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NEW ELASTIC PARTITION WALLS

BY

GH. COLBU*

“Gheorghe Asachi” Technical University of Iaşi
Faculty of Civil Engineering and Building Services

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Abstract. Acoustic requirements of internal partition elastic walls is achieved by a judicious design which takes into account the amount, characteristics and location of these components in the wall structure. For this purpose was designed a new type of elastic partition light wall with a role to improve sound insulation index (*R*).

To meet acoustic requirements within residential buildings, buildings for administrative and technical activities, hospitals, schools, easy elastic partitions, ensure good behavior in airborn noise coming from inside the functional units of the same type and of the related.

Key words: acoustic requirements; elastic rubber pieces; reinforced densified plaster boards; noise reduction.

1. Introduction

In order to eliminate the effects of noise, it is necessary that both partitions are the same as between functional units and between apartments and stairwells should provide as good sound insulation.

The building houses, administrative and technical buildings, hospitals and schools are currently used systems of bulkheads with plaster board posed

* *e-mail*: dcolbu@yahoo.com

on metallic tiles (metal profiles CW) with mineral wool in interspaces between the plates (Fig. 1).

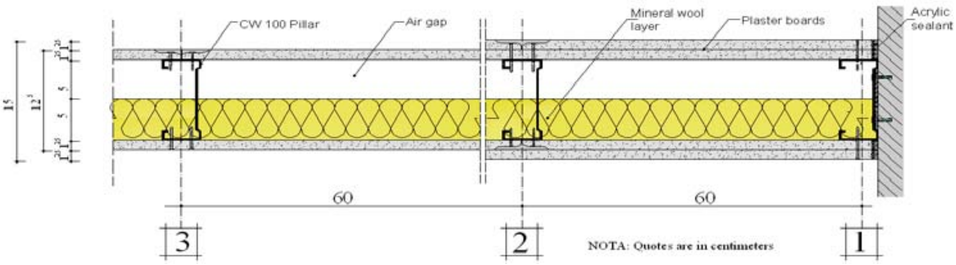

Fig. 1. – Bulkheads with metallic tiles (CW profiles) and plaster boards.

These types of bulkheads have the disadvantage that rigid link elements leading to a lower output noise than classical walls made of brick or BCA, which provides good isolation by their mass air noise.

2. Acoustic Requirements

In order to solve the acoustic requirements, the concept of new type elastic partition walls, the role of improving the sound insulation index (*R*), was created.

Sound insulation to certain limits to the requirement of elastic partition walls is achieved by: increasing the wall thickness, position within the area median mineral wool sound-absorbing layer, thickness and number of layers of reinforced plaster boards dispersed.

To the elastic partition walls, the elastic rubber parts have a significant importance in sound insulation, with a sound wave attenuation role in the “mass–spring–mass” system.

Positioning the mineral wool layer according to reinforced densified plaster boards influences the reduction index, which is higher if mineral wool layer is positioned joined to reinforced densified plaster boards, to the noise source.

Changing the direction of the noise source, this positioning of the mineral wool would not provide the same sound proofing. To eliminate this disadvantage, will adopted the following solution: reinforced densified plaster boards– mineral wool layer– air gap– reinforced densified plaster boards.

3. *In situ* Measurements

The novelty consists in creating a system of elastic partition walls, used to partition with role of increasing insulation index (*R*) (Fig. 2).

Composition design of elastic partition walls – profiles of 0.7 mm steel sheet cold-formed four pieces are assembled by means of end rubber parts

(Fig. 3 *b*) and field rubber parts (Fig. 3 *a*), hardness between 40…70 shores, are forming pillars, on which are fixed the reinforced disperse densified plaster plates boards with drilling screws.

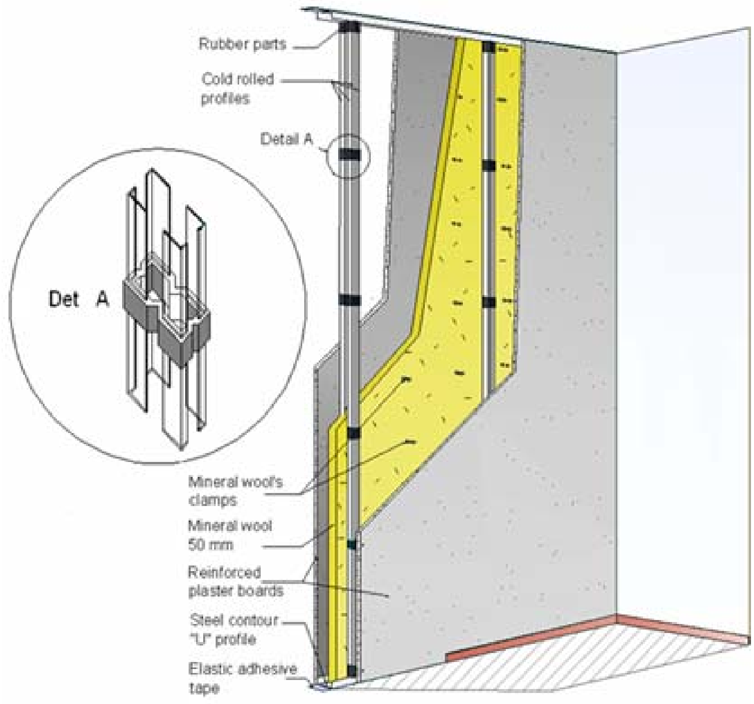

Fig. 2. – Elastic partition walls

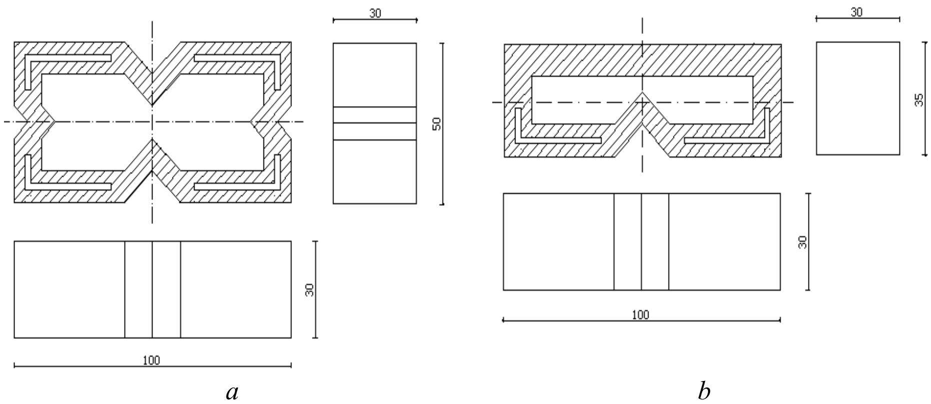

Fig. 3. – *a* – Field rubber parts; *b* – end rubber parts.

The distance between tiles is 600 mm horizontally, while on vertical, on the tiles structure, are placed rubber parts at a distance of 600 mm.

The role of rubber parts is to distance themselves the two sides of the wall (breaking the rigid links between sides) and noise attenuation, working as a spring.

Making process of this invention consists in the production of the rubber pieces mold shown in the Figs. 3 *a* and 3 *b*; draw axis on the plan where wall will be mounted; fixing the perimeter elements of the bulkhead; assembling and fixing tiles made through rubber parts and cold rolled sheet; mounting on one side of the wall of reinforced densified plaster boards through-drilling screws; mounting sound absorbing layer; mounting closing reinforced densified plaster boards; finishing joints between the plates; sealing contour perimeter on both sides of the wall.

To minimize sound propagation on collateral pathways, the tested wall was isolated through a perimetral acrylic sealant on both sides. In addition to using acrylic sealant, to reduce cracks it is used the joints sealant armed with fiber glass tape.

The soundproofing the inland side is better, the more effectively will be worth the acoustic performance of elastic partition walls.

The tested wall split the room în two chambers **–** emission (L_1) and reception (L_2) according to Fig. 4**.**

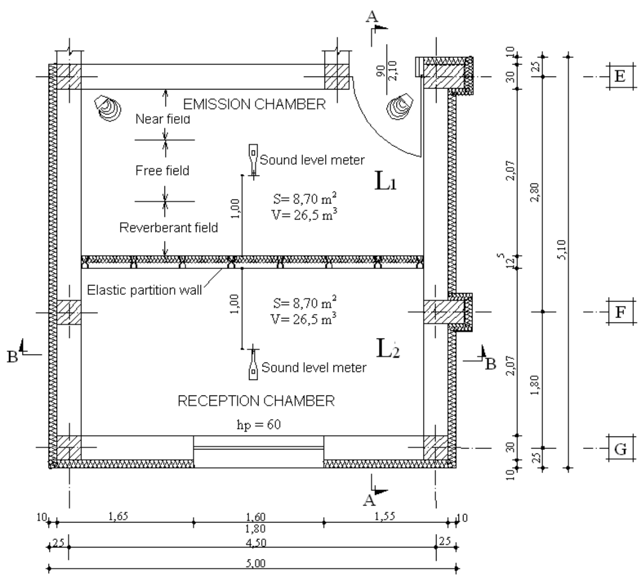

Fig. 4 – Emission chamber; reception chamber.

For *in situ* measurements were made by assembling and disassembling more types of elastic partition walls as follows:

a) partition walls on metal structure (metal profile CW100) and a layer of gypsum-cardboard plates (Fig. 1);

b) partition wall on metal structure (metal profile CW100) and two layers of gypsum-cardboard plates (Fig. 1);

c) elastic partition walls, with rubber parts which differ as follows: 40 shore; 50 shore; 60 shore; 70 shore with 1 layer / 2 layers of reinforced densified plaster boards (Fig. 5).

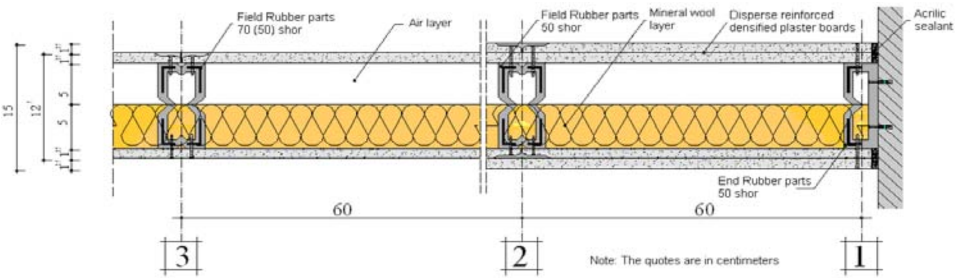

Fig. 5 – Horizontal section of elastic partition walls.

In the emission chamber was installed the equipment for noise emission, consisting of a low frequency generator (E0501, 1 Hz up to 1 MHz), the amplifier and speakers for sound on each sudied frequency.

The frequencies at which measurements were made are: 125 Hz, 250 Hz, 500 Hz, 1,000 Hz, 2,000 Hz, 4,000 Hz.

The *in situ* measurements were made using a sound level meter type Volcraft SL-100, disposed at a distance of 1 m from the tested wall, and the height of 1 m, 1.5 m and 2 m, both in emission and reception chamber.

Sound reduction index was determined after measurements using the relationship

$$R = L_1 - L_2 + 10\log\frac{S}{A}, \tag{1}$$

where: L_1 is the emission chamber noise level, [dB]; L_2 – reception chamber noise level, [dB]; S – tested wall area, [m^2]; A – reception chamber equivalent absorption; $A = 0.163\,V/T$.

4. Conclusions

The *in situ* results (Fig. 6) have shown that the elastic partition walls increase substantially the airborne noise attenuation (R) because of

a) rubber parts elasticity which varies depending on the number of off shore use in the manufacture of rubber (40…70 shore);

b) reinforced disperse densified plaster boards, made by increasing the mass (introduction of a quantity of sand in the composition of boards).

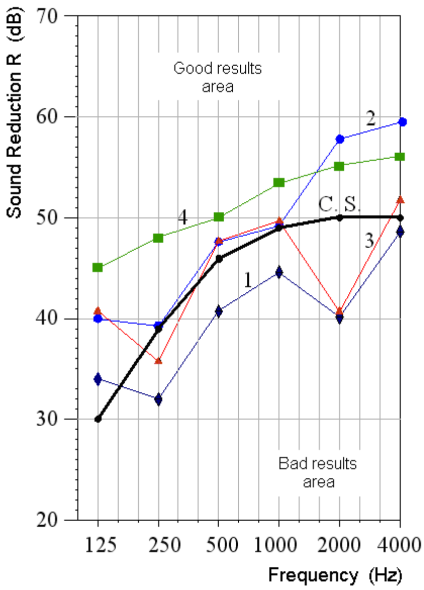

Fig. 6 – *In situ r*esults: 1 – Partition wall on metallic structure (CW 100 profiles) with one layer of gypsum-cardboard plates; 2 – Elastic partition wall (tiles mounted by rubber parts of 50 shore) with one layer of reinforced densified plaster boards; 3 – Partition wall on metallic structure (CW 100 profiles) with two layers of gypsum-cardboard plates; 4 – Elastic partition wall (tiles mounted by rubber parts of 50 shore) with two layers of reinforced densified plaster boards; C.S. – Standard curve.

Following *in situ* measurements made on the elastic partition wall with rubber parts of 40…70 shore for composition of tiles, concluded that variant design the best structure for airborne noise insulation is as follows: tiles is made of sections cold rolled sheet assembled using 0.7 mm, rubber parts with hardness of 50 shore and reinforced densified plaster boards fixed to both sides in one layer or two layers.

Good behavior of elastic walls to the airborne noise (the high frequency spectrum – over 2,000 Hz) is due to elasticity of rubber parts that make the wall to act as a spring (*2*) in comparison with classic wall structure with tiles of profiles CW100 and a layer of gypsum-cardboard plates (*1*). The double layer of reinforced densified plaster boards on both sides of the wall (*4*) curve measured values is much improved on the whole frequency spectrum, as compared with elastic partition wall with one layer of reinforced densified plaster boards (*2*) and with wall CW100 classic profiles and double layer gypsum-cardboard plates (*3*).

As required by acoustic noise easy elastic air partitions can be used to the division of housing buildings and technical and administrative, hospitals and schools.

The acoustic experiments suggest constructive composition of elastic partitions walls to delimit outer functional units with the following structure: double layer of reinforced densified plaster boards – elastic rubber parts 50 shore – 5 cm layer of mineral wool – 5 cm layer air gap – double layer of reinforced densified plaster boards (*4*).

To the partitioning of the rooms can be used elastic partitions walls that have the following composition design: simple layer of reinforced densified plaster boards – elastic rubber parts 50 shore – mineral wool 5 cm – 5 cm layer of air gap – simple layer reinforced densified plaster boards (*2*).

REFERENCES

Ciornei Al., *Noi elemente de construcţii civile din ipsos armat*. Ed. Junimea, 2004.
Ciornei Al., *Ingineria clădirilor*. Ed. Junimea, 2006.
Ciornei Al., Colbu Gh., *Pereți interiori de compartimentare. Exigența acustică*. Rev. Constr., *72* (2011).
Ciornei Al., Colbu Gh., *Pereți interiori din ipsos armat. Experimentări acustice*. Rev. Constr., *79* (2012).
Colbu Gh., Stângaciu D., *Pereți despărțitori elastici, uşori. Procedeu de realizare*. Invention Patent Request *A 01449*, OSIM, 23.12.2011.
Colbu Gh., Stângaciu D., European Exhibition of Creativity and Innovation, Euroinvent Catalogue, Iaşi, România, May 2012.

NOI SISTEME DE PEREȚI DESPĂRȚITORI ELASTICI UŞORI

(Rezumat)

Pentru satisfacerea cerințelor acustice din interiorul clădirilor de locuit, a clădirilor pentru activități tehnico-administrative, a spitalelor, a şcolilor, s-a creat un nou tip de pereți despărțitori elastici uşori, ce asigură o bună comportare la zgomotul aerian provenit atât din interiorul unităților funcționale de acelaşi fel cât şi din cele aferente.

Buna comportare la zgomotul aerian a pereților despărțitori elastici uşori se datorează, în principal, pieselor elastice de cauciuc din structura montanților şi plăcilor de ipsos armat densificat cu care se realizează închiderea acestor tipuri de pereți. Piesele elastice din cauciuc asigură desolidarizarea celor două fețe ale peretelui făcând ca sistemul să se comporte ca un resort.