

AUTHENTICATED TRANSLATION FROM THE POLISH LANGUAGE

[A document containing two pages has been submitted for translation. The translator's remarks have been included in square brackets in italics.]

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Test result confirmation

In the period from November 2017 to April 2019, the scientific research paper 'Development of a new service – hotel room arrangement with acoustic comfort improvement, including new product development – sound absorbing furniture' was prepared at the Silesian University of Technology. It is entered in the register under number NB/326/RAU1/2017. The research was ordered by Lupus Producent Mebli Krystyna Hyla with registered office in Katowice at ul. Bednorza 2a.

As a result of the performed research, **sound absorbing and diffusing furniture** allowing to provide high acoustic comfort to the hotel room users was designed, at the same time setting a new standard for high class rooms. Acoustic properties in the test room arranged on the basis of the obtained test results as well as in the comparative room fitted with standard furniture were measured. The results obtained for the test room indicate obtaining the following effects (in comparison to the results obtained for the comparative room):

- T_{60} reverberation time reduction by 38%;
- α_{av} average room absorption coefficient improvement by almost 60%;
- C_{50} clarity index improvement by 10 dB;
- obtaining a value close to the maximum value of D_{50} definition index;
- STI speech transmission index improvement by 0,12 and obtaining a very high value of 0,90.

The performed comparative analysis confirms effective functioning of the designed sound absorbing furniture.

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Description of indices applied

T_{60} room reverberation time was determined according to the Polish Standards PN-EN ISO 3382-1 and PN-EN ISO 3382-2. T_{60} time is defined as the time of the acoustic pressure decrease by 60 dB after switching on the source of the stimulation sound. It is an objective measure of interior acoustic evaluation. The following depend on it to a great extent: acoustic pressure level originating from the noise sources, speech comprehensibility, sense of intimacy in the room. The reverberation time is determined by many factors, including but not limited the size and shape of the room, type and arrangement of structural materials and elements of equipment.

The total A room acoustic absorption can be estimated if T_{60} reverberation time of the examined room is known, using Sabine's equation. On the other hand, α_{av} average room absorption coefficient can be calculated using the geometric dimensions of the room.

C_{50} clarity index was determined according to the Polish Standard PN-EN ISO 3382-1. It conditions the quality of conveyance of utterances. The early reflections that reach the listener with a delay not greater than 50 ms interfere with the direct signal as well as enhance it by improving the speech clarity. The subsequent reflections are regarded as reverberation. They affect message comprehensibility. From the technical point of view, C_{50} index compares the acoustic energy of the early reflections with the energy of the later reflections. The higher the index value, the better speech clarity. D_{50} definition index is similar to C_{50} index.

STI Speech Transmission Index was determined according to the Polish Standard PN-EN 60268-16:2011. It is an objective measure of comprehensibility of speech transmitted from the speaker to the recipient over a given acoustic trajectory. This measure depends mainly on sound distortion introduced by acoustic properties of the room as well as external interferences forming the acoustic background. The measure assumes the values from 0 to 1 where higher values mean better speech comprehensibility.

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I, Anna Wocka, a Sworn Translator of the English language, entered in the Register of Sworn Translators kept by the Minister of Justice under no. TP/109/13, hereby certify that the above is a true and accurate translation of the document drawn up in Polish and presented to me.

Mysłowice, 04.07.2019
Repertory: 513/2019

Anna Wocka

