

PRODUCT AND INSTALLATION MANUAL

Wavin AS+

Acoustic Soil System



Wavin AS+

Low noise soil & waste drainage



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Wavin AS+

1. Introduction

1.1. System description

With regards to noise, Wavin is one of the pioneers. More than 30 years ago Wavin introduced the world's first plastic low noise Soil & Waste system.

After serving its purpose for more than 30 years, Wavin is introducing the successor of Wavin AS and is setting a new standard for low noise Soil & Waste solutions.

Wavin AS+ is the new best in class plastic sound-insulating Soil & Waste piping system, suitable for drainage of hot and cold waste water and in accordance with all requirements for non-pressurized waste water piping as laid down in BS EN 12056 and DIN 1986-100.

Wavin AS+ reduces the noise level of the Soil & Waste system better than any other plastic pipe system.

Due to the unique material composition for improved noise performance, premium reduction of unwanted sound emissions by the drainage system inside the building is assured. Optimal sound reduction is guaranteed due to high density of material.

Wavin AS+ is a mineral reinforced polypropylene (PP) low noise soil and waste solution.

Wavin AS+ is available in sizes ranging from DN50, DN100 & DN150.

Like all plastics, Wavin AS+ is durable, corrosion-resistant and able to withstand the chemical attack of all kinds of aggressive waste waters.

The new Wavin AS+ has been designed to meet the needs of engineers and installers. On top of 30 years of experience, we spent over a hundred thousand hours on noise level testing, explored new materials and invested heavily in developing a seal with integrated lubricant. This is why we can confidently say that the ultimate noise reduction and super easy installation delivered by the new Wavin AS+ is no coincidence.

Wavin AS+ includes unique product features that are contributing to the ease and safety of an installation:

- ⦿ New patented blue seal with integrated lubricant
- ⦿ Sculptured spigot reduces push-in force with 50% compared to Wavin AS
- ⦿ Blue seal's shape guarantees leak-free, failure-proof installation
- ⦿ Unique material composition delivers perfect sound absorption
- ⦿ Angular rotation guidance to align and rotate fittings in the right direction
- ⦿ Insertion depth check on fittings to make a secure and safe connection
- ⦿ Better handling during installation due to the grip features
- ⦿ Compact design perfect for small and narrow spaces

Sealing

The elastomeric seal is made from EPDM in conformity with EN 681-1.

Approvals and testing

Wavin AS+ pipes and fittings are continually subject to strict quality controls according to DiBt in Berlin. Wavin AS+ pipes & fittings have been awarded DiBt buildings' inspection approval (DiBt Z-42.1-569) and are, therefore, deemed suitable for use as above ground pipework. Germany: DiBt, Z.-42.1-569

1.2. Field of application

Areas of application

Wavin AS+ is resistant to hot water and fulfils or exceeds all the requirements of BS EN 12056 and the associated norms given in DIN 1986-100, i.e. short-term exposure to temperatures of 95°C and long-term exposure to temperatures of 90°C.

The chemical resistance of Wavin AS+ makes it suitable for transporting waste water in the range pH 2 - 12.

Wavin AS+ is suitable for above ground drainage.

The outstanding acoustic performance of WAVIN AS+ makes it ideal for wherever DIN 4109-compliant sound insulation might be required, such as in hospitals, hotels, nursing homes, office buildings, or single/multi-occupancy residential properties.

Noise pollution affects both health and behaviour.

Exposure to noise can affect both health and behaviour. Unwanted sound (noise) can damage physiological health. It can cause hypertension, high stress levels, tinnitus, hearing loss, sleep disturbances, and other harmful effects. It is for this reason that modern buildings are equipped with a range of sound-insulation measures designed to favour comfortable living, such as thick exterior walls and soundproofed windows. But we often forget that noise is not just external; it can also be generated from inside the building. Wavin wants to create better buildings. Wavin AS+ is a premium-quality, sound-insulating pipe system designed to minimise noise from plumbing systems and maximise living comfort.

Commercial kitchens and abattoirs

Wavin AS+ is ideal draining fat-containing waste water from e.g. commercial kitchens and abattoirs. Long-term functional reliability and temperature resistance (continuous exposure up to 90°C / short-term up to 95°C in accordance with BS EN 12056 / DIN 1986-100) are fundamental requirements here. The smooth internal surface of the pipe prevents incrustations. When installing Wavin AS+ in commercial kitchen and abattoirs with high fat-containing waste water, the use of NBR sealing rings is advised. If fat-containing waste waters need to cover a long distance before reaching the grease-trap facilities, the premises have to be equipped with an auxiliary electric heating system designed to keep the waste water in a liquid state, while maintaining a temperature of no more than 70°C.

Photographic laboratories

Wavin AS+ pipes and fittings – made of mineral-reinforced PP and supplied with factory-fitted sealing rings – are resistant to the developing and fixing media used in photographic laboratories over long-term exposures at 60°C. They are also approved for short-term temperature loads of up to 95°C. (Please refer to the Chemical Resistance List in the annex for further details).

It is recommended that piping is installed with sufficient fall to reduce the contact time between fluid and guiding surface to a minimum.

Dental practices

Wavin AS+ can be used unreservedly in dental practices, provided the piping downstream of the dentist's chair is fitted with an integrated amalgam separator. Wavin AS+ (including the sealing rings) is resistant to dental amalgam. In addition, cleaning agents and disinfectants normally used in dental practices, if present in the usual concentrations, are harmless to the pipe system.

Food-processing and chemical industries

Usage with waste water containing lactic acid from the food sector and chemical industry, Wavin AS+ pipes and fittings are resistant to media containing lactic acid (at concentrations up to 90%) at liquid temperatures up to 60°C. This also applies to the factory-fitted EPDM sealing ring that form part of the push-fit connecting system, especially as contact is marginal. It is recommended that piping is installed with sufficient fall to reduce contact time to a minimum.

1.3 Chemical resistance

The data in the chemical resistance list is intended only as a guide for planning purposes and are not automatically applicable to all conditions of use. Considerable deviations 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.

For the complete chemical resistance list see Annex I.

Wavin AS+

2. Technical datasheet

Wavin AS+ is a mineral reinforced polypropylene (PP) low noise soil and waste solution. A unique material composition for improved noise performance. Optimal sound reduction is guaranteed due to high density of material. Optimized three layer pipe structure for low noise levels push fit connections with a pre-lubricated elastomer seal (EPDM) for quick, easy and reliable installation.

Material

Polypropylene, mineral-reinforced.

Physical properties

| | |
|---|---|
| ⦿ Density | ~ 1,9 g/cm ³ |
| ⦿ E-Modul | ~ 1800 N/mm ² |
| ⦿ Linear coefficient of thermal expansion | ~ 0,06 mm/mK |
| ⦿ Reaction to fire | DIN 4102, B2 and BS EN 13501 D-S3, d0 |
| ⦿ Temperature | Short-time load by 95°C and 90°C long-term stress |

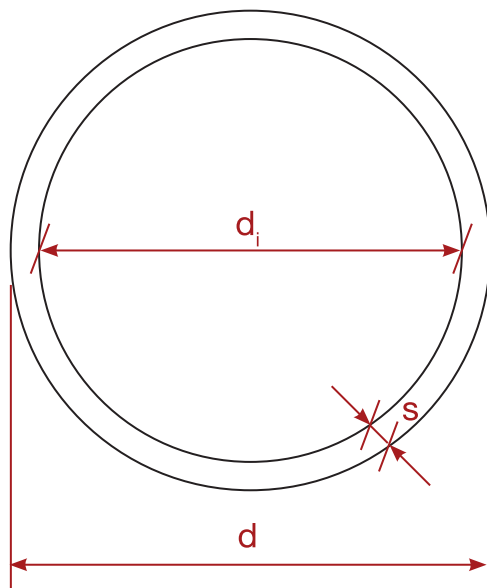
Colour

Light grey RAL7035

Pipe data

| DN | d ¹⁾ | d _i ²⁾ | s ³⁾ |
|-----|-----------------|------------------------------|-----------------|
| 50 | 50 | 44 | 3.0 |
| 100 | 110 | 99.4 | 5.3 |
| 150 | 160 | 148.8 | 5.6 |

1. Outer diameter in mm
2. Inner diameter in mm
3. Wall thickness in mm



Marking

Wavin AS+, nominal width, date, certification mark, material, fire class.

Example: Wavin AS+, DN100, date, Z.-42.1-569, mineral-reinforced PP Ü DIN 4102, B2.

Wavin AS+

3. Acoustics

3.1. Sound insulation by Wavin AS+

The excellent sound protection properties of Wavin AS+ are primarily attributed to its thick-walled design as well as special molecular structure and the high density of $\sim 1.9 \text{ g/cm}^3$ of the material. This property enables Wavin AS+ to absorb airborne sound as well as mechanical vibrations.



A contribution to sound protection is made by the special product design and system solutions.

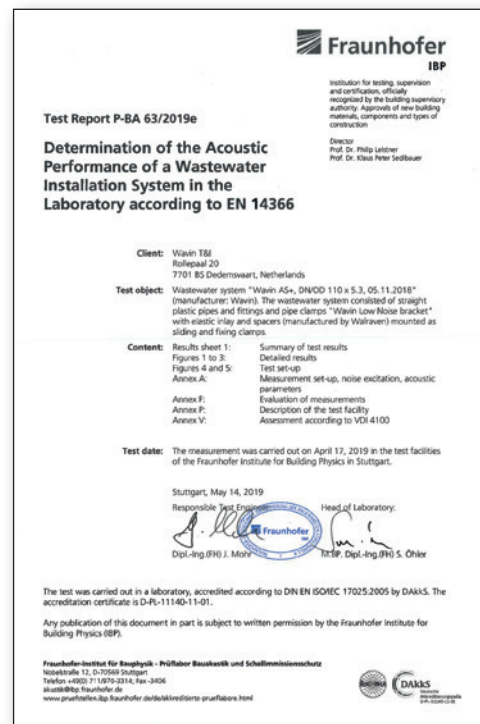
- Swept branches for minimal flow disturbance in the down pipe
- Due to unique system bracket and high structure born sound prevention



Figure 1: Double branch.



Figure 2: Wavin system bracket.



In studies conducted at the Fraunhofer Institut für Bauphysik (Fraunhofer Institute for Building Physics), Stuttgart, Wavin AS+ has proven its excellent sound absorption properties. The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.

The measurements in this test were performed following German standard DIN EN14366 and DIN 52219:1993-07; noise excitation by stationary water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s., 3.0 l/s and 4.0 l/s.

3.2. Noise calculation software

Determination of the sound level as conducted by Fraunhofer Institut Bauphysik is in general useful to determine the noise level of a pipe system in a static situation. The test method is, however, based on a laboratory set up in which all building parameters are kept the same except for a change in water flow. As a result it is impossible to obtain by this test a realistic figure of the noise levels for the protect chambers of actual projects.

Wavin AS+

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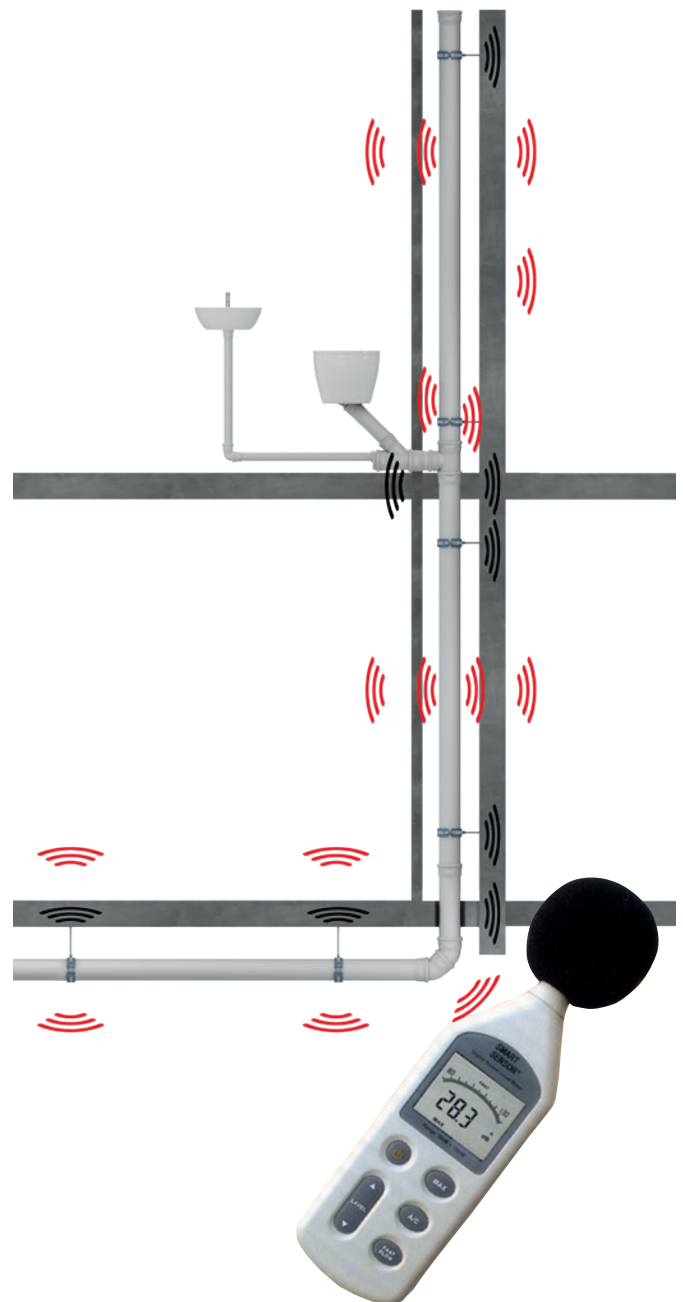
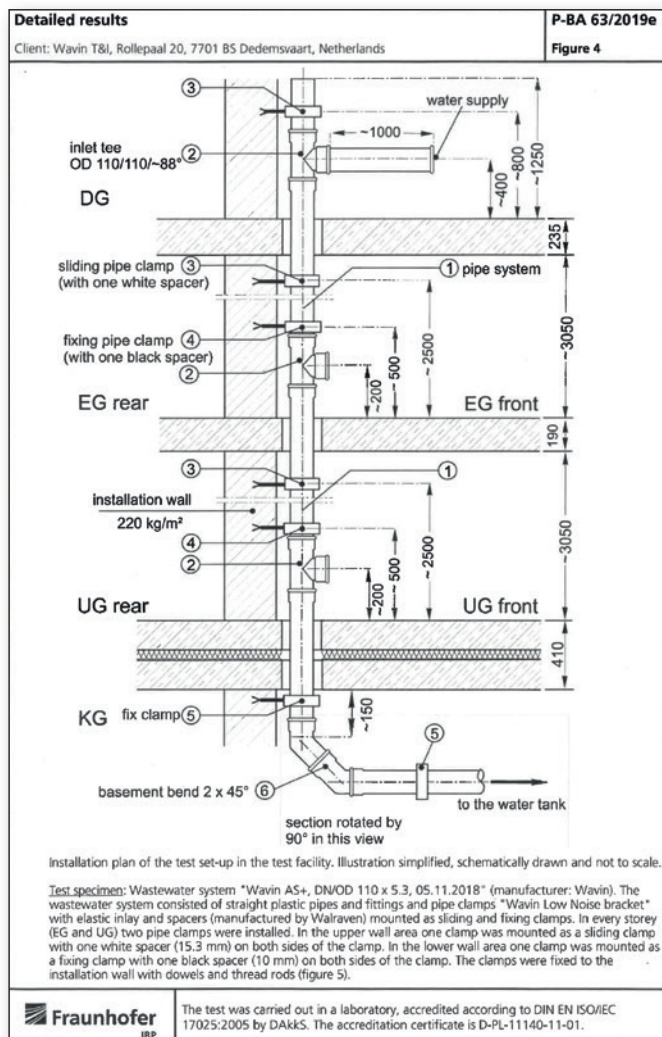


Figure 3: FRAUNHOFER Test set up for determination of the installation sound level in the laboratory.

To actually determine real noise emission of the pipe system into a room requires a more dynamic test set up in which at least the following parameters can be modified.

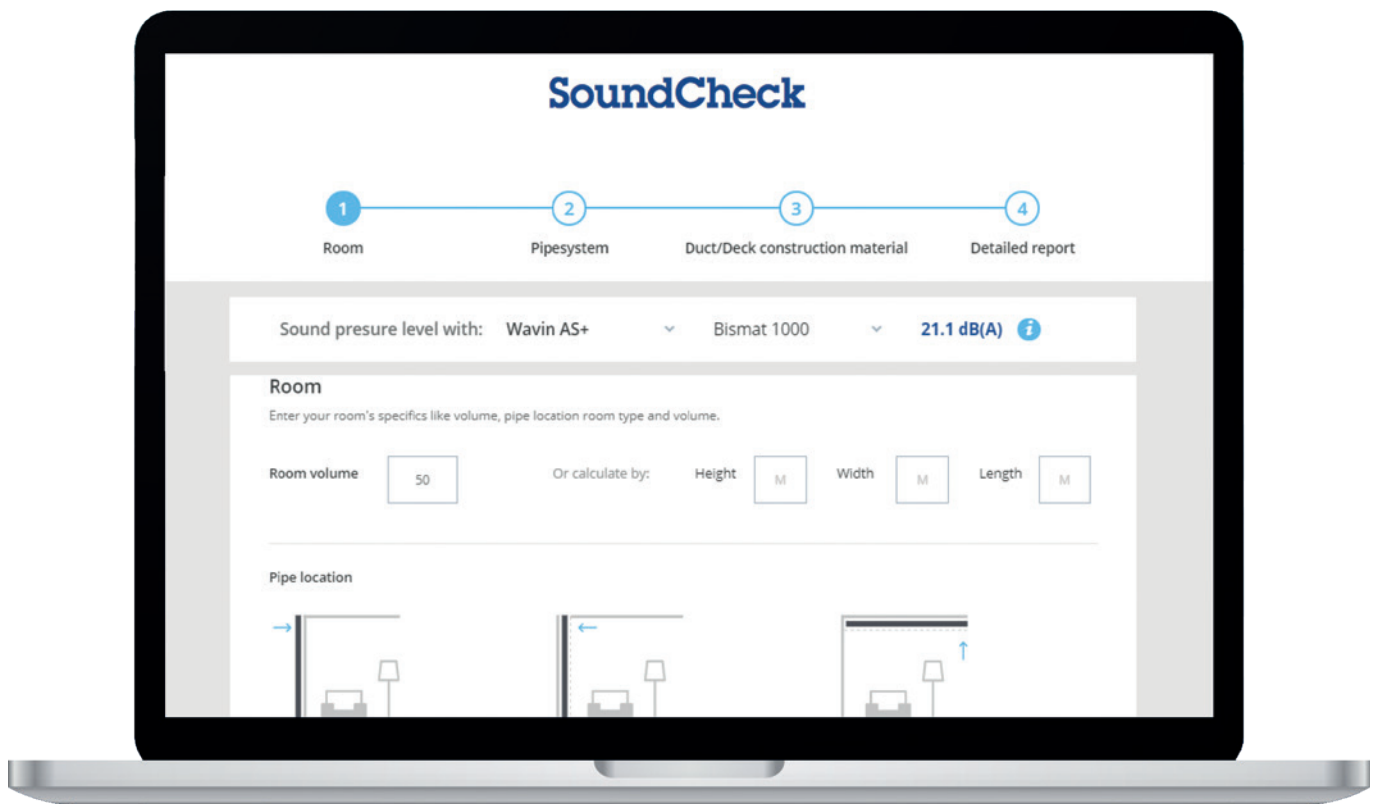
- ④ Pipe system characteristics
- ④ Building design
- ④ Shaft characteristics
- ④ Suspended ceiling criteria
- ④ Structural characteristics of the building
- ④ Flow parameters
- ④ Installation requirements
- ④ Insulation requirements

3.2.1. Wavin SoundCheck tool

Calculating system acoustic just got easier

With noise regulations continuously being updated, calculating noise levels to ensure your design meets requirements can be a complex exercise. Wavin's online SoundCheck Tool is designed to relieve some of that stress.

Unique to Wavin, the SoundCheck Tool simulates system acoustics in a final installation and calculates noise levels based on individual parameters. In just six clearly defined and intuitive steps, you can get the answers you need to see if your design meets regulations.



Wavin AS+

3. Acoustics

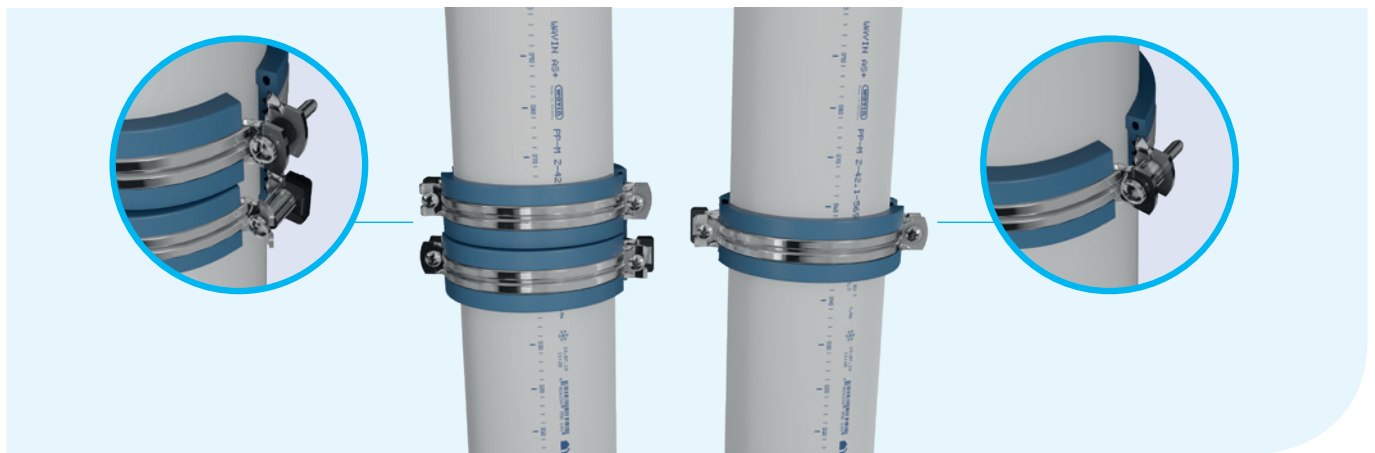
3.3. Sound-insulating performance

The excellent sound protection properties of Wavin AS+ are primarily attributed to its thick-walled design as well as special molecular structure and the high density of $\sim 1.9 \text{ g/cm}^3$ of the material used to make the pipes and fittings. This property enables Wavin AS+ to absorb airborne sound as well as structure borne sound.

Studies conducted at the Fraunhofer Institut für Bauphysik (Fraunhofer Institute for Building Physics), Stuttgart, on Wavin AS+ attest to its excellent sound absorption properties.

| Wavin low noise bracket installation | Volumetric flow rate* | | Meets standard |
|---|-----------------------|----------|----------------|
| | 2 l/s | 4 l/s | |
| DIN 4109 (public minimum legal requirement) specification 30dB(A) | 14 dB(A) | 19 dB(A) | ✓ |
| VDI 4100 sound insulation level II/III specification 27/24 dB(A) | 11 dB(A) | 16 dB(A) | ✓ |
| Installation noise level in rear basement (P-BA 63/2019) | | | |
| Wavin no noise bracket installation | Volumetric flow rate | | Meets standard |
| | 2 l/s | 4 l/s | |
| DIN 4109 (public minimum legal requirement) specification 30dB(A) | <10 dB(A) | 13 dB(A) | ✓ |
| VDI 4100 sound insulation level II/III specification 27/24 dB(A) | <10 dB(A) | 10 dB(A) | ✓ |
| Installation noise level in rear basement (P-BA 64/2019) | | | |

*Installation noise levels based on installation with Wavin system brackets.



With no noise bracket arrangement
 ⓘ <10 dB(A) according to 64/2019

With low noise bracket arrangement
 ⓘ 14 dB(A) according to 63/2019

3.4. About Sound

Sound is a sensation felt, a perception of what takes place around us, caused by various compression waves which cross the eardrum and are captured and transformed by the brain; it is composed of different frequencies. The acuteness or intensity of the perception depends on the frequency and range.

Sound is a wave that is:

- ⦿ Elastic (it needs a medium to be propagated)
- ⦿ Longitudinal (perturbation takes place parallel to the direction of propagation)

To exist it requires:

- ⦿ A source (vibrating body)
- ⦿ An elastic propagation medium (air, water, etc.)

A sound is therefore a method of transmitting mechanical energy. To propagate, a sound needs a medium: any means, whether solid, liquid or gassy, like air, is able to transport sound, influencing its speed according to density.

Sound is propagated through the exchange of air-solid-air or solid-air vibrations (in the second case the solid is the source of the sound). With respect to soundproofing soil and waste systems, we need to think in two different directions: (1) the noise created in the pipes and transmitted by them and (2) noise which is transmitted by the walls or surrounding media.

Sound is measured with a phonometer, an instrument which filters noise and measures intensity at its different frequencies. It is expressed in decibels.

The decibel is the logarithm of the ratio between the measured sound pressure and a reference sound pressure, multiplied by ten.

$$dB = 10 \log (P/Pa)$$

We need to remember that sound is an energy (just think of when you stand in front of the stereo speakers and you can "feel" the basses) but what we perceive is a processed sensation.

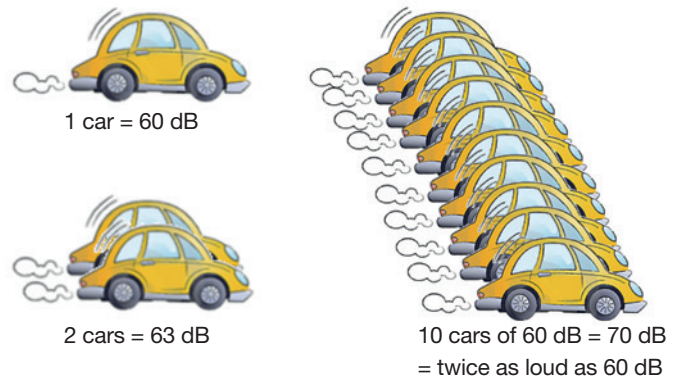
The human ear is sensitive to pressure in a NON LINEAR manner; therefore twice the pressure does not correspond to twice the sensation.

The doubling of acoustic power corresponds to an increase of 3 dB.

Every 10 dB increase is perceived by the human ear as twice as loud (10 cars are perceived as twice as loud as 1 car).

$$60 \text{ dB} + 50 \text{ dB} + 40 \text{ dB} = 60.5 \text{ dB} \longrightarrow$$

The highest dB is in a sum the most important



Sound intensity follows an inverse square law with distance from the source; doubling the distance from a noise source reduces its intensity by a factor of four, or 6 dB.

3.5. Noise

Noise can be described as unwanted sound. In relation to sound, noise is not necessarily random.

Acoustic noise can be anything from quiet but annoying to loud and harmful causing permanent irreversible hearing damage.



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Based on the World Health Organization (WHO) guidelines, European countries have maximized the noise level (in houses, apartments, hospitals, elderly homes, hotels, etc.) during the night to:

$L_A \text{ max night} = 30 \text{ to } 35 \text{ dB(A)}$.

Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources except noise at the industrial workplace.

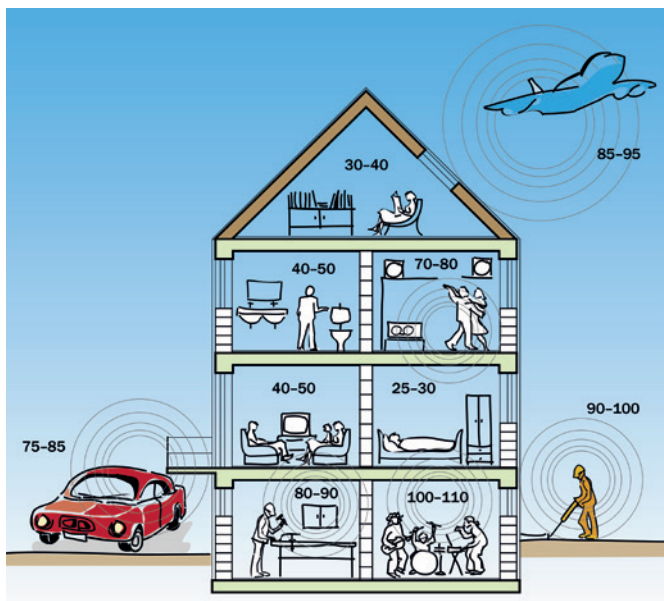


Figure 4: Example of community noise.

In the European Union about 40% of the population is exposed to road traffic noise with an equivalent sound pressure level exceeding 55 dB(A) daytime, and 20% are exposed to levels exceeding 65 dB(A). When all transportation noise is considered, more than half of all European Union citizens is estimated to live in zones that do not ensure acoustical comfort to residents. At night, more than 30% are exposed to equivalent sound pressure levels exceeding 55 dB(A), which are disturbing to sleep. Noise pollution is also severe in cities of developing countries.

In contrast to many other environmental problems, noise pollution continues to grow and it is accompanied by an increasing number of complaints from people exposed to the noise.

The growth in noise pollution is unsustainable because it involves direct, as well as cumulative, adverse health effects.

For instance sleep disturbance: measurable effects of noise on sleep begin at sound levels of about 30 dB. However, the more intense the background noise, the more disturbing is its effect on sleep. Sensitive groups mainly include the elderly, shift workers, people with physical or mental disorders and other individuals who have difficulty sleeping.

Table 1 presents the WHO guideline values arranged according to specific environments and critical health effects. The guideline values consider all identified adverse health effects for the specific environment. An adverse effect of noise refers to any temporary or long-term impairment of physical, psychological or social functioning that is associated with noise exposure. Specific noise limits have been set for each health effect, using the lowest noise level that produces an adverse health effect (i.e. the critical health effect).

Table 1: Guideline values for community noise in specific environments (Source World Health Organization).

| Specific environment | Critical health effect(s) | L_{Aeq} [dB(A)] | Time base [hours] | L_{Amax} fast [dB] |
|---|--|-------------------|-------------------|----------------------|
| Outdoor living area | Serious annoyance, daytime and evening | 55 | 16 | - |
| | Moderate annoyance, daytime and evening | 50 | 16 | - |
| Dwelling, indoors | Speech intelligibility & moderate annoyance, daytime & evening | 35 | 16 | |
| Inside bedrooms | Sleep disturbance, night-time | 30 | 8 | 45 |
| Outside bedrooms | Sleep disturbance, window open (outdoor values) | 45 | 8 | 60 |
| School class rooms & pre-schools, indoors | Speech intelligibility, disturbance of information extraction, message communication | 35 | during class | - |
| Pre-school bedrooms, indoor | Sleep disturbance | 30 | sleeping-time | 45 |
| School, playground outdoor | Annoyance (external source) | 55 | during play | - |
| Hospital, ward rooms, indoors | Sleep disturbance, night-time | 30 | 8 | 40 |
| | Sleep disturbance, daytime and evenings | 30 | 16 | - |
| Hospitals, treatment rooms, indoors | Interference with rest and recovery | #1 | | |
| Industrial, commercial shopping and traffic areas, indoors and outdoors | Hearing impairment | 70 | 24 | 110 |
| Ceremonies, festivals and entertainment events | Hearing impairment (patrons:<5 times/year) | 100 | 4 | 110 |
| Public addresses, indoors and outdoors | Hearing impairment | 85 | 1 | 110 |
| Music and other sounds through headphones/earphones | Hearing impairment (free-field value) | 85 #4 | 1 | 110 |
| Impulse sounds from toys, fireworks and firearms | Hearing impairment (adults) | - | - | 140 #2 |
| | Hearing impairment (children) | - | - | 120 #2 |
| Outdoors in parkland and conservations areas | Disruption of tranquillity | #3 | | |

#1: As low as possible.

#2: Peak sound pressure (not LAF, max) measured 100mm from the ear.

#3: Existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low.

#4: Under headphones, adapted to free-field values.

It is not enough to characterize the noise environment in terms of noise measures or indices based only on energy summation (e.g., LAeq), because different critical health effects require different descriptions.

It is equally important to display the maximum values of the noise fluctuations, preferably combined with a measure of the number of noise events. A separate characterization of nighttime noise exposures is also necessary.

For indoor environments, reverberation time is also an important factor for things such as speech intelligibility. If the noise includes a large proportion of low-frequency components, still lower guideline values should be applied.

Supplementary to the guideline values given in Table 1, precautions should be taken for vulnerable groups and for noise of certain character (e.g. low-frequency components, low background noise).

3.5.1. Sources of noise in buildings

The noise generated by the building and its utilities may be classified as follows:

- ④ Noise due to filling operations
- ④ Noise generated by control equipment
- ④ Intake noise
- ④ Discharge noise
- ④ Noise due to impact or shock

Noise is generated by moving parts or by flowing media. Waste water discharge pipes are prone to vibration, particularly where water flows through downpipes, or is forced to change direction in joints and elbows (noise due to impact or shock). Experience shows that the greatest problems are typically caused by the transmission of structural noise, particularly in the area of pipe clamps and brackets or where pipe-work is run through walls or ceilings.

The noise created from waste systems obviously depends greatly on the vertical piping. Here the falling water clashes against the wall of the pipes and fittings. The generated noise is transmitted directly to the pipes and indirectly through the ducts and installation walls. Therefore, the thickness and mass of the solid materials are of great importance, just like the fixing brackets and other elements which connect pipes to their supports.

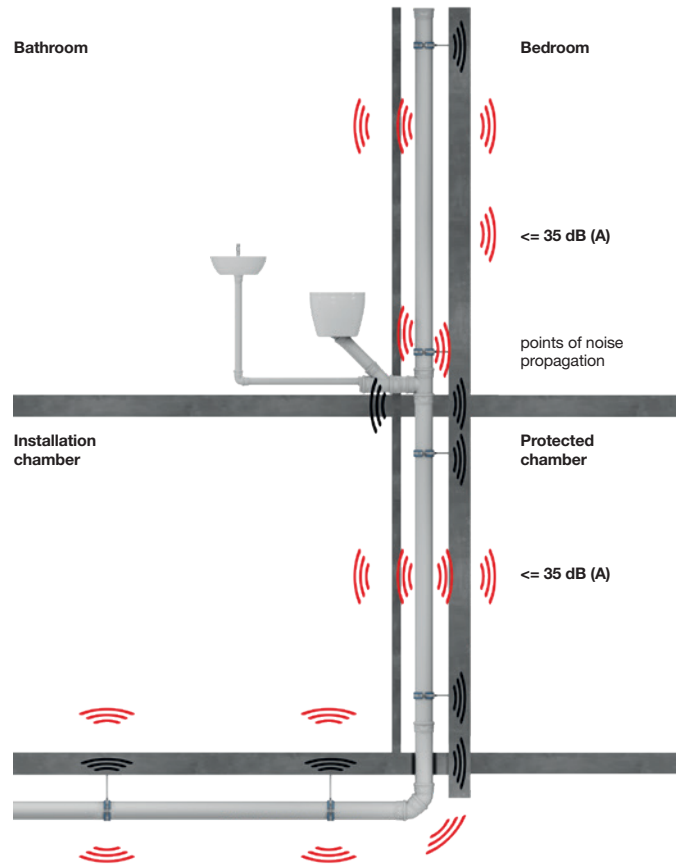


Figure 5: Example of noise propagation during drainage.

3.5.2. How noise is measured

If we consider the “installation chamber” to be the room in which the pipes are installed (generally the bathroom), the room next door divided by the installation wall is called the “protected chamber”. The noises emitted are measured in the protected chamber according to EN 14366.

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3.6. Acoustic requirements

Local ruling increasingly describe the maximum acceptable sound level inside the living area of a building. Subsequently such noise limitation will then have to be established in contracts between the contractor and the awarding authority.

The following technical regulations contain relevant advice and suggestions, which require a contractual agreement to become binding.

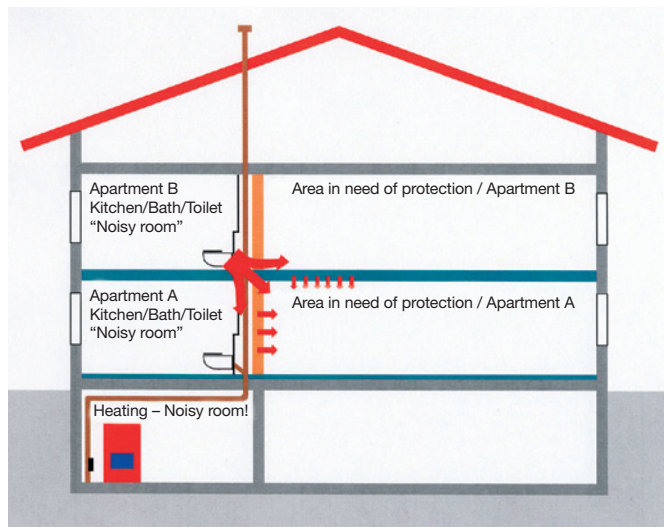


Figure 6: Example of areas requiring protection.

DIN4109-5

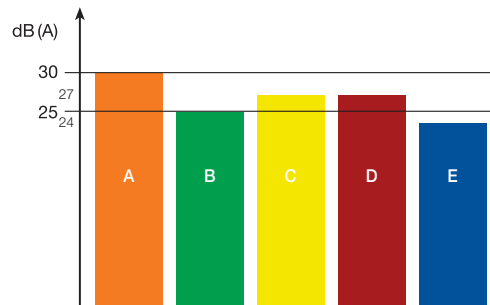
This supplement contains instructions relating to noise levels that lie 5 dB (A) below the values given in DIN 4109-1:20/6-07.

In accordance with DIN 4109-5, increased levels of sound insulation can be arranged, by agreement, to a maximum of 25 dB (A) in other areas requiring noise protection.

VDI 4100

In addition to the requirements of DIN 4109, which was adopted as Noise Protection Level I (NPL I), this guideline contains characteristic values for two additional noise protection levels – NPL II and NPL III.

These two additional noise protection levels specify the arrangements for increased sound insulation.



- A: DIN 4109 (minimum legal requirements)
- B: DIN4109-5 Living rooms and bedrooms in apartment buildings
- C: VDIN 4109-5 Living rooms and bedrooms in single-family houses
- D: DI4100 Noise Protection Level II
- E: VDI4100 Noise Protection Level III

Figure 7: Overview Noise Protection Standards and Guidelines.

3.7. Acoustic design

3.7.1. Advantageous layout

An important factor for the assurance of acoustic insulation is the design and implementation of an acoustically advantageous layout.

The following measures have proven to be of significant influence to the level of noise generated from the soil system inside the building:

- ④ Noise-sensitive areas should be kept away, as far as possible, from sources of noise
- ④ Non-sensitive areas should, wherever possible, be used as “buffer zones”
- ④ Noise-sensitive areas should not be positioned in the direct vicinity of bathrooms, toilets or stairwells
- ④ Potential sources of noise should be “bundled together” in the same area

The comparison between the two examples of layout shown above demonstrates how the acoustically advantageous layout in the second example contributes to a clear reduction in the acoustic pressure of the systems in the room which demands acoustic insulation.

However, even using highly efficient low-noise waste systems like Wavin AS+, one always has to seek for the best possible acoustic decoupling. This goes for the whole drainage system and its points of contact with the building (collars, crossings through walls and floors, plaster residues between the pipe and the building, etc...).

In designing piping, moreover, we need to avoid positioning waste pipes in the partition walls between apartments. Special noise-reduction measures also need to be adopted when fixing drain pipes to the partition walls between apartments. Protect the pipes from the propagation of intrinsic noise.

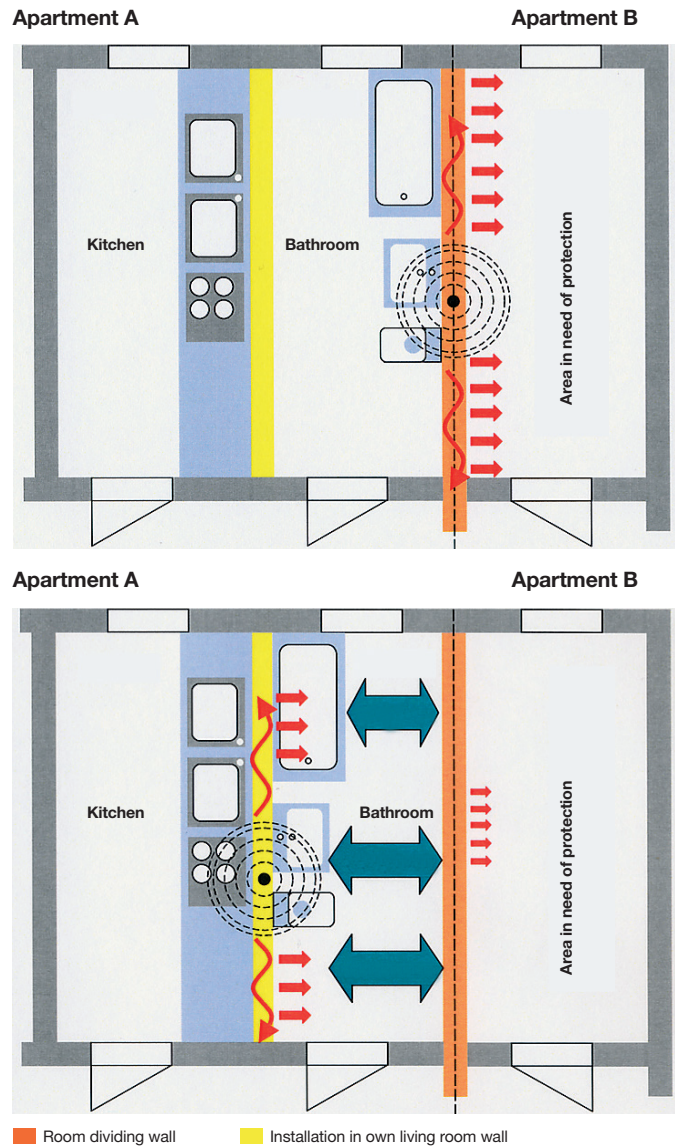


Figure 8: Examples of good acoustic practice in building design.

The comparison of the floor plans above demonstrates how good acoustic design in the lower building example can significantly reduce the noise levels to which areas requiring noise protection are exposed.

Wavin AS+

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3.7.2 Acoustic plumbing design

Wavin AS+ can significantly reduce noise levels when compared with other piping systems. However, when installing high performance sound-insulating waste water piping systems it is still necessary to consider how effectively the system can be sound-isolated. This applies to the waste water discharge system as a whole, including its points of contact with the building structure (pipe brackets and clamps, the running of pipework through walls and ceilings, mortar droppings between pipes and wall surfaces, etc.).

When planning pipe installation, waste water discharge pipes should not be allowed to run inside the walls separating living areas. The attachment of waste water discharge pipes to partition walls in living areas should only be carried out under application of special noise protection measures. DIN 4109 requires that single-skin walls to which, or in which, water installations or equipment (i.e. waste water pipes) are to be attached must have an area-related mass of at least 220 kg/ sq.m. Walls having an area-related mass of less than 220 kg/ sq.m may only be used where prior testing has demonstrated that the walls exhibit acceptable properties with respect to the transmission of noise.

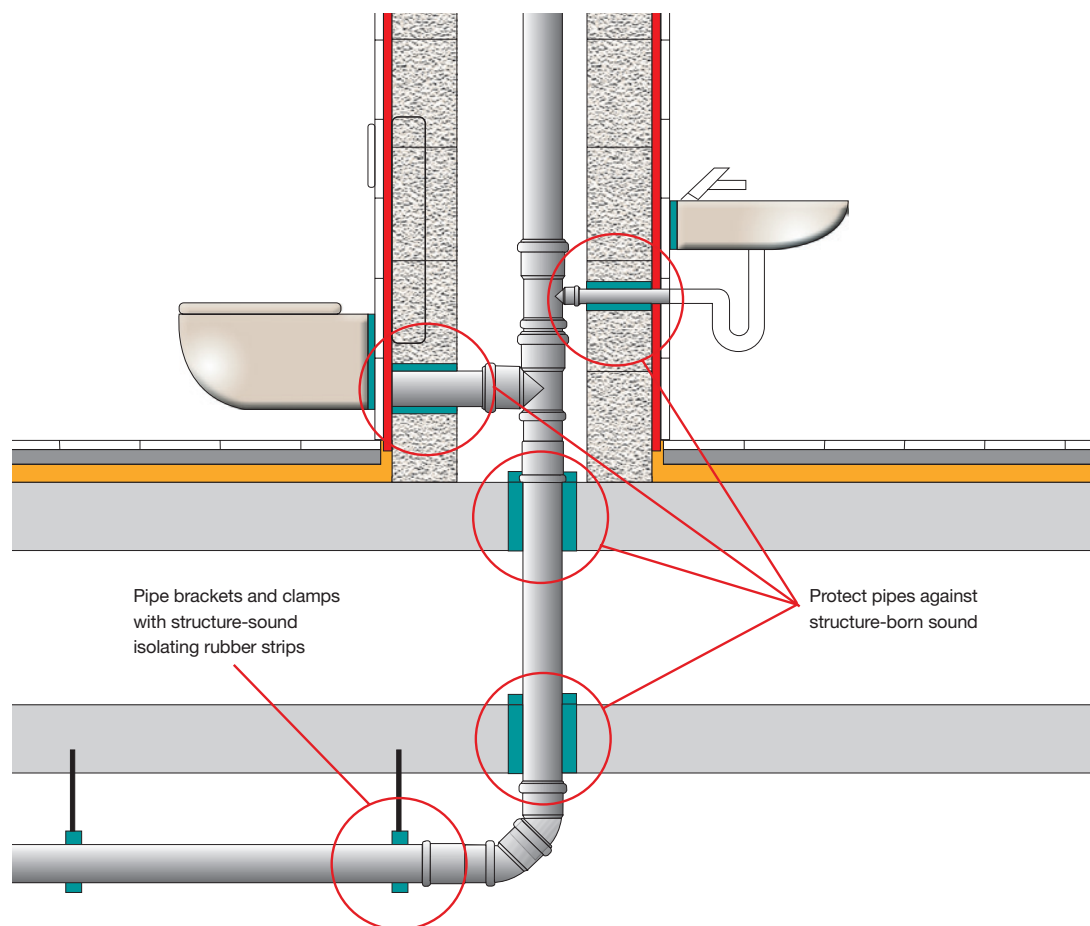


Figure 9: Sound insulation of waste water systems.

4. Design of the waste water system

4.1. Installation and layout principles for waste water drainage systems

The technical aspects of waste water drainage systems have been regulated in Europe for some time by an extensive set of standards established in the course of ongoing European harmonisation, started in 2000 with BS EN 12056 (“Gravity drainage systems inside buildings”).

This European drainage system standard consists of five parts

- Part 1:** General and performance requirements
- Part 2:** Sanitary pipework, layout and calculation
- Part 3:** Roof drainage, layout and calculation
- Part 4:** Waste water systems, layout and calculation
- Part 5:** Installation and testing, instructions for operation, maintenance and user

May 2008 saw the publication of the updated version of DIN 1986-100 “Drainage systems for buildings and provisions for private ground [...] in relation to DIN EN 752 and DIN EN 12056”.

This standard contains additional technical requirements for drainage systems, based on the earlier German standard DIN 1986, Parts 1+2, which were not incorporated into the DIN EN 12056 set of European standards.

The current version of the standard (from 2016) has been reorganised into key points for better readability, including, for example:

- ④ Basic requirements for the design and completion of waste water and rainfall drainage systems
- ④ The installation of pipes inside and outside buildings
- ④ Requirements concerning the quality and quantity of waste water
- ④ Backflow prevention
- ④ Sizing of waste water and rainfall drainage systems

DIN 1986-100 is therefore an extension of European waste water regulations for application in Germany, with uniform technical provisions for the design, construction, operation and maintenance of drainage systems used for the disposal of waste water in buildings and on private property.

For the sake of completeness, we also include other parts of the above-mentioned DIN 1986.

- Part 3:** Specifications for service and maintenance
- Part 4:** Fields of application of sewage pipes
- Part 30:** Maintenance of waste water drainage systems

4. Design of the waste water system

4.2. List of definitions according to BS EN 12056

Waste water drainage system

Structural system for the collection, drainage, disposal and treatment of waste water in buildings and on private property.

Collecting pipe

Horizontally installed pipe for the collection of waste water from downpipes and connected lines not buried below ground or installed in foundations.

Downpipe

Perpendicular pipe for the collection of waste water from individual and collective inlets. It directs the flow of waste water to a collecting pipe or underground and collector pipe.

Collecting connection pipe

Pipe designed to collect waste water from various single connection pipes and direct it to a downstream pipe.

Single connection pipe

Pipe from a sink drain or other drainage outlet, designed to direct waste water to a downstream pipe.

Bypass pipe

Pipeline for connection pipes in the retention area of a downpipe offset or in the transition between a downpipe and a collecting pipe or underground and collector pipe.

Discharge unit (DU)

The average discharge rate of a sanitary appliance expressed in litres per second (l/s).

Frequency factor

Variable to take into account the frequency of use of sanitary appliance (dimensionless).

Waste water flow rate (Q_{ww})

Total design flow rate from sanitary appliances in a drainage system or in a part of a drainage system in litres per second (l/s).

Continuous flow rate (Q_c)

Flow rate of all continuous flows, e.g. cooling water, etc. in litres per second (l/s).

Pumped water flow rate (Q_p)

Discharge rate of waste water pumps in litres per second (l/s).

Total flow rate (Q_{tot})

The total flow rate is the sum of the waste water flow rate (Q_{ww}) and continuous flow rate (Q_c) and pumped water flow rate (Q_p) in litres per second (l/s).

Hydraulic capacity (Q_{max})

Maximum flow rate of air through a ventilating pipe or air admittance valve, measured at 250 Pascal (Pa) pressure drop, in litres per second (l/s).

Types of system

The many types of drainage system that currently exist are a result of widely ranging areas of application for sanitary equipment in different countries and the variety of technical procedures and regulations that govern such systems.

BS EN 12056 classifies European waste water drainage systems into four types.

System I

Single downpipes with partly-filled connection pipes.

Sanitary drainage sources are joined to partly-filled connection pipes. These partly-filled connection pipes are designed for a filling factor (h/d) of 0.5 (50%), and are in turn connected to an individual waste water downpipe.

System II

Single downpipes with partly-filled connection pipes.

Sanitary drainage sources are joined to connection pipes of reduced size. These connection pipes are designed for a filling factor (h/d) of 0.7 (70%), and are in turn connected to an individual waste water downpipe. This configuration is used mainly in Scandinavian countries. It is not used in Germany.

System III

Single downpipe system with fully-filled connection pipes.

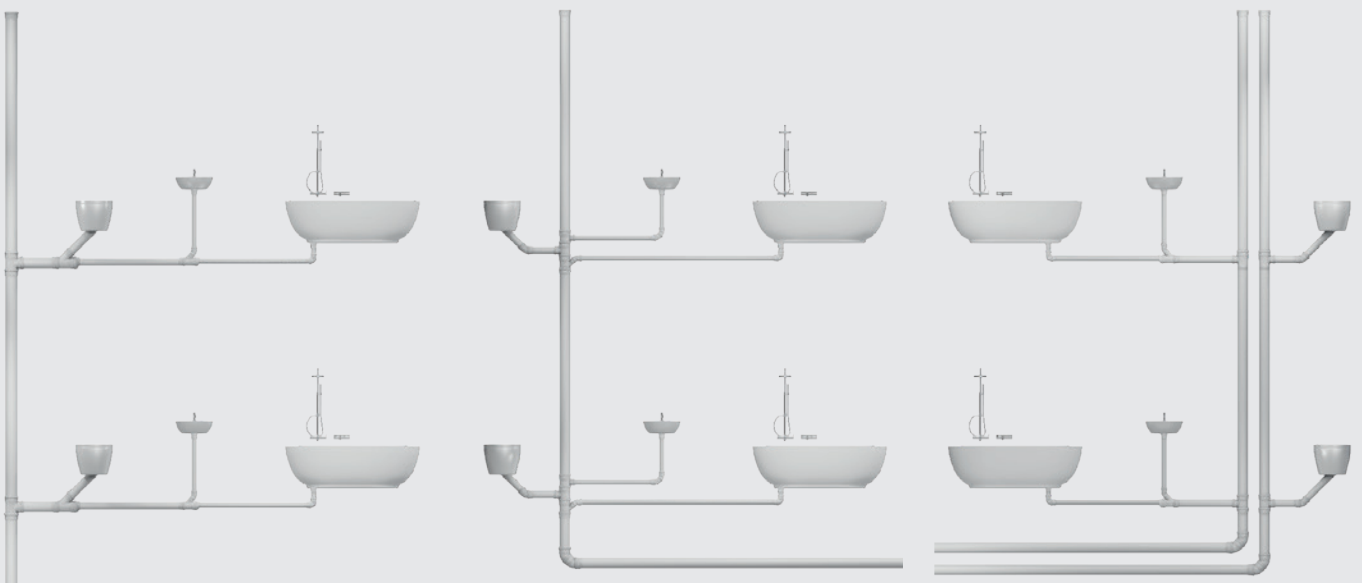
Sanitary drainage sources, which are linked via connection pipes and operated in a fully-filled state. These filled connection pipes have a filling factor (h/d) of 1.0 (100%). Each individual connection pipe is separately connected to the downpipe.

System III is the preferred configuration in English-speaking countries. It is not used in Germany.

System IV

System with separate waste water downpipes.

Configurations corresponding to systems I, II and III can also be divided into a waste water downpipe that collects waste from toilets and urinals and a waste water downpipe designed to collect waste water from all other drainage sources. This configuration is mainly used in France. Its use in Germany is only possible to a limited extent.



System I + II

System III

System IV

Figure 10: Waste water drainage systems in Europe.

Wavin AS+

4. Design of the waste water system

4.3. Functional requirements

The dimensional specifications of waste water standards are based on various requirements:

- ⦿ The loss of trap water resulting from the flow of water must not reduce the total level of the water seal by more than 25mm in height
- ⦿ The trap water must not be sucked out by a vacuum or expelled by excess pressure
- ⦿ The waste water pipeline must be self-cleaning

The following sizing method applies to all gravity waste water drainage systems designed to dispose of domestic waste water. The layouts of industrial and commercial waste water drainage systems used in such places as swimming pools or factory buildings must be designed individually. Performance figures are based on the minimum internal diameters specified in the table in BS EN 12056-2.

Please note that the product standards applied to pipes and fittings used in Germany are based on outside diameters, which might lead to certain deviations with respect to the tables in BS EN 12056.

| Nominal diameter DN | Minimum internal diameter Di (mm) |
|---------------------|-----------------------------------|
| 50 | 44 |
| 100 | 96 |
| 150 | 146 |

Nominal diameter (DN) with corresponding internal diameter Di_{min} as per Table 1, BS EN 12056-2 (extract).

| Nominal diameter DN | Minimum internal diameter Di (mm) |
|---------------------|-----------------------------------|
| 50 | 44 |
| 100 | 99.4 |
| 150 | 148.8 |

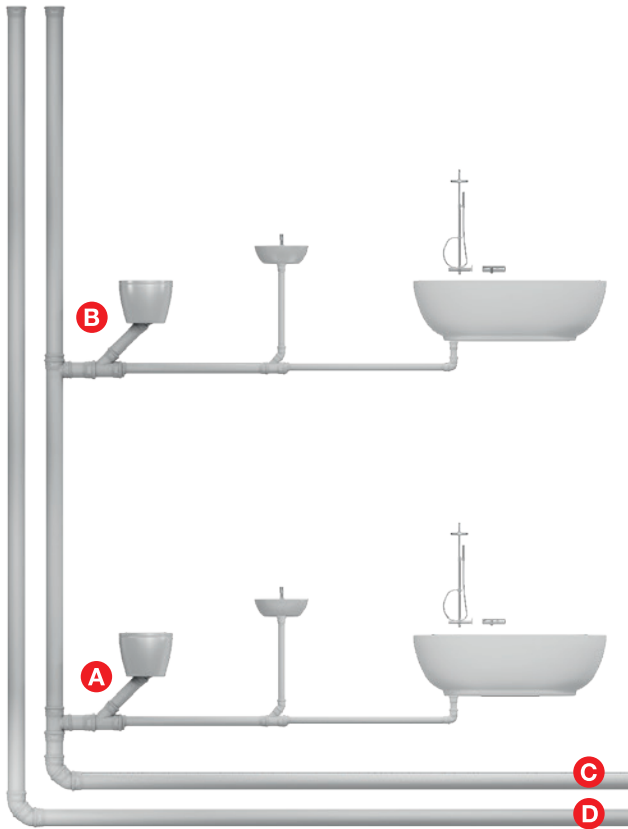
Nominal diameter and diameter used by Wavin AS+.

Minimum fall

Compliance with the required minimum fall is vital for the proper drainage of waste water. Waste water standards specify different minimum falls, depending on the piping area concerned.

Table 2: Minimum fall for waste water pipes in different piping areas.

| Area of piping | Minimum fall | Standard/section |
|-------------------------------|--------------|---|
| Unventilated connection pipes | 1% | BS EN 12056, Table 5 DIN 1986-100, Section 14.1.3.3 |
| Ventilated connection pipes | 0.5% | BS EN 12056, Table 8 |



| | |
|---|-----------|
| A Unventilated connection pipe | min. 1.0% |
| B Ventilated connection pipe | min. 0.5% |
| C Collecting pipe wastewater > DN100 | min. 0.5% |
| Collecting pipe wastewater DN90 | min. 1.5% |
| D Collecting pipe rainwater | 1:DIN |

Figure 11: Minimum fall for waste water pipes, example.

Basis of calculations

The hydraulic calculations for a waste water system begin at the starting point (e.g. a sink, toilet or shower, etc.) and cover the rest of the piping, the layout of which depends on the items included.

- ① Single connection pipe
- ① Collecting connection pipe
- ① Downpipe
- ① Collecting pipe
- ① Underground and collector pipe

Please refer to the following pages of the manual for further details of the areas covered by the waste water drainage pipes. The sum total quantities of waste water to be disposed of are normally based on various parameters.

The formula for calculating domestic waste water in accordance with BS EN 12056 is as follows:

Basis of calculation BS EN 12056:

$$Q_{\text{WW}} = K \cdot \sqrt{\sum DU}$$

$$Q_{\text{tot}} = Q_{\text{WW}} + Q_{\text{C}} + Q_{\text{P}}$$

Q_{WW} = Wastewater discharge
[flow rate of waste water]

Q_{tot} = Total wastewater discharge [l/s]
[flow rate, total]

Q_{C} = Continuous discharge [l/s]
[flow rate, constant]

Q_{P} = Pump flow rate
[flow of discharge from pumps]

DU = Design unit
[design unit]

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4. Design of the waste water system

As in the equation Q_{ww} , this takes into account the discharge coefficient K and the discharge unit DU.

Frequency factor K describes the frequency of use of the sanitary drainage sources concerned, along with its simultaneity. Frequency factor K is not expressed in dimensional terms.

Table 3: Typical frequency factor K as per BS EN 12056 - 2.

| Type of building | K |
|--|-----|
| Non-regular usage (e.g. in residential properties, boarding houses and offices) | 0.5 |
| Regular usage (e.g. in hospitals, schools, restaurants and hotels) and/or showers) | 0.7 |
| Frequent usage (e.g. in public toilets) | 1.0 |
| Special usage (e.g. laboratories) | 1.2 |

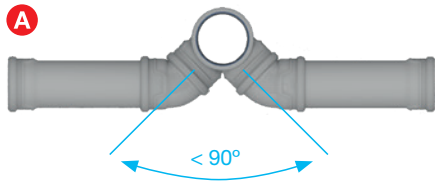
The discharge unit DU is described in terms of the expected amount of waste water for a given drainage source. 1 DU = 1 l/s.

Backflow

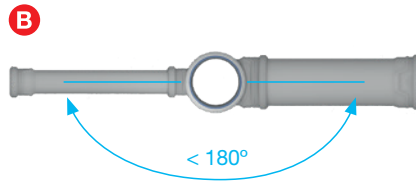
Connection pipes installed next to or opposite each other must be protected to prevent backflow. DIN 1986-100 contains corresponding suggestions for a hydraulically correct connection to a downpipe, as shown in the following illustrations.

WC + other drainage object

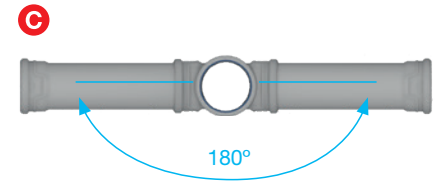
Opposite WC



- Minimum dimensions**
- ⦿ Height offset not necessary
 - ⦿ Max. angle 90°



- Minimum dimensions**
- ⦿ Height offset min. 20cm
 - ⦿ Max. angle 180°

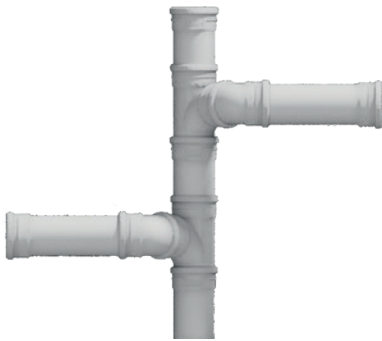


- Minimum dimensions**
- ⦿ Height offset not necessary
 - ⦿ Angle exactly 180°

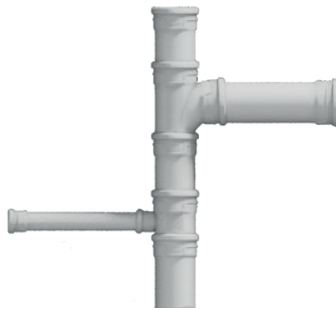
Example with Wavin AS+

Example with Wavin AS+

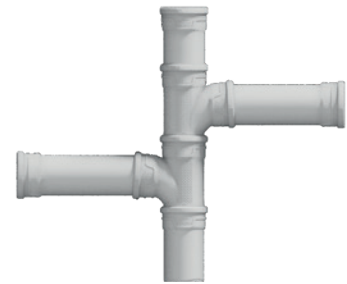
Example with Wavin AS+



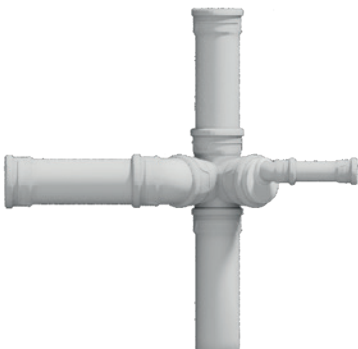
Branch DN 100



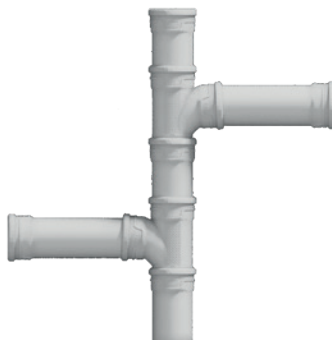
Different branches



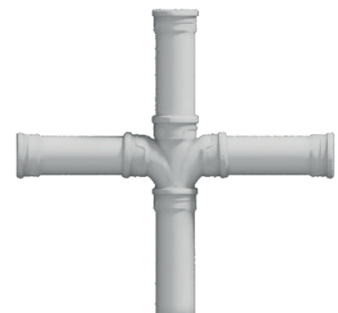
Branch DN 100



Corner branch with reducer



Branch DN 100



Double branch DN 100

Figure 12: Example of hydraulically correct connection to a downpipe

Wavin AS+

4. Design of the waste water system

Air-circulation pipes

Air-circulation pipes are used to ventilate collecting connection pipes which require such ventilation under certain circumstances, due to the length, height difference or the number of changes of direction; or for functional reasons.

Air-circulation pipes should have the same nominal diameter as the collecting connection pipes that they ventilate, as measured at the confluence with the downpipe. The cross-section of the pipe up to the start of the ventilation system should likewise be of this nominal diameter.



Figure 13: Air-circulation pipe.

Bypass pipes

Bypass pipes are required under certain circumstances for downpipe offsets or points of confluence between downpipes and underground and collector pipes. Please also refer to the section of this manual that deals with downpipes.

Bypass pipes have the same nominal diameter as the downpipe, but have a maximum diameter of DN100. The size of the ventilation section (the upper part of the bypass pipe without waste water connection) can be calculated using the following table.

Please note that this table is only a partial extract from BS EN 12056, Part 2.

It shows only the System I values (i.e. the ones relevant to Germany)

Table 4: Extract from Table 7, BS EN 12056-2.

Hydraulic capacity (Q_{max}) and nominal diameter (DN)

| Q_{max} (l/s) | Connection pipe / ventilation section (DN) |
|-----------------|--|
| 0.75 | 50/40 |
| 1.50 | 60/40 |
| 2.25 | 70/50 |
| 3.00 | 80/50** |
| 3.40 | 90/60*** |
| 3.75 | 100/60 |

** not applicable to toilets

*** not more than 1 toilet

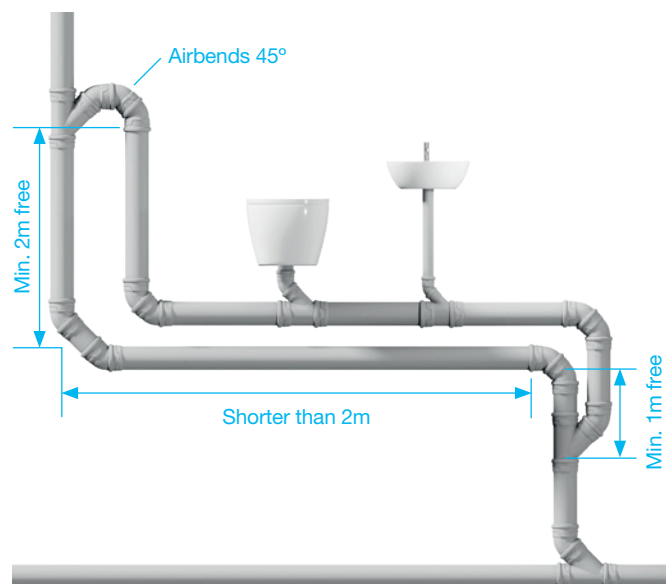


Figure 14: Bypass pipe conforming to DIN 1986-100.

Ventilation valves

Ventilation valves may be installed in drainage systems equipped with primary ventilation systems, as an alternative to air circulation or indirect secondary ventilation systems designed to reduce vacuums in the piping system. Only ventilation valves conforming to BS EN 12380 may be used.

Ventilation valves may be used as a substitute for primary ventilated pipes in single/two-family residential properties or buildings with comparable residential units with a drainage system only for residential waste water, provided there is at least one downpipe running up to above roof height. In this case, the downpipe with the largest nominal diameter should be aerated/ventilated at above roof height.

Ventilation valves should be installed in such a way that allows them to be replaced without structural building work in the event of a defect. A sufficient supply of air must be guaranteed.

This area of application is subject to the operating temperature and installation position specified in Table 2, in accordance with BS EN 12380.

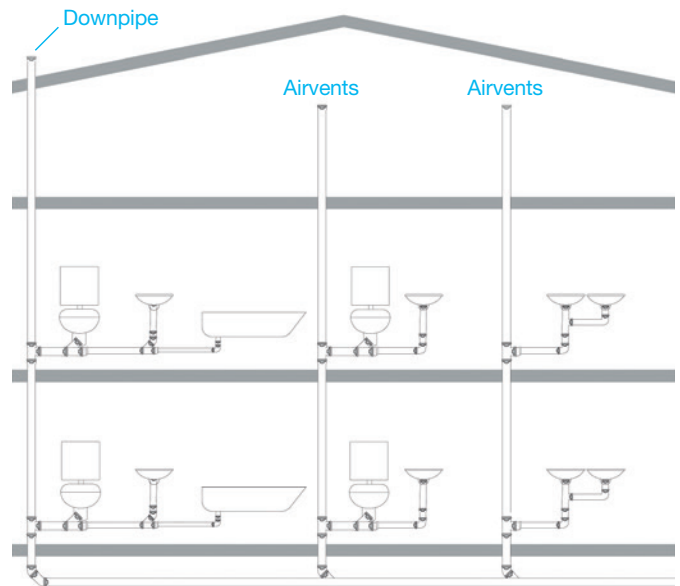


Figure 15: Use of ventilation valves in single/two-family residential properties

Ventilation valves must not be used in areas endangered by backflow or for the ventilation containers (e.g. pump stations).

Table 5: Operating conditions and designations of ventilation valves.

| Determining factor | Area/position | Designation |
|--|----------------|-------------|
| Location: Usable beneath flow level ^a of the connection pipe of the connected drainage sources | Yes | A |
| | No | B |
| Temperatures | -20°C to +60°C | I |
| | 0°C to +60°C | II |
| | 0°C to +20°C | III |

^a Flow level within the meaning of the term “backflow level”, as defined in BS EN 12380

NOTE Valves corresponding to Designation I are designed for use in places where the ambient temperature at the point of installation (e.g. unheated attics) may drop to below freezing point over several days.

Wavin AS+

4. Design of the waste water system

Rainwater pipes

Rainwater pipes must be capable of withstanding higher pressures under certain circumstances. Pressures above those foreseen may arise, for example, when overloaded sewers cause build-ups of rainwater. Thrust resistance must be sufficient to guarantee operating safety and reliability in such cases. To ensure this, the sleeves must be fastened using Wavin LKS clamps, for example.

The installation of rainwater pipes is also affected by the issue of condensation. Under certain operating conditions relating to room temperature, relative humidity in the room concerned and the temperature of the rainwater, the dew point of internal rainwater pipes may drop to below that specified.

Diffusion-resistant insulation should normally be fitted to internal rainwater pipes subject to any latent risk of condensation.

Rainwater downpipes/calculation

The minimum dimensions must not be less than the connection diameter of the roof guttering.

The filling factor of r rainwater downpipes totals $f \leq 0.33$

Downpipe deviations $\leq 10^\circ$ are not taken into account when calculating the dimensions of the rainwater downpipe. If downpipe offsets are $\geq 10^\circ$, the sizing should be calculated subject to rules similar to those governing the layout of collecting pipes described in Chapter 4 of this waste water manual.

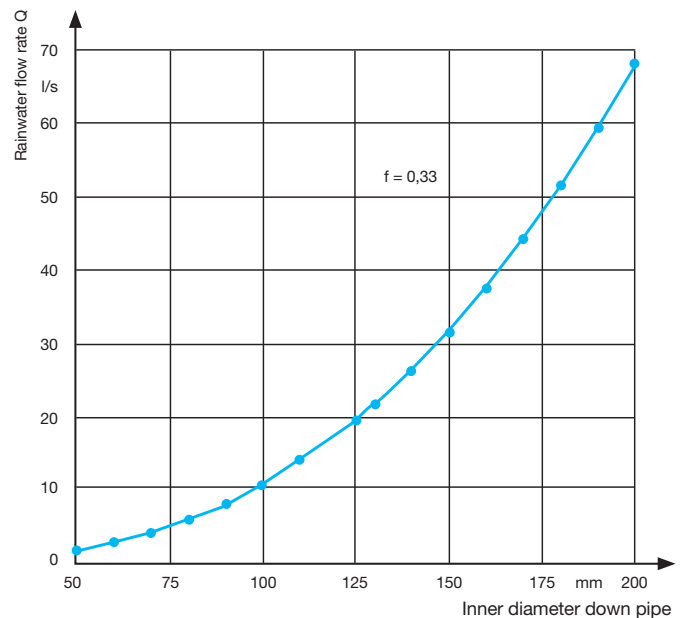


Figure 16: Drainage performance of rainwater downpipes.

Table 6: Nominal width and internal diameter, AS+.

| Nominal diameter DN | Internal diameter Di (mm) |
|---------------------|---------------------------|
| 50 | 44 |
| 100 | 99.4 |
| 150 | 148.8 |

Wavin AS+

5. Installation and jointing

Wavin has designed its low-noise systems to reduce noise emissions in concealed and visible installations. However, to ensure the system is leak-tight and to achieve a high level of soundproofing it is strongly recommended to follow the instructions given below.

5.1. Connecting Wavin AS+ to fittings and pipes

Wavin AS+ connections are fitted as follows:

- ⦿ Check position and condition of the seal in the socket. You may have to clean the socket and the seal
- ⦿ Clean the spigot-end of the pipe and/or fitting
- ⦿ In case of pipes: mark the insertion depth (socket length) on the spigot-end
- ⦿ Push the spigot-end into the socket according the insertion depth
- ⦿ The seal is pre-lubricated. For DN150 additional lubrication might ease assembly

For pipes ≥ 2 meters:

- ⦿ Pipes & fittings connected to horizontal and vertical pipes ≥ 2 meters to be retracted 10mm to allow for thermal expansion
- ⦿ For vertical pipes, directly secure position with brackets to prevent slipping and eliminating the 10mm dilatation space

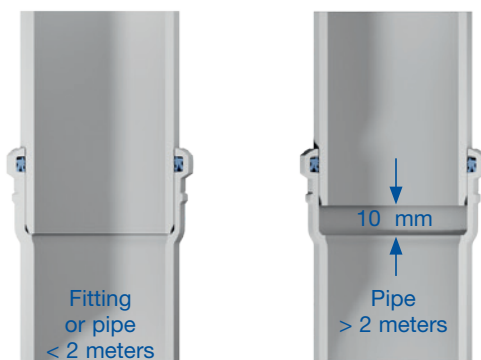


Figure 17: 10mm space for thermal expansion.

Cutting pipes to size

Pipes can be cut to size using standard pipe cutters. When cutting pipes to length, do so at an angle of 90° to their axis. Remove any burrs or unevenness from the cut ends and rub down sharp edges.



For connections to Wavin AS+ fittings or sockets the pipe end needs to be chamfered. It is recommended to chamfer over a length of 5mm under a 15 degrees angle. This can be done by using standard chamfer tooling.

Fixing

In principle, Wavin AS+ soil and waste water pipe systems should be installed tension-free and able to withstand changes in length. The pipes should be secured with sound-absorbing brackets that are compatible with the external diameter of the pipes and completely surround the circumference of the pipes. We recommend the use of Wavin low noise brackets, designed for securing to the brickwork with screws and plastic wall plugs. Metal anchors may also be used, although these do not favour sound insulation.



Wavin AS+

5. Installation and jointing

Installation in brickwork

DIN 1053, Sheet 1, Section 3.5 specifies that recesses and channels may be made in brickwork, provided they do not affect the stability or load-bearing capacity of the structure. In areas subject to high outside temperatures, thermal insulation measures must be applied (e.g. lagging of heating pipes). The key pipe dimensions to be taken into account when installing Wavin AS+ in brickwork recesses can be found in chapter 4 of this manual.

| DN | Pipe d_a mm | Coupling d_M mm | Recess depth* t_{erf} mm |
|-----|---------------|-------------------|----------------------------|
| 50 | 50 | 67 | 125 |
| 100 | 110 | 129 | 179 |

*These specified recess depths do not include pipe crossings.

Installation in concrete

Like all hollow items, pipes are subject to buoyancy load forces when installed in concrete. All materials used in the pipe structure must be able to withstand these buoyancy loads. To this end, we recommend filling the pipe with water before fitting suitable fixing clamps to the existing steel reinforcement. Wavin Soil & Waste pipe systems (pipes and fittings) can be set in concrete immediately after installation. There is no need to account for any thermal length-expansion of the pipes once they have been installed in keeping with the installation instructions. The pipe sections should be secured properly so as to prevent any change in length, particularly during the pouring of concrete.

To prevent liquid concrete from seeping into the joints, seal the sleeves with adhesive tape (e.g. Tesa Krepp). Exposed pipe ends should also be sealed off. Pour the concrete into the area around the pipe and allow it to flow into the working space. When using a concrete vibrator to compact the concrete, be sure not to come into direct contact with the pipe. If noise-insulating measures are required, insulate the pipe with suitable lagging material before starting work.

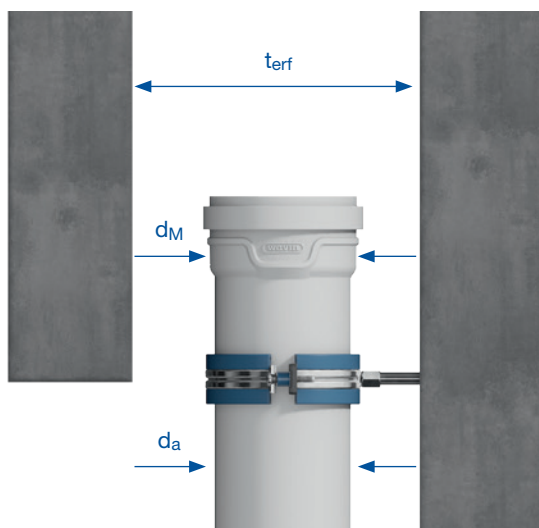


Figure 18: Example.

Floor crossings

Floor crossings should be made leak-resistant and sound-absorbent. If mastic asphalt is used to cover the floor, the pipe sections located near the floor crossings must be protected using a protection sleeve or heat insulating wrapping material.

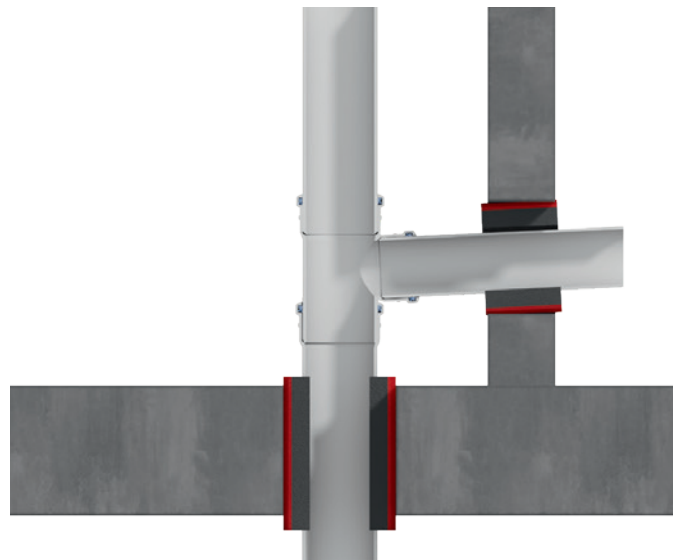


Figure 19: Floor and wall crossings.

Roof drainage pipes in living areas

Roof drainage pipes projected through living areas can be installed as shown in the example opposite. The specific area weight of the casting should be at least equal to the wall.

The use of condensation insulation is also recommended for Wavin AS+. The installation of rainwater pipes is also affected by the issue of condensation. Under certain operating conditions relating to room temperature, relative humidity in the room concerned and the temperature of the rainwater, the dew point of internal rainwater pipes may drop to below that specified.

Tensile resistant connection

Gravity drainage systems (for rain or waste water) can be subject to both planned and unplanned pressure surges. If Wavin AS+ or Wavin SiTech+ is used as a pressure line for a pump station, for example, the resulting pressure surges are planned. If an overloaded rainwater pipe is subject to hydrostatic pressure, however, this counts as an unplanned pressure surge.

For both types of pressure surge, the joints at changes of flow direction need to be secured to prevent them from detaching. The Wavin LKS clamp guarantees this for internal pressures of up to 2 bar.

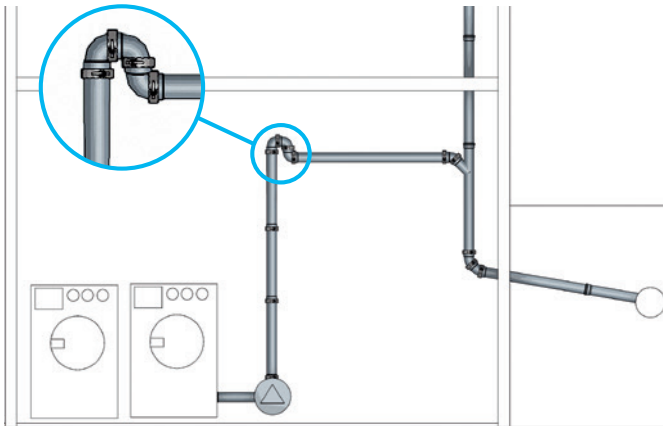


Figure 20: Tensile resistant connection.

Pressure surges may occur in any part of systems located downstream of pumps and pump stations. All fittings should therefore be secured using LKS clamps. Ensure that the fixings used are able to withstand such pressure surges. The system must be able to transfer dynamic loads to the supporting structure.

In the case of rainwater drainage systems, fittings located at changes of direction are critical. These fittings must therefore be equipped with LKS clamps. Vertical pipes (downpipes) do not require separate LKS clamps. Provided that the fixing specifications provided by us in this manual are observed, the joints on these sections will be suitably secured by the LKS clamp fitted where the change of direction occurs.

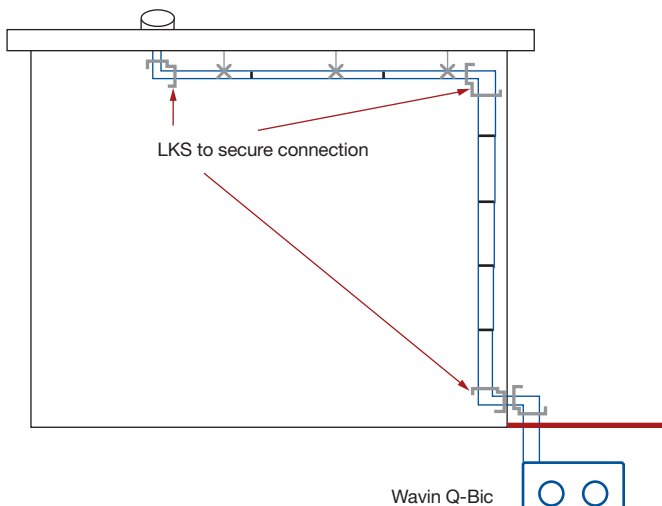


Figure 21

Wavin LKS clamps are available for use with Wavin AS+ sound-insulating pipe systems in sizes DN 50 to DN150.

For details of the required collar sizes and corresponding article numbers, please refer to page 56 of our AS+ range.



Figure 22: Wavin LKS Clamp.

Soundproofing

If interior spaces are subject to the technical provisions of DIN 4109 (sound insulation in buildings), with pipe-borne noise not exceeding 30 dB(A), all work must conform to the technical building regulations applying to in-building systems with respect to the configuration of pipes in the context of the corresponding floor plan. Waste water pipes that run through living areas must not be exposed. If they are to run adjacent to such living areas, they may only be installed inside walls with a minimum specific area weight of 220 kg/m² (See DIN 4109-5).

The same conditions apply when installing in brickwork recesses conforming to DIN 1053, with pipes running along the other side of an adjacent wall subject to protection measures, where minimum wall dimensions of 220 kg/m² apply in the area of the recess. Shafts or recesses in brickwork must then be fitted with a supporting structure (matting or metallic mesh) that allows them to be plastered over to a minimum depth 1.5cm. There must be no sound bridges between the pipe and plaster covering. Preventive measures in this respect include pipe lagging of material classes A1, A2, B1, B2 (e.g. glass fibre, mineral wool or plastic).

As the routing of the pipe has a considerable influence on both the generation and reduction of noise, measures should be taken to minimise its impact. Falling waste water should therefore be directed downwards in stages where possible, i.e. not abruptly, as this would be technically unfavourable. In the case of buildings with more than three storeys (> 10 m), a noise-damping length of 250mm is fitted between the downpipe and the horizontal pipe. This can take the form of two 45° bends and a corresponding length of pipe (see Fig. 24).

Wavin AS+

5. Installation and jointing

Alternatively, the use of one extended 45° bend and one normal 45° bend is recommended. The waste water pipes should likewise be dimensioned and installed in such a way that allows air to circulate freely around the water being drained.

Pipe clamps designed to comply with noise-prevention requirements must be fitted with a suitable rubber insert. In the case of bricked-up pipes, note that these must be secured to the underlying structure and not to the new brickwork. Wall and ceiling penetrations must be flexible.

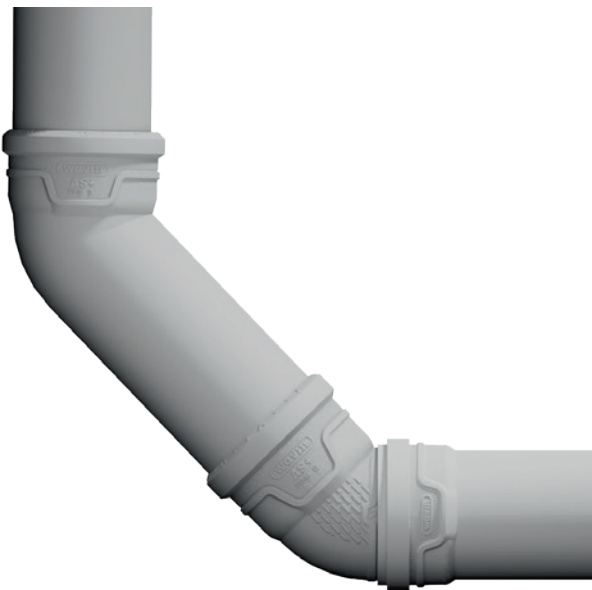


Figure 23: Extended 45° bend.

Installation of pipes in existing structures

If a pipe is to be connected to an existing system, Wavin AS+ fitting should be used.

Repair coupler: Observe the following procedure when using Wavin AS+ repair coupler:

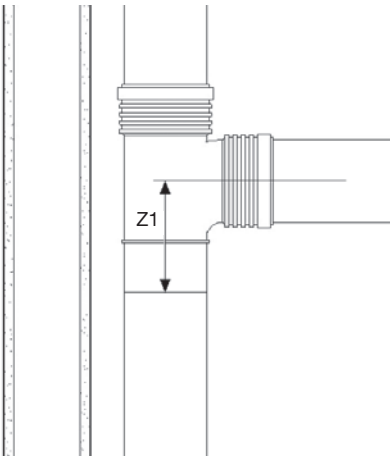


Figure 24: Example.

Repairs using repair couplers

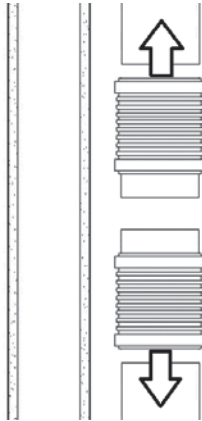
If a pipe section needs to be replaced or a branch needs to be added to the pipe system, please follow the following procedure.

1. Cut out the part which needs to be replaced. When inserting a branch at a later stage, please secure that the level of the branch is located at the right height. The Z1 value is mentioned for each branch in the product overview.

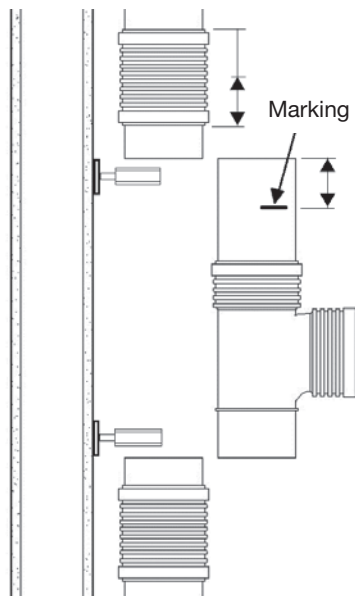


2. Install a short piece of temporary pipe halfway onto the repair coupler to secure a correct positioning of the rubber seal.

3. Install the free half of the coupler onto the existing pipe and slide the repair coupler completely over the existing pipe.

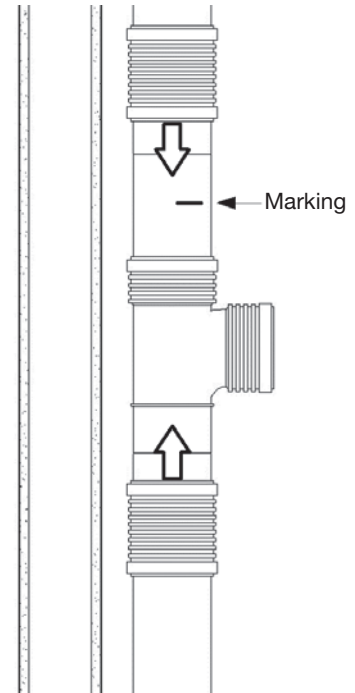


4. Secure that the pipe (or pipe and branch) has the same length as the part which has been cut out.
5. Measure half of the repair coupler length. Measure the same length from the new pipe ends and mark the pipe.



6. Install as close as possible to the two pipe ends wall plates for the fixed-point brackets and mount the threaded rod and back part of the brackets. When fixating the repair couplers with tensile resistant clamps this step can be skipped.

7. Install a tensile resistant clamp on each repair coupler to ensure no movement.

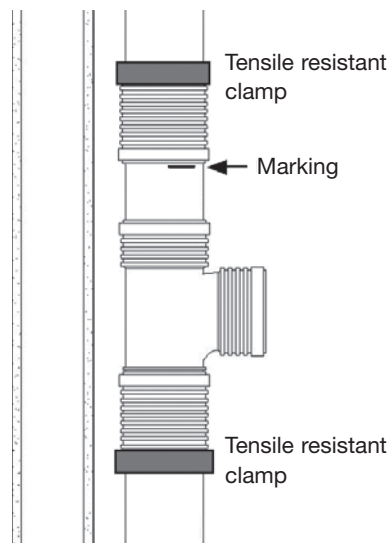
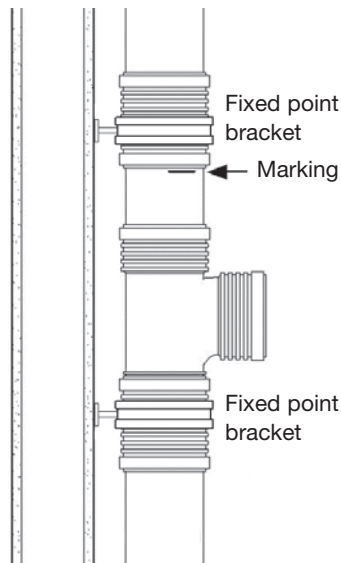


Wavin AS+

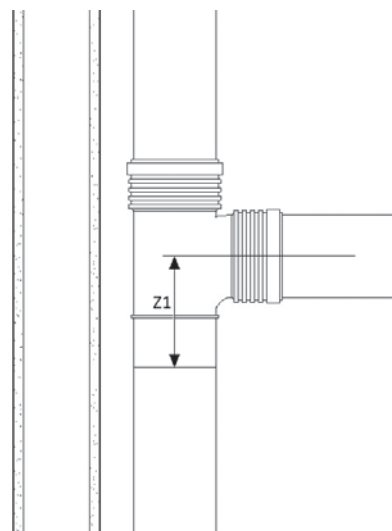
5. Installation and jointing

Repairs using a long socket and repair coupler

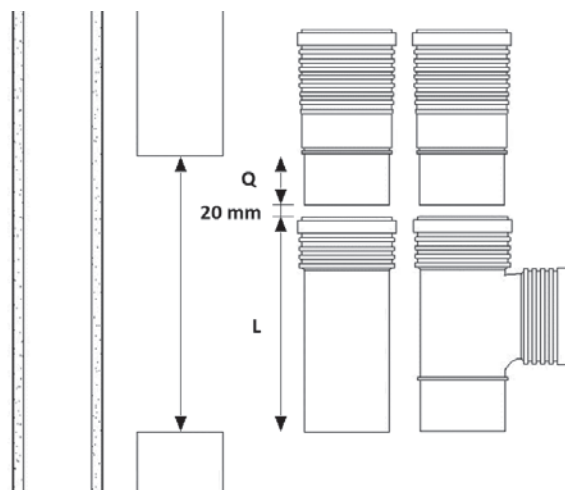
8. Finalise the installation of the fixed-point brackets or install a tensile resistant clamp on each repair coupler to ensure no movement.



1. When inserting a branch at a later stage, please secure that the level of the branch is located at the right height. The Z1 value is mentioned for each branch in the product overview.

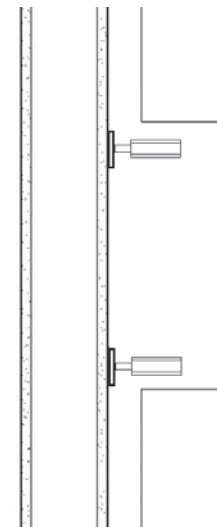


2. When inserting a branch, the length of the part to be cut out should have the length of the branch (L) + 20 mm + the length of the spigot of the long socket (Q).

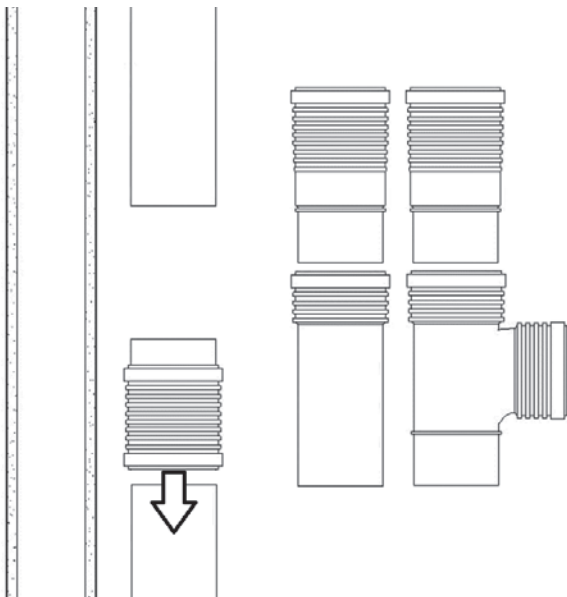


When replacing a piece of pipe, secure that the total length of the new socketed pipe (L) equals the length of the part cut out minus the length of the spigot of the branch (Q) minus 20 mm.

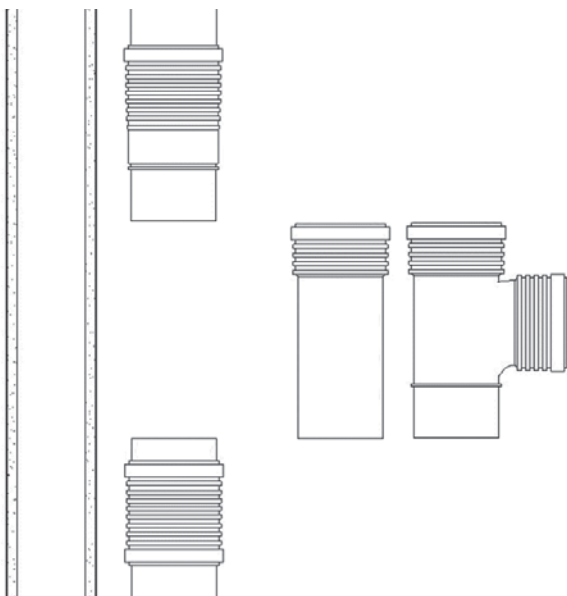
3. Install close to the two pipe ends wall plates for the fixed-point brackets and mount the threaded rod and back part of the brackets. When fixating the repair couplers with tensile resistant clamps this step can be skipped.



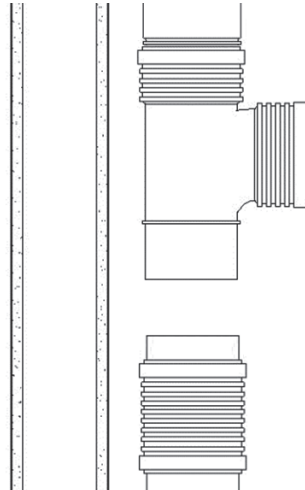
4. Install a short piece of temporary pipe halfway onto the repair coupler to secure a correct positioning of the rubber seal.
5. Install the free half of the coupler onto the existing pipe and slide the repair coupler completely over the existing pipe.



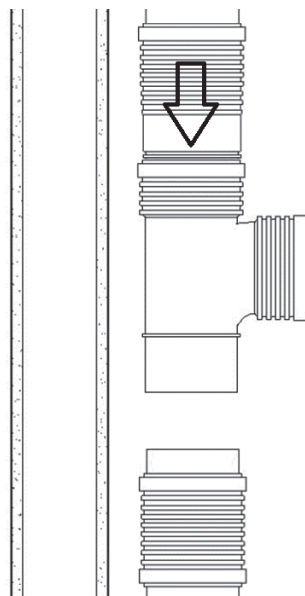
6. Slide the long socket over the other pipe end.



7. Push the socketed of the branch or pipe on to the long socket.



8. Push the long socket with the branch or pipe till the two pipe ends meet.
9. Finalise the installation of the fixed-point brackets or install a tensile resistant clamp on the long socket to ensure no movement.
10. If a pipe is inserted, measure half of the repair coupler length. Measure the same length from the new pipe end and mark the pipe.

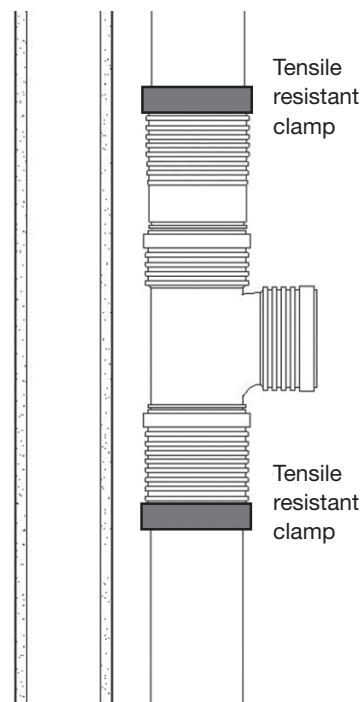
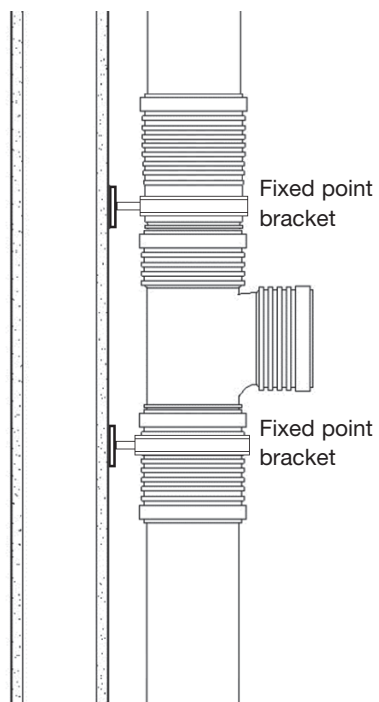
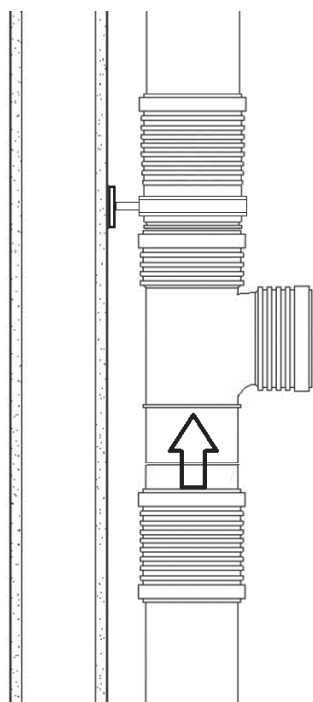


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11. Slide the repair coupler over the spigot end of the branch or to the marking on the pipe.

12. Finalise the installation of the fixed-point bracket or install a tensile resistant clamp on the repair socket to ensure no movement.



Parallel branch

Fixed to the finished floor, in wall-mounted configuration

When fitting to the finished floor in wall-mounted configuration, we recommend the use of a parallel branch matched to the connection dimensions of the wall-mounted item (WC element).

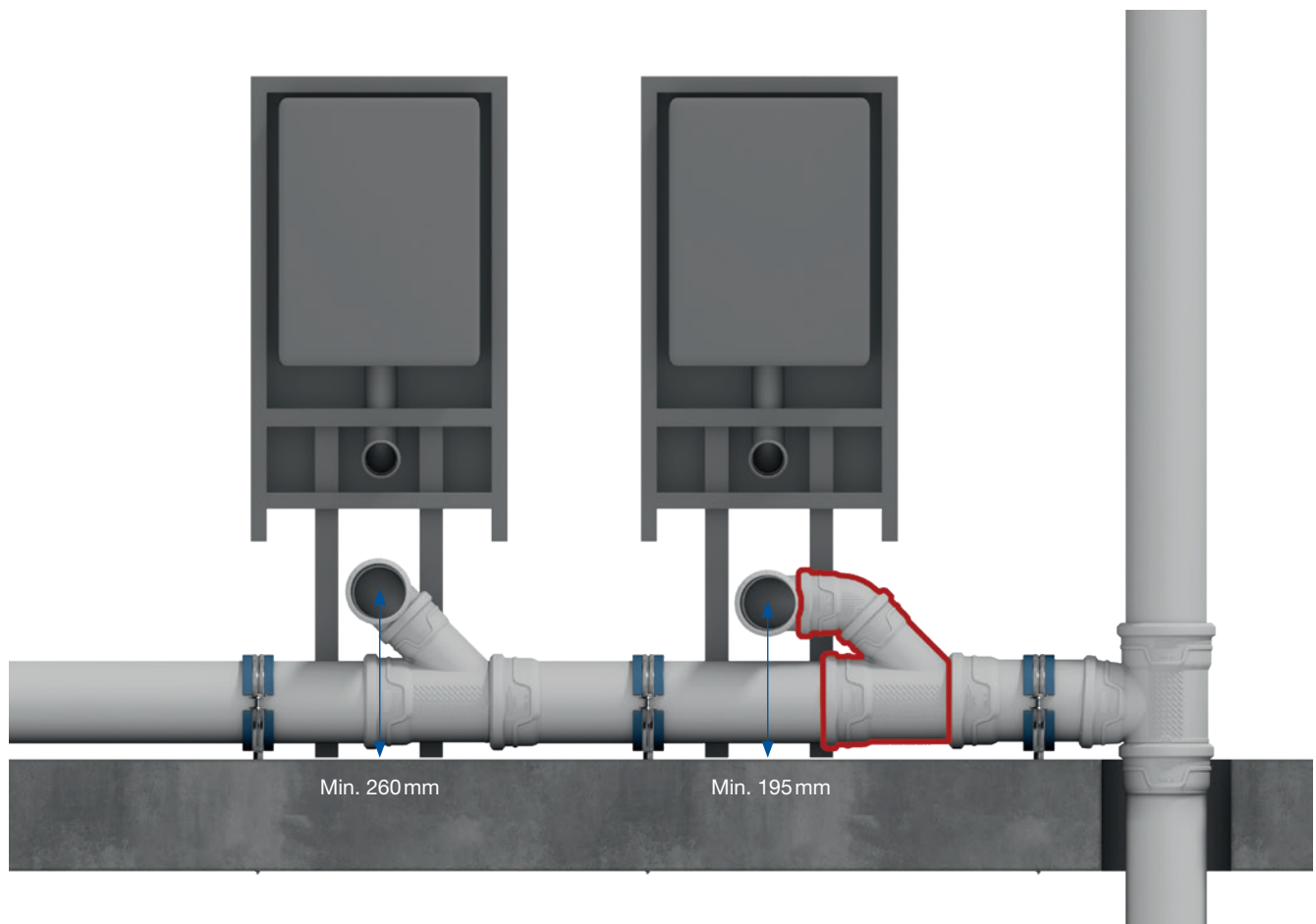


Figure. 25: Example of installation with or without parallel branch.

Wavin AS+

5. Installation and jointing

5.2. General bracketing rules

5.2.1. Bracket Fixing Instructions

Fixed Bracket

The fixed bracket creates a fixed point in the pipe system. The pipe or fitting cannot be moved through the bracket after the screws are tightened (no longitudinal movement is possible).

Use sound absorbing brackets, dimensionally compatible to the pipe diameter. Screw-pipe brackets with rubber inserts are recommended, which are fixed to the wall by screws and plastic plugs.

Sliding Bracket

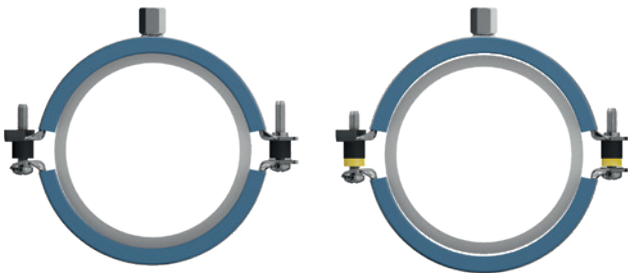
By using sliding brackets, the pipe can still expand and contract due to temperature changes after the screws are tightened. This make sure longitudinal movement is still possible once installed.

Changing from sliding to fixed

Wavin low noise brackets are usable as sliding and as fixed bracket. All brackets provided by Wavin are sliding as standard.

To change the bracket from sliding to fixed, a distance washer is removed from the bracket before installation. The sliding and fixed brackets can both be completely tightened until the bracket ears touch the distance washers. The distance washers make sure that in any situation, the clamping force on the pipe is perfect. This results in minimal structure borne sound transmission.

The distance washers also prevent over-tightening of the brackets, which could otherwise result in a reduction of sound performance.



Fixed bracket *removed distance washer

Sliding bracket *distance washer in place



Changing from sliding to fixed: Remove the distance washer.



Removeable distance washer.

5.2.2. Bracket Arrangement

During installation of Wavin AS+ pipes, the following should be considered:

Vertical pipes:

- ⦿ To prevent the vertical stack sliding down, each pipe section between floors must be secured by one fixed bracket at the spigot-end
- ⦿ All remaining pipe brackets at subject pipe must be sliding brackets
- ⦿ Table 7 prescribing the maximum distance between brackets is to be respected

Horizontal pipes:

- ⦿ Every horizontally installed pipe length ≥ 2 meters should always be fixed with one fixed bracket at the spigot-end
- ⦿ All remaining pipe brackets at one pipe must be sliding brackets
- ⦿ Table 7 prescribing the maximum distance between brackets is to be respected

Notes:

- ⦿ For all changes of direction - e.g. a bend at the bottom of a down pipe - 1 bracket directly before and after the change of direction
- ⦿ In case multiple fittings are assembled, additional bracket(s) before/after this assembly might be required to ensure:
 - A downward slope in flow direction is in place (in case of horizontal pipes)
 - The centre of the assembly cannot be excessively displaced (in case of vertical pipes)
- ⦿ Ensure the materials are installed tension-free by properly aligning the brackets
- ⦿ To achieve a high level of sound proofing, generally pipe brackets should not be installed in impact areas (e.g. diameter reductions and changes of directions in the system)
- ⦿ Pipe brackets to be fixed to building materials with high specific area weight
- ⦿ In multiple storey buildings (from 3 storeys and more) the stack pipes of 110mm must be secured by additional fixing (stack pipe support) to prevent sliding. In this case we advise using the Wavin AS+ socketed short length with a fixed bracket (see figure 26)

Table 7: Pipe bracket spacing.

| Nominal outer diameter DN/OD | Max distance between brackets | |
|------------------------------|-------------------------------|---------------|
| | Horizontal (mm) | Vertical (mm) |
| 50 | 750 | 1250 |
| 110 | 1500 | 2000 |
| 160 | 2000 | 2000 |

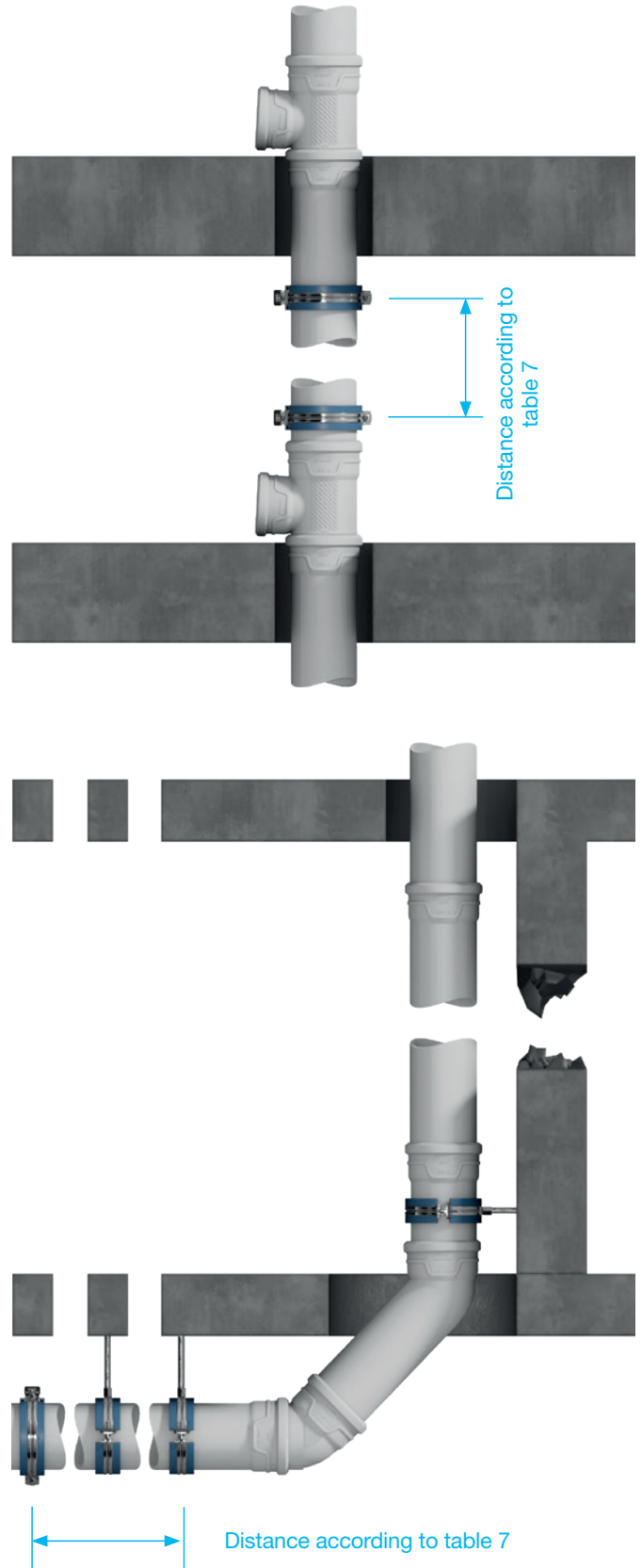


Figure. 26: Example horizontal and vertical installation.

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5. Installation and jointing

5.2.3. Max length of threaded rod

In the development of Wavin AS+ the product has fulfilled all testing procedures to ensure high quality. Wavin AS+ pipes and fittings comply to system tests as specified in EN1451-1. Wavin AS+ is approved via Type Testing (internal) as well as independently tested by accredited testing facilities.

Wavin AS+ pipes and fittings are continually subject to strict quality controls according to DiBt in Berlin. System requirements for leak tightness are prescribed in standards. Wavin AS+ is meeting leak-tightness requirements as set in the following standards:

- ④ EN ISO 1451-1 : leak-tight for 15 minutes with angular deflection of 2° at 0.5 bar
- ④ EN ISO 13257 : leak-tight for 15 minutes at 0.5 bar when filled after Temperature Cycle Test (1.500 cycles)

These requirements do not take into account fixation to a wall or ceiling. A proper installation is key to leak-tightness.

A poor installation cannot be compensated by a perfect system. Threaded rods are commonly used for suspension and fixing pipe brackets. It is important to keep in mind that threaded rods are designed to be used in tension and not to withstand bending moments.

For this reason, threaded rods to be used in AS+ installations have predefined maximum lengths. If the strength class is unknown, the maximum length can be retrieved from Table 8a and 8b. These tables were created, based on strength class 4.6.

Regarding internal pressure it is important to know what the impact can be in case maximum lengths are exceeded. In case the system gets clogged or otherwise is filled with water, an internal pressure builds up, the resulting forces cause the rods to bend and the joints might be pushed apart till leakage occurs.

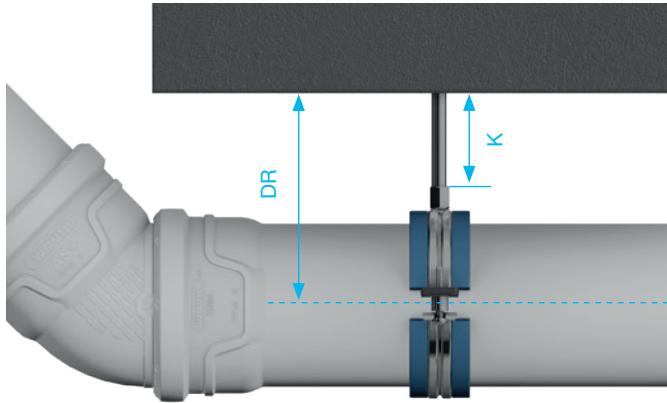
The maximum pressure that can occur when the system gets clogged is determined by the vertical distance between the horizontal line and the lowest sanitary application to which this horizontal line is connected. In most cases, this distance is ≤ 1 metre.

Therefore, the maximum lengths of the threaded rods in Tables 8a and 8b are such that they can withstand bending moments due to 0.1 bar internal pressure.

In the following cases, a heavier fixation needs to be applied – especially at changes of direction where resulting forces cause threaded rods to bend – to ensure the system remains leak-tight.

- ④ The distance between bracket and wall / ceiling exceeds the maximum lengths as given in the table
- ④ The maximum pressure in the system can exceed 0.1 bar in case of clogging
- ④ There is a wish to hydrotest the installed system at a pressure > 0.1 bar

In these cases it is advised to follow the method of statement for soil & waste pressure testing procedure or consult Wavin or bracket supplier.



Horizontal

Maximum (DR) distance to the ceiling and maximum length (K) of threaded rod or threaded pipe

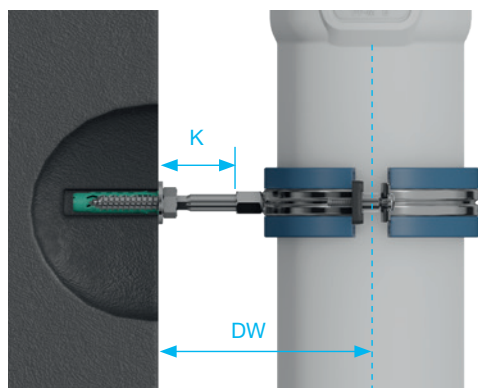
Table 8a: Fixing distance to the wall – Horizontal.

| | M8 | | M10 | | M12 | | 1/2" | | 1" | |
|----------|-----|----|-----|-----|-----|-----|------|------|------|------|
| | DR | K | DR | K | DR | K | DR | K | DR | K |
| DN/OD50 | 120 | 85 | 195 | 160 | 315 | 280 | 1535 | 1500 | 1535 | 1500 |
| DN/OD110 | 105 | 40 | 145 | 80 | 205 | 140 | 915 | 850 | 1565 | 1500 |
| DN/OD160 | | | 135 | 45 | 175 | 85 | 590 | 500 | 1590 | 1500 |

Note: for M12 threaded rods, 1/2" and 1" threaded pipes, adapter pieces are needed to connect to brackets.

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Vertical

Maximum (DW) distance to the wall and maximum length (K) of threaded rod or threaded pipe

Table 8b: Fixing distance to the wall - Vertical.

| | M8 | | M10 | | M12 | | 1/2" | | 1" | |
|----------|----|----|-----|-----|-----|-----|------|------|------|------|
| | DW | K | DW | K | DW | K | DW | K | DW | K |
| DN/OD50 | 95 | 60 | 155 | 120 | 245 | 210 | 1285 | 1250 | 1535 | 1500 |
| DN/OD110 | | | 115 | 50 | 150 | 85 | 565 | 500 | 1565 | 1500 |
| DN/OD160 | | | 120 | 30 | 140 | 50 | 390 | 300 | 1090 | 1000 |

Note: for M12 threaded rods, 1/2" and 1" threaded pipes, adapter pieces are needed to connect to brackets.

5.2.4. Extended wall distance

If the distance from the wall to the pipe is bigger than you can solve with a single threaded rod according to the Table 8a and 8b with the general fixing distances, or in case the internal pressure might exceed 0,1 bar then there are multiple options to increase the distance.

It is important to know what the impact can be in case maximum lengths are exceeded. In case the system gets clogged, an internal pressure builds up, the resulting forces cause the rods to bend and the joints might be pushed apart till leakage occurs. In these cases the following options could be considered:

1. An option could be to consider suspended bracketing for socket support. Bracket assemblies are available for suspended sanitary and drainage installations in a building.
2. Another option is to use a 'wall bracket' to extend the distance between wall and pipe.
3. A third option could be to mount the pipe brackets to a mounting rail, that is installed parallel to the complete installation of the pipe.
4. A fourth option could be securing the connection via a LKS clamp. The joints at changes of flow direction need to be secured to prevent them from detaching. The Wavin LKS clamp guarantees this for internal pressures of up to 2 bar.

5.3. Low noise installation – bracketing types

Low noise installation is all about minimizing the transfer of sound (vibration) to connecting rooms. Two types of sound can be distinguished; airborne and structure borne sound. Airborne sound is reduced by the mass of the AS+ pipe, and structure borne sound is reduced by low noise bracketing. For more information about noise reduction, please refer to chapter acoustics.

Wavin offers two types of installation using the Wavin low noise bracket. The single bracket installation offering sound performance as low as 14dB(A), and the No-noise installation offering sound performance lower than 10dB(A).

5.3.1. Low noise bracketing – single bracket – 14 dB(A)

The low noise installation makes use of a single “Wavin low noise bracket” that can be used as a sliding and a fixed bracket. The pipe bracket can be changed from sliding to fixed, by removing the distance washer. See 5.2.1. “Changing from sliding to fixed”.

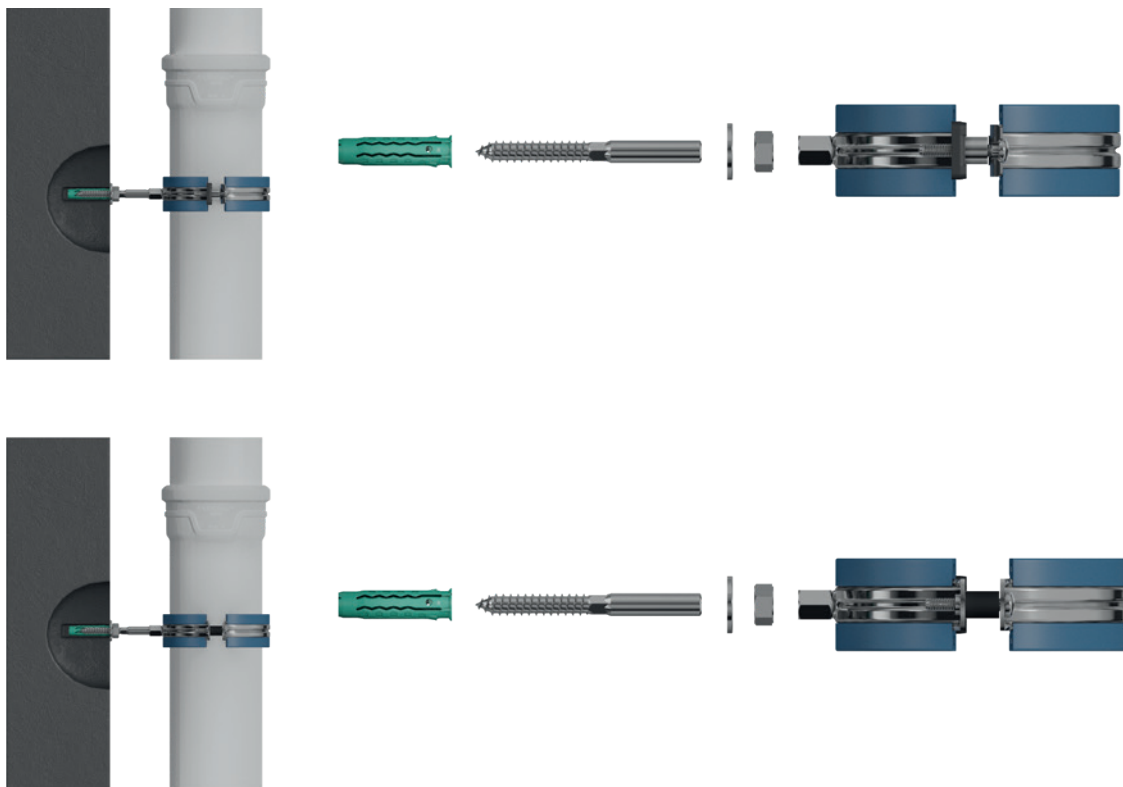
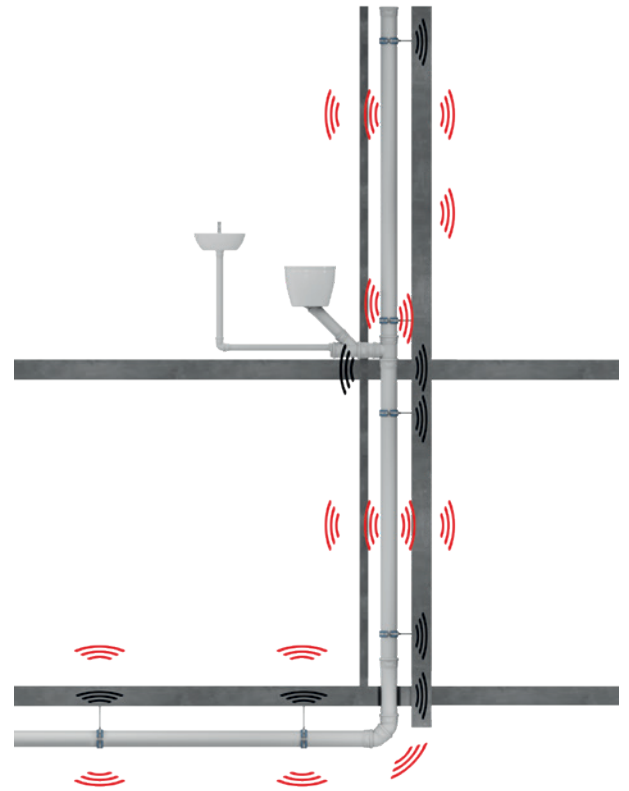


Figure 27: Low noise bracketing – 14dB(A).

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5.3.2 No-noise bracketing – Double bracket – lower than 10 dB(A)

The no-noise type installation makes use of the same “Wavin low noise bracket”, only difference in this installation is the stacked installation of the fixed bracket. The sliding bracket is the same as in the Low noise installation (see paragraph 5.3.1.). Each Wavin low noise bracket contains a rubber inlay that has foam sidewalls. The stacked installation offers further acoustic decoupling, for increased noise performance. The stacked installation consists of a sliding bracket that is mounted to the wall (not exceeding the threaded rod distances in table 8) and a fixed bracket that is mounted to the pipe. In final installed form, the fixed bracket is carried by the sliding bracket.

In the no-noise installation, the distance washers make sure that in any situation, the clamping force on the pipe is perfect. This results in minimal structure borne sound transmission. The distance washers also prevent over-tightening of the brackets, which could otherwise result in a reduction of sound performance.

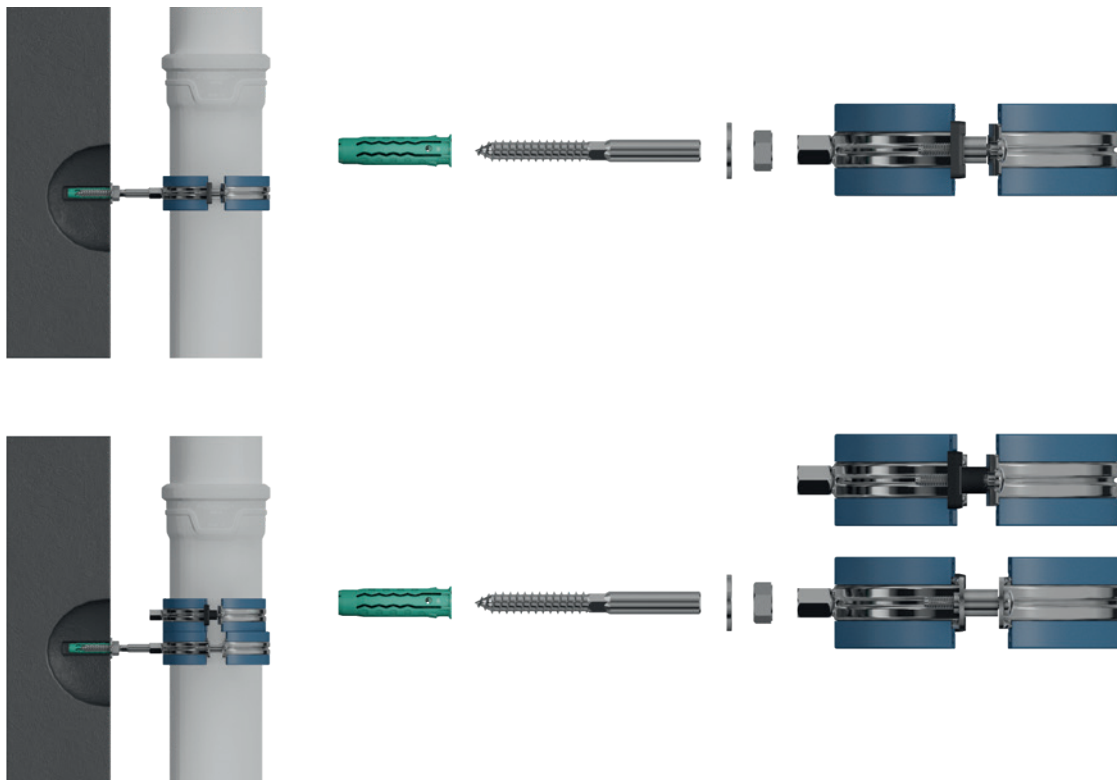


Figure 28: No-noise bracketing – lower than 10dB(A).

6. Fire protection

6.1 Fire behaviour classification

Fire behaviour of construction materials, e.g. piping systems and isolation materials, have been defined in fire classification classes as per DIN 4102-1. Construction materials are classified as combustible and non-combustible materials. According to DIN 4102-1 and EN 13501-1, PP, and thus Wavin AS+, is listed as B2 (normally flammable) or according European standard D S₃ do.

Table 9: Fire behaviour classification according to DIN 4102-1 and DIN EN 13501-1.

| Criteria | Old Classification as per DIN 4102-1 | New European classification according to DIN EN 13501-1 | | |
|--|--------------------------------------|---|----------|-------|
| | | Additional criteria | | |
| Non-combustible | A1 | A1 | – | – |
| | A2 | A2 | s1 | d0 |
| Non-readily ignitable (low flame spread) | B1 | B | s1 | d0 |
| | | C | s1 | d0 |
| | | A2 | s2/s3 | d0 |
| | | B | s2/s3 | d0 |
| | | C | s2/s3 | d0 |
| | | A2 | s1 | d1/d2 |
| | | B | s1 | d1/d1 |
| | | C | s1 | d1/d2 |
| | | A2 | s3 | d2 |
| | | B | s3 | d2 |
| Normally ignitable (normal fire behaviour) | B2 | D | s1/s2/s3 | d0 |
| | | E | – | d0 |
| | | D | s1/s2/s3 | d2 |
| | | E | – | d2 |
| Readily ignitable | B3 | F | – | – |

In line with European standardization, the fire classification classes as per DIN 4102-1 are translated into the European DIN EN 13501. The accreditation is based on the standardised Single-burning-Item-Test (SBI) in conformity with BS EN 13823.

6.2 Fire resistance classification

The fire resistance classification provides the fire resistance duration of a specific construction material.

Table 10: Fire resistance classification.

| Fire resistance classification | Fire resistance duration in minutes |
|--------------------------------|-------------------------------------|
| F30 | ≥ 30 = fire retardant |
| F60 | ≥ 60 = high fire retardant |
| F90 | ≥ 90 = fire resistant |
| F120 | ≥ 120 = high fire resistant |
| F180 | ≥ 180 = extreme fire resistant |

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Possible additions to these fire resistance classes, e.g. z.B. F90 A or F90 AB, can be explained as follows:

- A made of non-combustible materials
- B made of combustible materials
- AB in principle made of non-combustible materials

6.3 Wavin fire protection concept

Wavin Fire Protection Collar is in practice the best available solution. The Wavin Fire Protection Collar BM-R90 fully seal the wall or ceiling corridor in case of fire, due to special fire protection material which strongly expands by increased temperature.

The BM-R90 Fire Protection Collar (for Wavin AS+) is especially for sloped piping, suitable up to 45 degrees, and applicable for passages by sleeved pipes or fittings. In practice the collar is suitable to seal off almost any possible configuration.

Fire Protection Collar BM-R90

- ⦿ For wall and ceiling crossings
- ⦿ Suitable for pipes with or without sockets and fittings
- ⦿ Also suitable for angled passages (up to 45 degrees)
- ⦿ Approved for ceiling installation
- ⦿ Applicable for Wavin AS+ from DN50 – 160
- ⦿ Fire classification F90

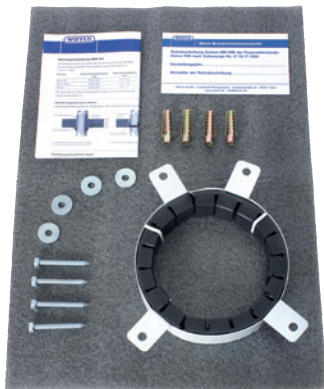


Figure 29: Fire Protection Collar BM-R90.

6.4 Assembly instructions

When the system is applied to a fire-resistant vertical (wall) or horizontal installation (floor) which separated a fire-risk area, only one Fire Protection collar is required. If the system is applied to a fire resistant vertical (wall) or horizontal (floor) installation which separated two fire-risk areas, use a Fire Protection collar on both sides.

Hole

Drill a circular hole into the wall or floor with a diameter of 2mm greater than the external diameter of the plastic pipe to be used.

Installing the pipe

Insert the PVC, PP, PE etc. pipe in the hole and clean the part the collar is to be applied to.

Closing and sealing against fumes and gas

If there are any gaps between the pipe and the wall, seal these using putty or intumescent strips according to the thickness, to prevent the passage of fumes in the event of a fire.

Cleaning the pipe

The expansion of the intumescent material in the collar completely closes the plastic pipes by a mechanical action. If the pipes are very dirty or have mortar residues, this may delay the action. Clean the surface of the plastic pipe in the point of installation of the fire protection collars.

NB: the fire protection collar can only prevent the passage of fire if it is properly installed

Precautions

In the case of contact of the intumescent material with the eyes, wash delicately with soap and water. Keep out of the reach of children.

Installation manual Wavin fire protection collar BM-R90

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 200mm 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

BM-R90 installation instruction

The BM-R90 fire collar provides fire resistant sealing for wall and ceiling installation of the Wavin AS acoustic insulation systems and other selected Wavin soil and waste systems.

General recommendations

1. Positioning of the collars:

On both sides of a wall; on one side under/in a ceiling

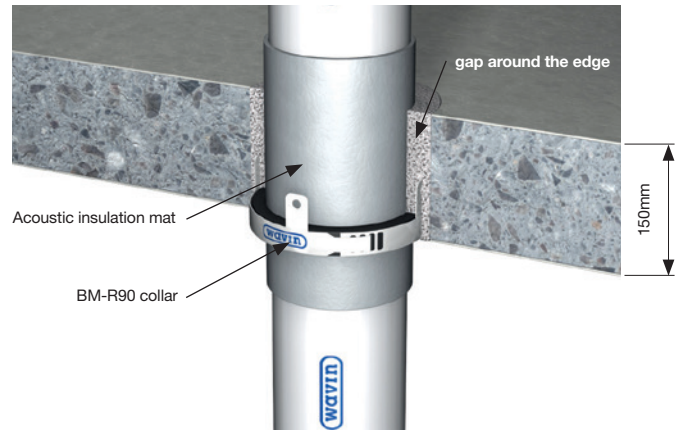


Figure 30: Straight installation with / without sleeve / socket.

2. Wall & ceiling types:

At least 10cm thick solid concrete, aerated concrete and sand-lime brick walls as well as light dividing walls (stud walls: both sides clad with 12.5mm plasterboard) and solid concrete and aerated concrete ceilings at least 15cm 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 31: BM-R90 fire collar.

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6. Fire protection

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:

- ④ Insulation mat
- ④ Fixing kit
- ④ Identification label

Table 11: BM-R90 selection table for various types of Wavin AS+ pipe installation.

| Wavin AS+ pipes DN | d (mm) | s (mm) | Straight installation | Straight installation with collar | Angled installation ¹⁾ with sleeve or socket ≤ 45° (mm) |
|--------------------|--------|--------|-----------------------|-----------------------------------|--|
| 56 | 50 | 3.0 | 63 | 75 | 90 |
| 100 | 110 | 5.3 | 110 | 125 | 140 |
| 150 | 160 | 5.6 | 160 | 180 | 200 |

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

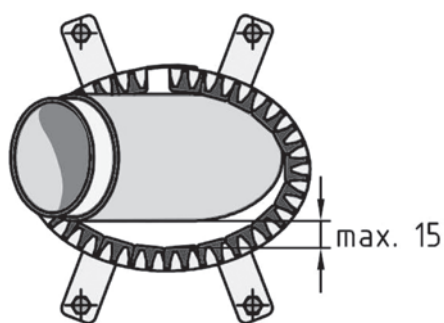


Figure 32: Maximum allowable gap between pipe and fire protection collar.

Types of installation

I. Ceiling installation

Minimum requirements of the ceiling: min. 150mm 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)).

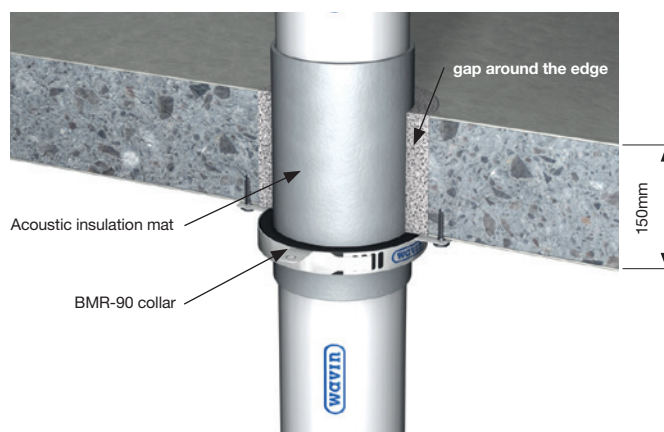


Figure 33: Straight installation without sleeve / socket up to 160mm.

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.

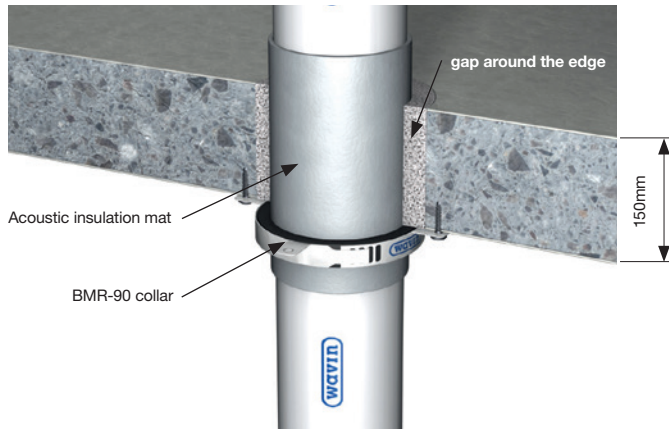


Figure 34: Straight installation with / without sleeve / socket.

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).

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 e.g. to external systems

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

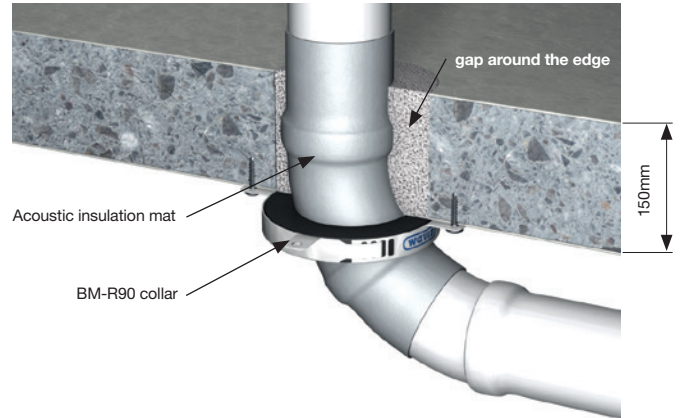


Figure 35: Angled ceiling installation $\leq 45^\circ$ with / without sleeve socket.

If two Wavin BM-R90 feedthroughs are installed next to each other, the distance between the pipes must be at least 100mm 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 0mm).

III. Wall installation

Minimum wall specifications: wall must be at least 100mm thick, made from concrete, aerated concrete, lime sandstone or lightweight partition walls (two-layer panelling on both sides with 12.5mm 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.

Wavin AS+

6. Fire protection

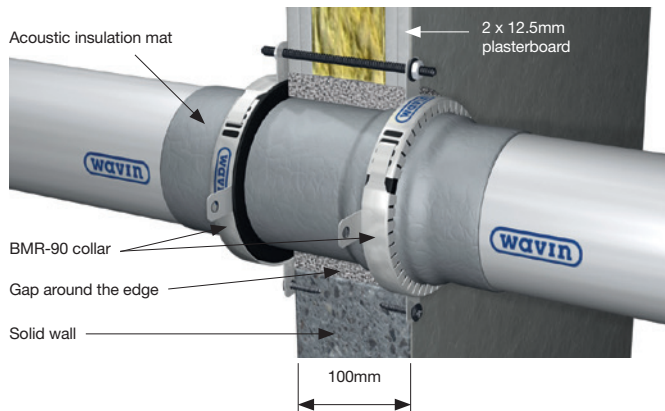


Figure 36: Straight installation with sleeve / socket.

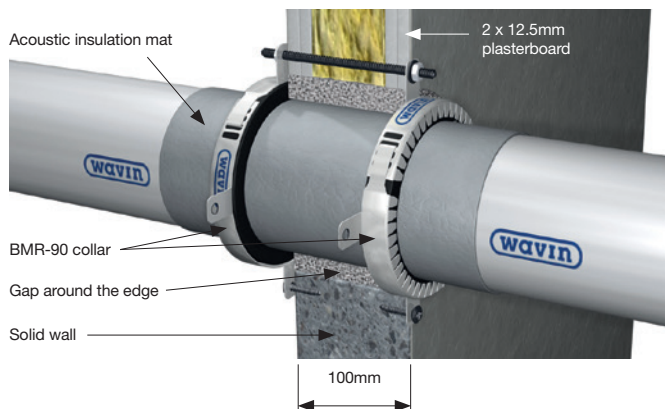


Figure 37: Straight installation without sleeve / socket.

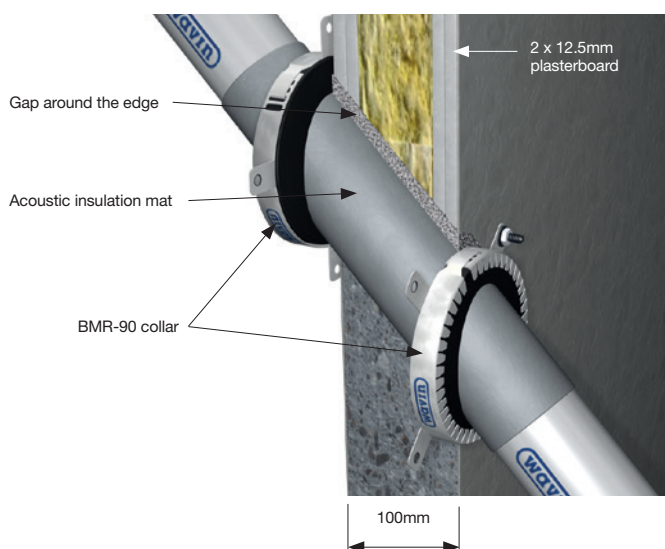


Figure 38: 45° angled installation with / without sleeve / socket.

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

If two Wavin BM-R90 feedthroughs are installed next to each other, the distance between the pipes must be at least 100mm 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 0mm).

Note

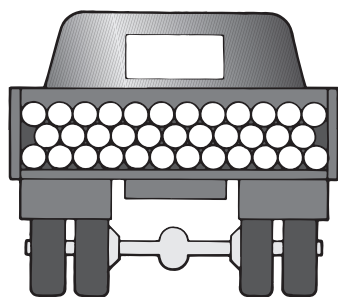
The presented data, especially recommendations for the processing and use of our products are based on our knowledge and experience. Due to differences in material and working conditions that are outside the scope of our influence, we recommend that sufficient internal trials be conducted in each case 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.

Wavin AS+

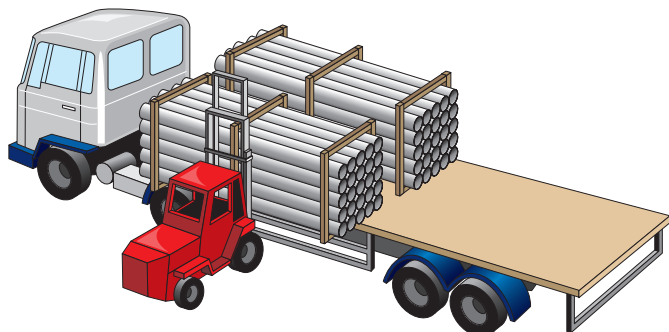
7. Packing, transport and storage

Handling

Handle pipes and fittings with care. Excessive scratching or impact damage on pipes can affect the external structure or impair its sealing performance. Loose pipes must be unloaded by hand. If pipes have been inserted into other pipes, always remove the inner pipe first. We recommend the use of nyloncovered or plastic forks when unloading bundles of pipes with a forklift truck. Do not allow metal forks, hooks or chains to come into contact with the pipes. Do not use extended forks. If you intend to load or unload with a crane or excavator arm, attach a sling of sufficient width at the centre of the pipes.



Transport of loose Wavin pipes.



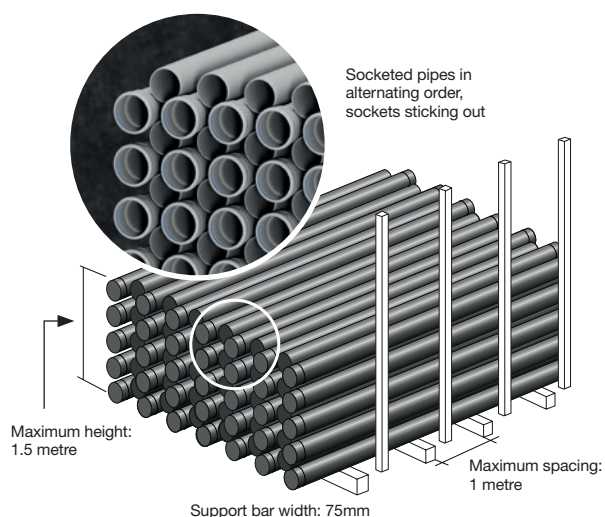
Unloading strapped pallets.

Transport

If Wavin AS+ pipes are no longer in their original packing, they must be fully supported along their entire length and placed on a clean surface for transport. Avoid any bending of the pipes. Protect the pipe ends and fittings from impact damage.

Storage

Always store pipes on a flat surface. Pallets may be stacked up to a maximum height of 1.5m without additional supports or side protection. Loose pipes must be held in place by at least 2 side supports spread evenly across their length. When storing, loose pipes may be stacked up to a maximum height of 1.5m, preferably supported along their entire length. If this is not possible, place wooden supports with a minimum width of 75mm under the pipes and spaced no more than 1m apart.



Stack pipes of different sizes separately or, if this is not possible, stack them in such a way that the largest diameter pipes are at the bottom. Pipes with sleeves should be stacked alternately so that they are supported along their entire length (see picture). Fittings are supplied in boxes and must be stored indoors. Do not subject fittings to heavy loads, as this can deform them.

Wavin AS+

8. Product range overview

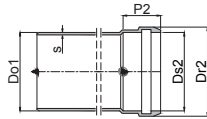
| Product | | DN 50 | DN 100 | DN 150 |
|-----------------------|---|-------|--------|--------|
| Pipe |  | ✓ | ✓ | ✓ |
| Double Socket Coupler |  | ✓ | ✓ | ✓ |
| Bend |  | ✓ | ✓ | ✓ |
| Long Bend |  | | ✓ | |
| Branch |  | ✓ | ✓ | ✓ |
| Double Branch |  | | ✓ | |
| Corner Branch |  | | ✓ | |
| Shower Branch |  | | ✓ | |
| Manifold |  | | ✓ | |
| Double Socket Sleeve |  | ✓ | ✓ | ✓ |

| Product | | DN 50 | DN 100 | DN 150 |
|-------------------------|---|-------|--------|--------|
| Long Socket |  | ✓ | ✓ | ✓ |
| Socket Plug |  | ✓ | ✓ | ✓ |
| Reducer |  | | ✓ | ✓ |
| Access Pipe |  | ✓ | ✓ | ✓ |
| Bracket |  | ✓ | ✓ | ✓ |
| Covering Clamp type LKS |  | ✓ | ✓ | ✓ |
| Gasket EPDM |  | ✓ | ✓ | ✓ |
| Gasket NBR |  | ✓ | ✓ | ✓ |
| BM-R90 |  | ✓ | ✓ | ✓ |

Wavin AS+

Product details Acoustic soil system – Astolan® and PVC-U

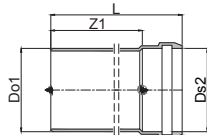
Pipe



Pipe with socket

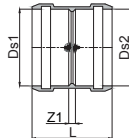
Material: Polypropylene with Astolan®

| Nominal Size (mm) | Outer diameter Do1 = Ds2 | Wall thickness s | Length of socket P2 |
|-------------------|--------------------------|------------------|---------------------|
| 50 | 50 | 3.0 | 46 |
| 100 | 110 | 5.3 | 59 |
| 150 | 160 | 5.6 | 71 |



| Nominal Size (mm) | Part Number | Dimensions (mm) | | | |
|-------------------|-------------|-----------------|-----|-------|------|
| | | Do1 | Ds2 | L | Z1 |
| 50 | 3080063 | 50 | 51 | 3046 | 3000 |
| 100 | 3080030 | 110 | 111 | 209 | 150 |
| 100 | 3080034 | 110 | 111 | 2059 | 2000 |
| 100 | 3080036 | 110 | 111 | 3059 | 3000 |
| 150 | 3080044 | 160 | 160 | 221.4 | 150 |
| 150 | 3080050 | 160 | 161 | 3070 | 3000 |

Fittings



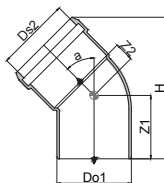
Double Socket Coupler

Material: Polypropylene with Astolan®

| Nominal Size (mm) | Part Number | Dimensions (mm) | | | |
|-------------------|-------------|-----------------|-----|-----|----|
| | | Ds1 | Ds2 | L | Z1 |
| 50 | 3080016 | 50 | 50 | 99 | 3 |
| 100 | 3080012 | 111 | 111 | 124 | 5 |
| 150 | 3080014 | 160 | 160 | 148 | 5 |

Wavin AS+

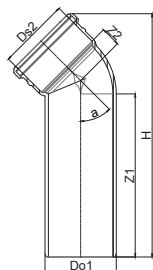
Product details Acoustic soil system – Astolan® and PVC-U



Bends – 15°, 30°, 45°, 67°, 87°

Material: Polypropylene with Astolan®

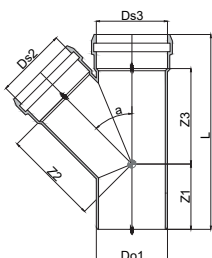
| Nominal Size (mm) | Part Number | Dimensions (mm) | | | | | |
|-------------------|-------------|-----------------|-----|-----|-----|-----|----|
| | | a | Do1 | Ds2 | H | Z1 | Z2 |
| 50 | 3079965 | 15° | 50 | 50 | 115 | 53 | 11 |
| 50 | 3079966 | 30° | 50 | 51 | 122 | 57 | 13 |
| 50 | 3079967 | 45° | 50 | 51 | 126 | 60 | 18 |
| 50 | 3079968 | 67° | 50 | 51 | 124 | 68 | 23 |
| 50 | 3079969 | 87° | 50 | 51 | 111 | 74 | 32 |
| 100 | 3079950 | 15° | 110 | 110 | 157 | 70 | 17 |
| 100 | 3079951 | 30° | 110 | 110 | 177 | 77 | 20 |
| 100 | 3079952 | 45° | 110 | 110 | 192 | 85 | 32 |
| 100 | 3079953 | 67° | 110 | 110 | 197 | 99 | 44 |
| 100 | 3079954 | 87° | 110 | 110 | 186 | 114 | 61 |
| 150 | 3079959 | 15° | 160 | 160 | - | 85 | 19 |
| 150 | 3079960 | 30° | 160 | 160 | - | 96 | 28 |
| 150 | 3079961 | 45° | 160 | 160 | - | 108 | 42 |
| 150 | 3079962 | 87° | 160 | 160 | - | 151 | 84 |



Long Bend – 45°

Material: Polypropylene with Astolan®

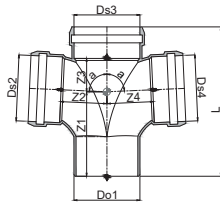
| Nominal Size (mm) | Part Number | Dimensions (mm) | | | |
|-------------------|-------------|-----------------|-----|----|-----|
| | | Do1 | Ds2 | H | Z1 |
| 100 | 3080026 | 110 | 110 | 25 | 250 |



Branch – 45° and 87°

Material: Polypropylene with Astolan®

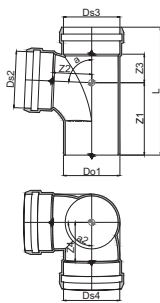
| Nominal Size (mm) | Part Number | Part | Dimensions (mm) | | | | | | |
|-------------------|-------------|------|-----------------|-----|-----|-----|-----|-----|-----|
| | | | a | Do1 | Ds2 | Ds3 | L | Z1 | Z2 |
| 50/50 | 3079996 | 45° | 50 | 50 | 50 | 171 | 60 | 62 | 62 |
| 50/50 | 3079997 | 87° | 50 | 50 | 50 | 150 | 75 | 29 | 29 |
| 100/50 | 3079982 | 45° | 110 | 50 | 110 | 197 | 59 | 106 | 81 |
| 100/50 | 3079983 | 87° | 110 | 50 | 110 | 178 | 85 | 59 | 36 |
| 100/100 | 3079981 | 45° | 110 | 111 | 110 | 277 | 83 | 194 | 138 |
| 100/100 | 3079980 | 87° | 110 | 110 | 110 | 253 | 136 | 77 | 56 |
| 150/100 | 3079991 | 45° | 160 | 110 | 160 | 304 | 71 | 175 | 165 |
| 150/100 | 3079992 | 87° | 160 | 110 | 160 | 256 | 124 | 87 | 6 |
| 150/150 | 3079994 | 45° | 160 | 160 | 160 | 375 | 108 | 200 | 199 |



Double Branch – 87°

Material: Polypropylene with Astolan®

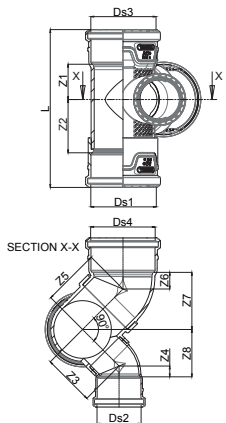
| Nominal | Part | Dimensions (mm) | | | | | | | | | |
|-------------|---------|-----------------|-----|-----|-----|-----|-----|----|----|----|--|
| Size (mm) | Number | Do1 | Ds2 | Ds3 | Ds4 | L | Z1 | Z2 | Z3 | Z4 | |
| 100/100/100 | 3080010 | 110 | 110 | 110 | 110 | 255 | 139 | 81 | 60 | 81 | |



Corner Branch – 87°

Material: Polypropylene with Astolan®

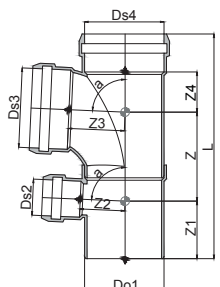
| Nominal | Part | Dimensions (mm) | | | | | | | | | |
|-------------|---------|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Size (mm) | Number | Do1 | Ds2 | Ds3 | Ds4 | L | Z1 | Z2 | Z3 | Z4 | |
| 100/100/100 | 3080008 | 110 | 110 | 110 | 110 | 251 | 122 | 139 | 128 | 139 | |



Shower Double Branch – 87°

Material: Polypropylene with Astolan®

| Nominal | Part | Dimensions (mm) | | | | | | | | | |
|------------|---------|-----------------|-----|-----|-----|-----|-----|----|----|----|--|
| Size (mm) | Number | Do1 | Ds2 | Ds3 | Ds4 | L | Z | Z1 | Z2 | Z3 | |
| 100/100/50 | 3080095 | 110 | 50 | 110 | 110 | 330 | 126 | 87 | 59 | 81 | |



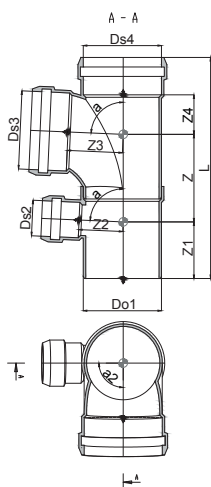
Shower Double Branch – 87° left

Material: Polypropylene with Astolan®

| Nominal | Part | Dimensions (mm) | | | | | | | | | |
|------------|---------|-----------------|-----|-----|-----|-----|-----|----|----|----|--|
| Size (mm) | Number | Do1 | Ds2 | Ds3 | Ds4 | L | Z | Z1 | Z2 | Z3 | |
| 100/100/50 | 3080096 | 110 | 50 | 110 | 110 | 330 | 126 | 87 | 59 | 81 | |

Wavin AS+

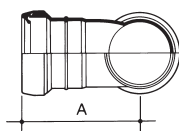
Product details Acoustic soil system – Astolan® and PVC-U



Shower Double Branch – 87° right

Material: Polypropylene with Astolan®

| Nominal Size (mm) | Part Number | Dimensions (mm) | | | | | | | | |
|----------------------|----------------|-----------------|-----|-----|-----|-----|-----|----|----|----|
| | | Do1 | Ds2 | Ds3 | Ds4 | L | Z | Z1 | Z2 | Z3 |
| 100/100/50 | 3080097 | 110 | 50 | 110 | 110 | 330 | 126 | 87 | 59 | 81 |

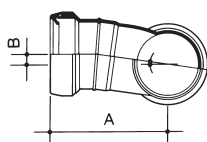


S/SW Manifold Branch – Straight

- One solvent weld and one push-fit socket (right hand illustrated)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) | |
|----------------------|----------------|-----------------|------------------|
| | | A | Effective Length |
| 110 | 4S601W | 180 | 132 |

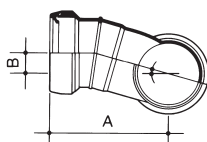


S/SW Manifold Branch – 8°

- One solvent weld and one push-fit socket (right hand illustrated)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) | | |
|----------------------|----------------|-----------------|----|------------------|
| | | A | B | Effective Length |
| 110 LH | 4S602W | 180 | 16 | 132 |
| 110 RH | 4S612W | 180 | 16 | 132 |

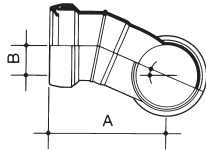


S/SW Manifold Branch – 15.5°

- One solvent weld and one push-fit socket (right hand illustrated)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) | | |
|----------------------|----------------|-----------------|----|------------------|
| | | A | B | Effective Length |
| 110 LH | 4S603W | 180 | 32 | 132 |
| 110 RH | 4S613W | 180 | 32 | 132 |

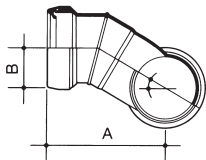


S/SW Manifold Branch – 23°

- One solvent weld and one push-fit socket (right hand illustrated)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) | | |
|-------------------|-------------|-----------------|----|------------------|
| | | A | B | Effective Length |
| 110 LH | 4S604W ♡ | 180 | 48 | 132 |
| 110 RH | 4S614W ♡ | 180 | 48 | 132 |

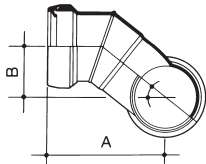


S/SW Manifold Branch – 30.5°

- One solvent weld and one push-fit socket (right hand illustrated)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) | | |
|-------------------|-------------|-----------------|----|------------------|
| | | A | B | Effective Length |
| 110 LH | 4S605W ♡ | 180 | 64 | 132 |
| 110 RH | 4S615W ♡ | 180 | 64 | 132 |



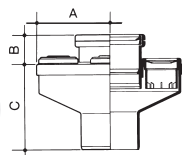
S/SW Manifold Branch – 38°

- One solvent weld and one push-fit socket (right hand illustrated)

Material: PVC-U

| Nominal Size (mm) | Part Number | Dimensions (mm) | | |
|-------------------|-------------|-----------------|----|------------------|
| | | A | B | Effective Length |
| 110 LH | 4S606W ♡ | 180 | 80 | 132 |
| 110 RH | 4S616W ♡ | 180 | 80 | 132 |

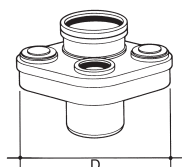
NOTE: All Manifold Branches are fitted with a gasket for direct connection to the outlets of WC's manufactured to BS 5503.



S/S Soil Manifold

- One plain end and one push-fit ring-seal socket
- Permits up to three 50mm connections to be made at floor level
- Complies with BS EN 12056-2:2000 clause ND. 3.3.2
- Make connections using 4Z124W, 2S355W or 2S356W (see below)
- Minimum installation aperture: 240mm square

Material: PVC-U, with Rubber seals



| Nominal Size (mm) | Part Number | Dimensions (mm) | | | |
|-------------------|-------------|-----------------|----|-----|-----|
| | | A | B | C | D |
| 110 | 3065902 ♡ | 138 | 55 | 160 | 275 |

Wavin AS+

Product details **Acoustic soil system – Astolan® and PVC-U**

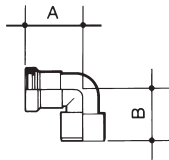


All-Fit Reducer – 40:32mm

- Connects to 32mm plastic pipe to BS EN 1451-1/BS EN 1455-1/ BS EN 1566-1, or to copper pipe manufactured to BS 659 or BS 2871
- Use with 2S355W (below) when a bend is required

Material: Polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) A |
|-------------------|-------------|-------------------|
| 40 | 4Z124W | 54 |

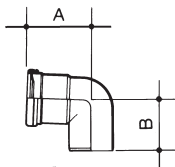


All-Fit Reduction Bend – 50:40mm

- Connects to 40mm plastic pipe to BS EN 1451-1/BS EN 1455-1/ BS EN 1566-1, or to copper pipe manufactured to BS 659 or BS 2871

Material: Polypropylene

| Nominal Size (mm) | Part Number | Dimensions (mm) A | Dimensions (mm) B |
|-------------------|-------------|-------------------|-------------------|
| 50 | 2S355W | 70 | 65 |

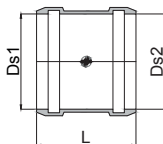


All-Fit 90° Spigot Bend – 50mm

- Connects to 50mm plastic pipe to BS EN 1451-1/BS EN 1455-1/ BS EN 1566-1, or to copper pipe manufactured to BS 659 or BS 2871

Material: ABS

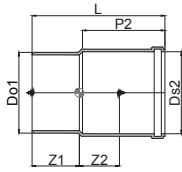
| Nominal Size (mm) | Part Number | Dimensions (mm) A | Dimensions (mm) B |
|-------------------|-------------|-------------------|-------------------|
| 50 | 2S356W | 79 | 64 |



Repair Coupler

Material: Polypropylene with Astolan®

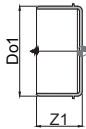
| Nominal Size (mm) | Part Number | Dimensions (mm) Ds1 | Dimensions (mm) Ds2 | Dimensions (mm) L |
|-------------------|-------------|---------------------|---------------------|-------------------|
| 50 | 3080092 | 50 | 50 | 99 |
| 100 | 3080088 | 110 | 110 | 124 |
| 150 | 3080090 | 160 | 160 | 148 |



Long Socket

Material: Polypropylene with Astolan®

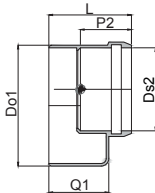
| Nominal Size (mm) | Part Number | Do1 | Ds2 | L | P2 | Z1 | Z2 |
|-------------------|-------------|-----|-----|-----|-----|----|-----|
| 50 | 3080023 | 50 | 50 | 184 | 105 | 57 | 60 |
| 100 | 3080019 | 110 | 110 | 219 | 137 | 69 | 88 |
| 150 | 3080021 | 160 | 160 | 264 | 164 | 85 | 123 |



End Cap

Material: Polypropylene with Astolan®

| Nominal Size (mm) | Part Number | Do1 | Z1 |
|-------------------|-------------|-----|----|
| 50 | 3080106 | 50 | 51 |
| 100 | 3080103 | 110 | 65 |
| 150 | 3080105 | 160 | 76 |



Reducer

Material: Polypropylene with Astolan®

| Nominal Size (mm) | Part Number | Do1 | Ds2 | L | P2 | Q1 |
|-------------------|-------------|-----|-----|-----|----|----|
| 100/50 | 3080078 | 110 | 51 | 90 | 53 | 79 |
| 150/100 | 3080082 | 160 | 111 | 114 | 59 | 98 |



Reducer

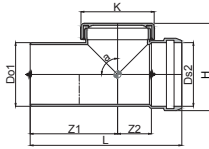
- DN50mm spigot fits to Wavin AS+ DN50mm socket and reduces to 40mm plastic pipe to BS EN 1451, BS EN 1455 and BS EN 1566

Material: ABS

| Nominal Size (mm) | Part Number | Dimensions (mm) A |
|-------------------|-------------|-------------------|
| 50/40 | 5Z124W | 78 |

Wavin AS+

Product details **Acoustic soil system – Astolan® and PVC-U**



Access Piece

Material: Polypropylene with Astolan®

| Nominal Size (mm) | Part Number | Dimensions (mm) | | | | | | | |
|----------------------|----------------|-----------------|-----|-----|-----|-----|-----|-----|----|
| | | a | Do1 | Ds2 | H | K | L | Z1 | Z2 |
| 50 | 3079917 | 90° | 50 | 50 | 84 | 65 | 164 | 82 | 37 |
| 100 | 3079913 | 90° | 110 | 110 | 156 | 130 | 258 | 129 | 72 |
| 150 | 3079915 | 90° | 160 | 160 | 213 | 130 | 271 | 135 | 68 |

Accessories



Wavin LKS-clamp

Material: Metal

| Nominal Size (mm) | Part Number |
|----------------------|----------------|
| 50 | 4065138 |
| 100 | 4065141 |
| 150 | 4065143 |



Gasket

Material: EPDM

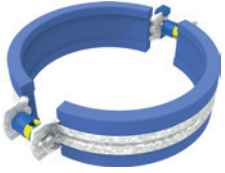
| Nominal Size (mm) | Part Number |
|----------------------|----------------|
| 50 | 4065145 |
| 100 | 4065188 |
| 150 | 4065190 |



Gasket

Material: NBR

| Nominal Size (mm) | Part Number |
|----------------------|----------------|
| 50 | 4065192 |
| 100 | 4025566 |
| 150 | 4025568 |



Wavin System Bracket

Material: Rubber, Metal

| Nominal Size (mm) | Part Number |
|----------------------|----------------|
| 50 | 4066449 |
| 100 | 4066452 |
| 150 | 4066454 |



M10 Bolt

Material: Metal

| Nominal Size (mm) | Part Number |
|----------------------|----------------|
| 80 | 3020511 |



Firecollar BM-R90

Material: Metal

| Nominal Size (mm) | Part Number |
|----------------------|----------------|
| 50 | 4026102 |
| 100 | 4026106 |
| 150 | 4026109 |

Wavin AS+

Annex I Chemical resistance list

Legend

- + = Resistant
- o = Limited resistance
- = Not resistant
- SA = Saturated, aqueous solutions
- TP = Technically pure
- D = Diluted
- C = Commercial



| Corrosive agent | Concentration | 20°C PP | 40°C PP | 60°C PP |
|---------------------------|---------------|------------|------------|------------|
| Acetaldehyde | TP | o | - | |
| Acetic acid | 60% | + | + | |
| Acetic acid | 10% | | | |
| Acetic acid | 25% | | | |
| Acetic acid | 60-95% | o | | |
| Acetic anhydride | TP | + | | |
| Acetone | TP | + | + | |
| Acetophenone | TP | + | o | |
| Acrylonitrile | TP | + | + | |
| Adipic acid | SA | + | + | |
| Air | - | + | + | + |
| Allyl alcohol | 96% | + | + | + |
| Aluminium chloride | SA | + | + | |
| Aluminium fluoride | SA | | | |
| Aluminium sulphate | SA | + | + | |
| Alums | SA | + | + | |
| Ammonia, aqueous | SA | + | + | |
| Ammonia, gas | TP | + | + | |
| Ammonia, liquid | TP | + | | |
| Ammonium acetate | SA | + | + | |
| Ammonium carbonate and bi | SA | + | + | |
| Ammonium chloride | SA | | | |
| Ammonium fluoride | 20% | | | |

| Corrosive agent | Concentration | 20°C PP | 40°C PP | 60°C PP |
|---|---------------|------------|------------|------------|
| Ammonium fluoride | SA | + | + | |
| Ammonium fluoride | >10% | | | |
| Ammonium hydroxide | SA | + | + | |
| Ammonium nitrate | SA | | | |
| Ammonium phosphate, including meta | SA | + | + | + |
| Ammonium sulphide | SA | + | + | |
| Amyl acetate | TP | o | | |
| Amyl alcohol | TP | + | + | + |
| Aniline | SA | | | |
| Aniline | TP | o | o | |
| Aniline hydrochloride | SA | + | + | |
| Anisole | TP | + | o | |
| Anthraquinone sulphonic acid, suspension | SA | | | |
| Antimony trichloride | 90% | + | | |
| Apple juice | C | + | | |
| Aqua regia (HCl/HNO3) | 03:01 | - | - | - |
| Arsenic acid | SA | | | |
| Barium salts | SA | + | + | + |
| Beer | C | + | + | |
| Benzaldehyde | o.1% | + | + | |
| Benzaldehyde | TP | | | |
| Benzene — super (fuel for internal combustion engines) | C | o | - | - |
| Benzene (cleaning agent) | C | o | | |
| Benzene-benzol mixture | 80/20 | o | - | - |
| Benzoic acid | SA | + | + | |
| Benzol | TP | o | - | - |
| Benzoyl chloride | TP | o | | |
| Benzyl alcohol | TP | + | o | |
| Borax | D | + | + | |
| Borax | SA | | | |
| Boric acid | SA | + | + | |
| Brandy | C | + | | |
| Bromic acid | 10% | | | |
| Bromine gas | - | o | - | - |
| Bromine water | SA | o | - | - |
| Bromine, gas, dry | TP | | | |
| Bromine, liquid | TP | - | - | - |
| Butadiene | TP | o | - | - |
| Butane, gas | TP | + | | |
| Butanol | TP | + | o | o |
| Butyl acetate | TP | o | - | - |
| Butyl glycol (butane diol) | TP | + | | |
| Butyl phenol | SA | + | | |
| Butyl phenol | TP | | | |
| Butyl phthalate | TP | + | o | o |
| Butyric acid | 20% | + | | |
| Butyric acid | TP | | | |
| Calcium carbonate | SA | + | + | + |
| Calcium chlorate | SA | | | |
| Calcium chloride | SA | + | + | + |
| Calcium hydroxide | SA | | | |
| Calcium hypochloride | SA | + | | |
| Calcium nitrate | 50% | | | |
| Calcium nitrate | SA | + | + | |
| Calcium sulphate | SA | | | |
| Calcium sulphide | SA | | | |
| Camphor oil | TP | - | - | - |
| Carbon dioxide | 100% | | | |
| Carbon dioxide | SA | + | + | |
| Carbon dioxide, gas, wet/dry | TP | + | + | |
| Carbon disulphide | TP | + | - | - |
| Carbon monoxide | TP | | | |
| Carbon tetrachloride | TP | - | - | - |
| Castor oil | TP | + | + | |
| Caustic soda solution | Up to 60% | + | + | + |
| Caustic soda, see caustic soda solution | | + | + | + |
| Chlorinated lime, slurry | - | | | |
| Chlorine ethanol | TP | + | + | |
| Chlorine water | SA | + | o | |
| Chlorine, gas, dry | TP | - | - | - |
| Chlorine, liquid | TP | - | - | - |

| Corrosive agent | Concentration | 20°C PP | 40°C PP | 60°C PP | Corrosive agent | Concentration | 20°C PP | 40°C PP | 60°C PP |
|--------------------------------------|---------------|------------|------------|------------|---|---------------|------------|------------|------------|
| Chloroacetic acid | 85% | + | + | | Hydrobromic acid | TP | | | |
| Chloroacetic acid | TP | | | | Hydrochloric acid | 20% | + | + | |
| Chloromethane | TP | | | | Hydrochloric acid | Up to 35% | + | 0 | 0 |
| Chlorosulphonic acid | D | - | - | - | Hydrochloric acid, aqueous | Conc. | | | |
| Chlorosulphonic acid | TP | | | | Hydrocyanic acid | 10% | + | + | |
| Chrome alum | SA | + | + | | Hydrofluoric acid | 40% | + | + | |
| Chromic acid | 1-50% | + | 0 | - | Hydrofluoric acid | 70% | + | 0 | |
| Citric acid | D | + | + | + | Hydrogen | TP | + | + | |
| Citric acid | SA | | | | Hydrogen chloride gas, dry | TP | + | + | |
| Coconut oil | TP | + | | | Hydrogen chloride gas, wet | TP | + | + | |
| Cooking salt, see sodium chloride | | | | | Hydrogen peroxide | 30% | + | 0 | |
| Copper chloride | SA | + | + | | Hydrogen peroxide | 90% | | | |
| Copper cyanide | SA | + | + | | Hydrogen sulphide | 100% | | | |
| Copper fluoride | 2% | | | | Hydrogen sulphide | SA | | | |
| Copper nitrate | 30% | + | + | + | Hydrogen sulphide | TP | + | + | |
| Copper nitrate | SA | | | | Iodine tincture | C | + | 0 | |
| Copper sulphate | SA | + | + | | I-propanol, see isopropanol | | + | + | |
| Cotton-seed oil | TP | + | + | | Iron II chloride | SA | + | + | |
| Cresol | Up to 90% | + | + | | Iron II sulphate | SA | | | |
| Cresol | >90% | + | | | Iron III chloride | SA | + | + | |
| Cresylic acid | SA | | | | Iron III nitrate | D | | | |
| Crotonic aldehyde | TP | + | | | Iron III sulphate | SA | | | |
| Cyclohexane | TP | + | | | Isopropanol | TP | + | + | + |
| Cyclohexanol | TP | + | 0 | | Isopropyl ether | TP | 0 | - | |
| Cyclohexanone | TP | 0 | - | - | Lactic acid | 10% | | | |
| Decahydronaphthalene (decalin) | TP | 0 | - | - | Lactic acid | TP | | | |
| Developers | C | | | | Lanolin (wool fat) | C | + | 0 | |
| Dextrin | D | + | + | | Lead acetate | SA | + | + | 0 |
| Dibutyl phthalate | TP | + | 0 | - | Linseed oil | TP | + | + | + |
| Dichloroacetic acid | TP | 0 | | | Magnesium carbonate | SA | + | + | + |
| Dichloroethylene | TP | 0 | | | Magnesium chloride | SA | + | + | + |
| Dichloromethane (methylene chloride) | TP | 0 | - | - | Magnesium hydroxide | SA | + | + | |
| Diethanolamine | TP | + | | | Magnesium nitrate | SA | + | + | |
| Diethyl ether | TP | + | 0 | | Magnesium sulphate | SA | + | + | + |
| Diglycolic acid | 30% | | | | Maize germ oil | TP | + | | |
| Diglycolic acid | SA | + | + | | Maleic acid | SA | + | + | |
| Diisooctyl phthalate | TP | | | | Malic acid | SA | + | | |
| Dimethylamine | 30% | | | | Mercuric chloride | SA | + | + | |
| Dimethylamine | TP | + | | | Mercuric cyanide | SA | + | + | |
| Dimethylformamide | TP | + | + | | Mercuric nitrate | D | + | + | |
| Diocetyl phthalate | TP | + | 0 | | Mercury | TP | + | + | |
| Dioxane | TP | 0 | 0 | | Methanol (methyl alcohol) | TP | + | + | - |
| Disodium phosphate | SA | + | + | | Methyl acetate | TP | + | + | |
| Drinking water, chlorinated | TP | + | + | + | Methyl bromide | TP | - | - | - |
| Ethanediol | TP | + | + | + | Methyl ethyl ketone | TP | + | + | |
| Ethanol | 40% | | | | Methyl methacrylate | TP | | | |
| Ethanol | TP | + | + | + | Methylamine | Up to 32% | + | | |
| Ethanolamine | TP | + | | | Methylene chloride, see dichloromethane | | 0 | - | - |
| Ether, see diethyl ether | | | | | Milk | C | + | + | + |
| Ethyl acetate | TP | 0 | - | - | Mineral oils | C | | | |
| Ethylene chloride, mono and di | TP | 0 | 0 | | Mineral water | C | + | + | + |
| Ethylene glycol, see ethanediol | | | | | MolaSAes | C | + | + | + |
| Fluorine | TP | - | | | Naphtha | C | + | - | - |
| Fluorosilic acid | 40% | | | | Naphthalene | TP | + | - | - |
| Formaldehyde (formalin) | 40% | + | + | | Nickel salts | SA | + | + | |
| Formic acid | 1-50% | + | + | 0 | Nicotinic acid | D | | | |
| Formic acid | TP | + | - | | Nitric acid | 10% | + | + | |
| Fructose | C | + | + | + | Nitric acid | 25% | | | |
| Fruit juices | C | + | + | | Nitric acid | Up to 40% | | | |
| Furfuryl alcohol | TP | + | 0 | | Nitric acid | 10-50% | 0 | - | - |
| Gelatine | D | + | + | + | Nitric acid | Over 50% | - | - | - |
| Glacial acetic acid | TP | + | 0 | - | Nitric acid | 75% | | | |
| Glucose | 20% | + | + | + | Nitric acid | 98% | | | |
| Glucose | SA | | | | Nitrobenzene | TP | + | 0 | |
| Glucose | D | + | + | + | N-propanol | TP | + | + | |
| Glycerin | TP | + | + | + | Oils and fats (vegetable/animal) | - | + | 0 | |
| Glycolic acid | 30% | + | | | Oleic acid | TP | + | 0 | |
| Glycolic acid | SA | + | - | | Olive oil | TP | + | + | 0 |
| Heptane | TP | + | 0 | - | Oxalic acid | SA | + | + | - |
| Hexadecanol | TP | | | | Oxygen | TP | | | |
| Hexane | TP | + | 0 | | Ozone | TP | | | |
| Hydrobromic acid | 10% | | | | Paraffin oil | TP | + | 0 | |
| Hydrobromic acid | 50% | + | - | - | Peanut oil | TP | + | + | |

Wavin AS+

Annex I Chemical resistance list

| Corrosive agent | Concentration | 20°C PP | 40°C PP | 60°C PP | Corrosive agent | Concentration | 20°C PP | 40°C PP | 60°C PP |
|--|---------------|------------|------------|------------|---|---------------------|------------|------------|------------|
| Peppermint oil | TP | + | | | Sodium cyanide | SA | | | |
| Perchloric acid | 10% | | | | Sodium dichromate | SA | + | + | + |
| Perchloric acid | 20% | + | + | | Sodium fluoride | SA | | | |
| Perchloric acid | 70% | | | | Sodium hexacyanoferrate (II+III) | SA | | | |
| Perchloric acid, see perchloric acid | | | | | Sodium hydrogen sulphite (sodium bisulphate) | SA | + | + | + |
| Perhydrol, see hydrogen peroxide | 30% | | + | 0 | Sodium hydroxide, see caustic soda solution | | + | + | + |
| Petroleum ether | TP | + | 0 | | Sodium hypochlorite | 13% effec. Chlorine | + | 0 | - |
| Phenol | D | | | | Sodium nitrate | SA | + | + | |
| Phenol, aqueous | 90% | + | | | Sodium nitrite | SA | + | + | |
| Phenylhydrazine | TP | 0 | 0 | | Sodium orthophosphate | SA | | | |
| Phenylhydrazine chlorhydrate | TP | + | 0 | - | Sodium perborate | SA | + | | |
| Phosphine | TP | | | | Sodium phosphate | SA | + | + | |
| Phosphoric acid | 50% | | | | Sodium silicate (water glaSA) | D | + | + | |
| Phosphoric acid | Up to 85% | + | + | + | Sodium sulphate and bi | SA | + | + | |
| Phosphorus oxychloride | TP | 0 | | | Sodium sulphide | SA | + | + | |
| Phosphorus trichloride | TP | 0 | | | Sodium sulphite | 40% | + | + | + |
| Picric acid | SA | + | | | Sodium thiosulphate | SA | + | + | |
| PotaSAium bichromate | 40% | | | | Soybean oil | TP | + | 0 | |
| PotaSAium bichromate | SA | + | + | | Strength | D | + | + | |
| PotaSAium borate | SA | + | + | | Sugar | SA | + | + | |
| PotaSAium bromate | SA | | | | Sulphur dioxide, dry, wet | TP | + | + | |
| PotaSAium bromate | 10% | + | + | | Sulphur dioxide, liquid | TP | + | | |
| PotaSAium bromide | SA | + | + | | Sulphur trioxide | TP | | | |
| PotaSAium carbonate and bi | SA | + | + | | Sulphuric acid | Up to 10% | + | + | - |
| PotaSAium chlorate | SA | + | + | | Sulphuric acid | 10-80% | + | + | |
| PotaSAium chloride | SA | + | + | | Sulphuric acid | 96% | 0 | - | |
| PotaSAium chromate | 40% | + | | | Sulphurous acid | SA | + | + | |
| PotaSAium cyanide | >10% | | | | Sulphurous acid | 30% | | | |
| PotaSAium cyanide | SA | + | + | | Tannic acid (tannin) | D | + | - | |
| PotaSAium fluoride | SA | + | + | | Tartaric acid | D | | | |
| PotaSAium hexacyanoferrate (II+III) | SA | | | | Tartaric acid | SA | + | - | |
| PotaSAium hydroxide | Up to 50% | + | + | + | Tetraethyl lead | TP | + | | |
| PotaSAium hydroxide | 60% | | | | Tetrahydrofuran | TP | 0 | - | - |
| PotaSAium hydroxide solution, see potaSAium hydroxide | | | | | Tetrahydronaphthalene (tetralin) | TP | - | - | - |
| PotaSAium hypochloride | D | | | | Thionyl chloride | TP | 0 | - | - |
| PotaSAium iodide | SA | + | + | | Thiophene | TP | + | 0 | |
| PotaSAium nitrate (potash) | SA | + | + | | Tin chloride II+IV | SA | + | + | |
| PotaSAium orthophosphate | SA | | | | Toluene | TP | 0 | - | - |
| PotaSAium perchlorate | 1% | | | | Trichloroacetic acid | 50% | + | + | |
| PotaSAium perchlorate | 10% | + | + | | Trichloroethylene | TP | - | - | - |
| PotaSAium perchlorate | SA | | | | Tricresyl phosphate | TP | + | 0 | |
| PotaSAium permanganate | SA | + | - | | Triethanolamine | D | - | | |
| PotaSAium permanganate | 20% | | | | Trimethyl propane | Up to 10% | | | |
| PotaSAium persulphate | SA | + | + | | Turpentine | TP | + | - | - |
| PotaSAium sulphate | SA | + | + | | Urea | 33% | | | |
| PotaSAium sulphide | D | | | | Urea | >10% | | | |
| Potash, see potaSAium nitrate | | + | + | | Urea | SA | + | + | |
| Propane, gas | TP | + | | | Urine | C | | | |
| Propionic acid | 50% | + | | | Vinegar (wine vinegar) | C | + | + | |
| Propionic acid | TP | | | | Vinyl acetate | TP | + | 0 | |
| Pyridine | TP | 0 | 0 | | Whisky | C | + | | |
| Saccharic acid | SA | + | + | | Wine vinegar | C | + | + | |
| Salicylic acid | SA | | | | Wines and spirits | C | + | | |
| Salt water, see sea water | | + | + | + | Xylene | TP | 0 | | |
| Sea water | C | + | + | + | Yeast | D | + | | |
| Silicon acid | D | | | | Yeast | SA | + | | |
| Silicon oil | TP | + | + | + | Zinc carbonate | SA | | | |
| Silver acetate | SA | | | | Zinc chloride | SA | + | + | |
| Silver cyanide | SA | | | | Zinc oxide | SA | + | + | |
| Silver nitrate | SA | + | + | 0 | Zinc sulphate | SA | + | + | |
| Soap | D | | | | | | | | |
| Soda, see sodium carbonate | | + | + | 0 | | | | | |
| Sodium acetate | SA | + | + | + | | | | | |
| Sodium benzoate | SA | + | + | | | | | | |
| Sodium bicarbonate | SA | + | + | + | | | | | |
| Sodium biphosphate | SA | | | | | | | | |
| Sodium borate | SA | + | + | | | | | | |
| Sodium bromide | SA | | | | | | | | |
| Sodium carbonate | SA | + | + | 0 | | | | | |
| Sodium chlorate | SA | + | + | | | | | | |
| Sodium chloride | SA | + | + | + | | | | | |
| Sodium chlorite | 20% | + | 0 | - | | | | | |

Wavin AS+

Annex II Low noise Soil and Waste specification clauses

Contents list

- 1000 Application
- 2000 Supplier
- 3000 Materials
- 4000 Performance Objectives
- 5000 Installation
- 6000 Documents to be provided to client

Wavin AS+, Low noise Soil and Waste system

1000 Application

- ⦿ Soil and waste system

2000 Supplier

- ⦿ Wavin

3000 Materials

- ⦿ Pipe
 - Material: Mineral filled PP, density ~1,9 kg/dm³
 - Colour: Grey RAL 7035
 - Stiffness: > 4 kN/m²
- ⦿ Fittings
 - Material: Mineral filled PP, density ~1,9 kg/dm³
 - Colour: Grey RAL 7035
 - Seal: SBR rubber
- ⦿ Outer diameters (mm) 50; 110; 160

4000 Performances Objectives

- ⦿ Noise barrier properties according to: EN 14366 (Fraunhofer test P-BA 63/2019)
 - 2 l/s WAVIN low noise bracket rubber lined metal bracket
- ⦿ Air borne: 48 dB(A)
- ⦿ Structure borne: 12 dB(A)
- ⦿ Temperature resistance: The pipe system needs to be resistant against continuous temperatures of 90°C and peak temperatures of 95°

5000 Installation

- ⦿ According to Wavin AS+ Installation manual
- ⦿ Bracket fixing instruction: Use full encircling metal brackets with rubber inserts.
Please use for correct installation the AS+ manual chapter 5 installation

6000 Documents to be provided to the client

Sound level: The contractor needs to demonstrate via an independent programme that the sound level in the rooms shall not exceed the required sound levels. Unless stated otherwise the maximum sound level is: 30 dB(A). Explanation: the sound level is dependent on amongst others the material of the pipe system, the wall thicknesses of the pipe and fittings, the diameter of the system, the flow capacity, the duct material and construction, the type of brackets and mass of the fixation wall and room size. When one of the variables changes, the calculation needs to be repeated with the new input values.

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Hot & Cold Water

Foul Water

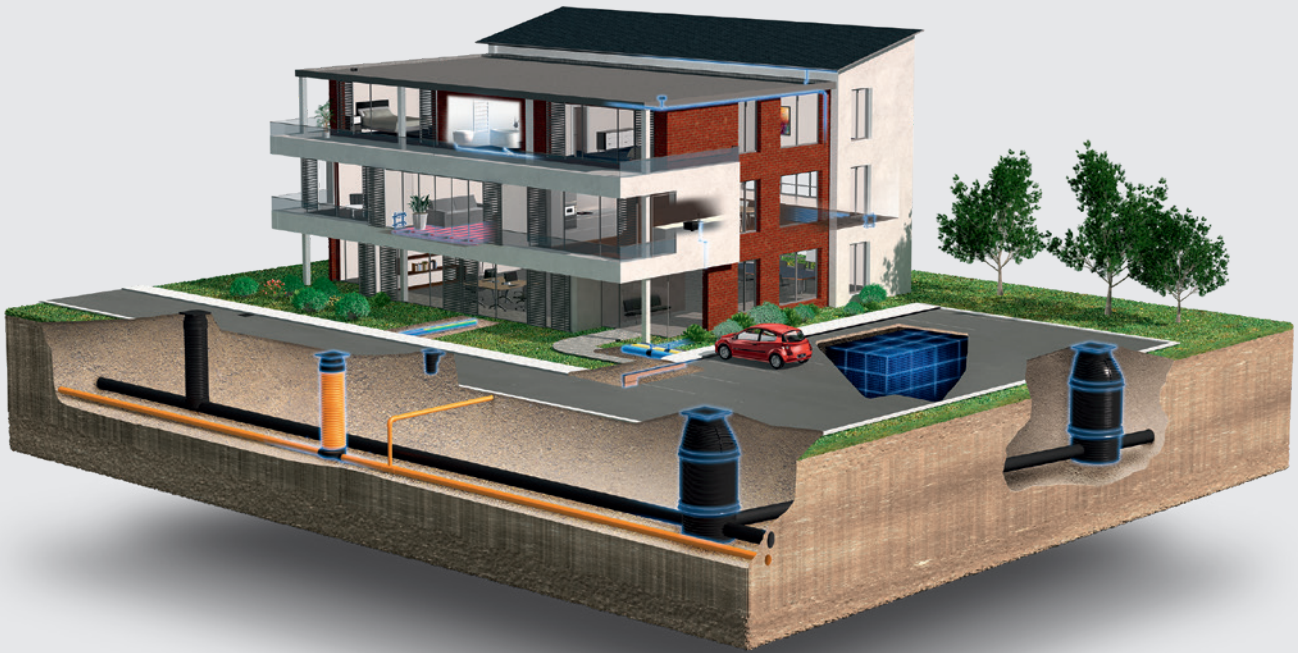
Gas & Water Mains

Indoor Climate

Storm Water

Geotextiles

Soil & Waste



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