

9WOOD, INC. ACOUSTICAL PERFORMANCE TEST REPORT

SCOPE OF WORK

ASTM C423 SOUND ABSORPTION TESTING ON 1000 SERIES SKU 1113-6 CROSS PIECE WOOD GRILLES WITH FIBERGLASS DUCT LINER

REPORT NUMBER

H5145.04-303-11 R0

TEST DATES

10/06/17 - 10/11/17

ISSUE DATE

11/06/17

RECORD RETENTION END DATE

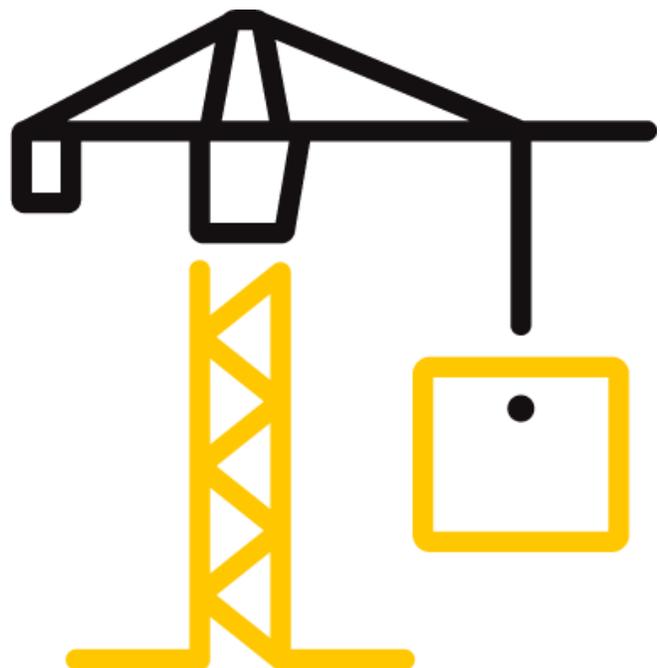
10/18/21

PAGES

12

DOCUMENT CONTROL NUMBER

ATI 00270 (07/24/17)
RT-R-AMER-Test-2755
© 2017 INTERTEK



TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

REPORT ISSUED TO

9WOOD, INC.

999 South A Street

Springfield, Oregon 97477

SECTION 1

SCOPE

Intertek Building & Construction (B&C) was contracted by 9Wood, Inc. to perform a sound absorption test. Results obtained are tested values and were secured by using the designated test method(s). The complete test data is included herein. The client provided the test specimen. All measurements were conducted in the HT test chambers at Intertek B&C located in Lake Forest, California.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

| | | | |
|----------------------|-------------------|---------------------|--------------------|
| COMPLETED BY: | Leeland S. Hoover | REVIEWED BY: | Bradlay D. Hunt |
| TITLE: | Technician I | TITLE: | Laboratory Manager |
| SIGNATURE: | | SIGNATURE: | |
| DATE: | 11/06/17 | DATE: | 11/06/17 |

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample(s) tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.



TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

SECTION 2

SUMMARY OF TEST RESULTS

| SERIES/MODEL | | 1000 Series SKU 1113-6 Cross Piece Wood Grilles | | | | | | |
|----------------------|---|---|------|------|------|------|------|------|
| SAMPLE TYPE | | Wood Ceiling | | | | | | |
| MOUNTING TYPE | | Type A | | | | | | |
| DATA FILE NO. | 1/3 OCTAVE SOUND ABSORPTION COEFFICIENTS AT THE OCTAVE BAND FREQUENCIES | | | | | | NRC | SAA |
| | 125 | 250 | 500 | 1000 | 2000 | 4000 | | |
| H5145.01D | 0.15 | 0.78 | 0.99 | 0.82 | 0.85 | 0.80 | 0.85 | 0.85 |

| SERIES/MODEL | | 1000 Series SKU 1113-6 Cross Piece Wood Grilles | | | | | | |
|----------------------|---|---|------|------|------|------|------|------|
| SAMPLE TYPE | | Wood Ceiling | | | | | | |
| MOUNTING TYPE | | Type E400 | | | | | | |
| DATA FILE NO. | 1/3 OCTAVE SOUND ABSORPTION COEFFICIENTS AT THE OCTAVE BAND FREQUENCIES | | | | | | NRC | SAA |
| | 125 | 250 | 500 | 1000 | 2000 | 4000 | | |
| H5145.01H | 0.78 | 0.93 | 0.89 | 0.98 | 0.87 | 0.65 | 0.90 | 0.93 |

SECTION 3

TEST METHOD(S)

The specimens were evaluated in accordance with the following:

ASTM C423-17, *Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method*

ASTM E795-16, *Standard Practices for Mounting Test Specimens During Sound Absorption Tests*

SECTION 4

SPECIMEN MOUNTING

For the Type A mounting, the test specimen was placed directly against the floor of the reverberation room with the absorptive side facing the sound field. The perimeter of the specimen was sealed to the floor with plywood and duct tape.

For the Type E-400 mounting, the specimen was placed on the Type E test assembly so that the absorptive face of specimen was suspended 400 mm above the floor of the reverberation room. The perimeter of the specimen was sealed to the test assembly with duct tape. The perimeter of the test assembly was sealed to the floor with duct tape.

TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

SECTION 5 EQUIPMENT

The equipment listed below meets the requirements of the test methods stated in Section 3 of this report.

INSTRUMENTATION

| INSTRUMENT | MANUFACTURER | MODEL | DESCRIPTION | ASSET # | CAL DATE |
|--------------------------------------|----------------------|----------|-----------------------------|----------|----------|
| Data Acquisition Unit | National Instruments | PXI-4462 | Input Card | INT00627 | 10/16 * |
| Data Acquisition Card | National Instruments | PXI-4462 | Data Acquisition Card | INT00395 | 10/16 |
| Data Acquisition Card | National Instruments | PXI-4462 | Data Acquisition Card | INT00396 | 10/16 |
| Data Acquisition Card | National Instruments | PXI-4462 | Data Acquisition Card | INT00397 | 10/16 |
| Source Room Microphone | PCB Piezotronics | 378B20 | Microphone and Preamplifier | INT00239 | 04/17 |
| Source Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT00240 | 04/17 |
| Source Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT00241 | 04/17 |
| Source Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT00242 | 04/17 |
| Source Room Microphone | PCB piezotronics | 378C20 | Microphone and Preamplifier | INT00243 | 04/17 |
| Receive Room Microphone | PBC Piezotronics | 378C20 | Microphone and Preamplifier | INT00244 | 04/17 |
| Receive Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT00245 | 04/17 |
| Receive Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT00246 | 04/17 |
| Receive Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT00247 | 04/17 |
| Receive Room Microphone | PCB Piezotronics | 378C20 | Microphone and Preamplifier | INT00228 | 04/17 |
| Receive Room Environmental Indicator | Comet | T7510 | Receive Room | INT00299 | 10/17 |
| Source Room Environmental Indicator | Comet | T7510 | Source Room | INT00300 | 10/17 |
| Microphone Calibrator | Norsonic | 1251 | Pistonphone Calibrator | INT00288 | 06/17 |

*- Note: The calibration frequency for this equipment is every two years per the manufacturer's recommendation.

TEST CHAMBER

| | VOLUME | DESCRIPTION |
|--------------|--------------------|---|
| RECEIVE ROOM | 231 m ³ | Rotating vane and stationary diffusers Temperature and humidity controlled Isolation pads under the floor |
| SOURCE ROOM | 196 m ³ | Stationary diffusers only Temperature and humidity controlled |

| | MAXIMUM SIZE | DESCRIPTION |
|-----------------|----------------------------|--|
| TL TEST OPENING | 4.27 m wide by 3.05 m high | Vibration break between source and receive rooms |

N/A-Not Applicable

TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

SECTION 6

LIST OF OFFICIAL OBSERVERS

| NAME | COMPANY |
|-------------------|--------------|
| Leeland S. Hoover | Intertek B&C |
| Ryan R. Lau | Intertek B&C |

SECTION 7

TEST PROCEDURE

The sensitivity of the microphones was checked before measurements were conducted. Empty room sound absorption measurements were conducted before the specimen was installed. Full room sound absorption measurements were conducted after the specimen was installed.

For the empty and full room measurements, ten decay measurements were conducted at each of the five microphone positions. Data was obtained at 1/3 octave band frequencies ranging from 80 to 5000 hertz. The air temperature and relative humidity conditions were monitored and recorded during the measurements.

Intertek B&C will store samples of test specimens for four years.

SECTION 8

TEST CALCULATIONS

The Sound Absorption Coefficient is the full room absorption minus the empty room absorption divided by the area of the sample in m². The Sound Absorption Coefficient is dimensionless.

The Noise Reduction Coefficient (NRC) rating is the arithmetic average of the sound absorption coefficients at 250, 500, 1000 and 2000 hertz. The average is rounded to the nearest multiple of 0.05.

The Sound Absorption Average (SAA) rating is the arithmetic average of the sound absorption coefficients at the frequencies ranging from 200 to 2500 hertz. The average is rounded to the nearest multiple of 0.01.

TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

SECTION 9

TEST SPECIMEN DESCRIPTION

Eight 0.30 m by 2.74 m panels were arranged to produce the 2.44 m by 2.74 m (96" by 108") test specimen. The cross piece wood grille consisted of 48 19 mm by 2743 mm wood pieces.

Providing an open area of 63%. The total weight of the specimen was 83.57kg.

| DESCRIPTION | THICKNESS | WEIGHT |
|---|------------------------|--|
| 1000 Series SKU 1113-6 Cross Piece Wood Grilles | 2.75 inches 69.85mm | 2.56 lbs/ft ² 12.5 kg/m ² |
| 2" Fiberglass Duct Liner | 1.80 inches 45.8 mm | 0.25 lbs/ft ² 0.11 kg/m ² |

* - Stated per Client/Manufacturer

TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

SECTION 10

TEST RESULTS

ASTM C423 SOUND ABSORPTION TEST



| | | |
|---------------|--|------|
| TEST DATE | 10/11/17 | |
| DATA FILE NO. | H5145.01D | |
| CLIENT | 9Wood, Inc. | |
| DESCRIPTION | Series/Model: 1000 Series SKU 1113-6 Cross Piece Wood Grilles with Fiberglass Duct Liner | |
| TECHNICIAN | Leeland S. Hoover | |
| SPECIMEN AREA | 6.69 m ² | |
| MOUNTING TYPE | Type A | |
| | EMPTY | FULL |
| TEMP °C | 19.7 | 20.3 |
| RH % | 50 | 47 |
| B.P. (mb) | 1012 | 1013 |

| FREQ (Hz) | EMPTY ROOM ABSORPTION (m ²) | UNCERTAINTY | FULL ROOM ABSORPTION (m ²) | UNCERTAINTY | ABSORPTION COEFFICIENT | RELATIVE UNCERTAINTY |
|--------------|---|-------------|--|-------------|---------------------------|-------------------------|
| 80 | 4.52 | 0.278 | 5.08 | 0.275 | 0.08 | 0.059 |
| 100 | 4.42 | 0.319 | 5.10 | 0.316 | 0.10 | 0.067 |
| 125 | 4.84 | 0.160 | 5.87 | 0.364 | 0.15 | 0.059 |
| 160 | 4.72 | 0.065 | 6.47 | 0.127 | 0.26 | 0.021 |
| 200 | 5.77 | 0.149 | 9.27 | 0.116 | 0.52 | 0.028 |
| 250 | 6.34 | 0.079 | 11.56 | 0.099 | 0.78 | 0.019 |
| 315 | 6.24 | 0.062 | 12.42 | 0.037 | 0.92 | 0.011 |
| 400 | 5.31 | 0.083 | 11.84 | 0.012 | 0.98 | 0.013 |
| 500 | 4.57 | 0.045 | 11.18 | 0.086 | 0.99 | 0.015 |
| 630 | 4.78 | 0.032 | 10.96 | 0.016 | 0.92 | 0.005 |
| 800 | 4.77 | 0.033 | 10.49 | 0.016 | 0.86 | 0.005 |
| 1000 | 4.74 | 0.019 | 10.19 | 0.021 | 0.82 | 0.004 |
| 1250 | 4.73 | 0.027 | 10.07 | 0.019 | 0.80 | 0.005 |
| 1600 | 4.88 | 0.013 | 10.49 | 0.016 | 0.84 | 0.003 |
| 2000 | 5.55 | 0.019 | 11.24 | 0.161 | 0.85 | 0.024 |
| 2500 | 5.70 | 0.009 | 11.67 | 0.081 | 0.89 | 0.012 |
| 3150 | 5.76 | 0.018 | 11.28 | 0.011 | 0.82 | 0.003 |
| 4000 | 5.93 | 0.007 | 11.28 | 0.008 | 0.80 | 0.002 |
| 5000 | 6.36 | 0.006 | 10.85 | 0.007 | 0.67 | 0.001 |

| | | |
|------------|------|-------------------------------|
| NRC RATING | 0.85 | (Noise Reduction Coefficient) |
| SAA RATING | 0.85 | (Sound Absorption Average) |

- Notes:
- 1) The NRC rating is the arithmetic average of the sound absorption coefficients at 250, 500, 1000, and 2000 hertz. The average is rounded to the nearest multiple of 0.05.
 - 2) The SAA rating is the arithmetic average of the sound absorption coefficients at the frequencies ranging from 200 to 2500 hertz. The average is rounded to the nearest multiple of 0.01.

TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

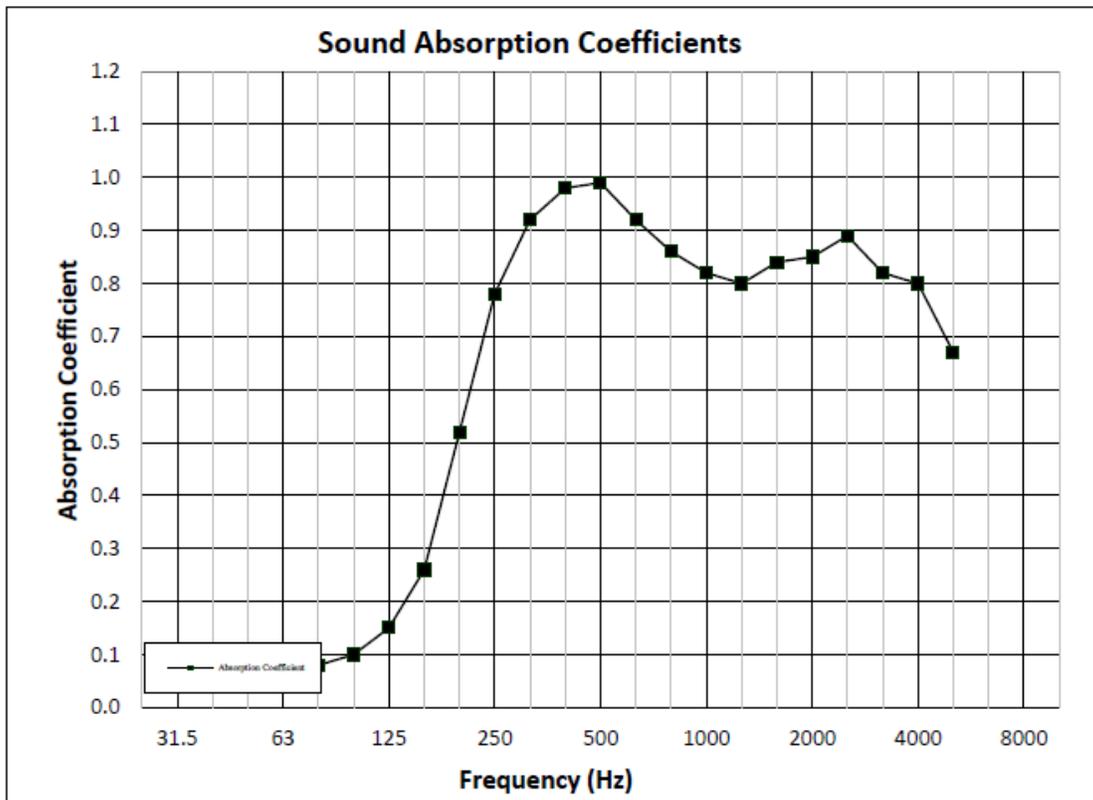
Date: 11/06/17

ASTM C423 SOUND ABSORPTION TEST



ACCREDITED
Testing
Laboratory

| | | |
|---------------|--|------|
| TEST DATE | 10/11/17 | |
| DATA FILE NO. | H5145.01D | |
| CLIENT | 9Wood, Inc. | |
| DESCRIPTION | Series/Model: 1000 Series SKU 1113-6 Cross Piece Wood Grilles with Fiberglass Duct Liner | |
| TECHNICIAN | Leeland S. Hoover | |
| SPECIMEN AREA | 6.69 m ² | |
| MOUNTING TYPE | Type A | |
| | EMPTY | FULL |
| TEMP °C | 19.7 | 20.3 |
| RH % | 50 | 47 |
| B.P. (mb) | 1012 | 1013 |



TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

ASTM C423 SOUND ABSORPTION TEST



| | | |
|---------------|--|------|
| TEST DATE | 10/11/17 | |
| DATA FILE NO. | H5145.01H | |
| CLIENT | 9Wood, Inc. | |
| DESCRIPTION | Series/Model: 1000 Series SKU 1113-6 Cross Piece Wood Grilles with Fiberglass Duct Liner | |
| TECHNICIAN | Leeland S. Hoover | |
| SPECIMEN AREA | 6.69 m ² | |
| MOUNTING TYPE | Type E400 | |
| | EMPTY | FULL |
| TEMP °C | 19.7 | 21.2 |
| RH % | 50 | 53 |
| B.P. (mb) | 1012 | 1011 |

| FREQ (Hz) | EMPTY ROOM ABSORPTION (m ²) | UNCERTAINTY | FULL ROOM ABSORPTION (m ²) | UNCERTAINTY | ABSORPTION COEFFICIENT | RELATIVE UNCERTAINTY |
|--------------|---|-------------|--|-------------|---------------------------|-------------------------|
| 80 | 4.52 | 0.278 | 7.04 | 0.304 | 0.38 | 0.062 |
| 100 | 4.42 | 0.319 | 8.05 | 0.212 | 0.54 | 0.057 |
| 125 | 4.84 | 0.160 | 10.08 | 0.253 | 0.78 | 0.045 |
| 160 | 4.72 | 0.065 | 10.22 | 0.126 | 0.82 | 0.021 |
| 200 | 5.77 | 0.149 | 12.04 | 0.060 | 0.94 | 0.024 |
| 250 | 6.34 | 0.079 | 12.56 | 0.065 | 0.93 | 0.015 |
| 315 | 6.24 | 0.062 | 12.40 | 0.037 | 0.92 | 0.011 |
| 400 | 5.31 | 0.083 | 11.60 | 0.048 | 0.94 | 0.014 |
| 500 | 4.57 | 0.045 | 10.52 | 0.137 | 0.89 | 0.022 |
| 630 | 4.78 | 0.032 | 10.97 | 0.025 | 0.93 | 0.006 |
| 800 | 4.77 | 0.033 | 11.20 | 0.035 | 0.96 | 0.007 |
| 1000 | 4.74 | 0.019 | 11.26 | 0.033 | 0.98 | 0.006 |
| 1250 | 4.73 | 0.027 | 10.99 | 0.025 | 0.94 | 0.005 |
| 1600 | 4.88 | 0.013 | 11.13 | 0.013 | 0.93 | 0.003 |
| 2000 | 5.55 | 0.019 | 11.36 | 0.088 | 0.87 | 0.013 |
| 2500 | 5.70 | 0.009 | 11.58 | 0.066 | 0.88 | 0.010 |
| 3150 | 5.76 | 0.018 | 10.93 | 0.009 | 0.77 | 0.003 |
| 4000 | 5.93 | 0.007 | 10.28 | 0.003 | 0.65 | 0.001 |
| 5000 | 6.36 | 0.006 | 9.27 | 0.011 | 0.43 | 0.002 |

| | | |
|------------|------|-------------------------------|
| NRC RATING | 0.90 | (Noise Reduction Coefficient) |
| SAA RATING | 0.93 | (Sound Absorption Average) |

- Notes:
- 1) The NRC rating is the arithmetic average of the sound absorption coefficients at 250, 500, 1000, and 2000 hertz. The average is rounded to the nearest multiple of 0.05.
 - 2) The SAA rating is the arithmetic average of the sound absorption coefficients at the frequencies ranging from 200 to 2500 hertz. The average is rounded to the nearest multiple of 0.01.

TEST REPORT FOR 9WOOD, INC.

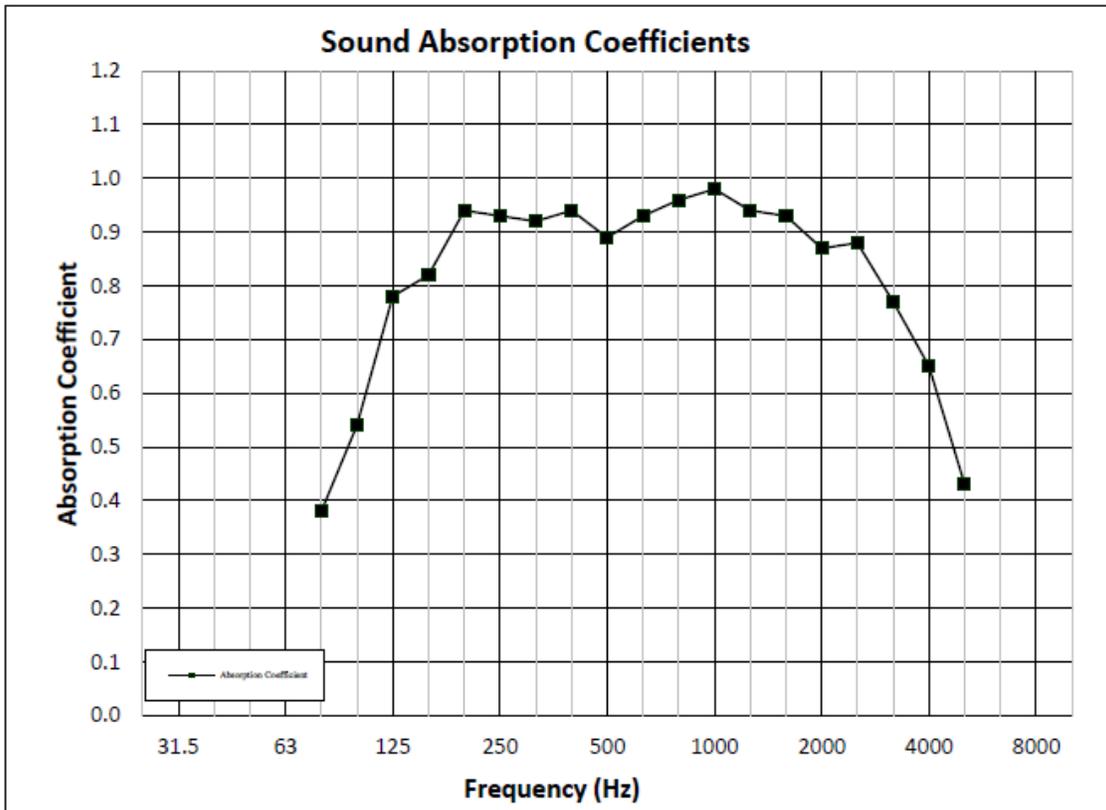
Report No.: H5145.04-303-11 R0

Date: 11/06/17

ASTM C423 SOUND ABSORPTION TEST



| | | |
|---------------|--|------|
| TEST DATE | 10/11/17 | |
| DATA FILE NO. | H5145.01H | |
| CLIENT | 9Wood, Inc. | |
| DESCRIPTION | Series/Model: 1000 Series SKU 1113-6 Cross Piece Wood Grilles with Fiberglass Duct Liner | |
| TECHNICIAN | Leeland S. Hoover | |
| SPECIMEN AREA | 6.69 m ² | |
| MOUNTING TYPE | Type E400 | |
| | EMPTY | FULL |
| TEMP °C | 19.7 | 21.2 |
| RH % | 50 | 53 |
| B.P. (mb) | 1012 | 1011 |



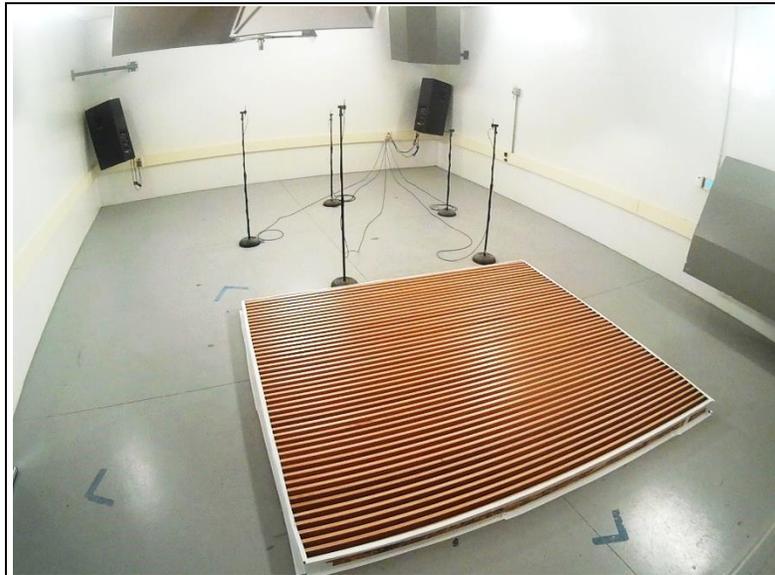
TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

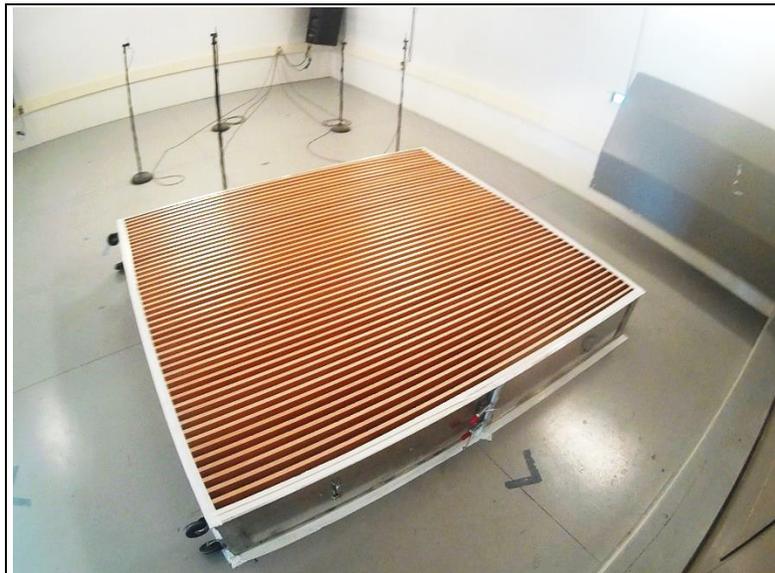
Date: 11/06/17

SECTION 11

PHOTOGRAPHS



View of Test Specimen (Type A Mount)



View of Test Specimen (Type E400 Mount)



Total Quality. Assured.

25800 Commercentre Drive
Lake Forest, California 92630

Telephone: 949-460-9600
Facsimile: 717-764-4129
www.intertek.com/building

TEST REPORT FOR 9WOOD, INC.

Report No.: H5145.04-303-11 R0

Date: 11/06/17

SECTION 12

REVISION LOG

| REVISION # | DATE | PAGES | REVISION |
|------------|----------|-------|-----------------------|
| 0 | 11/06/17 | N/A | Original Report Issue |