

Vetrom Oy
Jouko Urpolahti
Uusi-Jaakkolan polku 40
27320 IHODE
jouko.urpolahti@blocko.design



DETERMINATION OF EQUIVALENT SOUND ABSORPTION AREA IN LABORATORY CONDITIONS

1 CLIENT

Vetrom Oy, Jouko Urpolahti. Tender November 29, order November 30, 2021.

2 DESCRIPTION OF THE COMMISSION

The test specimen was BLOCKO OPEN design acoustic booth. Equivalent sound absorption area of the test specimen A_{obj} was measured within 1/3-octave bands 100–5000 Hz according to ISO 354:2003.

3 RESULTS

The equivalent sound absorption area of the test specimen A_{obj} [m²] in the octave bands 125–4000 Hz is presented in Table 1. Detailed results are presented in Annex 1.

Table 1. The equivalent sound absorption area of the test specimen A_{obj} [m²] in the octave bands 125–4000 Hz.

f [Hz]	125	250	500	1000	2000	4000
A_{obj} [m ²]	2.9	4.7	4.7	4.8	5.9	8.8

4 SIGNATURES



Valtteri Hongisto
Research Group Leader



Jukka Keränen
Specialized Research Scientist

Turku University of Applied Sciences
Acoustics Laboratory

ANNEXES

- Annex 1 – Test results (1 page)
- Annex 2 – Mounting of specimen (1 page)
- Annex 3 – Measurement arrangements (1 page)

Determination of sound absorption area according to ISO 354:2003 in laboratory conditions

Specimen id: BLOCKO OPEN design

Manufacturer: Vetrom Oy, Pori, Finland

Client: Vetrom Oy

Contact person: Jouko Urpolahti

Mounting by: Vetrom Oy

Test laboratory: Turku University of Applied Sciences, Acoustics Laboratory
Joukahaisenkatu 7, 20520 Turku, Finland

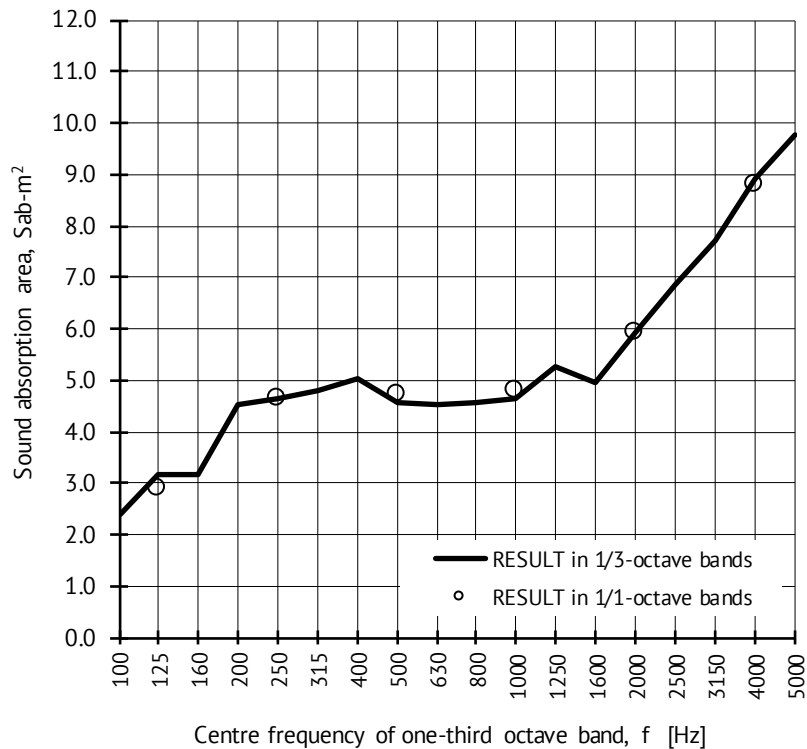
Number of objects, N : 1 Test room volume: 201 m³

Temperature of test room: 19 19 °C (without / with specimen) Room boundary area: 224 m²

Relative humidity: 33 36 % (without / with specimen) Test date: 10.12.2021

Atmospheric pressure: 101 101 kPa (without / with specimen) Test file identification: T101221C

f (Hz)	1/3 1/1	
	A _{obj} (m ²)	A _{obj} (m ²)
100	2.4	
125	3.1	2.9
160	3.2	
200	4.5	
250	4.6	4.7
315	4.8	
400	5.0	
500	4.6	4.7
630	4.5	
800	4.5	
1000	4.6	4.8
1250	5.3	
1600	5.0	
2000	5.9	5.9
2500	6.9	
3150	7.7	
4000	8.9	8.8
5000	9.8	



ANNEX 2 – MOUNTING OF SPECIMEN

The specimen was assembled in the middle zone of the reverberation room (201 m³). The distance from the walls was over 1.0 m. The depth of the specimen was 1100 mm and outer diameter of the circular shape 2155 mm.



Figure A3.1. The front side of the test specimen.



Figure A3.2. The test specimen in the measurement location in the reverberation room.



Figure A3.3. The reverberation room without the test specimen.

ANNEX 3 – MEASUREMENT ARRANGEMENTS

1 Acoustical measurements

The test signal was produced to the test room using three fixed omnidirectional loudspeakers (6 x Seas W12CY001). The test signal (pink noise) was produced by a real time analyzer (Soundbook MK2, serialnr. #07351) and amplified with terminal amplifier (QSC 1300 W USA). The sound pressure level in the reverberation room was measured with the condenser microphone (Bruel&Kjær 4165, serialnr. 1829762) and the pre-amplifier (Bruel&Kjær 2669, serialnr. -).

The reverberation time at third-octave bands was measured with the real time analyzer (Soundbook MK2, serialnr. #07351) using 20 dB decay range. All frequency bands were measured using 3 fixed source positions and 4 microphone positions. The total number of reverberation time measurements was 12.

The acoustical measurement equipment fulfilled the following IEC standards and grades of accuracy:

IEC 61672	Sound level meters	class 1
IEC 61260	Octave-band and fractional-octave-band filters	class 1
IEC 60942	Sound level calibrators	class 1

The test laboratory operates in conformance with EN/ISO/IEC 17025.

2 Other measurements

The temperature, the ambient atmospheric pressure and the relative humidity of the measurement room were measured using an environmental measurement device (Thermo Recorder TR-73U, serialnr. E00009). The dimensions of the specimen were measured with a roll meter (Stanley FatMax). The microphone positions and specimen's location were measured with laser distance meter (Bosch GLM 500).

3 The test room

The reverberation room was equipped with five fixed diffuser panels. The positions were selected randomly in respect with altitude, angle, and position. The number of diffusers and their arrangement fulfills the requirements of Annex A in ISO 354. The reverberation time of the empty reverberation room fulfills the requirements of ISO 354 for 200 m³ test room.

4 References to the ISO standards

Test: ISO 354:2003 (E) Acoustics - Measurement of sound absorption in a reverberation room, International Organization for Standardization, 2003, Genève, Switzerland.

SFS-EN ISO 12999-2:2020 (E) Acoustics – Determination and application of measurement uncertainties in building acoustics. Part 2: Sound absorption, International Organization for Standardization, 2020, Genève, Switzerland.