EAD **042232-00-0503**

www.eota.eu

April 2022

European Assessment Document for

Flexible interlayer for the reduction of flanking sound and vibration transmission

This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The product covered by this EAD, in the document also named as “flexible interlayer”, is a flexible interlayer made of a homogeneous viscoelastic layer of monolithic polyurethane or EPDM (ethylene propylene diene monomer rubber) or similar material, for the reduction of flanking sound and vibrations transmission.

Foam products are not covered by the present EAD.

The product can be placed on the market as a stripe, mat, washer or other shapes.

The flexible interlayer is not covered by a harmonized European standard.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise their clients on the transport, storage, maintenance, replacement and repair of the product, as the manufacturer considers necessary.

It is assumed that the product will be installed according to the manufacturer’s instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer’s stipulations, e.g., with regard to the intended end use conditions, having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA as long as the details of the assessment methods as laid down in this EAD are respected.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The product is used as flexible interlayer for the reduction of flanking transmission for airborne, impact and building service equipment sound between adjoining rooms frame and/or vibration transmission. The product is installed between at least two elements (i.e., floor and wall).

The product shall be used in environment not subjected to direct contact with weathering or wetting. Typically, the product is installed inside the construction works.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer’s request to take into account a working life of the flexible interlayer for the intended use of 25 years when installed in the works (provided that the flexible interlayer is subject to appropriate installation and maintenance). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use and maintenance as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[1].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

[1] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than the assumed working life.

1.3 Specific terms used in this EAD

1.3.1 Symbols

Symbol	[unit]	Description
$\frac{\Delta\varepsilon}{\varepsilon_1}$	-	Mean value of the creep index in compression.
$\frac{\Delta\varepsilon}{\varepsilon_1}i$	-	The creep index in compression of each test (sample).
δ_0	mm	Initial thickness of the test piece
δ_1	mm	Thickness of the compression test piece compressed under constant force 10 min after application of the force;
δ_2	mm	Thickness of the compression test piece after the specified test duration
c.s.	-	Difference between the initial thickness and the final thickness of a test piece of product after compression for a given time at a given temperature and after a given recovery time defined at point 8 of EN ISO 1856.
$c.s._i$	-	c.s. of each test (sample).
d_0	mm	Original thickness of the test piece defined in the EN ISO 1856
d_r	mm	Thickness of the test piece after recovery defined in the EN ISO 1856
t	mm	Nominal thickness of the product.
$t_{c.s.}$	mm	Calculated thickness of the product after compression and recovery
$\sigma_{x,\ lubricant}$	MPa	Mean value of compressive stress at x mm strain (surfaces treated with appropriate lubricant).
$\sigma_{x,\ lubricant,i}$	MPa	Compressive stress at x mm strain (surfaces treated with appropriate lubricant) of each test (sample).
σ_x	MPa	Mean value of compressive stress at x mm strain (surfaces not treated with lubricant).
$\sigma_{x,i}$	MPa	Compressive stress at x mm strain (surfaces not treated with lubricant) of each test (sample).
E'_{xHz}	MPa	Mean value of elastic normal modulus (storage normal modulus) at specific frequency.
E'_{xHz}	MPa	Elastic normal modulus (storage normal modulus) at specific frequency of each test (sample).
E''_{xHz}	MPa	Mean value of loss normal modulus at x Hz.
$E''_{xHz,i}$	MPa	Loss normal modulus at x Hz of each test (sample).
$\tan \delta_{xHz}$	-	Mean value of tangent of the loss angle at x Hz.
$\tan \delta_{xHz,i}$	-	Tangent of the loss angle at x Hz of each test (sample).
K_{ij}	dB	Vibration reduction index with resilient interlayer within the range frequency 100 Hz to 3150 Hz (one-third octave bands) (for type A elements).
$\overline{K_{ij}}$	dB	Arithmetic average of K_{ij} with resilient interlayer within the frequency range 200 Hz to 1250 Hz (one-third octave bands)
$\overline{K_{ij,0}}$	dB	Arithmetic average of K_{ij} without resilient interlayer within the frequency range 200 Hz to 1250 Hz (one-third octave bands)
$\overline{D_{v,ijn}}$	dB	Normalized direction-average vibration level difference (for type B elements).
$\overline{\overline{D_{v,ijn}}}$	dB	Arithmetic average of $\overline{D_{v,ijn}}$ within the frequency range 200 Hz to 1250 Hz (one-third octave bands)
$\Delta_{l,ij}$:	dB	Correction of the $\overline{K_{ij}}$ or $\overline{\overline{D_{vijn}}}$ in presence of elastic interlayers in junction.
$E_{c,\ lubricant}$	MPa	Mean value of the ratio of stress difference ($\sigma_{15} - \sigma_5$) to the corresponding strain difference value (ε_{15} - ε_5) (surfaces treated with appropriate lubricant).

$E_{c, lubricant,i}$	MPa	Ratio of stress difference ($\sigma_{15} - \sigma_5$) to the corresponding strain difference value (ε_{15} - ε_5) (surfaces treated with appropriate lubricant) of each test (sample).
$\sigma_{15,lubricant,i}$	MPa	Compressive stress at 15% strain (ε_{15}) (surfaces treated with appropriate lubricant) of each test (sample).
$\sigma_{5,lubricant,i}$	MPa	Compressive stress at 5% strain (ε_5) (surfaces treated with appropriate lubricant) of each test (sample).
E_c	MPa	Mean value of the ratio of stress difference ($\sigma_{15} - \sigma_5$) to the corresponding strain difference value (ε_{15} - ε_5) (surfaces not treated with lubricant).
$E_{c,i}$	MPa	Ratio of stress difference ($\sigma_{15} - \sigma_5$) to the corresponding strain difference value (ε_{15} - ε_5) (surfaces not treated with lubricant) of each test (sample).
$\sigma_{15,i}$	MPa	Compressive stress at 15% strain (ε_{15}) (surfaces not treated with lubricant) of each test (sample).
$\sigma_{5,i}$	MPa	Compressive stress at 5% strain (ε_5) (surfaces not treated with lubricant) of each test (sample).
ε_{15}	-	Strain at 15%
ε_5	-	Strain at 5%

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4.

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the flexible interlayer is established in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class
Basic Works Requirement 5: Protection against noise			
2	Compressive creep	2.2.2	Level $\frac{\Delta\varepsilon}{\varepsilon_1}$ Description
3	Compression set	2.2.3	Level **c.s.** **t** [mm] $\mathbf{t_{c.s.}}$ [mm]
4	Compressive stress and deformation	2.2.4	Level $\sigma_{1mm,\ lubricant}$ [MPa] $\sigma_{2mm,\ lubricant}$ [MPa] $\sigma_{3mm,\ lubricant}$ [MPa] σ_{1mm} [MPa] σ_{2mm} [MPa] σ_{3mm} [MPa]
5	Dynamic elastic modulus	2.2.5	Level E'_{1Hz} [MPa] E''_{1Hz} [MPa] E'_{5Hz} [MPa] E''_{5Hz} [MPa] E'_{10Hz} [MPa] E''_{10Hz} [MPa] E'_{50Hz} [MPa] E''_{50Hz} [MPa]
6	Damping factor	2.2.6	Level $\tan\delta_{1Hz}$ $\tan\delta_{5Hz}$ $\tan\delta_{10Hz}$ $\tan\delta_{50Hz}$
7	Flanking transmission for airborne, impact and building service equipment sound between adjoining rooms frame	2.2.7	Description Level K_{ij} [dB] $\overline{D_{v,ij}}_n$ [dB] $\Delta_{l,ij}$ [dB]
8	Compressive modulus	2.2.8	Level $E_{c,lubricant}$ [MPa] E_c [MPa]

2.2 Methods and criteria for assessing and classification of the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

2.2.1 Reaction to fire

The flexible interlayer shall be tested according to the test methods referred to in EN 13501-1 and relevant for the corresponding reaction to fire class. The product shall be classified according to Commission Delegated Regulation (EU) No 2016/364.

The product shall be tested directly exposed to the thermal attack with surface and edge exposure. The following parameters shall be considered when testing the flexible interlayer:

- The use on different substrates for end-use applications
- The highest and lowest thickness of the mat
- The highest and lowest density and weight per unit area respectively
- Any different chemical composition
- Any type of facings/ surface coatings
- Any type of adhesive layers
- Any different types of surface profiles
- Joints.

The reaction to fire class and the corresponding field of application of the flexible interlayer shall be stated in the ETA.

2.2.2 Compressive creep

This assessment determinate the increase in deformation of the test specimen over time whilst under a constant stress simulating the operating load.

The compressive creep shall be tested in accordance with clause 6.1 of ISO 8013 with the following assessment specifications.

During the test:

- Standard temperature laboratory of 23°C. Stability of temperature is defined by tolerance ± 2 °C.
- 3 samples Type B according with 6.1.1 of ISO 8013 shall be prepared (with no surface treatment) and tested.
- Before the measurement the product shall be compressed for 6000 seconds with the compressive stress at 10% strain defined according with EN ISO 844.
- The force shall be applied for 6000 seconds.
- The creep index in compression of each test is defined at clause 11.2.1 of ISO 8013:

$$\frac{\Delta\varepsilon}{\varepsilon_1} i = \frac{\delta_1 - \delta_2}{\delta_0 - \delta_1} \qquad (2.2.2.1)$$

The description of the long-term deformation shall be determined according with Annex A of EN ISO 16534 using the values (deformation and time) determined with ISO 8013 with the assessment specification above and the result shall be expressed as Figure B1 of Annex B of EN ISO 16534.

The mean value of the creep index in compression $\frac{\Delta\varepsilon}{\varepsilon_1}$ and the description of the long-term deformation shall be stated in the ETA.

2.2.3 Compression set

This assessment determinate the ending thickness of the product after compression for a given time and after a given recovery time.

The compressive set shall be tested in accordance with EN ISO 1856 method C with the following assessment specifications.

Specimen:
5 test specimens shall be prepared and tested in the shape of a square (50x50 ± 1) mm and at least 25 mm thick (if the products have a nominal thickness less than 25 mm, sufficient test pieces shall be taken and overlapped to have the minimum thickness and the assembly shall work as a single layer of equivalent thickness).

Conditioning of specimens for 24 h before testing at (23 ± 2) °C and (50 ± 10) % RH without any stress or strain applied shall be done.

The thickness of the product shall be measured in 5 points: one in the centre and four at the edges or perimeter. The nominal thickness t [mm] is defined by tolerance class M4 according to ISO 3302-1.

During the test:

- Standard temperature laboratory of 23°C. Stability of temperature is defined by tolerance ± 2 °C.
- Before the measurement the product shall be compressed for 22h with the compressive stress at 50% strain defined according to EN ISO 844.
- $c.s._i$ of each test is defined at point 8.1 of EN ISO 1856:

$$c.s._i = \frac{d_0 - d_r}{d_0} \times 100 \qquad (2.2.3.1)$$

- $\mathbf{t_{c.s.}}$ [mm] is defined as:

$$t_{c.s.} = c.s. \times t \qquad (2.2.3.2)$$

The mean value of compression set **c.s.**, the nominal thickness of the product **t** [mm] and the absolute value of the product after compression and recovery $\mathbf{t_{c.s.}}$ [mm] shall be stated in the ETA.

2.2.4 Compressive stress and deformation

The compressive stress and deformation are tested in accordance with EN ISO 844.

Specimen:
10 test specimens shall be prepared in the shape of square (50x50 ± 1) mm and tested. The thickness of the specimens is the nominal thickness t [mm] of the product (even if it less than 10 mm).

Conditioning of specimens for 24 h before testing at (23 ± 2) °C and (50 ± 10) % RH without any stress or strain applied shall be done.

Specimens shall be tested as following:

- 5 specimens with surfaces treated with an appropriate lubricant[2].
- 5 specimens with surfaces without any treatment.

The tests shall be performed according with the procedure A, clause 6.2.1 of EN ISO 844.

The following performance shall be measured during the tests on each of the 5 specimens with surface treated with appropriate lubricant:

- $\boldsymbol{\sigma}_{\mathbf{1mm, lubricant,i}}$ [MPa]: compressive stress at 1 mm strain.
- $\boldsymbol{\sigma}_{\mathbf{2mm, lubricant,i}}$ [MPa]: compressive stress at 2 mm strain.
- $\boldsymbol{\sigma}_{\mathbf{3mm, lubricant,i}}$ [MPa]: compressive stress at 3 mm strain.

---

[2] The lubricant used shall have no substantial action on the specimens during the test and it shall be described in the test report. For most purposes, a silicone or fluorosilicone liquid having a nominal kinematic viscosity of 100 mm^2/s at standard laboratory temperature is a suitable lubricant.

The following performance shall be measured during the tests on each of the 5 specimens with surface without any treatment:

- $\sigma_{1mm,i}$ [MPa]: compressive stress at 1 mm strain.
- $\sigma_{2mm,i}$ [MPa]: compressive stress at 2 mm strain.
- $\sigma_{3mm,i}$ [MPa]: compressive stress at 3 mm strain.

The mean values $\sigma_{1mm,\ lubricant}$ [MPa], $\sigma_{2mm,\ lubricant}$ [MPa], $\sigma_{3mm,\ lubricant}$ [MPa], σ_{1mm} [MPa], σ_{2mm} [MPa] and σ_{3mm} [MPa] shall be stated in the ETA.

2.2.5 Dynamic elastic modulus

The dynamic elastic modulus shall be tested in accordance with ISO 4664-1 with the following specifications.

Specimen:
3 test specimens shall be prepared and tested in the shape according with Table 4 and clause 9.1 of ISO 4664-1.

Conditioning of specimens for 24 h before testing at (23 ± 2) °C and (50 ± 10) % RH without any stress or strain applied shall be done.

The surface of specimens shall not be treated with lubricant.

During the test on each of the 3 specimens:

- The basic principles of dynamic testing using the test apparatus given in clause 9.1 of ISO 4664-1 shall be used.
- The compression mode of deformation according to Table 4 in clause 9.2.2 of ISO 4664-1 shall be followed.
- Stable temperature of (23 ± 2) °C during the test.
- The duration of the test is limited by the increase in the temperature of the sample from 21 to 25 °C.

Note. The material is intended to be subjected only to compression. The use of any set and combination of test conditions according to ISO 4664-1 / Table 4 (compression) is possible as it leads to comparable and reproducible results.

The following performance shall be measured during the tests on each of the 3 specimens:

- $E'_{1Hz,i}$ [MPa]: elastic normal modulus (storage normal modulus) at 1 Hz of frequency.
- $E''_{1Hz,i}$ [MPa]: loss normal modulus at 1 Hz of frequency.
- $E'_{5Hz,i}$ [MPa]: elastic normal modulus (storage normal modulus) at 5 Hz of frequency.
- $E''_{5Hz,i}$ [MPa]: loss normal modulus at 5 Hz of frequency.
- $E'_{10Hz,i}$ [MPa]: elastic normal modulus (storage normal modulus) at 10 Hz of frequency.
- $E''_{10Hz,i}$ [MPa]: loss normal modulus at 10 Hz of frequency.
- $E'_{50Hz,i}$ [MPa]: elastic normal modulus (storage normal modulus) at 50 Hz of frequency.
- $E''_{50Hz,i}$ [MPa]: loss normal modulus at 50 Hz of frequency.

The mean value E'_{1Hz} [MPa], E''_{1Hz}, [MPa], E'_{5Hz} [MPa], E''_{5Hz} [MPa], E'_{10Hz} [MPa], E''_{10Hz} [MPa], E'_{50Hz} [MPa] and E''_{50Hz} [MPa] shall be stated in the ETA.

2.2.6 Damping factor

The damping factor shall be tested in accordance with ISO 4664-1 with the following assessment specifications:

Specimen:
3 test specimens shall be prepared and tested in the shape according to Table 42 and clause 9.1 of ISO 4664-1.
Conditioning of specimens for 24 h before testing at (23 ± 2) °C and (50 ± 10) % RH without any stress or strain applied shall be done.
The surface of specimens shall not be treated with lubricant.

During the test on each of the 3 specimens:

- The basic principles of dynamic testing using the apparatus given in clause 9.1 of ISO 4664-1 shall be used.
- The compression mode of deformation according to Table 4 in clause 9.2.2 of ISO 4664-1 shall be followed.
- Stable temperature of (23 ± 2) °C during the test.
- The duration of the test is limited by the increase in the temperature of the sample from 21 to 25 °C

Note. The material is intended to be subjected only to compression. The use of any set and combination of test conditions according to ISO 4664-1 / Table 4 (compression) is possible as it leads to comparable and reproducible results

The following performance shall be measured during the tests on each of the 3 specimens:

- **tan** $\boldsymbol{\delta_{1Hz,i}}$: tangent of the loss angle at 1 Hz.
- **tan** $\boldsymbol{\delta_{5Hz,i}}$: tangent of the loss angle at 5 Hz.
- **tan** $\boldsymbol{\delta_{10Hz,i}}$: tangent of the loss angle at 10 Hz.
- **tan** $\boldsymbol{\delta_{50Hz,i}}$: tangent of the loss angle at 50 Hz.

The mean value **tan** $\boldsymbol{\delta_{,1Hz}}$**, tan** $\boldsymbol{\delta_{,5Hz}}$**, tan** $\boldsymbol{\delta_{,10Hz}}$ and **tan** $\boldsymbol{\delta_{,50Hz}}$ shall be stated in the ETA.

2.2.7 Flanking transmission for airborne, impact and building service equipment sound between adjoining rooms frame

This assessment defines K_{ij} of specific configuration (structural joint), $\overline{D_{v,ij,n}}$ and $\Delta_{l,ij}$ to be applied to generic joints according to Annex F of EN ISO 12354-1.

Specimen:
The build-up shall be as described in EN ISO 10848-1 section 6 and the joint shall be constructed with appropriate fastening systems.

Procedure for Type A elements:

The flanking transmission by coupled elements and junctions is assessed by vibration transmission across a junction using K_{ij} for Type A elements or combinations of Type A. The type A are elements with a structural reverberation time that is primarily determined by the connected elements (up to at least the 1 000 Hz one-third octave band) and a decrease in vibration level of less than 6dB across the element in the direction perpendicular to the junction line (up to at least the 1 000 Hz one-third octave band).

The values stated in the ETA refer to transmission path characterized by the presence of the resilient interlayer. For each path the vibration reduction index shall be defined with resilient interlayer in frequency (K_{ij}) and correction of the $\overline{K_{ij}}$ in the position of the elastic interlayers in junction ($\Delta_{l,ij}$).

$\Delta_{l,ij}$ for a specific path is calculated as difference between $\overline{K_{ij}}$ of the same path with and without resilient interlayer. $\overline{K_{ij}}$ is the arithmetic average of K_{ij} within the frequency range 200 Hz to 1 250 Hz (one-third octave bands) according to point 10 of EN ISO 10848-1.

$$\Delta_l = \overline{K_{ij,with}} - \overline{K_{ij,without}} \quad (2.2.7.1)$$

Note. EN ISO 12354-1 and -2 specifies calculation methods to estimate the impact sound insulation between rooms and the airborne sound insulation between adjacent rooms in buildings, primarily using measured data which characterize direct or indirect flanking transmission by the participating building elements, and theoretically derived methods of sound propagation in structural elements.

The vibration reduction index K_{ij} is defined in EN ISO 12354-1 and EN ISO 12354-2 as a situation invariant quantity to characterize a junction between elements. K_{ij} is measured with structure-borne excitation.

Measurement of K_{ij}:

The vibration reduction index K_{ij} shall be measured using structure-borne excitation and calculated according to equation (13) of EN ISO 10848-1. The required quantities, described in section 4 of the EN 10848-1, are the direction-averaged level difference $\overline{D_{v,ij}}$ and the equivalent absorption lengths a_i and a_j. $\overline{D_{v,ij}}$ shall be obtained from the mean value of the velocity level differences $D_{v,ij}$ and $D_{v,ji}$, and each velocity level difference obtained by exciting one structure at several points, and by measuring the surface average velocity level of both elements i and j. For Type A elements, the values of a_i and a_j shall be determined according to equation (16) of EN ISO 10848- 1, using measurements of the structural reverberation times $T_{s,i}$ and $T_{s,j}$.

The vibration measurements shall be carried out using accelerometers mounted directly onto the surface of the test element. For the power input two methods of excitation can be used;: electrodynamic shaker with broadband noise or an impact hammer.

The preparation of the test specimens with accelerometers shall be done in accordance with section 7.2.3 of EN ISO 10848-1.

The generation of vibration on the source element is established in accordance with section 7.2.4 in the EN ISO 10848-1.

Measurements shall be made with different excitation signals, which are equivalent:

- Steady-state (shaker or tapping machine) in accordance with section 7.2.6 of EN ISO 10848-1.
- Transient (impact hammer) in accordance with section 7.2.7 of EN ISO 10848-1 taking into account the provisions in ISO 7626-5 where applicable.

At least three excitation positions shall be used on the test element. At least three measurement positions shall be used for each excitation position.

The measurement transducers positions and the excitation signals positions shall be arranged using the following minimum distances:

- 0,5 m between measurement transducers positions and the test element boundaries.
- 1 m between the excitation signals position and the measurement transducers positions.
- 0,5 m between the measurement transducers positions
- 0,25 m between measurement positions and the test element boundaries.

The measurement transducers shall be uniformly distributed on the measuring surface, avoiding regular geometric patterns and/or any symmetrical or parallel lines with the boundaries of the specimens. This is necessary to avoid measuring any modal behaviour of the specimens under test.

Fixing of accelerometers:

- The axis of accelerometer is normal to the surface

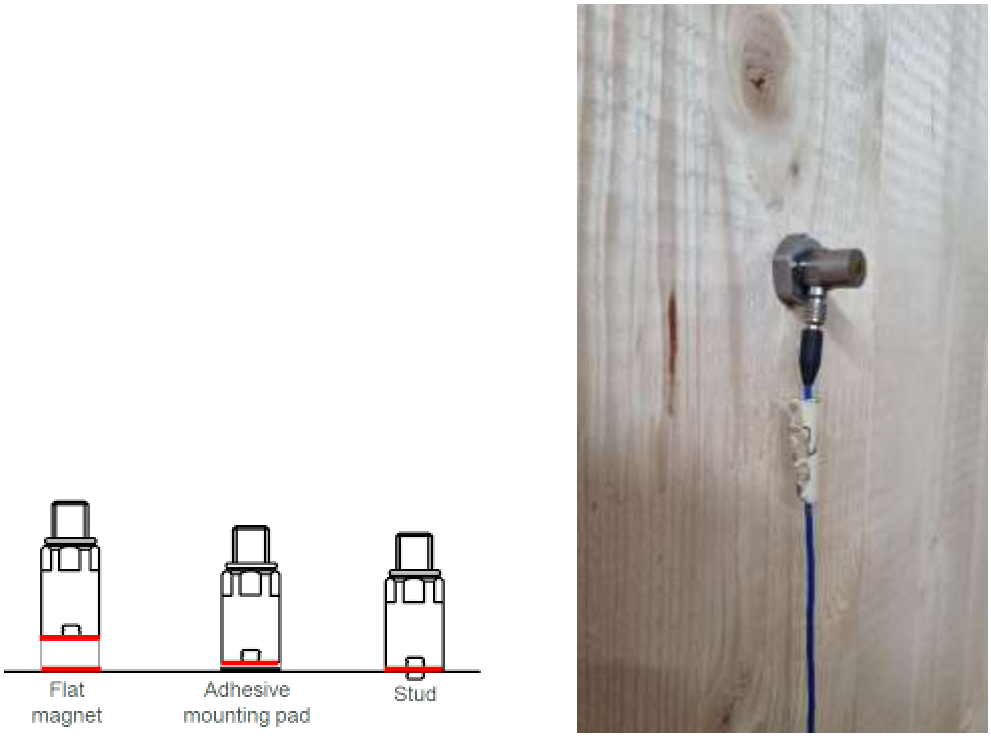


Figure 2.2.7.1 – example of the installation of the accelerometers

- Test arrangements

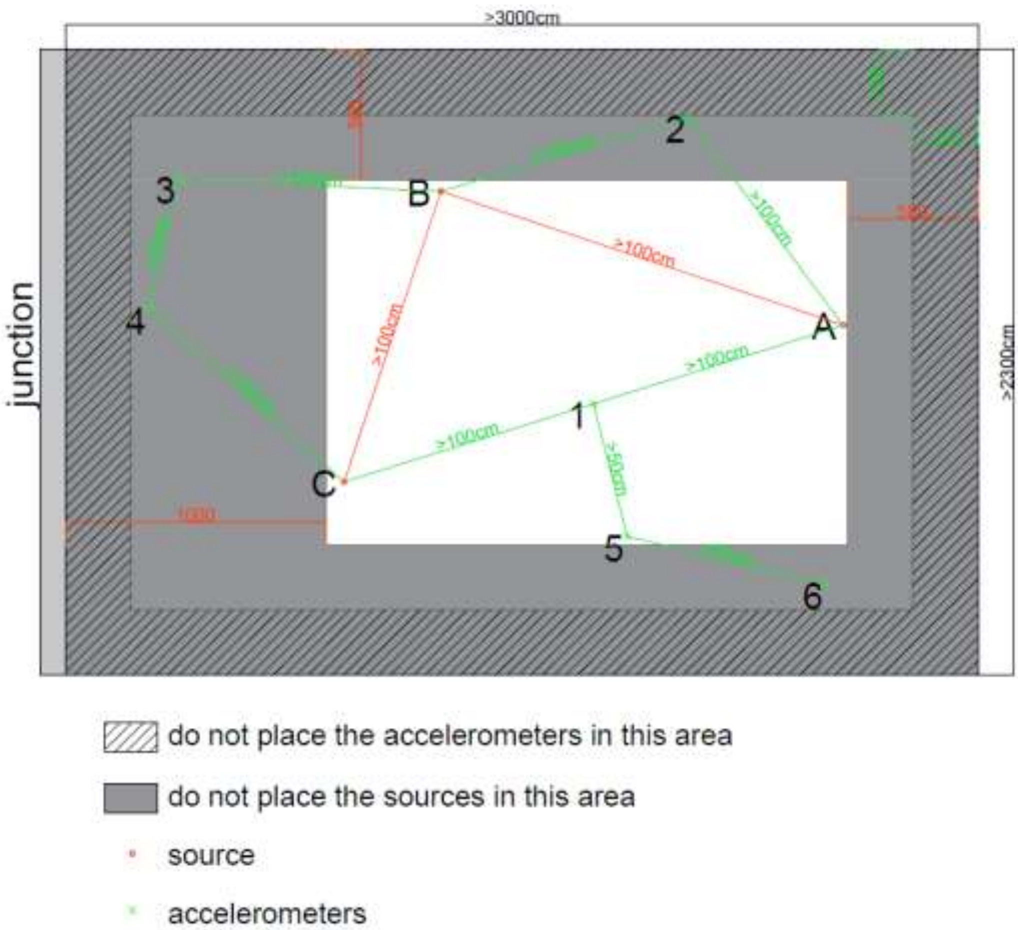


Figure 2.2.7.2 –Test arrangement

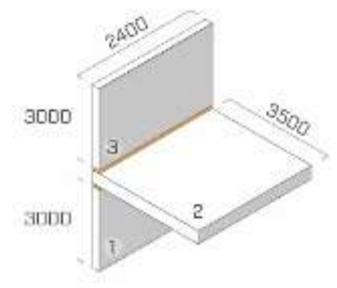
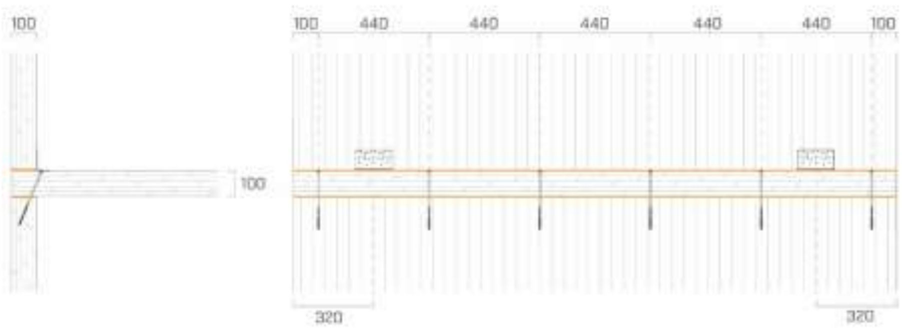
Note. Figure 2.2.7.2 is default test arrangement avoiding regular geometric patterns and/or any symmetrical or parallel lines with the boundaries of the specimens. Minimum distances of sources and accelerometers according to distances above. Other configurations may be possible by request of the applicant and shall in such cases be specified in the ETA.

The test results shall be evaluated according to Annex A.

The flanking transmission for airborne, impact and building service equipment sound between adjoining rooms frame shall be stated in the ETA with the following information:

- Joint type: progressive number and type of configuration (i.e., #1 L-joint, #2T-joint, etc.).
- Standard: reference to part of EN ISO 10848, i.e., “EN ISO 10848-1”.
- Tested build-up: Description of the test junction including material, size, thickness, number of layers (for CLT and composite materials), curing time (for concrete) condition of components (if available), load applied on the system.
- Fastening systems: type, number, step and dimension of screws, angles brackets and plates or other components.
- Flexible interlayer: type of product, width and thickness, contact area between interlayer and structure, position, load applied on the interlayer.
- Path: indication of which transmission paths i, j has been investigated.
- K_{ij} [dB]: vibration reduction index with resilient interlayer within the frequency range 100 Hz to 3150 Hz (one-third octave bands) (for Type A elements).
- $\overline{K_{ij}}$ [dB]: arithmetic average of K_{ij} with resilient interlayer within the frequency range 200 Hz to 1250 Hz (one-third octave bands)
- $\overline{K_{ij,0}}$ [dB]: arithmetic average of K_{ij} without resilient interlayer within the frequency range 200 Hz to 1250 Hz (one-third octave bands)
- $\overline{D_{v,ijn}}$ [dB]: normalized direction-average vibration level difference between elements i and j (for type B elements).
- $\Delta_{l,ij}$ [dB]: correction of the $\overline{K_{ij}}$ (for type A elements) or $\overline{\overline{D_{vijn}}}$ (for type B elements) in presence of elastic interlayers in junction.
- System drawing: section and front view with the indication of path.

Level and description to be stated in the ETA:

Joint type	Joint description	System drawing
1 T-joint	**Standard:** EN ISO 10848-1/4 **Tested build-up:** - Top wall: 5-ply CLT, 100mm, (2,4 m x 3 m), only self-weight - - Floor: 5-ply CLT 100 mm (2,4 m x 3,5 m), only self-weight - Bottom wall: 5-ply CLT, 100mm, (2,4 m x 3 m), only self-weight	 Executive drawing of the junction constructed for the test build up.  Executive drawings of the positioning of fastening system and resilient interlayers
	Fastening system: (full description of connectors and fastening system used) - 6 Partially threaded screws 8x240mm, step 440mm - 2 Angle brackets (commercial name of the product), 146x55x77x2,5 mm, full pattern with 31 screws 5x50 mm, step 1760mm **Flexible interlayer:** - Product type: Product name - Position: between top wall and floor and between floor and bottom wall. - Dimensions: width=100mm thickness=6mm length=2.40m - Contact area: continuous stripe (same width of the wall) - Load applied [kN]: self-weight of the structure	**Measurements and results:** (see below)

Measurements and results:

Path: 1-3

F (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150
K_{13} (dB)																

$\overline{K_{13}}$ =
$\overline{K_{13,0}}$ =

$\Delta_{l,13}$ =

Path: 1-2

F (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150
K_{12} (dB)																

$\overline{K_{12}}$=
$\overline{K_{12,0}}$=

$\Delta_{l,12}$ =

Path: 2-3

F (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150
K_{23} (dB)																

$\overline{K_{23}}$=
$\overline{K_{23,0}}$=

$\Delta_{l,23}$ =

Note. Other joint types can be assessed following the same principles, and in such cases the tested joint types shall be described and named in the ETA with the same information as above.

The description above, the vibration reduction index with resilient interlayer in frequency $\mathbf{K_{ij}}$ [dB] for type A elements, the arithmetic average of the vibration reduction index with resilient interlayer $\overline{K_{ij}}$ [dB] and without resilient interlayer $\overline{K_{ij,0}}$ [dB] for type A elements, the normalized direction-average vibration level difference between elements i and j $\overline{\boldsymbol{D_{v\imath\jmath n}}}$ [dB] for type B elements and correction of the $\overline{K\imath\jmath}$ in presence of elastic interlayers in junction $\boldsymbol{\Delta_{l,ij}}$ [dB] shall be stated in the ETA.

2.2.8 Compressive modulus

This assessment determinate the compressive modulus of the product at the operating strain.

The compressive modulus shall be tested in accordance with EN ISO 844 procedure A with the following assessment specifications:

Specimen:
10 test specimens shall be prepared in the shape of square (50x50 ± 1) mm and tested according to EN ISO 844.

The thickness of the specimens is the nominal thickness of the product (even if less than 10 mm)

Conditioning of 24 h before testing at (23 ± 2) °C and (50 ± 10) % RH shall be done.

The test speed shall be 1 mm/min.

Specimens shall be tested as following:
- 5 specimens with surfaces treated with an appropriate lubricant (see footnote 2), identified with $\mathbf{E_{c,lubricant,i}}$.
- 5 specimens with surfaces without any treatment, identified with $\mathbf{E_{c,i}}$.

The following performance shall be measured during the tests on each of the 5 specimens with surface treated with appropriate lubricant:
- $\boldsymbol{\sigma}_{\mathbf{15,lubricant,i}}$ [MPa]: compressive stress at 15% strain (ε_{15}).
- $\boldsymbol{\sigma}_{\mathbf{5,lubricant,i}}$ [MPa]: compressive stress at 5% strain (ε_5).
- $\mathbf{E_{c,lubricant,i}}$ [MPa] shall be calculated as following:

$$\mathrm{E_{c,lubricant,i}} = \frac{\sigma_{15,\mathrm{lubricant,i}} - \sigma_{5,\mathrm{lubricant,i}}}{\varepsilon_{15} - \varepsilon_5} \qquad (5)$$

The following performance shall be measured during the tests on each of the 5 specimens with surfaces without any treatment:
- $\boldsymbol{\sigma}_{\mathbf{15,i}}$ [MPa]: compressive stress at 15% strain (ε_{15}).
- $\boldsymbol{\sigma}_{\mathbf{5,\,i}}$ [MPa]: compressive stress at 5% strain (ε_5).
- $\mathbf{E_{c,i}}$ [MPa] shall be calculated as following:

$$E_{C,i} = \frac{\boldsymbol{\sigma}_{\mathbf{15,i}} - \boldsymbol{\sigma}_{\mathbf{5,i}}}{\varepsilon_{\mathbf{15}} - \varepsilon_{\mathbf{5}}} \quad (6)$$

The mean value compressive modulus $\mathbf{E_{c,lubricant}}$ [MPa] and $\mathbf{E_c}$ [MPa]shall be stated in the ETA.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act for the AVCPs systems is the Commission Decision 2000/273/EC as amended by 2001/596/EC.

The applicable AVCP system is 3 for any uses except the reaction to fire regulations.

For uses subject to regulations on reaction to fire the applicable AVCP systems regarding reaction to fire are 1,3 or 4 depending on the conditions defined in the said Decision.

3.2 Tasks of the manufacturer

The corner stones of the actions to be undertaken by the manufacturer of the flexible interlayer in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

Table 3.2.1 Control plan for the manufacturer; corner stones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Incoming row materials identification	Visual check	Conformity with the order	/	Each delivery
2	Checking of the recipe	Visual check and measuring by means of weight or volume of the components	According to the control plan	/	Every production day
3	Reaction to fire	2.2.1	According to the control plan	1	At least once per 5 years or after modifications in case of products of class E At least once per 2 years or after modifications in case of products of classes higher than E
4	Compressive creep	2.2.2	According to the control plan	/	According to the Control Plan (*)
5	Compression set	2.2.3	According to the control plan	/	According to the Control Plan (*)
6	Compressive stress and deformation	2.2.4	According to the control plan	/	According to the Control Plan (*)
7	Dynamic elastic modulus	2.2.5	According to the control plan	/	According to the Control Plan (*)
8	Damping factor	2.2.6	According to the control plan	/	According to the Control Plan (*)
9	Flanking transmission for airborne, impact and building service equipment sound between adjoining rooms frame	2.2.7	According to the control plan	1	At modification of product-type
10	Compressive modulus	2.2.8	According to the control plan	/	According to the Control Plan (*)
11	Thickness and density	Measurement	According to control plan	1	Each batch
(*) The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.					

3.3 Tasks of the notified body

The intervention of the notified body under AVCP system 1 are necessary for reaction to fire for products for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

In this case the cornerstones of the tasks to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.1.

Table 3.3.1 Control plan for the notified body; cornerstones

	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	The Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing related to reaction to fire, taking into account productions stages limiting of organic material and/or the addition of fire retardants.	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
Continuous surveillance, assessment, and evaluation of factory production control					
2	The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan related to resistance to fire and reaction to fire, taking into account productions stages limiting of organic material and/or the addition of fire retardants.	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in table 3.2.1	According to Control plan	According to Control plan	1/year

4 REFERENCE DOCUMENTS

EN 13501-1:2018, Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests

ISO 8013:2019, Rubber, vulcanized - Determination of creep in compression or shear

EN ISO 844:2021, Rigid cellular plastics -- Determination of compression properties

EN ISO 16534:2020, Thermal insulating products for building applications - Determination of compressive creep

EN ISO 1856:2018, Flexible cellular polymeric materials - Determination of compression set

ISO 4664-1:2022, Rubber, vulcanized or thermoplastic. Determination of dynamic properties. Part 1: General guidance

EN ISO 12354-1:2017, Building acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 1: Airborne sound insulation between rooms

EN ISO 12354-2:2017, Building acoustics - Estimation of acoustic performance of buildings from the performance of elements - Part 2: Impact sound insulation between rooms

EN ISO 10848-1:2017, Acoustics - Laboratory and field measurement of flanking transmission for airborne, impact and building service equipment sound between adjoining rooms - Part 1: Frame document

ISO 7626-5:2019, Mechanical vibration and shock. - Experimental determination of mechanical mobility – Part 5: Measurements using impact excitation with an exciter which is not attached to the structure

EN ISO 10140-4:2021, Acoustics. - Laboratory measurement of sound insulation of building elements - Part 4: Measurement procedures and requirements

EN ISO 3382-2/AC:2009: Acoustics - Measurement of room acoustic parameters - Part 2: Reverberation time in ordinary rooms

ISO 3302-1:2014: Rubber – Tolerances for products – Part 1: Dimensional tolerances

ANNEX A – FLANKING SOUND TRANSMISSION

The vibration reduction index Kij is a quantity related to the transmission of vibrations through the structural elements of a junction. It is calculated as

$$K_{ij} = \frac{D_{v,ij} + D_{v,ji}}{2} + 10\log\frac{l_{ij}}{\sqrt{a_i \cdot a_j}} \quad dB \qquad \text{(A.1)}$$

Where:

- $D_{v,ij}$ [dB] is the velocity level difference between element i and j, when element i is excited.
- $D_{v,ji}$ [dB] is the velocity level difference between element j and i, when element j is excited.
- l_{ij} [m] is the common length junction length between elements i and j.
- a_i [m] is the equivalent absorption length of element i.
- a_j [m] is the equivalent absorption length of element j.

The vibration reduction index K_{ij} shall be measured using structure-borne excitation and calculated according to Formula (A.1). The required quantities are the direction-averaged level difference $D_{v,ij}$ and the equivalent absorption lengths a_i and a_j. $\overline{D_{v,ijn}}$ shall be obtained from the mean value of the velocity level differences $D_{v,ij}$ and $D_{v,ji}$, and each velocity level difference obtained by exciting one structure at several points, and by measuring the surface average velocity level of both elements i and j.
If airborne or steady-state structure-borne excitation is used, the spatial averaging is calculated using Formula (A.2)

$$L_v = 10\lg\left(\frac{v_1^2 + v_2^2 + \ldots + v_n^2}{n \cdot v_0^2}\right) \qquad \text{(A.2)}$$

Where:

- v_1, v_2, v_n are r.m.s.(root means square) velocities at n different positions on the element, in m/s.

For steady-state excitation, the velocity level difference between element i and that of an element j, is calculated using Formula (A.3):

$$D_{v,ij} = L_{v,i} - L_{v,j} \qquad \text{(A.3)}$$

If transient structure-borne excitation is used, then the normal velocity should be measured simultaneously on both elements and the velocity level difference determined using Formulae (A.4) and (A.5):

$$D_{v,ij} = \frac{1}{MN}\sum_{m=1}^{M}\sum_{n=1}^{N}\left(D_{v,ij}\right)_{mn} \qquad \text{(A.4)}$$

Where:

- M is the number of excitation positions on element i.
- N is the number of measurement positions on each element for each excitation position.
- $(D_{v,ij})_{mn}$ is the velocity level difference as given by Formula (A.5) for one excitation position and one pair of measurement positions only, in dB:

$$\left(D_{v,ij}\right)_{mn} = 10\lg\left(\frac{\int_0^{T_{int}} v_{i,mn}^2(t)\,dt}{\int_0^{T_{int}} v_{j,mn}^2(t)\,dt}\right) \qquad \text{(A.5)}$$

Where:

- v_i, v_j are the normal velocities at points on elements i and j respectively, in m/s.
- T_{int} is the integration time, in s.

Vibration measurements shall be carried out using accelerometers mounted directly onto the surface of the test element. It shall have a sufficient sensitivity and low noise in order to obtain a signal-to-noise ratio of the measurement chain that is adequate to cover the dynamic range of the response of the structure.
To generate a vibrational field, the excitation shall be steady-state (shaker) or transient (hammer or impact machine). In each frequency band, the measured velocity level on the receiving element shall be at least 10 dB higher than the background noise level in any frequency band. If this is not fulfilled, corrections shall be applied as described in EN ISO 10140-4. The correction value shall not exceed 1,3 dB.

The equivalent absorption length is given by:

$$a = \frac{2.2\pi^2 S}{c_0 T_s}\sqrt{\frac{f_{ref}}{f}} \quad \text{(A.6)}$$

Where:

- T_s [s] is the structural reverberation time of the element i or j.
- S [m^2] is the area of the element i or j.
- f [Hz] is the centre band frequency.
- f_{ref} [Hz] is the reference frequency (1000 Hz).
- c_0 [m/s] is the speed of sound in air.

The structural reverberation time is determined with point excitation and measurements of acceleration at different measurement positions. The integrated impulse response method is used as defined in EN ISO 3382-2 with backward integration of the squared impulse response.
In general, acceleration rather than velocity should be used in order to avoid any signal processing affecting the decay curve.
The measurements shall be performed using one-third octave band filters having at least the following centre frequencies, in hertz: 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1 000, 1 250, 1 600, 2 000, 2 500, 3 150.
The $\overline{K_{ij}}$ value, is the arithmetic average of K_{ij} within the above-mentioned frequency range (one-third octave bands)
$\Delta_{l,ij}$ for a specific path is calculated as difference between $\overline{K_{ij}}$ of the same path with and without resilient interlayer.

$$\Delta_{l,ij} = \overline{K_{ij,with}} - \overline{K_{ij,without}} \quad \text{(A.7)}$$