4 Sound insulation

4.1 Noise in a soil & waste system

Noise is all around us all the time. In modern urbanised life there are few places left to enjoy the comfort of silence. In many building constructions like multi-storey apartment blocks, hospitals or luxurious spas, the sound of the sanitary and drainage systems have become a significant source of noise. Modern standards require the noise to stay within acceptable limits for everyday use.

Every object in motion makes noise transmitting its vibrations to the surrounding air as pressure waves. There are two types of noise in soil & waste systems:

Airborne noise
This is sound that travels through the air from its source. The source causes the air to vibrate. Airborne noise can pass through structures and is reduced by using absorbent materials.

Structure borne noise
This is sound that first occurs through a solid structure generated from a vibrating source or impact event. The vibrations pass through the structure and reach the human ear as airborne noise at different locations within the building. The building structure acts as an acoustic bridge. Structure borne noise is reduced by using soft material to acoustically uncouple the vibrating source or impact event.

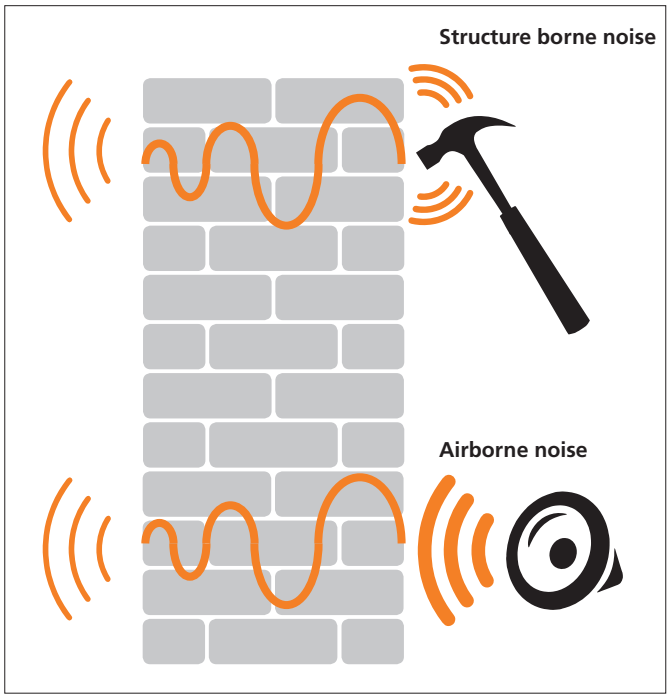


Illustration 4.1

4.2 Sound insulation requirements

The acceptable noise level that a human being can be exposed to while performing everyday activities and relaxing is described as 'the threshold noise level value'. According to the valid regulations, there are two categories of noise tests:

Category I: Noise measured outdoors, for instance a neighbouring area and open spaces. According to European Directive No.2002/49/EC (generally speaking) the acceptable noise in a built-up area during daytime is 60 dB and 50 dB at night (between 10.00 pm and 6.00 am).

Category II: Noise measured indoors. 'Building acoustics. Protection of rooms inside buildings against noise. Acceptable indoor sound level values'.

Table 4.1 presents several examples of the acceptable sound level in rooms designed for everyday stay.

	Acceptable average noise level	
Kind of room	**day**	**night**
Rooms designed for mental activities that require intense concentration	30 dB	-
Rooms in 3-star or below 3-star hotels	40 dB	30 dB
Accommodation in residential buildings, boarding schools, children's homes, old people's homes, 4 and more star hotels	35 dB	25 dB
Rooms in intensive medical care units	25 dB	25 dB
Patient's rooms in hospitals and sanatoriums except rooms in intensive care units	30 dB	25 dB
Kitchens and sanitary rooms in residential buildings	40 dB	40 dB

Table 4.1

Sound insulation

4.3 Sound reduction with Akatherm dBlue

Noise in a soil & waste system is caused by waste water flowing inside a drainage pipe system. The waste water is turbulent and causes noise as well as vibrations in the pipe structure.

The vibrations are emitted directly from the pipe surface as airborne noise and as Structure borne noise to the wall through the fixing system. Akatherm dBlue has been designed to reduce both airborne and Structure borne noise.

How Akatherm dBlue reduces airborne noise
Airborne noise is reduced by using absorbent materials. The plastic material PP-MD, used in Akatherm dBlue is made out of a special formula adding sound-dampening mineral fillers with increased weight to maximise the absorbance of airborne sound waves. Triple layer pipe and rubber ring joints further enhance the acoustic performance of the system thus reducing acoustic vibrations.

How Akatherm dBlue reduces Structure borne noise
Structure borne noise is reduced by using soft material to acoustically uncouple the vibrating source or impact event. The dBlue metal brackets with rubber lining have a special rubber lining designed to best uncouple any vibrations from the pipe system.

The combination of all these features is what makes Akatherm dBlue a system that takes reduction of soil & waste noise to the next level.

Non-system specific installation practice will also benefit a lower noise level, like to install the pipe systems to the heaviest wall and to properly insulate a pipe section passing through building slabs and other structural barriers.

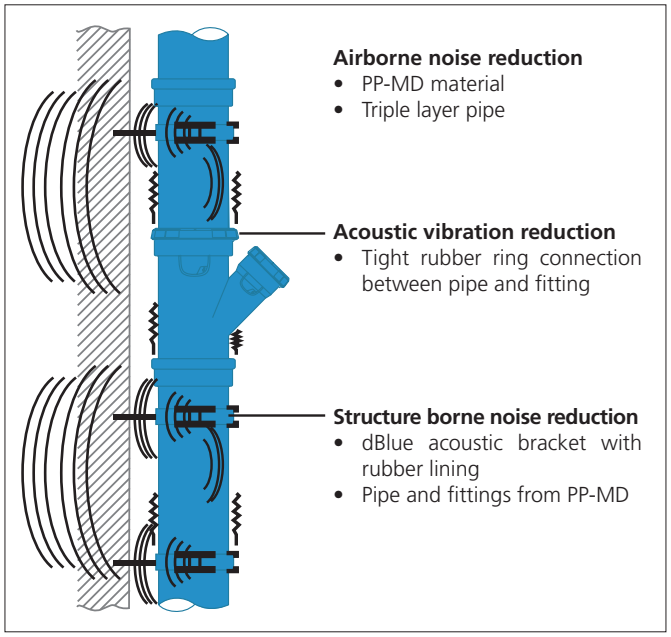


Illustration 4.2

4.4 Acoustic testing

Test and measurements of noise emitted by the Akatherm dBlue system were conducted according to the European standard EN 14366 'Laboratory measurement of noise from waste water installations' and to the requirements set by the Building Code of Australia (BCA).

4.4.1 Testing according to EN 14366
Illustration 4.3 presents noise measurement and its methodology inside the dBlue system. The test stand, diameters and types of components used are described in the standard. Water introduced into the system on the TF(f) floor and received on the C floor was the tested medium. Acoustic tests are conducted in rooms MR(b) and MR(f) and the least favourable boundary conditions are assumed in the comparative analysis with other soil & waste systems or other sources of noise. The boundary conditions are as follows:

- measured flow in the soil and waste system Q = 0,5/1/2/4 l/s
- pipe diameter DN = 110 mm (most frequent diameter)
- measurement taken on the lowest floor, in room MR(b) - room marked red in the diagram: safety standards determine and require the lowest noise levels at this point (room neighbouring the soil stack)
- partition wall - weight: 220 kg/m^2

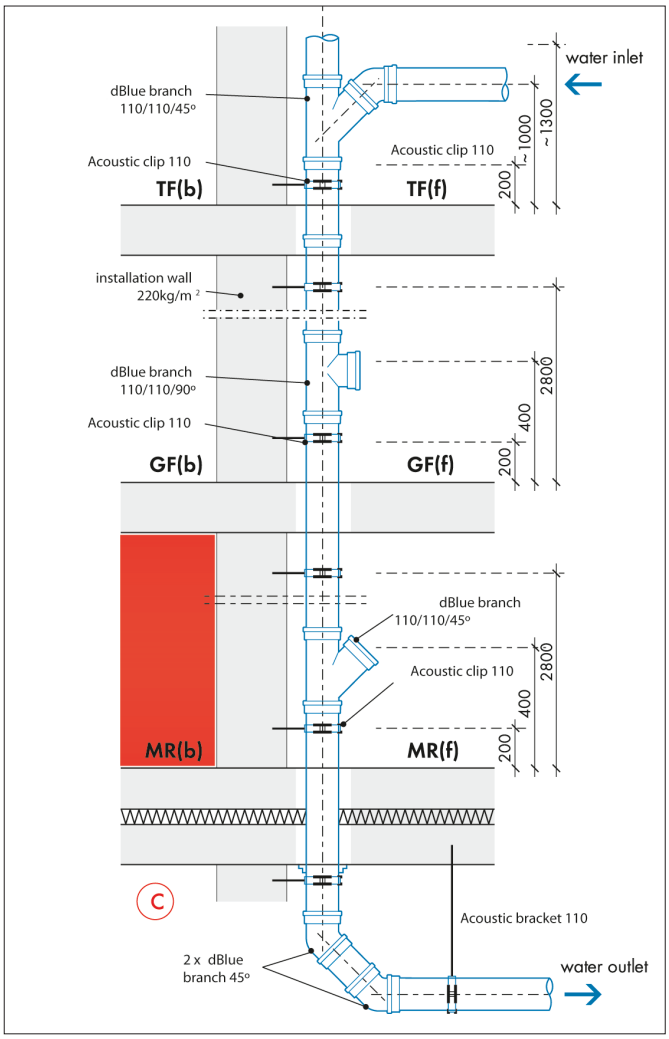
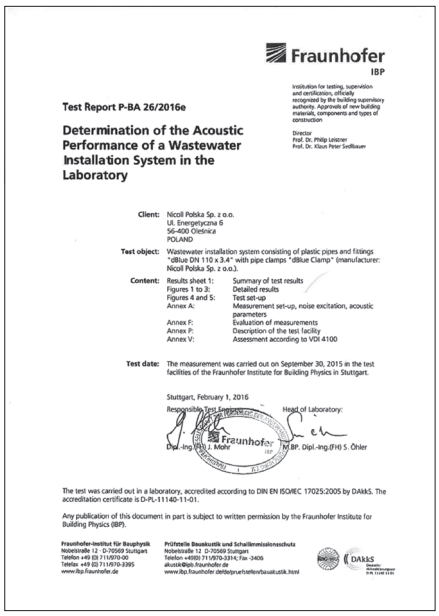


Illustration 4.3

The Akatherm dBlue system is certified at a noise transmission level of 18 dB at a water flow of 4 l/s using dBlue metal brackets with rubber lining. All tests were carried out in the accredited Institute for Building Physics Fraunhofer in Germany. Results are available in test report P-BA 26/2016e.



Fraunhofer IBP

Test Report P-BA 26/2016e

Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory

Client: Nicoll Polska Sp. z o.o.
Ul. Energetyczna 6
56-400 Oleśnica
POLAND

Test object: Wastewater installation system consisting of plastic pipes and fittings "dBlue DN 110 x 3.4" with pipe clamps "dBlue Clamp" (manufacturer: Nicoll Polska Sp. z o.o.).

Content:
Results sheet 1: Summary of test results
Figures 1 to 3: Detailed results
Figures 4 and 5: Test set-up
Annex A: Measurement set-up, noise excitation, acoustic parameters
Annex F: Evaluation of measurements
Annex P: Description of the test facility
Annex V: Assessment according to VDI 4100

Test date: The measurement was carried out on September 30, 2015 in the test facilities of the Fraunhofer Institute for Building Physics in Stuttgart.

Stuttgart, February 1, 2016

Responsible Test Engineer: Dipl.-Ing. (FH) J. Mohr
Head of Laboratory: M.BP. Dipl.-Ing.(FH) S. Öhler

The test was carried out in a laboratory, accredited according to DIN EN ISO/IEC 17025:2005 by DAkkS. The accreditation certificate is D-PL-11140-11-01.

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Illustration 4.4

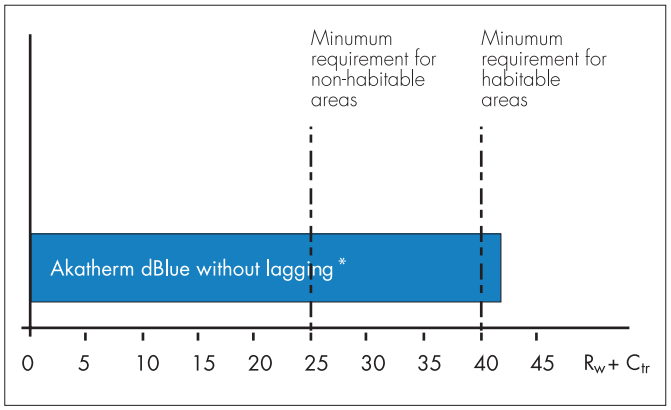
4.4.2 Testing according to Building Code of Australia

The National Construction Code (NCC) Comprises the Building Code of Australia (BCA). BCA Volume One Part F5.6 outlines the requirements for sound insulation.

"If a duct, soil, waste or water supply pipe, including a duct or pipe that is located in a wall or floor cavity, serves or passes through more than one sole-occupancy unit, the duct or pipe must be separated from the rooms of any sole occupancy unit by construction with an R_w+C_{tr} (airborne) not less than:

I. 40 if the adjacent room is a habitable room (other than a kitchen; or
II. 25 if the adjacent room is a kitchen or non-habitable room

Akatherm dBlue has been independently tested by the commonwealth Scientific and industrial research organisation (CSIRO) and meets the required R_w+C_{tr} (airborne) benchmarks without the need for lagging.

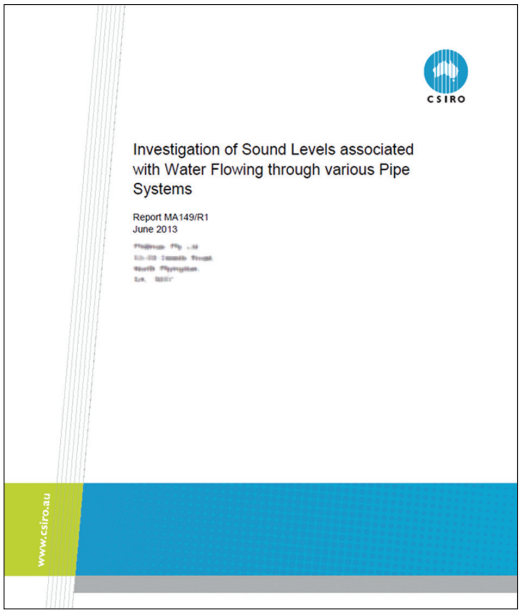


** required Rw+Ctr 40 results are extrapolated based on the Rw+Ctr 25 results.*

Illustration 4.5

No acoustic lagging required!
Akatherm dBlue does not require any additional acoustic lagging, offering many significant advantages:
- No lagging material required
- No lagging installation time
- Less scheduling of companies
- Consistent acoustic results during installation lifetime
- No unverified lagging materials
- Faster and easier inspection
- Faster and easier maintenance

CSIRO is Australia's national science agency, and is one of the largest and most diverse scientific institution in the world with more than 50 sites throughout Australia and overseas. The test results are available in test report MA149/R.



CSIRO

Investigation of Sound Levels associated with Water Flowing through various Pipe Systems

Report MA149/R1
June 2013

www.csiro.au

Illustration 4.6