	1200	1200	1250	1250	1250	1300	1250	1350	1300
1900	1000	1250	1050	1250	1100	1250	1150	1250	1200	1300	1250	1300	1300	1300	1350	1350
2000	1000	1300	1100	1300	1100	1300	1200	1300	1300	1400	1300	1400	1400	1400	1400	1400
2100	1100	1400	1100	1400	1200	1400	1200	1400	1300	1400	1300	1400	1400	1400	1400	1500
2200	1100	1400	1100	1400	1200	1400	1200	1400	1300	1500	1300	1500	1400	1500	1500	1500
2300	1100	1500	1200	1500	1200	1500	1300	1500	1300	1600	1400	1600	1400	1600	1500	1600
2400	1100	1500	1200	1500	1200	1500	1300	1500	1300	1600	1400	1600	1400	1600	1500	1600
2500	1100	1600	1200	1600	1200	1600	1300	1600	1400	1700	1400	1700	1500	1700	1500	1700
2600	1200	1600	1200	1600	1300	1600	1300	1600	1400	1700	1400	1700	1500	1700	1600	1700
2700	1200	1700	1300	1700	1300	1700	1400	1700	1400	1800	1500	1800	1500	1800	1600	1800
2800	1200	1700	1300	1700	1300	1700	1400	1700	1400	1800	1500	1800	1500	1800	1600	1800
2900	1300	1800	1300	1800	1400	1800	1400	1800	1500	1900	1500	1900	1600	1900	1600	1900
3000	1300	1800	1300	1800	1400	1900	1400	1900	1500	1900	1500	1900	1600	1900	1600	1900

Table 7-3-1 Header- and Branch Lengths Segmented Tee, in mm in Stiffness Classes acc. to Table 5-1

500		600		700		800		900		1000		1100		1200		1300	
HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1160	580	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1240	640	1360	680	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1240	680	1360	740	1500	760	-	-	-	-	-	-	-	-	-	-	-	-
1240	740	1380	800	1520	800	1640	840	-	-	-	-	-	-	-	-	-	-
1260	800	1380	840	1520	860	1660	880	1780	900	-	-	-	-	-	-	-	-
1300	850	1400	900	1550	950	1700	950	1800	950	1950	1000	-	-	-	-	-	-
1300	900	1400	950	1550	1000	1700	1000	1800	1000	1950	1050	2100	1050	-	-	-	-
1300	950	1400	1000	1550	1050	1700	1050	1850	1100	2000	1100	2100	1100	2250	1150	-	-
1300	1000	1450	1050	1550	1100	1700	1100	1850	1150	2000	1150	2100	1150	2250	1200	2400	1200
1350	1050	1450	1100	1550	1150	1700	1150	1850	1200	2000	1200	2150	1200	2250	1250	2400	1250
1350	1100	1450	1200	1600	1200	1700	1200	1850	1250	2000	1250	2150	1250	2250	1300	2400	1300
1350	1150	1450	1250	1600	1250	1700	1250	1850	1300	2000	1300	2150	1350	2300	1350	2400	1350
1350	1250	1500	1300	1600	1300	1750	1300	1850	1350	2000	1350	2150	1400	2300	1400	2450	1400
1400	1300	1500	1350	1600	1350	1750	1350	1850	1400	2050	1400	2150	1450	2300	1450	2450	1450
1400	1350	1500	1400	1650	1400	1750	1450	1900	1450	2050	1450	2150	1500	2300	1500	2450	1550
1500	1400	1600	1500	1700	1500	1800	1500	1900	1500	2100	1500	2200	1600	2300	1600	2500	1600
1500	1500	1600	1500	1700	1500	1800	1600	1900	1600	2100	1600	2200	1600	2300	1600	2500	1700
1500	1500	1600	1600	1700	1600	1800	1600	1900	1600	2100	1600	2200	1700	2400	1700	2500	1700
1500	1600	1600	1600	1700	1600	1800	1700	1900	1700	2100	1700	2200	1700	2400	1700	2500	1800
1500	1600	1600	1700	1700	1700	1900	1700	2000	1700	2100	1800	2200	1800	2400	1800	2500	1800
1600	1700	1700	1700	1800	1700	1900	1800	2000	1800	2100	1800	2200	1800	2400	1800	2500	1900
1600	1700	1700	1800	1800	1800	1900	1800	2000	1800	2100	1900	2300	1900	2400	1900	2500	1900
1600	1800	1700	1800	1800	1800	1900	1900	2000	1900	2200	1900	2300	1900	2400	2000	2600	2000
1700	1800	1800	1900	1900	1900	2000	1900	2100	1900	2200	2000	2300	2000	2400	2000	2600	2000
1700	1900	1800	1900	1900	2000	2000	2000	2100	2000	2200	2000	2300	2000	2400	2100	2600	2100
1700	1900	1800	2000	1900	2000	2000	2000	2100	2000	2200	2100	2300	2100	2400	2100	2600	2100

- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08

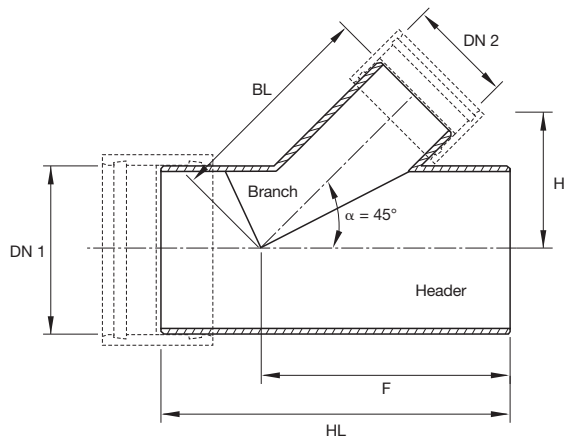


DN 2 = 1400 – 3000 mm

DN 1 [mm] \ DN 2 [mm]	1400		1500		1600		1700		1800		1900		2000		2100	
	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL	HL	BL
300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
450	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1400	2550	1300	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1500	2550	1350	2650	1350	-	-	-	-	-	-	-	-	-	-	-	-
1600	2550	1400	2700	1400	2800	1400	-	-	-	-	-	-	-	-	-	-
1700	2550	1450	2700	1450	2850	1500	2950	1500	-	-	-	-	-	-	-	-
1800	2600	1500	2700	1500	2850	1550	3000	1550	3100	1550	-	-	-	-	-	-
1900	2600	1550	2700	1550	2850	1600	3000	1600	3150	1650	3250	1650	-	-	-	-
2000	2600	1600	2800	1700	2900	1700	3000	1700	3200	1700	3300	1700	3400	1700	-	-
2100	2600	1700	2800	1700	2900	1700	3000	1700	3200	1800	3300	1800	3400	1800	3600	1800
2200	2600	1700	2800	1800	2900	1800	3000	1800	3200	1800	3300	1800	3400	1800	3600	1900
2300	2600	1800	2800	1800	2900	1800	3000	1800	3200	1900	3300	1900	3500	1900	3600	1900
2400	2600	1800	2800	1900	2900	1900	3100	1900	3200	1900	3300	1900	3500	2000	3600	2000
2500	2700	1900	2800	1900	2900	1900	3100	2000	3200	2000	3300	2000	3500	2000	3600	2000
2600	2700	1900	2800	2000	3000	2000	3100	2000	3200	2000	3400	2000	3500	2100	3700	2100
2700	2700	2000	2800	2000	3000	2000	3100	2100	3200	2100	3400	2100	3500	2100	3700	2100
2800	2700	2000	2800	2100	3000	2100	3100	2100	3300	2100	3400	2200	3500	2200	3700	2200
2900	2700	2100	2800	2100	3000	2100	3100	2200	3300	2200	3400	2200	3500	2200	3700	2200
3000	2700	2100	2800	2200	3000	2200	3100	2200	3300	2200	3400	2300	3500	2300	3700	2300

Table 7-3-2 Header- and Branch Lengths Segmented Tee, in mm in Stiffness Classes acc. to Table 5-1

7.4 Segmented Branches 45° – Equal & Reduced –



		HL	BL	F	H
DN 1 [mm]	DN 2 [mm]	Header Length [mm]	Branch Laying Length [mm]	[mm]	[mm]
100	100	600	420	350	300
150	100	600	420	375	300
	150	700	420	425	300
200	100	600	420	400	300
	150	700	500	450	350
	200	800	500	500	350
250	100	600	500	425	350
	150	700	500	475	350
	200	800	570	525	400
	250	900	570	575	400
300	100	700	500	500	350
	150	800	570	550	400
	200	900	570	600	400
	250	1000	640	650	450
	300	1100	710	700	500
350	100	700	570	550	400
	150	800	570	575	400
	200	900	640	625	450
	250	1000	640	675	450
	300	1100	710	725	500
	350	1200	780	775	550
400	100	700	570	550	400
	150	800	640	600	450
	200	900	640	650	450
	250	1000	710	700	500
	300	1100	780	750	550
	350	1200	850	800	600
	400	1300	850	850	600

Table 7-4-1 Header- and Branch Lengths Segmented Branches 45°, in mm in Stiffness Classes acc. to Table 5-1

		HL	BL	F	H
DN 1 [mm]	DN 2 [mm]	Header Length [mm]	Branch Laying Length [mm]	[mm]	[mm]
500	100	700	710	600	500
	150	800	710	650	500
	200	900	780	700	550
	250	1000	780	750	550
	300	1100	850	800	600
	350	1200	920	850	650
	400	1300	920	900	650
	500	1500	990	1000	700
600	300	1100	920	850	650
	400	1300	990	950	700
	500	1500	1060	1050	750
	600	1600	1130	1100	800
700	300	1100	990	900	700
	400	1300	1060	1000	750
	500	1500	1130	1100	800
	600	1700	1200	1200	850
	700	1900	1270	1300	900
800	300	1100	1060	950	750
	400	1300	1130	1050	800
	500	1500	1200	1150	850
	600	1700	1270	1250	900
	800	2100	1410	1450	1000
900	400	1300	1200	1100	850
	500	1500	1270	1200	900
	600	1700	1410	1300	1000
	700	1900	1490	1400	1050
	800	2100	1560	1500	1100
	900	2300	1630	1600	1150
1000	400	1300	1270	1150	900
	500	1500	1340	1250	950
	600	1800	1490	1400	1050
	700	1900	1560	1450	1100
	800	2100	1630	1550	1150
	1000	2500	1770	1750	1250

Table 7-4-2 Header- and Branch Lengths Segmented Branches 45°, in mm in Stiffness Classes acc. to Table 5-1

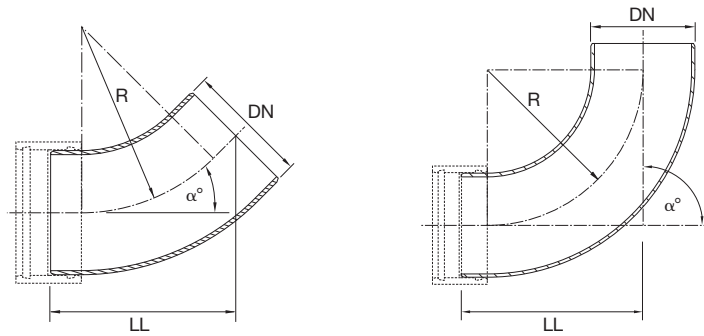
		HL	BL	F	H	
DN 1 [mm]	DN 2 [mm]	Header Length [mm]	Branch Laying Length [mm]	[mm]	[mm]	
1100	500	1500	1371	1332	1000	
	600	1600	1402	1384	1100	
	800	2100	1588	1588	1200	
	900	2300	1652	1640	1300	
	1000	2500	1793	1742	1350	
1200	500	1500	1490	1350	1050	
	600	1700	1560	1450	1100	
	800	2200	1770	1700	1250	
	900	2400	1840	1800	1300	
	1000	2500	1910	1850	1350	
	1200	2900	2050	2050	1450	
1300	600	1800	1532	1488	1200	
	800	2200	1699	1692	1350	
	900	2400	1744	1744	1400	
	1000	2600	1850	1846	1450	
	1200	3000	2022	1950	1550	
	1300	3100	2332	2052	1550	
	1400	3300	2330	2350	1650	
1400	600	1800	1770	1600	1250	
	800	2200	1980	1800	1400	
	900	2400	1980	1900	1400	
	1000	2600	2050	2000	1450	
	1200	2900	2190	2150	1550	
	1400	3300	2330	2350	1650	
	1500	600	1800	1668	1592	1300
		800	2300	1823	1796	1450
1000		2600	1952	1950	1550	
1200		3000	2115	2104	1650	
1300		3100	2194	2156	1700	
1400		3300	2303	2208	1750	
1500		3500	2633	2310	1800	
1600		600	1800	1910	1700	1350
		800	2200	2050	1900	1450
	1000	2600	2260	2100	1600	
	1200	3000	2400	2300	1700	
	1400	3400	2550	2500	1800	
	1600	3700	1750	2650	1900	
1700	800	2200	2100	1950	1500	
	1000	2600	2300	2150	1650	
	1200	3000	2450	2400	1750	
	1600	3700	2800	2700	1950	
	1700	3900	2900	2900	2050	

Table 7-4-3 Header- and Branch Lengths Segmented Branches 45°, in mm in Stiffness Classes acc. to Table 5-1

		HL	BL	F	H
DN 1 [mm]	DN 2 [mm]	Header Length [mm]	Branch Laying Length [mm]	[mm]	[mm]
1800	800	2200	2175	2000	1550
	1000	2700	2350	2250	1700
	1200	3100	2500	2450	1800
	1600	3800	2800	2800	2000
	1800	4100	2950	2950	2100
	1900	800	2200	2200	2100
1200		3100	2500	2500	1850
1600		3800	2850	2850	2050
1800		4100	2950	2950	2150
1900		4300	3050	3050	2200
2000		800	2300	2250	2150
	1200	3100	2550	2550	1900
	1600	3800	2850	2900	2100
	1800	4200	2950	3100	2200
	2000	4500	3150	3250	2300
2200	1200	2700	2450	2500	1900
	1600	3800	2750	2750	2100
	1800	4300	2900	3150	2250
	2000	4500	3100	3200	2400
	2200	4800	3300	3600	2600
2400	1200	3000	2650	2700	2100
	1600	3900	2975	3150	2350
	1800	4300	3125	3350	2450
	2000	4500	3250	3450	2500
	2400	5200	3550	3800	2700
2600	1400	3800	3025	3200	2139
	1600	4100	3175	3350	2246
	2000	4700	3450	3650	2440
	2400	5400	3750	4000	2652
	2600	6000	4100	4300	2900
2800	1600	4350	3425	3575	2422
	2000	4950	3700	3875	2617
	2400	5650	4000	4225	2829
	2600	6250	4350	4525	3076
	2800	6900	4700	4950	3324
3000	1800	5000	3800	4025	2688
	2000	5200	3925	4125	2776
	2400	5900	4225	4475	2988
	2800	7150	4925	5200	3483
	3000	7800	5300	5600	3748

Table 7-4-4 Header- and Branch Lengths Segmented Branches 45°, in mm in Stiffness Classes acc. to Table 5-1

7.5 Moulded Bends

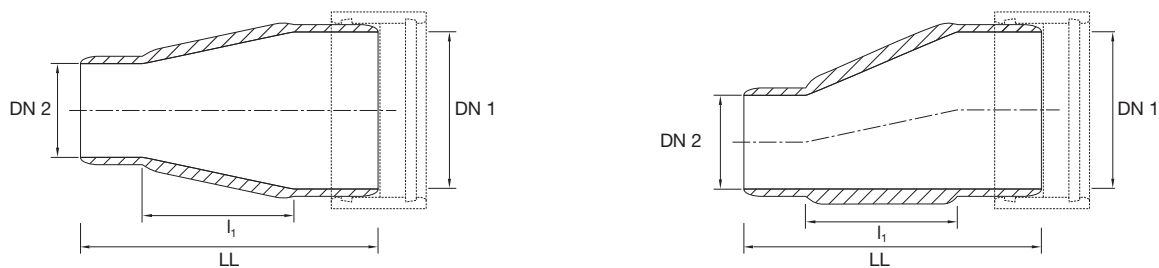


DN [mm]	R [mm]		Angle α													
			11°		15°		22°		30°		45°		60°		90°	
			LL min [mm]	Weight* [kg/pc]	LL min [mm]	Weight* [kg/pc]	LL min [mm]	Weight* [kg/pc]	LL min [mm]	Weight* [kg/pc]	LL min [mm]	Weight* [kg/pc]	LL min [mm]	Weight* [kg/pc]	LL min [mm]	Weight* [kg/pc]
100	150.0	+1 -0	94	1.06	100	1.09	109	1.14	120	1.21	142	1.33	167	1.44	230	1.68
150	225.0		102	1.87	110	1.93	124	2.05	140	2.19	173	2.44	210	2.70	305	3.21
200	300.0		122	3.01	132	3.13	151	3.33	173	3.57	217	4.02	266	4.47	393	5.36
250	375.0		130	4.63	143	4.83	167	5.18	194	5.58	249	6.33	311	7.08	469	8.58
300	450.0		184	7.84	200	8.17	228	8.74	262	9.39	327	10.61	401	11.84	591	14.28
350	525.0	+3 -0	193	11.47	211	11.97	244	12.83	283	13.82	359	15.68	445	17.54	667	21.25
400	600.0		199	13.06	220	13.77	258	15.02	302	16.44	390	19.11	487	21.78	741	27.12
500	750.0		213	18.98	240	20.32	287	22.67	342	25.35	452	30.37	574	35.40	891	45.45
600	900.0		259	29.99	290	32.15	347	35.92	413	40.23	545	48.32	692	56.41	1072	72.58
700	1050.0		273	42.49	310	45.93	376	51.95	453	58.82	607	71.72	778	84.61	1222	110.40
800	1200.0	289	52.98	331	57.91	406	66.53	495	76.38	670	94.84	866	113.31	1373	150.25	

* Approx. Weights

Table 7-5 Moulded Bends – Stiffness SN 10000 (N/m²)

7.6 Moulded Reducers – Concentric & Eccentric –



				Concentric	Eccentric	
DN 1 [mm]	DN 2 [mm]	l ₁ [mm]	LL [mm]	Weight* [kg/pc]		
150	100	135.0	315.0	+0 -4	1.72	1.72
200	100	260.0	453.0	+0 -6	2.88	2.88
200	150	135.0	328.0		2.72	2.72
250	150	260.0	454.0		3.87	4.33
250	200	135.0	342.0		3.81	4.16
300	200	260.0	514.0		6.21	7.45
300	250	135.0	390.0		5.73	6.66
400	250	385.0	640.0		10.73	12.81
400	300	260.0	562.0		11.28	13.05
500	300	510.0	812.0		18.45	21.66
500	400	260.0	562.0		16.65	18.90
600	400	510.0	843.0	25.20	31.23	
600	500	260.0	593.0	22.54	26.76	
700	500	510.0	843.0	+0 -8	35.00	42.18
700	600	260.0	624.0	32.63	37.67	
800	600	510.0	875.0	46.66	57.88	
800	700	260.0	625.0	42.67	50.41	

* Approx. Weights

Table 7-6 Concentric Reducers – Stiffness SN 10000 (N/m²)

- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08

01

02

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04

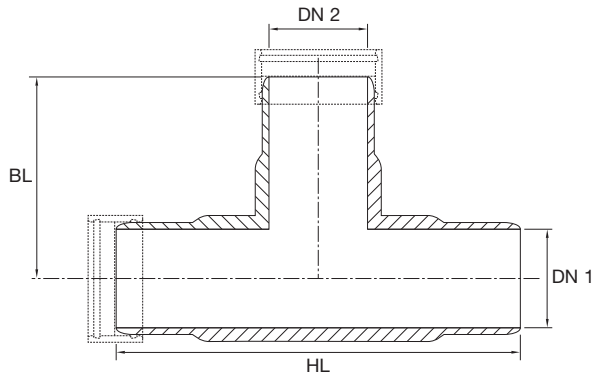
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7.7 Moulded Tees – Equal & Reduced –



DN 1 [mm]	DN 2 [mm]	HL [mm]		BL [mm]		Weight* [kg/pc]
100	100	330		165		1.68
150	100	370	+0 -4	185	+0 -2	2.58
150	150	370		185		3.00
200	100	454		215		4.07
200	150	454		215		4.50
200	200	454		227		5.14
250	200	624		312		6.84
250	250	624		312		7.28
300	200	780		342		10.50
300	250	780		342		10.94
300	300	780	+0 -6	390	+0 -3	12.55
350	300	810		405		14.14
350	350	810		405		14.77
400	300	860		430		17.14
400	400	860		430		18.99
500	400	970		485		26.05
500	500	970		485		28.22
600	500	1130		535		37.73
600	600	1130		565		41.22
700	600	1230		615		50.19
700	700	1230	+0 -8	615	+0 -4	53.28
800	700	1330		665		63.39
800	800	1330		665		66.92

* Approx. Weights

Table 7-7 Moulded Tees – Stiffness SN 10000 (N/m²)

7.8 Moulded Branches 45° – Equal & Reduced –

01

02

03

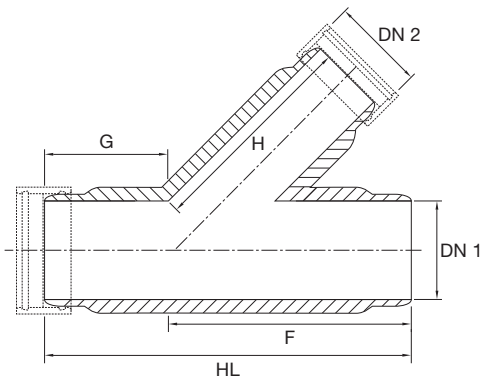
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DN 1 [mm]	DN 2 [mm]	HL [mm]		G [mm]		F [mm]		H [mm]		Weight* [kg/pc]
100	100	425		136		290		244		3.07
150	100	495	+0 -4	147	+0 -2	346	+0 -2	300	+0 -2	4.72
150	150	515		131		384		316		5.54
200	100	449		146		302		244		5.76
200	150	547		143		404		316		7.32
200	200	616		164		454		366		8.87
250	100	449		148		302		244		7.22
250	150	618		199		419		362		9.62
250	200	618		164		454		387		10.75
250	250	696		169		529		423		12.48
300	100	545		196		350		244		10.71
300	150	630		186		444		378		12.92
300	200	710		191		519		412		14.75
300	250	756		196		560		405		15.85
300	300	827		196		631		503		19.10
350	100	545	+0 -5	196	+0 -3	350	+0 -3	244	+0 -3	12.91
350	150	614		196		419		293		14.42
350	200	685		196		490		355		16.37
350	250	756		196		560		405		18.37
350	300	827		196		631		503		21.75
350	350	897		196		702		553		24.26
400	100	545		196		350		244		15.50
400	150	614		184		419		293		17.11
400	200	710		196		526		405		19.26
400	250	756		196		560		405		21.26
400	300	827		196		631		503		24.75
400	350	697		196		702		553		27.36
400	400	957		196		771		602		30.39

* Approx. Weights

Table 7-8-1 Moulded Branches 45° – Stiffness SN 10000 (N/m²)

01

02

03

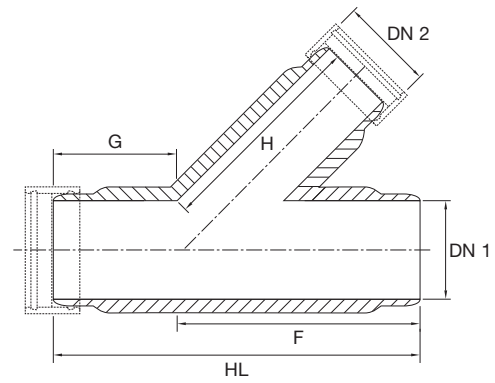
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DN 1 [mm]	DN 2 [mm]	HL [mm]	G [mm]	F [mm]	H [mm]	Weight* [kg/pc]
500	100	545	196	350	244	20.37
500	150	614	196	419	293	22.18
500	200	685	196	490	355	24.56
500	250	756	196	560	405	27.76
500	300	827	196	631	503	30.49
500	350	897	196	702	553	33.30
500	400	967	196	771	602	36.55
500	500	1106	196	913	702	43.13
600	100	605	226	380	244	28.33
600	150	674	226	449	293	30.41
600	200	745	226	520	355	32.87
600	250	816	226	590	405	35.24
600	300	887	226	661	503	39.17
600	350	957	226	732	553	42.29
600	400	1027	226	801	602	45.57
600	500	1158	226	943	702	52.49
600	600	1285	226	1060	815	60.86
700	100	608	226	383	247	37.48
700	150	678	226	452	296	39.76
700	200	746	226	523	358	42.42
700	250	819	226	594	406	45.00
700	300	890	226	664	506	49.16
700	350	960	226	735	556	52.48
700	400	1030	226	804	605	55.96
700	500	1171	226	946	705	63.28
700	600	1289	226	1063	816	72.02
700	700	1423	226	1197	913	81.84
800	100	611	226	386	250	44.55
800	150	681	226	455	299	47.05
800	200	751	226	526	361	49.93
800	250	822	226	597	411	52.71
800	300	893	226	667	509	57.11
800	350	964	226	738	559	60.65
800	400	1033	226	807	608	64.33
800	500	1174	226	949	708	72.08
800	600	1292	226	1066	821	81.19
800	700	1426	226	1201	916	91.61
800	800	1582	226	1356	1026	102.15

* Approx. Weights

Table 7-8-2 Moulded Branches 45° – Stiffness SN 10000 (N/m²)

7.9 Saddle Pieces – Screwed & Glued –

Saddle pieces allow branch connections on existing GRP gravity sewer pipelines.

Saddle pieces are available with 90° and 45° branches and a combination of different materials such as GRP, PVC or Clay is also possible. The installation is carried out with stainless steel bolts and rubber gaskets or as glued connection.

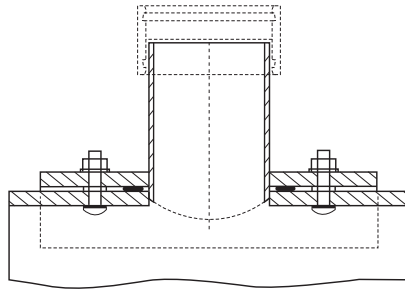


Figure 7-9-1 Saddle Pieces 90° – Screwed

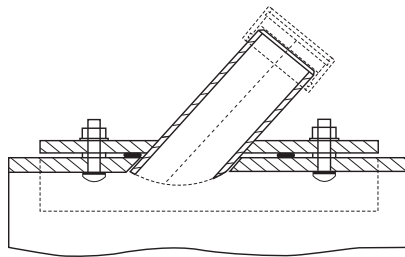


Figure 7-9-2 Saddle Pieces 45° – Screwed

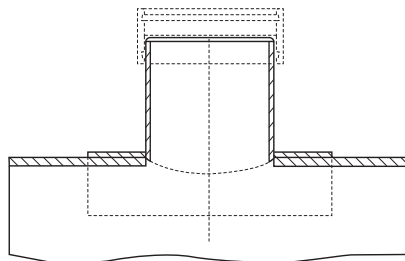


Figure 7-9-3 Saddle Piece 90° – Glued

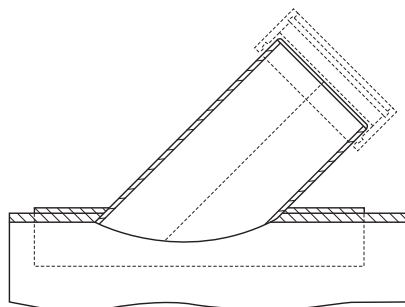


Figure 7-9-4 Saddle Piece 45° – Glued

01

02

03

04

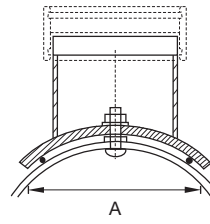
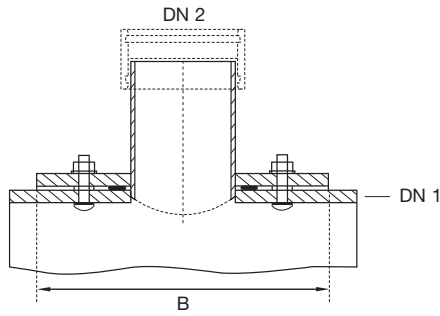
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7.10 Saddle Pieces 90° – Screwed & Glued –



				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
200	100	260	500	2	10	660
200	150	260	500	2	10	660
250	100	286	500	2	10	660
250	150	286	500	2	10	660
300	100	312	500	2	10	660
300	150	312	500	2	10	660
300	200	312	500	2	12	870
350	100	338	500	2	10	660
350	150	338	500	2	10	660
350	200	338	500	2	12	870
400	100	364	500	2	10	660
400	150	364	500	2	10	660
400	200	364	500	2	12	870
450	100	389	500	2	10	660
450	150	389	500	2	10	660
450	200	389	500	2	12	870
500	100	415	500	2	10	660
500	150	415	500	2	10	660
500	200	415	500	2	12	870
500	250	415	500	2	12	1080
600	100	459	500	2	10	660
600	150	459	500	2	10	660
600	200	459	500	2	12	870
600	250	459	500	2	12	1080
700	100	510	500	2	10	660
700	150	510	500	2	10	660
700	200	510	500	2	12	870
700	250	510	500	2	12	1080

Table 7-10-1 Saddle Pieces 90° – Screwed & Glued –

				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
800	100	561	500	2	10	660
800	150	561	500	2	10	660
800	200	561	500	2	12	870
800	250	561	500	2	12	1080
900	100	612	500	2	10	660
900	150	612	500	2	10	660
900	200	612	500	2	12	870
900	250	612	500	2	12	1080
1000	100	663	500	2	10	660
1000	150	663	500	2	10	660
1000	200	663	500	2	12	870
1000	250	663	500	2	12	1080
1100	100	714	500	2	10	660
1100	150	714	500	2	10	660
1100	200	714	500	2	12	870
1100	250	714	500	2	12	1080
1100	300	784	500	2	16	1140
1200	100	765	500	2	10	660
1200	150	765	500	2	10	660
1200	200	765	500	2	12	870
1200	250	765	500	2	12	1080
1200	300	835	500	2	16	1140
1300	100	816	500	2	10	660
1300	150	816	500	2	10	660
1300	200	816	500	2	12	870
1300	250	816	500	2	12	1080
1300	300	886	500	2	16	1140

Table 7-10-2 Saddle Pieces 90° – Screwed & Glued –

				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
1400	100	867	500	2	10	660
1400	150	867	500	2	10	660
1400	200	867	500	2	12	870
1400	250	867	500	2	12	1080
1400	300	937	600	2	16	1140
1500	100	918	500	2	10	660
1500	150	918	500	2	10	660
1500	200	918	500	2	12	870
1500	250	918	500	2	12	1080
1500	300	988	600	2	16	1140
1600	100	969	500	2	10	660
1600	150	969	500	2	10	660
1600	200	969	500	2	12	870
1600	250	969	500	2	12	1080
1600	300	1039	600	2	16	1140
1700	100	1020	500	2	10	660
1700	150	1020	500	2	10	660
1700	200	1020	500	2	12	870
1700	250	1020	500	2	12	1080
1700	300	1090	600	2	16	1140
1800	100	1071	500	2	10	660
1800	150	1071	500	2	10	660
1800	200	1071	500	2	12	870
1800	250	1071	500	2	12	1080
1800	300	1141	600	2	16	1140
1900	100	1122	500	2	10	660
1900	150	1122	500	2	10	660
1900	200	1122	500	2	12	870
1900	250	1122	500	2	12	1080
1900	300	1192	600	2	16	1140

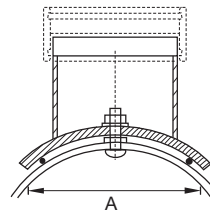
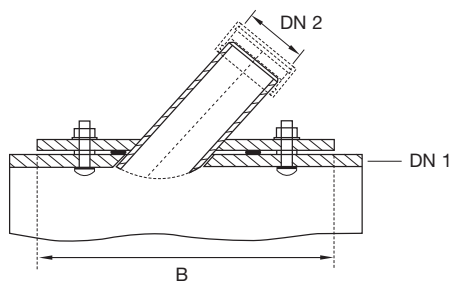
Table 7-10-3 Saddle Pieces 90° – Screwed & Glued –

				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
2000	100	1173	500	2	10	660
2000	150	1173	500	2	10	660
2000	200	1173	500	2	12	870
2000	250	1173	500	2	12	1080
2000	300	1243	600	2	16	1140
2100	100	1224	500	2	10	660
2100	150	1224	500	2	10	660
2100	200	1224	500	2	12	870
2100	250	1224	500	2	12	1080
2100	300	1294	600	2	16	1140
2200	100	1275	500	2	10	660
2200	150	1275	500	2	10	660
2200	200	1275	500	2	12	870
2200	250	1275	500	2	12	1080
2200	300	1345	600	2	16	1140
2300	100	1326	500	2	10	660
2300	150	1326	500	2	10	660
2300	200	1326	500	2	12	870
2300	250	1326	500	2	12	1080
2300	300	1396	600	2	16	1140
2400	100	1377	500	2	10	660
2400	150	1377	500	2	10	660
2400	200	1377	500	2	12	870
2400	250	1377	500	2	12	1080
2400	300	1447	600	2	16	1140

Table 7-10-4 Saddle Pieces 90° – Screwed & Glued –

Bigger diameters available on request

7.11 Saddle Pieces 45° – Screwed & Glued –



				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
200	100	340	500	2	12	870
200	150	340	500	2	12	870
250	100	340	500	2	12	870
250	150	340	500	2	12	870
300	100	340	500	2	12	870
300	150	340	500	2	12	870
300	200	340	500	2	12	1080
350	100	340	500	2	12	870
350	150	340	500	2	12	870
350	200	390	550	2	12	1080
400	100	340	500	2	12	870
400	150	340	500	2	12	870
400	200	340	550	2	12	1080
450	100	340	500	2	12	870
450	150	340	500	2	12	870
450	200	390	550	2	12	1080
500	100	340	500	2	12	870
500	150	340	500	2	12	870
500	200	390	550	2	12	1080
500	250	340	650	2	12	1080
600	100	340	500	2	12	870
600	150	340	500	2	12	870
600	200	390	550	2	12	1080
600	250	430	650	2	12	1080
700	100	340	500	2	12	870
700	150	340	500	2	12	870
700	200	390	550	2	12	1080
700	250	430	650	2	12	1080

Table 7-11-1 Saddle Pieces 45° – Screwed & Glued –

				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
800	100	340	500	2	12	870
800	150	340	500	2	12	870
800	200	390	550	2	12	1080
800	250	430	650	2	12	1080
900	100	340	500	2	12	870
900	150	340	500	2	12	870
900	200	390	550	2	12	1080
900	250	430	650	2	12	1080
1000	100	340	500	2	12	870
1000	150	340	500	2	12	870
1000	200	390	550	2	12	1080
1000	250	430	650	2	12	1080
1100	100	340	500	2	12	870
1100	150	340	500	2	12	870
1100	200	390	550	2	12	1080
1100	250	430	650	2	12	1080
1100	300	540	760	2	16	1430
1200	100	340	500	2	12	870
1200	150	340	500	2	12	870
1200	200	390	550	2	12	1080
1200	250	430	650	2	12	1080
1200	300	540	760	2	16	1430
1300	100	340	500	2	12	870
1300	150	340	500	2	12	870
1300	200	390	550	2	12	1080
1300	250	430	650	2	12	1080
1300	300	540	760	2	16	1430

Table 7-11-2 Saddle Pieces 45° – Screwed & Glued –

				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
1400	100	340	500	2	12	870
1400	150	340	500	2	12	870
1400	200	390	550	2	12	1080
1400	250	430	650	2	12	1080
1400	300	540	760	2	16	1430
1500	100	340	500	2	12	870
1500	150	340	500	2	12	870
1500	200	390	550	2	12	1080
1500	250	430	650	2	12	1080
1500	300	540	760	2	16	1430
1600	100	340	500	2	12	870
1600	150	340	500	2	12	870
1600	200	390	550	2	12	1080
1600	250	430	650	2	12	1080
1600	300	540	760	2	16	1430
1700	100	340	500	2	12	870
1700	150	340	500	2	12	870
1700	200	390	550	2	12	1080
1700	250	430	650	2	12	1080
1700	300	540	760	2	16	1430
1800	100	340	500	2	12	870
1800	150	340	500	2	12	870
1800	200	390	550	2	12	1080
1800	250	430	650	2	12	1080
1800	300	540	760	2	16	1430
1900	100	340	500	2	12	870
1900	150	340	500	2	12	870
1900	200	390	550	2	12	1080
1900	250	430	650	2	12	1080
1900	300	540	760	2	16	1430

Table 7-11-3 Saddle Pieces 45° – Screwed & Glued –

				For Screwed Only		
DN 1 [mm]	DN 2 [mm]	A [mm] +/- 5 mm	B [mm] +/- 5 mm	No. of Bolts	Sealing	
					d [mm]	L [mm]
2000	100	340	500	2	12	870
2000	150	340	500	2	12	870
2000	200	390	550	2	12	1080
2000	250	430	650	2	12	1080
2000	300	540	760	2	16	1430
2100	100	340	500	2	12	870
2100	150	340	500	2	12	870
2100	200	390	550	2	12	1080
2100	250	430	650	2	12	1080
2100	300	540	760	2	16	1430
2200	100	340	500	2	12	870
2200	150	340	500	2	12	870
2200	200	390	550	2	12	1080
2200	250	430	650	2	12	1080
2200	300	540	760	2	16	1430
2300	100	340	500	2	12	870
2300	150	340	500	2	12	870
2300	200	390	550	2	12	1080
2300	250	430	650	2	12	1080
2300	300	540	760	2	16	1430
2400	100	340	500	2	12	870
2400	150	340	500	2	12	870
2400	200	390	550	2	12	1080
2400	250	430	650	2	12	1080
2400	300	540	760	2	16	1430

Table 7-11-4 Saddle Pieces 45° – Screwed & Glued –

01 **7.12 Installation of Saddle Pieces**

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FLOWTITE saddle pieces can be used to connect lateral gravity sewers. The saddle pieces are available as screwed and glued version in 45° and 90°.

Direct lamination is possible on other materials, for example stoneware or PVC.

Installation instructions for GRP saddle pieces, screwed

The saddle installation is to be carried out according to the following procedure:

- 1** At the desired place, mark the installation position of the branch opening and the outline of the saddle plate by laying up the saddle piece. When working with a jig-saw or a cutting disc, increase the marking by the appropriate amount of the wall thickness of the exit pipe. When working the breakthrough with a core bit, mark the central point of the branch opening.

Connecting Piece Diameter (mm)	Hole Diameter
DN 100	118 – 122 mm
DN 150	170 – 174 mm
DN 200	222 – 226 mm
DN 250	274 – 278 mm
DN 300	326 – 330 mm

Table 7-12-1 Diameter Saddle Holes – Screwed

- 2** Taking into account the relevant work safety regulations, cut the branch opening using a high-speed jig-saw, a cutting disc (carbide or stone disc, no metal disc) or a drill with a high-speed, diamond-fitted bit.

! The inside edge of the opening is to be broken.

- 3** Lay up the saddle again and mark out the first drill hole for one of the securing screws. Using the included drill bit, drill 11 mm using light pressure (do not use a hammer drill!).

- 4** Put the flat round screw with the PTFE seal through the drill hole in the main pipe from the inside and secure with a counter nut. Use a 7 mm jaw wrench to prevent the screw from turning on the abraded surfaces.

- 5** Lay up the saddle again and mark and drill the remaining holes using the same method as the first hole. The contact surface for the saddle must be dry and clean. Fix the O-ring at equal distances in 3 to 4 places around the opening using the adhesive provided.

- 6** Attach the saddle piece and washers and secure using the hexagonal M10 nuts.

! Important: Tighten the screws using a torque wrench (40 Nm)! **Correct tightening of screws makes holding times redundant!**

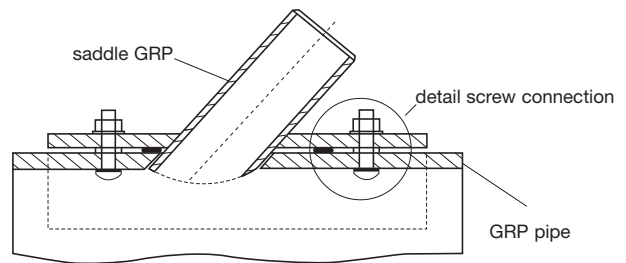


Figure 7-12-1 Saddle Piece 45° – Screwed

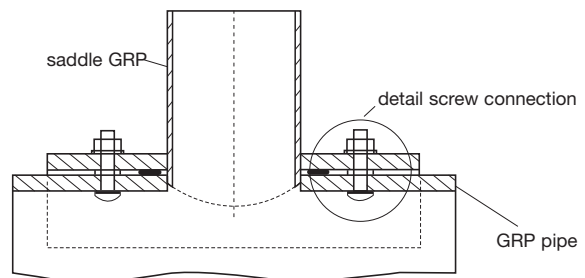


Figure 7-12-2 Saddle Piece 90° – Screwed

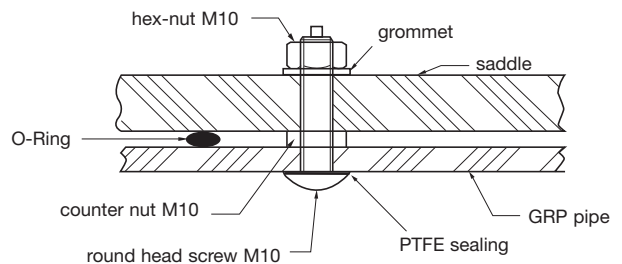


Figure 7-12-3 Detail Screw Connection

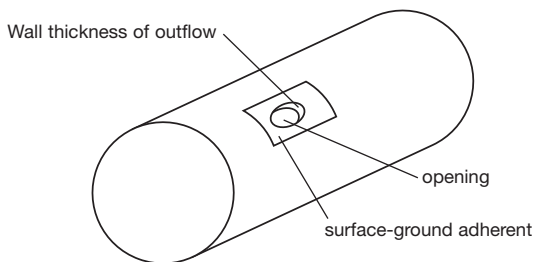


Figure 7-12-4

Installation instructions for GRP-saddle pieces, glued

1 At the desired place, mark the installation position of the branch opening and the outline of the saddle plate by laying up the saddle piece. When working with a jig-saw or a cutting disc, increase the marking by the appropriate amount of the wall thickness of the exit pipe. When working the breakthrough with a core bit, mark the central point of the branch opening.

Connecting Piece Diameter (mm)	Hole Diameter
DN 100	118 – 122 mm
DN 150	170 – 174 mm
DN 200	222 – 226 mm
DN 250	274 – 278 mm
DN 300	326 – 330 mm

Table 7-12-2 Diameter Saddle Holes – Glued

2 Taking into account the relevant work safety regulations, cut the branch opening using a high-speed jig-saw, a cutting disc (carbide or stone disc, no metal disc) or a drill with a high-speed, diamond-fitted bit.

! Note: The inside edge of the opening is to be broken.

3 Create a roughened, dry and dust free adhesion surface.

4 Applying the adhesive:
Single component packs (SIKABONT) can be used immediately.
Apply the adhesive to the whole area of the underside of the saddle and the marked surface of the pipe.

	Sikabont
Handling time	40 min*
Fixing time	60 min
Working temperatures	+5 – +35° C
Load bearing after	at 3 mm adhesion gap = 24h

* 23° C; 50% rel. humidity

Table 7-12-3 Handling Conditions – Glued Saddles

- 5** Position the saddle using light pressure. Fix with tensioning belts until completely hardened.
- 6** Once the saddle is fixed, reach through the opening and seal the remaining gap between pipe and saddle with the remaining adhesive. Also cleanly remove any residual adhesive.

! Important: Loads must be avoided during the hardening times.

Once the working conditions in **Table 7-12-2** have been observed, the laying, sealing and subsequent work can be continued.

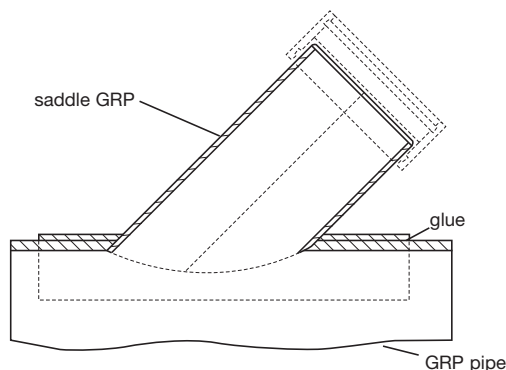


Figure 7-12-5 Saddle Piece 45° – Glued

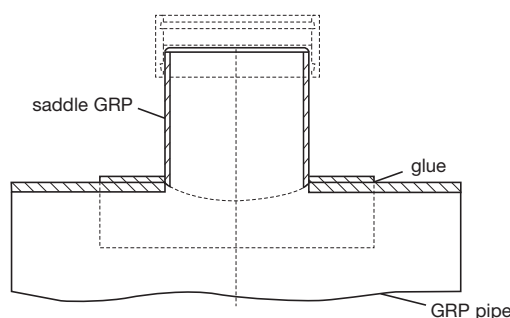
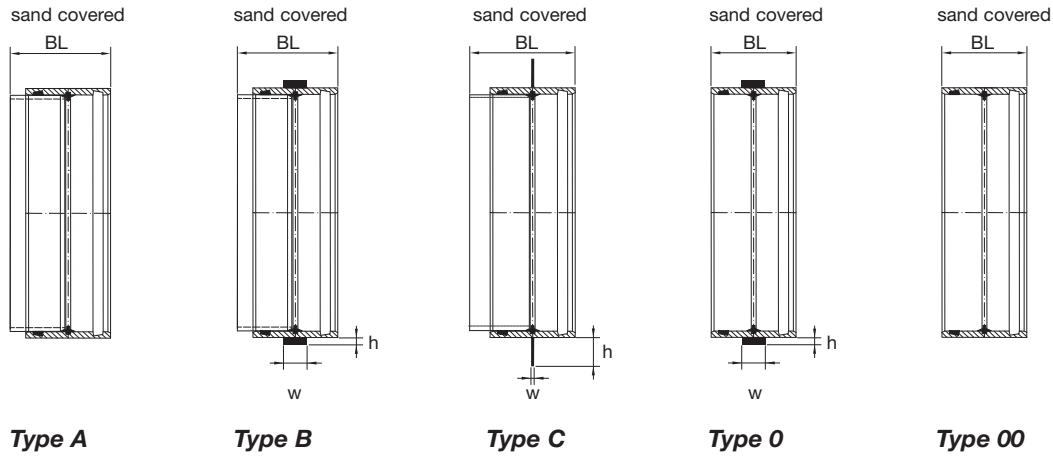


Figure 7-12-6 Saddle Piece 90° – Glued

7.13 Wall Couplings



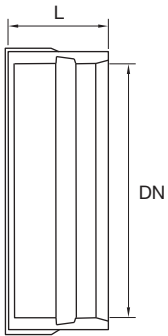
DN [mm]	Type A, B, C		Type B		Type C	
	BL [mm]	w [mm]	h [mm]	w [mm]	h [mm]	
100	300	50	11	8	80	
150	300	50	11	8	80	
200	300	50	16	8	80	
250	300	50	16	8	80	
300	300	50	21	8	80	
350	300	50	21	8	80	
400	300	50	21	8	80	
450	300	50	21	8	80	
500	300	50	21	8	80	
600	300	80	24	8	80	
700	300	80	24	8	80	
800	300	80	24	10	80	
900	300	80	24	10	80	
1000	300	80	25	12	100	
1100	300	80	25	12	100	
1200	300	80	25	12	100	
1300	300	120	26	15	100	
1400	300	120	26	15	100	
1500	300	120	26	15	100	
1600	300	120	26	15	100	
1700	300	120	27	15	100	
1800	300	120	27	20	120	
1900	300	120	27	20	120	
2000	300	120	27	20	120	
2100	300	120	27	20	120	
2200	300	120	27	20	120	
2300	300	120	28	20	120	
2400	300	120	28	20	120	

Table 7-13-1 Wall Couplings, Type A, B, C

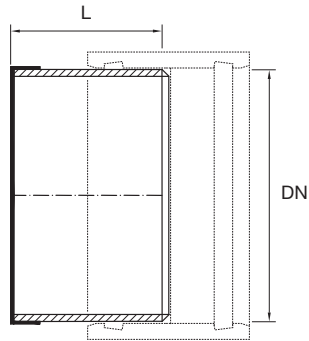
DN [mm]	Type 0, 00		Type 0	
	BL [mm]	w [mm]	h [mm]	h [mm]
100	150	50	11	11
150	150	50	11	11
200	175	50	16	16
250	175	50	16	16
300	240	50	21	21
350	240	50	21	21
400	240	50	21	21
450	240	50	21	21
500	240	50	21	21
600	240	80	24	24
700	240	80	24	24
800	240	80	24	24
900	240	80	24	24
1000	240	80	25	25
1100	240	80	25	25
1200	240	80	25	25
1300	240	120	26	26
1400	240	120	26	26
1500	240	120	26	26
1600	240	120	26	26
1700	240	120	27	27
1800	240	120	27	27
1900	240	120	27	27
2000	240	120	27	27
2100	240	120	27	27
2200	240	120	27	27
2300	240	120	28	28
2400	240	120	28	28

Table 7-13-2 Wall Couplings, Type 0, 00

7.14 End-Caps



7.15 Socket Plugs



DN [mm]	L [mm]
100	75.0
150	75.0
200	87.5
250	87.5
300	120.0
350	120.0
400	120.0
450	120.0
500	120.0
600	120.0
700	120.0
800	120.0
900	120.0
1000	120.0
1100	120.0
1200	120.0
1300	142.0
1400	142.0
1500	142.0
1600	142.0
1700	142.0
1800	142.0
1900	142.0
2000	142.0
2100	142.0
2200	142.0
2300	142.0
2400	142.0

Table 7-14 End-Caps

DN [mm]	L [mm]
100	200
150	200
200	200
250	250
300	250
350	250
400	250
450	250
500	250
600	300
700	300
800	300
900	300
1000	300
1100	300
1200	300
1300	300
1400	300
1500	400
1600	400
1700	400
1800	400
1900	400
2000	400
2100	400
2200	400
2300	400
2400	400

Table 7-15 Socket Plugs

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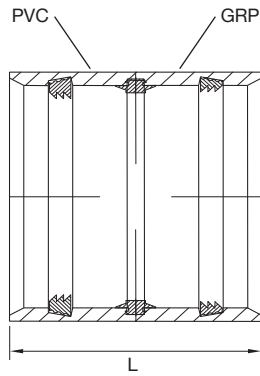
05

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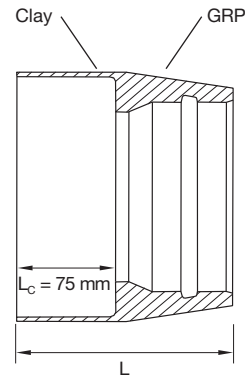
7.16 Adapter Couplings GRP-PVC Plain Ends



GRP	PVC	L
DN [mm]	DN [mm]	[mm]
150	150	149

Table 7-16 Adapter Couplings GRP-PVC Plain Ends

7.17 Adapter Couplings GRP-Clay Plain Ends

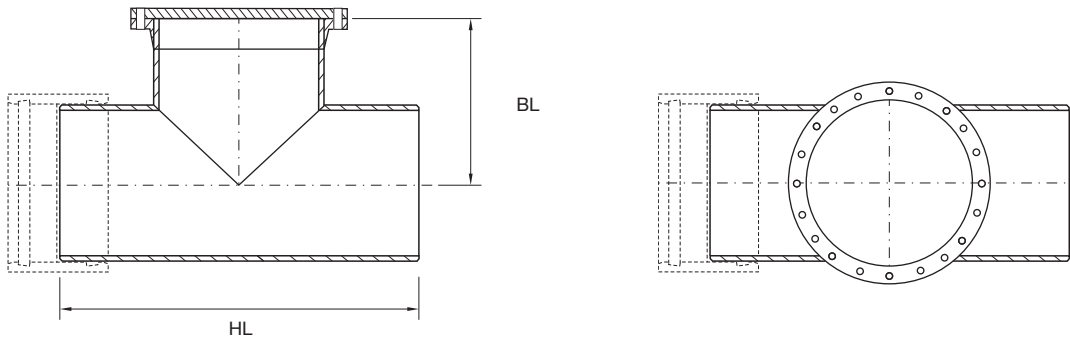


GRP	Clay	L
DN [mm]	DN [mm]	[mm]
150	150	164

Table 7-17 Adapter Couplings GRP-Clay Plain Ends

7.18 Segmented Inspection Pieces

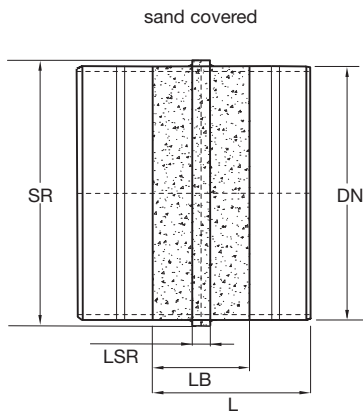
- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08



DN [mm]																					min	min							
																					mm	mm							
	200	250	300	350	400	450	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	BL	HL	
200	•																										600	300	
250	•	•																										600	350
300	•	•	•																									700	350
350	•	•	•	•																								700	400
400	•	•	•	•	•																							700	400
450	•	•	•	•	•	•																						700	500
500	•	•	•	•	•	•	•																					800	500
600	•	•	•	•	•	•	•	•																				800	550
700	•	•	•	•	•	•	•	•	•																			800	600
800	•	•	•	•	•	•	•	•	•	•																		800	600
900	•	•	•	•	•	•	•	•	•	•	•																	800	650
1000	•	•	•	•	•	•	•	•	•	•	•	•																800	700
1100	•	•	•	•	•	•	•	•	•	•	•	•	•															900	800
1200	•	•	•	•	•	•	•	•	•	•	•	•	•	•														900	850
1300	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•													900	900
1400	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•												900	950
1500	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•											900	1000
1600	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•										900	1050
1700	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•									900	1100
1800	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•								900	1150
1900	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•							900	1200
2000	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•						900	1250
2100	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•				900	1300	
2200	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			900	1350	
2300	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		900	1400	
2400	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	900	1450

Table 7-18 Inspection Pieces

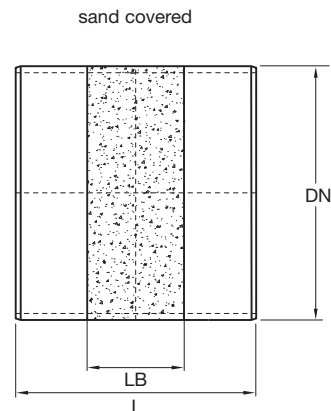
7.19 Wall Connection Pieces Type E



DN [mm]	SR	LSR	LB	L
100	125	50	300	1000
150	200	50	300	1000
200	250	50	300	1000
250	300	50	300	1000
300	350	50	300	1000
350	400	50	300	1000
400	450	50	300	1000
450	500	50	300	1000
500	600	50	300	1000
600	700	80	300	1000
700	800	80	300	1000
800	900	80	300	1000
900	1000	80	300	1000
1000	1100	80	300	1000
1100	1200	80	300	1000
1200	1300	80	300	1500
1300	1400	120	300	1500
1400	1500	120	300	1500
1500	1600	120	300	1500
1600	1700	120	300	1500
1700	1800	120	300	1500
1800	1900	120	300	1500
1900	2000	120	300	1500
2000	2100	120	300	1500
2100	2200	120	300	1500
2200	2300	120	300	1500
2300	2400	120	300	1500
2400	2400	120	300	1500

Table 7-19 Connection Pieces Type E

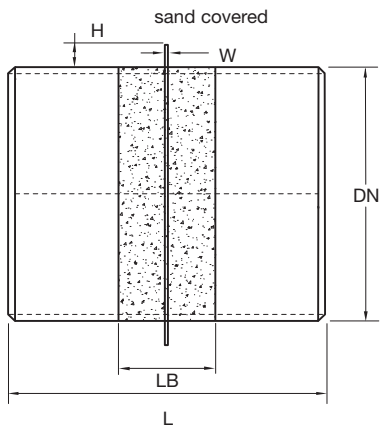
7.20 Wall Connection Pieces Type F



DN [mm]	LB	L
100	300	1000
150	300	1000
200	300	1000
250	300	1000
300	300	1000
350	300	1000
400	300	1000
450	300	1000
500	300	1000
600	300	1000
700	300	1000
800	300	1000
900	300	1000
1000	300	1000
1100	300	1000
1200	300	1500
1300	300	1500
1400	300	1500
1500	300	1500
1600	300	1500
1700	300	1500
1800	300	1500
1900	300	1500
2000	300	1500
2100	300	1500
2200	300	1500
2300	300	1500
2400	300	1500

Table 7-20 Connection Pieces Type F

7.21 Wall Connection Pieces Type G



DN [mm]	h	w	LB	L
100	80	8	300	1000
150	80	8	300	1000
200	80	8	300	1000
250	80	8	300	1000
300	80	8	300	1000
350	80	8	300	1000
400	80	8	300	1000
450	80	8	300	1000
500	80	8	300	1000
600	80	8	300	1000
700	80	8	300	1000
800	80	10	300	1000
900	80	10	300	1000
1000	100	12	300	1000
1100	100	12	300	1000
1200	100	12	300	1500
1300	100	15	300	1500
1400	100	15	300	1500
1500	100	15	300	1500
1600	100	15	300	1500
1700	100	15	300	1500
1800	120	20	300	1500
1900	120	20	300	1500
2000	120	20	300	1500
2100	120	20	300	1500
2200	120	20	300	1500
2300	120	20	300	1500
2400	120	20	300	1500

Table 7-21 Connection Pieces Type G

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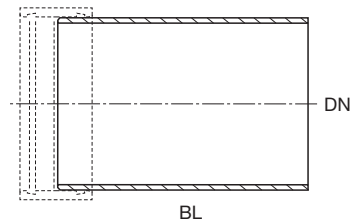
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7.22 Short Section Pipes



DN [mm]	BL [mm]
100	500
150	500
200	500
250	500
300	500
350	500
400	500
450	500
500	500
600	500
700	750
800	750
900	750
1000	750
1100	750
1200	1000
1300	1000
1400	1000
1500	1000
1600	1000
1700	1000
1800	1000
1900	1000
2000	1000
2100	1000
2200	1000
2300	1000
2400	1000

Table 7-22 Short Section Pipe

7.23 Manholes

The FLOWTITE standard finished manholes are preferential used for laying gravity sewer networks. Amiantit offers standard manholes as well as tangential manholes. Standard manholes have a fiberglass shaft connected to the manhole bottom and are manufactured in accordance to local regulations. FLOWTITE tangential manholes are very economic solutions for large bore pipelines. Our manhole product range is well known for its light weight and high buoyancy safety. You find details about manholes in our separate FLOWTITE manhole brochure.

Detailed information about the local availability of specific manhole types can be requested from your local supplier or is attached at the inner backpage of this brochure.

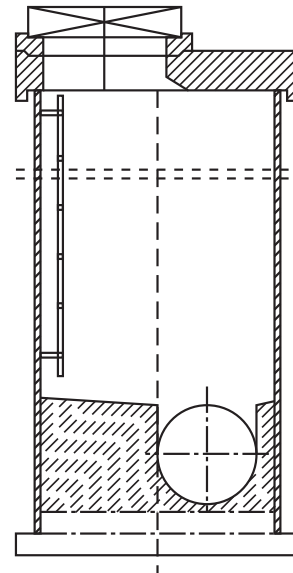


Figure 7-25-1 Standard Manhole

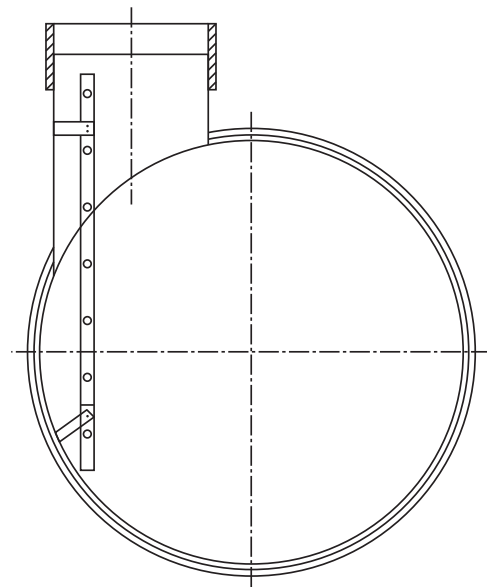


Figure 7-25-2 Tangential Manhole

8 Local Approvals & Certifications

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