LIMITED LIABILITY COMPANY
ACOUSTIC GROUP

APPROVED BY
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July 17, 2023

Standard Method Statement for Design of Soundproofing Framed Ceiling using Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik (AG.C-501/AG.C-502/AG.C-503)

TK-007-2023

Revision 2

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Standard Method Statement TK-007-2023 was developed as a supplement to Engineering Solutions Album Soundproofing Structures of ASP series.

1. General Design Specifications

1.1. Soundproofing framed ceiling on Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers (AG.C-501/AG.C-502/AG.C- 503) is a multi-layer structure on a steel frame made of PP 60/27 galvanized ceiling steel sections, which is fixed on slab supporting structures using Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers, ceiling track PPN 28/27. A single layer of 12.5 mm thick Gyproc AKU-line/AKU-line PRO* gypsum board and 16.5 mm thick Soundline-dB acoustic triplex are used as sheathing for the structure. The air space between steel sections is filled with special Shumanet-BM/Shumanet-ECO/Shumanet-SK Neo sound-absorbing plates.

The structure on Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers (AG.C-501/AG.C-502/AG.C-503) is used in rooms with dry and normal moisture conditions specified in Table 2 of this Method Statement according to SP 50.13330.2012.

*For application in moist rooms, Gyproc AKU-line PRO gypsum board should be used as a finish layer.

Figure 1. Image of soundproofing framed ceiling on Vibroflex-K15 hangers

1.2. The features of the structure include:

- fire specifications of special sound-absorbing plates – NG
- fire specifications of Soundline - dB – G1, V1, D1, T1 acoustic triplex boards
- fire specifications of Gyproc AKU-line/AKU-line PRO gypsum boards – G2, V2, D2, T2/G1, V1, D1, T1

Table 1. Design features

Structure name	**Structure code**	**Thickness, mm**	**Index of additional air-borne sound insulation, ΔRw, dB***
Suspended ceiling mounted on Vibroflex-Connect PP mounts	AG.C-501	100	17-19
Suspended ceiling mounted on Vibroflex-K15 mounts	AG.C-502	130	19-21
Suspended ceiling mounted on Vibroflex-K15 mounts with extensions from steel section PP 60/27	AG.C-503	≥ 200	21-23
* - Measurements were made in field conditions with minimization of indirect noise transmission routes on the base reinforced concrete slab with air-borne sound insulation index Rw = 49 dB In the protected room, all enclosing structures except for the one under test, are provided with mounted soundproofing structures with additional insulation index ΔRw ≥ 20 dB			

Table 2. Indoor conditions

Regimes	Room air humidity, %, at temperature		
	Up to 12°C	12°C to 24°C	Over 24°C
Dry	Up to 60	Up to 50	Up to 40
Normal	Over 60 to 75	Over 50 to 60	Over 40 to 50
Humid	Over 75	Over 60 to 75	Over 50 to 60
Wet	-	Over 75	Over 60

2. Scope of application

2.1. This Method Statement applies to the installation of soundproofing frame ceiling on Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik(AG.C-501/AG.C-502/AG.C-503) hangers, designed to increase the soundproofing of building structures (slabs) during construction and reconstruction of all types of buildings and structures.

2.2. The scope of work covered by the Method Statement includes:

- marking design positions of the suspended ceiling
- installing the frame using Vibroflex-K15, Vibroflex-Connect PP or Ultrakustik vibration suspensions and metal sections PPN 28/27 and PP 60/27;
- filling the framed space with Shumanet-BM/Shumanet-ECO/Shumanet-SK Neo sound-absorbing plates
- sheathing the frame with Soundline-dB acoustic triplex boards (inner layer)
- sealing joints between Soundline-dB acoustic triplex boards
- finish cladding with Gyproc AKU-line/AKU-line PRO gypsum boards.

2.3. Construction and finish work using structural elements of soundproofing frame ceiling on Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers shall be performed according to the installation method for dry and normal moisture conditions and temperatures not less than +10°C.

3. Transportation and storage

3.1. Steel sections shall be transported by all modes of transport in covered vehicles in accordance with the rules for the transportation of goods applicable to the particular mode of transportation.

3.2. During transportation, handling and storage of the steel sections, their protection from damage, contamination and moisture must be ensured. During material handling operations, safety rules established by GOST 12.3.009-76 shall be observed.

3.3. Steel sections shall be stored in closed dry rooms in conditions that prevent their exposure to rain and groundwater. Steel sections can be stored in stacks with a maximum height of 2 m.

3.4. Soundline-dB acoustic triplex shall be transported by all means of transport in covered vehicles in accordance with the rules for the transportation of goods, in force for this type of transport. Pallets with panels shall be transported in a single tier (42 pcs./pallet).

3.5. During transportation in open railroad or road vehicles, the packs shall be protected against moisture.

3.6. Soundline-dB acoustic triplex shall be stored in rooms with a dry and normal humidity, in a horizontal position on pallets with a maximum height of three tiers (1 tier - 42 pcs./pallet).

3.7. During handling, transportation, storage and other operations, no impacts on the boards are allowed.

3.8. During transportation, handling and storage of Vibrostack-M/ULTRAKUSTIK-LENTA F100 vibration insulating tape, protection from impacts, damage, contamination and moisture shall be ensured. During material handling operations, safety rules established by GOST 12.3.00976 shall be observed.

3.9. Vibrostack-M/ULTRACOUSTIC-LENTA F100 vibration insulating tape shall be transported in vertical position with a maximum height of 15 (fifteen) rows.

3.10. Vibroseal sealant shall be transported by all modes of transport in covered vehicles in accordance with the rules for the transportation of goods applicable to this mode of transport.

3.11. Free movement of the Vibroseal sealant during transportation shall be prevented.

3.12. During transportation, handling and storage of the Vibroseal sealant, protection from damage, contamination and moisture shall be ensured. The storage and transportation temperature should be within the range of +5°C to +25°C. During handling operations, the safety rules established by GOST 12.3.009-76 shall be observed.

3.13. Vibroseal sealant shall be stored in dry rooms in conditions that prevent its exposure to rain and groundwater. Vibroseal sealant can be stored in closed carton boxes, in stacks no more than 2 m high.

3.14. Shumanet-BM, Shumanet-ECO and Shumanet-SK Neo plates shall be transported by all modes of transport in covered vehicles in accordance with the rules for the transportation of goods applicable to this mode of transport.

3.15. During transportation and storage, Shumanet-BM, Shumanet-ECO и Shumanet-SK Neo plates shall be laid flat. The stacking height shall not exceed 2 m.

3.16. Free movement of Shumanet-BM, Shumanet-ECO и Shumanet-SK Neo plates during transportation shall be prevented.

3.17. During transportation, handling and storage of Shumanet-BM, Shumanet-ECO и Shumanet-SK Neo plates, protection from damage, contamination and moisture shall be ensured. During material handling operations, safety rules established by GOST 12.3.009 shall be observed.

3.18. Shumanet-BM, Shumanet-ECO и Shumanet-SK Neo plates shall be stored in packaging in dry rooms or under shelter away protected from rain and groundwater. During storage, Shumanet-BM, Shumanet-ECO и Shumanet-SK Neo plates should be laid on wooden pallets, boards or other padding materials without sagging.

3.19. Vibroflex/Ultrakustik fasteners shall be transported by any modes of transport in covered vehicles in accordance with the rules for the transportation of goods applicable for the given mode of transport.

3.20. During transportation, handling and storage of the Vibroflex fasteners, their protection from damage, contamination and moisture must be ensured. During material handling operations, safety rules established by GOST 12.3.009-76 shall be observed.

3.21. Vibroflex/Ultrakustik fasteners shall be stored in closed dry rooms in conditions that prevent their exposure to rain and groundwater. It is allowed to store packages with Vibroflex/Ultrakustik fasteners in stacks with a height of max 2 m.

3.22. Gyproc AKU-line/AKU-line PRO boards shall be transported by all means of transport in covered vehicles in accordance with the rules for the transportation of goods in force for this type of transport. Pallets with panels shall be transported in a single tier (48 pcs./pallet).

3.23. During transportation in open railroad or road vehicles, the packs shall be protected against moisture.

3.24. Gyproc AKU-line/AKU-line PRO boards shall be stored in rooms with a dry and normal humidity, in a horizontal position on pallets with a maximum height of three tiers (1 tier - 48 pcs./pallet).

3.25. During handling, transportation, storage and other operations, no impacts on the boards are allowed.

4. Structural solutions using soundproofing framed ceiling on Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers

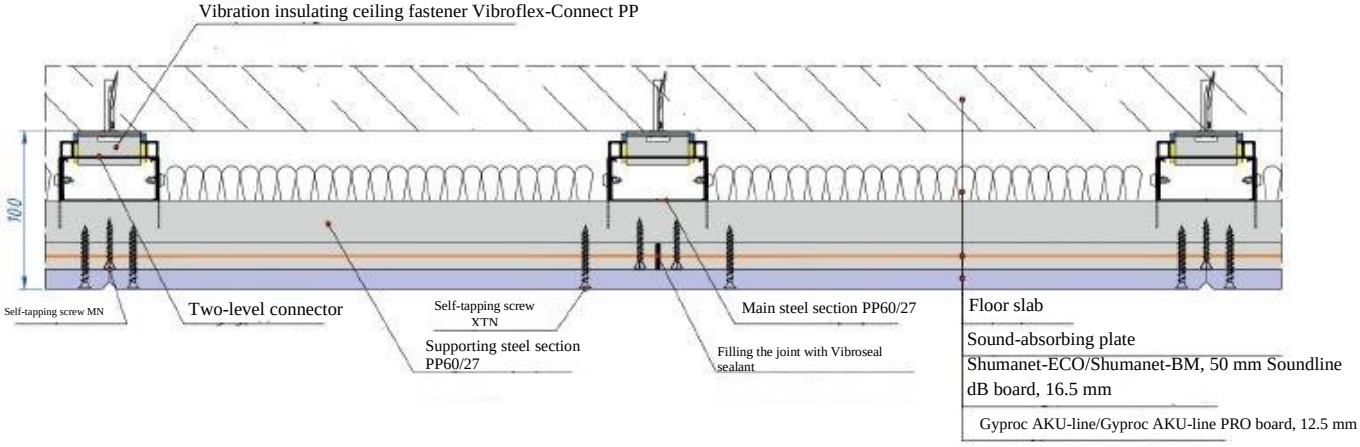

Figure 2. Soundproofing framed ceiling structure, 100 mm thick, using Vibroflex-Connect PP vibration insulating ceiling fasteners (AG.C-501).

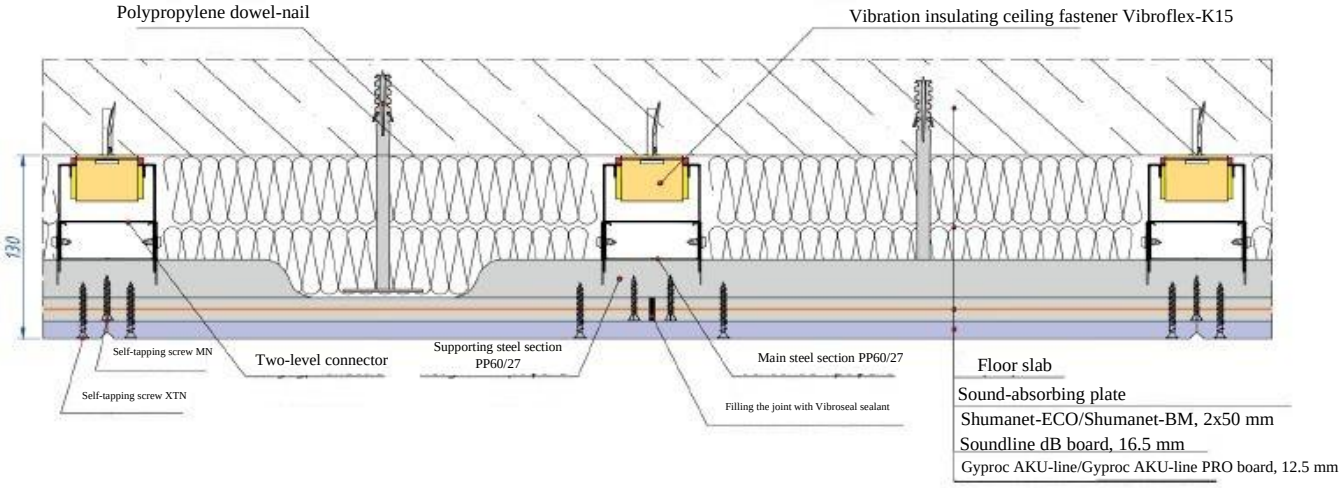

Figure 3. Soundproofing framed ceiling structure, 130 mm thick, using Vibroflex-K15 vibration insulating ceiling fasteners (AG.C-502).

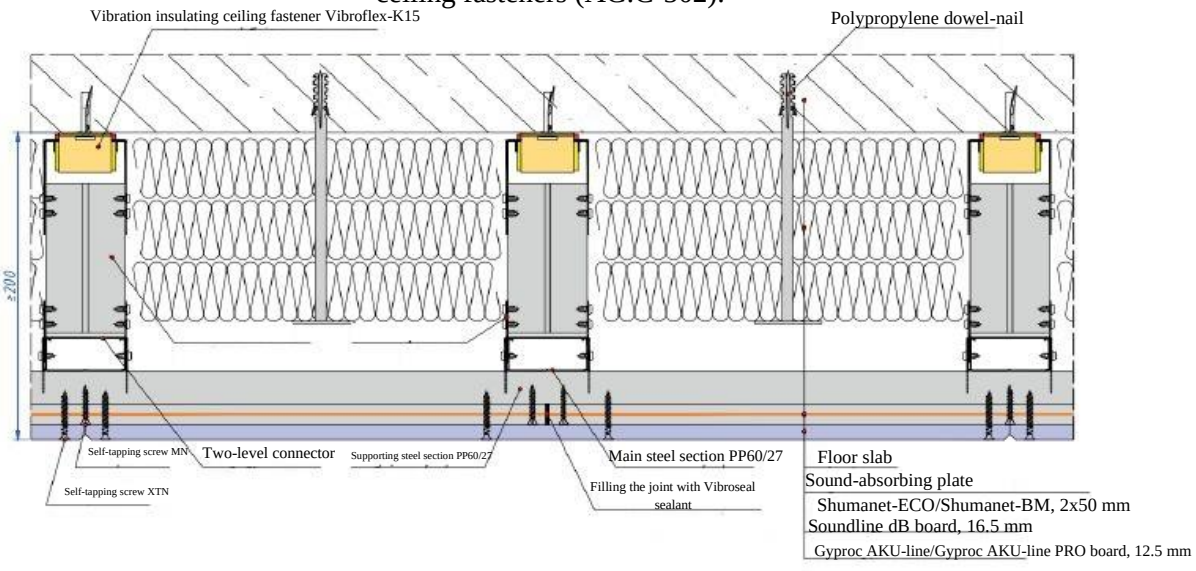

Figure 4. Soundproofing framed ceiling structure, over 200 mm thick, using Vibroflex-K15 vibration insulating ceiling fasteners (AG.C-503).

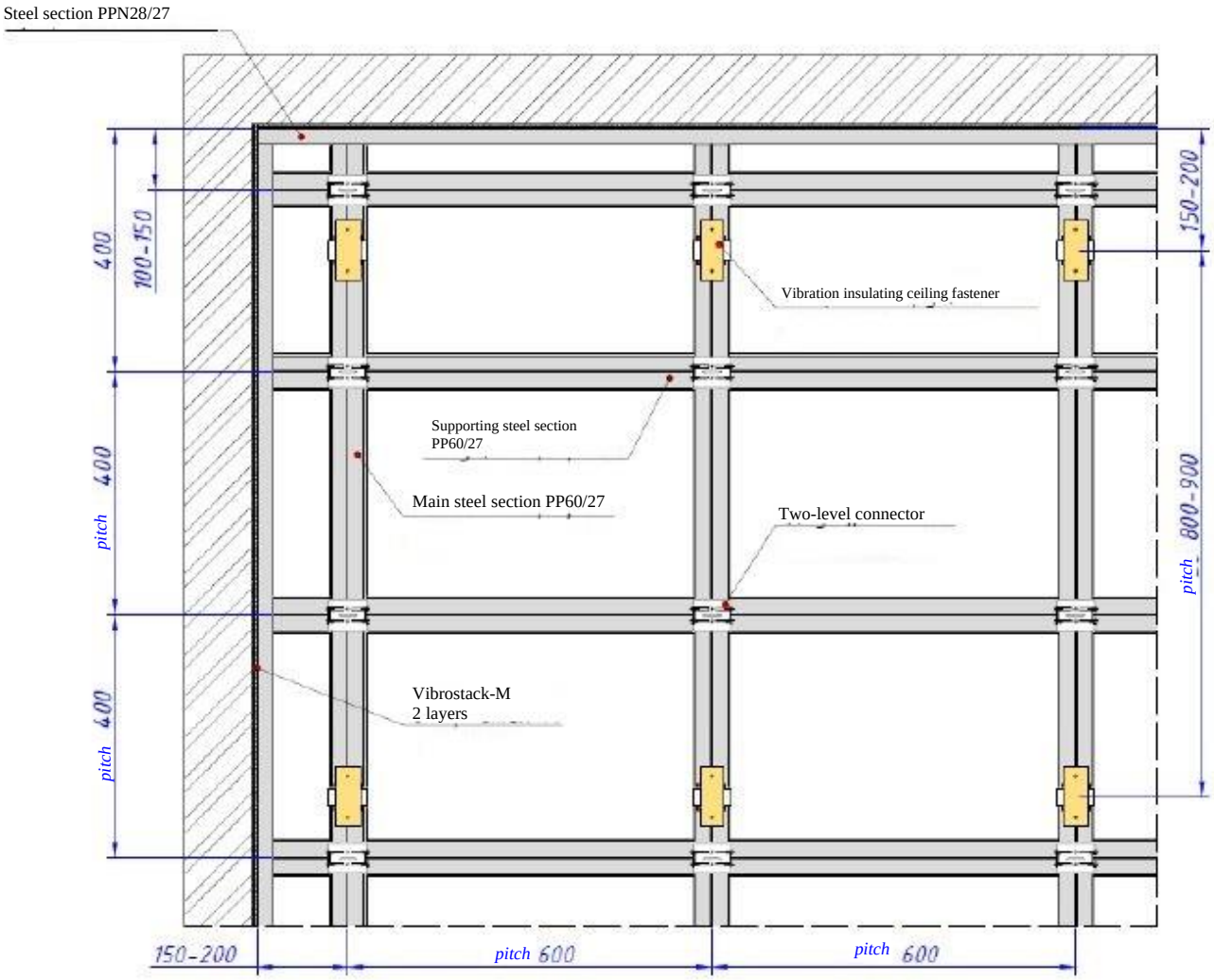

Figure 5. Schematic diagram of framed suspended ceiling installation. Top view.

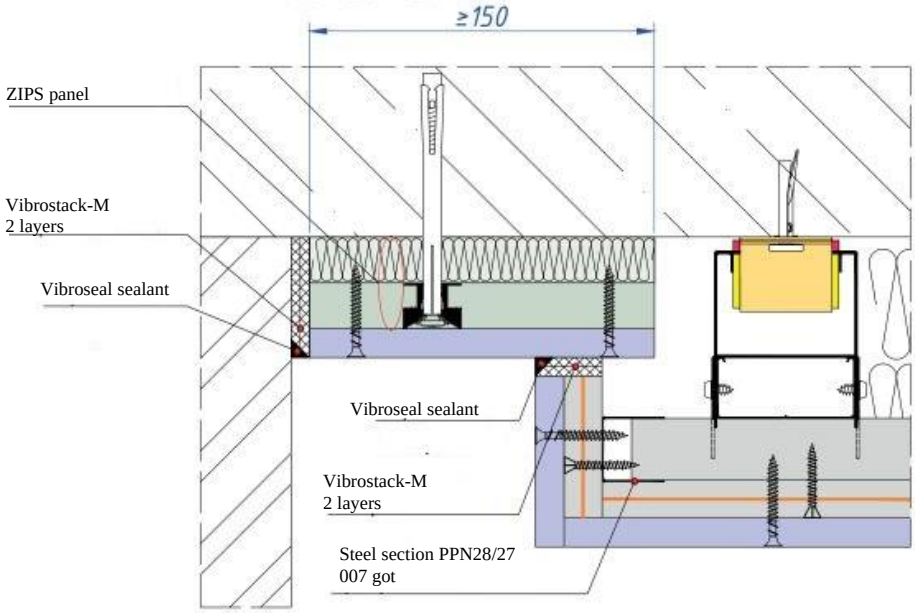

Figure 6. Schematic diagram of the niche along the perimeter of the room.

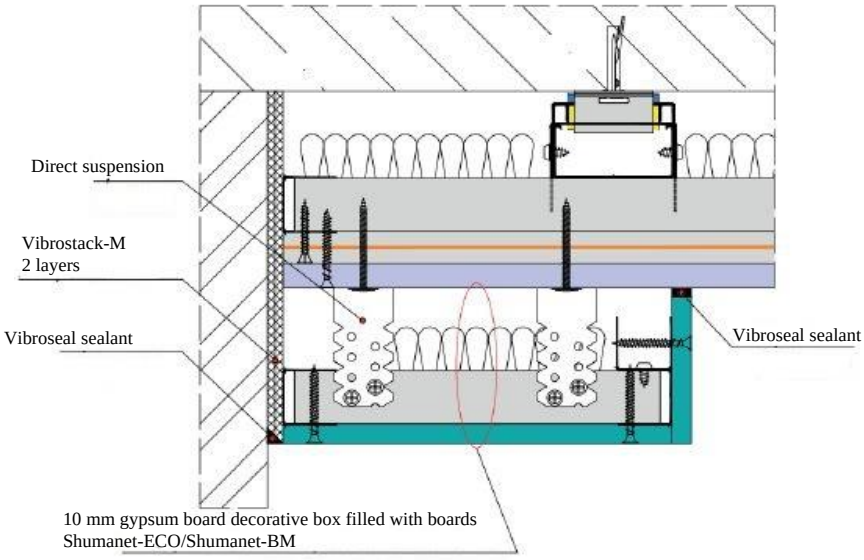

Figure 7. Schematic diagram of a niche in the center of the room.

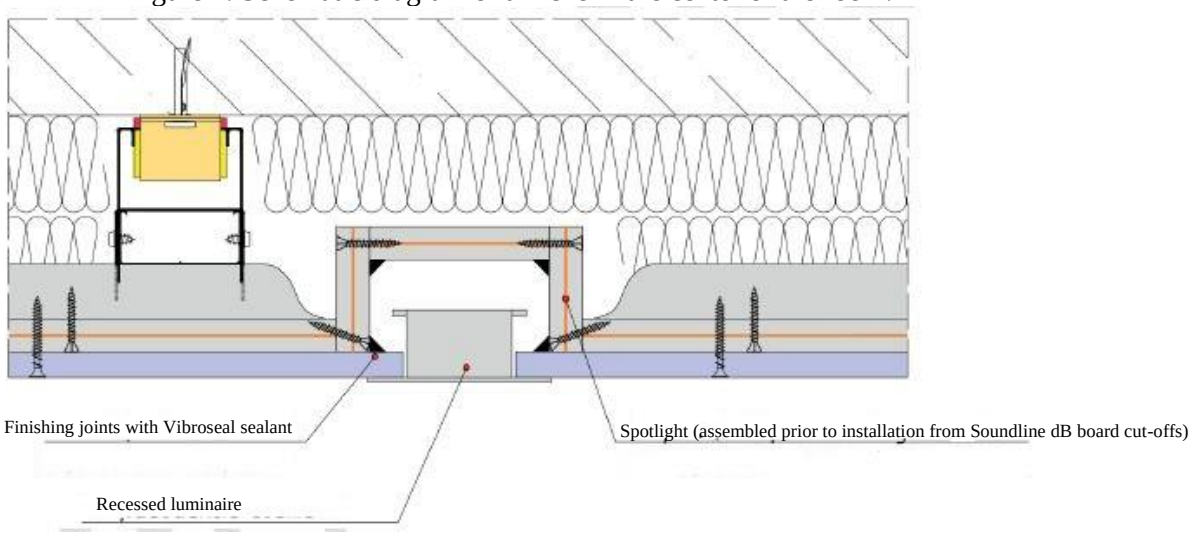

Figure 8. Schematic diagram of spotlight design for recessed luminaire installation.

5. Surface Preparation

5.1. The surfaces on which the soundproofing framed ceiling on Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers is installed do not require prior leveling.

5.2. The soundproofing framed ceiling should only be installed after completing the installation of all utilities, except for electrical wiring, from distribution boards to installation points of lamps built in the ceiling. Where the pitch for fixing the suspended ceiling and main steel sections is disrupted by engineering equipment and technological networks, use additional hangers and main steel sections.

5.3. The arrangement of electric and low-voltage wires in the suspended ceiling frame space should prevent their damaging by sharp edges of frame elements or screw nails when fixing gypsum building boards (gypsum fiber sheets). It is therefore recommended to arrange electrical wiring outside frame steel sections.

5.4. Mark the design position of the cladding on the ceiling using a chalk string (mark according to the design). Mark build-in lamps on the floor.

5.5. Marking the installation of suspended ceiling frame elements includes:

- marking channel level marks in room corners;
- marking track axes on walls along the perimeter of the room;
- marking fixing points for hanger rods and main steel section axes on the room slab.

IMPORTANT: The availability of extensive utilities and equipment can result in changes in the standard pitch of hangers and steel sections, use of engineering hangers and other structural solutions requiring additional calculation and individual solutions.

6. Installation technology

6.1. The walls, columns and other vertical enclosing structures should adjoin frame elements of soundproofing suspended ceiling via fasteners through 2 layers of Vibrostack-M vibration insulating tape or 1 layer of ULTRAKUSTIK-LENTA F100 tape. The tape shall be attached and fixed on the wall, ceiling and floor with Vibroseal sealant. Vibrostack-M tape should be bonded to itself using Vibroseal sealant as well. Vibrostack-M/ULTRAKUSTIK-LENTA F100 vibration insulating tape shall always be placed underneath the ends of gypsum fiber and gypsum boards used in the structure.

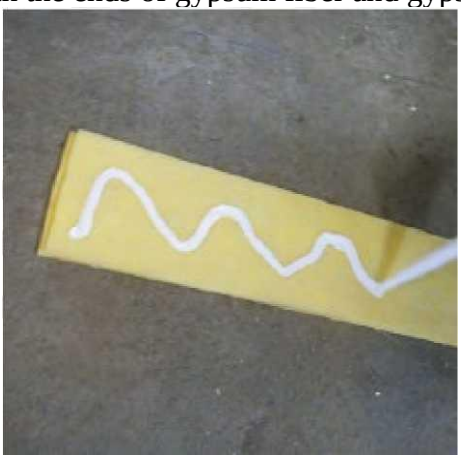

Figure 9. Applying Vibroseal sealant on Vibrostack-M vibration insulating tape.

6.2. According to marking, install and attach PN 28/27 channels to the walls with a maximum spacing of 1500 mm, but not less than three fixing points per a single piece.

6.3. According to the marking, install and fix Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers using wedge anchors (6/40; 6/60) to the reinforced concrete slab, or using universal self-tapping screws (6 mm in diameter) to wooden slabs.

6.4. Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers are installed with a pitch of 800-900 mm along the main steel section with a possible local increase in hanger pitch to 1000 mm in the presence of utilities on the slab surface. If the hanger pitch is to be increased by over 1000 mm, use engineering hangers designed for higher loads, perform additional calculations of the bearing capacity of main steel sections, and locally replace them with a shaped pipe with a required cross-section. The maximum distance from the edge of the section to the first hanger should not exceed 150-200 mm.

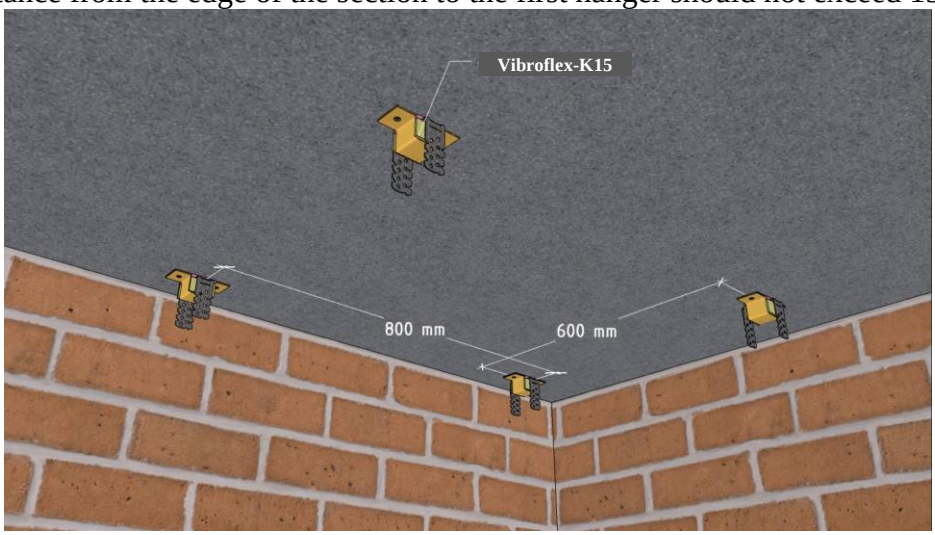

Figure 10. Installation diagram for Vibroflex-Connect PP/Vibroflex K15/Ultrakustik hangers.

6.5. Install the main (primary) metal sections PP 60/27 with a pitch of 600 mm to the previously installed Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers.

6.6. Install two-level connectors with a pitch of 400 mm on the main steel sections, with the first connector from the wall installed at a distance of max 100-150 mm (Figure 10);

6.7. Fix supporting steel sections PP 60/27 perpendicularly to the main steel sections with a pitch of 400 mm using two-level connectors.

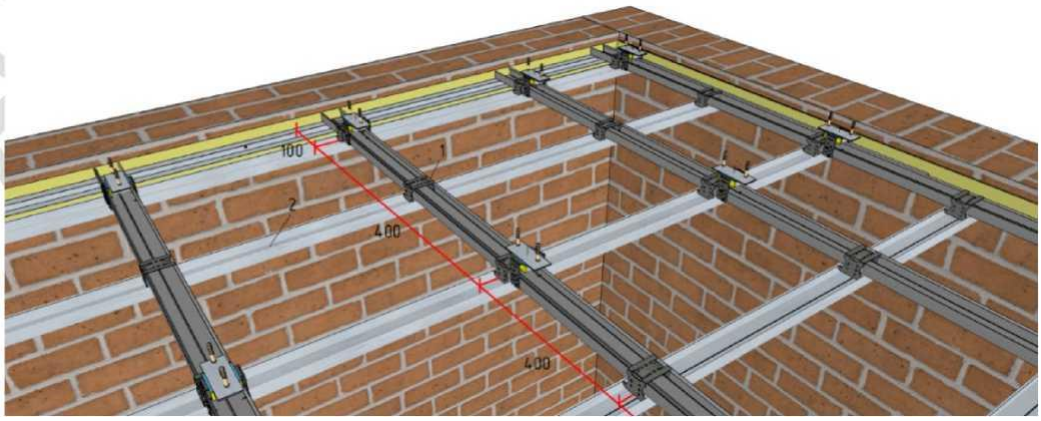

Figure 11. Fixing supporting steel sections on double-sided connectors. 1 – Double-sided connector; 2 – Supporting steel section PP 60/27.

6.8. After assembling the frame structure, detach channels PN 28/27 from walls be unscrewing self-tapping screws and removing dowels. Dowels should be removed with pliers.

6.9. Lay special Shumanet-BM/Shumanet-ECO/Shumanet-SK Neo sound-absorbing plates in the inner space of the frame. Shumanet-BM/Shumanet-ECO/Shumanet-SK Neo sound-absorbing plates can also be mounted in an insulated slab using polypropylene dowel screws for thermal insulation to the metal frame (ref. Figure 3-4).

6.10. Secure Soundline-dB acoustic triplex boards using 3.9x30 mm self-tapping screws for gypsum plasterboards (MN self-tapping screw or equivalent). Boards are fixed on metal sections with a pitch of 200 mm. The direction of installation is indicated on the sticker in the upper left corner of Soundline-dB acoustic triplex boards.

6.11. Soundline-dB acoustic triplex boards are installed in design position using an articulating boom lift (Figure 12).

Figure 12. Installing Soundline-dB acoustic triplex boards in design position. 1 – Soundline-dB acoustic triplex; 2 – articulating boom lift.

6.12. Fastening self-tapping screws shall penetrate Soundline-dB acoustic triplex boards at a normal angle and, further, section flange to at least 10 mm, screw heads shall be sunk in the gypsum fiber board surface to approximately 1 mm.

6.13. Soundline-dB acoustic triplex boards shall be mounted with a joint disarrangement at least 250 mm. The use the cut panels for sheathing the next row is recommended.

6.14. Joints between Soundline-dB acoustic triplex boards shall be filled with Vibroseal

vibroacoustic sealant.

6.15. A finishing layer of Gyproc AKU-line/AKU-line PRO gypsum boards 12.5 mm thick is fixed to the resulting surface. The sheets shall join the adjoining surfaces, also via 2 layers of Vibrostack-M vibration insulating tape or via 1 layer of ULTRAKUSTIK-LENTA F100 tape according to Item 6.1 of this Method Statement.

6.16. When mounting Gyproc AKU-line/AKU-line PRO boards, 3.9x41 mm self-tapping screws shall be used (XTN self-tapping screw or equivalent). The pitch of self-tapping screws to steel section shall be 200 mm. Horizontal joints of sheets shall be vertically displaced by at least 250 mm. Vertical joints relative to Soundline-dB acoustic triplex boards shall be displaced to the supporting steel sections. Self-tapping screws shall be at least 15 mm away from the short edge of sheathing sheets and at least 10 mm away from the long edge.

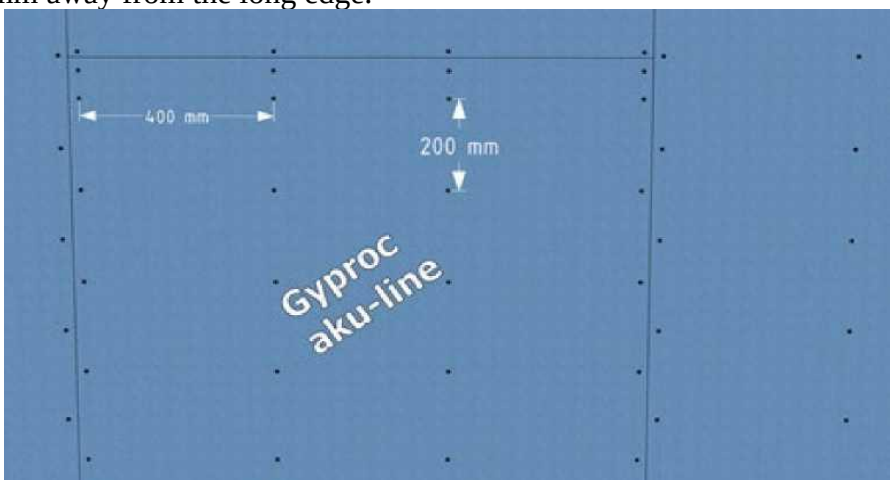

Figure 13. Fastening of Gyproc AKU-line/AKU-line PRO plasterboard sheets

6.17. The excessive protruding Vibrostack-M/ULTRAKUSTIK-LENTA F100 tape is cut flush with the finish layer of Gyproc AKU-line/AKU-line PRO boards. The joint shall be filled with Vibroseal vibroacoustic silicone sealant. For a high-quality joint, the use of a masking tape glued to surfaces forming an angle is recommended.

6.18. When installing built-in pinpoint lights into the framed soundproofing ceiling, install a spotlight (box) in the ceiling space, preassembled before installation from cutouts of Gyproc AKU-line/AKU-line PRO boards or Soundline-dB acoustic triplex, which is fixed on structure cladding sheets. When assembling the spotlight (box) made of Gyproc AKU-line/AKU-line PRO boards, box parts are bonded together using Vibroseal sealant.

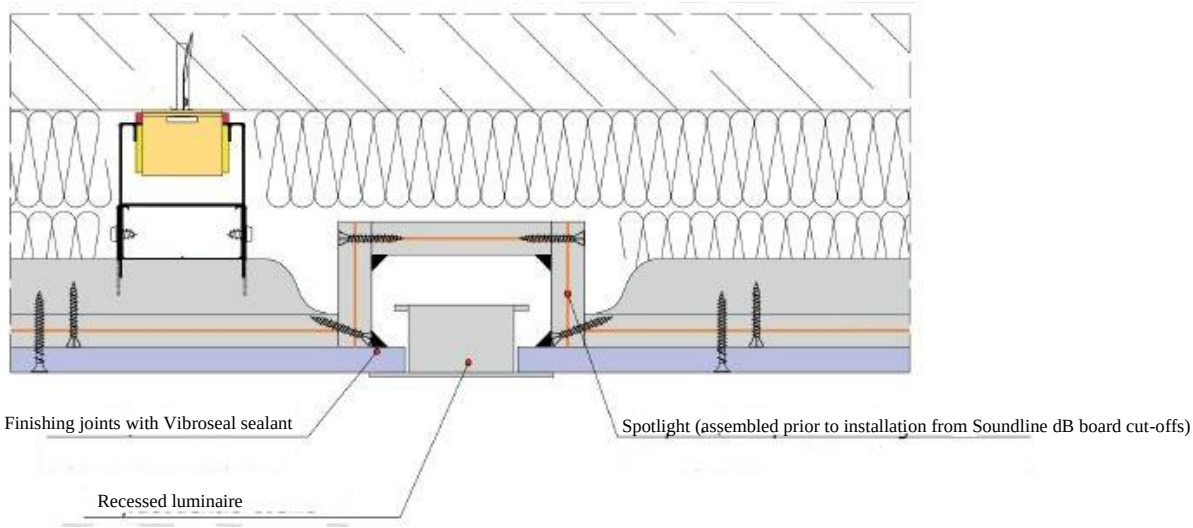

Figure 14. Schematic diagram of spotlight design for recessed luminaire installation.

6.19. Built-in track lamps are installed in the soundproofing framed ceiling according to diagrams (Figure 15-18), observing the following conditions:

- provide gaps at fixing points for track lamps in advance in the metal two-level frame;
- the box preassembled before installation from cutouts of Gyproc AKU-line/AKU-line PRO boards or Soundline-dB acoustic triplex is fitted on plywood with 3.9x30 self-tapping screws (MN self-tapping screws or equivalents);
- when assembling the box made of Gyproc AKU-line/AKU-line PRO boards, box parts are bonded together using Vibroseal sealant;
- when assembling the box from Soundline-dB acoustic triplex boards, interconnect box parts with gypsum plasterboard 3.9x30 self-tapping screws (MN self-tapping screws or equivalents);
- the track is installed, which is fixed on the plywood with 3.9x41 mm gypsum board self-tapping screws (XTN self-tapping screw or equivalents) through special grooves;
- the self-tapping screws securing the box should not intersect the self-tapping screw securing the track.

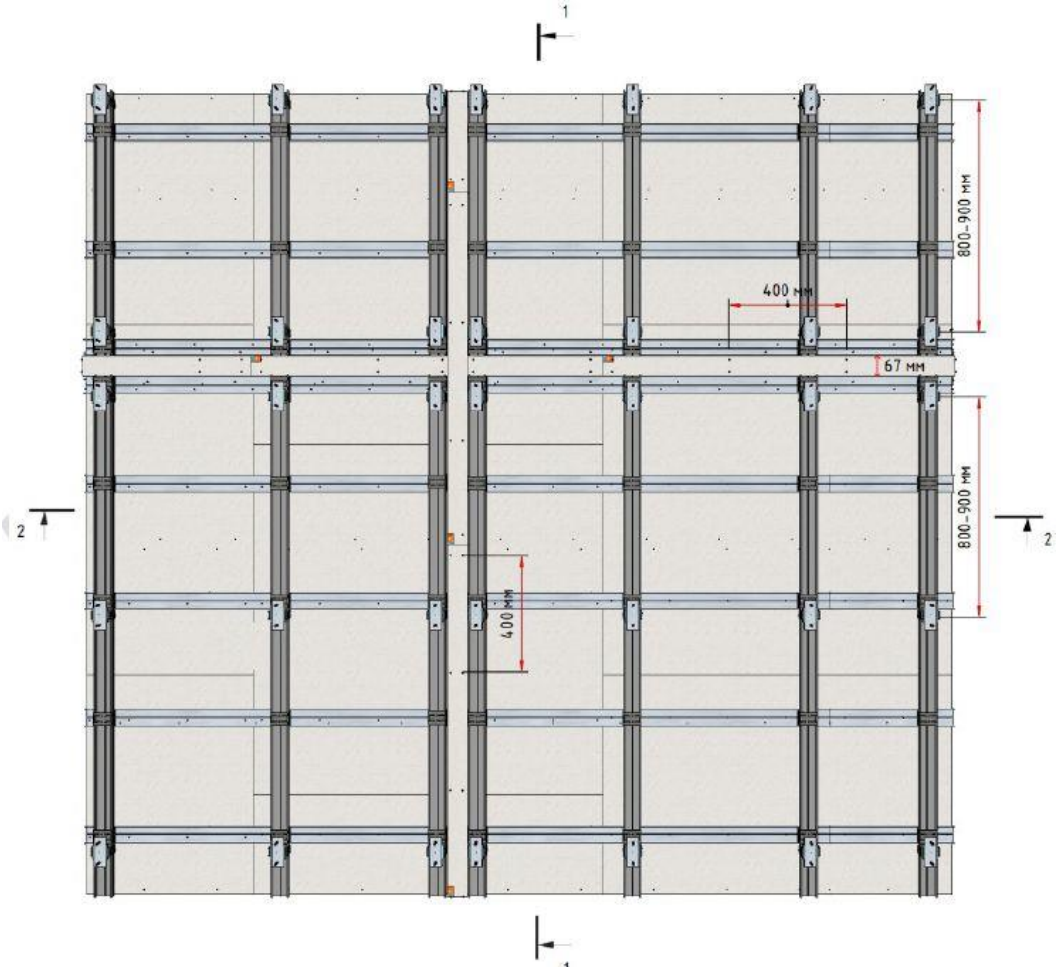

Figure 15. Schematic diagram of track lamps in the framed soundproofing ceiling structure. Frame installation. Top view.

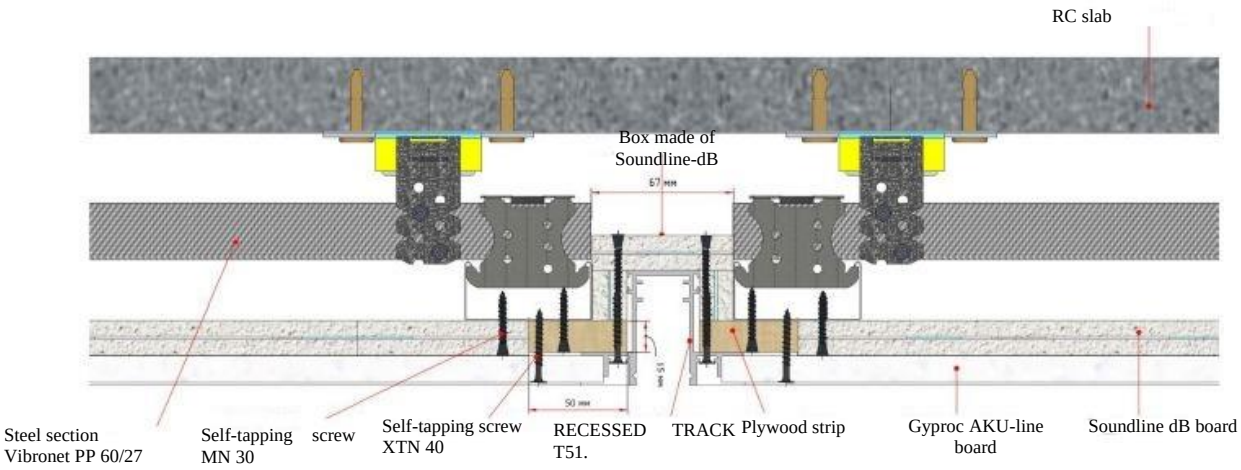

Figure 16. System for track attachment along supporting steel sections. Section 1-1.

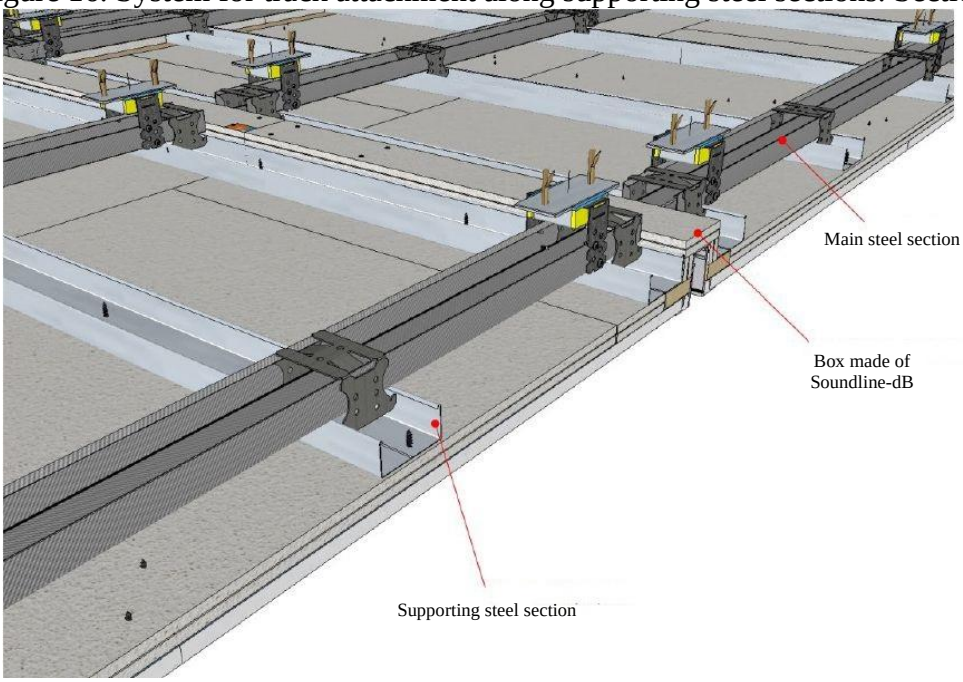

Figure 17. System for track attachment along supporting steel sections. Perspective view.

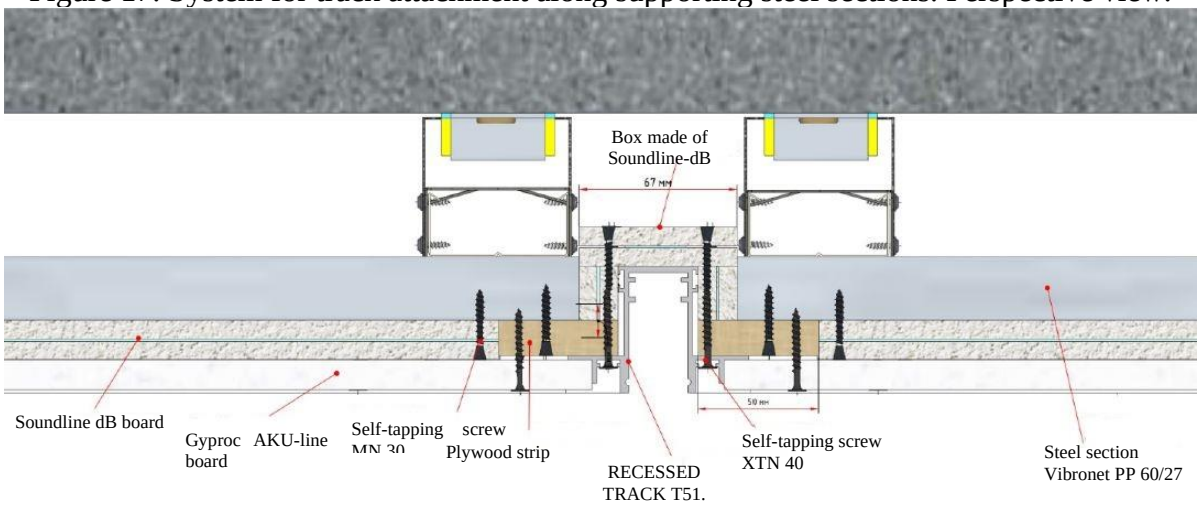

Figure 18. System for track attachment across supporting steel sections. Cross-section 2-2.

6.20. When passing through the soundproofing framed ceiling structure on Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik hangers, pipes and other utilities shall be wrapped with two layers of Vibrostack-M vibration insulating tape or one layer of ULTRAKUSTIK-LENTA F100 tape. The joints

should be filled with Vibroseal sealant.

7. Allowable loads for installing items on soundproofing framed ceiling structure using Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik

7.1. Load up to 6 kg per square meter can be fastened at any point of the structure using specialized fasteners (dowels) without reinforcing the frame.

7.2. For fastening the loads from 6 to 25 kg per square meter, it is necessary to use additional Vibroflex-K15, Vibroflex-Connect PP or Ultrakustik vibration insulating hangers. The maximum load on the vibration insulating hanger is 15 kg.

7.3. Loads over 25 kg per square meter are mounted directly to the floor slab using Vibroflex vibration insulating hangers of type 1, 2 or 4.

8. Hand tools

Table 3. List of required hand tools.

Name	Figure	Purpose
Chalk line		Marking the design position of the structure
Laser level (geodetic level)		Marking the design position of the structure
Putty knife		Grouting of joints and self-tapping screw heads

Name	Figure	Purpose
Drill driver		Drilling holes in the wall/ceiling/Soundline-dB board
Drywall carrying tool		Carrying gypsum boards and Soundline-dB
Articulating boom lift		Installing the Soundline-dB acoustic triplex boards and Gyproc AKU-line/AKU-line PRO in a design position.
Level		Level monitoring
Metl-working shears		Cutting the steel sections
Heat-insulating slab cutting knife		Cutting the Shumanet-BM/Shumanet-ECO/Shumanet-SK Neo sound-absorbing plates
Utility knife		Cutting the Vibrostack-M/ULTRAKUSTIK-LENTA F100 tape, cutting sheets

Name	Figure	Purpose
Tape measure		Size measurements
Aluminum leveling board		Measuring control, material cutting control
Power jigsaw		Sheet cutting
Caulking gun		Sealant application
Hammer		Wedge anchor driving

9. Workmanship

9.1. The quality and reliability of the soundproofing structure depends on the physical characteristics of the materials, as well as observance of the installation procedure and further operation.

9.2. The structure shall be mounted in a heated room where wet processes have been completed.

9.3. When mounting the cladding with Soundline-dB acoustic triplex boards, due to production tolerances, gaps up to 4 mm can be formed in joints that shall be filled with Vibroseal vibroacoustic

sealant.

9.4. Soundproofing works are concealed type of work, therefore, each completed stage shall be accepted and recorded in a certificate indicating the quality and certifying the absence of defects.

9.5. The scope of operations and quality controls is given in Table 4.

Table 4

Work stages	Controlled operations	Inspection (method, scope)	Documentation
Preparatory work	Check: - availability of an inspection certificate for previously performed work	Visual	Concealed Work Inspection Certificate, General Work Log
	- compliance of the surface with quality requirements	Visual, measurement	Concealed Work Inspection Certificate
	- availability of material quality document.	Visual	Certificate (Quality Certificate)
Installation	Inspect: - marking of attachment points for hangers and channels;	Technical inspection (measurement)	General work log
	- availability of Vibrostack-M/ULTRAKUSTIK-LENTA F100 tape in places where the soundproofing structure adjoins the enclosures and utilities	Visual	
	- pitch for installing main steel sections PP 60/27;	Measurement	
	- pitch for installing supporting steel sections PP 60/27;	Measurement	
	- availability of sound-absorbing plates in the frame space;	Visual	
	- horizontal joint disarrangement when installing Soundline-dB acoustic triplex boards	Visual, measurement	
	- pitch for attaching Soundline-dB acoustic triplex to supporting steel sections PP 60/27;	Measurement	
	- filling joints between Soundline-dB acoustic triplex boards with Vibroseal sealant	Visual	
	- pitch for attaching Gyproc AKU-line/AKU-line PRO gypsum boards to Soundline-dB acoustic triplex boards and supporting steel sections PP 60/27;	Measurement	
	- size of the cut parts of Soundline-dB acoustic triplex boards and Gyproc AKU-line/AKU-line PRO gypsum boards.	Measurement	
	Check:	Visual	

Work stages	Controlled operations	Inspection (method, scope)	Documentation
	- compliance of the mounting points of the soundproofing structure with the design condition		
Acceptance of the work	- quality of installed structure	Visual	General work log, work acceptance certificate
	- mounted structure quality.		

Notes:

1. Control and measuring tools: ruler, tape measure, leveling board.
2. Incoming and in-process inspection should be carried out by: foreman (construction superintendent), engineer – during the work.
3. Acceptance inspection should be carried out by: quality control employees, foreman (construction superintendent), and customer's inspectors.

9.6.The in-process quality control scheme is shown in Table 5.

Table 5

Controlled operations	Requirements, tolerances	Inspection methods and tools	Inspector and date	Documentation
Properties of materials	Compliance with regulatory requirements and design	Visual	Construction superintendent	Quality document, design
Marking of structure installation points	As per design	Measurement	Construction superintendent	General work log
Mounting of steel frame	Offset of channels from the layout axes: < 3 mm	Measurement	Foreman (construction superintendent) during the work	General work log
	Distance between stud centerlines: ±2 mm (in the absence of utilities)			
	Distance between mounting parts of the channels to the supporting structures: ±5 mm			
Filling the cladding with sound-absorbing materials	Filling at least 70% of the ceiling air space	Visually	Foreman (construction superintendent) during the work	General work log
Sheathing the frame with gypsum boards and gypsum-fiber boards	Minimum amount of overlap of the sheathing sheet on a steel section: 10 mm	Measurement	Foreman (construction superintendent) during the work	General work log
	Joint size between adjoining sheets: Gypsum board - 1-2 mm; Soundline dB – up to 4 mm.			
	Screw or fastener head sinking into the frame sheathing: 0.5-1.0 mm			
	Gap between adjacent sheets along the joint: 1 mm			
	Local vertical or horizontal	Measurement,		

Controlled operations	Requirements, tolerances	Inspection methods and tools	Inspector and date	Documentation
	deviation not more than 9 mm within 0.5 sq. m.	with a two-meter rail or leveling board installed in the center of the protruding part		
	Vertical or horizontal deviations not more than 7 mm per 3 m.	Measurement, with a two-meter rail or leveling board		
Making an acoustic joint between	Joint size along the perimeter of the soundproofing ceiling: ≤ 15 mm	Measurement	Foreman (construction superintendent) during the work	General work log
Controlled operations	Requirements, tolerances	Inspection methods and tools	Inspector and date	Documentation
adjoining structures				
Availability of rigid connections to enclosures, utilities	None	Visually	Foreman (construction superintendent) during the work	General work log

10. Finishing the structure surfaces using gypsum boards

10.1. Before finishing the surfaces of walls made of gypsum boards, construction and installation work shall be completed including the finishing work related to 'wet' processes (plastering, cement screeding, etc.).

10.2. Finishing work shall be performed at temperatures not less than 10°C and a relative air humidity not more than 60% according to the requirements of 7.1 SP 71.13330.2017.

10.3. To seal the joints between gypsum boards, use a dry putty mixture based on gypsum binder with special admixtures ensuring the extension of setting times and the increase of the water holding capacity, or a putty mixture based on a polymeric binder. Bending strength - at least 1.5 MPa, compressive strength - 2 MPa.

10.4. Puttying joints between gypsum boards includes:

- dedusting all sheet joints
- applying the first putty layer on the joint between gypsum boards with a width of at least 100 mm using a putty knife
- pressing the reinforcing tape (paper perforated) with a putty knife into the applied putty in the center of the joint
- after drying of the first putty layer, application of a covering putty layer across the entire seam width with a wide putty knife (200-300 mm).

10.5. After puttying the joints and screw attachment points, treat the surface using a manual grinding device and remove dust.

10.6. Treat the surfaces of structures operated in rooms with moist conditions with a waterproofing compound.

10.7. The surface of sheathing made of gypsum boards are suitable for any type of finish: paint, wallpaper, ceramic tiles, decorative plastering.

10.8. It is recommended to paint using oil, water-based, resin, polyurethane paints containing polymer plasticizers, etc. The use of lime-based or liquid glass-based paints for painting is not recommended. Prior to high-quality painting, finishing puttying and grinding shall be performed on

the entire surface of the sheathing.

10.9. After intermediate painting revealing different surface hues due to the availability of spots, etc., perform final painting of the sheathing surface.

10.10. Wallpapering of the gypsum board surface shall be performed on a well-dried primed base.

10.11. When cladding the gypsum board sheathing with ceramic tiles or mosaic, additional requirements to surface smoothness and sheathing strength are applied.

10.12. Puttying and finishing shall be limited by the seam area only, and the entire surface of gypsum board sheathing clad with tiles shall be pre-treated with a primer that shall only be applied with a brush or paintbrush. Never use spraying or a roller for application. Pay special attention to the thoroughness of priming the cut edges of gypsum boards and pipe intersections, the holes for which shall be made with a 10 mm allowance and sealed with silicone compounds. In rooms with high temperature and humidity conditions, provide waterproofing of the floor and walls using coating waterproofing mastics and reinforcing corner tapes.

10.13. Tile cladding with the use of a special adhesive is recommended. In rooms with high temperature and humidity conditions, use a special adhesive to bind tiles on waterproofing mastics. The adhesive is applied with a toothed spatula.

10.14. It is recommended to seal the joints between tiles using special joint fillers, and with joints between the walls and between the walls and floor shall be sealed with sealants.

10.15. As for soundproofing, it is recommended to cover joints along the perimeter of the structure with finish elements (corners, skirting boards, etc.) not making rigid joints between two adjoining structures (existing and soundproofing).

11. Material and technical resources

11.1. The necessary basic materials per 1 m^2 of structure are specified in Table 6. Standard consumption rates are based on calculations of room dimensions 5.3 m x 3.4 m = 18 m^2.

Table 6

Name	UoM	Solution thickness, mm		
		100	130	>200
Frame, filling, fasteners				
Channel PP 60/27	m	4.6		
Steel section PPN 28/27		1.0		
Two-level channel connector for channel PP 60/27	pcs.	5.0		
Extension of channels PP 60/27	pcs.	1.1		
Vibration insulating ceiling fastener Vibroflex-Connect PP/Ultrakustik	pcs.	2.8	-	
Vibration insulating ceiling fastener Vibroflex-K15	pcs.	-	2.8	
Vibrostack-M100 tape (30 m roll)	m	2.0		
ULTRAKUSTIK-TAPE F100 tape (15 m roll)	m	1.0		
Anchor dowel	pcs.	5.6		
Straight hanger	pcs.	-		2.8
Channel PP 60/27 (for direct hangers extension)	m	-		On site
Sound-absorbing plate Shumanet-BM/Shumanet-ECO/Shumanet-SK Neo (1200x600x50/1250x600x50 mm board)	sq. m	1.0	2.0	3.0-4.0*

Name	UoM	Solution thickness, mm		
		100	130	>200
Polypropylene dowel-nail	pcs.	7.0		
Metal self-drilling screws 3.5x11 (LN self-tapping screws or	pcs.	11.2	11.2	22.4
Sheathing				
Soundline-dB board (1200x1200x16.5 mm)	sq. m	1.0		
Gyproc AKU-line/AKU-line PRO board (1200x2500x12.5/1200x2000x12.5 mm)		1.0		
Self-tapping screws for gypsum plasterboards 3.9x30 (MN	pcs.	10		
Self-tapping screws for gypsum board 3.9x41 (XTN self-	pcs.	20		
Metal self-drilling screws 3.5x11 (MN self-tapping screws or	pcs.	35	35	70
Fixing edge layers, sealing the joints				
Vibroseal vibroacoustic sealant (Tube 290 ml)	pcs.	0.4		

* - With an offset of more than 200 mm, sound-absorbing plates are laid in 3-4 layers.

12. Need for personal protection equipment and overalls when installing soundproofing framed ceiling using Vibroflex-Connect PP/Vibroflex-K15/Ultrakustik

Table 7

Name	Specification	UoM	Qty
Overalls, hand and foot protection	GOST 12.4.103-83	pcs.	based on team size
Goggles	GOST 12.4.253-2013	pcs.	based on team size
Face mask	GOST 12.4.296-2015	pcs.	based on team size

13. Safety precautions

13.1. Only persons not younger than 18 years of age may be admitted to work after completing an introductory (general) safety briefing. Every worker shall undergo a medical examination before starting the work.

13.2. Work areas, workplaces and passages during the dark hours of the day shall be illuminated in accordance with GOST 12.1.046-2014. The illumination shall be uniform, without the glare of devices on the workers. No work in unlit areas shall be performed.

13.3. Workplaces and access ways shall be kept clean and free of debris in a timely manner.

14. Basic fire safety instructions

14.1. During construction and installation works, fire safety at the work site and at workplaces should be ensured in accordance with the requirements of the Fire Safety Regulations in the Russian Federation, approved by Russian Federation Government Resolution No. 1479 dated 06 September 2020.

14.2. Persons violating fire safety regulations will bear criminal, administrative, disciplinary or other liability in accordance with the applicable law.

14.3. A person from among the engineering and technical personnel of the company should be appointed by an order as the person responsible for fire safety at the construction site.

14.4. All workers engaged in production shall be allowed to work only after completing fire safety training and additional training in preventing and extinguishing potential fires.

14.5. Workplaces shall have signs with telephone number for calling the fire department and the evacuation plan for people in the event of a fire.

14.6. Fire-fighting posts equipped with fire extinguishers, sand boxes and toolboxes shall be installed at the work site, and warning posters shall be displayed. All equipment shall be in good

condition.

14.7. Never start fires, use open flames, or smoke in the area where soundproofing materials are installed and stored.

14.8. Smoking is permitted only in specially designated areas equipped for this purpose.

14.9. The power mains should always be kept in good condition. After the work, turn off the electrical switches of all units and working lighting, leaving only the emergency lighting and working equipment involved in a continuous cycle with the electrician on duty.

14.10. Never block driveways, passages, approaches to the locations of fire-fighting equipment, gates, and fire alarms.

14.11. For heating mobile (collapsible) buildings, factory-made steam and water heaters and electric heaters shall be used.

14.12. Clothes and shoes should be dried in rooms with central water heating specially adapted for this purpose, or using oil heaters.

14.13. Never dry wiping and other materials on heating devices. Oily overalls and rags, containers of flammable substances shall be stored in closed boxes and removed after completion of the work.

14.14. Never store fuel and oil supplies or empty containers in the construction site outside of fuel and oil storage facilities.

14.15. Washing of machines and mechanisms with fuel is permitted only in rooms specially designated for this purpose.

14.16. Spilled fuel and oil should be covered with sand, which should then be removed.

14.17. Workers and engineering and technical personnel engaged in production shall:

- comply with fire safety requirements in production, as well as comply with fire safety regulations
- take precautions when using fire hazardous substances, materials, and equipment
- in case of fire, report it to the fire department and take rescue measures.