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INSTRUCTION

ULTRA dB

95°C TEMPERATURE RESISTANCE

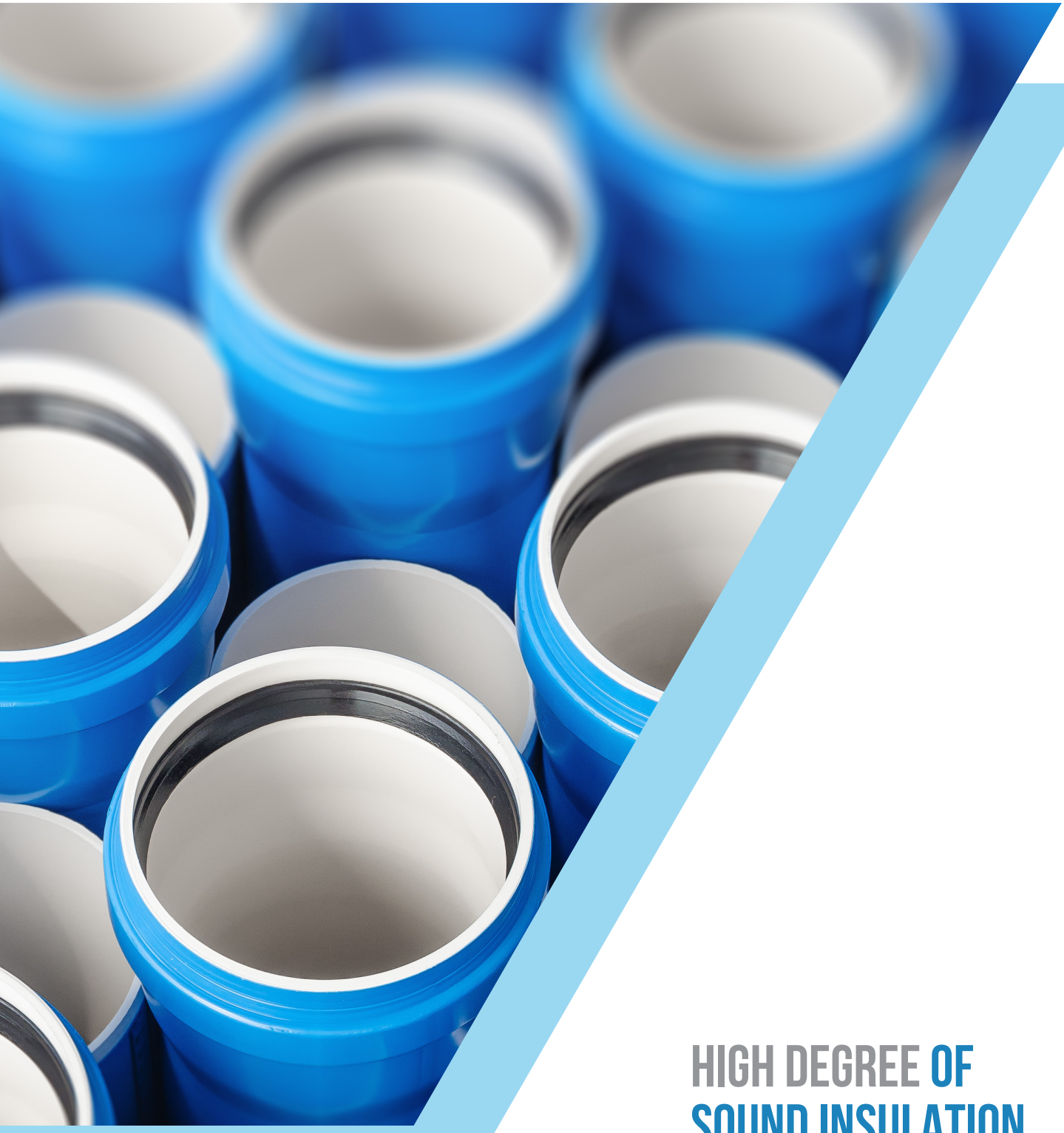
dB SOUND INTENSITY

100% RECYCLING

SOUNDPROOF SEWAGE SYSTEM

CONTENTS:

ULTRA dB



HIGH DEGREE OF SOUND INSULATION

INTRODUCTION

The Ultra dB soundproof indoor sewage system is a complete system of pipes and fittings made of mineral-enhanced polypropylene. Each pipe has a double-layered structure consisting of the internal (white) wall and the external (blue) wall which is smooth, resistant to dirt and permanently overprinted with a centimetre scale. Inspection is easy, as the internal surface is smooth and white.
The pipes are manufactured in the co-extrusion process, which allows for the creation of a molecularly bound solid layer. The fittings are manufactured by injection moulding. Thanks to the use of polypropylene and the special wall structure design, this system meets all the requirements imposed on modern sewage systems, namely: **safety, resistance to damage and long-lasting durability!**

Very good material properties: high resistance to impact, chemical compounds and hot temperature as well as excellent tightness, small weight and easy installation make mineral-enhanced PP products sought-after on the market while their market share, in comparison with traditional solutions based on PP or PVC-U, is on the increase by the day.

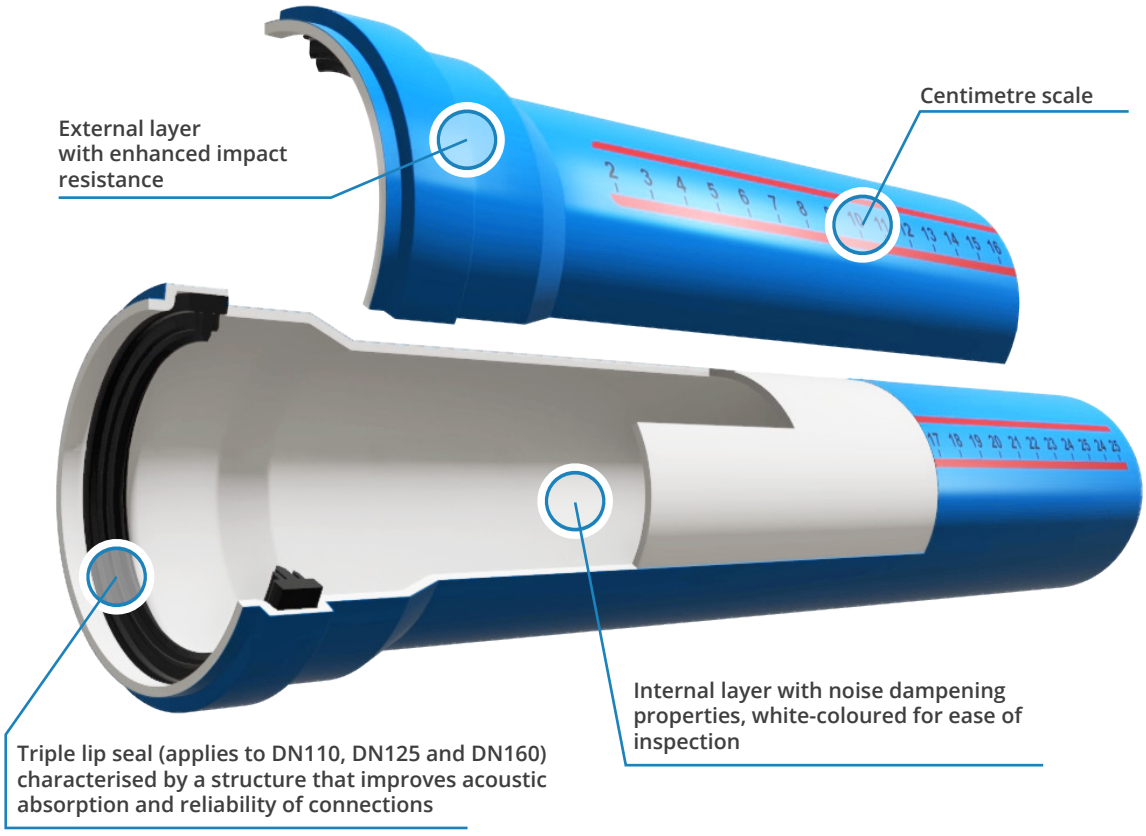
The Ultra dB system versions are available with the diameters of 50, 75, 110, 125 and 160 mm. The combination of the material composition and wall thickness ensures a very high degree of sound insulation, since the noise level is as low as 16 dB. Lip seals made of a rubber-based compound are used to connect the system components with one another.

As the pipes are lightweight, their installation is easy. Thanks to the smooth inner surface of each pipe, waste water encounters little resistance as it is drained, which even if the conduit gradient is extremely slight prevents deposits from forming. Consistently, no sewage putrefaction occurs in the pipes, which thus remain unclogged.

BENEFITS OF THE SYSTEM

- high degree of sound insulation due to the double-layered structure of the mineral-enhanced PP pipe wall, noise level as low as 16 dB, proved positive by the tests in the Fraunhofer Institute, Stuttgart, acc. to DIN 4109-10, 3rd class of sound insulation for civil structures intended for people to stay in permanently,
- resistance to aggressive sewage within the range from 2 to 12 pH, which ensures long-term and failure-free use of the system,
- high thermal resistance to the sewage temperature as high as 90°C when the flow is permanent and up to 95°C when the flow is short-term,
- high mechanical resistance at temperatures as low as -20°C, which enables the installation in winter conditions,
- easy and efficient installation of the system thanks to the innovative centimetre scale overprint on the pipes; possibility of cutting the pipes into sections of any length and very simple methods for connecting them without any special tools, thanks to factory-installed lip seals and rich assortment of fittings,
- superior effluent flow parameters thanks to the perfectly smooth inner surface of each pipe, preventing deposits from forming,
- very high resistance of the pipes to compression and impact as well as the possibility of mounting indoors and in the soil, under a structure or in the concrete, thanks to minimum ring stiffness of 4 kN/m2 (BD application scope),
- 100% recovery of raw materials used for production thanks to the recyclability of the pipes and fittings included in the Ultra dB system,
- steam condensation and release of fumes into the building are prevented (the sewage system consisting of Ultra dB pipes and fittings is gas- and water-tight in working conditions),
- the amount of waste is reduced to a minimum because the pipes are produced in sections of various lengths,
- the pipes with a relatively large wall thickness ensure high mechanical resistance and less deformation of an even heavily loaded sewage system as compared to traditional sewage systems currently available on the market,
- with a wide range of fittings, the indoor sewage system can be used equally appropriately and widely in new buildings and sewage system upgrades,
- B2 flammability rating according to DIN 4102,
- easy transport and storage thanks to low weight,
- resistance to stray currents,
- the system can be used for roof drainage in buildings in which the system height does not exceed 45 m; tightness of connections up to 4.5 bar, thanks to special triple lip seals - applies to DN110, DN125 and DN160,

- full dimensional compatibility with the existing systems, with the following dimensions maintained:
  - nominal diameter DN 50 70 100 125 150 (mm)
  - outer diameter DN 50 75 110 125 160 (mm)
- each pipe layer meets the applicable requirements:
  - internal layer (white) ensures resistance to high temperatures up to +90°C, +95°C for a short-term flow, high chemical resistance and reduction of noise level;
  - external layer (blue, smooth surface) ensures resistance to external stress, impacts and atmospheric conditions.



APPLICATION

The Ultra dB soundproof indoor sewage system is intended for the construction of non-pressure soundproof sanitary, storm water and process waste water systems. It is used for draining highly aggressive domestic, municipal and industrial types of sewage (2–12 pH), including ones characterised by a high concentration of hydrogen sulphide and, further, a high temperature.

Due to its benefits, the Ultra dB system has a wide range of applications, for instance in single- and multi-family residential housing, in low and high buildings; it is also used in the systems installed in: luxury apartment buildings, nursing homes, offices, doctors' surgeries, hotels, restaurants, hospitals, operating rooms, spas, laboratories, dentists' surgeries, schools, lecture halls at tertiary education institutions, reading rooms, radio and TV studios, concert and conference halls, theatres, shop floors and in order to drain effluent generated by – including but not limited to – the pharmaceutical, food and catering industries (rinsing the pipes with water heated to 70°C is recommended while draining fat-laden effluent).

The system is also perfectly suitable for draining storm water using systems installed inside the building structure.

The Ultra dB system has the BD designation, which indicates that the pipes and fittings can be used not only inside the building, but also fixed onto the external walls of the building and buried in the ground within the building structure. The installation of the Ultra dB system in the BD application area is also permissible at a temperature above -20°C, which is indicated by the graphic sign (ice crystal symbol) printed on the pipes that meet the applicable requirements of PN-EN ISO 11173:2017-12.

The Ultra dB pipes and fittings can also be used wherever the temperature of sewage does not exceed +90°C (permanent flow) or +95°C (temporary flow).

PRODUCT DATA SHEET

Material	PP-M polypropylene with mineral fillers (pipes and fittings)	
Diameters of pipes and fittings	DN50, DN75, DN110, DN125, DN160 mm	According to PN-EN 1451-1:2018
Wall thickness	DN50 e=2,0 mm; DN75 e=2,3; DN110 e=3,4 mm; DN125 e=3,9 mm; DN160 e=4,9 mm	
Application area	The „BD" application area according to PN-EN 1451-1:2008, i.e. in the systems inside buildings and outside buildings, fixed onto the walls, or in the underground systems buried in the ground or embedded in concrete within the building structure.	
Other applications	Draining of roof areas in buildings with rainwater drainage systems up to 45 m in height.	Technical Opinion issued by the Department of Material Engineering of the Central Mining Institute
Acoustic characteristics (tests carried out in the Fraunhofer Institute, Stuttgart)	Standard steel clamping rings with an elastomer insert	11 dB (0.5 l/s); 14 dB (1 l/s); 16 dB (2 l/s); 20 dB (4l/s)
	Special BISMAT 1000 clamping rings	≤ 10 dB (0.5 l/s); ≤ 10 dB (1 l/s); 13 dB (2 l/s); 16 dB (4l/s)
Colour	Pipes	internal layer: white external layer: blue
	Fittings	blue
Density	1,4 g/cm^3	
Linear expansion coefficient	99,5×10-6 mm/mmoC	
Ring stiffness	SN ≥ 4 KN/m^2, series S16, DN110-DN160 > SN8	
Type of connection	Push-in spigot-and-socket pipe joints. Sockets with a factory-installed elastomer seal. DN110, DN125 and DN160 pipes and fittings with factory-installed triple lip seals that improve acoustic absorption and reliability of connections	
Fire resistance class	B2	according to DIN 4102
Chemical resistance	Conveyance and drainage of sewage with pH value ranging from 2 to12	
Halogen content	Without halogens (Cl, F, Br, J)	
Maximum sewage temperature	90°C - permanent flow; 95°C - temporary flow	
Minimum installation temperature	- 20°C ❄	
Special fittings	Steel clamping rings additionally protect pipes and fittings from withdrawing from socket	
Documents	National Technical Assessment ITB-KOT-2017/0167, 2nd edition, National Declaration of Performance KDWU No. 067/3 and KDW 062/3, Hygienic Conformity Certificate issued by the National Institute of Public Health, test report DFW/116/2018	

NOISE PROTECTION

Considering the current development of the construction market and basing on numerous analyses of the issue, one can state that the noise emitted by systems affects the building acoustics to a large extent. Besides, users are raising their expectations, and requirements for noise reduction in buildings will doubtless become more stringent. Specific issues related to building acoustics, including permissible indoor levels of noise emitted by technical equipment installed in buildings, are provided for standard DIN4109 (noise protection in high-rise buildings) and VDI4100 (noise control in apartments - Guidelines). The weighed index for structure-borne noise level for the Ultra dB system is LSC,A dB(A) = 16 dB, which is confirmed by the results of the acoustics expert opinion prepared by the Fraunhofer Institute.

The noise measurement for the soundproof system made of the Ultra dB pipes was performed according to the methodology developed by the scientists from the IBP Fraunhofer Institute, Stuttgart, and specified in EN 14366. Pursuant to EN 14366, the test applies to the vertical system in a three-storey building, located next to the wall with basis weight of 220 kg/m². On each storey there is a tee-pipe, plugged on the other two storeys. The vertical section downstream the lowest storey continues further as a horizontal section with two 45° bends and a compensatory section. The floor pipe passage points are tightly sealed. Water, a test medium, is injected into the measuring system on the highest storey, and collected from the horizontal section on the lowest level. Noise is measured on the lowest storey at the following flow rates: 0.5; 1.0; 2.0 and 4.0 l/s.

The most disadvantageous boundary conditions:

- most common maximum flow rate: 4.0 l/s,
- diameter of the most common vertical section: DN 110 mm,
- the place of measurement is the lowest room behind the wall to which the waste stack is fixed.

Results of acoustic tests of Ultra dB system

Measured value	Ultra dB 110 x 3.4 system with "BISMAT 1000" clamps			
Flow rate, l/s	0,5	1,0	2,0	4,0
Material noise level L_{SC},A, dB(A)[1/]	<10	<10	13	16

[1/] determined according to PN-EN 14366:2006, for the systems with DN 110 pipes

Table 1a. Acoustic characteristics - „BISMAT 1000" clamping rings

Results of acoustic tests of Ultra dB system

Measured value	Ultra dB system with steel clamping rings with an elastomer insert			
Flow rate, l/s	0,5	1,0	2,0	4,0
Material noise level L_{sc},A, dB(A)[1/]	11	14	16	20

[1/] determined according to PN-EN 14366:2006, for the systems with DN 110 pipes

Table 1b. Acoustic characteristics - steel clamping rings with an elastomer insert

The tests have shown that the Ultra dB system displays a very high degree of sound insulation and emits noise at the level of 16 dB (BISMAT 1000 clamping ring - Table 1a) or 20dB (steel clamping ring with an elastomer insert - Table 1b).
The human nervous system begins to experience fatigue at the minimum noise level of 30 dB. The Ultra dB system, with the noise transmitted by air and solids, operates very quietly. The noise level is as low as that of a ticking clock. The system meets also rigorous requirements of DIN 4109 standard and very rigorous requirements of VDI 4100 standard (max. 20 dB for semi-detached and terraced houses).

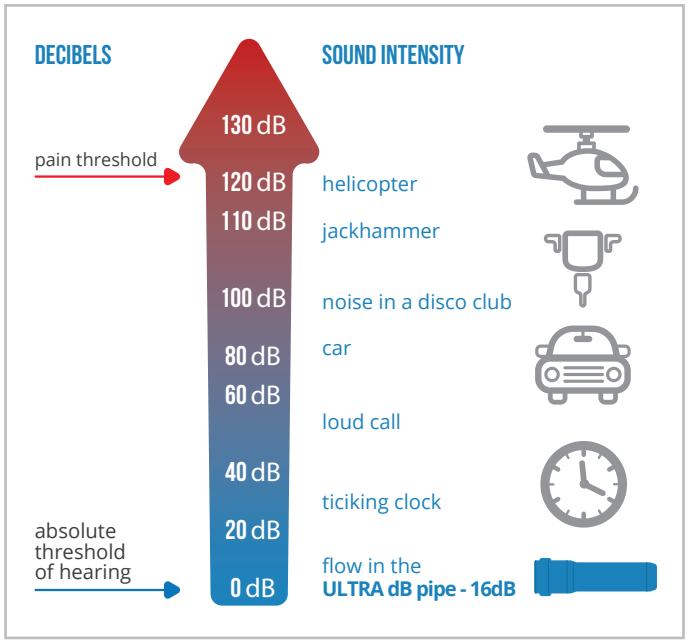


Fig. 1.
Examples of noise sources

The Ultra dB system is a universal solution. It should be used in each type of housing, hotels, schools and industry, since it guarantees silence, comfort and long-lasting durability. Figure 1 shows average noise levels in our environment.

NOISE – SOURCES AND TYPES

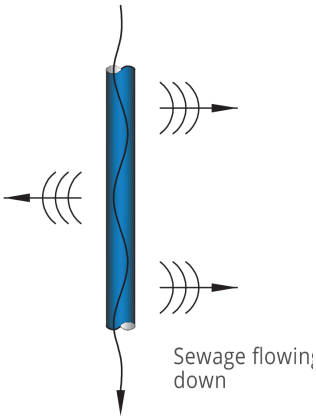
To ensure comfortable living conditions, all efforts should be made to eliminate sources of noise and noise nuisance in the environment. Therefore, in recent years there has been an increasing interest in the sources of noise generated inside buildings. The scope of interest includes the design and construction of buildings and the design of systems. The compliance with the acoustic comfort requirements defined for schools, apartments and working environment has become one of the essential conditions determining the design and construction of buildings. Downplaying the „noise issue" in sewage systems is tantamount to disregarding the current regulations on the design requirements and permissible noise levels.
The permissible noise level in rooms is defined by the national acoustic safety standards for buildings. Noise in the apartment is always a nuisance because the apartment should be a peaceful sanctuary. Such places as living rooms, bedrooms, hospital rooms and hotel rooms should be especially protected from noise. The noise-related issues should be borne in mind already at the stage of design and material selection.

One of the factors affecting the generation of noise in rooms is the operation of the internal sewage system.

The main source of acoustic vibrations in the waste stack is the stack itself and the horizontal branch connections, which transmit acoustic vibrations to the stack. Absorbed and reflected sound waves affect the pipes and fittings to experience acoustic resonance. The acoustic resonance, growing dynamically along the building height, in the direction of flowing waste, is transmitted through the fixing system (clamping rings) to the building structure. The dividing structures subjected to acoustic resonance transmit the resonance in the form of a sound wave to the adjacent rooms.

Clamping rings, their type and arrangement, as well as the design and the material formula of the system play the most important role in total reduction of the sewage system noise. Noise is transmitted through the building structure connections. Structure-borne noise is transmitted in all possible directions. Sources of noise in the building's sewage system: water filling the fixtures, water drained from the fixtures, inlets and outlets of horizontal branch connections, water dump in waste stacks, the places where the system changes its direction.

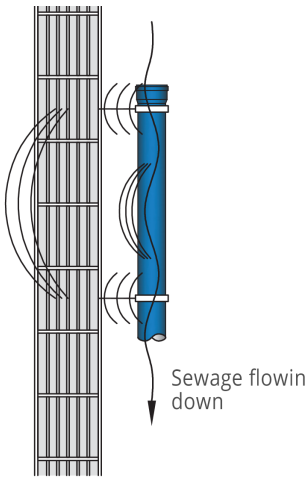
The two different material centres of the Ultra dB double-layer soundproof indoor sewage system hamper the propagation of intra-channel noise by partially absorbing and partially reflecting sound waves inwards, which in consequence significantly reduces noise transmission to the environment.



Types of noise in sewage systems

- **airborne noise** – the source of noise is the air in the drain pipe, especially at the junctions of vertical and horizontal pipe sections; the sewage flowing in the pipes produces a sound and thus transmits vibrations to the surrounding air in the form of pressure or negative pressure waves

- **material noise (structure-borne noise)** – the source of noise is the pipeline vibration transmitted through the mounting components (e.g. clamping rings) to the wall and floor structure and, consequently, to all adjacent rooms - perceived as an annoying acoustic wave that is harmful to health



For the noise protection to be effective, the levels of the above types of noise should be reduced. With the application of the Ultra dB soundproof indoor sewage system, the subjective perceived level of noise is considerably reduced as compared to the noise coming from standard drain pipes. Thanks to the use of the double-layer pipe wall, the airborne noise is considerably attenuated and it becomes almost inaudible.

In this case, it is important to design the system fixing the pipes and fittings to the building structure in such a manner as to ensure that the transmission of acoustic resonance to the building structure walls is as small as possible. The transmission of vibrations by solids to the wall adjacent to the system is reduced to a large extent by the fixing system that attenuates noise. Also, the way the pipelines are laid has a significant impact not only on noise generation but also on noise reduction. If possible, the sewage draining direction should be changed in stages, and never abruptly.

Bearing in mind all possible noise protection measures, follow the recommendations below:

- install the sewage system on the wall with basis weight of at least 220 kg/m2, acc. to DIN 4109, e.g. on the front wall (on the inside of the external wall),

- avoid installing the system next to the walls that require sound insulation

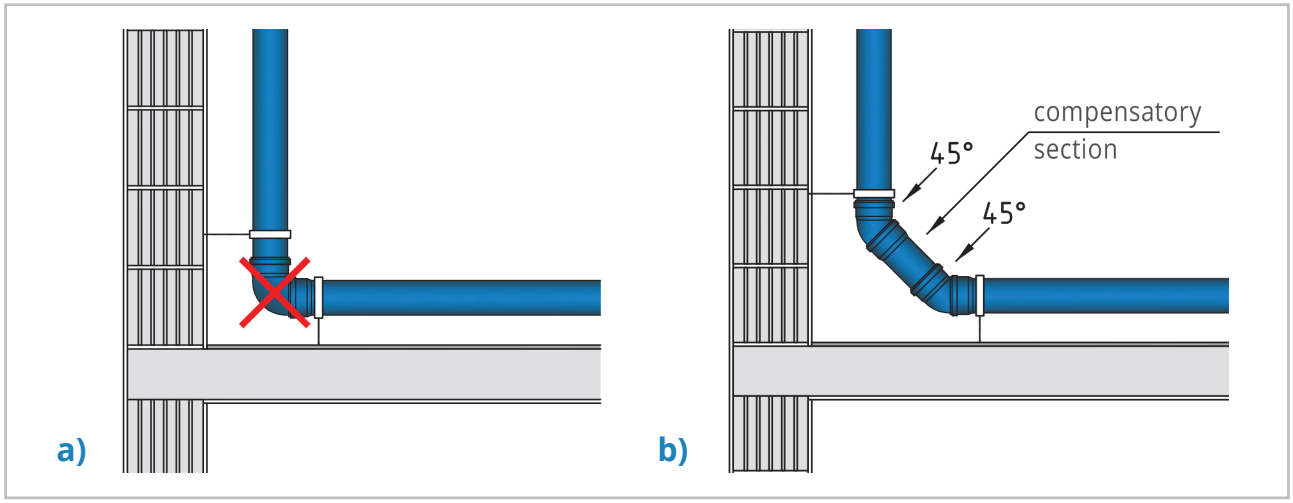


Fig. 2. **Transition of waste stack to horizontal branch drain**

a) - wrong - bend
b) - correct - two bends

- use soundproof fittings of Group I, with noise level up to 20 dB(A),
- use clamping rings with seals suppressing structure-borne noise,
- insulate the sewers passing through walls and floors,
- to make a transition from a waste stack to a horizontal section or change the pipeline direction, use 2 bends (max. 45°) and install a compensatory (stabilising) section between the bends, as shown in Fig. 2,
- when installing the system with the use of special BISMAT 1000 clamping rings, keep the required distances between the rings - Fig. 3, install BISMAT 1000 clamping rings

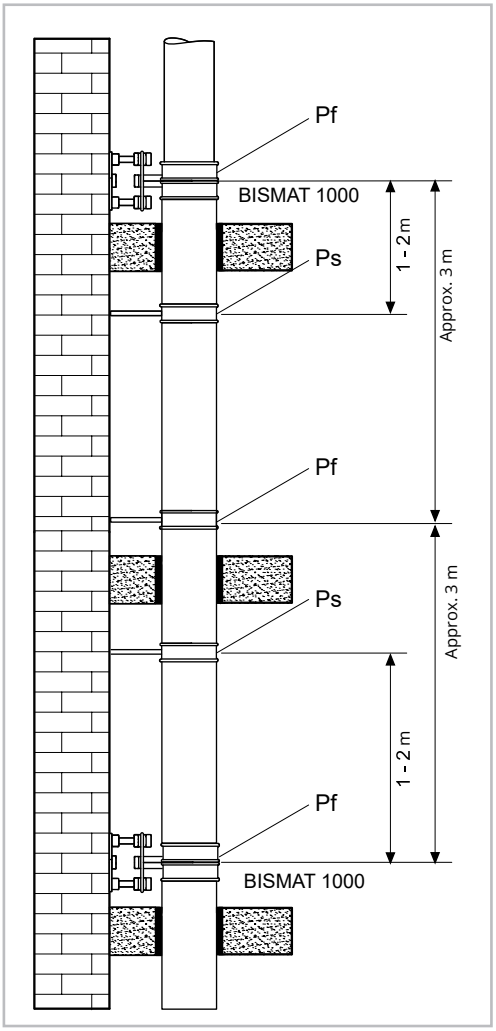


Fig. 3. **Fixing of waste stacks**

Pf - fixed point – Bismat 1000 clamping ring or standard clamping ring with a rubber insert
Ps - sliding point – standard clamping ring with a rubber insert.

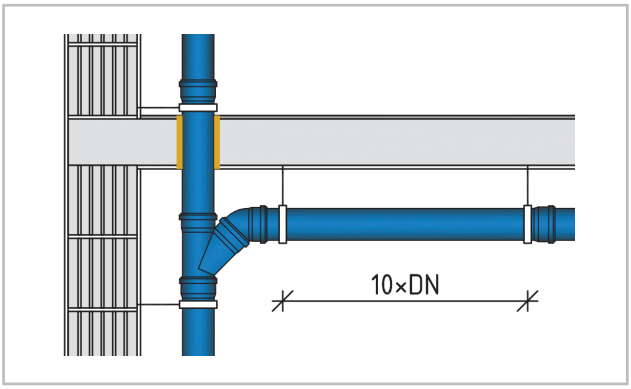


Fig. 4 Distance between clamping rings on horizontal branch

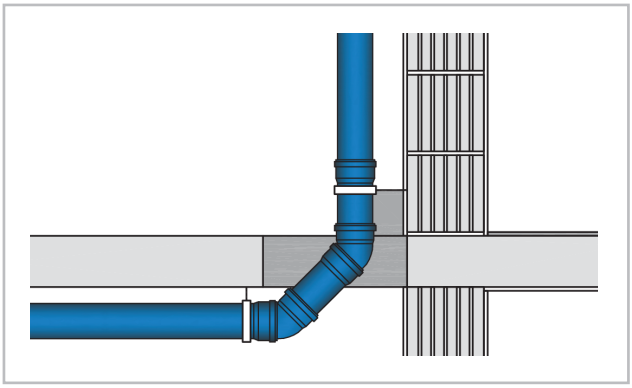


Fig. 5. Protection of lower part of waste stack

- on waste stacks as fixed points at least every second storey; install other fixed and sliding points using standard clamping rings with a rubber insert,
- keep a distance of about 10 x DN between clamping rings on horizontal branch; Fig. 4,
- in buildings more than three storeys in height, protect the waste stack against collapsing using additional holders, brackets and concrete, Fig. 5.

SEWAGE SYSTEM DESIGN

In order to determine the arrangement of sewers, location of waste stacks and flow capacity of the system, one should first analyse the profile and acoustic map of the designed building. Having determined the functions of individual rooms and permissible level of noise in the rooms, the designer can define the acoustic standard of the rooms. The next step for the designer is to perform hydraulic calculations and choose the suitable ventilation method.

The designer should prepare a sewage system design including a complete system of pipes, fittings and clamping rings to ensure a high degree of intra-system noise reduction and cost-effectiveness of the investment. A properly designed and constructed sewage system ensures safe and odourless drainage of sewage from the building as well as it can function reliably for a long time.

Complete sewage systems in all types of buildings can be made of polypropylene pipes with socket joints.
In general, the sewage system consists of 3 parts: horizontal fixture branches, waste stacks and outflow pipes. Sewage flow rates in individual sections of the system must be calculated to ensure correct sizing of the system sections.