

ENGINEERING SOLUTIONS

# SOUNDPROOFING STRUCTURES

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**ENGINEERING SOLUTIONS**  
**CODE: ASP-402EN-1018**

Acoustic Group Company presents the fourth updated version of the album «Soundproofing structures», code ASP-402EN-1018, released in October 2018.

The album presents typical engineering solutions for sound and vibration isolation structures with maximum acoustic efficiency. The proposed structures were successfully tested in practice and confirmed their high acoustic performance

The album of engineering solutions was approved by the Research Institute of Building Physics of the Russian Academy of Architecture and Structures Sciences and recommended for use in structures, restructures and restoration of buildings and structures of all types.



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 «Научно-исследовательский институт строительной физики  
 Российской академии архитектуры и строительных наук»  
 (НИИФ РААСН)  
 Research Institute of Building Physics  
 Russian Academy of Architecture and Construction Sciences  
 (NIISF RAACS)

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Вх. \_\_\_\_\_

Генеральному директору  
 ООО «Акустик Групп»  
 А.Г. Боганику

В соответствии с Вашим запросом, лабораторией акустики и акустических материалов НИИФ РААСН была выполнена техническая экспертиза типовых инженерных решений звукоизолирующих ограждающих конструкций, представленных в разработанном и выпущенном в 2015 году компанией ООО «Акустик Групп» специализированном пособии для инженеров и проектировщиков – альбоме инженерных решений «Звукоизолирующие конструкции», шифр ASP-401-0415.

В альбоме представлены инженерно-технические решения различных типов звукоизолирующих ограждающих конструкций, применяемых в строительстве, с указанием наименования их комплектующих, типоразмеров, а также акустической эффективности. Предлагаемые конструкции содержат в себе специализированные материалы, успешно прошедшие сертификационные испытания по системе «Виброакустика».

Таким образом, предложенные в альбоме типовые инженерно-технические решения могут быть рекомендованы для применения при строительстве, реконструкции и реставрации зданий и сооружений всех типов с целью увеличения звукоизоляции их ограждающих конструкций и борьбы с проникающими и внутренними шумами и вибрациями.

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# 1. SOUNDPROOF PARTITION WALLS

## 1.1 Soundproof properties of partition walls

Structures of soundproof framed partition walls are used in construction and renovation of buildings of any type and purpose. They are characterized by high values of insulation of air noise and low level of radiated structural noise. All these partition walls meet the requirements of SP 51.13330.2011 - updated SNiP-23-03-2003 «Acoustic protection».

Table 1.1 Soundproof properties of partition walls based on the measurements made by the Acoustics Laboratory of NNGASU, Nizhny Novgorod.

No.	Structures description	Thickness, mm	Weighted sound reduction index $R_w$ , dB	Maximum structures height, m	Diagram No.
1	Partition on a single frame 50 mm	108	56	4.5 <sup>1</sup>	1.1.1-1.16; 1.6.1
2	Partition on a single frame 100 mm	158	59	7 <sup>1</sup>	1.2.1-1.2.6; 1.6.2
3	Partition on Vibroflex-Wave single frame 100 mm	158	61	7 <sup>1</sup>	1.3.1-1.3.6
4	Partition on a double (independent) frame with a double C-stud 2x50 mm on separate bases of soundproof floors	168	65	3 <sup>2</sup>	1.4.1-1.4.5; 1.6.3
5	Partition on a double (independent) frame 2x100 mm on separate bases of soundproof floors	268	68	4.25 <sup>2</sup>	1.5.1-1.5.4; 1.6.4

## 1.2 Installation technology of soundproof partition walls

1.2.1 Installation of soundproof framed partition walls is performed in accordance with Gyproc technologies provided the following features:

- The elements of soundproof partition walls are abutted to the insulating structures through a tape made of Vibrostek material, the joint is filled with Vibrosil vibroacoustic sealant from the outside.
- Frames of double partition walls are not abutted with each other.
- The internal space of the frame is filled with specialized Shumanet-BM sound-absorbing slabs or Shumanet-sk-ECO.
- The frame on each side is lined with sheets of Soundline-dB acoustic triplex 16.5 mm and Gyproc AKU-Line gypsum cardboard sheets 12.5 mm.

1.2.2 Gaps and through-holes shall be eliminated in the structures of soundproof framed partition walls when installing.

1.2.3 The elements specified in Tables 8.1, 8.3 - 8.5, 8.7 - 8.8 are used when installing the framed partition structures

# 2. FRAMELESS SOUNDPROOF PANEL SYSTEMS ZIPS

## 2.1 Soundproof properties of frameless linings of walls and ceilings

The structures of frameless soundproof linings (ZIPS system) are used in construction and renovation of buildings of any type and purpose for additional sound insulation of single-layer massive walls and ceilings. They have high values of weighted sound reduction index improvement of air noise and low level of radiated structural noise.

Table 2.1 Soundproof properties of the panel system ZIPS based on the measurements made by the acoustic laboratories NIISF RAACS, Moscow and NNGASU\*\*, Nizhny Novgorod

№	Structures description	Thickness, mm	Weighted sound reduction index improvement $\Delta R_w^*$ , dB	Diagram No.
1	ZIPS-Vector soundproof system mounted on the wall	53	9-11	2.1.1 - 2.1.5; 2.2.1 - 2.2.3
2	ZIPS-III-Ultra soundproof system mounted on the wall	55	11-13**	2.1.1 - 2.1.5;
3	ZIPS-Module soundproof system mounted on the wall	83	12-14	2.1.1 - 2.1.5; 2.5.1 - 2.5.3
4	ZIPS-Cinema soundproof system mounted on the wall	133	16-18	2.1.1 - 2.1.5; 2.3.1 - 2.3.3

\* - Measurements are performed in the absence of indirect noise transmission paths, on a basic brick wall with an index of air noise reduction  $R_w = 50$  dB. All ZIPS systems rest on the floor **without soundproof floor structures**.

## 2.2 Installation technology of ZIPS system

- 2.2.1. ZIPS soundproof system consists of sandwich panels with a thickness of 40, 70 or 120 mm, Gyproc AKU-Line finishing sheets 12.5 mm thick and a set of fasteners.
- 2.2.2 The elements specified in Tables 8.4 - 8.8 are used in installation of ZIPS soundproof systems.
- 2.2.3 The installation procedure for the soundproof system is as follows: sandwich panels are mounted to the insulated surface. After installation of sandwich panels, the resulting surface without an additional frame is covered with Gyproc AKU-Line finishing sheets with a thickness of 12.5 mm.
- 2.2.4 Sandwich panels of additional sound reduction are fixed with screws to the isolated surface only through the available vibration-insulation fixing point in the panels. Screws with plastic dowels  $\varnothing 8$  mm are used for mounting the panels. The complete set includes universal dowel for monolithic and non-uniform (hollow) walls and floors.



- 2.2.5 When mounted on a ceiling, the sandwich panels are additionally secured with  $\varnothing 8$  mm metal anchor screws through two central fastening points of eight available. In the same manner (using central anchor points and metal anchors) ZIPS-CINEMA system panels are mounted to the walls. ZIPS- VECTOR, ZIPS-III-Ultra and ZIPS-MODULE sandwich panels are mounted to the walls only on plastic dowels. A special cone washer is used between the screw head and the vibration-insulation attachment point: for universal screws -  $\varnothing 5$  mm (M5) in diameter and for metal nail screws -  $\varnothing 8$  mm (M8) in diameter.
- 2.2.6 The sandwich panels are joined together by means of tongue-in-groove. The ends of sandwich panels are attached/supported with two layers of an elastic tape made of Vibrostek-M material to all adjacent insulating structures (walls, floor and ceiling). Tapes are glued to the side walls and ceiling with Vibrosil sealant. Tapes are not adhered to the floor surface. The finishing lining layer of Gyproc AKU-Line sheets shall also be adjacent to all adjoining surfaces (floor, walls, ceiling) through two layers of Vibrostek-M elastic tape. For this purpose the width of the elastic tape should be 30 mm larger than the thickness of the sandwich panel when installing panels.
- 2.2.7 It is recommended to mount ZIPS sandwich panels from left to right, from bottom to top (see diagram 2.1.1). Two ridges - left and bottom - shall be cut for the first left bottom panel, and only the left ridge shall be cut for the second left upper panel.
- 2.2.8 After the panel is attached to the wall or attached to the ceiling, the holes directly through the available vibration-insulation fastening points in the panel shall be made in the wall or slab with a long masonry drill  $\varnothing 8$  mm. The depth of the holes should be not less than 50 mm.
- 2.2.9 For all types of ZIPS panels mounted to the floor, as well as for installation of ZIPS-CINEMA panels to the walls, two central holes shall be made with  $\varnothing 8$  mm drill and 10 mm deep greater than the calculated landing depth of the metal anchor screw.
- 2.2.10 Without removing ZIPS panel from the surface of the wall/floor, a plastic dowel is inserted into the hole made, to which a screw with a washer is screwed in several turns (not allowing expansion of the dowel). After the dowel enters the drilled hole, it is clinched to the stop with a hammer, and the screw is tighten using a screwdriver provided M5 cone washer attached to its head.
- 2.2.11 An anchor dowel-screw used to mount the ceiling panels is inserted through the ZIPS panel into a drilled hole  $\varnothing 8$  mm and screwed with a clamp using a screwdriver. In this case, a special M8 cone washer is also installed under the screw head.
- 2.2.12 **IMPORTANT!** The heads of screws or anchor screws shall be recessed, but not more than 1 - 2 mm from the level of the panel front side plane.
- 2.2.13 If the wall panel is completely placed on the insulated surface, the sandwich panels are mounted using only six fixing points, the central fixing points are not used. If, according to the dimensions of the insulated surface, the wall panel is to be cut - all available fixing points shall be used. All modifications of ZIPS panels mounted to the floor, as well as ZIPS-CINEMA panels for wall mounting, in any case, are fixed with all eight fixing points, and the metal dowel screws must be used in the two central points.
- 2.2.14 There are two types of anchor screws - standard (the length of which is 50 mm larger than the thickness of the sandwich panel) and shortened in the kit of fasteners for installation of sandwich panels to the ceiling. The shortened anchor screws are used for mounting on hollow slabs of separate floors.
- 2.2.15 The marked panels are cut with a jigsaw.
- 2.2.16 Tongue-and-groove joints of sandwich panels are fastened together with self-tapping screws for gypsum cardboard 30 mm long. The distance between the screws is 150 - 200 mm.
- 2.2.17 After the sandwich panels have been mounted, the joints between the panels and along the perimeter of the panels adjoining to the side walls, the floor and the ceiling shall be sealed with vibroacoustic sealant «Vibrosil». Non-specialized hardening fillers and sealants for these purposes are strictly prohibited!
- 2.2.18 Gyproc AKU-Line sheets with a thickness of 12.5 mm shall be fixed directly to the sandwich panels upon completion of their installation.
- 2.2.19 **IMPORTANT!** When installing Gyproc AKU-Line sheets, 40 mm long self-tapping screws, which are used for fixation of the sheets to the sandwich panels should not be placed on the vibration-insulation points of the sandwich panels. Failure to comply with this requirement can lead to a significant reduction in the sound insulation level of ZIPS panel system. In this case, vertical pitch of the self-tapping screws should be 200 mm, and horizontal pitch - 400 mm.

## 3. SOUNDPROOF FRAMED LINING

### 3.1. Soundproof properties of framed lining

The structures of soundproof framed linings are used in construction and renovation of buildings of any type and purpose for additional sound reduction of single-layer massive walls. They have high values of weighted sound reduction index, improvement in air noise and low level of radiated structural noise.

Table 3.1 Soundproof properties of framed linings based on the measurements made by the acoustic laboratory NNGASU, Nizhny Novgorod

No	Structures description	Thickness, mm	Weighted sound reduction index improvement $\Delta R_w^{**}$ , dB	Maximum structures height	Diagram No.
1	Lining on an independent frame 50 mm	90	15-17	2.61	3.1.1-3.1.3
2	Lining on an independent double frame 50 mm	90	15-17	31	3.2.1 - 3.2.4
3	Vibroflex-Wave lining on an independent frame 100 mm	140	16-18	41	3.3.1 - 3.3.3
4.	Vibroflex-KS lining on the frame PP 60/27 with fastening to the wall on supports	110	15-17	12	3.5.1 - 3.5.3
5.	Vibroflex-connect PS lining on the frame PP 60/27 with fastening to the wall on supports	90	14-16	8	3.4.1 - 3.4.3
<p>** - Measurements are performed in the absence of indirect noise transmission paths, on a basic brick wall with a weighted sound reduction index <math>R_w = 50</math> dB. All the structures rest on the soundproof floor structures.</p>					
<p>Data on the maximum structures height are indicated for the C- stud standard pitch - 600mm.  <sup>1</sup> - When the pitch is reduced to 400 mm, the maximum structures height is increased by 0.5 m, and when the pitch is reduced to 300 mm, the maximum height is increased by 1 m compared to the standard height.</p>					

### 3.2 Installation technology of soundproof framed linings

#### 3.2.1 Installation of soundproof framed lining is performed in accordance with Gyproc technologies provided the following features:

- The elements of soundproof lining are abutted to the insulating structures exclusively through the tapes made of Vibrostek material, the joint is filled with Vibrosil vibroacoustic sealant from the outside.
- When installing the framed lining with Vibroflex-connect-PS and Vibroflex-KS anchorages, these supports shall be used from the following calculation: fasteners shall be spaced less than or equal to 1.5m. For studs less than or equal to 3 m, no less

than 3 fasteners shall be used. Fasteners are mounted at a distance of no more than 150 mm from the stud edge.

- To mechanically reinforce the lining frame of a 50 mm thick, a «double» version of fixing PS 50/40 for C-studs is used, which are fastened together by means of LN screws.
- The internal space of the frame is filled with Shumanet-BM or Shumanet-sk-ECO specialized sound-absorbing slabs.
- The lining frame is lined with sheets of Soundline-db acoustic triplex (inner layer) and Gyproc AKU-Line 12.5 mm (outer layer).

3.2.2 The elements specified in Tables 8.1 - 8.5, 8.7 - 8.8 are used when installing structures of soundproof framed lining.

## 4. SOUNDPROOF FRAMED SUSPENDED CEILING SYSTEMS

### 4.1 Soundproof properties of framed suspended ceiling systems

The structures of soundproof suspended ceilings are used in building construction and renovation of any type and purpose for additional sound reduction of floors. They have high values of additional air noise reduction and low level of radiated structural noise.

Table 4.1 Soundproof properties of suspended ceilings based on the measurements made by the Acoustic Measurement Laboratory of Acoustic Group

No.	Structures description	Thickness, mm	Weighted sound reduction index improvement $\Delta R_w^{***}$ , dB	Diagram No.
1	Vibroflex-Connect PP suspended ceiling mounted on fasteners	115	17-19	4.1.1 - 4.1.2
2	Vibroflex-K15 suspended ceiling mounted on fasteners	130	19-21	4.2.1 - 4.2.2; 4.4.1
3	Suspended ceiling mounted on Vibroflex-K15 fasteners with extensions from PP 60/27	$\geq 200$	21-23	4.3.1 - 4.3.3
<p>*** - Measurements are performed in the absence of indirect noise transmission paths, on armoured floor with an weighted sound reduction index <math>R_w = 49</math> dB.</p>				

- The elements of suspended ceiling are abutted to the walls, columns and other vertical insulating structures without fastening through the tapes made of Vibrostek-M material. The joint is filled with Vibrosil vibroacoustic sealant on the side of the room.
- Vibroflex-K15, Vibroflex-Connect PP hangers with a pitch of 800-900 mm are used when installing a soundproof suspended ceiling. The maximum distance from the channel edge to the first hanger should not be more than 150 mm. The rated load per hanger is 15 kg.
- The main channels of the two-level frame are mounted in pitches of 600 mm, the pitch of perpendicular secondary channels is 400 mm (the pitch multiples of the format of Soundline-dB sheets and Gyproc AKU-Line).
- Extension for ceiling hanger is made of PP 60/27 channel and straight Gyproc hanger which is cut into two parts (diagram 4.3.2).
- The internal frame space is filled with Shumanet-BM or Shumanet-sk-ECO specialized acoustic wool slabs.
- The ceiling frame is lined with sheets of Soundline-dB acoustic triplex (inner layer) and Gyproc AKU-Line 12.5 mm (outer layer).

## 5. SOUNDPROOF FLOOR STRUCTURES

### 5.1 Soundproof properties of the floating floor structures

The structures of soundproof floating floors are used in construction and renovation of buildings of any type and purpose for insulating floor from impact noise and providing additional reduction of airborne noise. It is necessary to take into account the change in the thickness of the soundproof layer when the workloads on the base change in the process of designing the structures of floating floors.

Table 5.1 Soundproof properties of floating floor structures based on the measurements made by the acoustic laboratory NNGASU and Acoustic Group company1

No.	Structures description	Total thickness of soundproof floor structures, mm	Thickness of soundproof material, mm	Thickness of levelling strainer, mm	Weighted normalized impact sound pressure level reduction, $\Delta L_{n,w}$ , dB	Weighted sound reduction index improvement $\Delta R_w$ , dB	Diagram No.
1	Parquet board 15 mm on Akuflex material		4	-	17	-	5.2.1-5.2.4; 5.3.4

CONTINUED Table 5.1 Soundproof properties of floating floor structures based on the measurements made by the acoustic laboratory NNGASU and Acoustic Group company								
2	Laminate 8 mm on Akuflex material			4	-	20	-	5.2.1-5.2.4; 5.3.4
3	Soundproof floor on Shumanet-100Combi material	65±5		5	60	25	-	5.1.1-5.1.4, 5.2.1; 5.2.3; 5.3.1-5.3.4; 5.6.3; 5.9.1
4	Soundproof floor on Shumanet-100Hydro material	65±5		5	60	24	-	5.1.1-5.1.4, 5.2.1; 5.2.3; 5.3.1-5.3.4; 5.6.3; 5.9.1
5	Soundproof floor with one layer of Shumostop S2/ K2 slab system	76±5		20	60	39	8-10 <sup>1</sup>	5.2.2; 5.4.1-5.4.4; 5.4.9 5.9.3
6	Soundproof floor with two layers of Shumostop S2/ K2 slab system	112±7		2x20	80	43	11-13 <sup>1</sup>	5.4.5 - 5.4.8; 5.4.9
7	Soundproof floor with one layer of Shumostop-K2 material	78±5		20	60	32	8-10 <sup>1</sup>	5.5.1 - 5.5.4
8	Soundproof floor with two layers of Shumostop-K2 material	96±5		2x20	60	34	10-12 <sup>1</sup>	5.2.3; 5.5.5-5.5.8
9	Shumoplast soundproof leveling mixture, 20 mm	80±5		20	60	28	7-9 <sup>1</sup>	5.2.4; 5.6.1-5.6.4; 5.9.2
10	ZIPS-POL Vector combined soundproof system	79±5		20		32 <sup>1</sup>	6 - 8 <sup>1</sup>	5.7.1 - 5.7.4; 5.7.9; 5.9.4
11	ZIPS-POL Module combined soundproof system	109±5		50		38 <sup>1</sup>	7 - 9 <sup>1</sup>	5.7.5 - 5.7.9; 5.9.4
12	Sylomer soundproof floor on joists and tapes	98±3		12		30 <sup>1</sup>	8 - 10 <sup>1</sup>	5.8.1-5.8.5

<sup>1</sup> - In-situ measurements with the presence of indirect noise transmission paths.

## 5.2 Technology of floating floor structures

The installation of soundproof floating floors structures is carried out in the following order:

### 5.2.1. With the help of Akuflex rolled soundproof underlayer under a finished floor covering:

- Akuflex material is rolled out and cut in accordance with the specified dimensions so as to cover the floor area completely not bringing the material in walls or columns.
- The material strips are laid «toe-to-toe» and pasted with scotch tape. Parquet board or laminate is laid on top directly on Akuflex underlayer. Plinth is fixed only to the walls (see diagram 5.2.2 - 5.2.4).

### 5.2.2. With the help of Shumanet-100Combi sound-waterproof material and Shumanet-100Hydro hydro-soundproof material:

- Before rolling out the strip of Shumanet-100Combi/Shumanet-100Hydro material, it is necessary to sweep the floor thoroughly in order to avoid debris between the base and the strips of material.
- Shumanet-100Combi/Shumanet-100Hydro material is rolled out and cut in accordance with the specified dimensions so as to cover the floor area completely bringing the material in walls or columns.
- The bituminous surface of the material should be facing upward, and the edges should be one on top of the other with overlapping. Therefore, each roll with one edge has a lap of bituminous waterproof layer with a width of 100 mm. Moreover, it is necessary to bring the edges of the material into walls or columns above the level of the screed to avoid rigid contact between the screed and other building structures. The material, if necessary, is fixed with a bituminous self-adhesive tape, or the bituminous lap is fixed to the wall using hot air gun to prevent shifting during the screed mounting. The joints between the material strips are also glued by softening the bitumen using a hot air gun. After the screed mounting completion, the edge of Shumanet-100Combi / Shumanet-100Hydro material is put on the wall (column) to a height of 100 mm.
- In places of doorways, corners, pipe outlets, internal utilities and other elements of the premises arrangement, it is necessary to provide wrapping (bypassing) with Shumanet-100Combi / Shumanet-100Hydro material of these elements. Shumanet-100Combi / Shumanet-100Hydro material is passed round the protruding element, fastened along the upper edge to the passed round element with a bitumen self-adhesive tape or using hot air gun.
- A cement-sand screed 60 mm thick is made of sand concrete of M-300 grade or ready-mixed concrete after laying Shumanet-100Combi / Shumanet-100Hydro spacing material.
- When making the screed, it is necessary to reinforce it with a metal mesh with a cell size of 50 x 50 mm and a rod diameter of 4 mm. The mesh should be located in the layer of screed not lower than 20 mm from its lower level and not above the middle line of the screed. The mesh is laid with overlapping joints of 100 mm, which are bonded by tying wire every 200 mm.

- The solution surface is leveled by means of a strip. In case of the large floor surface area, the leveling screed is performed by areas up to 30 m<sup>2</sup> with obligatory structures of expansion joints.

### 5.2.3. With the help of Shumostop S2/K2 slab system:

- Shumostop-K2 edge slabs are laid down to ensure the stability of the flooring underlay performed with Shumostop slabs around the perimeter of the room and also around the columns. Before you do the layout of Shumostop S2 slabs, you need to clean the floor thoroughly of the building debris.
- Shumostop-S2 and Shumostop-K2 soundproof slabs are laid down on the floor (see diagram 5.4.9.) “toe-to-toe” with no gap in accordance with the specified dimensions so as to cover the floor area completely. Shumostop-S2 material and Shumostop-K2 edge slabs can be laid down in 2 layers provided overlapping joints of the upper and lower layers of Shumostop-S2 in perpendicular directions. In this case, Shumostop-K2 edge slab of the second layer has a width of 250 mm (see diagrams 5.4.5 to 5.4.8).
- It is necessary to bring the edge tape into all walls along the perimeter of the room or column to the height of 30-40 mm above the floor level to avoid a rigid contact between the screed and other building structures. The edge tape can be made of Shumostop-K2 material in one layer or made of Vibrostek-M material. The edge tape shall be fixed with industrial glue.
- A separating layer of reinforced polyethylene membrane with a thickness of 200 µm is laid down on top of the layer of Shumostop-S2 and Shumostop-K2 soundproof slabs provided bringing the edges into all walls and columns. This is necessary to ensure that the solution does not fall on the fiberglass slabs and edge tape when the screed is installed. After the floor installation, the polyethylene membrane as well as excess edge tape shall be cut to the finished floor level.
- A cement-sand screed 60 mm thick for one layer of Shumostop slabs and 80 mm – for two layers is made of sand concrete of M-300 grade or ready-mixed concrete after laying the separating layer of polyethylene.
- When making the screed, it is necessary to reinforce it with a metal mesh with a cell size of 50 x 50 mm and a rod diameter of 4 mm.
- The mesh should be located in the layer of screed not lower than 20 mm from its lower level and not above the middle line of the screed. The mesh is laid with overlapping joints of 100 mm, which are bonded by tying wire every 200 mm.
- The solution surface is leveled by means of a strip. In case of the large floor surface area, the leveling screed is performed by areas up to 30 m<sup>2</sup> with obligatory structures of expansion joints. Vibrostek-M tape (see diagrams 5.4.1, 5.4.5, 5.4.9) shall be used at the expansion joints to exclude edge effects.

### 5.2.4. With the help of Shumostop-K2 slabs:

- Before laying out Shumostop-K2 slabs, it is necessary to clean the floor thoroughly of building debris.
- Shumostop-K2 soundproof slabs are laid down on the floor “toe-to-toe” with no gap in accordance with the specified dimensions so as to cover the floor area completely.

Shumostop-K2 material can be laid down in 2 layers provided overlapping joints of the upper and lower layers in perpendicular directions.

- It is necessary to bring the edge tape into all walls along the perimeter of the room or column to the height of 30-40 mm above the floor level to avoid a rigid contact between the screed and other building structures. The edge tape can be made of Shumostop-K2 material in one layer or made of Vibrostek-M material. The edge tape shall be fixed with industrial glue.
- A separating layer of reinforced polyethylene membrane with a thickness of 200 µm is laid down on top of the layer of Shumostop-K2 soundproof slabs provided bringing the edges into all walls and columns. This is necessary to ensure that the solution does not fall on the fiberglass slabs and edge tape when the screed is installed. After the floor installation, the polyethylene membrane as well as excess edge tape shall be cut to the finished floor level.
- A cement-sand screed 60 mm thick is made of sand concrete of M-300 grade or ready-mixed concrete after laying the separating layer of polyethylene.
- When making the screed, it is necessary to reinforce it with a metal mesh with a cell size of 50 x 50 mm and a rod diameter of 4 mm.
- The mesh should be located in the layer of screed not lower than 20 mm from its lower level and not above the middle line of the screed. The mesh is laid with overlapping joints of 100 mm, which are bonded by tying wire every 200 mm.
- The solution surface is leveled by means of a strip. In case of the large floor surface area, the leveling screed is performed by areas up to 30 m<sup>2</sup> with obligatory structures of expansion joints. Vibrostek-M tape (see diagrams 5.5.1, 5.5.5) shall be used at the expansion joints to exclude edge effects.

#### 5.2.5. With the help of Shumoplast leveling mixture:

- Before using the soundproof leveling Shumoplast mixture it is necessary to make sure that the local floor roughness and the structures debris size do not exceed 10 mm.
- A layer of Shumoplast-grunt primer with a height slightly greater than the height of the leveling screed is applied on the walls and columns around the perimeter of the room with a comb.
- Then Shumoplast mixture using the polyurethane float is applied to the walls and columns to the places treated with primer to a thickness of about 20 mm.
- Shumanet-100Combi / Shumanet-100Hydro materials (diagram 5.6.3) or Shumostop-K2 (diagram 5.6.4) are allowed as the edge layer around the perimeter of the room and around the columns. These materials are also brought into walls and columns a little higher than the height of the leveling screed. In this case, Shumostop-K2 slabs should be covered with a layer of polyethylene membrane to prevent contact with the screed.
- After processing the perimeter, Shumoplast mixture is poured onto the floor and compacted to a thickness of about 20 mm using polyurethane «float».
- A mixture of 20 mm thick is completely polymerized after 48 hours at a temperature of not less than 15°C, and the reinforced cement-sand screed made of M-300 sand concrete or 60 mm ready-mixed concrete shall be made directly on it. It is recommended

to use polyethylene membrane on top of which then the screed is mounted to protect the dried Shumoplast mixture in places of high passability (staircases, entrance lobbies) up to the moment of the leveling screed mounting.

- When making the screed, it is necessary to reinforce it with a metal mesh with a cell size of 50 x 50 mm and a rod diameter of 4 mm. The mesh should be located in the layer of screed not lower than 20 mm from its lower level and not above the middle line of the screed. The mesh is laid with overlapping joints of 100 mm, which are bonded by tying wire every 200 mm.
- The solution surface is leveled by means of a strip. In case of the large floor surface area, the leveling screed is performed by areas up to 30 m<sup>2</sup> with obligatory structures of expansion joints. Shumanet-100Combi / Shumanet-100Hydro rolled material (see diagrams 5.6.1) shall be used at the expansion joints to exclude edge effects.

#### 5.2.6. With the help of ZIPS-POL combined structures:

- ZIPS-POL soundproof system consists of sandwich panels with a thickness of 45 mm (Vector) or 75 mm (Module), a layer of Soundline-dB acoustic triplex with a thickness of 16.5 mm and a layer of plywood 18 mm.
- Installation of ZIPS-POL structures shall be made on a previously leveled base, which, after drying of the leveling screed, must be cleaned of the building debris.
- The panels are mounted on the floor in accordance with the diagram 5.7.9 by laying down the panels on the floor and fixing them together using tongue-in-groove and screws to the gypsum cardboard with a length of 30 mm and with a pitch of 50 - 200 mm.
- The ends of the sandwich panels are adjoined to the side surfaces (walls, columns and doorsteps) through two layers of an elastic tape made of Vibrostek-M material. The tape is pre-glued to the walls with Vibrosil sealant. The tape height shall be such that it also adheres to Soundline-dB sheets and plywood - i.e. 50 mm above the level of mounted ZIPS-POL panels.
- Installation of sandwich panels ZIPS-POL is recommended to carry out in rows, from left to right from any corner of the room (for diagram 5.7.9 - from the upper left corner). Two ridges from the first panel of the first row are cut off - the left and upper ones, and only the left ridge is cut off from the second panel of the same row.
- The marked panels are cut with a jigsaw. Cut panels less than 300 mm in length shall not be used. To prevent the occurrence of such cases, a preliminary layout of the room should be made. If necessary, the next row shall be start with panels cut to a certain size. For this reason, when calculating the amount of material, it is required to provide 10% of the margin.
- The cut edges of ZIPS-POL panels adjacent to the walls and columns shall be additionally supported by the elastic elements S-Vector and S-Module according to the diagram 5.7.9. These elements are a part of ZIPS-POL panel structures and can be taken from its scraps or ordered additionally. When mounting S-Vector and S-Module elements in the desired area of ZIPS-POL panel, the sound absorber layer is cut with a sharp knife at the point of their attachment and the supports are screwed to the panel



using universal 35 mm or 55 mm screws. Screws are tightened from the outside of the panel.

- Upon completion of ZIPS-POL panels installation, the joints between the panels and along the perimeter of abutting panels to the walls and columns are sealed with Vibrosil vibroacoustic sealant. The use of non-specialized hardening fillers and sealants for these purposes is strictly prohibited!
- The sheets of the acoustic triplex «Soundline-dB» with a thickness of 16.5 mm are fastened directly to ZIPS-POL panels. In this case, the pitch of the self-tapping screws to the gypsum cardboard should be 400x200 mm (the more frequent step is along the long side of the panel). In this case, «Soundline-dB» sheets must necessarily adhere to all walls and columns of the room through two layers of the Vibrostek-M elastic tape.
- To increase the strength of ZIPS-POL structures base, sheets of plywood 18 mm thick are glued with the rubber mastic on top of the acoustic triplex «Soundline-dB» after preliminary surface priming. Plywood sheets are mounted with a gap of 5 mm. The pitch of the screws that fix the plywood sheets shall be 300x300 mm. In this case, the ends of the plywood must adhere to all walls and columns through two layers of Vibrostek-M elastic tape.
- Upon hardening of the mastic, jutting edges of Vibrostek-M material are cut off with a sharp knife and all seams along the perimeter of the room, as well as between the plywood sheets, are sealed with Vibrosil sealant.

**5.2.7. With the help of joisted floors and Sylomer material**

- Before the structures of the floor on boarding joists, it is necessary to level and carefully sweep the floor of the building debris.
- It is necessary to bring the edge tape of the material Vibrostek-M into all walls along the perimeter of the room and all columns in 2 layers to a height of 30-50 mm above the level of the floor to avoid rigid contact between the floor structures and other building structures.
- The frame of the joisted floor is made of timbers with a section of 50 × 50 mm, the joists are fastened together by means of mounting corners, plates and self-tapping screws for wood.
- Joists made of 50 × 50 mm timber throughout the entire area of the room excluding the perimeter, shall be installed on a 12 mm thick material Sylomer SR18, the distance between the centers of the joists is 300-400 mm (according to diagram 5.8.5).
- Joists made of 50 × 50 mm timbers shall be installed on a 12 mm thick material Sylomer SR55 around the perimeter of the room and around the columns to ensure stability of the soundproof floor structures.
- The material Sylomer SR18 and Sylomer SR55 is pre-cut into strips with a width of 50 mm and is glued to the joists with polyurethane adhesive.
- Pipes of the heating / water supply system penetrating the floor structures are wrapped with elastic sleeves made of Vibrostek-M material in 2 layers.
- The space between the joists is filled with specialized sound-absorbing slabs Shumanet-BM or Shumanet-sk-ECO.

- Floor covering of plywood sheets 18 mm thick is laid on the wooden frame in 2 layers. Plywood sheets are laid with overlapping joints of the 1st and 2nd layers, the sheets are fixed to the boarding joists with the wood screws 3 x 50 mm with free running. A layer of rubber mastic is applied between the plywood sheets.
- Upon completion of laying the plywood sheets, jutting edges of Vibrostek-M material are cut off with a sharp knife and all seams around the perimeter of the room are treated with Vibrosil sealant.

**5.2.8. The materials and elements specified in Tables 8.3 to 8.7 and 8.10 are used when installing the structures of soundproof floating floors.**

## 6. VIBRATION INSULATION OF ENGINEERING EQUIPMENT

### 6.1. Vibration insulation properties of hangers on the elastomer

Vibration insulation hangers with elastomers are used to suspend noisy and vibrating technical equipment and pipelines in order to reduce the passage of vibrations from aggregates to the building enclosure. They have high values of vibration isolation and a long service life (more than 15 years). Vibration insulation characteristics of hangers are given in Table 6.1. The structures, using vibration insulation hangers, are shown in the diagrams 6.1.1 - 6.1.4.

Table 6.1 Vibration insulation properties of Vibroflex hangers based on the measurements made by the laboratory of acoustics NIISF

Average geometric frequencies of octave bands, Hz	Efficiency of vibration insulation Vibroflex hangers models 1/30M8 and 4/30M8 at a uniformly distributed load on the hanger unit kg/pc.			
	<b>7,5</b>	<b>15</b>	<b>20</b>	<b>30</b>
2	1	-1	5	-8
4	0	0	5	0
8	14	-3	6	12
16	7	-2	6	4
31.5	-2	3	20	16
63	3	3	8	6
125	11	15	14	6
250	10	12	9	11
500	11	12	13	4

## 6.2 Vibration insulation properties of Isotop springs

Isotop spring vibration isolators are used for vibration isolation of technical equipment, and provide low natural frequency of the system (from 3 Hz), which allows them to be used for vibration isolation of equipment with a rotation speed 400 rpm. It is recommended to use Isotop DSD vibration isolators with built-in elastomeric damper to isolate equipment subject from impulse loads (including windload), as well as to isolate piston machines. The structure of vibration isolation equipment with springs is shown in diagram 6.2.1.

Table 6.2 Characteristics of Isotop SD spring series according to the manufacturer

Model	Nominal load on the spring, N		Optimal load, N	Resonance frequency under optimum load, Hz minimum
	min	max		
Isotop SD 1	120	265	200	3.2
Isotop SD 2	195	380	310	3.2
Isotop SD 3	300	670	500	3.2
Isotop SD 4	475	1 200	780	3.2
Isotop SD 5	720	1 700	1 200	3.2
Isotop SD 6	1 130	2 700	1 850	3.2
Isotop SD 7	1 815	3 800	3 000	3.2
Isotop SD 8	2 800	5 200	4 500	3.2

Table 6.3 Characteristics of Isotop DSD spring series according to the manufacturer

Model	Nominal load on the spring, N		Optimal load, N	Resonance frequency under optimum load, Hz minimum
	min	max		
Isotop DSD 1	120	320	250	4.9
Isotop DSD 2	140	400	370	4.5
Isotop DSD 3	270	680	600	4.4
Isotop DSD 4	380	1 000	900	3.9
Isotop DSD 5	580	1 650	1 450	4.6
Isotop DSD 6	1 000	2 500	2 100	4.0
Isotop DSD 7	1 100	3 600	3 300	4.8
Isotop DSD 8	1 900	5 700	5 300	5.1

## 6.3 Installation technology of vibration insulation hangers and springs

**6.3.1. Installation of vibration insulation hanger structures is performed in accordance with the following features:**

- Vibration insulation Vibroflex hangers type 1/30 M8 are mounted directly to the ceiling on two wedge bolts  $\varnothing$  6 mm. After this, vibrating equipment or piping is hung on them with M8 studs. The working load range for one hanger is 20 - 30 kg.
- Vibration insulation Vibroflex hangers type 4/30 M8 are inserted into the gap of M8 tie-studs of technical equipment hangers. The working load range for one hanger is 20 - 30 kg.
- When passing through the Soundproofing structures, an air gap of 3-5 mm must be left between the boards and the tie-studs of the hangers, which is then treated with the Vibrosil sealant.
- If necessary, a layer of vibration isolation material Sylomer is placed directly between the pipelines (equipment) and the hanger traverses (diagram 6.1.4). In this case, the material thickness and its grade shall be selected according to the pipes (equipment) mass and their natural frequencies.

**6.3.2. Installation of equipment for the spring vibration isolators is performed in accordance with the following features:**

- All Isotop SD and Isotop DSD spring vibration isolators have a standard height of 94 mm and a diameter of 62 mm. Also they have a unified internal threads M10 and at the ends, designed for installation.
- Spring vibration isolators should take only the compressive forces while in service.
- Isotop SD and Isotop DSD vibration isolators can be combined into blocks of 2, 4, 6 and 9 springs.
- Height adjustment accessories and Isotop support plates can be used for mounting Isotop SD and DSD spring vibration isolators.

**6.3.3. The materials and elements specified in Tables 8.7 to 8.9 are used during installation of the structures on vibration insulation hangers and springs.**

## 7. STRUCTURES OF SOUNDPROOF SERVICE HATCHES

### 7.1. Technology of soundproof service hatches structures

Service hatches in Soundproofing structures of linings and suspended ceilings are used for inspection and technical maintenance of technical equipment and utility systems. These hatches must have a high sound insulation to ensure the required soundproof effect of linings and suspended ceilings. For this purpose, the service hatch installation is performed in accordance with the following features (diagrams 7.1 - 7.2):






- Service hatch in closed state should ensure the maximum tightness of structures. For this, EPDM rubber seals are used around the perimeter. The retaining hatch hardware should provide the necessary pressing of the hatch removable part to the frame.

- The hatch covering is made of sheets of the acoustic triplex "Soundline-dB" 16.5 mm and gypsum boards Gyproc AKU-Line 12.5 mm, the number of which must correspond to the number of layers and the thickness of lining materials or the suspended ceiling in which the hatch is made.

## 8. SOUNDPROOF STRUCTURES ELEMENTS

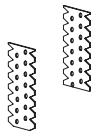
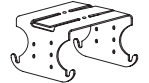
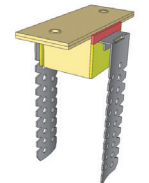
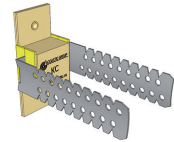
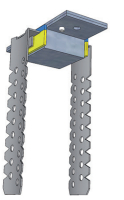
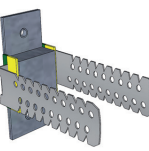
### 8.1. Frames of Soundproofing structures are made of galvanized metal channels produced by Gyproc (Table 8.1):

Table 8.1 Range of metal channels

No.	Description	Section	Grade	Length, m	Weight 1 m, kg	Scope of application
1.	U channel		50/37	2.5 2.75 3.0 4.0 4.5	0.61	U channels of partition walls frame and wall linings
2.			100/37		0.85	
3.	C stud		50/40		0.73	Studs of partition walls frame and wall linings
4.			100/40		0.97	
5.	Acoustic stud Vibroflex-Wave		100/44		1.15	Studs of partition walls frame and wall linings
6.	U Ceiling Channel		28/27		0.4	Frame of suspended ceiling and wall lining
7.	Ceiling Channel		60/27		0.6	Frame of suspended ceilings and wall lining

**8.2.** The following product range is used for mounting and installation of Soundproofing structures (Table 8.2):

Table 8.2 Product range for mounting and installation of framed structures

No.	Description	View	Scope of application
1.	Hanger cut into two parts		Fastening for the extension of ceiling channels PP 60/27
2.	Two-level channel connector		Connection of ceiling channels PP 60/27 on two levels
3.	Acoustic hanger Vibroflex-K15		For vibration isolation of framed suspended ceilings. Rated load per hanger is 15 kg
4.	Acoustic wall tie Vibroflex-KS		For vibration isolation of framed lining fastening to the wall. Rated load per fastening is 25 kg
5.	Acoustic hanger Vibroflex-Connect PP		For vibration isolation of framed suspended ceilings. Rated load per hanger is 15 kg
6.	Acoustic wall tie Vibroflex-Connect PS		For vibration isolation of framed lining fastening to the wall. Rated load per fastening is 25 kg

**8.3.** Filling of soundproof structures frames is made with sound-absorbing plates (Table 8.3, paragraphs 1 to 3); soundproof plates and roll materials are used for floating floors structures (Table 8.3, paragraphs 4-11):

Table 8.3 Range of sound-absorbing and soundproofing materials

No.	Description	Size, m	Quantity per pack, pcs/m <sup>2</sup>	Package size, m <sup>3</sup>
1	Acoustic wool slab Shumanet-BM	1.2 x 0.6 x 0.05	4/2.88	0.15
2	Acoustic wool slab Shumanet-sk-ECO	1.25 x 0.6 x 0.05	4/3	0.15
3	Acoustic wool slab for floor Shumostop-S2	1.25 x 0.6 x 0.02	10/7.5	0.15
4	Acoustic wool slab for floor edge Shumostop-K2	0.3 x 1.2 x 0.02	10/3.6	0.072
5	Acoustic underlay Shumanet-100Hydro	1.0 x 10.0 x 0.005	10	-
6	Acoustic underlay Shumanet-100Combi	1.0 x 10.0 x 0.005	10	-
7	Acoustic underlay Akuflex	1.0 x 15.0 x 0.004	15	-

**8.4.** The abutment of the soundproof structures end parts to the surrounding surfaces (floor, walls, ceiling slabs, lining made of gypsum-fiber sheets or gypsum plasterboards, ZIPS sandwich panels, ZIPS-POL panels) is made through the vibration insulating tape Vibrostek-M followed by filling the seam with the sealing mixture Vibrosil. Additional vibration-insulation S-supports are used for ZIPS-POL panels. Soundproof floor joists rest on the floor through tapes made of polyurethane elastomer Sylomer (Table 8.4):

Table 8.4 Range of vibration insulating tapes, supports and sealing mixtures

No.	Description	Size, m	Cartridge volume, ml	Pcs/ pack
1.	Vibrostek-M 100 (Vibration insulating tape)	30 x 0.1 x 0.004	-	1
2.	Vibrostek-M 150 (Vibration insulating tape)	30 x 0.15 x 0.004	-	1
3.	Vibrosil (one-component silicone sealant)	-	310	25
4.	S-Vector, vibration insulating bearing for panels ZIPS-POL Vector	0.06 x 0.06 x 0.025	-	-
5.	S-Module, vibration insulating bearing for panels ZIPS-POL Module	0.06 x 0.06 x 0.055	-	-
6.	Polyurethane elastomer Sylomer SR18	5 x 1.5 x 0.0125	-	1
7.	Polyurethane elastomer Sylomer SR55	5 x 1.5 x 0.0125	-	1

**8.5** Lining of soundproof partition frames, facings and suspended ceilings is made of the acoustic triplex sheets “Soundline-dB” 16.5 mm thick (inner layer) and gypsum plasterboards Gyproc AKU-Line 12.5 mm thick (outer layer). Sandwich panels ZIPS are faced with one layer of gypsum plasterboards Gyproc AKU-Line 12.5 mm thick. ZIPS-POL panels are faced with an acoustic triplex “Soundline-dB” with a thickness of 16.5 mm (Table 8.5):

Table 8.5 Nominal sizes of lining sheets used in Soundproofing structures

No.	Description	Size, m	Scope of application
1.	Acoustic triplex “Soundline-dB”	1.2 x 1.2 x 0.0165	Sound-proof framed wall linings, partition walls, suspended ceilings, ZIPS-POL system
2.	plasterboard Gyproc AKU-Line	2.5 x 1.2 x 0.0125	Sound-proof framed wall linings, partition walls, suspended ceilings; finishing sheet for lining of ZIPS panels

**8.6.** Sandwich panels ZIPS and panels ZIPS-POL are available in the following modifications (Table 8.6):


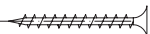
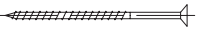

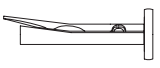

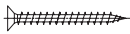




Table 8.6 ZIPS soundproof panels






No.	Description	Size, m	Scope of application
1.	Soundproofing panel ZIPS-Vector	1.2 x 0.6 x 0.04	Initial level system for additional sound reduction of walls and floors for private premises
2.	Soundproofing panel ZIPS-III-Ultra	1.2 x 0.6 x 0.042	Ultra-thin system of basic level of additional sound reduction of walls and floors for private premises
3.	Soundproofing panel ZIPS-Module	1.2 x 0.6 x 0.07	Basic level system of additional sound reduction of walls and floors for private premises
4.	Soundproofing panel ZIPS-Cinema	1.2 x 0.6 x 0.12	High level system of additional sound reduction of walls and floors for special and public premises
5.	Soundproofing panel ZIPS-POL Vector	1.2 x 0.6 x 0.045	Initial level system for additional sound reduction of floors for private premises
6.	Soundproofing panel ZIPS-POL Module	1.2 x 0.6 x 0.075	Basic level system of additional sound reduction of floors for premises



8.7. The following range of self-tapping and anchor screws and washers is used for installation of Soundproofing structures (Table 8.7):



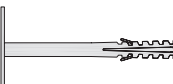

Table 8.7 Self-tapping and anchor screws

No.	Description	View	Diameter/ length, mm	Scope of application
1	Screw MN		3/30	Fastening of Soundline-dB boards to the frame
2	Screw TN		3/40	Fastening of plasterboard AKU-Line to the frame
3	Universal screw		6/80	Fastening of door frames
4	Screw LN		3/11	Connection of metal parts to each other
5	Wedge anchor		6/40	Mounting of vibration insulation fasteners Vibroflex to floor slabs
6	Universal screw		6/35	Fastening of supports S-Vector for ZIPS-POL panels
7	Universal screw		6/55	Fastening of supports S-Module for ZIPS-POL panels
8	Universal screw		5/120	Fastening of wall and ceiling panels ZIPS-Module
9	Universal screw		5/100	Fastening of wall and ceiling panels ZIPS-Vector
10	Universal screw		5/150	Fastening of wall and ceiling panels ZIPS-Cinema
11	Wedge anchor screw		8/72	Fastening of ceiling panels ZIPS-Vector and ZIPS-Module

12	Wedge anchor screw		8/92	Fastening of ceiling panels ZIPS-Vector and ZIPS-Module
13	Wedge anchor screw		8/112	Fastening of ceiling panels ZIPS- Module
14	Wedge anchor screw		8/172	Fastening of ceiling and wall panels ZIPS- Cinema
15	Special cone washer for universal screws		Ø 5 (M5)	Fastening of all types ZIPS panels
16	Special cone washer for metal anchor screws		Ø 8 (M8)	Fastening of ceiling panels ZIPS and wall panels ZIPS- Cinema

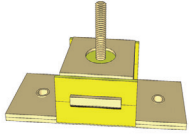
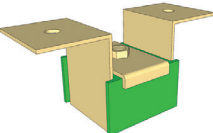
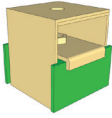


8.8. The following range of dowels is used for installation of Soundproofing structures (Table 8.8):

Table 8.8 Range of dowels

No.	Description	Dowel type & screw type for it	View
1.	For fastening of U-channels and ceiling channels and attachments to the solid section wall structures	Nylon dowel 6/30, 6/40 Type K Screw TN 3/30, TN 3/40	
2.	For fastening of ZIPS sandwich panels to brick, concrete, foam-, gas-, slag-concrete walls, as well as to monolithic and hollow slabs	Universal dowel Fisher UX 8/50 Screw 5/100, 5/120, 5/150	
3.	For fastening of two layers (2x50 mm) of acoustic slabs Shumanet-ECO / Shumanet-BM to the floor slabs	Polypropylene dowel-nail 8/150	
4.	For fastening of three layers (3x50 mm) of acoustic slabs Shumanet-ECO / Shumanet-BM to the floor slabs	Polypropylene dowel-nail 10/200	

**8.9** The following range of vibration insulation hangers and springs is used in structures of vibration isolation of the technical equipment (Table 8.9):

Table 8.9 Range of vibration insulation hangers and springs

No.	Description	View	Scope of application
1.	Anti-Vibration mount Vibroflex-EP25, threaded stud M6		For vibration isolation of technical equipment fastening units. Working load range is 15 - 20 kg per fastening unit
2.	Anti-Vibration hanger Vibroflex-1/30 M8 with threaded hanger M8		For vibration isolation of technical equipment hanger. Working load range is 20 - 30 kg per hanger
3.	Anti-Vibration hanger Vibroflex-4/30 M8 for threaded stud M8		For vibration isolation of technical equipment hanger. Working load range is 20 - 30 kg per hanger
4.	Isotop SD series spring vibration isolator, thread M10		For vibration isolation of technical equipment. Working load range is 12 - 520 kg per spring
5.	Isotop DSD series spring vibration isolator, thread M10		For vibration isolation of technical equipment. Working load range is 12 - 520 kg per spring

**8.10.** The following range of civil materials is used when constructing soundproof floating floors (Table 8.10):

Table 8.10 Range of civil materials for constructing soundproof floating floors

No.	Material description	Scope of application
1.	Cement-sand mixture M-300	Leveling screed
2.	Polyethylene reinforced membrane with a thickness of 200 microns	Separation layer between soundproof material and screed
3.	Reinforcing mesh 50x50 mm, Ø 4 mm	Reinforcing layer in the structures of the leveling screed
4.	Plywood 1520x1520x18 mm	Reinforcing layer in ZIPS-POL structures; Boarding joisted floors
5.	Rubber mastic	For gluing plywood with each other and in ZIPS-POL structures
6.	Timber bar 50x50x3000 mm	For structures of the joisted floor frame

## 9. ALLOWABLE LOADS ON SOUNDPROOFING STRUCTURES WHEN INSTALLING OBJECTS

During maintenance of premises with soundproof partition walls, wall linings and suspended ceilings, it becomes necessary to attach various hinged equipment, building structures or interior items to them. The fixing methods vary depending on the type of structures and the load rate.

**IMPORTANT:** All available attachment points must be used in the places where the attachable equipment is supposed to be fixed during installation to the ZIPS panel systems.

### 9.1 Framed soundproof linings, partition walls and wall panels ZIPS

#### 9.1.1. Load up to 35 kg

Light loads, such as paintings, photographs, shelves, etc. which mass does not exceed 15 kg, shall be hung directly on the boards (panels) with hooks or special dowels and anchors. Fastening of elements weighing up to 35 kg per running meter of the lining or partition with a gravity center distant no more than 30 cm from the wall can be carried out at any point of the lining by means of special anchoring items, plastic or metal dowels. The possibility of using a particular anchorage is determined by its bearing capacity (Table 9.1).

Table 9.1 Selection of allowable load on the fastening unit

Composition and thickness of the boarding layer, mm	Maximum allowable load on dowel, kg			
	Nylon dowels		Metal dowels	
	Ø 6mm	Ø 8mm	Ø 6mm	Ø 8mm
Gypsum plasterboard 16.5 (20)	35	40	50	50

When fixing the object at several points, the minimum distance between the fasteners is determined by the formula:

$$L = \frac{m}{n};$$

where: L - distance between fixing points, cm;  
M - mass of the object to be fixed, kg  
n - number of fixing points.

**For example,** when fixing an 18 kg element at two points, the distance between the fixing points shall be at least 9 cm.

#### 9.1.2. Load from 35 to 70 kg

The possibility of fixing additional loads of this weight to the ZIPS panel system is in the testing phase.

Fastening of loads on the framed linings and partition walls from 35 kg to 70 kg per 1 running meter including stationary attachable equipment (furniture, electrical panels, hinged fire cabinets, sanitary equipment, etc.) is carried out with the help of installed special inserts of the plywood sheet with a thickness of no more than 15 mm or by using additional channels fixed to vertical racks.

#### 9.1.3. Load from 70 to 150 kg

Mounting is only possible on the framed linings and partition walls. Fixing this load on the ZIPS panel system is not allowed.

### 9.2 Suspended soundproof ceiling

#### 9.2.1. Load up to 6 kg

Loads suspended directly on the lining sheets with special anchors (expanding anchor of Molly type or a pass through anchor) must not exceed 6 kg per m<sup>2</sup> and can be suspended at any point.

When fixing the object at several points, the minimum distance between the fasteners is determined by the formula:

$$L = \frac{m}{n};$$

where: L - distance between fixing points, cm;  
M - mass of the object to be fixed, kg  
n - number of fixing points.

#### 9.2.2. Load from 6 to 25 kg

Loads from 6 to 25 kg per m<sup>2</sup> are considered as an additional loads when calculating the suspended ceiling where it is necessary to provide additional basic channels and increase in the number of vibration insulation hangers Vibroflex-K15 or Vibroflex-Connect PP.

#### 9.2.3. Load over 25 kg

Equipment and building structures weighing more than 25 kg are mounted directly to the slab with the vibration insulation hangers Vibroflex 1/30 M8 or Vibroflex 4/30 M8.

### 9.3 Ceiling panels ZIPS

#### 9.3.1. Load up to 6 kg/m<sup>2</sup>

Loads suspended directly on the ZIPS panel surface with special anchors (expanding anchor of Molly type or a pass through anchor) must not exceed 6 kg per m<sup>2</sup> and can be suspended at any point.

When fixing the object at several points, the minimum distance between the fasteners is determined by the formula:

$$L = \frac{m}{n};$$

where: L - distance between fixing points, cm;  
M - mass of the object to be fixed, kg  
n - number of fixing points.

### 9.3.2. Load from 6 to 12 kg/m<sup>2</sup>

Maximum allowable load on the structures of the ZIPS ceiling panels should not exceed 15 kg/m<sup>2</sup>, and the number of fixing points should be at least 2.5 pcs/m<sup>2</sup>.

### 9.2.3. Load over 12 kg/m<sup>2</sup>

Equipment and building structures weighing more than 15 kg/m<sup>2</sup> are mounted directly to the slab with the vibration insulation hangers Vibroflex 1/30 M8 or Vibroflex 4/30 M8.

## 10. MATERIAL CONSUMPTION TABLES FOR SOUNDPROOFING STRUCTURES

The consumption rates of specialized and civil materials for Soundproofing structures are given in Tables 10.1 - 10.10 with reference to the album sheets where these structures are provided.

- For the structures of partition walls and lining, the rates are based on the calculation of the partition (lining) dimensions H = 2.75 m; L = 4.00 m; S = 11 m<sup>2</sup>. The calculated spacing of the frame C stud is 600 mm.
- For suspended ceilings and soundproof floors structures, the consumption rates are based on a room size 10 m x 10 m = 100 m<sup>2</sup>.
- The material consumption rates for floating floors are given for the thickness of the screed 60 mm.

For partition walls, linings, suspended ceilings and floors, the material consumption rates are given without regard for the openings, complex geometry of the room and losses for cutting and trimming.

Table 10.0 Material consumption per 1m<sup>2</sup> of soundproof partition structures (Sheets 1-8)

Description	Unit	Single frame		Double independent frame	
		Partition walls thickness, mm			
		108	158	158 Wave	168
<b>Frame and fasteners</b>					
U-channel	rm	0.7		1.4	
Gyproc Ultra PN 50/37		0.7		1.4	
Gyproc Ultra PN 100/37		0.7		1.4	
C stud	rm	2.0		8	
Gyproc Ultra PS 50/40		2.0		4	
Gyproc Ultra PS 100/40		2.0		4	
Vibroflex-Wave 100/44		2.0		4	
Vibroflex-Wave 100/44	rm	5		5	
Vibroflex-Wave 100/44		5		5	
Vibroflex-Wave 100/44	rm	2.5		5	
Vibroflex-Wave 100/44		2.5		5	
Dowel	pcs	1.6		3.2	
Shumanet-ECO / Shumanet-BM acoustic wool slab 50 mm	m <sup>2</sup>	1.0	2.0		4.0
<b>Boarding</b>					
Soundline-dB sheet 16.5 mm	m <sup>2</sup>	2.0		2.0	
Gyproc AKU-Line sheet 12.5 mm	m <sup>2</sup>	2.0		2.0	
Screws MN 30	pcs	12		12	
Screws TN 40	pcs	30		30	
<b>Joint sealing</b>					
Vibrosil sealant (Tube 310 ml)	pcs	0.9	1.2		1.2

Table 10.2 Material consumption per 1 m<sup>2</sup> of soundproof independent linings structures (Sheets 15-17)

Description	Unit	Lining thickness, mm			
		≥ 90	≥ 90	≥140 Wave	
<b>Frame and fasteners</b>					
U-channel	rm	0.7		0.7	
Gyproc Ultra PN 50/37		0.7		0.7	
Gyproc Ultra PN 100/37		0.7		0.7	
C stud	rm	2.0		4.0	
Gyproc Ultra PS 50/40		2.0		4.0	
Gyproc Ultra PS 50/40 dual		2.0		4.0	
Vibroflex-Wave 100/44		2.0		2.0	

Vibrostek-M100 tape	rm	2.5	2.5	
Vibrostek-M150 tape				2.5
Dowel	pcs	1.6		
Shumanet-ECO / Shumanet-BM acoustic wool slab 50 mm	m <sup>2</sup>	1.0	1.0	2.0
<b>Boarding</b>				
Soundline-dB sheet 16.5 mm	m <sup>2</sup>	1.0		
Gyproc AKU-Line sheet 12.5 mm	m <sup>2</sup>	1.0		
Screws MN 30	pcs	6		
Screws TN 40	pcs	15		
Screws LN 11	pcs	-	27	-
<b>Joint sealing</b>				
Vibrosil sealant (Tube 310 ml)	pcs	0.6		

Table 10.3 Material consumption per 1 m<sup>2</sup> of soundproof framed linings on the vibration-insulating fasteners Vibroflex-KS and Vibroflex-Connect PS (Sheet 18-19)

Description	Unit	Lining thickness, mm	
		≥ 90	≥ 110
<b>Frame and fasteners</b>			
<i><b>U-channel</b></i>			
Gyproc Ultra PPN 28/27	rm	0.7	
<i><b>C stud</b></i>			
Gyproc Ultra PP 60/27	rm	2.0	
Acoustic wall tie Vibroflex-KS	pcs		2.2
Acoustic wall tie Vibroflex-Connect PS	pcs	2.2	
Vibrostek-M100 tape	rm	2.5	
Vibrostek-M150 tape	rm		2.5
Dowel	pcs	1.6	
Shumanet-ECO / Shumanet-BM acoustic wool slab 50 mm	m <sup>2</sup>	1.0	
<b>Boarding</b>			
Soundline-dB sheet 16.5 mm	m <sup>2</sup>	1.0	
Gyproc AKU-Line sheet 12.5 mm	m <sup>2</sup>	1.0	
Screws MN 30	pcs	6	
Screws TN 40	pcs	15	
<b>Joint sealing</b>			
Vibrosil sealant (Tube 310 ml)	pcs	0.6	

Table 10.4 Material consumption per 1 m<sup>2</sup> of suspended soundproof ceiling on vibration-insulating Vibroflex hangers-K15 and Vibroflex-Connect PP (Sheets 20-26)

Description	Unit	Structures thickness, mm		
		115	130	≥200
<b>Frame and fasteners</b>				
Gyproc Ultra PP 60/27	rm	3.9		
Gyproc Ultra PPN 28/27	rm	Perimeter		
Two-level connector for Gyproc Ultra PP 60/27 channels	pcs	3.1		
Gyproc Ultra PP 60/27 channel extender	pcs	1		
Acoustic hanger Vibroflex-Connect PP	pcs	2.8	-	
Acoustic hanger Vibroflex-K15	pcs	-	2.8	
Vibrostek-M100 tape	rm	Perimeter x 2		
Anchor dowel	pcs	5.6		
Straight hanger	pcs	-	2.8	
Gyproc Ultra PP 60/27 (for extension of straight hangers)	rm			As applicable
Shumanet-ECO / Shumanet-BM acoustic wool slab 50 mm	m <sup>2</sup>	1.0	2.0	3.0-4.0*
Polypropylene dowel-nail	pcs	7.0		
Screws LN 11	pcs	24	35	
<b>Boarding</b>				
Soundline-dB sheet 16.5 mm	m <sup>2</sup>	1.0		
Gyproc AKU-Line sheet 12.5 mm	m <sup>2</sup>	1.0		
Screws MN 30	pcs	6		
Screws TN 40	pcs	15		
<b>Joint sealing</b>				
Vibrosil sealant (Tube 310 ml)	pcs	0.35		

\* - When the offset is more than 200 mm, sound absorbing plates shall be laid in 4 layers (2 layers to the floor surface are fixed with polypropylene dowels-nails, 2 layers are laid on the frame).

Table 10.5 Material consumption per 1 m<sup>2</sup> of ZIPS soundproof panels (Sheets 9-14)

Description	Unit	Structures thickness, mm			
		Vector 53	Ultra 55	Module 83	Cinema 133
<b>Lining elements</b>					
ZIPS panel	pcs	1.38			
Vibrostek-M100 tape	rm	2.5			
Vibrostek-M150 tape	rm	2.5			
<b>Boarding</b>					
Gyproc AKU-Line sheet 12.5 mm	m <sup>2</sup>	1.0			
Vibrosil sealant (Tube 310 ml)	pcs	0.6			
<b>Fastening kit</b>	pcs	1.38			



Table 10.6 Material consumption per 1 m<sup>2</sup> of Soundproofing structures with ZIPS-POL panels (Sheets 35-38, 41)

Description	Unit	Structures thickness, mm	
		Vector	Module
		83	113
<b>Floor elements</b>			
ZIPS-POL panel	pcs	1.38	
S-Vector / S-Module additional supports	pcs	Consumption depends on the room shape	
Vibrosteck-M100 tape	rm	Perimeter x 2	
Vibrosteck-M150 tape	rm		Perimeter x 2
<b>Boarding</b>			
Soundline-dB sheet 16.5 mm	m <sup>2</sup>	1.0	
Plywood sheet 18 mm	m <sup>2</sup>	1.0	
Vibrosil sealant (Tube 310 ml)	pcs	0.85	
Rubber mastic	kg	1.3	
Soil of deep penetration	kg	0.2	
<b>Fasteners</b>			
Screws MN 35	pcs	36	
Screws TN 40	pcs	16	

Table 10.7 Material consumption per 1 m<sup>2</sup> of soundproof floating floors (Sheets 27-29, 34, 41)

Description	Unit	Soundproof material		
		Shumanet-100Combi/ Shumanet-100Hydro	Shumoplast	
<b>Underlayer material</b>	m <sup>2</sup>	1.1	-	
	m <sup>3</sup>	-	0.02*	
<b>Floor elements</b>				
Sandcrete M300 (bag 50 kg)	pcs	2.3		
Coil mesh (cell 50x50 mm) rod diameter 4 mm (map 0.5 x 2 m)	m <sup>2</sup>	1.1		
Polyethylene membrane (for covering the screed)	m <sup>2</sup>	1.1		
Vibrosil sealant (Tube 310 ml)	pcs	0.35		
Shumoplast-Grunt	kg/rm	-	-	0.1**

\* - Calculation is given for the thickness of Shumoplast mixture layer 20 mm.

\*\* - When applied to the wall at a height of 100 mm.

Table 10.8 Material consumption per 1 m<sup>2</sup> of soundproof floors with Shumostop plate system (Sheets 28, 30-32, 41)

Description	Unit	Structures thickness, mm	
		80	120
		1 layer	2 layers
<b>Floor elements</b>			
Sandcrete M300 (bag 50 kg)	pcs	2.3	3
Coil mesh (cell 50x50 mm) rod diameter 4 mm (map 0.5 x 2 m)	m <sup>2</sup>	1.1	
Shumostop-K2	rm	Perimeter	Perimeter x 2
Shumostop-S2	m <sup>2</sup>	1.0	2.0
Polyethylene membrane (for covering the screed)	m <sup>2</sup>	1.1	
Reinforced polyethylene membrane (Separating layer)	m <sup>2</sup>	1.3	
Vibrosil sealant (Tube 310 ml)	pcs	0.35	
Vibrosteck-M150 tape	rm	Perimeter x 2	

Table 10.9 Material consumption per 1 m<sup>2</sup> of soundproof floors with Shumostop-K2 plates (Sheets 28-29, 33-34)

Description	Unit	Structures thickness, mm	
		80	100
		1 layer	2 layers
<b>Floor elements</b>			
Sandcrete M300 (bag 50 kg)	pcs	2.3	2.8
Coil mesh (cell 50x50 mm) rod diameter 4 mm (map 0.5 x 2 m)	m <sup>2</sup>	1.1	2.4
Shumostop-K2	m <sup>2</sup>	1	2
Polyethylene membrane (for covering the screed)	m <sup>2</sup>	1.1	
Reinforced polyethylene membrane (Separating layer)	m <sup>2</sup>	1.3	
Vibrosil sealant (Tube 310 ml)	pcs	0.35	
Vibrosteck-M150 tape	rm	Perimeter x 2	
Rubber mastic	kg	1.3	

Table 10.10 Material consumption per 1 m<sup>2</sup> of soundproof joisted floors with Sylomer material (Sheets 39-40)

Description	Unit	Structures thickness, mm	
		100	
		Joist pitch 300 mm	Joist pitch 400 mm
<b>Floor elements</b>			
Timber joists 50x50 mm	rm	3.6	2.8
Sylomer SR18 vibration-insulation tape	rm	3.2	2.4
Sylomer SR55 vibration-insulation tape	rm	Perimeter	
Shumanet-ECO / Shumanet-BM acoustic wool slab 50 mm	m <sup>2</sup>	1.0	
Vibrosteck-M150 tape	rm	Perimeter x 2	
<b>Boarding</b>			
Plywood sheet 18 mm	m <sup>2</sup>	2.0	
Vibrosil sealant (Tube 310 ml)	pcs	0.35	
Rubber mastic	kg	1.3	
<b>Fasteners</b>			
Screw TN 45	pcs	32	30

Table 10.4 Material consumption per 1 m<sup>2</sup> of suspended soundproof ceiling on vibration-insulating Vibroflex hangers-K15 and Vibroflex-Connect PP (Sheets 20-26)

Description	Unit	Structures thickness, mm		
		115	130	≥200
<b>Frame and fasteners</b>				
Gyproc Ultra PP 60/27	rm	3.9		
Gyproc Ultra PPN 28/27	rm	Perimeter		
Two-level connector for Gyproc Ultra PP 60/27 channels	pcs	3.1		
Gyproc Ultra PP 60/27 channel extender	pcs	1		
Vibroflex-Connect PP vibration-insulating hanger	pcs	2.8	-	
Vibroflex-K15 vibration-insulating hanger	pcs	-	2.8	
Vibrosteck-M100 tape	rm	Perimeter x 2		
Anchor dowel	pcs	5.6		
Straight hanger	pcs	-	2.8	
Gyproc Ultra PP 60/27 (for extension of straight hangers)	rm	As applicable		
Shumanet-ECO / Shumanet-BM acoustic wool slab 50 mm	m <sup>2</sup>	1.0	2.0	3.0-4.0*
Polypropylene dowel-nail	pcs	7.0		
Screws LN 11	pcs	24	35	
<b>Boarding</b>				
Soundline-dB sheet 16.5 mm	m <sup>2</sup>	1.0		
Gyproc AKU-Line sheet 12.5 mm	m <sup>2</sup>	1.0		
Screws MN 30	pcs	6		
Screws TN 40	pcs	15		
<b>Joint sealing</b>				
Vibrosil sealant (Tube 310 ml)	pcs	0.35		

\* - When the offset is more than 200 mm, sound absorbing plates shall be laid in 4 layers (2 layers to the floor surface are fixed with polypropylene dowels-nails, 2 layers are laid on the frame).

Table 10.5 Material consumption per 1 m<sup>2</sup> of ZIPS soundproof panels (Sheets 9-14)

Description	Unit	Structures thickness, mm			
		Vector	Ultra	Module	Cinema
		53	55	83	133
<b>Lining elements</b>					
ZIPS panel	pcs	1.38			
Vibrosteck-M100 tape	rm	2.5			
Vibrosteck-M150 tape	rm	2.5			
<b>Boarding</b>					
Gyproc AKU-Line sheet 12.5 mm	m <sup>2</sup>	1.0			
Vibrosil sealant (Tube 310 ml)	pcs	0.6			
<b>Fastening kit</b>	pcs	1.38			

Table 10.6 Material consumption per 1 m<sup>2</sup> of Soundproofing structures with ZIPS-POL panels (Sheets 35-38, 41)

Description	Unit	Structures thickness, mm	
		Vector	Module
		83	113
<b>Floor elements</b>			
ZIPS-POL panel	pcs	1.38	
S-Vector / S-Module additional supports	pcs	Consumption depends on the room shape	
Vibrosteck-M100 tape	rm	Perimeter x 2	
Vibrosteck-M150 tape	rm	Perimeter x 2	
<b>Boarding</b>			
Soundline-dB sheet 16.5 mm	m <sup>2</sup>	1.0	
Plywood sheet 18 mm	m <sup>2</sup>	1.0	
Vibrosil sealant (Tube 310 ml)	pcs	0.85	
Rubber mastic	kg	1.3	
Soil of deep penetration	kg	0.2	
<b>Fasteners</b>			
Screws MN 35	pcs	36	
Screws TN 40	pcs	16	

Table 10.7 Material consumption per 1 m<sup>2</sup> of soundproof floating floors  
(Sheets 27-29, 34, 41)

Description	Unit	Soundproof material		
		Shumanet-100Combi / Shumanet-100Hydro	Shumoplast	
<b>Underlayer material</b>	m <sup>2</sup>	1.1	-	
	m <sup>3</sup>	-	0.02*	
<b>Floor elements</b>				
Sandcrete M300 (bag 50 kg)	pcs	2.3		
Coil mesh (cell 50x50 mm) rod diameter 4 mm (map 0.5 x 2 m)	m <sup>2</sup>	1.1		
Polyethylene membrane (for covering the screed)	m <sup>2</sup>	1.1		
Vibrosil sealant (Tube 310 ml)	pcs	0.35		
Shumoplast-Grunt	kg/ m	-	-	0.1**

\* - Calculation is given for the thickness of Shumoplast mixture layer 20 mm.

\*\* - When applied to the wall at a height of 100 mm.

Table 10.8 Material consumption per 1 m<sup>2</sup> of soundproof floors with Shumostop plate system  
(Sheets 28, 30-32, 41)

Description	Unit	Structures thickness, mm	
		80	120
		1 layer	2 layers
<b>Floor elements</b>			
Sandcrete M300 (bag 50 kg)	pcs	2.3	3
Coil mesh (cell 50x50 mm) rod diameter 4 mm (map 0.5 x 2 m)	m <sup>2</sup>	1.1	
Shumostop-K2	rm	Perimeter	Perimeter x 2
Shumostop-S2	m <sup>2</sup>	1.0	2.0
Polyethylene membrane (for covering the screed)	m <sup>2</sup>	1.1	
Reinforced polyethylene membrane(Separating layer)	m <sup>2</sup>	1.3	
Vibrosil sealant (Tube 310 ml)	pcs	0.35	
Vibrostek-M150 tape	rm	Perimeter x 2	

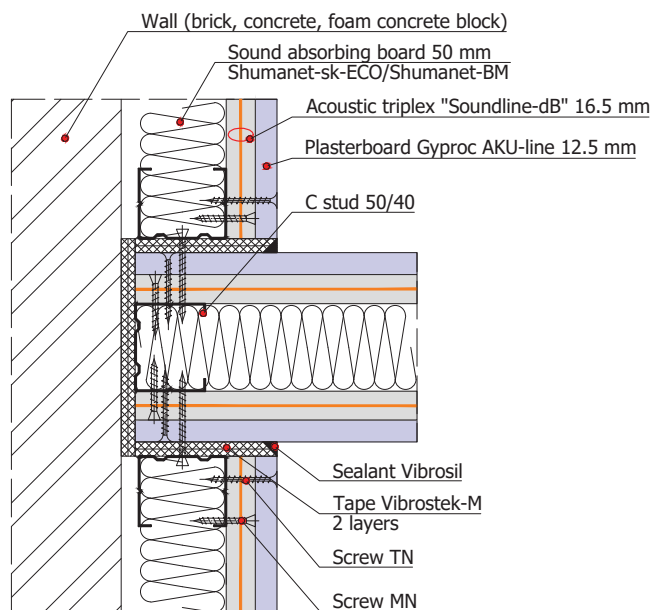
Table 10.9 Material consumption per 1 m<sup>2</sup> of soundproof floors with Shumostop-K2 plates  
(Sheets 28-29, 33-34)

Description	Unit	Structures thickness, mm	
		80	100
		1 layer	2 layers
<b>Floor elements</b>			
Sandcrete M300 (bag 50 kg)	pcs	2.3	2.8
Coil mesh (cell 50x50 mm) rod diameter 4 mm (map 0.5 x 2 m)	m <sup>2</sup>	1.1	2.4
Shumostop-K2	m <sup>2</sup>	1	2
Polyethylene membrane (for covering the screed)	m <sup>2</sup>	1.1	
Reinforced polyethylene membrane (Separating layer)	m <sup>2</sup>	1.3	
Vibrosil sealant (Tube 310 ml)	pcs	0.35	
Vibrostek-M150 tape	rm	Perimeter x 2	
Rubber mastic	kg	1.3	

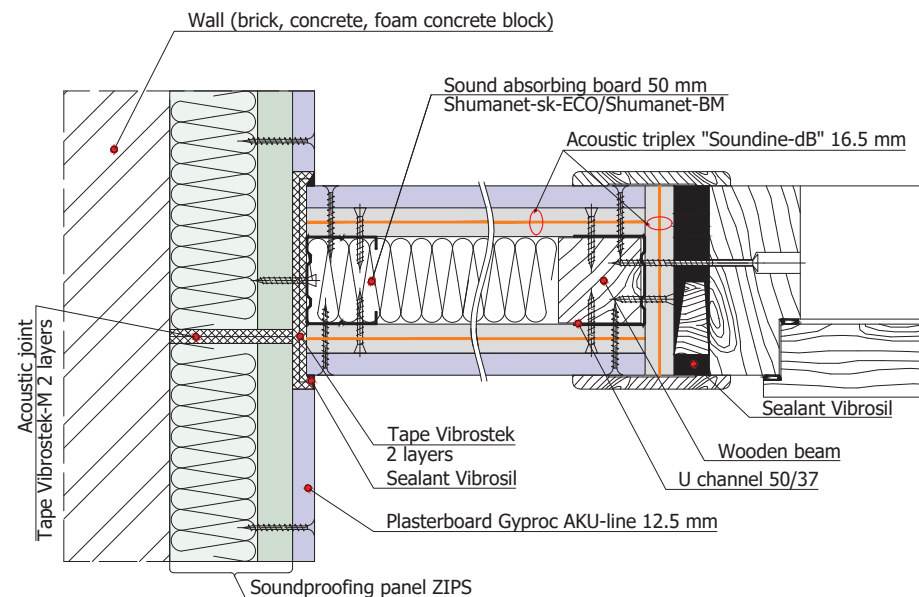
Table 10.10 Material consumption per 1 m<sup>2</sup> of soundproof joisted floors with Sylomer material  
(Sheets 39-40)

Description	Unit	Structures thickness, mm	
		100	
		Joist pitch 300 mm	Joist pitch 400 mm
<b>Floor elements</b>			
Timber joists 50x50 mm	rm	3.6	2.8
Sylomer SR18 vibration- insulation tape	rm	3.2	2.4
Sylomer SR55 vibration- insulation tape	rm	Perimeter	
Shumanet-ECO / Shumanet-BM acoustic wool slab 50 mm	m <sup>2</sup>	1.0	
Vibrostek-M150 tape	rm	Perimeter x 2	
<b>Boarding</b>			
Plywood sheet 18 mm	m <sup>2</sup>	2.0	
Vibrosil sealant (Tube 310 ml)	pcs	0.35	
Rubber mastic	kg	1.3	
<b>Fasteners</b>			
Screw TN 45	pcs	32	30

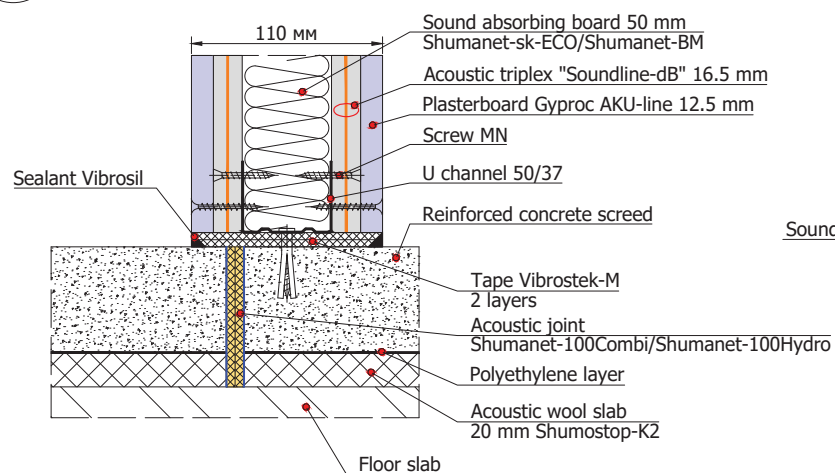
1.1.1 Junction of partition on a single frame 50 mm to the wall lining



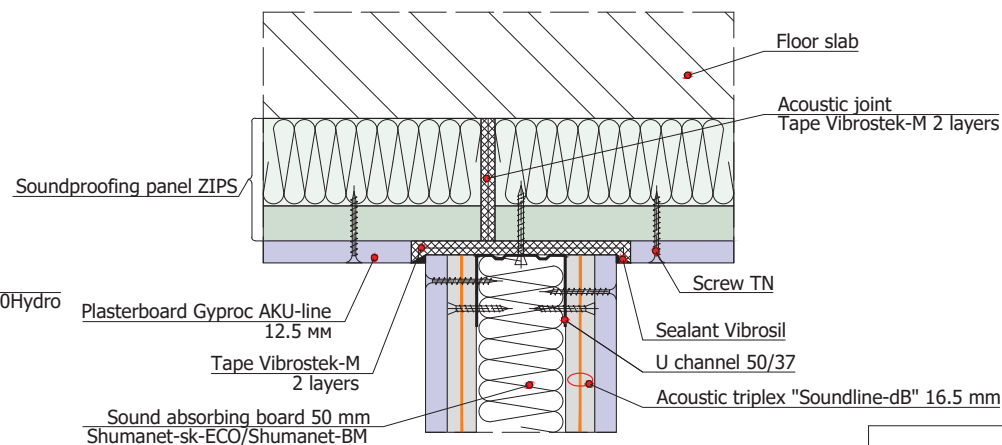
1.1.2 Junction of partition on a single frame 50 mm to soundproofing panels ZIPS on the wall and doorway



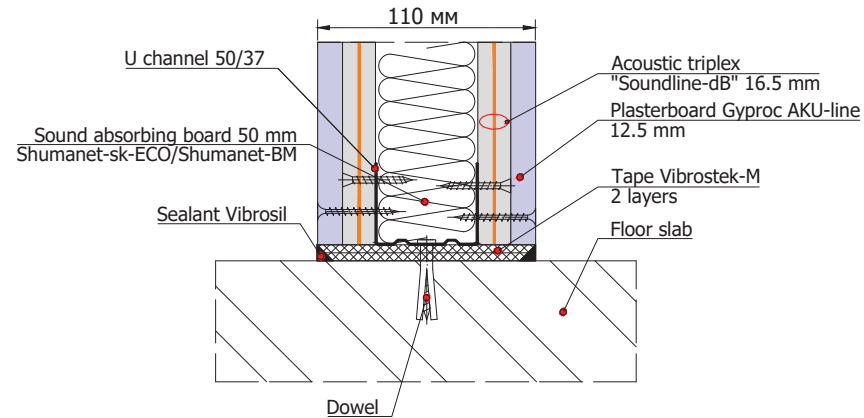
1.1.3 Junction of partition on a single frame 50 mm to a floating floor



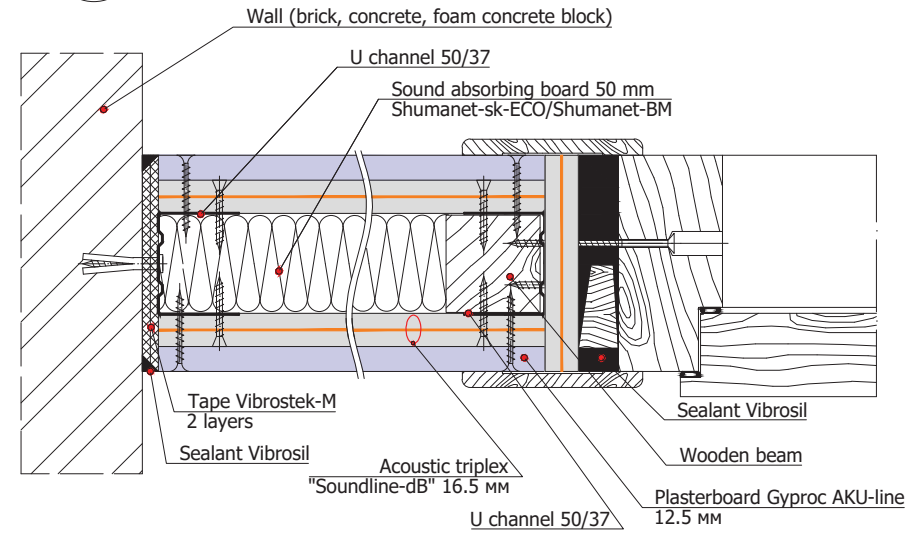
1.1.4 Junction of partition on a single frame 50 mm to soundproofing panels ZIPS on the ceiling



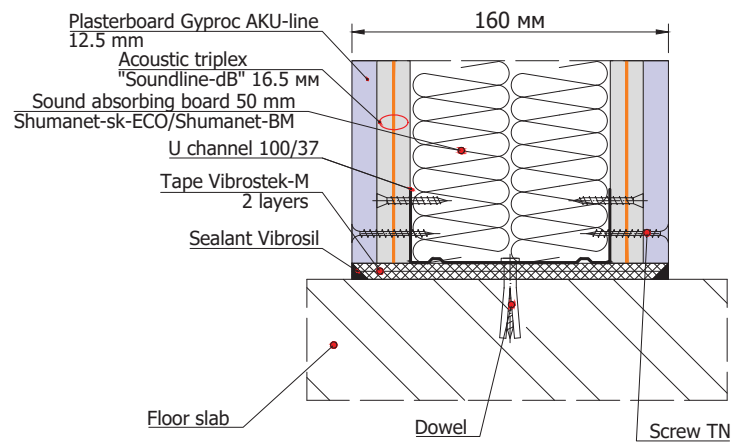
1.1.5 Junction of partition on a single frame 50 mm to the floor/ceiling slab



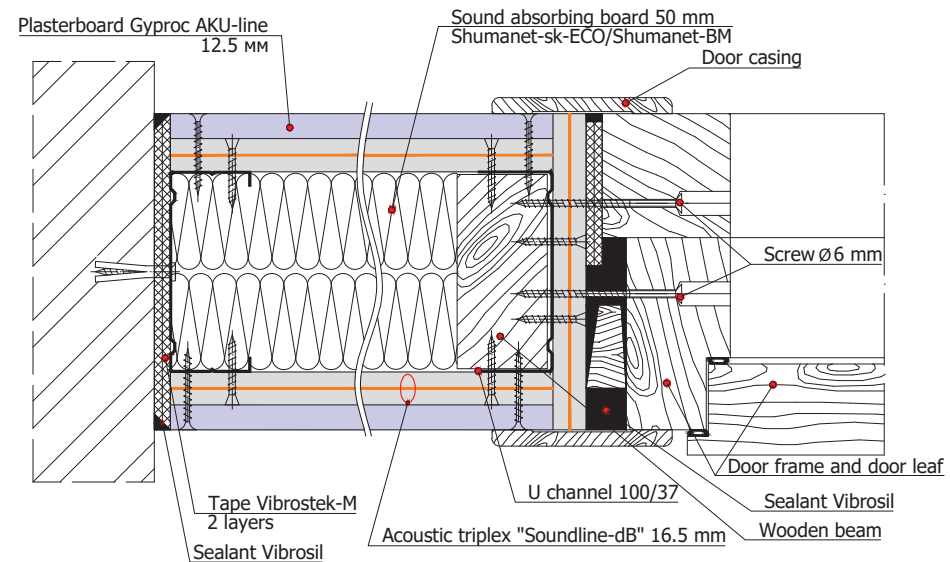
1.1.6 Junction of partition on a single frame 50 mm to the wall and doorway



1.2.1 Junction of partition on a single frame 100 mm to the floor/ceiling slab

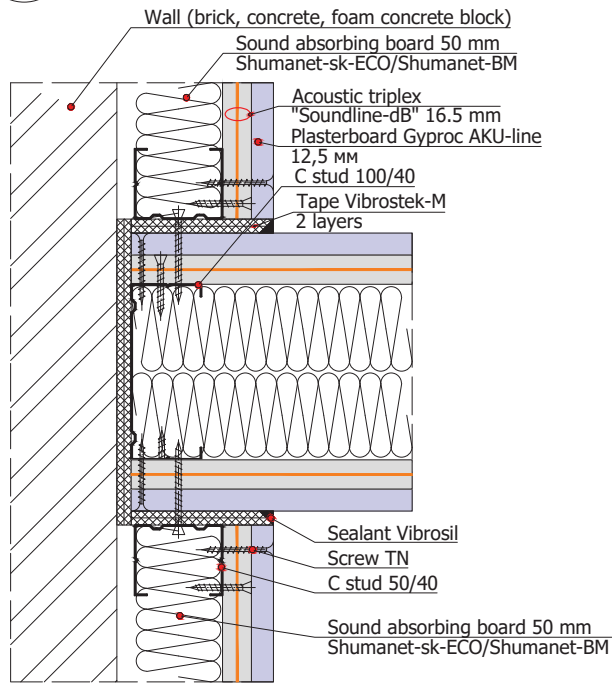


1.2.2 Junction of partition on a single frame 100 mm to the floor/ceiling slab

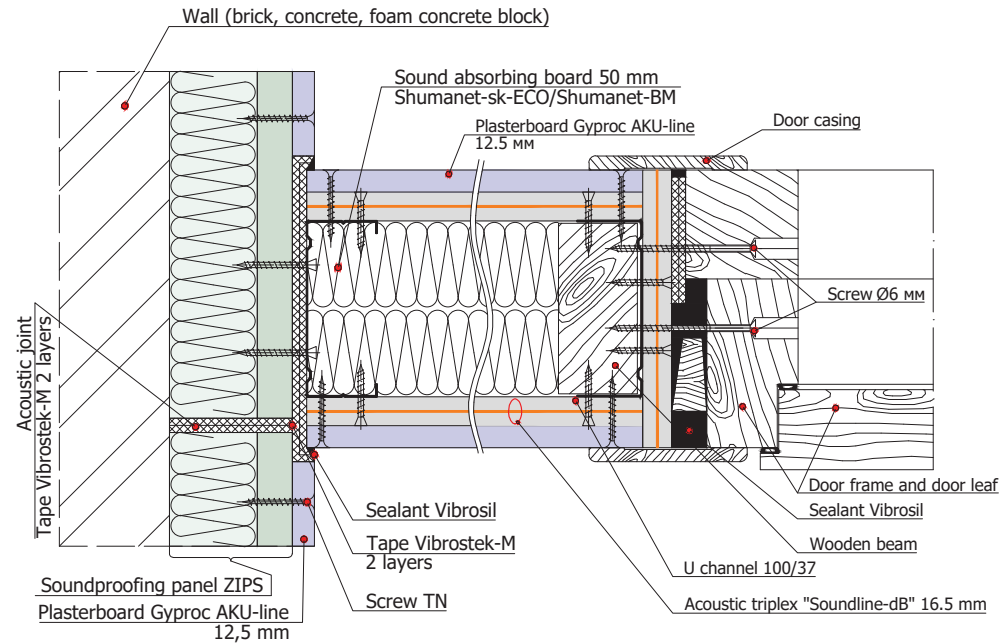




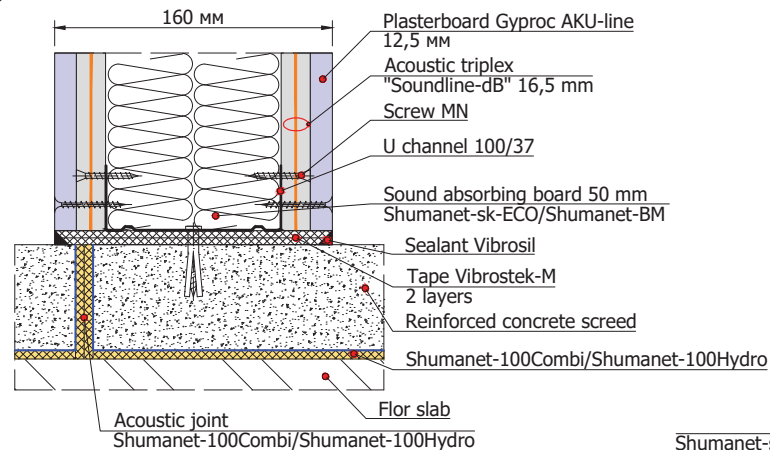
1.2.3 Junction of partition on a single frame 100 mm to the wall lining



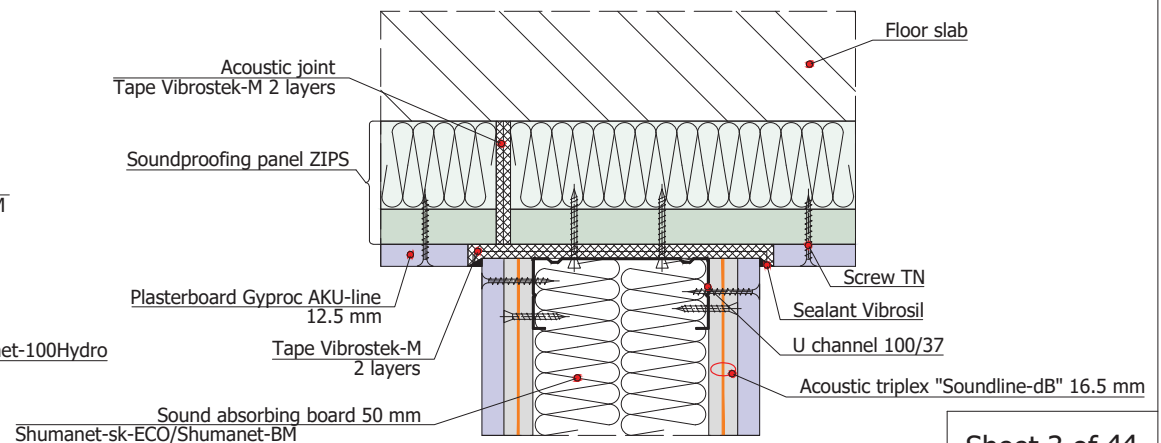
1.2.4 Junction of partition on a single frame 100 mm to soundproofing panels ZIPS on the wall and doorway



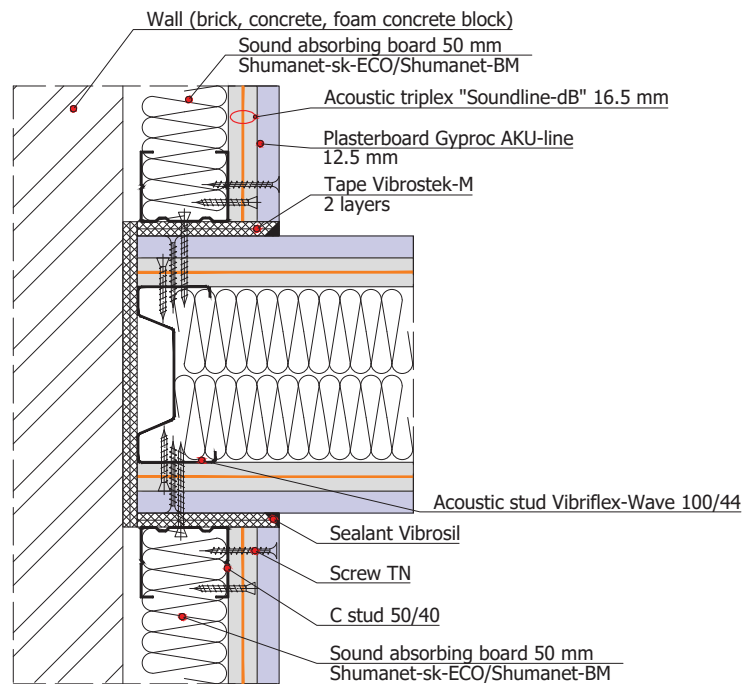
1.2.5 Junction of partition on a single frame 100 mm to the floating floor



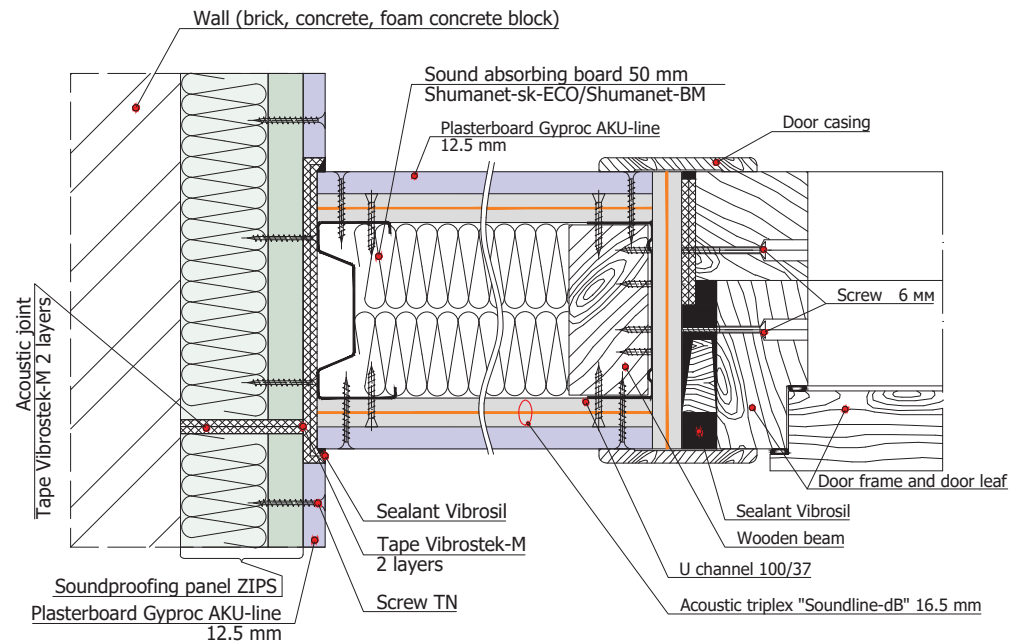
1.2.6 Junction of partition on a single frame 100 mm to soundproofing panels ZIPS on the ceiling



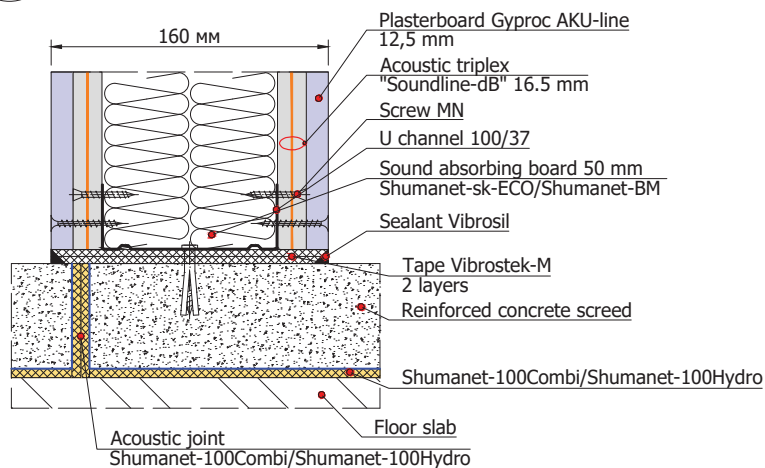
1.3.1 Junction of partition on a single frame Vibroflex-Wave 100 mm to the wall lining



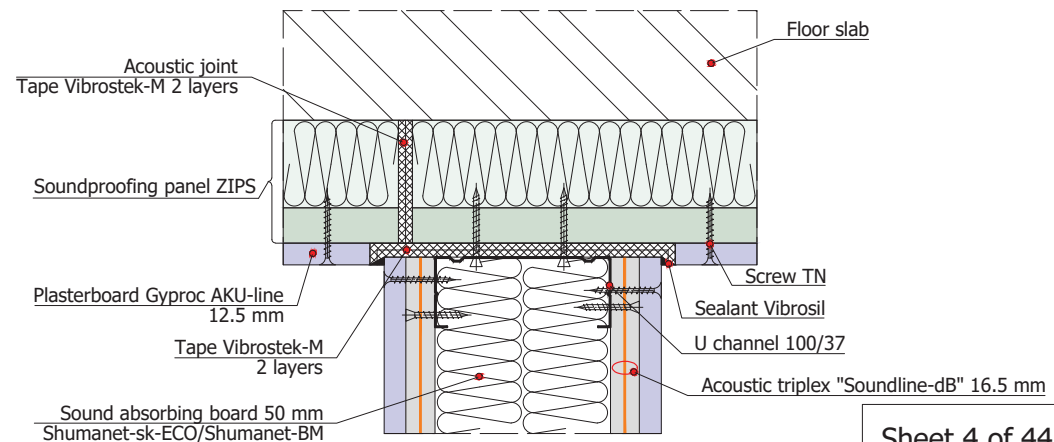
1.3.2 Junction of partition on a single frame Vibroflex-Wave 100 mm to soundproofing panels ZIPS on the wall and doorway



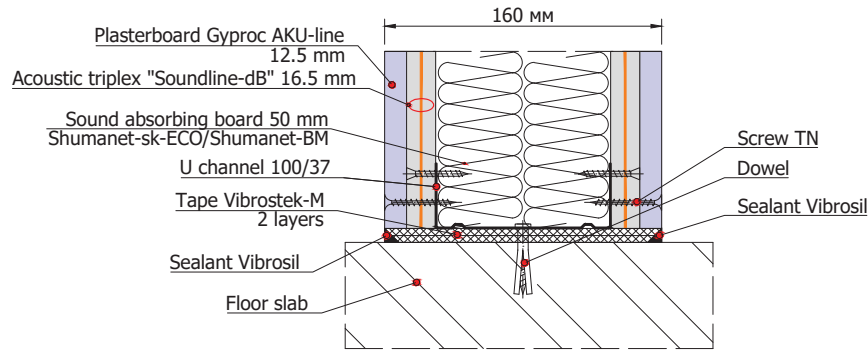
1.3.3 Junction of partition on a single frame Vibroflex-Wave 100 mm to the floating floor



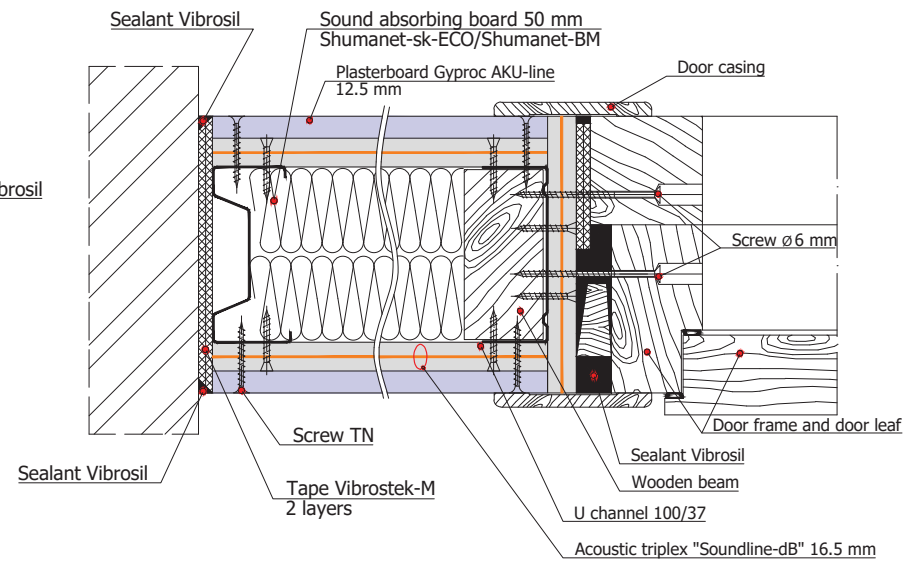
1.3.4 Junction of partition on a single frame Vibroflex-Wave 100 mm to soundproofing panels ZIPS on the ceiling



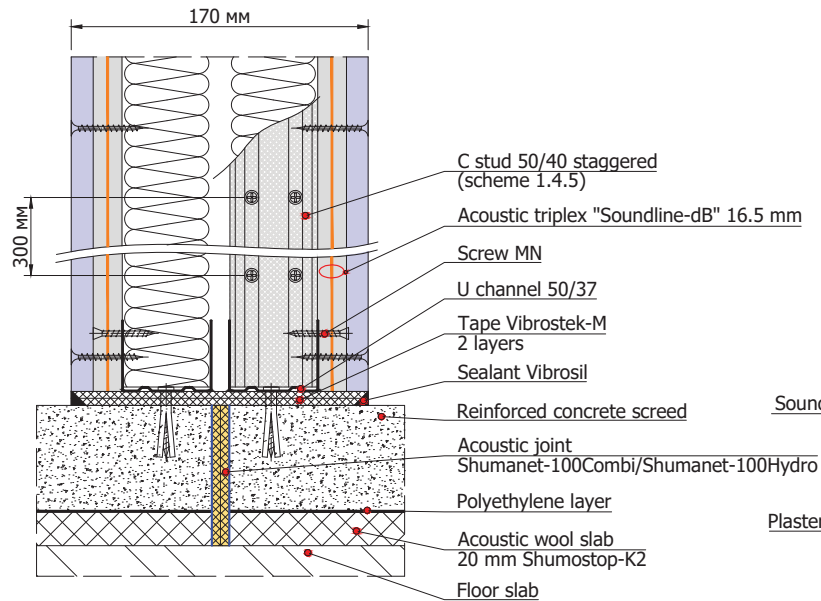
1.3.5 Junction of partition on a single frame Vibroflex-Wave 100 mm to the floor/ceiling slab



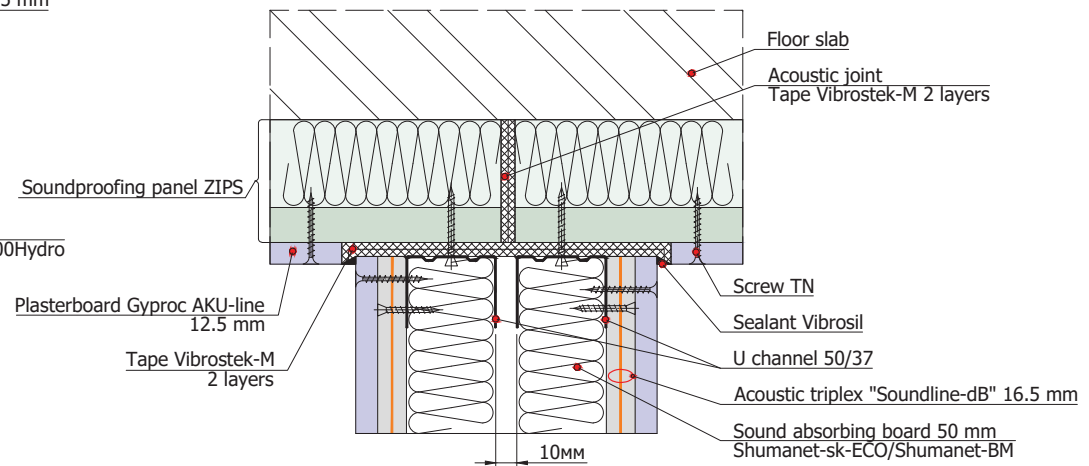
1.3.6 Junction of partition on a single frame Vibroflex-Wave 100 mm to the wall and doorway



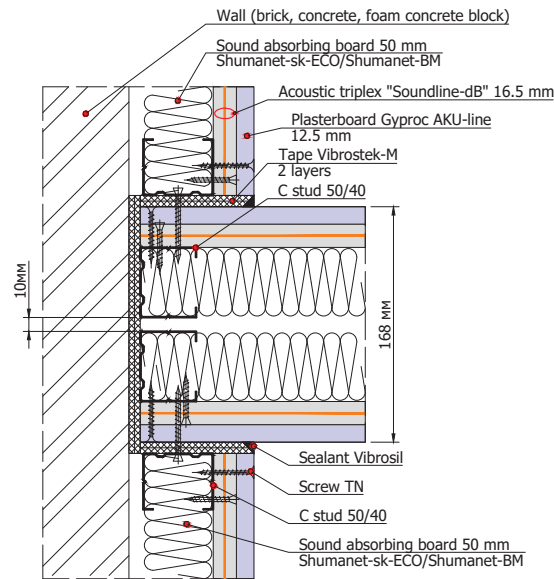
1.4.1 Junction of partition on a independent staggered frame 2x50 mm to the floating floor



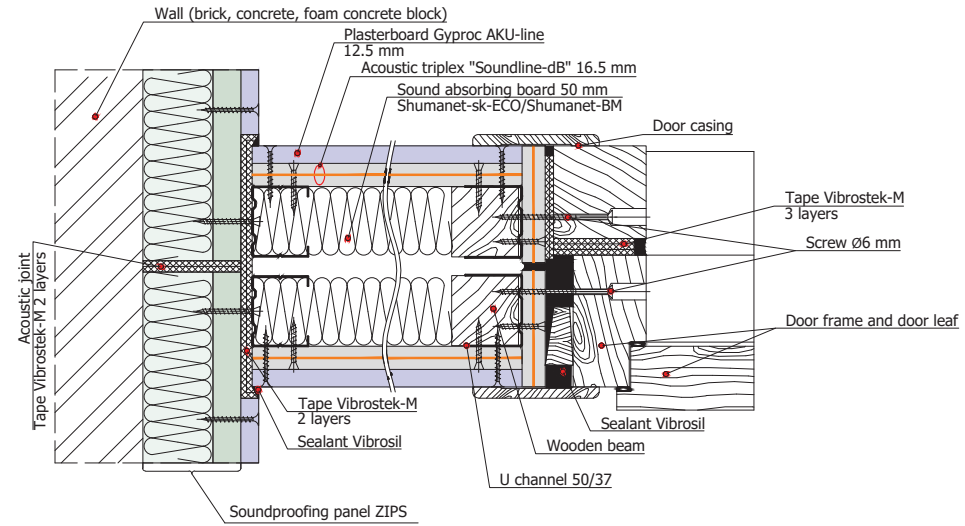
1.4.2 Junction of partition on a independent staggered frame 2x50 mm to soundproofing ZIPS panels



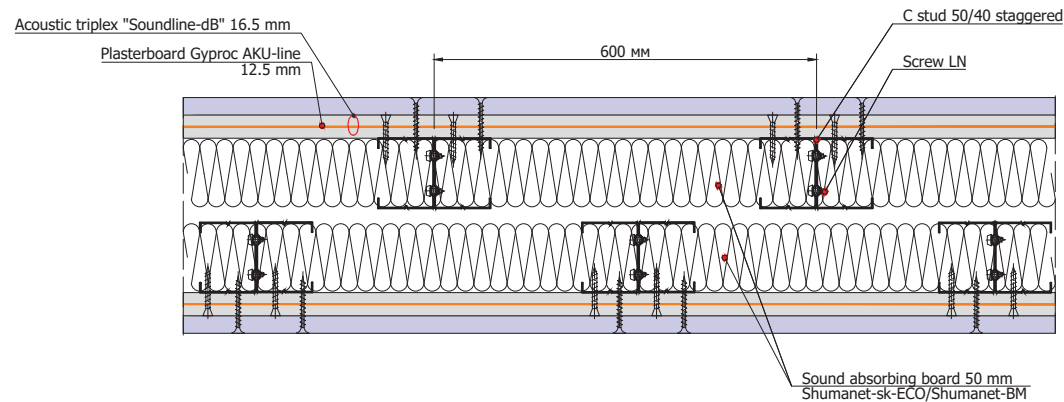
1.4.3 Junction of partition on a independent staggered frame 2x50 mm to the wall lining



1.4.4 Junction of partition on a independent staggered frame 2x50 mm to soundproofing panels ZIPS on the wall and doorway

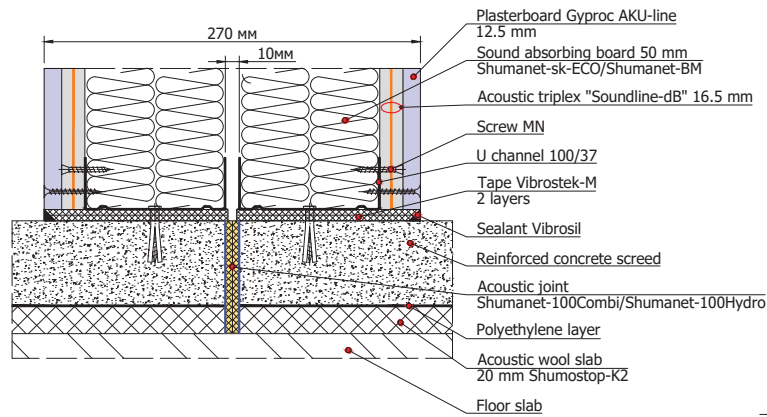


1.4.5 Junction of partition on a independent staggered frame 2x50 mm. Horizontal cross-section

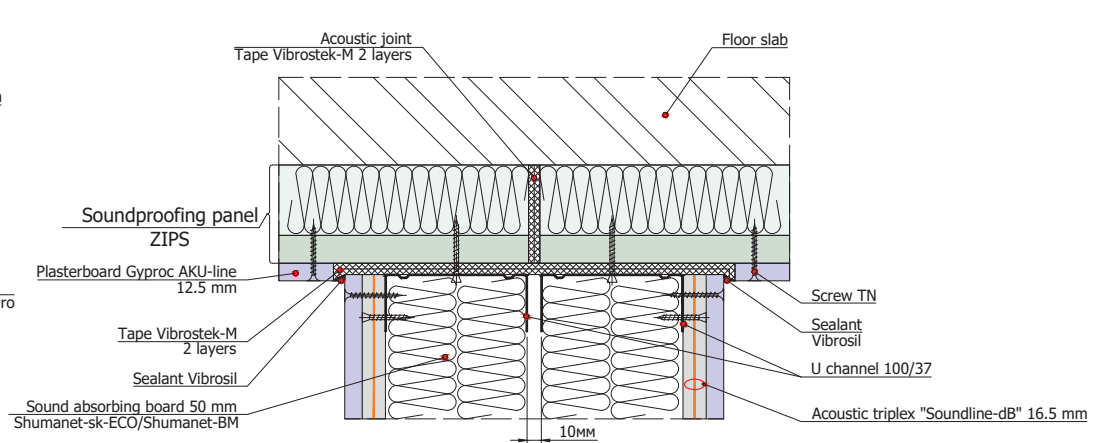




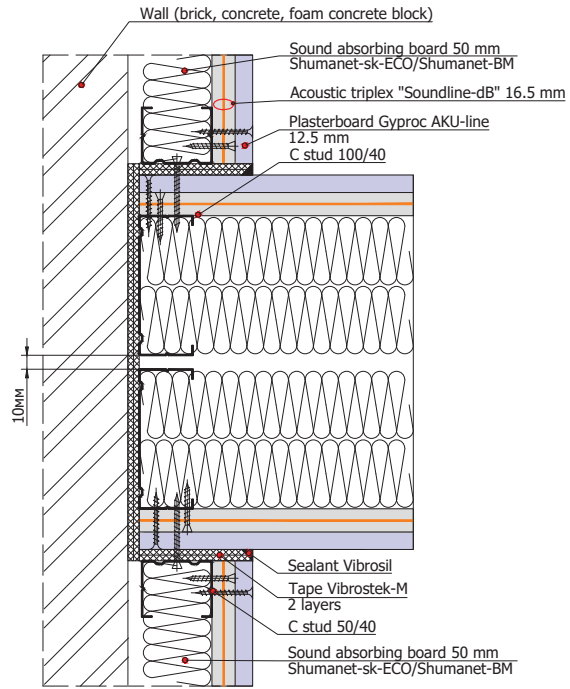
1.5.1 Junction of partition on a independent staggered frame 2x100 mm to the floating floor



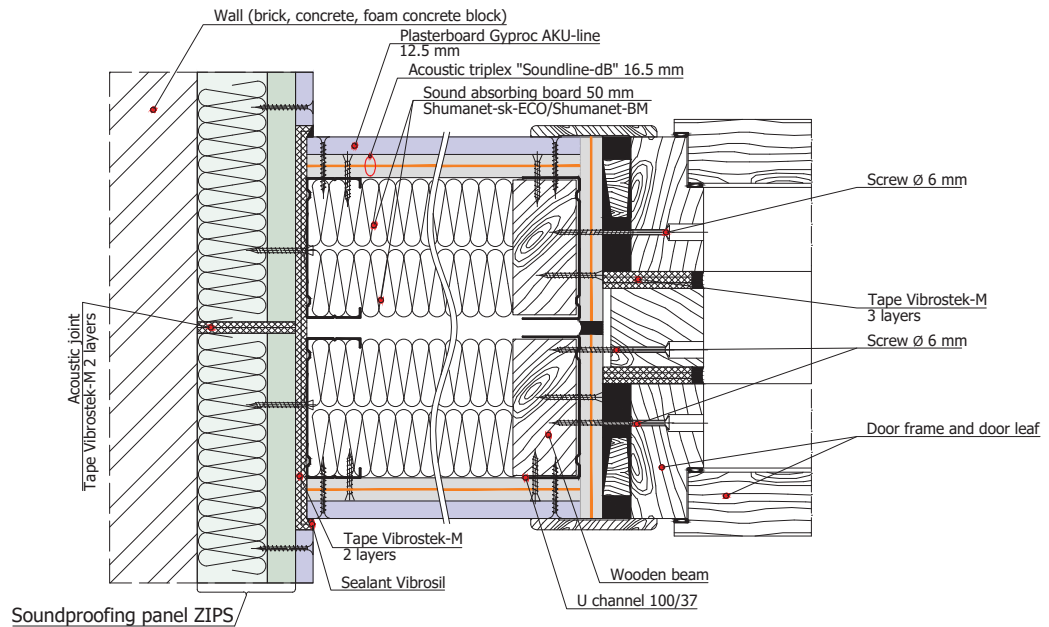
1.5.2 Junction of partition on a independent staggered frame 2x100 mm to soundproofing panels ZIPS on ceiling



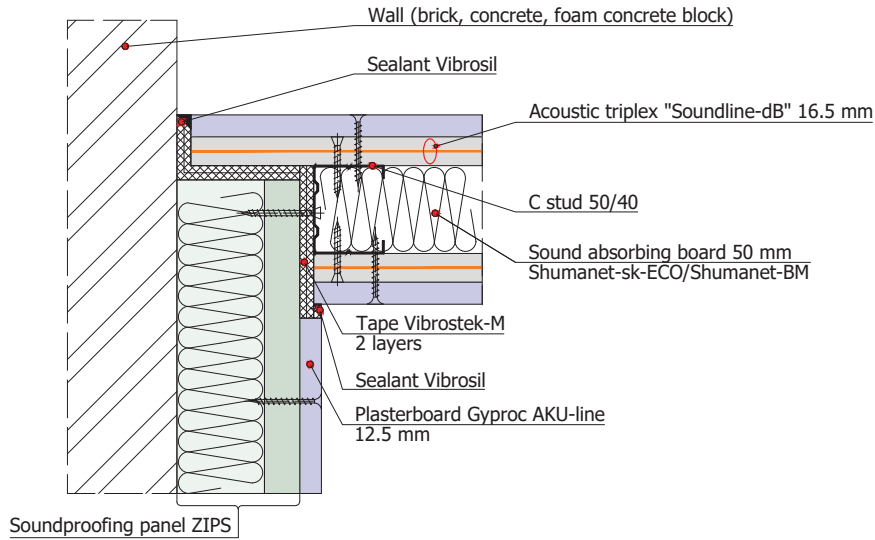
1.5.3 Junction of partition on a independent staggered frame 2x100 mm to the wall lining



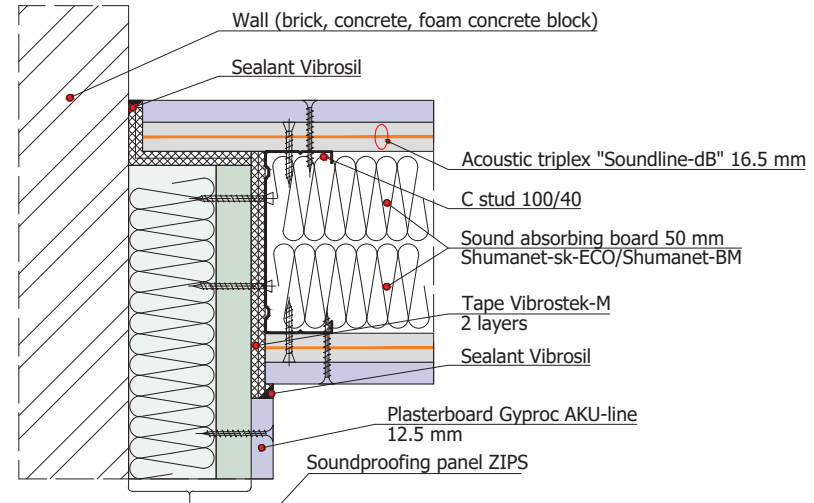
1.5.4 Junction of partition on a independent staggered frame 2x100 mm to soundproofing panels ZIPS on wall



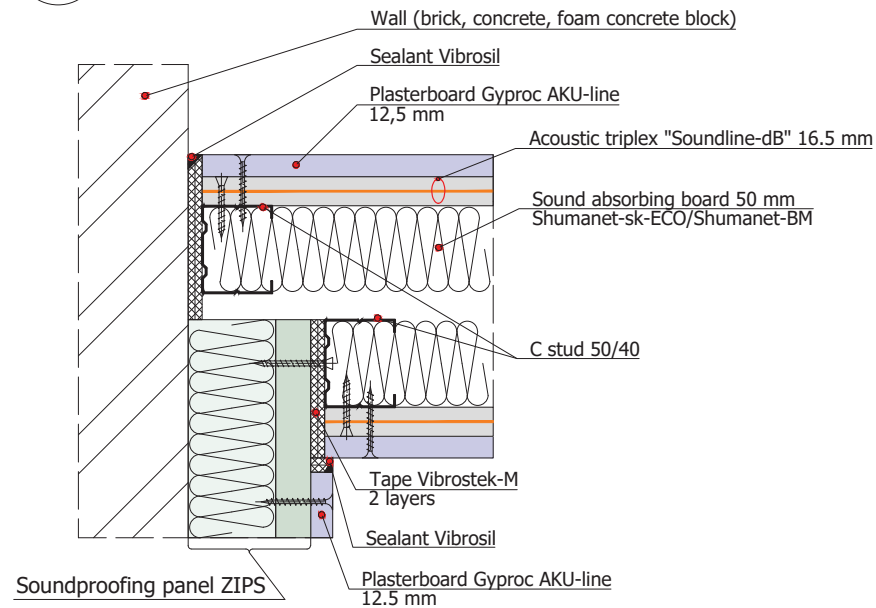
1.6.1 Corner junction of partition on a single frame 50 mm to soundproofing ZIPS panels on wall



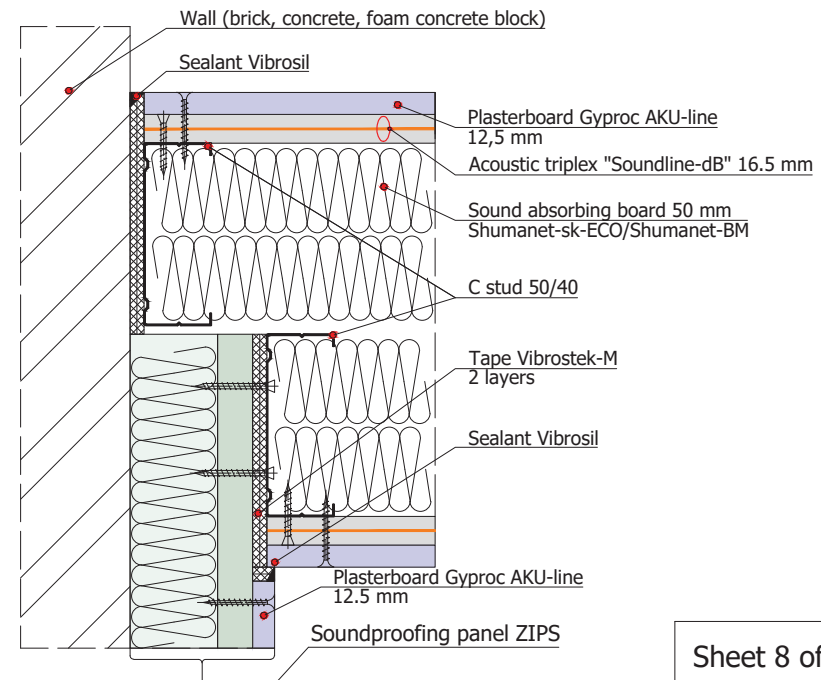
1.6.2 Corner junction of partition on a single frame 100 mm to soundproofing ZIPS panels on wall



1.6.3 Corner junction of partition on a independent staggered frame 2x50 mm to soundproofing ZIPS panels on the wall

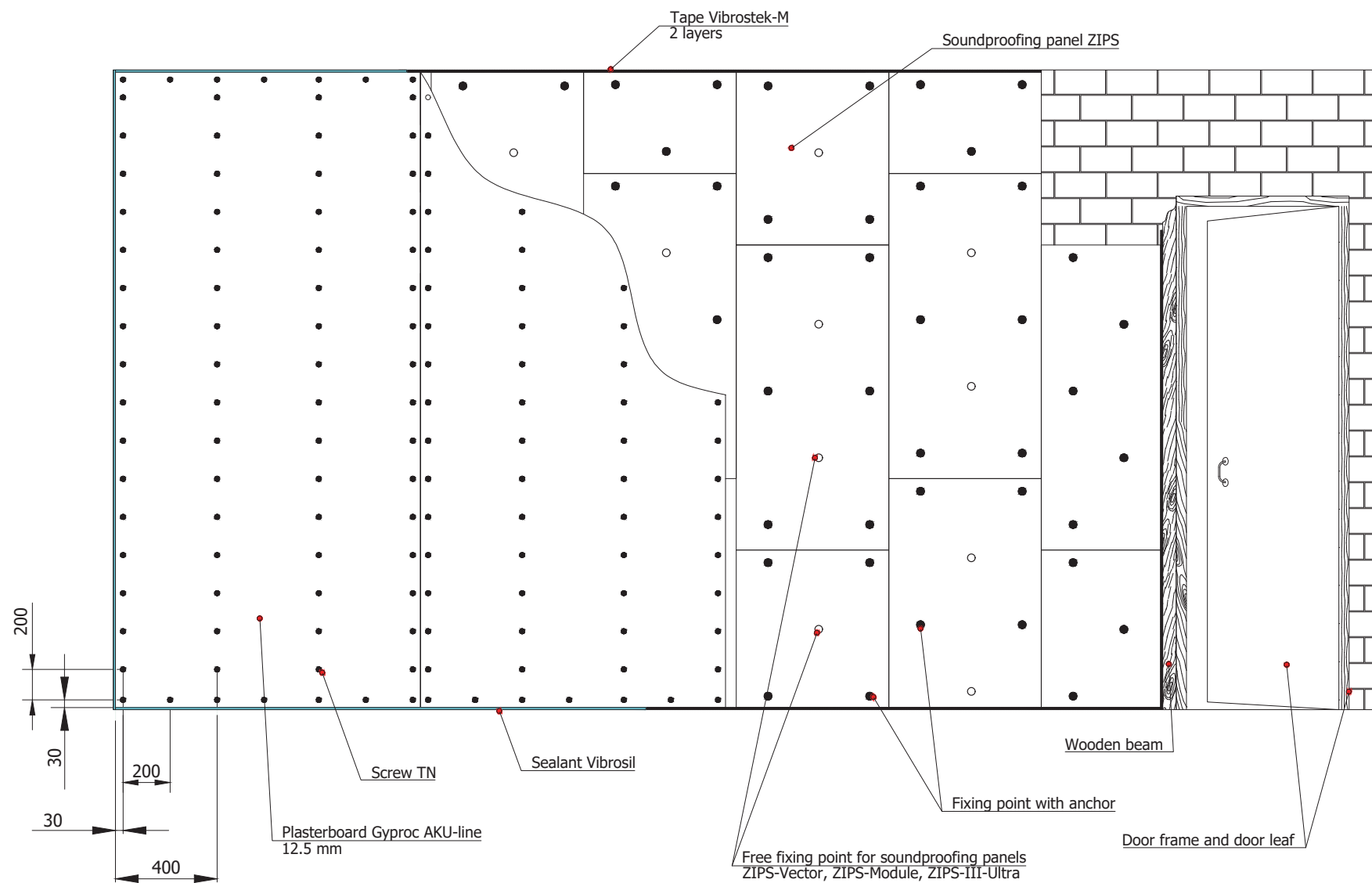


1.6.4 Corner junction of partition on a independent staggered frame 2x100 mm to soundproofing ZIPS panels on the wall

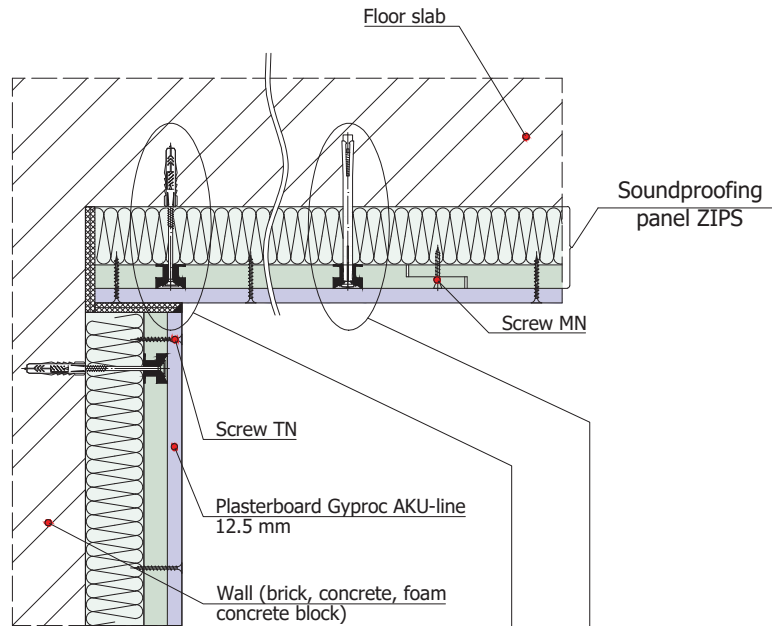




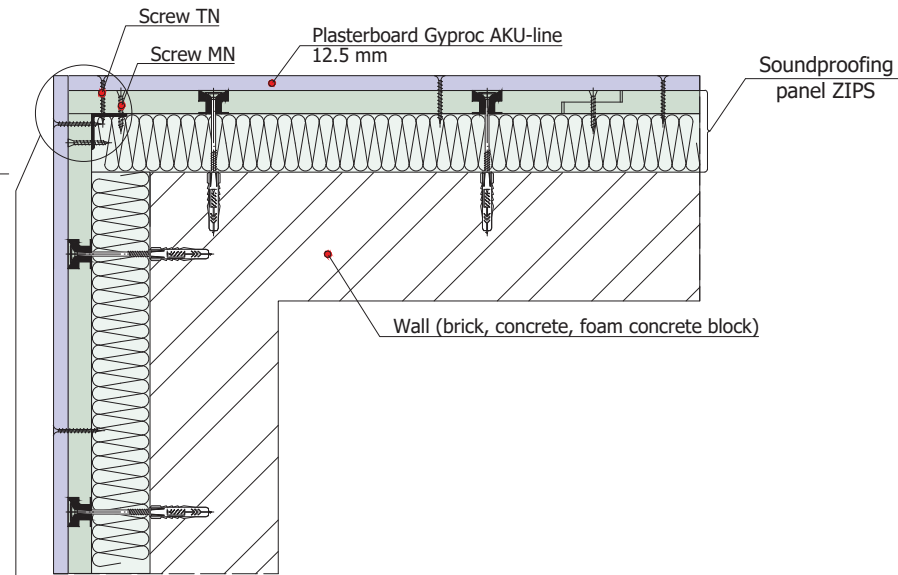
2.1.1 Installation scheme of soundproofing ZIPS panel system



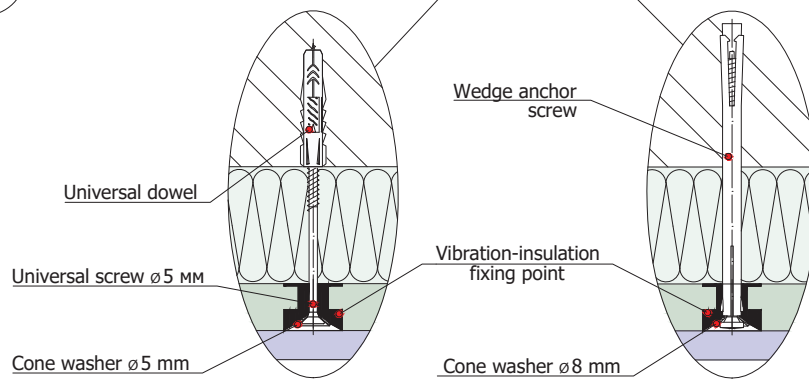
2.1.2 Installation of soundproofing ZIPS panel system (vertical cross-section)



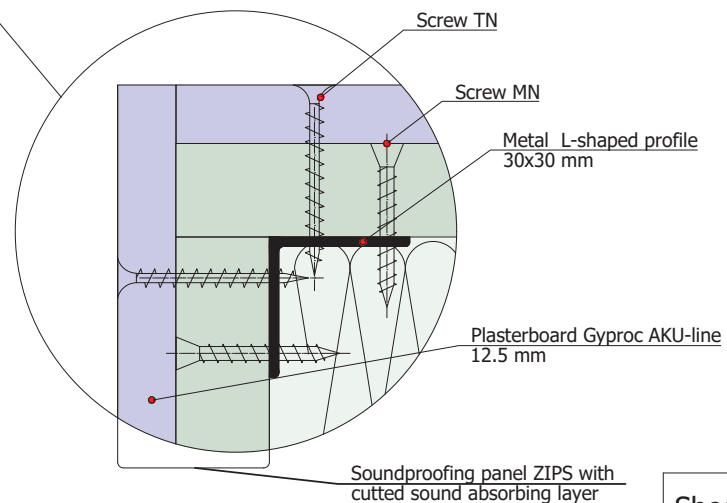
2.1.3 Installation of soundproofing ZIPS panel system on the outer corner (horizontal cross-section)



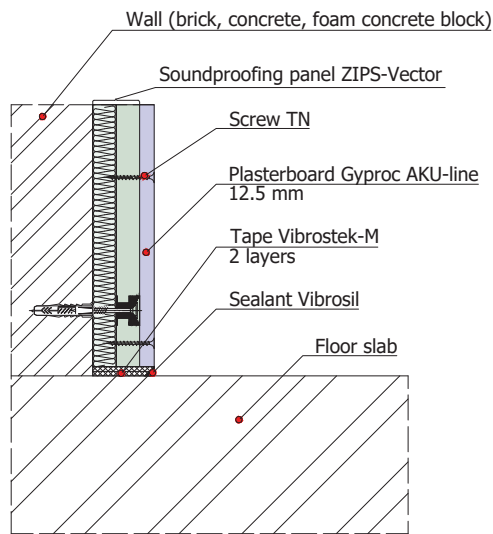
2.1.4 ZIPS panel fixing points



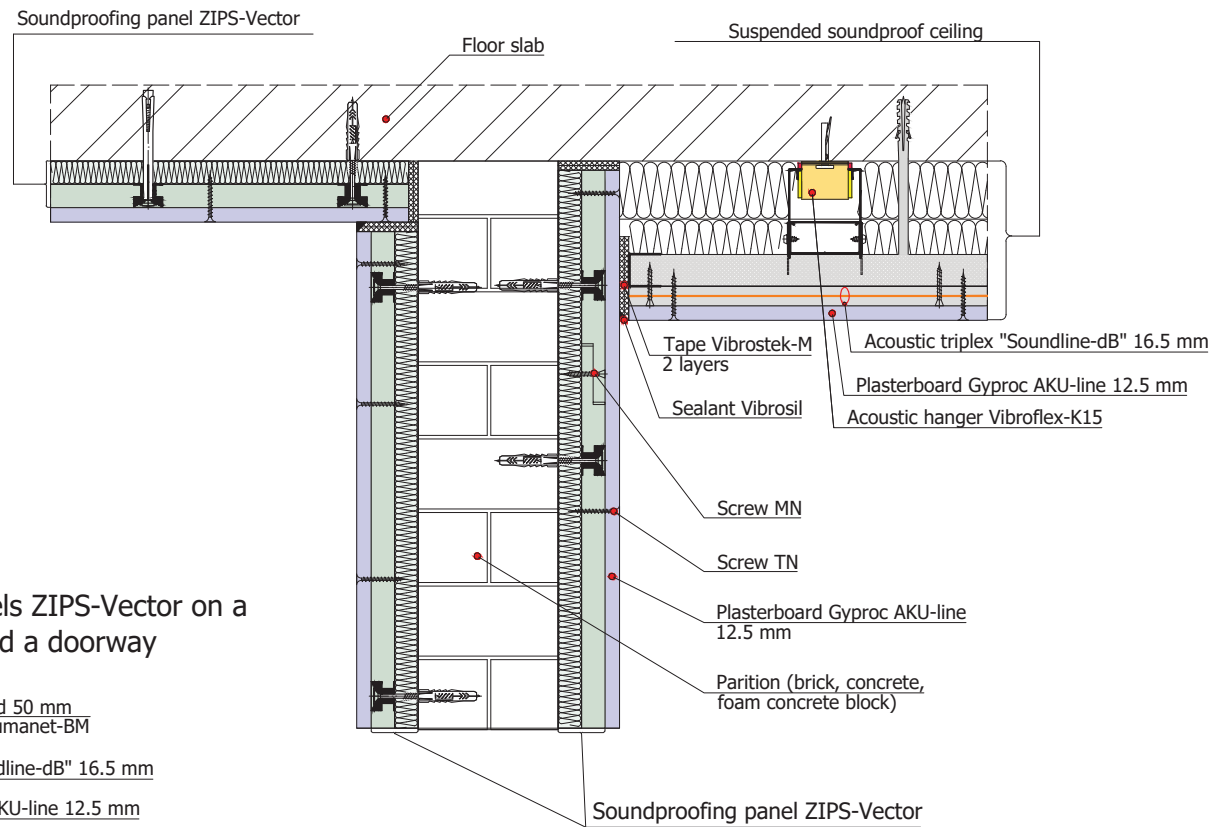
2.1.5 ZIPS panel fixing point for installation on the outer corner



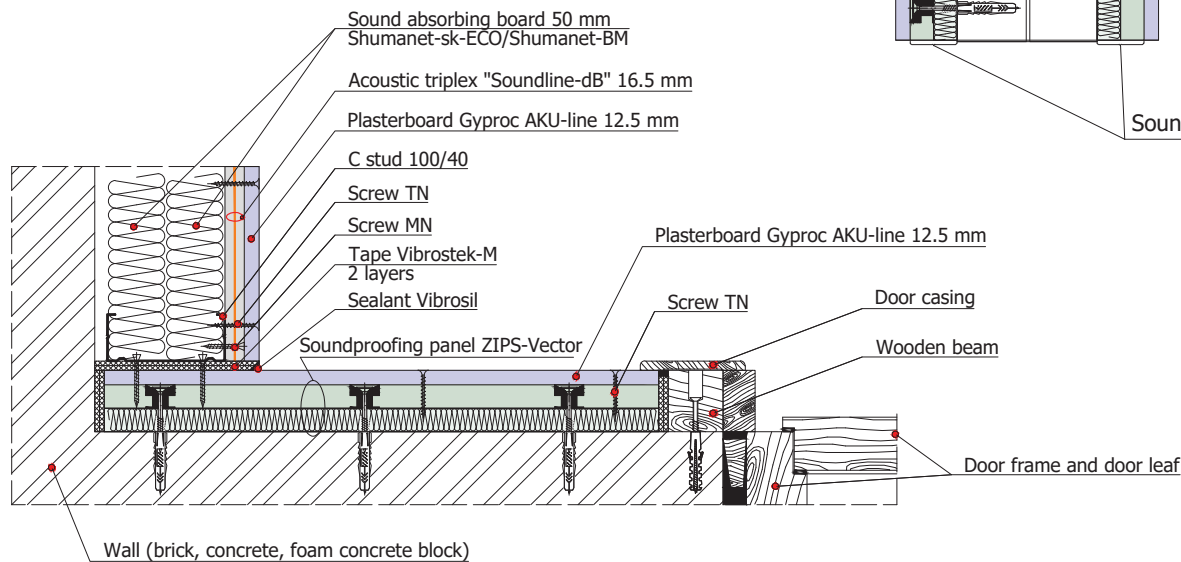
2.2.1 Junction of soundproofing panels ZIPS-Vector to a floor/ceiling slab



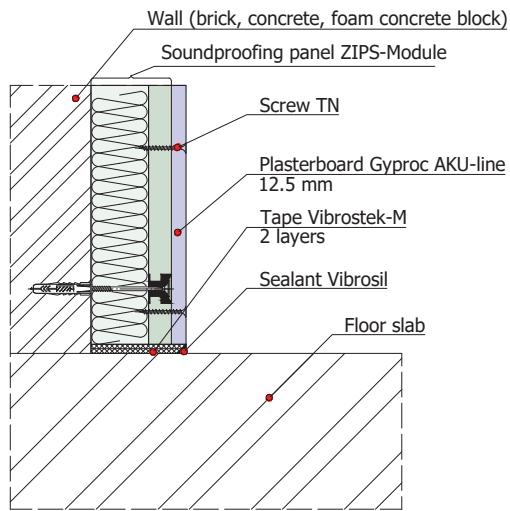
2.2.2 Junction of soundproofing panels ZIPS-Vector to soundproofing panels ZIPS-Vector on a ceiling slab and a suspended soundproof ceiling



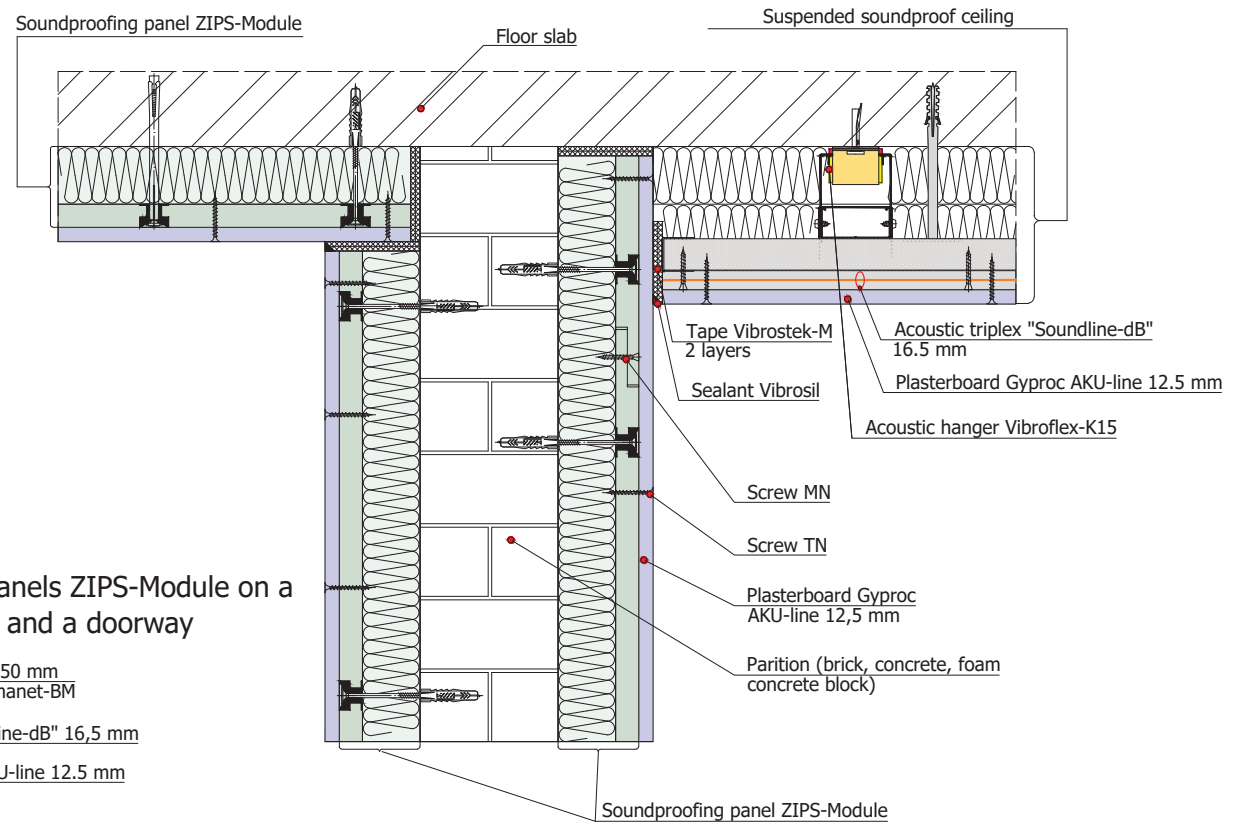
2.2.3 Corner junction of soundproofing panels ZIPS-Vector on a wall to a lining on a 100 mm frame and a doorway



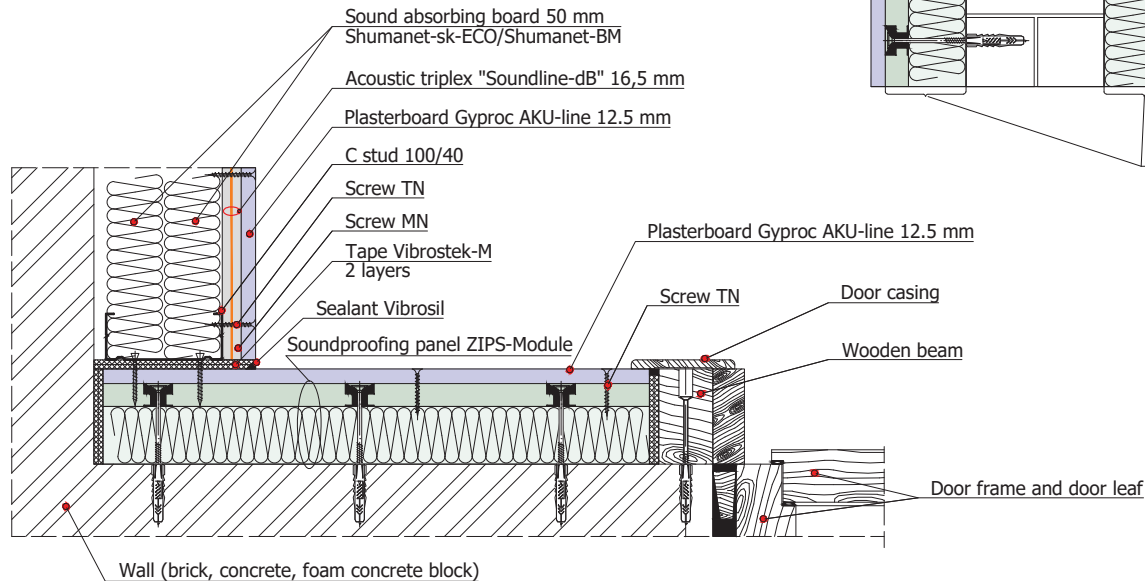
2.3.1 Junction of soundproofing panels ZIPS-Module to a floor/ceiling slab



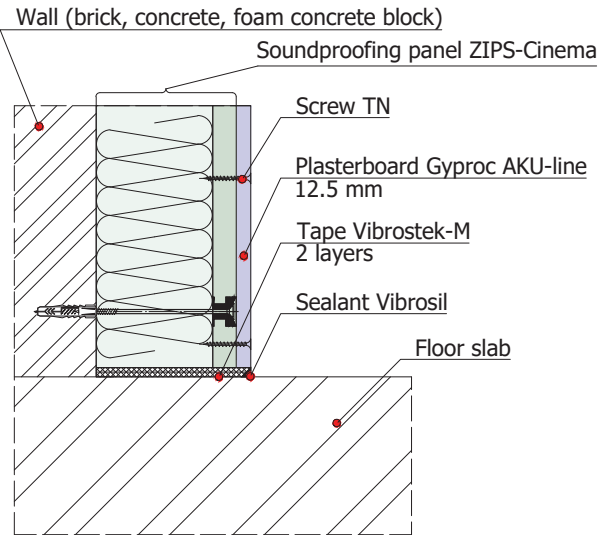
2.3.2 Junction of soundproofing panels ZIPS-Module to soundproofing panels ZIPS-Module on a ceiling slab and a suspended soundproof ceiling



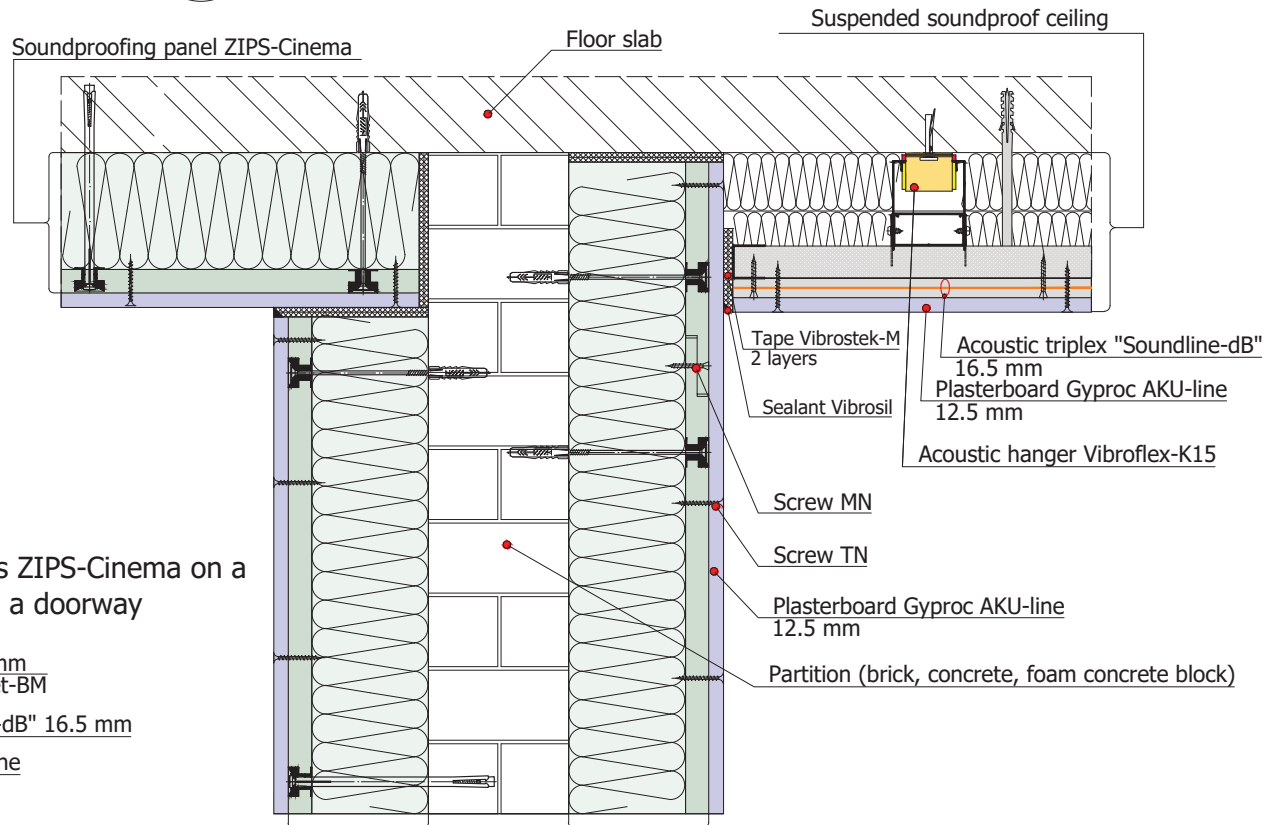
2.3.3 Corner junction of soundproofing panels ZIPS-Module on a wall to a lining on a 100 mm frame and a doorway



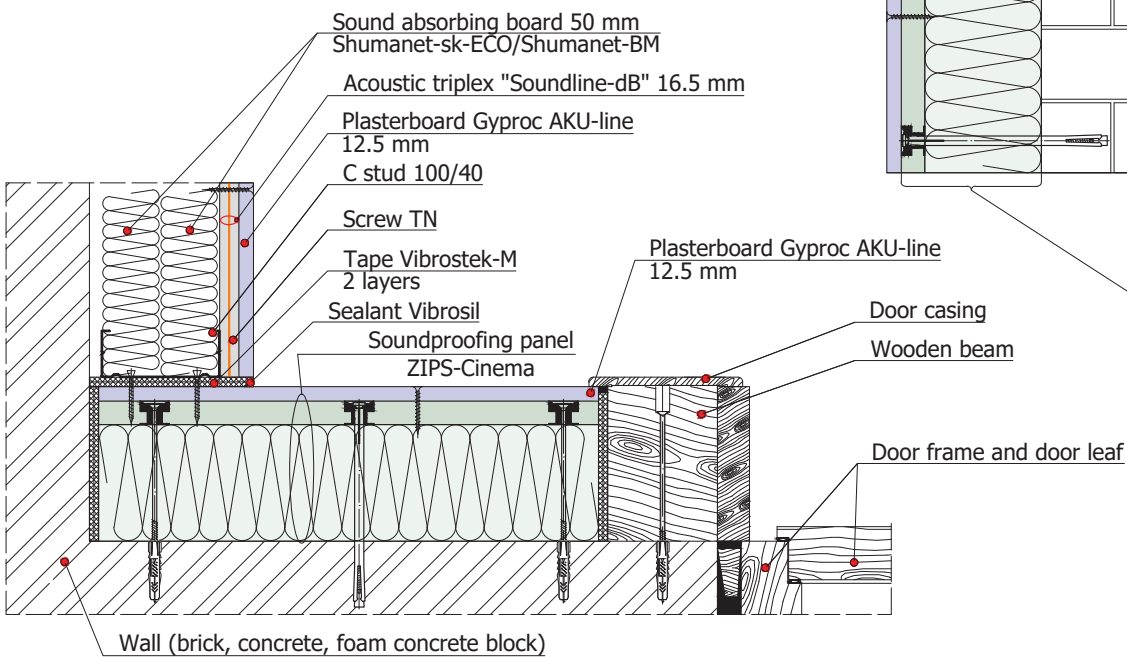
2.4.1 Junction of soundproofing panels ZIPS-Cinema to a floor/ceiling slab



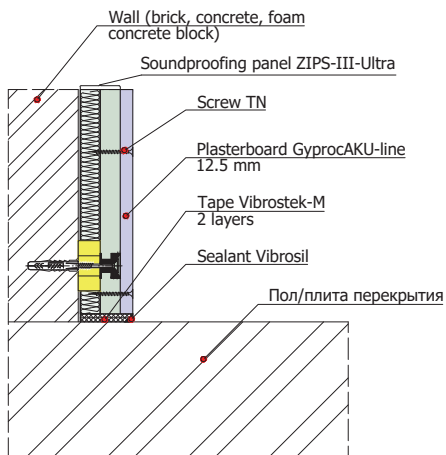
2.4.2 Junction of soundproofing panels ZIPS-Cinema to soundproofing panels ZIPS-Cinema on a ceiling slab and a suspended soundproof ceiling



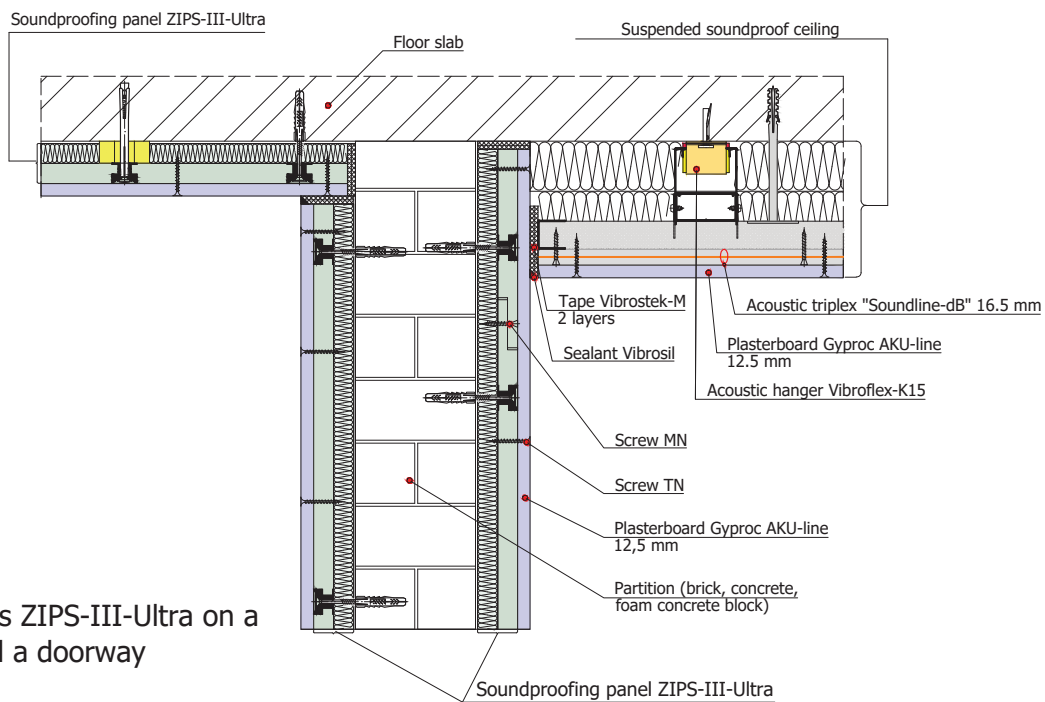
2.4.3 Corner junction of soundproofing panels ZIPS-Cinema on a wall to a lining on a 100 mm frame and a doorway



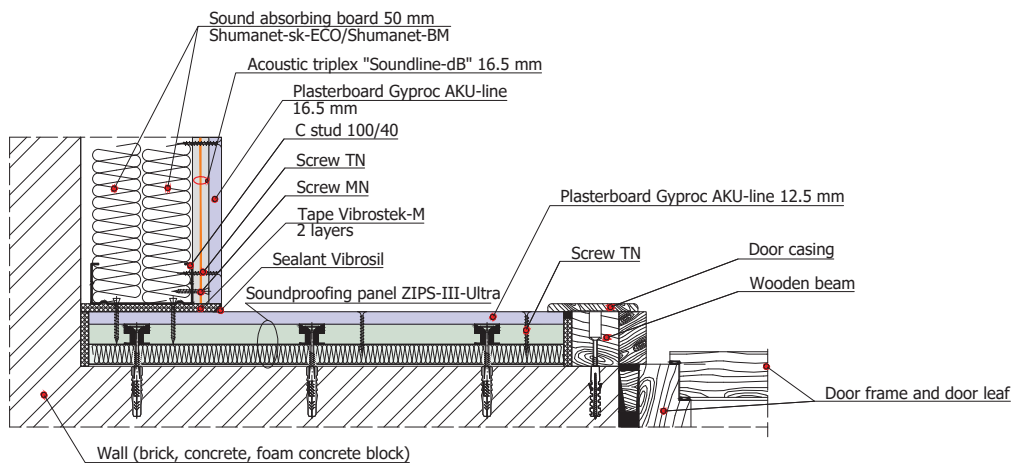
2.5.1 Junction of soundproofing panels ZIPS-III-Ultra to a floor/ceiling slab



2.5.2 Junction of soundproofing panels ZIPS-III-Ultra to soundproofing panels ZIPS-III-Ultra on a ceiling slab and a suspended soundproof ceiling

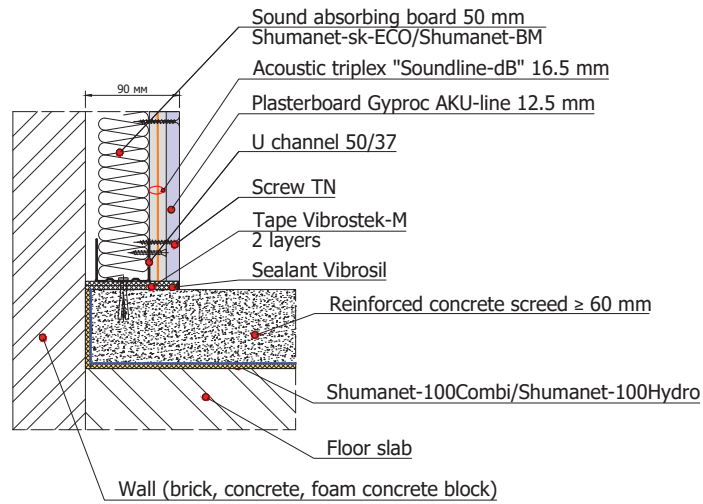


2.5.3 Corner junction of soundproofing panels ZIPS-III-Ultra on a wall to a lining on a 100 mm frame and a doorway

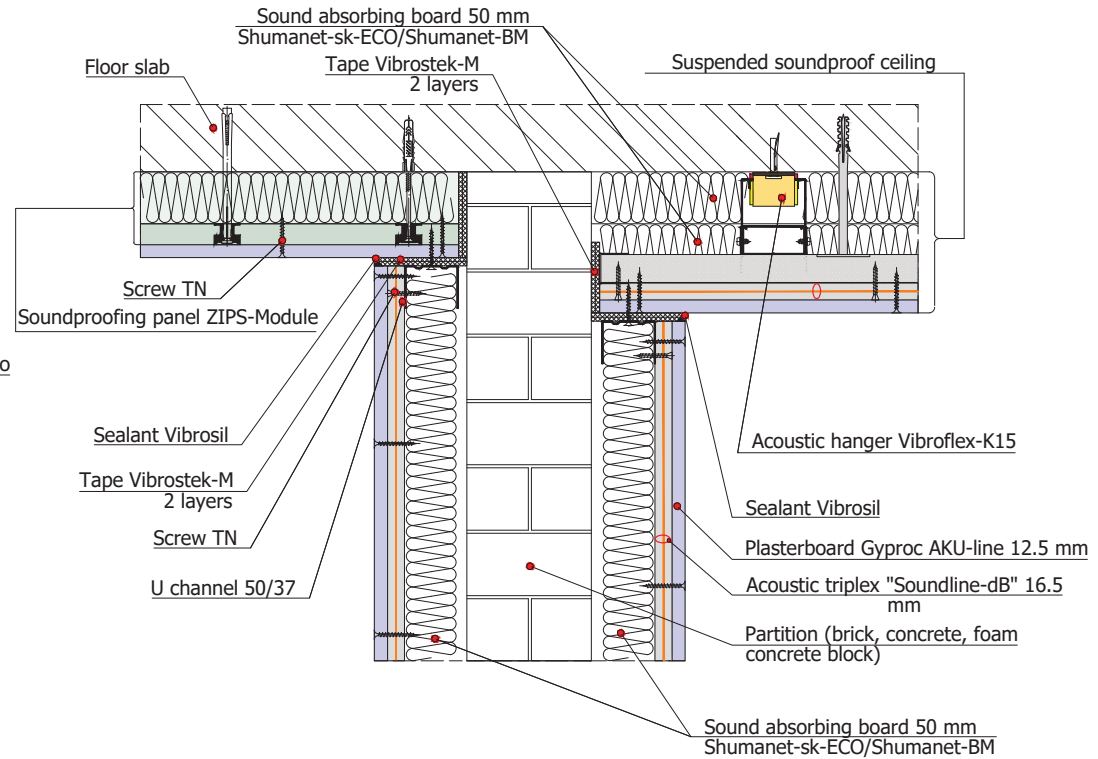




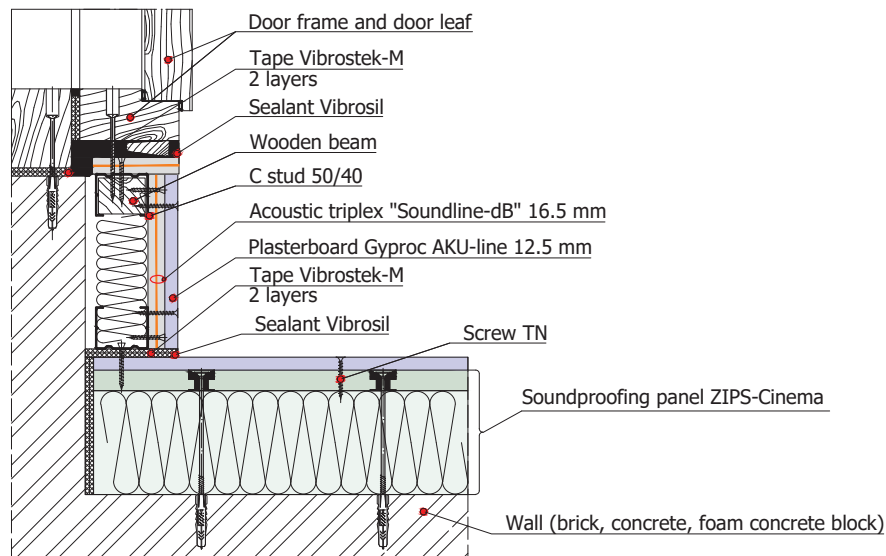
3.1.1 Junction of a wall lining on a 50 mm independent frame to a floating floor



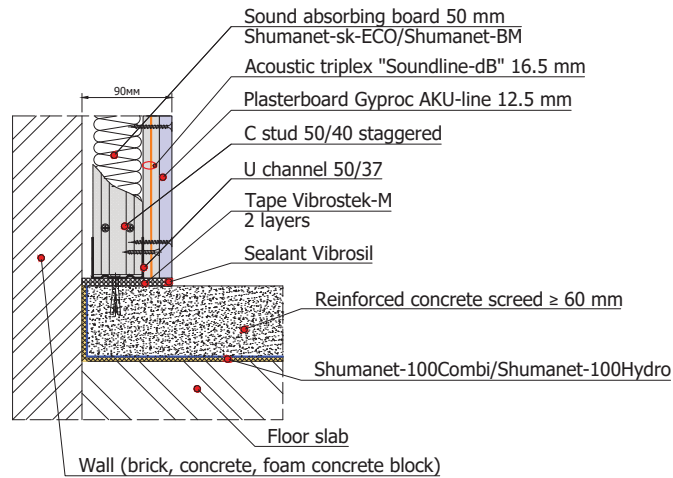
3.1.2 Junction of a wall lining on a 50 mm independent frame to soundproofing ZIPS panels on a ceiling slab and a suspended soundproof ceiling



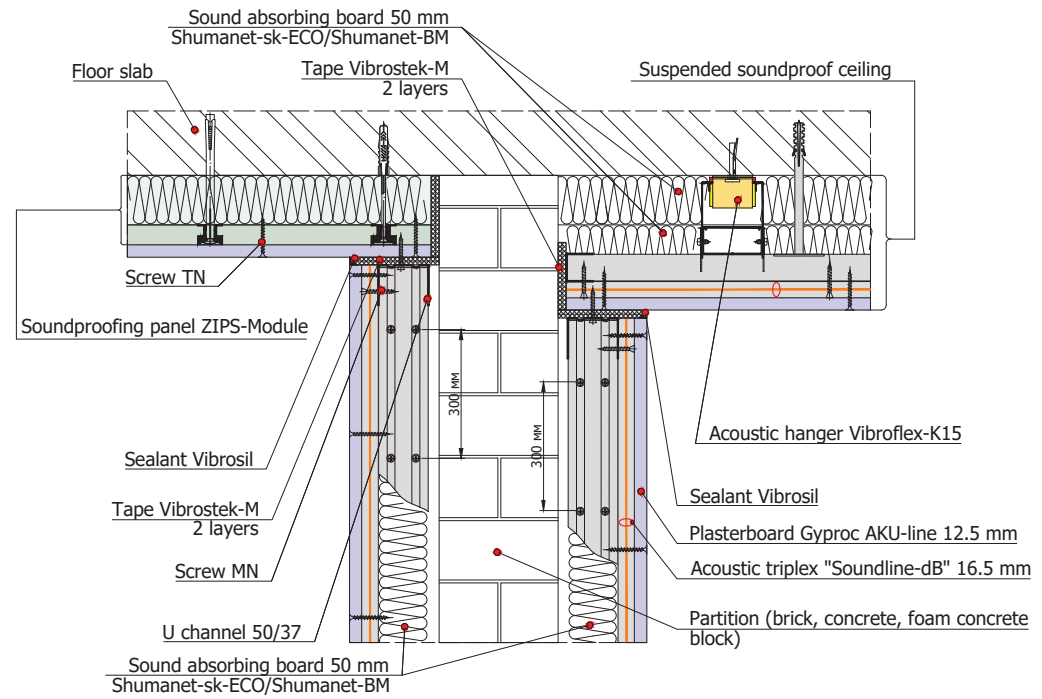
3.1.3 Corner junction of a wall lining on a 50 mm independent frame to soundproofing ZIPS panels on a wall and a doorway



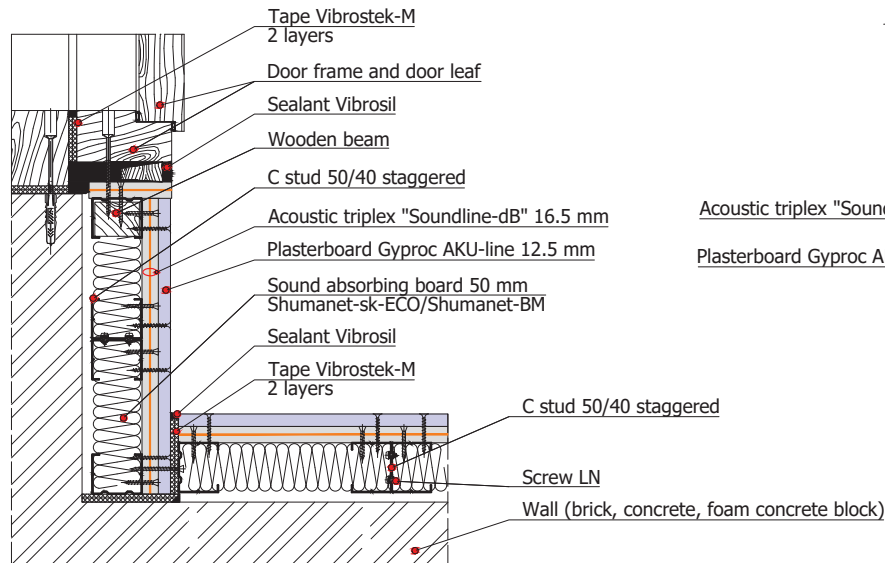
3.2.1 Junction of a wall lining on a 50 mm independent staggered frame to a floating floor



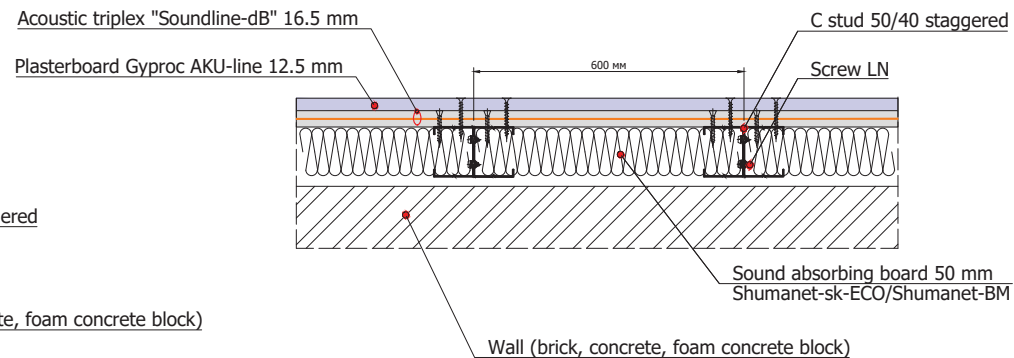
3.2.2 Junction of a wall lining on a 50 mm independent staggered frame to soundproofing ZIPS panels on a lining slab and a supported soundproof ceiling



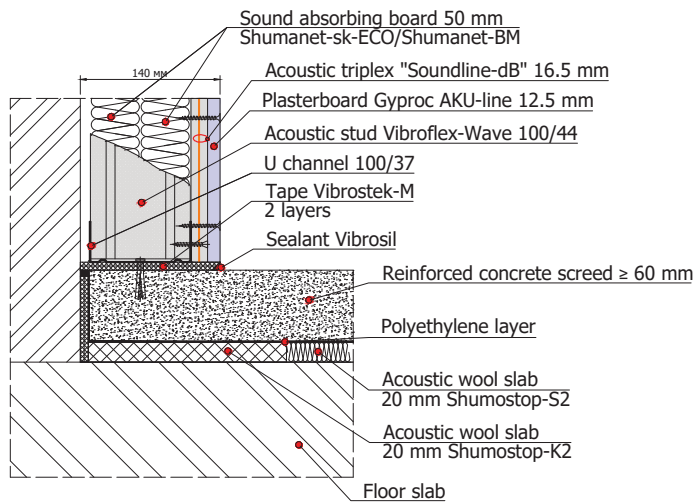
3.2.3 Installation of a wall lining on a 50 mm independent staggered frame to an inner corner and junction to a doorway



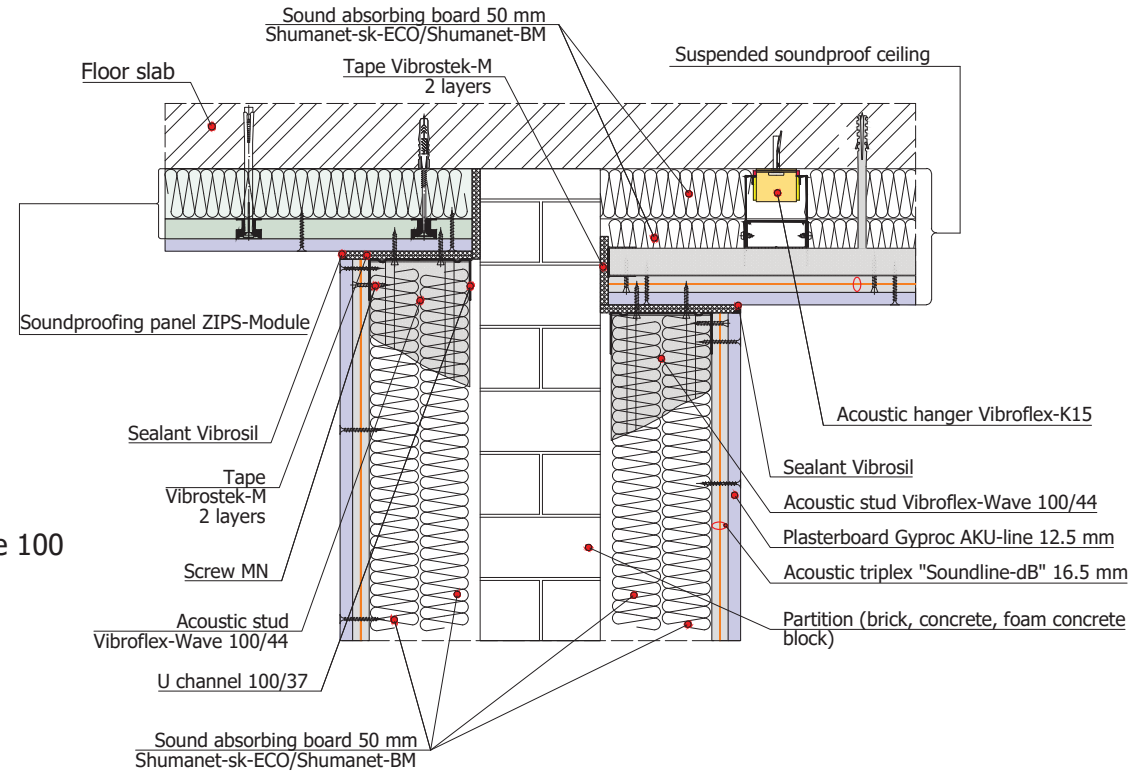
3.2.4 Wall lining on a 50 mm independent staggered frame. Horizontal cross-section



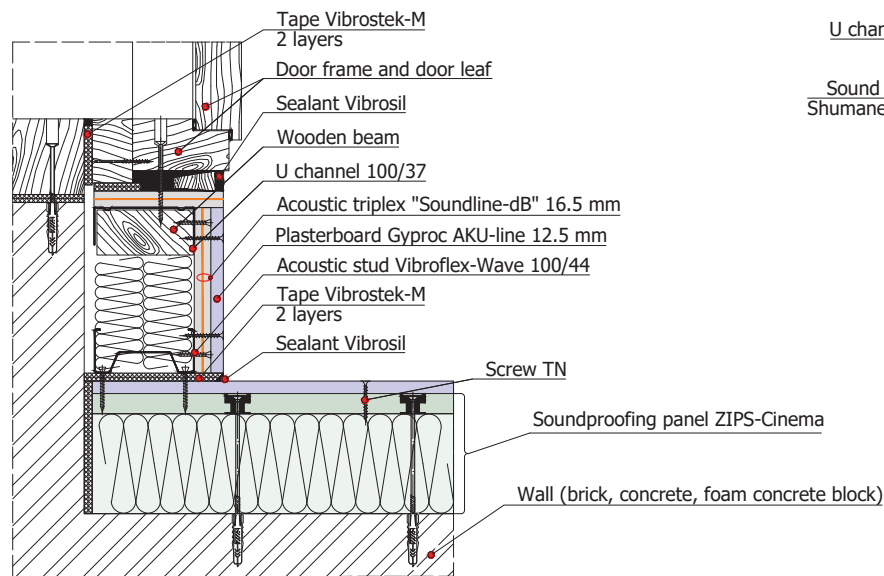
3.3.1 Junction of a wall lining on a Vibroflex-Wave 100 mm independent frame to a floating floor



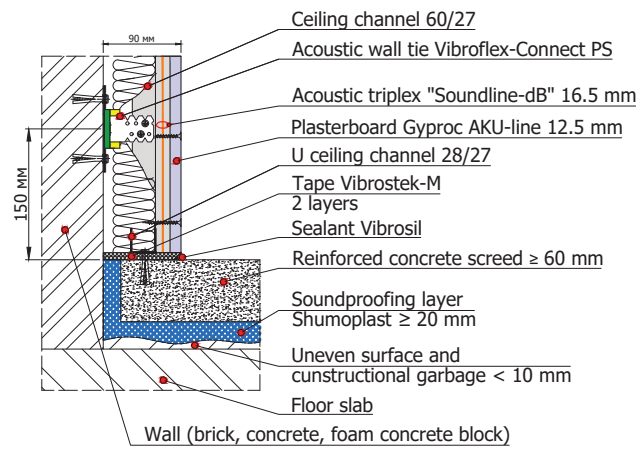
3.3.2 Junction of a wall lining on a Vibroflex-Wave 100 mm independent frame to soundproofing ZIPS panels on a ceiling slab and a suspended soundproof ceiling



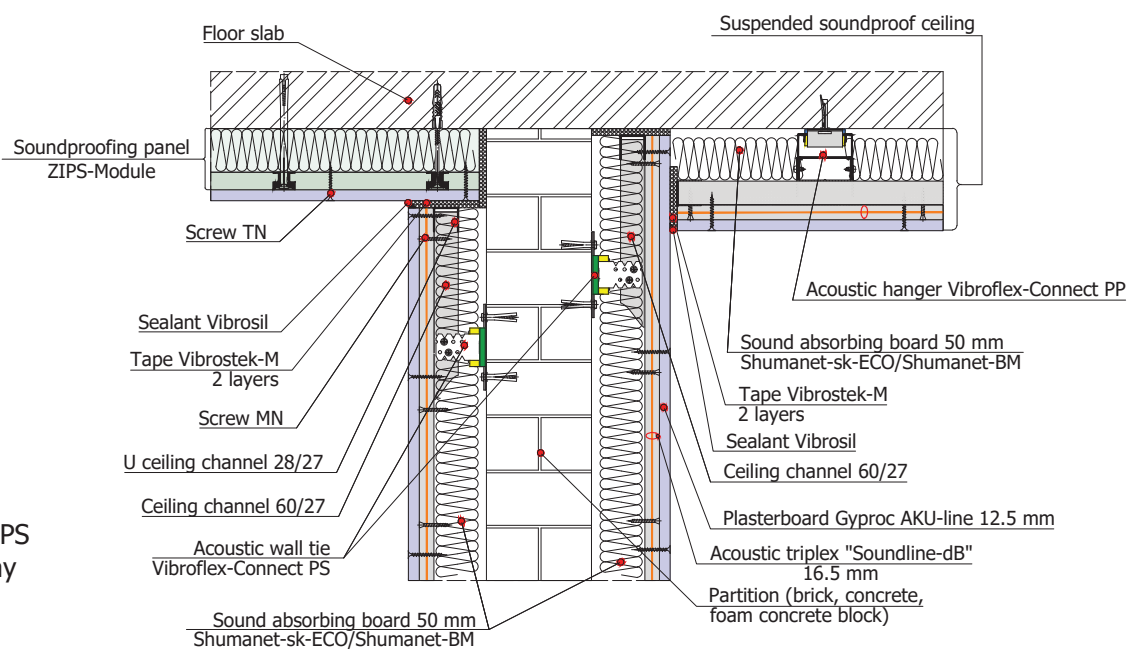
3.3.3 Corner junction of a wall lining on a Vibroflex-Wave 100 mm to soundproofing ZIPS panels on a wall and a doorway



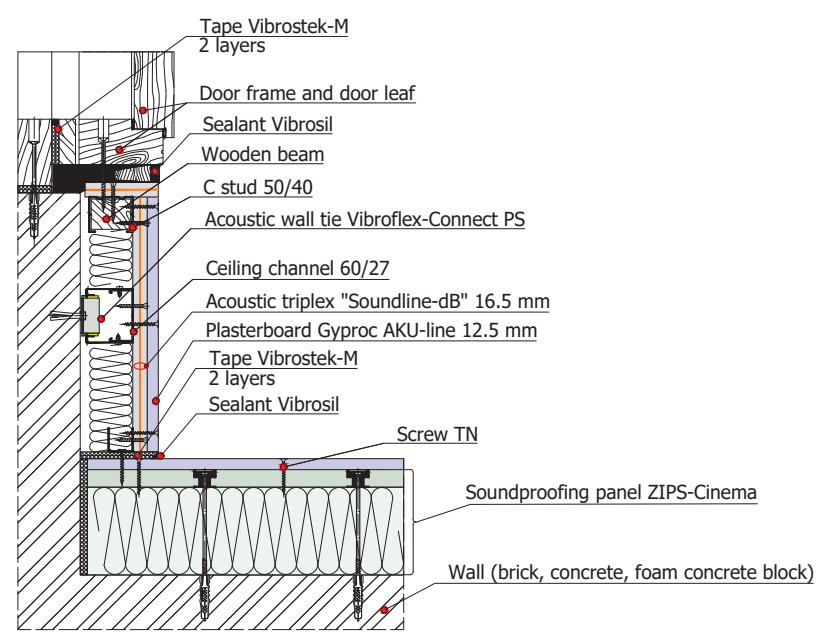
3.4.1 Junction of a wall lining on a ceiling channel 60/27 frame and acoustic wall ties Vibroflex-Connect PS to a floating floor



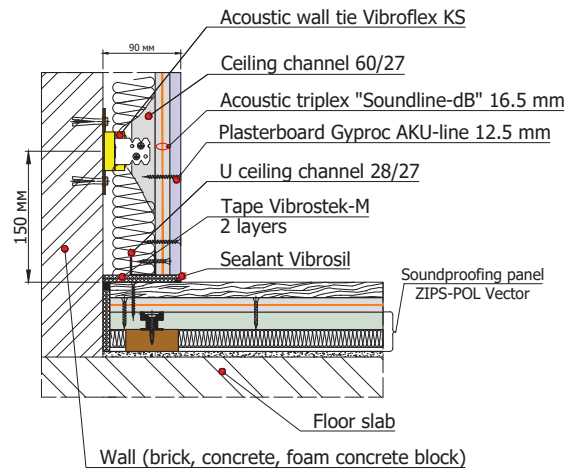
3.4.2 Junction of a wall lining on a ceiling channel 60/27 frame and acoustic ties Vibroflex-Connect PS to soundproofing ZIPS panels on a ceiling slab and a suspended soundproof ceiling



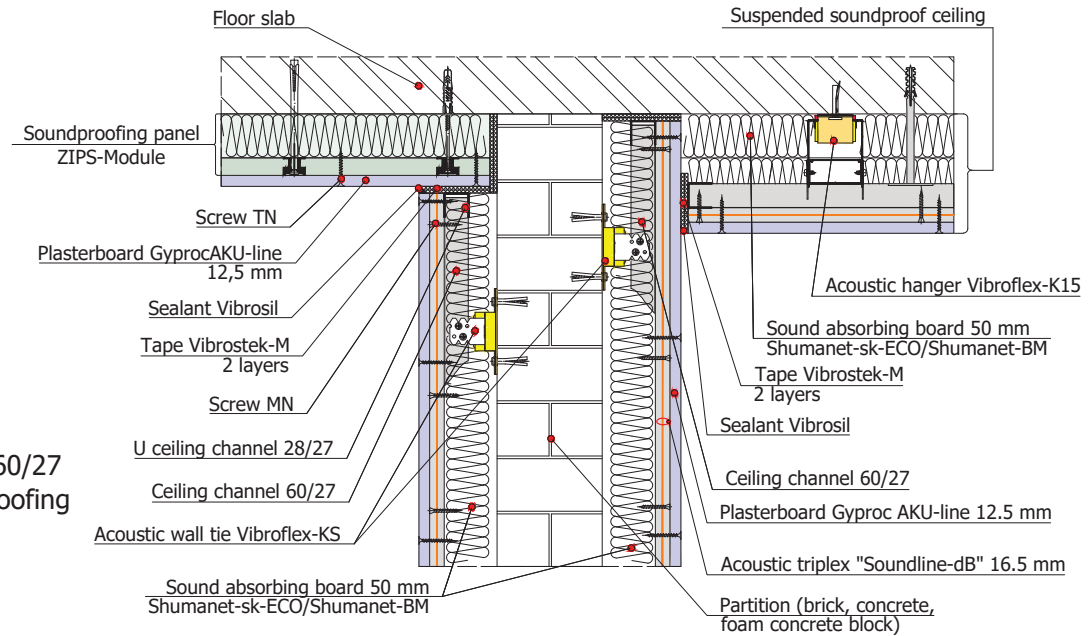
3.4.3 Corner junction of a wall lining on a ceiling channel 60/27 frame and acoustic wall ties Vibroflex-Connect PS to soundproofing ZIPS panels on a wall and a doorway



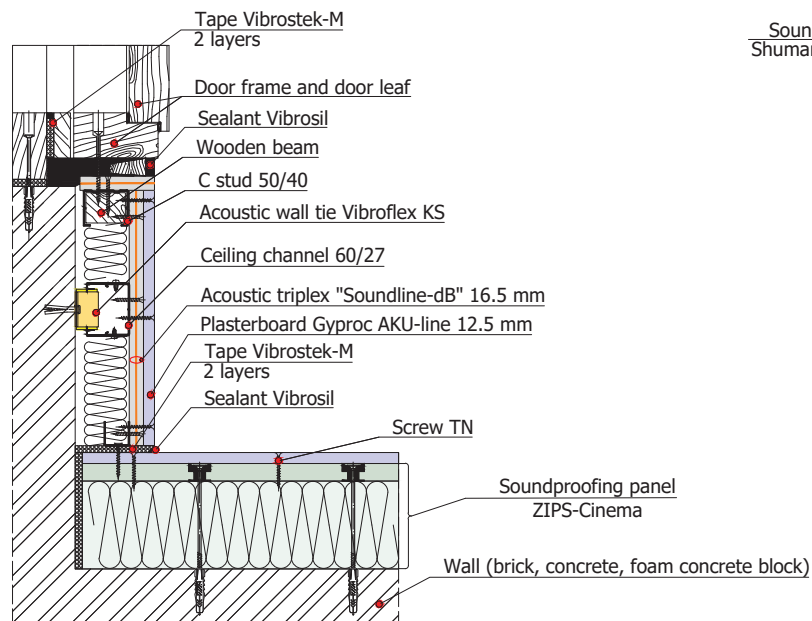
3.5.1 Junction of a wall lining on a ceiling channel 60/27 frame and acoustic wall ties Vibroflex-KS to a floating floor



3.5.2 Junction of a wall lining on a ceiling channel 60/27 frame and acoustic ties Vibroflex-KS to soundproofing ZIPS panels on a ceiling slab and a suspended soundproof ceiling

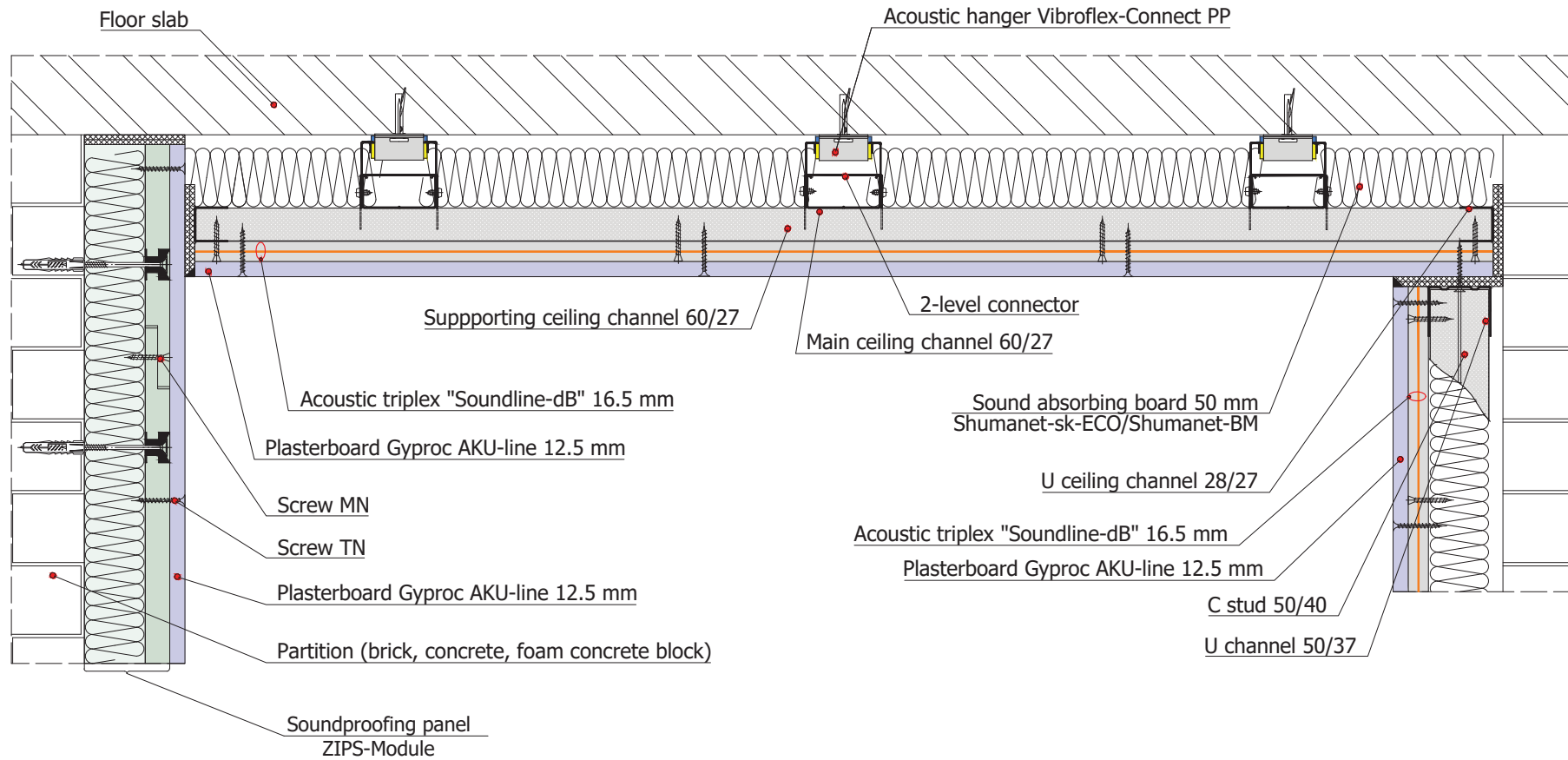


3.5.3 Corner junction of a wall lining on a ceiling channel 60/27 frame and acoustic wall ties Vibroflex-KS to soundproofing ZIPS panels on a wall and a doorway



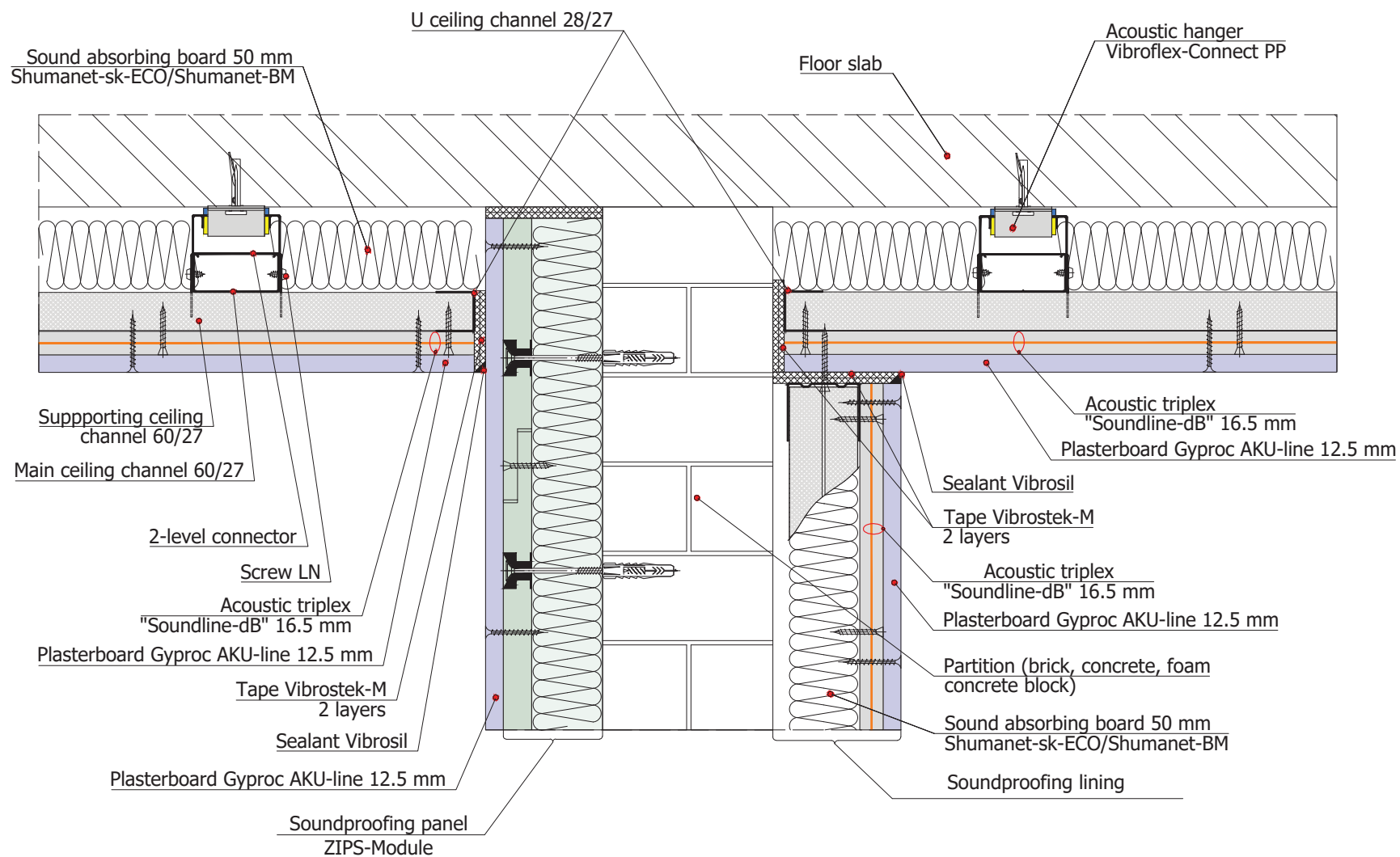


4.1.1 Suspended ceiling on acoustic hangers Vibroflex-Connect PP

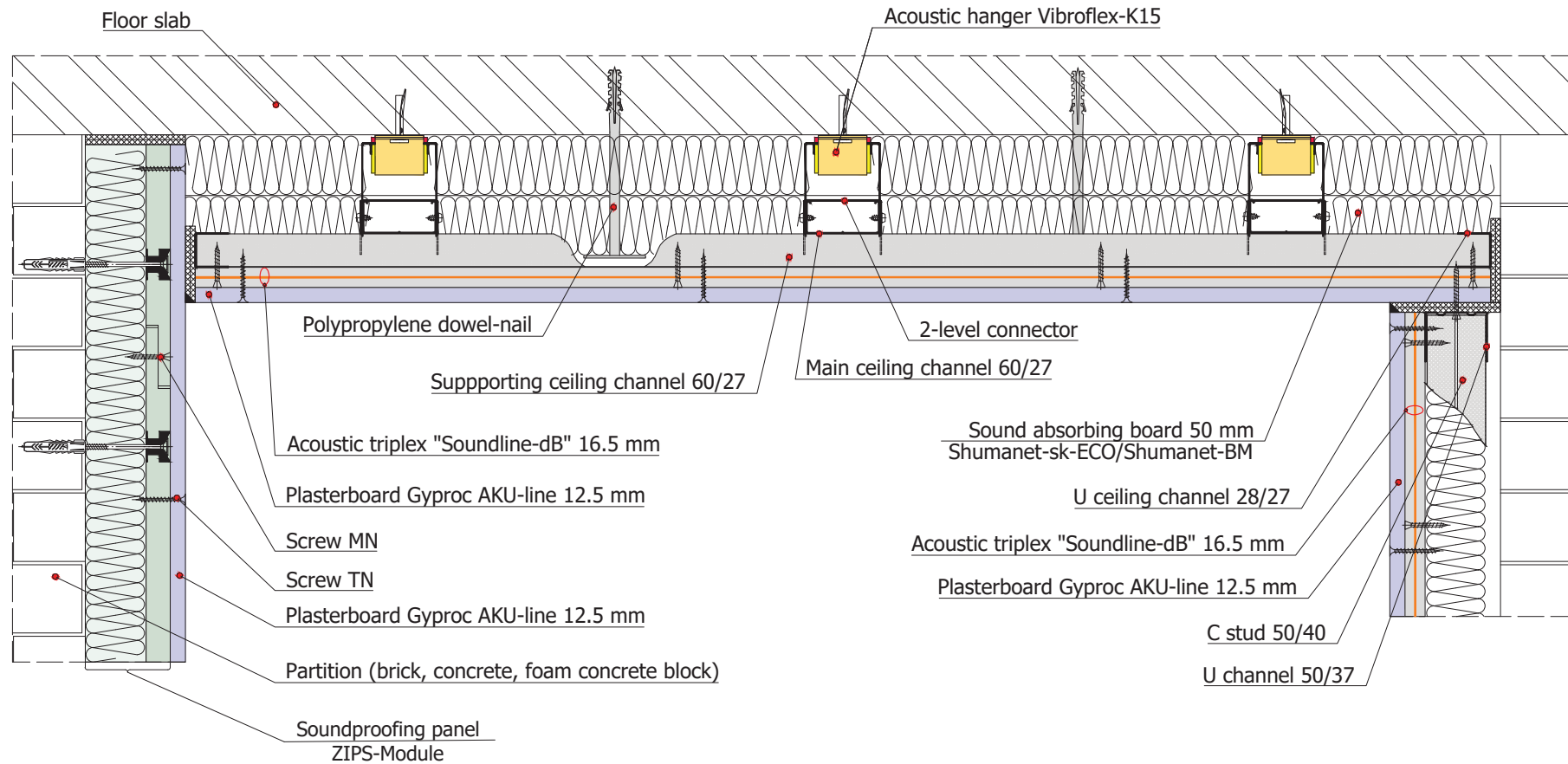




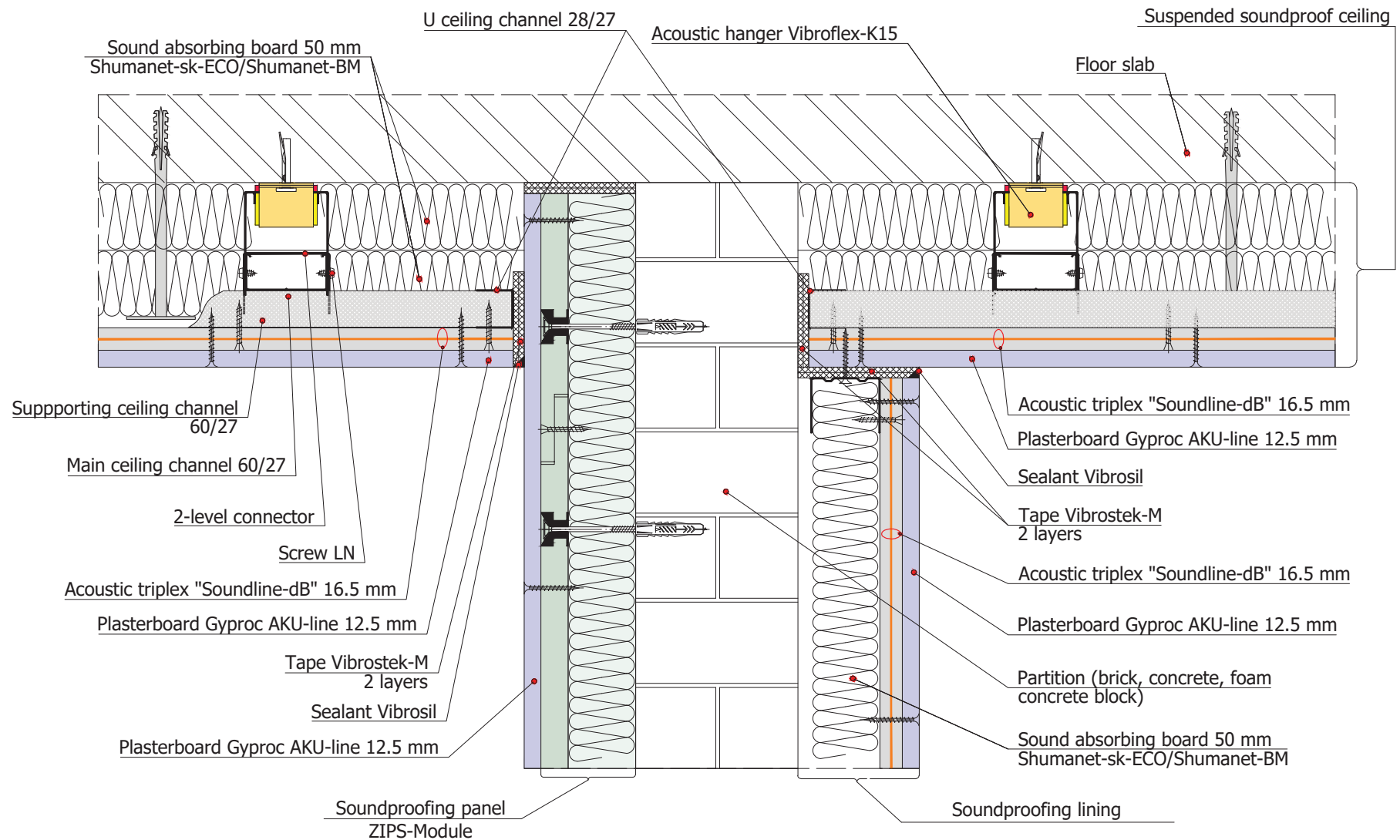
4.1.2 Junction of a suspended soundproof ceiling on acoustic hangers Vibroflex-Connect PP to a wall lining



4.2.1 Suspended ceiling on acoustic hangers Vibroflex-K15

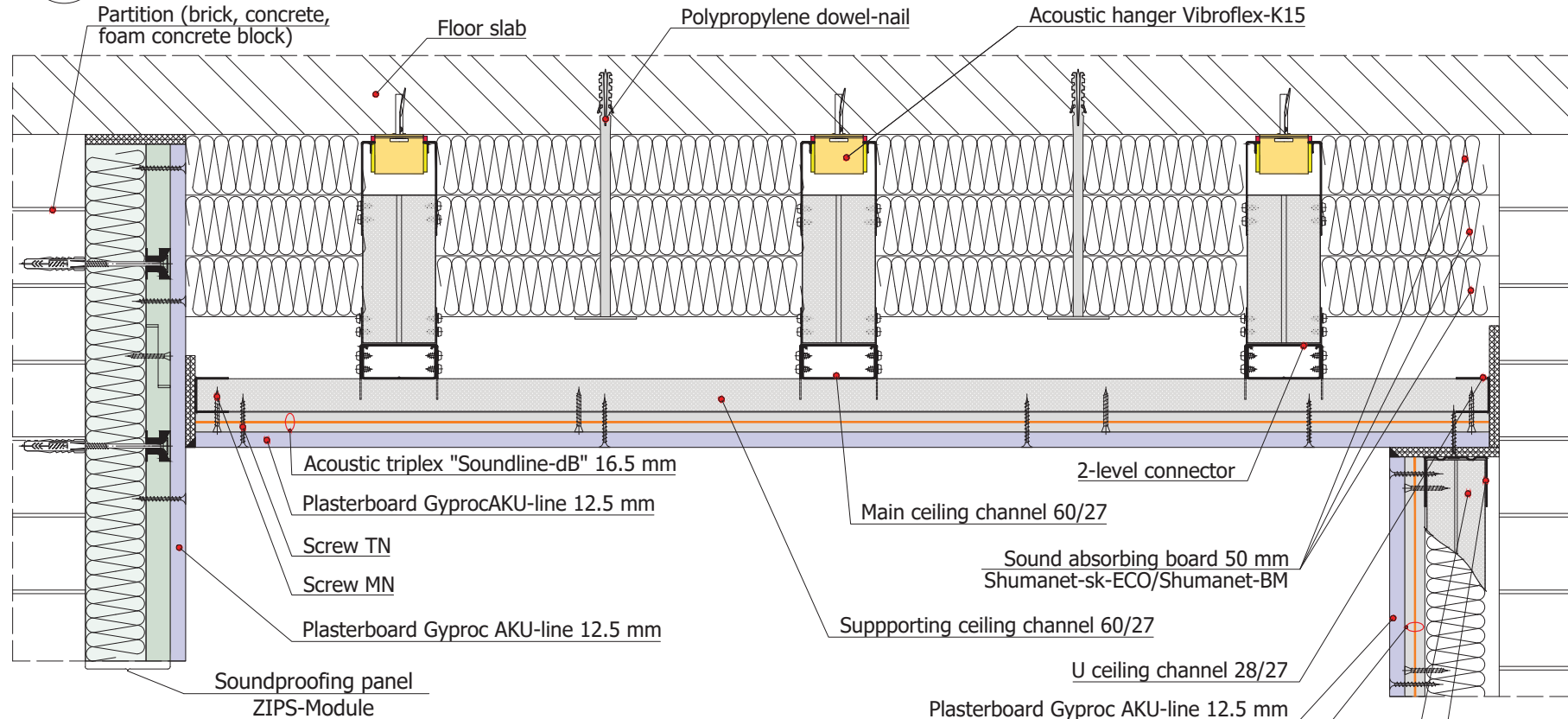


4.2.2 Junction of a suspended soundproof ceiling on acoustic hangers Vibroflex-K15 to a wall lining



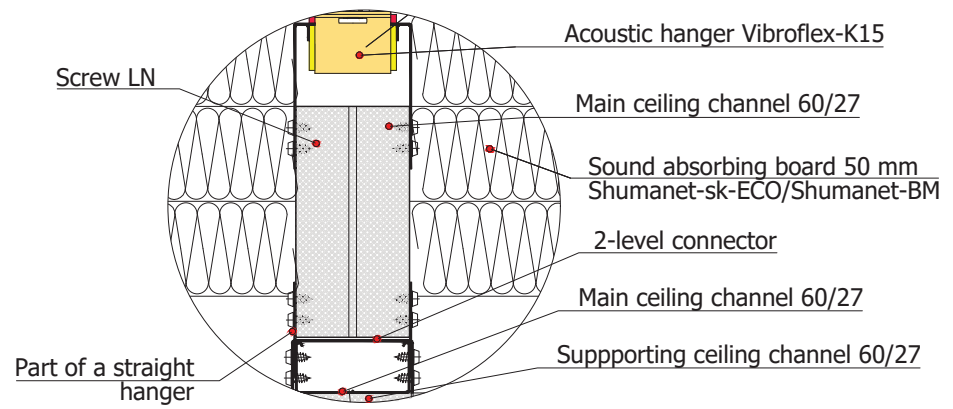
4.3.1

Suspended soundproof ceiling on acoustic hangers Vibroflex-K15.  
Construction on extensions from ceiling channel 60/27 (ceiling offset from the slab  $\geq 200$  mm)



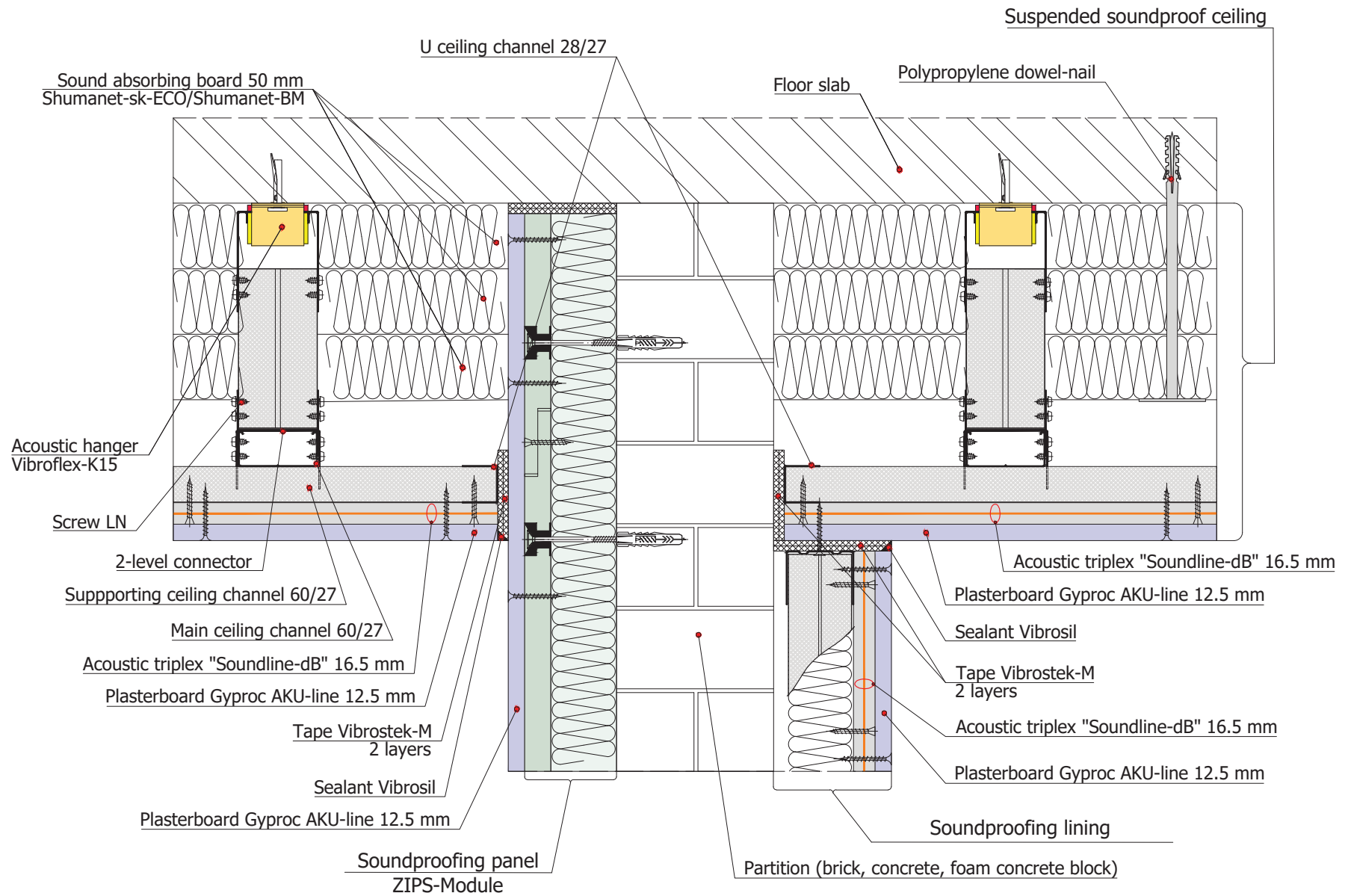
4.3.2

Variant of straight hanger elongation, using channel 60/27 in a soundproof ceiling construction, using acoustic hanger Vibroflex -K15



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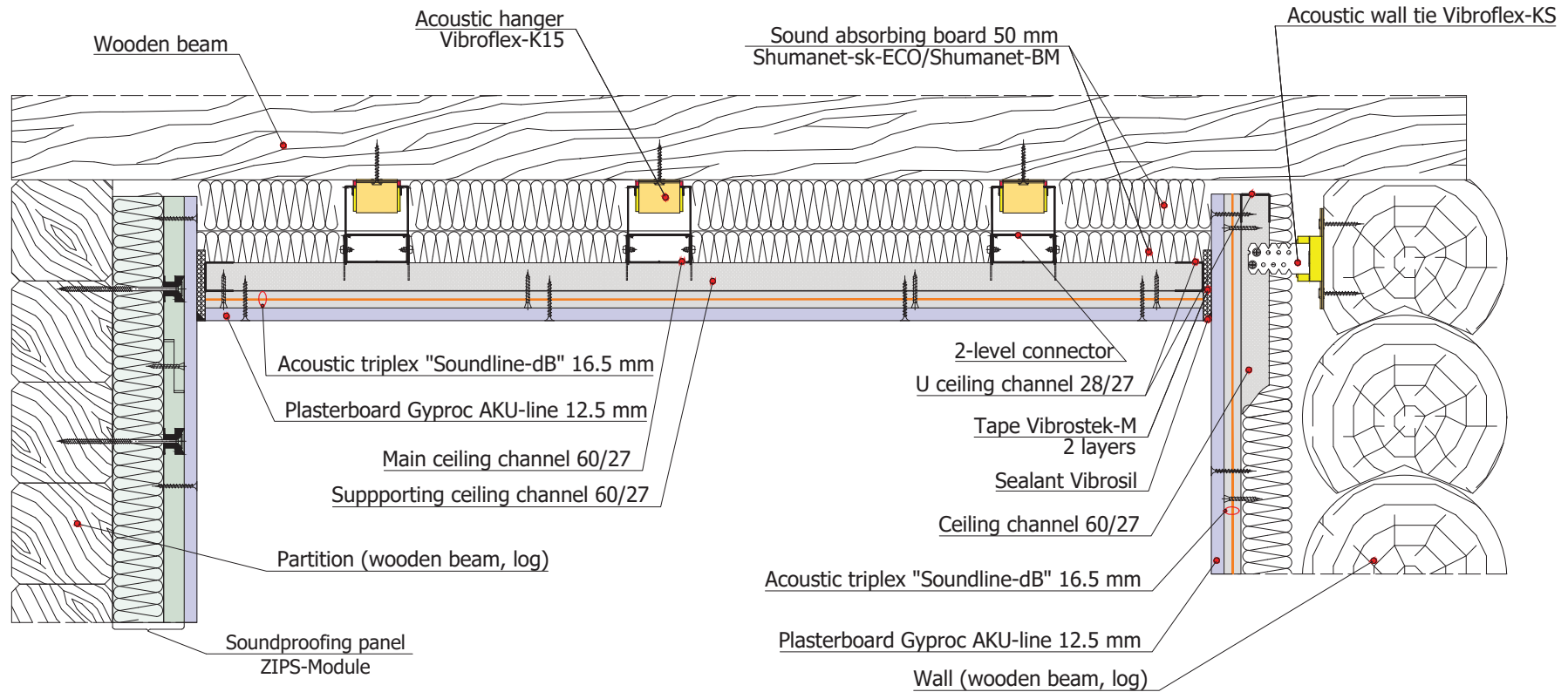
4.3.3 Junction of a suspended soundproof ceiling on acoustic hangers Vibroflex-K15 to a wall lining.  
Construction on extensions from ceiling channel 60/27





4.4.1

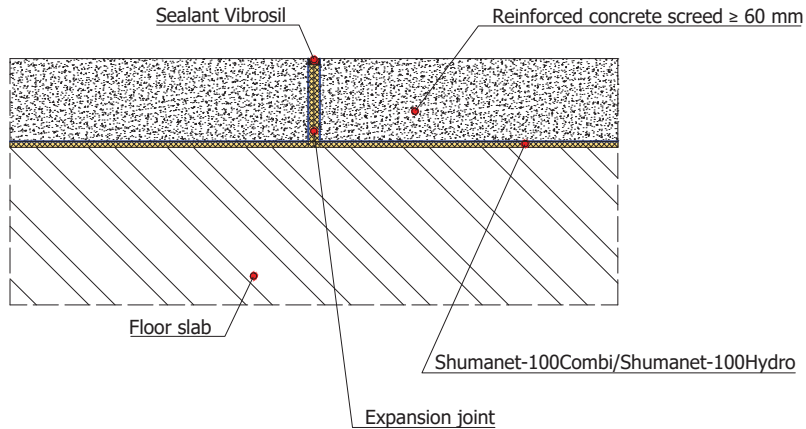
Suspended soundproof ceiling on acoustic hangers Vibroflex-K15 (slidable fixation points of ceiling and a wall lining). Method of performance in a wooden house



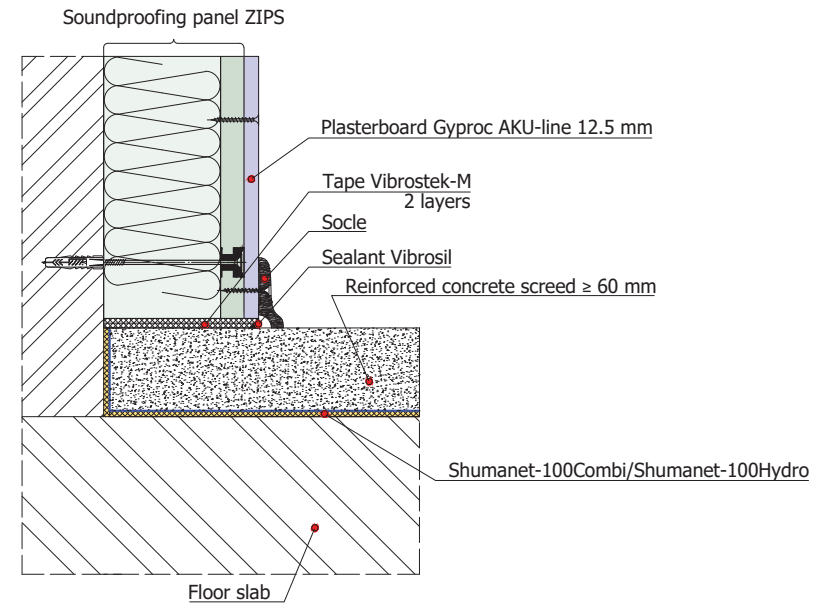
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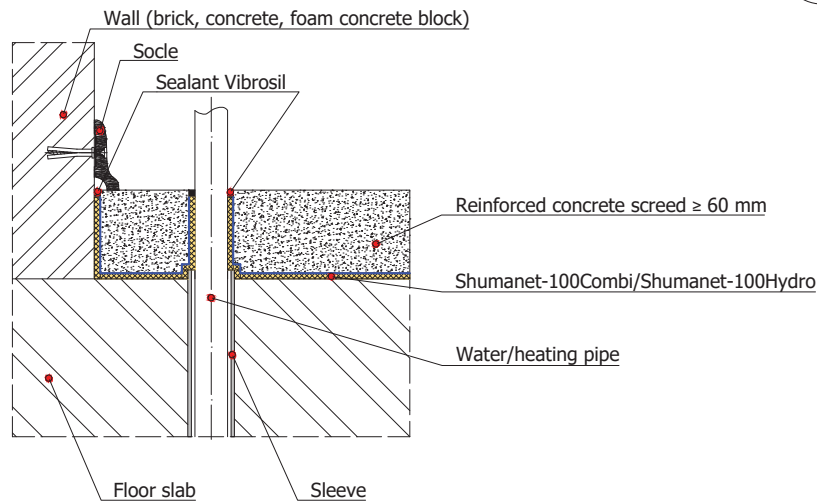
5.1.1 Installation scheme of floating floor construction, using soundproof underlayers Shumanet-100Combi/Shumanet-100Hydro



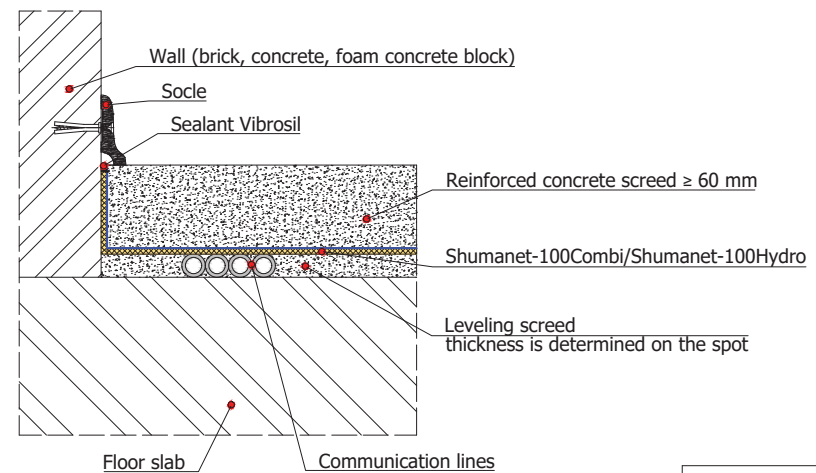
5.1.2 Junction of floating floor, using soundproof underlayers Shumanet-100Combi/Shumanet-100Hydro to a wall



5.1.3 Junction of floating floor, using soundproof underlayers Shumanet-100Combi/Shumanet-100Hydro to a wall and a water/heating pipe

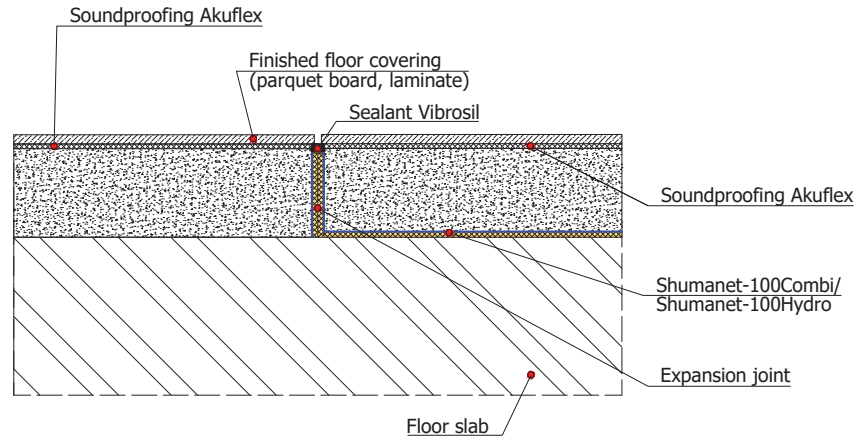


5.1.4 Junction of floating floor, using soundproof underlayers Shumanet-100Combi/Shumanet-100Hydro to a wall and a communication lines



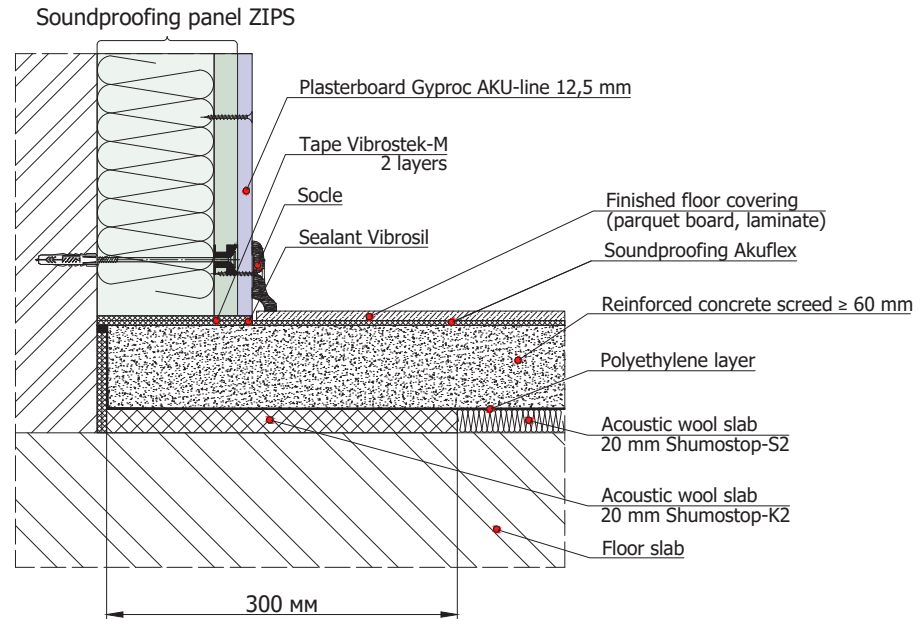
5.2.1

Scheme of using soundproofing material Akuflex under a finished floor covering in combination with floating floor, using soundproof underlayers Shumanet-100Combi/Shumanet-100Hydro



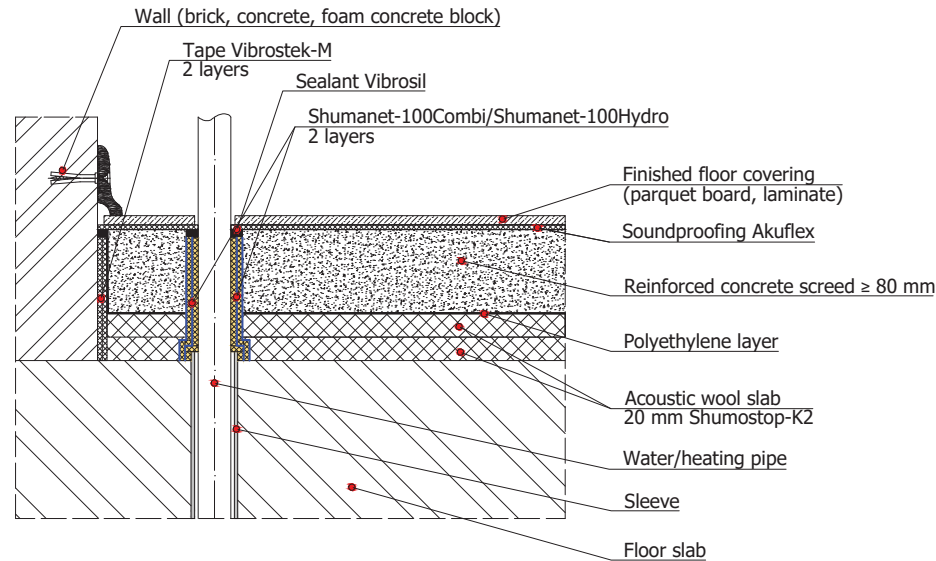
5.2.2

Scheme of using soundproofing material Akuflex under a finished floor covering in combination with floating floor, using acoustic wool slab Shumostop



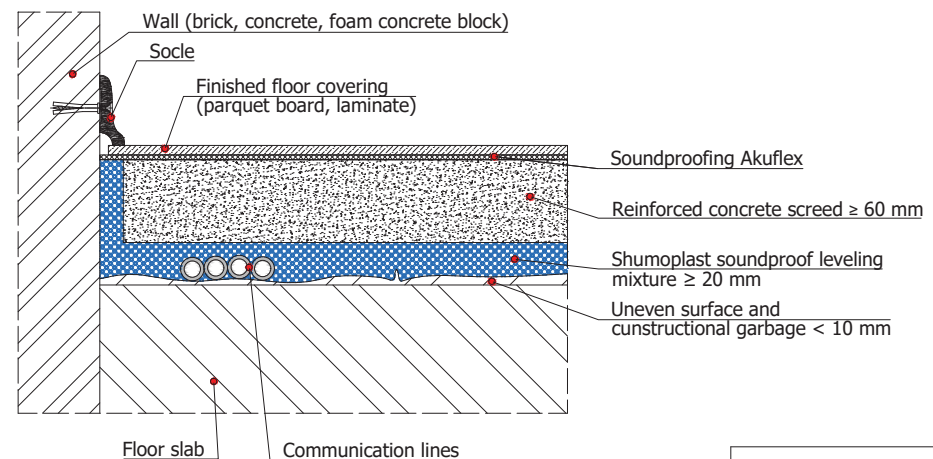
5.2.3

Scheme of using soundproofing material Akuflex under a finished floor covering in combination with floating floor, using 2 layers of acoustic wool slab Shumostop-K2



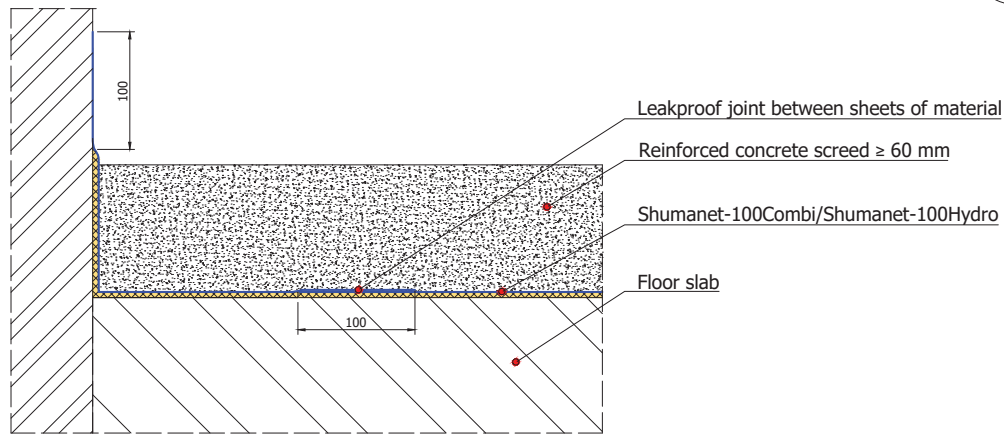
5.2.4

Scheme of using soundproofing material Akuflex under a finished floor covering in combination with floating floor, using Shumoplast soundproof leveling

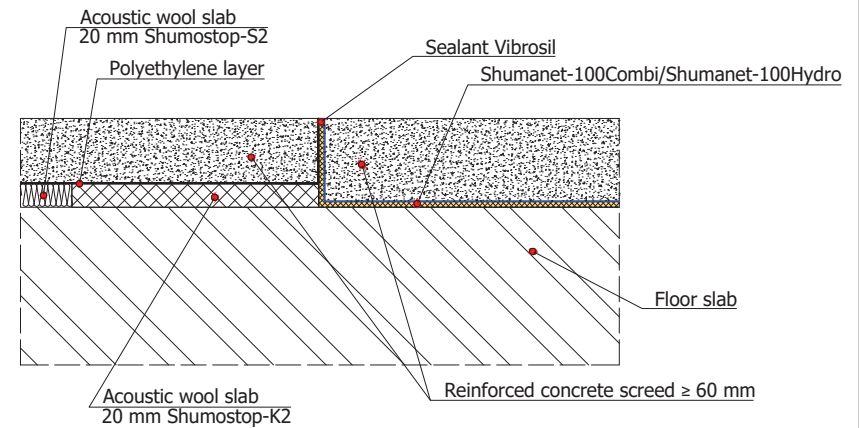


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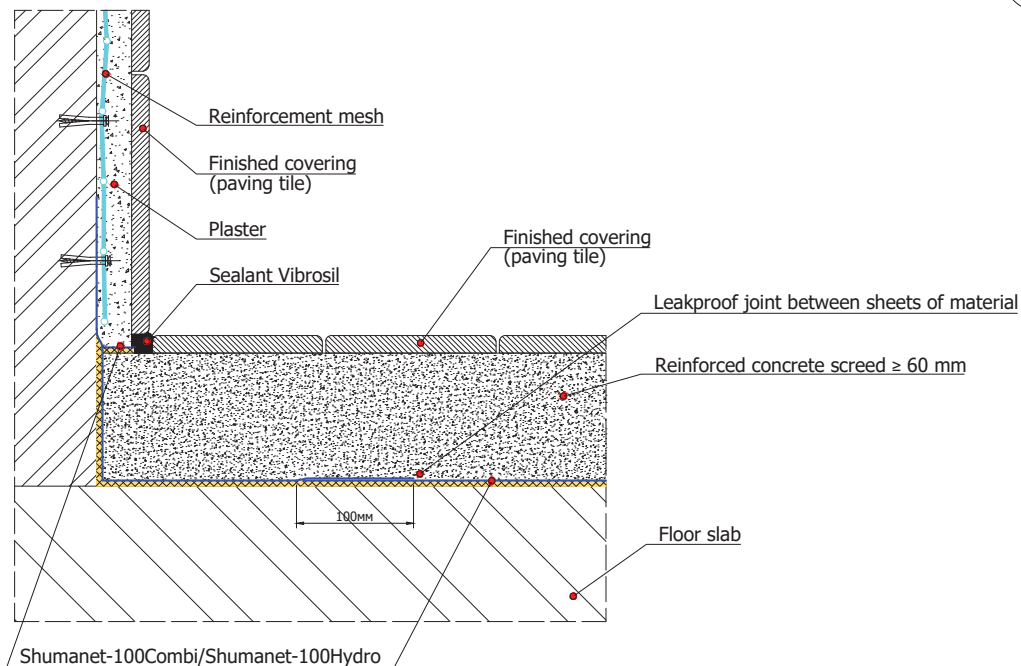
5.3.1 Installation scheme of floating floor construction, using sound-waterproof Shumanet-100Combi/Shumanet-100Hydro



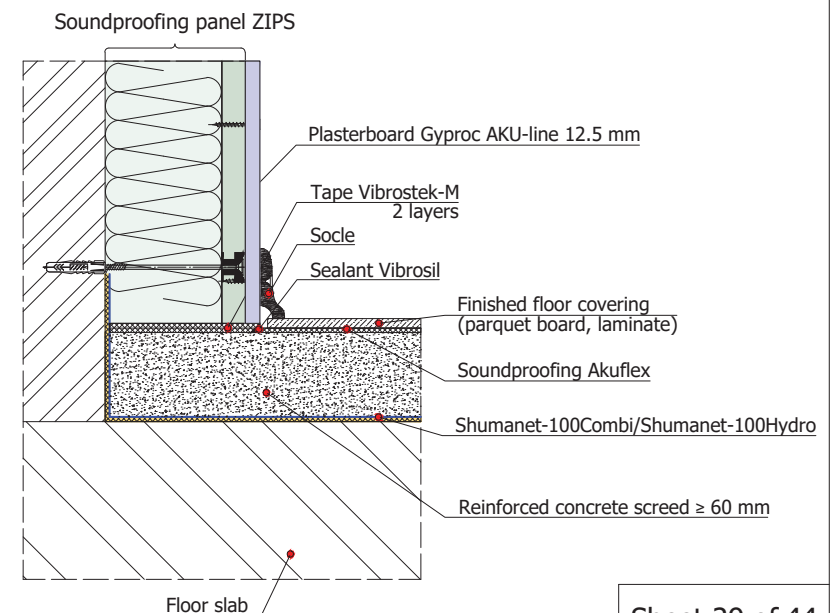
5.3.2 Junction of a construction, using sound-waterproof Shumanet-100Combi/Shumanet-100Hydro to a floating floor



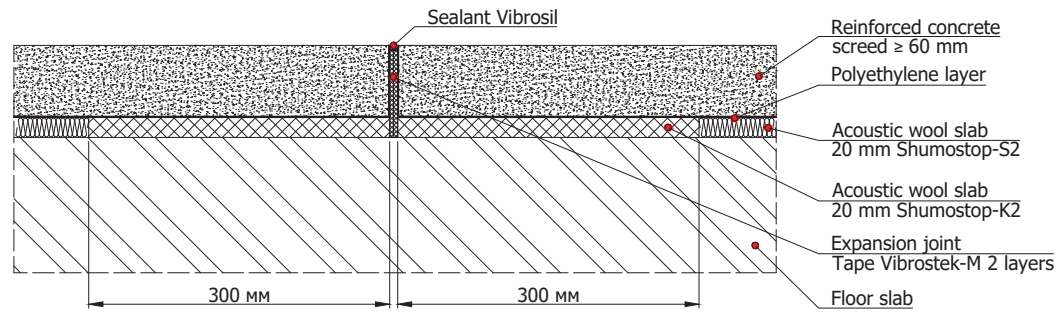
5.3.3 Installation scheme of floating floor construction, using sound-waterproof Shumanet-100Combi/Shumanet-100Hydro in a bathroom



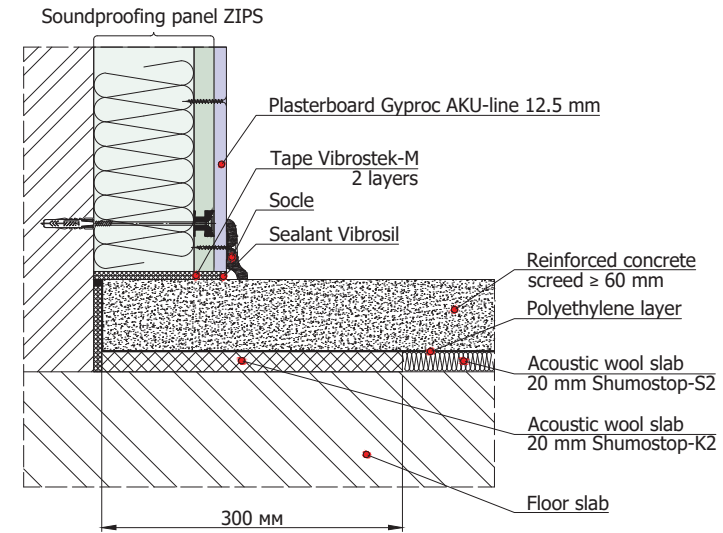
5.3.4 Junction of a floating floor construction, using sound-waterproof Shumanet-100Combi/Shumanet-100Hydro to a wall



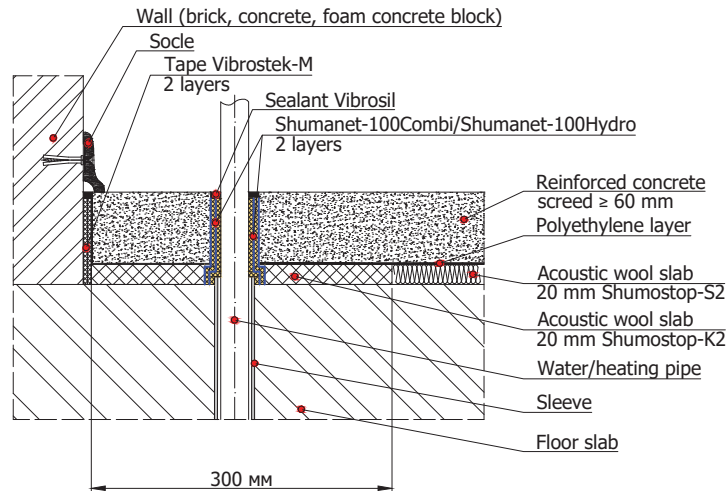
5.4.1 Installation scheme of a floating floor, using 1 layer of an acoustic wool slabs Shumostop



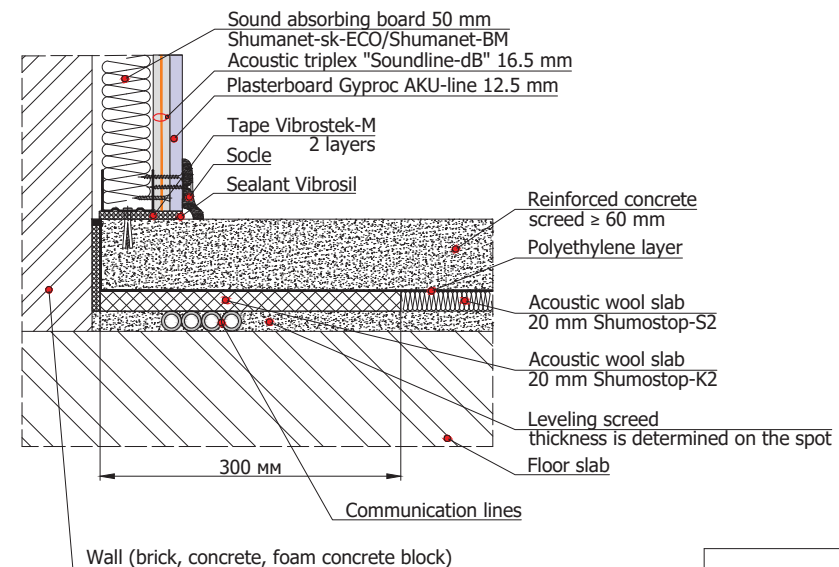
5.4.2 Junction of a floating floor, using 1 layer of an acoustic wool slabs Shumostop to a wall



5.4.3 Junction of a floating floor, using 1 layer of an acoustic wool slabs Shumostop to a wall and a water/heating pipe

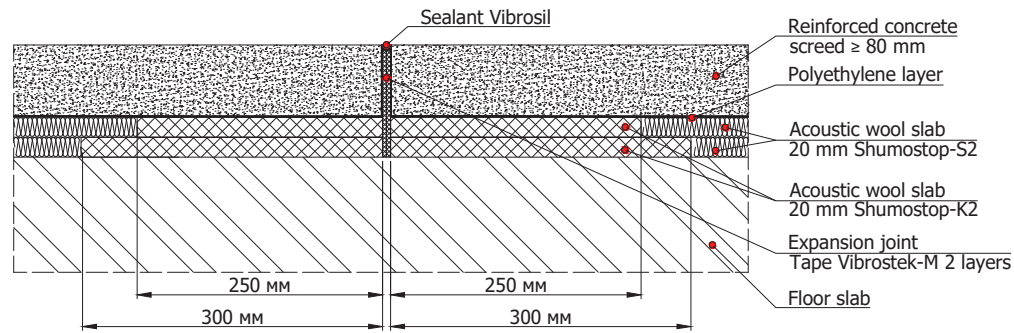


5.4.4 Junction of a floating floor, using 1 layer of an acoustic wool slabs Shumostop to a wall and communication lines under the screed

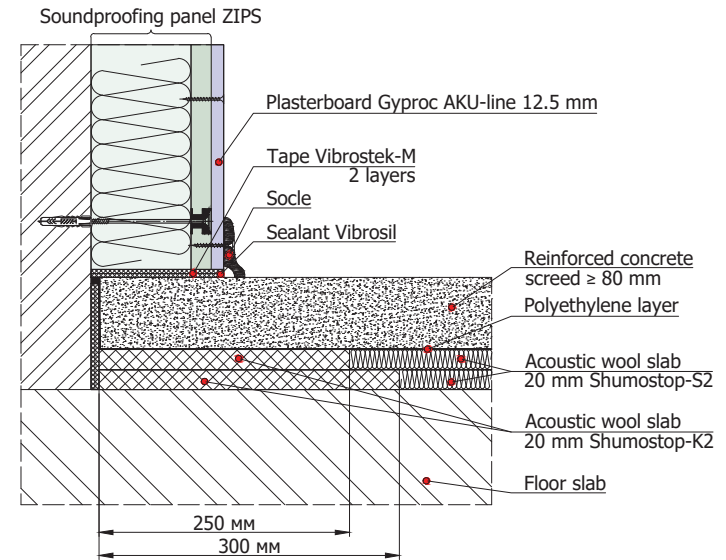




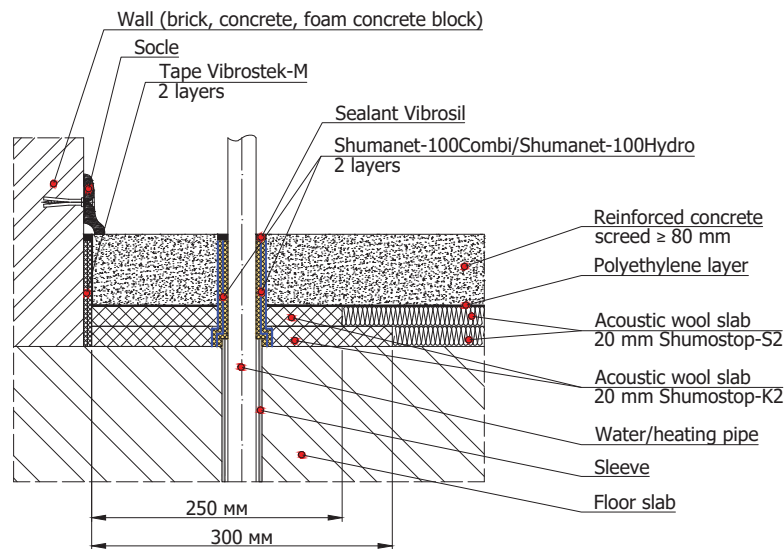
5.4.5 Installation scheme of a floating floor, using 2 layers of an acoustic wool slabs Shumostop



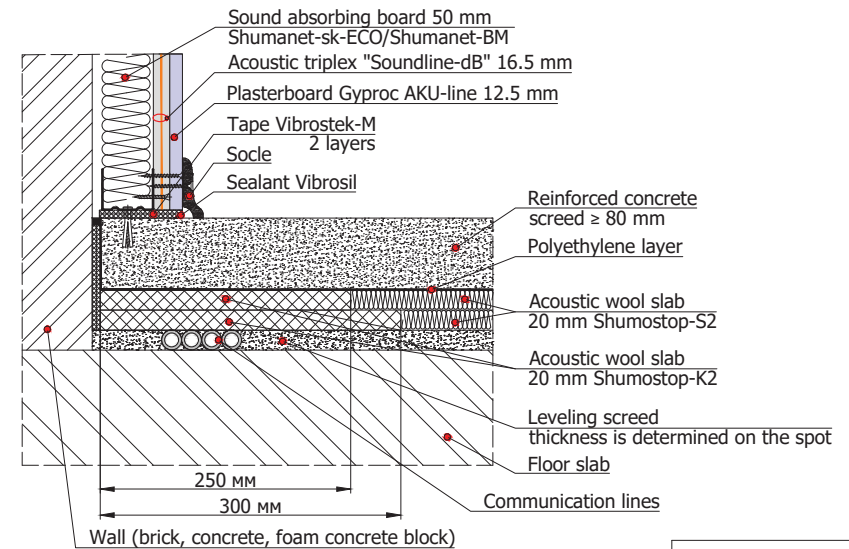
5.4.6 Junction of a floating floor, using 2 layers of an acoustic wool slabs Shumostop to a wall



5.4.7 Junction of a floating floor, using 2 layers of an acoustic wool slabs Shumostop to a wall and a water/heating pipe

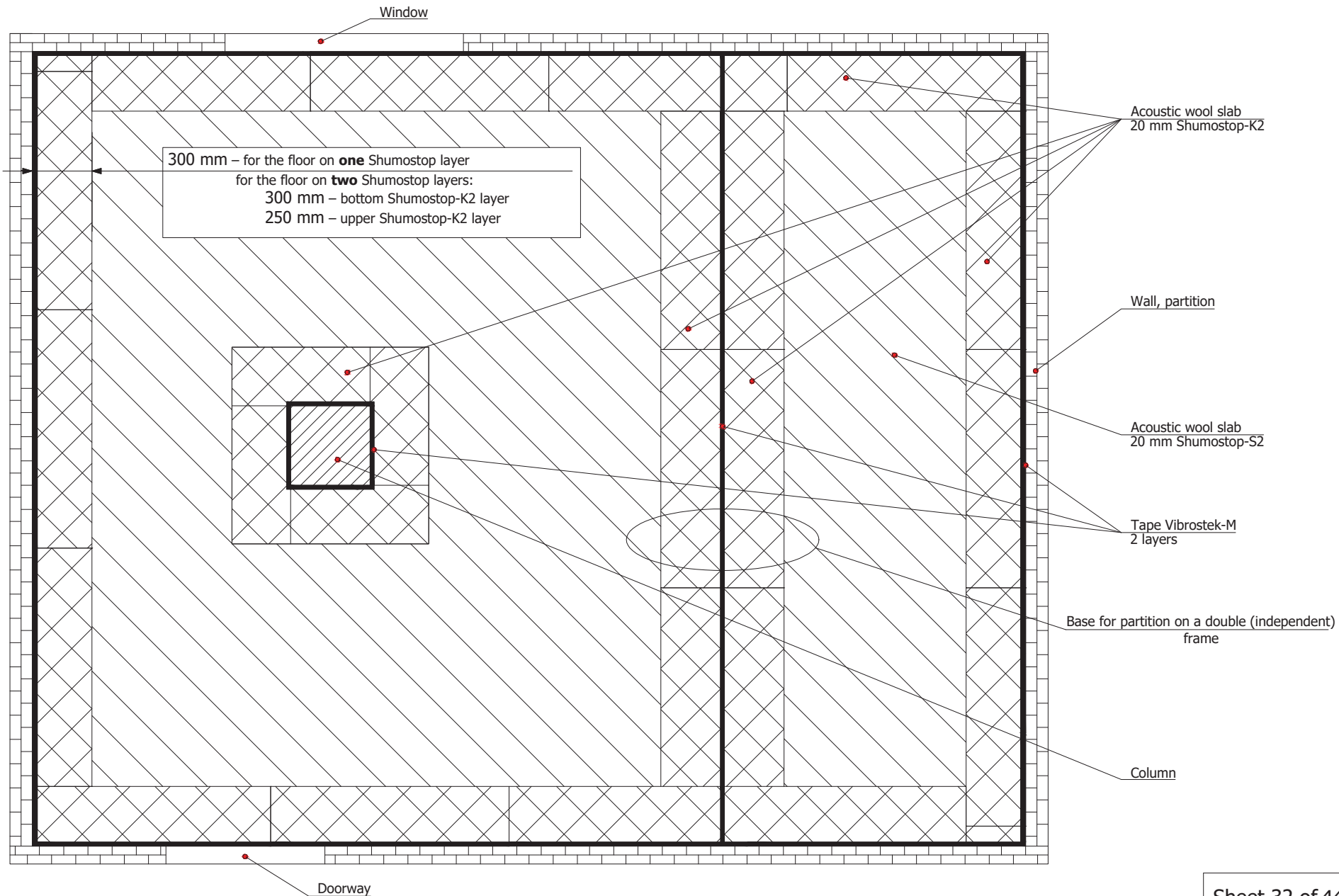


5.4.8 Junction of a floating floor, using 2 layers of an acoustic wool slabs Shumostop to a wall and communication lines under the screed





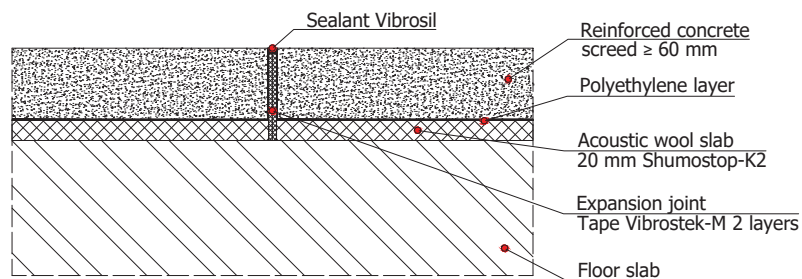
5.4.9 Installation scheme of floating floor, using asoustic wool slabs Shumostop (ground plan view)



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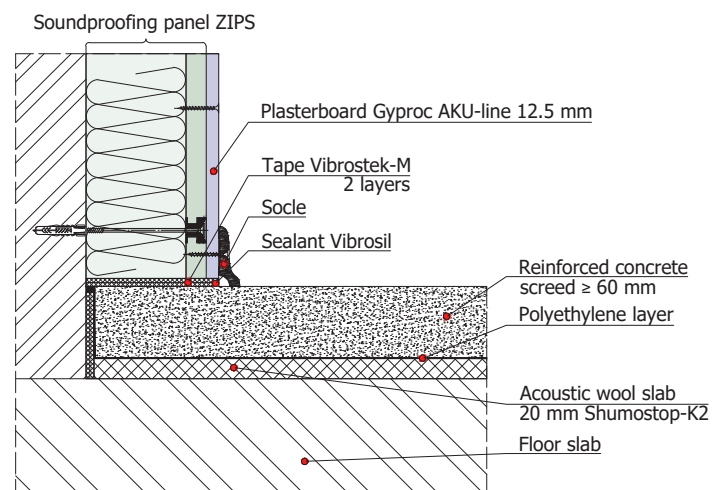
5.5.1

Installation scheme of a floating floor, using 1 layer of an acoustic wool slabs Shumostop-K2



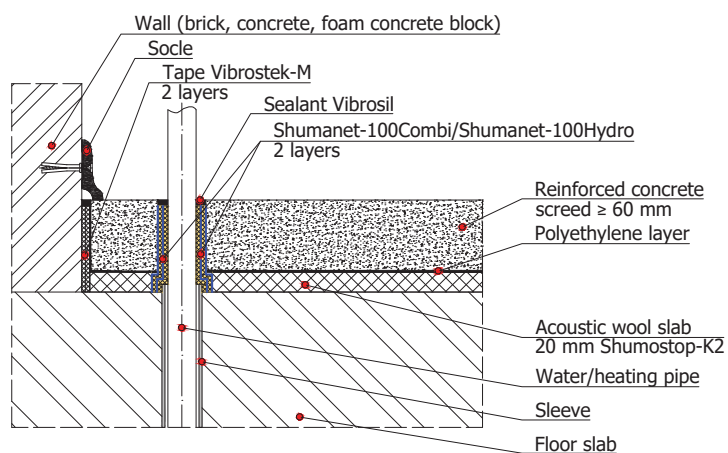
5.5.2

Junction of a floating floor, using 1 layer of an acoustic wool slabs Shumostop-K2 to a wall



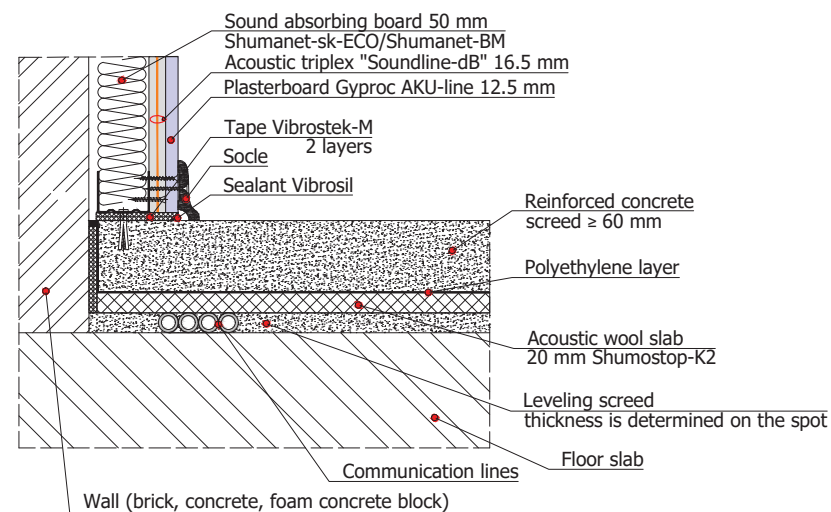
5.5.3

Junction of a floating floor, using 1 layer of an acoustic wool slabs Shumostop-K2 to a wall and a water/heating pipe



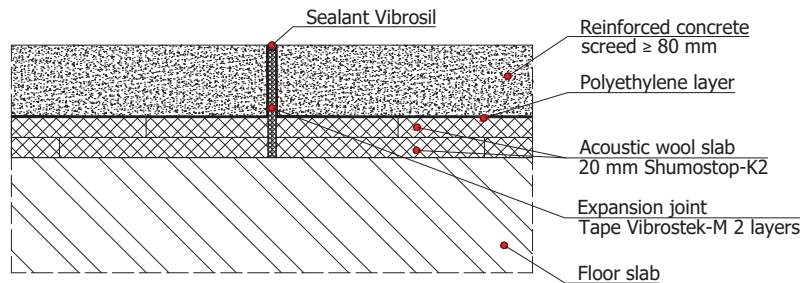
5.5.4

Junction of a floating floor, using 1 layer of an acoustic wool slabs Shumostop-K2 to a wall and communication lines under the screed



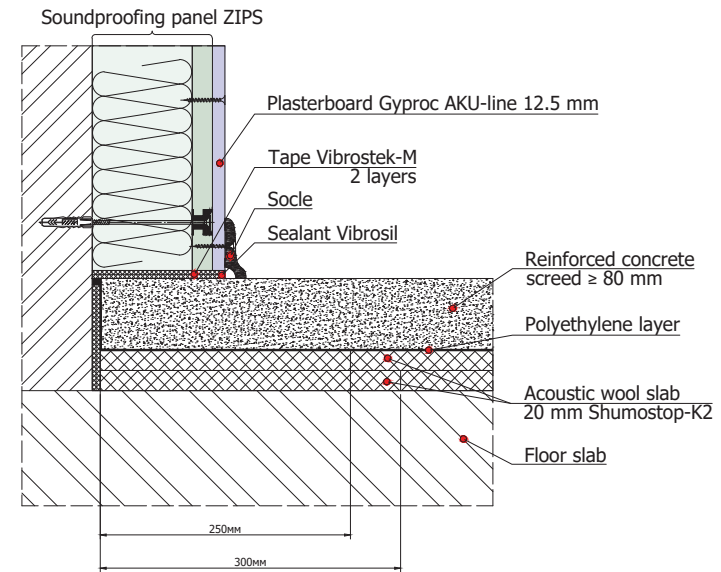
5.5.5

Installation scheme of a floating floor, using 2 layers of an acoustic wool slabs Shumostop-K2



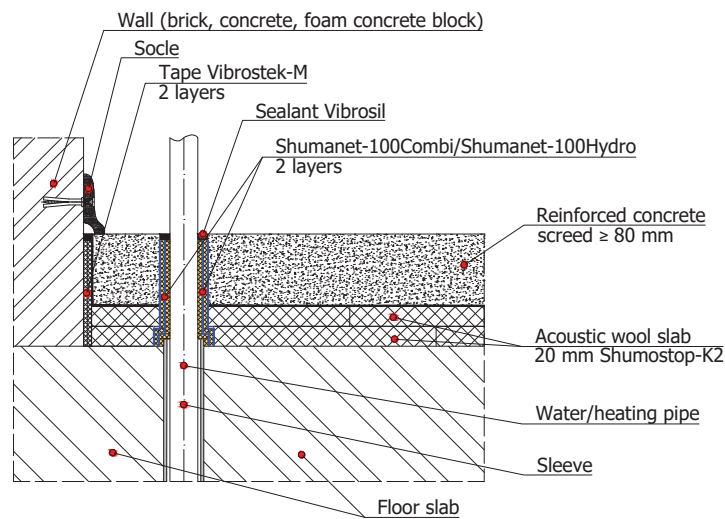
5.5.6

Junction of a floating floor, using 2 layers of an acoustic wool slabs Shumostop-K2 to a wall



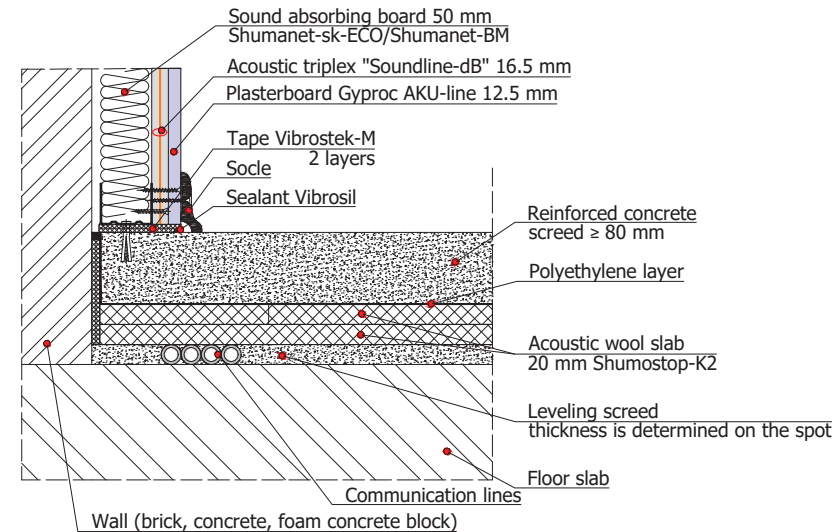
5.5.7

Junction of a floating floor, using 2 layers of an acoustic wool slabs Shumostop-K2 to a wall and a water/heating pipe

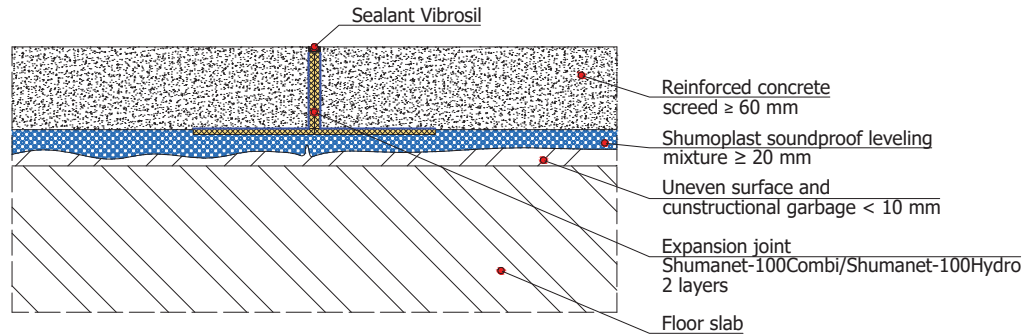


5.5.8

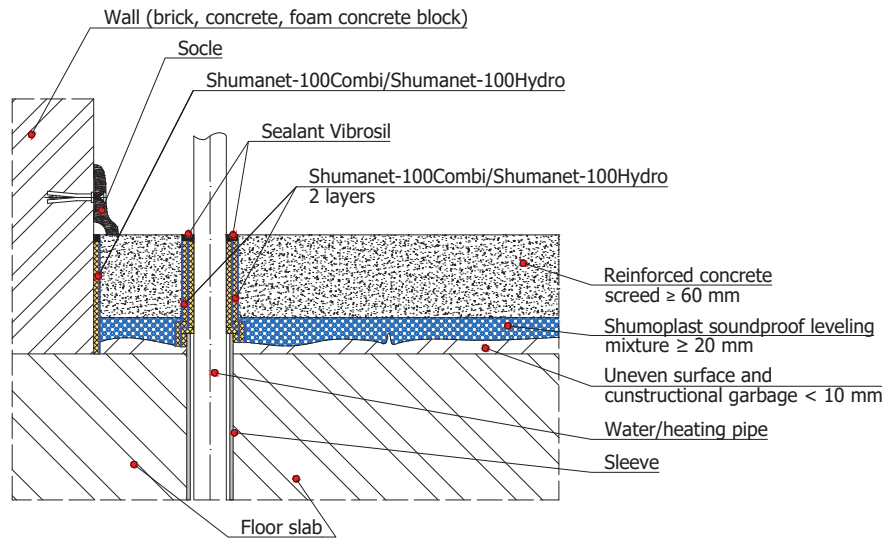
Junction of a floating floor, using 2 layers of an acoustic wool slabs Shumostop-K2 to a wall and communication lines under the screed



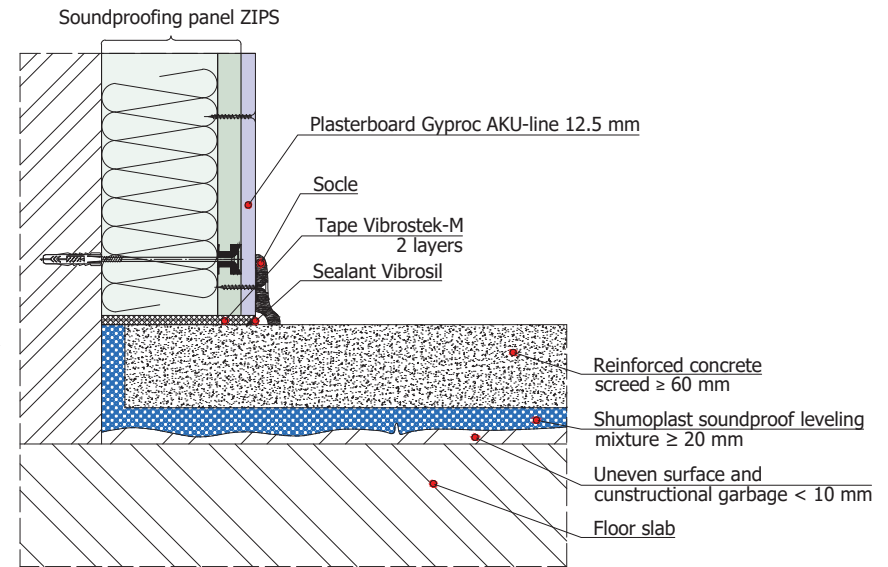
5.6.1 Installation scheme of a floating floor, using Shumoplast soundproof leveling



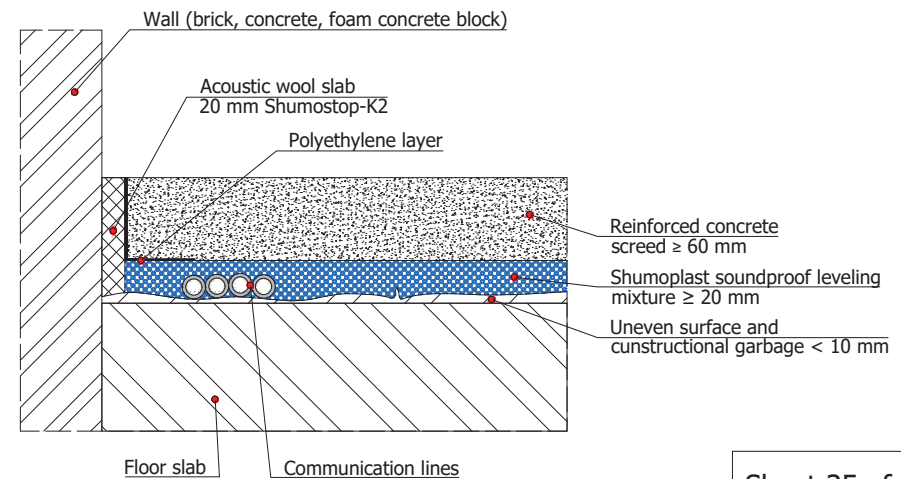
5.6.3 Junction of a floating floor, using Shumoplast soundproof leveling to a wall and a water/heating pipe



5.6.2 Junction of a floating floor, using Shumoplast soundproof leveling to a wall

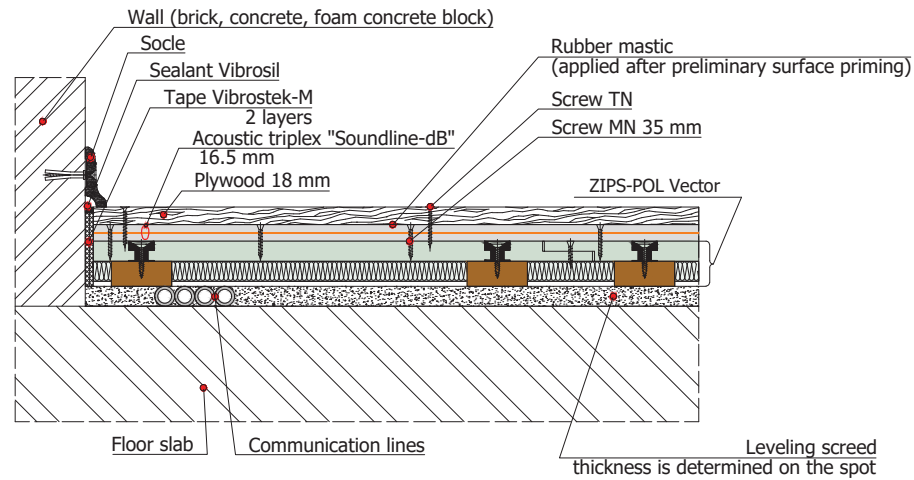


5.6.4 Installation scheme of a floating floor with communication lines under the screed, using Shumoplast soundproof leveling

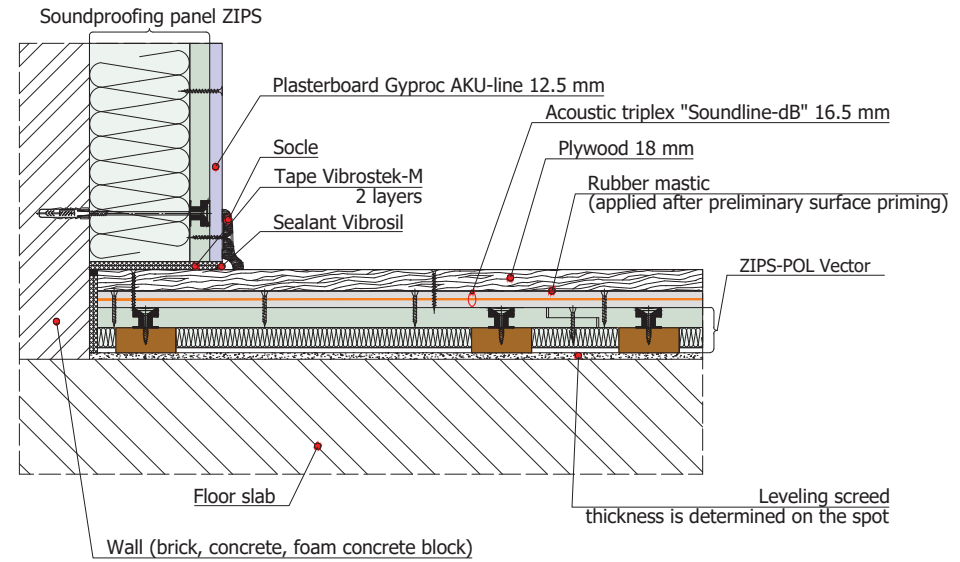




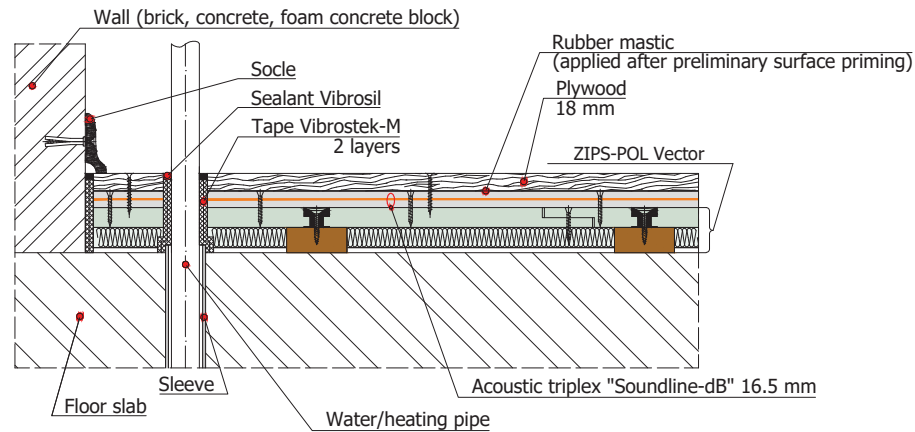
5.7.1 Installation scheme of a ZIPS-POL Vector construction



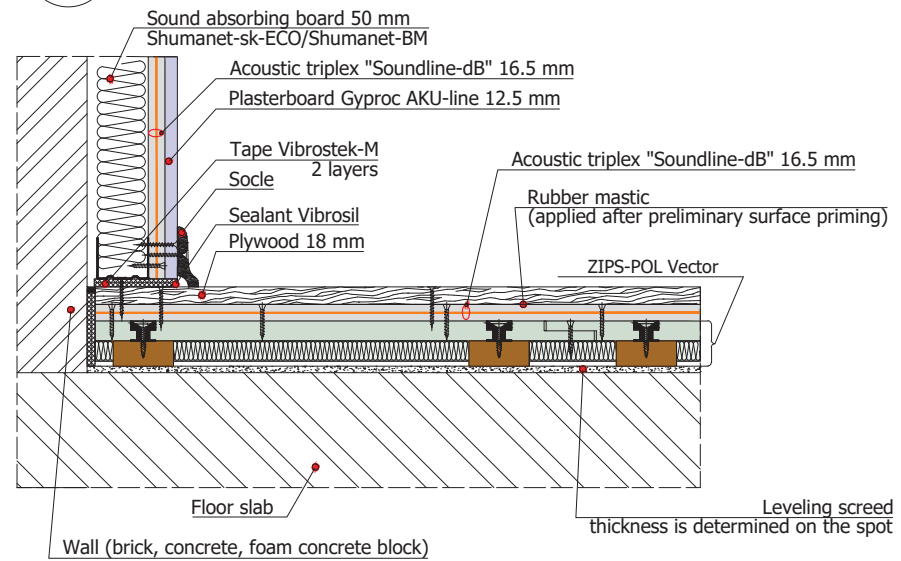
5.7.2 Junction of a ZIPS-POL Vector construction to soundproofing ZIPS panels



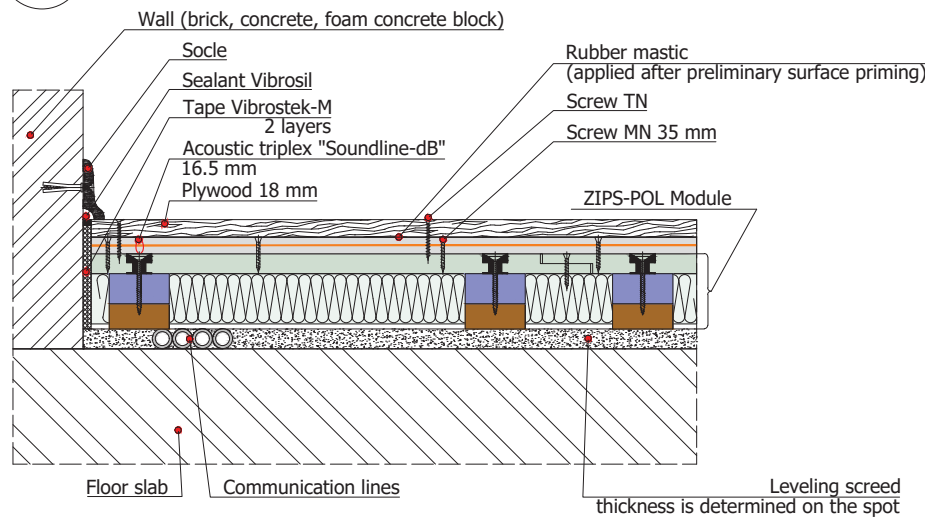
5.7.3 Junction of a ZIPS-POL Vector construction to a wall and a water/heating pipe (installation on a flat surface)



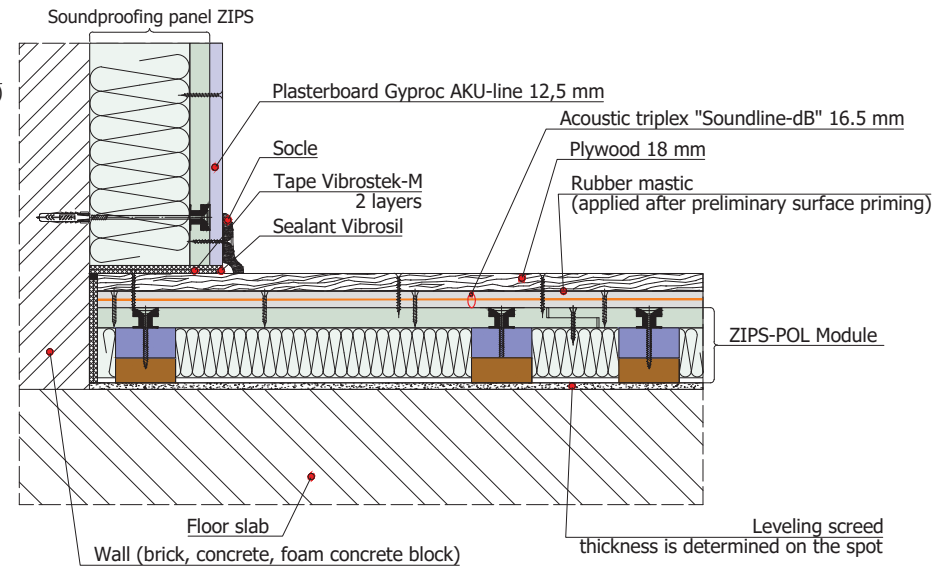
5.7.4 Junction of a ZIPS-POL Vector construction to a frame lining



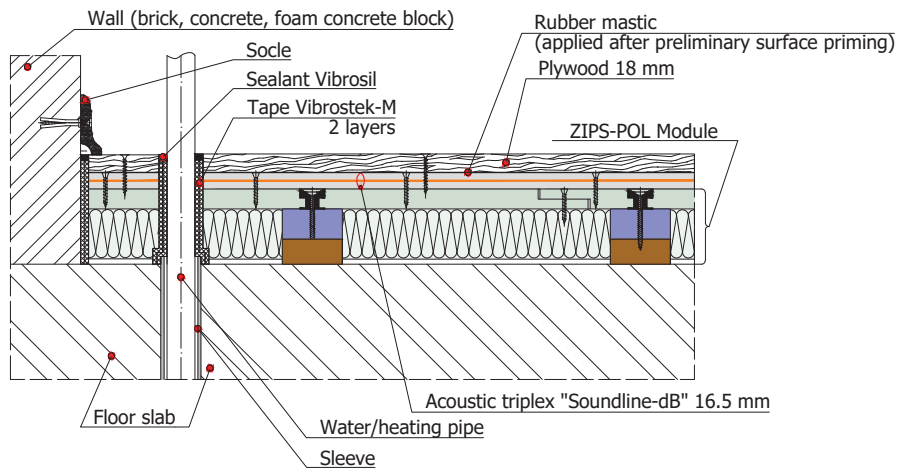
5.7.5 Installation scheme of a ZIPS-POL Module construction



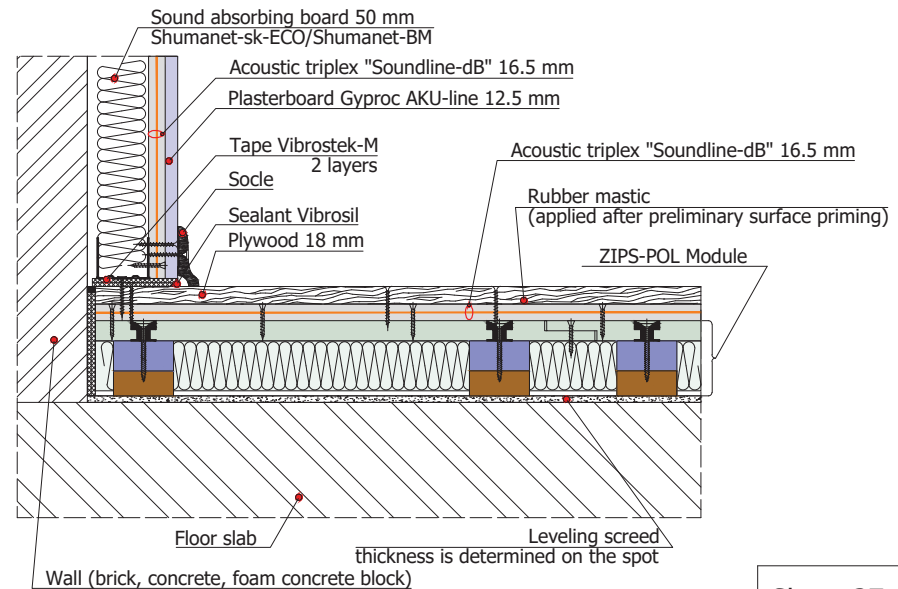
5.7.6 Junction of a ZIPS-POL Module construction to soundproofing ZIPS panels



5.7.7 Junction of a ZIPS-POL Module construction to a wall and a water/heating pipe (installation on a flat surface)

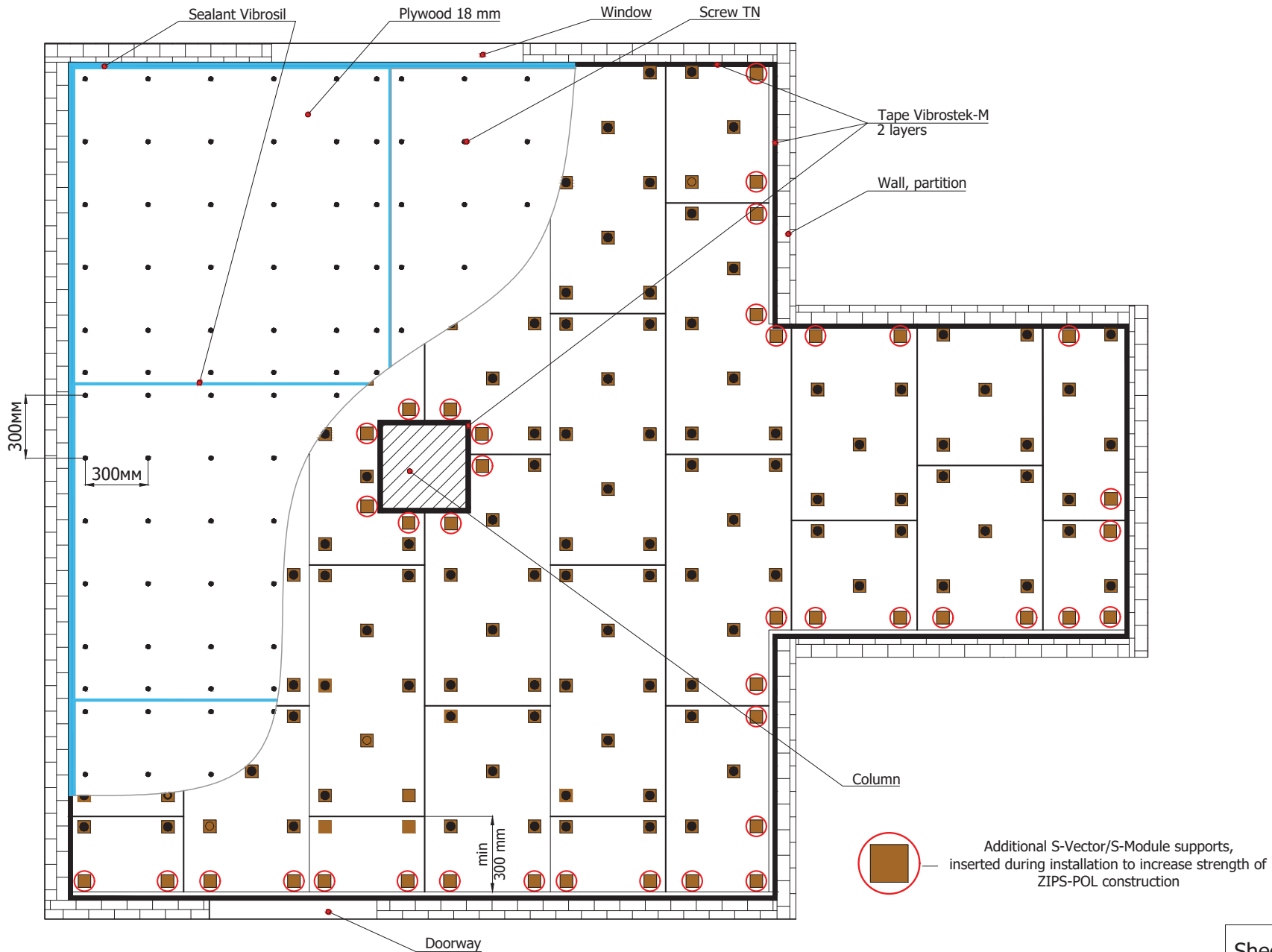


5.7.8 Junction of a ZIPS-POL Module construction to a frame lining

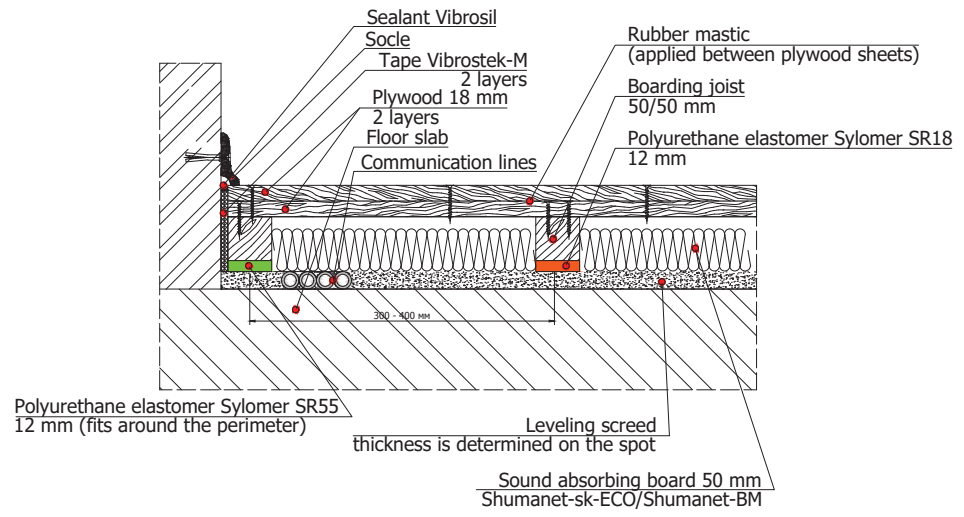




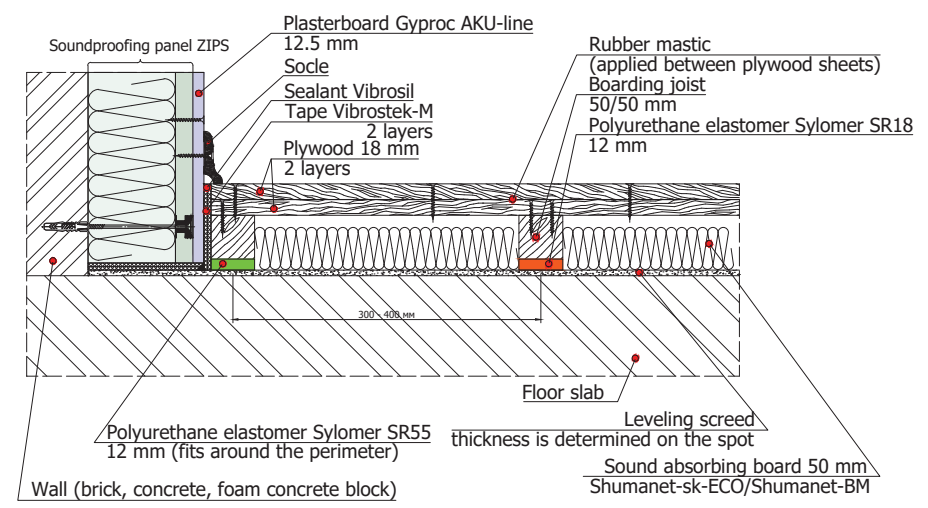
5.7.9 Installation scheme of floating floor, using soundproof ZIPS-POL panels (ground plan view)



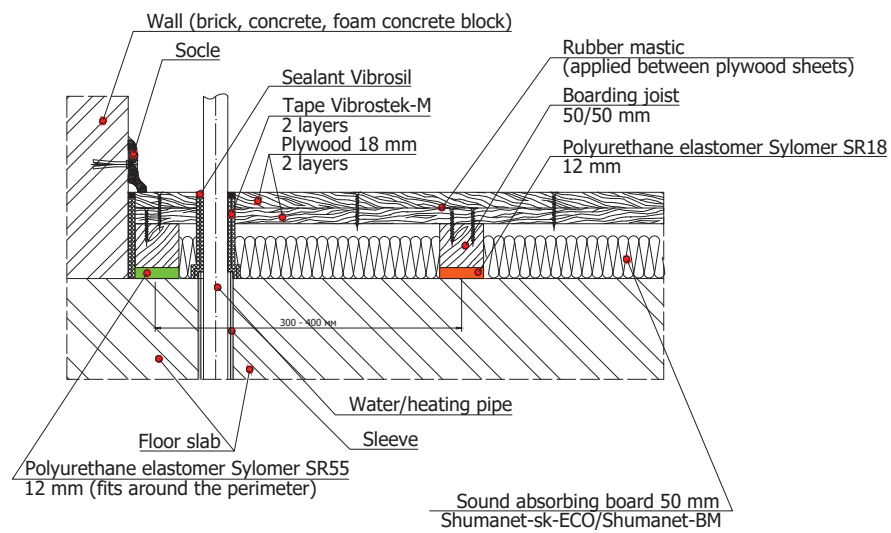
5.8.1 Installation scheme of a floor on wooden boarding joists, using polyurethane elastomer Sylomer



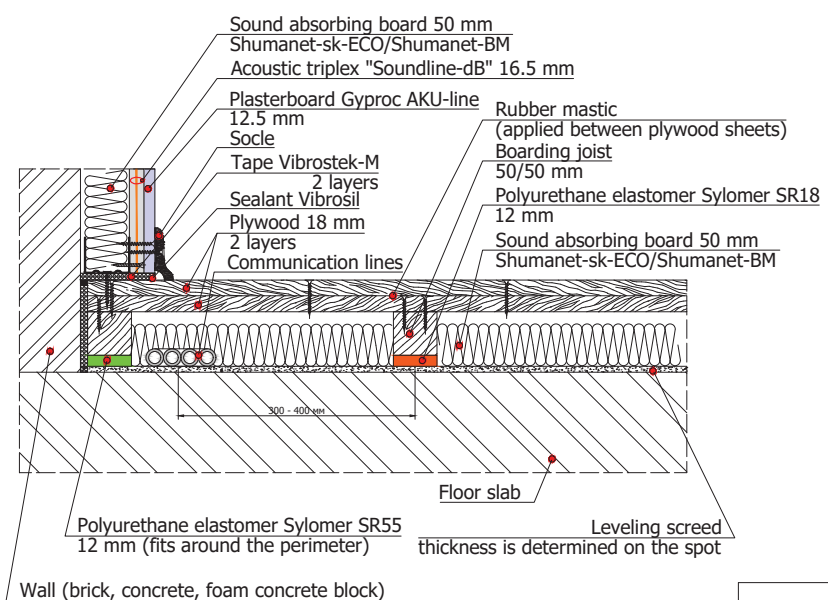
5.8.2 Junction of a floor on wooden boarding joists, using polyurethane elastomer Sylomer to soundproofing ZIPS panels



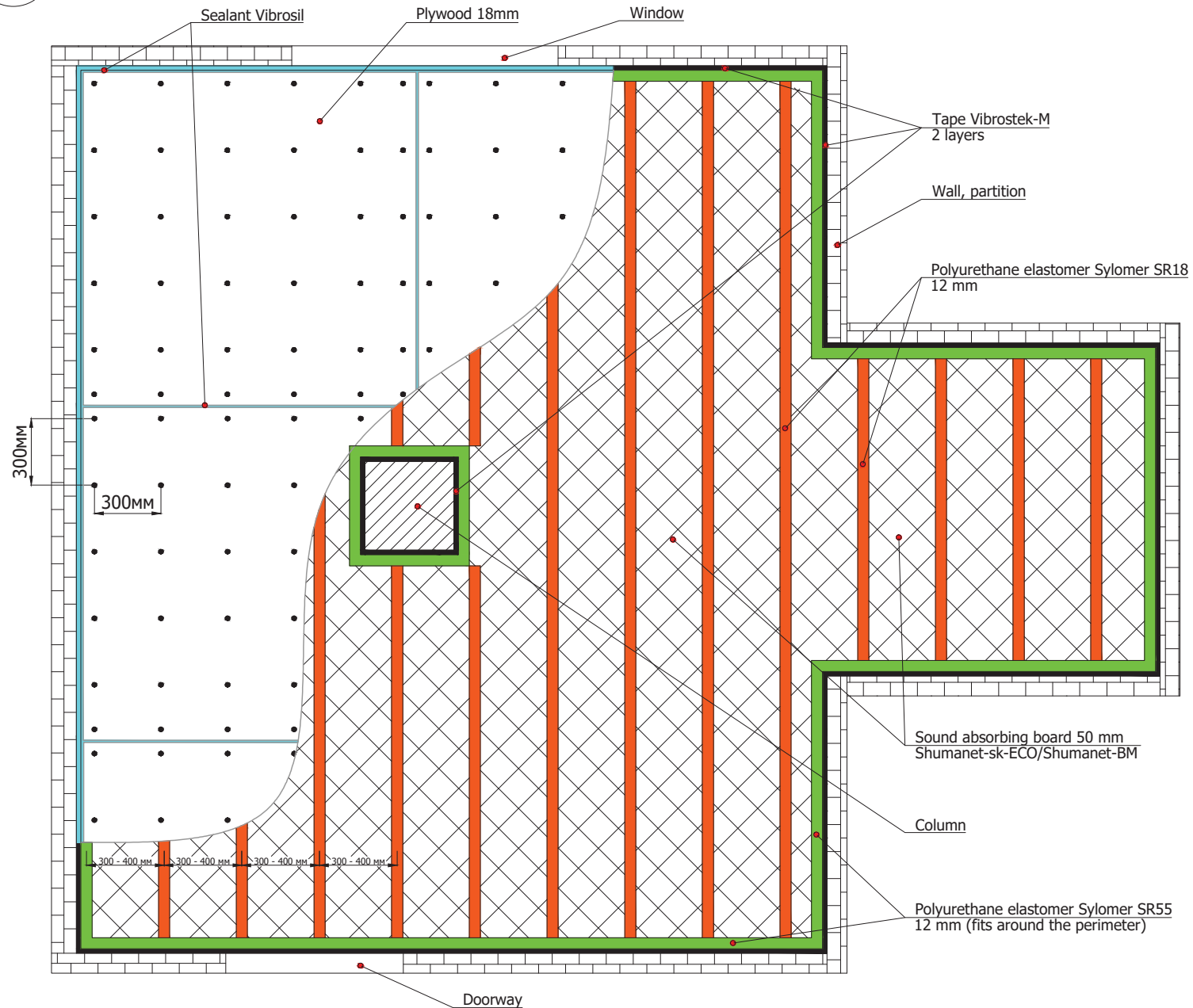
5.8.3 Junction of a floor on wooden boarding joists, using polyurethane elastomer Sylomer to a wall and a water/heating pipe (installation on a flat surface)



5.8.4 Junction of a floor on wooden boarding joists, using polyurethane elastomer Sylomer to a frame lining

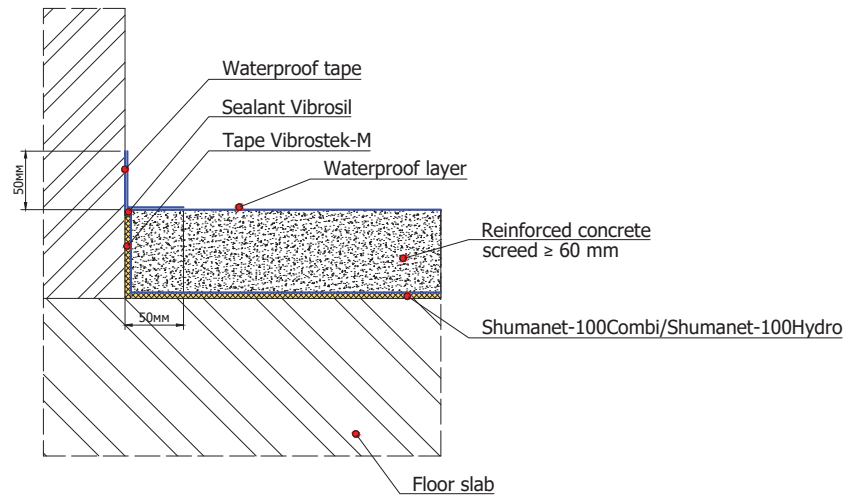


5.8.5 Installation scheme of floating floor on wooden boarding joists, using polyurethane elastomer Sylomer (ground plan view)

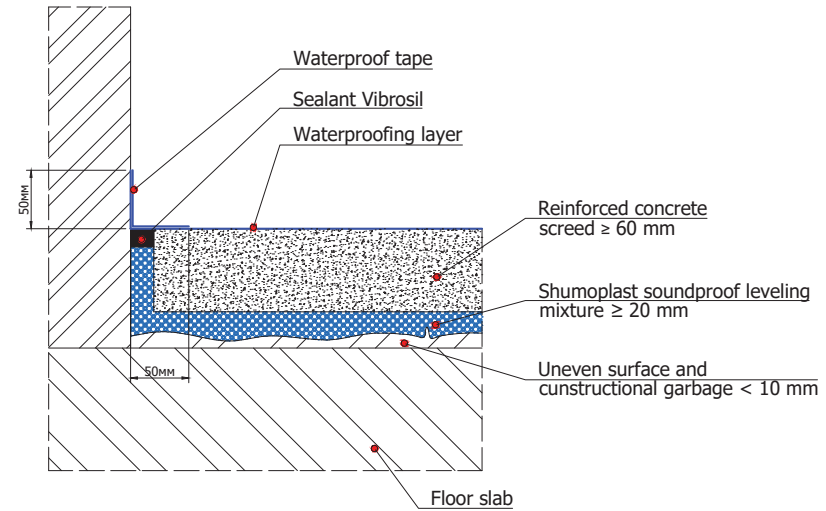


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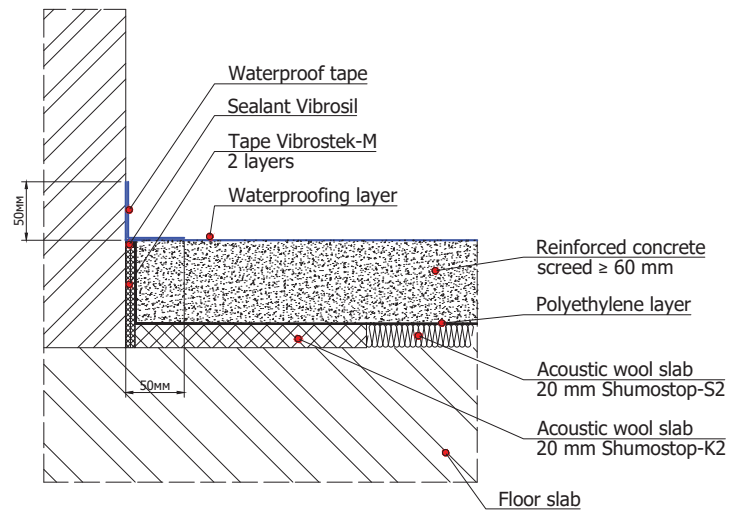
5.9.1 Installation scheme of waterproof layer in floating floor construction, using soundproof underlayers Shumanet-100Combi/Shumanet-100Hydro



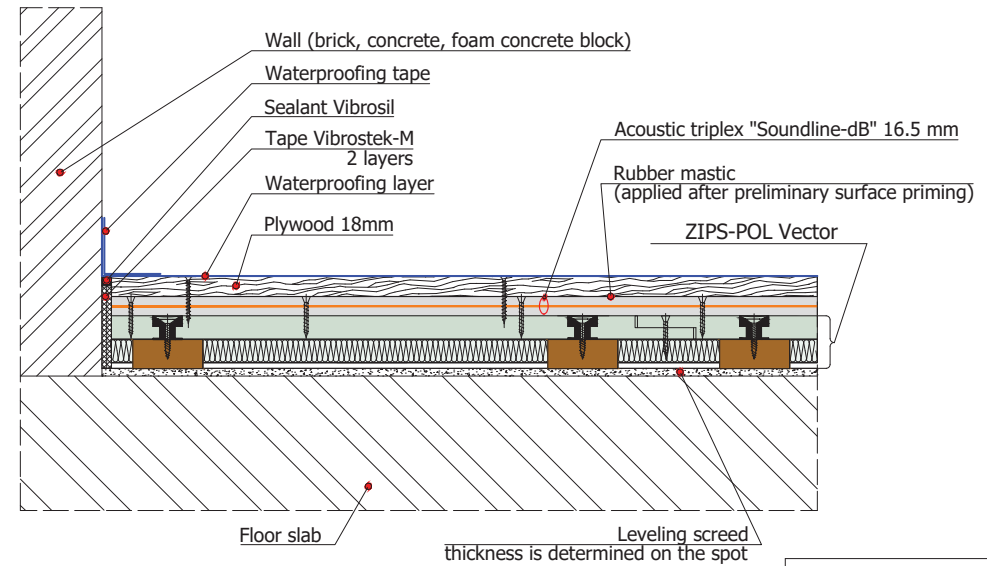
5.9.2 Installation scheme of waterproof layer in floating floor construction, using Shumoplast soundproof leveling mixture



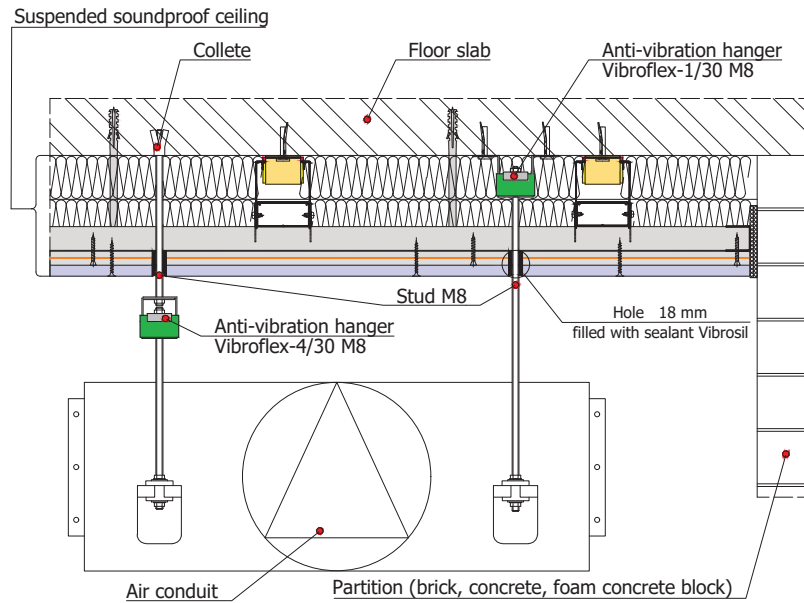
5.9.3 Installation scheme of waterproof layer in floating floor construction, using 1 layer of an acoustic wool slabs Shumostop



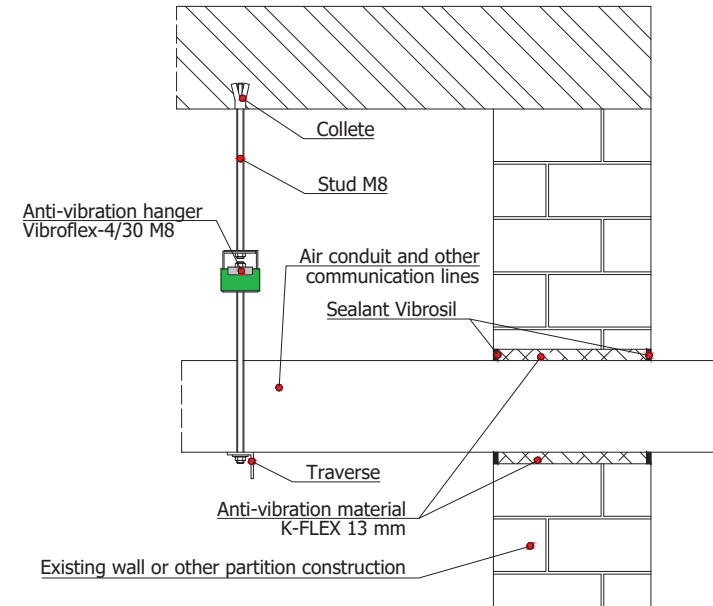
5.9.4 Installation scheme of waterproof layer in floating floor construction, using ZIPS-POL panels



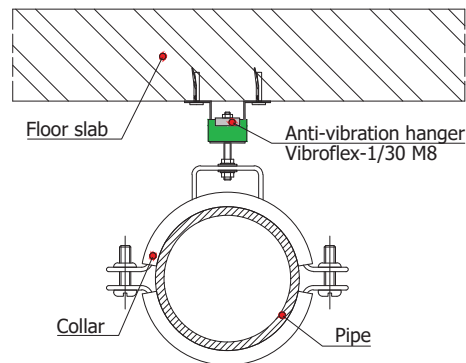
6.1.1 Installation scheme of air conduit to a slab through suspended soundproof ceiling, using anti-vibration hangers Vibroflex-1/30 M8 and 4/30 M8



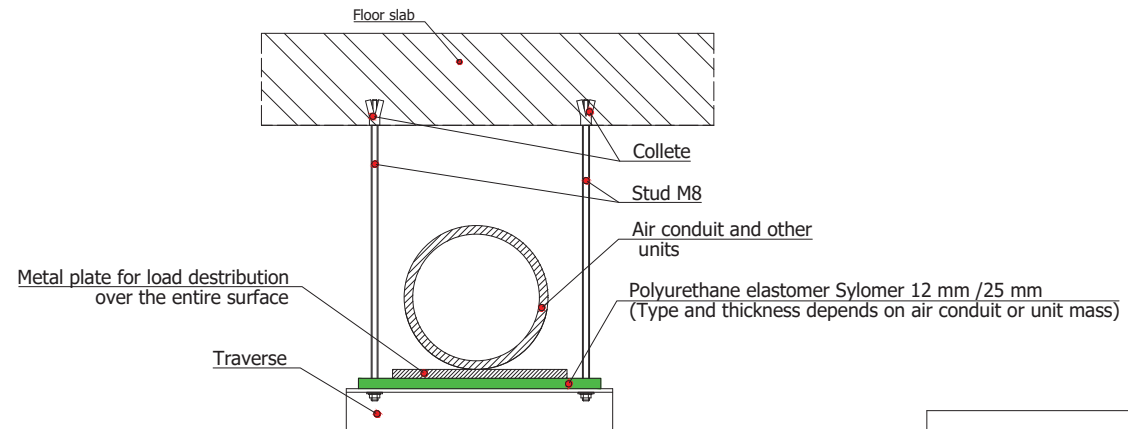
6.1.2 Scheme of fastening an air conduit to a slab, using a traverse and an anti-vibration hanger Vibroflex-4/30 M8



6.1.3 Scheme of fastening a pipe to the ceiling, using collar and an anti-vibration hanger Vibroflex-1/30 M8

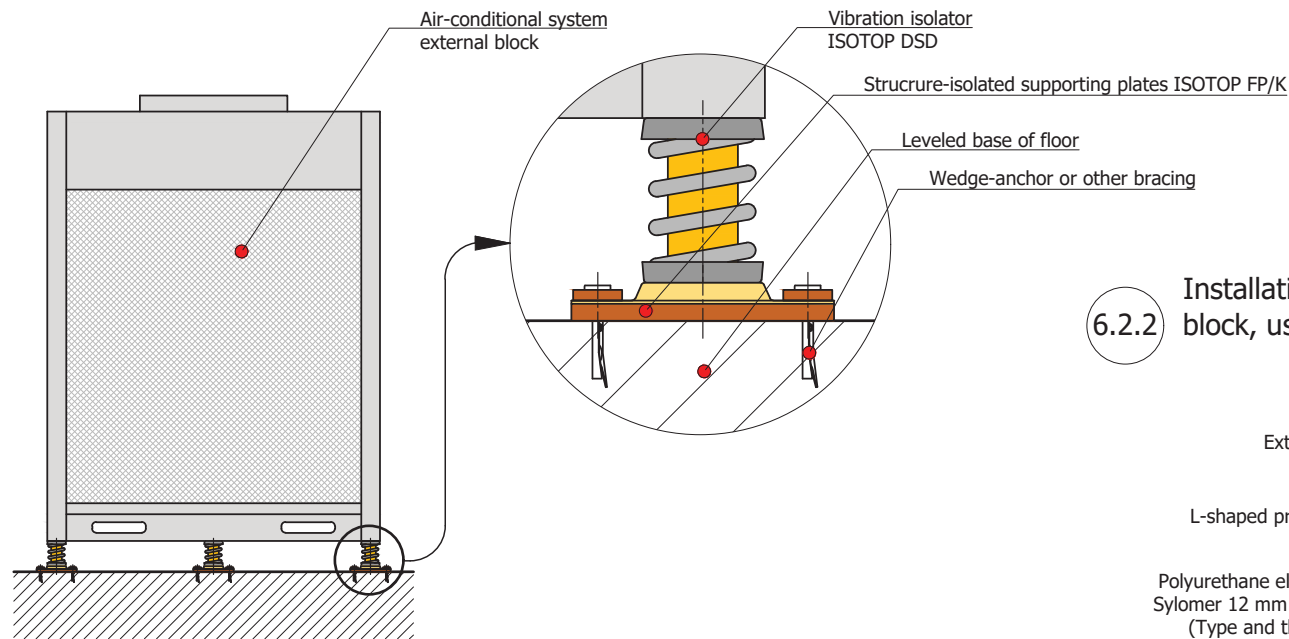


6.1.4 Scheme of fastening pipes, air conduits and other communication lines or units to a slab, using a traverse and polyurethane elastomer Sylomer

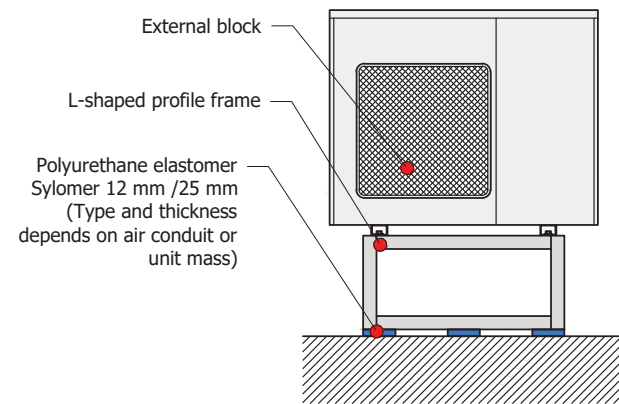


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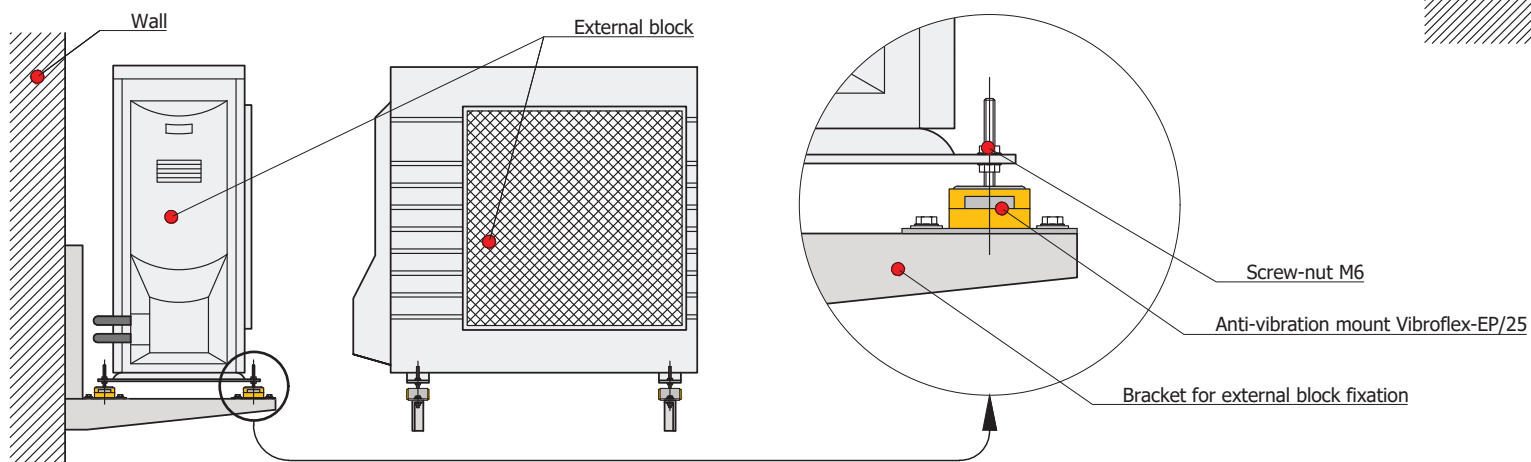
6.2.1 Installation scheme of external blocks of central ventilation and conditioning system, using ISOTOP vibration isolator



6.2.2 Installation scheme of conditioning system external block, using polyurethane elastomer Sylomer

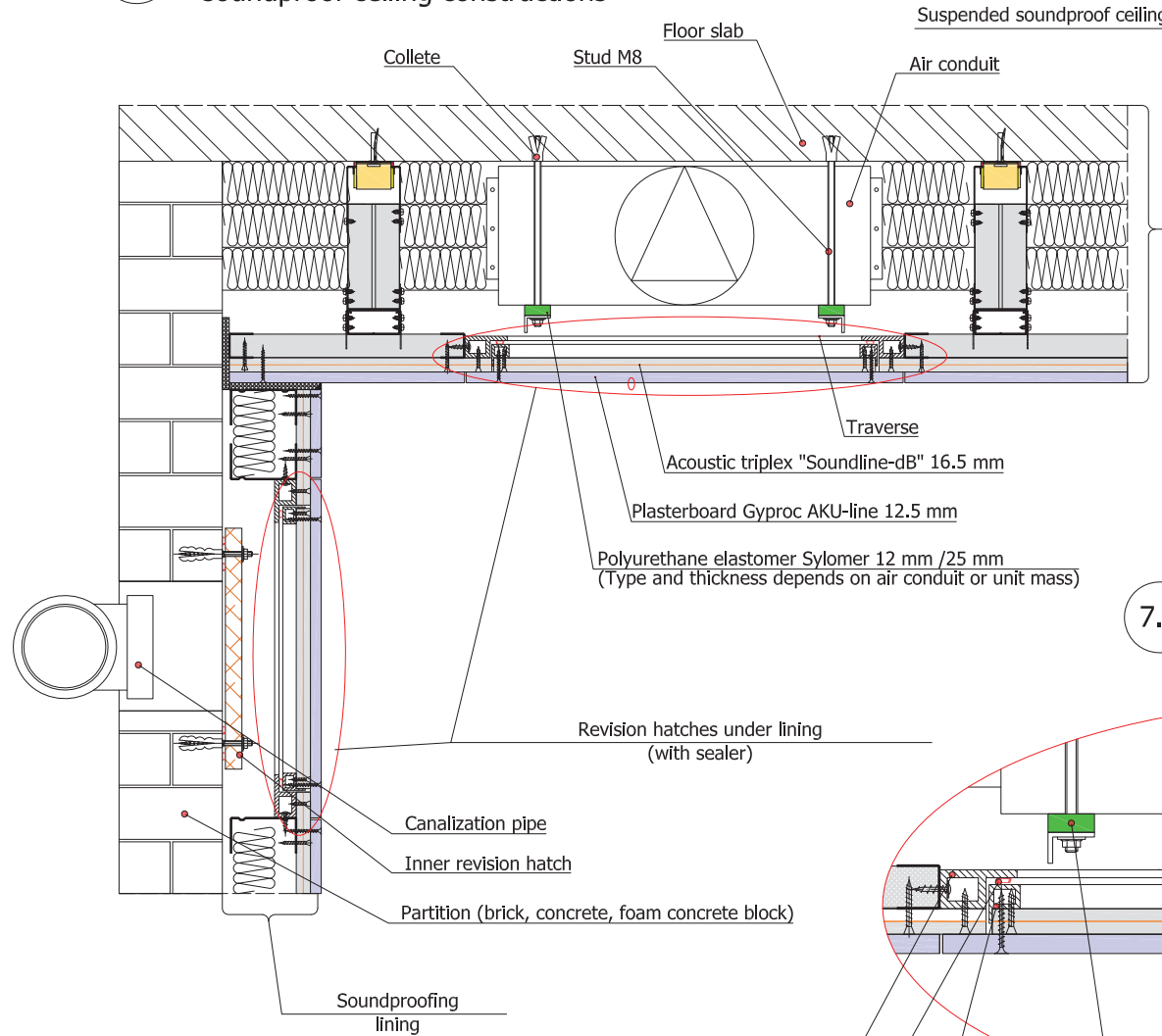


6.2.3 Installation scheme of conditioning system external block, using Vibroflex-EP/25 anti-vibration mounts

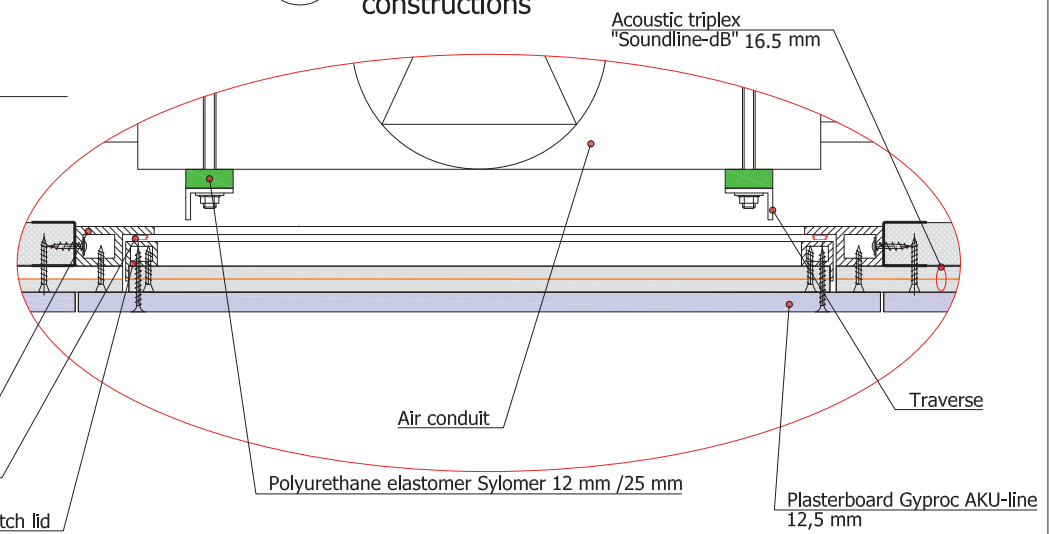




7.1 Revision hatches installation scheme in suspended soundproof ceiling constructions



7.2 Variant of revision hatch installation in suspended soundproof ceiling constructions



For notes

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PROVEN BY TIME

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ENGINEERING SOLUTIONS

# SOUNDPROOFING STRUCTURES

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