Waste water drainage

PRODUCT AND TECHNICAL MANUAL

wavin

CONNECT TO BETTER

Wavin PE Soil, Waste and Vent applications

Contents

Introduction

Wavin PE Product & Technical Guide

This technical manual on PE above-ground drainage systems deals with the removal of domestic waste water and rainwater from houses and residential and commercial properties using plastic piping systems.

It covers all aspects from design to installation. The manual is intended for clients, architects, construction specialists, building co-operatives, building inspectors and of course for installers. If you have any questions, wishes or practical problems not covered by this manual then we would ask you to submit them to us together with any suggestions for amendments and additions.

Since our systems are often utilised in circumstances beyond our control, we cannot accept liability for the consequences of applying the information provided in this manual. This edition of the manual supersedes all previously published technical data.

CONNECT TO BETTER

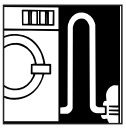
1. Wavin PE Soil, Waste and Vent system

1.1 System description

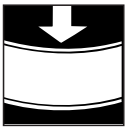
Wavin PE is a universal system approved for pipe installation in buildings to DIN 19535 and DIN EN 1519 and for underground pipes to DIN EN 12666. The product range includes pipes and fittings with dimensions between 40 and 315 mm.

Wavin PE is a complete soil, waste and vent system of pipes and fittings, manufactured from high-density polyethylene (PE HD). This tough and durable PE system offers an extraordinary chemical resistance in combination with a high flexibility level and great impact resistance. Wavin PE pipes and fittings are jointed by welding, making the joints resistant to tension. There are two methods of welding: butt welding and electro-fusion welding. Most Wavin PE products can also be used as part of under-pressure installations like the siphonic roof drainage system Wavin QuickStream.

1.2 Material characteristics



High-temperature resistance
Wavin PE guarantees resistance to temperatures of up to 100°C and is suitable for washing-machine and dishwasher drainpipes.



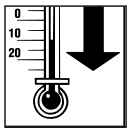
Flexibility
Wavin PE is well suited to assemblies subjected to vibration. It is therefore ideal for use in seismic zones and across expansion joints.

UV resistance
With the addition of a percentage of carbon black, PE is UV-stabilised and can therefore be installed outdoors without degradation problems.

Ease of welding
An advantage of Wavin PE is that it can be welded (both by butt welding and with electrofusion joints), thereby providing a perfectly sealed system.

Low weight
Wavin PE's lightness makes transportation and handling easy.

Use of adhesives
Because of its high resistance to chemical agents, Wavin PE cannot be jointed with adhesives.



Low-temperature resistance
The elasticity of Wavin PE allows pipes to withstand freezing of internal water.

Impact resistance
Wavin PE's elasticity gives pipes a high impact strength at temperatures as low as -40°C. This ruggedness makes handling of pipes easy during installation.

Blockage-free
The smooth surface of Wavin PE allows for both an optimum flow of any type of waste material and self-cleaning of pipes.

Fire Hazards
Wavin PE does not issue any toxic gases during combustion.

Wavin PE connection seals
Quick-fit coupling and expansion joint seals remain resistant to all chemical agents even if only slightly wetted by waste water. The seals are produced from an elastomer which guarantees sealing and durability even in extreme conditions.

1.3 Applications

Domestic waste-water system
Tensile resistant joint technology guarantees the highest levels of leakage security. The Wavin PE waste-water piping system complies with DIN 19535 and DIN EN 1519 and is resistant to the effects of hot water. It meets the requirements of DIN EN 12056 and DIN 1986 -100 (95° short-term loading).

Rainwater piping
Wavin PE waste-water piping is suitable for use on rainwater drainage systems. PE piping can be used in low-pressure systems to drain free surface waters and rainwater (see the Wavin QuickStream technical handbook).

Underground piping
The options for using PE piping systems for underground drainage are outlined in DIN 12666 -1:2005. This standard defines parameters such as pipe diameter, wall thickness and rigidity. Minimum ring stiffness standards of SN 4 (4 KN/m^2) are required for all "U"-category applications (external, underground piping). The Wavin PE (110 – 315 mm) waste-water system complies with the SN 4 (4 KN/m^2) ring stiffness specifications. Pipe range < SDR 26 (e.g. SDR 33/SN2) is not suitable for underground applications. Data on SDR and ring stiffness specifications can be found in the pipe data table.

Industrial waste-water
The Wavin PE system is resistant to aggressive chemicals. Further details about the chemical resistance of PE-HD can be found in chapter 7 on page 31 and in the Wavin "Chemical Resistance" data sheet.

Pumping systems
PE waste-water systems are primarily used on non-pressurised applications. However, they can also be used without hesitation on systems subject to short-term pressure loading (i.e. pumping systems). They are capable of handling maximum internal pressures of 1.5 bar. Installation and fixing must be carried out in accordance with the given specifications.

Manufacture and testing
Wavin PE piping complies with the technical specifications in DIN EN 1519 and DIN 19535 Part 2 as tested by the National Materials Testing Facility.

1.4 Product specifications

Basic material
Wavin PE waste-water pipes and fittings are manufactured from PE - HD material.

Colour
Black

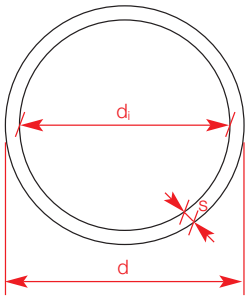
Identification and labelling
Wavin PE, nominal diameters, year of manufacture, material, supervision marks, fire category: B2

Example: Wavin PE EN 1519 IIP 152 UNI Ue DIN 19535 DN 100 110 x 4.3 PE BD S 12.5 weldable, tempered A-M-G-T

Properties

Melt flow index:	0.3 – 0.89 g/10 min
Coefficient of expansion:	0.2 mm/m °C
UV resistance:	given by carbon content of 2 – 2.5 %
Fire behaviour:	DIN 4102, B2

Pipe data



Calculating SDR category

$$SDR = \frac{di}{s}$$

DN	d[1]	di[2]	s[3]	SDR[4]	SN
mm	mm	mm			
40	40	34,0	3,0	13,6	-
50	50	44,0	3,0	17	-
56	56	50,0	3,0	17	-
60	63	57,0	3,0	21	-
70	75	69,0	3,0	26	-
90	90	83,0	3,5	26	4
100	110	101,4	4,3	26	4
125	125	115,2	4,9	26	4
150	160	147,6	6,2	26	4
200	200	187,6	6,2	33	2
200	200	184,6	7,7	26	4
250	250	234,4	7,8	33	2
250	250	230,8	9,6	26	4
300	315	295,4	9,8	33	2
300	315	290,8	12,1	26	4

1) external diameter in mm
2) internal diameter in mm
3) wall thickness in mm
4) SDR category
5) Max pressure in mbar

Table 1.

Quality assurance

All piping and fittings are subject to continuous internal quality control procedures. The system is also subject to external monitoring by the Materials Testing Facility. The system conforms to the established technical specifications set out in Building Regulations A, Part 1 Issue 2003/1 No.12.1.8 and comply with

DIN EN 1519 - 1:2001-01 and
DIN 19535 - 10:200-01.

Information on the transportation and storage of PE pipes and fittings

PE pipes must be protected against damage during transportation and especially during loading and unloading. Prior to any unloading, pipes should be carefully inspected for damage incurred during transportation. Where lifting gear is to be employed, the use of wide belts and slings is recommended. Unpaletted pipes should, wherever possible, be supported along their entire length and prevented from rolling against each other. Pipe storage areas and supporting surfaces should be free from sharp edges.

Caution:

Short-term pipe deformation can occur where pipes are unevenly exposed to the effects of the sun (or other forms of heat). Pipes should therefore not be stored in direct sunlight.

Assembly

As well as the design of the installation there is also the actual assembly. The design is complete, but many decisions remain to be taken by the fitter which will impact on the quality of the work and the problem-free operation of the waste removal system.

2.1 General

2.1.1 Pipework in the waste removal system

The pipework must be installed with a particular fall as indicated on the drawings using brackets, bands and supports. They must not be fitted horizontally, but there must not be too great a fall. Excessive fall leads to the complete closure of the pipe and to poor ventilation. Where reducing pieces are used the top of the pipework should be at the same level. The desired installation method must be known.

2.1.2. Brackets

All types can be used with support brackets; from light nylon band brackets, light or heavy PVC brackets to galvanised sewer brackets, and suspension bands. Ensure that any sliding brackets do actually slide (avoid over-tightening). Brackets used for clamping must be strong. For fixed point brackets (only with PE) galvanised steel brackets must be used.

2.1.3. Storage

Rubber O-rings must be kept in a cool and dark place and not exposed to sunlight (not even behind glass). Pipes must be stored as flat as possible to prevent sagging. It is difficult to produce neat, straight work with bent pipes. Keep pipes as clean as possible; this saves time when preparing and making connections. Covering is recommended during extended storage outdoors. Ensure that PE pipes, and particularly the ends, do not take on an oval shape. Oval pipes create extra work when welding joints. Bear in mind that pipes can get very hot in the sun. Once out of the sun they will shrink again. If the pipe is at 70°C and the temperature inside is 20°C, a 5 metre long PE pipe will be 0.2 x 50 x 5 = 50 mm shorter. Leave accessories in the packaging as long as possible. PE electroweld sleeves should be stored indoors and left as long as possible in the packaging to prevent oxidation from sunlight. Oxidation on the interior can badly affect welds.

2.1.4 Oval pipe ends

Excessively oval shape PE pipe ends should first be made rounder. This can be done by clamping the pipe with one or two brackets with one or two pieces of padding between, placed a little back from the eventual coupling insertion depth at the end of the pipe. The brackets are only removed after the weld has cooled.

2.1.5 Shortening of pipes

The best and simplest method is to use a proper pipe cutter. The cut is then straight and no burrs are generally created. If a saw is used, care needs to be taken to ensure that the cut is straight: mark the cut, use a stiff saw blade and use a saw horse with Ø above 50 mm. Remove internal and external burrs with steel wool or a knife. For sawing PE use a fairly coarse-toothed blade with a wide set.

2.2 Jointing

Joints fall in principle into two categories, those resistant to tension and those not resistant to tension. Welded and flanged joints are resistant to tension. Expansion sockets and connections using rubber seals are not resistant to tension. PE pipes can not be joined using solvent cement as PVC can. However welding of PE gives excellent results. This creates a tension-resistant connection. There are two methods of welding: butt welding and electro-welding using fittings with integral heating elements.

2.2.1 Principles of heat fusing polyethylene pipes and fittings

The Wavin PE range contains pipes, spigot fittings and electrofusion sockets. Pipes and fittings (both electro fusion couplers and spigot fittings) are provided with external marking ribs or marking stripes enabling easy alignment particularly in pre-fabrication. **Note**: polyethylene pipes and fittings cannot be joined using solvent cement!

For correct heat fusion of polyethylene, following basic equirements must be met in order to obtain good quality joints.

1. *Sufficient heat*
2. *Sufficient pressure*
3. *Sufficient welding & cooling time*
4. *"Clean to clean" material*

In the two most common applied welding techniques, electrofusion and butt-welding, these parameters are dependent on the design of the electrofusion socket and/or in the welding procedure.

2.2.2 Butt-welding

Butt-welding is a very economical jointing technique. Correctly made butt-welds reach the strength of the pipe. Well-trained personnel are recommended for making butt-welds.

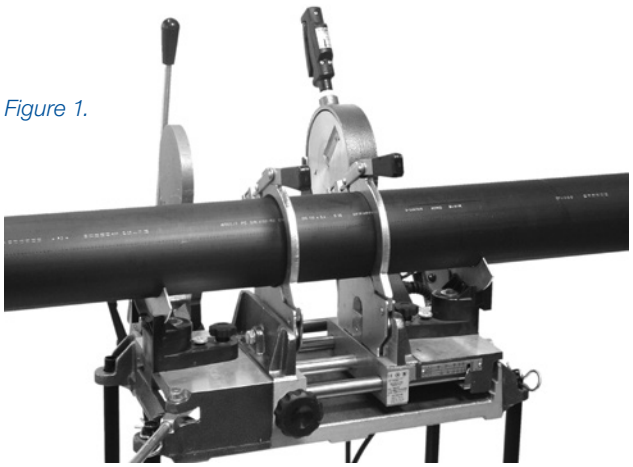
In butt welding, two pipe ends, two fitting ends or a pipe end and a fitting end are bonded by melting the circular pipe faces simultaneous and pressing these together. Butt-welding can only be performed using a butt-welding machine.

The butt-welding procedure incorporates the following 15 steps:

1. ***Check environmental conditions.***
   When the outside temperature is below 5 °C and/or during rainy and windy conditions, special precautionary measure have to be taken to ensure dry and sufficiently warm welding conditions.

2. ***Check welding machine is in good functional order.***
   At least the following issues should be checked: temperature, alignment, play of the moving parts, smooth movement of the moving parts, electrical connections, cutting machining plane (sharpness).

Figure 1.

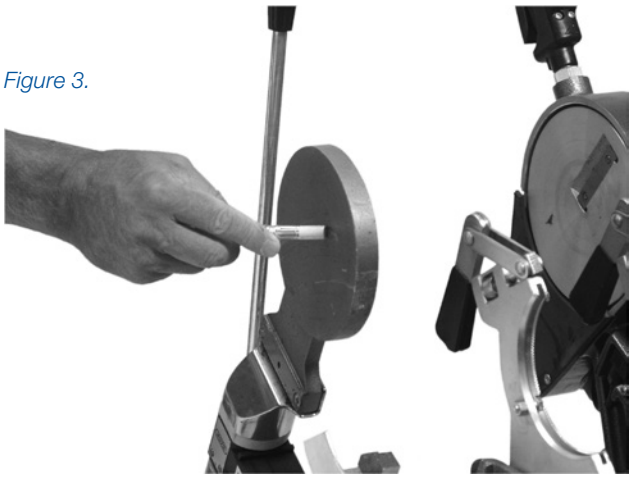


3. ***Clean heater plate with PE cleaner and a soft cloth***
   Prevent any damage of the Teflon coating.

Figure 2.

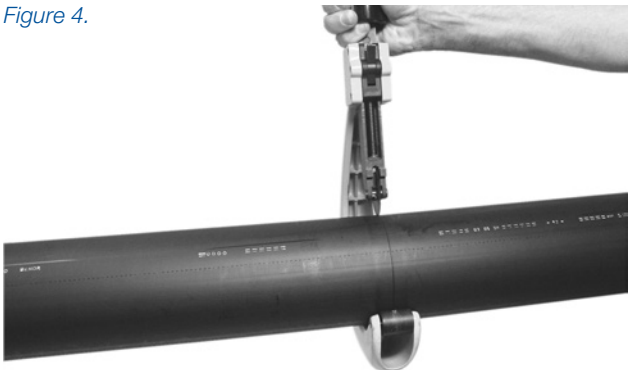
4. ***Check temperature heater plate on 210 °C.***

Figure 3.



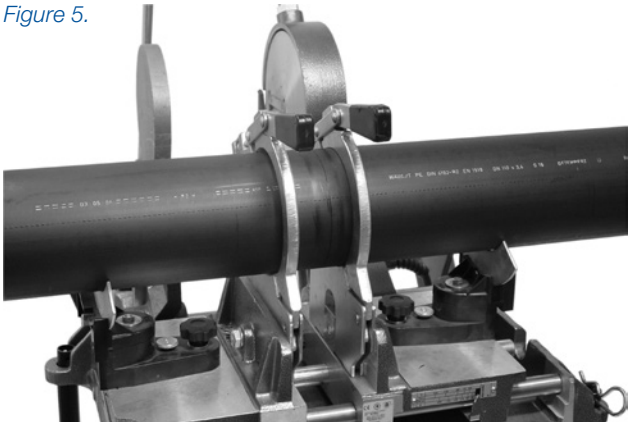
5. ***Cut pipe to required length.***
   Note: take into account that in the welding process a few millimetres pipe will be consumed. Best practice is to use a rotary pipe cutter. The pipe ends are then square and free from burrs. If a saw is used, it is advised to use a spare clamp as a sawing guide. Such cut pipe ends must be de-burred before placing in the welding machine.

Figure 4.



6. ***Clamp both pipe-ends in the welding machine and ensure correct alignment.***
   Eliminate any bending forces if present.

Figure 5.

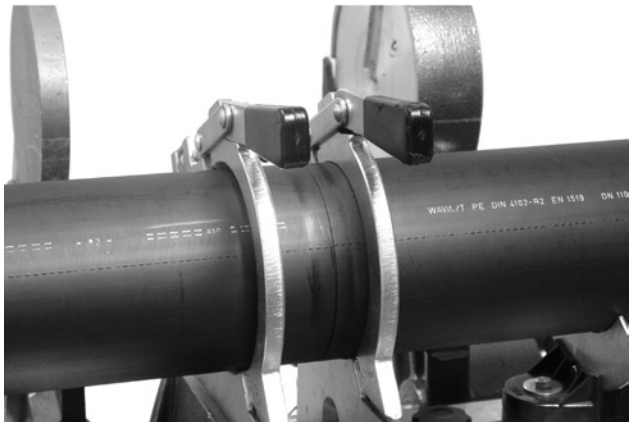


7. ***Trim both pipe-ends using the planer.***
   Keep planer running while slowly reducing pressure. Do not stop planer when still in contact with pipe ends in order to prevent uneven surfaces.

Figure 6.

8. ***Check that pipe ends are matching.***
   If not correct either re-clamp pipes (alignment) and/or repeat trimming. After re-clamping it is necessary to trim the pipe-end again with a planer.

Figure 7.



9. ***Insert heater plate and press both pipe ends during a few seconds with a higher force on the plate for ensuring full contact.***

Figure 8.

10. ***Reduce force until nearly zero, assuring contact with heater plate so that heat is soaked into both pipe ends.***

11. ***Maintain heat soaking till a bead is formed of approximate 1 mm for diameters 40 up to 200 and 1.5 mm for diameters 250 and 315 mm.***
    Use the figures mentioned in table 2 as guidance for the heat soaking duration.

12. ***After heating time is elapsed, quickly open the welding machine, remove the heater plate and close immediately.***
    This part of the welding operation must be kept as short as possible in order not to loose too much heat!

13. ***Slowly apply welding force and maintain for required cooling time according to table 2a.***

14. ***Inspect weld bead for evenness.***
    Uneven weld beads indicate incorrect alignment or out of roundness. Large weld beads could be caused by either too high a heater temperature and/or too high a welding force. A small weld bead could be caused by a too low a heater temperature and/or too low a welding force. In both cases the weld should be rejected due to reduced strength.

Figure 9.

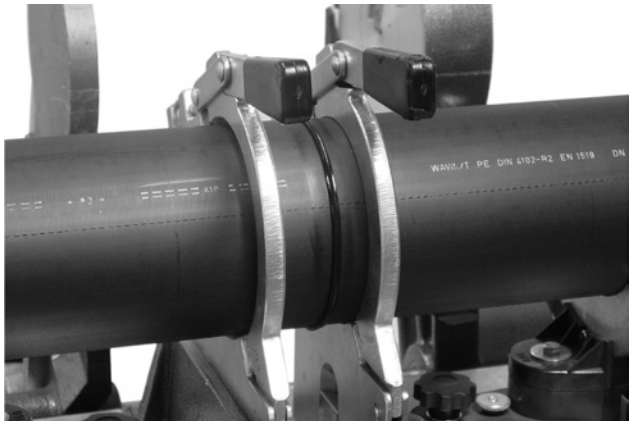


Figure 10.

15. ***Remove welded joint from the welding machine after cooling time is elapsed.***
    The joint need to be kept free from any loads within 5 minutes after the cooling time is elepsed.

If the above steps are followed correctly, the above mentioned four basic requirements should be fully met.

Table 2. Guidance of the heat soaking duration (in seconds) for butt-welding.

Diameter	40	50-110	125	160	200	250	315
Time [s]	30	40	60	80	100	140	170

Diameter	40-75	90	110	125	160	200	250	315
Time [s]	60	70	80	100	120	200	280	340

Table 2a. Guidance of the minimum cooling time (in seconds) for butt-welding at 20° C.

2.2.3. Electro fusion

Electro fusion couplers are fitted with a resistance wire. Heat should be applied to the welding zones using appropriate welding equipment (see Pages 58 and 59). The polyethylene expands during the fusion process. This expansion ensures that the necessary welding pressure is generated. Wavin welding equipment automatically supplies the precise amount of heat required for a perfect weld. One type of electro weld equipment is available (see product range).

Overview electro fusion machines and couplers

Equipment type	weld zone	Electro fusion couplers for use in jointing
WaviDuo Machine Type No. 4700.200	40 – 315	WaviDuo couplers

*plus compatible couplers up to 160 mm.

Electro fusion couplers, weld time (approx.)

Note: the data given in the following table is approximated, since weld times are dependent on ambient temperature and are a function of the welding equipment used. The data given in the table is relevant to ambient temperatures of 23 °C and 230 V supply.

WaviDuo electro fusion coupler

Dimension mm	Weldingtime (ca.) s
40 – 160	82
200 - 315	370

Using electroweld equipment

Always read the manufacturer's operating instructions and the contents of DVS 2207 before using pipe collar welding equipment. Where no operating instructions are available please contact Wavin Overseas.

Installation: Required tools:

- Pipe cutter
- Circumferential measuring tape
- Rotary peeler or hand scraper
- PE cleaner
- Lint-free, colorless and clean cloth
- Measuring stick
- Permanent marker
- 230VAC power supply
- Welding machine, suitable for WAVIDUO couplers (DUO 315)
- Pipe clamp if appropriate

NOTICE - Faulty pipe connection

Insufficient preparation and non-observance of the installation instructions may lead to a faulty pipe connection. The functioning and life-time of the system and the connection may be affected. Please adhere to the instructions in this installation manual and the operating instructions provided with the welding machine.

The pipe ends must be cut precisely. The pipe ends should be fully inserted until the marked position on the pipes. Failing to adhere to the welding instructions can lead to overheating of the pipe connection during the welding process and in extreme cases lead to a fire hazard.

NB: Never weld a WAVIDUO electro fusion coupler twice. A faulty connection must be cut out and be replaced by a new coupler.

General

With wet and cold conditions on site, take special precautions in order to create a working environment that is sufficiently dry and warm.

When installing the system, the maximum acceptable temperature range is -10°C to +40°C.

Electro fusion jointing procedure

1) Clean pipe roughly in the circumferential direction, cut precisely square with pipe cutter and deburr edges. Cut off obvious reversed pipe ends.

2) Check fusion ends with a circumferential measuring tape before and after peeling operation. Adhere to standards and specifications (EN 12666-1). (See Table 3).

3) Measure the length of the coupler with a measuring stick to calculate the peeling length. Formula for peeling length: (coupler length / 2) + 10mm. In case of use as a sliding coupler or repair coupler the peeling length is equal to the length of the coupler. Remove center stop with a knife.

4) Measure area which must be peeled with a measuring stick on the pipe and mark with a permanent marker.

Step 3.

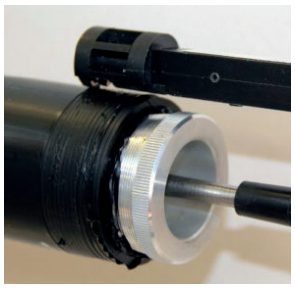
Step 4.

5) Peel pipe with a rotary peeler or hand scraper past the marking. Do not use sand paper. Ensure that the complete surface of the peeling area is peeled sufficiently. Minimum peeling thickness of 0.2 mm. (See Table 3).

6) Clean the peeled area of the pipe with PE cleaner using a clean, lint-free, colorless cloth in circumferential direction and let the cleaner evaporate.

7) Always mark the insertion depth with a permanent marker on the pipe. Formula for insertion depth: (coupler length / 2). See NOTICE Faulty pipe connection (page 12)!

8) Clean the inside of the electro fusion coupler with PE cleaner using a clean, lint-free, colorless cloth in circumferential direction and let the cleaner evaporate until coupler is free of residues.



Step 5.

Step 6.

Step 7.

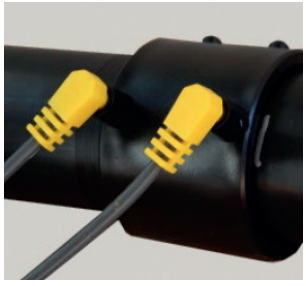
Step 8.

9) Proper marking allows complete control over fully inserting the pipe and movements of pipe and fittings during the welding process. See NOTICE Faulty pipe connection (page 12)!

10) Ensure a low stress installation. Secure pipe and electro fusion coupler against movements. If appropriate, use pipe clamps to hold the system in place.

11) Follow the instructions on the display of the welding machine. Control and supervise fusion process.
Do not touch the electro fusion coupler during the fusion process and the cooling time. Risk to be burned!

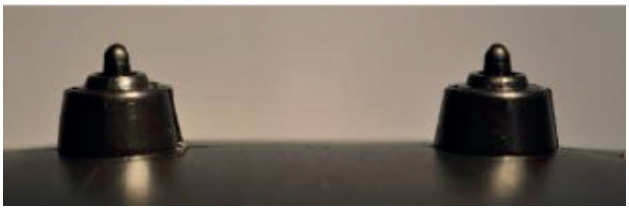
Step 9.



Step 11.

12) During and after fusion, check message on display of the fusion unit. When fusion is successful, remove fusion cables. Check fusion indicators on the coupler. Both indicators have to be visible. If not, coupler must be cut out and a new coupler should be installed. Defective connections must not be welded twice! See NOTICE Faulty pipe connection (page 12)!

Step 12. Before.



Step 12. After.

13) Make sure you have a low stress installation. Secure the pipe and electro fusion coupler against movements (i.e. using pipe clamps) and keep fixed and still until cooling time has elapsed.

Pressure testing pipe systems

There are no standard requirements relating to rainwater piping in buildings. Where a pressure test is to be carried out, close off the piping system at the cleaning trap using a sealing bladder. The system can then be filled with water and the pressure value above hydrostatic determined.

Diameter Ø	d40	d50	d56	d63	d75	d90	d110	d125	d160	d200	d250	d315
Min. pipe Ø [mm]	39.6	49.6	55.6	62.6	74.6	89.6	109.6	124.6	159.6	199.6	249.6	314.6
Cooling Time [min]	10	10	10	10	15	15	15	15	15	20	20	20

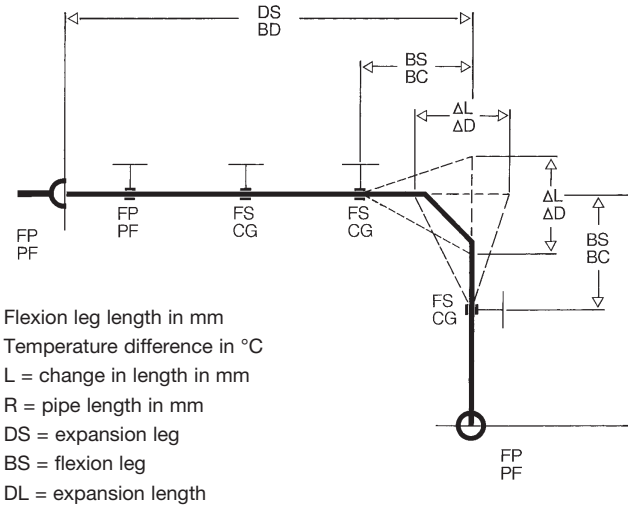
Minimum wall reduction by peeling 0.2 mm

Table 3.

Installation

3.1 Installation using flexion legs / expansion bends

Due to the elastic modulus of polyethylene, any temperature-related changes in length can be absorbed using flexion legs.



Flexion leg length in mm
Temperature difference in °C
L = change in length in mm
R = pipe length in mm
DS = expansion leg
BS = flexion leg
DL = expansion length
FP = fixing point
FS = guide clamp

Figure 11. Installation using flexion legs.

Flexion leg length (BS) is given by
- the change in length (DL) of the expansion leg (DS)
- PE piping external diameter

Temperature-related changes in PE pipe length (DL) are transferred to the flexion legs by the guide clamp fixing points (FP).

The following parameters are used to determine flexion leg length in the diagram below (Fig. 73):

- Average coefficient of linear expansion of PE - HD = 0.2 mm/m °C
- flexion leg: $\sqrt{de} \times \Delta L$
  de = external diameter
  L = change in length

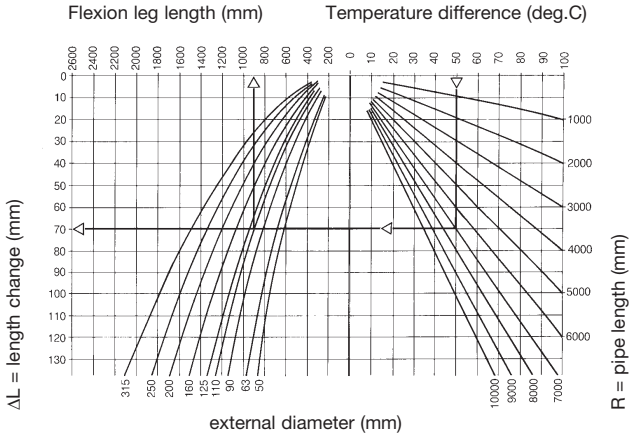


Figure 12. Calculation of flexion leg length.

3.2 Operation, treatment and installation of expansion sockets

Expansion sockets are used for taking up expansion on applications where flexion legs cannot be installed.

Long collars should be fixed rigidly to the supporting structure. The fixtures (clamps) must be capable of withstanding the forces applied during pipe installation and subsequent sliding movements. The forces applied during pipe installation are those generated when pushing home the tapered pipe ends. The sliding resistance is the ability of the long pipe collar to withstand the effects of temperature-related changes in the length of the pipe.

Dimensions	Installation forces	sliding resistance under operating conditions
De	N	N
50 - 63	200	100
75	250	120
90	300	200
110	400	300
125	550	400
160	800	700
200	1200	1000
250	1800	1500
315	2600	2200

Table 4. Installation force and sliding resistance.

Installation

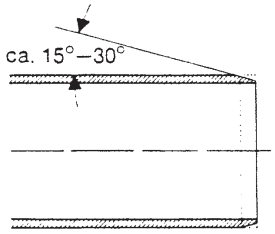


Figure 13. Chamfering in pipe ends.

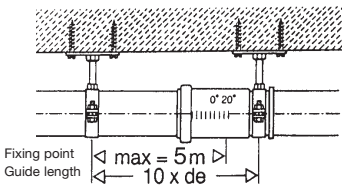


Figure 14. Fixing a long pipe collar.

Pipe ends should be evenly chamfered to an angle of approximately 15°. Use lubricant on the spigot end as this allows the pipe end to be inserted with minimum resistance.

Expansion socket is designed to support a maximum pipe length of 6 m. The appropriate number of long pipe collars must therefore be calculated when supporting longer pipe runs. Mark off the required insertion depths, champfer the male pipe ends and use lubricant.

The insertion lengths required are dependent on the temperature of the surroundings during installation. Installation temperatures of 20 °C require insertion lengths of 10.5 cm; installation temperatures of 0 °C require only 8 cm insertion lengths.

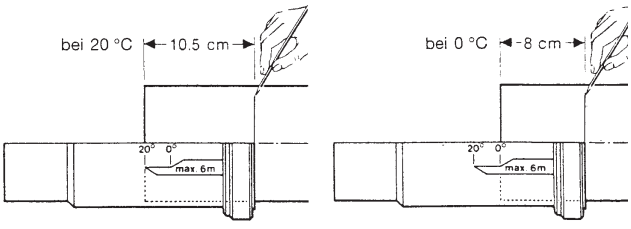


Figure 15. Insertion length as a function of installation temperature.

Fixation

The ceiling plates and pipe clamps to be used will dependent on the size of the wall or ceiling gap, L, and the pipe diameter.

Choose the appropriate ceiling plate or disc to match the gap, L.

The section modulus, W, should be calculated where the value of L is large. The following formula can be used:

W = L • K/s
W = section modulus in cm^3
L = Wall or ceiling gap (cm)
K = Sliding resistance (kp) in Newtons (N) – see table below
s = allowable bending stress of the fixture in kg/cm^2 ($2000\ kg/cm^2$)

Wall or ceiling gap L (mm)	**d 50 - 90**	**d 110**	**d 125**	**d 160**	**d 200**	**d 250**	**d 315**
100	½”	½”	½”	-	-	-	-
150	½”	½”	½”	½”	-	-	-
200	½”	½”	½”	½”	¾”	1”	-
250	½”	½”	½”	¾”	1”	1”	5/4”
300	½”	½”	½”	¾”	1”	5/4”	5/4”
350	½”	½”	½”	1”	1”	5/4” 1	½”
400	½”	½”	¾”	1”	1”	5/4” 1	½”
450	½”	½”	¾”	1”	5/4”	5/4” 1	½”
500	½”	¾”	¾”	1”	5/4”	1 ½”	2”
550	½”	¾”	¾”	1”	5/4”	1 ½”	2”
600	½”	¾”	1”	1”	5/4”	1 ½”	2”

Table 5. Threaded pipe (fittings) as a function of wall and ceiling gap.

3.3 Rigid installation of open-mounted PE piping

Wall- or ceiling-mounted piping should be installed under the following rigid fixing point (FP) conditions.

The fixtures (fixing points) must be capable of withstanding the often substantial forces generated by pipe expansion and contraction.

Dimension	ring surface	assumed temperature difference	
		ca. +20° C – +90°C	ca. +20° C – -20° C
		Sliding resistance	Sliding resistance
d	cm²	N	N
56	5,0	1250	3150
63	5,6	1288	2528
75	6,8	1700	4280
90	9,5	2375	5985
110	14,0	3500	8820
125	18,5	4600	11650
160	29,6	7400	18650
200	37,7	9400	23750
250	59,5	14900	37500
315	93,9	23500	59150

Table 6. Sliding resistance in N.

3.4 Securing using fixed points

The fixed points are used for rigid installation must be capable of withstanding much greater expansion forces than those occurring in the case of installations where expansion sockets or expansion legs and elbows are used. Pipes with diameters of up to 160 mm can be secured using clamps with G 1/2" threaded collars with fittings and mating pipes to G 2" (see Table 6). Reduction collars can be used to achieve the required diameters.

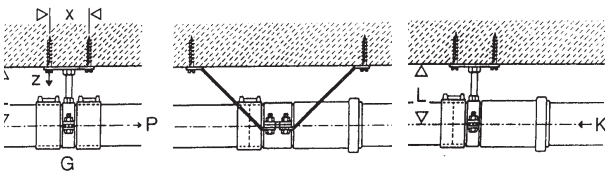
Wall or ceiling gap L (mm)	d 50 - 56	d 63 - 75	d 110	d 125	d 160
100	½"	¾"	1"	1"	1 ¼"
150	¾"	1"	1"	1 ¼"	1 ¼"
200	¾"	1"	1 ¼"	1 ½"	1 ½"
250	1"	1"	1 ¼"	1 ½"	2"
300	1"	1 ¼"	1 ¼"	2"	2"
350	1 ¼"	1 ¼"	1 ½"	2"	2"
400	1 ¼"	1 ¼"	1 ½"	2"	-
450	1 ¼"	1 ½"	2"	2"	-
500	1 ¼"	1 ½"	2"	-	-
550	1 ¼"	1 ½"	2"	-	-
600	1 ½"	1 ½"	2"	-	-

Table 7. Threaded pipe (fittings) as a function of wall and ceiling gap.

de mm	kg/ m	weight N/m
50	1,940	16
56	2,440	20
63	3,080	26
75	3,380	38
90	6,388	55
110	9,500	100
125	12,290	120
160	20,150	200
200	31,240	310
250	48,820	490
315	77,500	780

Table 8. Actual weight of the loaded piping.

Example: Given value: de = 110 mm
RA = 1.5 m (pipe clamp interval)
Required value: actual weight over section RA
Formula: G = N/m x RA
100 N/m (table left) x 1.5 m = 150/N



L = ceiling gap • X = hole distance • P = expansion force (see Table 1)
G = actual weight of loaded piping • Z = tensile force on screws
de = dimension • RA = pipe clamp interval

Figure 16. Examples of anchor point attachment.

The rawlplugs used must be capable of withstanding the actual weight of the loaded piping and the resulting tensile forces generated by expansion.

3.5 Installation of expansion joints

Expansion joints are push-fit sockets with a rubber seal. Expansion and contraction in the pipe system is absorbed by axial displacements in the sockets. Normally expansion joints are mostly located in the vertical downpipes. In special circumstances, if no other options remain to absorb thermally induced displacements, expansion joints can be positioned in horizontal collector pipes.

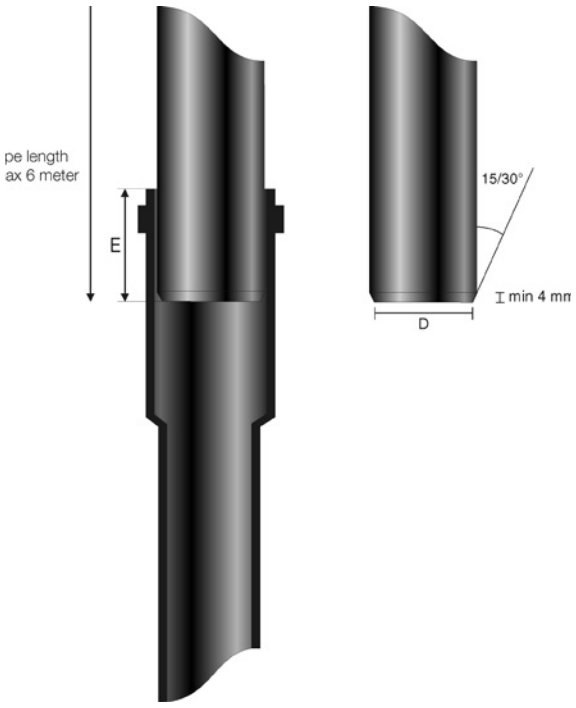


Figure 17. Installation of an expansion joint.

For a good functioning of the expansion joints, follow these instructions:

1. **Prepare positions of fix- and sliding brackets**
   Expansion sockets must always be configured as a fixed-point. That means that all other fixing points must be sliding brackets (see figure 87).

2. **Chamfer pipe end**
   Chamfer angle should be approximately 15° and chamfering length should be minimum 4 mm.

Figure 18.

3. **Mark insertion depth**
   Use the insertion depth for the ambient temperature during installation according to the values mentioned in table 9.

	Pipe diameter									
	≤ 50	63	75	90	110	125	160	200	250	315
Ambient temperature	Insertion depth in [mm] for pipe length of 6 meter									
- 10° C	65	70	70	80	85	90	100	140	140	140
0° C	75	80	80	90	95	100	110	150	150	150
+ 10° C	85	90	90	100	105	110	120	160	160	160
+ 20° C	95	100	100	110	115	120	130	170	170	170
+ 30° C	105	110	110	120	125	130	140	180	180	180

Table 9. Insertion depth of pipes into an expansion socket, max. pipe length 6 meter.

Figure 19.

4. Install pipe and fix with a fixed-point bracket on the socket side and sliding brackets over the rest of the pipe length.

Figure 20.

5. Check depth of insertion.

3.6. Installation of Wavin fire protection sleeves

3.6.1 Wavin BM-R90 fire protection sleeve

Wavin BM-R90 is a new fire-protection sleeve designed for use with Wavin domestic waste water removal piping systems according to DIN 4102-11. It is suitable for use on piping with external diameters of up to 160 mm and is able to provide a secure seal for use in all conceivable installation situations:

- Right-angled wall and ceiling penetration
- Lightly-constructed partition walls
- Angled wall and ceiling penetration to 45°
- For sealing over pipe collars (to 45°)
- For installation under ceilings and in front of walls
- Installation flush with ceiling surface

3.6.1.1 BM-R90 Installation instructions

The BM-R90 fire collar provides fire resistant sealing for wall and ceiling installation of the Wavin PE Soil & Waste system. The BM-R90 fire collar is approved by the German Institute Building (DIBt), approval no. Z-19.17-1924.

General recommendations

1) Positioning of the collars: on both sides of a wall; on one side under / in a ceiling (see Fig. 25).

2) Wall & ceiling types: at least 10 cm thick solid concrete, aerated concrete and sand-lime brick walls as well as light dividing walls (stud walls: both sides clad with 12.5 mm plasterboard) and solid concrete and aerated concrete ceilings at least 15 cm thick

3) Structural acoustic insulation: the acoustic insulation mat provided must be wrapped around the pipe where it passes through the wall or ceiling

4) Joint sealing between pipe and wall / ceiling: to be packed to the full thickness of the wall or ceiling using mineral materials such as concrete, cement or plaster .

Figure 21. BM-R90 fire collar.

3.6.1.2 Components

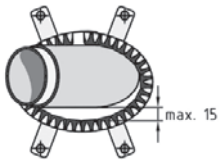
The fire collars are made from powder coated sheet steel with a push-in fastening and tab fixings with an integrated intumescent material for reliable closure in the event of fire. Also included:

- insulation mat,
- fixing kit,
- identification label,
- declaration of conformity (Enclosure 1)

Selection table

Wavin PE pipes	d mm	s mm	Straight Installation mm	Straight installation with sleeve	Angled installation [1] With sleeve or socket ≤ 45°
40	40	3.0	40	63	75
50	50	3.0	50	63	75
56	56	3.0	63	75	90
70	75	3.0	75	90	110
90	90	3.5	90	110	125
100	110	4.3	110	125	140
125	115	4.9	125	140	160
150	160	6.2	160	180	200
200	200	6.2/7.7	200	-	-

Table 10. BM-R90 selection table for various types of Wavin PE pipe installation.



[1] The shape of the sleeve must be turned oval by pushing on both sides. In that way the shape of the sleeve can be adapted when leading-through the pipes (see also Figure left).

3.6.1.3 Types of installation

I) Ceiling installation

Minimum requirements of the ceiling:
min. 150 mm thick concrete ceiling.

Flush ceiling installation

Wrap insulating mat around the pipe.

Open the collar and position it around the pipe, whilst hooking in the push-in fastening. Bend or angle the collar mounting tabs. Then install the collar flush with the ceiling. Fill the remaining ceiling gap with cement or concrete (see general recommendations (4).

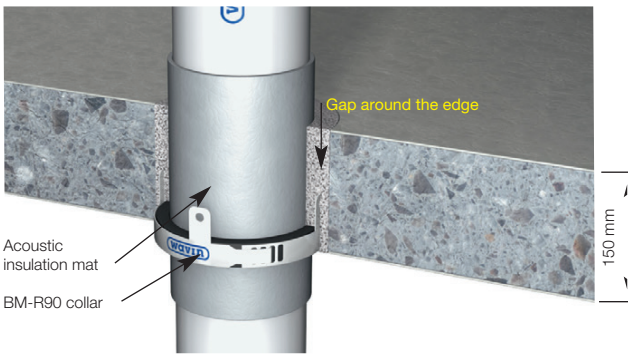


Figure 22. Straight installation without sleeve / socket up to 160 mm.

II) Installation under the ceiling

Straight ceiling installation

Wrap insulating mat around the pipe. Open the collar and position it around the pipe, whilst hooking in the push-in fastening. Fill the remaining gap with cement or concrete (see general recommendations (4)). Hold the collar firmly against the ceiling and mark the positions of the mounting holes.

Rotate the collar and drill the holes.

Insert plugs and fix the collar using screws and washers. (Mounting the collar using the washers, plugs and screws provided).

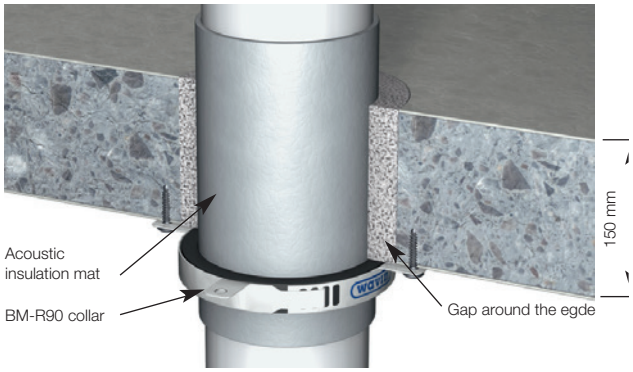


Figure 23. Straight installation with / without sleeve / socket.

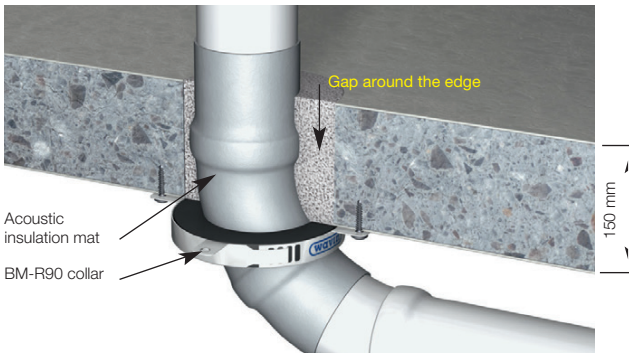


Figure 24. Angled ceiling installation ≤ 45º with / without sleeve / socket.

Angled ceiling installation

Wrap insulating mat around the pipe.

Open the collar and position it around the pipe, whilst hooking in the push-in fastening. Fill the remaining gap with cement or concrete (see general recommendations (4).

Hold the collar firmly against the ceiling and mark the positions of the mounting holes.

Rotate the collar and drill the holes.

Insert plugs and fix the collar using screws and washers. (Mounting the collar using the washers, plugs and screws provided).

Installation distances between BM-R90 fire protection collars eg to external systems

The distance to external, tested systems (inspected and approved) must be at least 50 mm between partitioned sections.

If two Wavin R90 feedthroughs are installed next to each other, the distance between the pipes must be at least 100 mm in the case of special partitioned sections (sloping pipes, partition via sleeve/socket or for ceiling installations). In the case of straight pipes without sleeve/socket in the partition area, the collar casings can adjoin each other (distance 0 mm).

III) Wall installation

Minimum wall specifications: wall must be at least 100 mm thick, made from concrete, aerated concrete, lime sandstone or lightweight partition walls (two-layer panelling on both sides with 12.5 mm plasterboard panels and mineral wool infill). The pipe must be clamped on both sides at a distance of ≤ 50 cm. For wall feedthroughs, a collar should always be fitted on both sides of the wall.

Wrap insulating mat around the pipe. Open the collar and position it around the pipe, whilst hooking in the push-in fastening. Fill the remaining gap with cement or concrete (see general recommendations (4). Hold the collar firmly against the ceiling and mark the positions of the mounting holes.

Rotate the collar and drill holes.

Insert plugs and fix the collar using screws and washers. (Mounting the collar using the washers, plugs and screws provided).

Repeat the steps described for the second collar required on the opposite side.

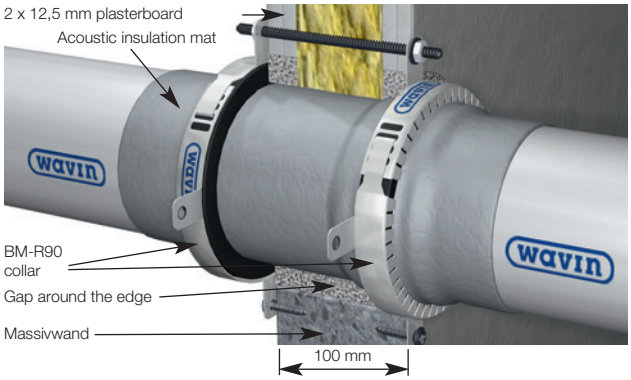


Figure 25. Straight installation with sleeve / socket.

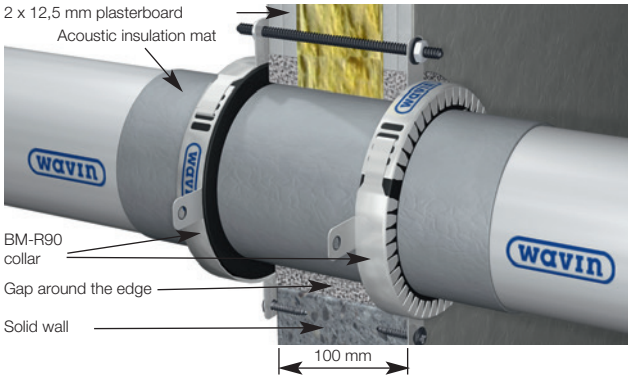


Figure 26. Straight installation without sleeve / socket.

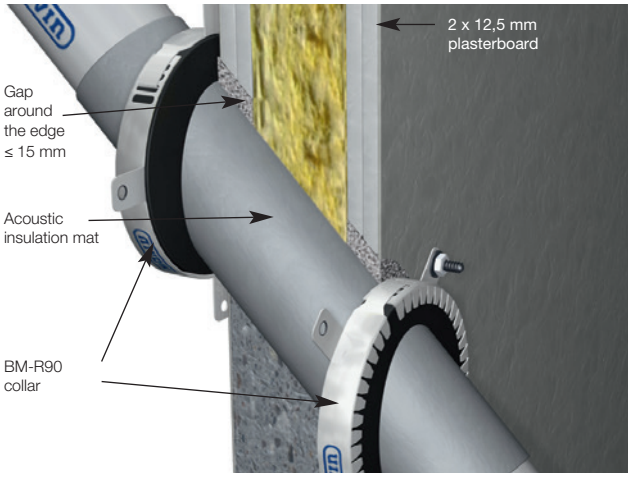


Figure 27. 45° angled installation with / without sleeve / socket.

Installation distances between BM-R90 fire protection collars eg to external systems

The distance to external, tested systems (inspected and approved) must be at least 50 mm between partitioned sections.

If two Wavin R90 feedthroughs are installed next to each other, the distance between the pipes must be at least 100 mm in the case of special partitioned sections (sloping pipes, partition via sleeve/socket or for ceiling installations). In the case of straight pipes without sleeve/socket in the partition area, the collar casings can adjoin each other (distance 0 mm).

Note

The presented data, especially recommendations for the processing and use of our products are based on our knowledge and experience. Due to differences in material and working conditions that are outside the scope of our influence, we recommend that sufficient internal trials be conducted in each case to ensure the suitability of our product to the intended method and processing purposes. No liability will be accepted either on the basis of these instructions or from an oral advice, unless we are accused of gross negligence or deliberate malice.

Enclosure 1
Declaration of conformity
for the Wavin BM-90 fire collar

Name and address of the installing company:

Site / building:

Date of manufacture:

Required fire safety class for pipe seal: R90

Declaration:

We hereby state that:
all details of the manufacture and installation of R90 fire resistant pipe seals for installation in walls and ceilings of fire class F90 have been carried out properly and according to the requirements of the Deutsche Institut für Bautechnik (DIBt / German Institute of Building Technology) National Technical Approval No.: Z-19.17-1924 dated 21.10.2008.

The signatories confirm that the products used in the manufacture of the object being certified (e.g. the pipe collar or the fitting kit, fire protection insert etc.) have been accredited according to the National Technical Approval standards.

Place / Date

Company / Signature

This declaration is to be given to the builder to be forwarded to the relevant building authorities if required.

3.6.2 Wavin BB-R90 fire protection tape

The fire protection tape BB-R90 is for the fire-resistant partition of the following pipe systems according to the approval numbers EN 13501 (European approval) esp. Z-19.17 1219/Z-19.17-1884.

Wavin waste water pipe system	ø in mm	wall thickness in mm
PE-Pipes	90/100	3.5 – 4.3

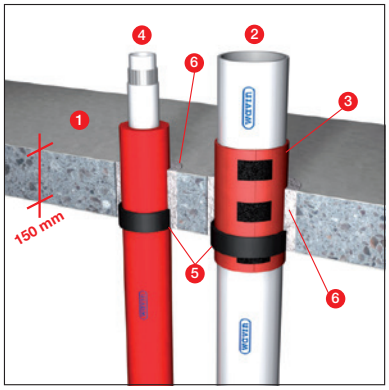
Table 11.

Overview of possible installation situations:

Installation example ceiling:
Minimum requirement: 150 mm thick ceiling of concrete or aerated concrete.

Scope of Delivery:
- fire protection tape (length/width: 2080/50 mm)
- sound insulation strip (length: 300 mm)
- 2 adhesive tapes
- fire protection sign
- certificate of compliance
- installation instruction

Figure 28.



1) Concrete ceiling, aerated concrete, thickness ≥ 150 mm
2) Wavin waste water pipe
3) Sound insulation strip
4) Wavin multilayer pipe (isolated)
5) Fire Protection Tape BB-R90 (flush with the ceiling)
6) Annular gap closed throughout with concrete, mortar

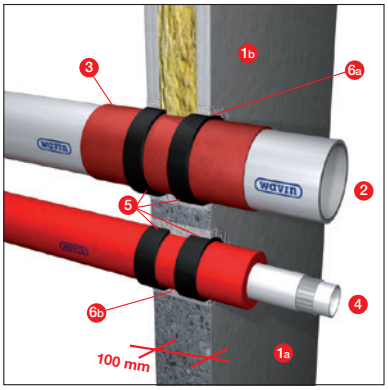
Possible fields of application: waste water pipe system:
Fire-resistant partitions in walls and ceilings (see figure 10 and 11). **Only in connection with smooth pipes (no moulds) and straight pipe fairlead.**
This fire protection tape is not suitable/permitted for the partition of sloped ducts and/or for sockets or moulds.
For these requirements/situations you can use the Wavin fire protection collar BM-R90 (with German DIBt certification) in connection with the Wavin waste water systems.

Possible fields of application: Installation pipe systems:
Fire-resistant partitions in walls and ceilings (see figure 10 and 11). **Only in connection with smooth pipes (no moulds) and straight pipe fairlead.**
With this fire protection tape BB-R90 you can also realize partitions with isolated multilayer pipes. The required wrappings are different according to the diameter and the insulation.

Installation example wall:
Minimum 100 mm thick wall of concrete, aerated concrete, sandlime brick or lightweight construction wall (both-sided double layer lining of 12,5 mm gypsum boards and filled with mineral wool).

- For wall ducts always place a tape at both sides of the wall.
- In a distance of ≤ 50 cm to the wall the pipe has to be fixed on both sides with pipe clamps.

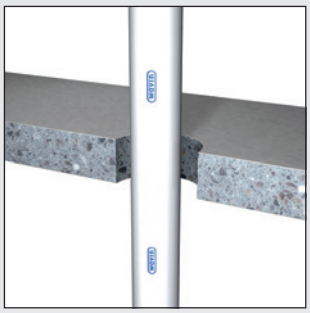
Figure 29.



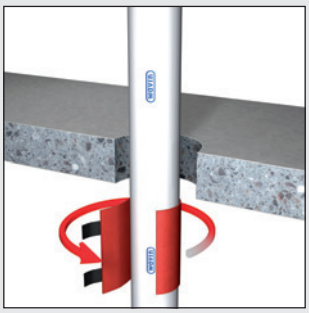
1a) Concrete wall, aerated concrete or sand-lime brick thickness ≥ 100 mm.
1b) lightweight construction wall, both-sided 2 x double layer lining of 12,5 mm gypsum boards and filled with mineral wool
2) Wavin waste water pipe
3) Sound insulation strip
4) Wavin multilayer pipe (isolated)
5) Fire Protection Tape BB-R90 (each flush with the wall)
6a) Annular gap both-sided closed (25 mm each)
(6b) Annular gap closed throughout with concrete, mortar.

Installation example ceiling

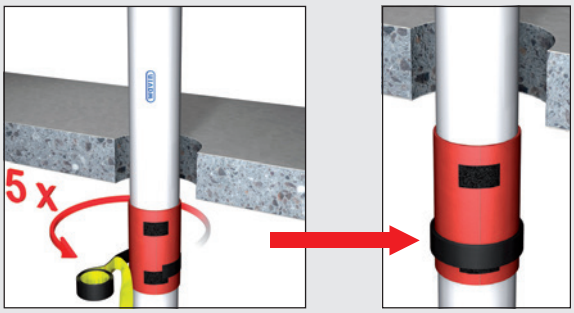
Step 1



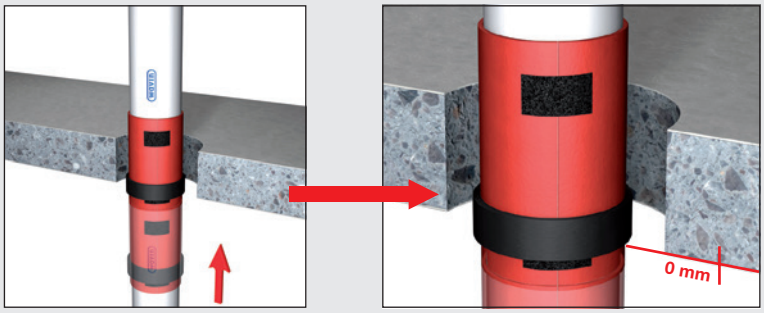
Step 2



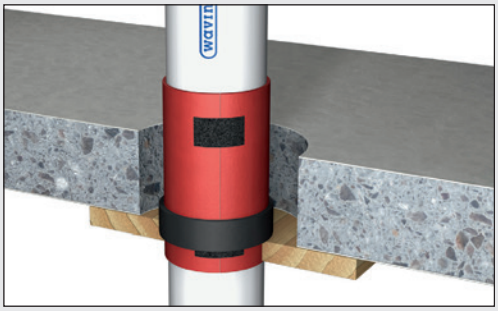
Step 3



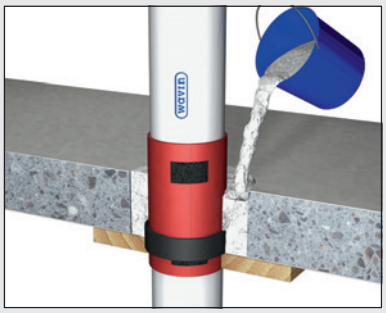
Step 4



Step 5

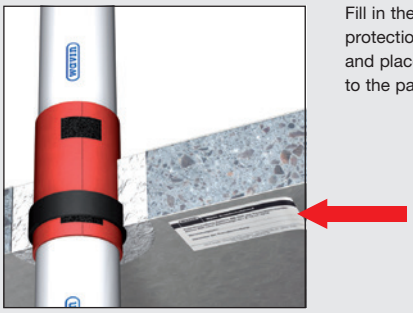


Step 6



Close the gap (wall/ceiling) with concrete or mortar. For lightweight construction walls the gap (gypsum board to Fire Protection tape) has to be closed completely (25 mm) with gypsum.

Step 7



Fill in the fire protection sign and place it next to the partition.

3.7 Wavin PE Airmix “Sovent” fitting

The Airmix “Sovent” fitting from Wavin is an ideal solution to reduce pressure fluctuations and to prevent installing an additional ventilation stack.

3.7.1 Introduction

In our daily life a lot of soil & waste water is being produced by toilets, bath, showers, dishwashers and washing machines. All this waste water has to be drained from the buildings and transported to the sewage facilities. A single drainage pipe would just be capable of draining the maximum amount of waste water. However, large pressure peaks do appear, blowing out all water traps and giving access for bad odors to enter the home.

To keep the pressure fluctuations low, the system has to be ventilated and an additional ventilation stack can do the work. But this additional ventilation stack is more complicated in construction, costs considerably more and takes up more valuable space in the building shafts.

Figure 30. Airmix “Sovent” fitting.

The Wavin PE “Airmix” Sovent fitting prevents all this. The principle of this system is based on keeping a free path air to leave or to enter the system and thereby keeping the pressure level within acceptable limit.

It interrupts the fall of the waste water on every floor resulting in a reduction of speed. The vent pipe is obsolete and the unique design increases the capacity of the riser.

This fitting will be delivered with closed caps. After removing the caps the required branches can be butt welded on the fitting.

3.7.2 Benefits

The Wavin PE Airmix “Sovent” offers the following benefits in comparison with conventional systems:

- One special fitting offers 6 connections
  - Gives multiple connections per floor
- Single stack system
  - No separate ventilation pipes required.
- Space savings
  - Reduced stack sizes with the same loading capacities as a secondary ventilated system gives extra space for other installations
- Cost savings
  - Installation time and material saved
- Lower speed
  - Reduces the hydraulic pressure

3.7.3 Applications

The Wavin Airmix “Sovent” is an ideal drainage system fitting that can be used for:

- Hotels
- Universities, schools
- High-rise buildings
- Hospitals
- Laboratories
- ndustrial plants

3.8. Casting in heat cured concrete and extrusion shrinkage

PE pipework gives excellent results when cast into concrete floors and walls (see Chapter 7, Installation). Concrete is sometimes brought to very high temperatures in order to allow shuttering to be struck the following day, particularly in tunnelling work. The temperature gauge controlling the burners may sometimes be defective. It is also sometimes the case that the control of the burners is carried out using the outermost tunnel sections, because these cool most rapidly. The temperature in the enclosed tunnel may then be appreciably higher. Extrusion shrinkage becomes significant for plastic pipework in these circumstances. Extrusion shrinkage is the single-occurrence shrinkage measurable when the pipe is heated and then cooled. The limits are set down in the standards against set temperatures, and are for PE: at 110°C max. 3%. The pipe will expand during heating of the liquid concrete. The degree of expansion is limited as the pipework is fixed at various points and (the mass of) the concrete restricts expansion. Once the concrete has hardened the pipe will shrink due to thermal shrinkage and extrusion shrinkage. This is resisted by the hardened concrete as the pipework is held fast by bends, sleeves, T-pieces and similar, so that tensile forces arise in the pipe. The tensile forces give rise to concentrations of stress which may lead to breakage. T-pieces are particularly susceptible to stress concentrations. The degree of extrusion shrinkage depends on the maximum temperature achieved.

It is clear that the temperature of the pipes may be no higher than 80 to 90°C to cut out all risk. Since the variation in temperature in the concrete can be fairly great, it is stipulated that the measured temperature shall be no higher than 50 to 60°C. Higher temperatures are in any case not good for the quality of the concrete.

PE pipes for above-ground drainage are sometimes “tempered” for safety reasons. That means that they are heat treated during or following manufacture (extrusion), largely removing extrusion shrinkage.

3.9 Cast-in pipework

Pipework cast into concrete can be regarded as rigidly installed. Any welded joints in PE must be allowed to cool first. It is recommended that the pipework is pressure tested and checked for leaks before the concrete is poured. The pipework must be well fixed to prevent flotation during pouring. Special brackets are available for this purpose (illustration 7.13). With HPE the bracket separation is around 8 x D (min. 0.75 metre, max. 1.5 metre). If pipework is cast vertically in concrete (e.g. columns, walls) the liquid concrete will produce an external overpressure. Illustration 7.14 shows the resistance of various classes of PE pipes to external overpressure in kPa at 30°C.

(SDR = external diameter/wall thickness)

Note: The calculated class does not always accord with the nominal class.

In order to calculate the external overpressure in kPa the height in metres of liquid concrete must be multiplied by 24. If the pipe is filled with water to counteract flotation the multiplication factor is 14.

Example: 6 metres of liquid concrete, pipe Ø 110 mm without water filling, pressure 6 x 24 = 144 kPa. Minimum required for PE: 110 x 34.

With water filling the external overpressure is 6 x 14 = 84 kPa. In PE SDR 26

PE				
SDR Du/e	**HPE pipe size**			**calculated resistance (kPa)**
13,3	40x3			635
	50x3;	63x3,6;	75x4,3	
17	90x5,1;	110x6,3;	125x7,1	348
	160x9,1;	200x11,4		
21	63x3			178
	75x3;	90x3,5;	110x4,3	
26	125x4,9;	160x6,2;		92
	200x7,7			
30	90x3			58
32	110x3,5;	125x3,9;		50
	160x5,0;	200x6,2		

Table 12.

4. Situations during construction

Fouling, damage and movement of the installed waste removal system must be avoided during construction.

Possible measures include:

- Closing off pipework with protective caps. Use caps that fit over the pipe wherever possible so that they are not accidentally left in place. When using caps that fit within pipes, this should be clearly indicated.
- Seal off spigot ends that are still to be connected (by insertion, welding or cement).
- Expansion socket sleeves in vertical pipework should be protected from materials such as mortar that might get into the sleeve.
- Protect around 20 mm of pipe ends emerging vertically from concrete floors by sealing with plastic foam or similar prior to pouring concrete. This often prevents damage when the floor is worked on later.
- Ensure adequate anchoring to prevent flotation or bending of pipes during concrete pouring.
- Check direction and height of pipework before ceilings or ducts are installed.
- Pressure test pipework before pouring concrete.
- Prevent grit from roofs entering waste pipework. This can be extremely difficult to flush out and can give rise to problems especially with rubber seals.

5. Pressure testing

Pressure testing is carried out most quickly and simply using air under a limited overpressure. This is also possible with internal rainwater systems. The simplest procedure is to close off all openings, apply air pressure of 2 to 3 kPa (0.2 to 0.3 metre water column) and apply soapy water to the joints. Specialised companies sometimes use smoke-testing.

It is recommended that sections to be cast in concrete be pressure tested before pouring. This is not only because repairs are so difficult afterwards, but also to establish whom is to bear the cost of any subsequent repairs. If it is decided to carry out pressure testing (to NEN 3215) then the procedure is as follows:

- The system is pressure tested with an air pressure of 400 Pa (40 mm water column). Where the total capacity of the system to be tested is greater than 0.3 m^3, then it must be tested in sections of 0.3 m^3.
- All open joints are to be sealed with ball-type valves and all traps are to be filled.
- After 15 minutes the drop in pressure must not exceed 50 Pa (= 5 mm water column). If the drop in pressure exceeds that, the test must be continued up to 60 minutes. After that period the drop in pressure may not exceed 200 Pa (= 20 mm water column).
- The drop in pressure may be caused by moving connections, such as toilet sealing sleeves and sealing sleeves between horizontal pipes and connecting pipes, as well as by temperature differences during the test.
- The temperature difference may be up to 0.3°C, measured in the spaces occupied by the waste pipework.
- The pipework must not be exposed to radiant heat, including the heat of the sun.
- Where this nevertheless occurs (usually prior to pouring of concrete) then pressurisation with air and soap testing of the joints is a good alternative.
- A test is carried out immediately prior to the pressure test in order to demonstrate that the equipment is in good order. For this purpose the internal pressure in an enclosed pipeline or hose of say ø10 mm and 2 metres in length, with the pressure meter attached, is brought up to 400 kPa. The pressure drop may not exceed 10 Pa (1 mm water column) in a period of 15 minutes. When that is the case the waste removal system may be placed under pressure and the actual test carried out.

6. Maintenance

A well-designed, properly installed and correctly used waste removal system will require little or no maintenance. Inadequacies in design and installation, and above all incorrect discharge activities may cause poor or slow removal of water or a blockage. Usually no action is taken until the water begins to drain slowly or there is a complete blockage. Checks on drainage and periodic maintenance are therefore recommended. In the event of blockages or threatened blockages which are not located in the traps, a clearing spring may be used. Care must be taken to prevent damage, especially in bends. High pressure cleaning with a jet head is a better approach. The use of explosive charges to cause pressure shocks in the pipes is not recommended.

The usual drain-clearing agents may be used provided the instructions on flushing are followed. Roof channels, roofs, roof gullies and the like should be periodically cleared of dirt, leaves etc.

Specialist firms may carry out major maintenance or the clearing of serious blockages. It is useful to build in a number of cleansing facilities to aid cleaning or removal of blockages:

- removable traps
- connections to underground pipes with rubber sleeves
- access fittings at strategic points such as at the transition from underground pipework to the domestic pipework, around hydraulic problem areas such as after a series of bends and with longer pipe runs, and in cast-in pipework.

Access fittings must be accessible and where possible be located higher than the horizontal pipework, or better still higher than the discharge level of fittings. This means that a section of the blocked pipework does not need to empty through the opened access fitting. Where the access fitting cap is more than around 100 to 150 mm from the exterior of the pipe, the use of a 45° fitting is recommended. Obstruction of drainage from roofs, gutters, gullies, overflows, rainwater drainage and other drainage constructions must be prevented by means of periodic maintenance.

Special attention must be paid to drainage where granular roof coverings are installed after the drainage system is in place. Grit which enters horizontal pipework is difficult to flush away using the normal speed of flow, and encourages fouling. Flushing clean before handover and after around a year is strongly recommended.

7. Chemical resistance

The data in this list is intended only as a guide for planning purposes and are not automatically applicable to all conditions of use.Considerable devations can occur dependent on type of exposure and probable contamination of the chemical medium.
Wavin cannot be held liable for any special, indirect or consequential damages irrespective of whether caused or allegedly caused by negligence. No warranty can be derived concerning the data mentioned.

Symbols used in the table:

+	resistant
0	limited resistance only
-	not resistant
SA	saturated, aqueous solution
T	customary in trade
TP	technically pure
D	diluted

No symbol means no testing, unknown.

Chemical resistance	Concentration	PE-HD Temperture °C.		
		20	40	60
acetaldehyde	TP	+	o	o
acetic acid	60%			
acetic acid	10%	+	+	+
acetic acid	25%			
acetic acid	60–95%			
acetic anhydride	TP	+		o
acetone	TP	+	+	o
acetophenone	TO	+		–
acrylonitrile	TO	+	+	+
adipic acid	SA	+	+	+
air	–	+	+	+
allyl alcohol	96%	–	+	+
aluminium chloride	SA	+	+	+
aluminium fluoride	SA	+	+	+
aluminium sulphate	SA	+	+	+
alums	SA	+	+	+
ammonia, aqueous	SA	+	+	+
ammonia, fluid	TP	+	+	+
ammonia, gaseous	TP	+	+	+
ammonium acetate	SA			
ammonium carbonate, and bi	SA			
ammonium chloride	SA	+	+	+
ammonium fluoride	>10%	+	+	+
ammonium fluoride	20%			
ammonium fluoride	SA			
ammonium hydroxide	SA			
ammonium nitrate	SA	+	+	+
ammonium phosphate, also meta	SA	+	+	+
ammonium sulphide	SA	+	+	+
amyl acetate	TP	+	+	o
amyl alcohol	TP	+	+	o
aniline	SA			
aniline	TP	+	+	
oaniline chlorhydrate	SA	+	+	+
anisole	TP	o	–	–
anthraquinone sulphonic acid, suspension	SA			
antimony trichloride	90%	+	+	+
apple juice	T	+	+	+
aqua regia (HCl / HNO3)	03:01	–	–	–
arsenic acid	SA	+	+	+
barium salts	SA	+	+	+
beer	T	+	+	+
benzaldehyde	o.1%			
benzaldehyde	TP	+	+	o
benzene	TP	o	o	o
benzine (cleaning benzine)	T	+	+	o
benzine -super (gas fuel)	T	+	+	o
benzine-benzene mixture	80/20			
benzoic acid	SA	+	+	+
benzoyl chloride	TP	o	o	o
benzyl alcohol	TP	+	+	o
borax	D			
borax	SA	+	+	+
boric acid	SA	+	+	+
brandy	T			
bromic acid	10%			

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Chemical resistance	Concentration	PE-HD Temperture °C.		
		20	40	60
bromine vapour	–			
bromine, fluid	TP	–	–	–
bromine, gaseous, dry	TP	–	–	–
butadiene	TP	o		–
butane, gaseous	TP	+	+	+
butanol	TP	+	+	+
butyl acetate	TP	o		–
butyl glycol (butandiol)	TP	+		
butyl phenol	SA			
butyl phenol	TP			
butyl phthalate	TP	+		o
butyric acid	20%			
butyric acid	TP	+	+	o
calcium carbonate	SA	+	+	+
calcium chlorate	SA	+	+	+
calcium choride	SA	+	+	+
calcium hydroxide	SA	+	+	+
calcium hypochloride	SA	+	+	+
calcium nitrate	50%			
calcium nitrate	SA	+	+	+
calcium sulphate	SA	+	+	+
calcium sulphite	SA	o	o	o
camphor oil	TP	–	–	–
carbon dioxide	100%	+	+	+
carbon dioxide, gaseous, wet/dry	TP	+	+	+
carbon disulphide	TP	o	–	–
carbon monoxide	TP	+	+	+
carbon tetrachloride	TP	o	–	–
carbonic acid	SA			
castor oil	TP	+	+	+
caustic soda, see sodium hydroxide solution		+	+	+
chlorethanol	TP	+	+	+
chlorinated lime, slurry	–	+	+	+
chlorine, fluid	TP	–	–	–
chlorine, gaseous, dry	TP	o	–	–
chloroacetic acid	85%	+	+	+
chloroacetic acid	TP			
chloromethane	TP	o	–	–
chlorosulphuric acid	D			
chlorosulphuric acid	TP	–	–	–
chrome alum	SA	+	+	+
chromic acid	1–50%	+	o	o
citric acid	D			
citric acid	SA	+	+	+
coconut oil	TP			
copper chloride	SA	+	+	+
copper cyanide	SA			
copper nitrate	30%			
copper nitrate	SA	+	+	+
copper sulphate	SA	+	+	+
coppper fluoride	2%			
corn germ oil	TP			
cottonseed oil	TP			
cresole	up to 90%	+	+	+
cresole	> 90%	+	+	o
cresylic acid	SA			

Chemical resistance	Concentration	PE-HD Temperture °C.		
		20	40	60
crotonaldehyde	TP	+		o
cyclohexane	TP			
cyclohexanol	TP	+	+	+
cyclohexanon	TP	+		o
decahydronaphtalene (decalin)	TP	+		o
developer	T	+	+	+
dextrin	D	+	+	+
dibutyl phthalate	TP	+	o	o
dichloroacetic acid	TP	o	o	o
dichloroethylene	TP			
dichloromethane (methylene chloride)	TP	o		–
diethanolamine	TP	+		
diethylether	TP	o		
diglycolic acid	30%			
diglycolic acid	SA	+	+	+
diisooctyl phthalate	TP	+	+	o
dimethylamine	30%			
dimethylamine	TP			
dimethylformamide	TP	+	+	o
dioctyl phthalate	TP	+		o
dioxane	TP	+	+	+
disodium phosphate	SA			
ethanediol	TP	+	+	+
ethanol	40%	+		o
ethanol	TP	+	+	+
ethanolamine	TP			
ether, see diethyl ether		o		
ethyl acetate	TP	+		–
ethyl chloride, mono and di	TP			
ethyl glycol, see ethanediol		+	+	+
flax oil	TP	+	+	+
fluoric acid	40%			
fluoric acid	70%	+	+	o
fluoride	TP	–	–	–
fluorosilicic acid	40%	+	+	+
formaldehyde (formalin)	40%	+	+	+
formic acid	1–50%	+	+	+
formic acid	TP	+	+	+
fructose	T	+	+	+
fruit juices	T	+	+	+
furfuryl alcohol	TP	+	+	o
gelatin	D	+	+	+
glacial acetic acid	TP	+		o
glucose	20%			
glucose	SA	+	+	+
glucose	D	+	+	+
glycerine	TP	+	+	+
glycolic acid	30%			
glycolic acid	SA	+	+	+
heptane	TP	+	o	–
hexadecanol	TP			
hexane	TP	+	o	o
hydrobromic acid	SA	+		
hydrobromic acid	10%			
hydrochloric acid	SA			
hydrocyanic acid	10%	+	+	+
hydrogen	TP	+	+	+

Chemical resistance	Concentration	PE-HD Temperture °C.		
		20	40	60
hydrogen bromide	50%	+	+	+
hydrogen bromide	TP	+	+	+
hydrogen chloride, damp	TP	+	+	+
hydrogen chloride, dry	TP			
hydrogen peroxide	30%	+	+	+
hydrogen peroxide	90%	+	0	–
hydrogen sulphide	100%	+	+	+
hydrogen sulphide	SA			
hydrogen sulphide	TP	+	+	+
iodine tincture	T	+		o
i-propanol, see isopropanol		+	+	+
iron II chloride	SA	+	+	+
iron II sulphate	SA	+	+	+
iron III chloride	SA	+	+	+
iron III nitrate	D	+	+	+
iron III sulphate	SA	+	+	+
isopropanol	TP			
isopropylether	TP			
lactic acid	10%			
lactic acid	TP	+	+	+
lanolin (wool lipids)	T	+	o	o
lead acetate	SA	+	+	+
lead tetraethyl	TP	+		
magnesium carbonate	SA	+	+	+
magnesium chloride	SA	+	+	+
magnesium hydroxide	SA	+	+	+
magnesium nitrate	SA	+	+	+
magnesium sulphate	SA			
maleic acid	SA	+	+	+
malic acid	SA			
mercury	TP	+	+	+
mercury chloride	SA	+	+	+
mercury cyanide	SA	+	+	+
mercury nitrate	D	+	+	+
methanol (methyl alcohol)	TP	+	+	o
methyl acetate	TP	+	+	
methyl bromide	TP	o		–
methyl ethyl ketone	TP	+		o
methyl methacrylate	TP			
methylamine	up to 32%	+		
methylene chloride, see dichloromethane		o	–	–
milk	T	+	+	+
mineral oils	T	+	+	o
mineral water	T	+	+	+
molasses	T	+	+	+
muriatic acid	up to 35%	+	+	+
muriatic acid	20%			
muriatic acid, dilute	conc.	+	+	+
naphtha	T	+	–	–
naphthalene	TP			
nickel salts	SA	+	+	+
nicotinic acid	D	+	+	
nitric acid	10%			
nitric acid	25%	+	+	+
nitric acid	up to 40%	o	o	–
nitric acid	10–50%	o	o	–

Chemical resistance	Concentration	PE-HD Temperture °C.		
		20	40	60
nitric acid	more than 50%			
nitric acid	75%	–	–	–
nitric acid	98%			
nitrobenzene	TP	+	o	o
n-propanol	TP	+	+	+
oils and fats (vegetable/animal)	–	+	o	o
oleic acid	TP	+	+	+
olive oil	TP	+	+	o
oxalic acid	SA	+	+	+
oxygen	TP	+	+	o
ozone	TP	o	–	–
paraffin oil	TP	+	o	o
peanut oil	TP	+		
peppermint oil	TP	+		
perchloric acid	10%			
perchloric acid	20%	+	+	+
perchloric acid	70%			
perhydrol, see hydrogen peroxide 30%		+	+	+
petrol ether	TP	+	o	o
phenol	D	+	+	+
phenol, dilute	90%			
phenylhydrazine	TP			
phenylhydrazine chlorohydrate	TP			
phosphine	TP			
phosphoric acid	50%	+	+	+
phosphoric acid	up to 85%	+	+	o
phosphorus trichloride	TP	+	+	o
phosphoryl chloride	TP	+	+	o
picric acid	SA	+	+	
potable water, chlorinated	TP	+	+	+
potash, see potassium nitrate		+	+	+
potassium bichromate	40%			
potassium bichromate	SA	+	+	+
potassium borate	SA			
potassium bromate	SA	+	+	+
potassium bromate	10%			
potassium bromide	SA	+	+	+
potassium carbonate and bi	SA	+	+	+
potassium chlorate	SA	+	+	+
potassium chloride	SA	+	+	+
potassium chromate	40%	+	+	+
potassium cyanide	>10%	+	+	+
potassium cyanide	SA			
potassium fluoride	SA	+	+	+
potassium hexacyanoferrate (II+III)	SA	+		+
potassium hydroxide	60%	+	+	+
potassium hydroxide	up to 50%	+	+	+
potassium hydroxide solution, see potassium hydroxide				
potassium hypochloride	D	+		o
potassium iodide	SA	+	+	+
potassium nitrate (potash)	SA	+	+	+
potassium orothophosphate	SA	+	+	+
potassium perchlorate	1%			
potassium perchlorate	10%			
potassium perchlorate	SA	+	+	+

Chemical resistance	Concentration	PE-HD Temperture °C.		
		20	40	60
potassium permanganate	SA			
potassium permanganate	20%	+	+	+
potassium persulphate	SA	+	+	+
potassium sulphate	SA	+	+	+
potassium sulphide	D	+	+	+
propane, gaseous	TR	+	+	
proprionic acid	50%	+	+	+
proprionic acid	TP	+	o	o
pyridine	TP	+	o	o
saccharic acid	SA			
salicylic acid	SA	+	+	+
sea water	T	+	+	+
sea water, see ocean water		+	+	+
silicone oil	TP	+	+	+
siliconic acid	D	+	+	+
silver acetate	SA	+	+	+
silver cyanide	SA	+	+	+
silver nitrate	SA	+	+	+
soap	D			
soda, see sodium carbonate		+	+	+
sodium acetate	SA	+	+	+
sodium benzoate	SA	+	+	+
sodium bicarbonate	SA	+	+	+
sodium biphosphate	SA	+	+	+
sodium borate	SA			
sodium bromide	SA	+	+	+
sodium carbonate	SA	+	+	+
sodium chlorate	SA	+	+	+
sodium chloride	SA	+	+	+
sodium chlorite	20%			
sodium cyanide	SA	+	+	+
sodium dichromate	SA	+	+	+
sodium fluoride	SA	+	+	+
sodium hexacyanoferrate (II + III)	SA	+	+	+
sodium hydrogen sulphite (sodium bisulphite)	SA	+	+	+
sodium hydroxide solution	up to 60%	+	+	+
sodium hydroxide, see sodium hydroxide solution		+	+	+
sodium hypochloride	13% active chlorine	+	+	+
sodium nitrate	SA	+	+	+
sodium nitrite	SA	+	+	+
sodium orthophosphate	SA	+	+	+
sodium perborate	SA	+		o
sodium phosphate	SA	+	+	+
sodium silicate (water glass)	D	+	+	+
sodium sulphate and bi	SA	+	+	+
sodium sulphide	SA	+	+	+
sodium sulphite	40%			
sodium thiosulphate	SA	+	+	+
soy bean oil	TP	+	o	o
strength	D	+	+	+
sugar	SA	+	+	+
sulphur dioxide, dry, wet	TP	+	+	+
sulphur dioxide, fluid	TP			
sulphur trioxide	TP	–	–	–

Chemical resistance	Concentration	PE-HD Temperture °C.		
		20	40	60
sulphuric acid	up to 10%			
sulphuric acid	10–80%	+	+	+
sulphuric acid	96%	o		–
sulphurous acid	SA			
sulphurous acid	30%	+	+	+
Superchloric acid, see perchloric acid				
table salt, see sodium chloride		+	+	+
tannic acid (tannins)	D	+	+	+
tartaric acid	D	+	+	+
tartaric acid	SA			
tetrahydrofuran	TP	o	o	–
tetrahydronaphthalene (tetralin)	TP	o	o	–
thionyl chloride	TP	–	–	–
thiophene	TP	o	o	–
tin chloride II + IV	SA	+	+	+
toluene	TP	o	–	–
trichloroacetic acid	50%	+	+	+
trichloroethylene	TP	–	–	–
tricresyl phosphate	TP	+	+	+
triethanolamine	D	+		o
trimethylol propane	up to 10%			
turpentine oil	TP	o	o	o
urea	33%			
urea	>10%	+	+	+
urea	SA			
urine	T	+	+	+
vinegar (wine vinegar)	T	+	+	+
vinyl acetate	TP	+	+	o
whisky	T			
wine and spirits	T	+	+	+
wine vinegar	T	+	+	+
xylene	TP	o	–	–
yeast	D	+	+	+
yeast	SA			
zinc carbonate	SA	+	+	+
zinc chloride	SA	+	+	+
zinc oxide	SA	+	+	+
zinc sulphate	SA	+	+	+

8. Packaging, transport and storage

8.1. Packaging

The packaging of Wavin domestic waste-water piping systems is both user-friendly and transportation-orientated. The packaging is designed to ensure maximum safety and easy storage and handling.

8.2. Transport

When loading and transporting Wavin domestic waste-water piping not still in its original packing, take care that the pipes are supported along their entire length to avoid their being bent. Arrange the pipes such that they lie with their end collars offset. Avoid subjecting the pipes to impact stress, particularly when temperatures are low.

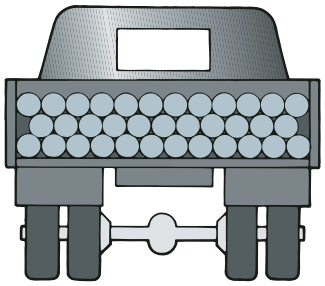


Figure 31. Transporting loose Wavin waste-water pipes.

When using machinery to load and unload packaged piping, ensure that the lifting forks are smooth and clean. Where this is not the case, support the packaging using nylon slings. Steel cables, chains, hooks and other metallic lifting gear must not be used.

8.3. Pipe storage

Pipe deformation or other forms of permanent damage must not be allowed to occur during storage. Factory-delivered piping palettes may be stacked to a height of 3 metres. Loose piping must be supported at the sides. Supports must be provided at least every 2 metres. This should be carried out using battens and crossbeams with a minimum section of 75 mm.

Caution:
Short-term pipe deformation can occur where pipe stacks are unevenly exposed to the effects of the sun (or other forms of heat). Pipes should not therefore be stored in direct sunlight.

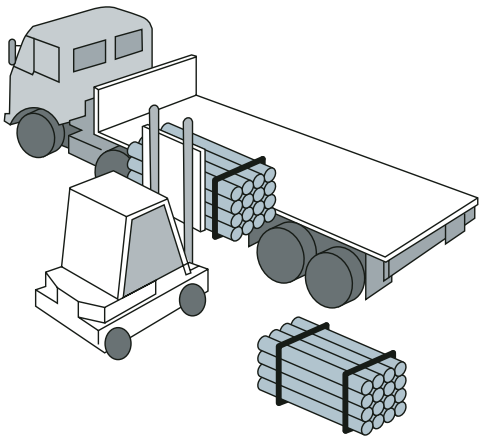


Figure 32. Unloading packaged waste-water piping.

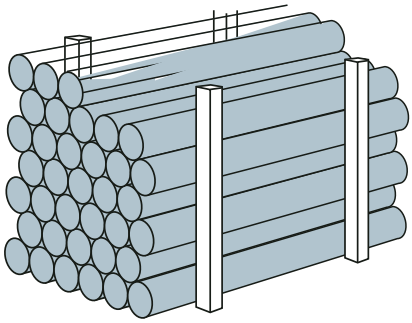


Figure 33. Pipes stored directly onto level flooring.

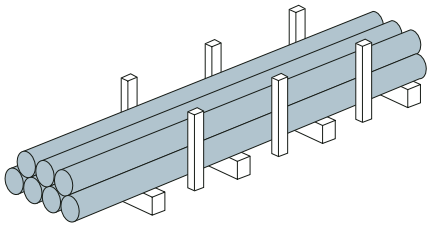


Figure 34. Pipes stored on timber supporting frame.

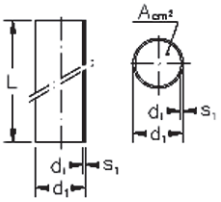
Where it is not possible to store piping on completely level flooring, we recommend the use of a timber supporting frame with crossbeams positioned at maximum intervals of 1 metre (see diagram).

8.4. Storing moulded fittings

Fittings should be kept in their factory-delivered packaging until required for use.

9. Products

Pipe

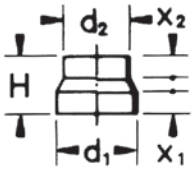


Pipes: From Ø 75 to Ø 160 pipe series S12,5 / PN 5. From Ø 200 to Ø 315 pipe series S16 / PN 4
Nominal diameters according to DIN 19535
Wavin PE standard pipes are supplied in 5 meter* lengths marked with co-extruded green lines.

* Exception: 32 mm pipes are supplied in 3 meter lengths.

Article code	d1	di	S1	L	A cm²
920001	32	26,0	3,0	3000	5,3
920003	40	34,0	3,0	5000	9,0
920005	50	44,0	3,0	5000	15,2
920006	56	50,0	3,0	5000	23,1
920007	63	57,0	3,0	5000	25,4
920008	75	69,0	3,0	5000	37,3
920009	90	83,0	3,5	5000	54,1
920010	110	101,4	4,3	5000	80,7
920011	125	115,2	4,9	5000	104,2
920013	160	147,6	6,2	5000	171,1
920015	200	187,6	6,2	5000	276,4
920017	250	234,4	7,8	5000	431,5
920019	315	295,4	9,8	5000	685,3

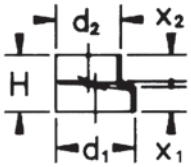
Concentric reducer



Article code	d1/d2	X1	X2	H
920508	40/32	30	30	80
920516	50/40	30	30	80
920522	56/50	30	30	80
920525	63/40	30	30	80
920526	63/50	30	30	80
920527	63/56	30	30	80
920530	75/40	30	30	80
920531	75/50	30	30	80
920533	75/63	30	30	80
920535	90/40	30	30	80
920536	90/50	30	30	80
920538	90/63	30	30	80
920539	90/75	30	30	80
920542	110/40	30	30	80
920543	110/50	30	30	80
920544	110/56	30	30	80
920545	110/63	30	30	80
920546	110/75	30	30	80
920547	110/90	30	30	80
920550	125/50	30	30	80
920552	125/63	30	30	80
920553	125/75	30	30	80
920554	125/90	30	30	80
920555	125/110	30	30	80
920558	160/110	32	29	100
920560	160/125	32	32	100
920562S	200/160	100	100	250
920564S	250/200	120	120	270
920566S	315/250	130	130	325

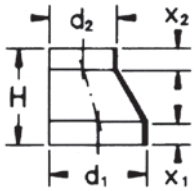
S = Segment Welded

9. Products



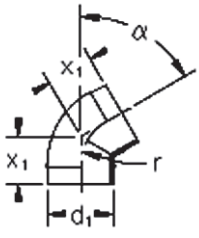
Eccentric reducer - short

Article code	d1/d2	X1	X2	H
920608	40/32	125,5	125,5	65
920616	50/40	35	37	80
920620	56/40	35	37	80
920622	56/56	35	37	80
920625	63/40	35	37	80
920626	63/50	35	37	80
920627	63/56	35	37	80
920630	75/40	33	30	80
920631	75/50	35	37	80
920632	75/56	35	37	80
920633	75/63	35	37	80
920635	90/40	30	34	80
920636	90/50	31	34	80
920637	90/56	31	36	80
920638	90/63	31	38	80
920639	90/75	31	43	80
920642	110/40	31	34	80
920643	110/50	31	34	80
920644	110/56	31	35	80
920645	110/63	35	37	80
920646	110/75	31	36	80
920647	110/90	35	37	80
920653	125/75	35	30	80
920654	125/90	35	32	80
920655	125/110	36	36	80
920671	160/110	35	37	80
920672	160/125	35	37	80



Eccentric reducer - short

Article code	d1/d2	X1	X2	H
920675	200/110	110	60	325
920676	200/125	110	70	310
920678	200/160	110	90	270
920690S	250/200	130	110	325
920698S	315/250	150	130	395

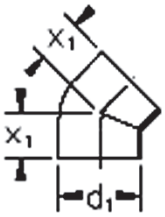


Elbow, larger thickness 15°

Article code	d1	∂	X1	r
921542	110	15°	45	80

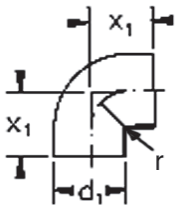
S = Segment Welded

Elbow 45°



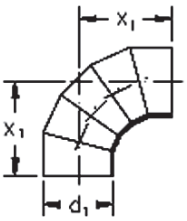
Article code	d1	X1
921232	32	25
921234	40	40
921254	50	45
921264	56	45
921274	63	50
921284	75	50
921294	90	55
921304	110	60
921314	125	65
921334	160	100
921354 (short radius)	200	160
921 374S	250	165
921 394S	315	230

Elbow 88.5°



Article code	d1	X1
921238*	40	60
921258*	50	70
921268	56	40
921519*	63	80
921528*	75	75
921538*	90	100
921298	90	80
921548*	110	110
921558*	125	125
921568*	160	180

Elbow 90° segment welded



Article code	d1	X1
921013	160	140
921015S	200	250
921017S	250	335
921019S	315	370

* Swept type

S = Segment Welded

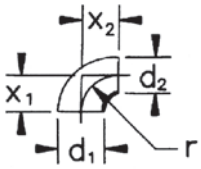
9. Products

Elbow 90° extended

Article code	d1	X1	X2	r
921002	32	100	30	30
921003	40	150	30	30
921005	50	180	40	40
921006	56	210	40	40
921007	63	210	50	50
921008	75	210	70	70
921009	90	240	90	90
921010	110	270	103	100
921011	125	200	110	110

Elbow, larger thickness 88.5°

Article code	d1	X1
921548	40	45



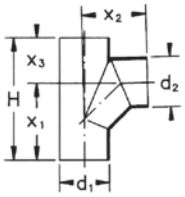
Reduced elbow 90°

Article code	d1/d2	X1-X2	r
921716	50/40	50	50

PE Airmix “Sovent”

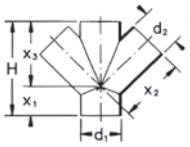
Article code	di
922991	110
922992	160

Airy branch 88.5°



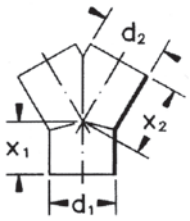
Article code	d1/d2	X1	X2	X3	H
922280	110	170	140	100	270

Double branch 45°



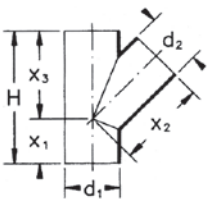
Article code	d1/d2	X1	X2-X3	H
922336	90/50	80	160	240
922343	110/50	80	180	260
922348	110/110	80	180	260
922350	125/110	100	200	300

Y-Branch 30°



Article code	d1/d2	X1	X2
922818	50/50	45	95
922848	110/110	90	120

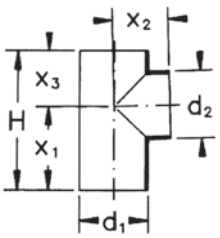
Branch 45°



Article code	d1/d2	X1	X2-X3	H
922005	32/32	35	70	105
922008	40/32	45	90	135
922009	40/40	45	90	135
922016	50/40	55	110	165
922018	50/50	55	110	165
922022	56/50	60	120	180
922023	56/56	60	120	180
922025	63/40	65	130	195
922026	63/50	65	130	195
922027	63/56	65	130	195
922028	63/63	65	130	195
922030	75/40	70	140	210
922031	75/50	70	140	210
922032	75/56	70	140	210
922033	75/63	70	140	210
922034	75/75	70	140	210

9. Products

922035	90/40	80	160	240
922036	90/50	80	160	240
922038	90/63	80	160	240
922039	90/75	80	160	240
922040	90/90	80	160	240
922042	110/40	90	180	270
922043	110/50	90	180	270
922045	110/63	90	180	270
922046	110/75	90	180	270
922047	110/90	90	180	270
922048	110/110	90	180	270
922050	125/50	100	200	300
922052	125/63	100	200	300
922053	125/75	100	200	300
922054	125/90	100	200	300
922055	125/110	100	200	300
922056	125/125	100	200	300
922071	160/110	125	250	375
922072	160/125	125	250	375
922074	160/160	125	250	375
922075	200/110	180	360	540
922076S	200/125	180	360	540
922078S	200/160	180	360	540
922079S	200/200	180	360	540
922086S	250/110	220	440	660
922087S	250/125	220	440	660
922089S	250/160	220	440	660
922090S	250/200	220	440	660
922092S	250/250	220	440	660
922093S	315/110	280	560	840
922094S	315/125	280	560	840
922095S	315/160	280	560	840
922096S	315/200	280	560	840
922098S	315/250	280	560	840
922099S	315/315	280	560	840

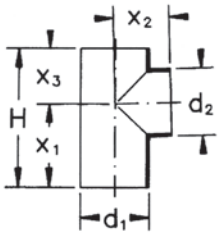


Branch 88.5°

Article code	d1/d2	X1	X2-X3	H
922205	32/32	50	50	100
922208	40/32	75	55	130
922209	40/40	75	55	130
922216	50/40	90	60	150
922218	50/50	90	60	150
922222	56/50	105	70	175
922223	56/56	105	70	175

S = Segment Welded

Branch 88.5° (continued)



Article code	d1/d2	X1	X2-X3	H
922225	63/40	105	70	175
922226	63/50	105	70	175
922228	63/63	105	70	175
922230	75/40	105	70	175
922231	75/50	105	70	175
922232	75/56	105	70	175
922233	75/63	105	70	175
922234	75/75	105	70	175
922235	90/40	120	80	200
922236	90/50	120	80	200
922238	90/63	120	80	200
922239	90/75	120	80	200
922240	90/90	120	80	200
922242	110/40	135	90	225
922243	110/50	135	90	225
922244	110/56	135	90	225
922245	110/63	135	90	225
922246	110/75	135	90	225
922247	110/90	135	90	225
922248	110/110	135	90	225
922252	125/63	150	100	250
922253	125/75	150	100	250
922254	125/90	150	100	250
922255	125/110	150	100	250
922256	125/125	150	100	250
922271	160/110	210	140	350
922272	160/125	210	140	350
922274	160/160	210	140	350
922275S	200/110	180	180	360
922276S	200/125	180	180	360
922278S	200/160	180	180	360
922279S	200/200	180	180	360
922286S	250/110	220	220	440
922287S	250/125	220	220	440
922289S	250/160	220	220	440
922290S	250/200	220	220	440
922292S	250/250	220	220	440
922293S	315/110	280	280	560
922294S	315/125	280	280	560
922295S	315/160	280	280	560
922296S	315/200	280	280	560
922298S	315/250	280	280	560
922299S	315/315	280	280	560

S = Segment Welded

9. Products

Bracket Insert

Article code	ø
305504	40
305505	50
305506	63
305507	75
305508	90
305509	110
305510	125
305511	160
305512	200

Galavanised PE Bracket

Article code	ø
305014	40 x ½"
305015	50 x ½"
305016	63 x ½"
305017	75 x ½"
305018	90 x ½"
305019	110 x ½"
305020	125 x ½"
305021	160 x ½"
305025	200 x 1"
305026	250 x 1"
305027	315 x 1"

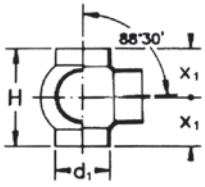
Galavanised PE Bracket M10 connection

Article code	ø
305004	40
305005	50
305006	63
305007	75
305008	90
305009	110
305010	125
305011	160

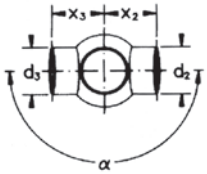
Fire Collar EFM

Article code	ø
309180	40x63
309182	75
309183	78x90
309184	110
309185	125
309186	135x160
309187	200
309188	250

Spherical branch, 2 stubs

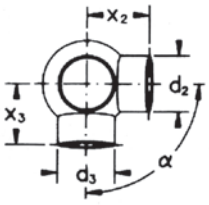


Type A - 180°



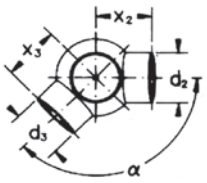
Article code	d1/d2-d3	X1	X2-X3	H
922443	110/50	100	120	200
922446	110/75	100	120	200
922447	110/90	100	120	200
922448	110/110	100	120	200
922455	125/110	100	125	200

Type B - 90°



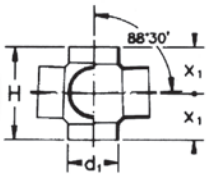
Article code	d1/d2-d3	X1	X2-X3	H
922517	110/50	100	120	200
922519	110/63	100	120	200
922521	110/90	100	120	200
922522	110/110	100	120	200
922528	125/110	100	125	200

Type C - 135°



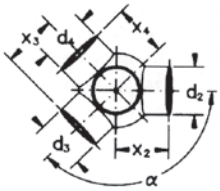
Article code	d1/d2-d3	X1	X2-X3	H
922572	110/110	100	120	200

9. Products



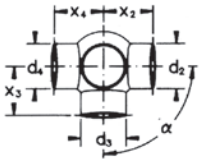
Spherical branch, 3 stubs

Type D - 135°



Article code	d1/d2-d3	X1	X2-X3	H
922672	110/110	100	120	200

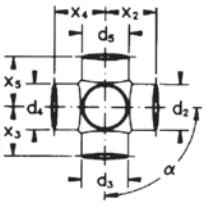
Type E - 90°



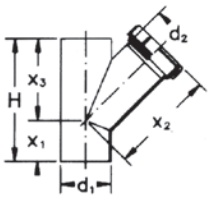
Article code	d1/d2-d3	X1	X2-X3	H
922622	110/110	100	120	200
922628	125/110	100	125	200

Spherical branch, 4 stubs

Type F - 90°

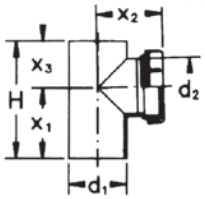


Article code	d1/d2-d3	X1	X2-X3	H
922721	110/90	100	120	200
922722	110/110	100	120	200



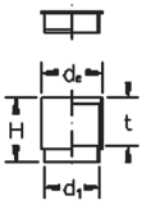
Access Tee 45°

Article code	d1/d2	X1	X2	X3	H
920711	110/110	90	230	180	270
920712	125/110	100	250	200	300
920716	160/110	125	300	250	375



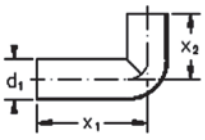
Access Tee 88.5°

Article code	d1/d2	X1	X2	X3	H
920863	40/40	75	70	50	125
920865	50/50	90	85	60	150
920867	63/63	105	80	70	175
920868	75/75	105	90	70	175
920869	90/90	120	100	80	200
920870	110/110	135	125	90	225
920871S	125/110	150	130	100	250
920873S	160/110	210	150	140	350
920875S	200/110	180	170	180	360
920877S	250/110	220	190	220	440
920879S	315/110	280	210	280	560



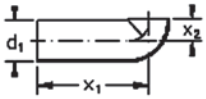
Floor-mounted toilet connector

Article code	d1/de	t	H
923006	90/120	95	125
923016	110/120	95	125



Constant diameter toilet elbow 90°

Article code	d1	X1	X2
923097	110	300	180

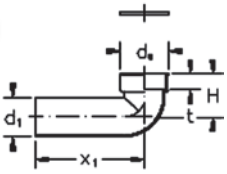


Connecting elbow 90°, smooth

Article code	d1	X1	X2
921139	90	270	50
921140	110	300	60

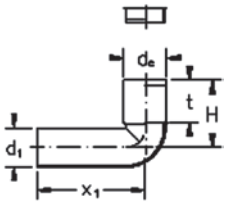
S = Segment Welded

9. Products



Toilet elbow 88.5°, smooth Type A

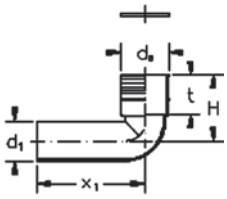
Article code	d1/de	X1	t	H
923072	90/132	270	60	120



Toilet elbow 88.5°, extended Type B

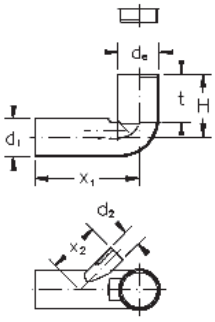
Article code	d1/de	X1	t	H	
4923057	923057*	90/120	270	120	160
4923067	923067	110/120	300	120	185

*with notch



Universal toilet elbow Type C

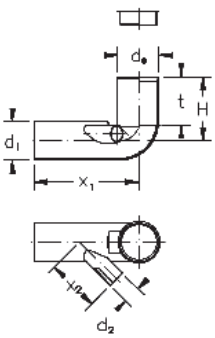
Article code	d1/de	X1	t	H
923087	110/132	300	120	185



Long spigot toilet elbow with right stubs

Article code	d1/d2	de	X1	X2	t	H
926002	90/40	120	270	180	120	160
926004	90/50	120	270	180	120	160
926008	110/50	120	300	150	140	185

Ø 190 with notch
Ø 110 with asymmetrical junction

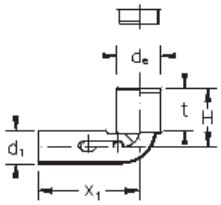


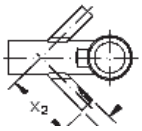
Long spigot toilet elbow with left stubs

Article code	d1/d2	de	X1	X2	t	H
926001	90/40	120	270	180	120	160
926003	90/50	120	270	180	120	160
926007	110/50	120	300	150	140	185

Ø 190 with notch
Ø 110 with asymmetrical junction

Long spigot toilet elbow with double stubs

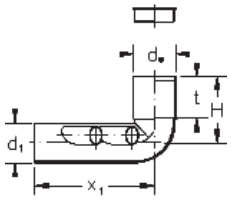


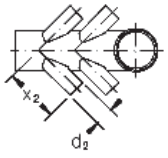


Article code	d1/d2	de	X1	X2	t	H
926010	90/40	120	270	180	120	160
926011	90/50	120	270	180	120	160
926012	110/40	120	300	150	140	185
926013	110/50	120	300	150	140	185

Ø 190 with notch
Ø 110 with asymmetrical junction

Long spigot toilet elbow with 4 stubs





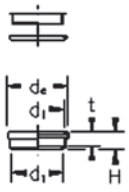
Article code	d1/d2	de	X1	X2	t	H
923107	110/40	120	300	150	140	185
923108	110/50	120	300	150	140	185

Floor mounted toilet connection gasket

Article code	d	Type of connection
308020	120	Toilet elbow - Type B
308010	135	C elbow - Type A - C
308107*	107	Floor mounted elbow

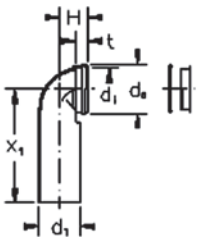
* Allows the connection between the toilet discharge fitting and the long toilet elbow.

Wall mounted toilet connector



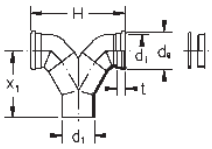
Article code	d1/di	de	t	H
924227	90/90	110	28	38
924228	110/110	131	28	38

9. Products



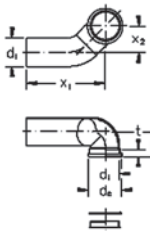
Wall mounted toilet connector elbow 90° for hanging toilets

Article code	d1/di	de	X1	t	H
923281	90/90	110	225	34	75
923280	110/90	110	225	34	75
923285	110/110	131	300	33	75



Wall mounted double toilet connector elbow 90°

Article code	d1/di	de	X1	t	H
923358	110/110	131	195	28	270

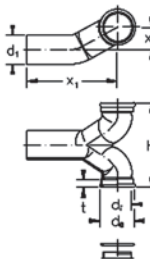


Toilet wall mounted connector, left

Article code	d1/di	de	X1	X2	t	H
923317	110/110	131	310	100	28	95

Toilet wall mounted connector, right

Article code	d1/di	de	X1	X2	t	H
923327	110/110	131	310	100	28	95

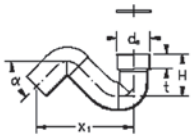


Toilet wall connector, double

Article code	d1/di	de	X1	X2	t	H
923337	110/110	131	340	100	28	270

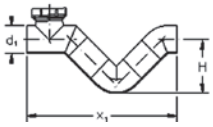
All fittings are supplied with gasket and protection cap.

Lavatory pan trap



Article code	d1	de	a	X1	t	H
923558	90	132	45°	330	60	145
923551	110	132	0°	290	60	165
923552	110	132	45°	380	60	165
923555	110	132	90°	330	60	165

Trap “Firenze”

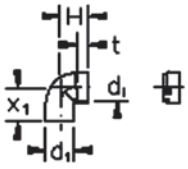


Article code	d1	X1	H
929992	110	580	200
929993	125	720	250

Outlet connector

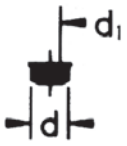
Article code	d1/di	t	H
923606	40/46	25	35
923612	50/46	25	35

Outlet connector elebow



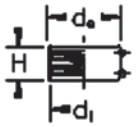
Article code	d1/di	X1	t	H
923623	32/46	60	20	50
923626	40/46	60	20	50
923632	50/46	60	20	50

Rubber gasket, Universal type



Article code	d	d1
308042	46	1” - 1 ¼”
308044	46	1 ½”

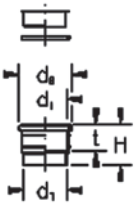
9. Products



Electro-fusion coupler Universal type (WAVIDUO)

Article code	d1	de	H
910104	40	54	52
910105	50	64	52
910106	63	77	52
910107	75	90	52
910108	56	68	52
910109	90	104	54
910111	110	124	64
910112	125	143	64
910116	160	180	63
910120	200	244	208
910125	250	304	244
910131	315	382	268

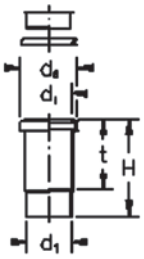
To be welded with:
Electro-fusion welding machine DUO 315 (reference nr. 711315)



Push-fit socket with gasket and cap

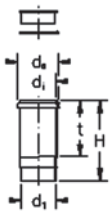
Article code	d1/di	de	t	H
924202	32/32	47	35	50
924203	40/40	57	50	85
924205	50/50	67	50	85
924206	56/56	57	52	85
924207	63/63	79	52	85
924208	75/75	92	65	100
924209	90/90	110	70	105
924210	110/110	131	70	105
924211	125/125	150	75	115
924213	160/160	190	93	140

Expansion socket with gasket and cap



Article code	d1/di	de	t	H
924103	40/40	57	170	235
924105	50/50	67	170	235
924106	56/56	57	170	235
924107	63/63	80	175	235
924108	75/75	92	179	240
924109	90/90	110	175	240
924110	110/110	130	178	255
924111	125/125	148	180	255
924113	160/160	188	190	285
924115S	200/200	225	200	345
924117	250/250	280	250	405
924119	315/315	350	250	405

The expansion sockets from 40 to 315 mm absorb the expansion and the contraction of a 5000 mm long pipe. 10°C temperature difference = 2 mm expansion or contraction per meter. On the expansion socket the push-in depth of the pipe at a room temperature of 0°C and + 20°C is mentioned.

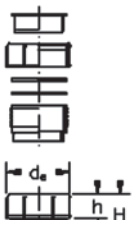


Push-fit depth in mm

Ø	-10°	0°	+10°	+20°
40 - 160	70	80	90	105
200 - 315	170	180	190	205

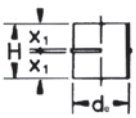
The expansion socket Ø 110 has an external ring for fixed-point bracket.

Complete screw connection



Article code	d1	de	h	H
924303	40	64	30	50
924306	50	74	34	58
924310	63	87	36	63
924311	75	103	42	65
924312	90	125	46	82
924313	110	145	57	90

Bush

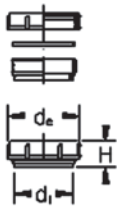


Article code	d1	X1	H
924363	40	29	62
924366	50	33	70
924370	63	37	79
924371	75	38	81
924372	90	48	101
924373	110	52	110

S = Segment Welded

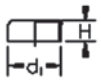
9. Products

Complete closing cap



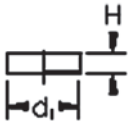
Article code	d1	de	H
924443	40	64	45
924446	50	74	55
924450	63	87	40
924451	75	103	45
924452	90	123	45
924453	110	145	50

Weld cap



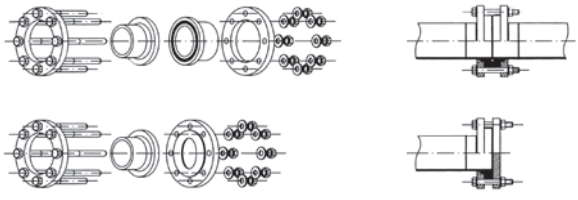
Article code	d1	H
924622	32	5
924623	40	38
924625	50	38
924627	63	38
924628	75	38
924629	90	40
924630	110	45
924631	125	46
924633	160	48

Protection cap for pipes and fitting

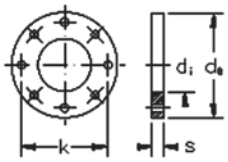


Article code	d1	H
929004	40	30
929005	50	30
929006	63	30
929007	75	30
929009	90	31
929011	110	33
929012	125	36
929016	160	36

Flange connection

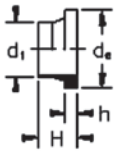


Flange, aluminium coated



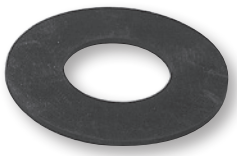
Article code	d1	di	de	K	S	bolts no.	thread
309121	50	62	150	110	16	4	M16
309122	56-63	78	165	125	16	4	M16
309123	75	92	185	145	16	4	M16
309124	90	108	200	160	18	8	M16
309125	110	128	220	180	22	8	M16
309127	125	135	220	180	22	8	M16
309128	160	178	285	240	24	8	M20
309129	200	235	340	295	26	8	M20
309119	250	288	395	350	28	12	M20
309120	315	338	445	400	28	12	M20

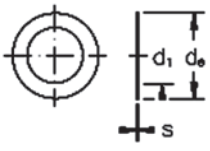
Flange adaptor



Article code	d1	de	h	H
926521	50	88	17	60
926522	63	102	19	65
926523	75	122	21	70
926524	90	138	22	70
926525	110	158	24	80
926527	125	158	24	80
926526	125	188	24	80
926528	160	212	24	85
926529	200	268	24	140
926519	250	320	27	145
926520	315	370	27	145

Flat gasket for blind flanges





Article code	d1	di	de	S
309250	250	252	328	4
309251	315	302	378	4

Note: for diameter 50-200 mm, use the gasket EPDM from Wavin PE80-PE100 product range. Please see below.

EPDM

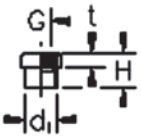
Article code	d1	de	S
904402	132	170	3
904403	140	182	3
904404	150	192	3
904405	163	107	3
904406	175	127	3
904407	190	142	3
904408	110	162	3
904462	160	218	3
904463	200/225	273	4

9. Products

Brass nut connection

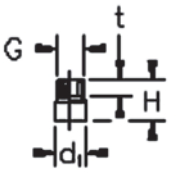
Article code	d1	G	H
924734	40	3/4”	60
924735	40	1”	60
924736	40	1- ¼”	60
924737	40	1- ½”	60
924743	50	¾”	75
924755	50	1”	60
924756	50	1- ¼”	60
924757	50	1- ½”	60
924758	50	2”	60
924760	63	2”	82

Internal thread joint



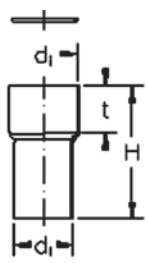
Article code	d1	G	t	H
307031	40	½”	20	55
307033	40	¾”	20	55
307035	40	1”	20	55
307039	50	½”	20	55
307041	50	¾”	22	55
307043	50	1”	24	55
307045	50	1-¼”	20	55
307047	50	1-½”	22	55
307049	50	2”	24	87
307051	63	2”	24	94

External thread joint



Article code	d1	G	t	H
307060	50	1-¼”	25	60
307062	50	1-½”	26	60
307064	63	2”	25	60

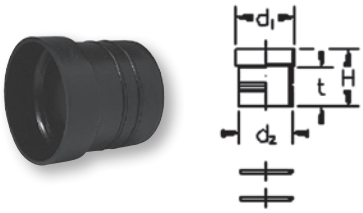
Shrink-on socket with seal



Article code	d1	di	t	H	Ø connection
925915	50	68	80	250	45 ÷ 60
925917	63	91	85	250	60 ÷ 82
925918	75	100	90	250	70 ÷ 92
925919	90	111	100	250	85 ÷ 102
925920	110	132	90	250	105 ÷ 124
925921	125	156	100	250	120 ÷ 148
925922	160	180	100	250	155 ÷ 172
925916	200	220	100	250	195 ÷ 212

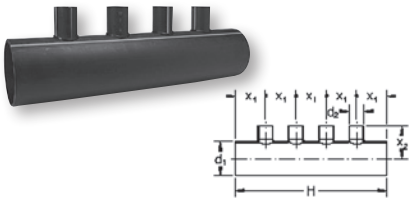
Other Ø on request.

Adaptor to PVC



Article code	d1/d2	t	H
925925	110/100	75	105

Connector with 4 stubs



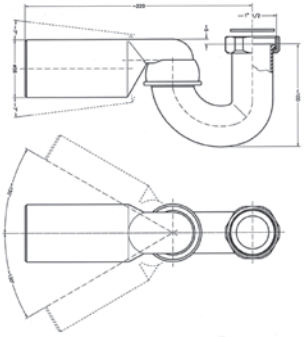
Article code	d1/d2	X1	X2	H
929997	110/40	100	105	500
929998	110/50	100	105	500

Bath trap - With joint and 1”¼ brass nut

- Black solderable HD PE
- Rotation: horizontal ~ 208° - vertical ~ 10°
- Self-cleaning
- Double seal
- DN 40/50 joint

Article code M852

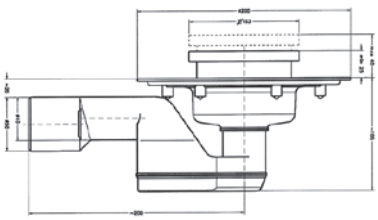
Bath trap - With joint and 1”½ brass nut



- Black solderable HD PE
- Rotation: horizontal ~ 208° - vertical ~ 10°
- Self-cleaning
- Double seal
- DN 40/50 joint

Article code M853

Floor drain - Small drain with DN 40/50 outlet

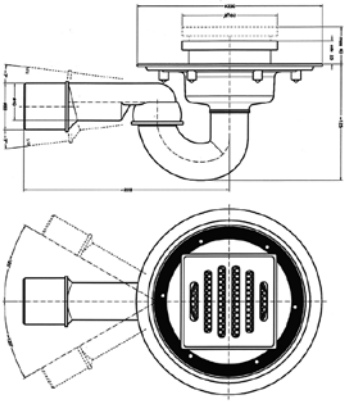


- Black solderable HD PE
- Adjustable backflow prevention device

Article code M611

SPARES M6111 100 x 100 mm grill
M6113 Filter
M6112 100 x 100 mm filter holder

9. Products

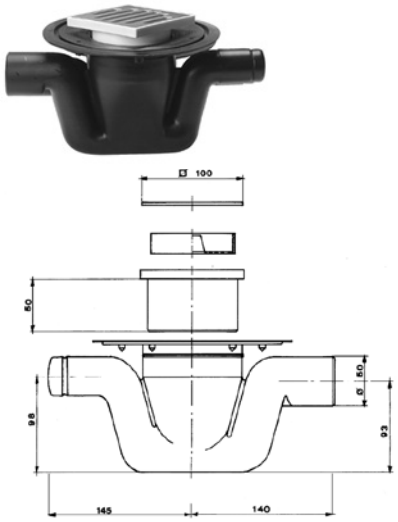


Floor drain - Small drain with joint and DN 40/50 outlet

- Black solderable HD PE
- Self-cleaning
- Double seal

Article code
M716/40

SPARES M6111 100 x 100 mm grill
M6113 Filter
M6112 100 x 100 mm filter holder

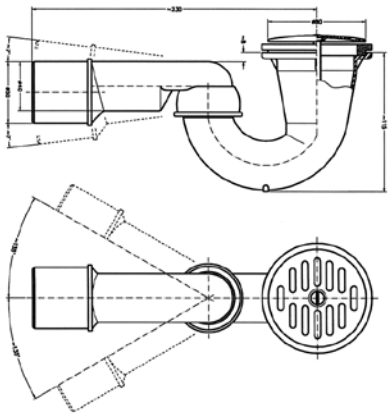


Floor drain - Large drain

- Black solderable HD PE
- Adjustable

Article code
M713

SPARES M6111 100 x 100 mm grill
M6113 Filter
M6112 100 x 100 mm filter holder

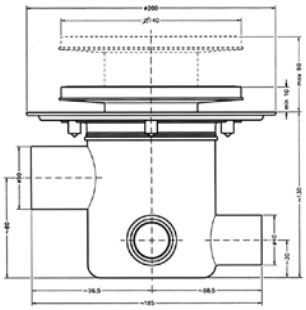


Shower trap - With DN 80 inlet

- Black solderable HD PE
- Rotation: horizontal ~ 270° - vertical ~ 10°
- Self-cleaning
- Double seal
- DN 40/50 joint

Article code
M655

SPARES M6111 100 x 100 mm grill
M6113 Filter
M6112 100 x 100 mm filter holder

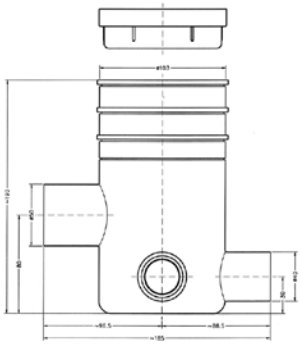


Floor trap - HD PE 4-way with grill and trap

- Black solderable HD PE
- Adjustable check valve H 53 mm
- 3 DN 40 inlets and 1 DN 50 outlet
  Inlets require boring

Article code
M612

SPARES M6121 140 x 140 mm grill
M6122 Grill holder
M6125 Open seal



Floor trap - High HD PE 4-way

- Black solderable HD PE
- 3 DN 40 inlets and 1 DN 50 outlet

Inlets require boring

Article code
M618

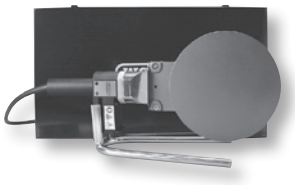
9. Products

Welding equipment

Electro welding machine - DUO 315 machine

Article code	Ø	Description
711315	40 – 315	WaviDuo machine
710001	40 – 160	Fusion Cable Green
710002	200 – 315	Fusion Cable Brown
710003	40 – 160	Serial Fusion Cable
710004	Transport Box Blue	

Supply voltage 220 V~ 50 Hz



Welding mirror complete with metal case

Article code	Ø Welding
700 016	200
700 017	300

- with termostat
- complete with supports
- 800 W
- teflon-coated
- metal carrying case
- supply voltage 220 V ~ 50 Hz

Universal 160

Article code	Ø	Description
700054	40 ÷ 160	Welding machine
701022	40 ÷ 160	Spare blade

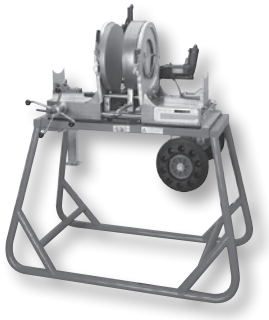
Welding machine provided with:

- teflon-coated thermoplate 220 V, 800 W, self-centering
- motorized facing miller supplied with right/left lock
- carriage with rack and check of the constant pressure
- jaws which can weld (by universal welding) branches 45°, 60°, 88.5°, fittings, elbows and pipes from Ø 40 - 160 mm

Media 250

Article code	Ø	Description
700002	75 ÷ 250	Welding machine
701024	75 ÷ 250	Spare blade

Welding machine provided with:
- electric rotary planer with microswitch incorporated in the handle
- teflon-coated thermoplate Ø 300 - 200 V, 1300 W
- set of jaws Ø 250 and reducers to be used for welding diameters 75/90/110/125/160/200



Maxi 315

Article code	Ø	Description
700003	125 ÷ 315	Welding machine
701026	125 ÷ 315	Spare blade

Welding machine provided with:
- electric rotary planer with microswitch incorporated in the handle
- teflon-coated thermoplate Ø 340 - 220 V, 1800 W
- set of jaws and reducers to be used for welding diameters 315/250/200/160/125
- assembled on trolley

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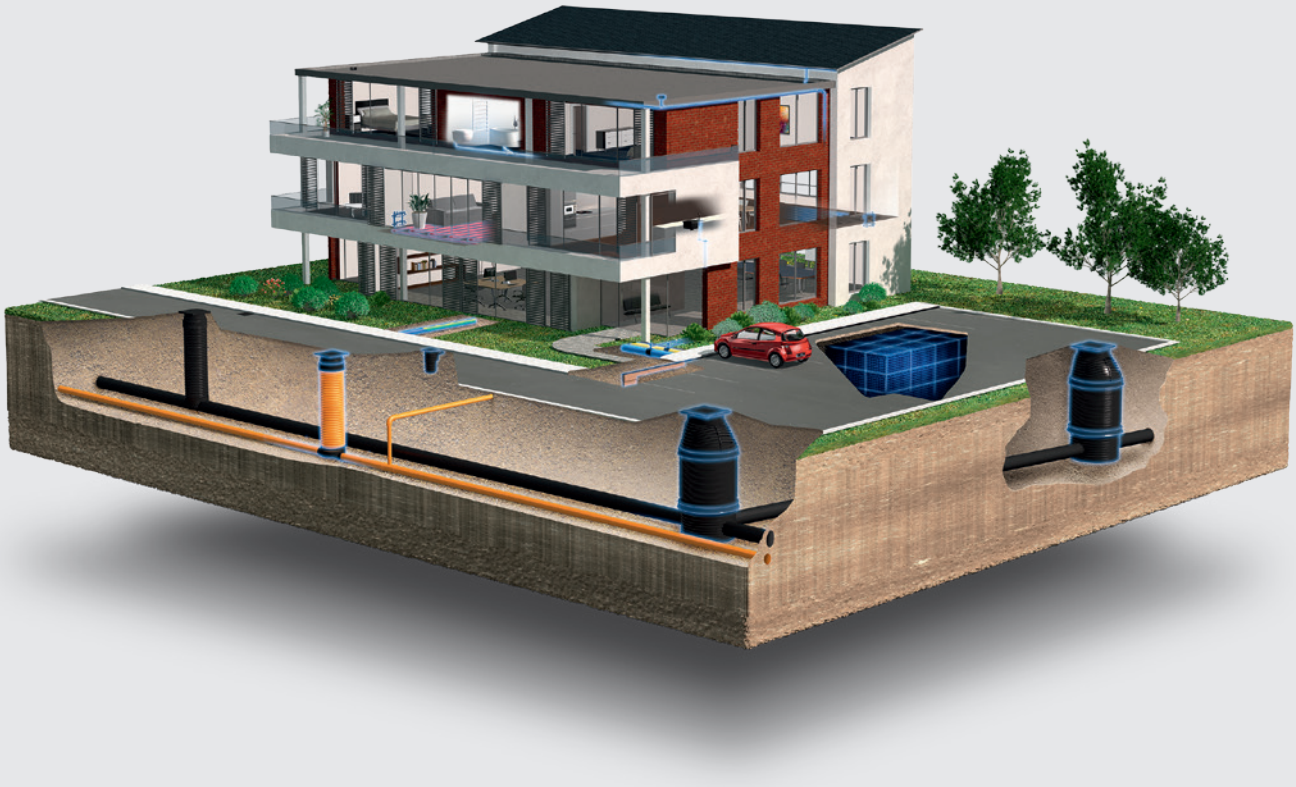

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