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Client Report

February 18, 2011

**Measurement of Sound
Absorption in Accordance with
ASTM C423, Performed on
"ezoBord" in a Type D50
Mounting, for iVekter, Inc.**

B3493.1 Final



National Research
Council Canada

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A Client Report based on the results of the IRC Research Project on:

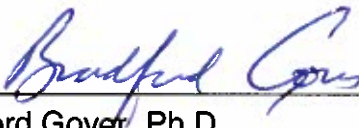
Measurement of Sound Absorption in Accordance with ASTM C423


for


iVekter, Inc.
Burlington, ON
L7P 5B7

February 18, 2011

Measurement of Sound Absorption in Accordance
with ASTM C423, Performed on "ezoBord" in a Type
D50 Mounting, for iVekter, Inc.

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Report No: B3493.1
Report Date: February 18, 2011
Contract No: B3493
Reference: Agreement dated 11 February, 2011
Program: Indoor Environment

Client: iVekter Inc.
1550 Yorkton Crt. Unit 11
Burlington, Ontario L7P 5B7

Specimen: ezoBord 9 mm polyester fibre board

Specimen ID: B3493-2A

Construction Date: February 16, 2011

Specimen Description:

The specimen was described by the client as a polyester fibre board, with a nominal thickness of 9 mm, and was identified as "ezoBord".

Six separate panels were used to assemble a rectangular patch measuring 2.44 x 2.74 m. Four of the panels each measured 1.22 x 1.22 m, and two of the panels each measured 0.30 x 1.22 m. (The four square pieces were arranged into a large square, and the two smaller pieces were added to one side to complete the rectangle.)

The average thickness of the panels was measured to be 9 mm. The total mass of the panels was 13.6 kg. The average density of the panels was 226 kg/m³.

Test Specimen Installation:

During the measurements, the test specimen was installed on the floor of the reverberation room in a "Type D50 Mounting", as defined in ASTM E795: laid on (nominal) 50 mm thick furring strips, creating an enclosed air space behind the specimen. The furring strips were placed under all joints between the panels, and under the perimeter edges, flush with the perimeter edges of the specimen. The furring strips were wood, 50 mm high, 38 mm wide, and held together with screws. Cloth tape was used to seal the perimeter edges of the test specimen to the furring strips, and to cover the furring strips themselves and to seal them to the facility floor. All joints between the panels comprising the specimen were taped with 25 mm wide cloth tape.

The specimen was tested in one position in accordance with procedures of ASTM C423. The area used for the calculation of sound absorption coefficients was 6.69 m².

The results in this report apply only to the specimen that was tested. NRC does not represent that the results in this report apply to any other specimen.

Sound absorption measurements were conducted in accordance with the requirements of ASTM C423, "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method"

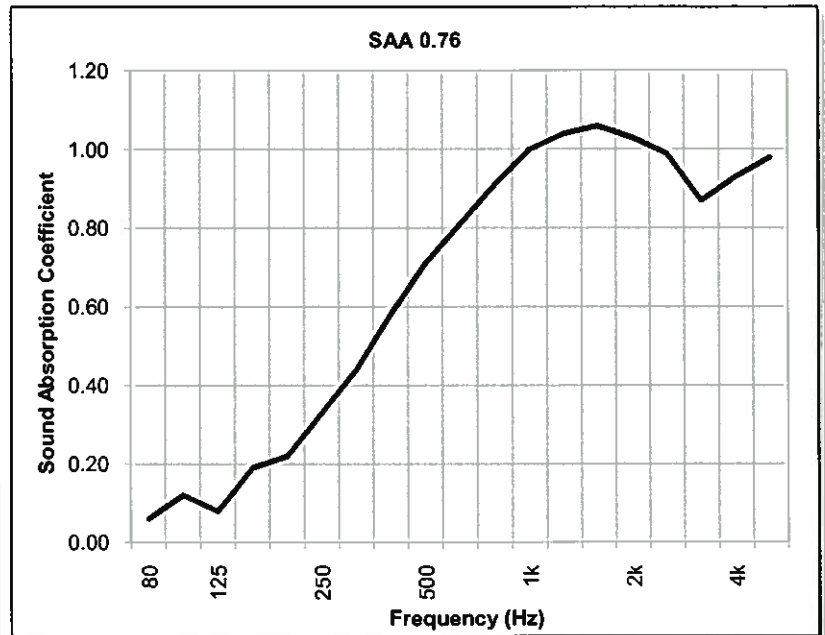
Client: iVekter Inc.
 Specimen ID: B3493-2A
 Test ID: ABA-11-003
 Date Tested: February 16, 2011

Large Chamber Volume 250.9 m³
 Specimen Surface Area 6.69 m²

Measured Temperature and Relative Humidity During Testing

	Temperature, °C	Humidity %
Large	20.7	52.1

Frequency (Hz)	Sound Absorption Coefficient	95% Confidence Limits
80	0.06	± 0.08
100	0.12	± 0.08
125	0.08	± 0.04
160	0.19	± 0.04
200	0.22	± 0.03
250	0.33	± 0.02
315	0.44	± 0.01
400	0.58	± 0.01
500	0.71	± 0.02
630	0.81	± 0.02
800	0.91	± 0.01
1000	1.00	± 0.01
1250	1.04	± 0.01
1600	1.06	± 0.01
2000	1.03	± 0.01
2500	0.99	± 0.01
3150	0.87	± 0.01
4000	0.93	± 0.01
5000	0.98	± 0.01
Sound Absorption Average (SAA)		0.76
Noise Reduction Coefficient (NRC)		0.75



In the graph:

Solid line is the measured sound absorption coefficient calculated for this specimen according to ASTM C423.

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**APPENDIX:
Sound Absorption
M-27 Facility**

National Research Council Canada
Institute for Research in Construction
Acoustics Laboratory
1200 Montreal Road, Ottawa, Ontario K1A 0R6
Tel: 613-993-2305 Fax: 613-954-1495

Facility and Procedure: The facility for absorption testing has a reverberation room with nominal volume of 250 m³. The room has four loudspeakers driven by separate amplifiers and noise sources controlled by a computer. To increase the randomness of the sound field, there are fixed and moving diffusing panels in the room. In this room, a calibrated Bruel & Kjaer type 4166 microphone with preamp is moved under computer control to nine repeatable positions, and measurements of sound decays are made. Sound absorption measurements are conducted in accordance with the requirements of ASTM C423-02a, "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method". Mean empty room reverberation times are obtained by averaging the measurements of ten decays at each of nine microphone positions. Similarly, mean reverberation times are obtained with the specimen in the chamber, at 9 microphone positions for each test specimen position; the latter depends on the specimen mounting (see below). The mean reverberation times are then used to calculate the absorption coefficient in each one-third-octave band.

Specimen Mounting: Standard mounting conditions for absorption testing conform to ASTM C423-02a and ASTM E795-00 "Standard Practices for Mounting Test Specimens During Sound Absorption Tests." Mountings normally used at this laboratory include:

- *A Mounting*—The test specimen is laid directly on the floor, with its perimeter edges covered by a wood frame that is sealed to the floor. Measurements are made for one standard position.
- *E400 Mounting*—The test specimen is installed in a standard frame (area 2.74 m x 2.44 m) that supports the specimen 400 mm above the chamber floor. Measurements are made for two standard positions, with the frame sealed to the floor.
- *Office screen*—This special case is referred to as "Type K Mounting" in ASTM E795-00. Measurements are made for three standard positions, with the test specimen standing on the floor.

Sound Absorption Coefficients: Sound absorption for a specimen is measured in square metres. "1 m² of absorption" may be thought of as one square metre of perfect absorber. Sound absorption coefficients are derived by dividing the sound absorption of the complete specimen (metric sabins) at each frequency by the total surface area of a specimen in square metres. Diffraction effects usually cause the effective area of a specimen to be greater than its geometrical area thereby increasing the measured absorption coefficient. When the coefficients are large, the measured values may exceed unity, but no adjustments to the measured coefficients are made.

Sound Absorption Average (SAA), and Noise Reduction Coefficient (NRC) are single number ratings calculated from measured sound absorption coefficients, as specified in ASTM C423-02a. SAA is the average of the sound absorption coefficients of a material for the one-third-octave bands from 200 through 2500 Hz, inclusive, rounded to the nearest multiple of 0.01. NRC is the average of the sound absorption coefficients of a material for 250, 500, 1000 and 2000 Hz rounded to the nearest multiple of 0.05. The higher the SAA or NRC value, the greater the average sound absorption.

Confidence Limits and Significance of Test Results: Acoustical measurement in rooms is a sampling process and as such has associated with it a degree of uncertainty. By using enough microphone and loudspeaker positions, the uncertainty can be reduced and upper and lower limits assigned to the probable error in the measurement. These limits are called 95% confidence limits. They are calculated for each test according to the procedures in ASTM C423-02a and must be less than upper limits given in the standards. These confidence limits do not relate directly to the variation expected when a nominally identical specimen is built, installed and tested (repeatability). Nor do they relate to the differences expected when nominally identical specimens are tested in different laboratories (reproducibility). Standard test procedures require measurements in 1/3-octave bands over a specified frequency range (100 to 5000 Hz for ASTM C423-02a). Within this range, reproducibility has been assessed by inter-laboratory round robin studies. The standards recommend making measurements and reporting results over a larger frequency range, and this report presents such results, which may be useful for expert evaluation of the specimen performance.

The results in this report apply only to the specimen that was tested. NRC does not represent that the results in this report apply to any other specimen.

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